



TECHNICAL

'Virgin Rear-end Conversion'

by Dick Lunney

Attending car club meetings and technical sessions across the country is one of the real pleasures of editing a magazine devoted to classic sports cars. However, when an invitation to attend a "Virgin Rear-end Conversion" appeared in our mail, the opportunity to watch an erotic pagan ritual was just too much to pass up. The Southeast MG T Register in Atlanta was to be the host of this erotic occasion which was said to offer up to six conversions for us to photograph and document. My only worry was whether or not the material would be suitable for our family oriented magazine focused on classic MG motorcars.

My worries (and fantasies) were all for naught, as the event turned out to be a fascinating and very interesting technical session on upgrading the MG TD/TF differential to a taller MGA ratio. The Atlanta club has been performing this



conversion for nearly twenty years with Jim Holcombe and Steve Rinaldo doing the first conversions back in the early '80s. Now Lenard Thomas has assumed the role of technical guru for this transformation and the Atlanta club turns out en masse for the camaraderie and spirited technical information sharing. In total, over 40 members turned out to watch and help with the conversion of five rear-ends brought by Florida, North Carolina, South Carolina and Georgia club members.

Having now done nearly fifty conversions over the years, the Atlanta club has refined the procedure to almost assembly-line precision. Key club

members bring the tools and gauges required to insure the proper tolerances are achieved. Lenard acted as the senior technical advisor as he rotated between four simultaneous conversion teams using wooden floor stands that make the task much easier on everyone's back.

Several uniquely original secrets were revealed during this conversion session that have been refined over the years to make the procedure much less difficult. This article is intended to de-mystify the conversion, which transforms the MG TD/TF into a much more highway friendly automobile, so hopefully anyone can successfully complete the task.

Tools Required:

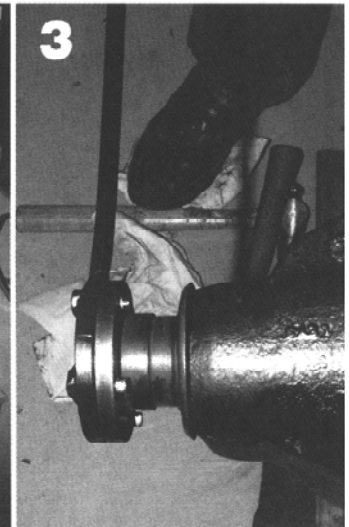
1. Wooden work stand made from 2x4s and plywood
2. Cooler with dry ice
3. Leather gloves
4. Large (foot/pound) and small (inch/pound) torque wrenches
5. Metal and nylon or rawhide hammers
6. Ratchet and wrench sets (American up to 1 1/8 in. and British sizes)
7. Emery cloth (coarse), Scotch Brite and brake cleaner
8. Machine press
9. Long brass drift
10. Two feeler gauges
11. Calipers
12. Shop manual
13. Brass shim stock from NAPA
14. 1/4 inch by 2 inch by 2 foot long steel bar with two holes to bolt to flange

TD/TF rear differential components required:

1. Differential cage containing the spider gears.
2. Carrier bearings — need to be replaced with new bearings to insure proper alignment. Use either MOSS (127-300) or Timken.
3. Bearing distance collars — note which side each collar came from (left or right). Often factory used different thickness collars to achieve proper centering. These collars need to be put back in the proper orientation and history has shown that the RH collar may need up to an additional 0.010 shim to achieve proper centering.
4. Locking tabs (4) — need to replace with new tabs MOSS (266-040).
5. Gasket (optional) — Atlanta club uses silicone (RTV) sealant in place of a paper gasket.
6. Lock washers (new) — always replace lock washers.

MGA rear differential components required:

1. Crown wheel (ring gear) and pinion gear — need to be carefully removed to prevent damaging gear teeth.
2. Crown wheel bolts will be reused since TD/TF bolts have different threads.
3. Pinion head washer (critical) — needs to be machined on opposite side of inside taper to achieve a total thickness of 0.094. This will properly center the MGA pinion gear onto the MGA crown wheel (ring gear) in the TD/TF housing.
4. Inner pinion bearing (critical) — marriage of MGA gears to TD/TF housing requires a new (different) bearing which can only be obtained from a local bearing distributor. Use Timken cone (3188) and Timken cup (3120).
5. Pinion bearing spacer — it may need to be reduced in length by using coarse emery cloth to achieve proper pre-load.
6. Pinion bear shims (0.004-0.006) — need to have on hand for use in case spacer pre-load requires.
0.004 — MOSS (267-330), 0.006 — MOSS (267-340)
7. Outer pinion bearing — new bearings can be purchased from MOSS (125-805), Victoria British (5-794) or Timken (outer cone 15100, outer cup 15250).
8. Oil seal — MOSS (120-800) or Victoria British (5-885)
9. Dust cover — optional since TD/TF did not use one. If used, the collar will need to be flattened slightly to prevent rubbing on TD/TF housing.
10. Flange — sealing surface needs to be polished (cleaned) using 3M green Scotch Brite.



