FAQ: Using AMCI Motion Add On Instructions with CIP Sync. Devices

Beginning in September 2024, with network firmware version 1.37, AMCI's networked integrated motor drivers now include the ability to use CIP Sync to more closely and quietly follow a master axis.

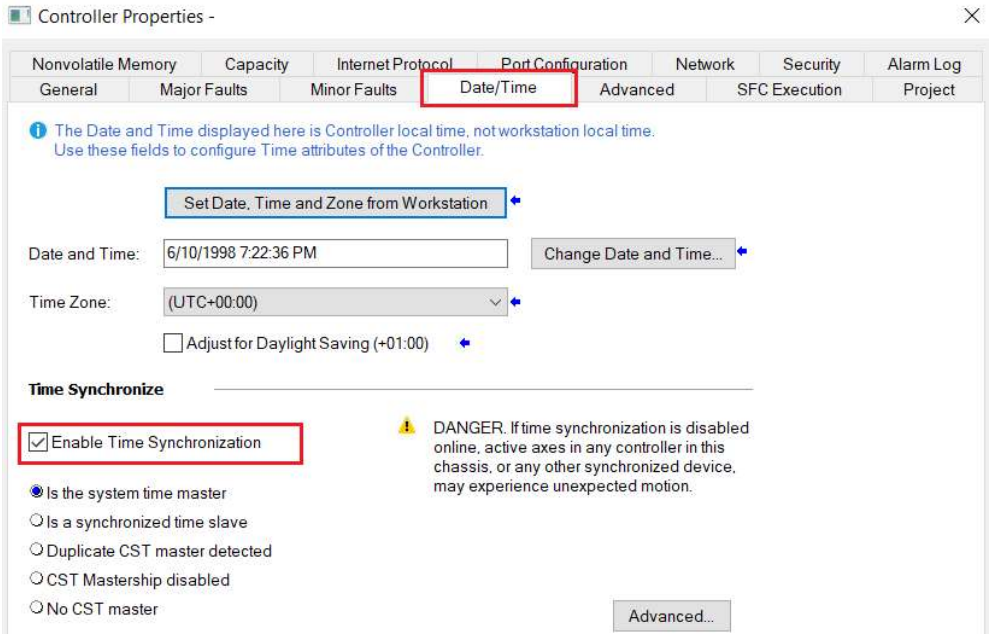
This document describes how to use the AMCI Motion Axis Add On Instructions with CIP Sync to follow a master axis. These Add On Instructions will work with the following AMCI integrated motion devices, including,

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

Step 1: Enabling the host controller for Time Synchronization

The first step in using CIP Sync is to Enable Time Synchronization in the host controller. Depending on the system being used, this may be located in the controller properties, in the network properties, or in the scanner module's properties.

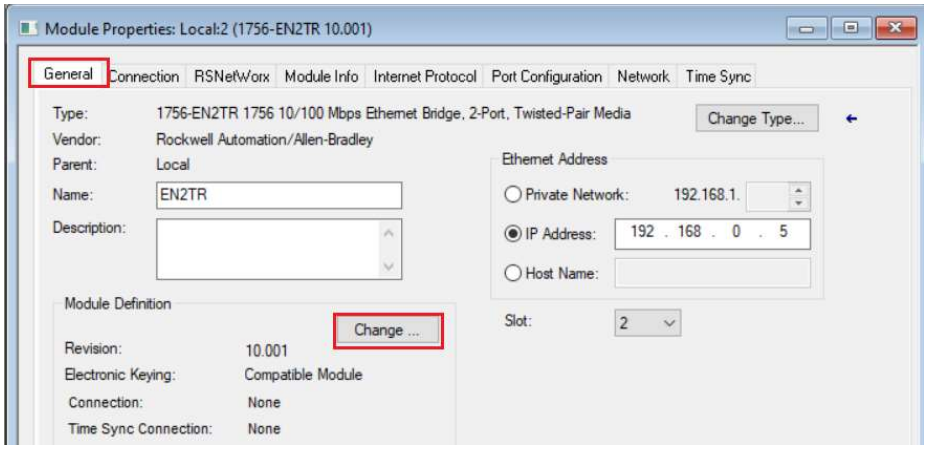
As shown in the following image, select the Date/Time tab and then place a check mark in the Enable Time Synchronization field.



