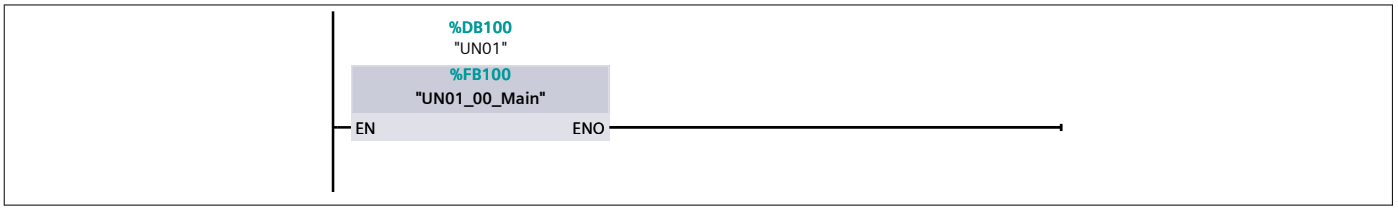
Program blocks

Main [OB1]

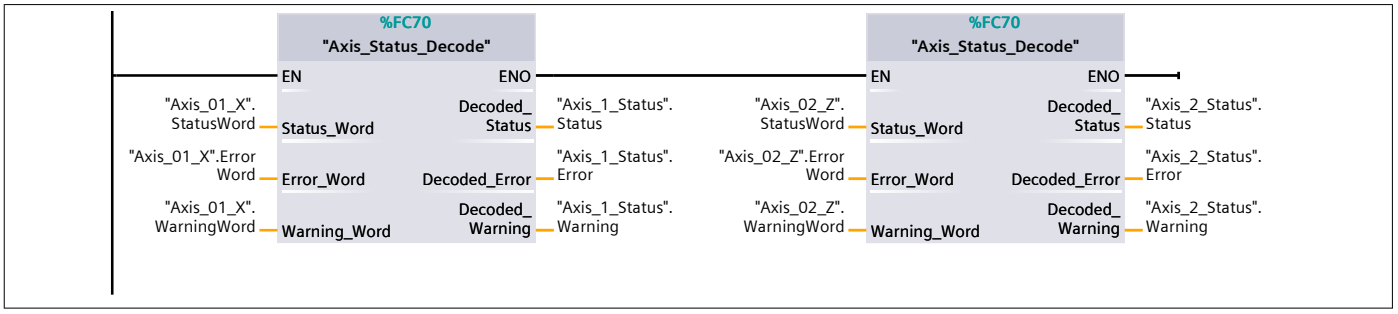
Main Properties					
General					
Name	Main	**Number**	1	**Type**	OB
Language	LAD	**Numbering**	Automatic		
Information					
Title	"Main Program Sweep (Cycle)"	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value
Input		
Initial_Call	Bool	
Remanence	Bool	
Temp		
Constant		

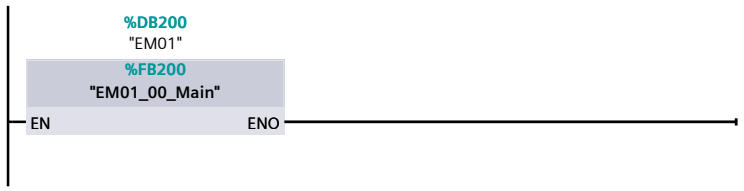
Network 2: Unit Processing



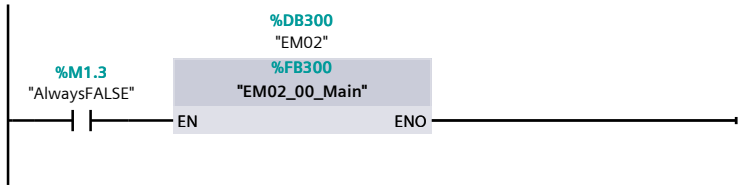
Network 3:



Network 4: EM 01 Processing


%DB200
"EM01"
%FB200
"EM01_00_Main"
EN
ENO

Network 5:


%DB300
"EM02"
%M1.3
"AlwaysFALSE"
%FB300
"EM02_00_Main"
EN
ENO

Program blocks / System blocks / Program resources

MC_POWER [FB1206]

MC_POWER Properties					
General					
Name	MC_POWER	**Number**	1206	**Type**	FB
Language	Motion_DB	**Numbering**	Automatic		
Information					
Title		**Author**	SIMATIC	**Comment**	
Family	MC_1500	**Version**	4.0	**User-defined ID**	

Name	Data type	Default value	Retain
▼ Input			
Axis	TO_Axis		
Enable	Bool	false	Non-retain
StartMode	DInt	1	Non-retain
StopMode	Int	0	Non-retain
▼ Output			
Status	Bool	false	Non-retain
Busy	Bool	false	Non-retain
Error	Bool	false	Non-retain
ErrorId	Word	16#0	Non-retain
InOut			
Static			

Program blocks / System blocks / Program resources

MC_HALT [FB1200]

MC_HALT Properties					
General					
Name	MC_HALT	**Number**	1200	**Type**	FB
Language	Motion_DB	**Numbering**	Automatic		
Information					
Title		**Author**	SIMATIC	**Comment**	
Family	MC_1500	**Version**	4.0	**User-defined ID**	

Name	Data type	Default value	Retain
▼ Input			
Axis	TO_SpeedAxis		
Execute	Bool	false	Non-retain
Deceleration	LReal	-1.0	Non-retain
Jerk	LReal	-1.0	Non-retain
AbortAcceleration	Bool	false	Non-retain
▼ Output			
Done	Bool	false	Non-retain
Busy	Bool	false	Non-retain
CommandAborted	Bool	false	Non-retain
Error	Bool	false	Non-retain
ErrorId	Word	16#0	Non-retain
InOut			
Static			

Program blocks / System blocks / Program resources

MC_RESET [FB1207]

MC_RESET Properties					
General					
Name	MC_RESET	**Number**	1207	**Type**	FB
Language	Motion_DB	**Numbering**	Automatic		
Information					
Title		**Author**	SIMATIC	**Comment**	
Family	MC_1500	**Version**	4.0	**User-defined ID**	

Name	Data type	Default value	Retain
▼ Input			
Axis	TO_Object		
Execute	Bool	false	Non-retain
Restart	Bool	false	Non-retain
▼ Output			
Done	Bool	false	Non-retain
Busy	Bool	false	Non-retain
CommandAborted	Bool	false	Non-retain
Error	Bool	false	Non-retain
ErrorId	Word	16#0	Non-retain
InOut			
Static			

Program blocks / System blocks / Program resources

MC_HOME [FB1201]

MC_HOME Properties					
General					
Name	MC_HOME	**Number**	1201	**Type**	FB
Language	Motion_DB	**Numbering**	Automatic		
Information					
Title		**Author**	SIMATIC	**Comment**	
Family	MC_1500	**Version**	4.0	**User-defined ID**	

Name	Data type	Default value	Retain
▼ Input			
Axis	TO_Axis		
Execute	Bool	false	Non-retain
Position	LReal	0.0	Non-retain
Mode	Int	0	Non-retain
▼ Output			
ReferenceMarkPosition	LReal	0.0	Non-retain
Done	Bool	false	Non-retain
Busy	Bool	false	Non-retain
CommandAborted	Bool	false	Non-retain
Error	Bool	false	Non-retain
ErrorId	Word	16#0	Non-retain
InOut			
Static			

Program blocks / System blocks / Program resources

MC_MOVEJOG [FB1203]

MC_MOVEJOG Properties					
General					
Name	MC_MOVEJOG	**Number**	1203	**Type**	FB
Language	Motion_DB	**Numbering**	Automatic		
Information					
Title		**Author**	SIMATIC	**Comment**	
Family	MC_1500	**Version**	4.0	**User-defined ID**	

Name	Data type	Default value	Retain
▼ Input			
Axis	TO_SpeedAxis		
JogForward	Bool	false	Non-retain
JogBackward	Bool	false	Non-retain
Velocity	LReal	100.0	Non-retain
Acceleration	LReal	-1.0	Non-retain
Deceleration	LReal	-1.0	Non-retain
Jerk	LReal	-1.0	Non-retain
PositionControlled	Bool	true	Non-retain
▼ Output			
InVelocity	Bool	false	Non-retain
Busy	Bool	false	Non-retain
CommandAborted	Bool	false	Non-retain
Error	Bool	false	Non-retain
ErrorId	Word	16#0	Non-retain
InOut			
Static			

Program blocks / System blocks / Program resources

MC_MOVERELATIVE [FB1204]

MC_MOVERELATIVE Properties					
General					
Name	MC_MOVERELATIVE	**Number**	1204	**Type**	FB
Language	Motion_DB	**Numbering**	Automatic		
Information					
Title		**Author**	SIMATIC	**Comment**	
Family	MC_1500	**Version**	4.0	**User-defined ID**	

Name	Data type	Default value	Retain
▼ Input			
Axis	TO_PositioningAxis		
Execute	Bool	false	Non-retain
Distance	LReal	0.0	Non-retain
Velocity	LReal	-1.0	Non-retain
Acceleration	LReal	-1.0	Non-retain
Deceleration	LReal	-1.0	Non-retain
Jerk	LReal	-1.0	Non-retain
▼ Output			
Done	Bool	false	Non-retain
Busy	Bool	false	Non-retain
CommandAborted	Bool	false	Non-retain
Error	Bool	false	Non-retain
ErrorId	Word	16#0	Non-retain
InOut			
Static			

Program blocks / System blocks / Program resources

MC_MOVEABSOLUTE [FB1202]

MC_MOVEABSOLUTE Properties					
General					
Name	MC_MOVEABSOLUTE	**Number**	1202	**Type**	FB
Language	Motion_DB	**Numbering**	Automatic		
Information					
Title		**Author**	SIMATIC	**Comment**	
Family	MC_1500	**Version**	4.0	**User-defined ID**	

Name	Data type	Default value	Retain
▼ Input			
Axis	TO_PositioningAxis		
Execute	Bool	false	Non-retain
Position	LReal	0.0	Non-retain
Velocity	LReal	-1.0	Non-retain
Acceleration	LReal	-1.0	Non-retain
Deceleration	LReal	-1.0	Non-retain
Jerk	LReal	-1.0	Non-retain
Direction	Int	1	Non-retain
▼ Output			
Done	Bool	false	Non-retain
Busy	Bool	false	Non-retain
CommandAborted	Bool	false	Non-retain
Error	Bool	false	Non-retain
ErrorId	Word	16#0	Non-retain
InOut			
Static			

Program blocks / 0_UN01_ExampleMachine

UN01_CM01_OperationLocal [FB101]

UN01_CM01_OperationLocal Properties					
General					
Name	UN01_CM01_Operation-Local	**Number**	101	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	Handle commands that are requests to change to a particular state
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
Wrk_StartWarning_TON	TON_TIME		Non-retain
Temp			
Constant			

Network 2: Clear faults conditions

CLEAR FAULTS CONDITIONS

The Unit Conditions Set Here Are Used to Clear Faults and Initiate a State Transition of the Current Mode Operation Procedure from the Aborted State:
1) To the Clearing State, If the Clearing State is Enabled
2) To the Stopped State, If the Clearing State is Disabled

Network 3: Reset Conditions

RESET CONDITIONS

The Unit Condition Set Here Is Used to Initate the Start Warning Cycle That Results in a State Transition of the Current Mode Operation Procedure from the Stopped State:
1) To the Resetting State, If the Resetting State is Enabled
2) To the Idle State, If the Resetting State is Disabled

Network 4: Start conditions

START CONDITIONS

The Unit Condition Set Here is Used to
1) If the Idle State is Enabled, Initiate a State Transition of the Current Mode Operation Procedure:
a) From the Idle State to the Starting State, If the Starting State Is Enabled
b) From the Idle State to the Execute State, If the Starting State Is Disabled

2) If the Idle State is Disabled, Initiate the Start Warning Cycle That Results in
a State Transition of the Current Mode Operation Procedure from the Stopped State:
a) To the Resetting State, If the Resetting State Is Enabled
b) To the Starting State, If the Resetting State is Disabled and the Starting State Is Enabled
c) To the Execute State, If Bothe the Resetting and Starting States Are Disabled

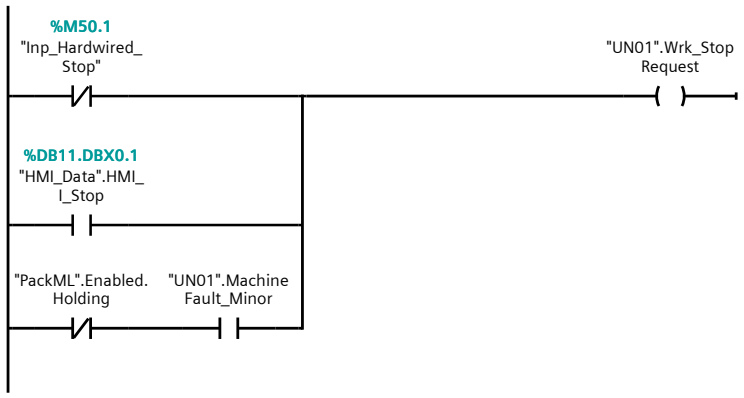
Network 5: Stop Conditions

***** Changed polarity of Inp_Hardwired_Stop to match it being a N.C. contact

STOP CONDITIONS

The Unit Condition Set Here is Used to Initaite a State Transition of the Current Mode Operation Procedure to the:
1) Stopping State, If the Stopping State Is Enabled
2) Stopped State, If the Stopping State Is Disabled

From Any of the Following States:
Resetting, Idle, Starting, Execute, Holding, Held, UnHolding, Suspending, Suspended, UnSuspending, Completing

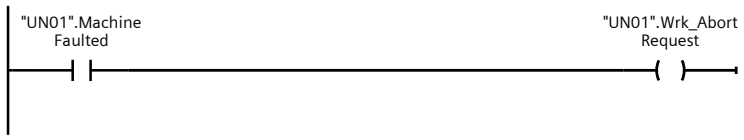


Network 6: Abort Conditions

ABORT CONDITIONS

The Unit Condition Set Here is Used to Initaite a State Transition of the Current Mode Operation Procedure to the:
1) Aborting State, If the Aborting State Is Enabled
2) Aborted State, If the Aborting State Is Disabled

From Any of the Following States:
Resetting, Idle, Starting, Execute, Holding, Held, UnHolding, Suspending, Suspended, UnSuspending, Completing, Stopped, Stopping, Clearing



Network 7: Hold Conditions

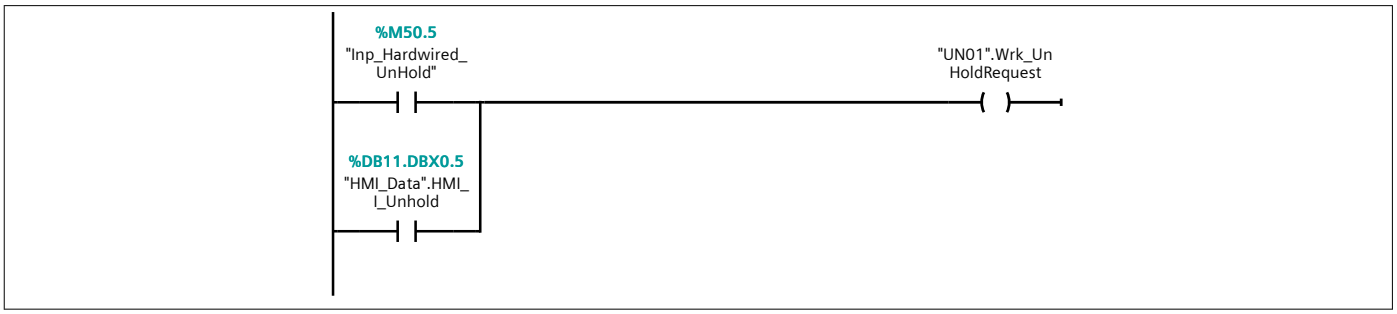
HOLD CONDITIONS

The Unit Condition Set Here is Used to Initiate a State Transition of the Current Mode Operation Procedure from the Execute State to the:
1) Holding State, If the Holding State is Enabled
2) Held State, If the Holding State is Disabled

Network 8: Un-hold conditions

UN-HOLD CONDITIONS

The Unit Condition Set Here is Used to Initiate a State Transition of the Current Mode Operation Procedure from the Held State to the:
1) UnHolding State, If the UnHolding State is Enabled
2) Execute State, If the UnHolding State is Disabled



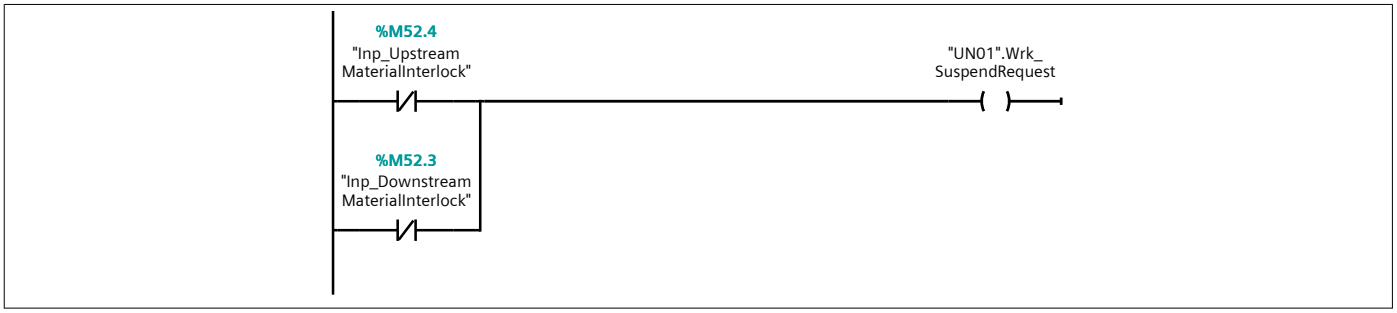
Network 9: Suspend Conditions

SUSPEND CONDITIONS

If any upstream or downstream material interlocks are not satisfied a suspend request will be made.

If a suspend request is made while the Machine is in the Execute State, Then a State Transition Is Initiated From the Execute State to the:
1) Suspending State, If the Suspending State Is Enabled
2) Suspended State, If the Suspending State Is Disabled

When ALL interlock conditions Are Satisfied, Then a State Transition Is Initiated From the Suspended State to the:
1) UnSuspending State, If the UnSuspending State Is Enabled
2) Execute State, If the UnSuspending State Is Disabled



Network 10: Complete Condition

COMPLETE CONDITION

The Unit Condition Set Here is Used to Indicate That the Unit Has Produced the Desired Quantity of Good Product. It is Used for Processes That Run Desired Batch or Job Quantities And Automatically Stop to Conserve Materials. Such Processes Take Advantage of the Completing And Complete States of the PackML Model.

This Unit Condition is Generated By Comparing the Quantity of Good Product Counted or Calculated By the Program (In this Example, the Information from the Performance Tracking AOI is Used to Calculate Good Product *), to the Batch Count Setpoint for the Current Recipe.

The Condition Initiates a State Complete Transition from the Execute State to the:
1) Completing State, If the Completing State Is Enabled
2) Complete State, If the Completing State Is Disabled

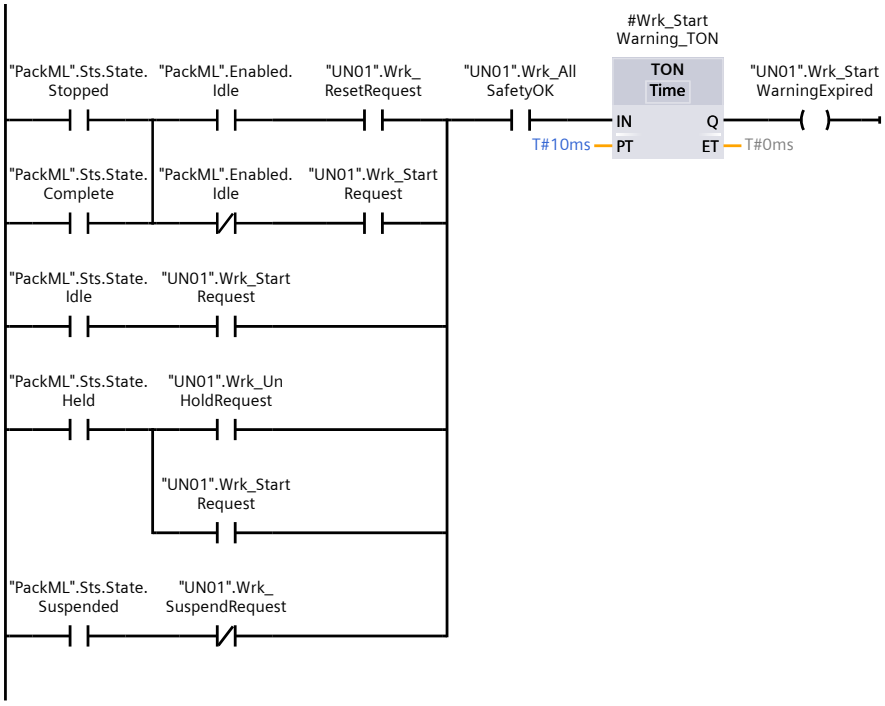
* The Production Counting Data Used By the Performance Tracking FB Must Be Generated By the Program and Input Into the UN01 DB.
It May Be Preferred to Use the Production Counting Data Directly for Setting this Condition.

Network 11: Unit Start Logic

UNIT START LOGIC

This Unit Start Logic is Used to Provide a Warning Cycle Time Before Motion Occurs on the Machine.
This Warning Cycle Should be Used Upon Initiating All State Transition Commands That Ultimately Result in Transition to the Execute State,
And May be Used to Provide Audible And/Or Visual Notification to the Operator That Motion Will Occur Upon Completion.

In case of Start warning buzzer included in the logic increase the timer preset to 1 or 2 sec



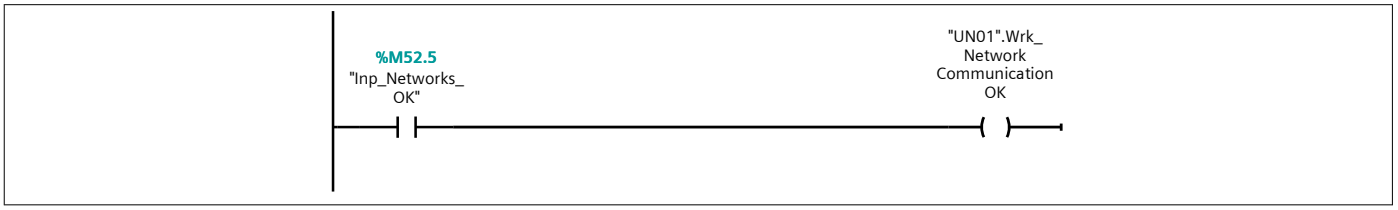
Program blocks / 0_UN01_ExampleMachine

UN01_CM03_FaultHandler [FB102]

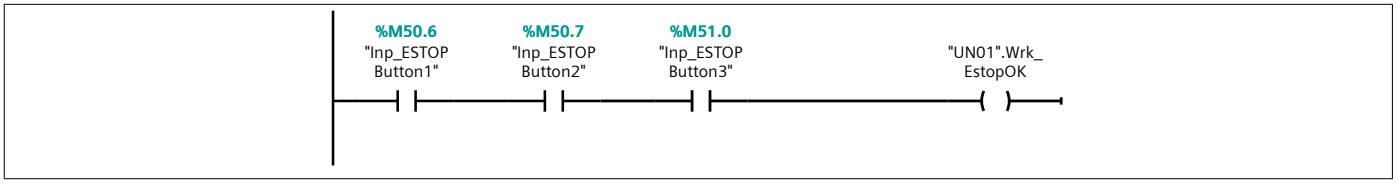
UN01_CM03_FaultHandler Properties					
General					
Name	UN01_CM03_FaultHan-dler	**Number**	102	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title	Handle unit faults	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
Temp_Dint	DInt	0	Non-retain
Temp_Bool	Bool	false	Non-retain
Temp			
Constant			

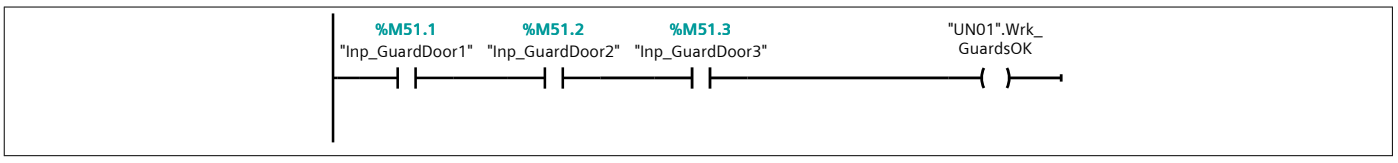
Network 2: Communication faults



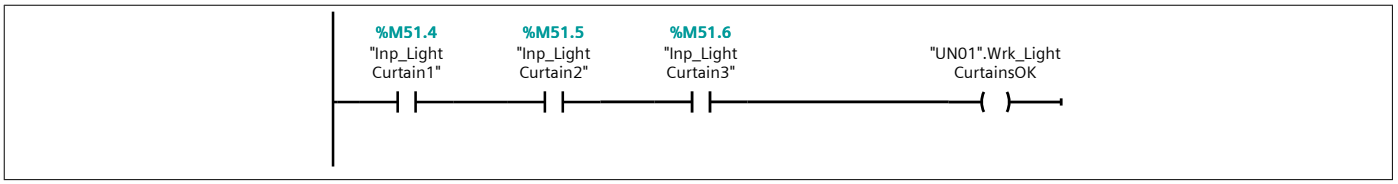
Network 3: E-Stop Collection



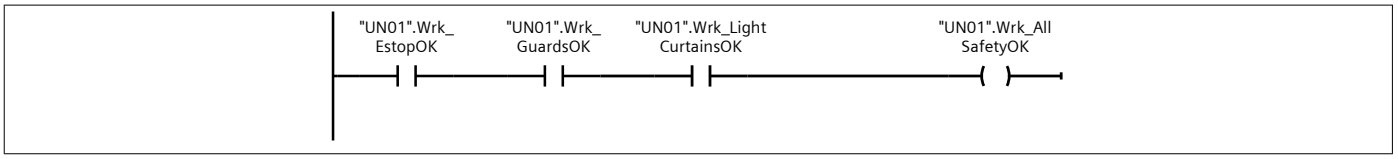
Network 4: Guard door collection



Network 5: Light curtain collection

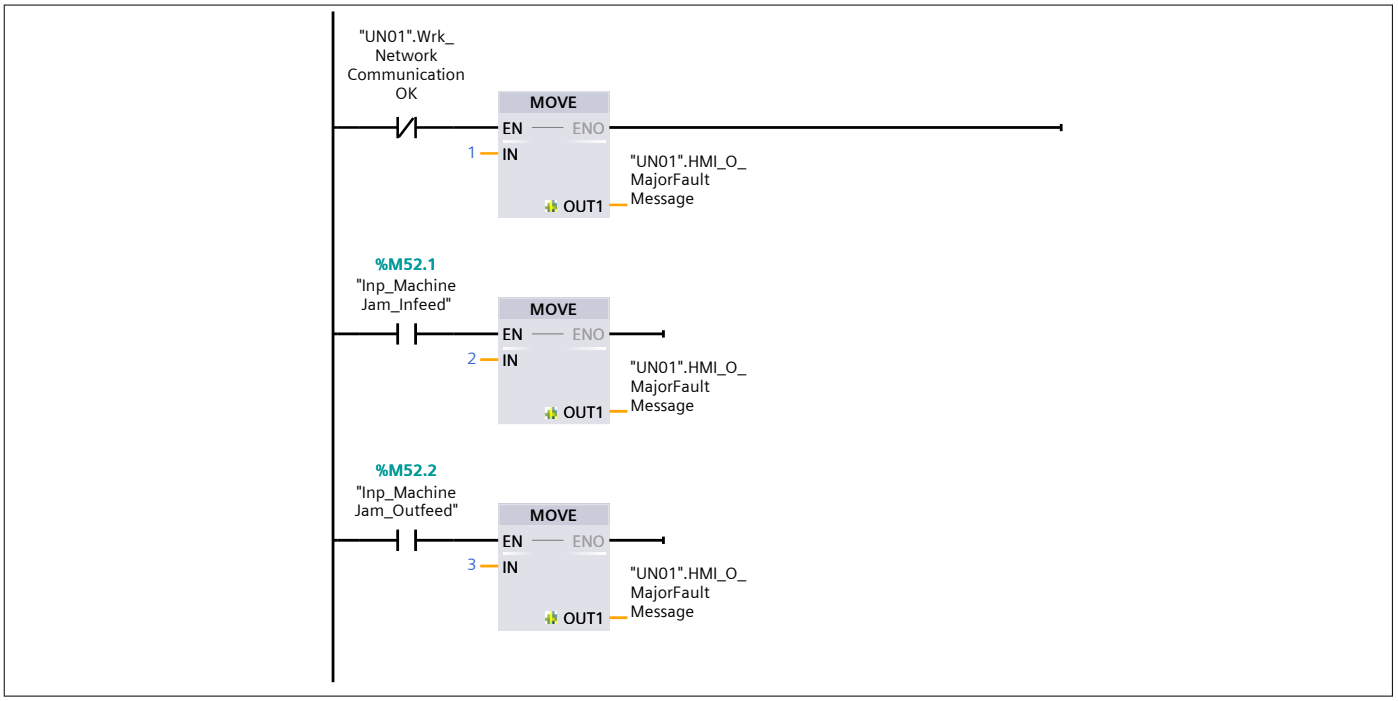


Network 6: All safety inputs OK



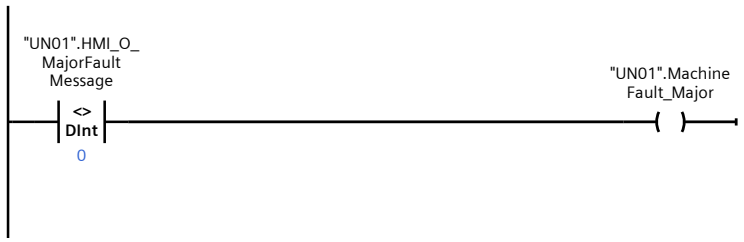
Network 7: Machine major faults

Add major machine faults that should result in an abort request to the machine

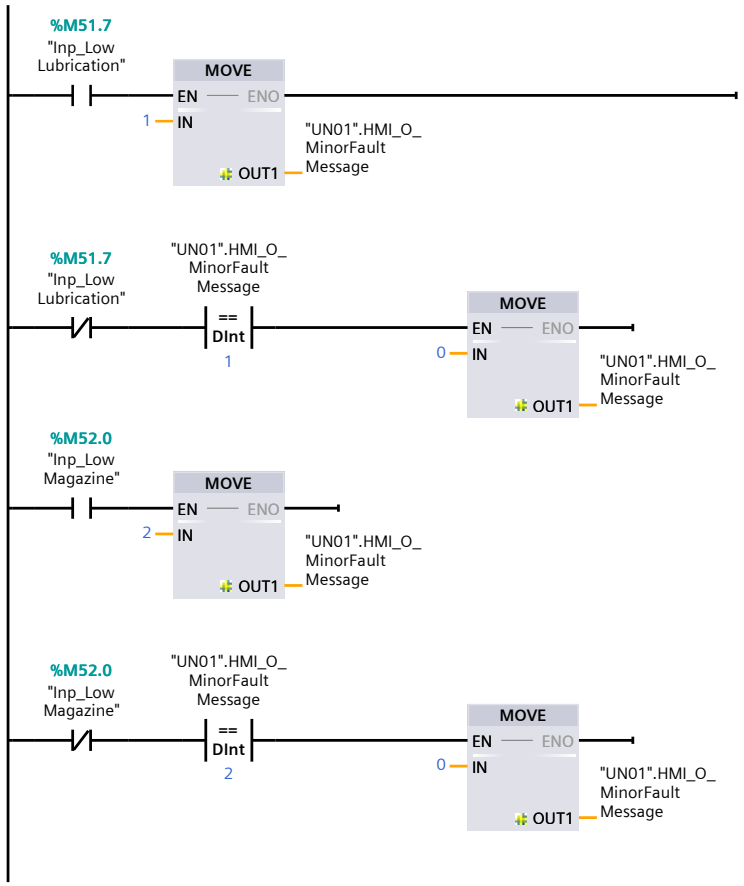


Network 8: General Unit Major Fault - WIll result in machine abort request.

Add machine-specific major fault conditions as rung in conditions.

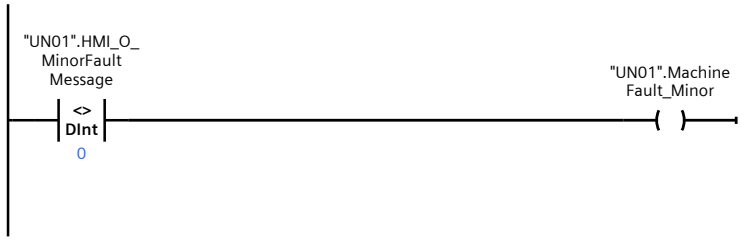


Network 9: Machine Minor faults

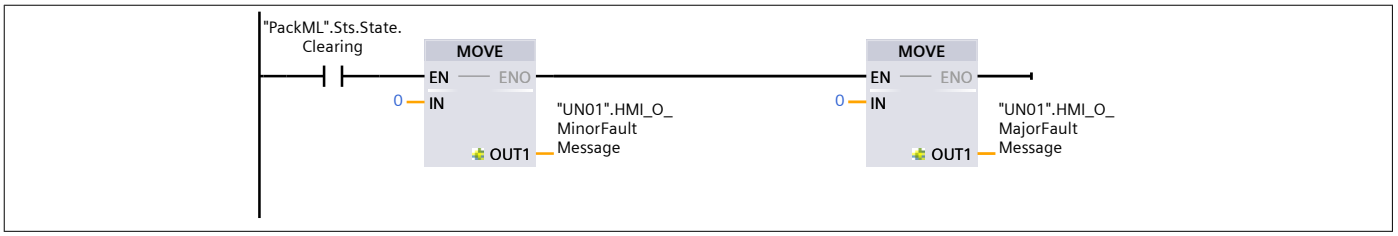


Network 10: General unit minor fault

Will result in machine hold request if holding state is enabled or stop if holding state is not enabled.

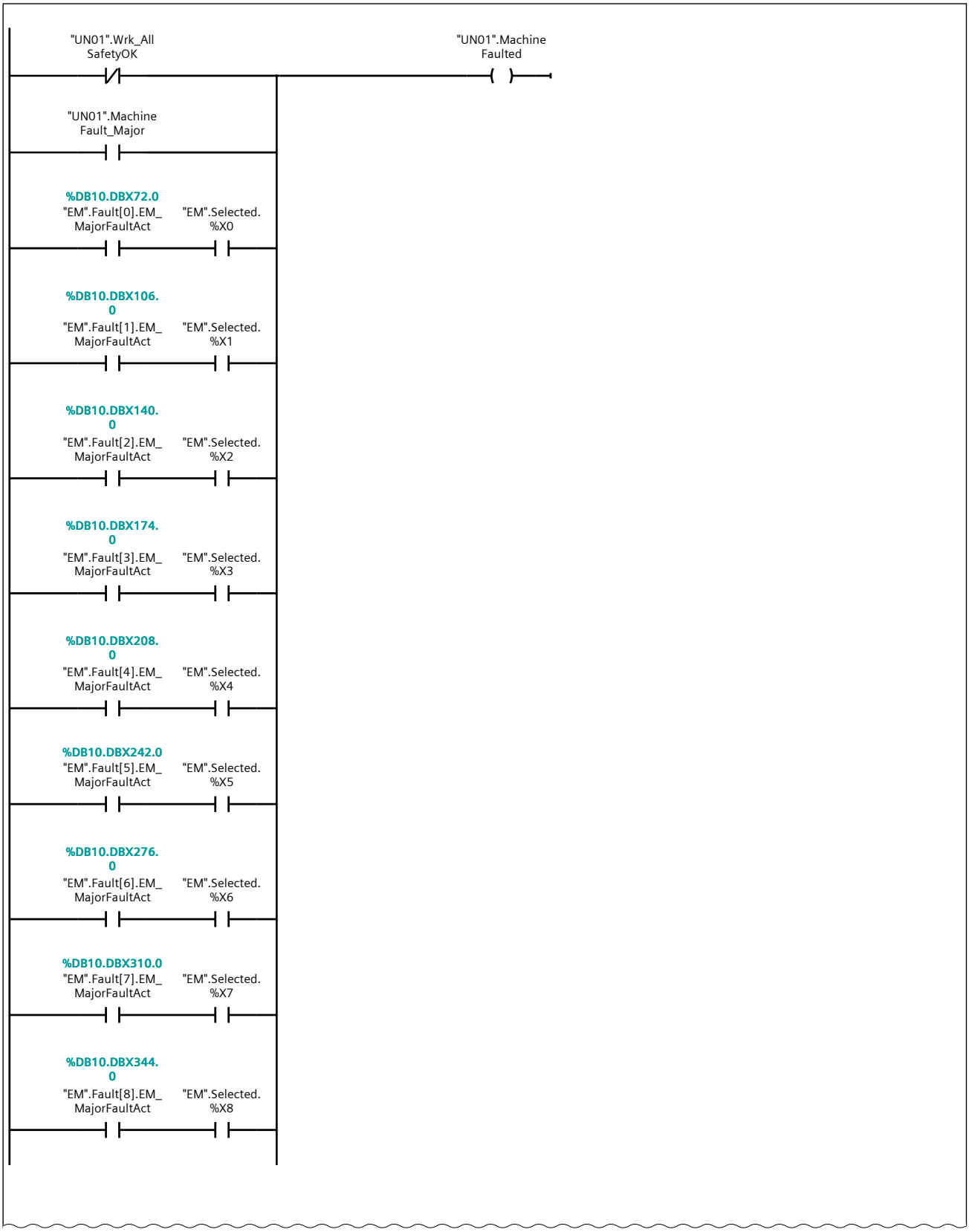


Network 11: Clear machine fault indicators



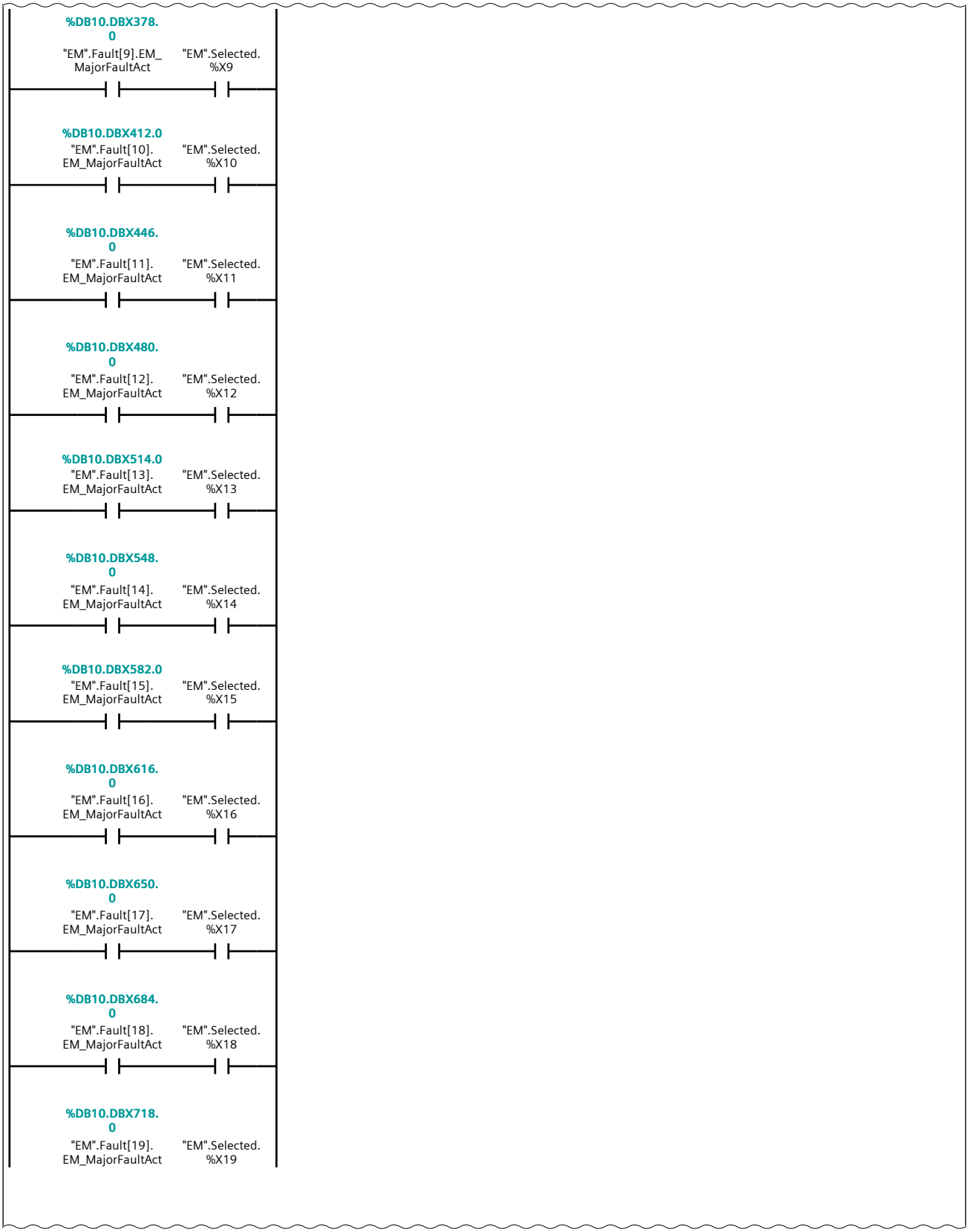
Network 12: General unit fault summary

Network 12: General unit fault summary (1.1 / 4.1)



Network 12: General unit fault summary (2.1 / 4.1)

1.1 (Page10 - 5)



3.1 (Page10 - 7)

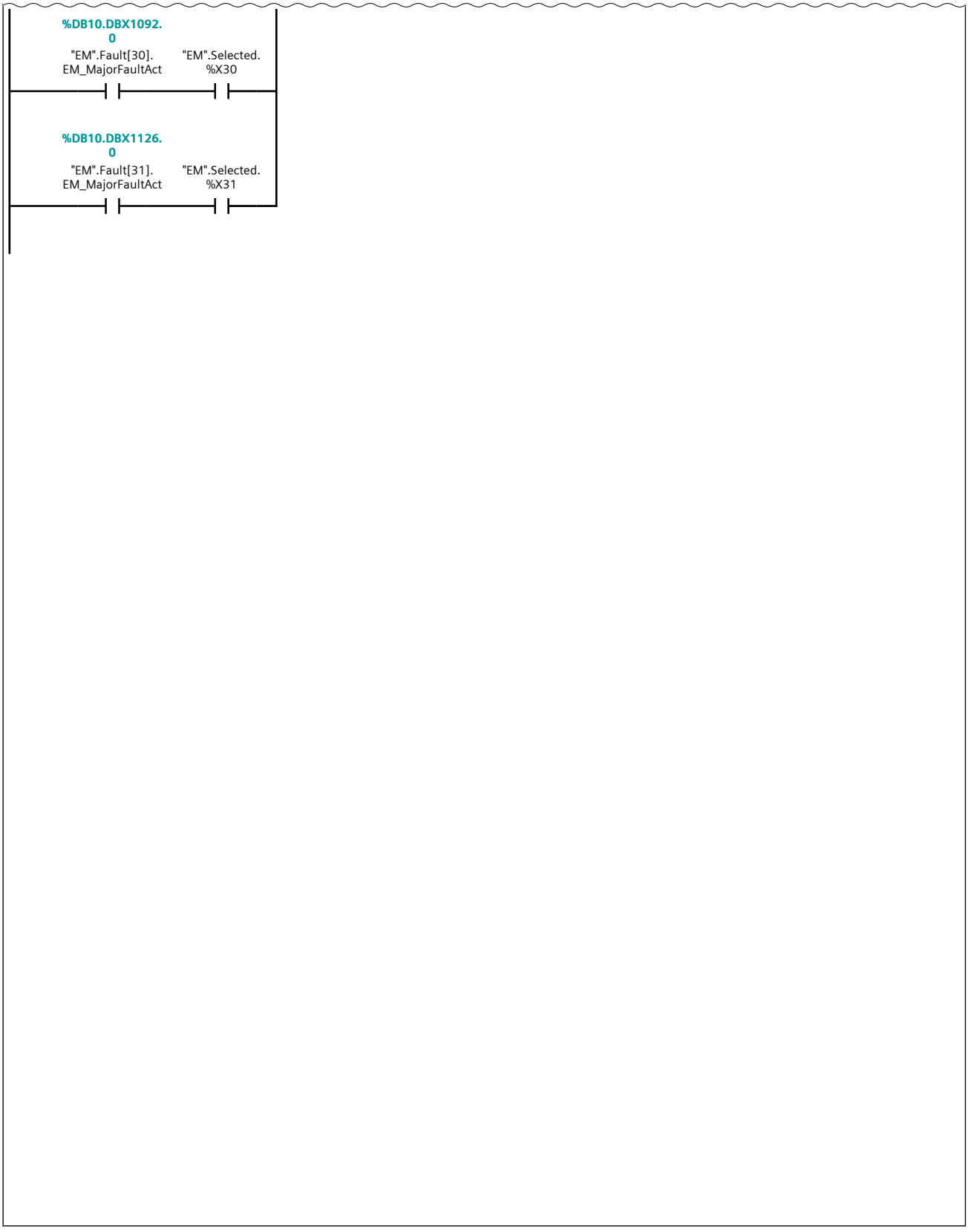
Network 12: General unit fault summary (3.1 / 4.1)

2.1 (Page10 - 6)

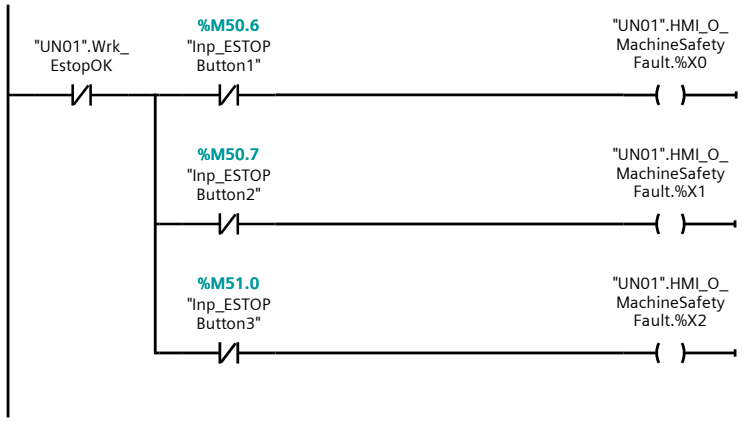
4.1 (Page10 - 8)

Network 12: General unit fault summary (4.1 / 4.1)

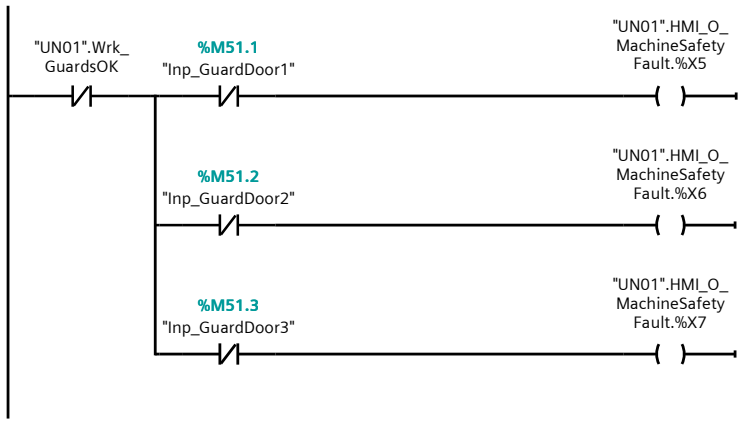
3.1 (Page10 - 7)



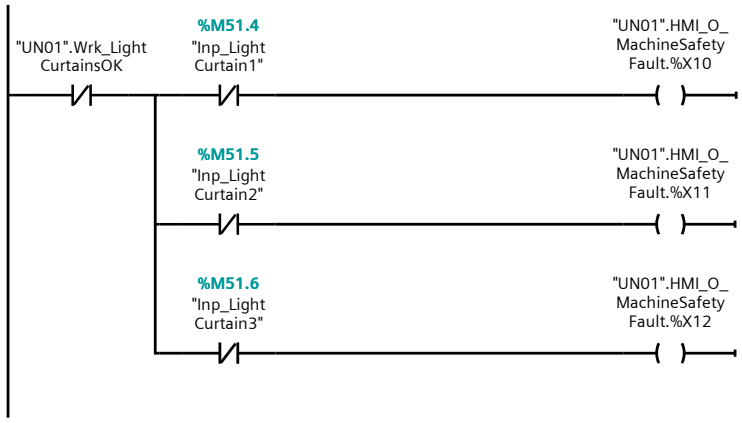
Network 13: Safety estops/guards/curtains status reporting



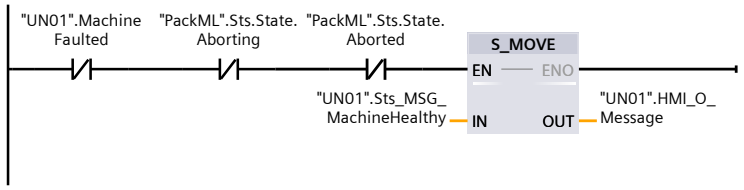
Network 14:



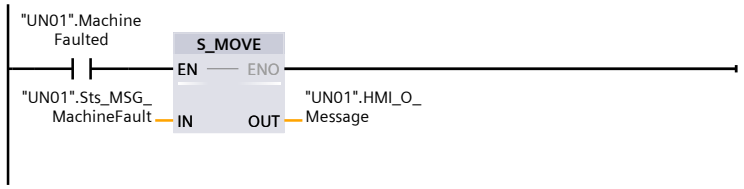
Network 15:



Network 16:



Network 17:



Program blocks / 0_UN01_ExampleMachine

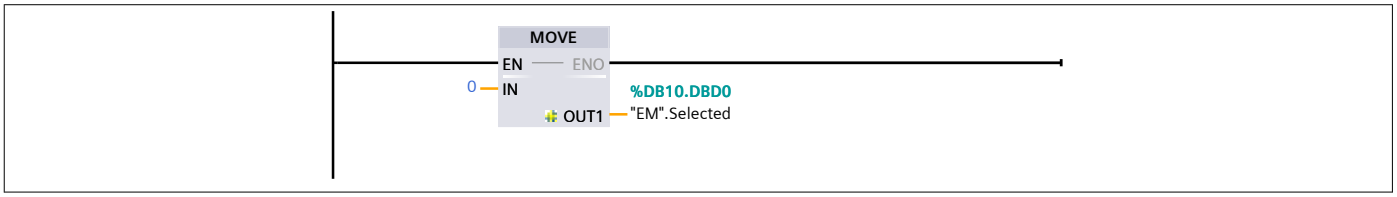
UN01_SR20_Initialize [FB103]

UN01_SR20_Initialize Properties					
General					
Name	UN01_SR20_Initialize	**Number**	103	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
Temp_Dint	DInt	0	Non-retain
Temp_Bool	Bool	false	Non-retain
Temp			
Constant			

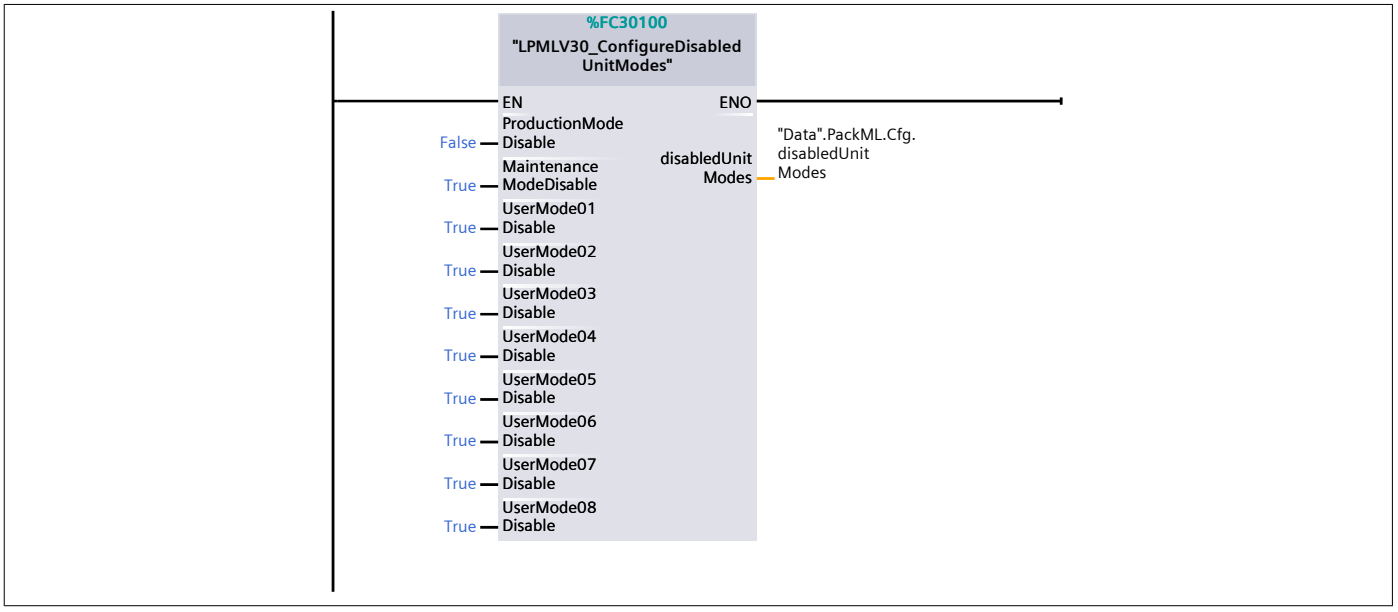
Network 2: Clear EM selected

Each EM will turn on its bit as it initializes



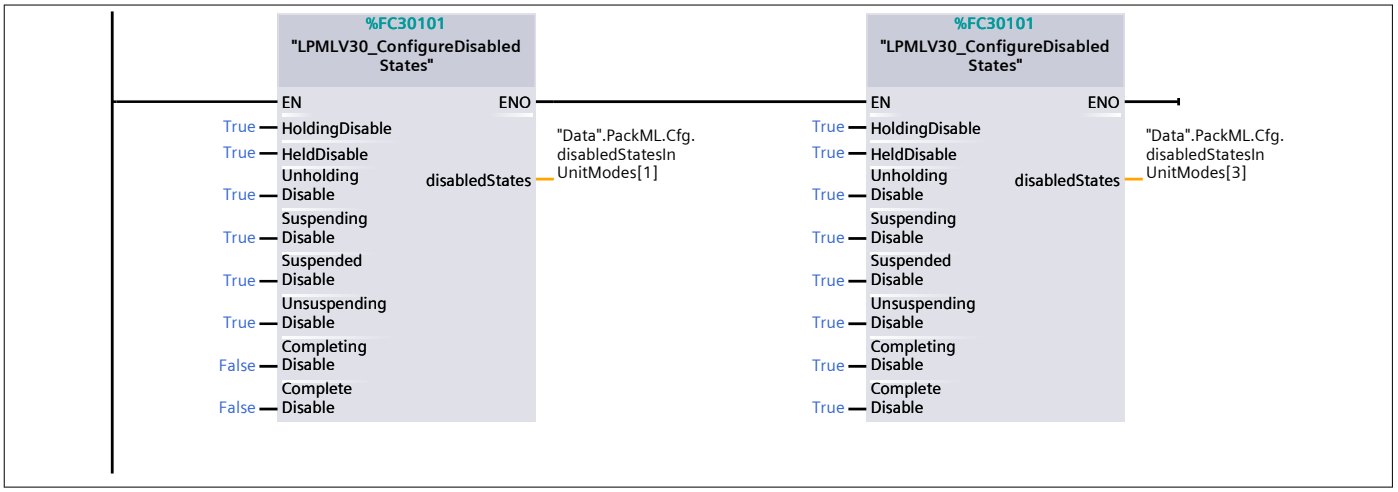
Network 3: Disable modes

Only enable modes 1 (Production) and 3 (Manual) Note that Manual can not be disabled.



