JVL MAC AOI Manual

Rockwell PLC AOI for the control of JVL MAC-Motors

V1.0 03/2023

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1 Note

Please note that this AOIs have been tested with MacTalk V1.90.21 and JVL Ethernet/IP firmware V3.42.

The JVL AOI's will simplify the integration into the Rockwell Logix5000 environment.

For the Rockwell motion programmer the JVL AOI's will help the integration of the JVL motors into a Rockwell application.

This document along with the example project should give a good understanding on how to setup and control a JVL motor.

2 Configuration

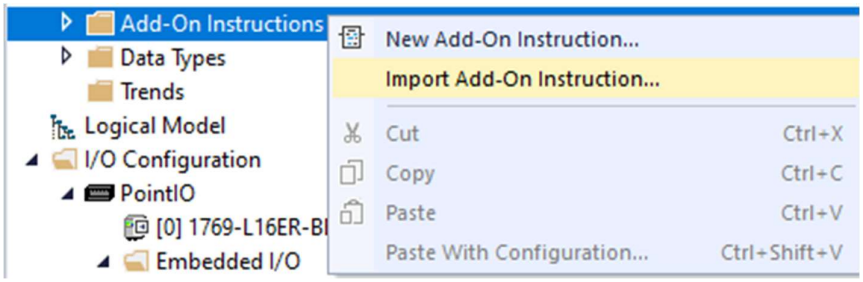
2.1 Requirements

Studio5000 V24 or higher.

MacTalk project for the JVL motor configuration.

2.2 Import AOIs and Data Types

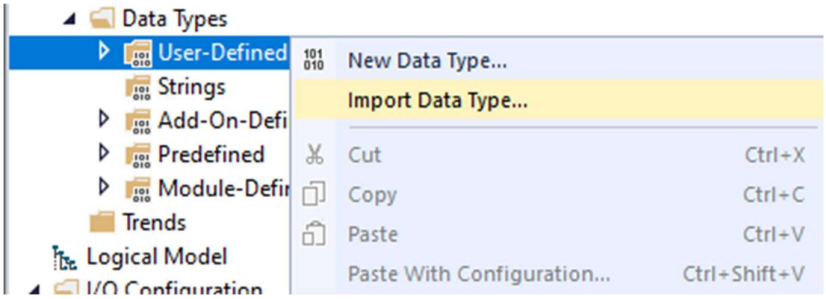
To import the Add-On Instruction and select Import Add-On Instruction and choose/open MAC_AOI_V1.L5X.



With these AOIs the Datatypes should be installed, too.

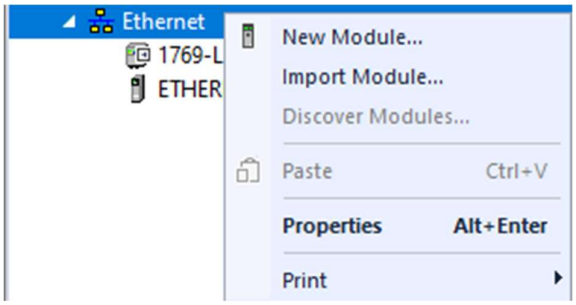
Otherwise do:

To import the Data Type and select Import User-Defined Data Types and choose/open JVL_MAC_Datatypes_V1.L5X.

