

[Instruction Set](#) > [Motion Configuration Instructions](#) > Motion Apply Hookup Diagnostics (MAHD)

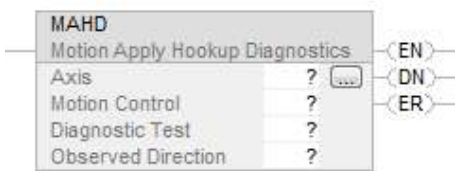
Motion Apply Hookup Diagnostics (MAHD)

This information applies to the CompactLogix 5370, ControlLogix 5570, Compact GuardLogix 5370, GuardLogix 5570, and ControlLogix 5580 controllers.

The Motion Apply Hookup Diagnostics (MAHD) instruction is used to apply the results of a previously run the Motion Run Hookup Diagnostics (MRHD) instruction to generate a new set of encoder and servo polarities based on the Observed Direction of motion during the test. As part of the application process the instruction updates the motion module with these new polarity settings. After execution of the MAHD instruction, and assuming that a stable set of gains has been established, the corresponding axis should be ready for servo activation.

Available Languages

Ladder Diagram



Function Block

This instruction is not available in function block.

Structured Text

MAHD(Axis,MotionControl,DiagnosticTest,ObservedDirection);

Operands

There are data conversion rules for mixed data types within an instruction. See [Data Conversion](#).

Ladder Diagram and Structured Text

Operand	Type	Format	Description
Axis	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.
Diagnostic Test	UDINT	Immediate	Selects the specific test for the motion module to run: 0 = motor/encoder hookup test 1 = encoder hookup test 2 = encoder marker test
Observed Direction	BOOLEAN	Immediate	Sets the direction of the test motion. Select either: 0 = forward 1 = reverse

Search

- ▷ [Quick Start Steps](#)
- ▷ [Logix Designer](#)
- ▷ [Module Information](#)
- ▲ [Instruction Set](#)
 - [Logix 5000 Controllers Instruction and Application Considerations](#)
 - [Logix Designer Application Instruction Set](#)
 - [Interpret the Attribute Tables Array Concepts](#)
- ▷ [CIP Axis Attributes](#)
- ▷ [Module Configuration Attributes](#)
- [Bit Addressing](#)
- [Common Attributes](#)
- [Data Conversions](#)
- [Elementary data types](#)
- [LINT data types](#)
- [Floating Point Values](#)
- [Immediate values](#)
- [Index Through Arrays](#)
- [Math Status Flags](#)
- [Motion Error Codes \(.ERR\)](#)
- [Structures](#)
- ▷ [Equipment Sequence instructions](#)
- ▷ [Equipment Phase Instructions](#)
- ▷ [Alarm Instructions](#)
- ▷ [Advanced Math Instructions](#)
- ▷ [Array \(File\)/Misc Instructions](#)
- ▷ [Array \(File\)/Shift Instructions](#)
- ▷ [ASCII Conversion Instructions](#)
- ▷ [ASCII Serial Port Instructions](#)
- ▷ [ASCII String Instructions](#)
- ▷ [Bit Instructions](#)
- ▷ [Compare Instructions](#)
- ▷ [Debug Instructions](#)
- ▷ [Drives Instructions](#)
- ▷ [Drive Safety Instructions](#)
- ▷ [For/Break Instructions](#)
- ▷ [Filter Instructions](#)
- ▷ [Function Block Attributes](#)
- ▷ [Structured Text Attributes](#)
- ▷ [Compute/Math Instructions](#)
- ▷ [Move/Logical Instructions](#)
- ▷ [Input/Output Instructions](#)
- ▷ [License Instructions](#)
- ▷ [Math Conversion Instructions](#)
- ▷ [Metal Form Instructions](#)
- ▲ [Motion Configuration](#)

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

For the operands that require you to select from available options, enter your selection as:

This Operand	Has These Options Which You	
	Enter as Text	Or Enter as a Number
DiagnosticTest	motor_encoder	0
	encoder	1
	marker	2
ObservedDirection	forward	0
	reverse	1

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 after the hookup test apply process has been successfully executed.
.ER (Error) Bit 28	It is set to indicate that the instruction detected an error, such as if you specified an unconfigured axis.

