



## Safety Controller SC10 ISD Setup 8/25/2022

This document covers the how to get a SC10 using ISD working with an Allen Bradley PLC.

### **UDT**

Banner\_ISD\_Dual\_Chain\_Status\_v1

### **UDT Packaged with UDT**

Banner\_Chain\_Status\_v1

### **Optional AOI**

Banner\_ISD\_v1.L5X

### **UDT's Packaged with the AOI**

Banner\_ISD\_Data\_v1

Banner\_ISD\_Devices\_v1

Banner\_ISD\_UDT\_v1

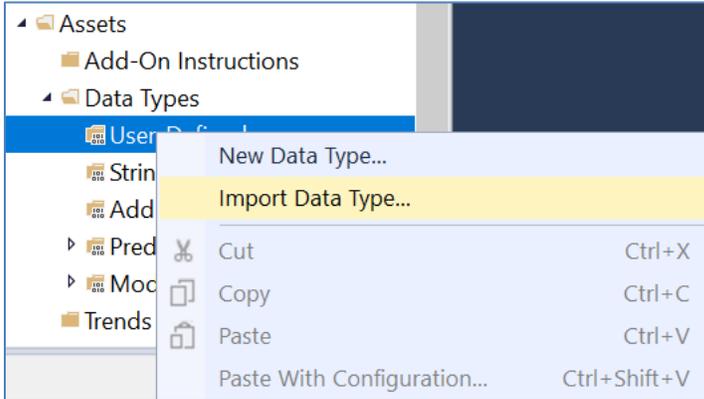
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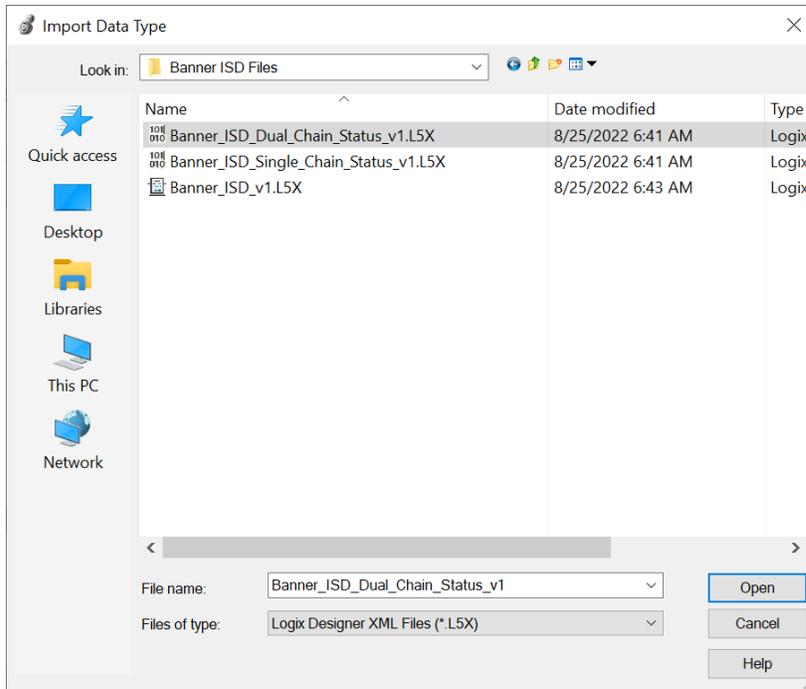
# 1. Installation Process

