

Homing with the PTi210 Module (Digitax HD/M751)

Objective

Create an application that demonstrates Homing using the PTi210 module and PowerTools Studio

Solution Summary

Nearly all motion control applications require a machine/system to be homed prior to beginning the machine sequence. Homing (also referred to as Datum) is a simple routine that is used to establish a known reference position for the machine sequence.

This Application Tool will cover the different options available for the internal homing sequence. Once the basics of homing have been covered, three common home sequence examples will be covered in detail: Home to Sensor, Using a Limit Switch as a Home Sensor, and Home to Sensor between two Limit Switches.

Step 1 – Select Drive Type

Using PowerTools Studio, select File/New and select the drive model you are working with. In this example, I will be using a M751 Digitax HD drive.

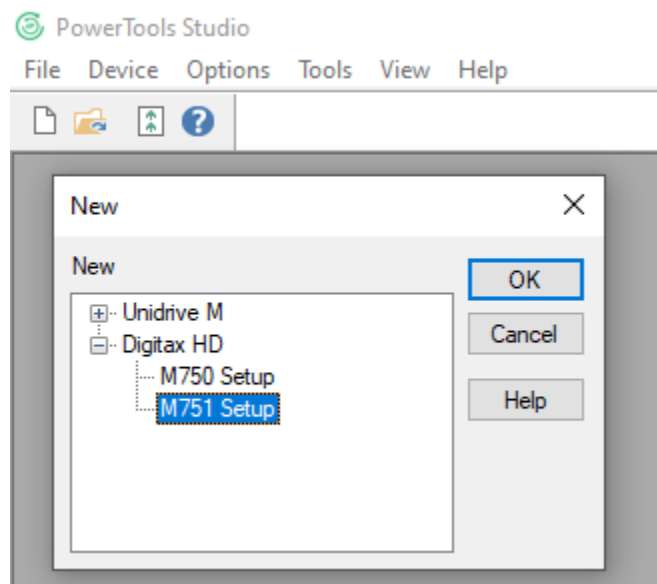


Figure 1

Step 2 – Select Drive/Motor/Feedback

Expand the Hardware branch on the hierarchy tree and select the Drive/Encoder/Motor branch. Doing so will display the view as seen in Figure 2 below. This view is used to select and configure the drive and motor to be used in the application.

Axis 1

Status

Graph

Hardware

Drive/ Encoder/ Mo...

Slot 1 - PTi210

Slot 2 - empty

Drive Menu Watch

Drive Menu Initialize

Setup

Devices / Vars

I/O Setup

Motion

Programs

Network

Configuration

Drive Model01200022

Drive modeRFC-S

Motor TypeXV-604

Thermistor TypeDIN44082

☒ Thermistor Mode Enable

Thermistor FaultTemperature

Trip Threshold3300ohms

Reset Threshold1800ohms

Drive Encoder P1

Drive Encoder P2

Motor

Encoder Configuration

Encoder TypeAB Servo

Encoder Setup

Encoder Supply Voltage5 Volts

Enable Auto Encoder Configuration☒

Encoder Turns16

Encoder Comms Resolution0

Lines Per Rev2048

Encoder Comms Baud Rate300K

Termination Select1

Error Detection

Enable wire break detection☐

Enable Phase Error Detection☐

Enable Power Supply Alarm☐

Enable commutator wire break detection☐

Enable marker wire break detection☐

Advanced Features

Additional Power Up delay0.0

Feedback FilterDisabled

Normalisation Turns16

Feedback Reverse☐

Calculation Time5

Additional Configuration0

Figure 2

Drive Type - Select the drive model number that matches the drive you are working with from the list box.

Motor Type - Select the servo motor model that matches the motor you are using from the list box. For this example, a standard Control Techniques motor will be chosen from the default list. For any custom motor or a Control Techniques Unimotor, the encoder settings will need to be reviewed and changed from the default settings if applicable.

Drive Mode – Select what type of application the drive will be configured for. Available selections are RFC-S for servo motors and RFC-A for induction motors. Based on the setting of this parameter, information on the Motor tab will change.

Thermistor Type - If the Thermistor mode is enabled, this option allows the thermistor type to be selected.

Thermistor Fault - This option sets the P1 Thermistor Fault Detection parameter (3.123) on the drive.

Trip Threshold - The value of this field is used to set the P1 Thermistor Trip Threshold parameter (3.120) on the drive.

Reset Threshold - The value of this field is used to set the P1 Thermistor Reset Threshold parameter (3.121) on the drive.

Drive Encoder P1 – This tab configures the settings for the encoder if connected to P1 on the drive. The settings are determined by the type of encoder. Refer to your motor/encoder documentation to determine the type of encoder being used.

Drive Encoder P2 – This tab configures the settings for the encoder if connected to P2 on the drive. The settings are determined by the type of encoder. Refer to your motor/encoder documentation to determine the type of encoder being used.

Motor – This tab allows the user to use the motor from the DDF file or manually adjust the motor parameters.

Encoder Type – This parameter defines what type of encoder is being used as the feedback device. This encoder could either be an external stand-alone encoder, or it could be an encoder from an upstream motor. If using a standard stand-alone encoder from Control Techniques, this should be set to Quadrature Incremental. If the feedback device is an upstream motor, the Encoder Type should be set to Quadrature Incremental w/ Commutation Outputs. All encoder types supported by the drive can be found in this listbox.

Encoder Supply Voltage – Select the correct supply voltage for the encoder from this list. Valid selections are 5V, 8V, and 15V. For standard quadrature encoders, 5V should be selected.