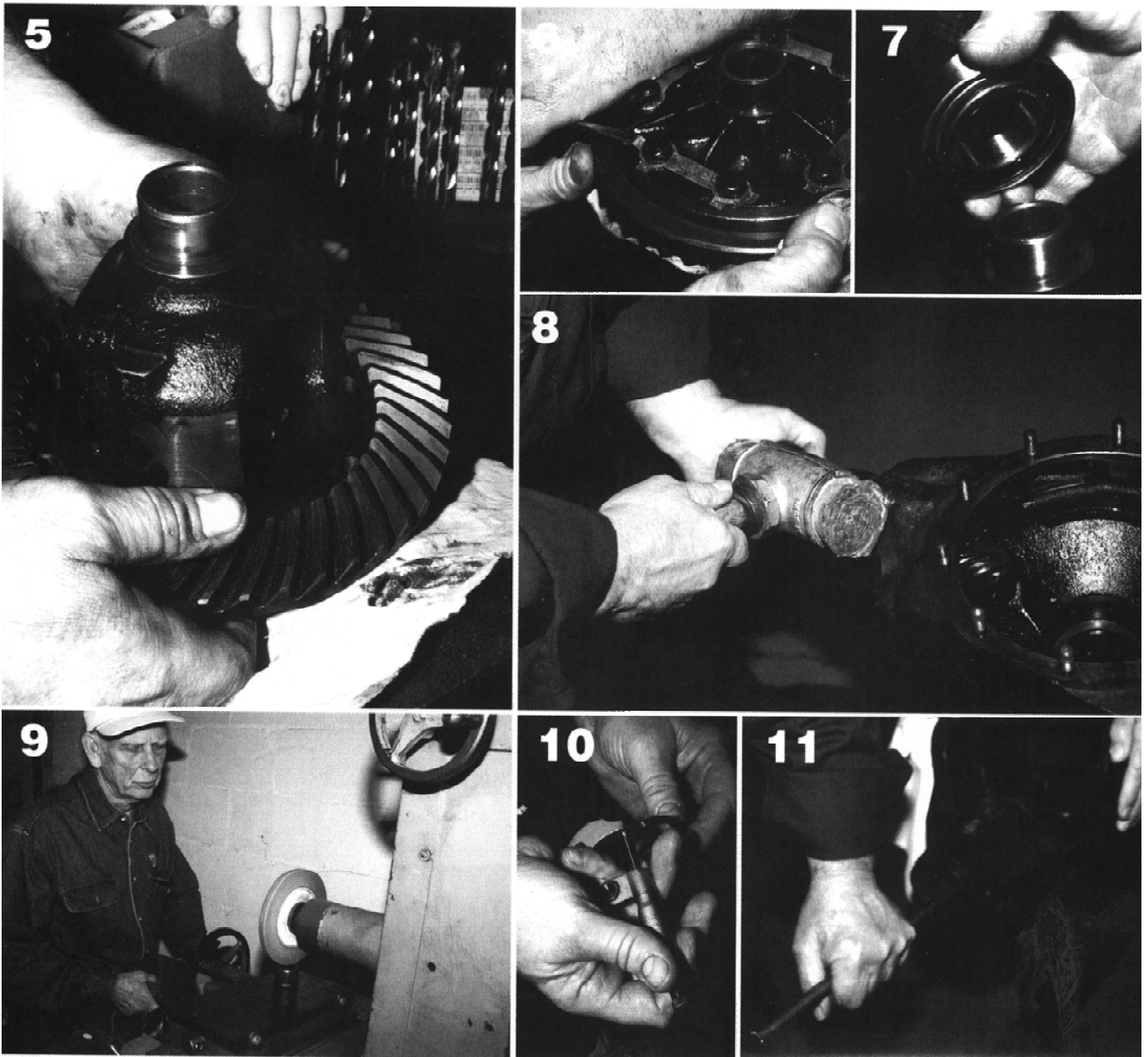
Conversion Instructions:

1. The first step in the conversion process is to obtain an MGA differential in good condition. Check gears for damage or wear. Then, disassemble, carefully noting which parts will be reused and machine (pinion head washer). (See Photo 1-3)

2. Remove the TD/TF rear axle from the car. It is much easier to remove the rear axle if the brake backing plates and drums are removed first (brake lines can remain attached). (See Photo 4)

