

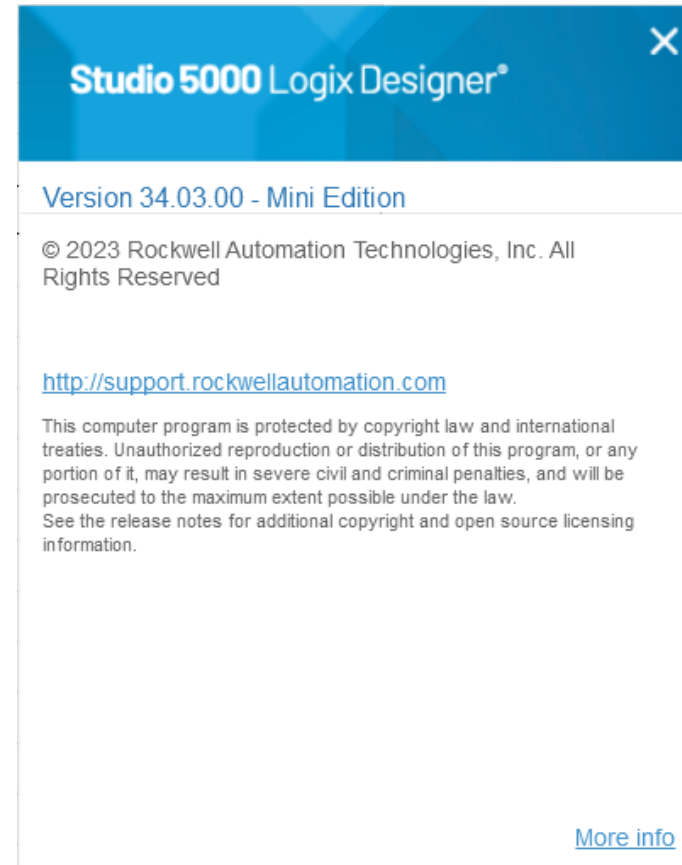
CasTemp Wireless CTWReadAssembler_CLX34 AOI Setup and Use

CompactLogix/ControlLogix AOI(Add-On Instruction) for Heraeus CasTemp Wireless
Input Telegram

[Link to Video Demonstration](#)

PLC Hardware and Software

- PLC data, configuration, and logic examples in this document are captured from:
 - Studio5000 Version 34.03.00 – Mini Edition
- The PLC used is a 1769-L24ER-QBFC1B CompactLogix 5370 Controller
- This document assumes an [EIP connection](#) between the ControlLogix/CompactLogix PLC and the CasTemp Wireless device has been configured successfully and the correct [telegram](#) installed.



PLC Global Input Tag From CTW

- The global tag name where the data from the CTW telegram will arrive will have the same name as the module that was set up to manage the communications to the CTW device.
- The array length is typically 128-bytes.

The screenshot displays the Siemens SIMATIC Manager interface. On the left, the 'Controller Organizer' shows a hierarchical tree of the PLC configuration. The 'ETHERNET-MODULE' is selected at the bottom, and the 'CasTemp' tag is highlighted within its configuration. On the right, the 'Controller Tags - CasTemp_AOI_EDS(controller)' window shows a table of tags. The 'CasTemp' tag is highlighted in the table, and its value is shown as '{...}'.

Name	Value	Force Mask
CasTemp	{...}	
CasTemp.I.Data	{...}	
CasTemp.I.Data[0]	8	
CasTemp.I.Data[1]	0	
CasTemp.I.Data[2]	0	
CasTemp.I.Data[3]	0	
CasTemp.I.Data[4]	0	
CasTemp.I.Data[5]	0	
CasTemp.I.Data[6]	64	
CasTemp.I.Data[7]	0	
CasTemp.I.Data[8]	0	
CasTemp.I.Data[9]	0	
CasTemp.I.Data[10]	0	
CasTemp.I.Data[11]	0	
CasTemp.I.Data[12]	0	
CasTemp.I.Data[13]	0	
CasTemp.I.Data[14]	0	
CasTemp.I.Data[15]	0	
CasTemp.I.Data[16]	0	
CasTemp.I.Data[17]	0	
CasTemp.I.Data[18]	0	
CasTemp.I.Data[19]	0	
CasTemp.I.Data[20]	0	

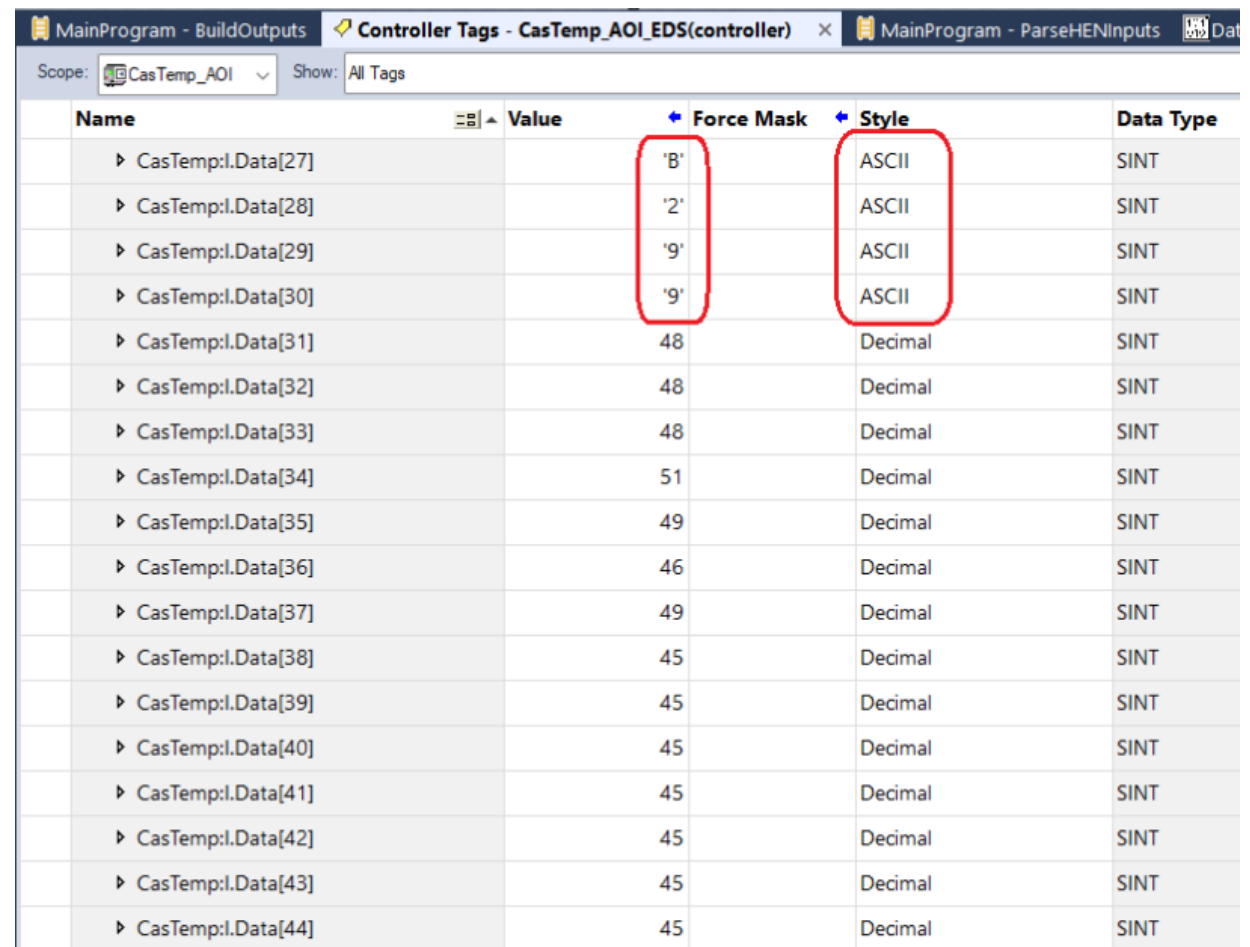
.ConnectionFaulted Status in Global Tags

- Module connections configured with the .EDS files include a ConnectionFaulted status bit in this case 'CasTemp:I.ConnectionFaulted'.
- This bit can be monitored to evaluate the communication status between the PLC and the CTW.
- The AOI uses this bit as an optional parameter to more accurately parse the data passed to it via the CTW input data array.

