Engineering Note

SPE

Integration to Studio 5000 Rockwell PLC

METTLER TOLEDO

Menu

Engineering Note

1. Overview

This Engineering Note is based on integration of Mettler Toledo's Automated High Precision Weighing Module (APW) SPE with Ethernet/IP to an Allen Bradley PLC. Go to www.mt.com/spe to download all the necessary files and documents.

Note: The configuration used in this sample code is based on the default settings：

- **STUDIO 5000 Logix Designer: V24**
- **SAI data format: 2-Block format and 8-Block format**
- **Device Name: SPE**
- **IP Address: 192.168.0.55 (default)**
- **SPE Firmware Version: 4.0.1.20231123 or higher**
- **GSDML File: GSDML – V2.43-MT-SPE-20230713.xml**

It is recommended to integrate one SPE into Studio 5000 and go through the sample code and each Add on Instruction before adding more devices.

2. Setup of Project Development Environment

2.1. Electrical Integration

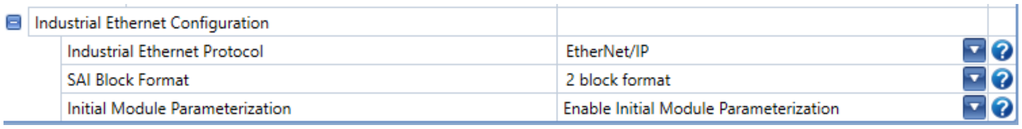
The SPE weigh module has two M12, D-coded female Ethernet ports with the same functionality, one located at the bottom and one at the rear side. One must be energized with Power over Ethernet POE (Mode A, Class 1 PD below 3.84 Watt)

Please refer SPE Weighing System Installation Instructions from www.mt.com/spe.

2.2. SPE Industrial Ethernet Configuration

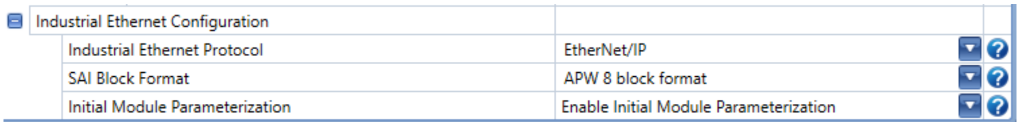
The SPE's industrial Ethernet communication can be configured using the APW-Link configuration tool. Get APW-Link from www.mt.com/apw-link.

The default IP address is "192.168.0.55" and port number is "80". Under the Industrial ethernet Configuration tab, select Ethernet/IP, and choose SAI Block Format (2 block format or APW 8 block format) to work on. SAI block format will be explained in Chapter 3 – SAI Data Structure.



Industrial Ethernet Configuration	
Industrial Ethernet Protocol	EtherNet/IP
SAI Block Format	2 block format
Initial Module Parameterization	Enable Initial Module Parameterization

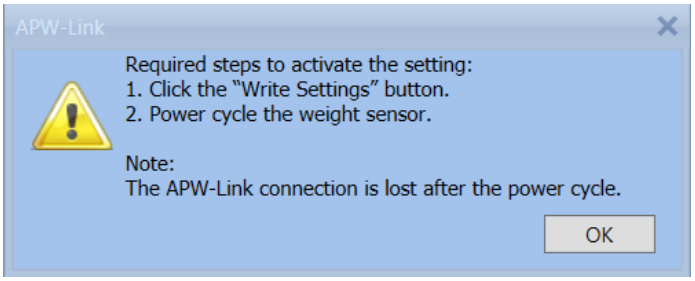
Figure 2-1: APW-Link SAI 2-Block Format selection



Industrial Ethernet Configuration	
Industrial Ethernet Protocol	EtherNet/IP
SAI Block Format	APW 8 block format
Initial Module Parameterization	Enable Initial Module Parameterization

Figure 2-2: APW-Link SAI 8-Block Format selection

After finished configuring all the Industrial Ethernet settings, click the "Write Settings" button and then manually power cycle the weigh module.



Required steps to activate the setting:
1. Click the "Write Settings" button.
2. Power cycle the weight sensor.

Note:
The APW-Link connection is lost after the power cycle.

Figure 2-3: Write settings and power cycle the weigh module after settings

2.3. Open the Sample Code

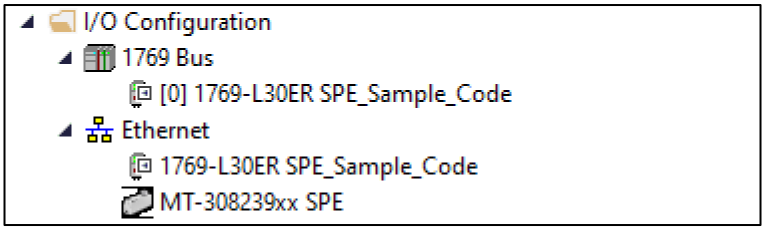
To open and use either sample code 2block, *SPE_Sample_Code_2block_v24*, or 8block *SPE_Sample_Code_8block_v24*, you need to use Studio 5000 version 24 or higher. All the required GSDML files will be installed automatically when opening either sample code.

2.4. Select the Suitable PLC Project

There are two sample projects – one for 2 block format and one for 8 block format. Both sample codes are using the 1769-L30ER Compact Logix 5370 Allen Bradley Controller

1) *SPE_Sample_Code_2block_v24* uses 1769-L30ER Compact Logix 5370 Allen Bradley Controller with SPE weigh module configured to communicate in SAI 2-Block data structure.

2) *SPE_Sample_Code_8block_v24* uses 1769-L30ER Compact Logix 5370 Allen Bradley Controller with SPE weigh module configured to communicate in SAI 8-Block data structure.

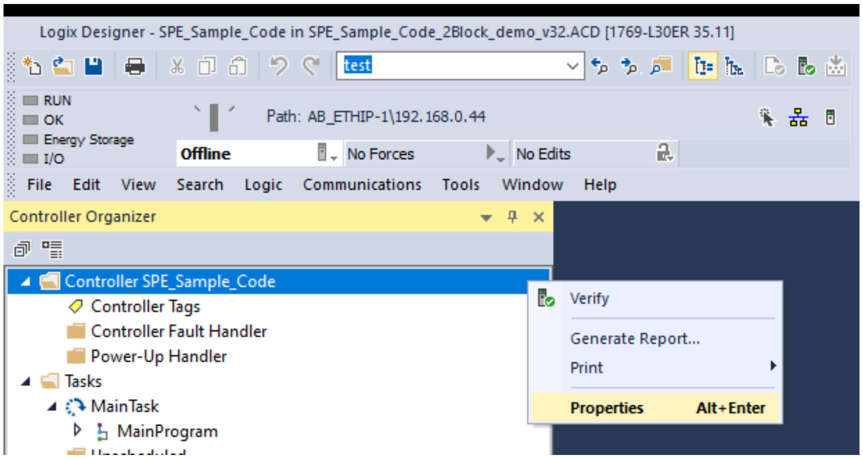


- I/O Configuration
  - 1769 Bus
    - [0] 1769-L30ER SPE_Sample_Code
  - Ethernet
    - 1769-L30ER SPE_Sample_Code
    - MT-308239xx SPE

Figure 2-4: SPE Sample Project Controller Organizer

To change the PLC model: Go to Device Configuration under the project folder, right click on the current controller, select "Change Device" and choose the new controller as well as its firmware version.

To change the PLC model: Go to Controller under Controller Organizer, right click on "Controller … ", select "Properties", "Change Controller" and chose the new controller as well as its software version.



