FlexPak 3000 AC Tachometer Interface Kit
Installation Instructions

M/N 907FK0301

Instruction Manual D2-3297-2

Rockwell Automation

Reliance Electric

The information in this manual is subject to change without notice.

DANGER

ONLY QUALIFIED PERSONNEL FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THIS EQUIPMENT AND THE HAZARDS INVOLVED SHOULD INSTALL, ADJUST, OPERATE, AND/OR SERVICE THIS EQUIPMENT. READ AND UNDERSTAND THIS INSTRUCTION SHEET IN ITS ENTIRETY BEFORE PROCEEDING. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.

CAUTION: The user is responsible for conforming with all applicable local, national, and international codes. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

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1.0 INTRODUCTION

The products described in this instruction manual are manufactured or distributed by Reliance Electric Industrial Company.

This instruction manual describes how to install and configure the optional AC Tachometer Interface kit used by FlexPak 3000 Digital DC drives to provide an interface for AC tachometers. The interface printed circuit board rectifies the tachometer's AC output voltage through a diode bridge and produces a DC voltage for the drive's Regulator board.

The AC Tachometer Interface kit is designed for use only with the following Reliance AC tachometers:

RE-045F
RE-045R
RE-050

The AC Tachometer Interface kit cannot be used in conjunction with the Pulse Tachometer Interface kit (M/N 907FK0101). Only one feedback interface kit can be used at any one time.

This instruction manual assumes that the FlexPak 3000 drive has been properly installed, and that one of the AC tachometers listed above has been properly installed on the drive's motor. Follow all instructions included with the tachometer. Refer to the FlexPak 3000 drive instruction manual for information about installing the drive.

Each Reliance Model 907FK0301 AC Tachometer Interface kit includes one AC Tachometer Interface board, part no. 58776-0A.

Getting Assistance from Reliance Electric

If you have any questions or problems with the products described in this instruction manual, contact your local Reliance Electric sales office. For technical assistance, call 1-800-RELIANCE.

2.0 PERFORMING PRELIMINARY CALCULATIONS

Before you install the AC Tachometer Interface, you must calculate your tachometer's maximum output voltage and the corresponding voltage that will be output by the Interface board. These calculations are used to do the following:

- Ensure you have the appropriate AC tachometer for your application
- Select the proper drive Regulator board jumper settings for your application
- Determine the proper wiring of the AC Tachometer Interface board to the Regulator board

Guideline

At the application's maximum motor speed in RPM, voltage at the input of the AC Tachometer Interface Board must not exceed 275V AC rms.

Calculating the Maximum AC Output from the Tachometer

Use the following formula to calculate the AC tachometer's maximum output voltage for your application. Round fractional values up to the nearest whole number.

$$\frac{\text{(Tachometer volts/1000) x max speed}}{1000} = \text{Max. AC tach. output voltage from pulse tachometer}$$

Calculating the Maximum DC Voltage Output from the AC Tachometer Interface Board

Use the following formula to calculate the AC Tachometer Interface board's maximum DC voltage output to the FlexPak 3000 drive. Round fractional numbers up to the nearest whole number.

$$\text{(Max AC output voltage from pulse tachometer x .9)} = \text{Max. DC voltage from Interface board}$$

Example

For example: An RE-045F tachometer is used and the maximum speed of the application is 2500 RPM. The specification for the RE-045F tachometer is 45V AC (+10V, −5V) /1000 RPM.

$$\frac{(45 + 10) \times 2500}{1000} = \frac{55 \times 2500}{1000} = 137.5\text{V AC max. from tachometer}$$

This result is well within the maximum of 275V AC accepted by the Interface board.

Now we multiply the result by .9 to find the maximum possible DC voltage from the Interface board.

$$137.5 \times .9 = 123.75\text{V DC}$$

The fractional value is rounded up, and our final result is 124V DC. This value is used to determine which terminals to connect to on the drive's Regulator board and how to set the jumpers on the drive's Regulator board.

Chapter 3 describes how to wire the Interface board and how to set jumpers.

3.0 INSTALLING THE AC TACHOMETER INTERFACE BOARD

DANGER

DO NOT INSTALL MODIFICATION KITS WITH POWER APPLIED TO THE DRIVE. DISCONNECT AND LOCKOUT INCOMING POWER BEFORE ATTEMPTING SUCH INSTALLATION. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.

CAUTION: The user is responsible for conforming with all applicable local, national, and international codes. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

After you have calculated the maximum DC voltage that can be output by the AC Tachometer Interface board, complete the following steps to install the board. When you have finished installing the board, adjust the required drive parameters as described in chapter 4.

- Open the drive and carrier
- Mount the AC Tachometer Interface board
- Set the Regulator board jumpers
- Connect the AC tachometer to the Interface board
- Check motor and drive wiring
- Close the carrier and drive

These steps are described in detail below.

3.1 Opening the Drive and Carrier

Step 1. Turn off, lockout and tag power to the drive.

Step 2. Make certain that the AC tachometer is mounted on the motor in accordance with its own installation instructions.