Name	Value	Force Mask	Style	Data Type
└ CasTemp:I	{...}	{...}		_005A:ABCC_81EA6AAD:I..
CasTemp:I.ConnectionFaulted	0		Decimal	BOOL
└ CasTemp:I.Data	{...}	{...}	Decimal	SINT[128]
└ CasTemp:I.Data[0]	8		Decimal	SINT
└ CasTemp:I.Data[1]	0		Decimal	SINT
└ CasTemp:I.Data[2]	0		Decimal	SINT
└ CasTemp:I.Data[3]	0		Decimal	SINT
└ CasTemp:I.Data[4]	0		Decimal	SINT
└ CasTemp:I.Data[5]	0		Decimal	SINT
└ CasTemp:I.Data[6]	64		Decimal	SINT
└ CasTemp:I.Data[7]	0		Decimal	SINT
└ CasTemp:I.Data[8]	0		Decimal	SINT
└ CasTemp:I.Data[9]	0		Decimal	SINT
└ CasTemp:I.Data[10]	0		Decimal	SINT
└ CasTemp:I.Data[11]	0		Decimal	SINT
└ CasTemp:I.Data[12]	0		Decimal	SINT
└ CasTemp:I.Data[13]	0		Decimal	SINT
└ CasTemp:I.Data[14]	0		Decimal	SINT
└ CasTemp:I.Data[15]	0		Decimal	SINT

Example of Module ID in Global Tags

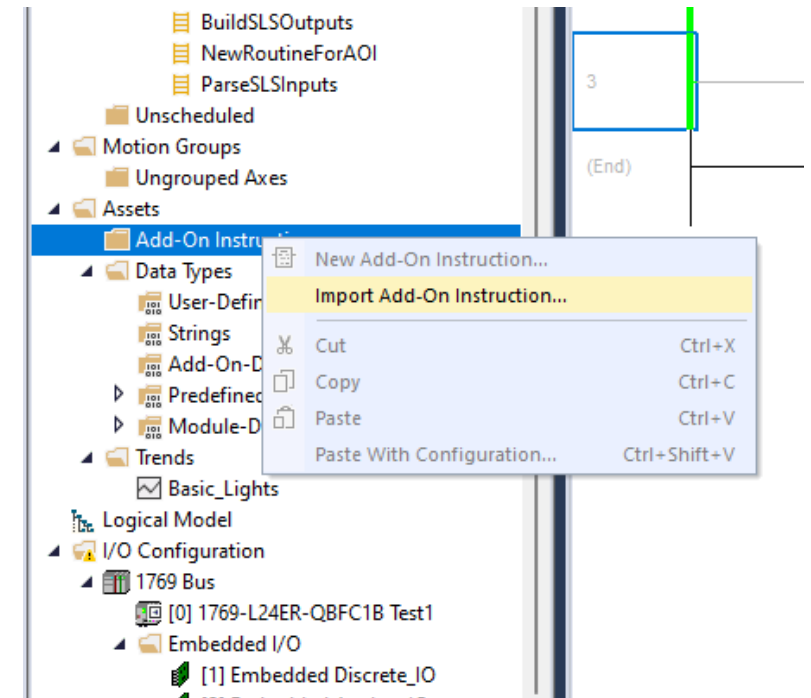
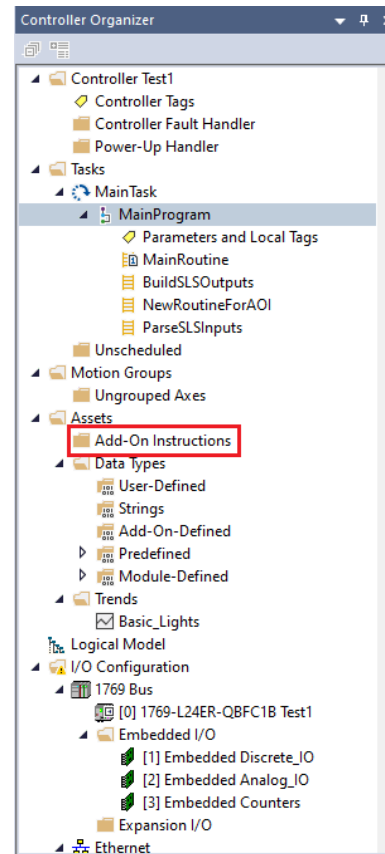
- The CTW telegram data starts at array element[27].
- In this case it is the Module ID = B299. If you change the display style dropdown to “ASCII” in the “Style” column, the values ‘B’ ‘2’ ‘9’ ‘9’ are displayed in the “Value” column as received from the CTW.



Name	Value	Force Mask	Style	Data Type
▶ CasTemp:I.Data[27]	'B'		ASCII	SINT
▶ CasTemp:I.Data[28]	'2'		ASCII	SINT
▶ CasTemp:I.Data[29]	'9'		ASCII	SINT
▶ CasTemp:I.Data[30]	'9'		ASCII	SINT
▶ CasTemp:I.Data[31]	48		Decimal	SINT
▶ CasTemp:I.Data[32]	48		Decimal	SINT
▶ CasTemp:I.Data[33]	48		Decimal	SINT
▶ CasTemp:I.Data[34]	51		Decimal	SINT
▶ CasTemp:I.Data[35]	49		Decimal	SINT
▶ CasTemp:I.Data[36]	46		Decimal	SINT
▶ CasTemp:I.Data[37]	49		Decimal	SINT
▶ CasTemp:I.Data[38]	45		Decimal	SINT
▶ CasTemp:I.Data[39]	45		Decimal	SINT
▶ CasTemp:I.Data[40]	45		Decimal	SINT
▶ CasTemp:I.Data[41]	45		Decimal	SINT
▶ CasTemp:I.Data[42]	45		Decimal	SINT
▶ CasTemp:I.Data[43]	45		Decimal	SINT
▶ CasTemp:I.Data[44]	45		Decimal	SINT

