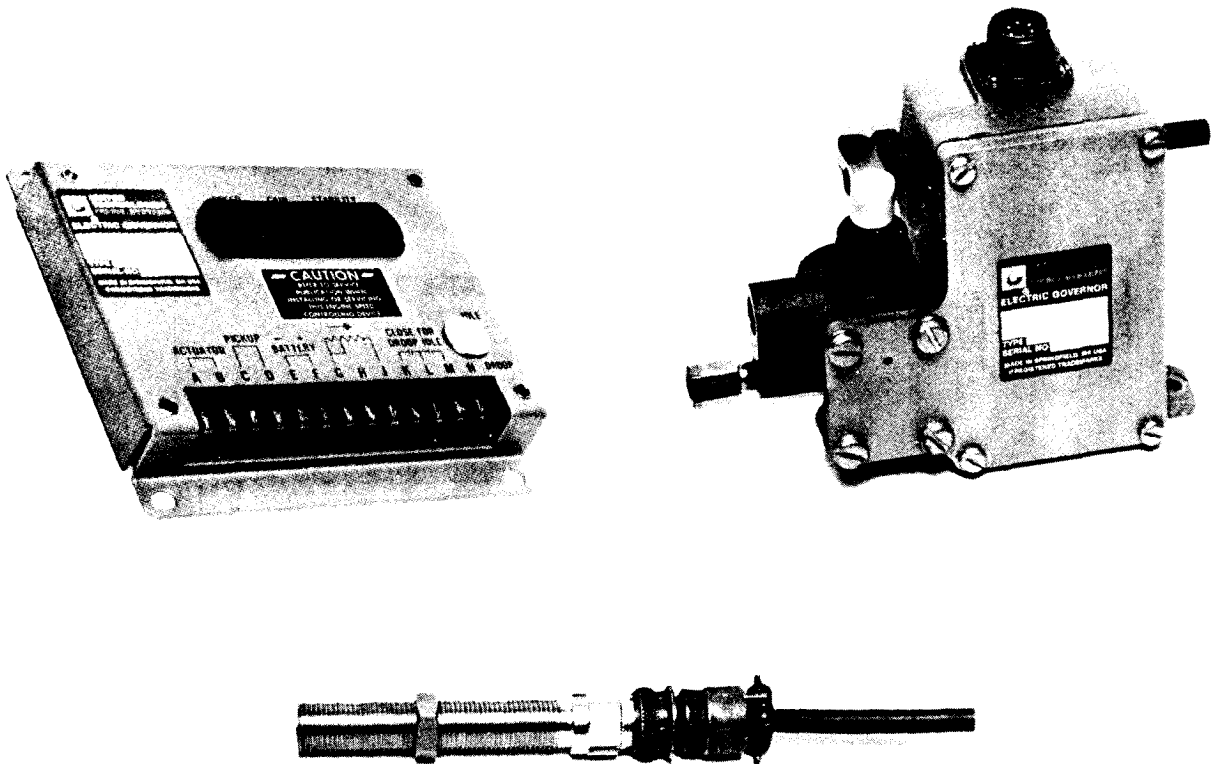


SECTION EG 80-2B

AMBAC
INTERNATIONAL

SINGLE ENGINE OPERATION FOR CUMMINS ENGINES



SYSTEM INTRODUCTION

This publication provides information pertaining to the application of the AMBAC International ECD 67-5111 Engine Governing System for Cummins engines.

The basic system consists of three (3) components: a speed control unit, actuator, and a magnetic speed sensor. (See Figure 1.)

SPEED CONTROL UNIT (ECD 67-5111)

The speed control unit contains all solid state electronic circuits which sense speed from a magnetic speed sensor or other suitable signal source. The pulse from the magnetic speed sensor, which is directly proportional to engine speed, is summed with the speed control unit speed set point. The appropriate current output is supplied to the actuator to control the engine fuel system.

The performance of the speed control unit is isochronous. The speed range is 6:1 and is adjustable via a 22 - turn speed adjust control. Speed droop can be selected. A droop control is provided on the speed control unit.

Only two governor system performance adjustments are needed to achieve optimum performance. A gain control to adjust the governor system's response and a stability control to match the time constant of governor system to the engine. All adjustments are accessible from the front cover.

The speed control unit also includes the special feature of speed anticipation to minimize speed overshoot on engine

start-up or from lug-down. Engine idle feature is selectable which may be utilized for engine warm-up or maintenance.

A wide tolerance of speed sensor input signals and DC supply voltages can be accepted by this speed control unit. In case of loss of the speed sensor signal or DC supply voltage, failsafe features are built-in to provide engine shutdown. Reverse voltage polarity protection is also provided at the battery input.

The speed control unit is adaptable to a wide variety of Cummins Diesel engines requiring applications such as constant speed or wide range variable speed control.

ACTUATOR (AGD 130)

The actuator is a linear electro-magnetic fuel metering device. It meters fuel quantities up to 1700 lbs. per hr. according to the amount of current flowing from the speed control unit through the actuator.

MAGNETIC SPEED SENSOR

The magnetic speed sensor responds to the number or ring gear teeth, or other types of ferrous projections, which pass the tip of the magnetic speed sensor, by inducing an electrical pulse within the coil. The pulses are then sent into the speed control unit. In effect, the magnetic speed sensor signals the number of teeth per second which pass the tip. This signal is directly proportional to engine speed.