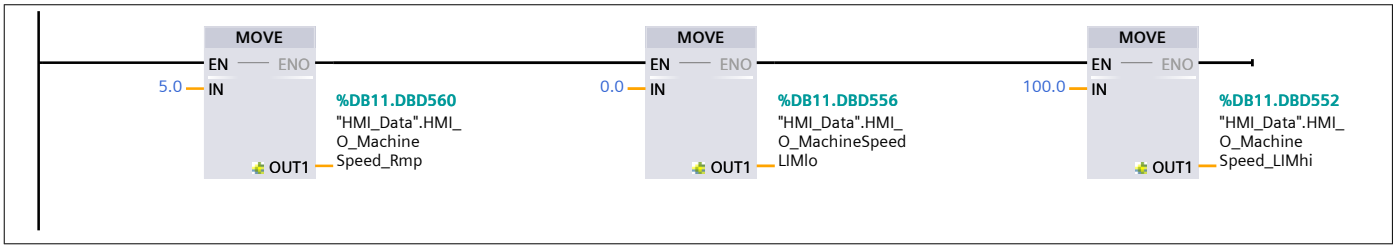
Network 4: Set disabled states

For both Production and Manual modes

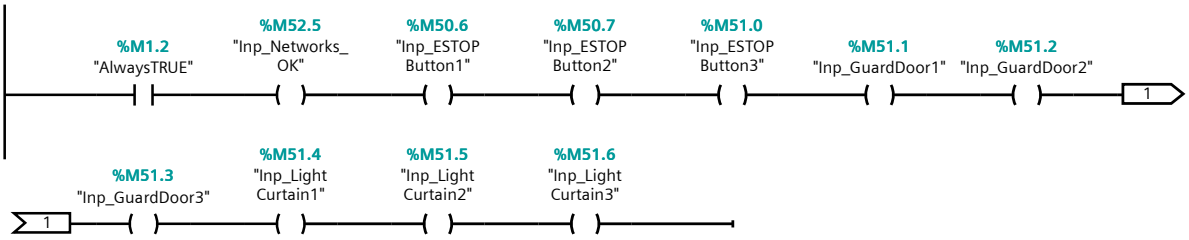


Network 5: Initialize HMI machine speed limits

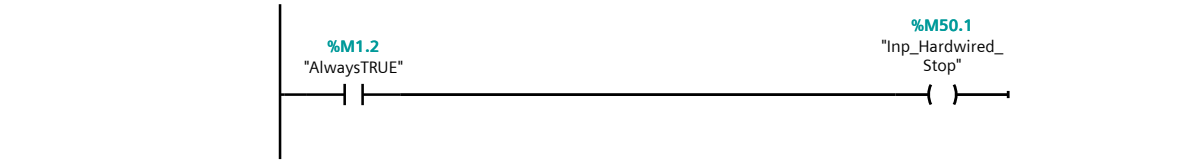
Ramp increment
Machine speed minimum
Machine speed maximum



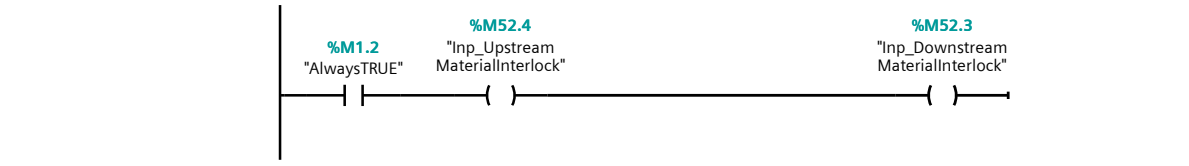
Network 6: Unused safety and status inputs



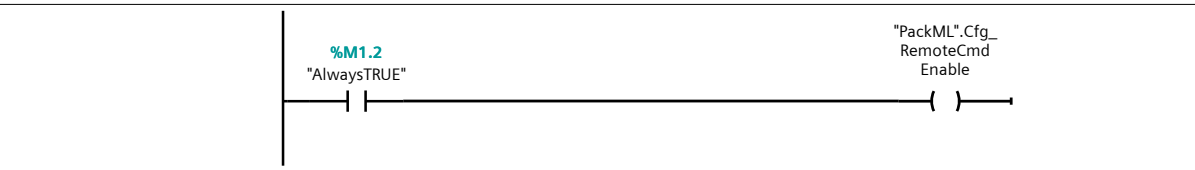
Network 7: Disabled unused stop



Network 8: Disable interlocks



Network 9: Enable remote commands



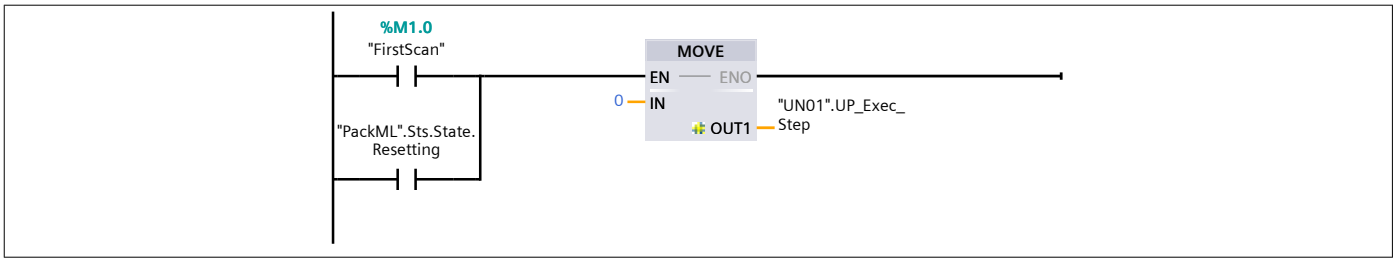
Program blocks / 0_UN01_ExampleMachine

UN01_UP00_Procedure [FB104]

UN01_UP00_Procedure Properties					
General					
Name	UN01_UP00_Procedure	**Number**	104	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title	Execute State motion steps/commands for over-all operation	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

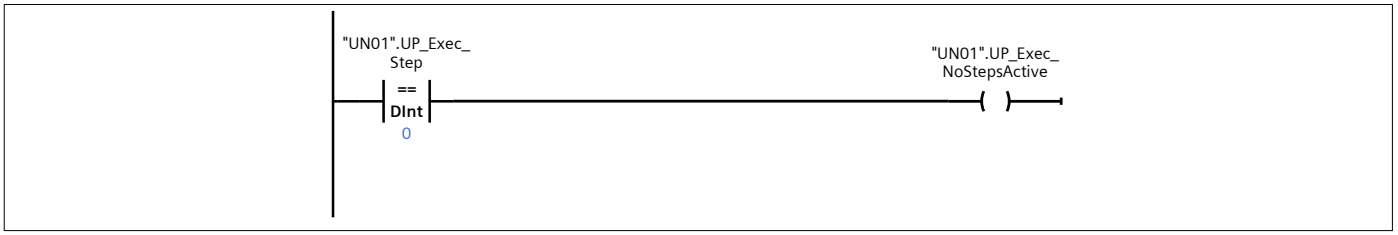
Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
Wrk_Delay1	TON_TIME		Non-retain
Wrk_Delay2	TON_TIME		Non-retain
Wrk_Delay3	TON_TIME		Non-retain
Wrk_Delay4	TON_TIME		Non-retain
Push	Bool	false	Non-retain
Temp			
Constant			

Network 2: First scan or resetting - clear all steps



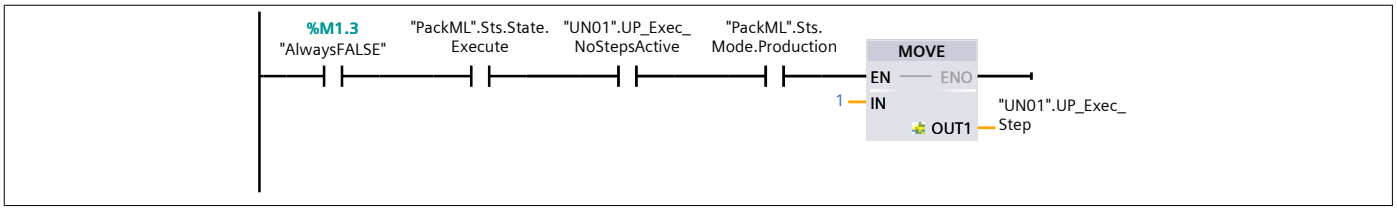
Network 3: Indication that all steps reset

Used by RESETTING state complete logic and initial execute step

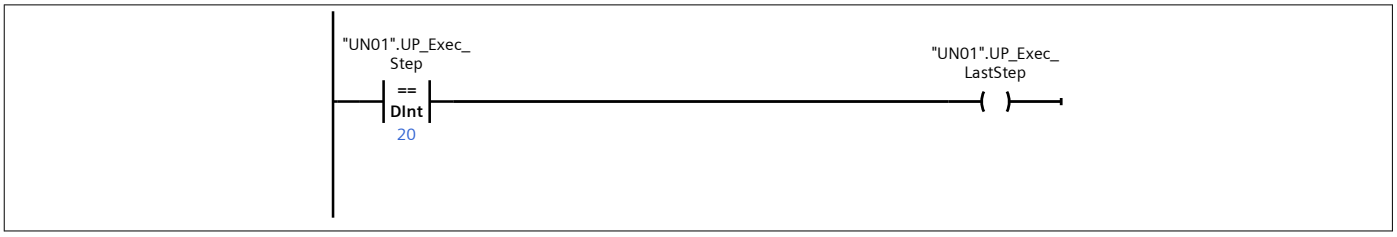


Network 4: EXECUTE - start

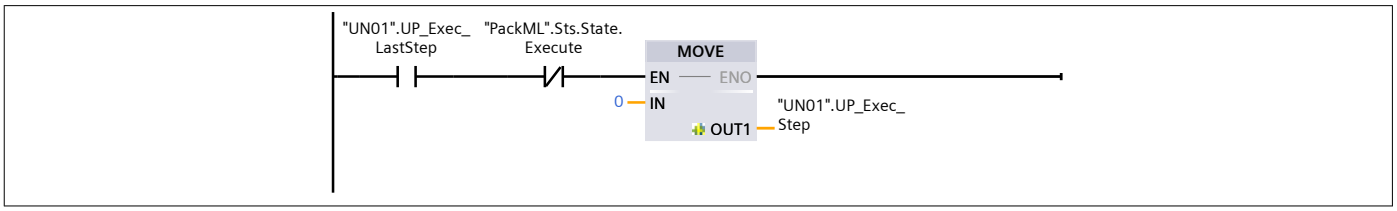
If no steps active, start in step 1



Network 5:



Network 6: Step 20 - When out of Execute, move zero into step number so it will start over at next push of start



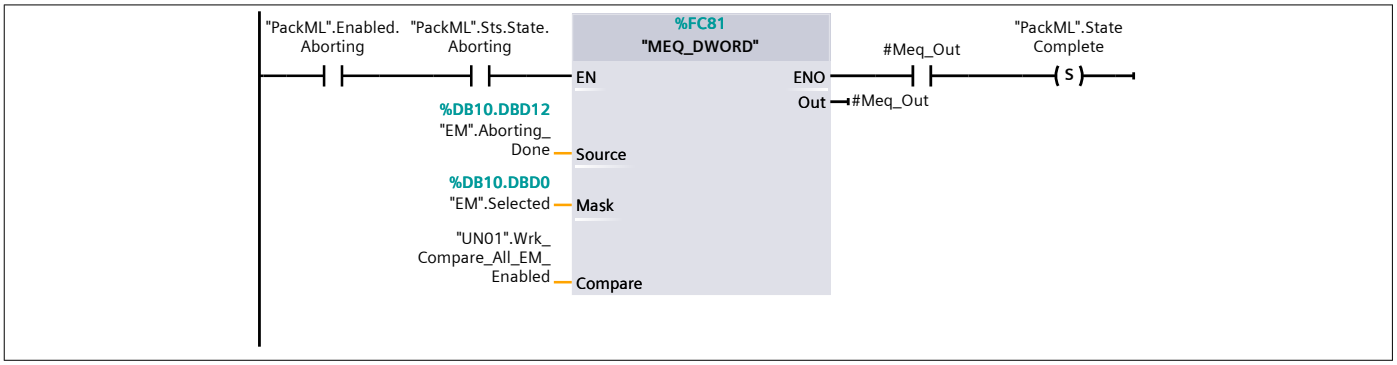
Program blocks / 0_UN01_ExampleMachine

UN01_UP02_StateComplete [FB106]

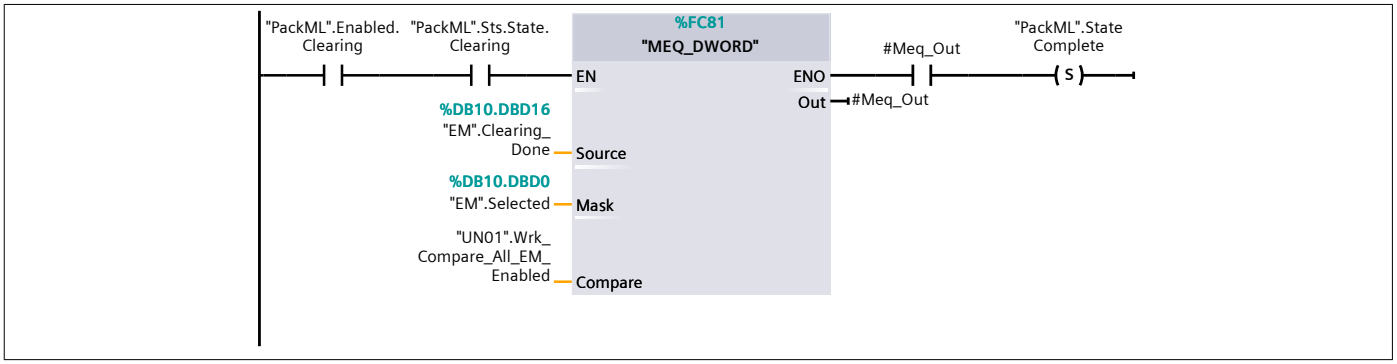
UN01_UP02_StateComplete Properties					
General					
Name	UN01_UP02_StateCom-plete	**Number**	106	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title	State Complete Logic	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
Temp_Dint	DInt	0	Non-retain
Temp_Bool	Bool	false	Non-retain
▼ Temp			
Meq_Out	Bool		
Constant			

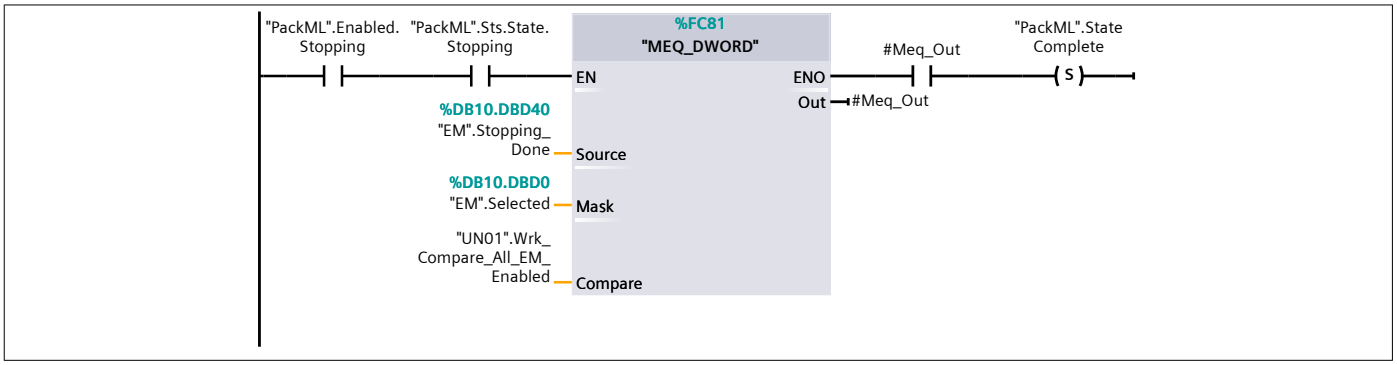
Network 2: Aborting state complete



Network 3: Clearing state complete

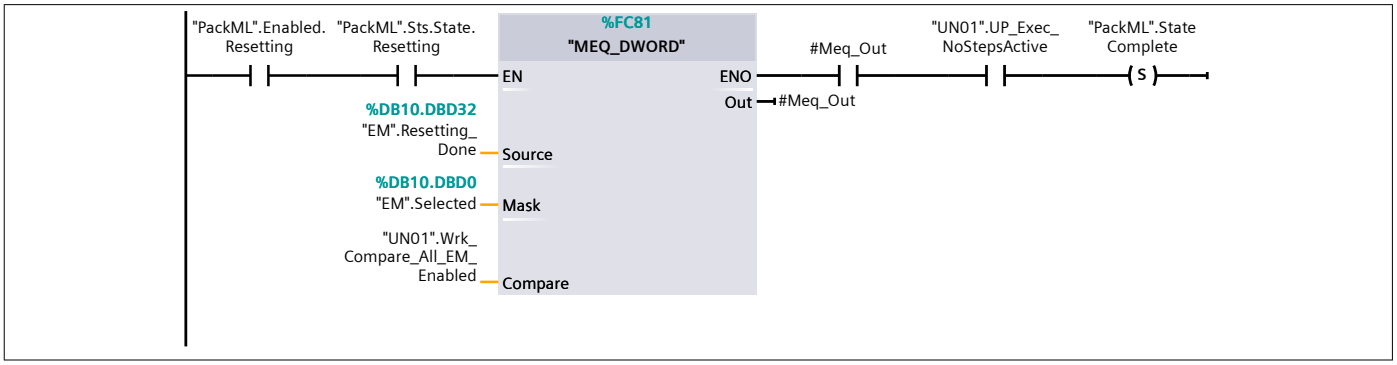


Network 4: Stopping state complete

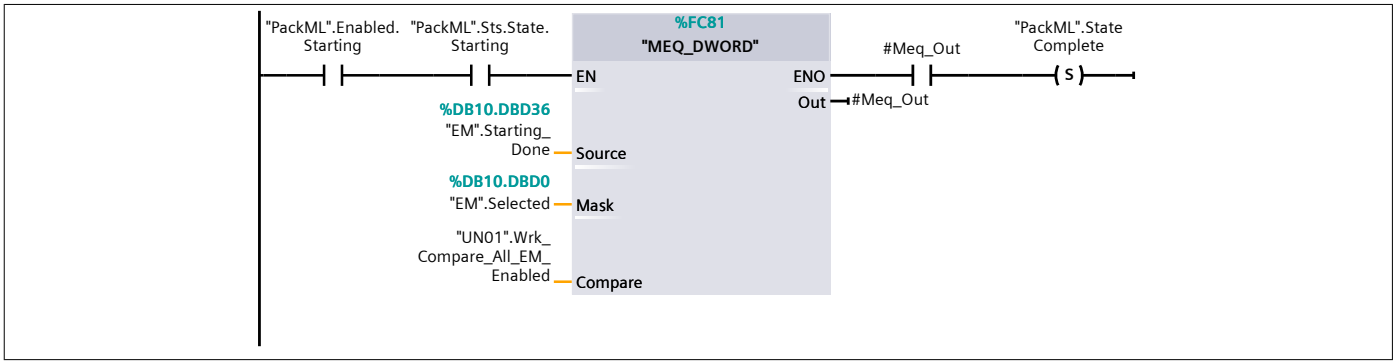


Network 5: Resetting state complete

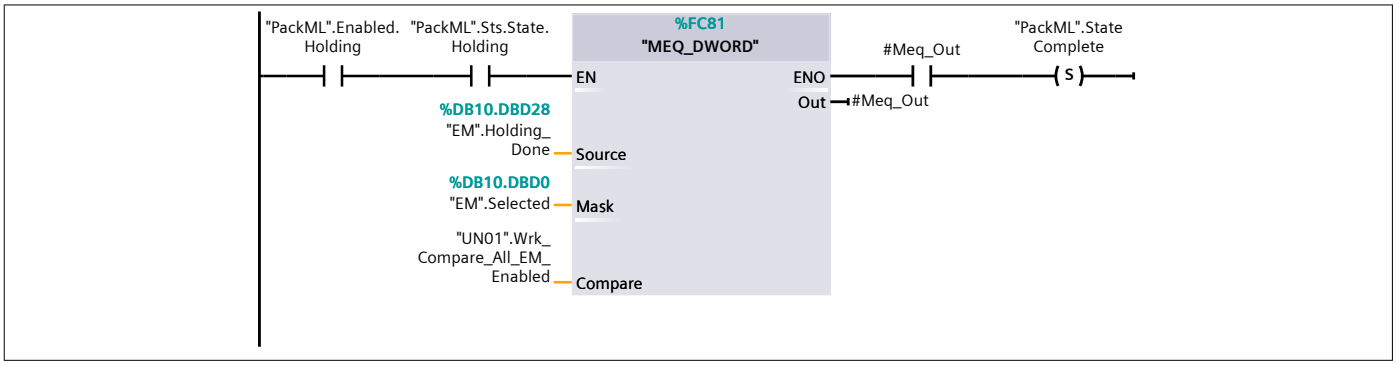
For resetting, make sure unit procedure initialized



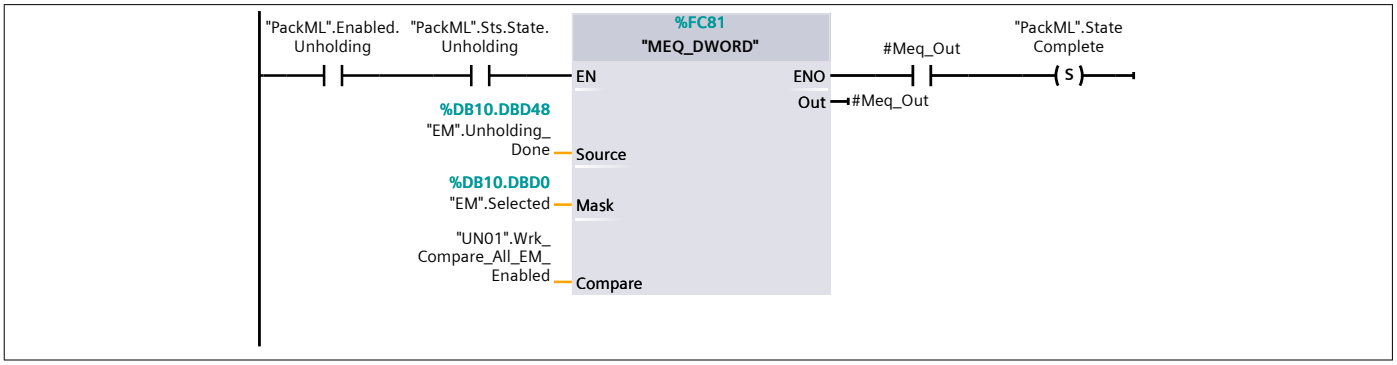
Network 6: Starting state complete



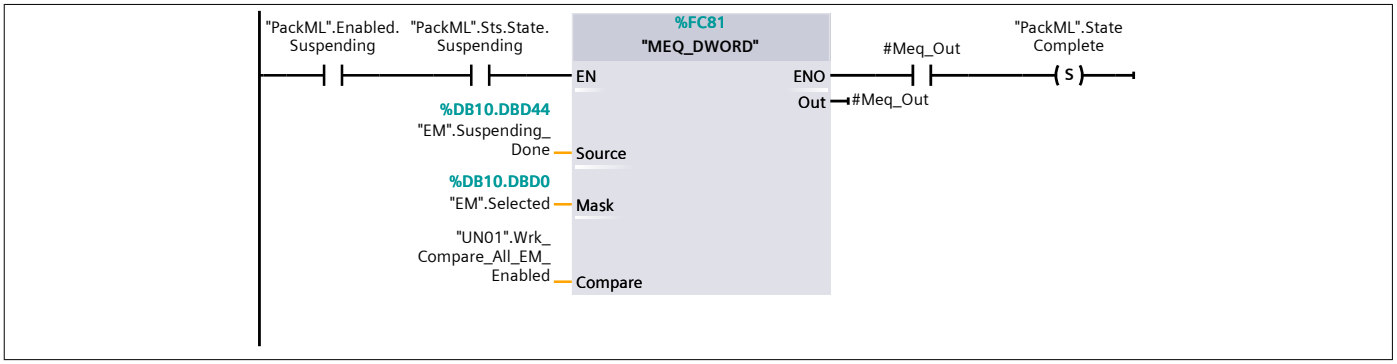
Network 7: Holding state complete



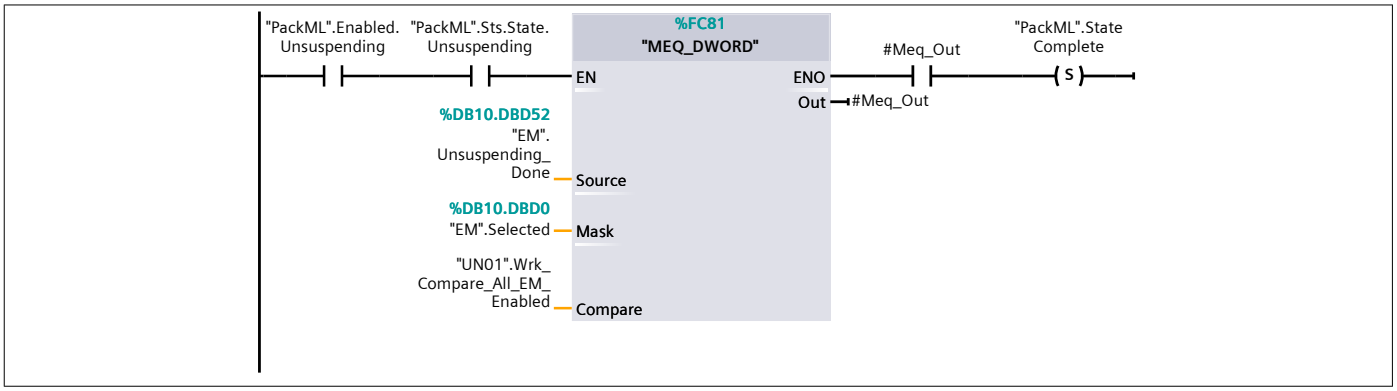
Network 8: Unholding state complete



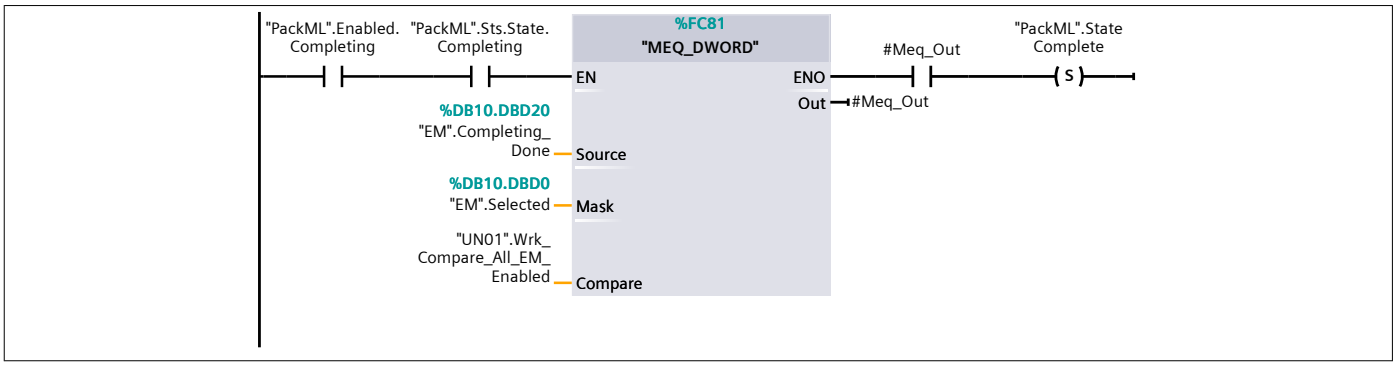
Network 9: Suspending state complete



Network 10: Unsuspending state complete

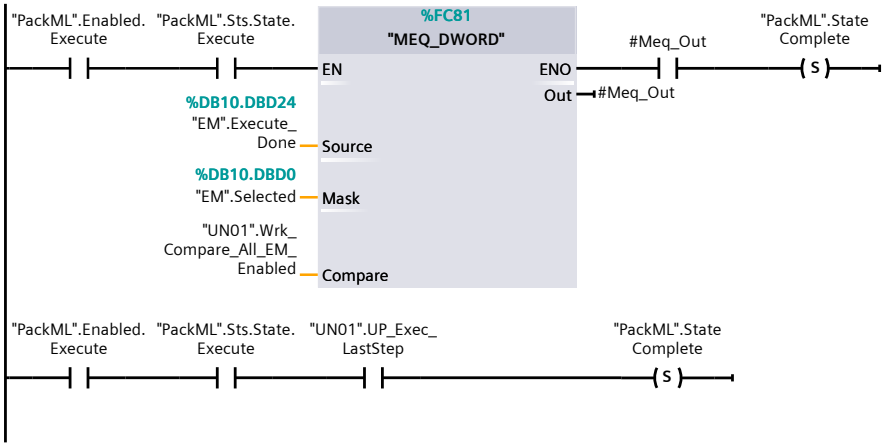


Network 11: Completing state complete



Network 12: Execute state complete

Complete when all EM's complete, or when unit procedure finished.


"PackML".Enabled.
Execute
"PackML".Sts.State.
Execute
%FC81
"MEQ_DWORD"
EN
ENO
#Meq_Out
"PackML".State
Complete
S
Out
#Meq_Out
%DB10.DBD24
"EM".Execute_
Done
Source
%DB10.DBD0
"EM".Selected
Mask
"UN01".Wrk_
Compare_All_EM_
Enabled
Compare
"PackML".Enabled.
Execute
"PackML".Sts.State.
Execute
"UN01".UP_Exec_
LastStep
"PackML".State
Complete
S

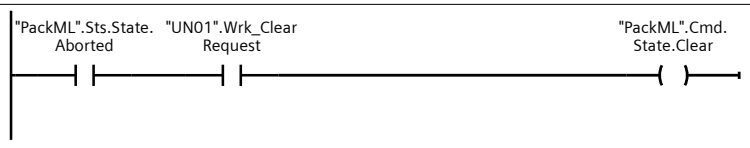
Program blocks / 0_UN01_ExampleMachine

UN01_UP01_PackML [FB105]

UN01_UP01_PackML Properties					
General					
Name	UN01_UP01_PackML	**Number**	105	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title	*** PackML Template *** Controls the machines modes & states	**Author**	FoodBev	**Comment**	The
Family	FoodBev	**Version**	1.0	**User-defined ID**	OMAC

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
LPMLV30_UnitModeStateManager_Instance	"LPMLV30_UnitModeStateManager"		
LPMLV30_UnitModeStateTimes_Instance	"LPMLV30_UnitModeStateTimes"		
RemoteCommand_ModeChageRequest	Struct		Non-retain
SC_InputToBlock	Bool	false	Non-retain
SC_TrigStorage	Bool	false	Non-retain
▼ Temp			
temp_ReadClock_RetVal	Int		
temp_HMI_RetVal	Int		
temp_OEE_Availability	Real		
temp_OEE_Performance	Real		
temp_OEE_Quality	Real		
temp_Ret_Val	Int		
temp_Int	Int		
temp_string	String[10]		
temp_DisabledStates	DInt		
temp_ModeCurrent	DInt		
temp_StateCurrent	DInt		
temp_StateRequested	DInt		
Constant			

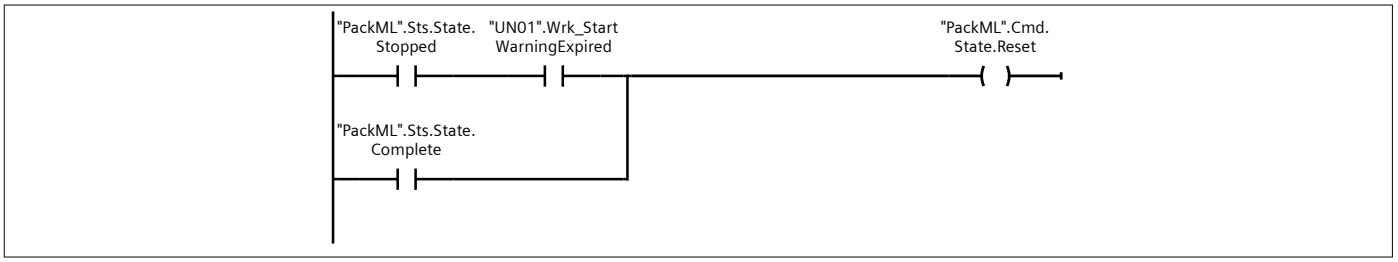
Network 1: PackML ModeManager & State Model - Clear Command



Network 2: PackML ModeManager & State Model - Reset command

STATE COMMAND
RESET

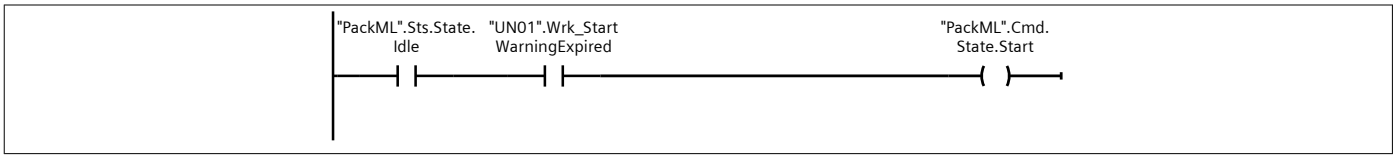
This Command is Triggered by the Unit Condition Indicating the Start Warning Cycle Has Completed.
The Command Initiates in the PackML FB for the Current Mode Operation Procedure to Transition From the Stopped or Complete State to:
1) The Resetting State, If Resetting Is Enabled
2) The Idle State, If Resetting is Disabled and Idle Is Enabled
3) The Starting State, If Resetting and Idle Are Disabled and Starting is Enabled
4) The Execute State, If Resetting, Idle, and Starting Are Disabled



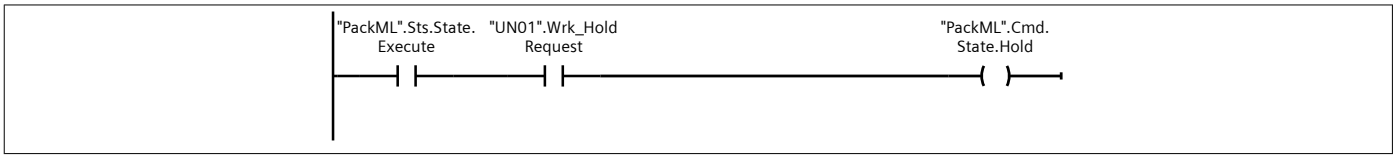
Network 3: PackML ModeManager & State Model - Start command

STATE COMMAND
START

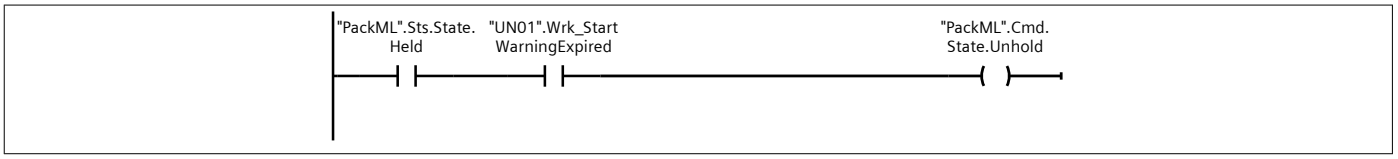
This Command is Triggered by the Unit Condition Indicating the Start Warning Cycle Has Completed.
The Command Initiates in the PackML FB for the Current Mode Operation Procedure to Transition From the Idle State to:
1) The Starting State, If Starting is Enabled
2) The Execute State, If Starting is Disabled



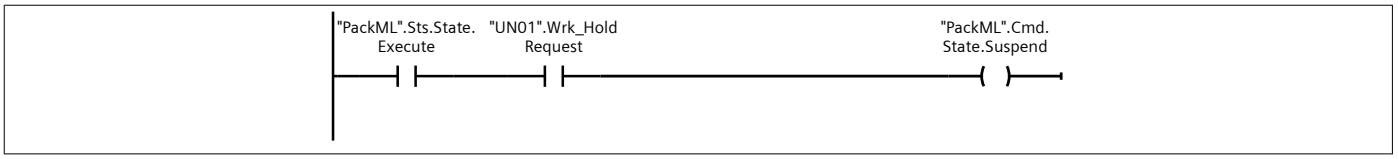
Network 4: PackML ModeManager & State Model - Hold command



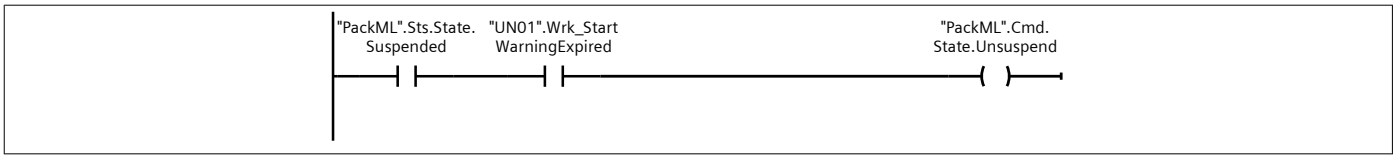
Network 5: PackML ModeManager & State Model - UnHold command



Network 6: PackML ModeManager & State Model - Suspend command



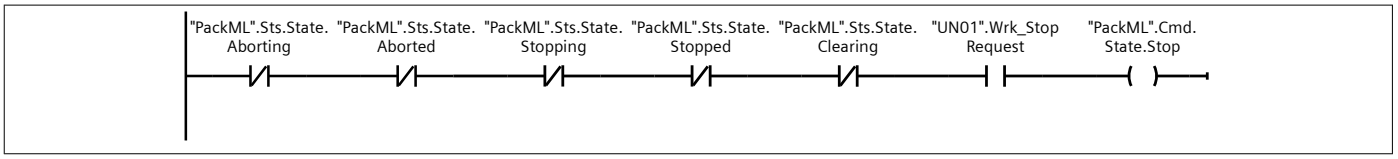
Network 7: PackML ModeManager & State Model - UnSuspend command



Network 8: PackML ModeManager & State Model - Stop command

STATE COMMAND
STOP

This Command is Triggered by the Unit Condition Indicating Any Stop Condition Is Present.
The Command Initiates in the PackML AOI for the Current Mode Operation Procedure to Transition From the Following List of States
(Resetting, Idle, Starting, Execute, Holding, Held, UnHolding, Suspending, Suspended, UnSuspending, Completing, Or Complete), When Each Is Enabled, To:
1) The Stopping State, If Stopping is Enabled
2) The Stopped State, If Stopping is Disabled

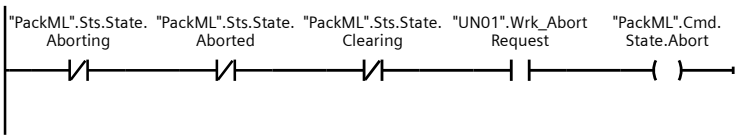


Network 9: PackML ModeManager & State Model - Abort command

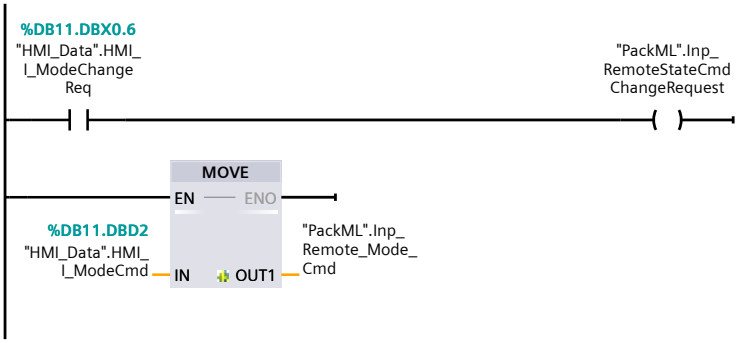
STATE COMMAND
ABORT

This Command is Triggered by the Unit Condition Indicating Any Fault Condition Is Present.
The Command Initiates in the PackML FB for the Current Mode Operation Procedure to Transition From the Following List of States
(Resetting, Idle, Starting, Execute, Holding, Held, UnHolding, Suspending, Suspended, UnSuspending, Completing, Complete, Stopping, Stopped, Or Clearing),
When Each Is Enabled, To:
1) The Aborting State, If Aborting is Enabled
2) The Aborted State, If Aborting is Disabled

MAKE SURE THAT ALL EQUIPMENT MODULES REPORT BACK A FAULTRESET_DONE AT SOME POINT IN TIME (EVEN IF FAULTS ARE PRESENT) TO AVOID THAT THE STATEMACHINE GETS STUCK IN CLEARING



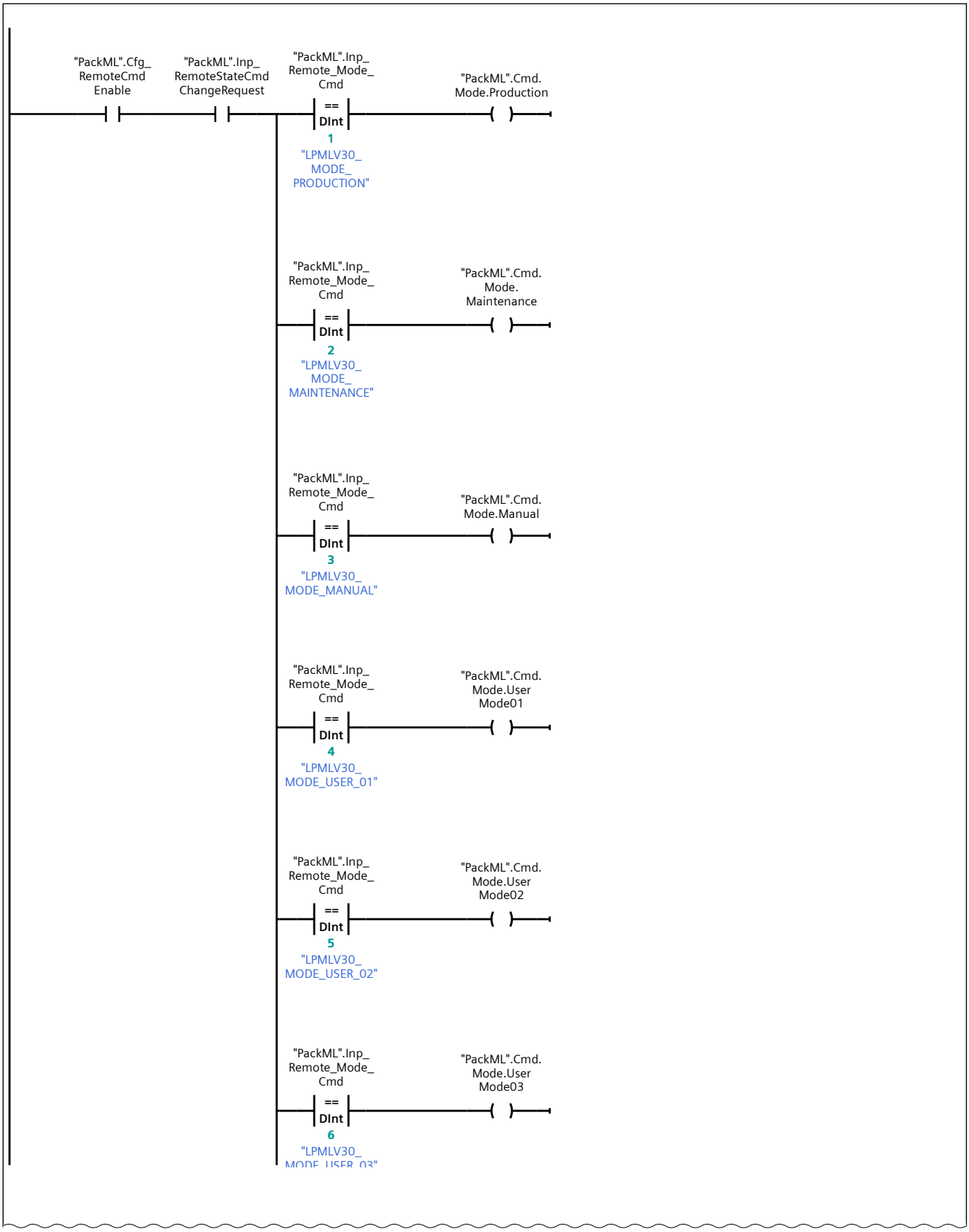
Network 10: Mode change requests from operator



Network 11: External PackML Mode Commands

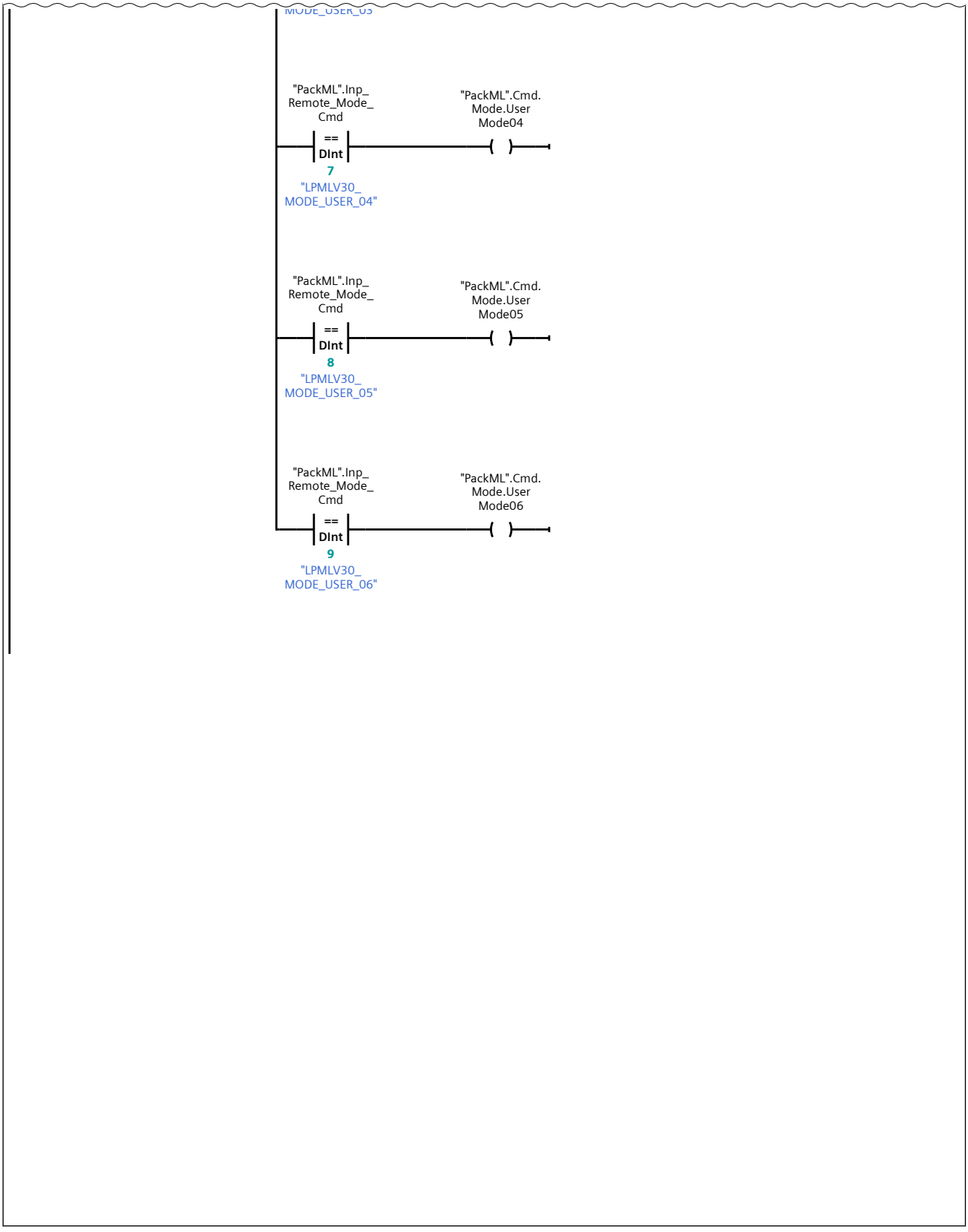
Rung from original program from CPG modified to use "PackML".Cmd.Mode. bits to change mode.

Network 11: External PackML Mode Commands (1.1 / 2.1)



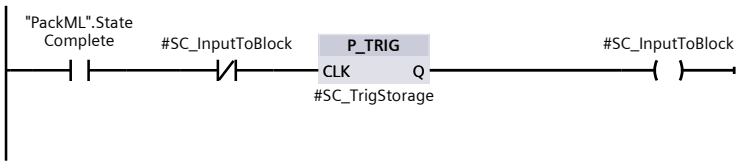
Network 11: External PackML Mode Commands (2.1 / 2.1)

1.1 (Page14 - 5)



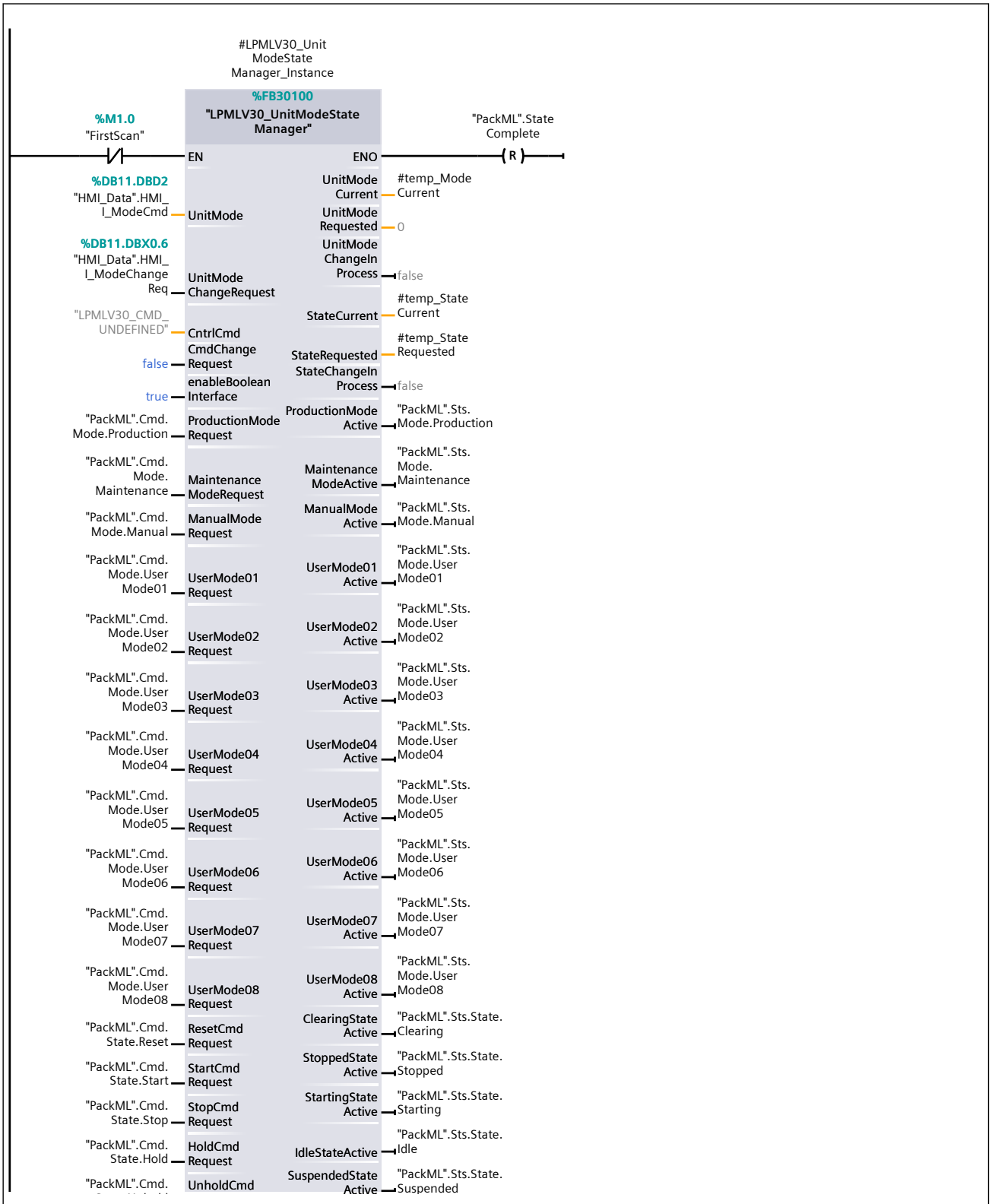
Network 12: Enforce change in SC input to block

If state changes, but SC does not change because the state complete conditions are fulfilled as soon as the state is active, the SC input to LPMLV30_StateManager must still see a transition. This logic makes sure that the SC input is off at the next scan after it turns on.



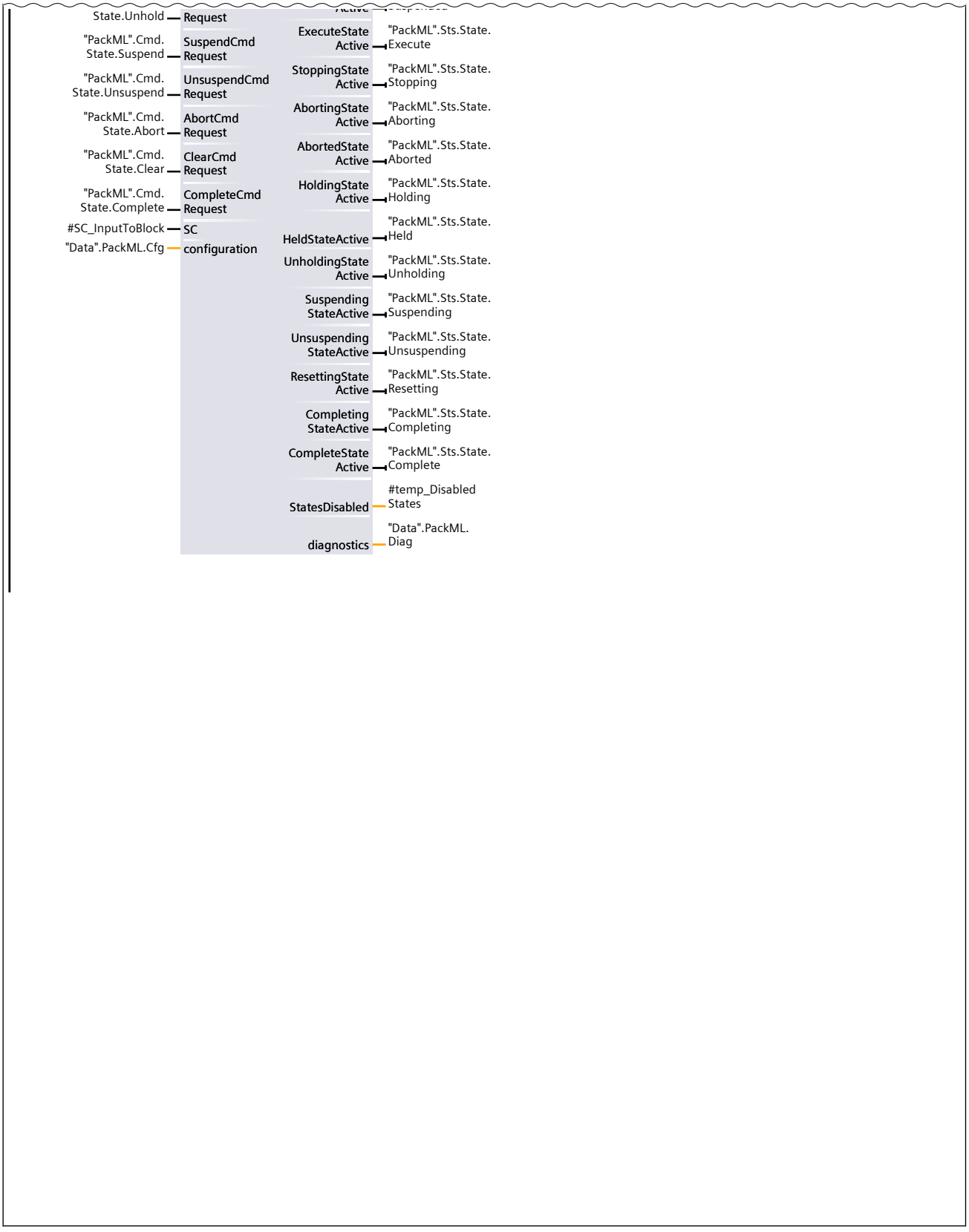
Network 13: Call thePackML Mode Manager & State Model FB

Network 13: Call thePackML Mode Manager & State Model FB (1.1 / 2.1)

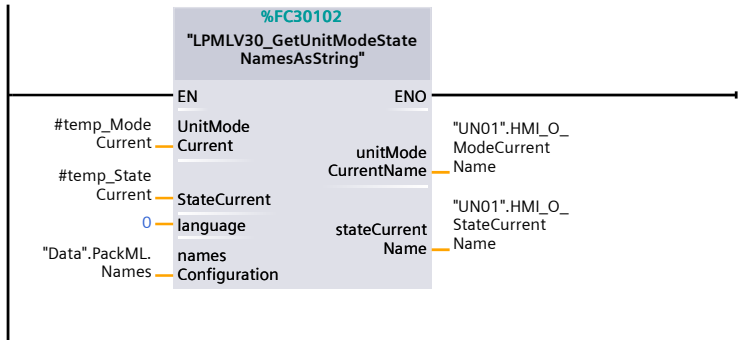


Network 13: Call thePackML Mode Manager & State Model FB (2.1 / 2.1)

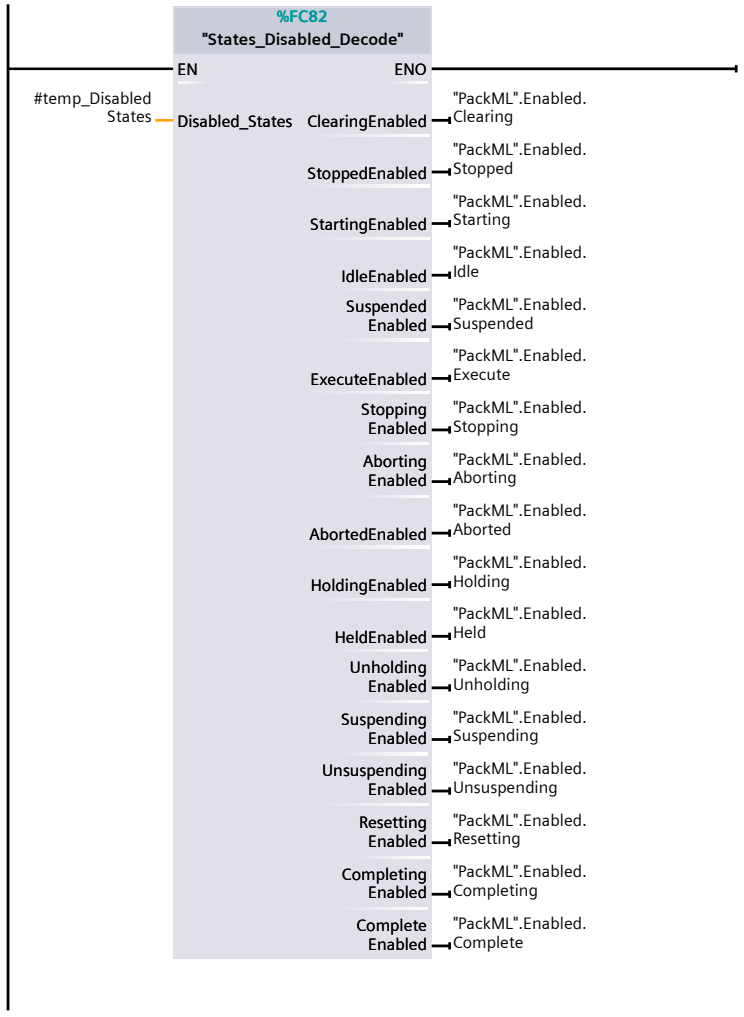
1.1 (Page14 - 8)



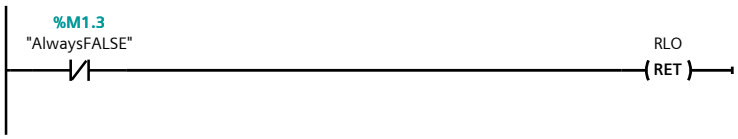
Network 14: Mode / State Names.



