MCFG Block Required to Configure Axis Structure for Use in AOIs; Also provides diagnostics useful for interlocking logic properly

IO Functions for this demo program:
CN 1 SI 3 - Home Flag (selected for use in MAH)
CN 1 SI 4 - Registration Input (If registration is used in MAM or MAJ)
CN 1 SI 5 - Trigger High Speed Index Move when MHSI is enabled

Sample Interlocking Logic checking for valid Ethernet Connection, Alarms, Servo Ready Status, Servo Enable Status
Also checks to see if an AOI is already in use as several motion blocks will not execute if another AOI is already in progress
Yaskawa SigmaLogic Axis Structure Digital IO Status. Bits 0-7, CN13 Inputs 0-7, Used as Flag 65-72. Bits 8-15, CN13 Outputs 0-7, Used as Flag 73-80. Bits 16-22, CN1 Inputs 0-6, Used as Flag 81-87. Bits 23-25, CN1 Outputs 0-2, Used as Flag 88-90. The only reason for using the IOStatusBits variable instead of the Axis.I.IOStatusBits location was to be able to customize the labels/descriptions.
Motion Axis Home
"Set Position"

MAH Motion Axis Home Block Section
Consult help file for all the available homing methods and options
Home Type 3 has been selected here
(Search in Pos Direction, Search for SI3 (Flag 84), Stop and search for C-Pulse in the Neg direction, Perform an Offset Move in the Neg direction and Define Position)
MainRoutine - Ladder Diagram

Motion Axis Home

- MAH_Yaskawa
- MAH_1

Axis
HomeType: 3
Direction: 0
Use_C Pulse: 1
SetPosition: 0
Speed: 2
Accel_Decel: 20
TorqueLimit: 100
FlagNo: 84
OffsetDistance: 0.42
OffsetSpeed: 1
BackoffDistance: 0
CreepSpeed: 0.25
Axis_FaultCode: 0

HomeSearchReq
### MAJ Jog Block Section

**11**

- **JogFwd**
  - Axis Ready
  - Move
  - Source 0
  - Dest JogDirection 0

- **JogRev**
  - Axis Ready
  - Move
  - Source 1
  - Dest JogDirection 0

### MAM Positioning Block Section; Incremental and Absolute Moves selected by the value of the Move_Type Parameter

**12**

- **IncMoveStart**
  - Move
  - Source IncDistance 10.0
  - Dest MAM_Position 2.5

**13**

- **AbsMoveStart**
  - Move
  - Source AbsPosition 2.5
  - Dest MAM_Position 2.5
IncMoveStart - ONS - Axis_ReadyForMotion - MoveReq

AbsMoveStart

Motion Axis Move The axis has reached the end Position ("Position Completed")

MoveReq - MAM_1.PC - StopReq

MoveReq

MAM_Yaskawa

Motion Axis Move
MAM_Yaskawa MAM_1

Axis Move_Type MAM_MoveType
0

Position MAM_Position
2.5

Speed Speed
5.0

Accel_Rate Accel
20.0

Decel_Rate Decel
20.0

RegistrationUse
0

Reg_Position
2

Reg_Speed
2

Reg_Accel
20

Reg_Decel
20

Axis_FaultCode
0
MHSI Motion High Speed Index Block Section
Move Mode = 0 (Relative Move based on Distance input)
Move Type = 0 (Single Move instead of repeating moves)
CalcMethod = 0 (Use Accel/Decel)
Trigger Flag = Flag 86 (CN 1 SI 5)
Axis.I.HSI_Moving and Axis.I.HSI_Done bits are linked to CN 13 DO 6 and DO 7 just to show how the moving and done status can be accessed and used.
The advantage to this type of move over the traditional MAM block is response time.

The Yaskawa SigmaLogic controller provides a motion axis high speed index (MHSI) that can be used for quick moves.

Yaskawa SigmaLogic
Axis Structure
Structure of data coming from the Yaskawa SigmaLogic controller.
Axis.I.HSI_Moving

RSLogix 5000
Yaskawa SigmaLogic
Axis Structure
Structure of data coming from the Yaskawa SigmaLogic controller.
Axis.I.HSI_Done

RSLogix 5000
MAB Blended Move Block Section
Note: All positions are absolute
After execution is started, the move is commanded to Blend1_Position using the Blend1 Accel, Decel and Speed
After reaching Blend1_Position, the axis will continue on to Blend2_Position at the Blend2 Accel, Decel and Speed without stopping

MAB Yaskawa
Motion Axis Blend
MAB_1
EN
B1_DN
B1_IP
B2_DN
B2_IP
ER
FLT_RDY
FLT_BSY

Motion Axis Blend
MAB_1
Accel
20.0
Decel
20.0
Speed
5.0
Position
5.0

MoveBlend1ErrorCode
0
MoveBlend2ErrorCode
0
MAG Electronic Gearing Section
When enabled, the motor follows the external encoder input at a ratio of Slave_Counts/Master_Counts.
Superimposed Move allows the user to add a move on top of the gearing operation. This is enabled whenever SuperUse is set to 1.
Superimposed Move parameters can be updated even when gearing is enabled. The AOI looks at these parameters on the rising edge of SuperStart.

