

Appendix: OEM010 User Guide

This appendix is designed to help you install, develop, and maintain your system. Each section begins with a list of specific objectives that should be met after you have read the chapter. This section will help you find and use the information in this appendix.

Assumptions

To use this product and its instructions effectively, you should have a fundamental understanding of the following information.

- Electronics concepts (voltage, switches, current, etc.)
- Motion control concepts (torque, velocity, distance, force, etc.)

Appendix Contents

Section A1: Introduction

This chapter provides a description of the product and a brief account of its specific features.

Section A2: Installation

This chapter contains a ship kit list of items you should have received with your OEM010. Instructions to mount and connect the system properly are included. Upon completion of this chapter, your system should be completely installed and ready to perform basic operations.

Section A3: Specifications

This chapter contains information on system performance specifications (environmental, etc.).

Section A4: Troubleshooting

This chapter contains information on identifying and resolving system problems. Descriptions of LED signals, debugging tools, problems/solutions table are included.

Installation Process Overview

To ensure trouble-free operation, pay special attention to the environment in which the equipment will operate, the layout and mounting, and the recommended wiring and grounding. These recommendations will help you easily and safely integrate the OEM010 into your manufacturing facility. If your environment contains conditions that may adversely affect solid-state equipment (electrical noise or atmospheric contamination), be sure to follow any special instruction

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to ensure the safety and long life of your equipment.

Installation Preparation

Before you install this product, complete the following steps:

1. Review this user guide. Become familiar with the user guide's contents so that you can quickly find the information you need.
2. Develop a basic understanding of all system components, their functions, and inter-relationships.
3. Complete the basic system configuration and wiring instructions (in a simulated environment, not a permanent installation) provided in *Section A2, Installation*.
4. Perform as many basic functions as you can with the preliminary configuration. Try to simulate the task(s) that you expect to perform when you permanently install your application (however, do not attach a load at this time). This will give you a realistic preview of what to expect from the complete configuration.
5. After you have tested the system's functions and become familiar with the system's basic features, carefully read *Section A2*.
6. After you have read *Section A2* and clearly understand what must be done to properly install the system, begin the installation process. Do not deviate from the instructions provided.
7. Before you customize your system, check all of the system functions and features to ensure that you have completed the installation process correctly.

The successful completion of these steps will prevent subsequent performance problems and allow you to isolate and resolve potential system difficulties before they affect your system's operation.

Warnings & Cautions

Warning and caution notes alert you to problems that may occur if you do not follow the instructions correctly. Situations that may cause bodily injury are presented as warnings. Situations that may cause system damage are presented as cautions.

CAUTION

System damage will occur if you power up the system improperly.

A1 Introduction

Section Objective

The information in this section will enable you to:

- Understand the product's basic functions and features

OEM010 Description

The OEM010 is a stand-alone indexer with the same capabilities as the OEM750X, OEM650X and OEM350X, but for use with other drives. It is compatible with all Compumotor Step and Direction drives (including the Dynaserv) and is suitable for less demanding motion control applications such as:

- Rotary Indexing
- Step and Repeat
- Linear Slide Positioning

The OEM010 uses the same software commands as the OEM750X, OEM650X and OEM350X.

Features

The OEM010 requires an external 5VDC power supply. The OEM010 provides the following features:

- Microprocessor-controlled microstepping provides smooth operation over a wide range of speeds
- 3 user-defined inputs/2 user-defined outputs
- Step, direction, and shutdown outputs are compatible with all Compumotor drives
- Compatible with optical encoders for position verification
- RS-232C communication for programming or direct operation
- Can daisy chain up to 8 units via hardware/up to 255 in software
- 1.5 MHz step output
- 3 Inputs for remote sequence selection
- Can store 7 programmed sequences in 2k of BBRAM memory
- Dedicated Home, CW, CCW limit inputs
- Flat or side panel mountable

A2 Installation

Section Objectives

The information in this section will enable you to:

- Verify that each component of your system has been delivered safely and completely
- Become familiar with components and their interrelationships
- Mount unit within recommended thermal specifications

OEM010 Ship kit

Inspect the OEM010 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 receive an indexer and a software reference guide. Compare your order with the units shipped.

