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TURCK

IO-Link
Ethernet IP Add-On-Instruction
Startup Guide

555Txxxxxx
0817 Rev.A

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1 General Information

1.1 About these instructions

The following user manual describes the setup, functions, and use of the system. It helps you to plan, design, and implement the system for its intended purpose.

Note*: Please read this manual carefully before using the system. This will prevent the risk of personal injury or damage to property or equipment. Keep this manual safe during the service life of the system. If the system is passed on, be sure to transfer this manual to the new owner as well.

1.2 Explanation of symbols used

Action-related warnings are placed next to potentially dangerous work steps and are marked by graphic symbols. Each warning is initiated by a warning sign and a signal word that expresses the gravity of the danger. The warnings have absolutely to be observed:

DANGER!

DANGER indicates an immediately dangerous situation, with high risk, the death or severe injury, if not avoided.

WARNING!

WARNING indicates a potentially dangerous situation with medium risk, the death or severe injury, if not avoided.

ATTENTION!

ATTENTION indicates a situation that may lead to property damage, if it is not avoid-ed.

NOTE

In NOTES you find tips, recommendations and important information. The notes facilitate work, provide more information on specific actions and help to avoid overtime by not following the correct procedure.

➢ CALL TO ACTION

This symbol identifies steps that the user has to perform.

➔ RESULTS OF ACTION

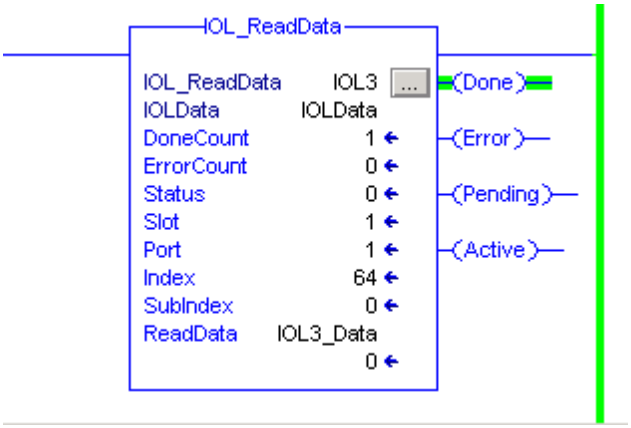
This symbol identifies relevant results of steps

1.3 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to techdoc@turck.com.

2 Introduction

This startup guide describes the IOLink Add-On-Instructions (AOIs) providing IOLink acyclic read and write capability when used with RSLogix 5000 programmed ControlLogix or CompactLogix (CLX) PLC's. The AOIs allow simple implementation of acyclic IOLink read and write operations using modular Turck BL20 in-cabinet and BL67 on-machine IO, or BLCompact and TBEN hardened on-machine IO stations.



IOLink provides digital communication to the device and includes cyclic data (the state of the device process variable) and acyclic data (device configuration and status information). Cyclic data transfer can be implemented using either Generic Ethernet/IP CIP Bridge or Generic Ethernet Module. Acyclic data transfer is implemented using the IOLink AOI's.

IOLink Add-On-Instruction Family

- IOL_ReadString – read string type data
- IOL_WriteString – write string type data
- IOL_ReadData – read 8,16 and 32-bit precision numeric data
- IOL_WriteData – write 8,16 and 32-bit precision numeric data
- IOLService – execute the Ethernet IP communication required to execute requested transfers

Each IOLink read and write request is instantiated uniquely and the number of reads and writes is limited only by controller memory. Pending requests are executed serially in the order they scanned.

The IOLink AOI's can be used with the following Turck IOLink masters:

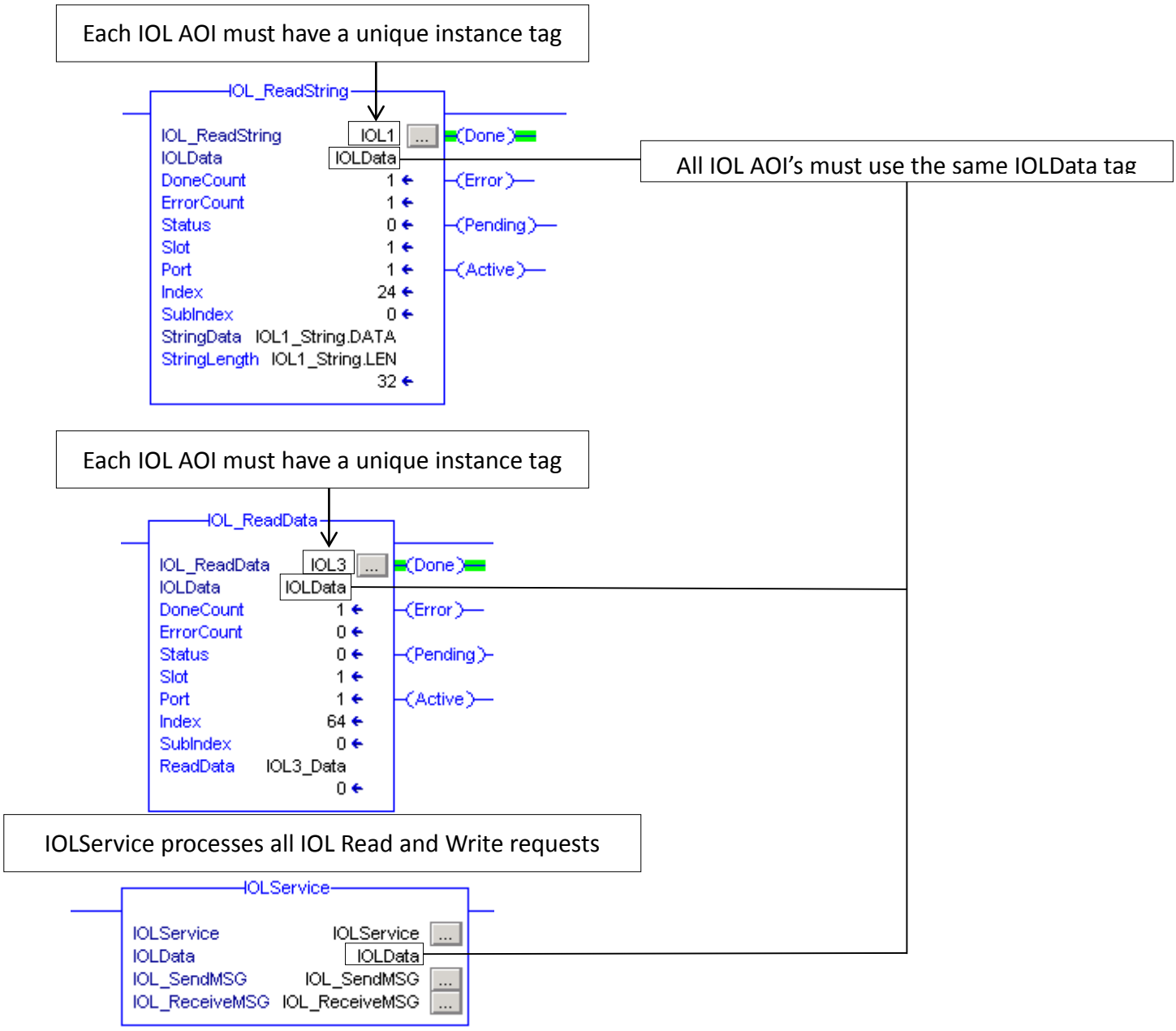
- BL20-E-4IOL(s) used with multiprotocol BL20-E-GW-EN
- BL67-4IOL(s) used with multiprotocol BL67-GW-EN
- TBEN-S2-4IOL
- BLCEN-4M12MT-4IOL
- BLCEN-8M12LT-4IOL-4IOL
- BLCEN-6M12LT-4IOL-2RFID-S
- BLCEN-8M12LT-4IOL-8XSG-P
- BLCEN-8M12LT-4IOL-4AI-VI
- BLCEN-8M12LT-4IOL-4AI4AO-VI
- TBIP-L4-FDIO1-2IOL
- TBEN-L5-8IOL
- TBEN-L4-8IOL

IOLink applications range from simple discrete IO expansion to sophisticated continuously monitored sensor applications. For a simple IO expansion application the IOLink AOI's are not required and all configuration occurs in the PLC controller tags. As application grow in sophistication the AOI's can be added to a program at any time.

3 IO-Link AOI Programming

3.1 AOI Instances and IOLService Integration

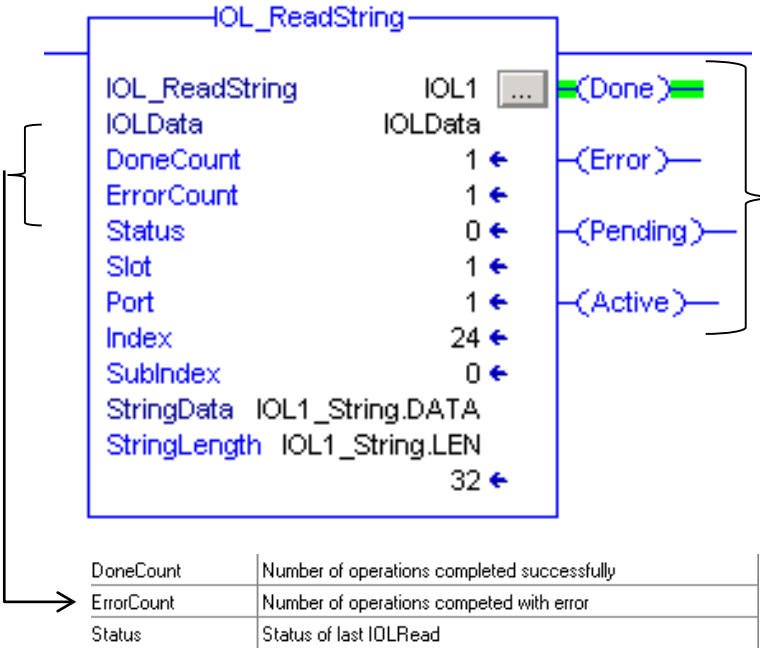
- Each IOLink transfer request must have a unique instance tag
- All IOLink transfer requests must use the same IOLData tag to share data with IOLService.



The IOLService AOI appears a single time in the application program and processes all IOLink read and write requests. The number of read and write requests in an application is limited only by controller memory. Multiple read and write requests can be triggered simultaneously and will be processed in the order they appear in the program.

3.2 IOL Operation Status

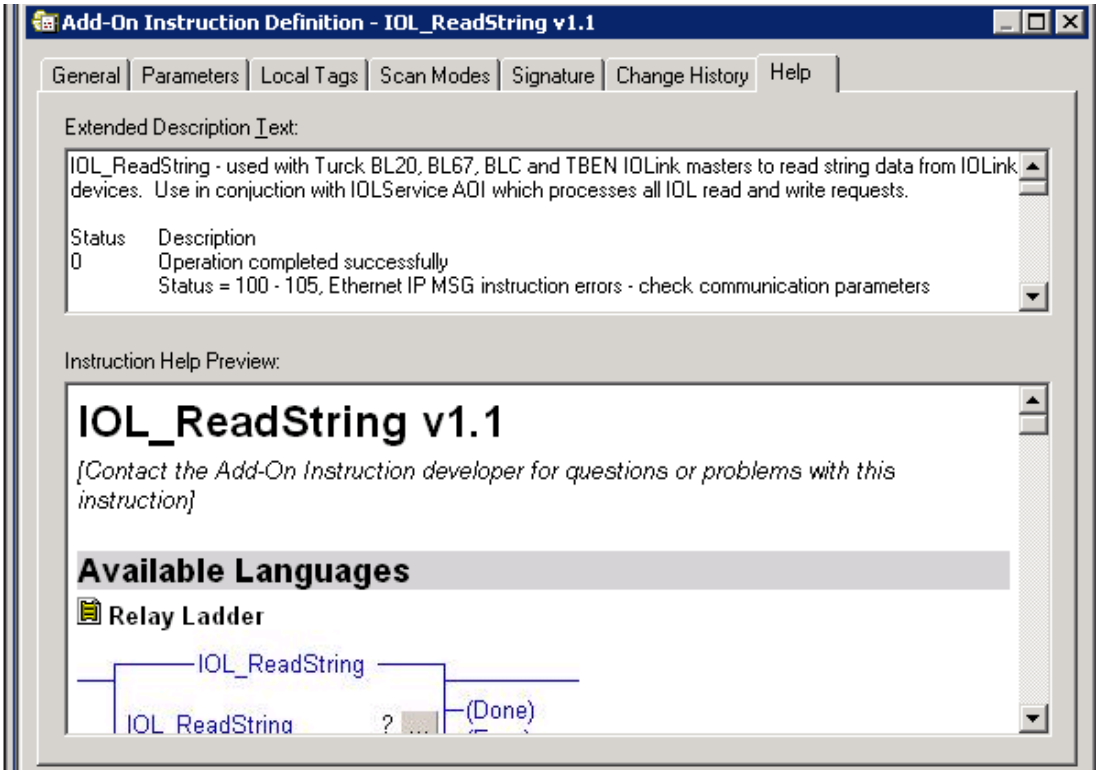
Current operation status is indicated by Done, Error, Pending and Active coils to the right of the AOI. Cumulative DoneCount and ErrorCount and last operation Status are presented on the AOI template.