3. Carefully disassemble the TD/TF differential assembly following the instructions in the shop manual. Note the orientation of the bearing distance collars (left or right). Remove the crown wheel (ring gear) from the differential cage. (See Photo 5) Replace with the MGA crown wheel using the TD/TF bolts and new lock tabs. (See Photo 6) Press off the carrier bearings from the differential cage and install new bearings making sure the *inner chamfer* (beveled edge) goes toward the





differential cage, and the *outer chamfer* goes toward the housing. (.See Photos 7-10)

4. Remove the TD TF pinion bearing races (cones) from the TD/TF differential housing using a long brass drift to remove the cups from housing. (.See Photo 11)

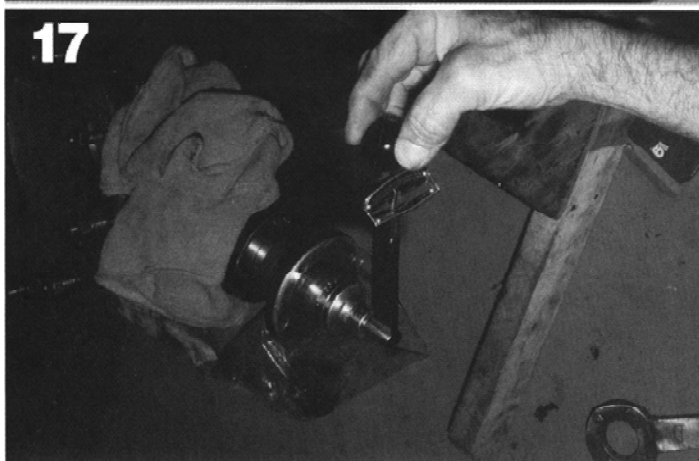
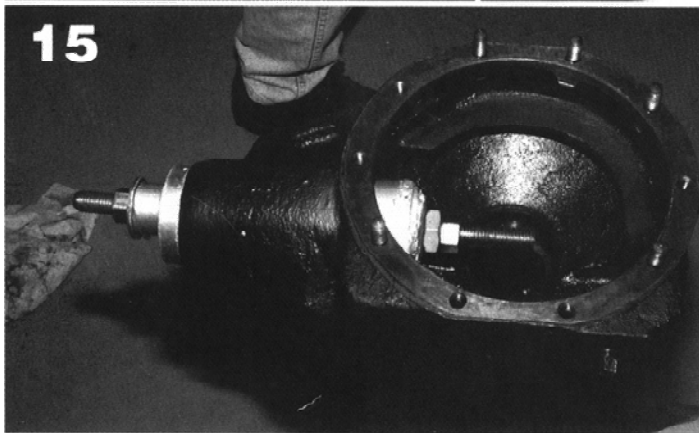
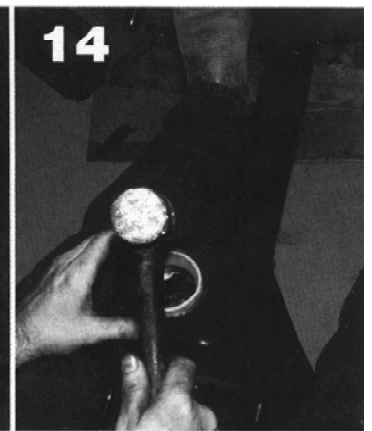
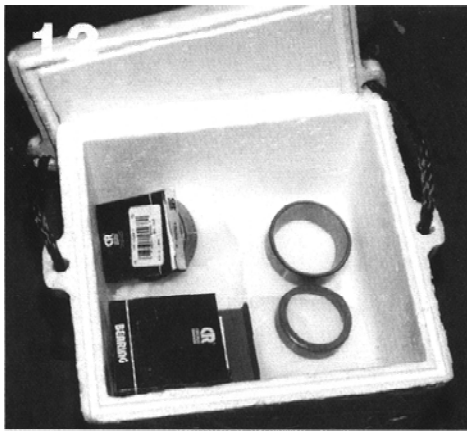
Important that a brass drift be used to prevent damage to the housing.

5. Place new pinion bearing (races) cups in “dry ice” to shrink for at least 20 minutes. Wearing gloves, quickly remove one race at a time from ice and position it into the appropriate location in the housing and drive home with brass drift. (.See Photos 12-14)

Atlanta club has created a unique compressor (puller) contraption made from threaded rod, old original races, large washers, and miscellaneous spacers to pull in the inner race completely. (.See Photo 15)

6. Assemble the MGA pinion and by first slipping on the newly machined MGA pinion gear washer, keeping the beveled edge toward the gear. Press the inner pinion bearing onto the pinion gear shaft. Place the pinion bearing spacer onto the shaft and position this unit into the housing. (.See Photo 16 and your *stop manual*) Install outer pinion bearing onto shaft and gently tap into position with a nylon or rawhide hammer. Put the flange onto the shaft and install old *lock washer* and *nut*. Tighten to 125 ft-pound torque. (.See Photo 17) Measure the bearing pre-load with an inch pound torque wrench to achieve 6 in-pound reading (+ or - 2 inch pounds). If there is not enough resistance to obtain the desired reading, disassemble and remove the spacer. Reduce (grind down) the length of the spacer using coarse emery cloth (0.001 in. reduction = additional 3 in-pound resistance).

