

A green and white GMC One Ton truck is shown from a front-three-quarter view. The truck has a custom front suspension conversion. The front grille features the GMC logo. The license plate is 706 MLB. The truck is parked on a paved surface with trees in the background.

One Ton Truck Front Suspension Conversion

By Stan Edwards

With Special Thanks to:

Bill Hubler

Tim Petras

Jim Kanomata

Paul Leavitt



Disclaimer

The author is not an expert on automotive suspension and brakes. This information is presented as a matter of general interest. Please confirm any information presented independently. You are responsible for any actions you may chose to take.



Outline

- Comparison and advantages, motorhome vs one ton truck
- Where to get your one ton truck parts
- Lower ball joint location vs suspension alignment settings
- Lower A arm modification
- Steering knuckle modification/What upper ball joint to use
- Assembly to the coach
- Alignment procedures
- Torque values
- What were my costs?



Original GMC Front Suspension

- Original wheel bearings are marginal.
- Original lower ball joint is marginal.
- Lower A arm ends sometimes fail.
- Front brakes are small.
- Original parts (hubs, steering knuckles) are becoming difficult to find.
- Maintenance requires special tools, and is tedious.



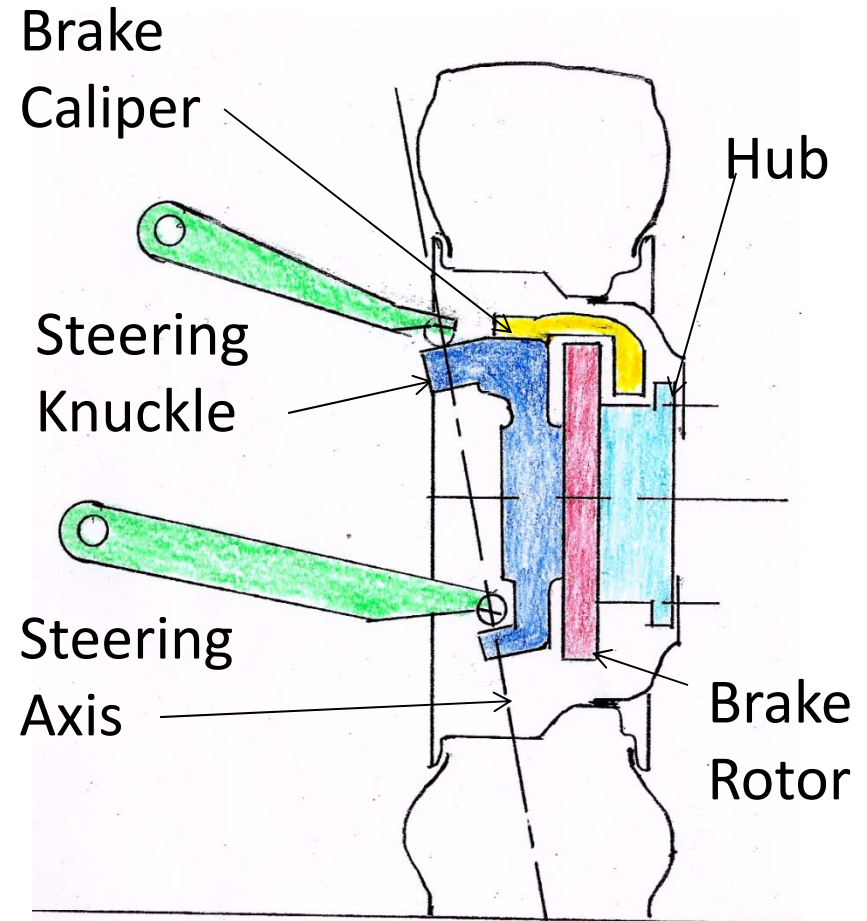
One Ton Truck

- Wheel bearings are much larger, last longer.
- Lower ball joint is much more robust
- Modified A arms are stronger.
- Larger front brakes.
- Replacement parts are readily available.
- Front wheels are essentially in line with rear wheels.
- Wheel bearings are “sealed for life.”
- Maintenance is much easier – no special tools required.



