
FAQ: Using AMCI Motion Axis Add On Instructions with SD, SMD, and SV Motion Devices

This document describes how to use the AMCI Motion Axis Add On Instructions. With a few exceptions, these Add On Instructions will work with all of AMCI's integrated motion devices, including,

- SD4840E2
- SD17060E2
- SD31045E2
- SMD17E2
- SMD23E2
- SMD24E2
- SMD34E2
- SV160E2
- SV400E2

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Importing Data Types


Two new User Defined Data types must be imported into your program before the Motion Axis Add On Instructions described below can be used. They are,

AMCI_Motion_Axis_Input_Data.L5X
AMCI_Motion_Axis_Output_Data.L5X

Creating New Tag Arrays

Create two new tag arrays using the above data types for each AMCI Motion Device, one for input data (from the motion device) and one for output data (to the motion device).

The following image shows the tag arrays being created for the AMCI SMD23E2.

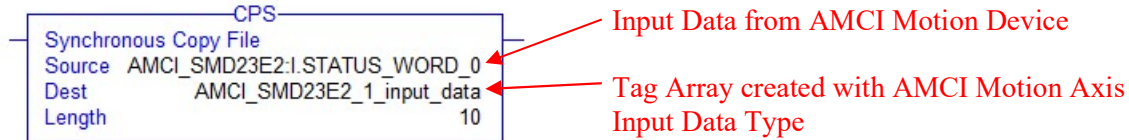


Name	Alias For	Base Tag	Data Type
+ AMCI_SMD23E2:C			_000A:SMD23E2_70B06087:C:0
+ AMCI_SMD23E2:I			_000A:SMD23E2_31A45667:I:0
+ AMCI_SMD23E2:O			000A:SMD23E2_788832CB:O:0
+ AMCI_SMD23E2_1_input_data			AMCI_Motion_Axis_Input_Data
+ AMCI_SMD23E2_1_output_data			AMCI_Motion_Axis_Output_Data

It is these tag arrays that will be used in the Axis_Input_Data and Axis_Output_Data fields of all of the following Add On instructions.

Copying Data from the AMCI motion device

At the top of your program, before all of the Add On Instructions, use a CPS instruction to copy the input data from the AMCI motion device to the input data tag array.

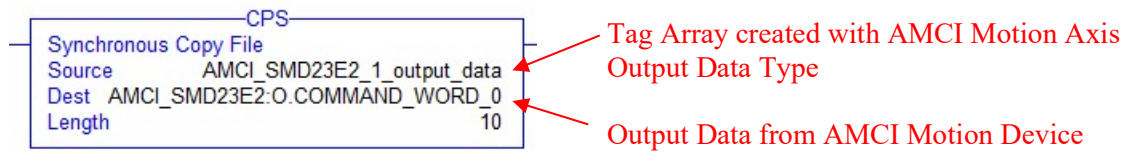


The input data in this tag array is made up of named tags, see the following image, and will also be used as the buffered data in your program. It is this buffered data that must be used in place of the input data directly from the AMCI motion device.

AMCI_SMD23E2_1_input_data	{ ... }	{ ... }		AMCI_Motion_Axis_Input_Data
AMCI_SMD23E2_1_input_data.Moving_CW	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Moving_CCW	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.In_Hold_State	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Stopped	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.At_Home	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Accelerating	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Decelerating	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Move_Complete	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Status_Word_0_Bit_8	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Status_Word_0_Bit_9	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Position_Invalid	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Input_Error	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Command_Error	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Configuration_Error	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Module_OK	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Mode_Flag	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.IN1_Active	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.IN2_Active	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.IN3_Active	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.IN4_Active	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Status_Word_1_Bit_4	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Status_Word_1_Bit_5	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Connection_Was_Lost	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Driver_Fault	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Status_Word_1_Bit_8	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Invalid_Jog_Change	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Status_Word_1_Bit_10	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Heartbeat_Bit	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Status_Word_1_Bit_12	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Status_Word_1_Bit_13	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Stall_Detected	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Drive_Is_Enabled	0		Decimal	BOOL
AMCI_SMD23E2_1_input_data.Motor_Position	0		Decimal	DINT
AMCI_SMD23E2_1_input_data.Encoder_Position	0		Decimal	DINT
AMCI_SMD23E2_1_input_data.Trapped_Encoder_Pos...	0		Decimal	DINT
AMCI_SMD23E2_1_input_data.Input_Word_8	0		Decimal	INT
AMCI_SMD23E2_1_input_data.Input_Word_9	0		Decimal	INT