If resistance reading is too high (greater than



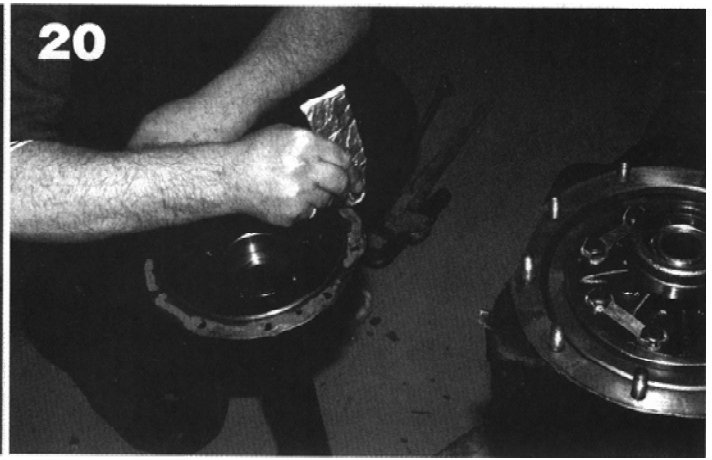
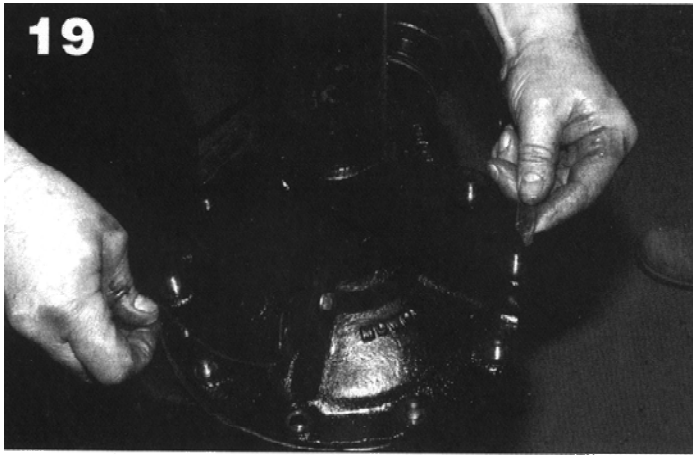
8 in-pounds). add shim ((0.001 shim = 3 in-pound resistance reduction).

Reassemble as above and recheck. Once desired resistance (pre-load) is achieved, remove flange and install new oil seal and new washer and nut (be sure to grease sealing surface on flange). Tighten and retorqued to 125 ft-pounds torque.

7. Reinstall RH bearing distance collar into differential housing. Place differential assembly into housing. Assembly may need some finesse and careful prodding to properly seat. (See Photo 18) Place LH bearing distance spacer onto differential assembly. Lower the LH portion of the housing over studs, carefully noting the spring mount brackets on matching side. First we must check pre-load, this is accomplished by measuring with a feeler gauge the

distance between the two housings (LH & RH). It should measure 0.010 (See Photo 19)

A. If it is less than 0.010 then add a shim under the RH bearing distance collar (initially add a 0.010 shim and reassemble and remeasure; use either brass shim stock from NAPA or a VW crank shaft shim). Once the 0.010 distance is achieved then set the back-lash to no less than 1.5 degrees and no more than 3 degrees rotation of the pinion shaft. Strategically install and tighten three nuts to a snug fit to pull the housings together then measure. If it is less than 1.5 degrees then add more shim stock to the RH side and remeasure. Once the backlash is greater than 1.5 degrees, check the pre-load, if it is over 0.010 then the LH bearing distance collar will need to be machined



(the difference between 0.010 and your measurement). If the rotation is greater than 3 degrees, then the RH shim size must be reduced and that amount must be added to the LH side.

B. If this distance is greater than 0.010, the LH bearing collar must be machined to achieve the 0.010 distance between the housings (only one out of 50 differentials ever needed this).

Once the desired pre-load and back-lash is achieved, install proper gasket or silicone RTV sealant. (Note: if paper gasket is

used, pre-load distance between housing sections needs to be 0.012). (See Photo 20)

8. Reassemble housing and install new washers and stud nuts tightening to 30 in-pounds torque.

9. Reinstall axle assembly into your TD/TF. Atlanta club recommends the Use of Mobile One synthetic gear oil (75W90).

Depending on tire size you will be gaining about 10 mph at 4000 rpm.

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