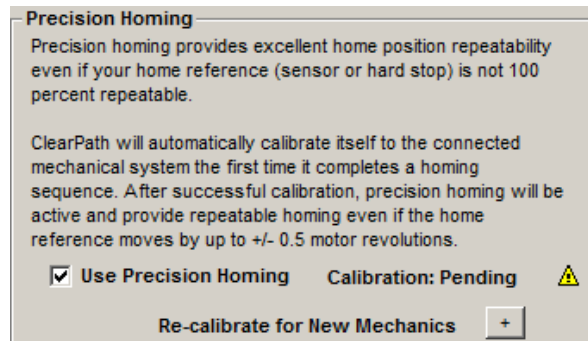### Precision Homing

The Precision Homing feature was created to help ensure that ClearPath always finds the exact same Software Home (zero) position, even in cases where the hard stop or home switch has slipped, bent, or otherwise drifted in position. See the "Precision Homing" section later in this document for more information.

Precision Homing section of Homing Dialog

Shaft Angle Homing

This homing method was designed with a rotary axis in mind– a rotary tool changer for example. This method requires no additional sensor or end of travel hard stop to use.
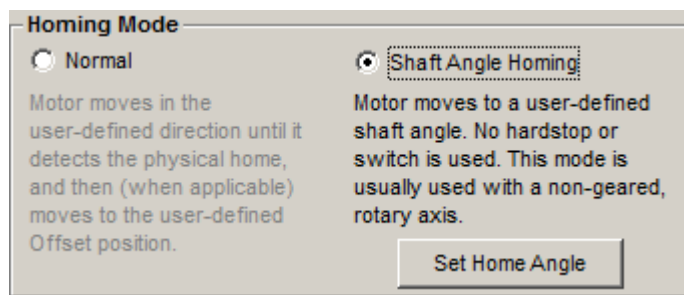
To use Shaft Angle Homing:

1. Select "Shaft Angle Homing" from the homing dialog (see image above).

2. Manually move the motor shaft to the desired position.

3. Click "Set Home Angle" button to store the shaft angle in the motor's memory. This setting will be retained in motor memory, even if main power to ClearPath is cycled.

Note: on first power-up, the motor may move more than 1 revolution before reaching the desired shaft angle.
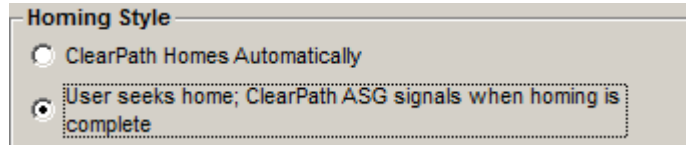
Manual Homing aka "User Seeks Home"

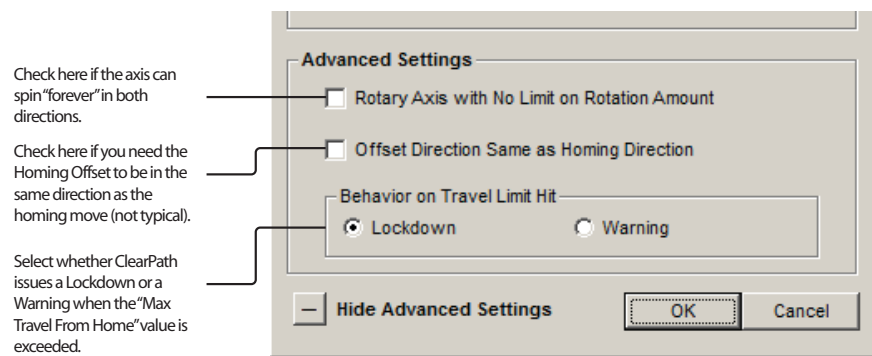*Manual Homing is available in Step & Direction and Pulse Burst Positioning modes only.*

When using Manual Homing, the user is responsible for sending homing moves to ClearPath via step and direction or pulse burst signals.

To use this feature, select the **"User Seeks Home"** setting in the homing dialog of Step and Direction or Pulse Burst Positioning mode.

See typical homing sequences section for more information on manual hard stop homing.

Homing Style
- ○ ClearPath Homes Automatically
- ◉ User seeks home; ClearPath ASG signals when homing is complete

Advanced Settings

Check here if the axis can spin "forever" in both directions.