Part	Part Number
Indexer	OEM010
OEM Series Software Ref. Guide	88-013785-01

OEM010 Quick Test

1. Connect the OEM010 to a suitable Step and Dir input drive or monitor the Step and Dir output on an oscilloscope.
2. Connect the OEM010 to an RS-232C communications device (i.e., computer, PLC, etc.). The OEM010's communication parameters are listed below:
 - Baud Rate: 9600
 - Data Bits: 8
 - Stop Bit: 1
 - Parity: None

Terminals should be set for full duplex mode. Reference the **XONOFF** command for handshaking support.

CAUTION

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

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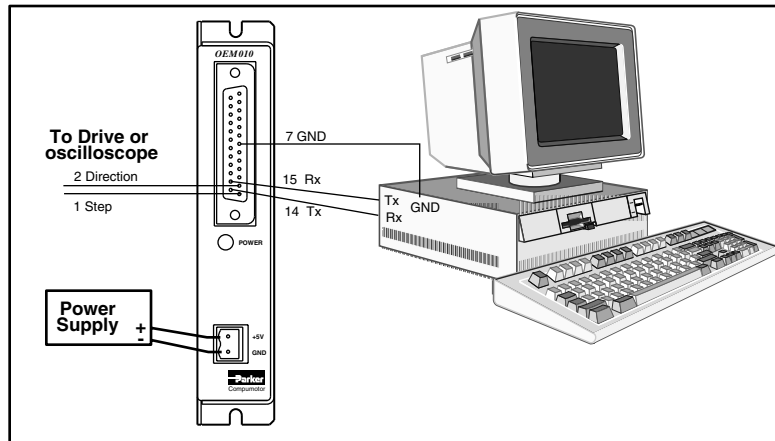
3. Apply power. The OEM's green power LED should be on.

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 OEM010.

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
A10	Set acceleration to 10 rps ²
V10	Set velocity to 10 rps
D25000	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.



OEM010 Test Configuration

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OEM010 Mounting

If you mount the OEM010 in an enclosure, observe the following guidelines:

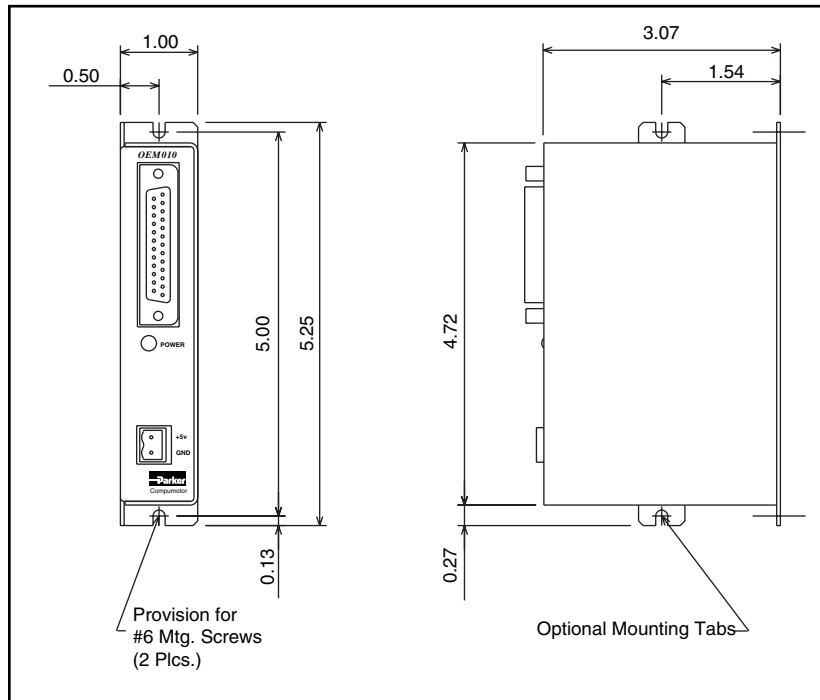
- ❑ Do not mount large, heat-producing equipment directly beneath the OEM010.
- ❑ Do not mount the OEM010 directly above a drive (the drive produces more heat than an indexer).