GMC Motorhome Front Suspension

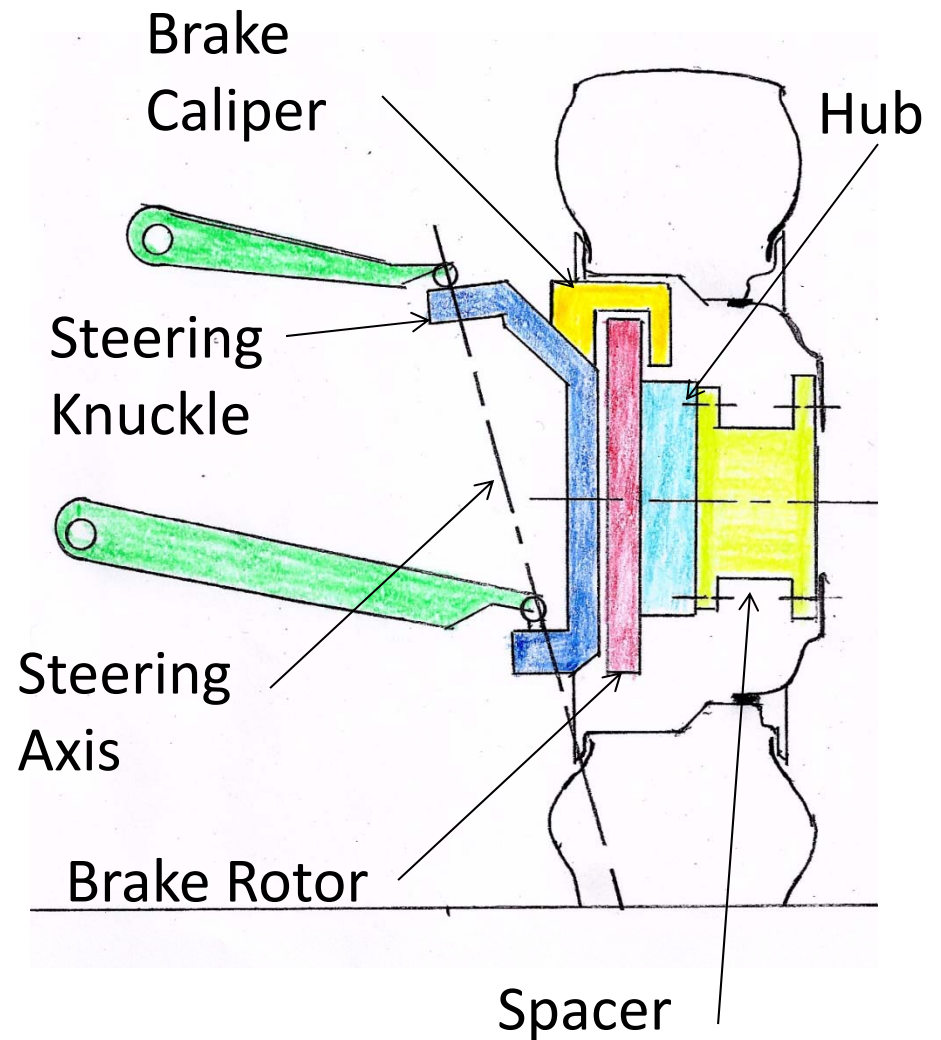
- Brakes are inside the smallest diameter in the rim.
- Brake rotor is 10 ½”.
- No wheel spacer is used.
- Wheel bearings are near the center of the wheel.
- The steering axis intersects the ground near the center of the tire contact patch.
- Steering axis is approx. 11 degrees.





One Ton Truck Front Suspension

- Brakes are inside the Largest diameter in the rim.
- Brake rotor is 12".
- Wheel bearings are near the center of the wheel.
- Wheel spacer is required, Standard is 4.25".
- The steering axis intersects the ground near the center of the tire contact patch.
- Steering axis is approx. 16 degrees.





Where to get your parts?

- You want the suspension from a 1988 – 91 four wheel drive, one ton Chevy or GMC truck. This will be a K3500.
- You will want the steering knuckle, hub and bearing assy, brake rotor, brake caliper and pads, and the axle/CV half shaft from each side. You might as well get the lower ball joint, brake hose, and all of the fasteners .
- If you can get it all from the same vehicle, then you know that it all matches and fits together.
- If you get it from a dual wheel vehicle, get the wheel spacers and lug nuts as well. If not, you will have to find them elsewhere.



Where to get your parts?

- If you can find them from a private individual on E Bay or Craig's List, it will undoubtedly be cheaper than buying from a commercial wrecking yard.
- There are apparently two widths of brake rotor, 1" and 1 ¼". You have to be careful not to mix rotor and caliper widths – either on the same side, or from side to side.
- The 1988 uses a different upper ball joint with a smaller tapered stud, so the tapered hole in the top of the steering knuckle is smaller on the '88. More on this later.
- Many of these parts carry on thru 2000, but you may start running into ABS brakes, etc.



Where to get your parts?

- Both Bob Peltzer & I found ours on Craig's List. Both were single rear wheel vehicles, so we had to find the spacers separately. We both spent basically \$300 for everything.
- My parts appeared good enough to use "as is," Bob is turning rotors, rebuilding calipers, replacing brake pads, replacing CV boots, and replacing the hub & bearing assemblies as a precaution.
- New hub & bearing assys can be bought on line for \$135 - \$175.



Lower A Arm Modification

- I would suggest starting with Toronado or Eldorado A arms. They must be newer than 74.
- The factory strengthening of the ball joint end on the Motorhome A arms will cause additional work.
- You will want to strengthen the torsion bar socket more than the MH anyway.
- The torsion bar sockets in the passenger car A arms is likely to be in better condition than a motorhome A arm – it is more lightly loaded.
- Your left over motorhome A arms can enter the “parts pool.”



Where to Locate the Lower Ball Joint?

- The upper A arm will locate the upper ball joint in its original location.
- The upper ball joint will locate the top of the steering knuckle.
- If we set the wheel vertical (no camber,) then the lower ball joint must be moved out from its original location.
- Tim Petras moved his out $\frac{1}{2}$ ", and had to slot the upper A arm to move the upper ball joint in approx. $\frac{1}{4}$ " to get zero camber.
- I moved the lower ball joint out $\frac{3}{4}$ ", and got zero camber with the alignment adjusters most of the way in.
- I would recommend that you move the lower ball joint out 1" from its original location, and you will have zero camber with the adjusters at the center of their range.

