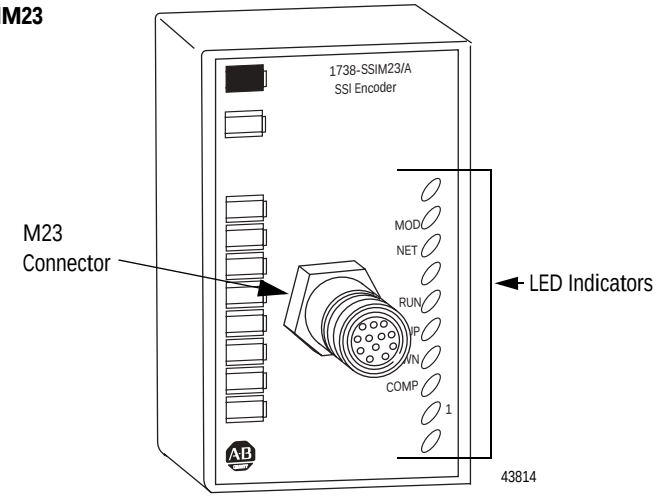
Installation Instructions

ArmorPoint I/O Synchronous Serial Interface (SSI) Absolute Encoder Module, Series A

(Cat. No. 1738-SSIM23)

The ArmorPoint™ I/O family (Cat. no. 1738) consists of modular I/O modules. The sealed IP67 housing of these modules requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) The I/O connector is sealed M23 style. The mounting base ships with the module. The 1738-SSIM23 module is shown below.

1738-SSIM23



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Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.ab.com/manuals/gi) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual 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.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
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 • recognize the consequence
SHOCK HAZARD 	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be located on or inside the equipment to alert people that surfaces may be dangerous temperatures.

ATTENTION

Environment and Enclosure

This equipment is intended for use in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as "enclosed" equipment. It should not require additional system enclosure when used in locations consistent with the enclosure type ratings stated in the Specifications section of this publication. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings, beyond what this product provides, that are required to comply with certain product safety certifications.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the Allen-Bradley publication 1770-4.1 ("Industrial Automation Wiring and Grounding Guidelines"), for additional installation requirements pertaining to this equipment.

ATTENTION

Preventing Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

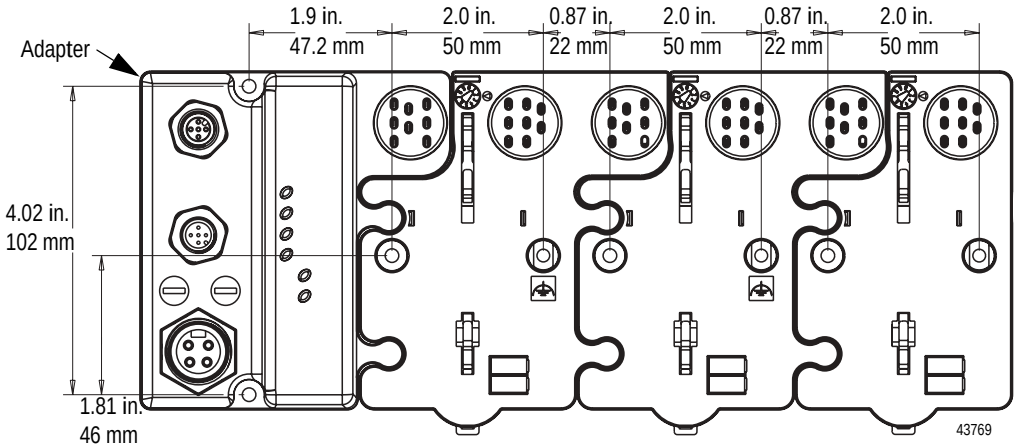
Mount the I/O Base

To mount the ArmorPoint I/O base on a wall or panel, use the screw holes provided in the ArmorPoint base.

