

Citroen XM Strut Top Repair Manual



This is not a sight you want to see.

Contents

1.0	Acknowledgements	3
2.0	Background	4
3.0	Anatomy of a Strut Top	5
4.0	Common Failure Modes	6
5.0	Repair Type 1	9
6.0	Repair Type 2	11
7.0	Repair Type 3	14
8.0	Repair Kits	15
9.0	Disclaimer	17

Appendix A – Removing a strut top from the car

Appendix B – Refitting a strut top to the car

Appendix C – Aligning the parts of the strut top for left and right handed versions

Version 1.0	<i>Released as Draft. Further revisions will be issued in due course. Appendices A & B to be completed. Appendix C to be added. Check the Self-Help section here for updates: club-xm.com/forum</i>
-------------	--

1.0 Acknowledgements

The photos and diagrams contained in this repair manual were taken from the following sources:

- Club-XM.com/forum (thanks to Paul aka 'minijet' and Ken aka 'kenhall1202')
- <http://www.aussiefrogs.com/forum> (thanks to 'GreenBlood' although he in turn credits XM-L but I can't find who owns the photos. If the owner lets me know I will edit the acknowledgements)
- The author's own photographs

2.0 Background

There are many reasons why a Citroen XM reaches the end of its useful life. It's usually at the point where the repair cost to keep it on the road approaches or matches its residual value. For the real enthusiast the repair cost may even be more than the value of the car but is judged to be an acceptable expense to keep the car on the road.

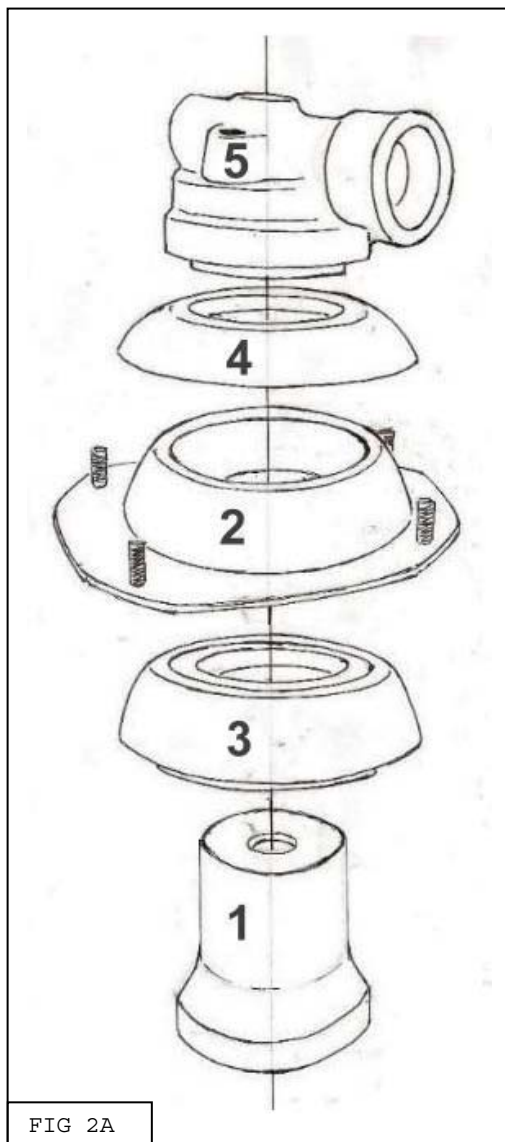
Inevitably the reasons to scrap an XM will naturally fall into groupings of common failures. These are likely to reflect design or manufacturing weaknesses in the original assembly. Of these, one failure would appear to stand head and shoulders above all others and that is the failure of the Strut Tops, Strut Mountings or as they are called in the Citroen parts manual, "Sphere Brackets". The failure of these parts probably results in the scrapping of more XMs than all other failures.

The strut tops are the assemblies which provide the fixing mechanism between the body of the car and the suspension strut (often called a MacPherson Strut after the designer). They are fixed to the underside of the inner wings and the upper part protrudes through a hole in the wing. The strut top has a hydraulic connection from the suspension pipe network and also has a sphere attached to provide the 'spring' and the 'damper'.

There are two components which are part of the strut top assembly which are bonded together with a rubber compound injected into the annular gap between them. The anchor plate has a cone-shaped section formed on it probably by a metal spinning process. It would appear that the anchor plate is not annealed after the spinning or stamping process so the cone part of the plate has the stresses of that process locked into the steel. These stresses result in accelerated surface oxidation which in turn delaminates the moulded rubber from its surface.

