SUNBEAM TIGER OWNERS ASSOCIATION

TECHNICAL TIPS

ON THE SUNBEAM TIGER

June 1999

URETHANE BUSHINGS AND ALL STEEL BALL JOINTS ARE FINALLY AVAILABLE

At long last, the wait for a good quality urethane suspension bushing for Tiger enthusiasts is over. Rick at Sunbeam Specialties is expecting his first production run in mid July 1999. Many owners have waited patiently as this vital component was developed. The manufacturing quality of the old rubber based "Metalastic" bushings and their sporadically available alternatives have been going downhill in quality for several years. This urethane bushing development project has been a long program but we all hope that the final results will make our Tigers handle and perform even better than ever.

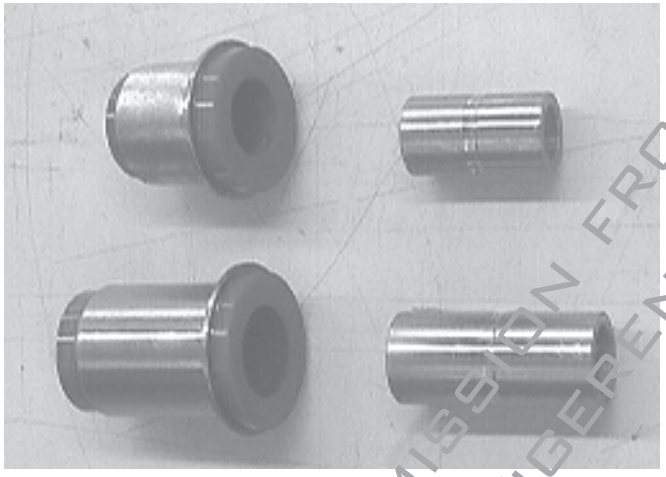


Figure1. The Urethane Bushings with their inner sleeve tubes. Note that the tubes shown have been modified with a radial groove at the center for uniform grease distribution.

The new urethane bushings will be available in two hardness levels. The black urethane compound is intended as a standard replacement for the OEM rubber bushings and are specified as having a durometer rating of about 70. The red urethane compound is intended for high performance applications and will have a durometer of about 95. Other than the compounds, the bushings will be otherwise physically identical. Rick's (SS) part numbers will be found near the end of this Tech Tip.

There are two differences in the design of these urethane bushings that are important to understand. The first is that urethane bushings are designed to "rotate" on a surface as opposed to the OEM rubber bushings which operate by twisting the rubber between the bonded shells without actually rotating. This means that the rotational surface must remain smooth and rust free in order to prevent that annoying squeak that frequently develops in solid bushing installations. The second difference is that the cross-section of the urethane is about half that of the OEM rubber bushings. This will tend to make the bushings "feel"stiffer and more responsive because there is less room for them to deflect. In order to avoid the potential for the development of squeaks, Rick requested that the bushing manufacturer use a stainless steel material for the inner sleeves that the bushings actually pivot on. Like many manufacturers they think they know better and rejected the idea. They stated that they had never had a problem with squeaks as long as you used their grease at the time of assembly. Taking all that with a few grains of salt and many years of experience with solid bushings, this installation tip recommends two possible alternatives that will make silent operation a more assured outcome.

The first alternative is to replace the sleeves supplied with stainless replacements. They are simple tubes to fabricate and Rick may end up offering them as an accessory in the future. A sketch of these tubes will be found at the end of this tip for those that would rather do it themselves. The second alternative is to install grease fittings that will allow lubrication to reach that twisting surface. The photos and descriptions in this tip show this second method of assembly.

