

Fisher™ L2sj Low Emission Liquid Level Controller



Table of Contents

Section 1: Introduction

1.1	Scope of the Manual	1
1.2	Description	4
1.3	Specifications	4
1.4	Educational Services	4

Section 2: Principle of Operation 4

Section 3: Installation

3.1	Mounting the Controller to the Vessel.....	6
3.2	Attaching a Vertical Displacer	7
3.3	Attaching a Horizontal Displacer.....	7
3.4	Supply Pressure Connections	7
3.5	Vent.....	8

Section 4: Setup and Adjustments

4.1	Dry Displacer Setup	9
4.2	Wet Displacer Adjustments	10

Section 5: Maintenance

5.1	Removing the Controller from the Sensor	11
5.2	Replacing the Sensor O-rings.....	12
5.3	Replacing the Controller Relay	14
5.4	Replacing the Controller Supply Filter	14

Section 6: Parts Ordering

6.1	Parts Kits.....	15
6.2	Parts List	16

Section 1: Introduction

1.1 Scope of the Manual

This instruction manual includes installation, adjustment, maintenance and parts ordering information for the Fisher L2sj low emission liquid level controller.

WARNING


 Do not install, operate or maintain a L2sj low emission liquid level controller without being fully trained and qualified in valve, actuator and accessory installation, operation and maintenance. To avoid personal injury or property damage, it is important to carefully read, understand and follow all contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact your [Emerson sales office](#) before proceeding.

Figure 1. Fisher L2sj Liquid Level Controller



W9331

Table 1. Specifications

Available Configuration	Sensor to Vessel Connection
Controller: On/Off / Direct-Acting Sensor: Displacer-type liquid level sensor for mounting to side of vessel.	<ul style="list-style-type: none"> ■ 2 NPT threaded or ■ NPS 2 CL150 through 1500 slip-on flange connection
Input Signal	Controller Connections
Liquid Level (gas over liquid)	Supply: 1/4 NPT internal located on the bottom of the case Output: 1/4 NPT internal located on the top of the case Case Vent: 1/4 NPT internal with vent screen assembly located on the back of the case
Liquid Level Span ⁽¹⁾	Displacer Size
See Table 2	<ul style="list-style-type: none"> ■ 48 x 305 mm, 541 cm³ / 1-7/8 x 12 in., 33 in.³⁽⁴⁾ or ■ 76 x 152 mm, 688 cm³ / 3 x 6 in., 42 in.³⁽⁵⁾
Minimum Specific Gravity	Maximum Sensor Working Pressure ⁽⁶⁾
3 x 6 in. displacer: 0.6 1-7/8 x 12 in. displacer: 0.75	PVC Displacer: Consistent with CL1500 pressure temperature ratings per ASME B16.34 up to maximum pressure of 258 bar / 3750 psig For PED (2014/68/EU) maximum pressure limited to 200 bar / 2900 psig S31603 SST Displacer: CL600 pressure temperature ratings per ASME B16.34 up to maximum pressure of 99.3 bar / 1440 psig Note: For slip-on flange connection, maximum sensor working pressure must be consistent with the flange ratings.
Output Signal	Sensor Temperature Limits ⁽⁶⁾
Control: Pneumatic On/Off Range: 0 psi (off) or full supply pressure (on) Action: Direct-acting (increasing level increases output signal)	PVC Displacer: -18 to 71 °C / 0 to 160 °F S31603 SST Displacer: -40 to 204 °C / -40 to 400 °F
Supply Pressure Requirements	Operative Ambient Temperature Limits ⁽⁶⁾
Any desired pressure between 0.34 and 2.4 bar / 5 and 35 psig.	Controller: -29 to 71 °C / -20 to 160 °F
Supply Medium	Standard Supply and Output Pressure Gauge Indications
Air or natural gas ⁽²⁾	Triple scale gauges in 0 to 60 psig / 0 to 0.4 MPa / 0 to 4.0 bar
Steady-State Air Consumption ⁽³⁾	
0.01 normal m ³ /hr / < 0.3 scfh at 1.4 bar / 20 psig supply pressure	

- continued -

Table 1. Specifications (continued)