3.0 Anatomy of a Strut Top

An exploded view of the parts of the strut top are shown below (sketch courtesy of Paul aka minijet from Club-XM.com) :

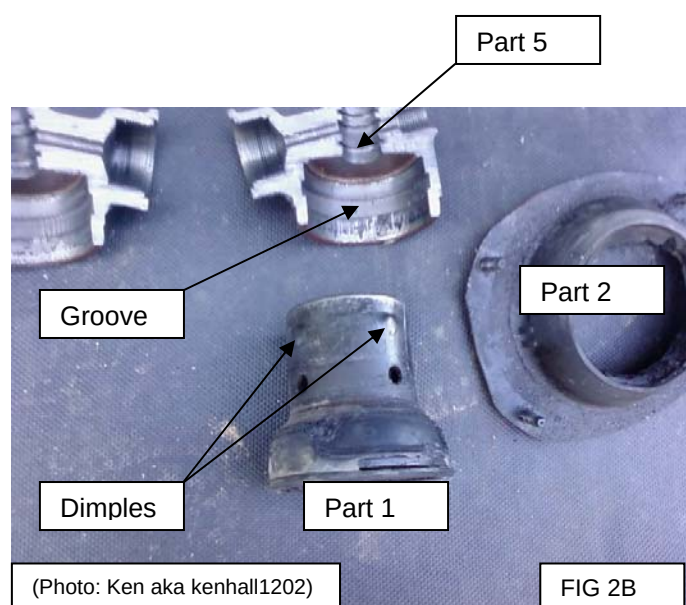


This is a photo of an old strut top with an early design of retaining dimples. Originally only 4 dimples were used but due to a number of failures this was increased to 10.

Since all of these components are sold assembled as a complete part there are no official names for the individual components. Therefore we will name them here for future reference (again taking the lead from Paul's annotation of the attached drawing)

- Part 1 – Lower Steel Cylinder
- Part 2 – Anchor Plate
- Part 3 – Injection Moulded Rubber
- Part 4 – Dust Shield
- Part 5 – Upper Hydraulic Block

It is envisaged that, in the factory, Parts 1 and 2 are assembled in a jig. They are then placed in a mould and the rubber (Part 3) is injected into the annular gap between the two parts adhering to the inner surfaces in the process. The assembly of Parts 1, 2 and 3 is then offered through the dust cap (Part 4) before entering the upper hydraulic block (Part 5). To lock Parts 1 and 5 together, a mandrel is entered into Part 1 from below and approximately 10 ball bearings are made to expand outwards. This stretches the steel body of Part 1 in a series of dimples which locate in an annular groove machined on the inside of Part 5. The dimples, having been expanded into the groove prevent Parts 1 and 5 from coming apart. The assembly of parts 1, 2 and 3 are not handed and would fit the right or left hand side of the car at this point in their manufacture. However, when Part 1 is offered up into Part 5, the two parts are aligned which results in the finished component being left or right handed accordingly.



4.0 Common Failure Modes

The first common failure is the deterioration of the rubber itself. After some time the Rubber Moulding (Part 3) appears to be 'torn' out of its fixings. This may occur if the strut top is subjected to greater forces than those for which it was designed. This can occur if the car is run with flat spheres and therefore the shock coming up through the strut from the roadwheel is transmitted directly through the rubber due to the lack of a 'spring' in the sphere. To make matters worse, the lower section of Steel Cylinder (Part 1) is a smaller diameter than the central hole at the top of the cone in the Anchor Plate (Part 2). When the moulded Rubber (Part 3) finally fails, the strut pushes Parts 1, 3, 4 and 5 upwards and through the inner wheel arch leaving the Anchor Plate Part 2 behind.



There is not enough space inside the engine compartment to accommodate this extra height and therefore the strut top pushes on the inside of the bonnet lid bending it up locally in the process. This bend in the bonnet is usually severe and can sometimes break the bonnet hinges at the side closest to the failed strut top.



Here you can see the strut having pushed the strut top clear of the body and the lower part of the strut sticking through the hole that is left.



When the Anchor Plate Part 2 is removed from the car after failure this is what it looks like:



As you can see the rubber appears to be 'torn' out of the anchor plate.

