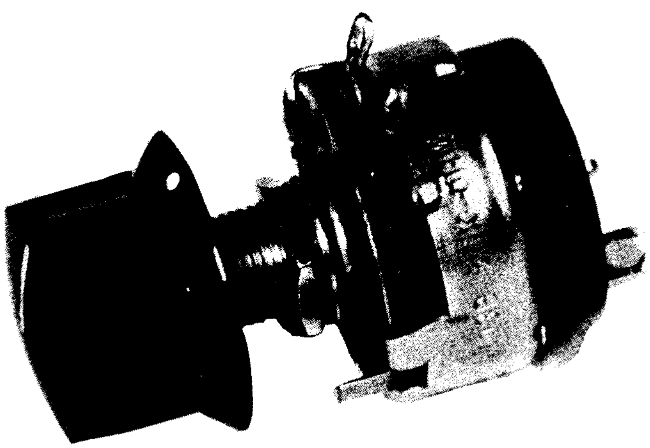
ENGINE
GOVERNING SYSTEMS

AMBAC INTERNATIONAL

SPEED DROOP CONTROL
CU 6711A



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INTRODUCTION

The CU 6711A speed droop control is normally mounted on the engine control panel and is used to change the speed mode of the engine from isochronous (constant steady state speed regardless of load change) to speed droop (decrease in steady state engine speed with increase in load). The droop control can also be used to obtain negative droop (increase in engine speed with increase in load).

The maximum full range of the droop control is 300 Hz. (number of teeth per second passing the tip of the magnetic speed sensor). Assuming a ring gear having 132 teeth, the full range of the droop control would be -135 RPM or -4.5 Hz. generator output of 7½% droop for a 60 Hz. generator.

SPECIFICATIONS

CU 6711A SPEED DROOP CONTROL PERFORMANCE

- Type .... RV 4 with switch, per MIL-R-94, variable resistor
- Rating - Switch .... 2A, 125 VAC
10A, 10 VDC
- Rating - Control .... 50,000 ohms, 2.25 watts maximum, 300 volts rms
- Life - Switch .... 5,000 cycles
- Life - Control .... 100,000 cycles
- Rotation .... 333° (single turn)

ENVIRONMENTAL

- Temperature Range .... −55° to + 120°C (−65° to + 250°F)
- Construction .... Dust, splash, and corrosion resistant

PHYSICAL

- Dimensions .... See Figure 1

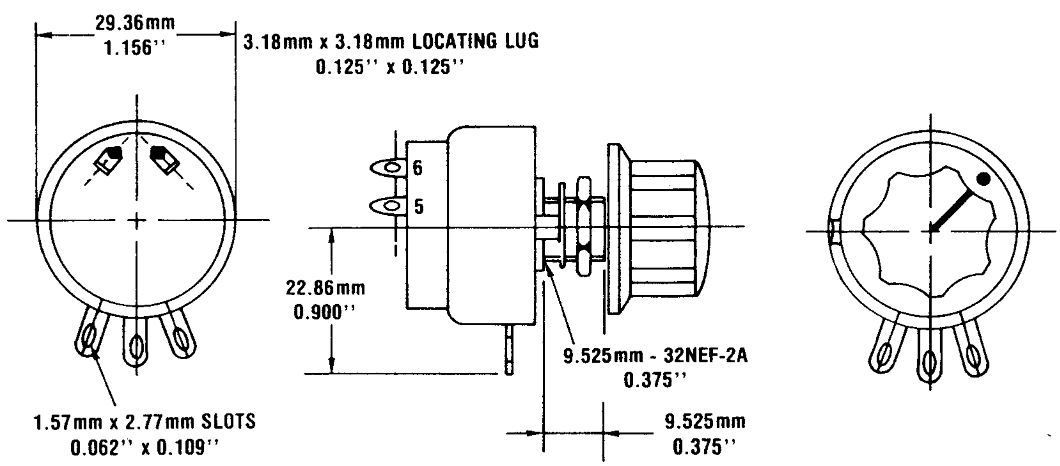

Figure 1. CU 6711A speed droop control dimensions

INSTALLATION

Drill mounting holes on the control panel, or other convenient location as per Figure 2.

