

Meggitt Fuelling Products
Avery-Hardoll
Whittaker Controls

Maintenance Manual

3-Inch Internal Valve F660 Series



Whittaker Controls

12838 Saticoy Street
North Hollywood
CA 91605-3505
USA

Tel: +1 818 765 8160
Fax: +1 818 759 2194

www.wkr.com
www.meggitt.com

Avery-Hardoll

Holland Way
Blandford Forum
Dorset DT11 7BJ
UK

Tel: +44 (0) 1258 486600
Fax: +44 (0) 1258 486601

www.meggittfuelling.com
www.meggitt.com

MEGGITT

NOTICE: Proprietary information of Meggitt Fuelling Products. The information contained in this document is disclosed in confidence. It is the property of Meggitt Fuelling Products, and shall not be used, disclosed to others, or reproduced in whole or in part without the express written consent of Meggitt Fuelling Products. If consent is given this notice shall appear in any such reproduction. These commodities, technology or software were exported from the United States in accordance with the export administration regulations. Diversion contrary to U.S. law is prohibited.

Revision 1.2 – 02/01/2006

LIST OF EFFECTIVE PAGES

On a revised page, the portion of text or illustrations affected by the change is indicated by a vertical line in the outer margin of the page. When a revision is issued, the entire document is reissued with the current revision number and date shown on all pages. For major revisions, the basic number is incremented. For minor revisions, the number following the decimal is incremented. Dates of issue for original and subsequent revisions are as follows:

Original 1.0	12/01/2001
Revision 1.1	03/15/2002
Revision 1.2	02/01/2006

The total number of pages in this technical document is 21 consisting of the following:

Title, 2 – 21

TABLE OF CONTENTS

SUBJECT	PAGE
Introduction	3
Description and Operation	3
Fault Isolation	7
Disassembly	9
Cleaning	11
Inspection	12
Assembly	13
Illustrated Parts List	16

INTRODUCTION

1. General

This manual provides component maintenance shop instructions for the 3-Inch Internal Valve (valve).

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 primarily in English (U.S. customary) and selected Metric (SI) units.

DESCRIPTION AND OPERATION

1. Description

- A. The 3-Inch Internal Valve (valve) (see Figure 1) is designed to provide normal and emergency shutoff functions and tank liquid level control with low surge, low pressure drop, and high reliability. When used with the F613 jet level sensor, fuel pressure provides the actuation force for opening and closing the valve during tank filling.
- B. The basic valve can be used for off-loading. Single or dual stage tank filling control is available by adding one or two pilot valves. A lever is provided for attachment of a cable to open the valve during off-loading.

2. Operation

A. Starting Fuel Flow into the Tank

Fuel flow into the tank commences when the upstream fuel pressure is applied both to the pilot valve(s) and to the valve inlet (main piston). When the fuel pressure applied to the pilot valve increases to approximately 6 psi, the pilot valve will open. When the pilot valve opens, the fuel trapped in the main piston chamber is relieved into the tank. The upstream pressure then opens the main piston, establishing flow into the tank.

B. Stopping Fuel Flow into the Tank

Fuel flow into the tank stops when the fuel level reaches the F613 jet level sensor shutoff point. Pressure to the pilot valve is relieved and the pilot valve closes. When the pilot valve closes, fuel fills the main piston chamber and the main piston is closed by spring force and fuel pressure.

