BMC_AOI_PROC_BCM0001

Add-On Instruction User Guide

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1.0 Scope

1.1 This User Guide describes the installation, use and maintenance of the Add-On Instruction (AOI) software module for the BCM R15E-001-DI00-01,5-S4. This software module is designed for use with RSLogix5000, version 18.01 or later.

2.0 Products

2.1 This guide was developed for use with the software module BMC_AOI_PROC_BCM0001.L5X. These software modules are available for download at the web site www.Balluff.com/AOI.

2.2 This software module was developed for use with Balluff IO-Link condition monitoring devices BCM R15E-001-DI00-01,5-S4.

2.3 For the development of this software module and hardware configuration, the following system components were used and validated:

2.3.1 RSLogix5000, version 18.01 (or later)

2.3.2 Rockwell 1756-L63 controller

3.0 Instructions

3.1 This section describes the process for installing and using the AOI module. This is a three step process that must be followed sequentially: hardware configuration; import AOI module along with all associated UDTs; and create new ladder logic with AOI modules.

3.2 Hardware Configuration

3.2.1 The BCM R15E-001-DI00-01,5-S4 does not have any configuration setting in the RSLogix5000 I/O Configuration Tree. All of its data must be passed through an IO-Link master that communicates with the PLC using EtherNet/IP. To understand how to configure an IO-Link master, please refer to the AOI_BNI004A_40_27_041 User Guide (for use with the Balluff BNI EIP-502-105-Z015).

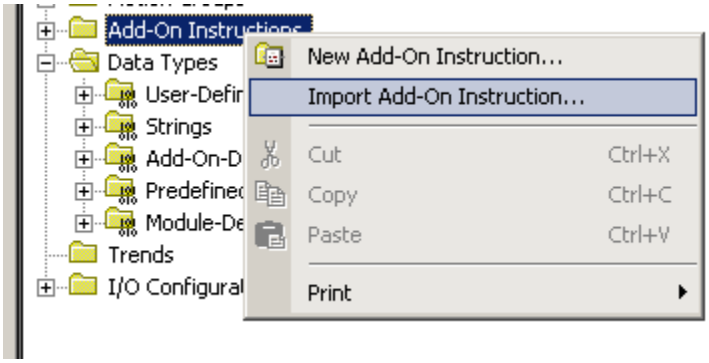
3.2.2 When the IO-Link master has established a connection with the PLC using EtherNet/IP, the IO-Link port connected to the BCM R15E-001-DI00-01,5-S4 must be configured for IO-Link mode as described in the AOI_BNI004A_40_27_041 User Guide.

3.2.3 The BCM0001 is a configurable IO-Link device, therefore, certain parameters can be changed from the default setting. This is done by using an Explicit message OR Balluff webserver function to the IO-Link Master that will write to the parameters as defined in the BCM manual.

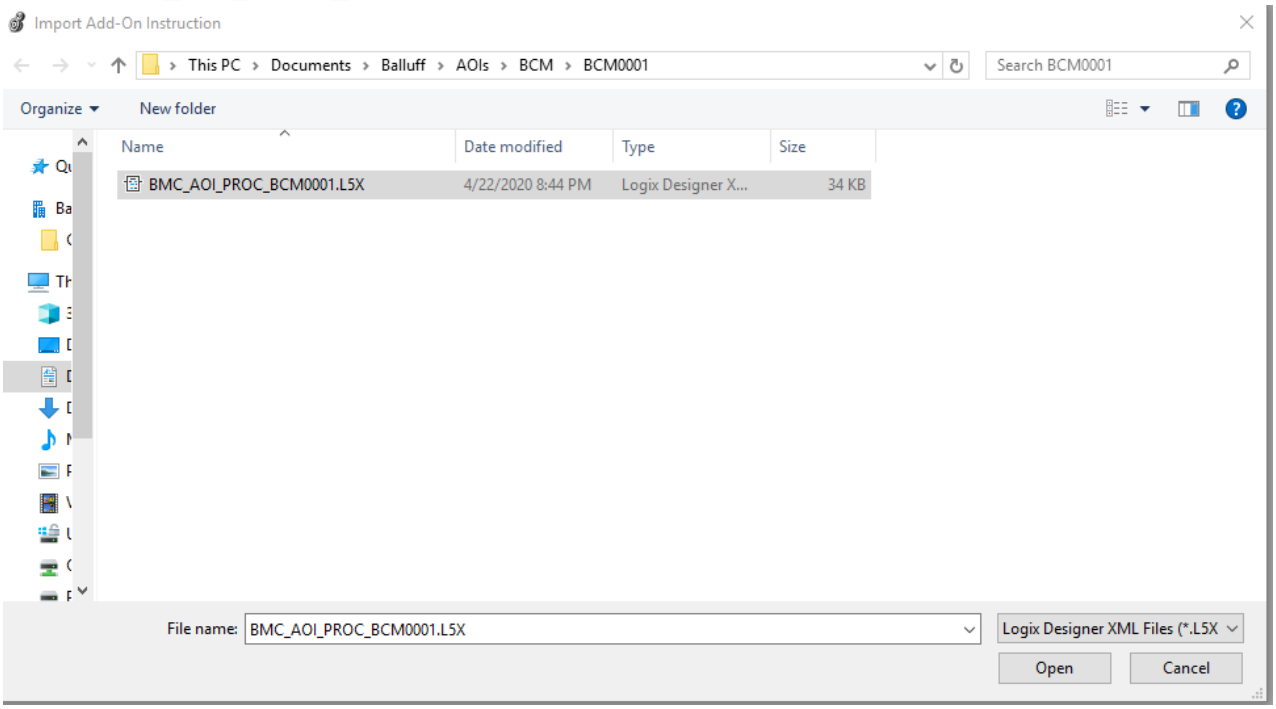
3.2.4 For more information about setting up explicit message instructions or using the webserver function, please reference IO-Link master user manual.