Once removed from the car the associated strut top looks something like this:



Part of the lower rim at the right hand side is missing. It is likely that this was sheared off resulting in the reduction of the diameter to allow it to pass up through the cone section of the Anchor Plate (Part 2).

A second failure mode is the delamination of the Moulded Rubber (Part 3) from the Anchor Plate (Part 2). I believe this is caused by the surface corrosion of the Anchor Plate (Part 2) due to the stresses left in the cone section during cold working with no annealing treatment afterwards. The surface to which the rubber is bonded corrodes and spalls leaving a thin film of rust bonded to the rubber but separated from the remainder of the cone. Once the rubber has delaminated from the steel cone it is then free to rotate and rise and fall with the strut. Although the rubber begins at a larger diameter than the hole in the cone on the Anchor plate, repeated impacts breaks the rubber down until at some point it can fit through the cone. Once this happens the results are the same as shown above.

A third failure mode is a slight variation on the above. In this case the cone on the Anchor Plate (Part 2) corrodes so badly that the actual steel cone fails again allowing the steel Cylinder (Part 1) complete with Moulded Rubber (Part 3) attached to come right up and through the bonnet.

So, regardless of the failure mode the end results are the same. The bonnet is damaged and would require a good bodyshop to straighten and repair the bonnet to a condition where the damage is hidden. The hydraulic piping connected to the Hydraulic Block (Part 5) is usually damaged and requires to be replaced. And finally there is a new strut top is required which, at the time of writing, is approximately £400 from Citroen, if they can actually source the parts.

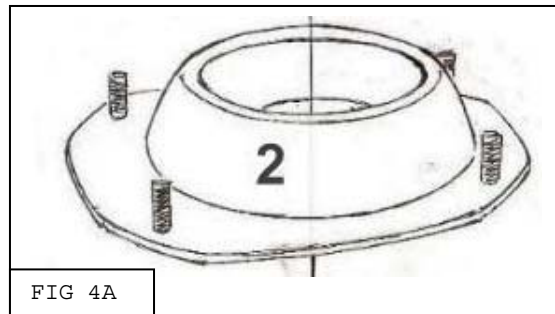
However, help is at hand. In the next section

5.0 Repair Type 1

The repairs are listed in order of the severity of the failure. Repair Type 1 is not only a repair. It can be regarded as a preventative measure for strut tops which are still in good or fair condition. It is designed to halt the deterioration at the level it has currently reached and extend the life of the existing strut tops, probably until the end of life of the car as a whole.

The repair consists of adding a plate to the underside of the existing Anchor Plate (Part 2). To do this the strut top must be removed from the car (See Appendix A for removal instructions)

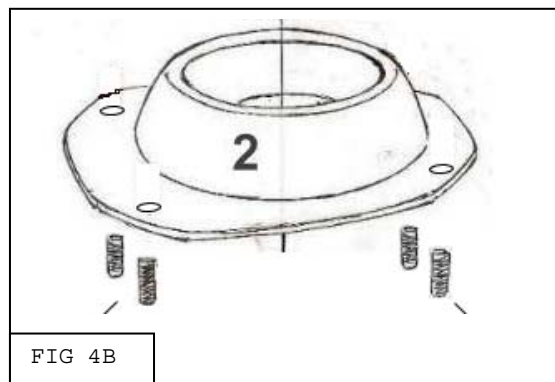
The Anchor Plate (Part 2) is shown here without the Rubber Moulding (Part 3), the Dust Shield (Part 4) and the Hydraulic Block (Part 5) for clarity.



Press the captive studs out of the Anchor Plate (Part 2).

Carefully clean the underside of the Anchor Plate (Part 2) so that no dust, mud or salt remains. The cleaner this is the longer it is going to last.

Clean the top half of the Anchor Plate (Part 2) as best you can. Cleaning under the Dust Shield (Part 4) will be difficult. If already torn, remove the thin rubber coating on the upper cone of the Anchor Plate (Part 2).



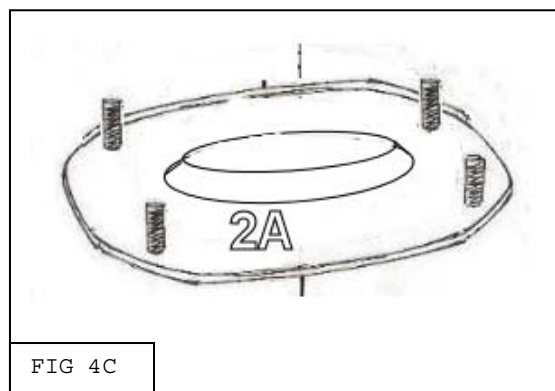
Press the captive studs into the new Repair Plate (Part 2A).

