I、Introduction

The S6700H Speed Control Unit is an all-electronic device designed to control engine speed with fast and precise response according to the momentary load changes. Based on a closed loop control, the basic characteristics of this unit is to reach rated speed and output power stably as well as reducing smoke emission through adjustment of firing fuel and speed fluctuation. S6700H provides power source reversal connect protection, actuator faults protection, speed sensor's signal missed protection, over-speed protection and system input error protection;

II、Technical Parameters

Environmental	Working environment temperature	－40～80℃
	Relative humidity	95%
Input power	Supply	24VDC
	Actuator current range	0-10A（continuous）
	Speed sensor signal	1-20V
Characteristics：	Rated frequency	1k～5k HZ
	Frequency trimming scope	Over ±200HZ (when connected with 5KΩ)
	Steady frequency zone	〈0. 5%
	Momentary frequency deviation--anticlimax	〈10%
	Momentary frequency deviation--sudden apply	〉-7%
	Frequency recovery time	〈2s
	Frequency drop	0 ～ 3%(adjustable when pin10、11short circuit)
	Temperature drift	±1%（maximum）

III、The S6700H Speed Control Unit Wiring/Outline （see the final page)

IV、Function Description

A、Basic fuction

a〉 closed loop speed control

b〉 parallel machine control

c〉 external speed trimming

d〉 external idle speed/ switch rated speed

B、Protection

a〉power source reversal connect protection

b〉actuator faults protection

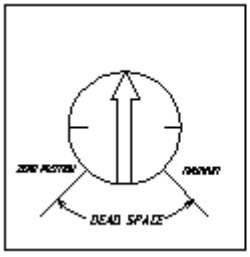
c〉speed sensor's signal missed protection

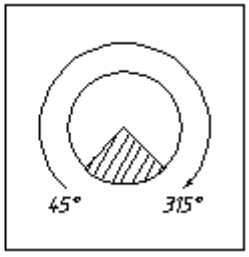
d〉over-speed and external high level input alarm

V、Adjustments

Before starting engine: Check the wiring, remove terminal 1 and 2 ' s connections and measure the resistance value of the actuator. If the value is OK, connect the removed wirings with the positive and negative electrode of the battery. If applied, the actuator will energize to maximum fuel position with a sound of “Pa”, and return to minimum fuel position with another sound of “Pa” when power is off. At last, check fuel pump racks to insure they can move smoothly.

The FIRING adjustment: The FIRING is a single coil potentiometer, which set the oil supply when firing, and the maximum effective adjust angle is 270°. It is factory set at mid position. The oil supply is increased by clockwise rotation of the FIRING adjustment control, and decreased by counterclockwise rotation of that. Screw the FIRING clockwise to the end before starting the engine, then rotate FIRING from the maximum clockwise to the minimum counterclockwise when the power generator set is ready; Start the engine and rotate the FIRING clockwise to a position where engine is just able to working. Then, start the generator repeatedly and adjust FIRING until reach the lowest smoke emmissions .

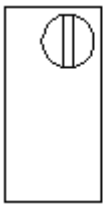


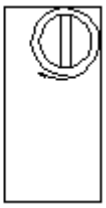


The SPEED RAMPING Adjustment: The SPEED RAMPING adjustment is a single coil potentiometer which sets time of adjustment from engine’s idle speed to rated speed, the maximum effective adjust angle is 270°. It always points to the mid position when delivered. Rotate the SPEED RAMPING adjustment clockwise to prolong the time(the minimum is 20 seconds), and counterclockwise to shorten it.

The RATED SPEED adjustment: The RATED SPEED adjustment is a loopy potentiometer which sets rated speed of the engine. It is originally set as 3.5KHZ. Rotate the SPEED adjustment clockwise to increase the speed and anticlockwise to decrease the speed.

Formula: f=nz/60.....formula 5-1
f:impulse frequency (HZ)
n:speed (r/min)
z: teeth number of flying wheel on the engine





The IDLE adjustment: The IDLE adjustment is a single coil potentiometer which sets the idle speed. Enter idle state after short connecting the pin 7 and pin12. Rotate the IDLE adjustment clockwise to increase the speed and anticlockwise to decrease the speed. You can apply a switch between pin7 and pin 12 to converse the engine idle speed to rated speed. The idle speed approximately set as 60% of rated speed when delivered, just as 2.1kHZ. The proportion ---60% keeps the same even when you change the rated speed. Needn't reset the idle speed.

The STAB adjustment: It is a single coil potentiometer which originally points to mid position. Once the engine start and set speed reached, rotate the STAB adjustment clockwise until engine instability happens, it is place A; Then drastically move the STAB counterclockwise until engine stability returns. And then rotate the STAB clockwise to the place which is 20 degree counterclockwise of place A. To insure the stability (under any load condition).