Description

The MAHD instruction is used to execute a series of computations resulting in values for the Encoder Polarity and Servo Polarity configuration bit parameters of the specified axis. As part of work performed by MAHD, these resultant configuration bit parameters are applied to the motion module so that the axis is ready for full servo operation. This instruction is designed to follow execution of the Motion Run Hookup Diagnostics (MRHD) instruction which generates axis input configuration values for the MAHD instruction. See the MRHD instruction description for more information. MAHD requires specification of the Diagnostic Test to apply and the Observed Direction of motion during the previous Motion Run Hookup Diagnostics (MRHD) instruction test process. Enter or select the Diagnostic Test and the Observed Direction and the desired physical axis.

If the targeted axis does not appear in the list of available axes, the axis has not been configured for operation. Use the Tag Editor to create and configure a new axis.

The MAHD instruction uses axis configuration parameters as input and output. The input configuration parameters that MAHD uses are shown in the table below. The Test Direction Forward bit is automatically established as output from the Motion Run Hookup Diagnostics (MRHD) instruction.

Axis Parameter	Data Type	Units	Meaning
Test Direction Forward	Boolean	-	Direction of axis travel during hookup test as seen by the motion module

Instructions

[Motion Apply Axis Tuning \(MAAT\)](#)

[MAAT Flow Chart \(True\)](#)

[Motion Apply Hookup Diagnostics \(MAHD\)](#)

[MAHD Flow Chart \(True\)](#)

[Motion Run Axis Tuning \(MRAT\)](#)

[MRAT Flow Chart \(True\)](#)

[Motion Run Hookup Diagnostics \(MRHD\)](#)

[MRHD Flow Chart \(True\)](#)

▷ [Motion Event Instructions](#)

▷ [Motion Group Instructions](#)

▷ [Motion Move Instructions](#)

▷ [Motion State Instructions](#)

▷ [Multi-Axis Coordinated Motion Instructions](#)

▷ [Logical and Move Instructions](#)

▷ [Program Control Instructions](#)

▷ [Sequencer Instructions](#)

▷ [Special Instructions](#)

▷ [Timer and Counter Instructions](#)

▷ [Trigonometric Instructions](#)

▷ [Process Control Instructions](#)

▷ [Select/Limit Instructions](#)

▷ [Sequential Function Chart \(SFC\) Instructions](#)

▷ [Statistical Instructions](#)

▷ [Safety Instructions](#)

▷ [Studio 5000 Logix Designer Glossary](#)

Forward			by the motion module.
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Motor Encoder Hookup Test

If the Motor Encoder Test is selected, the controller computes the proper setting for both the Encoder Polarity and the Drive Polarity based on the Observed Direction instruction parameter and the state of Test Direction Forward bit which was established by the output of the Motion Run Hookup Diagnostics (MRHD) instruction. Once the Encoder Polarity and Drive Polarity settings are computed the MAHD applies these values to the corresponding axis configuration parameter bits as shown in the following table:

Axis Parameter	Data Type	Units	Meaning
Encoder Polarity Negative	Boolean	-	Inverts the sense of the encoder feedback input to the motion module.
Drive Polarity Negative	Boolean	-	Inverts the sense of the DAC analog output from the motion module.

Encoder Hookup Test

If the Encoder Test is selected, the controller computes the proper setting for just the Encoder Polarity based on the Observed Direction instruction parameter and the state of Test Direction Forward bit which was established by the output of the Motion Run Hookup Diagnostics (MRHD) instruction. Once the Encoder Polarity and Drive Polarity settings are computed, the MAHD applies these values to the corresponding axis configuration parameter bits as shown in the following table.

Axis Parameter	Data Type	Units	Meaning
Encoder Polarity Negative	Boolean	-	Inverts the sense of the encoder feedback input to the motion module.

To successfully execute a MAHD instruction running the Motor Encoder Test, the targeted axis must be configured as either a Servo or Feedback Only axis type. If any of these conditions are not met than the instruction errs.

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.

This is a transitional instruction:

- In relay ladder, toggle Rung-condition-in from false to true each time the instruction should execute.
- In structured text, condition the instruction so that it only executes on a transition.

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
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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 the 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 the 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 MAHD instruction receives a Servo Message Failure (12) error message.

Associated Error Code (decimal)	Extended Error Code (decimal)	Meaning
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)

Status Bits

MAHD Changes to Status Bits

None

Example

When the input conditions are true, the controller applies the results of a previously executed Motion Run Hookup Diagnostics (MRHD) instruction to axis1.

Ladder Diagram



See also

[Structured Text Syntax](#)

[MAHD Flow Chart \(True\)](#)

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

[Motion Configuration Instructions](#)

[Common Attributes](#)