Coat the underside of the Anchor Plate (Part 2) and the upper side of the new Repair Plate (Part 2A) with a good quality wax sealant.

Offer up the new Repair Plate (Part 2A) to the underside of the Anchor Plate (Part 2) passing the studs up through the original holes in the Anchor Plate (Part 2).

Press the Anchor Plate (Part 2) and the new Repair Plate (Part 2A) together.

Now carefully coat the upper and lower parts of the Anchor Plate and Repair Plate with the same high quality wax sealant.



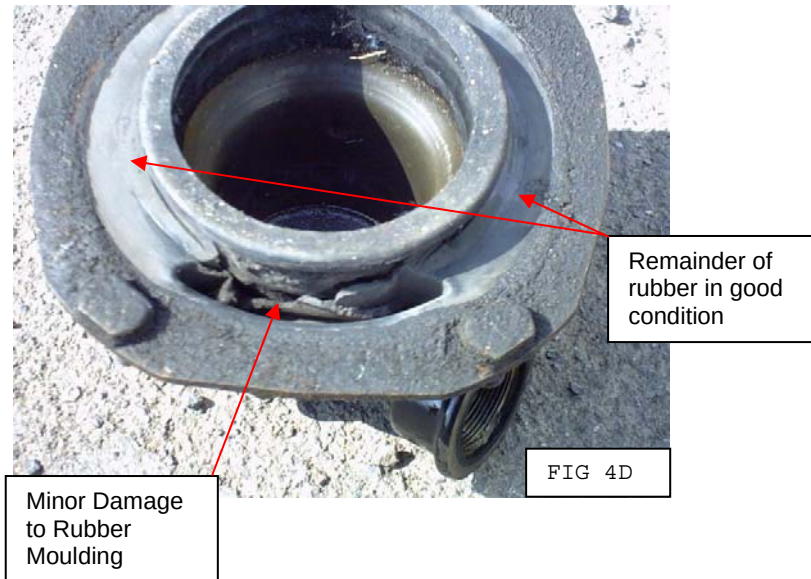
If the Moulded Rubber (Part 3) had started to separate from the Anchor Plate (Part 2) simply clean as best as you can and squeeze some wax sealant into the gap to keep the moisture and the salt out. If the rubber had become completely detached then the assembly of Parts 1, 3, 4 and 5 will need to be aligned with Parts 2 and 2A at the correct angle before tightening the nuts on Part 2A. (see Appendix C for alignment details)

Although not clear on FIG 4B, the centre hole has a bevel upwards which pushes into the Moulded Rubber Part 3 to prevent it moving.

The studs should be long enough to pass through the holes in the inner wing so that the original securing nuts can be refitted

Refit the strut top to the car (See Appendix B for refitting instructions).

This is an example of a Rubber Moulding Part 3 which has started to deteriorate but is salvageable:



This is another strut top which would be suitable for this type of repair. Although the rubber moulding Part 3 has become completely detached from the Anchor Plate Part 2 it is still in good condition and still fully adhered to the Steel Cylinder Part 1.

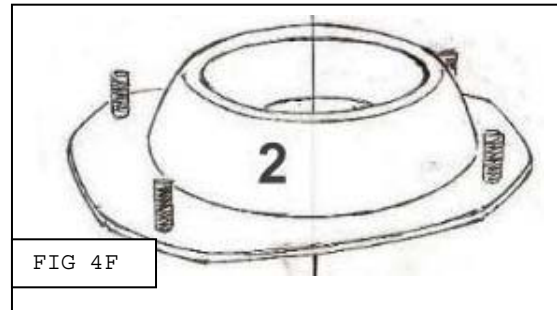


Ultimately it is a judgement you must make whether the rubber moulding is suitable for reuse. There are too many permutations of partial degradation to analyse them here. If you are in any doubt as to the suitability for reuse then consider Repair Type 2.

