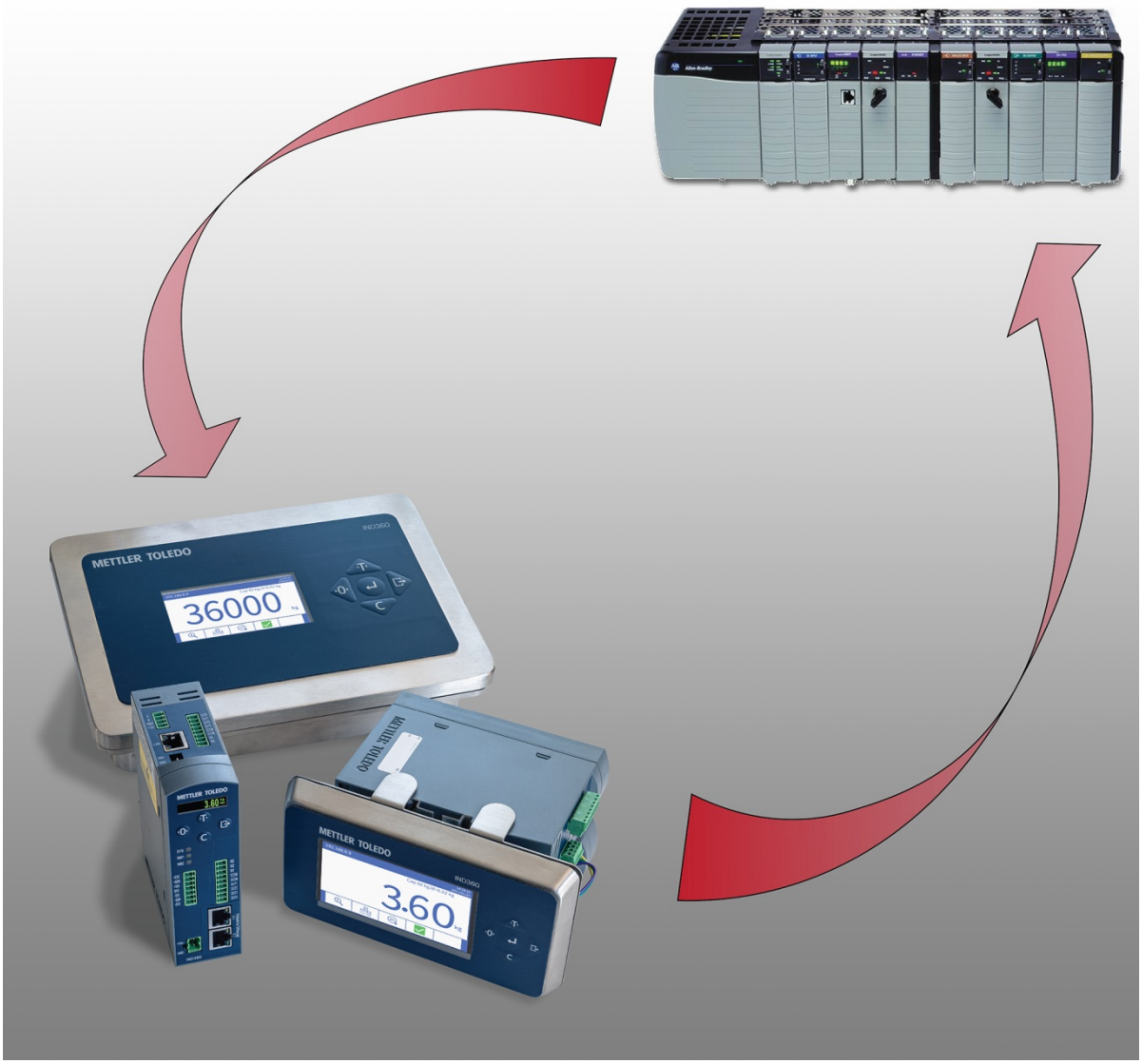
Engineering Note

IND360 Precision

EtherNet/IP Sample Code



METTLER TOLEDO

Table of Contents

NOTICE	
NOTE: THE CONFIGURATION USED IN THIS SAMPLE CODE IS BASED ON THE DEFAULT SETTINGS:	
Rockwell Studio5000:	Version 24
PLC:	1769-L30ER
SAI DATA FORMAT:	2-BLOCK FORMAT (DEFAULT), 8-BLOCK FORMAT
IND360 IP ADDRESS:	192.168.0.2
EDS FILE:	MT_IND360_EIP_V1.1_20200728
IND360 DEVICE FIRMWARE VERSION:	V1.00.0012

It is recommended to integrate one IND360 into the PLC EtherNet/IP network and go through the sample code to understand the functionality of each Add-On Instruction (AOI).

1. Configure Development Environment

1.1. Confirm EDS Installation

This sample code project utilizes an EDS file for the IND360. These files can be found on www.mt.com/ind-ind360-downloads.

To confirm installation of IND360 EDS file:

1. In any Studio 5000 project, right click on "Ethernet" within the I/O Configuration folder in the controller organizer.
2. Select New Module.

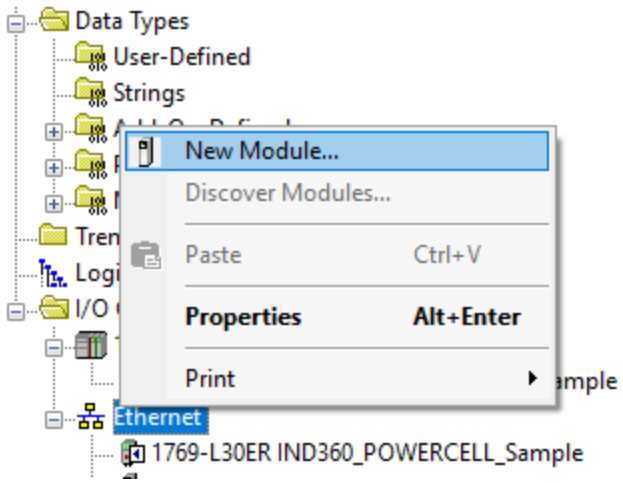


Figure 1-1: Try to add a new module to confirm EDS is installed

3. Search IND360

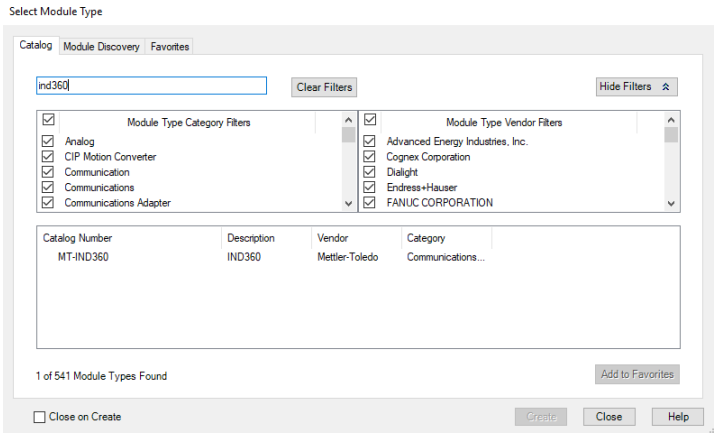


Figure 1-2: Search for IND360

If the EDS is installed, there should be an option for MT-IND360. If the search returns no results, follow these steps to install the EDS:

1. Go to the IND360 download page: www.mt.com/ind-IND360-downloads
2. Click the EDS file to begin the download.
3. Once the download is complete, unzip the folder
4. Use the EDS installation tool in Studio5000 to install the EDS.