Done	IOLRead completed successfully
Error	IOLRead completed with error, check status
Pending	IOLRead waiting to be processed
Active	IOLRead in progress

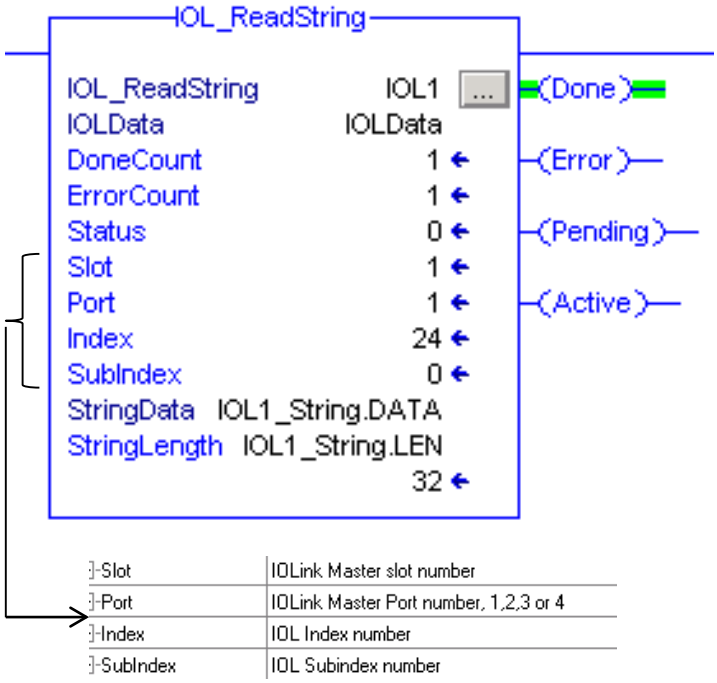
DoneCount	Number of operations completed successfully
ErrorCount	Number of operations competed with error
Status	Status of last IOLRead

Select the AOI template and press F1 to access help which contains the description of the values presented in Status. Scroll down to view a description of the Status value when an error occurs.



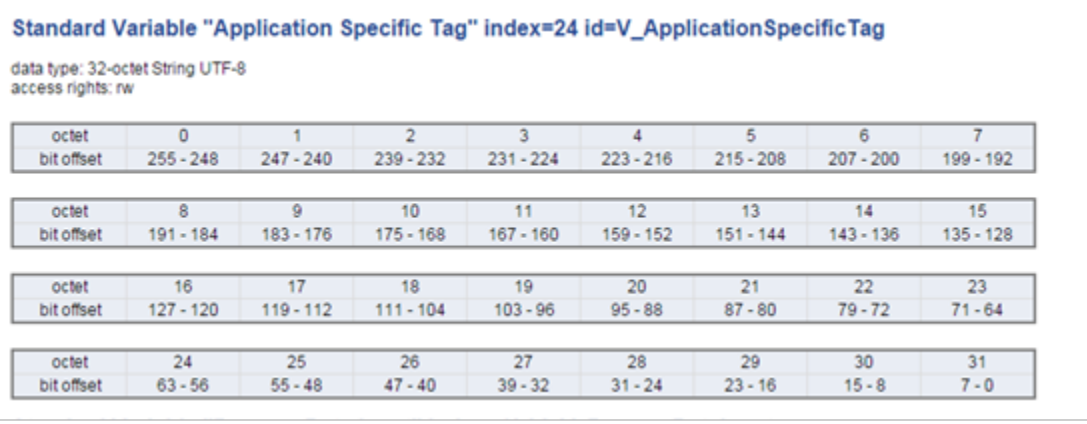
3.3 Specifying IOLink Operations

Slot and Port specify where the IOLink device is connected. Index and Subindex specify which parameter in the IOLink device is to be read or written. When using BL20 or BL67 slot specifies the position in the rack. Using BLCEN slot is set to 1 or 2 specifying the upper or lower position in the block. Set slot to 1 for TBEN-S2-4IOL



The available parameters for each IOLink device varies and the device data dictionary is usually provide in the manufacturer's datasheet, or an html file or an IODD (IO Link data definition file).

Shown below is the Turck-TBIL-M1-16DI-20130704-IODD1.1-en.html after dropping it in Google Chrome.



Standard Variable "Application Specific Tag" index=24 id=V_ApplicationSpecificTag

data type: 32-octet String UTF-8
access rights: rw

octet	0	1	2	3	4	5	6	7
bit offset	255 - 248	247 - 240	239 - 232	231 - 224	223 - 216	215 - 208	207 - 200	199 - 192

octet	8	9	10	11	12	13	14	15
bit offset	191 - 184	183 - 176	175 - 168	167 - 160	159 - 152	151 - 144	143 - 136	135 - 128

octet	16	17	18	19	20	21	22	23
bit offset	127 - 120	119 - 112	111 - 104	103 - 96	95 - 88	87 - 80	79 - 72	71 - 64

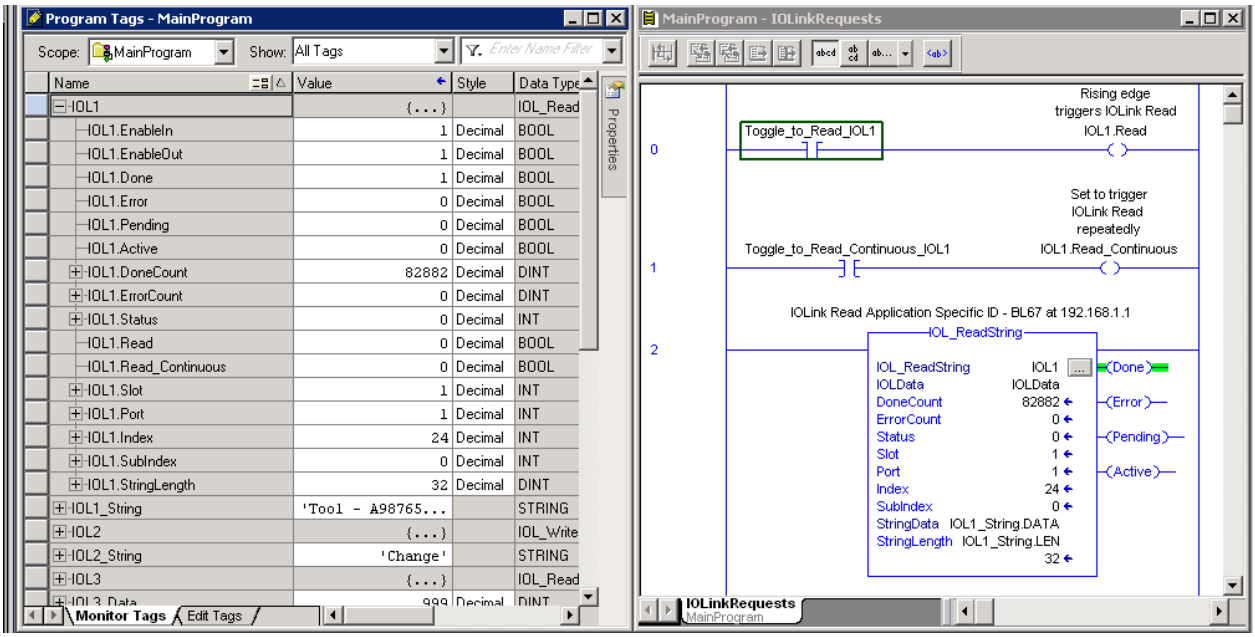
octet	24	25	26	27	28	29	30	31
bit offset	63 - 56	55 - 48	47 - 40	39 - 32	31 - 24	23 - 16	15 - 8	7 - 0

As shown, the Application Specific Tag can be read and written and is a 32-character string. This is often used for Tooling Identification when using the Turck TBIL IOLink hubs.

3.4 IOL_ReadString

Use IOL_ReadString to read ASCII strings up to 82 characters long. As shown below, IOL_ReadString instance IOL1 reads the IOLink Device Application Specific ID found at Index 24 Subindex 0. An off-to-on transition of IOL1.Read will trigger the operation a single time. Setting IOL1.Read_Continuous to 1 will trigger repeated reads.

The target variable for the read operation must be a standard RSL5000 string. The array of characters (DATA) and string length (LEN) must be specified separately as shown. The length of the string returned by the IOLink Device is stored by the AOI in the variable specified at StringLength.



The table below shows a list of the string type data available from most IOLink devices:

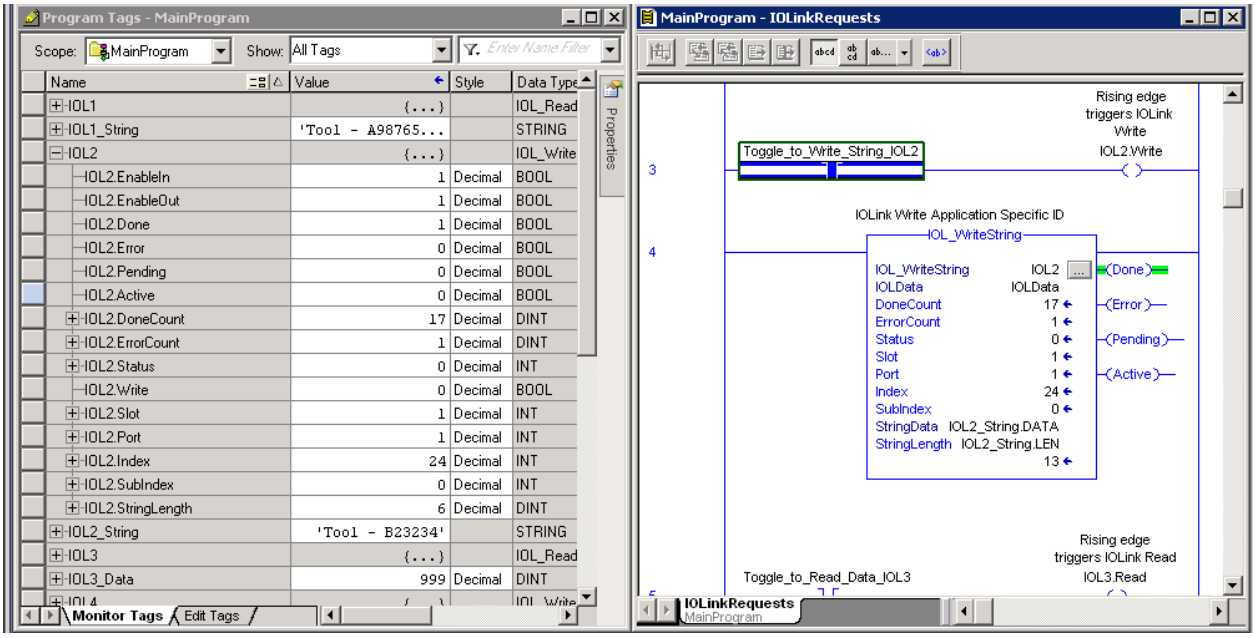
Index (dez.)	R/W	Function
16	R	Manufacturer's name
17	R	Manufacturer text
18	R	Product name
19	R	Product ID
20	R	Product text
21	R	Serial number
22	R	Hardware version
23	R	Firmware version
24	R/W	Specific name of the application

The Application Specific ID at Index 24 Subindex 0 is particularly useful for tooling identification when using the Turck TBIL-M1-16DXP IOLink hub.

3.5 IOL_WriteString

Use IOL_WriteString to write ASCII strings up to 82 characters long. As shown below, IOL_WriteString instance IOL2 writes the IOLink Device Application Specific ID found at Index 24 Subindex 0. An off-to-on transition of IOL2.Write will trigger the operation a single time.

The source variable for the write operation must be a standard RSL5000 string. The array of characters (DATA) and string length (LEN) must be specified separately as shown. The number of characters specified by StringLength are written to the IOLink device.