Sequence Table Section; This executes a pre-programmed Sequence Table in SigmaLogic
Note: No Sequence Complete Bit exists so the Sequence Table in SigmaLogic has been programmed to turn on General Flag 64 (Axis.I.FlagStatusBit2.31) after the last step is finished. This provides feedback that the sequence is complete. Flag 64 is reset (turned OFF) when the enable to the MSQR block is removed.
Sequence Edit Type was selected to be 3 (Speed and Distance); This was picked arbitrarily for demo purposes. Whenever the SeqEdit bit it triggered, the Speed and Distance for the step (EditStepNum) will be modified. Note: These changes take effect immediately but are not saved when power is cycled.

MAS Stop Block to Stop Motion Regardless of the Current State of the Axis
Section to Scale Feedback parameters from SigmaLogic into REAL for display purposes and easy use in comparison functions

**Divide**

<table>
<thead>
<tr>
<th>Source A</th>
<th>Source B</th>
<th>Dest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axis.I.Position</td>
<td>2500</td>
<td>ActualPosition</td>
</tr>
<tr>
<td>Axis.I.Speed</td>
<td>0</td>
<td>ActualVelocity</td>
</tr>
<tr>
<td>Axis.I.Torque</td>
<td>-1300</td>
<td>ActualTorque</td>
</tr>
</tbody>
</table>

MTRQ Motion Axis Torque Block
TorqueStart will start the motor spinning in torque mode. The torque will be clamped at the Torque setpoint (SP). If the torque has been achieved for at least 500ms, then it is considered successful. If the torque has not been achieved for 5 seconds, it is assumed that the torque operation has failed.
Yaskawa SigmaLogic
Axis Structure
Structure of data
coming from the
Yaskawa SigmaLogic
controller.

MCLK Motion Set Clock Block
When Enabled, the MCLK AOI sends over the Year, Month, Day, Hour, Minute and Second to the SigmaLogic Axis
This example uses a built-in System function to read the date and time and store it into a User-Defined Data Type (structure) called TIME
The variable LocalDateTime was defined using the TIME data type. The details of the TIME UDT are found in the DataTypes -> User-Defined folder in the Controller Organizer
The TIME structure is then copied into individual INT variables for use with the MCLK AOI.
MainRoutine - Ladder Diagram

34

Move Source LocalDateTime.Year 2015
Dest

Move Source LocalDateTime.Month 8
Dest

Move Source LocalDateTime.Day 7
Dest

Move Source LocalDateTime.Hour 7
Dest

Move Source LocalDateTime.Minute 50
Dest

Move Source LocalDateTime.Second 50
Dest

35

UpdateServoClock

Motion Set Clock

Motion Set Clock
MCLK_Yaskawa MCLK_1
Axis
Year
2015
Month
8
Day
7
Hour
Minute
Second
Axis_FaultCode
MPLS Motion Programmable Limit Switch Block Section
Switch 1 defined as: (Flag 73) CN 13 DO 00 is ON when 0 <= ActualPosition <= 2
Switch 2 defined as: (Flag 74) CN 13 DO 01 is ON when 1.5 <= ActualPosition <= 4
Switches 3 & 4 not configured

Structure of parameters needed for PLS switch operation using MPLS_Yaskawa
If OnPosition < OffPosition output is ON between them.
If OnPosition > OffPosition output is OFF between them and ON everywhere else.

Structure of parameters needed for PLS switch operation using MPLS_Yaskawa
Assigns a Flag number to the PLS output channel. Must be a physical output Flag 73-80, 88-90.

**MOV**
**Source** Switch1OnPosition 0.5
**Dest** Switch1Data.OnPosition 0.5

**MOV**
**Source** Switch2OnPosition 1.5
**Dest** Switch2Data.OnPosition 1.5

**MOV**
**Source** Switch1OffPosition 2.0
**Dest** Switch1Data.OffPosition 2.0

**MOV**
**Source** Switch2OffPosition 4.0
**Dest** Switch2Data.OffPosition 4.0

**MOV**
**Source** 73
**Dest** Switch1Data.FlagNumber 73

**MOV**
**Source** 74
**Dest** Switch2Data.FlagNumber 74
Write Digital Outputs to SigmaLogic (CN13 DO 0-7 and CN1 SO 1-3)
Code above writes to the OutputCommandBits variable and this MOV instruction sends the command to SigmaLogic

Yaskawa SigmaLogic
Axis Structure
Digital Output commands.
Bits 0-7 correspond to CN13 Digital Outputs 0-7, used as Flag 73-80.
Bits 8-10 correspond to CN1 Digital Outputs 0-2 used as Flag 88-90