SINGER VALVE
Result-Based Solutions. Globally.™

12850-87th Avenue
Surrey, BC. Canada. V3W 3H9
Ph: 604-594-5404
Fx: 604-594-8845
www.singervalve.com

SINGER MODEL 301- 4

Altitude Pilot Drawing A0847A
Installation, Operating and Maintenance Instructions

DESCRIPTION:

Model 301-4 is a 3-way pilot that controls water level in a reservoir by sensing the hydrostatic head of the reservoir.

Maximum operating temperature is 60ºC (140ºF).

DESCRIPTION OF OPERATION:

Refer to Drawing A0847A.

The hydrostatic head of the reservoir pushing the Diaphragm (11) down is opposed by the Spring (4) pushing Stem (2A) up. When reservoir level reaches the setpoint of the valve, the downward force of Diaphragm (11) overcomes the spring force. The Bonnet Piston (23) moves down. When the Bonnet Piston contacts Inner Valve (24), connection from bonnet ('K') to drain port (EX) is closed. As the Bonnet Piston continues moving down, it pushes Inner Valve (24) down and opens the connection from upstream supply connection ('X') to bonnet connection ('K').

When reservoir level drops, Spring (7) lifts the Stem (2A) up, allowing Piston Spring (21) to lift Bonnet Piston (23) up. Inner Valve (24) closes the connection from port ('X') to port ('K'). As the Bonnet Piston moves further up, port ('K') is connected to drain port (EX).

Model 301-4 is not designed for modulating control. It keeps the main valve (Model 106/206-PG) either fully open or closed tight.

INSTALLATION:

1. Install Model 301-4 as shown in the enclosed schematic.
2. Model 301-4 must be installed stem vertical.

ADJUSTING PROCEDURE:

1. To increase altitude (level) setting, turn Adjusting Nut (12) clockwise.
2. To decrease setting, turn Adjusting Nut (12) counterclockwise.

SERVICE SUGGESTIONS:

List of problems and solutions that follows deals with problems **IN THE PILOT.** Refer to altitude valve instructions for problems related to pilot system and main valve.

1. **Main valve fails to open**. It is determined that port ('X') is connected to port ('K') and there is no flow from drain port (EX). - Altitude setting is too low **or** sensing connection is shut, trapping water in the sensing chamber. Loosen a connection in the sensing line to check for trapped pressure.
2. **Continuous exhaust to drain.** This is a seating problem between Bonnet Piston (23) and Inner Valve (24) or between Inner Valve and Body (20). If the problem is caused by foreign material on the seating surfaces, it might be cleared by cycling the pilot. Allow the reservoir level to rise to setpoint (or lower setting below reservoir level). Pressurize and depressurize the sensing chamber by closing the sensing line and cracking a connection to drop the sensing pressure. Open sensing to re-pressurize. If this does not cure the problem, the body assembly must be removed and the seating surfaces inspected. Lower Pilot Body Seal Ring (22) could also cause leakage to drain.
3. **External leakage between Upper Diaphragm Casing (1) and Upper Clamp Plate (6).** Seal Diaphragm (7) is ruptured or not installed correctly.
4. **External leakage from guide pin holes in Lower Diaphragm Casing** (33). Diaphragm (11) ruptured or not assembled correctly or upper Pilot Body Seal Ring (22) not sealing properly.
5. **Main valve fails to close**. It is determined that port ('K') is connected to drain and port ('X') is not connected to port ('K'). - Altitude setting is too high **or** sensing connection is shut.

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DISASSEMBLY:

1. Remove copper tubes from ports 'X', 'K' and 'EX'. Remove sensing connection.
2. Remove the two mounting bracket capscrews and move the pilot to a clean work area.
3. Mark the two holes for the mounting bracket capscrews and also mark the relative position of Upper Diaphragm Casing (1), Lower Diaphragm Casing (33) and Body (20).

BODY ASSEMBLY REMOVAL:

1. Remove capscrews (28) to remove the body assembly. Note that Spacer (34) and Bonnet Piston (23) do not come out with the Body (20). Check that upper Pilot Body Seal Ring (22), Seal Cage (27) and Cage Seal (35) are removed with the Body. Avoid damage to the Bonnet Piston.
2. If it is necessary to remove the Pilot Body Seal Rings (22) from the Body (20) and the Seal Cage (27), use a small screwdriver to push them out. Avoid damaging the inside of the seal ring.

BODY ASSEMBLY:

NOTE: Use a good quality silicon lubricant, such as Dow-Corning # 111 when installing O-Rings.

