BANNER ⬡ **IO**-Link

S15C MGN IO-Link Device Parameter Data Add-On Instruction Guide, v4
September 12th, 2023

This document covers the installation and use of Add-On Instruction (AOI) for the Logix Designer software package from Rockwell Automation. This AOI handles acyclic IO-Link commands to and from a S15C-MGN. This AOI has six User Defined Tag data types.

This IO-Link Device Parameter Data AOI is meant to be used alongside a v4 Banner IO-Link Master AOI.

Components
Banner _S15C_MGN_Param_v4_AOI.L5X

UDT's Packaged with the AOI
Banner_IOL_Port_v4
Banner_S15C_MGN_RD_v4
Banner_S15C_MGN_v4
Banner_S15C_MGN_WD_v4
Banner_S15C_RSSS_v4
Banner_S15C_WRSS_v4

<table>
<tr><td>NOTE:

This Banner IO-Link Device Parameter AOI is useless on its own.

It is intended to be linked to a v4 Banner IO-Link Master AOI to function.</td></tr>
</table>

Usage
Add and configure the relevant v4 Banner IO-Link Master AOI in your ladder logic program first; then add and configure v4 Banner IO-Link Device Parameter Data AOIs as desired, linking them to the Master AOI.

Other AOIs Available Separately
Banner has AOI files for controlling other Banner IO-Link devices and for a variety of IO-Link Masters. Banner also has AOI files for easily handling Banner device Process Data.

Contents

1.   Installation Process

This section describes how to install the AOIs in Logix Designer software.

