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Maintenance Manual

Water Slug Control Switch

F599A/ F599AB Series

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LIST OF EFFECTIVE PAGES

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INTRODUCTION

1. General

This manual provides component maintenance shop instructions for the Water Slug Control Switch (switch).

2. Revision Service

This manual will be revised as necessary to show the current information.

3. Weights and Measurements

Weights and measurements in this manual are expressed in both English (U.S. customary) and Metric (SI) units.

DESCRIPTION AND OPERATION

1. Description

The Water Slug Control Switch (switch) (see Figures 1 and 2) provides the means of detecting free water accumulation in filter/separators, storage tanks and other refueling system components. The major functional components of the switch are the float, the switch, the switch actuating mechanism, the test lever, the sump and the plunger assembly. The fully enclosed F599AB version is designed for remote installation.

2. Operation

A. Negligible Free Water Accumulation

When the accumulated free water in the sump is negligible, the specific gravity of the float is sufficient to keep it from floating, and the refueling system operates normally.

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B. Excessive Free Water Accumulation

As free water accumulates, its higher specific gravity causes the float to move upward. When the free water accumulation is sufficient, float movement actuates its normally closed switch contacts to their open position, interrupting the circuit path for the control signal. When this occurs, the refueling system shuts down.

C. Refueling System Restart

When the refueling system has been shut down due to excessive free water accumulation in the water sump, operator action is required to drain the water. When the water has drained, the float will sink, the switch will close and complete the control signal, path and normal operation will resume.

D. TEST Lever

The TEST lever provides the means to verify proper operation of the switch. When the lever is rotated downward, it removes ballast weight from the float, allowing it to float in fuel. This causes the normally closed contacts of the switch to open. An audible click is produced when the switch is actuated. The TEST lever should be used periodically, in accordance with the operator's established operating procedures.

3. Leading Particulars (Refer to Table 1)

Table 1. Leading Particulars	
Service	Automotive and Aviation Fuels and Water (Specific gravity: 0.83 maximum)
Operating Pressure	
Maximum Working Through Switch	200 psi (1 380 kPa) 85 psi (590 kPa)
Switch Contact Rating	1.0 ampere
Fluid Temperature	–35 to 135°F (–37 to 57°C)
Ambient Temperature	–65 to 160°F (–54 to 71°C)
Weight (approximate)	15 pounds (6,8 kg)

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FAULT ISOLATION

1. General

Refer to Table 2 for fault isolation information. Locate suspected faulty component and take appropriate remedial action.

Table 2. Fault Isolation		
FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
Switch will not close	Rod (45, IPL Figure 1) improperly adjusted	Adjust the rod (refer to ASSEMBLY section, paragraph 3F).
	Defective switch (35)	Replace the switch body.
	Weight of float assembly (2) is incorrect	Check and correct the float weight (refer to ASSEMBLY paragraph 3F).

DISASSEMBLY

NOTE: Prior to disassembly, the vessel in which the water slug control switch is installed must be drained in accordance with the applicable instructions, and the water slug control switch must be disconnected and removed from the vessel.

1. Seal Replacement Parts Kits

Refer to the **ILLUSTRATED PARTS LIST** section for the Replacement Parts Kit information.

2. Disassembling the Water Slug Control Switch (Refer to IPL Figure 1)

A. (For P/N F599AB only) Remove the nuts (55), the washers (56), bolts (54), the upper sump (49) and the spacer (50) from the lower sump (1). Remove the packings (27) from the packing grooves of the sumps. Remove the screws (52), the washers (24), the plate (51) and the packing (53) from the sump.

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- B. Remove the packing (27) from the packing groove of the sump (11).
 - C. Remove the screw (42), the washers (40 and 41) and the cover (39) from the switch housing (33).
 - D. Remove the screws (38), the washers (37), the switch (35) and the insulator (36) from the switch housing (33). Remove the washer (47) and the grommet (48) from the electrical wires of the switch.
- Remove the screw (46) (switch adjustment) from the rod (45).
- Remove the screws (43), the washers (24) and gently pull the switch housing (33) away from the sump (1). Using a suitable small diameter tool (a straightened large paper clip works well), push out the pin (2.7), and remove the switch housing and associated parts.
- Remove the packing (17) from the switch housing (33).
- Remove the retaining ring (44) and the packing (34) from the switch housing (33).
- I. Remove the float (2) from the sump. Remove the pin (29) and the rod (45) from the sump.
 - J. Remove the plug (2.2) and the packing (2.4) from the float. If there has been leakage from the float, remove the plug (2.5).
 - K. Remove the screws (12) and the collar (5) from the link (4) and the shaft (3). Remove the shaft, the link, and the torsion spring (6) from the sump (1). Remove the bearing (8) and the packing (7) from the shaft.
 - L. Remove the plug (10), the mandrel (11) and the torsion spring (9) from the sump (1).
 - M. If replacement is necessary, remove the screw (57) and the nut (58) from the sump (1).