Step 3. Loosen the two drive cover screws and remove the cover from the drive.

Step 4. Loosen the captive screw securing the Operator Interface Module (OIM) carrier and swing open the carrier.

Step 5. Loosen and remove the four screws attaching the carrier shield to the carrier. See figure 3.1.

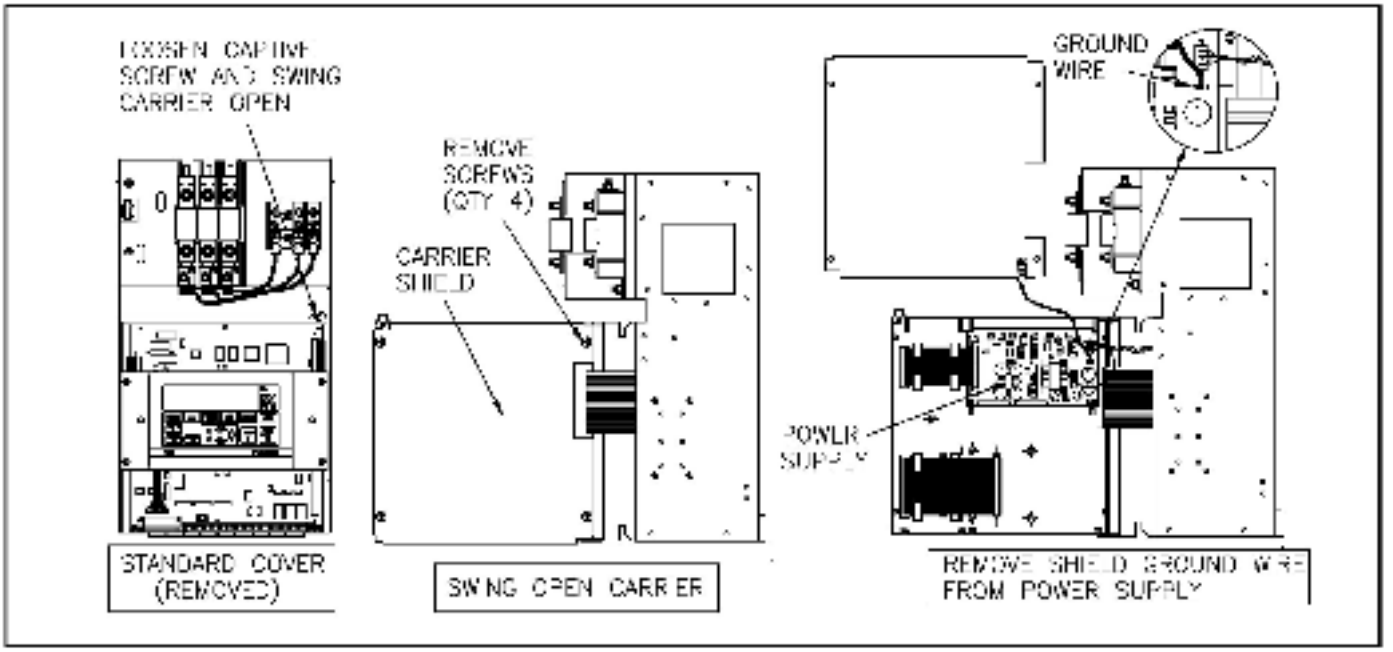


Figure 3.1 - Removing the Carrier Shield

Step 6. Remove the connector that attaches the shield's ground wire to the drive's power supply. Set the shield aside.

3.2 Mounting the AC Tachometer Interface Board

The AC Tachometer Interface board is mounted on the back of the OIM carrier in one of two ways: directly on the carrier or on the optional I/O Expansion board. If the carrier does not have an I/O Expansion board, go to step 1. If an I/O Expansion board is mounted in the carrier, skip to step 2.

Step 1. Mounting the Interface board on carriers with no I/O Expansion board.

a) Position the AC Tachometer Interface board over the carrier's molded standoffs as shown in figure 3.2.

b) Secure the AC Tachometer Interface board to the carrier with its mounting screws.