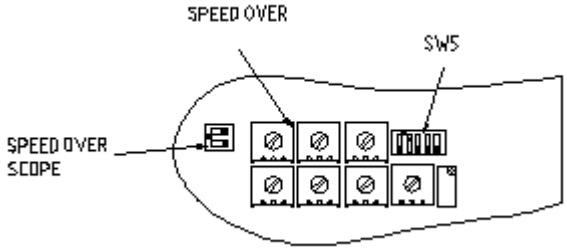
The GAIN adjustment: It is a single coil potentiometer which originally points to mid position. Once the engine start and set speed reached, rotate the GAIN adjustment clockwise until engine instability happens, it is place B. Then drastically move the GAIN counterclockwise until engine stability returns. And then rotate the GAIN clockwise to the place which is 20 degree counterclockwise of place B. To insure the stability(under any loading condition)

The DROOP adjustment: The DROOP adjustment sets the frequency descending characteristic(apply when parallel control). It is available when pin10 connects with pin11. Rotate the DROOP adjustment clockwise to increase the frequency descending and counterclockwise to decrease the frequency descending.

The SW5、SPEED OVER、SPEED OVER SCOPE adjustment: The SW5 is OFF(Over-speed protection is closed) when delivered. When input frequency reach the set value of over-speed, or the system error input present high level, the alarm light turns on, meanwhile, the speed control unit stop offering power for the actuator, the ALARM closed. The SPEED OVER can adjust the set alarm frequency when over-speed occurs; Rotate the SPEED OVER counterclockwise to decrease the alarm frequency, which is set as 4.6kHZ. The SPEED OVER SCOPE is to determine the scope of impulse frequency set

by the SPEED OVER.
See diagram 5-1

OFF OFF	OFF ON	ON OFF	ON ON
3.5kHZ~4.1kHZ	4.1kHZ~4.7kHZ	4.7kHZ~5.5kHZ	5.2kHZ~6.1kHZ



Notice: Over-speed protection should follow the professional suggestion, do not change the set random.

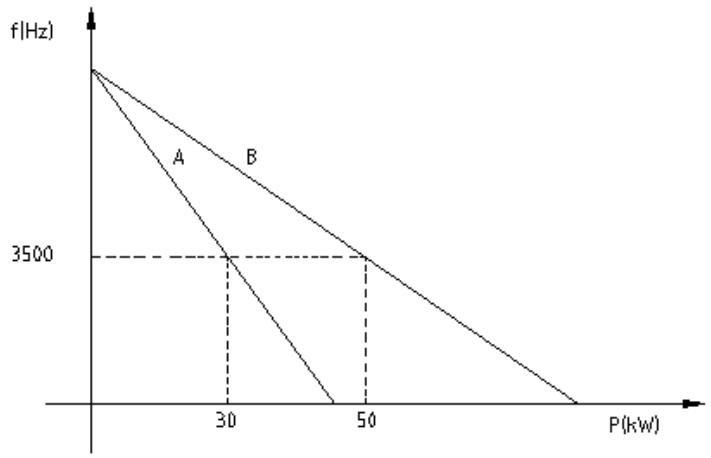
The SW1 adjustment: It is OFF when delivered. Can switch to ON when the actuator response slowly. Can switch to OFF when S6700H work well but the actuator jump rapidly.
The SW2、SW3 adjustment: They are ON/OFF when delivered to show the circuit disconnected; When the actuator jump irregular because of the soft connection, turn the switch to OFF/ON.

The SW4 adjustment: It is factory set as OFF; When the GAIN is in a low position and there is a fast instability in the system, put the SW4 OFF; When there is a slow instability in the system, put the SW4 ON;

VI、Parallel Control

The assignment of power when parallel control can be categorized into two types:
1. **Apply DROOP** to set frequency/ power diagram. The frequency of each generator is the same when parallel control, the corresponding power can be defined according to the diagram. For example, generator A and B offer 30kw and 50kw power when the total output power is 80kw;A and B can offer power by half-half once you set the same frequency/power diagram for them when

the generator model is the same;



2. **Apply Load Dispenser** on terminal 13 to assign power automatically. The input voltage scope of terminal 13 is 0-9V. When terminal 13 connect with an input 4V, the speed nearly keeps the same as no input connect, so take 4V as a critical value when need to adjust the dispenser. The speed will decrease when the input voltage is increased.

VII、Operation and Maintenance

. Wiring

S6700H is rugged enough to be placed in a control cabinet. If water,mist, or condensation may come in contact with the controller, it should be mounted vertically. This will allow the fluid to drain away from the speed control unit. It will need special shield equipment if there is strong magnetic nearby.