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

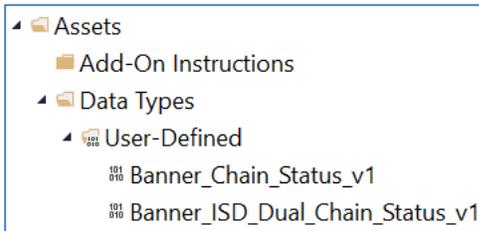
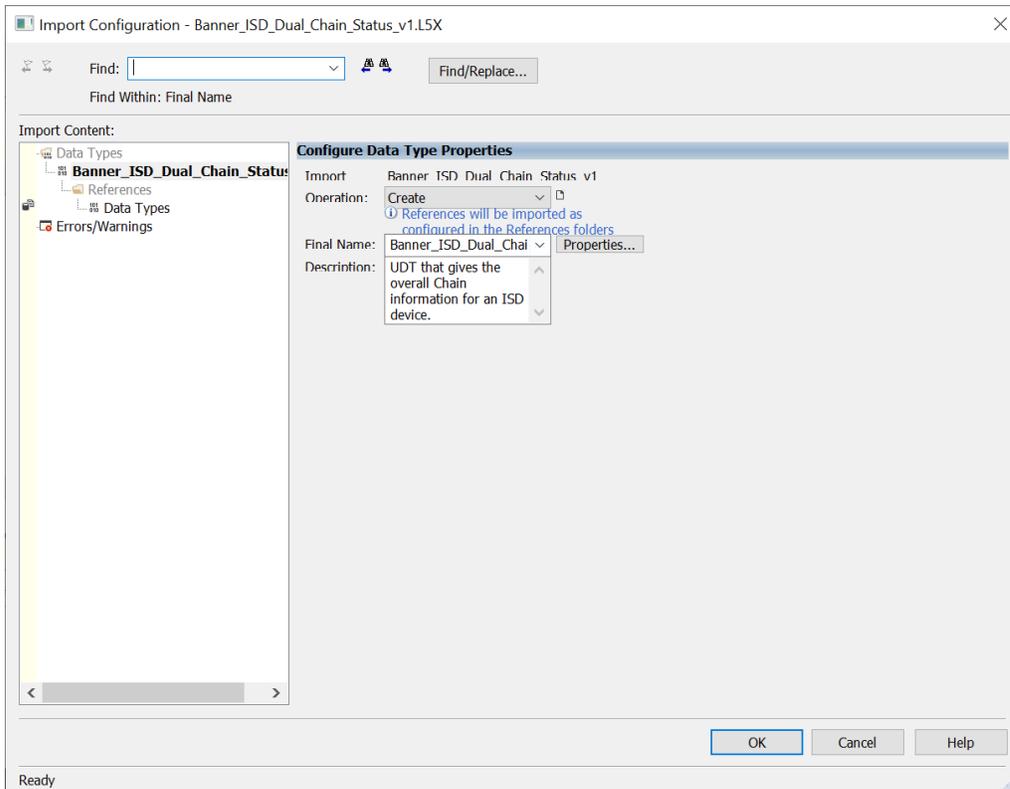
1. Open a project.
2. In the Controller Organizer window, expand the Data Types folder and then right-click on the User Defined folder. Select the Import Data Type Instruction option.



3. Navigate to the correct file location and select the L5X to be installed. In this example the "Banner\_ISD\_Dual\_Channel\_v1.L5X" file will be selected. Click the Open button.



4. The Import Configuration window will pop up. Click the OK button to complete the import process.



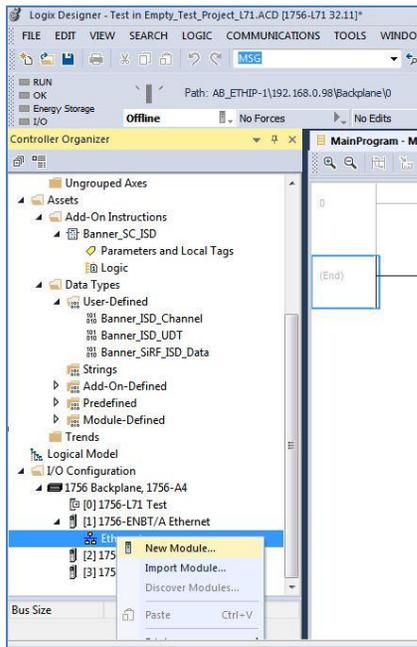
5. The UDT is added to the Controller Organizer window and should look like the picture at left.
6. UDT installation into the Logix Designer software complete.