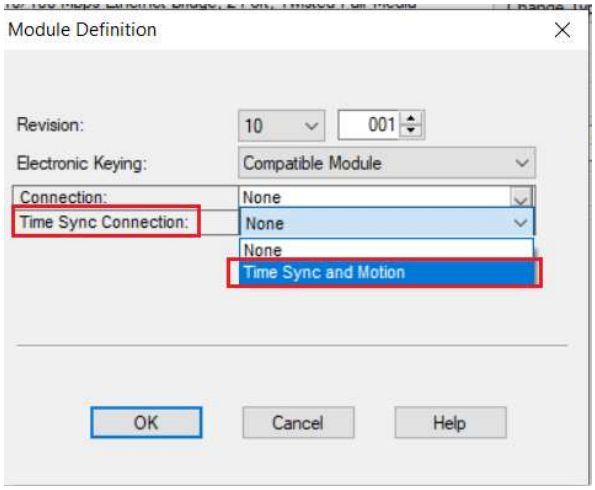
Step 2: Scanner Module Configuration

Perform this step only if a separate Ethernet scanner module, as opposed to a built in Ethernet Port, is being used.

On the General Tab of the Ethernet scanner module, click on the Change button.



Click on the down arrow next to Time Sync Connection and select Time Sync and Motion. Click on the OK button to accept this change.

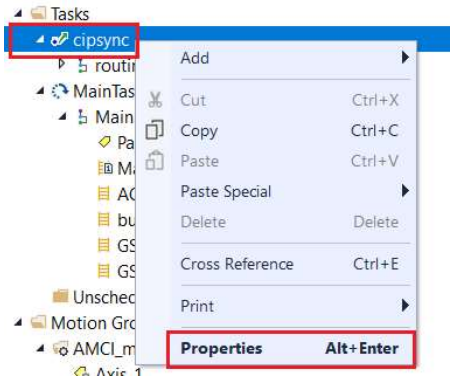


Back on the General tab, click on Apply.

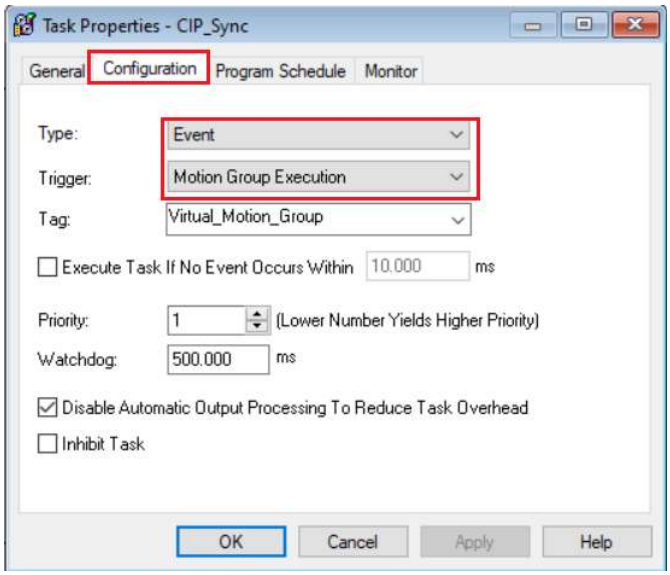
Step 3: Create a Task

While not absolutely required, the AMCI motion device will more closely follow the master axis if the supporting logic, including the AMCI AOIs, is in an Event Driven Task, where the trigger for the task is Motion Group Execution.

To create an Event Driven Task, right click on the desired task in the project tree and select Properties.