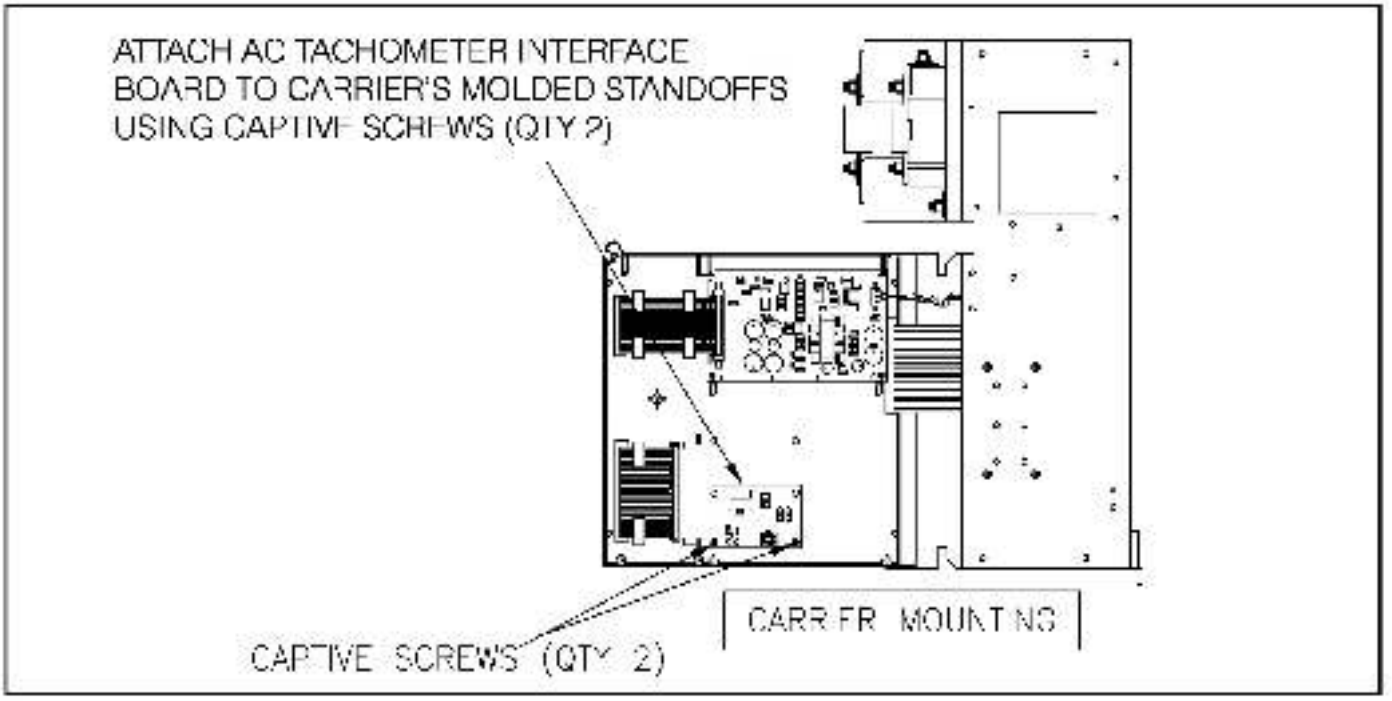


Figure 3.2 - Mounting the AC Tachometer Interface Board on the Carrier

Step 2. Mounting the interface board on carriers with an I/O Expansion board.

a) Position the AC Tachometer Interface board over the I/O Expansion board's standoffs as shown in figure 3.3.

b) Secure the AC Tachometer Interface board to the I/O Expansion board with the mounting screws.