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

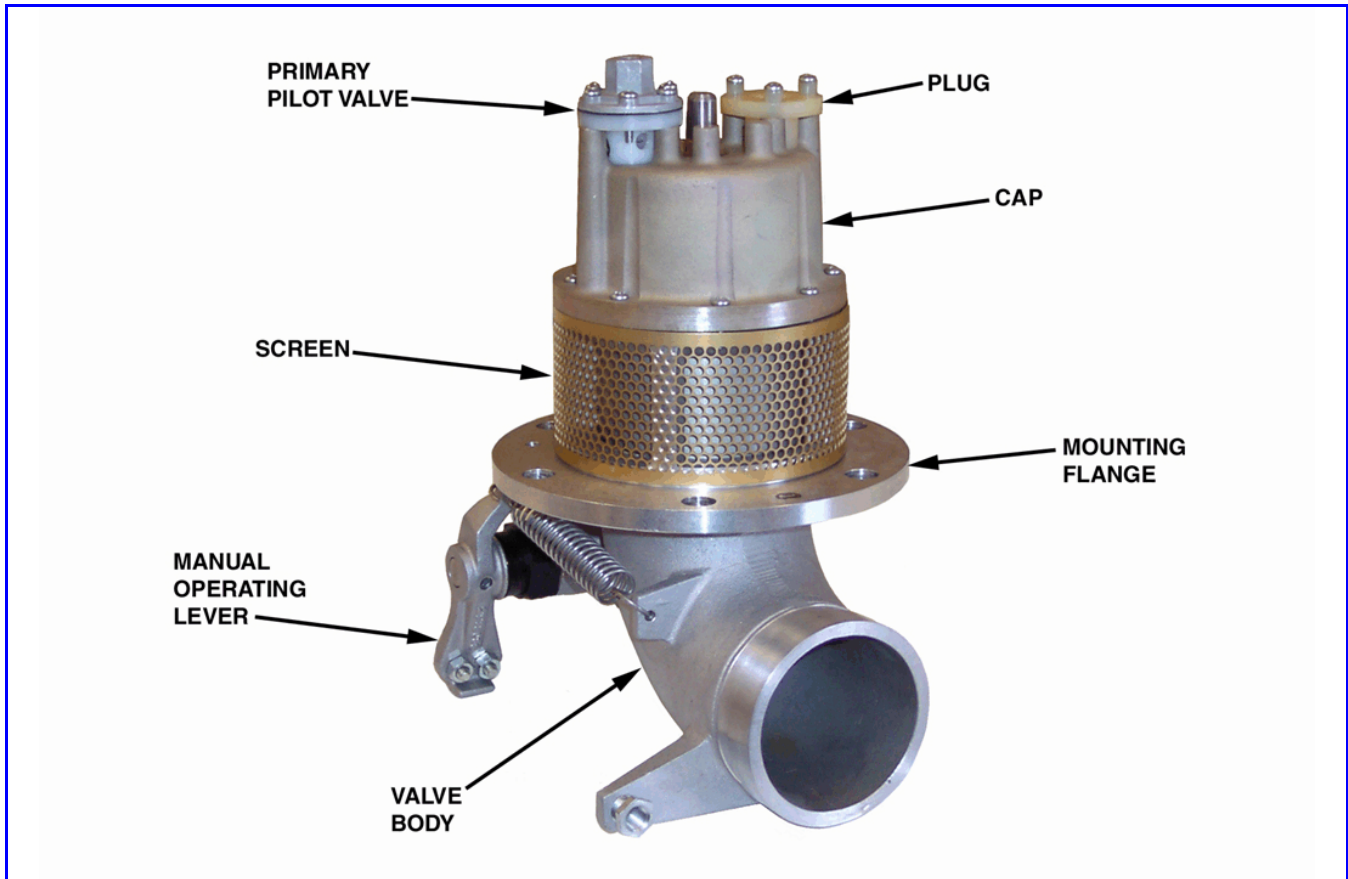


Figure 1. 3-Inch Internal Valve

C. Off-Loading Fuel

Fuel off-loading is accomplished by manually operating the lever. The lever pushes the main piston to its open position, allowing fuel to flow.

3. Leading Particulars (Refer to Table 1)

4. Model Variations

Refer to Table 2 for the available F660 series valve variations. Refer to the **ILLUSTRATED PARTS LIST** section for additional details.