Logix Designer - SPE_Sample_Code in SPE_Sample_Code_2Block_demo_v32.ACD [1769-L30ER 35.11]

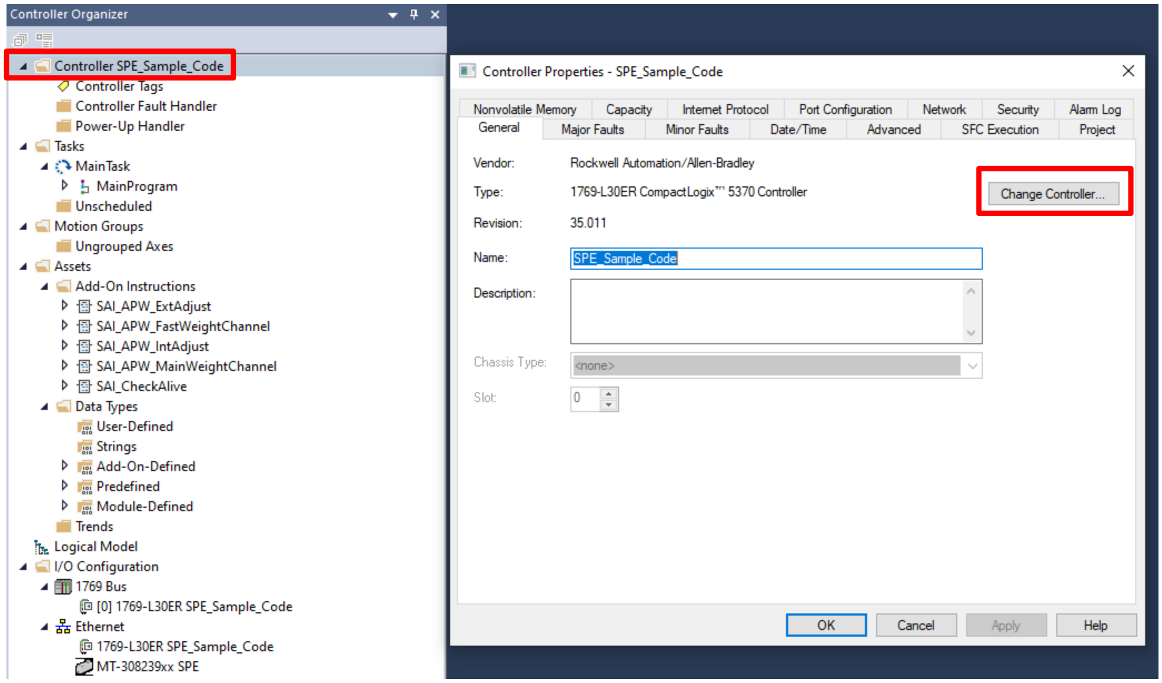
Path: AB_ETHIP-1\192.168.0.44

Offline | No Forces | No Edits

Controller Organizer

- Controller SPE_Sample_Code
  - Controller Tags
  - Controller Fault Handler
  - Power-Up Handler
- Tasks
  - MainTask
    - MainProgram

Figure 2-5: Change controller type, Controller Properties



Vendor: Rockwell Automation/Allen-Bradley

Type: 1769-L30ER CompactLogix™ 5370 Controller

Revision: 35.011

Name: SPE_Sample_Code

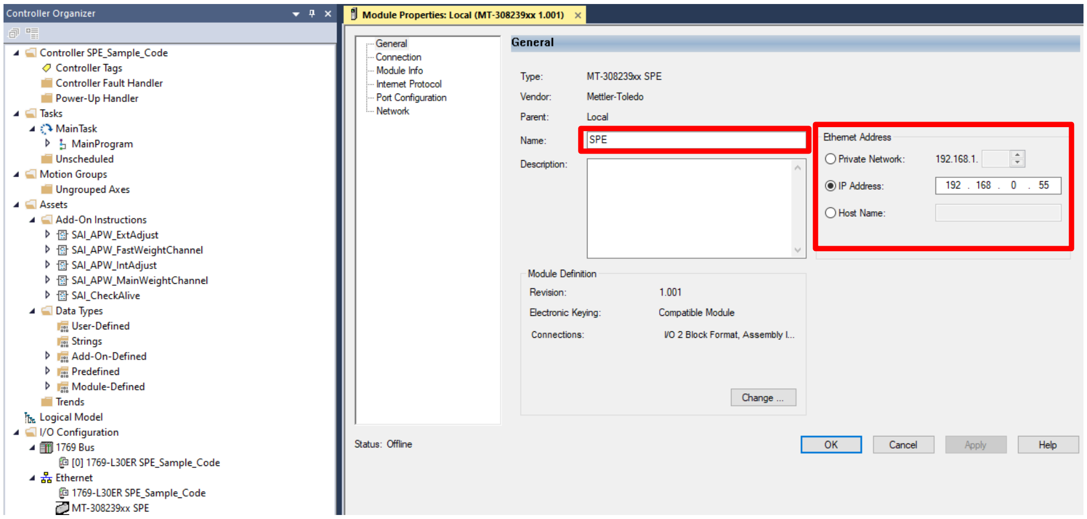
Description:

Chassis Type: <none>

Slot: 0

Figure 2-6: Change controller type, Change Controller

Verify IP Address of the SPE



Type: MT-308239xx SPE

Vendor: Mettler-Toledo

Parent: Local

Name: SPE

Description:

Ethernet Address

○ Private Network: 192.168.1.

● IP Address: 192 . 168 . 0 . 55

○ Host Name:

Module Definition

Revision: 1.001

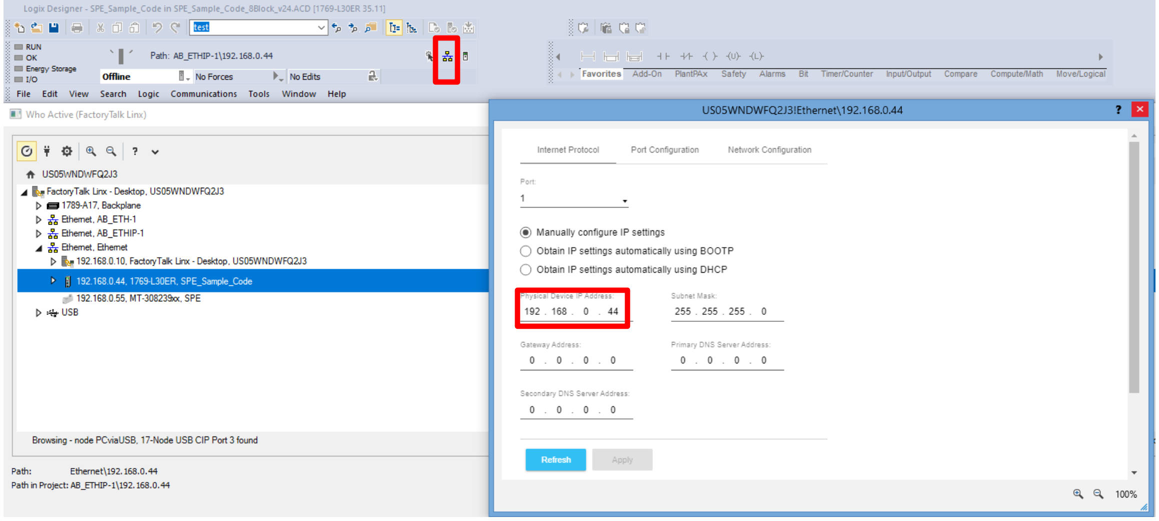
Electronic Keying: Compatible Module

Connections: I/O 2 Block Format, Assembly I...

