SUNBEAM TIGER OWNERS ASSOCIATION

TECHNICAL TIPS ON THE SUNBEAM TIGER

February 1996

General Discussion of Tiger Unibody and Examination for Faults

We've written several Tech Tips describing fatigue failures associated with the Tiger front cross members including spreading to original specifications and strengthening and re-enforcing operations, but it recently occurred to me that we've never made a comprehensive list and explanation of the expected problem areas in the rest of the Tiger chassis. Even without accident damage, many Tiger chassis have experienced some fatigue or environmental degradation at this age. The more severe the history (accidents, rust, high performance engines, aggressive driving) the higher the probability that some level of degradation is present. The positive side of this is the fact that we have a fairly large experience base and most of the problems occur in a similar pattern on all chassis. It is also my experience that most owners rarely, if ever, give their Tigers the detailed inspections they really need to avoid having small problems turn into major failures.

Because subtle accident damage frequently occurs in the same areas of the chassis structure, we have elected to describe the common features of both, so that you will be better informed when performing an examination. The primary areas for chassis fatigue are the attachment points where forces are transferred between the suspension components and the unibody chassis. You're primarily looking for what is termed "incipient" damage where the failure is just beginning. Fatigue cracks start very small, but they quickly grow if left unchecked. If you find more major damage, such as open cracks or separations, it will be more obvious.

In order to properly inspect for fatigue damage, it is important to properly clean and prepare the areas to be inspected. You don't have to strip the chassis to bare metal for a simple inspection, but the areas to be inspected should be cleaned to remove grease, grime, oil residue, and road dirt buildup. Damaged areas will require some level of disassembly along with thorough cleaning and stripping before welding or other repair methods are applied.

Fatigue damage is normally restricted to that area of the front frame horns, forward of the rear crossmember attachment bolt. On the attached diagram (fig. 1), This would be areas 1 and 2, from "c" toward "a". Accident damage in this area will commonly be more obvious, with bent frame rails, cracks, etc. Even after most body shops repair this obvious damage, some subtle damage may remain in the arched portion of the frame rails, in area 3, from "c" to "d". The Tiger may appear "fixed" but a substantial displacement may still be present which will alter the front end alignment and handling of the car. Simply striking a curb hard enough with the front crossmember can product bending in that area of the frame. This bending is frequently downward, slightly shortening the wheelbase, or it may include a narrowing component which causes the frame rails to be closer together and altering the location of the upper suspension components. The best way to check for bending in this area is to closely compare an undamaged chassis, and if possible, the fabrication of sheet metal templates (shades of NASCAR).

Please note the lower diagram, (fig 2). Measurement between the centers of the two rear threaded insert tubes should be approximately 22 ½ inches. After a collision or other front end damage, it is common for this measurement to be reduced by as much as 3/4"or more. The crossmember assembly will also show a corresponding movement between the rear two bolt holes. High mileage and aggressive shocks and spring rates can also cause this compound degradation due to simple fatigue without any accident damage. A fatigue collapsed frame and crossmember will also show a related reduction in the measurement of the distance between the shock towers, causing problems in obtaining proper front end alignment. The measurement between the rear top corners of the shock towers should be approximately 28". Spreading the frame and crossmember back to original specifications is necessary in order to obtain proper camber adjustment. A major question is the advisability of bending or spreading the frame of a Tiger that has already been repaired and “finish” painted. This work and any other frame repair should be among the initial steps of any serious restoration project. The challenge associated with repairs done to “finished” cars is that the repair displacements required, may tend to crack other nearby welds and warp body/fender panels because of the Tigers unibody construction methods. If you are in this situation it would be advisable to consult a frame repair shop before applying the jacks.