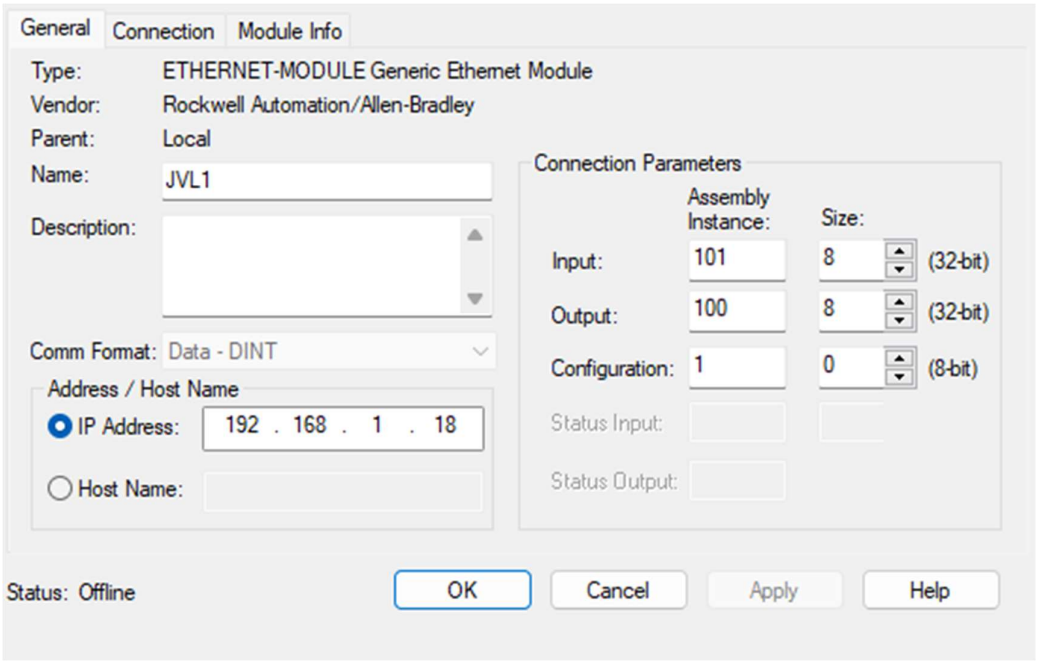


2.3 Add new MAC-Motor

To add a new MAC-Motor click right and choose New Module.



Then select the Generic Ethernet Module. Enter the Name and IP address and set the Connection Parameters as shown below.

