MagneTek

For use with Saber 3306 and 3412 DC Drives.

# VOLTAGE/CURRENT FOLLOWER MODIFICATION

(3306 KIT: MODEL 72391)

PCB 46S02269-0010 SCHEMATIC 45S02269-0010

AND

# AUTO/MANUAL MODIFICATION

(3306 KIT: MODEL 73496)

PCB 46S02276-0010 SCHEMATIC 45S02276-0010

## DESCRIPTION

These modifications are two of a series available for Saber DC drives. Each modification may be used separately, or the two may be used in combination.

The Voltage/Current Follower modification consists of components necessary for modifying the basic Controller for a voltage or current follower.

The Auto/Manual modification consists of components necessary for modifying the basic Controller for manual or automatic speed control. The Auto/Manual modification enables the operator to control drive speed manually or automatically. In the manual speed mode (MAN/AUTO switch in MAN), the speed reference signal is supplied by the SPEED CONTROL potentiometer. In the auto speed mode (MAN/AUTO switch in AUTO), the speed reference signal follows a customer supplied speed signal or the output of the follower mod.

## CAUTION

THE SIGNAL INPUT LINES TO THE VOLTAGE/CURRENT FOLLOWER PCB HAVE A MAXIMUM COMMON NODE VOLTAGE OF 20V PEAK ABOVE CIRCUIT COMMON. THEREFORE, COMMON NODE VOLTAGE BETWEEN INPUT LINES AND COMMON MUST BE LIMITED TO THIS VALUE. IF THE JUMPERS ON THE RELAY INTERFACE PCB ARE IN A POSITION OTHER THAN A TO E AND A' TO E', THE COMMON NODE VOLTAGE (VCM) OF THIS PCB CAN BE INCREASED BY THE FOLLOWING FORMULA:

$$V_{CM} = \frac{20K + R_{\&I}}{10K} \times 10$$

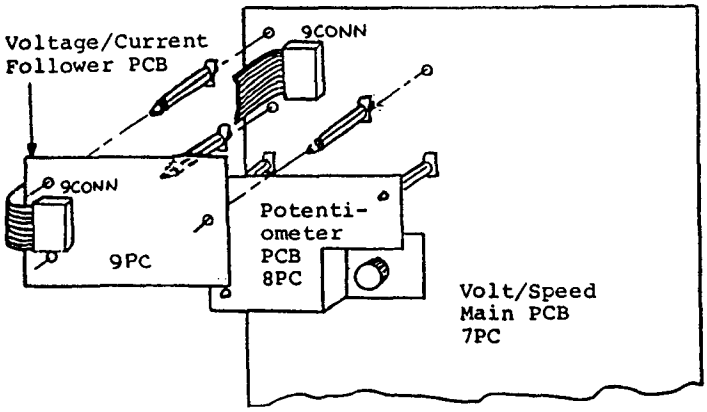
WHERE: $R_{\&I}$ IS THE SERIES RESISTANCE NOT SHORTED OUT BY THE JUMPERS. NOTE: USE ONLY THE RESISTANCE OF ONE CHANNEL FOR $R_{\&I}$. ALSO VCM IS MEASURED BETWEEN 7PC COMMON AND THE COMMON OF THE VOLTAGE/CURRENT FOLLOWER INPUT.

| CHANGE RECORD | | | | | | |
|---|---|---|---|---|---|---|
| 1 | STD-1430 3/4/82 | 4 | Publ. Chg 11/30/83 | | | DWG. NO. 02Y00025-0046<br>SHEET 1 OF 10<br>EFF. 5/5/82 (CS90) |
| 2 | STD-1570 8/18/82 | 5 | STD-2666 2-3-87 | | | |
| 3 | STD-1667 11/30/82 | 7 | STD-3924 11-10-89 | | | |