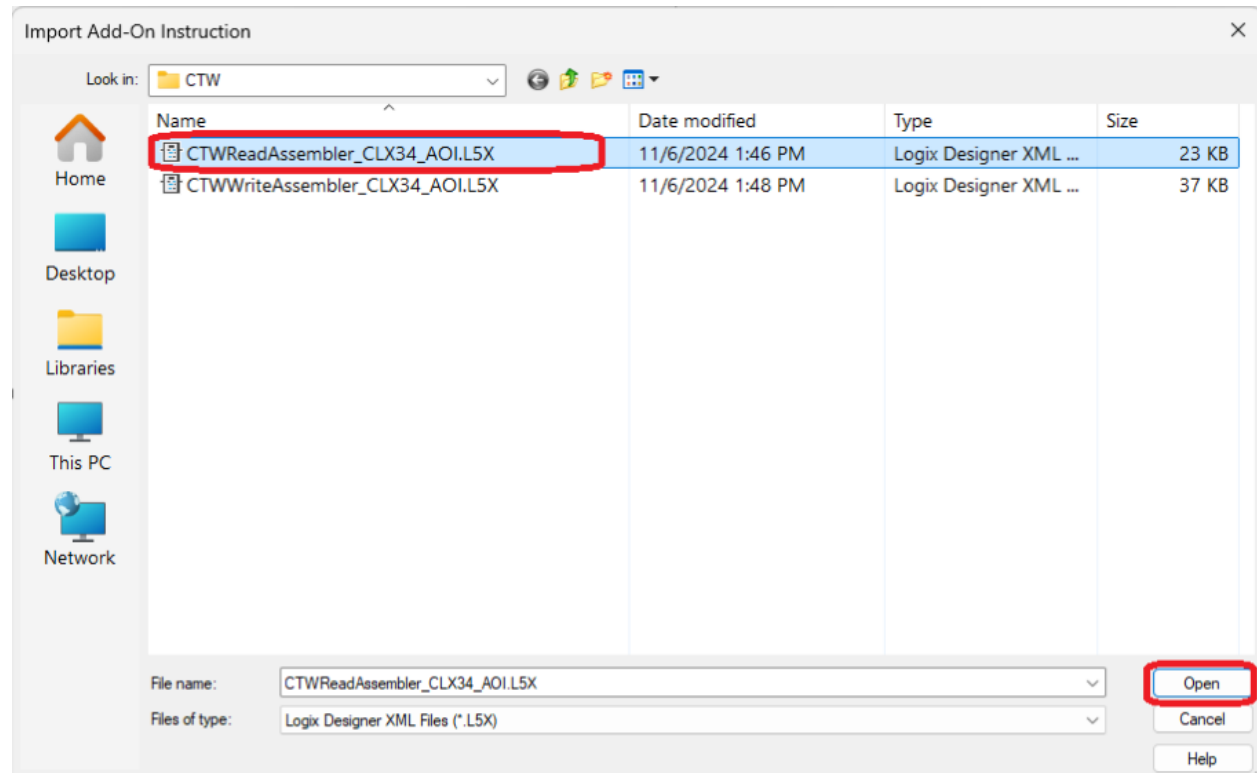
Importing the AOI (Add-On Instruction)

- After you have added the communication module and confirmed its connection to the CTW it is time to import the CTW Add-On Instruction.
- The Add-On Instructions Folder is located in the Assets Folder on the Controller Organizer Tab of Studio 5000.
- Right-click the Add-On Instructions Folder to bring up the menu and select Import Add-On Instruction



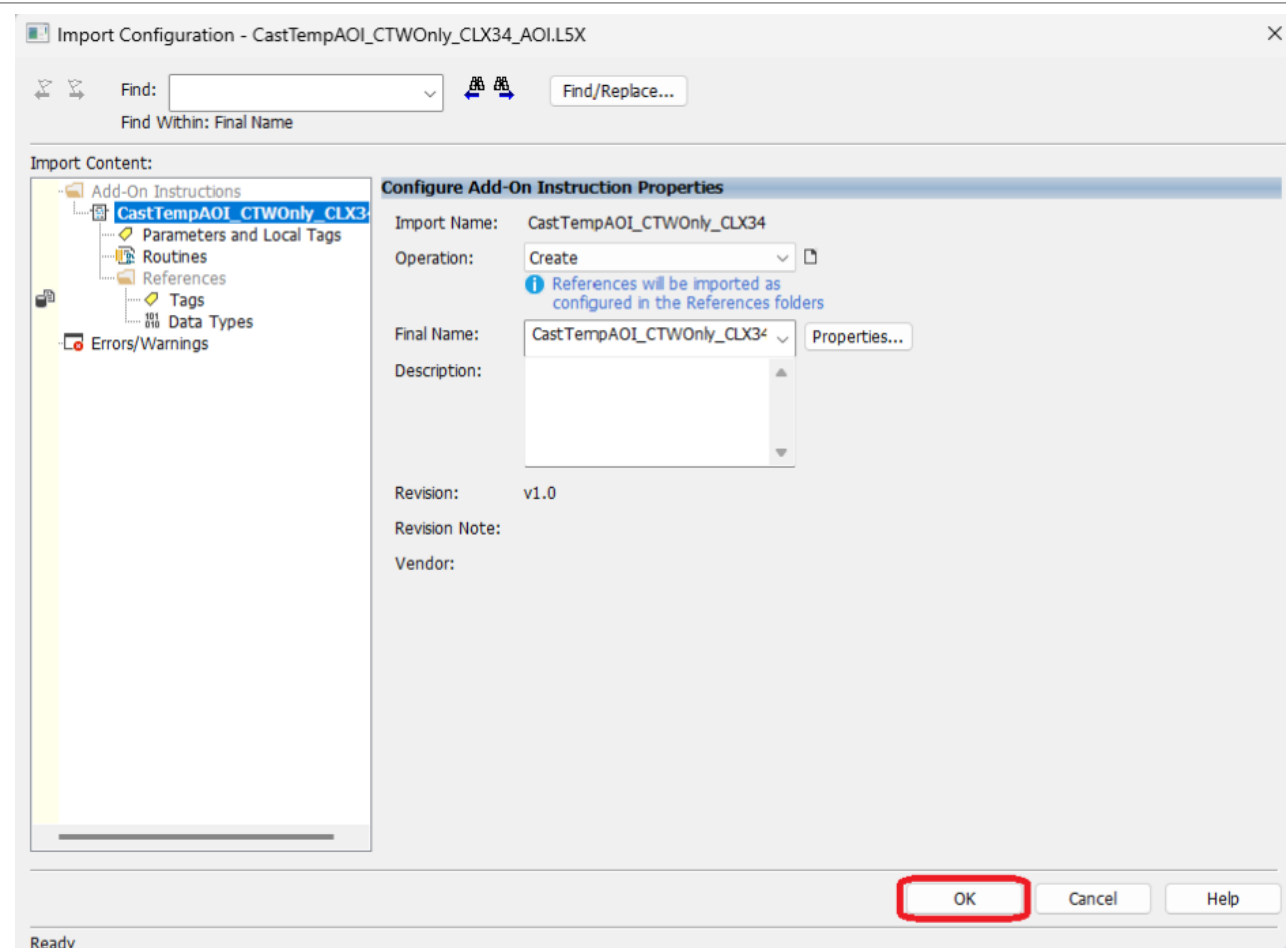
Importing the AOI (Cont.)

- Browse to the location you saved the CTW Add-On Instruction from HEN, and open that file to import it into your project. (This file will be named "CTWReadAssembler_CLX34_AOI.L5X " or similar)



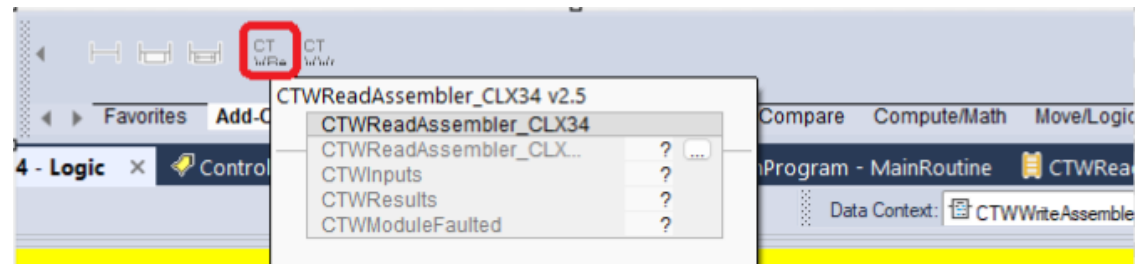
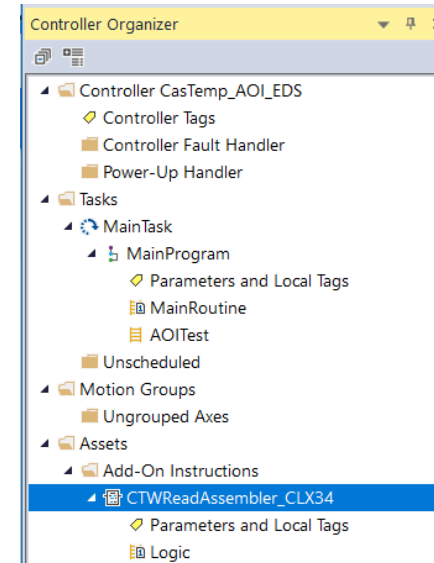
Importing the AOI (Cont.)

