

**SPINDLE SPEED CHANGER
INSTRUCTION MANUAL**

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REV. 2



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CHAPTER 1: GENERAL INFORMATION

SECTION 1-1 INTRODUCTION

The Aerotech Spindle Speed Changer provides a convenient means of changing the speed of the spindle. Speeds can be changed through the front panel mounted switches or by control through the digital interface.

The external digital interface control can be adapted and set to operate in one of several formats. BCD and Binary are the most common. Contact the factory concerning any format requirements.

SECTION 1-2 FEATURES

1. Coding - Binary, BCD (consult the factory)
2. Interface Levels - Opto Coupler Circuits; 15 to 24 volt supply (15 mA at 24 V), jumper configured
3. Continue output - Opto coupler transistor output

30 V C-E Max.
20 mA. Max.
.15 Watt Max. Pwr. Dissipation

4. Manual Speed Override - 50% to 120%

CHAPTER 2: INSTALLATION INSTRUCTIONS

This unit has been checked and configured for your system at the factory. If complete information was not provided at the factory, additional board configuration changes may be required. To insure that the Speed Changer is set up properly, follow the installation procedures. (Refer to sections 2-1 to 2-7.)

Check that you have received all of the following items (OEM Installations only) and that the parts have not been damaged during shipment.

1. Digital speed changer controller
2. 16 Pin Jumper Headers, blank (4 headers)
3. Prom for your system (should be installed already - socket M1)
4. 1 Gear Motor (Daytom 4Z064)
5. 1 ONCE/REV Sensor and Magnet
6. Interface Schematic 690D1244

SECTION 2-1 BOARD CONFIGURATION

The following list will provide information which will aid in setting up the Speed Changer Board (Jumpers on Logic Board).

JUMPER	EXPLANATION
1. 1-2, 2-3	Jumper 1-2 and open 2-3 if Once/Rev. (once per revolution) signal is a high pulse. Jumper 2-3 and open 1-2 if Once/Rev. signal is a low pulse.
2. 4-5, 5-6	Jumper 4-5 and open 5-6 if Data DO-D11 logic 1 is represented by turning on the Opto Coupler.

Jumper 5-6 and open 4-5 if Data D0-D11 logic 1 is represented by turning off the Opto Coupler

3. 14-15, 13-14

Jumper 15-14 and open 14-13 to turn on the Opto Coupler Continue output transistor during a Continue pulse.

Jumper 14-13 and open 15-14 to turn off the Opto Coupler Continue output transistor during a Continue pulse.

4. 7-8, 8-9

Logic polarity reversal: Jumper used on some systems for Hi/Lo range or extra data line.

Set Jumper for (7-8 in and 8-9 out) or (8-9 in and 7-8 out); consult the factory if D12, Hi/Lo input is used.

5. 12-11, 11-10

Jumper 12-11 and open 11-10 when strobe is represented by no current flow through the strobe input.

Jumper 11-10 and open 12-11 when strobe is represented by current flow through the strobe input.

6. D0-D12 (Set-Up)

Place these header jumpers in so that current will flow through the Opto Coupler. If data input is more negative than the +V/COM terminal, install cross jumpers and verify that the straight jumpers are not connected. If data input is more positive than +V/COM terminal, remove cross jumpers and install straight jumpers.

7. EPROM (M1) This IC contains the conversion table for your system. The EPROM will be marked with an Aerotech code. This code is important since it will aid in identifying the type of format used in your system.

SECTION 2-2 POWER CONNECTIONS

Power connections are made to the Power Board. There are two AC power inputs to this card:

1. The motor AC power input
2. The power supply AC

The motor AC power (TB1-1,2) must always be 120 VAC. The power supply AC power (TB1-3,4) can be either 120 or 240 VAC but should not be a line which would be subject to a large amount of voltage transients and line sags. See the following information for set-up:

Motor Power AC:

1. TB1-1 - 120VAC Hi (2 amps)
2. TB1-2 - 120VAC Lo (2 amps)

Power Supply AC (120VAC):

1. TB1-4 - 120VAC Hi (1/2 amp)
2. TB1-3 - 120VAC Lo (1/2 amp)
3. Jumpers 1-2 and 3-4 IN, Jumper 2-3 OUT

Power Supply AC Wiring (240VAC):