D&S 333-3/86

## INSTALLATION

SABER 3306




SABER 3412

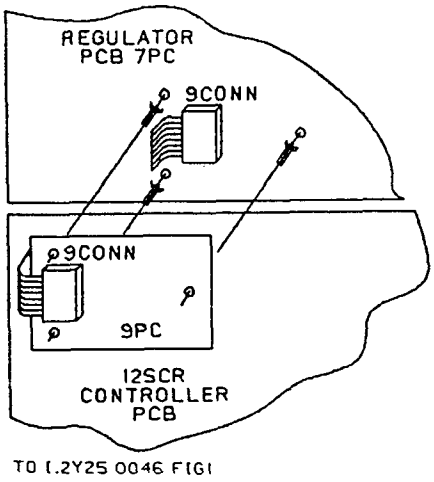



Figure 1.

**WARNING**

REMOVE ALL INPUT POWER TO DRIVE BEFORE INSTALLING MODIFICATION KIT.

The Voltage/Current Follower PCB is to be installed on the Volt/Speed Main PCB (3306) or the Regulator PCB (3412) as shown in Figure 1. The two IC Resistor networks supplied in the mod kit are to be installed on the Relay/Interface PCB as shown in Figure 2.

The Auto/Manual PCB is to be installed on the Relay/Interface PCB as shown in Figure 2.

Either modification requires 2TB installed on the Relay/Interface PCB.

After installing the modification PCB(s), apply the appropriate overlays to the schematic diagram, as described in the Controller manual.

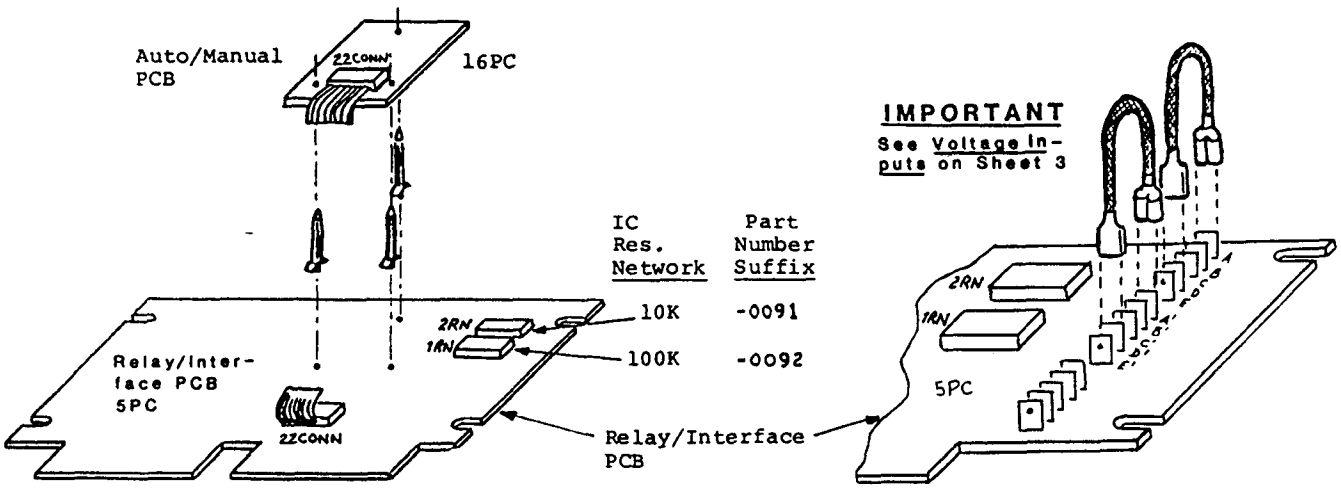



Figure 2.

