C H A P T E R ②

Installation

Chapter Objectives

The information in this chapter will enable you to:

- Verify that each component of your system has been delivered safely and completely
- Become familiar with the system components and their interrelationships
- Ensure that each component functions properly by bench testing
- Mount the drive within recommended thermal specifications

OEM750/OEM750X Ship kit

Inspect the OEM750 or OEM750X upon receipt for obvious damage to its shipping container. Report any such damage to the shipping company. Parker Compumotor cannot be held responsible for damage incurred in shipment. You should have received either a drive (OEM750) or drive/indexer (OEM750X). Compare your order with the units shipped.

Part	Part Number
OEM Microstepping Drive	OEM750
OEM Microstepping Drive/Indexer	OEM750X

The following option may be used with the OEM750X.

Option	Description
-M2	Nonvolatile Memory (2k BBRAM)

The following motor(s) may be used with the OEM750 and OEM750X. Compare your order with the motors shipped.

Part	Part Number	
Size 23—1/2 Stack Stepping Motor	OS2HA	(OEM57-40)
Size 23—1 Stack Stepping Motor	OS21A	(OEM57-51)
Size 23—2 Stack Stepping Motor	OS22A	(OEM57-83)
Size 34—1 Stack Stepping Motor	RS31B	(OEM83-62)
Size 34—2 Stack Stepping Motor	RS32B	(OEM83-93)
Size 34—3 Stack Stepping Motor	RS33B	(OEM83-135)

The motors above are single-shafted. Motors can be purchased with a double-shaft option.

The following accessories are available.

Accessories	Part Number
OEM750/OEM750X User Guide	88-016109-01
OEM Series Software Ref. Guide	88-013785-01
Low Current Heatsink	OEM-HS1
High Current Heatsink	OEM-HS2

Quick Test

Use the following procedure to have your drive perform its *automatic test* function. Once you set DIP switches, connect the motor, and apply DC power, the automatic test will begin—the motor will alternately turn in the clockwise and counterclockwise direction. This will verify that the OEM750 (or the amplifier portion of an OEM750X), motor, motor cable, and power supply work properly as a system.

This is a *bench top* procedure—you can perform it before you connect an indexer, mount the drive, or mount the motor. Full installation instructions follow this section.

An additional procedure will verify operation of the internal indexer in an OEM750X drive.

You will need the following:

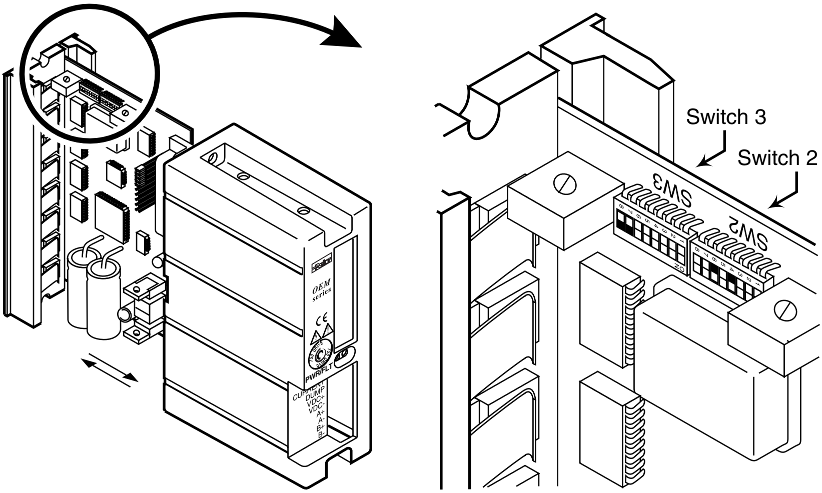
- Flathead screw driver (1/10")

CAUTION

The drive and motor should be mounted to a heatsink. Drive mounting does not affect the following tests, but operating the OEM750/OEM750X and motor for extended periods without proper mounting can cause the drive to fault due to overheating. Possible motor damage may occur. When you complete the quick tests, remove power to the drive.

Perform installation and test procedures in a properly grounded environment. Compumotor recommends the use of a grounding strap.

1. Remove the cover by applying pressure to the 25 pin D-connector. With the cover off, the DIP switches will be exposed, as shown in the next drawing.



DIP Switch Location

2. To test the system, you will use the Automatic Test function. To enable the function, turn DIP switch SW3-#3 to the *off* position. When power is applied to the drive with SW3-#3 in the *off* position, the Automatic Test function will rotate the motor in an Alternating mode approximately 6 revolutions at 1 rps.

   If you are testing an OEM750 with a separate indexer, or an OEM750X, you will use the indexer to command the motor to turn; you will not use the automatic test function. Therefore, set DIP switch SW3-#3 to the *on* position to disable the automatic test function.

3. Set the current loop gain DIP switches, SW3-#4 – SW3#6.

   If you use a Compumotor OEM Series, OS Series, or RS Series motor, you can leave the switches in their default position for the purposes of this Quick Test (SW3-#4 = on, SW3-#5 = on, SW3-#6 = off).

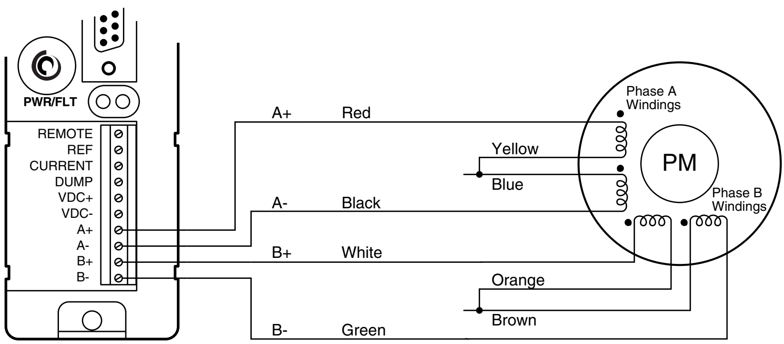
   The current loop gain adjustment allows you to configure the drive to maximize your system's performance. If you use the default switch position for this Quick Test now, be sure that when you complete your final installa tion later, you reset these switches for your particular motor. For instruc tions, see *DIP Switch Functions* following this *Quick Test* section.

   If you use a non-Compumotor motor, see *DIP Switch Functions* following this *Quick Test* section for instructions on setting the current loop gain DIP switches. After you properly set the switches, proceed to *Step 4* below.

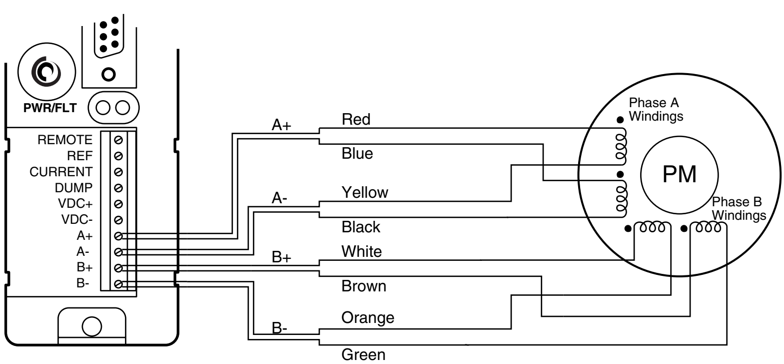
4. Slide the drive cover back on.

5. Attach the motor (to A+, A-, B+, B-). Do not connect the motor to the load at this time. Compumotor OS Series (OEM size 23) motors may be wired in a series or parallel configuration. However, if you are using a 75VDC power supply (such as an OEM300), we recommend that you use a series configuration. A parallel configuration should be used when the power supply is 24VDC - 48VDC. Parallel configurations will cause the drive to dissipate slightly more heat than a series configuration. This increase in drive temperature will not affect the drive's performance, but it may adversely affect heat-sensitive devices that are stored within the same enclosure.

   The next drawings show wiring instructions for frame size 23 motors.



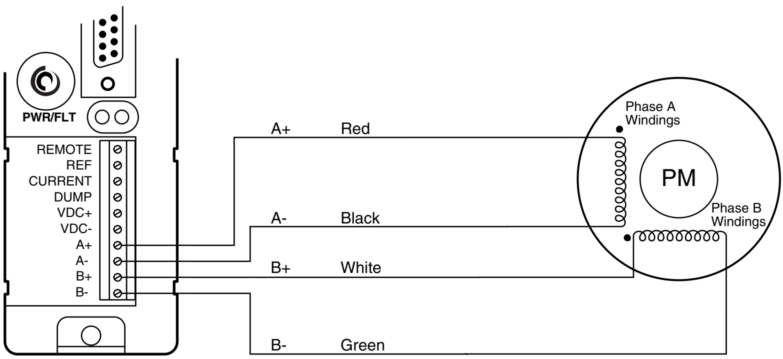
*Motor Wiring: Size 23, OS and OEM57 Motors – **Series Wiring***



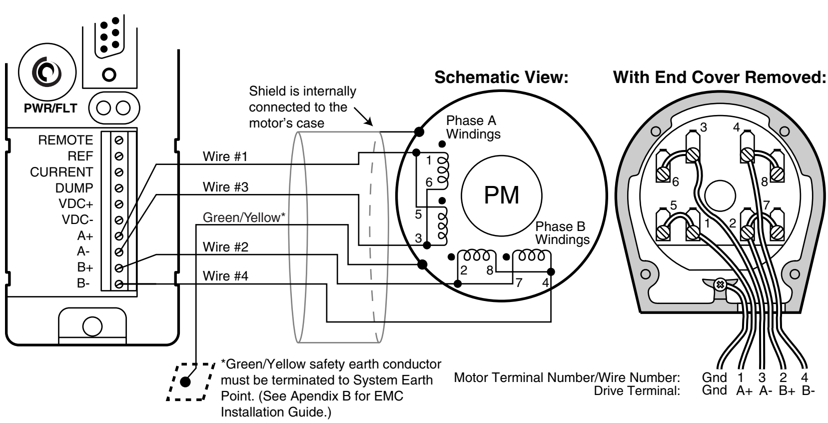
*Motor Wiring: Size 23, OS and OEM57 Motors – **Parallel Wiring***

The next drawings show wiring instructions for frame size 34 motors.

Compumotor's size 34 motors should only be used in a parallel wiring configuration. To achieve maximum performance, you must use a 75VDC power supply, such as a Compumotor OEM300. However, lower voltage power supplies may be used (24 - 75VDC). The lower voltage power supply will not adversely affect the system's low-speed performance, but it will not yield the optimum high-speed performance achieved by using the 75VDC power supply.

