Control Tower IO-Link Class B Light and Sound Module Controller

Catalog Number 856T-B24LC

Allen-Bradley
by ROCKWELL AUTOMATION

User Manual Original Instructions

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

Notes:

This manual is a reference guide for the 856T-B24LC IO-Link module for Control Tower™ stack lights. It describes the procedures to install, wire, and troubleshoot this device.

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Replaced Message Structure and Configuration Example Chapter	47

Who Should Use This Manual

Use this manual if you design, install, program, or troubleshoot systems that use the 856T-B24LC module for stack lights.

You must have a basic understanding of electrical circuitry and familiarity with safety-related systems. If you do not, obtain the proper training before using this product.

Qualified personnel must conduct all inspections. A qualified person must perform these tasks:

- Undergone the appropriate technical training
- The responsible machine operator has instructed personnel in the operation of the machine and the current safety guidelines.
- Has read and has access to the user manual.

Abbreviations

Abbreviation	Description
ADC	Automatic Device Configuration
AOI	Add-On Instruction
AOP	Add-On Profile
ASN	Application-Specific Name
IEC	International Electrotechnical Commission
IODD	I/O Device Description
NEC	National Electric Code
QD	Quick disconnect
RGB	Red, green, blue
SIO	Standard I/O
IO-Link module	Tower light IO-Link Class B light and sound module controller
856T-B24LC	
IOLD	
POST	IO-Link module power on self test

Download Firmware, AOP, EDS, and Other Files

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from the Product Compatibility and Download Center at rok.auto/pcdc.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Signaling Specifications Technical Data, publication 855-TD001	Provides specifications and information to select signaling products.
Bulletin 856T Control Tower Installation Instructions, publication 856T-IN013	Provides information to install and wire the 856T IO-Link module.
System Security Design Guidelines, publication SECURE-RM001	Provides guidelines for how to use Rockwell Automation products to improve the security of your Industrial Automation system.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications.	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at rok.auto/literature.

Product Overview

The 856T-B24LC module allows the control and configuration of a standard 856T stack light via the IO-link protocol. This configuration helps your save time and money in wiring, commissioning, and startup of the entire stack light while providing access to valuable real-time diagnostics and prognostic information.

Operation Modes

The 856T-B24LC module is compatible with the current light and sound modules that are offered in the standard 856T product line. The 856T-B24LC module is capable to control up to seven modules in the stack light arrangement. The maximum number of light and sound modules in a stack light configuration depends on the number of circuits that are used individually by the specific light or sound module (up to seven per 856T-B24LC module). A summary of all 856T light and sound modules that can be controlled with the 856T-B24LC module is shown in Table 12 on page 57.

Product Features

- Mechanically compatible with all 856T base mount adapters to offer vertical, surface, pole, and tube mounting options
- 70 mm external diameter
- Visible status indicator that shows the result of the device self test at powerup.
- IP66/67 rated enclosure
- IO-Link 1.1 communication protocol compliant
- Class B device

IO-Link Features

- Built-in counters to allow you to know the number of times a specific module has been turned ON.
- Operation hours since inception and since powerup that can help you correlate machine availability.
- Vibration indication to alert you about unusual mechanical behavior when the IO-Link module detects vibration above certain threshold values.
- Class A and Class B voltage monitoring
- Short-circuit detection to help protect the circuitry of the device and the master from a light or sound module short circuit.
- Open load condition useful to indicate when light or sound modules in the stack light have not been properly installed.
- Premier integration design that enables configuration via the Rockwell Automation® IO-Link master Add-on Profile.
- Automatic Device Configuration that helps you replace the device quicker, if necessary.

- Embedded IODD file in the device saves configuration time because there is no need to find this file somewhere else. This file also makes IODD registration quicker.
- Process Data Maps allow for selection of the type of information that is continuously sent to the PLC as a process data parameter.
- Internal temperature indication that helps to understand changes in the temperature of the application environment.

Installation

IMPORTANT The 856T tower light product family (including the 856T-B24LC module) is designed for general signaling applications and should not be wired to any safety circuit in the application.

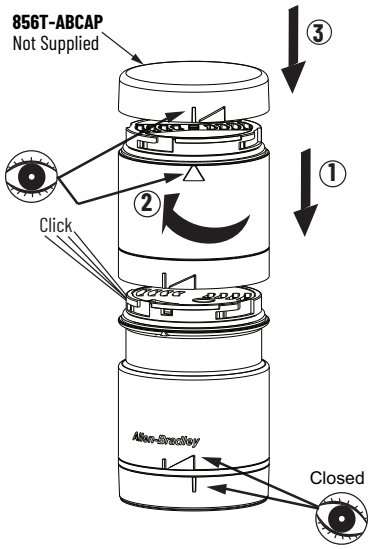
The 856T-B24LC module is mounted without the use of a tool in any of the 856T standard base mount adapters that are shown in Figure 2.

For a good mechanical fit, the module provides a haptic feedback (click) only when it is fully twisted onto the base mount adapter.

IMPORTANT Verify that the right edge on the alignment mark (triangle shape) in the 856T-B24LC module is aligned with the arrow mark on the base mount adapter as shown in Figure 1.

The 856T-B24LC module encloses the 5-pin M12 connector on the bottom of the device and accepts standard cordsets to connect to an IO-Link Master Class B.

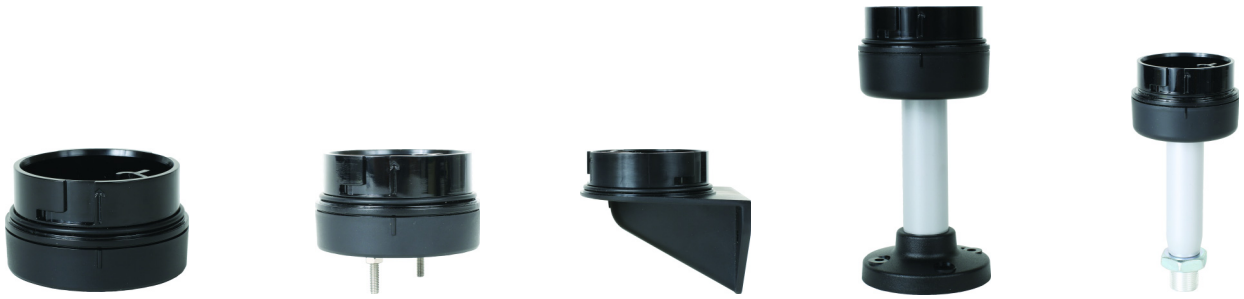
Figure 1 - Mount the IO-Link Module



IMPORTANT Physical protection of the stack light is recommended where the possibility of unwanted access or damage to the device exists in the application. You should also consider the use of conduit to shield the cable to avoid cable or wiring cuts.

IMPORTANT Since the IO-Link protocol is not encrypted or authenticated, you should protect the cabling and the connectors in both the IO-Link master and the 856T-B24LC module to help prevent unwanted access when a distributed control architecture is used. When the device is installed on top of a control panel, the panel enclosure must provide protection against unwanted accessibility to the cabling.

Figure 2 - Base Mounting Adapters



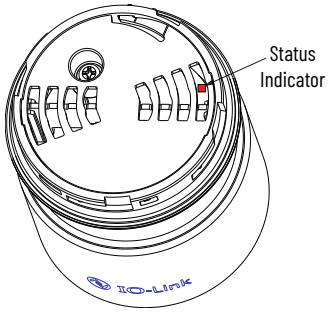
856T - BMA P10
a b

a	
Housing Color	
Code	**Description**
BMA	Black

b	
Mounting Style	
Code	**Description**
SN	NPT surface mount, Type 4/4X/13
VM	Vertical mount
SH	Surface mount NPT, Type 4/4X/13, preinstalled mounting hardware
P10	10 cm (3.9 in.) aluminum pole mount
P25	25 cm (9.8 in.) aluminum pole mount
P40	40 cm (15.7 in.) aluminum pole mount
P60	60 cm (23.6 in.) aluminum pole mount
T10	10 cm (3.9 in.) threaded tube (M20)
T25	25 cm (9.8 in.) threaded tube (M20)

When power is applied to the device, the module runs a self-test routine to verify the health of its internal electronic components and the result of this test is visible via a bicolor status indicator that is mounted inside the module but visible from the top. In addition, this status indicator also displays if the device is communicating with the IO-Link Master. For more information on these results, see Power On Self Test (POST) on page 43.

Figure 3 - Status Indicator Location on IO-Link Module

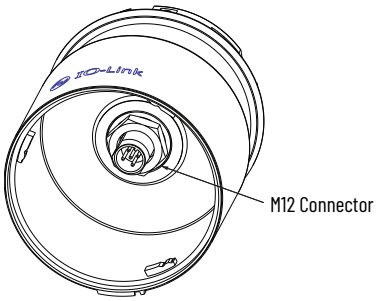


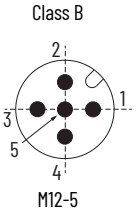
Wiring

The 856T-B24LC module has an embedded 5-pin M12 connector at the bottom of the unit. This connector accepts standard cordsets when connecting the device with a Class B Master. Figure 4 shows the pin arrangement.

IMPORTANT See Class A IO-Link Master Connection Consideration on page 45 for specific considerations when connecting the 856T-B24LC module to an Allen-Bradley Class A IO-Link master.

Figure 4 - M12 Connector Location and Pin Arrangement



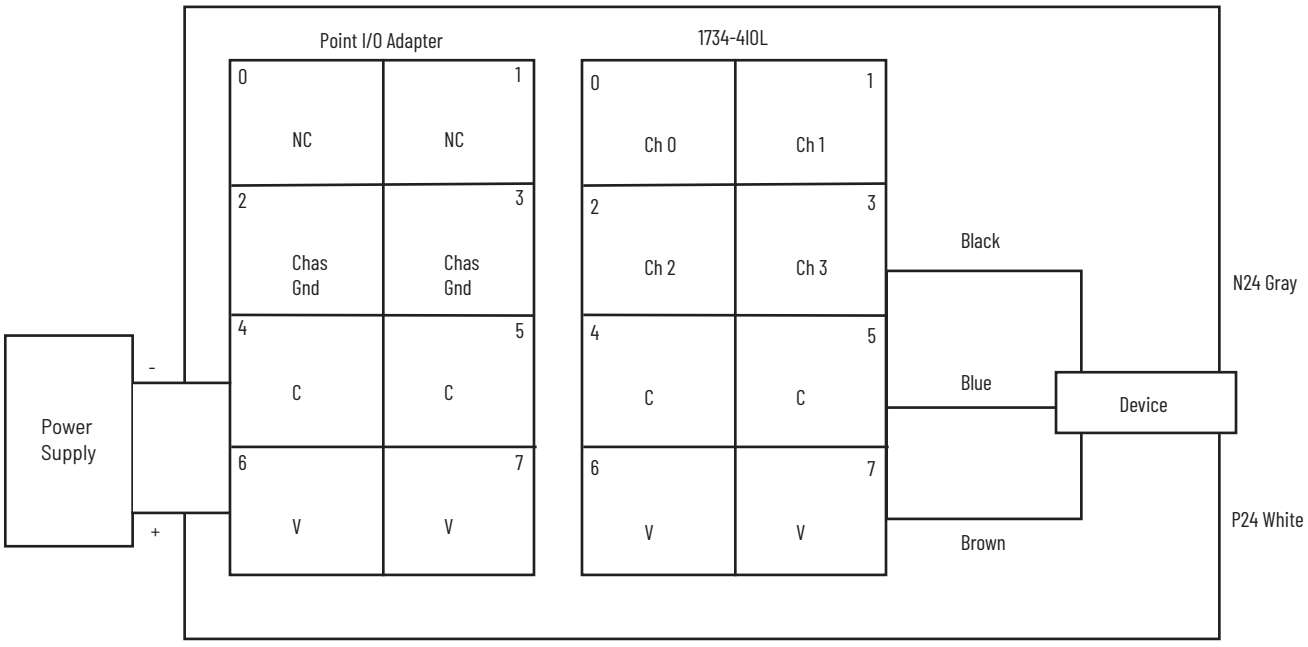


Pin	Signal	Description
1	L+	Power supply (+)
2	P24	P24 (port Class B)
3	L-	Power supply (-)
4	C/Q	SIO/SDCI
5	N24	N24 (port Class B)

Table 1 - Wiring the 856T-B24LC Module to the 1734-4IOL Master

856T-B24LC Module		889D Cordset Wire Color	1734-4IOL Connection
M12 Connector Pin #	Signal		
1	L+	Brown	Voltage
2	P24	White	–
3	L-	Blue	Common
4	C/Q	Black	Channel
5	N24	Gray	–

Figure 5 - Connection Example: 856T-B24LC Module to the 1734-4IOL Master



IMPORTANT Use an 889D-F5AC-* cordset to connect the 856T-B24LC module to the 1734 IO-Link master.

IO-Link Overview

IMPORTANT This chapter provides a short overview of IO-Link technology. For more details, see the IO-Link specification at io-link.com.

What is IO-Link?

The IO-Link technology is an open point-to-point communication standard and was launched as (IS) IEC 61131-9. IO-Link is now the first globally standardized technology for sensor and actuator communication with a fieldbus system. This technology provides benefits to both OEMs and end users.

IO-Link provides communications-capable sensors to the control level by a cost-effective point-to-point connection. IO-Link provides a point-to-point link between the I/O module and device that is used for transferring detailed diagnostics, device identity information, process data, and parameterization.

IO-Link communication is based on a master-slave structure in which the master controls the interface access to the sensor. The option of using the intelligence that is integrated into the sensor provides you with new methods to commission your device. Benefits of IO-Link technology range from reduced installation time during startup to increased diagnostics over the lifetime of the machine. Other benefits of IO-Link technology include:

- Reduced inventory and operating costs
- Increased uptime/productivity
- Simplified design, installation, creation, and maintenance
- Enhanced flexibility and scalability
- Detailed diagnostic information for preventive maintenance

Why IO-Link?

IO-Link offers a full range of advanced features and functions

Seamless Integration

- Forward and backward compatible
- No special cables required
- Connectivity options remain the same
- Access IO-Link functionality by simply connecting an IO-Link enabled device to an IO-Link master

Real-time Diagnostics and Trending

- Real-time monitoring of the entire machine down to the IO-Link device level
- Optimized preventative maintenance-identify and correct issues before Anomaly can occur
- Detect IO-Link device malfunctions/Anomalies

IO-Link Device Status

- Real-time monitoring verifies that IO-Link devices are operating correctly
- Detect damaged IO-Link device and pinpoint their exact location for quick troubleshooting through Application-Specific Name parameter

Device Profiles and Automatic Device Configuration

- Device configurations are stored in the IO-Link master module
- Multiple configurations can be stored in controller to support changes in machine production, for example tool changes
- Within minutes instead of hours, modify sensor parameters to produce different finished goods

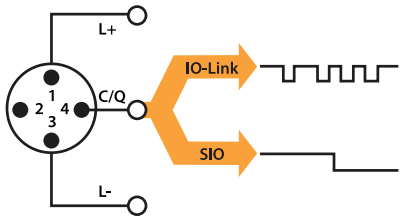
Descriptive Tags

- Faster programming during initial setup
- More efficient troubleshooting process-data tags are named based on the information they provide
- Easily monitor device data though intuitive tag names

How Does IO-Link Work?

IO-Link delivers data over the same standard field cabling used today. By connecting an IO-Link device to an IO-Link master, the field-device data and diagnostics are accessible. So, go beyond detecting products on the machine-now the health of the machine can be monitored as it runs.

Figure 6 - Typical IO-Link Wiring



Pin	Signal	Note
1	L+	24V
2	Out	Depends on sensor
3	L-	Ground
4	C/Q	Communication/ switching signal

IMPORTANT It is possible that the response time of an IO-Link system is not fast enough for high-speed applications.

Transmission Rates

Three communication rates are specified for the IO-Link device:

- COM1 = 4.8 kBd
- COM2 = 38.4 kBd
- COM3 = 230.4 kBd

An IO-Link device typically supports only one of the specified transmissions rates (see IO-Link Specifications on page 55). IO-Link V1.1 specification requires an IO-Link master to support all three communication rates.

Transmission Quality

The IO-Link communication system operates at a 24V level. If a transmission fails, the frame is repeated two more times. If the transmission fails on the second try, the IO-Link master recognizes a communication failure and signals it to the controller.

Response Time of the IO-Link System

The device description file (IODD) of the device contains a value for the minimum cycle time of the device. This value indicates the time intervals at which the master addresses the device. The value has a large influence on the response time. In addition, the master has an internal processing time that is included in the calculation of the system response time.

Devices with different minimum cycle times can be configured on one master. The response time differs so for these devices. When configuring the master, you can specify a fixed cycle time (minimum of 3 ms) and the device-specific minimum cycle time that is stored in the IODD. The master then addresses the device that is based on this specification. The typical response time for a device therefore results from the effective cycle time of the device and the typical internal processing time of the master.

IO-Link Data Types

There are four data types available through IO-Link:

Process data	→	Cyclic data
Value status	→	Cyclic data
Device data	→	Acyclic data
Events	→	Acyclic data

Process Data

The process data of the devices are transmitted cyclically in a data frame in which the device specifies the size of the process data. Depending on the device, 0...32 bytes of process data are possible (for each input and output). The consistency width of the transmission is not fixed and is thus dependent on the master.

Value Status

The value status indicates whether the process data is valid or invalid. The value status can be transmitted cyclically with the process data.

Device Data

Device data supports device-specific configurable parameters, identification data, and diagnostic information. They are exchanged acyclically and at the request of the IO-Link master. Device data can be written to the device (Write) and read from the device (Read).

Events

When an event occurs, the device signals the presence of the event to the master. The master then reads out the event. Events can be error messages and warnings/maintenance data. Error messages are transmitted from the device to the controller via the IO-Link master. The transmission of device parameters or events occurs independently from the cyclic transmission of process data.

Access IO-Link Data

Cyclic Data

To exchange the cyclic process data between an IO-Link device and a controller, the IO-Link data from the IO-Link master is placed on the address ranges assigned beforehand. The user program on the controller accesses the process values using these addresses and processes them. The cyclic data exchange from the controller to the IO-Link device is performed in reverse.

Acyclic Data

Acyclic data, such as device parameters or events, are exchanged using a specified index range. The controller accesses these using Explicit Messaging. The use of the index and subindex ranges allows targeted access.

I/O System Startup

If the port of the master is set to IO-Link mode, the IO-Link master attempts to communicate with the connected IO-Link device. To do so, the IO-Link master sends a defined signal (wake up pulse) and waits for the IO-Link device to reply.

The IO-Link master initially attempts to communicate at the highest defined data transmission rate. If unsuccessful, the IO-Link master then attempts to communicate at the next lower data transmission rate.

If the master receives a reply, the communication begins. Next, it exchanges the communication parameters. If necessary, parameters that are saved in the system are transmitted to the device. Then, the cyclic exchange of the process data and value status begins.

Assign Device Parameters

A device that is built for a specific application requires changes to parameter settings. The device parameters and setting values are contained in the IODD of the device.

I/O Device Description (IODD) files contain information about the device identity, parameters, process data, diagnostic data, and communication properties. These files are required to establish communication with the sensors via IO-Link.

The IODD consists of multiple data files; the main file and several optional language files are in XML-format and graphic files are in PNG format (portable network graphics). These files adhere to the IO-Link open standard, which means that they can be used with any IO-Link masters.