Status: Offline

Figure 2-7: SPE Device Properties – IP Addresses

Verify IP Address of the Controller


Logix Designer - SPE_Sample_Code in SPE_Sample_Code_8Block_v24.ACD [1769-L30ER 35.11]
RUN
OK
Energy Storage
I/O
Offline
No Forces
No Edits
File Edit View Search Logic Communications Tools Window Help
Favorites Add-On PlantPAx Safety Alarms Bit Timer/Counter Input/Output Compare Compute/Math Move/Logical
Who Active (FactoryTalk Linx)
US05WNDWFQ2J3
FactoryTalk Linx - Desktop, US05WNDWFQ2J3
1789-A17, Backplane
Ethernet, AB_ETH-1
Ethernet, AB_ETHIP-1
Ethernet, Ethernet
192.168.0.10, FactoryTalk Linx - Desktop, US05WNDWFQ2J3
192.168.0.44, 1769-L30ER, SPE_Sample_Code
192.168.0.55, MT-308239xx, SPE
USB
Browsing - node PCviaUSB, 17-Node USB CIP Port 3 found
US05WNDWFQ2J3!Ethernet\192.168.0.44
Internet Protocol
Port Configuration
Network Configuration
Refresh
Apply
100%

Path: AB_ETHIP-1\192.168.0.44

Path: Ethernet\192.168.0.44

Path in Project: AB_ETHIP-1\192.168.0.44

Port: 1

● Manually configure IP settings

○ Obtain IP settings automatically using BOOTP

○ Obtain IP settings automatically using DHCP

Physical Device IP Address: 192 . 168 . 0 . 44

Subnet Mask: 255 . 255 . 255 . 0

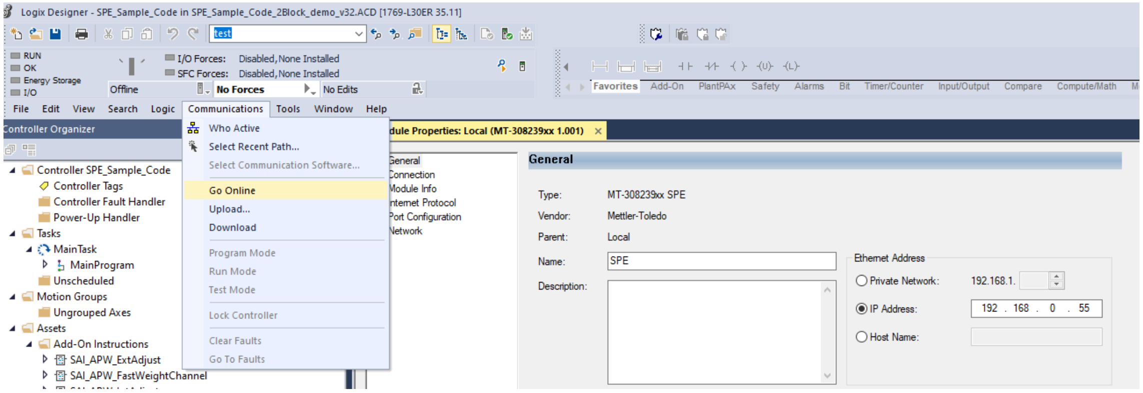
Gateway Address: 0 . 0 . 0 . 0

Primary DNS Server Address: 0 . 0 . 0 . 0

Secondary DNS Server Address: 0 . 0 . 0 . 0

Figure 2-8: PLC Device Properties – IP Addresses

Select the "MT_SPE_Application" task, click on "Go Online" button to start using the sample code.



I/O Forces: Disabled, None Installed

SFC Forces: Disabled, None Installed

Type: MT-308239xx SPE

Vendor: Mettler-Toledo

Parent: Local

Name: SPE

Description:

Ethernet Address

○ Private Network: 192.168.1.

● IP Address: 192 . 168 . 0 . 55

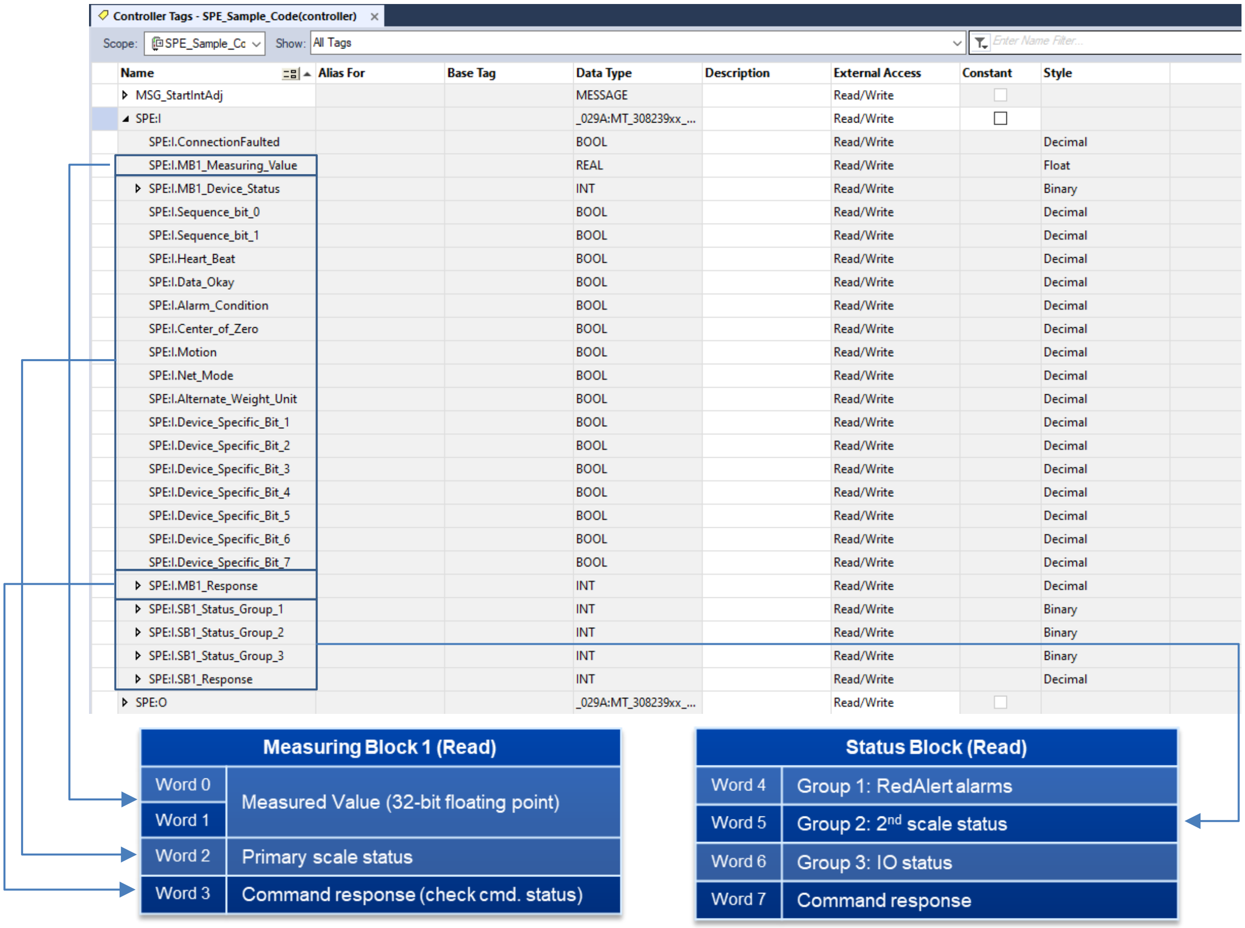
○ Host Name:

Figure 2-9: Go online with MT_APW_Application

3. SAI Data Structure

In the SPE 2 Block Sample Project, the SPE's SAI data format is the default "2 block format". For more details on SAI data structure, please refer to the User's Guide: Standard Automation Interface (SAI) and APW specific Reference Guide: Standard Automation Interface (SAI) APW Products English, which are downloadable from the SPE Downloads Page www.mt.com/spe.

SAI 2 Block Format consists of a single Measuring Block and a Status Block. In the figure below, the Read and Write are referring to the PLC point of view. The SAI input and output data structure has been assigned tags as SPE:I for Input and SPE:O for output.