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

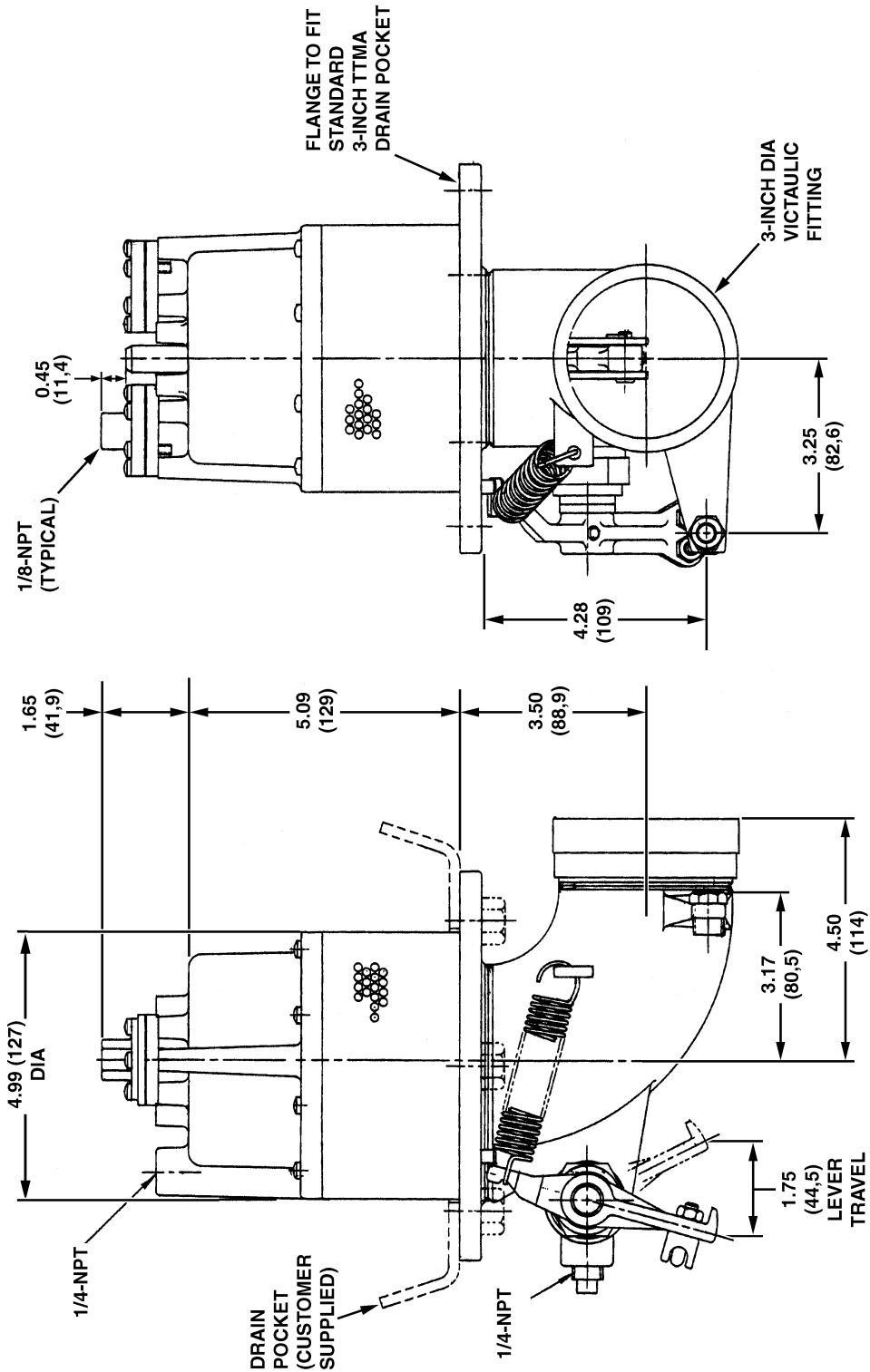
Table 1. Leading Particulars

Service	Automotive and Aviation Fuels
Pressures	
Operating Pressure Range	6 to 100 psi
Static Fuel Pressure (maximum)	150 psi
Flow Rate (maximum)	450 gpm
Fluid Temperature	–40 to 140°F (–54 to 60°C)
Ambient Temperature	–40 to 140°F (–54 to 60°C)
Weight (basic model) (approximate)	8.3 pounds (3,8 kg)
Envelope Dimensions	See Figure 2

Table 2. Model Variations

MOD LETTER	DESCRIPTION
(Basic)	Manually operated valve
A	Single Stage Pilot Control – Adds primary pilot valve for shutoff
C	Enhanced Performance – Adds seal backup ring (for flow rates of more than 400 gpm)

Meggitt Fuelling Products
 Maintenance Manual
 3-Inch Internal Valve - F660 Series



NOTE: DIMENSIONS ARE IN INCHES AND (MILLIMETERS).

Figure 2. Envelope Dimensions

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

FAULT ISOLATION

1. General

Refer to Table 3 for fault isolation information. Locate suspected faulty component and take appropriate remedial action.

Table 3. Fault Isolation

FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
BOTTOM FILLING OPERATION		
Valve will not open	Insufficient fuel pressure at pilot valve (1, IPL Figure 1)	Check and correct the air pressure supply.
	Pilot valve diaphragm (3, IPL Figure 2) leaking	Overhaul or replace the pilot valve.
	Jammed main piston (14, IPL Figure 1) due to contamination	Overhaul the valve.
Surging fuel flow	Insufficient fuel pressure at pilot valve (1)	Check and correct the air pressure supply.
Valve will not close	Jammed main piston (14) due to contamination	Overhaul the valve.
	Main piston seal (11) damaged (deformed)	Replace the seal and install backup ring (11A) (install kit, P/N KITF660-301).
	Operating cable incorrectly adjusted	Adjust the operating cable.
	Incorrectly installed or damaged plug (5)	Re-install the plug. Replace the plug if damaged.
	Tension spring (33) missing or disconnected	Replace or connect the spring.

