Emerson Industrial Automation

RSLogix 5000 Unidrive M AMC Add-On Instruction User Guide

Introduction

The Add-On Instruction (AOI) was created to expedite and simplify integration of Emerson Control Techniques Unidrive M products into Rockwell Automation PLC applications. The AOI enables premier integration of an Emerson Control Techniques Unidrive M700 and M702 drive into the RSLogix 5000 programming and configuration environment, as well as the Logix Architecture by incorporating the drives' ladder logic, controller tags and user-defined variables into one simple instruction.

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Features and Functionality

- Homing
  - Define home now
  - Home to encoder marker pulse
  - Home to limit switch
  - Home to limit switch and encoder marker pulse
  - Home to hard stop
  - Home to hard stop and encoder marker pulse
- Jogging
- Indexing
  - 8 index positions (absolute)
- Status
  - Position feedback in user units
  - Following error (position error) in user units
  - Velocity feedback in user units
  - Motor current
  - Drive status bits
  - Index status bits
- Diagnostics
  - Drive trip and sub-trip codes
  - State of drive discrete inputs
  - AOI Error Code
  - Keypad display state
- Current Limit Control
- Motor Brake Control
- Over-travel Limits (both hardware and software)
- Following Error Detection
- Ability to switch motor direction for positive motion (clockwise is default)

Notes:

- All motion commands will stop motion immediately when the control signal becomes false.
- All motion starts on the rising edge of the control signal becoming true.
- Only one motion command can be enabled at the same time.

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Requirements

- Either of the following Emerson Control Techniques drives:
  - Unidrive M700 or M702 with Firmware 1.11 or greater
  - Ethernet Firmware 1.04 or greater
- Emerson Industrial Automation Unidrive M Connect software version 2.2.0 or greater
- Emerson Control Techniques Add-On Instruction for your drive model
- Emerson Control Techniques AMC macro file for your drive model
- Allen-Bradley ControlLogix or CompacLogix PLC with Ethernet interface
- Allen-Bradley RSLogix 5000 Version 16 or greater
- Ethernet connection between Allen-Bradley PLC and Emerson Control Techniques drive, CAT5E minimum Ethernet cable required

I/O Wiring

- Input 1 –Home Switch — M702 – terminal 7 (M700 – terminal 27)
- Input 2 – Minus Over-travel — M702 – terminal 8 (M700 – terminal 28)
- Input 3 – Plus Over-travel — M702 – terminal 9 (M700 – terminal 29)
- STO Input(s) — M702 – terminals 11 & 13 (M700 – terminal 31)
- Motor Brake Control — Relay Contact (terminals 41 & 41)

Note: 0v common on external 24 Vdc power supply must be connected to drive 0V common

Setup Overview

1. Setup Unidrive M for the motor and feedback used.
2. Use Keypad or Preset mode to test motor and feedback setup.
3. Change tuning parameters if required. Refer to Emerson CT Unidrive M700 User Guide.
4. Disable the drive and download the AMC macro file to the Emerson CT drive.
5. Save the parameters in the Unidrive M700.
6. Configure the Allen-Bradley PLC EtherNet/IP interface to the Unidrive M700 using RSLogix5000.
7. Import the Control Techniques Add-On Instruction into your PLC program using RSLogix 5000.
8. Create a tag with the data type UniM_AMCIndex.
9. Create MSG data type.
10. Insert the Add-On Instruction into your PLC program. There are only 7 required fields when inserting the instruction: Tag created for AOI data type in the previous step, Out_ToDrive (Ethernet Output Array Data), Inp_FromDrive (Ethernet Input Array Data) and Explicit Messaging Items (SendMsg, SendData, ReadMsg, ReadData).
11. Test the drive system using the Jog function tags (Jog_Plus and Jog_Minus).
12. Write your application logic using the pre-defined data structures.

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Emerson Control Techniques Supplied Items

Drive Model	AMC Macro File	Add-On Instruction File	Example PLC Logic
Unidrive M700	M700AMCIndexAOI.macro	UniM_AMCIndex.L5X	UniM_AMCIndexAOIEx.ACD
Unidrive M702	M702AMCIndexAOI.macro	UniM_AMCIndex.L5X	UniM_AMCIndexAOIEx.ACD

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Setup the Unidrive M700 / M702

Setting the Drive IP Address

- Set PC to obtain an IP address automatically. Unidrive M DHCP is enabled by default.
- Open Unidrive M Connect software.
- Using Unidrive M Connect, build a new project by scanning the Ethernet network.
- Go ***Online*** with the drive.
- Disable DHCP by selecting the Ethernet tab from the Unidrive M Connect Dashboard and setting Ethernet parameter 4.02.005 (DHCP Enable) to "Off".
- Enter the desired IP address in Ethernet parameter 4.02.006 (IP Address).
- Select ***Save parameters in drive*** from the Unidrive M Connect Dashboard.
- Turn "On" drive parameter 24.007 (Reset) to reset Ethernet and update the drive with the newly assigned IP address.
- Repeat the above steps for each drive.
- Close Unidrive M Connect project.
- Change the PC's IP address to be on the same sub network as the assigned drive IP address.
- Build a new project In Unidrive M Connect by scanning the Ethernet network.

Checking Firmware Versions and Updating Firmware

- In Unidrive M Connect, go ***Online*** with the drive.
- In Unidrive M Connect Dashboard, select ***Change Firmware***.
    - The current version of firmware is displayed
    - Minimum drive firmware 1.11 or greater and Ethernet firmware 1.04 or greater is required.
    - Load and update firmware if required. Drive and option module firmware are available for download from the CT website (http://www.emersonindustrial.com/en-US/controltechniques/Pages/home.aspx).
- Save parameters in the drive.
- Repeat the above steps for each drive.

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Configure the Drive Using Unidrive M Connect

- In Unidrive M Connect, go ***Online*** with the drive.
- From the Unidrive M Connect Dashboard, select ***Set mode and region*** and select RFC-S for Servo or RFC-A for Closed-Loop Vector (AC Motor) and frequency to 60Hz.
- Use Unidrive M Connect Dashboard to ***Rename*** the drive if desired.
- Select ***Motor Setup*** using the ***Setup Wizard*** in the Setup and Diagnostics section from the Dashboard.
    - When using an Emerson servo motor, use the built-in database to ***Choose a motor***
        - Note: Brake option motors are not in the database but are the same as non- brake motors, i.e. for a 190U2B30 use 190U2B300.
    - If using an AC motor or non-Emerson servo motor, manually enter nameplate data into motor setup.
    - After entering desired motor data, click ***Send to drive.***
- ***Motor Feedback Setup*** using ***Setup Wizard*** dropdown.
    - Use motor part number and tables below to configure feedback.
    - If using an absolute encoder use “Auto Configuration” set to “On”. Note: M Connect has text error which shows “Auto Configuration Disable” when it should be “Auto Configuration Enable”
    - For incremental encoders with servo motors, select ***AB Servo*** from Encoder Type dropdown.
    - Select the encoder supply voltage from dropdown.
    - Click ***Send to drive*** in the upper right corner of the screen.
- Save parameters in the drive.

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FM Motor Call-out:

95	U	2	B	30	5	B	A	CA	A	100	190
Frame Size	Motor Voltage	Peak Torque Selection	Stator Length	Winding Speed RPM	Holding Brake	Connection Type	Output Shaft	Feedback Device	Inertia	BCD**	Shaft Dia.