Check here if you need the Homing Offset to be in the same direction as the homing move (not typical).

Select whether ClearPath issues a Lockdown or a Warning when the "Max Travel From Home" value is exceeded.

Homing: Advanced Settings

Rotary Axis with No Limit on Rotation Amount

Check this box if you have an axis such as a conveyor or turntable with unlimited travel in either direction.

Offset Direction Same as Homing Direction *(not commonly used)*

Check this box if you want the post-homing offset move to be in the same direction as the homing move. This setting is mainly used with rotary axes with unlimited bi-directional motion such as a turntable or conveyor.

Behavior on Travel Limit Hit

This setting tells ClearPath whether to issue either a Warning or a Lockdown (read note below) if you attempt to move past the "Max Travel from Home" setting described earlier.

Warning vs. Lockdown

A Lockdown disallows motion until you toggle Enable to clear it. The indicator LED on ClearPath flashes alternating yellow and green when a Lockdown occurs.

A Warning allows motion only in the direction away from the soft limit and the Warning automatically clears when the condition that caused it is no longer present. The indicator LED on ClearPath flashes a green 2-blink code when a Warning occurs.

TYPICAL HOMING SEQUENCES

This section enumerates the main steps involved in the most common ClearPath homing scenarios.

For the sake of discussion, we will assume that the ClearPath motor described in this section is set to **home every time it is enabled** (as opposed to homing only the first time it is enabled after power up).

AUTOMATIC SWITCH HOMING SEQUENCE

1. The user Enables ClearPath. (Enabling energizes the motor coils and puts ClearPath in Automatic Homing mode.)
2. ClearPath automatically moves the load toward Physical Home (a sensor) at the user-specified acceleration, speed, and direction.
3. The sensor is actuated. The point of actuation is defined as Physical Home. The Software Home (zero position) is defined to be the Physical Home Clearance away from the Physical Home.
4. The motor begins to decelerate.
5. The motor stops at some point past the sensor location (determine by homing velocity and deceleration).
6. ClearPath moves towards the offset location as defined by the [Home Offset Move Distance] parameter. If this value is zero, ClearPath moves to the Software Home (zero position).
7. Homing is complete. ClearPath can now act on motion commands.

AUTOMATIC HARD STOP HOMING SEQUENCE

1. The user Enables ClearPath. (Enabling energizes the motor coils and puts ClearPath in Automatic Homing mode.)
2. ClearPath automatically moves the load toward Physical Home (a hard stop in this case) at the user-specified acceleration, speed, and direction.
3. The load hits the hard stop, triggering the Hard Stop Detection algorithm. Holding torque against the hard stop is automatically rolled back.
4. Physical Home is established. This then defines the Software Home(zero position) to be the Physical Home Clearance away from the Physical Home.
5. ClearPath moves away from the Physical Home to the offset location specified in the [Home Offset Move Distance] parameter. If this value is zero, ClearPath moves to the Software Home(zero position).
6. Homing is complete. ClearPath can now act on motion commands.

MANUAL HARD STOP HOMING SEQUENCE

1. The user Enables ClearPath. (Enabling energizes the motor coils and puts ClearPath in Manual Homing mode.)

2. The motor remains stationary until the user's control system issues a move toward the Physical Home (hard stop) using Step & Direction or Pulse Burst signals. *Note: This initial move must be long enough to guarantee the load will hit the hard stop from the farthest point away from the stop.*

3. The load hits the hard stop, triggering the Hard Stop Detection algorithm. Holding torque against the hard stop is automatically rolled back.

4. If the motor's HLFB output is set to "ASG", the output asserts.

5. ClearPath waits for the user's controller to send pulses to command motion *away* from the hard stop. Any further commands into the hardstop are disregarded while the motor is folding back torque.

6. Upon seeing the first step or pulse away from the hard stop ClearPath's position counter is automatically zeroed. ClearPath exits homing mode and is ready for further move commands.