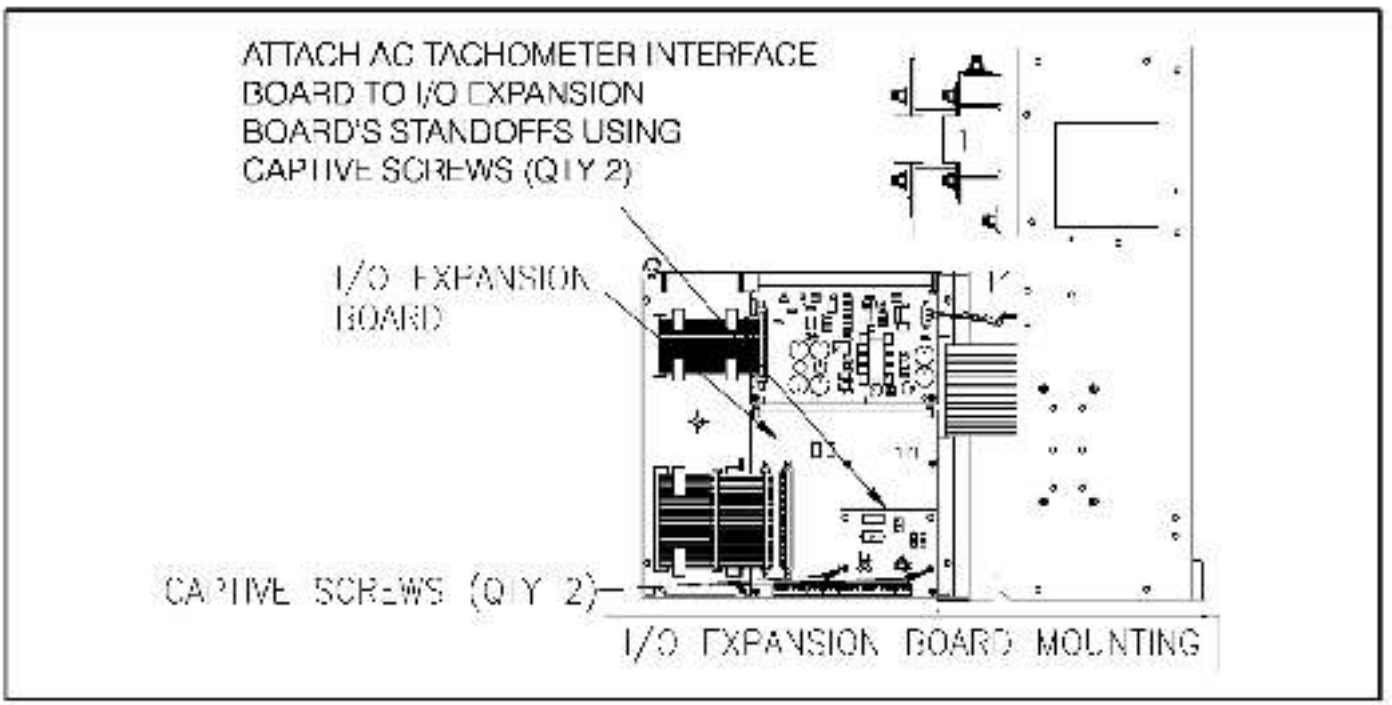
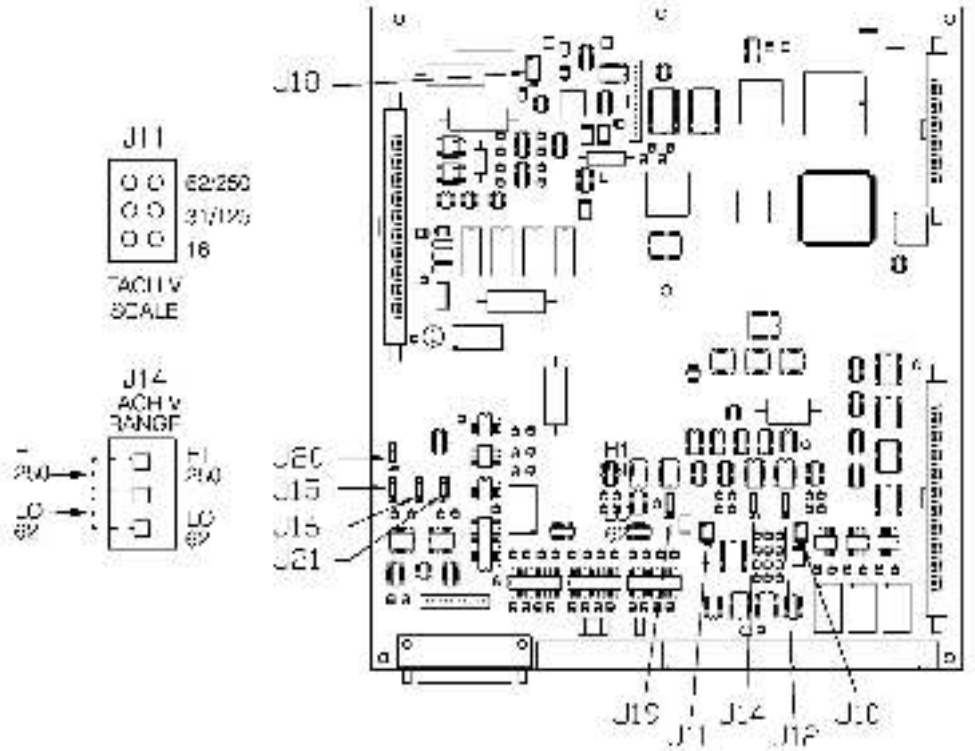


Figure 3.3 - Mounting the Interface Board on an I/O Expansion Board

3.3 Setting the Jumpers on the Drive's Regulator Board

Step 1. For drives earlier than Version 3, remove the four (4) screws holding the drive's OIM in place and remove the OIM to gain access to the drive's Regulator board. Do not attempt to remove the OIM completely.

Step 2. Locate jumpers J11 and J14 on the drive's Regulator board. See figure 3.4.



Set jumpers J11 and J14 as shown for the AC Tachometer Interface Board.

Figure 3.4 - Regulator Board Jumper Locations

Step 3. Set the jumpers according to table 3.1.

Table 3.1 - Regulator Board Jumper Settings

If calculated DC volts from the Interface board is:	Use these jumper settings: *	
	J11	J14
Less than or equal to 16 volts	16	LO 62
17 to 31 volts	31/125	LO 62
32 to 62 volts	62/250	LO 62
63 to 125 volts	31/125	HI 250
126 to 250 volts	62/250	HI 250

*** Note that if you set AC Tachometer Interface board parameters while performing the quickstart procedure described in the FlexPak 3000 drive instruction manual, you will be prompted with these jumper settings.**

3.4 Connecting the AC Tachometer to the Interface Board

Read and follow the recommendations listed below before proceeding with the AC Tachometer Interface board wiring.

- Install all wiring in conformance with the NEC/CEC and all other applicable local codes.
- Use twisted pair having two or three twists per inch. (Reliance twisted pair. 12 to 18 AWG. is recommended for optimum long-distance noise immunity.)
- Route all tachometer wiring in its own or separate grounded conduit.
- Refer to figure 3.5 when making wiring connections.