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## Voltage Inputs

When the Voltage/Current Follower modification is used as a voltage follower, the Controller input will accept a differential or single-ended voltage signal of either polarity. Jumper wires are provided with the modification to scale the voltage input to a proper usable level. BOTH of these jumper connections MUST BE made on the Relay/Interface PCB AS ILLUSTRATED IN Figure 2. Examples of voltage ranges and associated jumpers are listed below. Note: If a single-ended voltage signal is used, an additional jumper (not supplied) MUST BE connected from the unused input terminal, 2TB (16) or 2TB (18), to Controller circuit common, 1TB (2) or 1TB (4).

| Max Voltage Input From | To | Jumpers |
|---|---|---|
| 2.5V | 5V | A to E A' to E' |
| 5V | 15V | A to D A' to D' |
| 15V | 90V | A to C A' to C' |
| 90V | 175V | A to B A' to B' |
| 175V | 200V | No Jumpers Req'd. |

If the input voltage signal is AC, switch 6SS on the Voltage/Current Follower PCB MUST BE in the ON position for rectification. A ripple filter on the rectified output stage may be inserted in to the circuit by switching 7SS to the ON position. Signal noise filter switch 8SS MUST ALWAYS be in the OFF position when an AC signal is used.

## DC Current Inputs

When the Voltage/Current Follower modification is used as a DC current follower, the Controller will accept a differential or single-ended current signal up to 50mA max. BOTH jumpers supplied with the modification MUST BE connected from A to E and A' to E' on the Relay/Interface PCB as illustrated in Figure 2. Select one of the following four signal input ranges and set the corresponding switch(es) located on the Voltage/Current Follower PCB to the ON position. Note: If a single-ended current signal is used, an additional jumper (not supplied) MUST BE connected from the unused input terminal, 2TB (16) or 2TB (18), to Controller circuit common 1TB (2) or 1TB (4).

| RANGE | SWITCH POSITIONS |
|---|---|
| 1-5MA | 1SS ON, 2, 3, 4SS OFF |
| 2-10MA | 2SS ON, 1, 3, 4SS OFF |
| 4-20MA | 3SS ON, 1, 2, 4SS OFF |
| 10-50MA | 1, 2, 3, 4SS ON |

A signal noise filter after the ratio adjustment stage can be inserted by switching 8SS to the ON position. This filter is for use with a DC voltage or current signal ONLY.

## INTERCONNECTIONS

### Voltage or DC Current Inputs

Perform basic equipment interconnections according to the Controller manual. After these interconnections have been made, refer to the accompanying diagrams and wire tables, and perform the appropriate interconnections.

An external RATIO pot may be remotely installed to operate in place of 3RH on the Voltage/Current Follower PCB. The value of this external pot should be 5K ohms. MagneTek part no. 43T00572-5023 is recommended. Set switch 5SS (on the Voltage/Current Follower PCB) to the OFF position and connect the RATIO pot as illustrated in Figure 3 or 5.

### Auto/Manual

This modification can be used with or without the Voltage/Current Follower PCB, and requires the addition of a two-position Man/Auto switch to the Operator Control Station. When used separately, a customer supplied 0 to -10 VDC auto speed reference signal is required.