IMPORTANT

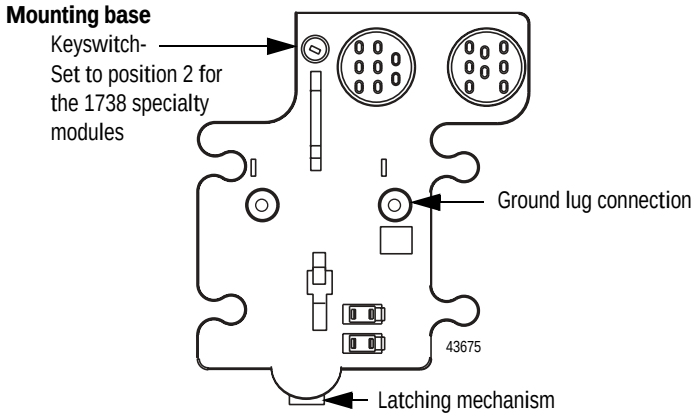
The ArmorPoint I/O module must be mounted on a grounded metal mounting plate or other conductive surface.

A mounting illustration for the ArmorPoint base with an adapter is shown below.



Install the mounting base as follows:

1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the base using #8 (M4) screws.
4. Ground the system using the ground lug connection. (The ground lug connection is also a mounting hole.)

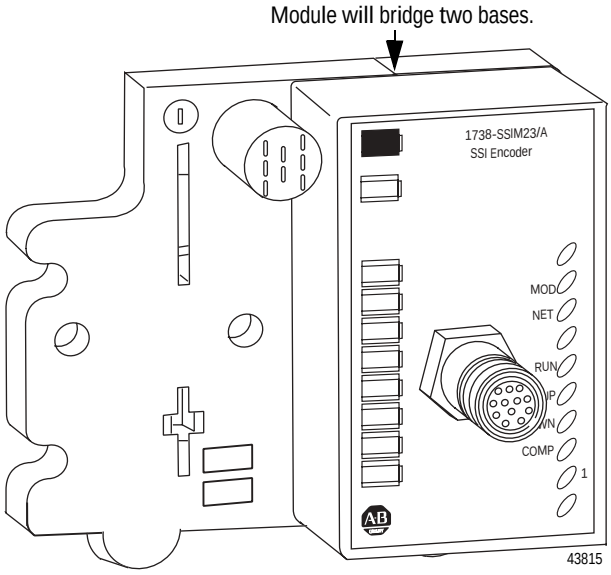


Install the ArmorPoint SSI Absolute Encoder Module

To install the ArmorPoint SSI Absolute Encoder module, proceed as follows.

1. Using a bladed screwdriver, rotate the keyswitch on the mounting base clockwise until the number 2 aligns with the notch in the base.

2. Position the module vertically above the mounting base. The module will bridge two bases.



3. Push the module down until it engages the latching mechanism. You will hear a clicking sound when the module is properly engaged.

   The locking mechanism will lock the module to the base.

Remove the ArmorPoint SSI Absolute Encoder Module From the Mounting Base

To remove the module from the mounting base:

1. Put a flat blade screwdriver into the slot of the orange latching mechanism.

2. Push the screwdriver toward the I/O module to disengage the latch.

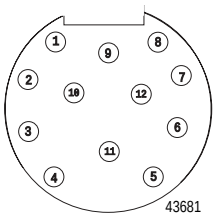
   The module will lift up off the base.

3. Pull the module off of the base.

Wire the SSI Absolute Encoder Module

Following are wiring instructions for the ArmorPoint SSI Absolute Encoder module.

1738-SSIM23



1738-SSIM23
(view into connector)
Pin 1 - Data +
Pin 2 - Data -
Pin 3 - V +
Pin 4 - V -
Pin 5 - Chassis
Pin 6 - Input 0
Pin 7 - Clock +
Pin 8 - Clock -
Pin 9 - Return (Com)
Pin 10 - Return (Com)
Pin 11 - 24 V dc
Pin 12 - Chassis

IMPORTANT Shield lead can be connected to chassis pin 5 or 12 on the connector.

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Communicate With Your Module

The 1738-SSIM23 module transmits SSI sensor data over the DeviceNet™, ControlNet™, Ethernet®, and PROFIBUS network. Data can be exchanged with the master through a polled, cyclic, or change-of-state connection. The module produces 10 byes of data and consumes 2 bytes of data.