1. TB1-3 - 240VAC (1/2 Amp)
2. TB1-4 - 240VAC (1/2 Amp)
3. Jumper 2-3 IN, Jumpers 1-2 and 3-4 OUT

SECTION 2-3 MOTOR CONNECTIONS

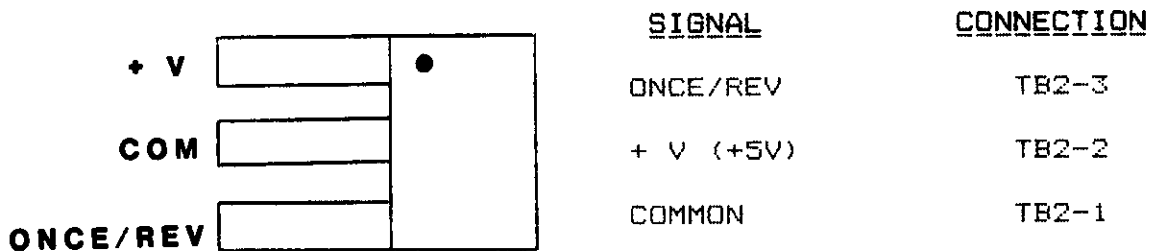
There are two motor windings that have to be connected. Connect the motor winding which must be placed in series with the capacitor (CM) to TB1-5 and TB1-6. The remaining winding is connected to TB1-9 and TB1-10. Windings may be identified by color and diagram on the motor.

Refer to section 2-7A to verify that the windings are polarized correctly.

SECTION 2-4 ONCE/REV SENSOR INSTALLATION

The ONCE/REV sensor is mounted so that it is 1/8 to 3/16 inch away from the rotating magnet when passing the sensor. The magnet is screwed into the driven fixed sheave of the variable pitch pulley. A hole must be drilled and tapped (8-32) to accept this magnet. Use Loctite to secure the magnet and prevent it from becoming loose. The flat surface with the small dot (indentation) must face the magnet.

The Once/Rev Sensor Connections are located on the Logic Board TB2. The connections for the ONCE/REV Sensor are:



NOTE: The ONCE/REV Sensor wires must be enclosed in shielded wire with the shield connected to TB2-1 with the COMMON.

SECTION 2-5 MSO (MANUAL SPEED OVERRIDE) CONNECTION

The MSO circuit allows the operator to increase or decrease spindle speeds in programs without changing the program. If external MSO is to be used, the internal MSO should be disabled by setting the MSO switch to the slowest setting. It can be completely disconnected by removing the 10 pin connector from the MSO switch board. The MSO has a range of approximately 50% to 120% of programmed speed. The hex MSO lines are activated by connecting them to +V (+5V). As the hex MSO number is increased, the resultant speed is increased.

The MSO connections are:

<u>SIGNAL</u>	<u>CONNECTION</u>
1	TB5-2
2	TB5-3
4	TB5-1
8	TB5-4
+V	TB5-5
COM	TB5-6

SECTION 2-6 DATA CONNECTIONS

The data connections are the connections required to interface the speed changer to the remote NC controller. This interface consists of 13 data lines, a strobe line, a continue output, +V/COM line for the Opto Coupler return, +24V, +15V and a COM. These connections are located on the Logic Board.

DATA CONNECTION DESCRIPTION

<u>SIGNAL</u>	<u>TERMINAL</u>	<u>REMARKS</u>
+V/COM	TB1-4	Return bus for D0-D12 and strobe Opto Couplers
D0	TB1-5	Data line #1
D1	TB1-6	Data line #2

<u>SIGNAL</u>	<u>TERMINAL</u>	<u>REMARKS</u>
D2	TB1-7	Data line #3
D3	TB1-8	Data line #4
D4	TB1-9	Data line #5
D5	TB1-10	Data line #6
D6	TB1-11	Data line #7
D7	TB1-12	Data line #8
D8	TB1-13	Data line #9
D9	TB1-14	Data line #10
D10	TB1-15	Data line #11
D11	TB1-16	Data line #12
D12, Lo/Hi	TB1-17	Special function input
Strobe	TB1-18	Signal used to initiate speed changer operation
Continue +	TB1-19	Continue output from Opto Coupler transistor, connect to + side (voltage source)
Continue -	TB1-20	Continue output from Opto Coupler transistor, connect to the least positive side (voltage source)
+24 V	TB1-3	Can be used to power Opto Coupler Ckts. (D0-D12, Strobe)
+15 V	TB1-2	Can be used to power Opto Coupler Ckts. (D0-D12, Strobe)
COM	TB1-1	Common connection to be used if needed

SECTION 2-7 ADJUSTMENTS

If the Speed Changer has been factory adjusted and wired, no adjustments should be required. However, the following two adjustments should be checked:

1. Motor Phase Test
2. Speed Range Check

A. MOTOR PHASE TEST

The motor phase test is performed to check that the motor moves in the direction commanded. To perform this test, apply the power to the system, then using the UP/DOWN pushbuttons, verify that the spindle speed changes in accordance to the buttons pressed. If backwards, reverse the wires going to TB1-5 and TB1-6 of the Power Board. Verify that the speed changes in accordance with the commanded direction.