1. Open a project.
2. In the Controller Organizer window, right-click on the Add-On Instruction folder. Select the Import Add-On Instruction option.
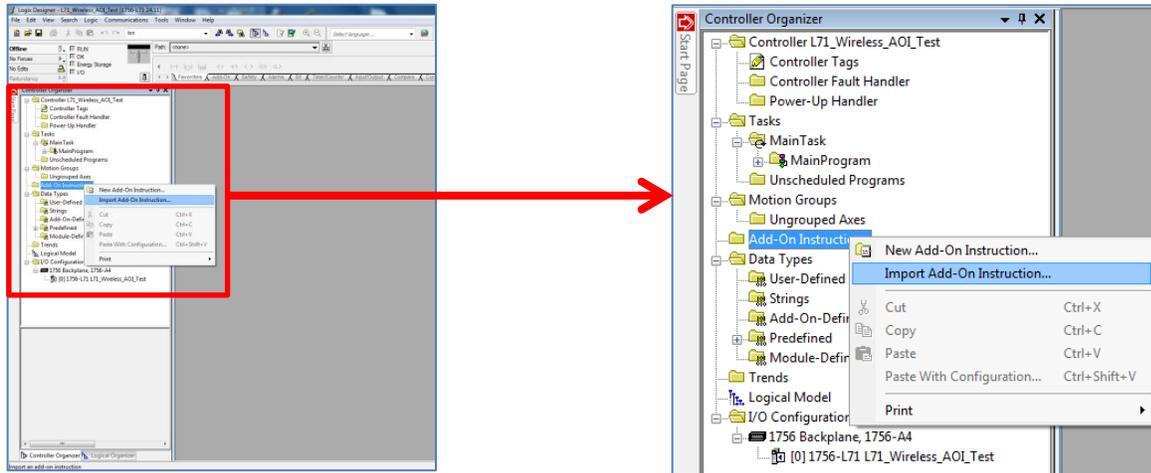
3. Navigate to the correct file location and select the AOI to be installed. In this example the "Banner_ S15C_MGN_Param_v4_AOI.L5X" file will be selected. Click the Open button.
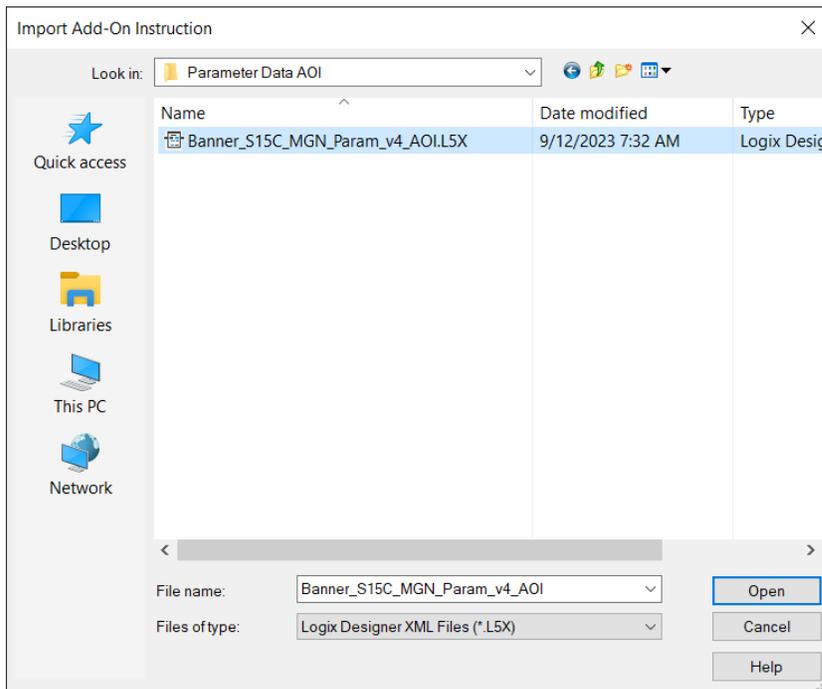
4. The Import Configuration window will pop up. The default selection will create all the necessary items for the AOI. Click the OK button to complete the import process.
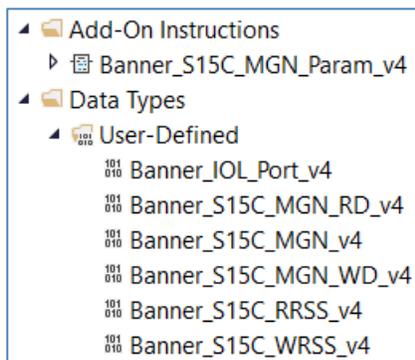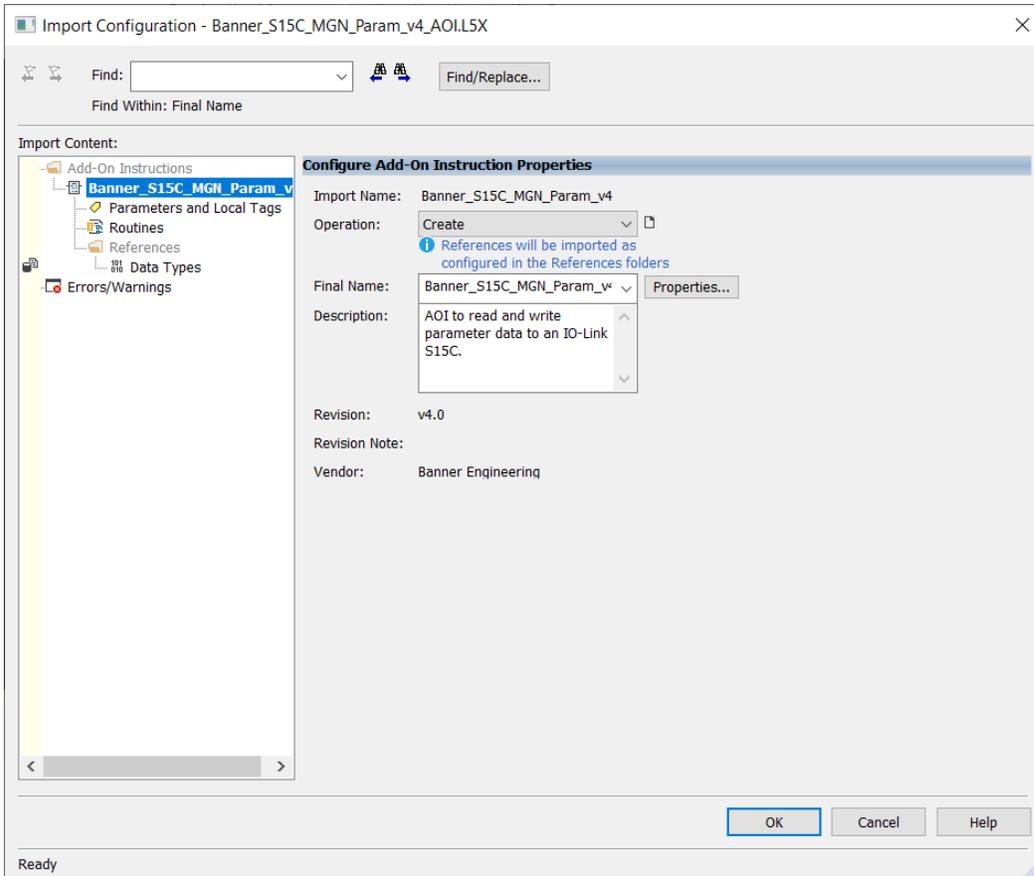