CAUTION: Do not route tachometer wiring with power (AC and DC power) or logic control wiring in the same conduit. This may cause interference with drive operation. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

CAUTION: Do not ground any tachometer wiring connection. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

Step 1. Place a lead number on each of the tachometer output leads (twisted pair wires).

Step 2. Run the tachometer output leads from the motor to the drive's enclosure.

Continue routing the tachometer analog output leads as follows:

If the drive is not in a NEMA 1 enclosure: Route the tachometer output leads to the OIM carrier's pivot point and then along the carrier to the terminal block labeled J1 on the Interface board. Secure the leads to the tie bar on the carrier.

If the drive is in a NEMA 1 enclosure: Route the tachometer output leads through the bottom of the enclosure and to the OIM carrier's pivot point and then along the carrier to the terminal block labeled J1 on the Interface board. Secure the leads to the tie bar on the carrier.

Step 3. Make sure that the tachometer leads can reach the Interface board terminal block and then cut off any excess wire.

Step 4. Strip about 1/4 inch (6.35 mm) of the insulation from each wire.

Step 5. Connect one of the tachometer leads to position 77 on the AC Tachometer Interface board terminal block and the other lead to position 78. Polarity is unimportant for these terminals. See figure 3.5

Tighten the terminal block hardware to 7 lb-in (0.79 Nm) maximum.

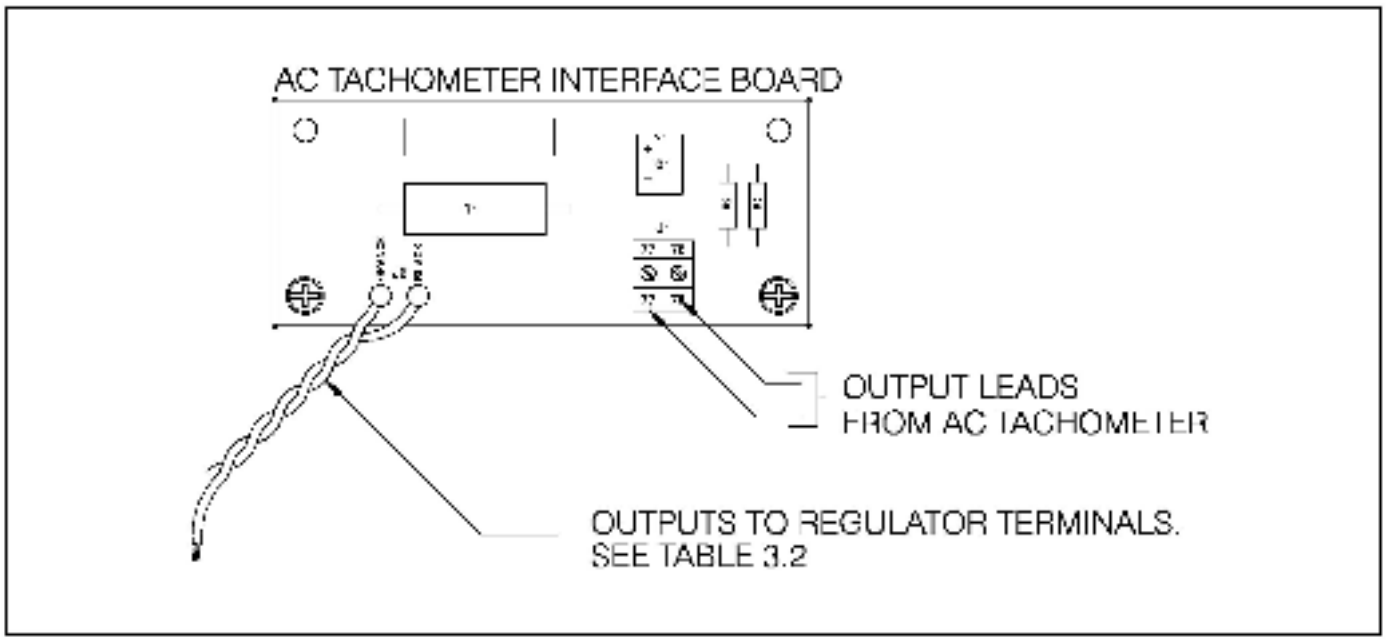


Figure 3.5 - AC Tachometer Wiring

WARNING
APPLYING THE INCORRECT POLARITY TO THE AC TACHOMETER INTERFACE BOARD J2 OUTPUT WIRES (ORANGE AND BLACK) CAN CAUSE AN OVERSPEED CONDITION. MAKE SURE THE ORANGE WIRE IS CONNECTED TO TERMINAL 21 OR 22 OF THE REGULATOR BOARD AND ALSO THAT THE BLACK WIRE IS CONNECTED TO TERMINAL 23 OF THE REGULATOR BOARD. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

Step 6. Route the orange and black wires from the AC Tachometer Interface board to the terminals on the drive's Regulator board. Tighten the terminal block hardware to 7 lb-in (0.79 Nm) maximum.