Hazardous Area Classification	Canadian Registration
<p>Complies with the requirements of ATEX Group II Category 2 Gas and Dust</p> <p>  II 2 G D EX h IIC Tx Gb EX h IIIC Tx Db</p> <p>Maximum surface temperature (Tx) depends on operating conditions</p> <p>Gas: T6</p> <p>Dust: T71</p> <p>Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment</p> <p> II Gb c T*X  III Db c T*X</p>	<p>The L2sj utilizes the same sensor unit pressure component as the L2 pneumatic controller version. Refer to the L2 CRN which is deemed applicable to the L2sj.</p> <p style="background-color: #0056b3; color: white; padding: 2px;">Declaration of SEP</p> <p>Fisher Controls International LLC declares this product to be in compliance with Article 4, paragraph 3 of the PED Directive 2014/68/EU and Part 1, Requirement 8 of the PESR Regulation. It was designed and manufactured in accordance with Sound Engineering Practice (SEP) and cannot bear the CE marking related to PED compliance or the UKCA mark related to the PESR Regulation.</p> <p>However, the product may bear the CE or UKCA marking to indicate compliance with other applicable European Community Directives or UK Regulations (Statutory Instruments).</p>
<p>NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.</p> <ol style="list-style-type: none"> Level change required for full change in output signal. This product can be used with natural gas as the supply medium. Normal m³/hr — Normal cubic meters per hour 0 °C and 1.01325 bar, absolute / Scfh — Standard cubic feet per hour / 60 °F and 14.7 psia. Supplied with 6 in. extension. Supplied with 3 in. extension. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded. 	

Table 2. Liquid Level Span

SENSOR	SPECIFIC GRAVITY OF LIQUID		
	0.6	0.75	1
Vertical Displacer	Span, mm. / in.		
1-7/8 x 12 in. Displacer with 6 in. extension	n/a	135 / 5.3	102 / 4.0
3 x 6 in. Displacer 3 in. extension	57 / 2.25	46 / 1.8	34 / 1.35
Horizontal Displacer	Span, mm. / in.		
3 x 6 in. Displacer with 3 in. extension	22 / 0.85	17 / 0.67	13 / 0.5
<p>Notes:</p> <ol style="list-style-type: none"> Level change required for full change in output signal. Span adjuster set for maximum sensitivity. 1.4 bar / 20 psig supply pressure. For vessels with fast dump cycles, actual liquid span will be larger. 			

1.2 Description

The rugged L2sj low emission liquid level controller uses a displacer type sensor (see Figure 1) to detect liquid level. The controller features a rugged, metal-seated relay with proportional and integral action. The device delivers a pneumatic output signal to a control/dump valve.

1.3 Specifications

Specifications for the controller and sensor are listed in Table 1.

1.4 Educational Services

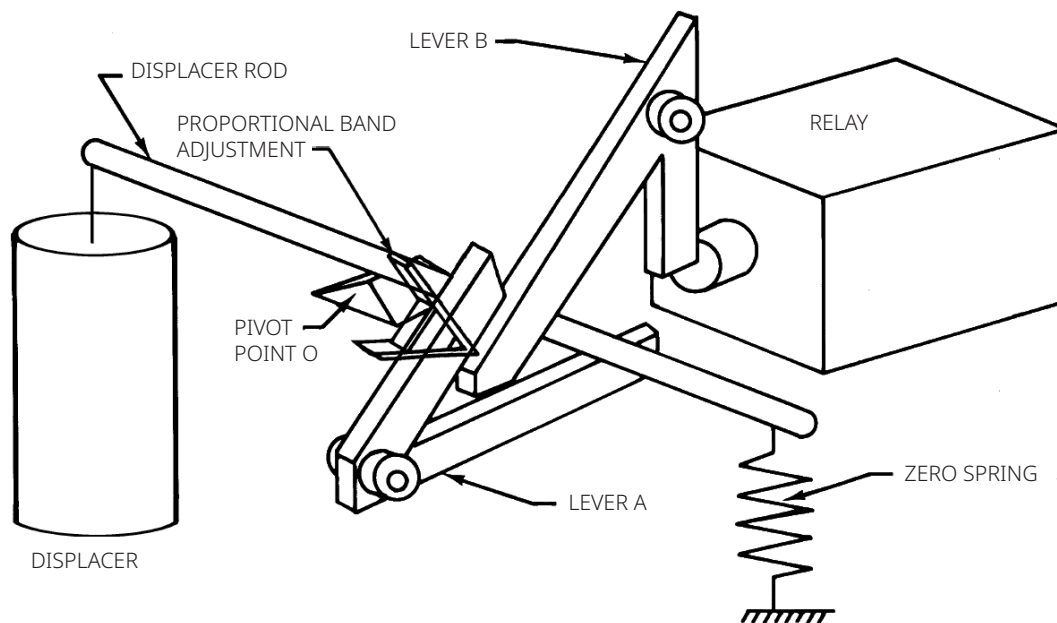
Emerson Educational Services
Phone: +1-800-338-8158
E-mail: education@emerson.com
emerson.com/mytraining

Section 2: Principle of Operation

The operation of the L2sj controller in combination with the sensor is based on the Archimedes Principle, which states that a body immersed in a liquid will be buoyed up by a force equal to the weight of the liquid displaced. The buoyant force and resultant movement of the displacer in the liquid is transmitted to the controller which delivers a pneumatic signal to a control valve.

