



Meggitt Fuelling Products

Avery-Hardoll
Whittaker Controls

Hose end unit HUMY4000 M2 series

Maintenance manual with spare parts list

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AMENDMENT RECORD

AMENDMENT/ ISSUE NO.	CHAPTER/ PAGE	REASON	DATE

Avery-Hardoll

It is the aim of Avery-Hardoll to maintain a policy of continuous progress and for this reason reserve the right to modify specifications without notice. This manual provides the information required to install, service and overhaul the equipment. Although every effort has been made to ensure absolute accuracy, Avery-Hardoll does not hold itself responsible for any inaccuracies that may be found.

HEALTH AND SAFETY AT WORK ACT 1974

REFERENCE: CHAPTER 37, PART 1, SECTION 6

Avery-Hardoll take every care to ensure that, in accordance with the above Act, our products, as far as is reasonably practical in an industrial environment, are when operated and maintained in accordance with the appropriate manual, safe without risk to health.

PRODUCT SAFETY

In the interest of safety it is strongly recommended by Avery-Hardoll that the following details receive strict attention.

For the Purpose of Definition, the word PRODUCT applies to any product sold by Avery-Hardoll.

- 1 The Product is used only with fluids stated as acceptable by Avery-Hardoll.
- 2 The Product, whilst in service, must not be subjected to pressures greater than the Maximum Working Pressure or tested to pressures greater than the Test Pressure as specified in the manual.
- 3 The Product must only be coupled/connected to equipment considered acceptable by Avery-Hardoll.
- 4 The Product must be handled using the lifting handles where fitted, or in accordance with the manual.
- 5 The Product must not be misused or handled in any way liable to cause damage.
- 6 The Product must be inspected for any signs of damage prior to use e.g. cracks, damaged seals, seized or tight operating mechanisms.
- 7 The Product must be subjected to a regular maintenance programme, either in accordance with the manual or as agreed with Avery-Hardoll.
- 8 Only technically competent personnel should repair or maintain the Product and only parts supplied by Avery-Hardoll may be used.
- 9 Products covered by warranty may not be modified in any way without prior written permission of Avery-Hardoll.
- 10 Products not in service, must be stored in a clean area, and should not be subjected to excessive temperature, humidity, sunlight, or strong artificial light. Products should be protected to prevent damage or the ingress of foreign matter.
- 11 Where applicable, attention should be drawn to dangers resulting from the generation of static electricity in product flow lines. We strongly recommend account is taken of BS5958 parts 1 and 2.
- 12 This equipment is not suitable for use with Liquid Petroleum Gas (L.P.G).

WARNINGS

DO NOT HANDLE O-RING SEALS IF THEIR MATERIAL APPEARS CHARRED, GUMMY OR STICKY. USE TWEEZERS AND WEAR NEOPRENE OR PVC GLOVES. DO NOT TOUCH ADJACENT PARTS WITH UNPROTECTED HANDS. NEUTRALIZE ADJACENT PARTS WITH A SOLUTION OF CALCIUM HYDROXIDE. IF THE DEGRADED MATERIAL OR ADJACENT PARTS TOUCH THE SKIN, DO NOT WASH OFF WITH WATER; SEEK IMMEDIATE MEDICAL AID FOR POSSIBLE CONTAMINATION WITH HYDROFLUORIC ACID. HYDROFLUORIC ACID IN CONTACT WITH SKIN HAS DELAYED SYMPTOMS OF CONTAMINATION. IT IS EXTREMELY TOXIC.

DO NOT EXCEED PRESSURES AND TEMPERATURES QUOTED OR SERIOUS INJURY AND COMPONENT FAILURE MAY OCCUR.

PRIOR TO OPERATING THE HOSE UNIT, ENSURE THAT ALL AIRPORT/LOCAL PROCEDURES HAVE BEEN COMPLIED WITH.

NEVER USE THE OPERATING LEVER TO START OR STOP FUEL FLOW.

NO SOLVENTS, CLEANING AGENTS, GREASES OR OTHER MATERIALS ARE TO BE USED ON INTERNAL SURFACES IN CONTACT WITH FUEL. CLEANING IS TO BE CARRIED OUT USING CLEAN AVIATION FUEL ONLY.

WORK MUST BE CARRIED OUT ONLY BY SUITABLY QUALIFIED PERSONNEL.

PRIOR TO COMMENCING WORK, ENSURE THAT ALL AIRPORT/COMPANY SAFETY PROCEDURES HAVE BEEN COMPLIED WITH.

WHEN BEING USED DURING PRESSURE ASSISTED DE-FUELING OPERATIONS, HOSE END PRESSURE CONTROL DEVICES MUST BE MADE INOPERATIVE BY USING AN APPROVED LOCKOUT DEVICE.

CONTENTS

Preliminary material

Title page
Amendment record
Health and safety at work act
Product safety
Warnings
Contents (this page)

Chapters

- 1 Introduction
- 2 Technical description
- 3 Specifications
- 4 Operation
- 5 Servicing
- 6 Testing
- 7 Fault finding
- 8 Spares

Chapter 1

INTRODUCTION**1 GENERAL**

- 1.1 The HUMY4000M2 series Hose Unit is a 2.5 inch lever operated aircraft refuelling nozzle, designed for underwing connection. In certain builds the hose unit may also be used for ground connections such as loading of refuellers or in conjunction with a 2.5 inch hydrant system. The unit is for use with aviation kerosenes or gasolenes only. Consult Meggitt Fuelling Products, Avery-Hardoll for applications with other liquids.
- 1.2 The hose unit components are modular and a number of optional add-on units are available. Technical descriptions, maintenance and overhaul procedures for these units are included in the following Chapters.

NOTE:

The strainers used in the adaptors (Chap 2) are designed for use in refuelling operations, where fuel is discharged from the nozzle. Strainers **MUST NOT** be used in conjunction with ground units or defuelling operations.

- 1.3 When used in conjunction with a pit valve, at a hydrant pressure in excess of 5.5 bar (80 psi), a pressure equalised opening is necessary on the pit valve.

2 UNIT IDENTIFICATION

- 2.1 The HUMY4000M2 series hose end units can be supplied with optional units and ancillaries to suit particular applications. The following coding sheet lists these and the identifying code numbers from which the relevant fit can be identified.

Chapter 2

TECHNICAL DESCRIPTION

CONTENTS

Para			
1	Nozzle		
2	Surge Controller		
3	Adaptors		
4	Flight Refuelling Adaptor		
6	Selective Sleeve		
7	Hose connectors		
Fig			Page
2.1	Typical hose end unit		1

1 NOZZLE

- 1.1 The nozzle comprises a cast aluminium alloy body with an aluminum bronze nose ring and internal lever operated mechanism for attachment to an aircraft or ground unit, providing a safe interlock. The nose ring has six slots for easy connection to the aircraft adaptor.
- 1.2 The operating handle, through a crank and link, opens and closes the poppet valve which is used to seal the hose between refuelling operations. The operating mechanism has an over centre action to prevent the valve being opened or closed by fuel pressure.
- 1.3 The bayonet coupling and poppet valve are mechanically interlocked, by means of the index ring, to ensure that the valve cannot be opened unless the unit is coupled to an aircraft or ground unit. The unit cannot then be uncoupled with the valve open.

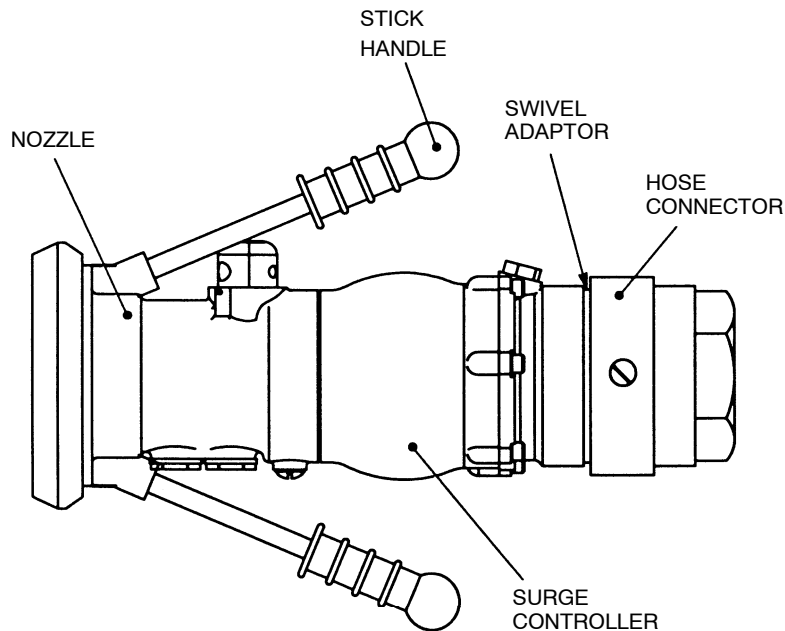


Fig 2.1 Typical hose end unit

- 1.4 Handles are fitted to the unit for ease of coupling. These may be stick handles (standard) as illustrated, stirrup handles or a ring handle. An optional bonding wire sub-assembly may be screwed into the handle mounts. A rubber buffer is fitted for protection.

2 SURGE CONTROLLER

- 2.1 The surge controller provides pressure regulation to the system, eliminating surge pressures downstream and preventing refuelling pressures exceeding a pre-determined limits.
- 2.2 The unit comprises an anodised cast aluminium body, incorporating a plate valve, piston and piston guide/adaptor. The unit is swivel joint coupled to the nozzle and the appropriate adaptor.
- 2.3 The piston is mounted on the piston guide/adaptor which is then bolted onto the controller body. A stainless steel spring holds the piston in the open position allowing unrestricted flow of fuel through the controller.
- 2.4 The piston and piston guide/adaptor combine to form two chambers within the body. The outer chamber is open to fuel pressure above and below the piston through ports in the piston crown and drillings in the plate valve which equalise pressures above and below the piston. The inner chamber, containing the stainless steel spring is open to atmospheric pressure via the vent port so the piston is held open by spring pressure until the system pressure overcomes the force exerted by the spring. Springs can be selected to operate at 30, 45, 50 and 55 psi depending on system requirements.
- 2.5 When the fuel pressure in the system exceeds the spring pressure the piston will start to close and will continue to close until the fuel pressure on the downstream side of the piston drops to the required value. The piston will then be held in balance in a semi-open position and will regulated in response to changes in downstream pressure. As downstream pressure drops the piston will open until a balance is restored.
- 2.6 The piston is provided with a damping device to ensure flow stability and give smooth opening of the valve. This device consists of a spring loaded plate valve attached to the piston, allowing fast flow in one direction and slow flow in the other, in and out of the chamber below the piston. It thus gives fast closure of the piston, but slow opening.
- 2.7 If the piston is held in the fully closed 'lock up' condition, fuel pressure in the outer chamber will be released through the non-return check valve as the inlet fuel pressure decreases.

3 SWIVEL ADAPTORS

- 3.1 The swivel adaptors enable the hose end unit to swivel whilst attached to a refuelling hose.
- 3.2 The straight adaptor is of anodised aluminium alloy, with ball tracks at each end to enable attachment to the nozzle or surge controller and the appropriate hose connector. The hose connector end of the unit houses an optional mesh strainer, which is secured by a clip.
- 3.3 The 90° elbow adaptor attached to the nozzle, surge controller and hose connector in exactly the same way as the straight adaptor. The 90° elbow however, is not fitted with a strainer.

4 FLIGHT REFUELLING ADAPTOR

- 4.1 An anodised cast aluminium alloy adaptor, similar in construction to the straight swivel adaptor described in Para 3.2 gives compatibility with a Flight Refuelling Quick Disconnect Unit. The profile of the adaptor is shaped to allow this.

5 SELECTIVE SLEEVE

- 5.1 To ensure that a hose is used for one grade of fuel only, a selective sleeve may be fitted to the nozzle. Two types of sleeve allow five selective positions to be chosen, depending on the sleeve fitted and its position. The sleeves are used in conjunction with selective ground units.
- 5.2 The anodised aluminium sleeve, fitted with selective pins, is fitted over the nozzle nose ring after removal of the buffer, and held in place by three screws into the nozzle. A buffer fits over the sleeve and a dust cap covers the open end.
- 5.3 Alternative screw positions are given in the selectivity sleeve, each marked with a number (1, 2 or 3 for one sleeve type and 4 or 5 for the other). The three attachment screws are inserted through the holes determined by the selective position required.

NOTE:

Non-selective hose units will fit all ground units, selective or non-selective. Selective hose units will only fit ground units with their corresponding selectivity.

6 HOSE CONNECTORS

- 6.1 The anodised aluminium alloy hose connectors are machined with either a BSP or NPT female thread for attachment to the appropriate threaded hose end. The hose connector is attached to the relevant adaptor by a swivel coupling, comprising stainless steel balls which run on ball tracks. Two wear strips are used and an O-ring provides a pressure tight seal.
- 6.2 Various types of hose connector are available, e.g. swivel, quick disconnect, lightweight quick disconnect, and quick disconnect isolating valve, with either push button or screw locking. Details of where these may be used can be found in the coding sheet in Chap 1.

Chapter 3

SPECIFICATION

WARNING

DO NOT EXCEED PRESSURES AND TEMPERATURES QUOTED IN THIS CHAPTER OR SERIOUS INJURY AND COMPONENT FAILURE MAY OCCUR.

1 STANDARDS

1.1 The hose unit and associated ancillaries mate to adaptors built to comply with the following standards:

- British Standard Aerospace Specification - 4C14
- International Standards Organisation, recommendation 45
- NATO Standardisation Agreement - STANAG 3105.

2 MATERIALS

2.1 Components in contact with fuel are manufactured from the following materials:

- Anodised aluminium alloy
- Stainless Steel
- PTFE
- High nitrile and fluorocarbon rubbers

3 OPERATING ENVIRONMENT

3.1 The following units and ancillaries are operational under the following conditions:

- Test pressure gauge 15.5 bar (225 psi)
- Maximum safe working pressure (gauge) 10.3 bar (150 psi)
- Vacuum test 0.96 bar (28 in.Hg)
- Operating temperature -20 to +60 deg C (-4 to +140 deg F)

4 STORAGE LIFE

4.1 Storage life of units is three years, limited by deterioration of seals and O-rings only.

5 DIMENSIONS

5.1 The dimensions of a standard unit comprising nozzle surge controller and quick disconnect and fitted with stick handles is as follows:

- Length 370 mm (14.6 in.)
- Weight 5.3 kg (11.6 lb)

Chapter 4

OPERATION**CONTENTS**

Para

- 1 Connection
- 2 Disconnection
- 3 Lightweight quick disconnect operation
- 4 Quick disconnect operation
- 6 Maintenance

WARNING

PRIOR TO OPERATING THE HOSE UNIT, ENSURE THAT ALL AIRPORT/LOCAL PROCEDURES HAVE BEEN COMPLIED WITH.

NEVER USE THE NOZZLE OPERATING LEVER TO START OR STOP FUEL FLOW.

1 CONNECTION

- 1.1 In accordance with airport fuelling operating instructions 'Ground' or 'Earth' the hose unit to the aircraft or pit valve using the clip or plug on the bonding wire assembly, or locally provided alternative.
- 1.2 Ensure that the sleeve is locked if a quick disconnect swivel connector is used.
- 1.3 Ensure that the quick disconnect isolating valve operating lever is in the 'OPEN' position if the isolating valve is used.
- 1.4 Remove dust cap from unit (if fitted).
- 1.5 Offer up the hose unit to the aircraft unit, adaptor, or ground unit as applicable. Engage the bayonet lugs and turn the unit clockwise until it stops (approximately 28°).
- 1.6 Open the hose unit by turning the nozzle operating lever counter clockwise through 210°.
- 1.7 With all connections made, start fuel flow.

2 DISCONNECTION

- 2.1 Stop fuel flow.
- 2.2 To close the hose unit turn the nozzle operating lever clockwise through 210°.
- 2.3 Disconnect the hose unit by rotating it counter clockwise and withdrawing it from the applicable equipment.
- 2.4 Disconnect the earthing/bonding arrangement.
- 2.5 Replace all dust caps and replace hose unit in vehicle stowage position.

3 LIGHTWEIGHT QUICK DISCONNECT OPERATION

- 3.1 Depressurise and if necessary drain the hose.
- 3.2 Remove and discard the locking wire and slacken the two locking screws.

- 3.3 Move the slide retaining ring to the rear park position.
- 3.4 Pull back the sleeve, pull and twist the hose connector away from the adaptor.

4 QUICK DISCONNECT OPERATION

- 4.1 Depressurise and if necessary drain the hose.
- 4.2 Remove the locking clip from the hose connector.
- 4.3 Depress the two spring loaded catches on the quick disconnect sleeve, pull back on and hold the sleeve, then pull and twist the hose connector away from the flanged adaptor.

5 If a quick disconnect isolating valve fitted proceed as follows:

- 5.1 Depressurise and if necessary drain the hose.
- 5.2 Depress the press button or withdraw the locking screw on the isolating valve operating lever and close the valve by turning the lever clockwise 90°.
- 5.3 Pull back on and hold the spring loaded sleeve, pull and twist the hose connector away from the flanged adaptor.

6 MAINTENANCE

WARNING

NO SOLVENTS, CLEANING AGENTS, GREASES OR OTHER MATERIALS ARE TO BE USED ON INTERNAL SURFACES IN CONTACT WITH FUEL. CLEANING IS TO BE CARRIED OUT USING CLEAN AVIATION FUEL ONLY.

6.1 Daily

Before each refuelling operation, carefully inspect all components for damage, particular attention must be paid to mating faces. Damaged units must be withdrawn from service for overhaul as described in Chapter 5.

6.2 Weekly

Inspect all strainers and wash with clean aviation kerosene or gasolene. When removing the strainer fitted to an adaptor, hang the end of the hose unit downwards to prevent particles caught in the strainer mesh falling back into the hose.

6.3 Six monthly

Carry out electrical bonding checks as described in Chapter 6 Para 2.

Carry out dynamic testing as described in Chapter 6 Para 6.

6.4 Annually

Renew all seals follow the procedures laid down in Chapter 5.

NOTE:

The above maintenance frequencies are the minimum recommended but local company instructions must be observed.

Chapter 5
SERVICING
CONTENTS

Para

1	General
2	Nozzle unit
3	Surge controller
4	Standard swivel adaptors
5	90° Elbow Adaptor
6	Flight Refuelling swivel adaptor
7	Standard swivel hose connector
8	Lightweight quick disconnect hose connector
9	Quick disconnect isolating valve hose connectors
10	Quick disconnect hose connector
11	Selective sleeve

Fig		Page
5.1	Nozzle assembly	2
5.2	Surge controller	6
5.3	Standard swivel adaptors	8
5.4	Flight Refuelling swivel adaptor	11
5.5	Swivel hose connector	13
5.6	Lightweight disconnect isolating valve hose connectors	15
5.7	Quick disconnect isolating valve hose connector	17
5.8	Quick disconnect hose connector	20
5.9	Selective sleeve	22

1 GENERAL

WARNING

DO NOT HANDLE O-RING SEALS IF THEIR MATERIAL APPEARS CHARRED, GUMMY OT STICKY. USE TWEEZERS AND WEAR NEOPRENE OR PVC GLOVES. DO NOT TOUCH ADJACENT PARTS WITH UNPROTECTED HANDS. NEUTRALIZE ADJACENT PARTS WITH A SOLUTION OF CALCIUM, HYDROXIDE. IF THE DEGRADED MATERIAL OR ADJACENT PARTS TOUCH THE SKIN, DO NOT WASH OFF WITH WATER, SEEK IMMEDIATE MEDICAL AID FOR POSSIBLE CONTAMINATION WITH HYDROFLUORIC ACID. HYDROFLUORIC ACID IN CONTACT WITH SKIN HAS DELAYED SYMPTOMS OF CONTAMINATION. IT IS EXTREMELY TOXIC.