Network 15: Decode disabled states



Network 16: END: Update the ENO Output. (DO NOT REMOVE. Must be last rung)


%M1.3
"AlwaysFALSE"
RLO
RET

Program blocks / 0_UN01_ExampleMachine

UN01 [DB100]

UN01 Properties					
General					
Name	UN01	**Number**	100	**Type**	DB
Language	DB	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Start value	Retain
Input			
Output			
InOut			
▼ Static			
HMI_O_ModeCurrentName	String[18]	''	False
HMI_O_StateCurrentName	String[16]	''	False
HMI_O_MachineSafetyFault	DInt	0	False
HMI_O_MajorFaultMessage	DInt	0	False
HMI_O_MinorFaultMessage	DInt	0	False
HMI_O_Message	String[18]	''	False
Sts_GoodProducts	DInt	0	False
Sts_MSG_MachineFault	String	'Machine Fault'	False
Sts_MSG_MachineHealthy	String	'Machine Healthy'	False
MachineFault_Major	Bool	false	False
MachineFault_Minor	Bool	false	False
MachineFaulted	Bool	false	False
UP_Exec_Step	DInt	0	False
UP_Exec_StepDn	Array[0..32] of DInt		False
UP_Exec_LastStep	Bool	false	False
UP_Exec_NoStepsActive	Bool	false	False
Inp_BatchCountSetpoint	DInt	0	False
Wrk_StartRequest	Bool	false	False
Wrk_StopRequest	Bool	false	False
Wrk_ResetRequest	Bool	false	False
Wrk_AbortRequest	Bool	false	False
Wrk_ClearRequest	Bool	false	False
Wrk_CompleteRequest	Bool	false	False
Wrk_HoldRequest	Bool	false	False
Wrk_UnHoldRequest	Bool	false	False
Wrk_SuspendRequest	Bool	false	False
Wrk_Compare_All_EM_Enabled	DInt	-1	False
Wrk_AllSafetyOK	Bool	false	False
Wrk_EstopOK	Bool	false	False
Wrk_GuardsOK	Bool	false	False
Wrk_LightCurtainsOK	Bool	false	False

Name	Data type	Start value	Retain
Wrk_NetworkCommunicationOK	Bool	false	False
Wrk_StartWarningExpired	Bool	false	False
S20_InitializeData	"UN01_SR20_Initial-ize"		False
CM01_OperationLocal	"UN01_CM01_Opera-tionLocal"		False
CM03_FaultHandler	"UN01_CM03_FaultH-andler"		False
UP02_StateComplete	"UN01_UP02_State-Complete"		False
UP01_PackML	"UN01_UP01_PackML"		False
UP00_Procedure	"UN01_UP00_Proce-dure"		False

Program blocks / 0_UN01_ExampleMachine

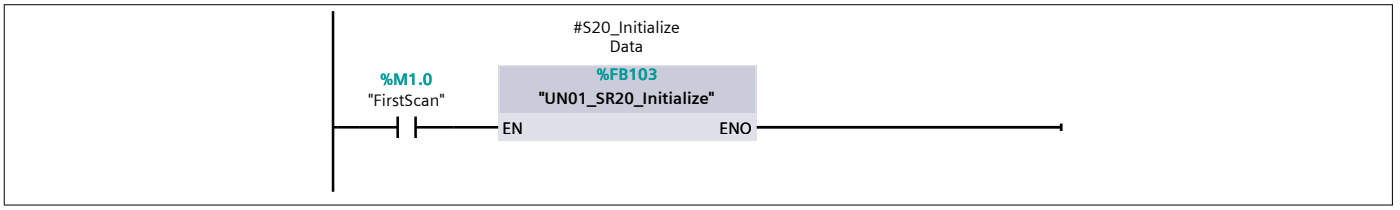
UN01_00_Main [FB100]

UN01_00_Main Properties					
General					
Name	UN01_00_Main	**Number**	100	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

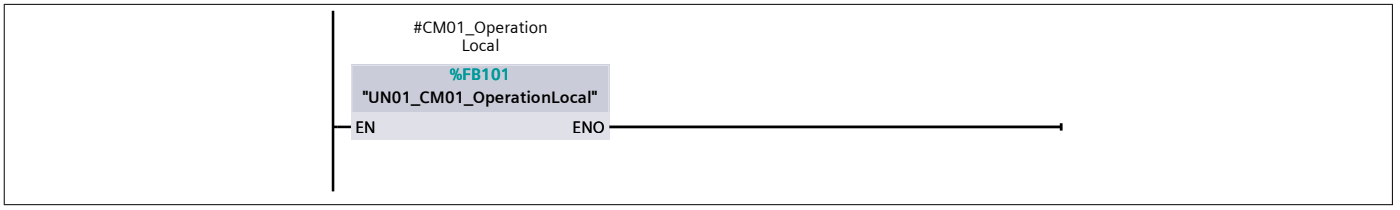
Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
HMI_O_ModeCurrentName	String[18]	''	Non-retain
HMI_O_StateCurrentName	String[16]	''	Non-retain
HMI_O_MachineSafetyFault	DInt	0	Non-retain
HMI_O_MajorFaultMessage	DInt	0	Non-retain
HMI_O_MinorFaultMessage	DInt	0	Non-retain
HMI_O_Message	String[18]	''	Non-retain
Sts_GoodProducts	DInt	0	Non-retain
Sts_MSG_MachineFault	String	'Machine Fault'	Non-retain
Sts_MSG_MachineHealthy	String	'Machine Healthy'	Non-retain
MachineFault_Major	Bool	false	Non-retain
MachineFault_Minor	Bool	false	Non-retain
MachineFaulted	Bool	false	Non-retain
UP_Exec_Step	DInt	0	Non-retain
UP_Exec_StepDn	Array[0..32] of DInt		Non-retain
UP_Exec_LastStep	Bool	false	Non-retain
UP_Exec_NoStepsActive	Bool	false	Non-retain
Inp_BatchCountSetpoint	DInt	0	Non-retain
Wrk_StartRequest	Bool	false	Non-retain
Wrk_StopRequest	Bool	false	Non-retain
Wrk_ResetRequest	Bool	false	Non-retain
Wrk_AbortRequest	Bool	false	Non-retain
Wrk_ClearRequest	Bool	false	Non-retain
Wrk_CompleteRequest	Bool	false	Non-retain
Wrk_HoldRequest	Bool	false	Non-retain
Wrk_UnHoldRequest	Bool	false	Non-retain
Wrk_SuspendRequest	Bool	false	Non-retain
Wrk_Compare_All_EM_Enabled	DInt	-1	Non-retain
Wrk_AllSafetyOK	Bool	false	Non-retain
Wrk_EstopOK	Bool	false	Non-retain
Wrk_GuardsOK	Bool	false	Non-retain
Wrk_LightCurtainsOK	Bool	false	Non-retain

Name	Data type	Default value	Retain
Wrk_NetworkCommunicationOK	Bool	false	Non-retain
Wrk_StartWarningExpired	Bool	false	Non-retain
S20_InitializeData	"UN01_SR20_Initial-ize"		
CM01_OperationLocal	"UN01_CM01_Op-erationLocal"		
CM03_FaultHandler	"UN01_CM03_Fault Handler"		
UP02_StateComplete	"UN01_UP02_State-Complete"		
UP01_PackML	"UN01_UP01_Pack ML"		
UP00_Procedure	"UN01_UP00_Pro-cedure"		
Temp			
Constant			

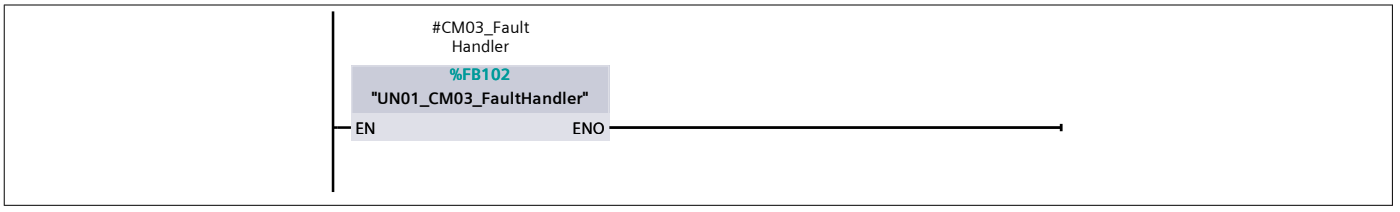
Network 2:



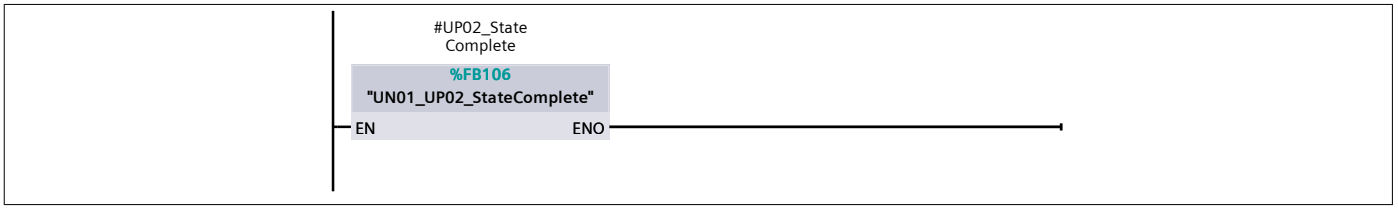
Network 3:



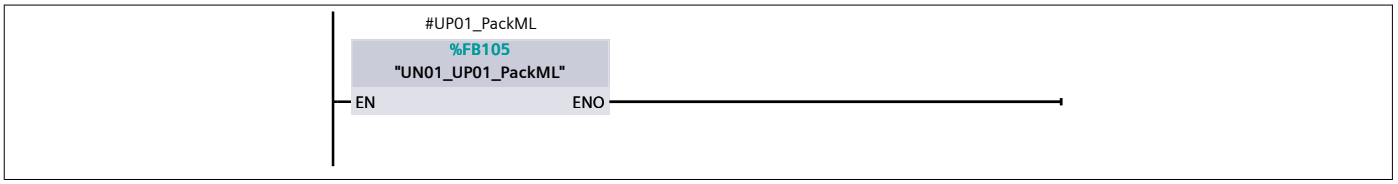
Network 4:



Network 5:

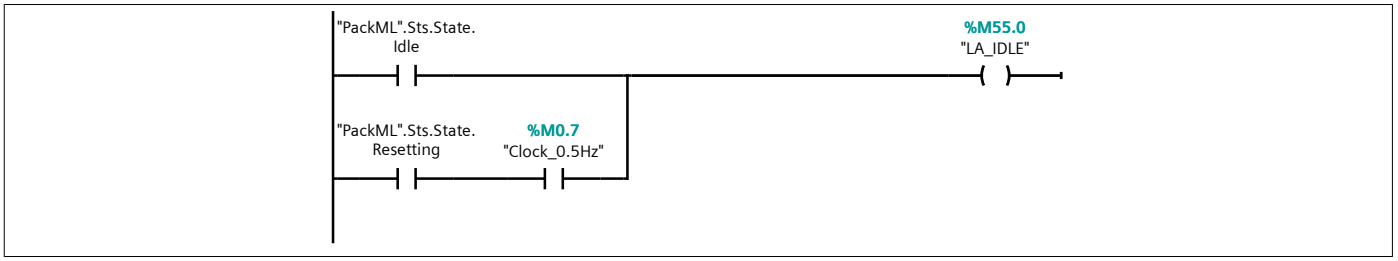


Network 6:

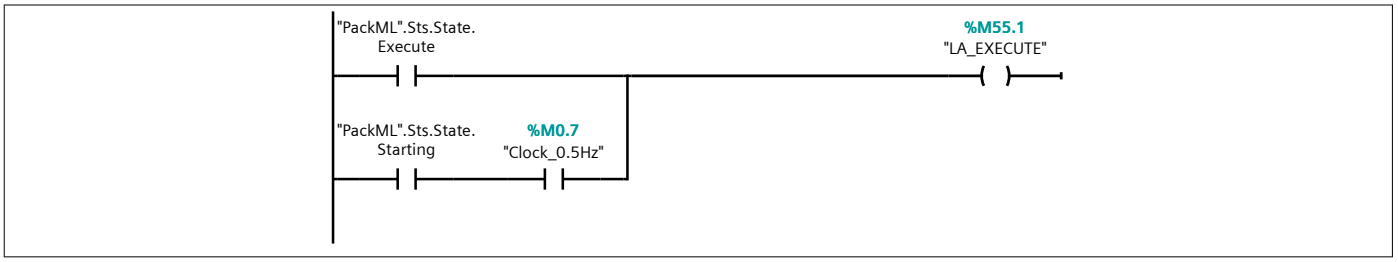


Network 7:

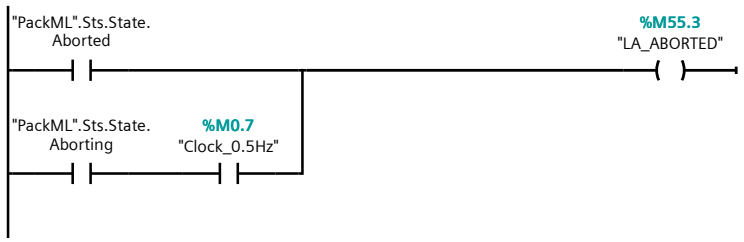
Network 8: INDICATOR LAMPS for C-More



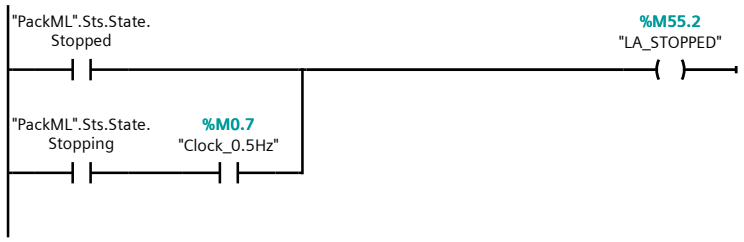
Network 9:



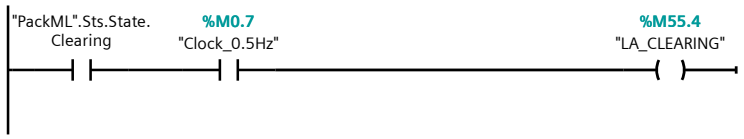
Network 10:



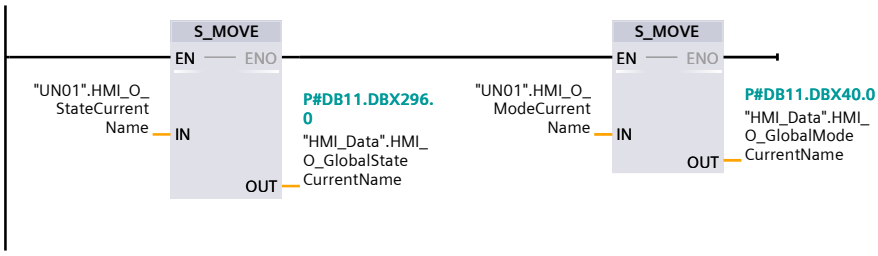
Network 11:



Network 12:



Network 13: Pass on state and mode names to global hmi



Program blocks / Data

EM [DB10]

EM Properties					
General					
Name	EM	**Number**	10	**Type**	DB
Language	DB	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Start value	Retain
▼ Static			
Selected	DInt	0	False
Faulted	DInt	0	False
No_Motion	DInt	0	False
Aborting_Done	DInt	0	False
Clearing_Done	DInt	0	False
Completing_Done	DInt	0	False
Execute_Done	DInt	0	False
Holding_Done	DInt	0	False
Resetting_Done	DInt	0	False
Starting_Done	DInt	0	False
Stopping_Done	DInt	0	False
Suspending_Done	DInt	0	False
Unholding_Done	DInt	0	False
Unsuspending_Done	DInt	0	False
Fault	Array[0..31] of "EM_Faults"		False

Program blocks / Data

HMI_Data [DB11]

HMI_Data Properties					
General					
Name	HMI_Data	**Number**	11	**Type**	DB
Language	DB	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Start value	Retain
▼ Static			
HMI_I_Start	Bool	false	True
HMI_I_Stop	Bool	false	True
HMI_I_Clear	Bool	false	True
HMI_I_Reset	Bool	false	True
HMI_I_Hold	Bool	false	True
HMI_I_Unhold	Bool	false	True
HMI_I_ModeChangeReq	Bool	false	True
HMI_I_JogNegative	Bool	false	True
HMI_I_JogPositive	Bool	false	True
HMI_I_ModeCmd	DInt	0	True
HMI_I_Select_JogAxis	DInt	0	True
HMI_I_MachineSpeed_Cmd	Real	0.0	True
HMI_I_XMovePosition	Real	100.0	True
HMI_I_XMoveSpeed	Real	50.0	True
HMI_I_XMoveAccelDecel	Real	50.0	True
HMI_I_ZMovePosition	Real	35.0	True
HMI_I_ZMoveSpeed	Real	50.0	True
HMI_I_ZMoveAccelDecel	Real	50.0	True
HMI_O_LAAborted	Bool	false	True
HMI_O_LAExecute	Bool	false	True
HMI_O_LAIdle	Bool	false	True
HMI_O_LAStopped	Bool	false	True
HMI_O_GlobalModeCurrentName	String	''	True
HMI_O_GlobalStateCurrentName	String	''	True
HMI_O_MachineSpeed_LIMhi	Real	0.0	True
HMI_O_MachineSpeedLIMlo	Real	0.0	True
HMI_O_MachineSpeed_Rmp	Real	0.0	True

Program blocks / Data

Data [DB1]

Data Properties					
General					
Name	Data	**Number**	1	**Type**	DB
Language	DB	**Numbering**	Automatic		
Information					
Title	Machine Data	**Author**		**Comment**	Machine Data
Family		**Version**	1.0	**User-defined ID**	

Name	Data type	Start value	Retain
▼ Static			
PackML	Struct		False
ProdSchedule_BoxesMoveSP	DInt	L#30000	True
ProdSchedule_BoxesMovePV	DInt	L#46	True
ProdSchedule_Complete	Bool	false	True
ProdSchedule_Reset	Bool	false	True
OEE_RealTime	Real	4.479167e-1	True
OEE_Availabilty	Real	0.0	False
OEE_Performance	Real	0.0	False
OEE_Quality	Real	0.0	False

Program blocks / Data

PackML [DB19]

PackML Properties					
General					
Name	PackML	**Number**	19	**Type**	DB
Language	DB	**Numbering**	Automatic		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Start value	Retain
▼ Static			
Cmd	Struct		False
Sts	Struct		False
Enabled	Struct		False
StateComplete	Bool	false	False
Cfg_RemoteCmdEnable	Bool	false	False
Inp_RemoteStateCmdChangeRequest	Bool	false	False
Inp_Remote_Mode_Cmd	DInt	0	False

Program blocks / Data

Axis_1_Status [DB75]

Axis_1_Status Properties					
General					
Name	Axis_1_Status	**Number**	75	**Type**	DB
Language	DB	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Start value	Retain
▼ Static			
Status	"Servo_Status-Word_Type"		False
Error	"Servo_Error-Word_Type"		False
Warning	"Servo_Warning-Word_Type"		False

Program blocks / Data

Axis_2_Status [DB76]

Axis_2_Status Properties					
General					
Name	Axis_2_Status	**Number**	76	**Type**	DB
Language	DB	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Start value	Retain
▼ Static			
Status	"Servo_Status-Word_Type"		False
Error	"Servo_Error-Word_Type"		False
Warning	"Servo_Warning-Word_Type"		False

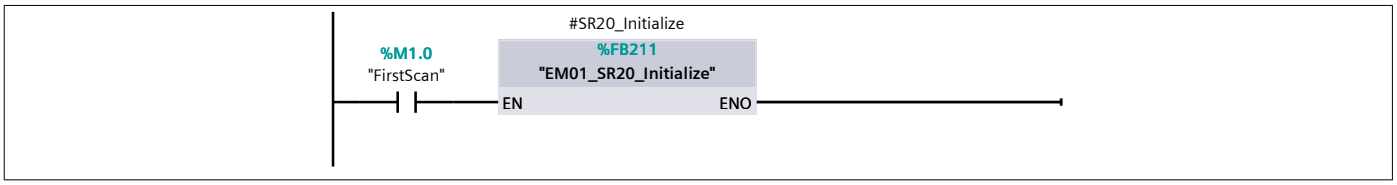
Program blocks / EM01_AxisXZ

EM01_00_Main [FB200]

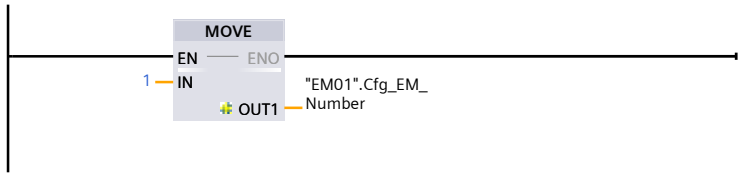
EM01_00_Main Properties					
General					
Name	EM01_00_Main	**Number**	200	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
Cfg_EM_Number	Int	0	Non-retain
Par_Jog_Accel	Real	0.0	Non-retain
Par_Jog_Decel	Real	0.0	Non-retain
Par_Jog_Speed	Real	0.0	Non-retain
CM00_EM_Procedure	"EM01_CM00_Procedure"		
CM01_EMConditions	"EM01_CM01_EMConditions"		
CM02_1_Axis_X	"EM01_CM02_ServoAxisObject"		
CM02_2_Axis_Z	"EM01_CM02_ServoAxisObject"		
CM03_1_AxisJog_X	"EM01_CM03_ServoAxisJog"		
CM03_2_AxisJog_Z	"EM01_CM03_ServoAxisJog"		
SR03_FaultHandler	"EM01_SR03_Fault Handler"		
SR20_Initialize	"EM01_SR20_Initialize"		
SR30_Simulate	"EM01_SR30_Simulate"		
Wrk_Temp_Bit	Bool	false	Non-retain
Temp			
Constant			

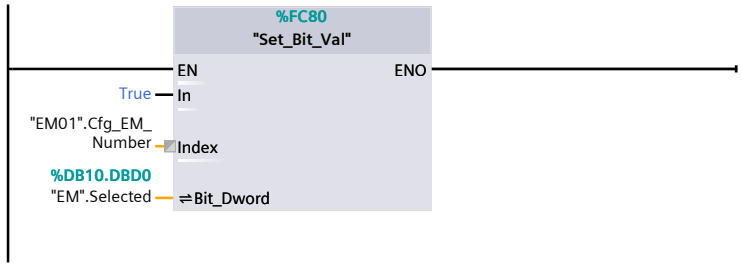
Network 1:



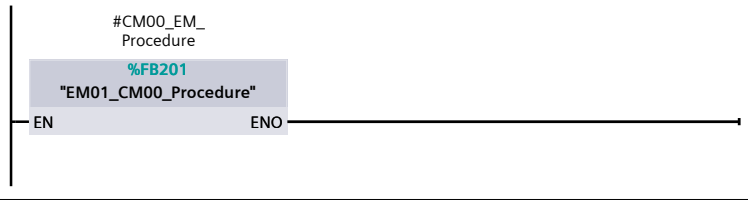
Network 2: Set EM number



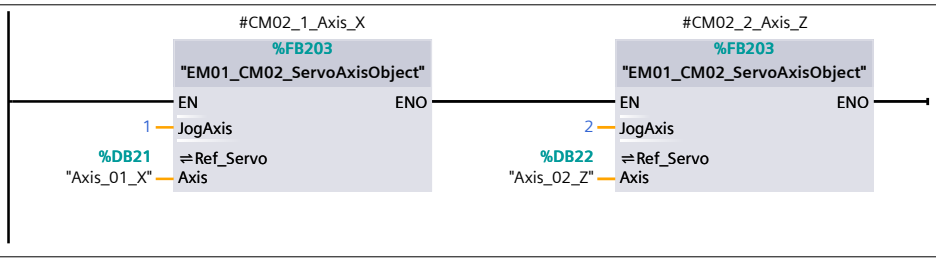
Network 3: Equipment module is selected and active



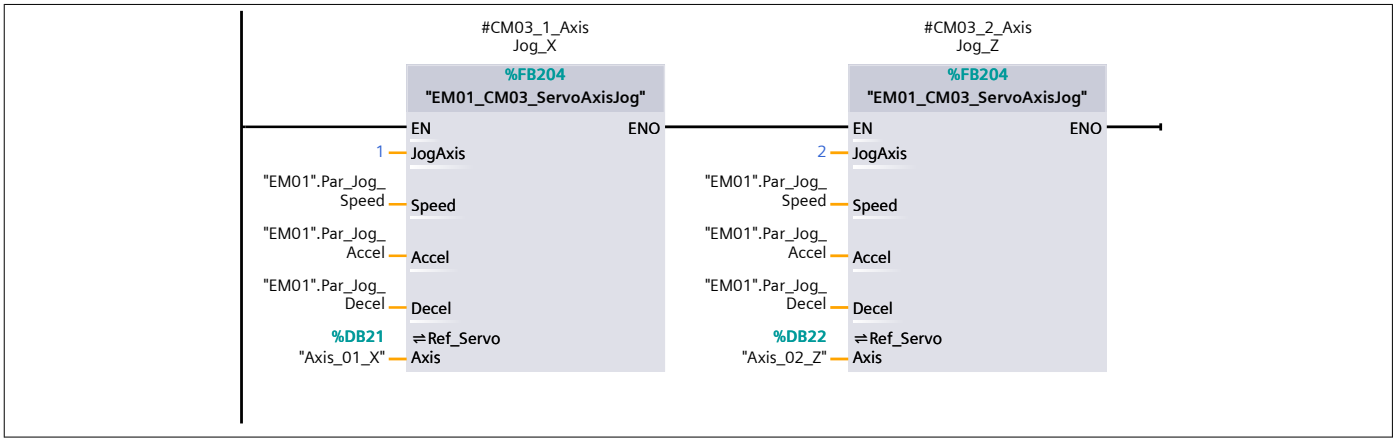
Network 4: EM Procedure



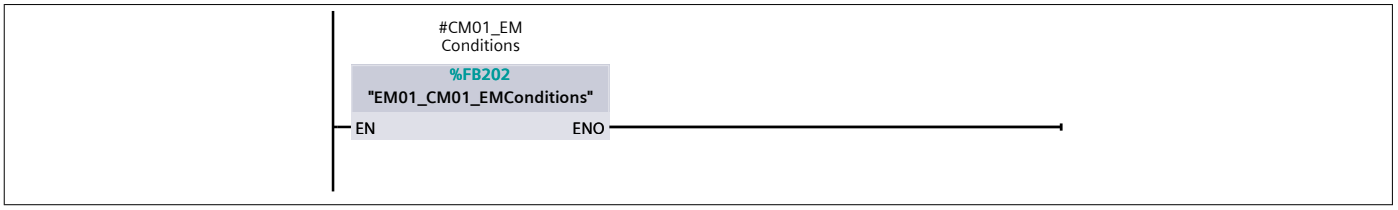
Network 5: Axis servo objects



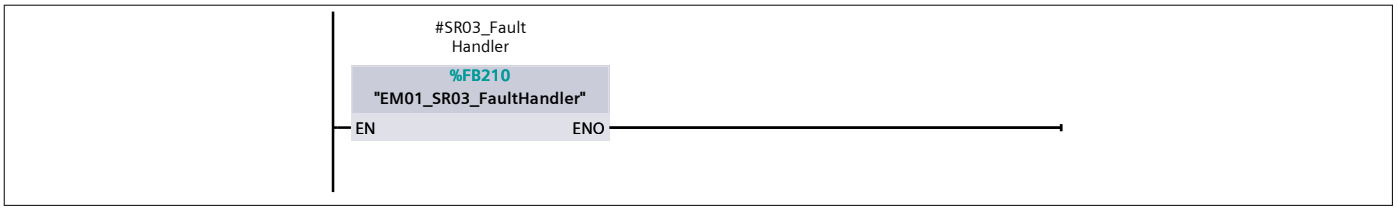
Network 6: Axis jogging



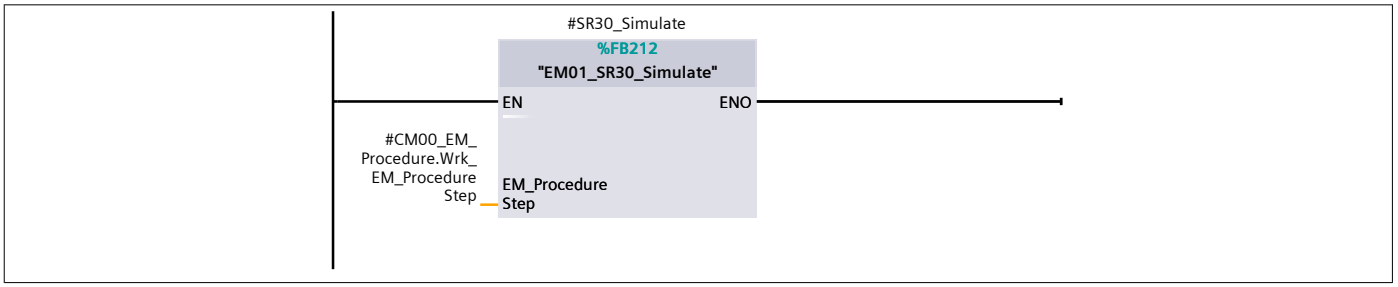
Network 7: State complete handling for EM



Network 8: Error handling



Network 9: Simulation



Program blocks / EM01_AxisXZ

EM01_CM00_Procedure [FB201]

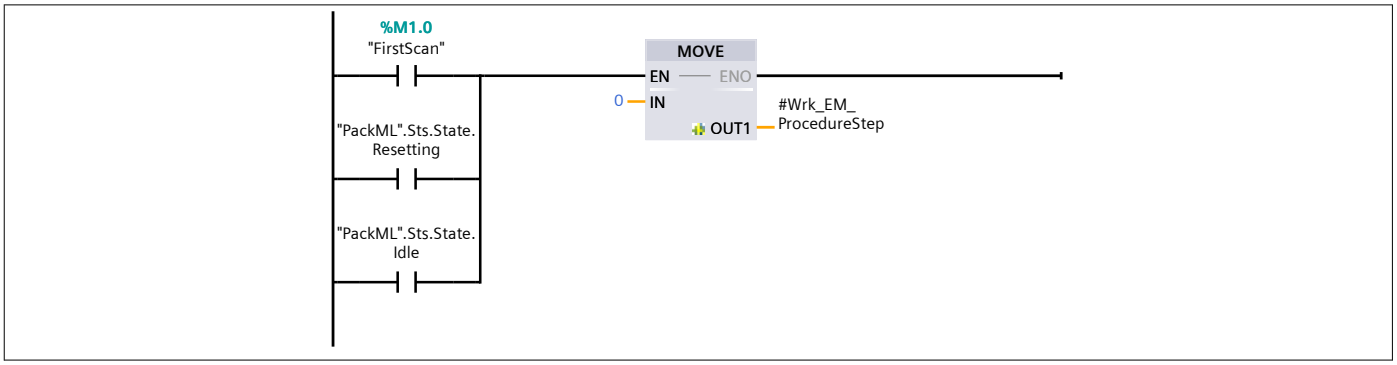
EM01_CM00_Procedure Properties					
General					
Name	EM01_CM00_Procedure	**Number**	201	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title	EM Procedure Sequence	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
ErrorID	Word	16#0	Non-retain
Sts_Err	Int	0	Non-retain
Wrk_EM_ProcedureStep	DInt	0	Non-retain
Wrk_EM_ProcedureNoStepsActive	Bool	false	Non-retain
Wrk_EM_ProcedureDone	Bool	false	Non-retain
Wrk_EM_ProcedureFault	Bool	false	Non-retain
Wrk_MC_Move1_1_X	MC_MOVERELATIVE		
Wrk_MC_Move1_2_Z	MC_MOVERELATIVE		
Wrk_MC_Move2_2_Z	MC_MOVEABSO-LUTE		
Wrk_MC_Move2_1_X	MC_MOVEABSO-LUTE		
Wrk_Axis_X_Accel	Real	0.0	Non-retain
Wrk_Axis_X_Decel	Real	0.0	Non-retain
Wrk_Axis_Z_Accel	Real	0.0	Non-retain
Wrk_Axis_Z_Decel	Real	0.0	Non-retain
Wrk_TempReal	Real	0.0	Non-retain
MC_Move1_X_Done	Bool	false	Non-retain
MC_Move1_X_Busy	Bool	false	Non-retain
MC_Move1_X_CommandAborted	Bool	false	Non-retain
MC_Move1_X_Error	Bool	false	Non-retain
MC_Move1_X_ErrorID	Word	16#0	Non-retain
MC_Move1_Z_Done	Bool	false	Non-retain
MC_Move1_Z_Busy	Bool	false	Non-retain
MC_Move1_Z_CommandAborted	Bool	false	Non-retain
MC_Move1_Z_Error	Bool	false	Non-retain
MC_Move1_Z_ErrorID	Word	16#0	Non-retain
MC_Move2_X_Done	Bool	false	Non-retain
MC_Move2_X_Busy	Bool	false	Non-retain
MC_Move2_X_CommandAborted	Bool	false	Non-retain
MC_Move2_X_Error	Bool	false	Non-retain
MC_Move2_X_ErrorID	Word	16#0	Non-retain

Name	Data type	Default value	Retain
MC_Move2_Z_Done	Bool	false	Non-retain
MC_Move2_Z_CommandAborted	Bool	false	Non-retain
MC_Move2_Z_Error	Bool	false	Non-retain
MC_Move2_Z_Busy	Bool	false	Non-retain
MC_Move2_Z_ErrorID	Word	16#0	Non-retain
Temp			
Constant			

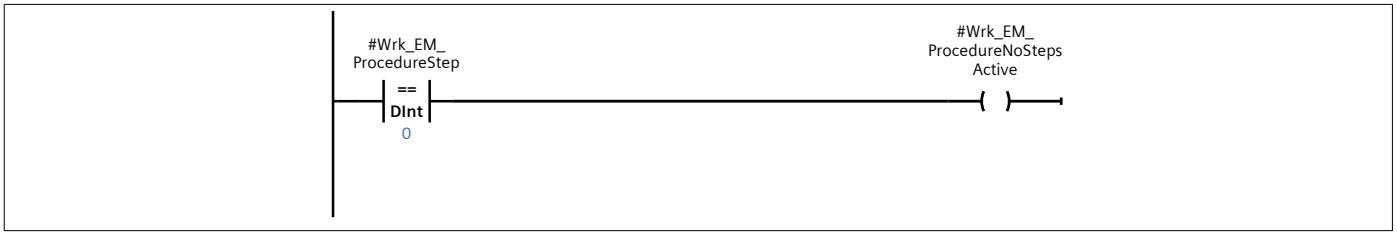
Network 1: Reset step number

First scan or resetting or idle - clear all steps



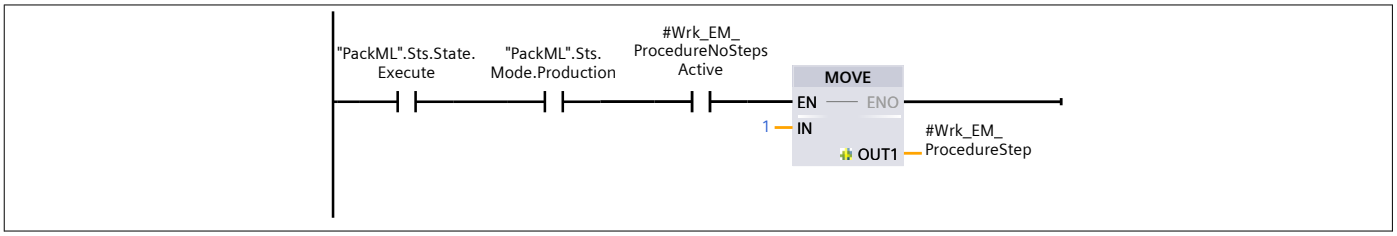
Network 2: Indication that all steps reset

Used by RESETTING state and initial execute step

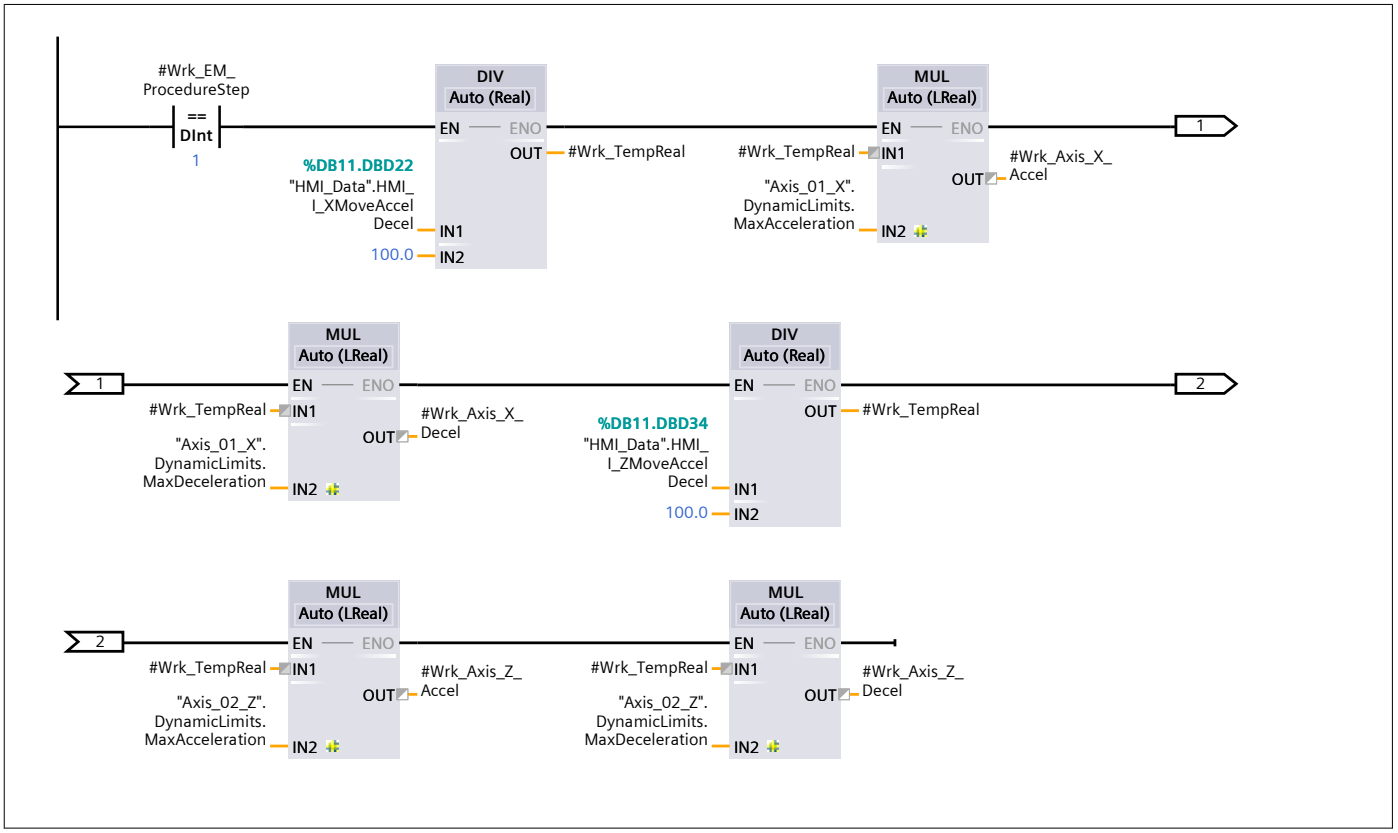


Network 3: EXECUTE -

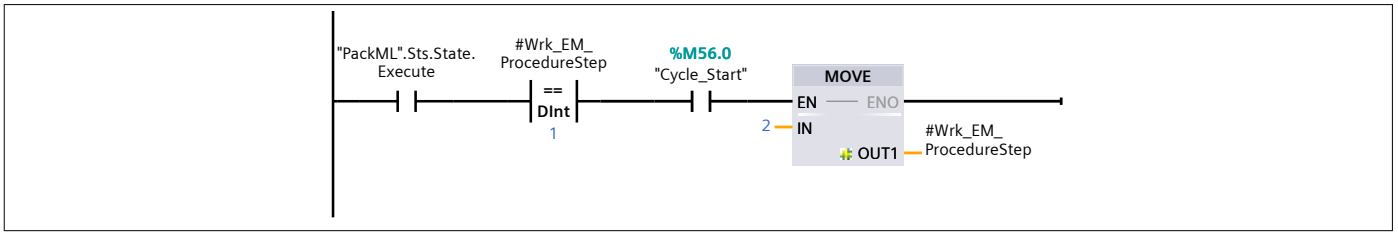
If no steps active go to step 1



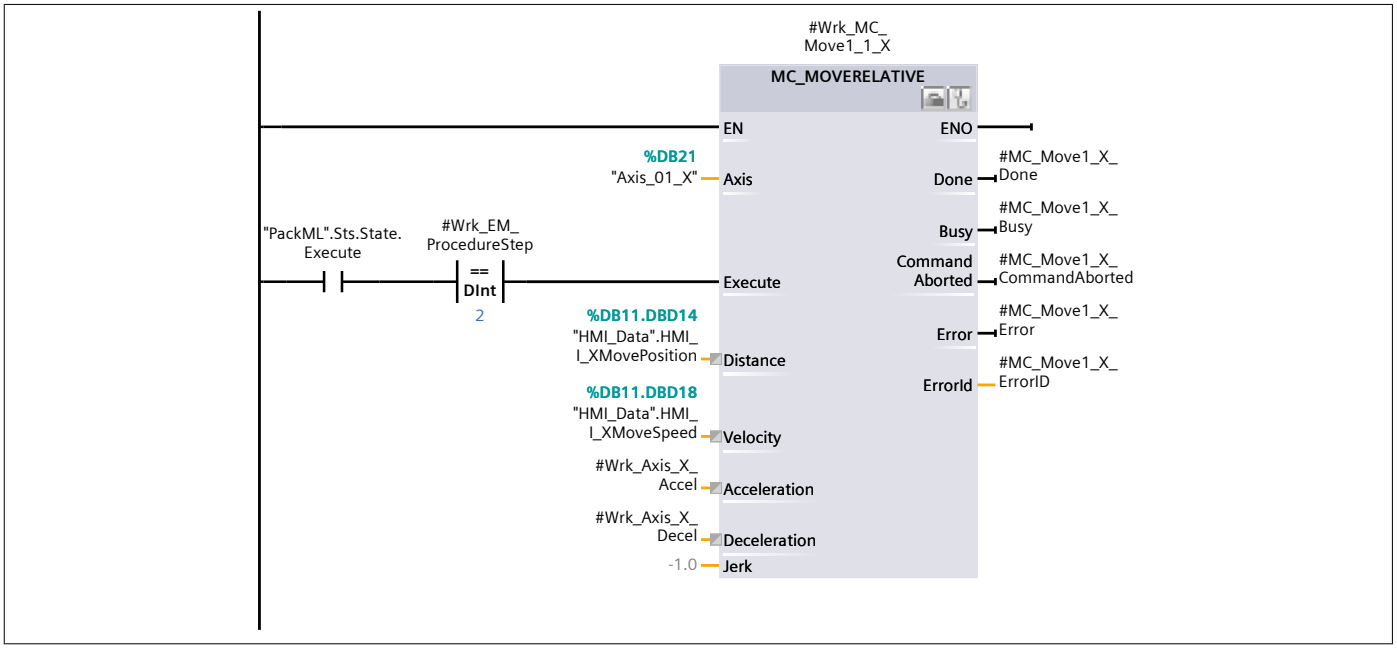
Network 4: Calculate Accel/Decel in actual units in step 1



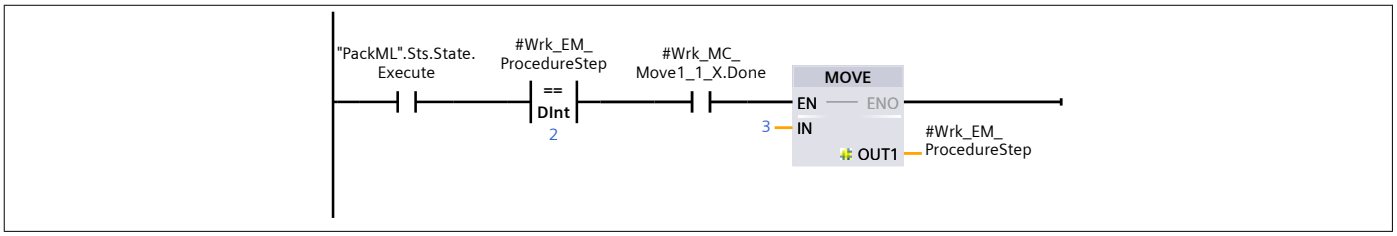
Network 5: EM Procedure Step 1 - Wait for Cycle_Start signal



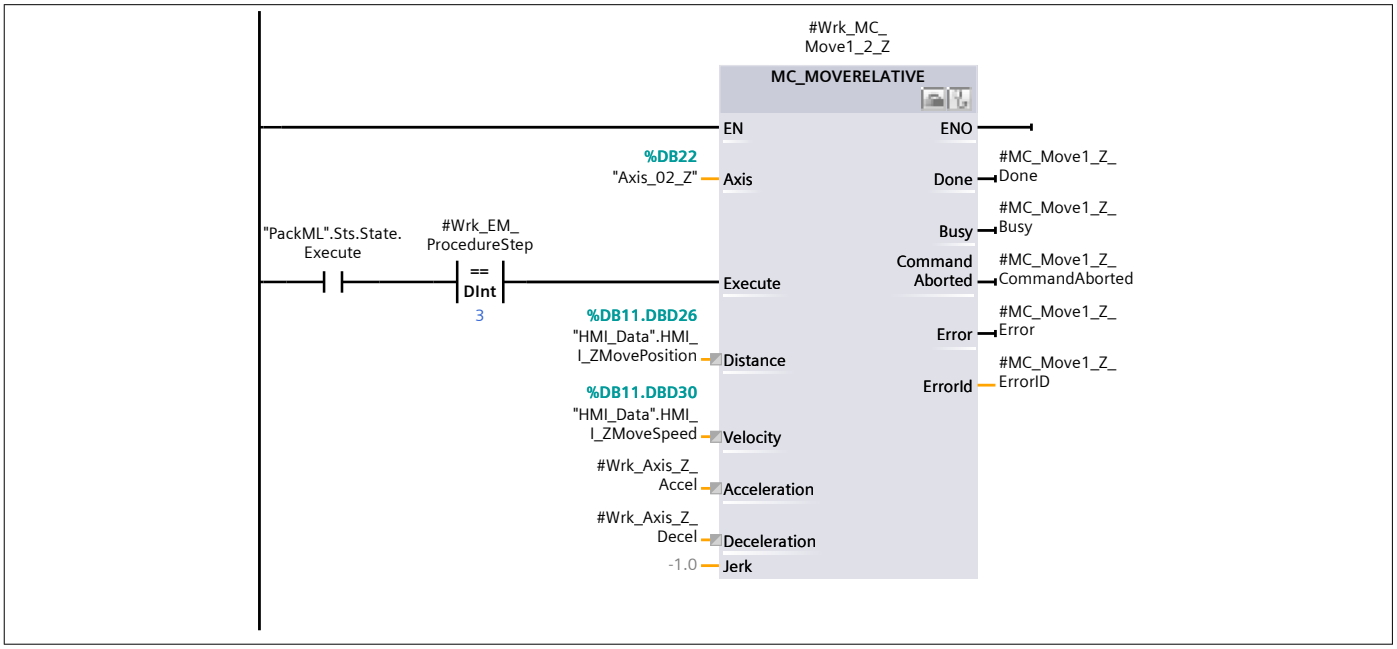
Network 6: EM Procedure Step 2 - X +move



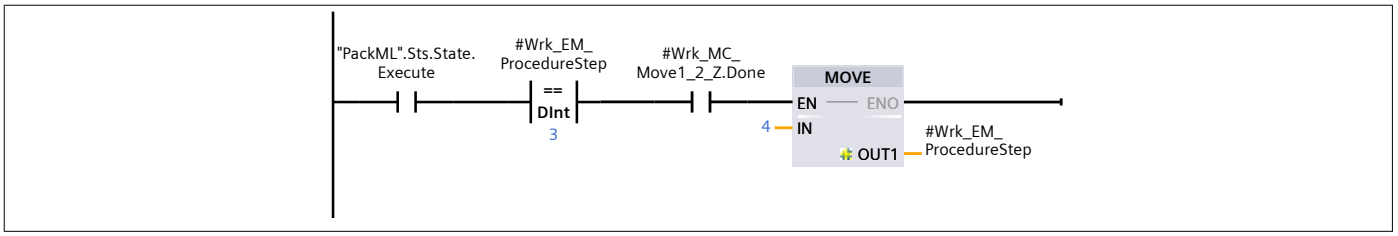
Network 7: Check for move done to advance to next step



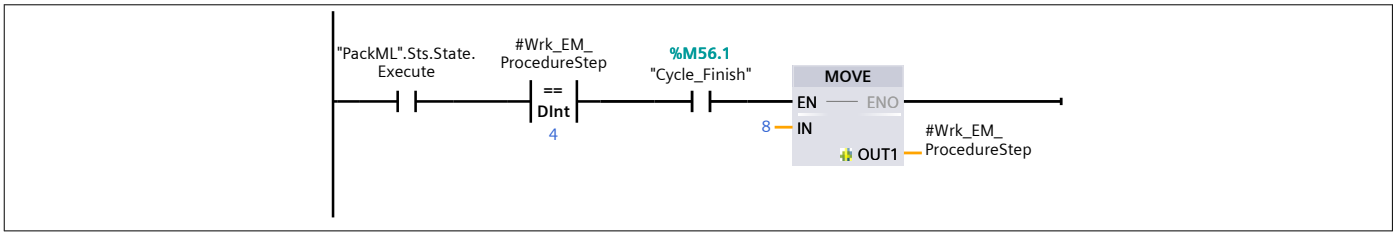
Network 8: EM Procedure Step 3 - Z +move



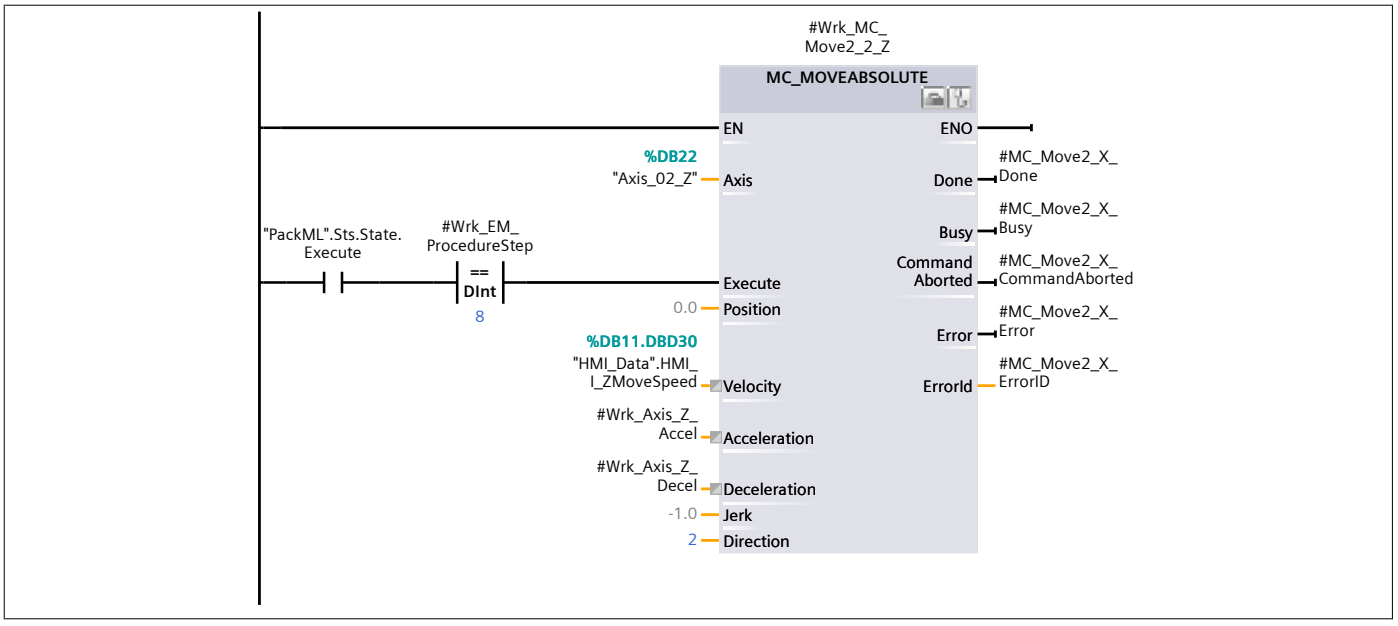
Network 9: Check for move done to advance to next step



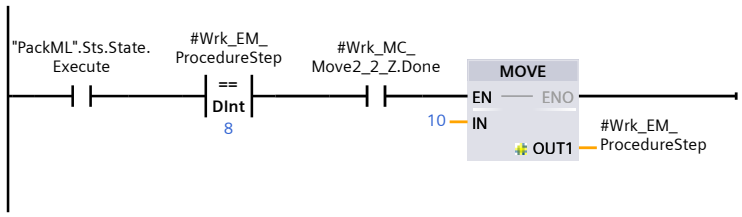
Network 10: EM Procedure Step 4 - Wait for Cycle_Finish



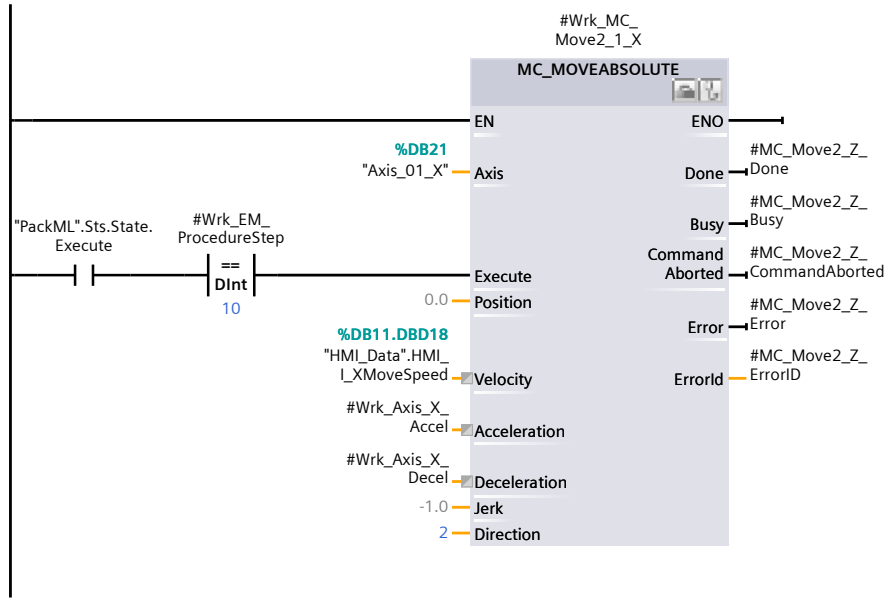
Network 11: EM Procedure Step 8 - Move Z back to starting point (home)



