
Maintenance Manual

4-INCH INTERNAL VALVE

F614 Series

MMF614
Revision 2.0
21 October 2013



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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS!

This manual contains important instructions that shall be followed during installation and maintenance of the 4-inch Internal Valve. The following are general safety precautions that are not related to specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during maintenance.

The valve is a mechanical device and can be dangerous if incorrectly operated or maintained.

Safety Alert Symbols

Safety alert symbols are used in this manual to identify potential or immediate personal injury hazards. The safety alert symbol words are explained below:



- indicates an imminently hazardous situation which, if not avoided, will result in injury or serious injury.



- indicates a potentially hazardous situation which, if not avoided, could result in injury or serious injury.



- indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



- used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

WEAR PROTECTIVE CLOTHING

- Wear protective clothing (gloves, apron, etc.) approved for the materials and tools being used.

USE APPROVED SAFETY EQUIPMENT

- Use only approved equipment and make sure firefighting equipment is readily available.

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GIVE CLEANERS SPECIAL CARE

- When cleaners are being used read and follow the material safety data sheet (MSDS) instructions for correct handling.

Equipment Safety Information

The following safety information briefly discusses hazards peculiar to the equipment, which are likely to be encountered during maintenance activity.

GENERAL OPERATING LOCATION PRECAUTIONS

- Use only authorized replacement parts or hardware.
- Obey Lock-Out/Tag-Out procedures when working on the valve.

OPERATION AND MAINTENANCE OF FUEL SYSTEMS

- Protect all fuel lines from damage or puncture. Do not operate the valve if a fuel leak is detected.
- Do not use flammable solvents for cleaning parts.
- Check for tools, rags, or loose parts left in the area before resuming operation.
- Do not attempt to remove the valve from the system without first isolating it from the line pressure and venting all of the trapped internal pressure.

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INTRODUCTION

1. General

The information and procedures contained in this manual have been prepared to assist qualified repair personnel in off-aircraft maintenance of the 4-Inch Internal Valve (valve). The instructions provide information necessary to perform maintenance functions. The valve is manufactured by Meggitt (North Hollywood), Inc., 12838 Saticoy Street, North Hollywood, California 91605.

2. Scope

The instructions contained in this manual do not claim to cover all details or variations in equipment. They do not provide for every problem that could occur during installation, operation, or maintenance. If further information is required, contact Meggitt (North Hollywood), Inc., Product Support Department.

3. Standard Shop Practices

Use approved procedures and safety precautions to prevent damage to the equipment and injury to personnel.

4. Weights and Measurements

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

5. Revision Service

This manual will be revised, as necessary, to reflect current information.

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DESCRIPTION AND OPERATION

1. Description

The 4-Inch Internal Valve (valve) (see [Figure 1](#)) is designed to 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 or F619B float operated pilot valve, fuel pressure provides the actuation force for opening and closing the valve during tank filling.

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 lug is provided for attachment of a lanyard to manually open the valve for emergency off-loading.

2. Operation (See [Figure 2](#))

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 (41.36 kPaG), 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.

C. Off-Loading Fuel

Fuel off-loading is accomplished by applying air pressure to the power cylinder on the top of the valve. The power cylinder pulls the main piston to its open position.

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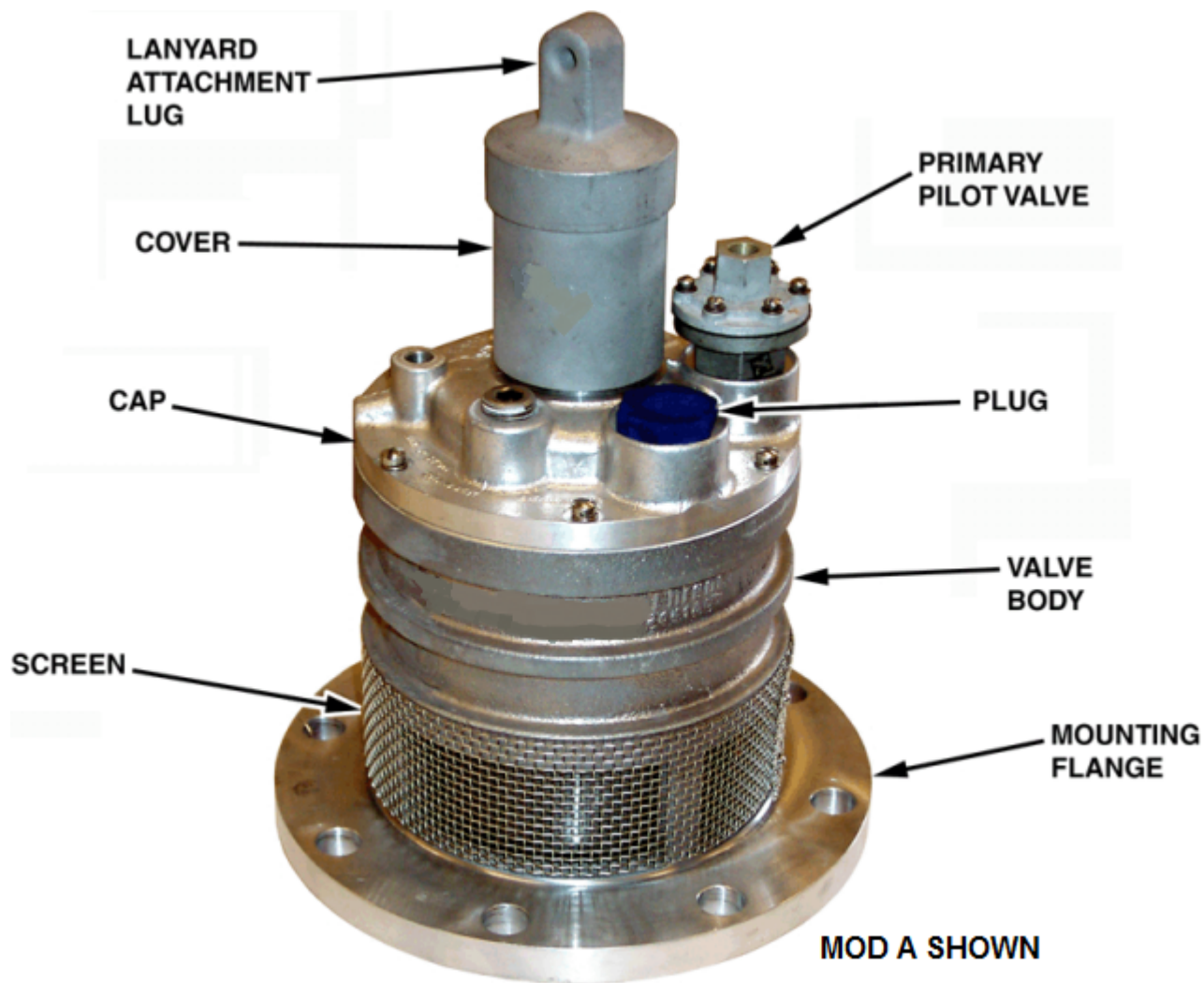