Enable Auto Encoder Configuration – This checkbox is available only when using an Absolute encoder with a communications protocol. The encoder can be interrogated on power up for Encoder Turn Bits, Lines Per Rev, and Encoder Comms Resolution automatically.

Encoder Turns – This is an Absolute encoder type term. This is how many revolutions will be recorded before the Revolution Counter rolls over. The parameter is the number of bits of resolution and should be provided by the encoder manufacturer.

Encoder Comms Resolution – This is an Absolute encoder type with a communications protocol term. This parameter defines the maximum resolution of the absolute position of the encoder being transmitted.

Lines Per Rev (pre quadrature) – The user should enter the pre-quadrature resolution of the feedback device here. For an encoder such as a SCSLD-4, enter 3000. For a Control Techniques MG/MH/NT/XV motor enter 2048. For most Control Techniques Unimotors, enter 4096. Check the Unimotor nameplate, since it's possible it may have a 2048 device installed.

Lines Per Rev Divider – This is used to scale the equivalent lines per revolution of incremental and SINCOS encoders, without comms, on rotary motors, and all but comms only encoders on linear motors (servo encoders must have the same number and pitch of poles as the motor) The equivalent line per revolution parameter is divided by the Lines Per Rev Divider. This is most often used when an encoder is used with a linear motor where the number of counts or sine waves per pole is not an integer.

Encoder Comms Baud Rate – This is an Absolute encoder type with a communications protocol term. This is the user-defined baud rate of the Absolute encoder.

Termination Select – P1 Termination Select is used to enable or disable the terminations on the position feedback interface inputs. This function depends on the position feedback device type selected. Refer to the drive manual or Online Help in PowerTools Studio for more information.

Step 3 – Configure the Option Module Slots

The next step is to define what type of Solutions Module is fitted in each of the drive's option slots. Figure 2 above shows what is assigned in this example. For this application, the only module necessary is a PTi210 and is assigned to Slot 1.

Step 4 – Configure the Assignments

To use the built-in home routine, there are two events that we need to assign to our digital I/O. These events are the Home Initiate, and the Home Sensor. For this example, we will use the I/O on the PTi210 module. Figure 3 below shows the Assignments view with the necessary I/O configured.

I/O Setup - Assignments

	Source	Assigned to	Polarity	Destination	Set From	Polarity
Axis 1	InitiallyActive			Bits		
Status	> Bits			> Cam		
Graph	> Cam			> Capture		
Hardware	> Capture			> Current		
Setup	> Current			> CyclicProgram		
Devices / Vars	> CyclicProgram			> Errors		
I/O Setup	> Errors			> Gearing		
Assignments	> Gearing			> Home		
Selector	> Home			> Home0		
Drive I/O Setup	AbsolutePosnValid	→ ModuleOutput.1	Active On	Home0		
PTi210 I/O Setup	Home.AnyCommandCo...			Home.0.Initiate	← ModuleInput.1	Active On
Analog Inputs	> Home0			Home.0.SensorTrigger	← ModuleInput.2	Active On
Motion	> Index			> Index		
Programs	> Inputs			> Jog		
Network	> DriveInput			> Master		
	> ModuleInput			> Outputs		
	ModuleInput.1	→ Home.0.Initiate	Active On	> DriveOutput		
	ModuleInput.2	→ Home.0.SensorTrigger	Active On	> ModuleOutput		
	ModuleInput.3			> ModuleOutput.1	← AbsolutePosnValid	Active On
				> ModuleOutput.2		

Figure 3

Following is a description of each of the assignments created:

ModuleInput.1 → Home.0.Initiate

This assignment is used to start the homing sequence. When a rising edge of the input is detected, it causes Home.0.Initiate to activate, and therefore the home sequence begins.

ModuleInput.2 → [Home.0.SensorTrigger](#)

When homing to a sensor, the home profile travels at the specified velocity until the Home.0.SensorTrigger event activates. ModuleInput.2 is used to activate the Home.0.SensorTrigger event. Therefore, the actual hardware sensor should be wired to Input 2 on the EZMotion module. When the sensor activates, the input will see a rising edge, and will cause Home.0.SensorTrigger to activate, and then the Home profile will begin its Offset routine

AbsolutePosnValid → ModuleOutput.1

This assignment is used to activate a digital output indicating that the home sequence is complete and is entirely optional. Absolute Position Valid is a very important signal for many features. If Absolute Position Valid is not active, then Software Limit Switches and PLS's will not function. This signal indicates the system has been homed and there has been no error/trip that has caused the system to lose position. If a following error fault or encoder fault occurs, AbsolutePosnValid will automatically deactivate.

Step 5 – Configure the Home Profile

The screenshot shows the 'Home Profile' configuration window for 'Axis 1'. The left sidebar lists various system components, with 'Homes' expanded to show 'Home0'. The main configuration area is divided into several sections:

- Home Identification:** Home Number (0), Name (Home0), Home Reference (Sensor), and Time Base (Realtime).
- Home Offset:** Options for 'Calculated offset' (-0.0161 Inches) and 'Specified offset' (0.0000 Inches).
- Home Behavior:** 'If on sensor...' options: 'Back off before homing' (selected) and 'Go forward to next sensor'.
- Limiting:** 'Limit Distance' (10.1000 Inches) and 'End Of Home Position' (2.0000 Inches).
- Performance:** Velocity (-30 Inches/m), Acceleration (500.00 Inches/m/s), and Deceleration (500.00 Inches/m/s).

Figure 4

This view is used to configure the motion performance of the home sequence, and how to handle certain sensor conditions. Following is a description of each of the Home parameters:

Home Number – The Home Number (or Home Instance) allows the user to select from multiple home routines. However, at this point in time, only one home instance is available in the PTi210 module. More Home Instances may be added in the future.