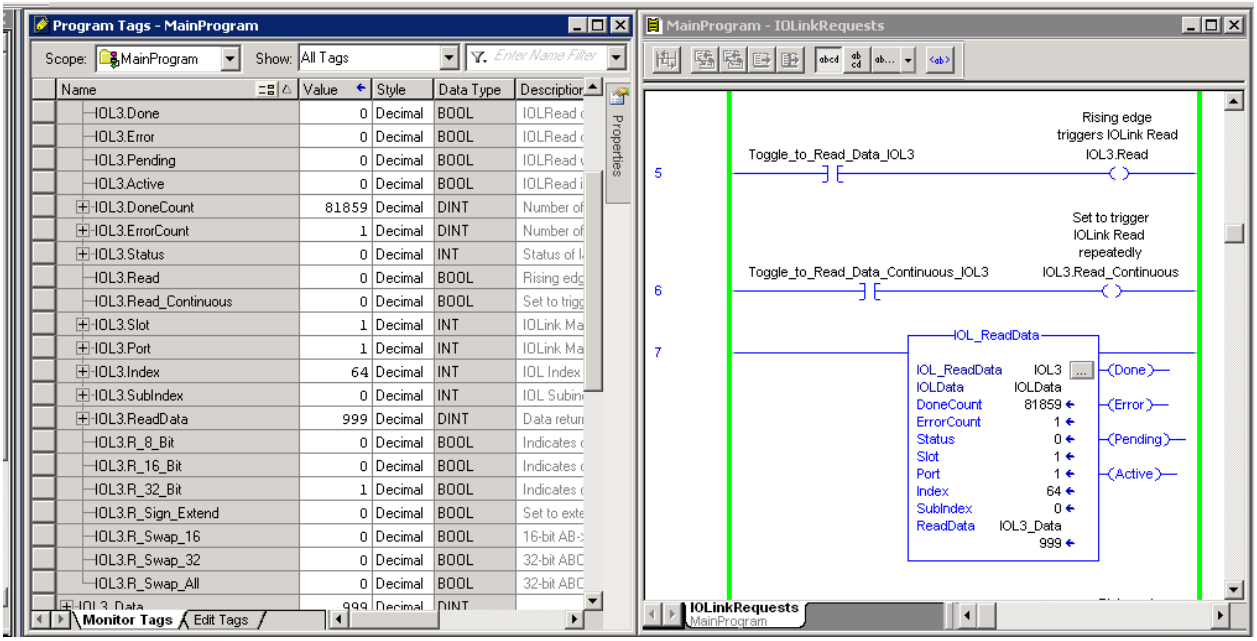


As shown above, the value specified by IOL2_String, “Tool – B23234” will be written to the IOLink device Application Specific ID at Index 24 Subindex 0.

Index (dez.)	R/W	Function
24	R/W	Specific name of the application

3.6 IOL_ReadData

Use IOL_ReadData to read 8, 16 or 32-bit numeric data. As shown below, IOL_ReadData instance IOL3 reads the IOLink Parmeter ID found at Index 64 Subindex 0. An off-to-on transition of IOL3.Read will trigger the operation a single time. Setting IOL3.Read_Continuous on will trigger repeated reads



The target variable specified at ReadData must be a DINT type. When the read operation completes the precision of the data read, 8, 16 or 32-bit, is reported back to the application. This information is provided as a convenience since you'll need to specify the precision to use IOL_WriteData.

IOL3.ReadData	999	Decimal	DINT	Data returned from IOLink device
IOL3.R_8_Bit	0	Decimal	BOOL	Indicates data received is 8 bit precision
IOL3.R_16_Bit	0	Decimal	BOOL	Indicates data received is 16 bit precision
IOL3.R_32_Bit	1	Decimal	BOOL	Indicates data received is 32 bit precision

The data translation settings shown below are provided to perform any data manipulation required when reading signed data of less than 32-bit precision or when the device byte order differs from RSL5000.

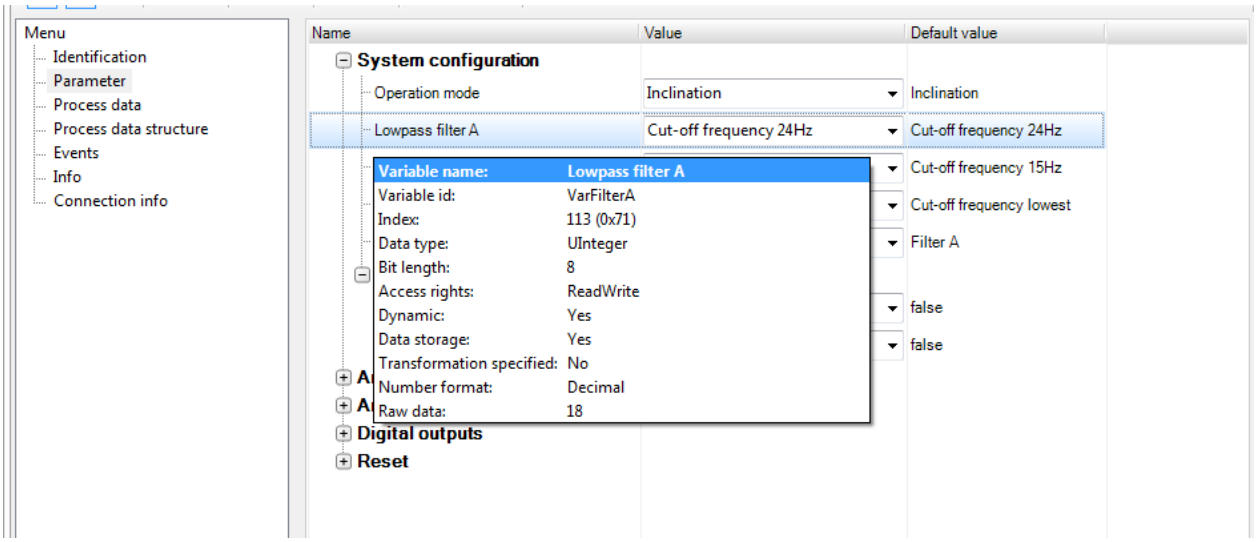
IOL3.R_Sign_Extend	0	Decimal	BOOL	Set to extend 8/16 bit precision data sign bit
IOL3.R_Swap_16	0	Decimal	BOOL	16-bit AB->BA, 32-bit ABCD->BADC
IOL3.R_Swap_32	0	Decimal	BOOL	32-bit ABCD->DCBA
IOL3.R_Swap_All	0	Decimal	BOOL	32-bit ABCD->CDBA

Shown below is the Turck-TBIL-M1-16DI-20130704-IODD1.1-en.html after dropping it in Google Chrome.

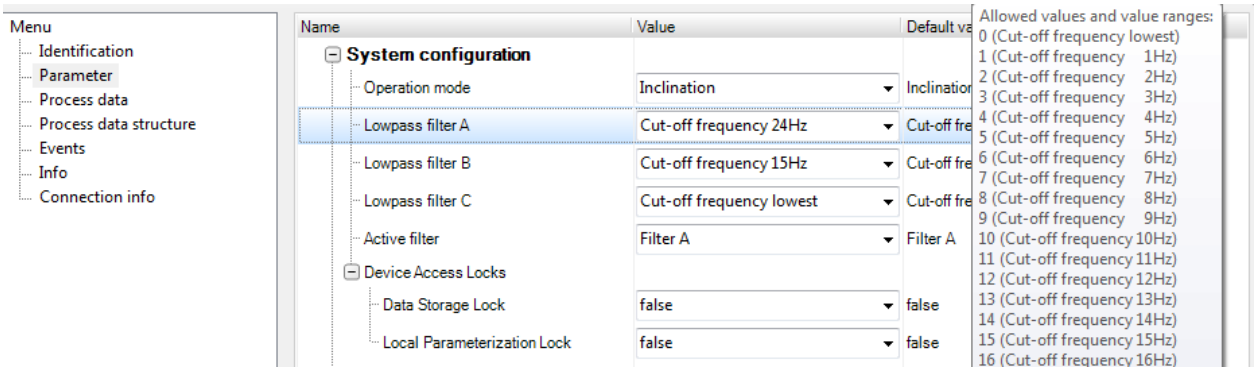
Variable "Parameter ID" index=64 id=V_Parameter_ID

data type: 32-bit UInteger
default value: 0
access rights: rw
excluded from data storage

Depending on the device and the manufacturer finding the IOLink Index and Subindex value and data precision will be documented either in the device datasheet or in the IODD file. Using PACTware you can view information about the IOLink parameters. As shown below, if you hover over “Lowpass filter A” and right-click the IOLink Index, data precision and access rights are displayed.

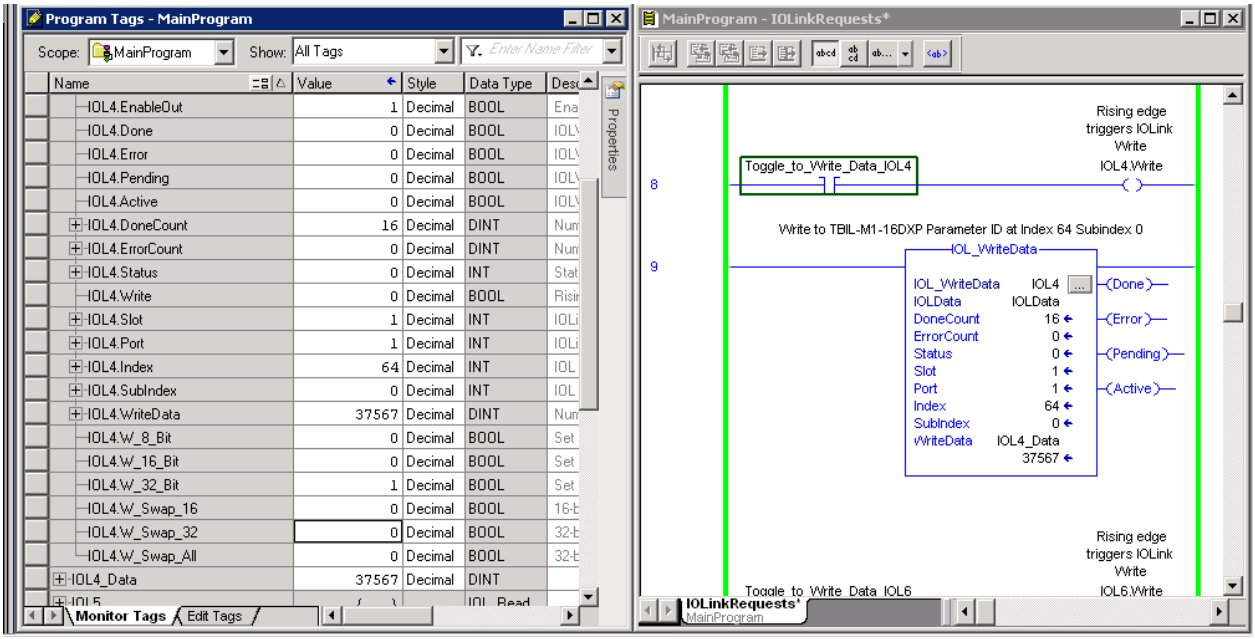


Similarly, if you hover over “Cut-off frequency 24Hz” in the Default Value column and right-click then a description of values that can be written to the device is shown.



3.7 IOL_WriteData

Use IOL_WriteData to write 8, 16 or 32-bit precision numeric data. As shown below, IOL_WriteData instance IOL4 writes the 32-bit precision TBIL Parameter ID found at Index 64 Subindex 0. An off-to-on transition of IOL4.Write will trigger the operation a single time.



Unlike read operations that return the precision of the data Write operations require that the application specify whether the target parameter is 8, 16 or 32 bit precision. This is done by setting the appropriate bit in the IOL4 instance tags.

IOL4.W_8_Bit	0	Decimal	BOOL	Set for 8 bit precision
IOL4.W_16_Bit	0	Decimal	BOOL	Set for 16 bit precision
IOL4.W_32_Bit	1	Decimal	BOOL	Set for 32 bit precision

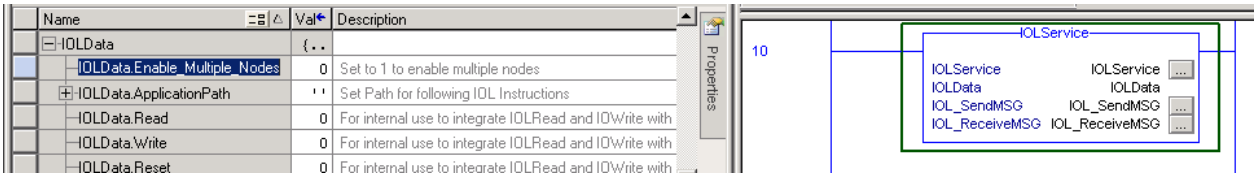
The data translation settings shown below are provided to perform any data manipulation required when the device byte order differs from RSL5000.