HD Motor Call-out:

089	UD	B	30	5	B	A	CA	A
Frame Size	Motor Voltage	Stator Length	Speed	Brake (24V)	Connection Type	Output Shaft	Feedback Device	Inertia
		055 - 089						

Motor Feedback Device Data:

Feedback Device Order Code	Feedback Type	Encoder Supply Voltage[1]	SinCos Cycles or Incremental Pulses per Revolution
			055 motors
AR	Resolver	7V Excitation 5kHz	1
KR	Incremental Encoder	5V	1024
MR			2048
CR			4096
EM (Multi-turn) FM (Single-turn)	Inductive Absolute Encoder EnDat 2.1	5V	16
TL (Multi-turn) UL (Single-turn)	SinCos Optical Encoder Hiperface	7 - 12V	128
			075-190 motors
AE	Resolver	6 Vrms Excitation 6kHz	1
CA	Incremental Encoder	5V	4096
EC (Multi-turn) FC (Single-turn)	Inductive Absolute Encoder EnDat 2.1	7 - 10V	32
RA (Multi-turn) SA (Single-turn)	SinCos Optical Encoder Hiperface	7 - 12V	1024
EB (Multi-turn) FB (Single-turn)	Optical Absolute Encoder EnDat 2.2	3.6 - 14V	2048

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Run Autotune to Set Current Loop Gains (no load attached to motor)

- Use Unidrive M Connect and go ***Online*** with the drive.
- Set drive parameter 1.014 (Reference Selector) to “Preset”.
- Enter “10” rpm in drive parameter 1.021 (Preset Reference 1).
- Set drive parameter 5.012 (Auto-tune) to “2”.
- Enable the drive by switching On STO input.
- Turn “On” drive parameter 6.034 (Run) to perform an Autotune. Note that the Autotune may take several seconds.
- Turn “Off” drive parameter 6.034 (Run) and turn off the drive STO input.
- Save parameters in the drive.

Testing Drive and Motor Setup (no load attached to motor)

- Use Unidrive M Connect and go ***Online*** with the drive.
- Set drive parameter 1.014 (Reference Selector) to “Preset”.
- Enter “10” rpm in drive parameter 1.021 (Preset Reference 1).
- Enable the drive via the STO Input.
- Turn “On” drive parameter 6.034 (Run) and motor should rotate at 10 rpm.
- Turn “Off” drive parameter 6.034 (Run) and disable the drive STO switch.

Download AOI Macro File

- Load macro file into Unidrive M Connect software.
  - Right click the ***Macro Files*** folder in navigation tree and select “Add Files…”
  - Navigate to the Unidrive M AOI macro file and open.
- Right click on added AOI macro file and download file to drive.
  - Ignore any warning messages.
- Save parameters in drive.
- Reset drive Ethernet using drive parameter 24.007 (Reset).

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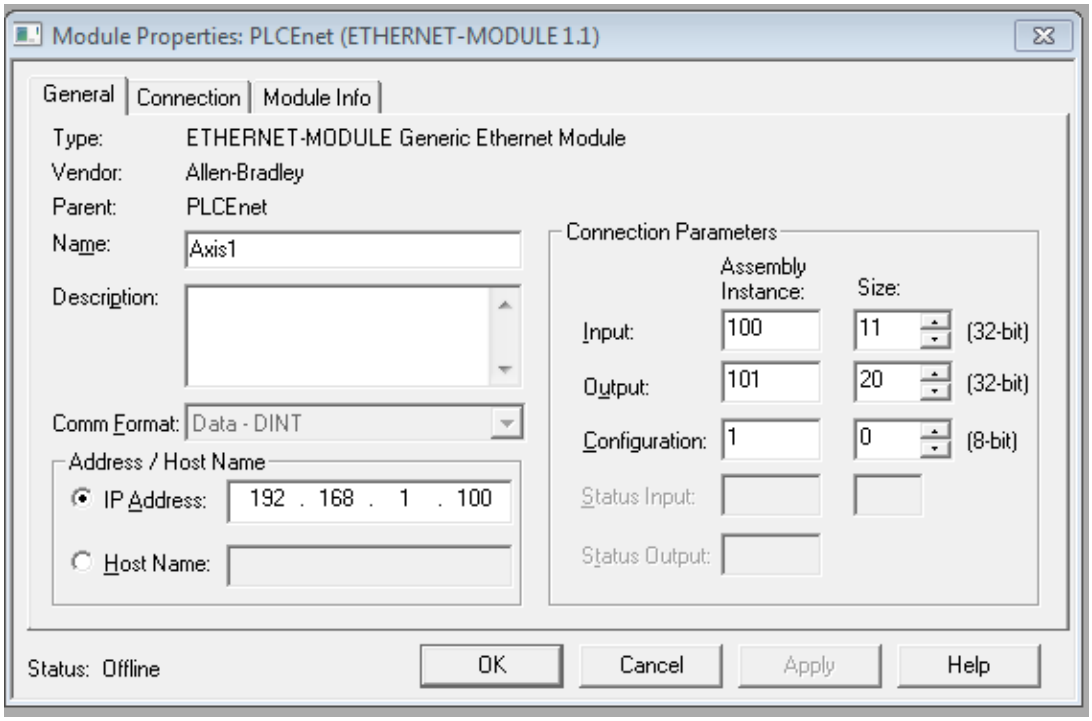
Setting up the PLC Program using RSlogix5000

Configuring the Ethernet Communication to the Unidrive M

1. Using RSLogix 5000, add a Generic Ethernet Module (ETHERNET-MODULE) to the Ethernet network.
2. Using RSLogix 5000, setup the Ethernet module name (use a descriptive name), IP address (the IP Address for the drive) and connection parameters. See example screens below.

Generic Ethernet Module:



Note: Input and Output Assembly Instance should always be 100 and 101 and size should be 11 & 20

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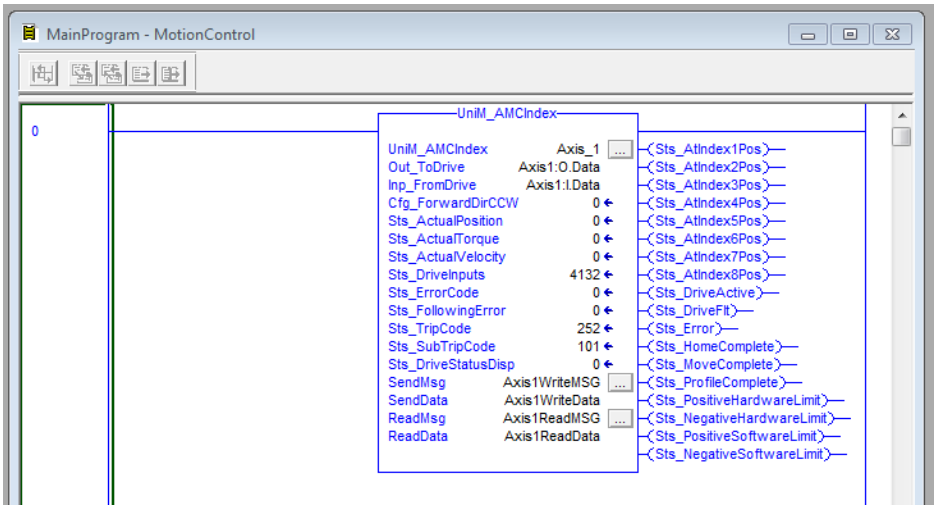
Load AOI into PLC program

1. Import AOI file UniM_AMCIndex.L5X
   - Make sure a controller tag of type UniM_AMCIndex is created
   - Create 4 controller tags. Two of type Message and two of type DINT