IODD files are assigned using Studio 5000® and the 1734-4IOL Add-on Profile (AOP). [(a)]

(a) When using the 1734-4IOL IO-Link master module.

Notes:

Configure the 856T-B24LC IO-Link Module

This chapter describes the physical hardware and software that is required to configure the 856T-B24LC module. It also provides a guide to hardware installation.

Products Required

Hardware

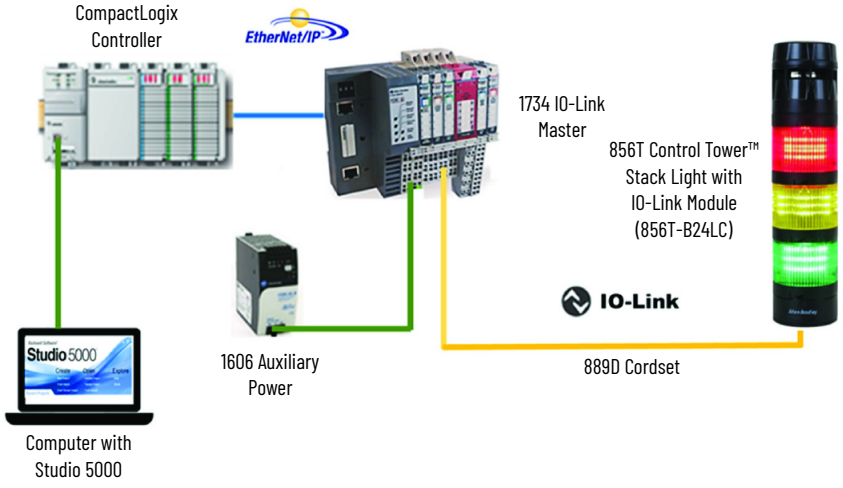
- 856T-B24LC IO-Link module
- CompactLogix™ or ControlLogix® PLC Platform
- POINT I/O™ Communications Interface: 1734-AENTR
- POINT I/O IO-Link Master Module: 1734-4IOL
- POINT I/O terminal base: 1734-TB
- RJ45 network cable for EtherNet/IP™ connectivity: 1585J-M8TBJM-1M9*
- 889D cordsets (optional): 889D-F5AC-5** (IO-Link maximum cable length is 20 m [65.6 ft])

Software

- Studio 5000® environments, version 20 and higher
- Sensor-specific I/O Device Description (IODD)
- 1734-4IOL IO-Link Add-on Profile (AOP)

Figure 7 shows a POINT I/O chassis with a 1734-AENTR adapter and a 1734-4IOL IO-Link master module in the first slot. The 1734-AENTR adapter is communicating with a CompactLogix controller via EtherNet/IP.

Figure 7 - IO-Link Hardware and Software Required



AOP Installation

Add-on Profiles (AOPs) are files that you add to your Rockwell Automation library. These files contain the pertinent information for configuring a device that is added to the Rockwell Automation network. The Add-on Profile simplifies the setup of devices because it presents the necessary fields in an organized fashion. The Add-on Profile allows for the efficient configuration of systems. The Add-on Profile is a folder that contains numerous files for the device. It comes as an installation package.

Before you start making a project in Studio 5000, verify that the proper and latest versions of the AOP files are installed. In this example, you need the AOP for 1734-AENTR (POINT I/O) and 1734-4IOL (IO-Link Master).

If the AOP is required to be downloaded and installed, you can find it at: download.rockwellautomation.com/esd/download.aspx?downloadid=addonprofiles

Extract the AOP zip file, open the folder, and click the MPSetup.exe file.

Create Project

The following steps show you how to create simple configurations with the 856T-B24LC module.

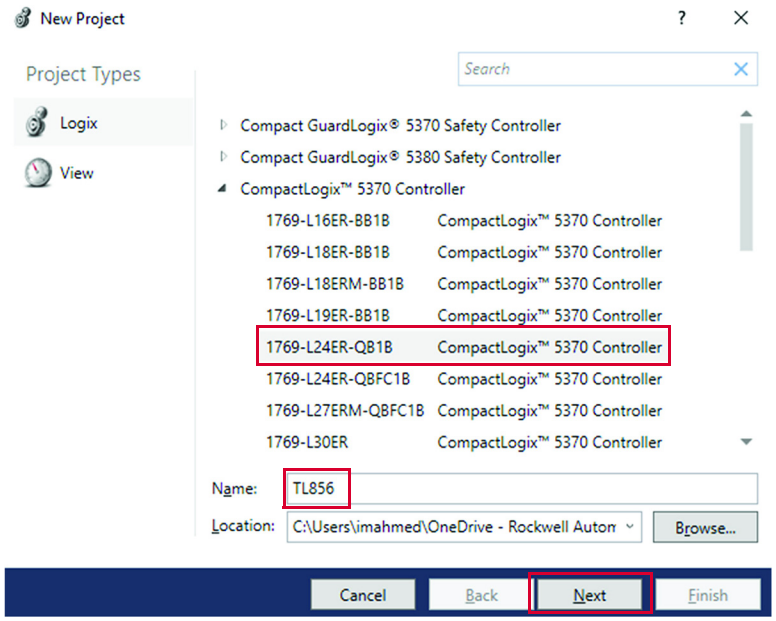
To begin a new project in Studio 5000, follow these steps.

1. Click the Studio 5000 icon. In this example, version 32 of Studio 5000 is used.

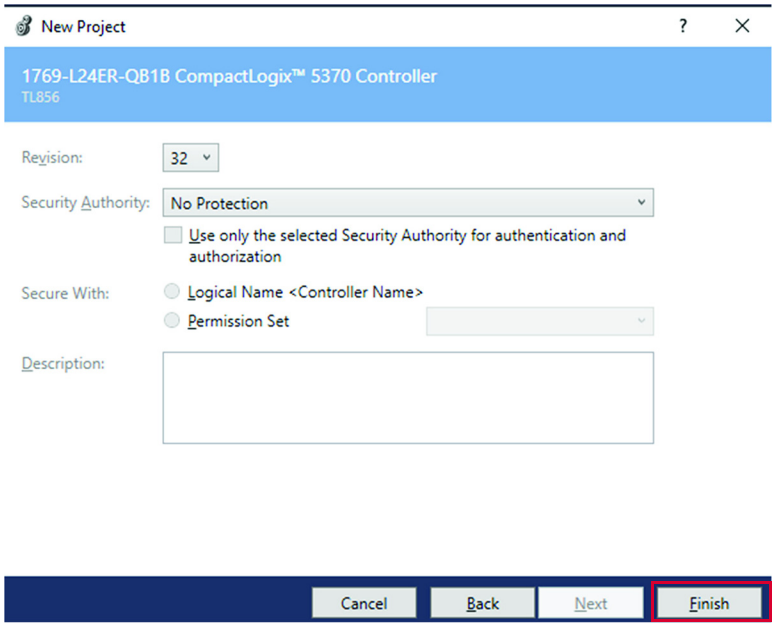
2. Click New Project

Add Controller

1. To program the controller, select the controller that is used, name the project, and click Next.



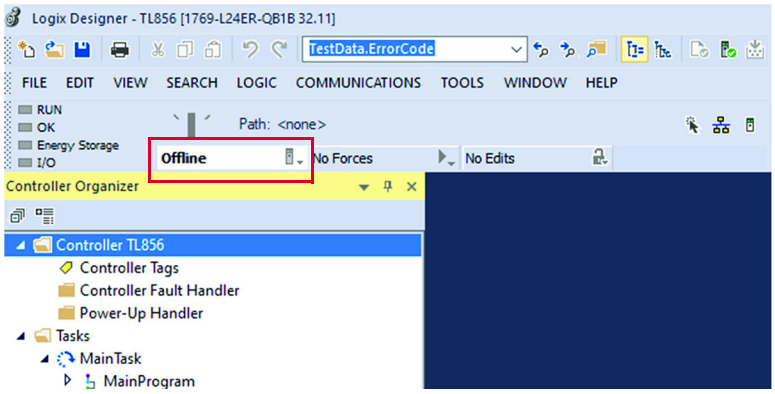
Depending on Studio 5000 version, you may be required to configure additional parameters. Configure as needed and click Finish.



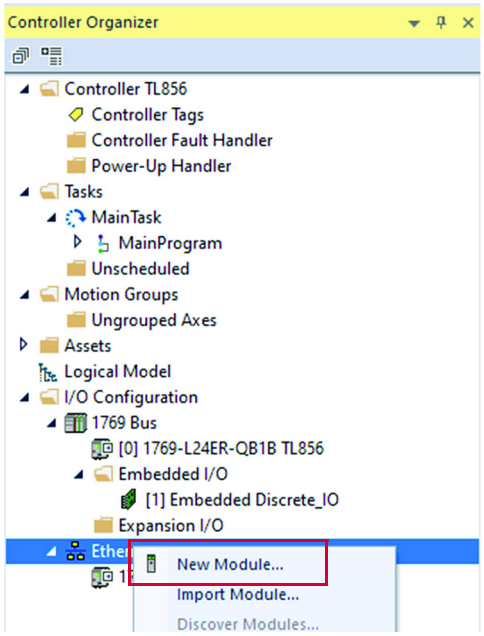
Add POINT I/O Ethernet Adapter

1. Add POINT I/O to the project. The 1734-AENTR adapter is used in this project.

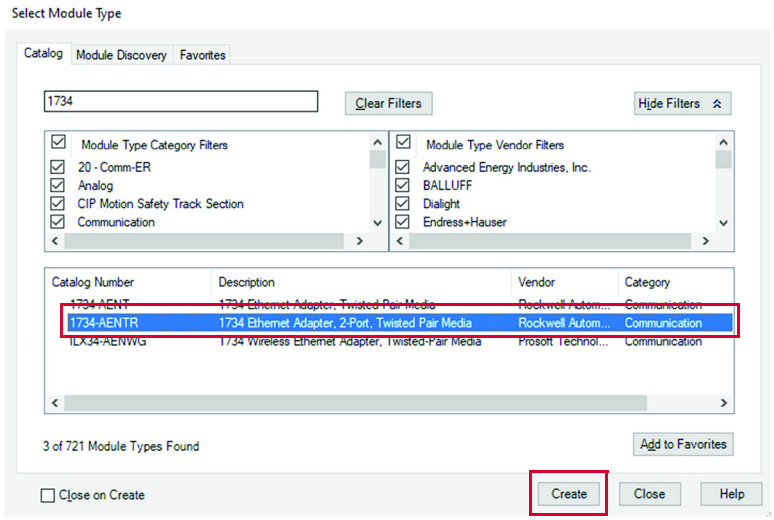
   To add device to the project, Studio 5000 must be in Offline mode.



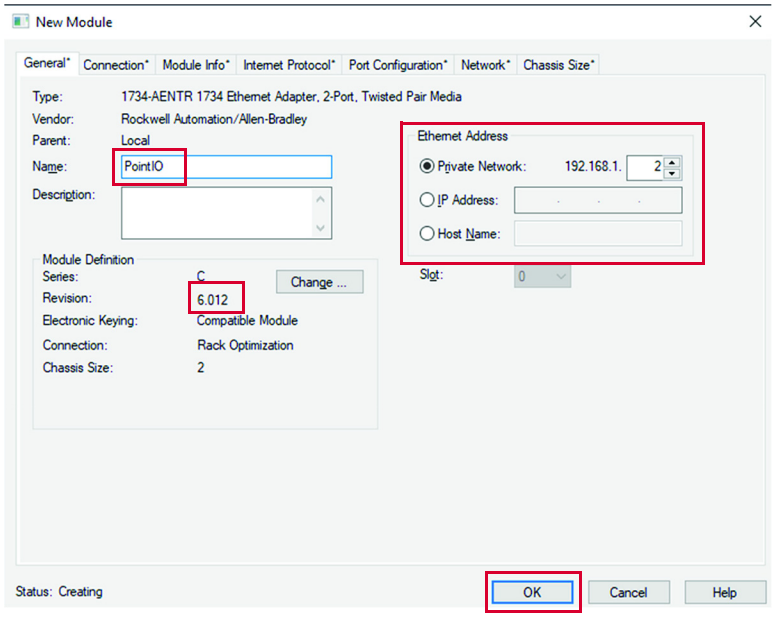
2. In the controller organizer tree, find Ethernet under I/O Configuration and right-click to select New Module...



3. The module window opens and shows the available modules. Use the filter to select 1734-AENTR adapter and click Create.



4. Name the Ethernet adapter (in this example we used name PointIO), set the chassis size, check the module revision, and configure the adapter IP address. Click OK and Close.

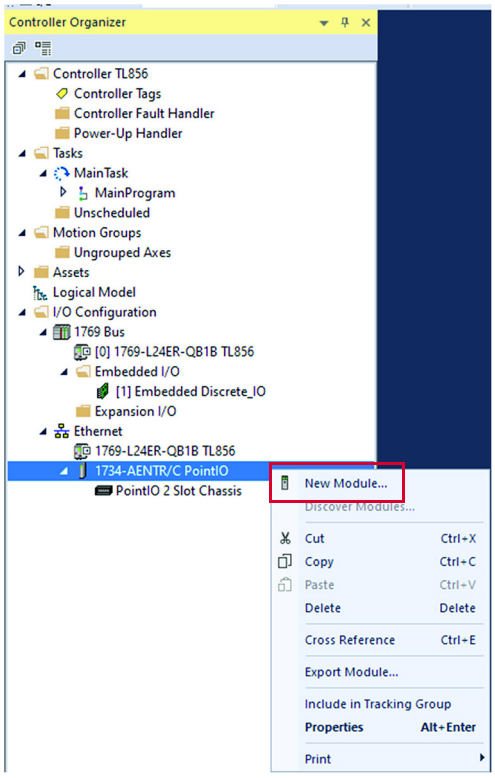


5. The 1734-AENTR adapter is now visible in the Controller Organizer tree in the Ethernet section.

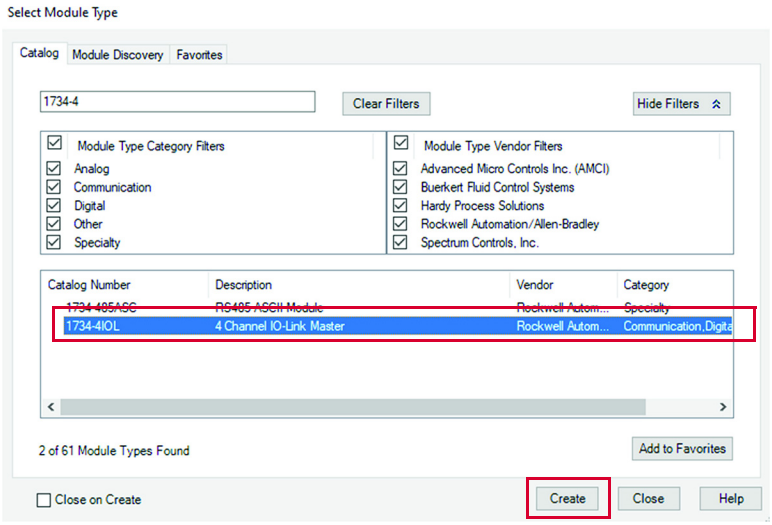
Add IO-Link Master

Now, the IO-Link Master module must be added. Make sure that the controller is Offline before you start configuration.

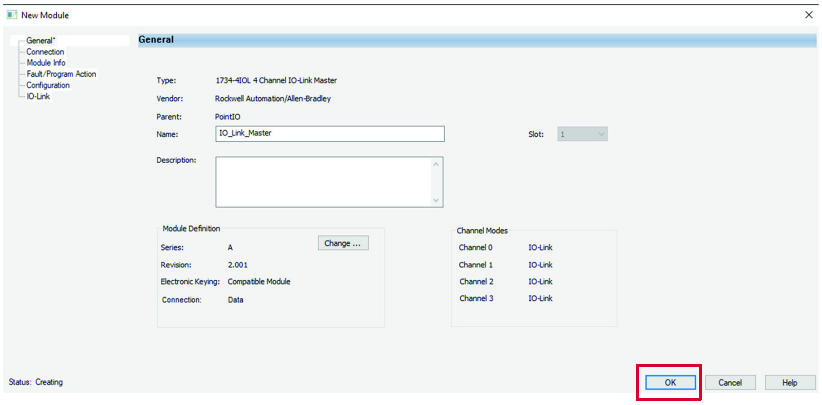
1. In the Controller Organizer tree, find Ethernet under I/O Configuration. Right-click the 1734-AENTR adapter and select New Module.



2. The module window pops up and shows the available modules. Use the filter to select 1734-4IOL module and click Create.



3. The IO-Link Configuration screen appears, click OK.



Close the selection popup window if still visible.

4. The IO-Link Master can now be configured. To configure the device, a device-specific IODD (I/O Device Description) file is required. The following section shows how to register the IODD file.

Register the 856T-B24LC Module IODD File

To initialize a device on an IO-Link Master, register the IODD of the device. The IO Device Description (IODD) files contain the information that is related to the device, integrated into the system environment. There are three ways to get the IODD file:

- The 856T-B24LC module has an embedded IODD that can be automatically loaded into Studio 5000. Customer does not need to register the IODD file.
- The IODD file for the 856T-B24LC module can be downloaded from rok.auto/pcdc and loaded manually to Studio 5000.
- The 856T-B24LC module IODD is available in the IODD finder section of the IO-Link.com website.

Embedded IODD File

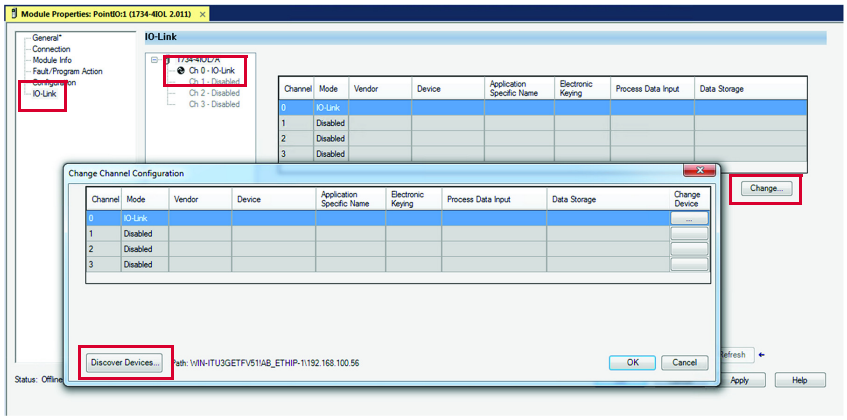
IMPORTANT Rockwell Automation IO-Link masters with AOP and firmware revisions newer than the following, have the device discovery functionality that is required to extract the embedded IODD from the 856T-B24LC module.