Refer to the subsequent instructions and diagrams in this section for specific mounting information.

The OEM010 produces almost no heat and can be mounted almost anywhere. The OEM010 is not water-proof, dust-proof, or splash proof, so please provide suitable indexer protection.

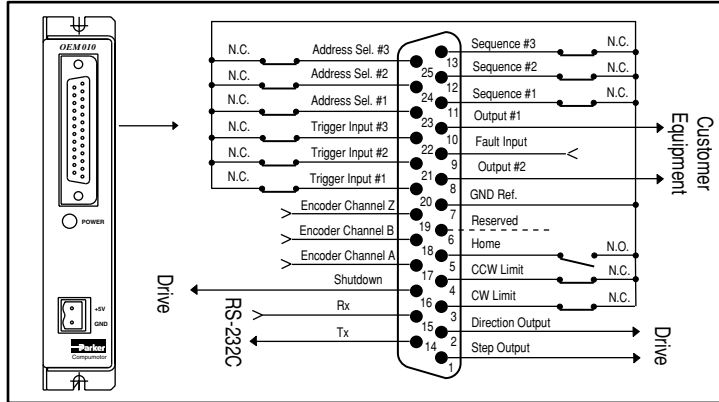
OEM010 Dimensions

The OEM Indexer mounting is designed to minimize panel area or footprint (refer to the figure below).



OEM010 Mounting Dimensions

OEM010 Inputs and Outputs



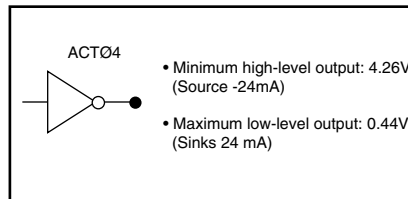
OEM010 Inputs & Output Schematic

CAUTION

I/O is not OPTO isolated, I/O GND is common to GND.

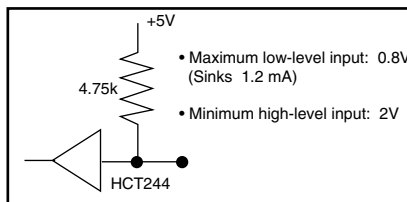
Step (Signal 1) & Direction (Signal 2) Outputs

The OEM010 produces a step and direction output that is compatible with all step and dir input drives. The Direction output's default state is logic high. The Step output's default state is a high, pulsing low output. The figure represents a typical configuration of this output. See also the CMDDIR command.



CW (Signal 3) & CCW (Signal 4) Limit Inputs

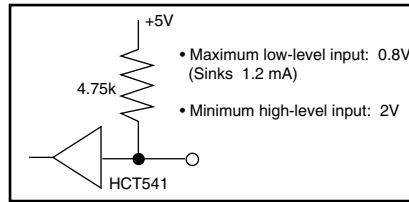
The OEM010 has two dedicated hardware end-of-travel limits (CCW and CW). When you power up the OEM010, these inputs are enabled (high). To test the OEM010 without connecting the CCW and CW limits, you must disable the limits with the **LD3** command. You can use the Limit Switch Status Report (**RA**) and Input Status (**IS**) commands to monitor the limits' status. The figure represents a typical configuration of these inputs. Minimum pulse width 1 ms.



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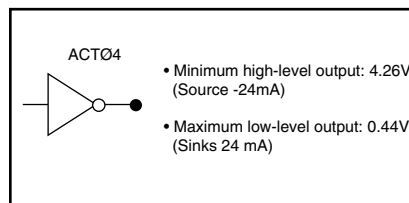
Home Position Input (Signal 5)

The OEM010 has one dedicated home input. The Home Limit input allows you to establish a home reference input. This input is not active during power-up. Refer to the Go Home (**GH**) command for more information on setting up and using this function. Minimum pulse width is 1 ms. The figure represents a typical configuration.