     Example:
     - Axis1WriteData DINT
     - Axis1ReadData DINT
     - Axis1WriteMSG MESSAGE
     - Axis1ReadMSG MESSAGE



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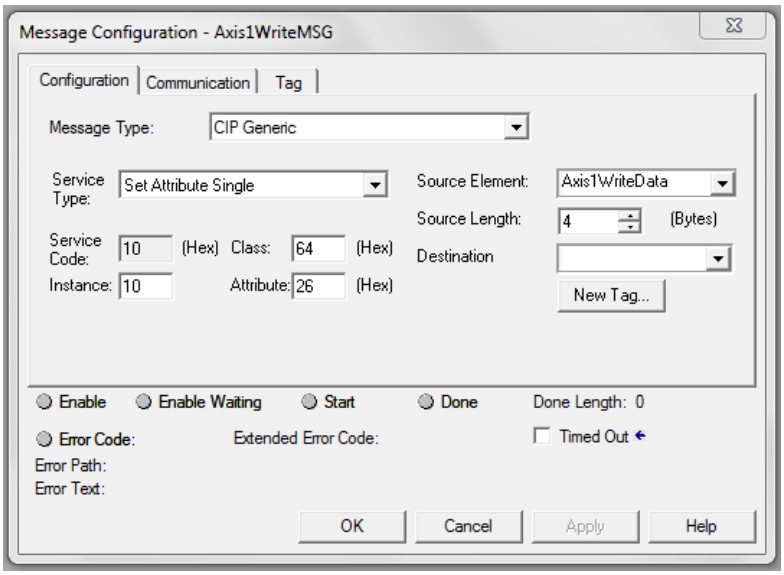
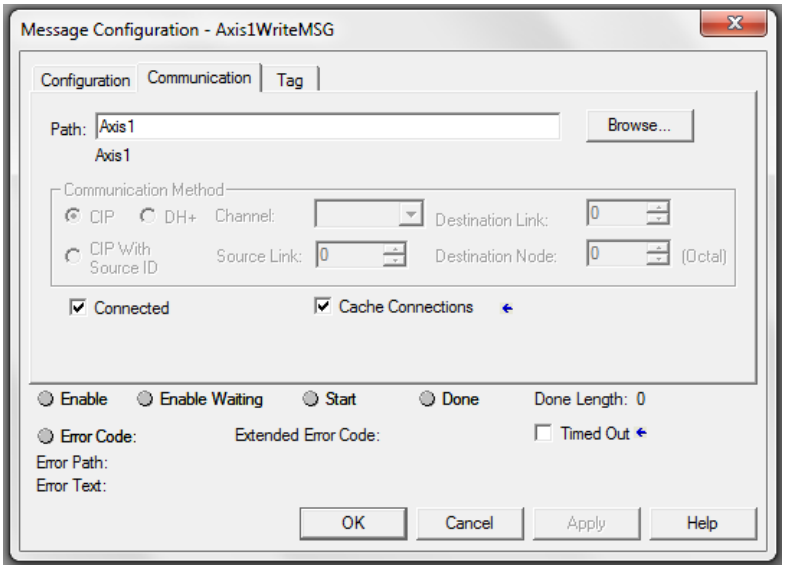
Setup Explicit Messaging

1. Configure Send MSG from AOI by right clicking on MESSAGE Tag





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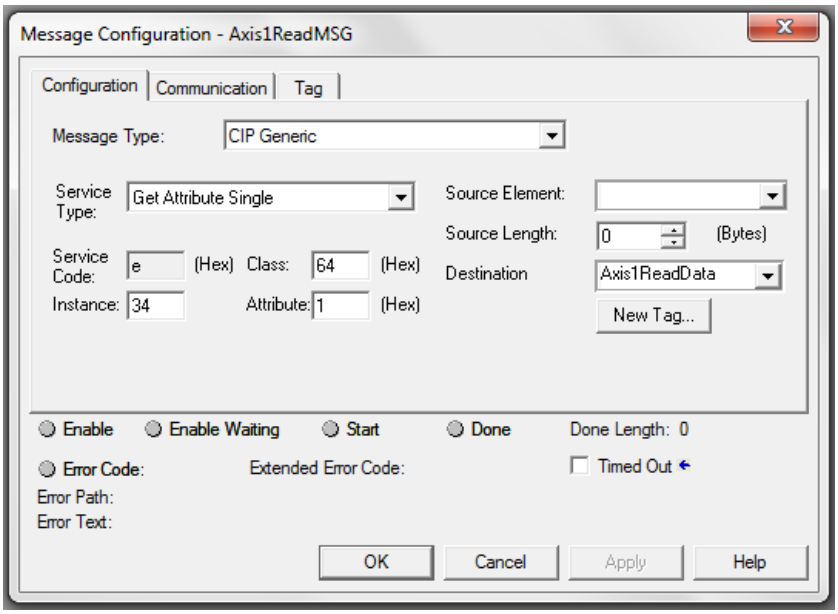
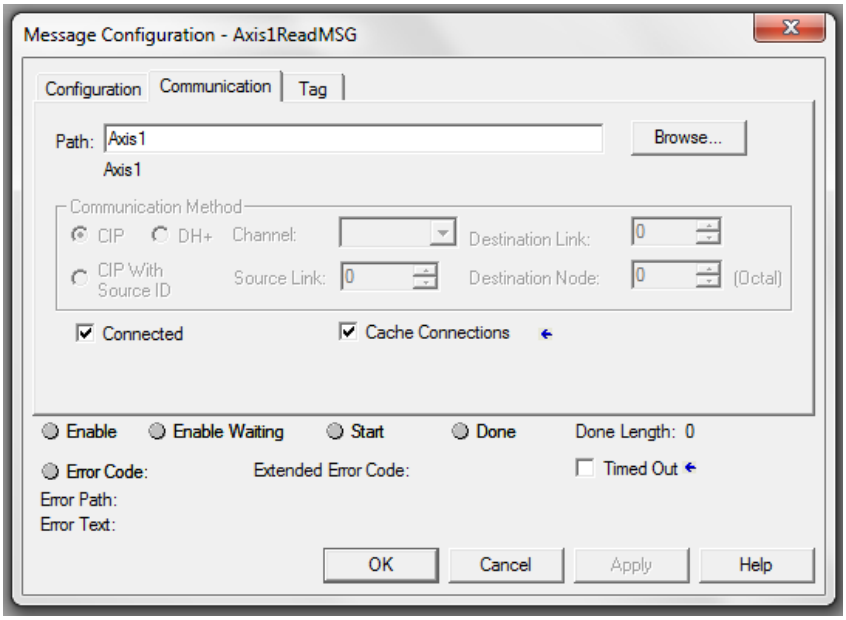
2. Configure Read MSG from AOI





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Creating the Application Logic

AOI Variable Nomenclature

- Variables with “Cfg” prefix are read/write system configuration setup data.
- Variables with “Sts” prefix are read only status information. Examples include: Actual Position, Drive Enabled, etc.
- Variables with “Set” prefix are read/write control word information. Examples include: Index Position, Jog Velocity, etc.
- Variables with “Cmd” prefix are read/write command bits. Examples include: Jog Minus, Jog Plus, Home, etc.

Notes:

- Most data words have implied decimal points.
- All motion commands start on the rising edge of the command signal.
- Indexing commands need to remain on until motion is completed. This allows for permissives or interlocks to stop motion by removing the command signal.