- 1734-4IOL (Add on Profile: 2.1.55 / Firmware: 2.011)
- 1732E-8IOLM12R (Add on Profile: 3.1.55 / Firmware: 3.011)

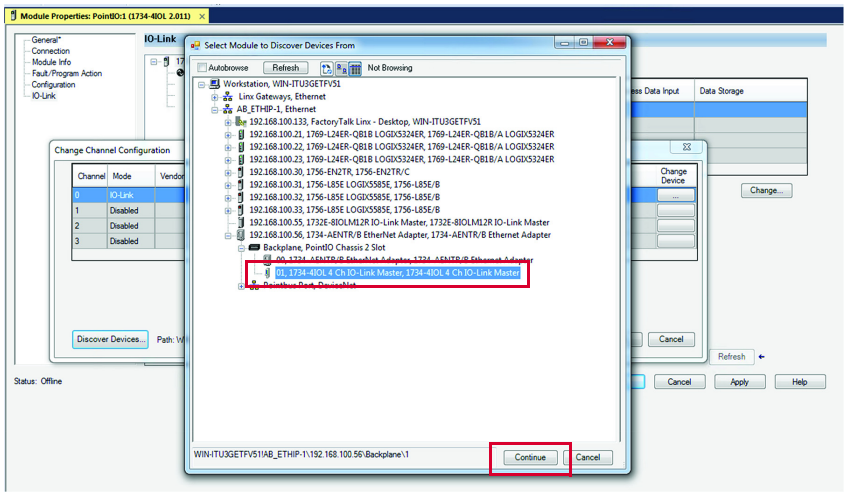
Follow these steps to use the embedded IODD feature in the 856T-B24LC module and register it in Studio 5000 automatically:

1. Verify that Studio 5000 is online with Logix Controller.
2. Verify that the connection with the IO-Link Master (1734-4IOL or 1732E-8IOLM12R) is inhibited.

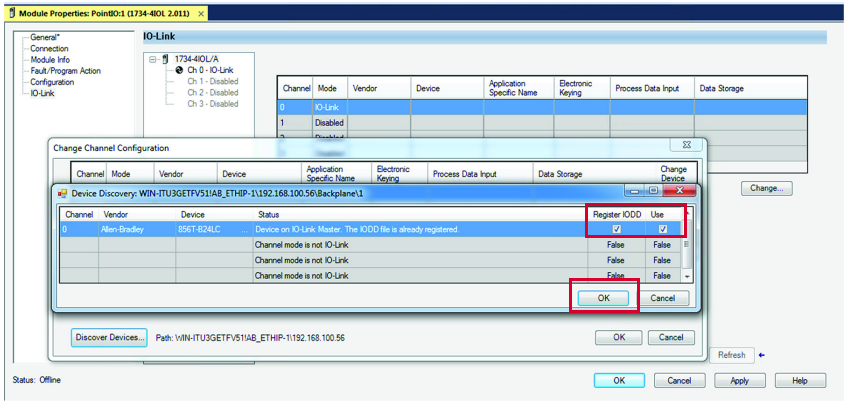
3. Verify that Studio 5000 is Offline with Logix Controller.
4. In the IO-Link Master AOP, select IO-Link and click Change. The Change Channel Configuration window appears. On the Change Channel configuration windows, click Discover Devices.



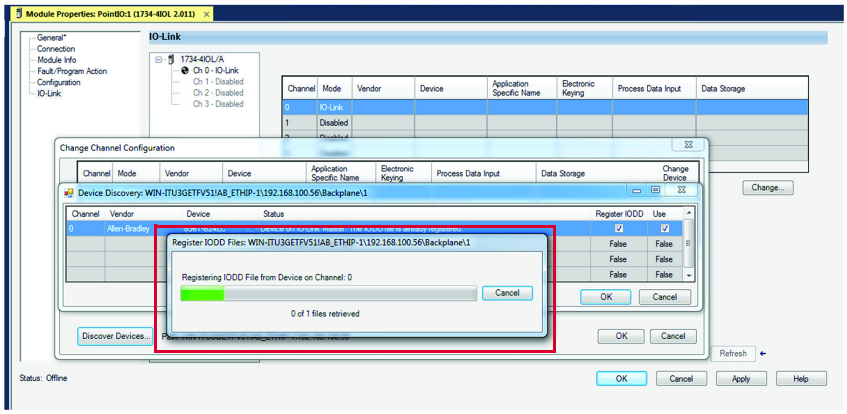
5. Click Select Module to Discover Devices From and select the path to the IO-link Master where the 856T-B24LC module is connected. Click Continue.



6. On the Device Discovery window, check the Register IODD and Use checkboxes. Click OK.

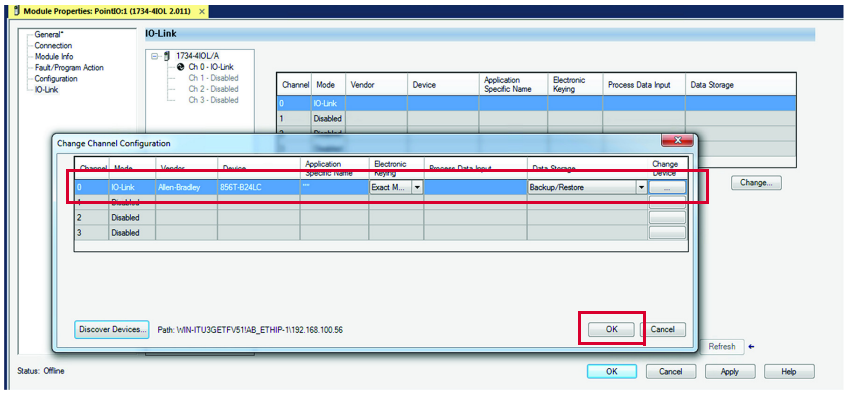


7. The IODD begins to download and the Register IODD Files window appears.



The Register IODD Files window closes once the download is complete.

8. IODD file is downloaded and device is added to the IO-Link Channel. Click OK.

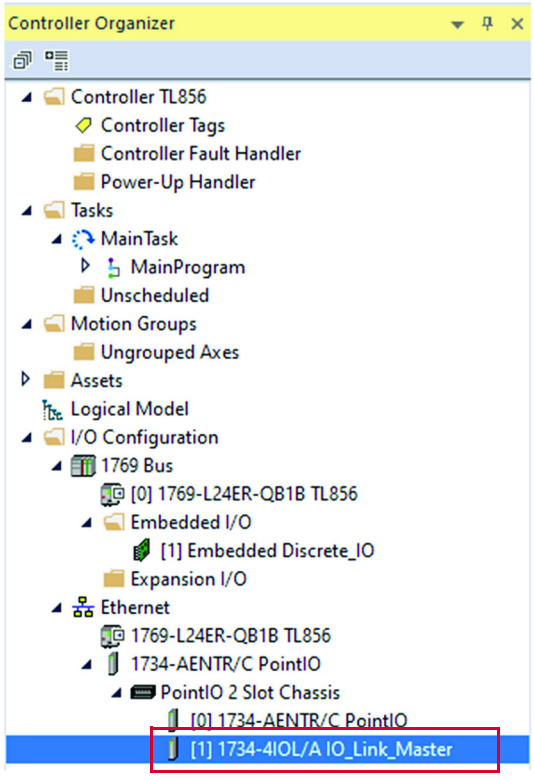


The 856T-B24LC module can now be configured.

Download IODD File

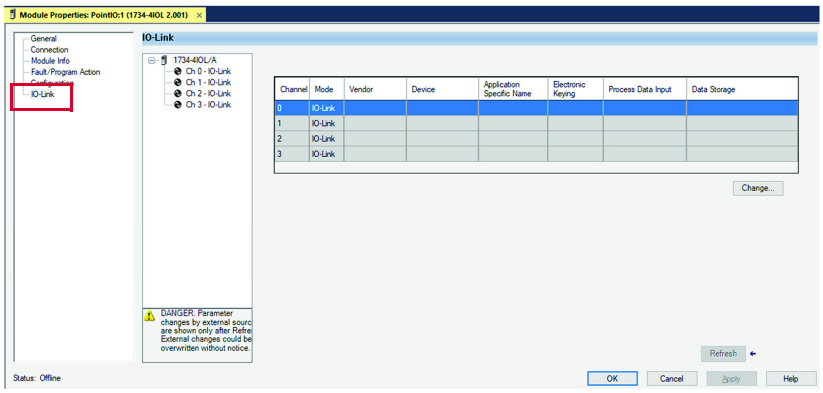
IMPORTANT Once the IODD is registered, there is no need to register the IODD again unless it is manually deleted from the Master Tree.

1. Click the 1734-4IOL in the Controller Organizer tree in the Ethernet section

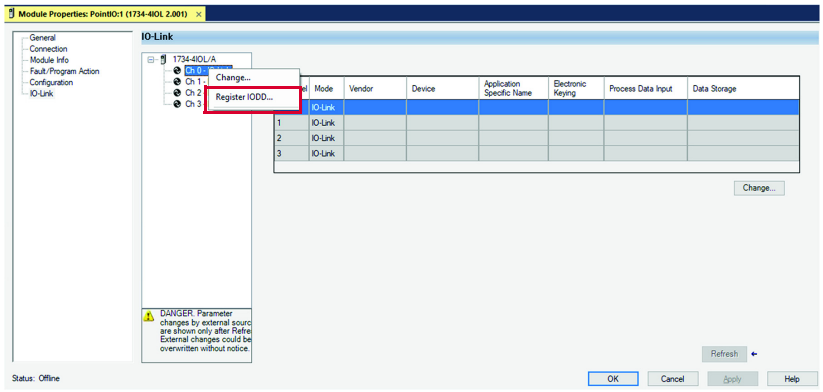


The Properties window opens.

2. Click IO-Link on the left side of the window.

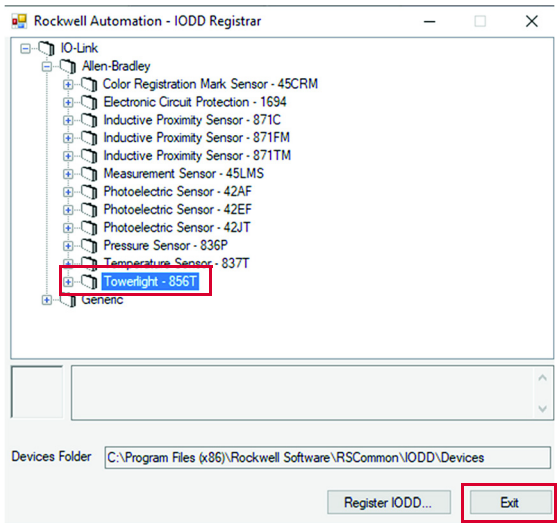


3. Right-click the channel and click Register IODD.



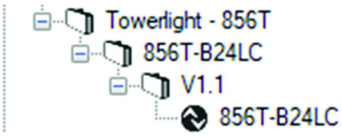
4. Select the IODD file that is needed for the device being configured.

   Click Exit.



IMPORTANT If there is no proper IODD file on the list, then click Register IODD and select folder and file that was previously downloaded to your computer. Selected IODD is shown on the list.

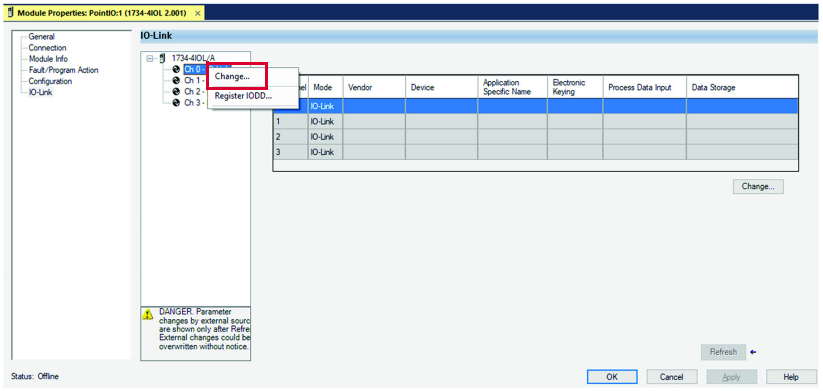
5. The IODD registration is completed.



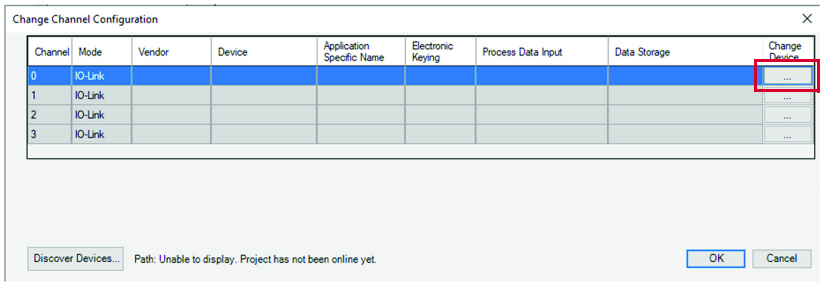
Connect the 856T-B24LC Module to the IO-Link Master

Once the IODD file is registered, the device must be connected to the IO-Link master. The controller must always be Offline to add a device to the IO-Link Master.

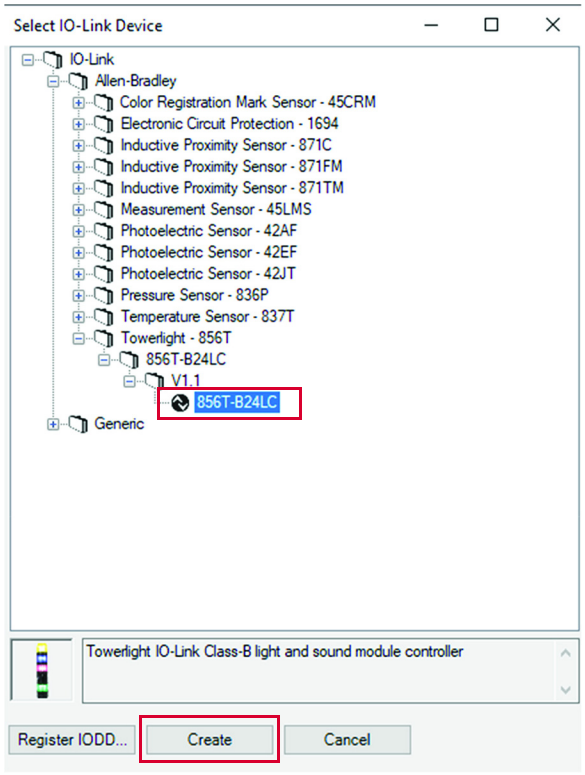
1. Right-click the channel number where the 856T-B24LC module is configured and click Change.



2. On Change Channel Configuration window, click "...".

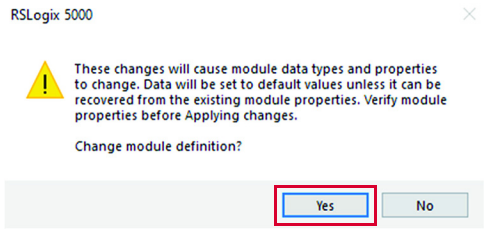


3. Select the appropriate device and click Create.

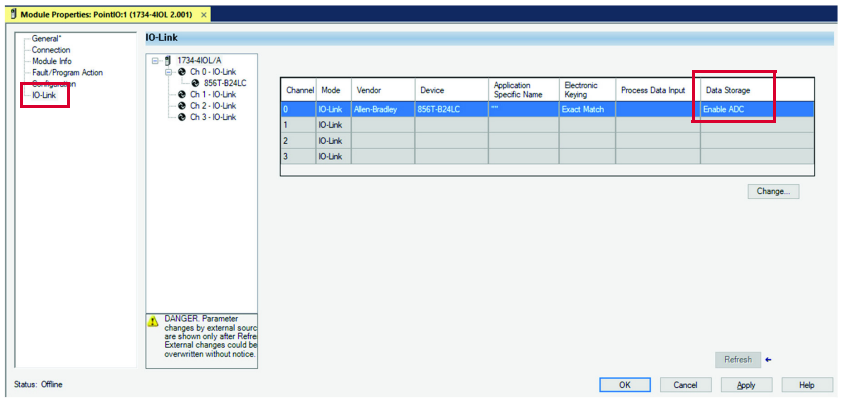


IMPORTANT Once you click Create, you may have to wait for the configuration update to complete. During this time, Studio 5000 does not respond.

4. Click Yes to accept changes in module definition.



5. Click Apply and OK to accept configuration.
6. In IO-Link Tab, Check if Data Storage mode for IO-Link module is established as Enable ADC. If not, then you are not able to change the module configuration.

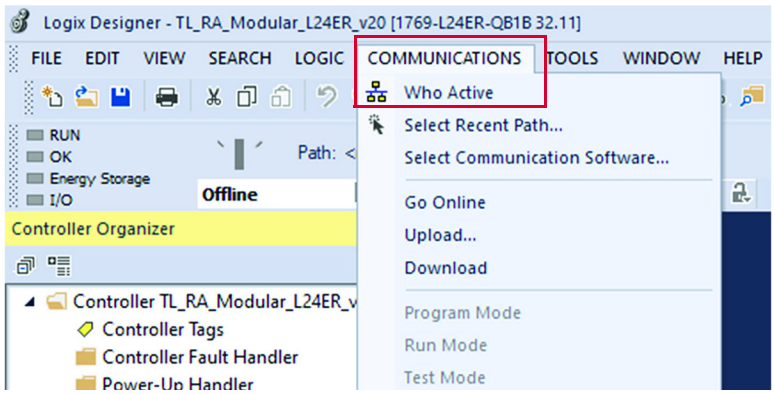


Download the Project to the PLC

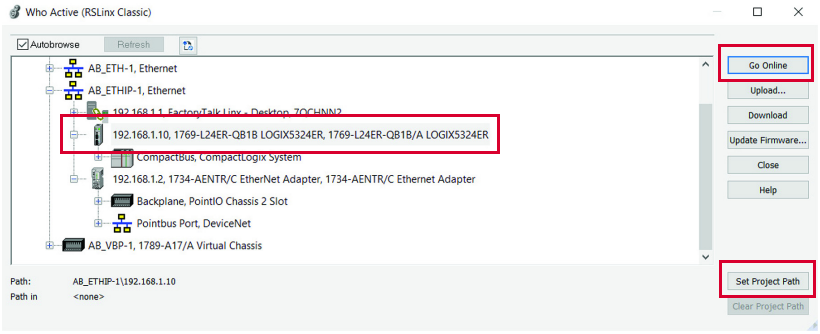
You are almost ready to go online to download the project to controller.

Before you go online, you must configure the communication path.

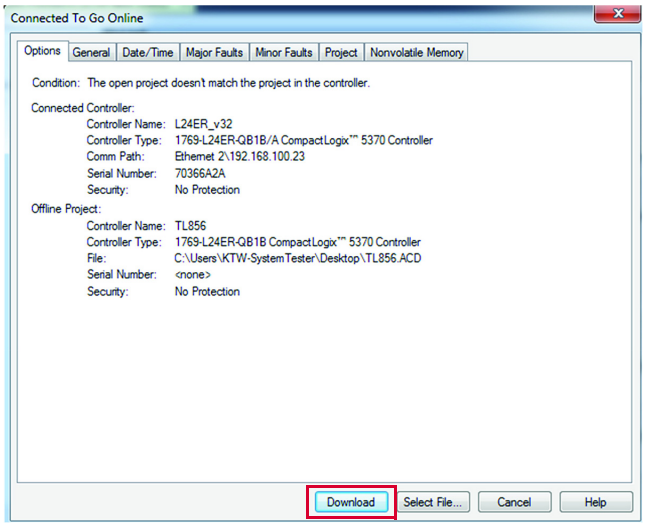
1. Setup controller communication path. Click the Communication menu and select Who Active.