3.3 Import AOI

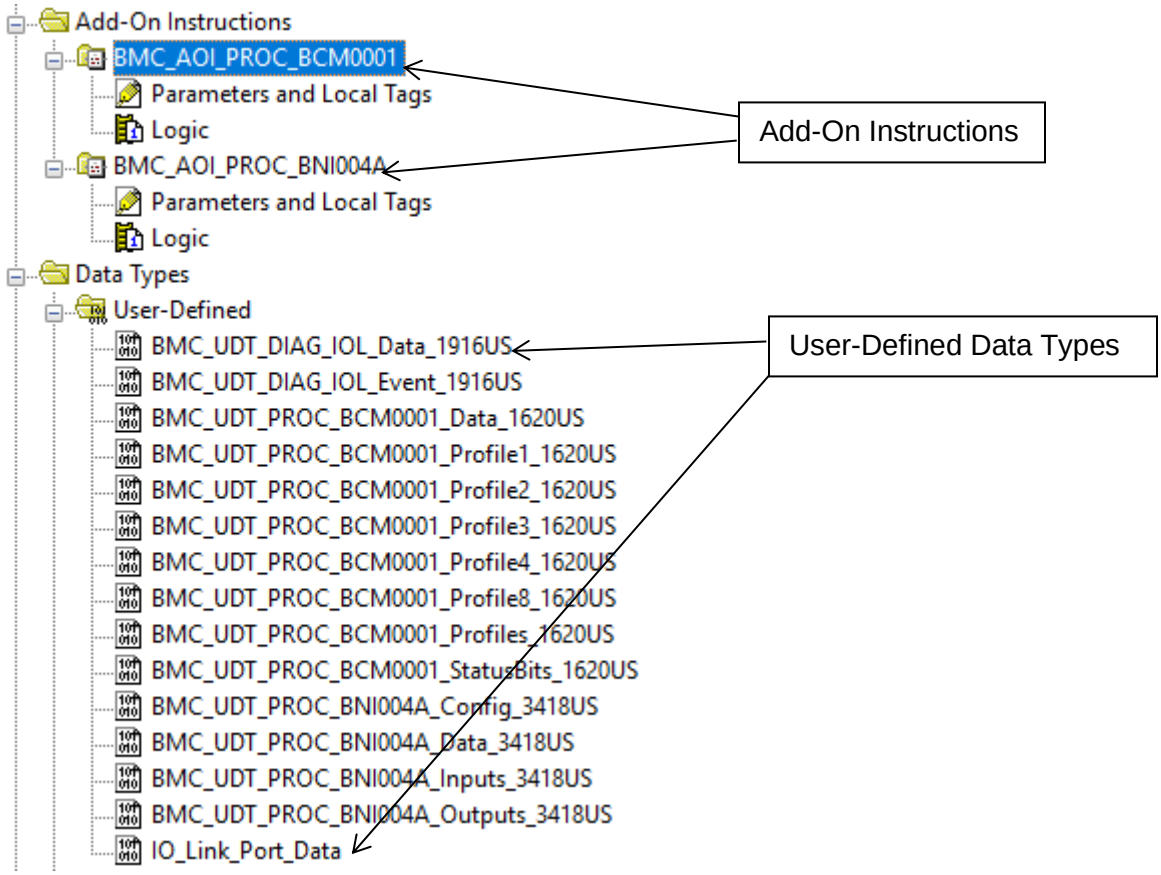
3.3.1 Right click on the Add-On Instructions element of the Controller Organizer to view a menu that includes “Import Add-On Instruction…” as shown below:



3.3.2 Locate your folder containing the downloaded Balluff AOI modules, highlight BMC_AOI_PROC_BCM0001.L5X and click *Import…* as shown below:

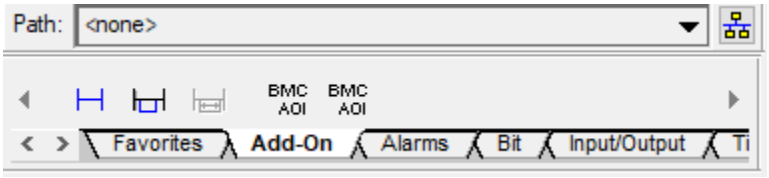


3.3.3 If it has not already been done, also import the AOI for the IO-Link master in the same manner. If the operation is successful, all UDTs associated with the AOI module will be imported into the project along with the AOI. This can be verified by checking the User-Defined element under Data Types in the Controller Organizer.