Figure 2 shows a simple schematic of the controller and sensor. In its normal position, the counterclockwise moment due to the weight of the displacer about pivot point O is balanced by the sum of the clockwise zero spring moment and the counterclockwise relay force moment applied through lever A to the displacer rod. The weight of the displacer decreases when the liquid level increases and the subsequent buoyant force increases causing a force imbalance between the zero spring, relay and displacer forces. This force imbalance is transmitted to the relay by levers A and B. The relay compensates for the force imbalance by converting it to a pressure output to a control/dump valve and bringing the forces back into equilibrium.

Figure 2. Operational Schematic



Section 3: Installation

⚠ WARNING

- **Wear protective clothing, gloves and eyewear whenever possible when performing any installation operations to avoid personal injury or property damage.**
- **To avoid personal injury or property damage caused by the sudden release of process fluid, be certain that the service conditions do not exceed the sensor pressure limits. Use pressure-limiting or pressure-relieving devices to prevent service conditions from exceeding these limits.**
- **Personal injury or property damage may result from fire or explosion if natural gas is used as the supply medium and preventive measures are not taken. Preventive measures may include, but are not limited to, one or more of the following: Remote venting of the unit, re-evaluating the hazardous area classification, ensuring adequate ventilation and the removal of any ignition sources. For information on remote venting of this controller, refer to page 8.**
- **If installing this into an existing application, also refer to the WARNING at the beginning of the Maintenance section of this instruction manual.**
- **Check with your process or safety engineer for any additional measures that must be taken to protect against process media.**

NOTICE

Do not use sealing tape on pneumatic connections. This instrument contains small passages that may become obstructed by detached sealing tape. Thread sealant paste should be used to seal and lubricate pneumatic threaded connections.

NOTICE

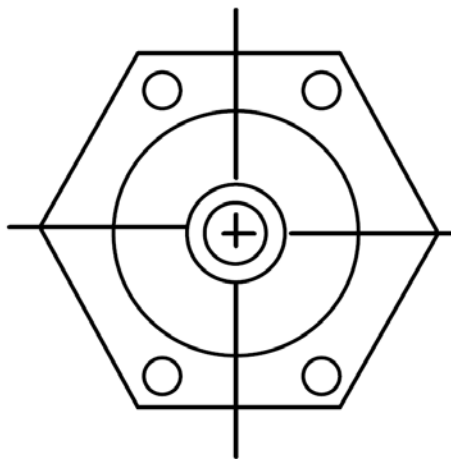
If the L2sj low emission liquid level controller is installed on a vessel that is to be shipped to a different location (e.g. skid mounted units), remove the displacer and displacer rod extensions before shipment. Failure to do so could result in damage to the displacer rod due to vibration and impact loading during shipment. After the vessel is installed at its final location, reassemble the displacer and displacer rod extension.

1. Be sure there are no obstructions inside the vessel that will interfere with displacer installation or operation.
2. Provide the appropriate connection in the vessel wall to match the sensor connection. Locate the vessel connection so that the displacer will be at the desired control level.

3.1 Mounting the Controller to the Vessel

Insert the displacer end of the controller-sensor assembly into the vessel connection and screw the sensor threads into the vessel connection. Tighten sufficiently to seal the threads. If necessary, loosen or tighten slightly to obtain the orientation shown in Figure 3. Make sure that the controller case is level.

Figure 3. Sensor Orientation



CORRECT CONTROLLER MOUNTING HOLE ORIENTATION
WHEN MOUNTED ON VESSEL

NOTICE

Do not pick up the controller/sensor by lifting the displacer rod (key 64). This action could place excessive stress on the displacer rod and cause the unit to malfunction.

3.2 Attaching a Vertical Displacer

Refer to Figure 5 for part locations.

1. Thread jam nut (key 63) all the way onto the threaded portion of the universal joint assembly (key 69).
2. Thread the displacer (key 81) all the way onto the threaded portion of the universal joint assembly.
3. Tighten the jam nut (key 63) against the displacer (key 81).

3.3 Attaching a Horizontal Displacer

Refer to Figure 5 for part locations.

1. Thread jam nut (key 63) all the way onto the displacer rod (key 64) or extension (key 82).
2. Thread the displacer (key 81) all the way onto the displacer rod (key 64) or extension (key 82).
3. Tighten the jam nut (key 63) against the displacer (key 81).