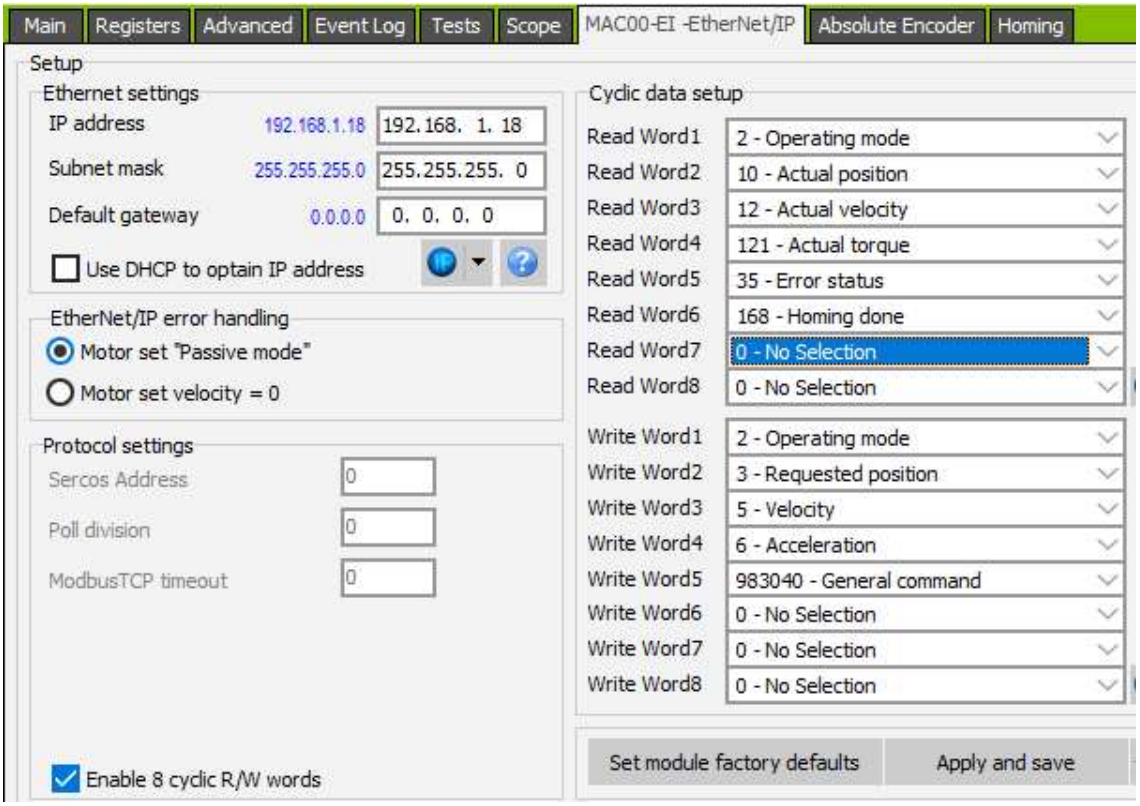


2.4 MacTalk Configuration

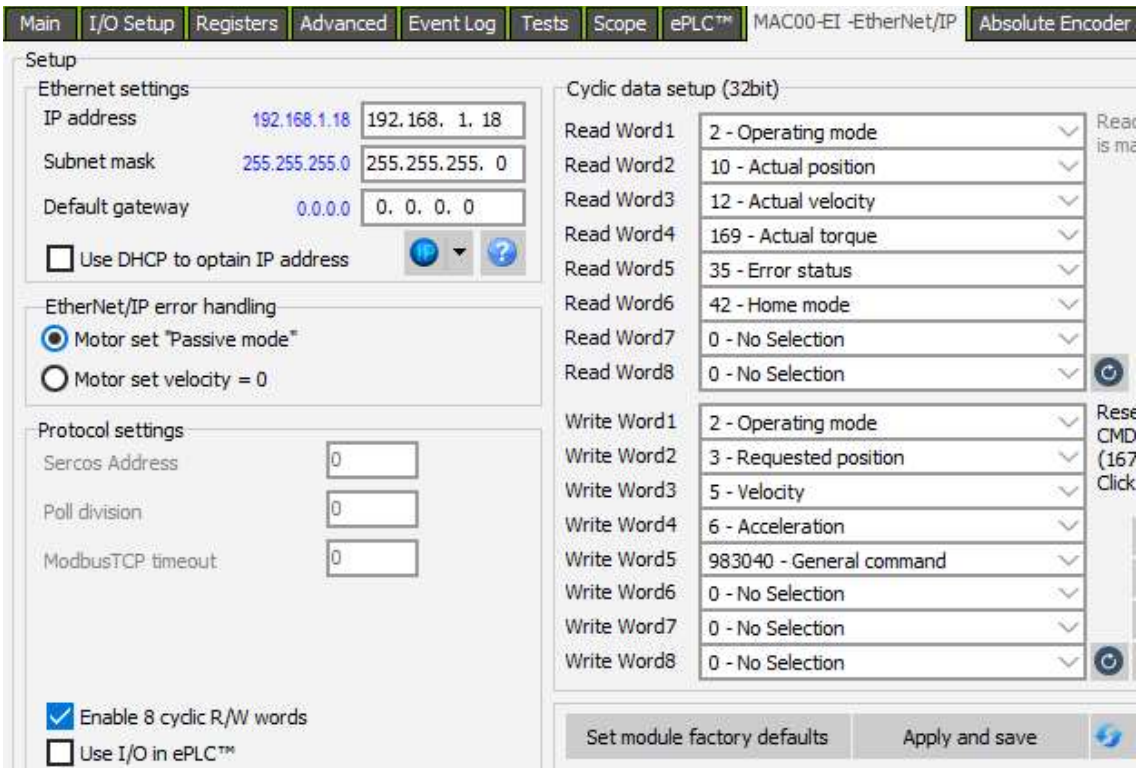
In the MacTalk project for your JVL motor, a cyclic data setup must be set in order to communicate with the Ethernet/IP AOIs. The contents of this setup depend on the type of JVL drive to be used. Use the cyclic data setup section of the MAC00-EI EtherNet/IP tab in MacTalk to configure the telegram.

> Once configured, please remember to click the Apply and Save button in order to save the setup configuration in the drive.

2.4.1 For MAC50-MAC141 A/K old Devices (older smaller MACs)



2.4.2 For MAC50F-MAC141F (F-Type) and MAC400 - MAC4500 Motors



3 MAC Addon Instructions

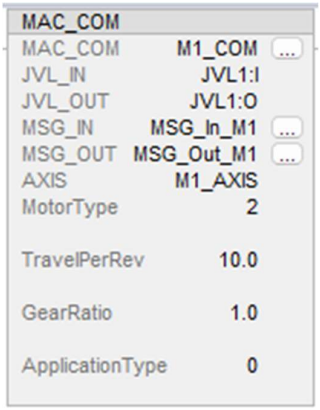
3.1 MAC_COM

3.1.1 Description

MAC_COM performs cyclic EtherNet/IP communication. The cyclic data setup is transferred between PLC input/output area and the axis data.

This AOI also calculates the position and velocity depending on the application type.

This AOI is required for all other motion control AOIs to operate.