Click on the Configuration tab and select the Type to be "Event" and the Trigger to be "Motion Group Execution. The Tag field will be the motion axis that is being followed.

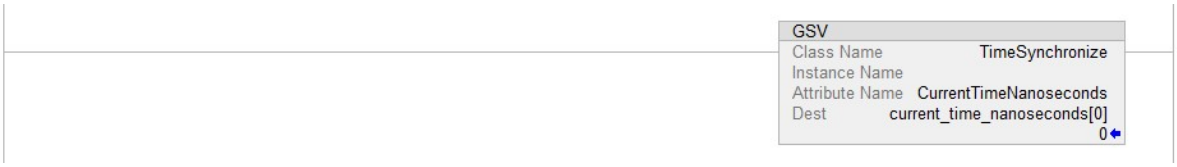


Step 4: Add the GSV (Get System Value) instruction

The final step in using the AMCI motion devices with CIP Sync is to add a GSV instruction to your logic. As shown in the following image,

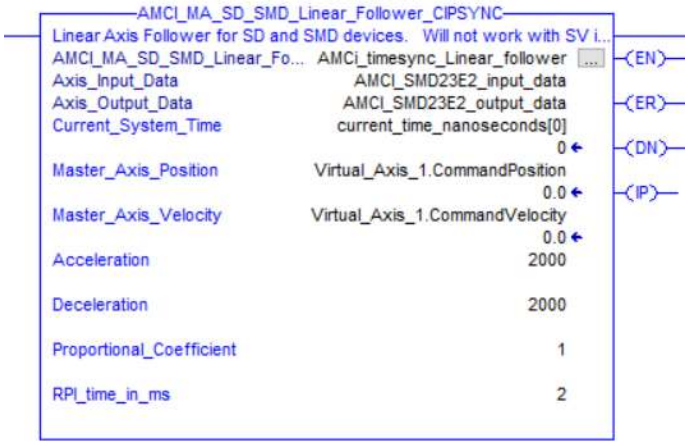
Class Name: TimeSynchronize
Attribute Name: CurrentTimeNanoseconds
Destination: An array consisting of two DINT registers

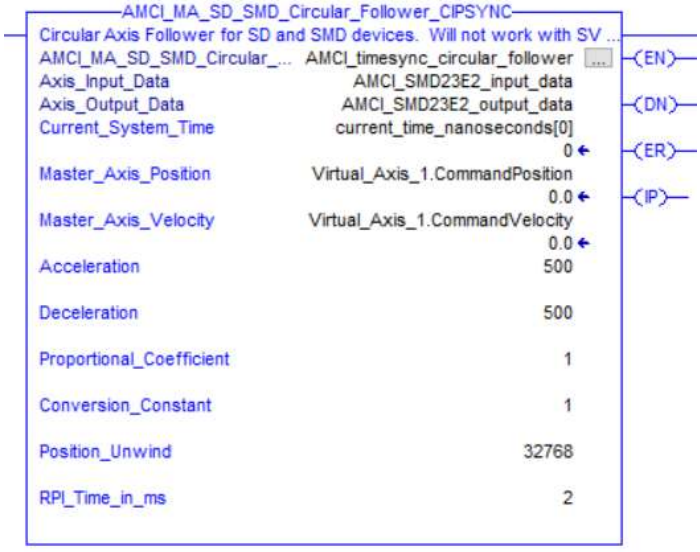
The GSV instruction should be located in an unconditional rung should be in the Event Driven Task created in Step 2 above.