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

Table 3. Fault Isolation (continued)

FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
BOTTOM FILLING OPERATION		
Internal leakage	Main piston seal (11) damaged (deformed)	Replace the seal and install backup ring (11A) (install kit, P/N KITF660-301).
	Damaged seat on main piston (14) or contamination of sealing surfaces	Overhaul the valve.
	Incorrectly installed or damaged plug (5)	Re-install the plug. Replace the plug if damaged.
OFF-LOADING OPERATION		
Valve will not open	Operating cable incorrectly adjusted	Adjust the operating cable.
	Jammed main piston (14) due to contamination	Overhaul the valve.
	Main piston seal (11) damaged (deformed)	Replace the seal and install backup ring (11A) (install kit, P/N KITF660-301).
Valve will not close	Jammed main piston (14) due to contamination	Overhaul the valve.
	Main piston seal (11) damaged (deformed)	Replace the seal and install backup ring (11A) (install kit, P/N KITF660-301).
	Operating cable incorrectly adjusted	Adjust the operating cable.

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

Table 3. Fault Isolation (continued)

FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
OFF-LOADING OPERATION		
Leakage when valve is closed (NOTE: Leakage of up to 20 cc/minute is allowed.)	Contaminated pilot valve (1)	Overhaul or replace the pilot valve.
	Excessively worn or contamin- ated main piston seal (11)	Replace the seal.
	Excessively worn or contamin- ated quad ring (9)	Replace the quad ring.
	Damaged seat on main piston (22) or contamination of sealing surfaces	Overhaul the valve.
Shaft leakage	Excessively worn or contamin- ated quad ring (38)	Replace the quad ring.
	Excessively worn or contamin- ated packing (40)	Replace the packing.

DISASSEMBLY

1. Disassembly of the Valve (Refer to IPL Figure 1)

A. Removing the Pilot Valve or Plugs

Remove the screws (4) and the plugs (5) or the pilot valve (1) and the packing (44) from the cap (3).

B. Removing the Gland Assembly

- 1) Disconnect the spring (33) and drive the pin (41) out of the shaft (35). Remove the lever (42) from the shaft. Remove the wire clip (43) from the lever.
- 2) Unscrew and remove the gland assembly (items 37 through 40) from the valve body (31).
- 3) Using a suitable tool, drive the bushing (39) out of the gland (37). Remove the packing (40) and the quad ring (38) from the gland.

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

C. Removing the Shaft

Rotate the shaft (35) clockwise until it can be pulled out of the valve body (31). Remove the shaft from the valve body.

D. Removing the Cap

WARNING: THE CAP (3) IS UNDER HEAVY SPRING PRESSURE. YOU MUST BE VERY CAREFUL TO RESTRAIN IT DURING REMOVAL.

1) Remove the screws (4) and the cap (3) from the valve body (31).

CAUTION: WHEN REMOVING THE BUSHING, BE CAREFUL TO AVOID DAMAGING ITS BORE.

2) Remove the retaining ring (6). Using a suitable tool, drive the bushing (7) out of the cap (3). Remove the packing (8) and the quad ring (9).

NOTE: If further disassembly of the valve is required, note the positions of the seal (11) and the garter spring (10) before removing the piston and shaft assembly from the valve body.

3) Remove the garter springs (10), the seal (11), the backup ring (11A) (Mod C), and the spring (12).

4) Remove the tubes (26 and 26) from the valve body (31).

E. Removing the Main Piston

Remove the retaining ring (13) and slide the piston (14) and the spring (19) off of the shaft (15).

F. Removing and Disassembling the Linkage and Shaft Assembly

1) Remove the shaft and linkage assembly (items 15, 16, 17, 18, 20, 21, 22, 23, 24 and 25) from the valve body (31).

2) Remove the cotter pin (16) from the shaft (15). Remove the cotter pin (24) and the clevis pin (25) from the links (23).

G. Disassembly of the Valve Body

1) Remove the tubes (26 and 27) from the valve body (31).

2) Remove the screws (28) and the screen (29) from the valve body (31).

3) Remove the bushing (32) from the valve body (31).

