

SPEED REGULATOR WITH TACH FEEDBACK MODIFICATION

KIT MODEL 73445N

PCB 46S02268-0020 SCHEMATIC 45S02268-0020

DESCRIPTION

This modification is one of a series available for Louis Allis Saber DC drives. It consists of components necessary for modifying the basic Controller for a speed regulator with separate proportional and integral gain adjustments. It also includes modification overlays for the Controller schematic diagram.

This modification enables the operator to control drive speed manually utilizing an AC or DC tachometer (tach). This option has three potentiometers (pots): PROPORTIONAL GAIN, INTEGRAL GAIN and TACH CAL(IBRATION). The PROPORTIONAL GAIN adjusts the amount of instantaneous droop as a function of loss and provides damping from drive system disturbances, such as a speed reference change or drive loading. The INTEGRAL GAIN adjusts the response time of the drive to drive system disturbances. Two ranges are provided to fine tune the tachometer feedback signal at rated speed. This option is used with a tapped resistor network on the Relay/Interface PCB for rough tachometer calibration. Fine tach trim is provided with the TACH CAL potentiometer.

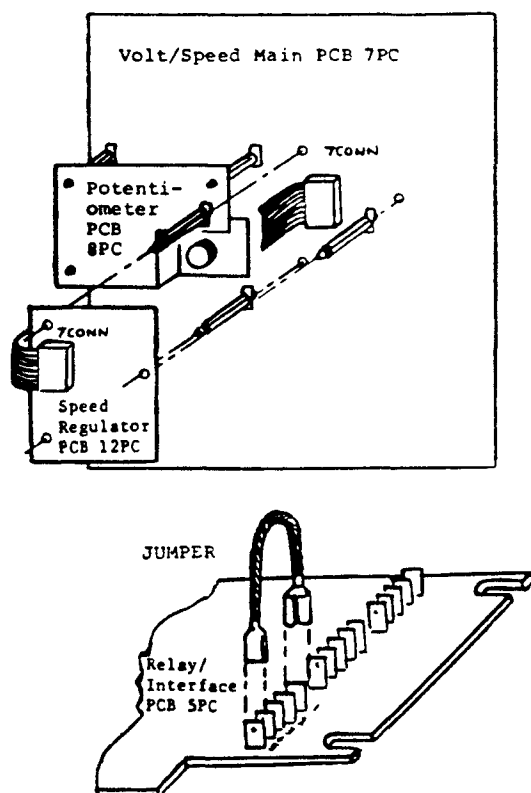
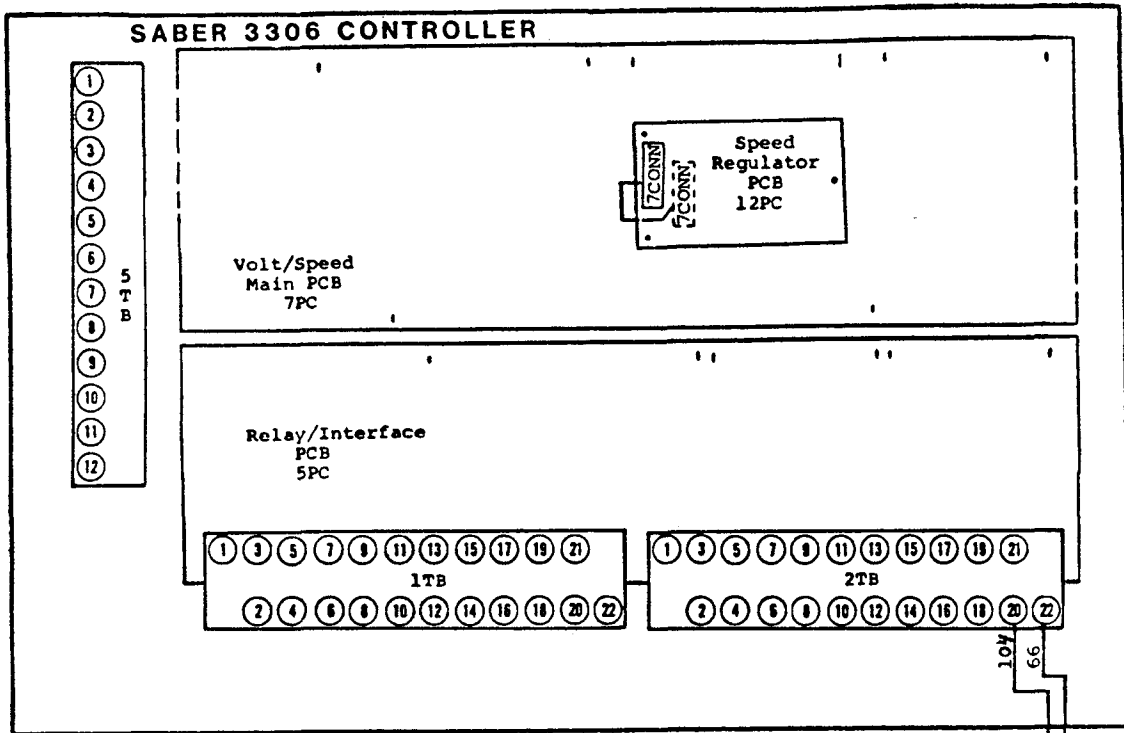


Figure 1.