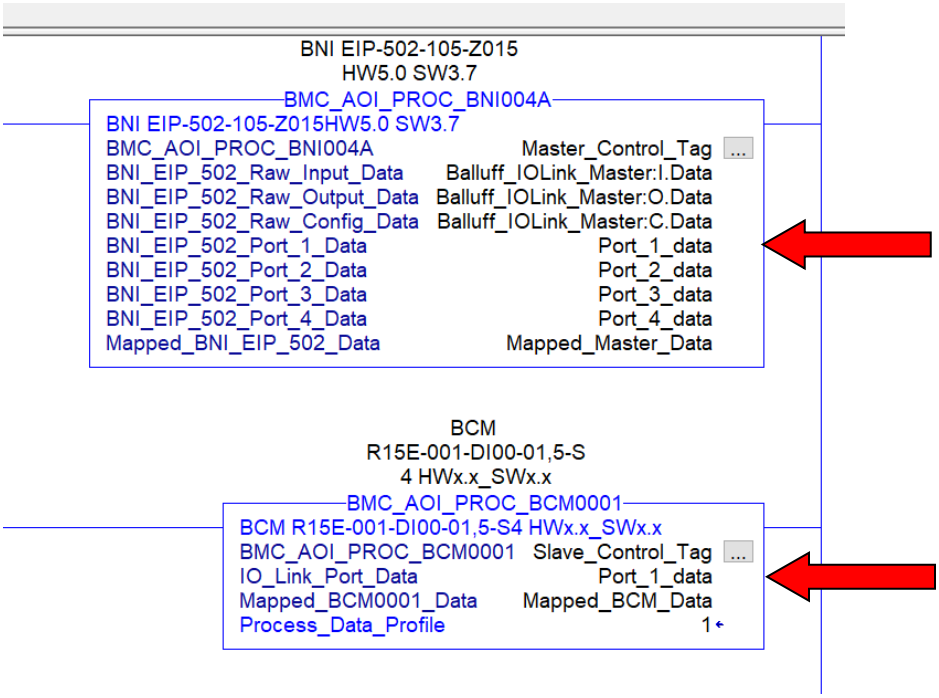


3.4 Create logic using RSLogix5000

3.4.1 Once an AOI has been imported, it can be used in the same manner as other ladder instructions. A new Element Group tab will be displayed in RSLogix5000's Language Element toolbar. This is shown here:



3.4.2 The AOI module can now be added to a rung of ladder:

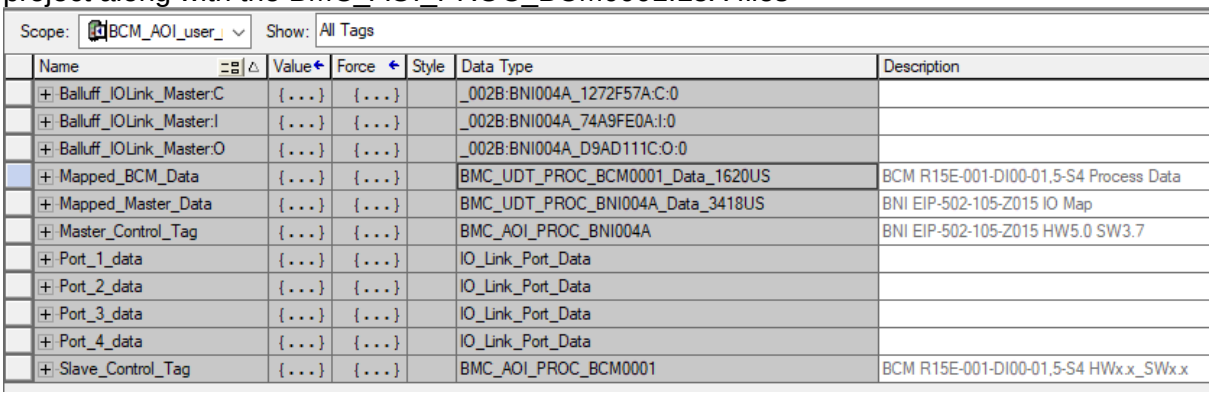


Note that in order for the AOI for the BCM to function, it must be tied to the corresponding AOI for the Balluff IO-Link master. This is accomplished as shown above by using a “Drag and Drop” procedure to copy the BNI_EIP_502_Port_1_Data tag from the master AOI to the IO_Link_Port_Data tag in the slave. In the above example, the tag name that is copied this way is “Port1_Data” which is of the data type IO_Link_Port_Data. The tag chosen for this “Drag and Drop” is dependent on which port of the IO-Link master device that the slave is connected to.