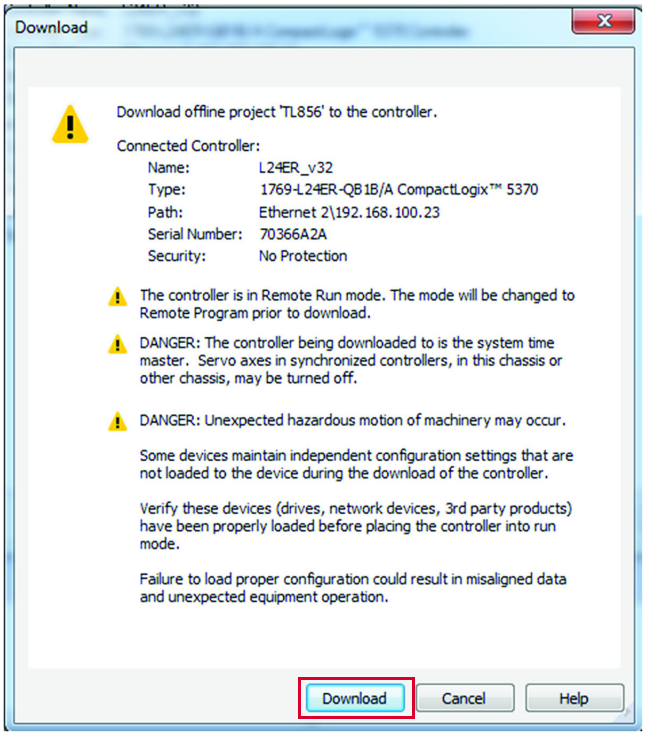


2. Select the controller that is being used for the project. In this example, we are using 1769-L24ER-QB1B CompactLogix. Once controller is selected, click Set Project Path and then Go online to start communication.



3. Download the project to controller. Click Download and then confirm downloading on the next window.





4. Project is loaded to the controller.

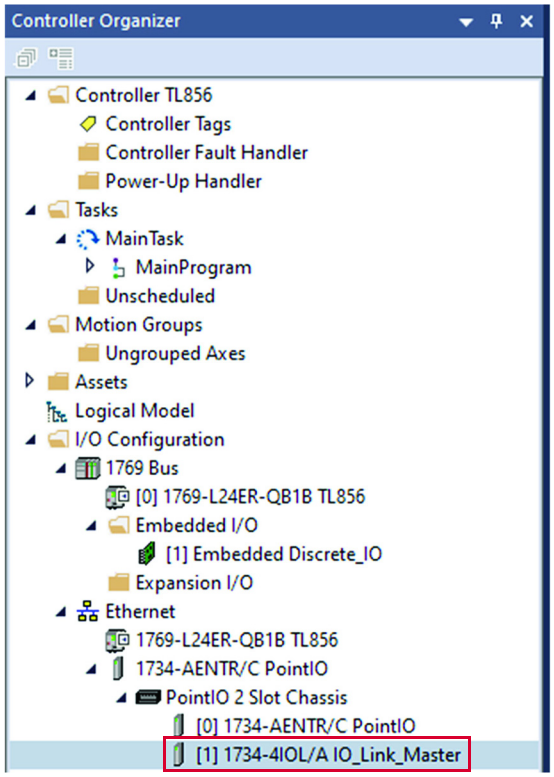
Notes:

IO-Link Parameters

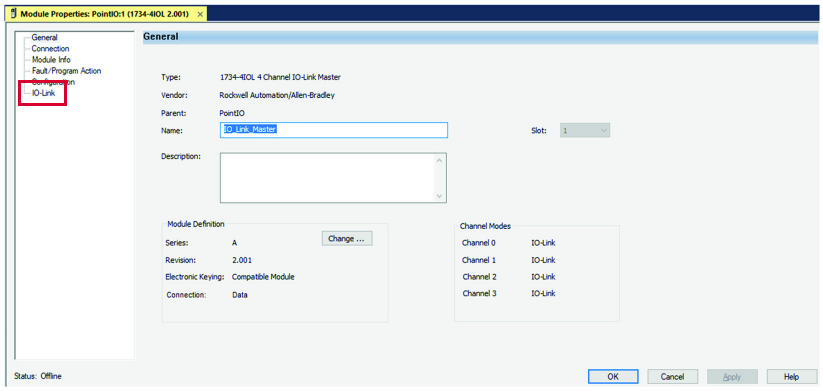
Display Parameters

To display 856T-B24LC module parameters in the AOP, you must open the IO-Link Master AOP. To open the AOP, follow these steps:

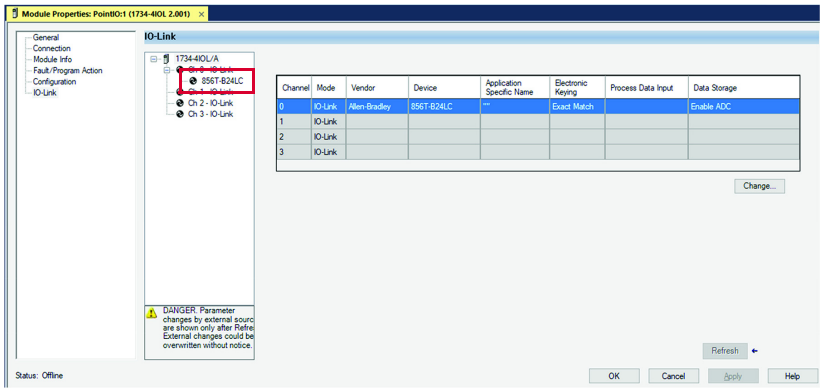
1. In the Controller Organizer tree, find Ethernet under I/O Configuration and click the IO-Link Master).



2. The Properties window opens. Click IO-Link on the left side of the window on IO-Link description.



3. In IO-Link section, click the proper channel of IO-link Master where 856T-B24LC module is installed (Ch0 in this example) and click the device that is attached to this channel.



The 856T-B24LC module IO-Link parameters are displayed, see IO-Link Tabs.

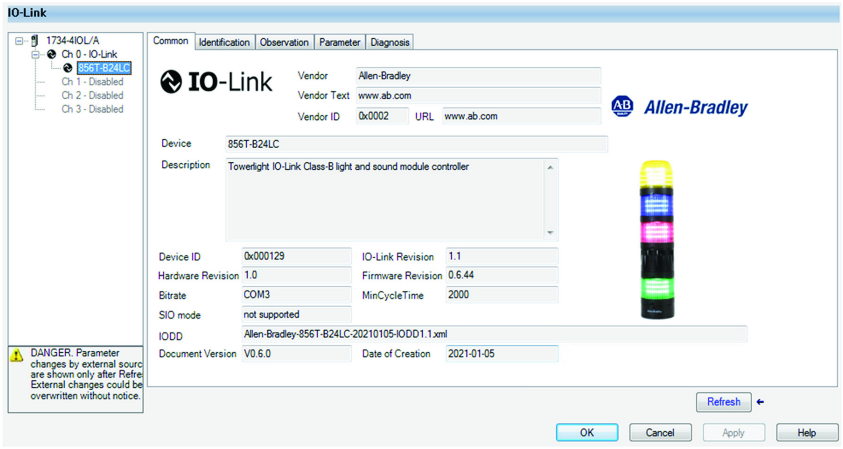
IO-Link Tabs

The 856T-B24LC module offers five different tabs to describe the device functionality and operations. These tabs are:

Table 2 - Tab Descriptions

Tab	Description
Common (page 35)	General product information about the device specifications and IO-Link IODD Information.
Identification (page 36)	The device catalog number, series letter, general product description including the current product firmware, and hardware revisions.
Observation (page 37)	Information about the stack light status, measurements, and alarm status for the 856T-B24LC module.
Parameter (page 39)	Displays and allows you to configure the stack light by changing the device parameters.
Diagnosis (page 41)	Displays the diagnostics parameters. This tab shows information about Device Access Lock, results of the power on self test, service functions, and operation information.

Common Tab

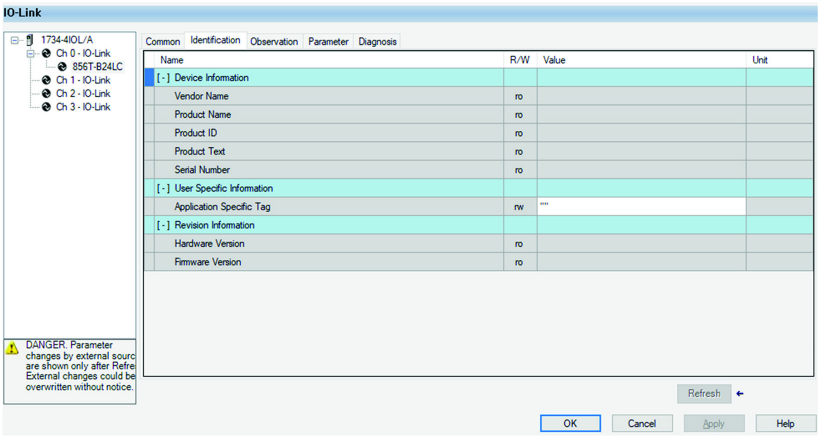


The Common tab contains the following device information:

Table 3 - Common Tab

Parameter	Description
Vendor	Provides the vendor name that is assigned to Vendor ID.
Vendor Text	Field used to describe additional product information. In this case, it displays product Internet webpage address.
Vendor ID	Describes the worldwide unique vendor ID of the manufacturer of the product as designated in the IO-Link Consortium.
URL	Displays the vendor URL.
Device	Provides the specific catalog number of the product.
Description	This parameter displays the product description.
Device ID	Displays the unique device ID as defined in the IO-Link specifications.
IO-Link Revision	Displays the current IO-Link version that the device supports.
Hardware Revision	Displays the device hardware revision number.
Firmware Revision	Displays the device firmware revision number.
Bitrate	Displays the supported bitrate for communications as defined in the IO-link 1.1 standard.
Minimum Cycle Time	The parameter to inform the master about the shortest cycle time supported by the device. Value is given in microseconds.
IODD	Information about the IODD that has been used to configure the 856T-B24LC module.
SIO mode	Information whether the device supports the SIO (Standard Input and Output).
Document Version	Displays information about the IODD version that has been used to configure the IO-Link device
Date of Creation	This field displays date when the IODD file has been CRC stamped

Identification Tab



The Device Information shows us the Vendor Name, Product Name, Product Text, Product ID, and Serial Number of the exact device that is configured.

These fields automatically populate according to the device information. These fields are read-only (ro).

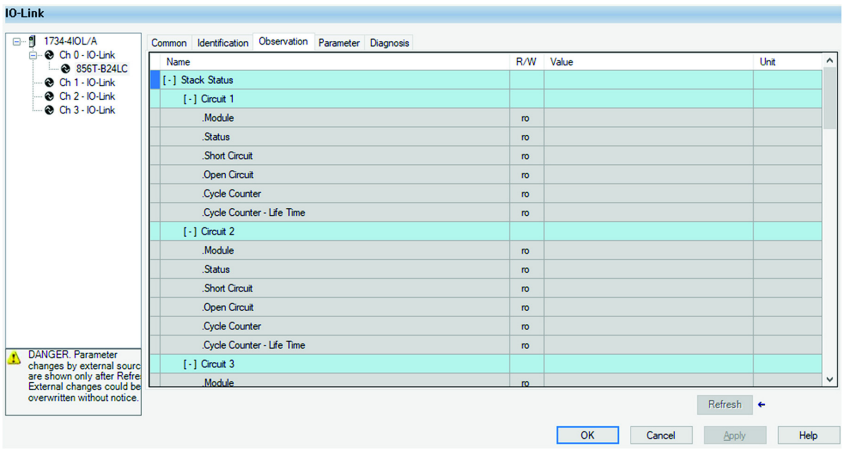
The User Specific Information contains the Application Specific Name (ASN) where you can name the device with a unique text string for identification.

The Identification tab contains the following device information:

Table 4 - Identification Tab

Parameter	Description
Device Information	
Vendor Name	The vendor name of the product. For the 856T-B24LC module, this name is Allen-Bradley.
Product Name	The product catalog number information. For this device, this name is 856T-B24LC module.
Product ID	Product catalog number information with series letter.
Product Text	Product description. In this case, “Tower light IO-Link Class B light and sound module controller.”
Serial Number	Serial number of the device as unique numeric value.
User Specific Information	
Application Specific Tag	Device-specific name that is assigned to device for device identification. This tag is a unique identity of each device. You can customize this read/write field.
Revision Information	
Hardware Version	Hardware version of the 856T-B24LC module that is provided as alphanumeric value
Firmware Version	Firmware revision of the 856T-B24LC module that is provided as numeric value.

Observation Tab



This tab indicates each circuit status on the stack light, shows alarm status, and provides a view of the measurement values.

All data that is displayed on this tab is read-only (ro).

The Observation tab contains the following device information:

Table 5 - Observation Tab

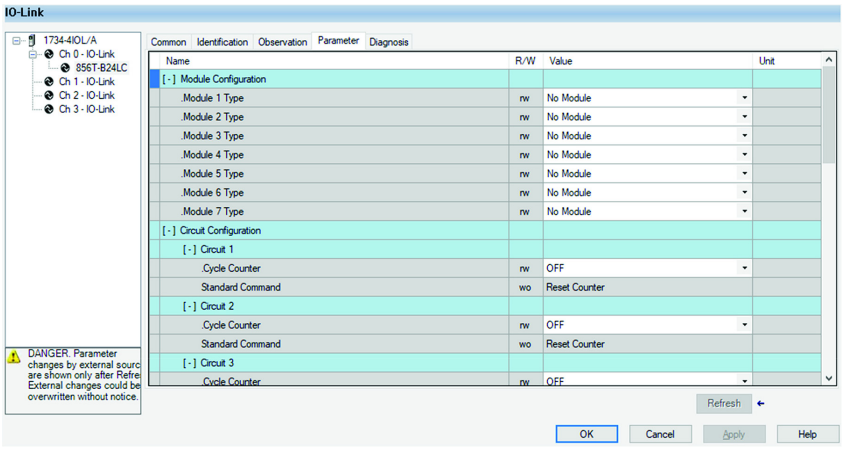
Parameter	Description	Value
Stack Light Status (Circuit s 1...7)		
. Module	Indicates if a module selected in the parameter tab is using this circuit	No Module Module 1...7
. Status	Denotes ON/OFF condition for this circuit	ON= Circuit is turned ON OFF= Circuit is turned OFF
. Short Circuit	Indicates if a short circuit condition is present in this circuit. For more details on how the short circuit detection works please see Short Circuit on page 72.	TRUE=Short circuit detected FALSE =No short circuit exists
. Open Circuit	Indicates if the stack light module is making electrical connection with this circuit when a command to turn On the circuit is sent.	TRUE= Open circuit condition exists FALSE= No open Circuit detected.
. Cycle Counter	Indicates the number of times a circuit has transitioned from OFF to ON state.	0...4,294,967,296
. Cycle Counter - Life Time	Indicates the number of times a circuit in the IO-link module has transitioned from OFF to ON state since inception.	0...4,294,967,296
Alarm Status		
. Class-A Over Voltage	Indicates if the voltage is above 30V DC	TRUE= Event triggering alarm occurred FALSE= Event did not occur
. Class-A Under Voltage	Indicates if the supply voltage is below 18V DC	TRUE= Event triggering alarm occurred FALSE= Event did not occur
. Class-B Over Voltage	Indicates if the auxiliary supply voltage is above 30V DC	TRUE= Event triggering alarm occurred FALSE= Event did not occur
. Class-B Under Voltage	Indicates if the auxiliary supply voltage is below 18V DC	TRUE= Event triggering alarm occurred FALSE= Event did not occur
. Device Over Temperature	Displays if the internal temperature in the IO-Link module is above the specified upper limit	TRUE= Event triggering alarm occurred FALSE= Event did not occur
. Device Under Temperature	Displays if the internal temperature in the IO-Link module is below the specified lower limit	TRUE= Event triggering alarm occurred FALSE= Event did not occur
. Excessive Vibration	Indicates if the vibration detected by the IO-Link module is above certain threshold on any of the X, Y, or Z motion axis	TRUE= Event triggering alarm occurred FALSE= Event did not occur
. Short Circuit	Indicates that a short circuit condition on any of the stack light or sound modules exist	TRUE= Event triggering alarm occurred FALSE= Event did not occur
. Open Circuit	Flags an open load condition in specific circuits due to an improper assembly of light modules in the stack light	TRUE= Event triggering alarm occurred FALSE= Event did not occur
. Power on Self-Test Failure	Indicates if a fault either recoverable or unrecoverable has been detected during the IO-Link module self-test	TRUE= Event triggering alarm occurred FALSE= Event did not occur

Table 5 - Observation Tab (Continued)

Parameter	Description	Value
. Internal Communication Processor Failure	Flags an internal communication problem with the main processor after two frame repetitions without answer.	TRUE= Event triggering alarm occurred FALSE= Event did not occur
. Invalid Configuration	Indicates if an improper light or sound module configuration has been made. The alarm is TRUE in the following situations: • You configure a module in a circuit slot without having a module in a preceding circuit slot. For example, module is selected in circuit 2 without a module being selected in circuit 1. • You allocate too many circuits. For example, three RGB light modules are selected (which requires nine circuits) and only are seven available. • If a beacon module, transducer, or recordable sound module is used, it must always be the last module in the stack as long as there is at least one circuit available. When the Invalid configuration status condition is active, all outputs in the IO-link module are disabled.	TRUE= Event triggering alarm occurred FALSE= Event did not occur
Measurements		**Unit**
Voltage		
Class A	The Class A power supply voltage.	V
Class B	The Class B (auxiliary) power supply voltage.	V
Device Temperature		
Actual - Since Power Up	The current internal temperature of the IO-Link module since powerup or last power cycle.	C
Minimum - Since Power Up	The minimum internal temperature of the IO-Link module since powerup or last power cycle.	C
Maximum - Since Power Up	The maximum internal temperature of the IO-Link module since powerup or last power cycle.	C
Vibration	The values that are associated to the vibration indication feature (if selected).	
Calibration Status	The functional state of the calibration process once activated. The default value is Not calibrated.	• Not calibrated • Calibration in Progress • Calibration Complete
.X-axis - Average	The average vibration value for X-axis.	m/s^2
.Y-axis - Average	The average vibration value for Y-axis.	m/s^2
.Z-axis - Average	The average vibration value for Z-axis.	m/s^2
.X-axis - Maximum - Since Power Up	The maximum vibration value for X-axis since powerup.	m/s^2
.Y-axis - Maximum - Since Power Up	The maximum vibration value for Y-axis since powerup.	m/s^2
.Z-axis - Maximum - Since Power Up	The maximum vibration value for Z-axis since powerup.	m/s^2
.X-axis - Maximum - Life Time	The maximum vibration value for X-axis since inception. This value is not resettable.	m/s^2
.Y-axis - Maximum - Life Time	The maximum vibration value for Y-axis since inception. This value is not resettable.	m/s^2
.Z-axis - Maximum - Life Time	The maximum vibration value for Z-axis since inception. This value is not resettable.	m/s^2

IMPORTANT Power cycle does not reset the statistical data.

Parameter Tab



The Parameter tab displays the parameter settings of the 856T-B24LC module where you can configure the stack light by defining the type of modules (light or sound) in this specific stack light arrangement. In addition, you can set counter functions per circuit, select required alarms to be monitored and execute system and standard commands as well.