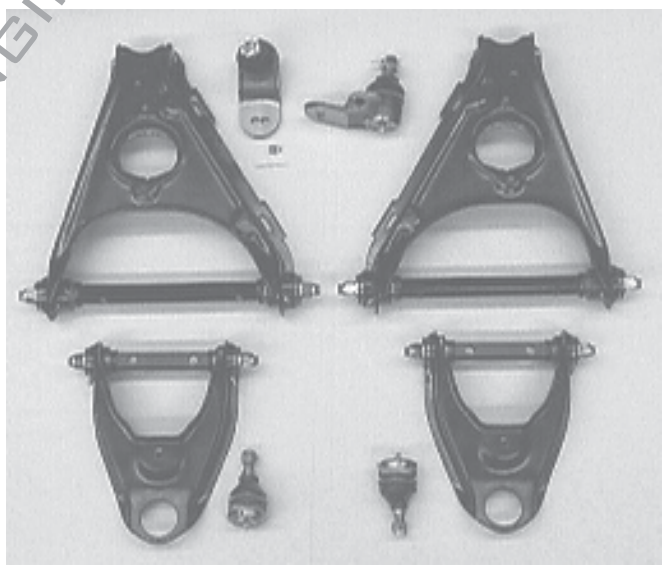


Figure 2. Here's the completed A-Arm sub-assemblies ready for Ball Joint fitting and installation. These ball joints and bushings are Rick's latest suspension components.

Fortunately for us, the manufacturer provided Rick with a prototype set of the urethane bushings in advance of production and that allowed the double checking of production dimensions and the following pictures and descriptions to be developed. It also allowed me to develop a set of drill fixtures which properly guide the modifications that locate the grease fittings. These locations were selected to allow easy access for the grease gun and proper grease distribution to the bushings rotational surfaces. The grease fittings modifications shown would be appropriate for any solid bushing installation. Unfortunately,

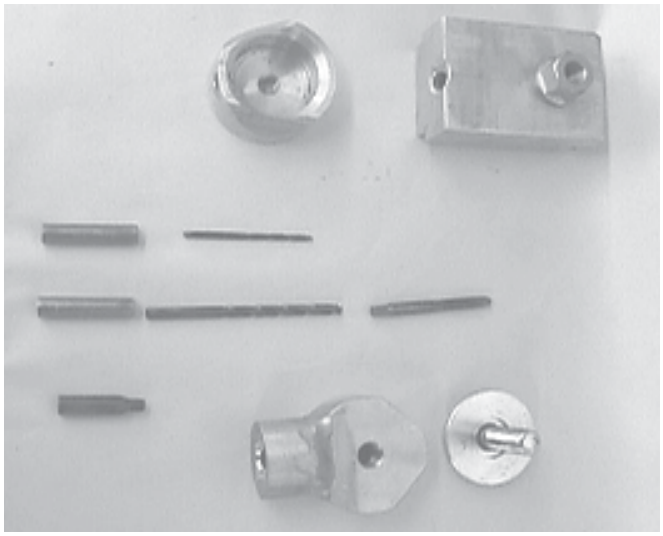


Figure 3. Here's the three drill alignment fixtures and bushings for drilling and tapping the A-Arms and then drilling through the installed bushings to the rotating surface. The three fittings allow straight or angled penetrations as require for optimum lubrication distribution and installed access.

the Tiger A-Arms are not easily fixtured and held for modifications on a drill press or milling machine. The drill fixtures depicted herein are made to bolt directly to the A-Arms and allow the use of a hand held electric drill. These fixtures allow drilling, threading and fitting installations at the optimum locations without machine tool requirements. They are used once after disassembly and cleaning to drill and tap the holes for the grease fittings and again after welding, painting and bushing installation and assembly to drill and complete the "path" which allows the grease to reach the inside rotational surface.