- A configuration window with details describing the Add-on instruction will pop up allowing you to confirm that you have selected the Add-On instruction you intended.
- Click the OK button to perform the import.



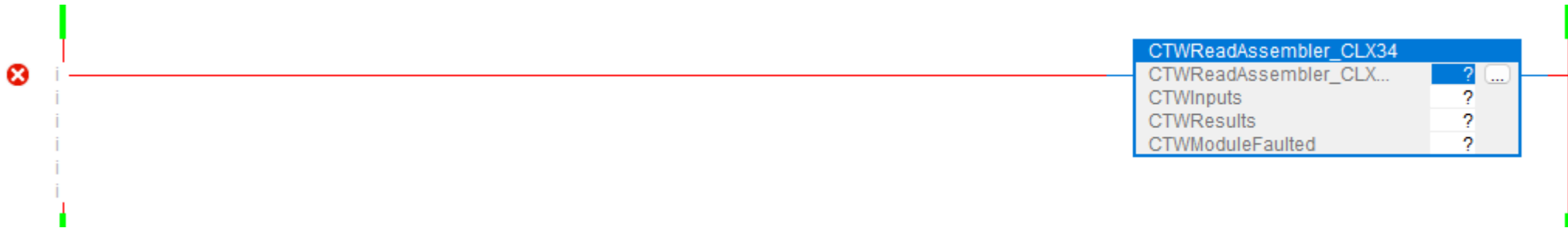
Importing the AOI (Cont.)

- Once the Import is complete the CTWReadAssembler_CLX34 will show up under the Add-On Instructions Folder under Assets and be available for use.
- The Add-On Instruction will be available on the element group toolbar in the Add-on group tab.
- An image of the AOI control will pop up if the mouse is hovered over the Add-On icon.



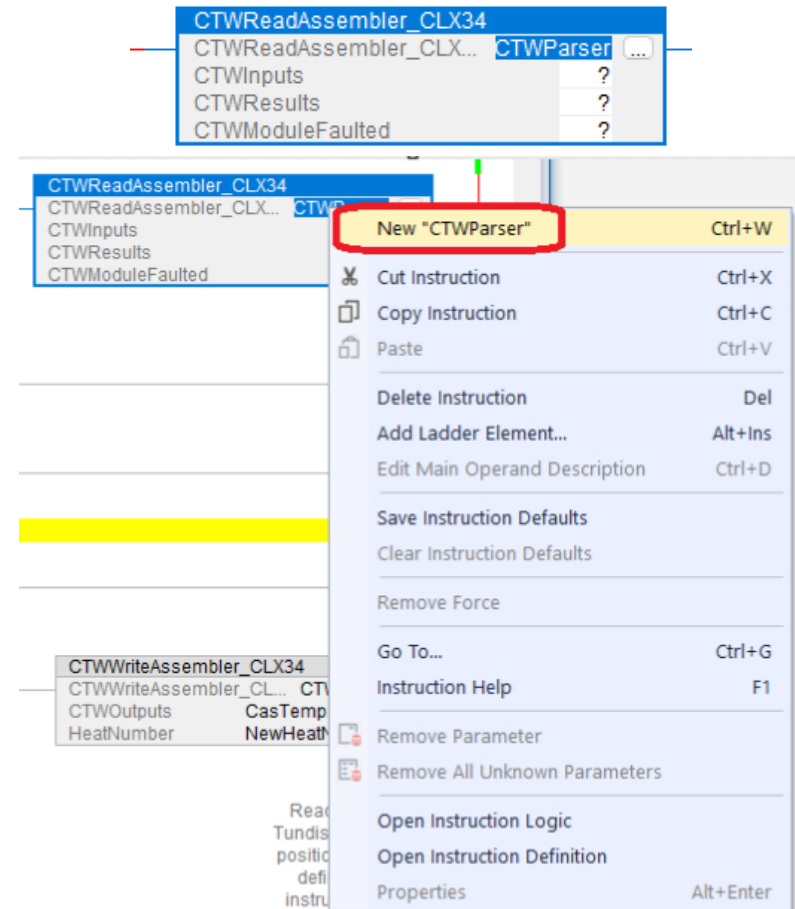
Adding the AOI to Ladder

- Edit or add an appropriate rung and drag the CTWReadAssembler_CLX34 instruction onto the rung.



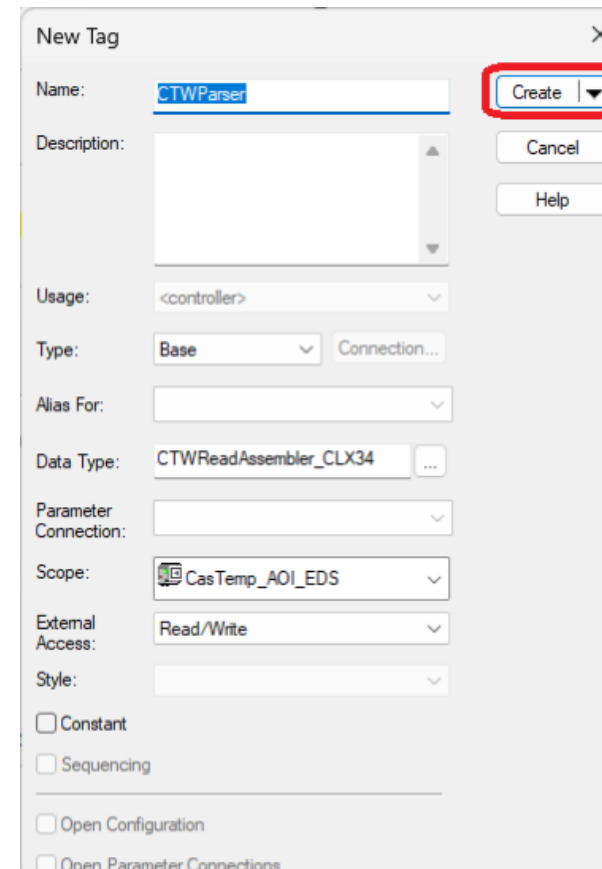
Adding the AOI to Ladder (Cont.)

- Start adding tags to the control. For the CTWReadAssembler_CLX34 Field:: Give the control an appropriate tag name....
- ...and then define that tag by right clicking the tag and selecting "New 'TagName' ".



Adding the AOI to Ladder (Cont.)

- This opens the New Tag window...just leave everything at the defaults and click the <Create> button.



New Tag

Name: CTWParser

Description:

Usage: <controller>

Type: Base

Alias For:

Data Type: CTWReadAssembler_CLX34

Parameter Connection:

Scope: CasTemp_AOI_EDS

External Access: Read/Write

Style:

☐ Constant

☐ Sequencing

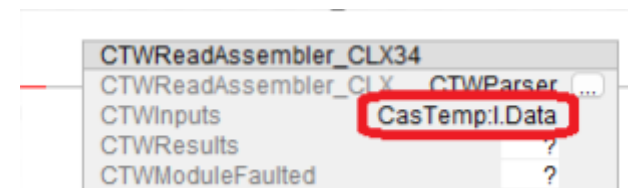
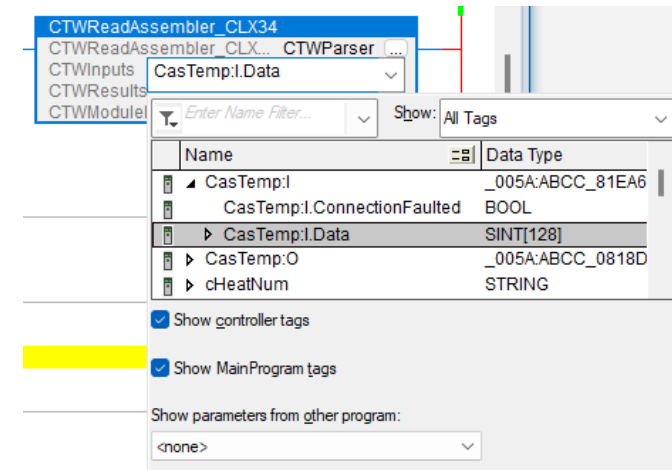
☐ Open Configuration