Copying Data to the AMCI motion device

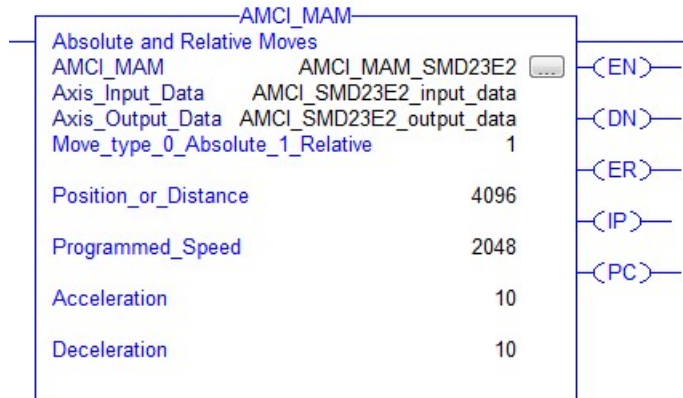
At the bottom of your program, after all of the Add On Instructions, use a CPS instruction to copy the output data from the AOIs to the output registers of the AMCI motion device.



This output data consists of named tags that easily allow you to verify that the correct data is reaching the AMCI motion device.

[-] AMCI_SMD23E2_1_output_data	{ ... }	{ ... }		AMCI_Motion_Axis_Output_D...
[+] AMCI_SMD23E2_1_output_data.Control_Word_0	0		Decimal	INT
[+] AMCI_SMD23E2_1_output_data.Control_Word_1	0		Decimal	INT
[+] AMCI_SMD23E2_1_output_data.Position_or_Distance	0		Decimal	DINT
[+] AMCI_SMD23E2_1_output_data.Programmed_Speed	0		Decimal	DINT
[+] AMCI_SMD23E2_1_output_data.Acceleration	0		Decimal	INT
[+] AMCI_SMD23E2_1_output_data.Deceleration	0		Decimal	INT
[+] AMCI_SMD23E2_1_output_data.Output_Word_8	0		Decimal	INT
[+] AMCI_SMD23E2_1_output_data.Output_Word_9	0		Decimal	INT

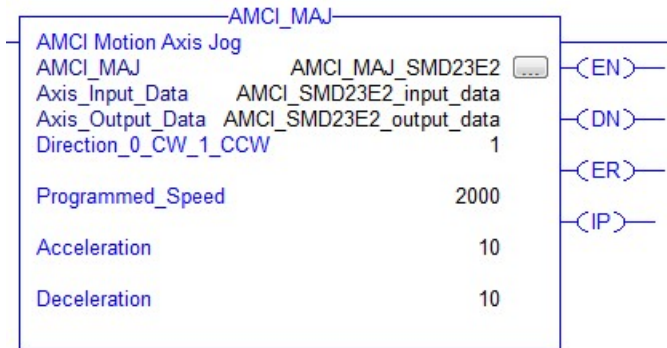
AMCI_MAM: Motion Axis Move: Performs Absolute and Relative Moves



Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.
Move Type	0 = Absolute Move, 1 = Relative Move
Position_or_Distance	Target Position of the Absolute Move or the distance to move of a Relative Move.
Programmed_Speed	Speed of move in units of steps / sec
Acceleration	Acceleration Rate in units of steps / sec / ms
Deceleration	Deceleration Rate in units of steps / sec / ms

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false
IP (In Process)	Motion is occurring	Motion Stops or rung goes false
PC (Process Complete)	Move is complete	The next time the rung with the AOI transitions from false to true.