Connect the black wire to Regulator board terminal 23 (COMMON). See figure 3.6 for terminal locations.

Connect the orange wire to the appropriate Regulator board terminal based on the information in table 3.2.

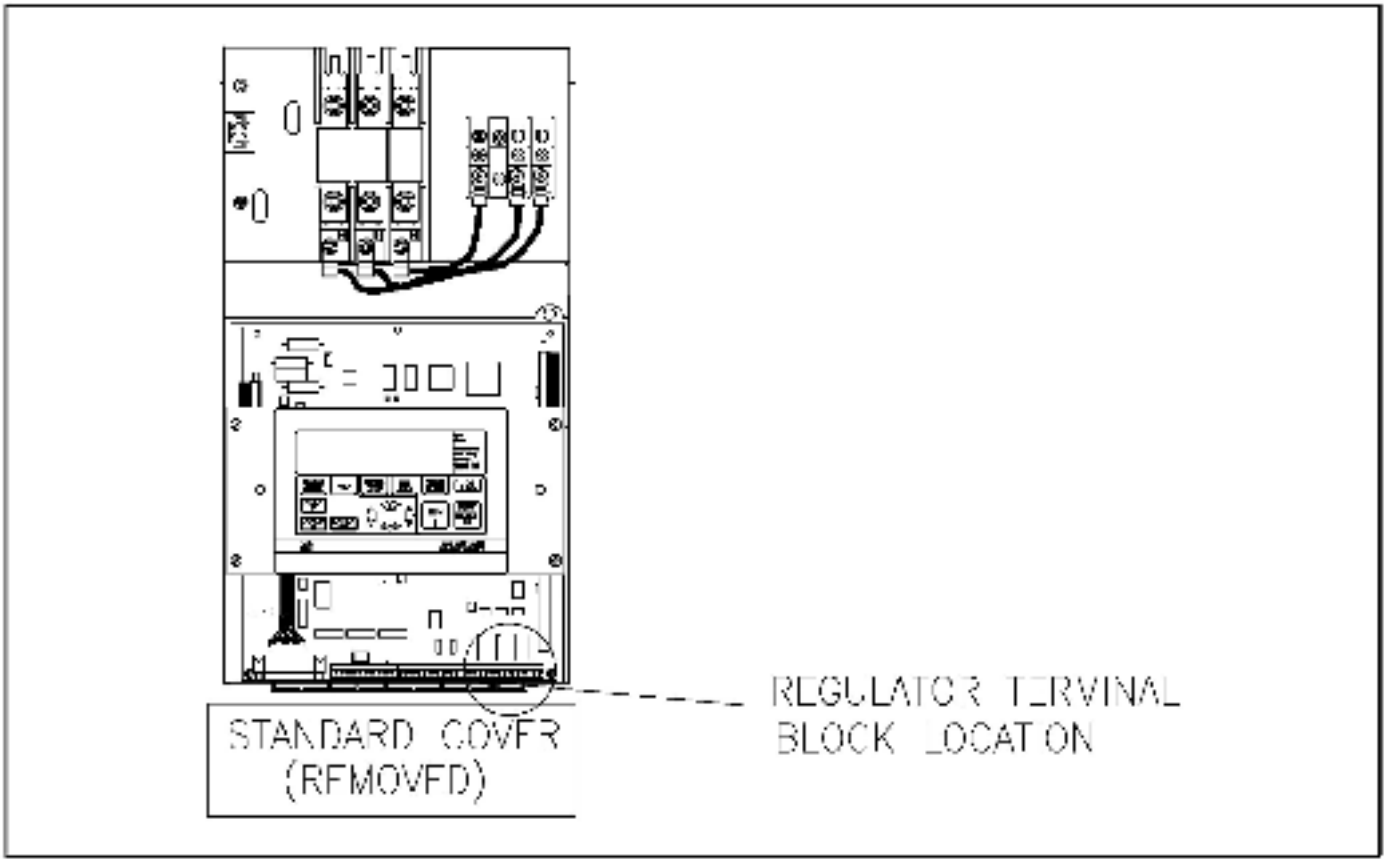


Figure 3.6 - Regulator Board Terminal Location

Table 3.2 - Regulator Board Terminal Wiring

If the calculated DC output from the Interface board is:	And the Regulator board jumpers are set to:		Connect the orange wire to this terminal
	J11	J14	
less than or equal to 16 Volts	16	LO 62	22 (LO RANGE)
17 to 31 Volts	31/125	LO 62	22 (LO RANGE)
32 to 62 Volts	62/250	LO 62	22 (LO RANGE)
63 to 125 Volts	31/125	HI 250	21 (HI RANGE)
126 to 250 Volts	62/250	HI 250	21 (HI RANGE)

Step 7. Replace the drive's OIM and secure it in place with its screws.

3.5 Checking Motor and Drive Wiring

Refer to the instruction manual for your drive and check all motor and drive wiring.

3.6 Closing the Carrier and Drive

Step 1. Close and secure the carrier. Replace the front cover on the drive.