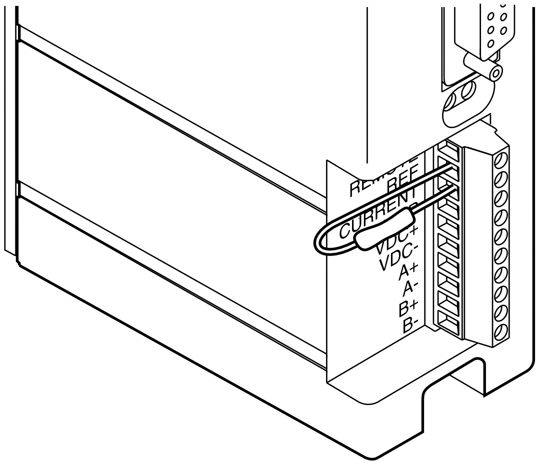


Motor Wiring: Size 34, OEM83 Motors – ***Parallel Wiring***



Motor Wiring: Size 34, RS Motors, C10 (NPS) Endbell Construction – ***Parallel Wiring***

6. Set motor current by connecting a 1/4 watt resistor between **REF** and **CURRENT**, as shown in the drawing below.



Motor Current Selection Resistor

Motor Current/Resistor Settings for Compumotor Motors

The next table shows motor current settings for Compumotor OS and RS motors. Choose a resistor from the table that matches drive current to the motor your are using. DIP switches that set the current range—SW3-#7 and SW3-#8—should be in the *off* position for these resistor values (*off* is the factory default position).

Motor Size		Current	Resistor	Voltage
Size 23				
OS2HA **S**	(OEM57-40 **S)**	2.65A	21.0 kΩ	48 - 75VDC
OS2HA **P**	(OEM57-40 **P)**	5.3A	5.76 kΩ	24 - 75VDC
OS21A **S**	(OEM57-51 **S)**	3.3A	15.8 kΩ	48 - 75VDC
OS21A **P**	(OEM57-51 **P)**	6.6A	2.05 kΩ	24 - 75VDC
OS22A **S**	(OEM57-83 **S)**	3.8A	12.7 kΩ	48 - 75VDC
OS22A **P**	(OEM57-83 **P)**	7.5A	0.00 kΩ	24 - 75VDC
Size 34				
RS31B **P**	(OEM83-62)*	4.4A	9.53 kΩ	24 - 75VDC
RS32B **P**	(OEM83-93)*	5.6A	4.87 kΩ	24 - 75VDC
RS33B **P**	(OEM83-135)*	6.9A	1.27 kΩ	24 - 75VDC

S: Series Configuration P: Parallel Configuration

*OEM83 Series motors are wired internally in parallel

Motor Current/Resistor Settings for Other Motors

If you use a non-OS or non-RS motor, carefully follow the motor manufacturer's instructions regarding motor wiring and the proper operating current. Compumotor recommends a motor inductance of between 1 mH and 10 mH, measured in series or parallel (0.2 mH – 80 mH is acceptable). The next table shows resistor values that you must use to properly set motor current when using the OEM750/ OEM750X with a non-OS or non-RS Series motor. The drive can generate from 0.2 to 7.5 amps, determined by the ***motor current range DIP switches*** (SW3-#7 and SW3-#8).

SW3–#7 Off / #8 Off

Current (Amps*)	Resistance (Ohms)	Current (Amps*)	Resistance (Ohms)
7.5	0 Ω	4.9	7.32 kΩ
7.4	205 Ω	4.8	7.68 kΩ
7.3	412 Ω	4.7	8.06 kΩ
7.2	619 Ω	4.6	8.45 kΩ
7.1	825 Ω	4.5	8.87 kΩ
7.0	1.02 kΩ	4.4	9.53 kΩ
6.9	1.27 kΩ	4.3	10.0 kΩ
6.8	1.54 kΩ	4.2	10.5 kΩ
6.7	1.78 kΩ	4.1	10.0 kΩ
6.6	2.05 kΩ	4.0	11.5 kΩ
6.5	2.26 kΩ	3.9	12.1 kΩ
6.4	2.55 kΩ	3.8	12.7 kΩ
6.3	2.80 kΩ	3.7	13.3 kΩ
6.2	3.09 kΩ	3.6	13.7 kΩ
6.1	3.32 kΩ	3.5	14.3 kΩ
6.0	3.57 kΩ	3.4	15.0 kΩ
5.9	3.92 kΩ	3.3	15.8 kΩ
5.8	4.22 kΩ	3.2	16.5 kΩ
5.7	4.53 kΩ	3.1	17.4 kΩ
5.6	4.87 kΩ	3.0	18.2 kΩ
5.5	5.11 kΩ	2.9	19.1 kΩ
5.4	5.49 kΩ	2.8	20.0 kΩ
5.3	5.76 kΩ	2.7	20.5 kΩ
5.2	6.19 kΩ	2.6	21.5 kΩ
5.1	6.49 kΩ	2.5	22.6 kΩ
5.0	6.81 kΩ		

SW3–#7 On / #8 Off

Current (Amps*)	Resistance (Ohms)
2.5	0 Ω
2.4	619 Ω
2.3	1.27 kΩ
2.2	2.05 kΩ
2.1	2.80 kΩ
2.0	3.57 kΩ
1.9	4.53 kΩ
1.8	5.49 kΩ
1.7	6.49 kΩ
1.6	7.68 kΩ
1.5	8.87 kΩ
1.4	10.5 kΩ
1.3	12.1 kΩ
1.2	13.7 kΩ
1.1	15.8 kΩ
1.0	18.2 kΩ
0.9	20.5 kΩ
0.83	22.6 kΩ

SW3–#7 Off / #8 On

Current (Amps*)	Resistance (Ohms)	Current (Amps*)	Resistance (Ohms)
2.0	0 Ω	1.3	7.32 kΩ
1.9	787 Ω	1.2	8.87 kΩ
1.8	1.62 kΩ	1.1	10.7 kΩ
1.7	2.49 kΩ	1.0	13.0 kΩ
1.6	3.57 kΩ	0.9	15.4 kΩ
1.5	4.64 kΩ	0.8	18.2 kΩ
1.4	5.90 kΩ	0.7	21.5 kΩ

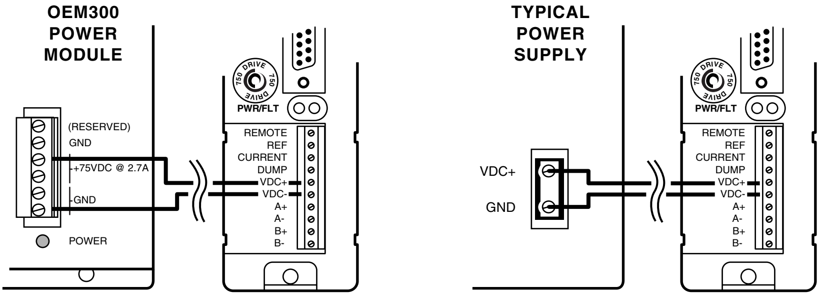
SW3–#7 On / #8 On

Current (Amps*)	Resistance (Ohms)
0.7	0 Ω
0.6	2.21 kΩ
0.5	5.36 kΩ
0.4	10.0 kΩ
0.3	16.2 kΩ
0.2	27.4 kΩ

*NOTE: Current is specified in I_{pk}, or *peak* amperes per phase. I_{pk} is related to the average current value, I_{rms}, as follows: $I_{pk} = \sqrt{2}(I_{rms})$

***OEM750/750X** Resistor Selection for Motor Current*

7. Connect a 24VDC - 75VDC power supply to **VDC+** and **VDC-**, as shown in the next drawing.



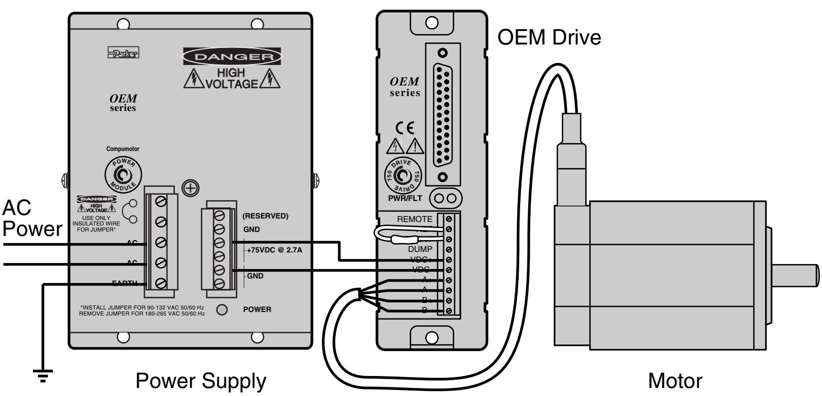
Power Supply Connections

CAUTION

Do not reverse VDC+ and VDC-. Reversing these connections can seriously damage the drive.

If you are testing an OEM750 with a separate indexer, or an OEM750X, skip *Step 8* below, and proceed to one of the next two sections.

The next drawing shows the complete OEM750 test configuration with a motor and an OEM300 Power Module.



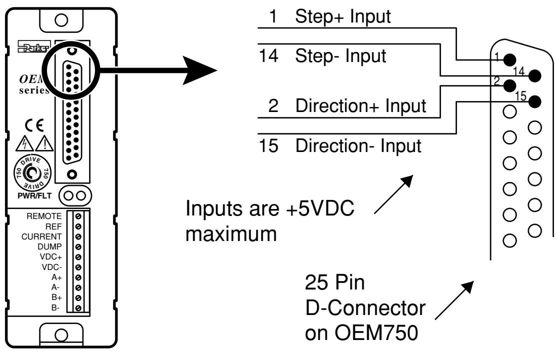
Test Configuration with OEM750

8. Apply power. The drive's green **POWER** LED should be on. If the red **FAULT** LED is on, consult *Chapter 4, Troubleshooting***.** After verifying that the motor moves clockwise and counterclockwise, turn off power.
   - Disconnect cables and resistor.
   - Remove cover.
   - Turn DIP SW3-#3 *on* to disable the automatic test function.
   - Replace cover.