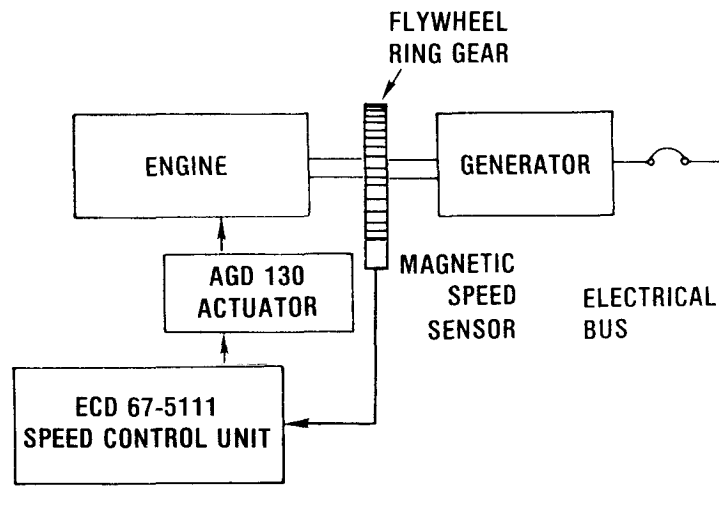


Figure 1. Block diagram of a basic engine governing system

SPECIFICATIONS

ECD 67-5111 SPEED CONTROL UNIT PERFORMANCE CHARACTERISTICS

- Isochronous $\pm 0.25\%$ regulation or better
- Droop 0.2-5% regulation
- Steady-state Stability $\pm 0.25\%$ or better
- Frequency Range 1K-6K Hz continuous
- Frequency Range (Idle) 1K-2.9K Hz maximum
- Speed Trim Range ± 200 Hz.
- Speed Drift with Temperature $\pm 1\%$ maximum

POWER INPUT

- Magnetic Speed Sensor Signal 0.25-30 volts rms on S/N below 2L2900 and
0.25-120 volts rms on S/N above 2L2900
- Supply 10 - 40 VDC (transient and reverse voltage protected)
- Polarity Negative Ground (Case isolated)
- Power Consumption 90mA (continuous) plus actuator current
- Maximum Controllable Actuator Current at 25°C (77°F) 7 Amps

ENVIRONMENTAL

- Temperature Range -40° to $+85^{\circ}$ C (-40° to $+185^{\circ}$ F)
- Relative Humidity up to 100%
- Case Fungus proof and corrosion resistant

PHYSICAL

- Dimensions See Figure 2
- Weight 0.82 kgs (1.8 lbs)
- Mounting Any position (See Installation Page 8)

RELIABILITY

- Tested 100%
- Vibration All printed circuit boards are conformally coated on both sides

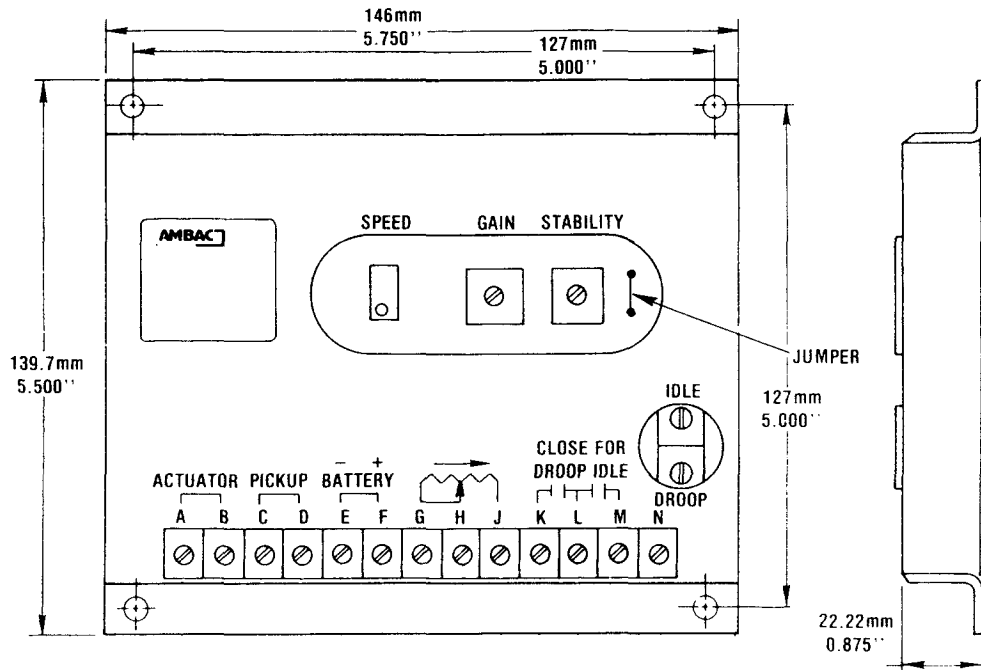


Figure 2. ECD 67-5111 speed control unit dimensions

SPECIFICATIONS

AGD-130 ACTUATOR PERFORMANCE

- Maximum Flow Rate (Diesel #2) 771 kg/hr (14.4 litre/min)
1700 lbs/hr (3.80 gpm)

POWER INPUT

- Operating Voltage 12, 24, or 32 VDC
- Normal Operating Current 2A at 12 VDC
1.5A at 24 or 32 VDC
- Maximum Current (Instantaneous) 6A at 12 VDC
3A at 24 or 32 VDC

ENVIRONMENTAL

- Temperature Range - 54° to + 93°C (- 65° to + 200°F)
- Relative Humidity up to 100%
- Case Fungus proof and corrosion resistant

PHYSICAL

- Dimensions See Figure 3
- Weight 1.75 kgs (3.85 lbs)
- Mounting Any position (See Installation Page 8)