Figure 1. 4-Inch Internal Valve

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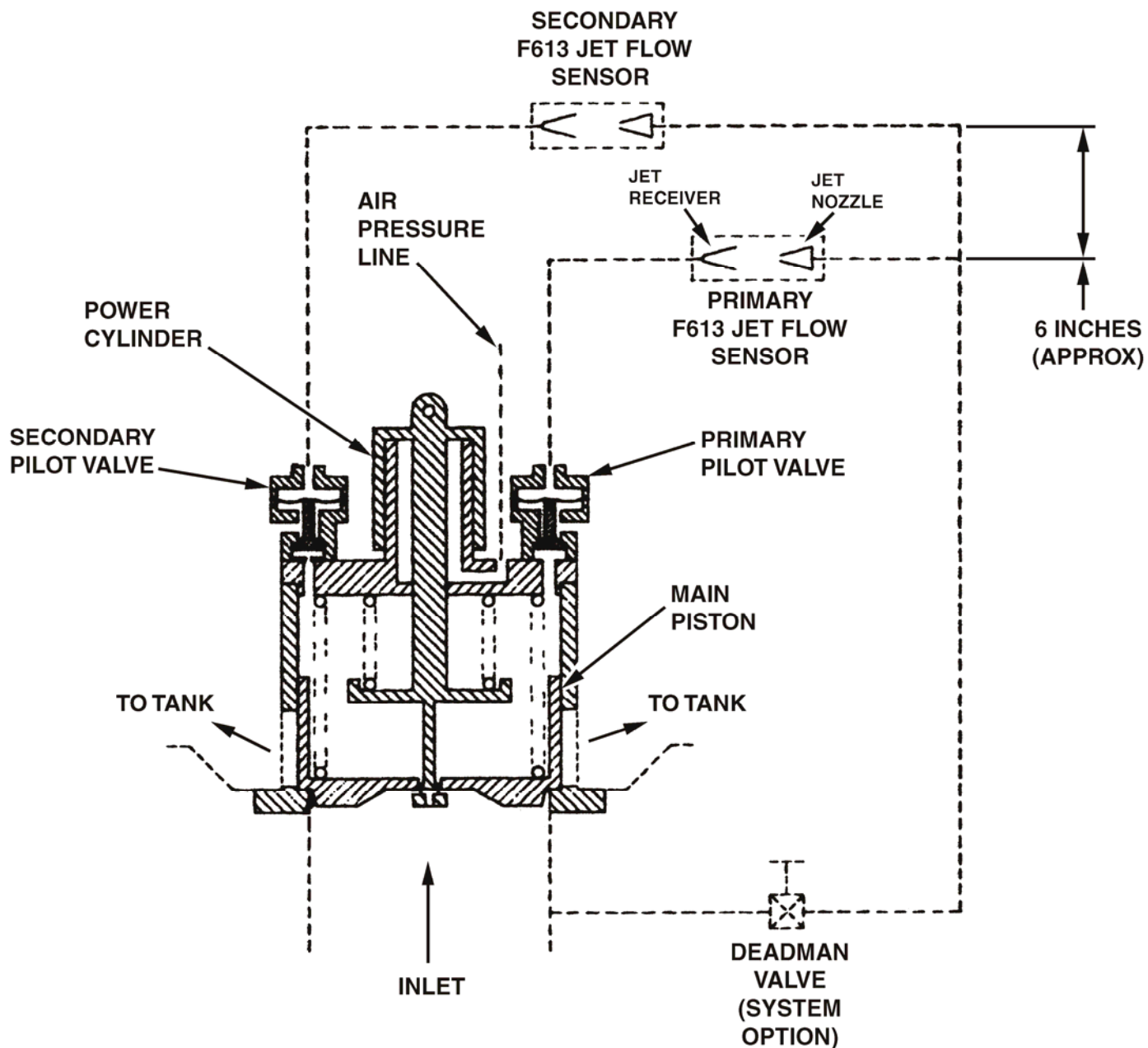


Figure 2. Flow Diagram

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3. Leading Particulars

For the leading particulars refer to [Table 1](#).