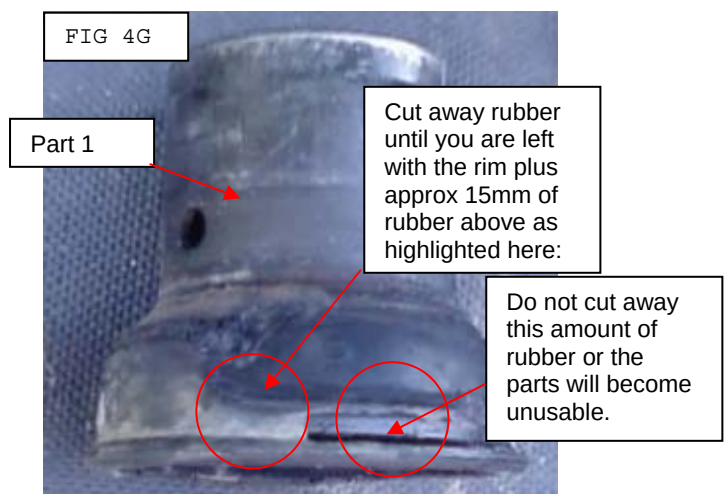
6.0 Repair Type 2

This repair is required when the Rubber Moulding Part 3 has deteriorated so such a degree that it is considered not to be reusable. In which case the Rubber Moulding (Part 3) should be replaced with a Repair Moulding (Part 3A) and a new Repair Plate (Part 2A) fitted to the underside of the strut top. To do this the strut top must be removed from the car (See Appendix A for removal instructions)

The Anchor Plate (Part 2) is shown here without the Rubber Moulding (Part 3), the Dust Shield (Part 4) and the Hydraulic Block (Part 5) for clarity.



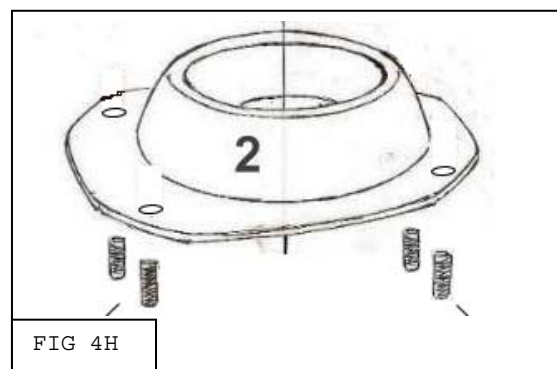
Using a long sharp blade cut the rubber moulding out of the gap between the cone of the Anchor Plate (Part 2) and the cone of the Steel Cylinder (Part 1). However, do not remove the rubber rim on the lower edge of the steel cylinder. This rubber edge must be retained because the gaiter which covers the strut ram is secured using this rubber rim. If you remove it there will be no support for the gaiter. Cut out all of the rubber until there is none left except the rubber edge on the bottom of the Steel Cylinder (Part 1). The Anchor Plate (Part 2) should now be able to be separated completely from the assembly of Parts 1, 4 and 5.



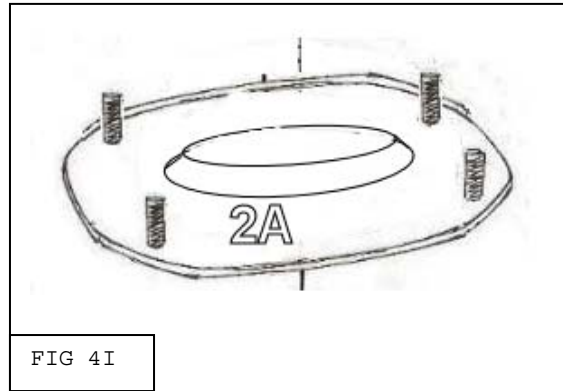
Press the captive studs out of the Anchor Plate (Part 2).

Carefully clean the underside of the Anchor Plate (Part 2) so that no rust, mud or salt remains. The cleaner this is the longer it is going to last.

Clean the top half of the Anchor Plate (Part 2) as best you can. Cleaning under the Dust Shield (Part 4) will be difficult. If already torn, remove the thin rubber coating on the upper cone of the Anchor Plate (Part 2). Clean off all the rust from the cone. Treat with rust inhibitor.