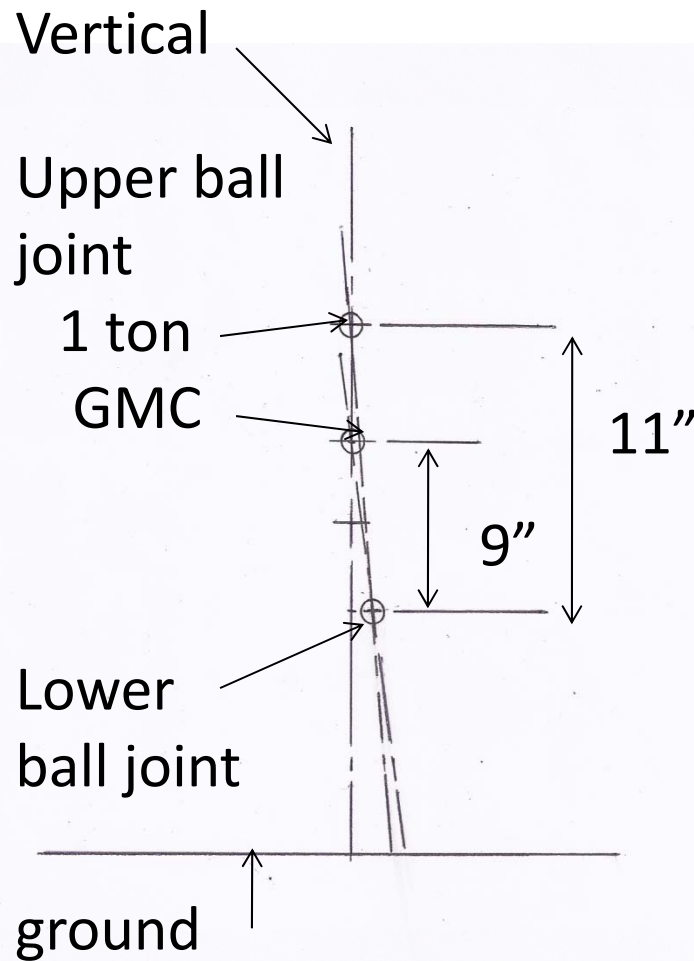


What Camber to Build For?

- Factory specification for camber is :
Left $+3/4 + - 1/4$ degree, Right $+1/2 + - 1/4$ degree.
- Note that both are positive (top of wheel tipped out) and that the right side is less positive than the left side.
- I set mine to zero camber on the left, $- 1/4$ degree on the right.
- I have heard Dave Lenzi say zero camber to as much as $1 1/2$ degrees negative camber (top tipped in.)
- The alignment adjusters have approx. $1/2$ " of travel either direction, which results in approx. $2 1/2$ degrees of camber adjustment either direction.
- So, you don't have to build it exact, but you would like to build it close.



Where to Locate the Lower Ball Joint – Fore and Aft?



- If GMC caster was set perfectly to 2 degrees, the lower ball joint would be .314" ahead of the upper ball joint.
- If you then moved the upper ball joint up 2", as on the 1 ton, the caster would decrease to 1.6 degrees.
- If you move the lower ball joint fwd by $\frac{1}{2}$ ", you increase the caster by the angle whose tangent is $.5/11 = .045$, or 2.6 degrees.
- So for every $\frac{1}{4}$ " fwd that you move it, you gain 1.3 degrees.



What Caster to Build For?

- Factory spec. for caster is $+2 \pm \frac{1}{2}$ degree.
- Bill Bramlett likes close to stock – up to maybe 3 degrees.
- Jim Kanomata says they run great at $4 \frac{1}{2}$ degrees.
- Dave Lenzi likes 5 degrees, and maybe even 6 degrees.
- I moved the lower ball joint fwd $\frac{1}{2}$ ", and got 4 degrees. I like the way the coach drives, and will probably leave it.
- Choose what caster you want, and build to get it.
- $\frac{1}{2}$ " fwd will get you about 4 degrees. Every $\frac{1}{4}$ " further will get you about 1.3 degrees more.