RELIABILITY

- Tested 100%

MATING CONNECTOR

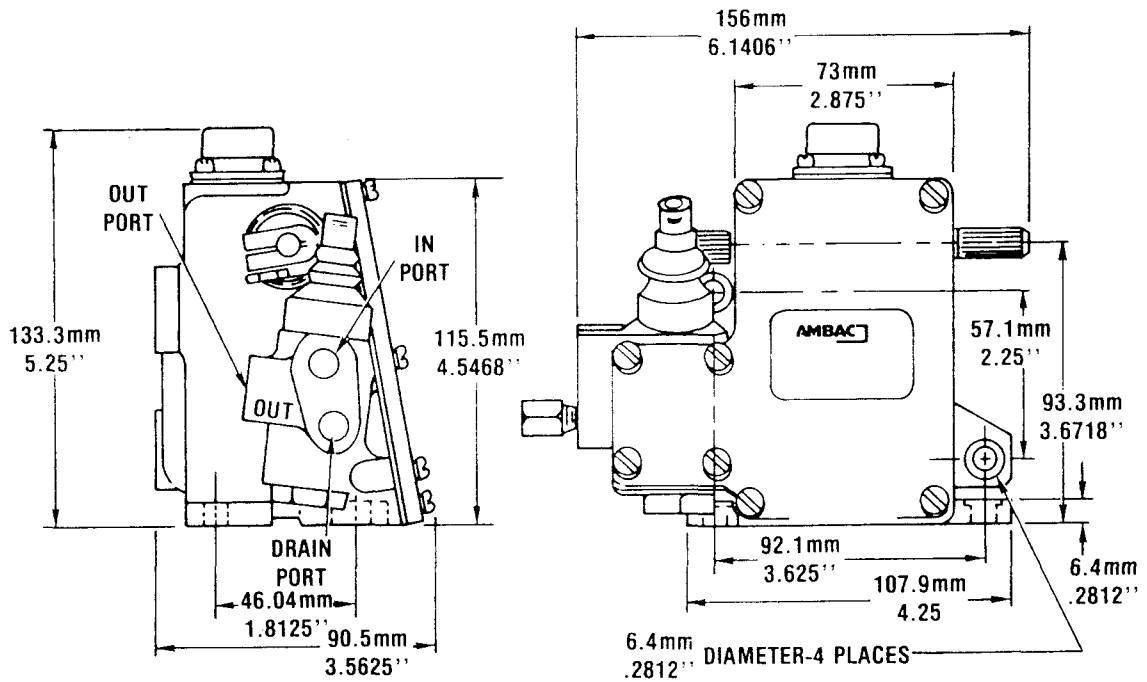
- Use EC1249-2 (6 pins)/MS3106R14S-6S
- Wiring harness (includes both connectors prewired) CB679

VARIATIONS

- AGD 130 E4 With temperature probe and standard fuel metering valve
- AGD 130 E5 High temperature coil and standard fuel metering valve - 54° to + 107°C (- 65° to + 225°F)
- AGD 130 F2 High temperature electro-mechanical section with a low fuel limiting valve (prevents engine shutdown)
- AGD 130 G4 Reverse acting with fuel metering valve (use CU 673C-9 speed control unit)

REBUILD KITS

- KT 6723 For all AGD 130 Series Actuators
 - contains Fuel Metering Valve, Actuator Lever Assembly, Dust Boot
- KT 6724 For VA 671A and VA 673A valves
 - contains Valve Plunger Assembly, Actuator Lever Assembly, Dust Boot
"O" Ring Gasket, (2) Aluminum Gaskets
- KT 6726 For AGD 100A1 and AGD 130D1 actuator
 - contains Fuel Metering Valve, Actuator Lever Assembly, Dust Boot
Spacer Plate, (4) Screws, Gasket
- KT 6732 For AGD 130 E4/F1 (High Temperature Coils)
 - contains Housing Assembly, Plate - Ident, Gasket



EG 30-1

Figure 3. AGD 130 actuator dimensions

SPECIFICATIONS

MAGNETIC SPEED SENSOR

- Dimensions (Unshielded) See Figure 4 and Table A
- Thread Size 5/8 - 18 UNF-2A
- Tap Drill Size 37/64"
- Proximity to Gear Teeth 0.75mm (0.030 in.)
- Temperature Range -55° to + 105°C (-65° to + 225°F)
- Output 0.50 to 30 volts RMS is recommended to input to the speed control unit
- Resistance 50 to 500 ohms

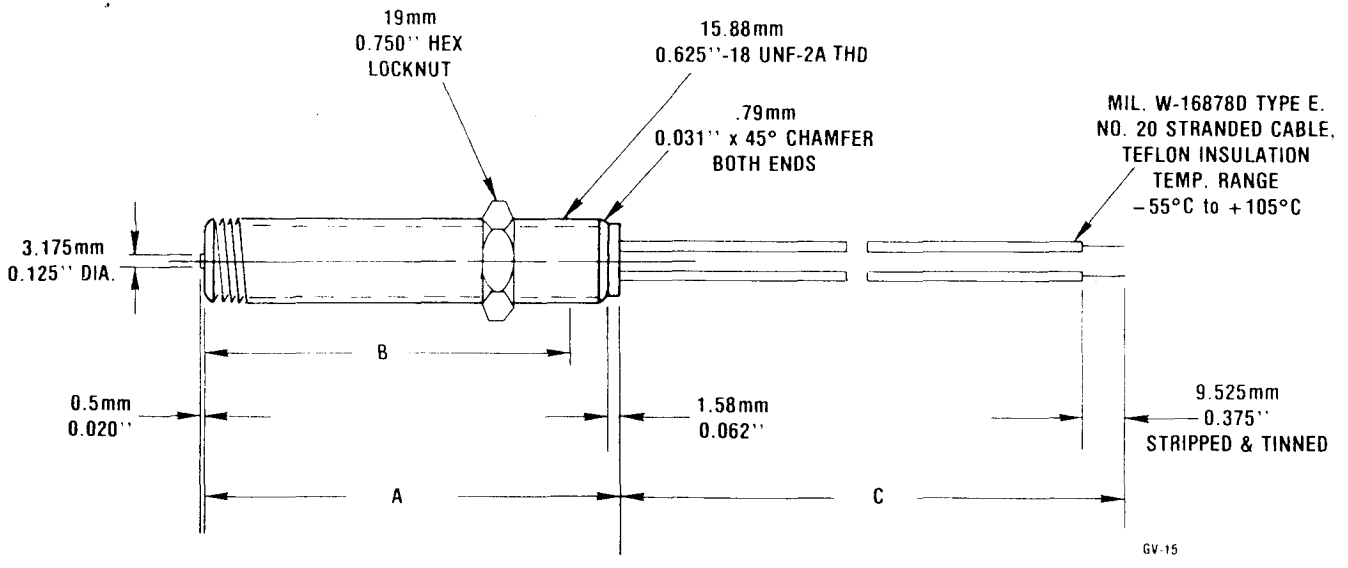


Figure 4. Unshielded magnetic speed sensor dimensions

CAT. NO.	DIMENSION A	DIMENSION B MAX. USABLE THREAD LENGTH	DIMENSION C WIRE LEAD LENGTH
MP 675	76mm 3 inches	67mm 2-5/8 inches	305mm 12 inches
MP 676	127mm 5 inches	118mm 4-5/8 inches	305mm 12 inches

Table A
Unshielded magnetic speed sensor dimensions

SYSTEM DESCRIPTION

SPEED CONTROL UNIT

The speed control unit circuits are designed to operate directly from a 12, 24 or 32 VDC battery system. An internal 10 volt regulator supplies all DC power to the speed control circuits. The speed control unit has sufficient current capacity to handle all actuators.