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CLEANING

1. Cleaning Materials

Refer to Table 3 for recommended cleaning materials. Suitable equivalent cleaning materials may be substituted for the items listed.

DESCRIPTION	SPECIFICATION	SOURCE
Brush, Bristle, stiff, nonmetallic	--	Commercially available
Dry Cleaning Solvent	P-D-680, Type 2	Commercially available
Pick, Teflon	--	Commercially available
Plastic Bags	--	Commercially available
Tissues, lint-free	--	Commercially available

2. Cleaning Procedures

WARNING: DRY CLEANING SOLVENT IS FLAMMABLE AND TOXIC TO EYES, SKIN, AND RESPIRATORY TRACT. SKIN/EYE PROTECTION REQUIRED. AVOID REPEATED/PROLONGED CONTACT. USE ONLY IN WELL VENTILATED AREAS. GOOD GENERAL VENTILATION IS NORMALLY ADEQUATE. KEEP AWAY FROM OPEN FLAMES OR OTHER IGNITION SOURCES.

A. Clean all metal parts by washing thoroughly in dry cleaning solvent. Remove stubborn deposits by scrubbing with a nonmetallic stiff bristle brush. Use a Teflon pick to remove obstructions from ports, grooves and passages.

NOTE: All of the parts must be free of corrosion, dirt, grease, oil, or any other foreign matter.

WARNING: WEAR EYE PROTECTION WHEN DRYING PARTS WITH COMPRESSED AIR. DO NOT DIRECT AIRSTREAM AT PERSONNEL OR LIGHT METAL PARTS.

B. Dry parts with clean lint-free tissues or clean, dry compressed air.

C. Package clean parts in plastic bags.

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INSPECTION

1. General

- A. Under strong light and magnification, visually check all parts in accordance with the general criteria specified in paragraph 2 below.
- B. Repair minor damage in accordance with local directives. If damage is major or beyond simple repair, replace the part rather than attempt extensive repairs.

2. Component Checks (Refer to Table 4)

Table 4. Component Checks	
DESCRIPTION (IPL Figure 1 Item Number)	CHECK CRITERIA
General	Visually check all parts as applicable for nicks, cracks, cuts, burrs, corrosion, breaks, scoring, chafing, scarring, deformation, dents, thread damage, or any other obvious defects. Make sure that the ports, passages, recesses and sealing grooves are clean and unobstructed.
	Check all sealing and seating surfaces for damage or corrosion that would affect sealing.
Float (2)	Check for weight of 3.03 (± 0.03) pounds (1,37 to 1,39 kg) (including the packing (2.4) and the plug (2.2))

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ASSEMBLY

1. Overhaul and Seal Replacement Parts Kits

Refer to the **ILLUSTRATED PARTS LIST** section for the recommended seal and overhaul replacement parts kit information.

2. Assembly Materials

Refer to Table 5 for recommended assembly materials. Suitable equivalent materials may be substituted for the items listed.

Table 5. Recommended Assembly Materials		
DESCRIPTION	SPECIFICATION	SOURCE
Grease, Silicone	33	Dow Corning (commercially available)
Pipe Sealant	SWAK	Commercially available
Thread Locking Compound	Loctite 262	Loctite (commercially available)
Thread Sealing Compound	Loctite NV	Loctite (commercially available)

3. Assembling the Water Slug Control Switch (Refer to IPL Figure 1)

A. Lubrication

Prior to assembly, lightly lubricate all of the packings, seals and screw threads with silicone grease (#33).

B. Assembling the Float Assembly

- 1) Apply pipe sealant (SWAK) to the threads of the plug (2.5). Install the plug in the float (2), flush or below flush with its outer surface.
- 2) Fill the float (2) with water to a weight of 3.03 (± 0.03) pounds (1,37 to 1,39 kg) (including the packing (2.4) and the plug (2.2)).