AMCI_MA_SD_SMD_Linear Follower with CIP SYNC
AMCI_MA_SD_SMD_Circular_Follower with CIP SYNC

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



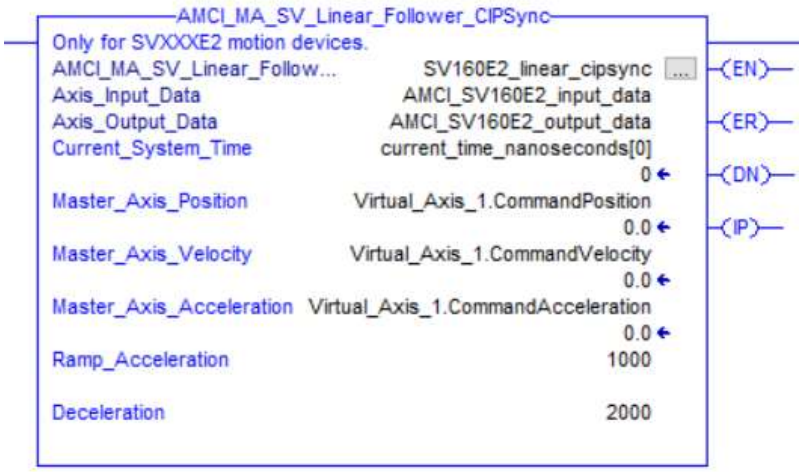


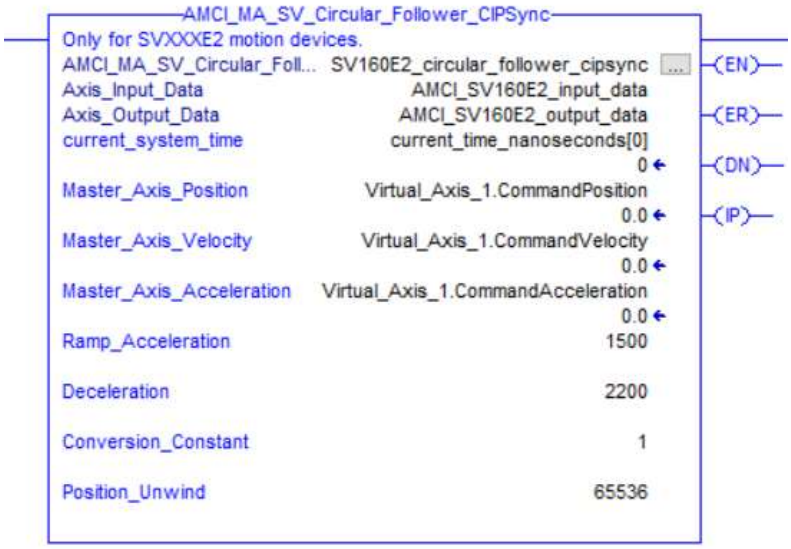
Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI_Motion_Axis_Input_Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI_Motion_Axis_Output_Data User Defined Data Type.
Current_System_Time	The first word of the two DINT word array of the current time in nanoseconds read by a GSV instruction.
Master_Axis_Position	REAL DATA TYPE position directly from the motion axis.
Master_Axis_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.
Conversion_Constant (Circular Follower Only)	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 (Circular Follower Only)	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.
RPI_Time_in_ms	The RPI time used when the AMCI Motion Device was added to the network. Used by the AOI to control how long the Preset Command is sent to the Motion Device before motion begins. A value of zero will cause the AOI to assume that the default RPI of 8ms is being used.

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 with CIP SYNC
AMCI_MA_SV_Circular_Follower with CIP SYNC

These AOIs will only work with the SVXXXE2 motion devices. The SD and SMD motion devices have their own follower AOIs.