The engine speed signal is usually obtained from a magnetic speed sensor mounted in close proximity to the teeth of a ferrous gear that is driven by the engine. The frequency of the speed sensor signal is proportional to the engine speed.

The flywheel ring gear is normally used because of the ease of speed sensor installation and because of the high frequency speed sensor signal. Other speed sensors may be used for a speed signal. The governor will accept any signal if the frequency is proportional to the engine speed, and in the frequency range of the governor (1K to 6K Hz).

The signal strength must also be within the range of the input amplifier (0.25 volts rms to 30 volts rms for approximately sinusoidal signals). When a magnetic speed sensor is used, it is connected to terminals C and D. The speed control unit has an input impedance of 10,000 ohms between terminal C and terminal D. Terminal D is connected internally to the battery negative.

The speed sensor signal is amplified and shaped by the circuit to form pulses. These pulses form the speed sensor amplifier section of the speed control unit are then fed to a summing circuit (see Figure 5).

A speed sensor monitor circuit detects the pulses and, if the pulses disappear for longer than 0.1 second, the speed control unit will turn off the output circuit (current to actuator).

During cranking, the actuator will move to full load position and remain there during starting and acceleration of the engine. The summing point of the speed sensor and the speed adjust control is the input to the dynamic control section of the governor.

A gain control is provided to adjust the governor sensitivity. The gain is usually advanced (CW) as far as possible for best performance without instability. (See adjustment procedure).

The gain control has a non-linear range of 33:1. The dynamic control circuit has a control function that will provide isochronous and stable performance from almost all types of engine systems. The stability control will match the time constants of engines with a wide variety of characteristics.

The output actuator current switching circuit provides current to drive the actuator. The output transistor is alternately switched off and on at a frequency of 400 Hz, which is well beyond the natural frequency of the actuator, hence no visible motion from the switching results. The actuator responds to the average current to position the engine throttle. The output transistor is switched to reduce its internal power dissipation. The output of the circuit provides up to 12 amps instantaneously at voltages up to 40 VDC. The output is suitable to drive AMBAC actuators or a similar proportional electric actuator. Excellent start-up performance is assured via a speed anticipation circuit which minimizes the overshoot of speed on start-up.

ACTUATOR

The AC frequency signal (proportional to speed) is generated by a magnetic speed sensor and is constantly fed into the speed control unit and compared with a preset frequency. If the frequencies do not remain identical, a change in current from the speed control unit changes the magnetic force in the actuator which causes angular rotation of the actuator shaft and, in turn, linear movement of the metering valve. Fuel metering is proportional to the amount of current flowing through the actuator and is counterbalanced by an internal spring. The valve is used to meter fuel quantities up to (1700 lbs. per hour) 771 kg per hour, which is ample for all Cummins engines. The valve is specifically designed for Cummins engines and is connected between the outlet of the fuel pump and the common rail which feeds the injectors. By regulating pressure in the rail, the valve determines the engine output. Linearity of the system is controlled by the fuel valve contour which is designed to match the Cummins fuel system. The valve also has a drain port which relieves pressure in the rail line quickly when the engine load is suddenly decreased. This feature considerably improves the engine transient response on load rejection. The actuator is controlled and monitored electrically by the speed control unit. As the electrical signal is changed, the actuator adjusts the amount of metered fuel that is allowed to flow through the valve. The valve has ample capacity to control all Cummins engine generator sets up to 1000 KW. The actuator housing is sealed against engine environment with gaskets at all openings so steam or other water based cleaning will not affect the system's operation. **No maintenance is necessary.**

MAGNETIC SPEED SENSOR

The magnetic speed sensor is an electromagnetic device that is mounted in the flywheel housing. As the flywheel gear teeth pass the speed sensor, an AC voltage is induced, one cycle for each tooth. The input signal strength from the

magnetic speed sensor may be as low as 0.5 volts RMS or as high as 120 volts RMS. A value of 1 volt RMS at cranking speed is adequate. Terminal "D" on the speed control is connected to ground, hence one side of the speed sensor is internally grounded.