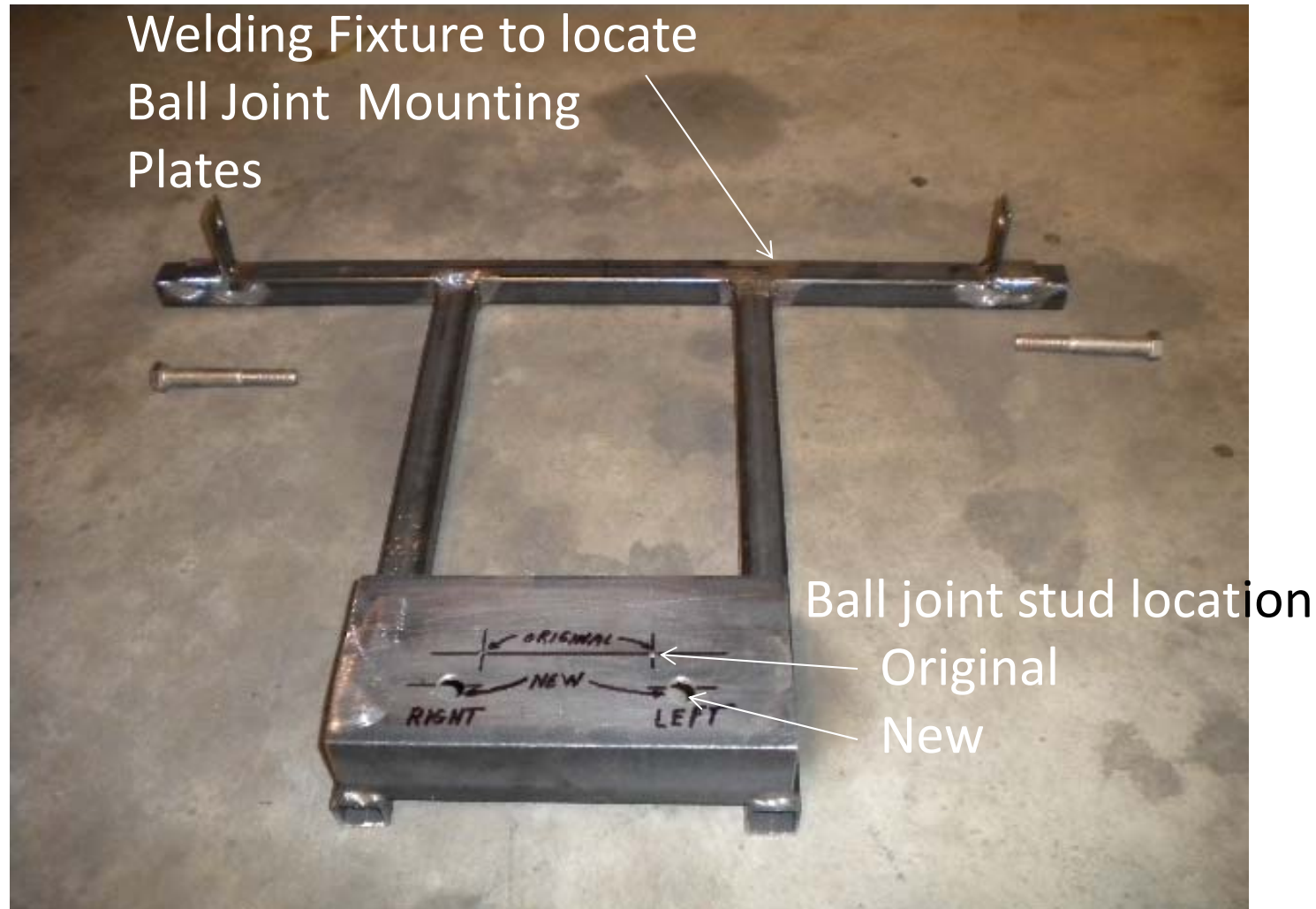


What Caster to Build For?

- If the camber is OK with the alignment adjusters near neutral, a fair amount of caster adjustment will be available.
- Off set upper bushings will give you yet more adjustment.
- Again, you don't have to get it exact, but you would like to get it close so you have room for adjustment.



How to put the Ball Joint Where You Want it.





Fixture Locates A Arm on its Pivot Point – Functional Location

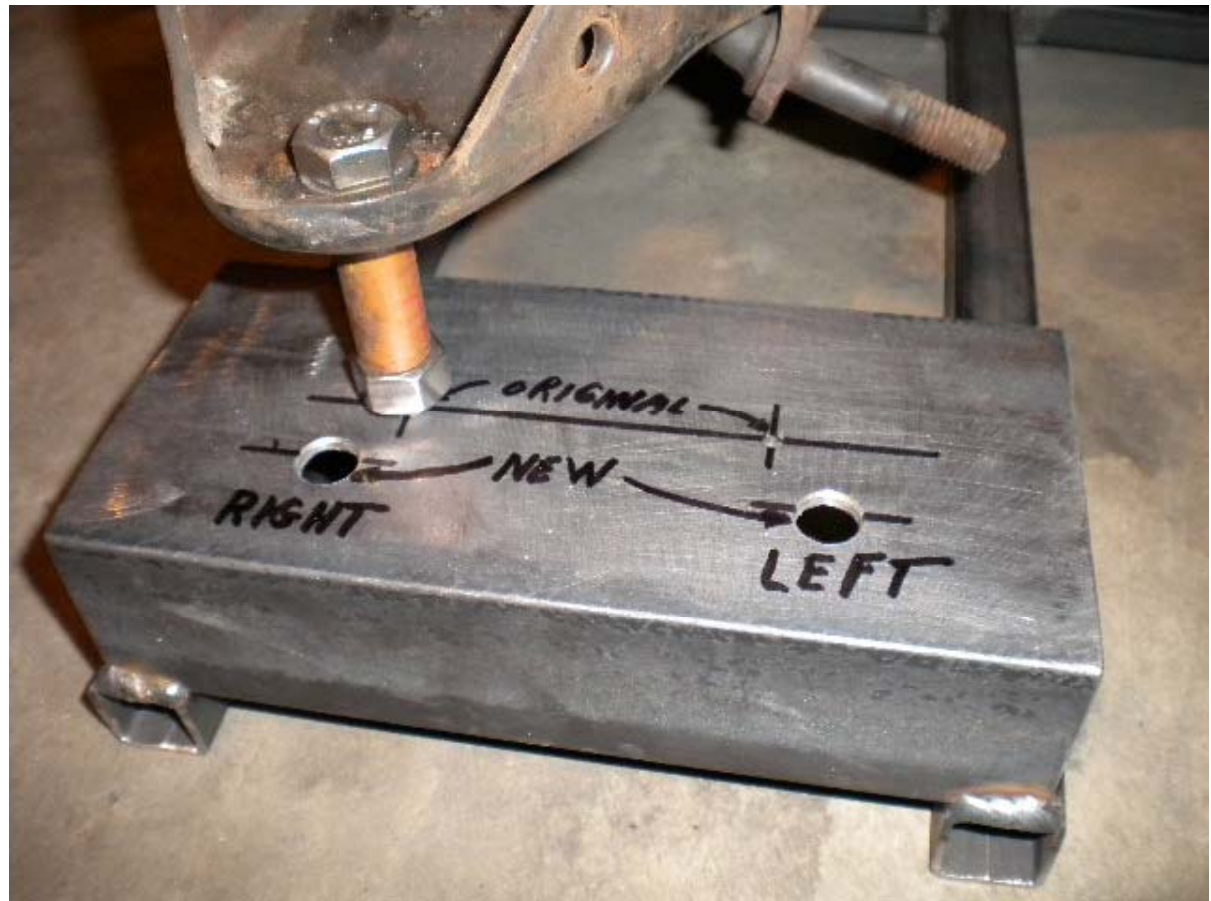
- My fixture works with the A arm upside- down.
- $\frac{1}{2}$ X 2 $\frac{1}{2}$ " bolt with 1 $\frac{1}{8}$ of $\frac{1}{2}$ " copper pipe as a sleeve.





Mark original ball joint location on welding fixture – drill 1/8" hole

This fixture puts the ball joint $\frac{3}{4}$ " out and $\frac{1}{2}$ " further fwd.





Lower A arm marked to cut off
end – 2 3/8", 40 degrees

Use an
abrasive
wheel in a
circular saw
to make the
cut.





Lower A Arm with End Cut Off

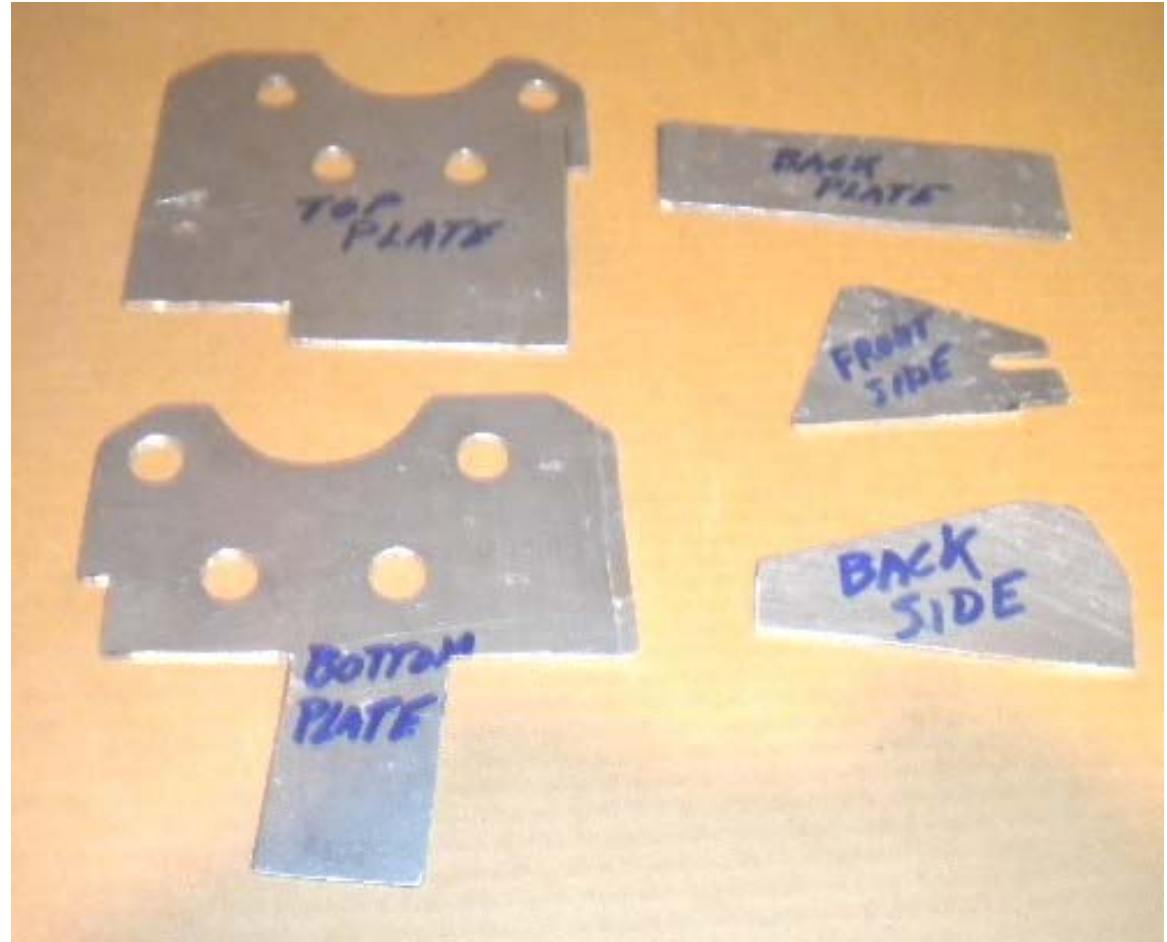


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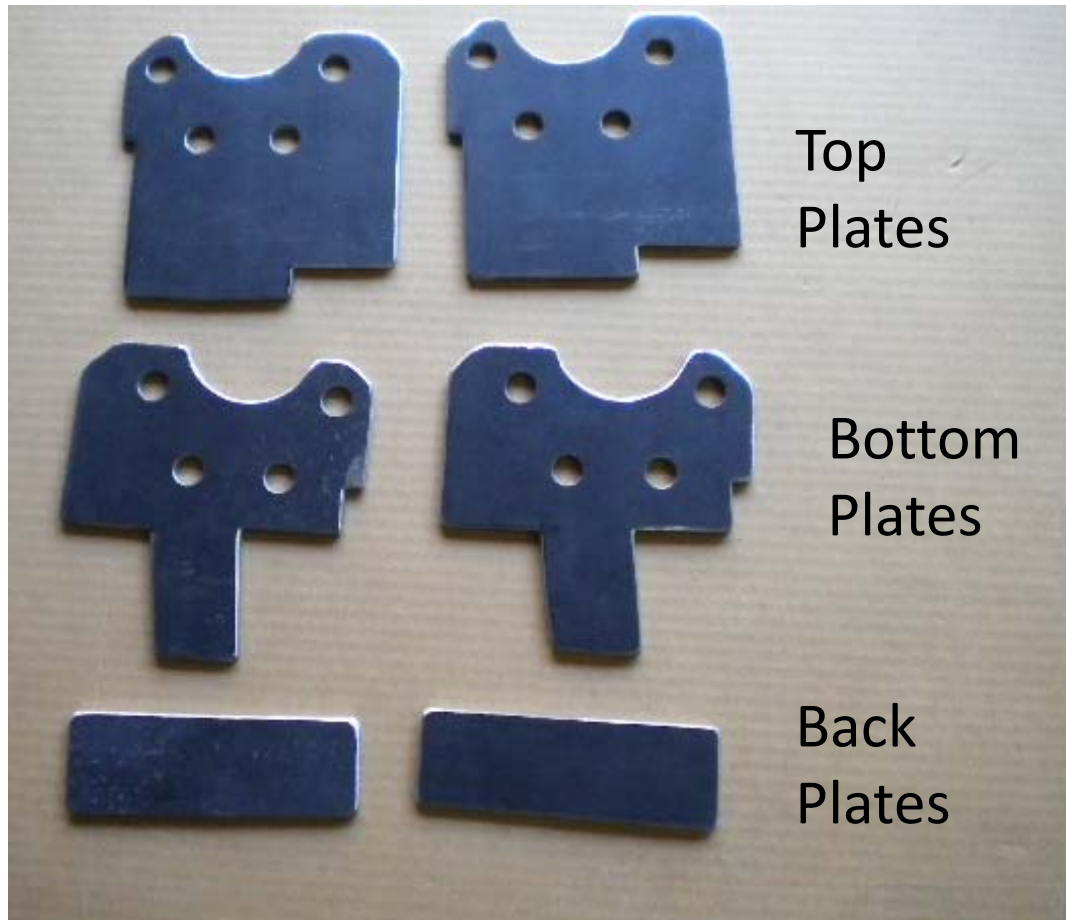
Aluminum Templates for the Steel Plates to Modify the Lower A Arm

- I made aluminum templates so they could withstand handling.
- Trace directly onto 3/16" steel plate.
- Same templates work for left and right A arms.





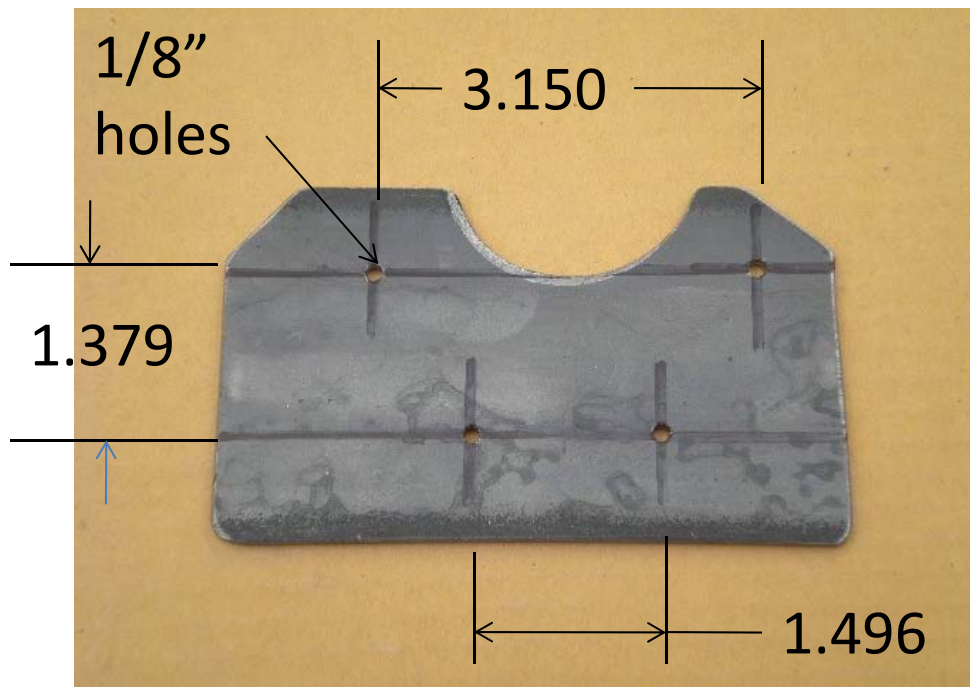
Steel Plates for A Arm Modification



- Cut from 3/16 steel plate.
- Drill ball joint holes 31/64" preferable, or 1/2".
- I cut the notch with a 2" hole saw, then grind & file to clear ball joint body. A 2 1/4" hole might work better. Oil while cutting.



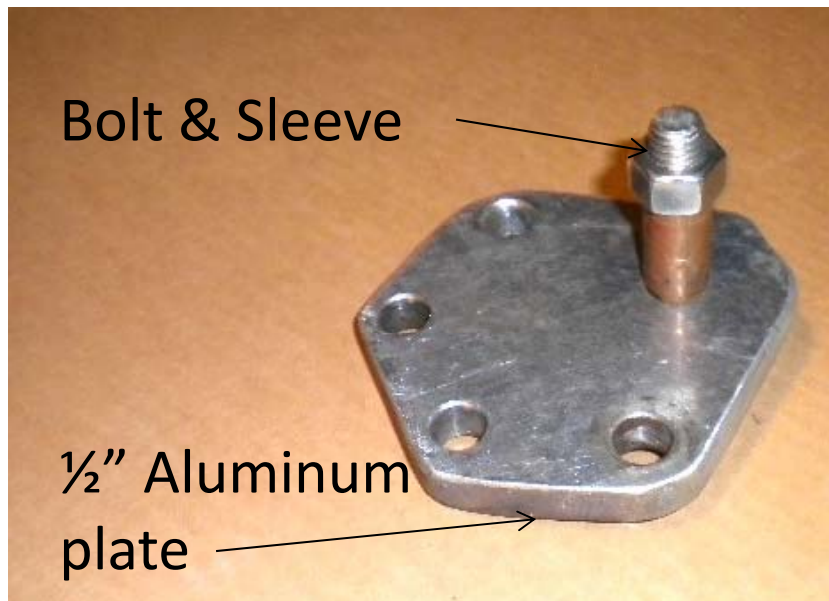
Drill Template for Ball Joint Holes in Top and Bottom Plates



- Line template up with plate to be drilled.
- Clamp template to plate with two clamps.
- Drill one hole, 1/8" dia.
- Insert one Cleco.
- Drill the second hole, insert a second Cleco.
- Drill the last two holes.
- Repeat on three other plates.
- Drill all holes 31/64.



Dummy Ball Joint



- Made from 1/2" thick aluminum plate.
- 1/2" bolt and sleeve.
- Used to locate the top plate with respect to the A arm.
- Used to control spacing between top and bottom plates.