Default Data Map for the ArmorPoint Absolute Encoder Module

1738-SSIM23

Consume and Produce Bit/Byte Definitions		
Byte	**Bit**	**Description**
Produce 0	0-7	Low byte of present low SSI word. Bit 0 is the least significant bit of the entire present SSI word.
Produce 1	0-7	High byte of present low SSI word.
Produce 2	0-7	Low byte of present high SSI word.
Produce 3	0-7	High byte of present high SSI word. Bit 7 is the most significant bit of the entire present SSI word.
Produce 4	0-7	Low byte of stored low SSI word. Bit 0 is the least significant bit of the entire stored SSI word.
Produce 5	0-7	High byte of stored low SSI word.
Produce 6	0-7	Low byte of stored high SSI word.
Produce 7	0-7	High byte of stored high SSI word. Bit 7 is the most significant bit of the entire stored SSI word.

Message Size: 10 Bytes

Byte	**Bit**								**Description**
Produce 8	7	6	5	4	3	2	1	0	Status Byte 0
	C2ST	C1ST	C2R	C1R	INC	DEC	RUN	I1	
Produce 9	7	6	5	4	3	2	1	0	Status Byte 1
	RES	RES	RES	LHON	IDF[1]	CCE	CCF	SPF	

1 Monitor IDF to determine the validity of the produced data. If IDF=1, the SSI data is false.

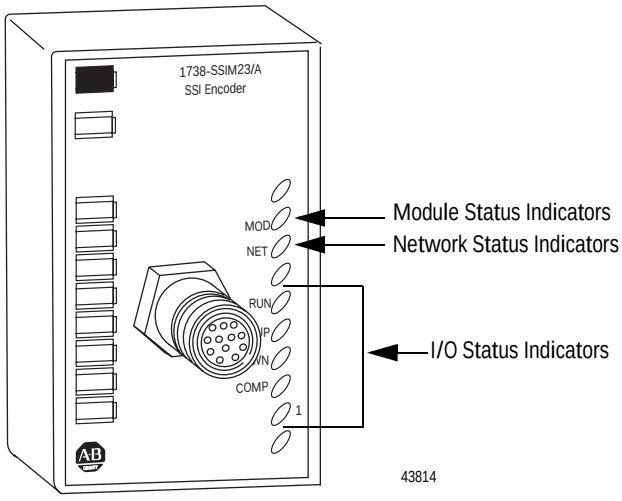
Message Size: 2 Bytes

Byte	Bit								Description
Consume 0	7	6	5	4	3	2	1	0	Master ACK Byte[1]
	RES	RES	RES	SCMP2	SCMP1	CC2	CC1	LACK	
Consume 1	7	6	5	4	3	2	1	0	CONS1
	RES	RES	RES	RES	RES	RES	RES	RES	

1 The master must provide the Master ACK Byte in order to receive the polled Produced bytes 0-9.

Troubleshoot with the Indicators

1738-SSIM23



Indication	Probable Cause
Module Status	
Off	No power applied to device
Green	Device operating normally
Flashing Green	Device needs commissioning due to missing, incomplete, or incorrect configuration
Flashing Red	Recoverable fault
Red	Unrecoverable fault - may require device replacement
Flashing Red/Green	Device is in self-test

Indication	Probable Cause
Network Status	
Off	Device is not on line: - Device has not completed dup_MAC-id test. - Device not powered - check module status indicator.
Flashing Green	Device is on line but has no connections in the established state.
Green	Device is on line and has connections in the established state.
Flashing Red	One or more I/O connections in timed-out state.
Red	Critical link failure - failed communication device. Device detected error that prevents it from communicating on the network.
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identity Communication Faulted Request - long protocol message.

Indication	Probable Cause
I/O Status	
Run Status	
Off	Module is commanded to stop retrieving SSI data.
Green	Module is commanded to retrieve SSI data.
Up Status	
Off	SSI data not increasing or no SSI data is being received.
Green	SSI data is increasing.
Down Status	
Off	SSI data not decreasing or no SSI data is being received.
Green	SSI data is decreasing.
Comp Status	
Off	Comparator function not in use or comparator value not attained.
Green	Comparator value is attained.
I1 Status	
Off	Latching input I1 is OFF.
Green	Latching input I1 is ON.