Step 2. Remove the lockout and tag from the incoming power to the drive.

Step 3. Turn on power to the drive. Go to chapter 4 for information on setting parameters for the AC Tachometer Interface board.

4.0 SETTING AC TACHOMETER PARAMETERS

Before you can use the AC Tachometer Interface kit, you must set the parameters listed below in the FlexPak 3000 drive. You must set the parameters in the sequence shown.

While you are setting these parameters, the drive must be energized, but not running. The motor and load do not need to be connected except for the the last parameter to be set, ANALOG TACH GAIN ADJUST.

AC Tachometer Interface Kit Parameters

1. Parameter 006 (NEGATIVE CURRENT LIMIT)
2. Parameter 015 (REVERSE DISABLE)
3. Parameter 200 (FEEDBACK SELECT)
4. Parameter 203 (ANLG TACH VOLTS/1000)
5. Parameter 202 (ANALOG TACH ZERO ADJ)
6. Parameter 201 (ANALOG TACH GAIN ADJ)

If you are installing and setting up the interface board as part of your initial drive setup, and are using the quickstart procedure described in the drive's instruction manual, you will be prompted for the first four parameters listed above. In this case, after you finish the quickstart procedure, make sure you set the last two parameters above. Note that you will also be prompted with the correct setting of jumpers J11 and J14, which you have already set correctly if you followed the procedure in chapter 3.

If you are installing and setting up the interface board after you have already set up the drive, you do not need to rerun the quickstart procedure. Simply access the parameters and set the values as described below.

Refer to sections 4.1 to 4.6 in numerical order for how to set up the parameters.

4.1 Setting Parameter 006 (NEGATIVE CURRENT LIMIT)

DANGER

IMPROPER SETTING OF NEGATIVE CURRENT LIMIT AND/OR REVERSE DISABLE PARAMETERS WILL ALLOW REVERSE AND/OR REGENERATIVE OPERATION OF THE DRIVE, WHICH MAY RESULT IN UNCONTROLLED, INCREASING REVERSE SPEEDS. SET THE NEGATIVE CURRENT LIMIT AND REVERSE DISABLE PARAMETERS EXACTLY AS DESCRIBED IN THIS INSTRUCTION MANUAL PRIOR TO STARTING THE DRIVE. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.

NEGATIVE CURRENT LIMIT represents the highest amount of current (% motor rated armature amps) for the reverse bridge. It is also used as a low limit for the speed loop PI block output. In non-regenerative drive applications, the software will clamp this input to zero.

RANGE: 0 to MAXIMUM CURRENT

DEFAULT: 150%FLA

Step 1. Access the Speed/Voltage Loop (SPD) Tuning menu or the CML Tuning menu to select this parameter.

Step 2. For drives earlier than Version 2.0, always set this parameter to 0. For drives later than Version 2.0, set the parameter as required by the application.

4.2 Setting Parameter 015 (REVERSE DISABLE)

DANGER

IMPROPER SETTING OF NEGATIVE CURRENT LIMIT AND/OR REVERSE DISABLE PARAMETERS WILL ALLOW REVERSE AND/OR REGENERATIVE OPERATION OF THE DRIVE, WHICH MAY RESULT IN UNCONTROLLED, INCREASING REVERSE SPEEDS. SET THE NEGATIVE CURRENT LIMIT AND REVERSE DISABLE PARAMETERS EXACTLY AS DESCRIBED IN THIS INSTRUCTION MANUAL PRIOR TO STARTING THE DRIVE. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.

If REVERSE DISABLE is set to ON, the speed reference will not go below zero. However, setting the value to ON does not prevent the reverse bridge from being activated (as a regenerative stop).

DEFAULT: OFF (For non-regenerative drives, clamped to ON)

Step 1. Access the Drive Reference Limits menu to select this parameter.

Step 2. For drives earlier than Version 2.0, always set this parameter to 0. For drives later than Version 2.0, set the parameter as required by the application.

4.3 Setting Parameter 200 (FEEDBACK SELECT)

DANGER

SELECTING DC TACH WHEN SETTING THE FEEDBACK SELECT PARAMETER WILL ALLOW REVERSE AND REGENERATIVE OPERATION OF THE DRIVE, WHICH MAY RESULT IN UNCONTROLLED, INCREASING REVERSE SPEEDS. DO NOT SELECT DC TACH AS THE FEEDBACK SOURCE WHEN USING AN AC TACHOMETER. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.

FEEDBACK SELECT determines the type of feedback signal used for the FlexPak 3000 major control loop. The range of values for the parameter depends on the software version of the drive.

Range for Software Earlier Than Version 2	Range for Version 2 & Later Software Only
ARMATURE VOLT	ARMATURE VOLT
ANALOG TACH	DC TACH
PULSE TACH	PULSE TACH
	AC TACH

DEFAULT: ARMATUREVOLT

Step 1. Access the Speed/Voltage Loop (SPD) Feedback menu.

Step 2. For drives earlier than Version 2.0, always set this parameter to ANALOG TACH.

