**INSTALLATION**

The ESD5300 speed control unit is rugged enough to be placed in a control cabinet or on the engine mounted enclosure with the control equipment. The circuit board is conformally coated to seal out moisture and resist vibration. If water, mist or condensation can come in contact with the unit, it should be mounted vertically.

This will allow any accumulated fluids to drain away from the speed control unit.

**WIRING**

See the back of this document for the wiring diagram.

**DEFINITION**

A strip chart recorder can be used to further optimize the adjustments.

**NOTES**

Active when closed

**DIAGRAM**

A thermal sensor and fuse should be provided to prevent loss of engine control, which may occur under high heat conditions.

**TECHNICAL NOTES**

An irregularity of speed above 3Hz is considered “jitter”

**FUNCTION**

For Activator Series

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Normal Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 DTC 8K</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>2 DTC 1X</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>3 DTC 2K</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

**GROUND SIGNAL**

If the system exhibits these characteristics, turn ON SW1, C2 to institute this feature. Refer to Section 6 STARTING FUEl LIMIT adjustment.

**FREQUENCY TRIM**

The overspeed monitor circuit trip point is set by the multi-turn potentiometer. This is normally set by turning the engine over several seconds with the speed control power OFF. The potentiometer will rotate the speed control output circuit and change the state of the internal relay contacts at the ESD5300. The relay contacts may be monitored as described in the previous section.

**ACCESSORY INPUT**

The auxiliary input Terminal M directly accepts output signals from GAC Load Sharing units. Auto Synchronizers and other governor system accessories. Consult the applicable GAC publications for details. It is recommended that this connection from accessories be a shielded cable as it is a sensitive input terminal.

**DUAL GAIN FEATURE**

The ESD5300 can operate with two distinct gain settings. The two gain adjustments, Gain 1 and Gain 2, are independent adjustments. With the connection from R to L and “Open,” the Gain 1 adjustment is in operation. With a connection from R to L and “Closed,” the Gain 2 adjustment is in operation. The Gain 2 adjustment should be used when fuel flow is limited in applications. The Gain 2 setting must be used when fuel flow is limited or if the engine runs faster at wide open throttle (WOT). The Gain 2 should be used when the engine is running at high speed and the operator desires a faster acceleration.

**ACCESSORY SUPPLY**

The +10 V regulated supply Terminal L can be used to provide power to GAC governor system accessories. Up to 50 watts of power can be drawn from this supply. See actuator publication for testing procedure on the actuator.

**FINAL SETTINGS**

After the Drop, Frequency Trim, and/or accessory inputs have been connected. Readout the operating SPEED and I.DLE.

**TROUBLESHOOTING**

If the engine governing system does not function, the fault may be determined by performing the voltage check at terminals N and P and refer to “Overspeed Monitor Circuit” in this section.

For testing purposes, the engine is started at WOT, then shut off, except where noted. See actuator publication for testing procedure on the actuator.

The test is performed with battery power on and the engine off, except where noted. See actuator publication for testing procedure on the actuator.

**NOTES**

The GAC Auto Synchronizer is used alone, not in conjunction with other governor accessories. It is not recommended that the GAC Auto Synchronizer be used when the frequency trim is greater than 1.5Hz. The engine should be running at rated speed as the frequency trim is increased. This is required to match the voltage levels between the ESD5300 speed controller and the GAC Load Sharing unit.

**REFERENCES**

The overspeed monitor circuit trip point is set by the multi-turn potentiometer. This is normally set by turning the engine over several seconds with the speed control power OFF. The potentiometer will rotate the speed control output circuit and change the state of the internal relay contacts at the ESD5300. The relay contacts may be monitored as described in the previous section.

**RECOMMENDATION**

After the droop, frequency trim, and/or accessory inputs have been connected, readout the operating speed and idle.