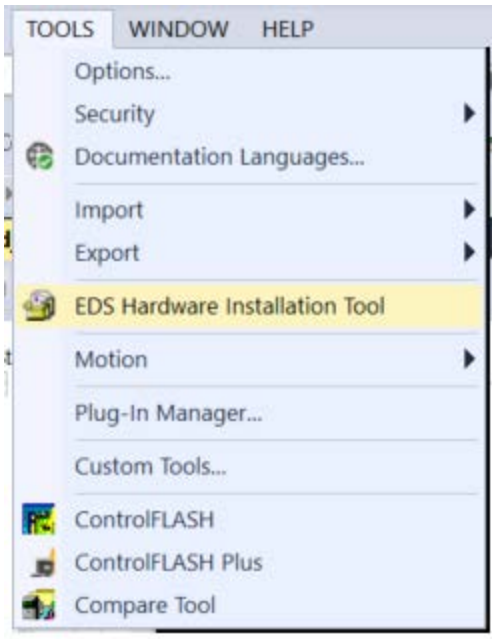


Figure 1-3: Use the EDS Hardware Installation Tool to complete installation

1.2. Import Example as a New Project

You need Studio5000 V24 or above to import the examples.

Import the project in Studio5000, click "File-> Open"

Select the .ACD file and click open. The project will load.

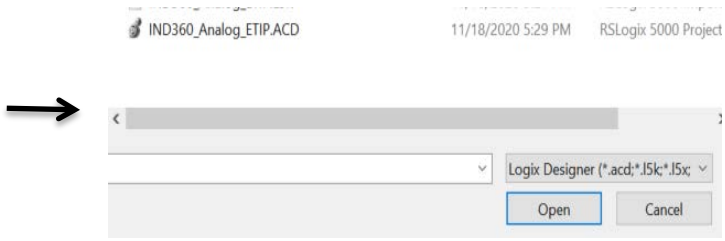


Figure 1-4: Import Project

1.3. Import Example to an Existing Project

1. Add an MT-IND360 to the I/O Configuration in the existing project. See the first steps of Section 3 for more information on how to complete this. Using the name "IND360" and the IP Address 192.168.0.2 will require no changes to the sample code. If a different name or IP address is required, steps explaining what changes to make are provided below.

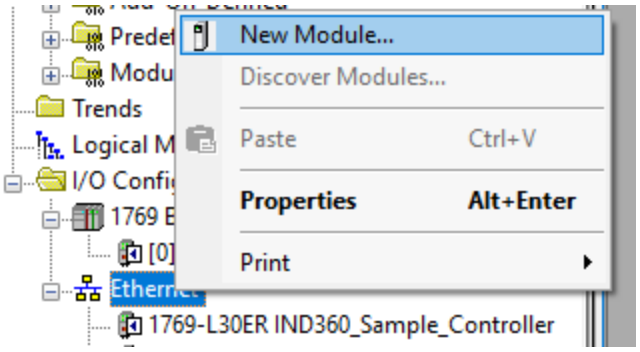


Figure 1-5: Add IND360 to the existing project

2. Copy the Add-On Instructions from the Add-On Instructions folder in the Controller Organizer of the sample project and paste in the same location in the existing project.

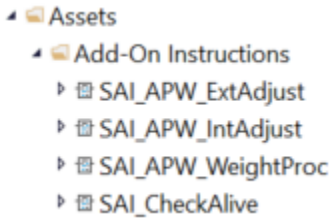


Figure 1-6: Copy/Paste AOIs

3. Copy the controller tags from the sample code project and paste in the controller tags of the existing project. Make sure not to copy the IND360:I and IND360:O tags since those are already present in the existing project.

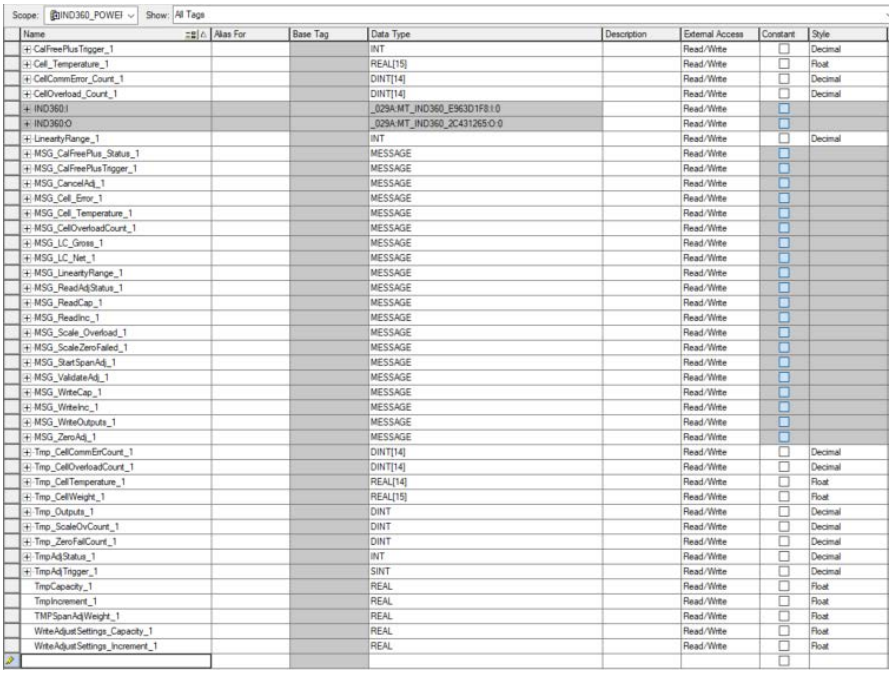


Figure 1-7: Copy/Paste Controller Tags

4. Copy the Main Program local tags from the sample project and paste in the tags for the existing project.

Figure 1-8: Copy/Paste Main Program Local Tags

5. Copy the "MT_IND_Application" routine from the sample project and paste in the existing project.

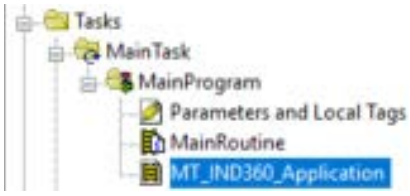


Figure 1-9: Copy/Paste the Routine

6. Make sure something in the existing project calls the MT_IND_Application. Any AOIs that automatically monitor weight conditions will not run if nothing calls this routine.

7. If a name other than "IND360" was used as the name of the transmitter in the project, replace every use of "IND360" in the AOI instances with the name given to the transmitter in the project.

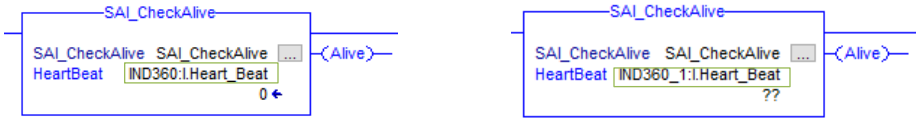


Figure 1-10: Example of name "IND360_1" used in project

8. If an IP address other than 192.168.0.2 was used for the IND360 in the project, open the message configuration for every message in every AOI instance and in the communication tab, browse to the appropriate IND360 to set the path for the message.

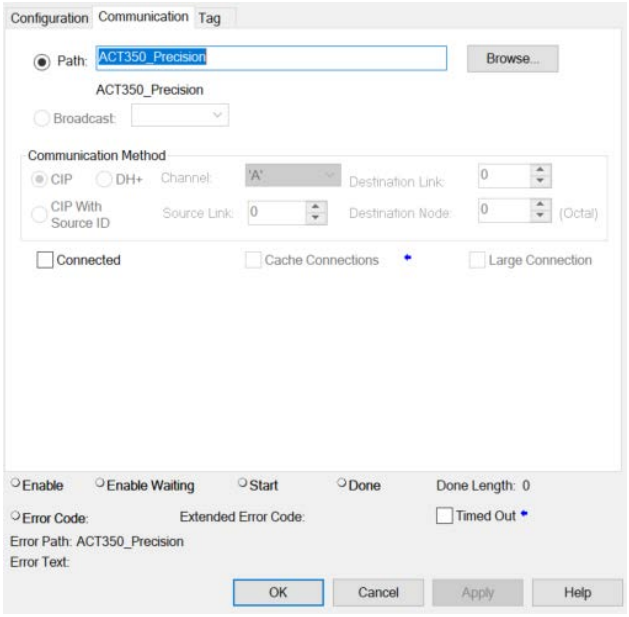


Figure 1-11: Set the Communication Path for each Message

1.4. Configure Controller Type

Please note that this is only necessary if using the sample code as the basis for the PLC project. If importing the routine and AOIs into an already existing project, this is unnecessary.