## 2. Connecting to the Safety Controller

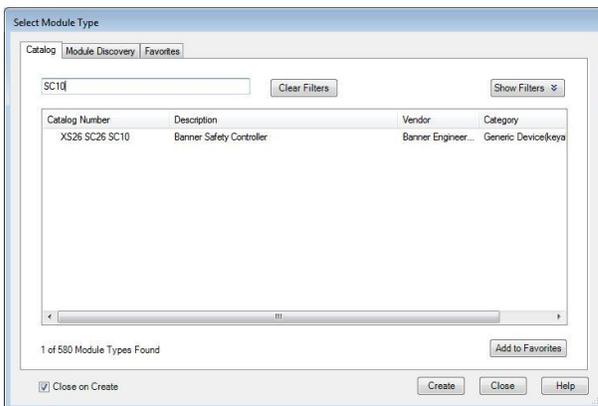
Make an EtherNet/IP connection to the Banner Safety Controller.

Create an Ethernet communications module for the Banner Safety Controller. In this example the EDS file was used, and the connection was named “SC10”. The controller tags include Input (I) and Output (O) Assembly Instances. Each Assembly has a corresponding tag array. Creating this Class 1 EtherNet/IP implicit IO connection will provide the PLC access to data from the Banner Safety Controller.

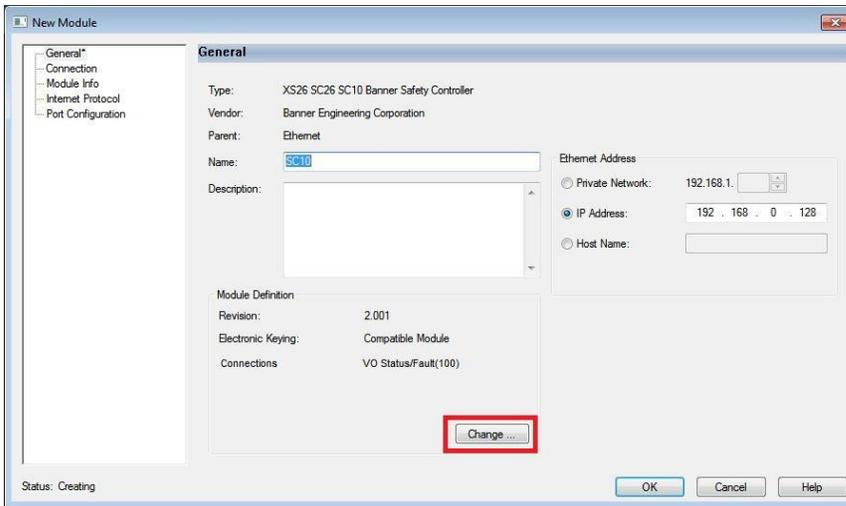
1. Download the Banner Safety Controller EDS file from the website and install it in the Logix Designer software.
2. Add a new communications module to the PLC program. Right click on the Ethernet card and choose “New Module...”



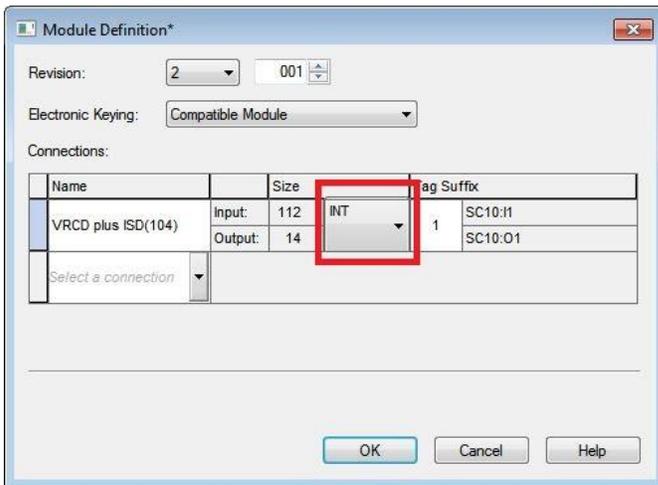
3. Search for the correct module (named XS26 SC26 SC10 Banner Safety Controller).