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

2. Disassembly of the Pilot Valve (Refer to IPL Figure 2)

- 1) Remove the screws (4) and the cover (2) from the base (6)
- 2) Remove the diaphragms (3) from the base (6).
- 3) Remove the retaining ring (7), the spring retainer (4), the spring (5) and the poppet (8) from the base (6).

CLEANING

1. Cleaning Materials

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

Table 5. Recommended Cleaning Materials

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. Brush all threaded areas. Use a Teflon pick to remove obstructions from the ports, the seal or packing grooves and the flow passages.

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

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

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.

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 standard procedures. If damage is major or beyond simple repair, replace the part rather than attempt any extensive repairs.

2. Component Checks (Refer to Table 6)

Table 6. Component Checks

DESCRIPTION (IPL Figure 1 Item No.)	CHECK CRITERIA
General	<ul style="list-style-type: none">1) Visually check all parts as applicable for nicks, cracks, cuts, burrs, corrosion, breaks, scoring, deformation, dents, thread damage, or any other obvious defects.2) Make sure that the ports, passages, recesses and sealing grooves are clean and unobstructed.3) Check all sealing and seating surfaces for damage or corrosion which would affect sealing.
Main Piston (1-14)	<ul style="list-style-type: none">1) Replace the piston if there is scoring on the outside diameters of the piston body.2) Replace the piston if bare metal shows through the anodized surface.3) The bonded seal in the seating face must not have any cut, crack or chip which would affect sealing.
Valve Body (1-31)	Check the main piston seating surface for any damage or corrosion which would affect sealing.

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

ASSEMBLY

1. Replacement Parts Kits

Refer to the **ILLUSTRATED PARTS LIST** section for recommended replacements parts kit information.

2. Assembly Materials

Refer to Table 7 for recommended assembly materials. Suitable equivalent materials may be substituted for the items listed.

Table 7. Recommended Assembly Materials

DESCRIPTION	SPECIFICATION	SOURCE
Petrolatum	–	Commercially available
Thread Sealant	T40-32	Commercially available

3. Assembling the Pilot Valve

A. Lubrication

Prior to assembly, lightly lubricate the packing and the screw threads with petrolatum.

B. Assembly Procedure (Refer to IPL Figure 2)

- 1) Install the poppet (8), the spring (5) and the spring retainer (4) in the base (6). Secure the parts by installing the retaining ring (7).
- 2) Put the diaphragms (3) on the base (7) with their cupped side up. Install the cover (2) and secure it with the screws (1).

4. Assembly of the Valve

A. Lubrication

Prior to assembly, lightly lubricate the seals, the packings and the screw threads with petrolatum.

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

B. Assembly Procedure (Refer to IPL Figure 1)

1) Installing the Piston and Linkage Assembly (Items 13 through 25)

- a) Install the retaining ring (17) on the shaft (15).
- b) Install the shaft (15) in the piston (14) and secure it by installing the retaining ring (13).
- c) Install the orifice (20) and the limit pin (22) on the shaft (15).
- d) Put the spacer (21) (recessed side up) on the shaft (15). Install the cotter pin (16) and bend its ends to fit them into the recess of the washer.

NOTE: The cotter pin must allow the washer to seat squarely against the pin with no binding.

- e) Install the spring (19) on the shaft assembly. Slide the links (23) over the pin (22). Move the spring from side to side to ease assembly. The spring should seat on the shoulders of the links.
- f) Install the cam (18) and the pin (25). Secure the parts with the cotter pin (24). Make sure that the stops on the cam are correctly positioned as shown in IPL Figure 1.

2) Assembling the Cap

- a) Install the packing (8) in the packing groove of the sleeve (7). Install the quad ring (9) in the sleeve.
- b) Lightly lubricate the inside and outside diameters of the sleeve with petrolatum. Press the sleeve into the cap (3). Install the retaining ring (6) to secure the sleeve in the cap.

3) Installing the Gland Assembly (Lower Shaft)

- a) Install the packing (40) in the packing groove of the bushing (39). Install the quad ring (38) in the bushing. Lightly lubricate the inside and outside diameters of the bushing with petrolatum.
- b) Press the bushing (39) into the gland (37) (packing end outward). Install the packing (36) in the packing groove of the gland.

4) Installing the Shaft and Lever Assembly

With the spring pins (34) pressed into the shaft (35) slide the gland assembly (items 36 through 40) over the shaft. Install the lever (42) in the shaft and press in the spring pin (41).

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

5) Installing the Piston and the Linkage Assembly

- a) Put the piston and linkage assembly into the valve body (31).