3.4.3 All parameters must be defined with tags of valid data type as defined by the AOI module. The user should create each Tag Name relevant to the user's project.

Parameter Name	Description	Data Type	Tag Name (User specific)
BMC_AOI_PROC_BCM0001	Unique Control Tag for AOI Module	BMC_AOI_PROC_BCM0001	Slave_Control_Tag
IO_Link_Port_Data	All I/O Data Associated with IO-Link Port 1	IO_Link_Port_Data	Port_1_Data
Mapped_BCM0001_Data	All Unique data associated with BCM module	BMC_UDT_PROC_BCM0001_Data_1620US	Mapped_BCM_Data

3.4.4 It is also important to verify that the following Local Tags have been created, along with the AOI Parameters, when the AOI file is imported. Because they are local tags, multiple instances of the AOI will not cause any conflicts. Note that the associated UDTs will be imported to the project along with the BMC_AOI_PROC_BCM0001.L5X files

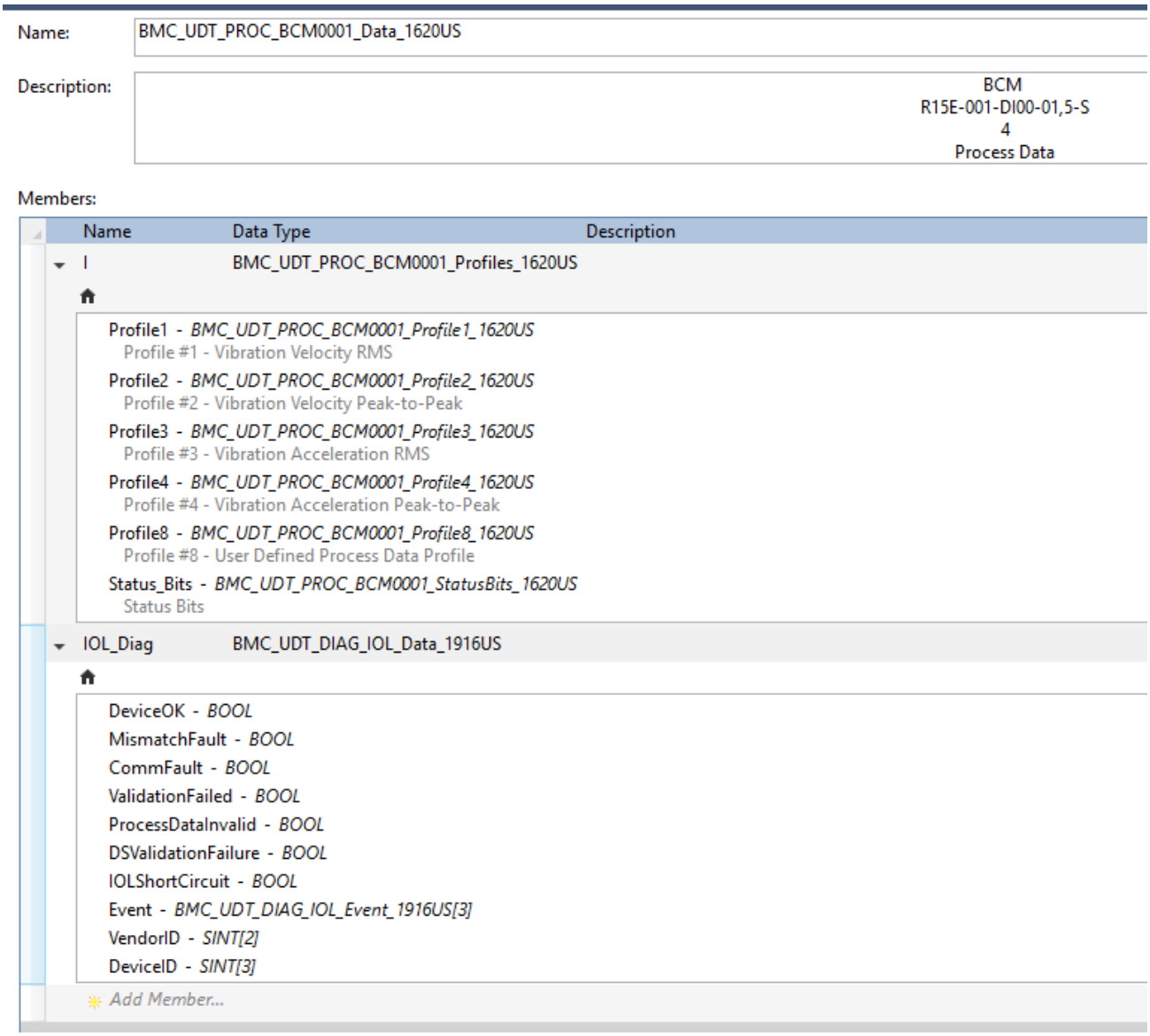

Scope: BCM_AOI_user_ Show: All Tags

Name	Value	Force	Style	Data Type	Description
Balluff_IOLink_Master:C	{...}	{...}		_002B:BNI004A_1272F57A:C:0	
Balluff_IOLink_Master:I	{...}	{...}		_002B:BNI004A_74A9FE0A:I:0	
Balluff_IOLink_Master:O	{...}	{...}		_002B:BNI004A_D9AD111C:O:0	
Mapped_BCM_Data	{...}	{...}		BMC_UDT_PROC_BCM0001_Data_1620US	BCM R15E-001-DI00-01,5-S4 Process Data
Mapped_Master_Data	{...}	{...}		BMC_UDT_PROC_BNI004A_Data_3418US	BNI EIP-502-105-Z015 IO Map
Master_Control_Tag	{...}	{...}		BMC_AOI_PROC_BNI004A	BNI EIP-502-105-Z015 HW5.0 SW3.7
Port_1_data	{...}	{...}		IO_Link_Port_Data	
Port_2_data	{...}	{...}		IO_Link_Port_Data	
Port_3_data	{...}	{...}		IO_Link_Port_Data	
Port_4_data	{...}	{...}		IO_Link_Port_Data	
Slave_Control_Tag	{...}	{...}		BMC_AOI_PROC_BCM0001	BCM R15E-001-DI00-01,5-S4 HWx.x_SWx.x

4.0 User-Defined Data Type (UDT)

The User-Defined Data Type for the Add-On Instruction defines the interface for the AOI and the user's project. For BMC_AOI_PROC_BCM0001, only one UDT, BMC_UDT_PROC_BCM0001_Data_1620US, is used for passing data between the AOI and the master project. Seven additional UDTs (BMC_UDT_PROC_BCM0001_Profile1_1620US, BMC_UDT_PROC_BCM0001_Profile2_1620US, BMC_UDT_PROC_BCM0001_Profile3_1620US, BMC_UDT_PROC_BCM0001_Profile4_1620US, BMC_UDT_PROC_BCM0001_Profile8_1620US, BMC_UDT_PROC_BCM0001_Profiles_1620US, BMC_UDT_PROC_BCM0001_StatusBits_1620US) are used internally within the AOI. One additional UDT is defined, IO_Link_Port_Data, for integrating data through configured IO-Link ports.

