Motion Axis Home (MAH)

This information applies to the CompactLogix 5370, ControlLogix 5570, Compact GuardLogix 5370, GuardLogix 5570, Compact GuardLogix 5380, CompactLogix 5380, CompactLogix 5480, ControlLogix 5580, and GuardLogix 5580 controllers. Controller differences are noted where applicable.

Use the Motion Axis Home (MAH) instruction to home an axis. Two different homing modes can be selected during axis configuration: Active or Passive. If an Active homing sequence is selected, the axis executes the configured Home Sequence Type and establishes an absolute axis position. If Passive homing is selected, however, no specific homing sequence is executed and the axis is left waiting for the next marker pulse to establish the home position.

Available Languages

Ladder Diagram

Function Block

This instruction is not available in function block

Structured Text

MAH(Axis,MotionControl);

Operands

Ladder Diagram and Structured Text

Operand	Type	Type	Format	Description
	CompactLogix 5370, Compact GuardLogix 5370, Compact GuardLogix 5380, CompactLogix 5380, CompactLogix 5480	**ControlLogix 5570, GuardLogix 5570, ControlLogix 5580, and GuardLogix 5580 controllers**		
Axis	AXIS_CIP_DRIVE AXIS_VIRTUAL	AXIS_CIP_DRIVE AXIS_VIRTUAL AXIS_GENERIC_DRIVE AXIS_SERVO AXIS_SERVO_DRIVE	Tag	Name of the axis to perform operation on.
Motion Control		MOTION_INSTRUCTION	Tag	Structure used to access instruction status parameters.

See Structured Text Syntax for more information on the syntax of expressions within structured text.

MOTION_INSTRUCTION Structure

Mnemonic	Description

.EN (Enable) Bit 31	It is set when the rung makes a false-to-true transition and remains set until the servo message transaction is completed and the rung goes false.
.DN (Done) Bit 29	It is set when axis home has been successfully completed or is aborted.
.ER (Error) Bit 28	It is set to indicate that the instruction detected an error, such as if you specified an unconfigured axis.
.IP (In Process) Bit 27	It is set on positive rung transition and cleared after the Motion Home Axis is complete, or terminated by a stop command, shutdown, or a servo fault.
.PC (Process Complete) Bit 26	It is set when axis home is successfully completed.

Description

The MAH instruction is used to calibrate the absolute position of the specified axis. For axes that are configured as type Servo, the axis can be homed using Active, Passive, or Absolute Homing Mode configuration. For Feedback Only axes, only Passive and Absolute homing modes are available. Absolute Homing Mode requires the axis to be equipped with an absolute feedback device.

Important: Absolute Homing mode is not available with a CIP axis. However, any successful Home sequence establishes an absolute position.

For CIP axes only, software overtravels are disabled if the Home status bit transitions to the FALSE state.

The MAH instructions sets the HomedStatus bit upon successful completion of the configured homing sequence. This bit indicates that an absolute machine reference position has been established. When this bit is set, operations that require a machine reference, such as Software Overtravel checking can be meaningfully enabled.

For non-CIP Drive axis data types, the HomedStatus bit is cleared under the following conditions:

- Download
- Control power cycle
- Reconnection to Motion Module
- Feedback Loss Fault
- Shutdown

Active Homing

When the axis Homing Mode is configured as Active, the physical axis is first activated for servo operation. As part of this process, all other motion in process is canceled and appropriate status bits are cleared. The axis is then homed using the configured Home Sequence, which may be Immediate, Switch, Marker, or Switch-Marker. The latter three Home Sequences result in the axis being jogged in the configured Home Direction and then, after the position is re-defined based on detection of the home event, the axis is automatically moved to the configured Home Position.

Passive Homing

When the axis Homing Mode is configured as Passive, the MAH instruction re-defines the actual position of a physical axis on the next occurrence of the encoder marker. Passive

homing is most commonly used to calibrate Feedback Only axes to their markers, but can

also be used on Servo axes. Passive homing is identical to active homing to an encoder marker, except that the motion controller does not command any axis motion.

After initiating passive homing, the axis must be moved past the encoder marker for the homing sequence to complete properly. For closed-loop Servo axes, this may be accomplished with a MAM or MAJ instruction. For physical Feedback Only axes, motion cannot be commanded directly by the motion controller, and must be accomplished via other means.

Absolute Homing

If the motion axis hardware supports an absolute feedback device, Absolute Homing Mode may be used. The only valid Home Sequence for an absolute Homing Mode is "immediate". In this case, the absolute homing process establishes the true absolute position of the axis by applying the configured Home Position to the reported position of the absolute feedback device. Prior to execution of the absolute homing process via the MAH instruction, the axis must be in the Axis Ready state with the servo loop disabled.

To successfully execute a MAH instruction on an axis configured for Active homing mode, the targeted axis must be configured as a Servo Axis Type. To successfully execute an MAH instruction, the targeted axis must be configured as either a Servo or Feedback Only axis. If any of these conditions are not met, the instruction errors.