3.1.2 InOut/Inputs

Input	Data Type
MAC_COM	MAC_COM
JVL_IN	AB:ETHERNET_MODULE_DINT_32Byte:I:0
JVL_OUT	AB:ETHERNET_MODULE_DINT_32Byte:O:0
MSG_IN	MESSAGE
MSG_OUT	MESSAGE
Axis	JVL _AXIS_MAC
MotorType	DINT
TravelPerRev	REAL
GearRatio	REAL
ApplicationType	DINT

3.1.2.1 MAC_COM

An Instance of the AOI MAC_COM

3.1.2.2 JVL_IN

This InOut-Parameter should be linked to a Controller Tag of the cylic read values of the ethernet module (8 read registers, 32 byte).

3.1.2.3 JVL_OUT

This InOut-Parameter should be linked to a Controller Tag of the cylic write values of the ethernet module (8 write registers, 32 byte).

3.1.2.4 MSG_IN

This InOut-Parameter should be linked to the reading Message Command. The message command is used for acyclic communication.

3.1.2.5 MSG_OUT

This InOut-Parameter should be linked to the writing Message Command. The message command is used for acyclic communication.

3.1.2.6 Axis

The axis InOut-Parameter should be linked to a Controller Tag of datatype JVL_Axis_MAC.

3.1.2.7 MotorType

For the MAC-Motors set the MotorType.

1 = MAC50-141A/K, 2 = MAC50-141F, MAC400/402, MAC1500-4500;

3 = MAC800-1200 with incremental encoder, 4 = MAC800-1200 with absolute encoder.

3.1.2.8 TravelPerRev

Set the Travel per Revolution in a linear application. For example for a screw pitch of 10.0 mm set it to 10.0.

3.1.2.9 GearRatio

Set the gear ratio of a gear box. For example a gear ratio of 5:1 is 5.0.

3.1.2.10 ApplicationType

Depending on the application type the position and velocity are calculated in all the AOIs.

0 = Position in counts and velocity in rpm.

1 = Linear Application. Position in units and velocity in units/s.

2 = Position in degree and velocity in rpm.

For example a linear application with 10 mm screwpitch:

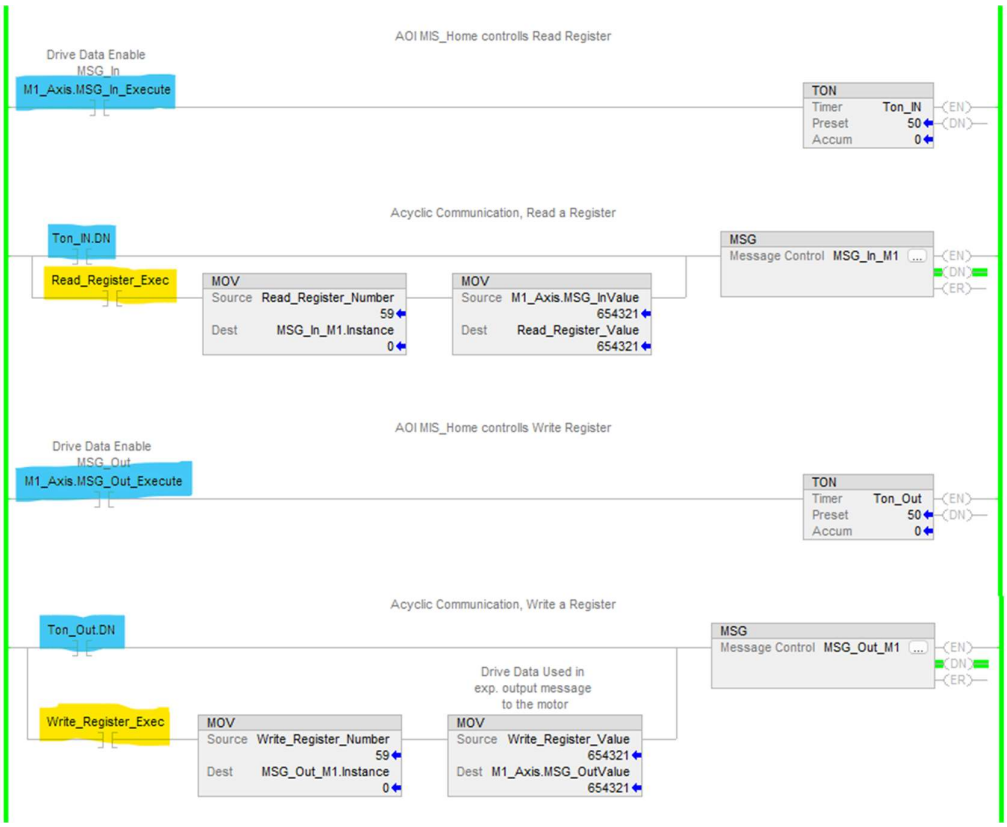
Set ApplicationType = 1, TravelPerRevolution = 10,

then set position in mm and velocity in mm/s in the other AOIs.