The main UDT (BMC_UDT_PROC_BCM0001_Data_1620US) consists of all values associated with the inputs and outputs of the BCM device. A description of this UDT and its functions is included here:



4.1.1 BMC_UDT_PROC_BCM0001_Profiles_1620US – This UDT data structure that contains process data profiles, as well as status of device status bits

4.1.1.1 BMC_UDT_PROC_BCM0001_Profile1_1620US – UDT structure that contains process data from profile 1 – Vibration Velocity RMS - 16 bytes of process data
- Vibration Velocity RMS X axis - REAL
- Vibration Velocity RMS Y axis - REAL
- Vibration Velocity RMS Z axis - REAL
- Contact Temperature – REAL

4.1.1.2 BMC_UDT_PROC_BCM0001_Profile2_1620US – UDT structure that contains process data from profile 2 – Vibration Velocity Peak-to-Peak - 16 bytes of process data
- Vibration Velocity Peak-to-Peak X axis – REAL
- Vibration Velocity Peak-to-Peak Y axis – REAL
- Vibration Velocity Peak-to-Peak Z axis – REAL
- Contact Temperature – REAL

4.1.1.3 BMC_UDT_PROC_BCM0001_Profile3_1620US – UDT structure that contains process data from profile 3 – Vibration Acceleration RMS – 16 bytes of process data
- Vibration Acceleration RMS X axis – REAL
- Vibration Acceleration RMS Y axis – REAL
- Vibration Acceleration RMS Z axis – REAL
- Contact Temperature – REAL

4.1.1.4 BMC_UDT_PROC_BCM0001_Profile4_1620US - UDT structure that contains process data from profile 3 – Vibration Acceleration Peak-to-Peak – 16 bytes of process data
- Vibration Acceleration Peak-to-Peak X axis – REAL
- Vibration Acceleration Peak-to-Peak Y axis – REAL
- Vibration Acceleration Peak-to-Peak Z axis - REAL
- Contact Temperature – REAL

4.1.1.5 BMC_UDT_PROC_BCM0001_Profile8_1620US – UDT structure that contains process data from profile 8 - User defined process data – 16 bytes of process data
- Slot 1 – User defined - REAL
- Slot 2 – User defined - REAL
- Slot 3 – User defined - REAL
- Slot 4 – User defined - REAL
- NOTE – For available content for user defined profile, please reference Table 6-6 of user manual on page 22.