Quick Test: OEM750 with Separate Indexer

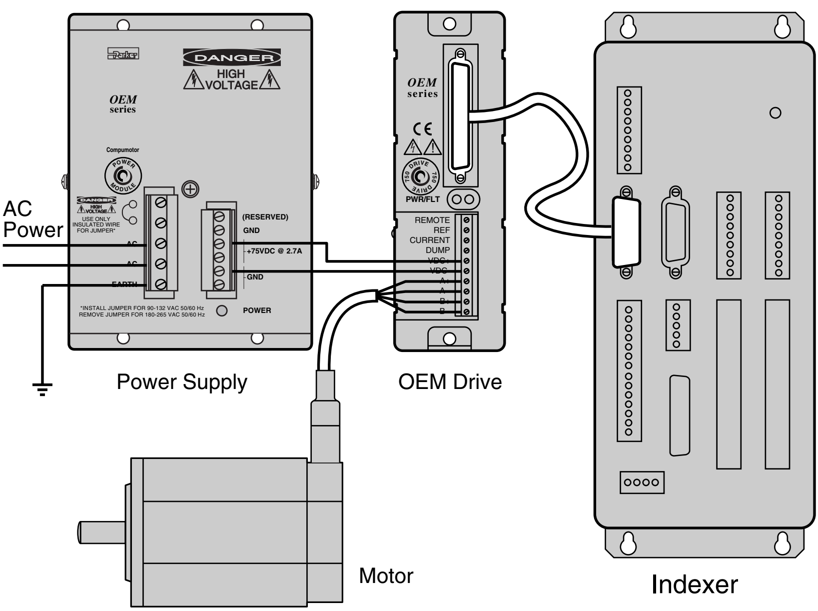
1. Complete steps 1 – 7 from the *Quick Test*, ***but turn DIP SW3-#3 ON*** to disable the automatic test function.
2. To connect a ***Compumotor indexer*** to the OEM750's 25 pin D-connector, use the cable provided with the indexer. Plug the cable into the OEM750's 25 pin D-connector. No additional wiring is necessary. Refer to the indexer's user guide for specific instructions for operating the Compumotor indexer.

   To connect a ***non-Compumotor indexer***, connect step and direction outputs from the indexer to the OEM750's 25 pin D-connector, according to the next drawing.



Test Configuration – OEM750 Step and Direction Inputs

The next drawing shows the test configuration with a separate indexer, a motor, and an OEM300 Power Module.



Test Configuration with OEM750 and Separate Indexer

3. Apply power. The OEM750's green power LED should be on. If the red **FAULT** LED is on, consult *Chapter 4, Troubleshooting*.

This test assumes that your indexer's motor resolution is set to 25,000 steps/rev. This is the default motor resolution setting for the OEM750.

4. Using the indexer, send step pulses to the drive that will rotate the motor one **CW** revolution (25,000 step pulses) at 1 rps (25,000 steps per second).
5. Using the indexer, send step pulses to the drive that will rotate the motor one **CCW** revolution at 1 rps. The drive's default direction is CCW (i.e., if the direction input is not activated, the motor will rotate CCW—if the direction input is activated, the motor will rotate CW). If the motor does notro tate in the desired direction, remove drive power and reverse the direction sense for your system by reversing the motor leads going to the A+ and A- terminals.

WARNING

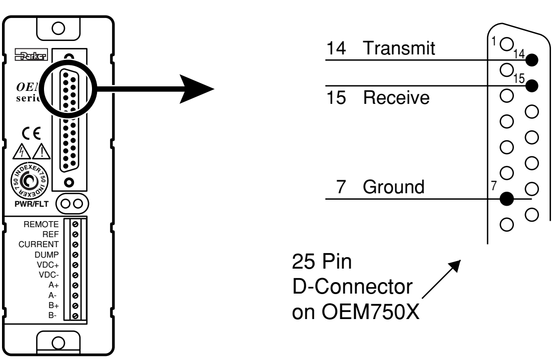
Never connect or disconnect any component to or from the drive with power applied. System damage or personal injury may occur.

6. After verifying that the motor moves CW and CCW, turn off power.

Quick Test: OEM750X

1. Complete steps 1- 7 from the OEM750 Quick Test, ***but turn DIP SW3-#3 ON*** to disable the automatic test function.
2. Connect the OEM750X to an RS-232C communications device (i.e., computer, PLC, etc.). The OEM750X's communication parameters are listed below:
   - Baud Rate: 9600
   - Data Bits: 8
   - Stop Bit: 1
   - Parity: None

   Reference XONOFF command for handshaking support. Terminals should be set for full duplex mode. The next drawing shows pins to use for transmit, receive, and ground.

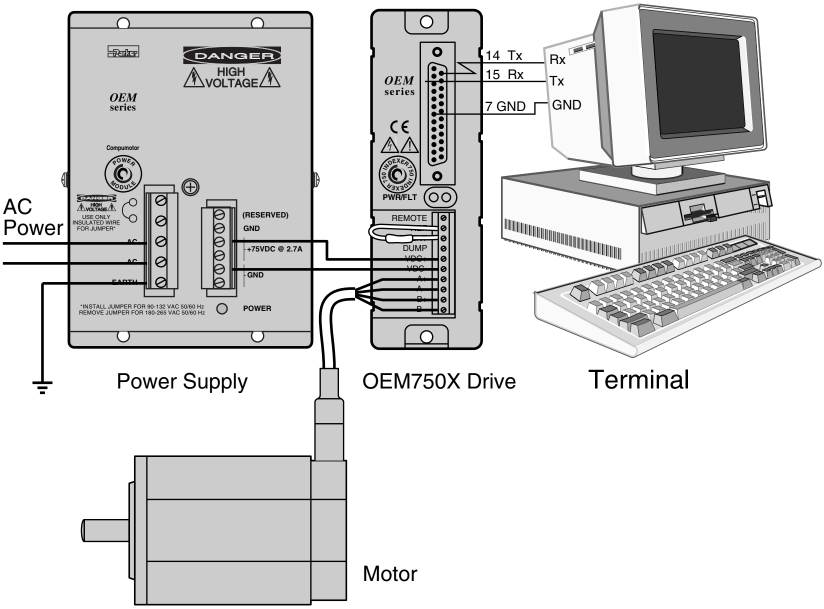


Test Configuration – OEM750X RS-232C Connections

CAUTION

RS-232C signals are not on pins 2, 3, and 7 of the 25 pin D-connector.

The next drawing shows the test configuration with an OEM750X and an RS-232C terminal.



Test Configuration with OEM750X

3. Apply power. The OEM750X's green power LED should be on. If the red **FAULT** LED is on, consult *Chapter 4, Troubleshooting*.

   This test assumes that your indexer's motor resolution is set to 25,000 steps/rev. This is the default motor resolution setting for the OEM750X.

   Note: The drive and indexer resolutions are set independently. Verify that the four drive resolution dip switches (SW2-#2 – SW2-#5) are all ON for 25,000 steps/rev. You must cycle power for DiP switch changes to take effect.

4. Enter and run the following command sequence to test the system.

Command	Description
MN	Sets unit to Normal mode
LD3	Disables CW & CCW Limits
A1Ø	Set acceleration to 10 rps^2
V1Ø	Set velocity to 10 rps
D25ØØØ	Set move distance to 1 CW revolution
G	Initiate move (Go)
H	Reverse move direction (CCW)
G	Initiate move (Go)

5. After verifying that the motor moves CW and CCW, turn off power.

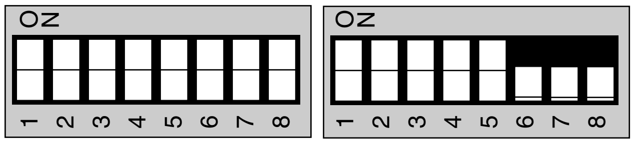
DIP Switch Functions

Configure the OEM750/OEM750X's DIP switches for your motor and application. See *Quick Test* for switch location. The following table and descriptions summarize switch settings.

OEM750 DIP SETTINGS

on

Factory Default Configuration Shown



SW 2

Anti-resonance

		1
	Anti-res. Disabled	off
Default	**Anti-res. Enabled**	**on**

Resolution (Steps per Revolution)

	Steps per Revolution	2	3	4	5
	50,800	on	on	on	off
	50,000	on	on	off	on
	36,000	on	on	off	off
	25,600	on	off	on	on
	25,400	on	off	on	off
Default Setting	**25,000**	**on**	**on**	**on**	**on**
	21,600	on	off	off	on
	20,000	on	off	off	off
	18,000	off	on	on	on
	12,800	off	on	on	off
	10,000	off	on	off	on
	5,000	off	on	off	off
	2,000	off	off	on	on
	1,000	off	off	on	off
	400	off	off	off	on
	200	off	off	off	off

Waveform

		6	7	8
	Pure Sine	off	off	on
	-2% 3rd Harmonic	off	on	off
	-4% 3rd Harmonic	off	off	off
Default Setting	**-4% 3rd Harmonic**	**on**	**on**	**on**
	-4% 3rd Harmonic	off	on	on
	-6% 3rd Harmonic	on	off	off
	-8% 3rd Harmonic	on	off	on
	-10% 3rd Harmonic	on	on	off

SW 3

Automatic Standby

		1	2
Default Setting	**Full Current**	**on**	**on**
	75% Current	off	on
	50% Current	on	off
	25% Current	off	off

Automatic Test

		3
Default Setting	**Automatic Test Disabled**	**on**
	Automatic Test Enabled	off

Current Loop Gain

		4	5	6
	1	off	off	off
	2	on	off	off
	4	off	on	off
Default Setting	**8**	**on**	**on**	**off**
	16	off	off	on
	32	on	off	on
	64	off	on	on
	64	on	on	on

Current Range

		7	8
Default Setting	**2.5 – 7.5 amps**	**off**	**off**
	0.83 – 2.5 amps	on	off
	0.7 – 2.0 amps	off	on
	0.2 – 0.7 amps	on	on

Anti-Resonance
SW2-#1 should be *on* for the anti-resonance circuit to be enabled. Normally, you will want anti-resonance to be enabled; therefore, this switch should be on. If you are using pulse placement for positioning, you may need to disable anti-resonance. You can disable anti-resonance by turning SW2-#1 *off.*

Drive Resolution
Set DIP switches SW2-#2 — SW2-#5 for drive resolution. There are sixteen settings, which range from 200 to 50,800 steps per revolution. The default setting is 25,000 steps per revolution.

Waveform
Set SW2-#6 — SW2-#8 to select a current waveform. There are six choices: one is a pure sine wave; the others reduce the current waveform's 3rd harmonic by 2%, 4%, 6%, 8% and 10%. In most cases, the default setting (*all three switches on = -4% 3rd harmonic*) provides the best performance. For further information about selecting a waveform, see *Adjusting Motor Current Waveforms* in *Chapter 3*.

Automatic Standby
SW3-#1 and SW3-#2 should be *on* if you do not use automatic standby (this is the default position). If you use an indexer and encoder for position maintenance, we recommend that you do not use automatic standby.