☐ Open Parameter Connections

Create Cancel Help

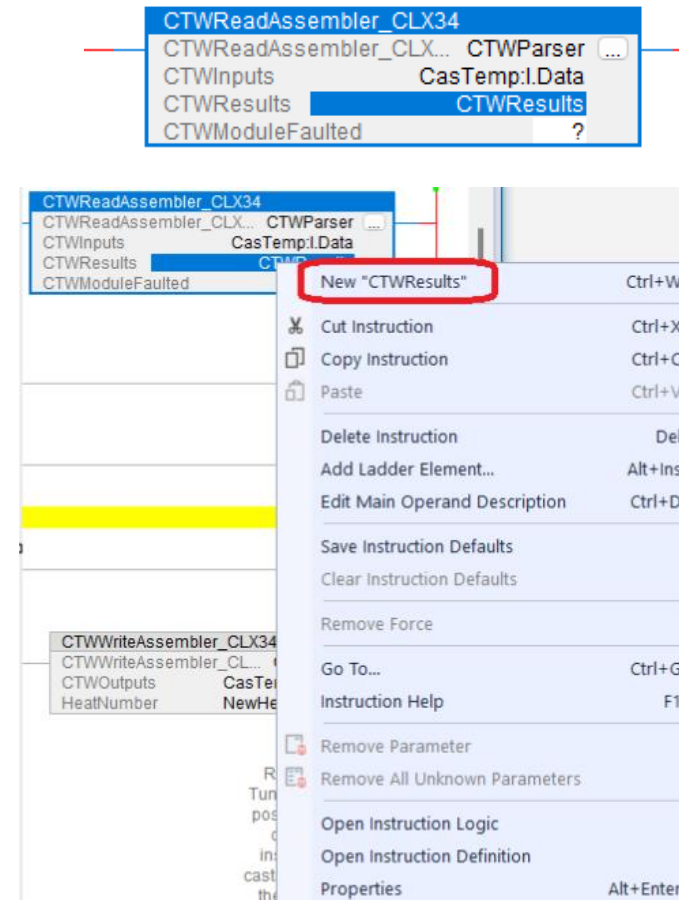
Adding the AOI to Ladder (Cont.)

- For the CTWInputs Field:: This is where you point the data from the incoming communication module to the AOI instruction. Notice the name you gave the module communicating with the CTW. In this case it is "CasTemp".
- Add the name of the Ethernet module in the program you are working on then click the down arrow beside that name. Expand the Tagname tree and select the one with the ":I.Data" added to the end. In this case it would be "CasTemp:I.Data".



Adding the AOI to Ladder (Cont.)

- For the Results Field:: Give the results an appropriate tag name...
- ...and then define that tag by right-clicking the tag and selecting "New 'TagName' ".



Adding the AOI to Ladder (Cont.)

- This opens the New Tag window...just leave everything at the defaults and click the <Create> button.
- This CTWResults UDT tag will be where the parsed values from the inputs elements are placed.

The screenshot shows the 'New Tag' dialog box with the following fields and values:

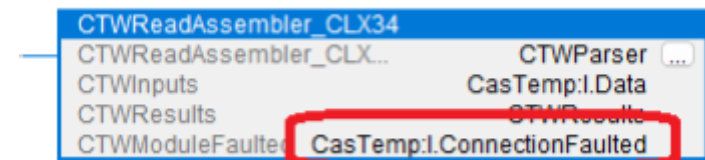
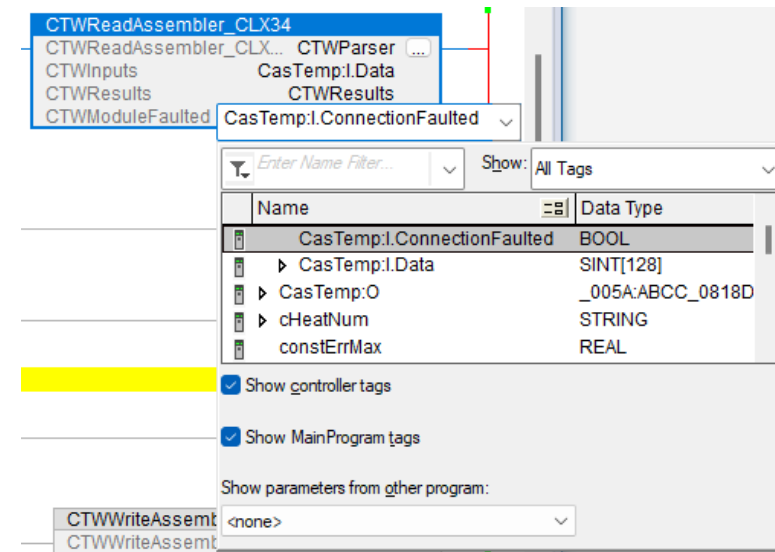
- Name:** CTWResultsN
- Description:** (empty text area)
- Usage:** <controller>
- Type:** Base
- Alias For:** (empty dropdown)
- Data Type:** CTWResults
- Parameter Connection:** (empty dropdown)
- Scope:** CasTemp_AOI_EDS
- External Access:** Read/Write
- Style:** (empty dropdown)

At the bottom, there are four unchecked checkboxes: Constant, Sequencing, Open Configuration, and Open Parameter Connections. The 'Create' button is highlighted with a red rectangle.

Adding the AOI to Ladder (Cont.)

CTWModuleFaulted Parameter for .EDS Configuration

- The last AOI parameter 'CTWModuleFaulted' is optional based on the type of communications module that was set up.
- The Ethernet communications modules set up with the .EDS files automatically create a 'ConnectionFaulted' bit. Add the name of the Ethernet module in the program you are working on then click the down arrow beside that name. Expand the Tagname tree and select the one with the ":I.ConnectionFaulted" added to the end. In this case it would be "CasTemp":I.ConnectionFaulted".



Adding the AOI to Ladder (Cont.)

CTWModuleFaulted Parameter for Generic Module Configuration

- The last AOI parameter 'CTWModuleFaulted' is optional based on the type of communications module that was set up.
- The Ethernet communications modules set up with the Generic Ethernet Module have no ConnectionFaulted bit available.
- Adding a Boolean tag to the 'CTWModuleFaulted' parameter can be used to control the parsing. Setting this bit to 'OFF' will allow the parsing of the incoming array elements from the CTW. Setting this bit to 'ON' will inhibit the parsing of the incoming array elements from the CTW.