The first step in the rebuilding process is to remove the old bushings and fulcrum pins. All of this suspension repair work requires specialized tooling including custom fixturing, hydraulic press, lathe and preferably blast cleaning equipment. Care must be taken to minimize the distortion of the A-Arms during disassembly. Long

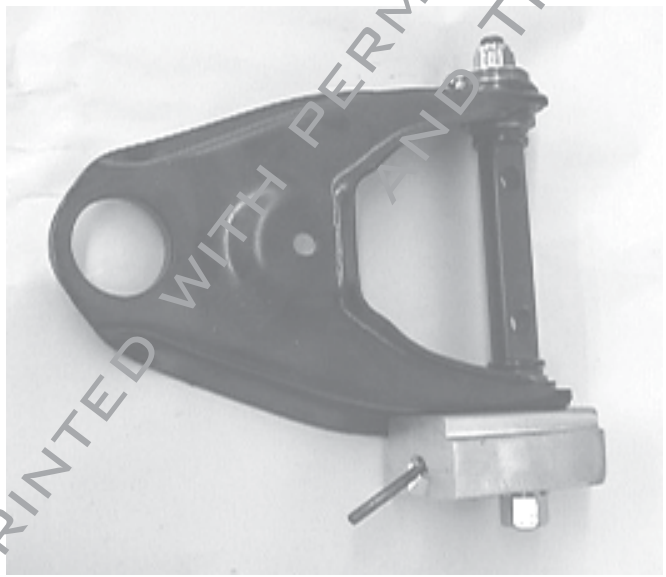


Figure 4. Here's the drill fixture mounted on the upper A-Arm with the #3 tap drill protruding. Note that this modification would normally be done before bushing installation

term degradation and rust make this process difficult and it's not something to attempt at home if you don't have access to the proper equipment. Even with proper equipment, it is not unlikely that you will deform some of the components, such as the beveled thrust washers on the fulcrum pins thus requiring repair or replacement. This Tip is not intended to be a step-by-step procedure for bushing removal and installation but rather an overview and recommendations which will allow you to understand the process.

Another topic which must be considered at this point are the controversial lower fulcrum pins. It has been pretty well established that Tigers that have seen a lot of high performance time (High performance engines, Autocrossing, etc.) have tended to be harder on these highly stressed components than un-raced stockers and Alpines. Breakage of these pins is not uncommon but almost always happens at low speeds and when backing up. If you are going to pursue high performance activities, or simply want to decrease your chances for fulcrum pin failure, Doug Jennings of Tiger Auto (937 252-3317) in Dayton, Ohio is the only available "stock configuration" fulcrum pin replacements. There are no guarantees against breakage, but the prototype bushing set you see here was assembled with Doug's pins, just to be on the safe side.

With the components appropriately separated, It's time for cleanup and assembly preparation. I like mechanical preparation such as abrasive blasting to remove all traces of rust and prepare the surfaces for paint. Chemical stripping can be used but I prefer not to use harsh chemicals in areas where unknown metallurgical conditions exist. I typically mask all the threads and protect them with vinyl tape prior to blast cleaning.

Protective painting can be applied by any of several methods. I prefer urethane coatings for cost effectiveness, but the powder coating process may also allow some level of thermal annealing of built up structural stresses.

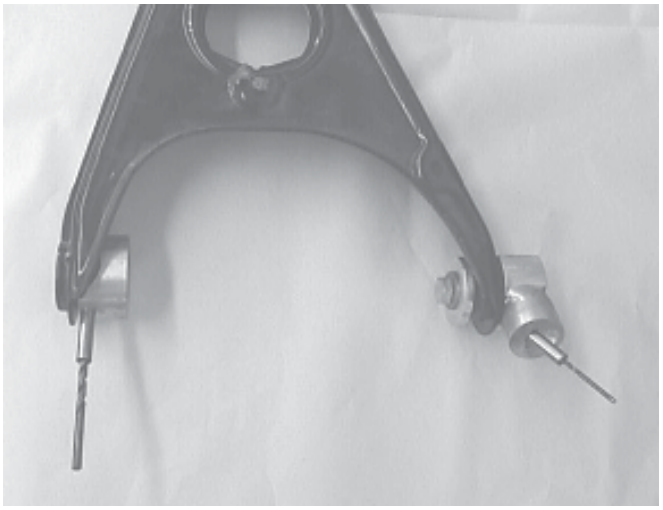


Figure 5. This view shows the straight and angled fixtures for the Lower A-Arms. If you choose to drill your Arms for fittings, you would install the rear bushing first so that you could still re-install the drill guide and drill through the shell and urethane media before the fulcrum pin is installed.