5.   The AOI is added to the Controller Organizer window and should look like the picture at left.

6.   AOI installation into the Logix Designer software complete.

2.   Configuring the AOI

Make sure to add and configure a Banner IO-Link Master AOI to your program before adding a Banner IO-Link Device AOI.

1. Add the "Banner_S15C_MGN_Param_v4" AOI to your ladder logic program. For each of the question marks shown in the instruction we need to create and link a new tag array. The AOI includes new types of User Defined Tag (UDT): custom arrays of tags meant specifically for this AOI.
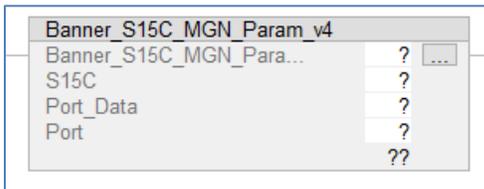
2. In the AOI, right-click on the question mark on the line labeled "Banner_S15C_MGN_Param_v4". Click New Tag. In this example, we will use the name "S15C_IOLM1_01_Status". The example naming convention accounts for this being a S15C-MGN sensor connected to IO-Link Master #1, port #1, in our program. More masters could be named IOLM2, IOLM3, and different sensors could be connected at other port numbers, etc.
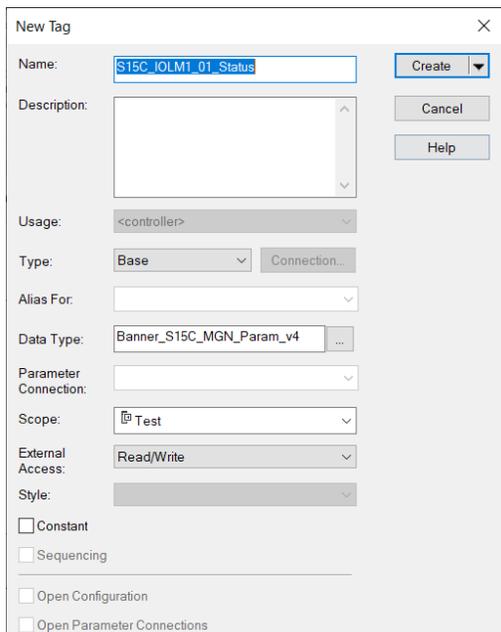
The "EnableIn" and "EnableOut" variables are ladder logic rung status bits automatically added to all AOIs.

3. Now click on the question mark on the line labeled "S15C". Click New Tag. In this example, we will use the name "S15C_IOLM1_01". This array of tags includes the Read and Write data blocks, made up of the information from the S15C-MGN IO-Link Index and Subindex values.

3.   Linking the Device AOI to the Master AOI

The third tag in the S15C-MGN AOI is meant to be tied into the IO-Link Master AOI.