Right-click the project's controller, select Properties, and set the controller type.

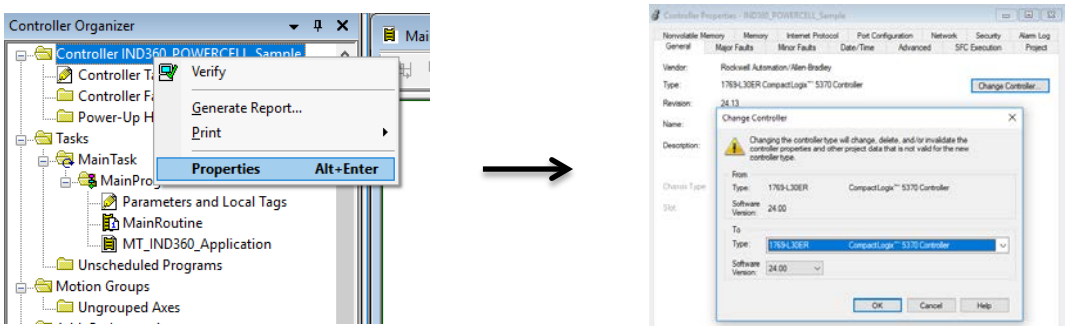


Figure 1-12: Configure controller type

Download the project to the controller and test.

2. Add-On Instructions(AOI)

About the configuration of the Messages in the add-on instructions:

Add-On Instructions that use acyclic communication functions, such as zero point adjustment, span adjustment, etc. need to create and configure Message variables, set paths and indicate which device to use for acyclic communication. The path of each device is different when multiple devices are networked.

Figure 2-2-1: Configure Message Variable

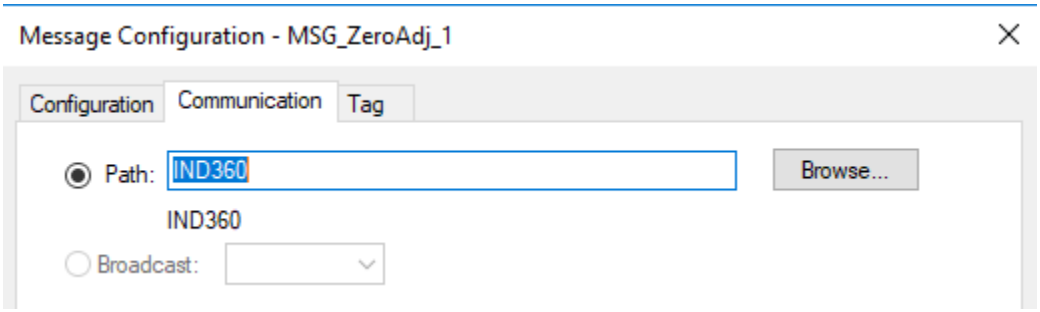


Figure 2-2-2: Set the path of the Message variable

Message configuration must be accessed via the AOI block in the main program. The message configuration cannot be accessed inside of the AOI logic files.

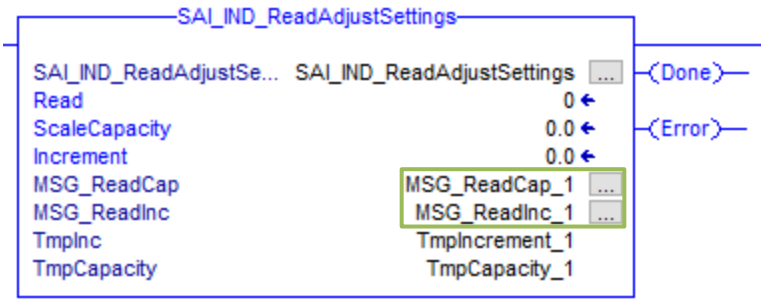


Figure 2-3: Access Message Configuration

2.1. Cyclic Weight Data

Read the real-time and stable weight from the transmitter. When performing zero and tare commands, the weight will stop updating.

Trigger execution of stable tare, stable zero, immediate tare, immediate zero and clear tare by setting that particular bit high. The response can be read, and there are flags for execution success and failure to indicate the result.

After the zero and tare commands are completed, the AOI will automatically restore whatever command is in WeightCmd and weight will be reported again. Typical values for WeightCmd are 0 (report gross weight) or 3 (report net weight). The DataOK bit is reset to 0 during overload, underload, adjustment and several other scenarios which can be used to judge abnormal conditions.

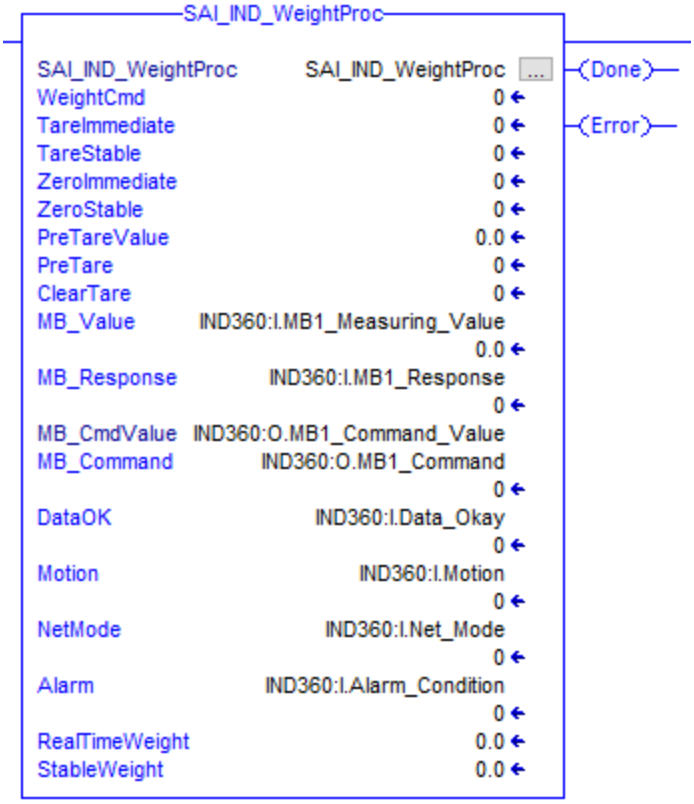


Figure 2-4: SAI_IND_WeightProc AOI

Input Parameters	Data Type	Description
WeightCmd	INT	Use this value to request the IND360 to report weight. When a zero or tare cyclic command is sent, the IND360 stops reporting weight. This AOI will automatically restore this command once the zero or tare command completes. 0 or 1 = Report gross weight 2 = Report tare weight 3 = Report net weight 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	Set = 1 to issue tare command regardless of whether the weight value is stable or not. Net weight will not automatically be reported after tare command is issued. Recommended to use cyclic command 3 (report net weight) in WeightCmd input to receive net weight
TareStable	Bool	Set = 1 to issue tare command to IND360 when weight is stable. Command will timeout if remain within the stability criteria (+/- 1d within 0.3 seconds default) for a predefined timeout range (3 seconds default). Net weight will not automatically be reported after tare command is issued. Recommended to use cyclic command 3 (report net weight) in WeightCmd input to receive net weight