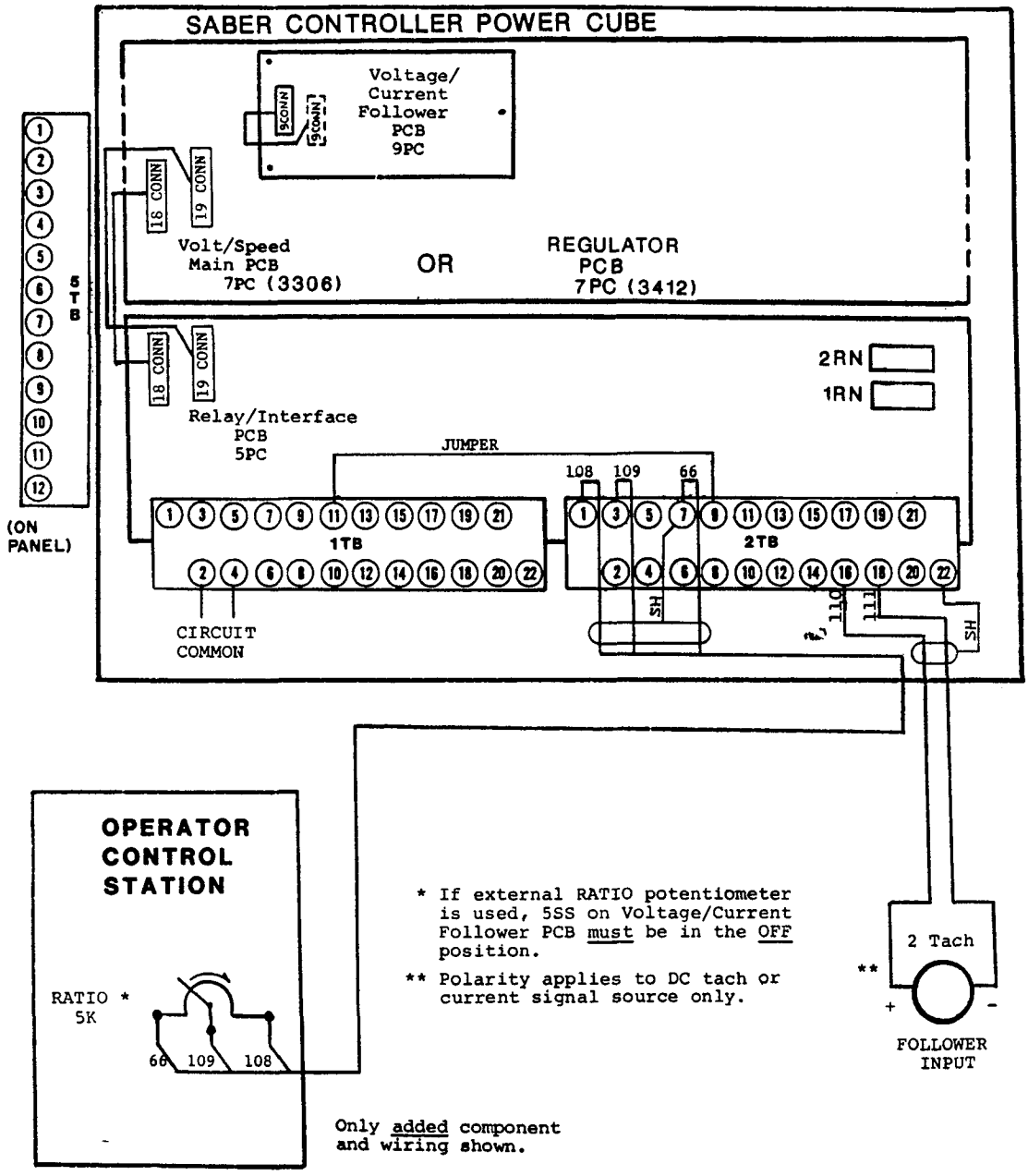


Figure 3. Interconnection Diagram
Voltage/Current Follower Only

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Table 1. Interconnection Table
Voltage/Current Follower Only

| WIRE NO. | FROM | | TO | | REMARKS |
|---|---|---|---|---|---|
| | EQUIPMENT | TB OR OTHER MARKING | EQUIPMENT | TB OR OTHER MARKING | |
| JUMPER | Controller | 2TB (9) | Controller | 1TB (11) | |
| 66 | External RATIO Pot | CCW | Controller | 2TB (7) | 3-Conductor Shielded |
| 108 | | CW | | 2TB (1) | |
| 109 | | Wiper | | 2TB (3) | |
| SH | | No Connection | | 2TB (7) | |
| 110 | DC *** Tachomoter | (+) | Controller | 2TB (16) | |
| 111 | | (-) | | 2TB (18) | |
| SH | | No Connection | | 2TB (22) | |
| 110 | AC *** Tachometer | | Controller | 2TB (16) | 2-Conductor Shielded *** |
| 111 | | | | 2TB (18) | |
| SH | | No Connection | | 2TB (22) | |
| 110 | 0-50mA DC *** Current Signal | (+) | Controller | 2TB (16) | |
| 111 | | (-) | | 2TB (18) | |
| SH | | No Connection | | 2TB (22) | |

*** Wire Only one input signal to Controller.

ADJUSTMENTS

A. Auto/Manual ONLY

No special adjustments are required for this modification. Make sure that switch 1SS on this modification is in the closed position, set the external Auto/Manual switch to Manual, and perform all adjustments as specified in the Controller manual. The drive will then be set up to follow either the manual speed setter signal or the customer supplied 0 to -10 VDC auto speed reference signal.