Table 1. Leading Particulars

Service Fluid	Automotive and Aviation Fuels
Operating Pressures:	
Loading	5 to 150 psig (34.47 to 1034.21 kPaG)
Off-Loading (Air Pressure)	50 to 150 psig (344.73 to 1034.21 kPaG)
Pressure Drop (approximate) (600 gpm):	
Loading	4.5 psig (31.02 kPaG)
Off-Loading	1.5 psig (10.34 kPaG)
Flow Rate (maximum)	600 gpm (37.85 l/sec)
Jet Sensor Flow Rate (approximate) (15 psi).....	0.5 gpm (0.031 l/sec)
Temperature:	
Ambient	-40 to 140°F (-40 to 60°C)
Fluid	-40 to 140°F (-40 to 60°C)
Weight (Basic Model) (Approximate).....	9.5 pounds (4.3 kg)
Dimensions.....	See Figure 3

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4. Model Variations

Refer to [Table 2](#) for the available F614 series valve variations. Refer to the **ILLUSTRATED PARTS LIST** section for additional details.

Table 2. Model Variations

MOD LETTER	DESCRIPTION
(Basic)	Manual or air operated valve (no pilot valves, for off-loading only)
A	Single Stage Pilot Control – Adds primary pilot valve for simple automatic shutoff
B	Dual Stage Pilot Control – Adds primary and secondary pilot valves for accurate automatic shutoff
C	Dual Service Pilot Control – Adds two primary pilot valves to control shutoff selectively at two different shutoff pressure levels
G	Adds stainless steel weld sump
L	Adds thread locking compound on metering pin

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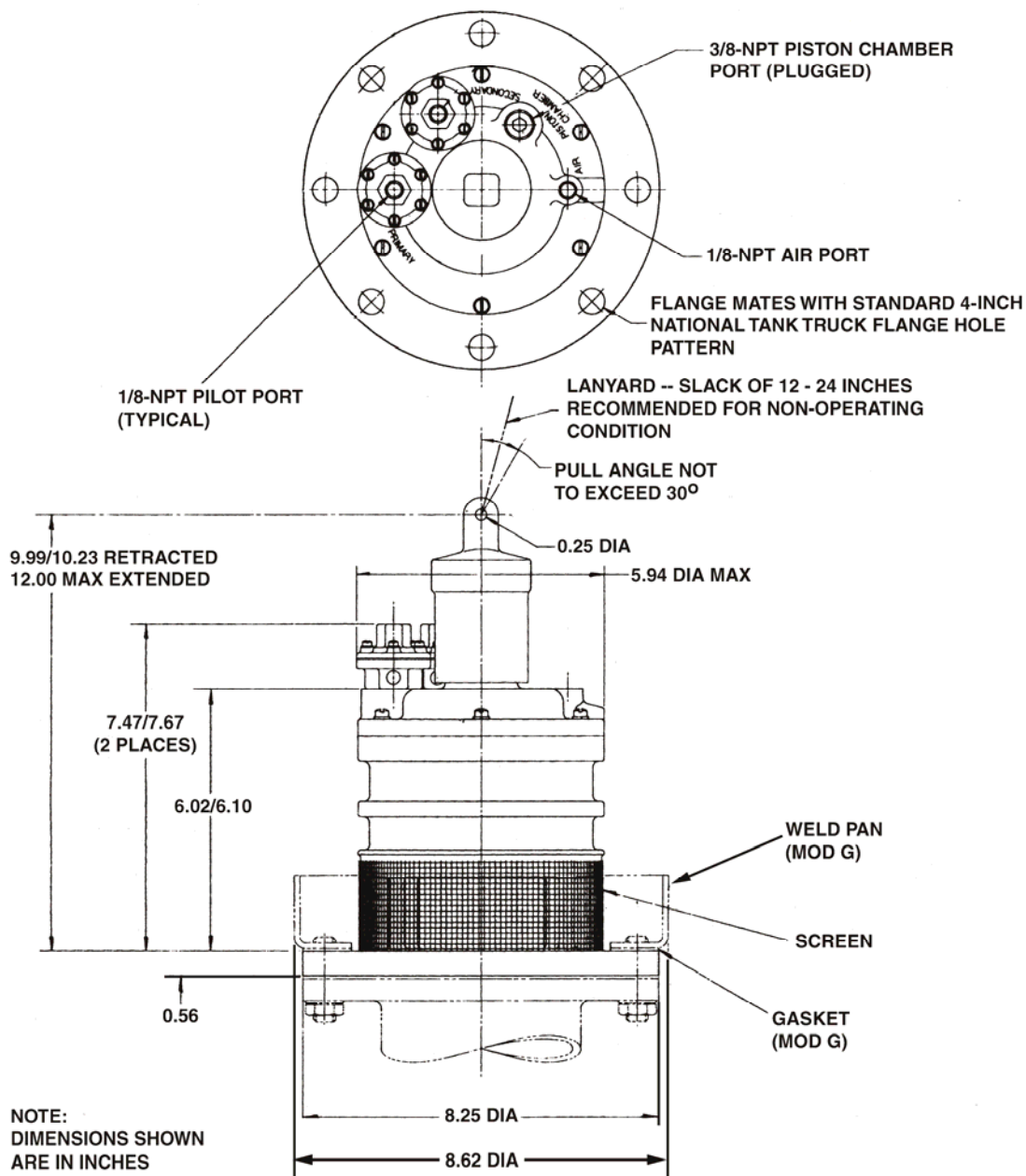


Figure 3. Valve Dimensions

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FAULT ISOLATION

1. General

This section contains fault isolation procedures for the valve. Operate the valve in accordance with the Operation section, if the valve fails to operate correctly refer to [Table 3](#) and select the applicable corrective action. [Table 3](#) identifies the Fault, Probable Cause and Corrective Action.