CAUTION: THE CAM STOP ORIENTATION IS CRITICAL. MAKE SURE THAT THE STOPS ON THE CAM ARE CORRECTLY POSITIONED AS SHOWN IN IPL FIGURE 1.

- b) Install the shaft and lever assembly in the valve body (31). Make sure that the pins (34) and the shaft (35) are correctly engaged with the cam (18). Tighten the gland assembly in the valve body (31). Torque the gland ((37) to 80 to 100 pound-inches (9 to 11 Nm).
- c) Install the tubes (26 and 27) in the valve body (31).
- d) Wrap the screen (29) tightly around the valve body (31), approximately in the center of the window. Secure the screen with the screws (28). Slight bending of the screen wires is permitted to provide a good fit.
- e) Install the seal (11) and the backup ring (11A) ((Mod C) on the piston (14). Put the garter springs (10) over the seal.

NOTE: The outer lip of the seal (11) fits into the groove in the cap (3). Be careful not to crush it by installing it incorrectly.

- f) Install the spring (12) in the piston (14). Put the cap assembly on the valve body (31). Carefully align the tubes (26 and 27) with the hole in the cap (3). Make sure that the spring (12) remains in its correct position and press the cap downward. Secure the cap with two of the screws (4).
- g) Install the remaining six screws (4) and tighten all eight of the screws evenly in the sequence shown in Figure 4 (the starting point optional).
- h) Install the plugs (2) in the valve body as required, using commercial sealant on the threads.

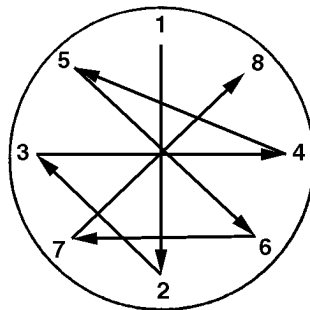


Figure 4. Cap Attaching Screw Tightening Sequence

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

- i) Install the cable clip (43) on the lever (42).
- j) Install the bushing (32) in the valve body (31). Install the spring (33) between the valve body and the lever (42).
- k) (Mod A) Install the pilot valve (1) in the secondary port and secure it with three of the screws (4). Tighten the screws evenly.
- l) Install the plug (5) in the primary port and secure it with three of the screws (4). Tighten the screws evenly.

ILLUSTRATED PARTS LIST

1. General

This section lists, describes, and illustrates all detail parts required for maintenance support of the 4-Inch Internal Valve.

2. Scope of Information

A. The listing 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. MODIFICATION CODE

The modification code indicates the parts usage with respect to the end item. When the MOD column is blank, the part usage is applicable to all versions unless otherwise specified in the DESCRIPTION column. Modification codes used in this manual are listed in the following table.