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AOI User Units

- User Unit Setup
  - Any user units can be used. There is no text entry for the user units.
  - Include an implied decimal point in Cfg_DistancePerRev to at least three digits.
  - Example: Cfg_DistancePerRev =72123 is 72.123 user units (UU) per rev
- Velocity Scaling
  - With 4 decimal point user unit scaling:
    - Velocity will be in UU/s with 3 implied decimal digits.
    - Example: 1234 = 1.234 UU/s
  - With 3 decimal point user unit scaling:
    - Velocity will be in UU/s with 2 implied decimal digits.
    - Example: 123 = 1.23 UU/s
- Acceleration/Deceleration scaling
  - With 4 decimal point user unit scaling:
    - Acceleration/Deceleration will be in UU/s/s with 1 implied decimal digit.
    - Example: 1234 = 123.4 UU/s/s
  - With 3 decimal point user unit scaling:
    - Acceleration/Deceleration will be in UU/s/s with 0 implied decimal digits.
    - Example: 123 = 123 UU/s/s

Scaling Examples

	3 Implied decimals	**4 Implied decimals**	**5 Implied decimals**
System Mechanics	1.23 uu per rev	1.23 uu per rev	1.23 uu per rev
Cfg_DistancePerRev	1230	12300	123000
Desired Position	12.125 uu	12.125 uu	12.125 uu
Set_IndexXPos	12125	121250	1212500
Desired Speed	10.1 uu/s	10.1 uu/s	10.1 uu/s
Set_IndexXVel	1010	10100	101000
Desired Accel/Decel	100 uu/s/s	100 uu/s/s	100 uu/s/s
Set_IndexXAccel or Set_IndexXDecel	100	1000	10000

Note: The implied decimal point of the velocity is one less than the implied decimal point of the position. The implied decimal point of the acceleration is three less than the implied decimal point of the position.

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AOI Axis Configuration

- Make sure the drive is disabled
- Set the following parameters

Name	Data Type	Default Value	Units	Description
Cfg_DistancePerRev	DINT	1000	UU	Distance per motor revolution
Cfg_InMotionBand	DINT	1000	UU/s	In motion window
Cfg_InPosnBand	DINT	5000	UU	In position window
Cfg_FollowingErrorWindow	DINT	256	UU	Following error limit set point
Cfg_FollowingErrorEnable	BOOL	0		Enable following error detection
Cfg_ForwardDirCCW	BOOL	0		Reverse motor direction
Cfg_SoftOvertravelMinus	DINT	0	UU	Software over travel minus set point
Cfg_SoftOvertravelPlus	DINT	0	UU	Software over travel plus set point
Cfg_SoftOverTravelEnable	BOOL	0		Enable software over travel
Cfg_StopDecel	DINT	1000000	UU	Cmd_MotionStop Deceleration

- Turn “On” Cmd_SendCfgData to send the configuration data to the drive. Cmd_SendCfgData will turn “Off” automatically.
- Need to invert over-travel inputs if they are normally closed
    - On M702 invert drive parameters 8.015 and 8.053
    - On M700 invert drive parameters 8.015 and 8.016

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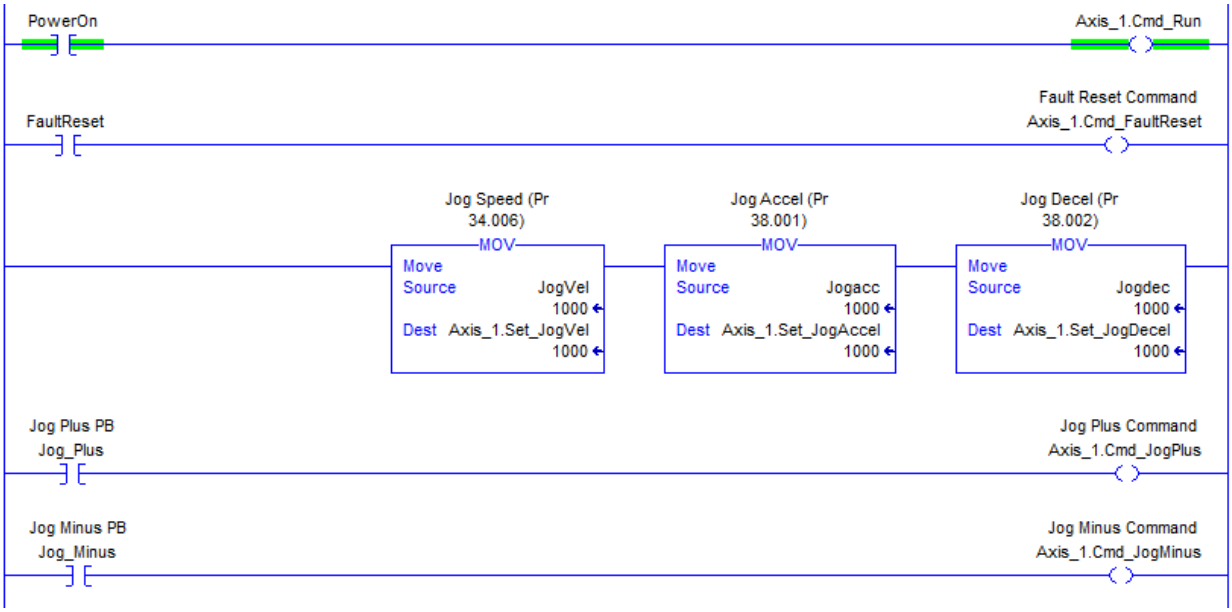
Example Jog Logic:



Testing Jog PLC Logic

- Connect the PLC, Unidrive M and PC via Ethernet
- Check status of the communications between PLC and Unidrive M
- Go Online with the PLC, download and run in Rem Run mode
- Enter a jog velocity UU/s into JogVel (i.e. 1000)
- Enable the Drive
- Toggle bit PowerOn “on” to put the drive in run mode
- Toggle bit Jog_Plus “on”
- Motor will jog at entered velocity until Jog_Plus bit is toggled “off”

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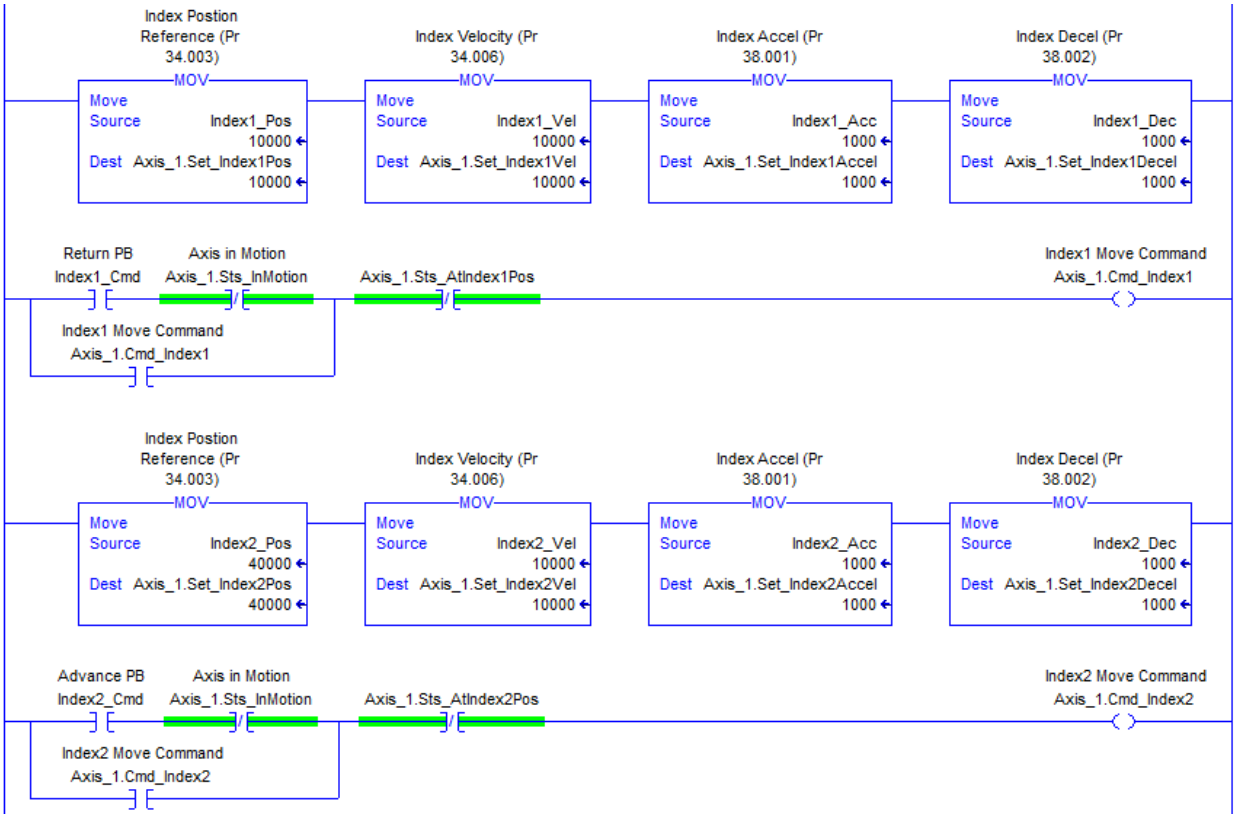
Example Index Logic:



Testing Indexing PLC logic

- Connect the PLC, Unidrive M and PC via Ethernet
- Check status of the communications between PLC and Unidrive M
- Go Online with the PLC, download and run in Rem Run mode
- Enter a position UU into Index1_Pos (i.e. 20000)
- Enable the drive
- Toggle bit Index1_Cmd "on"
- Motor will index to entered position. Indexing is complete when Sts_ActualPosition equals Index1_Pos. Note: Drive must be homed (Sts_HomeComplete) before indexing command will execute.

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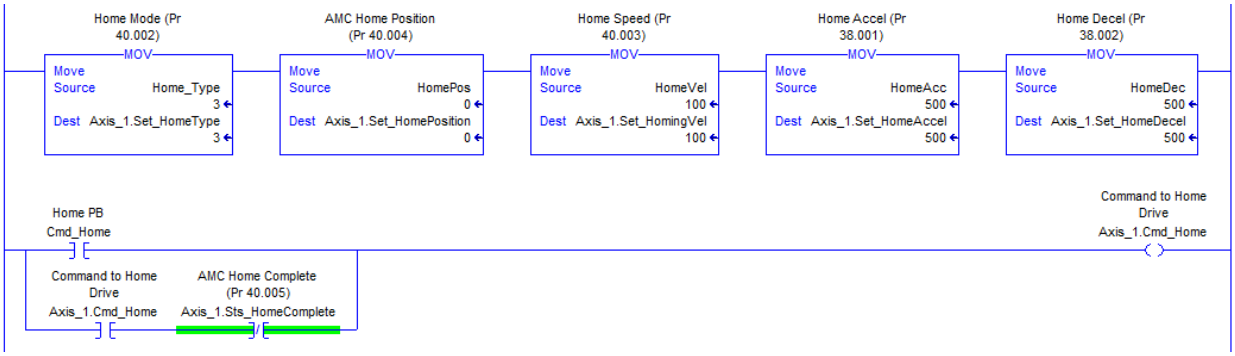
Example Home Logic:



Testing Home PLC logic

- Connect the PLC, Unidrive M and PC via Ethernet
- Check status of the communications between PLC and Unidrive M
- Go Online with the PLC, download and run in Rem Run mode
- Enter a Home_Type: 1-6 (i.e. Home_Type 1, defines home now)
- Enter a home position UU into HomePos (i.e 0)
- Enter a home velocity UU/s into HomeVel (i.e. 10)
- Enable the Drive
- Toggle bit Cmd_Home “on”
- Sts_ActualPosition in UnidriveM_AMC will be set to HomePos (i.e. 0)
- Drive I/O terminals used for the different Home Types (Page 17 of this User Guide)

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AOI Homing Types

- For all Homing Types
  - Set_HomePosition = Desired position (example: 0)
  - Set Set_HomingVel, Set_HomeAccel and Set_HomeDecel = Desired values
  - Set Set_HomeOffset =Desired value (example:0)
  - Set_HomeDirection = 0 (positive direction) or 1 (negative direction)
- (Set_HomeType =1) Define Home Now
  - Used to set the current position to a value without moving the axis
  - Set_HomePosition = Desired position (example: 0)
  - Cmd_Home = 1 and the current position will be updated
  - Cmd_Home = 0
- (Set_HomeType =2) Home to Marker Pulse
  - Cmd_Home = 1 and the axis will move to the marker pulse and stop
  - Cmd_Home = 0
- (Set_HomeType =3) Home to Limit Switch
  - Cmd_Home = 1 The axis will move to the home switch and stop
  - Cmd_Home = 0
- (Set_HomeType =4) Home to Limit Switch and Marker Pulse
  - Cmd_Home = 1 The axis will move to the home switch and reverse direction to marker
  - Cmd_Home = 0
- (Set_HomeType =5) Home to a Hard Stop
  - Set_HardStopThreshold = desired % Torque (Has 1 implied decimal point)
  - Cmd_Home = 1 The axis will move to a hard stop
  - Cmd_Home = 0
- (Set_HomeType =6) Home to a Hard Stop and Marker Pulse
  - Set_HardStopThreshold = desired % Torque (Has 1 implied decimal point)
  - Cmd_Home = 1 The axis will move to a hard stop and reverse direction to marker
  - Cmd_Home = 0

Note: Set_HomeType is not the same as AMC Home Mode parameter 40.002

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Troubleshooting

- Make sure drive is enabled (STO input is ON)
- Make sure drive is not tripped
- Check Sts_ErrorCode and refer to Appendix B
- Make sure motor brake is functioning properly, if the motor has a brake
    - Will get OI.AC if brake is not releasing
- Make sure over-travel limits are not active
    - Will need to invert over-travel inputs if they are normally closed
    - On M702 invert drive parameters 8.015 and 8.053
    - On M700 invert drive parameters 8.015 and 8.016
- Check for position error fault
- Encoder 2 trip
    - Check correct encoder voltage selected
    - Check correct cable
    - Check correct encoder type selected
- If the home decel rate is too small, the homing sequence will not end at the set home position
- Explicit messaging writing 100 into parameter xx.000
    - SendMSG data incorrectly configured
- Explicit messaging issues
    - If the MSG block error bit is active, make sure the MSG configuration has the correct path and the connection check box is set
- Make sure the drive parameters were not changed or macro file downloaded to the drive when the drive was enabled
- Thermistor.4 trip
    - Check feedback wiring of thermistor
    - Disable thermistor if not present, set drive parameter 3.123 (P1 Thermistor Fault Detection) to “None”
- Cyclic data communications are not working but configured correctly
    - Check Ethernet parameter 4.20.007 (Cyclic data transfers per second) for message count, should be > 0
    - Reset Ethernet/IP on the drive by turning Ethernet parameter 4.20.002 (Reset) to “On”

Drive Troubleshooting Parameters

- 6.042 Drive Control Word
- 41.002 AMC Status Word
- 34.0007 & #4.009 Reference Selectors
- 41.019 AMC Control Word

