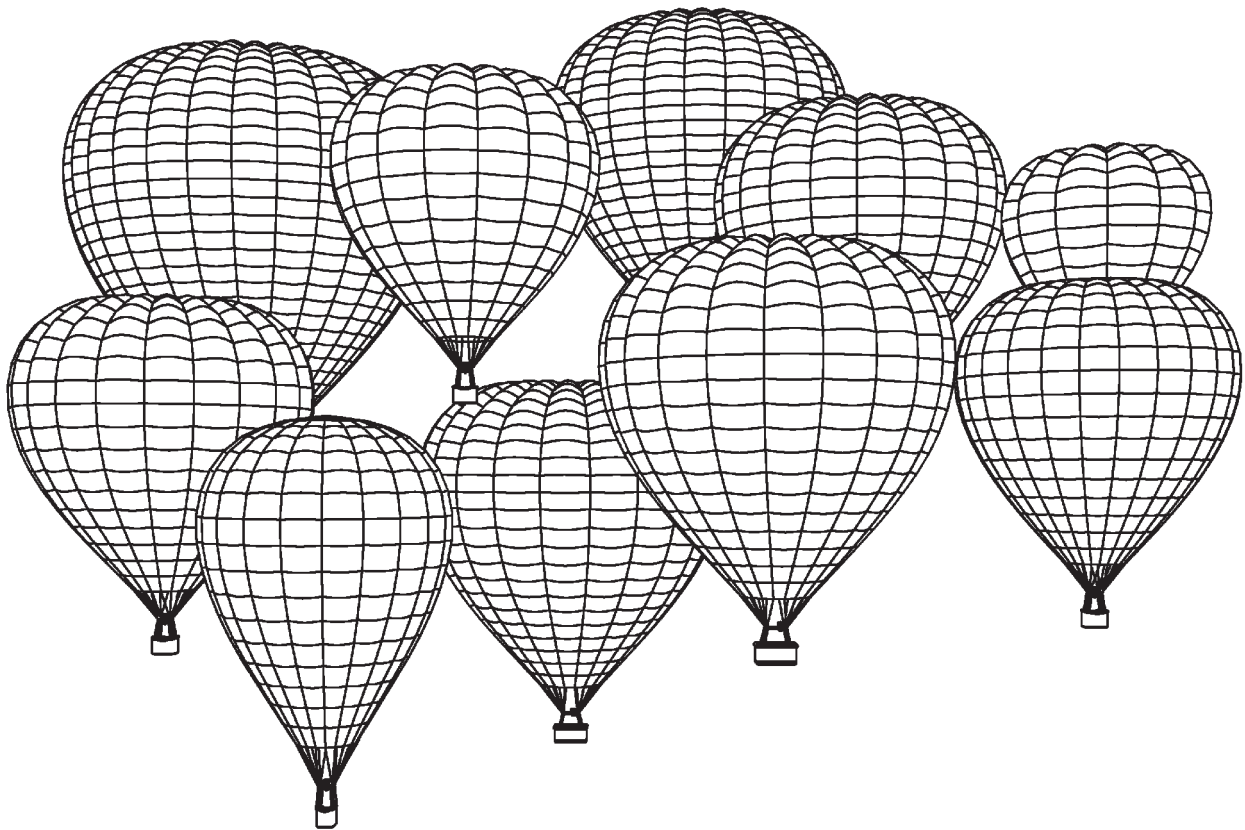

**KAVANAGH BALLOONS AUSTRALIA
PTY LIMITED**

**HOT AIR BALLOON
MAINTENANCE MANUAL**

ISSUE 4 - Revision 8



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Applicability of this manual is detailed on page 1-1

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1	11th Dec 2009	ii, iii, 2-5, 2-10, 6-7, 7-1, 7-2, 7-3	
2	1st Sep 2010	i, ii, iii, iv, v, vii, 2-8, 2-9, 2-10, 2-11, 2-12, 4-7, 6-1, 6-2, 6-3, 6-4, 6-5, 6-6, 6-14, 6-15, 6-16, 7-2, 7-3	
3	6th Sep 2010	i, ii, iii, v, vii, 2-5, 3-2, 3-3, 3-4, 3-5, 3-6, 6-1, 6-6, 6-12, 6-13, 6-14, 7-1, 7-2, 7-3	
4	1st May 2012	i, ii, iii, v, 3-5, 3-6, 6-6, 6-13, 7-3, 7-4	
5	22nd May 2012	i, ii, iii, vi, vii, viii, ix, x, 1-1, 4-15, 4-16, 4-17, 4-18, 4-19, 4-20, 4-21, 4-22, 4-23, 4-24, 4-25, 4-26, 4-27, 4-28, 4-29, 4-30, 6-11, 6-12, 6-13, 7-2, 7-3, 7-4, 7-5, 7-6, 7-7, 7-8, 7-9, 7-10, 7-11, 7-12, 7-13, 7-14, 7-15, 7-16	
6	1st Oct 2015	i, ii, iii, iv, v, vi, vii, viii, ix, 2-5, 2-6, 2-7, 3-6, 3-7, 3-8, 4-15, 4-16, 7-1, 7-2, 7-3, 7-4, 7-7, 7-12	
7	27th Nov 2017	i, ii, iii, iv, v, vi, vii, viii, ix, x, 2-5, 2-6, 2-8, 2-9, 2-10, 2-11, 2-12, 3-1, 3-2, 3-3, 3-4, 3-5, 3-6, 3-7, 3-8, 3-9, 3-10, 4-2, 4-3, 4-4, 4-5, 4-16, 4-17, 4-18, 4-19, 4-20, 4-21, 4-22, 4-23, 4-24, 4-25, 4-26, 4-27, 4-28, 4-29, 4-30, 6-1, 6-2, 6-3, 6-4, 6-5, 6-6, 6-10, 6-11, 6-12, 6-13, 6-14, 6-15, 6-16, 6-17, 7-7, 7-8, 7-9, 7-10, 7-11, 7-12, 7-13, 7-14, 7-15, 7-16, 7-17, 7-18	
8	15th May 2019	i, ii, iii, iv, v, vi, vii, viii, ix, 2-5, 2-12, 3-3, 3-4, 3-5, 3-6, 3-7, 3-8, 3-9, 3-10, 5-1, 5-2, 6-1, 6-2, 6-3, 6-4, 6-5, 6-6, 6-7, 6-8, 6-9, 6-10, 6-11, 6-12, 6-13, 6-14, 6-15, 6-16, 6-17, 6-18, 6-19, 7-10, 7-13, 7-15, 7-16	



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SECTION 1 - GENERAL

1.0 APPLICABILITY

This manual applies to the following models and components of Kavanagh Balloons manufactured after 1980. For maintenance of older models of burners not covered in this manual, refer to the original maintenance manual supplied with the equipment or contact Kavanagh Balloons technical staff for more information.

Envelopes	All Kavanagh models
Baskets	All Kavanagh models
Burners	All Kavanagh Series 3 and Series 4 Crossfire
Fuel Tanks	All fuel tanks supplied by Kavanagh Balloons

1.1 DEFINITION OF A MAJOR REPAIR

A major repair is defined as listed below and must be made only to approved data, using approved materials and by appropriately qualified organisations. If the approved data required for a major repair is not available in this manual, it must be obtained from the manufacturer, Kavanagh Balloons.

- Repairs to, or replacement of any load tapes, envelope suspension cables or basket cables.
- Fabric repairs necessary to return a balloon to an airworthy state, requiring replacement of more than two adjacent panels below the equator or more than one panel above the equator.
- Any metal repairs requiring welding, including, but not limited to basket frames, load frames, burners or fuel tanks.
- Any burner repairs other than replacement of fuel hoses with approved hoses, main valve seal replacement, of liquid fire or pilot burner valves, replacement of screwed fasteners and load frame pivot bolts.

1.2 PROHIBITED REPAIRS

The following repairs are prohibited without direct consultation with Kavanagh Balloons technical staff.

Envelopes:	Replacement of original fabric panels exceeding 50% of the total panel count given in Appendix 1, irrespective of the total area.
Metal components:	Welding repairs to any part of the burner, load frame, fuel system (including fuel tanks) or basket frames.
Load Bearing Cables:	Swaging or repair of flying wires or basket wire assemblies.

1.3 PARTS AND MATERIALS

All replacement parts and materials used during maintenance must be approved by Kavanagh Balloons.



1.4 AIRWORTHINESS LIMITATIONS

This airworthiness limitations section is verified by the Civil Aviation Safety Authority of Australia. It specifies the airworthiness limitations required to maintain conformance with the airworthiness requirements of CASR 31.

1.4.1 TIMED LIFE COMPONENTS

The following components have a limited life based on physical age. At the end of their life they must be removed from the balloon and discarded. Replacement parts must be fitted and recorded in the log book.

Component	Life limit
Main liquid fuel hoses	10 years from manufacture

Approved by:.....

Printed Name:.....

Delegate of the Authority

Approval Date:.....



SECTION 2 - ENVELOPE

2.1 GENERAL

2.1.1 ROUTINE MAINTENANCE AND STORAGE

The fabric used in hot air balloons can be subject to degradation from overheating, ultra violet light exposure and fungal attack. To maximise the life of the balloon, all of these factors should be minimised by keeping the following in mind when operating and storing the balloon,

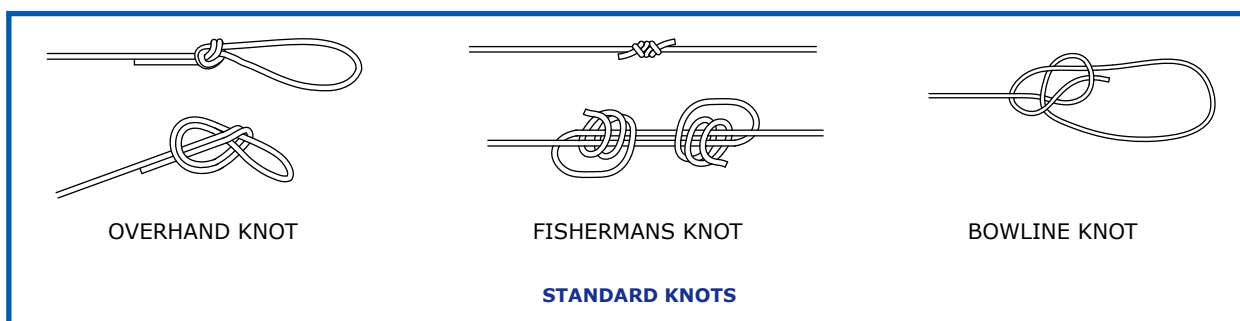
Pay careful attention to the loading of your balloon and never operate it outside the specified loading limitations in the Flight Manual.

Keep the balloon envelope covered or in its bag until ready to fly. At the completion of a flight, pack the balloon away as soon as possible after landing to reduce UV exposure and likewise only remove the balloon from the bag immediately prior to inflation.

Whenever possible avoid flight in rain and pack the balloon away dry. If the conditions prevent the balloon from being packed up dry, the envelope should be dried at the earliest opportunity. Never leave the balloon in the bag wet for long periods of time.

2.1.2 STANDARD KNOTS

There are three types of knots used in all models of Kavanagh Balloons. Whenever carrying out any repairs or re-rigging any cord or rope, only the specified knot should be used.



2.1.3 ENVELOPE IDENTIFICATION

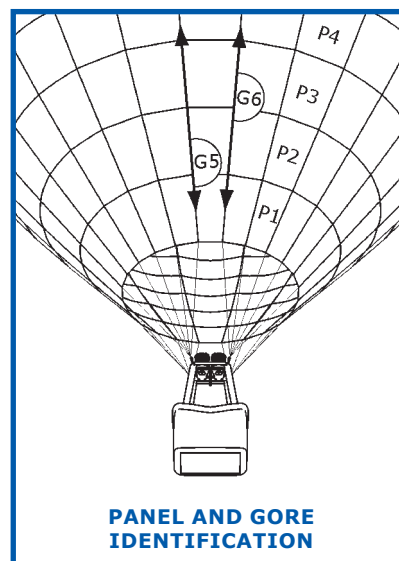
The envelope data plate is located on the mouth rim tape on gore 3,4,5,6 or 7 depending on the model. On balloons manufactured prior to June 2003 the data plate is located at the top of the envelope on gore 1.

All balloons have the model, serial number, date of manufacture and registration mark inscribed on the crown ring.

2.1.4 PANEL IDENTIFICATION

Panels are counted from bottom to top with the first panel (Nomex cloth) counted as number one. Vent panels are counted from the edge of the vent towards the centre and are numbered V1,V2,V3 etc.

Gore numbers are marked on the vertical load tapes at the mouth and vent rim tapes. Numbering is clockwise when looking from the bottom of the balloon with the load tape number corresponding to the gore to the right of that load tape.



2.2 FABRIC REPAIRS

The balloon is designed with a large factor of safety and is capable of flying with minor damage to the envelope. The balloon can be flown with torn or burnt panels in the lower part of the envelope. The allowable minor damage limits are as shown in the Limitations section of the Flight Manual. Any damage beyond these limits must be repaired before the aircraft is flown again.

2.2.1 LOWER PART OF THE ENVELOPE

The lower part of the envelope is defined as the bottom 6 metres of the balloon. On all models this will be up to and including panel 4.

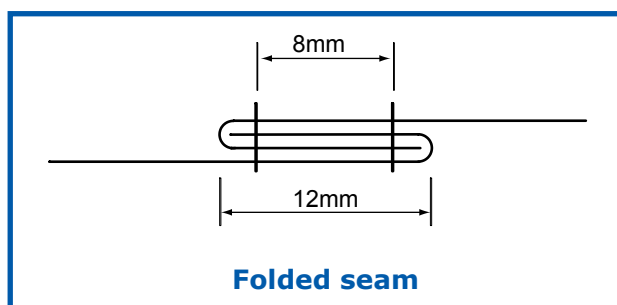
2.2.2 FOLDED SEAMS

A folded twin needle seam is used during construction of the balloon. A correctly folded seam will have both rows of stitching penetrate both folded layers of fabric. Inlay seams for artwork or repairs as per 2.4 are the only accepted variation to this seam construction.

All folded seams are considered structural and must be sewn with a metric 30 polyester thread such as KP2601. Stitching must be a lock stitch with a stitch length between 2.5 - 4mm. Where a twin needle machine is used, needle spacing should be 8mm (5/16").

Where a seam is restarted, a minimum overlap of 100mm is required to ensure the seam cannot be pulled undone.

Where possible, use of a mechanical folder is recommended for consistent and high quality seams.



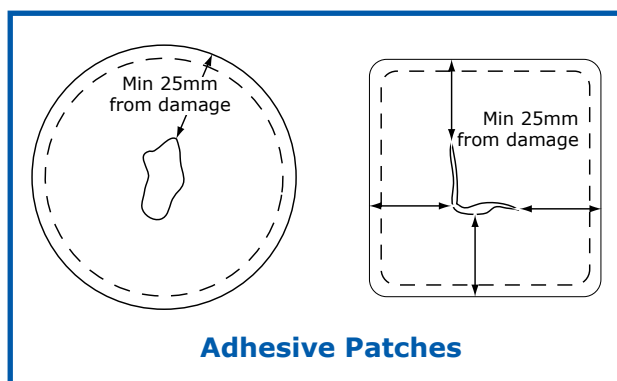
2.3 SMALL TEARS AND HOLES

Repairs to small tears or holes in the fabric smaller than 100mm in any direction can be made using adhesive sailcloth repair tape or pieces of adhesive insignia cloth provided they are not closer than 25mm to a vertical seam.

For tears or holes smaller than 50mm in any direction and in the lower part of the balloon, sewing of the adhesive patch is not required.

For tears or holes smaller than 10mm in any direction, in any part of the balloon, sewing of the adhesive patch is not required if adequate adhesion of the patch can be achieved.

For tears or holes larger than 50mm in any direction or in the top part of the balloon or where adequate adhesion of the patch cannot be achieved, a single row of stitching must be sewn around the edge of the patch.



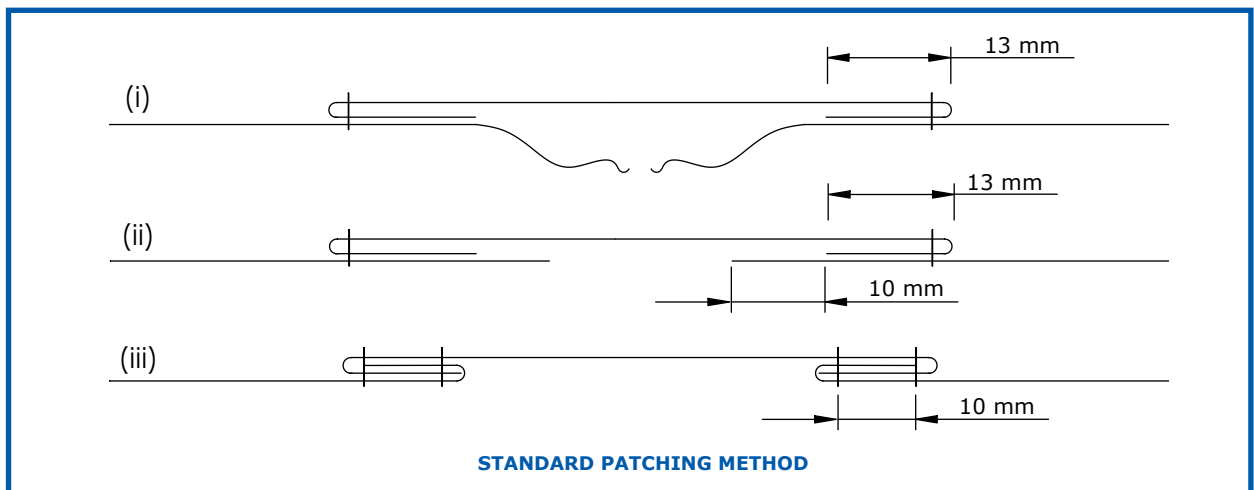
In all cases where an adhesive patch is used, the edge of the patch must extend at least 25mm past the damage in all directions.

Sewing thread used must be metric 30 polyester (KP2601) using a 3-4mm lock stitch.

2.4 PATCHES

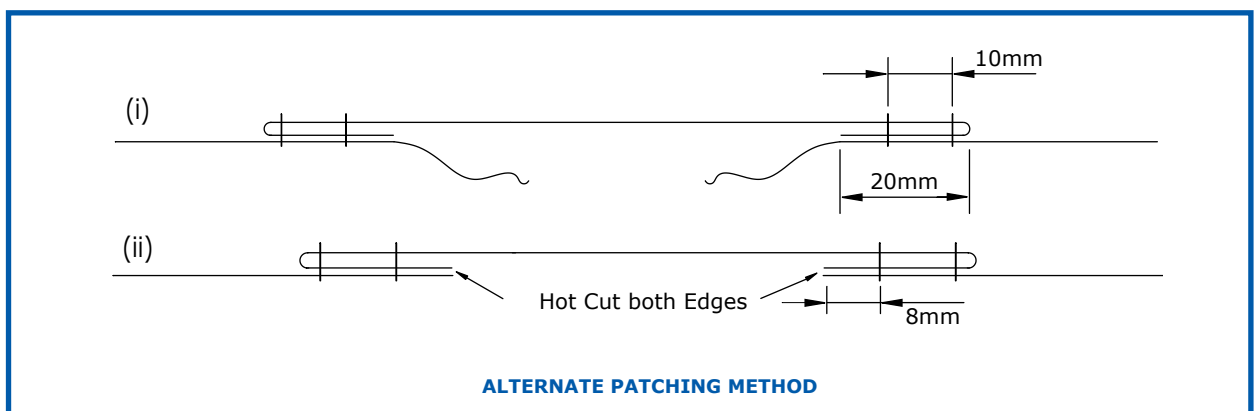
Patching of larger tears or holes is best done in the approved manner shown below. All repairs should be carried out with metric 30 thread (KP2601). For nomex repairs, metric 35 kevlar thread KP2602 is recommended to ensure the longest possible service life of the repair.

- i) Cut a patch to shape, fold edges over 13mm and sew over the damaged area of balloon with one row of stitching around the edge.
- ii) Cut the damaged area away from the inside surface, leaving 10mm excess from the original panel as shown below.
- iii) Fold the excess under (making small diagonal cuts at the corners) and sew as shown below to complete the repair.



2.4.1 ALTERNATIVE PATCHING METHOD

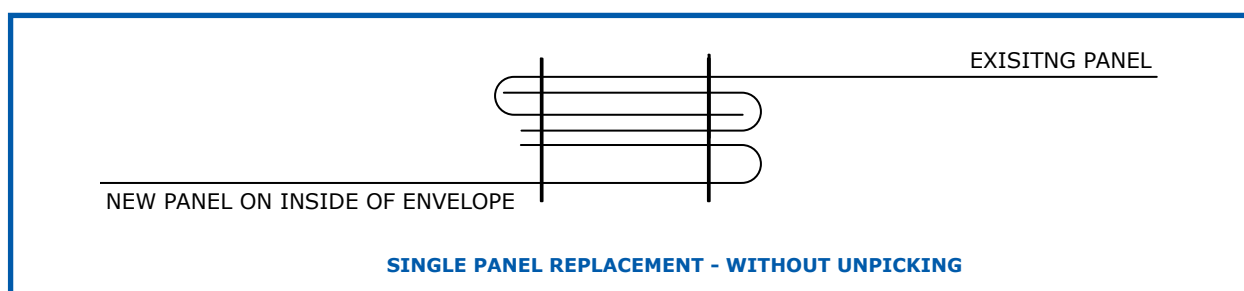
- i) Cut patch to shape, and fold edges under 20mm, then sew over the damaged area with twin rows of stitching as shown below.
- ii) Cut the damaged area away from the inside of the balloon about 8mm inside the stitching, using a hot knife to seal the edges and prevent fraying of the exposed edges as shown below.



2.5 REPLACEMENT OF A WHOLE PANEL

If the damage to a panel is severe, it may warrant the replacement of the whole panel, this is often less time consuming and similar in expense to patching. The use of a pre-cut replacement panel from the manufacturer is recommended, as this will ensure the correct shape is used.

- i) Remove the damaged panel from the envelope by either unpicking the adjacent seams or cutting around the edge of the panel close to the bordering seams, taking care not to cut the existing seams or panels remaining in the balloon.
- ii) If the damaged panel is bordered on one side by a horizontal load tape on the inside of the balloon, this tape must be unpicked and re-sewn after the panel is replaced.
- iii) The new panel is then either sewn in on the inside of the envelope with two rows of stitching over the existing stitching OR if the panel was unpicked for removal, the new panel is sewn in place with a folded seam.



NOTE: *If multiple adjoining panels are to be replaced, all surrounding seams must be unpicked so the new panels can be sewn in place with the correct folded seam.*

2.6 VERTICAL LOAD TAPE REPAIRS

If damage occurs to a load tape, and it is apparent that more than 10% of the fibres are cut or burnt, the damaged section must be repaired before a further flight is attempted.

If pulleys or attachment points inside the balloon need to be removed during repairs, refer to section 2.8 for the approved method of re-attachment.

Note: *The lengths given in the tables and diagrams are the initial measurements. After sewing the joints there will be some shrinkage of the tape and an overall reduction in length of the joint.*

- i) Determine the type of load tape, thread and joint method required from the tables below. Due to changes in suppliers different materials are used depending on the serial number of the balloon. Diagrams of all joint methods are on page 5.

Model	Applicable Serial Numbers	Load Tape	Thread	Stitch length	Joints
EX-60, EX-65, EX-70, EX-77, B-77	All	20mm KP2307	KP2606	5 per 25mm	A1, A2, A3
G-450	up to and including 343	35mm KP2323	KP2608	5 per 25mm	B1, B2, B3
G-450, G-525	greater than 343	35mm KP2327	KP2608	5 per 25mm	B1, B2, B3
B-105 C-56, C-65, C-77 D-77, D-84, D-90, D-105 E-120, E-140	up to and including 310	25mm KP2308	KP2606	5 per 25mm	B1, B2, B3
B-105 C-56, C-65, C-77 D-77, D-84, D-90, D-105 E-120, E-140	311 - 376	25mm KP2321	KP2608	5 per 25mm	B1, B2, B3
B-105 C-56, C-65, C-77 D-77, D-84, D-90, D-105 EX-90, E-120, BOX-90	greater than 376	25mm KP2329	KP2608	5 per 25mm	B1, B2, B3
E-160, E-180, E-210 E-240, E-260, E-300	up to and including 305	25mm KP2306	KP2606	5 per 25mm	B1, B2, B3
E-160, E-180, E-210 E-240, E-260, E-300	306 to 363	25mm KP2322	KP2608	5 per 25mm	B1, B2, B3
E-140, E-160, E-180, E-210 E-240, E-260, E-300	greater than 363	25mm KP2328	KP2608	5 per 25mm	B1, B2, B3
B-350, B-400	up to and including 344	35mm KP2314	KP2606	5 per 25mm	B1, B3, B4
B-350, B-400	345 - 360	35mm KP2323	KP2608	5 per 25mm	B1, B2, B3
B-350, B-400, B-425	greater than 360	35mm KP2327	KP2608	5 per 25mm	B1, B2, B3

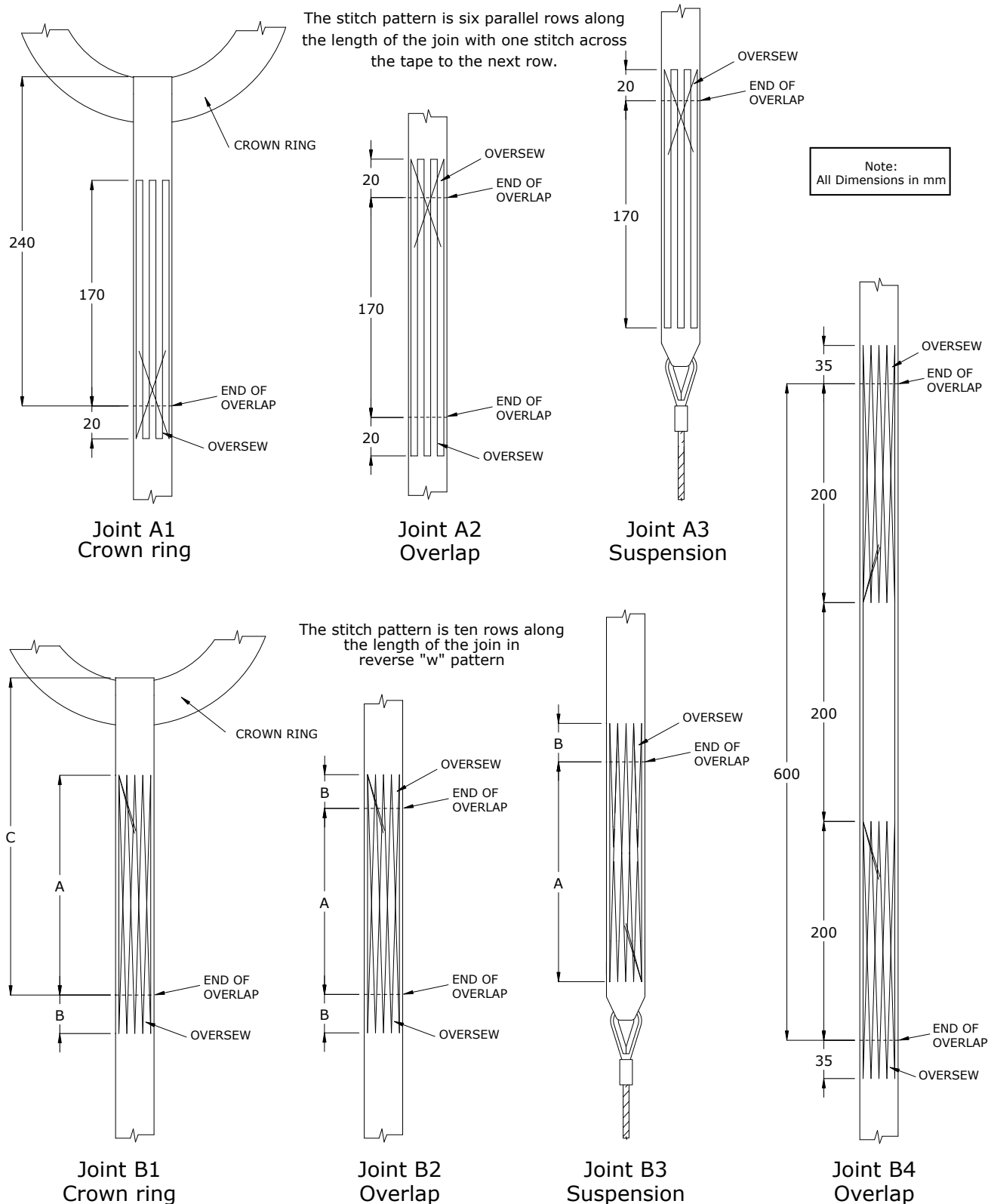
- ii) Unpick the damaged section of load tape ensuring that the fabric is unpicked for 400mm each side of the damaged section.

- iii) Join in a new section of load tape as required making sure that the correct final length is obtained.

Where the suspension joint is damaged a new suspension joint can be made directly onto the existing flying wire (subject to successful inspection of the flying wire - refer to 1.1.14) and the new section joined to the existing load tape above the new suspension joint.

Similarly, a new crown ring joint can be added with the new section joined in below the crown ring.

- iv) When the load tape overlap joint is complete, the balloon fabric can be sewn back onto the load tape.