The automatic standby function allows the motor to cool when it is not commanded to move. Automatic standby reduces motor current (by 25%, 50%, or 75%) if the drive does not receive a step pulse for one second. Full current is restored upon the first step pulse that the drive receives. ***Be aware that reduced current results in reduced holding torque.***

Automatic Test
Set SW3-#3 to the *off* position to select the automatic test function. The automatic test turns the motor shaft slightly less than six revolutions in an alternating mode at 1 rps. Automatic standby and drive resolution settings are disabled when you use the automatic test.

The default position for SW3-#3 is *on*, which disables the automatic test function.

Current Loop Gain

Set the current loop gain DIP switches to maximize your system's performance.

Your system has a gain. Its value is determined by three parameters: power supply voltage, motor inductance, and current loop gain. If you increase power supply voltage or decrease motor inductance, the system will have more gain. Conversely, if you decrease power supply voltage or increase motor inductance, the system will have less gain. Too much gain may cause oscillations, resulting in audible noise and excess motor heating.

In most applications, power supply voltage and motor inductance are determined by the application's requirements. To set your system's gain at its optimum value, you can adjust the third parameter—the current loop—by setting three *current loop gain* DIP switches. There are seven loop gain settings, which range from 1 to 64, as shown in the *DIP Settings* table on Page 16.

Use the next equation to determine your *ideal* loop gain:

Current Loop Gain = (Motor inductance/Power Supply Voltage) ∗ 364,000

Note: inductance is in henrys; supply voltage is in VDC. For inductance, use small signal inductance value measured using an ordinary inductance bridge or meter. Large signal inductance is found by measuring the actual generator AC flux linkage and generator short circuit current under dynamic conditions.

Small signal inductance * 1.5 ≈ large signal inductance

To determine your *actual* loop gain, choose a value from the *DIP Settings* table that is less than or equal to the ideal value.

Example:

An RS33B motor is used with a 75VDC power supply. The ideal current loop gain is:

Current Loop Gain = (0.0022 H / 75VDC) ∗ 364,000 = 10.7

From the DIP switch table, select a current loop gain of 8, because 8 is less than 10.7

The next table shows settings for Compumotor motors.

Motor Size Size 23		Connection	Inductance (small signal)	Loop Gain@ 24vdc	Loop Gain@ 48vdc	Loop Gain@ 75vdc
OS2HA	(OEM57-40)	Series	1.6 mH	16	8	8
OS2HA	(OEM57-40)	Parallel	400 µH	4	4	2
OS21A	(OEM57-51)	Series	1.7 mH	16	8	8
OS21A	(OEM57-51)	Parallel	425 µH	4	2	2
OS22A	(OEM57-83)	Series	2.6 mH	32	16	8

OS22A	(OEM57-83)	Parallel	650 µH	8	4	2
Size 34						
RS31B	(OEM83-62)*	Parallel	2.9 mH (2.2 mH)	32	16	8
RS32B	(OEM83-93)*	Parallel	2.9 mH (2.2 mH)	32	16	8
RS33B	(OEM83-135)*	Parallel	2.4 mH (2.2 mH)	32	16	8

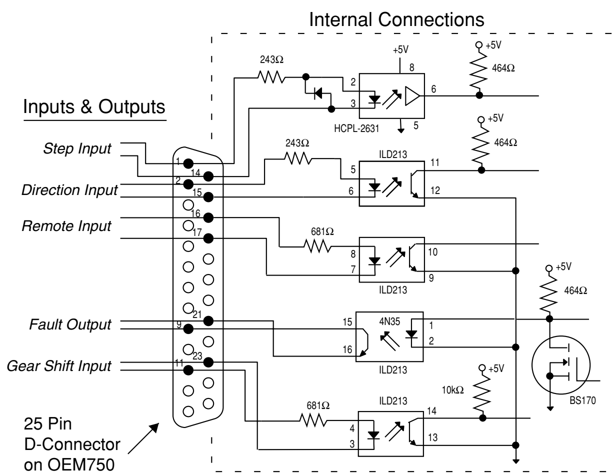
*OEM83 motors are wired internally in parallel

Current Range

Set SW3-#7 and SW3-#8 to select a range for motor current settings. In *Step 6* of the *Quick Test* you installed a resistor that determines motor current. Be sure that SW3-#7 and SW3-#8 are set to the proper current range for the resistor you installed.

OEM750 Inputs and Outputs

The next figure shows internal connections for the OEM750. See the following section for OEM750X internal connections.



Inputs and Outputs – OEM750 Schematic

STEP INPUT

For every step pulse it receives on its step input, the drive will commutate the motor to increment rotor position. To send a step pulse to the drive, apply a positive voltage to `STEP+` with respect to `STEP-`. The drive registers the pulse on the rising edge.

The step input is optically isolated. Driving the step input differentially will provide the best noise immunity. Your input driver must provide a minimum of 6.5 mA—*approximately 3.5 VDC*. With no external current limiting resistor, the current is controlled by the applied voltage. This is due to a fixed voltage drop of 1.7VDC on the opto LED and the internal series resistor (243Ω). Increased voltage will result in increased current.

Step Pulse Requirements

Operate the step pulse input within the following guidelines:

- 200 nanosecond pulse – minimum
- 40% – 60% duty cycle (2 MHz maximum pulse rate)

DIRECTION INPUT SIGNAL SPECIFICATION

While a positive voltage is applied to `DIR+` with respect to `DIR–`, the drive will commutate the motor in the clockwise (positive) direction as it receives step pulses on its step input.

While zero voltage (or a negative voltage) is applied to `DIR+` with respect to `DIR–`, the drive will commutate the motor in the counterclockwise (negative) direction as it receives step pulses.

The input is optically isolated. It may be differentially driven.

CAUTION

Reverse voltage in excess of 6VDC may damage this device.

Your input driver must provide a minimum of 8mA at 3.5VDC to ensure proper operation. With no external current limiting resistor, the current is controlled by the applied voltage. This is due to a fixed voltage drop of 1.5VDC on the opto LED and the internal series resistor (243Ω).

Direction Change

The direction may change polarity coincident with the last step pulse. The direction input must be stable for at least 200 microseconds before the drive receives the first pulse.

REMOTE INPUT

The remote input is an optically isolated input. It requires a minimum of 3.5 mA—*approximately 4.0 VDC*—to ensure proper system operation. This input may be differentially driven.

CAUTION
Reverse voltage in excess of 6VDC may damage this device.

With no external current limiting resistor, the current is controlled by the applied voltage. This is due to a fixed voltage drop of 1.5VDC on the opto LED and the internal series resistor (681Ω).

This input allows you to reduce current to a motor from a remote location. This is accomplished by changing the current select resistor via the remote input. When the remote input is enabled, the open collector transistor internally connected to the `REMOTE` screw terminal will conduct to ground.

To reduce motor current to zero, short the `CURRENT` and `REMOTE` terminals together (with a wire).

You can also reduce motor current by a percentage if you short `CURRENT` and `REMOTE` with the appropriate resistor (R_{REMOTE}). To calculate R_{REMOTE}, first select R_C, the resistor associated with your normal operating current (see resistor selection tables in the *Quick Test*). Next select R_S, the resistor in the same section of the table that is associated with your desired standby current. Then use the following equation to find R_{REMOTE}.

$$R_{REMOTE} = -13{,}300\ (3750 + R_C) / (R_C - R_S)$$

R_C = Resistor associated with the operating current
R_S = Resistor associated with the desired standby current

FAULT OUTPUT

The fault output is an open-collector, open emitter output from an ILQ2 OPTO isolator. The output transistor will conduct when the drive is functioning properly. The transistor will not conduct when any of the following conditions exist.

- No power is applied to the drive
- There is insufficient voltage (<24VDC)

- The driver detects a motor fault
- The remote input is enabled

The fault output has the following electrical characteristics (OEM750):

- V_{CE} = 70VDC
- V_{CESAT} = 0.3VDC
- Collector Current = 10 mA maximum
- Dissipation = 55 mW maximum

GEAR SHIFT INPUT

The gear shift input is an optically isolated input. The GS+ terminal (pin 11) is connected to the anode of the OPTO lead via a 681Ω current limiting resistor. The GS- terminal (pin 12) is connected to the cathode of the OPTO lead. The OPTO requires a minimum of 3.5 mA—*approximately 4.0 VDC*—to ensure proper system operation. This input may be differentially driven.

CAUTION
Reverse voltage in excess of 6VDC may damage this device.

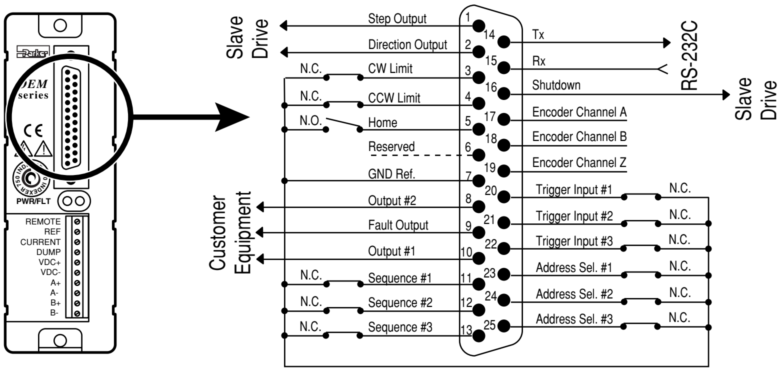
With no external current limiting resistor, the current is controlled by the applied voltage. This is due to a fixed voltage drop of 1.5VDC on the opto LED and the internal series resistor (681Ω).

The gear shift function allows a user with a limited frequency generator to achieve higher velocities while using high resolution settings. The drive multiplies each step pulse it receives by a factor of 8. This function may be invoked *on-the-fly*; however, to prevent stalling and to keep track of motor position, it should only be invoked when the motor is not moving.

Using the gear shift function is equivalent to changing drive resolution, and may have an adverse effect on low speed performance (smoothness). We recommend that you do not use the gear shift with resolution settings less than 10,000 steps per revolution.

OEM750X Inputs and Outputs

The next drawing shows the pin-out for the OEM750X.