Terminal	Below 6 meters	Above 6 meters
Terminal 1-2 connect to the actuator	2.5mm^2	4.0 mm^2
Terminal 3-4 connect to the speed sensor (The lowest operation signal between 3 and 4 is AC 2.5V）	2×0.75mm^2 or 2×1mm^2 with shielding mesh, the end of the shielding mesh on the controller should be connected to terminal 5 .	
Terminal 5-6 connect to the battery jar（24V）	2.5 mm^2	4.0 mm^2
Terminal 7-9 connect to the trimming	In electromagnetic field, cable shield should be placed. The shielding mesh	

Terminal 7-12 connect to the switch（idle/ rated speed switch)	should be connected to terminal 7.
Terminal 10-11 connect to switch(DROOP）	
Terminal 13 for input signal such as synchronizer, load dispenser, ramp generator. Apply when parallel control or instability adjustment	
Terminal 14 for 10V power output	
FAULT IN	
ALARM	It is a output contact switch, the maximum is 5A.The connection is refer to the load.

. Debugging

The most job of debugging is GAIN and STAB, whose value decide the frequency wave of engine under different load, as well as the frequency wave and recover time when load arise rapidly or anticlimax.

Skill:

1. GAIN and STAB are interactional. To make engine work stable is a precondition, when one is rotated clockwise, the other one's adjustable clockwise angle lessened.
2. GAIN has more force on frequency wave when load change rapidly.
3. STAB has more force on frequency recover time when load change rapidly.

. Steps of Using Speed-over protection

1.Choose the alarm speed according to the rated speed, it is 115% of the rated speed usually.

2.Calculate the impulse frequency according to the formula 5-1 and number of teeth of engine fly wheel.

3.Set the SPEED OVER SCOPE switch according to the diagram 5-1 under power cut off condition. Switch SW5 to ON; Rotate SPEED OVER clockwise to the maximum.

4.Connect to the power, input stable alarm impulse frequency to Terminal 3 and 4. The frequency can be offered by the signal generator or the over-speed engine when system allowed.

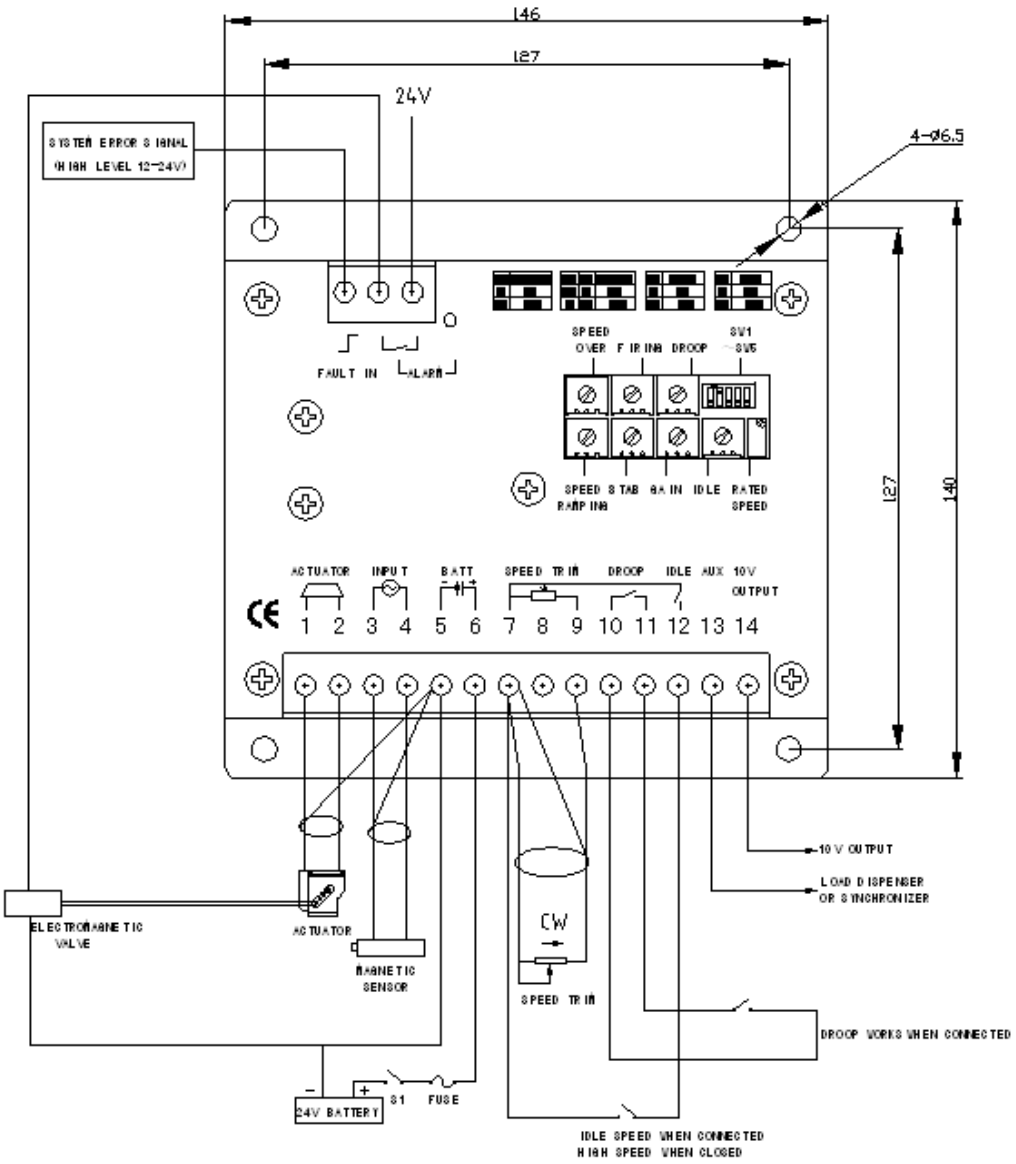
5. Rotate the SPEED OVER counterclockwise slowly till the alarm light turn on, then rotate it clockwise for 10 degree angle.