The primary front suspension attachment points are the four bolts that hold the cross member to the frame assembly. They screw into four threaded tube inserts that are welded into the frame rails. The attached diagram of the Tiger chassis indicates these as b and c. The areas of concern for the frame inspection are noted by numbers and letters on the diagram. The primary front frame fatigue inspection area is that between the threaded insert tubes for cross member attachment, and the front bumper(a). This is a rather weak area of the frame due to the small space for the sheetmetal flanges and spot welds and the change of the structural materials in that area. In addition to the possible overall change in frame curvature, the other thing you are going to be looking for in this area is the failure of the tube insert welds, (normally the front “b” tubes), allowing the tubes to pull down through the top frame surface, into the frame, and for the outside bottom of the frame rail flange to begin de-laminating in area 2. If the cross member is out, the movement of the tubes will be detected as downward swelling of the frame at any of the four threaded insert locations (It was originally very flat in this area). If the cross member is installed, movement can be detected by close examination of the weld area surrounding the inserts at the top of the frame for cracks and local bending. As the associated de-lamination occurs, it normally progresses forward on the frame, popping spot weld after spot weld, toward the front bumper mount. This failure mechanism is also possibly the result of cyclic fatigue resulting from applying the brakes several hundred thousand times. Each brake application applies a torsional load to these attachment points, which can eventually lead to structural failures.

De-lamination of the front frame horns and bumper mount in area 1 between a and b is a very common problem. It is not as serious as the suspension attachment tubes, but will cause problems if not repaired. If left unchecked, this failure will eventually work it’s way back to area 2, and into the suspension mounting tubes.

We have not visually detailed the crossmember itself in this Tech Tip. The failure points have been well documented, but they will be briefly described to aid continuity. The upper snubber welds will break first at the heat effected zone of the attachment welds. If this failure is not repaired, the failure normally progresses to the outside welds on the shock tower upright. This structural failure causes the upper A-Arm to move inward with diminished direction control an obvious outcome. The other common failure is the splitting of the top and bottom shells of the crossmember at the weld juncture of the rack clearance stamping with the top-bottom flange. The crack starts at the flange and typically progresses horizontally towards the center of the stamping behind the steering rack. Other failure crack frequently occur near the spacer pads for the lower A-Arms.

At the rear of the chassis, the most frequent failure is the cracking of the angle shaped re-enforcement between the front spring eye bolt and the inside surface of the frame X. This is indicated as area 4. Another important rear area to examine for damage is the area behind the seats as the floor pan rises up to the shelf behind the seat. The area to be examined is that which contains the spot and tack welds between the sub-frame and the floor pan. This is the area of load connection for the front of the rear springs. It has to transfer the majority of the rear suspension forces to the chassis. Commonly, these welds have pulled out of the floor pan on Tigers that are rusty or have been used for drag racing or other hard acceleration which resulted in wheel hop.

Tigers have had several designs for traction bars. Almost all of them have had problems unless the installer re-enforced the areas of attachment. The “short” traction bars (where the front of the traction bar ends right below the spring bolts), and “long” traction bars (where the front of the bar is attached forward of the spring bolt. In most cases, brackets for the short bars were simply welded to the existing spring mount area. Failure of original structural welds in this area is very common due to torque fatigue of the frame elements. The area of frame failure for the long traction bars is typically the triangular shaped lateral brace. The mounting brackets for these bars were most commonly welded to the bottom of this brace. Examine these areas carefully for signs of cracking at the edge of all welds and also where those frame elements attach to the rest of the chassis.

Finally we come to the pannard bar mount. Yes it’s very difficult to effectively examine this area, but failures are very common and a sudden failure during a spirited drive could easily change your direction into a ditch. Check this area frequently.

This information is intended to be used as a guide for self examination. The areas described are well known to most Tiger experts, but this list is not all inclusive. Other potential problem areas exist. If you have additional information, please write and share your knowledge. If sufficient interest and feedback is forthcoming, typical methods for repair can be described in future Tech Tips.