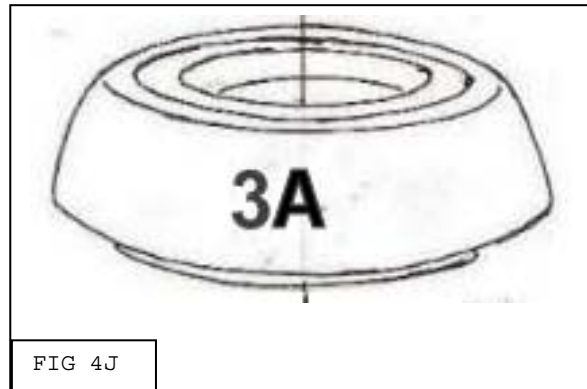


Press the captive studs into the new Repair Plate (Part 2A).
Coat the underside of the Anchor Plate Part 2 and the upper side of the new Repair Plate (Part 2A) with a good quality wax sealant.



If the upper assembly of Parts 1, 4 and 5 have been separated from Part 2, reassemble now by passing Part 1 down through the hole in the cone of Part 2.

Stretch the new Rubber Moulding (Part 3A) over the rubber rim at the bottom of the Steel Cylinder (Part 1). This will be difficult. Do not apply lubricant to help get it over the rim since the lubricant will then allow the new Rubber Moulding (Part 3A) to slide up and down on the Steel Cylinder (Part 1) and you don't want that to happen.



Once the new Rubber Moulding (Part 3A) is beyond the rim at the bottom coat the outer surface of the Steel Cylinder (Part 1) with the injectable rubber compound. Also coat the inside of the cone on the Anchor Plate (Part 2). Offer up the new Repair Plate (Part 2A) to the underside of the Anchor Plate (Part 2) passing the studs up through the original holes in the Anchor Plate (Part 2). Press the Anchor Plate (Part 2) and the new Repair Plate (Part 2A) together. Before tightening the nuts on the 4 studs the Anchor Plate (Part 2) must be correctly aligned with the remainder of the components since the strut tops are sided. It is still possible at this point to choose whether to make a left hand or right hand strut top. See Appendix C for the correct handings.

The order of assembly is shown in Fig 4K.

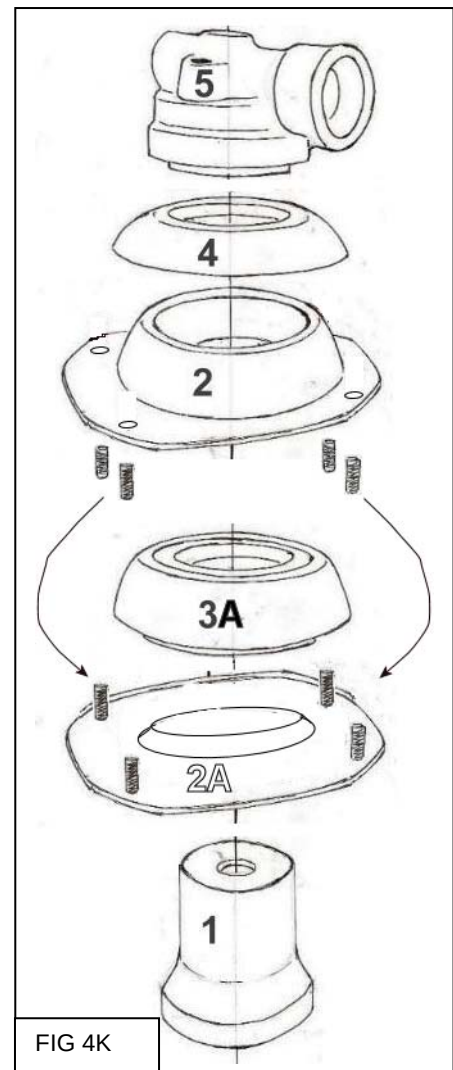
Now carefully coat the upper and lower parts of the Anchor Plate and Repair Plate with the same high quality wax sealant.

Coat the lower surface of the Moulded Rubber (Part 3A) with some wax sealant to keep the moisture and the salt out.

Although not clear on FIG 4K, the centre hole has a bevel upwards which pushes into the Moulded Rubber (Part 3A) to prevent it moving.

The studs should be long enough to pass through the holes in the inner wing so that the original securing nuts can be refitted

Refit the strut top to the car (See Appendix B).



7.0 Repair Type 3

This repair is required when the Anchor Plate (Part 2) is too badly corroded to re-use. In which case the Anchor Plate must be salvaged from another failed strut top or a new, remanufactured Anchor Plate (Part 2B) must be fitted.

Once in possession of a salvaged or remanufactured Anchor Plate follow the instructions for Repair Type 2.