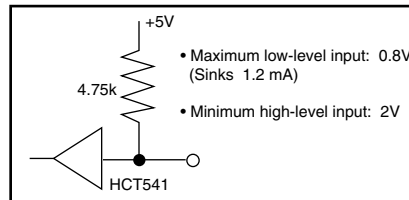
Output #1 (Signal 10) and Output #2 (Signal 8)

The OEM010 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. Refer to the Output (**O**) command for information on using these outputs.



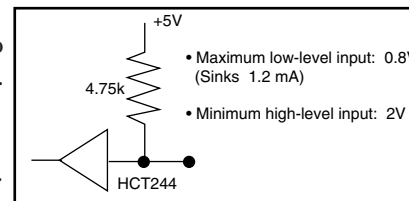
Dedicated Fault Input (Signal 9)

The OEM010 has one dedicated fault input. Input status can be checked with the **IS** or **R** command. An active low on the input will perform an immediate kill of step pulse generation. The figure represents a typical configuration of the input.



Sequence Inputs #1 - #3 (Signals 11 - 13)

The OEM010 has three dedicated sequence inputs that allow you to control seven different sequences. During power-up, the inputs are pulled up internally, which activates **power-up sequence #7**. Sequence #0 is not a valid sequence. Sequences are executed remotely by using one of the following logic patterns in conjunction with the **XP** command.

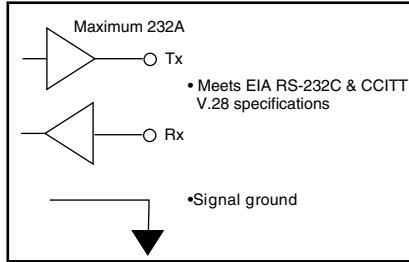


Sequence #	0	1	2	3	4	5	6	7
SEQ Input #1	0	1	0	1	0	1	0	1
SEQ Input #2	0	0	1	1	0	0	1	1
SEQ Input #3	0	0	0	0	1	1	1	1

0 = low, pulled to ground
1 = high, 5VDC

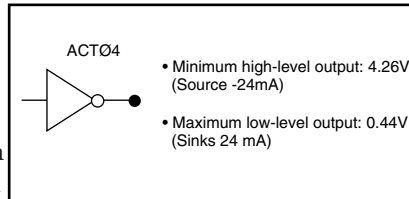
RS-232C—Tx (Signal 14), Rx (Signal 15), and Ground (Signal 7)

The OEM010 uses RS-232C as its communication medium. This indexer does not support handshaking. A typical three-wire (Rx, Tx, and Signal Ground) configuration is used. The figure represents a typical RS-232C configuration.



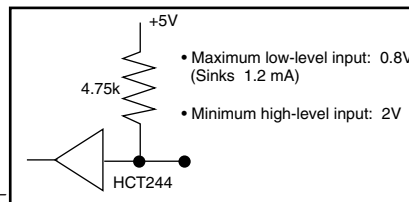
Shutdown Output (Signal 16)

The OEM produces a Shutdown output that is used to remotely disable a drive. This function is controlled by the **ST** command. The Shutdown output's default state is logic high: output is high when the motor is not shutdown (STØ).



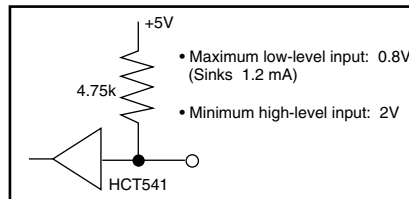
Encoder Inputs A,B,Z (Signals 17 - 19)

The OEM650X has three dedicated inputs for use with a single ended incremental encoder. With differential encoders, leave A-, B-, and Z- isolated and tie the encoder GND to pin 7 (GND). These inputs in conjunction with the **FS** commands will determine the encoder functionality.