Sunbeam Tiger Inspection Areas

See Attached notes for detail instructions

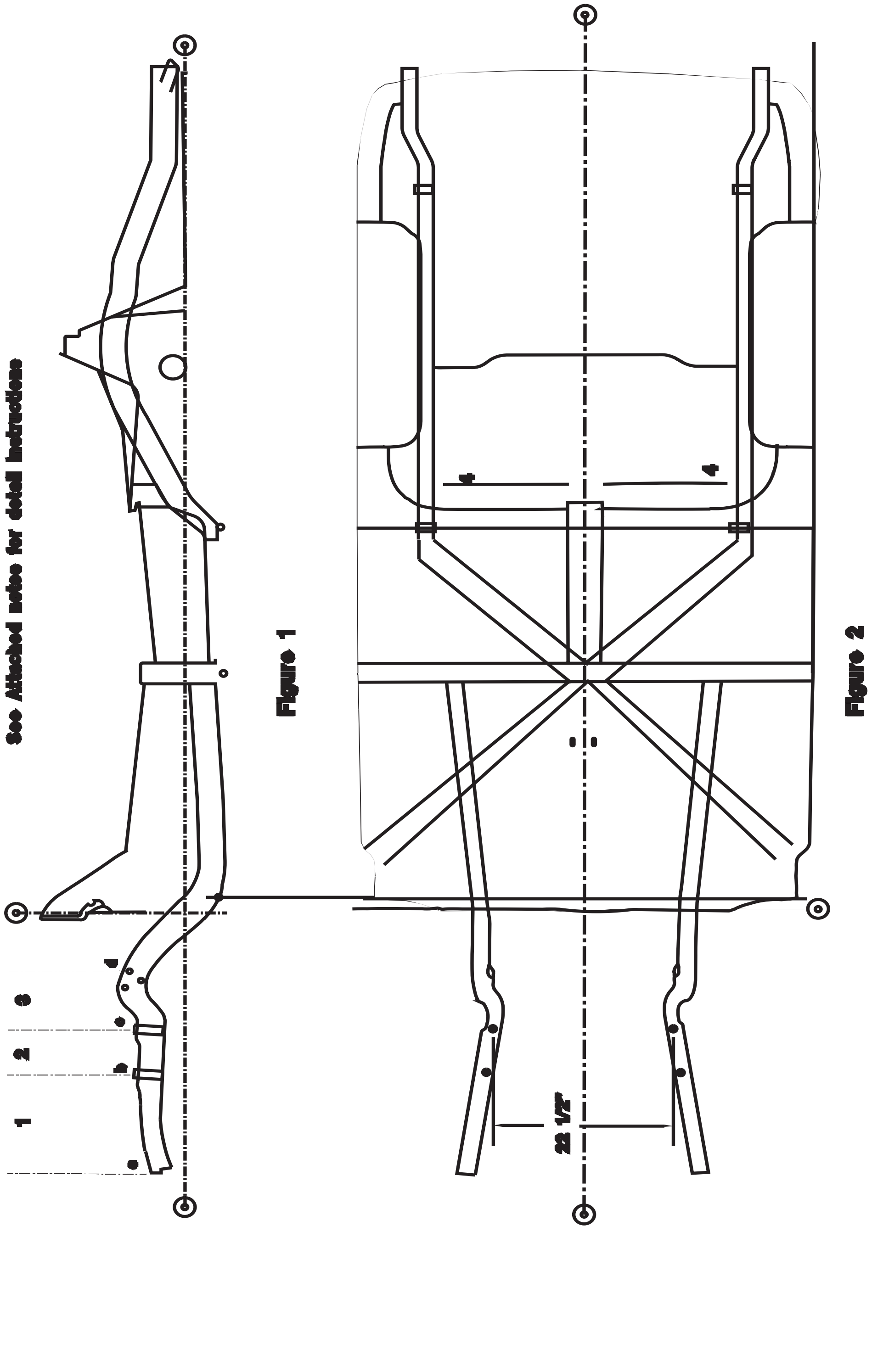

Figure 1

Figure 2