Solder #20 gauge stranded wire (or other convenient size) to the terminal locations as shown in Figure 3 and indicated below as in Table A.

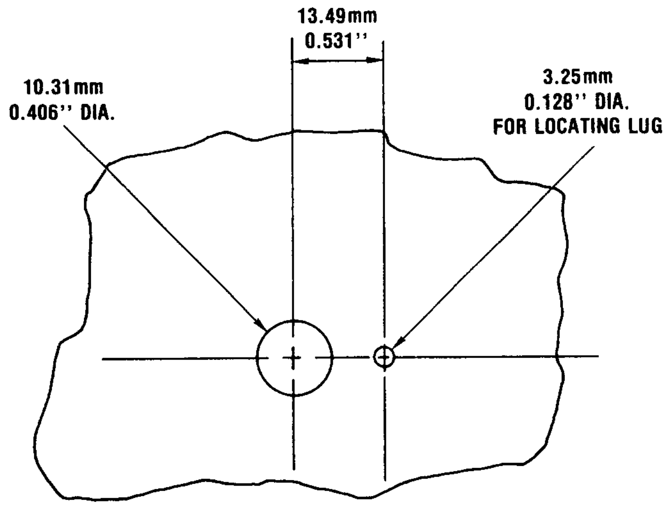

Figure 2. Speed droop control mounting holes

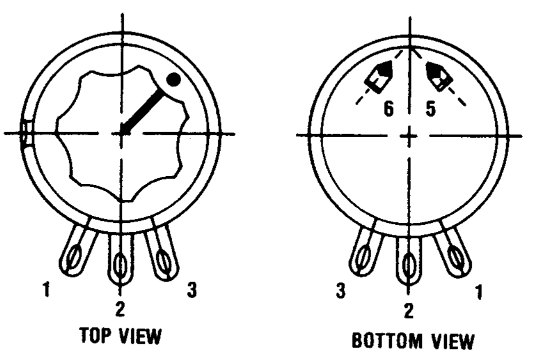

Figure 3. Speed droop control terminal locations

TERMINALS OF CU 6711A		TERMINALS OF SPEED CONTROL UNIT	*TERMINALS OF ACTUATOR
1	to	P	F
2 to 5			
3	to	N	E
6	to	R**	

*Actuator connections are only necessary when the actuator being used is equipped with a temperature probe to improve the temperature stability during droop operation. These actuators are AGB 130 D3, AGB 200 A3, AGB 200 A4, AGB 200 A5, AGB 250 A3 and AGD 130 E4.
**Connect to J for applications using the CU 673C-23 Speed Control Unit.

Table A
Wiring chart for speed droop control

ADJUSTMENTS

Turn the droop control CCW until the switch clicks to the off position. The engine speed will be isochronous (no change in engine speed with change in load). To introduce droop, apply load to engine. Turn the droop control CW until engine speed reduces to the desired speed. This change in engine speed is droop, usually expressed in percent. As load is removed, engine speed will increase.

If engine speed with droop is lower than desired, the speed trim control, CU 6710A, is turned CW to increase engine speed.

A representation of droop curves which can be expected is shown in Figure 4.

The slope of these curves can be adjusted with the droop control (CU 6711A). Curves can be moved up or down with the speed trim control (CU 6710A).

