Homing

The *homing operation* is a sequence of moves that position an axis using assigned inputs and/or the Z Channel input of an incremental encoder. The goal of the homing operation is to return the load to a repeatable initial starting location.

**Zero Reference After Homing:** As soon as the homing operation is successfully completed, the absolute position register is reset to zero, thus establishing a zero reference. The homing operation has several potential homing functions you can customize to suit the needs of your application (illustrations of the effects of these commands are presented below):

<table>
<thead>
<tr>
<th>Description</th>
<th>Command</th>
<th>Example</th>
<th>Example Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiate the homing move. To start the homing move in the positive direction, use JOG HOME {Axis Alias}; to home in the negative direction, use JOG HOME {Axis Alias}</td>
<td>JOG HOME</td>
<td>JOG HOME X1</td>
<td>Positive Direction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JOG HOME X-1</td>
<td>Negative Direction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AXIS0 JOG HOME 1</td>
<td>Positive Direction, outside master program</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AXIS0 JOG HOME -1</td>
<td>Negative Direction, outside master program</td>
</tr>
<tr>
<td>Acceleration while homing.</td>
<td>JOG ACC</td>
<td>JOG ACC X100</td>
<td>within master assigned master</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AXIS0 JOG ACC100</td>
<td>outside master program</td>
</tr>
<tr>
<td>S-curve acceleration/deceleration while homing.</td>
<td>JOG JRK</td>
<td>JOG JRK X1000</td>
<td>within assigned master</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AXIS0 JOG JRK 1000</td>
<td>outside master program</td>
</tr>
<tr>
<td>Deceleration while homing.</td>
<td>JOG DEC</td>
<td>JOG DEC X100</td>
<td>within assigned master</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AXIS0 JOG DEC 100</td>
<td>outside master program</td>
</tr>
<tr>
<td>Back up to home. The load will decelerate to a stop after encountering the active edge of the home region, and then will move in the opposite direction at the JOG HOMVF velocity until the active edge of the home region is encountered.</td>
<td>CLR/SET</td>
<td>CLR 16152</td>
<td>Axis0 backup disabled, default</td>
</tr>
<tr>
<td></td>
<td>Home Backup Enable Flag</td>
<td>SET 16152</td>
<td>Axis0 backup enabled</td>
</tr>
<tr>
<td>Final approach direction — during backup to home</td>
<td>CLR/SET</td>
<td>CLR 16154</td>
<td>Axis0, Postive Direction, default</td>
</tr>
<tr>
<td></td>
<td>Home Negative Final Direction Flag</td>
<td>SET 16154</td>
<td>Axis0 Negative Direction</td>
</tr>
<tr>
<td>Specify the side of the home switch on which to stop</td>
<td>CLR/SET</td>
<td>CLR 16153</td>
<td>Axis0, Postive side of home switch, default</td>
</tr>
<tr>
<td></td>
<td>Home Negative Edge Select flag</td>
<td>SET 16153</td>
<td>Axis0, Postive side of home switch, default</td>
</tr>
<tr>
<td>Velocity while seeking the home position</td>
<td>JOG VEL</td>
<td>JOG VEL X10</td>
<td>within assigned master</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AXIS0 JOG VEL 10</td>
<td>outside master program</td>
</tr>
<tr>
<td>Velocity while in final approach to home position — during backup to home</td>
<td>JOG HOMVF</td>
<td>JOG HOMVF X2</td>
<td>within assigned master</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AXIS0 JOG HOMVF 2</td>
<td>outside master program</td>
</tr>
</tbody>
</table>
NOTES

- To better illustrate the direction changes in the backup-to-home operation, the illustrations in this section show the backup-to-home movements with varied velocities. In reality, the backup-to-home movements are performed at the same velocity (JOG HOMVF value).
- Program examples listed are for AXIS0. Assumes that the Axis Alias is “X” and that the program is run in the master where AXIS0 is attached.
- Backup flags settings are listed for all axes in each scenario.
- CLR statements are optional. Flags referenced below default to zero/clear state.
- For axes attached to the same master, home routines can be initiated simultaneously for multiple axes as follows: JOG HOME X1 Y1 Z1 A1
- If an end-of-travel limit is encountered during the homing operation, the motion will be reversed and the home switch will be sought in the opposite direction. If a second limit is encountered, the homing operation will be terminated, stopping motion at the second limit.
- Relevance of positive and negative direction:
**Figure A**

Start home move in positive direction  
Backup To Home disabled

**Program**

```
JOG VEL X10  
JOG ACC X100  
JOG DEC X100  
JOG JRK X0  
CLR16152  
JOG HOME X1  
ENDP
```

**Figure B**

Start home move in negative direction  
Backup To Home disabled

**Program**

```
JOG VEL X10  
JOG ACC X100  
JOG DEC X100  
JOG JRK X0  
CLR16152  
JOG HOME X-1  
ENDP
```

**Figure C**

Start home move in positive direction  
Backup To Home enabled  
Final approach direction is positive  
Stop on the positive-travel side of the home active region