B. SPEED ADJUST

Begin speed adjust procedure by setting MSD for 100%. Next, program a high and then a low speed, noting if the result is too high or too low. If both speeds are either too high or too low, adjust R20 as follows. Turn R20 CW to increase speeds and CCW to decrease speeds. Repeat this procedure until the error is less than 6%.

CHAPTER 3: OPERATION

SECTION 3-1 MANUAL OPERATION

For manual operation, there are two front panel mounted switches which enable the operator to "UP" the speed or "DOWN" the speed. Press the UP pushbutton to increase the speed and press the DOWN pushbutton to decrease the speed (refer to section 2-7 if backwards). Upon releasing the button, adjustment will stop.

SECTION 3-2 EXTERNAL SPEED SELECTION

To set speeds remotely, set the D0-D12 data lines for the speed required according to your format. Enter a strobe pulse (strobe of as least 10 milliseconds is recommended) and the speed changer will then proceed to set the speed. Depressing either the UP or DOWN pushbutton will reset the system and stop the speed changer, if searching for a speed. Following a remote speed change selection, a continue pulse will be output from the Continue outputs. With some loads, there is a lag between the speed it is presently at, and the real speed it will obtain. Because of this, more than one programming of the same speed may be beneficial to insure a correct speed.

NOTE: D0-D12 lines must not be changed until Continue is output in order to insure that the correct speed is obtained.

SECTION 3-3 MSO (MANUAL SPEED OVERRIDE)

The MSO is used only in the External mode and must be set before the strobe pulse is sent to the speed changer. Either the front panel or external MSO can be used, but it is not recommended that both be connected at the same time because there will be interaction between the two MSO's. Switch MSO to 50% and it will not effect an external MSO. For normal operation, the MSO should be set for 100%, which represents a 1:1 correspondence between programmed

speed and the speed it will adjust to. It should also be noted that in many cases, the MSO Switch will call for a speed that cannot be obtained for a given programmed speed, due to speed limits restricting the machine. In these cases, the motor will move into a limit which can be damaging to the motor or result in jamming. If jamming should occur, press the appropriate manual UP or DOWN pushbutton in a direction which should free the motor. Better results are usually obtained by a series of short depressions (approximately 1 second on and 1 second off) of the switch. DO NOT ALLOW THE MOTOR TO REMAIN IN A JAMMED POSITION IN THE EXTERNAL MODE.

CHAPTER 4: TROUBLESHOOTING AND MAINTENANCE

SECTION 4-1 TROUBLESHOOTING

Start troubleshooting by noting all problems, failures or other information which can be possibly related to the trouble encountered. By using this information and the following guide, it may be possible to locate and correct the problem.

<u>PROBLEM</u>	<u>REMARKS</u>
Will not operate at all (all modes)	<ol style="list-style-type: none">1. Check for power to power board2. Check fuse F1 and F2 on power board3. Check connections and wiring4. Motor jammed (see below)5. Check for proper voltage jumpers on power board
Power applied, but motor does not run (all modes)	<ol style="list-style-type: none">1. Motor jammed (see below)2. Check fuse F1 or F2 on power board3. Check connections (AC and motor)
Runs only in MAN mode (UP/DOWN pushbuttons)	<ol style="list-style-type: none">1. Check PROM2. Check Interface Connections (especially strobe)3. Verify external data sent

4. Check for strobe of at least 10 milliseconds

Runs into stop in the Remote mode

1. Check motor phasing (section 2-7A)
2. Check the ONCE/REV sensor
3. MSD causes out of range speed
4. Check PROM (correct PROM and correct installation)
5. Check D0-D12 lines for correct command
6. Check Board jumpers
7. Check Speed Adjust (section 2-7B)

Sets wrong speeds

1. Check MSD Switch and external MSD input
2. Verify D0-D12 inputs and connections
3. Check D0-D12 jumpers
4. Check the ONCE/REV signal and jumper
5. Check the EPROM
6. Check the Speed Adjust (section 2-7B)

Motor jammed

1. MSO switch may be causing out of range speed
2. Briefly depress UP/DOWN pushbutton once per second in the direction which should free the motor

SECTION 4-2 MAINTENANCE

Maintenance is not required once this unit has been installed and adjusted. The Speed Changer box should be kept clean and as unobstructed as possible in order to allow for good air circulation. Wipe the outside box to remove dirt and oil so it will not tend to seep into any seams and accumulate inside.

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