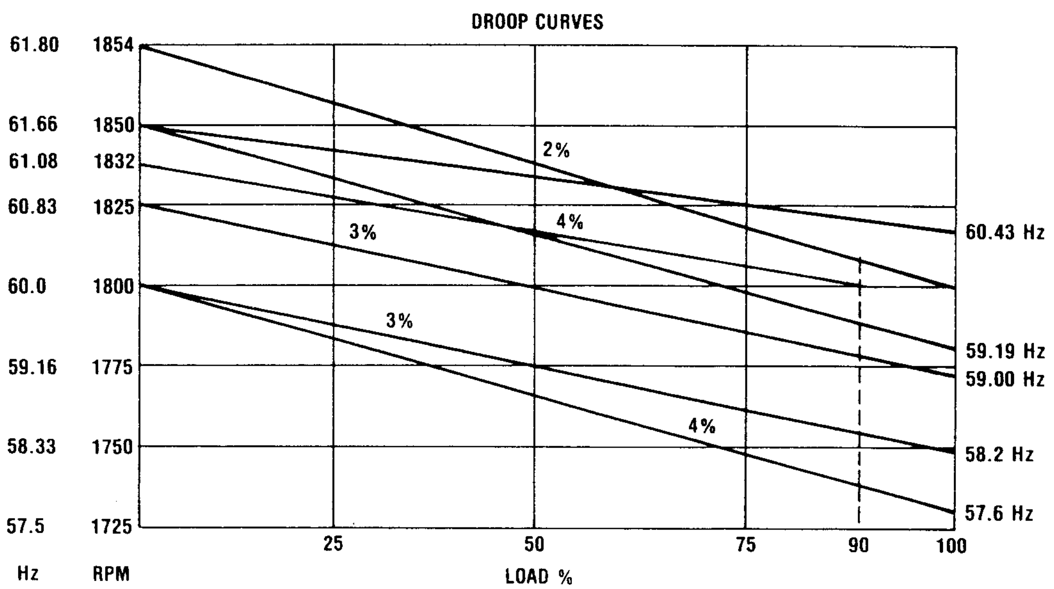

Figure 4. Speed droop curves

NEGATIVE DROOP:

The droop control can be used to cause the engine to increase speed as load is applied. This is done by connecting terminal (3) to terminal "B" of the "C" series speed control unit rather than to terminal "N". With 12 volt systems, the speed increase from no load to full load will be up to 5%. With 24 and 32 volt systems, the speed increase from no load to full load will be up to 10%. Turning the droop control CW will cause the speed to increase with load.

Using Droop to Share Load Between Generator Sets

If two or more isochronous engine generator sets are paralleled (electrically locked together) and a load applied, one engine will tend to take all of the load within its capabilities. To overcome this, some form of load sharing device is required. The simplest method of sharing load is to introduce speed droop.

To introduce speed droop, operate one engine at no load and set the frequency by means of a speed trim control CU 6710A, at 60.00 Hz. Apply a given load, for instance, 50% and turn the droop control, CU 6711A, CW to obtain ½ the desired amount of full droop. Then remove the load and re-check the frequency at no load. If necessary, repeat the step until no load remains at 60.00 Hz. and ½ load is ½ the amount of full desired droop. Then repeat the above steps on the remaining sets which are to be paralleled.

If it is desirable to operate the engine generator sets at 60.00 Hz. full load, turn the speed trim control, CU 6710A, CW until the no load speed is raised to the desired droop percent above 60.00 Hz.

For example, if the desired droop is 3% and the desired frequency is 60.00 Hz. at full load, the no load setting would be 61.80 Hz. Similarly, if the desired droop is 2% and the desired frequency is 60.00 Hz. at 90% load, then the no load setting would be (0.02) (0.90) or 61.08 Hz. (See Figure 4.)

When the engines are then paralleled, they are electrically locked together. As load is applied, they will slow down thus changing the frequency. As load is removed, engine speeds will increase, depending upon amount of droop which was introduced.

Due to the added stabilizing effect of droop, the gain control can be turned more CW than under isochronous operation for better performance. Engines will share load within approximately 10% using this speed droop method.

Usually a 3% speed droop for paralleling several engine generator sets is adequate.

It should be noted that droop is a function of actuator current and position. Therefore, the percent of droop is affected by the actuator travel and linkage. Also in carbureted engines droop will be non-linear.