3.4 Supply Pressure Connections

 WARNING

Personal injury or property damage may occur from an uncontrolled process if the supply medium is not clean, dry, oil-free air or non-corrosive gas. While use and regular maintenance of a filter that removes particles larger than 40 micrometers in diameter will suffice in most applications, check with an Emerson field office and industry instrument air quality standards for use with corrosive air or if you are unsure about the proper amount or method of air filtration or filter maintenance.

NOTICE

Do not use sealing tape on pneumatic connections. This instrument contains small passages that may become obstructed by detached sealing tape. Thread sealant paste should be used to seal and lubricate pneumatic threaded connections.

Provide a source of clean, dry air that meets the requirements of ISA Standard 7.0.01 or noncorrosive gas as the operating medium. Refer to Table 1 to determine supply pressure.

1. Connect the supply pressure to the 1/4 NPT internal connection on the bottom of the controller case.
2. Connect the output signal line to the equipment being operated and to the 1/4 NPT output connection on the top of the controller case.

3.5 Vent

WARNING

If a flammable or hazardous gas is to be used as the supply pressure medium, personal injury or property damage could result from fire or explosion of accumulated gas or from contact with hazardous gas. The controller/actuator assembly does not form a gas-tight seal and when the assembly is enclosed, a remote vent line, adequate ventilation and necessary safety measures should be used. A remote vent pipe alone cannot be relied upon to remove all hazardous gas. Vent line piping should comply with local and regional codes and should be as short as possible with adequate inside diameter and few bends to reduce case pressure buildup.

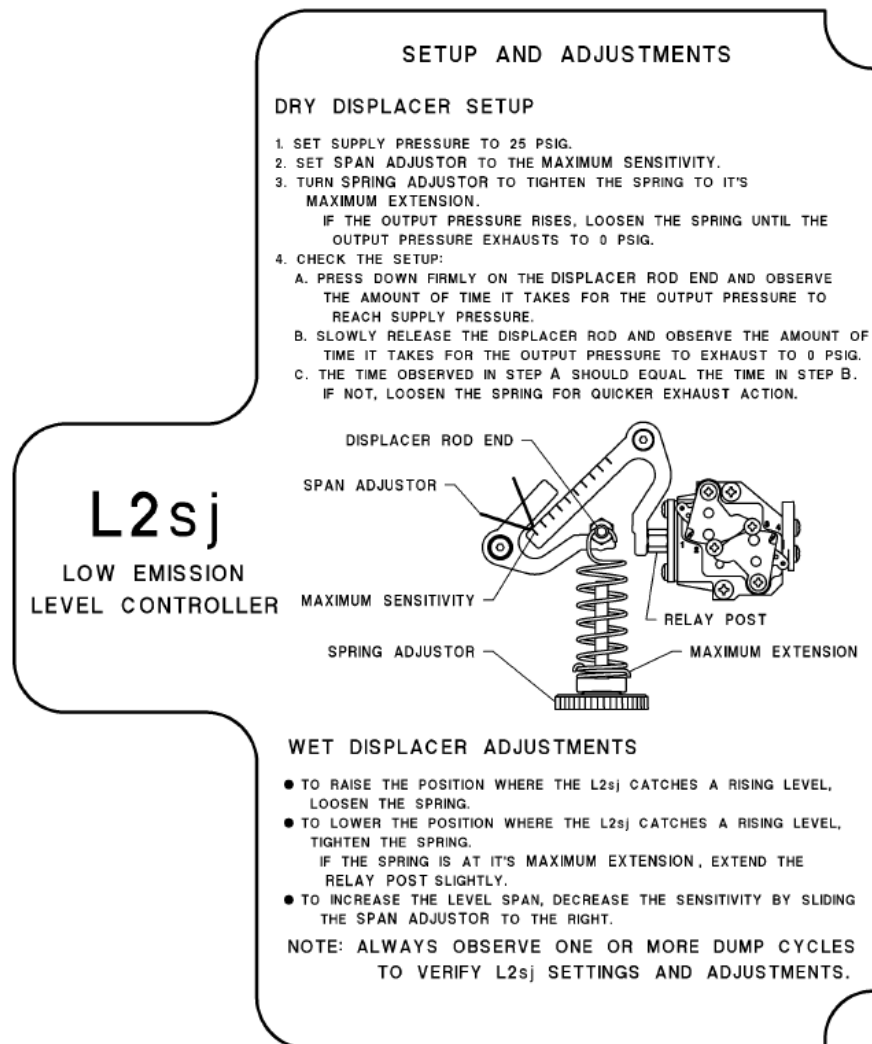
The vent opening or the end of the remote vent pipe, if one is required, must be protected against the entrance of all foreign matter that could plug the vent. Use 13 mm / 1/2-in. diameter pipe for the remote vent pipe. Check the vent periodically to be certain it is free of any obstructions.