Table 3. Fault Isolation

FAULT	PROBABLE CAUSE	CORRECTIVE ACTION
BOTTOM FILLING OPERATION		
Valve will not open	Insufficient fuel pressure at pilot valve (IPL Figure 1, 40)	Check and correct the fuel pressure supply.
	Metering Rod (26) missing	Replace the metering rod.
Valve will not open and close	Jammed main piston (22) due to contamination	Overhaul the valve.
	Excessively worn or contaminated quad ring (5)	Replace the quad ring.
	Excessively worn or contaminated packing (8)	Replace the packing.
Valve will not close	Metering rod (26) missing	Replace the metering rod.
	Air pressure not completely exhausted	Check and correct the air pressure supply.
	Retaining ring (14) missing	Replace the retaining ring.

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Table 3. Fault Isolation – (cont.)

FAULT	PROBABLE CAUSE	CORRECTIVE ACTION
BOTTOM FILLING OPERATION		
Leakage when valve is closed NOTE: Leakage up to 20 cc/min is allowed.	Contaminated pilot valve (40)	Overhaul or replace the pilot valve.
	Excessively worn or contaminated quad ring (5)	Replace the quad ring.
	Excessively worn or contaminated packing (8)	Replace the packing.
	Excessively worn or contaminated main piston seat	Overhaul the valve.
Fuel in air system	Excessively worn or contaminated quad ring (5)	Replace the quad ring.
	Excessively worn or contaminated packing (8)	Replace the packing.
Air Leakage	Excessively worn or contaminated quad ring (5)	Replace the quad ring.
	Excessively worn or contaminated packing (8)	Replace the packing.
	Damaged plug (32)	Replace the plug.
OFF-LOADING OPERATION		
Valve will not open	Insufficient fuel pressure at pilot valve (40)	Check and correct the fuel pressure supply.
	Damaged (leaking) pilot valve diaphragm (IPL Figure 2, 4)	Overhaul or replace the pilot valve.

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Table 3. Fault Isolation – (cont.)

FAULT	PROBABLE CAUSE	CORRECTIVE ACTION
Valve will not open (continued)	Metering rod (IPL Figure 1, 26) missing	Replace the metering rod.
	Jammed main piston (22) due to contamination	Overhaul the valve.
Surging fuel flow	Insufficient air pressure in cover (2)	Check and correct the air pressure supply.
Valve will not close	Metering rod (26) incorrectly adjusted	Adjust the metering rod (refer to the ASSEMBLY section.)
	Jammed main piston (22) due to contamination	Overhaul the valve.
	Air pressure not completely exhausted	Check and correct the air pressure supply.
	Damaged (deformed) seal (21)	Replace the seal
	Damaged plug (32)	Replace the plug.
Internal Leakage	Damaged (deformed) seal (21)	Replace the seal.
	Damaged seat on main piston (22) or contamination of sealing surfaces	Overhaul the valve.

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DISASSEMBLY

1. Disassembly of the Valve (See [IPL Figure 1](#))

- A. Remove the plugs (31) or the pilot valve(s) (40). Remove the packing(s) (29). Refer to paragraph 2 for disassembly of the pilot valve(s) (40).
- B. Remove the metering rod (26).



USE CARE WHEN REMOVING THE SCREWS (24), A SPRING FORCE IS APPLIED TO THE CAP (4).

- C. Remove the screws (24), washers (25) and cap (4). Remove the packing (15) from the cap (4).
- D. Remove the piston (22) and spring (23) from the valve body (16). Remove the packing (20) and seal (21) from the valve body (16).
- E. Compress the spring (13) by pressing the outer spring retainer (11). Remove the retaining ring (14).

NOTE: The rod (1) and cover (2) are bonded together with adhesive and cannot be separated. If either part is damaged, both parts must be replaced.
- F. Pull the rod (1) and cover (2) out of the cap (4).
- G. Remove the quad ring (5) and felt strip (6) from the cap (4).
- H. Remove the screws (12), inner spring retainer (11), spring (10), washer (9), backup rings (7) and the packing (8) from the cap (4).
- I. Remove the nuts (19), screws (18) and screen (17) from the valve body (16).
- J. Remove the plug (32) from the valve body (16).

2. Disassembly of the Pilot Valve (See [IPL Figure 2](#))

- A. Remove the screws (1), washers (2) and cover (3) from the flange (7). Remove the diaphragm (4).
- B. Remove the retaining ring (8), washer (5), spring (6) and poppet (9) from the flange (7).

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CLEANING

1. Cleaning Materials

Refer to [Table 4](#) for recommended cleaning materials. Equivalent items may be used.