Important:	The instruction execution may take multiple scans to execute because it requires multiple coarse updates to complete the request. The Done (.DN) bit is not set immediately, but only after the request is completed.

In this transitional instruction, the relay ladder, toggle the Rung-condition-in from cleared to set each time the instruction should execute.

Master Driven Speed Control (MDSC) and the MAH Instruction

When either an MDAC or MDCC is active:

- If a MAH is executed (goes IP) on a Master axis and the Master axis is not moving, the MDAC or MDCC remains active. If MDAC or MDCC is active while the MAH is executed (goes IP), the slave moves.

- If an MAH is executed (goes IP) on a Master axis and the Master axis is moving, the MAH will error. The MDAC or MDCC state remains unchanged.

- If an MAH is executed (goes IP) on a Slave axis and the Slave axis is not moving, the MDAC or MDCC is canceled.

- If an MAH is executed (goes IP) on a Slave axis while it is moving in MDSC Driven or Time Driven modes, the MAH will error. The state of MDAC or MDCC remains unchanged.

Affects Math Status Flags

No

Major/Minor Faults

None specific to this instruction. See Common Attributes for operand-related faults.

Execution

Ladder Diagram

Condition/State	Action Taken
Prescan	The .EN, .DN, .ER, and .IP bits are cleared to false.

Rung-condition-in is false	The .EN bit is cleared to false if the .DN or .ER bit is true.
Rung-condition-in is true	The .EN bit is set to true and the instruction executes.
Postscan	N/A

Structured Text

Condition/State	Action Taken
Prescan	See Prescan in Ladder Diagram table
Normal execution	See Rung-condition-in is false, followed by rung is true in the Ladder Diagram table.
Postscan	See Postscan in Ladder Diagram table.

Error Codes

See Motion Error Codes (.ERR) for Motion Instructions.

Extended Error Codes

Extended Error Codes provide additional instruction specific information for the Error Codes that are generic to many instructions. See Motion Error Codes (.ERR) for Motion Instructions.

The following Extended Error codes help to pinpoint the problem when the MAH instruction receives a Servo Message Failure (12) error message or Illegal Homing Configuration (41).

Associated Error Code (decimal)	Extended Error Code (decimal)	Meaning
SERVO_MESSAGE_FAILURE (12)	Process terminated on request (1)	Home execution followed by an instruction to shutdown/disable drive, or a motion stop instruction or a Processor change requests a cancel of Home.
SERVO_MESSAGE_FAILURE (12)	No Resources (2)	Not enough memory resources to complete request. (SERCOS)
SERVO_MESSAGE_FAILURE (12)	Object Mode conflict (12)	Axis is in shutdown.
SERVO_MESSAGE_FAILURE (12)	Permission denied (15)	Enable input switch error. (SERCOS)
SERVO_MESSAGE_FAILURE (12)	Device in wrong state (16)	Redefine Position, Home, and Registration 2 are mutually exclusive (SERCOS), device state not correct for action. (SERCOS)

ILLEGAL_HOMING_CONFIG (41)	Home sequence (4)	The Home Sequence is incompatible with the Home Mode.
ILLEGAL_HOMING_CONFIG (41)	Home speed of zero (6)	Home speed cannot be zero.
ILLEGAL_HOMING_CONFIG (41)	Home return speed of zero (7)	The Home Return Speed cannot be zero.

For the Error Code 54 – Maximum Deceleration Value is Zero, if the Extended Error returns a positive number (0-n) it is referring to the offending axis in the coordinate system. Go to the Coordinate System Properties General Tab and look under the Brackets ([ ])column of the Axis Grid to determine which axis has a Maximum Deceleration value of 0. Click on the ellipsis button next to the offending axis to access the Axis Properties screen. Go to the Dynamics tab and make the appropriate change to the Maximum Deceleration Value. If the Extended Error number is -1, this means the Coordinate System has a Maximum Deceleration Value of 0. Go to the Coordinate System Properties Dynamics Tab to correct the Maximum Deceleration value.

Status Bits

MAH Changes to Single Axis Status Bits

Bit Name	State	Meaning
HomingStatus	TRUE	Axis is Homing.
JogStatus	FALSE	Axis is no longer Jogging.*
MoveStatus	FALSE	Axis is no longer Moving.*
GearingStatus	FALSE	Axis is no longer Gearing.
StoppingStatus	FALSE	Axis is no loner Stopping.

*During portions of the active homing sequence these bits may be set and cleared. The MAH instruction uses the Move and Jog motion profile generators to move the axis during the homing sequence. This also means that any disruption in the Move or Jog motion profiles due to other motion instructions can affect the successful completion of the MAH initiated homing sequence.

If in Passive homing mode, the MAH instruction simply sets the Homing Status bit.

See also

[Structured Text Syntax](#)

[MAH Flow Chart (True)](#)

[Motion Error Codes (.ERR)](#)

[Common Attributes](#)

[How are we doing?](#)