Section 4: Setup and Adjustments

4.1 Dry Displacer Setup

Refer to the setup and adjustments label shown in Figure 4 for the following adjustments.

Figure 4. Setup and Adjustments Label (Inside Fisher L2sj Cover)



GE16844

1. Set the supply pressure to 25 psig.

NOTE

Supply pressure can be set between 0.34 and 2.4 bar / 5 and 35 psig.

2. Set the span adjuster to the maximum sensitivity.
3. Turn the spring adjuster to tighten the spring to its maximum extension. If the output pressure rises, loosen the spring until the output pressure exhausts to 0 psig.
4. Check the setup, as follows:
 - a. Press down firmly on the displacer rod end and observe the amount of time it takes for the output pressure to reach supply pressure.
 - b. Slowly release the displacer and observe the amount of time it takes for the output pressure to exhaust to 0 psig.
 - c. The time observed in step a should equal the time observed in step b. If these times are not equal, loosen the spring for quicker exhaust action and repeat step 4.

NOTE

Always observe one or more dump cycles to verify the L2sj controller settings and adjustments.

4.2 Wet Displacer Adjustments

Refer to the setup and adjustments label shown in Figure 4 for the following adjustments.

- To raise the position where the L2sj catches a rising level, loosen the spring.
- To lower the position where the L2sj catches a rising level, tighten the spring. If the spring is at its maximum extension, extend the relay post slightly.
- To increase the level span, decrease the sensitivity by sliding the span adjuster to the right.

NOTE

Always observe one or more dump cycles to verify the L2sj controller settings and adjustments.

Section 5: Maintenance

Parts are subject to normal wear and must be inspected periodically and replaced as necessary. The frequency of parts inspection and replacement depends upon the severity of service conditions. When inspection or repairs are required, disassemble only those parts necessary to accomplish the task.

WARNING

Always wear protective clothing, gloves and eyewear whenever possible when performing any maintenance operations to avoid personal injury or property damage. To avoid personal injury or property damage caused by the release of pressure or process fluid, observe the following before starting maintenance:

- **Personal injury or property damage may result from fire or explosion if natural gas is used as the supply medium and preventive measures are not taken. Preventive measures may include, but are not limited to, one or more of the following: Remote venting of the unit, re-evaluating the hazardous area classification, ensuring adequate ventilation and the removal of any ignition sources. For information on remote venting of this controller, refer to page 8.**
- **Completely shut off the process to isolate the controller/sensor from process pressure.**
- **Provide a means of containing the process fluid before removing any measurement devices from the process.**
- **Vent any trapped process pressure.**
- **Check with your process or safety engineer for any additional measures that must be taken to protect against process media.**

5.1 Removing the Controller from the Sensor

1. Disconnect the supply and output pressure lines.
2. Slide the hook end of the zero spring (key 5, Figure 6) over and off the controller end of the displacer rod (key 64, Figure 5).
3. Remove the four controller mounting screws (key 11, Figure 6) and pull the controller straight away from the sensor.

5.2 Replacing the Sensor O-rings

Refer to Figure 5 for key number locations unless otherwise indicated.

Disassembly

1. Remove the controller from the sensor by following the procedure outlined in the previous section.
2. Remove the sensor from the tank.
3. Unscrew the hex nut (key 67) and remove the spacer (key 66) and spring (key 68). After removing the spring, replace the spacer (key 66) and hex nut (key 67) on the displacer rod.
4. From the displacer end, pull the displacer rod away from the sensor connection (key 65) to pull the pivot base (key 73) loose from the sensor connection. Remove the hex nut (key 67) to permit removing the displacer rod, pivot base, pivot body and spacer from the sensor connection.
5. Slide the pivot base (key 73), retaining ring (key 76), anti-extrusion ring (key 75) and O-ring (key 74) off the displacer rod. Remove the O-ring (key 77) and backup ring (key 78) from the pivot base.