It is appropriate to measure the inside bore diameter of the A-Arm bushing tubes and the outside diameter of the new urethane bushing shells. While there is a range of allowable interference it should not exceed 0.005" or you may end up perminently deforming the bushing

shells before they are fully installed. It is also advisable to grind a small (.03") chamfer on the leading edge of the external steel bushing shell. This will allow a better "slip" into the A-Arm bore. This press fit can also be aided by the use of a small amount of grease.

If you end up with a "loose fit", apply Locktite 609 to the cleaned bushing shell before its pressed into place. This the appropriate cure to obtain proper bushing/shell adhesion with loose bushings. Your installation tooling must apply the press force to the rolled lip of the bushing shell. If you simply press on the end of the bushing, damage to the bushing is very likely to occur.

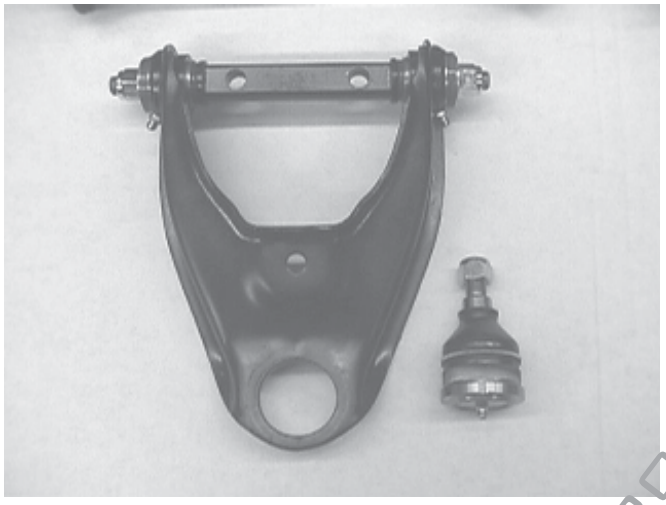


Figure 6. Here we have the Upper arm re-assembled except for the upper ball joint. Make sure that you maintain good alignment when re-installing the new ball joints. Rick's new ball joints are 0.015" larger in diameter that the OEM ball joints. That's because most of the replacements for the last 15 years were made to this oversize dimension. Better to have them tight to install than trying to hold them in a loose hole.

I make it a practice to install the rear bushings first. The upper A-Arms are symetrical and interchangable but the lowers are not. The lower fulcrum pins are machined with an offset to cause the A-Arms to be mounted toward the rear. The spacing from the front of the fulcrum pins, where they change from "double D" to round to the

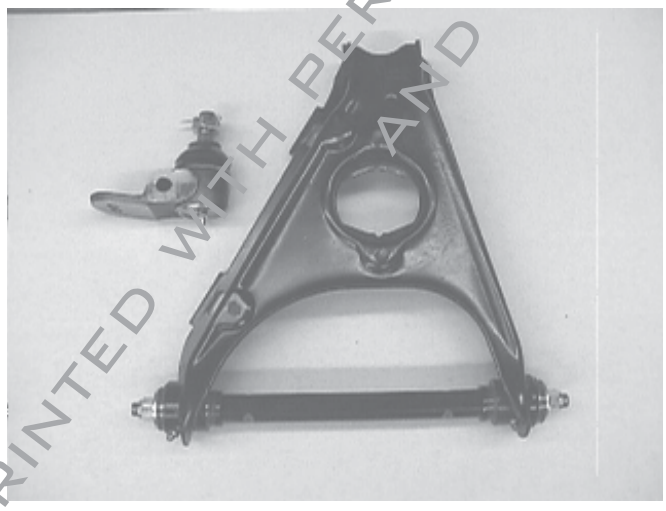


Figure 7. Here's the completed Lower A-Arm and the new lower ball joint. These new ball joints are metal to metal with no nylon inserts that could fail and allow the joint to come apart. This was the design used by the factory OEM supplier back in the 60's.