- 4. Give the module a name. In this example, the name SC10 was used. Enter the IP address of the Banner Safety Controller, then click the “Change...” button in the Module Definition area.

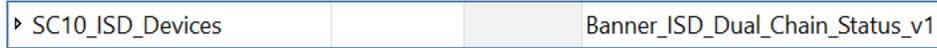


- 5. Make sure to select the Connection called “VRCD plus ISD(104)”, and change the Data Type to INT.

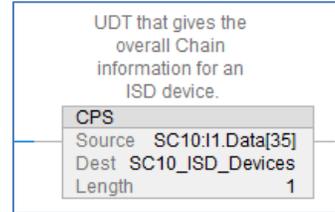


### 3. Configuring the UDT

1. Create a new tag. This tag will have the type of Banner\_ISD\_Dual\_Channel\_v1 (the UDT that was just imported).



2. Create a rung in which a Copy or Copy Synchronous command will be used. The source will be the raw data from the safety controller (SC10:I1.Data[35] for this example). The destination is linked to the tag created above. A length of 1 is the final operation needed here.



3. Download the project into the PLC.
4. Go to the SC10\_ISD\_Devices tag and expand it.
5. The data for the chains is now being shown. This is cyclic data, so it is updating continuously.
6. In this example channel 2 is being used, while 1 is not. There are devices in on chain 2 (see C2\_Inputs). The C2\_On\_Off tag tells you which of the switches is detected. If the C2\_On\_Off tag is expanded, you can see the states the switches directly. All the tags expect Inputs and Series Status follows this.

Name	Value
SC10_ISD_Devices	{...}
SC10_ISD_Devices.C1_Inputs	0
SC10_ISD_Devices.C2_Inputs	2
SC10_ISD_Devices.C1_On_Off	0
SC10_ISD_Devices.C2_On_Off	3
SC10_ISD_Devices.C1_Fault	0
SC10_ISD_Devices.C2_Fault	0
SC10_ISD_Devices.C1_Marginal	0
SC10_ISD_Devices.C2_Marginal	0
SC10_ISD_Devices.C1_Alert	0
SC10_ISD_Devices.C2_Alert	0
SC10_ISD_Devices.C1_Reset	0
SC10_ISD_Devices.C2_Reset	0
SC10_ISD_Devices.C1_Actuator_State	0
SC10_ISD_Devices.C2_Actuator_State	3

SC10_ISD_Devices.C2_On_Off	3
SC10_ISD_Devices.C2_On_Off.0	1
SC10_ISD_Devices.C2_On_Off.1	1
SC10_ISD_Devices.C2_On_Off.2	0
SC10_ISD_Devices.C2_On_Off.3	0