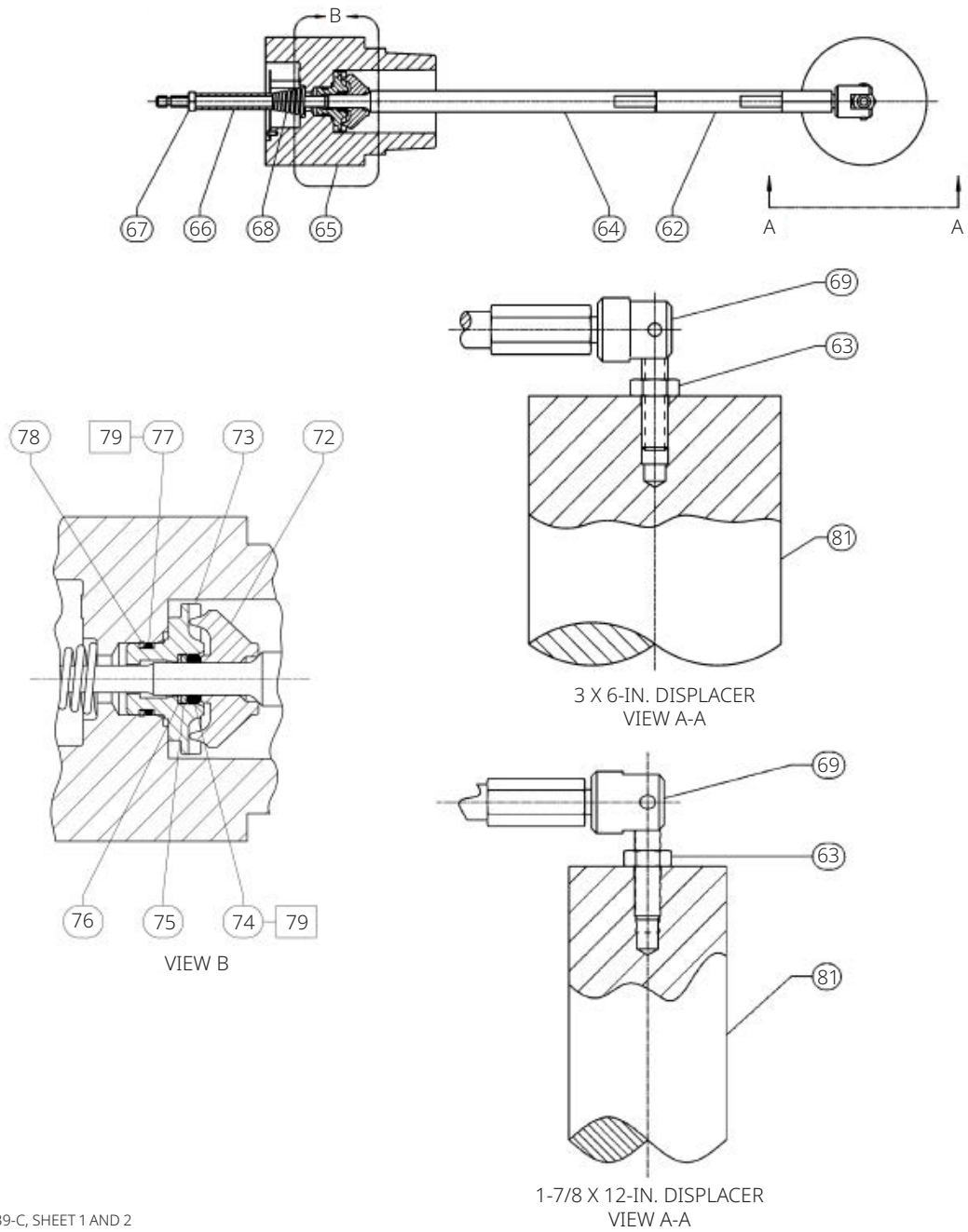
Assembly

WARNING

Improper assembly of the O-rings, anti-extrusion ring and backup ring could result in O-ring extrusion and permit leakage of process fluids. To avoid personal injury or property damage from leaking process fluid, be sure the O-rings, anti-extrusion ring and backup ring are assembled in the order shown in Figure 5.

1. Place the pivot body (key 72) on the displacer rod (key 64) so that it is positioned as shown in Figure 5.
2. Slide the O-ring (key 74), anti-extrusion ring (key 75) and retaining ring (key 76) onto the displacer rod assembly (key 64). Be sure the O-ring, anti-extrusion ring and retaining ring are in the order shown in Figure 5. Slide the pivot base onto the displacer rod so that the points of the pivot body (key 72) will engage the slots in the pivot base (key 73).
3. Install the O-ring (key 77) and backup ring (key 78) into the groove on the pivot base (key 73). Be sure the backup ring is on the downstream pressure side of the O-ring as shown in Figure 5.