Controller Tags - SPE_Sample_Code(controller)

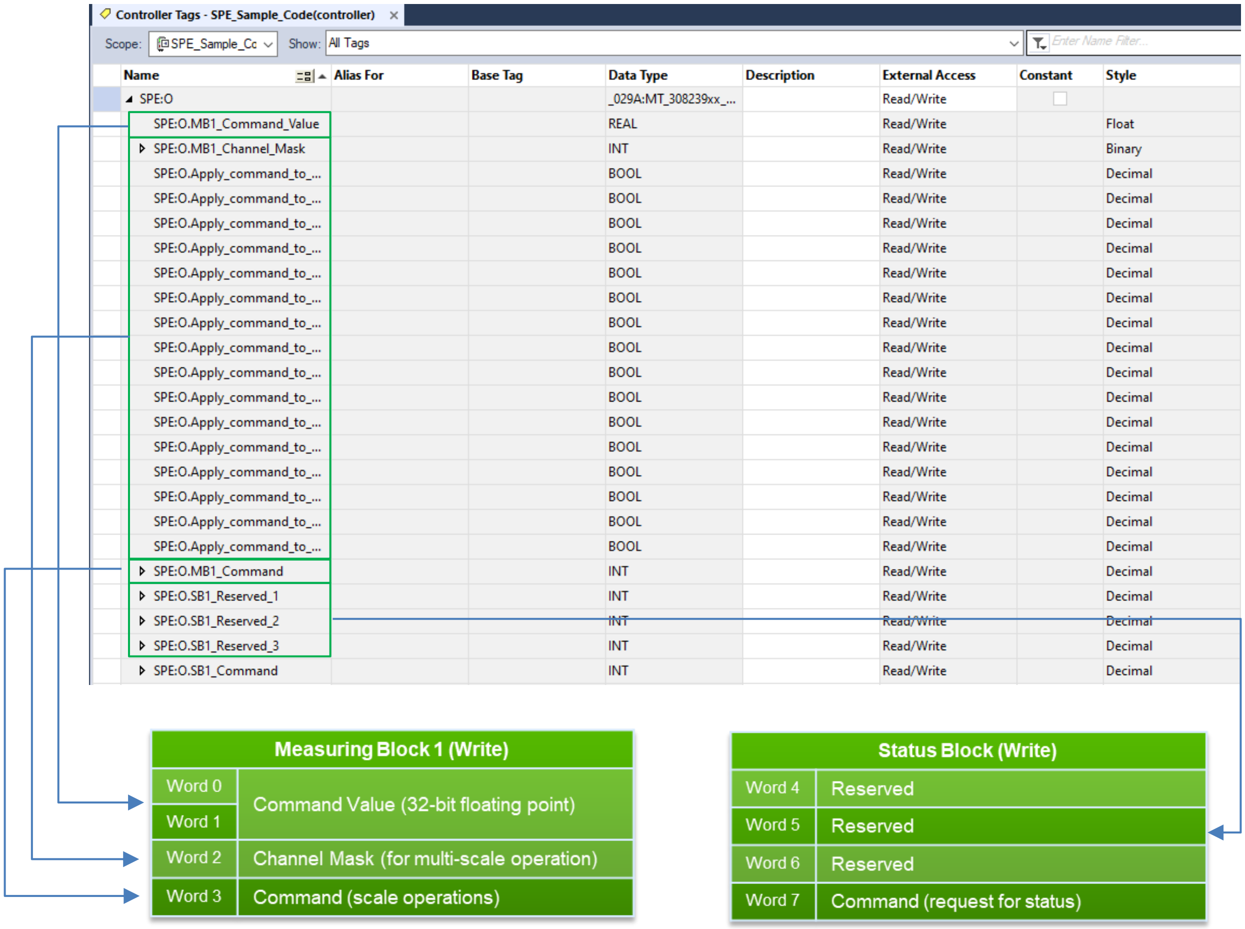
Scope: SPE_Sample_Cc Show: All Tags

Name	Alias For	Base Tag	Data Type	Description	External Access	Constant	Style
MSG_StartIntAdj			MESSAGE		Read/Write	☐	
SPE:I			_029A:MT_308239xx_...		Read/Write	☐	
SPE:I.ConnectionFaulted			BOOL		Read/Write		Decimal
SPE:I.MB1_Measuring_Value			REAL		Read/Write		Float
SPE:I.MB1_Device_Status			INT		Read/Write		Binary
SPE:I.Sequence_bit_0			BOOL		Read/Write		Decimal
SPE:I.Sequence_bit_1			BOOL		Read/Write		Decimal
SPE:I.Heart_Beat			BOOL		Read/Write		Decimal
SPE:I.Data_Okay			BOOL		Read/Write		Decimal
SPE:I.Alarm_Condition			BOOL		Read/Write		Decimal
SPE:I.Center_of_Zero			BOOL		Read/Write		Decimal
SPE:I.Motion			BOOL		Read/Write		Decimal
SPE:I.Net_Mode			BOOL		Read/Write		Decimal
SPE:I.Alternate_Weight_Unit			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_1			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_2			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_3			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_4			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_5			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_6			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_7			BOOL		Read/Write		Decimal
SPE:I.MB1_Response			INT		Read/Write		Decimal
SPE:I.SB1_Status_Group_1			INT		Read/Write		Binary
SPE:I.SB1_Status_Group_2			INT		Read/Write		Binary
SPE:I.SB1_Status_Group_3			INT		Read/Write		Binary
SPE:I.SB1_Response			INT		Read/Write		Decimal
SPE:O			_029A:MT_308239xx_...		Read/Write	☐	

Measuring Block 1 (Read)	
Word 0	Measured Value (32-bit floating point)
Word 1	
Word 2	Primary scale status
Word 3	Command response (check cmd. status)

Status Block (Read)	
Word 4	Group 1: RedAlert alarms
Word 5	Group 2: 2nd scale status
Word 6	Group 3: IO status
Word 7	Command response

Figure 3-1: SAI Input Data Structure as shown in the Device Overview



Name	Alias For	Base Tag	Data Type	Description	External Access	Constant	Style
SPE:O			_029A:MT_308239xx_...		Read/Write	☐	
SPE:O.MB1_Command_Value			REAL		Read/Write		Float
SPE:O.MB1_Channel_Mask			INT		Read/Write		Binary
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.Apply_command_to_...			BOOL		Read/Write		Decimal
SPE:O.MB1_Command			INT		Read/Write		Decimal
SPE:O.SB1_Reserved_1			INT		Read/Write		Decimal
SPE:O.SB1_Reserved_2			INT		Read/Write		Decimal
SPE:O.SB1_Reserved_3			INT		Read/Write		Decimal
SPE:O.SB1_Command			INT		Read/Write		Decimal

Measuring Block 1 (Write)	
Word 0	Command Value (32-bit floating point)
Word 1	
Word 2	Channel Mask (for multi-scale operation)
Word 3	Command (scale operations)

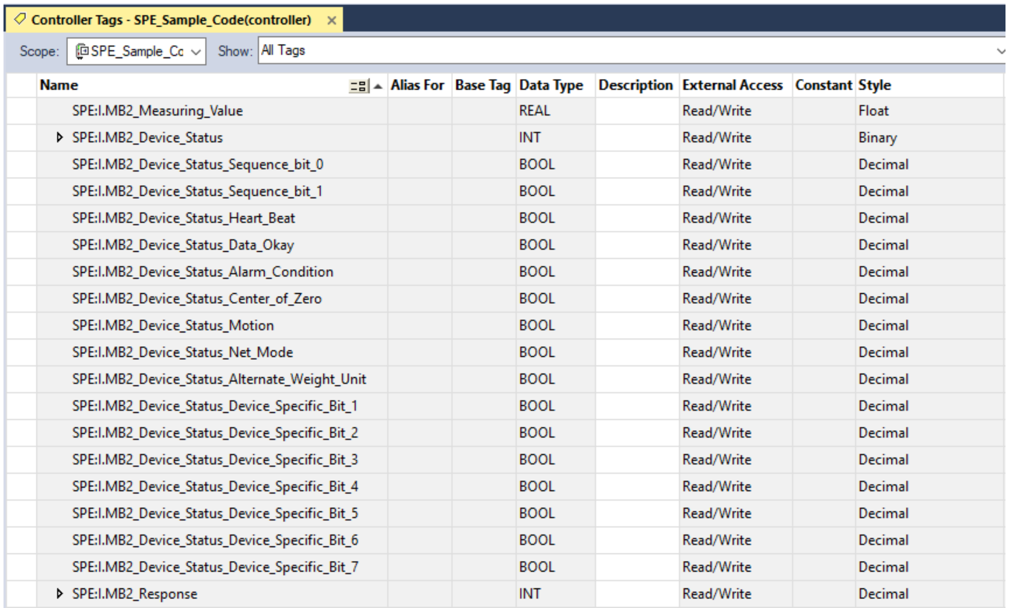
Status Block (Write)	
Word 4	Reserved
Word 5	Reserved
Word 6	Reserved
Word 7	Command (request for status)

Figure 3-2: SAI Output Data Structure as shown in the Device Overview

The SPE:I and SPE:O tags above will be used as input/output parameters in 4. Add on Instructions

The SPE 8-block project uses SAI 8 Block format which builds on the format structure used by the 2 Block format; providing support for higher cyclic data throughput (488 Hz update rate). This format was designed for applications where the users would need to control precise filling cut-off or other actions based on the weight data.