ZeroImmediate	BOOL	Set = 1 to issue zero command regardless of whether the weight value is stable or not. This is only intended for minor changes to the zero point due to drifting. For a formal zero adjustment, use the SAI_IND_ZeroAdjust AOI. Command will return an error if weight value is not within the zero range (+/- 2% default).
ZeroStable	BOOL	Set = 1 to issue zero command to IND360 when weight is stable. Command will timeout if remain within the stability criteria (+/- 1d within 0.3 seconds default) for a predefined timeout range (3 seconds default). This is only intended for minor changes to the zero point due to drifting. For a formal zero adjustment, use the SAI_IND_ZeroAdjust AOI. Command will return an error if weight value is not within the zero range (+/- 2% default).
PreTareValue	Real	Configure with preset tare value. This value will not be sent to IND360 until Pretare input is set to 1.
Pretare	BOOL	Set = 1 when ready to perform preset tare using the value from PreTareValue.
ClearTare	BOOL	Set = 1 to clear the current tare value.
MB_Value	Real	This should always be set to the MB1_Measuring_Value of the IND360. This will provide weight data for the AOI
MB_Response	INT	This should always be set to MB1_Response value of the IND360. Once a cyclic command is successfully executed, MB_Response = MB_Command. The AOI uses this information to detect if a command has been executed successfully or if an error has occurred.
DataOK	BOOL	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
Motion	Bool	This should always be set to Motion bit of IND360. Motion bit is high when the weight value is not stable. ZeroStable and TareStable commands will not complete while the Motion bit is high.
NetMode	BOOL	This should always be set to the Net_Mode bit of the IND360. NetMode = 1 after a tare command has been executed. Just because NetMode = 1, does not mean net weight is being reported by the IND360. Net weight must be requested by the PLC (cyclic command 3).
Alarm	BOOL	This should always be set to Alarm_Condition bit of IND360. Bit will go high when alarm conditions are present. Bit will automatically go low when no alarm conditions are present. See SAI manual for more information on what causes the Alarm_Condition to go high.
Output Parameters	Data Type	Description
MB_Command	INT	This should always be set to MB1_Command value of the IND360. Value of the last cyclic command sent to the IND360. Once successfully executed, MB_Response = MB_Command.

RealTimeWeight	Real (32 bits)	Current weight of the scale. This value is updated constantly while the AOI is enabled.
StableWeight	Real (32 bits)	Latest stable weight reading of the scale. This value does not update whenever the Motion bit is high.
Done	BOOL	Will be latched high when zero or tare command has successfully completed. When a new zero or tare command begins, bit will be unlatched until command completes successfully
Error	BOOL	Will be latched high when zero or tare command fails to complete. When a new zero or tare command begins, bit will be unlatched until a command fails to complete.

2.2. Communication Heart Beat Monitoring

Monitoring communication between the controller and IND360. If Alive bit is set, cyclic communications between the controller and transmitter are active.

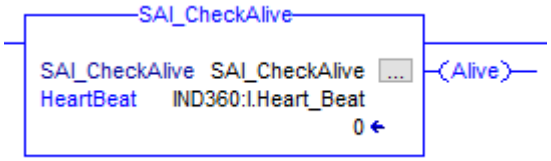


Figure 2-5: SAI_CheckAlive AOI

Input Parameters	Data Type	Description
HeartBeat	BOOL	This should always be set to Heart_Beat bit of IND360. This bit will pulse on and off each second if cyclic communications between the IND360 and the controller are established
Output Parameters	**Data Type**	**Description**
Alive	BOOL	This bit = 1 if cyclic communications are established between the IND360 and the controller.

2.3. Internal Adjustment

Some select Precision scales feature a built-in test weight to perform an adjustment. This AOI allows the automation system to trigger this internal adjustment. Once triggered, the scale will automatically lower and raise the internal test weight. Set the Start bit = 1 to start the adjustment. The Done and Error flags will indicate the result. The DataOK bit is cleared during the adjustment process.

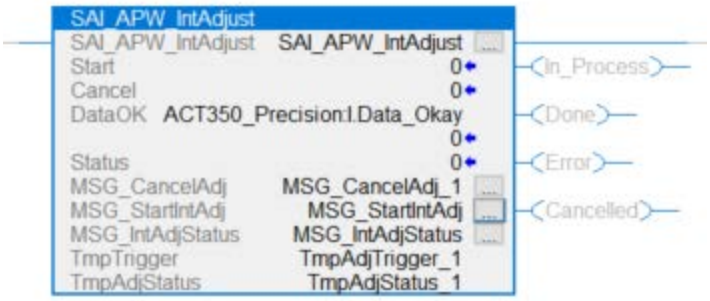


Figure 2-6: SAI_APW_IntAdjust AOI

Input Parameters	Data Type	Description
Start	BOOL	Set = 1 to begin the internal adjustment process
Cancel	BOOL	Set = 1 to cancel the internal adjustment process
DataOK	BOOL	Should always be set to the DataOK bit of the IND360. This bit will go low while the adjustment is in progress.
Output Parameters	**Data Type**	**Description**
Done	BOOL	Latched high when internal adjustment successfully completes. Unlatched when a new internal adjustment begins.
Error	BOOL	Latched high if an error occurred and internal adjustment could not complete. Unlatched when a new internal adjustment begins. Check the errors of the messages for this AOI to troubleshoot
Status	INT	0 = internal adjustment has not begun. 2047 = internal adjustment in process. 2046 = internal adjustment completed successfully.
In/Out Parameters	**Data Type**	**Description**
MSG_CancelAdj	Message	**Message Type:** CIP Generic **Service Type:** Set Attribute Single **Class:** 410 (Hex) **Instance:** 1 **Attribute:** 4 (Hex) **Source Element:** TmpAdjTrigger_1 **Source Length:** 1 (Bytes) **Communication -> Path:** Browse for the appropriate IND360
MSG_StartIntAdj	Message	**Message Type:** CIP Generic **Service Type:** Set Attribute Single **Class:** 410 (Hex) **Instance:** 1 **Attribute:** 1 (Hex) **Source Element:** TmpAdjTrigger_1 **Source Length:** 1 (Bytes) **Communication -> Path:** Browse for the appropriate IND360
MSG_IntAdjStatus	Message	**Message Type:** CIP Generic **Service Type:** Get Attribute Single **Class:** 410 (Hex) **Instance:** 1 **Attribute:** 7 (Hex) **Destination Element:** TmpAdjStatus_1 **Communication -> Path:** Browse for the appropriate IND360
TmpTrigger	SINT	Temporary value for use with AOI message

TmpAdjStatus	INT	Temporary value for use with AOI message

2.4. External Adjustment

This AOI performs an adjustment of the scale using an external test weight.

Configure test weight to be used in the adjustment process. Set Start = 1 when ready to begin adjustment.

When Unload_Weight = 1, remove all weight from the scale. When LoadWeight = 1, place the external test weight on the scale.

If the Done or Error flag is set, the adjustment is complete.
The adjustment process can be cancelled any time by setting Cancel = 1.
The DataOK bit is cleared during the calibration process.