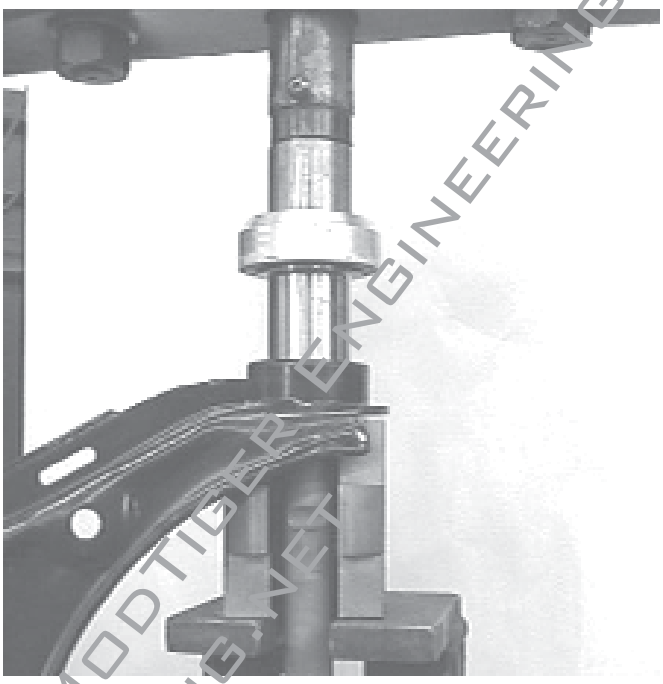


Figure 8. This is a picture of the proper press setup with tooling to maintain alignment and apply the assembly forces to the bushing shell and A-Arm without distortion. Measure the diameters before you press and choose your tolerances to avoid trying to press more than 0.005" interference. Remember to chamfer the bushing shell to allow an easier start for the bushing.

mounting bolt reliefs is approximately 0.9". This distance at the rear is 1.125". If you reverse this pin, you will increase the offset of the lower A-Arm forward over 0.200" increasing your static caster. This may or may not be an desired or intended consequence but at least make sure the pins on both sides are the same or your wheel alignment will be much more difficult. After you have installed the first bushing, you need to install the beveled washers on the fulcrum pin and install it into the bushing/A-Arm assembly. Then the second bushing is installed. Alignment of the bushing shell is very critical during the press fitting. If the bushing is cocked or crooked during assembly, major deformation damage can be done that will require bushing replacement.

After the bushing are installed, a threaded drill guide fitting is reinstalled in the tapped holes and a 1/8" grease path is drilled through the installed bushing shell and the body of the urethane material to the surface intercept of the inner pivot tube. This intercept area is the reason that the inner tube was prepared with a radial relief. This relief allows grease to flow around the complete circumference of the tube. After the drill chips have been removed the inner tubes are installed and Zirk fittings can then be installed and lubrication applied. I use red grease for assembly but I prefer to use Marine grease for field lubrication. Marine grease has a formula that resists rust and may increase the service life of these bushings.

The remaining photos show some closeups and details of the bushings and A-Arms and my recomendations for appropriate welding points to provide perminent attachment of the spin weld tubes to the A-Arm structures. All welding operations are done to the bare, properly cleaned A-Arm structures. When you prep for painting, don't forget to mask the bushing tube bores. Paint buildup in this area may prevent getting accurate measurement in the bores to fit the bushings.

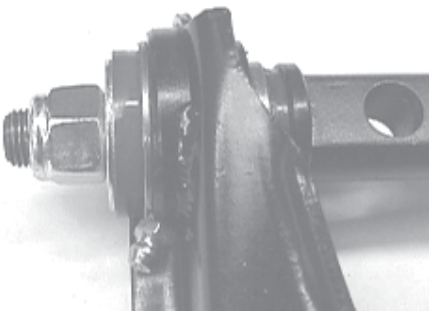


Figure 9. This is a closeup of the completed upper A-Arm showing the position of the grease fitting. Also visable in this shot is the skip weld connecting the bushing shell to the A-Arm stamping.