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Appendix A - PLC AOI Parameters

Name	Usage	Data Type	Default Value	Units	Description	Ext Access
Out_ToDrive	InOut	DINT[20]			Comms Data to Drive	R/W
Inp_FromDrive	InOut	DINT[11]			Comms Data from Drive	R/W
SendMsg	InOut	MSG			Explicit Message Control to Drive	
SendData	InOut	DINT			Explicit Message Data to Drive	
ReadMsg	InOut	MSG			Explicit Message Control from Drive	
ReadData	InOut	DINT			Explicit Message Data from Drive	
Sts_Error	Output	BOOL			Error Bit	R
Sts_ErrorCode	Output	DINT			Error Code	R
Cfg_FollowingErrorEnable	Input	BOOL			Enable Following Error	
Cfg_SoftOvertravelEnable	Input	BOOL			Enable Software Over-travel	
Cfg_ForwardDirCCW	Input	BOOL			Changes Positive Direction to CCW	
Cfg_DistancePerRev	Input	DINT		UU	Distance per Revolution (User Units)	EXP
Cfg_InPosnBand	Input	DINT	5	UU	AOI Position Band	R/W
Cfg_InMotionBand	Input	DINT	5	UU/s	AOI in Motion Velocity Band	R/W
Cfg_StopDecel	Input	DINT		UU/s/s	Travel Limit and Stop Command Decel	R/W
Cfg_FollowingErrorWindow	Input	DINT		UU		
Cfg_SoftOvertravelPlus	Input	DINT		UU		
Cfg_SoftOvertravelMinus	Input	DINT		UU		
Cmd_AMCEnable	Input	BOOL	On		Command to Enable AMC	R/W
Cmd_Home	Input	BOOL			Command to Home Drive	R/W
Cmd_JogPlus	Input	BOOL			Jog Plus Command	R/W
Cmd_JogMinus	Input	BOOL			Jog Minus Command	R/W
Cmd_Index1	Input	BOOL			Index1 Move Command	R/W
Cmd_Index2	Input	BOOL			Index2 Move Command	R/W
Cmd_Index3	Input	BOOL			Index3 Move Command	R/W
Cmd_Index4	Input	BOOL			Index4 Move Command	R/W
Cmd_Index5	Input	BOOL			Index5 Move Command	R/W
Cmd_Index6	Input	BOOL			Index6 Move Command	R/W
Cmd_Index7	Input	BOOL			Index7 Move Command	R/W
Cmd_Index8	Input	BOOL			Index8 Move Command	R/W
Cmd_SoftwareDriveEnable	Input	BOOL			Software Drive Enable	R/W
Cmd_FaultReset	Input	BOOL			Fault Reset command	R/W
Cmd_Run	Input	BOOL			Run Command	R/W
Cmd_SendCfgData	Input	BOOL			Update Explicit MSG Cfg Data	
Cmd_MotionStop	Input	BOOL			Stop Motion	
Set_TorqueLimit	Input	DINT	175.0%	xxx.x %	Torque Limit	R/W
Set_JogVel	Input	DINT		UU/s	Based on User Units in Drive	R/W
Set_JogAccel	Input	DINT		UU/s/s	Jog Acceleration	R/W
Set_JogDecel	Input	DINT		UU/s/s	Jog Deceleration	R/W
Set_HomingVel	Input	DINT		UU/s	Home Velocity	R/W
Set_HomeAccel	Input	DINT		UU/s/s	Home Acceleration	R/W

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Name	Usage	Data Type	Default Value	Units	Description	Ext Access
Set_HomeDecel	Input	DINT		UU/s/s	Home Deceleration	R/W
Set_HomeType	Input	DINT			AOI Home Type	
Set_HomePosition	Input			UU		
Set_HomeDirection	Input	BOOL	0			
Set_HardStopThreshold	Input	DINT		xxx.x %	Home to Hardstop % Torque	R/W
Set_HomeOffset	Input	DINT		UU	Distance moved after home event	
Set_Index1Pos	Input	DINT		UU	Index 1 Position	R/W
Set_Index1Vel	Input	DINT		UU/s	Index 1 Velocity	R/W
Set_Index1Accel	Input	DINT		UU/s/s	Index 1 Acceleration	R/W
Set_Index1Decel	Input	DINT		UU/s/s	Index 1 Deceleration	R/W
Set_Index2Pos	Input	DINT		UU	Index 2 Position	R/W
Set_Index2Vel	Input	DINT		UU/s	Index 2 Velocity	R/W
Set_Index2Accel	Input	DINT		UU/s/s	Index 2 Acceleration	R/W
Set_Index2Decel	Input	DINT		UU/s/s	Index 2 Deceleration	R/W
Set_Index3Pos	Input	DINT		UU	Index 3 Position	R/W
Set_Index3Vel	Input	DINT		UU/s	Index 3 Velocity	R/W
Set_Index3Accel	Input	DINT		UU/s/s	Index 3 Acceleration	R/W
Set_Index3Decel	Input	DINT		UU/s/s	Index 3 Deceleration	R/W
Set_Index4Pos	Input	DINT		UU	Index 4 Position	R/W
Set_Index4Vel	Input	DINT		UU/s	Index 4 Velocity	R/W
Set_Index4Accel	Input	DINT		UU/s/s	Index 4 Acceleration	R/W
Set_Index4Decel	Input	DINT		UU/s/s	Index 4 Deceleration	R/W
Set_Index5Pos	Input	DINT		UU	Index 5 Position	R/W
Set_Index5Vel	Input	DINT		UU/s	Index 5 Velocity	R/W
Set_Index5Accel	Input	DINT		UU/s/s	Index 5 Acceleration	R/W
Set_Index5Decel	Input	DINT		UU/s/s	Index 5 Deceleration	R/W
Set_Index6Pos	Input	DINT		UU	Index 6 Position	R/W
Set_Index6Vel	Input	DINT		UU/s	Index 6 Velocity	R/W
Set_Index6Accel	Input	DINT		UU/s/s	Index 6 Acceleration	R/W
Set_Index6Decel	Input	DINT		UU/s/s	Index 6 Deceleration	R/W
Set_Index7Pos	Input	DINT		UU	Index 7 Position	R/W
Set_Index7Vel	Input	DINT		UU/s	Index 7 Velocity	R/W
Set_Index7Accel	Input	DINT		UU/s/s	Index 7 Acceleration	R/W
Set_Index7Decel	Input	DINT		UU/s/s	Index 7 Deceleration	R/W
Set_Index8Pos	Input	DINT		UU	Index 8 Position	R/W
Set_Index8Vel	Input	DINT		UU/s	Index 8 Velocity	R/W
Set_Index8Accel	Input	DINT		UU/s/s	Index 8 Acceleration	R/W
Set_Index8Decel	Input	DINT		UU/s/s	Index 8 Deceleration	R/W
Sts_DriveEnabled	Output	BOOL			Drive Enabled	R
Sts_DriveActive	Output	BOOL			Drive Active	R
Sts_DriveOK	Output	BOOL			Drive OK	R
Sts_DriveHomed	Output	BOOL			Drive Homed	R
Sts_DriveFlt	Output	BOOL			Drive Fault	R