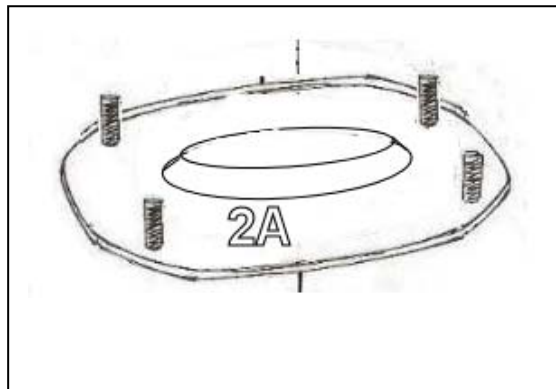
8.0 Repair Kits

The repairs listed in Section 4 require new parts to be fitted as part of the repair.

The repair kits are as follows:

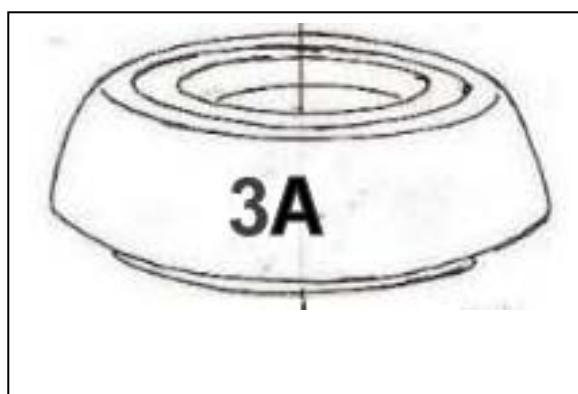
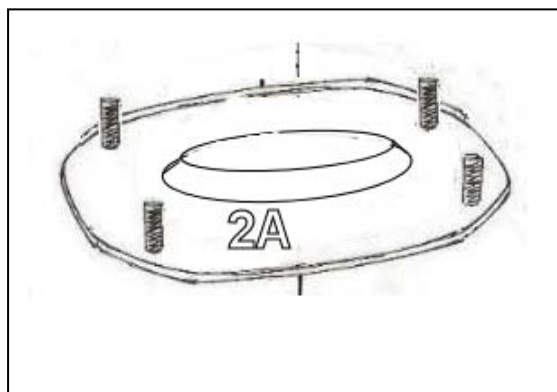
Repair Kit No. ST-RK01

This repair kit consists of a new Repair Plate (Part 2A)



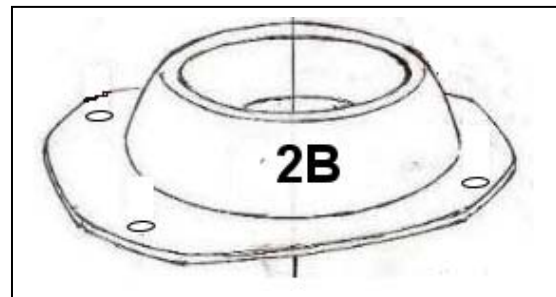
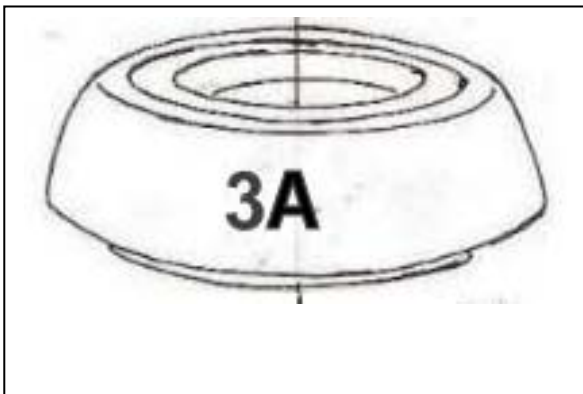
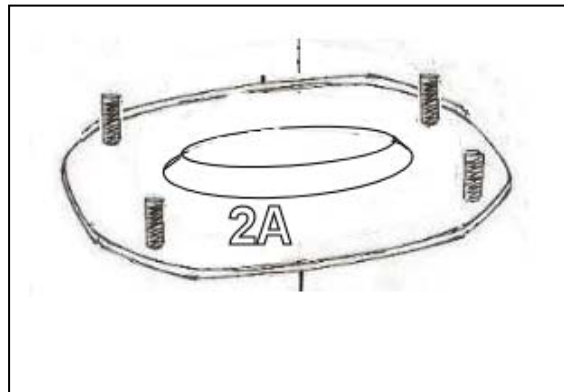
Repair Kit No. ST-RK02

This repair kit consists of a new repair Plate (Part 2A) and a new Rubber Moulding (Part 3A).