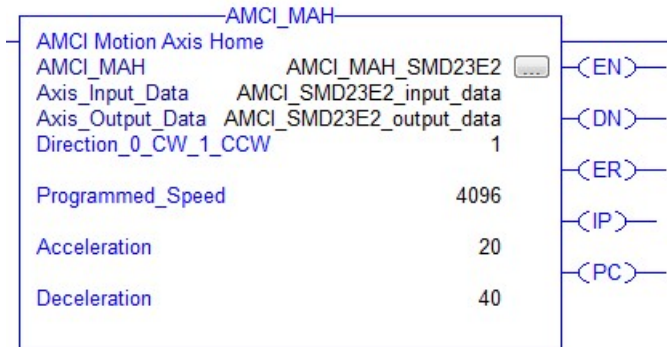
AMCI_MAJ: Motion Axis Jog: Performs CW and CCW Jog Moves



Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.
Direction	0 = CW Jog, 1 = CCW Jog
Programmed_Speed	Speed of move in units of steps / sec
Acceleration	Acceleration Rate in units of steps / sec / ms
Deceleration	Deceleration Rate in units of steps / sec / ms

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false
IP (In Process)	Motion is occurring	Motion Stops or rung goes false

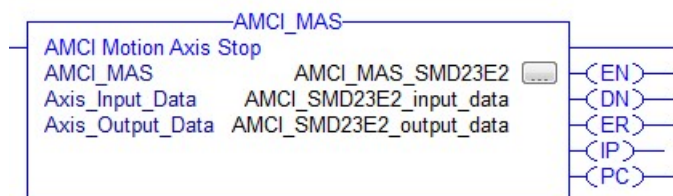
AMCI_MAH: Motion Axis Home: Performs CW and CCW Home Moves



Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.
Direction	0 = CW Home, 1 = CCW Home
Programmed Speed	Speed of move in units of steps / sec
Acceleration	Acceleration Rate in units of steps / sec / ms
Deceleration	Deceleration Rate in units of steps / sec / ms

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false
IP (In Process)	Motion is occurring	Motion Stops or rung goes false
PC (Process Complete)	The At Home Status bit is set	The next time the rung with the AOI transitions from false to true.

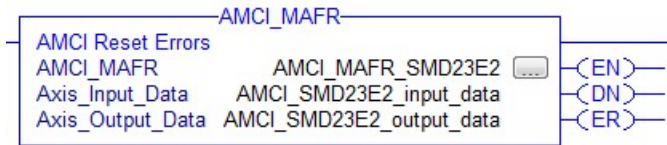
AMCI_MAS: Motion Axis Stop: Stops motion that is in process



Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false
IP (In Process)	Axis is decelerating	Motion Stops or rung is false.
PC (Process Complete)	Motion has stopped	The next time the rung with the AOI transitions from false to true.

AMCI_MAFR: Motion Axis Fault Reset: Resets Command and Input Error



Note 1: This command will not reset Configuration Errors or the Position Invalid status bit.

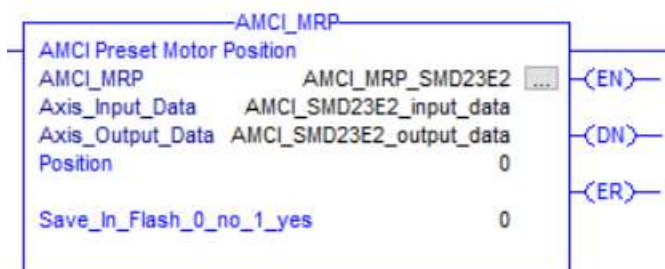
Note 2: The MAFR instruction will maintain the motion device's current enabled state. That is, if the device is enabled, it will remain enabled. If it is disabled, it will remain disabled.

Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	A Command or Input Error failed to clear.	Rung is false

AMCI_MRP: Motion Redefine Position

Sets the Current Motor Position to the value in the Position field of the AOI. This command will also reset the Position Invalid status bit.



Note: The MRP instruction will maintain the motion device's current enabled state. That is, if the device is enabled, it will remain enabled. If it is disabled, it will remain disabled.

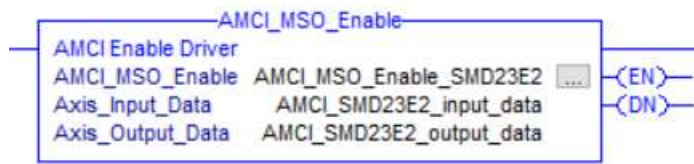
Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.
Position	Position to which the Motor Position is to be set.
Save_In_Flash_0_no_1_yes	Saves the offset in the flash memory. Only used on the SVXXE2 units. Must be zero on all other units.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false

AMCI_MSO_Enable AMCI_MSF_Disable

These two commands either send power to the motor or remove power from the motor.

These instructions must only be used to change the existing enabled / disabled state of the AMCI motion device. They must not be used in unconditional rungs because they will interfere with the other instructions sending commands to the motion device.