Name – The Home Name parameter allows the user to give a descriptive name to the home sequence. The Name may be up to twelve characters in length. Alpha and Numeric characters may be used. No spaces are allowed (underscore should be used instead).

Home Reference – The Home Reference is the signal that activates to tell the system that it is “at the home position”. The user can select from three different Home Reference types including: Marker, Sensor, and Sensor then Marker.

The term “Marker” refers to the motor encoder marker pulse (or Z channel). The user can use the marker pulse of the motor as the zero point or home position of the system.

The term “Sensor” refers to some external device (i.e. proximity sensor, switch, electric eye) that activates when the machine is at its desired home position.

Following is a graphical interpretation of each of the three Home Reference Types:

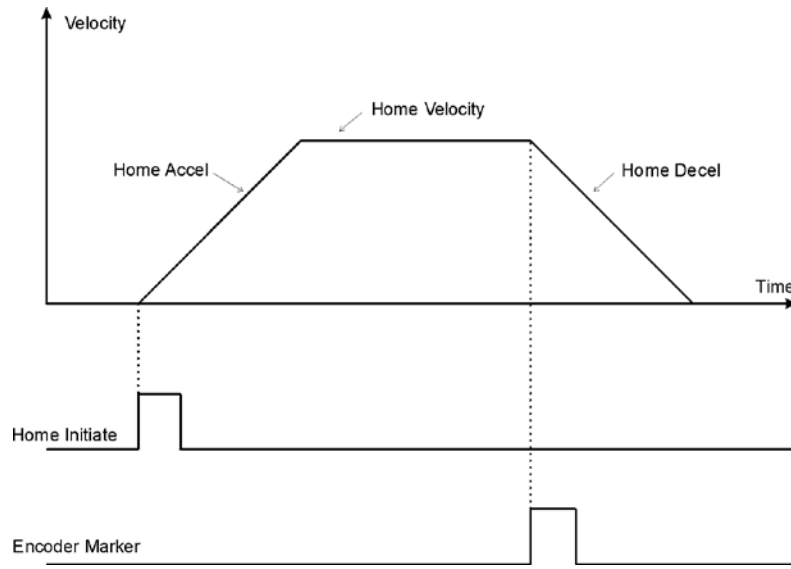


Figure 5 – Home to Marker Profile

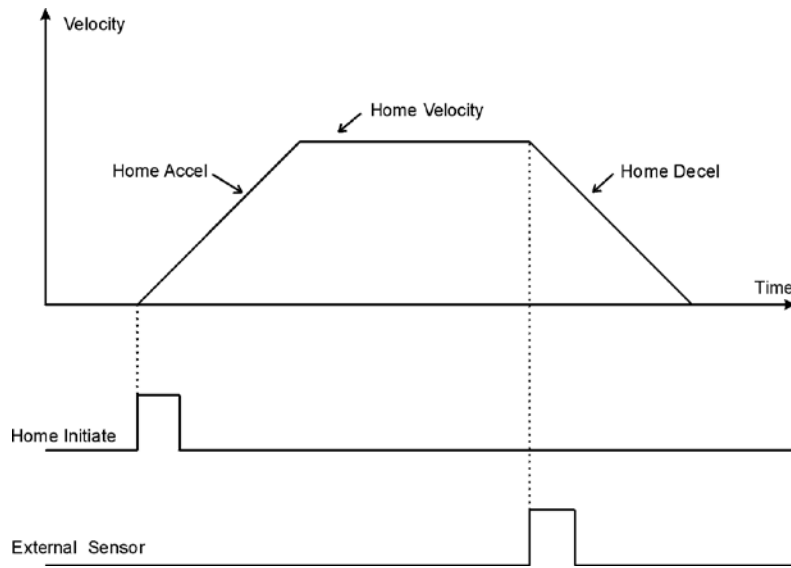


Figure 6 – Home to Sensor Profile

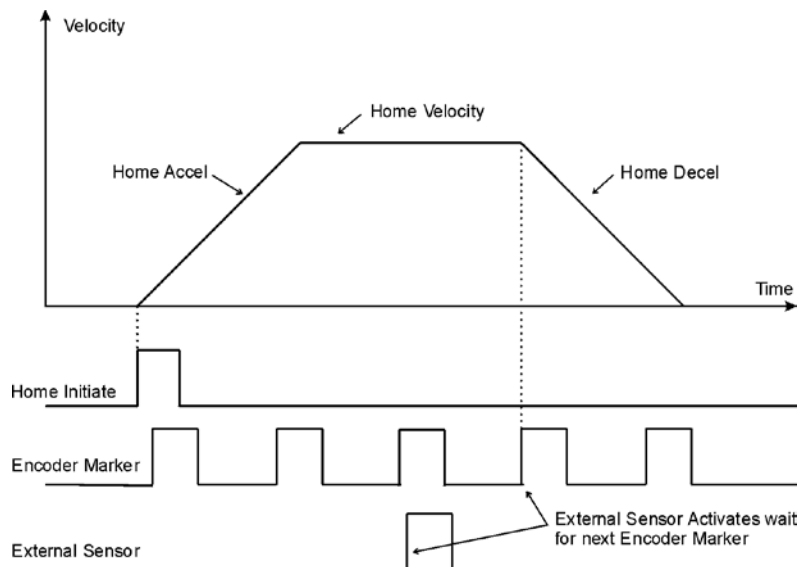


Figure 7 – Home to Sensor then Marker Profile

Time Base – The Time Base parameter allows the user to define the velocity and position reference for the Home motion profile. The user can select from Realtime or Synchronized. Realtime indicates that the internal clock is used as the time reference (t) in the velocity and accel/decel units ($v = d / t$ and $a = v / t$). If the user selects Synchronized, then the master encoder signal is used as the time reference (t) for velocity units ($v = d / \text{MasterDist}$ and $a = v / \text{MasterDist}$).