B. Voltage/Current Follower WITH Auto/Manual

It is important that the Controller be set up first in the Manual mode of operation before any attempt is made to adjust the drive in the Auto mode. Place external switch in the Manual position and perform all adjustments as specified in the Controller manual. Then turn switch to Auto and perform the following.

Voltage Follower

1. Set MAX RATIO pot (4RH) at zero (fully CCW). Set RATIO pot (3RH or external) at 100% (fully CW), LOW SPEED TRACKING pot (1RH) at 50% and CURRENT OFFSET pot (2RH) at zero. The current offset adjustment is not used for voltage input and should not be changed during voltage follower adjustments.

2. Start drive and apply the maximum input voltage signal. Adjust the MAX

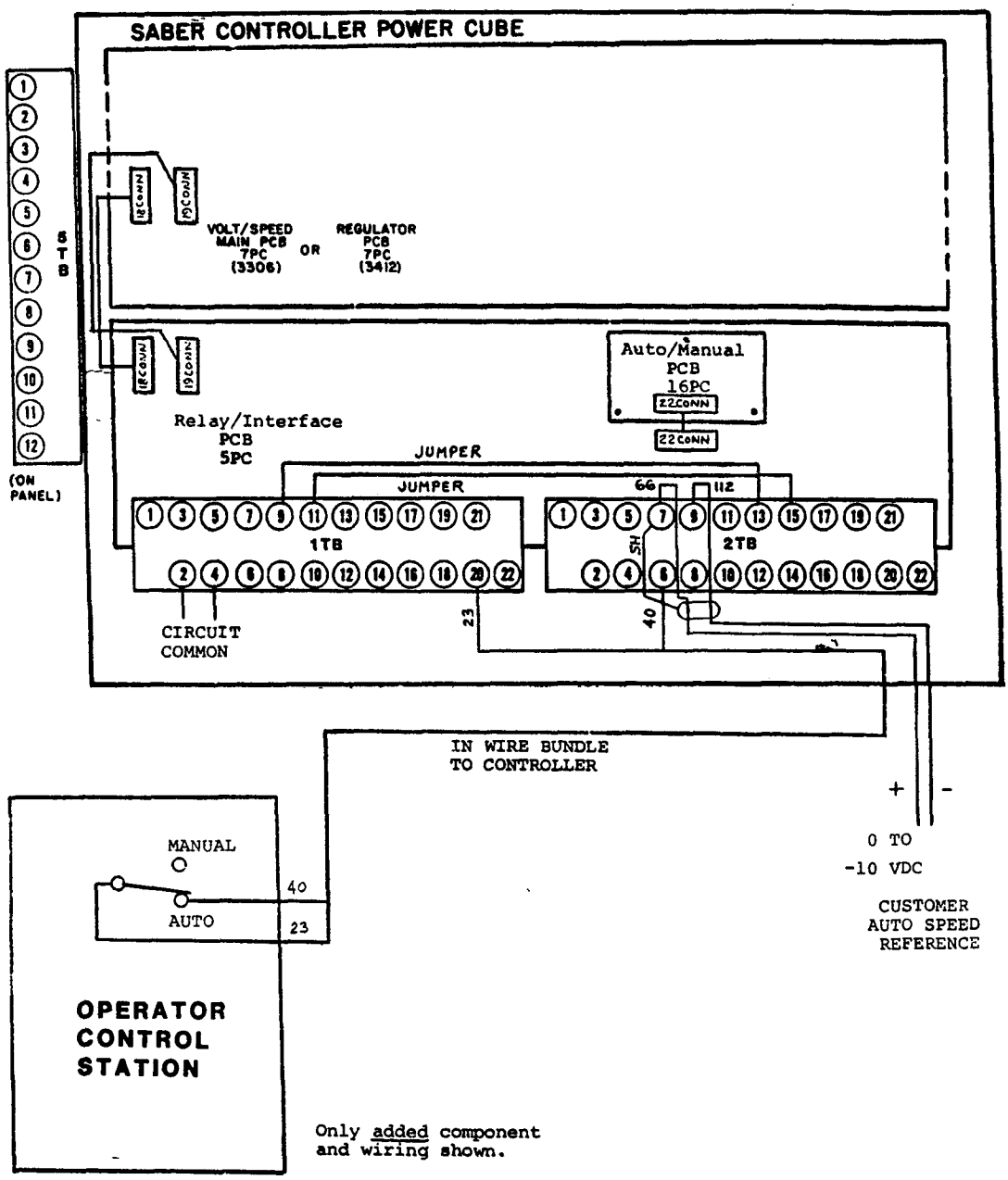


Figure 4. Interconnection Diagram
Auto/Manual Only

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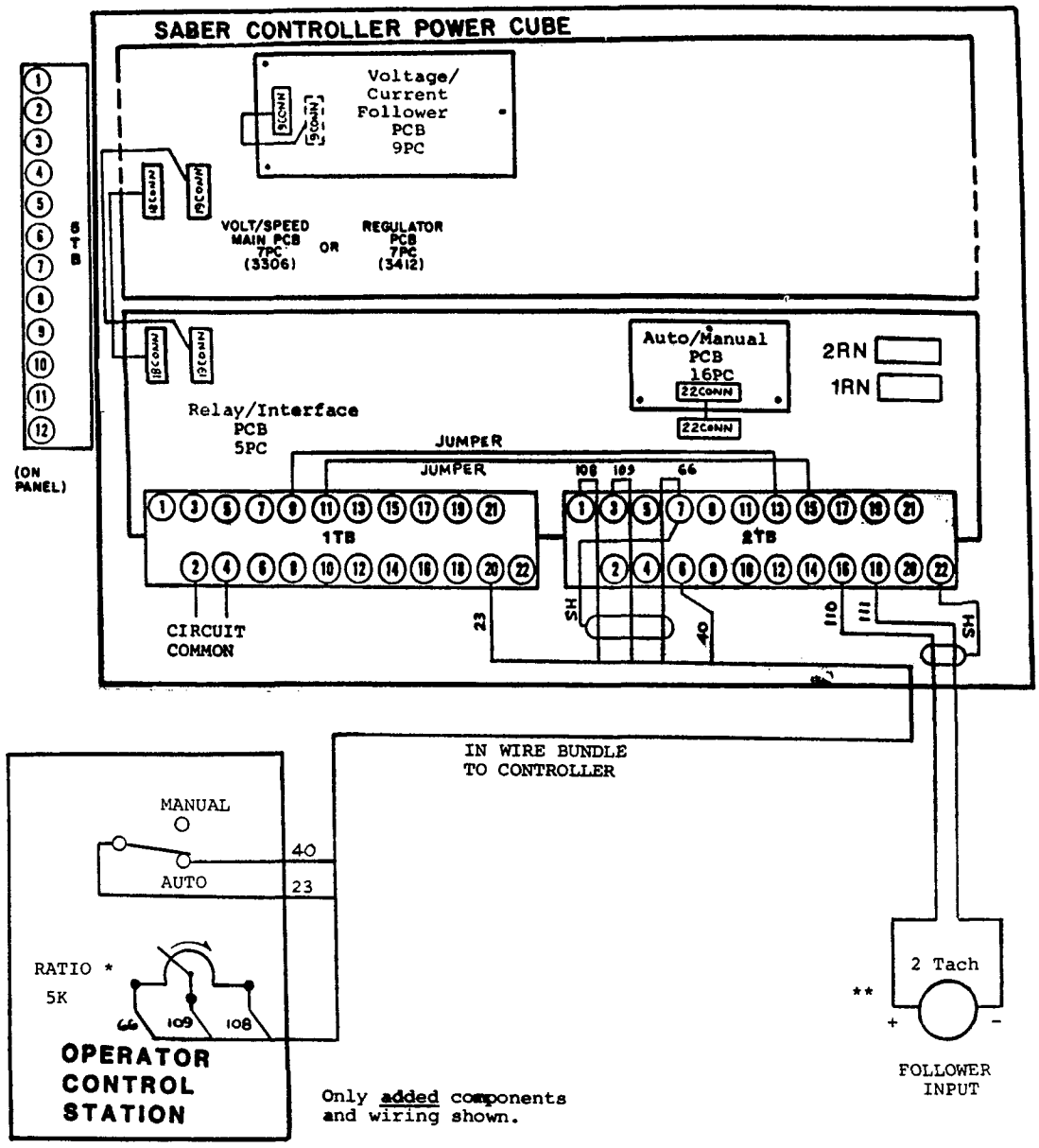
Table 2. Interconnection Table
Auto/Manual Only