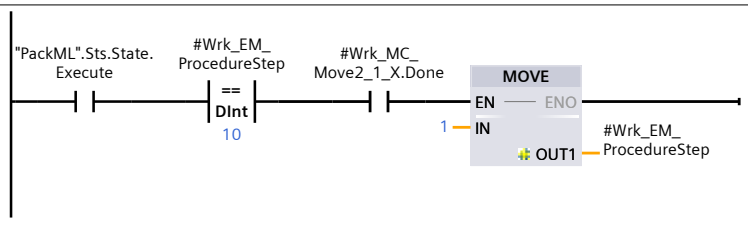
Network 12: Check for move done to advance to next step



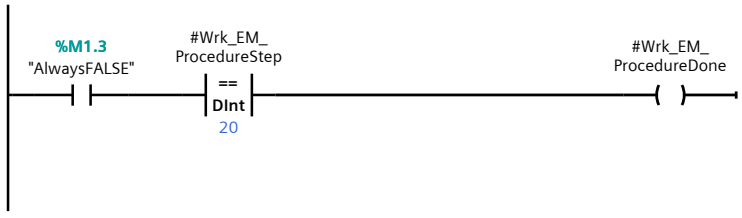
Network 13: EM Procedure Step 10 - X back to starting position (home)



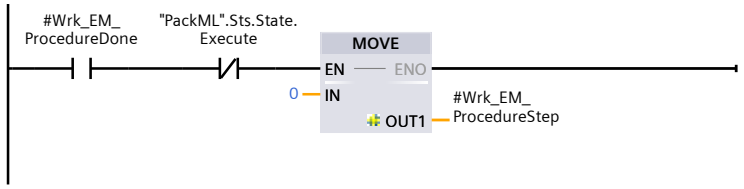
Network 14: Check for move done to advance to next step - back to start



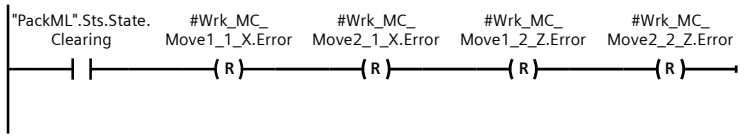
Network 15: Last step - set done indication. Only used if last step finishes Execute state



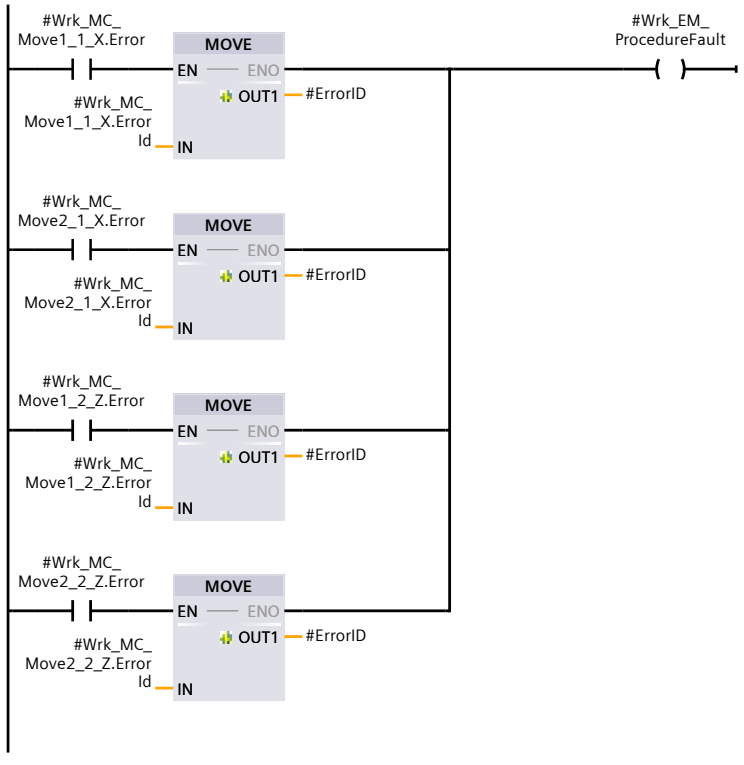
Network 16: When done, wait for out of execute step, then set step back to zero so can restart without resetting



Network 17: Clearing state resets all motion errors



Network 18: Motion block errors for X Axis



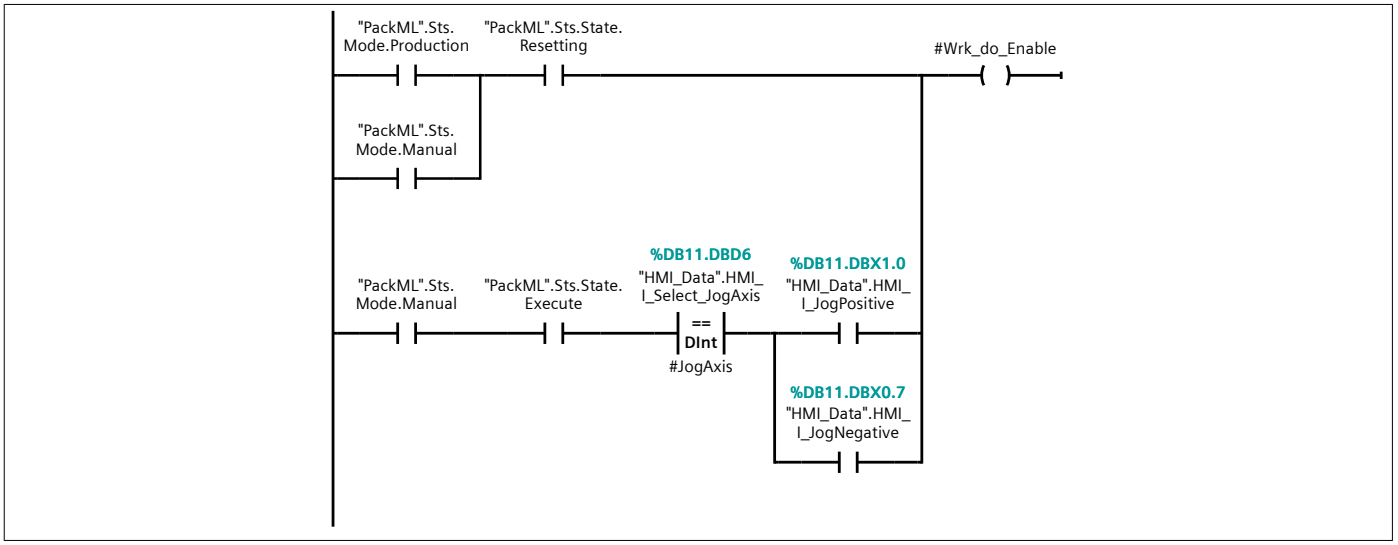
Program blocks / EM01_AxisXZ

EM01_CM02_ServoAxisObject [FB203]

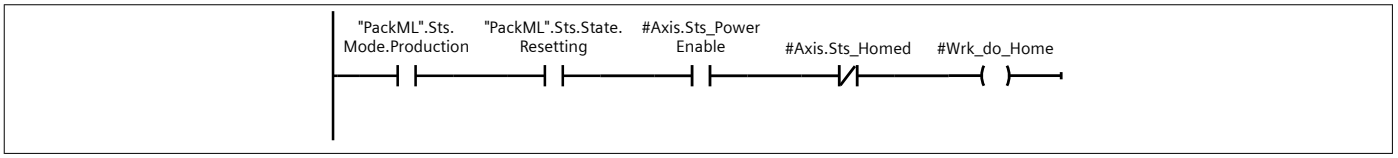
EM01_CM02_ServoAxisObject Properties					
General					
Name	EM01_CM02_ServoAxi-sObject	**Number**	203	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title	Servo Axis object for X ax-is	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
▼ Input			
JogAxis	DInt	0	Non-retain
Output			
▼ InOut			
Ref_ServoAxis	TO_PositioningAxis		
▼ Static			
Axis	"Axis_ObjectPOS"		
Wrk_DisableDelay	TON_TIME		Non-retain
Wrk_DisableDelay_IN	Bool	false	Non-retain
Wrk_do_Enable	Bool	false	Non-retain
Wrk_do_Home	Bool	false	Non-retain
Wrk_do_Stop	Bool	false	Non-retain
Wrk_do_Disable	Bool	false	Non-retain
Wrk_Temp_Bit	Bool	false	Non-retain
Temp			
Constant			

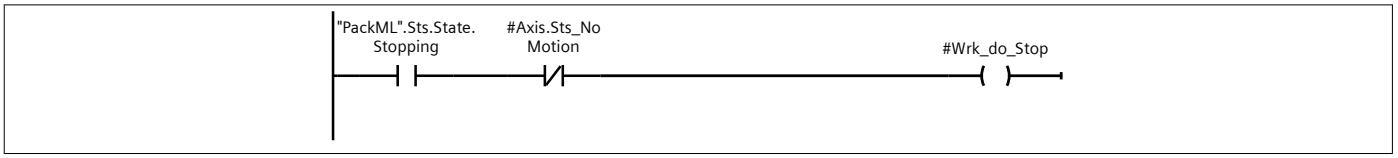
Network 1: Enable logic for production and manual (jogging)



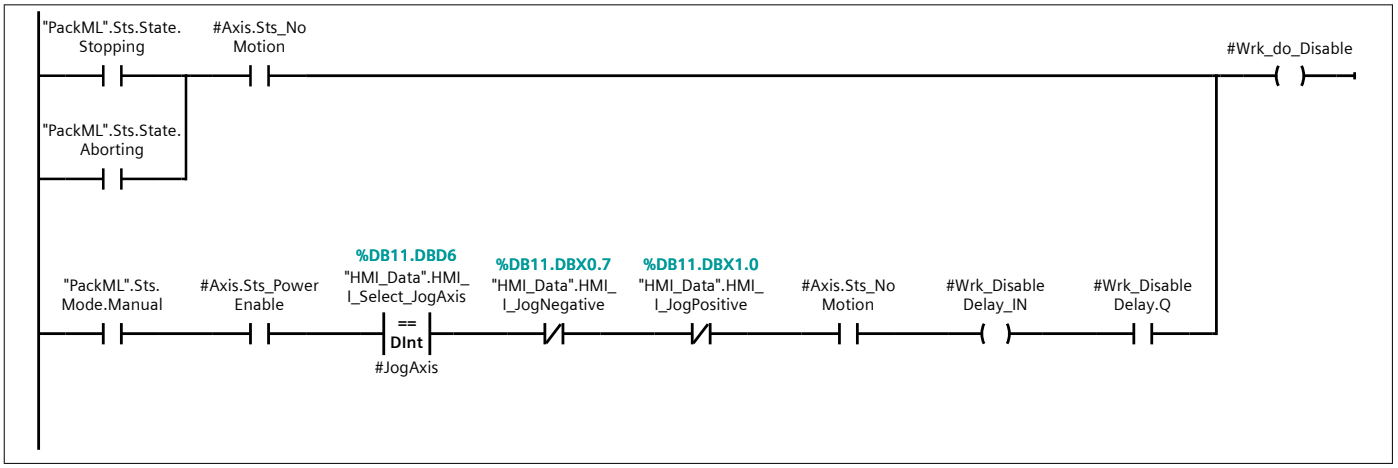
Network 2: Homing logic



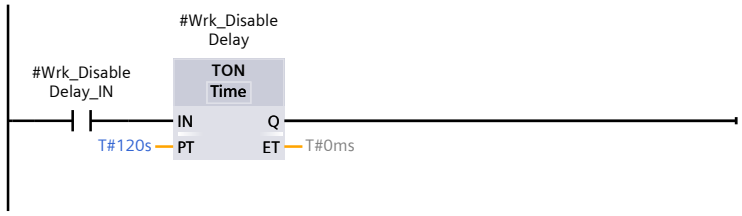
Network 3: Stop logic



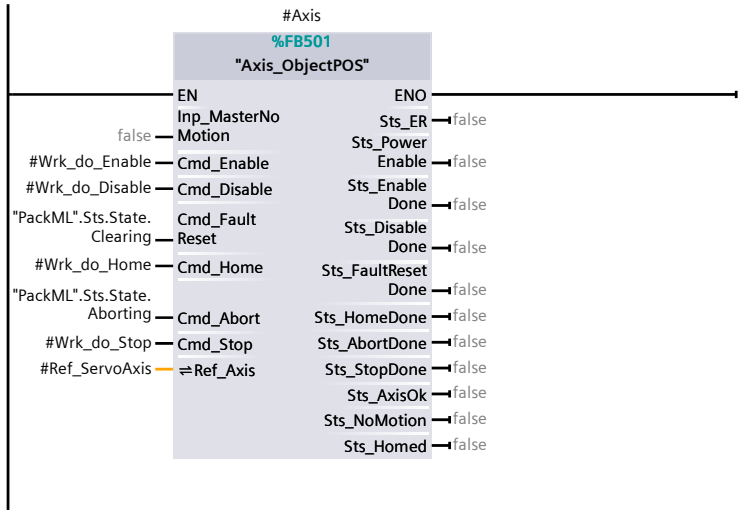
Network 4: Do_Disable logic



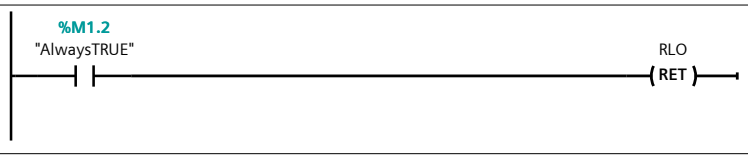
Network 5: Disable delay timer for manual mode - if no jogging for 2 min, disable axis



Network 6:



Network 7: END: Update the ENO Output. (DO NOT REMOVE. Must be last rung)



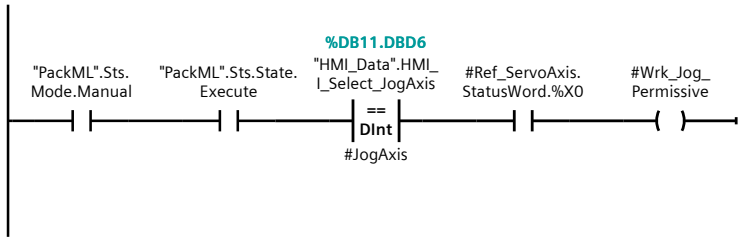
Program blocks / EM01_AxisXZ

EM01_CM03_ServoAxisJog [FB204]

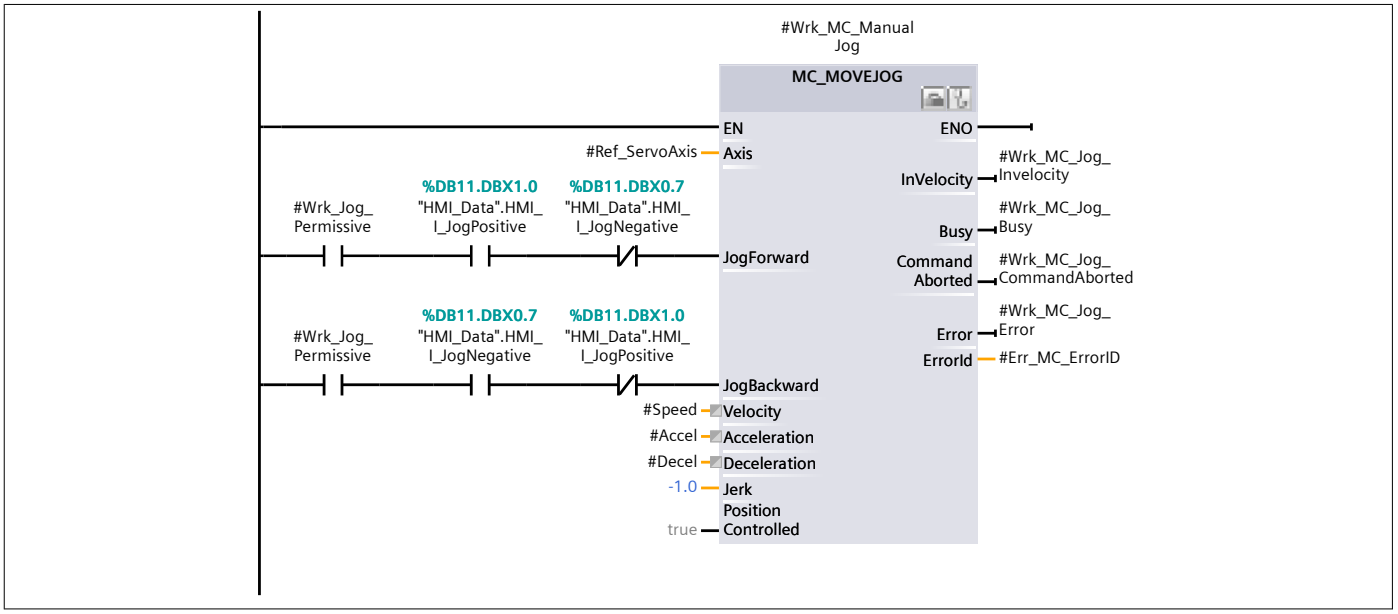
EM01_CM03_ServoAxisJog Properties					
General					
Name	EM01_CM03_ServoAxis-Jog	**Number**	204	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title	Jog servo axis in manual mode	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
▼ Input			
JogAxis	DInt	0	Non-retain
Speed	Real	0.0	Non-retain
Accel	Real	0.0	Non-retain
Decel	Real	0.0	Non-retain
Output			
▼ InOut			
Ref_ServoAxis	TO_PositioningAxis		
▼ Static			
Sts_JogFault	Bool	false	Non-retain
Err_MC_ErrorID	Word	16#0	Non-retain
Wrk_Jog_Permissive	Bool	false	Non-retain
Wrk_MC_ManualJog	MC_MOVEJOG		
Wrk_MC_Jog_Invelocity	Bool	false	Non-retain
Wrk_MC_Jog_Busy	Bool	false	Non-retain
Wrk_MC_Jog_CommandAborted	Bool	false	Non-retain
Wrk_MC_Jog_Error	Bool	false	Non-retain
Temp			
Constant			

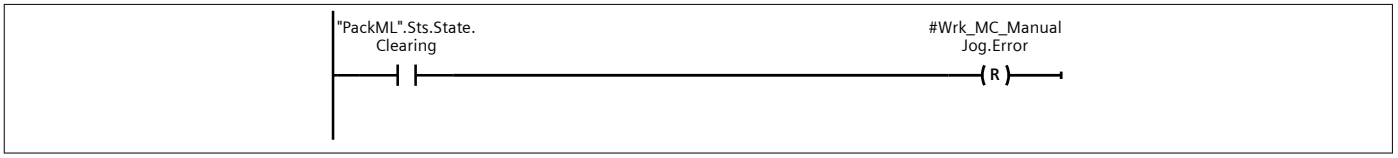
Network 2: RELEASE JOG FUNCTION (-> SELECT EM NUMBER VIA HMI)



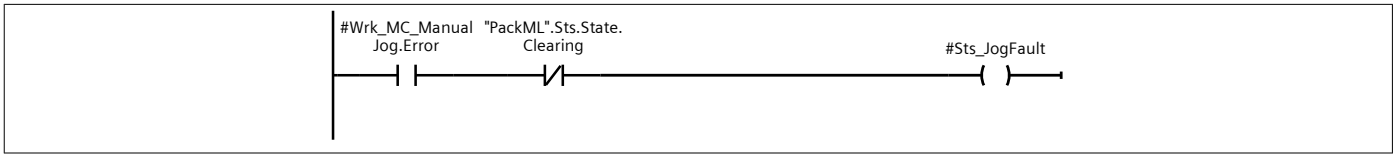
Network 3: JOG SERVO AXIS



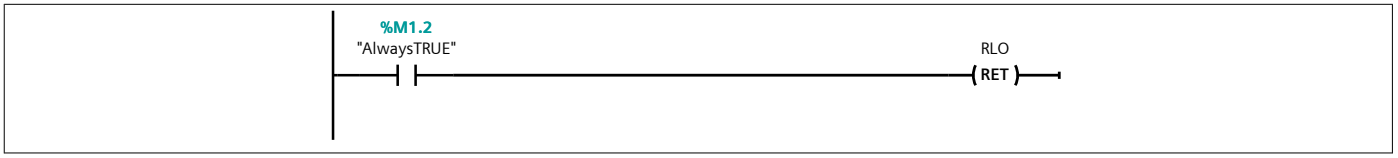
Network 4: Fault Reset



Network 5:



Network 6: END: Update the ENO Output. (DO NOT REMOVE. Must be last rung)



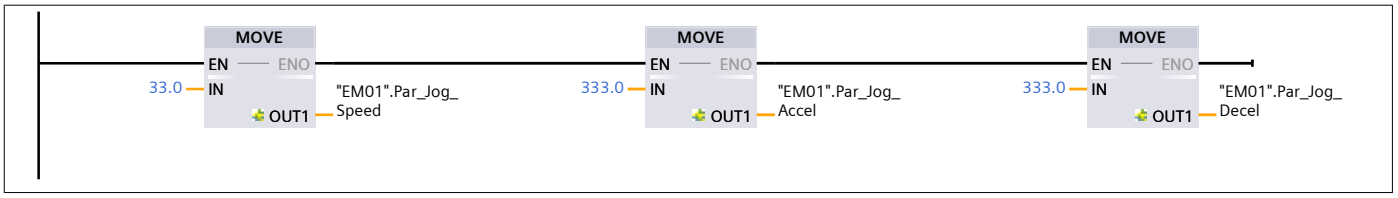
Program blocks / EM01_AxisXZ

EM01_SR20_Initialize [FB211]

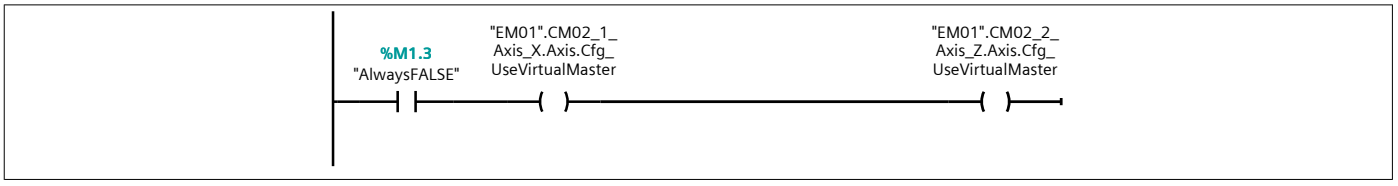
EM01_SR20_Initialize Properties					
General					
Name	EM01_SR20_Initialize	**Number**	211	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title	Initialization for EM	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
Temp_Dint	DInt	0	Non-retain
Temp			
Constant			

Network 2:



Network 3: Both axes do not use a virtual master



Program blocks / EM01_AxisXZ

EM01 [DB200]

EM01 Properties					
General					
Name	EM01	**Number**	200	**Type**	DB
Language	DB	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Start value	Retain
Input			
Output			
InOut			
▼ Static			
Cfg_EM_Number	Int	0	False
Par_Jog_Accel	Real	0.0	False
Par_Jog_Decel	Real	0.0	False
Par_Jog_Speed	Real	0.0	False
CM00_EM_Procedure	"EM01_CM00_Procedure"		False
CM01_EMConditions	"EM01_CM01_EMConditions"		False
CM02_1_Axis_X	"EM01_CM02_ServoAxisObject"		False
CM02_2_Axis_Z	"EM01_CM02_ServoAxisObject"		False
CM03_1_AxisJog_X	"EM01_CM03_ServoAxisJog"		False
CM03_2_AxisJog_Z	"EM01_CM03_ServoAxisJog"		False
SR03_FaultHandler	"EM01_SR03_FaultHandler"		False
SR20_Initialize	"EM01_SR20_Initialize"		False
SR30_Simulate	"EM01_SR30_Simulate"		False
Wrk_Temp_Bit	Bool	false	False

Program blocks / EM01_AxisXZ

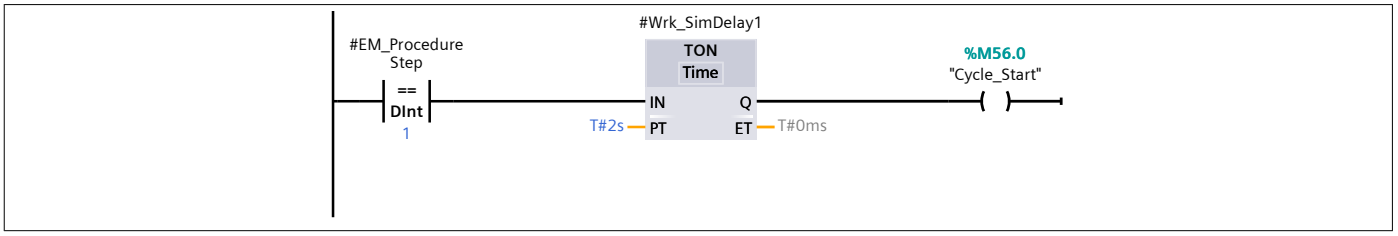
EM01_SR30_Simulate [FB212]

EM01_SR30_Simulate Properties					
General					
Name	EM01_SR30_Simulate	**Number**	212	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title	Simulate Cycle_Start and Cycle_Finish for EM procedure	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
EM_ProcedureStep	DInt	0	Non-retain
Output			
InOut			
Static			
Wrk_SimDelay1	TON_TIME		Non-retain
Wrk_SimDelay2	TON_TIME		Non-retain
Act_Pass	Bool	false	Non-retain
Wrk_SwitchPresnt	Bool	false	Non-retain
Wrk_AtHome	Bool	false	Non-retain
Temp			
Constant			

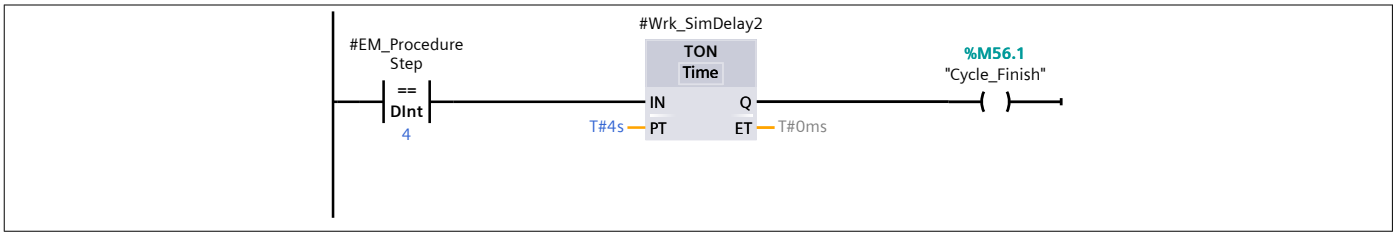
Network 1: Cycle_Start simulation

Turn on when procedure step 1 for 2 secs

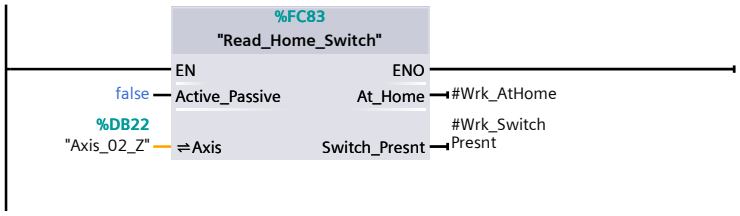


Network 2: Cycle_Finish simulation

Turn on when procedure step 4 for 4 secs



Network 3:


%FC83
"Read_Home_Switch"
EN
ENO
false
Active_Passive
At_Home
#Wrk_AtHome
%DB22
"Axis_02_Z"
⇌Axis
Switch_Presnt
#Wrk_Switch
Presnt

Program blocks / EM01_AxisXZ

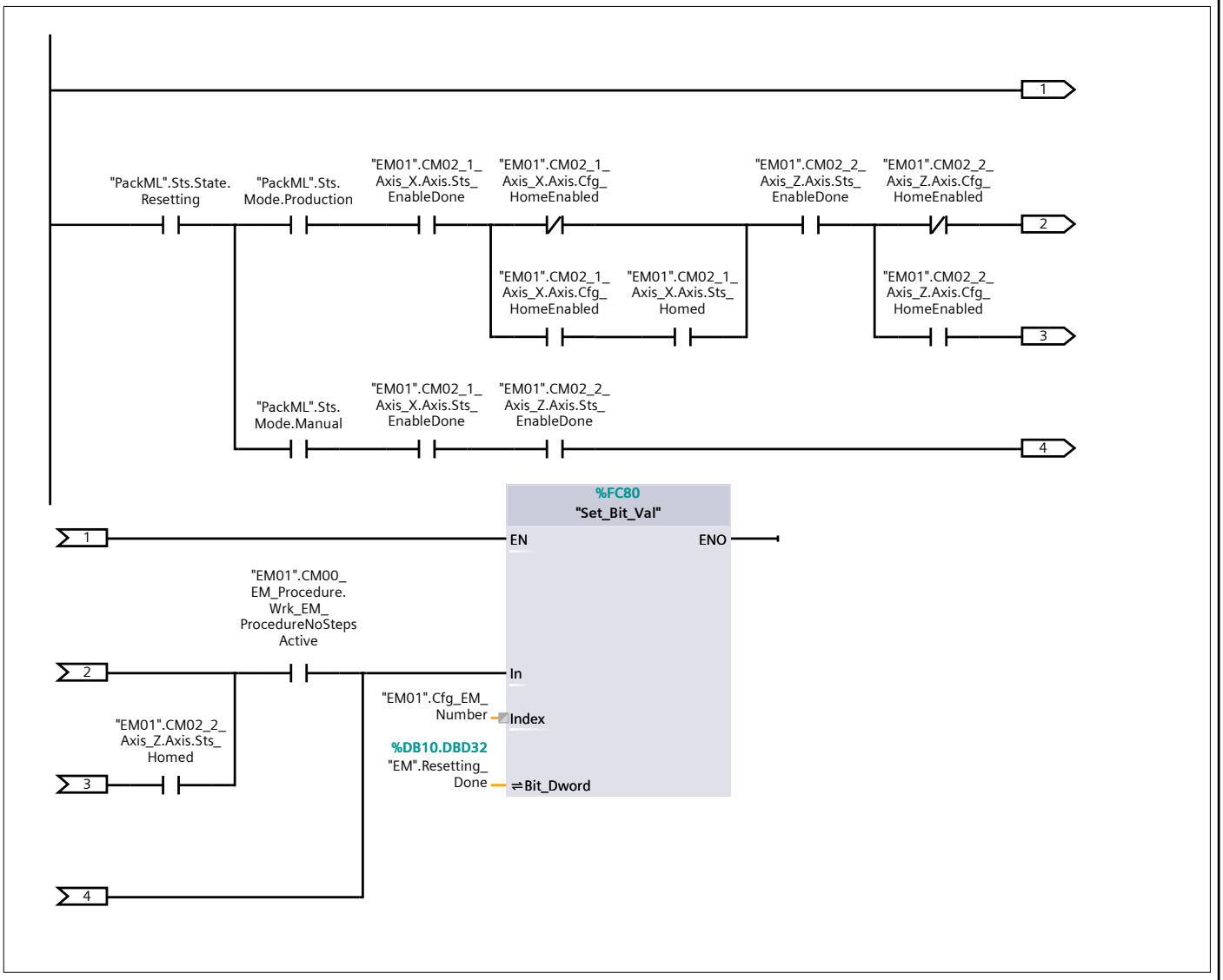
EM01_CM01_EMConditions [FB202]

EM01_CM01_EMConditions Properties					
General					
Name	EM01_CM01_EMCondi-tions	**Number**	202	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

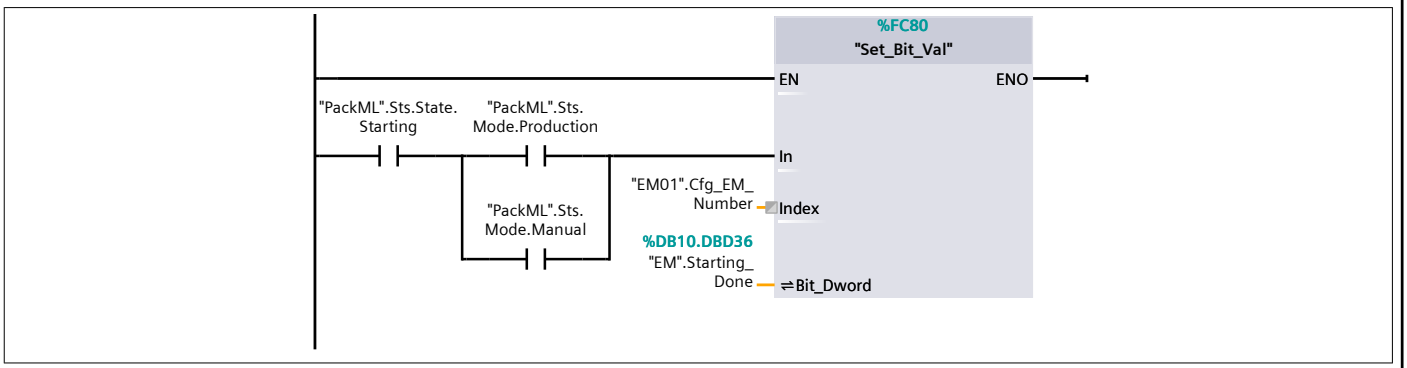
Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
Wrk_Temp	DInt	0	Non-retain
Temp			
Constant			

Network 1: Handles EM state complete conditions

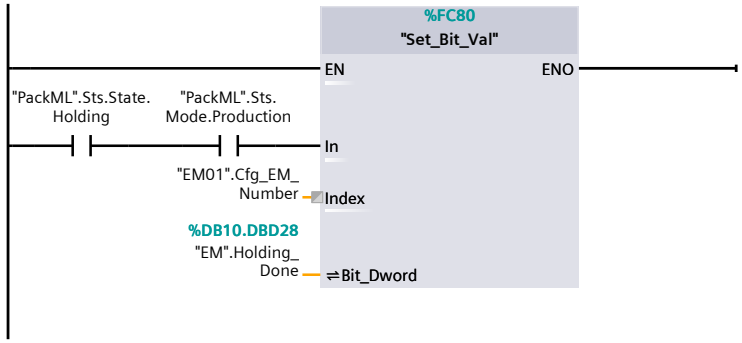
Network 2: Resetting state



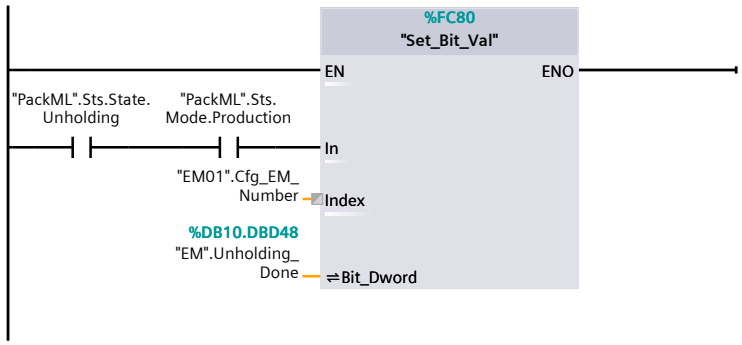
Network 3: Starting state



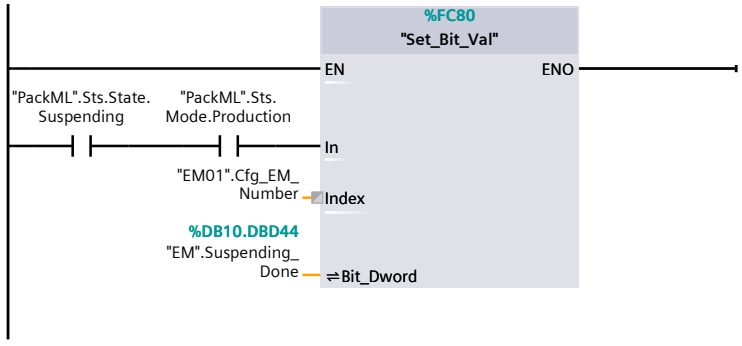
Network 4: Holding state



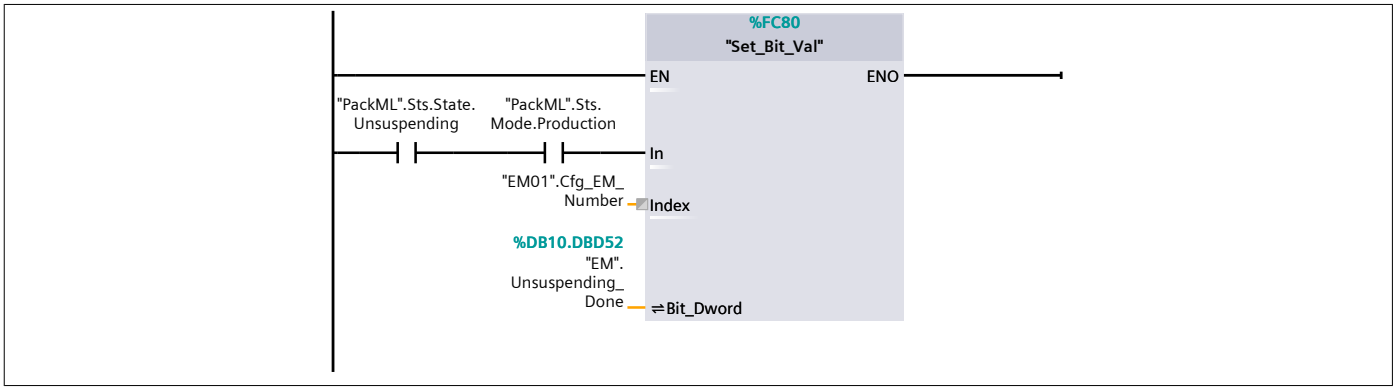
Network 5: Unholding



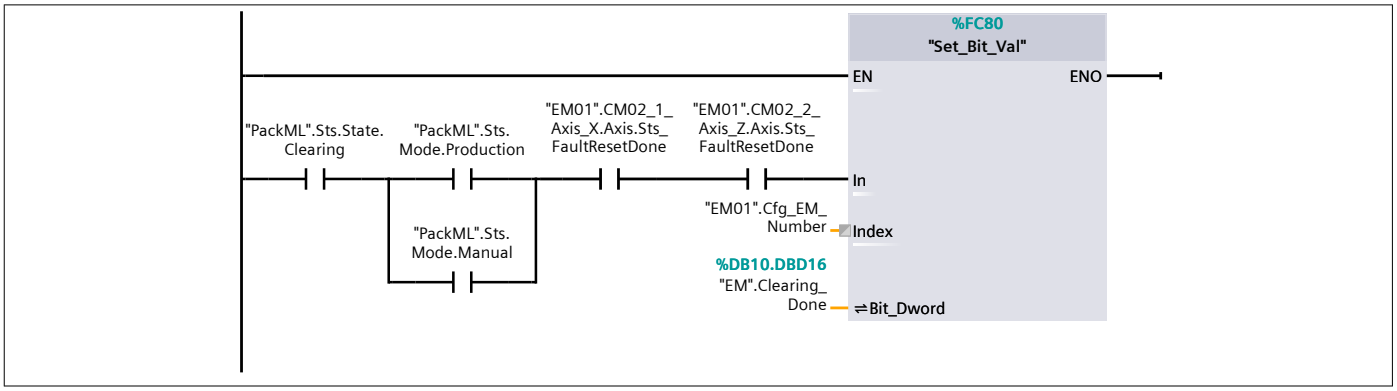
Network 6: Suspending state



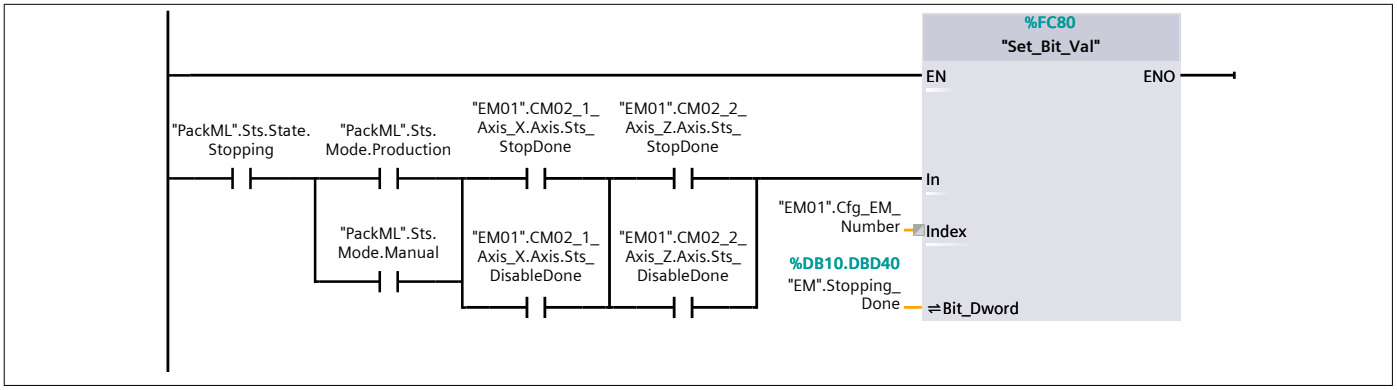
Network 7: Unsuspending



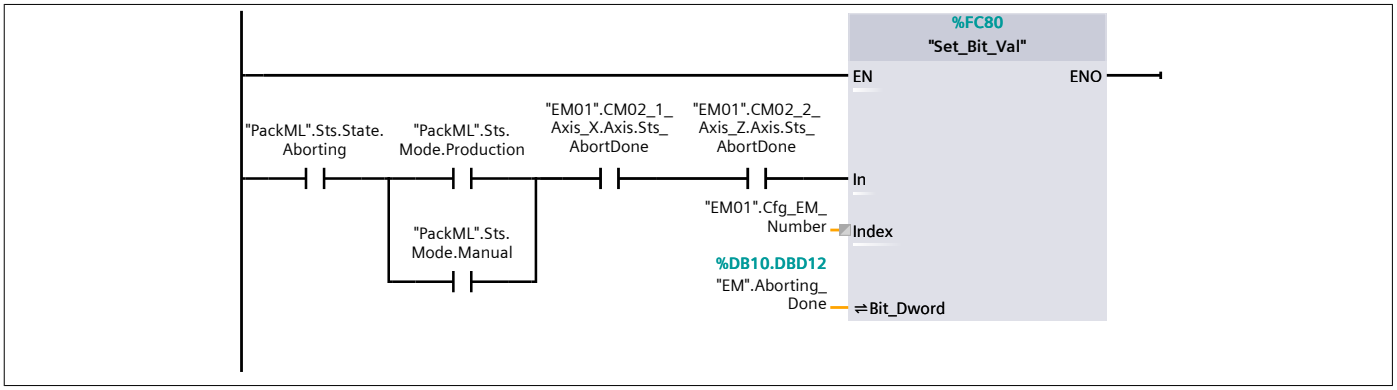
Network 8: Clearing state



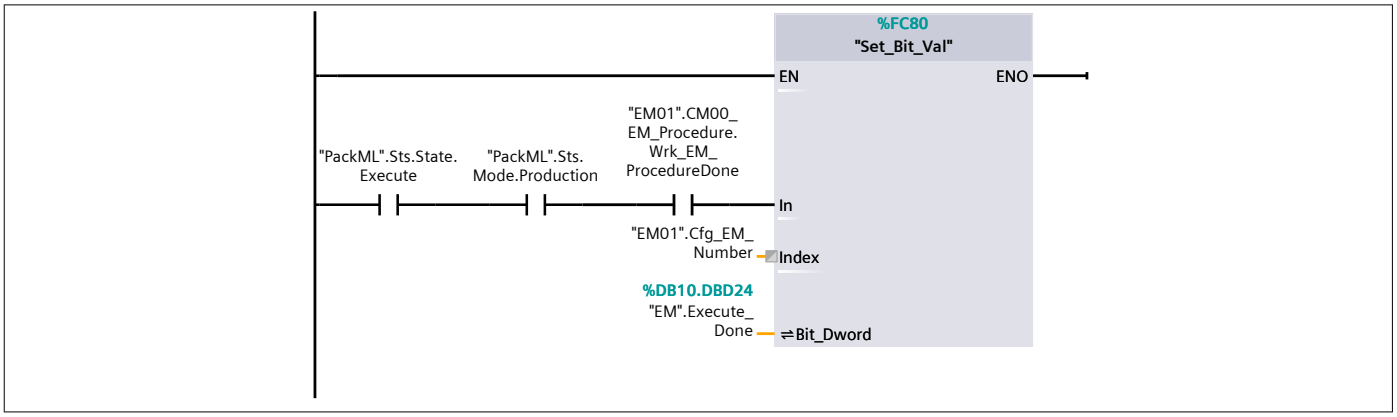
Network 9: Stopping state



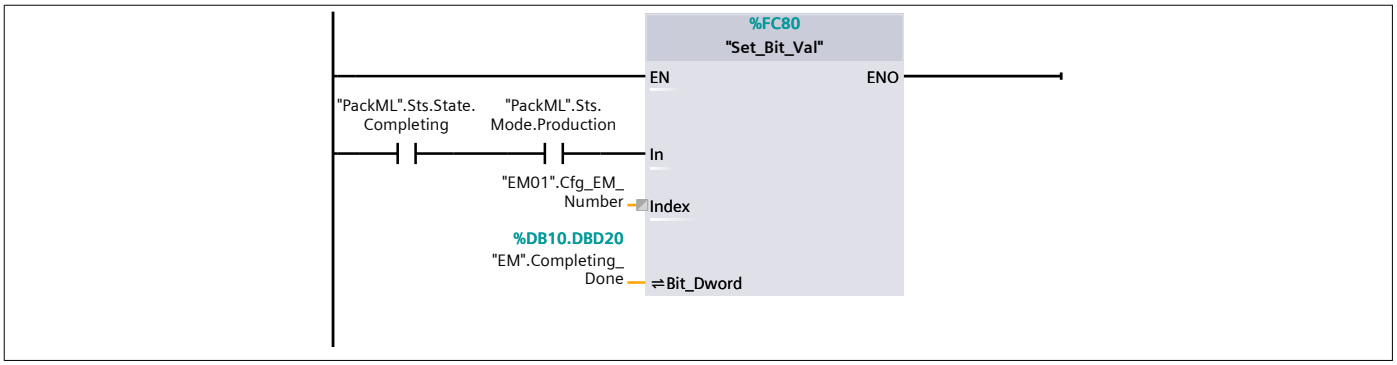
Network 10: Aborting state



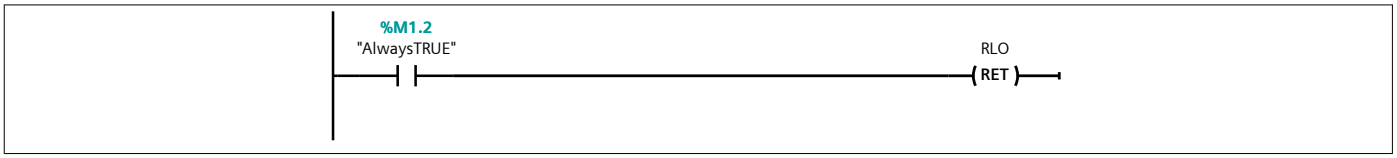
Network 11: Execute state



Network 12: Completing State



Network 13: Update the ENO output. Must be last rung.



Program blocks / EM01_AxisXZ

EM01_SR03_FaultHandler [FB210]

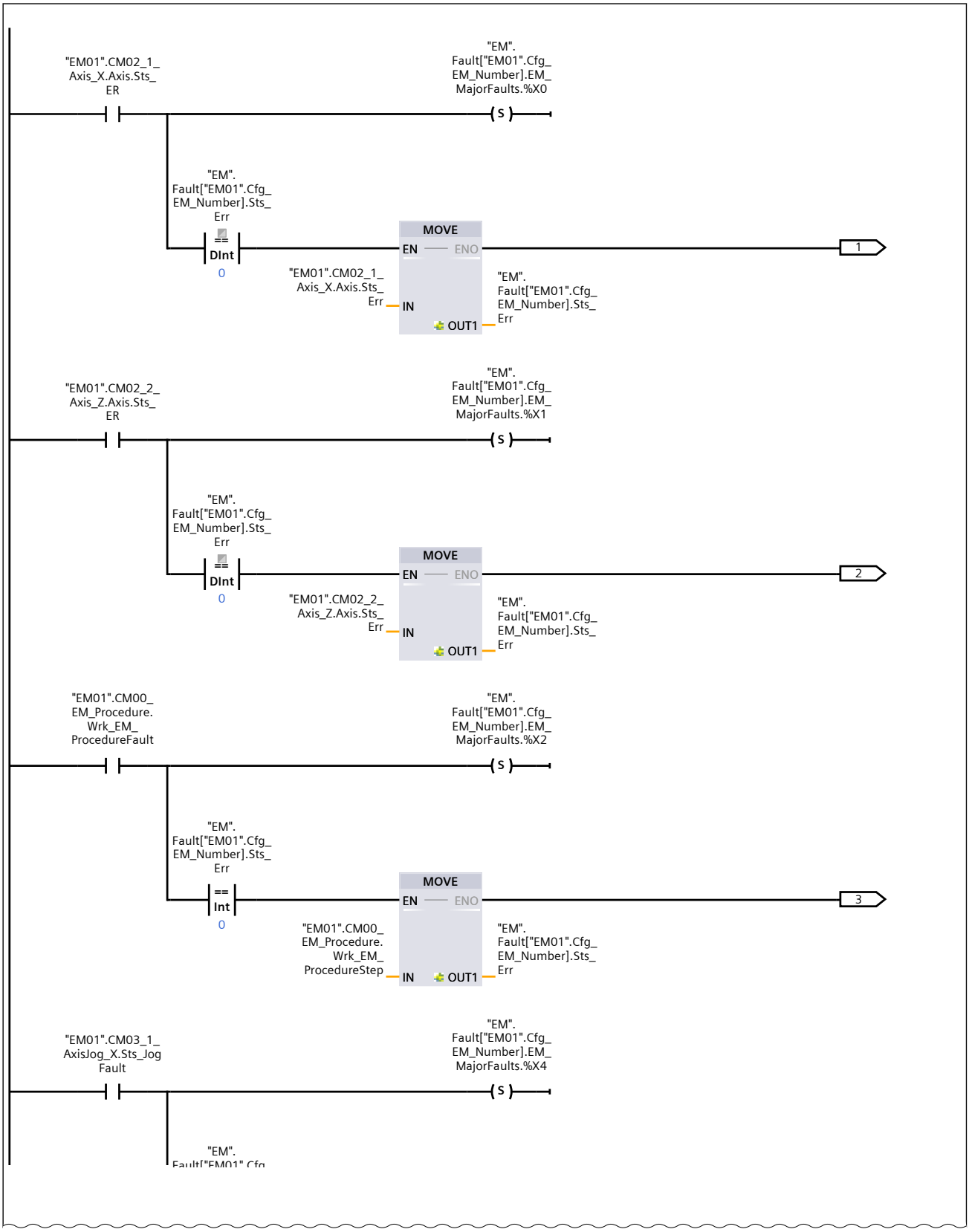
EM01_SR03_FaultHandler Properties					
General					
Name	EM01_SR03_FaultHandler	**Number**	210	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
Wrk_Temp	DInt	0	Non-retain
Wrk_Temp_Bit	Bool	false	Non-retain
Temp			
Constant			

Network 2: Map axis errors, procedure motion errors, and jogging errors into bits of the EM_Major-Faults

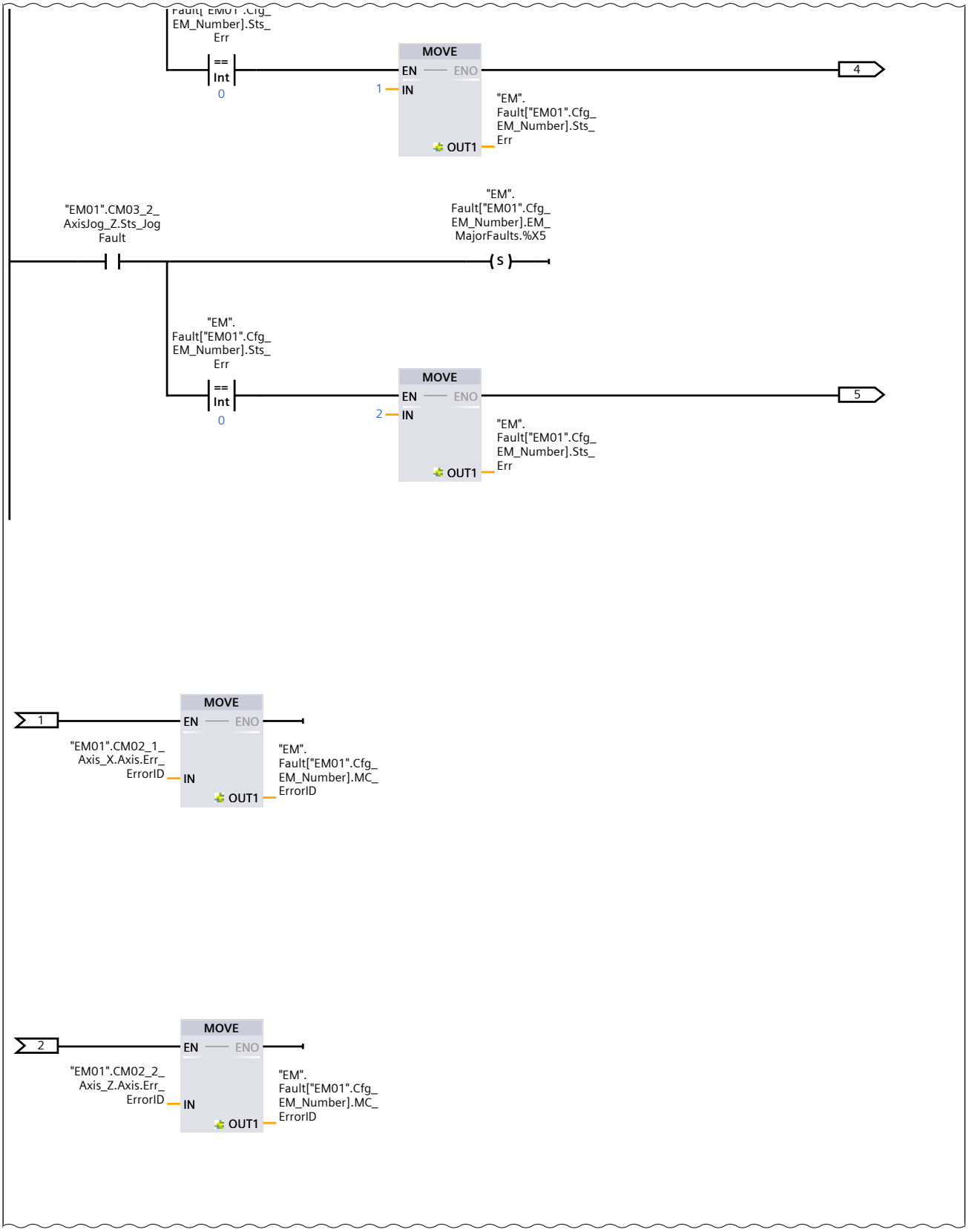
Only first error is recorded. Subsequent errors are not recorded.