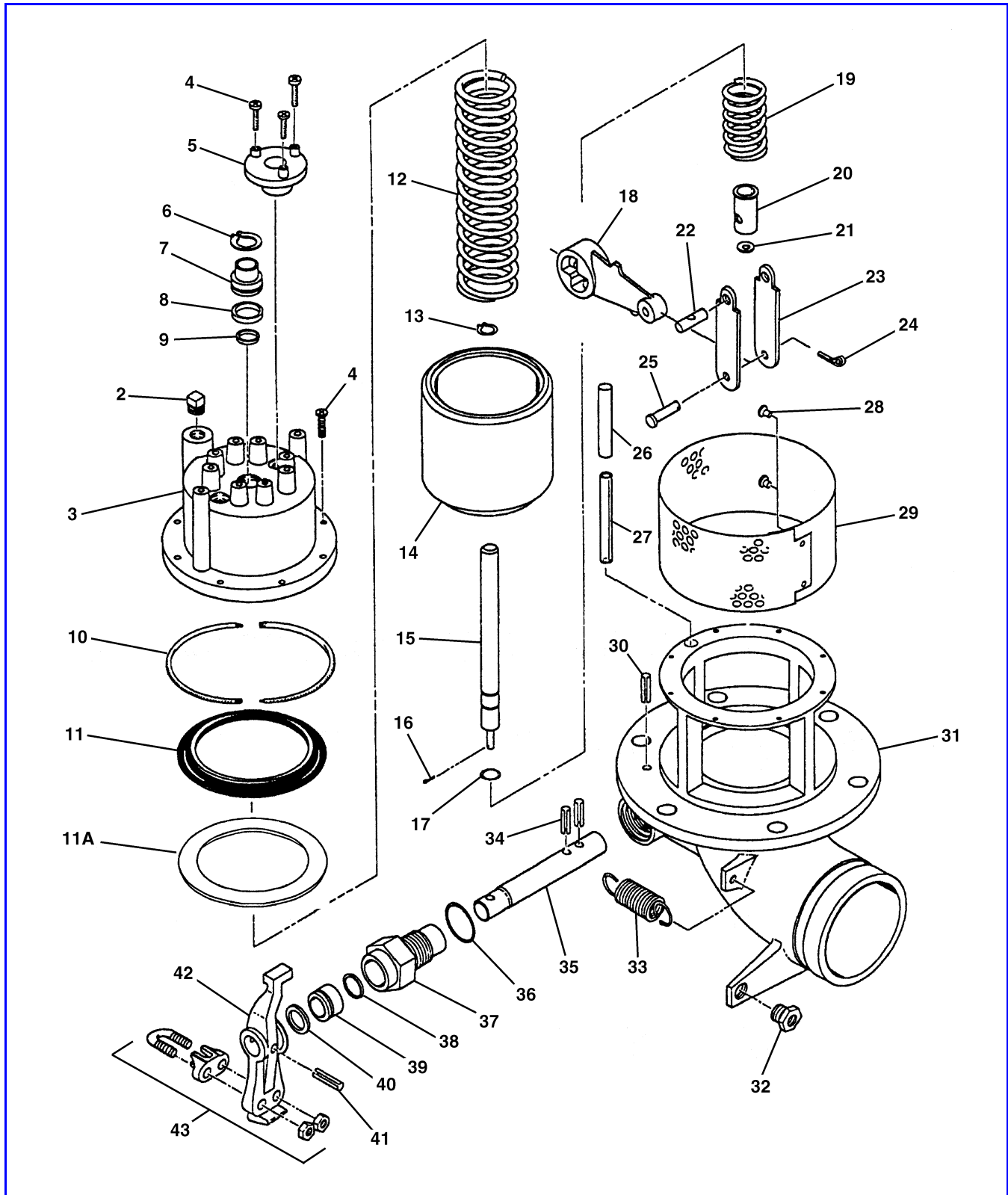
C. How to Identify a Part

- 1) **When the part number is known:** Refer to the parts list for the item number, description, modification codes, and quantity. Refer to the illustration to verify the physical appearance and location of the part.
- 2) **When the part number is not known:** Review the illustrations to identify the part by physical appearance and location. Refer to the accompanying parts list to obtain the part number, description, modification codes, and quantity.

D. Abbreviations

ASSY	Assembly.
FIG.	Figure.
IPL	Illustrated Parts List.
MOD	Modification.