| WIRE NO. | FROM | | TO | | REMARKS |
|---|---|---|---|---|---|
| | EQUIPMENT | TB OR OTHER MARKING | EQUIPMENT | TB OR OTHER MARKING | |
| 23 | AUTO/MAN Switch | | Controller | 1TB (20) | |
| 40 | | Auto | | 2TB (6) | |
| JUMPER | Controller | 1TB (9) | Controller | 2TB (13) | |
| JUMPER | | 1TB (11) | | 2TB (15) | |
| 66 | Customer 0 to -10 VDC Auto Speed Signal | (+) | Controller | 2TB (7) | 2-Conductor Shielded; Input Impedance is 20K |
| 112 | | (-) | | 2TB (9) | |
| SH | | No Connection | | 2TB (7) | |

Table 3. Interconnection Table
Voltage Current Follower With Auto/Manual

| WIRE NO. | FROM | | TO | | REMARKS |
|---|---|---|---|---|---|
| | EQUIPMENT | TB OR OTHER MARKING | EQUIPMENT | TB OR OTHER MARKING | |
| 23 | Auto/Man. SW. | | Controller | 1TB (20) | |
| 40 | Auto/Man. SW. | Auto | Controller | 2TB (6) | |
| JUMPER | Controller | 1TB (9) | Controller | 2TB (13) | |
| JUMPER | | 1TB (11) | | 2TB (15) | |
| 66 | External RATIO Pot | CCW | Controller | 2TB (7) | 3-Conductor Shielded |
| 108 | | CW | | 2TB (1) | |
| 109 | | Wiper | | 2TB (3) | |
| SH | | No Connection | | 2TB (7) | |
| 110 | DC *** Tachometer | (+) | Controller | 2TB (16) | 2-Conductor Shielded *** |
| 111 | | (-) | | 2TB (22) | |
| SH | | No Connection | | 2TB (22) | |
| 110 | AC *** Tachometer | | Controller | 2TB (16) | |
| 111 | | | | 2TB (18) | |
| SH | | No Connection | | 2TB (22) | |
| 110 | 0-50mA DC *** Current Signal | (+) | Controller | 2TB (16) | |
| 111 | | (-) | | 2TB (18) | |
| SH | | No Connection | | 2TB (22) | |

*** Wire only one input to Controller




* If external RATIO potentiometer is used, 5SS on Voltage/Current Follower PCB must be in the OFF position.

** Polarity applies to DC Tach or current signal source only.

Figure 5. Interconnection Diagram
Voltage/Current Follower With Auto/Manual

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RATIO pot for desired maximum drive speed. This setting should result in a maximum of -10V at the output of this PCB (test point 1TP).