Trigger Inputs #1 - #3 (Signals 20 - 22)

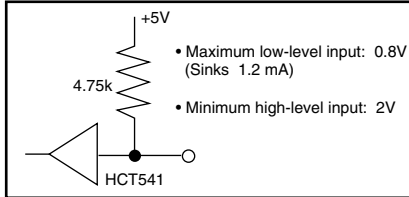
The OEM010 has three dedicated Trigger inputs. These inputs are pulled up internally. These inputs are used with the Trigger (**TR**) command to control the OEM010's trigger function. The figure represents a typical configuration of these inputs. Minimum pulse width is 1 ms.



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Address Signals #1 - #3 (Signals 23 - 25)

The OEM010 has three dedicated address inputs that allow you to specify a unique address for each OEM010 in your configuration. 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.

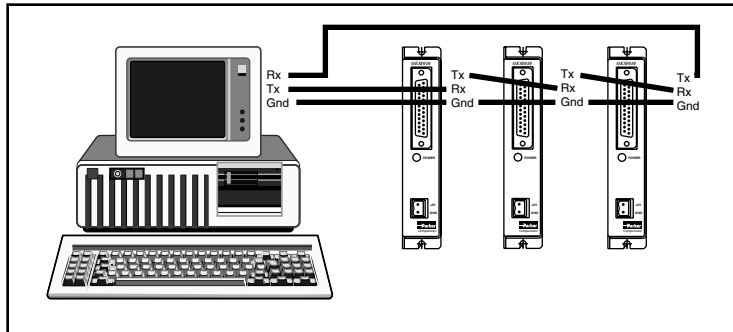


Address #	1	2	3	4	5	6	7	8
Address #1	0	1	0	1	0	1	0	1
Address #2	0	0	1	1	0	0	1	1
Address #3	0	0	0	0	1	1	1	1

0 = low, pulled to ground
1 = high, 5VDC

Daisy Chaining

You may daisy chain up to 8 OEM010s. Individual drive addresses are set with signals 23, 24, and 25 on the 25-pin D connector. When daisy chained, the units may be addressed individually or simultaneously. You should establish a unique device address for each OEM010. Refer to the figure below for OEM010 daisy chain wiring.



Daisy Chain wiring

Commands prefixed with a device address control only the unit specified. Commands without a device address control all units 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 units from all transmitting at the same time.

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

When you use a single communications port to control more than one OEM010, all units in a daisy chain receive and echo the same commands. Each device executes these commands, unless this command is preceded with an address that differs from the units on the daisy chain. This becomes critical if you instruct any indexer to transmit information. To prevent all of the units on the line from responding to a command, you must precede the command with the device address of the designated unit.

A3 Specifications

Section Objectives

The information in this section will enable you to:

- Verify and identify product specifications

Parameter	Value
Performance	
Stepping accuracy	±0 steps from preset total
Velocity accuracy	±0.02% of maximum rate 0.01 rev/sec
Velocity repeatability	±0.02% of maximum rate
Power	
	+5 VDC ±5%, 500 mA maximum
Inputs	
RS232 Interface	3-wire implementation(Tx, Rx, Gnd)
Control lines	0.80 VDC maximum low level (sinks 1.2 mA, Minimum pulse width: 1 millisecond
Sequence select	Pulse width set by SN command
Encoder	
	Single ended. Accepts two phase quadrature incremental encoders 5 volt TTL compatible
Outputs	
Step , Dir , Shutdown	Active high: <0.44 VDC max low, >4.26 VDC Max high 1.5 MHz maximum output frequency
Control Outputs	4.26 VDC Minimum high (source -24mA) 0.44 VDC maximum low (sinks 24 mA)
Environmental	
Operating	0°C to 50°C (32°F – 122°F)
Storage	-30°C to 85°C (-22°F – 185°F)
Humidity	0 to 95% non condensing
Contaminants	The OEM010 is not water-proof, oil-proof, or dust-proof.

