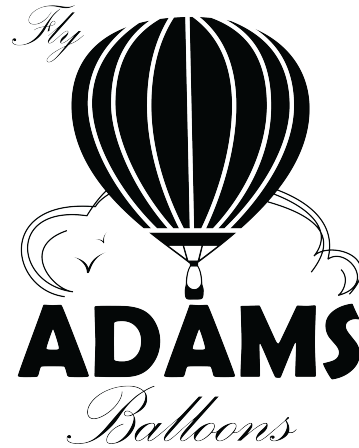


# **Adams Balloons LLC**



**MAINTENANCE AND STRUCTURAL REPAIR MANUAL  
FOR  
ADAMS BALLOONS  
PRODUCED UNDER TYPE CERTIFICATE NUMBER A15SO**

First Edition September, 1981

17 Total Pages

Revised January 1984

17 Total Pages

Second Revision June 2015

17 Total Pages

Third Revision December 2019

39 Total Pages

5445 Edith Blvd, Albuquerque, New Mexico 87113 U.S.A.  
Telephone: (505) 433-2094

## 0.1 Record of Revisions

<b>Rev #</b>	<b>Section(s)</b>	<b>Pages</b>	<b>Date of Issue</b>
0	All	All	September 1981
1	All	All	January 1984
2	All	All	June 2015
3	II & III	6-15	December 2019
3.1	IV	16-17	
3.2	V	18	
3.3	VI	19-21	
3.4	Appendix A	New	

## CONTENTS

* SPECIAL NOTICE *	4
I. INTRODUCTION	5
II. 100 HOUR INSPECTION	6
III. ANNUAL INSPECTION	11
IV. MATERIALS DESCRIPTION	16
A. FABRICS	16
B. WEBS	16
C. THREAD	16
D. STITCHING	16
E. LINES	17
F. STEEL CABLES	17
G. FUEL HOSES	17
H. BURNER	17
I. BURNER SUPPORT STRUT TUBES	17
J. MISCELLANEOUS	17
V. REPLACEMENT OF PARTS	18
VI. REPAIR TECHNIQUES	19
A. FABRIC REPAIRS	19
B. WEBBING PATCHES OR SPLICES	20
C. FUEL HOSES	20
D. STEEL CABLES	21
E. WICKER AND WOOD REPAIRS	21
F. FUEL SYSTEM REPAIRS	21
G. BURNER (PN5-2)	21
H. BURNER (CrossFire)	21
APPENDIX A - Crossfire Burner	22

**\* SPECIAL NOTICE \***

ATTENTION

This manual contains only a list of repair, inspection and maintenance procedures to be followed by qualified and certain personnel. This manual is not to be used by unqualified personnel in performing any inspections or repairs to any Adams Balloon.

This manual in no way undertakes to provide instruction in the repair and maintenance of an Adams ballon, and Adams Balloons expressly disclaims any liability whatsoever arising out of the use of this manual.

## I. INTRODUCTION

Material which follows in this manual is a listing of approved inspection, maintenance and repair procedures for persons skilled in balloon repair, and is NOT INTENDED to teach basic skills.

Only materials and parts approved by TC # A15SO may be used in repair and maintenance of Adams Balloons. Use of other materials or techniques must be considered as a major alteration of the aircraft and should be done in compliance with the appropriate Federal Aviation Administration regulations.

Unless otherwise specified techniques approved in the "Airframe and Powerplant Mechanics Handbook" are acceptable.

Mike Adams Balloon Loft, Inc. expressly denies any liability for damage or any claim arising out of the use of this manual for the inspection or repair of any balloon performed by any person.

## II. 100 HOUR INSPECTION

The balloon must undergo an inspection after 12 calendar months or 100 hours of operation, whichever is the sooner.

If the total operating time reaches 100 hours before the 12 calendar months have elapsed, a 100 Hour inspection is required and the following checklists must be followed. Any repairs must be conducted in accordance with approved Adams materials, parts and procedures listed herein before returning to service.

<b>A. Envelope</b>		
Inspection during a hot inflation is preferred as it allows a more complete view and easier identification of potential damage. When an inflation is not possible, a careful, panel by panel inspection may be carried out at the inspectors discretion. The inspection must complete the following list:		
1	General integrity of all fabric seams.	<input type="checkbox"/>
2	Each fabric panel for tears, melt holes, Abrasions and heat damage.	<input type="checkbox"/>
3	Fabric tensile strength to 30 LBS minimum over a one inch area. Test area will be within 15 feet of the balloon apex with intent to find the weakest fabric.	<input type="checkbox"/>
4	Temperature recording tabs located on gore seam 1 in crown of balloon, if tabs have been activated replace and attach old tabs to the current page in the aircraft logbook.	<input type="checkbox"/>
5	All webbing for proper attachment to envelope and possible wear or heat damage.	<input type="checkbox"/>
6	All cable connections for possible wear or heat damage.	<input type="checkbox"/>
7	Crown load plate and web connections on prevent and multi vent models.	<input type="checkbox"/>
8	Control lines for heat or chafe damage.	<input type="checkbox"/>
9	Control line guides (grommets) and junctions of web to cable or line.	<input type="checkbox"/>
10	Deflation mechanism (pop top models) and crown safety lines.	<input type="checkbox"/>
11	Suspension cables for frays kinks or damage.	<input type="checkbox"/>
12	Envelope attachment carabiners for wear, fatigue and swing gate function.	<input type="checkbox"/>
13	Heat guards at web cable connections of envelope suspension cables.	<input type="checkbox"/>
14	Inflate and check that all vents open and close properly and control lines are proper length (enough excess for 10% elongation of total assembly).	<input type="checkbox"/>

<b>B. Pulleys</b>		
1	Clear the fabric away from the pulley during the inspection.	<input type="checkbox"/>
2	Visually inspect the pulley with particular emphasis on the pulley wheel.	<input type="checkbox"/>
3	Manually rotate the pulley wheel to ensure that it spins freely without resistance.	<input type="checkbox"/>
4	Manually slide the parachute redline through the pulley to ensure that the line moves freely without resistance.	<input type="checkbox"/>
5	<p>If any sign of wear, damage, or distortion is discovered, the damaged pulley must be replaced.</p> <p><b>IMPORTANT:</b> Only pulleys received directly from Adams Balloons may be used for replacement. Each will have an Adams part number attached and this part number must be recorded with the description of the repair.</p>	<input type="checkbox"/>
6	When replacing a pulley, take note of the pulley attachment tape and sew the sew back in exactly the same way as the original attachment.	<input type="checkbox"/>

<b>C. Gondola</b>		
1	All suspension cables especially in the area where the cable passes through the flooring and between the flooring and skid assemblies. Check for abrasion, fraying, or other damage. Maximum allowable slack in cables with burner struts up is one inch excess in length.	<input type="checkbox"/>
2	Nicopress fittings- thimble liner must be proper in position and sleeve is not damaged.	<input type="checkbox"/>
3	Load plate in the center of the basket must be secure and undamaged.	<input type="checkbox"/>
4	Plywood floor for possible cracks or rot	<input type="checkbox"/>
5	Oak Skids must be secure, check for general wear, possible cracks or splits	<input type="checkbox"/>
6	Stainless steel eye bolt where envelope attaches to gondola for any signs of wear or distortion.	<input type="checkbox"/>
7	Burner load ring welds for cracks or possible distortion.	<input type="checkbox"/>
8	All bolts and nuts (except skids) replace where corroded or otherwise damaged replace any worn fiber lock nuts.	<input type="checkbox"/>
9	All straps for general integrity.	<input type="checkbox"/>



<b>D. Instruments</b>		
1	Altimeter and vertical speed instruments may be serviced only by a licensed repairman at an authorized repair facility. For calibration of either instrument send it to the factory or an approved facility.	<input type="checkbox"/>
2	WESTON temperature gauge should be calibrated to boiling water. Adjustment is made with an Allen screw located on the side of the face housing. Use a known accurate thermometer to calibrate with.	<input type="checkbox"/>
3	Breather ports, small holes located one inch up and over from the bottom back corners of the instrument box must be clear of all obstructions.	<input type="checkbox"/>
4	Compass is glued in with silicone glue and should not be removed except for replacement.	<input type="checkbox"/>
5	Instrument attachment screws should be checked for possible looseness.	<input type="checkbox"/>
6	For other instrumentation see that manufacturer's maintenance instructions.	<input type="checkbox"/>

<b>E. Burner and fuel supply system</b>		
1	Check for any distortion or physical damage.	<input type="checkbox"/>
2	Pressurize entire system and check for leaks.	<input type="checkbox"/>
3	Light pilot lights and check function of each.	<input type="checkbox"/>
4	Fire burner and check flame pattern.	<input type="checkbox"/>
5	Service REGO T-50 valve cores.	<input type="checkbox"/>
6	Service PARKER Pilot valve.	<input type="checkbox"/>
7	Snug gimbal bolts to dampen gimbal swing of burners and replace safety wire	<input type="checkbox"/>
8	Inspect for any loose fittings.	<input type="checkbox"/>
9	Check that anti-swivel link between triggers allows free action of triggers.	<input type="checkbox"/>
10	Check all fuel hoses for correct identification labels. Identification must include the maximum working pressure, identification or name of the manufacturer, month & year of manufacture.	<input type="checkbox"/>
11	Inspect all fuel lines for ware, cuts or swelling.	<input type="checkbox"/>
12	Check all fuel line end fittings for security.	<input type="checkbox"/>
13	Service all tank valves_ replace “O” rings and lubricate.	<input type="checkbox"/>
14	Inspect external surface area of tanks for pitting or other physical damage.	<input type="checkbox"/>

### III. ANNUAL INSPECTION

The balloon must undergo the annual/100 hour inspection after 12 calendar months or 100 hours of operation, whichever is the sooner.

The following checklists must be followed for an **Annual Inspection**. Any repairs must be conducted in accordance with approved Adams materials, parts and procedures listed herein before returning to service.

<b>A. Envelope</b>		
Inspection during a hot inflation is preferred as it allows a more complete view and easier identification of potential damage. When an inflation is not possible, a careful, panel by panel inspection may be carried out at the inspectors discretion. The inspection must complete the following list:		
1	General integrity of all fabric seams.	<input type="checkbox"/>
2	Each fabric panel for tears, melt holes, Abrasions and heat damage. Damage, if any, must have been repaired using approved methods.	<input type="checkbox"/>
3	Fabric tensile strength to 30 LBS minimum over a one inch area. Test area will be within 15 feet of the balloon apex with intent to find the weakest fabric.	<input type="checkbox"/>
4	Temperature recording tabs located on gore seam 1 in crown of balloon, if tabs have been activated replace and attach old tabs to the current page in the aircraft logbook.	<input type="checkbox"/>
5	All webbing for proper attachment to envelope and possible wear or heat damage.	<input type="checkbox"/>
6	All cable connections for possible wear or heat damage.	<input type="checkbox"/>
7	Crown load plate and web connections on prevent and multi vent models.	<input type="checkbox"/>
8	Control lines for heat or chafe damage.	<input type="checkbox"/>
9	Control line guides (grommets) and junctions of web to cable or line.	<input type="checkbox"/>
10	Deflation mechanism (pop top models) and crown safety lines.	<input type="checkbox"/>
11	Suspension cables for frays kinks or damage.	<input type="checkbox"/>
12	Envelope attachment carabiners for wear, fatigue and swing gate function.	<input type="checkbox"/>
13	Heat guards at web cable connections of envelope suspension cables.	<input type="checkbox"/>
14	Inflate and check that all vents open and close properly and control lines are proper length (enough excess for 10% elongation of total assembly).	<input type="checkbox"/>

<b>B. Pulleys</b>		
1	Clear the fabric away from the pulley during the inspection.	<input type="checkbox"/>
2	Visually inspect the pulley with particular emphasis on the pulley wheel.	<input type="checkbox"/>
3	Manually rotate the pulley wheel to ensure that it spins freely without resistance.	<input type="checkbox"/>
4	Manually slide the parachute redline through the pulley to ensure that the line moves freely without resistance.	<input type="checkbox"/>
5	If any sign of wear, damage, or distortion is discovered, the damaged pulley must be replaced. <b>IMPORTANT:</b> Only pulleys received directly from Adams Balloons may be used for replacement. Each will have an Adams part number attached and this part number must be recorded with the description of the repair.	<input type="checkbox"/>
6	When replacing a pulley, take note of the pulley attachment tape and sew the sew back in exactly the same way as the original attachment.	<input type="checkbox"/>

<b>C. Gondola</b>		
1	All suspension cables especially in the area where the cable passes through the flooring and between the flooring and skid assemblies. Check for abrasion, fraying, or other damage. Maximum allowable slack in cables with burner struts up is one inch excess in length.	<input type="checkbox"/>
2	Nicopress fittings- thimble liner must be proper in position and sleeve is not damaged.	<input type="checkbox"/>
3	Load plate in the center of the basket must be secure and undamaged.	<input type="checkbox"/>
4	Plywood floor for possible cracks or rot	<input type="checkbox"/>
5	Oak Skids must be secure, check for general wear, possible cracks or splits	<input type="checkbox"/>
6	Stainless steel eye bolt where envelope attaches to gondola for any signs of wear or distortion.	<input type="checkbox"/>
7	Burner load ring welds for cracks or possible distortion.	<input type="checkbox"/>
8	All bolts and nuts (except skids) replace where corroded or otherwise damaged replace any worn fiber lock nuts.	<input type="checkbox"/>
9	All straps for general integrity.	<input type="checkbox"/>

<b>D. Instruments</b>		
1	Altimeter and vertical speed instruments may be serviced only by a licensed repairman at an authorized repair facility. For calibration of either instrument send it to the factory or an approved facility.	<input type="checkbox"/>
2	WESTON temperature gauge should be calibrated to boiling water. Adjustment is made with an Allen screw located on the side of the face housing. Use a known accurate thermometer to calibrate with.	<input type="checkbox"/>
3	Breather ports, small holes located one inch up and over from the bottom back corners of the instrument box must be clear of all obstructions.	<input type="checkbox"/>
4	Compass is glued in with silicone glue and should not be removed except for replacement.	<input type="checkbox"/>
5	Instrument attachment screws should be checked for possible looseness.	<input type="checkbox"/>
6	For other instrumentation see that manufacturer's maintenance instructions.	<input type="checkbox"/>

<b>E. Burner and fuel supply system</b>		
1	Check for any distortion or physical damage.	<input type="checkbox"/>
2	Pressurize entire system and check for leaks.	<input type="checkbox"/>
3	Light pilot lights and check function of each.	<input type="checkbox"/>
4	Fire burner and check flame pattern.	<input type="checkbox"/>
5	Service REGO T-50 valve cores.	<input type="checkbox"/>
6	Service PARKER Pilot valve.	<input type="checkbox"/>
7	Snug gimbal bolts to dampen gimbal swing of burners and replace safety wire	<input type="checkbox"/>
8	Inspect for any loose fittings.	<input type="checkbox"/>
9	Check that anti-swivel link between triggers allows free action of triggers.	<input type="checkbox"/>
10	Check all fuel hoses for correct identification labels. Identification must include the maximum working pressure, identification or name of the manufacturer, month & year of manufacture.	<input type="checkbox"/>
11	Inspect all fuel lines for ware, cuts or swelling.	<input type="checkbox"/>
12	Check all fuel line end fittings for security.	<input type="checkbox"/>
13	Service all tank valves_ replace “O” rings and lubricate.	<input type="checkbox"/>
14	Inspect external surface area of tanks for pitting or other physical damage.	<input type="checkbox"/>

## IV. MATERIALS DESCRIPTION

### A. FABRICS

- 1) Nomex: fire retardant 4 to 7.5oz
- 2) Nylon 6: is a generic designation for a family of synthetic polymers, based on aliphatic or semi-aromatic polyamides. Nylon is a thermoplastic silky material that can be melt-processed into fibers, films or shapes **or**
- 3) Nylon 66 (aka nylon 6-6, nylon 6/6 or nylon 6,6) is a type of polyamide or nylon. the two most common for textile and plastics industries are nylon 6 and nylon 66.)

30-210 Denier warp and fill

Weight: 1.3 -3.4 ounce per square yard

Thickness: .003" - .010"

Coatings: one of the following options; Urethane solvent, Polyurethane solvent, Silicone, Mylar, Metallic, resin impregnated, UV resistant Ink jet, Calendared.

These coatings are applied to the fabric per the specifications of each approved supplier.

Strength:

- ◆ Tongue tear            4.5 lb. minimum, Tested under ASTM D2261
- ◆ Tensile                    30 lbs. minimum, Tested under ASTM D5034

Optional not required: Fire Resistance: Per FR CPAI-84

### B. WEBS

- 1) Mil -T-5038, Type IV, Class 1A
- 2) 1" wide nylon, 1000 lb. min tensil.
- 3) 3/8" wide nylon or polyester, 200 lb. min. tensil.

### C. THREAD

- 1) Polyester Bonded V-69 OR DB-69
- 2) Nylon Bonded size ticket B69
- 3) Equivalent to NU. 24 or Size E

Note: Polyester thread is specified By Aerostar/Raven, Piccard, etc. and nylon thread is specified by Cameron Balloons.

### D. STITCHING

- 1) Stitch code 2S-1/2                    ½ in gauge, 7 stitches (+/-1) per inch
- 2) Stitch code ZWL                      ZigZag wide bite long stitch length)
- 3) Stitch Code S                          as above single Needle
- 4) Stitch code 2S-1/2                    as above ½ inch gauge 7 stitch (+/- 1) per inch
- 5) Zig-Zag single step lock stitch
- 6) Fed. Std. stitch type 304
- 7) Guage                                    1/2 or 3/8 inch
- 8) Needle Size                            18
- 9) Stitch width (bight or throw)      3/16 inch
- 10) Stitch length:                        7 plus or minus 1stitches/inch (4 ½ cycles/inch)

**NOTE:** Bobbin and needle thread tensions must be balanced on all locking stitches.



**E. LINES**

- 1) GONDOLA
  - 1/2" Polypropelene Twist.
- 2) ENVELOPE
  - 1/2 "-5/8" Nylon Yacht Braid
  - 5/16 Nylon Yacht Braid
  - 1/4" Nylon Diamond Braid
  - 1/8" Nylon Diamond Braid

**F. STEEL CABLES**

- 1) GONDOLA SUSPENSION
  - 5/32" 7 X 19 Galv. Carbon Steel Aircraft
- 2) ENVELOPE SUSPENSION
  - 3/32" 7 X 19 Stainless Steel Aircraft
  - 1/8" 7 X 19 Stainless Steel Aircraft
  - 3/32" 7 X 19 Stainless Steel Or Galv. Carbon Steel Aircraft
- 3) DEFLATION CONTROL
  - 3/32" 7 x 19 Galv. Carbon Steel aircraft cable

NOTE: Use Only A.N. Hardware & Swedging Specs.

**G. FUEL HOSES**

Parker GlobalCore 387	3000 psi
Parker 451TC	3000 psi
Parker 451ST	3000 psi

**IMPORTANT:** Factory parts are required for all fuel hoses.

**H. BURNER**

**IMPORTANT:** Factory parts are required for entire burner assembly and fuel system.

**I. BURNER SUPPORT STRUT TUBES**

6061-T6 1 1/4 " X .035"

**J. MISCELLANEOUS**

- 1) Glue: Beacon Fabri-Tac adhesive for fabrics. Note: (This process simply holds the artwork in place while it is walked from the gluing area to the sewing machine.)
- 2) Hook & Loop (Velcro)
  - 1-inch
  - 2-inch
- 3) Paracord
  - 550

## V. REPLACEMENT OF PARTS

The following is the basic criteria for replacement of damaged components and deals only with minimum acceptable standards. When In doubt contact the factory.

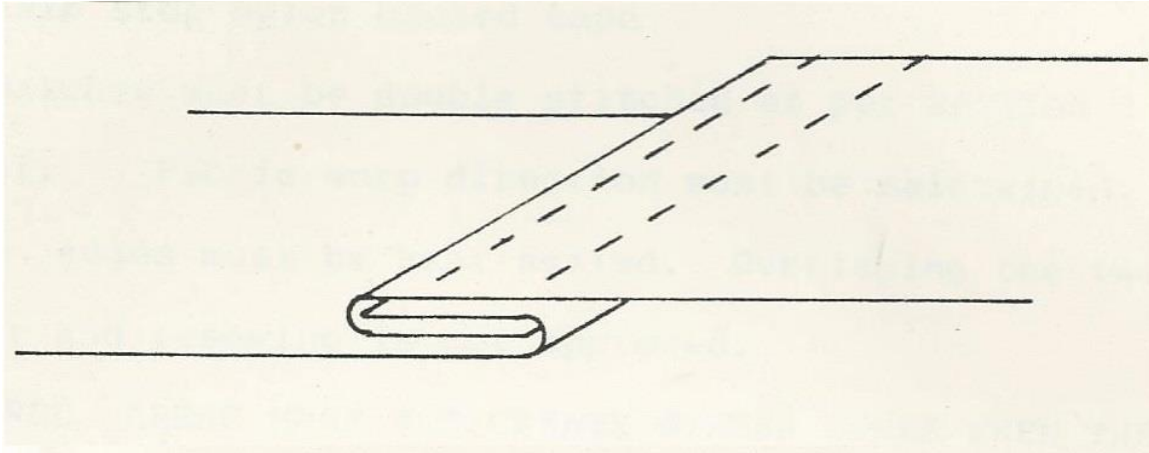
THIS SECTION IS NOT INTENDED TO BE A COMPLETE GUIDE FOR REPLACEMENT

- 1) Replace any fabric which fails minimum strength test.
- 2) It is possible to replace all fabric panels in the balloon if the repair station or mechanic feels it to be necessary.
- 3) Replace any part which is specified or found faulty by the check list.
- 4) Replace any web or line which appears to have heat or other damage to 10% or more of its width.
- 5) Replace any steel cable which has rust, broken fibers or shows loss of temper from annealing.
- 6) Replace yellow deflation mechanism in POP-TOP models at 100 hours total service or if there is evidence that there has been enough wear in the area where the pin slides through to cause binding. Replace only with factory part.
- 7) Replace any REGO-50 valve core bonnet in which the cylinder wall is scored in any way.
- 8) Replace any fuel lines that show wear, cuts or swelling.
- 9) Replace any fuel hoses over 10 years of age. If labels are missing, refer to the balloon logbook to determine the age. If the age cannot be determined then use the date of manufacture for the burner.
- 10) Replace deflation pin on POP-TOP models if pin is scarred sufficiently to cause friction binding in the mechanism.

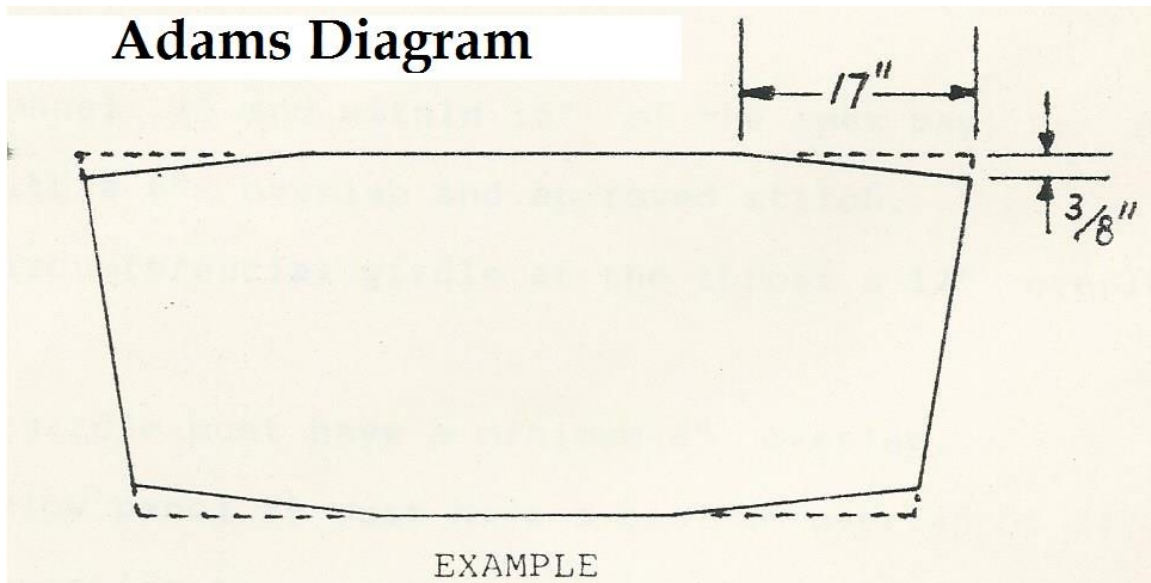
## VI. REPAIR TECHNIQUES

### A. FABRIC REPAIRS

- 1) Replacing Complete Panels - Use LSC2 fell seam for all panel replacements.



**NOTE:** Panels are cut with a  $\frac{3}{8}$ " taper on top and bottom. Edges extending 17" toward the center of each panel except deflation port panels and #1 NOMEX throat panels. All panels use between 42 and 60" fabric and all cuts are straight lines.



**IMPORTANT:** Only fabric received directly from Adams Balloons may be used for panel replacement. This fabric will have an Adams part number attached and this part number must be recorded with the description of the repair.

- 2) Fabric Patches - The minimum allowable unpatched tear above panel #5 (panels are counted from bottom up beginning with the NOMEX throat panel as panel #1) is 1/2 in length or one square inch for melt hole or scorch area.

Any time a tear or melt crosses a panel seam the panel seam must be reestablished by opening up the seam and patching the panels separately and the resewing that area of the panel seam.

Fabric patches may be:

- LSC2 fell seam
- Flat lap with hot knife edges
- Rip stop nylon backed tape

All patches must be double stitched as per Section IV D of this manual.

Fabric warp direction must be maintained.

All exposed edges must be heat sealed.

Overlapping the two edges of a tear and resewing is not approved.

NOTE: Repaired area must not create stress lines when the balloon is inflated.

**IMPORTANT:** Only fabric received directly from Adams Balloons may be used for patch repairs. This fabric will have an Adams part number attached and this part number must be recorded with the description of the repair.

## B. WEBBING PATCHES OR SPLICES

- 1) Not approved for control lines.
- 2) Between panel #5 and within 15" of the apex may be accomplished with a 6" overlap and approved stitch.
- 3) For the circumferential girdle A at the throat a 12" overlap is required.
- 4) The crown girdle must have a minimum 6" overlap.
- 5) Splices below panel # 5 must have a minimum overlap of 24".
- 6) If web connection to suspension cables is replaces a 3three ft. splice must be made to the remaining web and then sewn to the envelope.
- 7) It is possible to replace an entire load tape from apex to mouth if the repair station or mechanic feels it to be necessary.

**IMPORTANT:** Only webbing received directly from Adams Balloons may be used for webbing patches or splicing. This webbing will have an Adams part number attached and this part number must be recorded with the description of the repair.

## C. FUEL HOSES

Fuel hoses must not be repaired. Damaged or out of date hoses must be replaced.

**IMPORTANT:** Only fuel hoses received directly from Adams Balloons may be used. Each hose have an Adams part number attached and this part number must be recorded with the description of the repair. Additionally, each hose will have a date engraved.

## D. STEEL CABLES

Steel cables must not be repaired. Splices are not approved. Damaged cables must be replaced.

## E. WICKER AND WOOD REPAIRS

The woven sides of the gondola are considered secondary load bearing and may be patched, repaired or rewoven at the discretion of the repairman. The plywood floor is a primary load bearing component however and should be maintained in accordance with approved woodworking methods.

(see "AIRFRAME AND POWERPLANTS MECHANICS HANDBOOK").

## F. FUEL SYSTEM REPAIRS

Servicing of fuel tanks includes:

- ◆ Removal of all valve cores, replacement and lubrication of "O" rings with unmedicated Vaseline.
- ◆ Clean and lubricate with WD40 or equivalent all REGO 7141 connectors.
- ◆ Replace worn "O" rings and flat washers.
- ◆ Add two ounces of methanol or equivalent to each fuel cylinder with at least one gallon of L.P.G.
- ◆ **IMPORTANT:** Do not leave methanol in empty tanks.
- ◆ Observe D.O.T. standards for hydrostatic test of tanks 12 years after date of mfg. Stamped on cylinder.

## G. BURNER (PN5-2)

- 1) Burner model PN5-2, standard equipment for all Adams Balloons S/N 072 and above, requires considerable experience to align. It is recommended that for alignment or replacement of parts other than valves or pilot light components the entire unit be returned to the factory.
- 2) Defective or clogged pilot orifices can not be recycled and the entire sub assembly should be replaced.
- 3) If during normal operation the burner manifold temperature goes above 125 degrees F. or below 50 degrees F the entire assembly should be returned to the factory for servicing and alignment.
- 4) When servicing REGO T-50 valve cores replace "O" ring and lubricate with unmedicated Vaseline. Use two wraps of TEFLON tape on hex bonnet threads and tighten to 60 ft. lbs.

## H. BURNER (CrossFire)

Burner model Crossfire is standard equipment for all Adams Balloons S/N 072 and above.

The burner is supplied by Kavanagh Balloons and all maintenance requirements and procedures are documented in the KAVANAGH BALLOONS AUSTRALIA PTY LIMITED - HOT AIR BALLOON MAINTENANCE MANUAL. The relevant section(s) are included in Appendix A for easy reference.

## **APPENDIX A - Crossfire Burner**

The information on the follow pages is taken from:

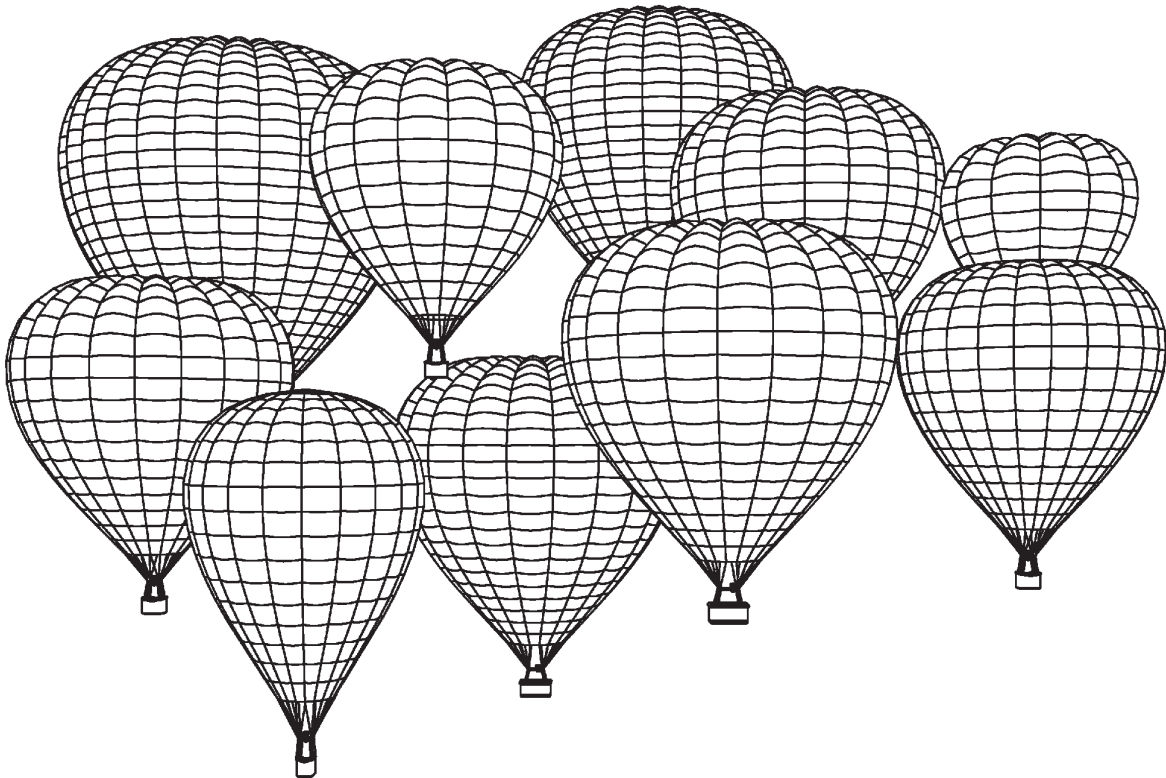
**KAVANAGH BALLOONS AUSTRALIA PTY LIMITED  
HOT AIR BALLOON MAINTENANCE MANUAL  
ISSUE 4 - Revision 6**

---

**KAVANAGH BALLOONS AUSTRALIA  
PTY LIMITED**

**HOT AIR BALLOON  
MAINTENANCE MANUAL**

**ISSUE 4 - Revision 6**



**Kavanagh Balloons Australia Pty. Ltd.**  
10 Marina Close Mount Kuring-Gai, NSW, 2080 Australia  
Tel: (612) 9457 8060  
Fax: (612) 9457 8403

Email: [sales@kavanaghballoons.com.au](mailto:sales@kavanaghballoons.com.au)  
Web Site: [www.kavanaghballoons.com.au](http://www.kavanaghballoons.com.au)

Copyright 2005 by Kavanagh Balloons Pty. Ltd. All rights reserved.

Applicability of this manual is detailed on page 1-1

### 4.7 SERIES 4 - CROSSFIRE BURNER

#### 4.7.1 REGULAR MAINTENANCE

Occasional cleaning of the burner is recommended as it will make identification of wear or problems easier. A non abrasive cloth and commercial light detergents can be used provided all residue is removed with fresh water. Disassembly of the main jets for cleaning is not recommended and should not be required. Cleaning with a soft brush such as a tooth brush will remove any external carbon deposits.

Lubrication of the main valves can be achieved as per section 4.7.10.1. Due to the seal design, lubrication does not affect the operation or life of the seal and as such is only required if operation of the valve is no longer smooth.

#### 4.7.2 INSTALL /REMOVE FROM LOAD FRAME

The Series 4 burner is installed into the load frame with a central gimbal block assembly. Removal of either half of the gimbal block will remove the burner from the load frame and will leave the other half of the gimbal block with the burner or load frame as required.

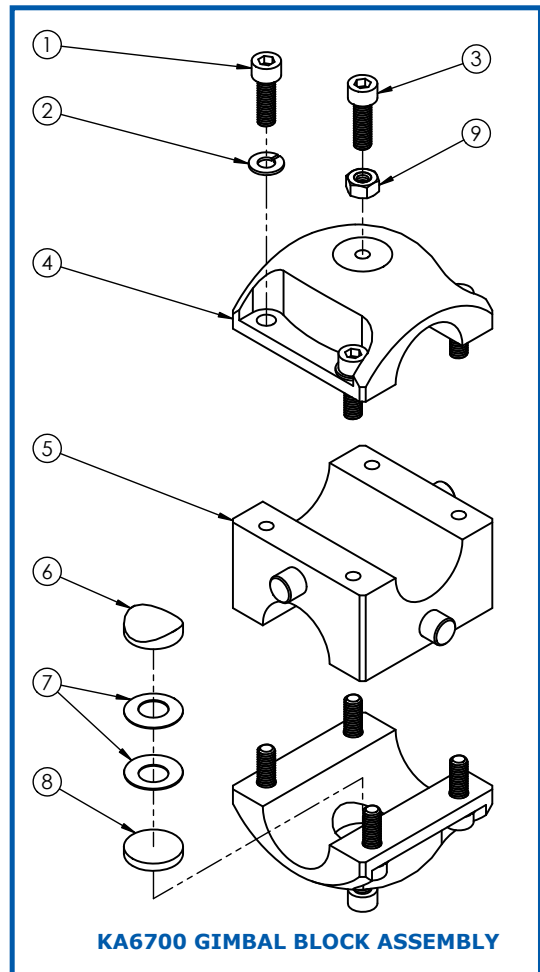
In all installations the gimbal block and burner will hang under the load frame.

##### 4.7.2.1 REMOVAL OF THE GIMBAL BLOCK

- i) Loosen the friction adjusting screw (3) and locking nut (9) in the gimbal end cap to be removed.
- ii) Remove the 4 screws (1) and lock washers (2) securing the gimbal block end cap (4).
- iii) Remove the gimbal block end cap ensuring the friction block (6), spring washers (7) and thrust plate (8) are collected.

##### 4.7.2.2 INSTALLATION OF THE GIMBAL BLOCK

- i) Ensure the friction adjusting screw (3) is fully released
- ii) Install the friction mechanism components into the gimbal block end cap making sure the two disc springs (7) are stacked with the outer edges against each other as shown.
- iii) Apply a thin film of KP4065 grease to both halves of the gimbal block bore.
- iv) Locate the burner or load frame into the gimbal block and install the 4 screws (1) with lock washers (2).
- v) Torque in a cross pattern to 6NM.







#### 4.7.2.3 ADJUST THE GIMBAL BLOCK FRICTION

Adjust the friction of the gimbal block using the friction adjusting screws (3) in the centre of each end cap. Torque on this screw should not exceed 6Nm and the burner must be able to tilt through its full range of motion without excessive force.

Once the required friction is achieved, tighten the locking nut (9) down against the end cap while holding the screw (3) in position. If sufficient friction cannot be achieved, remove the end cap as per 4.7.2.1 and inspect the disc springs for damage or deformation (they should each measure 1.2mm (+/- 0.1) high at rest). Inspect the friction plate for wear and replace as necessary. Check for excessive lubrication in the area of the friction block.

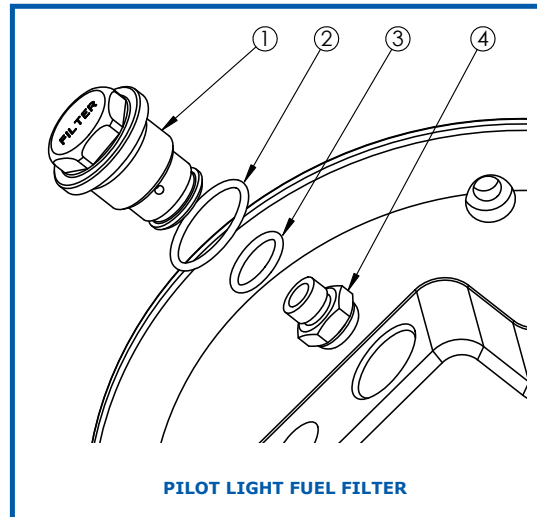
#### 4.7.3 PILOT LIGHT FUEL FILTER

The Series 4 burner has an in line filter for the pilot light system. The filter is to catch any contamination before the fuel reaches the pilot light valve and regulator system.

Fuel flows from the hole in the side of the filter plug, through the bore of the filter plug and through the brass filter. Any contamination will be captured inside the filter plug.

##### 4.7.3.1 REMOVE AND INSPECT THE PILOT LIGHT FILTER

- i) Using a 19mm spanner or socket, unscrew the filter housing (1) from the valve block.
- ii) Using a 13mm spanner or socket, unscrew the brass filter (4) from the filter housing.
- iii) Inspect the inside of the filter and filter housing for contamination.
- iv) Clean with compressed air and a clean cloth. The brass filter should be blown out with compressed air from the outlet side so any contamination is removed in the direction it would have entered the filter.
- v) If the filter cannot be cleaned successfully cleaned it should be replaced.



##### 4.7.3.2 INSTALL THE FILTER

- i) Wrap two turns of KP1070 PTFE tape around the thread of the filter housing ensuring the inlet is clear of tape.
- ii) Install the filter into the filter housing and nip tight with minimal torque.

##### 4.7.3.3 INSTALL THE FILTER HOUSING

- i) Inspect the Orings (2) (3) for condition and replace as necessary.
- ii) Apply a thin film of KP6708 grease to the Orings and thread of the filter housing.
- iii) Inspect the filter housing bore in the valve block for contamination and clean with a lint free cloth as required.
- iv) Install the filter housing and tighten so that the plug is flush with the valve block.
- v) Apply fuel pressure and perform a leak check and pilot light operational check as per section 4.7.14

### 4.7.4 FUEL HOSES

Fuel hoses must be approved for use with LPG and if used in Australia they must comply with Australian Standard AS1869 or other standard listed in the latest amendment of AD/BAL/4.

Main liquid fuel hoses have a service life of 10 years and must be replaced at this time. Every fuel hose should have a label indicating the maximum working pressure, name or identification of the manufacturer, month and year of manufacture.

Both ends of the main liquid hose must have male 1/4" NPT end fittings for installation into the valve block and 1 1/4" ACME coupling (KP4001).

Fuel hoses must be free of cuts, abrasions, kinks, bulges or visible aging such as cracking of the outer sheath. The fuel hose must be flexible with no steel braid showing.

#### 4.7.4.1 REPLACEMENT OF THE MAIN FUEL HOSE

- i) Remove the 1 1/4" ACME coupling from the hose. Inspect for damage and retain for fitting to the new hose if serviceable.
- ii) Unscrew the hose from the valve block. Inspect and clean the thread path in the valve block.
- iii) Install the new fuel hose with PTFE tape (KP1070) and torque to a maximum of 20Nm
- iv) Install the 1 1/4" ACME coupling as per 4.6.8.2
- v) Pressurize the hose with normal fuel pressure and carry out a leak and functional check.

#### 4.7.4.2 REPLACEMENT OF THE 1 1/4" ACME COUPLING

- i) Remove the 1 1/4" ACME coupling from the hose.
- ii) Inspect and clean the thread path on the hose end.
- iii) Install the new 1 1/4" ACME coupling (KP4001) with Loxeal (KP3687) and torque to a maximum of 20Nm.
- iv) Pressurize the hose with normal fuel pressure and carry out a leak and functional check.

### 4.7.5 PIEZO IGNITOR

#### 4.7.5.1 REMOVE THE PIEZO IGNITOR

- i) Open the pilot valve to gain access to the piezo assembly.
- ii) Loosen the socket head set screw in the side of the valve block
- iii) Pull the piezo assembly down and clear of the valve block. Alternately, light pressure may be required from the top of the piezo assembly body.



#### 4.7.5.2 INSTALL THE PIEZO IGNITOR

- i) Identify and align the locking hole in the base of the piezo ignitor assembly with the socket head set screw in the valve block.
- ii) Install the piezo ignitor assembly into the valve block.
- iii) Slowly tighten the socket head set screw while rotating the piezo ignitor assembly slightly to ensure the set screw engages in the locking hole.

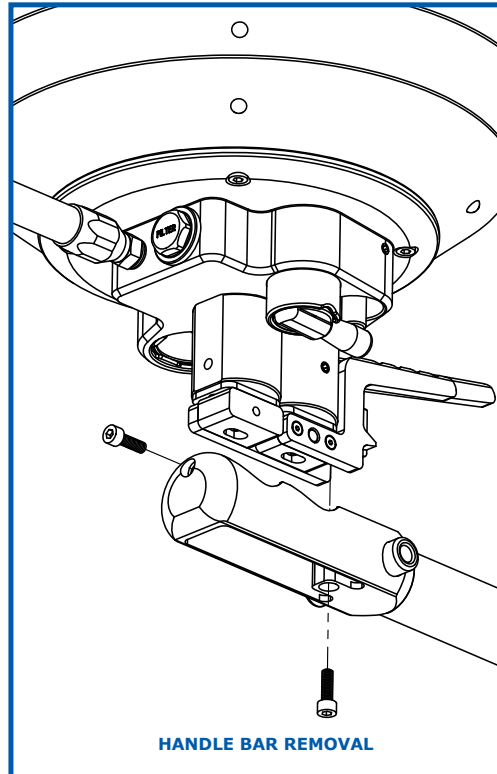
#### 4.7.6 HANDLE BARS

##### 4.7.6.1 REMOVE THE HANDLE BAR

- i) Remove the two cap head screws from each of the handle caps
- ii) Slide the handle cap clear of the valve levers

##### 4.7.6.2 INSTALL THE HANDLE BAR

- i) If alignment of the handle bar is difficult, loosen but don't remove the four valve block screws in each valve block to give the assembly some movement.
- ii) Ensure the main valve rubbing plates are in line with the valve levers and all valve lever pivot pins are installed.
- iii) Align the handle bar so that the lever lock button colours match the valve levers
- iv) Slide into place and ensure the handle bar is flush
- v) Install the two cap head screws in each handle cap and tighten to 4Nm.
- vi) Test the operation of the valve levers for smooth and correct function and test the lever lock buttons operate and release as required.



#### 4.7.7 VALVE BLOCK ASSEMBLY

The valve block assembly contains all the valve and pilot light assembly components and can be removed with just four cap head screws. Connection to the coil unit is with a multiple Oring seal and allows for tool free separation of the two parts.

Work on the valves and pilot light will require removal of the valve block assembly

##### 4.7.7.1 REMOVE THE VALVE BLOCK ASSEMBLY

- i) Remove the handle bar assembly as per 4.7.6.1
- ii) Remove the four socket head set screws from the base of the valve block
- iii) Gently rotate and pull the valve block free from the coil and can unit making sure to ease the water extractor assembly past the jet ring.

### 4.7.7.2 INSTALL THE VALVE BLOCK ASSEMBLY

- i) Inspect the coil inlet orings for condition. Change if required as per section 4.7.7.3
- ii) Lubricate the coil inlet Orings with KP6708 grease.
- iii) Inspect the main inlet body on the valve block for damage, wear or contamination. Clean the bore with a soft lint free cloth.
- iv) Align the valve block with the coil/can unit and ease into place making sure the water extraction tube clears the jet ring.
- v) Insert and start the four cap head screws then tighten to xxNm.

### 4.7.7.3 CHANGE THE INLET ORINGS

- i) Remove the Orings with a soft Oring pick. It may be easier to lift one edge of each Oring and cut the old Oring off.
- ii) Inspect the seal carrier for damage ensuring there are no scratches or wear spots.
- iii) Warm the new KP6706 Orings to ensure they are ductile - cold Orings may be damaged during installation.
- iv) Install the new Orings using a seal bullet and lubrication with KP6708 grease.

### 4.7.8 PILOT LIGHT SYSTEM

The liquid pilot light system consists of a vaporiser/regulator system coupled with a flame tube on the top side of the valve block. The pilot light assembly is screwed into the pilot light valve connecting the two parts through the valve block.

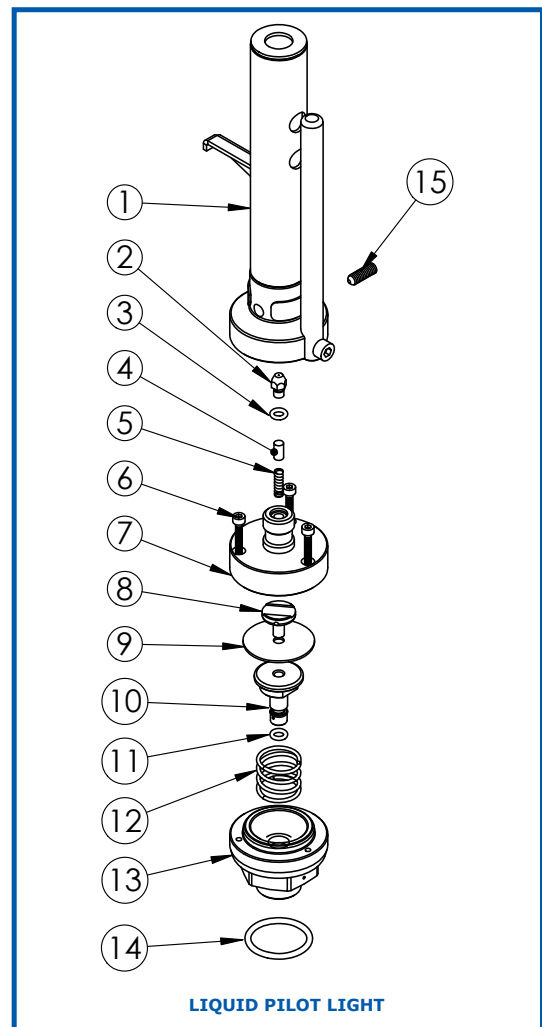
If a reduction in pilot light flame size and strength is found, the pilot light fuel filter should be inspected as per 4.7.3.

Cleaning of the pilot light jet and outlet filter along with cleaning of the regulator may be required.

Removal of the entire pilot light assembly is covered in 4.7.9 in conjunction with the pilot light valve.

#### 4.7.8.1 PILOT LIGHT JET CLEANING / REPLACEMENT

- i) Remove the valve block from the burner unit as per 4.7.7.1
- ii) Remove the flame tube assembly (1) from the pilot light by unscrewing the socket head set screw (15) in the base of the flame tube.
- iii) Inspect the flame tube for contamination and clean with compressed air and a lint free cloth.
- iv) Remove the jet (2), Oring (3), outlet filter (4) and spring (5).





- v) Inspect for contamination or blockages in the jet. Jets may be cleaned with compressed air or a suitable strand of fine wire. Replace any jet that cannot be cleaned.
- vi) Inspect the outlet filter for contamination and clean by soaking in a white solvent then blowing clean with compressed air. Alternately replace the filter.
- vii) Inspect the jet Oring for condition and replace as required.
- viii) Install the spring, filter, Oring then jet into the regulator body.
- ix) Install the flame tube and align the edge of the starter arm with the piezo.
- x) Tighten the socket head set screw in the flame tube base.

### **4.7.8.2 PILOT LIGHT REGULATOR DISASSEMBLY AND CLEANING**

- i) Remove the valve block from the burner unit as per 4.7.7.1
- ii) Remove the flame tube assembly as per 4.7.8.1 step ii and iii)
- iii) Remove the three cap head screws (6) from the top of the regulator body and remove the top of the regulator body (7).
- iv) Inspect and clean the jet as per 4.7.8.1
- v) Inspect and clean the top of the regulator body using a lint free cloth and white spirits if necessary.
- vi) Remove the piston and diaphragm assembly (8-11) and inspect the diaphragm (9) for damage or cracking. Clean with a lint free cloth. Replace the diaphragm as per 4.7.8.3 if required.
- vii) Inspect the seal on the base of the piston for damage. Replace the piston lower section if required or forward to Kavanagh Balloons for overhaul.
- viii) Inspect the bores of the piston and clean using compressed air to ensure there are no blockages.
- ix) Inspect the Oring (11) on the base of the piston and replace if required, lubricating lightly with KP6708 grease.
- x) Inspect and clean the piston bore in the base of the regulator and the spring groove using a lint free cloth or cotton tip ear bud or similar.

### **4.7.8.3 PILOT LIGHT REGULATOR DIAPHRAGM REPLACEMENT**

- I) Using a 14mm spanner or soft jaw vice, hold the base of the piston (10) securely on the flats.
- li) Insert a 2mm or smaller rod or allen key shaft into the top of the piston (8) and unscrew to release the diaphragm (9).
- iii) Inspect the thread and bore of the two piston halves.
- iv) Install the new diaphragm onto the piston top and apply a small amount of KP3623 (569 loctite) to the thread.
- v) Screw the piston top back into the base and tighten until the diaphragm starts to distort.

### 4.7.8.4 RE-ASSEMBLE THE PILOT LIGHT REGULATOR

- i) Install the regulator spring into the bottom of the regulator body.
- ii) Apply a small amount of KP6708 grease to the Oring on the piston.
- iii) Install the piston into the bottom regulator body making sure it is acting against the spring correctly.
- iv) Install the regulator top body and rotate to align the screw holes.
- v) Loosely install all three cap head screw and tighten in a circular pattern.
- vi) Check there is no gap at the join between the two halves of the regulator body and the top has pulled down evenly.
- vii) If not already done, re-install the jet and outlet filter as per 4.7.8.1

### 4.7.8.5 PILOT LIGHT AIR INLET ADJUSTMENT

Adjustment of the pilot light air inlet is accomplished by rotation of or lifting of the inlet adjuster band on the base of the flame tube. In general, for operation below 5000ft AMSL, one inlet hole will be fully exposed by the gap in the adjuster band.

The adjuster band should be pushed around to either slightly cover the inlet hole or raised to expose the second inlet hole until consistent starting and mostly blue flame is obtained when the pilot light is running.

If the inlet is made too big, the pilot may have trouble starting or may roar during normal operation.

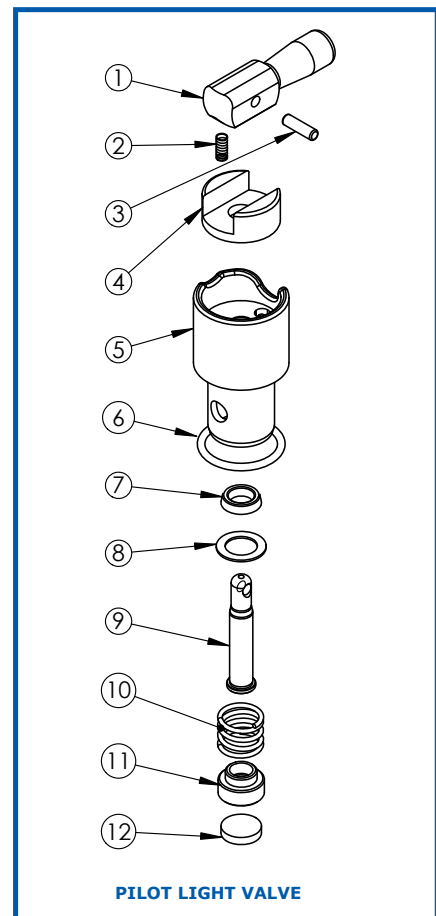
### 4.7.9 PILOT LIGHT VALVE

The pilot light valve has no external lubrication port so needs to be disassembled if lubrication of the shaft is required. The seal in the pilot light valve does not require lubrication for correct operation or extended life so overhaul of the valve is only required in the instance of a leak or rough operation.

#### 4.7.9.1 PILOT LIGHT VALVE REMOVAL

The pilot light valve and pilot light regulator assembly screw together through the valve block. The two parts may be separated without disassembly of the pilot light assembly.

- i) Remove the valve block from the burner unit as per 4.7.7.1
- ii) Remove the piezo ignitor assembly as per 4.7.5.1
- iii) Using a 32mm spanner, unscrew the pilot light assembly from the pilot light valve assembly.
- iv) Separate the two assemblies from the valve block
- v) Inspect the face Orings from both parts and replace or set aside for re-use.





#### 4.7.9.2 PILOT LIGHT VALVE DISASSEMBLY

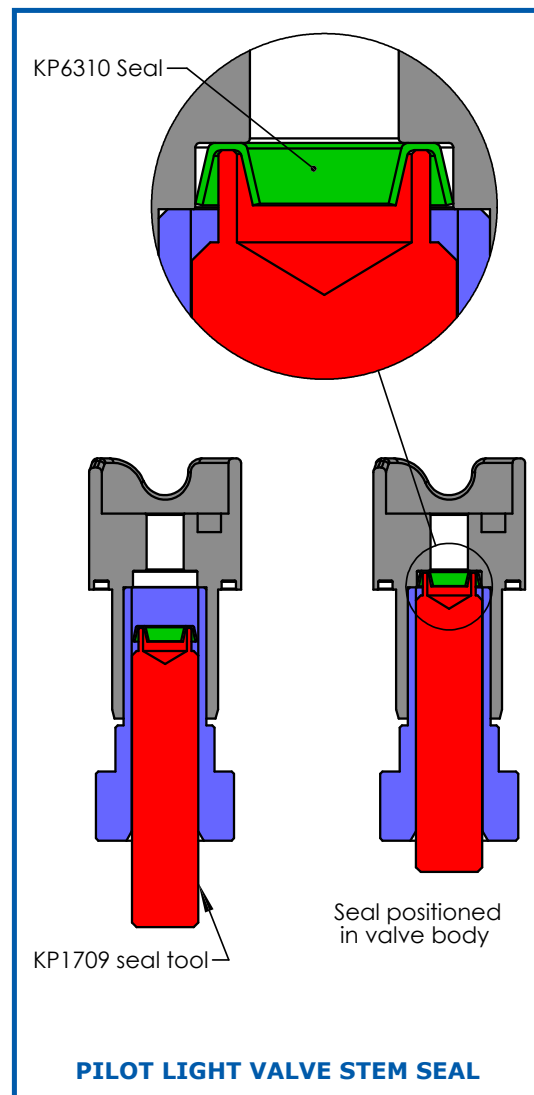
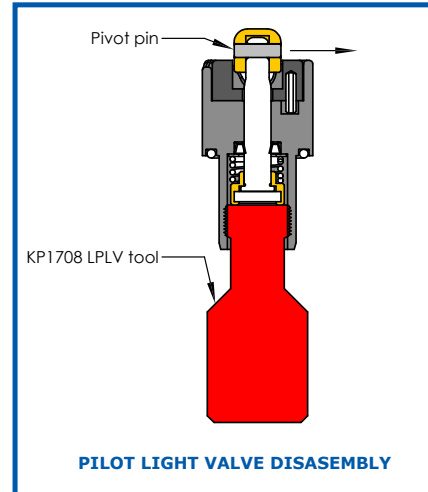
Either the KP1708 pilot light valve tool or a suitable 5mm thick spacer is required to disassemble the valve. If using a spacer, it must be not more than 16mm in diameter with a bore of 6mm diameter to protect the seat on the liquid pilot light base. Nylon or a similar soft plastic is suggested for production of both tool options.

While it may not be necessary, It is recommended that the seal be replaced if the valve is disassembled.

If the seal is to be replaced or comes out during disassembly and cleaning, the KP1709 seal installation tool will be required for insertion of the new seal.

Do not attempt this work without the correct tools.

- i) Screw the KP1708 pilot light valve tool compressing the valve spring until the pivot pin (3) clears the guide plate (4).
- ii) Press the pivot pin (3) out with a 3mm punch or similar tool to separate the lever from the valve stem (8). Be careful not to lose the spring (2) in the end of the valve lever.
- iii) Remove the guide plate (4) from the top of the valve body (5) and clean the visible part of the stem (8) with a lint free cloth. Check the pivot pin hole for burrs or edges that may damage the valve body or stem seal (6) during disassembly.
- iv) Remove the KP1708 pilot light valve tool from the valve body.
- v) Gently push the valve stem (9) clear of the valve body and collect the spring (10) and washer (8). If the seal is on the stem, carefully remove it from the stem making sure not to distort or squash the stem seal.
- vi) Inspect the stem (9) for wear, scratches or damage. The area where the stem seal operates will appear polished and is the critical area to check for damage.
- vii) Inspect the rubber seat (12) for damage - indentation is acceptable and to be expected but cracking is cause for replacement.
- viii) Clean and inspect the bore of the valve body (5) for damage and wear.



#### 4.7.9.3 PILOT LIGHT VALVE STEM SEAL REPLACEMENT

- i) Lubricate the bore of the valve body with KP6708 grease.
- ii) Insert the KP1709 seal tool into the valve body.
- iii) Insert the KP6310 seal (7), closed side first, into the seal tool body.

- iv) Gently push the seal down the bore and into place with the seal tool piston.
- v) Remove both halves of the seal tool.
- vi) Visually inspect that the stem seal is properly located in the valve body.

#### **4.7.9.4 REPLACE THE PILOT LIGHT VALVE RUBBER SEAT**

The following job is best done with the stem held in a protective nylon block with an 8mm dia bore to hold the stem. Alternately, the stem and seat can be replaced as assembly or returned to Kavanagh Balloons for overhaul.

- i) Dig the damaged or worn rubber seat (12) out from the seal carrier (11) using a small screw driver or similar tool making sure not to damage the seal carrier.
- ii) Clean and inspect the seal carrier (11) for damage.
- iii) Carefully insert one edge of the new seal disk into the seal carrier and work into place with a soft wedge or screw driver making sure not to damage the seal face.
- iv) Inspect for scratches or damage to the seal face and ensure that the edge is fully retained in the seal carrier.

#### **4.7.9.5 ASSEMBLE THE PILOT LIGHT VALVE**

- i) Assemble the spring (10) and washer (8) onto the stem and seal carrier (9,11,12) with the narrow end of the spring towards the seal carrier.
- ii) Gently ease the tip of the stem into the stem seal and guide the stem into the valve body as far as possible.
- iii) Rotate the stem such that the pivot hole is in line with the "On" guide position on the valve body.
- iv) Screw the KP1708 pilot light valve tool compressing the valve spring until the pivot pin (3) can be inserted.
- v) Transfer any excess lubrication from the exposed stem onto the top face of the valve body and install the guide plate locating the pin into the stop groove.
- vi) Check the spring (2) is installed in the valve lever (1) and align with the stem (8), inserting the pivot pin (3) until flush with the lever.
- vii) Remove the KP1708 pilot light valve tool and cycle the valve making sure the operation is as smooth and the pivot pin cannot be removed from the lever in the normal range of motion.

#### **4.7.9.6 INSTALL THE PILOT LIGHT VALVE**

- i) Inspect the valve body port for the pilot light valve and pilot light assembly for contamination and damage to the sealing face.
- ii) Install the face oring (6) onto both the pilot light valve and the pilot light assembly with a light lubrication of KP6708 grease. Apply a small amount of grease to the threads of the pilot light assembly.
- iii) Install the valve body such that the locating pin is in the mating groove in the valve body.
- iv) Screw the two components together ensuring the Orings are correctly installed.
- v) Tighten the pilot light assembly down until it is flush with the valve block surface.
- vi) Install the piezo assembly as per 4.7.5.2
- vii) Adjust the alignment of the pilot light starter relative to the piezo ignitor as per 4.7.8.1 part ix





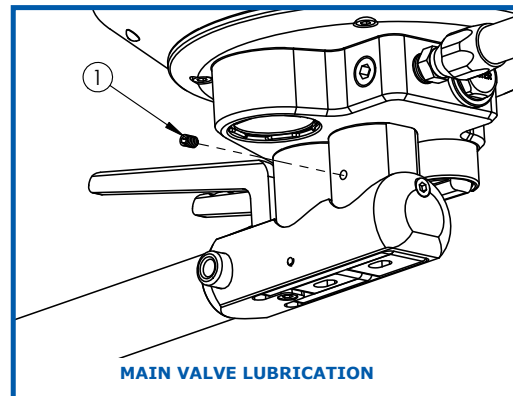
viii) Carry out a full functional and leak check of the pilot light system as per 4.7.14

#### 4.7.10 MAIN AND LIQUID FIRE VALVES

The main and liquid fire valves have an external lubrication port do not have to be disassembled if lubrication of the shaft is required. The seal in the main and liquid fire valves does not require lubrication for correct operation or extended life so overhaul of the valve is only required in the instance of a leak or rough operation.

##### 4.7.10.1 MAIN AND LIQUID FIRE VALVE LUBRICATION

- i) Remove the socket head set screw (1) from the side of the valve block.
- ii) Fill the lubrication port with KP6708 grease.
- iii) Start to insert the socket head set screw and operate the valve lever to work the grease into the space between the valve body and stem.
- iv) When the set screw is flush with the valve body, clean off any excess grease.

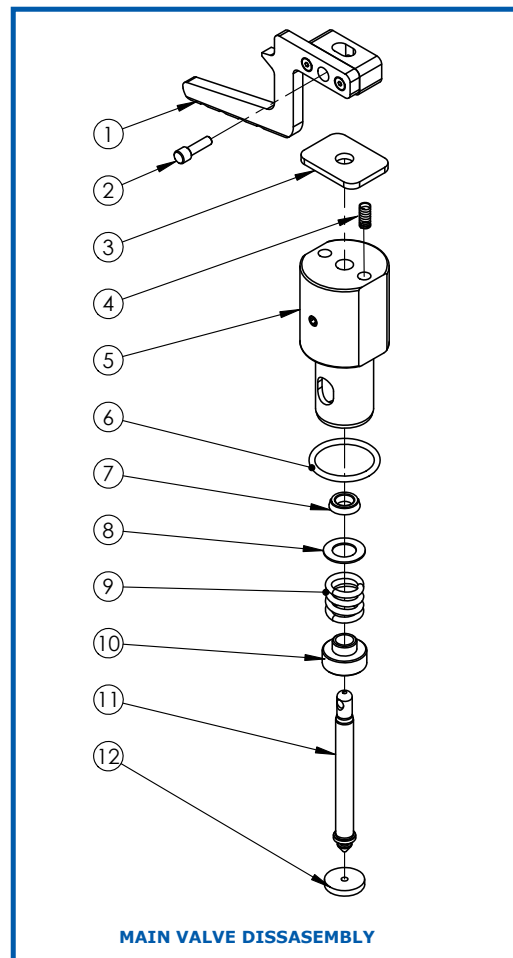


##### 4.7.10.2 MAIN AND LIQUID FIRE VALVE LEVER REMOVAL

- i) Remove the handle bar as per 4.6.7.1
- ii) Remove the pivot pin (2) from the main lever first.
- iii) Remove the lever (1), rubbing plate (3) and return spring (4) from the main valve.
- iv) Repeat for the liquid fire valve, note the main valve lever will need to be removed to remove the liquid fire lever.

##### 4.7.10.3 MAIN AND LIQUID FIRE VALVE LEVER INSTALLATION

- i) Align the valve stems such that the pivot hole is parallel to the flat faces on the valve bodies.
- ii) Install the return springs in the holes towards the rear of the lever.
- iii) Install the rubbing plate and position the liquid fire valve lever first.
- iv) Install the pivot pin so the head is flush with the lever face.
- v) Repeat for the main valve lever.



### 4.7.10.4 MAIN OR LIQUID FIRE VALVE REMOVAL

The main / liquid fire valve and main inlet / liquid fire nozzle assembly screw together through the valve block. The valves can be worked on individually or both removed at the same time.

- i) Remove the valve block from the burner unit as per 4.7.7.1
- ii) Removal the valve levers as per 4.7.10.2
- iii) Using a 25mm deep socket, unscrew the main inlet / liquid fire nozzle assembly from the valve assembly.
- iv) Separate the two assemblies from the valve block
- v) Inspect the face Orings from both parts and replace or set aside for re-use.

### 4.7.10.5 MAIN VALVE DISASSEMBLY

While it may not be necessary, it is recommended that the stem seal be replaced if the valve is disassembled.

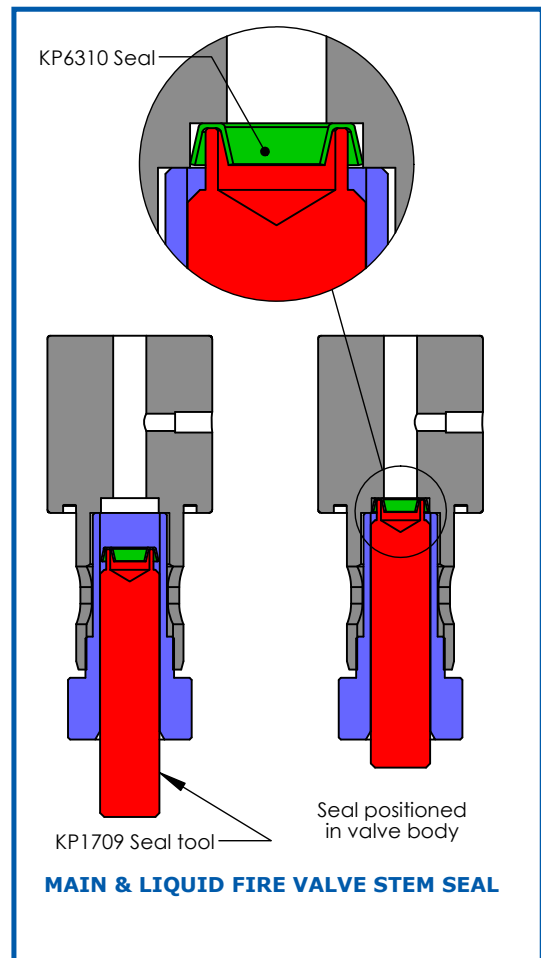
If the seal is to be replaced or comes out during disassembly and cleaning, the KP1709 seal installation tool will be required for insertion of the new seal.

Do not attempt this work without the correct tools.

- i) Clean and inspect the free end of the valve stem (11) for burrs or edges that may damage the valve body or stem seal during disassembly.
- ii) Gently push the valve stem clear of the valve body (5) and collect the spring (9) and washer (8). If the stem seal (7) is on the stem, carefully remove it from the stem making sure not to distort or squash the stem seal.
- iii) Inspect the stem for wear, scratches or damage. The area where the stem seal operates will appear polished and is the critical area to check for damage.
- iv) Inspect the rubber seat (12) for damage - indentation is acceptable and to be expected but cracking is cause for replacement.
- v) Clean and inspect the bore of the valve body for damage and wear.

### 4.7.10.6 MAIN AND LIQUID FIRE VALVE STEM SEAL REPLACEMENT

- i) Lubricate the bore of the valve body with KP6708 grease.
- ii) Insert the KP1709 seal tool into the valve body.
- iii) Insert the KP6310 seal, closed side first, into the seal tool body.
- iv) Gently push the seal down the bore and into place with the seal tool piston.
- v) Remove both halves of the seal tool.





- vi) Visually inspect that the stem seal is properly located in the valve body.

### **4.7.10.7 REPLACE THE MAIN / LIQUID FIRE VALVE RUBBER SEAT**

The following job is best done with the stem held in a protective nylon block with an 8mm dia bore to hold the stem. Alternately, the stem and seat can be replaced as an assembly or returned to Kavanagh Balloons for overhaul.

- i) With the valve stem secured, press the seal carrier down until the rubber seal disk pops clear of the seal carrier.
- ii) Clean and inspect the seal carrier for damage.
- iii) Remove the old seal disk from the central spike on the stem and install a new seal disk.
- iv) Carefully insert one edge of the new seal disk into the seal carrier and work into place with a soft wedge or screw driver making sure not to damage the seal face.
- v) Inspect for scratches or damage to the seal face and ensure that the edge is fully retained in the seal carrier.

### **4.7.10.8 ASSEMBLE THE MAIN VALVE**

- i) Assemble the spring and washer onto the stem and seal carrier.
- ii) Gently ease the tip of the stem into the stem seal and guide the stem into the valve body as far as possible.

### **4.7.10.9 INSTALL THE MAIN / LIQUID FIRE VALVE**

The following steps suggest that valve bodies be lined up in and installed in the handle bar to allow easy alignment of all parts. This is not necessary but it guarantees correct alignment of all parts.

- i) Install both valve bodies into the handle bar with the cap head screws. If only one valve was removed then still install it in the appropriate position in the handle bar.
- ii) Inspect the valve body ports for contamination and damage to the sealing face(s).
- iii) Install the face Orings onto valve body and the main inlet or liquid fire nozzle with a light lubrication of KP6708 grease.
- iv) Apply a small amount of grease to the threads of the main inlet or liquid fire nozzle.
- v) Install the valve body(s) into the valve block ensuring the correct orientation of the valves such that the main valve will be located at the main fuel inlet and filter end of the valve block.
- vi) Screw the main inlet / liquid fire nozzle and valve body components together ensuring the Orings are correctly installed.
- vii) Holding the handle cap, tighten the main inlet / liquid fire nozzle assembly down until it is flush with the valve block surface.
- viii) Remove the handle bar.
- ix) Carry out a full functional and leak check of the main and liquid fire valves as per 4.7.14 - the levers should not be installed until required as part of the leak check.

### 4.7.11 COIL UNIT

The coil unit may be removed without disassembly of any other components. Access to the nuts is best achieved with a 12" long 1/4" drive extension and 10mm socket through the gap above the top can ring.

No welding repairs are to be carried out on a coil unit, in any location. Damaged coils units must be referred to Kavanagh Balloons technical staff for advice.

Cleaning can be done without removal of the coil unit.

#### 4.7.11.1 COIL UNIT REMOVAL

- i) Remove the 8 button head socket screws (1) and nuts (3) from the coil bars.
- ii) Gently wiggle the coil unit free of the main inlet Orings.
- iii) Collect the four coil bar spacers (2) from between the coil bars and the can support bars.

#### 4.7.11.2 COIL UNIT INSTALLATION

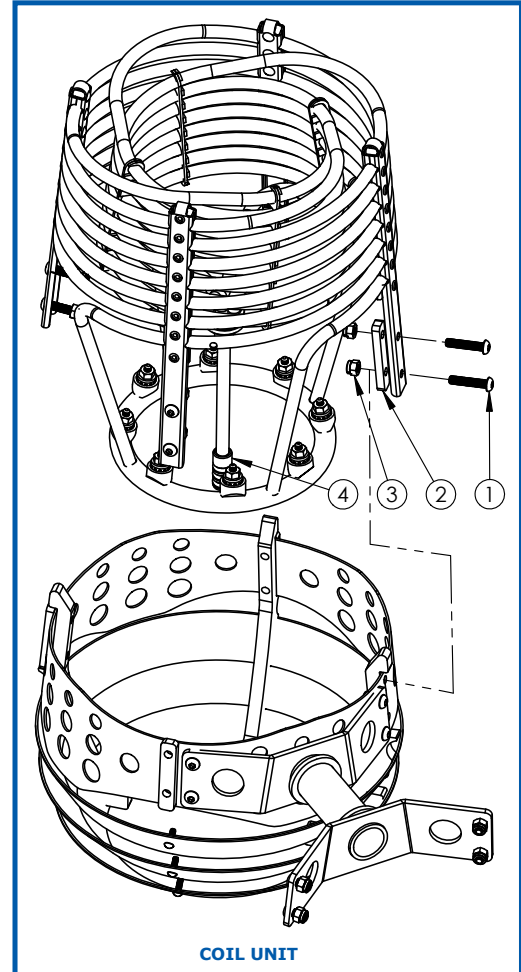
- i) Inspect the condition of the coil inlet Orings (4) and replace as necessary as per 4.7.7.3 or lubricate with KP6708 grease.
- ii) Align the coil unit with the can support bars and main inlet.
- iii) When lowering into place, if the valve block is installed, ensure the jet ring clears the water extractor.

**Note:** *There will be a distinct colouring to the inner coils adjacent to the flow from the liquid fire. The coils may be re-positioned to spread this localised heating to a new section of the coils if required.*

- iv) Insert the four coil bar spacers (2) between the coil bars and the can support bars with the large gap to the top.
- v) Insert the eight button head socket screws (1) without tightening any of them
- vi) Install the nuts (3) and tighten to 8Nm

#### 4.7.11.3 JET CLEANING

Cleaning of the jet foils is best accomplished externally with soft nylon brush such as a tooth brush or similar. Carbon build up is typically external only so disassembly of the jets is unnecessary in most cases.





#### 4.7.11.4 REMOVE AND INSTALL THE JETS

**NOTE:** See the notes on cleaning jets first. Only remove the jet(s) if an obvious blockage exists or abnormal flow that cannot be rectified by external cleaning. Jet removal is best done with the coil unit removed although this is not mandatory.

The jet centers and foils are precision machines and may affect burner performance if they are dropped or damaged during the course of maintenance.

Jet foils may be re-installed but may deform and need to be replaced if the correct torque cannot be achieved. Spare parts should be on hand if jets are to be disassembled.

- i) Using a 10mm socket and extension, unscrew the jet center being careful not to drop it on a hard surface.
- ii) Using a soft tool, pick the jet foil from the holder with a light twisting motion until it can be withdrawn.
- iii) Inspect and clean both the foil and jet center with a soft cloth. Foils with a twisted or damaged leg should be replaced. Jet centers with excessive grooves or dimples from the foil should be replaced.
- iv) Inspect the jet holder for contamination and clean as required.
- v) Jet foils may be re-installed or a new flat foil placed over the center post.
- vi) Screw the jet center into place so that it either engages the pre-used foil or bends the new foil into the jet holder.
- vii) Torque the jet center to 7Nm (+/- 1Nm) and inspect all legs of the foils appear straight and have an even gap.

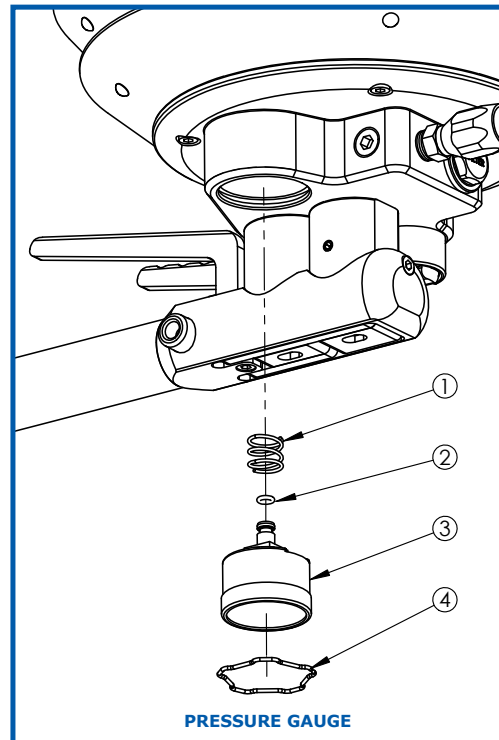
**Note:** If the legs are not aligned properly after the correct torque is applied, remove the foil, straighten the leg and try at the low end of the torque scale.

#### 4.7.12 PRESSURE GAUGE

##### 4.7.12.1 PRESSURE GAUGE REMOVAL

The pressure gauge can be changed without removal of any other parts. Ensure the valve block has no fuel pressure when changing a gauge.

- i) Identify the join in the wire form spring clip (4) that retains the pressure gauge (3).
- ii) Apply a light pressure to the gauge face to depress the gauge against its removal spring.
- iii) Insert a small screwdriver or similar tool and carefully release one end of the wire clip.
- iv) Withdraw the full clip from the valve block.
- v) Release the pressure on the gauge face and allow the extraction spring (1) to raise the pressure gauge from the valve block for removal.



### 4.7.12.2 PRESSURE GAUGE INSTALLATION

- i) Ensure the pressure gauge has an Oring (2) installed and lightly lubricate with KP6708 grease.
- ii) Inspect the bore of the pressure gauge cap for contamination and clean with a lint free cloth as required.
- iii) Install the removal spring (1) into the valve block.
- iv) Install the pressure gauge (3) and rotate until the green band is on the side of the main and liquid fire valves and the gauge will press into it's full depth.
- v) Hold the pressure gauge in place and install the wire retaining clip (4) starting from the side opposite the gap.

### 4.7.13 BURNER MOUNT BRACKETS

The following remove and install procedures for mount brackets cover double, triple and quad burners where one or more can sections needs to be removed from the mount bracket or the mount bracket needs to be changed.

#### 4.7.13.1 REMOVE CAN ASSEMBLY FROM THE MOUNT BRACKET

- i) Remove the handle bar and or valve block(s) as required for the level of disassembly required.
- ii) Remove the four button head socket screws and nuts from the mount bracket on each can unit to be removed.

#### 4.7.13.2 INSTALL CAN ASSEMBLY TO THE MOUNT BRACKET

- i) Install the four button head socket screws and nuts on each mount bracket to be installed.
- ii) Torque the nuts to 8Nm
- iii) Install the valve block and / or handle bar as required.

### 4.7.14 FUNCTIONAL AND LEAK CHECKS

Leak checks of the valve block may be carried out with the valve block installed in the burner but are easier before the valve block is installed if major work has been carried out.

Once installed a final leak and operational check of the burner unit is required.

#### 4.7.14.1 VALVE BLOCK LEAK AND FUNCTIONAL CHECK - VALVE BLOCK REMOVED

**CAUTION:** *When the valve block is not installed in the burner, make sure the main and liquid fire valves are not inadvertently operated as injury may occur from either liquid propane or flame.*

- i) If not already done, remove the main and liquid fire levers, guide plates and return springs as per 4.7.10.2
- ii) Apply fuel pressure or shop air to the valve block and check the pressure gauge is reading a minimum of 90 psi)
- iii) Apply a commercial leak detector or soapy water solution to all joints in the inlet filter, pilot light valve and liquid pilot light assembly, main valves, pressure gauge cap, main inlet and liquid fire nozzle.
- iv) Open the pilot light valve but do not ignite the pilot light.
- v) Check for leaks in all areas.



- vi) Clean off leak detection fluid with fresh water and dry.
- vii) Apply fuel to the valve block and ignite the pilot light.
- viii) If necessary, adjust the pilot light inlet as per 4.7.8.5 to get the correct flame and starting characteristics.

**4.7.14.1 FULL SYSTEM LEAK AND FUNCTIONAL CHECK**

- i) With the valve block installed and all levers and handle bars in place apply fuel to the burner unit.
- ii) Ignite the pilot light and check that the full pilot light ignites with one to two operations of the piezo.
- iii) Apply leak detection fluid to the main inlet at the base of the coils.
- iv) Operate the main burner and watch for signs of leaks at the main inlet.
- v) Check for abnormal flow from any of the jets.
- vi) Check for abnormal flame pattern or excessive flame egress from the coils.
- vii) Operate the liquid fire and check for abnormal flame pattern or impact on the coils.
- viii) Clean off leak detection fluid with fresh water and dry.