The measuring value of Fast Weight Update Channel is in SPE:MB2. The Fast Weight Update Channel is in the Add-On Instruction “SAI_APW_FastWeightChannel”. The structure of Measuring Block 2 (as well as all subsequent blocks) is identical to SAI Measuring Block 1, consisting of one floating point measuring value, one status word and a response integer.



Controller Tags - SPE_Sample_Code(controller)

Scope: SPE_Sample_Cc Show: All Tags

Name	Alias For	Base Tag	Data Type	Description	External Access	Constant	Style
SPE:I.MB2_Measuring_Value			REAL		Read/Write		Float
▸ SPE:I.MB2_Device_Status			INT		Read/Write		Binary
SPE:I.MB2_Device_Status_Sequence_bit_0			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Sequence_bit_1			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Heart_Beat			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Data_Okay			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Alarm_Condition			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Center_of_Zero			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Motion			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Net_Mode			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Alternate_Weight_Unit			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Device_Specific_Bit_1			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Device_Specific_Bit_2			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Device_Specific_Bit_3			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Device_Specific_Bit_4			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Device_Specific_Bit_5			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Device_Specific_Bit_6			BOOL		Read/Write		Decimal
SPE:I.MB2_Device_Status_Device_Specific_Bit_7			BOOL		Read/Write		Decimal
▸ SPE:I.MB2_Response			INT		Read/Write		Decimal

Figure 3-3: SAI Measuring Block 2_1 in the SPE Controller Tags

By default, upon powering up the SPE weigh module, the Fast Weight Update Channel weight value (MB2_Measuring Value) reports the exact same net weight as the Main Weight Channel (MB Measuring Value).

To receive the net weight with high update rate through the Fast Weight Update Channel (Measuring Block 2), the PLC must write the decimal value "14" into the Measuring Block 2 Command word (MB2 Command). However, all these PLC commands and responses have been taken care by the **"***SPE_Sample_Code_8block_v24"* sample project.

4. Add-On Instructions

Add-On Instructions are available for both cyclic and acyclic SAI commands. Cyclic Communication includes the Main Weight Channel, the Data OK and the Fast Weight Channel (8-block only). Examples of Add-On Instructions with acyclic communication are the Internal and External Adjustment

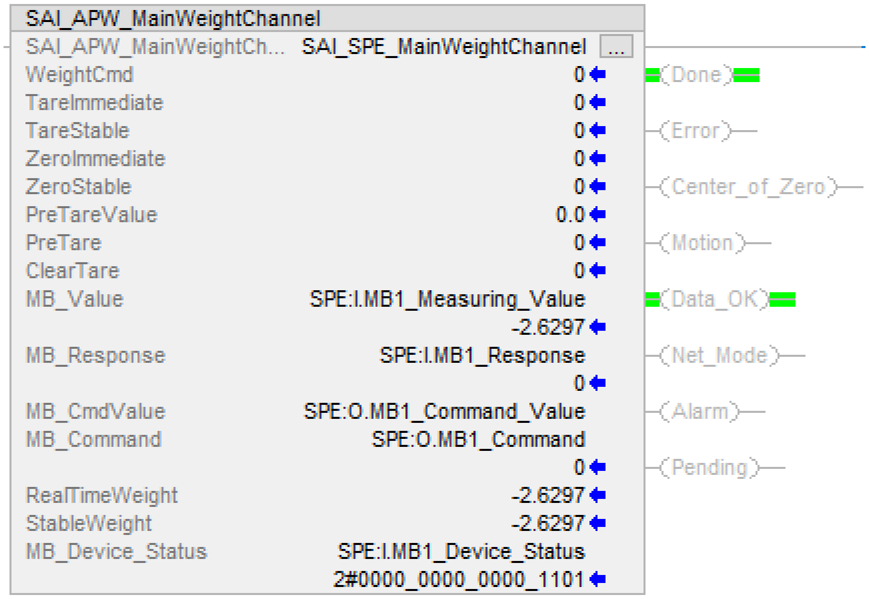
4.1. Main Weight Channel Control

This Add-On Instruction reads in all the important real-time, cyclical weighing data such as weight value, Data OK bit, Motion bit, Net mode bit and critical alarm bit.

Set the scale command bit one at a time to trigger different commands such as tare stable, zero stable, tare immediate, zero immediate, preset tare and clear tare. A successful execution of a scale command will set the Done bit on, else the Error bit will be set on instead.

The cyclic weight data can be reported automatically right after any scale command. The type of weight data (gross, net, or tare) being reported depends on the setting for WeightCmd. By default, the WeightCmd is decimal "3" and the function block will return a net weight value every time after any scale command such as tare or zero. Similarly, if the WeightCmd parameter is configured as decimal "0" or "1" the function block will then return a gross weight after any scale command.

This Add-On Instruction is occupying the SAI Measuring Block 1 input and output addresses.



SAI_APW_MainWeightChannel

SAI_APW_MainWeightCh...	SAI_SPE_MainWeightChannel
WeightCmd	0
TareImmediate	0
TareStable	0
ZeroImmediate	0
ZeroStable	0
PreTareValue	0.0
PreTare	0
ClearTare	0
MB_Value	SPE:I.MB1_Measuring_Value -2.6297
MB_Response	SPE:I.MB1_Response 0
MB_CmdValue	SPE:O.MB1_Command_Value
MB_Command	SPE:O.MB1_Command 0
RealTimeWeight	-2.6297
StableWeight	-2.6297
MB_Device_Status	SPE:I.MB1_Device_Status 2#0000_0000_0000_1101

Figure 4-1: SAI_APW_MainWeightChannel Add-On Instruction

Table 4-1: SAI_APW_MainWeightChannel Add-On Instruction Parameters

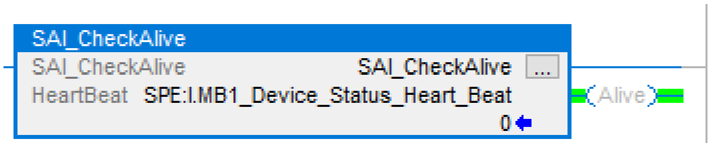
Input Parameters	Data Type	Values	Description
WeightCmd	Word	0, 1	Report gross weight value
		2	Report tare weight value
		3 (default)	**Report net weight value**
		5	Report gross weight value (with internal resolution)
		6	Report tare weight value (with internal resolution)
		7	Report net weight value (with internal resolution)
TareImmediate	Bool		Trigger this bit to perform immediate tare command. This tare command doesn't check for stability criteria. Upon completion of this command, the input bit will be reset.
TareStable	Bool		Trigger this bit to perform stable tare command. This tare command requires the weight value to remain stable within the stability criteria (+-1d within 0.3 second) for a predefined timeout range (3 seconds by default), failing