Inputs and Outputs – OEM750X Schematic

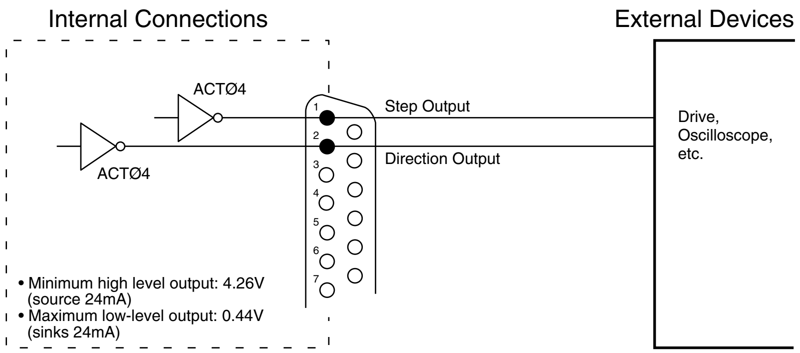
Several functions—triggers, limits, sequence select inputs, home, and address select inputs—require a ground reference. For these functions, use pin 7 on the 25 pin D-connector for the ground. Do not use the power supply ground VDC–. Pin 7 and VDC- are internally connected, but your system will be more immune to electrical noise if you use pin 7.

CAUTION

I/O is not OPTO isolated. Use Pin 7 for a ground reference. Do not use VDC- for a ground reference.

STEP (PIN 1) & DIRECTION (PIN 2) OUTPUTS

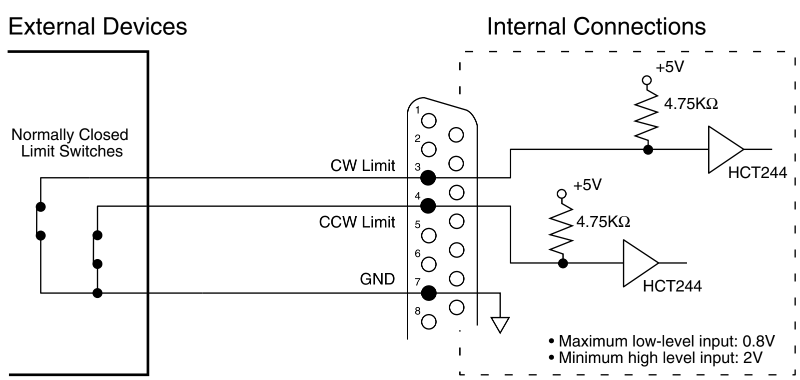
The OEM750X produces step and direction outputs that are identical to its own internal step and direction signals. These outputs can be used to slave to another drive or to monitor the OEM750X's position and velocity. The direction output's default state is logic high. The step output's default state is a high, pulsing low output. The next figure represents a typical configuration of this output.



Step and Direction Outputs

CW (PIN 3) & CCW (PIN 4) LIMIT INPUTS

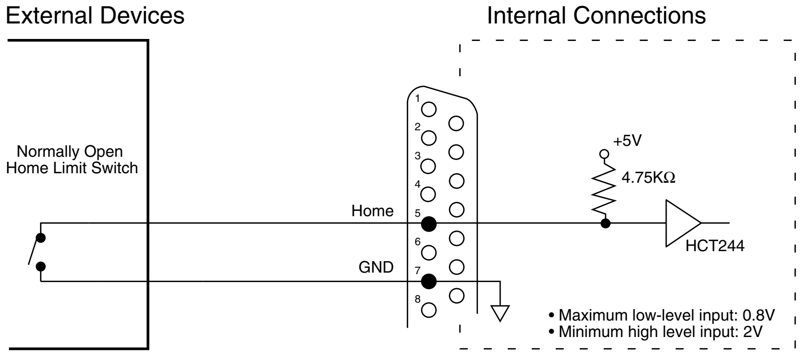
The OEM750X has two dedicated hardware end-of-travel limits—clockwise (CW) and counterclockwise (CCW). When you apply power to the OEM750X, these inputs are enabled—the default active state is *high*. To test the OEM750X without connecting the CW and CCW limits, you must disable the limits with the **LD3** command. You can use the Limit Switch Status Report (**RA**) and Input Status (**IS**) commands to monitor the limits' status, and the **OSA** command to change the active level of the inputs. The figure represents a typical configuration of these inputs.



Limit Inputs

HOME POSITION INPUT (PIN 5)

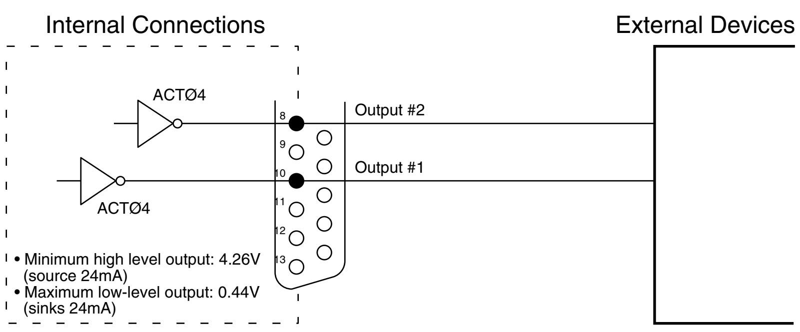
The OEM750X has one dedicated home input. The home input allows you to establish a home reference input. This input is not active during power-up—its default active state is *low*. Refer to the Go Home (**GH**) command for more information on setting up and using this function. The figure represents a typical configuration of this input. (Refer to the **OSC** command, which changes the active level of the home input, and the **GH** command.)



Home Input

OUTPUT #1 (PIN 10) AND OUTPUT #2 (PIN 8)

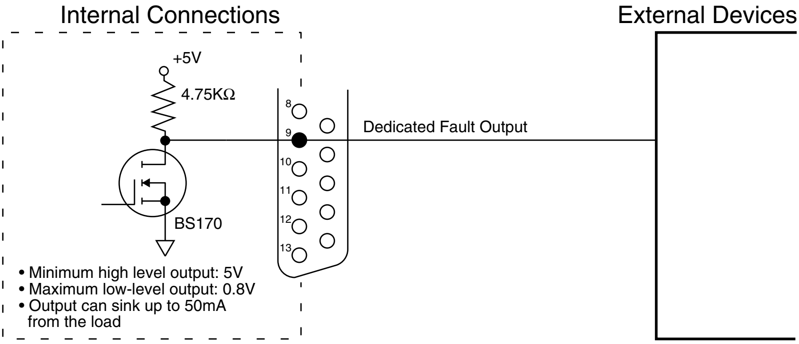
The OEM750X has two dedicated programmable outputs. They may be used to signal peripheral devices upon the start or completion of a move. The default state for outputs #1 and #2 is logic low. The outputs are internally pulled up to 5VDC when active. The figure represents a typical configuration of these outputs. (Refer to the **O** command.)



Output #1 and Output #2

DEDICATED FAULT OUTPUT (PIN 9)

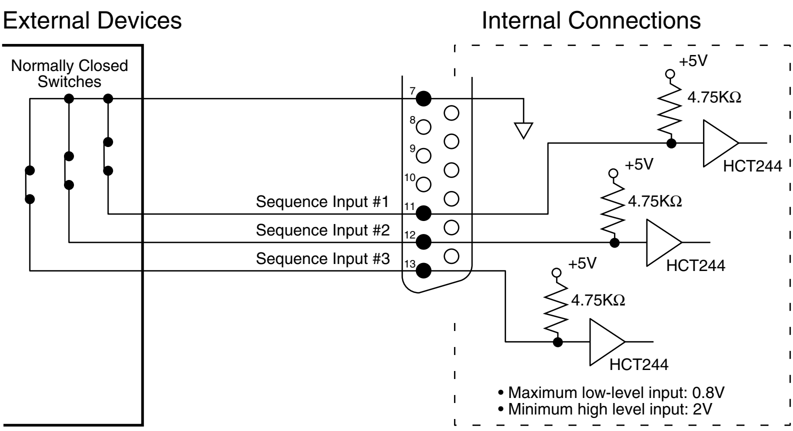
The OEM750X has one dedicated fault output. This output may be used to signal peripheral devices if an OEM750X failure occurs. The Fault output's default state is logic high. If a fault occurs, internal circuitry energizes the transistor's base, pulling the output low. The figure represents a typical configuration of this output.



Dedicated Fault Output

SEQUENCE INPUTS #1 – #3 (PINS 11 – 13)

The OEM750X has three dedicated sequence inputs that allow you to control seven different sequences. The default active state is *high*. You must use the **X** commands (particularly the **XP** command) to configure these inputs. Sequence #Ø is not a valid sequence.



Sequence Inputs

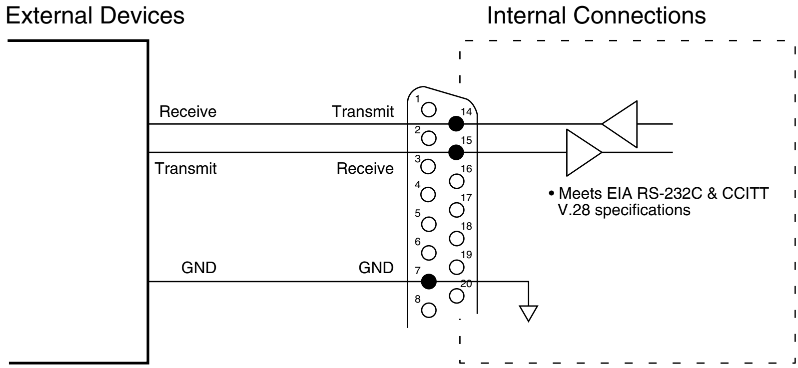
Sequences are executed remotely by using one of the following logic patterns. (1 represents a +5V signal, Ø represents a ØV signal.)

Sequence #	**Ø**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SEQ Input #1	Ø	1	Ø	1	Ø	1	Ø	1
SEQ Input #2	Ø	Ø	1	1	Ø	Ø	1	1
SEQ Input #3	Ø	Ø	Ø	Ø	1	1	1	1

The figure represents a typical configuration of these outputs.

RS-232C—TX (PIN 14), RX (PIN 15), AND GROUND (PIN 7)

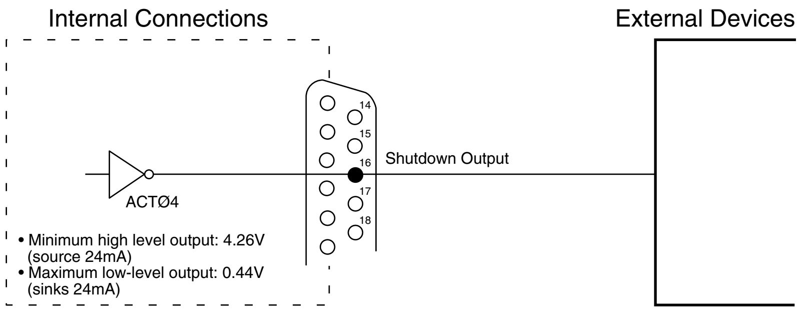
The OEM750X uses RS-232C as its communication medium. A typical three-wire (Receive, Transmit, and Signal Ground) configuration is used. The figure represents a typical RS-232C configuration.