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

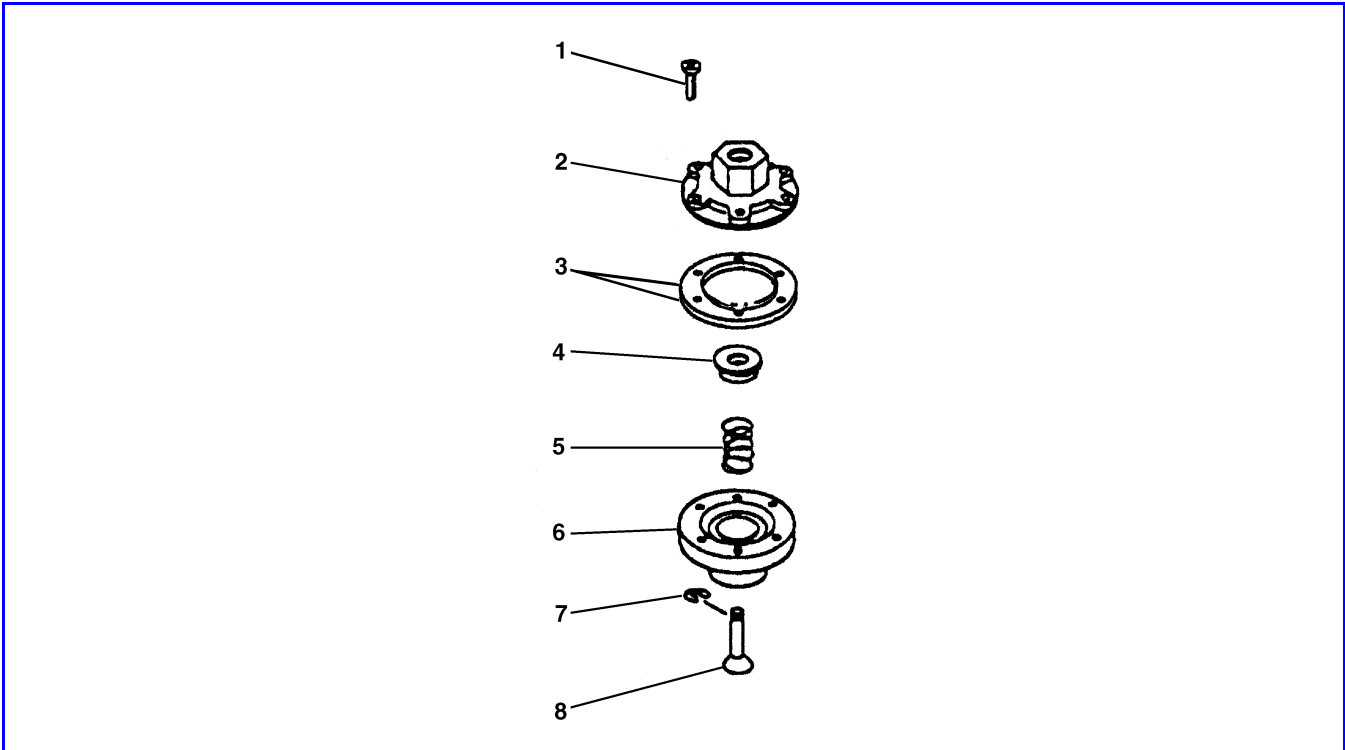


IPL Figure 1. 3-Inch Internal Valve (Sheet 1 of 2)

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

FIG. ITEM	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	MOD CODES	UNITS PER ASSY
1 18	2775036-101	• CAM		1
19	2776155-119	• SPRING, COMPRESSION		1
20	2793082-101	• ORIFICE		1
21	2793089-101	• WASHER, RETAINER		1
22	2793081-101	• PIN, LIMIT		1
23	2775034-101	• LINK		2
24	CMS24665-151	• PIN, COTTER		1
25	98306A159	• PIN, CLEVIS		1
26	2775053-101	• TUBE		1
27	2775052-101	• TUBE (Aluminum)		1
28	CAN470A4-4	• RIVET, SOLID		2
29	2775153-101	• SCREEN		1
30	CMS171648	• PIN, SPRING		1
31	2775027-101	• BODY, VALVE		1
32	2721205-1	• BUSHING		1
33	2775163-101	• SPRING, TENSION		1
34	CMS171651	• PIN, SPRING		2
35	2775154-101	• SHAFT		1
36	2661058BD121	• PACKING, PREFORMED		1
37	2775042-101	• GLAND		1
38	Q4114-366Y	• RING, QUAD		1
39	2793360-101	• BUSHING		1
40	2661058BD116	• PACKING, PREFORMED		1
41	CMS171654	• PIN, SPRING		1
42	2775038-101	• LEVER		1
43	3465T27	• CLIP, WIRE		1
44	2661058A016	• PACKING, PREFORMED		1

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series



IPL Figure 2. Pilot Valve

FIG. ITEM	PART NUMBER	DESCRIPTION							MOD CODES	UNITS PER ASSY
		1	2	3	4	5	6	7		
2	2775237-101	VALVE, PILOT							A	REF
1	2706560C0832075	• SCREW, MACHINE								3
2	2681197	• COVER								1
3	2775233-101	• DIAPHRAGM								2
4	2775235-101	• RETAINER, SPRING								1
5	LC035F3MW	• SPRING, COMPRESSION								1
6	2775234-101	• BASE								1
7	CMS16633-4018	• RING, RETAINING								1
8	2775236-101	• POPPET								1

Meggitt Fuelling Products
Maintenance Manual
3-Inch Internal Valve – F660 Series

OVERHAUL PARTS KIT AVAILABLE		
KIT PART NUMBER	DESCRIPTION	ITEMS IN KIT
KITF660-101	Seal Replacement	6, 8, 9, 11, 16, 17, 34, 36, 38 and 40, IPL Figure 1, and 3, IPL Figure 2
KITF660-201	Valve Spring Update (Allows operation at lower inlet pressure. Standard on all valves manufactured since August 1989)	11, 12, 16, 19, 21 and 24, IPL Figure 1
KITF660-301	Enhanced Performance (Adds seal backup ring for flow rates of more than 400 gpm)	9, 10, 11, 11A, IPL Figure 1