CHANGE RECORD		4	STD-2415	12-5-85			
1	STD-1561	8-18-82	5	STD-2666	2-3-87		
2	STD-0284	2-24-84	6	STD-2760	5-8-87	RL	
3	STD-2083	6-14-84					

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*Supplied only when specified.

Figure 2.

Table 1. Interconnection Table

WIRE NO.	FROM		TO	
	EQUIPMENT	TB OR OTHER MARKING	EQUIPMENT	TB OR OTHER MARKING
104	Tachometer	(+)	Controller	2TB (20)
66		(-)		2TB (22)
104	1TVM*	Pot Terminal	Controller	2TB (20)
66		Meter Terminal		2TB (22)
SH		No Connection		2TB (22)

* Supplied only when specified.

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INSTALLATION

WARNING

REMOVE ALL INPUT POWER TO DRIVE
BEFORE INSTALLING MODIFICATION KIT.

The modification PCB is to be installed to the Voltage/Speed Main PCB, as shown in Figure 1, after removing the jumper plug from 7CONN. Installation instructions are contained in the Controller instruction manual. This modification requires 2TB installed on Relay/Interface PCB.

After installing the modification PCB, apply the schematic overlays to the schematic diagram as described in the Controller instruction manual.

INTERCONNECTION

This modification requires that an AC or DC tachometer be installed to the DC motor. Perform equipment interconnection according to the Controller instruction manual. Then perform interconnections as shown in Figure 2 and Table 1.

The allowable input voltage range is 250 VDC (175 VAC). By installing jumpers between tabs 1 thru 5 on the Relay/Interface PCB (as shown in Figure 1) and setting TACH CAL, a tachometer calibration can be performed as follows:

AC TACH CALIBRATION

A. Disconnect tach leads from 2TB-20 and 2TB-22.

B. On Speed Regulator option PCB, set DIP switch 3SS to ON (right) and 4SS to OFF (left).

C. On Volt/Speed Main PCB, set DIP switch 5SS to OFF (left).

D. Calculate required resistance load on tach input as follows:

$$R_{\text{Load}} \text{ (K-ohms)} = \frac{\text{RPM}_{\text{MAX}} \times \text{Volts}/1000\text{RPM of tach}}{.93}$$

E. Select a resistor series combination on Relay/Interface PCB (see the Tach Input line on the Controller schematic) closest to, but not more than, $R_{\text{Load}} - 35\text{K}$.

Connect jumpers to the appropriate faston tabs to bypass the resistors not needed in the series.

F. Measure resistance between 2TB-20 and 2TB-22 and adjust the TACH CAL pot on Speed Regulator option PCB to obtain R_{Load} (k-ohms) calculated in Step D.

G. The above calibration should result in producing 9.3V RMS at 1TP and 8.4 VDC at 2TP on Speed Regulator PCB at maximum tach speed.

EXAMPLE:

1. Assume:

Tach is 45 VAC/1000 RPM.

Max motor/tach speed is
1750 RPM.

2. Therefore:

$$R_{\text{Load}} = \frac{(1750) \times (45/1000)}{.93} = 84.7\text{K ohms}$$

3. Select combination of resistors on Relay/Interface PCB closest to $84.7\text{K} - 35\text{K} = 49.7\text{K}$.

4. Closest selection would be 45.6K (3R + 4R); therefore, place jumper from #3 faston to #5 faston to eliminate 6R and 5R from the series.

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5. Set TACH CAL pot to obtain 84.7K ohms between 2TB-20 to 2TB-22.

H. Reconnect tach leads to 2TB-20 and 2TB-22. Then proceed to Regulator Gain Setup.

DC TACH CALIBRATION

A. Disconnect tach leads from 2TB-20 and 2TB-22.

B1. For Unidirectional Operation: On Speed Regulator option PCB, set DIP switch 4SS to ON (right) and 3SS to OFF (left).

B2. For Bidirection Operation: On Speed Regulator option PCB, set DIP switch 4SS to OFF (left) and 3SS to ON (right).