1. For the "Port_Data" line, choose the relevant IO-Link Master AOI's "Port_Data" variable. In this example, we choose "IOLM1.Port_Data".
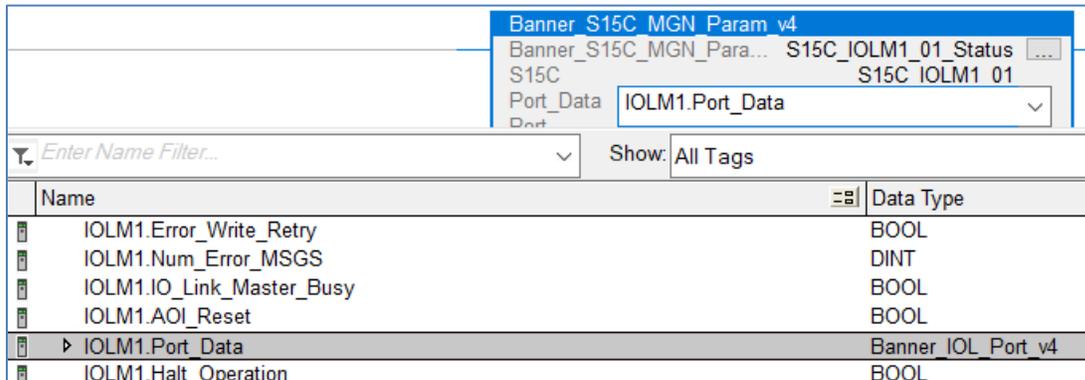
2. For the last line of the S15C-MGN AOI, "Port", type in a number equal to the IO-Link Master port number to which the S15C-MGN is connected. In this example, the S15C-MGN is on port 1.
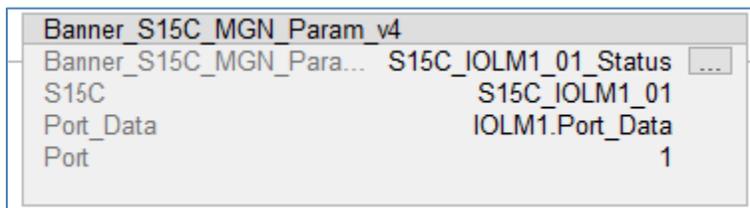
3. The S15C is now linked to the IO-Link Master AOI. Add an Examine On instruction to the beginning of the ladder rung. Tie it to the IO-Link Master AOI's "Port_Activate" bit corresponding to the port number to which the S15C is connected. In this example the S15C is on Port 1 of the IO-Link Master named IOLM1, so the bite "IOLM1.Port_Data_Port.Port_Activate.1" is used.
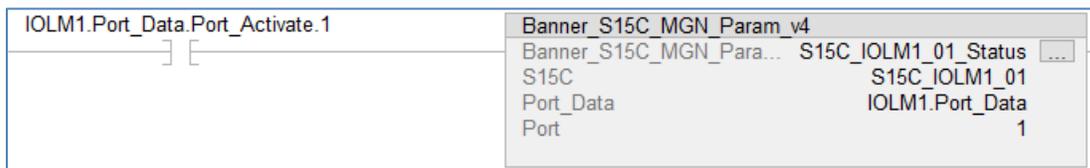
4.   Using the Paired IO-Link Master and Device Parameter Data AOIs

The goal is to make the Banner device's IO-Link Index and Subindex values appear in PLC tag arrays as if it were an EtherNet/IP-speaking device. Reading from and writing to the Banner IO-Link device becomes as easy a changing tag values in the PLC. All the complicated work of translating from EtherNet/IP to IO-Link is handled automatically, behind the scenes.

When the program is downloaded to the PLC and the PLC goes into run mode, the IO-Link Master AOI performs a global read for each connected Banner device AOI. The Banner device AOI then creates an archive copy of all writeable parameters for that device. This archive is used to determine whether one of the writeable data tags has been changed. If so, the AOI automatically triggers the process of acyclic writing, using correctly formatted CIP generic message commands.

There are two methods for acyclic reading of Banner device Index and Subindex values.

1. The initial global read, as requested by the IO-Link Master AOI after the PLC program is downloaded and run.

2. Manually via the "Command" variable found in every Device Parameter Data AOI. The "Command" register can be used to force one-time read or write actions, as described in Appendix A of any Banner Device Parameter AOI guide.

Acyclic writes to the IO-Link device are handled by simply changing the relevant tag values in the device's "Write_Data" tag array.