			which, the command will return an error. Upon completion of this command, the input bit will be reset.
ZeroImmediate	Bool		Trigger this bit to perform immediate zero command. The zero command can only be executed when the weight value is within the zero range (+-2% by default). Else, the command will return an error. Upon completion of this command, the input bit will be reset.
ZeroStable	Bool		Trigger this bit to perform a stable zero command. This zero command requires the weight value to remain stable within the stability criteria (+-1d within 0.3 second) for a predefined timeout range (3 seconds by default). Furthermore the weight value has to be in the zero range to trigger this command, failing either condition; the command will return an error. Upon completion of this command, the input bit will be reset.
PreTareValue	Real		The preset tare value which has to be configured before issuing the PreTare command. Valid PreTare value is between scale's zero point up to maximum capacity.
PreTare	Bool		Trigger this bit to perform a preset tare command. The PreTareValue has to be configured prior to issuing this PreTare command. Upon completion of this command, the input bit will be reset.
ClearTare	Bool		Trigger this bit to perform a clear tare command. This command removes the tare and brings the scale into gross mode. Upon completion of this command, the input bit will be reset.
MB_Value	Real		Refer to Device Overview, input address of MB Measuring Value
MB_Device_Status	Word		Refer to Device Overview, input address of MB Device Status
MB_Response	Word		Refer to Device Overview, input address of MB Response
MB_CmdValue	Real		Refer to Device Overview, output address of MB Command Value
MB_Command	Word		Refer to Device Overview, output address of MB Command
Output Parameters	Data Type	Values	Description
RealTimeWeight	Real		Real-time weight value, can be gross, tare or net weight
StableWeight	Real		Stable weight value, the last real-time weight during Motion = 0
DataOK	Bool	0	This bit gets set to 0 when the device is still operational but the value being reported cannot be guaranteed to be valid. The following conditions cause the Data Okay bit to be set to 0: • Device is powering up • Device is in setup mode • Device is in test mode • Over capacity condition occurs - When the A/D converter is at its limit

			- Product dependent over capacity that occurs when the device determines it cannot trust the weight • Under capacity condition occurs - When the A/D converter is at its limit - Product dependent under capacity that occurs when the device determines it cannot trust the weight
		1	Weight data is normal, valid
CenterOfZero	Bool		1 = Gross weight value is at a value of zero +/- one quarter of a weight and measures verification interval denoted as "e".
Motion	Bool	0	Weight value is stable
		1	Weight value is in motion
NetMode	Bool	0	Weighing is in gross mode
		1	Weighing is in net mode
Alarm	Bool	0	No alarm
		1	Also called the RedAlert alarm. If this bit is true it is an indication that the control device should stop until the source of the alarm is evaluated and corrected. The control system should use a Field Value command or evaluate the RedAlert status block to determine the nature of the alarm.
Pending	Bool	0	Zero, tare or clear tare command is completed, or failed
		1	Zero, tare or clear tare command is in process
Done	Bool	0	Zero, tare or clear tare command is in process, or failed
		1	Zero, tare or clear tare command is successful
Error	Bool	0	Zero, tare or clear tare command is in process, or succeeded
		1	Zero, tare or clear tare command is not completed due to error

4.2. SAI_CheckAlive

Use this Add-On Instruction to cyclically verify the device's connectivity to the PLC. The alive bit will toggle between 0 and 1 to verify communication between the SPE and the PLC.



SAI_CheckAlive
SAI_CheckAlive   SAI_CheckAlive
HeartBeat   SPE:I.MB1_Device_Status_Heart_Beat
0

Figure 4-2: SAI_CheckAlive Add-On Instruction

Table 4-2: SAI_CheckAlive Add-On Instruction Parameters

Input Parameters	Data Type	Values	Description
HeartBeat	Bool		Toggles between 0 and 1 to monitor the 'heatbeat' of the device. If it is stays at 0 or 1 then there is no communication to the device.
Output Parameters	**Data Type**	**Values**	**Description**
Alive	Bool	0	Critical device failure
		1	No alarm

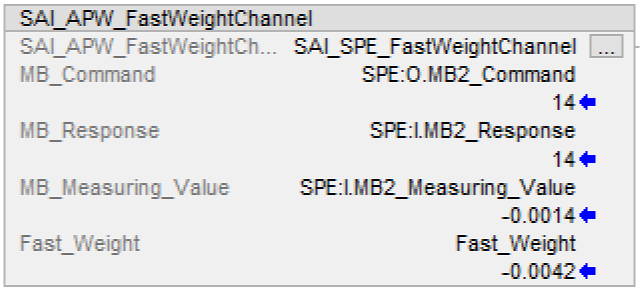
4.3. Fast Weight Channel

SPE modules by default have a Main Weight Channel for weight values with an update rate of 122 values per second and includes filters optimized for gross-tare weighing.

The SPE firmware versions 4.0.1 and higher include an additional Fast Weight Update Channel with increased weight update rate of 488 values per second for sending and 244 values per second for receiving data. This Fast Weight Update Channel is tailored to address the needs of filling applications where precision is required.

This increased weight update rate enables the user to make control decisions more quickly than in previous versions. The dual channel concept and an 8-block Standard Automation Interface (SAI) format allows the user to simultaneously observe weight values at 122Hz and at 488Hz. This new firmware allows separate filter settings on the Main Weight Channel (adaptive or linear filter) and the Fast Weight Update Channel (linear filter, or FCUT2). With this functionality, the Fast Weight Update Channel is optimized on speed, and the Main Weight Channel can be tuned to achieve more stability.

The Add-On Instruction "SAI_APW_FastWeightChannel" is only available in the SAI 8 Block sample project. This Add-On Instruction occupies the SAI Measuring Block 2 input and output addresses.



SAI_APW_FastWeightChannel
SAI_APW_FastWeightCh... SAI_SPE_FastWeightChannel
MB_Command SPE:O.MB2_Command
14
MB_Response SPE:I.MB2_Response
14
MB_Measuring_Value SPE:I.MB2_Measuring_Value
-0.0014
Fast_Weight Fast_Weight
-0.0042

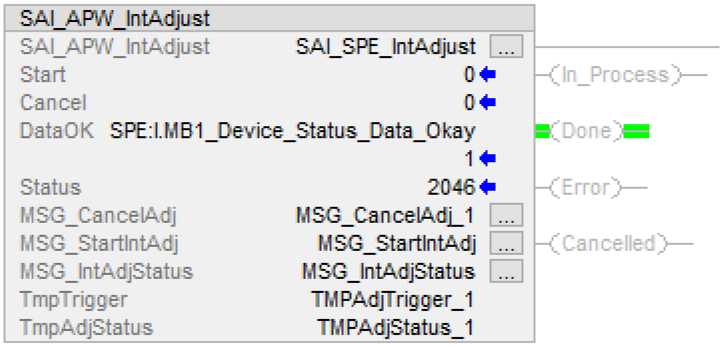
Figure 4-3: SAI_APW_FastWeightChannel Add-On Instruction

Table 4-3: SAI_APW_FastWeightChannel Add-On Instruction Parameters

Input Parameters	Data Type	Values	Description
MB_Measuring_Value	Real		Refer to Device Overview, input address of MB2 Measuring Value
MB_Command	Word		Refer to Device Overview, output address of MB2 Command
MB_Response	Word		Refer to Device Overview, input address of MB2 Response
Output Parameters	Data Type	Values	Description
Fast_Weight	Real		Real-time fast channel net weight value at 366Hz. The cut-off frequency of fast weight channel is the FCUT2 setting on Function Block "SAI_APW_ModuleParameters".

4.4. APW Internal Adjustment

Use this Add-On Instruction to perform scale adjustment with built-in internal weight.



SAI_APW_IntAdjust
SAI_APW_IntAdjust SAI_SPE_IntAdjust ...
Start 0
Cancel 0
DataOK SPE:I.MB1_Device_Status_Data_Okay 1
Status 2046
MSG_CancelAdj MSG_CancelAdj_1 ...
MSG_StartIntAdj MSG_StartIntAdj ...
MSG_IntAdjStatus MSG_IntAdjStatus ...
TmpTrigger TMPAdjTrigger_1
TmpAdjStatus TMPAdjStatus_1

Figure 4-4: SAI_APW_IntAdjust Add-On Instruction

When the operating environment is in stable condition, trigger the Start input bit to run the adjustment procedure.