IOL4.W_Swap_16	0	Decimal	BOOL	16-bit AB->BA, 32-bit ABCD->BADC
IOL4.W_Swap_32	0	Decimal	BOOL	32-bit ABCD->DCBA
IOL4.W_Swap_All	0	Decimal	BOOL	32-bit ABCD->CDBA

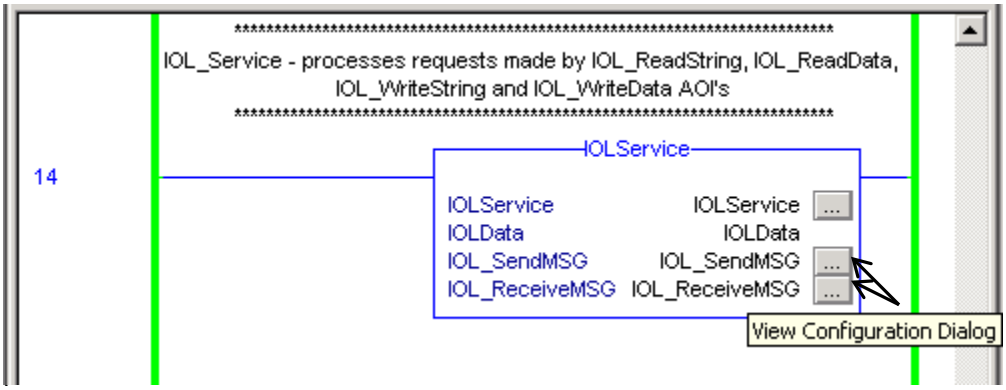
3.8 IOL_Service - Single Ethernet Node Support

IOL_Service performs all of the Ethernet IP communications required to execute the acyclic read and write operations requested by IOLink AOI's. The application program must contain a single instance of IOL_Service. The IOLData UDT is used to share information between IOL_Service and all of the IOL AOI's. When interfacing to a single BLxx or TBEN IOLink master the setting of the RSL5000 MSG instruction communication path is done in the controller tags as shown below.

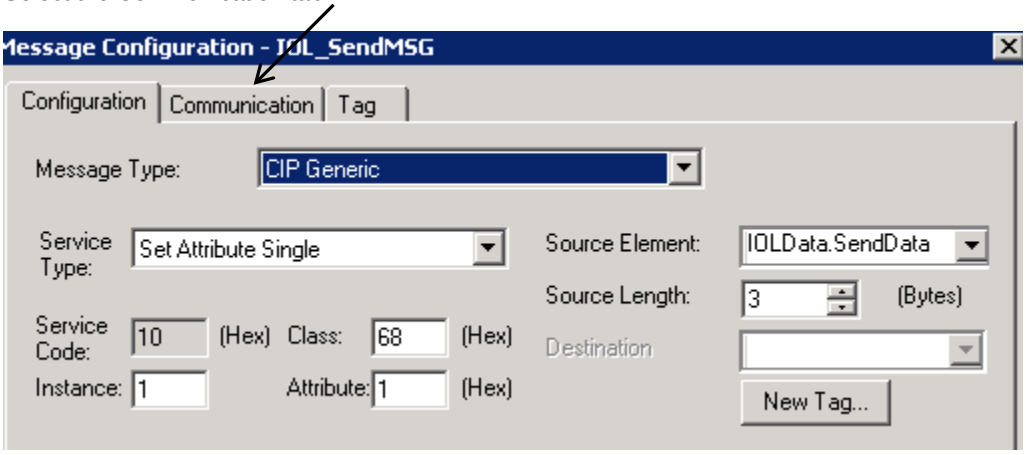
For single Ethernet node applications IOLData.Enable_Multiple_Nodes must be set to 0.



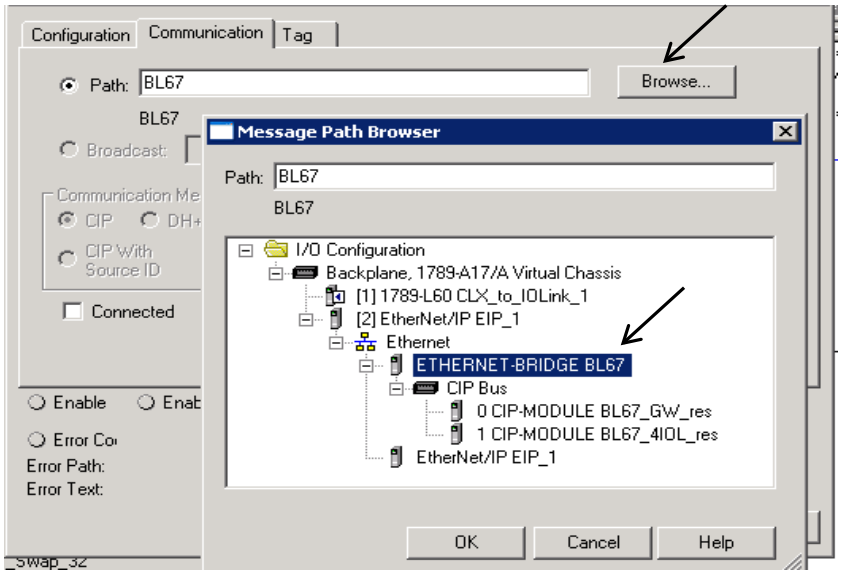
To set the communication path for your application click on the ellipsis next to IOL_SendMSG and IOL_ReceiveMSG to access their parameters.



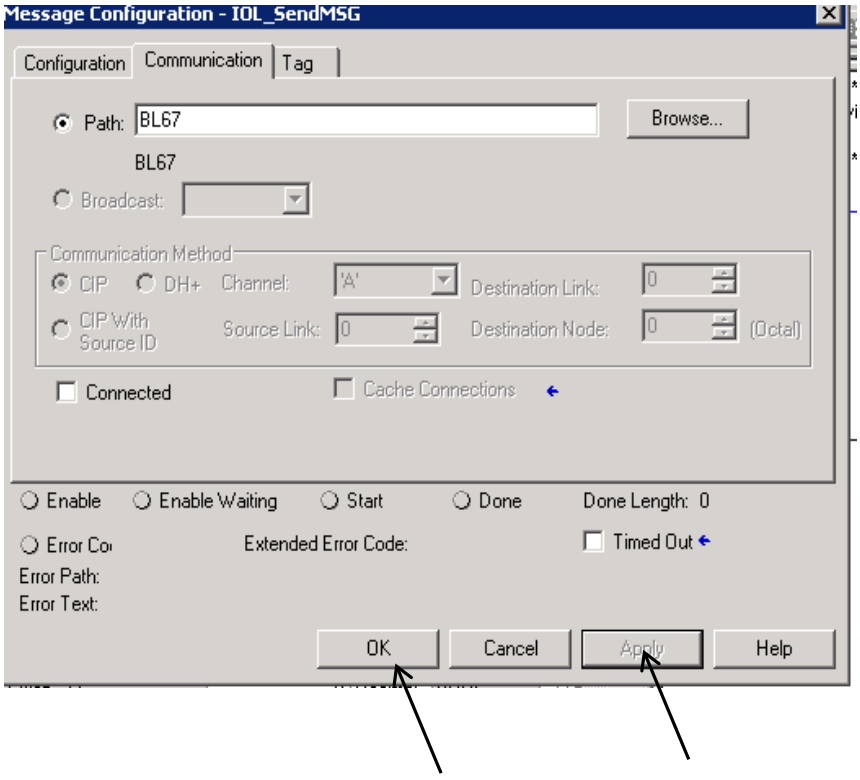
Select the Communication tab.



Select the Communication tab, click on Browse then highlight the station with the IOLink master.



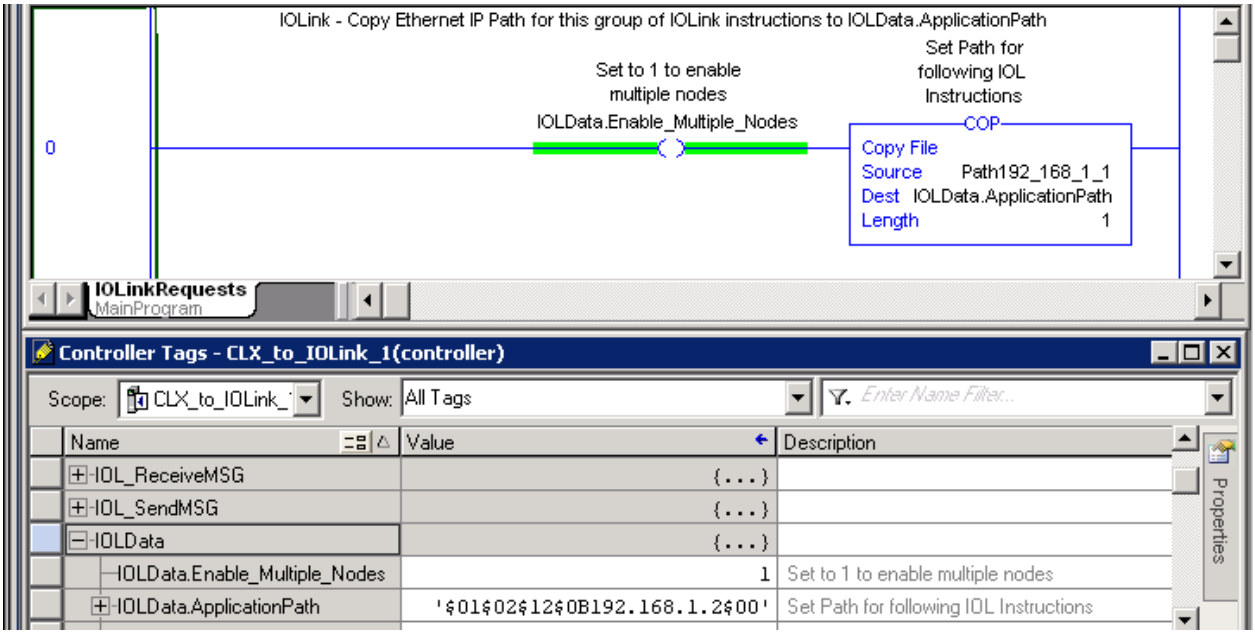
Click on Apply then Okay to complete setting the IOL_SendMSG communication path. Repeat these steps for IOL_ReceiveMSG.



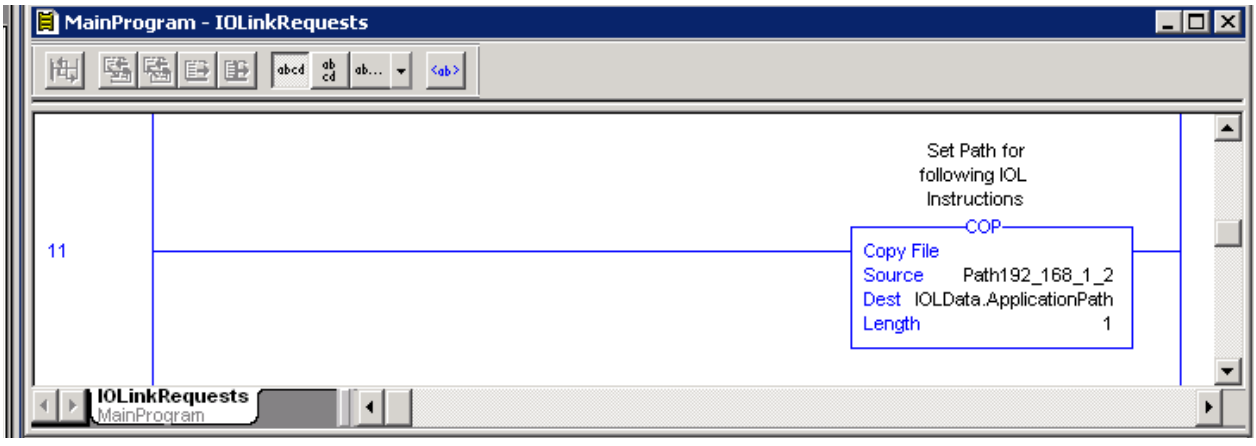
3.9 IOLService – Multiple Ethernet Node Support

IOL_Service performs all of the Ethernet IP communications required to execute the acyclic read and write operations requested by IOLink AOI's. The application program must contain a single instance of IOL_Service. The IOLData UDT is used to share information between IOL_Service and all of the IOL AOI's. When interfacing to multiple BLxx or TBEN IOLink masters the setting of the RSL5000 MSG instruction communication path needs to be set prior to each group of read and write AOI's corresponding to a specific Ethernet node.

For multiple Ethernet node applications IOLData.Enable_Multiple_Nodes must be set to 1. At the beginning of the program containing IOL read and write AOI's simply copy the nodes path into IOLData.ApplicationPath.