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Name	Usage	Data Type	Default Value	Units	Description	Ext Access
Sts_AtZeroSpeed	Output	BOOL			At Zero Speed	R
Sts_AtSpeed	Output	BOOL			At Speed	R
Sts_AtRatedLoad	Output	BOOL			At Rated Load	R
Sts_BrakeIGBTActive	Output	BOOL			Brake IGBT Active	R
Sts_BrakeResistorAlarm	Output	BOOL			Thermal Accumulator > 75%	R
Sts_CurrentLimitActive	Output	BOOL			Current Limit Active	R
Sts_FollowingErrorFlag	Output	BOOL			Following Error Flag	R
Sts_FollowingErrStop	Output	BOOL			Following Error has stopped motion	R
Sts_HomeComplete	Output	BOOL			First stage of home cycle is complete	R
Sts_HomeResetComplete	Output	BOOL			Home offset move cycle is complete	R
Sts_HomeSwitchOn	Output	BOOL			Home Switch Input Status	R
Sts_MasterSpeedHigh	Output	BOOL				R
Sts_PositiveHardwareLimit	Output	BOOL			AMC Positive Hardware limit status	R
Sts_NegativeHardwareLimit	Output	BOOL			AMC Negative Hardware limit status	R
Sts_PositiveSoftwareLimit	Output	BOOL			AMC Positive Software limit status	R
Sts_NegativeSoftwareLimit	Output	BOOL			AMC Negative Software limit status	R
Sts_MoveComplete	Output	BOOL			AMC Move Complete	R
Sts_NoMotionCommand	Output	BOOL				R
Sts_ProfileComplete	Output	BOOL				R
Sts_Regenerating	Output	BOOL				R
Sts_SupplyLoss	Output	BOOL				R
Sts_OTLMinusOn	Output	BOOL			Hardwired Over-travel Minus	R
Sts_OTLPlusOn	Output	BOOL			Hardwired Over-travel Plus	R
Sts_InMotion	Output	BOOL			Axis in Motion	R
Sts_AtZeroPos	Output	BOOL			At Zero Position	R
Sts_AtIndex1Pos	Output	BOOL			At Index 1 Position	R
Sts_AtIndex2Pos	Output	BOOL			At Index 2 Position	R
Sts_AtIndex3Pos	Output	BOOL			At Index 3 Position	R
Sts_AtIndex4Pos	Output	BOOL			At Index 4 Position	R
Sts_AtIndex5Pos	Output	BOOL			At Index 5 Position	R
Sts_AtIndex6Pos	Output	BOOL			At Index 6 Position	R
Sts_AtIndex7Pos	Output	BOOL			At Index 7 Position	R
Sts_AtIndex8Pos	Output	BOOL			At Index 8 Position	R
Sts_MotionCancelled	Output	BOOL			Motion Cancelled	R
Sts_MotionInitiated	Output	BOOL			Motion Initiated	R
Sts_ActualPosition	Output	DINT		UU	Actual Velocity	R
Sts_ActualVelocity	Output	DINT		UU/s	Actual Position	R
Sts_FollowingError	Output	DINT		UU	Actual Following Error	R
Sts_ActualTorque	Output	DINT		xxx.x %	Actual Torque	R
Sts_DriveInputs	Output	DINT			Drive Inputs Status	R
Sts_DriveStatusDisp	Output	DINT			Drive Status shown on keypad	R
Sts_TripCode	Output	DINT			Drive Trip Code 10.020	
Sts_SubTripCode	Output	DINT			Drive Sub Trip Code 10.070	

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Appendix B - AOI Error Codes (Sts_ErrorCode)

Code	Description	Recovery
1	Motion initiated when drive is not active	Make sure drive is enabled and not faulted
2	Configuring Axis when Drive is Enabled	Disable drive when sending axis configuration
3	Cfg_InPosnBand is zero	Place a non-zero positive value in Cfg_InPosnBand
4	Following Error Stop	Tune Axis or Increase following error window
5	Drive has not been homed	Issue home command
6		
7		
8		
9		
10	Scaling in drive does not match PLC	Set “Cfg_DistancePerRev”
11	Index 1 velocity is zero	Place a non-zero value in Cfg_Index1Vel
12	Index 2 velocity is zero	Place a non-zero value in Cfg_Index2Vel
13	Index 3 velocity is zero	Place a non-zero value in Cfg_Index3Vel
14	Index 4velocity is zero	Place a non-zero value in Cfg_Index4Vel
15	Index 5 velocity is zero	Place a non-zero value in Cfg_Index5Vel
16	Index 6 velocity is zero	Place a non-zero value in Cfg_Index6Vel
17	Index 7 velocity is zero	Place a non-zero value in Cfg_Index7Vel
18	Index 8 velocity is zero	Place a non-zero value in Cfg_Index8Vel
19		
20		
21		
22		
23		
24		
25		

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Appendix C - PLC AOI Local Tags

Name	Data Type	Default Value	Units	Description
HOME_MODE	DINT	5		Constant used for reference selector
INDEX_MODE	DINT	1		Constant used for reference selector
SPEED_MODE	DINT	2		Constant used for reference selector
HomeMem	BOOL			Used to send save command to drive after home
Sts_IndexInit	DINT			Index Control (bit 1 - index1, bit 2 - index2, etc.)
Sts_UnsignedVelocity	DINT			Used for In Motion Status
Sts_PositionMinusBand	DINT			Used for Index Position Bits
Sts_PositionPlusBand	DINT			Used for Index Position Bits
Sts_AbsoluteEncoderHomed	BOOL			Used as homed memory for absolute encoder
DriveData	DINT[20]			Data Array for sending MSG data to drive
DriveMenu	DINT[20]			Menu Array for sending MSG data to drive
DriveParm	DINT[20]			Parameter Array for sending MSG data to drive
SendCTR	Counter			Counter used to send MSG data to drive
NumParms	DINT			Number of drive parameters for MSG to drive
WriteMsg	DINT			Used to sequence MSG write data
ReadDriveData	DINT[20]			Data Array for reading MSG data from drive
ReadDriveMenu	DINT[20]			Menu Array for reading MSG data from drive
ReadDriveParm	DINT[20]			Parameter Array to read MSG data from drive
ReadCTR	Counter			Counter used to read MSG data from drive
ReadThrottleTMR	Timer			Time delay between each MSG read
DrvDistancePerRev	DINT			MSG Read - 31.006
DrvFollowingErrorEnable	DINT			MSG Read – 34.001
DrvFollowingErrorWindow	DINT			MSG Read – 41.007
DrvSoftOvertravelMinus	DINT			MSG Read – 41.027
DrvSoftOvertravelPlus	DINT			MSG Read – 41.026
DrvDriveType	DINT			MSG Read –11.028
DrvEncoderType	DINT			MSG Read –3.038

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Appendix D - Ethernet IP Cyclic Data Interface

Cyclic Data from drive (Inp_FromDrive)