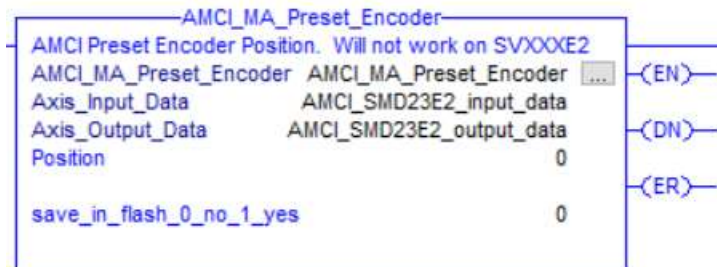


Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false

AMCI_MA_Preset_Encoder: Preset Encoder Position to a value

This AOI will only work on AMCI Motion Devices that have an encoder. This AOI will not work with SVXXE2 units.



Note: The MA_Preset_Encoder instruction will maintain the motion device's current enabled state. That is, if the device is enabled, it will remain enabled. If it is disabled, it will remain disabled.

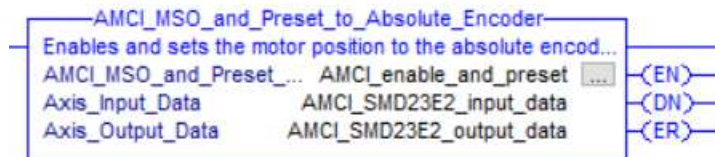
Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI_Motion_Axis_Input_Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI_Motion_Axis_Output_Data User Defined Data Type.
Position	Position to which the Encoder Position is to be set.
Save_In_Flash_0_no_1_yes	Saves the offset encoder value in the flash memory. Only used on the SMDXXE2 units with Absolute Encoders. Must be zero on all other units.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false

AMCI_MSO_and_Preset_to_Absolute_Encoder

This AOI will only work with SMDXXE2 units with an absolute encoder. This AOI will not work with SDXXXXXE2 or SVXXXE2 units.

This instruction enables the motion device before presetting the motor position to the absolute encoder position.

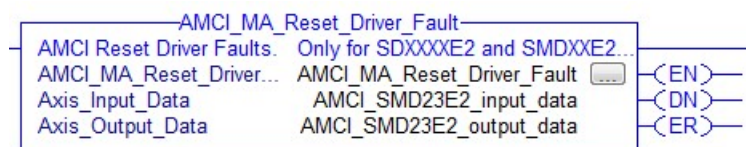


Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false

AMCI_MA_Reset_Driver_Fault: Resets Driver Fault.

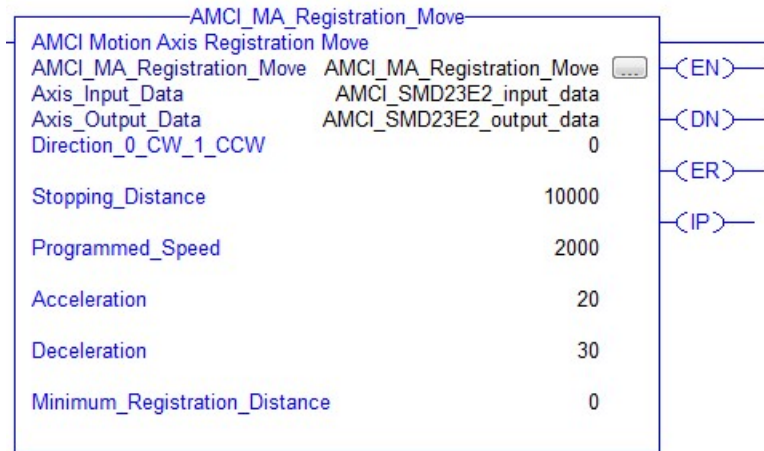
This AOI will only work with SMD34E2, SD4840E2, SD17060E2, and SMD31045E2 units. It will not work with SV160E2 and SV400E2 units.



Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	The Driver Fault failed to clear.	Rung is false

AMCI_MA_Registration_Move: Motion Axis CW and CCW Registration Moves

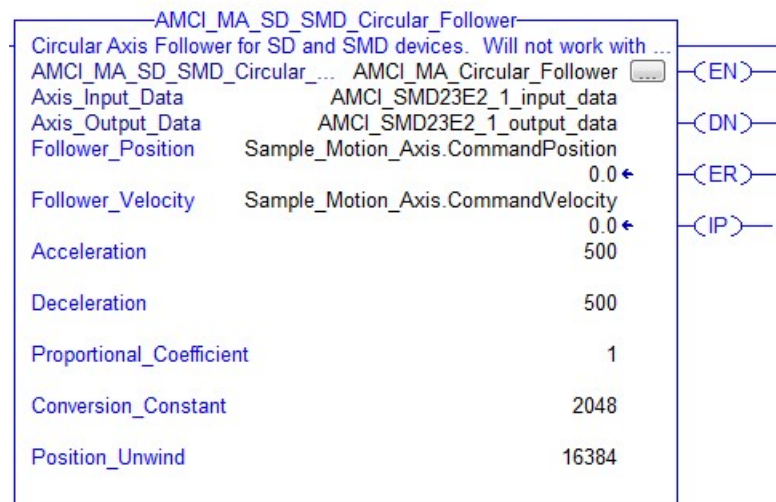
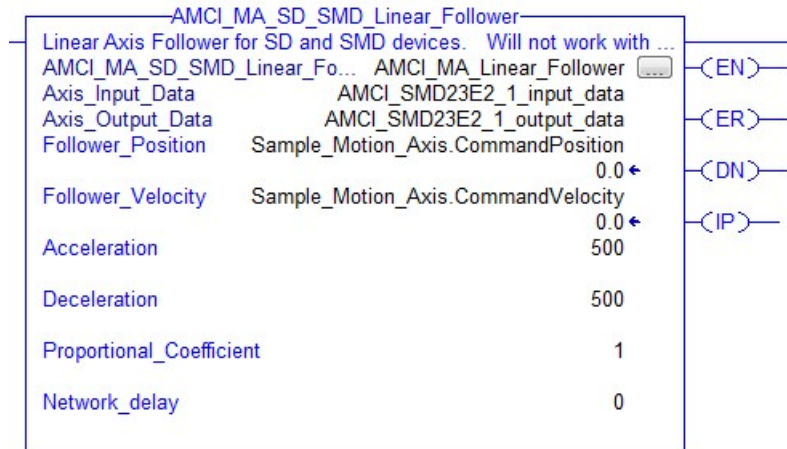


Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.
Direction	0 = CW Motion, 1 = CCW Motion
Stopping Distance	The number of steps to move after the registration input has become active.
Programmed Speed	Speed of move in units of steps / sec
Acceleration	Acceleration Rate in units of steps / sec / ms
Deceleration	Deceleration Rate in units of steps / sec / ms
Minimum Registration Distance	The number of steps to move during which the registration input is ignored.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false
IP (In Process)	Motion is occurring	Motion Stops or rung goes false

AMCI_MA_SD_SMD_Linear_Follower AMCI_MA_SD_SMD_Circular_Follower

These AOIs will only work with the SD and SMD motion devices. The SV motion devices have their own follower AOIs.

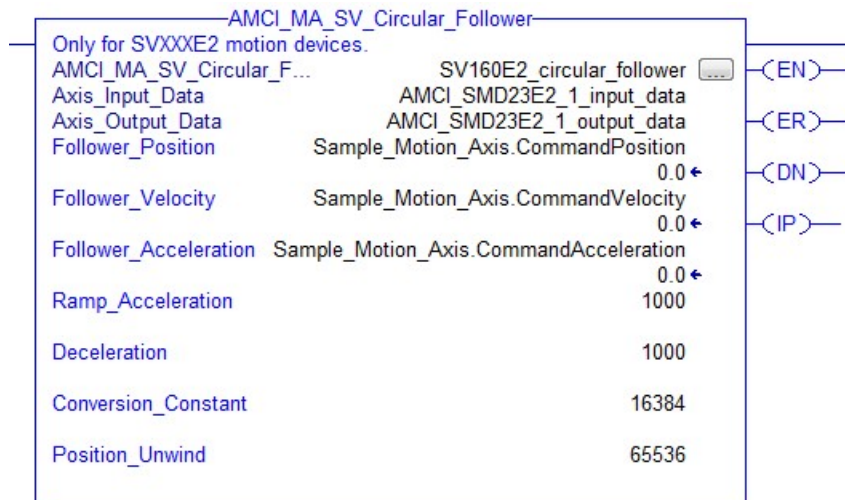
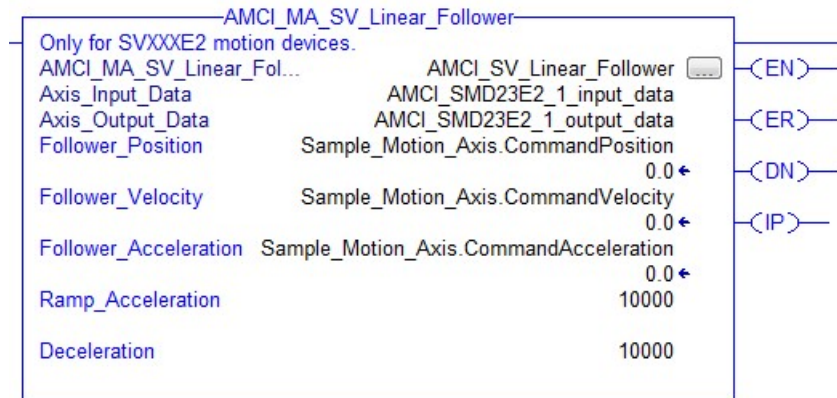


Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.
Follower_Position	REAL DATA TYPE position directly from the motion axis.
Follower_Velocity	REAL DATA TYPE velocity directly from the motion axis.
Acceleration & Deceleration	An actual value or an INT DATA TYPE. Larger acceleration and deceleration values will cause the motion device to more quickly react changes in the source position and velocity values.
Proportional_Coefficient	A value of 1 or 2 is recommended.
Network_Delay	This parameter, entered in milliseconds, can be used to compensate for network communication delays. A value of zero, or 1 to the RPI time, will work in most applications.
Conversion_Constant	The data from a circular motion axis has units of revolutions and revolutions / second. However, the AMCI Motion Device requires that the position and velocity have units of counts and counts / sec. The AOI performs this conversion by multiplying both the position and velocity from the motion axis by Conversion Constant parameter before sending them to the AMCI Motion Controller. This field is typically, but does not have to be, set to the master axis' Conversion Constant. The Conversion Constant can be a fractional number. A negative Conversion Constant will cause the motor to turn in the opposite direction from the master axis
Position_Unwind	Must be set to the Unwind Value of the motion axis and defines the point at which the position data will transition from its maximum to its minimum value. The Position Unwind Value MUST BE IN THE RANGE OF 21 TO 65535.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false
IP (In Process)	The follower command is active, even if the master motion axis position and velocity are not changing.	Rung goes false

AMCI_MA_SV_Linear_Follower AMCI_MA_SV_Circular_Follower

These AOIs will only work with the SVXXE2 motion devices. The SD and SMD motion devices have their own follower AOIs.



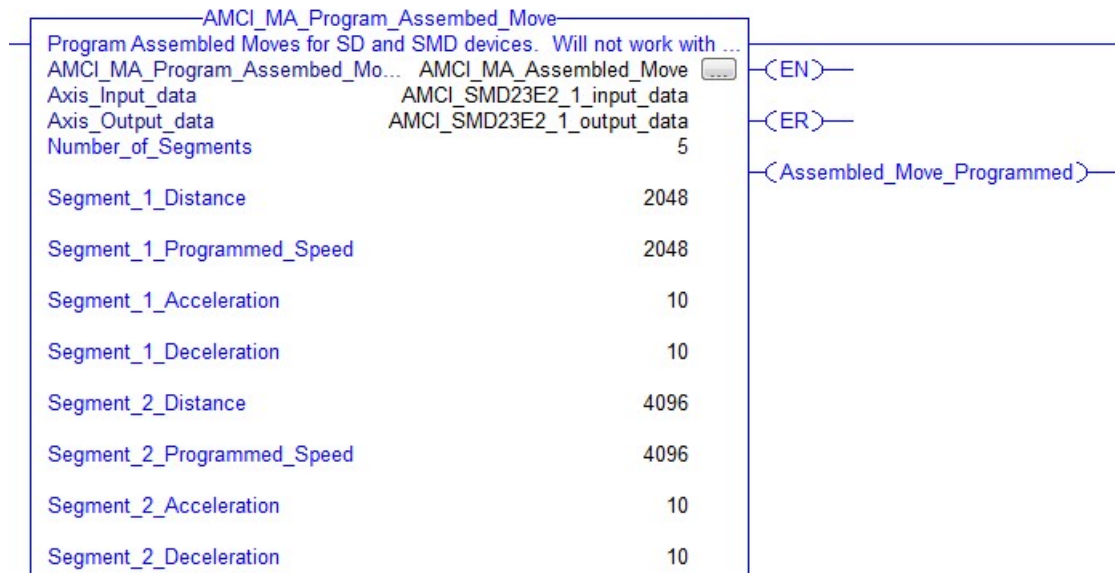
Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.
Follower_Position	REAL DATA TYPE position directly from the motion axis.
Follower_Velocity	REAL DATA TYPE velocity directly from the motion axis.
Follower_Acceleration	REAL DATA TYPE acceleration directly from the motion axis.
Ramp Acceleration	An actual value or INT value used to transition from no motion to motion. Once motion is occurring, the follower acceleration will be used. Range of 0 to 15,999.
Deceleration	An actual value or INT value used to transition from motion to no motion. Range of 0 to 15,999.
Conversion_Constant	An actual value or a REAL data type register. The value in this field is multiplied by the Position, Velocity, and Acceleration from the master axis before being sent to the servo and scales the supplied data to the servo motor counts per turn. This field is typically, but does not have to be, set to the master axis' Conversion Constant.
Position_Unwind	An actual value or a DINT TYPE register. This parameter defines the point at which the position data will transition from its maximum to its minimum value.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false
IP (In Process)	Motion is occurring	Motion stops or the rung goes false