WORK MUST BE CARRIED OUT ONLY BY SUITABLY QUALIFIED PERSONNEL.

PRIOR TO COMMENCING WORK, ENSURE THAT ALL AIRPORT/COMPANY SAFETY PROCEDURES HAVE BEEN COMPLIED WITH.

- 1.1 Before dismantling any unit ensure that all special tools, materials and replacement parts are available. Only Avery Hardoll brand supplied parts and special tools are to be used.
- 1.2 On completion of overhaul, units are to be tested as detailed in Chapter 6.
- 1.3 In the following text, the Item No. in brackets refers to the relevant Item in Table 5.1.

NOTE:

The strainers used in the adaptors (Chap 2) are designed for use in refuelling operations, where fuel is discharged from the nozzle. Strainers **MUST NOT** be used in conjunction with ground units or defuelling operations.

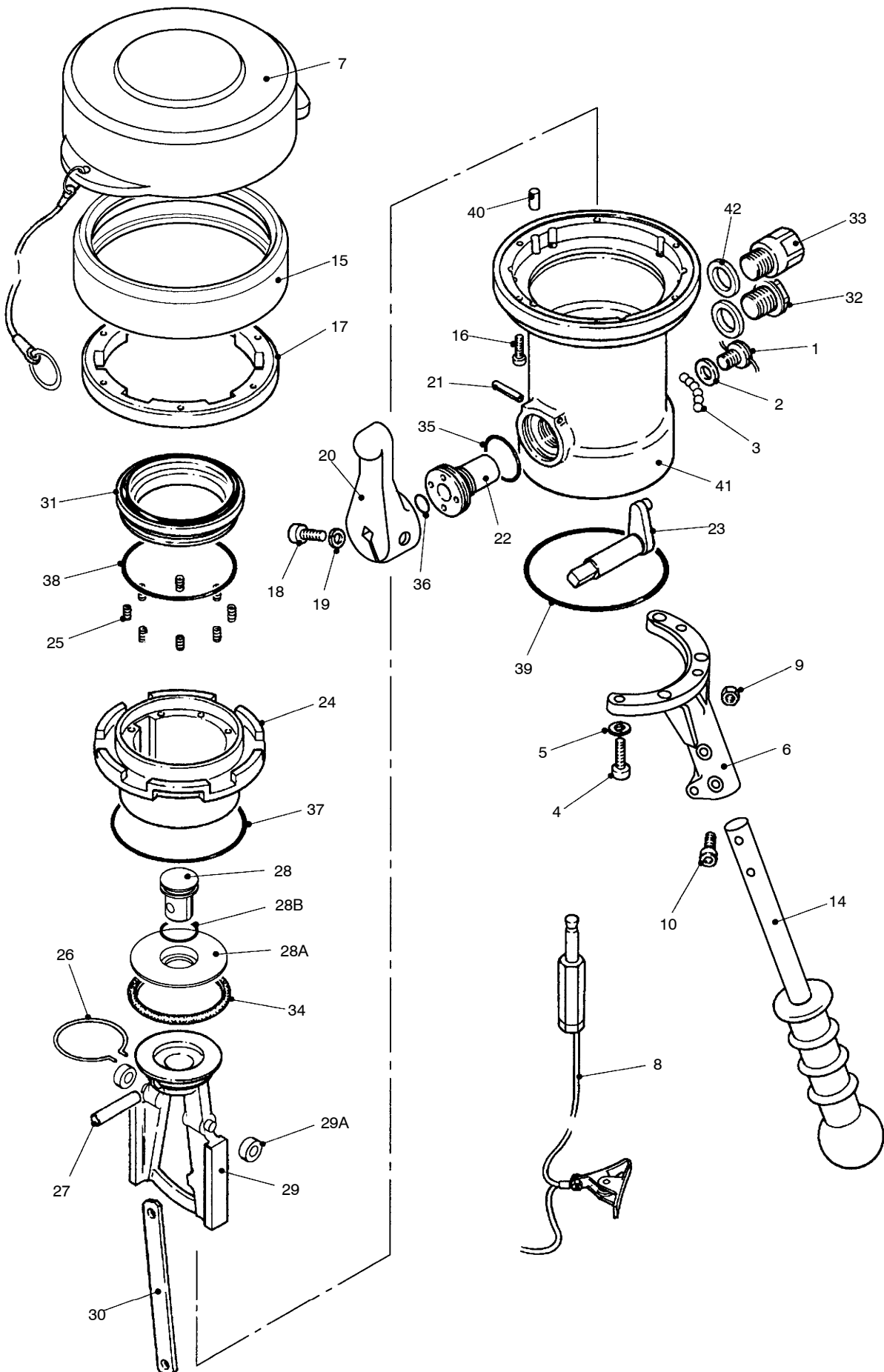


Fig 5.1 Nozzle Assembly

TABLE 5.1 - SPECIAL TOOLS AND MATERIALS

ITEM	PART NUMBER	DESCRIPTION
1	TASZ5065	Coupling tool
2	TAMS5092	Pin spanner
3	TASS5093	Ball track assembler
4	RMCR920	Locking wire
5	ZMLZ0230-13	Loctite 222 (ALT PN 992-4-05242-000)
6	BDH29442-4B	Paraffin wax, soft

2 NOZZLE UNIT (Fig 5.1)

2.1 Poppet maintenance

- 2.1.1 If the poppet seal (34), poppet seal O-ring (37) or poppet pin O-ring (28B) only require renewal, do not dismantle the nozzle completely but proceed as follows. For more detailed maintenance, follow the procedures as described in Para 2.6 to 2.8 inclusive.

2.2 Partial dismantling of nozzle

WARNING

DO NOT HANDLE O-RING SEALS (35, 36, 38, 39) IF THEIR MATERIAL APPEARS CHARRED, GUMMY OR STICKY. USE TWEEZERS AND WEAR NEOPRENE OR PVC GLOVES. DO NOT TOUCH ADJACENT PARTS WITH UNPROTECTED HANDS. NEUTRALIZE ADJACENT PARTS WITH A SOLUTION OF CALCIUM, HYDROXIDE. IF THE DEGRADED MATERIAL OR ADJACENT PARTS TOUCH THE SKIN, DO NOT WASH OFF WITH WATER, SEEK IMMEDIATE MEDICAL AID FOR POSSIBLE CONTAMINATION WITH HYDROFLUORIC ACID. HYDROFLUORIC ACID IN CONTACT WITH SKIN HAS DELAYED SYMPTOMS OF CONTAMINATION. IT IS EXTREMELY TOXIC.

- 2.2.1 Drain down the hose.
- 2.2.2 Remove dust cap (7) (if fitted).
- 2.2.3 Prise off the buffer (15).
- 2.2.4 Remove and discard the lip seal (39).
- 2.2.5 Fit coupling tool (Item 1) and rotate index ring (24) to the OPEN position.
- 2.2.6 Turn the nozzle operating lever to open plate (29).
- 2.2.7 Carefully prise open circlip (26) and lower it clear of gudgeon pin (27). **Do not overstress circlip.**
- 2.2.8 Push out the gudgeon pin and remove plate (29), poppet pin (28), O-ring (28B), poppet plate (28A) and seal (34). Remove and discard the poppet seal (34) and O-ring (28B).
- 2.2.9 Close the operating lever and remove the coupling tool.
- 2.2.10 Carefully remove nose seal (31) complete with O-ring seal (38). Retain eight springs (25). Remove O-ring from poppet seat.

2.3 Cleaning and Inspection

- 2.3.1 Clean all metal components using a lint free cloth moistened with the relevant aviation fuel. Ensure that residues of seal and O-ring material are removed from grooves and sealing faces.
- 2.3.2 Examine parts for damage or wear. Renew any defective parts and all used seals and O-rings. Refer to spares list for replacement parts.

2.4 Assembly

- 2.4.1 Assemble the parts in the reverse order of dismantling and note the following:
 - (a) Lubricate the lip seal, poppet seal and the O-ring seals with clean fuel before fitting.
 - (b) Take care not to dislodge the springs when assembling the coupling tool to the index ring.
 - (c) Make sure the open ends of the circlip are at 90 degrees to the axis of the gudgeon pin.
 - (d) Ensure the valve is fully closed before removing the coupling tool.
 - (e) Install dust cap (if removed).

2.5 Testing

- 2.5.1 Apply pressure to the hose unit and check integrity of seals and O-rings.

2.6 Complete dismantling of nozzle

- 2.6.1 Carefully drain down the hose. Unscrew the hose connector and remove the hose unit complete with hose connector seal.
- 2.6.2 Remove ball retaining screw (1) and bonded washer (2). Remove steel balls (3) into a suitable container. Separate nozzle from ancillary units, if fitted i.e. surge controller etc.
- 2.6.3 Remove six screws (4), washers (5) and remove two handle mounts (6) complete with handles and grips. Retain dust cap (7) if fitted. Remove bonding lead assembly (8), if fitted.
- 2.6.4 To remove handles from mounts, remove two stiffnuts (9) and cap head screws (10) and remove mounts (6).
- 2.6.5 Prise off buffer (15).
- 2.6.6 Remove the six socket head screws (16) securing the nose ring (17) to the nozzle body (41) and remove the nose ring.
- 2.6.7 Carefully turn operating lever (20) through 90°, to push poppet assembly (28,28A,28B) and index ring (24) partially out of nozzle body (41). Keep body upright to prevent springs (25) from falling out.
- 2.6.8 Make a note of and suitably mark the relative way the index ring (24) and plate (29) are fitted into the nozzle body (41).
- 2.6.9 Carefully rotate the operating lever (20) to push the index ring and poppet assembly clear of the nozzle body (a further rotation of 120°).
- 2.6.10 Remove operating lever screw (18) and washer (19) and slide operating lever (20) off crank (23). Using a 3/32 in. pin punch remove Spirol pins (21) and using the pin spanner (Item 2) unscrew boss (22) and remove it and crank (23), taking care that the index ring and poppet assembly does not fall back into the nozzle body (41). Withdraw the index ring and plate (29) from the nozzle body.
- 2.6.11 Using coupling tool (Item 1), rotate the index ring (24) until the inner slots align with the guides on the plate (29). Separate the index ring from the plate. Remove the rollers (29A) from plate. Retain the eight springs (25).

- 2.6.12 Note and mark the position of link (30) in plate (29). Push down on nose seal (31), remove circlip (26) and press out gudgeon pin (27) from the plate (29). Separate poppet assembly from plate (29) and remove link (30). Withdraw poppet pin (28) from poppet plate (28A). Remove nose seal (31).
- 2.6.13 Remove two plugs (32) and/or vacuum relief valve (33). Remove and discard seals and O-rings (28B, 34, 35, 36, 37, 38, 39).

2.7 Inspection

- 2.7.1 Carefully wash all parts in clean aviation kerosene or gasoline. Ensure that residues of seal and O-ring material are removed from sealing faces and O-ring grooves.
- 2.7.2 Examine parts for wear or damage. Renew any defective parts. Ensure that pivot pins, guides and bores are free of burrs and that all steel balls are clean prior to assembly.

2.8 Assembling

NOTE:

Always use new seals and O-rings during assembling. Lubricate seal or O-ring with clean, relevant aviation fuel.

- 2.8.1 Install four O-rings (35–38) onto boss (22), nozzle body (41) and nose seal (31) respectively.
- 2.8.2 Insert crank (23) through tapped hole in body (41) and engage crank pin in hole in link (30). Carefully slide boss (22) over the crank and screw boss into body (41), using Loctite (Item 5) on thread of boss. Using pin spanner (Item 2), torque tighten boss to 20 lbf in (27 Nm). Install Spirol pin (21).
- 2.8.3 Temporarily install operating lever (20) onto crank (23). Install spring washer (19) and screw (18) in lever and hand tighten.
- 2.8.4 Locate rollers (29A) onto plate (29) and plate assembly into index ring (24).
- 2.8.5 Install eight springs (25) into locating holes in index ring and install nose seal (31) onto index ring (24).
- 2.8.6 Install O-ring (28B) on to poppet pin (28) and locate into poppet plate (28A). Install poppet seal (34) to poppet plate (28A). Locate poppet assembly in plate (29), aligning holes in poppet pin and plate for gudgeon pin (27).
- 2.8.7 Install link (30) into slot in poppet pin (28), making sure the bottom of the link is correctly positioned in the plate (29) (see Para 2.6.11). Line up gudgeon pin holes and insert gudgeon pin (27) and circlip (26). Make sure that ends of circlip are at 90° to ends of gudgeon pin.
- 2.8.8 Make sure that index ring (24) and plate (29) are correctly aligned with slots in nozzle body (Para 2.6.7) then locate complete assembly in body.
- 2.8.9 Locate link (30) onto pin of crank (23) and turn operating lever (20) to the valve closed position. Using coupling tool (Item 1), turn index ring to locked position.

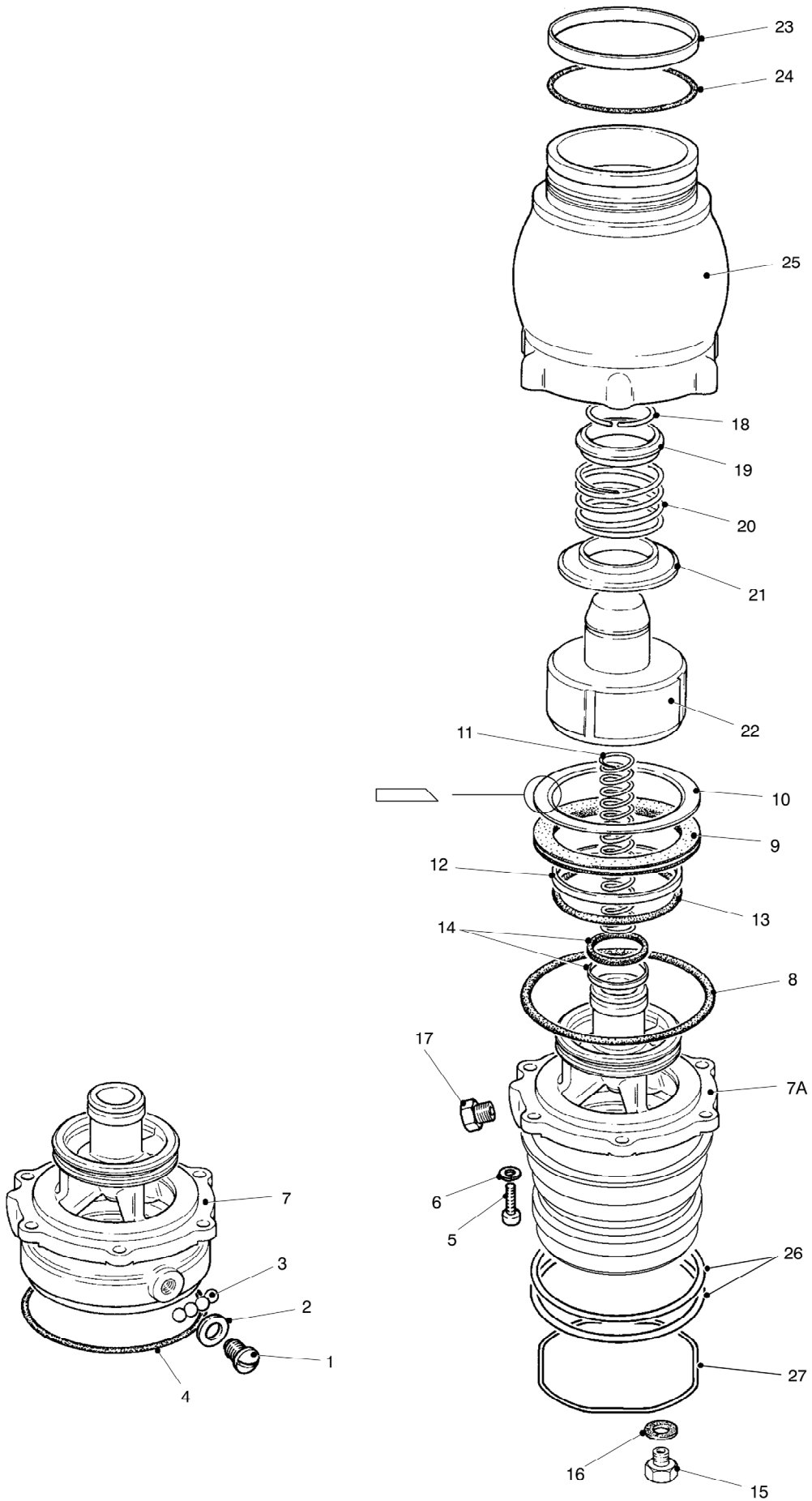


Fig 5.2 Surge Controller

- 2.8.10 Install plugs (32) and/or vacuum relief valve (33), using Loctite (Item 5) on threads.
- 2.8.11 Locate nose ring (17) onto body (41) making sure slots align with those on index ring. Secure with six screws (16) using Loctite (Item 5) and torque tighten to 3 lbf ft (4 Nm). Fit buffer (15) over nose ring.
- 2.8.12 check that handle of operating lever (20) is pointing away from poppet valve, adjusting its position if necessary. Tighten screw (18).
- 2.8.13 Install handle mount (6) to handle(s) (14) and secure with cap head screws (10) and stiffnuts (9). If stick handles are fitted, install grips (13) and secure with spring washers (12) and screw (11).
- 2.8.14 Install handles and mountings to nozzle body and secure with eight screws (4) and washers (5). If fitted, install dust cap (7) and secure under one of these screws.
- 2.8.15 If fitted, install bonding lead (8) and secure to handle mount.
- 2.8.16 Insert relevant ancillary (i.e. surge controller or adaptor) into nozzle, feed the steel balls (3) through the threaded hole in the nozzle body. Install bonded washer (2) and ball retaining screw (1). Wire lock screw, using locking wire (Item 4).

3 SURGE CONTROLLER (Fig 5.2)

3.1 Dismantling

WARNING

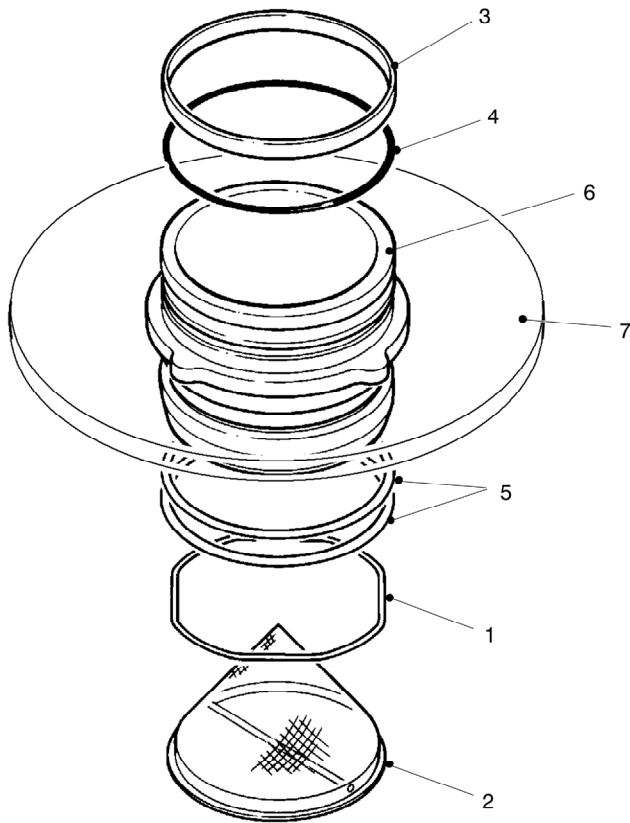
DO NOT HANDLE O-RING SEALS (4, 24) IF THEIR MATERIAL APPEARS CHARRED, GUMMY OR STICKY. USE TWEEZERS AND WEAR NEOPRENE OR PVC GLOVES. DO NOT TOUCH ADJACENT PARTS WITH UNPROTECTED HANDS. NEUTRALIZE ADJACENT PARTS WITH A SOLUTION OF CALCIUM, HYDROXIDE. IF THE DEGRADED MATERIAL OR ADJACENT PARTS TOUCH THE SKIN, DO NOT WASH OFF WITH WATER, SEEK IMMEDIATE MEDICAL AID FOR POSSIBLE CONTAMINATION WITH HYDROFLUORIC ACID. HYDROFLUORIC ACID IN CONTACT WITH SKIN HAS DELAYED SYMPTOMS OF CONTAMINATION. IT IS EXTREMELY TOXIC.