**DEFINITION**

The governed speed set point is increased by clockwise rotation of the speed adjustment potentiometer. The governor speed setting potentiometer is used with an optional 0-10 V frequency trim control. See Section 10 WIRING DIAGRAM.

**GOVERNOR SPEED SETTING**

The speed setting at which this occurs is determined by the multi-turn speed setting potentiometer. CW adjustment will increase the speed above 3Hz.

**CAUTION**

The GAC Auto Synchronizer is used alone, not in conjunction with other governor accessories. It is not recommended that the GAC Auto Synchronizer be used when the frequency trim is greater than 1.5Hz. The engine should be running at rated speed as the frequency trim is increased. This is required to match the voltage levels between the ESD5300 speed controller and the GAC Load Sharing unit.

**APPLICATION**

For testing purposes, the engine is started at WOT, then shut off, except where noted. See actuator publication for testing procedure on the actuator.

The test is performed with battery power on and the engine off, except where noted. See actuator publication for testing procedure on the actuator.

**ACCESSORY SUPPLY**

The +10 V regulated supply Terminal L can be used to provide power to GAC governor system accessories. Up to 50 watts of power can be drawn from this supply. See actuator publication for testing procedure on the actuator.

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After the Drop, Frequency Trim, and/or accessory inputs have been connected. Readout the operating SPEED and I.DLE.

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For testing purposes, the engine is started at WOT, then shut off, except where noted. See actuator publication for testing procedure on the actuator.

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The test is performed with battery power on and the engine off, except where noted. See actuator publication for testing procedure on the actuator.
## SPECIFICATIONS

### PERFORMANCE

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Operating Speed (Governed)</td>
<td>± 0.25%</td>
</tr>
<tr>
<td>Speed Range / Governor</td>
<td>1.0 - 7.5 kHz Continuous</td>
</tr>
<tr>
<td>Speed Drift with Temperature</td>
<td>± 1% Max.</td>
</tr>
<tr>
<td>Idle Speed Adjust Range</td>
<td>25 - 85% of rated speed</td>
</tr>
<tr>
<td>Droop Range</td>
<td>0 - 5% for a 1.5 A actuator current change</td>
</tr>
<tr>
<td>Speed Trim Range</td>
<td>± 200 Hz</td>
</tr>
<tr>
<td>Remote Variable Speed Range</td>
<td>120, 175, 225, 275 Actuators / SW2-7 “OFF” (24 Volt Only) 2000 Actuator / SW2 “ON”</td>
</tr>
<tr>
<td>Overload Set Point</td>
<td>2300 Hz - 8500 Hz</td>
</tr>
<tr>
<td>Crank Termination Set Point</td>
<td>200 Hz - 2050 Hz</td>
</tr>
<tr>
<td>Terminal Sensitivity</td>
<td>1.250 A</td>
</tr>
<tr>
<td>Current, Relay Contact</td>
<td>1000 Hz, ±50 Hz/Volt @ 8 K Impedance</td>
</tr>
<tr>
<td>Maximum Actuator Current</td>
<td>105 Hz, ±15 Hz/Volt @ 5 K Impedance</td>
</tr>
<tr>
<td>Maximum Current, Relay Contact</td>
<td>6.625 A</td>
</tr>
<tr>
<td>Chopping Frequency Range</td>
<td>60 - 380 Hz</td>
</tr>
</tbody>
</table>

### ENVIRONMENTAL

- Ambient Temperature: -40 to 85°C (-40 to 185°F)
- Relative Humidity: 20% - 95% (non-condensing)
- Non-conductive field of a powerful transmitting source, the shielding may require to be a special EMI class shield.
- Radiation is when the interfering signal is radiated directly through space to the governing system.
- Conduction is when the interfering signal is conducted through the interconnecting wiring to the governor system electronics.
- Insufficient Magnetic Speed Signal

If slow instability is not corrected by the above listed procedure, then a small amount of additional dead time control can be added by connecting a capacitor across the two posts below the ACCEL/DECEL adjustments. The positive side (+) of the capacitor to be connected to E3, 20 MFD and above should be used.