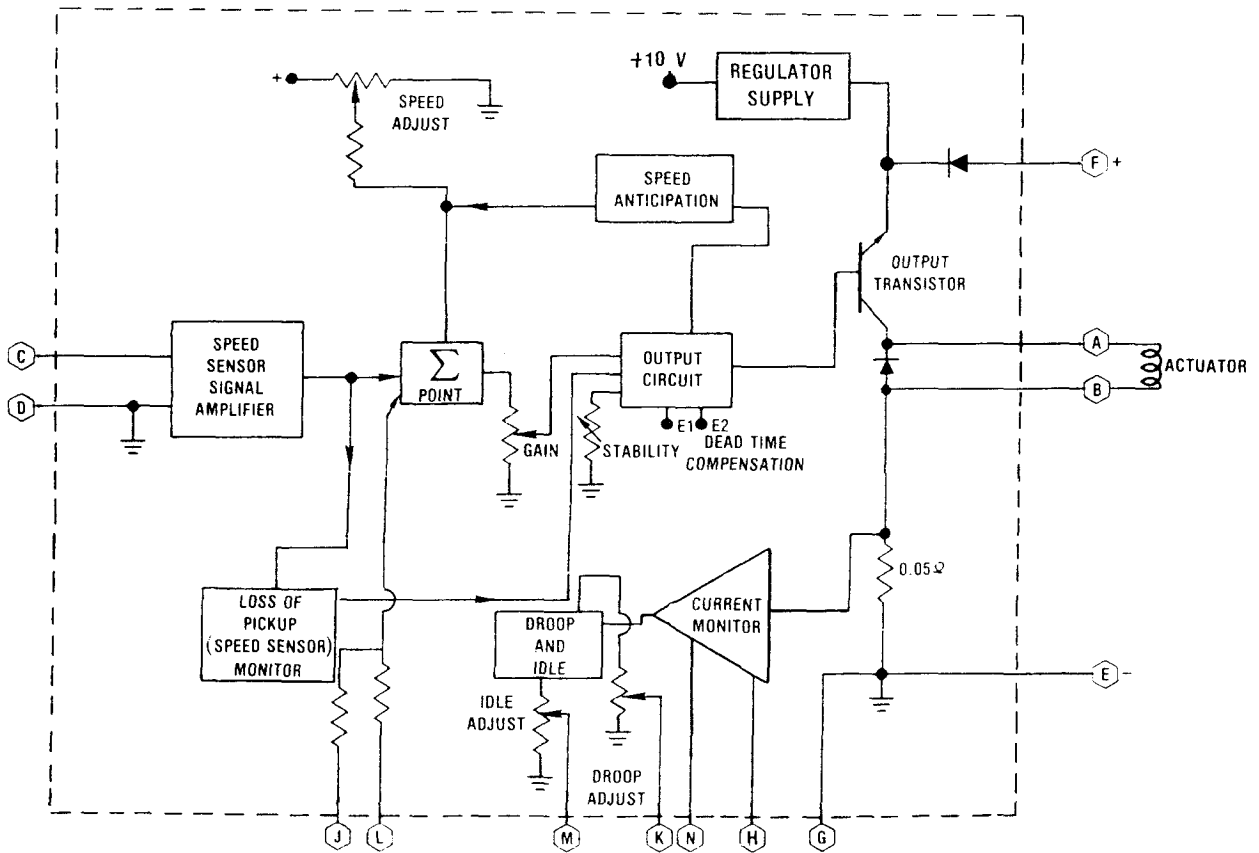


Figure 5. Functional schematic

SYSTEM INSTALLATION

SPEED CONTROL UNIT

The speed control unit is rugged enough for mounting in the control cabinet or engine mounted enclosure. Care should be taken to insure that the speed control unit is not subjected to extreme heat, as the life of electronic devices is always related to heat. If it is expected that water or mist will come in contact with the speed control unit, mount it vertically so the condensation will not accumulate in the speed control unit.

WIRING

Wiring to the speed control unit should be as shown in Figure 6. Leads to the battery and the actuator from the speed control unit should be #16 or larger. These are the leads that are connected to terminals A, B, E and F of the speed control unit. An external fuse or circuit breaker is recommended in series with terminal F, the positive (+) battery input terminal. The magnetic speed sensor leads are twisted and/or shielded for their entire length.

Connect leads to terminals C and D. Connect the shield to terminal D only. Do not connect the shield at the speed sensor end.

ACTUATOR

The actuator should be mounted as closely as possible to the outlet of the fuel injection pump. The actuator may be mounted in any position. However, the preferred mounting position is with the electrical connector at the top. The actuator should be located in an air stream if possible. No adjustment of the valve linkage is necessary. (If readjustment is ever required turn to page 14.)

Actuator bracket, BK 6726 may be used to facilitate preferred mounting on all Cummins engines. The fuel valve is connected into the fuel line to the injectors. The valve inlet (marked "in") on the actuator is connected to the outlet of the PT fuel pump. The valve outlet (marked "out") is connected to the rail leading to the injectors. Steel tubing or single wire braided rubber hose may be used for all fuel lines. Use 5/16" I.D. tubing for all engines except the 12 and 16 cylinder units which required 3/8" I.D. lines. The valve ports are 1/4" NPTF.

The drain port (marked drain) is 1/8" NPTF. It should be connected to the injector fuel return line. A normal back pressure on the drain of 2-4 PSI is acceptable. Higher back pressures may cause external fuel leakage. Additionally, all fuel valve fittings should be hand tightened and then wrench tightened 1 to 1-1/2 turns. If sealant is used it should be liquid type and not tape.

Right angle bends in fuel lines and fittings should be avoided near the fuel pump and actuator; use 30° or 45° fittings, or tubing with gradual sloping bends.

On original installations made at the factory, the fuel pumps have been calibrated to compensate for a small pressure drop across the actuator valve and extra fittings. On installations made in the field, it will be necessary to re-adjust the throttle stop as required to obtain rated h.p. However, on engines where the h.p. is marginal for the load at the outset, it will be necessary to compensate for the pressure drop by adding shims to the PTR pumps. On AFC pumps, it will be necessary to replace the throttle shaft, and turn in the adjusting screw until the required rail pressure is obtained. The pressure drop should be measured only at rated speed. This adjustment is necessary only for engines that have no reserve power.

AFC fuel pumps with turbo-charger fuel limiting will limit the transient response of the engine.

MAGNETIC SPEED SENSOR

The speed sensor is mounted in the gear case or flywheel bell housing. The speed sensor can be screwed in (with the engine stopped) until the tip strikes the top of the gear tooth, then backed out 3/4 of a turn and secure it by the locknut. The threaded hole should be relatively perpendicular to the centerline of the crankshaft and a spot face should be provided for a flat surface to anchor the locknut securely. Any ferrous gear may be used as long as the frequency and amplitude meet the speed control unit specification.

The wire leads from the speed sensor should be twisted for their entire length up to the speed control unit. The speed sensor leads may need to be shielded if they are exceptionally long 3 meters (10 ft.) or if external interference from spark ignited engines or external equipment is encountered.

Do not ground either of the speed sensor leads. Only the shielded wire is to be grounded to one specific terminal on the speed control unit. One of the speed sensor input terminals "D" on the speed control unit is commonly connected to ground and should be utilized for the shield connection.