- 3.1.1 Drain down hose and remove hose unit as detailed in Para 2.6.1.
- 3.1.2 Separate surge controller from hose connector and nozzle (procedures similar to Para 2.6.2).

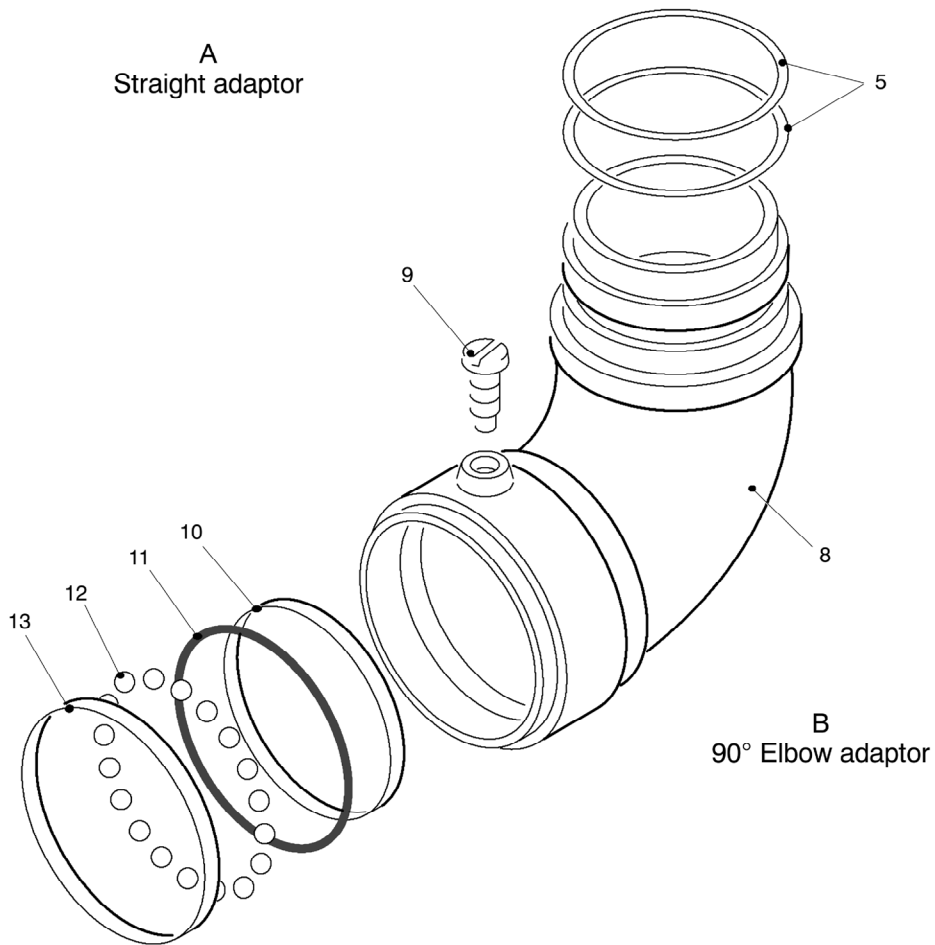
WARNING

THE SPRING IN THE SURGE CONTROLLER IS ASSEMBLED UNDER COMPRESSION. RELEASE PISTON GUIDE SCREWS (5) CAREFULLY AND EVENLY.

- 3.1.3 With the inlet end uppermost maintain a downward force to prevent the spring (11) expanding and remove the socket head cap screws (5) and washers (6) securing the piston guide (7) to the body (25).
- 3.1.4 Carefully ease off on the downward force and remove the piston guide (7), O-ring seal (8), seal (9) and backing ring (10).
- 3.1.5 Remove the spring (11) and complete piston assembly from the body.
- 3.1.6 From the piston guide remove the seal annulus (12) O-ring seal (13) and co-axial seal (14). Remove the check valve (15) and fibre washer (16).
- 3.1.7 Remove vent port assembly (17) from piston guide (7).
- 3.1.8 Remove circlip (18), spring retainer (19), spring (20) and valve plate (21) from the piston (22).
- 3.1.9 Remove swivel ring (23) and O-ring (24) from body (25).



A
Straight adaptor



B
90° Elbow adaptor

Fig 5.3 Standard swivel adaptors

3.2 Inspection

- 3.2.1 Carefully wash all parts in clean aviation kerosene or gasolene.
- 3.2.2 Inspect all parts for signs of wear or damage, pay particular attention to the piston sealing edges and ensure the surfaces of the piston are undamaged. Renew all defective parts, if a new spring (11) is required ensure it is the same rating as the one removed.

3.3 Assembling

NOTE:

Always use new seals and O-rings during assembling. Lubricate seal or O-ring with clean, relevant aviation fuel.

- 3.3.1 Fit the valve plate (21), spring (20) and spring retainer (19) to the piston (22) and secure with circlip (18). Insert the complete piston assembly into the body (25). Position the spring (11) into the piston recess.

CAUTION

IN THE FOLLOWING OPERATION, MAKE SURE THAT THE CHAMFERED FACE OF BACKING RING (10) IS TOWARDS PISTON (22) OR DAMAGE MAY OCCUR.

- 3.3.2 Install baking ring (10) into recess in body (25).
- 3.3.3 Fit fibre washer (16) to check valve (15) apply Loctite (Item 5) to the check valve thread and screw into piston guide (7).
- 3.3.4 Fit O-ring seal (13) and the two parts of the co-axial seal (14) to the piston guide. Fit the seal annulus (12) over the O-ring seal (13). Position the seal (9) onto its sealing face on the piston guide forcing it gently into position.
- 3.3.5 Position O-ring seal (8) over the spigot on the piston guide. Lift the complete piston guide and position it over spring (11) and, taking great care to fit down squarely so as not to damage the seals, press the piston guide into the body, ensure that the O-ring seal (8) seats correctly.
- 3.3.6 Maintaining a downward pressure against spring (11), secure the piston guide to the body with six socket cap head screws (5) and spring washers (6). Torque tighten to 5 lbf ft (6.8 Nm).
- 3.3.7 Install vent port (17), using Loctite (Item 5) on threads.
- 3.3.8 Install O-ring (24) and swivel ring (23).
- 3.3.9 If removed, assemble surge controller to nozzle and adaptor using procedure similar to that detailed in Para 2.8.16. Secure ball retaining screw with locking wire (Item 4).

4 STANDARD SWIVEL ADAPTORS (Fig 5.3A)

- 4.1 The HUMY4000 hose end unit utilises a standard straight adaptor. The end of this unit interfaces with nozzle/surge controllers and hose connectors. The following dismantling, inspection and assembling information applies to the standard adaptor only. The parts list provides full details of the component parts (refer to Chapter 8).
- 4.2 Additional optional swivel adaptors include the DR, Thiem and Carter types. Details of these last three are available from Meggitt Fuelling Products, Avery-Hardoll if required.

4.3 Dismantling

WARNING

DO NOT HANDLE O-RING SEALS (4) IF THEIR MATERIAL APPEARS CHARRED, GUMMY OR STICKY. USE TWEEZERS AND WEAR NEOPRENE OR PVC GLOVES. DO NOT TOUCH ADJACENT PARTS WITH UNPROTECTED HANDS. NEUTRALIZE ADJACENT PARTS WITH A SOLUTION OF CALCIUM, HYDROXIDE. IF THE DEGRADED MATERIAL OR ADJACENT PARTS TOUCH THE SKIN, DO NOT WASH OFF WITH WATER, SEEK IMMEDIATE MEDICAL AID FOR POSSIBLE CONTAMINATION WITH HYDROFLUORIC ACID. HYDROFLUORIC ACID IN CONTACT WITH SKIN HAS DELAYED SYMPTOMS OF CONTAMINATION. IT IS EXTREMELY TOXIC.

- 4.3.1 Drain down hose and remove hose unit as detailed in Para 2.6.1.
- 4.3.2 Separate adaptor from nozzle/surge controller and hose connector (swivel type or quick disconnect). The swivel type separation procedure is similar to that detailed in Para 2.6.2.

NOTE:

The swivel hose connector (Fig 5.5) has 40 steel balls, instead of the 39 found in the nozzle and surge controller swivel couplings.

- 4.3.3 If fitted, remove strainer retaining clip (1) and strainer (2) from the body (6).
- 4.3.4 Remove swivel ring (3) and O-ring (4).
- 4.3.5 Remove protection ring (7), if fitted.

4.4 Inspection

- 4.4.1 Carefully wash all parts in clean aviation kerosene or gasolene.
- 4.4.2 Inspect all parts for signs of wear or damage. Renew all defective parts. If the ball tracks (5a, 5b) require renewal, great care must be taken not to damage the adaptor sealing faces.

4.5 Assembling

NOTE:

Always use new seals and O-rings during assembling. Lubricate seal or O-ring with clean, relevant aviation fuel.

- 4.5.1 If the ball track renewal is required, use the ball track assembler (Item 3), fitted with its spacer. Install the outer ball track (5a) to the adaptor. Remove the spacer and install the inner ball track (5b) to the adaptor. Ensure the joins in the tracks are 180° apart.
- 4.5.2 Install protection ring (7), if used.
- 4.5.3 Install O-ring (4) and swivel ring (3).
- 4.5.4 Insert strainer (2), if fitted and hold in place with retaining clip (1) to body (6).
- 4.5.5 If removed, assemble adaptor to surge controller/nozzle, using procedure detailed in Para 2.8.16.
- 4.5.6 Assemble adaptor to hose connector. If a swivel connector (Fig 5.5) is used, feed the 40 balls (3) through the hole in the hose connector. Secure with the ball retaining screw (2), using Loctite (Item 5) on the threads.

5 90° ELBOW ADAPTOR

5.1 Dismantling (Refer Fig 5.3B)

WARNING

DO NOT HANDLE O-RING SEALS (4) IF THEIR MATERIAL APPEARS CHARRED, GUMMY OR STICKY. USE TWEEZERS AND WEAR NEOPRENE OR PVC GLOVES. DO NOT TOUCH ADJACENT PARTS WITH UNPROTECTED HANDS. NEUTRALIZE ADJACENT PARTS WITH A SOLUTION OF CALCIUM, HYDROXIDE. IF THE DEGRADED MATERIAL OR ADJACENT PARTS TOUCH THE SKIN, DO NOT WASH OFF WITH WATER, SEEK IMMEDIATE MEDICAL AID FOR POSSIBLE CONTAMINATION WITH HYDROFLUORIC ACID. HYDROFLUORIC ACID IN CONTACT WITH SKIN HAS DELAYED SYMPTOMS OF CONTAMINATION. IT IS EXTREMELY TOXIC.

- 5.1.1 Drain down hose and remove hose unit as detailed in Para 2.6.1.
- 5.1.2 Separate elbow adaptor from the standard adaptor by unscrewing the plug (3) and feeding out the 40 st. steel balls (6).
- 5.1.3 Disconnect the hose connector, swivel or quick disconnect (Section 6.1 or Section 7.0).
- 5.1.4 Remove the two wear strips (4 & 7) and 'O' ring (5).

5.2 Inspection

- 5.2.1 Carefully wash all parts in clean aviation kerosene or gasolene.
- 5.2.2 Inspect all parts for signs of wear or damage, defective parts must be renewed, care should be taken not to damage sealing faces.

5.3 Assembly (New 'O' ring must always be used in assembly)

- 5.3.1 Insert wear strips (4 & 7) and 'O' ring (5) into their respective groove with end of the elbow.
- 5.3.2 Replace hose connector.
- 5.3.3 Connect the elbow adaptor to the standard adaptor by sliding the elbow over the ball bracks and feeding in the st. steel balls. Refit plug using Loctite (222) on the threads.
- 5.3.4 Carry out test procedures as laid down in Chapter 6.

6 FLIGHT REFUELLING SWIVEL ADAPTOR (Fig 5.4)

6.1 Dismantling

WARNING

DO NOT HANDLE O-RING SEALS (4) IF THEIR MATERIAL APPEARS CHARRED, GUMMY OT STICKY. USE TWEEZERS AND WEAR NEOPRENE OR PVC GLOVES. DO NOT TOUCH ADJACENT PARTS WITH UNPROTECTED HANDS. NEUTRALIZE ADJACENT PARTS WITH A SOLUTION OF CALCIUM, HYDROXIDE. IF THE DEGRADED MATERIAL OR ADJACENT PARTS TOUCH THE SKIN, DO NOT WASH OFF WITH WATER, SEEK IMMEDIATE MEDICAL AID FOR POSSIBLE CONTAMINATION WITH HYDROFLUORIC ACID. HYDROFLUORIC ACID IN CONTACT WITH SKIN HAS DELAYED SYMPTOMS OF CONTAMINATION. IT IS EXTREMELY TOXIC.

- 6.1.1 Drain down hose and remove hose unit as detailed in Para 2.6.1.
- 6.1.2 Separate adaptor from nozzle/surge controller and Flight Refuelling hose connector.
- 6.1.3 Remove strainer retaining clip (1) and strainer (2) from body (6), if fitted.

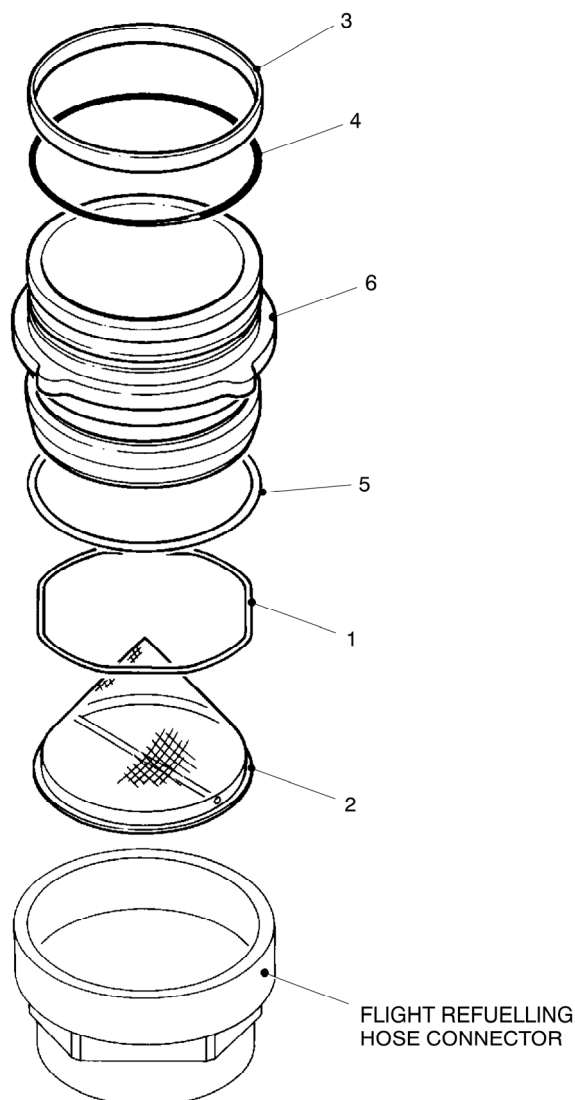


Fig 5.4 Flight Refuelling swivel adaptor

- 6.1.4 Remove swivel ring (3) and O-ring (4).
- 6.1.5 Remove protection ring, if fitted.

6.2 Inspection

- 6.2.1 Carefully wash all parts in clean aviation kerosene or gasolene.
- 6.2.2 Inspect all parts for signs of wear or damage. Renew all defective parts. If the ball track (5) requires renewal, great care must be taken not to damage the adaptor sealing faces.

6.3 Assembling

NOTE:

Always use new seals and O-rings during assembling. Lubricate seal or O-ring with clean, relevant aviation fuel.

- 6.3.1 If ball track renewal is required, use the ball track assembler (Item 3) fitted with its spacer. Install the ball track (5) to the adaptor.
- 6.3.2 Install protection ring, if used.
- 6.3.3 Install O-ring (4) and swivel ring (3).
- 6.3.4 Install strainer (2) and secure with retaining clip (1) to body (6).
- 6.3.5 If removed, assemble adaptor to surge controller/nozzle, using procedure detailed in Para 2.8.16.
- 6.3.6 Assemble adaptor to Flight Refuelling hose connector.

7 STANDARD SWIVEL HOSE CONNECTOR (Fig 5.5)

7.1 Dismantling

WARNING

DO NOT HANDLE O-RING SEALS (4) IF THEIR MATERIAL APPEARS CHARRED, GUMMY OR STICKY. USE TWEEZERS AND WEAR NEOPRENE OR PVC GLOVES. DO NOT TOUCH ADJACENT PARTS WITH UNPROTECTED HANDS. NEUTRALIZE ADJACENT PARTS WITH A SOLUTION OF CALCIUM, HYDROXIDE. IF THE DEGRADED MATERIAL OR ADJACENT PARTS TOUCH THE SKIN, DO NOT WASH OFF WITH WATER, SEEK IMMEDIATE MEDICAL AID FOR POSSIBLE CONTAMINATION WITH HYDROFLUORIC ACID. HYDROFLUORIC ACID IN CONTACT WITH SKIN HAS DELAYED SYMPTOMS OF CONTAMINATION. IT IS EXTREMELY TOXIC.

- 7.1.1 Drain down hose and remove hose unit as detailed in Para 2.6.1. Remove seal ring (1) from BSP models.
- 7.1.2 Remove ball retaining plug (2) from connector body (7) and remove 40 steel balls (3) into a suitable container. Separate hose connector from adaptor.
- 7.1.3 Remove and discard O-ring (4) and wear strips (5) and (6).

7.2 Inspection

- 7.2.1 Carefully wash all parts in clean aviation kerosene or gasolene.
- 7.2.2 Inspect all parts for signs of wear or damage. Renew all defective parts.