AMCI_MA_Program_Assembled_Move

This AOIs will only work with the SD and SMD motion devices. The SV motion devices do not support Assembled Moves.

Up to 16 segments can be programmed into an Assembled Move.

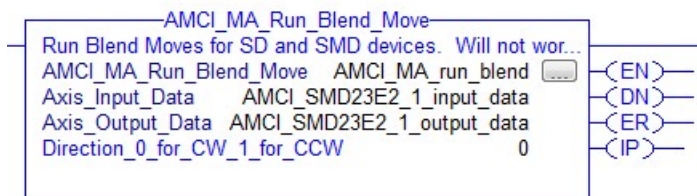


Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.
Number_of_Segments	Number of move segments, range of 2 to 16.
Segment_X_Distance	The relative number of steps to move in the “X” segment.
Segment_X_Programmed_Speed	The target speed of the “X” segment
Segment_X_Acceleration	If the programmed speed of the previous segment is less than the programmed speed of the current segment, the acceleration is used as the rate of change of the speed between the two segments.
Segment_X_Deceleration	If the programmed speed of the previous segment is greater than the programmed speed of the current segment, the deceleration is used as the rate of change of the speed between the two segments.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false
Assembled_Move_Programmed	All segments of the Assembled Move have been programmed	Rung is false

AMCI_MA_Run_Blend_Move

This AOI will only work with the SD and SMD motion devices. The SV motion devices do not support Assembled Moves.

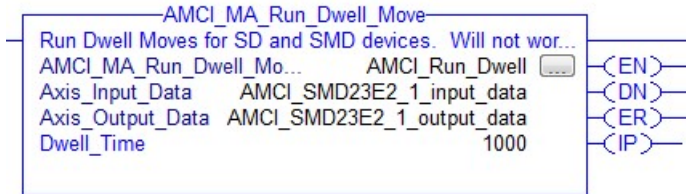


Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.
Direction	0 = CW Motion, 1 = CCW Motion

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false
IP (In Process)	Motion is occurring	Motion Stops or rung goes false

AMCI_MA_Run_Dwell_Move

This AOI will only work with the SD and SMD motion devices. The SV motion devices do not support Assembled Moves.



Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI Motion Axis Input Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI Motion Axis Output Data User Defined Data Type.
Dwell_Time	Time in milliseconds between each of the assembled move segments.

Enumerations	Set When.....	Reset When
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false
IP (In Process)	Motion is occurring	During the dwell time, motion Stops, or the rung goes false

Rev 0 was released on 1/11/2023 and was the initial release of the document.

Rev A was released on 3/08/2023. Added the save in flash bits to the MRP and Preset_Encoder AOIs. Also created the MSO_Enable and MSF_Disable AOIs, and renamed the Preset_Motor_to_encoder AOI to MSO_and Preset_to_Absolute_Encoder.

File: FAQ_Using_AMCI_Motion_Axis_AOIs.doc
Date: 3/08/2023