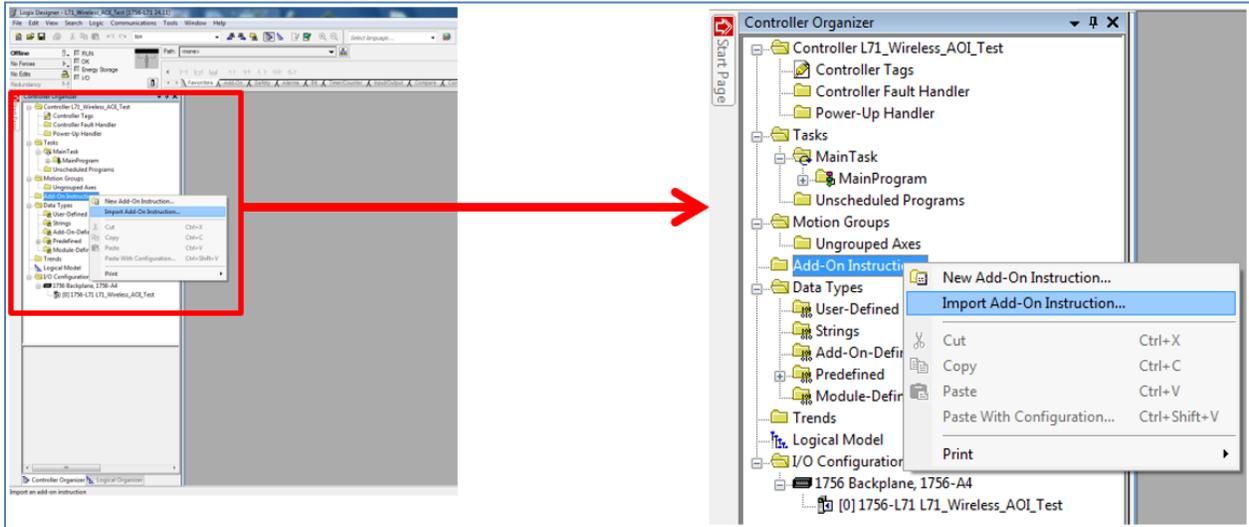
7. Standard configuration complete.

## Appendix A

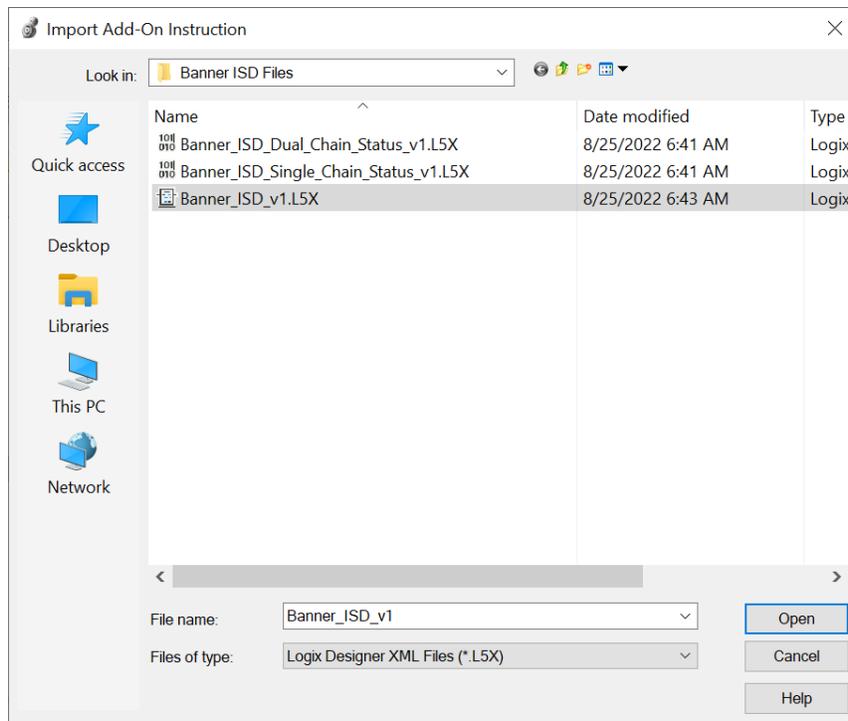
The previous sections showed how to get the status of the ISD chains for the SC10. This section will show how to configure and use the optional AOI that allows individual device data to be received.