Table 4. Recommended Cleaning Materials

DESCRIPTION	SPECIFICATION	SOURCE
Alcohol, Isopropyl	ASTM D770	Commercially available
Bags, Plastic	-	Commercially available
Brush, Bristle, Stiff, Non-metallic	-	Commercially available
Pick, Teflon®	-	Commercially available
Solvent, Dry Cleaning	P-D-680, Type 2	Commercially available
Tissues, Lint-free	-	Commercially available

2. Cleaning Procedures



DRY CLEANING SOLVENT AND ISOPROPYL ALCOHOL ARE HAZARDOUS MATERIALS. BEFORE USE, READ AND OBEY THE MATERIAL SAFETY DATA SHEET (MSDS) INSTRUCTIONS FOR CORRECT HANDLING. FAILURE TO OBEY THIS WARNING MAY RESULT IN PERSONAL INJURY, LONG TERM HEALTH HAZARDS OR DEATH.

- A. Clean all of the metal parts by washing them thoroughly in dry cleaning solvent. Remove any stubborn deposits by scrubbing them with a non-metallic stiff bristle brush. Use a Teflon® pick to remove obstructions from the ports, the grooves, and the flow passages.
- B. Clean all of the non-metallic parts by wiping them with clean lint-free tissues slightly moistened with isopropyl alcohol.

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

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WEAR EYE PROTECTION WHEN USING COMPRESSED AIR. DO NOT DIRECT AIRSTREAM AT PERSONNEL OR LIGHT METAL PARTS.

- C. Dry the parts with clean lint-free tissues or clean, dry, compressed air.
- D. Package all of the clean parts in plastic bags.

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CHECK/INSPECTION

1. General

Under strong light and magnification, look at all parts in accordance with the general criteria specified in [Table 5](#).

Repair minor damage in accordance with instructions presented in the **REPAIR** section. If damage is major or beyond simple repair, replace the part.

2. Component Checks (Refer to [Table 5](#))

Table 5. Component Checks

DESCRIPTION	INSPECTION CRITERIA
General	Look at the parts for; nicks, cracks, cuts, burrs, corrosion, breaks, scoring, deformation, dents, thread damage, serration damage, or other damage.
	Make sure the ports, passages, recesses, and grooves are clean and are not blocked.
	Make sure all sealing and seating surfaces are free from damage or corrosion.
Main Piston (IPL Figure 1, 22)	Make sure there is no scoring on the outside diameters of the piston body, replace as necessary.
	Make sure the anodized surface does not show any bare metal, replace as necessary.
	Make sure the bonded seal in the seating face does not have any cuts, cracks or chips, replace as necessary.
Valve Body (16)	Make sure the main piston seating surface is free from any damage or corrosion, replace as necessary.

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ASSEMBLY

1. Replacement Parts Kits

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

2. Assembly Materials

Refer to [Table 6](#) for recommended assembly materials. Suitable equivalent materials may be substituted for the items listed.

Table 6. Recommended Assembly Materials

DESCRIPTION	SPECIFICATION	SOURCE
Adhesive	R313 or Epoxipatch 1C	Commercially available
Petroleum Jelly	-	Commercially available
Tape, PTFE (unsintered)	0.38 (±0.13) inch wide x 0.004 inch thick	Commercially available
Thread Sealant	Loctite, Grade 242	Commercially available

3. Pilot Valve Assembly

A. Lubrication

Before assembly, lightly lubricate the packings and the screw threads with petroleum jelly.

B. Assembly Procedure (See [IPL Figure 2](#))

1. Install the poppet (9), spring (6) and washer (5) in the flange (7). Secure with retaining ring (8).
2. Put the diaphragm (4) on the flange (7) with its cupped side down. Install the cover (3) and secure it with the screws (1) and the washers (2).

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4. Valve Assembly

A. Lubrication

Before assembly, lightly lubricate the seals, the packings and the screw threads with petroleum jelly.

B. Assembly Procedure (See [IPL Figure 1](#))

1. Wrap the screen (17) tightly around the valve body (16), approximately in the center of the window. Secure the screen with the screws (18) and the nuts (19). Slight bending of the screen wires is permitted to provide a good fit.
2. Install the packing (8), backup rings (7), washer (9), spring (10) and inner spring retainer (11) in the cap (4). Secure the parts by installing the screws (12).
3. Install the felt strip (6) and quad ring (5) in the grooves of the cap (4).

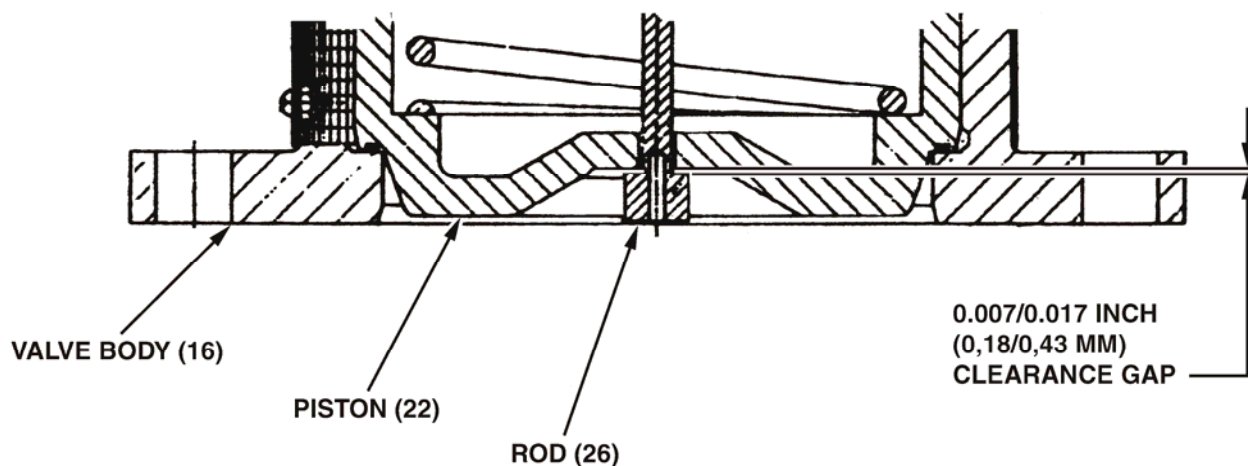
NOTE: The rod (1) and the cover (2) are bonded together with adhesive, they cannot be separated. If either part is damaged, both parts must be replaced.
4. Apply epoxy adhesive to the threads of the rod (1). Thread the rod into the cover (2) and tighten it securely. Allow sufficient time for the adhesive to cure.
5. Install the rod (1) with the cover (2) in the cap (4).
6. Position the spring (13) and the outer spring retainer (11) over the rod (1). Compress the spring (13) by pressing the spring retainer (11) and secure the parts by installing the retaining ring (14).
7. Install the packing (20) and the seal (21) on the valve body (16). Install the piston (22) and the spring (23) in the valve body (16).
8. Install the packing (15) in the cap (4). Install the cap (4) on the valve body (16) and secure it with the screws (24) and the washers (25).
9. Install the metering rod (26) to rod (1) and tighten it as necessary to meet the dimensional requirement shown in [Figure 4](#).
10. Install the packings (29) and pilot valve(s) (40) or plug(s) (31).