A4 Troubleshooting

Section Objectives

The information in this section will enable you to:

- Maintain the system to ensure smooth, efficient operation
- Isolate and resolve system problems

Reducing Electrical Noise

For detailed information on reducing electrical noise in your system, refer to the current Compumotor Catalog.

Problem Isolation

When your system does not function properly (or as you expect it to operate), the first thing that you must do is identify and isolate the problem. When you accomplish this, you can effectively begin to resolve and eradicate the problem.

The first step is to isolate each system component and ensure that each component functions properly when it is run independently. You may have to dismantle your system and put it back together piece by piece to detect the problem. If you have additional units available, you may want to use them to replace existing components in your system to help identify the source of the problem.

Determine if the problem is mechanical, electrical, or software-related. Can you repeat or re-create the problem? Random events may appear to be related, but they may not be contributing factors to your problem. Investigate the events that occur before the subsequent system problem.

You may be experiencing more than one problem. You must solve one problem at a time. Document all testing and problem isolation procedures. You may need to review and consult these notes later. This will also prevent you from duplicating your testing efforts.

Once you isolate the problem, take the necessary steps to resolve it. Use the solutions in this chapter. If your system's problem persists, call Compumotor at 800-358-9070.

Front Panel LEDs

There is one LED on the front panel of the OEM010. The POWER LED is green and turns on when there is +5V applied to the power input. Should the LED go out at any time, your OEM010 is in need of repair.

RS-232C Problems

Use the following procedure to troubleshoot communication problems that you may have with the OEM010.

1. Be sure the host computer's transmit (Tx) wire is wired to the peripheral's receive (Rx) connection, and the host computer's receive (Rx) wire is wired to the peripheral's transmit (Tx) connection. Switch the receive and transmit wires on either the host or peripheral if the problem persists.

CAUTION

OEM010 Rx, Tx, and GND pin outs are not 2, 3, and 7 like most devices.

2. Confirm that the host and peripheral are configured for the same baud rate, 8 data bits, 1 stop bit, and no parity.
3. Use DC common or signal ground as a reference, not earth ground.
4. Cable lengths should not exceed 50 ft. unless you are using some form of line driver, optical coupler, or shield. As with any control signal, be sure to shield the cable-to-earth ground at one end only.
5. To test the terminal or terminal emulation software and the RS-232C cable for proper three-wire communication, unhook the OEM010 and enter a character. You should not receive an echoed character. If you do, you are in half duplex mode. Connect the host's transmit and receive lines together and send another character. You should receive the echoed character. If not, consult the manufacturer of the host's serial interface for proper pin outs.
6. (Note: This only applies to firmware 92-016638-01.) If the controller echoes back **&** for each byte sent to the controller, a data communication error has occurred. To re-establish communication, see the **%** command.
7. (Note: This only applies to firmware 92-016638-01.) To extend cable length and/or improve noise immunity, the RS-485 option is available as a custom product request. Contact the Custom Products department for details.
8. (Note: This only applies to firmware 92-016638-01.) If commands are being lost intermittently while data streaming, reference the **XONOFF** command for using software flow control.

Software Debugging Tips

This section offers helpful tips for debugging programs and understanding errors and fault conditions. The OEM010 has several tools that you can use to debug a problem in the system. The software tools are listed below:

RA—Limit Switch Status Report

R—Report Status

IS—Input Status Report

BS—Buffer Status Report

B—Buffer Status Report

Homing Diagrams

The following diagrams are examples of the many possible homing set-ups. Your parameters may vary and the results may vary slightly depending on your settings.

The CW side of the home pulse is the side closest to the CW limit.

The CCW side of the home pulse is the side closest to the CCW limit.