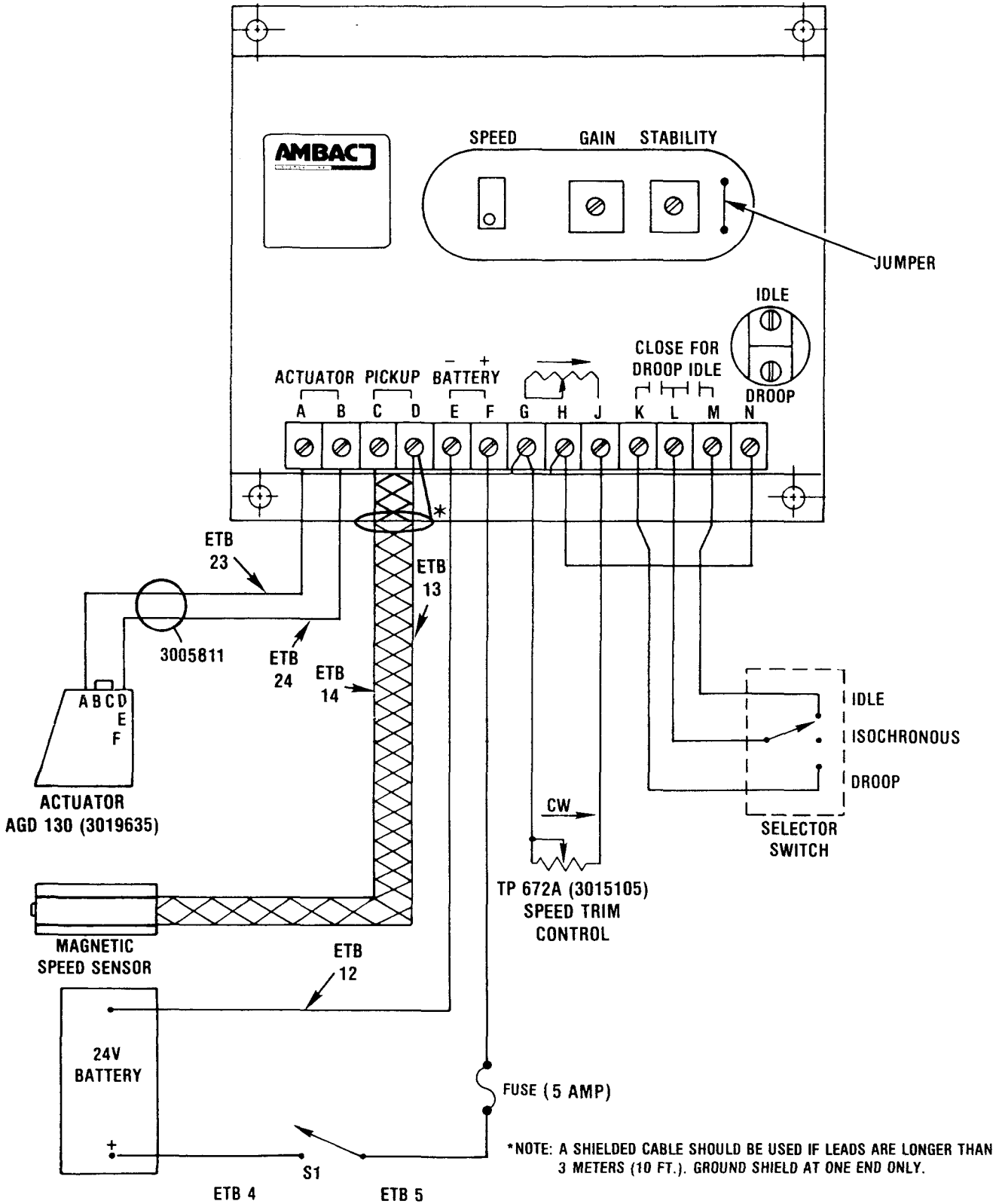


Figure 6. Wiring to ECD 67-5111 using AGD 130 actuator

SYSTEM ADJUSTMENTS

SPEED CONTROL UNIT

CAUTION:
THE ENGINE SHOULD BE EQUIPPED WITH AN
INDEPENDENT OVERSPEED SHUTDOWN
MECHANISM TO PREVENT RUNAWAY WHICH CAN
CAUSE EQUIPMENT DAMAGE OR PERSONNEL
INJURY.

CAUTION:
DO NOT
CONNECT THE SPEED CONTROL UNIT
TO A BATTERY CHARGER.

STARTING THE ENGINE INITIALLY

The speed control unit has been adjusted at the factory for starting conditions and will control the engine at approximately idle speed (1000 Hz. speed sensor signal). The following adjustments or checks should be made prior to starting the engine.

- A. Pre-set the gain, stability, and if used, the external speed trim control to their mid-points.
- B. Apply DC power to the engine governing system thru the wiring system by closing the switch S1. The actuator may momentarily move but should remain in the no fuel position. (See **ADJUSTMENTS: Actuator**)
- C. For speed control units with serial numbers below 2L23000 momentarily connect terminal A to terminal E. For speed control units with serial numbers above 2L23000 momentarily connect terminal A to terminal F. This should cause the actuator to snap into the maximum fuel position. If not, check for wiring defects or consult the "Trouble-shooting" Section (Page 12).

Crank the engine. During cranking, the actuator will move the fuel control to the maximum fuel position. Once started, the engine will be controlled at a low idle by the engine governing system.

GOVERNOR SPEED

Increase the engine speed to the desired governed speed by turning the "speed adjust" control in a CW direction. If used, final precise speed adjustment may be made with the external Speed Trim control. If at any time the engine governing system becomes unstable, turn the gain and stability controls CCW until the engine is stable.

PERFORMANCE

Once the engine is at governed speed, the two performance adjustments, gain and stability can be made as follows:

- A. At no load, turn the gain control CW until instability results. Then back-off slightly CCW (1/8 turn) beyond the point where stability returns.
- B. Turn the stability control CW until instability results. Then back-off slightly CCW (1/8 turn) beyond the point where stability returns. Excellent performance should result from these adjustments.
- C. Load may now be applied to the engine or push on the fuel valve to disturb the engine. If necessary, repeat A and B above until optimum performance is obtained. Normally, the critical condition for gain and stability adjustment is at no load.

NOTE: Optimum adjustment of both controls is in the furthest CW position, without causing instability and will result in the best response and stability under all operating conditions. Backing off slightly from this position will allow for changing conditions that may affect the dynamic response of the engine. If a load bank and a recorder are available, use them to verify the performance using Figure 7 as a guide. If a stable system cannot be obtained, refer to the "Trouble-shooting Section, Page 12".