The Parameter tab contains the following device information:

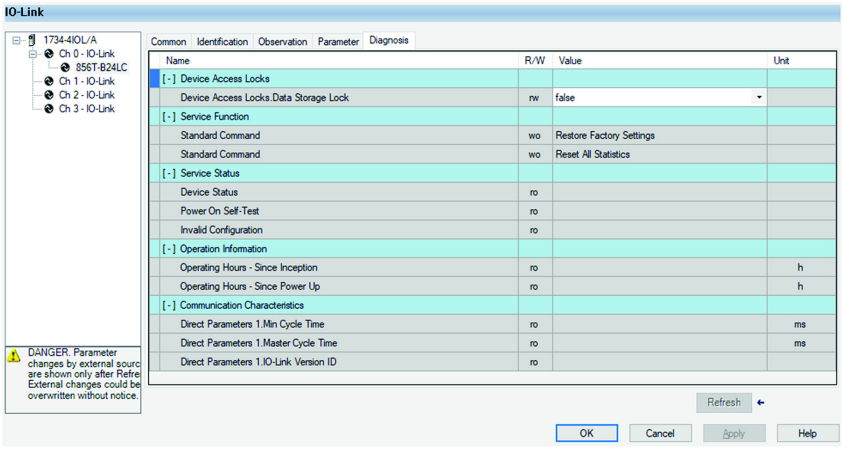
Table 6 - Parameter Tab

Parameter	Description	Value
Module Configuration		
.Module 1 Type	Allows the selection of the stack light module in the first position of the stack light (Bottom to Up)	• No Module • 856T Steady Light • 856T Multifunction module • 856T Rotating Module • 856T Multi-color light Module • 856T Steady/Flashing Beacon • 856T Strobe beacon • 856T Rotating Beacon • 856T Multi-color beacon • 856T Piezo Electric sounder • 856T Transducer sounder • 856T Recordable sound module
.Module 2 Type	Allows the selection of the stack light module in the second position of the stack light (Bottom to Up)	
.Module 3 Type	Allows the selection of the stack light module in the third position of the stack light (Bottom to Up)	
.Module 4 Type	Allows the selection of the stack light module in the fourth position of the stack light (Bottom to Up)	
.Module 5 Type	Allows the selection of the stack light module in the fifth position of the stack light (Bottom to Up)	
.Module 6 Type	Allows the selection of the stack light module in the sixth position of the stack light (Bottom to Up)	
.Module 7 Type	Allows the selection of the stack light module in the seventh position of the stack light (Bottom to Up)	
Circuit Configuration (Circuits 1...7)		
.Cycle Counter	This parameter enables the cycle counter for this specific circuit and its value is incremented each time that the circuit transitions from OFF to ON. This value is persisted in EEPROM and restored on powerup.	ON= power cycle Counter ON OFF= power cycle counter OFF
Standard Command- Reset Counter	The IO-Link device resets the circuit counter (1...7) when the system command (0xA0...0xA6) is received via the IO-link protocol. It also allows you to reset the counter that is associated with this circuit by clicking Reset Counter in this tab of the AOP.	

Table 6 - Parameter Tab (Continued)

Parameter	Description	Value
Alarm Configuration		
.Class-A Over Voltage	The alarm configuration parameters allow you to select which alarms are required to be enabled and monitored in the Observation tab while masking the alarms that are not of interest for this application. The alarm configuration mirrors the Alarm status word and is readable and writable via the IO-Link protocol.	ON= Alarm Enabled OFF= Alarm Disabled
.Class-A Under Voltage		
.Class-B Over Voltage		
.Class-B Under Voltage		
.Device Over Temperature		
.Device Under Temperature		
.Excessive Vibration		
.Short Circuit		
.Open Circuit		
.Power On Self-Test Failure		
.Internal Communication Processor Failure		
.Invalid Configuration		
Vibration		**Unit**
Configuration		
.X-axis Warning Limit	Allows you to enter a desired vibration threshold manually on each one of the X, Y, or Z axis (if these values are known). If thresholds are not known, IO-Link module calculates them by sampling vibration during the calibration time you entered. The default and maximum allowable value is 160.0 m/s2	m/s2
.Y-axis Warning Limit		
.Z-axis Warning Limit		
Calibration Period	Allows you to enter the time in which the IO-Link module gathers vibration samples to compute and obtain the vibration thresholds per axis. During this time, a value of Calibration in progress is displayed in the calibration status in the Observation tab. After the elapsed time, the calibration status will change to Calibration complete. This parameter is read/write. This parameter can be set in tenths of an hour and the minimum value is 0 and maximum is 48 hours. The actual calibration time has an accuracy of ±1.5% of its programmed value.	hours
Standard Commands		
Start Calibration	The IO-Link module begins the vibration calibration when a start calibration system command (0xA7) is received via the IO-Link protocol or by clicking Start Calibration on this AOP tab.	
Cancel Calibration	The IO-Link module stops the vibration calibration process when it receives the Cancel calibration system command (0xA8) via the IO-Link protocol or by clicking Cancel Calibration in this AOP tab. If the IO-Link module was previously calibrated, after cancellation, the status goes to calibration complete and uses the previous threshold values. It helps protect against unwanted or accidental Start Calibration commands.	

Diagnosis Tab



The Diagnosis tab provides device status, operation information, and the results of the internal device self-checking at powerup. It allows you to perform a reset to the factory settings of the device and to reset all permissible statistics and offers you the option to help protect setup against unintended parameter changes after configuration.

Diagnosis tab contains the following device information:

Table 7 - Diagnosis Tab

Parameter	Description	Value
Device Access Locks		
Device Access Locks.Parameter(write) Access Lock	This variable is read/write. If selected, the IO-Link module does not accept any parameter change after it is set with a value of TRUE.	TRUE= Parameter Write Access Locked FALSE= Parameter Write Access Unlocked
Device Access Locks.Data Storage Lock	This variable is read/write. When it is selected as TRUE it prevents updates to the Data stored in the device. Also, if marked as TRUE, to avoid a communication loss with the 856T-B24LC module, you must select either Disabled or Enable ADC in the Data Storage field in the master IO-Link AOP configuration table.	TRUE= Data Storage Locked FALSE= Data Storage Unlocked
Service Functions		
Standard Command-Restore Factory Settings	The IO-Link module resets to its factory default values when the system command (0x82) is received via the IO-link protocol. It also erases all user configuration and diagnostic data but not data that is related to Operating hours and module (circuit) ON/OFF counters.	See Table 26 on page 75 for parameters can be reset using this command.
Standard Command-Reset All Statistics	The IO-Link module resets all statistic back to their default value when a system command (0xAA) is received via the IO-link protocol. This command resets all circuit counters, vibration max since powerup and minimum and maximum internal temperature values	See Table 27 on page 76 for a complete list of statistical information can be reset using this command.
Service Status		
Device Status	The actual operational device state. See Table 24 on page 71 for a detailed explanation on each of the values displayed in this diagnostic. This data is read-only.	• Device is OK • Maintenance Required • Out of specification • Functional Check • Failure
Power On Self-Test	The device performs power on self test after startup. If a test fails, and it is possible to execute the application code, the error code is passed to the application code for processing. Otherwise, the IO-Link device blinks the device status indicator error code according to the self-test result code. A lower value result code has higher priority. This data is read-only. An explanation of each one of the results of this test is described in Power On Self Test (POST) on page 43.	• Success • Firmware Integrity Failure • Internal RAM Failure • Secondary Processor Failure • IO-Link PHY failure • Accelerometer Communication failure • Serial nonvolatile memory Integrity failure • Class A voltage out of range • Class B voltage out of range
Invalid Configuration	This field verifies if the configuration of the light or sound module in the stack light is valid. This field is read-only type.	• FALSE= Light or sound module configuration is valid • TRUE= Invalid Light /sound module configuration.

Table 7 - Diagnosis Tab (Continued)

Parameter	Description	Value
Operation Information		**Unit**
Operating Hours-Since inception	Indicates the time the IO-link module has been functional since first powered. This value cannot be reset and is read-only.	Hours
Operating Hours-Since Power Up	Indicates the amount of time the IO-link module has been functional since last power cycle. This value is read-only	Hours
Communication Characteristics		
Direct Parameters 1.Min Cycle Time	Displays the minimum cycle time of the IO-Link device. This value indicates the time intervals at which the master addresses the device. This value is read-only.	ms
Direct Parameters 1.Master Cycle Time	This parameter gives the actual cycle duration that is used by the Master to address the IO-Link device. This value is read/write.	ms
Direct Parameters 1.IO-Link Version ID	Displays the standard version applicable to Master-IO-link device communication	1.1

Power On Self Test (POST)

The 856T-B24LC module runs a self-test routine to check on the health of its electronic components at powerup.

This read-only diagnostic value (ISDU= 0x0137) is available via the IO-Link protocol.

Table 8 shows the result/error codes that are associated with this test.

Table 8 - Result/Error Codes After POST

Result/Error Code Decimal (Binary)	Description	Device Hardware Fault Condition	Recommended Action
0 (0000)	Success	–	–
1 (0001)	Firmware image corrupted	Non-recoverable	Replace the 856T-B24LC module.
5 (0101)	RAM test failed	Non-recoverable	Replace the 856T-B24LC module.
6 (0110)	Secondary processor failed	Critical	• Check Class B voltage is in specified range. • If Class B voltage is present and in range, replace the 856T-B24LC module.
7 (0111)	IO-Link PHY failed	Critical	• Check that cordset or patchcord is properly attached to the IO-link device and the IO-link master. • Replace the 856T-B24LC module.
9 (1001)	Accelerometer communication failed	Severe	Replace the 856T-B24LC module.
10 (1010)	Serial flash integrity failed	Severe	Replace the 856T-B24LC module.
11 (1011)	Bad Class-A voltage	Severe	Verify that Class A voltage is in range and that the patchcord or cordset is attached properly.
12 (1100)	Bad Class-B voltage	Severe	Verify that Class B voltage is in range and that the patchcord or cordset is attached properly.

Hardware Fault Conditions

There are three types of hardware fault conditions:

- Non-recoverable
- Critical
- Severe

Non-recoverable

A non-recoverable fault means that MCU flash and/or RAM is corrupted and the device cannot work anymore, however, the result code may be communicated using the device status indicator.

Critical

A critical hardware fault indicates that the device does not pass critical self-test checks, therefore ISDU communications is not possible. In this scenario, the result codes are communicated using the device status indicator only.

Severe

A severe hardware fault indicates that the device passes a minimal set of power on self test checks allowing execution of its application firmware and processing of ISDU commands. In this scenario, the result code is communicated via 'Power On Self Test Status' ISDU command and the POST alarm is raised via Alarm Status variable. The device status indicator also communicates this fault.

Device Status Indicator - Error Codes

When the firmware of the device detects an error condition, the error code is communicated by blinking the device status indicator red in the following way:

<start pattern>, <1 s OFF>, <binary error code>, <2 s OFF>, <repeat>

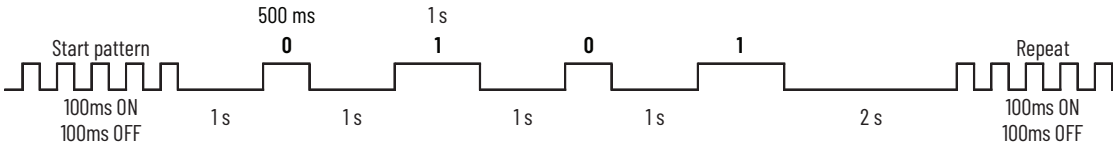
<start pattern> = 100 ms ON, 100 ms OFF, <repeat four more times>

where:

<binary error code> = 4-bit error value, where a 1 is 1 sec ON, and a 0 is 500 ms ON. Each bit is separated by a 1 sec OFF.

The value of the binary error codes are shown in Table 8 on page 43 (for example, RAM test failed is 0101.)

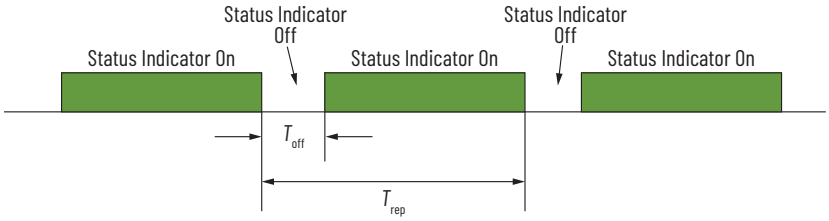
Figure 8 - Error Code Status Indicator Example



IO-Link Status Indicator Timing

The IO-Link status indicator is normally in the ON state. Communication activity turns off (T_{off}) the green indicator for a minimum of 7.5% but no more than 12.5% of the duty cycle (T_{rep}). The minimum status indicator ON time (T_{rep}) is 750 ms, and the maximum ON time during activity is 1250 ms. Each (T_{rep}) period begins in the OFF state.

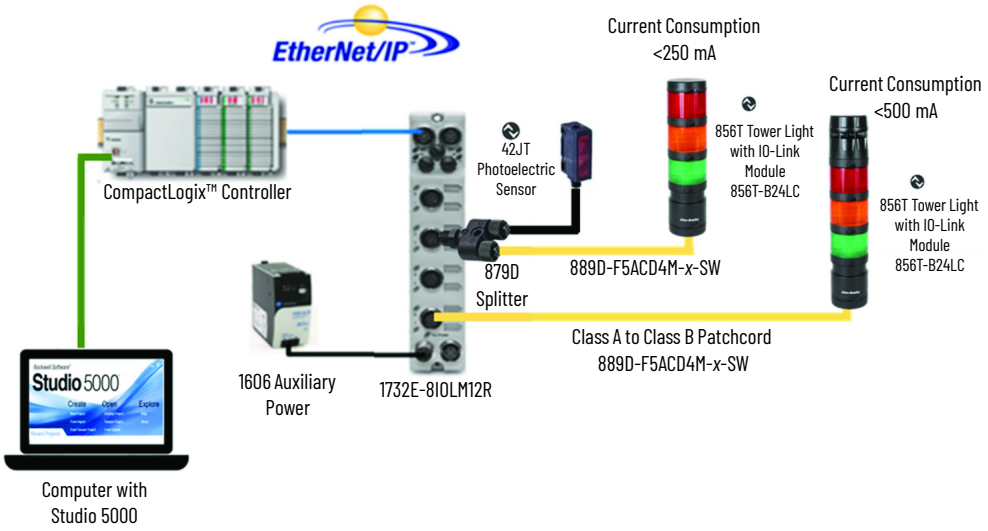
Figure 9 - Status Indicator Timing



Class A IO-Link Master Connection Consideration

If the 856T-B24LC module is going to be connected to an Allen-Bradley® IP67 ArmorBlock® IO-Link Master (1732E-8IOLM12R), then the following content must be considered.

Figure 10 - Configuration Example



Patchcord

The 856T-B24LC module is a Class B device, however, it can still be used with a Class A ArmorBlock (1732E-8IOLM12R) IO-Link master if it is connected to one master port with a Class A to Class B patchcord. The Class A to Class B patchcord provides up to 500 mA per port on the Master to supply to the IO-Link module.

The catalog number 889D-F5ACD4M-*x*-SW patchcord is available in 1, 2, 5, and 10 meter lengths. Replace the *x* with a 1, 2, 5, or 10 for the required cord length.

Maximum Number of Light/ Sound Modules in the Stack Light

Although the 856T-B24LC module can control up to seven single-circuit modules in the stack light, the maximum number of modules must be determined by calculating the total current consumption (including the current consumption of the 856T-B24LC module) to make sure that its value is not above the maximum current that the IO-Link master port can supply.

To calculate this current consumption effectively, see Table 11 on page 56 for the 856T light and sound module electrical specifications where operating current consumption is indicated. The current consumption for the IO-Link module is shown in Table 9 on page 55.

For example, the total current consumption for an IO-Link stack light with three 856T steady light modules green-amber-red (bottom to top) is:

Total (mA)	=	856T-B24LC	+	856T-BT3	+	856T-BT5	+	856T-BT4		
Total (mA)	=	30 mA	+	58 mA	+	58 mA	+	58 mA	=	204 mA

Since the maximum current per port in the 1732E-8IOLM12R IO-Link master is 500 mA, the stack light configuration in the previous example can work within the master parameters.

IMPORTANT If a splitter is used to connect the 856T-B24LC module, then the maximum total current consumption (856T-B24LC module + light and sound modules) must not exceed 250 mA.

Inrush Current Calculation

To minimize total inrush current seen by the IO-Link Master, the 856T-B24LC module staggers the turn on time of the connected modules. For seven light/sound modules in a stack light arrangement, this time does not exceed 60 ms. The inrush current values for each standard 856T light/sound module are shown in Table 11 on page 56.

Stack light config	=	856T-B24LC	+	856T-BT3	+	856T-BT5	+	856T-BB4
Inrush of every module	=	0.1 A		0 A		0 A		1.82 A

Since the maximum inrush (1.82 A) at a given time is below the IO-Link master port (4 A), then this configuration is within the IO-Link master parameters.

Overcurrent Protection

When an overcurrent or short circuit condition in one or more light or sound modules in the stack light exists, the 856T-B24LC module disables the entire stack when any of the circuits demands a load current that exceeds 450 mA (±15%). The first circuit that was detected to cause the short-circuit condition is indicated by its respective bit number in the Short Circuit Status byte.

The short circuit status bit is only cleared when you attempt to turn the circuit back ON and the short circuit is no longer present. Since the entire stack is disabled during a short circuit, the Control Circuit Status (ISDU 0x0134), reports OFF for all circuits when a short circuit condition exists.

Under a dead short condition, it is possible that the ArmorBlock master port could be damaged. Therefore, it is recommended to use a 24V DC power supply that is limited to a maximum current of 5 A.

Message Structure and Configuration Example

Configure a Message Instruction

This section provides additional information and examples that explain how to configure message instructions to exchange IO-Link parameters with the 856T-B24LC module.

In the examples that we show, we are assuming the use of the ControlLogix® controller. The message instruction dialog blocks should be formatted as shown in the examples that are given in this chapter.

Service Code

The following table is used to determine the Service Code that is needed for a specific Message Instruction.

Service Code (Hex)	Service Name	Service Description
4B	Read Subindex	Reads a parameter subindex value from the IO-Link device
4C	Write Subindex	Writes a parameter subindex value to the IO-Link device
4D	Read Index	Reads an entire index from the IO-Link device
4E	Write Index	Writes an entire index to the IO-Link device

Source Length: From Data Structure Tables

Use these tables to determine the source length that is based on the Service Code that is used and the number of bytes being written.

Read Subindex (4B) and Read Index (4D) Message Data Format:

Byte 0
Channel Number
Source Length= 1 byte

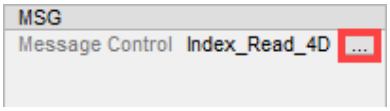
Write Subindex (4C) and Write Index (4E) Message Data Format:

Byte 0	Byte 1 to n
Channel Number	Data Bytes
Source Length=1 + number of data bytes (n) being written	

Example Format of a Read Index Message

In this example, the steps necessary to read the IO-Link parameter value for Vendor Name from the 856T-B24LC module are shown. The Message Configuration window shows all the information that is required to complete this task. To open this window, click the button highlighted below in the MSG instruction.