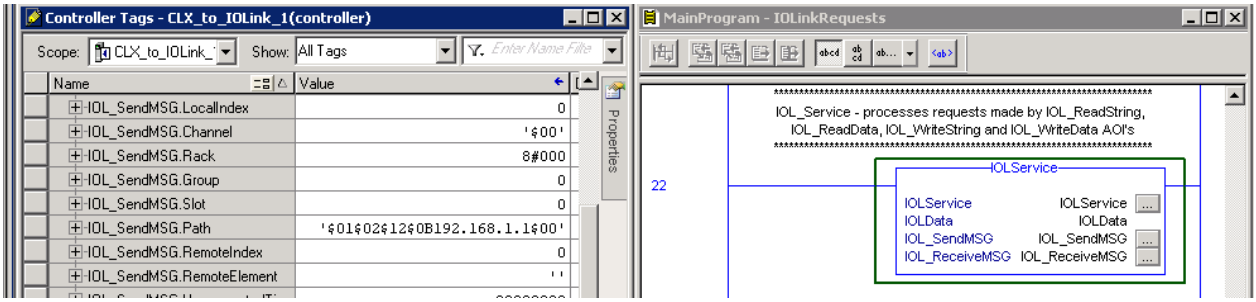


At the beginning of the program containing the IOL reads and write for the next Ethernet node you simply copy that nodes Ethernet communication path into IOLData.ApplicationPath

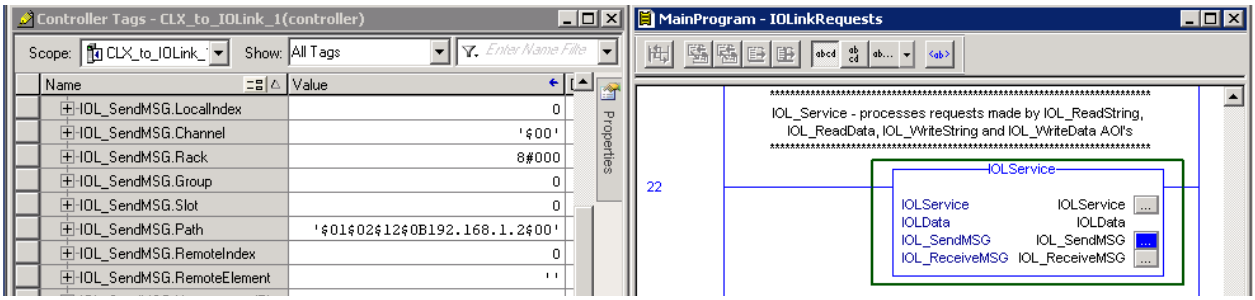


All communications is still processed through a single IOL_Service and IOL_Read and IOL_Write requests for all of the Ethernet nodes can be triggered simultaneously with no concerns.

To determine the communication path string for each node follow the steps described in section 2.8 for setting the communication path for a single node. Once the path is set go to the controller tags and expand IOL_SendMSG. As shown below the path for this node is “$01$02$12$0B192.168.1.2$00” – this can be entered into a standard RSL5000 string variable exactly as shown.



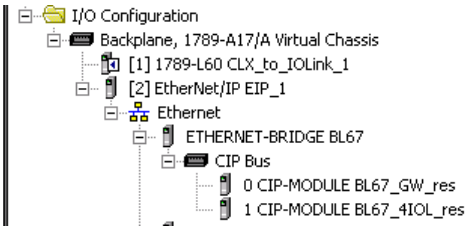
Repeat for each node and create a string variable for each that can be copied into IOLData.ApplicationPath.



4 Configuring IO-Link using Generic Ethernet/IP CIP Bridge

Using the Generic Ethernet/IP CIP Bridge method of integrating the IOLink master has the great advantage that the IOLink module configuration data is saved as part of the RSL5000 program and the module configuration is applied every time the Ethernet connection is activated. If the BLxx or TBEN needs to be replaced no configuration of the IOLink channels is required – just set the units IP address. When the Ethernet connection is established the configuration data saved in the RSL5000 program will be applied.

After adding Generic Ethernet/IP CIP Bridge to your program simply drag and drop the gateway and IOLink master modules from an existing application or the Turck supplied catalog file.



When the BL67_4IOL is dropped on the CIP Bus the fully commented input, output and configuration tags are automatically inserted in the Controller Tags.

BL67:1:C	{...}	***Configuration BL67-4IOL
BL67:1:I	{...}	BL674IOL Input/Diag
BL67:1:O	{...}	BL67-4IOL Output

Expand BL67:1.C to set up the initial values for each IOLink channel. A brief overview of the configuration follows. For in-depth information refer to the D301333 IOLink Master for BL20 and BL67 User manual.

BL67:1:C.Data[4]	16#34	IO-Link Channel 1 port parameters
BL67:1:C.Data[5]	16#00	Channel 1 Cycle time
BL67:1:C.Data[6]	16#00	Channel 1 IO data mapping
BL67:1:C.Data[7]	16#02	Channel 1 IO data length

Port Parameters to see the operating mode, data storage mode and quick start configuration.

BL67:1:C.Data[4]	16#30	SINT	IO-Link Channel 1 port parameters
BL67:1:C.Data[4].0	0	BOOL	Channel 1 Mode b3-b0: 0000=IO-Link without validation, 0001=res, 0010=IO-Link with compatible device
BL67:1:C.Data[4].1	0	BOOL	Channel 1 Mode b3-b0: 0011=IO-Link with identical device, 0100=DI (with parameter access)
BL67:1:C.Data[4].2	0	BOOL	Channel 1 Mode b3-b0: 1000=DI
BL67:1:C.Data[4].3	0	BOOL	Channel 1 Mode b3-b0: res
BL67:1:C.Data[4].4	1	BOOL	Channel 1 Data storage mode b5-b4: 00=activated, 01=overwrite
BL67:1:C.Data[4].5	1	BOOL	Channel 1 Data storage mode b5-b4: 10=read in, 11=deactivated, clear
BL67:1:C.Data[4].6	0	BOOL	Channel 1 Activate Quick Start-Up: 0=no, 1=yes
BL67:1:C.Data[4].7	0	BOOL	Channel 5 Activate output: 0=no, 1=yes
BL67:1:C.Data[5]	16#00	SINT	Channel 1 Cycle time
BL67:1:C.Data[6]	16#00	SINT	Channel 1 IO data mapping

A simple place to start is with BL67:1:C.Data[4] bits .3, .2, .1 and .0 all 0 corresponding to *Channel 1 Mode b3-b0: 0000=IO-Link without validation*. It's also convenient to configure unused channels as 24VDC inputs by setting b3-b0 *to Channel x Mode b3-b0: 1000=DI* this eliminates the diagnostic indication for missing device.

An important benefit of IOLink is simplified device replacement. This requires the device be an IOLink Version 1.1 device and typically uses *Channel 1 Data storage mode b5-b4: 00=activated*. While you're getting started a simple configuration to start is with *Channel 1 Data storage mode b5-b4: 11=deactivated*, clear, as shown above. See the manual for a very clear description of this feature.

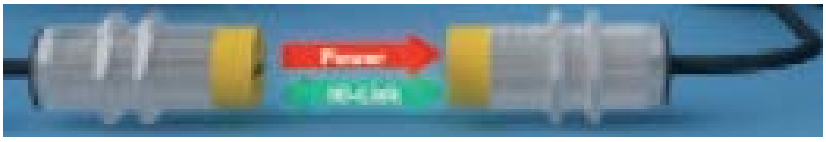
4.1 Cycle Time

⊞ BL67:1:C.Data[5]	16#00	SINT	Channel 1 Cycle time

In the majority of applications the Cycle Time is left at 16#00 which results in the IOLink cyclic data update time being automatically set to the value specified by the device.

As an example the TBIL-M1-16DXP Cycle Time is automatically set to 3.2ms.

An exception would be when using IOLink through an inductive coupler as shown below. The inductive coupler transfers 0.5 amps of 24V power as well as IOLink communication and is an effective means of controlling IO though and air gap when compared to slip rings. When using the inductive coupler set the time delay to 16#44 which corresponds to an 8ms cycle time.



4.2 IO Data Mapping

⊟ BL67:1:C.Data[6]	16#00	SINT	Channel 1 IO data mapping
BL67:1:C.Data[6].0	0	BOOL	Channel 1 Revision: 0=automatic, 1=V1.0
BL67:1:C.Data[6].1	0	BOOL	Channel 1 Process input data invalid: 0=diagnostic generated, 1=no diagnostic generated
BL67:1:C.Data[6].2	0	BOOL	Channel 1 Deactivate diagnostics b3-b2: 00=no, 01=notifications
BL67:1:C.Data[6].3	0	BOOL	Channel 1 Deactivate diagnostics b3-b2: 10=notifications and warnings, 11=yes
BL67:1:C.Data[6].4	0	BOOL	Channel 1 Input data mapping b5-b4: 00=direct, 01=swap 16 bit
BL67:1:C.Data[6].5	0	BOOL	Channel 1 Input data mapping b5-b4: 10=swap 32 bit, 11=swap all
BL67:1:C.Data[6].6	0	BOOL	Channel 1 Output data mapping b7-b6: 00=direct, 01=swap 16 bit
BL67:1:C.Data[6].7	0	BOOL	Channel 1 Output data mapping b7-b6: 10=swap 32 bit, 11=swap all

Typically b3 thru b0 are left 0 however when using the inductive coupler you can set *Channel 1 Deactivate diagnostics b3-b2: 11=yes* to eliminate the diagnostic error annunciation during the time when the couplers are not aligned. An example would be a dial index application during station change.

The input and output data mapping selections provide the necessary byte order swapping when interfacing devices using a different byte order than RSL5000.

4.3 IO Data Length and Input Data Mapping

Typical IOLink devices have 16-bits of cyclic process data that be transferred from the IOLink device to the IOLink master. The cyclic data will be mapped into the Ethernet nodes input data tags. The configuration data below shows *Channel 1 Input data length 0010=2 byte* which results in the state of the TBIL-M1-16DXP inputs being mapped to BL67:I:Data[1] IO-Link input data word 0

Configuration data BL67:1:**C**.Data

BL67:1:C.Data[7]	16#22	SINT	Channel 1 IO data length
BL67:1:C.Data[7].0	0	BOOL	Channel 1 Input data length b3-b0: 0000=0 byte, 0001=1 byte, 0010=2 byte, 0011=4 byte
BL67:1:C.Data[7].1	1	BOOL	Channel 1 Input data length b3-b0: 0100=6 byte, 0101=8 byte, 0110=10 byte, 0111=12 byte
BL67:1:C.Data[7].2	0	BOOL	Channel 1 Input data length b3-b0: res
BL67:1:C.Data[7].3	0	BOOL	Channel 1 Input data length b3-b0: 1111=14 byte

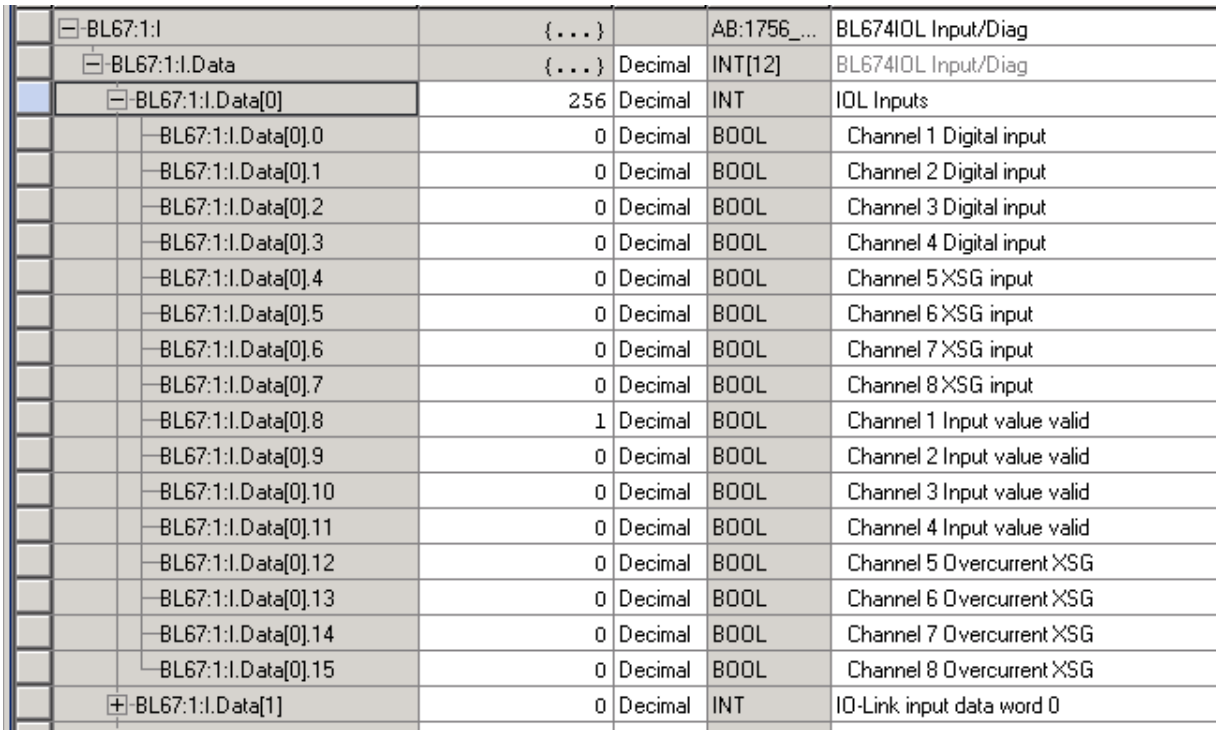
Input data BL67:1:**I**.Data

BL67:1:I.Data	{...}	INT[12]	BL674IOL Input/Diag
BL67:1:I.Data[0]	256	INT	IOL Inputs
BL67:1:I.Data[1]	0	INT	IO-Link input data word 0
BL67:1:I.Data[2]	0	INT	IO-Link input data word 1
BL67:1:I.Data[3]	0	INT	IO-Link input data word 2
BL67:1:I.Data[4]	0	INT	IO-Link input data word 3
BL67:1:I.Data[5]	0	INT	IO-Link input data word 4
BL67:1:I.Data[6]	0	INT	IO-Link input data word 5
BL67:1:I.Data[7]	0	INT	IO-Link input data word 6
BL67:1:I.Data[8]	0	INT	Channel 1 diagnostics
BL67:1:I.Data[9]	0	INT	Channel 2 diagnostics
BL67:1:I.Data[10]	0	INT	Channel 3 diagnostics
BL67:1:I.Data[11]	0	INT	Channel 4 diagnostics

IOLink channel input data is mapped onto IO-Link input data words 0 thru 7 in ascending order. In the example above the TBIL-M1-16DXP input states will be available at BL67:1:I.Data[1].0 to .15 = *IO-Link input data word 0*. Subsequent IOLink device input data will appear in the words that follow.