Word (32-Bit)	Direct AOI Tag	Unidrive M Parameter	Notes
Word 0		41.002	AMC Status Bits
Word 0 Bit 0	Sts_EGB_Locked	37.006	AMC EGB Locked
Word 0 Bit 1	Unused	35.010	AMC Cam Complete
Word 0 Bit 2	Sts_MoveComplete	41.004	AMC Move Complete
Word 0 Bit 3	Sts_ProfileComplete	41.006	AMC Profile Complete
Word 0 Bit 4	Sts_FollowingErrorFlag	41.008	AMC Following Error Flag
Word 0 Bit 5	Sts_AtSpeed	41.010	AMC at Speed Flag
Word 0 Bit 6	Sts_MasterSpeedHigh	41.011	AMC Master Speed High
Word 0 Bit 7	Sts_FollowingErrStop	41.012	AMC Following Error Stop
Word 0 Bit 8	Sts_HomeComplete	40.005	AMC Home Complete
Word 0 Bit 9	Sts_HomeResetComplete	40.008	AMC Home Reset Complete
Word 0 Bit 10	Sts_PositiveHardwareLimit	41.013	Positive Hardware Limit
Word 0 Bit 11	Sts_NegativeHardwareLimit	41.014	Negative Hardware Limit
Word 0 Bit 12	Sts_PositiveSoftwareLimit	41.015	Positive Software Limit
Word 0 Bit 13	Sts_NegativeSoftwareLimit	41.016	Negative Software Limit
Word 0 Bit 14	Unused	41.017	AMC Home Required
Word 0 Bit 15	Unused		Not Used
Word 1	Sts_ActualPosition	33.004	Position Feedback
Word 2	Sts_FollowingError	39.008	Following Error
Word 3	Sts_ActualVelocity	33.005	Velocity Feedback
Word 4	Sts_DriveStatusDisp	10.101	Drive Status on Display
Word 5	Sts_TripCode	10.020	New Meaning Trip 0
Word 6	Sts_SubTripCode	10.070	New Meaning Sub Trip 0
Word 7	Sts_ActualTorque	4.020	Percent Load
Word 8	Sts_DriveEnabled	6.029	Hardware Enable Status
Word 9	Sts_DriveInputs	8.072	Drive Inputs
Word 9 Bit 0	Unused	8.021	Digital Input/Output 1
Word 9 Bit 1	Unused	8.022	Digital Input/Output 2
Word 9 Bit 2	Unused	8.023	Digital Input/Output 3
Word 9 Bit 3		8.024	Digital Input 4
Word 9 Bit 4		8.025	Digital Input 5
Word 9 Bit 5		8.026	Digital Input 6
Word 9 Bit 6	Unused		Reserved
Word 9 Bit 7	Unused		Reserved
Word 9 Bit 8		8.009	Safe Torque Off 1 Input State
Word 9 Bit 9		8.040	Safe Torque Off 2 Input State
Word 9 Bit10			Keypad Run Button
Word 9 Bit11			Keypad Aux Button
Word 9 Bit12		8.043	24V Supply Input
Word 9 Bit 13			Keypad Stop Button

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Word 9 Bit 14	Unused		Reserved
Word 10	Sts_DriveStatus	10.040	Drive Status
Word 10 Bit 0	Sts_DriveOK	10.001	Drive Healthy
Word 10 Bit 1	Sts_DriveEnabled	10.002	Drive Active
Word 10 Bit 2	Sts_AtZeroSpeed	10.003	Zero Speed
Word 10 Bit 3	Unused	10.004	At or Below Min Speed
Word 10 Bit 4	Unused	10.005	Below Set Speed
Word 10 Bit 5	Unused	10.006	At Speed
Word 10 Bit 6	Unused	10.007	Above Set Speed
Word 10 Bit 7	Sts_AtRatedLoad	10.008	Rated Load Reached
Word 10 Bit 8	Sts_CurrentLimitActive	10.009	Current Limit Active
Word 10 Bit 9	Sts_Regenerating	10.010	Regenerating
Word 10 Bit 10	Sts_BrakeIGBTActive	10.011	Braking IGBT Active
Word 10 Bit 11	Sts_BrakeResistorAlarm	10.012	Braking Resistor Alarm
Word 10 Bit 12	Unused	10.013	Reverse Direction Commanded
Word 10 Bit 13	Unused	10.014	Reverse Direction Running
Word 10 Bit 14	Sts_SupplyLoss	10.015	Supply Loss

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Cyclic Data to Drive (Out_ToDrive)

Word (32-Bit)	Direct AOI Tag	Unidrive M Parameter	Notes
Word 0		34.009	AMC Reference Selector
Word 1	Set_HomeVel	40.003	Home Speed
Word 2		38.001	AMC Accel
Word 3		38.002	AMC Decel
Word 4		34.003	Index Position
Word 5		38.003	Profile Speed (index)
Word 6		6.042	Drive Control Word
Word 6 Bit 0		6.015	Drive Enable
Word 6 Bit 1		6.030	Run Forward
Word 6 Bit 2	Unused	6.031	Jog
Word 6 Bit 3	Unused	6.032	Run Reverse
Word 6 Bit 4	Unused	6.033	Forward/Reverse
Word 6 Bit 5	Unused	6.034	Run
Word 6 Bit 6	Unused	6.039	Not Stop
Word 6 Bit 7			Auto/Manual
Word 6 Bit 8	Unused		Analog/Preset Reference
Word 6 Bit 9	Unused	6.037	Jog Reverse
Word 6 Bit 10	Unused		Not Used
Word 6 Bit 11	Unused		Not Used
Word 6 Bit 12	Unused		Trip Drive
Word 6 Bit 13		10.033	Drive Reset
Word 6 Bit 14	Unused		Watchdog
Word 6 Bit 15	Unused		Not Used
Word 7		41.019	AMC Control Word
Word 7 Bit 0	Cmd_AMCEnable	41.001	AMC Enable
Word 7 Bit 1	Unused	31.002	AMC Absolute Mode Enable
Word 7 Bit 2	Unused	31.003	AMC Incremental Position Reset Mode
Word 7 Bit 3	Unused	40.012	Home Switch State
Word 7 Bit 4	Unused	40.013	Home Positive Limit State
Word 7 Bit 5	Unused	40.014	Home Negative Limit State
Word 7 Bit 6	Unused	32.002	AMC Master Invert
Word 7 Bit 7		33.002	AMC Slave Invert
Word 7 Bit 8		39.013	AMC Output Invert
Word 7 Bit 9	Unused	37.001	AMC EGB Enable Rigid Lock
Word 7 Bit 10	Unused	31.014	AMC Speed Mode Enable
Word 7 Bit 11		41.025	AMC Software Limit Enable
Word 7 Bit 12	Unused	31.015	AMC Auto Resolution Enable
Word 7 Bit 13	Unused	40.020	AMC Home Required
Word 7 Bit 14	Unused		Not Used
Word 7 Bit 15	Unused		Not Used
Word 8	Set_JogVel	34.006	Jog Speed
Word 9	Set_TorqueLimitSP	4.007	Torque Limit

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Word 10		40.002	AMC Home Mode
Word 11	Set_HomePosition	40.004	AMC Home Position
Word 12	Set_HomeOffset	40.007	AMC Home Reset Position
Word 13	Set_HardStopThreshold	40.018	AMC Hard Stop Threshold
Word 14		3.100	Freeze Trigger Source
Word 15		40.011	AMC Home on Freeze
Word 16		40.001	AMC Home Direction
Word 17		40.015	AMC Positive Limit Selector
Word 18		40.016	AMC Negative Limit Selector
Word 19	Unused		Spare

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Appendix E - Ethernet IP Explicit Message Interface

Explicit Message Data from Drive

- 31.006 [0] AMC User unit scaling
- 31.009 [1] AMC User unit scaling
- 41.026 [2] AMC Software Limit Plus
- 41.027 [3] AMC Software Limit Minus
- 41.007 [4] AMC Following Error Window
- 34.001 [5] AMC Stop Mode (used to enable following error)
- 11.028 [6] Drive Derivative. 1=M700, 3=M702
- 3.038 [7] Encoder Type (used to determine absolute feedback)

Explicit Message Data to Drive

- XX.000 Used to save parameter data by writing 1001
- 10.038 Used to reset drive with the 1001 save command
- 31.006 AMC User Units Scaling
- 31.009 AMC User Units Scaling
- 41.026 AMC Positive Software Limit
- 41.027 AMC Negative Software Limit
- 41.007 AMC Following Error Window
- 34.001 (AMC Stop Mode) switched between “0” and “2” to enable following error detection

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