The previous procedures should result in a high performance isochronous governed speed control system.

ACTUATOR

The throttle lever on the PT pump should be held in the full fuel position. However, it may be used to manually control the engine during the first startup. DC power should be applied through the wiring harness to the engine governing system by closing a switch in the battery circuit. Starting the engine may now proceed normally. During cranking, but before the engine starts, the actuator will push its valve open. Once started, the engine will be controlled at low idle by the speed control unit. The throttle lever on the PT pump should be held wide open at this time if it hasn't been earlier. If the engine is under the control of the governor, engine speed and performance adjustments can be made in accordance to the speed control unit publication.

IDLE SPEED SETTING

Place the external selector switch in the idle position. Adjust the idle adjustment of the speed control unit for ideal engine idle speed. CW rotation increases idle speed setting.

SPEED DROOP

Place the external selector switch in the droop position. An adjustment range of 0.2 to 5% can be obtained. CW rotation increases droop.

If engine speed with droop is lower than desired, turn the speed adjust control CW to increase the engine speed. If used, fine tuning of engine speed can then be obtained by turning the speed trim control.

An external jumper between terminals "H" and "N" will decrease the droop range to allow for 2% droop at 50 Hz.

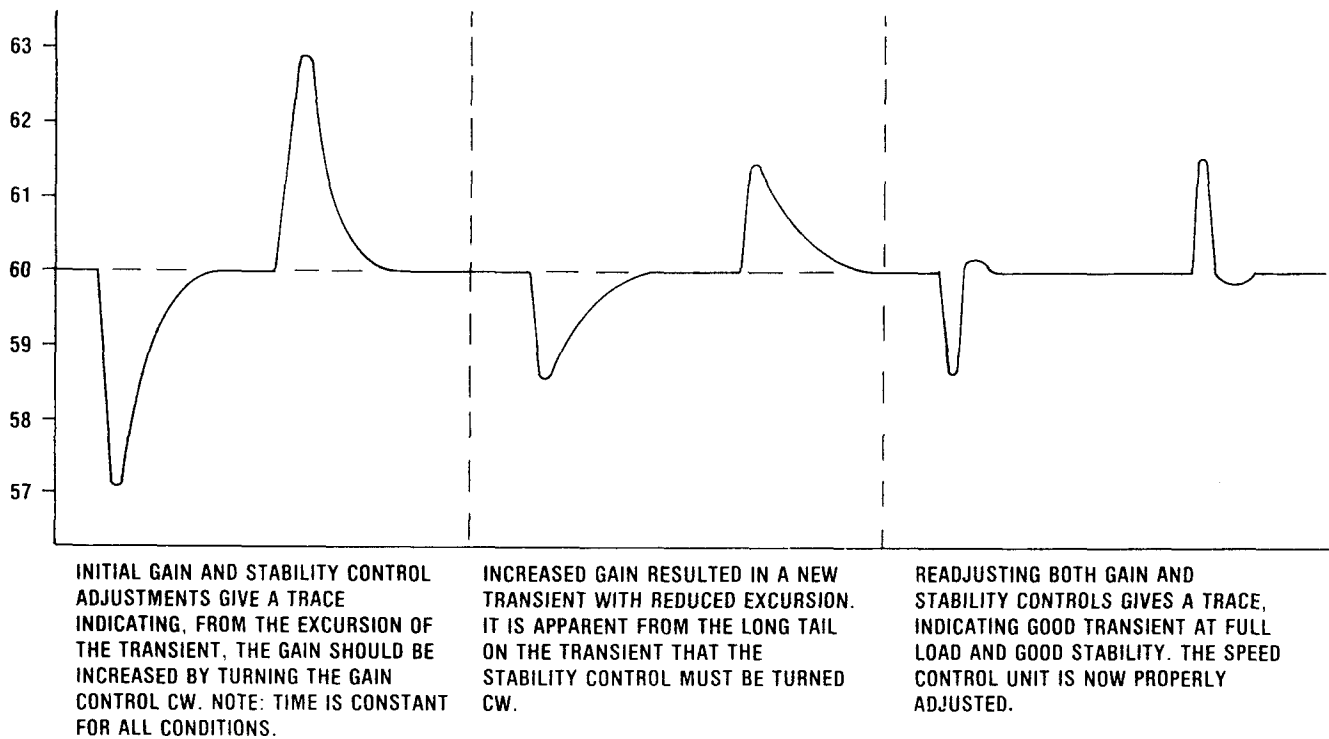


Figure 7. Typical performance chart

TROUBLESHOOTING

SPEED CONTROL UNITS WITH SERIAL NUMBERS BELOW SN 2L23000

SYSTEM INOPERATIVE

If the engine governing system does not operate, the fault may be found by performing the following tests. Should all three voltage tests indicate normal values, the defect must be in the actuator or the wiring to the actuator.

STEP	TERMINALS	NORMAL VALUE	PROBABLE CAUSE OF ABNORMAL READING
1	C & E	1.0 VAC RMS minimum while cranking	1. Defective magnetic speed sensor. 2. Gap between speed sensor and gear tooth too large. 3. Improper or defective wiring to the speed sensor.
2	D & E	Zero ohms	1. Internal jumper burnt due to high voltage on magnetic speed sensor lines. Can be repaired by external jumper D to E once high voltage is removed.
3	B & E	12.0 or 24.0 VDC (Battery voltage)	1. DC power not connected or low battery voltage. 2. Wiring error. 3. Defective speed control unit.
4.	A & E	2.5 VDC maximum while cranking	1. "Speed adjust" set too low. Turn CW. 2. Error in wiring to actuator. 3. Defective speed control unit. 4. Defective actuator.
5.	G to J	10.2 volts (With no connections on G of J)	1. Internal supply defective

UNSATISFACTORY SYSTEM OPERATION

SYMPTOM	TEST	PROBABLE TROUBLE
Engine overspeeds	Measure the voltage between terminals A and E on the speed control unit	1. If the voltage is 1.5 to 3.0 volts a) Frequency set too high, turn "speed adjust" CCW b) Wiring to actuator incorrect. c) Defective speed control unit. 2. If the voltage is over 3.0 volts a) Fuel metering valve or linkage sticking. 3. If voltage is below 1.5 volts a) Shorted output transistor. Defective speed control unit.
Actuator does not fully open	1. Measure the voltage at the battery while cranking. It must not be less than 8 VDC. 2. Ground terminal A of the speed control unit. The fuel metering valve should move to the full fuel position.	1. Replace the battery if it is defective. If it is undersized replace the battery with one with a proper CCA rating. 2. a) Wiring to the actuator or the battery is incorrect. b) Fuel metering valve or actuator sticking. c) Defective actuator.
Engine stays at idle		Fuel pump throttle lever not at full fuel position when operating on lever other than throttle lever.