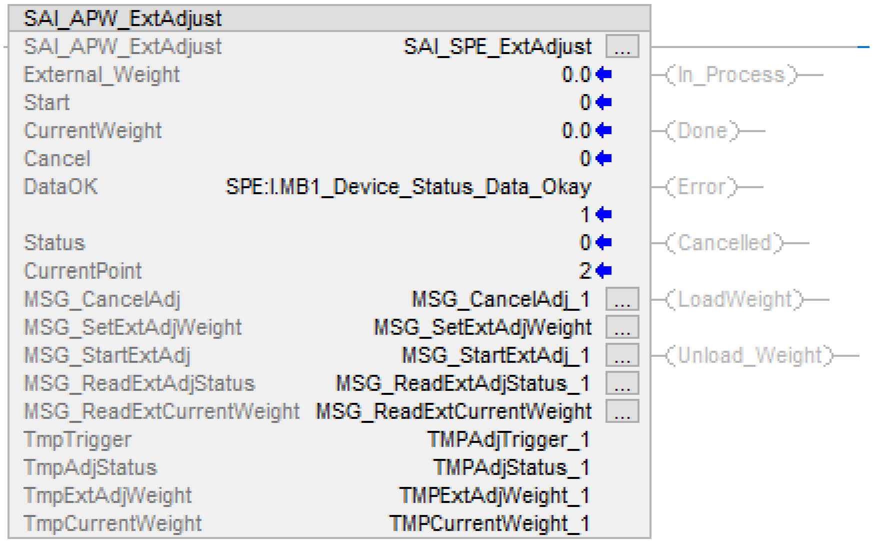
Table 4-4: SAI_APW_IntAdjust Add-On Instruction Parameters

Input Parameters	Data Type	Values	Description
Start	Bool	1, 0	Trigger this input bit to start the adjustment process.
Cancel	Bool	1, 0	Trigger this input bit to cancel/ abort the adjustment process after being started.
Output Parameters	Data Type	Values	Description
InProcess	Bool	1	Adjustment is started and in process
		0	Adjustment is not started
Done	Bool	1	Adjustment is completed successfully

		0	Adjustment is in process or in error state
Error	Bool	1	Adjustment failed due to error
		0	No error
Cancelled	Bool	1	Adjustment is cancelled successfully
		0	No cancellation

4.5. APW External Adjustment

Use this Add-On Instruction to perform scale adjustment with external weight.



SAI_APW_ExtAdjust
SAI_APW_ExtAdjust SAI_SPE_ExtAdjust
External_Weight 0.0
Start 0
CurrentWeight 0.0
Cancel 0
DataOK SPE:I.MB1_Device_Status_Data_Okay 1
Status 0
CurrentPoint 2
MSG_CancelAdj MSG_CancelAdj_1
MSG_SetExtAdjWeight MSG_SetExtAdjWeight
MSG_StartExtAdj MSG_StartExtAdj_1
MSG_ReadExtAdjStatus MSG_ReadExtAdjStatus_1
MSG_ReadExtCurrentWeight MSG_ReadExtCurrentWeight
TmpTrigger TMPAdjTrigger_1
TmpAdjStatus TMPAdjStatus_1
TmpExtAdjWeight TMPExtAdjWeight_1
TmpCurrentWeight TMPCurrentWeight_1

Figure 4-5: SAI_APW_ExtAdjust Add-On Instruction

Configure the "External_Weight" according to the adjustment weight to be used. The weight unit is gram by default. Trigger the Start input bit to run the adjustment procedure.

Table 4-5: SAI_APW_ExtAdjust Add-On Instruction Parameters

Input Parameters	Data Type	Values	Description
External_Weight	REAL (32 bits)	Example: "200.00"	This is the span weight value for the sensitivity adjustment.
Start	Bool	1, 0	Trigger this input bit to start the adjustment process.
Cancel	Bool	1, 0	Trigger this input bit to cancel/ abort the adjustment process after being started.
Output Parameters	Data Type	Values	Description
CurrentWeight	REAL (32 bits)	Example: "200.00"	The required reference weight here is shown here.
Load_Weight	Bool	1	User has to load the external weight according to the value displayed in CurrentWeight.

		0	No action required from the user
Unload_Weight	Bool	1	User has to unload the external weight
		0	No action required from the user
InProcess	Bool	1	Adjustment is started and in process
		0	Adjustment is not started
Done	Bool	1	Adjustment is completed successfully
		0	Adjustment is in process or in error state
Error	Bool	1	Adjustment failed due to error
		0	No error
Cancelled	Bool	1	Adjustment is cancelled successfully
		0	No cancellation

5. Sample Code Migration

5.1. Hardware Configurations

1) Under Controller Organizer -> I/O Configuration -> Right click on Ethernet and select “New Module…”.

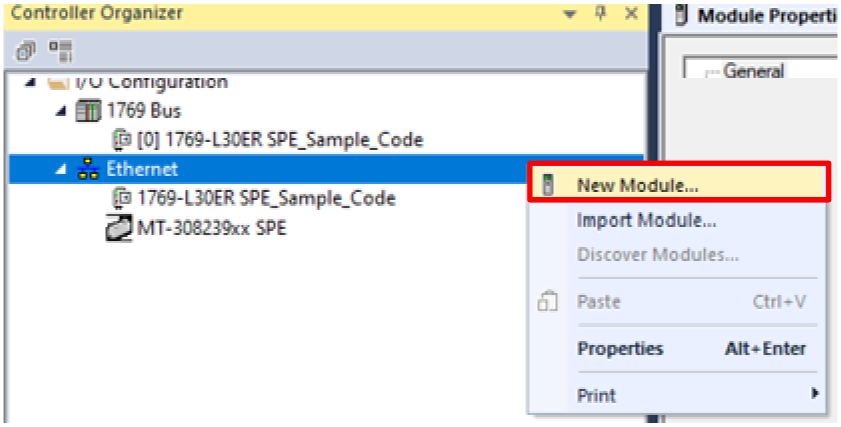
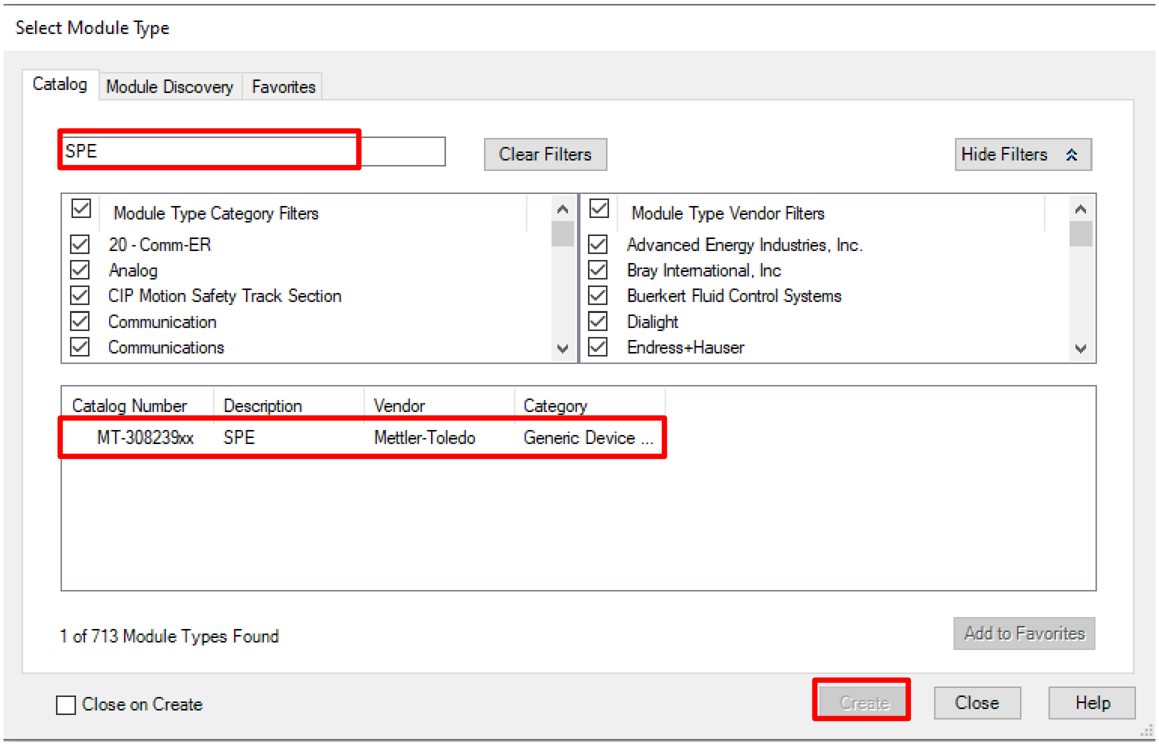