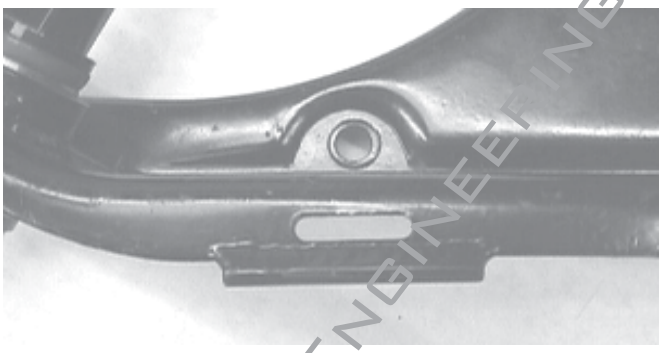


Figure 12. A shot of the reinforcement applied to the sway bar attachment point. This is a 1/4" diameter rod that is welded to bridge the slot to prevent the mounting clip from shearing the edges of the slot. Used properly, this modification will hold a 1" diameter sway bar.

Figure 10. A closeup of the skip weld on the lower bushing shell. This is an important safety modification. Stock spin wells have been known to fail.

Figure 13. This is a closeup of the skip welds on the ball joint mounting ring and the Upper A-Arm. Installation of a 0.015" larger ball joint is likely to fail the OEM spin weld. This simple skip weld modification maintains this integrity and enhances safety.

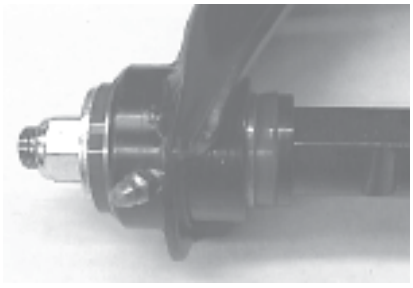
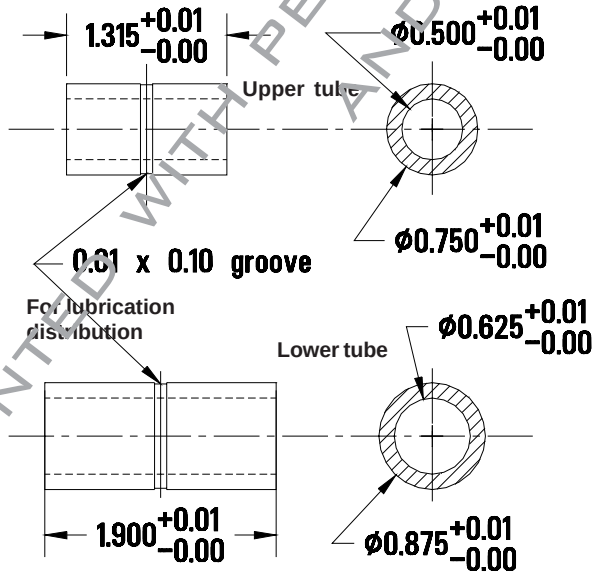


Figure 11. A closeup of the Lower A-Arm with fitting and welds.

Figure 14. This is a sketch of the modified inner pivot tubes of the urethane bushings. They can be produced in a 300 series stainless steel to eliminate the chances for rust to form and cause squeeks. These may be available from Rick in the future but he won't have them in the near term.



The Sunbeam Specialties Part numbers for appropriate related suspension parts are as follows:

Set of 8 Black urethane (4 upper, 4 lower) bushings.....FS-78
Set of 8 Red (HP) urethane(4 upper, 4 lower) bushings.....FS-78H
Lower Ball Joints, each.....FS-53
Upper Ball Joints, each.....FS-57
Upper Beveled Thrust Washers (Set of 4).....FS-67
Lower Beveled Thrust Washers (Set of 4).....FS-62

Thanks to Rick at Sunbeam Specialties for his help with this Tech Tip.
Tom Hall