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- 3) Install the packing (2.4) on the plug (2.2). Apply thread sealant (Loctite NV) to the threads of the plug. Install the plug in the float (2) and tighten it securely.
- C. Install the torsion spring (9) and the mandrel (11) in the sump (2). Apply pipe sealant (SWAK) to the threads of the plug (10). Install the plug in the sump, flush with or up to two threads below the its outer surface.
- D. Install the screw (57) and the nut (58) in the float assembly (2). Pre-adjust the screw as follows:
- 1) Fill the sump (1) with 2.00 quarts (1 890 ml) of water.
 - 2) Refer to Figure 4 and adjust the screw (57) until the clearance gap between the head of the screw and the surface of the sump (1) is 0.09 to 0.17 inch (2,3 to 4,3 mm).
 - 3) Lock the screw (58) in position by tightening the nut (58). Recheck to make sure that the clearance gap is correct.
 - 4) Empty the sump (1) and allow the parts to dry.
- E. The bearing (8) (Nylon) may be split in one place for installation. Install the packing (7) and the bearing in the grooves of the shaft (3).
- F. Install the torsion spring (6), the link (4), and the shaft (3) in the sump (1). Make sure that the end of the spring is engaged with the link.
- G. Apply thread locking compound to the threads of the screws (12). Line up the screw holes in the link (4) and the shaft (3), and install the screws and the collar (4). Tighten the screws securely.
- H. Install the rod (45) and the pin (2.7) on the float (2). Lift the end of the torsion spring (9) and carefully install the float in the sump (1). Release the spring and make sure that its roller rides on the V-track of the float.
- I. Install the packing (34) and the retaining ring (44) (prongs outward) in the switch housing (33). Install the packing (17) in the packing groove of the switch housing.

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J. Insert the rod (45) on the float (2) through the retaining ring (44) and the packing (34) in the switch housing (33). Line up the pivot pin hole of the switch housing with the holes in the arm of the float and install the pin (29).

K. Make sure that the packing (17) is correctly seated in its groove on the switch housing (33). Secure the switch housing to the sump with the screws (43) and the washers (24).

L. Thread the screw (46) (switch adjustment) into the rod (45), so that its head is approximately 0.14 inch (3,5 mm) from the end of the rod.

M. Install the grommet (48) in the hole of the washer (47). Insert the electrical wires of the switch (35) through the grommet. Install washer, grommet and wires in the switch housing (33).

N. Install the insulator (36) and the switch (35) in the switch housing (33) and secure them with the screws (38) and the washers (37).

O. Adjusting the Switch (35)

- 1) Connect a test light and voltage source (0.5 ampere maximum) between in series with the switch.
- 2) Fill the sump (1) with 2.00 quarts (1 890 ml) of water.

NOTE: A wire inserted into the hole in the head of the screw (46) can be used to turn it.

- 3) Adjust the screw (46) outward (counterclockwise) until the test light goes off. The switch must open at the 2.00 quart (1 890 ml) level within ± 190 ml.
- 4) Empty the sump (1) and allow the parts to dry.
- 5) Install the water slug control switch in the switch test fixture (P/N T90109) or equivalent. Fill the sump (1) with cleaning solvent (P-D-680) so that the float assembly (2) is completely submerged.
- 6) The float assembly must sink and the test light must come on and remain on.

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7) Drain the cleaning solvent and remove the water slug control switch from the switch test fixture. Allow the parts to dry.

P. Install the cover (39) and secure it with the screw (12) and the washers 10 and 11). Tighten the screw securely.

Q. (For P/N F599AB only) Install the packings (27) in the packing grooves of the sumps (1 and 49). Assemble the sumps with the spacer (50) and secure them by installing the bolts (54), the washers (56) and the nuts (55). Tighten the nuts securely.

R. (For P/N F599AB only) Install the packing (53) in the packing groove of the plate (51). Install the plate on the sump (49) and secure it with the screws (52) and the washers (24). Tighten the screws securely.

TESTING

NOTE: Prior to testing, the vessel in which the water slug control switch is installed must be drained in accordance with the applicable instructions, and the switch must be disconnected and removed from the vessel.

1. Leakage and Functional Test

A. Connect a test light and voltage source (0.5 ampere maximum) between in series with the switch electrical wires. The test light should come on.

WARNING: AVIATION FUEL IS FLAMMABLE AND TOXIC TO YOUR EYES, YOUR SKIN, AND YOUR RESPIRATORY TRACT. SKIN AND EYE PROTECTION IS REQUIRED. AVOID REPEATED OR PROLONGED CONTACT. KEEP AWAY FROM OPEN FLAMES OR OTHER IGNITION SOURCES.