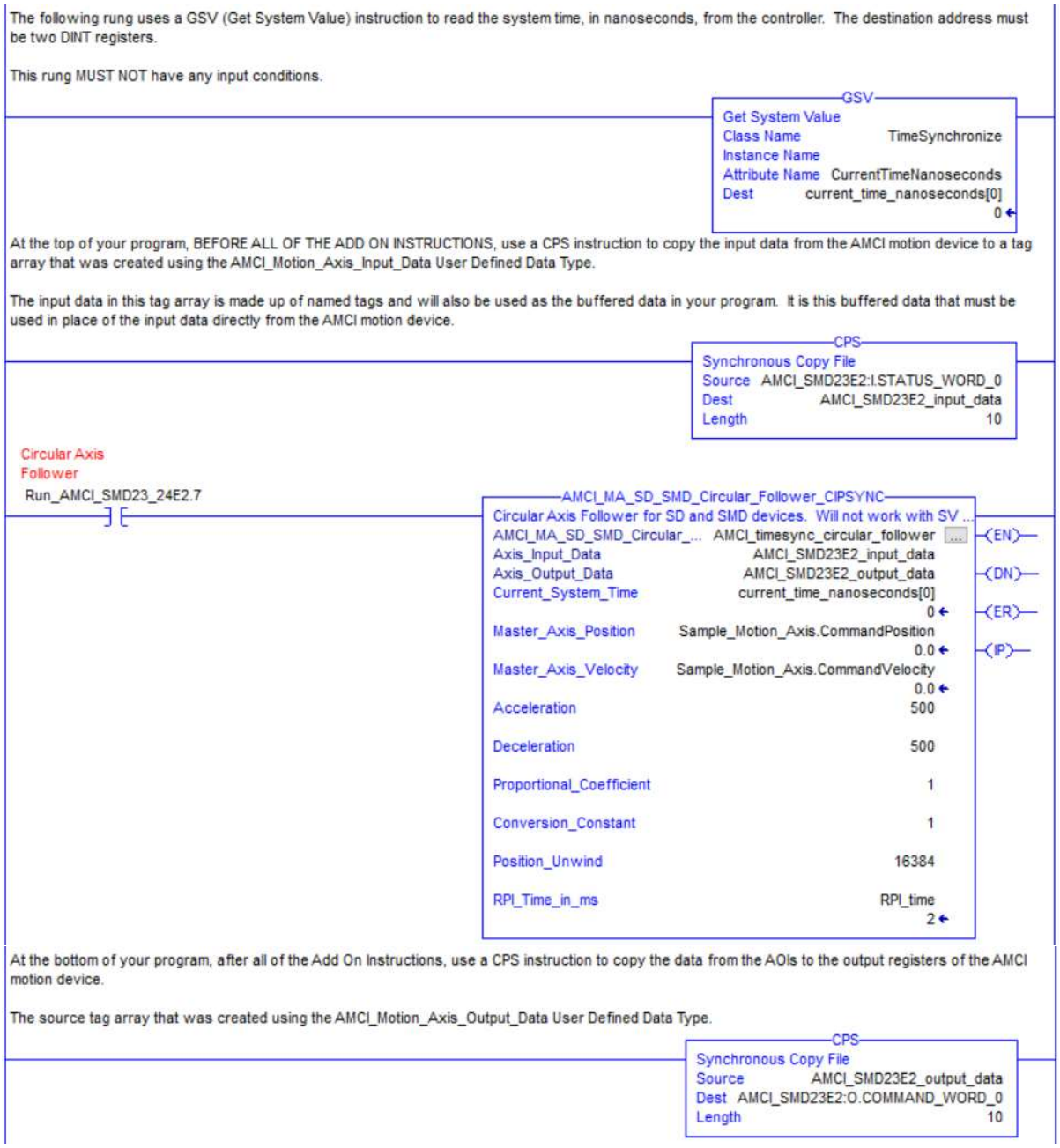




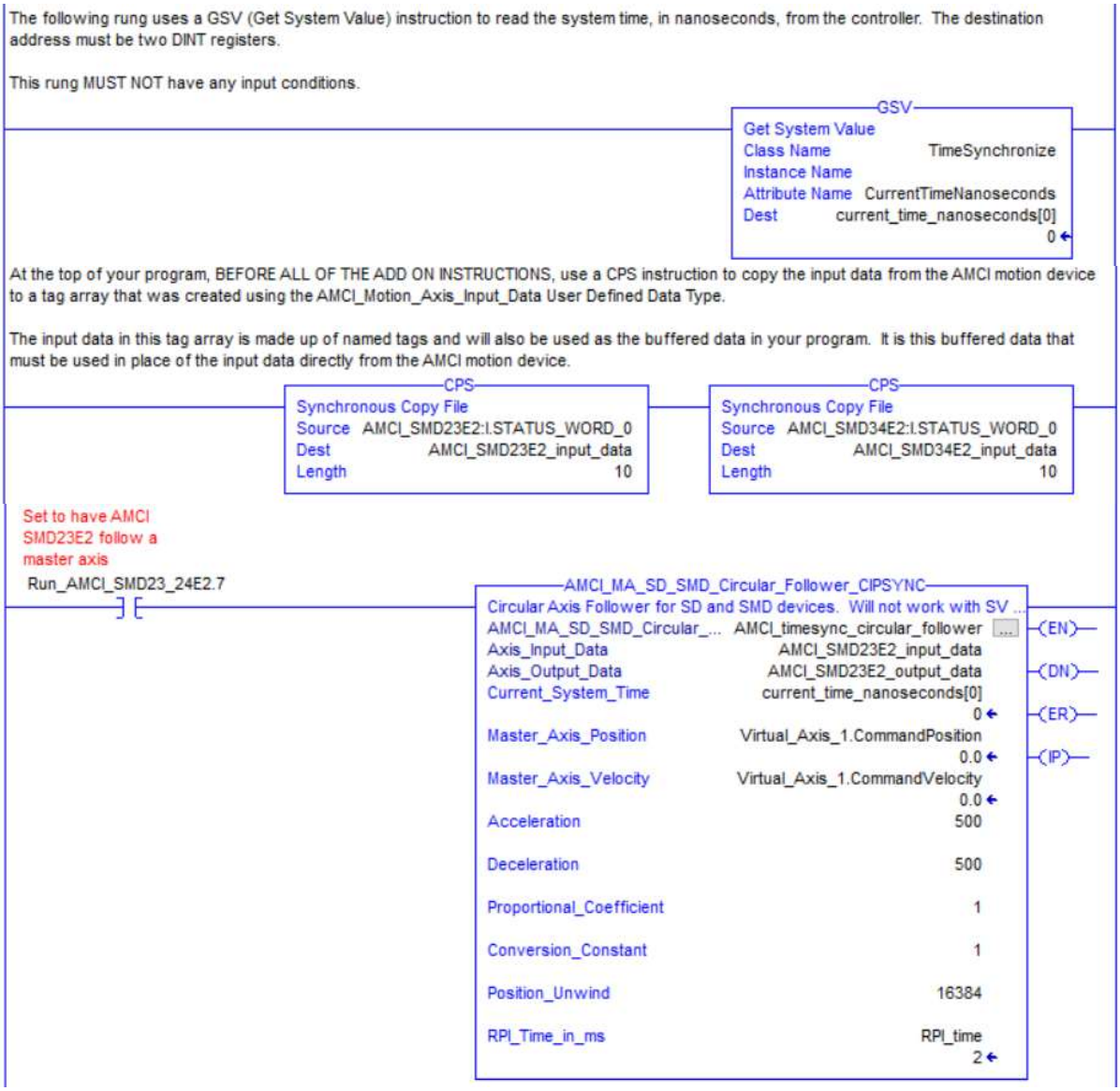
Parameter	
Axis_Input_Data	Input data from AMCI motion device. Uses the AMCI_Motion_Axis_Input_Data User Defined Data Type.
Axis_Output_Data	Output data from the AOI to the AMCI motion device. Uses the AMCI_Motion_Axis_Output_Data User Defined Data Type.
Current_System_Time	The first word of the two DINT word array of the current time in nanoseconds read by a GSV instruction.
Master_Axis_Position	REAL DATA TYPE position directly from the motion axis.
Master_Axis_Velocity	REAL DATA TYPE velocity directly from the motion axis.
Master_Axis_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 (Circular Follower Only)	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 (Circular Follower Only)	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.