Velocity – This parameter defines the target speed for the Home profile. The motor may or may not be able to reach the programmed velocity depending on the Accel/Decel ramps specified. The Home Velocity is a signed parameter that determines the direction of travel for the homing routine. If the value is positive, the home will travel in the positive direction. If the value is negative, the home will travel in the negative direction.

Acceleration – This parameter defines the ramp used to reach the target velocity when the home is initiated.

Deceleration – This parameter defines the ramp used to decelerate to zero velocity when the home sequence is complete.

If On Sensor Options

In the condition where the Home sequence is initiated while the Home reference is already active, the following two options define how the sequence will react:

Back Off Before Homing – If the Home Sensor is active when the Home sequence is initiated, and this option is selected, then the motor will move in the opposite direction as specified by the Home Velocity. The motor will continue in the opposite direction until the Home.0.SensorTrigger event deactivates. When the Home Reference deactivates, then the profile will decelerate to a stop, and then begin homing in the direction originally specified by the Home Velocity. The profile will continue in the specified direction until a rising edge is seen on the Home.0.SensorTrigger event.

Go Forward to Next Sensor - If the Home Sensor is active when the Home sequence is initiated, and this option is selected, then the motor will move in the direction as specified by the Home Velocity. The motor will continue in the specified direction until the next rising edge of the Home.0.SensorTrigger event.

Home Offset Options

The Home Offset is the distance that is traveled after the Home Reference activates. The user can choose between two different offset types including Calculated Offset and Specified Offset.

Calculated Offset – If the user selects Calculated Offset, then the motor will begin decelerating immediately after the rising edge of the Home Reference. The distance of the offset is automatically calculated based on the Home Velocity and the Home Deceleration parameters. The motor decelerates using the specified deceleration ramp and comes to a stop. When the motor reaches zero velocity, the position feedback is set to the Define Home Position. Figure 8 below shows a Home to Sensor using a Calculated Offset. Compare Figure 8 to Figure 9 to see the difference between Calculated and Specified Offsets.

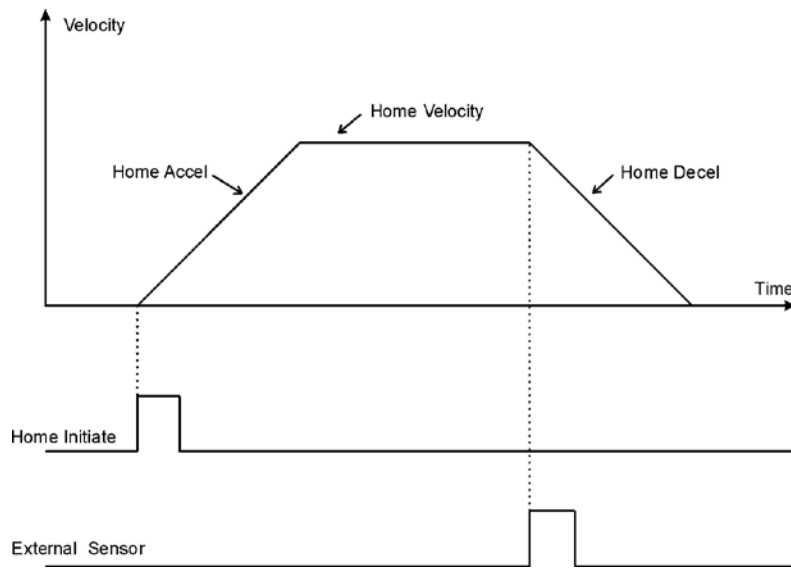


Figure 8 – Home to Sensor using Calculated Offset

Specified Offset - If the user selects Specified Offset, then the motor will continue at the Home Velocity for a specified distance after the rising edge of the Home Reference. The user can enter the desired distance in the Specified Offset value parameter. The Offset parameter is a signed value, so the user can specify a positive or negative offset distance. If the Offset value has a different sign than the Home Velocity, then the motor will decelerate to a stop immediately after the rising edge of the Home Reference, and then the motor will back up until the motor is exactly the Home Offset Value distance from where the Reference activated.

Figure 9 below shows a Home to Sensor using a Calculated Offset. Compare Figure 9 below to Figure 8 above to see the difference between Calculated and Specified Offsets.

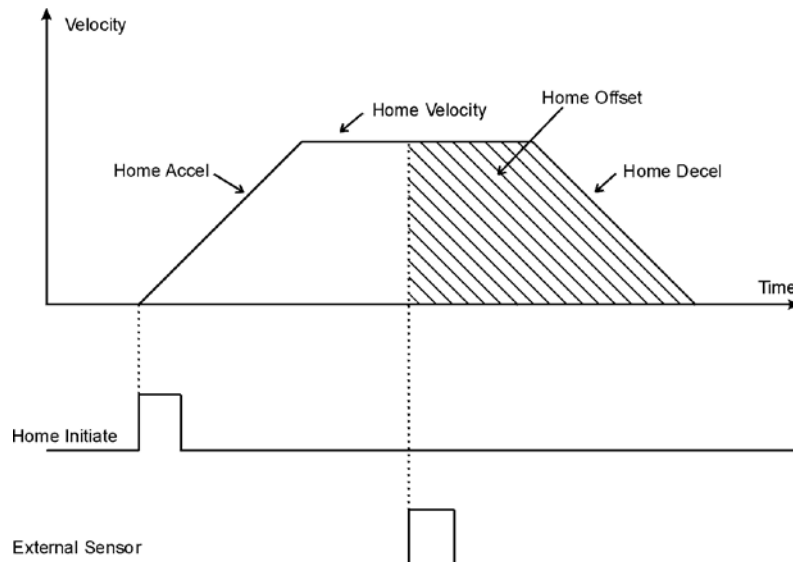


Figure 9 – Home to Sensor using Specified Offset

Limit Distance Enable – If the user wishes to set a maximum distance that the Home profile will travel in search of the Home Reference, simply check this checkbox to Enable the Limit Distance.