Model - these dimensions apply to Joints B1, B2, B3	Dim A	DIM B	Dim C
B-105, C-56, C-65, C-77, D-77, D-84, D-90, D-105, E-120, E-140, E-160, E-180, E-210, E-240, E-260, E-300	170	25	240
B-350, B-400, B-425, G-450, G-525	200	35	290

2.7 REPAIR METHOD FOR HORIZONTAL LOAD TAPES

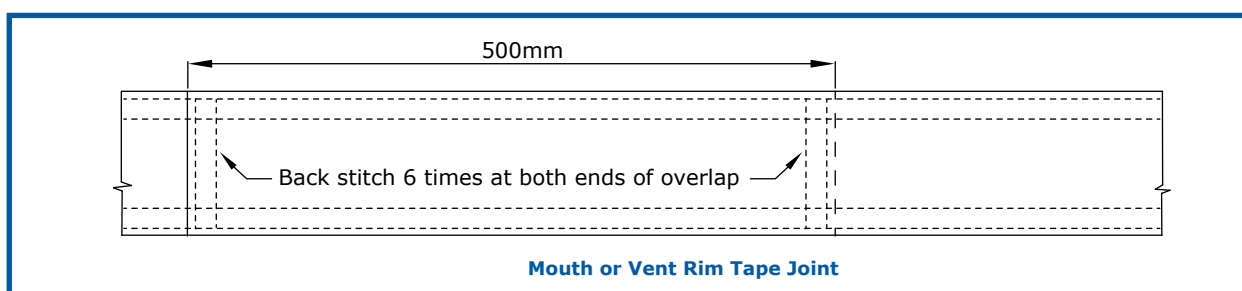
If damage occurs to a load tape, and it is apparent that more than 10% of the fibres are cut or burnt, the damaged section must be repaired before a further flight is attempted.

If pulleys, attachment points or rigging covers need to be removed during repairs, refer to section 2.9 for the approved method of re-attachment.

2.7.1 48MM MOUTH AND VENT RIM TAPES

The mouth and vent rim taps are 48mm webbing (KP2303). Where a section is to be replaced a 500mm overlap is required at each end of the new piece of tape.

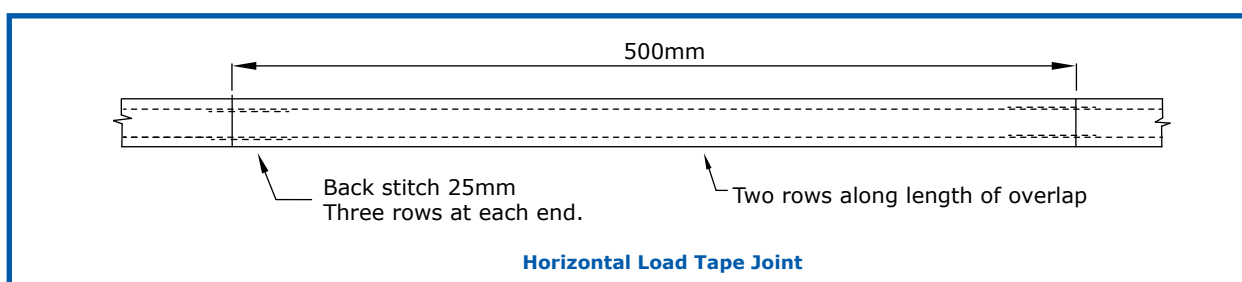
Follow the stitch pattern of the existing tape. Typically the tape is sewn in place with twin rows of stitching using metric 30 polyester thread (KP2601) at the top and bottom of the tape. At each end of the 500mm overlap, 6 rows of twin needle back stitching are used to secure the ends of the overlap.



2.7.2 16MM INTERNAL HORIZONTAL LOAD TAPES

Horizontal load tapes on all models are 16mm webbing (KP2301). The tape is attached to the inside of the envelope after completion of the vertical seams and typically follows an existing horizontal seam. The tape is sewn on with twin rows of stitching using metric 30 polyester thread (KP2601).

For most repair situations the fabric should be unpicked from the tape and then the tape re-sewn at the end of the repair. If the horizontal load tape is damaged or cut during a repair then an overlap joint as shown in the diagram below is used to join in a new section of tape.



2.8 REPLACEMENT OF ROTATION VENT EYELETS

Eyelets are located at the top of panel 1 for rotation vent lines to exit the balloon. These may be worn provided they are not causing excessive wear on the rotation vent lines and pose no risk of snagging or jamming the rotation vent lines.

Replacement will require a SP9 hand forming tool for the replacement eyelet. Eyelets may be brass or stainless steel.

- i) Untie the webbing strap attached to the rotation vent line and pass the rotation vent line through the existing eyelet to the inside of the balloon.
- ii) Carefully remove the existing eyelet by removal of the backing face of the eyelet inside the balloon.
- iii) Install the new eyelet ensuring it is properly formed with no sharp edges or burrs.
- iv) Inspect the rotation vent line for excessive wear.
- v) Re-install the rotation vent line through the eyelet and connect the correct coloured webbing strap.

NOTE: *The Green strap (White on some early models) is for clockwise (right hand) rotation of the balloon, the black strap is for anti-clockwise (left hand) rotation of the balloon.*

2.9 ATTACHMENT POINTS AND PULLEYS

All the pulleys and attachment points are sewn in place using a twin needle machine and metric 30 polyester thread (KP2601).

If attachment points or pulleys need to be removed to carry out repairs then the method of attachment should be inspected prior to removal so it can be duplicated.

If a box stitch with a cross is used, the method is to use a single needle machine and metric 20 polyester thread (KP2607).

If the KP2005 pulleys used in Smart Vent and Lite Vent deflation systems or the lower rotation vent pulleys require replacement spares can be supplied installed on the KP2301 16mm webbing ready for installation. Alternately the webbing attachment points can be re-made by following the assembly of part to be replaced.

2.9.1 CONTROL LINE PULLEYS

All deflation system control line pulleys are installed on KP2001 6mm quick links.

- i) Undo the quick link and remove the old pulley
- ii) Install the new pulley onto the quick link and tighten
- iii) Re-run the control line through the new pulley ensuring the pulley is not twisted on the attachment point.
- iv) Carry out a full inflation and operational test of the control line prior to flight.

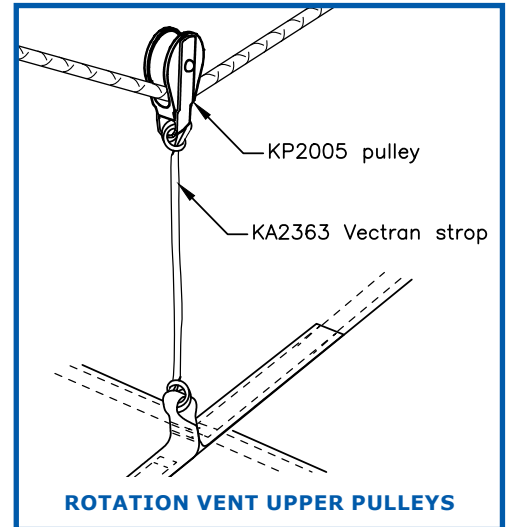
Note: *Where possible it is suggested that a piece of cord is used as a mouse line when replacing pulleys so the positioning and location of control lines is not disturbed.*

2.9.2 ROTATION VENT UPPER PULLEYS

The two upper pulleys for the rotation vent control lines may be replaced with a KP2005 pulley installed on a KA2363 Vectran strop.

Note: *If the pulley is already installed on a KA2363 strop then just the pulley may be replaced if the strop is not worn.*

- i) Remove the old pulley from the attachment point by cutting through the metal cheek of the pulley.
- ii) Inspect the attachment point for damage and wear.
- iii) Install the KP2005 pulley onto the KA2363 Vectran strop by passing one end of the strop through the back of the pulley and then through itself to form a hitch on the pulley.
- iv) Install the pulley and strop onto the attachment point by passing the free end of the strop through the attachment point and then passing the pulley through the loop in the KA2363 strop to form a hitch on the attachment point.
- v) Re-run the rotation vent control line through the new pulley.
- vi) Carry out a full inflation and operational test of the rotation vent system prior to flight.



2.10 CONTROL LINES

Control lines with damage to the outer sheath exposing the core or damage in a location where the damaged section will run through a pulley, must be replaced.

All control lines must be replaced with colour coding identical to the original and the ends must be heat sealed.

Control lines must not be shortened, as excess is required during operation of the deflation system and to allow for elongation of the balloon in-flight or during deflation.

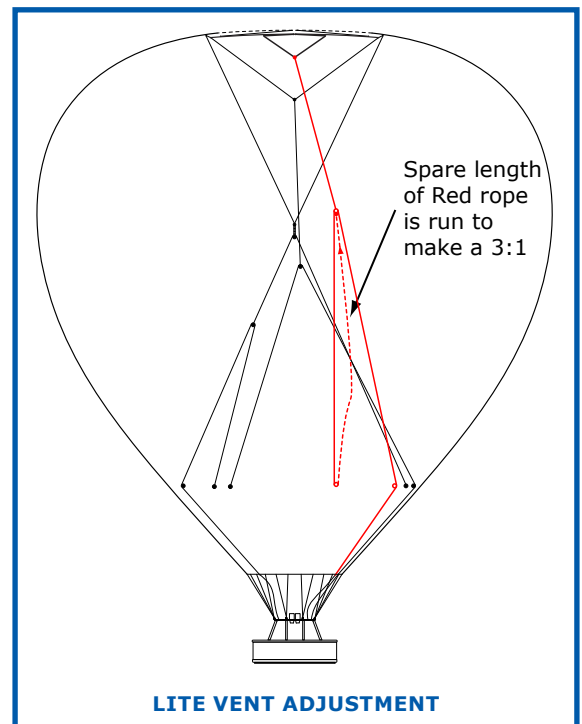
Knots must not be made in any part of a control line except to add an extension. See Section 2.10.1

2.10.1 CONTROL LINE EXTENSION

Extension of control lines may only be carried out on balloons over 180,000 cu.ft in volume and on control lines that are rigged as 2:1 with the extension being placed onto the end of the control line that is fixed inside the envelope.

The maximum length of any extension is 2 metres.

- i) Locate the final attachment point for the control line to be extended and confirm an extension is not already in place. Only one single extension is allowed per control line.
- ii) Untie the existing knot from the attachment point and ensure that the control line is not passed over or under any other control lines.
- iii) Join the new section of rope to the end of the existing control line using a fishermans knot. Ensure the tails of the rope do not extend more than 40mm from the knot.
- iv) Attach the other end of the extension to the attachment point with an overhand knot.
- v) Carry out a full inflation and operational test of the deflation system prior to returning the balloon to service.



2.10.2 CONTROL LINE REPLACEMENT

Replacement of any control line is best accomplished during a cold inflation of the envelope.

- i) The length of the new control line should be matched to the line it is replacing either by measurement or direct comparison.
- ii) Where possible, follow the existing control line through the system, feeding the new line through pulleys etc. as required.
- iii) Termination knots are as per the standard knots in section 2.1.2, follow the example of the line you are replacing.
- iv) Carry out a full inflation and control line check prior to flight to ensure that control lines are not crossed, function as required and are the correct length.

2.10.3 VENT RIGGING LINE REPLACEMENT

Replacement of all rigging lines for parachute vent, Smart Vent and Lite Vent deflation systems may be carried out as follows;

- i) Pre-cut replacement supplied from Kavanagh Balloons or lines measured and cut on site to match an existing line may be used. KP2709 Vectran lines are standard in all locations and are a suitable replacement for polyester or kevlar lines in older balloons.
- ii) Where possible, follow the existing rigging line through the system, ensuring the line is not twisted or interfering with other rigging lines and has stopper knots/balls in the correct locations.
- iii) Termination knots are as per the standard knots in section 2.1.2, follow the example of the line you are replacing.
- iv) Carry out a full inflation and deflation system check prior to flight to ensure that the rigging lines are not crossed, are free to run and function as required.

2.11 LITE VENT ADJUSTMENT

Final deflation line loads may increase during the life of the balloon due to excessive friction between the vent panel and the overlying load tapes. This is normally due to impregnation with dirt and dust.

In all cases an inspection of all pulleys in the system should be carried out for worn or seized pulleys. The condition of the cords should also be checked for abrasion and wear marks or signs of friction on the pulleys.

The following adjustment can be made to reduce the line load.

- i) Remove the extra length on the red deflation line from the storage pouch at the top of panel 3.
- ii) Untie the knot so the rope is free to run through the lower pulley.
- iii) Follow the rope back to the upper pulley, taking care not to twist the two lines.
- iv) Tie the end to the becket of the upper pulley with an overhand knot.
- v) A test inflation and functional check must be carried out before returning the balloon to service.

NOTE: *If the extra rope is not already installed on the balloon, contact Kavanagh Balloons technical staff for replacement rope length and details on changing/installing the necessary pulleys for a 3:1.*

2.12 VELCRO

Two piece velcro style touch tape closure is used on all vent systems for securing the vent panel during inflation or in the case of a circular rip panel deflation system, during flight.

2.12.1 VELCRO CLEANING

The performance of the velcro seal is improved by regular cleaning. Carefully remove all materials and debris (e.g. grass, thread etc.) trapped in either side of the velcro.

Balloons with velcro circular rip panels are best packed away with the velcro closed as the hook side is abrasive and may damage adjacent stitching.

2.12.2 VELCRO REPLACEMENT ON CIRCULAR RIP PANELS

WARNING: *Kavanagh Balloons use two different specifications of velcro depending on the application. The two types are not interchangeable or able to be mixed and matched.*

When replacing velcro on rip panels, use only KP2039 Loop and KP2040 Hook sewn on with metric 30, KP2601 polyester thread.

- i) Carefully unpick the old velcro from the backing tape and remove excess threads.
- ii) Re-sew the new velcro, copying the original method.

Note: *Both the hook and the loop velcro must be replaced at the same time.*

2.12.3 VELCRO REPLACEMENT ON ALL OTHER DEFLATION SYSTEMS

Velcro replacement on Parachute Vent, Smart Vent and Lite Vent may be carried out by sewing a matching piece of KP2312 loop or KP2315 hook over the top of the existing piece of velcro provided there is no more than two layers on any particular velcro tab. Copy the original sewing method using KP2601 polyester thread.

2.13 ENVELOPE FLYING WIRES

Damage to envelope flying wires must not exceed 6 broken strands. Where flying wires are swaged as pairs, damage to one leg of the wire will require replacement of the pair. Excessive heat damage to flying wires is also cause for rejection.

Heat damage can be identified by a change in colour to a dull blue or brown instead of the normal polished metal finish. "Bluing" of the wire rope indicates that the wire has been heated enough to cause annealing and a significant reduction in strength.

If damage exceeds these limits then the relevant cable or cables must be replaced.

If minor damage occurs, resulting in frayed ends protruding, care should be taken to ensure these are bound or glued in place in such a way as to allow for ease of future inspection.

2.13.1 REPLACEMENT OF ENVELOPE FLYING WIRES

Replacement flying wires must be supplied by Kavanagh Balloons and will be of a reduced length to allow fitting with a KP2001 quick link to the existing load tape turn back.

The specification for the flying wires vary from model to model. Refer to the following table for the correct specification wire rope.

Model	Wire Rope	Description	Swage	Thimble
EX-65, B-77, B-105, BOX-90	KP2702	3.2mm (1/8") 7x19 304 Stainless Steel	KP2009	KP2003
All other models	KP2701	4mm (5/32") 7x19 304 Stainless Steel	KP2004	KP2003

- Unpick the rigging cover.
- Cut the damaged wire away at the load tape suspension joint with wire cutters. Take care not to damage the load tape suspension joint.
- Inspect the load tape joint and loop for damage or wear. If the load tape wear exceeds the limits in Section 2.6 then the load tape must be repaired before the flying wire is replaced.
- Attach the new flying wire with the supplied quick link and tighten.
- Sew the new rigging cover in place.

NOTE: *The load tape suspension joint should never be unpicked to install a replacement flying wire.*

NOTE: *In situations where the load tape turn back is also damaged, full length flying wires attached to a pre-sewn turn back and length of load tape can be supplied so the new section of load tape can then be joined in as per section 2.6*

2.13.2 FLYING WIRE GROUPING

Flying wires are grouped onto the karabiners to match the intended load frame configuration. Load frames may have 4 or 8 attachment points and the balloon flying wires will require the same number of karabiners.

4 point	Group 1	Group 2	Group 3	Group 4
12 gore	1,2,3	4,5,6	7,8,9	10,11,12
16 gore	1,2,3,4	5,6,7,8	9,10,11,12	13,14,15,16
20 gore	1,2,3,4,5	6,7,8,9,10	11,12,13,14,15	16,17,18,19,20
24 gore	1,2,3,4,5,6	7,8,9,10,11,12	13,14,15,16,17,18	19,20,21,22,23,24

8 point	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
20 gore	1,2,3	4,5	6,7	8,9,10	11,12,13	14,15	16,17	18,19,20
24 gore	1,2,3,4	5,6	7,8	9,10,11,12	13,14,15,16	17,18	19,20	21,22,23,24
28 gore	1,2,3,4	5,6,7	8,9,10	11,12,13,14	15,16,17,18	19,20,21	22,23,24	25,26,27,28

2.13.3 REPLACEMENT OF ENVELOPE KARABINERS

Karabiners are 3000kg steel oval as standard. Optional 4000kg steel oval karabiners may be used as an option on all models.

Karabiners should be matched by rating so that either all karabiners on the envelope flying wires are the KP1001 rated at 3000kg or all are the KP1234 rated at 4000kg

SECTION 3 - BASKETS

3.1 GENERAL

3.1.1 ROUTINE MAINTENANCE AND STORAGE

The basket should be stored under cover and out of direct sunlight between flights. For long term storage the basket should be dry and if possible in a well ventilated area to assist in the prevention of mould or fungal growth.

3.1.2 CLEANING

It is recommended to clean out any build-up of dirt behind the chrome hide around the base of the basket, at least once each year using a reasonably high pressure stream of air or water. This will stop mud forming, which will cause the wickerwork to rot.

The wickerwork can be cleaned using water - detergents are not recommended. High pressure washers can be used but care must be taken not to apply too much force or the varnish may be stripped off. The basket should be left to dry out thoroughly before being put into covered storage.

Suede or leather upholstery and basket padding may be cleaned with any appropriate cleaning products.

3.1.3 BASKET TOP UPHOLSTERY

Suede or smooth leather upholstery is installed over a foam profile to provide padding on the top edge of the basket.

The upholstery is laced in place with KP2710 polyester cord as required. A second layer of leather may be laced over scuffs or damage to the leather as required to avoid removal of the length of leather for repairs.

Hand sewing of tears in the top leather is also acceptable using any commercial thread.

3.2 NYLON FLEX FRAME POLES

The nylon flex frame support poles do not require much maintenance, but if the balloon is stored in a very dry climate, the poles will need to be soaked for 24 hours in water every couple of months to maintain optimum flexibility. Cracked or broken flex frame poles should be replaced.

3.3 BASE PROTECTION - CHROME HIDE

The chrome hide at the base of the basket provides protection for the bottom edges of the basket during landing. Damaged areas should be replaced at the first available opportunity. Any chrome tanned leather of between 3-5mm thickness can be used.

On woven floor baskets, both the top and bottom edges are laced on with 3mm polyester cord (KP2710) or 3mm black polypropylene cord (KP3803). The new section of hide should overlap the old part by at least 60mm and can be over or under the existing hide.

On solid floor baskets, the top edge is laced on with 3mm polyester or polypropylene cord and the bottom edge is stapled in place with 15mm KP1031, 12mm KP1032, or 10mm KP1033 ss staples, depending on the floor thickness. Make sure all staples are removed from the area to be replaced and use the removed staples as a guide to the size used. The new hide should overlap the old section by at least 60mm and staples must not penetrate the inside of the floor.

Removal of the chrome hide on solid floor baskets should be avoided for all but necessary repairs. Where possible, the hide should be unlaced from the wicker and folded back while still stapled to the floor before being re-laced.

3.4 WICKERWORK

Damage to the wickerwork creating a hole, which exceeds 50mm in any direction should be repaired by re-weaving of the local area. No sharp ends should be left inside or outside the basket and the area should be re-varnished.

Re-weaving should be limited to 20% of the basket surface area and not more than 25% of any one side of the basket including woven floors.

Distorted wickerwork may be straightened by soaking and allowing to dry with the wickerwork held in the correct position.

3.4.1 RE-VARNISHING

The basket can be re-finished using a high quality exterior gloss varnish if needed. The basket should be thoroughly cleaned and it is recommended that all basket fittings are removed (tank straps, handling line and pouch, fire extinguisher etc.) and that all chrome hide and top upholstery are masked to prevent overspray.

3.5 SOLID BASKET FLOORS

Cracks or splits in the floor are acceptable provided they are not longer than 400mm and not visible on both sides of the floor. Cracks that appear to penetrate the entire floor and/or are visible on both sides of the floor must not be over 75mm in length and must be referred to Kavanagh Balloons technical staff for advice on an approved repair method.

3.5.1 PLYWOOD PARTITION WALLS

Cracked or damaged partition walls should be replaced with a new unit. Pre-fabricated partition walls complete with rope handles can be purchased from Kavanagh Balloons and are laced/bolted in place as per the existing structure. Careful notes or photographs of the lacing and orientation should be taken prior to removal of the damaged partition wall.

4mm polyester cord (KP2711) is used for all lacing of partition walls.

Persons with a suitable workshop and tools can manufacture a new partition wall by removing the damaged component and making an exact copy using the original as a template.

Partition walls are made from structural grade 12mm F14 A bond plywood, which complies with Australian Standard AS2269. Plywood conforming to an equivalent standard may also be used.

The new partition wall should be finished with a high quality exterior varnish prior to installation.

3.5.2 FLEXIBLE PARTITION WALLS

Flexible partition walls are laced in place using KP2709 2.8mm Vectran cord at the top of each vertical support cable.

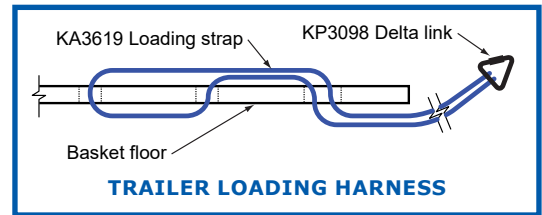
Excessive flex in the wall will require adjustment of the tension in each vertical support wire. The top edge of the padding should be unlaced to reveal the Vectran tensioning loops and each one re-tightened as required. Inspect the condition of the tensioning loop and replace with a similar length of cord if any wear is found.

Broken or excessively bent slats in the flexible wall will require replacement of the entire wall.

3.5.3 TRAILER LOADING HARNESS

An optional trailer loading harness may be fitted to either end of a partitioned basket for winching the basket onto a trailer. Use of the harness requires an appropriate trailer set up and must be designed and operated in such a way that damage to the basket does not occur.

The loading harness consists of two KA3619 webbing straps that are woven through holes in the basket floor. The ends of the straps are joined by a KP3098 delta quick link for attachment to the trailer winch system.



If the mounting holes were not part of the original basket manufacture, the position of mounting holes and instructions for modification details for the basket floor must be supplied by Kavanagh Balloons technical staff.

3.6 BASKET RUNNERS

If floor runners are loose the bolts should be tightened. Excess bolt length should be trimmed off to below the level of the underside of the runner. In particular with woven floor baskets, bolts must not protrude above the internal runners or they may cause damage to fuel tanks.

Excessively worn or cracked basket runners should be replaced using F27 to F22 kiln dried hardwood such as Keruing, Merbau or other similar hardwood. Alternately structural grade F7 or GL8 laminated / finger jointed pine may be used on all single and double tee basket runners. Dimensions should be obtained by measuring an undamaged section of the runner or directly from Kavanagh Balloons technical staff.

Runners are not bonded to the floor and all nuts should be recessed. Care should be taken to ensure basket rigging wires have a clear and straight path under the new runner.

HDPE rubbing strips if fitted are secured with KP3045 screws. Screws should be recessed into the rubbing strip. Rubbing strips are optional and as such damaged strips may be removed from individual runners without affecting serviceability of the basket.

3.7 METAL BASKET FRAMES

Cracked or bent basket frames should be referred to Kavanagh Balloons technical staff for advice on approved repairs.

3.8 BASKET CABLES

All basket cables are 1/4 inch 7/19 strand 316 stainless steel. Damage to basket cables must not exceed 6 broken strands.

If damage exceeds this limit then the relevant cable or cables should be replaced. Refer to Kavanagh Balloons technical staff for advice on approved repair and replacement techniques.

If minor damage occurs, resulting in frayed ends protruding, care should be taken to ensure these are bound or glued in place in such a way as to allow for ease of future inspection.

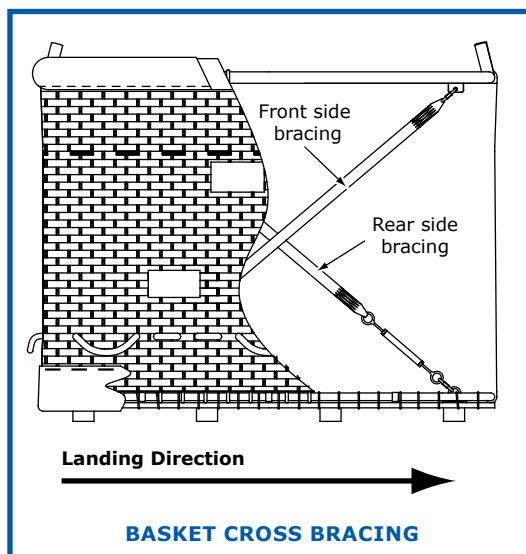
3.9 BASKET CROSS BRACING

Cross bracing is optional on solid floor, partitioned baskets and is used to prevent permanent distortion of the basket from landing. The bracing is not structural, so worn or damaged webbing is not an airworthiness issue but should be repaired or replaced at the earliest convenient opportunity.

Adjustment for the bracing is by turnbuckle. In the pilot's compartment the bracing is installed with the turnbuckle at the top end of the bracing so it can be adjusted with minimal disturbance to the fuel tanks. In the passenger compartments, the turnbuckle is on the lower end of the bracing near the floor so it is clear of the passengers.

Bracing in the passenger compartment may pass in front of or behind the optional passenger compartment end padding.

NOTE: *Worn, broken or missing cross bracing is not a cause for failure of the annual/periodic inspection unless it may cause injury to an occupant of the basket.*



3.9.1 CROSS BRACING ADJUSTMENT

Adjustment of the cross bracing is only required if it becomes loose or the basket develops a lean towards the landing side.

If the cross bracing is loose it may be tightened until just firm, using the turnbuckle on each strap.

NOTE: *Start the adjustment with bracing in the pilots compartment to pull the landing side of the basket back towards vertical. If all bracing is tight before adjustment, loosen the rear side bracing first to allow the basket to be pulled back into shape.*

- i) Loosen the two locking nuts on the turnbuckle to be adjusted.
- ii) Ensuring the bracing strap does not rotate, turn the centre section of the turnbuckle to tighten the bracing.

WARNING: *Do not overtighten the bracing as this will place undue strain on the bracing hardware and the basket.*

- iii) Repeat steps i & ii for all bracing on the front side before continuing with the rear side bracing.
- iv) Hold the centre section of the turnbuckle to prevent rotation and tighten the locking nuts firmly against the turnbuckle centre.

3.9.2 CROSS BRACING REPLACEMENT

The cross bracing is attached using KP2001 quick links at both ends. For repairs or replacement it is easiest to completely remove the bracing at the quick links.

The webbing used in the cross bracing is KP2323 or KP2314, and the thread used on the end turnbacks is KP2608. When sewing these turnbacks, duplicate the length of turnback and the stitch pattern.

3.10 PILOT RESTRAINT HARNESS

Two pilot restraint systems are available.

The original KA3023 restraint can only be used on single tee and double tee partitioned baskets with the standard pilots compartment.

The KA3037 restraint system is available from 2017 and is installed to a folding ring plate on any basket with a solid floor.

3.10.1 KA3023 PILOT RESTRAINT HARNESS INSTALLATION

The KA3023 restraint harness comprises two parts:- There is a lap belt, fitted with a quick release seat belt style buckle sewn to an adjustable tether strap. The other part is single webbing length with a loop at each end to form the attachment to the basket.

- Starting inside the pilot compartment, feed the long webbing strap out through tank strap hole (a), through (b) to the outside of the basket, through (c) back into the pilot compartment, out through (d) to the outside of the basket, in through (e) to the passenger compartment and through (f) to the pilots compartment.
- Using a KP3035, 8mm quick link, join the two ends of the strap to the middle of the strap between tank strap holes (c) and (d).
- Attach the loose end of the adjustment strap to the same quick link and tighten.

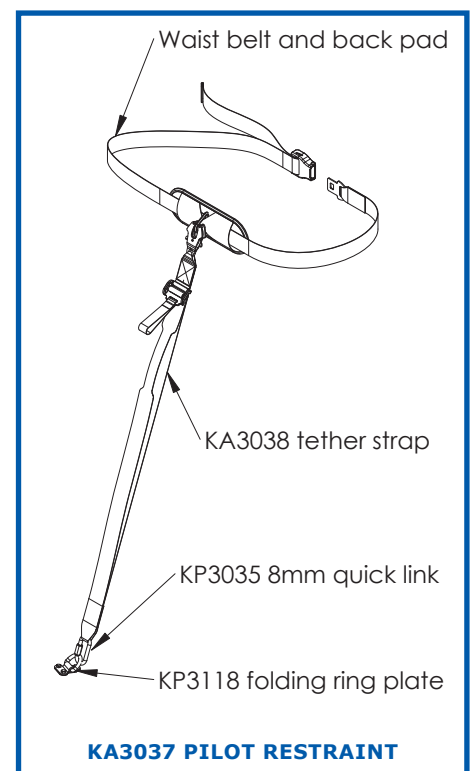
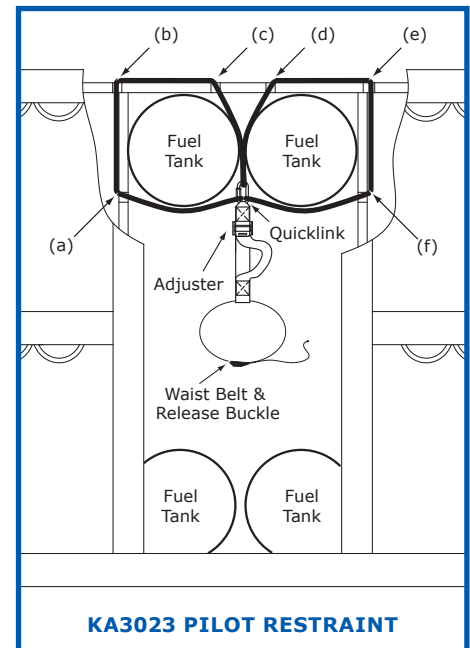
Note: *Ensure the tape ends all run onto the quick link in sequence and that all folds in the tape ends are neat on the quick link.*

3.10.2 KA3037 PILOT RESTRAINT INSTALLATION

All solid floor baskets may be fitted with a folding ring plate for attachment of the KA3037 pilot restraint system. A kit and instructions for installing the hard mount in the basket floor can be obtained from Kavanagh Balloons.

The KA3037 restraint harness comprises two parts:- A lap belt with back pad, fitted with a quick release seat belt style buckle and a separate adjustable tether strap that connects to the lap belt with a dual action safety connector.

- Attach the lower end of the restraint tether to the folding ring plate on the basket floor using the 8mm quick link.
- Tighten the quick link



3.11 CONTROL LINE & CAMERA LINE ATTACHMENT POINTS

The KA3622 control line ring assembly or generic D Rings such as the 25mm KP3807 may be attached in convenient locations around the basket - internally or externally as required for attaching the ends of control or camera lines or as guides for camera lines.

Rings may be held in place using webbing or polyester cord provided the attachment method passes over three horizontal strands of cane or around one vertical stake cane or around the basket top frame.

Each attachment point must be checked with a proof load of 10kg in all reasonable directions.

3.11.1 BASKET TIE DOWN RINGS

The KA3623 basket tie down rings may be fitted to the basket top frame under the upholstery and padding. These rings are spaced along the basket top edge as required by the customer as points for tying the basket to a trailer during ground transport.

- i) Remove lacing from the top frame upholstery as required to gain access to the top frame.
- ii) Pass the webbing loop between the top frame and the top row of weaving from the outside of the basket.
- iii) Loop the webbing over the top of the frame and then pass the ring through the webbing loop so it forms a hitch on the top frame.
- iv) Re-install the top upholstery

3.12 LANDING SEATS IN PARTITIONED BASKETS

Landing seats may be fitted to partitioned baskets as an option and these are made from 300mm high blocks of high density closed cell foam, covered with fabric. The length of each seat is such that it is a tight fit lengthwise in the compartment to assist in keeping the seat in place. The seats are positioned so the passengers will be facing away from the direction of landing. Regular inspection of the cushion seats is recommended to ensure the foam remains sound and the fabric covers do not deteriorate.

3.13 UNIVERSAL ACCESS DOOR IN BASKETS

A universal access door may be fitted to either open baskets or partitioned baskets as an option. In both types, the door is always fitted to the side of the basket which will be on top during inflation and landing. There is a full depth hinge mechanism and depending on the size of the basket there are either three or four locking latches controlled by a single lever near the top of the basket. The lever is held in place with a self locking pin when the door is closed. On partitioned baskets, a semi tubular frame further strengthens the top rail of the basket and this is held in place by two larger self locking pins.

Regular inspections of the door mechanism should be carried out to ensure the opening and closing sequences are smooth. If the door panel becomes distorted and requires repair, contact Kavanagh Balloons technical staff for advice and a repair scheme if necessary.

3.13.1 UNIVERSAL ACCESS DOOR LOCKING PIN REPLACEMENT

KP1163 locking pins are used to latch the door latching arm in the closed position. KP3108 pins secure the semi tubular top frame on single tee baskets.

Pins should be free from distortion and wear and the ball lock mechanism must operate smoothly.

Pins are tied to the basket with a lanyard of 3mm polyester cord (KP3803). Worn or damaged lanyards should be replaced with a new length of cord.

3.14 SEAT BELTS IN PARTITIONED BASKETS

In partitioned baskets, where seats and the universal door system are fitted, there may be a maximum of two sets of seat belts fitted as well. These seat belts are set up so they can be used as lap belts during flight and a further two shoulder straps are added for landing.

Regular inspections should be carried out to ensure there is no wear to the seat belt system which may degrade the strength of the webbing or the hardware. Care should be taken to ensure the seat belts are kept out of direct sunlight between flights as far as possible.

3.14.1 REPLACE SEAT BELTS

If seat belts need replacing, take note of the manner in which they are fitted and replicate the method when re-fitting new or repaired belts.

- i) Remove the bolts securing the seat belt from the partition wall.
- ii) Inspect the partition wall for cracks or damage.
- iii) Inspect the bolt for wear or damage, inspect the self locking nut for operation and replace if necessary.
- iv) Fit the repaired or new seat belt and check operation and adjustment.

Note: *Belts to be repaired must be returned to Kavanagh Balloons or repaired by an organization with the correct approvals for aircraft seat belt repairs.*

3.15 BASKET ANCILLARY EQUIPMENT & STORAGE

Ancillary equipment including but not limited to, rope or storage pouches, handling lines, fire extinguishers, radios, radio antennae, instruments or other electronic devices such as tablets or cameras may be mounted in any of the following locations subject to the guidelines set in 3.15.1 and 3.15.2;

- i) Either on the inside or outside walls of the basket including the passenger compartment
- ii) On the upright pole covers
- iii) On the padded top rail of the basket
- iv) On the load frame or heat shield
- v) Sewn or laced to the basket padding

Note: *Multiple items including multiple handling lines and fire extinguishers may be installed at the operators discretion. Re-weighing of the basket will be required if the weight change exceeds the limit data on the weight sheet.*

3.15.1 ANCILLARY EQUIPMENT INSIDE BASKETS

Installation in these locations may be permanent or temporary provided the following conditions are met.

- i) The item including additional contents must not exceed 5kg in weight.
- ii) The item should be located such that it can not interfere with the envelope control lines, fuel hoses or present a risk to pilot or passengers at any time in the flight or landing.
- iii) Attachment to the woven structure of the basket must be at no less than two points per item and may be by either webbing, polyester cord or cable ties.
- iv) Attachment to the load frame may be with cable ties or commercial hardware such as hose clamps or bar mount clamps for action cameras provided the load frame does not require modification.
- v) Items such as radio or transponder aerals may be mounted through the heat shield provided the mounting hole is not less than 30mm from any edge of the heat shield or an adjacent mounting hole.
- vi) Temporary bags such as pilot bags or small back packs may be secured to rope handles with a carabiner or similar mechanical clip provided a minimum of one rope handle per occupant is still available for use during the landing.

3.15.2 ANCILLARY EQUIPMENT OUTSIDE BASKETS

Where items are installed on the outside wall of the basket, the following further conditions must be met.

- i) The balloon must have rotation vents fitted.
- ii) The items must not be located on the down wind or landing side of the basket.
- iii) The item must be within reach of the pilot from within the pilots compartment.
- iv) External fire extinguishers must be attached to the inside of the basket with a lanyard of KP2711 Poly cord or KP2709 Vectran cord with a release mechanism such as a KP2022 brass snap hook.
- v) External handling lines must be attached to the basket with the quick release clip at all times.

3.16 HEAT SHIELD EXTENSIONS

Optional retractable heat shields may be installed on large 8 point load frames. Mounting hardware will be welded to the frame at manufacture or by approved modification of the load frame not covered in this document.

Heat shield extensions are optional so one or both may be removed if needed.

The retractable heat shields include the following components;- the heat shield and frame, the linear bearing tube, the upper and lower guides and the control lines.

3.16.1 INSTALL THE HEAT SHIELD EXTENSIONS.

- i) Check the bearing blocks are installed into the heat shield extension and the M5 socket head set screws have been installed with Loctite 243 to retain the bearing blocks
- ii) Check the lower guides are installed as per 3.16.4
- iii) With at least one upper guide removed, fit the heat shield extension to the linear bearing bar and place the heat shield extension in place
- iv) Before securing, feed the extension line through the guide loop at the end of the load frame and back to the inner mount / guide
- v) Feed the retraction line through the inner mount / guide
- vi) Insert the inner and outer M10 button head screws into the linear bearing bar with Loctite 243 medium strength thread locker and tighten to 6-8Nm
- vii) Install the upper guide(s) as per 3.16.3

- viii) Check the heat shield opens and closes smoothly.
- ix) Adjust the closing line length and clip so that the heat shield can be clipped to the basket to lock it in the closed position.
- x) Adjust the opening line length so that it has an overhand knot in the end and 100-200mm of free cord is accessible when the heat shield extension is closed.

3.16.2 REMOVE THE HEAT SHIELD EXTENSIONS

- i) Remove all knots from the extension and retraction lines
- ii) Remove one or both of the upper guides as per 3.16.3
- iii) Remove the two M10 button head socket screws at each end of the linear bearing bar
- iv) Remove the heat shield extension while clearing all extension and retraction lines

3.16.3 REMOVE / INSTALL THE UPPER GUIDES

The upper guides are installed with an M6 socket head cap screw that passes through the guide, the main heat shield and the heat shield tab welded to the load frame. The two guides are linked by a length of tube to prevent flying wires getting hooked on the guides.

An M6 washer and nut are installed on the under side of the heat shield tab.

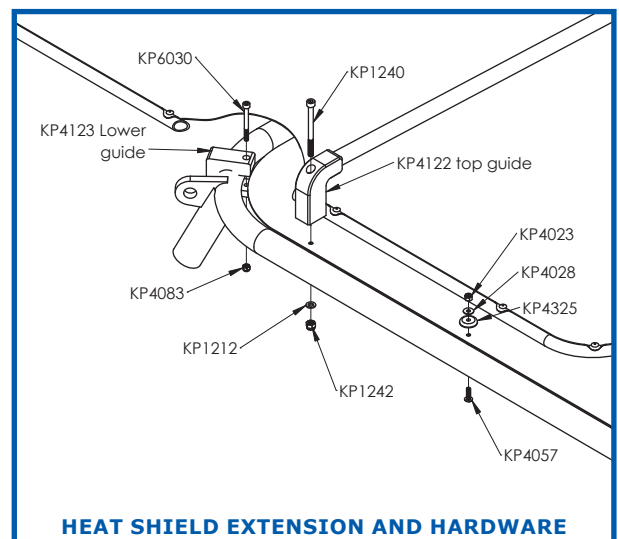
If fitting a new upper guide to an older load frame, the rear edge of the guide may need to be trimmed back either by filing or grinding to adequately clear the load frame tube. Remove the minimum material during fitting.

3.16.4 REMOVE / INSTALL THE LOWER GUIDES

The lower guides are fitted to the outer corners of the load frame for the heat shield extension to run on and prevent damage to the main load frame.

The guides can only be installed with the heat shield extension removed. Snap the guide over the corner of the load frame tube on the short side of the load frame. Move the guide so the flat top section is level and the guide is as close to the corner pole socket as possible.

The guide is secured with an M5 socket head screw and lock nut to clamp the guide onto the load frame tube. Do not over tighten, apply just enough clamping force to keep the guide in place.



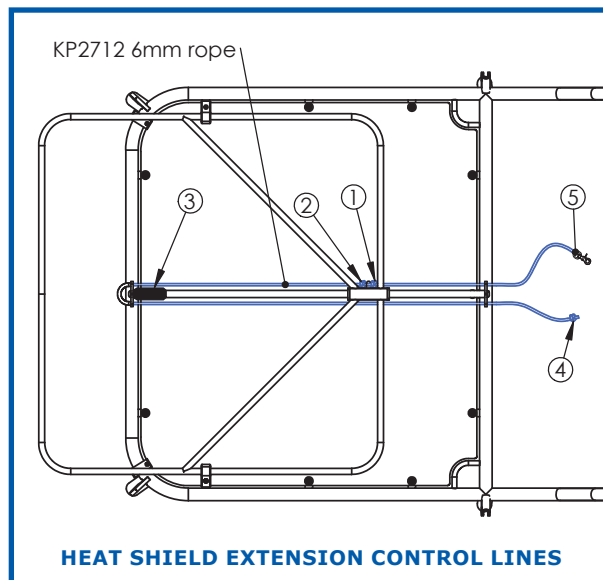
3.16.5 REPLACE THE EXTEND / RETRACT LINE

The operating line for the heat shield extension is a single length of KP2712 6mm double braid rope with knots to secure it to the heat shield extension and to secure the KP1266 stopper ball to the ends of the lines.

Replacement of a worn or damaged line will require partial or total removal of the heat shield extension as per 3.16.2

Approximately 4m of KP2712 rope will be required.

- i) When running the control line rope through the system the knots 1 & 2 will be about 1.6m from the retraction end of the rope.
- ii) Tie one knot on either side of the rope fixed to the heat shield extension.
- iii) With the heat shield fully retracted, set the length of the extension line so there is 100-200mm of rope and a knot (4) with KP1266 stopper ball extending past the inner mount bracket.
- iv) Extend the heat shield and check the stopper block (3) correctly limits the extension of the heat shield and that the top guides are still supporting the heat shield.
- v) With the heat shield fully retracted, set the length of the retract line (5) so a KP3638 clip can be fitted under the KP1266 stopper ball and the line will clip onto a control line ring fitted to the pilots compartment of the passenger compartment top frame.



Note: *When clipped onto the basket, the closing line will prevent the heat shield extending during landing or road transport.*

SECTION 4 - FUEL SYSTEM

4.1 GENERAL NOTES

All burner and fuel system maintenance should be carried out in a clean location to prevent contamination of seals or valves.

All burner fuel system maintenance will require a full functional check as per section 6.2.10.2 before the burner can return to service.

4.1.1 SPARE PARTS

Unless otherwise stated, only genuine parts from Kavanagh Balloons should be used in the maintenance or repair of the fuel and burner systems.

4.1.2 MAJOR DAMAGE

Repairs to any part of the fuel system requiring welding should be referred to Kavanagh Balloons for an approved repair scheme. Welding repairs are not covered by this manual.

Damage limits for burners and load frames are covered in 6.2.10.1

Damage limits for fuel tanks are covered in 6.2.11.1

4.2 STANDARD PRACTICES

4.2.1 THREAD SEALING

All sealing techniques defined for the fuel system should comply with the following standard practices. Ensure both threads are clean and free from dirt and old sealant. Clean with a wire brush or solvent cleaner.

When using yellow PTFE tape (KP1070), wrap the thread in three layers of tape and smooth the end of the tape into the thread to prevent unwinding.

When using liquid sealants, apply just enough liquid sealant to fill the thread path. Wipe off excess sealant after the joint has been made. Unless specified in this manual, refer to the sealant instructions for drying times before leak testing.

4.2.2 LEAK TESTING

Unless otherwise specified, leak tests can be carried out using LPG. A leak check solution such as soapy water or a commercially available product should be applied to the joints.

Leaks will be indicated by the formation of bubbles.

After inspection, excess leak checking fluid should be cleaned off with a soft cloth and water.

4.2.3 GENERAL CLEANING

Light detergents, water and a soft cloth can be used to clean excess carbon deposits from the burner. Avoid the use of abrasive scourers such as Scotchbrite on polished stainless steel as they will permanently dull and scratch the surface. Any quality stainless steel polish can be used to polish the coils and can of the burner or fuel tanks.

4.2.4 TORQUE SETTINGS

A calibrated torque wrench must be used where a torque value is specified. Where not specified, torque settings for all nuts and bolts are as per standard workshop practices for the particular size fitting.

4.3 TOOLS AND CONSUMABLE MATERIALS

In order to carry out the various fuel system maintenance tasks described in this manual, the following special tooling and / or consumable items will be required.

Where applicable, acceptable alternatives have been listed for some consumable materials.

Kavanagh Part No.	Description	Notes & Acceptable alternative
KP3691	Loctite 222	Low strength thread locker
KP1262	Loctite 243	Medium strength thread locker
KP6227	Loctite 263	High strength thread locker
KP3623	Loctite 569	Low pressure LPG joints
KP3682	Loctite 577	Loxal (KP3687)
KP3687	Loxal	Loctite 577 (KP3682)
KP1070	Teflon Tape	Any high density PTFE tape for LPG use
KP4065	Gas cock grease	
KP1701	Liquid valve spanner	Rem/Inst. Sherwood liquid valves and QSOV base plates
KP1702	Vapour valve spanner	Rem/Inst. SCG vapour valves with PRV
KP1703	AFL spanner	Rem/Inst. Automatic Fill Limiters
KP6708	Molykote FS3452 grease	Can be ordered as KA1017 in 10ml syringe

4.4 FUEL TANKS

Before any work is carried out on fuel tanks all fuel must be removed from the tank and all traces of vapour removed, preferably by purging.

Smooth operation of all hose connectors can be ensured through occasional lubrication with a silicone spray lubricant.

After refuelling, fuel pressure should be released from the space between the tank valve and the self seal check valve in the 1¼" ACME connector. This is best done by connecting a fuel hose and venting the fuel through the burner.

Fuel vapour pressure should also be released from between the tank vapour valve and the regulator quick disconnect fitting to reduce the chance of damage to the regulator diaphragm.

All vapour valves not fitted with a regulator must have a blanking POL plug installed.

4.4.1 FUEL TANK PURGING

Fuel tank purging must be carried out in a well ventilated area and away from ignition sources.

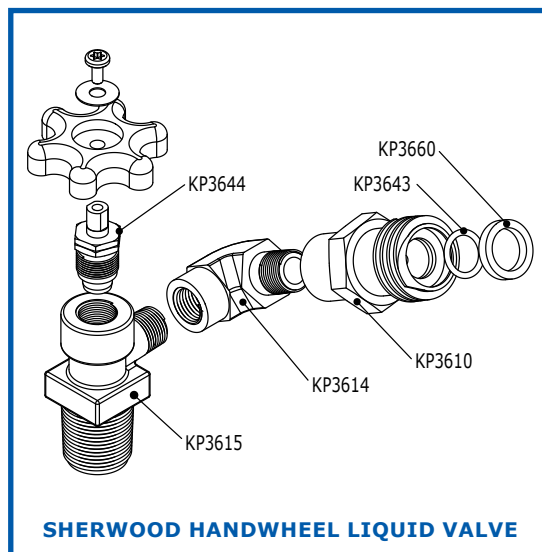
- Ensure all residual LPG has been removed from the tank prior to purging. Open the fixed liquid level gauge to ensure there is no pressure in the tank.
- Remove the four screws that secure the contents gauge and remove the contents gauge.
- Invert the fuel tank to allow the LPG vapour to drain from the tank.
- With the tank still inverted, purge the tank with an inert gas such as nitrogen or helium to ensure there is no LPG vapour in the tank.
- Return the tank to the upright direction and install the contents gauge, ensuring the seal is in place and is serviceable.
- Close the fixed liquid level gauge and fill the tank with the inert gas (Do not exceed 50PSI).
- Open the fixed liquid level gauge to return the tank to atmospheric pressure before work is started.

4.4.2 LIQUID ACME CONNECTOR

The self sealing 1¼" ACME outlet (KP3610) has two seals that should be inspected regularly and replaced if wear is found.

The "O" ring (KP3643) in the bore of the connector provides a dynamic seal during connection of a hose and receives the most wear. The square section washer (KP3660) at the front of the connector forms the main static seal when a hose is connected. The seals do not have to be replaced as a pair and only subject to their condition.

The self sealing check valve in the connector has no serviceable parts and a leaky self seal check valve requires replacement of the entire KP3610 fitting.



4.4.2.1 REPLACE THE ACME CONNECTOR (HANDWHEEL VALVE)

- i) Ensure the tank valve is closed or the tank is empty and purged.
- ii) Remove the ACME connector (KP3610) from the elbow and discard. There are no serviceable parts in the connector.
- iii) Inspect and clean the thread on the elbow.

Note: *The connector and elbow should be aligned so the connected fuel hose just clears the top of tank cowl. The correct alignment of the elbow and 1¼ inch ACME outlet is necessary for the safe location of the connection - all inflexible parts of the connection must be lower than the top of the tank cowl. If the elbow is not located correctly, remove it completely at this time and install with new sealant, Loxseal (KP3687) to the correct position.*

- iv) Install the new ACME connector (KP3610) with Loxeal (KP3687)
- v) Ensure the tank has fuel pressure and carry out a functional and leak check of the fitting.

4.4.2.2 REPLACE THE ACME CONNECTOR (QSOV)

- i) Ensure the tank valve is closed or the tank is empty and purged.
- ii) Remove the ACME connector from the QSOV top block and discard. There are no serviceable parts in the connector.
- iii) Inspect and clean the thread in the QSOV top block. Ensure there is no debris in the bore of the top block.

Note: *If the KA5007 ACME connector has an O Ring groove, a KP6401 O Ring is required. If the rear of the hex is flat then a KP3719 bonded seal is used for installation.*

- iv) On QSO valves supplied after March 2007, install the new KA5007 connector with a KP6401 O ring.
- v) On QSO valves supplied after November 2016, install the new KA5007 with a KP3719 bonded seal.
- vi) Install the new fitting (KA5007) with Loctite 577 (KP3682) or Loxeal (KP3687)
- vii) Ensure the tank has fuel pressure and carry out a functional and leak check of the fitting.

4.4.3 LIQUID OR VAPOUR VALVE - (HANDWHEEL TYPE)

Liquid or vapour valves that are not smooth to operate, exhibit grinding or excessive force to operate, do not shut off or have a stem leak, require servicing.

Note: *These valves are supplied by different manufacturers and spare parts are not interchangeable between makes of valve.*

4.4.3.1 BONNET ASSEMBLY REPLACEMENT

- Empty and purge the fuel tank.
- Remove the valve handle.
- Remove the stem and bonnet assembly - note the bonnet assembly normally has a left hand thread.
- Check the bore and seat of the valve for contamination or damage. Inspect the seal on the valve bonnet for signs of wear or damage.
- Install the new stem and bonnet assembly.
- Pressurize the tank with compressed air or inert gas to carry out a functional and leak check.
- Remove all pressure from the tank prior to returning to service.

4.4.4 LIQUID VALVE - (QSOV TYPE)

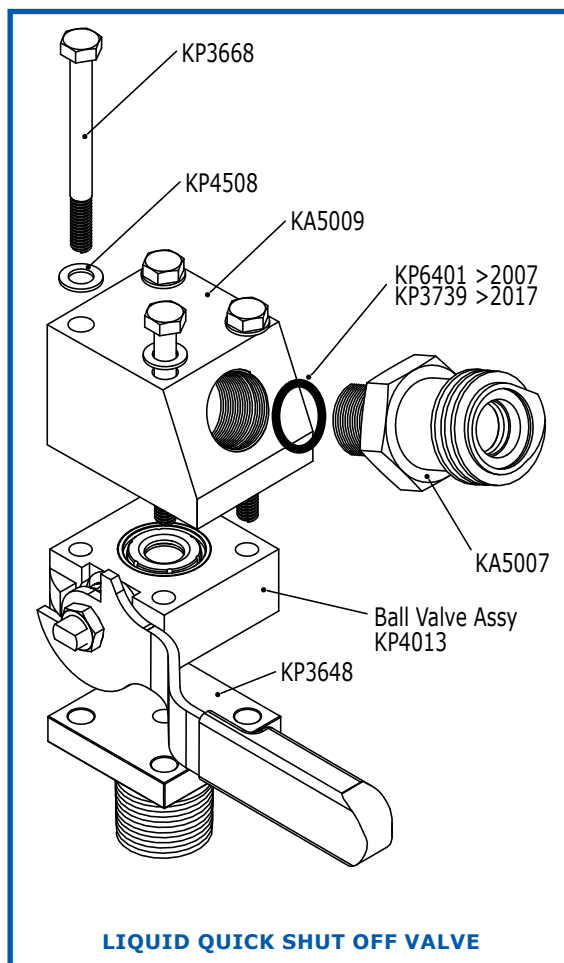
The quick shut off valve is comprised of a base plate, Worcester or Habonim ball valve and top block with the male quick connect fitting.

4.4.4.1 MINOR STEM SEAL LEAKS

Minor stem seal leaks can often be fixed by tightening of the gland nut under the blast valve handle as follows:

Warning: *This procedure can be carried out with the tank still containing fuel. Care should however be taken to ensure the gland nut on the stem is not loosened further or an uncontrolled leak may ensue.*

- Remove the nut from the blast valve handle to remove the handle and locking washer from the stem of the valve. Depending on the generation of valve, a spring lock washer may not be fitted.
- Remove the locking clip from the gland nut with a small screw driver.
- Tighten the gland nut by one flat of the nut at a time while holding the stem with another spanner or the handle itself.
- Install the locking clip and check the valve operation. Operation should be smooth with some noticeable friction. If the valve is still loose, remove the locking clip and tighten by another flat of the nut.
- Install the handle and spring washer and nut. If a spring washer is not fitted to the handle nut, it must be locked using KP1262 Loctite 243.
- Carry out a leak check on the stem seal by pressurizing the fuel system, then apply light pressure on the valve handle perpendicular to the direction of operation while moving the valve between closed and open a few times.



4.4.5 QUICK SHUT OFF VALVE OVERHAUL

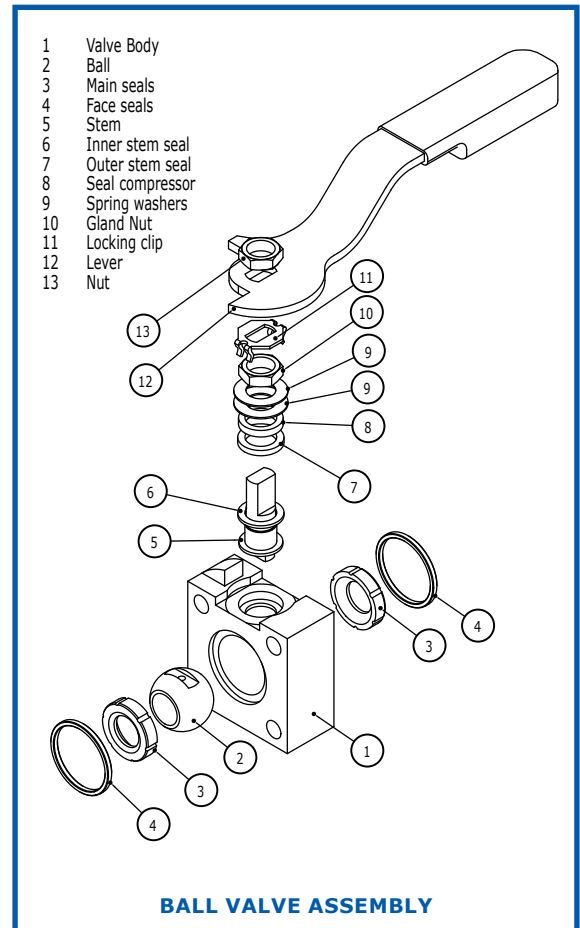
In the event that the valve fails to shut off or stem seal leaks cannot be fixed by the procedure in section 4.4.4.1 then the valve will require an overhaul.

4.4.5.1 REMOVAL AND INSPECTION OF THE BALL VALVE ASSEMBLY

- i) Empty and purge the fuel tank.
- ii) Remove the four bolts holding the QSOV assembly together.
- iii) Remove the top block of the QSOV assembly and remove the valve body. Care must be taken to ensure the ball in the centre of the assembly is not dropped as the valve is removed.
- iv) Remove the main seals and inspect the ball for damage or scoring. The ball can be removed by rotating the valve stem through 90 degrees to the closed position.
- v) Once removed the ball can be cleaned with a soft cloth (or cloth buff) and metal polish - no other abrasive should be used on the ball.

4.4.5.2 REPLACEMENT OF THE STEM SEALS

- i) Remove the handle, locking clip and gland nut from the stem. Under the gland nut there will be two spring washers, a spacer and the top stem seal which can now be removed.
- ii) With the ball removed, light pressure is applied to the stem, towards the centre of the valve body. The stem will drop into the body and can be carefully manipulated out through the centre of the body.
- iii) Inspect the top and inside of the stem bore for remains of the stem seals. Remove the stem seals from the body of the valve or stem as required. Inspect the faces of the stem bore and seal faces for damage or scoring and cleanliness.
- iv) Install the new lower seal onto the stem and slide the stem back into the body.
- v) Install the upper stem seals from the outside of the body and then fit the seal compression ring on top.
- vi) Install the gland nut and tighten until the stem is just firm to operate with the handle.
- vii) Fit the locking clip onto the gland nut
- viii) Install the handle and spring washer and nut. If a spring washer is not fitted to the handle nut, it must be locked using KP1262 Loctite 243.





4.4.5.3 RE-ASSEMBLE THE QSOV VALVE

- i) Clean the mating faces on the valve blocks that interface with the ball valve centre. There should be no corrosion or pitting of the surface.
- ii) With the stem turned so the slot runs in line with the valve body, locate the ball into the body. Turn the stem through 90 degrees so the ball can not drop out again.
- iii) Install the new body seals into the groove in each side of the valve body.
- iv) Install the new main ball seals on either side of the ball.
- v) Apply a light film of gas cock grease (KP4065) to the base plate and top block to assist with sealing.
- vi) Place the ball valve between the base plate and the top block and install the four bolts with Loctite 222 (KP3691), to lock the threads. Maximum torque is 8Nm.
- vii) Ensure the tank has fuel pressure and carry out a functional and leak check of the fitting. Check the stem seal by applying light pressure perpendicular to the operating direction of the handle while opening and closing the valve.

4.4.6 CONTENTS GAUGE

4.4.6.1 CONTENTS GAUGE DIAL

There are no user serviceable components on the contents gauge dial and lens assembly and it is not available as a replacement part. Scratched or damaged gauge lenses may be repaired by careful polishing with a plastic polish. If the gauge dial can not be read, the entire contents gauge must be replaced.

4.4.6.2 REMOVE/INSTALL THE CONTENTS GAUGE

- i) Ensure the fuel tank has been purged as per 4.4.1
- ii) Remove the four screws that secure the contents gauge.
- iii) Extract the contents gauge from the tank.
- iv) Inspect or renew the contents gauge gasket as required and ensure it is seated correctly on the body of the gauge.
- v) Install the contents gauge into the tank with the top of the gauge (15-20% markings) located towards the fixed liquid level gauge and AFL (if installed) or PRV)
- vi) Install the four screws and tighten in a cross pattern to a maximum torque of 4Nm.

4.4.7 VAPOUR REGULATORS

Vapour regulators should be adjusted to give a stable pilot light flame. Adjustment is made via the red/orange knob on the end of the regulator. If a stable flame cannot be produced by adjustment of the regulator then inspection and cleaning of the pilot light jet is recommended.

Failure of the regulator diaphragm is identified by gas leakage from the adjustment knob of the regulator and will require the regulator to be overhauled as per 4.4.7.1 for the KA4003 model or replacement of the regulator for the KA5030 model.

The quick coupling for the pilot light hose may occasionally require lubrication with a silicone spray or similar and should not allow gas to pass when a hose is not connected. A leaking connector is cause for rejection and must be replaced as per 4.4.7.2

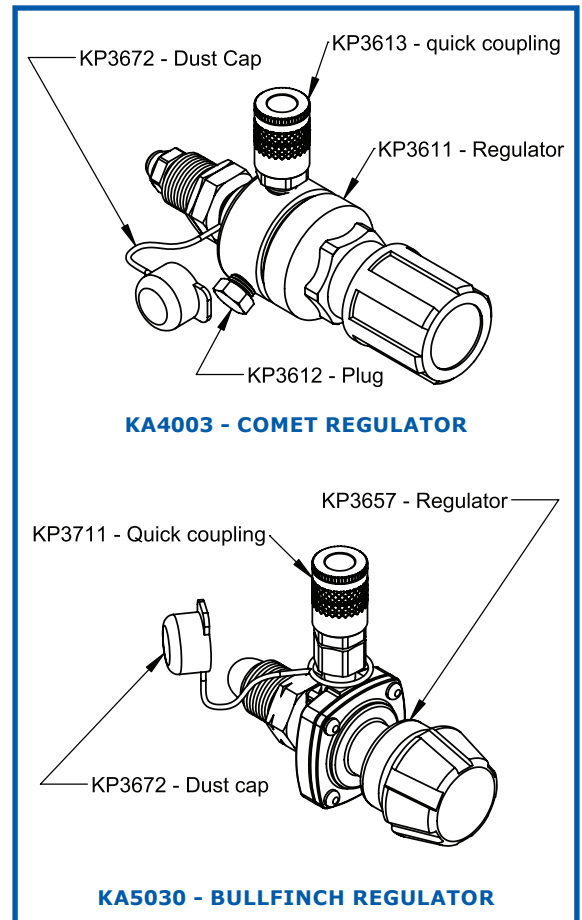
4.4.7.1 DIAPHRAGM REPLACEMENT

The following applies to the KA4003 - Comet regulator only.

- i) Remove the regulator from the tank.
- ii) Secure the high pressure end of the regulator body in a bench vice with soft jaws and unscrew the other half. Care must be taken to ensure that excessive compression is not applied to the regulator body or permanent damage may result.
- iii) Note the location of the regulator spring and disks during disassembly.
- iv) Remove and discard the diaphragm. Note: a failure in the diaphragm is indicated by splits or cracks in the rubber. It is recommended that a new diaphragm is installed after disassembly even if no obvious defects are found. Clean all mating surfaces and the spring pressure plate.
- v) Install the new diaphragm (KP1058) and re-assemble the regulator body. Ensure the regulator spring and disks are installed as noted during disassembly. No sealants or thread locking materials are required.
- vi) Carry out a function and leak check of the regulator.

4.4.7.2 QUICK COUPLING REPLACEMENT

- i) Remove the regulator from the tank.
- ii) Secure one half of the regulator body in a bench vice with soft jaws and remove the quick coupling and discard.
- iii) Clean the threads on the regulator body and ensure there is no debris in the outlet hole.
- iv) Install the new coupling with Loctite 569 (KP3623). The coupling should be tightened to a maximum torque of 4Nm.
- v) Carry out a function and leak check of the regulator.



4.4.8 PADDED TANK JACKETS

Tank jackets are made from cordura and can be repaired using any of the methods described in sections 2.3 and 2.4

The padding is 20mm thick foam and should be replaced if damaged.

Fitting of tank jackets is made easier by either spraying the tank with silicone spray or a light dusting of talcum powder.

4.5 SERIES 1 & 2 BURNER

Specific maintenance tasks for early series 1 & 2 burners are not covered by this Maintenance Manual. Refer to the original maintenance manual supplied with the burner.

4.6 SERIES 3 BURNER

4.6.1 ROUTINE MAINTENANCE AND STORAGE

Occasional cleaning of the burner is recommended as it will make it easier to identify any problems or wear. When storing the burner it is suggested that all hose ends, in particular the vapour pilot light hoses, are capped or left connected to the fuel tanks to prevent insects from making a home in the supply hoses.

4.6.2 VAPOUR PILOT LIGHT

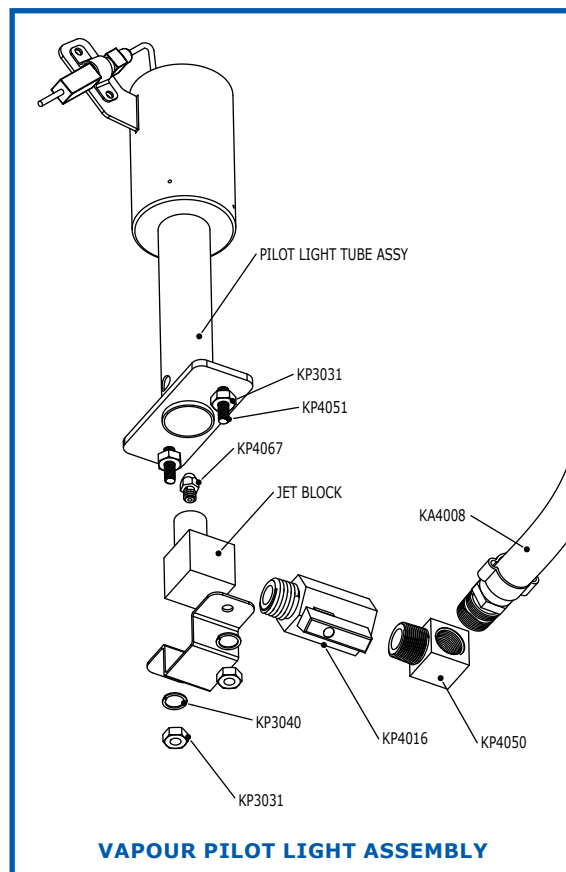
Regular cleaning (annual or after 100 hours flight time) of the pilot light jet will ensure trouble free operation of the pilot light system. If the pilot light flame is weak and not adjustable with the regulator on the tank, the jet must be cleaned or replaced.

4.6.2.1 PILOT LIGHT JET CLEANING & REPLACEMENT.

- i) Remove the jet block assembly by removing the two small nuts on the underside of the burner can, and removing the stainless steel saddle which holds the jet block in place.
- ii) The jet block, along with the pilot light shut-off valve and the pilot hose, can be withdrawn downwards.
- iii) Remove the jet with a spanner or socket.

WARNING: *Compressed air is dangerous if applied directly to the skin. Always wear gloves or ensure that concentrated streams of compressed air can not come into direct contact with your skin.*

- iv) Hold the jet up to a light source and inspect the bore of the jet for fouling. The jet can be cleaned using compressed air or a suitable strand of wire. After cleaning, inspect again against a light source to see if there is any improvement.
- v) To clean the brass filter located in the jet block, open the pilot light shut off valve and blow compressed air back down the jet block towards the valve and hose for more than 10 seconds. Do not blow from the hose end as this may dislodge the brass filter.



- vi) Re-install the jet with a small amount of yellow PTFE tape (KP1070) making sure the entrance to the jet is not covered.
- vii) Install the jet block assembly and carry out a functional check of the pilot burner.

4.6.2.2 PILOT LIGHT VALVE

The pilot light valve is a mini ball valve with 90 degree operation. If the valve fails to shut off or develops a stem leak it will need to be replaced as there are no serviceable parts in the valve.

Replace the valve as follows:

- i) Remove the two small nuts on the underside of the burner can, and remove the stainless steel saddle which holds the jet block in place. The jet block, along with the pilot light shut-off valve and the pilot hose, can now be withdrawn downwards.
- ii) Take note of the orientation of the valve to the jet block before removal. Hold the valve in a bench vice so you can carefully remove the hose from one end and the jet block from the other end. Discard the old valve.
- iii) Clean the threads on the pilot light hose and the jet block. Ensure both components are clean with no thread sealant or dirt in the bores.
- iv) Install the hose onto the new valve using Loctite 569 (KP3623)
- v) Install the jet block onto the new valve with Loctite 569 (KP3623) making sure that it is lined up as per the original set up.
- vi) Allow 15 minutes drying time for the joints then carry out a leak check.
- vii) Re-install the pilot light jet block assembly and carry out a functional check of the pilot light.

4.6.3 PILOT BURNER PEIZO UNIT

Cleaning of the electrode on the pilot burner may be needed to prevent a build-up of carbon which will prevent the igniter from working efficiently.

Remove excess carbon from the electrode and wire with a cloth. If needed, the electrode tip may be cleaned with a light abrasive paper or Scotchbrite.

Check the security of the electrode insulator, and for cracks in the insulator. Check the electrode wire has a clear path and does not come into contact with any components of the burner or pass close enough to any part of the burner to cause a short circuit.

If the peizo igniter no longer functions or produces a spark or the button is seized, the unit must be replaced.

4.6.3.1 PEIZO UNIT REPLACEMENT

- i) Remove the screw securing the igniter wire to the top of the mounting block.
- ii) By holding the base of the igniter unit - not the actual button - you can then unscrew the nylon mounting block.
- iii) Check the inside of the mounting block is clean and free from moisture.
- iv) Re-install the new peizo unit - the block does not have to be more than hand tight or else future removal will be difficult.
- v) Attach the electrode wire and carry out a functional check.



4.6.3.2 INSTALL NEW IGNITER ELECTRODE

- i) Remove the screw securing the igniter wire to the top of the mounting block.
- ii) Remove the pilot light jet block assembly by removing the two small nuts on the underside of the burner can, and removing the stainless steel saddle which holds the jet block in place. The jet block, along with the pilot light shut-off valve and the pilot hose, can be withdrawn downwards.
- iii) If a liquid fire is fitted to the pilot light flame tube, undo the compression fitting on the liquid fire tube.
- iv) Remove the two nuts securing the pilot light flame tube assembly to the can and remove the pilot light flame tube assembly and igniter electrode from the burner. Take care to avoid damage to the electrode wire.
- v) The electrode is held in place on the pilot light with two pop rivets that must be drilled out from the attachment on the pilot burner cup.
- vi) Remove the electrode and, using two pairs of pliers, make bends in the new electrode wire to copy the old electrode and wire.
- vii) Install the new electrode with the supplied pop rivets and saddle.
- viii) Re-install the pilot light flame tube assembly, carefully feeding the electrode wire back to the original location. Secure with the nuts and screws.
- ix) If disconnected in step (iii), reconnect the liquid fire tube.
- x) Attach the electrode wire to the peizo housing and carry out a functional check to ensure there is a solid spark at the end of the electrode to the pilot light cup. Adjust the clearance of the electrode wire from all metallic items using two pairs of pliers to ensure there is no short circuits.

Note: *Do not apply a load to the electrode when bending the wire as the insulation will crack causing a failure of the unit.*

- xi) Install the pilot light jet block assembly and carry out a functional test of the pilot light system and leak check of the liquid fire if required.

4.6.4 LIQUID FIRE VALVE

The liquid fire valve is a small ball valve which has no replaceable parts. Generally if the valve is seizing, not shutting off or is leaking it will need to be replaced.

4.6.4.1 LIQUID FIRE VALVE STEM SEAL

The stem on the liquid fire valve may be tightened as follows:

- i) Remove the screw which secures the valve handle.
- ii) Tighten the stem seal gland nut while holding the stem in place.
- iii) Check that the valve is still free and operates smoothly.
- iv) Re-fit the handle and carry out a functional / leak check of the stem.
- v) If the valve stem still leaks, the entire valve will need to be replaced.

4.6.4.2 REPLACE THE LIQUID FIRE VALVE

- i) Disconnect the supply tube from the liquid fire valve to the liquid fire nozzle. The tube cannot be removed from the fitting at this time.
- ii) Remove the four bolts, which hold together the main valve block and slide the main blast valve centre out from between the two blocks of the valve body. Be careful not to lose the seals.
- iii) On the inside of the base of the burner can there is a bolt, which secures the outer valve block to the outside of the can. Remove this bolt to separate the outer valve block, fuel hose and liquid fire valve.
- iv) Secure the valve block in a bench vice being careful not to damage the mating face.
- v) Remove the elbow from the liquid fire valve, then remove the liquid fire valve from the valve block. The nipple can be left in the valve block.
- vi) Inspect and clean the threads on the valve block/nipple and install the new liquid fire valve so it is orientated the same way as the old one.
- vii) Install the elbow and compression fitting onto the valve so it matches the original location.
- viii) Locate the valve block on the burner can and attach the liquid fire line to the compression fitting on the elbow and also start the bolt from inside the burner can into the valve block. Do not tighten either the fitting or the bolt at this time.
- ix) Inspect the mating faces of the valve blocks and the main valve body for cleanliness and slide the main valve into place making sure all seals are in place.
- x) Fit the four bolts to assemble the valve block and tighten.
- xi) Tighten the bolt from inside the burner can and tighten the liquid fire line compression fitting.
- xii) Pressurize the fuel system and carry out a leak and functional check of all valves and joints.

4.6.5 MAIN BLAST VALVE

The Worcester type ball valves used in the main blast valves are particularly reliable and normally have a long and trouble free service life. Replacement of seals is only required when inspection shows scoring or damage to the seals. It is good practice to change all seals if the valve is disassembled.

4.6.5.1 STEM SEAL ADJUSTMENT

Minor stem seal leaks can often be fixed by tightening of the gland nut under the blast valve handle. If the stem seal leak persists or requires tightening to the point that the valve is hard to operate then a full service of the ball valve is required, including stem seal replacement.

- i) Remove the nut from the blast valve handle to remove the handle and locking washer from the stem of the valve.
- ii) Remove the locking clip from the gland nut with a small screw driver.
- iii) Tighten the gland nut by one flat of the nut at a time while holding the stem with another spanner or the handle itself.
- iv) Install the locking clip and check the valve operation. Operation should be smooth with some noticeable friction. If the valve is still loose, remove the locking clip and tighten by another flat of the nut.
- v) Re-Install the valve handle.
- vi) Carry out a leak check on the stem seals by pressurizing the fuel system, then light the pilot burner and run the main burner while applying light pressure on the valve handle perpendicular to the direction of operation while moving the valve between closed and open a few times.

4.6.6 MAIN BLAST VALVE - OVERHAUL

The KP4502 seal kit contains all new seals, nuts and locking clips required to overhaul the main ball valve. Refer to the diagram in section 4.4.5 for assembly of the ball valve.

4.6.6.1 REMOVAL AND INSPECTION OF THE BALL VALVE ASSEMBLY

- i) Remove the four bolts holding the valve block assembly together.
- ii) The valve body will slide out from between the two outer halves of the valve block. Care must be taken to ensure the ball in the centre of the assembly is not dropped as the valve is removed.
- iii) Remove the main seals and the ball and inspect for damage or scoring. The ball can be removed by rotating the valve stem through 90 degrees so the valve is in the closed position.
- iv) Once removed the ball can be cleaned with a soft cloth and metal polish - no other abrasive should be used on the ball. The main seals can also be cleaned and the face inspected for damage.

4.6.6.2 REPLACEMENT OF THE STEM SEALS

- i) Remove the handle, locking clip and gland nut from the stem. Under the gland nut there will be two spring washers, a metal or fibre spacer and the top stem seal which can now be removed.
- ii) With the ball removed, light pressure is applied to the stem, towards the centre of the valve body. The stem will drop into the body and can be carefully manipulated out through the centre of the body.
- iii) Inspect the top and inside of the stem bore for remains of the stem seals. Remove the stem seals from the body of the valve or stem as required. Inspect the faces of the stem bore and seal faces for damage or scoring and cleanness.
- iv) Install the new lower seal onto the stem and slide the stem back into the body.
- v) Install the upper stem seal from the outside of the body and the spacer on top of it.
- vi) Install the spring washers and gland nut and tighten until the stem is just firm to operate with the handle.
- vii) Fit the locking clip to the gland nut and install the handle and locking nut.

4.6.6.3 RE-ASSEMBLE THE BALL VALVE

- i) Clean the mating faces on the valve blocks which interface with the ball valve centre. There should be no corrosion or pitting of the surface.
- ii) With the stem turned so the slot runs in line with the valve body, the ball can then be located into the body. Turn the stem through 90 degrees so the ball cannot drop out again.
- iii) Install the new circular body seals into the groove in each side of the valve body.
- iv) Install the new main ball seals on either side of the ball.
- v) Apply a light film of gas cock grease (KP4065) to the faces of the valve body to assist with sealing and slide the valve back into the valve block making sure the seals are not displaced.
- vi) Install the four bolts and nuts through the valve block.
- vii) With the valve in the closed position, pressurize the fuel system and check for leaks. Check the stem seal by applying light pressure perpendicular to the operating direction of the handle.
- viii) If there are no leaks, perform a functional check of the burner, ensuring that when the valve is closed, there is no leakage through the valve.

4.6.7 PRESSURE GAUGES

If the pressure gauge is damaged or has the lens cover missing it must be replaced.

- i) Unscrew the pressure gauge from the valve block.
- ii) Check the thread path in the valve block for damage and remove any remaining thread tape.
- iii) Apply PTFE thread sealing tape (KP1070) to the new pressure gauge (KP4503)
- iv) Install the pressure gauge and carry out a functional and leak check.

4.6.8 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.

4.6.8.1 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 Loxeal (KP3687) 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.



4.6.8.2 REPLACEMENT OF THE 1¼" ACME COUPLING

- i) Remove the 1¼" ACME coupling from the hose.
- ii) Inspect and clean the thread path on the hose end.
- iii) Install the new 1¼" 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.

4.6.8.3 REPLACEMENT OF THE VAPOUR PILOT LIGHT HOSE

Vapour hoses use a PARKER H8C quick connector (KP4604) to connect to the vapour regulator. Hoses are supplied as an assembly with all fittings in place.

- i) For ease of disassembly, remove the pilot light hose and jet assembly as per 4.2.1
- ii) Secure the elbow (KP4050) in a vice and remove the hose.
- iii) Clean and inspect the threads on the elbow.
- iv) Install the new hose assembly with Loctite 569 (KP3626) or PTFE tape and torque to a maximum of 4Nm
- v) Carry out a leak test of between 80 and 100 psi)
- vii) Re-assemble the pilot light and carry out a functional check.

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.

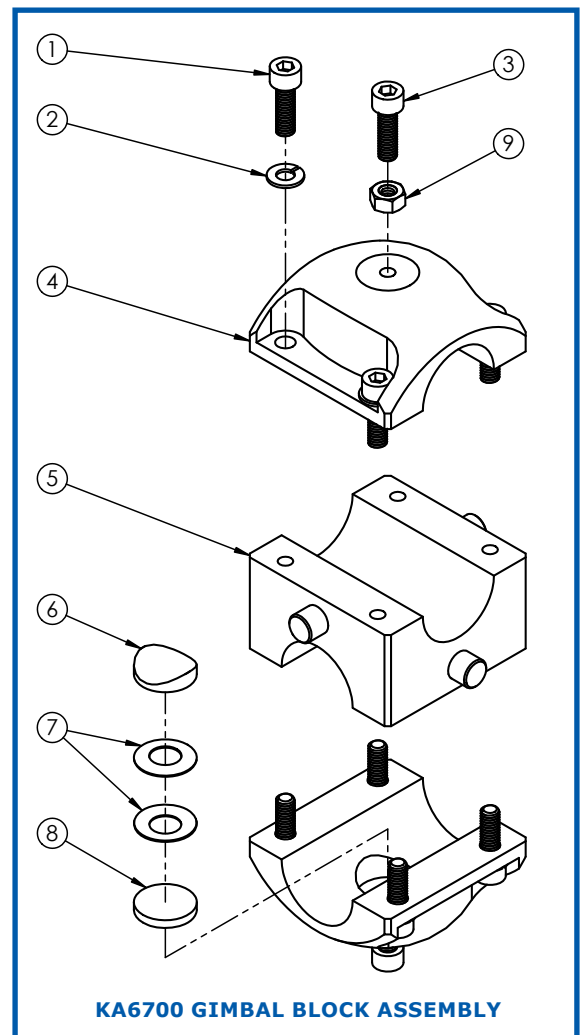
In all installations the gimbal block and burner will hang under the load frame.

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 KA6700 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 it's 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.

4.7.2.4 KA6703 GIMBAL BLOCK

The KA6703 gimbal block supersedes the KP6700 version and introduces a more consistent friction adjustment.

4.7.2.5 REMOVAL OF THE KA6703 GIMBAL BLOCK

- i) In the gimbal end cap to be removed, loosen then remove the two M6 nuts (1) and washers (2) on the side of the end cap (4) for friction adjustment. The index mark (3) in the end cap indicates the side for friction adjustment.
- ii) Remove the two remaining nuts and washers and remove the end cap.

4.7.2.6 INSTALLATION OF THE KA6703 GIMBAL BLOCK

- i) Ensure the friction rod (5) is installed in the end cap. This is a press fit into the groove.
- ii) Apply a thin film of KP4065 grease to both halves of the gimbal block bore.
- iii) Fit the end cap (4) onto the studs and install the washer (2) and Aerotight nut (1) on the fixed side of the end cap.
- iv) Torque the two fixed nuts to 6Nm.
- v) Install the washers and Aerotight nuts onto the adjustment side for the Gimbal block and tighten until a minimum of 1 thread is visible clear of the nut.

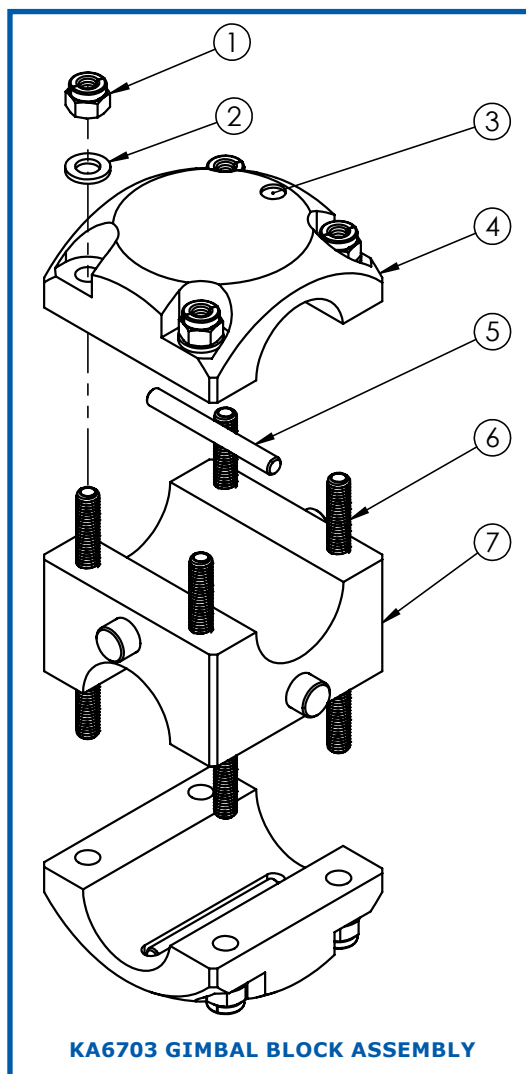
4.7.2.7 ADJUST THE KA6703 GIMBAL BLOCK FRICTION

Adjust the friction of the gimbal block using the two nuts on the side of the end cap indicated with the index mark (3).

Torque on these nuts should not exceed 6Nm and the burner must be able to tilt through it's full range of motion without excessive force.

There must be a minimum of 1 thread visible above the locking mechanism on the Aerotight nuts (1).

If adequate friction is not achievable within the torque limits, check for wear on the friction rod in the end cap. The friction rod should be proud of the inner surface of the top cap. Replace the worn friction rod as necessary.



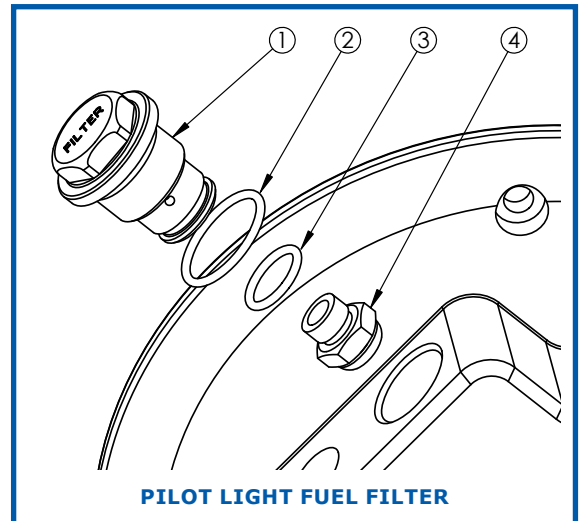
4.7.3 PILOT LIGHT FUEL FILTER

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

- iii) Inspect the Orings (2) (3) for condition and replace as necessary.
- iv) Apply a thin film of KP6708 grease to the Orings and thread of the filter housing.
- v) Inspect the filter housing bore in the valve block for contamination and clean with a lint free cloth as required.
- vi) Install the filter housing and tighten so that the plug is flush with the valve block.
- vii) 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 1¼" 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 1¼" 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 1¼" ACME COUPLING

- i) Remove the 1¼" ACME coupling from the hose.
- ii) Inspect and clean the thread path on the hose end.
- iii) Install the new 1¼" 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 KPxxxx Oring on the ignitor
- iii) Apply a small amount of KPxxxx grease above the Oring to assist in waterproofing
- iv) Install the piezo ignitor assembly into the valve block.
- v) Slowly tighten the socket head set screw while rotating the piezo ignitor assembly slightly to ensure the set screw engages in the locking hole.

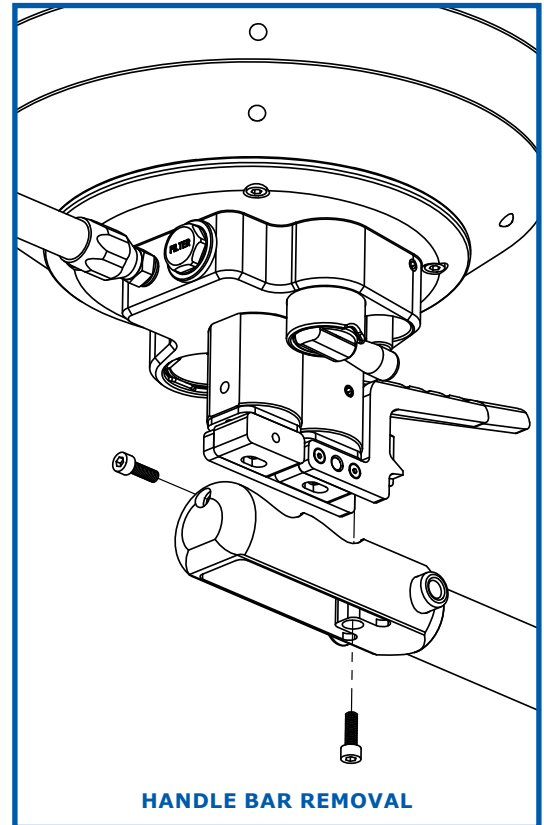
4.7.6 HANDLE BARS

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 O-ring 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 4Nm.

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.

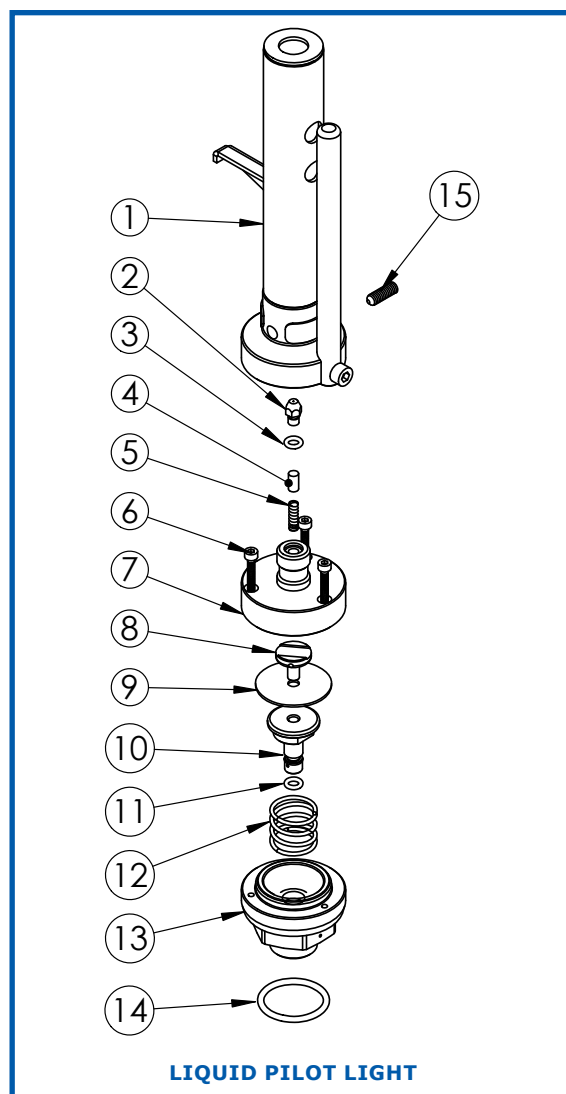
If a reduction in pilot light flame size and strength is found, the pilot light fuel filter should be inspected as per 4.7.3.

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.
- ii) 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.

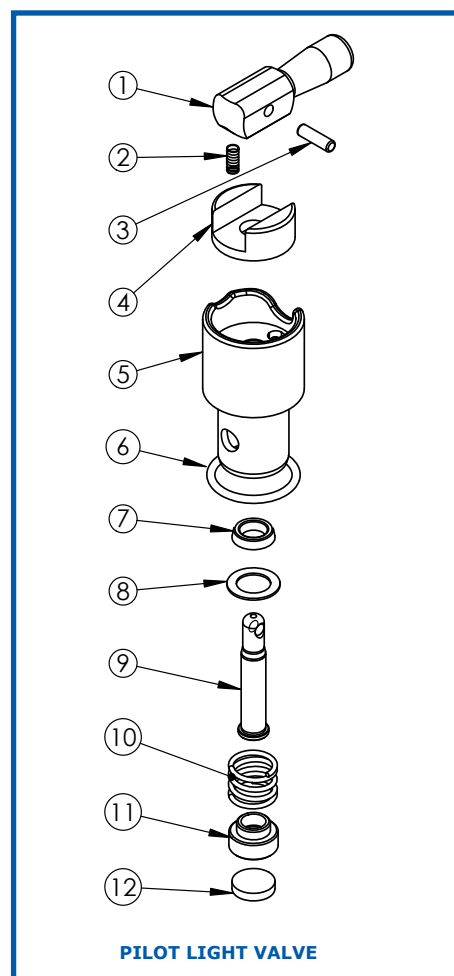
4.7.9 PILOT LIGHT VALVE

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

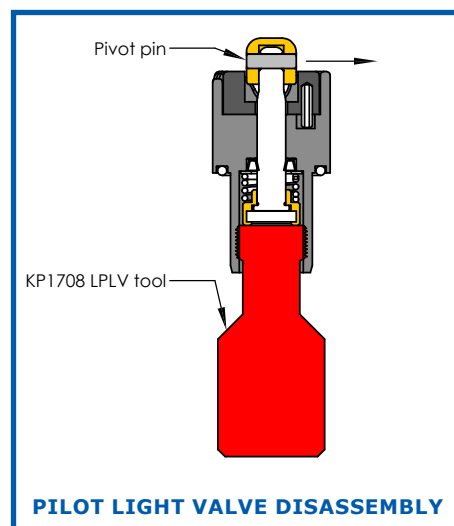
Either the KP1708 pilot light valve tool or a suitable 5mm thick spacer is required to disassemble the valve. If using a spacer, it must be not more than 16mm in diameter with a bore of 6mm diameter to protect the seat on the liquid pilot light base. Nylon or a similar soft plastic is suggested for production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

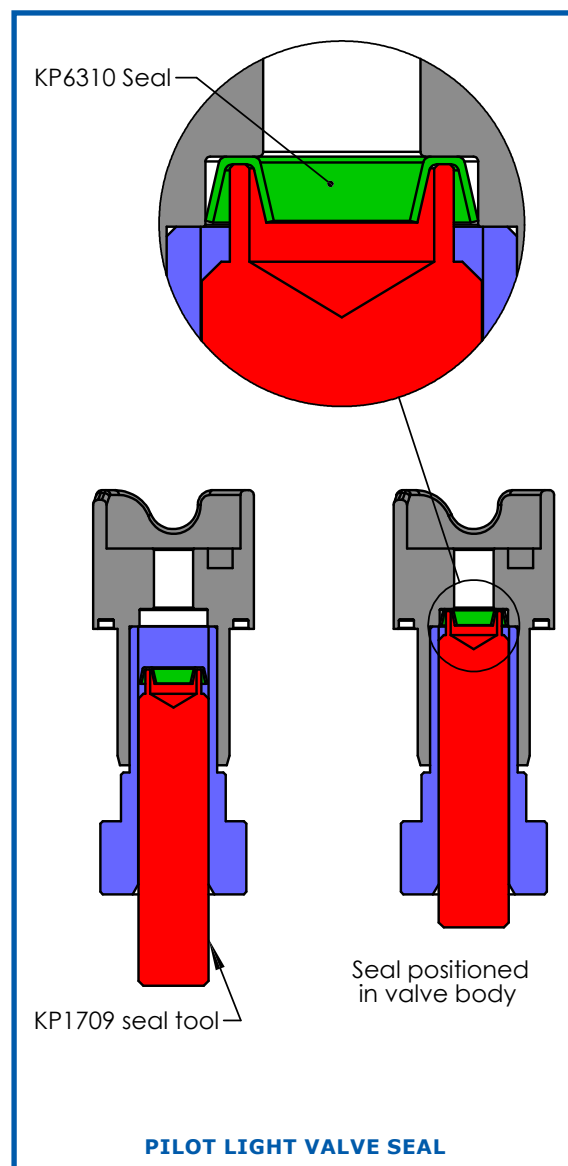
Do not attempt this work without the correct tools.

- 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 seal (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

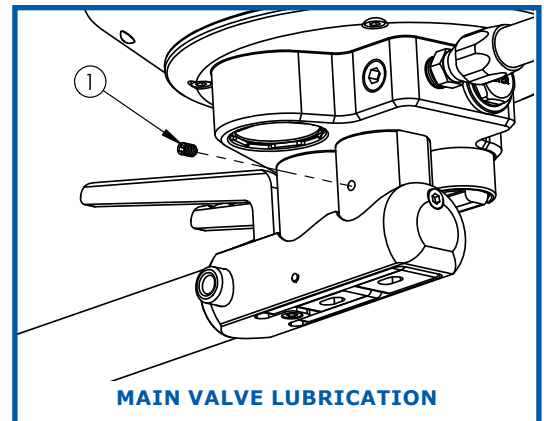
- i) Inspect the valve body port for the pilot light valve and pilot light assembly for contamination and damage to the sealing face.
- ii) Install the face oring (6) onto both the pilot light valve and the pilot light assembly with a light lubrication of KP6708 grease. Apply a small amount of grease 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) Yighten 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.

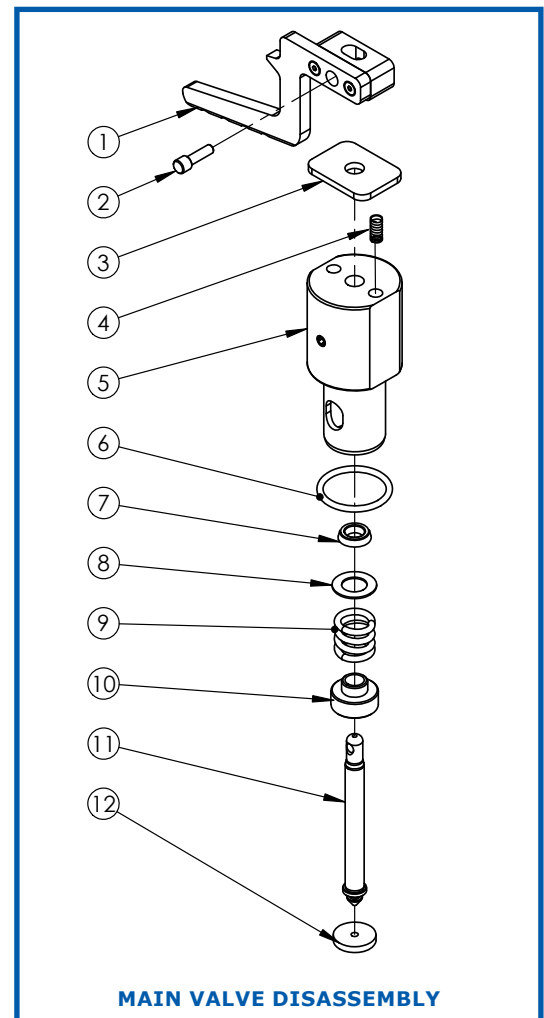


4.7.10.2 MAIN AND LIQUID FIRE VALVE LEVER REMOVAL

- 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.

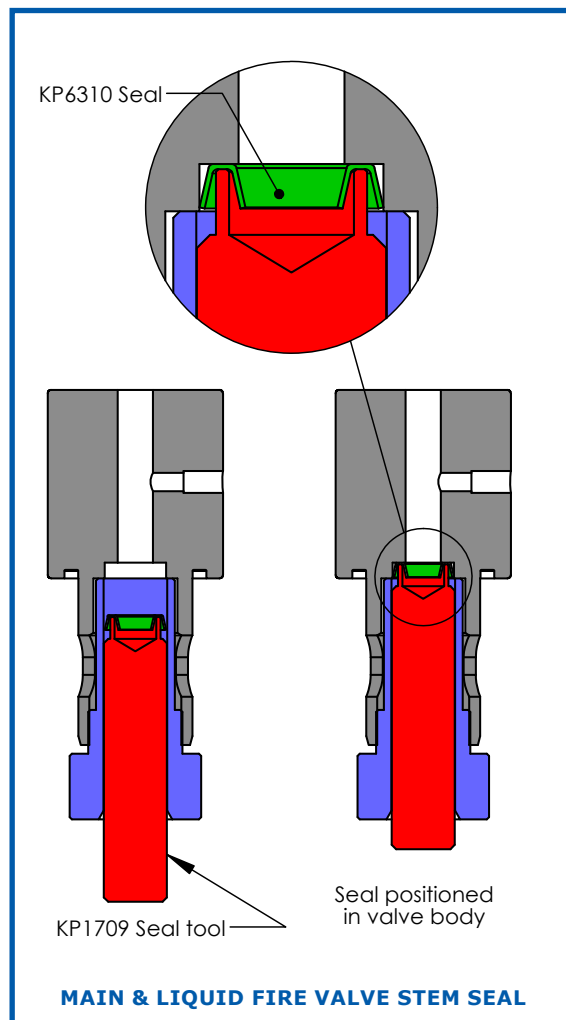
If the seal is to be replaced or comes out during disassembly and cleaning, the KP1709 seal installation tool will be required for insertion of the new seal.

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.

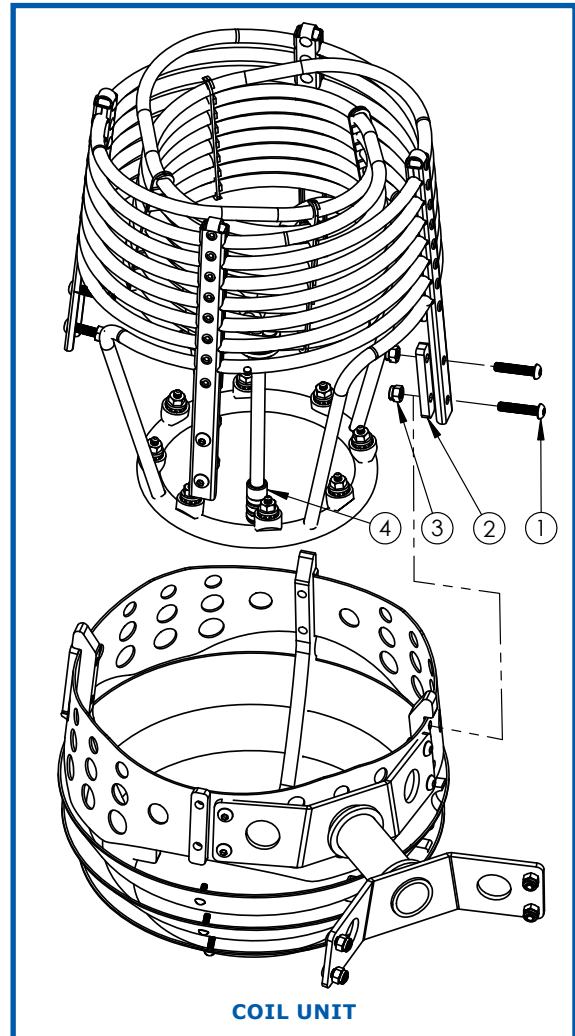
4.7.11.1 COIL UNIT REMOVAL

- 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

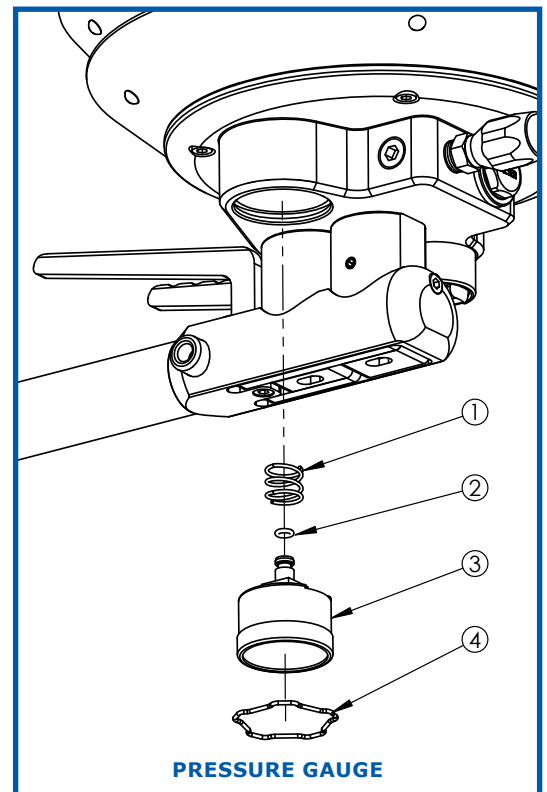
4.7.12.1 PRESSURE GAUGE REMOVAL

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 O-ring (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 its 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.

SECTION 5 - INSTRUMENTS

5.1 WIRELESS TEMPERATURE SENSOR

The Flytec 3040 and Digitool DBi3 instrument pack can be used in conjunction with wireless remote envelope temperature sensor. Both models of wireless sensor use a common mounting system and similar case design.

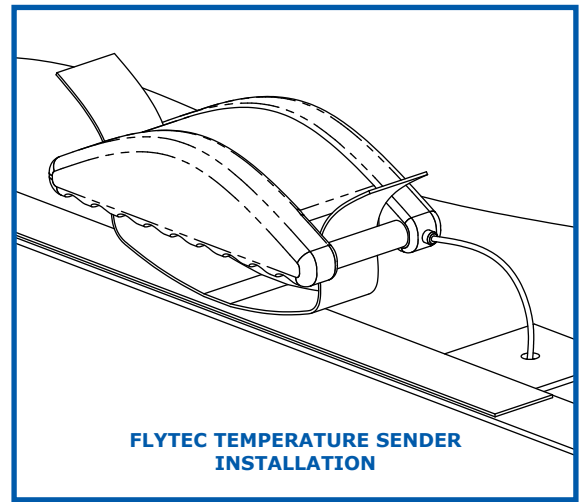
An attachment point needs to be fitted to the envelope for installation of the sensor. The attachment point is not fitted as standard. Contact Kavanagh Balloons technical staff for fitting details if required.

5.1.1 INSTALLATION

If fitted, an attachment point for the wireless Temperature sensor will be located approximately 1 metre below the edge of the vent rim tape on a vertical load tape number 1.

To fit the temperature sender to the attachment point -

- i) Ensure the serial number of the temperature sensor is coded into the instrument pack. Refer to the Flytec or DBi3 manual for details on how to do this.
- ii) Peel back the velcro from the load tape.
- iii) Ensure the sender unit is located with the probe wire adjacent to the leather patch and hole for insertion into the envelope.
- iv) Feed each end of the velcro through a slot in each end of the sender so the velcro runs under the body of the sender.
- v) Press the Velcro and the sender onto the Velcro attached to the load tape.
- vi) Insert the probe wire into the hole in the leather patch and tie in place with the cord loop sewn to the inside of the envelope.
- vii) Check that the ridged surface of the sender is facing the envelope and that the probe is secured inside the envelope not more than 10mm from the fabric.



5.1.2 ALTERNATE INSTALLATION

On later model balloons the envelope may be fitted with a sock to receive the temperature sensor. Installation will vary as follows.

- viii) Carry out steps i to v in 5.1.1 to secure the temperature sender.
- ix) Insert the probe wire into the hole in the patch adjacent to the sender attachment velcro. Feed the probe all the way into the sleeve until the end is exposed on the inside of the balloon.
- x) Check the probe is clear of the sleeve and is not more than 10mm from the fabric surface on the inside of the balloon.
- xi) Tie the probe in place with the cord loop sewn to the inside of the envelope.



5.1.3 LOSS OF TEMPERATURE SIGNAL

In the event that the temperature signal is not being received by the instrument pack the following checks should be made -

NOTE: *The sender will not transmit until there is a temperature difference of 10°C between the probe and the sender unit.*

- i) Remove the temperature sender (The reverse of 5.1.1 or 5.1.2) and either test or replace the battery in the unit as per the Flytec or Digitool manual.
- ii) Check the pairing of the sender to the instrument pack as per the Flytec or Digitool manual. Each sender has a unique serial number which should be coded to the instrument pack used to display the temperature.

SECTION 6 - INSPECTION SCHEDULE

6.1 SCHEDULED INSPECTIONS

The inspection schedule set out in 6.1 - 6.15 is to be carried out at periods not exceeding 100 hours time in service of the balloon or twelve calendar months whichever occurs first.

Fire extinguishers are inspected every 6 months as set out in 6.14 and detailed in 6.2.14

This inspection schedule is the minimum required by Kavanagh Balloons. Inspections must be carried out by an appropriately qualified person as required by the relevant national Airworthiness Authority.

It is recommended that section 6.1 be photocopied/printed and used as a check list for each inspection. Refer to section 6.2 for the detailed inspection criteria.

ANNUAL/100 HOUR MAINTENANCE INSPECTION

Inspector's Name : _____

Maintenance Licence/Authority Number _____

6.1.1 LOG BOOK

	Certification
The balloon log book must be present at the time of inspection.	
Record the total time in service:	
Examine the log book with particular attention to maintenance entries, number of hours and flights and any modifications or changes made since the last inspection. Verify as far as possible that all entries are correct and up-to-date.	
Check that the balloon complies with all current Airworthiness Directives as applicable in the country where the balloon is registered.	
Check that the correct serial numbers are recorded for all components and that component cards are present for all components.	

6.1.2 COMPONENT INSPECTION LIST

Record the component details in the table below for easy reference. For fuel tanks and instruments, enter the last test stamp or release note date.

	MODEL	SERIAL NO.	Certification
ENVELOPE:			
BASKET:			
LOAD FRAME:			
BURNER:			

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	MODEL	SERIAL NO.	TEST DATE:	Certification
INSTRUMENTS:				
FUEL TANK 1:				
FUEL TANK 2:				
FUEL TANK 3:				
FUEL TANK 4:				
FUEL TANK 5:				
FUEL TANK 6:				
FUEL TANK 7:				

6.1.3 ENVELOPE FABRIC AND LOAD TAPES

	Certification
Record the envelope details in 6.1.2	
Check the heat link for security and the temperature tell tale label for indication of overheating.	
If overheating is indicated (above 120°C), carry out the overheating inspection described in section 6.3.3	
If the balloon has logged more than 300 hours or is suspected of having been overheated or at the inspector's discretion, perform the grab test as described in Section 6.3.1	
Inspect for holes, tears and abrasions. Small holes or low quality fabric repairs in the lowest six metres of the envelope are acceptable, but all other damage must have been repaired using approved methods.	
Check fabric porosity by sucking or blowing air (by mouth) through the fabric. If substantial porosity is suspected, perform a flight test as described in section 6.3.2 to establish if controllability is in question.	
Check both vertical and horizontal tapes for security of stitching.	
Check the stitching of the crown ring and the joints between overlying tapes and the top rim tape as well as the security of the of the load tape to rigging wire joints at the bottom of the balloon.	

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Section 6 - Inspection Schedule



6.1.4 SMART VENT (IF FITTED)

	Certification
Check for wear in the small pulleys and their attachment points at the outer end of each centralising line.	
Check for wear in the small pulleys, their attachment points and the centralising attachment points on the vent panel.	
Check condition of the shroud/centralising cords.	
Check condition of the vent panel fabric.	
Check the centring cords on the upper surface of the vent panel, as well as the rings on the underside of the crown ring.	
Inspect the condition of the lip seal at the edge of the vent orifice.	
Check security of the centre pull extension rope and pulley. The attachment points on the underside of the vent, and the activation rope.	
Check security of the parachute/reset activation rope and pulley.	
If the balloon is inflated, activate the vent fully and reset it to check for smooth operation.	

6.1.5 LITE VENT (IF FITTED)

	Certification
Check for wear of the small pulleys and their attachment points at the outer end of each centralizing line.	
Check for wear of the centre pull pulleys (if fitted) on the underside of the vent panel and the attachment points on the outer edge of the vent panel.	
Check the condition of the parachute shroud lines and the reset/centralising cords.	
Check the condition of the vent panel stitching and fabric.	
Check the centring cords on the upper surface of the vent panel, as well as the attachment at each end to the crown ring and vent panel.	
Check the security of the centre pull extension rope , pulleys and the red activation rope.	
Check the attachment points, (and pulleys if fitted) and centre pull shrouds on the underside of the vent.	
Check the security of the white closing line and pulleys.	
Check the weight at the base of the reset shroud lines to ensure there is no leakage of lead pellets.	
Check security of the red and white parachute activation rope and associated extension rope and pulleys.	
If the balloon is inflated, activate the parachute and centre pull. Reset the vent to ensure smooth operation.	

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6.1.6 PARACHUTE VENT (IF FITTED)

	Certification
Check for wear of the attachment points on the outer edge of the vent panel.	
Check the condition of the parachute shroud lines and centralizing cords.	
Check the condition of the envelope attachment points and stitching for the centralising cords.	
Check the condition of the vent panel stitching and fabric.	
Check security of the parachute activation rope.	
If the balloon is inflated, activate the vent to ensure smooth operation.	

6.1.7 VELCRO RIP PANEL (IF FITTED)

	Certification
Check the visual appearance and performance of the velcro on the rip panel and also on the balloon envelope.	
Check condition of the fabric adjacent to the edges of the velcro.	
Check the condition of the rip lock installations.	
Check the condition of the entire length of the red rip line.	
Check condition of the two rip line pulleys.	
Check the length of the free load tapes over the top of the rip panel towards the crown. See Inspection criteria section 6.2.7.1 of this manual.	

6.1.8 ROTATION VENTS (IF FITTED)

	Certification
Check control lines for wear or burn damage, including shock cord retaining lines.	
Check control line attachments and pulleys, as well as stitching of pulling triangles.	
Check the upper and lower attachments of the rotation vent panel to the vertical load tapes.	
Check condition of fabric in the outer rotation vent flaps.	

6.1.9 FLYING WIRES

	Certification
Check the condition of the flying wires.	
Check the condition of the karabiners.	

AIRCRAFT DETAILS

Maintenance Manual

Section 6 - Inspection Schedule



6.1.10 BURNER AND FUEL SYSTEM

	Certification
Record the Burner details in 6.1.2	
Check load frame for cracked welds, particularly if the frame shows signs of distortion.	
If fitted, check heat shields and heat shield extensions for cracks and damage	
If fitted, check heat shield extensions for wear or damage to guides and control lines	
If fitted, check heat shield extensions operate as require and lock in the closed position.	
Check burner for external signs of damage.	
Check security of main jets and ensure there are no jet blockages.	
Check blast valves for signs of wear or leakage	
Check all joints and connections are leak proof.	
Check the operation of the pilot burner shut-off valve.	
Check the sound and appearance of the pilot light flame.	
Carry out a burner test using each fuel tank as per 6.2.10.2	
Observe function of pressure gauges, blast valves and tank valves.	
Check all fuel hoses are labelled and within the 10 year service life.	
Check all fuel hoses for wear, cuts or kinks.	

6.1.11 FUEL TANKS

	Certification
Record the fuel tank details in 6.1.2	
Check tank test period stamps are within 10 years.	
Check for external damage.	
Check condition of "O" ring and washer seals in liquid outlets.	
Check the self-seal on couplings are functioning.	
Check that liquid fuel can be drawn from the tank.	
Check for leaks	
Check operation of contents gauge.	
Check that all vapour valves have either a regulator or blanking plug fitted.	

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6.1.12 BASKET

		Certification
Record the Basket details in 6.1.2		
Check condition of nylon burner support poles		
Check the condition of the basket flying wires.		
Check the condition of the karabiners.		
Check for damage to weave, especially in area around the base.		
Check weave for excessive dryness or dampness and fungal attack.		
Check the chrome hide or rawhide protection around the base of the basket.		
Inspect upper and lower basket frames for cracks or excessive bends.		
Check the floor and runners for breaks or cracks and excessive wear.		
Check the partition walls for breaks or cracks and excessive wear.		
Check all drain holes are clear.		
Check that the tank straps are intact and that the buckles are functioning.		
Check that one or more NO SMOKING signs are present and legible.		
If fitted, check condition of webbing and buckle used in the pilot restraint harness.		
If fitted, check condition of webbing and link in the trailer loading harness.		
If fitted, check quick release device for condition. Inspect launch rope and bridle for wear and signs of ageing or abrasion. Check any karabiners for damage and correct operation.		
If fitted, Check landing seats for deformation and/or fabric wear		
If fitted, Check functionality of the universal access door.		
If fitted, Check door hinge and latches for wear and/or distortion.		
If fitted, Check the locking bar and top rail strengthener.		
If fitted, Check all self locking pins in door mechanism		
If fitted, Check functionality and condition of seat belts.		

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Section 6 - Inspection Schedule



6.1.13 INSTRUMENTS

	Certification
Record the Instruments details in 6.1.2	
Check that the calibration date is current. Current release note must be sighted.	
Check the altimeter is functioning correctly.	
Check the variometer is functioning correctly.	
Check the ambient temperature sensor is functioning correctly.	
If fitted, check the envelope temperature sensor is functioning correctly.	

6.1.14 FIRE EXTINGUISHER

	Certification
Check the fire extinguisher is either a dry powder or BCF vapourising-liquid type portable extinguisher.	
Inspect the extinguisher as per the instructions in 6.2.14 of this manual.	
Update the maintenance tag on the extinguisher as per 6.2.14 of this manual.	

6.1.15 LOG BOOK ENTRY

	Certification
Complete the logbook entry for the inspection.	

AIRCRAFT DETAILS



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6.2 INSPECTION CRITERIA

6.2.1 LOGBOOK

Check the log book is present and that all maintenance and flight entries have been recorded and are up to date.

Note the number of hours flown since the last inspection and check that the balloon complies with all current Airworthiness Directives as applicable in the country where the balloon is flown.

When the inspection is complete, an entry must be made in the log book to identify the details of the inspection, any work carried out and the person and authority under which the inspection and work was carried out.

6.2.2 COMPONENT INSPECTION LIST

For ease of record keeping section 6.1 can be printed out and used as a check sheet. The table in 6.1.2 can be used to record the details of the components inspected.

6.2.3 ENVELOPE FABRIC AND LOAD TAPES

The general envelope inspection is best carried out during a hot inflation test as it allows easy viewing for damage and operation of all control lines. With the exception of special shape envelopes, when an inflation is not possible, a careful, panel by panel inspection may be carried out. Although recommended, a functional check of the deflation system is at the inspectors discretion and must be carried out if there is reason to suspect excessive opening force for the deflation system may be required.

NOTE: Special shape envelopes require a hot inflation for inspection

If excessive opening force for the deflation system is found, a line load test must be carried out as per Section 6.3.4.

Check the heat link for security and the temperature tell tale for indication of overheating. The heat link is located near the top of the balloon on gore 1 and should be a red flagged, 120°C heat link.

The temperature tell tale must be inspected for indication of overheating. If the most recent temperature tell tale label indicates heating to above 120°C, even if the heat link is still present, an envelope overheat inspection as per 6.3.3 is required. Tell tale labels must not be removed from the balloon.

If the tell tale is water damaged or illegible, a new tell tale should be installed as per 6.3.3 and the log book entry should record the reason for installing the new tell tale.

Check the balloon log book for the total hours logged. If the envelope has logged more than 300 hours or is suspected of having been overheated perform the grab test as described in Section 6.3.1. The grab test may be performed at the inspector's discretion if the condition of the fabric is in question.

Check the envelope for holes, tears and abrasions. Small holes or low quality fabric repairs in the lowest six metres of the envelope are acceptable, but all other damage must have been repaired using approved methods.

Check the envelope for fabric porosity by sucking or blowing air (by mouth) through the fabric. If substantial porosity is suspected, perform a flight test as described in section 6.3.2 to establish if controllability is in question.

Check all vertical and horizontal tapes for security of stitching. In particular, inspect the stitching of the crown ring and the joints between overlying tapes and the top rim tape as well as the security of the of the load tape to rigging wire joints at the bottom of the balloon. Load tape that has more than 10% of its fibres worn, melted or broken or has broken stitching on any joint, is cause for rejection.

6.2.4 SMART VENT

Check all pulleys for wear or seizure. Pulleys with excessive play or pulleys showing signs of seizure or wear are cause for rejection.

Any damage to cords or ropes which make up part of the deflation system rigging or controls must not exceed 10% of the cross sectional area. Even if there is less damage than the specified limit, the part must be replaced if it is possible that the damage could cause entanglement or failure which may prevent the smooth operation of the deflation system.

Inspect the fabric and load tapes in the vent panel and lip seal for signs of wear, broken stitching or over heating. Check and clean velcro tabs if required.

Check the security of all attachment points for the centre pull deflation line. Check the top centralising lines and guide rings on the under side of the crown ring for wear and abrasion.

If operation of the Smart Vent rip line (centre pull) is difficult - refer to Section 6.3.4 to carry out a line load test.

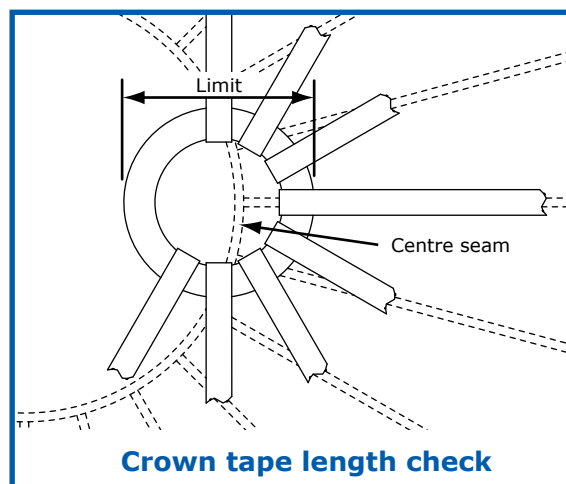
6.2.5 LITE VENT

Check all pulleys for wear and seizure. Pulleys with excessive play or pulleys showing signs of seizure or wear are cause for rejection.

Any damage to cords or ropes which make up part of the deflation system rigging or controls must not exceed 10% of the cross sectional area. Even if there is less damage than the specified limit, the part must be replaced if it is possible that the damage could cause entanglement or failure which may prevent the smooth operation of the deflation system.

Inspect the fabric and load tapes in the vent panel for signs of wear, broken stitching or over heating. Check and clean velcro tabs if required.

Check the security of all attachment points for the centre pull deflation line. Check all extension ropes for wear and condition. Check the top centralising lines for wear and abrasion.



Check the condition of the reset weight and pulley. Worn or damaged (leaking or depleted) reset weights must be replaced.

If operation of the Lite Vent rip line (centre pull) is difficult - refer to Section 6.3.4 to carry out a line load test.

6.2.6 PARACHUTE VENT

Check all attachment points, centralising lines and shroud lines for wear.

Any damage to cords or ropes which make up part of the deflation system rigging or controls must not exceed 10% of the cross sectional area. Even if there is less damage than the specified limit, the part must be replaced if it is possible that the damage could cause entanglement or failure which may prevent the smooth operation of the deflation system.

Inspect the fabric and load tapes in the vent panel for signs of wear, broken stitching or over heating. Check and clean velcro tabs if required.

6.2.7 CIRCULAR RIP PANEL

Inspect the velcro for general condition and operation. Velcro contaminated with grass or other matter which is reducing the performance of the velcro seal should be cleaned as per 2.12.1

Broken hooks and frayed loops on the velcro are indicators that the performance of the seal should be checked. If there is any indication of the seal releasing during use, both sides of the velcro should be replaced.

The fabric adjacent to the velcro edges may become worn due to rubbing against the stiff edge of the velcro. The backing tape is wider than the velcro, so this wear is not critical, but should be repaired as it appears.

Check the condition of the rip lock assemblies. Excessive corrosion or wear will require replacement of the rip lock. Wear exceeding 10% of the load tape width in the rip lock assembly is cause for repairs.

Check the condition of the entire length of the rip line. Wear or damage which exposes the rope core will require replacement of the deflation line. Wear or damage that prevents smooth running of the rip line through pulleys or rip locks is cause for replacement of the rip line.

Check the condition of the upper and lower rip line pulleys.

6.2.7.1 CIRCULAR RIP PANEL CROWN TAPE LENGTH

The free tapes (from the edge of the velcro towards the crown ring) over the top of the rip panel must be shorter than the radius of the rip panel to ensure proper fitting of the rip panel. At each annual inspection the following check must be made.

- i) Ensure the velcro rip panel is correctly installed.
- ii) Hold the top crown tape against the corresponding seam in the rip panel so there is no slack but no excessive tension.
- iii) The edge seam of the centre panel is compared to the crown ring and must fall within the outside diameter of the crown ring as shown.
- iv) Load tapes longer than the maximum limit need to be shortened at the crown ring. The load tape must be unpicked from the crown ring, shortened and re-sewn using the method shown in Section 2.6 of this manual

6.2.8 ROTATION VENTS

Check all controls lines for burn damage and wear. Check the eyelets in the top of panel 1 for wear.

Eyelets in the top of panel 1 where the rotation vent lines exit the balloon may be worn provided there are no sharp edges or damage is being caused to the rotation vent lines. Excessively worn eyelets must be replaced.

Any damage to cords or ropes which make up part of the rotation vent system controls must not exceed 10% of the cross sectional area. Even if there is less damage than the specified limit, the part must be replaced if it is possible that the damage could cause entanglement or failure which may prevent the smooth operation of the rotation vents.

Pulleys should be inspected for wear and replaced if required.

Check the condition of the fabric in the rotation vents for damage and overheating, paying particular attention to the pulling triangles and joints at the top and bottom of each vertical seam.

6.2.9 FLYING WIRES

Flying wires must be stainless steel and 7x19 construction. Specifications can be found in section 2.13.1. There should be no severe kinks or patches of a bluish or brown discolouration. Discolouration due to overheating is cause for rejection. Damage must not exceed 6 broken strands on any one flying wire.

Check security of thimbles and copper swages.

Karabiners should be free of distortion with fully operational screw gates. Check the karabiners are of the correct type, ie 3000kg or 4000kg steel oval. Karabiners which have been distorted or the screw gate does not run freely must be replaced. Karabiners must be all of the same rating on a particular basket but do not have to match the envelope. Karabiner keepers are optional but should be removed if found damaged.

6.2.10 BURNER AND FUEL SYSTEM

Check the inner and outer load frames, coil units and jet ring for dents, cracks or excessive distortion.

Check the heat shields for cracking and if fitted heat shield extensions for cracking and damage and loose rivets.

Check the operation of heat shield extensions does not require excessive force. Inspect the upper and lower guide blocks are installed and not damaged. Wear marks are normal provided operation is not affected. Check for wear on the extension and retraction lines and function of the locking clip.

Check the coil bars for distortion and worn or eroded rivets. In particular check the top corner of the coil bars are restraining the coils and are not chafing on the top bend in the coils.

Check and adjust the friction on all gimbals. The burner must be able to remain in any given position without assistance but not tight to the extent that great force is required to move the burner.

Check all main and pilot light fuel hoses and fuel manifolds for correct identification labels. Identification must include the maximum working pressure, identification or name of the manufacturer, month & year of manufacture.

Where labels are not fitted to the hose or manifold, check all component cards and the aircraft logbook to determine the age of the hoses or manifold.

If the age of the hose cannot be determined then the date of manufacture for the burner is used. For further assistance with the dating or specifications of fuel hoses, contact Kavanagh Balloons technical staff.

Main liquid fuel hoses over 10 years of age must be replaced. Pilot light vapour hoses are not lifed components.

Note: *Main liquid fuel hoses that will exceed 10 years before the next annual/periodic inspection may remain in service until their individual expiry dates are reached.*

Check the fuel hoses for cuts, abrasion, kinks or bulging or visible aging such as cracking. The fuel hose must be flexible with no steel braid showing. In particular, the area adjacent to the burner is susceptible to abrasion by control lines and accelerated aging from radiant heat.

Check the fuel hose end fittings for damage and correct operation. Fittings which do not operate smoothly or leak must be replaced.

6.2.10.1 BURNERS & LOAD FRAME DAMAGE LIMITS

The following rejection limits apply to the burner or load frame;

- i) Distortion of the coils or load frame from an impact.
- ii) Any cracking in the coils, jet ring, load frame or any weld.

If any of the above are found, the burner or load frame must be removed from service and referred to the manufacturer, Kavanagh Balloons for inspection and /or repair before further flight or operation.

6.2.10.2 BURNER FUNCTIONAL TEST

Fuel tanks must be vertical for the functional test of the burner. Fuel pressure must be within normal operating ranges as defined in the appropriate Flight Manual.

Check the condition of the liquid hose connectors for general damage and contamination. Check the condition of tank fittings for the condition of all seals and contamination.

Connect the Liquid supply hoses and pressurise the fuel system. With all valves closed, pressurise the fuel system and check the hose, connectors and all valves and joints for leaks.

Check that the pressure gauges are functional and are not damaged. Pressure gauges with missing or cracked lenses must be replaced.

If a vapour pilot light system is fitted, connect the vapour supply hose and check the regulator adjustment. With the pilot light valve turned off carry out a leak check of the hose, valve and connector. Leaking connectors should be checked for contamination or corrosion. If leaking continues, test the connector in another regulator to determine if the hose end fitting or the quick connector on the regulator is at fault.

Check the operation of the Peizo ignition system. All peizos must be operational and must light the pilot light in a minimal number of strikes. Repeat the ignition test a few times to ensure ignition is reliable. Check for carbon contamination of the electrode and cracks in the insulator body. Check for short circuits in the ignition system identified by a spark jumping to parts of the burner other than from electrode to pilot light cup.

Check that the pilot light flame is consistent. For vapour pilot light systems, ensure the pilot light can be adjusted at the vapour regulator on the tank. It is recommended that the pilot light jet is cleaned in vapour pilot light systems at each annual/100 hour inspection.

Inspection of the pilot light fuel filter on the Series 4 Crossfire burner should be carried out if contamination is suspected. The liquid pilot light is not adjustable and as such a weak or reduced flame will require cleaning of the pilot light fuel filter, pilot light jet or cleaning of the pilot light regulator assembly.

For normal operation of a vapour pilot light, the vapour regulator must be adjusted to no more than 1/2 of its full range of adjustment. If the regulator needs to be adjusted above this level to get a stable pilot light then the pilot light jet requires cleaning and the pilot light hose should be checked for contamination.

Operate all valves including, main valves, liquid fire valves and cross flow valves. During operation check for leaks at all fittings, connections and valves. Check for smooth operation of the valves.

6.2.11 FUEL TANKS

Check the last inspection date stamp on all fuel tanks is less than ten years old.

Note: *Fuel tanks which become due for inspection and testing before the next annual/periodic inspection may remain in service until their individual expiry dates are reached.*

Check the tank for external damage that exceeds the limits set out in 6.2.11.1

Check the liquid outlet connector seals for condition and replace as required.

Check the operation of the self seal in the liquid outlet without the hoses connected. No leakage should occur. A convenient way to check is to force a rubber balloon over the outlet before opening the valve. After closing the liquid valve, release the pressure in the coupling by depressing the central pin or connecting a hose.

Check all valves and connectors for leaks.

Connect each tank to a burner and check that liquid fuel is delivered to the burner. The fuel tank must be upright for this check.

If a vapour regulator is fitted, connect a pilot light hose to the regulator and check for leaks at the connector. Disconnect the pilot light hose and check the operation of the self seal in the connector.

Check all vapour valves not fitted with a regulator are blanked with a brass POL plug.

6.2.11.1 FUEL TANK DAMAGE LIMITS

The following damage limits are provided for external visual inspections at annual/periodic inspections.

Where the inspector is uncertain if damage falls outside the limits provided here, the tank must be removed from service and referred to either Kavanagh Balloons technical staff or another approved tank testing station for further inspection before the tank can be returned to service.

The following rejection limits apply to the fuel tank pressure vessel;

- i) Bulges where the measured circumference varies by more than 1% between any two similar sections of the tank.
- ii) Dents where the depth of the dent exceeds 10% of the average dent diameter or the average diameter of the dent exceeds 25% of the tank diameter or the dent impinges on a weld and exceeds 6.5mm in depth.
- iii) Digs, cuts or gouges where the length exceeds 75mm or the depth exceeds 25% of the original wall thickness.
- v) Corrosion which exceeds 25% of the original wall thickness.
- vi) Cracks in any section of the pressure vessel.
- v) Burn or heat damage from fire or electrical arcing. Any discolouration, even if localised is cause for referral to Kavanagh Balloons technical staff or an approved test station for further investigation.

The following rejection limits apply to the fuel tank top and bottom cowls:

- i) Dents or damage that expose the fittings or valves or restrict normal operation of the valves.
- ii) Dents or damage which present a risk of injury to the pilot or occupants of the basket (sharp edges or tears in the cowl).
- iii) Dents or damage to the bottom cowl enough to allow the lower dome of the tank to come into contact with the ground.

Note: *All Kavanagh stainless steel tanks manufactured by PVL, STPV or Mytton Rod have a wall thickness of 1.9mm. Worthington aluminium tanks have a minimum wall thickness of 3.5mm.*

6.2.12 BASKETS

Check the nylon burner support poles for fractures or damage which may cause a failure.

Check the basket flying wires for abrasion, kinks or broken strands. A maximum of six broken strands is permissible.

Check the thimble and swages for condition. Slight distortion of the thimble is permissible provided the karabiner will still move freely through the thimble.

Karabiners should be free of distortion with fully operational screw gates. Check the karabiners are of the correct type, ie 3000kg or 4000kg steel oval. Karabiners which have been distorted or the screw gate does not run freely must be replaced. Karabiners must be all of the same rating on a particular basket but do not have to match the envelope.

Check for damage to weave including dry and brittle areas or dampness and fungal attack. Missing or broken canes are permissible provided there are no sharp edges protruding into the basket. If objects over 50mm in diameter can pass through a hole in the wicker work, the damage must be repaired.

Check the condition of the chrome hide base protection. For plywood floor baskets, staples must be secure and no sharp edges or staples protruding from the base.

Check all runners (internal and external) for security and cracking. Wear and general damage to runners is permissible provided the runner does not have full thickness splits or cracks exceeding 200mm in length along

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Section 6 - Inspection Schedule



the length of the runner. Splits or splinters may extend the full length of the runner provided they can be removed and smoothed off to remove sharp edges without removing more than 25% of the original runner depth and 25% of the original width from either side. Wear or damage must not leave runner bolts exposed.

HDPE rubbing strips on the base of runners must be secure and free from sharp edges or protruding mounting screws. These rubbing strips are optional so one or more can be missing or removed without causing the basket to be unserviceable.

Check solid floors for cracks. Cracks that do not extend through the entire thickness of the floor are permissible provided they are under 400mm in length. Cracks visible on both sides of the floor must not exceed 75mm in length. Check all partition walls for condition and security. Wooden partition walls have the same damage limitations as solid floors. Flexible partition walls must not have any broken slats or excessive flex.

Check all pole sockets for security and alignment. Check the upper and lower frame for distortion. Obvious bends in the frame will require closer inspection of welds adjacent to the bend and at the ends of that section of frame.

The basket frame inspection is an external visual inspection and can only be made to parts that are not hidden under padding. If the frame appears loose, or if the pole sockets are out of alignment or loose, the padding must be removed for inspection in that area.

Check all drain holes in solid floor baskets are clear and not obstructed by aerobic flooring.

Check all tank straps and pilot restraint webbing for condition and wear. Tank straps must be Kavanagh supplied parts unless other approval has been sought. Wear exceeding 10% of the webbing width is cause for rejection. Check all buckles are functioning correctly.

Check that NO SMOKING signs are present and legible. No Smoking signs can be affixed to the basket, tanks or load frame.

Check the trailer loading harness for wear or damage that may cause failure. Wear exceeding 10% of the webbing width or distorted links/karabiners are cause for rejection. Ensure the harness can be stowed on the basket without presenting a risk to passengers when entering or leaving the basket.

Check the inflation restraint / quick release device for condition and operation. Wear, abrasion, broken stitching and UV fading is cause for rejection of any "3 ring" type release. Check the launch rope and bridle for wear and signs of ageing or abrasion. Check any karabiners for damage and correct operation.

Note: ***The condition of the inflation restraint/quick release and trailer loading harness does not affect the airworthiness of the aircraft and is not cause for failure of the Annual/Periodic inspection. It is however important that damaged or worn quick releases or trailer loading harnesses are removed from service as failure may result in damage to the aircraft or injury to personnel.***

Check the condition of the closed cell foam in the basket seats. If there is permanent deformation or if the foam is torn or broken, then the seat must be replaced. If the covering is torn or worn, it must be repaired.

Check the functionality of the universal access door. If the door is deformed to the point where it will not smoothly open or close, then it must be repaired. Similarly if the locking pins cannot be removed and replaced easily the structure must be repaired. Check the hinge and the latches to ensure there is no distortion which may cause a malfunction. Check the locking pins for wear and correct operation of the ball lock mechanism. Locking pins must not be able to be removed without releasing the locking mechanism.

Check the condition of the seat belts. There must be no damage to the webbing or the stitching. The buckles must function correctly and there must be no distortion of the attachment plates or anchor bolts. The seat belt system must be returned to Kavanagh Balloons (or a suitably authorised organization) for repairs if there is any such damage or wear.

6.2.13 INSTRUMENTS

Check that the instruments meet the calibration requirements and details such as the release note are sighted in the log book.

Check the operation of the altimeter by setting the unit to the current barometric pressure (QNH). If the altitude registered varies more than 50ft from the actual altitude above sea level for your location, the altimeter will need to be serviced.

Check the variometer for normal operation and minimal fluctuations when static. If during the instrument warm-up, function is observed to be normal, then the instrument can be assumed to be in working condition. A flight test can be performed to confirm the operation if a defect is suspected or the unit should be serviced.

Check the envelope and ambient temperature sensors are working. Envelope temperature sensors can be checked before or during the test inflation. The full length of the sensor wire from the base of the rigging to the sensor in the top of the balloon should be checked for abrasion and near the base for burn damage and security of end fittings.

Temperature sensor wires should be taped to a flying wire to prevent damage.

Note: *An inoperable envelope temperature sender is not cause for failure of the Annual/ Periodic inspection provided a serviceable melting heat link is installed in the balloon.*

6.2.14 FIRE EXTINGUISHERS

Check that the fire extinguisher is either a dry powder or BCF vapourising-liquid type portable extinguisher of at least 1kg capacity complying with Australian Standard AS1841 or equivalent.

The following inspection is based on Australian Standard AS1851 for level 1 & 2. Level 1 & 2 inspections are identical for both dry powder and BCF vapourising-liquid type portable extinguishers and is required at 6 and 12 month intervals respectively. Level 4 inspections are required at 5 years and must be carried out by an appropriately licensed person IAW AS1851 or equivalent.

- i) Check that the extinguisher is within 5 years of manufacture date or the last Level 4 inspection IAW AS1851. If the extinguisher exceeds 5 years then maintenance will be IAW Australian Standard AS1851 or equivalent.
- ii) Check that the extinguisher is in a conspicuous location and readily accessible to the pilot and in an appropriate bracket or pouch.
- iii) Check that the anti-tamper device where fitted is intact and will not prevent operation of the extinguisher.
- iv) Carry out an external inspection of the extinguisher. It must be clean with clear instructions for use. The maintenance record tag must be attached.
- v) Check that the extinguisher, including attachments and mechanism is not damaged.
- vi) Check for external corrosion on the pressure vessel and all mechanisms.
- vii) Without discharging the extinguisher, confirm the actuating device is undamaged and moves freely.
- viii) Check that the discharge nozzle is not damaged or modified. If a hose is fitted ensure it is secure, free from obstruction or cracking and other signs of deterioration.
- ix) Check that the extinguisher is fully charged eg: by overall mass. Feel for movement of the contents when inverting or shaking the extinguisher.
- x) Check the pressure indicator is registering in the operable range and is free from damage.

- xi) Check that the operating head or cap seal(s) are in good condition.
- xii) On the maintenance record tag, indicate this check has been carried by stamping a "1" in the month the check was carried out for 6 month inspections and a "2" for the 12 month inspection.

6.3 UNSCHEDULED INSPECTIONS

The following inspections may be required due to special circumstances or issues found during scheduled inspections.

6.3.1 FABRIC GRAB TEST

The grab test is used to check the integrity of the fabric in the balloon. The test must be carried out in fabric near the top of the envelope and must be carried out on all colours. Where the balloon is manufactured with two types of fabric, both fabrics need to be tested. Nomex used in panels 1 or 2 does not need to be tested.

The grab test should be carried out a minimum of 40mm from any seam or load tape and should not be carried out across seams or load tapes.

A 14kg load is smoothly applied to the fabric through two 25mm (1") square clamps, located 75mm apart.

For accurate results, the clamps used should be free from burrs or rough edges and the fabric clamped such that the same fibres are being loaded from each end. Ensure the ends of the clamps are parallel to each other for even loading of the sample.

The fabric must survive a 14kg load with no breakage of fibres to be airworthy. If the fabric fails below 14kg then all weak fabric must be replaced.

6.3.2 INFLATION OR FLIGHT TEST

If it is felt that fabric porosity warrants a flight test, the flight test should be carefully monitored to assess fuel consumption accurately. Subjective impressions are of no value for assessing fuel consumption or porosity of an envelope.

The following method should be used to perform the flight test.

- i) The flight test should take place in stable conditions and not in rain. Record the details for the flight test including cloud cover and time of day.
- ii) Allocate a fuel tank to use for the actual test. This tank should be full and weighed before the flight.
- iii) Inflate the balloon and heat up prior to launch using a tank that will not be carried on the flight.
- iv) Record the ambient temperature at the launch site and altitude with the altimeter set to 1013 hpa
- v) Load the balloon close to its maximum take off weight (MTOW) for the day and record this weight.
- vi) Disconnect/remove the inflation tank and with minimum delay, climb to a known pressure height with the altimeter set to 1013 hPa and establish level flight. Record the pressure height used in the test.
- vii) Change over to the test tank and record the start time for the consumption test. Maintain level flight until the tank is empty or a minimum of 20 minutes has elapsed. The longer the test is performed for the more accurate the results.
- viii) Record the finish time of the test and resume the flight on the other tanks.
- ix) On landing weigh and record the test tank to determine the fuel consumed during the test.

Data collected may be interpreted by the inspector or forwarded to Kavanagh Balloons Technical staff for analysis.

6.3.3 OVERHEAT INSPECTION

This inspection is only required if the 121°C square on the tell tale temperature label has turned black or if other signs of overheating are obvious.

Note: *The melting heat link may be dropped during a momentary peak in envelope temperature without it registering on the tell tale. In this case the full overheat inspection is not required.*

- i) Check for fabric and load tapes with abnormal stiffness or changes in colour. Particular attention should be paid to the edges of the vent panel and fabric near the top of the balloon.
- ii) Check pulleys on deflation system control lines and rigging for heat damage or seizure. Check control lines in the top part of the balloon for heat damage or stiffness.
- iii) Carry out the fabric grab test as described in 6.3.1
- iv) Install a new tell tale temperature label along side the original. Stick the self adhesive label to a small piece of card and write the balloon model, serial number, registration marks, the date installed and the name and M.A. Number of the inspector.

NOTE: *Do not remove previous tell tale labels as they are an indication of the past history of the balloon. If all tell tale pouches become full then the oldest label should be removed and fixed in the log book.*

- v) If missing, install a new heat link
- vi) Record the maximum temperature indicated on the tell tale in the log book and the results of this inspection.

6.3.4 DEFLATION SYSTEM LINE LOAD CHECK

Operation of the red rip line should never exceed 34kg on any deflation system. If it is suspected that the line load is excessive it can be checked by carrying out a line load test as follows:

Required equipment

Calibrated scales with peak hold or lazy finger to record the maximum load.
Pulley and attachment method - karabiner or rope.

- i) The balloon should be inflated on a calm day and loaded appropriately to simulate normal operations for the ambient temperature of the day. A launch restraint is recommended.
- ii) Attach a pulley to the load frame - either by rope or Karabiner so that the red deflation line will have a clear path when running through the pulley.
- iii) Undo the knot and remove the clip from the end of the red deflation line so it can be passed through the pulley.
- iv) Have a crew person (not the pilot) attach the scales to the end of the red deflation line and walk away from the balloon at a steady pace to fully open the deflation system. The pilot should indicate when the vent is fully open so the deflation line can be released and the vent re-set by the pilot.
- v) The maximum load should be noted during opening and the test repeated at least twice to confirm the readings.

If the line load exceeds 34kg then carry out the Lite Vent adjustment described in 2.6.1 if applicable, or contact Kavanagh Balloons technical staff for further advice.

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SECTION 7 - LIST OF PARTS AND MATERIALS

7.1 ENVELOPE PARTS

KA2001	120 DEGREE HEAT LINK
KA2006	LITE VENT RESET WEIGHT- 5KG
KA2007	LITE VENT RESET WEIGHT- 6KG
KP1001	12MM OVAL STEEL KARABINER
KP1038	2MM PLAITED POLYESTER CORD
KP1314	NO. 20 KEVLAR THREAD
KP1316	HTN90 CLOTH - 90 GSM HIGH TENACITY NYLON
KP1317	LUCKENHAUS CLOTH - 60 GSM RIPSTOP NYLON
KP1318	DURALIFE CLOTH - 68GSM RIPSTOP NYLON
KP1319	NOMEX CLOTH - SCOOP AND BASE PANELS
KP1320	K27 CLOTH - 80 GSM HIGH TENACITY NYLON
KP2001	6MM QUICK LINK
KP2002	VENT PULLEY (LARGE)
KP2003	4MM SS THIMBLE
KP2004	COPPER SWAGE FOR 5/32" WIRE ROPE
KP2005	SMALL PULLEY FOR ROTATION/SMART/LITE VENT
KP2006	VENT PULLEY (LARGE WITH BECKET)
KP2007	4MM SS DEE SHACKLE FOR SCOOP ATTACHMENT
KP2008	12.7MM ACETAL BALL STOP FOR SMART VENT AND LITE VENT RIGGING
KP2022	SNAP HOOK
KP2024	TEMPERATURE TELL-TALE
KP2038	1/2" X 2.5MM WELDED RING FOR SCOOP
KP2039	50MM KLEGGTOSTAR VELCRO LOOP - CIRCULAR RIP PANELS ONLY
KP2040	50MM KLEGGTOSTAR VELCRO HOOK - CIRCULAR RIP PANELS ONLY
KP2301	16MM HORIZONTAL LOAD TAPE.
KP2303	48MM LOAD TAPE.
KP2304	80MM LOAD TAPE FOR VELCRO TAB BACKING.
KP2306	25MM VERTICAL LOAD TAPE E-160 TO E-300
KP2307	20MM VERTICAL LOAD TAPE EX-65 & B-77
KP2308	25MM VERTICAL LOAD TAPE C-56 TO E-140
KP2309	25MM BLACK WEBBING FOR LEFT ROTATION VENT LOWER END.
KP2312	VELCRO 50MM VELCRO (LOOP) - SEE KP2039 FOR CIRCULAR RIP PANELS
KP2314	35MM POLYESTER LOAD TAPE FOR VERTICAL LOAD TAPES, B-350 & B-400.
KP2315	VELCRO 50MM VELCRO (HOOK) - SEE KP2040 FOR CIRCULAR RIP PANELS
KP2320	25MM GREEN WEBBING FOR RIGHT ROTATION VENT LOWER END.
KP2321	25MM VERTICAL LOAD TAPE C-56 TO E-140
KP2322	25MM VERTICAL LOAD TAPE E-160-E-300
KP2323	35MM VERTICAL LOAD TAPE, B-350, B-400, G-450
KP2325	80MM RIP PANEL BACKING
KP2327	35MM VERTICAL LOAD TAPE, B-350, B-400, G-450
KP2328	25MM VERTICAL LOAD TAPE E-140 TO E-300
KP2329	25MM VERTICAL LOAD TAPE C-56 TO E-120 & BOX-90
KP2601	SEWING THREAD - POLYESTER METRIC 30 FOR NORMAL SEAMS.
KP2602	SEWING THREAD - KEVLAR METRIC 35
KP2606	SEWING THREAD - BONDED NYLON NO. 13 FOR VERTICAL LOAD TAPE JOINS. SEE SECTION 1.1.9
KP2607	SEWING THREAD - POLYESTER METRIC 20 ATTACHING PULLEYS, VELCRO, ETC.



KP2608	SEWING THREAD - POLYESTER 277 FOR VERTICAL LOAD TAPE JOINS & TURNBACKS
KP2701	ENVELOPE SUSPENSION CABLES 4MM (5/32") 7/19 SS
KP2702	ENVELOPE SUSPENSION CABLES 3.2MM (1/8") 7/19 SS
KP2706	8MM ROPE KEVLAR CORE - RED (SMART VENT)
KP2707	8MM ROPE KEVLAR CORE - WHITE (SMART/LITE VENT)
KP2708	8MM KEVLAR CORE - RED & WHITE (LITE VENT, SMART VENT & PARACHUTE VENT)
KP2709	2.8MM VECTRAN SHROUD LINE CORD
KP2711	4MM POLYESTER ROTATION VENT CORD
KP2712	6MM POLYESTER ROPE FOR ENVELOPE BAG
KP2713	12MM POLYESTER CROWN ROPE
KP2714	14MM POLYESTER CROWN ROPE
KP2715	10MM 16 PLAIT POLYESTER CROWN ROPE
KP2719	6MM SHOCK CORD FOR ROTATION VENTS AND SCOOPS
KP4006	80MM SS SNAP HOOK FOR SCOOP

7.2 BURNER PARTS

7.2.1 SERIES 3 AND GENERAL BURNER PARTS

KA4001	TWO WAY TANK MANIFOLD
KA4002	THREE WAY TANK MANIFOLD
KA4008	VAPOUR HOSE ASSEMBLY VARIOUS LENGTHS, INCLUDES BOTH END FITTINGS
KA4010	PILOT BURNER ELECTRODE & WIRE
KA4014	5/16" SS PIVOT BOLTS FOR BURNER FRAME
KP4001	MAIN LIQUID HOSE END COUPLING 1 1/4" ACME
KP4016	PILOT BURNER MINI BALL VALVE
KP4067	PILOT BURNER JET
KP4005	LIQUID FIRE AND CROSS FLOW BALL VALVE
KP4010	PEIZO IGNITER
KP4013	BALL VALVE CENTRE 1/2" COMPLETE
KA4025	MAIN HOSE ASSEMBLY VARIOUS LENGTHS, INCLUDES KP4001 END COUPLING
KP4501	BALL VALVE 1/2" SS STEM ONLY
KP4502	BALL VALVE 1/2" SEAL KIT
KP4503	PRESSURE GAUGE 0-1600 KPA
KP4513	SOCKET CAP SCREW FOR VALVE BLOCKS (1/4" X 3 1/2")
KP4602	MAIN LIQUID HOSE (2200MM)
KP4605	MAIN LIQUID HOSE (2400MM)
KP4608	MAIN LIQUID HOSE (3000MM)
KP4609	MAIN LIQUID HOSE (3200MM)
KP4611	MAIN LIQUID HOSE (2800MM)
KP4612	MAIN LIQUID HOSE (3500MM)

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Section 7 - Parts List



7.2.2 KBS4 - CROSSFIRE BURNER PARTS AND IPC

7.2.2.1 KBS4 - CROSSFIRE HAND TOOL LIST

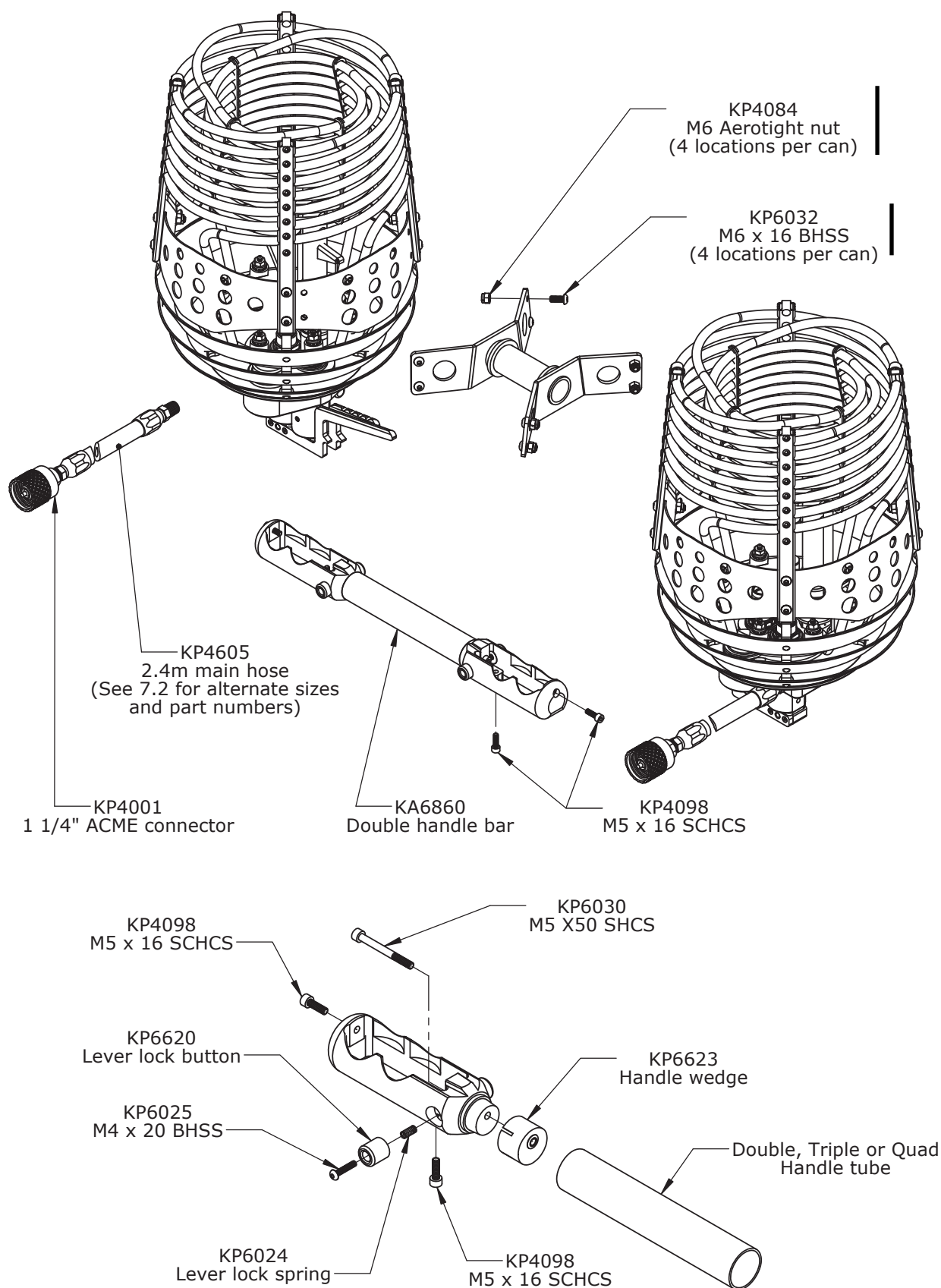
	2.5 MM HEX ALLEN KEY
	4 MM HEX ALLEN KEY
	5 MM HEX ALLEN KEY
	6.5 MM SOCKET OR SPANNER (1/4" OPTIONAL ALTERNATE)
	10 MM SOCKET OR SPANNER
	13 MM SOCKET OR SPANNER (1/2" OPTIONAL ALTERNATE)
	19 MM SOCKET OR SPANNER (3/4" OPTIONAL ALTERNATE)
	25 MM DEEP SOCKET OR SPANNER (1" OPTIONAL ALTERNATE)
	32 MM SPANNER (1 1/4" OPTIONAL ALTERNATE)
KP1708	LIQUID PILOT LIGHT VALVE TOOL
KP1709	VALVE STEM SEAL INSERTION TOOL
KP1710	MAIN INLET SEAL BULLET

7.2.2.2 KBS4 - CROSSFIRE ASSEMBLY AND SEAL KIT LIST

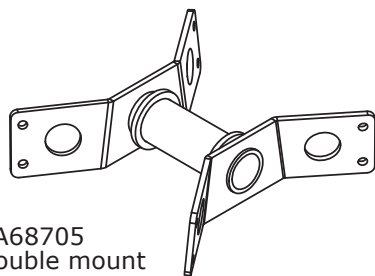
KA1017	MOLYKOTE GREASE - 10ML SYRINGE PACKAGED KP6708
KA6701	GIMBAL BLOCK FRICTION KIT (KP6000 X 4, KP6504 X 2, KP6505 X2)
KA6702	GIMBAL HARDWARE KIT (KP6002 X 8, KP6003 X 8)
KA6716	LIQUID PILOT LIGHT PISTON (KP6413 X 1, KP6416 X1, KP6405 X1, KP4029 X1 - ASSEMBLED)
KA6718	LIQUID PILOT LIGHT SEAL KIT (KP6416 X1, KP4029 X1, KP6703 X 1)
KA6719	LIQUID PILOT LIGHT JET KIT (KP4067 X1, KP4029 X1, KP6407 X 1)
KA6721	LEFT PILOT LIGHT VALVE - ALL PARTS, ASSEMBLED READY FOR INSTALLATION
KA6722	RIGHT PILOT LIGHT VALVE - ALL PARTS, ASSEMBLED READY FOR INSTALLATION
KA6724	PILOT LIGHT STEM KIT (KP6304 X1, KP6309 X1, KP6322 X1 - ASSEMBLED)
KA6726	PILOT LIGHT VALVE SEAL KIT (KP6703 X2, KP6310 X1)
KA6732	PILOT LIGHT FILTER KIT (KP6701 X1, KP6705 X1, KP6410 X1)
KA6746	PRESSURE GAUGE KIT (KP6013 X 1, KP4029 X1)
KA6751	MAIN / LIQUID FIRE VALVE ASSEMBLY - ALL PARTS ASSEMBLED READY FOR INSTALLATION (HANDLE MOUNT LUG, LEVERS AND RUBBING PLATE ETC. NOT INCLUDED)
KA6752	MAIN/ LIQUID FIRE LEVER INSTALL KIT (KP6038 X 1, KP6383 X1, KP6385 X 1)
KA6758	MAIN VALVE STEM KIT (KP6313 X 1, KP6316 X 1, KP6301 X 1 - ASSEMBLED)
KA6760	MAIN VALVE SEAL KIT (KP6310 X 1, KP6704 X 2)
KA6761	MAIN INLET SEAL KIT (KP6706 X3)
KA6776	JET KIT (KP6223 X 8, KP6601 X8)
KA6782	COIL MOUNTING HARDWARE KIT (KP6023 X 8, KP4084 X 8)
KA6860	DOUBLE HANDLE BAR - ENGRAVED TUBE ONLY
KA6862	DOUBLE HANDLE BAR - COMPLETE WITH HANDLE CAPS AND LOCK BUTTONS
KA6870	TRIPLE HANDLE BAR - WELDED AND ENGRAVED TUBE ONLY
KA6872	TRIPLE HANDLE BAR - COMPLETE WITH HANDLE CAPS AND LOCK BUTTONS
KA6880	QUAD HANDLE BAR - WELDED AND ENGRAVED TUBE ONLY
KA6882	QUAD HANDLE BAR - COMPLETE WITH HANDLE CAPS AND LOCK BUTTONS
KP6708	MOLYKOTE GREASE FOR KBS4 CROSSFIRE BURNERS



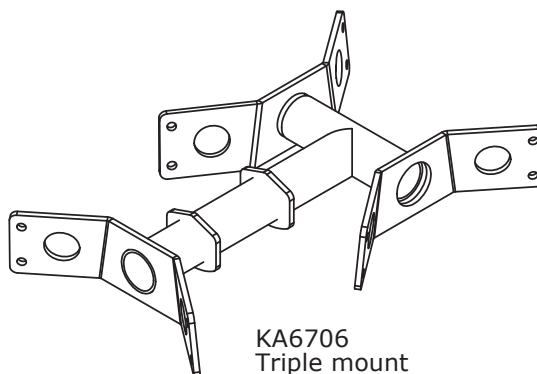
7.2.2.3 KBS4 - CROSSFIRE ILLUSTRATED PARTS CATALOGUE



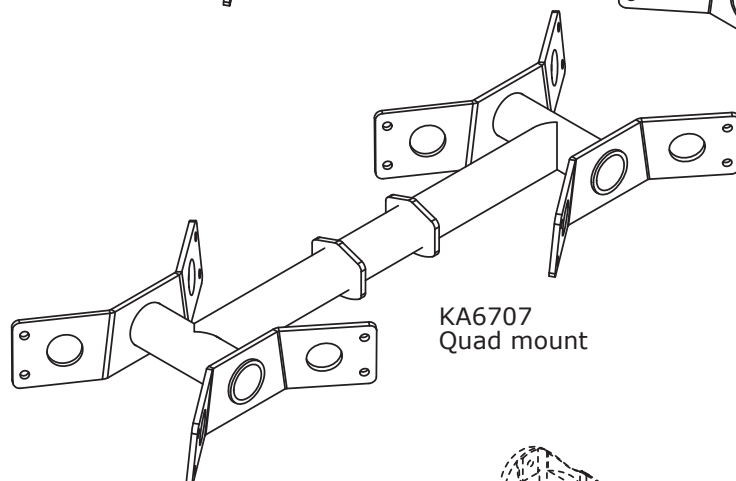
7.2.2.4 KBS4 - CROSSFIRE MOUNTS AND HANDLE BARS



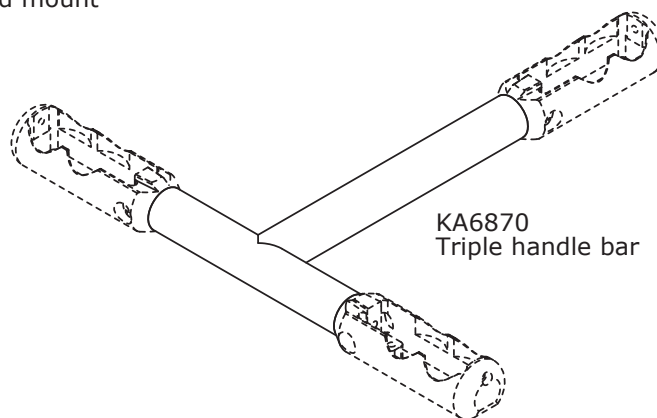
KA68705
Double mount



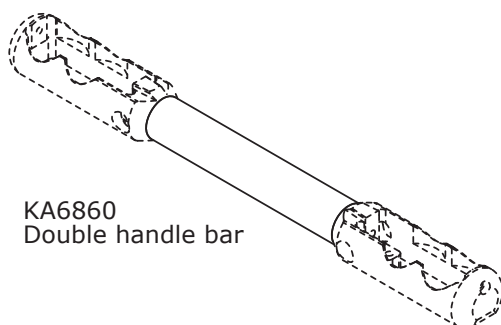
KA6706
Triple mount



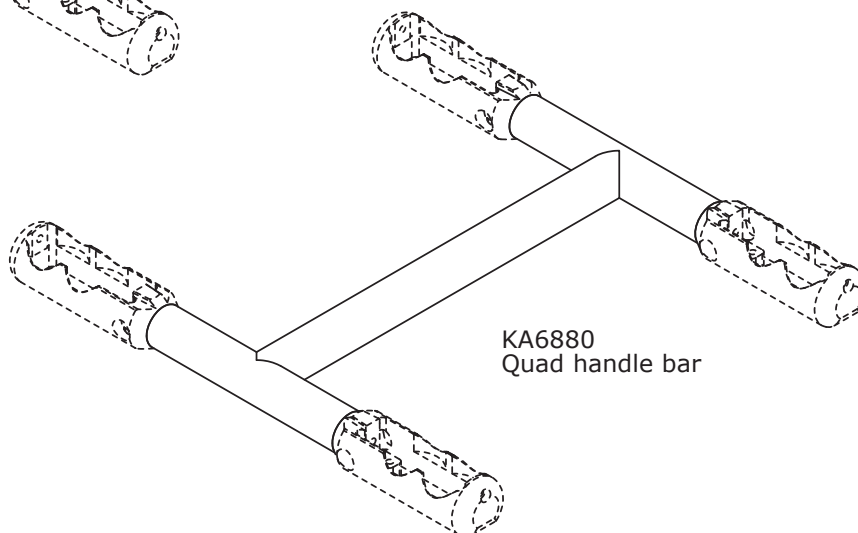
KA6707
Quad mount



KA6870
Triple handle bar



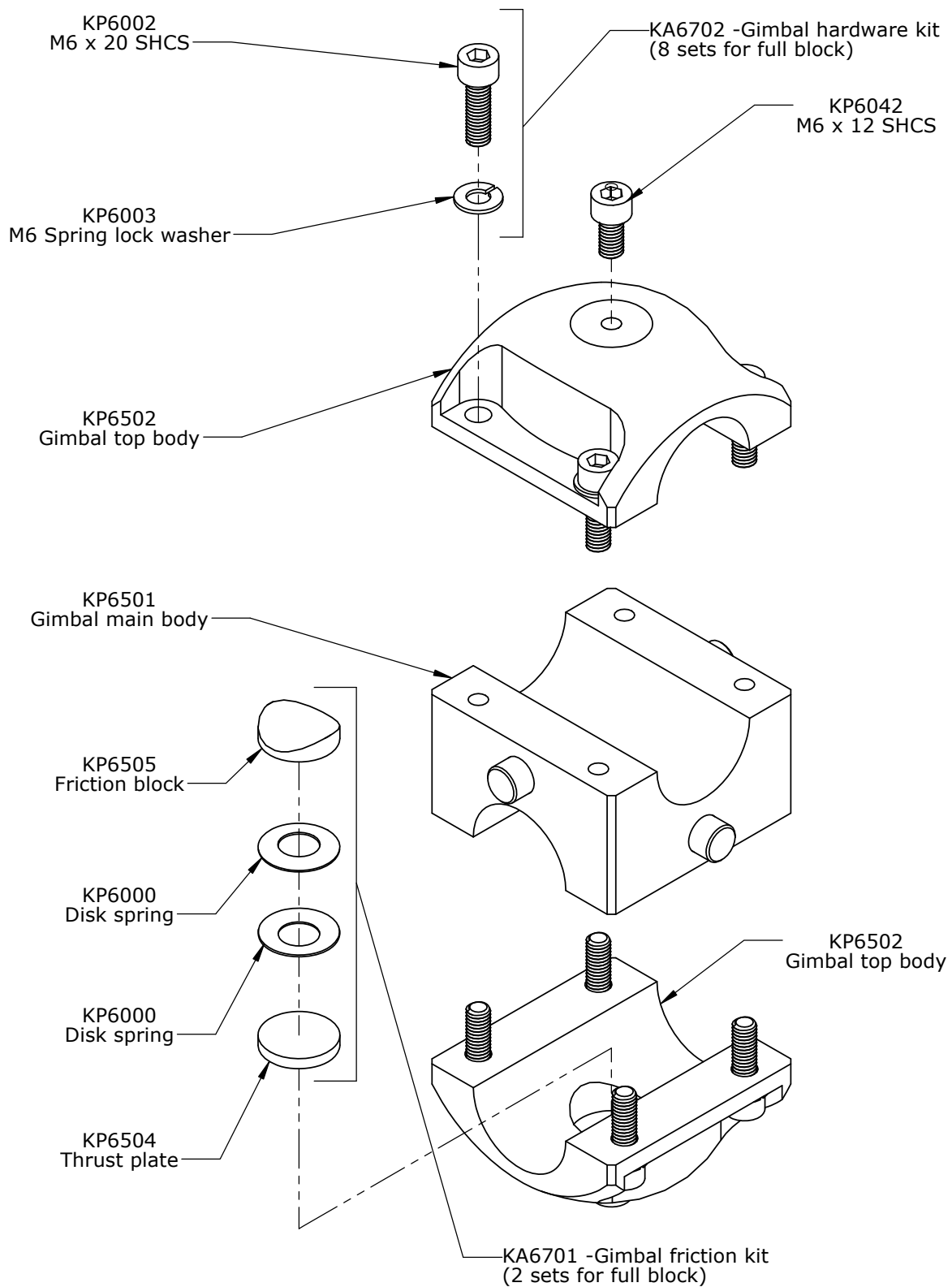
KA6860
Double handle bar



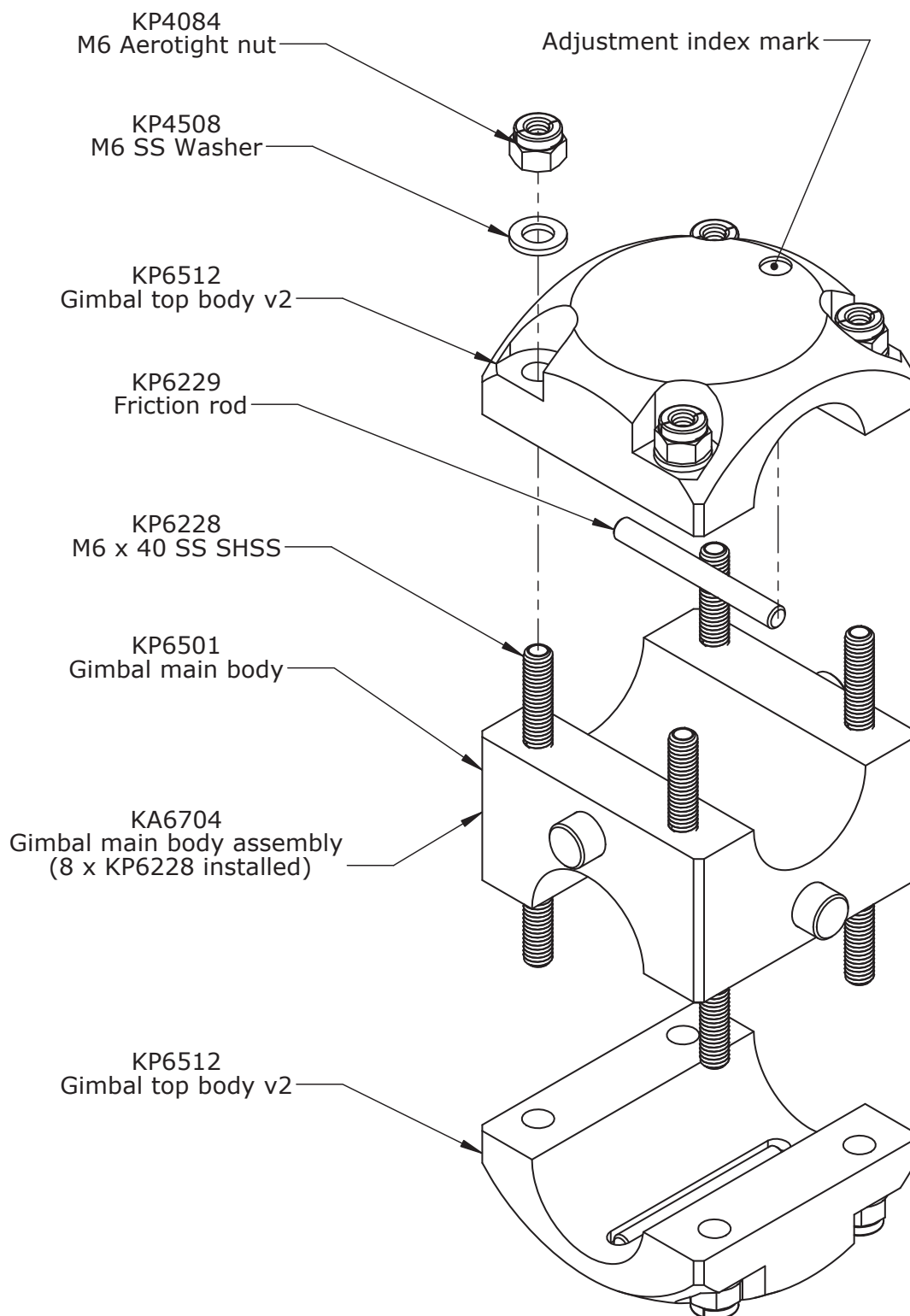
KA6880
Quad handle bar



7.2.2.5 KBS4 - CROSSFIRE GIMBAL MOUNT

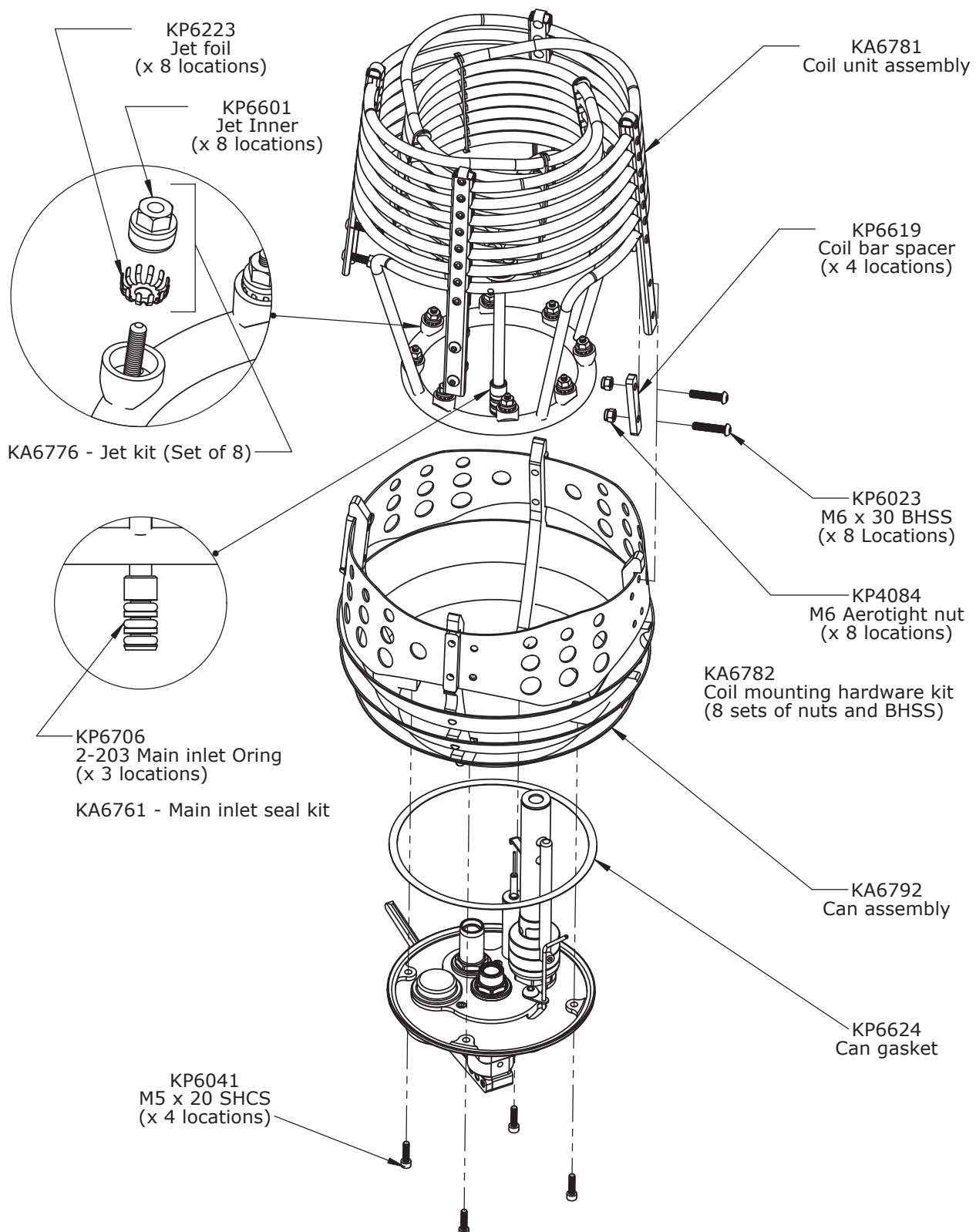


7.2.2.6 KBS4 - KA6703 CROSSFIRE GIMBAL MOUNT

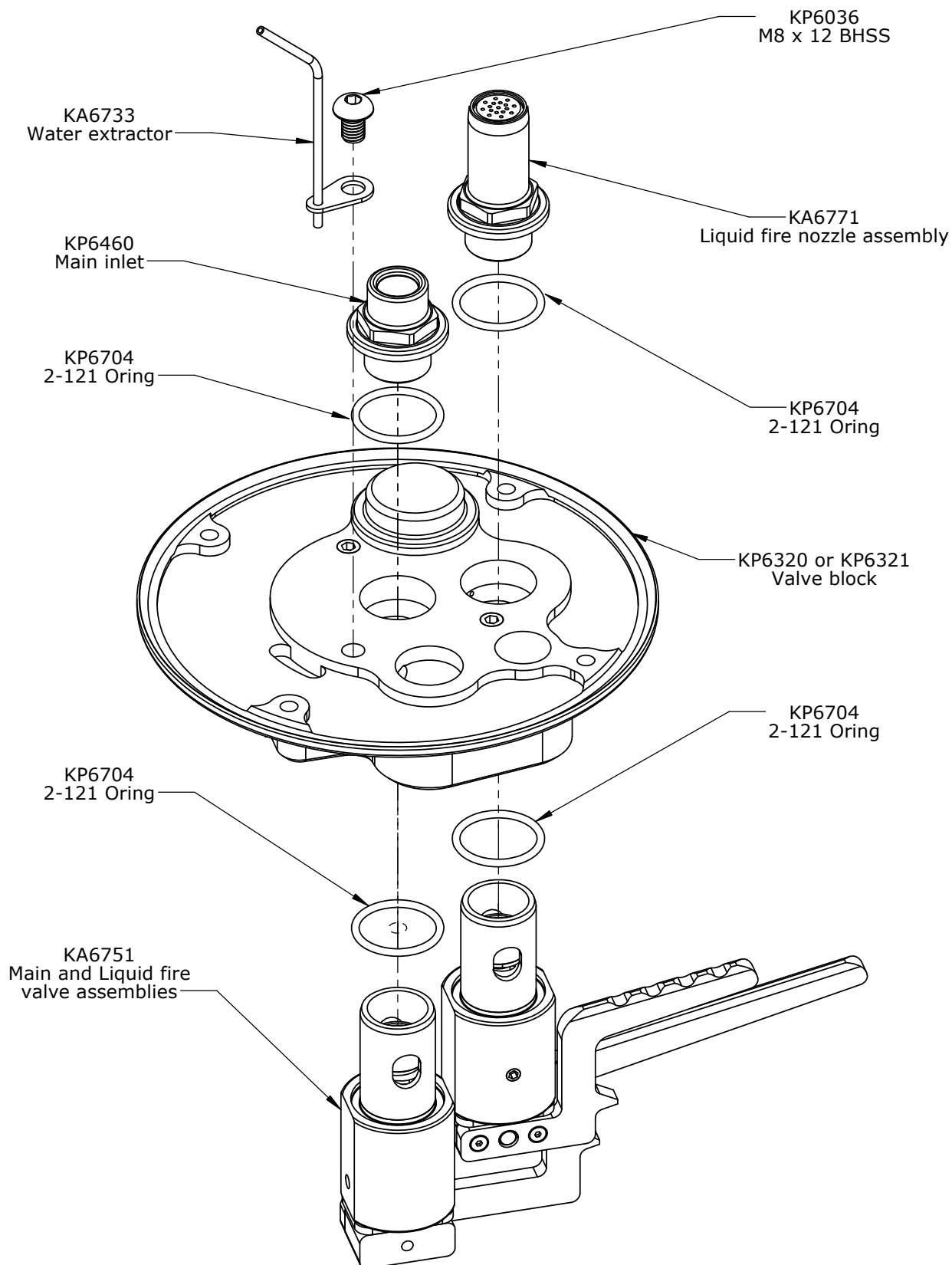




7.2.2.7 KBS4 - CROSSFIRE COIL, CAN AND VALVE BLOCK ASSEMBLY

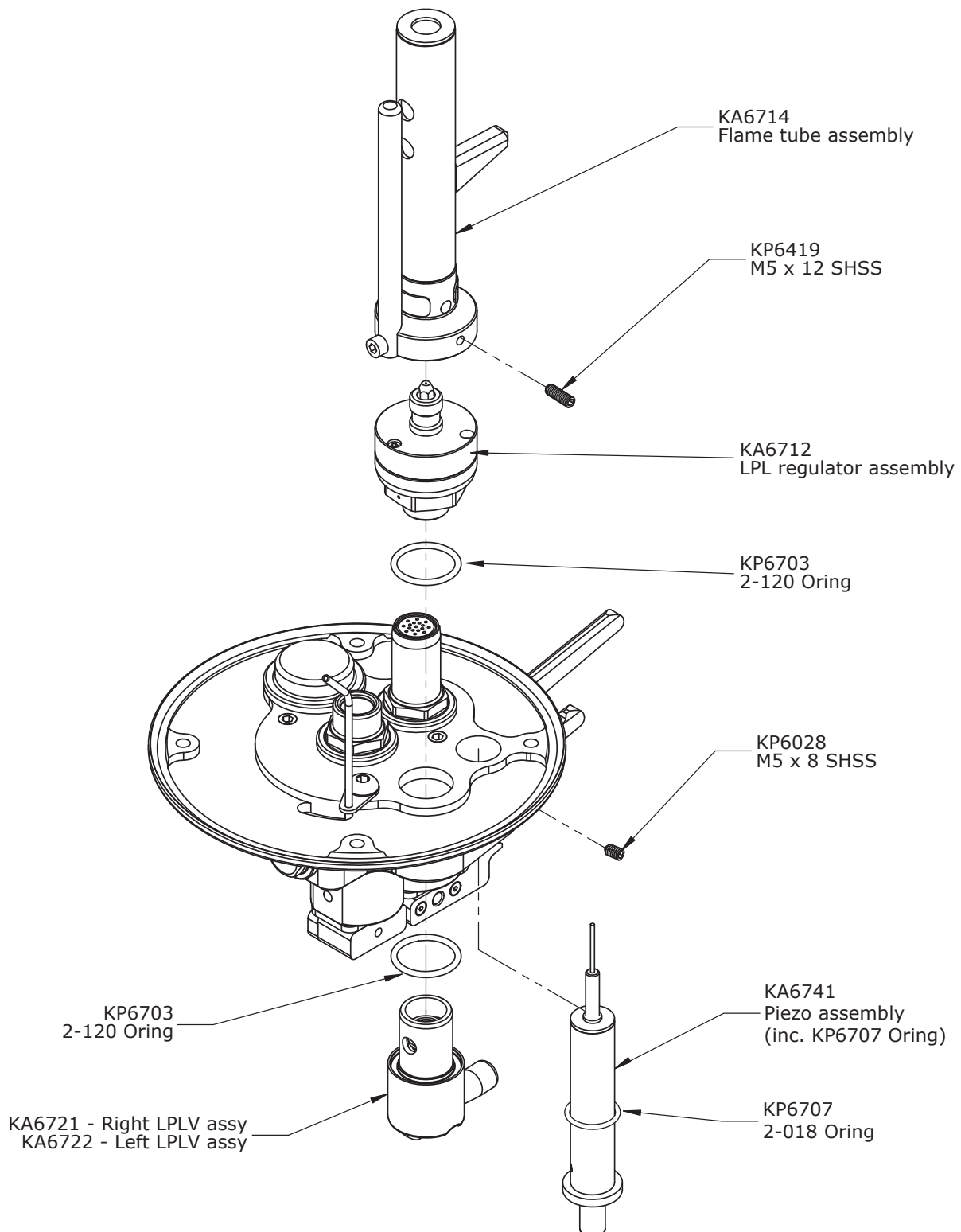


7.2.2.8 KBS4 - CROSSFIRE VALVE BLOCK DETAIL

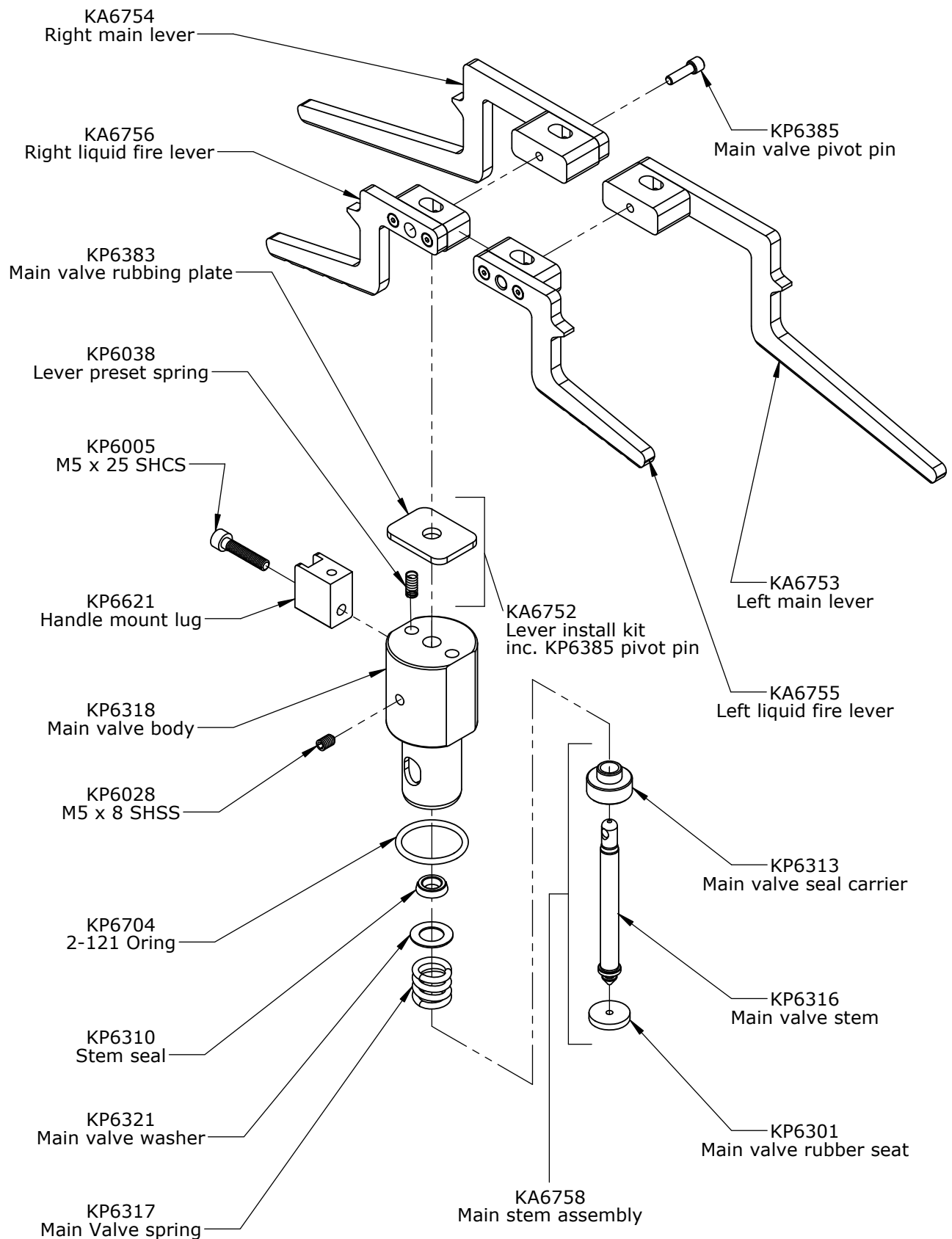




7.2.2.9 KBS4 - CROSSFIRE VALVE BLOCK DETAIL

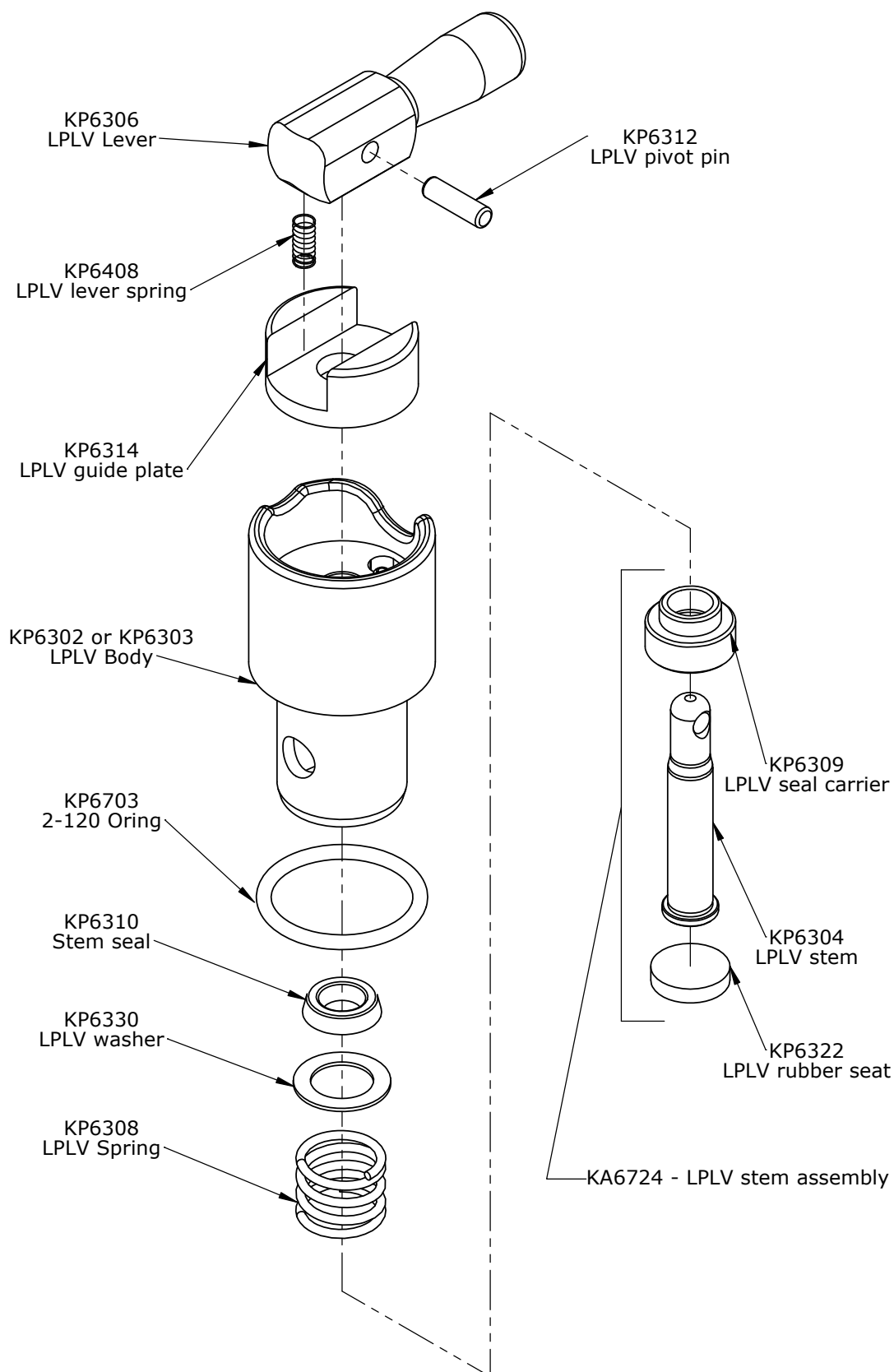


7.2.2.10 KBS4 - CROSSFIRE MAIN & LIQUID FIRE VALVES

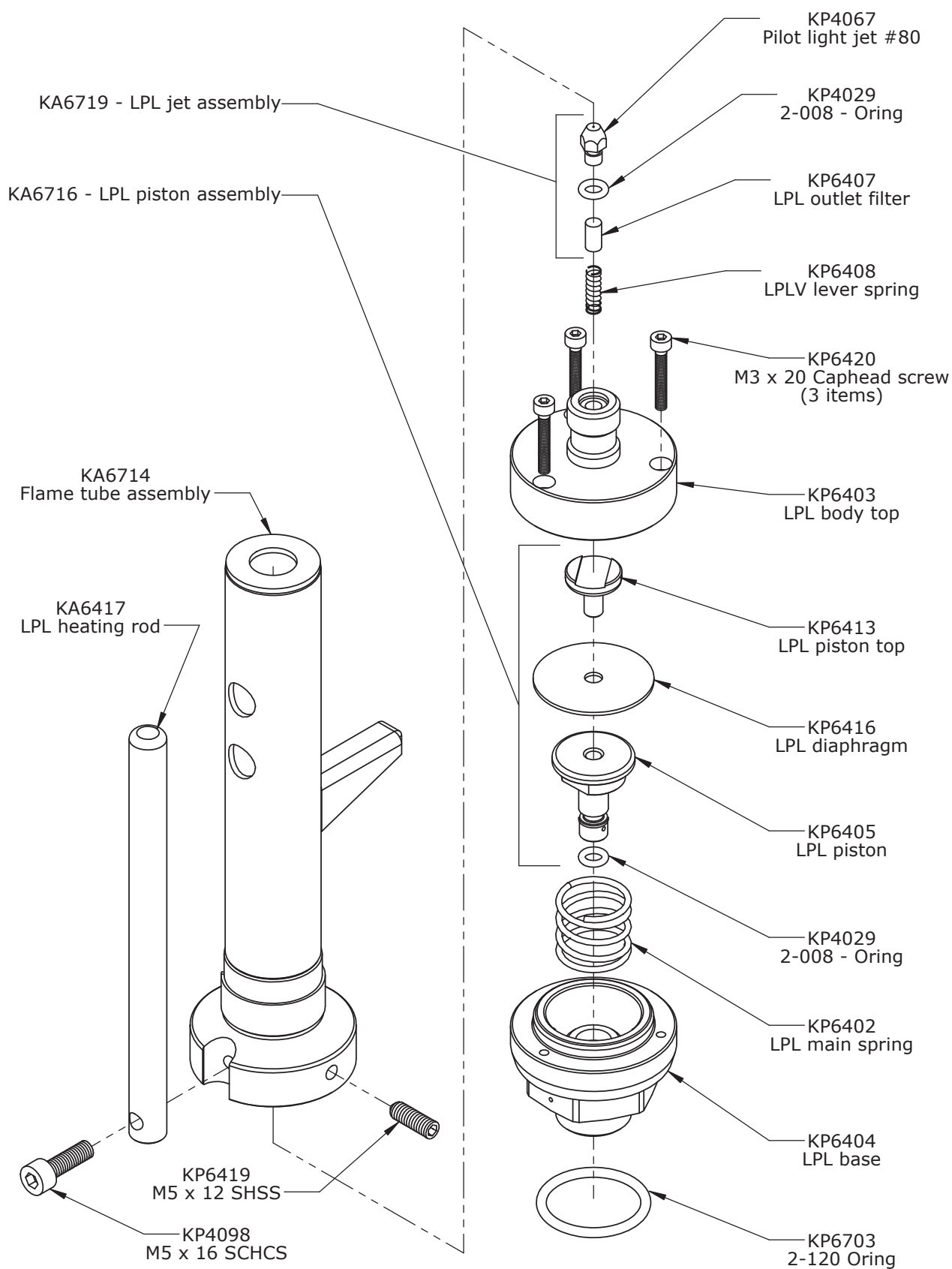




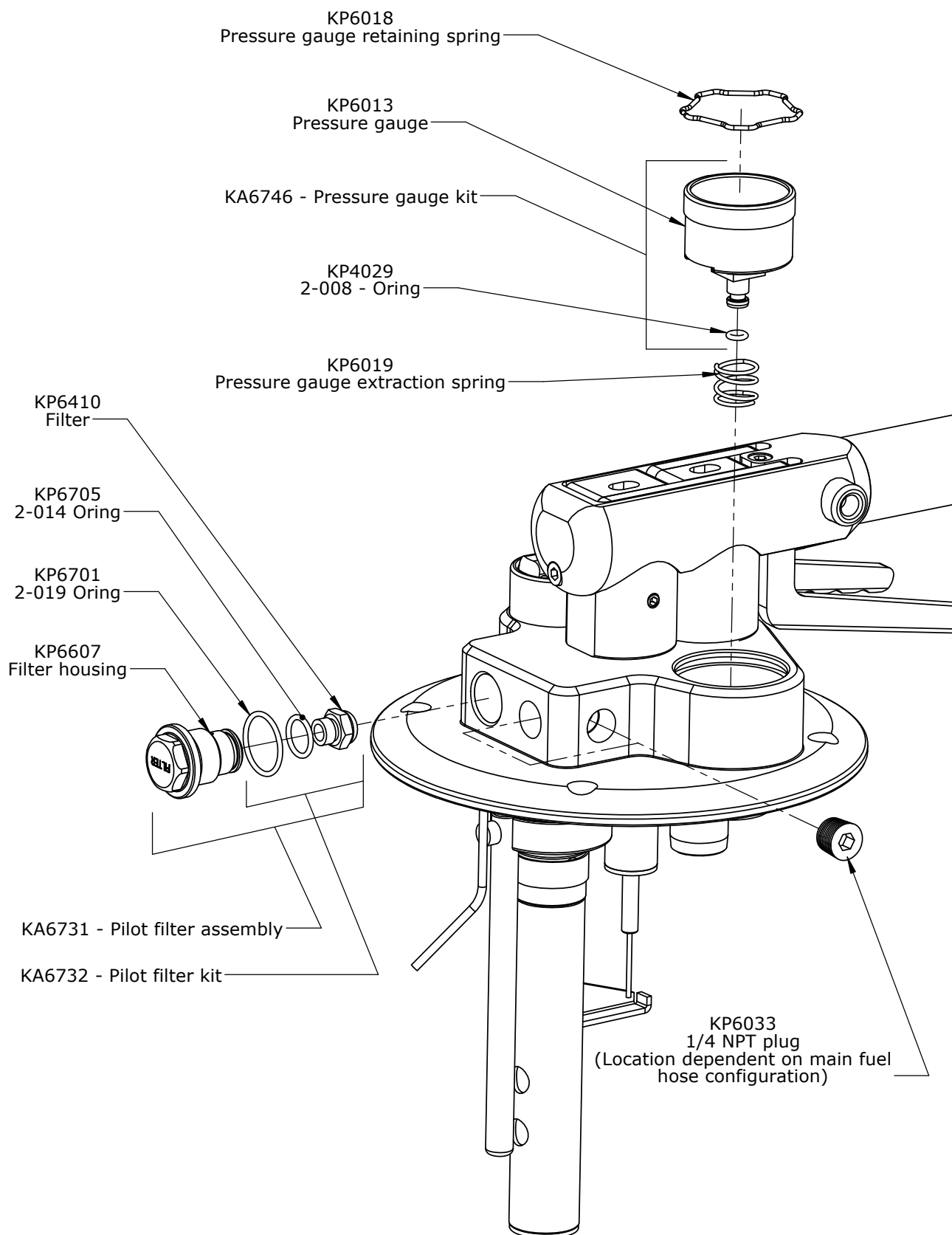
7.2.2.11 KBS4 - CROSSFIRE PILOT LIGHT VALVE



7.2.2.12 KBS4 - CROSSFIRE LIQUID PILOT LIGHT



7.2.2.13 KBS4 - CROSSFIRE PILOT LIGHT FILTER & PRESSURE GAUGE



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7.3 FUEL TANKS

KP1701	LIQUID VALVE SPANNER - SHERWOOD AND QSO VALVES
KP1702	VAPOUR VALVE SPANNER - VAPOUR VALVE WITH PRV
KP1703	AFL SPANNER - AUTOMATIC FILL LIMITERS
KA3030	FIXED LIQUID LEVEL GAUGE - WORTHINGTON 38L
KA3031	FIXED LIQUID LEVEL GAUGE - MYTTON / STPV 55L
KA3035	FIXED LIQUID LEVEL GAUGE - PVL 60L
KA3032	FIXED LIQUID LEVEL GAUGE - STPV / PVL 72L
KA3033	FIXED LIQUID LEVEL GAUGE - STPV / PVL 76L
KA3034	FIXED LIQUID LEVEL GAUGE - STPV / PVL 82L
KA3035	FIXED LIQUID LEVEL GAUGE - PVL 60L
KA3601	PADDED TANK COVER - WORTHINGTON
KA3661	PADDED TANK COVER - PVL 60
KA3602	PADDED TANK COVER - MYTTON / STPV 55
KA3603	PADDED TANK COVER - STPV / PVL 76
KA3604	PADDED TANK COVER - STPV / PVL 82
KP3605	AUTOMATIC FILL LIMITER - MYTTON / STPV 55
KP3618	AUTOMATIC FILL LIMITER - PVL 60
KP3616	AUTOMATIC FILL LIMITER - STPV / PVL 76
KP3606	AUTOMATIC FILL LIMITER - STPV / PVL 82
KP3692	AUTOMATIC FILL LIMITER CAP
KP3646	AUTOMATIC FILL LIMITER GASKET - MAIN SEAL
KP3678	CONTENTS GAUGE GASKET (ALL MODELS)
KP4064	CONTENTS GAUGE SCREWS (ALL MODELS)
KP4080	CONTENTS GAUGE DIAL FACE - ROCHESTER
KP3683	CONTENTS GAUGE ASSEMBLY - ROCHESTER - MYTTON / STPV 55L
KP3718	CONTENTS GAUGE ASSEMBLY - ROCHESTER - PVL 60L
KP3684	CONTENTS GAUGE ASSEMBLY - ROCHESTER - STPV / PVL 76L
KP3685	CONTENTS GAUGE ASSEMBLY - ROCHESTER - STPV / PVL 82L
KA3605	QSOV - QUICK SHUT OFF LIQUID TANK VALVE KIT
KA5007	QSOV - MALE LIQUID CONNECTOR 1 1/4" ACME
KA5009	QSOV - TOP BLOCK
KP3648	QSOV - BASE PLATE
KP3668	QSOV - M6 X 75 H/T HEX HEAD BOLTS
KP3719	QSOV - M22 BONDED SEAL
KP4013	QSOV - WORCESTER OR HABONIM 15MM BALL VALVE ASSEMBLY
KP4508	QSOV - M6 WASHER
KA3004	REGO DUST CAP WITH LANYARD
KA4003	COMET VAPOUR PRESSURE REGULATOR ASSEMBLY
KA5030	BULLFINCH VAPOUR PRESSURE REGULATOR ASSEMBLY
KP3607	VAPOUR WITHDRAWAL TANK VALVE (POL) WITH INTEGRAL PRESSURE RELIEVE VALVE
KP3608	POL VAPOUR VALVE PLUG
KP3610	MALE LIQUID CONNECTOR 1 1/4" ACME
KP3613	VAPOUR PILOT LIGHT CONNECTOR (FEMALE) FOR KA4003 REGULATOR
KP3614	LIQUID OUTLET ELBOW M/F 3/8" NPT
KP3615	LIQUID WITHDRAWAL TANK VALVE - SHERWOOD HANDWHEEL
KP3643	O RING - MALE LIQUID CONNECTOR 1 1/4" ACME



KP3644	BONNET & STEM ASSY FOR SHERWOOD LIQUID VALVE (KP3615)
KP3657	VAPOUR REGULATOR - BULLFINCH TINYREG
KP3660	GASKET - MALE LIQUID CONNECTOR 1 1/4" ACME
KP3703	BONNET & STEM ASSY FOR SHERWOOD VAPOUR VALVE WITH PRV (KP3607)
KP3711	VAPOUR PILOT LIGHT CONNECTOR (FEMALE) FOR KA5030 REGULATOR

7.4 BASKET PARTS

KA3001	50M HANDLING LINE, ROLLED IN BAG
KA3003	TANK STRAP
KA3613	BRACKET FOR FIRE EXTINGUISHER
KA3023	PILOT RESTRAINT HARNESS
KP1001	3000KG STEEL KARABINER
KP1163	QUICK RELEASE PIN - 5/16" X 1.5" STAINLESS STEEL
KP2001	6MM QUICK LINK FOR CROSS BRACING
KP2314	WEBBING FOR CROSS BRACING
KP2323	WEBBING FOR CROSS BRACING
KP3001	BASKET SUSPENSION CABLES 1/4" 7/19 SS
KP3002	6MM SS THIMBLE
KP3006	NYLON BURNER POLES (BLACK) LENGTH AS REQUIRED.
KP3009	COPPER SWAGE FOR 1/4" WIRE ROPE
KP3010	70MM SS SNAP SHACKLE FOR HANDLING LINE
KP3021	15MM HOOP PINE OR KAURI PINE PLYWOOD FOR BASKET FLOORS
KP3027	FIRE EXTINGUISHER 1KG DRY POWDER B(E)
KP3037	TURNBUCKLE FOR CROSS BRACING
KP3050	10MM EYE BOLT FOR CROSS BRACING
KP3108	QUICK RELEASE PIN - 3/8" X 3.5" STAINLESS STEEL
KP3401	17MM HOOP PINE OR KAURI PINE PLYWOOD FOR BASKET FLOORS
KP3402	12MM HOOP PINE OR KAURI PINE PLYWOOD FOR BASKET PARTITION WALLS
KP3403	90X45 KERUING F22 RUNNERS FOR LARGE PARTITIONED BASKETS
KP3404	75X45 KERUING F22 RUNNERS FOR SMALL TO MEDIUM PARTITIONED BASKETS
KP3406	75X38 KERUING F22 RUNNERS FOR SMALL BASKETS
KP3638	SWIVEL EYE SNAP HOOK
KP3815	16MM DOUBLE BRAID ROPE BASKET HANDLES
KP3806	24MM NYLON ROPE OUTER BASKET HANDLES

Maintenance Manual

Section 7 - Parts List



7.5 LOAD FRAME PARTS

KA4023	SMALL LOAD FRAME FLEXIBLE SOCKET
KA4412	HEAT SHIELD EXTENSION FOR KLF2711 LOAD FRAME (960 X 1200)
KA4416	HEAT SHIELD EXTENSION FOR KLF2010 LOAD FRAME (860 X 860)
KP1199	M10 X 20 BHSS (HEAT SHIELD EXTENSION)
KP1212	M6 WASHER (UPPER GUIDE HEAT SHIELD EXTENSION)
KP1240	M6 X 75 SHCS (UPPER GUIDE HEAT SHIELD EXTENSION)
KP3030	1/4" CONELOCK NUT (SMALL LOAD FRAME FLEXIBLE SOCKET)
KP3034	1/4 X 1 1/4" HEX HEAD BOLT (SMALL LOAD FRAME FLEXIBLE SOCKET)
KP4023	3/16" NYLOC NUT (HEAT SHIELDS)
KP4028	3/16" WASHER (HEAT SHIELDS)
KP4057	3/16" X 1" ROUND HEAD SCREW (HEAT SHIELDS)
KP4083	M5 AEROTIGHT NUT (LOWER GUIDE HEAT SHIELD EXTENSION)
KP4084	M6 AEROTIGHT NUT (UPPER GUIDE HEAT SHIELD EXTENSION)
KP4121	BEARING BLOCK (HEAT SHIELD EXTENSION)
KP4122	UPPER GUIDE (HEAT SHIELD EXTENSION)
KP4123	LOWER GUIDE (HEAT SHIELD EXTENSION)
KP4325	HEAT SHIELD WASHER
KP6028	M5 X 8 SHSS (HEAT SHIELD EXTENSION BEARING BLOCK)
KP6030	M5 X 50 SHCS (LOWER GUIDE HEAT SHIELD EXTENSION)



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