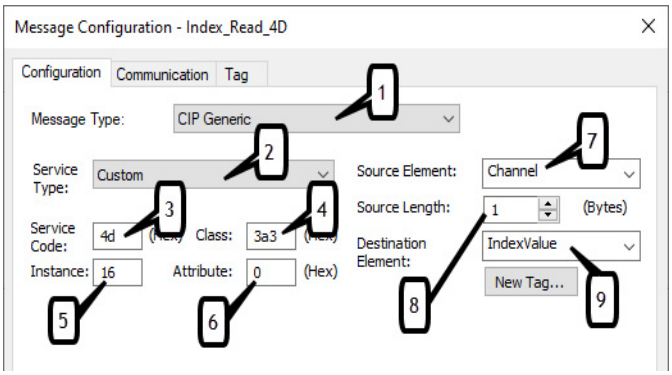
Figure 11 - Read Index Message Example



Some of the data that are required to complete the Message Configuration dialog box comes from Appendix C on page 59. Appendix C shows the Index Number, Data Type, and Size of all parameters that are available in the IO-Link module. To complete the dialog box, the Service Code and Source Length must be provided.

Service Code on page 51 shows the different Read and Write Service Codes and their associated Source Lengths.

Figure 12 - Index Read Message Configuration



The following table identifies the data that is required to complete the Message Configuration dialog box to read the Vendor Name from the 856T-B24LC module:

Item	Description	Value
1	**Message Type** The message type is CIP™ Generic.	CIP Generic
2	**Service Type** The service type is Custom.	Custom
3	**Service Code** Established from Service Code Table for read index.	4D
4	**Class** The class is 3a3.	3a3
5	**Instance** The index number of the parameter being read (established from Appendix C)	16
6	**Attribute** The Attribute value is always 0 for an index read.	0
7	**Source Element** Contains the name of the tag of the channel number (0-7) to be read.	Channel
8	**Source Length** This box contains the number of bytes of service data to be sent in the message. Defined in Data Structure Tables.	1 byte
9	**Destination Element** The name of the destination array tag for containing the data received.	IndexValue

Once the Message Instruction dialog box has been populated, trigger the rung of the logic that contains the message instruction. The Vendor Name is read from the 856T-B24LC module and copied into the IndexValue Array. When viewed as ASCII the name Allen-Bradley is displayed.

Figure 13 - Index Values

Name	Value	Data Type
IndexValue	{...}	SINT[20]
IndexValue[0]	'A'	SINT
IndexValue[1]	'l'	SINT
IndexValue[2]	'l'	SINT
IndexValue[3]	'e'	SINT
IndexValue[4]	'n'	SINT
IndexValue[5]	'-'	SINT
IndexValue[6]	'B'	SINT
IndexValue[7]	'r'	SINT
IndexValue[8]	'a'	SINT
IndexValue[9]	'd'	SINT
IndexValue[10]	'l'	SINT
IndexValue[11]	'e'	SINT
IndexValue[12]	'y'	SINT

Example Format of a Write Index Message

It is possible to write a unique name to the 856T-B24LC module. This Parameter is called Application-Specific Name. Appendix C on page 57 shows the Index Number for this Parameter (24) and the maximum length of the String (32 characters). Each character is equivalent to 1 byte. This example shows the steps necessary to write Test to the Application-Specific Name index.

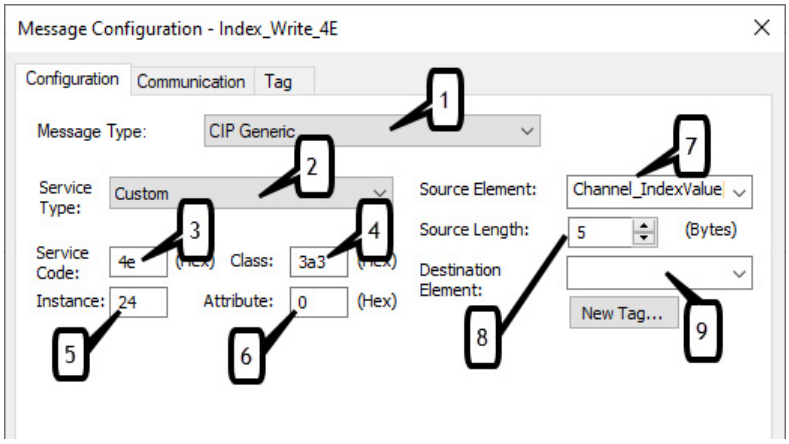
The source element array is Channel_IndexValue - byte 0 is the channel number followed by the data to be written.

Figure 14 - Write Index Message Example

Name	Value	Data Type
Channel_IndexValue	{...}	SINT[5]
Channel_IndexValue[0]	'$01'	SINT
Channel_IndexValue[1]	'T'	SINT
Channel_IndexValue[2]	'E'	SINT
Channel_IndexValue[3]	'S'	SINT
Channel_IndexValue[4]	'T'	SINT

Following is the Message Configuration dialog box that shows the information that is required to Write to the Application-Specific Name Parameter in the 856T-B24LC module.

Figure 15 - Index Write Message Configuration



The following table identifies the data that are required to complete the Message Configuration dialog box to write "TEST" to the Application-Specific Name in the 856T-B24LC module:

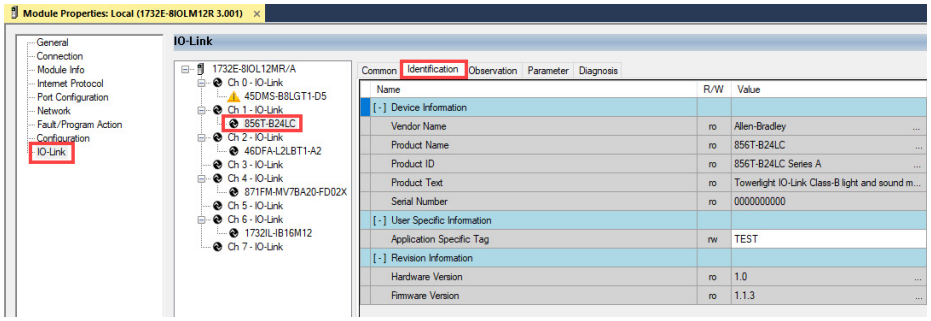
Item	Description	Value
1	**Message Type** The message type is CIP™ Generic	CIP Generic
2	**Service Type** The service type is Custom	Custom
3	**Service Code** Established from Service Code Table for write index	4e
4	**Class** The class is 3a3	3a3
5	**Instance** The index number of the parameter being written (established from Appendix C)	24
6	**Attribute** The Attribute value is always 0 for an index write	0
7	**Source Element** The name of the array tag to be written containing the channel and index value.	Channel_IndexValue
8	**Source Length** This box contains the number of bytes of service data to be sent in the message. Defined in Data Structure Tables.	5 (Bytes)
9	**Destination Element** None required	

Validation of the Write

Once the Message Instruction dialog box has been populated; trigger the rung of logic that contains the message instruction. The word "TEST" is written from the Channel_IndexValue array tag to the Application-Specific Name Parameter Index in the 856T-B24LC module. The data is validated when reading the value of Index 24 in the module or when viewing the IO-Link master configuration. To view the configuration of the IO-Link master, follow these steps:

1. Go online with the Logix controller and double click the IO-Link master in the I/O tree to bring up the module properties.
2. Select IO-Link, then select the 856T-B24LC module. Click on the Identification tab to view the Application Specific Tag value.

Figure 16 - Module Properties - Application Specific Tag Value



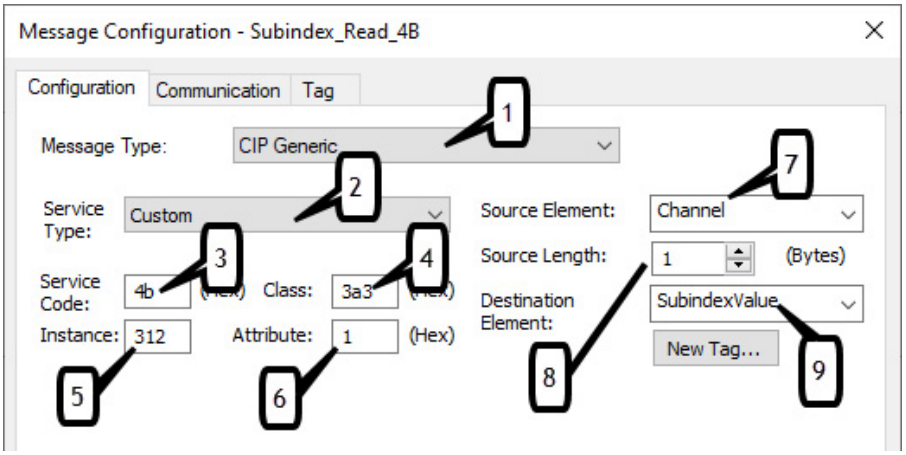
Example Format of a Read Subindex Message

In this example, the steps necessary to read the IO-Link parameter value of Module Type for Module 1 from the 856T-B24LC module are shown. The Message Configuration window shows all information that is required to complete this task. To open this window, click the blue square box in the Message Instruction.

Some of the data that are required to complete the Message Configuration dialog box comes from Appendix C on page 59. Appendix C shows the Index Number, Data Type, and Size of all parameters that are available in the IO-Link module. To complete the dialog box, the Service Code and Source Length must be provided.

Service Code on page 47 shows the different Read and Write Service Codes and their associated Source Lengths.

Figure 17 - Message Configuration



The following table identifies the data that is required to complete the Message Configuration dialog box to read the Module Type of Module 1 from the 856T-B24LC module:

Item	Description	Value
1	**Message Type** The message type is CIP™ Generic.	CIP Generic
2	**Service Type** The service type is Custom.	Custom
3	**Service Code** Established from Service Code Table for read subindex.	4b
4	**Class** The class is 3a3.	3a3
5	**Instance** The index number of the parameter being read (established from Appendix C).	312
6	**Attribute** The subindex number of the parameter being read (established from Appendix C).	1
7	**Source Element** Contains the name of the tag of the channel number (0-7) to be read.	Channel
8	**Source Length** This box contains the number of bytes of service data to be sent in the message. Defined in Data Structure Tables.	1 (Byte)
9	**Destination Element** The name of the destination tag for containing the data received.	SubindexValue

Once the Message Instruction dialog box has been populated, trigger the rung of the logic that contains the message instruction. The Module Type of Module 1 is read from the 856T-B24LC module and copied into the SubindexValue tag. Possible values are:

0	No Module
1	856T Steady Light
2	856T Multi-function Modules
3	856T Rotating Light Module
4	856T Multi-color Light Module
5	856T Steady/Flashing beacon
6	856T Strobe beacon
7	856T Rotating beacon
8	856T Multi-color beacon
9	856T Piezo Electric Sounder
10	856T Transducer Sounder
11	856T Recordable Sound Module

Example Format of a Write Subindex Message

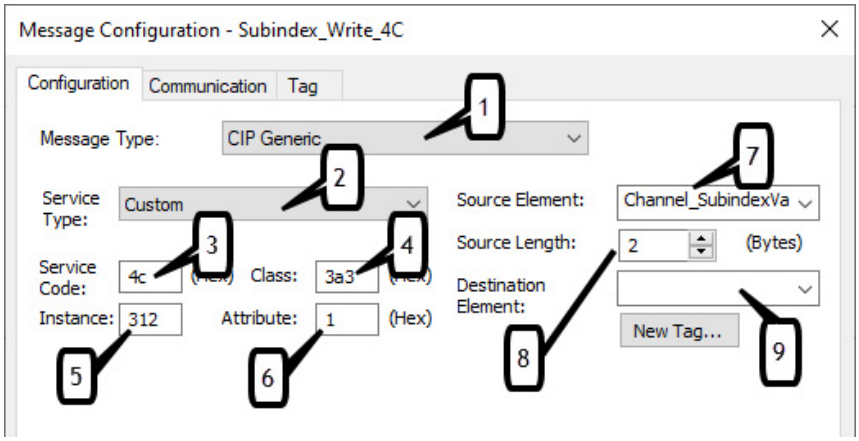
This example shows the steps necessary to write a value to the IO-Link parameter subindex Module 1 for index Module Type. The source element array is Channel_SubindexValue - byte 0 is the channel number followed by the subindex value to be written.

Figure 18 - Sub Index Value

Name	Value	Data Type
◢ Channel_SubindexValue	{...}	SINT[2]
▷ Channel_SubindexValue[0]	1	SINT
▷ Channel_SubindexValue[1]	1	SINT

Following is the Message Configuration dialog box that shows the information that is required to write to the IO-Link parameter subindex Module 1 for index Module Type in the 856T-B24LC module.

Figure 19 - Message Configuration - Sub Index Write



The following table identifies the data that is required to complete the Message Configuration dialog box to write the Module Type of Module 1 from the 856T-B24LC module:

Item	Description	Value
1	**Message Type** The message type is CIP™ Generic.	CIP Generic
2	**Service Type** The service type is Custom.	Custom
3	**Service Code** Established from Service Code Table for write subindex.	4c
4	**Class** The class is 3a3.	3a3
5	**Instance** The index number of the parameter being written (established from Appendix C).	312
6	**Attribute** The subindex number of the parameter being written (established from Appendix C).	1
7	**Source Element** The name of the array tag to be written containing the channel and subindex value.	Channel_SubindexValue
8	**Source Length** This box contains the number of bytes of service data to be sent in the message. Defined in Data Structure Tables.	2 (Bytes)
9	**Destination Element** None required.	

Use the previous read subindex example message instruction to verify the value that you wrote.

Notes:

Specifications

IO-Link Module Specifications

Table 9 - 856T-B24LC Module Specifications

Attribute	856T-B24LC
Certifications	• c-UL-us • CE (EMC and RoHS) • UKCA • RCM • KCC • Morocco
Vibration	According to EN 60068-2-6, EN60721-3-2 Class 2M2. See Table 10 on page 55.
Shock	According to EN60068-2-27. See Table 10 on page 55.
Status indicator	Bicolor (red/green) LED
Operating voltage	18…30V DC per IO-Link specification
Operating current consumption at 24V DC	30 mA
Inrush current at 24V DC	0.1 A
EMC compliance	60947-5-1 standard
IO-Link Specifications	
Communication rate	COM3 (230.4 kBd)
IO-Link cycle time, min	2 ms
Process data	• Input bit length: 48 bits (6 Bytes) • Output bit length: 56 bits (7 Bytes)
IO-Link standard (version)	1.1.2
M12 connector	5-pin, Class B
Mechanical	
Material	• Housing and Cover: Polycarbonate • M12 connector: Nylon • Connector O-rings: Silicone (1) • IO-Link module O-ring: Nitrile rubber
Weight	0.157 kg (0.346 lb)
Dimensions	• Height: 65.1 mm (2.56 in.) • Diameter: 70 mm (2.8 in.)
Environmental	
Ingress protection rating	IP66/67, UL Type 4/4X/13
Operating temperature	-30…+70 °C (-22…+158 °F)
Storage temperature	-30…+85 °C (-22…+185 °F)
Relative humidity	90% (noncondensing)
Reliability	
MTTF	41,600 hr

(1) The O-ring was tested to be well below 1% by weight when tested according to GMW17224 (Test for Volatiles in Silicone Rubber).

Table 10 - 856T-B24LC Module Shock and Vibration Specifications

Attribute	Shock, Peak [G]	Vibration, Peak [G]
Surface mount base (seven modules stacked)	20	3
Surface mount base (five modules stacked, max)	30	3
Vertical mount base	50	3
10 cm pole/tube base	50	3
25 cm pole/tube base	50	3
40 cm pole base	50	3
60 cm pole base	50	3

Table 11 - Current Consumption and Life of 856T Light/Sound Modules

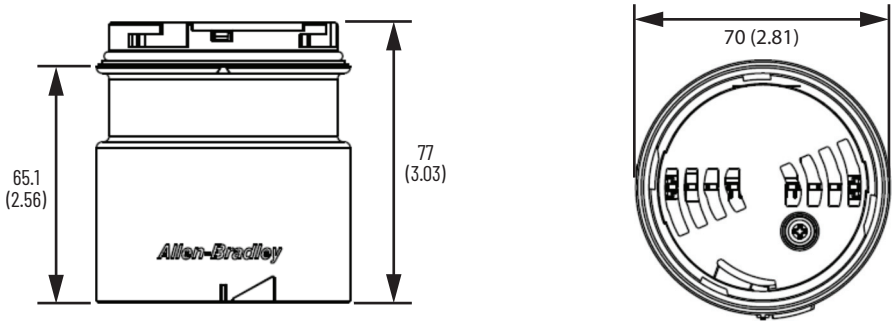
Device	Nominal Current	Inrush Current	Life
Power Modules			
856T-B24C	–	–	–
856T-BAC3C, three-circuit SMPS	150 mA, max	6 A AC, max	30,000 hr
856T-BAC7C, seven-circuit SMPS	340 mA, max	3.5 A AC, max	30,000 hr
Sound Modules			
856T-BP1, piezo, top mount	120 mA	1.8 A DC 2.15 A AC	20,000 hr
856T-BTR3, transducer	200 mA	1.06 A DC 1.24 A AC	20,000 hr
856T-BPL1, piezo, in-line	120 mA	1.8 A DC 2.15 A AC	20,000 hr
856T-BH3, recordable	140 mA	0.5A DC 1.0 A AC	10,000 hr
Steady Light Modules			
856T-BT3 (green)	58 mA	–	>60,000 hr
856T-BT4 (red)			>40,000 hr
856T-BT5 (amber)			>60,000 hr
856T-BT6 (blue)			
856T-BT7 (white)			
856T-BT8 (yellow)			
856T-BT9 (magenta)			
Multifunction Light Modules			
856T-BB3 (green)	100 mA	1.79 A DC 2.66 A AC	>60,000 hr
856T-BB4 (red)		1.82 A DC 2.66 A AC	>40,000 hr
856T-BB5 (amber)		1.79 A DC 2.66 A AC	>60,000 hr
856T-BB6 (blue)			
856T-BB7 (white)			
856T-BB8 (yellow)			
856T-BB9 (magenta)			

Device	Nominal Current	Inrush Current	Life
Rotating Light Modules			
856T-BR3 (green)	40 mA	1.79 A DC 2.64 A AC	>60,000 hr
856T-BR4 (red)	45 mA	1.79 A DC 2.66 A AC	>40,000 hr
856T-BR5 (amber)	40 mA	1.79 A DC 2.64 A AC	>60,000 hr
856T-BR6 (blue)			
856T-BR7 (white)			
856T-BR8 (yellow)			
Multicolor Light Modules			
856T-BMC	110 mA	1.30 A DC 1.94 A AC	30,000 hr
Beacon Light Modules (Steady/Flashing)			
856T-BGB3 (green)	100 mA	0.74 A DC 1.24 A AC	>60,000 hr
856T-BGB4 (red)	108 mA	0.70 A DC 1.16 A AC	>40,000 hr
856T-BGB5 (amber)	100 mA	0.74 A DC 1.24 A AC	>60,000 hr
856T-BGB6 (blue)			
856T-BGB7 (white)			
856T-BGB8 (yellow)			
Beacon Light Modules (Strobe)			
856T-BSB4 (red)	190 mA	0.76 A DC 1.11 A AC	>40,000 hr
856T-BSB5 (amber)		0.77 A DC 1.11 A AC	>60,000 hr
856T-BSB6 (blue)			
Beacon Light Modules (Rotating)			
856T-BRB4 (red)	65 mA	0.74 A DC 1.09 A AC	>40,000 hr
856T-BRB5 (amber)		0.75 A DC 1.11 A AC	>60,000 hr
Beacon Light Modules (Multicolor)			
856T-BMB	200 mA	1.65 A DC 2.46 A AC	30,000 hr

Approximate Dimensions

Figure 20 shows the dimensions of the IO-Link module.