Limit Distance – If the Limit Distance Enable is activated, the user must specify the maximum distance that the motor will travel in search of the Home Reference. If the Home is initiated, and the profile reaches this specified distance without seeing a rising edge of the Home Reference signal, then the Home.0.LimitDistHit signal will activate. This signal could be used to indicate to a master controller that the Home Reference was not found properly.

End of Home Position – When the Home sequence is finished (Offset is complete), then the Position Feedback and Position Command parameters are automatically set to the End of Home Position value. Typically, the End of Home Position has a value of 0, but it is possible to specify any non-zero value. This is often used when some long offset is preformed, and the ending position of the home is not the actual “machine zero position”.

Now that we have covered the details of the Homing profile, let’s look at the three examples mentioned earlier:

- Home to Sensor
- Using a Limit Switch as a Home Sensor
- Home to Sensor Between Two Limit Switches

Homing Example #1 – Homing to a Sensor

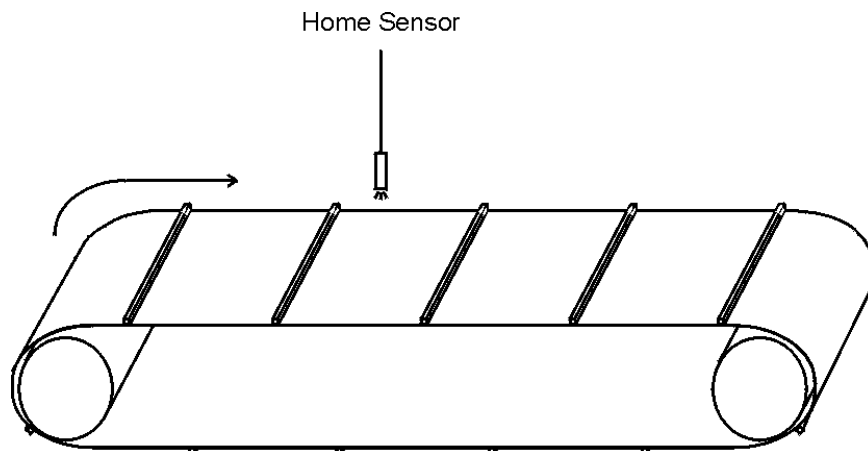


Figure 10 – Home to Sensor Example

On many machines, there is an external sensor that is used to define the Home position or zero cycle position for the machine. The sensor can be used to detect a lug on a belt, gap between products, a printed mark on material, or any other configuration.

In the example shown in Figure 10 above, the motor turns a conveyor belt with evenly spaced flights on the conveyor. Some product needs to be placed in between the flights so that the product can then be loaded into a box. In order to receive parts in-between the flights, the belt needs to be in a known position with respect to a flight when the system starts. Therefore, the Home routine is configured to turn the conveyor until the proximity sensor activates indicating that a flight (or lug) is beneath the sensor. The home then decelerates to a stop, and that is defined as the Home Position of the machine.

The user has a push-button on a panel that is used to initiate the Home. That push-button is wired to Module Input 1 on the PTi210 module and the home initiate is assigned in PowerTools Studio as shown in Figure 3.

The external sensor is wired to a Module Input 2 on the PTi210 module and the home sensor is assigned in PowerTools Studio as shown in Figure 3 as well.

Next, the user must navigate to the Home view in PowerTools Studio and specify the Home Reference to be "Sensor". Then enter a Velocity, Acceleration and Deceleration for the home profile as shown in Figure 4.

To initiate the home, the user then must activate the push-button. The motor will then turn the conveyor until a flight passes the sensor, which causes the sensor to activate. When the sensor activates, the Home.0.SensorTrigger activates because of the Assignment created earlier. The home then performs the Offset (either Specified or Calculated) and the home is complete.