**Program**

```
JOG VEL X10  
JOG ACC X100  
JOG DEC X100  
JOG JRK X0  
CLR16152 CLR16153 CLR16154  
JOG HOMVF X1  
JOG HOME X1  
ENDP
```

**Backup Bit settings**

<table>
<thead>
<tr>
<th>Axis</th>
<th>SET 16184</th>
<th>CLR 16185</th>
<th>CLR 16186</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXIS1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AXIS2</td>
<td>SET 16216</td>
<td>CLR 16217</td>
<td>CLR 16218</td>
</tr>
<tr>
<td>AXIS3</td>
<td>SET 16248</td>
<td>CLR 16249</td>
<td>CLR 16250</td>
</tr>
<tr>
<td>AXIS4</td>
<td>SET 16280</td>
<td>CLR 16281</td>
<td>CLR 16282</td>
</tr>
<tr>
<td>AXIS5</td>
<td>SET 16312</td>
<td>CLR 16313</td>
<td>CLR 16314</td>
</tr>
<tr>
<td>AXIS6</td>
<td>SET 16344</td>
<td>CLR 16345</td>
<td>CLR 16346</td>
</tr>
<tr>
<td>AXIS7</td>
<td>SET 16376</td>
<td>CLR 16377</td>
<td>CLR 16378</td>
</tr>
</tbody>
</table>
**Figure D**

Start home move in positive direction
Backup To Home enabled
Final approach direction is positive
Stop on the negative-travel side of the home active region

**Figure E**

Start home move in positive direction
Backup To Home enabled
Final approach direction is negative
Stop on the positive-travel side of the home active region

**PROGRAM**

**JOG VEL X10**
**JOG ACC X100**
**JOG DEC X100**
**JOG JRK X0**
**SET 16152 SET 16153 CLR 16154**
**JOG HOMVF X1**
**JOG HOME X1**
**ENDP**

**Backup Bit settings**

**AXIS0**
**SET 16152**
**SET 16153**
**CLR 16154**

**AXIS1**
**SET 16184**
**SET 16185**
**CLR 16186**

**AXIS2**
**SET 16216**
**SET 16217**
**CLR 16218**

**AXIS3**
**SET 16248**
**SET 16249**
**CLR 16250**

**AXIS4**
**SET 16280**
**SET 16281**
**CLR 16282**

**AXIS5**
**SET 16312**
**SET 16313**
**CLR 16314**

**AXIS6**
**SET 16344**
**SET 16345**
**CLR 16346**

**AXIS7**
**SET 16376**
**SET 16377**
**CLR 16378**
### ACR9000 Homing

#### Figure F

**Start home move in positive direction**  
Backup To Home enabled  
Final approach direction is negative  
Stop on the negative-travel side of the home active region

```
PROGRAM
JOG VEL X10
JOG ACC X100
JOG DEC X100
JOG JRK X0
SET 16152 SET 16153 SET 16154
JOG HOMVF X1
JOG HOME X1
ENDP
```

**Backup Bit settings**

<table>
<thead>
<tr>
<th>AXIS</th>
<th>SETs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>16152 16153 16154</td>
</tr>
<tr>
<td>1</td>
<td>16184 16185 16186</td>
</tr>
<tr>
<td>2</td>
<td>16216 16217 16218</td>
</tr>
<tr>
<td>3</td>
<td>16248 16249 16250</td>
</tr>
<tr>
<td>4</td>
<td>16280 16281 16282</td>
</tr>
<tr>
<td>5</td>
<td>16312 16313 16314</td>
</tr>
<tr>
<td>6</td>
<td>16344 16345 16346</td>
</tr>
<tr>
<td>7</td>
<td>16376 16377 16378</td>
</tr>
</tbody>
</table>

#### Figure G

**Start home move in negative direction**  
Backup To Home enabled  
Final approach direction is negative  
Stop on the negative-travel side of the home active region

```
PROGRAM
JOG VEL X10
JOG ACC X100
JOG DEC X100
JOG JRK X0
SET 16152 SET 16153 SET 16154
JOG HOMVF X1
JOG HOME X-1
ENDP
```

**Backup Bit settings**

<table>
<thead>
<tr>
<th>AXIS</th>
<th>SETs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>16152 16153 16154</td>
</tr>
<tr>
<td>1</td>
<td>16184 16185 16186</td>
</tr>
<tr>
<td>2</td>
<td>16216 16217 16218</td>
</tr>
<tr>
<td>3</td>
<td>16248 16249 16250</td>
</tr>
<tr>
<td>4</td>
<td>16280 16281 16282</td>
</tr>
<tr>
<td>5</td>
<td>16312 16313 16314</td>
</tr>
<tr>
<td>6</td>
<td>16344 16345 16346</td>
</tr>
<tr>
<td>7</td>
<td>16376 16377 16378</td>
</tr>
</tbody>
</table>