5.   Read and Write Device Parameter Data Setup

The S15C-MGN-KQ can read and write to holding registers in a Modbus RTU device. The parameter data requires the read data sets to be configured for which holding registers will be read. There are four read data sets. Similarly, there is one write data set that can be configured. When entering the values into either of the data set types use the full five-digit number (example 40001). Below is an example of this. A M12FTH3Q Modbus RTU Temperature and Humidity sensor will be used.

Modbus Registers for a M12FTH3Q

Sensor Address	Description
40001	Humidity (%RH)
40002	Temperature (°C)
40003	Temperature (°F)

Read Register Set configuration for S15C_IOLM1_01.Write.RRS[0]. The full five digit number must be used.

⊿ S15C_IOLM1_01.Write.RRS	{...}
⊿ S15C_IOLM1_01.Write.RRS[0]	{...}
⊿ S15C_IOLM1_01.Write.RRS[0].MB_Reg	{...}
▷ S15C_IOLM1_01.Write.RRS[0].MB_Reg[0]	0
▷ S15C_IOLM1_01.Write.RRS[0].MB_Reg[1]	40001
▷ S15C_IOLM1_01.Write.RRS[0].MB_Reg[2]	40002
▷ S15C_IOLM1_01.Write.RRS[0].MB_Reg[3]	40003
▷ S15C_IOLM1_01.Write.RRS[0].MB_Reg[4]	0

Process Data for that Read Data Set

▷ S15C_IOLM1_01_PD.Read.Read_Regs[1]	4640
▷ S15C_IOLM1_01_PD.Read.Read_Regs[2]	484
▷ S15C_IOLM1_01_PD.Read.Read_Regs[3]	1512

Humidity is 4640/100 or 46.40 percent
Temperature in C is 484/20 or 24.2 C
Temperature in F is 1512/20 or 75.6 F

Appendix A   Command Register

The "Command" register can be used to control the connected IO-Link device 'by hand'. Placing the correct command numbers into this register is how the AOI achieves its automatic control. The write commands are most useful when an IO-Link device has been physically replaced with a new device of the same type.

◢ S15C_IOLM1_01	{...}
S15C_IOLM1_01.Initial_Global_Read	0
▷ S15C_IOLM1_01.Command	0
▷ S15C_IOLM1_01.Read	{...}
▷ S15C_IOLM1_01.Write	{...}
▷ S15C_IOLM1_01.Archive	{...}
S15C_IOLM1_01.Reset	0

The table below shows the command numbers associated with the reading and writing of specific pieces of data. See the S15C-MGN IODD file or the S15C-MGN IO-Link Data Reference Guide for more information about the parameters.

Table 1: AOI Command Numbers

Q4X Parameter (IO-Link Index #)	Read Command	Write Command
Global Read (all)	1	
Direct Parameters (0)	2	
System Command (2)		42
Device Access Locks (12)	3	43
Product Name (18)	4	
Serial Number (21)	5	
Modbus Settings (80)	6	44
Read Register Set 0 Settings (96)	7	45
Read Register Set 1 Settings (97)	8	46
Read Register Set 2 Settings (98)	9	47
Read Register Set 3 Settings (99)	10	48
Write Register Set 0 Settings (106)	11	49

Appendix B   AOI Resets

From time to time, a reset may be needed for an AOI, particularly if one of the read/write processes the AOI undertakes is interrupted. To this end, each Device Parameter Data AOI and IO-Link Master AOI has a reset bit.

Toggling this bit to a "1" causes the AOI to start over and try again.

▲ S15C_IOLM1_01	{...}
S15C_IOLM1_01.Initial_Global_Read	0
▷ S15C_IOLM1_01.Command	0
▷ S15C_IOLM1_01.Read	{...}
▷ S15C_IOLM1_01.Write	{...}
▷ S15C_IOLM1_01.Archive	{...}
S15C_IOLM1_01.Reset	0

Best practices suggest adding a rung to your ladder logic program that resets all IO-Link Master and Device Parameter AOIs on the first scan. The example below shows one IO-Link Master, called IOLM1, and one connected S15GN having their respective AOIs being reset in this way.

```
 s:fs                                    S15C_IOLM1_01.Reset   IOLM1.AOI_Reset
──┤ ├──────────────────────────────────────────(L)──────────────────(L)──────
```

9