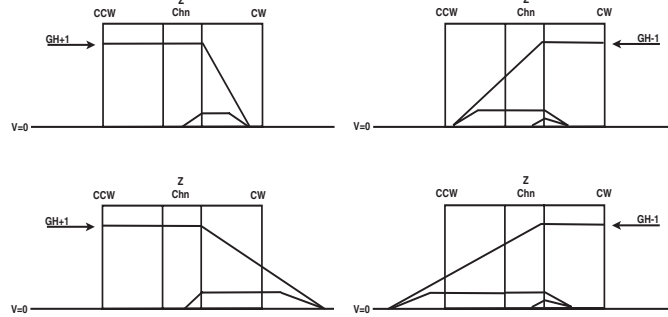
The long pulse diagrams are indicative of situations where the motor decelerates while remaining inside the home pulse width due to the rapid homing deceleration or a very wide home pulse. The short pulse diagrams are indicative of situations where the motor decelerates through the home pulse width due to slow deceleration or a very narrow pulse width.

If an end-of-travel limit is hit during the initial homing, refer to the homing diagram for the opposite direction of travel.

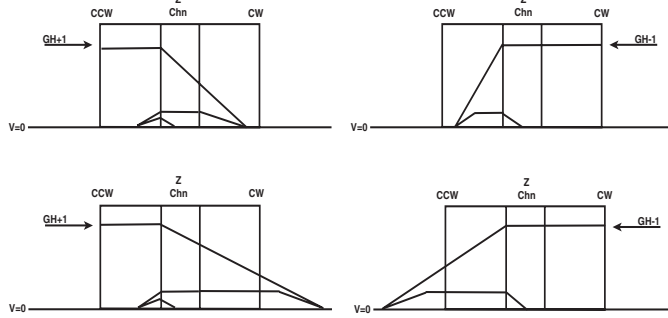
The diagrams are drawn as a general guide. Velocity levels and slopes are drawn to indicate the general move profile the motor will make during the go home move. The vertical axis is velocity and the horizontal axis the position in relation to the home input transitions. Some lines are drawn as closely as possible together to indicate identical velocities, yet remain discernible.

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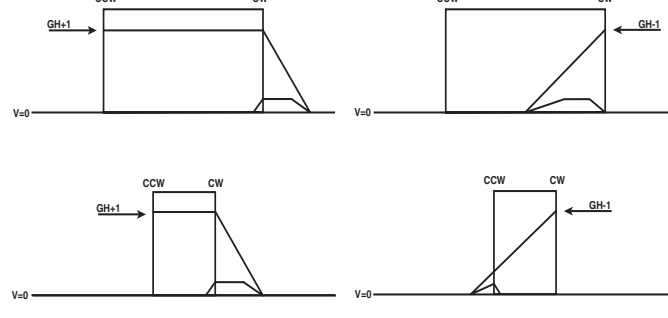
OSB1
OSD1
OSHØ
FSB1



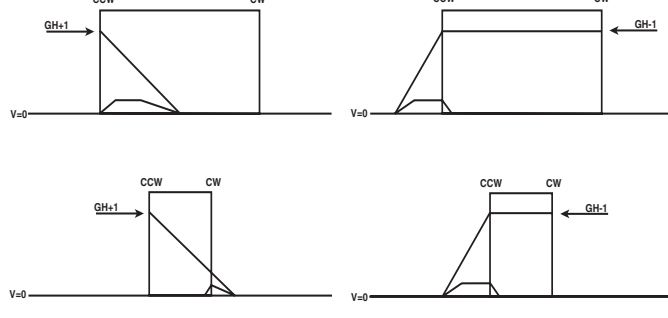
OSB1
OSD1
OSH1
FSB1



OSB1
OSDØ
OSHØ



OSB1
OSDØ
OSH1



Returning the System

If your OEM010 system is faulty, you must return the drive and motor for replacement or repair. A failed drive can damage motors. If you must return your OEM010 to effect repairs or upgrades, use the following steps:

- ① Get the serial number and the model number of the defective unit(s), and a purchase order number to cover repair costs in the event the unit is determined by Parker Compumotor to be out of warranty.
- ② Before you ship the drive to Parker Compumotor, have someone from your organization with a technical understanding of the OEM010 and its application include answers to the following questions: What is the extent of the failure/reason for return?
 - How long did it operate?
 - How many units are still working?
 - How many units failed?
 - What was happening when the unit failed (i.e., installing the unit, cycling power, starting other equipment, etc)?
 - How was the product configured (in detail)?
 - What, if any, cables were modified and how?
 - With what equipment is the unit interfaced?
 - What was the application?
 - What was the system sizing (speed, acceleration, duty cycle, inertia, torque, friction, etc.)?
 - What was the system environment (temperature, enclosure, spacing, unit orientation, contaminants, etc.)?
 - What upgrades are required (hardware, software, user guide)?
- ③ Call Parker Compumotor's Applications Engineering Department [(800) 358-9070] for a Return Material Authorization (RMA) number. Returned products cannot be accepted without an RMA number.
- ④ Ship the unit to: Parker Compumotor Corporation
5500 Business Park Drive, Suite D
Rohnert Park, CA 94928

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XU—Upload Sequence 62

Y

Y—Stop Loop 62

Z

Z—Reset 63

Summary of Commands

A—Acceleration	PR—Absolute Position Report
B—Buffer Status	PS—Pause
BS—Buffer Size Status	PX—Report Absolute Encoder Position
C—Continue	PZ—Set Absolute Counter to Zero
CG—Correction Gain	“—Quote
CMDDIR—Commanded Direction	Q1—Enter Velocity Profiling Mode
Polarity	QØ—Exit Velocity Profiling Mode
CR—Carriage Return	R—Request Indexer Status
D—Distance	RA—Limit Switch Status Report
DB—Dead Band	RB—Loop, Pause, Shutdown, Trigger
DW—Deadband Window	Status Request
E—Enable Communications	RC—Closed Loop Status
ER—Encoder Resolution	RM—Rate Multiplier in Velocity
F—Disable Communications	Streaming Mode
FS—Encoder Functions Report	RV—Revision Level
FSA—Set Indexer to Incremental/ Absolute Mode	S—Stop
FSB—Set Indexer to Motor/Encoder Step Mode	SN—Scan
FSC—Enable/Disable Position Maintenance	SS—Software Switch Function Status
FSD—Stop on Stall	SSA—RS-232C Echo Control
FSE— Turn On Output Number 1 on Stall	SSD—Add Device ID Prefix
FSF—Stop Motion on Trigger 3	SSE—Enable/Disable Communication Error Checking
FSG—Turn On Output Number 2 when in Deadband	SSG—Clear/Save the Command Buffer on Limit
FSH—Enable Stall Detect	SSH—Clear/Save Command Buffer on Stop
G—Go	ST—Shutdown
GH—Go Home	SV—Servoing Parameter
^H—Delete	T—Time Delay
H—Set Direction	TR—Wait For Trigger
IS—Input Status	TS—Trigger Input Status
K—Kill	U—Pause and Wait for Continue
L—Loop	V—Velocity
LD—Limit Disable	W1—Signed Binary Position Report
LF—Line Feed	W3—Hexadecimal Position Report
MC—Mode Continuous	XC—Sequence Checksum
MN—Mode Normal	XD—Sequence Definition
MPA—Mode Position Absolute	XE—Sequence Erase
MPI—Mode Position Incremental	XONOFF—Enable/Disable XON/XOFF
MR—Motor Resolution	XP—Set Power-up Sequence Mode
N—End of Loop	XQ—Sequence Interrupted Run Mode
O—Output	XR—Run a Sequence
OS—Report Homing Function Set-Ups	XRP—Sequence Run With Pause
OSA—Define Active State of End-of- Travel Limits	XSD—Sequence Status Definition
OSB—Back Up To Home	XSP—Sequence Status Power-up
OSC—Define Active State of Home Switch	XSR—Sequence Status Run
OSD—Enable Encoder Z Channel for Home	XSS—Sequence Status
OSH—Reference Edge of Home Switch	XT—Sequence Termination
	XU—Upload Sequence
	Y—Stop Loop
	Z—Reset
	#—Remote Address Numbering
	%—Reset Communication