4.1.1.6 BMC_UDT_PROC_BCM0001_StatusBits_1620US - UDT structure that contains status bit process data – this information is tied to event bits of the sensor – 4 bytes of process data
- Vibration Acceleration RMS status bits
  - MAIN_ALARM_aRMS_MAG_Status – user defined set point - BOOL
  - PRE_ALARM_aRMS_MAG_Status – user defined set point – BOOL
  - MAIN_ALARM_aRMS_Z_Status – user defined set point – BOOL
  - PRE_ALARM_aRMS_Z_Status – user defined set point – BOOL
  - MAIN_ALARM_aRMS_Y_Status – user defined set point – BOOL
  - PRE_ALARM_aRMS_Y_Status – user defined set point – BOOL
  - MAIN_ALARM_aRMS_X_Status – user defined set point – BOOL
  - PRE_ALARM_aRMS_X_Status – user defined set point – BOOL
- Vibration Velocity RMS status bits
  - MAIN_ALARM_vRMS_MAG_Status – user defined set point - BOOL
  - PRE_ALARM_vRMS_MAG_Status – user defined set point – BOOL

- MAIN_ALARM_vRMS_Z_Status – user defined set point – BOOL
- PRE_ALARM_vRMS_Z_Status – user defined set point – BOOL
- MAIN_ALARM_vRMS_Y_Status – user defined set point – BOOL
- PRE_ALARM_vRMS_Y_Status – user defined set point – BOOL
- MAIN_ALARM_vRMS_X_Status – user defined set point – BOOL
- PRE_ALARM_vRMS_X_Status – user defined set point – BOOL

- Vibration Severity Zone – current severity zone status bits
  - VIB_SEVERITY_ZONE_D – user defined set point – BOOL
  - VIB_SEVERITY_ZONE_C – user defined set point – BOOL
  - VIB_SEVERITY_ZONE_B – user defined set point – BOOL
  - VIB_SEVERITY_ZONE_A – user defined set point – BOOL
- Contact Temperature status bits
  - CONTACT_TEMP_UPPER_ALM – user defined set point – BOOL
  - CONTACT_TEMP_LOW_ALM – user defined set point – BOOL

NOTE: Reference user manual for parameter data list to define set points starting on page 19.

4.1.2 IOL_Diag – BMC_UDT_DIAG_IOL_DATA_1916US - This UDT data structure contains 16 bytes of additional IO-Link slave device diagnostic information.

4.1.2.1 DeviceOK – Port in IO-Link mode, device is connected, vendor and device ID match - BOOL

4.1.2.2 MismatchFault – Port in IO-Link mode, device is connected, vendor or device ID doesn't match - BOOL

4.1.2.3 CommFault – Port in IO-Link mode, device not connected - BOOL

4.1.2.4 ValidationFailed – validation failed – IO-Link master function - BOOL

4.1.2.5 ProcessDataInvalid – Process data invalid – IO-Link master function - BOOL

4.1.2.6 DSValidationFailure – Data storage validation failure - BOOL

4.1.2.7 IOLShortCircuit – IO-Link short-circuit - BOOL

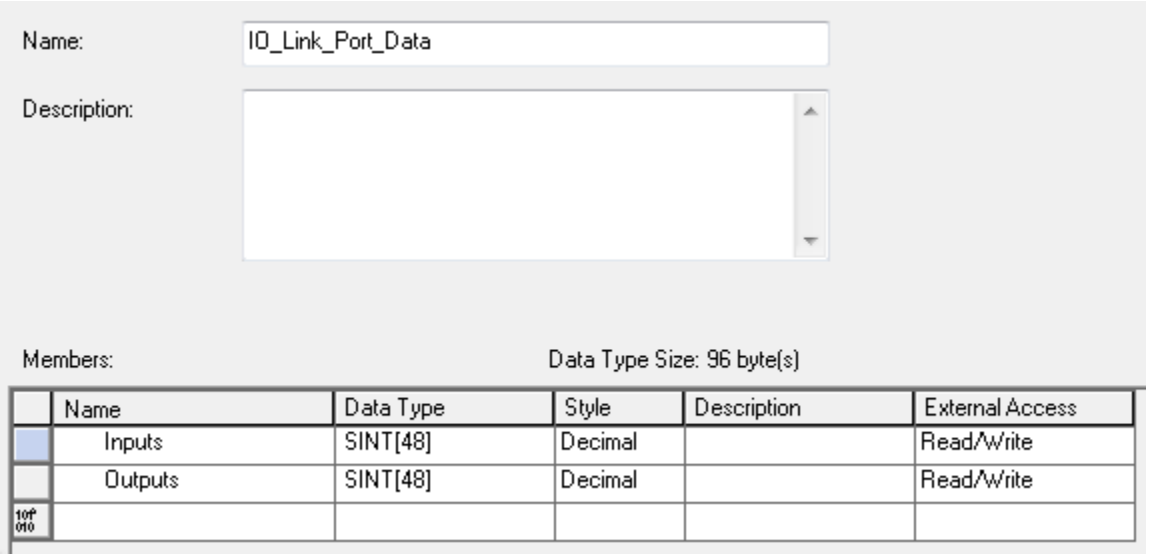
4.1.2.8 Event – IO-Link slave device event codes – 9 bytes – 3 event buffer - FIFO

4.1.2.9 VendorID – 2 byte vendor ID

4.1.2.10 DeviceID – 3 byte device ID

NOTE: IO-Link diagnostic data is only available from Balluff EtherNET/Ip IO-Link masters. For more details, please reference IO-Link master user manual under "IO-Link Input Data".