In Axis.Position_AppType you find the actual Position according to the Application Type.

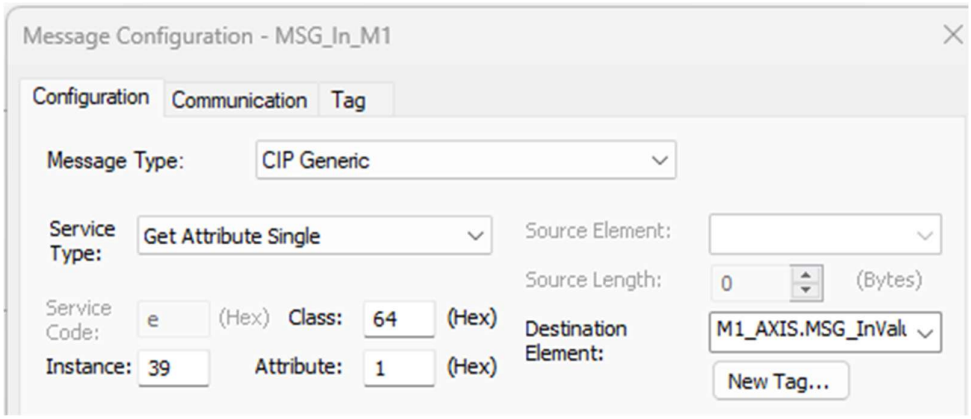
3.1.3 Acyclic Communication

For the acyclic communication you have to add Message Commands. This is needed for the AOI MAC_Home because you have to set additional parameters like TorqueLimit, Offset and homing velocity. You can also read and write other registers by this Message commands. Also set the Instance and the destination or source of this Message.



For the acyclic communication add these 4 rungs.

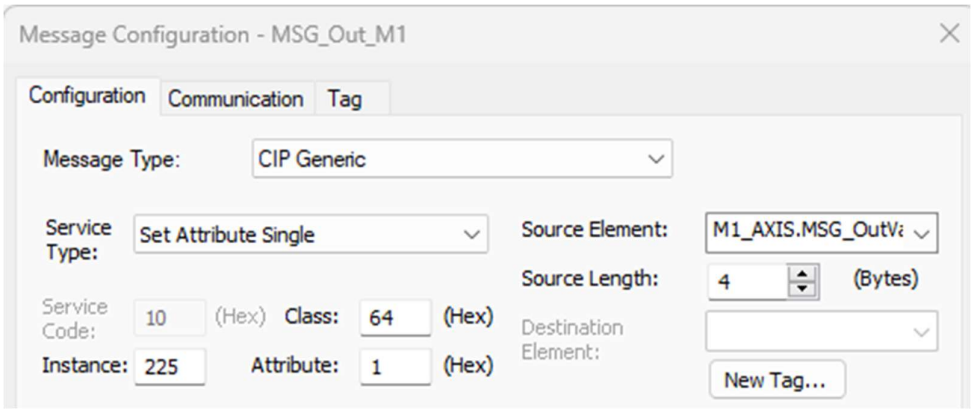
Configure the Message read command like this:



The Instance is the register number to read.

The Destination Element is MSG_InValue. It is an element of the Axis.

Configure the Message write command like this:



The Instance is the register number to write.

The Source Element is MSG_OutValue. It is an element of the Axis.

Set the Path of both Message Commands: Browse to the Ethernet Module:



3.2 MAC_Disable

3.2.1 Description

Place the drive in passive mode, removing all torque from the motor.

If the motor is running then it stops with the configured deceleration of the command that is in progress.

> Caution, this can result in a long stopping distance if the configured deceleration is low. It is recommended that JVL_MAC_Stop is used with suitable deceleration before then executing JVL_MAC_Disable.



3.2.2 InOut/Inputs

Input	Data Type
MAC_Disable	MAC_Disable
Axis	JVL _AXIS_MAC
Execute	BOOL

3.2.2.1 MAC_Disable

An Instance of the AOI MAC_Disable

3.2.2.2 Execute

A rising edge is required to start the motion command. If the input is given a rising edge whilst a motion command is currently running, then the current motion command is overriden/aborted. The input is not required to remain TRUE for the duration of the motion command.