B. Immerse the switch with its mounting flange horizontal and facing upward in a container of clean aviation fuel.

C. The float must remain at its lower travel limit. The test light must remain on.

D. Turn off the voltage source. Remove the water slug control switch from the container and blow it dry with shop air.

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- E. Immerse the switch with its mounting flange horizontal and facing upward in a container of clean water. Turn on the voltage source.
- F. The float should rise to its upper travel limit. The test light must go off.
- G. Manually push the float to its lower travel limit and hold it down. The test light must come on.
- H. Release the float. The float should rise to its upper travel limit. The test light must go off.
- I. Manually push the float to its fully down position and hold it down. The test light must come on.
- L. Remove the test voltage and disconnect the test light circuit. Remove the switch from the container and thoroughly dry it with shop air.

ILLUSTRATED PARTS LIST

1. General

This section lists, describes, and illustrates all detail parts required for maintenance support of the Water Slug Control Switch.

2. Scope of Information

A. The parts list is indented to show the relationship between each part and its next higher assembly. Item numbers used in the parts list are keyed to the corresponding numbers of the accompanying illustration.

B. Abbreviations

ASSY	Assembly.
FIG.	Figure.
REF	Reference item.

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FIG. ITEM	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	USAGE	UNITS
			CODES	PER ASSY
1	F599A	SWITCH, WATER SLUG CONTROL	A	REF
	F599AB	SWITCH, WATER SLUG CONTROL	B	REF
1	931021-101	· SUMP		1
2	931205-101	· FLOAT ASSEMBLY		1
2.2	CAN814-16D	· · PLUG		1
2.4	CMS29512-16	· · PACKING, PREFORMED		1
2.5	2706138-105	· · PLUG		1
2.7	79-012-062-0687	· · PIN, SPRING		1
3	931208-101	· SHAFT		1
4	931023-101	· LINK, PRECHECK		1
5	931026-101	· COLLAR, SHAFT		1
6	931033-101	· SPRING, TORSION		1
7	2661058BD109	· PACKING, PREFORMED		1
8	931027-101	· BEARING, SLEEVE (Nylon)		1
9	921315-101	· SPRING, TORSION		1
10	CAN932D2	· PLUG		1
11	921316-101	· MANDREL, SPRING		1
12	2706700-19	· SCREW, SOCKET HEAD CAP		2
17	2661058A133	· PACKING, PREFORMED		1
24	CMS35333-39	· WASHER, LOCK	A	5
	CMS35333-39	· WASHER, LOCK	B	9
27	2661058A266	· PACKING, PREFORMED	A	1
	2661058A266	· PACKING, PREFORMED	B	2
29	F60W1627	· PIN, HINGE		1
33	F60W1760	· HOUSING, SWITCH		1
34	2661058BD007	· PACKING, PREFORMED		1
35	F60W1761	· SWITCH		1
36	AT10063	· INSULATOR		1
37	CAN935B2	· WASHER, LOCK		2

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FIG. ITEM	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODES	UNITS
				PER ASSY
38	CAN515B2-8	· SCREW, MACHINE		2
39	F60W1763	· COVER		1
40	CAN960C2	· WASHER, FLAT		1
41	CAN935-6	· WASHER, LOCK		1
42	CAN515-6-5	· SCREW, MACHINE		1
43	CAN500-10-10	· SCREW, MACHINE		4
44	5000-37H	· RING, RETAINING		1
45	F60W1758	· ROD		1
46	NK500A2-8	· SCREW, SELF-LOCKING		1
47	F60W1958	· WASHER, FLAT		1
48	CMS35489-4	· GROMMET		1
49	F60W1622-2	· SUMP	B	1
50	F61W2186	· SPACER	B	1
51	F61W2207	· PLATE	B	1
52	CAN503-10-10	· SCREW, MACHINE	B	4
53	CMS29513-133	· PACKING, PREFORMED	B	1
54	CMS90727-66	· BOLT, MACHINE	B	8
55	CMS35690-628	· NUT, HEX	B	8
56	CAN935-616	· WASHER, LOCK	B	8
57	CAN520-10-10	· SCREW, MACHINE		1
58	CMS35650-304	· NUT, HEX		1

REPLACEMENT PARTS KITS AVAILABLE		
KIT	DESCRIPTION	ITEMS IN KIT (IPL Figure 1)
KITF599-2	Seal Replacement	2.4, 7, 17, 27, 34, 53
KITF599-3	Overhaul	2.4, 2.7, 7, 8, 17, 27, 29, 34, 35, 46, 48, 53

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