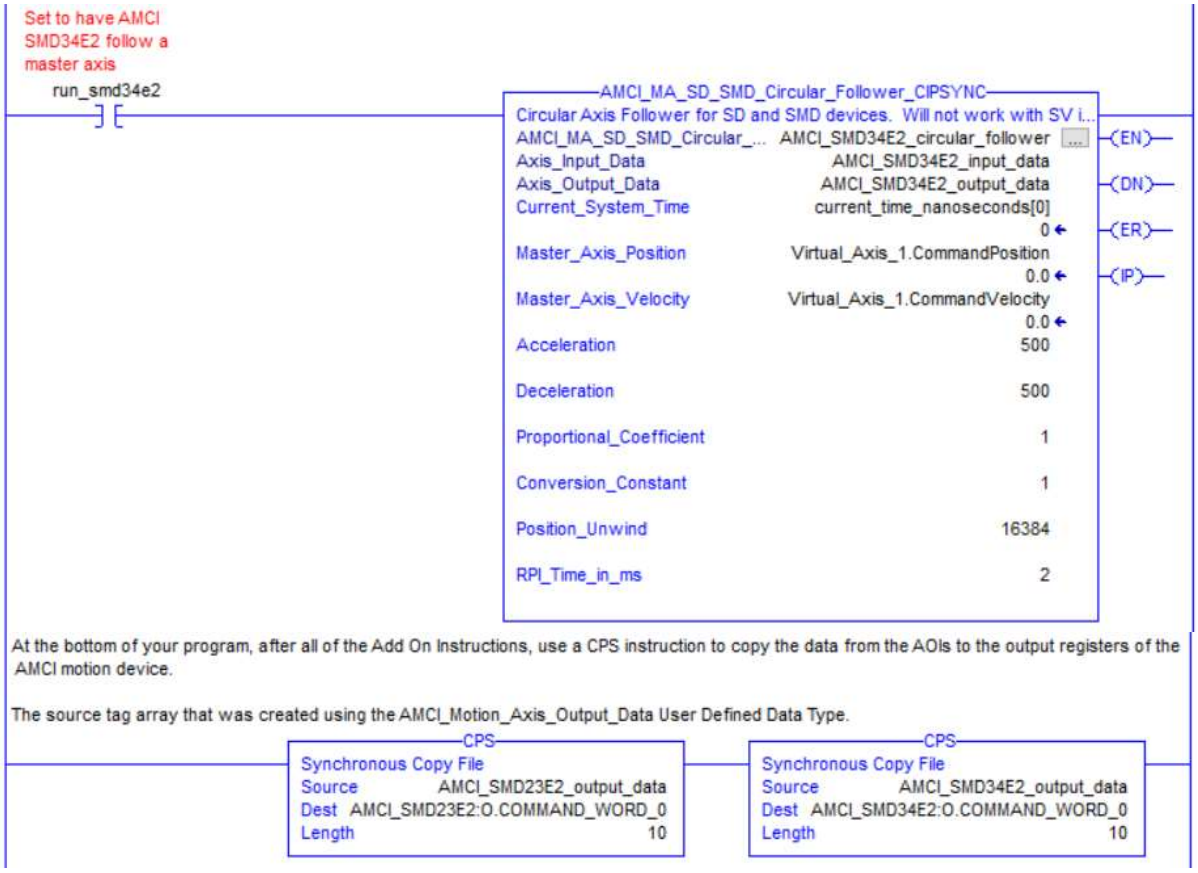
Enumerations	Set When…..	Reset When …..
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the motion device	Rung is false
ER (Error)	There is an Input, Command, or Configuration Error	Rung is false
IP (In Process)	Motion is occurring	Motion stops or the rung goes false

The following logic shows all of the elements required to use an AMCI motion device in a follower system with CIP Sync.



The logic on this and the following page shows how a single master axis can be used to control multiple AMCI motion devices.





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