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11. Apply PTFE tape to the threads of the plug (32). Install the plug in the valve body (16) and tighten.



ADJUST THE ROD (26) TO PROVIDE THE CLEARANCE GAP SHOWN WHEN THE COVER (2) AND THE PISTON (22) ARE BOTTOMED OUT BY APPLYING 80 PSI AIR PRESSURE TO THE PILOT VALVE PORT. (AIR LEAKAGE AT THE ROD TO VALVE BODY INTERFACE IS ALLOWED.)

Figure 4. Adjusting the Rod

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ILLUSTRATED PARTS LIST

1. General

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

2. Scope of Information

The parts list is arranged in the general order of disassembly. 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.

A. 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.

B. How to Identify a Part

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 make sure of the physical appearance and location of the part.

When the part number is not known: Examine the illustrations to identify the part by physical appearance and location. Refer to the accompanying parts list to get the part number, nomenclature, modification codes, quantity, etc.

C. Abbreviations

ASSY	Assembly
FIG.	Figure
IPL	Illustrated Parts List
MOD	Modification
REF	Reference Item.

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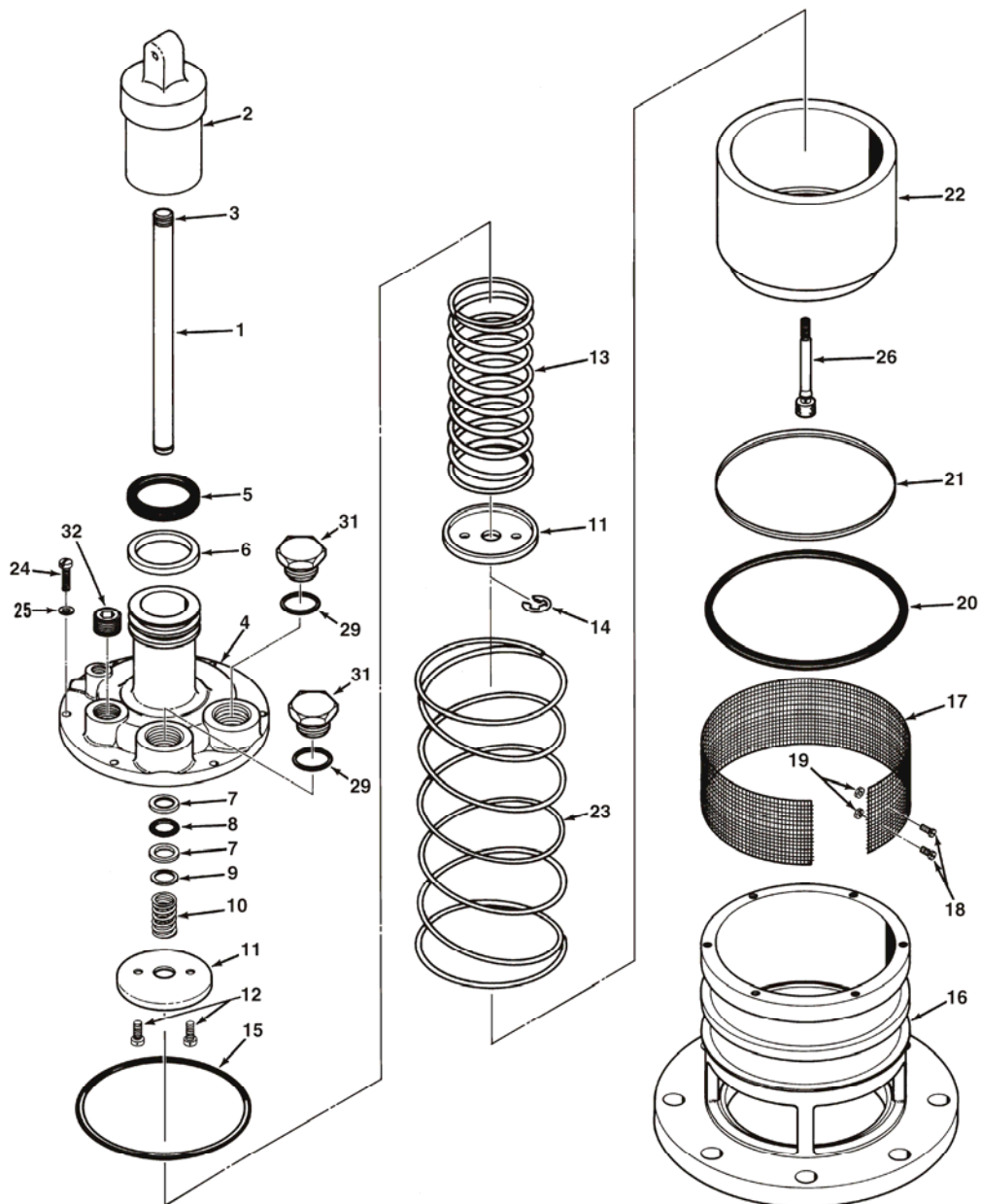
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Aerospace products | Thermal management solutions | Train control & control systems | Electro-mechanical products
Ground fuelling products | Energy products | Aftermarket services