Monitoring the Parsed Results

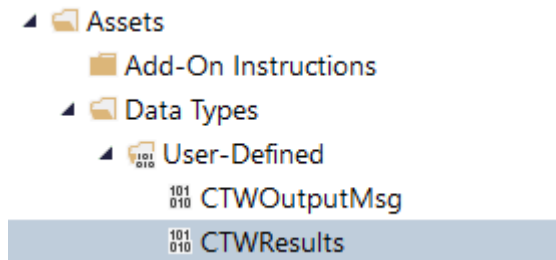
CTWModuleFaulted Parameter for Generic Module Configuration

- In the controller tags window, locate the tagname that was put in the Add-on CTWResults parameter field.
- The parsed result data structure will look like this with the UDT CTWResults tagname reflecting your tagname choice. In this case it is CTWResultsN.
- Expand the CTWResults tag to display the individual data fields.
- [Link](#) to video demonstrating this procedure

CTWResultsN	{...}
▶ CTWResultsN.DateTime	'1/8/1998 04:19:36'
▶ CTWResultsN.Heatnumber	' '
▶ CTWResultsN.InstrumentName	'CTWGMOOffice'
CTWResultsN.Temperature	88.1
▶ CTWResultsN.QUBE_ID	'B299'
CTWResultsN.QUBE_CJTemp	73.0
▶ CTWResultsN.QUBE_Charge	98
▶ CTWResultsN.QUBE_RFSignal	57
CTWResultsN.ERR_OpenCircuit	0
CTWResultsN.ERR_CJHighTemp	0
CTWResultsN.ERR_LostTransmission	0
CTWResultsN.ERR_LowBattCharge	0
CTWResultsN.ERR_LowSignal	1
CTWResultsN.ERR_NotPaired	0
CTWResultsN.ModuleFaultDetected	0

Additional Information

PLC Results Msg UDT Field Definition



Controller Tags - CasTemp_AOI_EDS(controller) MainProgram - AOITest Data Type: CTWResults x

Name: Data Type Size: 364 bytes

Description:

Members:

Name	Data Type	Description
▶ DateTime	STRING	Date time value
▶ Heatnumber	STRING	Current heat number
▶ InstrumentName	STRING	
Temperature	REAL	Temperature Value
▶ QUBE_ID	STRING	Unique ID of module connected to CTW
QUBE_CJTemp	REAL	Cold Junction temperature
QUBE_Charge	SINT	0 to 100% battery charge
QUBE_RFSignal	SINT	0 to 100% connection strength
ERR_OpenCircuit	BOOL	CTW is open circuit
ERR_CJHighTemp	BOOL	CTW cold junction temperature > 85 °C
ERR_LostTransmission	BOOL	CTW Lost Transmission
ERR_LowBattCharge	BOOL	CTW Battery < 1-%
ERR_LowSignal	BOOL	CTW Signal strength < 40dB
ERR_NotPaired	BOOL	CTW Not Paired
ModuleFaultDetected	BOOL	Comms Module to CTW Fault

OK Cancel Apply Help

Additional Information

The HEN AOI Encapsulates: Parse the Binary Based Results

- In this CTW telegram the ErrorPresent result starts at array element[31].
 - ERR_PRESENT_OFFSET = 31
- The bit offset is described in the manual.
- An 'OkToParse' OTE instruction is operated off of the error status' and will be used to make decisions about default values.

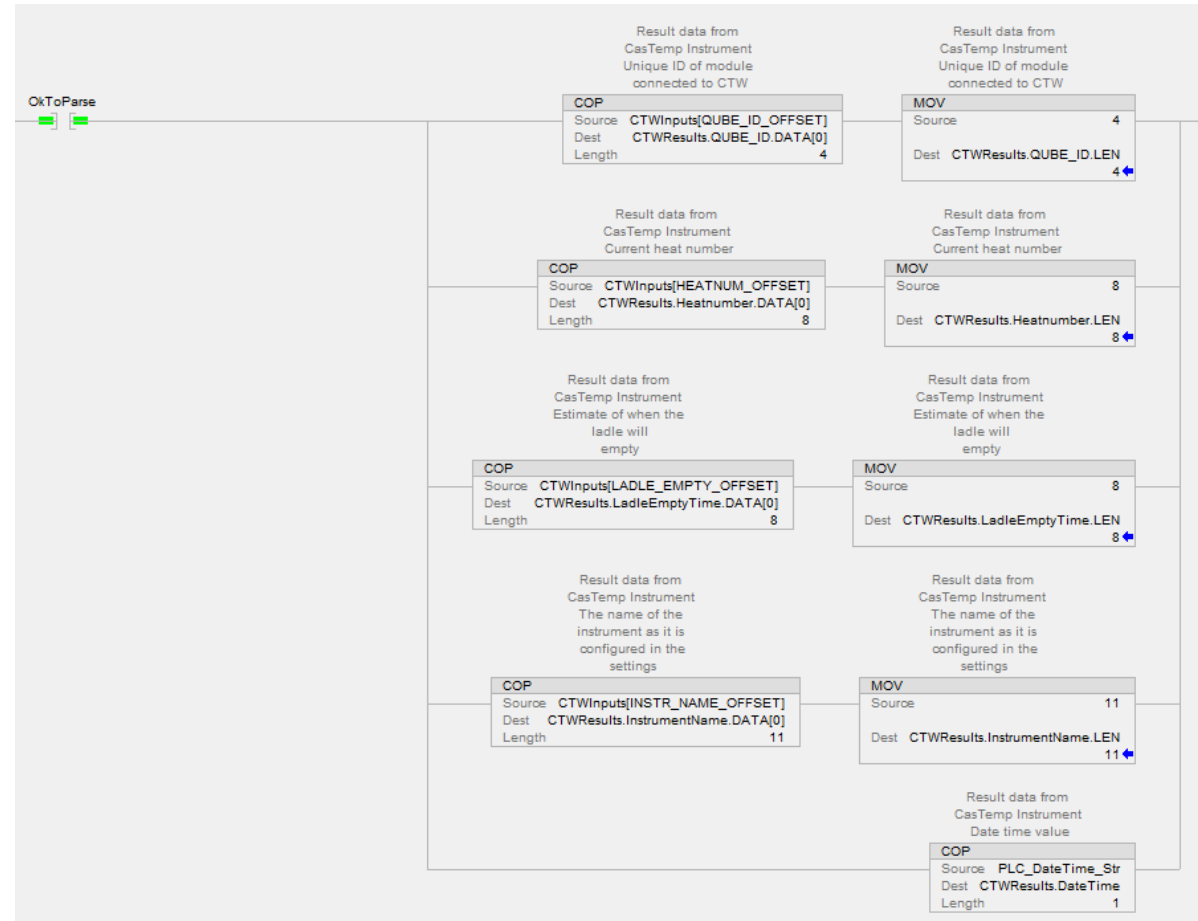
ErrorPresent[0]	Bit 1 = CTW is open circuit	1 byte
	Bit 2 = CTW cold junction temperature > 85 °C	1 byte
	Bit 3 = CTW lost transmission	1 byte
	Bit 4 = CTW battery charge is critical (charge < 10%)	1 byte
	Bit 5 = CTW signal strength is critical (strength < 40dB)	1 byte
	Bit 6 = Reserved for future use	1 byte
	Bit 7 = Instrument is not paired with CTW	1 byte
	Bit 8 = Not used	1 byte