For Version 2.0 and later drives, set this parameter to AC TACH.

4.4 Setting Parameter 203 (ANLG TACH VOLTS/1000)

WARNING

INCORRECT SETTING OF THIS PARAMETER CAN CAUSE AN OVERSPEED CONDITION. THIS PARAMETER MUST BE SET BY A QUALIFIED PERSON WHO UNDERSTANDS THE SIGNIFICANCE OF THE SETTING. SET THE VALUE OF THIS PARAMETER ACCURATELY PER YOUR APPLICATION REQUIREMENTS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

ANALOG TACH VOLTS/1000 represents analog tachometer volts per 1000 revolutions per minute. This tachometer rating is normally found on the label of the tachometer. The drive calculates the value of the tachometer range it expects based on the value of this parameter and TOP SPEED.

DEFAULT: 18.0 Volts/1000

Step 1. Access the Speed/Voltage Loop (SPD) Feedback menu.

Step 2. For drives earlier than Version 2.0, multiply the value on the nameplate of the AC tachometer by 0.9 and then enter the result as the value of this parameter.

For Version 2.0 and later drives, enter the value on the nameplate of the AC tachometer as listed.

4.5 Setting Parameter 202 (ANALOG TACH ZERO ADJ)

WARNING

INCORRECT SETTING OF THIS PARAMETER CAN CAUSE AN OVERSPEED CONDITION. THIS PARAMETER MUST BE SET BY A QUALIFIED PERSON WHO UNDERSTANDS THE SIGNIFICANCE OF THE SETTING. SET THE VALUE OF THIS PARAMETER ACCURATELY PER YOUR APPLICATION REQUIREMENTS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

ANALOG TACH ZERO ADJ is used to remove any hardware-introduced offset from the analog tachometer feedback signal.

RANGE: −200 to +200

DEFAULT: 0

Step 1. With the drive stopped (armature not energized), note the value of output parameter ANALOG TACH FEEDBACK (Code 291). Access this parameter from the Speed/Voltage Loop (SPD) / Speed/Voltage Loop (SPD) Test Points menus.

ANALOG TACH FEEDBACK is the RPM digital value of the analog tachometer input reported to the OIM after all hardware and software scaling. This parameter can only be used with analog tachometer feedback.

Step 2. The value of ANALOG TACH FEEDBACK determines if ANALOG TACH ZERO ADJ must be adjusted. See the table below.

If the value of ANALOG TACH FEEDBACK is:	Then adjust ANALOG TACH ZERO ADJUST as follows:
0	no adjustment; leave at default value
negative	enter a positive value
positive	enter a negative value

Continue to adjust ANALOG TACH ZERO ADJ until the value of ANALOG TACH FEEDBACK reads 0.

4.6 Setting Parameter 201 (ANALOG TACH GAIN ADJ)

WARNING
INCORRECT SETTING OF THIS PARAMETER CAN CAUSE AN OVERSPEED CONDITION. THIS PARAMETER MUST BE SET BY A QUALIFIED PERSON WHO UNDERSTANDS THE SIGNIFICANCE OF THE SETTING. SET THE VALUE OF THIS PARAMETER ACCURATELY PER YOUR APPLICATION REQUIREMENTS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

ANALOG TACH GAIN ADJ is used to scale the analog tachometer feedback signal after it has been conditioned by the drive hardware.

NOTE: *The motor must be connected to the drive in order to set this parameter correctly.*

RANGE: For drives earlier than Version 2.0: 0.9 to 1.1
For Version 2.0 and later drives: 0.75 to 1.25

DEFAULT: 1.000

Step 1. Start the drive. Run the motor at over 60 RPM, but below maximum speed. Within this range, the motor's speed does not affect the validity of the software calibration you are performing via the ANALOG TACH GAIN ADJ parameter. The motor does not need to be connected to the load.

Step 2. Measure the speed of the motor using a hand-held tachometer or another calibrated device.

Step 3. Compare the value of the speed measured with the hand-held tachometer with that displayed on the drive. Note that this assumes you have set up the speed display in RPM units.

Step 4. If the measured and keypad display values are the same, no further adjustments are required. The AC Tachometer Interface board setup is complete. If the values are not the same, go on to step 5.

Step 5. Adjust ANALOG TACH GAIN ADJ as follows.

If the value displayed on the drive is:	Adjust ANALOG TACH GAIN ADJ as follows:
less than the value displayed for the hand-held tachometer	enter a larger value
more than the value displayed for the hand-held tachometer	enter a smaller value

Continue to adjust ANALOG TACH GAIN ADJ until the speed measured with the hand-held tachometer is the same as the speed displayed on the keypad.

The AC Tach Interface board setup is complete.

Appendix A

Technical Specifications

Table A.1 - AC Tachometer Interface Board Specifications

AC Input	
Maximum cable length	See tachometer instructions
Maximum power dissipation	4 watts
Maximum input voltage from tachometer	275V AC rms
Input impedance	20k ohms

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