Network 2: Map axis errors, procedure motion errors, and jogging errors into bits of the EM_MajorFaults (1.1 / 3.1)



Network 2: Map axis errors, procedure motion errors, and jogging errors into bits of the EM_MajorFaults (2.1 / 3.1)

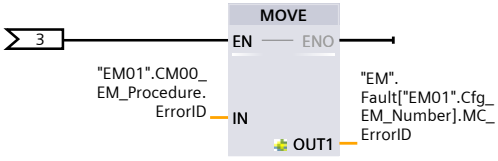
1.1 (Page31 - 2)

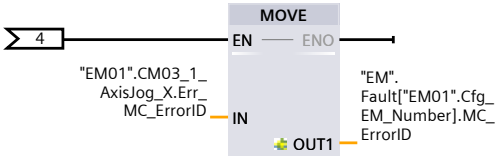


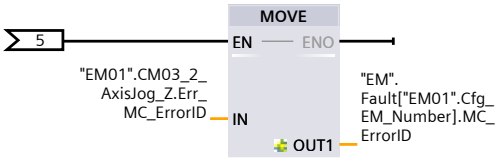
3.1 (Page31 - 4)

Network 2: Map axis errors, procedure motion errors, and jogging errors into bits of the EM_MajorFaults (3.1 / 3.1)

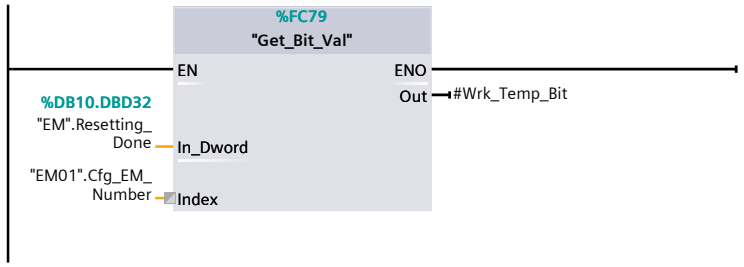
2.1 (Page31 - 3)



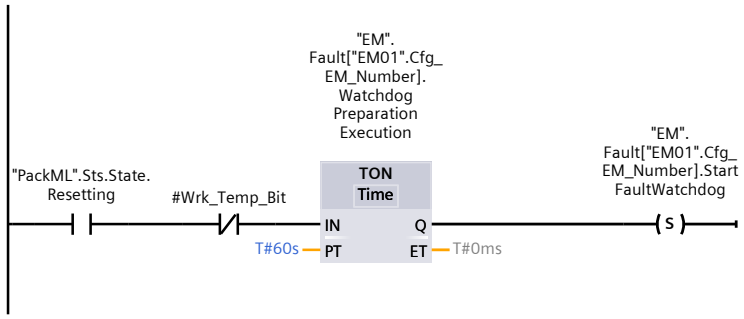




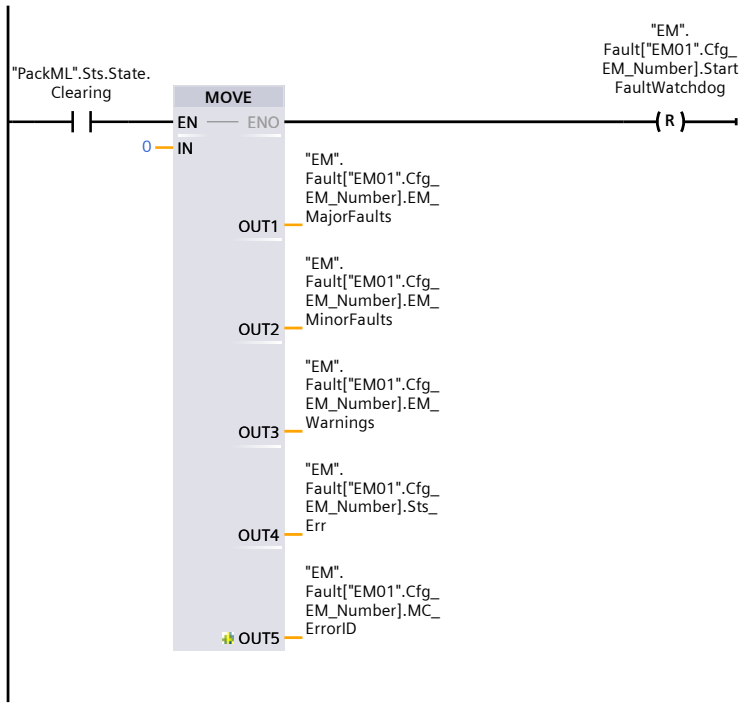
Network 3: Get resetting status for this EM



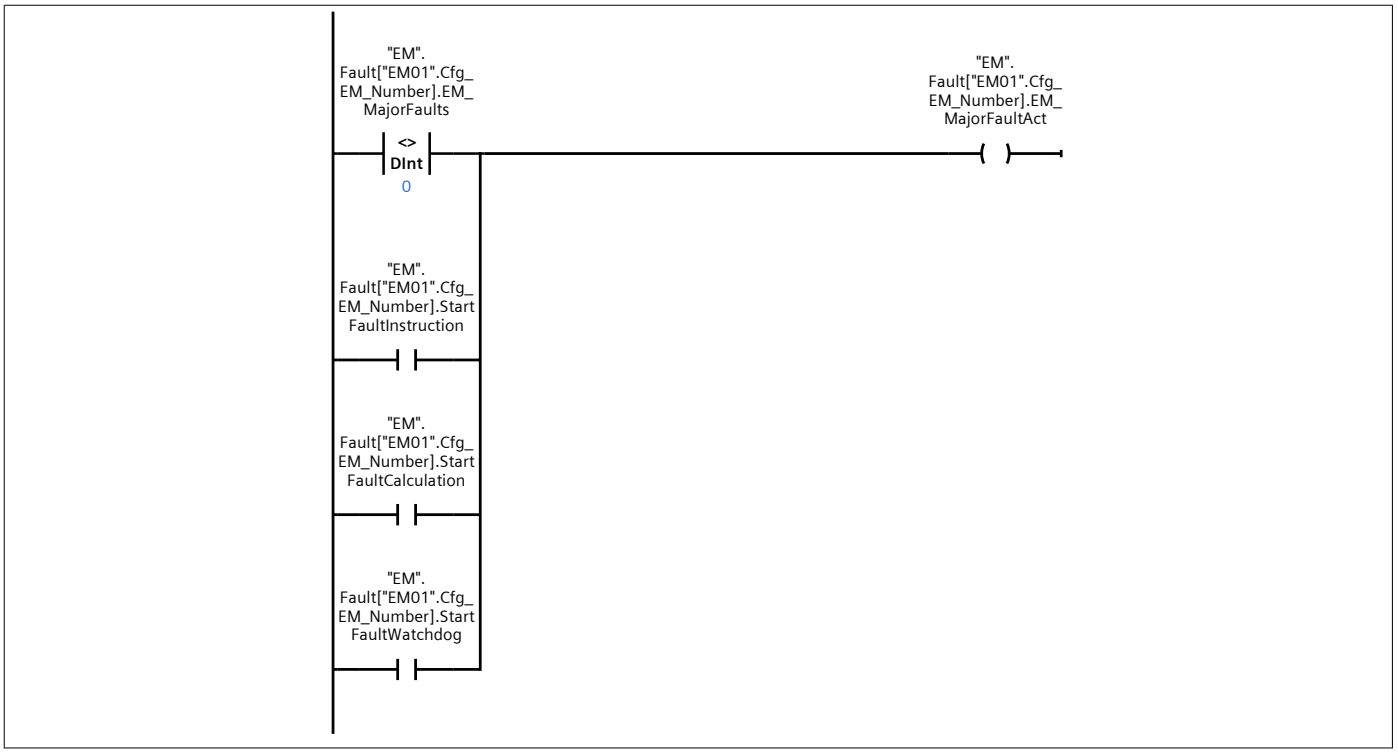
Network 4: Watchdog for resetting - Creat an error if timeout occurs



Network 5: Clear watchdog fault and instruction fault error details



Network 6: Summary of EM faults



Network 7:

Network 8:

Program blocks / LPMLV30

LPMLV30_ConfigureDisabledStates [FC30101]

LPMLV30_ConfigureDisabledStates Properties					
General					
Name	LPMLV30_ConfigureDisa-bledStates	**Number**	30101	**Type**	FC
Language	SCL	**Numbering**	Automatic		
Information					
Title	LPMLV30_ConfigureDisa-bledStates	**Author**	APC_ERLF	**Comment**	Support: tech.team.mo-tioncontrol@siemens.com Fax: +49 (0) 9131/98-1297
Family	OMAC	**Version**		**User-defined ID**	

Name	Data type	Default value
▼ Input		
HoldingDisable	Bool	
HeldDisable	Bool	
UnholdingDisable	Bool	
SuspendingDisable	Bool	
SuspendedDisable	Bool	
UnsuspendingDisable	Bool	
CompletingDisable	Bool	
CompleteDisable	Bool	
▼ Output		
disabledStates	DInt	
InOut		
Temp		
▼ Constant		
DISABLE_ALL_STATES	DWord	16#FFFF_FFFF
▼ Return		
LPMLV30_ConfigureDisabledStates	Void	

```
0001 //
     ============================================================================
     ============================
0002 // SIEMENS AG
0003 // (c)Copyright 2015 All Rights Reserved
0004 //----------------------------------------------------------------------------
     ----------------------------
0005 // Library: LPMLV30
0006 // Tested with: S7-1200 with FW version V4.1, S7-1500 with FW version V1.7
0007 // Engineering: TIA Portal V13 SP1
0008 // Restrictions: ---
0009 // Requirements: S7-1200 / S7-1500
0010 // Functionality: The function generates a double integer value which represents
     the state configuration
0011 // for one unit mode.
```

```
0012 //-----------------------------------------------------------------------------
     ----------------------------
0013 // Change log table:
0014 // Version Date Expert in charge Changes applied
0015 // 03.00.01 29.05.2015 RK First released version
0016 //
     ============================================================================
     ============================
0017 // Function: LPMLV30_ConfigureDisabledStates
0018 //
     ============================================================================
     ============================
0019
0020 #disabledStates := DWORD_TO_DINT(#DISABLE_ALL_STATES);
0021
0022 #disabledStates.%X0  := FALSE; // Undefined state is mandatory
0023 #disabledStates.%X1  := FALSE; // Clearing state is mandatory
0024 #disabledStates.%X2  := FALSE; // Stopped state is mandatory
0025 #disabledStates.%X3  := FALSE; // Starting state is mandatory
0026 #disabledStates.%X4  := FALSE; // Idle state is mandatory
0027 #disabledStates.%X5  := #SuspendedDisable;
0028 #disabledStates.%X6  := FALSE; // Execute state is mandatory
0029 #disabledStates.%X7  := FALSE; // Stopping state is mandatory
0030 #disabledStates.%X8  := FALSE; // Aborting state is mandatory
0031 #disabledStates.%X9  := FALSE; // Aborted state is mandatory
0032 #disabledStates.%X10 := #HoldingDisable;
0033 #disabledStates.%X11 := #HeldDisable;
0034 #disabledStates.%X12 := #UnholdingDisable;
0035 #disabledStates.%X13 := #SuspendingDisable;
0036 #disabledStates.%X14 := #UnsuspendingDisable;
0037 #disabledStates.%X15 := FALSE; // Resetting state is mandatory
0038 #disabledStates.%X16 := #CompletingDisable;
0039 #disabledStates.%X17 := #CompleteDisable;
0040
0041 //
     ============================================================================
     ============================
0042 // End of function: LPMLV30_ConfigureDisabledStates
0043 //
     ============================================================================
     ============================
```

Program blocks / LPMLV30

LPMLV30_ConfigureDisabledUnitModes [FC30100]

LPMLV30_ConfigureDisabledUnitModes Properties					
General					
Name	LPMLV30_ConfigureDisabledUnitModes	**Number**	30100	**Type**	FC
Language	SCL	**Numbering**	Automatic		
Information					
Title	LPMLV30_ConfigureDisabledUnitModes	**Author**	APC_ERLF	**Comment**	Support: tech.team.motioncontrol@siemens.com Fax: +49 (0) 9131/98-1297
Family	OMAC	**Version**		**User-defined ID**	

Name	Data type	Default value
▼ Input		
ProductionModeDisable	Bool	
MaintenanceModeDisable	Bool	
UserMode01Disable	Bool	
UserMode02Disable	Bool	
UserMode03Disable	Bool	
UserMode04Disable	Bool	
UserMode05Disable	Bool	
UserMode06Disable	Bool	
UserMode07Disable	Bool	
UserMode08Disable	Bool	
▼ Output		
disabledUnitModes	Array[0.."LPMLV30_MAX_MODES_UPPER_LIM"] of Bool	
InOut		
▼ Temp		
tempI	Int	
Constant		
▼ Return		
LPMLV30_ConfigureDisabledUnitModes	Void	

```
0001 //
     ============================================================================
     ============================
0002 // SIEMENS AG
0003 // (c)Copyright 2015 All Rights Reserved
0004 //----------------------------------------------------------------------------
     ----------------------------
0005 // Library: LPMLV30
0006 // Tested with: S7-1200 with FW version V4.1, S7-1500 with FW version V1.7
0007 // Engineering: TIA Portal V13 SP1
```

```
0008 // Restrictions: ---
0009 // Requirements: S7-1200 / S7-1500
0010 // Functionality: The function generates the unit mode configuration as Array[] of Bool.
0011 //-----------------------------------------------------------------------------------------------
0012 // Change log table:
0013 // Version Date Expert in charge Changes applied
0014 // 03.00.01 29.05.2015 RK First released version
0015 //
     ================================================================================================
0016 // Function: LPMLV30_ConfigureDisabledUnitModes
0017 //
     ================================================================================================
0018
0019 // Initialize unitMode configuration
0020 FOR #tempI := 0 TO "LPMLV30_MAX_MODES_UPPER_LIM" DO
0021   #disabledUnitModes[#tempI] := TRUE;
0022 END_FOR;
0023
0024 // Set unitMode configuration
0025 #disabledUnitModes["LPMLV30_MODE_INVALID"]      := FALSE;
0026 #disabledUnitModes["LPMLV30_MODE_PRODUCTION"]   := #ProductionModeDisable;
0027 #disabledUnitModes["LPMLV30_MODE_MAINTENANCE"] := #MaintenanceModeDisable;
0028 #disabledUnitModes["LPMLV30_MODE_MANUAL"]       := FALSE;
0029 #disabledUnitModes["LPMLV30_MODE_USER_01"]      := #UserMode01Disable;
0030 #disabledUnitModes["LPMLV30_MODE_USER_02"]      := #UserMode02Disable;
0031 #disabledUnitModes["LPMLV30_MODE_USER_03"]      := #UserMode03Disable;
0032 #disabledUnitModes["LPMLV30_MODE_USER_04"]      := #UserMode04Disable;
0033 #disabledUnitModes["LPMLV30_MODE_USER_05"]      := #UserMode05Disable;
0034 #disabledUnitModes["LPMLV30_MODE_USER_06"]      := #UserMode06Disable;
0035 #disabledUnitModes["LPMLV30_MODE_USER_07"]      := #UserMode07Disable;
0036 #disabledUnitModes["LPMLV30_MODE_USER_08"]      := #UserMode08Disable;
0037
0038 //
     ================================================================================================
0039 // End of function: LPMLV30_ConfigureDisabledUnitModes
0040 //
     ================================================================================================
```

Program blocks / LPMLV30

LPMLV30_GetUnitModeStateNamesAsString [FC30102]

LPMLV30_GetUnitModeStateNamesAsString Properties					
General					
Name	LPMLV30_GetUnitModeS-tateNamesAsString	**Number**	30102	**Type**	FC
Language	SCL	**Numbering**	Automatic		
Information					
Title	LPMLV30_GetUnitModeS-tateNamesAsString	**Author**	APC_ERLF	**Comment**	Support: tech.team.mo-tioncontrol@siemens.com Fax: +49 (0) 9131/98-1297
Family	OMAC	**Version**		**User-defined ID**	

Name	Data type	Default value
▼ Input		
UnitModeCurrent	DInt	
StateCurrent	DInt	
language	Int	
namesConfiguration	"typeLPMLV30_Name-sConfiguration"	
▼ Output		
unitModeCurrentName	String	
stateCurrentName	String	
InOut		
▼ Temp		
tempUnitModeCurrent	DInt	
tempStateCurrent	DInt	
tempLanguage	Int	
Constant		
▼ Return		
LPMLV30_GetUnitModeStateNamesAsString	Void	

```
0001 //
     ============================================================================
     ============================
0002 // SIEMENS AG
0003 // (c)Copyright 2015 All Rights Reserved
0004 //----------------------------------------------------------------------------
     ----------------------------
0005 // Library: LPMLV30
0006 // Tested with: S7-1200 with FW version V4.1, S7-1500 with FW version V1.7
0007 // Engineering: TIA Portal V13 SP1
0008 // Restrictions: ---
0009 // Requirements: S7-1200 / S7-1500
0010 // Functionality: Gets the names for current unit mode and state in one language
0011 // corresponding to the names configuration
0012 //----------------------------------------------------------------------------
     ----------------------------
```

```
0013 // Change log table:
0014 // Version Date Expert in charge Changes applied
0015 // 03.00.01 29.05.2015 RK First released version
0016 //
     ================================================================================
     ============================
0017 // Function: LPMLV30_GetUnitModeStateNamesAsString
0018 //
     ================================================================================
     ============================
0019
0020 #tempUnitModeCurrent := #UnitModeCurrent;
0021 #tempStateCurrent    := #StateCurrent;
0022 #tempLanguage        := #language;
0023
0024 IF #tempUnitModeCurrent < 0 OR #tempUnitModeCurrent > "LPMLV30_MODES_UP-
     PER_LIM" THEN
0025   #tempUnitModeCurrent := "LPMLV30_MODE_INVALID";
0026 END_IF;
0027 IF #tempStateCurrent < 0 OR #tempStateCurrent > "LPMLV30_STATES_UPPER_LIM" THEN
0028   #tempStateCurrent := "LPMLV30_STATE_UNDEFINED";
0029 END_IF;
0030 IF #tempLanguage < 0 OR #tempLanguage > "LPMLV30_LANGUAGES_UPPER_LIM" THEN
0031   #tempLanguage := "LPMLV30_LANGUAGE_1";
0032 END_IF;
0033
0034 #unitModeCurrentName := #namesConfiguration.unitModesNames[#tempLanguage, #tempU-
     nitModeCurrent];
0035 #stateCurrentName    := #namesConfiguration.statesNames[#tempLanguage, #tempSta-
     teCurrent];
0036
0037 //
     ================================================================================
     ============================
0038 // End of function: LPMLV30_GetUnitModeStateNamesAsString
0039 //
     ================================================================================
     ============================
```

Program blocks / LPMLV30

LPMLV30_UnitModeStateManager [FB30100]

LPMLV30_UnitModeStateManager Properties					
General					
Name	LPMLV30_UnitModeState-Manager	**Number**	30100	**Type**	FB
Language	SCL	**Numbering**	Automatic		
Information					
Title	LPMLV30_UnitModeState-Manager	**Author**	APC_ERLF	**Comment**	Support: tech.team.mo-tioncontrol@siemens.com Fax: +49 (0) 9131/98-1297
Family	OMAC	**Version**		**User-defined ID**	

Name	Data type	Default value	Retain
▼ Input			
UnitMode	DInt	"LPMLV30_MODE_INVALID"	Non-retain
UnitModeChangeRequest	Bool	false	Non-retain
CntrlCmd	DInt	"LPMLV30_CMD_UNDEFINED"	Non-retain
CmdChangeRequest	Bool	false	Non-retain
enableBooleanInterface	Bool	false	Non-retain
ProductionModeRequest	Bool	false	Non-retain
MaintenanceModeRequest	Bool	false	Non-retain
ManualModeRequest	Bool	false	Non-retain
UserMode01Request	Bool	false	Non-retain
UserMode02Request	Bool	false	Non-retain
UserMode03Request	Bool	false	Non-retain
UserMode04Request	Bool	false	Non-retain
UserMode05Request	Bool	false	Non-retain
UserMode06Request	Bool	false	Non-retain
UserMode07Request	Bool	false	Non-retain
UserMode08Request	Bool	false	Non-retain
ResetCmdRequest	Bool	false	Non-retain
StartCmdRequest	Bool	false	Non-retain
StopCmdRequest	Bool	false	Non-retain
HoldCmdRequest	Bool	false	Non-retain
UnholdCmdRequest	Bool	false	Non-retain
SuspendCmdRequest	Bool	false	Non-retain
UnsuspendCmdRequest	Bool	false	Non-retain
AbortCmdRequest	Bool	false	Non-retain
ClearCmdRequest	Bool	false	Non-retain
CompleteCmdRequest	Bool	false	Non-retain
SC	Bool	false	Non-retain
configuration	"typeLPMLV30_Configuration"		Non-retain
▼ Output			
UnitModeCurrent	DInt	"LPMLV30_MODE_MANUAL"	Non-retain

Name	Data type	Default value	Retain
UnitModeRequested	DInt	0	Non-retain
UnitModeChangeInProcess	Bool	false	Non-retain
StateCurrent	DInt	"LPMLV30_STATE_STOPPED"	Non-retain
StateRequested	DInt	0	Non-retain
StateChangeInProcess	Bool	false	Non-retain
ProductionModeActive	Bool	false	Non-retain
MaintenanceModeActive	Bool	false	Non-retain
ManualModeActive	Bool	false	Non-retain
UserMode01Active	Bool	false	Non-retain
UserMode02Active	Bool	false	Non-retain
UserMode03Active	Bool	false	Non-retain
UserMode04Active	Bool	false	Non-retain
UserMode05Active	Bool	false	Non-retain
UserMode06Active	Bool	false	Non-retain
UserMode07Active	Bool	false	Non-retain
UserMode08Active	Bool	false	Non-retain
ClearingStateActive	Bool	false	Non-retain
StoppedStateActive	Bool	false	Non-retain
StartingStateActive	Bool	false	Non-retain
IdleStateActive	Bool	false	Non-retain
SuspendedStateActive	Bool	false	Non-retain
ExecuteStateActive	Bool	false	Non-retain
StoppingStateActive	Bool	false	Non-retain
AbortingStateActive	Bool	false	Non-retain
AbortedStateActive	Bool	false	Non-retain
HoldingStateActive	Bool	false	Non-retain
HeldStateActive	Bool	false	Non-retain
UnholdingStateActive	Bool	false	Non-retain
SuspendingStateActive	Bool	false	Non-retain
UnsuspendingStateActive	Bool	false	Non-retain
ResettingStateActive	Bool	false	Non-retain
CompletingStateActive	Bool	false	Non-retain
CompleteStateActive	Bool	false	Non-retain
StatesDisabled	DInt	0	Non-retain
diagnostics	"typeLPMLV30_Di-agnostics"		Non-retain
InOut			
▼ Static			
statConfiguration	"typeLPMLV30_Con figuration"		Non-retain
statUnitModeChangeRequest	Bool	false	Non-retain
statCmdChangeRequest	Bool	false	Non-retain
statFirstCycle	Bool	true	Non-retain
statSCOld	Bool	false	Non-retain
statUnitMode	DInt	"LPMLV30_MODE_MANUAL"	Non-retain
statUnitModeOld	DInt	"LPMLV30_MODE_MANUAL"	Non-retain
statUnitModeCurrentInternal	DInt	"LPMLV30_MODE_MANUAL"	Non-retain
statUnitModeCurrentInternalOld	DInt	"LPMLV30_MODE_INVALID"	Non-retain
statStateCurrentOld	DInt	"LPMLV30_STATE_STOPPED"	Non-retain