4.4 IO –Link Input Information

The Turck IOLink master provides four channels that can be used as either IOLink masters or standard 24V inputs and four channels that can be used as either 24V inputs or 24V outputs. Channels 1 to 4 of the IOLink master are the IOLink/24V input channels. Channels 5 through 8 are the configurable (XSG) standard 24V IO channels. The current state of the 24V inputs as well as the state of the IOLink channel is available in the first word of the IOLink master input data – BL67:1:I.Data[0]. In applications using inductive coupling the *IOLink status Channel x Input value valid* is used to confirm the IOLink connection has been established.



BL67:1:I	{...}		AB:1756_...	BL674IOL Input/Diag
BL67:1:I.Data	{...}	Decimal	INT[12]	BL674IOL Input/Diag
BL67:1:I.Data[0]	256	Decimal	INT	IOL Inputs
BL67:1:I.Data[0].0	0	Decimal	BOOL	Channel 1 Digital input
BL67:1:I.Data[0].1	0	Decimal	BOOL	Channel 2 Digital input
BL67:1:I.Data[0].2	0	Decimal	BOOL	Channel 3 Digital input
BL67:1:I.Data[0].3	0	Decimal	BOOL	Channel 4 Digital input
BL67:1:I.Data[0].4	0	Decimal	BOOL	Channel 5 XSG input
BL67:1:I.Data[0].5	0	Decimal	BOOL	Channel 6 XSG input
BL67:1:I.Data[0].6	0	Decimal	BOOL	Channel 7 XSG input
BL67:1:I.Data[0].7	0	Decimal	BOOL	Channel 8 XSG input
BL67:1:I.Data[0].8	1	Decimal	BOOL	Channel 1 Input value valid
BL67:1:I.Data[0].9	0	Decimal	BOOL	Channel 2 Input value valid
BL67:1:I.Data[0].10	0	Decimal	BOOL	Channel 3 Input value valid
BL67:1:I.Data[0].11	0	Decimal	BOOL	Channel 4 Input value valid
BL67:1:I.Data[0].12	0	Decimal	BOOL	Channel 5 Overcurrent XSG
BL67:1:I.Data[0].13	0	Decimal	BOOL	Channel 6 Overcurrent XSG
BL67:1:I.Data[0].14	0	Decimal	BOOL	Channel 7 Overcurrent XSG
BL67:1:I.Data[0].15	0	Decimal	BOOL	Channel 8 Overcurrent XSG
BL67:1:I.Data[1]	0	Decimal	INT	IO-Link input data word 0

4.5 IO Data Length and Output Data Mapping

An example of an IOLink device using Output Data would be the TBIL-M1-16DXP which provides 16 points of configurable 24V IO points. In this case 16-bits of cyclic process data will be transferred from the IOLink master to the TBIL-M1-16DXP. The cyclic data will be sourced from the Ethernet nodes output data tags. The configuration data below shows *Channel 1 Output data length b7-b4: 0010=2 byte* which results in the output states of the TBIL-M1-16DXP being sourced from BL67:1:O.Data[1].

Configuration data BL67:1:**C**.Data

BL67:1:C.Data[7].4	0	BOOL	Channel 1 Output data length b7-b4: 0000=0 byte, 0001=1 byte, 0010=2 byte, 0011=4 byte
BL67:1:C.Data[7].5	1	BOOL	Channel 1 Output data length b7-b4: 0100=6 byte, 0101=8 byte, 0110=10 byte, 0111=12 byte
BL67:1:C.Data[7].6	0	BOOL	Channel 1 Output data length b7-b4: res
BL67:1:C.Data[7].7	0	BOOL	Channel 1 Output data length b7-b4: 1111=14 byte

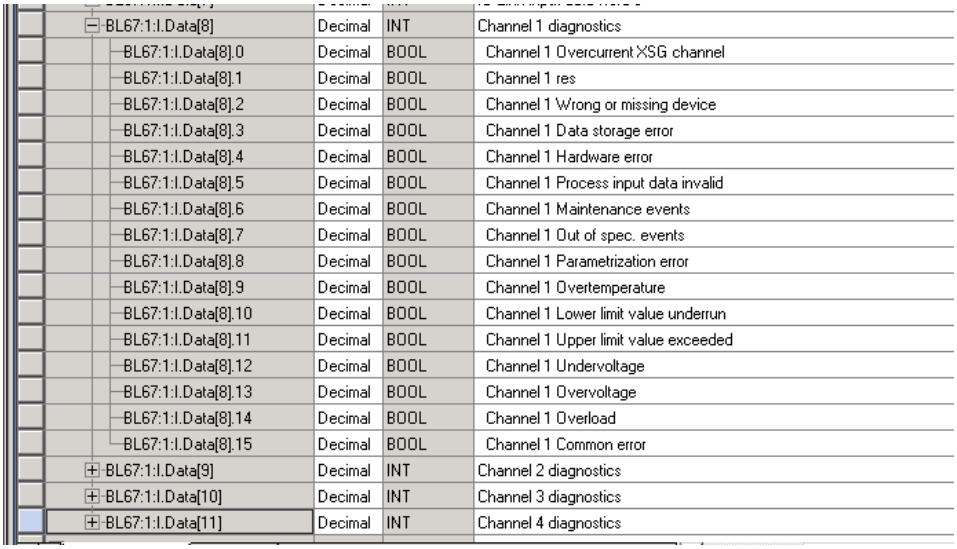
Input data BL67:1:**O**.Data

BL67:1:O	{...}	AB:1756_...	BL67-4IOL Output
BL67:1:O.Data	{...}	INT[8]	BL67-4IOL Output
BL67:1:O.Data[0]	0	INT	BL20-4IOL Output Channel 5..8
BL67:1:O.Data[1]	0	INT	IO-Link output data word 0
BL67:1:O.Data[2]	0	INT	IO-Link output data word 1
BL67:1:O.Data[3]	0	INT	IO-Link output data word 2
BL67:1:O.Data[4]	0	INT	IO-Link output data word 3
BL67:1:O.Data[5]	0	INT	IO-Link output data word 4
BL67:1:O.Data[6]	0	INT	IO-Link output data word 5
BL67:1:O.Data[7]	0	INT	IO-Link output data word 6

IOLink channel output data is sourced from IO-Link output words 0 thru 7 in ascending order. In the example above the TBIL-M1-16DXP output states will be source from BL67:1:O.Data[1].0 to .15 – *IO-Link output data word 0*. Subsequent IO-Link device output data will appear in the words that follow. No additional configuration of the TBIL-M1-16DXP is required – for IO points used as inputs simply leave the corresponding output bits turned off.

4.6 IO –Link Input Information

Diagnostic information for each of the IOLink channels is available following the cyclic input data at BL67:I:Data[8] through [11]. Typical errors include *Channel x Data storage error* when the configuration activates data storage but the device is a V1.0 instead of V1.1 or *Channel x Process input data invalid* when the device is not connected or the inductive coupler set is misaligned.



BL67:1:I.Data[8]	Decimal	INT	Channel 1 diagnostics
BL67:1:I.Data[8].0	Decimal	BOOL	Channel 1 Overcurrent XSG channel
BL67:1:I.Data[8].1	Decimal	BOOL	Channel 1 res
BL67:1:I.Data[8].2	Decimal	BOOL	Channel 1 Wrong or missing device
BL67:1:I.Data[8].3	Decimal	BOOL	Channel 1 Data storage error
BL67:1:I.Data[8].4	Decimal	BOOL	Channel 1 Hardware error
BL67:1:I.Data[8].5	Decimal	BOOL	Channel 1 Process input data invalid
BL67:1:I.Data[8].6	Decimal	BOOL	Channel 1 Maintenance events
BL67:1:I.Data[8].7	Decimal	BOOL	Channel 1 Out of spec. events
BL67:1:I.Data[8].8	Decimal	BOOL	Channel 1 Parametrization error
BL67:1:I.Data[8].9	Decimal	BOOL	Channel 1 Overtemperature
BL67:1:I.Data[8].10	Decimal	BOOL	Channel 1 Lower limit value underrun
BL67:1:I.Data[8].11	Decimal	BOOL	Channel 1 Upper limit value exceeded
BL67:1:I.Data[8].12	Decimal	BOOL	Channel 1 Undervoltage
BL67:1:I.Data[8].13	Decimal	BOOL	Channel 1 Overvoltage
BL67:1:I.Data[8].14	Decimal	BOOL	Channel 1 Overload
BL67:1:I.Data[8].15	Decimal	BOOL	Channel 1 Common error
BL67:1:I.Data[9]	Decimal	INT	Channel 2 diagnostics
BL67:1:I.Data[10]	Decimal	INT	Channel 3 diagnostics
BL67:1:I.Data[11]	Decimal	INT	Channel 4 diagnostics

5 Status Error Code Descriptions

Errors are typically caused by incorrect Index or Sub-index values, data out of range or write data precision errors.

Status	Description
0	Operation completed successfully
	Status = 100 - 101, Ethernet IP MSG instruction errors - check communication parameters
100	IOL_SendMSG completed with error, check communication parameters
101	IOL_RecevieMSG completed with error, check communication parameters
110	IOL_Service Retry Limit exceeded
111	Slot specified not an IOLink master
	Status = 1000 to 1255, no response from device, connection error
1016	Device not connected or Port not configured as IOLink port
	Status = 2000 to 2255, device response indicates error
2000	Device error, no details
2017	Device error, Index not available
2018	Device error, Subindex not available
2032	Device error, Service temporarily not available
2033	Device error, Service temporarily not available - local control
2034	Device error, Service temporarily not available - device control
2035	Device error, Index not writeable
2048	Device error, Parameter value out of range
2049	Device error, Parameter value above limit
2050	Device error, Parameter value below limit
2051	Device error, Parameter value length overrun (check IOLWrite precision/string length)
2052	Device error, Parameter value length underrun (check IOLWrite precision/string length)
2053	Device error, Function not available
2054	Device error, Function temporarily not available
2064	Device error, Parameter set invalid
2065	Device error, Inconsistent parameter set
2130	Device error, Application not ready
	Status = 3000 to 3255, device response indicates vendor specific error
3000	Vendor specific error, no details
3001	Vendor specific error, vendor specific error number
3255	Vendor specific error, vendor specific error number
	Status = 7000 to 7255, IOL-M Error Codes
7000	Unexpected write request instead of read request
7001	Decode error
7002	Port occupied by another task
	Status = 8000 to 8255, IOL-M Error Codes
8000	Timeout when IOL-Ds or IOL-M ports are busy
8001	IOL Index out of range
8002	Port address greater than maximum
8003	Port function not supported

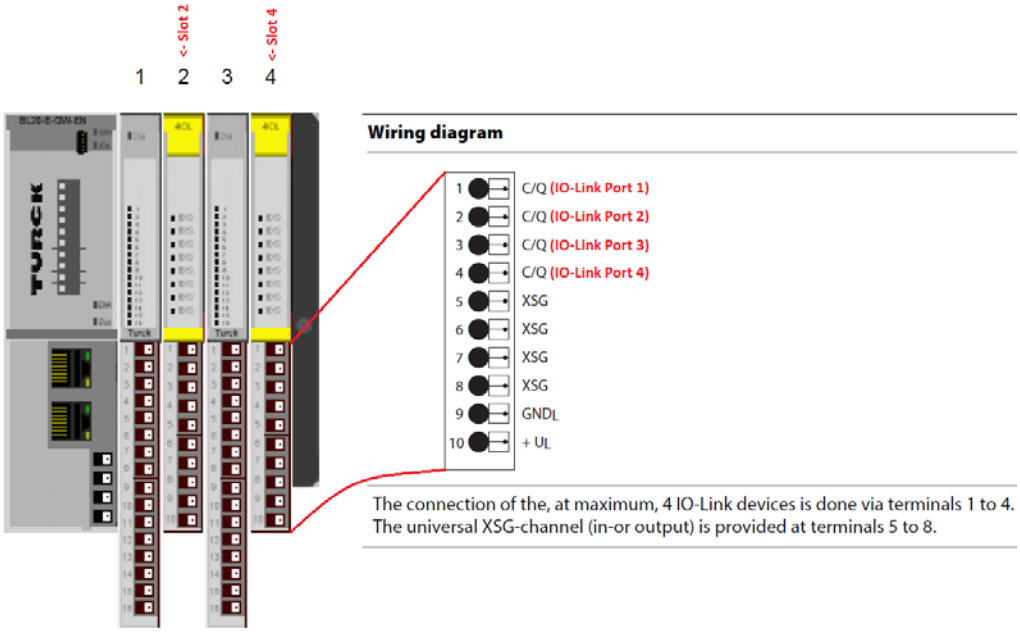
6 Appendix A – Slot and Port Designations Explained

Each physical IO-Link Master Port on a station is addressed with the IO-Link Call AOI by Slot and Port. The following diagrams show how to determine Slot and Port on your Turck station.