Homing Example #2 – Using a Limit Switch as a Home Sensor

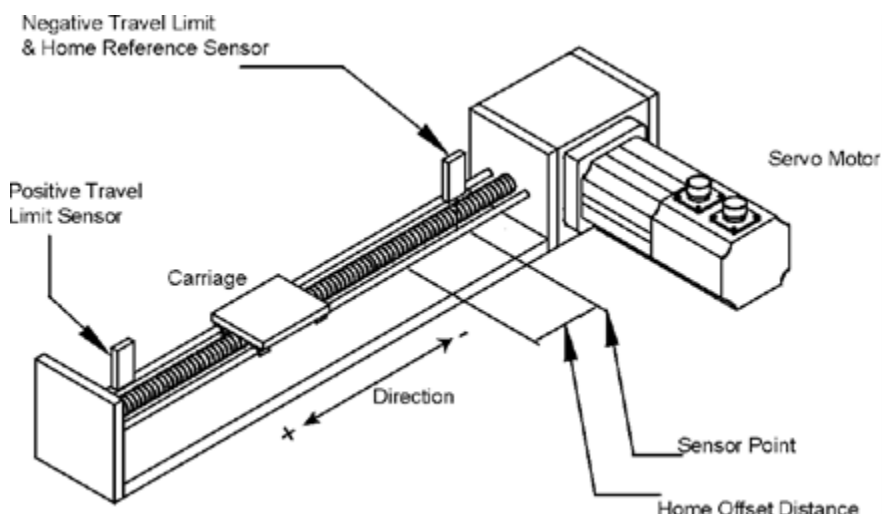


Figure 11 – Using a Limit Switch as a Home Sensor Example

In this example, a servo motor is used to control the position of a carriage on a leadscrew. The machine has two sensors that act as limit switches for the machine. The Limit Switches are used to protect against the motor running into the hard stops on either end of the leadscrew, which could damage the mechanics. In this example, the user wishes to use the Negative Travel Limit Sensor as the Home Sensor as well. For this to work, we must disable the functionality of the Travel Limits while the home is in progress, otherwise, the travel limit would activate and the home sequence would stop. One of the keys to this application is that when the home is complete, it must be clear of the Travel Limit Sensor so that when travel limits are reactivated, a travel limit doesn't turn on immediately after the home.

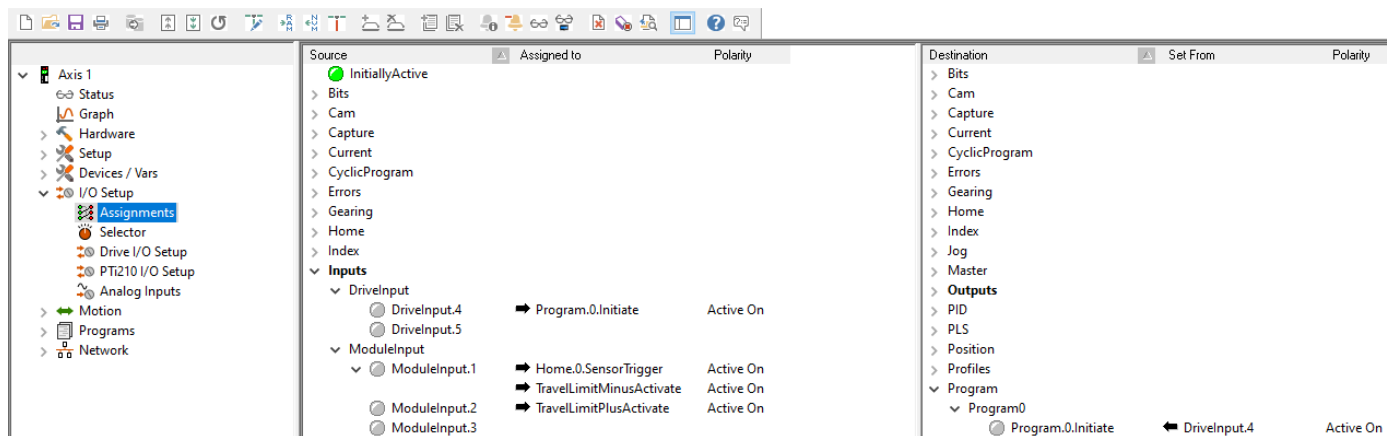


Figure 12 – Assignments for the Using a Limit Switch as a Home Switch Example

DriveInput.4 – Program.0.Initiate

Since this example requires the use of a program, we need a way to start the user program. In this example, digital input 4 on the Unidrive M751 is used to initiate the program. This could be a push-button wired to input 4 on the drive.

ModuleInput.1 – Home.0.SensorTrigger

TravelLimitMinusActivate

This digital input is used for multiple functions. Under normal conditions, the input acts as the Negative Travel Limit sensor input. Therefore, the Negative Limit Sensor should be wired to this digital input. While the system is homing, however, this input will also act as the Home.0.SensorTrigger for the condition where the carriage is on the negative side of the Home Sensor when the home begins. Once the home is complete, we check if this input is active. If so, then we need to back off of the travel limit until we pass the home sensor, and then re-home the machine.

ModuleInput.2 – TravelLimitPlusActivate

This input is used to signal that the carriage has reached the Positive Travel Limit position. When this input activates, motion in the positive direction will be prevented.

Motion – Home View

Home Number	0	Velocity	-100	revs/m
Name	Home0	Acceleration	1000	revs/m/s
Home Reference	Sensor	Deceleration	1000	revs/m/s
Time Base	Realtime			
If on sensor...		Home Offset		
<input checked="" type="radio"/> Back off before homing		<input type="radio"/> Calculated offset -0.0868 revs		
<input type="radio"/> Go forward to next sensor		<input checked="" type="radio"/> Specified offset 0.1 revs		
<input type="checkbox"/> Limit Distance	0.0000 revs	End Of Home Position	0.1000	revs

Figure 13 – Parameter setup for Home profile

In order to move off of the travel limit at the end of the home sequence, we select the Offset type of Specified Offset, and enter a value of 0.1 revs. Doing so causes the carriage to move off of the negative travel limit 0.1 revolutions in the positive direction. This is done so that when the travel limits are re-enabled, a travel limit trip does not occur instantly.

Notice also that the Home Velocity is negative meaning that the home will move in the negative direction in search of the Home Reference.

Program0 – Actual Program Code

```
'-----  
'Program 0 -  
'Description: Using a Limit Switch as a Home Switch -  
'Filename(s): EZAT1.PTi -  
'Revision 1 - 3/22/2021, Created using PowerTools Studio 1.2 -  
'Min. Software Level Required: PowerTools Studio 1.1 or higher -  
'Min. Firmware Required: V01.01.00.20 -  
'-----  
  
TravelLimitDisable = ON  
  
Home.0.Initiate 'Home0,Sensor,SpecifiedOffset=0.0000 revs,Vel=10 revs/m  
Wait For Home.AnyCommandComplete
```

```
TravellLimitDisable = OFF
```

Description of Program Code Used

The first instruction in the program is used to turn off the travel limit functionality during the home routine. This is done because it is possible that the negative travel limit sensor will activate during the home. By turning off the travel limits, if the negative travel limit is reached during the home, the user program will continue to process when the TravellLimitMinusActive function turns on. If travel limits were not disabled, the program would stop when the travel limit activates.