Repair Kit No. ST-RK03

This repair kit consists of a new repair Plate (Part 2A) and a new Rubber Moulding (Part 3A) and a remanufactured Anchor Plate (Part 2B).



9.0 Disclaimer

And now for the nasty bit....

As we all know we live in very litigious times. We have been brainwashed into believing that for every accident there must be a perpetrator. It is not acceptable that an accident just happens. Someone must be accountable and that someone must be sued and because of that risk everyone now needs insurance. Personal accountability has been all but eliminated.

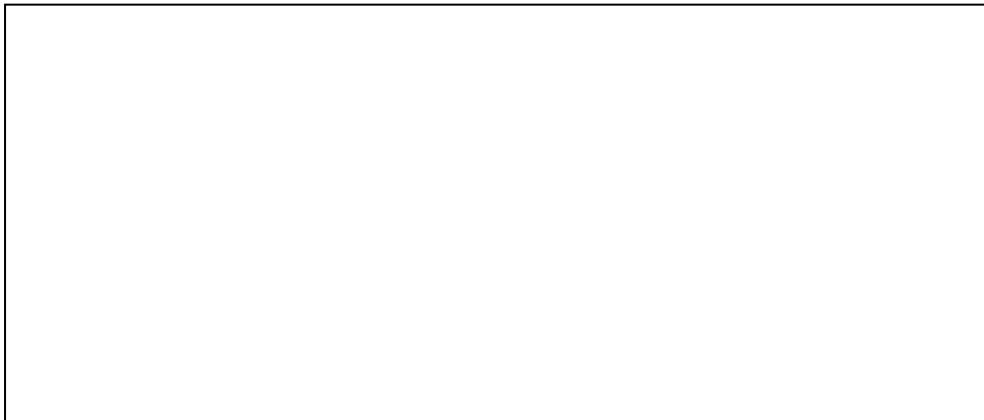
I'm sorry, I don't live in that world. I believe in personal responsibility and accountability.

The purpose of this manual is to assist the owner of a Citroen XM to keep his or her cherished possession in working order for as long as possible. It is aimed at responsible adults who understand the concept of personal responsibility. When deciding to utilise any of the information contained in this manual it is incumbent on the reader to act like a sane, sound-minded adult human being, assess the risks and take the appropriate action. If you are the kind of person who, when faced with a failure of your strut top with any permutation of consequential effects, will come looking for someone to sue then you are the wrong person to be reading this manual. **If this is you then you are expressly forbidden to read or implement any ideas or concepts contained in this document. You are in a dangerous place and should leave immediately. This manual is not for you.**

For the rest of the responsible, sane adults I hope you will find this manual of use.

The author cannot be held liable for any damages no matter of what magnitude as a result of implementing any of the ideas or concepts contained in this manual. Any use of the information is at the sole risk of the reader and implementer of such ideas and concepts. If you do not agree to this then you should burn this manual and purchase your new strut tops from Citroen.

Now it is likely that this manual will be read by some whose first language is not English. For those people, you must take a copy of this page and put it into an online language translator. No liability will be accepted on the basis of not being able to read or understand English.



The box above contains the strongest legal disclaimer in the world. It is valid in every single legal justice system in the world. The disclaimer is written in every conceivable language existing on this planet. Do not be fooled into thinking the box is empty. That disclaimer absolves me of any liability whatsoever. If, as a result of implementing any ideas or concepts in this manual, the unthinkable happens, don't even think for one millisecond about coming back here to complain or sue. I am ex-directory, operate under a pseudonym and live off-shore. Furthermore, and most importantly, I have **no money**. Suing me would gain you precisely nothing.

I hope I have made myself crystal clear. If you are in any doubt whatsoever, please put this manual in the bin.

Appendix 1

Removing a strut top from the car.

There follows a description for the removal of the strut top from the car.

Appendix B

Refitting a strut top to the car.

There follows a description for the refitting of the strut top to the car.

Appendix C

Aligning the upper and lower sections of the strut tops.

There follows a description for the correct alignment of the lower and upper parts of the strut top to achieve the left and right handings.