Figure 5. Sensor



GB0139-C, SHEET 1 AND 2

4. Insert the displacer rod (key 64) into the vessel side of the sensor connection (key 65).
5. The pivot base must seat in the slots cast in the sensor connection. These slots will be horizontal when the sensor connection (key 65) is oriented as shown in Figure 3.
6. To reduce the possibility of nicking the O-ring (key 77) on the pivot base, keep the displacer rod centered in the sensor connection as much as possible while pushing the pivot base into the sensor connection. Be sure the pivot base seats in the slots cast in the sensor connection.
7. Slide the spring (key 68) and spacer (key 66) onto the displacer rod and secure with the hex nut (key 67). Fully tighten the hex nut (key 67).
8. View the sensor connection from the vessel side. Ensure that the pivot body arms remain aligned with the pivot base arms (the two pivot body points are seated in the pivot base slots).
9. Install the sensor in the vessel.

5.3 Replacing the Controller Relay

Refer to Figure 6 for key number locations unless otherwise indicated.

1. Disconnect the supply and output pressure lines.
2. Remove the two relay mounting screws (key 33) and pull the relay, including the relay mounting O-rings (keys 43 and 44, not shown), away from the controller base (key 1).
3. Install the new relay using two relay mounting screws (key 33). To install it properly, you will need to shift it to the right. Make certain that the relay mounting O-rings (keys 43 and 44, not shown) are lubricated and completely in their mounting bosses before installing the relay. Make certain the span lever assembly (key 6) is in line with and pushing in on the end of the relay post (key 87).

5.4 Replacing the Controller Supply Filter

Refer to Figure 6 for key number locations unless otherwise indicated.

1. Disconnect the supply and output pressure lines.
2. Loosen the filter cap screws (key 17) and rotate the filter cap (key 14) to the side to uncover the supply filter (key 15).
3. Remove the O-ring (key 16) and the old filter (key 15) and remove any debris from the filter boss.
4. Install a new supply filter and O-ring (key 16). Reinstall the filter cap (key 14) and tighten the filter cap screws (key 17).

Section 6: Parts Ordering

When corresponding with your [Emerson sales office](#) about this equipment, always mention the serial number of the controller. The serial number can be found on the nameplate (key 55, Figure 6).

WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson should not, under any circumstances, be used in any Fisher instrument. Use of components not supplied by Emerson may void your warranty, might adversely affect the performance of the valve and could cause personal injury or property damage.

6.1 Parts Kits

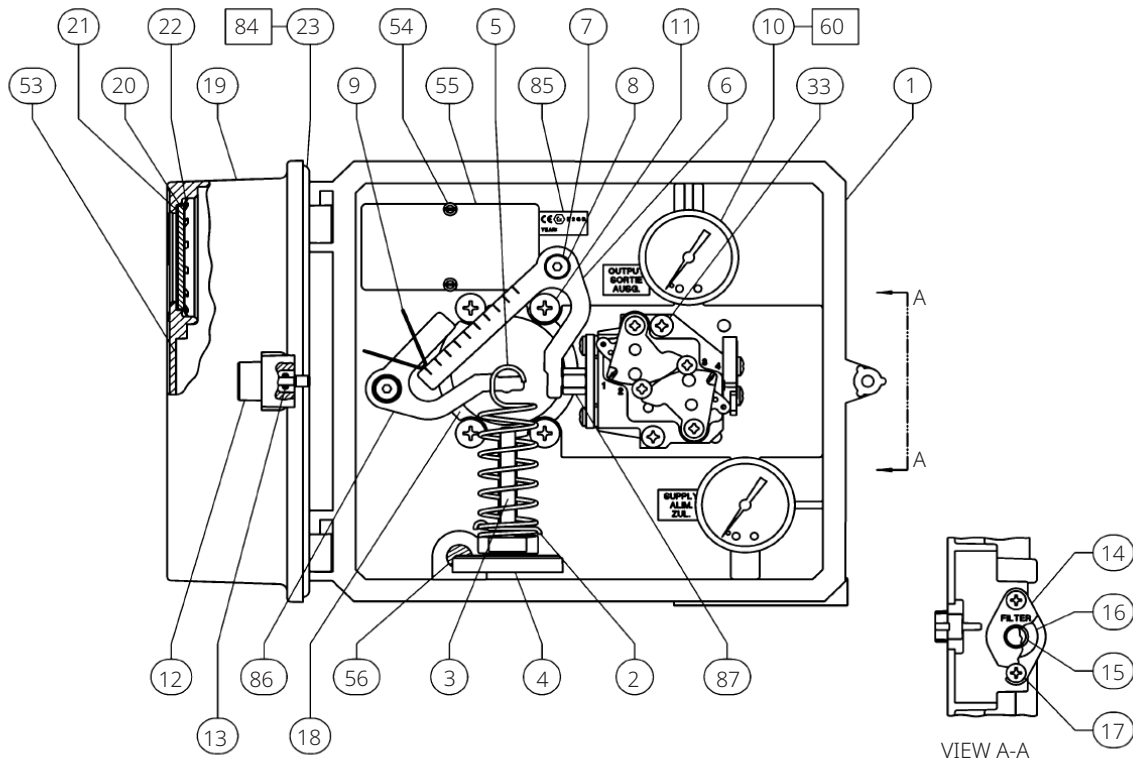
Description	Part Number
Controller Repair Kit Kit includes O-rings (keys 13 and 16) and gaskets (keys 18, 21 and 23)	RL2CNTRX012
Relay Repair Kit Kit includes relay assembly, relay mounting screws (key 33) and O-rings (keys 43 and 44) On/Off Control	GE16507X012
Sensor Repair Kit Kit includes keys 74, 75, 76, 77 and 78 (fluorocarbon O-rings, anti-extrusion ring, retaining ring and fluorocarbon backup ring)	RL2SENSX012