RS-232C Input and Output

SHUTDOWN OUTPUT (PIN 16)

The OEM750X produces a shutdown output that is identical to its own internal signal. This output may be used to slave to another drive or to monitor the OEM750X. The shutdown output's default state is logic high. The figure represents a typical configuration of this output. (Refer to the **ST** command.)



Shutdown Output

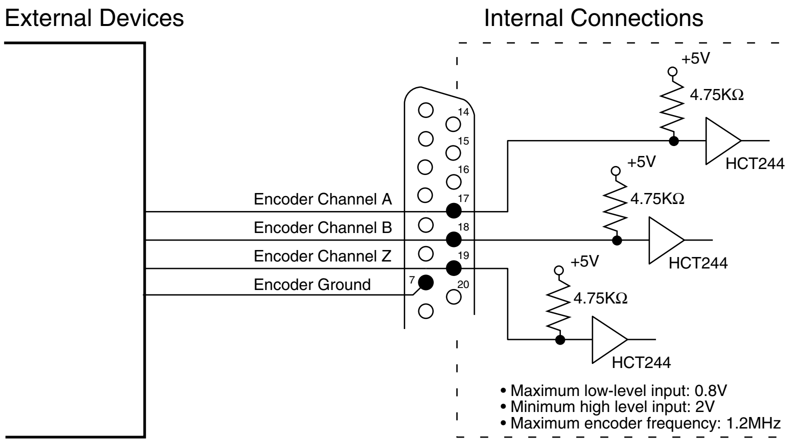
CLOSED LOOP OPERATION

Closed loop moves require an external encoder to provide position correction signals. Motor position may be adjusted to reach the desired position. To implement the closed loop functions, you must connect a single-ended, incremental, optical encoder to the OEM750X. You can then use the **FS** commands, which add the functions below:

- Encoder referenced positioning
- Encoder position servoing
- Motor stall detection
- Higher accuracy homing function

ENCODER INPUTS A, B, Z (PINS 17–19)

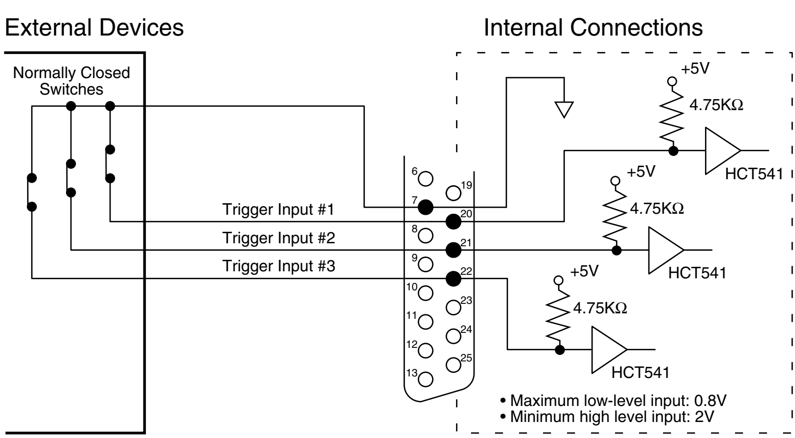
The OEM750X has three dedicated inputs for use with a single ended incremental encoder. These inputs, in conjunction with the **FS** commands, determine encoder functionality. Reference the encoder ground to pin 7 of the OEM750X.



Encoder Inputs

TRIGGER INPUTS #1 – #3 (PINS 20 – 22)

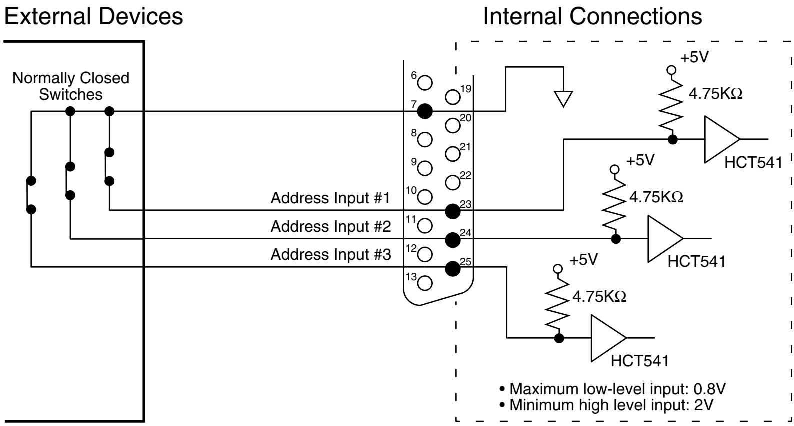
The OEM750X has three dedicated trigger inputs. These inputs are pulled up internally. They can be active high or active low, depending on how you configure them with the Trigger (**TR**) command. The figure represents a typical configuration of these inputs.



Trigger Inputs

ADDRESS INPUTS #1 – #3 (PINS 23 – 25)

The OEM750X has three dedicated address inputs that allow you to specify a unique address for each OEM750X in your configuration. Their default active state is *high*.



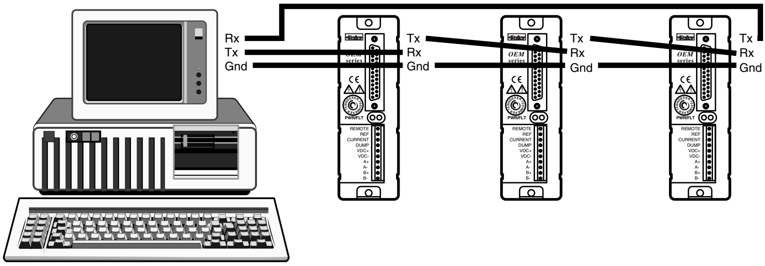
Address Inputs

Units may be assigned a valid address from 1 to 8. Each unit in the configuration must have a unique address. The default address is 8 (all three inputs are internally pulled up). The address inputs are read only during power-up and when Restart (**Z**) commands are issued. Use the matrix below to assign unique address values. (Refer to the **#** command for more information.)

Address #	**1**	**2**	**3**	**3**	**5**	**6**	**7**	**8**
Address #1	Ø	1	Ø	1	Ø	1	Ø	1
Address #2	Ø	Ø	1	1	Ø	Ø	1	1
Address #3	Ø	Ø	Ø	Ø	1	1	1	1

DAISY CHAINING

You may daisy chain up to 8 OEM750Xs. Individual drive addresses are set with the address inputs (pins 23 – 25 on the 25 pin D-connector). You should establish a unique device address for each OEM750X. When daisy chained, the units may be addressed individually or simultaneously. Refer to the next figure for OEM750X daisy chain wiring.



Daisy Chain Configuration

Commands prefixed with a device address control only the drive specified. Commands without a device address control all drives on the daisy chain. The general rule is: *Any command that causes the drive to transmit information from the RS-232C port (such as a status or report command), must be prefixed with a device address*. This prevents daisy chained drives from all transmitting at the same time.

Attach device identifiers to the front of the command. The Go (**G**) command instructs all drives on the daisy chain to go, while **1G** tells only drive #1 to go.

When you use a single communications port to control more than one OEM750X, all drives in a daisy chain receive and echo the same commands. Each drive executes these commands, unless this command is preceded with an address that differs from the drives' addresses on the daisy chain. This becomes critical if you instruct any drive to transmit information. To prevent all of the drives on the line from responding to a command, you must precede the command with the device address of the designated drive. No OEM750X executes a drive-specific command unless the drive number specified with the command matches the OEM750X's drive number. Drive-specific commands include both buffered and immediate commands.

Choosing a Power Supply

The next table contains power ratings to help you choose a power supply. Combinations of motors and current levels other than those shown may result in power values that are not recommended.

Motor Size (@75VDC)	Peak Motor Current	Motor Heat + Avg. Shaft Power	Drive Heat	Supply Total**
Size 23				
OS2HA **S** (OEM57-40 **S**)	2.65A	56 Watts	9 Watts	65 Watts
OS2HA **P** (OEM57-40 **P**)	5.3A	56 Watts	19 Watts	75 Watts
OS21A **S** (OEM57-51 **S**)	3.3A	75 Watts	11 Watts	86 Watts
OS21A **P** (OEM57-51 **P**)	6.6A	75 Watts	25 Watts	100 Watts
OS22A **S** (OEM57-83 **S**)	3.8A	86 Watts	13 Watts	99 Watts
OS22A **P** (OEM57-83 **P**)	7.5A	86 Watts	31 Watts	117 Watts
Size 34				
RS31B **P** (OEM83-62)*	4.4A	113 Watts	15 Watts	128 Watts
RS32B **P** (OEM83-93)*	5.6A	133 Watts	20 Watts	153 Watts
RS33B **P** (OEM83-135)*	6.9A	155 Watts	27 Watts	182 Watts

S: Series Configuration   P: Parallel Configuration

*OEM83 motors are wired internally in parallel
** User must supply this level of wattage

Use the following equation to determine drive heat.

Drive Heat (Watts) = $(0.31)(I_M^2) + (1.13\, I_M) + 3$ I_M = *Motor Current*

Conversions

- To convert watts to horsepower, **divide by 746**
- To convert watts to BTU/hour, **multiply by 3.413**
- To convert watts to BTU/minute, **multiply by 0.0569**

Series and Parallel Wiring

Compumotor OS motors may be configured in parallel or series. Refer to the *Quick Test* section at the beginning of this chapter for wiring instructions.

Motor Type

Compumotor's OS and RS Series motors are custom-made for use with the OEM750/OEM750X. These motors are not available as a standard model from any other manufacturer. They are designed for low loss at rest and at high speed.

Motors in the same frame size from other manufacturers may sustain considerably higher iron losses than an OEM750/ OEM750X motor. OS and RS motors are wound to render inductances within a range suitable for OEM Series products. If you do not use an OS or RS motor, you should consult Compumotor's Applications Engineering Department for assistance (800-358-9070).

The OEM750/OEM750X is designed to run 2-phase PM step motors only. Do not use variable reluctance or DC motors.

CURRENT (AMPS)

We have chosen motor current values (shown earlier) so the motors can produce the highest possible torque, while maintaining smoothness. Higher currents will produce higher static torque; but, the motor will run roughly and may overheat. Do not run the parallel rated current into a motor that is wired in series—it will destroy the motor's windings.