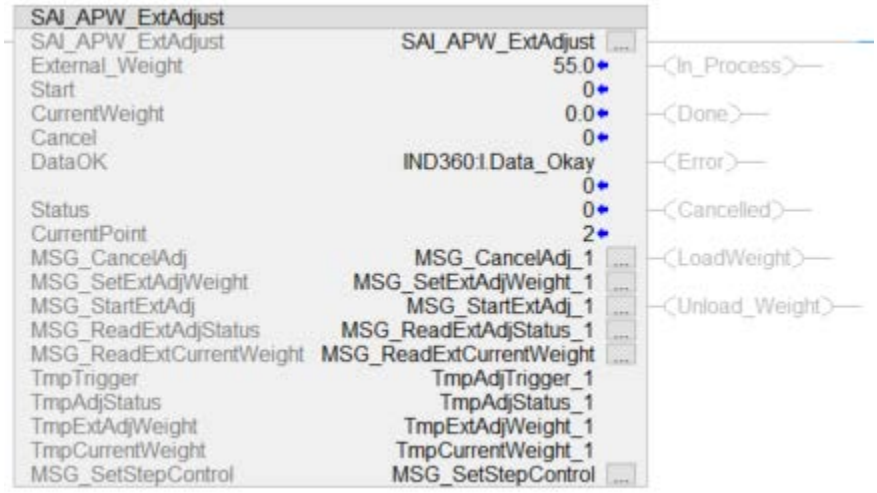


Figure 2-7: SAI_APW_ExtAdjust AOI

Input Parameters	Data Type	Description
External_Weight	REAL	Weight value of the external test weight
Start	BOOL	Set = 1 once External_Weight is configured to begin process.
Cancel	BOOL	Set = 1 to cancel adjustment process
DataOK	BOOL	Always set to the DataOK bit of the IND360. This bit will go low when the adjustment is in progress.
Output Parameters	**Data Type**	**Description**
CurrentWeight	REAL	The value of the test weight that should be placed on the scale
In_Process	BOOL	Goes high while the external adjustment is in process.
Done	BOOL	Latched high when adjustment completes successfully. Unlatched when another external adjustment begins.
Error	BOOL	Latched high if an error occurred and adjustment could not

		complete. Unlatched when another span adjustment begins. Check the errors of the messages for this AOI to troubleshoot
Cancelled	BOOL	Latched high if the adjustment process was cancelled. Unlatched when another span adjustment begins.
LoadWeight	BOOL	High when user needs to load test weight corresponding to the value of External_Weight.
Unload_Weight	BOOL	High when user needs to remove all weight from the scale.
Status	INT	Value generally only needed for troubleshooting purposes. 0 = span adjustment has not begun or has completed. 2047 = span adjustment in process.
CurrentPoint	DINT	Value = current adjustment point being calibrated
In/Out Parameters	Data Type	Description
MSG_CancelAdj	Message	**Message Type:** CIP Generic **Service Type:** Set Attribute Single **Class:** 410 (Hex) **Instance:** 1 **Attribute:** 4 (Hex) **Source Element:** TmpAdjTrigger_1 **Source Length:** 1 (Bytes) **Communication -> Path:** Browse for the appropriate IND360
MSG_SetExtAdjWeight	Message	**Message Type:** CIP Generic **Service Type:** Set Attribute Single **Class:** 410 (Hex) **Instance:** 1 **Attribute:** 9 (Hex) **Source Element:** TMPExtAdjWeight_1 **Source Length:** 4 (Bytes) **Communication -> Path:** Browse for the appropriate IND360
MSG_StartExtAdj	Message	**Message Type:** CIP Generic **Service Type:** Set Attribute Single **Class:** 410 (Hex) **Instance:** 1 **Attribute:** 2 (Hex) **Source Element:** TMPAdjTrigger_1 **Source Length:** 1 (Bytes) **Communication -> Path:** Browse for the appropriate IND360
MSG_ReadExtAdjStatus	Message	**Message Type:** CIP Generic **Service Type:** Get Attribute Single **Class:** 410 (Hex) **Instance:** 1 **Attribute:** 7 (Hex) **Destination Element:** TmpAdjStatus_1 **Communication -> Path:** Browse for the appropriate IND360
MSG_ReadExtCurrentWeight	Message	**Message Type:** CIP Generic **Service Type:** Get Attribute Single **Class:** 410 (Hex) **Instance:** 1 **Attribute:** 11 (Hex) **Destination Element:** TmpCurrentWeight_1 **Communication -> Path:** Browse for the appropriate IND360
TmpTrigger	SINT	Temporary value for use with AOI message
TmpAdjStatus	INT	Temporary value for use with AOI message
TmpExtAdjWeight	REAL	Temporary value for use with AOI message

TmpCurrentWeight	REAL	Temporary value for use with AOI message
MSG_SetStepControl	Message	**Message Type:** CIP Generic **Service Type:** Set Attribute Single **Class:** 410 (Hex) **Instance:** 1 **Attribute:** 1F (Hex) **Source Element:** Always_Zero **Source Length:** 1 (Bytes) **Communication -> Path:** Browse for the appropriate IND360

3. Steps to Add New IND360s

Because EtherNet/IP uses IP addresses to distinguish different devices, when multiple IND360s are networked, the default IP address needs to be modified first. Each IND360 must have a different IP address.

1) Click "Communication-> Industrial Ethernet -> IP Address" in the IND360 Advanced Service Mode in order to modify the IP address

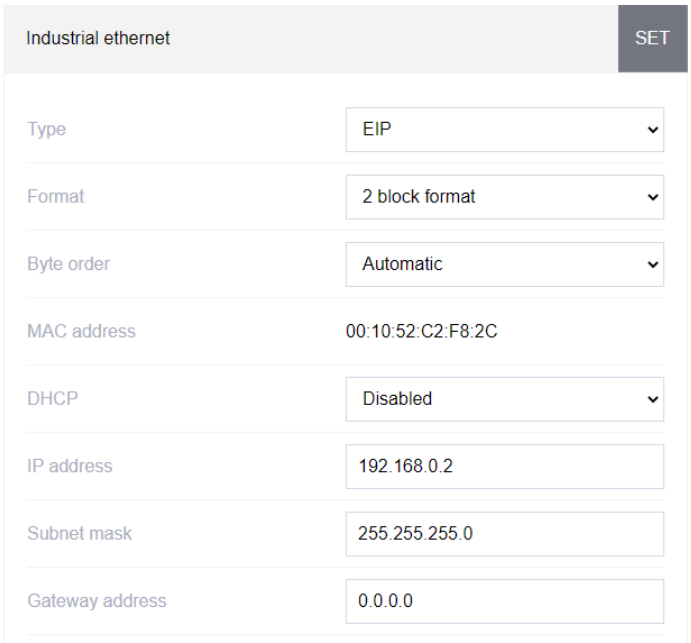


Figure 3-1: IND360 IP Address Menu

2) Add an MT-IND360 to "I / O Configuration-> Ethernet" in Studio5000.

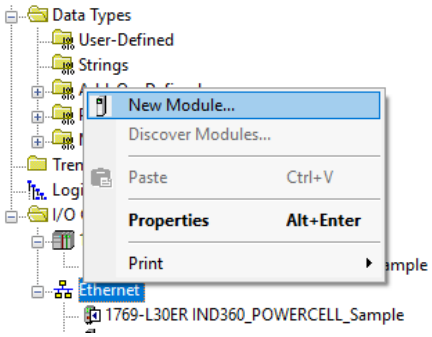


Figure 3-2: Add a device

3) Configure the name and IP address. Each device needs a unique name and IP address, and then click "Change".

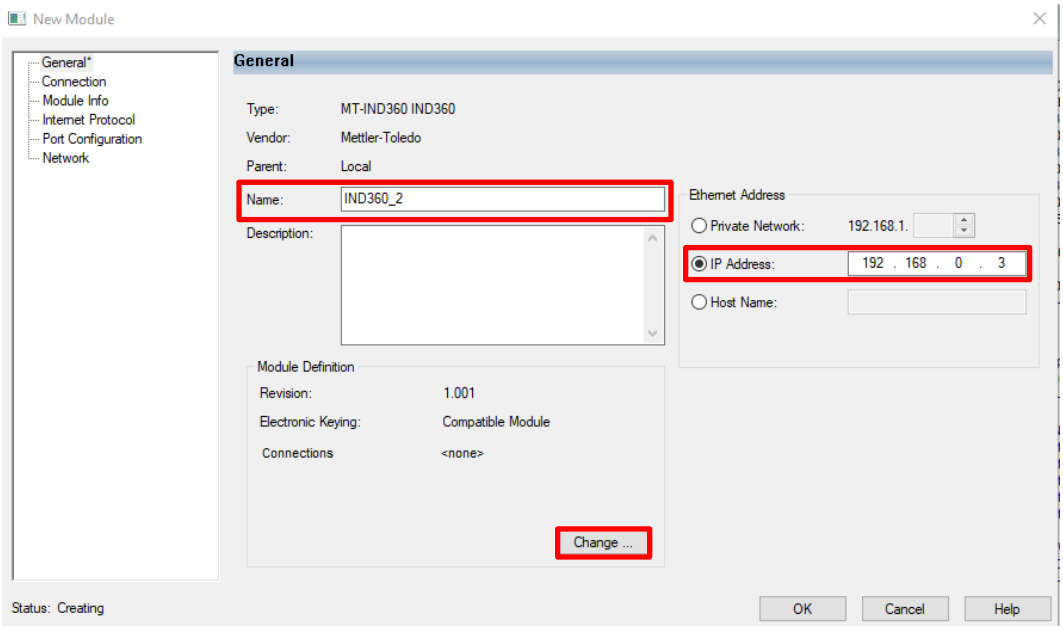


Figure 3-3: Configure name and IP address

4) Select "I/O 2 Block Format" to have the sample code function with minimal changes. Select 8 Block if required to receive multiple pieces of cyclic data simultaneously. For example, if it is required to read the gross weight, net weight and target weight at one time, 8 Block can easily accomplish this.

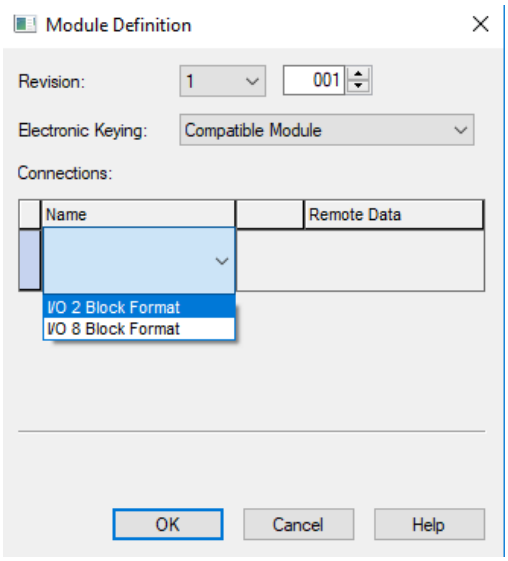


Figure 3-4: Module Definition Configuration

5) Copy the controller tags relating to the sample code and paste in the same location in order to create a duplicate set of tags. Please note that since all tags end with "_1", Studio 5000 will create duplicates that all end with "_2" instead.

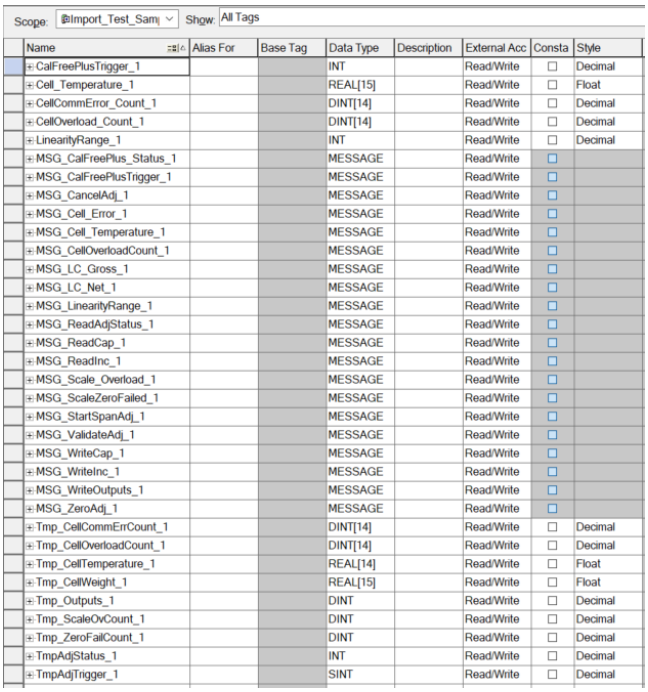


Figure 3-5: Copy/Paste Tags to Create Duplicates

6) Copy and paste the Add-On Instructions and configure the instance name along with the input and output parameters. Refer to Section 2 for additional instructions for configuring the Message parameters. Each device must correspond to a unique instance of the AOI. As shown in the figure below, both devices call the AOI SAI_CheckAlive, but the corresponding instances are SAI_CheckAlive and SAI_CheckAlive_1. Notice that the Heartbeat parameter is also

configured with different devices for these two instances. See the Add-On Instructions section of this note for information on configuring parameters for a particular AOI. Make sure that all tags for the second device for instance now end in "_2" as opposed to "_1" for the first device.

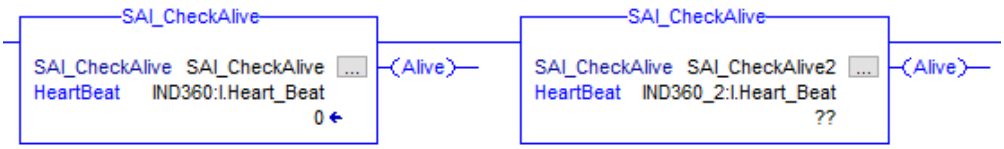


Figure 3-6: Two instances of the SAI_CheckAlive AOI for two IND360s

7) Repeat steps 1 to 6 until the configuration of all devices is completed.

4. Steps to Use 8 Block Format Instead of 2 Block Format

The 8 Block Format for SAI is incredibly powerful for viewing more information simultaneously compared to the 2 Block Format. The sample code by default is configured for the 2 Block Format, but changing the format is incredibly simple.

1. Right click on the IND360 in the Controller Organizer
2. Click "Properties"

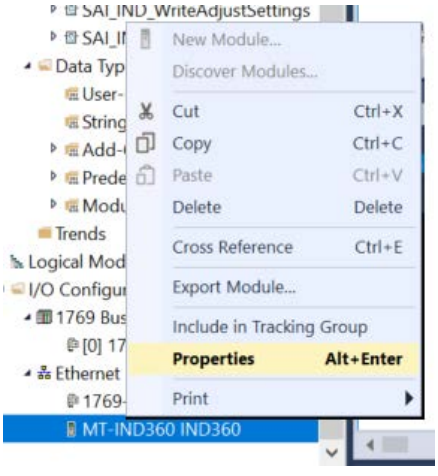


Figure 4-1 Select Properties

3. Click "Change" under the Module Definition

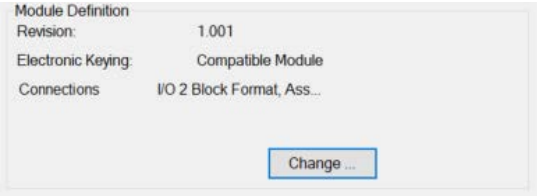


Figure 4-2 Click "Change"

4. Select the drop-down arrow next to "I/O 2 Block Format" and Select "I/O 8 Block Format

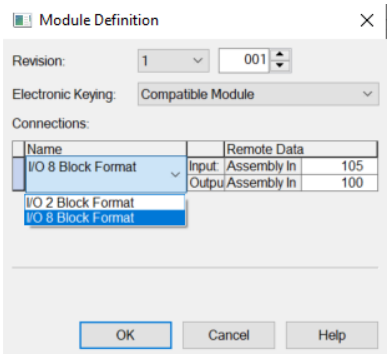


Figure 4-3 Select "I/O 8 Block Format"

At this point, the project has the IND360 configured for the 8 block format. No changes to the AOIs are required since the 8 Block Format just expands upon the 2 Block format utilized by the AOIs. There is now an additional AOI in the sample project that can be used though. The final step is to confirm the IND360 itself is configured for the 8 block format. This setting can be found in the IND360 setup menu or via the web interface at Communication -> Industrial Ethernet -> Format.

4.1. Add-On Instruction for 8 Block Format

The AOI for the 8 block format is available in the controller organizer under Assets -> Add-On Instructions -> SAI_IND_8Block. This AOI can be dragged from the controller organizer into the "MT_IND_360" routine. Information for configuring the AOI can be found below.

In the 8 block format, there is one measuring block and seven status blocks. The first measuring block and status block are also used in the 2 block format. What is gained by changing to the 8 block format is measuring blocks 2-7.

This AOI allows the user to enter a cyclic command (MBx_Command_In) and an optional parameter associated with the command (MBx_Value_In), see the result from the command (MBx_Measuring Value), whether the command executed (Done_MBx) and if there was an error executing the command (Error_MBx).

Figure 4-4 SAI_IND_8Block

Input Parameters	Data Type	Description
MB2_Measuring_Value	Real	This should always be set to the MB2_Measuring_Value of the IND360. Measured value returned from the last successfully executed command for MB2. Ignore value if neither Done_MB2 nor Error_MB2 is set since that means a command is in the process of executing.
MB3_Measuring_Value	Real	This should always be set to the MB3_Measuring_Value of the IND360. Measured value returned from the last successfully executed command for MB3. Ignore value if neither Done_MB3 nor Error_MB3 is set since that means a command is in the process of executing.
MB4_Measuring_Value	Real	This should always be set to the MB4_Measuring_Value of the IND360. Measured value returned from the last successfully executed command for MB4. Ignore value if neither Done_MB4 nor Error_MB4 is set since that means a command is in the process of executing.

MB5_Measuring_Value	Real	This should always be set to the MB5_Measuring_Value of the IND360. Measured value returned from the last successfully executed command for MB5. Ignore value if neither Done_MB5 nor Error_MB5 is set since that means a command is in the process of executing.
MB6_Measuring_Value	Real	This should always be set to the MB6_Measuring_Value of the IND360. Measured value returned from the last successfully executed command for MB6. Ignore value if neither Done_MB6 nor Error_MB6 is set since that means a command is in the process of executing.
MB7_Measuring_Value	Real	This should always be set to the MB7_Measuring_Value of the IND360. Measured value returned from the last successfully executed command for MB7. Ignore value if neither Done_MB7 nor Error_MB7 is set since that means a command is in the process of executing.
MB2_Command_In	INT	Place the cyclic command to be executed using MB2 here. See the SAI manual for terminals and transmitters to see all valid cyclic commands. Data reported will be found in MB2_Measuring Value. Optional parameter information should be placed in MB2_Value_In before changing the command. Some examples of common cyclic commands: 0 or 1 = Report gross weight 2 = Report tare weight 3 = Report net weight 5 = Report gross weight value (with internal resolution) 6 = Report tare weight value (with internal resolution) 7 = Report net weight value (with internal resolution)
MB3_Command_In	INT	Place the cyclic command to be executed using MB3 here. See the SAI manual for terminals and transmitters to see all valid cyclic commands. Data reported will be found in MB3_Measuring Value. Optional parameter information should be placed in MB3_Value_In before changing the command. Some examples of common cyclic commands: 0 or 1 = Report gross weight 2 = Report tare weight 3 = Report net weight 5 = Report gross weight value (with internal resolution) 6 = Report tare weight value (with internal resolution) 7 = Report net weight value (with internal resolution)
MB4_Command_In	INT	Place the cyclic command to be executed using MB4 here. See the SAI manual for terminals and transmitters to see all valid cyclic commands. Data reported will be found in MB4_Measuring Value. Optional parameter information should be placed in MB4_Value_In before changing the command. Some examples of common cyclic commands: 0 or 1 = Report gross weight 2 = Report tare weight 3 = Report net weight 5 = Report gross weight value (with internal resolution) 6 = Report tare weight value (with internal resolution) 7 = Report net weight value (with internal resolution)

MB5_Command_In	INT	Place the cyclic command to be executed using MB5 here. See the SAI manual for terminals and transmitters to see all valid cyclic commands. Data reported will be found in MB5_Measuring Value. Optional parameter information should be placed in MB5_Value_In before changing the command. Some examples of common cyclic commands: 0 or 1 = Report gross weight 2 = Report tare weight 3 = Report net weight 5 = Report gross weight value (with internal resolution) 6 = Report tare weight value (with internal resolution) 7 = Report net weight value (with internal resolution)
MB6_Command_In	INT	Place the cyclic command to be executed using MB6 here. See the SAI manual for terminals and transmitters to see all valid cyclic commands. Data reported will be found in MB6_Measuring Value. Optional parameter information should be placed in MB6_Value_In before changing the command. Some examples of common cyclic commands: 0 or 1 = Report gross weight 2 = Report tare weight 3 = Report net weight 5 = Report gross weight value (with internal resolution) 6 = Report tare weight value (with internal resolution) 7 = Report net weight value (with internal resolution)
MB7_Command_In	INT	Place the cyclic command to be executed using MB7 here. See the SAI manual for terminals and transmitters to see all valid cyclic commands. Data reported will be found in MB7_Measuring Value. Optional parameter information should be placed in MB7_Value_In before changing the command. Some examples of common cyclic commands: 0 or 1 = Report gross weight 2 = Report tare weight 3 = Report net weight 5 = Report gross weight value (with internal resolution) 6 = Report tare weight value (with internal resolution) 7 = Report net weight value (with internal resolution)
MB2_Value_In	Real	Place the optional parameter associated with MB2_Command_In here. For example, if executing a pretare command, MB2_Value_In would be set to the pretare value before changing MB2_Command_In
MB3_Value_In	Real	Place the optional parameter associated with MB3_Command_In here. For example, if executing a pretare command, MB3_Value_In would be set to the pretare value before changing MB3_Command_In
MB4_Value_In	Real	Place the optional parameter associated with MB4_Command_In here. For example, if executing a pretare command, MB4_Value_In would be set to the pretare value before changing MB4_Command_In
MB5_Value_In	Real	Place the optional parameter associated with MB5_Command_In here. For example, if executing a pretare command, MB5_Value_In would be set to the pretare value before changing MB2_Command_In
MB6_Value_In	Real	Place the optional parameter associated with MB6_Command_In here. For example, if executing a pretare command, MB6_Value_In would be set to the pretare value before changing MB6_Command_In