3.2.2.3 Axis

The axis InOut-Parameter should be linked to a Controller Tag of datatype JVL_Axis_MAC.

3.2.3 Outputs

Output	Data Type
Busy	Bool
Done	Bool
Command Aborted	Bool
Error	Bool

3.2.3.1 Busy

Busy is TRUE whenever the motion command is running and the Error output is FALSE.

3.2.3.2 Done

Done is TRUE when the motor has entered passive mode.

> Note, if moving when the disable command was executed, Done = TRUE does not indicate that the motor has stopped. It is recommended that JVL_MAC_Halt is used with suitable deceleration before then executing JVL_MAC_Disable.

3.2.3.3 Command Aborted

The command was interrupted by the execution of another command.

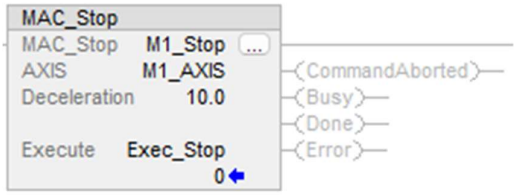
3.2.3.4 Error

Error is TRUE if there is an error in the drive while the motion command is running, given by the ANY_ERR signal in the drive status word (register 35 ERR_STAT).

3.3 MAC_Stop

3.3.1 Description

Brings the motor to a standstill with defined deceleration.



3.3.2 InOut/Inputs

Input	Data Type	Units
MAC_Stop	MAC_Stop	
Axis	JVL _AXIS_MAC	
Execute	Bool	
Deceleration	REAL	RPM/s

3.3.2.1 MAC_Stop

An Instance of the AOI MAC_Stop

3.3.2.2 Execute

A rising edge is required to start the motion command.
If the input is given a rising edge whilst a motion command is currently running, then the current motion command is overridden/aborted.
The input is not required to remain TRUE for the duration of the motion command.
Setting the value of Execute to FALSE during the motion command will not stop the motion command.

3.3.2.3 Deceleration

The target deceleration in RPM/s.

3.3.2.4 Axis

The axis InOut-Parameter should be linked to a Controller Tag of datatype JVL_Axis_MAC.

3.3.3 Outputs

Output	Data Type
Busy	Bool
Done	Bool
Command Aborted	Bool
Error	Bool

3.3.3.1 Busy

Busy is TRUE whenever the motion command is running (both when the motor is accelerating and when 'At Velocty') and the Error output is FALSE.

3.3.3.2 Done

Done is TRUE when the motor has come to a standstill.

3.3.3.3 Command Aborted

The command was interrupted by the execution of another command.

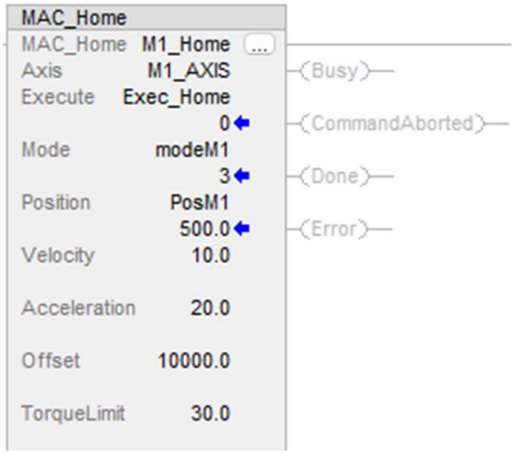
3.3.3.4 Error

Error is TRUE if there is an error in the drive while the motion command is running, given by the ANY_ERR signal in the drive status word (register 35 ERR_STAT).

3.4 MAC_Home

3.4.1 Description

MAC_HOME homes or references the motor position.



3.4.2 InOut/Inputs

Input	Data Type	Units
MAC_Home	MAC_Home	
Axis	JVL _AXIS_MAC	
Execute	Bool	
Mode	Int	
Position	Real	Counts, units or degree
Velocity	Real	RPM or units/s
Acceleration	Real	RPM/s
Offset	Real	Counts, units or degree
TorqueLimit	Real	%

3.4.2.1 MAC_Home

An Instance of the AOI MAC_Home

3.4.2.2 Execute

A rising edge is required to start the motion command.
If the input is given a rising edge whilst a motion command is currently running, then the current motion command is overriden/aborted.
The input is not required to remain TRUE for the duration of the motion command.
Setting the value of Execute to FALSE during the motion command will not stop the motion command.