Additional Information

The HEN AOI Encapsulates: Parse the Text Based Results - No errors

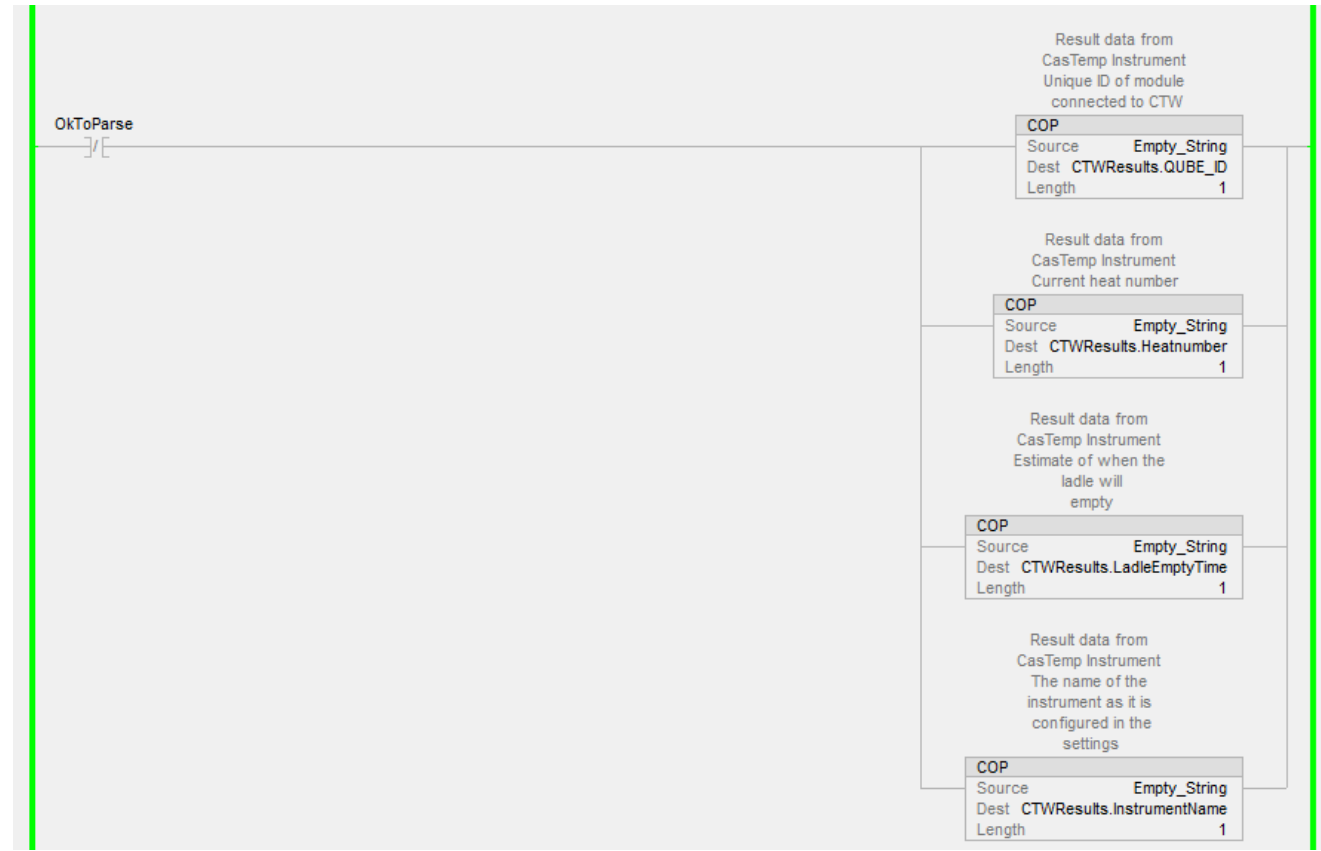
- Perform these operations for the text based telegram items when there are no errors as indicated by the 'OkToParse' XIC instruction.
- Copy the byte array elements for each text based result to the data array of a string variable.
- Set the string variable length to the length of the result byte array.



Additional Information

The HEN AOI Encapsulates: Parse the Text Based Results - Error Present

- Perform these operations for the text based telegram items when there are errors present as indicated by the 'OkToParse' XIO instruction.
- Copy the Empty_String variable to the string variable for each CTW result as a default.



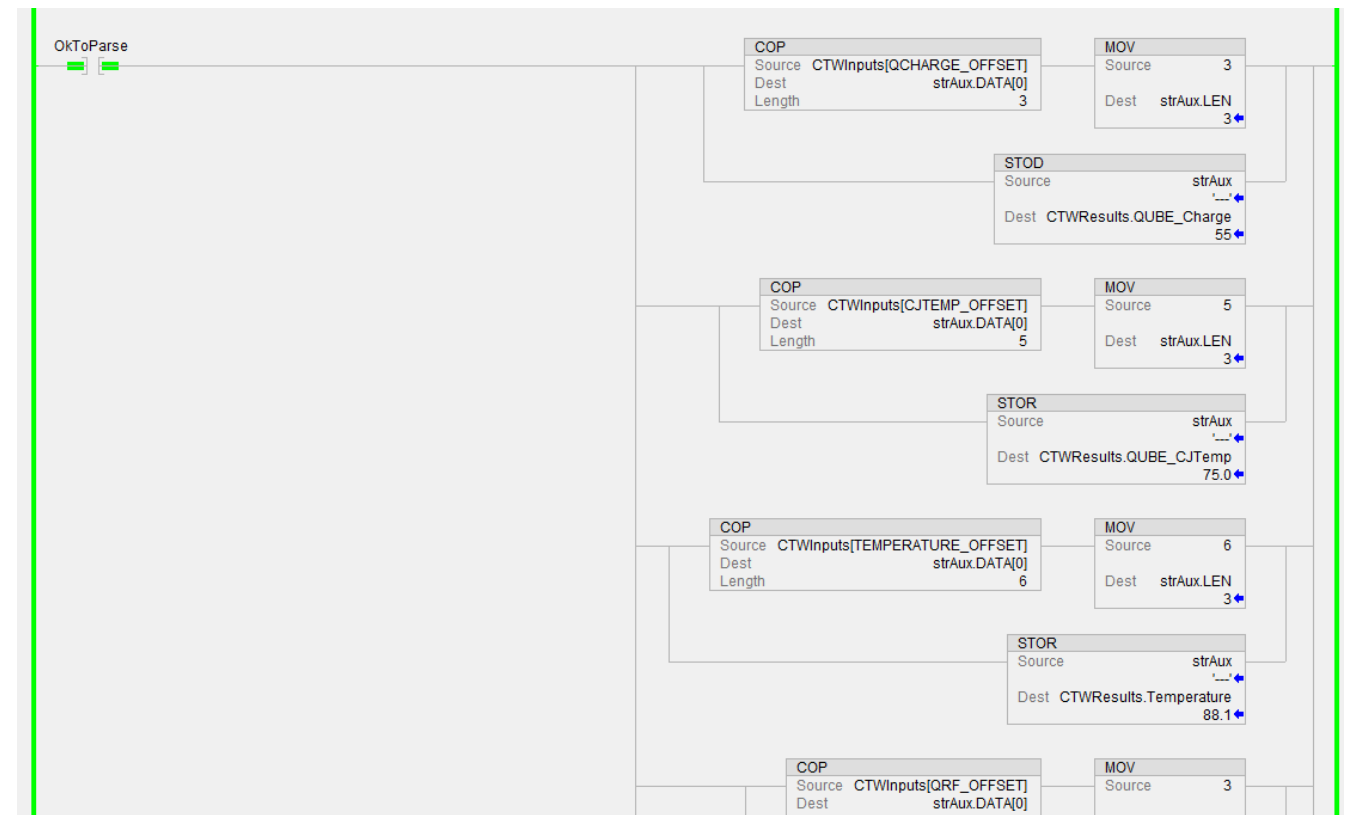
Additional Information

The HEN AOI Encapsulates: Parse the Single Based Results - No errors

- Perform these operations for the single based telegram items when there are no errors as indicated by the 'OkToParse' XIC instruction.
- In this instance the temperature values are sent in a 6-byte array of ASCII hex format (see example below)
 - TEMP_OFFSET = 41
- Copy the byte array elements for each text based result to the data array of a string variable.
- Set the string variable length to the length of the result byte array.
- Use a STOR instruction to convert that string value to a float.

Example temperature Input from CTW::

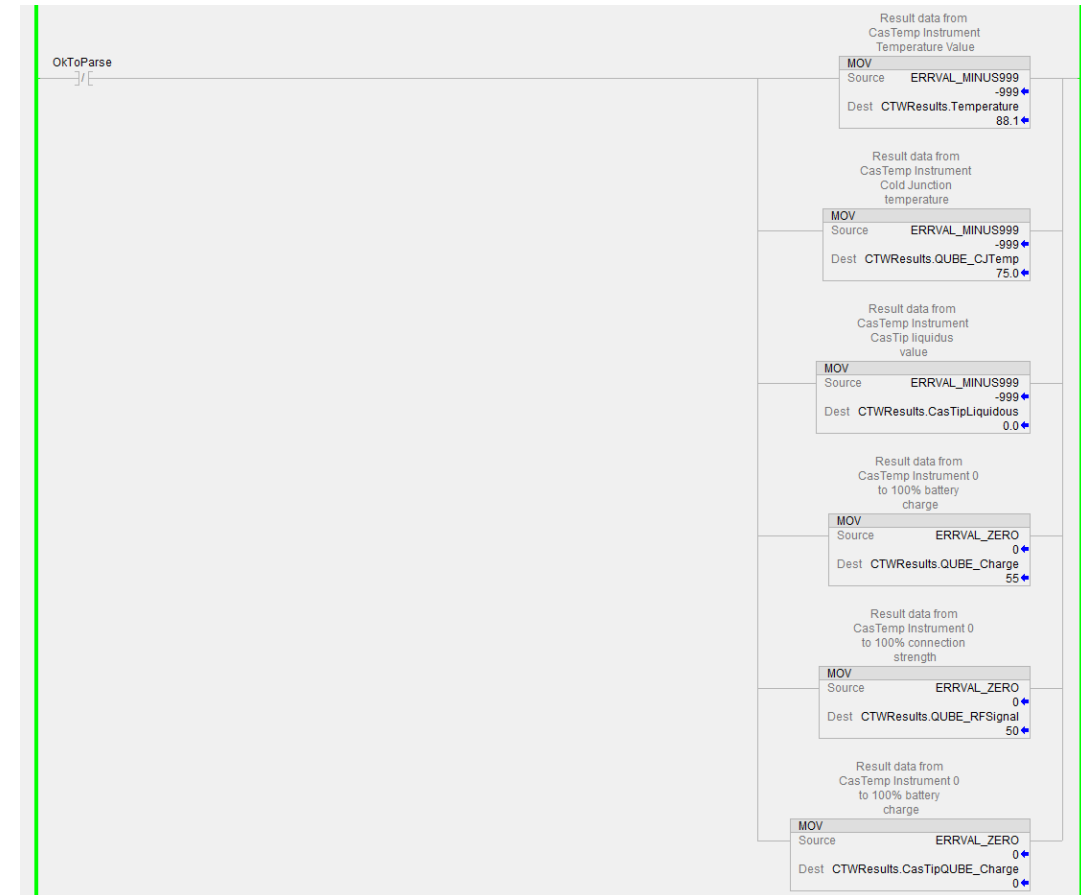
▸ CasTemp:I.Data[41]	16#30	Hex	SINT	▸ CasTemp:I.Data[41]	'0'	ASCII	SINT
▸ CasTemp:I.Data[42]	16#30	Hex	SINT	▸ CasTemp:I.Data[42]	'0'	ASCII	SINT
▸ CasTemp:I.Data[43]	16#38	Hex	SINT	▸ CasTemp:I.Data[43]	'8'	ASCII	SINT
▸ CasTemp:I.Data[44]	16#38	Hex	SINT	▸ CasTemp:I.Data[44]	'8'	ASCII	SINT
▸ CasTemp:I.Data[45]	16#2e	Hex	SINT	▸ CasTemp:I.Data[45]	'.'	ASCII	SINT
▸ CasTemp:I.Data[46]	16#31	Hex	SINT	▸ CasTemp:I.Data[46]	'1'	ASCII	SINT



Additional Information

The HEN AOI Encapsulates: Parse the Single Based Results - Error present

- Perform these operations for the single based telegram items when there are errors present as indicated by the 'OkToParse' XIO instruction.
- Copy the ERRVAL_MINUS999 variable to the single variable for each CTW result as a default. (in this case = -999.0) or
- Copy the ERRVAL_ZERO variable to the single variable for each CTW result as a default. (in this case = 0) whichever case is appropriate



Additional Information

Required CTW Output Telegram

- The CTW telegram used here consists of the results displayed. This order must be maintained for the AOI to function correctly.
- Note that in this case those results are left in the native formatting and the PLC logic to follow will handle parsing the results into the desired data types as required.

Name NewAOITelegram

Telegram definition [ModuleID][ErrorPresent][BatteryCharge][CjTemp][Temperature][SignalStrength][LTCasTip][BatteryChargeCasTip][HeatNumber][LadleEmptyTime][InstrumentName]

Available results

ModuleID	ErrorState	ErrorPresent	BatteryCharge	SystemTimestamp	SystemDateTimestamp
CjTemp	Temperature	BatteryVoltage	InstrumentName	SignalStrength	Superheat
LTCasTip	DateTimeLTCasTip	BatteryChargeCasTip	HeatNumber	GradeNumber	
PredictedSuperheat	LadleEmptyTime	SHLimitTime	RateOfChange		

Control characters

NULL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	TAB	LF	VT
FF	CR	SO	SI	DLE	DC1	DC2	DC3	DC4	NAK	SYN	ETB
CAN	EM	SUB	ESC	FS	GS	RS	US				

Parsing arguments

Floating point = [Name:F{HL}]

[Name:FH] = floating point value in high byte first order

[Name:FL] = floating point value in low byte first order

OK Cancel

Additional Information

Module Connection Option 1 – Generic Ethernet Module

- Name the module. In this case 'CasTemp. The controller tags automatically created to manage the data from this module will use this name (ie CasTemp:I.Data[0]).
- Change the Comm format to SINT.
- Add the EIP address for the CTW instrument. In this example '10.10.10.169'.
- Enter the Connection Parameters as shown on the screenshot .
- Click <Ok>

The screenshot shows the 'Connection Parameters' dialog box for a Generic Ethernet Module. The 'General' tab is active. The 'Name' field is set to 'CasTemp'. The 'Comm Format' is set to 'Data - SINT'. The 'IP Address' is set to '10 . 10 . 10 . 169'. The 'Connection Parameters' section shows the following values:

Input	Output	Configuration	Status Input	Status Output
100	150	1		

The 'Size' for each parameter is set to 128 (8-bit) for Input and Output, and 0 (8-bit) for Configuration. The 'OK' button is highlighted.

Additional Information

Module Connection Option 2 – Anybus M30

005A0000002E0100.eds

- Name the module. In this case 'CasTemp'. The controller tags automatically created to manage the data from this module will use this name (ie CasTemp:I.Data[0]).
- Change the Comm format to SINT.
- Add the EIP address for the CTW instrument. In this example '10.10.10.169'.
- Enter the Connection Parameters as shown on the screenshot .
- Click <Ok>

The 'New Module' window shows the 'General' tab with the following fields:

- Type: ABCC CompactCom EtherNet/IP(TM) 2P
- Vendor: HMS Networks
- Parent: Local
- Name: CasTemp
- Description:
- Ethernet Address: IP Address: 10.10.10.169
- Module Definition: Revision: 1.013, Electronic Keying: Compatible Module, Connections: Exclusive Owner

The 'Module Definition*' window shows the 'Connections' table:

Name	Size
Exclusive Owner	Input: 128, Output: 128, SINT

Additional Information

Module Connection Option 3– Anybus M40

005A002B00370100.ed5

- Name the module. In this case 'CasTemp'. The controller tags automatically created to manage the data from this module will use this name (ie CasTemp:I.Data[0]).
- Change the Comm format to SINT.
- Add the EIP address for the CTW instrument. In this example '10.10.10.169'.
- Enter the Connection Parameters as shown on the screenshot .
- Click <Ok>

New Module

General

Type: ABCC CompactCom 40 EtherNet/IP(TM)
Vendor: HMS Networks
Parent: Local
Name: CasTemp
Description:
Ethernet Address:
☐ Private Network: 192.168.1.
☒ IP Address: 10.10.10.169
☐ Host Name:
Module Definition:
Revision: 1.052
Electronic Keying: Compatible Module
Connections: Exclusive Owner
Change ...

Status: Creating

OK Cancel Help

Module Definition*

Revision: 1 058
Electronic Keying: Compatible Module
Connections:

Name	Size
Exclusive Owner	Input: 128 Output: 128 SINT

OK Cancel Help