3. Apply the minimum input voltage signal and adjust the LOW SPEED TRACKING pot for desired minimum speed (turning pot CW increases speed). A range of ±30% of maximum PCB output is possible.

4. Repeat steps 2 and 3 several times until desired speed range is obtained. The RATIO pot (3RH or external) can now be adjusted over the entire speed range from min to max.

5. If desired speeds cannot be obtained, perform modification kit troubleshooting procedures.

Current Follower

1. Set the MAX RATIO pot (4RH) at zero (fully CCW). Set the RATIO pot (3RH or external) at 100% (fully CW), LOW SPEED TRACKING pot (1RH) at 50%, and CURRENT OFFSET pot (2RH) at 50%.

2. Apply the normal minimum input current signal (1, 2, 4 or 10mA). Monitor test point 4TP on the Follower PCB, and adjust CURRENT OFFSET pot to obtain zero volts.

3. Start the drive. With minimum current signal applied, adjust the LOW SPEED TRACKING pot for desired minimum speed (turning pot CW increases speed).

4. Apply the maximum current signal and adjust the MAX RATIO pot for desired maximum drive speed. This setting should result in a maximum of -10V at the output of this PCB (test point 1TP). The RATIO pot can now be adjusted over the entire speed range from min to max.

5. If desired speeds cannot be obtained, perform modification kit troubleshooting procedures.

C. Voltage/Current Follower ONLY (Auto mode only; no Manual mode)

The MAX SPEED adjustment procedure described in the Controller manual is invalid for drives without a manual speed mode of operation. To set max drive speed proceed as follows:

1. Connect the jumpers on the Relay/Interface PCB from A to D and A' to D'.

2. Set the MAX SPEED pot 8RH on 8PC, Potentiometer PCB (3306) (or 18RH on 8PC, Adjustment PCB (3412)) and MAX RATIO pot (4RH) at zero (fully CCW). Set the internal RATIO pot (3RH) at 100% and the LOW SPEED TRACKING pot (1RH) at 50%.

3. Remove follower signal connections from 2TB(16) and (18). Connect temporary jumpers from 1TB(3) to 2TB(18) and from 1TB(4) to 2TB(16).

4. Adjust MAX RATIO pot to obtain -10V at the output of this PCB (test point 1TP.

5. Start drive and perform all adjustments (MAX SPEED, etc.) as specified in the Controller manual.

6. Remove temporary jumpers and reconnect follower signal at 2TB. Reconnect jumpers on Relay/Interface PCB to match follower signal input, as described under INSTALLATION. Then perform the following:

Voltage Follower

1. Perform Voltage Follower adjustment procedures under B.

Current Follower

1. Perform Current Follower adjustment procedures under B.

## MODIFICATION RECORDS

After completing installation of all modifications:

A. Modify the Controller identification number using Method 1 in the Controller manual. Insert the appropriate designators in blocks 2 and 4.

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: for Auto/Manual, the setting (closed) of 1SS; for the Voltage/Current Follower, the input range selected and the settings of 1RH-4RH and 1SS-8SS.

D. Insert this instruction sheet immediately behind the Controller 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 voltage of the circuit while the drive is operating.

1. Start the drive. Place the MAN/AUTO switch to AUTO.

2. Refer to the schematic diagram of the Voltage/Current Follower PCB and check for proper input voltage between terminal connection 2TB(16) (+) and 2TB(18) (-) (polarity applies to DC input only). If input voltage is incorrect, repair or replace external voltage follower source.

3. Check that input voltage from 30TP to 33TP (common) of the Volt/Speed Main PCB (3306) (or to 63TP (common) of the Regulator PCB (3412)) varies as the RATIO potentiometer setting is varied. If not, replace the Voltage/Current Follower PCB.

4. Place the MAN/AUTO switch to MAN and check that the output voltage from 30TP to 33TP (or 63TP) varies as the reference input signal on 2TB(13) is varied. If not, replace the Auto/Manual PCB.