PRECISION HOMING

Precision Homing helps assure home position repeatability *even if the Physical Home (sensor or hard stop) is not perfect, such as when a hard stop wears out, shifts position, or becomes deformed.*

When set up for Precision Homing, ClearPath automatically calibrates itself to the connected mechanical system *only the very first time* it completes a homing operation. After successful calibration, Precision Homing remains active, ensuring highly repeatable homing *even if the physical home moves by up to ± 1/2 of a motor revolution.*
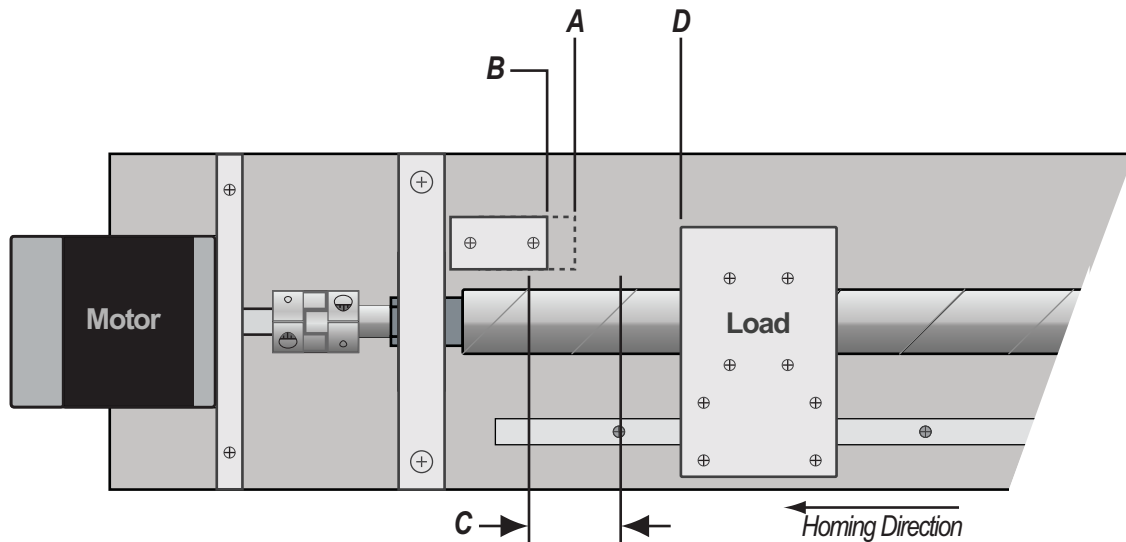
Precision Homing Nomenclature

(a) **Original Physical Home** - This is the Physical Home reference *point found during the initial homing/calibration* operation. Note: This reference position is stored in the motor's NV memory. It is not reset if power is cycled.

(b) **Current Physical Home** - This is the most recent Physical Home found. This position will only be different from Original Physical Home if the associated sensor or hard stop has moved or drifted.

(c) **Max. Error Between Original (Calibrated) Physical Home and Current Physical Home.** Precision Homing will successfully complete as long as the Current Physical Home position does not exceed +/- 1/2 rev from Original Physical Home.

(d) **Final Position** after homing is complete (defined by the Physical Home Clearance, and Offset Move Distance parameters).

PRECISION HOMING SETUP
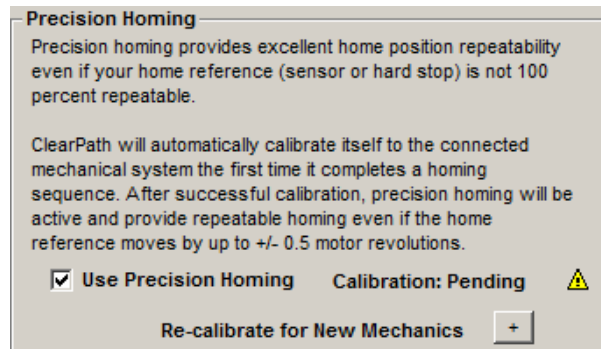
Precision Homing dialog in Homing Setup window

To calibrate ClearPath to your mechanics, you only need to complete one initial homing operation. Whenever you need to clear and reset calibration, click the (+) button as shown in the above screenshot and follow the prompts to clear the calibration.

Important: Any time a motor is connected to new or different mechanics, or is disassembled from its associated mechanics and reassembled, **you must clear the Precision Homing calibration data** to allow a new calibration to occur.

Manually clear the Precision Homing calibration data by doing one of the following:

- Press the "Clear Calibration..." button.

- Load a motor configuration file.

- Run Auto-tune.

- Reset the configuration to factory default settings. Once cleared, re-calibration will occur on the very next homing operation.