4.2 The IO_Link_Port_Data UDT consists of the 48 input bytes (SINTs) and 48 output bytes (SINTs) that the IO-Link master allocates to each port. Under normal operating conditions, the user will not be aware of any data being passed through this UDT. The AOI automates the parsing of the data for each port and allows the user to access the data directly without mapping each of the four port's data into the master's single data buffer. This UDT is used for both the IO-Link master AOI as well as each IO-Link slave AOI. The master and slave must share the same tag name for the corresponding port.



4.2.1 Inputs – this 48-byte SINT array contains all raw input data values being passed from the IO-Link slave device input array to the master device input array.

4.2.2 Outputs – this 48-byte SINT array contain all raw output data values being passed from the IO-Link slave device output array to the master device output array.

5.0 AOI Implementation

5.1 In order for the AOI to display correct values, user must ensure that correct process data profile number is referenced.

5.1.1 1 – Profile 1 – Vibration Velocity RMS

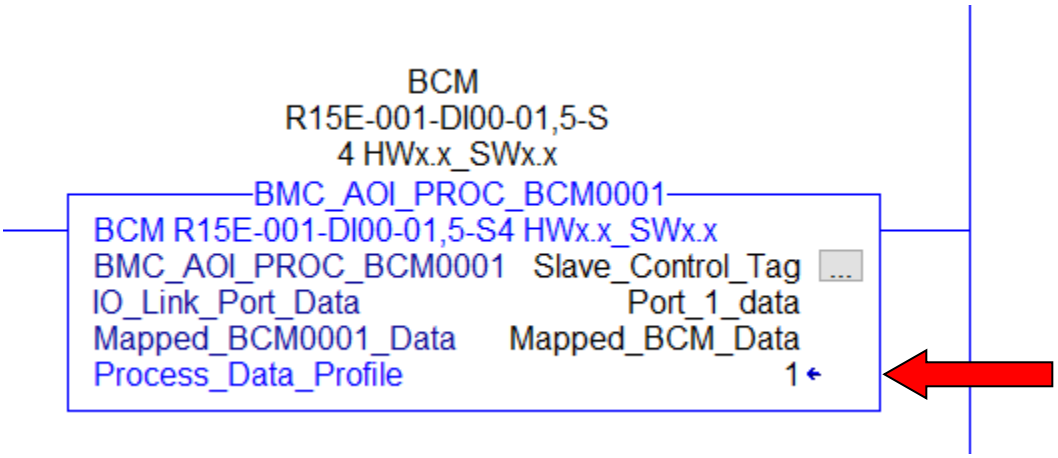
5.1.2 2 – Profile 2 – Vibration Velocity Peak-to-Peak

5.1.3 3 – Profile 3 – Vibration Acceleration RMS

5.1.4 4 – Profile 4 – Vibration Acceleration Peak-to-Peak

5.1.5 8 – Profile 8 – User defined process data

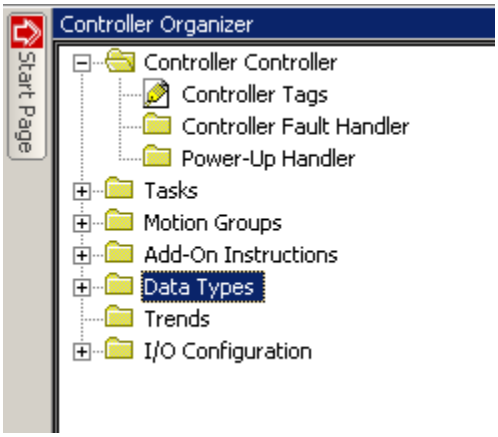
NOTE: Use parameter data to change profile index 0x2000hex (8192dec) – see table 6-4 of the user manual. Changing the “Process_Data_Profile” input variable in the AOI will not change the configuration of the sensor. This is only used to match current configuration of the sensor to properly display process data in the AOI.