Name	Data type	Default value	Retain
statStateInternal	DInt	"LPMLV30_STATE_STOPPED"	Non-retain
statStateInternalOld	DInt	"LPMLV30_STATE_UNDEFINED"	Non-retain
statCntrlCmdOld	DInt	"LPMLV30_CMD_UNDEFINED"	Non-retain
statStatesInCurrentMode	Struct		Non-retain
statBooleanInterfaceModeOld	DWord	16#0	Non-retain
statBooleanInterfaceCmdOld	Word	16#0	Non-retain
statCmdChangeRequestOld	Bool	false	Non-retain
statUnitModeChangeRequestOld	Bool	false	Non-retain
▼ Temp			
tempCntrlCmd	DInt		
tempBooleanInterfaceMode	DWord		
tempBooleanInterfaceCmd	Word		
tempSCInternal	Bool		
tempRetVal	Int		
tempDiagnosticsBufferIndex	Int		
tempDiagnosticsBufferIndexSC	Int		
tempDiagnosticsBufferIndexCmd	Int		
▼ Constant			
MSG_NO_MESSAGE	Byte	16#00	
MSG_MODE_CHANGED_SUCCESSFUL-LY	Byte	16#01	
MSG_STATE_CHANGED_SUCCESSFUL-LY	Byte	16#02	
MSG_MODE_ALREADY_ACTIVE	Byte	16#03	
MSG_MODE_NOT_DEFINED	Byte	16#80	
MSG_CMD_NOT_DEFINED	Byte	16#81	
MSG_REQ_MODE_NOT_CONFIGURED	Byte	16#82	
MSG_MODE_TRANSITION_NOT_AL-LOWED	Byte	16#83	
MSG_CMD_NOT_ALLOWED	Byte	16#84	
MSG_SC_NOT_ALLOWED	Byte	16#85	
MSG_STATE_CONFIG_FORCED	Byte	16#86	

```
0001 //
     ============================================================================
     ============================
0002 // SIEMENS AG
0003 // (c)Copyright 2015 All Rights Reserved
0004 //----------------------------------------------------------------------------
     ----------------------------
0005 // Library: LPMLV30
0006 // Tested with: S7-1200 with FW version V4.1, S7-1500 with FW version V1.7
0007 // Engineering: TIA Portal V13 SP1
0008 // Restrictions: ---
0009 // Requirements: S7-1200 / S7-1500
0010 // Functionality: Management of unit modes and states according to ISA
     TR88.00.02 - June 4, 2014
0011 //----------------------------------------------------------------------------
     ----------------------------
0012 // Change log table:
0013 // Version Date Expert in charge Changes applied
```

```
0014 // 03.00.01 29.05.2015 RK First released version
0015 //
     ================================================================================
     ============================
0016 // Function block: LPMLV30_UnitModeStateManager
0017 //
     ================================================================================
     ============================
0018
0019 IF NOT #statCmdChangeRequest AND #statCmdChangeRequestOld THEN // Falling edge
     CmdChangeRequest
0020   #statCntrlCmdOld := "LPMLV30_CMD_UNDEFINED";
0021 END_IF;
0022 #statCmdChangeRequestOld := #statCmdChangeRequest;
0023
0024 IF NOT #statUnitModeChangeRequest AND #statUnitModeChangeRequestOld THEN // Fall-
     ing edge UnitModeChangeRequest
0025   #statUnitModeOld := "LPMLV30_MODE_INVALID";
0026 END_IF;
0027 #statUnitModeChangeRequestOld := #statUnitModeChangeRequest;
0028
0029 #tempDiagnosticsBufferIndex    := #diagnostics.bufferIndex; // Work with tempora-
     ry variable during block execution
0030 #tempDiagnosticsBufferIndexSC  := -1;
0031 #tempDiagnosticsBufferIndexCmd := -1;
0032
0033 IF #statFirstCycle THEN // Initialize values in first cycle
0034   #tempDiagnosticsBufferIndex := -1;
0035
0036   #statConfiguration := #configuration; // Copy configuration from input
0037   #statConfiguration.disabledUnitModes["LPMLV30_MODE_MANUAL"] := FALSE; // Unit
     mode Manual is mandatory
0038
0039   // Initialize unit mode
0040   #statUnitMode                    := "LPMLV30_MODE_MANUAL";
0041   #statUnitModeOld                 := "LPMLV30_MODE_MANUAL";
0042   #UnitModeCurrent                 := "LPMLV30_MODE_MANUAL";
0043   #statUnitModeCurrentInternal     := "LPMLV30_MODE_MANUAL";
0044   #statUnitModeCurrentInternalOld := "LPMLV30_MODE_INVALID";
0045   #statBooleanInterfaceModeOld     := 0;
0046
0047   // Initialize state
0048   #StateCurrent          := "LPMLV30_STATE_STOPPED";
0049   #StateRequested        := "LPMLV30_STATE_STOPPED";
0050   #statStateInternal     := "LPMLV30_STATE_STOPPED";
0051   #statStateInternalOld := "LPMLV30_STATE_UNDEFINED";
0052   #statStateCurrentOld   := "LPMLV30_STATE_STOPPED";
0053
0054   // Initialize control command
0055   #tempCntrlCmd                := "LPMLV30_CMD_UNDEFINED";
0056   #statCntrlCmdOld             := "LPMLV30_CMD_UNDEFINED";
0057   #statBooleanInterfaceCmdOld := 0;
0058 END_IF; // End: Initialize values in first cycle
0059
```

```
0060 //-----------------------------------------------------------------------------
     ------------------
0061 // Evaluation of input parameters -> UnitMode, CntrlCmd
0062 //-----------------------------------------------------------------------------
     ------------------
0063 IF NOT #statFirstCycle THEN // As from second cycle
0064   IF NOT #enableBooleanInterface THEN // Set unit mode and control command ac-
     cording to input parameters
0065   #statUnitMode := #UnitMode;
0066   #tempCntrlCmd := #CntrlCmd;
0067
0068   // Set change requests from input
0069   #statUnitModeChangeRequest := #UnitModeChangeRequest;
0070   #statCmdChangeRequest      := #CmdChangeRequest;
0071   ELSE // Read boolean interface inputs
0072   #statUnitModeChangeRequest := TRUE; // Change request static TRUE
0073   #statUnitMode              := "LPMLV30_MODE_INVALID";
0074   #tempBooleanInterfaceMode  := 0;
0075
0076   // Collect unit mode from boolean inputs
0077   #tempBooleanInterfaceMode.%X1  := #ProductionModeRequest;
0078   #tempBooleanInterfaceMode.%X2  := #MaintenanceModeRequest;
0079   #tempBooleanInterfaceMode.%X3  := #ManualModeRequest;
0080   #tempBooleanInterfaceMode.%X4  := #UserMode01Request;
0081   #tempBooleanInterfaceMode.%X5  := #UserMode02Request;
0082   #tempBooleanInterfaceMode.%X6  := #UserMode03Request;
0083   #tempBooleanInterfaceMode.%X7  := #UserMode04Request;
0084   #tempBooleanInterfaceMode.%X8  := #UserMode05Request;
0085   #tempBooleanInterfaceMode.%X9  := #UserMode06Request;
0086   #tempBooleanInterfaceMode.%X10 := #UserMode07Request;
0087   #tempBooleanInterfaceMode.%X11 := #UserMode08Request;
0088   // #tempBooleanInterfaceMode.%X12 := #UserMode09Request;
0089   // #tempBooleanInterfaceMode.%X13 := #UserMode10Request;
0090   // #tempBooleanInterfaceMode.%X14 := #UserMode11Request;
0091   // #tempBooleanInterfaceMode.%X15 := #UserMode12Request;
0092   // #tempBooleanInterfaceMode.%X16 := #UserMode13Request;
0093   // #tempBooleanInterfaceMode.%X17 := #UserMode14Request;
0094   // #tempBooleanInterfaceMode.%X18 := #UserMode15Request;
0095   // #tempBooleanInterfaceMode.%X19 := #UserMode16Request;
0096   // #tempBooleanInterfaceMode.%X20 := #UserMode17Request;
0097   // #tempBooleanInterfaceMode.%X21 := #UserMode18Request;
0098   // #tempBooleanInterfaceMode.%X22 := #UserMode19Request;
0099   // #tempBooleanInterfaceMode.%X23 := #UserMode20Request;
0100   // #tempBooleanInterfaceMode.%X24 := #UserMode21Request;
0101   // #tempBooleanInterfaceMode.%X25 := #UserMode22Request;
0102   // #tempBooleanInterfaceMode.%X26 := #UserMode23Request;
0103   // #tempBooleanInterfaceMode.%X27 := #UserMode24Request;
0104   // #tempBooleanInterfaceMode.%X28 := #UserMode25Request;
0105   // #tempBooleanInterfaceMode.%X29 := #UserMode26Request;
0106   // #tempBooleanInterfaceMode.%X30 := #UserMode27Request;
0107   // #tempBooleanInterfaceMode.%X31 := #UserMode28Request;
0108
0109   // Selection indicator: Rising edge at input, Priority (in case of multiple
     selection): Manual, Maintenance, User Mode 01..28, Production
```

```
0110    IF #tempBooleanInterfaceMode.%X3  AND NOT #statBooleanInterfaceMo-
      deOld.%X3  THEN
0111      #statUnitMode := "LPMLV30_MODE_MANUAL";
0112    ELSIF #tempBooleanInterfaceMode.%X2  AND NOT #statBooleanInterfaceMo-
      deOld.%X2  THEN
0113      #statUnitMode := "LPMLV30_MODE_MAINTENANCE";
0114    ELSIF #tempBooleanInterfaceMode.%X4  AND NOT #statBooleanInterfaceMo-
      deOld.%X4  THEN
0115      #statUnitMode := "LPMLV30_MODE_USER_01";
0116    ELSIF #tempBooleanInterfaceMode.%X5  AND NOT #statBooleanInterfaceMo-
      deOld.%X5  THEN
0117      #statUnitMode := "LPMLV30_MODE_USER_02";
0118    ELSIF #tempBooleanInterfaceMode.%X6  AND NOT #statBooleanInterfaceMo-
      deOld.%X6  THEN
0119      #statUnitMode := "LPMLV30_MODE_USER_03";
0120    ELSIF #tempBooleanInterfaceMode.%X7  AND NOT #statBooleanInterfaceMo-
      deOld.%X7  THEN
0121      #statUnitMode := "LPMLV30_MODE_USER_04";
0122    ELSIF #tempBooleanInterfaceMode.%X8  AND NOT #statBooleanInterfaceMo-
      deOld.%X8  THEN
0123      #statUnitMode := "LPMLV30_MODE_USER_05";
0124    ELSIF #tempBooleanInterfaceMode.%X9  AND NOT #statBooleanInterfaceMo-
      deOld.%X9  THEN
0125      #statUnitMode := "LPMLV30_MODE_USER_06";
0126    ELSIF #tempBooleanInterfaceMode.%X10 AND NOT #statBooleanInterfaceMo-
      deOld.%X10 THEN
0127      #statUnitMode := "LPMLV30_MODE_USER_07";
0128    ELSIF #tempBooleanInterfaceMode.%X11 AND NOT #statBooleanInterfaceMo-
      deOld.%X11 THEN
0129      #statUnitMode := "LPMLV30_MODE_USER_08";
0130    ELSIF #tempBooleanInterfaceMode.%X12 AND NOT #statBooleanInterfaceMo-
      deOld.%X12 THEN
0131      #statUnitMode := "LPMLV30_MODE_USER_09";
0132    ELSIF #tempBooleanInterfaceMode.%X13 AND NOT #statBooleanInterfaceMo-
      deOld.%X13 THEN
0133      #statUnitMode := "LPMLV30_MODE_USER_10";
0134    ELSIF #tempBooleanInterfaceMode.%X14 AND NOT #statBooleanInterfaceMo-
      deOld.%X14 THEN
0135      #statUnitMode := "LPMLV30_MODE_USER_11";
0136    ELSIF #tempBooleanInterfaceMode.%X15 AND NOT #statBooleanInterfaceMo-
      deOld.%X15 THEN
0137      #statUnitMode := "LPMLV30_MODE_USER_12";
0138    ELSIF #tempBooleanInterfaceMode.%X16 AND NOT #statBooleanInterfaceMo-
      deOld.%X16 THEN
0139      #statUnitMode := "LPMLV30_MODE_USER_13";
0140    ELSIF #tempBooleanInterfaceMode.%X17 AND NOT #statBooleanInterfaceMo-
      deOld.%X17 THEN
0141      #statUnitMode := "LPMLV30_MODE_USER_14";
0142    ELSIF #tempBooleanInterfaceMode.%X18 AND NOT #statBooleanInterfaceMo-
      deOld.%X18 THEN
0143      #statUnitMode := "LPMLV30_MODE_USER_15";
0144    ELSIF #tempBooleanInterfaceMode.%X19 AND NOT #statBooleanInterfaceMo-
      deOld.%X19 THEN
0145      #statUnitMode := "LPMLV30_MODE_USER_16";
```

```
0146    ELSIF #tempBooleanInterfaceMode.%X20 AND NOT #statBooleanInterfaceMo-
      deOld.%X20 THEN
0147      #statUnitMode := "LPMLV30_MODE_USER_17";
0148    ELSIF #tempBooleanInterfaceMode.%X21 AND NOT #statBooleanInterfaceMo-
      deOld.%X21 THEN
0149      #statUnitMode := "LPMLV30_MODE_USER_18";
0150    ELSIF #tempBooleanInterfaceMode.%X22 AND NOT #statBooleanInterfaceMo-
      deOld.%X22 THEN
0151      #statUnitMode := "LPMLV30_MODE_USER_19";
0152    ELSIF #tempBooleanInterfaceMode.%X23 AND NOT #statBooleanInterfaceMo-
      deOld.%X23 THEN
0153      #statUnitMode := "LPMLV30_MODE_USER_20";
0154    ELSIF #tempBooleanInterfaceMode.%X24 AND NOT #statBooleanInterfaceMo-
      deOld.%X24 THEN
0155      #statUnitMode := "LPMLV30_MODE_USER_21";
0156    ELSIF #tempBooleanInterfaceMode.%X25 AND NOT #statBooleanInterfaceMo-
      deOld.%X25 THEN
0157      #statUnitMode := "LPMLV30_MODE_USER_22";
0158    ELSIF #tempBooleanInterfaceMode.%X26 AND NOT #statBooleanInterfaceMo-
      deOld.%X26 THEN
0159      #statUnitMode := "LPMLV30_MODE_USER_23";
0160    ELSIF #tempBooleanInterfaceMode.%X27 AND NOT #statBooleanInterfaceMo-
      deOld.%X27 THEN
0161      #statUnitMode := "LPMLV30_MODE_USER_24";
0162    ELSIF #tempBooleanInterfaceMode.%X28 AND NOT #statBooleanInterfaceMo-
      deOld.%X28 THEN
0163      #statUnitMode := "LPMLV30_MODE_USER_25";
0164    ELSIF #tempBooleanInterfaceMode.%X29 AND NOT #statBooleanInterfaceMo-
      deOld.%X29 THEN
0165      #statUnitMode := "LPMLV30_MODE_USER_26";
0166    ELSIF #tempBooleanInterfaceMode.%X30 AND NOT #statBooleanInterfaceMo-
      deOld.%X30 THEN
0167      #statUnitMode := "LPMLV30_MODE_USER_27";
0168    ELSIF #tempBooleanInterfaceMode.%X31 AND NOT #statBooleanInterfaceMo-
      deOld.%X31 THEN
0169      #statUnitMode := "LPMLV30_MODE_USER_28";
0170    ELSIF    #tempBooleanInterfaceMode.%X1  AND NOT #statBooleanInterfaceMo-
      deOld.%X1  THEN
0171      #statUnitMode := "LPMLV30_MODE_PRODUCTION";
0172    END_IF;
0173    #statBooleanInterfaceModeOld := #tempBooleanInterfaceMode; // Save values for
      edge detection
0174
0175    // Evaluate CntrlCmd in boolean interface; priority descending: abort, stop,
      other commands
0176    #statCmdChangeRequest    := TRUE; // Change request static TRUE
0177    #tempBooleanInterfaceCmd := 0;
0178
0179    #tempBooleanInterfaceCmd.%X1  := #ResetCmdRequest;
0180    #tempBooleanInterfaceCmd.%X2  := #StartCmdRequest;
0181    #tempBooleanInterfaceCmd.%X4  := #HoldCmdRequest;
0182    #tempBooleanInterfaceCmd.%X5  := #UnholdCmdRequest;
0183    #tempBooleanInterfaceCmd.%X6  := #SuspendCmdRequest;
0184    #tempBooleanInterfaceCmd.%X7  := #UnsuspendCmdRequest;
0185    #tempBooleanInterfaceCmd.%X9  := #ClearCmdRequest;
```

```
0186   #tempBooleanInterfaceCmd.%X10 := #CompleteCmdRequest; // Remember, complete
       command is not specified in the OMAC standard
0187
0188   IF #AbortCmdRequest THEN
0189     #tempCntrlCmd := "LPMLV30_CMD_ABORT";
0190   ELSIF #StopCmdRequest THEN
0191     #tempCntrlCmd := "LPMLV30_CMD_STOP";
0192   ELSE
0193     #tempCntrlCmd := "LPMLV30_CMD_UNDEFINED";
0194
0195     // Selection indicator: Rising edge at input, Priority (in case of multiple
       selection): complete, reset, start, hold, unhold, suspend, unsuspend, clear
0196     IF    #tempBooleanInterfaceCmd.%X10 AND NOT #statBooleanInterfaceCm-
       dOld.%X10 THEN
0197     #tempCntrlCmd := "LPMLV30_CMD_COMPLETE";
0198     ELSIF #tempBooleanInterfaceCmd.%X1  AND NOT #statBooleanInterfaceCm-
       dOld.%X1  THEN
0199     #tempCntrlCmd := "LPMLV30_CMD_RESET";
0200     ELSIF #tempBooleanInterfaceCmd.%X2  AND NOT #statBooleanInterfaceCm-
       dOld.%X2  THEN
0201     #tempCntrlCmd := "LPMLV30_CMD_START";
0202     ELSIF #tempBooleanInterfaceCmd.%X4  AND NOT #statBooleanInterfaceCm-
       dOld.%X4  THEN
0203     #tempCntrlCmd := "LPMLV30_CMD_HOLD";
0204     ELSIF #tempBooleanInterfaceCmd.%X5  AND NOT #statBooleanInterfaceCm-
       dOld.%X5  THEN
0205     #tempCntrlCmd := "LPMLV30_CMD_UNHOLD";
0206     ELSIF #tempBooleanInterfaceCmd.%X6  AND NOT #statBooleanInterfaceCm-
       dOld.%X6  THEN
0207     #tempCntrlCmd := "LPMLV30_CMD_SUSPEND";
0208     ELSIF #tempBooleanInterfaceCmd.%X7  AND NOT #statBooleanInterfaceCm-
       dOld.%X7  THEN
0209     #tempCntrlCmd := "LPMLV30_CMD_UNSUSPEND";
0210     ELSIF #tempBooleanInterfaceCmd.%X9  AND NOT #statBooleanInterfaceCm-
       dOld.%X9  THEN
0211     #tempCntrlCmd := "LPMLV30_CMD_CLEAR";
0212     END_IF;
0213   END_IF; // End: abort or stop cmd
0214
0215   #statBooleanInterfaceCmdOld := #tempBooleanInterfaceCmd; // Save values for
       edge detection
0216   END_IF; // End: boolean interface
0217 END_IF; // End: As from second cycle
0218 // End: Evaluation of input parameters -> UnitMode, CntrlCmd
0219
0220 //-------------------------------------------------------------------------------
       -------------------
0221 // Unit mode manager
0222 //-------------------------------------------------------------------------------
       -------------------
0223 IF NOT #statFirstCycle THEN // As from second cycle
0224   //-----------------------------------------------
0225   //Message handling for mode manager: head part
0226   //-----------------------------------------------
```

```
0227   IF #statUnitModeChangeRequest AND #statUnitMode <> #statUnitModeOld AND #statU-
       nitMode <> "LPMLV30_MODE_INVALID" THEN
0228   #tempDiagnosticsBufferIndex := #tempDiagnosticsBufferIndex + 1; // Next buffer
       index
0229   IF #tempDiagnosticsBufferIndex > "LPMLV30_DIAG_BUFFER_UPPER_LIM" THEN
0230     #tempDiagnosticsBufferIndex := 0;
0231   END_IF;
0232   // Check for defined unit modes
0233   #tempRetVal := RD_SYS_T(#diagnostics.buffer[#tempDiagnosticsBufferIndex].time-
       stamp);
0234   #diagnostics.buffer[#tempDiagnosticsBufferIndex].UnitModeCur-
       rent := DINT_TO_BYTE(#UnitModeCurrent);
0235   #diagnostics.buffer[#tempDiagnosticsBufferIndex].StateCur-
       rent    := DINT_TO_BYTE(#StateCurrent);
0236   #diagnostics.buffer[#tempDiagnosticsBufferIndex].Uni-
       tMode := DINT_TO_BYTE(#statUnitMode);
0237   #diagnostics.buffer[#tempDiagnosticsBufferIn-
       dex].CntrlCmd := DINT_TO_BYTE(#tempCntrlCmd);
0238   #diagnostics.buffer[#tempDiagnosticsBufferIndex].SC := #SC;
0239   #diagnostics.buffer[#tempDiagnosticsBufferIndex].message := #MSG_NO_MESSAGE;
0240
0241   IF #statUnitMode < "LPMLV30_MODE_INVALID" OR #statUnit-
       Mode > "LPMLV30_MODE_USER_28" THEN
0242     #diagnostics.buffer[#tempDiagnosticsBufferIndex].message := #MSG_MODE_NOT_DE-
       FINED;
0243   ELSIF #statUnitMode = #statUnitModeCurrentInternal THEN
0244     #diagnostics.buffer[#tempDiagnosticsBufferIndex].message := #MSG_MODE_AL-
       READY_ACTIVE;
0245   END_IF;
0246   END_IF; // End: message handling for mode manager: head part
0247 END_IF; // End: As from second cycle
0248
0249 //-----------------------------------------------
0250 // Unit mode machine
0251 //-----------------------------------------------
0252 // Check if unit mode has to be changed
0253 IF (#statUnitModeChangeRequest AND
0254   #statUnitMode <> #statUnitModeCurrentInternal AND
0255   #statUnitMode <> #statUnitModeOld AND
0256   #statUnitMode > "LPMLV30_MODE_INVALID" AND
0257   #statUnitMode <= "LPMLV30_MODE_USER_28"
0258   ) OR
0259   #statFirstCycle
0260 THEN
0261   // Check if state is available
0262   IF #statStateInternal = "LPMLV30_STATE_EXECUTE" OR // Every state but not in
       execute
0263   #statStateInternal <> #StateRequested // Means to be in wait state or target
       state
0264   THEN
0265   #diagnostics.buffer[#tempDiagnosticsBufferIndex].message := #MSG_MODE_TRANSI-
       TION_NOT_ALLOWED;
0266   ELSE
0267   IF #statConfiguration.disabledUnitModes[#statUnitMode] = FALSE THEN
0268     // State in target unit mode available
```

```
0269     IF ((NOT #statConfiguration.disabledStatesInUnitModes[#statUnit-
Mode].%X17 = FALSE) AND (#statStateInternal = "LPMLV30_STATE_COMPLETE")) OR
0270     ((NOT #statConfiguration.disabledStatesInUnitModes[#statUnit-
Mode].%X11 = FALSE) AND (#statStateInternal = "LPMLV30_STATE_HELD")) OR
0271     ((NOT #statConfiguration.disabledStatesInUnitModes[#statUnit-
Mode].%X5 = FALSE) AND (#statStateInternal = "LPMLV30_STATE_SUSPENDED"))
0272     THEN
0273     #diagnostics.buffer[#tempDiagnosticsBufferIndex].message := #MSG_MODE_TRANSI-
TION_NOT_ALLOWED;
0274     ELSE
0275     // Set outputs
0276     #UnitModeChangeInProcess := TRUE;
0277     #UnitModeRequested := #statUnitMode;
0278     // Set internal variable
0279     #statUnitModeCurrentInternal := #statUnitMode;
0280
0281     // Read current configuration for state
0282     #statStatesInCurrentMode.clearing := NOT #statConfiguration.disabledStatesI-
nUnitModes[#statUnitMode].%X1;
0283     #statStatesInCurrentMode.stopped := NOT #statConfiguration.disabledStatesInU-
nitModes[#statUnitMode].%X2;
0284     #statStatesInCurrentMode.starting := NOT #statConfiguration.disabledStatesI-
nUnitModes[#statUnitMode].%X3;
0285     #statStatesInCurrentMode.idle := NOT #statConfiguration.disabledStatesInU-
nitModes[#statUnitMode].%X4;
0286     #statStatesInCurrentMode.suspended := NOT #statConfiguration.disabledStatesI-
nUnitModes[#statUnitMode].%X5;
0287     #statStatesInCurrentMode.execute := NOT #statConfiguration.disabledStatesInU-
nitModes[#statUnitMode].%X6;
0288     #statStatesInCurrentMode.stopping := NOT #statConfiguration.disabledStatesI-
nUnitModes[#statUnitMode].%X7;
0289     #statStatesInCurrentMode.aborting := NOT #statConfiguration.disabledStatesI-
nUnitModes[#statUnitMode].%X8;
0290     #statStatesInCurrentMode.aborted := NOT #statConfiguration.disabledStatesInU-
nitModes[#statUnitMode].%X9;
0291     #statStatesInCurrentMode.holding := NOT #statConfiguration.disabledStatesInU-
nitModes[#statUnitMode].%X10;
0292     #statStatesInCurrentMode.held := NOT #statConfiguration.disabledStatesInU-
nitModes[#statUnitMode].%X11;
0293     #statStatesInCurrentMode.unholding := NOT #statConfiguration.disabledStatesI-
nUnitModes[#statUnitMode].%X12;
0294     #statStatesInCurrentMode.suspending := NOT #statConfiguration.disabledState-
sInUnitModes[#statUnitMode].%X13;
0295     #statStatesInCurrentMode.unsuspending := NOT #statConfiguration.disabledSta-
tesInUnitModes[#statUnitMode].%X14;
0296     #statStatesInCurrentMode.resetting := NOT #statConfiguration.disabledStatesI-
nUnitModes[#statUnitMode].%X15;
0297     #statStatesInCurrentMode.completing := NOT #statConfiguration.disabledState-
sInUnitModes[#statUnitMode].%X16;
0298     #statStatesInCurrentMode.complete := NOT #statConfiguration.disabledStatesI-
nUnitModes[#statUnitMode].%X17;
0299     END_IF; // End: state in target unit mode available
0300   ELSE
0301     #diagnostics.buffer[#tempDiagnosticsBufferIndex].mes-
sage := #MSG_REQ_MODE_NOT_CONFIGURED;
```

```
0302    END_IF;
0303    END_IF;
0304
0305    // Set the minimum required states for every unit mode
0306    IF NOT #statStatesInCurrentMode.stopped OR
0307    NOT #statStatesInCurrentMode.idle OR
0308    NOT #statStatesInCurrentMode.execute OR
0309    NOT #statStatesInCurrentMode.aborted OR
0310    NOT #statStatesInCurrentMode.resetting OR
0311    NOT #statStatesInCurrentMode.starting OR
0312    NOT #statStatesInCurrentMode.stopping OR
0313    NOT #statStatesInCurrentMode.clearing OR
0314    NOT #statStatesInCurrentMode.aborting OR
0315    (NOT #statStatesInCurrentMode.complete AND #statStatesInCurrentMode.complet-
      ing) OR
0316    (NOT #statStatesInCurrentMode.suspended AND (#statStatesInCurrentMode.suspend-
      ing OR #statStatesInCurrentMode.unsuspending)) OR
0317    (NOT #statStatesInCurrentMode.held AND (#statStatesInCurrentMode.hold-
      ing OR #statStatesInCurrentMode.unholding))
0318    THEN
0319    #statStatesInCurrentMode.stopped := TRUE;
0320    #statStatesInCurrentMode.idle := TRUE;
0321    #statStatesInCurrentMode.execute := TRUE;
0322    #statStatesInCurrentMode.aborted := TRUE;
0323
0324    #statStatesInCurrentMode.resetting := TRUE;
0325    #statStatesInCurrentMode.starting := TRUE;
0326    #statStatesInCurrentMode.aborting := TRUE;
0327    #statStatesInCurrentMode.stopping := TRUE;
0328    #statStatesInCurrentMode.clearing := TRUE;
0329
0330    // Held
0331    IF NOT #statStatesInCurrentMode.held
0332      AND (#statStatesInCurrentMode.holding OR #statStatesInCurrentMode.unholding)
0333    THEN
0334      #statStatesInCurrentMode.held := TRUE;
0335      #statStatesInCurrentMode.holding := TRUE;
0336      #statStatesInCurrentMode.unholding := TRUE;
0337    END_IF;
0338    // Suspended
0339    IF NOT #statStatesInCurrentMode.suspended
0340      AND (#statStatesInCurrentMode.suspending OR #statStatesInCurrentMode.unsus-
      pending)
0341    THEN
0342      #statStatesInCurrentMode.suspended := TRUE;
0343      #statStatesInCurrentMode.suspending := TRUE;
0344      #statStatesInCurrentMode.unsuspending := TRUE;
0345    END_IF;
0346    // Complete
0347    IF NOT #statStatesInCurrentMode.complete
0348      AND #statStatesInCurrentMode.completing
0349    THEN
0350      #statStatesInCurrentMode.complete := TRUE;
0351      #statStatesInCurrentMode.completing := TRUE;
0352    END_IF;
```

```
0353
0354    #tempDiagnosticsBufferIndex := #tempDiagnosticsBufferIndex + 1; // Next buffer
        index
0355    IF #tempDiagnosticsBufferIndex > "LPMLV30_DIAG_BUFFER_UPPER_LIM" THEN
0356      #tempDiagnosticsBufferIndex := 0;
0357    END_IF;
0358
0359    // Write diagnostics
0360    #tempRetVal := RD_SYS_T(#diagnostics.buffer[#tempDiagnosticsBufferIndex].time-
        stamp);
0361    #diagnostics.buffer[#tempDiagnosticsBufferIndex].UnitModeCur-
        rent := DINT_TO_BYTE(#UnitModeCurrent);
0362    #diagnostics.buffer[#tempDiagnosticsBufferIndex].StateCur-
        rent    := DINT_TO_BYTE(#StateCurrent);
0363    #diagnostics.buffer[#tempDiagnosticsBufferIndex].Uni-
        tMode := DINT_TO_BYTE(#statUnitMode);
0364    #diagnostics.buffer[#tempDiagnosticsBufferIn-
        dex].CntrlCmd := DINT_TO_BYTE(#tempCntrlCmd);
0365    #diagnostics.buffer[#tempDiagnosticsBufferIndex].SC := #SC;
0366    #diagnostics.buffer[#tempDiagnosticsBufferIndex].message := #MSG_STATE_CON-
        FIG_FORCED;
0367    END_IF; // End: set the minimum required states for every unit mode
0368
0369    #UnitModeCurrent := #statUnitModeCurrentInternal; // Write current unit mode
        on output
0370
0371    // Write correct state configuration of current mode
0372    #StatesDisabled.%X1 := NOT #statStatesInCurrentMode.clearing;
0373    #StatesDisabled.%X2 := NOT #statStatesInCurrentMode.stopped;
0374    #StatesDisabled.%X3 := NOT #statStatesInCurrentMode.starting;
0375    #StatesDisabled.%X4 := NOT #statStatesInCurrentMode.idle;
0376    #StatesDisabled.%X5 := NOT #statStatesInCurrentMode.suspended;
0377    #StatesDisabled.%X6 := NOT #statStatesInCurrentMode.execute;
0378    #StatesDisabled.%X7 := NOT #statStatesInCurrentMode.stopping;
0379    #StatesDisabled.%X8 := NOT #statStatesInCurrentMode.aborting;
0380    #StatesDisabled.%X9 := NOT #statStatesInCurrentMode.aborted;
0381    #StatesDisabled.%X10 := NOT #statStatesInCurrentMode.holding;
0382    #StatesDisabled.%X11 := NOT #statStatesInCurrentMode.held;
0383    #StatesDisabled.%X12 := NOT #statStatesInCurrentMode.unholding;
0384    #StatesDisabled.%X13 := NOT #statStatesInCurrentMode.suspending;
0385    #StatesDisabled.%X14 := NOT #statStatesInCurrentMode.unsuspending;
0386    #StatesDisabled.%X15 := NOT #statStatesInCurrentMode.resetting;
0387    #StatesDisabled.%X16 := NOT #statStatesInCurrentMode.completing;
0388    #StatesDisabled.%X17 := NOT #statStatesInCurrentMode.complete;
0389
0390    //-----------------------------------------------
0391    // Message handling for mode manager: foot part
0392    //-----------------------------------------------
0393    IF NOT #statFirstCycle THEN
0394    IF #diagnostics.buffer[#tempDiagnosticsBufferIndex].message = #MSG_NO_MES-
        SAGE THEN // ELSE: Unit mode wasn´t changed successfully
0395      #diagnostics.buffer[#tempDiagnosticsBufferIndex].mes-
        sage := #MSG_MODE_CHANGED_SUCCESSFULLY;
0396    END_IF;
0397    END_IF;
```

```
0398 ELSE
0399   #UnitModeChangeInProcess := FALSE; // No unit mode change
0400 END_IF;// End: check if unit mode has to be changed
0401 // End: Unit mode manager
0402
0403 //------------------------------------------------------------------------------
     --------------------
0404 // State manager
0405 //------------------------------------------------------------------------------
     --------------------
0406 IF NOT #statFirstCycle THEN // As from second cycle
0407   IF #SC AND NOT #statSCOld THEN // Detect a rising edge at state complete signal
0408   #tempSCInternal := TRUE;
0409   ELSE
0410   #tempSCInternal := FALSE;
0411   END_IF;
0412   #statSCOld := #SC; // End: Detect a rising edge at state complete signal
0413
0414   //-----------------------------------------------------------------
0415   // Message handling for state manager: head part
0416   //-----------------------------------------------------------------
0417   IF #tempSCInternal THEN // Check if rising edge of SC was detected
0418   #tempDiagnosticsBufferIndex := #tempDiagnosticsBufferIndex + 1; // Next buffer
     index
0419   IF #tempDiagnosticsBufferIndex > "LPMLV30_DIAG_BUFFER_UPPER_LIM" THEN
0420     #tempDiagnosticsBufferIndex := 0;
0421   END_IF;
0422   #tempDiagnosticsBufferIndexSC := #tempDiagnosticsBufferIndex;
0423
0424   // Check current state to use SC
0425   IF #statStateInternal = "LPMLV30_STATE_CLEARING"    OR
0426     #statStateInternal = "LPMLV30_STATE_STARTING"     OR
0427     #statStateInternal = "LPMLV30_STATE_STOPPING"     OR
0428     #statStateInternal = "LPMLV30_STATE_ABORTING"     OR
0429     #statStateInternal = "LPMLV30_STATE_HOLDING"      OR
0430     #statStateInternal = "LPMLV30_STATE_UNHOLDING"    OR
0431     #statStateInternal = "LPMLV30_STATE_SUSPENDING"   OR
0432     #statStateInternal = "LPMLV30_STATE_UNSUSPENDING" OR
0433     #statStateInternal = "LPMLV30_STATE_RESETTING"    OR
0434     #statStateInternal = "LPMLV30_STATE_COMPLETING"   OR
0435     #statStateInternal = "LPMLV30_STATE_EXECUTE"
0436   THEN // Write diagnostics
0437     #tempRetVal := RD_SYS_T(#diagnostics.buffer[#tempDiagnosticsBufferIn-
     dex].timestamp);
0438     #diagnostics.buffer[#tempDiagnosticsBufferIndex].UnitModeCur-
     rent := DINT_TO_BYTE(#UnitModeCurrent);
0439     #diagnostics.buffer[#tempDiagnosticsBufferIndex].StateCur-
     rent    := DINT_TO_BYTE(#StateCurrent);
0440     #diagnostics.buffer[#tempDiagnosticsBufferIndex].Uni-
     tMode := DINT_TO_BYTE(#statUnitMode);
0441     #diagnostics.buffer[#tempDiagnosticsBufferIn-
     dex].CntrlCmd := DINT_TO_BYTE(#tempCntrlCmd);
0442     #diagnostics.buffer[#tempDiagnosticsBufferIndex].SC := #SC;
0443     #diagnostics.buffer[#tempDiagnosticsBufferIndex].message := #MSG_NO_MESSAGE;
0444   ELSE // Write diagnostics
```

```
0445      #tempRetVal := RD_SYS_T(#diagnostics.buffer[#tempDiagnosticsBufferIn-
      dex].timestamp);
0446      #diagnostics.buffer[#tempDiagnosticsBufferIndex].UnitModeCur-
      rent := DINT_TO_BYTE(#UnitModeCurrent);
0447      #diagnostics.buffer[#tempDiagnosticsBufferIndex].StateCur-
      rent     := DINT_TO_BYTE(#StateCurrent);
0448      #diagnostics.buffer[#tempDiagnosticsBufferIndex].Uni-
      tMode := DINT_TO_BYTE(#statUnitMode);
0449      #diagnostics.buffer[#tempDiagnosticsBufferIn-
      dex].CntrlCmd := DINT_TO_BYTE(#tempCntrlCmd);
0450      #diagnostics.buffer[#tempDiagnosticsBufferIndex].SC := #SC;
0451      #diagnostics.buffer[#tempDiagnosticsBufferIndex].message := #MSG_SC_NOT_AL-
      LOWED;
0452    END_IF; // End: Check current state to use SC
0453    END_IF;
0454
0455    // Check if defined control command was sent correctly
0456    IF #statCmdChangeRequest AND #tempCntrlCmd <> #statCntrlCm-
      dOld AND #tempCntrlCmd <> "LPMLV30_CMD_UNDEFINED" THEN
0457    IF #tempCntrlCmd = "LPMLV30_CMD_RESET"      OR
0458       #tempCntrlCmd = "LPMLV30_CMD_START"      OR
0459       #tempCntrlCmd = "LPMLV30_CMD_STOP"       OR
0460       #tempCntrlCmd = "LPMLV30_CMD_HOLD"       OR
0461       #tempCntrlCmd = "LPMLV30_CMD_UNHOLD"     OR
0462       #tempCntrlCmd = "LPMLV30_CMD_SUSPEND"    OR
0463       #tempCntrlCmd = "LPMLV30_CMD_UNSUSPEND" OR
0464       #tempCntrlCmd = "LPMLV30_CMD_ABORT"      OR
0465       #tempCntrlCmd = "LPMLV30_CMD_CLEAR"      OR
0466       #tempCntrlCmd = "LPMLV30_CMD_COMPLETE" // Info: Complete command not in the
      OMAC standard
0467    THEN
0468      #tempDiagnosticsBufferIndex := #tempDiagnosticsBufferIndex + 1; // Next buf-
      fer index
0469      IF #tempDiagnosticsBufferIndex > "LPMLV30_DIAG_BUFFER_UPPER_LIM" THEN
0470      #tempDiagnosticsBufferIndex := 0;
0471      END_IF;
0472      #tempDiagnosticsBufferIndexCmd := #tempDiagnosticsBufferIndex;
0473
0474      // Write diagnostics
0475      #tempRetVal := RD_SYS_T(#diagnostics.buffer[#tempDiagnosticsBufferIn-
      dex].timestamp);
0476      #diagnostics.buffer[#tempDiagnosticsBufferIndex].UnitModeCur-
      rent := DINT_TO_BYTE(#UnitModeCurrent);
0477      #diagnostics.buffer[#tempDiagnosticsBufferIndex].StateCur-
      rent     := DINT_TO_BYTE(#StateCurrent);
0478      #diagnostics.buffer[#tempDiagnosticsBufferIndex].Uni-
      tMode := DINT_TO_BYTE(#statUnitMode);
0479      #diagnostics.buffer[#tempDiagnosticsBufferIn-
      dex].CntrlCmd := DINT_TO_BYTE(#tempCntrlCmd);
0480      #diagnostics.buffer[#tempDiagnosticsBufferIndex].SC := #SC;
0481      #diagnostics.buffer[#tempDiagnosticsBufferIndex].message := #MSG_NO_MESSAGE;
0482      // Write message if CntrlCmd is not allowed
0483      IF ((#statStateInternal = "LPMLV30_STATE_CLEARING" OR
0484      #statStateInternal = "LPMLV30_STATE_STARTING" OR
0485      #statStateInternal = "LPMLV30_STATE_STOPPING" OR
```

```
0486      #statStateInternal = "LPMLV30_STATE_ABORTING" OR
0487      #statStateInternal = "LPMLV30_STATE_HOLDING" OR
0488      #statStateInternal = "LPMLV30_STATE_UNHOLDING" OR
0489      #statStateInternal = "LPMLV30_STATE_SUSPENDING" OR
0490      #statStateInternal = "LPMLV30_STATE_UNSUSPENDING" OR
0491      #statStateInternal = "LPMLV30_STATE_RESETTING" OR
0492      #statStateInternal = "LPMLV30_STATE_COMPLETING") AND
0493      NOT (#tempCntrlCmd = "LPMLV30_CMD_ABORT") AND NOT (#tempCntrlCmd =
      "LPMLV30_CMD_STOP")) OR
0494      (#statStateInternal = "LPMLV30_STATE_ABOR-
      TED" AND (#tempCntrlCmd = "LPMLV30_CMD_ABORT"))
0495      THEN
0496      #diagnostics.buffer[#tempDiagnosticsBufferIndex].message := #MSG_CMD_NOT_AL-
      LOWED;
0497      END_IF;
0498    ELSE
0499      // Not defined control command was sent
0500      #tempDiagnosticsBufferIndex := #tempDiagnosticsBufferIndex + 1; // Next buf-
      fer index
0501      IF #tempDiagnosticsBufferIndex > "LPMLV30_DIAG_BUFFER_UPPER_LIM" THEN
0502      #tempDiagnosticsBufferIndex := 0;
0503      END_IF;
0504      #tempDiagnosticsBufferIndexCmd := #tempDiagnosticsBufferIndex;
0505
0506      // Write diagnostics
0507      #tempRetVal := RD_SYS_T(#diagnostics.buffer[#tempDiagnosticsBufferIn-
      dex].timestamp);
0508      #diagnostics.buffer[#tempDiagnosticsBufferIndex].UnitModeCur-
      rent := DINT_TO_BYTE(#UnitModeCurrent);
0509      #diagnostics.buffer[#tempDiagnosticsBufferIndex].StateCur-
      rent    := DINT_TO_BYTE(#StateCurrent);
0510      #diagnostics.buffer[#tempDiagnosticsBufferIndex].Uni-
      tMode := DINT_TO_BYTE(#statUnitMode);
0511      #diagnostics.buffer[#tempDiagnosticsBufferIn-
      dex].CntrlCmd := DINT_TO_BYTE(#tempCntrlCmd);
0512      #diagnostics.buffer[#tempDiagnosticsBufferIndex].SC := #SC;
0513      #diagnostics.buffer[#tempDiagnosticsBufferIndex].message := #MSG_CMD_NOT_DE-
      FINED;
0514    END_IF;
0515    END_IF; // End: message handling for state manager: head part
0516
0517    //-----------------------------------------------------------------------
0518    // State machine
0519    //-----------------------------------------------------------------------
0520    IF #statCmdChangeRequest AND #tempCntrlCmd <> #statCntrlCm-
      dOld AND #tempCntrlCmd = "LPMLV30_CMD_ABORT" AND // Check if
      abort command was sent correctly
0521    #statStateInternal <> "LPMLV30_STATE_ABORTED" AND
0522    #statStateInternal <> "LPMLV30_STATE_ABORTING"
0523    THEN
0524    // Abort command was sent correctly
0525    #StateChangeInProcess := TRUE;
0526    #StateRequested := "LPMLV30_STATE_ABORTED";
0527    // Select next state
0528    IF #statStatesInCurrentMode.aborting THEN
```

```
0529      #statStateInternal := "LPMLV30_STATE_ABORTING";
0530    ELSE
0531      #statStateInternal := "LPMLV30_STATE_ABORTED";
0532    END_IF;
0533
0534    ELSIF #statCmdChangeRequest AND #tempCntrlCmd <> #statCntrlCm-
      dOld AND #tempCntrlCmd = "LPMLV30_CMD_STOP" AND // Check if
      correct stop command was sent
0535    #statStateInternal <> "LPMLV30_STATE_ABORTED"  AND
0536    #statStateInternal <> "LPMLV30_STATE_ABORTING" AND
0537    #statStateInternal <> "LPMLV30_STATE_CLEARING" AND
0538    #statStateInternal <> "LPMLV30_STATE_STOPPING" AND
0539    #statStateInternal <> "LPMLV30_STATE_STOPPED"
0540    THEN
0541    // Stop command was sent correctly
0542    #StateChangeInProcess := TRUE;
0543    #StateRequested := "LPMLV30_STATE_STOPPED";
0544    // Select next state
0545    IF #statStatesInCurrentMode.stopping THEN
0546      #statStateInternal := "LPMLV30_STATE_STOPPING";
0547    ELSE
0548      #statStateInternal := "LPMLV30_STATE_STOPPED";
0549    END_IF;
0550
0551    ELSE // Internal state machine
0552    CASE #statStateInternal OF
0553      "LPMLV30_STATE_EXECUTE":
0554      #StateChangeInProcess := FALSE;
0555      // Check if state is completed
0556      IF #tempSCInternal AND #statStatesInCurrentMode.completing THEN // ELSE:
      Wait for SC (state complete)
0557        #StateChangeInProcess := TRUE;
0558        #StateRequested    := "LPMLV30_STATE_COMPLETE";
0559        #statStateInternal := "LPMLV30_STATE_COMPLETING";
0560      ELSIF #tempSCInternal AND #statStatesInCurrentMode.complete THEN
0561        #StateChangeInProcess := TRUE;
0562        #StateRequested    := "LPMLV30_STATE_COMPLETE";
0563        #statStateInternal := "LPMLV30_STATE_COMPLETE";
0564      ELSIF #tempSCInternal AND NOT #statStatesInCurrentMode.complet-
      ing AND NOT #statStatesInCurrentMode.complete THEN
0565        #diagnostics.buffer[#tempDiagnosticsBufferIndexSC].mes-
      sage := #MSG_SC_NOT_ALLOWED;
0566      END_IF;
0567
0568      IF #statCmdChangeRequest AND #tempCntrlCmd <> #statCntrlCm-
      dOld AND #tempCntrlCmd <> "LPMLV30_CMD_UNDEFINED" AND
0569        NOT (#tempSCInternal AND (#statStatesInCurrentMode.completing OR #statSta-
      tesInCurrentMode.complete))
0570      THEN // Check if state change is requested
0571        CASE #tempCntrlCmd OF // Check control command
0572        "LPMLV30_CMD_COMPLETE": // Remember, the Complete command is not specified
      in the OMAC standard
0573          // Check if valid state for command is in use by current unit mode
0574          IF #statStatesInCurrentMode.completing THEN
0575          #StateChangeInProcess := TRUE;
```

```
0576          #StateRequested    := "LPMLV30_STATE_COMPLETE";
0577          #statStateInternal := "LPMLV30_STATE_COMPLETING";
0578          ELSIF #statStatesInCurrentMode.complete THEN
0579          #StateChangeInProcess := TRUE;
0580          #StateRequested    := "LPMLV30_STATE_COMPLETE";
0581          #statStateInternal := "LPMLV30_STATE_COMPLETE";
0582          ELSE
0583          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0584          END_IF;
0585
0586        "LPMLV30_CMD_RESET":
0587          IF NOT #statStatesInCurrentMode.completing AND NOT #statStatesInCurrent-
      Mode.complete THEN
0588          // Check if valid state for command is in use by current unit mode
0589          IF #statStatesInCurrentMode.resetting THEN
0590            #StateChangeInProcess := TRUE;
0591            #StateRequested    := "LPMLV30_STATE_IDLE";
0592            #statStateInternal := "LPMLV30_STATE_RESETTING";
0593          ELSIF #statStatesInCurrentMode.idle THEN
0594            #StateChangeInProcess := TRUE;
0595            #StateRequested    := "LPMLV30_STATE_IDLE";
0596            #statStateInternal := "LPMLV30_STATE_IDLE";
0597          ELSE
0598            #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0599          END_IF;
0600          END_IF;
0601
0602        "LPMLV30_CMD_HOLD":
0603          // Check if valid state for command is in use by current unit mode
0604          IF #statStatesInCurrentMode.holding THEN
0605          #StateChangeInProcess := TRUE;
0606          #StateRequested    := "LPMLV30_STATE_HELD";
0607          #statStateInternal := "LPMLV30_STATE_HOLDING";
0608          ELSIF #statStatesInCurrentMode.held THEN
0609          #StateChangeInProcess := TRUE;
0610          #StateRequested    := "LPMLV30_STATE_HELD";
0611          #statStateInternal := "LPMLV30_STATE_HELD";
0612          ELSE
0613          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0614          END_IF;
0615
0616        "LPMLV30_CMD_SUSPEND":
0617          // Check if valid state for command is in use by current unit mode
0618          IF #statStatesInCurrentMode.suspending THEN
0619          #StateChangeInProcess := TRUE;
0620          #StateRequested    := "LPMLV30_STATE_SUSPENDED";
0621          #statStateInternal := "LPMLV30_STATE_SUSPENDING";
0622          ELSIF #statStatesInCurrentMode.suspended THEN
0623          #StateChangeInProcess := TRUE;
0624          #StateRequested    := "LPMLV30_STATE_SUSPENDED";
0625          #statStateInternal := "LPMLV30_STATE_SUSPENDED";
0626          ELSE
```

```
0627          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0628          END_IF;
0629        ELSE
0630          IF #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage = #MSG_NO_MESSAGE THEN // ELSE: Message was already
      written in head part of message handling
0631          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0632          END_IF;
0633        END_CASE;
0634      END_IF;
0635
0636      "LPMLV30_STATE_COMPLETING":
0637      // Check if state is completed
0638      IF #tempSCInternal AND #statStatesInCurrentMode.complete THEN
0639        #statStateInternal := "LPMLV30_STATE_COMPLETE";
0640      ELSIF #tempSCInternal AND NOT #statStatesInCurrentMode.complete THEN
0641        #diagnostics.buffer[#tempDiagnosticsBufferIndexSC].mes-
      sage := #MSG_SC_NOT_ALLOWED;
0642      END_IF;
0643
0644      "LPMLV30_STATE_COMPLETE":
0645      #StateChangeInProcess := FALSE;
0646      IF #statCmdChangeRequest AND #tempCntrlCmd <> #statCntrlCm-
      dOld AND #tempCntrlCmd <> "LPMLV30_CMD_UNDEFINED" THEN // Check
      if state change is requested
0647        CASE #tempCntrlCmd OF // Check control command
0648        "LPMLV30_CMD_RESET":
0649          // Check if valid state for command is in use by current unit mode
0650          IF #statStatesInCurrentMode.resetting THEN
0651          #StateChangeInProcess := TRUE;
0652          #StateRequested    := "LPMLV30_STATE_IDLE";
0653          #statStateInternal := "LPMLV30_STATE_RESETTING";
0654          ELSIF #statStatesInCurrentMode.idle THEN
0655          #StateChangeInProcess := TRUE;
0656          #StateRequested    := "LPMLV30_STATE_IDLE";
0657          #statStateInternal := "LPMLV30_STATE_IDLE";
0658          ELSE
0659          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0660          END_IF;
0661
0662        "LPMLV30_CMD_START":
0663          // Check if valid state for command is in use by current unit mode
0664          IF NOT #statStatesInCurrentMode.resetting AND NOT #statStatesInCurrent-
      Mode.idle THEN
0665          #StateChangeInProcess := TRUE;
0666          #StateRequested := "LPMLV30_STATE_EXECUTE";
0667          // Check if valid state for command is in use by current unit mode
0668          IF #statStatesInCurrentMode.starting THEN
0669            #statStateInternal := "LPMLV30_STATE_STARTING";
0670          ELSE
0671            #statStateInternal := "LPMLV30_STATE_EXECUTE";
0672          END_IF;
```

```
0673          ELSE
0674          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0675          END_IF;
0676        ELSE
0677          IF #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage = #MSG_NO_MESSAGE THEN // ELSE: Message was already
      written in head part of message handling
0678          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0679          END_IF;
0680        END_CASE;
0681      END_IF;
0682
0683      "LPMLV30_STATE_RESETTING":
0684      // Check if state is completed
0685      // No message handling needed -> Idle is minimum required state
0686      IF #tempSCInternal THEN // ELSE: Wait for state complete signal
0687        #statStateInternal := "LPMLV30_STATE_IDLE";
0688      END_IF;
0689
0690      "LPMLV30_STATE_IDLE":
0691      #StateChangeInProcess := FALSE;
0692      // No message handling needed -> Execute is minimum required state
0693      // Check if valid command is sent
0694      IF #statCmdChangeRequest AND #tempCntrlCmd <> #statCntrlCm-
      dOld AND #tempCntrlCmd <> "LPMLV30_CMD_UNDEFINED" THEN // Check
      if state change is requested
0695        CASE #tempCntrlCmd OF // Check control command
0696        "LPMLV30_CMD_START":
0697          #StateChangeInProcess := TRUE;
0698          #StateRequested := "LPMLV30_STATE_EXECUTE";
0699          // Check if valid state for command is in use by current mode
0700          IF #statStatesInCurrentMode.starting THEN
0701          #statStateInternal := "LPMLV30_STATE_STARTING";
0702          ELSE
0703          #statStateInternal := "LPMLV30_STATE_EXECUTE";
0704          END_IF;
0705        ELSE
0706          IF #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage = #MSG_NO_MESSAGE THEN // ELSE: Message was already
      written in head part of message handling
0707          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0708          END_IF;
0709        END_CASE;
0710      END_IF;
0711
0712      "LPMLV30_STATE_STARTING",
0713      "LPMLV30_STATE_UNHOLDING",
0714      "LPMLV30_STATE_UNSUSPENDING":
0715      // Check if state is completed
0716      IF #tempSCInternal THEN // ELSE: Wait for state complete signal
0717        #statStateInternal := "LPMLV30_STATE_EXECUTE";
0718      END_IF;
```

```
0719
0720      "LPMLV30_STATE_HOLDING":
0721      // Check if state is completed
0722      IF #tempSCInternal AND #statStatesInCurrentMode.held THEN // ELSE: Wait for
          state complete signal
0723        #statStateInternal := "LPMLV30_STATE_HELD";
0724      ELSIF #tempSCInternal AND NOT #statStatesInCurrentMode.held THEN
0725        #diagnostics.buffer[#tempDiagnosticsBufferIndexSC].mes-
          sage := #MSG_SC_NOT_ALLOWED;
0726      END_IF;
0727
0728      "LPMLV30_STATE_HELD":
0729      #StateChangeInProcess := FALSE;
0730      // Check if valid command is sent
0731      IF #statCmdChangeRequest AND #tempCntrlCmd <> #statCntrlCm-
          dOld AND #tempCntrlCmd <> "LPMLV30_CMD_UNDEFINED" THEN // Check
          if state change is requested
0732        CASE #tempCntrlCmd OF // Check control command
0733        "LPMLV30_CMD_UNHOLD":
0734          #StateChangeInProcess := TRUE;
0735          #StateRequested := "LPMLV30_STATE_EXECUTE";
0736          // Check if valid state for command is in use by current mode
0737          IF #statStatesInCurrentMode.unholding THEN
0738          #statStateInternal := "LPMLV30_STATE_UNHOLDING";
0739          ELSE
0740          #statStateInternal := "LPMLV30_STATE_EXECUTE";
0741          END_IF;
0742        ELSE
0743          IF #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
          sage = #MSG_NO_MESSAGE THEN // ELSE: Message was already
          written in head part of message handling
0744          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
          sage := #MSG_CMD_NOT_ALLOWED;
0745          END_IF;
0746        END_CASE;
0747      END_IF;
0748
0749      "LPMLV30_STATE_SUSPENDING":
0750      // Check if state is completed
0751      IF #tempSCInternal AND #statStatesInCurrentMode.suspended THEN // ELSE: Wait
          for state complete signal
0752        #statStateInternal := "LPMLV30_STATE_SUSPENDED";
0753      ELSIF #tempSCInternal AND NOT #statStatesInCurrentMode.suspended THEN
0754        #diagnostics.buffer[#tempDiagnosticsBufferIndexSC].mes-
          sage := #MSG_SC_NOT_ALLOWED;
0755      END_IF;
0756
0757      "LPMLV30_STATE_SUSPENDED":
0758      #StateChangeInProcess := FALSE;
0759      // Check if valid command is sent
0760      IF #statCmdChangeRequest AND #tempCntrlCmd <> #statCntrlCm-
          dOld AND #tempCntrlCmd <> "LPMLV30_CMD_UNDEFINED" THEN // Check
          if state change is requested
0761        CASE #tempCntrlCmd OF // Check control command
0762        "LPMLV30_CMD_UNSUSPEND":
```

```
0763          #StateChangeInProcess := TRUE;
0764          #StateRequested := "LPMLV30_STATE_EXECUTE";
0765          // Check if valid state for command is in use by current mode
0766          IF #statStatesInCurrentMode.unsuspending THEN
0767          #statStateInternal := "LPMLV30_STATE_UNSUSPENDING";
0768          ELSE
0769          #statStateInternal := "LPMLV30_STATE_EXECUTE";
0770          END_IF;
0771        ELSE
0772          IF #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage = #MSG_NO_MESSAGE THEN // ELSE: Message was already
      written in head part of message handling
0773          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0774          END_IF;
0775        END_CASE;
0776      END_IF;
0777
0778      "LPMLV30_STATE_ABORTING":
0779      // Check if state is completed
0780      IF #tempSCInternal THEN // ELSE: Wait for state complete signal
0781        #statStateInternal := "LPMLV30_STATE_ABORTED";
0782      END_IF;
0783
0784      "LPMLV30_STATE_ABORTED":
0785      #StateChangeInProcess := FALSE;
0786      // Check if valid command is sent
0787      IF #statCmdChangeRequest AND #tempCntrlCmd <> #statCntrlCm-
      dOld AND #tempCntrlCmd <> "LPMLV30_CMD_UNDEFINED" THEN // Check
      if state change is requested
0788        CASE #tempCntrlCmd OF // Check control command
0789        "LPMLV30_CMD_CLEAR":
0790          #StateChangeInProcess := TRUE;
0791          #StateRequested := "LPMLV30_STATE_STOPPED";
0792          // Check if valid state for command is in use by current mode
0793          IF #statStatesInCurrentMode.clearing THEN
0794          #statStateInternal := "LPMLV30_STATE_CLEARING";
0795          ELSE
0796          #statStateInternal := "LPMLV30_STATE_STOPPED";
0797          END_IF;
0798        ELSE
0799          IF #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage = #MSG_NO_MESSAGE THEN // ELSE: Message was already
      written in head part of message handling
0800          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0801          END_IF;
0802        END_CASE;
0803      END_IF;
0804
0805      "LPMLV30_STATE_CLEARING",
0806      "LPMLV30_STATE_STOPPING":
0807      // Check if state is completed
0808      IF #tempSCInternal THEN // ELSE: Wait for state complete signal
0809        #statStateInternal := "LPMLV30_STATE_STOPPED";
```

```
0810      END_IF;
0811
0812      "LPMLV30_STATE_STOPPED":
0813      #StateChangeInProcess := FALSE;
0814      IF #statCmdChangeRequest AND #tempCntrlCmd <> #statCntrlCm-
      dOld AND #tempCntrlCmd <> "LPMLV30_CMD_UNDEFINED" THEN // Check
      if state change is requested
0815        // Check if valid command is sent
0816        CASE #tempCntrlCmd OF
0817        "LPMLV30_CMD_RESET":
0818          // Check if valid state for command is in use by current unit mode
0819          IF #statStatesInCurrentMode.resetting THEN
0820          #StateChangeInProcess := TRUE;
0821          #StateRequested    := "LPMLV30_STATE_IDLE";
0822          #statStateInternal := "LPMLV30_STATE_RESETTING";
0823          ELSIF #statStatesInCurrentMode.idle THEN
0824          #StateChangeInProcess := TRUE;
0825          #StateRequested    := "LPMLV30_STATE_IDLE";
0826          #statStateInternal := "LPMLV30_STATE_IDLE";
0827          ELSE
0828          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0829          END_IF;
0830
0831        "LPMLV30_CMD_START":
0832          IF NOT #statStatesInCurrentMode.resetting AND NOT #statStatesInCurrent-
      Mode.idle THEN
0833          #StateChangeInProcess := TRUE;
0834          #StateRequested := "LPMLV30_STATE_EXECUTE";
0835          // Check if valid state for command is in use by current mode
0836          IF #statStatesInCurrentMode.starting THEN
0837            #statStateInternal := "LPMLV30_STATE_STARTING";
0838          ELSE
0839            #statStateInternal := "LPMLV30_STATE_EXECUTE";
0840          END_IF;
0841          ELSE
0842          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0843          END_IF;
0844        ELSE
0845          IF #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage = #MSG_NO_MESSAGE THEN // ELSE: Message was already
      written in head part of message handling
0846          #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
      sage := #MSG_CMD_NOT_ALLOWED;
0847          END_IF;
0848        END_CASE;
0849      END_IF;
0850
0851      "LPMLV30_STATE_UNDEFINED":
0852      #StateChangeInProcess := FALSE;
0853      #StateRequested    := "LPMLV30_STATE_STOPPED";
0854      #statStateInternal := "LPMLV30_STATE_STOPPED";
0855      ELSE
0856      ; // Undefined state
```

```
0857    END_CASE;
0858    END_IF; // End: state machine
0859
0860    //-----------------------------------------------
0861    // Message handling for state manager: foot part
0862    //-----------------------------------------------
0863    IF #statStateInternal <> #statStateCurrentOld THEN // ELSE: States were not
changed
0864    IF #tempDiagnosticsBufferIndexCmd >= 0 AND #tempDiagnosticsBufferIn-
dexCmd <= "LPMLV30_DIAG_BUFFER_UPPER_LIM" THEN
0865      IF #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].message = #MSG_NO_MES-
SAGE THEN
0866      #diagnostics.buffer[#tempDiagnosticsBufferIndexCmd].mes-
sage := #MSG_STATE_CHANGED_SUCCESSFULLY;
0867      END_IF;
0868    END_IF;
0869    IF #tempDiagnosticsBufferIndexSC >= 0 AND #tempDiagnosticsBufferIn-
dexSC <= "LPMLV30_DIAG_BUFFER_UPPER_LIM" THEN
0870      IF #diagnostics.buffer[#tempDiagnosticsBufferIndexSC].message = #MSG_NO_MES-
SAGE THEN
0871      #diagnostics.buffer[#tempDiagnosticsBufferIndexSC].mes-
sage := #MSG_STATE_CHANGED_SUCCESSFULLY;
0872      END_IF;
0873    END_IF;
0874    END_IF; // End: message handling for state manager: foot part
0875 END_IF; // End: As from second cycle
0876 // End: State manager
0877
0878 //-----------------------------------------------------------------------------
-------------------
0879 // Write outputs including boolean interface outputs
0880 //-----------------------------------------------------------------------------
-------------------
0881 IF #statUnitModeCurrentInternal <> #statUnitModeCurrentInternalOld THEN // Check
if new unit mode is selected
0882    #ProductionModeActive  := FALSE;
0883    #MaintenanceModeActive := FALSE;
0884    #ManualModeActive      := FALSE;
0885    #UserMode01Active      := FALSE;
0886    #UserMode02Active      := FALSE;
0887    #UserMode03Active      := FALSE;
0888    #UserMode04Active      := FALSE;
0889    #UserMode05Active      := FALSE;
0890    #UserMode06Active      := FALSE;
0891    #UserMode07Active      := FALSE;
0892    #UserMode08Active      := FALSE;
0893    // #UserMode09Active := FALSE;
0894    // #UserMode10Active := FALSE;
0895    // #UserMode11Active := FALSE;
0896    // #UserMode13Active := FALSE;
0897    // #UserMode14Active := FALSE;
0898    // #UserMode15Active := FALSE;
0899    // #UserMode16Active := FALSE;
0900    // #UserMode17Active := FALSE;
0901    // #UserMode18Active := FALSE;
```

```
0902    // #UserMode19Active := FALSE;
0903    // #UserMode20Active := FALSE;
0904    // #UserMode21Active := FALSE;
0905    // #UserMode22Active := FALSE;
0906    // #UserMode23Active := FALSE;
0907    // #UserMode24Active := FALSE;
0908    // #UserMode25Active := FALSE;
0909    // #UserMode26Active := FALSE;
0910    // #UserMode27Active := FALSE;
0911    // #UserMode28Active := FALSE;
0912
0913    CASE #statUnitModeCurrentInternal OF // Set new bit for current unit mode
0914    "LPMLV30_MODE_PRODUCTION":
0915      #ProductionModeActive := TRUE;
0916    "LPMLV30_MODE_MAINTENANCE":
0917      #MaintenanceModeActive := TRUE;
0918    "LPMLV30_MODE_MANUAL":
0919      #ManualModeActive := TRUE;
0920    "LPMLV30_MODE_USER_01":
0921      #UserMode01Active := TRUE;
0922    "LPMLV30_MODE_USER_02":
0923      #UserMode02Active := TRUE;
0924    "LPMLV30_MODE_USER_03":
0925      #UserMode03Active := TRUE;
0926    "LPMLV30_MODE_USER_04":
0927      #UserMode04Active := TRUE;
0928    "LPMLV30_MODE_USER_05":
0929      #UserMode05Active := TRUE;
0930    "LPMLV30_MODE_USER_06":
0931      #UserMode06Active := TRUE;
0932    "LPMLV30_MODE_USER_07":
0933      #UserMode07Active := TRUE;
0934    "LPMLV30_MODE_USER_08":
0935      #UserMode08Active := TRUE;
0936    // LPMLV30_MODE_USER_09:
0937    // #UserMode09Active := TRUE;
0938    // LPMLV30_MODE_USER_10:
0939    // #UserMode10Active := TRUE;
0940    // LPMLV30_MODE_USER_11:
0941    // #UserMode11Active := TRUE;
0942    // LPMLV30_MODE_USER_12:
0943    // #UserMode12Active := TRUE;
0944    // LPMLV30_MODE_USER_13:
0945    // #UserMode13Active := TRUE;
0946    // LPMLV30_MODE_USER_14:
0947    // #UserMode14Active := TRUE;
0948    // LPMLV30_MODE_USER_15:
0949    // #UserMode15Active := TRUE;
0950    // LPMLV30_MODE_USER_16:
0951    // #UserMode16Active := TRUE;
0952    // LPMLV30_MODE_USER_17:
0953    // #UserMode17Active := TRUE;
0954    // LPMLV30_MODE_USER_18:
0955    // #UserMode18Active := TRUE;
0956    // LPMLV30_MODE_USER_19:
```

```
0957    // #UserMode19Active := TRUE;
0958    // LPMLV30_MODE_USER_20:
0959    // #UserMode20Active := TRUE;
0960    // LPMLV30_MODE_USER_21:
0961    // #UserMode21Active := TRUE;
0962    // LPMLV30_MODE_USER_22:
0963    // #UserMode22Active := TRUE;
0964    // LPMLV30_MODE_USER_23:
0965    // #UserMode23Active := TRUE;
0966    // LPMLV30_MODE_USER_24:
0967    // #UserMode25Active := TRUE;
0968    // LPMLV30_MODE_USER_25:
0969    // #UserMode25Active := TRUE;
0970    // LPMLV30_MODE_USER_26:
0971    // #UserMode26Active := TRUE;
0972    // LPMLV30_MODE_USER_27:
0973    // #UserMode27Active := TRUE;
0974    // LPMLV30_MODE_USER_28:
0975    // #UserMode28Active := TRUE;
0976    ELSE
0977      ; // No bit is set
0978    END_CASE;
0979
0980    #statUnitModeCurrentInternalOld := #statUnitModeCurrentInternal;
0981  END_IF;
0982
0983  IF #statStateInternal <> #statStateInternalOld THEN // Check if new state is se-
      lected
0984    #StateCurrent := #statStateInternal; // Set output
0985
0986    // Set states of boolean interface out
0987    // Delete old state
0988    #ClearingStateActive     := FALSE;
0989    #StoppedStateActive      := FALSE;
0990    #StartingStateActive     := FALSE;
0991    #IdleStateActive         := FALSE;
0992    #SuspendedStateActive    := FALSE;
0993    #ExecuteStateActive      := FALSE;
0994    #StoppingStateActive     := FALSE;
0995    #AbortingStateActive     := FALSE;
0996    #AbortedStateActive      := FALSE;
0997    #HoldingStateActive      := FALSE;
0998    #HeldStateActive         := FALSE;
0999    #UnholdingStateActive    := FALSE;
1000    #SuspendingStateActive   := FALSE;
1001    #UnsuspendingStateActive := FALSE;
1002    #ResettingStateActive    := FALSE;
1003    #CompletingStateActive   := FALSE;
1004    #CompleteStateActive     := FALSE;
1005
1006    // Set new state
1007    CASE #statStateInternal OF
1008    "LPMLV30_STATE_CLEARING":
1009      #ClearingStateActive := TRUE;
1010    "LPMLV30_STATE_STOPPED":
```

```
1011      #StoppedStateActive := TRUE;
1012    "LPMLV30_STATE_STARTING":
1013      #StartingStateActive := TRUE;
1014    "LPMLV30_STATE_IDLE":
1015      #IdleStateActive := TRUE;
1016    "LPMLV30_STATE_SUSPENDED":
1017      #SuspendedStateActive := TRUE;
1018    "LPMLV30_STATE_EXECUTE":
1019      #ExecuteStateActive := TRUE;
1020    "LPMLV30_STATE_STOPPING":
1021      #StoppingStateActive := TRUE;
1022    "LPMLV30_STATE_ABORTING":
1023      #AbortingStateActive := TRUE;
1024    "LPMLV30_STATE_ABORTED":
1025      #AbortedStateActive := TRUE;
1026    "LPMLV30_STATE_HOLDING":
1027      #HoldingStateActive := TRUE;
1028    "LPMLV30_STATE_HELD":
1029      #HeldStateActive := TRUE;
1030    "LPMLV30_STATE_UNHOLDING":
1031      #UnholdingStateActive := TRUE;
1032    "LPMLV30_STATE_SUSPENDING":
1033      #SuspendingStateActive := TRUE;
1034    "LPMLV30_STATE_UNSUSPENDING":
1035      #UnsuspendingStateActive := TRUE;
1036    "LPMLV30_STATE_RESETTING":
1037      #ResettingStateActive := TRUE;
1038    "LPMLV30_STATE_COMPLETING":
1039      #CompletingStateActive := TRUE;
1040    "LPMLV30_STATE_COMPLETE":
1041      #CompleteStateActive := TRUE;
1042    ELSE
1043      ;
1044    END_CASE; // End: Set new state
1045
1046    #statStateInternalOld := #statStateInternal;
1047  END_IF;// End: Write boolean interface outputs
1048
1049  #diagnostics.bufferIndex := #tempDiagnosticsBufferIndex; // Temporary variable
      is used during block execution -> Copy back/Set output
1050  IF #statFirstCycle THEN
1051    #statFirstCycle := FALSE;
1052  END_IF;
1053
1054  // Save values for edge detection
1055  IF #statUnitModeChangeRequest THEN
1056    #statUnitModeOld := #statUnitMode;
1057  END_IF;
1058  IF #statCmdChangeRequest THEN
1059    #statCntrlCmdOld := #tempCntrlCmd;
1060  END_IF;
1061  IF #statStateInternal <> #statStateCurrentOld THEN
1062    #statStateCurrentOld := #statStateInternal;
1063  END_IF;
1064
```

```
1065 //
     ============================================================================
     ============================
1066 // End of function block: LPMLV30_UnitModeStateManager
1067 //
     ============================================================================
     ============================
```

Program blocks / LPMLV30

LPMLV30_UnitModeStateTimes [FB30101]

LPMLV30_UnitModeStateTimes Properties					
General					
Name	LPMLV30_UnitModeState-Times	**Number**	30101	**Type**	FB
Language	SCL	**Numbering**	Automatic		
Information					
Title	LPMLV30_UnitModeState-Times	**Author**	APC_ERLF	**Comment**	Support: tech.team.mo-tioncontrol@siemens.com Fax: +49 (0) 9131/98-1297
Family	OMAC	**Version**		**User-defined ID**	

Name	Data type	Default value	Retain
▼ Input			
UnitModeCurrent	DInt	"LPMLV30_MODE_INVALID"	Non-retain
StateCurrent	DInt	"LPMLV30_STATE_UNDEFINED"	Non-retain
resetTimes	Bool	false	Non-retain
▼ Output			
ModeCurrentTime	Ar-ray[0.."LPMLV30_MODES_UPPER_LIM"] of DInt		Non-retain
ModeCumulativeTime	Ar-ray[0.."LPMLV30_MODES_UPPER_LIM"] of DInt		Retain
StateCurrentTime	Ar-ray[0.."LPMLV30_MODES_UPPER_LIM", 0.."LPMLV30_STATES_UPPER_LIM"] of DInt		Non-retain
StateCumulativeTime	Ar-ray[0.."LPMLV30_MODES_UPPER_LIM", 0.."LPMLV30_STATES_UPPER_LIM"] of DInt		Retain
actualTimeCurrentMode	DInt	0	Non-retain
cumulativeTimeCurrentMode	DInt	0	Non-retain
actualTimeCurrentStates	Ar-ray[0.."LPMLV30_STATES_UPPER_LIM"] of DInt		Non-retain
cumulativeTimeCurrentStates	Ar-ray[0.."LPMLV30_STATES_UPPER_LIM"] of DInt		Non-retain
AccTimeSinceReset	DInt	0	Retain
InOut			

Name	Data type	Default value	Retain
Static			
statUnitModeCurrentOld	DInt	"LPMLV30_MODE_INVALID"	Non-retain
statStateCurrentOld	DInt	"LPMLV30_STATE_UNDEFINED"	Non-retain
statResetTimesOld	Bool	false	Non-retain
statStartingPointMeasureRuntime	LReal	0.0	Non-retain
statRuntime	LReal	0.0	Non-retain
statFirstCycle	Bool	true	Non-retain
Temp			
tempI	Int		
tempJ	Int		
tempMeasuredRuntime	LReal		
tempRuntimeIntegerPart	DInt		
tempUnitModeCurrent	DInt		
tempStateCurrent	DInt		
Constant			

```
0001 //
     ================================================================================
     ============================
0002 // SIEMENS AG
0003 // (c)Copyright 2015 All Rights Reserved
0004 //------------------------------------------------------------------------------
     ----------------------------
0005 // Library: LPMLV30
0006 // Tested with: S7-1200 with FW version V4.1, S7-1500 with FW version V1.7
0007 // Engineering: TIA Portal V13 SP1
0008 // Restrictions: ---
0009 // Requirements: S7-1200 / S7-1500
0010 // Functionality: Determination of unit modes and states times (current and also
     cumulative times)
0011 //------------------------------------------------------------------------------
     ----------------------------
0012 // Change log table:
0013 // Version Date Expert in charge Changes applied
0014 // 03.00.01 29.05.2015 RK First released version
0015 //
     ================================================================================
     ============================
0016 // Function block: LPMLV30_UnitModeStateTimes
0017 //
     ================================================================================
     ============================
0018
0019 IF #statFirstCycle OR (#resetTimes AND NOT #statResetTimesOld) THEN
0020   // Reset times structures
0021   FOR #tempI := "LPMLV30_MODE_INVALID" TO "LPMLV30_MODES_UPPER_LIM" DO
0022   #ModeCurrentTime[#tempI] := 0;
0023   IF NOT #statFirstCycle THEN // Do only with rising edge at resetTimes
0024     #ModeCumulativeTime[#tempI] := 0;
0025   END_IF;
0026   FOR #tempJ := "LPMLV30_STATE_UNDEFINED" TO "LPMLV30_STATES_UPPER_LIM" DO
0027     #StateCurrentTime[#tempI, #tempJ] := 0;
```

```
0028      IF NOT #statFirstCycle THEN // Do only with rising edge at resetTimes
0029      #StateCumulativeTime[#tempI, #tempJ] := 0;
0030      END_IF;
0031    END_FOR;
0032    END_FOR;
0033    IF NOT #statFirstCycle THEN // Do only with rising edge at resetTimes
0034    #AccTimeSinceReset := 0;
0035    END_IF;
0036
0037    // Reset additional outputs
0038    #actualTimeCurrentMode := 0;
0039    IF NOT #statFirstCycle THEN // Do only with rising edge at resetTimes
0040    #cumulativeTimeCurrentMode := 0;
0041    END_IF;
0042    FOR #tempI := "LPMLV30_STATE_UNDEFINED" TO "LPMLV30_STATES_UPPER_LIM" DO
0043    #actualTimeCurrentStates[#tempI] := 0;
0044    IF NOT #statFirstCycle THEN // Do only with rising edge at resetTimes
0045      #cumulativeTimeCurrentStates[#tempI] := 0;
0046    END_IF;
0047    END_FOR;
0048
0049    // Set starting point for calculation of elapsed seconds
0050    #tempMeasuredRuntime := RUNTIME(#statStartingPointMeasureRuntime);
0051    #statRuntime := 0.0;
0052
0053    IF #statFirstCycle THEN
0054    #statFirstCycle := FALSE;
0055    RETURN; // Nothing else in this cycle to avoid runtime peaks
0056    END_IF;
0057  END_IF;
0058
0059  // Inputs UnitModeCurrent and StateCurrent
0060  #tempUnitModeCurrent := #UnitModeCurrent;
0061  #tempStateCurrent    := #StateCurrent;
0062
0063  // Measure program runtime
0064  #tempMeasuredRuntime := RUNTIME(#statStartingPointMeasureRuntime);
0065  IF #tempMeasuredRuntime > 0.0 THEN //value OK
0066    #statRuntime := #statRuntime + #tempMeasuredRuntime;
0067  END_IF;
0068
0069  // Check if at least one second has been reached
0070  IF #statRuntime > 1.0 THEN
0071    #tempRuntimeIntegerPart := TRUNC_DINT(#statRuntime);
0072
0073    IF #statUnitModeCurrentOld >= "LPMLV30_MODE_INVALID" AND #statUnitModeCurren-
      tOld <= "LPMLV30_MODES_UPPER_LIM" THEN
0074    //DINT overflow is not taken into account, because DINT in seconds means ap-
      prox. 68 years
0075    #ModeCurrentTime[#statUnitModeCurrentOld]     := #ModeCurrentTime[#statUnitMode-
      CurrentOld]     + #tempRuntimeIntegerPart;
0076    #ModeCumulativeTime[#statUnitModeCurrentOld] := #ModeCumulativeTime[#statUnit-
      ModeCurrentOld] + #tempRuntimeIntegerPart;
0077
```

```
0078   IF #statStateCurrentOld >= "LPMLV30_STATE_UNDEFINED" AND #statStateCurren-
       tOld <= "LPMLV30_STATES_UPPER_LIM" THEN
0079     //DINT overflow is not taken into account, because DINT in seconds means
       approx. 68 years
0080     #StateCurrentTime[#statUnitModeCurrentOld, #statStateCurren-
       tOld]     := #StateCurrentTime[#statUnitModeCurrentOld, #statStateCurren-
       tOld]     + #tempRuntimeIntegerPart;
0081     #StateCumulativeTime[#statUnitModeCurrentOld, #statStateCurren-
       tOld] := #StateCumulativeTime[#statUnitModeCurrentOld, #statStateCurren-
       tOld] + #tempRuntimeIntegerPart;
0082   END_IF;
0083   END_IF;
0084
0085   //DINT overflow is not taken into account, because DINT in seconds means ap-
       prox. 68 years
0086   #AccTimeSinceReset := #AccTimeSinceReset + #tempRuntimeIntegerPart;
0087
0088   #statRuntime := #statRuntime - #tempRuntimeIntegerPart; //fractional part of
       runtime variable for next cycle
0089 END_IF;
0090
0091 // Check if new unitMode is selected
0092 IF #tempUnitModeCurrent <> #statUnitModeCurrentOld THEN
0093   IF #tempUnitModeCurrent >= "LPMLV30_MODE_INVALID" AND #tempUnitModeCur-
       rent <= "LPMLV30_MODES_UPPER_LIM" THEN
0094   #ModeCurrentTime[#tempUnitModeCurrent] := 0;
0095   IF #tempStateCurrent >= "LPMLV30_STATE_UNDEFINED" AND #tempStateCur-
       rent <= "LPMLV30_STATES_UPPER_LIM" THEN
0096     #StateCurrentTime[#tempUnitModeCurrent, #tempStateCurrent] := 0;
0097   END_IF;
0098   END_IF;
0099
0100 // Check if new state is selected
0101 ELSIF #tempStateCurrent <> #statStateCurrentOld THEN
0102   IF #tempUnitModeCurrent >= "LPMLV30_MODE_INVALID"    AND #tempUnitModeCur-
       rent <= "LPMLV30_MODES_UPPER_LIM" AND
0103    #tempStateCurrent    >= "LPMLV30_STATE_UNDEFINED" AND #tempStateCur-
       rent    <= "LPMLV30_STATES_UPPER_LIM"
0104   THEN
0105   #StateCurrentTime[#tempUnitModeCurrent, #tempStateCurrent] := 0;
0106   END_IF;
0107 END_IF;
0108
0109 // Update additional outputs
0110 IF #tempUnitModeCurrent >= "LPMLV30_MODE_INVALID" AND #tempUnitModeCur-
       rent <= "LPMLV30_MODES_UPPER_LIM" THEN
0111   #actualTimeCurrentMode     := #ModeCurrentTime[#tempUnitModeCurrent];
0112   #cumulativeTimeCurrentMode := #ModeCumulativeTime[#tempUnitModeCurrent];
0113   IF #tempStateCurrent >= "LPMLV30_STATE_UNDEFINED" AND #tempStateCur-
       rent <= "LPMLV30_STATES_UPPER_LIM" THEN
0114   #actualTimeCurrentStates     := #StateCurrentTime[#tempUnitModeCurrent];
0115   #cumulativeTimeCurrentStates := #StateCumulativeTime[#tempUnitModeCurrent];
0116   ELSE
0117   FOR #tempI := "LPMLV30_STATE_UNDEFINED" TO "LPMLV30_STATES_UPPER_LIM" DO
0118     #actualTimeCurrentStates[#tempI] := 0;
```

```
0119      #cumulativeTimeCurrentStates[#tempI] := 0;
0120    END_FOR;
0121    END_IF;
0122  ELSE
0123    #actualTimeCurrentMode     := 0;
0124    #cumulativeTimeCurrentMode := 0;
0125
0126    FOR #tempI := "LPMLV30_STATE_UNDEFINED" TO "LPMLV30_STATES_UPPER_LIM" DO
0127    #actualTimeCurrentStates[#tempI]     := 0;
0128    #cumulativeTimeCurrentStates[#tempI] := 0;
0129    END_FOR;
0130  END_IF;
0131
0132  // Save values for state change detection
0133  #statResetTimesOld      := #resetTimes;
0134  #statUnitModeCurrentOld := #tempUnitModeCurrent;
0135  #statStateCurrentOld    := #tempStateCurrent;
0136
0137  //
      ============================================================================
      ============================
0138  // End of Function block: LPMLV30_UnitModeStateTimes
0139  //
      ============================================================================
      ============================
```

Program blocks / Servo_Control

Axis_ObjectPOS [FB501]

Axis_ObjectPOS Properties					
General					
Name	Axis_ObjectPOS	**Number**	501	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

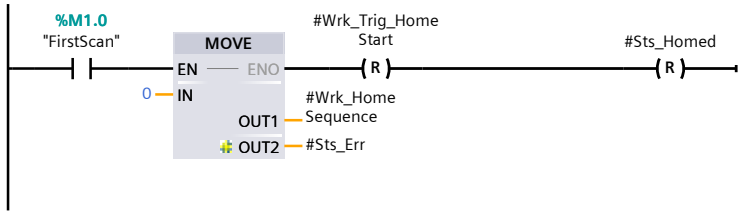
Name	Data type	Default value	Retain
▼ Input			
Inp_MasterNoMotion	Bool	false	Non-retain
Cmd_Enable	Bool	false	Non-retain
Cmd_Disable	Bool	false	Non-retain
Cmd_FaultReset	Bool	false	Non-retain
Cmd_Home	Bool	false	Non-retain
Cmd_Abort	Bool	false	Non-retain
Cmd_Stop	Bool	false	Non-retain
▼ Output			
Sts_ER	Bool	false	Non-retain
Sts_PowerEnable	Bool	false	Non-retain
Sts_EnableDone	Bool	false	Non-retain
Sts_DisableDone	Bool	false	Non-retain
Sts_FaultResetDone	Bool	false	Non-retain
Sts_HomeDone	Bool	false	Non-retain
Sts_AbortDone	Bool	false	Non-retain
Sts_StopDone	Bool	false	Non-retain
Sts_AxisOk	Bool	false	Non-retain
Sts_NoMotion	Bool	false	Non-retain
Sts_Homed	Bool	false	Non-retain
▼ InOut			
Ref_Axis	TO_PositioningAxis		
▼ Static			
Cfg_UseVirtualMaster	Bool	false	Non-retain
Cfg_HomeEnabled	Bool	true	Non-retain
Cfg_StopEnabled	Bool	true	Non-retain
Cfg_AbortEnabled	Bool	true	Non-retain
Cfg_ZeroSpeedTolerance	Real	0.1	Non-retain
Cfg_AbortRamp	Real	100.0	Non-retain
Cfg_StopRamp	Real	20.0	Non-retain
Sts_Err	DInt	0	Non-retain
Err_MCBlockFault	Bool	false	Non-retain
Err_ErrorID	Word	16#0	Non-retain
Out_StatusWord	DWord	16#0	Non-retain
Out_ErrorWord	DWord	16#0	Non-retain

Name	Data type	Default value	Retain
Out_WarnWord	DWord	16#0	Non-retain
Wrk_DecelRate	Real	0.0	Non-retain
Wrk_TempR	Real	0.0	Non-retain
Wrk_Velocity	Real	0.0	Non-retain
Wrk_MaskedStillStatus	Real	0.0	Non-retain
Wrk_ER_Trig	Bool	false	Non-retain
Wrk_Trig_HomeStart	Bool	false	Non-retain
Wrk_AtHome1	Bool	false	Non-retain
Wrk_AtHome2	Bool	false	Non-retain
Wrk_AtHome3	Bool	false	Non-retain
Wrk_HomeSwPresent	Bool	false	Non-retain
Wrk_HomeJogFwd	Bool	false	Non-retain
Wrk_Trig_Init	Bool	false	Non-retain
Wrk_HaltEnable	Bool	false	Non-retain
Wrk_Sts_ER	Bool	false	Non-retain
Wrk_StatusWord_Homed	Bool	false	Non-retain
Wrk_Sts_NoMotion	Bool	false	Non-retain
Wrk_Trig_UnlatchHomeStatus	Bool	false	Non-retain
Wrk_FaultReset_Delay	TON_TIME		Non-retain
Wrk_DisabWatchdog	TON_TIME		Non-retain
Wrk_EnabWatchdog	TON_TIME		Non-retain
Wrk_HomeSequence	DInt	0	Non-retain
Wrk_HomeMode	Int	0	Non-retain
Wrk_StatusWord	DWord	16#0	Non-retain
Wrk_ErrorWord	DWord	16#0	Non-retain
MC_Power_Enable	Bool	false	Retain
MC_Power_Status	Bool	false	Non-retain
MC_Power_Busy	Bool	false	Non-retain
MC_Power_CommandAborted	Bool	false	Non-retain
MC_Power_Error	Bool	false	Non-retain
MC_Power_ErrorID	Word	16#0	Non-retain
MC_Halt_Execute	Bool	false	Non-retain
MC_Halt_Done	Bool	false	Non-retain
MC_Halt_Busy	Bool	false	Non-retain
MC_Halt_CommandAborted	Bool	false	Non-retain
MC_Halt_Error	Bool	false	Non-retain
MC_Halt_ErrorID	Word	16#0	Non-retain
MC_Reset_Execute	Bool	false	Non-retain
MC_Reset_Done	Bool	false	Non-retain
MC_Reset_Busy	Bool	false	Non-retain
MC_Reset_CommandAborted	Bool	false	Non-retain
MC_Reset_Error	Bool	false	Non-retain
MC_Reset_ErrorID	Word	16#0	Non-retain
MC_Home_Done	Bool	false	Non-retain
MC_Home_Busy	Bool	false	Non-retain
MC_Home_CommandAborted	Bool	false	Non-retain
MC_Home_Error	Bool	false	Non-retain
MC_Home_ErrorID	Word	16#0	Non-retain
MC_Jog_InVelocity	Bool	false	Non-retain

Name	Data type	Default value	Retain
MC_Jog_Busy	Bool	false	Non-retain
MC_Jog_CommandAborted	Bool	false	Non-retain
MC_Jog_Error	Bool	false	Non-retain
MC_Jog_ErrorID	Word	16#0	Non-retain
Wrk_MC_Power	MC_POWER		
Wrk_MC_Halt	MC_HALT		
Wrk_MC_Home	MC_HOME		
Wrk_MC_Reset	MC_RESET		
Wrk_MC_Jog	MC_MOVEJOG		
Wrk_Jog_Velocity	LReal	0.0	Non-retain
Temp			
Constant			

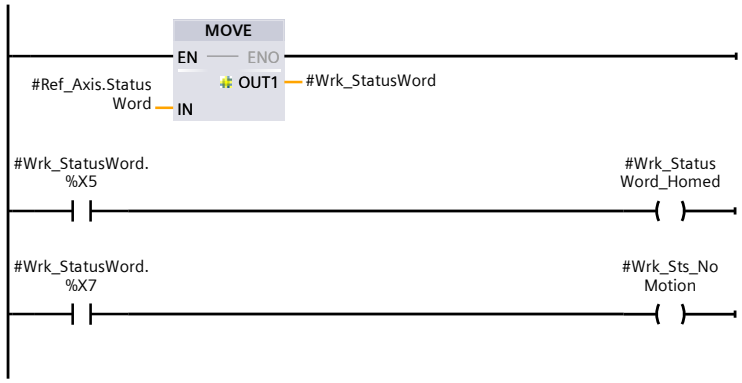
Network 2: First scan initialization

Initialize homing and fault errors



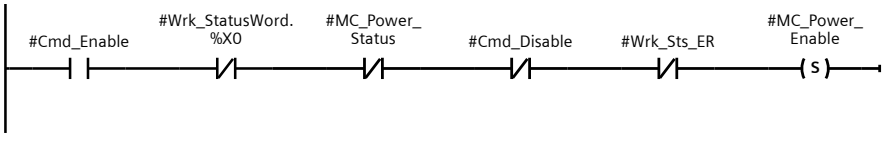
Network 3: Get axis state

To avoid warning when using outputs as contacts keep some statuses in static area of DB