Specifications

Following are specifications for the 1738 ArmorPoint SSI Absolute Encoder module.

ArmorPoint 1738-SSIM23 Module			
Number of SSI Channels	1		
Encoder Type	Any absolute encoder supporting standard SSI protocol including linear, rotary, and optical distance measuring devices. Most-Significant Bit Aligned data format. Physical interface for clock and data signals is RS-422.		
SSI Data Rate	125kHz, 250kHz, 500kHz, 1MHz, 2MHz (software selectable)		
SSI Bits Per Word	2-31 (software selectable)		
SSI Word Delay Time[1]	16μs-64ms (software selectable)		
SSI Word Length	4 bytes (32 bits)		
SSI Features	Gray or binary code capable with gray to binary conversion, increasing or decreasing SSI count indication, 2 SSI word comparator values, SSI word latching with I1 input.		
SSI Position Forming Time[2]	≥ 0.5ms		
SSI Cable Type	UL CM/AWM 2464/CSA Type CMG FT4 or similar cable utilizing shielded twisted pairs for D+/- and C+/- connections. See sensor manufacturer for actual cable required for the SSI sensor under use. I1 input can be wired separate from SSI cable[1].		
SSI Cable Length	Depends on desired SSI data rate: 125kHz - 1050ft (320m) 250kHz - 525ft (160m) 500kHz - 195ft (60m) 1MHz - 65ft (20m) 2MHz - 25ft (8m)		
SSI Sensor Power (At V +/- Terminals)	10-28.8V dc common with field power voltage, 0.75A dc maximum with short circuit protection		
SSI Clock Drive Current (Out of Clock +/- Terminals)	125mA maximum		
Input I1	IEC Type 3 voltage and current characteristics, sourcing type		
	Minimum	Nominal	Maximum
ON-State Voltage	0V dc	--	FPV* -10
ON-State Current	2mA	4mA (FPV=24V dc)	5mA
OFF-State Voltage	FPV-5	--	FPV
OFF-State Current	1.2mA	--	--
Input Impedance	--	3.6kΩ	4.7kΩ
Input Filter Time	--	0.5ms	--
	* = FPV Field Power Supply Voltage		
Field Power Supply Voltage (Bus Supply)	Minimum	Nominal	Maximum
	10V dc	24V dc	28.8V dc
Keyswitch Position	2		

General Specifications	
LED Indicators	1 green run status, logic side 1 green up status, logic side 1 green down status, logic side 1 green comp status, logic side 1 green/red network status, logic side 1 green/red module status, logic side
PointBus Current, Maximum	110mA
Power Dissipation, Maximum	0.94 W @ rated load
Thermal Dissipation, Maximum	3.21 BTU/hr. @ rated load
Isolation Voltage (continuous-voltage withstand rating)	50V rms Tested at 1250V ac rms for 60s
Dimensions Inches (Millimeters)	1.25H x 2.63W x 4.25D (31.75H x 66.80W x 107.95D)
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5-95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10-500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 1000MHz
EFT/B Immunity	IEC 61000-4-4: ±2kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on signal ports ±2kV line-earth(CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Weight Imperial (Metric)	0.637 lb. (0.289 kg)
Wiring Category[3]	2 - on signal ports

General Specifications (continued)		
Certifications: (when product is marked)	c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada
	CE[4]	European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity
	C-Tick[4]	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

1 Time between successive SSI words (T_p) (also called Dwell Time).

2 Roughly corresponds to the maximum time the SSI sensor can be expected to output a particular position value while in motion. To use the 1738-SSI module with sensors that have faster position forming times, change the SSI Word Filter Control parameter from its default value of 5 (max). Changing this parameter from its default value sacrifices electrical noise environment performance for sensor data conversion speed.

3 Use this conductor category information for planning conductor routing as described in publication 1770-4.1, “Industrial Automation Wiring and Grounding Guidelines.”

4 See the Product Certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using our products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of our products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

www.rockwellautomation.com

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