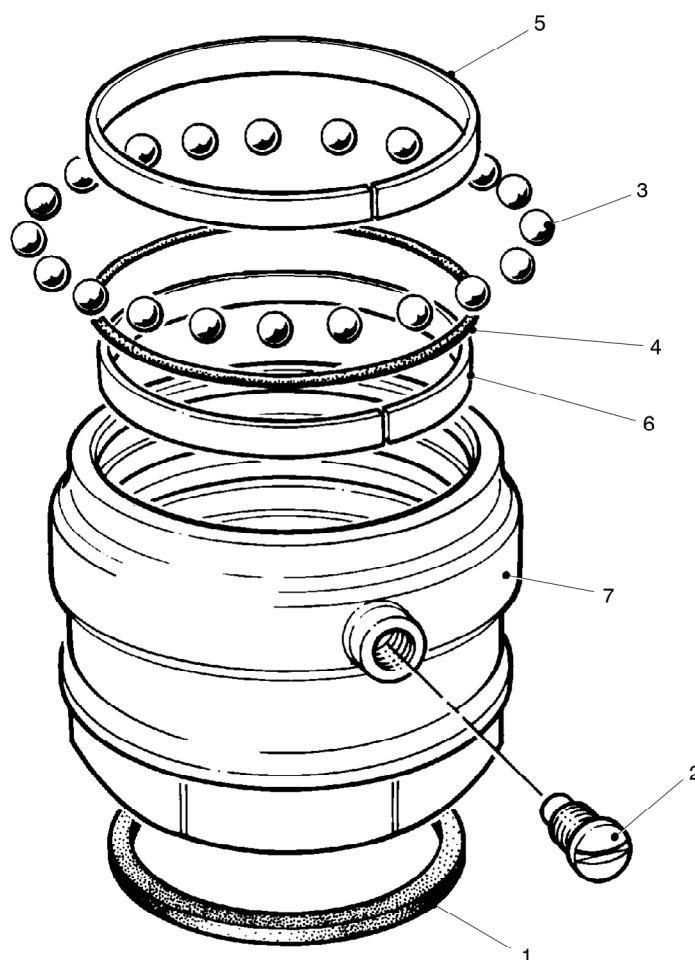


Fig 5.5 Swivel hose connector

7.3 Assembling

NOTE:

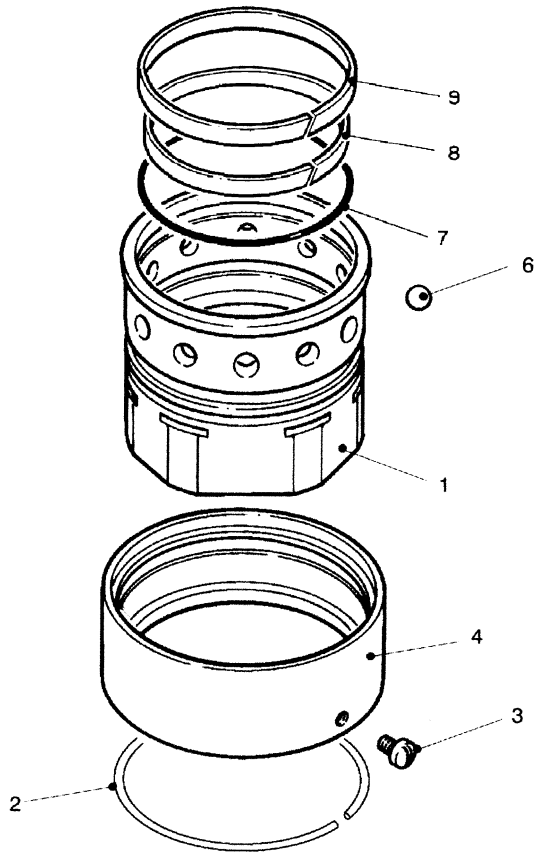
Always use new seals and O-rings during assembly. Lubricate seal or O-ring with clean, relevant aviation fuel.

- 7.3.1 Install wear strips (5) and (6) and O-ring seal (4) to the internal bore of connector body (7). On BSP types, fit the seal ring (1).
- 7.3.2 Assemble hose connector to adaptor, feed the 40 steel balls (3) through the hole in the connector and secure with the ball retaining plug (2), using Loctite (Item 5) on the plug thread.

8 LIGHTWEIGHT QUICK DISCONNECT HOSE CONNECTOR (Fig 5.6)

8.1 Dismantling

- 8.1.1 Carefully drain down the hose and unscrew the hose connector from the hose.
- 8.1.2 Move sleeve retaining ring (2) to its 'parking' groove. Partially unscrew the two screws (3), pull sleeve (4) back and uncouple connector from adaptor.
- 8.1.3 Restrain the sleeve (4), prise out the end of the Spirolox ring (5) and ease ring out of its recess.
- 8.1.4 Remove the sleeve (4) from the connector body (1). Recover the twelve steel balls (6) into a suitable container.



2.5 inch version

3 inch version

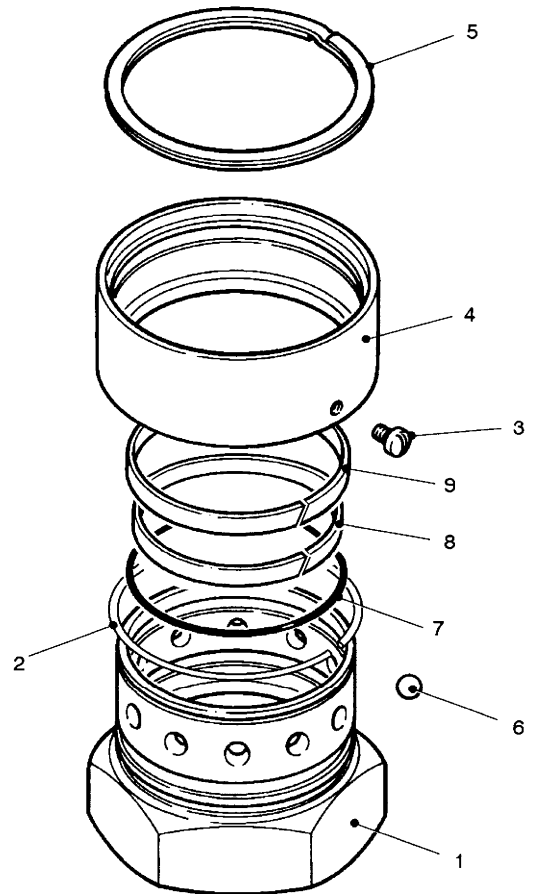


Fig 5.6 Lightweight quick disconnect hose connector

8.1.5 From the internal bore of the connector, remove the O-ring (7) and wear strips (8, 9).

8.1.6 Remove and retain the two locking screws (3) and sleeve retaining ring (2).

8.2 Inspection

8.2.1 Carefully wash all parts in clean aviation kerosene or gasolene.

8.2.2 Inspect all parts for signs of wear or damage. Renew all defective parts. Under normal conditions a small groove will be observed on the inside of the sleeve (4). If the groove exceeds 0.125 inch in width renew the sleeve.

8.3 Assembling

NOTE:

Always use new seals and O-rings during assembling. Lubricate seal or O-ring with clean, relevant aviation fuel, unless stated otherwise.

8.3.1 Insert O-ring (7) and wear strips (8, 9) into recesses in the internal bore of the hose connector body (1).

8.3.2 Install the sleeve retaining ring (2) over the connector body (1) and locate it in its 'parking' groove.

8.3.3 Using a smear of paraffin wax on each, carefully place the twelve steel balls (6) into the holes in connector body (1).

8.3.4 Fit the sleeve (4) over the connector body. Apply a smear of paraffin wax to the outer face of the connector body over which the sleeve operates.

8.3.5 Install the Spirolox ring (5) into its slot in the connector body (1).

8.3.6 Locate the adaptor into the connector and move retaining ring (2) into its locking position.

8.3.7 Install the two locking screws (3) through the sleeve and into the slots in the connector body. Tighten and secure with locking wire (Item 4).

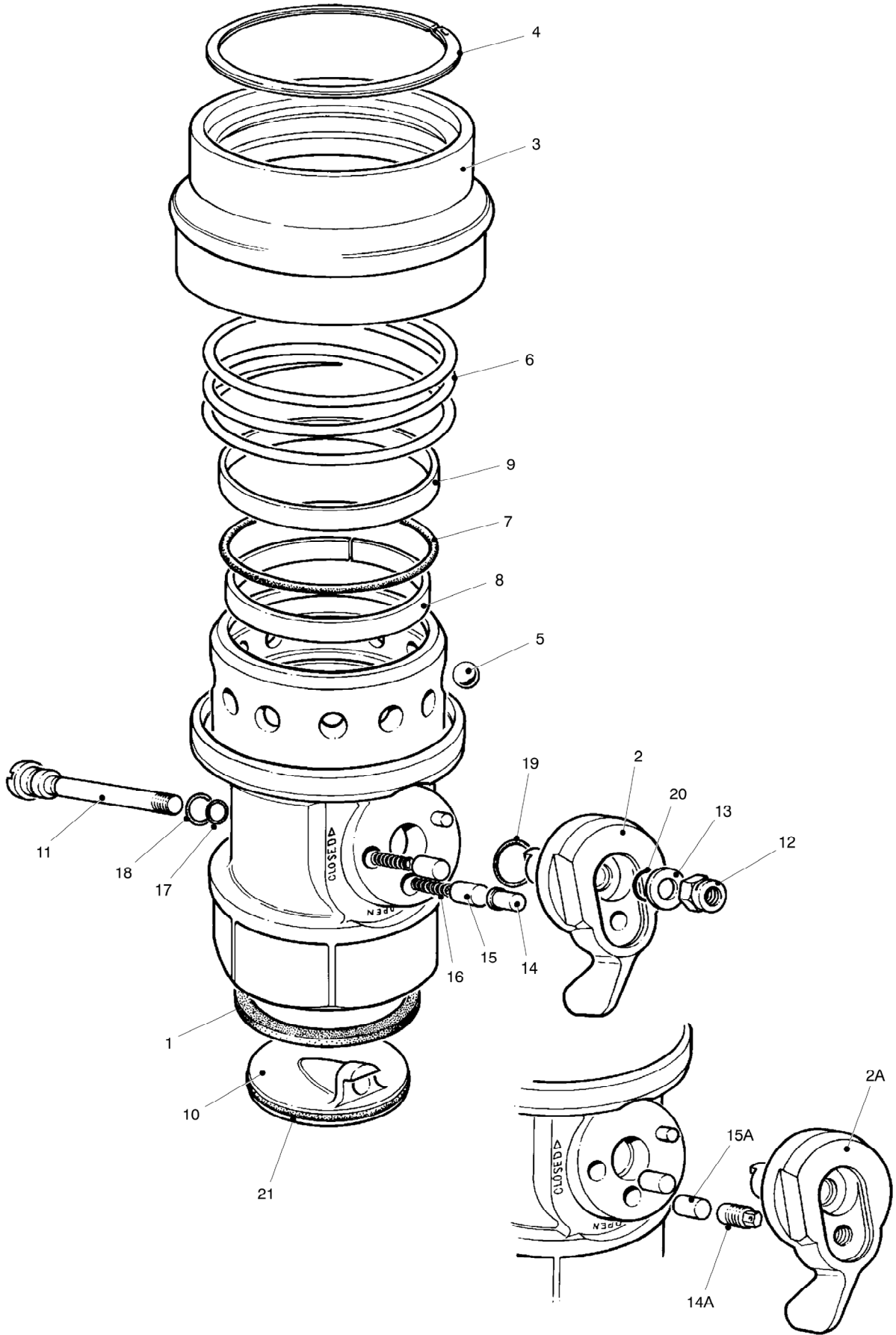


Fig 5.7 Quick disconnect isolating valve hose connectors

9 QUICK DISCONNECT ISOLATING VALVE HOSE CONNECTORS (Fig 5.7)

9.1 Dismantling

WARNING

DO NOT HANDLE O-RING SEALS (4, 24) IF THEIR MATERIAL APPEARS CHARRED, GUMMY OR STICKY. USE TWEEZERS AND WEAR NEOPRENE OR PVC GLOVES. DO NOT TOUCH ADJACENT PARTS WITH UNPROTECTED HANDS. NEUTRALIZE ADJACENT PARTS WITH A SOLUTION OF CALCIUM, HYDROXIDE. IF THE DEGRADED MATERIAL OR ADJACENT PARTS TOUCH THE SKIN, DO NOT WASH OFF WITH WATER, SEEK IMMEDIATE MEDICAL AID FOR POSSIBLE CONTAMINATION WITH HYDROFLUORIC ACID. HYDROFLUORIC ACID IN CONTACT WITH SKIN HAS DELAYED SYMPTOMS OF CONTAMINATION. IT IS EXTREMELY TOXIC.

- 9.1.1 Carefully drain down the hose and unscrew the hose connector from the hose, remove the seal ring (1) from BSP models.
- 9.1.2 Ensure the isolating valve is closed and separate the hose connector from the adaptor.

WARNING

THE SLEEVE (3) IS ASSEMBLED UNDER SPRING PRESSURE AND CARE MUST BE TAKEN TO ENSURE THAT IT IS RESTRAINED DURING REMOVAL.

- 9.1.3 With the operating lever (2, 2a) in the CLOSED position push down on the sleeve (3), prise the Spirolox ring (4) free and ease it out of its recess.
- 9.1.4 Taking care to recover the twelve stainless steel balls (5) remove the sleeve (3) and spring (6) from the connector.
- 9.1.5 From the internal bore of the connector remove the O-ring seal (7) and the two wear strips (8) and (9).
- 9.1.6 Take note of the way the flap valve (10) is fitted into the bore (i.e. dog facing upwards). Hold the spindle (11) with a screw driver remove the nut (12) and washer (13) from the spindle and withdraw the spindle.
- 9.1.7 Withdraw the operating lever (2, 2A) from the body of the connector, ensure the press button (14) (or locking screw (14A)), lock buttons (15) (or spacers (15A)) and springs (16) are retained, remove the flap valve (10) from the bore of the connector.

NOTE:

The flap valve can only be removed and replaced from the coupling (sleeve) end of 1 2 inch connector.

- 9.1.8 Remove and discard the two O-rings (17, 18) from the spindle, the two O-rings (19, 20) from the operating lever and the O-ring (21) from the flap valve (10).

9.2 Inspection

- 9.2.1 Carefully wash all parts in clean aviation kerosene or gasolene.
- 9.2.2 Inspect all parts for signs of wear or damage. Renew all defective parts. Under normal conditions a small groove will be observed on the steel insert fitted in the sleeve (3). If the groove exceeds 0.125 inch in width, renew the sleeve.

9.3 Assembling

NOTE:

Always use new O-rings and seals when assembling. Lubricate seal or O-ring with clean, relevant aviation fuel, unless stated otherwise.

WARNING

THE SLEEVE (3) IS ASSEMBLED UNDER SPRING PRESSURE AND CARE MUST BE TAKEN DURING SLEEVE INSTALLATION.

- 9.3.1 Install O-ring (21) onto flap valve (10).
- 9.3.2 Ensuring that it is located the same as when removed, fit the flap valve (10) into the bore of the connector body (22).
- 9.3.3 Fit O-rings (19) and (20) to operating lever (2 or 2A). Locate springs and lock buttons (16, 15) or spacers (15A) into the two locking hole positions. Fit the press button (14) or locking screw (14A) into the operating lever.
- 9.3.4 Fit the operating lever (2 or 2A) into the connector body (22) ensuring it aligns and engages with the flap valve.
- 9.3.5 Fit O-rings (17, 18) to the spindle (11) and fit the spindle into the connector, flap valve and operating lever. Secure with washer (13) and nut (12).
- 9.3.6 Set the operating lever in the closed position, checking that flap valve positively seats in the bore of the connector.
- 9.3.7 Insert the wear strips (8) and (9) and the O-ring seal (7) into the recesses in the internal bore of the connector body.
- 9.3.8 Using a smear of paraffin wax (Item 6) on each of the 12 stainless steel balls (5) and locate the balls into the holes in the hose connector, fit the spring (6) over the connector body. Apply a smear of the wax to the outer face of the connector over which the sleeve operates.
- 9.3.9 Fit the sleeve (3) over the connector and press it down against spring pressure, fit the Spirolox ring (4) into its slot in the connector. Test as detailed in Chapter 6.
- 9.3.10 Couple the hose connector to an adaptor/surge controller/nozzle assembly. Set the operating lever (2 or 2A) to the 'OPEN' position. Ensure the flap valve is fully open and that the lever position prevents the sleeve being retracted.
- 9.3.11 Fit seal ring (1) to BSP model connectors.

10 QUICK DISCONNECT HOSE CONNECTOR (Fig 5.8)

10.1 Dismantling

- 10.1.1 Carefully drain down the hose and remove hose unit from hose as detailed in Para 2.6.1. Remove the seal ring (1) from BSP models.
- 10.1.2 Remove the locking clip (2), press the two latches and separate the hose connector from the adaptor.

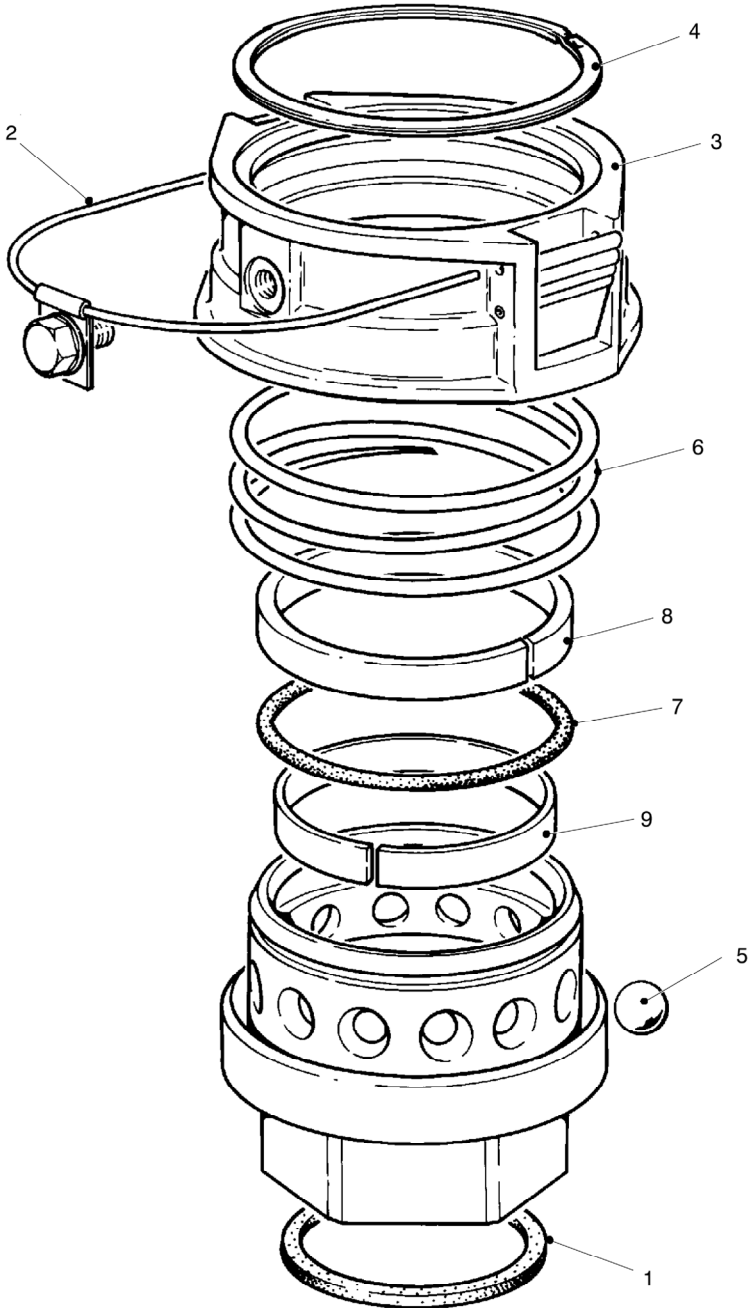


Fig 5.8 Quick disconnect hose connectors

WARNING

THE SLEEVE (3) IS ASSEMBLED UNDER SPRING PRESSURE AND CARE MUST BE TAKEN DURING SLEEVE INSTALLATION.

- 10.1.3 Restrain the sleeve (3), prise out the end of the Spirolox ring (4) and ease ring out of its recess.
- 10.1.4 Taking care to recover the twelve stainless steel balls (5) into a suitable container, remove the sleeve (3) and spring (6) from the connector body (10).
- 10.1.5 From the internal bore of the connector remove the O-ring seal (7) and the two wear strips (8) and (9).