3.4.2.3 Mode

Set the homing method.

Value	Name
0	Set Home Position
1	Home to Sensor
2	Home to Endstop
3	Set Absolute Encoder

0 - Set Home Position
The current motor actual position is set to the value of the Position input. The motor does not move. If the motor is running then it is stopped.

1 - Home to Sensor
The motor runs until it reaches the home sensor and then stops. The position of the motor is set relative to the point at which the home sensor was triggered. The exact homing operation is configured in MacTalk.

> Note: Please make sure to use Input AIN on the MAC device as the homing sensor. See MAC operating instructions for details of input wiring.

2 - Home to Endstop
The motor runs until the torque limit is reached. The position of the motor is set relative to the point at which the torque limit was reached.

3 - Set Absolute Encoder

The current motor Absolute Encoder position is set to the value of the Position input. The motor does not move. If the motor is running then it is stopped. Only available for motors with Absolute Encoder (MAC400-MAC3000). The range is $\pm 2^{24}$ (different to actual position: $\pm 2^{31}$)

3.4.2.4 Position

The new axis position, after referencing, in encoder counts. Only effective in homing mode 0 and 3.

3.4.2.5 Velocity

The target velocity for the homing move.

Only effective in homing modes 1 and 2.

3.4.2.6 Acceleration

The target acceleration and deceleration in RPM/s.

Only effective in homing modes 1 and 2.

3.4.2.7 TorqueLimit

The torque threshold for the motor to stop and home position to be set in %.

Valid range 0 – 100%. Only effective in homing mode 2.

3.4.2.8 Offset

Relative distance for offset move following home to sensor or home to torque limit in counts. The operation of Offset depends on the homing configuration in MacTalk.

Only effective in homing modes 1 and 2.

3.4.2.9 Axis

The axis InOut-Parameter should be linked to a Controller Tag of datatype JVL_Axis_MAC.

3.4.3 Outputs

Output	Data Type
Busy	Bool
Done	Bool
Command Aborted	Bool
Error	Bool

3.4.3.1 Busy

Busy is TRUE whenever the motion command is running and the Error output is FALSE.

3.4.3.2 Done

Done is TRUE when the homing sequence has completed and the axis has been successfully referenced.

3.4.3.3 Command Aborted

The command was interrupted by the execution of another command.

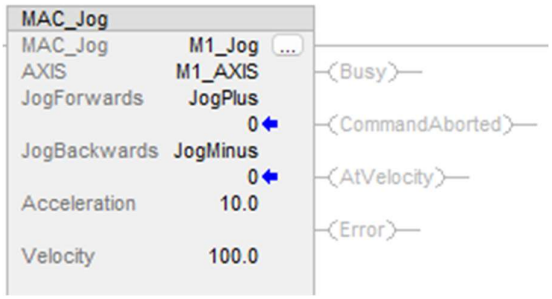
3.4.3.4 Error

Error is TRUE if there is an error in the drive while the motion command is running, given by the ANY_ERR signal in the drive status word (register 35 ERR_STAT).

3.5 MAC_Jog

3.5.1 Description

Run the motor at the specified velocity. The axis is stopped when the control inputs JogForwards and JogBackwards are reset.



3.5.2 InOut/Inputs

Input	Data Type	Units
MAC_Jog	MAC_Jog	
Axis	JVL _AXIS_MAC	
JogForwards	Bool	
JogBackwards	Bool	
Velocity	Real	RPM, units/s
Acceleration	Real	RPM/s

3.5.2.1 MAC_Jog

An Instance of the AOI MAC_Jog

3.5.2.2 JogForwards

When TRUE, the axis runs in the positive direction at the speed set in the Velocity input.

3.5.2.3 JogBackwards

When TRUE, the axis runs in the negative direction at the speed set in the Velocity input.

> Note: If JogForwards and JogBackwards are both set TRUE, the axis will come to a standstill.

3.5.2.4 Velocity

The target velocity in RPM. Giving a negative value will NOT reverse the motor direction.

3.5.2.5 Acceleration

The target acceleration and deceleration in RPM/s.

3.5.2.6 Axis

The axis InOut-Parameter should be linked to a Controller Tag of datatype JVL_Axis_MAC.

3.5.3 Outputs

Output	Data Type
Busy	Bool
AtVelocity	Bool
Command Aborted	Bool
Error	Bool

3.5.3.1 Busy

Busy is TRUE whenever the motion command is running (both when the motor is accelerating/decelerating and when 'AtVelocty') and the Error output is FALSE.