6.2 Parts List

Controller, Figure 6

Key	Description	Key	Description
1	Controller Base	20	Cover Lens (2 req'd)
2	Zero Spring Seat	21*	Gasket (2 req'd) ⁽¹⁾
3	Zero Adjustment Bolt	22	Retaining Ring (2 req'd)
4	Spring Adjustment	23*	Cover Gasket ⁽¹⁾
5	Zero Spring	33	Relay Mounting Screw (2 req'd) ⁽²⁾
6	Span Lever Assembly	43*	Relay Mounting O-ring (not shown) ⁽²⁾
7	Shoulder Screw (2 req'd)	44*	Relay Mounting O-ring (not shown) ⁽²⁾
8	Flanged Bearing (4 req'd)	53	Label, setup and calibration
9	Span Adjustor	54	Self-Tapping Screw (2 req'd)
10*	Pressure Gauge (2 req'd)	55	Nameplate
11	Mounting Screw (4 req'd)	56	Screen
12	Cover Screw	60	Anti-seize sealant (not furnished with controller)
13*	O-ring ⁽¹⁾	61	Lubricant, silicone sealant (not furnished with controller)
14	Filter Cap	62	Thread locking adhesive, mild strength (not furnished with controller)
15*	Filter	84	Adhesive
16*	O-ring ⁽¹⁾	85	Nameplate (ATEX)
17	Machine Screw (2 req'd)	86	Span Lever Assy, min adj
18*	Sensor Gasket ⁽¹⁾	87	Relay Post
19	Cover	-	-
* Recommended spare parts 1. Included in the Controller Repair Kit 2. Included in the Relay Repair Kit			

Figure 6. Fisher L2sj Low Emission Liquid Level Controller

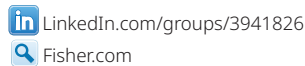


GB16509-A

NOTE:
APPLY LUB/SEALANT

Sensor, Figure 5

Key	Description	Key	Description
63	Hex Nut	11	Pivot Base
64	Displacer Rod	73	O-ring ⁽³⁾
65	Sensor Connection	74*	Anti-Extrusion Ring ⁽³⁾
66	Spacer	75*	Retaining Ring ⁽³⁾
67	Hex Nut	76	O-ring ⁽³⁾
68	Conical Spring	77*	Backup Ring ⁽³⁾
69	Universal Joint (vertical displacer only)	78*	Lubricant, silicone sealant (not furnished with sensor)
70	Nameplate (not shown)	79	Instruction Tag
71	Drive Screw (not shown)	80	Displacer 1-7 / 8 x 12-in. 3 x 6-in.
72	Pivot Body	81	Extension 3-in. 6-in.
* Recommended spare parts 3. Included in the Sensor Repair Kit			



D103216X012 © 2005, 2024. Fisher Controls International LLC. All rights reserved.

Neither Emerson, nor any of its affiliated entities assume responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains solely with the purchaser and end user.

Fisher is a mark owned by one of the companies in the Emerson Automation Solutions business unit of Emerson Electric Co. Emerson Automation Solutions, Emerson, and the Emerson logo are trademarks and service marks of Emerson Electric Co. All other marks are the property of their respective owners.

The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available upon request. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.

Emerson
 Marshalltown, Iowa 50158 USA
 Sorocaba, 18087 Brazil
 Cernay 68700 France
 Dubai, United Arab Emirates
 Singapore 128461 Singapore

www.Fisher.com