Figure 20 - 856T-B24LC Module [mm (in.)]



IO-Link Operation Modes of 856T Light and Sound Modules

856T Light and Sound Module Operation Mode

Table 12 - 856T Light and Sound Modules Operation Modes

Module	IO-Link Operation Mode/Control			Comments
	Mode 1	Mode 2	Mode 3	
Steady LED Light Module (1-circuit Device)				
Steady LED	ON or OFF	Slow flash	Fast flash	Module operates on Steady mode only
Multi-function LED Light Module (1-circuit Device)				
Steady	ON or OFF			Customer selects operating mode via DIP switch inside the light module
Flashing				
Strobe#1				
Strobe#2				
Rotating LED Light Module (1-circuit Device)				
Rotating speed #1	ON or OFF			Customer selects operating speed via DIP switch inside the light module
Rotating speed #2				
Multi-color LED Light Module (3-circuit Device)				
Input#1	ON or OFF	Slow flash	Fast flash	Color selection is made via three input terminals in the light module (can produce up to seven different colors)
Input#2				
Input#3				
Steady/Flashing Beacon (1-circuit Device)				
Steady	ON or OFF			Customer selects operating mode via DIP switch inside the beacon
Flashing				
Strobe Beacon (1-circuit Device)				
Strobe#1	ON or OFF			Customer selects operating mode via DIP switch inside the light module
Strobe#2				
Rotating Beacon (1-circuit Device)				
Rotating speed #1	ON or OFF			Customer selects operating speed via DIP switch inside the light module
Rotating speed #2				
Multi-color LED Beacon (3-circuit Device)				
Input#1	ON or OFF	Slow flash	Fast flash	Color selection is made via three input terminals in the light module (can produce up to seven different colors)
Input#2				
Input#3				
Piezo Electric End-of-line Sound Module				
Continuous tones	ON or OFF			Single-circuit device. Customer can select up to eight different tones via DIP switch inside the sounder.
Pulsing tones				
Sweeping tones				
Alternating tones				
Piezo Electric In-line Sound Module				
Continuous tones	ON or OFF			Single-circuit device. Customer can select up to eight different tones via DIP switch inside the sounder.
Pulsing tones				
Sweeping tones				
Alternating tones				

Table 12 - 856T Light and Sound Modules Operation Modes (Continued)

Module	IO-Link Operation Mode/Control			Comments
	Mode 1	Mode 2	Mode 3	
Transducer Sound Module				
Input#1	ON or OFF			This sounder is a three circuit device that can produce up to seven different tones via three field inputs. Customer can select the seven tones to play from 16 tone tables via DIP switch inside the module.
Input#2				
Input#3				
Recordable Sound Module				
Input#1	ON or OFF			This sounder is a three circuit device that can play up to seven different user prerecorded voice messages or tones via three field inputs.
Input#2				
Input#3				

IMPORTANT Although it is allowed, we do not recommend using strobe or flashing light modules or sound modules with the 856T-B24LC module slow or fast flash operating modes.

Device Parameters

When you use Explicit Messages to read/write parameter values from/to the 856T-B24LC module, you must know the index number, data type, and size of the data that is transmitted/received. The Identification table provides this information for each of the device parameters.

Identification Tab

Table 13 - Identification Tab

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
Device Information						
Vendor Name	0x0010/16	–	Read-only	Allen-Bradley	Allen-Bradley	StringT (13 bytes)
Product Name	0x0012/18	–	Read-only	856T-B24LC	856T-B24LC	StringT (10 bytes)
Product ID	0x0013/19	–	Read-only	856T-B24LC	856T-B24LC	StringT (19 bytes)
Product Text	0x0014/20	–	Read-only	Towerlight IO-Link class-B light and sound module controller	Towerlight IO-Link class-B light and sound module controller	StringT (60 bytes)
Serial Number	0x0015/21	–	Read-only	–	–	StringT (10 bytes)
User-specific Information						
Application-Specific Tag	0x0018/24	–	Read/write		–	StringT (32 bytes)
Revision Information						
Hardware Revision	0x0016/22	–	Read-only	–	–	StringT (16 bytes)
Firmware Revision	0x0017/23	–	Read-only	–	–	StringT (6 bytes)

Observation Tab

Table 14 - Observation Tab

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
Stack Status						
.Module (Circuit_)	0x0133/307	–	Read-only	0	0...7	RecordT (bit length = 56)
.Module (Circuit 1)	0x0133/307	0x0001/1	Read-only	0	0...7	UIntegerT (bit length = 8, bit offset = 48)
.Module (Circuit 2)	0x0133/307	0x0002/2	Read-only	0	0...7	UIntegerT (bit length = 8, bit offset = 40)
.Module (Circuit 3)	0x0133/307	0x0003/3	Read-only	0	0...7	UIntegerT (bit length = 8, bit offset = 32)

Table 14 - Observation Tab (Continued)

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
.Module (Circuit 4)	0x0133/307	0x0004/4	Read-only	0	0...7	UIntegerT (bit length = 8, bit offset = 24)
.Module (Circuit 5)	0x0133/307	0x0005/5	Read-only	0	0...7	UIntegerT (bit length = 8, bit offset = 16)
.Module (Circuit 6)	0x0133/307	0x0006/6	Read-only	0	0...7	UIntegerT (bit length = 8, bit offset = 8)
.Module (Circuit 7)	0x0133/307	0x0007/7	Read-only	0	0...7	UIntegerT (bit length = 8, bit offset = 0)
Circuit Status	0x0136/310	–	Read-only	0	0...127	RecordT (bit length =8)
				OFF=0	Bit 0= Circuit 1 (ON/OFF) ON= Bit value=1 OFF= Bit value= 0	BOOL (bit length = 1, bit offset = 0)
				OFF=0	Bit 1= Circuit 2 (ON/OFF) ON= Bit value=1 OFF= Bit value= 0	BOOL (bit length = 1, bit offset = 1)
				OFF=0	Bit 2= Circuit 3 (ON/OFF) ON= Bit value=1 OFF= Bit value= 0	BOOL (bit length = 1, bit offset = 2)
				OFF=0	Bit 3= Circuit 4 (ON/OFF) ON= Bit value=1 OFF= Bit value= 0	BOOL (bit length = 1, bit offset = 3)
				OFF=0	Bit 4= Circuit 5 (ON/OFF) ON= Bit value=1 OFF= Bit value= 0	BOOL (bit length = 1, bit offset = 4)
				OFF=0	Bit 5= Circuit 6 (ON/OFF) ON= Bit value=1 OFF= Bit value= 0	BOOL (bit length = 1, bit offset = 5)
				OFF=0	Bit 6= Circuit 7 (ON/OFF) ON= Bit value=1 OFF= Bit value= 0	BOOL (bit length = 1, bit offset = 6)
Short Circuit Status	0x014C/332	–	Read-only	0	0...127	RecordT (bit length =8)
				FALSE=0	Bit 0= Circuit 1 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 0)
				FALSE=0	Bit 1= Circuit 2 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 1)
				FALSE=0	Bit 2= Circuit 3 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 2)
				FALSE=0	Bit 3= Circuit 4 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 3)
				FALSE=0	Bit 4= Circuit 5 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 4)
				FALSE=0	Bit 5= Circuit 6 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 5)
				FALSE=0	Bit 6= Circuit 7 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 6)

Table 14 - Observation Tab (Continued)

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
Open Circuit Status	0x014D/333	–	Read-only	0	0...127	RecordT (bit length = 8)
				FALSE=0	Bit 0= Circuit 1 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 0)
				FALSE=0	Bit 1= Circuit 2 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 1)
				FALSE=0	Bit 2= Circuit 3 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 2)
				FALSE=0	Bit 3= Circuit 4 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 3)
				FALSE=0	Bit 4= Circuit 5 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 4)
				FALSE=0	Bit 5= Circuit 6 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 5)
				FALSE=0	Bit 6= Circuit 7 (TRUE/FALSE) TRUE=1 FALSE=0	BOOL (bit length = 1, bit offset = 6)
Circuit Cycle Counter	0x0132/306	–	Read-only	0	0...4,294,967,296	RecordT (bit length = 224)
Cycle counter (Circuit 1)	0x0132/306	0x0001/1	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 192)
Cycle counter (Circuit 2)	0x0132/306	0x0002/2	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 160)
Cycle counter (Circuit 3)	0x0132/306	0x0003/3	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 128)
Cycle counter (Circuit 4)	0x0132/306	0x0004/4	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 96)
Cycle counter (Circuit 5)	0x0132/306	0x0005/5	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 64)
Cycle counter (Circuit 6)	0x0132/306	0x0006/6	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 32)
Cycle counter (Circuit 7)	0x0132/306	0x0007/7	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 0)
Cycle Counter -Life time	0X014B/331	0	Read-only	0	0...4,294,967,296	RecordT (bit length = 224)
Cycle counter-Life time (Circuit 1)	0X014B/331	0x0001/1	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 192)
Cycle counter-Life time (Circuit 2)	0X014B/331	0x0002/2	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 160)
Cycle counter-Life time (Circuit 3)	0X014B/331	0x0003/3	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 128)
Cycle counter-Life time (Circuit 4)	0X014B/331	0x0004/4	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 96)
Cycle counter-Life time (Circuit 5)	0X014B/331	0x0005/5	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 64)

Table 14 - Observation Tab (Continued)

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
Cycle counter-Life time (Circuit 6)	0X014B/331	0x0006/6	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 32)
Cycle counter-Life time (Circuit 7)	0X014B/331	0x0007/7	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32, bit offset = 0)
Alarm Status						
Alarm status	0x0135/309	–	Read-only	–	0...4095	RecordT (bit length = 16)
		0x0001/1		FALSE=0	Bit 0- Short Circuit (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 0)
		0x0002/2		FALSE=0	Bit 1- Open Circuit (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 1)
		0x0003/3		FALSE=0	Bit 2 -Class A Over Voltage (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 2)
		0x0004/4		FALSE=0	Bit 3- Class A Under Voltage (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 3)
		0x0005/5		FALSE=0	Bit 4 -Module Excessive Vibration (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 4)
		0x0006/6		FALSE=0	Bit 5 -Device Over Temperature (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 5)
		0x0007/7		FALSE=0	Bit 6 -Device Under Temperature (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 6)
		0x0008/8		FALSE=0	Bit 7 -ICP Communication Fault (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 7)
		0x0009/9		FALSE=0	Bit 8 -Invalid Configuration (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 8)
		0x000A/10		FALSE=0	Bit 9 -Class B Over Voltage (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 9)
		0x000B/11		FALSE=0	Bit 10-Class B Under Voltage (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 10)
		0x000C/12		FALSE=0	Bit 11- Power On Self-Test Failure (TRUE=Bit=1) / (FALSE= Bit=0)	BOOL (bit length = 1, bit offset = 11)
Measurements						
Class-A (Voltage)	0x0148/328	–	Read-only	–	15,000...32,000	UIntegerT (bit length = 16)
Class-B (Voltage)	0x0149/329	–	Read-only	–	15,000...32,000	UIntegerT (bit length = 16)
Actual internal temperature (°C)	0x005A/90	–	Read-only	–	-40...+95	IntegerT (bit length = 8)
Min Temperature since power up (°C)	0x0147/327	–	Read-only	–	-40...+95	IntegerT (bit length = 8)
Max Temperature since power up (°C)	0x0146/326	–	Read-only	–	-40...+95	IntegerT (bit length = 8)
Calibration status	0x0134/308	–	Read-only	0	0- Not calibrated 1- Calibration in progress 2-Calibration complete	UIntegerT (bit length = 2)
Average vibration	0x0142/322	–	Read-only	–	0...16,000	RecordT (bit length = 48)

Table 14 - Observation Tab (Continued)

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
X-axis average vibration	0x0142/322	0x0001/1	Read-only	–	0...16,000	IntegerT (bit length = 16, bit offset = 32)
Y-axis average vibration	0x0142/322	0x0002/2	Read-only	–	0...16,000	IntegerT (bit length = 16, bit offset = 16)
Z-axis average vibration	0x0142/322	0x0003/3	Read-only	–	0...16,000	IntegerT (bit length = 16, bit offset = 0)
Max Vibration since power up	0x0145/325	–	Read-only	–	0...16,000	RecordT (bit length = 48)
X-axis Max Vibration since power up	0x0145/325	0x0001/1	Read-only	–	0...16,000	IntegerT (bit length = 16, bit offset = 32)
Y-axis Max Vibration since power up	0x0145/325	0x0002/2	Read-only	–	0...16,000	IntegerT (bit length = 16, bit offset = 16)
Z-axis Max Vibration since power up	0x0145/325	0x0003/3	Read-only	–	0...16,000	IntegerT (bit length = 16, bit offset = 0)
Max Vibration Lifetime	0x014F/335	–	Read-only	–	0...16,000	RecordT (bit length = 48)
X-axis Max vibration Lifetime	0x014F/335	0x0001/1	Read-only	–	0...16,000	IntegerT (bit length = 16, bit offset = 32)
Y-axis Max vibration Lifetime	0x014F/335	0x0002/2	Read-only	–	0...16,000	IntegerT (bit length = 16, bit offset = 16)
Z-axis Max vibration Lifetime	0x014F/335	0x0003/3	Read-only	–	0...16,000	IntegerT (bit length = 16, bit offset = 0)

Parameter Tab

Table 15 - Parameter Tab

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
Module Type	0x0138/312	–	Read/write	0	0...11	RecordT (bit length = 56)
. Module 1 Type	0x0138/312	0x0001/1	Read/write	0	0= No Module 1=856T Steady Light 2=856T Multi-function Modules 3=856T Rotating Light Module 4=856T Multi-color Light Module 5=856T Steady/Flashing beacon 6=856T Strobe beacon 7=856T Rotating beacon 8=856T Multi-color beacon 9=856T Piezo Electric Sounder 10=856T Transducer Sounder 11=856T Recordable Sound Module	Uinteger (bit length = 8, bit offset = 48)
. Module 2 Type	0x0138/312	0x0002/2	Read/write	0	0= No Module 1=856T Steady Light 2=856T Multi-function Modules 3=856T Rotating Light Module 4=856T Multi-color Light Module 5=856T Steady/Flashing beacon 6=856T Strobe beacon 7=856T Rotating beacon 8=856T Multi-color beacon 9=856T Piezo Electric Sounder 10=856T Transducer Sounder 11=856T Recordable Sound Module	Uinteger (bit length = 8, bit offset = 40)

Table 15 - Parameter Tab (Continued)

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
. Module 3 Type	0x0138/312	0x0003/3	Read/write	0	0= No Module 1=856T Steady Light 2=856T Multi-function Modules 3=856T Rotating Light Module 4=856T Multi-color Light Module 5=856T Steady/Flashing beacon 6=856T Strobe beacon 7=856T Rotating beacon 8=856T Multi-color beacon 9=856T Piezo Electric Sounder 10=856T Transducer Sounder 11=856T Recordable Sound Module	Uinteger (bit length = 8, bit offset = 32)
. Module 4 Type	0x0138/312	0x0004/4	Read/write	0	0= No Module 1=856T Steady Light 2=856T Multi-function Modules 3=856T Rotating Light Module 4=856T Multi-color Light Module 5=856T Steady/Flashing beacon 6=856T Strobe beacon 7=856T Rotating beacon 8=856T Multi-color beacon 9=856T Piezo Electric Sounder 10=856T Transducer Sounder 11=856T Recordable Sound Module	Uinteger (bit length = 8, bit offset = 24)
. Module 5 Type	0x0138/312	0x0005/5	Read/write	0	0= No Module 1=856T Steady Light 2=856T Multi-function Modules 3=856T Rotating Light Module 4=856T Multi-color Light Module 5=856T Steady/Flashing beacon 6=856T Strobe beacon 7=856T Rotating beacon 8=856T Multi-color beacon 9=856T Piezo Electric Sounder 10=856T Transducer Sounder 11=856T Recordable Sound Module	Uinteger (bit length = 8, bit offset = 16)
. Module 6 Type	0x0138/312	0x0006/6	Read/write	0	0= No Module 1=856T Steady Light 2=856T Multi-function Modules 3=856T Rotating Light Module 4=856T Multi-color Light Module 5=856T Steady/Flashing beacon 6=856T Strobe beacon 7=856T Rotating beacon 8=856T Multi-color beacon 9=856T Piezo Electric Sounder 10=856T Transducer Sounder 11=856T Recordable Sound Module	Uinteger (bit length = 8, bit offset = 8)
. Module 7 Type	0x0138/312	0x0007/7	Read/write	0	0= No Module 1=856T Steady Light 2=856T Multi-function Modules 3=856T Rotating Light Module 4=856T Multi-color Light Module 5=856T Steady/Flashing beacon 6=856T Strobe beacon 7=856T Rotating beacon 8=856T Multi-color beacon 9=856T Piezo Electric Sounder 10=856T Transducer Sounder 11=856T Recordable Sound Module	Uinteger (bit length = 8, bit offset = 0)

Table 15 - Parameter Tab (Continued)

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
Circuit counters enable	0x0141/321	–	Read/write	0	0...127	RecordT (bit length = 8)
	0x0141/321	–	Read/write	0	Bit 0= Circuit 1 (ON/OFF) On=1 / OFF=0	BOOL (bit length = 1, bit offset = 0)
	0x0141/321	–	Read/write	0	Bit 1= Circuit 2 (ON/OFF) ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 1)
	0x0141/321	–	Read/write	0	Bit 2= Circuit 3 (ON/OFF) ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 2)
	0x0141/321	–	Read/write	0	Bit 3 = Circuit 4 (ON/OFF) ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 3)
	0x0141/321	–	Read/write	0	Bit 4 = Circuit 5 (ON/OFF) ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 4)
	0x0141/321	–	Read/write	0	Bit 5 = Circuit 6 (ON/OFF) ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 5)
	0x0141/321	–	Read/write	0	Bit 6 = Circuit 7 (ON/OFF) ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 6)
Alarm Configuration						
Alarm Configuration	0x014E/334	–	Read/write	4095	0...4095	RecordT (bit length = 16)
	0x014E/334	–	Read/write	ON=1	Bit 0- Short Circuit ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 0)
	0x014E/334	–	Read/write	ON=1	Bit 1- Open Circuit ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 1)
	0x014E/334	–	Read/write	ON=1	Bit 2 -Class A Over Voltage ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 2)
	0x014E/334	–	Read/write	ON=1	Bit 3- Class A Under Voltage ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 3)
	0x014E/334	–	Read/write	ON=1	Bit 4 -Module Excessive Vibration ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 4)
	0x014E/334	–	Read/write	ON=1	Bit 5 -Device Over Temperature ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 5)
	0x014E/334	–	Read/write	ON=1	Bit 6 -Device Under Temperature ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 6)
	0x014E/334	–	Read/write	ON=1	Bit 7 -ICP Communication Fault ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 7)
	0x014E/334	–	Read/write	ON=1	Bit 8 -Invalid Configuration ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 8)
	0x014E/334	–	Read/write	ON=1	Bit 9 -Class B Over Voltage ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 9)
	0x014E/334	–	Read/write	ON=1	Bit 10-Class B Under Voltage ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 10)
	0x014E/334	–	Read/write	ON=1	Bit 11- Power On Self-Test Failure ON=1 / OFF=0	BOOL (bit length = 1, bit offset = 11)