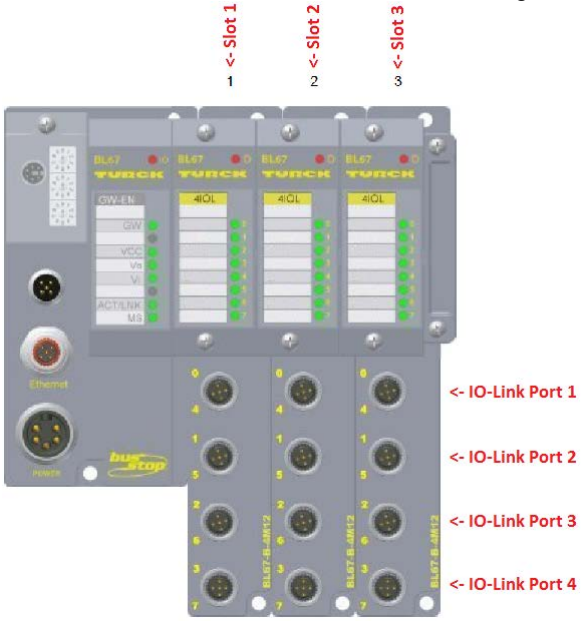
6.1 BL20 and BL67 Modular Platforms

The BLxx Modular platforms are Slot based, each I/O slice represents 1 Slot. Slots are numbered 1 through 32 from left to right.

As an example, the BL20 Station below with IO-Link Master cards in Slots 2 and 4 would support an IO-Link Call through the IO-Link Call AOI on Slots 2 or 4, Ports 1 through 4.

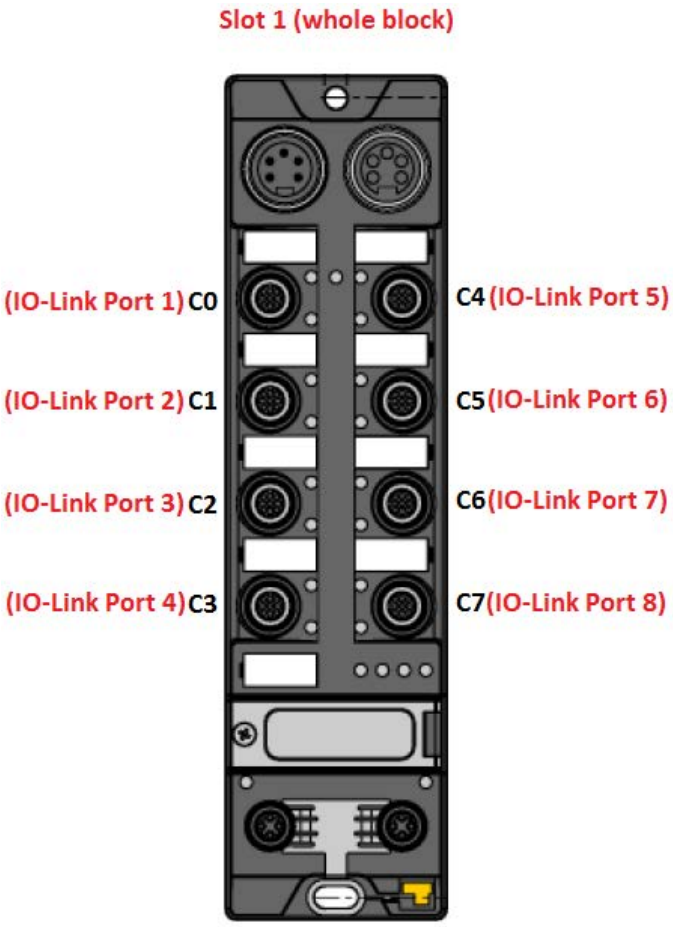


As an example, the BL67 Station below with IO-Link Master cards in Slots 1, 2 and 3 IO-Link would support an IO-Link Call through the IO-Link Call AOI on Slots 1, 2 or 3, Ports 1 through 4.



6.2 TBEN-Lx-8IOL

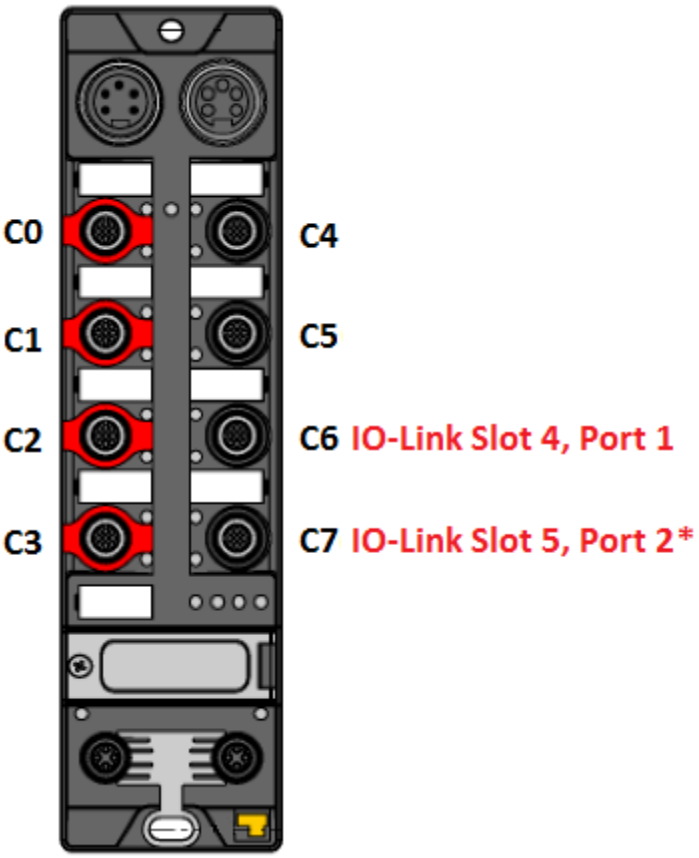
The TBEN-Lx-8IOL blocks are Slot based, all ports on this block are in Slot 1. Ports are numbered 1 through 8. Note that IO-Link Port 1 is on the physical connector designated C0, this pattern follows for all 8 ports.



6.3 TBIP-Lx-FDIO1-2IOL

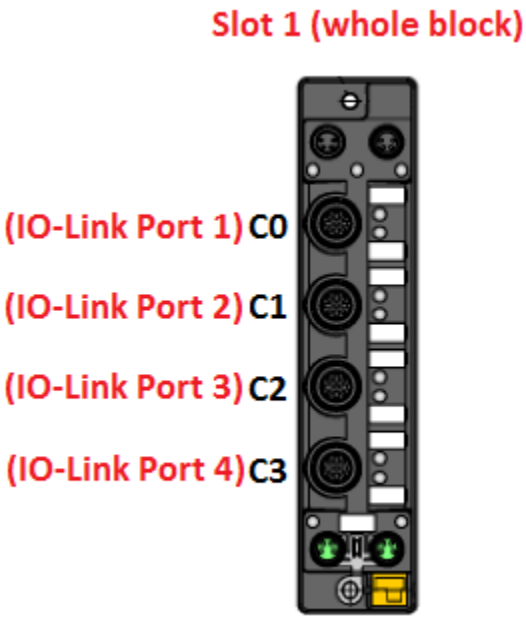
The TBIP-Lx-FDIO1-2IOL blocks are Slot based, IO-Link ports on this block are in Slots 4 and 5. Ports are numbered 1 and 2. Note that IO-Link Port 1 is on the physical connector designated C6 and IO-Link Port 2 is on the physical connector designated C7*.

*For the TBIP-Lx-FDIO1-2IOL power must be supplied to the IO-Link Master on Port C7 via Safety Bit FSO 1 before the port will respond to any IO-Link Call requests from the IO-Link Call AOI function, Port C6 is powered at all times by V1.



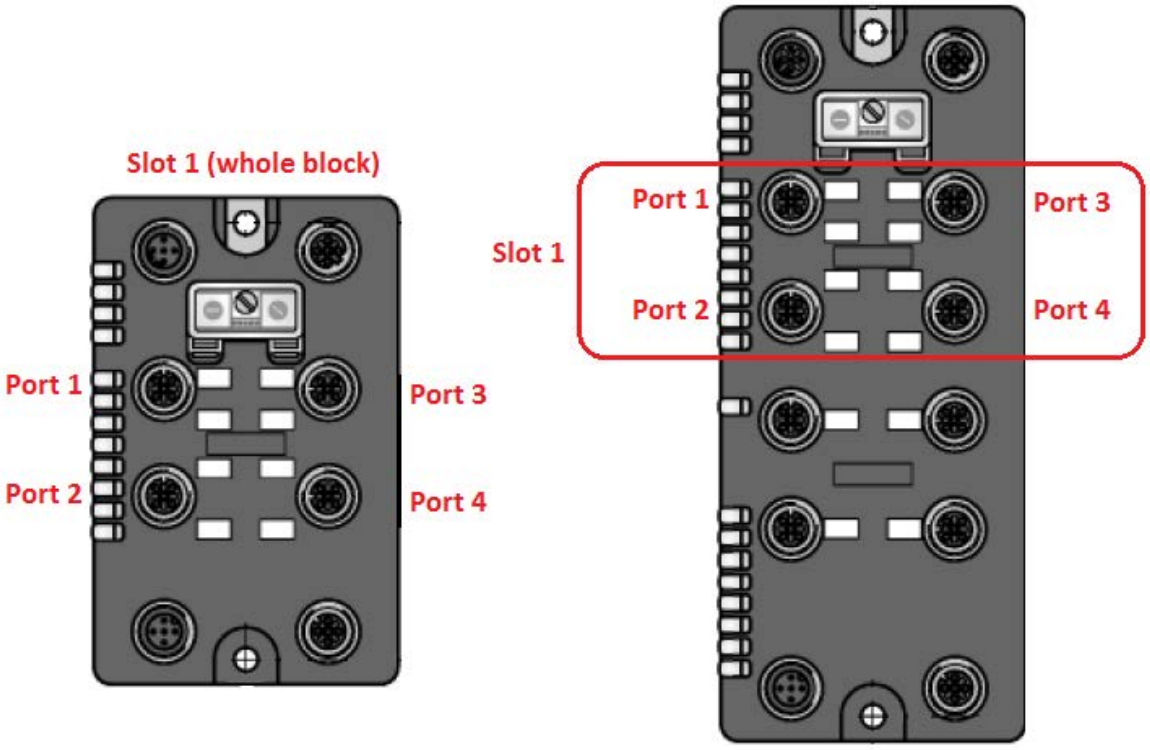
6.4 TBEN-S2-4IOL

The TBEN-S2-4IOL blocks are Slot based, all ports on this block are in Slot 1. Ports are numbered 1 through 4. Note that IO-Link Port 1 is on the physical connector designated C0, this pattern follows for all 4 ports.