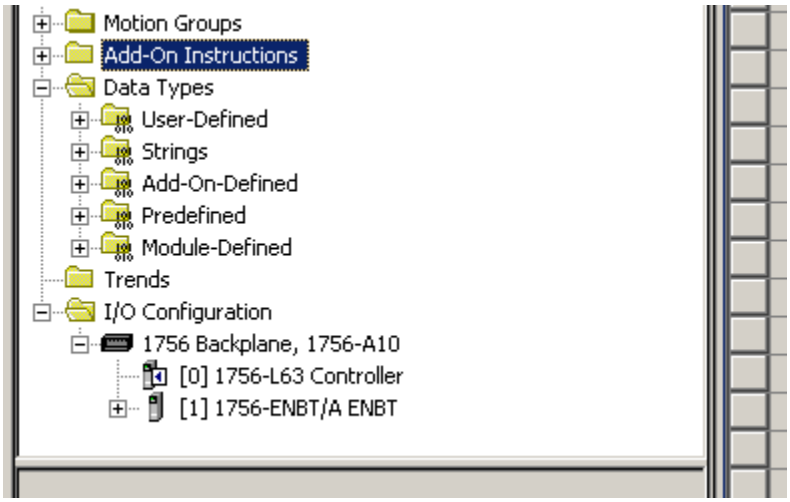
6.0 Definitions

6.1 The following terms are used in this guide with these definitions:

6.1.1 Controller Organizer – the area of RSLogix5000 where all project components can be accessed. If this toolbar is not visible, it can be opened by pressing Alt+0.



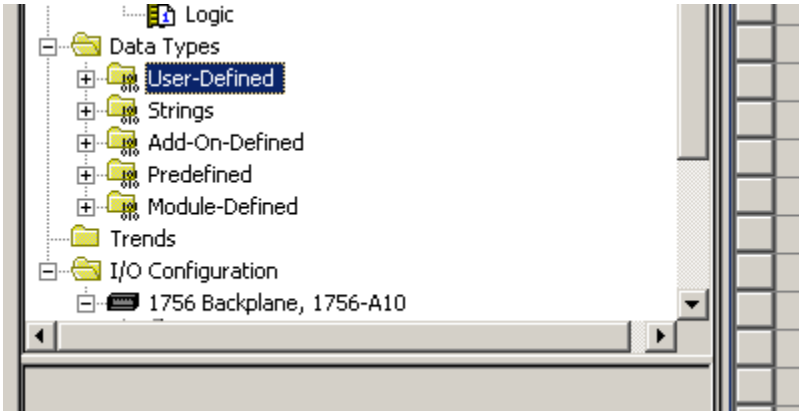
6.1.2 AOI – Add-On Instruction – reusable software module created with RSLogix5000. Balluff's AOI modules are composed of UDTs and associated logic to implement control algorithms. This module is hardware specific. All AOI modules contained in a project will be located in the Controller Organizer as shown below:



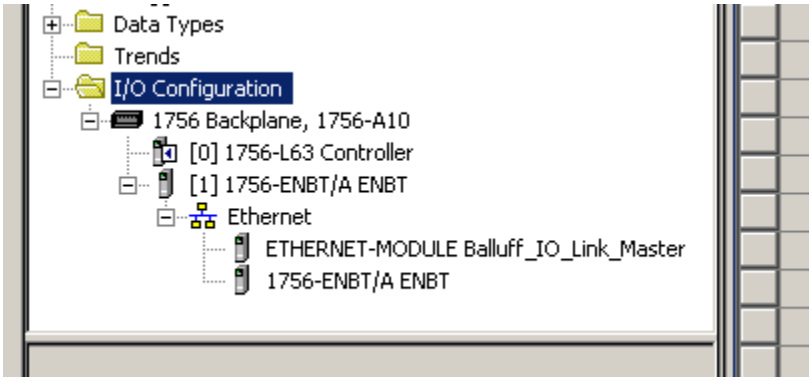
6.1.3 Controller scoped tag – a tag of any valid data type that is available to all programs within a project and must be used uniformly throughout the entire project.

6.1.4 AOI Parameter – a tag of any valid data type that is created during the definition of the AOI module and is isolated to that AOI. Its scope is limited to each discrete use of the AOI function.

6.1.5 UDT – User-Defined Data Type – reusable software module created with RSLogix5000. Balluff's UDTs define the input and output tag names to be used when implementing our AOI modules. A UDT can be composed of any combination of standard Data Types defined by RSLogix5000 or other UDTs. All UDTs contained in a project will be located in the Controller Organizer as shown below:



6.1.6 I/O Configuration Tree – the area of RSLogix5000 where all physical, or "real world", Inputs and Outputs associated with the controller are defined. One example of an I/O Configuration Tree is shown below:



6.1.7 EDS – Electronic Data Sheet – software configuration file that defines how a hardware product will communicate with the network master using EtherNet/IP. The format and content of an EDS is defined by ODVA, the controlling organization for EtherNet/IP specifications.

7.0 Related Documents

7.1 The following Balluff documents support the release of this User Guide and its related software module. Each of these documents can be obtained by contacting Balluff Technical Support at technicalsupport@balluff.com or at http://www.balluff.com/balluff/MUS/en/home.jsp:

7.1.1 AOI_BNI004A_40_27_041 User Guide

7.1.2 BNI EIP-502-105-Z015 User's Guide

8.0 References

8.1 None