Table 15 - Parameter Tab (Continued)

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
Vibration Configuration						
Vibration Warning limit	0x0143/323	–	Read/write	16,000	100...16,000	RecordT (bit length = 48)
X-axis Vibration Warning Limit	0x0143/323	0x0001/1	Read/write	16,000	100...16,000	IntegerT (bit length = 16, bit offset = 32)
Y-axis Vibration Warning Limit	0x0143/323	0x0002/2	Read/write	16,000	100...16,000	IntegerT (bit length = 16, bit offset = 16)
Z-axis Vibration Warning Limit	0x0143/323	0x0003/3	Read/write	16,000	100...16,000	IntegerT (bit length = 16, bit offset = 0)
Vibration Calibration period	0x0144/324	–	Read/write	10	0...480	UIntegerT (bit length = 16)

Diagnostics Tab

Table 16 - Diagnostics Tab

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
Device Access Locks	0x000C/12	–	Read/write	0	0...3	RecordT (bit length = 16)
			Read/write	0	Bit 0 - ParameterAccessLock (0=unlocked) (1= locked)	BooleanT (bit length = 1 bit offset = 0)
			Read/write	0	Bit 1 - DataStorageLock (0=unlocked) (1= locked)	BooleanT (bit length 1 bit offset=1)
Service Status						
Device Status	0x0024/36	–	Read-only	0	0: Device is operating properly 1: Maintenance Required 2: Out of Specification 3: Functional Check 4: Failure (see Appendix D on page 71 for details)	UIntegerT (bit length = 8)
Power On self-test	0x0137/311	–	Read-only	0	0...12 0: Success 1: Firmware Image Corrupted 5: RAM test Failed 6: Secondary Processor Failed 7: IO Link PHY Failed 9: Accelerometer Communication Failed 10: Serial Flash Integrity Failed 11: Bad Class Voltage 12: Bad Class B voltage (see Power On Self Test (POST) on page 43 for details)	UIntegerT (bit length = 16)
Invalid Configuration	0x0150/336	–	Read-only	0	0: Valid Configuration 1: Invalid Configuration	UIntegerT (bit length = 1)
Operation Information						
Operating Hours since inception	0x0151/337	–	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32)
Operating Hours since power up	0x005B/91	–	Read-only	0	0...4,294,967,296	UIntegerT (bit length = 32)

Table 16 - Diagnostics Tab (Continued)

Parameter Name	Index (Hex/Dec)	Sub Index (Hex/Dec)	Access	Default Value	Allowed Value	Data Type (Length, Offset)
Communication Characteristics						
Master Cycle Time	0x0000/0	0x0002/2	Read/write	–	2 ms	UIntegerT (bit length = 8)
Minimum Cycle Time	0x0000/0	0x0003/3	Read-only	–	2 ms	UIntegerT (bit length = 8)
IO-Link Version ID	0x0000/0	0x0005/5	Read/write	1.1	0x011	UIntegerT (bit length = 8)

IO- Link System Commands

Table 17 - IO-Link System Commands

Command Name	Index (Hex/Dec)	Command (Hex/Dec)	Access	Default Value	Description	Data Type (Length, Offset)
System Command	0x0002/2	–	Write-only	–	–	UIntegerT (bit length = 8)
ParamDownloadStore	0x0002/2	0x0005/5	Write-only	–	Finalize parameterization and start data storage	UIntegerT (bit length = 8, bit offset = 0)
Device Reset	0x0002/2	0x0080/128	Write-only	–	Enables a device to perform a warm start. Useful whenever a Device has to be reset to an initial state such as power on.	UIntegerT (bit length = 8)
Restore Factory Settings	0x0002/2	0x0082/130	Write-only	–	Restores parameters to the original delivery status. Parameters such as Error Count, Device Status, and Detailed Device Status must be reset when this feature is applied. This restore does not include vendor-specific parameters such as counters or operating hours.	UIntegerT (bit length = 8)
					Erases all user configuration and diagnostic data. Data written during manufacture, and operating hours and module on/off counters are preserved.	UIntegerT (bit length = 8)

Table 17 - IO-Link System Commands

Command Name	Index (Hex/Dec)	Command (Hex/Dec)	Access	Default Value	Description	Data Type (Length, Offset)
Reset Counter Circuit 1	0x0002/2	0x00A0/160	Write-only	–	Reset the ON/OFF counter for Circuit 1	UIntegerT (bit length = 8)
Reset Counter Circuit 2		0x00A1/161	Write-only		Reset the ON/OFF counter for Circuit 2	UIntegerT (bit length = 8)
Reset Counter Circuit 3		0x00A2/162	Write-only		Reset the ON/OFF counter for Circuit 3	UIntegerT (bit length = 8)
Reset Counter Circuit 4		0x00A3/163	Write-only		Reset the ON/OFF counter for Circuit 4	UIntegerT (bit length = 8)
Reset Counter Circuit 5		0x00A4/164	Write-only		Reset the ON/OFF counter for Circuit 5	UIntegerT (bit length = 8)
Reset Counter Circuit 6		0x00A5/165	Write-only		Reset the ON/OFF counter for Circuit 6	UIntegerT (bit length = 8)
Reset Counter Circuit 7		0x00A6/166	Write-only		Reset the ON/OFF counter for Circuit 7	UIntegerT (bit length = 8)
Start Calibration		0x00A7/167	Write-only		Starts the calibration of the accelerometer max thresholds. Returns success immediately	UIntegerT (bit length = 8)
Stop calibration		0x00A8/168	Write-only		Cancels the calibration of the accelerometer. Returns success immediately	UIntegerT (bit length = 8)
Reset All Statistics		0x00AA/170	Write-only		Resets all circuit counters back to default value as well as Maximum Vibration Since Power Up, Min Module Temperature since Power up and Max Module Temperature since power up	UIntegerT (bit length = 8)

Process Data Input

The 856T-B24LC module transmits the following Process Input Data to the master each cycle.

The total size of data is 48 bits where Alarm status word is at the most significant position of the Data process Input.

- Class B Voltage bits [7:0] - The IO-Link module maintains 8-bit value that represents the Class B power supply voltage. This value is Read-only via the IO-Link protocol.
- Class A Voltage bits [15:8] - The IO-Link module maintains 8-bit value that represents the Class A power supply voltage. This value is Read-only via the IO-Link protocol.
- Internal temperature [23:16] - The internal temperature of the IO-Link module is provided as part of the process data input.
- Circuit Status [31:24]- The IO-Link module provides the control circuit status of the unit as part of the process data input.
- Alarm Status [47:32] - The 856T-B24LC module provides the alarm status of the unit as part of the process input data.

Table 18 - Process Data Input

[47:32]	[31:24]	[23:16]	[15:8]	[7:0]
Alarm Status	Circuit Status	Internal Temperature	Class A Voltage	Class B Voltage

See Table 14 on page 59 for a detailed view of the bits for each of the fields in the Process Data Input.

Process Data Output

The 856T-B24LC module receives the following process data output from the IO-Link master each cycle.

The total size of data is 56 bits where Module one control is at the most significant position of the Data process output.

Table 19 - Process Data Output

[55:48]	[47:40]	[39:32]	[31:24]	[23:16]	[15;08]	[7:0]
Module 1 Control	Module 2 Control	Module 3 Control	Module 4 Control	Module 5 Control	Module 6 Control	Module 7 Control

The IO-link device maintains seven 8-bit module control bytes in RAM. Each control byte is composed of three bit-fields that control the color/sound and operation behavior of the module. The control bytes are readable and writable via the IO-Link protocol.

Bit Fields	Description
0...2	Behavior
3...5	Color or sound (1)
6...7	Reserved

(1) Color is only be supported on 856T multi-color light module type.
Sound is only be supported on the transducer and recordable sound module type.

Binary Value	Behaviors [0...2]
000	OFF
001	ON Steady
010	Slow Flash
011	Fast Flash

Binary Value	Color [3:5]	Sound [3:5]
000	Red	Sound 1
001	Reserved	Sound 2
010	Yellow	Sound 3
011	Green	Sound 4
100	Blue	Sound 5
101	Cyan (Turquoise)	Sound 6
110	Magenta	Sound 7
111	White	Reserved

Configuration Tables

Table 20 - Multi-color Light Modules — Behavior ON Steady

Binary [bit 7...0]	Dec	Color
000...001	1	Red
001...001	—	Reserved
010...001	17	Yellow
011...001	25	Green
100...001	33	Blue
101...001	41	Cyan (Turquoise)
110...001	49	Magenta
111...001	57	White

Table 21 - Multi-color Light Modules — Behavior Slow Flash

Binary [bit 7...0]	Dec	Color
000...010	2	Red
001...010	—	Reserved
010...010	18	Yellow
011...010	26	Green
100...010	34	Blue
101...010	42	Cyan (Turquoise)
110...010	50	Magenta
111...010	58	White

Table 22 - Multi-color Light Modules — Behavior Fast Flash

Binary [bit 7...0]	Dec	Color
000...011	3	Red
001...011	—	Reserved
010...011	19	Yellow
011...011	27	Green
100...011	35	Blue
101...011	43	Cyan (Turquoise)
110...011	51	Magenta
111...011	59	White

Table 23 - Transducer and Recordable Sound Modules — Behavior ON Steady

Binary [bit 7...0]	Dec	Sound
000...001	1	Sound 1
001...001	9	Sound 2
010...001	17	Sound 3
011...001	25	Sound 4
100...001	33	Sound 5
101...001	41	Sound 6
110...001	49	Sound 7
111...001	—	Reserved

Device Status

Operational State

The Device Status ISDU 0x0024 (Dec:36) indicates the operational state of the IO-Link module.

In this case there are five possible scenarios:

Scenario	Description
Device is operating properly	No faults have been detected on the POST self-test and after that all components and code routines within the device are working correctly.
Maintenance required	The device indicates a state that one or both of the following conditions produce: • Open circuit due improper assembly of light or sound modules in the stack light. • Short circuit condition present in one or more of the Light and sound modules in the stack light. In both cases, you can correct the situation either by the reassembly of the stack light or by removing the short-circuit condition.
Out of specification	This state represents a condition where the IO-link module is functioning out of its design parameters and for practical purposes it refers to a non-optimal voltage or temperature conditions present in the application.
Functional check	The device status indicates when the device is running the calibration process that is required for the vibration indication feature if you have selected it.
Failure	This state reflects the results of the POST test that is described in Power On Self Test (POST) on page 43.

Table 24 - Device Status Definitions

Status	Parameter (ISDU) or Description	POST Result Code #	Definition
Success	–	–	Device working correctly
Maintenance required	0x014D/ 333	–	Open Circuit Condition present
	0x014C/ 332	–	Short Circuit Condition present
Out of specification	0x005A /90	–	Device temperature <-30 °C (-22 °F) or device temperature >+90 °C (+194 °F)
	0x0148/328	–	Voltage out of range Voltage< 17.5V or Voltage >30.5V
	0x0149/329	–	
Functional check	Calibration	–	Active when device is under calibration
Failure	FW corrupt (primary and secondary)	1	POST failure upon FW corrupt test
	RAM test fail (primary and secondary)	5	POST failure upon RAM corrupt test
	Communication with second processor fail	6	POST failure upon corrupt test
	PHY communication test	7	POST failure upon PHY communication test failed
	Accelerometer communication test	9	POST failure upon Accelerometer communication test failed
	Serial flash integrity test	10	POST failure upon serial flash integrity test failed

Short Circuit

The firmware of the 856T-B24LC module disables the entire stack light when any of the circuits demands a load current that exceeds 450 mA ± 15% of current (at least for 40 ms) and is less than 4.5 A ± 15%. In this case, the first circuit that was detected to cause the short circuit is indicated by its respective bit number in the short circuit status byte (ISDU= 0x014C 332). Also, the bit representing that a short circuit condition exists is indicated in the Alarm status word (ISDU= 0X0135/ 309).

Since the entire stack light is disabled during a short circuit, the (ISDU=0x0136/ 310) Control Circuit status reports OFF for all circuits when a short circuit condition exists.

The short circuit status bit only clears when you attempt to turn the circuit back ON and the short circuit is no longer present.

If the short circuit condition exceeds the 4.5 A ± 15%, then a dead short occurs and the 856T-B24LC hardware detects it, all outputs are disabled, and the short circuit status is reported for all the outputs that were ON when the short circuit occurred. This short circuit detection takes priority over the firmware detection explained previously.

The short circuit status bit only clears when the short circuit is no longer present and you attempt to turn each one of the circuits involved back ON.

IMPORTANT The 856T-B24LC short circuit performance may vary depending on the IO-link master used. For example, a master with rapid short circuit protection may disable the 856T-B24LC before the short circuit detection in the 856T-B24LC base takes effect.

IMPORTANT Remove incoming power before you check connections or replace light or sound modules in the stack. If you replace one or several light or sound modules when the respective circuit is energized at the time of the replacement (hot swap), the situation may cause a temporary short circuit condition that is indicated in the alarm status word. You must clear the alarm bit to be in operational mode again.

Events

The 856T-B24LC module reports the following device event types.

The device status value that is indicated in the following tables should match the value on ISDU 0x0024 (Dec: 36).

Table 25 - Event Codes

Event Code	Definition and Recommended Maintenance Action	Device Status Value	Type
0x0000	No malfunction	0 - Operating Properly	Notification
0x4210	Device temperature over-run - Clear source of heat	2 - Out-of-Specification	Warning
0x4220	Device temperature under-run - Insulate device	2 - Out-of-Specification	Warning
0x5000	Device hardware fault - Device exchange	4 - Failure	Error
0x5110	Primary supply voltage over-run - Check tolerance	2 - Out-of-Specification	Warning
0x5111	Primary supply voltage under-run - Check tolerance	2 - Out-of-Specification	Warning
0x5112	Secondary supply voltage fault (Port Class B) - Check tolerance	2 - Out-of-Specification	Warning
0x7710	Short Circuit - Check installation	4 - Failure	Error

IMPORTANT The short circuit event code 0X7710 is issued only when a short circuit condition is detected on the IO-Link cordset or patchcord.

Notes:

Factory Reset

Reset to Factory Settings – Variables

Table 26 shows what 856T-B24LC module variables can be reset to factory settings when a command (0x082) is received via the IO-link protocol.

Table 26 - Reset to Factory Settings Variables

Parameter Name	ISDU (Hex/Dec)	Access	Size	Data Type	Storage	Min	Max	Default
Application-Specific Tag	0x0018/24	Read/write	256	StringT	Non-volatile			""
Device Access Locks	0x000C/12	Read/write	16	RecordT	Non-volatile	0	3	0
Master Cycle Time	0x0001/01	Read/write	8	UIntegerT	Non-volatile			
Alarm Configuration	0x014E/334	Read/write	16	RecordT	Non-volatile	0	4095	4095
Calibration Status	0x0134/308	Read-only	1	UIntegerT	Non-volatile	0	2	0
Circuit Counters Enable	0x0141/321	Read/write	8	RecordT	Non-volatile	0	0x7F	0
Circuit Cycle Counter	0x0132/306	Read-only	224	RecordT	Non-volatile	0	4294967296	0
.Module (Circuit_)	0x0133/307	Read-only	56	RecordT	Non-volatile	0	7	0
Module Type	0x0138/312	Read/write	56	RecordT	Non-volatile	0	11	0
Vibration Calibration Period	0x0144/324	Read/write	16	UIntegerT	Non-volatile	0	480	10
Vibration Warning Limit	0x0143/323	Read/write	48	RecordT	Non-volatile	0	16000	16000

IMPORTANT If you want to perform the Reset to Factory Settings of the parameters shown in Table 26 when connected to a 1734-4IOL IO-link master, you must perform the task manually for each one of these parameters. In some cases (such as Circuit Cycle Counter), a given ISDU may include several subindexes that must be reset individually.

Reset All Statistics – Variables

Table 27 shows what 856T-B24LC module statistic values can be reset when a command 0x00AA (Dec: 170) is received via the IO-link protocol.

Table 27 - Reset All Statistics –Variables

Parameter Name	ISDU (Hex/Dec)	Access	Size	Data Type	Storage	Min	Max	Default
Circuit Cycle Counter	0x0132/306	Read-only	224	RecordT	Non-volatile	0	4294967296	0
Max Temperature since power up	0x0146/326	Read-only	8	IntegerT	Volatile	-40	95	–
Min Temperature since power up	0x0147/327	Read-only	8	IntegerT	Volatile	-40	95	–
Max Vibration since power up	0x0145/325	Read-only	48	RecordT	Volatile	0	16000	0

Troubleshooting

This appendix shows ways to determine the possible cause of the 856T-B24LC module being in a faulted state or not operating properly. It describes the procedures that you use to troubleshoot your module.

IMPORTANT The following table describes errors or conditions that may be encountered after a successful Power On Self Test (POST).
For more information on POST test results, see Table 8 on page 43.

Error Resolution

Error/ Condition	Possible Cause	Recommended Action
Internal status indicator on 856T-B24LC module does not light up	Power supply switched off.	• Review that Power is switched ON. • Check that connection IO-Link Master and 856T-B24LC module is properly made. • Review physical integrity of the patch cord or cordset used (that is, free of cuts and similar.)
Communication loss (Green status indicator on 856T-B24LC module is not blinking)	Cable between IO-link master and 856T-B24LC module is loose or has been cut.	Check cable integrity and replace if necessary.
	Voltage to the 856T-B24LC module is below accepted limit levels	Check voltage that is supplied to the master and the 856T-B24LC module.
Light or sound modules do not turn on.	No Class B power is applied to 856T-B24LC module.	If the 856T-B24LC module is used with a Rockwell Automation Class A master, verify that you are using the recommended patchcord. See Patchcord on page 45 for more details.
	Short circuit alarm is present.	Clear short circuit condition.
	Open condition alarm is present	Check that all modules have been properly placed and twisted in the stack light.
	Light/sound module malfunction.	Replace Light or sound module in the tower light.
	Improper light or sound module configuration	Check that the light or sound module is configured correctly in AOP.
Short circuit indication present	Light or sound modules present a short circuit.	• Disconnect power to the 856T-B24LC module. • Physically replace the modules that show the short circuit condition. • Power cycle the circuit where the fault was shown to clear the fault.
	Performed a hot swap of light or sound modules in the stack light.	• Always disconnect power to the 856T-B24LC module before replacing a light module. • Reinstall the light or sound modules in the stack light. • Power cycle the circuit where the fault was shown to clear the fault.
Multifunction light module not working as expected when internally configured as flashing or strobe light module.	Multi-function module is selected as steady light with slow or fast flash in the AOP.	Change 856T-B24LC module configuration to multi-function module.
Invalid Device Status	Device status shown as maintenance required, out of specification, or failure.	See Table 24 on page 71 for more details.

Notes:

History of Changes

New or Updated Information

This appendix contains the new or updated information for each revision of this publication. These lists include substantive updates only and are not intended to reflect all changes. Translated versions are not always available for each revision.

856T-UM001C-EN-P, December 2021

Change
Updated the entire Message Structure and Configuration Example Chapter

856T-UM001B-EN-P, April 2021

Change
Added illustration with example of connecting the 856T to Channel 3 in the 1734-4IOL master

Notes:

Numerics

A

B

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D

E

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H

I

T

V

W

Rockwell Automation Support

Use these resources to access support information.

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