NOTE: The SPEED OVER is a single coil potentiometer which is easy to adjusted.

VIII. SYSTEM TROUBLESHOOTING

Symptoms	Probable cause	Treatments
Engine can not be started	Air in fuel system	Discharge the air
	Speed signals missing	Check the sensor and cables
	Power of S6700H is off or connected reversely	Check the power supply and wiring
	Driving bars are deadlocked in null-position.	Reinstall and adjust
	S6700H allowed output current too low	Adjust FIRING clockwisely
	External input protect in effect	check the system error input
Engine starts over-speed	The adjusting direction of fuel-adjustment mechanism and movement direction of the actuator conflict, or their null-positions are not consistent with each other.	Check, reinstall and adjust
	The rated speed is set too high	Decrease the rated speed
	The governor parameter is wrongly adjusted	Increase the GAIN moderately.
	allower Output current too high	Adjust FIRING counterclockwise
Unstable engine rotation speed	clamping stagnation of the driving bar between the actuator and rack happens or the gap is too large	Check and reinstall. Drip moderate amount of engine oil on the pre and post bearings of the actuator. Push it with hands several times. If it moves smoothly without any clamping stagnation, it can be used normally.
	Engine overloads	reduce the load of the engine
	Speed sensor loose or wear	Retighten or change
	The installation gap of Speed sensor is too large	Check and reinstall (about 0.8mm)
	Governor parameter is adjusted wrongly	1) high frequency oscillation of rotation speed （＞10Hz）: Decrease the GAIN moderately. 2) low frequency oscillation of rotation speed （＜1Hz）: Increase the GAIN moderately.
Engine shuts off unexpectedly	Power supply of the governor breaks off	Check power supply and cables.

	Feedback signals of the speed breaks off	Check the sensor and its cables
	Setting signals of the speed breaks off	Check the remote-control adjustment and its cables
	Open-circuit or short-circuit of actuator's electronic cable happens	Check the actuator and its cables
	Fuel supply of the engine stops	Add fuel and discharge air in the pipes
	Speed -over protection effective and set frequency too low	Reset the speed voer protection frequency
Engine will not shut off	Null-positions of the actuator and control rack conflict	Check and reinstall
	Control rack is deadlocked	Check and reinstall
	Power supply of the governor can't disconnect	Check power supply and cables
The engine rotation speed can not be adjusted	Control rack is deadlocked	Check and reinstall or cleaning the fuel injection system


146
127
24V
SYSTEM ERROR SIGNAL
(HIGH LEVEL 12-24V)
4-Ø6.5
FAULT IN
ALARM
SPEED
OVER
FIRING
DROOP
SW1
SW5
SPEED
RAMP ING
STAB
GAIN
IDLE
RATED
SPEED
127
140
ACTUATOR
INPUT
BATT
SPEED TRIM
DROOP
IDLE
AUX 10V
OUTPUT
1 2 3 4 5 6 7 8 9 10 11 12 13 14
10 V OUTPUT
LOAD DISPENSER
OR SYNCHRONIZER
ELECTROMAGNETIC
VALVE
ACTUATOR
MAGNETIC
SENSOR
CW
SPEED TRIM
DROOP WORKS WHEN CONNECTED
24V BATTERY
S1
FUSE
IDLE SPEED WHEN CONNECTED
HIGH SPEED WHEN CLOSED