3.5.3.2 AtVelocity

At Velocity is TRUE when the drive has reached the motion command target velocity and the Error output is FALSE.

3.5.3.3 Command Aborted

The command was interrupted by the execution of another command or an error on the motor (e.g. position limit reached).

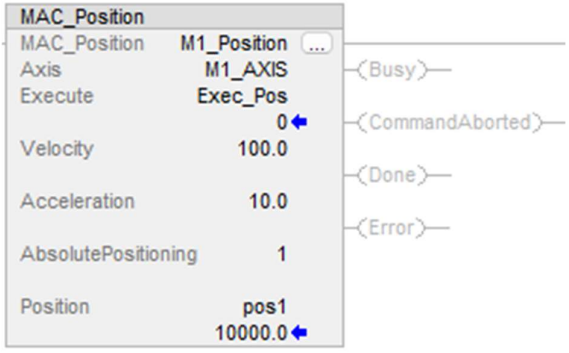
3.5.3.4 Error

Error is TRUE if there is an error in the drive while the motion command is running, given by the ANY_ERR signal in the drive status word (register 35 ERR_STAT).

3.6 MAC_Position

3.6.1 Description

Move the axis to the specified position, or by the specified distance.



3.6.2 InOut/Inputs

Input	Data Type	Units
MAC_Position	MAC_Position	
Axis	JVL _AXIS_MAC	
Execute	Bool	
ContinuousUpdate	Bool	
Position	Real	Counts, units or degree
Velocity	Real	RPM or units/s
Acceleration	Real	RPM/s
AbsolutePositioning	Bool	

3.6.2.1 MAC_Stop

An Instance of the AOI MAC_Stop

3.6.2.2 Execute

A rising edge is required to start the motion command.
If the input is given a rising edge whilst a motion command is currently running, then the current motion command is overriden/aborted.
The input is not required to remain TRUE for the duration of the motion command.

Setting the value of Execute to FALSE during the motion command will not stop the motion command.

3.6.2.3 Position

The axis target position, or distance to move. See AbsolutePositioning input.

3.6.2.4 Velocity

The target velocity for the positional move.

A negative velocity does not affect the direction of movement.

3.6.2.5 Acceleration

The target acceleration and deceleration in RPM/s.

3.6.2.6 AbsolutePositioning

Choose between absolute or relative positioning.

Value	Description
TRUE	Absolute Positioning Selected
FALSE	Relative Positioning Selected

3.6.2.7 Axis

The axis InOut-Parameter should be linked to a Controller Tag of datatype JVL_Axis_MAC.

3.6.3 Outputs

Output	Data Type
Busy	Bool
Done	Bool
Command Aborted	Bool
Error	Bool

3.6.3.1 Busy

Busy is TRUE whenever the motion command is running (both when the motor is accelerating and when 'At Velocty') and the Error output is FALSE.

3.6.3.2 Done

Done is TRUE when the positioning command has completed successfully.

3.6.3.3 Command Aborted

The command was interrupted by the execution of another command or an error on the motor (e.g. position limit reached).

3.6.3.4 Error

Error is TRUE if there is an error in the drive while the motion command is running, given by the ANY_ERR signal in the drive status word (register 35 ERR_STAT).

3.7 MAC_Reset

3.7.1 Description

MAC_Reset resets any errors or faults in the drive.



3.7.2 InOut/Inputs

Input	Data Type
MAC_Reset	MAC_Reset
Axis	JVL _AXIS_MAC
Execute	Bool

3.7.2.1 MAC_Reset

An Instance of the AOI MAC_Reset

3.7.2.2 Execute

A rising edge is required to start the command.
If the input is given a rising edge whilst a command is currently running, then the current command is overriden/aborted.
The input is not required to remain TRUE for the duration of the command.
Setting the value of Execute to FALSE during the command will not stop the command.

3.7.2.3 Axis

The axis InOut-Parameter should be linked to a Controller Tag of datatype JVL_Axis_MAC.

3.7.3 Outputs

Output	Data Type
Busy	Bool
Done	Bool
Command Aborted	Bool

3.7.3.1 Busy

Busy is TRUE whenever the command is in progress.

3.7.3.2 Done

Done is TRUE when the reset command has completed successfully.

3.7.3.3 Command Aborted

The command was interrupted by the execution of another command.