POWER DUMP

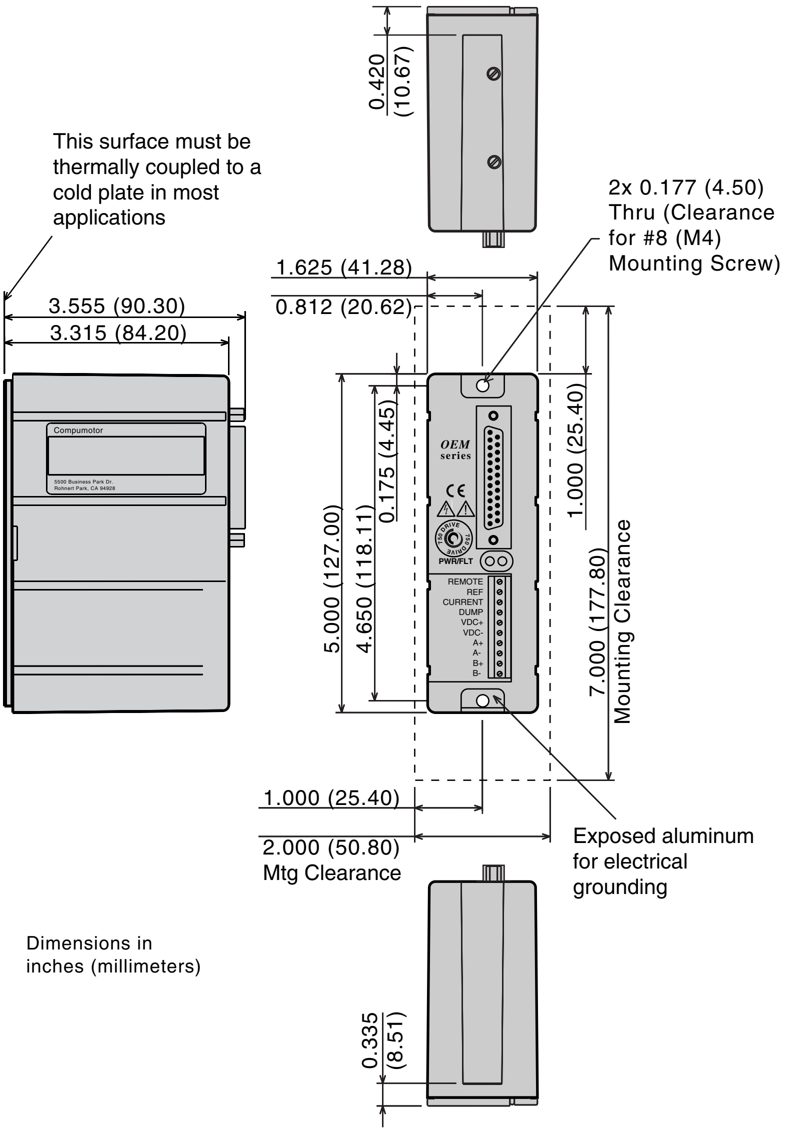
This drive has built-in power dump circuitry to monitor power supply surges caused by a regenerative load. The power dump circuit is used in conjunction with an externally mounted power resistor. You must connect the power resistor from the **VDC+** terminal to the **DUMP** terminal. The circuitry effectively closes a “switch” to ground when the power supply voltage exceeds 85VDC. This “switch” terminal is connected at the screw terminal labeled **DUMP**. The power dump feature dissipates the energy created by a regenerative load (100 joules maximum). ***The power dump is <u>not</u> designed to protect the drive from overvoltage caused by a poorly regulated or faulty power supply.*** A 35 ohm, 10 watt power resistor (such as a Dale RH-10) is the recommended power dump resistor. You must heat sink the resistor for it to meet its rated wattage.

CAUTION

Never allow the voltage supplied by the power supply to exceed 80VDC. Damage to the power dump resistor may result.

Mounting

The OEM750/OEM750X is designed for a *minimum area* mounting configuration. An optional heatsink can be used for a *minimum depth* mounting configuration.



OEM750/OEM750X Dimensions

PANEL LAYOUT

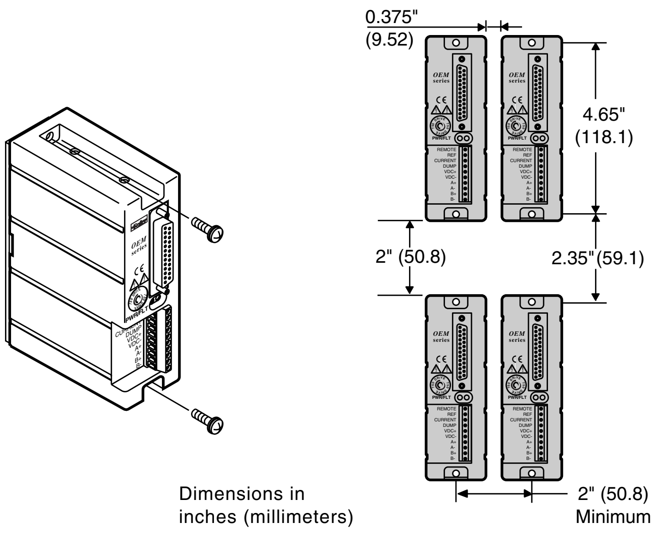
If you mount the OEM750/OEM750X in an enclosure, observe the following guidelines:

- Do not mount large, heat-producing equipment directly beneath the OEM750 or OEM750X.
- Do not mount the OEM750 directly below an indexer or other heat sensitive equipment (the drive produces more heat than an indexer).
- Fan cooling may be necessary.

Refer to the instructions and diagrams in this section for specific mounting information about your configuration.

Mounting Without a Heatsink

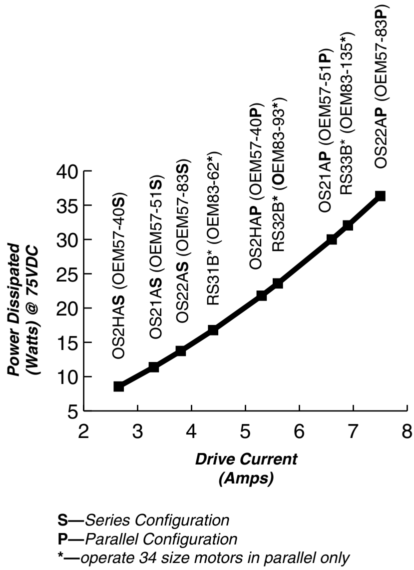
If you use the OEM750/OEM750X without a heatsink, the next drawing shows the minimum recommended panel layout. Additional space may be required if heat dissipation is an issue.



Panel Layout (Without a Heatsink)

The OEM uses a heatplate design to dissipate heat. The drive should never be operated for more than a few minutes without properly mounting the drive to an adequate thermal heatsink.

The next drawing shows how much heat is generated by the OEM750/OEM750X. This heat must be dissipated by the mounting surface.



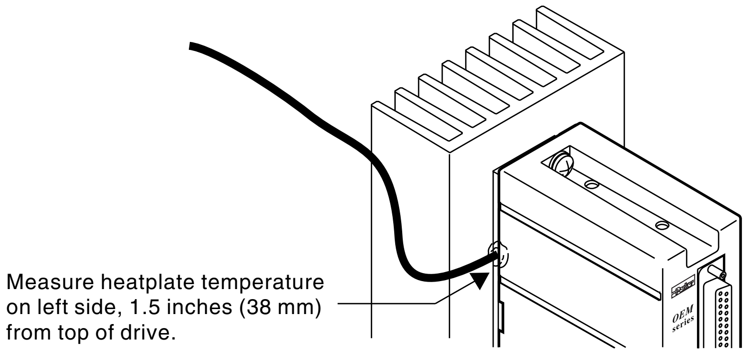
Power Dissipation

The total thermal dissipation in the OEM750/OEM750X is almost constant, regardless of whether the motor is stationary or in motion. The current range DIP switches and the resistor that sets motor current determine the motor phase currents that cause the power losses shown in the figure above.

Overtemperature Protection

The OEM750/OEM750X is overtemperature protected. The drive is designed to operate in a maximum 50°C (122°F) ambient with a maximum heatplate temperature of 55°C (131°F). ***Do not allow the drive's heatplate temperature to exceed 55°C.*** The drive will fault if it's heatplate temperature exceeds 55°C.

To measure drive temperature under operating conditions, position a thermal probe on the left edge of the heatplate, approximately 1.5 inches (38 mm) from the top of the drive, as shown in the next drawing.



Heatplate Temperature Measurement

To ensure that the over-temperature protection does not unexpectedly shut down the drive, mount the drive to a suitable heat-dissipating surface. If you operate the drive in high ambient temperatures—greater than 40°C (104°F)—ensure there is unobstructed airflow over the drive.

Do not use a star washer between the back of the drive's heatplate and the mounting surface. The mounting surface must be flat. Use thermal grease or thermal pads to facilitate heat transfer from the drive's heatplate to your mounting surface.

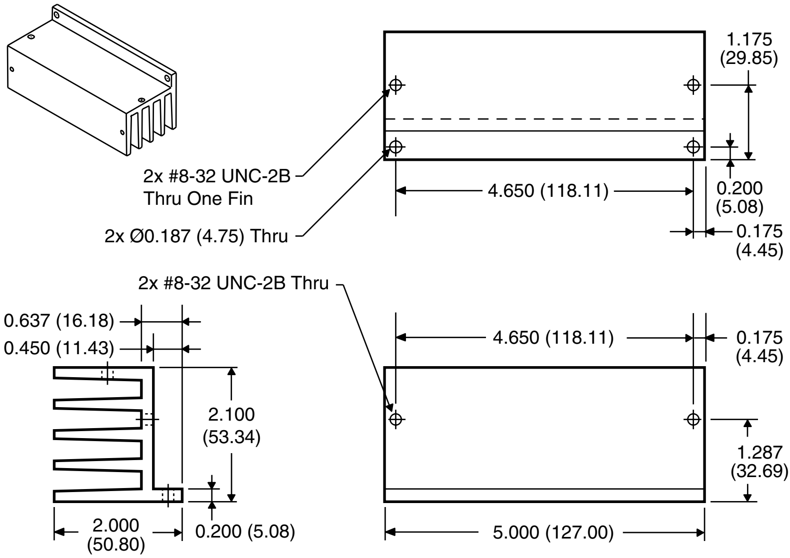
Two types of optional heatsinks can be used for applications that do not have an adequate mounting surface.

Mounting With OEM-HS1 Heatsink

The small heatsink (OEM-HS1) may be purchased as an option. It is intended to be used with a current setting up to 5A peak in still air, at an ambient temperature of 25°C (77°F). If the drive is mounted in ambient temperatures hotter than 25°C, active cooling (forced air) will be required to maintain the heatplate temperature below 55°C (131°F).

Mount the OEM750/OEM750X to the OEM-HS1 heatsink with two #8-32 screws. (A heatsink with holes tapped for metric screws is available. Its part number is OEM-HS1-M4. Consult your Compumotor sales guide for more information.)