### AOI Configuration

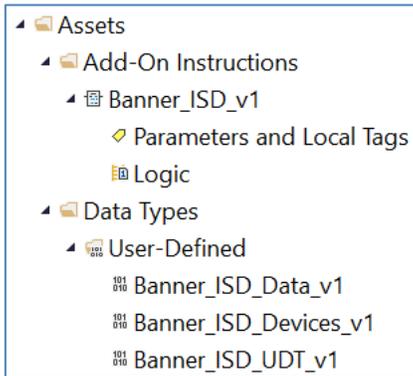
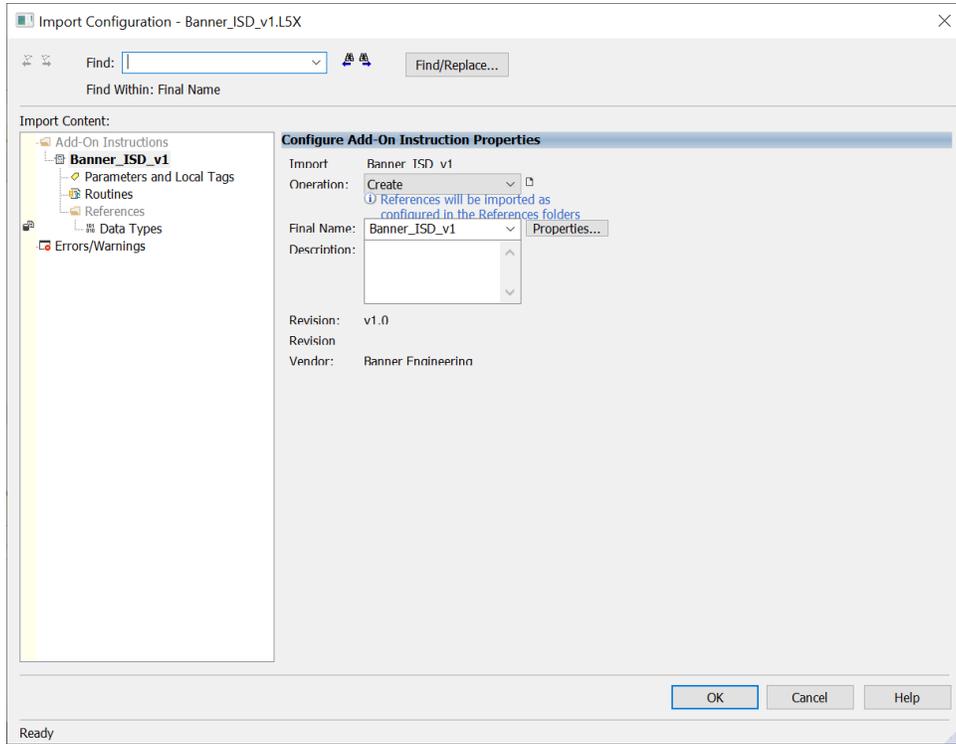
1. Start by selecting the Add-On Instruction option.



2. Navigate to the correct file location and select the AOI to be installed. In this example the "Banner\_ISD\_v1.L5X" file will be selected. Click the Open button.

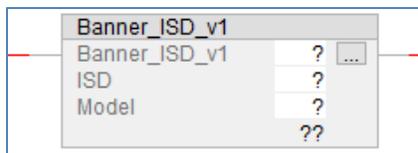


- The Import Configuration window will pop up. The default selection will create all the necessary items for the AOI. Click the OK button to complete the import process.



- The AOI is added to the Controller Organizer window and should look like the picture at left.
- The next step is to configure the AOI.

- Add the "Banner\_ISD\_v1" 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 Tags (UDT): custom arrays of tags meant specifically for this AOI.



- In the AOI, right-click on the question mark on the line labeled “Banner\_ISD\_v1”. Click New Tag. In this example, we’ll use the name “SC10\_ISD\_01\_Status”. The “01” is used to signify this is the first SC10 in the system as an example.

The 'New Tag' dialog box contains the following fields and options:

- Name:** SC10\_ISD\_01\_Status
- Description:** (Empty text area)
- Usage:** <controller>
- Type:** Base
- Alias For:** (Empty dropdown)
- Data Type:** Banner\_ISD\_v1
- Parameter Connection:** (Empty dropdown)
- Scope:** Test
- External Access:** Read/Write
- Style:** (Empty dropdown)
- Constant
- Sequencing
- Open Configuration
- Open Parameter Connections

The “EnableIn” and “EnableOut” variables are ladder logic rung status bits automatically added to all AOIs.