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smart engineering for
extreme environments

Energy products

Meggitt Fuelling Products
Maintenance Manual (MMF614)
4-Inch Internal Valve – F614 Series



IPL Figure 1. 4-Inch Internal Valve (Sheet 1 of 2)

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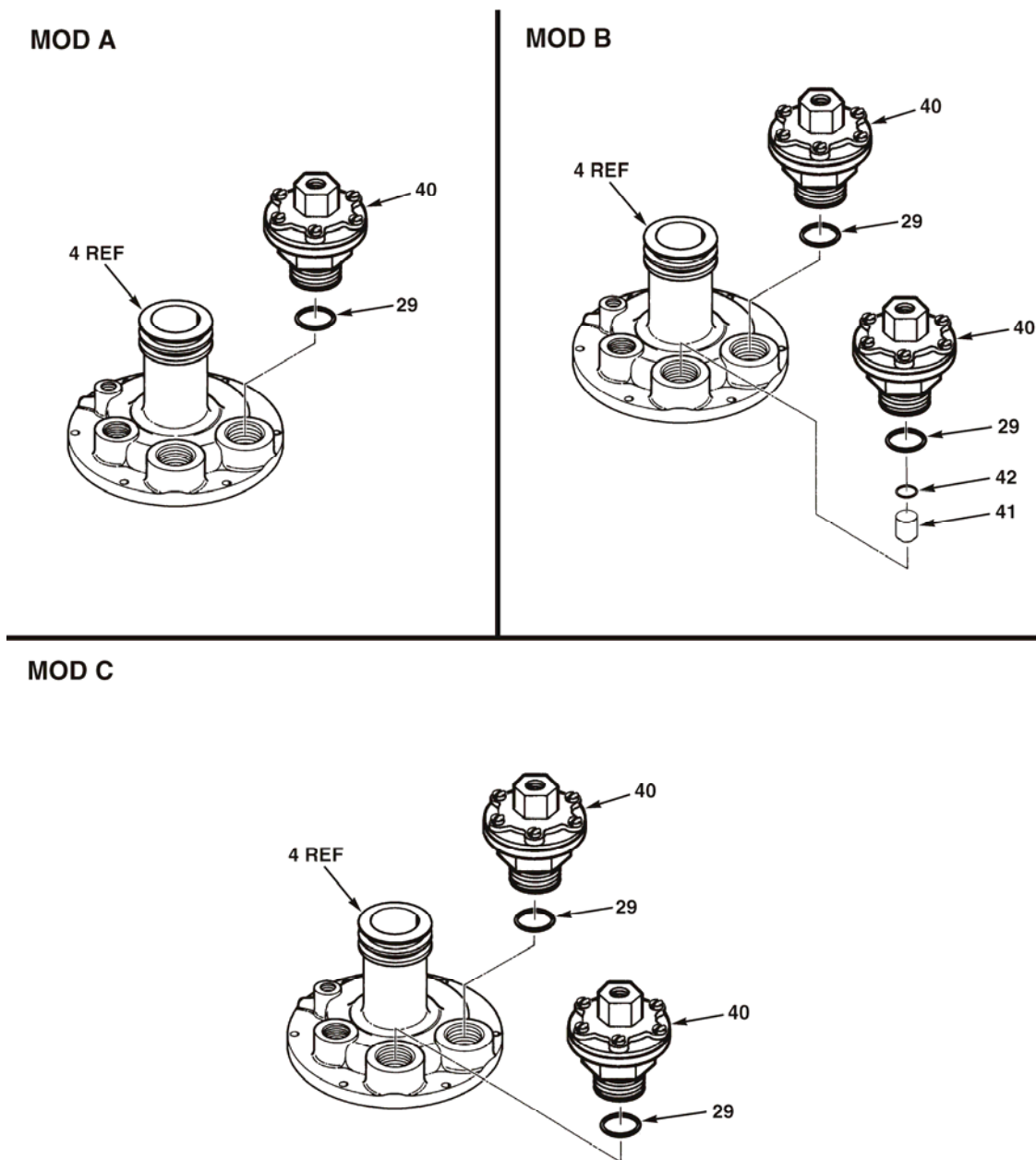
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Maintenance Manual (MMF614)
4-Inch Internal Valve – F614 Series



IPL Figure 1. 4-Inch Internal Valve (Sheet 2)

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Meggitt Fuelling Products Maintenance Manual (MMF614) 4-Inch Internal Valve – F614 Series