C. On Volt/Speed Main PCB, set DIP switch 5SS to OFF (left).

D. Calculate required resistance load on tach input as follows:

$$R_{Load} \text{ (K-ohms)} = \frac{\text{RPM}_{MAX} \times \text{Volts}/1000 \text{ RPM of Tach}}{.84}$$

E. Select a resistor series combination on Relay/Interface PCB (see Tach Input line on the Controller schematic) closest to, but not more than, $R_{Load} - 35K$. Connect jumpers to the appropriate faston tabs to bypass the resistors not needed in the series.

F. Measure resistance between 2TB-20 and 2TB-22 and adjust the TACH CAL pot on Speed Regulator option PCB to obtain R_{Load} (K-ohms) calculated in Step D.

G. The above calibration should result in producing 8.4 VDC at 1TP and 2TP on Speed Regulator PCB at maximum tach speed.

EXAMPLE:

1. Assume:

Tach is 50 VDC/1000 RPM.

Max motor/tach speed is 1750 RPM.

2. Therefore:

$$R_{Load} = \frac{(1750) \times (50/1000)}{.84} = 104K \text{ ohms}$$

3. Select combination of resistors on Relay/Interface PCB closest to $104K - 35K = 69K$.

4. Closest selection would be 66.6K (4R + 5R); therefore, place jumper from #5 faston to #4 faston and #2 faston to #1 faston to eliminate 6R and 3R from the series.

5. Set TACH CAL pot to obtain 104K ohms between 2TB-20 to 2TB-22.

H. Reconnect tach leads to 2TB-20 and 2TB-22, then proceed to Regulator Gain Setup.

REGULATOR GAIN SETUP

Set switches 1SS and 2SS on the Speed Regulator PCB to the ON position for medium performance applications and both to the OFF position for high performance applications. Generally, the tachometer ripple can be excessive, due to eccentric tach mounting, especially for some AC tachs. Therefore, it may be necessary to set 1SS and 2SS to the ON position, using the PROPORTIONAL and INTEGRAL GAIN settings near maximum.

ADJUSTMENTS

After performing the adjustments in the Controller instruction manual, adjust the modification PCB as follows:

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1. Set SPEED control on Operator Control Station and MAX SPEED (ten-turn) and MIN SPEED potentiometers on the Potentiometer PCB all to zero (fully CCW). Set PROPORTIONAL GAIN and INTEGRAL GAIN to approximately 25% from fully CCW position.

2. Start drive and slowly increase SPEED control until drive reaches 30% of maximum speed.

3. Increase PROPORTIONAL GAIN until drive becomes unstable, then back off 10%. It may be possible to switch 1SS to the OFF position, especially when using DC tachs. The maximum setting of this pot should not produce more than .25V to .5V peak to peak ripple at 8TP on Volt/Speed Main PCB at any point in the desired speed range.

4. Increase INTEGRAL GAIN until drive instability results, then back off 10%. It may be possible to open 2SS, especially when using DC tachs.

5. Adjust SPEED control until maximum setting is obtained. Adjust MAX SPEED until desired maximum speed is reached.

6. Turn SPEED control fully counter-clockwise. Then turn MIN SPEED potentiometer clockwise until minimum desired operating speed is reached.

MODIFICATION RECORDS

After completing installation of all modifications:

A. Modify the Controller identification number using Method 1 in the Controller instruction manual. Insert the appropriate designator in Block 3.

B. If not already present, affix the OPTION ADJUSTMENTS label to the inside of the Power Cube cover, to the right of the STANDARD ADJUSTMENTS label.

C. On the OPTION ADJUSTMENTS label, record the final settings of all pots or switches on this modification.

D. Insert this instruction sheet immediately behind the front cover of the Controller instruction manual.

TROUBLESHOOTING

If other mod boards have been installed, troubleshoot them thoroughly before discarding this board as faulty.

Troubleshooting consists of checking the input and output voltages of the circuit.

1. With power applied to the Controller, measure on the Volt/Speed Main PCB (or Regulator PCB) from 31TP to 33TP (63TP) for +15 VDC, and from 35TP to 33TP (63TP) for -15 VDC.

If either voltage is not correct, check Power Supply PCB (6PC) or ribbon cable 6CONN and replace as required.

2. With drive running at maximum speed, measure from 1TP on Speed Regulator PCB to 2TB-22 for 9.3V RMS (AC tach) or 8.4 VDC (DC tach). If voltage is not present, check tach and wiring to 2TB. If voltage is too high or too low, check for correct tach calibration according to this instruction sheet.

3. With drive still at maximum speed, measure from 2TP on Speed Regulator PCB to 2TB-22 for 8.4 VDC. If voltage is not correct, replace Speed Regulator PCB.

4. If drive operation is unstable, first troubleshoot Tach Damping modification PCB, if present. Then check PROPORTIONAL GAIN and INTEGRAL GAIN adjustments according to this instruction sheet. If proper operation cannot be obtained, replace Speed Regulator PCB or ribbon cable 7CONN.

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