SC10_ISD_01_Status	{..}
SC10_ISD_01_Status.EnableIn	1
SC10_ISD_01_Status.EnableOut	0
SC10_ISD_01_Status.Model	0

- Now click on the question mark on the line labeled “ISD”. Click New Tag. In this example, we’ll use the name “X26\_ISD\_01”. This array of tags includes all the data necessary for the ISD devices.

**New Tag** ✕

Name:  Create ▼

Description: Cancel

Usage: <controller> ▼ Help

Type: Base ▼ Connection...

Alias For:   ▼

Data Type: Banner\_ISD\_UDT\_v1 ...

Parameter Connection:   ▼

Scope: Test ▼

External Access: ReadWrite ▼

Style:   ▼

Constant

Sequencing

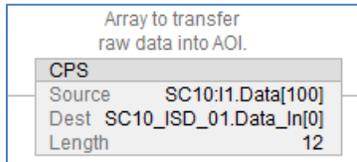
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Open Configuration

Open Parameter Connections

SC10_ISD_01	{...}
SC10_ISD_01.ISD_Request	0
SC10_ISD_01.ISD_Chain	0
SC10_ISD_01.ISD_Device	0
SC10_ISD_01.ISD_Request_ACK	0
SC10_ISD_01.ISD_Chain_ACK	0
SC10_ISD_01.ISD_Device_ACK	0
SC10_ISD_01.Error	0
SC10_ISD_01.Data	{...}
SC10_ISD_01.Devices	{...}
SC10_ISD_01.Data_In	{...}
SC10_ISD_01.Data_InList	{...}
SC10_ISD_01.Data_Out	{...}
SC10_ISD_01.Data_Storage_Req...	0
SC10_ISD_01.Reset	0

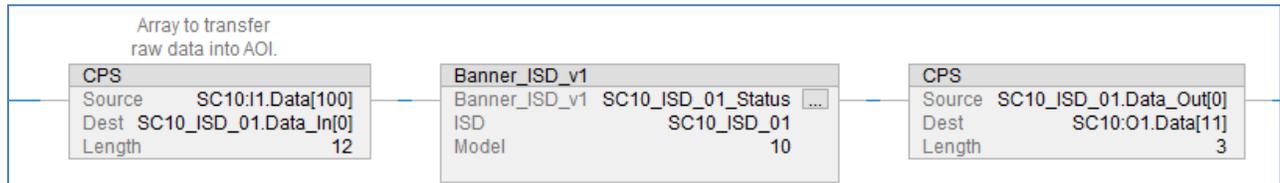
9. Add two CPS commands to the rung, one before and one after the Banner ISD AOI. These instructions pass raw, compressed data to and from the Safety Controller. The input raw data starts at register 100 in the PLC Input Assembly Instance for the Banner Safety Controller. Enter this as the Source for the CPS command. In this case, the cyclic connection’s module name was “SC10”, so the Source should be linked to SC10:I1.Data[100]. The destination is the AOI’s Data\_In array created as part of step 3, above. This example used the name SC10\_ISD\_01, so the destination will be “SC10\_ISD\_01.Data\_In[0]”. The length to be copied is 12.



The second CPS instruction, placed after the AOI, takes data from the AOI to the Banner Safety Controller (via the PLC Output Assembly Instance 114). The Source in our example will be the AOI’s Data\_Out array, SC10\_ISD\_01.Data\_Out[0]. The destination begins at register 11 in the PLC Output Assembly Instance of the Banner Safety Controller, SC10:O1.Data[11]. The length to be copied is 3.



The rung should look like the example below.



10. Configuration of AOI is complete.

**Using the AOI**

1. Go to the Controller tags for the PLC. Find the tag SC10\_ISD\_01 that was created in the previous section.
2. Expand the data tag. When data needs to be collected from the ISD portion of the safety controller the Chain, Device, and Request need to be activated. Chain is the variable stating which of the Chains (1 to 2 for SC10) will be communicated with. Device is the variable stating which device (1 to 32) should be queried. Request is set to 1 to begin the ISD communications. Error gives the current error that occurred during ISD communications. The ACK variables are used to determine if the communications request was successful or not.