Next, the Home sequence is initiated using the Home.0.Initiate instruction. This is followed by the Wait For Home.AnyCommandComplete instruction, which causes the program to wait on that line until the home sequence is complete.

Once the Home is complete, then the program re-enables the Travel Limits using the TravellLimitDisable = OFF instruction.

Once the program is complete, the home is done, and the carriage will always be in the same position. This program could then be used to call another program, or the rest of the users program could be added to this program at the end.

Homing Example #3 – Homing to a Sensor in-between two Limit Switches

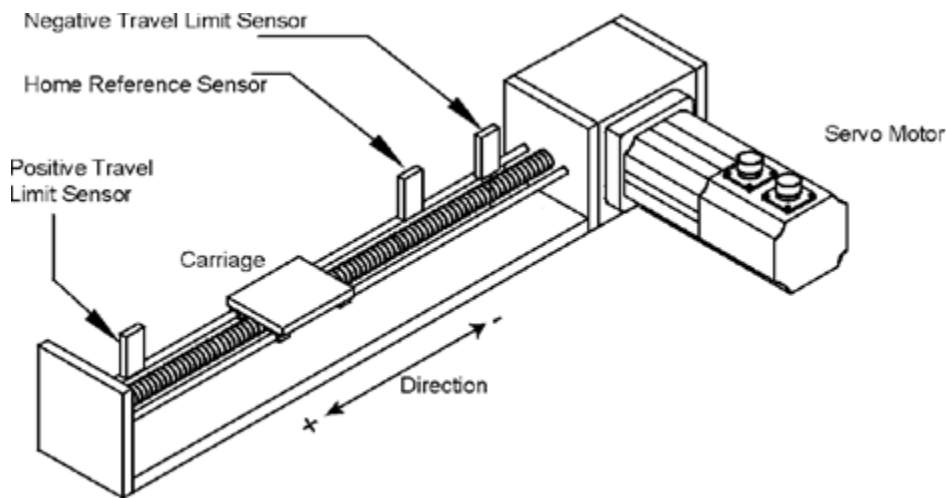


Figure 14 – Home to a Sensor Between Two Limit Switches

In this example, a servo motor is used to control the position of a carriage on a leadscrew. The machine has two sensors that act as limit switches for the machine. The Limit Switches are used to protect against the motor running into

the hardstops on either end of the leadscrew, which could damage the mechanics. The user wishes to home to a Sensor that is located in-between the two travel limit sensors. This can be a challenging task because it is not possible to know which side of the Home Sensor that the carriage is on when the Home profile begins. Since the Home Sensor is located near the Negative Travel Limit Sensor, it is most likely that the carriage is on the “positive side” of the Home Sensor. Therefore, we will choose to Home in the negative direction by default. We must create a program that handles the condition when the home is initiated when the carriage is on the “negative side” of the Home Sensor. In this case, the Home will cause the carriage to move into the Negative Travel Limit. The program must move the carriage off of the travel limit, and then past the Home Sensor in the positive direction, and then again Home in the negative direction. This is done because it is desirable to always home in the same direction (otherwise the Home Position would be off by the width of the carriage).

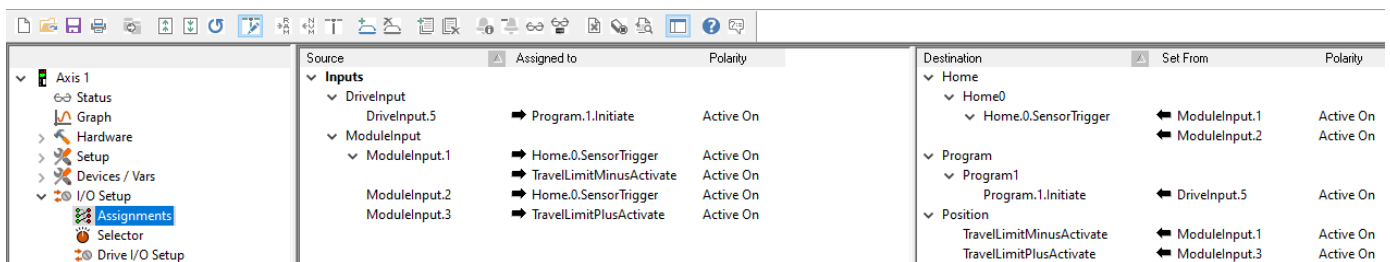


Figure 15 – Parameter Setup for using a Limit switch as a Home Sensor

DriveInput.5 – Program.1.Initiate

Since this example requires the use of a program, we need a way to start the user program. In this example, Drive Input 5 on the M751 is used to initiate the program.

ModuleInput.1 – Home.0.SensorTrigger

TravellLimitMinusActivate

This input is used for multiple functions. Under normal conditions, the input acts as the Negative Travel Limit sensor input. Therefore, the Negative Limit Sensor should be wired to this digital input. While the system is homing however, this input will also act as the Home.0.SensorTrigger for the condition where the carriage is on the negative side of the Home Sensor when the home begins. Once the home is complete, we check if this input is active. If so, then we need to back off of the travel limit until we pass the home sensor, and the re-home the machine.

ModuleInput.2 – Home.0.SensorTrigger

When homing to a sensor, the home profile travels at the specified velocity until the Home.0.SensorTrigger event activates. ModuleInput 2 is used to activate the Home.0.SensorTrigger event. When the sensor activates, ModuleInput.2

will see a rising edge, and will cause Home.0.SensorTrigger to activate, and then the Home profile will begin its Offset routine.

ModuleInput.3 – TravelLimitPlusActivate

This input is used to signal that the carriage has reached the Positive Travel Limit position. When this input activates, motion in the positive direction will be prevented.

Program1 – Actual Program Code

```
'-----
'Description - Homing with Home Sensor located between Travel Limit Sensors -
'Revision 1 - 2/03/21, Created using PowerTools Studio Software V01.02.00.02 -
'and Pti210 Firmware V01.02.00.04 -
'-----

' Initialize Variables & Bits
DriveOutput.1 = Off 'clear home complete output
DriveOutput.2 = Off 'clear home aborted output
Index.0.Dist = 2.1000 'Inches
Home.0.LimitDist = 10.1000 'Inches
Home.0.Reference=Sensor

'Main Program
UndefineHome=True
TravelLimitDisable=True
Wait For Time .05 'seconds

Do While AbsolutePosnValid = False
  If TravelLimitMinusActive Then
    Index.0.Initiate 'Index0,Incremental,Dist=2.1000 Inches,Vel=75 Inches/m
    Wait For Index.AnyCommandComplete
    Wait For Time 1 'second pause before homing
  Endif
  Home.0.Initiate 'Home0,Sensor,SpecifiedOffset=0.0000 Inches,Vel=-30 Inches/m
  Wait For Home.AnyCommandComplete
  Wait For Time 1 'second

  If Home.0.LimitDistHit=True Then
    DriveOutput.2 = On 'Home Aborted - Home Reference Sensor not made
  End
Endif
Loop

If ModuleInput.2 = On Then
  Home.0.Reference=Marker
  Wait For Time .05 'seconds
  Home.0.Initiate 'Home0,Sensor,SpecifiedOffset=0.0000 Inches,Vel=-30 Inches/m
  Wait For Home.AnyCommandComplete
Else
  Index.0.Initiate 'Index0,Incremental,Dist=2.1000 Inches,Vel=75 Inches/m
  Wait For Index.AnyCommandComplete
  Home.0.Reference=Sensor
  Wait For Time 1 'second pause before homing
  Home.0.Initiate 'Home0,Sensor,SpecifiedOffset=0.0000 Inches,Vel=-30 Inches/m
  Wait For Home.AnyCommandComplete
  Wait For Time .05 'seconds
  If TravelLimitMinusActive Then
    DriveOutput.2 = On 'Home Aborted - Home Reference Sensor not made
  End
Endif
```

Description of Program Code

DriveInput.5 is used to initiate the Home program. First, the drive outputs used to signal Home Complete and Home Aborted are cleared. Home.0.Reference=Sensor is initialized to set the first home type as sensor home type only. The final type of home is a marker home after seeing the Home Reference Sensor; this is chosen to increase the final accuracy and repeatability of the home. The two separate sensor then marker homes were needed because we cannot guarantee that the first sensor homed to is not the Negative Travel Limit.

UndefinedHome=True is used to clear the AbsolutePosnValid bit. TravelLimitDisable=True disables the travel limit sensors. If we do not disable the travel limit sensors and a travel limit is encountered during a program, this would cause a travel limit fault, which in turn would halt the current program. A short delay is placed after this instruction to make sure the travel limits are disabled prior to issuing the Home instruction.

Home Number	0	Velocity	-30	Inches/m
Name	Home0	Acceleration	500.00	Inches/m/s
Home Reference	Sensor	Deceleration	500.00	Inches/m/s
Time Base	Realtime			
If on sensor...		Home Offset		
<input checked="" type="radio"/> Back off before homing		<input type="radio"/> Calculated offset -0.0161 Inches		
<input type="radio"/> Go forward to next sensor		<input checked="" type="radio"/> Specified offset 0.0000 Inches		
<input checked="" type="checkbox"/> Limit Distance	10.1000 Inches	End Of Home Position	2.0000	Inches

Figure 16 – Home Setup for Having a Home Sensor between Two Limit Switches

In the Home instruction itself, it should be noted that the radio button Back off before homing is selected and there is a Home Limit Distance set to 10.1 revs. Detailed information on the Home Instruction can be found in the PTi210 User's Guide, or in the Power Tools Studio Online Help. Since the home direction is chosen to be in the negative direction and the travel limits are disabled, we do not have to test if the carriage starts on the Positive Travel Limit Sensor. Because the home instruction has the radio button selected Back off sensor before homing, we also do not need to test for this condition. Therefore, the first If/Then test in the program is to test if the carriage is on the Negative Travel Limit Sensor.

If this test is TRUE, we immediately index a known distance. 2.1 revs is arbitrarily chosen in this example, to clear past the Home Reference Sensor and continue homing. If the test is FALSE, we continue with the first sensor home. If the Home Limit Distance is encountered, DriveOutput3 is turned ON and the program is ended. If the Home is successful, we then need to test if we are on the Home Reference Sensor.

If this is TRUE, the home reference is changed to marker, the final marker home is completed, the travel limits are re-enabled and DriveOutput1 is turned ON to signal Home Complete, and the program is ended. Otherwise, the carriage is on the Negative Travel Limit, Index 0 is initiated to clear past the Home Reference

Sensor and the sensor home to the actual Home Reference Sensor is attempted one last time. If the Negative Travel Limit is found once again, DriveOutput2 is turned on signaling the Home is Aborted and the program is ended. If the Home Reference Sensor is ON, the home reference is changed to marker, the final marker home is completed, the travel limits are re-enabled and DriveOutput1 is turned ON to signal Home Complete, and the program is ended.