- EM Radiation Susceptibility - The governor system can be adversely affected by large interfering signals. Be sure to ask assistance. A strong magnetic field of a powerful transmitting source, the shielding may require to be a special EMI class shield.

### COMPLIANCE / STANDARDS

- CE and RoHS Requirements
- RS-232-C, IEEE J1939

### PHYSICAL

- Dimension: See Section 10 “Wiring & Outline Diagram”
- Weight: 3 lb

### RELIABILITY

- Voltage: 10.0, 20-100 Hz
- Shock: 10 G (11ms)
- Testing: 100% Functional Testing

---

**Insufficient Magnetic Speed Signal**

The speed control unit will govern well with 1.0 VDC RMS speed sensor signal. A speed sensor signal of 3 volt RMS or greater at governed speed is recommended. A strong magnetic field of a powerful transmitting source, the shielding may require to be a special EMI class shield.

**Electromagnetic Compatibility (EMC)**

- Radiation is when the interfering signal is radiated directly through space to the governing system.
- Conduction is when the interfering signal is conducted through the interconnecting wiring to the governor system electronics.
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- Conduction is when the interfering signal is conducted through the interconnecting wiring to the governor system electronics.

**Specifications**

For slow instability, use the SLOW INSTABILITY SEQUENCE and for fast instability, use the FAST INSTABILITY SEQUENCE. Start by setting the switches to reflect Sequence 1. If in slow instability persists, adjust the switches to reflect Sequence 2. Continue through each sequence until instability stops.

**SW1 SWITCH SETTINGS FOR INSTABILITY**

1. SW1 SW2 SW3 SW4
2. ON ON ON ON
3. OFF ON ON ON
4. OFF OFF ON ON
5. OFF OFF OFF ON
6. OFF OFF OFF OFF
7. OFF OFF OFF OFF
8. OFF OFF OFF OFF
9. OFF OFF OFF OFF
10. OFF OFF OFF OFF
11. OFF OFF OFF OFF
12. OFF OFF OFF OFF
13. OFF OFF OFF OFF
14. OFF OFF OFF OFF
15. OFF OFF OFF OFF
16. OFF OFF OFF OFF

**SW2 SWITCH SETTINGS FOR INSTABILITY**

1. SW2-1 SW2-2 SW2-3 SW2-4
2. ON ON ON ON
3. OFF ON ON ON
4. OFF OFF ON ON
5. OFF OFF OFF ON
6. OFF OFF OFF OFF
7. OFF OFF OFF OFF
8. OFF OFF OFF OFF
9. OFF OFF OFF OFF
10. OFF OFF OFF OFF
11. OFF OFF OFF OFF
12. OFF OFF OFF OFF
13. OFF OFF OFF OFF
14. OFF OFF OFF OFF
15. OFF OFF OFF OFF
16. OFF OFF OFF OFF

**Non-Periodic**

- Erratic Engine Behavior

Increasing the Gain should reduce the instability but not totally correct it. If increasing the gain reduces the instability, the problem is probably with the engine. Higher gain allows the governor to respond faster and correct for the disturbance. Look for engine hang-ups, erratic fuel system, load change, engine governor, engine speed sensor, or voltage regulator instability.

**Periodic**

- Amplitude of a signal

Slight droop.

If unsuccessful in solving instability, contact GAC for assistance.

**FAST INSTABILITY SEQUENCE**

1. Set the switches to reflect Sequence 1. If in fast instability use the FAST INSTABILITY SEQUENCE and for fast instability use the FAST INSTABILITY SEQUENCE.

**SLOW INSTABILITY SEQUENCE**

1. Set the switches to reflect Sequence 1. If in slow instability use the SLOW INSTABILITY SEQUENCE and for fast instability use the FAST INSTABILITY SEQUENCE.