SC10_ISD_01	{...}
SC10_ISD_01.ISD_Request	0
SC10_ISD_01.ISD_Chain	0
SC10_ISD_01.ISD_Device	0
SC10_ISD_01.ISD_Request_ACK	0
SC10_ISD_01.ISD_Chain_ACK	0
SC10_ISD_01.ISD_Device_ACK	0
SC10_ISD_01.Error	0

3. Set the Chain parameter to 1 and the Device parameter to 2.

SC10_ISD_01	{...}
SC10_ISD_01.ISD_Request	0
SC10_ISD_01.ISD_Chain	1
SC10_ISD_01.ISD_Device	2
SC10_ISD_01.ISD_Request_ACK	0
SC10_ISD_01.ISD_Chain_ACK	0
SC10_ISD_01.ISD_Device_ACK	0
SC10_ISD_01.Error	0

4. Set the Request to 1. The AOI will start processing the command. Request will be set back to 0 after the operation is complete. Error is 0 if the operation completed successfully. If a non-zero value is present in Error, then something went wrong. The Request ACK, Chain ACK, and Device ACK will come back with the value placed into the Request, Chain, and Device parameters if the operation was successful. If an error is encountered the Request Ack comes back as 0, while the Chain Ack and Device Ack come back as -1.

SC10_ISD_01	{...}
SC10_ISD_01.ISD_Request	0
SC10_ISD_01.ISD_Chain	1
SC10_ISD_01.ISD_Device	2
SC10_ISD_01.ISD_Request_ACK	1
SC10_ISD_01.ISD_Chain_ACK	1
SC10_ISD_01.ISD_Device_ACK	2
SC10_ISD_01.Error	0

Successful Command

SC10_ISD_01	{...}
SC10_ISD_01.ISD_Request	0
SC10_ISD_01.ISD_Chain	1
SC10_ISD_01.ISD_Device	2
SC10_ISD_01.ISD_Request_ACK	0
SC10_ISD_01.ISD_Chain_ACK	-1
SC10_ISD_01.ISD_Device_ACK	-1
SC10_ISD_01.Error	3

Failed Command

Error 1: Chain not set for 1 through 8 for XS26, or 1 through 2 for SC10.

Error 2: Device not set to 1 through 32.

Error 3: Communications error to selected Series and device. Chain or Device is not wired into system.

Error 4: Used Request command 2 with a SC10. SC10 does not allow for List request.

- The data is stored in the .Data element. If this is expanded all the data for the current device is shown.

▾ SC10_ISD_01.Data	{...}
▸ SC10_ISD_01.Data.Safety_Input_Fault	0
▸ SC10_ISD_01.Data.Reserved	0
▸ SC10_ISD_01.Data.Sensor_not_Paired	0
▸ SC10_ISD_01.Data.ISD_Data_Error	0
▸ SC10_ISD_01.Data.Wrong_Actuator	0
▸ SC10_ISD_01.Data.Marginal_Range	0
▸ SC10_ISD_01.Data.Actuator_Detected	1
▸ SC10_ISD_01.Data.Output_Error	0
▸ SC10_ISD_01.Data.Input_1	1
▸ SC10_ISD_01.Data.Input_2	1
▸ SC10_ISD_01.Data.Local_Reset_Expected	0
▸ SC10_ISD_01.Data.Operating_Voltage_Warning	0
▸ SC10_ISD_01.Data.Operating_Voltage_Error	0
▸ SC10_ISD_01.Data.Output_1	1
▸ SC10_ISD_01.Data.Output_2	1

- The data will be stored in all structure until another command to read an ISD device is completed. If the data needs to be saved create a tag with the Data Type of “Banner\_ISD\_Data\_v1”. Move the data from the temporary structure to the just created tag. If gathering data from multiple devices the tag crated may need to be an array.
- Optional AOI instructions complete.