FIG. ITEM	PART NUMBER	DESCRIPTION	MOD CODES	UNITS PER ASSY
4-INCH INTERNAL VALVE ASSEMBLY				
1	F614	VALVE ASSEMBLY, INTERNAL, 4-INCH		REF
1	2681180	. ROD.....		1
2	2681181	. COVER.....		1
4	2681183-1	. CAP		1
5	Q4325-366Y	. RING, QUAD		1
6	CMS28932C05-05	. STRIP, FELT		1
7	2681184	. RING, BACKUP.....		2
8	2661058BD206	. PACKING, PREFORMED		1
9	2681186	. WASHER, FLAT.....		1
10	2681187	. SPRING, COMPRESSION.....		1
11	2681188	. RETAINER		2
12	LP500AC10-8	. SCREW, SELF-LOCKING.....		2
13	2681189	. SPRING, COMPRESSION.....		1
14	CMS16633-4050	. RING, RETAINING		1
15	2661058A157	. PACKING, PREFORMED		1
16	2641407	. BODY, VALVE.....		1
17	2641414-1	. SCREEN.....		1
18	CAN515C4-5	. SCREW, MACHINE		2
19	CMS21042-04	. NUT, SELF-LOCKING.....		2
20	2661058A248	. PACKING, PREFORMED		1
21	4631062-248	. SEAL		1
22	2641403	. PISTON, MAIN		1
23	2661177	. SPRING, COMPRESSION.....		1
24	CMS35275-265	. SCREW, MACHINE		6
25	CMS35338-138	. WASHER, LOCK.....		6
	CAN935-10	. WASHER, LOCK.....		6
26	2681190-1	. ROD, METERING		1

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Meggitt Fuelling Products Maintenance Manual (MMF614) 4-Inch Internal Valve – F614 Series

FIG. ITEM	PART NUMBER	DESCRIPTION							MOD CODES	UNITS PER ASSY
		1	2	3	4	5	6	7		
1										
29	CMS29512-10	.								2
31	CAN814-10D	.								2
32	CAN932-4S	.								1
40	2681193	.							A,B,C	1
41	2681192-1	.							B	1
42	2661058A114	.							B	1
- 45	CMS51031-155	.							G	1
- 46	2753349-101	.							G	1
- 47	2753351-101	.							G	1

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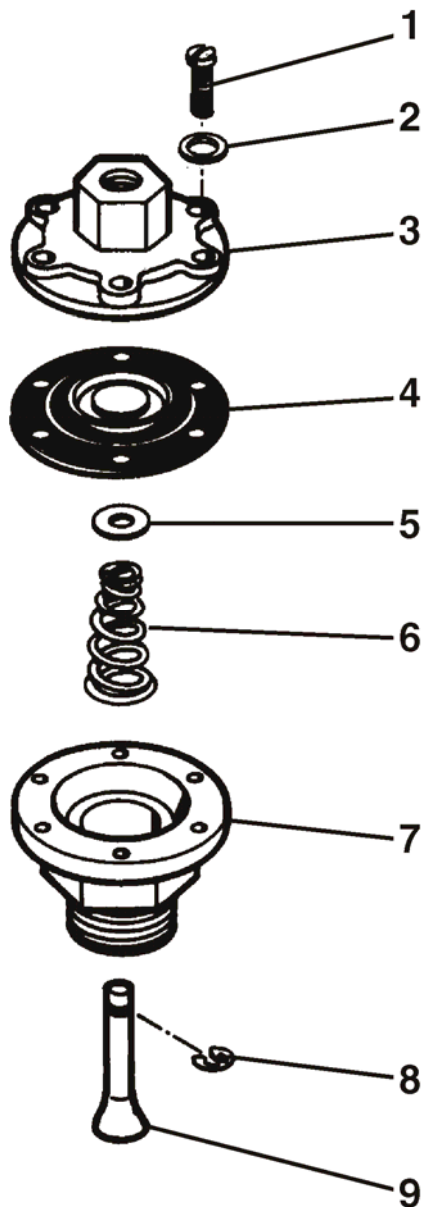
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Ground fuelling products | Energy products | Aftermarket services

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Meggitt Fuelling Products Maintenance Manual (MMF614) 4-Inch Internal Valve – F614 Series



IPL Figure 2. Pilot Valve

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Ground fueling products | Energy products | Aftermarket services

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Meggitt Fuelling Products Maintenance Manual (MMF614) 4-Inch Internal Valve – F614 Series

FIG. ITEM	PART NUMBER	DESCRIPTION							MOD CODES	UNITS PER ASSY
		1	2	3	4	5	6	7		
PILOT VALVE ASSEMBLY										
2	2681193	VALVE ASSEMBLY, PILOT							A,B,C	REF
1	LP35275-230	. SCREW, SELF-LOCKING								6
2	CNAS620C6	. WASHER, FLAT								6
3	2681197	. COVER.....								1
4	2633219	. DIAPHRAGM								1
5	CAN960C10L	. WASHER, FLAT.....								1
6	2681196	. SPRING, COMPRESSION								1
7	2681194	. FLANGE								1
8	CMS16633-4018	. RING, RETAINING.....								1
9	2813374-101	. POPPET.....								1

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OVERHAUL PARTS KIT AVAILABLE	
KIT PART NUMBER	ITEMS IN KIT (IPL Figure 1)
2701191-2	IPL Figure 1, 5, 6, 8, 14, 20, 21 and 29 and IPL Figure 2, 4

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