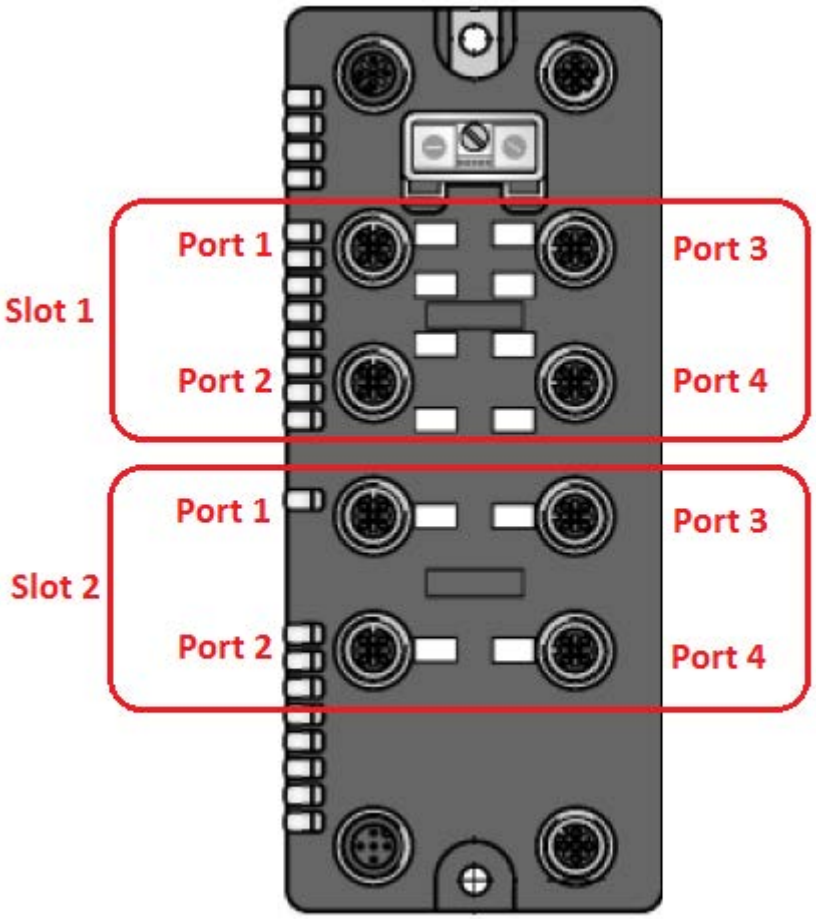
6.5 BLCEN-xM12MT-4IOL-xxx

The BLCEN blocks are Slot based, all ports on this block are in Slot 1. Ports are numbered 1 through 4. Note that IO-Link Port 1 is on the physical connector designated C0, this pattern follows for all 4 ports.



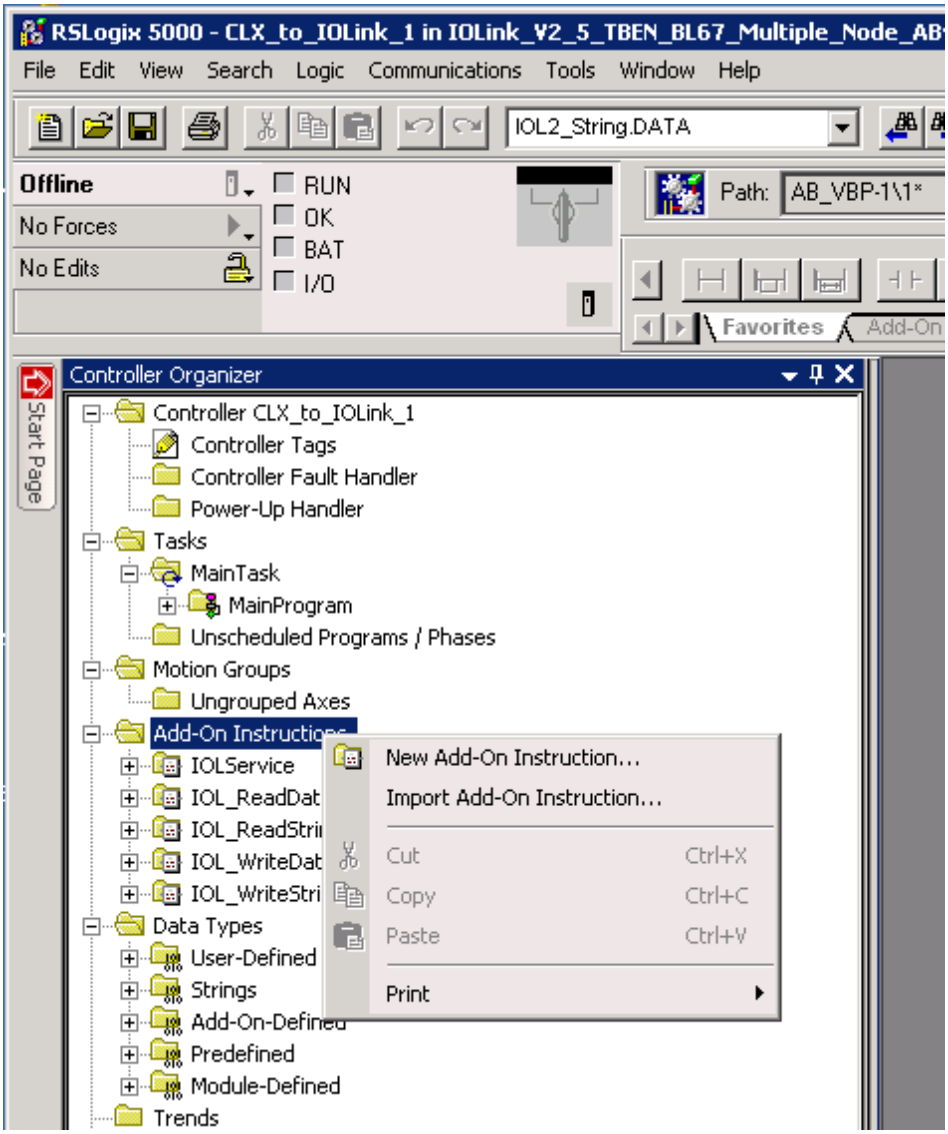
6.6 BLCEN-xM12MT-4IOL-4IOL

The BLCEN blocks are Slot based, all ports on the block with 2 IO-Link Masters are in Slot 1 or Slot 2. Ports are numbered 1 through 4.

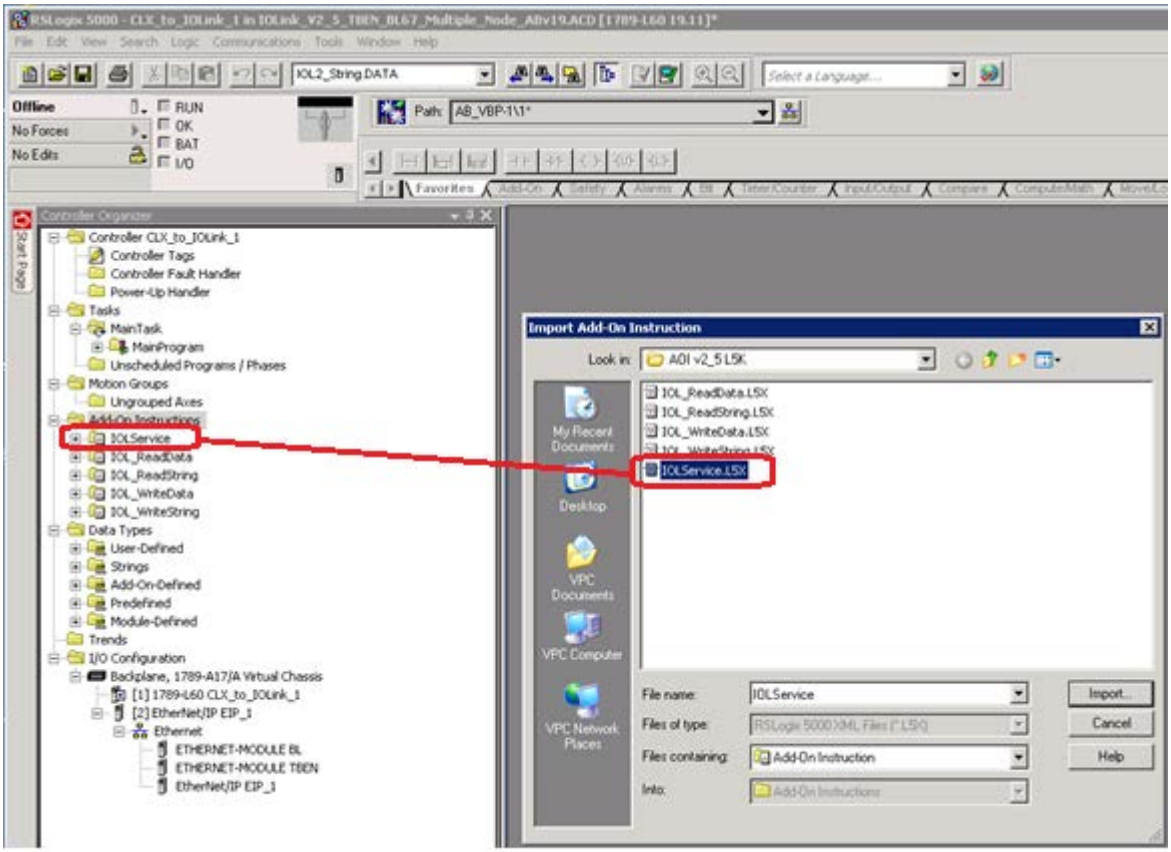


7 Appendix B – Updating Older Versions of the IO-Link Call AOI

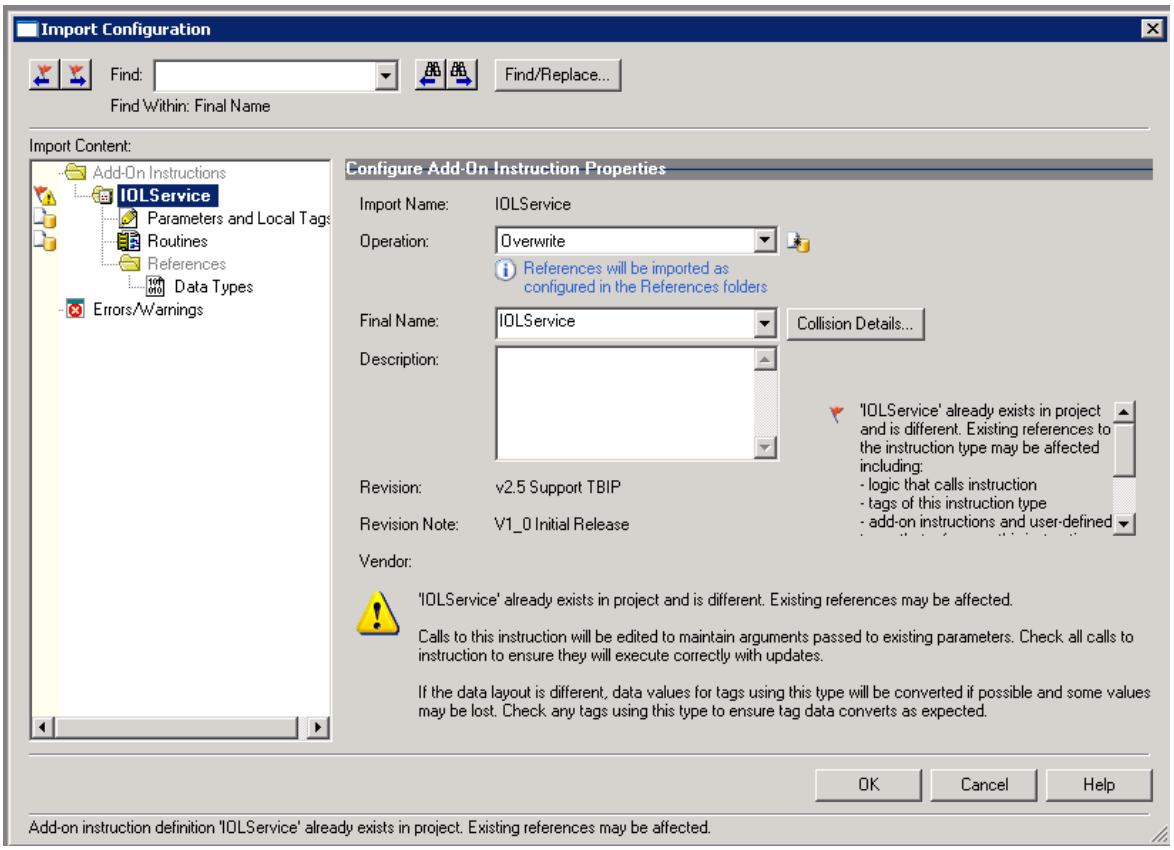
To update the versions of the AOI to the latest version, right click on Add-On Instructions and click Import Add-On Instruction…



Select the Add-On instruction you want to update, note the names MUST be the same:



RSLogix will warn you that you are about to replace an existing AO, you can verify you are importing the correct revision on this screen:



Once imported you can verify you have the correct version of each AOI, it is recommended all AOIs for the IO-Link call be the same revision: