



Part Number: ALS3T0010F
Version: 1

ACCUSUMP

PROCESS
SHEET



Lotus Sport – Fitting Instructions

ACCUSUMP

Application Specific to:

- Lotus Sport S2 Exige 'Cup' Vehicles with Toyota 2ZZ-GE Engines with the lotus oil cooler system
- Lotus Sport S2 Exige 240R Vehicles with Toyota 2ZZ-GE Engines with the lotus oil cooler system
- VIN numbers prior to SCCPA11116HN80001 (MY05 – Mechanical Throttle Vehicles)

Difficulty





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OVERVIEW

Accumulators have been used in many applications to limit surges in hydraulic systems. The basic concept of using a gas cushion to even out pressure spikes has been used in industry for years. The Accusump is an accumulator that is purposely designed for the protection of automotive engines. The system consists of a tube and a piston that separates the oil from the air within the tube. As oil enters one side under pressure the piston is pushed back, compressing the air in the other side. The piston will always move toward equilibrium where the pressure in the airside equals the pressure of the oil side.

The Accusump holds the oil in the oil side under the engine's operating pressure and can supply the engine with that oil if the normal supply is interrupted. It releases the stored oil when a pressure loss in the engine puts the system out of equilibrium and causes the oil to exit the Accusump in an attempt to regain equilibrium. Most accumulators are designed to limit high-pressure spikes, the Accusump limits low-pressure drops. The piston keeps the oil from mixing with air, which allows the units to be mounted in any position and also permits a pre-charge of pressure in the airside. The pre-charge of air pressure ensures that the unit empties under pressure. However, since the piston always moves to equilibrium the pre-charge cannot create more oil pressure or effect the pressure oil is stored at.

Under Normal Operation:

Pre-oiling

- With electric units wired into the ignition, the oil valve will open on the Accusump, this will happen automatically when the ignition is turned on. This will purge air from the oil gallery and pre-oil the engine before it is started.

Surge Control

- During operation of the engine, the Accusump will operate automatically to supply oil to the engine any time that the oil pump loses suction due to oil surges. Should there be a failure in the oiling system, the Accusump will supply 15 to 60 seconds of oil (depending on engine size and speed) to protect the engine.

Shut Down

- During shut down the Accusump will hold whatever pressure your engine has at the time it is shut off. On manual valve units you will need to close the valve before shutting the engine off. On electric units, the valve will close automatically when the engine is shut off. If the engine has low oil pressure at idle you may want to hold the engine at a higher speed as you close the valve to develop more oil pressure for pre-oiling. If the manual oil valve is left open when the engine is shut off, the Accusump will not store its oil and require refilling at start up. It may be refilled by leaving open the oil valve during start up to allow oil to enter the Accusump



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IMPORTANT PRECAUTIONS

The following precautions must be taken for your Accusump to operate correctly. Failure to do so can result in damage to the unit.

- Never allow your Accusump to become hydraulically locked, that is, having the unit totally filled with oil with the valve closed. There should always be a cushion of air in the Accusump when the valve is closed.
- There should be a 7-15 psi. pre-charge of air pressure when the unit is totally empty of oil.

CAUTION

The Accusump tube's inside diameter has a very smooth finish. Should this finish become damaged by foreign material (from engine failure or contaminated oil), the piston seals will wear rapidly, leading to malfunctioning of the Accusump.

MAINTENANCE

- When in operation, the reading on the air gauge of the unit should increase and decrease with engine oil pressure fluctuations.
- Routinely check the pre-charge pressure with the unit totally empty of the oil to make sure air has not leaked out of the unit. This is extremely important when a remote air gauge is used.
- Never bleed air from the unit while in operation or when full of oil as this will defeat the purpose of the pre-charge and make the unit ineffective.
- These units should not be mounted in a place where they can become excessively hot, especially not in a place where they will absorb heat after the engine is shut off and the Accusump control valve has been closed.
- Improper disassembly can cause damage to the Accusump and can be very dangerous.

NOTES

- The Accusump Unit is fitted within the luggage compartment of the vehicle then plumbed in to the inlet side of the Oil Cooler System.
- All threaded unions should be wrapped in ptfе tape to ensure a good seal is obtained.
- To ease fitment of the hoses it is a good idea to allow the ends to soak in boiling water before hand. Please ensure that all necessary safety procedures are followed whilst doing this.

NORMAL CARE

There are Accusump units that have been in service for many years and have bores which look like new. The key to long life for the Accusump is proper care and oil filtration.

- The Accusump should be protected by a quality oil filter that does not have a bypass. The filter should be replaced and inspected at frequent intervals. The life of your Accusump, like the life of your engine, will depend on how clean your oil remains.
- The Accusump tube has close tolerances of roundness; care must be taken that the tube is not distorted. The unit should be mounted so that it is not twisted or bent, however slightly. Do not use the Accusump as a step or allow anything to be dropped on it. The Accusump is a precision piece of equipment.
- Keep the dust cap on the air valve to prevent the introduction of dirt into the air end of the unit.
- When breaking in a fresh engine do not operate your Accusump if it is equipped with an electric valve. Passages in the valve can clog with the assembly lube that is present in the oil during engine break-in.



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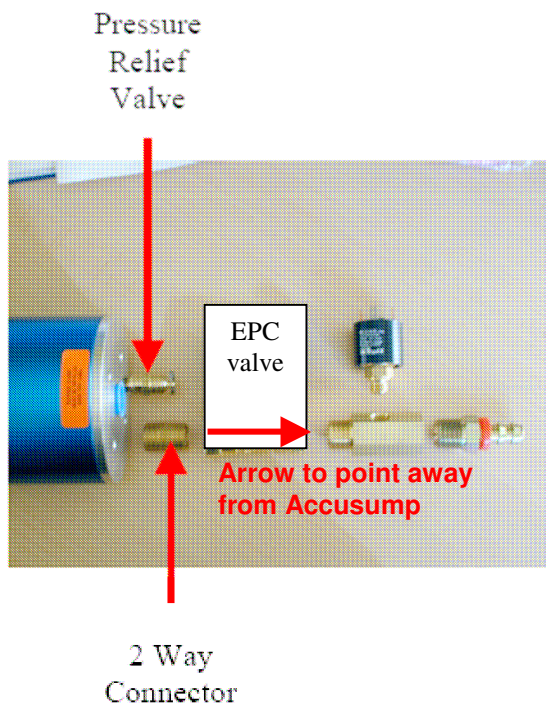


Tools Required

Lotus Service Manual (A120T0327J) Soldering Iron and Solder 25mm Hole Saw Wire Crimpers ½" Hole Punch Vehicle Support Ramp Oil Drain Can 2x Large Adjustable Spanners Ratchet Spanners – 8mm, 10mm, 15mm, 17mm	Drill 12mm Drill Bit 6mm Drill Bit Rivnut Tool Pop Rivet Gun Boiling Water to soften hose ends PTFE Tape Side Cutters Hose Cutters	Crimping Pliers for Oetega Clips 3mm Allen Key Terminal Extractor Set Phillip Screwdriver Flat Bladed Screwdriver T20 Star drive key Shreader Valve Key Centre Punch Sockets – 8mm, 10mm and 11mm deep
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Kit Contents

P/N	PART	QTY	P/N	PART	QTY
ALS3E6001F	ACCUSUMP	1	A075W3009Z	NUT, M6	1
ALS3E6002F	CLAMP, ACCUSUMP MTG	1	A075W4015Z	WASHER, M6	5
ALS3E6003J	EPC VALVE	1	A111W1163F	BOLT, M5	2
ALS3E6004F	CONNECTOR, 5/8 BSP, 90°	1	A100W3113F	NUT, M5	2
ALS3E6005F	CONNECTOR, -10 JIC FOR 5/8" HOSE	2	A111W4168F	WASHER, M5	2
ALS3E6006F	T PIECE	1	X036B6010Z	GROMMET	1
ALS3E6007F	CHECK VALVE	1	X036B6167Z	GROMMET	1
ALS3E6008F	CONNECTOR, -10 JIC FOR ½" HOSE	1	A082H6046F	GROMMET	1
ALS3E6009F	CONNECTOR, ½ NPT FOR ½" HOSE	1	A075W3031Z	JACKNUT, 6MM	4
ALS3E6011F	HOSE, 5/8 ID, BLACK	0.5m	A918W5217F	BOLT, M6 X 40	4
ALS3E6012F	HOSE, ½ ID, BLACK	3m	ALS3U0002F	WARNING LABEL, ENGLISH	1
BLS3E6013F	ACCUSUMP PLUMBING SCHEMATIC	1	ALS3U0003F	WARNING LABEL, FRENCH	1
ALS3M0006K	ACCUSUMP WIRING KIT	1	ALS3U0004F	WARNING LABEL, GERMAN	1
ALS3E6016F	INLINE OIL FILTER	1	ALS3U0005F	WARNING LABEL, ITALIAN	1
ALS3E6017F	CONNECTOR, -8 JIC FOR ½" HOSE	2	ALS3T0001K	ACCUSUMP INFORMATION SHEET	1
ALS1E0072K	MOUNTING BRACKET	1	A111U0368F	NYLON SPACER	4
A111W6624F	P CLIP	1		CABLE TIE	10
A075W1030Z	BOLT, M6	1		FITTING INSTRUCTIONS	1



SEQ	ACTIVITY – ACCUSUMP UNIT / EPC VALVE MOUNTING
10	Assemble the Accusump unit with the mounting Clamps, 2 way threaded union, EPC valve and Solenoid as illustrated below (also refer to Accusump Plumbing Schematic on page 3 of these instructions)
20	The Accusump is fitted as rearward as possible and across to the right hand side as possible within the Luggage compartment, remembering to leave enough room for the ½” connecting hose to be fitted without any kinks. Remove the Boot Carpet and Sound Deadening material then place the assembled Accusump into position and mark the position of the 4 mounting points for the clamps. Then remove the Accusump and drill through the boot floor with an 11mm drill bit and affix the M6 jack nuts into these holes.
30	Replace the floor sound deadening material and, using a ½” hole punch, punch 4 holes above the 4 jack nuts. Then follow the same procedure for the boot carpet.
40	Place the 4 White Nylon Spacers through the holes made in the insulation and carpet, then bolt the Accusump into position through these spacers.

CAREPOINT

- 10 It will be necessary to remove the Pressure Relief Valve from the Accusump before this is possible. **The arrow on the EPC valve should always point away from the Accusump.**
- 10 Please ensure this is refitted afterwards and is tight. Also ensure that the mounting clamps are only tightened on the area marked on the Accusump Canister.

QUALITY STANDARD

SEQ	PART NUMBER	PART DESCRIPTION	QTY	F/C	TORQUE	TOOLING
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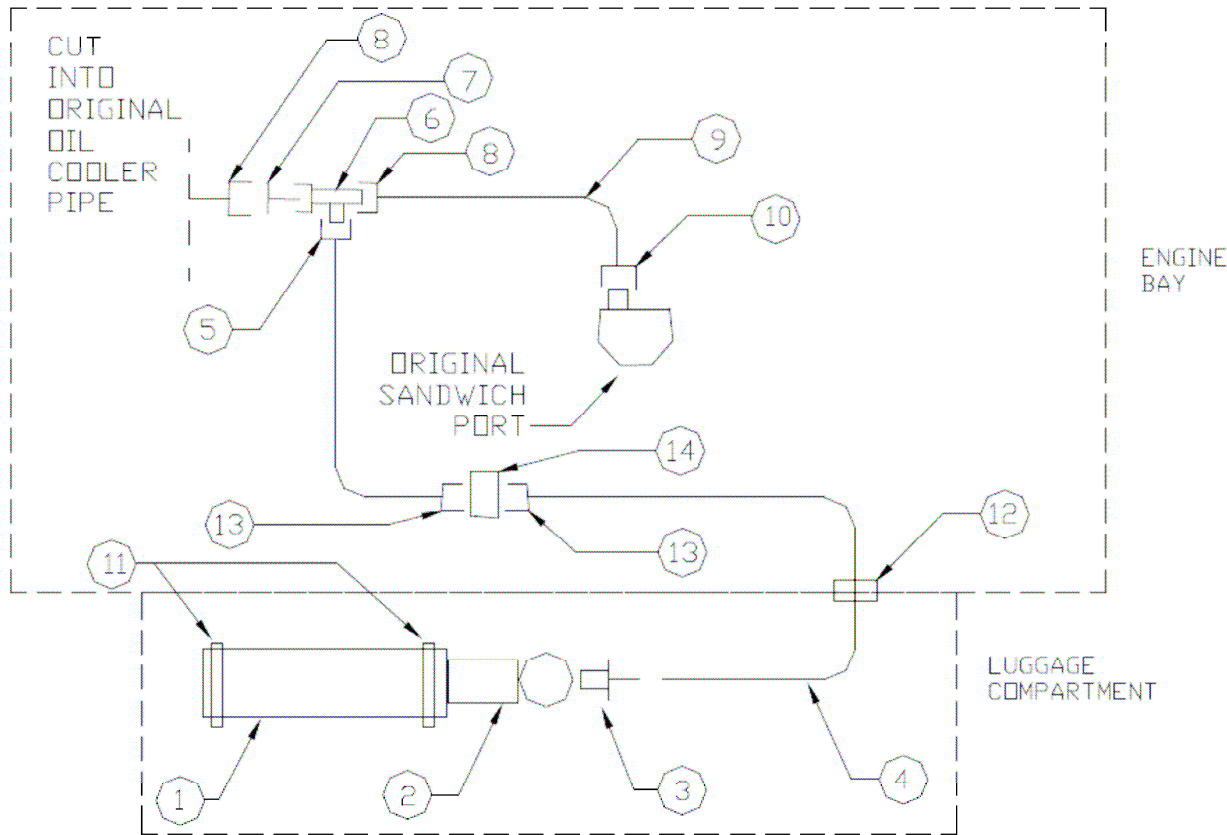
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PLAN VIEW

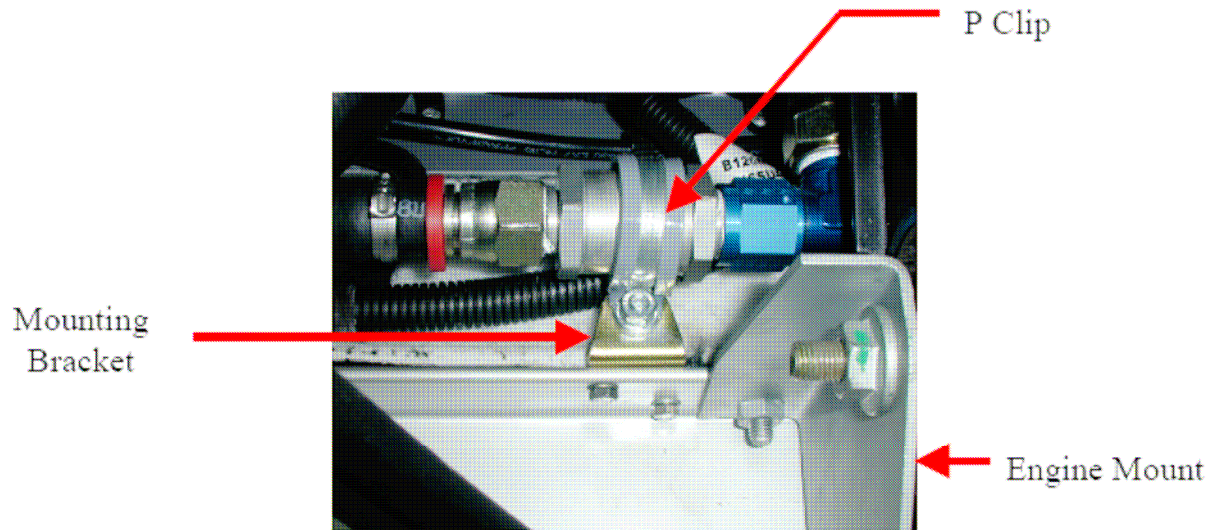


SEQ	ACTIVITY – ACCUSUMP PLUMBING SCHEMATIC	
10	Solenoid Fitted after EPC Valve	
20	Grommet Used for Protection through boot	
30		
40		
COMPONENT ID	PART NUMBER	DESCRIPTION
1	ALS3E6001F	ACCUSUMP, 2QT
2	ALS3E6003J	EPC VALVE
3	ALS3E6009F	1/2 NPT CONNECTOR
4	ALS3E6012F	1/8 HOSE
5	ALS3E6008F	-10 JIC CONNECTOR, 1/2 HOSE
6	ALS3E6006F	T PIECE
7	ALS3E6007F	ONE WAY VALVE
8	ALS3E6005F	CONNECTOR, -10JIC TO 1/2 HOSE
9	ALS3E6011F	1/8 HOSE
10	ALS3E6004F	CONNECTION, 1/2 BSP, 90 DEG
11	ALS3E6002F	MOUNTING CLAMP
12	A082H6046F	GROMMET
13	ALS3E6017F	CONNECTOR, -8 TO 1/2 HOSE
14	ALS3E6016F	INLINE OIL FILTER

CAREPOINT

QUALITY STANDARD

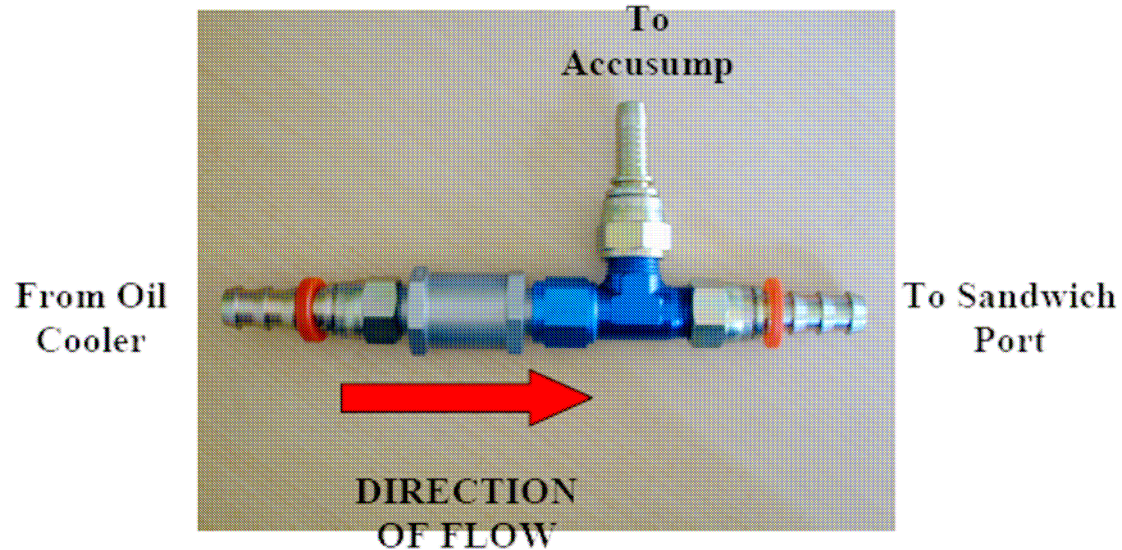
SEQ	PART NUMBER	PART DESCRIPTION	QTY	F/C	TORQUE	TOOLING
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SEQ	ACTIVITY – PLUMBING IN THE ACCUSUMP
10	Support the vehicle in the air, ensuring that all safety requirements are met, and remove the vehicles Undertray and Diffuser following the instructions laid out in the Lotus Service Notes.
20	Ensuring that the Engine Oil has cooled down, disconnect the Oil Cooler Return hose from the Oil Filter Sandwich Port inside the Engine bay (the one on the left hand side of the Sandwich Port when looking to the front of the vehicle). Allow any oil that may escape to drain into a drain can. Then move the Oil Cooler Hose out of the way for now.
30	Take the L shaped Bracket (ALS1E0072K) supplied in the kit and position it on the upper lip of the chassis approximately 20mm to the left of the central engine mount. Mark 2 of the diagonally opposed holes, illustrated below, and drill these through the chassis. Bolt the bracket to the chassis using the M5 bolts, nuts and washers supplied.
40	

CAREPOINT	QUALITY STANDARD
20	It is not necessary to drain the oil system.

SEQ	PART NUMBER	PART DESCRIPTION	QTY	F/C	TORQUE	TOOLING
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SEQ

ACTIVITY – PLUMBING IN THE ACCUSUMP

- 10 Referring to the Plumbing Schematic and the Illustration below assemble the Check Valve, T Piece and Hose Connections. Then, using the P clip wrapped around the Check Valve, bolt the assembly to the bracket as shown in the above illustration.

CAREPOINT

- 10 Please ensure that the check valve allows the flow of oil from the original oil cooler pipe to the oil filter sandwich block. Failure to do this will result in oil starvation to the engine and engine damage.

QUALITY STANDARD

SEQ

PART NUMBER

PART DESCRIPTION

QTY

F/C

TORQUE

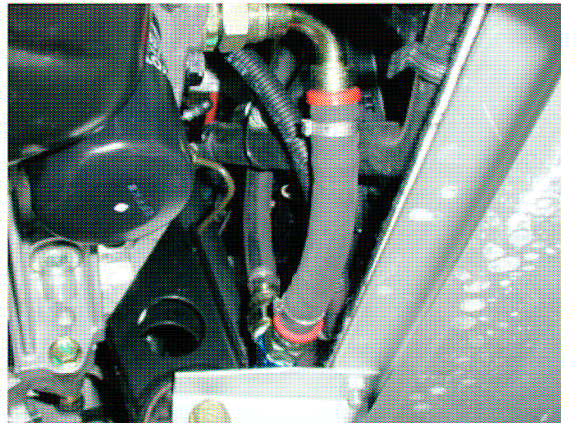
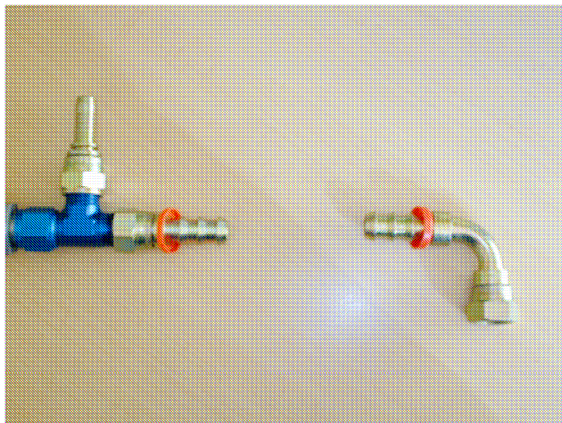
TOOLING



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SEQ

ACTIVITY – PLUMBING IN THE ACCUSUMP

- 10 Fit the 90° Connection to the Oil Filter Sandwich plate inlet connection with the hose connection facing the T Piece assembly. Then join the two assemblies together using the 5/8 hose supplied and secure using Oetega Clips. This connects to the right hand side of the T piece.

CAREPOINT

- 20 Please ensure that the check valve allows the flow of oil from the original oil cooler pipe to the oil filter sandwich block. Failure to do this will result in oil starvation to the engine and engine damage.

QUALITY STANDARD

SEQ	PART NUMBER	PART DESCRIPTION	QTY	F/C	TORQUE	TOOLING
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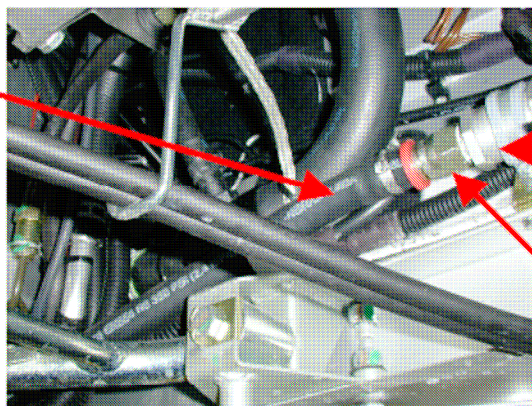
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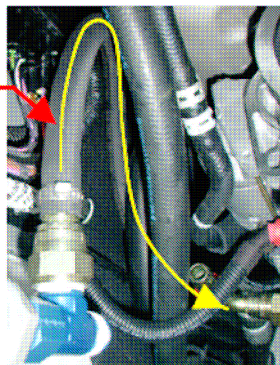
Original
Oil
Cooler
Return
Hose



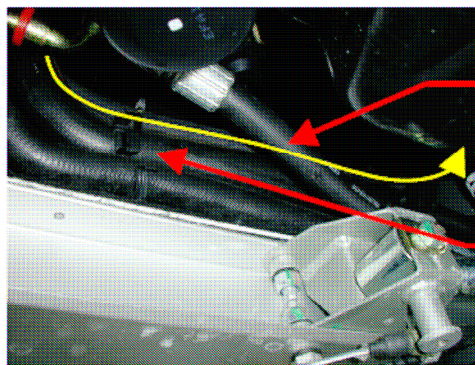
Check
Valve

New
Connection

Initial path
of 1/2" Hose



Path of 1/2"
Hose to RH
engine mount



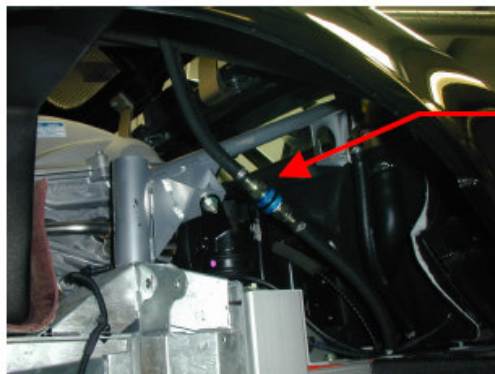
Coolant
Hose

SEQ	ACTIVITY – PLUMBING IN THE ACCUSUMP
10	Take the original Oil Cooler pipe, measure and cut to length and fit in a similar manner. This connects to the left hand side of the T Piece. It will not be necessary to use boiling water on this pipe.
20	Connect the 1/2" Hose to the remaining connection of the T Piece then feed it upwards for approximately 12 inches, then loop it so that it comes back down above the coolant hose. Cable tie the 1/2" Hose to the Coolant Hose and follow it routing to the right hand side of the vehicle. Continue routing the 1/2" Hose round the Engine bay, ensuring that the Hose is kept away from any sharp objects, until you reach the right hand Engine Mount.
30	
40	

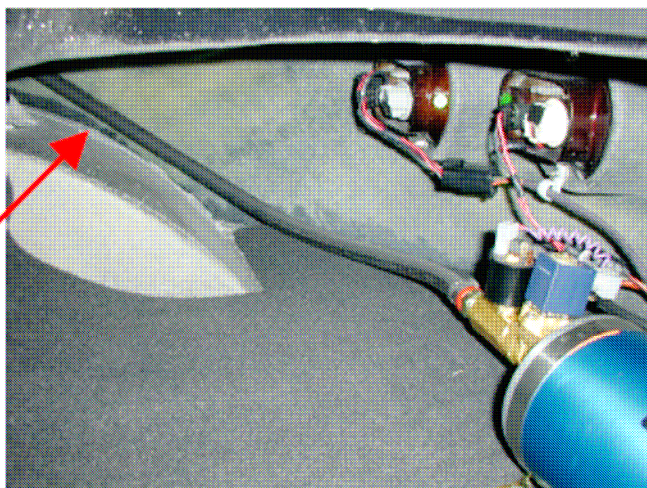
CAREPOINT

QUALITY STANDARD

SEQ	PART NUMBER	PART DESCRIPTION	QTY	F/C	TORQUE	TOOLING
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Secure Oil
Filter to RH
engine mount



Feed 1/2" Hose
through 25mm
Hole in boot

SEQ	ACTIVITY – PLUMBING IN THE ACCUSUMP
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- | | |
|----|---|
| 10 | Assemble the Accusump Inline Oil Filter and connections. Cut the hose and plumb in the filter. Cable tie the Filter to the Engine mount. Attach the Hose to the other end of the Oil Filter connection and continue the routing of the pipe towards the right hand rear of the vehicle. |
| 20 | Using the 25mm Hole Saw cut a hole in the rear boot face on the extreme right hand side of the boot box, ensure that the Tyre Inflation Canister is missed whilst drilling, then place the Grommet supplied in the hole and feed the Accusump pipe through this. |
| 30 | Feed the Hose to the Accusump and cut to length. Connect up the pipe, using the same method as previously mentioned, to the Accusump connector. |

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Fuse to be
removed



SEQ

ACTIVITY – ACCUSUMP WIRING

Electrical warning – please ensure that all necessary electrical safety procedures are followed during the Installation of this accusump. If in any doubt please consult a qualified vehicle electrician.

- 10 **DISCONNECT THE BATTERY EARTH LEAD (BLACK WIRE)** referring to Owners Handbook for Safety precautions.
- 20 Remove the front Access Cover
- 30 Unbolt the Fuse Box from its location and remove Fuse Number 7 (10A). Remove the green wire and terminal leading to this fuse, using the terminal extractor, from the back of the Fuse Box and cut terminal from the end of the wire. Join the original wire to the new green wire, supplied in the kit, refit with the new terminal and reassemble the fuse box with both the new wiring and the original fuse. Sheath the new green wire and refit the Fuse Box.

CAREPOINT

QUALITY STANDARD

SEQ

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F/C

TORQUE

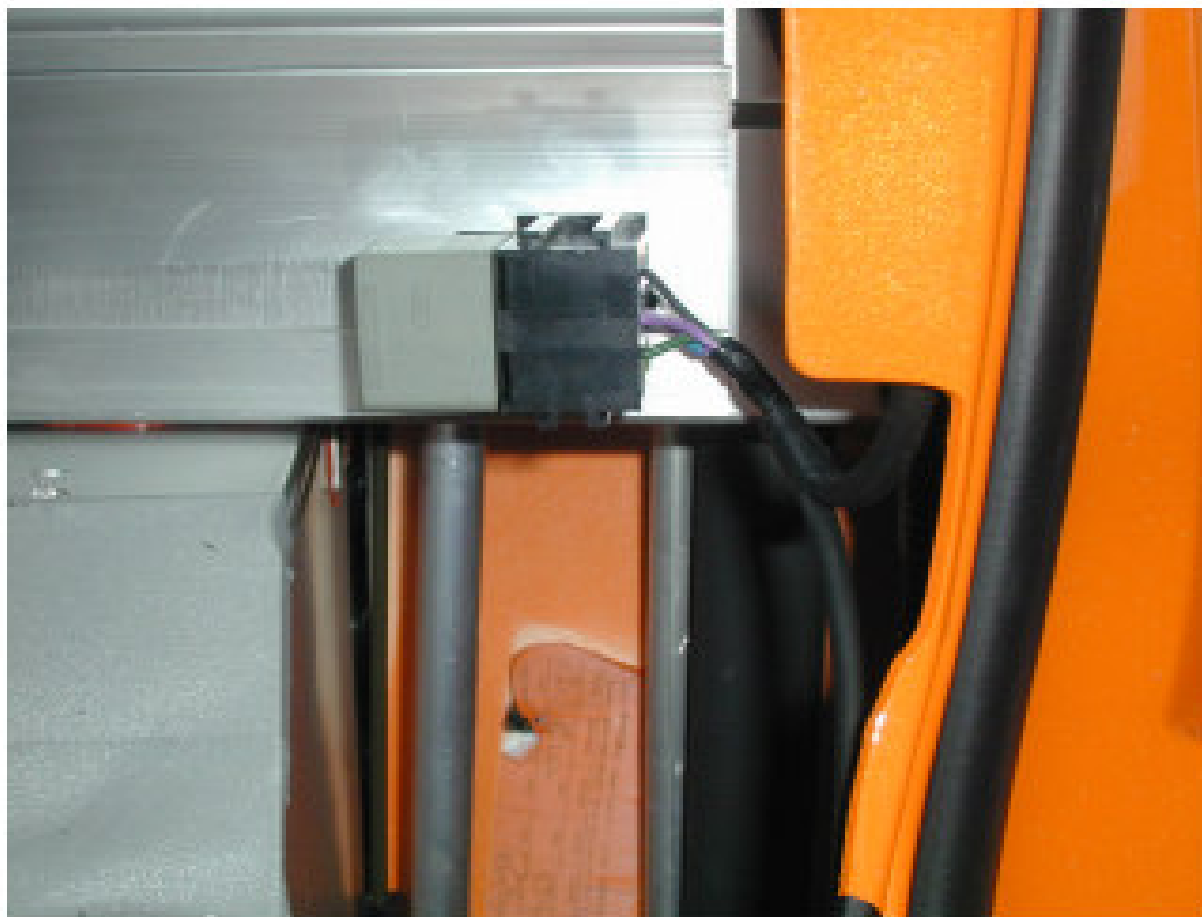
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SEQ	ACTIVITY – ACCUSUMP WIRING
10	Route the new wire across the vehicle and through the right hand sill on LHD cars and the left hand sill on RHD cars, if the vehicle has not got Air Conditioning then this can be fed through the hole for this; otherwise a new hole will need to be drilled. Use the grommet provided to ensure that chaffing does not occur.
20	From inside the vehicle, remove the right hand Speaker Cover, Speaker and Bracketry, Black ABS Triangular Panel (situated behind the Speaker) and the Dash Panel/Instrument Binnacle.
30	Fit the Relay and connection block, from the kit, to the mounting for the triangular ABS Panel, this is pop riveted in the same place. The green wire connects to this relay, cut this to length but do not connect at this point.
40	Remove the connection block from the Radio, if a Radio is not fitted this block should still be available for use. Remove the Black and Purple wires/terminals from the connection block and cut the Terminals from the ends. Then join together the old black wire with the new black wire, supplied, and fit the new terminal and the old purple wire to the new purple wire and fit the other new terminal. Refit these to the connection block and reconnect to the radio if desired.
50	Sheath the new wires together and route them both towards the relay, fitted in Cut to length. Fit the new female spade connectors to the new purple, black and green wires and connect to the relay as follows: -

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TORQUE

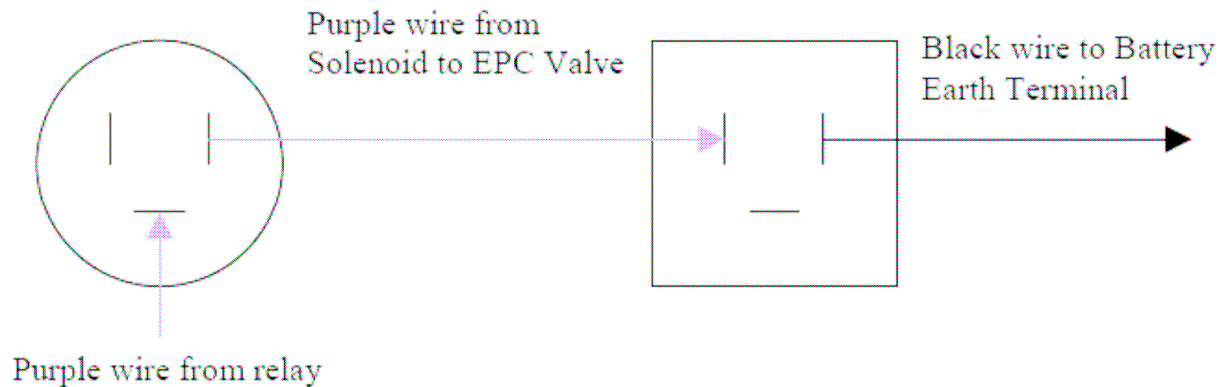
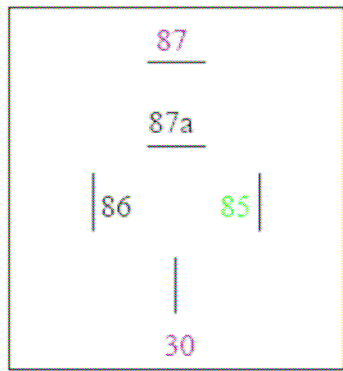
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SEQ	ACTIVITY – RELAY WIRING CONNECTION GUIDE
10	Green wire from fuse box – to port 85 Purple wire from Radio block – to port 30 Black wire from Radio block – to port 86 Port 87 is utilized in to connect to the Accusump, see section 10. of these instructions. Port 87a is left blank.
20	Fit the remaining female spade connector to the length of purple wire left over from previously and connect to port 87 of the relay. Sheath this wire and route this inside the sill so that it comes out above the Sill crash foam. It is then cable tied to the ½” hose used for the Accusump feed hose earlier. Follow the routing for this hose up to the boot compartment.
30	Drill a 12mm hole in the boot compartment, next to the Accusump Hose, fit the grommet supplied and continue to route the purple wire and protective sheath through this and then, once again, follow the hose routing to the Accusump.
40	The purple wire connects to the Solenoid valve, as illustrated below, using the terminal provided. From this valve another smaller length of wire is used to connect the solenoid to the EPC Valve, also illustrated. Make this wire and fit as shown.
50	Using the remains of the Black wire from earlier, sheath and connect to the terminal shown above then route this wire along the wiring harness for the rear lights, situated on the rear of the luggage compartment, towards the Battery. Fit the Ring terminal supplied to the negative side of the Battery and reconnect the Battery earth lead.

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SEQ	ACTIVITY – RELAY WIRING CONNECTION GUIDE
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- | | |
|----|--|
| 10 | Test the system to ensure it is functioning correctly. To do this simply start the engine and read the pressure shown on the dial indicator fitted to the Accusump. This should read approximately 80psi when the engine is cold. Then turn the Ignition Key to position 2 on the switch (engine off but ignition lights still on) and check the dial indicator again, the pressure should slowly drop to the original setting, 7 to 15 psi. One final test is to then start the engine again and have the dial indicator on approximately 80psi then shut the engine off totally very quickly. This should trap some of the pressure inside the Accusump indicating that the Solenoid is functioning correctly. For full details of this please refer to Accusump Information Sheet (ALS3T0001K). |
| 20 | Ensure that all wiring is tidy and routed safely, refit the Dash Panel and front Access Cover. When refitting the Speaker Cover it will be necessary, if Speakers are not fitted to the vehicle, to fit the Speaker Mounting Bracket as a support for the Speaker Cover, please refer to the Lotus Service Manual for fitting instructions for this part. |
| 30 | Fit the Accusump Warning Labels to the Engine Cover, as illustrated below. |
| 40 | |

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ACTIVITY – FINAL SETUP

Check the Oil Level and top up as necessary to the maximum mark on the dipstick.
Pressurize the Accusump to 50 psi and then bleed the system to between 7 and 15psi. Please refer to Accusump Information Sheet (ALS3T0001K) before commencing this operation.

- 10 Once the Accusump is mounted and the plumbing installed take some time to set the Accusumps precharge. Improper pre-charge can result in many problems. To ensure your Accusump will work correctly follow the steps listed here.
- 20 With the valve in the open position (electric units energized) and the engine not running; pressurize the Accusump to 50 psi. This will ensure all the oil is out of the unit and the piston is all the way to the oil end. While the Accusump is pressurized to 50 psi check all the fittings (gauges and lines) for leaks. Apply soapy water to each area and check for bubbles. If possible, wait overnight to ensure there is no loss of pressure. For the unit to operate correctly there cannot be any leaks in the airside. Temperature change will affect pressure.
- 30 Once you are sure there are no leaks, bleed down the air pre-charge to between 7 and 15 psi. Now when you start the engine and open or energize the valve, the pressure in the airside of the Accusump should increase to approximately that of your engine oil pressure. After you close the valve and shut your engine off, check your oil level. Add oil as required to compensate for the oil being held in the Accusump.
- 40 Under normal conditions the pre-charge should not need resetting after the initial set up. However, if a leak occurs or if the unit's pre-charge seems to have changed you may need to reset your pre-charge to ensure your Accusump performs correctly. To reset your pre-charge, set the valve to the open position (electric units energized) while the engine is not running; and pressurize the Accusump to 50 psi. Next bleed down the air pre-charge to between 7 and 15 psi.
- 50 Under no circumstances should the safety valve be removed, as this will void the warranty. If oil leaks from the safety valve, be sure that it is sealed with Teflon tape and tightened; the safety valve is hand tight when delivered and requires final tightening after installation of the Accusump valve. If oil still leaks from the safety valve, there is a problem in the installation. These valves are very reliable and are set to open at 175 PSI, which is far above the pressure the unit would see if installed correctly.

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SEQ	ACTIVITY – TESTING
10	Check the Accusumps ability to fill.
20	Make sure your Accusump is working correctly. After the pre-charge has been set according to the installation instructions, run the normal engine shut down procedure: with the engine oil pressure up, close the valve on the Accusump (cut the power to electric units) and shut the engine off. The pressure showing in the air gauge should be close to what the engine oil pressure was during shut down. The oil level in the oil pan should be at the full mark.
30	Check the Discharge
40	Power up the electric units with the engine off. You should hear the oil discharge into the engine and see the pressure on the air gauge drop down to the pre-charge setting and the pressure on the engine's oil gauge go up. If not, reset the pre-charge. The engine oil level will be above full by the amount that was stored in the Accusump.
50	Check the Refill
60	Start the engine, establish good oil pressure, oil should enter the Accusump and the air pressure should increase to approximately that of the engine oil pressure.

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Disclaimer

Lotus accepts no liability for any direct, indirect or consequential damage or loss (including as a result of negligence) arising from the application of these fitting instructions by any person. For the avoidance of doubt, this does not affect your statutory rights and Lotus does not exclude liability (if any) to you for death or personal injury arising out of Lotus' negligence.

Please note that the fitting of any Lotus approved part(s) by anyone other than a Lotus approved engineer may invalidate the vehicle warranty.