1. Install LOWER Pilot Body Seal Ring (22).
2. Install Seal Cage (27) and UPPER Pilot Body Seal Ring (22).
3. Install Cage Seal (35).
4. Hold the Diaphragm Casing and Spring Assembly upside down to facilitate Body installation.
5. Install Inner Valve Spring (25) on the Inner Valve (24). Install (24) and (25) in the Body (20) as shown in the drawing.
6. Install Bottom Cap Seal (36) and Bottom Cap (26).
7. Check that all O-Ring seals are correctly located and install the Body/Bottom Cap assembly on the Lower Diaphragm Casing (33) and install Body Screws (28).

DIAPHRAGM ASSEMBLY:

(DISASSEMBLY IS THE REVERSE OF ASSEMBLY).

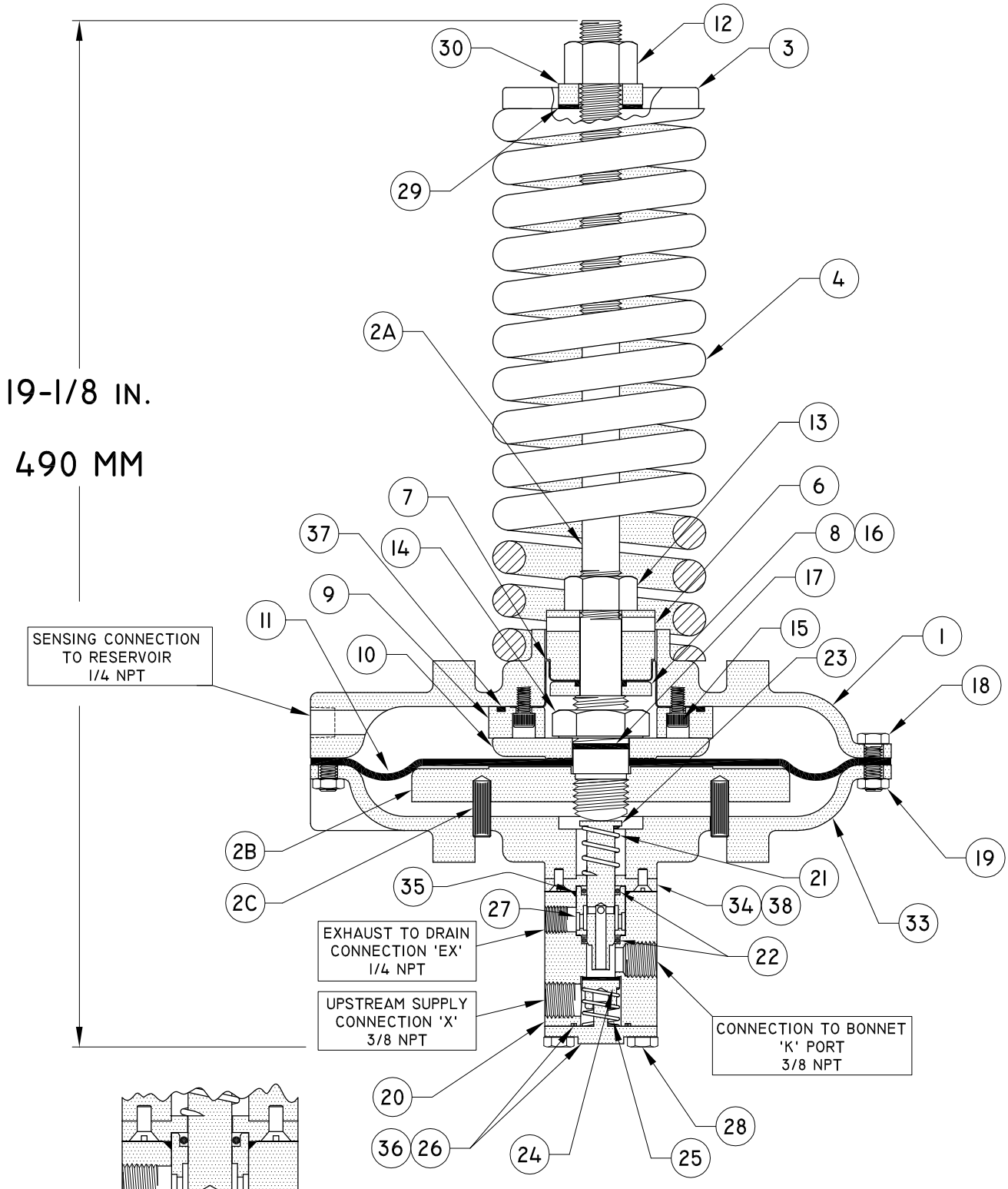
1. Engage Guide Pins (2C) with corresponding holes in the Lower Diaphragm Casing (33).
2. Slip Diaphragm (11), Lower Diaphragm Seal (17), Clamp Plate (10) and Diaphragm Nut (14) onto stem (2A).
3. in Lower Diaphragm Casing (33). Tighten Diaphragm Nut (14). **Make sure that Guide Pins (2C) can move freely without rubbing when diaphragm bolt holes are aligned with lower diaphragm casing bolt holes.**
4. Install Seal Diaphragm (7) to Upper Diaphragm Casing (1). Note that **fabric side of Seal Diaphragm is towards the Upper Diaphragm Casing.**
5. Install Seal Ring Seal (37) to Seal Ring (9) and Clamp the Seal Diaphragm as shown in the drawing using Socket Head Capscrews (15).
6. Slip onto stem (2A); Lower Clamp Plate (8) and Upper Diaphragm Seal (16), then add assembly of paragraphs 4 and 5 followed by Upper Clamp Plate (6) and Seal Diaphragm Nut (13). **DO NOT TIGHTEN THE SEAL DIAPHRAGM NUT (13) AT THIS TIME.**
7. Assure correct alignment of the two casings (1) and (33). Install Diaphragm Casing Capscrews (18) through the holes on the outside flanges of the two diaphragm casings (1) and (33) and Diaphragm (11). Install and tighten Diaphragm Casing Nuts (19).
8. Check that Seal Diaphragm (7) is in proper position (as shown in the assembly drawing A0847A). Carefully position Upper Clamp Plate (6) over Seal Diaphragm (7). Install a 1/4" (6mm) pin to a hole in the side of Upper Clamp plate (6) to keep it from turning and tighten seal diaphragm nut (13).
9. Install Spring (4), Spring Step (3), Slip Washer (29), Washer (30) and Adjusting Nut (12).

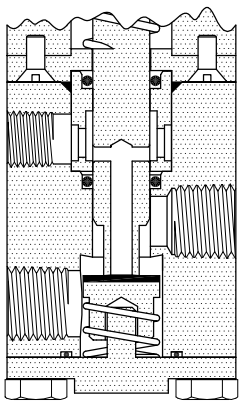
INSPECTION:

1. Clean all parts with water.
2. Inspect all parts for scale, damage and wear. Pay particular attention to sliding and seating surfaces.

A0847A

ALTITUDE PILOT





PILOT SHOWN IN THE OPEN POSITION

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Drawn By:	Approved By:
Stephen Bishop	Kari Oksanen
Date:	Drawing:
May 2, 2001	A0847A

Model 301-4

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SINGER MODEL 301-4 ALTITUDE PILOT VALVE

MATERIAL SPECIFICATION FOR DRAWING A0847A

ITEM		PART NAME	STANDARD MATERIAL
1		Upper Diaphragm Casing	Ductile Iron
2		Lower Clamp Plate & Stem Assy.	Aluminum & Stainless Steel 303
3		Spring Step	Stainless Steel 303
4		Spring	Steel
6		Upper Clamp Plate	Brass
7	**	**Seal Diaphragm**	**Buna-N Nylon Inserted**
8		Lower Clamp Plate	Brass
9		Seal Ring	Brass B-16
10		Clamp Plate	Brass B-16
11	**	**Diaphragm**	**Neoprene Nylon Inserted**
12		Adjusting Nut	Brass B-16
13		Seal Diaphragm Nut	Brass B-16
14		Diaphragm Nut	Brass B-16
15		Socket Head Capscrews (4)	Stainless Steel 18-8
16	**	**Upper Diaphragm Seal**	**Buna-N**
17	**	**Lower Diaphragm Seal**	**Buna-N**
18		Diaphragm Casing Capscrews	Stainless Steel 18-8
19		Diaphragm Casing Nuts	Stainless Steel 18-8
20		Body	Stainless Steel 18-8
21		Piston Spring	Stainless Steel 303
22	**	**Pilot Body Seal Rings (2)**	**Buna-N**
23		Bonnet Piston	Stainless Steel 303
24	**	**Inner Valve**	**Stainless Steel 303 & Buna-N**
25		Inner Valve Spring	Stainless Steel 302
26		Bottom Cap	Stainless Steel 303
27		Seal Cage	Stainless Steel 303
28		Body Screws (4)	Stainless Steel 18-8
29	**	**Slip Washer**	**Teflon**
30		Washer	Stainless Steel 303
31		Mounting Bracket Capscrew (2)	Stainless Steel 18-8
32		Locating Pin (2)	Stainless Steel 18-8
33		Lower Diaphragm Casing	Ductile Iron
34		Spacer	Stainless Steel 303
35	**	**Cage Seal**	**Buna-N**
36	**	**Bottom Cap Seal**	**Buna-N**
37	**	**Seal Ring Seal**	**Buna-N**
38		Spacer Screw	Stainless Steel 18-8

**** Parts included in Parts KIT**

Available Ranges:

4 – 20 ft	**1 – 6 M**
10 – 60 ft	**3 – 18 M**
40 – 125 ft	**12 – 38 M**

(July 2002)