TROUBLESHOOTING

SPEED CONTROL UNITS WITH SERIAL NUMBERS ABOVE SN 2L23000

SYSTEM INOPERATIVE

If the engine governing system does not operate, the fault may be found by performing the following tests. Should all three voltage tests indicate normal values, the defect must be in the actuator or the wiring to the actuator.

STEP	TERMINALS	NORMAL VALUE	PROBABLE CAUSE OF ABNORMAL READING
1	C & E	1.0 VAC RMS minimum while cranking	1. Defective magnetic speed sensor. 2. Gap between speed sensor and gear tooth too large. 3. Improper or defective wiring to the speed sensor.
2	F & E	24.0 VDC (Battery Voltage)	1. DC power not connected or low battery voltage. 2. Wiring error.
3	F & A	2.5 VDC maximum while cranking	1. "Speed adjust" set too low. Turn CW. 2. Error in wiring to actuator. 3. Defective speed control unit. 4. Defective actuator.
4	G to J	10.0 volts (With no connections on G or J)	1. Internal supply defective.

UNSATISFACTORY SYSTEM OPERATION

SYMPTOM	TEST	PROBABLE TROUBLE
Engine overspeeds	Measure the voltage between terminals A and F on the speed control unit	1. If the voltage is 1.5 to 2.5 volts a) Frequency set too high, turn "speed adjust" CCW b) Defective speed control unit. 2. If the voltage is over 2.5 volts a) Fuel metering valve or linkage sticking. 3. If voltage is below 1.5 volts a) Shorted output transistor. Defective speed control unit.
Actuator does not fully open	1. Measure the voltage at the battery while cranking. It must not be less than 8 VDC. 2. Momentarily connect terminal A to F. The fuel metering valve should move to the full fuel position.	1. Replace the battery if it is defective. If it is undersized, replace the battery with one with a proper CCA rating. 2. a) Wiring to the actuator or the battery is incorrect. b) Fuel metering valve or actuator sticking. c) Defective actuator.
Engine stays at idle		Fuel pump throttle lever not at full fuel position when operating on other than throttle lever.

Insufficient Magnetic Speed Sensor Signal

Although the speed control unit will govern well on 0.5 volts RMS signal if it is a clean sine wave, a signal from the magnetic speed sensor of 3 volts RMS at governed speed will eliminate any possibility of missed or extra pulses. This signal is measured at terminals "C" and "D". Raise the magnetic speed sensor voltage by reducing the gap between the speed sensor and the ring gear to not closer than 0.75mm (0.030 in.). This is equivalent to backing the speed sensor out by $\frac{1}{4}$ turn after it touches the ring gear tooth.

Electrical Noise or Unwanted Droop

If noisy electrical devices are present, such as magnetos, solid state ignition systems, battery chargers or regulators which emit radio frequency interference (RFI), then unstable governing or droop may be noticed. The speed control unit has internal filters which provide some protection from radio frequency interference. Excessive levels of RFI must be treated separately. A metal shield placed around the emitting source will help. **Always twist the leads from the magnetic speed sensor all the way back to the speed control unit.** When extreme RFI is encountered, it may be necessary to shield all the leads to the speed control unit. These shields must be grounded at terminal "D" only.

Fuel Metering Valve/Actuator Sticking

If the valve or the actuator is sticking, as determined by hand, this can cause erratic behavior. If the cause is dirt in the valve, the valve can be cleaned by removing the lower cap nut. Otherwise, replace the valve or actuator. Insufficient lubrication of the rod in the cap nut assembly can also cause binding and excessive wear. Assure drain connection has a slight positive pressure 1-5 PSI.

Fuel Metering Valve Leaking

If there is leaking at the pin on the valve, there is too great a pressure at the drain port (Max. 5 PSI). Temporarily disconnect the drain line. Plug the line coming from the injectors. Allow the drain fuel to flow externally. If the

leakage does not stop, the check valve (VA 678) may be plugged. Remove, clean, and recheck the check valve operation.

Leakage at the upper cap nut is probably due to defective gaskets (GA 678) which should be replaced. Torque to 120-150 lbs. in.

Actuator Test

The resistance between terminals A and B at the speed control unit connector should be about 8 ohms. If it is not, the coils in the actuator should be checked directly. Remove the wiring harness from the actuator and measure the resistance from A to B and C to D. They should read about 4 ohms. If not, replace the actuator. If the coils have the correct resistance, the wiring or connectors are defective.

Low Frequency Instability

For four and six cylinder engines which exhibit low frequency surging (about 1 Hz.), replacing the jumper next to the stability control (Figure 1) should eliminate this problem.

NOTE: Fuel system problems that may cause instability.

1. The AFC feature of the fuel pump must be modified by the Cummins Engine Co. for proper operation.
2. If air is suspected in the fuel line, use a sight glass to check for bubbles at the fuel pump inlet.

Readjustment of Linkage

If the linkage on the actuator is ever removed or replaced, follow these instructions for resetting. Roll the boot up over the plastic link on the lever. Place the actuator with its label flat down on a table. Rotate the lever on its shaft till all the play is just removed between the fuel valve ball and the plastic link. Tighten the lever holding nut and unroll the boot. No preload or play should exist on the valve stem for proper setting.



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Printed in U.S.A.

Issued December, 1984