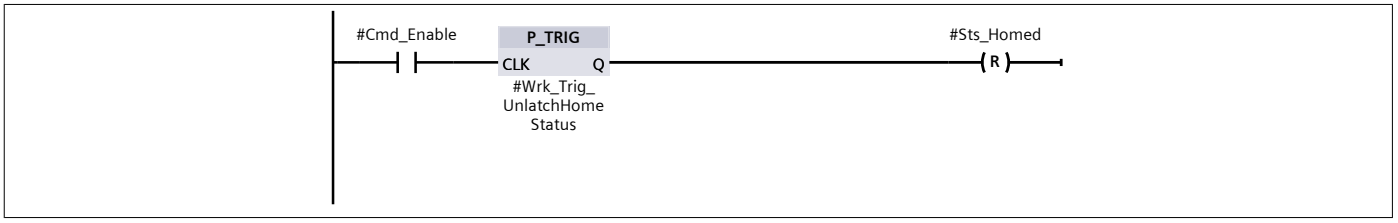
Network 4: - SECTION AXIS ENABLE

Enable axis indicated by result of MC_POWER

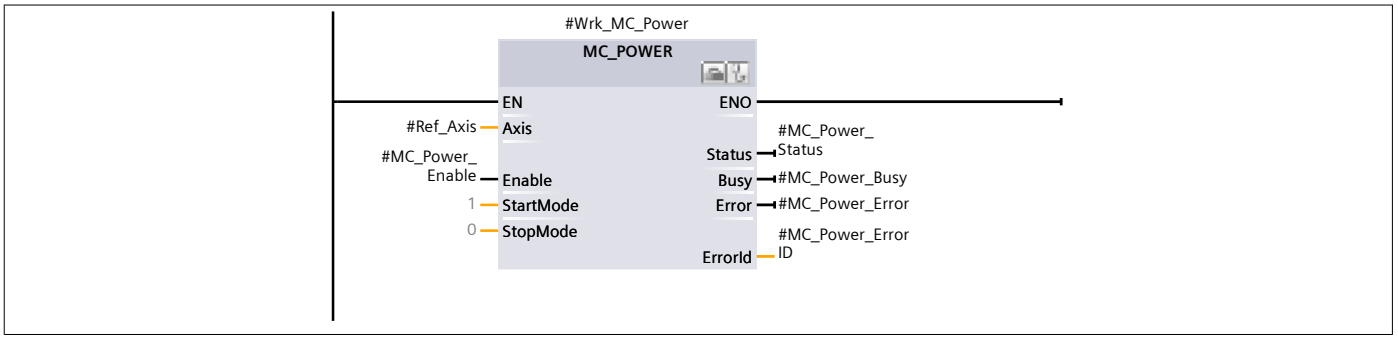


Network 5: Reset homed status

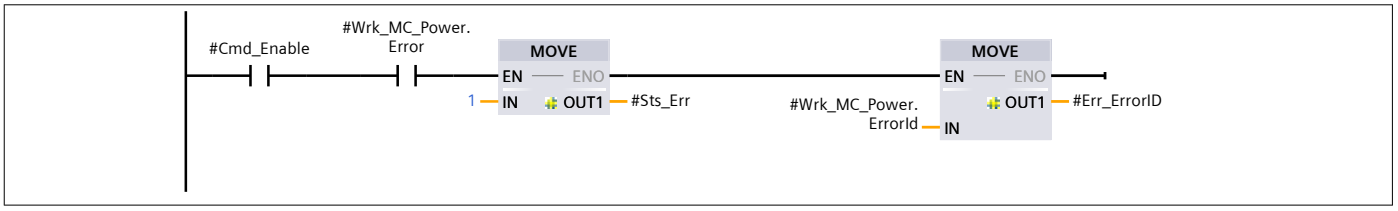
Reset when axis enabled



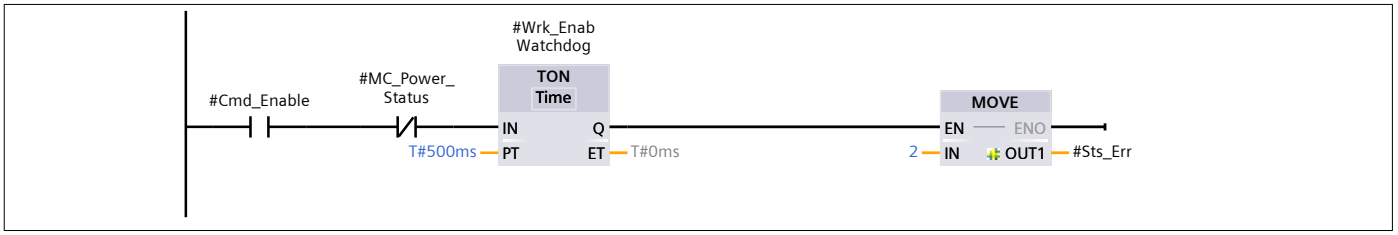
Network 6: MC_Power for axis



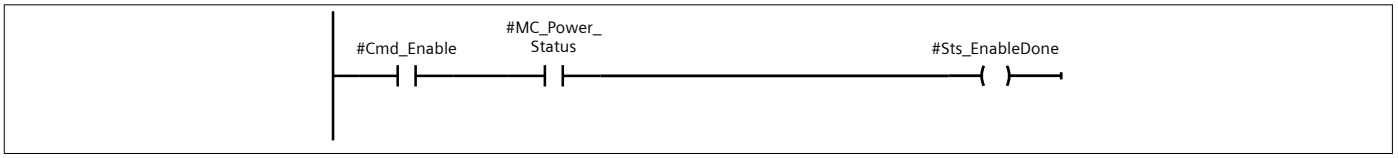
Network 7:



Network 8: Axis enable watchdog

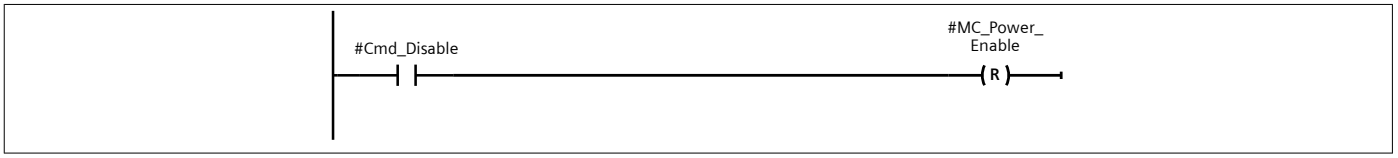


Network 9: Enable status for block output

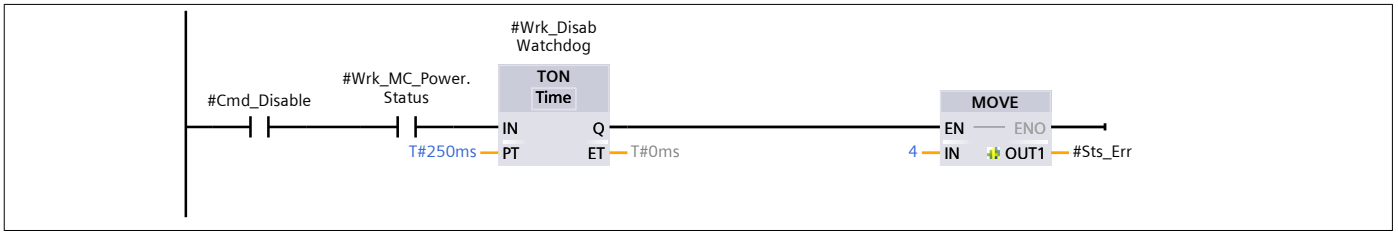


Network 10: - SECTION AXIS DISABLE

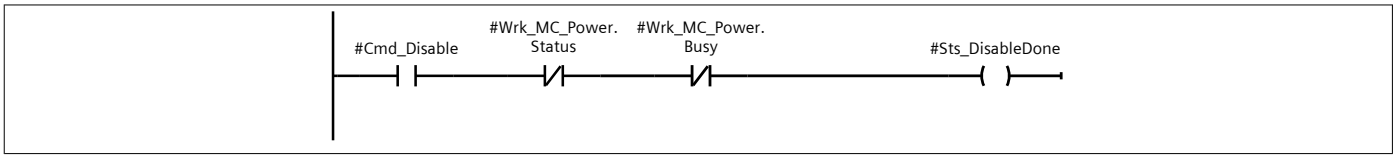
Turn off enable input to MC_POWER block



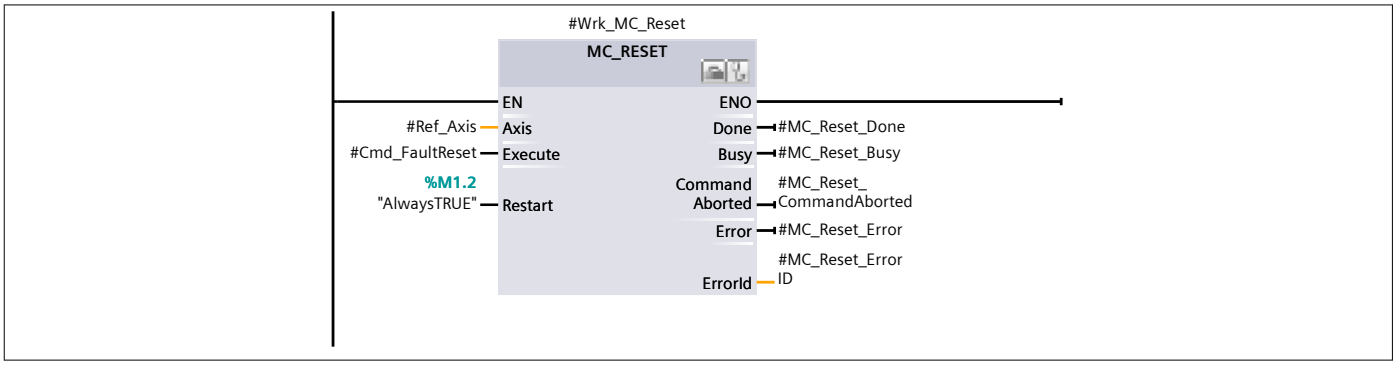
Network 11:



Network 12: Disable status for block output

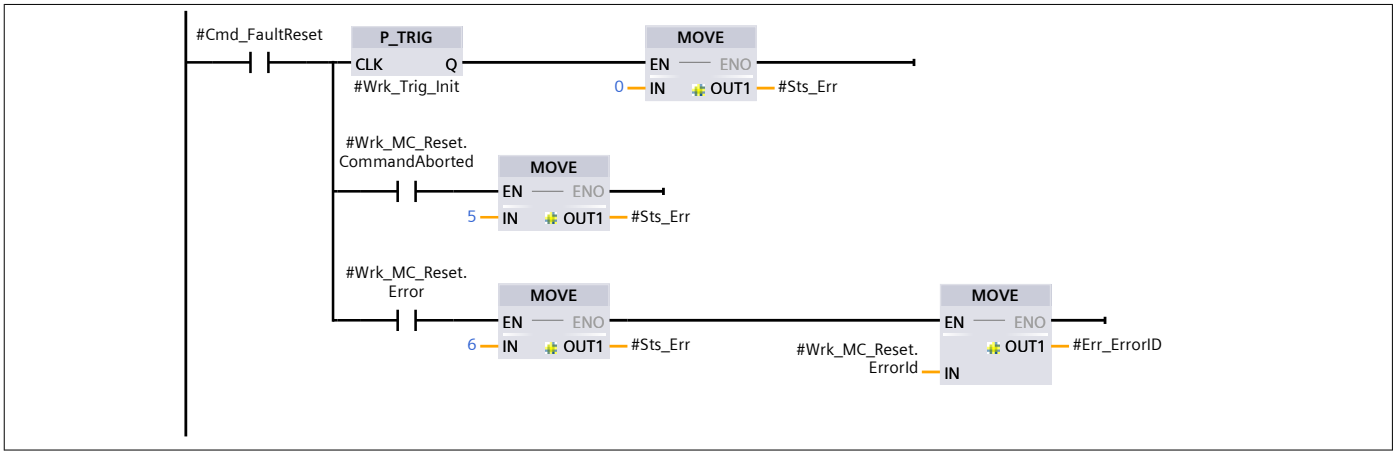


Network 13: - SECTION AXIS FAULT RESET

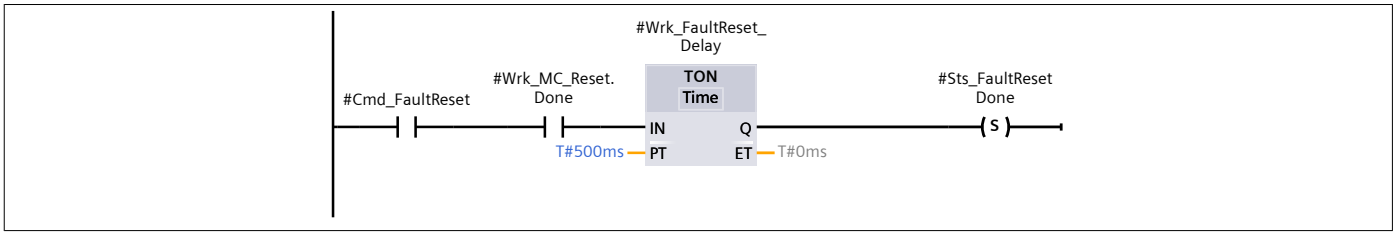


Network 14: Fault clearing indications

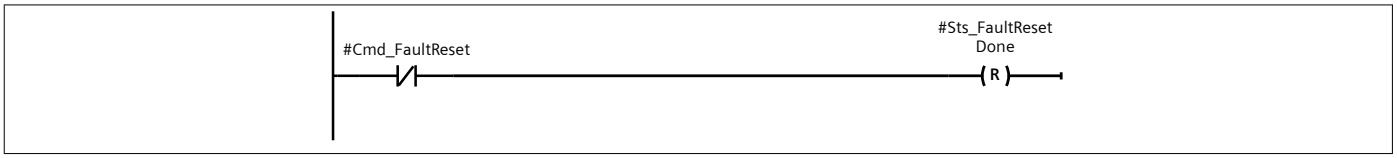
Error status output bits reset on earlier network.
Network reports errors from MC_Reset execution



Network 15: Fault Reset done / handshake

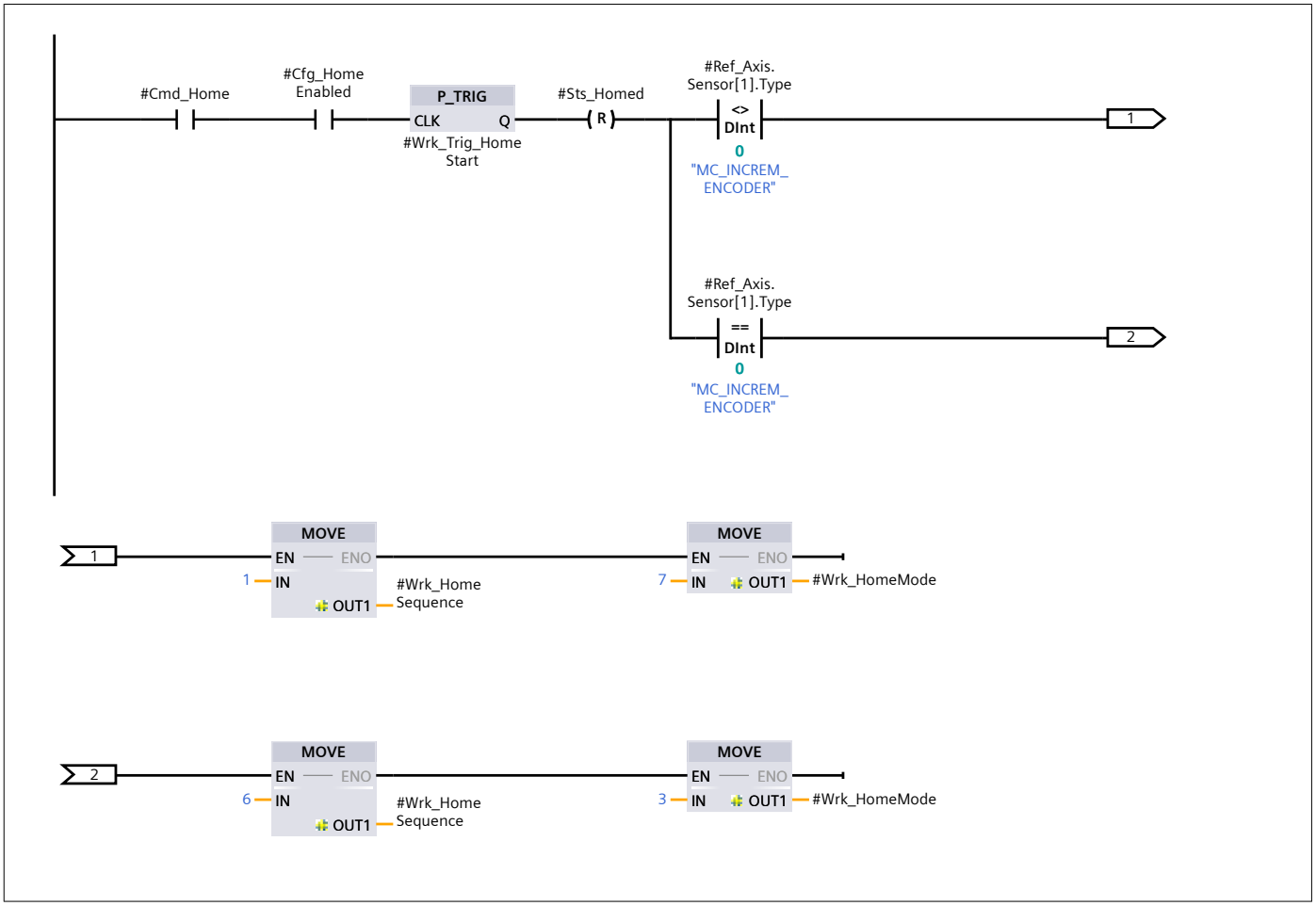


Network 16:



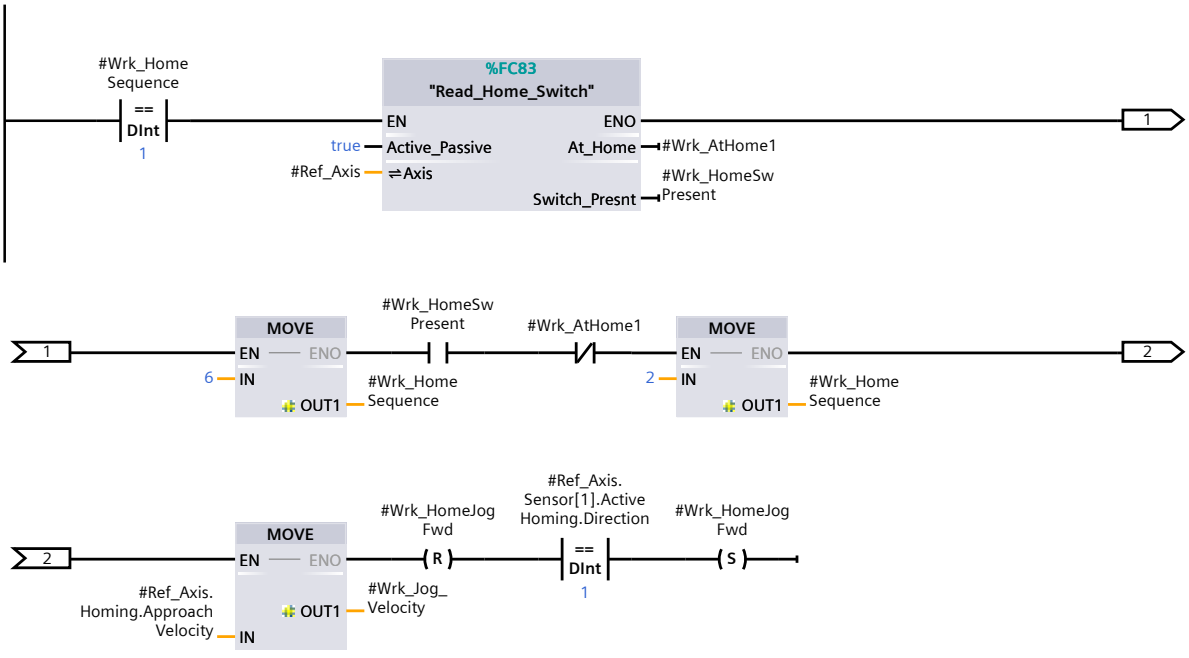
Network 17: - SECTION AXIS HOMING

Home command, initiate sequence
If incremental encoder, use mode=3 and home position is 0.0. MC_HOME block implements homing.
If absolute or cyclic absolute encoder, use mode=7 and home position is set to 0.0. If active homing configured to use a switch, jog to position before setting position to zero.
Assumes encoder is [1].



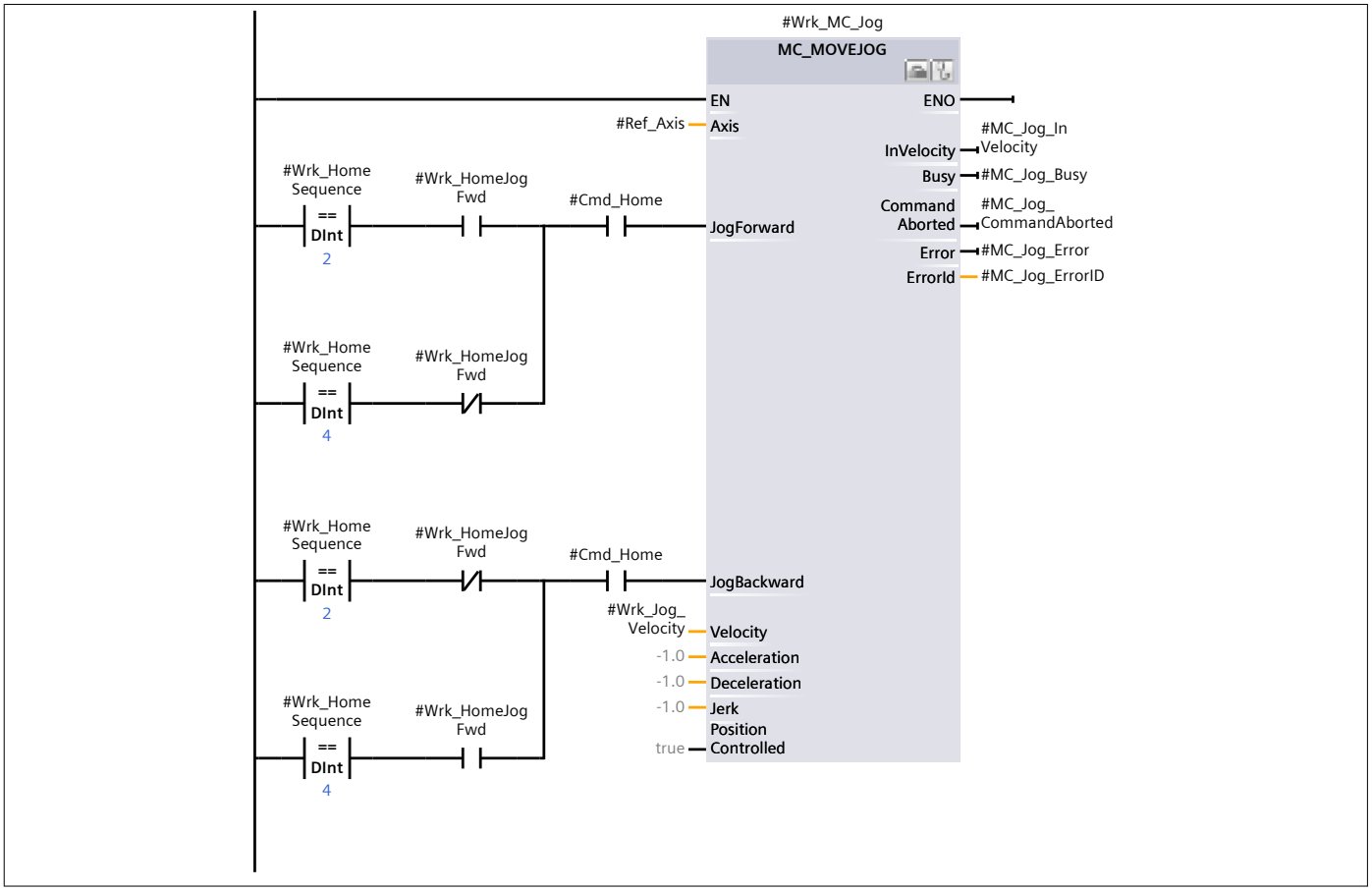
Network 18: Home sequence step 1- incremental encoder checks.

Check for home switch configuration and not at home switch.
If home switch present and home switch does not indicate home position, then jog to home. Otherwise, skip to step 6 to do home.
For approach, set jog direction to reverse of what is configured in active homing for homing direction. Direction is reversed for homing until switch open.

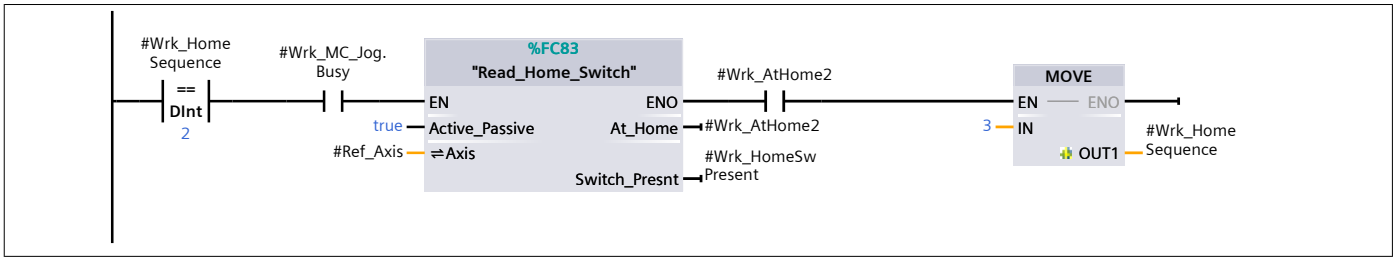


Network 19: Home sequence step 2 and 4 Jog - Jog toward sensor with approach velocity

Use opposite direction in active homing for step 2. For step 4, it is the same direction.

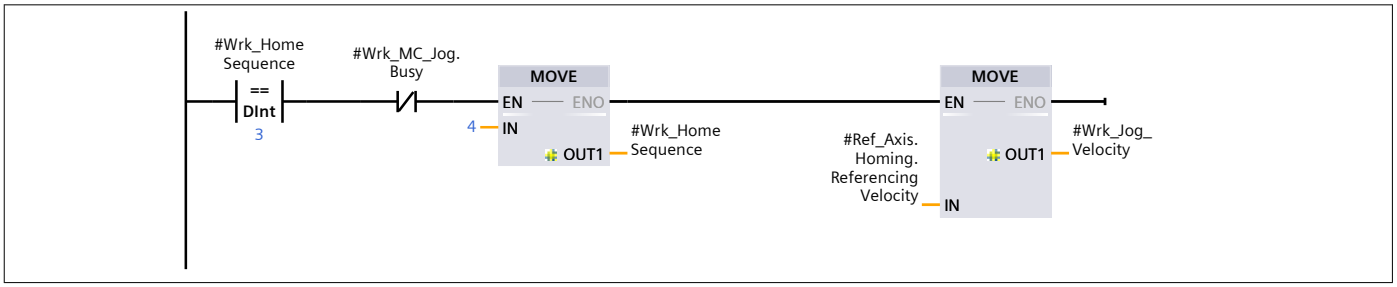


Network 20: Home sequence step 2 - finished when at home sensor

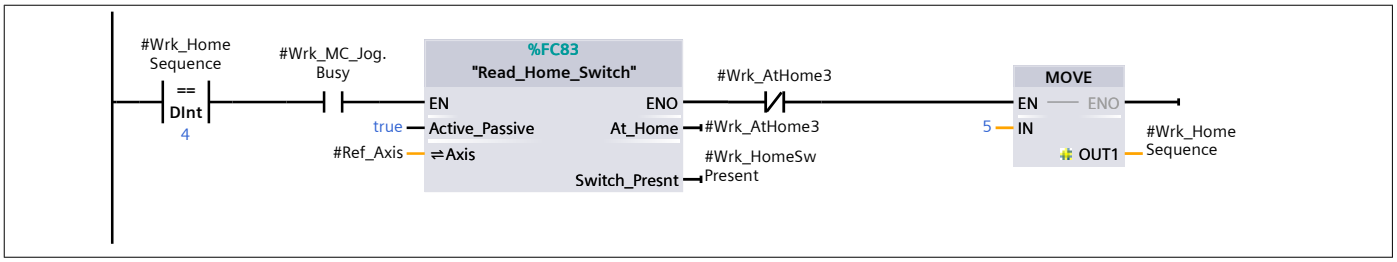


Network 21: Home sequence step 3 - wait for jog busy to be off, signaling that it is stopped

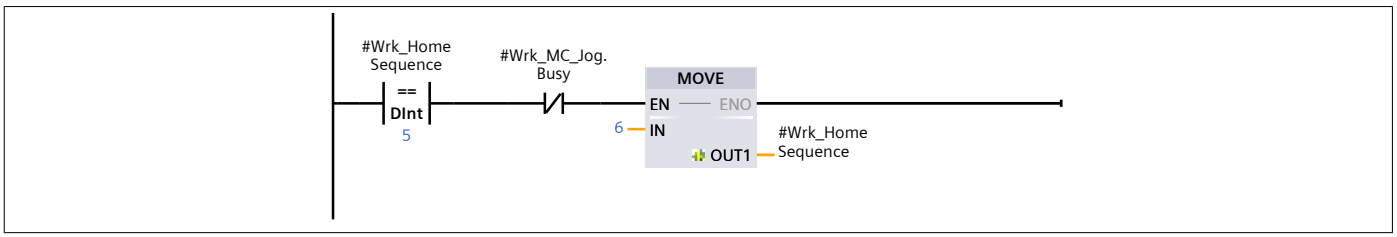
In preparation for step 4, set the jog velocity to the homing velocity



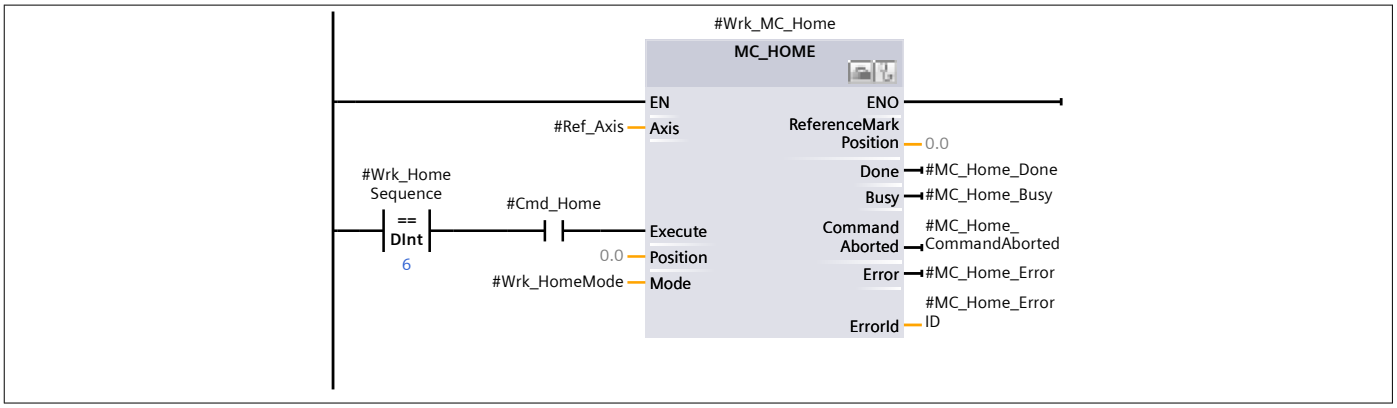
Network 22: Home sequence step 4 - finished when not at home sensor



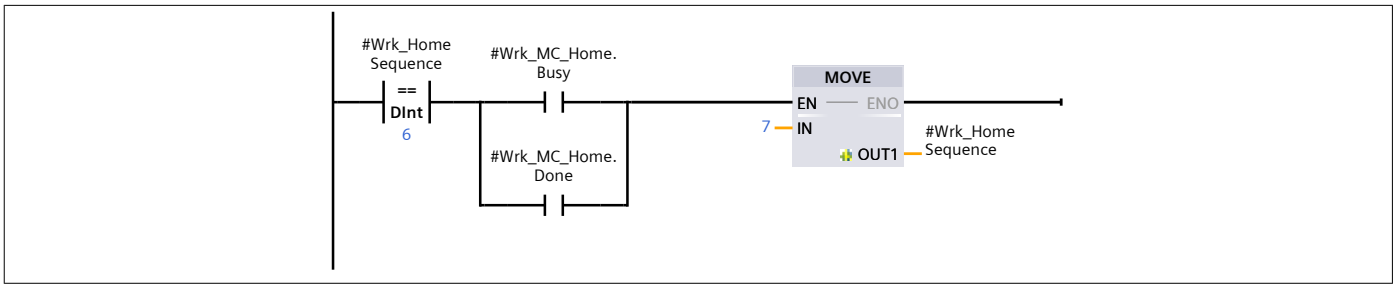
Network 23: Home sequence step 5 - wait for jog busy to be off, signaling that it is stopped



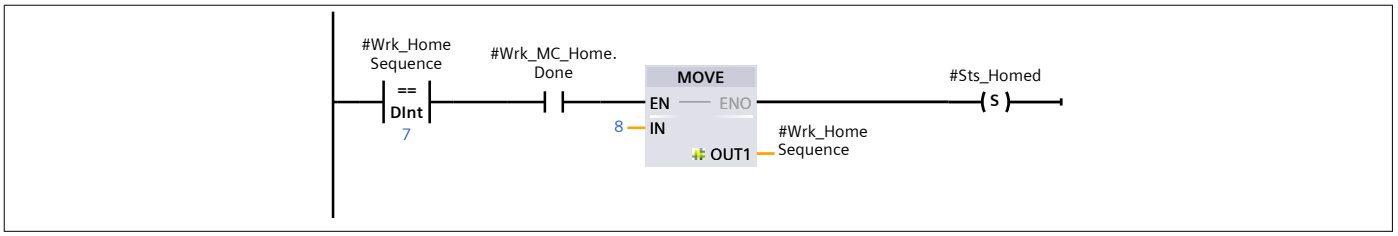
Network 24: Home sequence execution - Step 6 initiates Home command



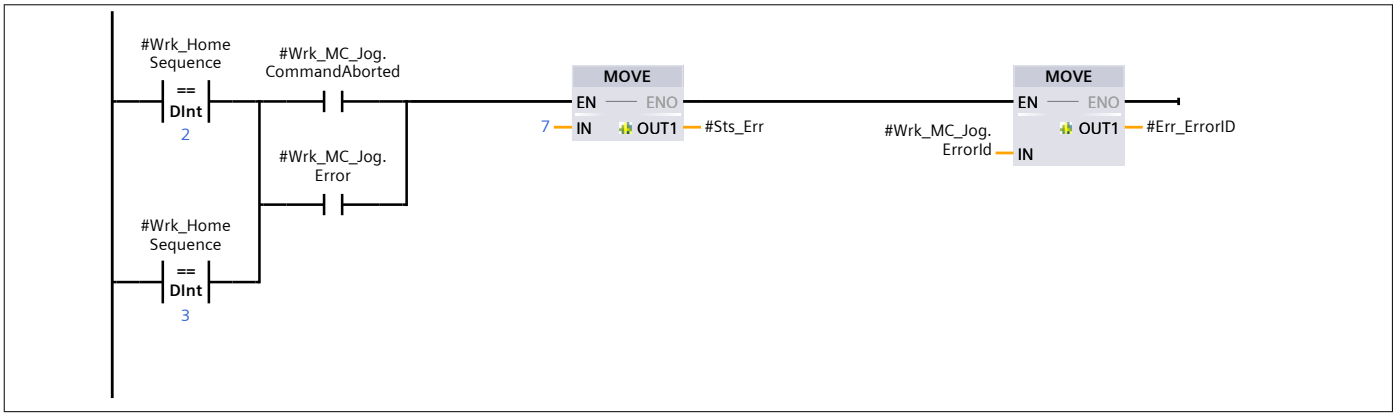
Network 25: Home sequence execution - When busy, go to step 5 and wait for finished



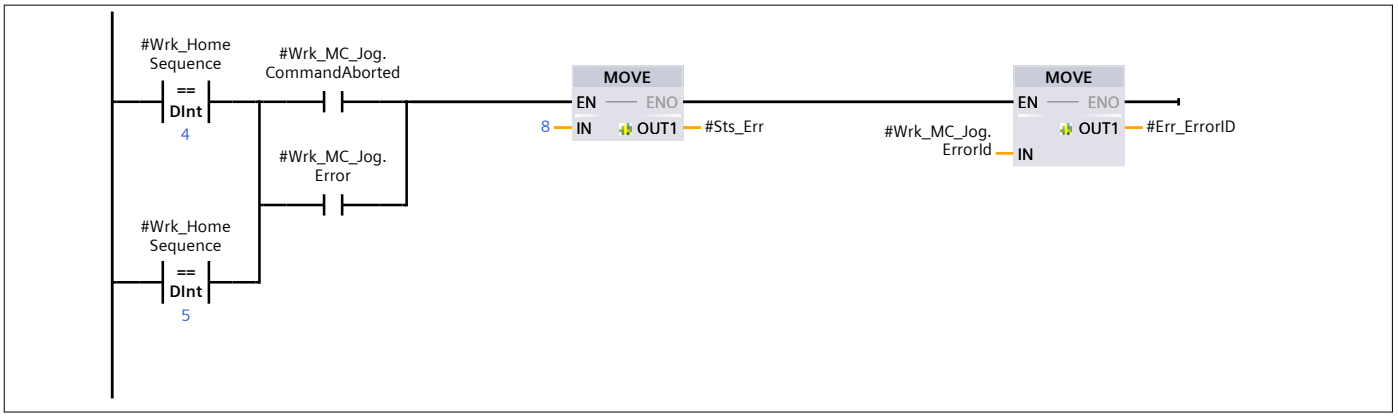
Network 26: Axis is homed



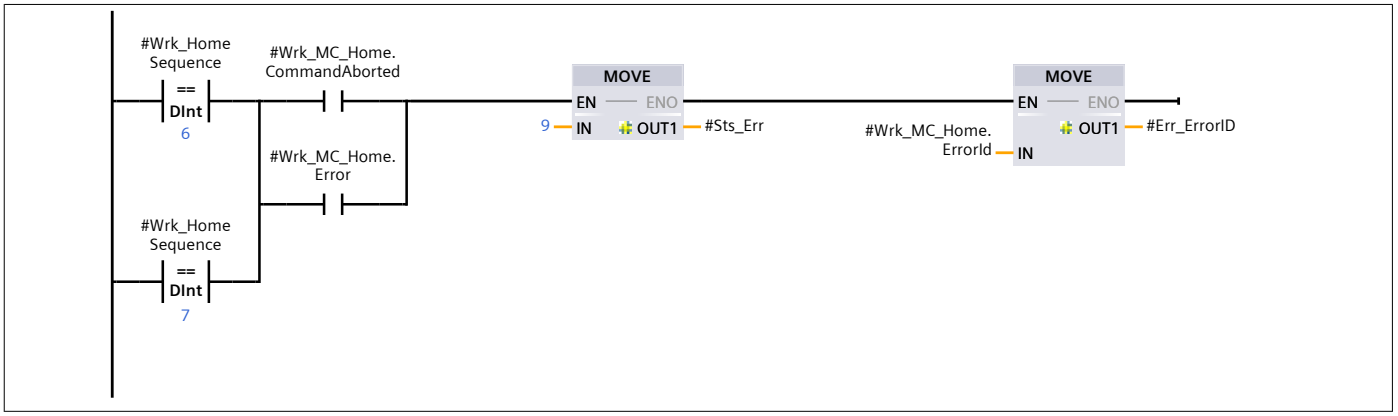
Network 27: Home error handling for MC_MOVEJOG for first jog



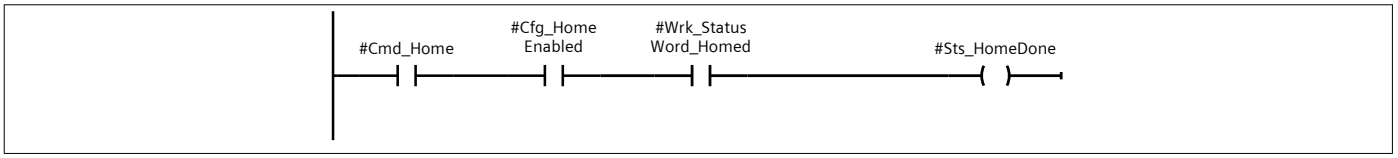
Network 28: Home error handling for MC_MOVEJOG for second jog



Network 29: Home error handling for MC_HOME



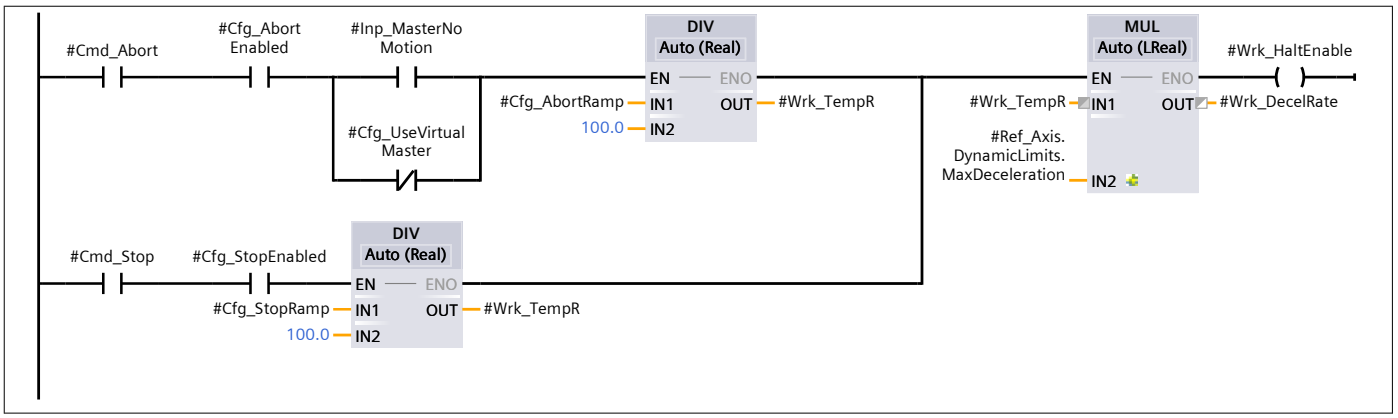
Network 30: Home done handshake



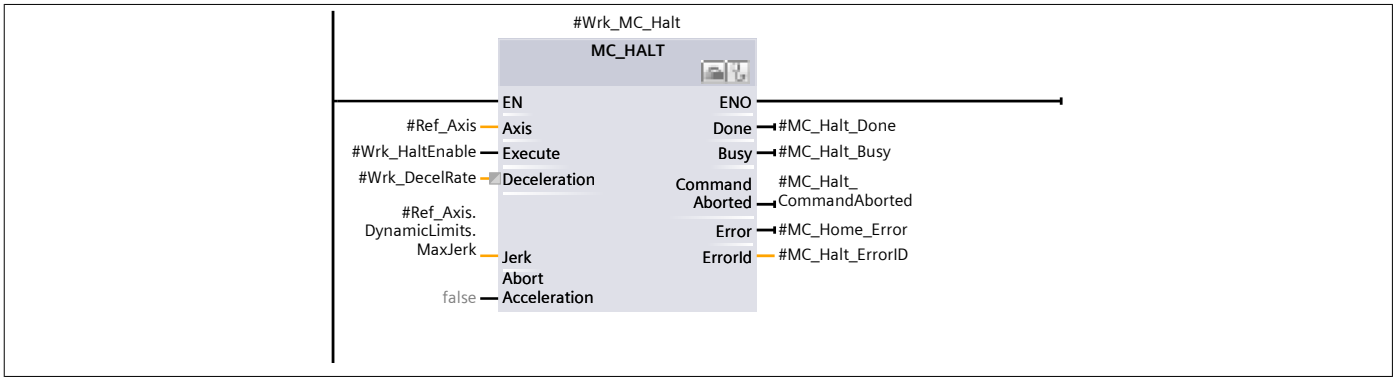
Network 31: - SECTION AXIS STOP

Whenever the machine enters either the stopping or aborting state, stop the axis
-If stopping, all axes are stopped AFTER the virtual stops, providing a coordinated stop
-Aborting causes all axes

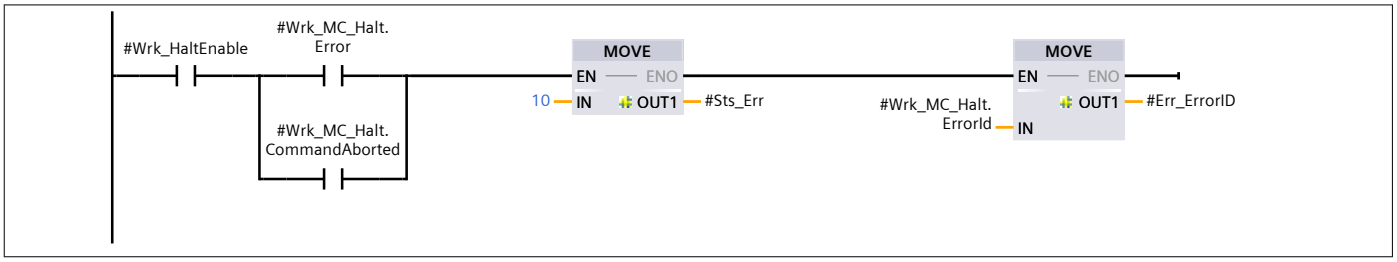
Deceleration as percent of maximum, obtained from axis structure
Jerk set to max



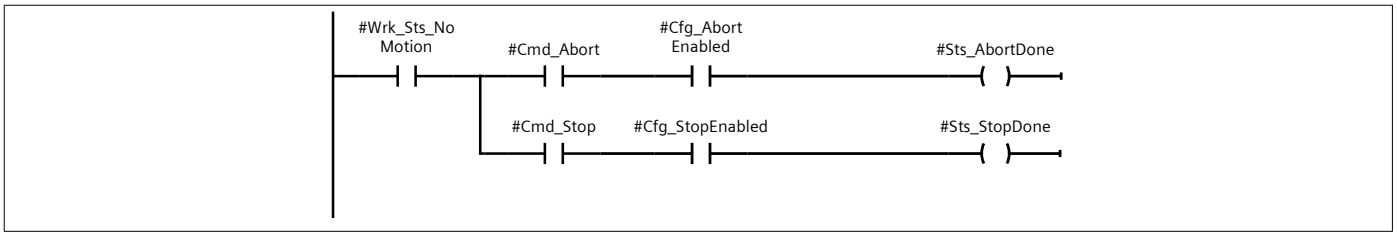
Network 32: MC_Halt block



Network 33:



Network 34: Stop done handshake



Network 35: - SECTION STATUS BIT UPDATE

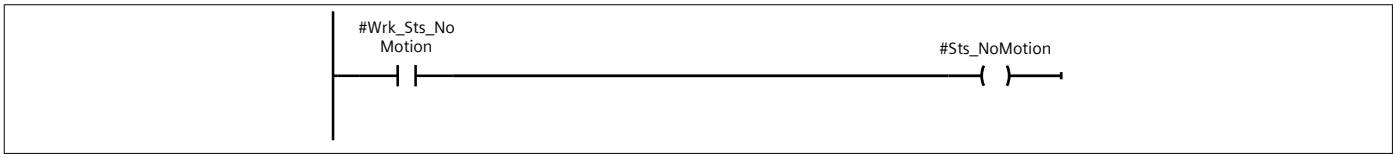
Check for no axis movement

Status word relevant bits - x if relevant to no motion check
Bit 00 1 if enabled
Bit 01 1 error present
Bit 02 1 restart active
Bit 03 1 restart tags changed
Bit 04 1 control panel active
Bit 05 1 axis homed
Bit 06 x 1 if no motion job running
Bit 07 x 1 at standstill
Bit 08 x 0 no positioning job running
Bit 09 x 0 no jog job running
Bit 10 x 0 no MoveVelocity running
Bit 11 x 0 no Home job running
Bit 12 x 1 axis running at constant velocity or at stanstill
Bit 13 x 0 No acceleration

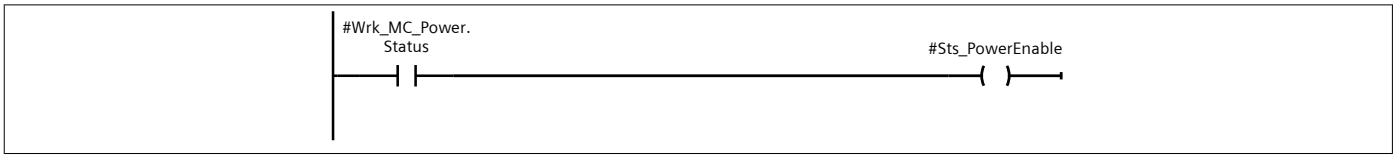
Bit 14 x 0 No deceleration
Bit 21 x 0 Axis not being synchronized to leading value
Bit 22 x 0 Axis is not moving synchronously
BIt 23 x 0 No superimposed motion active
Bit 24 x 0 No motion control instruction for leading value shift is active

Mask = DW#16#01E07FC0
Value to check is = DW#16#000010C0

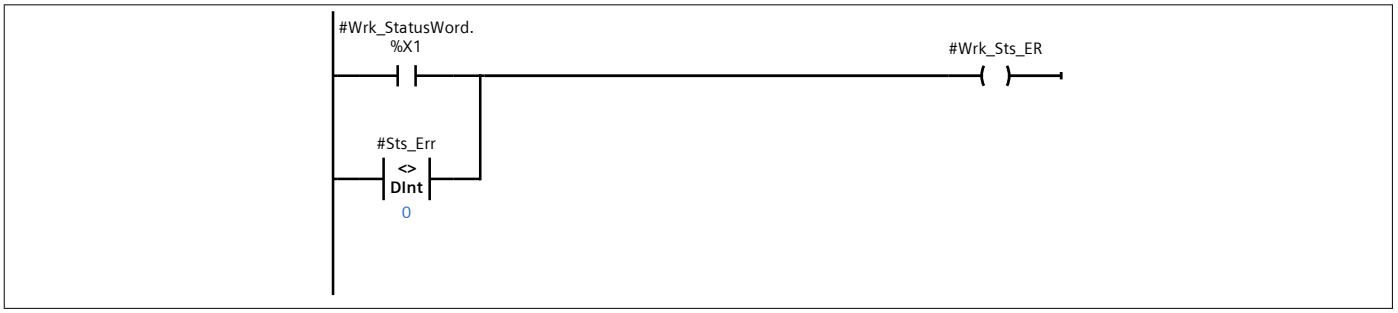
Err_Sts Values
1 = MC_Power error
2 = more than 500 msecs for axis to enable
4 = more than 250 msecs for axis to disable
5 = MC_Reset command aborted
6 = MC_Reset error
7 = MC_MOVEJOG when homing error
8 = MC_HOME error
9 = MC_HALT error



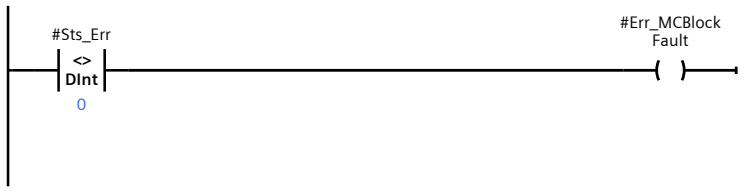
Network 36:



Network 37: General error

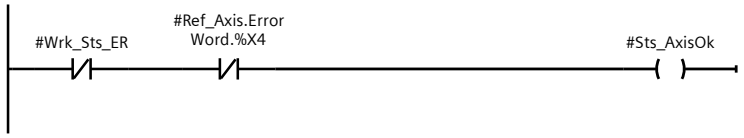


Network 38: Summary of motion block errors

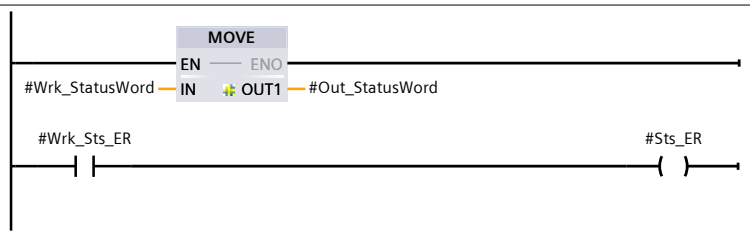


Network 39: Axis is okay and ready

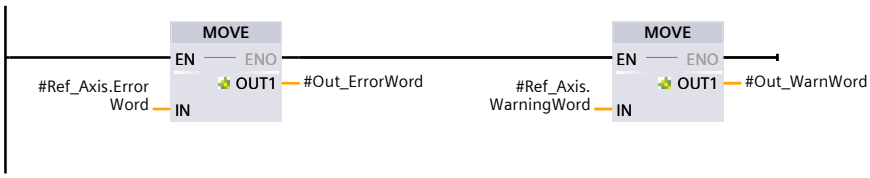
Bit 4 in ErrorWord is drive fault



Network 40: Copy working statuses to block outputs



Network 41: Copy axis error and warnings to outputs



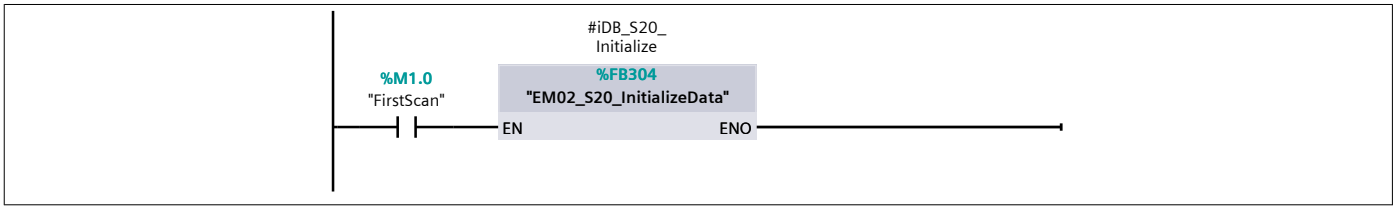
Program blocks / EM02_AxisDum

EM02_00_Main [FB300]

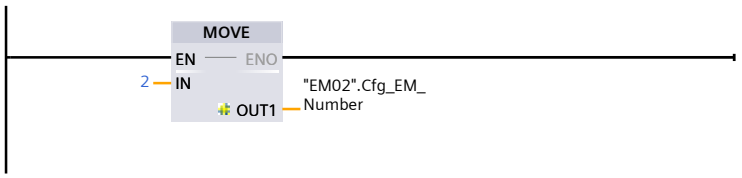
EM02_00_Main Properties					
General					
Name	EM02_00_Main	**Number**	300	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
Cfg_EM_Number	Int	0	Non-retain
Par_Jog_Accel	Real	0.0	Non-retain
Par_Jog_Decel	Real	0.0	Non-retain
Par_Jog_Speed	Real	0.0	Non-retain
iDB_EM_Procedure	"EM02_CM00_Procedure"		
iDB_CM02_ServoAxisObject	"EM01_CM02_ServoAxisObject"		
iDB_CM03_ServoAxisJog	"EM01_CM03_ServoAxisJog"		
iDB_S20_Initialize	"EM02_S20_InitializeData"		
Wrk_Temp_Bit	Bool	false	Non-retain
Temp			
Constant			

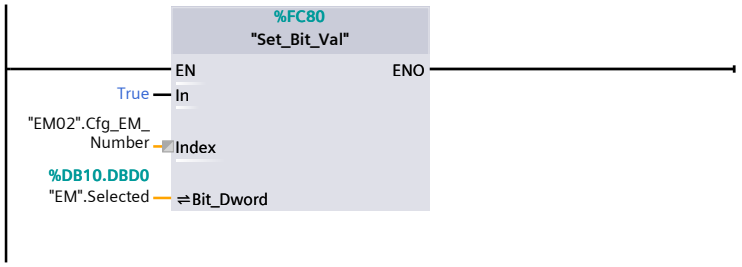
Network 2:



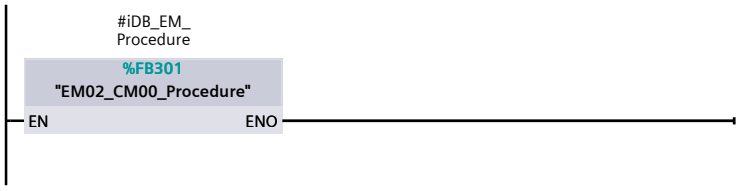
Network 3: Set EM number



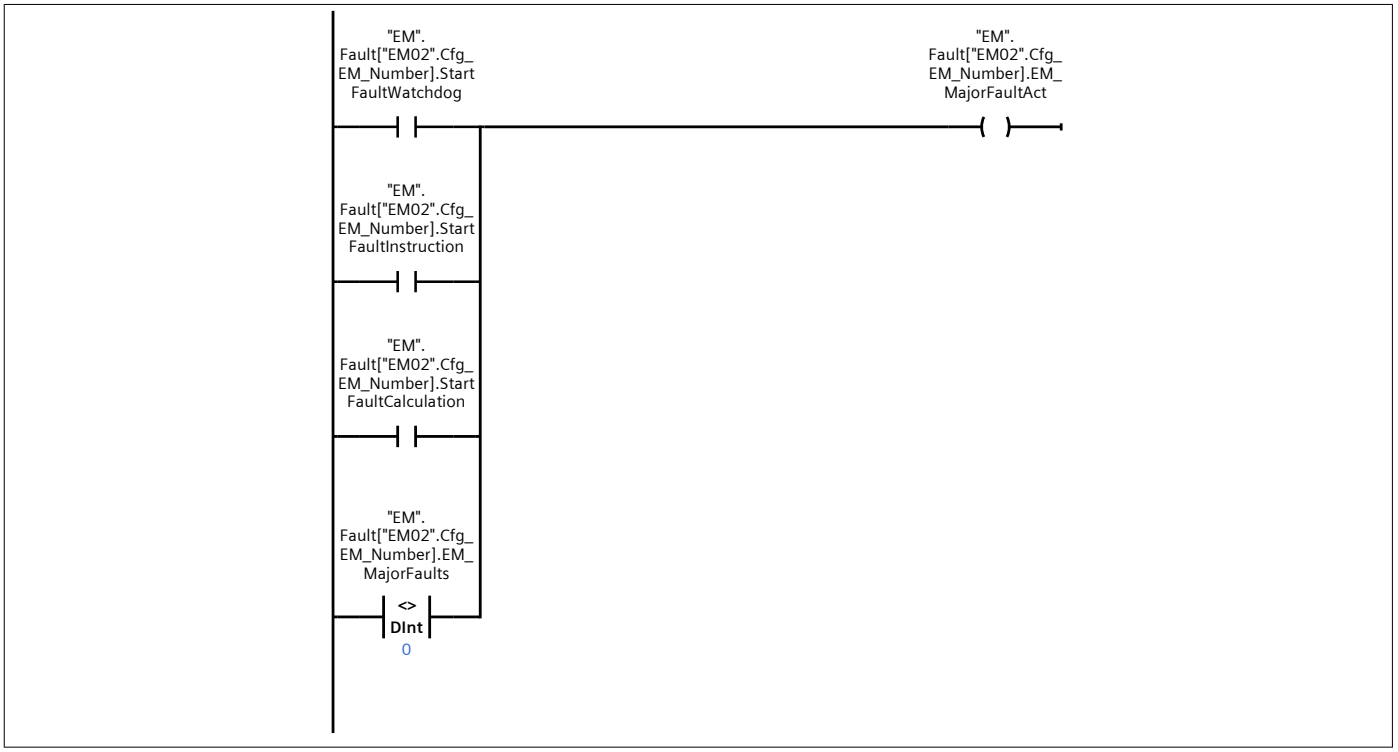
Network 4: Equipment module is selected and active



Network 5:

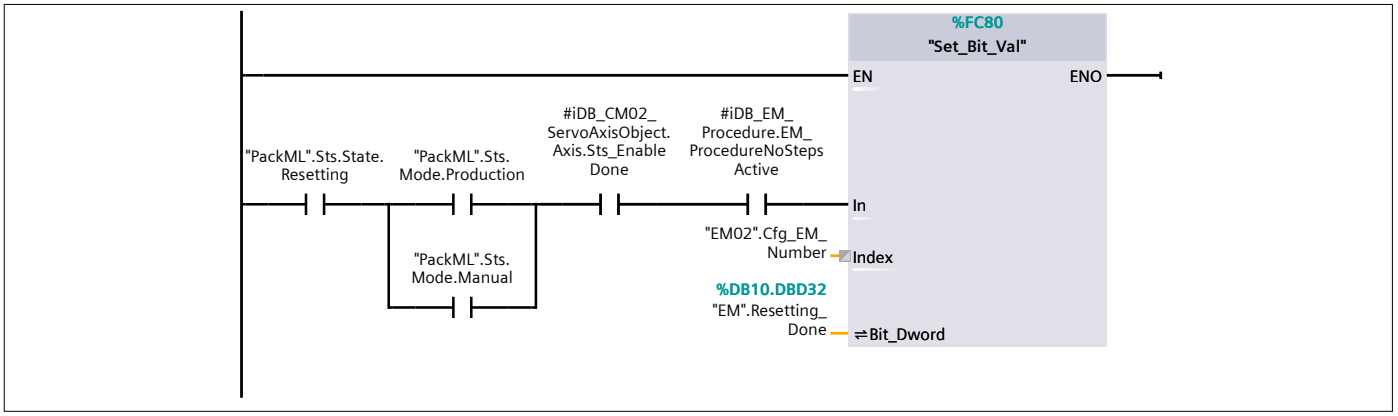


Network 6:

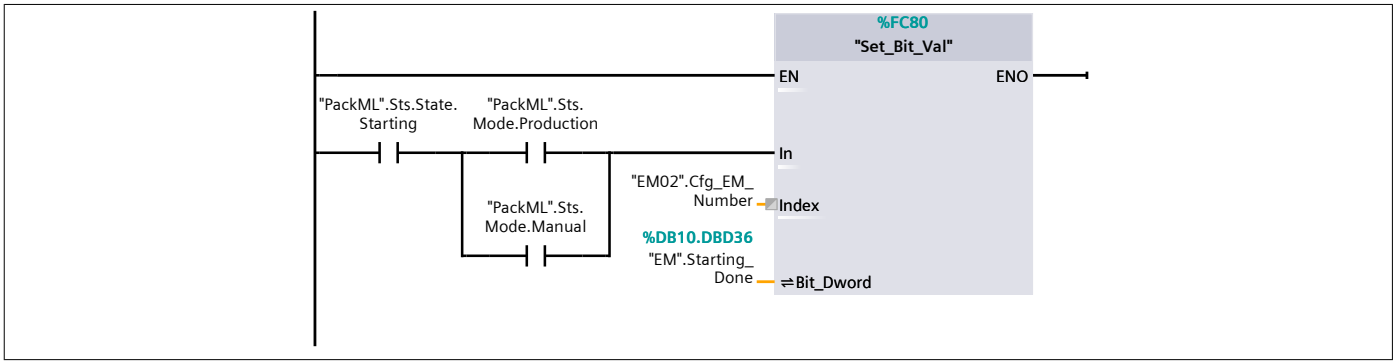


Network 7: SECTION EQUIPMENT MODULE STATE COMPLETE HANDLING - SET DONE BITS

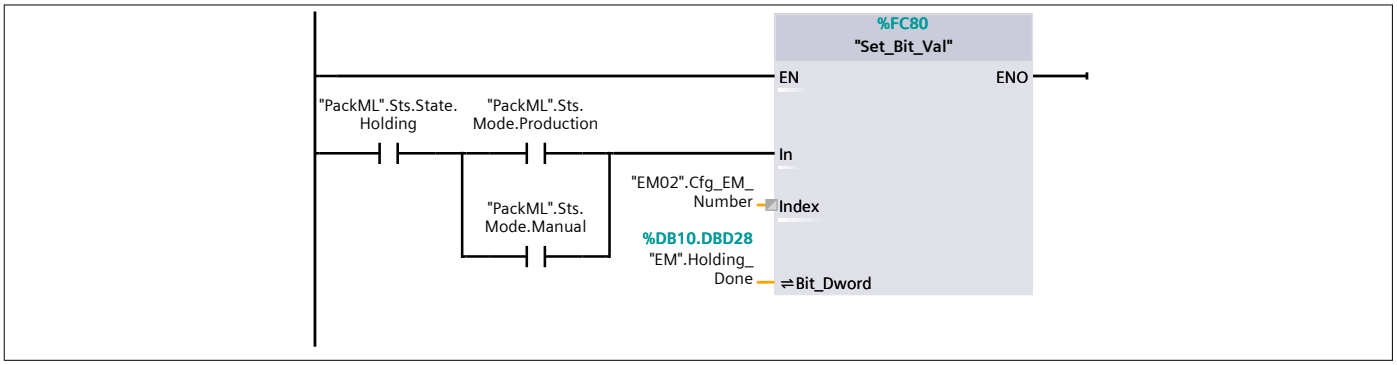
Network 8: Resetting state



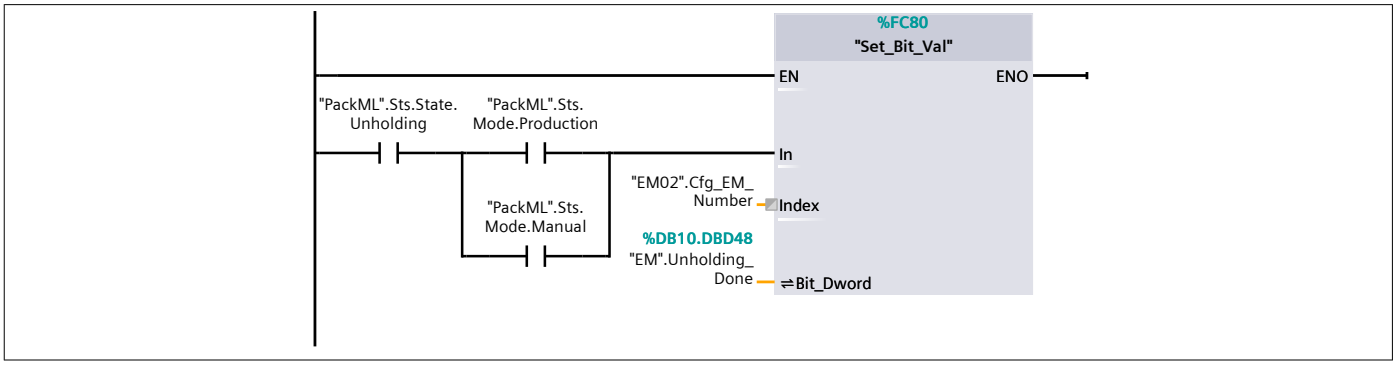
Network 9: Starting state



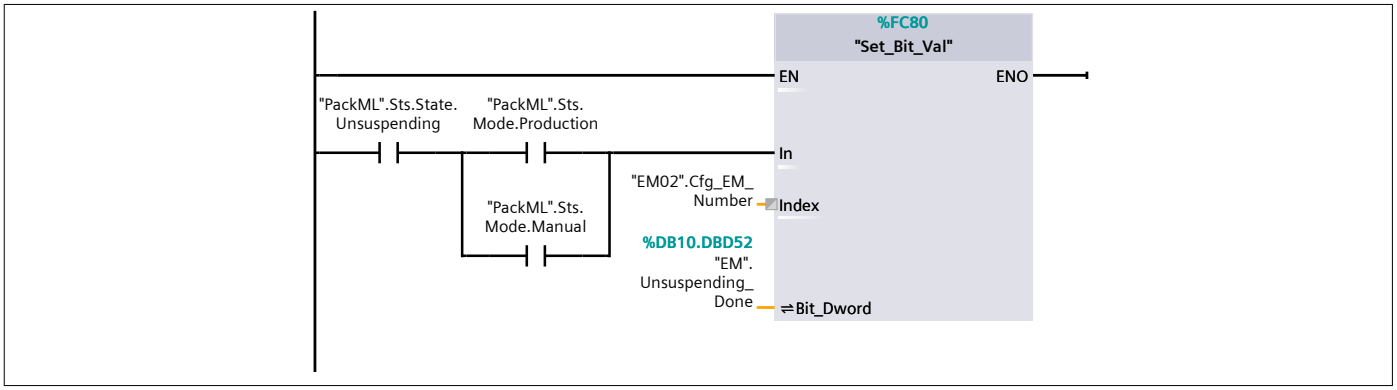
Network 10: Holding state



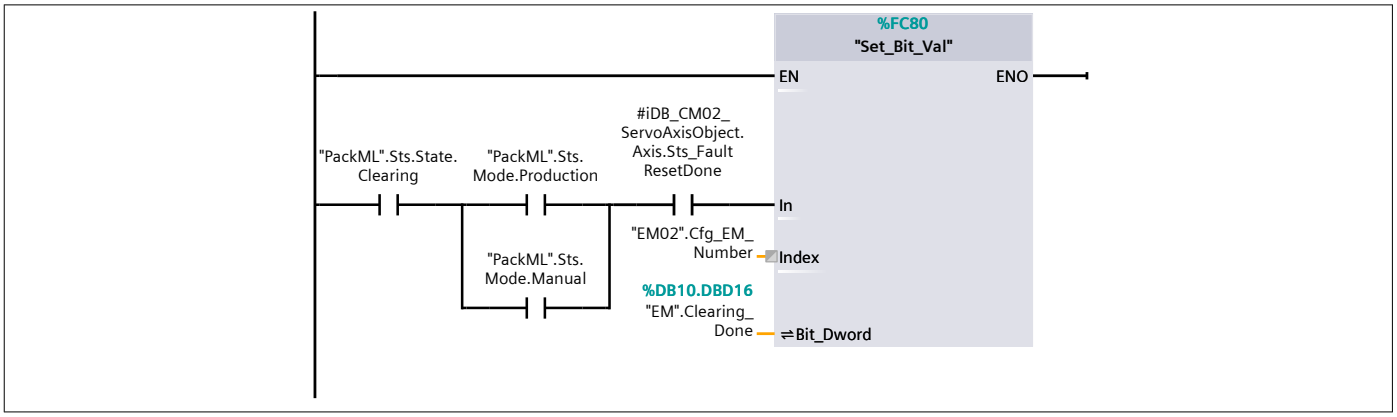
Network 11: Unholding



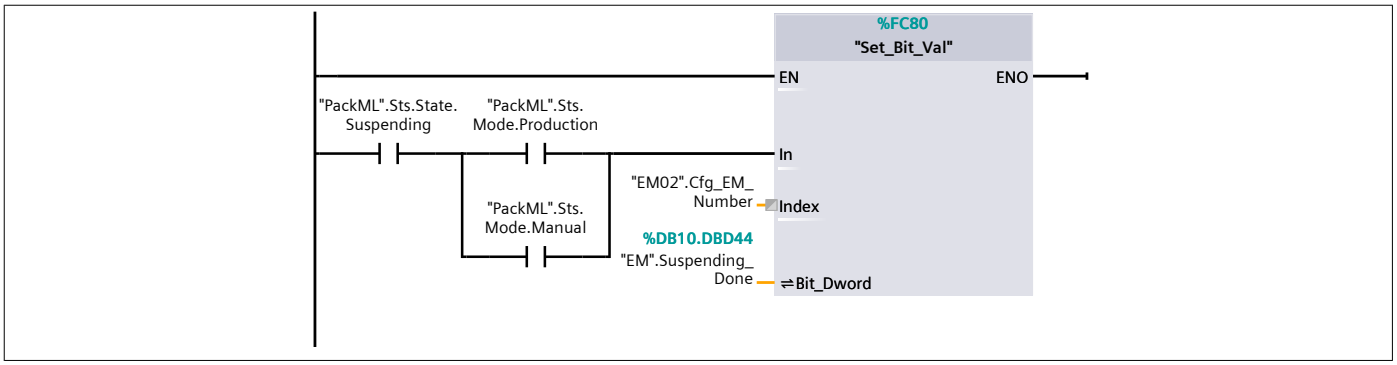
Network 12: Unsuspending



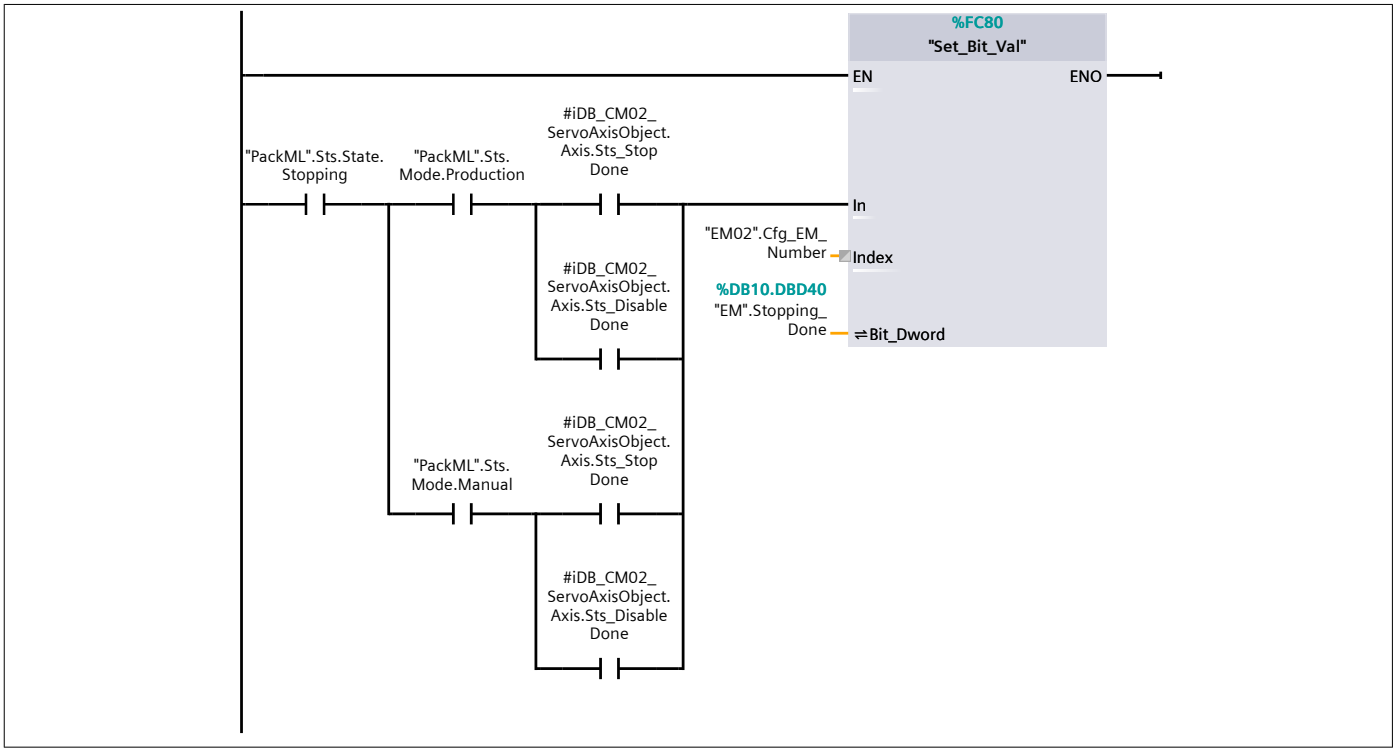
Network 13: Clearing state



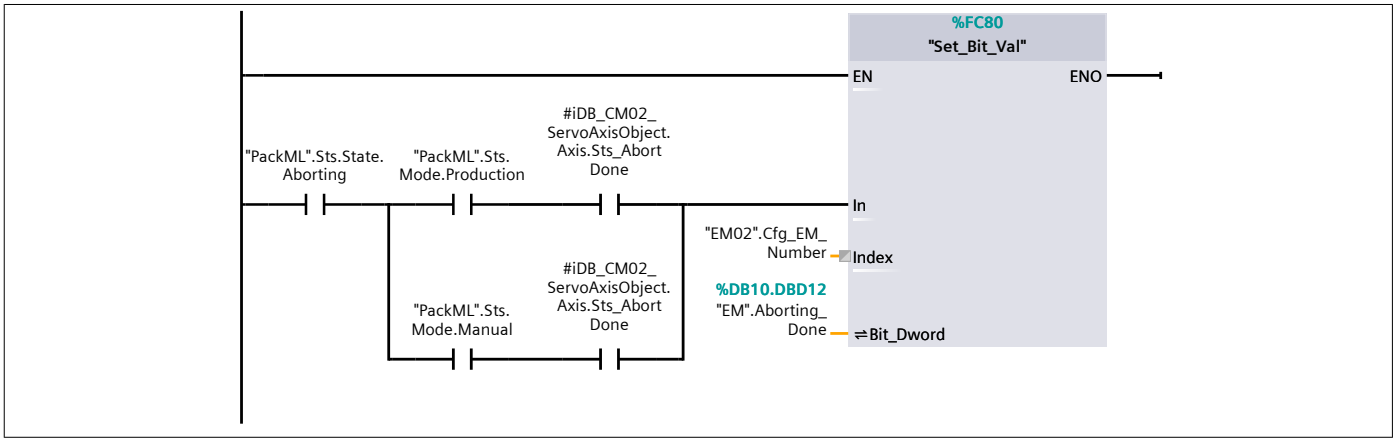
Network 14: Suspending state



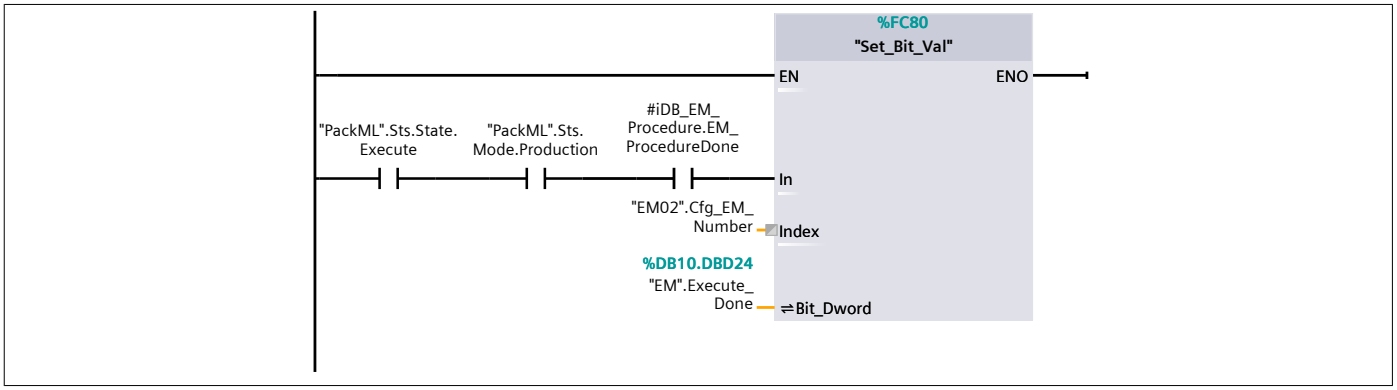
Network 15: Stopping state



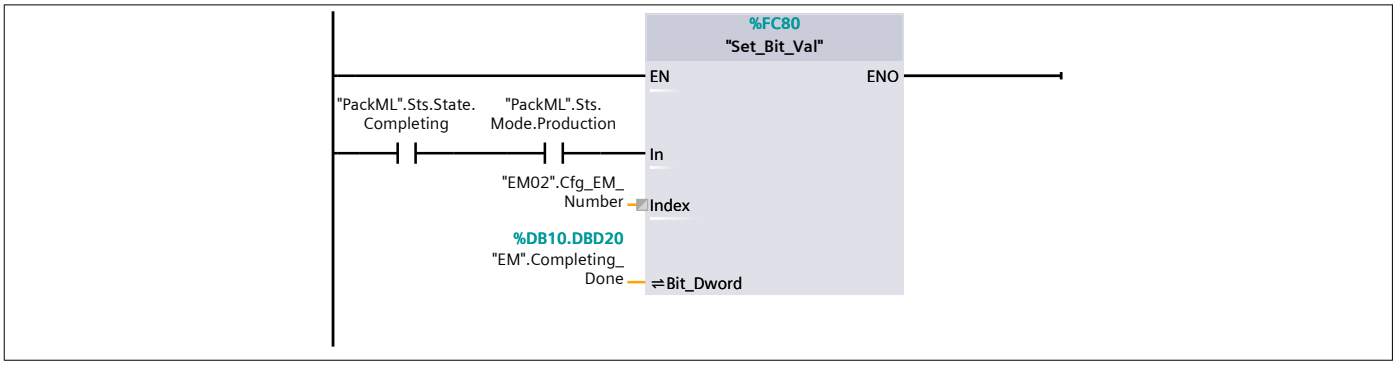
Network 16: Aborting state



Network 17: Execute state

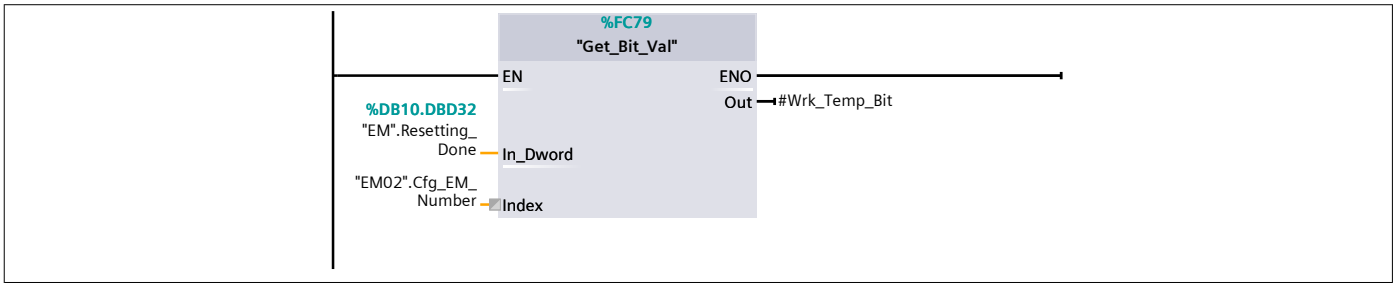


Network 18: Completing State

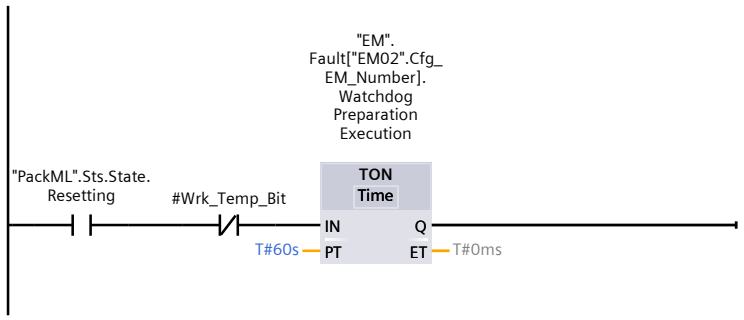


Network 19: Map axis errors, procedure motion errors, and jogging errors into bits of the EM_Major-Faults

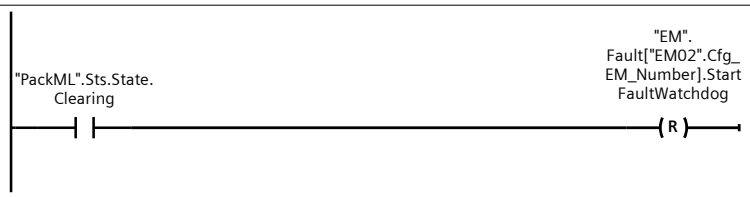
Network 20: Get resetting status for this EM



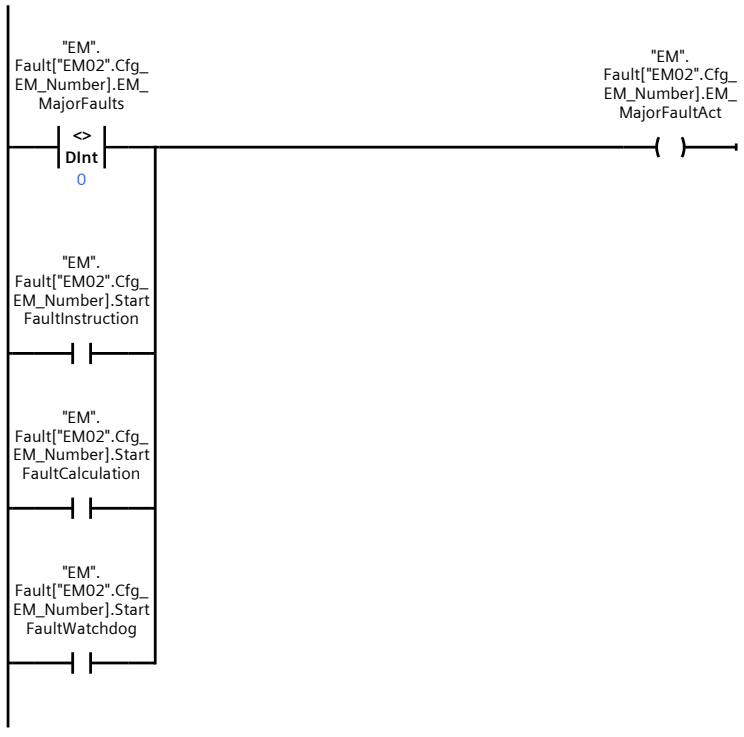
Network 21: Watchdog for resetting - CREATE AN ERROR IF TIMEOUT OCCURS



Network 22: Error cleared in clearing state



Network 23: Summary of EM faults



Network 24:


"EM".
Fault["EM02".Cfg_
EM_Number].EM_
MinorFaults
<>
DInt
0
"EM".
Fault["EM02".Cfg_
EM_Number].EM_
MinorFaultAct

Network 25:


"EM".
Fault["EM02".Cfg_
EM_Number].EM_
Warnings
<>
DInt
0
"EM".
Fault["EM02".Cfg_
EM_Number].EM_
WarningAct

Program blocks / EM02_AxisDum

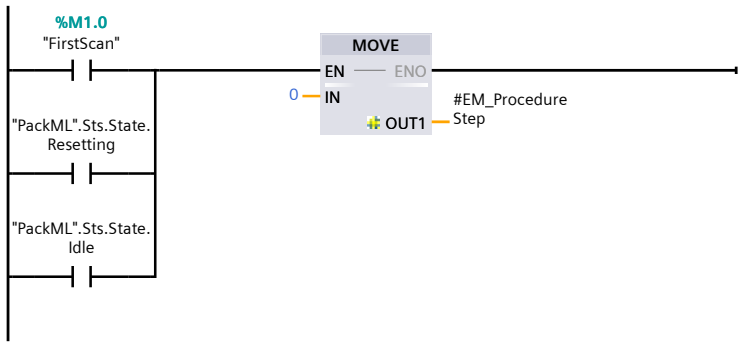
EM02_CM00_Procedure [FB301]

EM02_CM00_Procedure Properties					
General					
Name	EM02_CM00_Procedure	**Number**	301	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title	EM Procedure Sequence	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
EM_ProcedureStep	DInt	0	Non-retain
EM_ProcedureNoStepsActive	Bool	false	Non-retain
EM_ProcedureDone	Bool	false	Non-retain
EM_ProcedureError	Bool	false	Non-retain
MC_MoveRel1_DB	MC_MOVERELATIVE		
MC_MoveRel2_DB	MC_MOVERELATIVE		
MC_Home_DB	MC_HOME		
Delay	TON_TIME		Non-retain
MC_MoveRel1_Done	Bool	false	Non-retain
MC_MoveRel1_Busy	Bool	false	Non-retain
MC_MoveRel1_CommandAborted	Bool	false	Non-retain
MC_MoveRel1_Error	Bool	false	Non-retain
MC_MoveRel1_ErrorID	Word	16#0	Non-retain
MC_MoveRel2_Done	Bool	false	Non-retain
MC_MoveRel2_Busy	Bool	false	Non-retain
MC_MoveRel2_CommandAborted	Bool	false	Non-retain
MC_MoveRel2_Error	Bool	false	Non-retain
MC_MoveRel2_ErrorID	Word	16#0	Non-retain
MC_Home_Done	Bool	false	Non-retain
MC_Home_Busy	Bool	false	Non-retain
MC_Home_CommandAborted	Bool	false	Non-retain
MC_Home_Error	Bool	false	Non-retain
MC_Home_ErrorID	Word	16#0	Non-retain
Temp			
Constant			

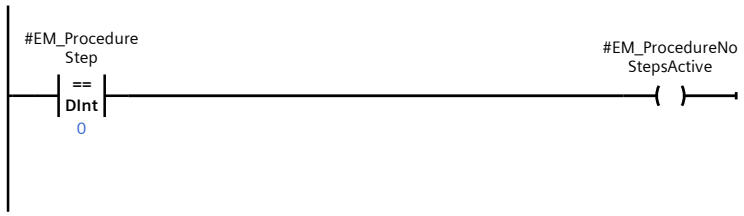
Network 1: Reset step number

First scan or resetting or idle - clear all steps



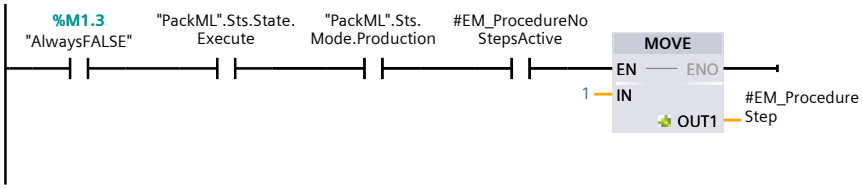
Network 2: Indication that all steps reset

Used by RESETTING state and initial execute step

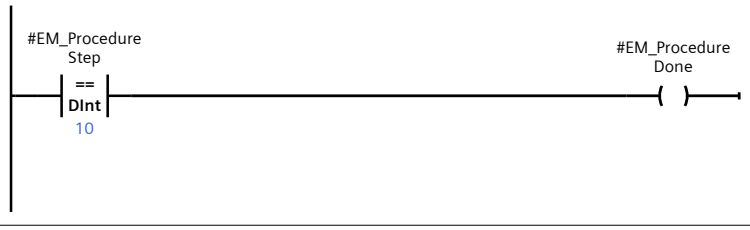


Network 3: EXECUTE - Disabled

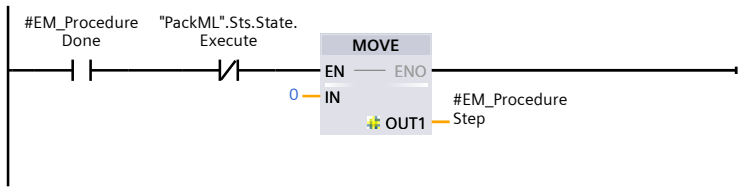
If no steps active go to step 1



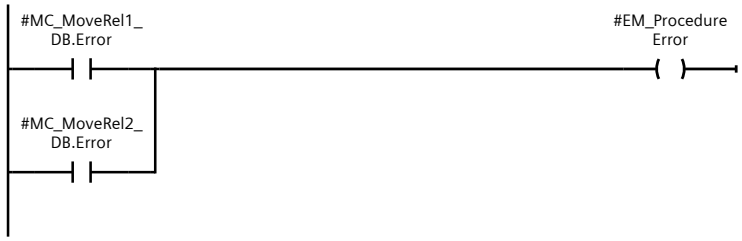
Network 4: Last step - set done



Network 5: When done, wait for out of execute step, then set step back to zero so can restart without resetting



Network 6: Put any error handling here



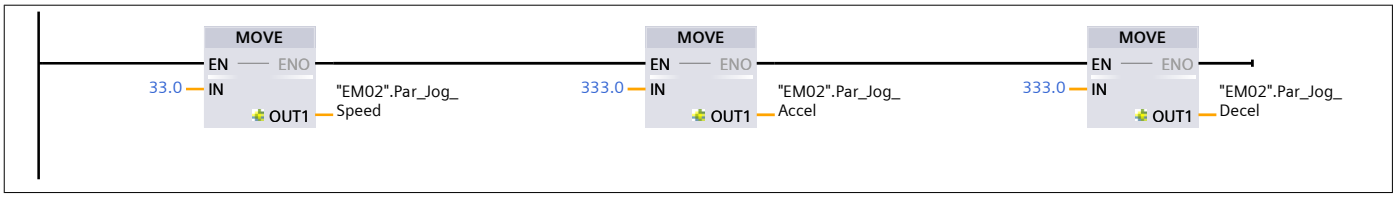
Program blocks / EM02_AxisDum

EM02_S20_InitializeData [FB304]

EM02_S20_InitializeData Properties					
General					
Name	EM02_S20_InitializeData	**Number**	304	**Type**	FB
Language	LAD	**Numbering**	Manual		
Information					
Title	Initialization for EM	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value	Retain
Input			
Output			
InOut			
▼ Static			
Temp_Dint	DInt	0	Non-retain
Temp			
Constant			

Network 2:



Program blocks / EM02_AxisDum

EM02 [DB300]

EM02 Properties					
General					
Name	EM02	**Number**	300	**Type**	DB
Language	DB	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Start value	Retain
Input			
Output			
InOut			
▼ Static			
Cfg_EM_Number	Int	0	False
Par_Jog_Accel	Real	0.0	False
Par_Jog_Decel	Real	0.0	False
Par_Jog_Speed	Real	0.0	False
iDB_EM_Procedure	"EM02_CM00_Procedure"		False
iDB_CM02_ServoAxisObject	"EM01_CM02_ServoAxisObject"		False
iDB_CM03_ServoAxisJog	"EM01_CM03_ServoAxisJog"		False
iDB_S20_Initialize	"EM02_S20_InitializeData"		False
Wrk_Temp_Bit	Bool	false	False

Program blocks / 0_Organization Blocks

MC-Interpolator [OB92]

MC-Interpolator Properties					
General					
Name	MC-Interpolator	**Number**	92	**Type**	OB
Language	LAD	**Numbering**	Automatic		
Information					
Title		**Author**		**Comment**	
Family		**Version**	1.0	**User-defined ID**	

Name	Data type	Default value
▼ Input		
Initial_Call	Bool	
PIP_Input	Bool	
PIP_Output	Bool	
IO_System	USInt	
Event_Count	Int	
Reduction	UInt	

Program blocks / 0_Organization Blocks

MC-Servo [OB91]

MC-Servo Properties					
General					
Name	MC-Servo	**Number**	91	**Type**	OB
Language	LAD	**Numbering**	Automatic		
Information					
Title		**Author**		**Comment**	
Family		**Version**	1.0	**User-defined ID**	

Name	Data type	Default value
▼ Input		
Initial_Call	Bool	
PIP_Input	Bool	
PIP_Output	Bool	
IO_System	USInt	
Event_Count	Int	
Synchronous	Bool	

Program blocks / 0_Organization Blocks

Startup [OB100]

Startup Properties					
General					
Name	Startup	**Number**	100	**Type**	OB
Language	LAD	**Numbering**	Automatic		
Information					
Title	"Complete Restart"	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value
▼ Input		
LostRetentive	Bool	
LostRTC	Bool	
Temp		
Constant		

Program blocks / Misc Blocks

States_Disabled_Decode [FC82]

States_Disabled_Decode Properties					
General					
Name	States_Disabled_Decode	**Number**	82	**Type**	FC
Language	SCL	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value
▼ Input		
Disabled_States	DInt	
▼ Output		
ClearingEnabled	Bool	
StoppedEnabled	Bool	
StartingEnabled	Bool	
IdleEnabled	Bool	
SuspendedEnabled	Bool	
ExecuteEnabled	Bool	
StoppingEnabled	Bool	
AbortingEnabled	Bool	
AbortedEnabled	Bool	
HoldingEnabled	Bool	
HeldEnabled	Bool	
UnholdingEnabled	Bool	
SuspendingEnabled	Bool	
UnsuspendingEnabled	Bool	
ResettingEnabled	Bool	
CompletingEnabled	Bool	
CompleteEnabled	Bool	
InOut		
Temp		
Constant		
▼ Return		
States_Disabled_Decode	Void	

```
0001 // Decode StatesDisabled Dint output from LPMLV30_UnitModeStateManager FB
0002 // Disabled states are "1" bits in the Dint.
0003 // Decode into individual enable Booleans that are "1" if state is enabled
0004 //
0005 #ClearingEnabled := NOT #Disabled_States.%X1;
0006 #StoppedEnabled := NOT #Disabled_States.%X2;
0007 #StartingEnabled := NOT #Disabled_States.%X3;
0008 #IdleEnabled := NOT #Disabled_States.%X4;
0009 #SuspendedEnabled := NOT #Disabled_States.%X5;
0010 #ExecuteEnabled := NOT #Disabled_States.%X6;
```

```
0011 #StoppingEnabled := NOT #Disabled_States.%X7;
0012 #AbortingEnabled := NOT #Disabled_States.%X8;
0013 #AbortedEnabled := NOT #Disabled_States.%X9;
0014 #HoldingEnabled := NOT #Disabled_States.%X10;
0015 #HeldEnabled := NOT #Disabled_States.%X11;
0016 #UnholdingEnabled := NOT #Disabled_States.%X12;
0017 #SuspendingEnabled := NOT #Disabled_States.%X13;
0018 #UnsuspendingEnabled := NOT #Disabled_States.%X14;
0019 #ResettingEnabled := NOT #Disabled_States.%X15;
0020 #CompletingEnabled := NOT #Disabled_States.%X16;
0021 #CompleteEnabled := NOT #Disabled_States.%X17;
```

Program blocks / Misc Blocks

Set_Bit_Val [FC80]

Set_Bit_Val Properties					
General					
Name	Set_Bit_Val	**Number**	80	**Type**	FC
Language	SCL	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value
▼ Input		
In	Bool	
Index	DInt	
Output		
▼ InOut		
Bit_Dword	DWord	
Temp		
Constant		
▼ Return		
Set_Bit_Val	Void	

```
0001 // Places boolean value in bit of Dword
0002 CASE #Index OF
0003   0:
0004     #Bit_Dword.%X0 := #In;
0005   1:
0006     #Bit_Dword.%X1 := #In;
0007   2:
0008     #Bit_Dword.%X2 := #In;
0009   3:
0010     #Bit_Dword.%X3 := #In;
0011   4:
0012     #Bit_Dword.%X4 := #In;
0013   5:
0014     #Bit_Dword.%X5 := #In;
0015   6:
0016     #Bit_Dword.%X6 := #In;
0017   7:
0018     #Bit_Dword.%X7 := #In;
0019   8:
0020     #Bit_Dword.%X8 := #In;
0021   9:
0022     #Bit_Dword.%X9 := #In;
0023   10:
0024     #Bit_Dword.%X10 := #In;
0025   11:
0026     #Bit_Dword.%X11 := #In;
0027   12:
```

```
0028      #Bit_Dword.%X12 := #In;
0029    13:
0030      #Bit_Dword.%X13 := #In;
0031    14:
0032      #Bit_Dword.%X14 := #In;
0033    15:
0034      #Bit_Dword.%X15 := #In;
0035    16:
0036      #Bit_Dword.%X16 := #In;
0037    17:
0038      #Bit_Dword.%X17 := #In;
0039    18:
0040      #Bit_Dword.%X18 := #In;
0041    19:
0042      #Bit_Dword.%X19 := #In;
0043    20:
0044      #Bit_Dword.%X20 := #In;
0045    21:
0046      #Bit_Dword.%X21 := #In;
0047    22:
0048      #Bit_Dword.%X22 := #In;
0049    23:
0050      #Bit_Dword.%X23 := #In;
0051    24:
0052      #Bit_Dword.%X24 := #In;
0053    25:
0054      #Bit_Dword.%X25 := #In;
0055    26:
0056      #Bit_Dword.%X26 := #In;
0057    27:
0058      #Bit_Dword.%X27 := #In;
0059    28:
0060      #Bit_Dword.%X28 := #In;
0061    29:
0062      #Bit_Dword.%X29 := #In;
0063    30:
0064      #Bit_Dword.%X30 := #In;
0065    31:
0066      #Bit_Dword.%X31 := #In;
0067  END_CASE;
0068
```

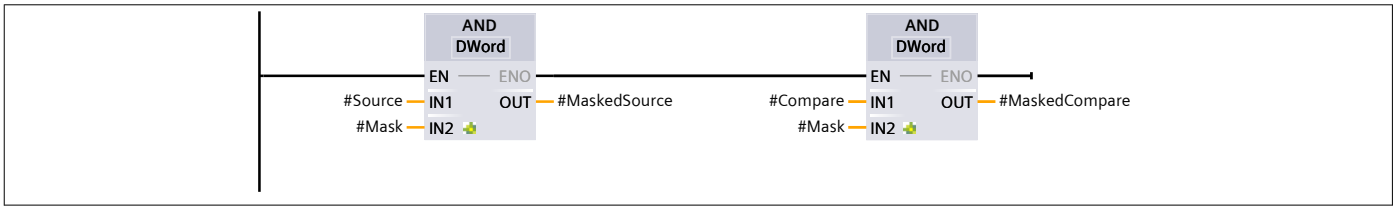
Program blocks / Misc Blocks

MEQ_DWORD [FC81]

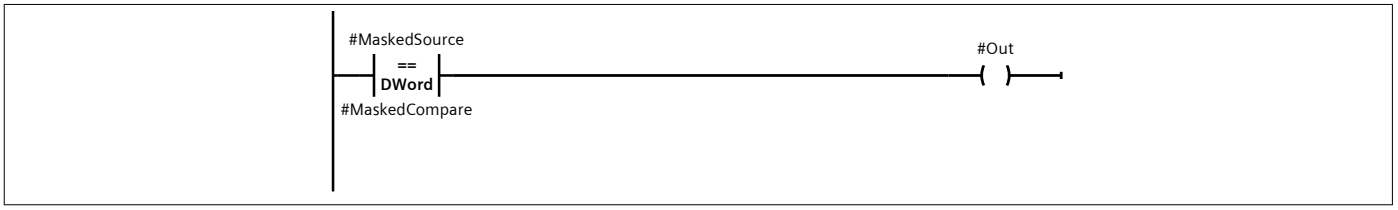
MEQ_DWORD Properties					
General					
Name	MEQ_DWORD	**Number**	81	**Type**	FC
Language	LAD	**Numbering**	Manual		
Information					
Title	Masked Equal for DWord	**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value
Input		
Source	DWord	
Mask	DWord	
Compare	DWord	
Output		
Out	Bool	
InOut		
Temp		
MaskedSource	DWord	
MaskedCompare	DWord	
Constant		
Return		
MEQ_DWORD	Void	

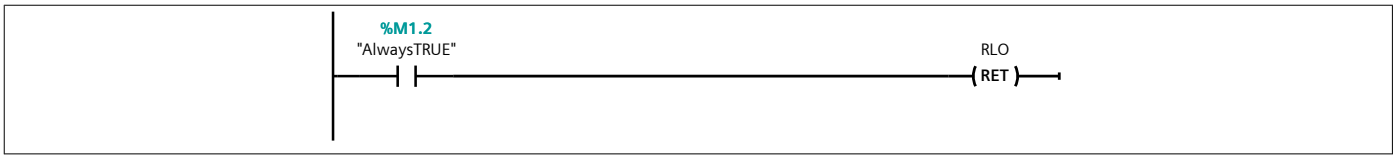
Network 1: Do masking



Network 2: Compare



Network 3: Always sets ENO true



Program blocks / Misc Blocks

Get_Bit_Val [FC79]

Get_Bit_Val Properties					
General					
Name	Get_Bit_Val	**Number**	79	**Type**	FC
Language	SCL	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value
▼ Input		
In_Dword	DWord	
Index	DInt	
▼ Output		
Out	Bool	
InOut		
Temp		
Constant		
▼ Return		
Get_Bit_Val	Void	

```
0001 // Gets value of bit of Dword
0002 CASE #Index OF
0003   0:
0004     #Out := #In_Dword.%X0;
0005   1:
0006     #Out := #In_Dword.%X1;
0007   2:
0008     #Out := #In_Dword.%X2;
0009   3:
0010     #Out := #In_Dword.%X3;
0011   4:
0012     #Out := #In_Dword.%X4;
0013   5:
0014     #Out := #In_Dword.%X5;
0015   6:
0016     #Out := #In_Dword.%X6;
0017   7:
0018     #Out := #In_Dword.%X7;
0019   8:
0020     #Out := #In_Dword.%X8;
0021   9:
0022     #Out := #In_Dword.%X9;
0023   10:
0024     #Out := #In_Dword.%X10;
0025   11:
0026     #Out := #In_Dword.%X11;
0027   12:
```

```
0028      #Out := #In_Dword.%X12;
0029    13:
0030      #Out := #In_Dword.%X13;
0031    14:
0032      #Out := #In_Dword.%X14;
0033    15:
0034      #Out := #In_Dword.%X15;
0035    16:
0036      #Out := #In_Dword.%X16;
0037    17:
0038      #Out := #In_Dword.%X17;
0039    18:
0040      #Out := #In_Dword.%X18;
0041    19:
0042      #Out := #In_Dword.%X19;
0043    20:
0044      #Out := #In_Dword.%X20;
0045    21:
0046      #Out := #In_Dword.%X21;
0047    22:
0048      #Out := #In_Dword.%X22;
0049    23:
0050      #Out := #In_Dword.%X23;
0051    24:
0052      #Out := #In_Dword.%X24;
0053    25:
0054      #Out := #In_Dword.%X25;
0055    26:
0056      #Out := #In_Dword.%X26;
0057    27:
0058      #Out := #In_Dword.%X27;
0059    28:
0060      #Out := #In_Dword.%X28;
0061    29:
0062      #Out := #In_Dword.%X29;
0063    30:
0064      #Out := #In_Dword.%X30;
0065    31:
0066      #Out := #In_Dword.%X31;
0067  END_CASE;
```

Program blocks / Misc Blocks

Axis_Status_Decode [FC70]

Axis_Status_Decode Properties					
General					
Name	Axis_Status_Decode	**Number**	70	**Type**	FC
Language	SCL	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value
▼ Input		
Status_Word	DWord	
Error_Word	DWord	
Warning_Word	DWord	
▼ Output		
Decoded_Status	"Servo_StatusWord_Type"	
Decoded_Error	"Servo_ErrorWord_Type"	
Decoded_Warning	"Servo_Warning-Word_Type"	
InOut		
Temp		
Constant		
▼ Return		
Axis_Status_Decode	Void	

```
0001 // Decodes servo status words into booleans.
0002 //
0003 // Inputs are the 3 status Dwords from the technology object.
0004 // Outputs are data types that have the DWord and the individual booleans.
0005 //
0006 #Decoded_Status.TO_DWord                  := #Status_Word;
0007 #Decoded_Status.Enable                    := #Decoded_Status.TO_DWord.%X0;
0008 #Decoded_Status.Error                     := #Decoded_Status.TO_DWord.%X1;
0009 #Decoded_Status.RestartActive             := #Decoded_Status.TO_DWord.%X2;
0010 #Decoded_Status.OnlineStartValuesChanged  := #Decoded_Status.TO_DWord.%X3;
0011 #Decoded_Status.ControlPanelActive        := #Decoded_Status.TO_DWord.%X4;
0012 #Decoded_Status.HomingDone                := #Decoded_Status.TO_DWord.%X5;
0013 #Decoded_Status.Done                      := #Decoded_Status.TO_DWord.%X6;
0014 #Decoded_Status.Standstill               := #Decoded_Status.TO_DWord.%X7;
0015 #Decoded_Status.PositioningCommand        := #Decoded_Status.TO_DWord.%X8;
0016 #Decoded_Status.JogCommand               := #Decoded_Status.TO_DWord.%X9;
0017 #Decoded_Status.VelocityCommand           := #Decoded_Status.TO_DWord.%X10;
0018 #Decoded_Status.HomingCommand             := #Decoded_Status.TO_DWord.%X11;
0019 #Decoded_Status.ConstantVelocity          := #Decoded_Status.TO_DWord.%X12;
0020 #Decoded_Status.Accelerating             := #Decoded_Status.TO_DWord.%X13;
0021 #Decoded_Status.Decelerating             := #Decoded_Status.TO_DWord.%X14;
0022 #Decoded_Status.SWLimitMinActive         := #Decoded_Status.TO_DWord.%X15;
0023 #Decoded_Status.SWLimitMaxActive         := #Decoded_Status.TO_DWord.%X16;
```

```
0024 #Decoded_Status.HWLimitMinActive           := #Decoded_Status.TO_DWord.%X17;
0025 #Decoded_Status.HWLimitMaxActive           := #Decoded_Status.TO_DWord.%X18;
0026 #Decoded_Status.Synchronizing              := #Decoded_Status.TO_DWord.%X21;
0027 #Decoded_Status.Synchronous                 := #Decoded_Status.TO_DWord.%X22;
0028 #Decoded_Status.SuperimposedMotionCommand := #Decoded_Status.TO_DWord.%X23;
0029 //
0030 //
0031 #Decoded_Error.TO_DWord                    := #Error_Word;
0032 #Decoded_Error.SystemFault                 := #Decoded_Error.TO_DWord.%X0;
0033 #Decoded_Error.ConfigurationFault          := #Decoded_Error.TO_DWord.%X1;
0034 #Decoded_Error.UserFault                   := #Decoded_Error.TO_DWord.%X2;
0035 #Decoded_Error.CommandNotAccepted          := #Decoded_Error.TO_DWord.%X3;
0036 #Decoded_Error.DriveFault                  := #Decoded_Error.TO_DWord.%X4;
0037 #Decoded_Error.SensorFault                 := #Decoded_Error.TO_DWord.%X5;
0038 #Decoded_Error.DynamicError                := #Decoded_Error.TO_DWord.%X6;
0039 #Decoded_Error.CommunicationFault          := #Decoded_Error.TO_DWord.%X7;
0040 #Decoded_Error.SWLimit                     := #Decoded_Error.TO_DWord.%X8;
0041 #Decoded_Error.HWLimit                     := #Decoded_Error.TO_DWord.%X9;
0042 #Decoded_Error.HomingFault                 := #Decoded_Error.TO_DWord.%X10;
0043 #Decoded_Error.FollowingErrorFault         := #Decoded_Error.TO_DWord.%X11;
0044 #Decoded_Error.PositioningFault            := #Decoded_Error.TO_DWord.%X12;
0045 #Decoded_Error.PeripheralError             := #Decoded_Error.TO_DWord.%X13;
0046 #Decoded_Error.SynchronousError            := #Decoded_Error.TO_DWord.%X14;
0047 //
0048 //
0049 #Decoded_Warning.TO_Dword                  := #Warning_Word;
0050 #Decoded_Warning.ConfigurationFault        := #Decoded_Warning.TO_Dword.%X1;
0051 #Decoded_Warning.CommandNotAccepted        := #Decoded_Warning.TO_Dword.%X3;
0052 #Decoded_Warning.DynamicError              := #Decoded_Warning.TO_Dword.%X6;
0053 #Decoded_Warning.FollowingErrorWarning     := #Decoded_Warning.TO_Dword.%X11;
```

Program blocks / Misc Blocks

Read_Home_Switch [FC83]

Read_Home_Switch Properties					
General					
Name	Read_Home_Switch	**Number**	83	**Type**	FC
Language	SCL	**Numbering**	Manual		
Information					
Title		**Author**		**Comment**	
Family		**Version**	0.1	**User-defined ID**	

Name	Data type	Default value
▼ Input		
Active_Passive	Bool	
▼ Output		
At_Home	Bool	
Switch_Presnt	Bool	
▼ InOut		
Axis	TO_PositioningAxis	
▼ Temp		
Area	Byte	
DBNumber	UInt	
Offset	UDInt	
ByteOffset	DInt	
BitNumber	DInt	
DigitalInEnabled	Bool	
SwitchLevel	Bool	
SwitchStatus	Bool	
PeekByte	Byte	
Constant		
▼ Return		
Read_Home_Switch	Void	

```
0001 // Read_Home_Switch.
0002 // Active_Passive indicates which homing configuration to read. True = active,
0003 // false = passive.
0004 //
0005 // At_Home is true if home switch indicates at home position
0006 // No_Switch is true if homing mode not 2, missing address or not discrete input
     address
0007 // Get switch address and level.
0008 //
0009 // Initialize outputs to no valid switch address and not at home.
0010 #Switch_Presnt := False;
0011 #At_Home := False;
0012
0013 // Get switch configuration info from appropriate homing structure
0014 IF #Active_Passive THEN
```

```
0015    #DigitalInEnabled := (#Axis.Sensor[1].ActiveHoming.Mode = 2);
0016    #Area := #Axis.Sensor[1].ActiveHoming.DigitalInputAddress.AREA;
0017    #DBNumber := #Axis.Sensor[1].ActiveHoming.DigitalInputAddress.DB_NUMBER;
0018    #Offset := #Axis.Sensor[1].ActiveHoming.DigitalInputAddress.OFFSET;
0019    #SwitchLevel := #Axis.Sensor[1].ActiveHoming.SwitchLevel;
0020  ELSE
0021    #DigitalInEnabled := (#Axis.Sensor[1].PassiveHoming.Mode = 2);
0022    #Area := #Axis.Sensor[1].PassiveHoming.DigitalInputAddress.AREA;
0023    #DBNumber := #Axis.Sensor[1].PassiveHoming.DigitalInputAddress.DB_NUMBER;
0024    #Offset := #Axis.Sensor[1].PassiveHoming.DigitalInputAddress.OFFSET;
0025    #SwitchLevel := #Axis.Sensor[1].PassiveHoming.SwitchLevel;
0026  END_IF;
0027  //
0028  // Check for switch configured and a discrete input address
0029  IF #DigitalInEnabled AND (#Area = 16#81) AND (#DBNumber = 0) THEN
0030    #ByteOffset := #Offset / 8;
0031    #BitNumber := #Offset MOD 8;
0032    #PeekByte := PEEK(area:=#Area, dbNumber:=#DBNumber, byteOffset:=#ByteOff-
      set, ENO => ENO);
0033    IF ENO THEN
0034      #Switch_Presnt := True;
0035      CASE #BitNumber OF
0036        0:
0037          #SwitchStatus := #PeekByte.%X0;
0038        1:
0039          #SwitchStatus := #PeekByte.%X1;
0040        2:
0041          #SwitchStatus := #PeekByte.%X2;
0042        3:
0043          #SwitchStatus := #PeekByte.%X3;
0044        4:
0045          #SwitchStatus := #PeekByte.%X4;
0046        5:
0047          #SwitchStatus := #PeekByte.%X5;
0048        6:
0049          #SwitchStatus := #PeekByte.%X6;
0050        7:
0051          #SwitchStatus := #PeekByte.%X7;
0052      END_CASE;
0053      // If status of switch matches configured level, then at home
0054      //
0055      IF (#SwitchLevel AND #SwitchStatus) OR
0056        (NOT #SwitchLevel) AND (NOT #SwitchStatus) THEN
0057        #At_Home := True;
0058      END_IF;
0059    END_IF;
0060  END_IF;
0061
0062
```