#### Figure H

**Start home move in negative direction**  
Backup To Home enabled  
Final approach direction is negative  
Stop on the positive-travel side of the home active region

```
PROGRAM
JOG VEL X10
JOG ACC X100
JOG DEC X100
JOG JRK X0
SET 16152 CLR 16153 SET 16154
JOG HOMVF X1
JOG HOME X-1
ENDP
```

**Backup Bit settings**

<table>
<thead>
<tr>
<th>AXIS</th>
<th>SETs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>16152 16153 16154</td>
</tr>
<tr>
<td>1</td>
<td>16184 16185 16186</td>
</tr>
<tr>
<td>2</td>
<td>16216 16217 16218</td>
</tr>
<tr>
<td>3</td>
<td>16248 16249 16250</td>
</tr>
<tr>
<td>4</td>
<td>16280 16281 16282</td>
</tr>
<tr>
<td>5</td>
<td>16312 16313 16314</td>
</tr>
<tr>
<td>6</td>
<td>16344 16345 16346</td>
</tr>
<tr>
<td>7</td>
<td>16376 16377 16378</td>
</tr>
</tbody>
</table>
**Application Notes:**

ACR9000 Homing

**Figure I**

- Start home move in negative direction
- Backup To Home enabled
- Final approach direction is positive
- Stop on the negative-travel side of the home active region

**PROGRAM**

```plaintext
JOG VEL X10
JOG ACC X100
JOG DEC X100
JOG JRK X0
SET 16152 SET 16153 CLR 16154
JOG HOMVF X1
JOG HOME X-1
ENDP
```

**Backup Bit settings**

- AXIS0 SET 16152 SET 16153 CLR 16154
- AXIS1 SET 16184 SET 16185 CLR 16186
- AXIS2 SET 16216 SET 16217 CLR 16218
- AXIS3 SET 16248 SET 16249 CLR 16250
- AXIS4 SET 16280 SET 16281 CLR 16282
- AXIS5 SET 16312 SET 16313 CLR 16314
- AXIS6 SET 16344 SET 16345 CLR 16346
- AXIS7 SET 16376 SET 16377 CLR 16378

**Figure J**

- Start home move in negative direction
- Backup To Home enabled
- Final approach direction is positive
- Stop on the positive-travel side of the home active region

**PROGRAM**

```plaintext
JOG VEL X10
JOG ACC X100
JOG DEC X100
JOG JRK X0
SET 16152 CLR 16153 CLR 16154
JOG HOMVF X1
JOG HOME X-1
ENDP
```

**Backup Bit settings**

- AXIS0 SET 16152 CLR 16153 CLR 16154
- AXIS1 SET 16184 CLR 16185 CLR 16186
- AXIS2 SET 16216 CLR 16217 CLR 16218
- AXIS3 SET 16248 CLR 16249 CLR 16250
- AXIS4 SET 16280 CLR 16281 CLR 16282
- AXIS5 SET 16312 CLR 16313 CLR 16314
- AXIS6 SET 16344 CLR 16345 CLR 16346
- AXIS7 SET 16376 CLR 16377 CLR 16378
Hardware Limit Detection

The following commands are set during this operation:

- HLDEC Hardware Limit Deceleration
  
  **HLDEC X500**

- HLIM Hardware Limit Enable

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Disables positive limit and negative limit (default)</td>
</tr>
<tr>
<td>1</td>
<td>Enables positive limit and disables negative limit</td>
</tr>
<tr>
<td>2</td>
<td>Disables positive limit and enables negative limit</td>
</tr>
<tr>
<td>3</td>
<td>Enables positive limit and negative limit</td>
</tr>
</tbody>
</table>

**HLIM X3**

If limits are enabled and the motor/load encounters a hardware limit, motion stops at the rate set by the HLDEC command. To clear the switch, motion must occur in the opposite direction.

Software Limit Detection

The following commands are set during this operation:

- SLDEC Software Limit Deceleration

  **SLDEC X500**

- SLIM Hardware Limit Enable

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Disables positive limit and negative limit (default)</td>
</tr>
<tr>
<td>1</td>
<td>Enables positive limit and disables negative limit</td>
</tr>
<tr>
<td>2</td>
<td>Disables positive limit and enables negative limit</td>
</tr>
<tr>
<td>3</td>
<td>Enables positive limit and negative limit</td>
</tr>
</tbody>
</table>

**SLIM X3**

If limits are enabled and the motor/load encounters a hardware limit, motion stops at the rate set by the SLDEC command. To clear the switch, motion must occur in the opposite direction.
Assign Digital Inputs for Specific Functions

Hardware limits and home can be assigned to Onboard or Expansion Inputs. User can define any physical input for the positive limit. The controller automatically sets the next contiguous input for the negative hardware limit, and sets the next contiguous input for homing.

- **HLBIT Hardware Limit Deceleration**
  
  \[
  \text{HLBIT } \text{X0 REM Positive Hardware Limit set to Onboard Input 0, negative limit to Input 1} \\
  \text{& Home to input 3}
  \]