Figure 5-1: Add a Ethernet device, Add Module

2) Search “SPE” and add the appropriate Module



SPE

☑ Module Type Category Filters
☑ 20 - Comm-ER
☑ Analog
☑ CIP Motion Safety Track Section
☑ Communication
☑ Communications

☑ Module Type Vendor Filters
☑ Advanced Energy Industries, Inc.
☑ Bray International, Inc
☑ Buerkert Fluid Control Systems
☑ Dialight
☑ Endress+Hauser

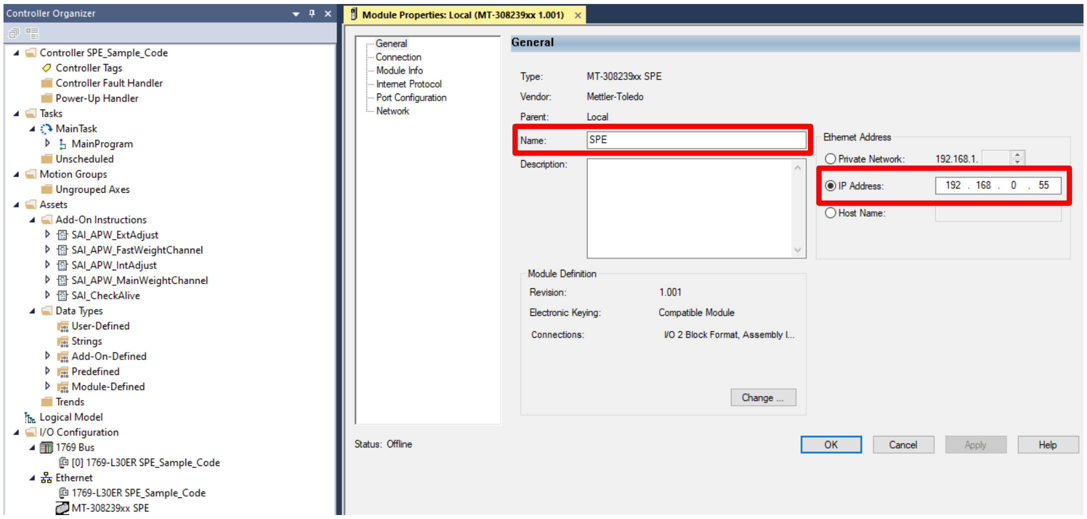
Catalog Number	Description	Vendor	Category
MT-308239xx	SPE	Mettler-Toledo	Generic Device ...

1 of 713 Module Types Found

☐ Close on Create

Figure 5-2: Add a Ethernet device, Search for SPE

3) Assign the independent device name and IP address for the added device.



Type: MT-308239xx SPE
Vendor: Mettler-Toledo
Parent: Local
Name: SPE
Description:

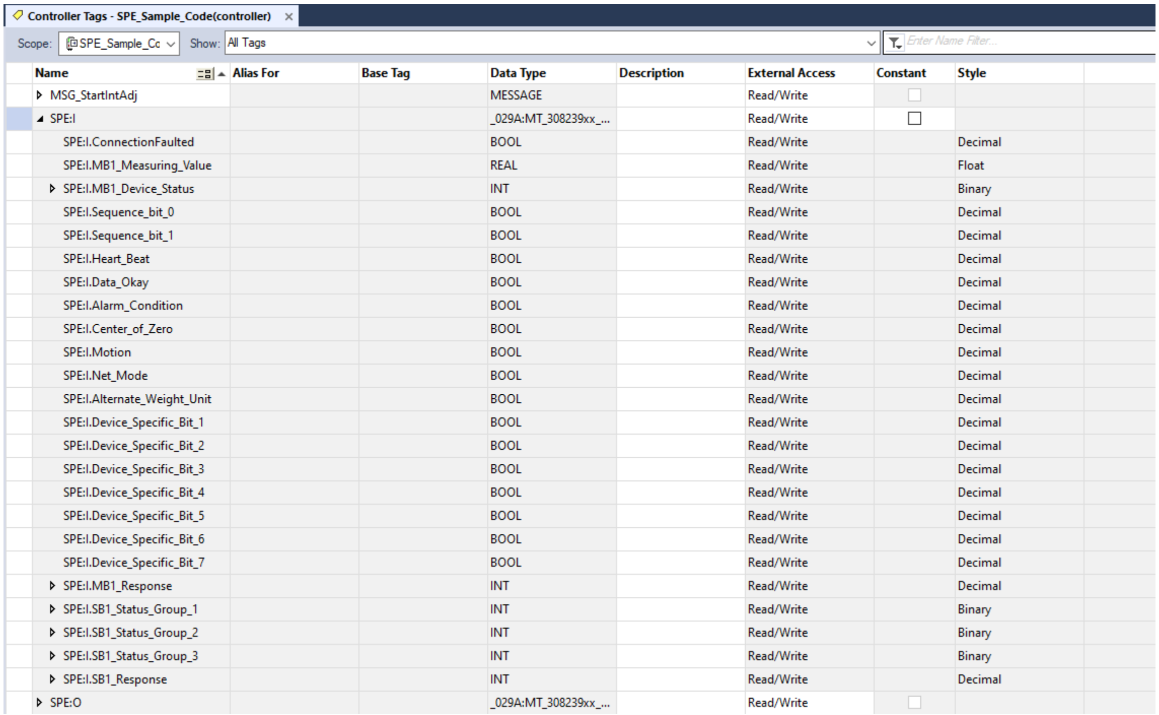
Ethernet Address
○ Private Network: 192.168.1.
● IP Address: 192 . 168 . 0 . 55
○ Host Name:

Module Definition
Revision: 1.001
Electronic Keying: Compatible Module
Connections: I/O 2 Block Format, Assembly I...

Status: Offline

Figure 5-3: Ethernet/IP device name and IP address

4) The sample code is following the default I/O tag assignment as shown below. To minimize the modification to the code, consider sticking to the same I/O tag assignment.



Name	Alias For	Base Tag	Data Type	Description	External Access	Constant	Style
MSG_StartIntAdj			MESSAGE		Read/Write	☐	
SPE:I			_029A:MT_308239xx_...		Read/Write	☐	
SPE:I.ConnectionFaulted			BOOL		Read/Write		Decimal
SPE:I.MB1_Measuring_Value			REAL		Read/Write		Float
SPE:I.MB1_Device_Status			INT		Read/Write		Binary
SPE:I.Sequence_bit_0			BOOL		Read/Write		Decimal
SPE:I.Sequence_bit_1			BOOL		Read/Write		Decimal
SPE:I.Heart_Beat			BOOL		Read/Write		Decimal
SPE:I.Data_Okay			BOOL		Read/Write		Decimal
SPE:I.Alarm_Condition			BOOL		Read/Write		Decimal
SPE:I.Center_of_Zero			BOOL		Read/Write		Decimal
SPE:I.Motion			BOOL		Read/Write		Decimal
SPE:I.Net_Mode			BOOL		Read/Write		Decimal
SPE:I.Alternate_Weight_Unit			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_1			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_2			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_3			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_4			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_5			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_6			BOOL		Read/Write		Decimal
SPE:I.Device_Specific_Bit_7			BOOL		Read/Write		Decimal
SPE:I.MB1_Response			INT		Read/Write		Decimal
SPE:I.SB1_Status_Group_1			INT		Read/Write		Binary
SPE:I.SB1_Status_Group_2			INT		Read/Write		Binary
SPE:I.SB1_Status_Group_3			INT		Read/Write		Binary
SPE:I.SB1_Response			INT		Read/Write		Decimal
SPE:O			_029A:MT_308239xx_...		Read/Write	☐	

Figure 5-4: Controller Tags