MB7_Value_In	Real	Place the optional parameter associated with MB7_Command_In here. For example, if executing a pretare command, MB7_Value_In would be set to the pretare value before changing MB7_Command_In
MB2_Response	INT	This should always be set to MB2_Response value of the IND360. Once a cyclic command is successfully executed, MB2_Response = MB2_Command_In. The AOI uses this information to detect if a command has been executed successfully or if an error has occurred.
MB3_Response	INT	This should always be set to MB3_Response value of the IND360. Once a cyclic command is successfully executed, MB3_Response = MB3_Command_In. The AOI uses this information to detect if a command has been executed successfully or if an error has occurred.
MB4_Response	INT	This should always be set to MB4_Response value of the IND360. Once a cyclic command is successfully executed, MB4_Response = MB4_Command_In. The AOI uses this information to detect if a command has been executed successfully or if an error has occurred.
MB5_Response	INT	This should always be set to MB5_Response value of the IND360. Once a cyclic command is successfully executed, MB5_Response = MB5_Command_In. The AOI uses this information to detect if a command has been executed successfully or if an error has occurred.
MB6_Response	INT	This should always be set to MB6_Response value of the IND360. Once a cyclic command is successfully executed, MB6_Response = MB6_Command_In. The AOI uses this information to detect if a command has been executed successfully or if an error has occurred.
MB7_Response	INT	This should always be set to MB7_Response value of the IND360. Once a cyclic command is successfully executed, MB7_Response = MB7_Command_In. The AOI uses this information to detect if a command has been executed successfully or if an error has occurred.
Output Parameters	Data Type	Description
MB2_Command_Out	INT	This should always be set to MB2_Command of the IND360. Value of the last cyclic command sent to the IND360. Once successfully executed, MB2_Response = MB2_Command_Out = MB2_Command_In.
MB3_Command_Out	INT	This should always be set to MB3_Command of the IND360. Value of the last cyclic command sent to the IND360. Once successfully executed, MB3_Response = MB3_Command_Out = MB3_Command_In.
MB4_Command_Out	INT	This should always be set to MB4_Command of the IND360. Value of the last cyclic command sent to the IND360. Once successfully executed, MB4_Response = MB4_Command_Out = MB4_Command_In.
MB5_Command_Out	INT	This should always be set to MB5_Command of the IND360. Value of the last cyclic command sent to the IND360. Once successfully executed, MB5_Response = MB5_Command_Out = MB5_Command_In.
MB6_Command_Out	INT	This should always be set to MB6_Command of the IND360. Value of the last cyclic command sent to the IND360. Once successfully executed, MB6_Response = MB6_Command_Out = MB6_Command_In.
MB7_Command_Out	INT	This should always be set to MB7_Command of the IND360. Value of the last cyclic command sent to the IND360. Once successfully executed, MB7_Response = MB7_Command_Out = MB7_Command_In.

MB2_CmdValue_Out	Real	This should always be set to MB2_Command_Value of IND360
MB3_CmdValue_Out	Real	This should always be set to MB3_Command_Value of IND360
MB4_CmdValue_Out	Real	This should always be set to MB4_Command_Value of IND360
MB5_CmdValue_Out	Real	This should always be set to MB5_Command_Value of IND360
MB6_CmdValue_Out	Real	This should always be set to MB6_Command_Value of IND360
MB7_CmdValue_Out	Real	This should always be set to MB7_Command_Value of IND360
Done_MB2	BOOL	Will be latched high when command has successfully completed for MB2. When a new command begins, bit will be unlatched until command completes successfully
Done_MB3	BOOL	Will be latched high when command has successfully completed for MB3. When a new command begins, bit will be unlatched until command completes successfully
Done_MB4	BOOL	Will be latched high when command has successfully completed for MB4. When a new command begins, bit will be unlatched until command completes successfully
Done_MB5	BOOL	Will be latched high when command has successfully completed for MB5. When a new command begins, bit will be unlatched until command completes successfully
Done_MB6	BOOL	Will be latched high when command has successfully completed for MB6. When a new command begins, bit will be unlatched until command completes successfully
Done_MB7	BOOL	Will be latched high when command has successfully completed for MB7. When a new command begins, bit will be unlatched until command completes successfully
Error_MB2	BOOL	Will be latched high when command fails to complete for MB2. When a new command begins, bit will be unlatched until a command fails to complete.
Error_MB3	BOOL	Will be latched high when command fails to complete for MB3. When a new command begins, bit will be unlatched until a command fails to complete.
Error_MB4	BOOL	Will be latched high when command fails to complete for MB4. When a new command begins, bit will be unlatched until a command fails to complete.
Error_MB5	BOOL	Will be latched high when command fails to complete for MB5. When a new command begins, bit will be unlatched until a command fails to complete.
Error_MB6	BOOL	Will be latched high when command fails to complete for MB6. When a new command begins, bit will be unlatched until a command fails to complete.
Error_MB7	BOOL	Will be latched high when command fails to complete for MB7. When a new command begins, bit will be unlatched until a command fails to complete.

5. Frequently Asked Questions

1. Q: How do I access the parameters in the AOI variables within my PLC program?

A: You can use the format "instance_name.parameter" to access parameters in your PLC program. For example, if we create an instance of the SAI_CheckAlive AOI and name the instance "IND360_Comm", we can monitor the alive bit by looking at "IND360_Comm.Alive"

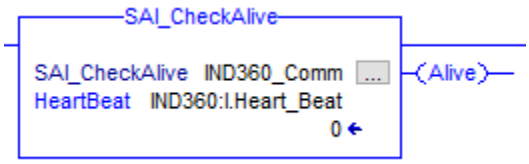


Figure 5-1: SAI_CheckAlive AOI with different instance name

2. Q: Does my AOI instance always have to match the name of the AOI?

   A: No, the AOI instance can be named anything as long as the name is unique. They must be unique so that if we are using multiple of the same AOI, we can distinguish between them in the code. See Figure 4-1 for an example of an AOI instance name that does not match the AOI name but is still valid.

3. Q: How do I read gross, tare or net weight?

   A: Use the WeightCmd parameter of the SAI_IND_WeightProc AOI to issue different weight commands. A value of 0 = report gross weight, 2 = report tare weight and 3 = report net weight. The weight will be updated in StableWeight if the weight value is stable. StableWeight will freeze with the last reported stable weight while the scale is in motion. RealTimeWeight will constantly update the weight value regardless of whether the scale is in motion.

4. Q: How do I know the source of the error in the SAI_IND_WeightProc AOI?

   A: Typical errors in this AOI include:

   - Pushbutton zero failure -> tried to zero when the weight value is outside of the pushbutton zero range (+/- 2% by default). If a substantial zero adjustment needs to be made, use the SAI_IND_ZeroAdjust AOI instead.
   - Tare failure -> Typically seen if trying to tare a negative gross weight value. Try to tare again with a positive gross weight.
   - Stability failure -> Can occur with either the ZeroStable or Tare Stable command. The weight value must meet the stability criteria (no more than 1 division of change occurring in a 0.3 second period by default) at some point before a timeout occurs (3 seconds by default).

5. Q: An AOI is very close to what I want to do in my PLC logic, but I need to make a few changes. How can I do that?

   A: If necessary to view or modify the logic of an AOI, simply use the Controller Organizer view in Studio 5000 to navigate to Add-On Instructions, expand the AOI you are interested in viewing and double-click "Logic". This will show you the ladder logic used in the AOI and can be changed as necessary for your particular application.

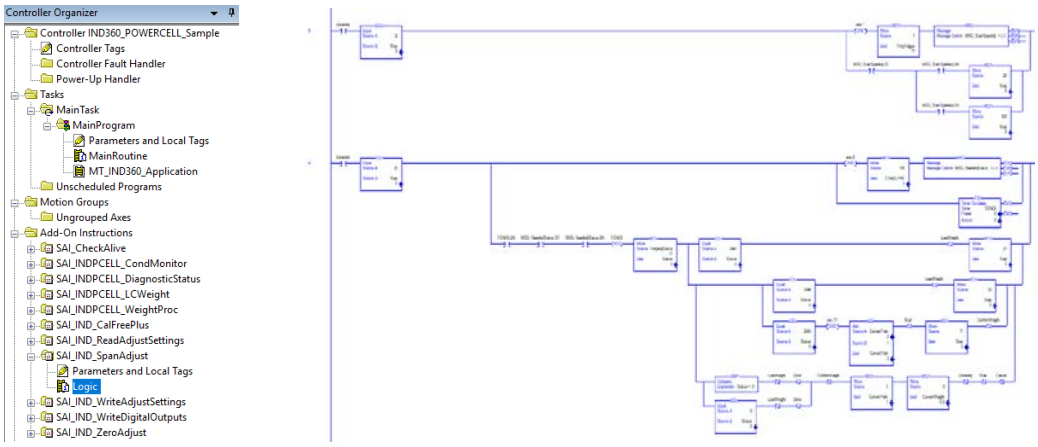


Figure 5-2: Example of AOI ladder logic