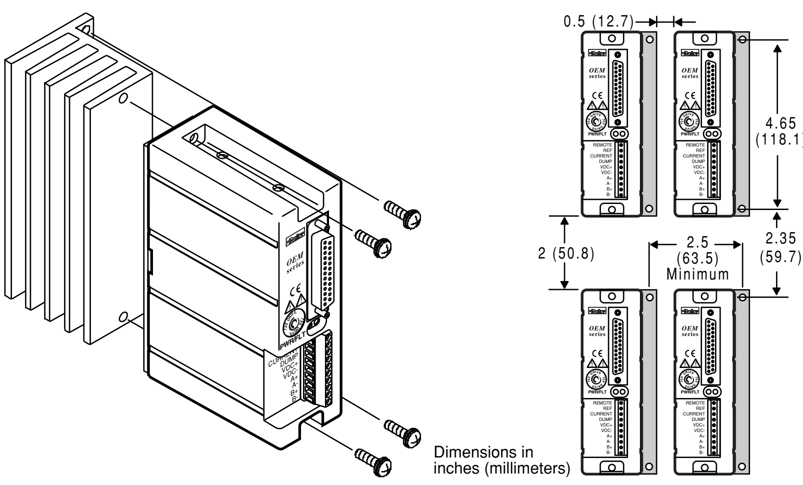
Use a *star washer* on the bottom screw to ensure proper electrical grounding. To facilitate heat transfer, use thermal grease or a thermal pad between the drive and the heatsink. Secure the drive and heatsink to your mounting surface with two #8 screws.



OEM-HS1 Dimensions

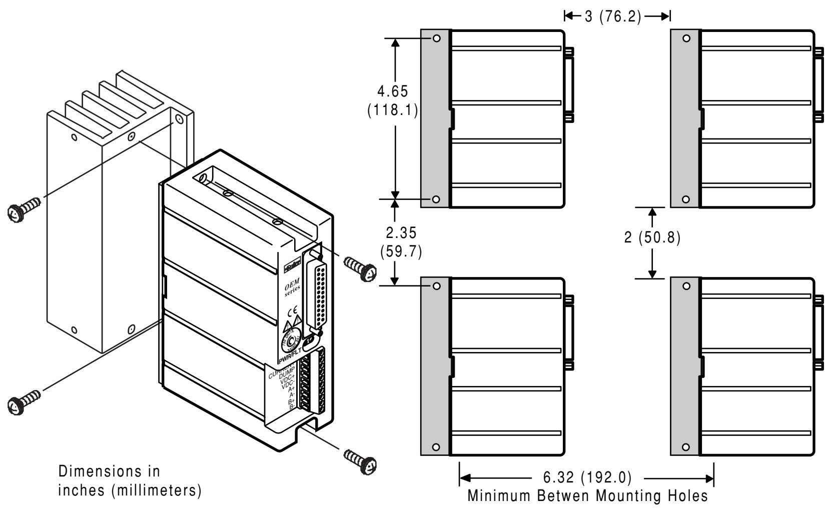
You can mount the drive in two different configurations with the OEM-HS1. One is a *minimum area* configuration—it uses the least amount of panel area. The other is a *minimum depth* configuration.

Panel layout for minimum area is shown in the next figure.



OEM-HS1 Minimum Area Panel Layout

Panel layout for minimum depth is shown in the next figure.



OEM-HS1 Minimum Depth Panel Layout

Mounting With OEM-HS2 Heatsink

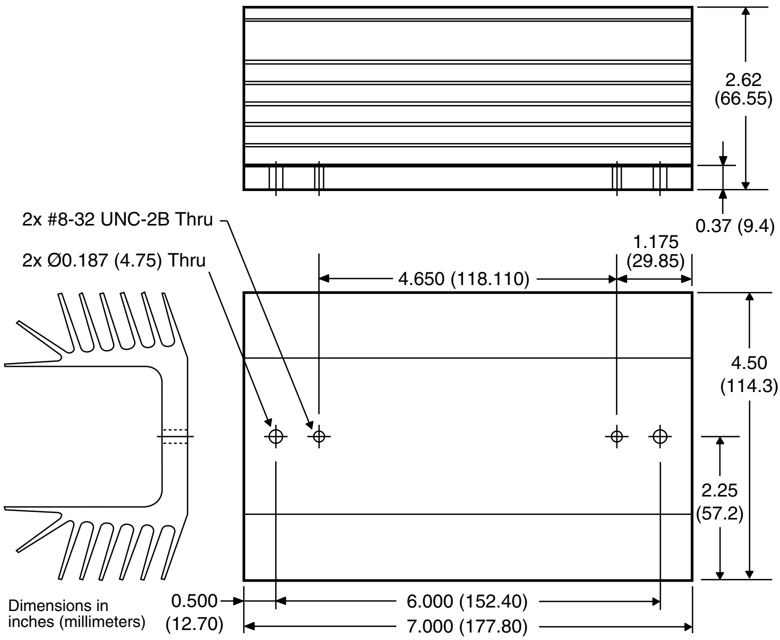
The large heatsink (OEM-HS2) may be purchased as an option. It is intended to be used with a current setting up to the drive's maximum of 7.5A in still air, at an ambient temperature of 25°C (77°F). If the drive is mounted in ambient temperatures hotter than 25°C, active cooling (forced air) will be required to maintain the heatplate temperature below 55°C (131°F).

Mount the OEM750/OEM750X to the OEM-HS2 heatsink with two #8-32 screws. (A heatsink with holes tapped for metric screws is available. Its part number is OEM-HS2-M4. Consult your Compumotor sales guide for more information.)

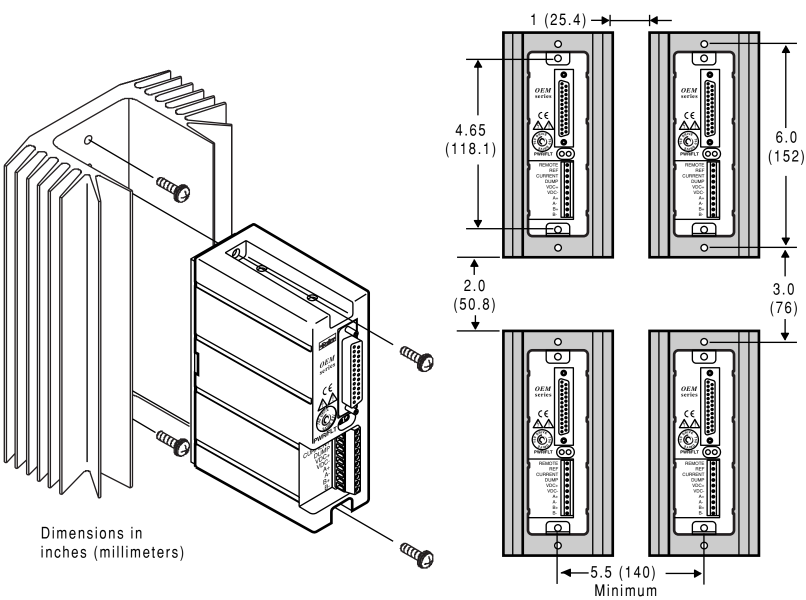
Use a star washer on the bottom screw to ensure proper electrical grounding. To facilitate heat transfer, use thermal grease or a thermal pad between the drive and the heatsink.

Secure the drive and heatsink to your mounting surface with two #8 screws.

The next two drawings show OEM-HS2 dimensions, and panel layout dimensions.



OEM-HS2 Dimensions



OEM-HS2 Minimum Area Panel Layout

Motor Mounting

Use the flange bolt holes to mount rotary step motors. The *pilot*, or centering flange on the motor's front face, should fit snugly in the pilot hole.

Do not use foot-mount or cradle configurations, because they do not evenly distribute the motor's torque around its case. When a foot mount is used, for example, any radial load on the motor shaft is multiplied by a much longer lever arm.

Motors used with the OEM750/OEM750X can produce very high torques and accelerations. If the mounting is inadequate, the high torque/high acceleration combination can shear shafts and mounting hardware. High acceleration can also produce shock and vibration—therefore, you may need heavier hardware than for static loads of the same magnitude.

Under some move profiles, the motor may produce low-frequency vibrations in the mounting structure that can cause fatigue in structural members. A mechanical engineer should check the machine design to ensure the mounting structure is adequate.

WARNING

Improper mounting can reduce performance and jeopardize personnel safety

Do not modify or machine the motor shaft.

CAUTION

Modifying or machining the motor shaft will cause bearing damage and void the motor warranty. Contact a Compumotor applications engineer (800-358-9070) about shaft modifications as a custom product.

MOTOR TEMPERATURE AND COOLING

The motor's face flange is used not only for mounting—it is also a heat dissipating surface. Mount the face flange to a large thermal mass, such as a thick steel or aluminum plate, which should be unpainted, clean, and flat. Heat will be conducted from inside the motor, through the face flange, and dissipated in the thermal mass. This is the best way to cool the motor. If conduction through the flange does not provide enough cooling, you can also use a fan to blow air across the motor for increased cooling.

Attaching the Load – Couplers

Align the motor shaft and load as accurately as possible. In most applications, some misalignment is unavoidable, due to variations in component tolerance. However, excessive misalignment may degrade system performance. Three misalignment conditions, which can exist in any combination, are:

- Angular Misalignment: The center lines of two shafts intersect at an angle other than zero degrees.
- Parallel Misalignment: The offset of two mating shaft center lines, although the center lines remain parallel to each other.
- End Float: A change in the relative distance between the ends of two shafts.

The type of misalignment in your system will affect your choice of coupler.

Single-Flex Coupling

Use a single-flex coupling when you have angular misalignment only. Because a single-flex coupling is like a hinge, one and only one of the shafts must be free to move in the radial direction without constraint. *Do not us a double-flex coupling in this situation*: it will allow too much freedom and the shaft will rotate eccentrically, which will cause large vibrations and catastrophic failure. *Do not use a single-flex coupling with a parallel misalignment*: this will bend the shafts, causing excessive bearing loads and premature failure.

Double-Flex Coupling

Use a double-flex coupling whenever two shafts are joined with parallel misalignment, or a combination of angular and parallel misalignment (the most common situation).

Single-flex and double-flex couplings may or may not accept end play, depending on their design.

Rigid Coupling

Rigid couplings are generally not recommended, because they cannot compensate for *any* misalignment. They should be used only if the motor is on some form of floating mounts that allow for alignment compensation. Rigid couplings can also be used when the load is supported entirely by the motor's bearings. A small mirror connected to a motor shaft is an example of such an application.