10.2 Inspection

- 10.2.1 Carefully wash all parts in clean aviation kerosene or gasolene.
- 10.2.2 Inspect all parts for signs of wear or damage. Renew all defective parts. Under normal conditions a small groove will be observed on the steel insert fitted in the sleeve (3). If the groove exceeds 0.125 inch in width renew the sleeve.

10. Assembling**NOTE:**

Always use new O-rings and seals when assembling. Lubricate seal or O-ring with clean, relevant aviation fuel, unless stated otherwise.

WARNING

THE SLEEVE (3) IS ASSEMBLED UNDER SPRING PRESSURE AND CARE MUST BE TAKEN DURING SLEEVE INSTALLATION.

- 10.3.1 Insert the wear strips (8) and (9) and the O-ring seal (7) into the recesses in the internal bore of the hose connector.
- 10.3.2 Using a smear of paraffin wax (Item 6) on each, locate the twelve stainless steel balls (5) into the holes in the connector body, fit the spring (6) over the connector. Apply a smear of paraffin wax (Item 6) to the outer face of the connector body over which the sleeve operates.
- 10.3.3 Fit the sleeve (3) over the connector body (10) and press it down against spring pressure (spring load catches depressed); fit the Spirolox ring (4) into its slot in the connector.
- 10.3.4 Locate the adaptor into the connector and fit locking clip (2).
- 10.3.5 Fit seal ring (1) to BSP model connectors.

11 SELECTIVE SLEEVE (Fig 5.9)**11.1 Dismantling**

- 11.1.1 Remove the dust cap (if fitted), and note the selective position number where a screw is fitted.
- 11.1.2 Remove the three retaining screws (1) and using a soft faced mallet gently tap the sleeve off the nozzle.
- 11.1.3 Remove the rubber buffer (2) from the sleeve (3).

11.2 Inspection

- 11.2.1 Carefully wash all parts in clean aviation kerosene or gasolene.
- 11.2.2 Inspect all parts for signs of wear or damage. Ensure there is no impact or abrasion damage to the sleeve, and that the pins are tight and not worn. Defective parts must be renewed.

11.3 Assembling

- 11.3.1 Fit the rubber buffer (2) to the sleeve (3).
- 11.3.2 Position the sleeve so that the hole directly above the operating lever has the same number as noted in Para 10.1.1. Insert a screw (1) into this hole, using Loctite (Item 5) on the screw thread.
- 11.3.3 Using the two holes in the sleeve exposed by the appropriate selective number, apply Loctite (Item 5) to the threads of two screws (1) and secure the sleeve to the nozzle with the screws.
- 11.3.4 Install the dust cap (if fitted).

12 TESTING

- 12.1 After servicing and assembling a hose end unit, test as detailed in Chapter 6.

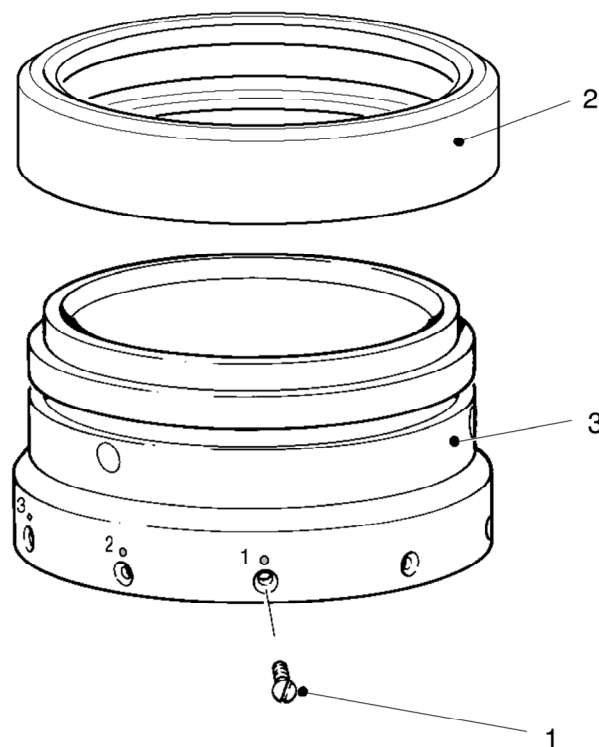


Fig 5.9 Selective sleeve

Chapter 6

TESTING

CONTENTS

Para		
1	General	
2	Electrical bonding test	
3	Static tests (all build standards)	
4	Static tests (surge controller fitted)	
5	Static test (quick disconnect isolating valve)	
6	Dynamic tests (all build standards)	
Fig		Page
6.1	Static test rig arrangements	2
6.2	Dynamic test rig arrangements	6
Table		Page
1	Surge controller pressure limits	5
2	Pressure control test limits	6

1 GENERAL

- 1.1 The following test procedures are to be carried out by suitably qualified engineers, at the intervals stated and when units have been overhauled as described in Chapter 5, Servicing.
- 1.2 If the required test standards are not met, refer to Chapter 7, Fault Finding.
- 1.3 If a vacuum relief valve is normally fitted, it must be replaced by a blank plug for the duration of the tests.

2 ELECTRICAL BONDING TEST (All Build Standards)

- 2.1 The electrical bonding test is to be carried out every six months, following repair or overhaul and when returning to service from stores. Using an 'AVO' meter Model 8 (or suitable equivalent), on the 'OHMS' range, test as follows:
 - 2.1.1 Remove the hose unit from the hose and take it to a safe area.
 - 2.1.2 Using the resistance meter, measure the resistance between the following points:
 - (a) From the bonding wire assembly earth clip (or locally used alternative) to the nose ring.
 - (b) From the earth clip to the hose connector thread. Rotate swivel through 180 degrees during this test.
 - (c) From the earth clip to the strainer (inside the adaptor).
 - 2.1.3 The resistance in each case must be less than 10 ohm.

3 STATIC TESTS (All Build Standards)

- 3.1 All build standards of the HUMY4000M2 units are to be tested follows:
 - 3.2 Test 1** (Pressure/vacuum test, poppet valve open).

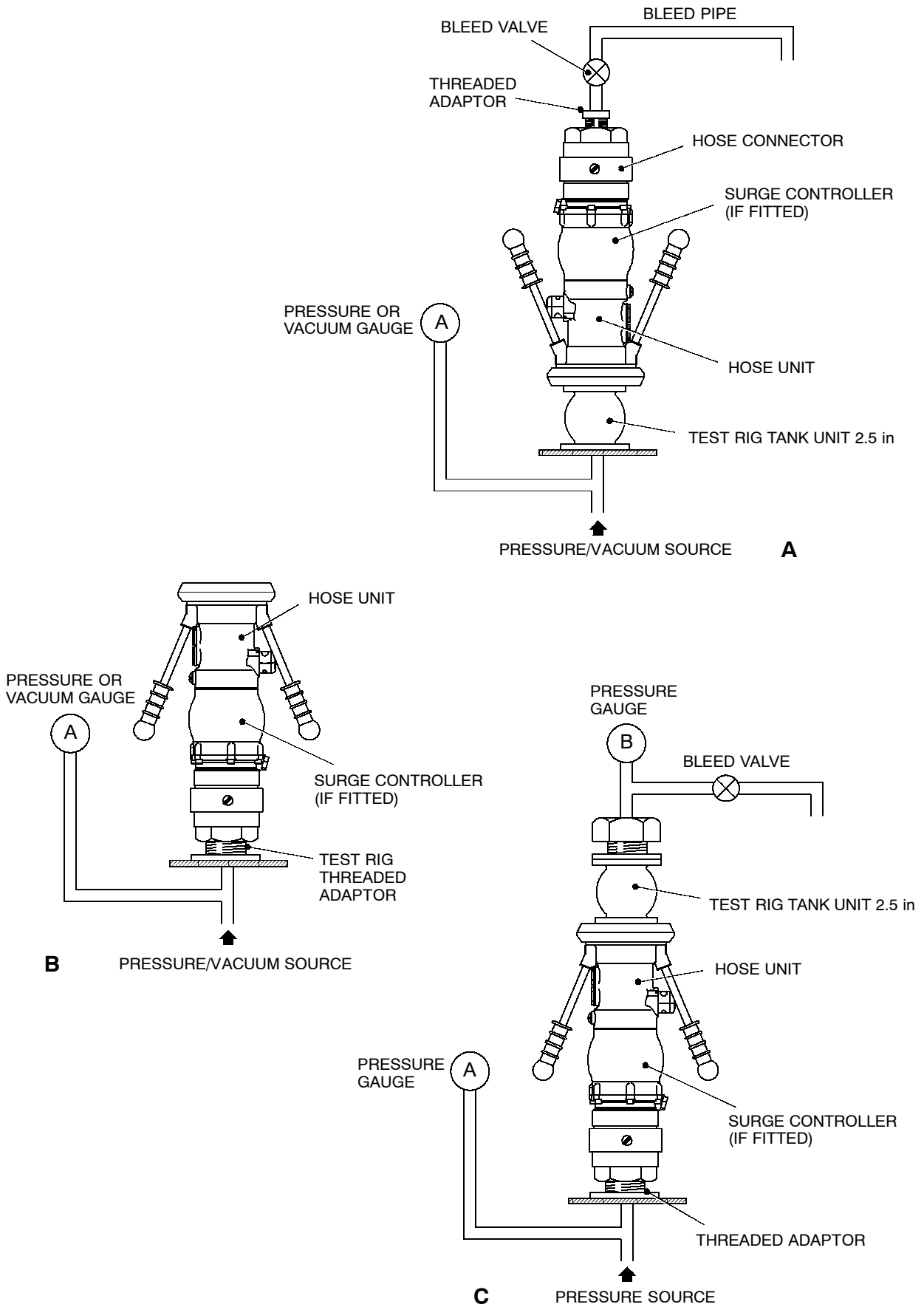


Fig 6.1. Static test rig arrangements

3.2.1 Equipment required:

- (a) Pressure/vacuum source with gauge (A) to provide 31 bar (450 psig) pressure and -0.96 bar (28 in.Hg) vacuum.
- (b) Adaptor to connect pressure source to hose unit.
- (c) Bleed pipe with valve and threaded end adaptor to fit hose connector.

3.2.2 Assemble the test equipment as shown in Fig 6.1A. With the poppet valve open, fill the unit with fuel. Purge the system of air and close the bleed valve.

3.2.3 Apply a pressure of 15.5 bar (225 psi) to the unit. Check that the unit will maintain the pressure, without significant fall, for not less than one minute.

3.2.4 If a quick disconnect isolating valve is fitted, operate the valve ten times while under pressure. There must be no leakage from the spindle or any other failure.

3.2.5 Release the pressure through the bleed valve and then close the bleed valve.

3.2.6 Apply a vacuum of -0.96 bar (28 in.Hg) to the unit. Check that the unit will maintain the vacuum for not less than one minute. Release vacuum, drain unit.

3.3 Test 2 (Pressure/vacuum test, poppet valve closed)

3.3.1 Equipment required:

- (a) Pressure/vacuum source with gauge (A) to provide 31 bar (450 psig) pressure and -0.96 bar (28 in.Hg) vacuum.
- (b) Adaptor to connect pressure/vacuum source to the quick disconnect hose connector.
- (c) If a surge controller is fitted one of the block out devices recommended must be fitted in place of the vent port assembly. This is necessary to overcome the normal shut off characteristic of the controller. Recommended block out devices are:
 1. ZMMZ0320-01, Gammon vent port adaptor GTP-77.
 2. ZMMZ0320-10, Block out device.
 3. ZMMZ0320-02, Gammon jet test quick disconnect coupler.

3.3.2 Assemble the test equipment as shown in Fig 6.1B. Using TASZ5065 coupling tool or aircraft adaptor release the index ring and open the poppet valve, fill the unit with fuel. Purge air from the unit, close the poppet valve.

3.3.3 Apply a pressure of 15.5 bar (225 psi) to the unit. Check that the unit will maintain the pressure, without significant fall, for not less than one minute.

3.3.4 If a quick disconnect isolating valve is fitted, operate the valve ten times while under pressure. There must be no leakage from the spindle or any other failure.

3.3.5 Apply a vacuum of -0.96 bar (28 in.Hg) to the unit. Check that the unit will maintain the vacuum for not less than one minute. Release vacuum, drain unit.

4 STATIC TESTS (SURGE CONTROLLER FITTED)

4.1 All HUMY4000M2 units fitted with surge controllers are to be tested as follows:

4.2 Test 3 (Unit fitted with a single surge controller)

4.2.1 Equipment required:

- (a) Pressure source with gauge (A) to provide 31 bar (450 psig) pressure.
- (b) Adaptor to connect pressure source to quick disconnect unit.
- (c) Adaptor, attached to a hose or tank, with a minimum capacity of 6 litres (1.5 imp gall), to simulate aircraft manifold piping.
- (d) Pressure gauge (B) to provide 0 to 6.9 bar (0 to 100 psig) with a bleed pipe and valve.

4.2.2 Assemble the test equipment as shown in Fig 6.1C with the poppet valve open, fill the unit with fuel. Purge the system of air and close the bleed valve.

4.2.3 Slowly increase the pressure in the system until the pressure on gauge (B) is approximately equal to the nominal pressure of the controller (ie 50 psi for a 50 psi controller). Hold pressure for 20 seconds, pressure should remain stable. If not, check all air is bled from unit and repeat pressurisation.

4.2.4 Slowly increase pressure until gauge (A) reads 10.4 bar (150 psi). A small increase in pressure, less than 0.7 bar (10 psi) above controller rating may be shown on gauge (B).

4.2.5 Hold pressure for one minute. The pressure on gauge (B) may creep slightly, but must not exceed the pressure stated in Table 1.

4.3 Test 4 (Unit fitted with twin surge controllers)

4.3.1 Assemble the test equipment as shown in Fig 6.1C with the poppet valve open, fill the unit with fuel. Purge the system of air and close the bleed valve.

4.3.2 Slowly increase the pressure in the system until the pressure on gauge (B) is approximately equal to the nominal pressure of controller (ie 50 psi for 50 psi controller and 55 psi for a 55 psi controller). Hold pressure for 20 seconds, pressure should remain stable. If not, check all air is bled from unit and repeat pressurisation. Release pressure.

4.3.3 Using recommended block out device Para 3.3.1(c) fitted to the vent port and connected to an air pressure of at least 6 bar (85 psi). Block out one surge controller to render it inoperative.

4.3.4 Slowly increase fuel pressure until gauge (A) reads 8 bar (120 psi). A small increase in pressure, less than 0.7 bar (10 psi) above controller rating may be shown on gauge (B).

4.3.5 Hold pressure for one minute. The pressure on gauge (B) may creep slightly, but must not exceed the pressure stated in Table 1.

4.3.6 Release the pressure in the unit, remove the block out device and fit it to the second controller, repeat the tests above.

4.3.7 Remove the block out device, slowly increase fuel pressure until gauge (A) reads 10.4 bar (150 psi). A small increase in pressure, less than 0.7 bar (10 psi) above controller rating may be shown on gauge (B).

4.3.8 Hold pressure for one minute. The pressure on gauge (B) may creep slightly, but must not exceed the pressure stated in Table 1.

TABLE 1 - SURGE CONTROLLER PRESSURE LIMITS

Nominal control pressure bar (psi)		Maximum pressure after 1 minute bar (psi)	
2	(30)	2.75	(40)
3	(45)	3.8	(55)
3.5	(50)	4.1	(60)
3.8	(55)	4.5	(65)

5 STATIC TEST (QUICK DISCONNECT ISOLATING VALVE)

5.1 All HUMY4000M2 units fitted with a quick disconnect isolating valve are to be tested as follows:

5.2 Test 5. To test the integrity of the flap valve, the quick disconnect isolating valve must be tested separately as follows:

WARNING

TO ENSURE PERSONAL SAFETY IN THE EVENT OF A FLAP VALVE LEAKING, COVER THE OPEN END OF THE UNIT WITH A SUITABLE MATERIAL E.G. A PIECE OF CLEAR PERSPEX.

- 5.2.1 Disconnect the other hose end unit components and connect the hose (threaded) end of the valve to the test equipment. (Refer to 6.1C for connection)
- 5.2.2 With the flap valve open, fill the unit with fuel. Ensure all air is bled from the unit, then close the flap valve.
- 5.2.3 Position a protective clear plastic cover over the open end of the unit.
- 5.2.4 Slowly pressurise the valve to a pressure of 31 bar (450 psi) and hold for a period of one minute. No leakage or failure is allowed.

6 DYNAMIC TESTS (All Build Standards)

- 6.1 Dynamic tests are carried out with the unit coupled to a test rig as shown in Fig 6.2. A pressure control test is carried out every six months, subject to local company instructions, to ensure the correct operation of the surge controller under dynamic conditions. A surge pressure control test, which is not a routine test, is carried out from time to time as a quality audit test.
- 6.2 Carry out a pressure control test as follows:
 - 6.2.1 Taking each hose unit in turn, connect it to the test rig (Fig 6.2). With a unit fitted with twin surge controllers, each controller must be tested separately with the other blocked out using a block out device (Para 3.3.1(c)) connected to the vent port and using an air pressure of at least 6 bar (85 psi).
 - 6.2.2 Open the ball valve until a maximum flow of 1900 lpm (420 igpm) is reached.
 - 6.2.3 Slowly close the ball valve reducing the flow, allow the pressure to stabilise for a few seconds at several points during the closure. Check that the gauge readings do not exceed the values given in Table 2 for the controller spring rating.
 - 6.2.4 When the flow reaches zero, note the shut off pressure. With the ball valve closed, note the pressure after one minute. The pressure must not exceed the value given in Table 2 for the controller spring rating.

- 6.2.5 If the pressure is exceeded, suspect internal defects in the controller, refer to Chapter 7.
- 6.2.6 If the pressure drops suspect external leaks or damaged coaxial seal in the controller, refer to Chapter 7.

TABLE 2 - PRESSURE CONTROL TEST LIMITS

Nominal control pressure bar (psi)	Maximum control pressure bar (psi)		Maximum shut-off pressure bar (psi)	Maximum pressure after 1 minute bar (psi)
	Down to 50 igpm	Below 50 igpm		
2 (30)	2.6 (37)	2.8 (40)	2.8 (40)	3 (45)
3 (45)	3.4 (50)	3.8 (55)	3.8 (55)	4.1 (60)
3.4 (50)	3.8 (55)	4.1 (60)	4.1 (60)	4.5 (65)
3.8 (55)	4.1 (60)	4.5 (65)	4.5 (65)	4.8 (70)

6.3 Carry out a surge pressure test as follows:

NOTE

The peak pressures reached in this test should be measured using a suitable electronic indicator, if one is not available a gauge having a discrimination of not less than 0.3 bar (5 psi) with a peak pressure indicator may be used.

- 6.3.1 Taking each hose unit in turn, connect it to the test rig. With a unit fitted with twin surge controllers, block out each one in turn as for pressure control test.
- 6.3.2 Increase the flow, opening the ball valve, until the maximum flow 1900 lpm (420 igpm) is reached.
- 6.3.3 Close the ball valve at an even rate over a period of one second. Check that the peak pressure during closing does not exceed 8.2 bar (120 psi). After closure the maximum stable pressure must not exceed 1.38 bar (20 psi) above the nominal control pressure of the controller.

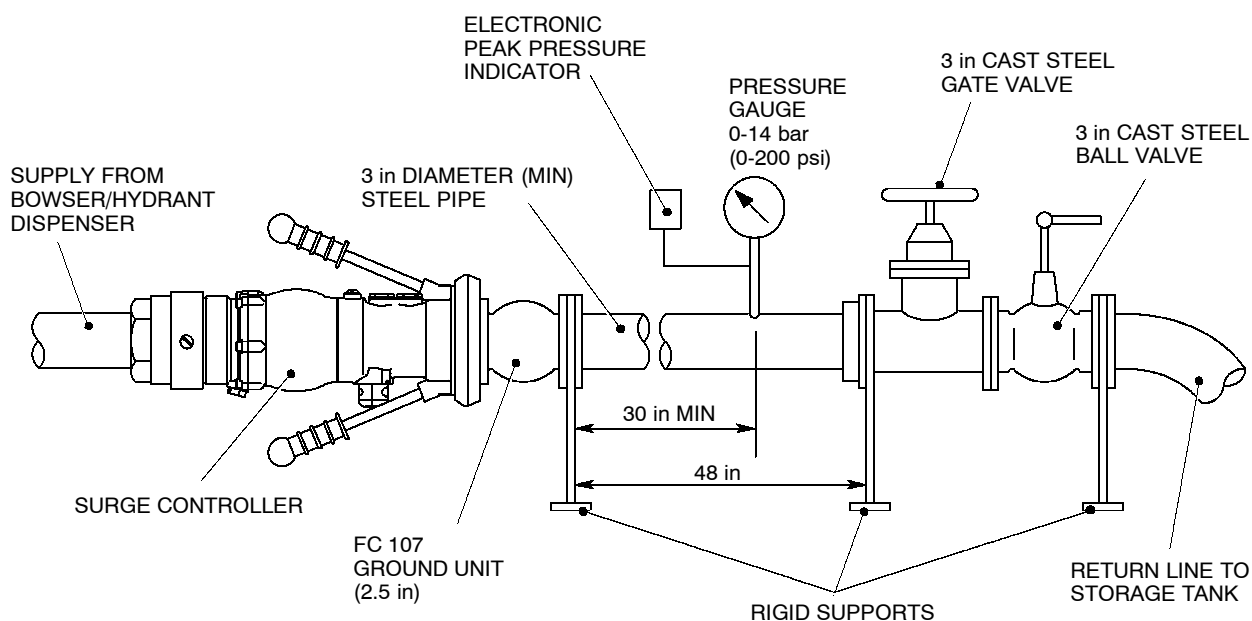


Fig 6.2 Dynamic test rig arrangements

Chapter 7

FAULT FINDING**1 GENERAL**

- 1.1 In most cases faults on the hose unit will be self evident and will show as leaks, seizure of operating mechanisms or jamming of components, the following tables show common faults, probable cause and remedy. It must be remembered that these tables are a guide in no order of priority and not a complete list. Operation and maintenance procedures correctly carried out should keep faults to a minimum.
- 1.2 Table 1 gives faults that may occur to the hose unit generally during normal operation.
- 1.3 Table 2 gives faults that may occur when carrying out static tests as described in Chapter 6.
- 1.4 Table 3 gives faults that may occur when carrying out dynamic tests as described in Chapter 6.

TABLE 1 - OPERATIONAL FAULTS

Fault	Cause	Remedy
Nozzle (Refer Fig 8.1)		
Fuel leaking between A/C Unit and Nozzle.	Nose seal worn or damaged. A/C Unit sealing face worn or damaged.	Replace nose seal (39) and O-ring (38). Use an alternative adaptor, if available, or advise A/C Operator.
Excessive build up of fuel in area of index ring after disconnect - in excess of 10 ml.	Poppet seal (34) worn or damaged. nose seal overstressed or damaged.	Refer to Chapter 5, Para 2.
	Index ring seal (37) damaged, or contaminated by foreign matter.	Refer to Chapter 5, Para 2.
Fuel leak between units, e.g. nozzle and surge controller.	O-ring seal, e.g. (40), worn or damaged.	Separate the effected units and renew the O-ring.
Leakage from Swivels or Quick Disconnect Unit.	O-ring seal, e.g. (40) worn or damaged.	Replace defective item, refer to Chapter 5, Para 6, 7 or 8.
Surge Controller (Refer Fig 8.2)		
Fuel leaking from vent port.	Coaxial seal (14), on the controller piston guide, worn or damaged.	Renew seal, refer to Chapter 5, Para 3.

TABLE 2 - STATIC TEST FAULTS

Fault	Cause	Remedy
Earth bonding resistance 1 Ohm or higher.	Internal damage to grounding cable.	Carry out continuity test, renew cable as necessary.
Static Pressure Test 1 and 2 Pressure/vacuum not maintained for one minute.	Test rig adaptor leak. One or more seals worn, or damaged.	Rectify leak. Inspect for leaks and rectify.
Static Pressure Test 3 Pressure at gauge 'B' exceeds specified pressure.	Surge Controller piston seal (9) worn or damaged. Damage to piston sealing edge. Seal annulus (12) or O-ring (13) worn or damaged. Check valve (15) damaged.	Refer to Chapter 5, Para 3. Dismantle, clean, inspect for wear and damaged, renew defective items.
Note: After static tests some residual fuel from the block out device may be evident.		

TABLE 3 - DYNAMIC TEST FAULTS

Fault	Cause	Remedy
Pressure Control Test: Pressure at zero flow rises above specified pressure.	Surge Controller piston seal (9) worn or damaged. Damage to piston sealing edge. Seal annulus (12) or O-ring (13) worn or damaged; check valve or piston damaged.	Refer to Chapter 5, Para 3; dismantle the Controller clean and inspect for wear and damaged, renew any items found defective.
Pressure at zero flow, decreases.	Coaxial seal (14) worn or damaged. Leakage on test rig.	Refer to Chapter 5, Para 3, dismantle the Surge Controller, clean, inspect for wear or damage, renew defective items. Repair leak.
Surge Pressure: Peak reading on pressure gauge in excess of 8.2 bar - (120 psi).	Surge Controller piston seals too slowly due to vent system restriction. Piston seal (9) or piston sealing edge worn or damaged.	Refer to Chapter 5, Para 3, dismantle the Surge Controller, clean, inspect for wear or damage, renew defective items.
Maximum pressure after closing rises above 4.8 bar - (70 psi).	Surge Controller piston seat worn or damaged. Damage to piston sealing edge. Seal annulus (12) or O-ring (13) worn or damaged. Check for valve and piston damage.	Refer to Chapter 5, Para 3, dismantle the Surge Controller, clean and inspect for wear or damage, renew defective items.

Chapter 8

SPARE PARTS CATALOGUE

CONTENTS

Para		
1	General	
2	Spare parts details	
	Nozzle assembly	
	Surge controller	
	Standard swivel adaptors	
	Flight Refuelling swivel adaptor	
	Swivel hose connector	
	Quick disconnect hose connector	
	Quick disconnect isolating valve hose connectors	
	Lightweight quick disconnect hose connector	
	Selective sleeve	
Fig		Page
8.1	Nozzle assembly	2
8.2	Surge controller	8
8.3	Standard swivel adaptors	12
8.4	Flight Refuelling swivel adaptor	14
8.5	Swivel hose connector	16
8.6	Lightweight quick disconnect hose connector	18
8.7	Quick disconnect isolating valve hose connectors	20
8.8	Quick disconnect hose connector	24
8.9	Selective sleeve	26

1 GENERAL

1.1 When ordering spare parts please quote the following information:

- (a) Publication number and issue
- (b) Fig/Item number
- (c) Part number and description
- (d) Quantity

2 The following tables of spare parts also contain the relevant attaching parts, i.e. screws, washers, nuts, etc, which may fail as a result of repeated removal and insertion.

NOTES

- (1) '+' in the Fig/Item column indicates Item is not illustrated.
- (2) 'REF' in the Qty column indicates Item is for reference purposes only and is **not available** as a spare.
- (3) '**' in the Fig/Item column indicates Item is recommended as a spare part
- (4) Spares kit HUMS4600 is a seal kit for a swivel junction. The first item in the kit is a part of one half of the junction, while the other two items are parts of the other half of the junction. The kit will suffice for any nozzle/surge controller/adaptor combination.

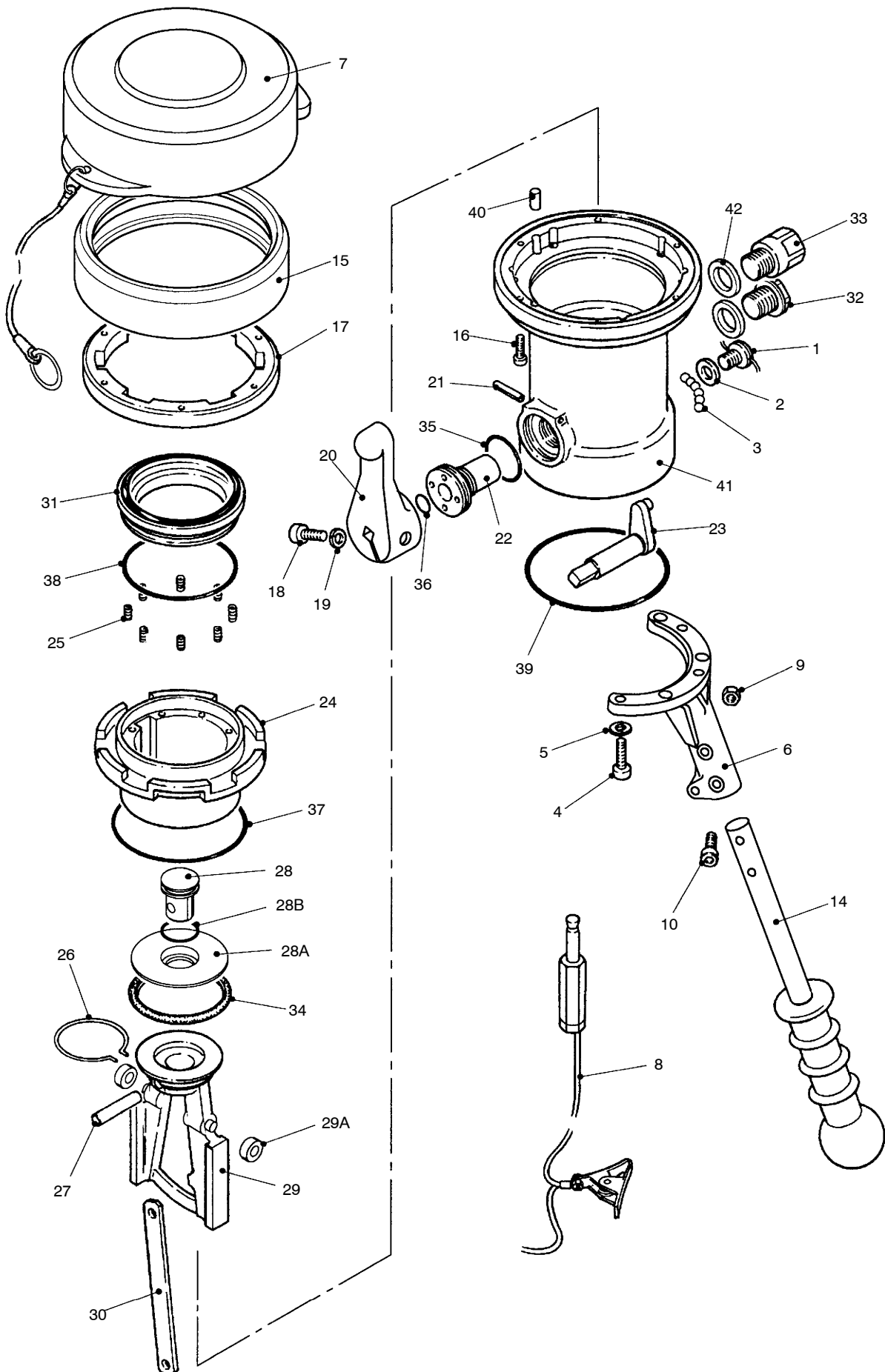


Fig 8.1 Nozzle Assembly

NOZZLE ASSEMBLY

Fig/ Item No.	Part No.	Description	Qty
8.1- +	HUMZ4300	Nozzle, Assembly (without handles)	REF
1	HUSZ4318	Ball Retaining Screw 3/8in - 24 UNF	1
2	ZMMZ0135-4	Bonded Seal 1/8" BSP	1
3	ZASZ0068-5	Ball, 1/4 in. dia. st.st	39
4	ZS3225D0814A	Screw, 1/4 in. UNC x 7/8 in. Socket Head	6
5	ZW8207G08A	Washer, 1/4 in. Single Coil Spring	6
6	HUAZ4355	Handle Mount	2
7	HUMZ4362	Dust Cap Assy, internal and external (replaces HUMZ3320 and HUPZ3527)	1
8	HUMZ1366	Grounding Cable Assembly	1
9	ZASZ0070-10	Nut, stiff, 1/4 in. UNC	4
10	ZS3226D0820A	Bolt, 1/4 in. UNC x 1.25 in. Hex Hd Hts	4
12	HUMS4360	Stick Handle Assy (comprises 4, 5, 6, 9, 10 &14)	
13	HUMS4361	Stirrup Handle Assy (comprises 4, 5, 6, 9, 10 &14a)	
14	HUMZ4353	Stick Handle	2
14 a	HUAZ4358	Stirrup Handle	2
+	HUAZ4357	Ring Handle	1
15	HURZ4350	Rubber Buffer	1
16	ZS4025D0616A	Screw HT 10-24 UNC x 1 in. Socket Head	6
17	HUCZ4363	Nose Ring (Lead in)	1
18	ZS4025D0814A	Screw, Operating Lever	1
19	ZW8207G08A	Washer, 1/4 in. Single Coil Spring	1
20	HUAZ4348	Operating Lever	1
21	ZT4011E0312A	Spirol pin 3/32 in. x 3/4 in. st.st	1
22	HUSZ3269	Boss	1
23	HUSZ3267	Crank	1
24	HUSZ3530	Index Ring	1
25	HUSZ3529	Spring, Poppet Seat	8
26	HUSZ3265	Circlip, gudgeon pin	1
27	HUSZ3264	Gudgeon Pin	1
28	HUSZ3442	Poppet Pin	1
28 A	HUAZ4346	Poppet Plate	1
*28 B	Z032M019624A	O-Ring seal	1

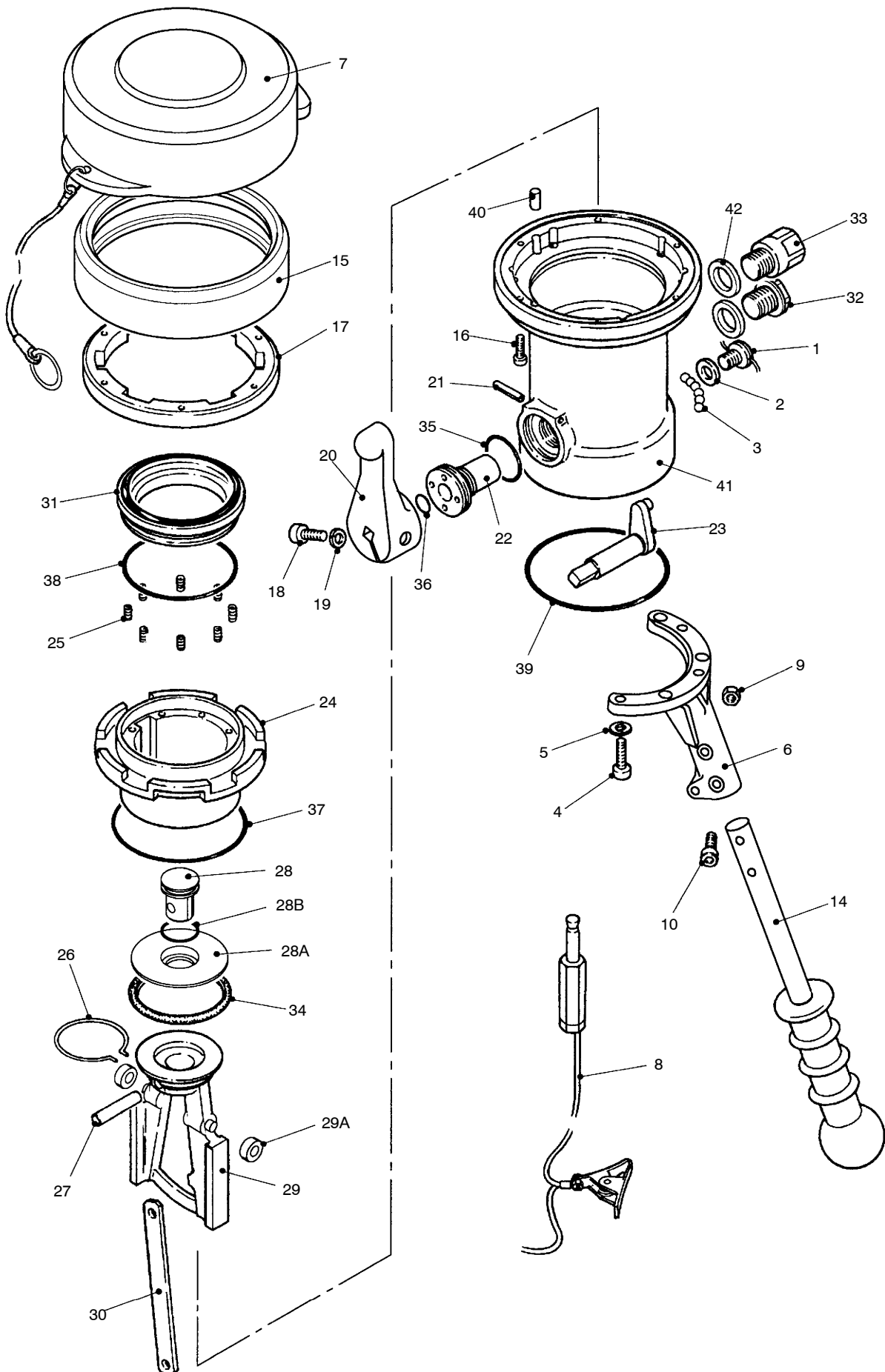


Fig 8.1 Nozzle Assembly

NOZZLE ASSEMBLY (continued)

Fig/ Item No.	Part No.	Description	Qty
29	HUMZ4342	Plate	1
29 A	HUSZ3279	Roller	2
30	HUSZ4316	Link	1
31	HUMZ4560	Nose Seal	1
32	FCCZ653	Plug 3/8 in. BSP	2
	ZMMZ0320-02	Gammon Jet Test Quick Disconnect (alt. to Qty 1 Item 32, when required)	1
33	HUMZ3635-2 HUMZ3635-3	Vacuum Relief Valve 15 in. Hg 22 in. Hg	1
*34	HURZ3272	Poppet Seal	1
*35	Z032E023070A	O-Ring, Fluorocarbon	1
*36	Z032M010624A	O-Ring, Fluorocarbon	1
*37	ZARZ0041-69	O-Ring Seal	1
*38	Z032M067624A	O-Ring, Fluorocarbon	1
*39	Z032E235139A	O-Ring, Fluorocarbon	1
40	HUSZ4319	Index Peg	2
41	NOT SPARED	Nozzle Body	1
*42	ZMMZ0135-1	Bonded Seal 3/8" BSP	2

* = Suggested spare part

Ref = Reference only

+ = Item not illustrated

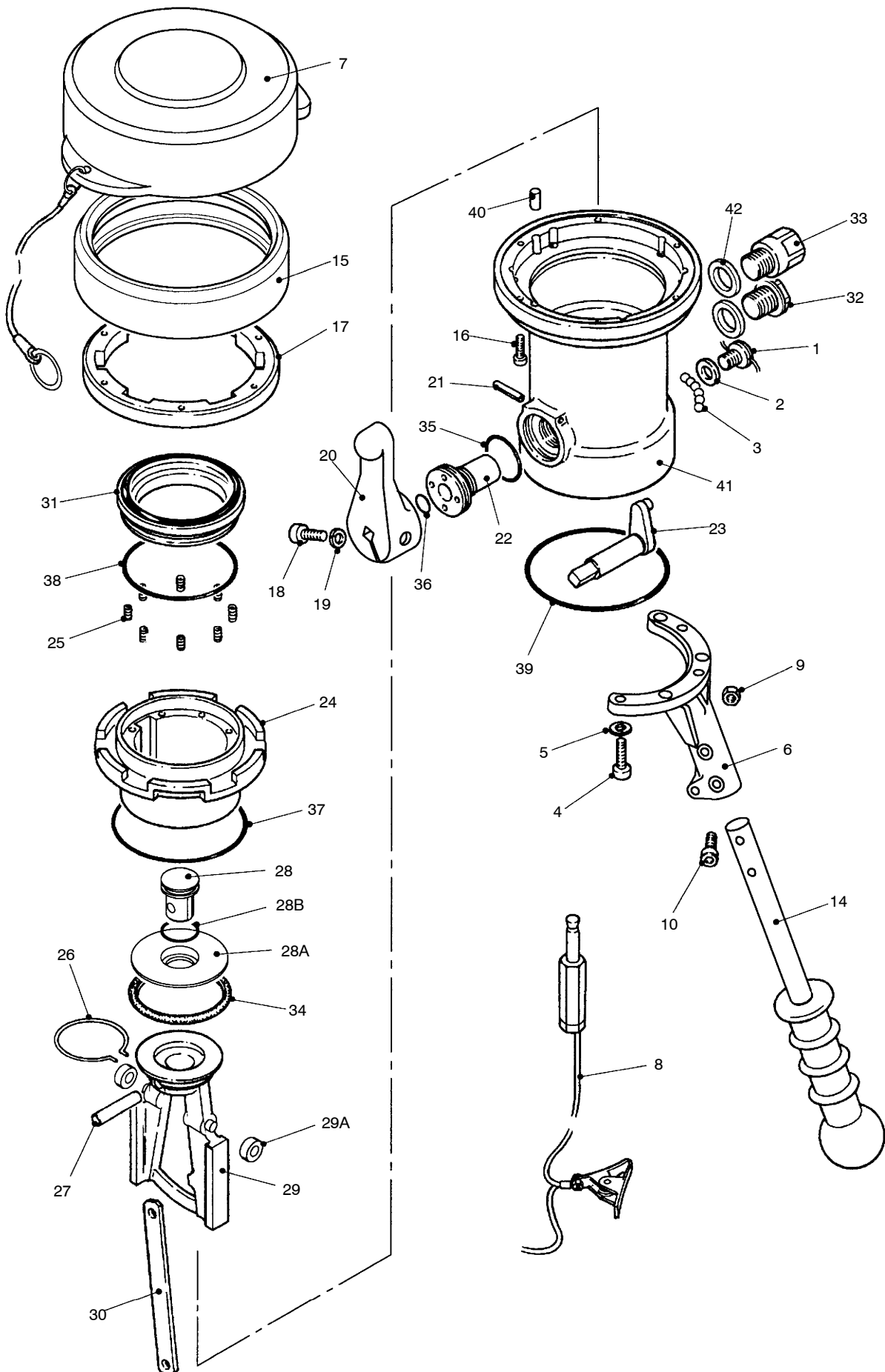


Fig 8.1 Nozzle Assembly

NOZZLE ASSEMBLY SPARES KITS

Fig/ Item No.	Part No.	Description	Qty
	HUMS3460	Kit Set, Seal, Nozzle comprising:	
8.1 - 2	ZMMZ0135-1	Bonded Seal	1
28B	Z032M019624A	O-Ring	1
34	HURZ3272	Poppet Seal	1
35	Z032E023070A	O-Ring, Fluorocarbon	1
36	Z032M010624A	O-Ring, Fluorocarbon	1
37	ZARZ0041-69	O-Ring, Seal	1
38	Z032M067624A	O-Ring, Fluorocarbon	1
39	Z032E235139A	O-Ring, Fluorocarbon	1
	HUMS4600	Kit, Seal, Swivel comprising:	
8.1 39	Z032E235139A	O-Ring, Fluorocarbon	1
8.2 23	HUPZ4512	Swivel Ring	1
24	Z032E040070A	O-Ring BS No. 040 Fluorocarbon	1

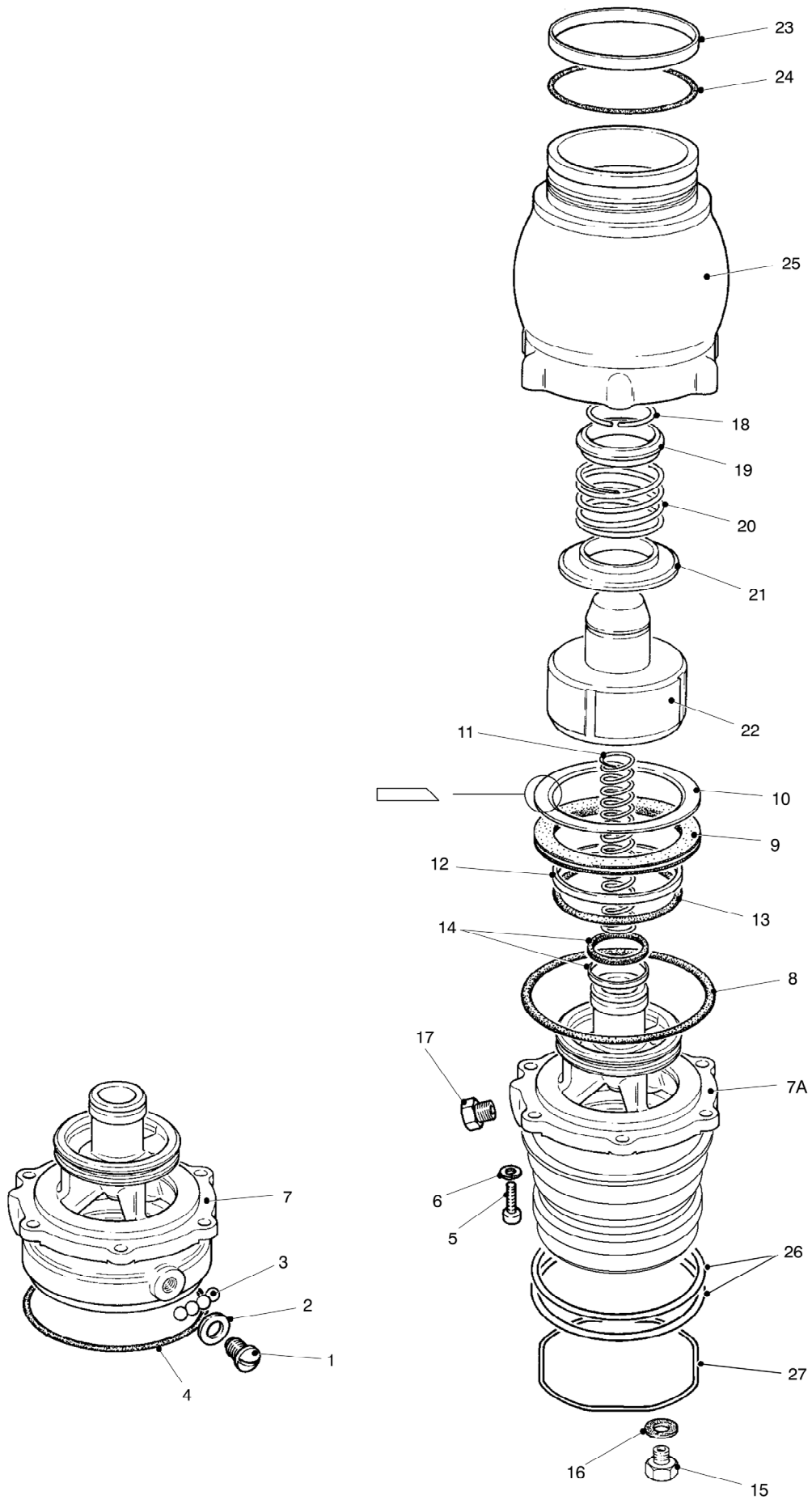


Fig 8.2 Surge Controller

SURGE CONTROLLER

Fig/ Item No.	Part No.	Description	Qty
8.2- +	HUMS4506	Surge Controller 50 psi	REF
	HUMS4504	30 psi	
	HUMS4505	45 psi	
	HUMS4507	55 psi	
1	HUSZ4318	Ball Retaining Screw	1
*2	ZMMZ0135-1	Bonded Seal	1
3	ZASZ0068-5	Ball, 1/4 in. dia., st.st	39
*4	ZO32E235139A	O-Ring, Fluorocarbon	1
5	ZS3225D0812A	Screw 1/4 in. UNC x 3/4 in., Socket Head	6
6	ZW8207G08A	Washer 1/4 in. Single Coil Spring	6
7	NOT SPARED	Piston Guide sub assembly	1
7A	NOT SPARED	Piston Guide/Adaptor	1
*8	ZARZ0041-14	O-Ring	1
*9	HUMZ3566	Seal	1
10	HUSZ3523	Backing Ring	1
11	HUSZ3559	Spring, Stainless Steel - 50 psi	1
	HUSZ3560	- 30 psi	1
	HUSZ3525	- 45 psi	1
	HUSZ3565	- 55 psi	1
*12	ZAPZ0039-3	Seal Annulus	1
*13	ZARZ0041-61	O-Ring	1
*14	ZAMZ0039-4	Coaxial Seal	1
15	HUMZ1329	Check Valve Assy	1
16	ZAFZ0010-12	Fibre Washer	1
17	HUAZ4343	Vent Port Assembly	1
18	HUSZ3522	Circlip	1
19	HUAZ3517	Spring Retainer	1
20	HUSZ4516	Spring, Compression	1
21	HUAZ4515	Valve Plate	1
22	HUAZ3515	Piston	1
23	HUPZ4512	Swivel Ring	1
*24	ZO32E040070A	O-Ring, Fluorocarbon	1
25	NOT SPARED	Body Assembly	1
26	HUSZ3339	Ball Track	2
27	HUSZ3336	Filter Clip	1
+	ZMMZ0320-10	Block out device	1

* = Suggested spare part

Ref = Reference only

+ = Item not illustrated

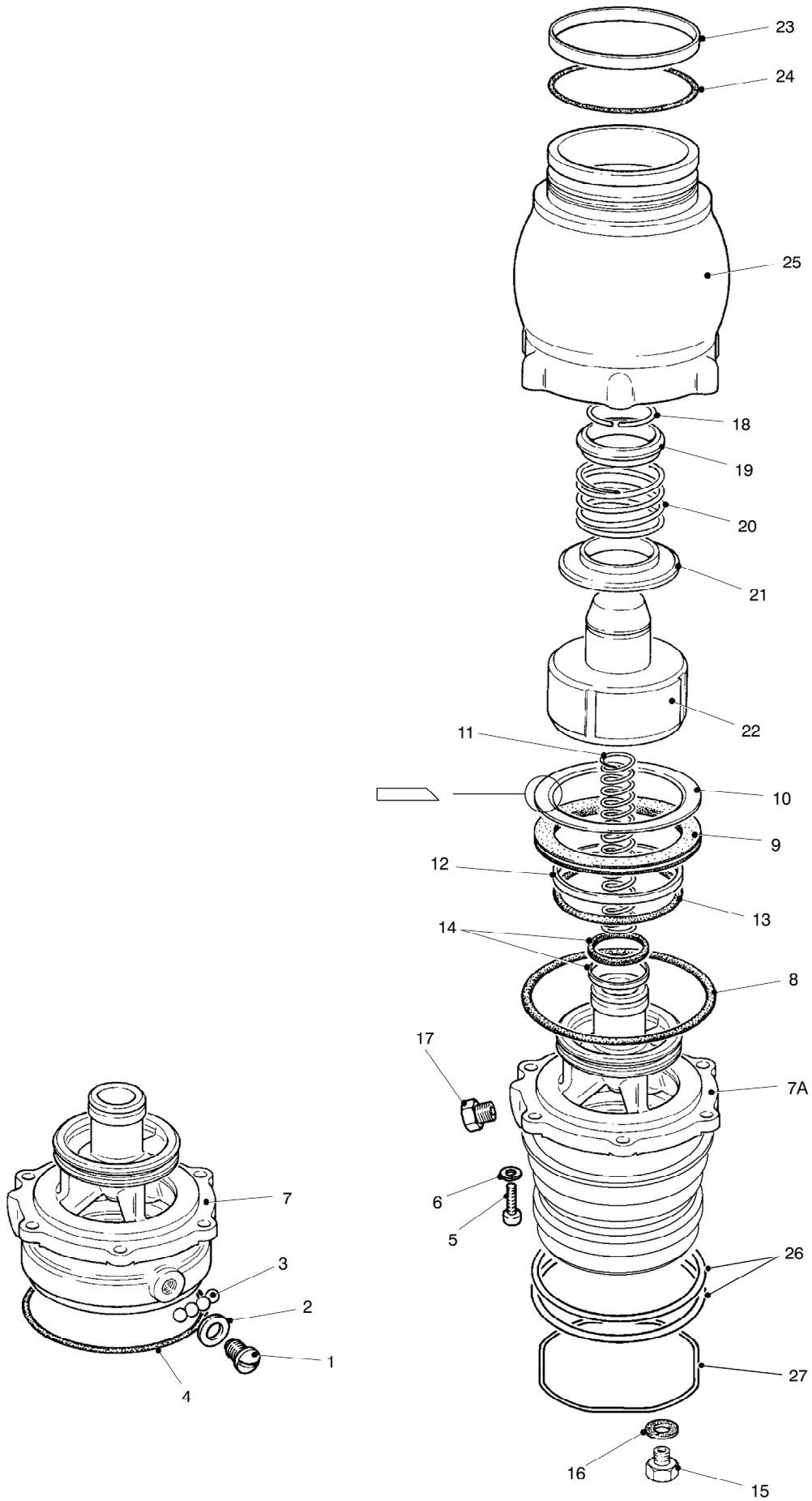


Fig 8.2 Surge Controller

SURGE CONTROLLER SPARES KITS

Fig/ Item No.	Part No.	Description	Qty
	HUMS4600	Kit, Seal, Swivel comprising:	
4	ZO32E235139A	O-Ring, Fluorocarbon	1
23	HUPZ4512	Swivel Ring	1
24	ZO32E040070A	O-Ring, Fluorocarbon	1
	HUMS3462	Kit Set, Seal, Surge Controller comprising:	
2	ZMMZ0135-1	Bonded Seal	1
4	ZO32E235139A	O-Ring, Fluorocarbon	1
8	ZARZ0041-14	O-Ring	1
9	HUMZ3566	Seal	1
12	ZAPZ0039-3	Seal Annulus	1
13	ZARZ0041-61	O-Ring	1
14	ZAMZ0039-4	Coaxial Seal	1
15	HUMZ1329	Check Valve Assembly	1
16	ZAFZ0010-12	Fibre Washer	1
24	ZO32E040070A	O-Ring, Fluorocarbon	1

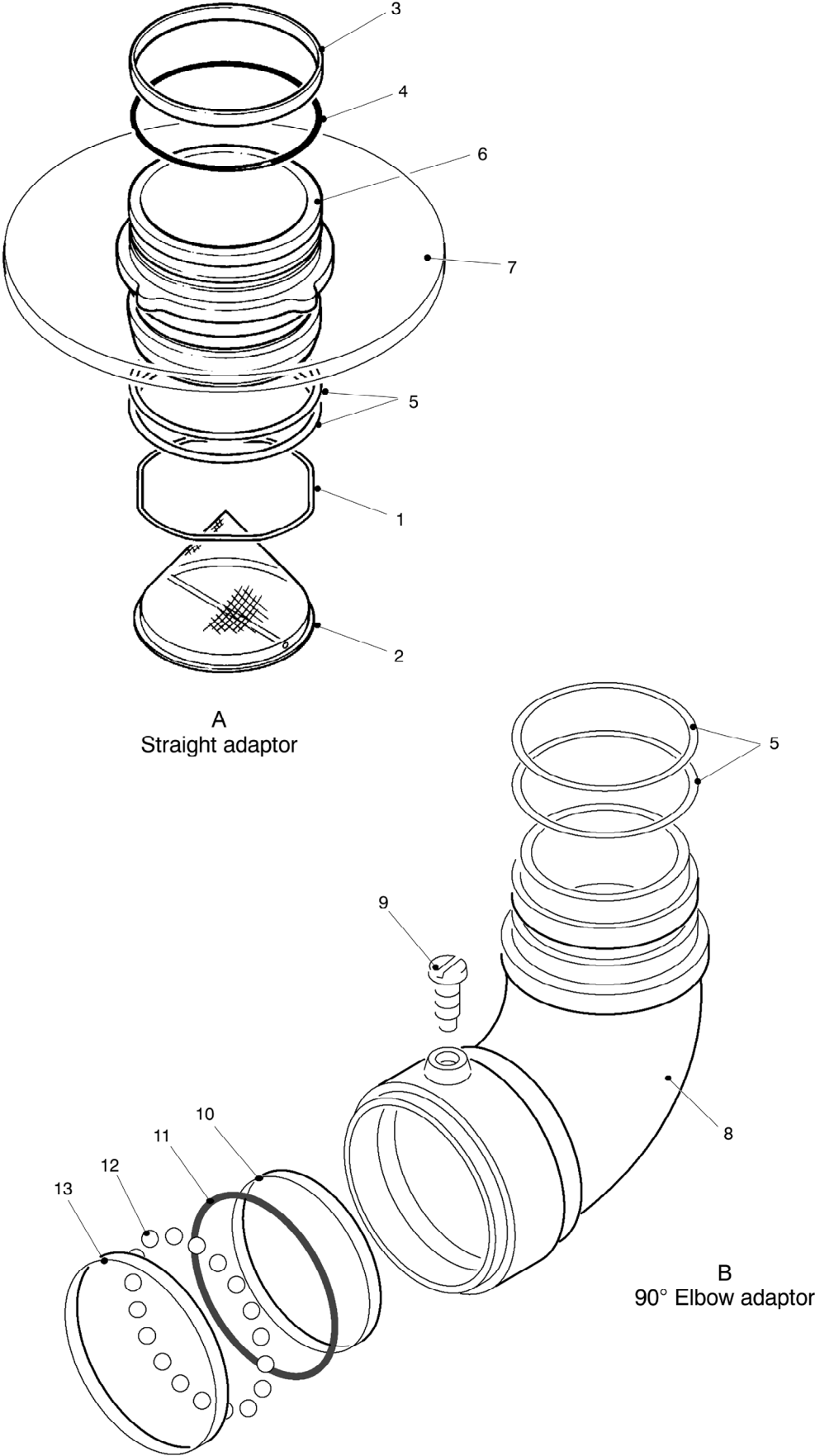


Fig 8.3 Standard swivel adaptors

STANDARD SWIVEL ADAPTORS

Fig/ Item No.	Part No.	Description	Qty
8.3--+	HUMY4400 Series	Swivel Adaptor	REF
1	HUSZ3336	Strainer Retaining Clip	1
2	HUSZ4421	Strainer, 100 Mesh	1
	HUSZ4422	Strainer, 60 Mesh	
	HUSZ3312	Strainer, 100 Mesh) If Surge Controller	
	HUSZ4423	Strainer, 60 Mesh) fitted	
3	HUPZ4512	Swivel Ring	1
4	ZO32E040070A	O-Ring, Fluorocarbon	1
5	HUSZ3339	Ball Track	2
6	HUAZ4420	Adaptor Body, straight	1
7	HUPZ4339	Ring, Protection (for Item 6, if required)	1
8	HUMS3455	Elbow Assembly (inc item 5 and tested)	1
9	FCCZ862	Ball Retaining Plug	1
10	HUPZ3338	Wear Strip	1
11	ZARZ0041/69	'O' Ring	1
12	ZASZ0068/5	Balls Stainless Steel 1/4" dia.	40
13	HUPZ3338/1	Wear Strip	1

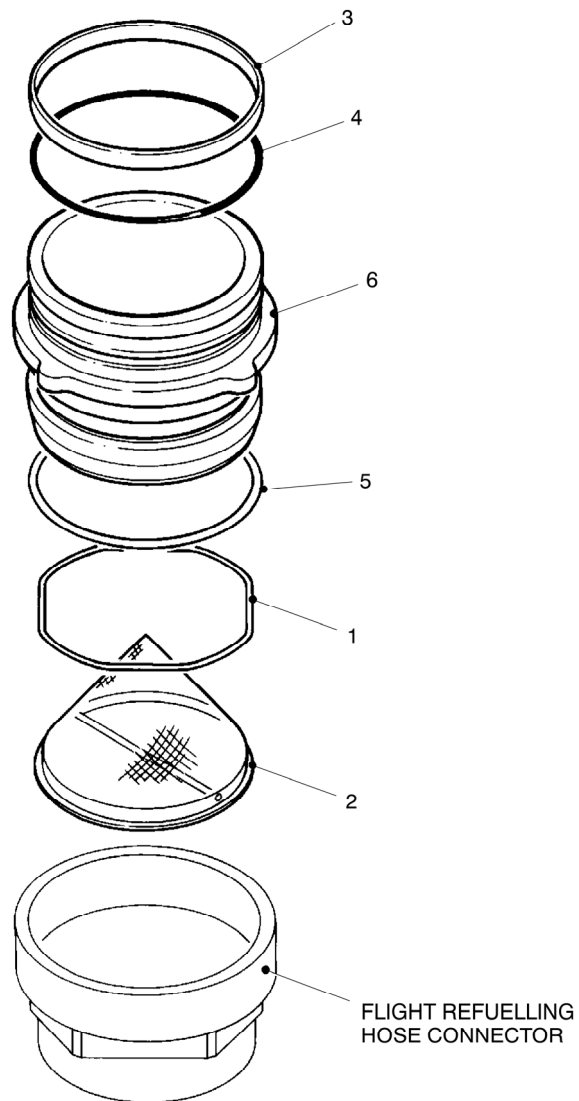


Fig 8.4 Flight Refuelling swivel adaptor

FLIGHT REFUELLING SWIVEL ADAPTOR

Fig/ Item No.	Part No.	Description	Qty
8.4- +	HUMS4401	Flight Refuelling swivel adaptor	REF
1	HUSZ3336	Strainer Retaining Clip	1
2	HUSZ4421	Strainer, 100 Mesh	1
	HUSZ4422	Strainer, 60 Mesh	
	HUSZ3312	Strainer, 100 Mesh) If Surge Controller	
	HUSZ4423	Strainer, 60 Mesh) fitted	
*3	HUPZ4512	Swivel Ring	1
*4	ZO32E040070A	O-Ring, Fluorocarbon	1
5	HUSZ3339	Ball Track	1
6	HUAS4426	Adaptor Body	1
7+	HUPZ4339	Ring, Protection (if required)	1

FLIGHT REFUELLING SWIVEL ADAPTOR SPARES KITS

Fig/ Item No.	Part No.	Description	Qty
	HUMS4600	Kit, Seal, Swivel, comprising:	
8.4- 3	HUPZ4512	Swivel Ring	1
4	ZO32E040070A	O-Ring, Fluorocarbon	1
8.2- 4	ZO32E235139A	O-Ring, Fluorocarbon	1

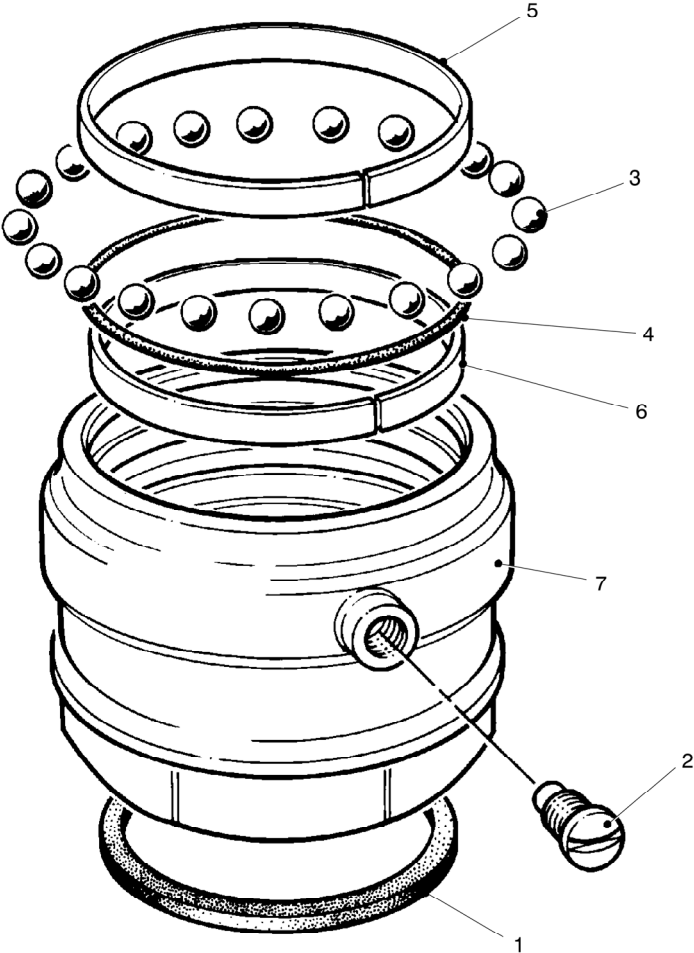


Fig 8.5 Swivel hose connector

SWIVEL HOSE CONNECTOR

Fig/ Item No.	Part No.	Description	Qty
8.5- +	HUMS4416 HUMS4417 HUMS4418 HUMS4419	Hose Connector Assembly 2.5 in. BSP 3.0 in. BSP 2.5 in. NPT 3.0 in. NPT	REF
*1	HURZ3344 FCRZ518	Seal Ring, 2.5 in.) not fitted to Seal Ring, 3 in.) NPT versions	1
2	FCCZ862	Ball retaining plug	1
3	ZASZ0068-5	Ball, 1/4 in. dia., st.st	40
*4	ZARZ0041-69	O-Ring, seal	1
*5	HUPZ3338	Wear Strip, Slydring	1
*6	HUPZ3338-1	Wear Strip, Slydring	1

* = Suggested spare part

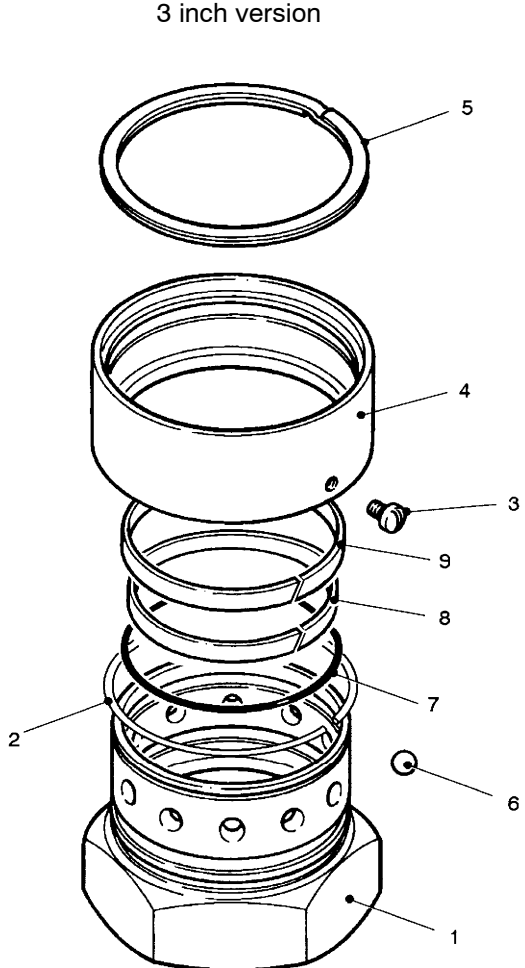
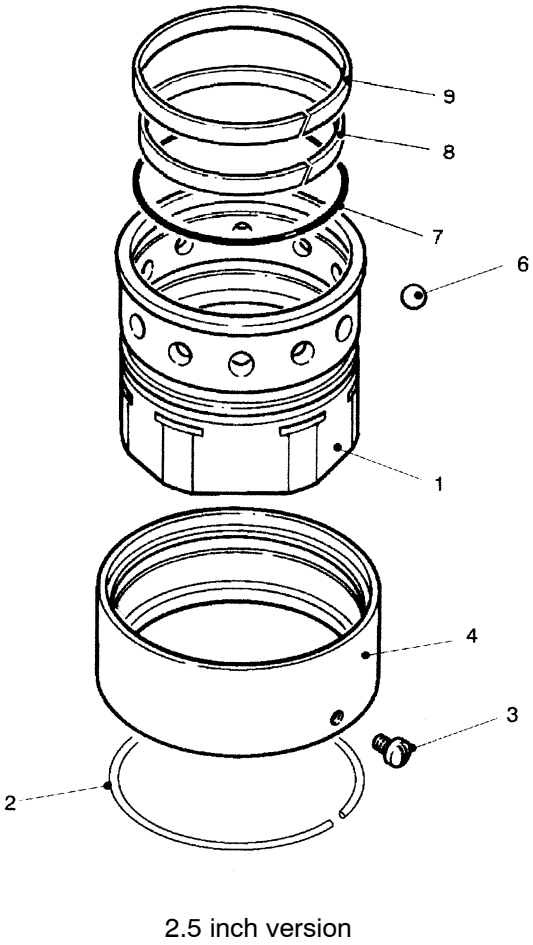


Fig 8.6 Lightweight quick disconnect hose connector

LIGHTWEIGHT QUICK DISCONNECT HOSE CONNECTOR

Fig/ Item No.	Part No.	Description	Qty
8.6- +		Hose Connector,	REF
	HUAZ4536	2.5 in. BSP	
	HUAZ4537	3.0 in. BSP	
	HUAZ4538	2.5 in. NPT	
	HUAZ4539	3.0 in. NPT	
8.6- +		Lightweight Quick Disconnect Hose Connector,	REF
	HUMZ4561	2.5 in. BSP	
	HUMZ4562	3.0 in. BSP	
	HUMZ4563	2.5 in. NPT	
	HUMZ4564	3.0 in. NPT	
2	HUSZ3535	Sleeve Retaining Ring	1
3	ZASZ0008-9	Locking Screw	2
4	HUAZ4540	Sleeve	1
5	ZASZ0038-13	Retaining Ring, Spirolox	1
6	ZASZ0068-6	Ball, 5/16 in. dia., st.st	12
*7	ZARZ0041-69	O-Ring, Seal	1
*8	HUPZ4541-2	Wear Strip, Slydring	1
*9	HUPZ4541-1	Wear Strip, Slydring	1

* = Suggested spare part

QUICK DISCONNECT ISOLATING VALVE HOSE CONNECTOR

Fig/ Item No.	Part No.	Description	Qty
8.7- +		Quick Disconnect Isolating Valve assembly,	REF
	HUMY3666	2.5 in. BSP (Push Button)	
	HUMY3667	2.0 in. BSP (Push Button)	
	HUMY3668	2.5 in. NPT (Push Button)	
	HUMY3669	2.0 in. NPT (Push Button)	
	HUMY3670	2.5 in. BSP (Locking Screw)	
	HUMY3671	2.0 in. BSP (Locking Screw)	
	HUMY3672	2.5 in. NPT (Locking Screw)	
	HUMY3673	2.0 in. NPT (Locking Screw)	
*1	HURZ3344	Seal Ring, 2.5 in.) not fitted to	1
	HURZ3581	2.0 in.) NPT versions	
2	HUSZ3572	Operating Lever (Push Button version)	1
2A	HUMZ3596	Operating Lever (Locking Screw version)	1
3	HUMS3585	Sleeve Assembly	1
4	ZASZ0038-3	Retaining Ring, Spirolox	1
5	ZASZ0068-6	Ball, 5/16 in. dia., st.st	12
6	HUSZ3341	Spring	1
*7	ZARZ0041-69	O-Ring, seal	1
*8	HUPZ3338	Wear Strip, Slydring	1
*9	HUPZ3338-1	Wear Strip, Slydring	1
10	HUSZ3598	Flap Valve	1
11	HUSZ3574	Valve Spindle	1
12	ZASZ0070-19	Nut, locking, 5/16 UNF	1
13	HUSZ3577	Special Washer	1
14	HUSZ3576	Press Button	1
14A	HUSZ3595	Locking Screw	1
15	HUCZ3575	Lock Button	2
15A	HUSZ3597	Spacer	2
16	HUSZ3578	Spring	2
*17	Z022E008070A	O-Ring, Seal	1
*18	Z022E110103A	O-Ring, Seal	1
*19	Z022E112103A	O-Ring, Seal	1
*20	Z022E011070A	O-Ring, Seal	1
*21	Z032E226139A	O-Ring, Fluorocarbon	1

* = Suggested spare part

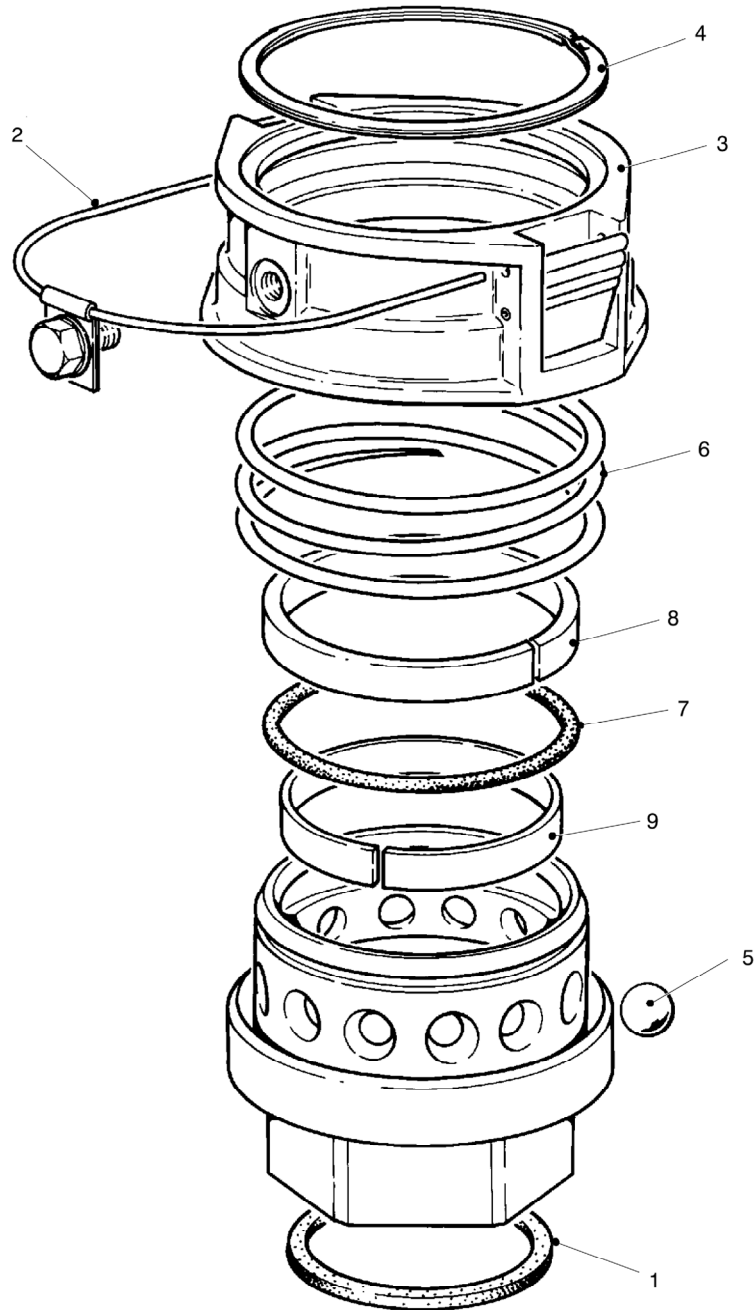


Fig 8.8 Quick disconnect hose connector

QUICK DISCONNECT HOSE CONNECTOR

Fig/ Item No.	Part No.	Description	Qty
8.8- +	HUMS4412 HUMS4413 HUMS4414 HUMS4415	Connector Assembly 2.5 in. BSP 3.0 in. BSP 2.5 in. NPT 3.0 in. NPT	REF
*1	HURZ3344 FCRZ518	Seal Ring 2.5 in.) not fitted to 3.0 in.) NPT versions	1
2	HUMS3382	Locking Clip Assembly	1
3	HUMZ3564	Sleeve Assembly	1
4	ZASZ0038-3	Retaining Ring, Spirolox	1
5	ZASZ0068-6	Ball, 5/16 in. dia, st.st	12
6	HUSZ3341	Spring	1
*7	ZARZ0041-69	O-Ring, seal	1
*8	HUPZ3338	Wear Strip, Slydring	1
*9	HUPZ3338-1	Wear Strip, Slydring	1

* = Suggested spare part

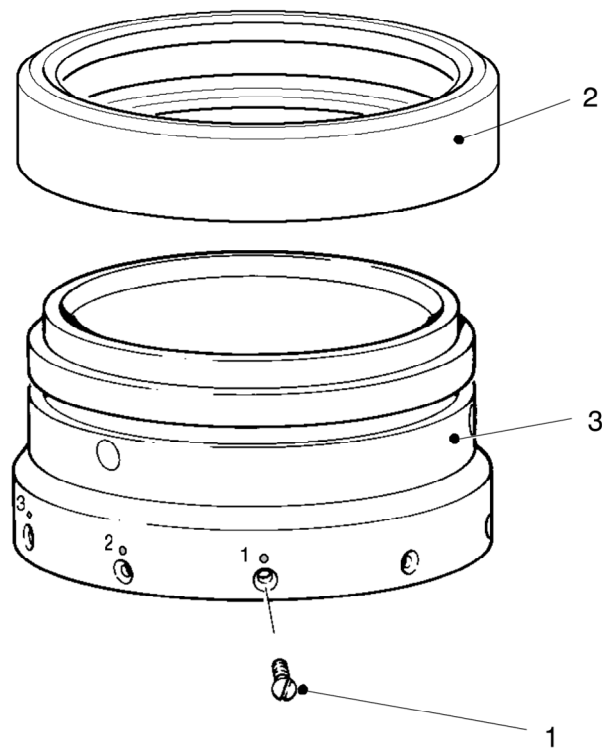


Fig 8.9 Selective sleeve

SELECTIVE SLEEVE

Fig/ Item No.	Part No.	Description	Qty
8.9- +	-	Selective sleeve assembly, positions 1, 2 & 3 positions 4 & 5	REF
1	ZS4001E0606A	Screw, Csk, 10-32 UNF x 3/8 in. st.st	3
2	HURZ4350	Buffer Ring	1
3	HUMS3424 HUMS3425	Selective Sleeve, positions 1, 2 & 3 positions 4 & 5	1

* = Suggested spare part