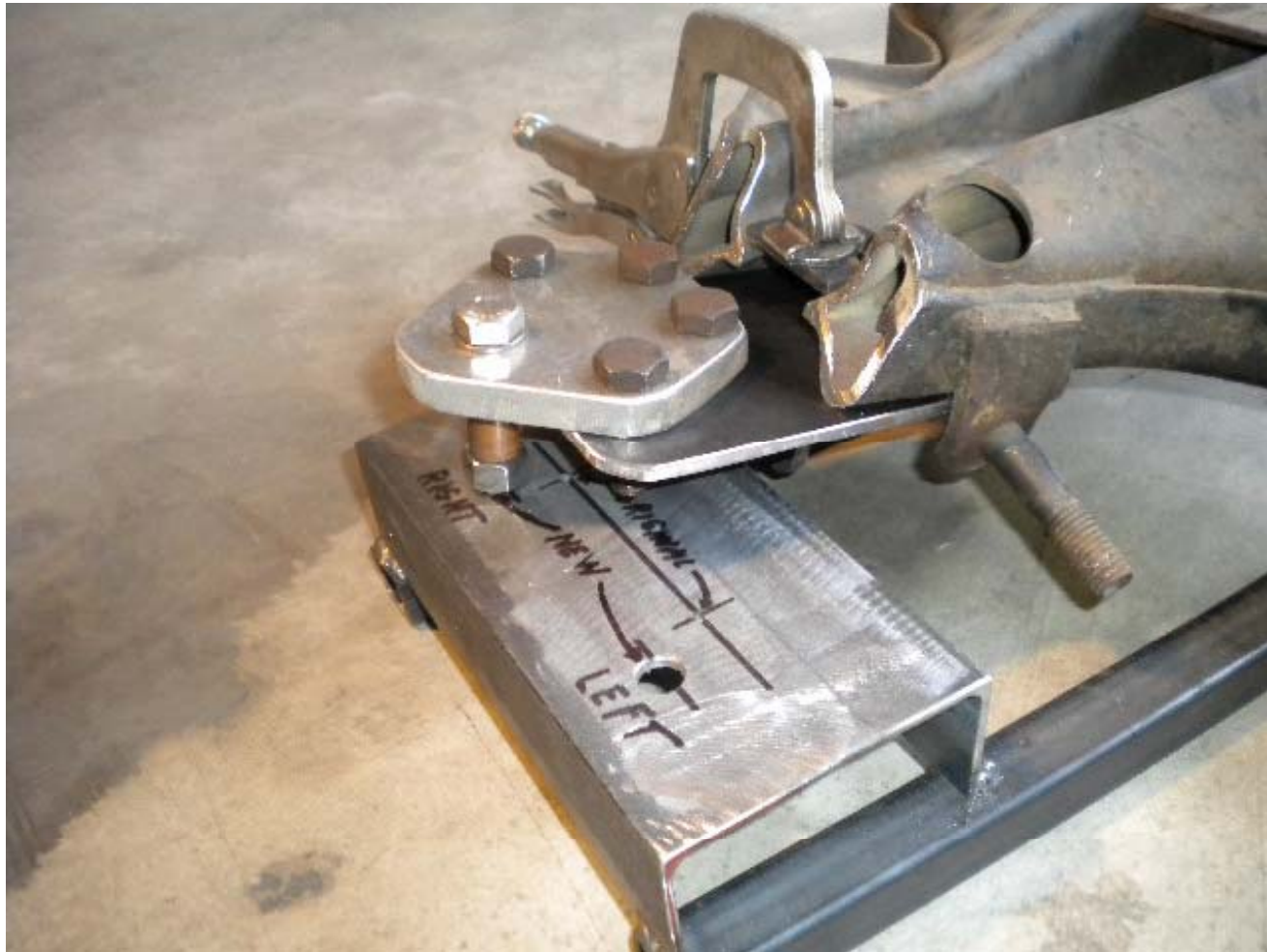
Ready to Weld Top Plate to A Arm

- Dummy ball joint establishes the proper location for the top plate.
- Tack weld first.





Another View



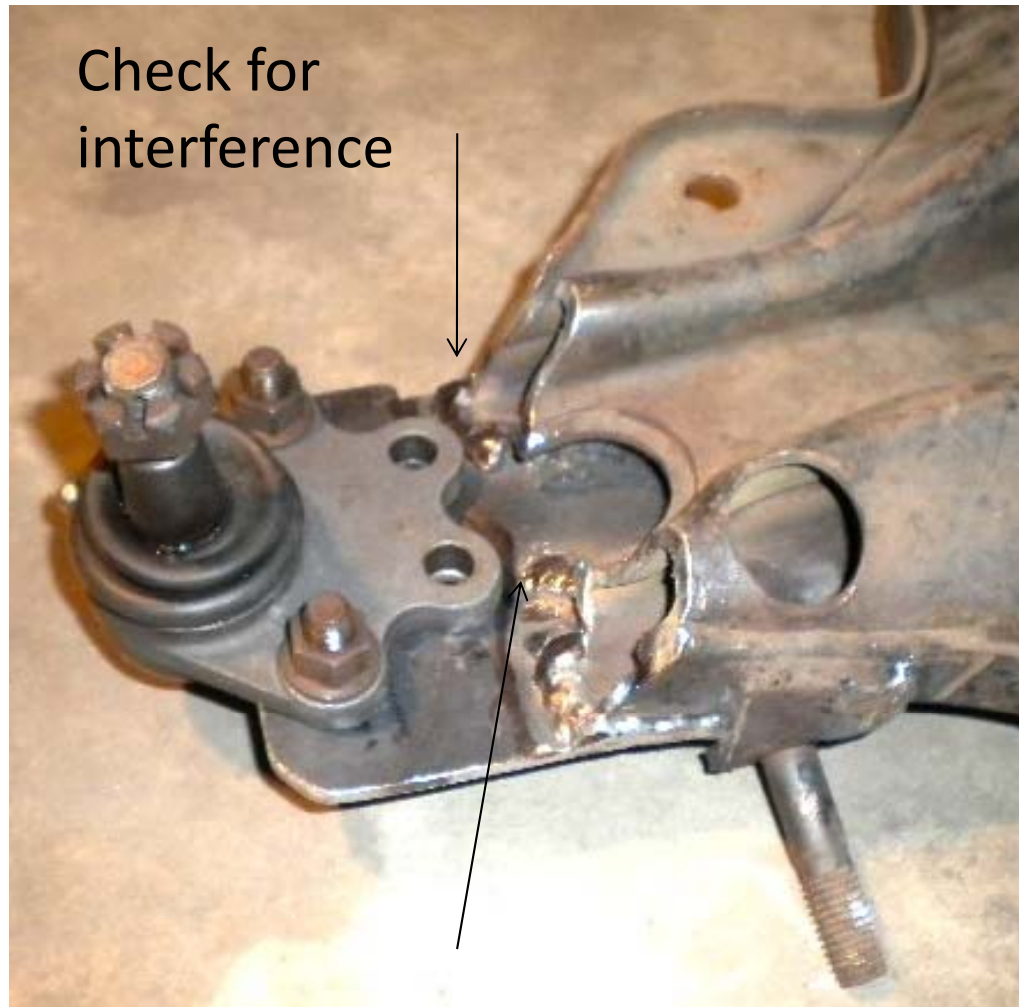


Weld Top Plate to A Arm

- Tack top plate in place
- Remove dummy ball joint
- Weld all around
- Grind welds
- Test fit actual ball joint
- Grind as required for clearance



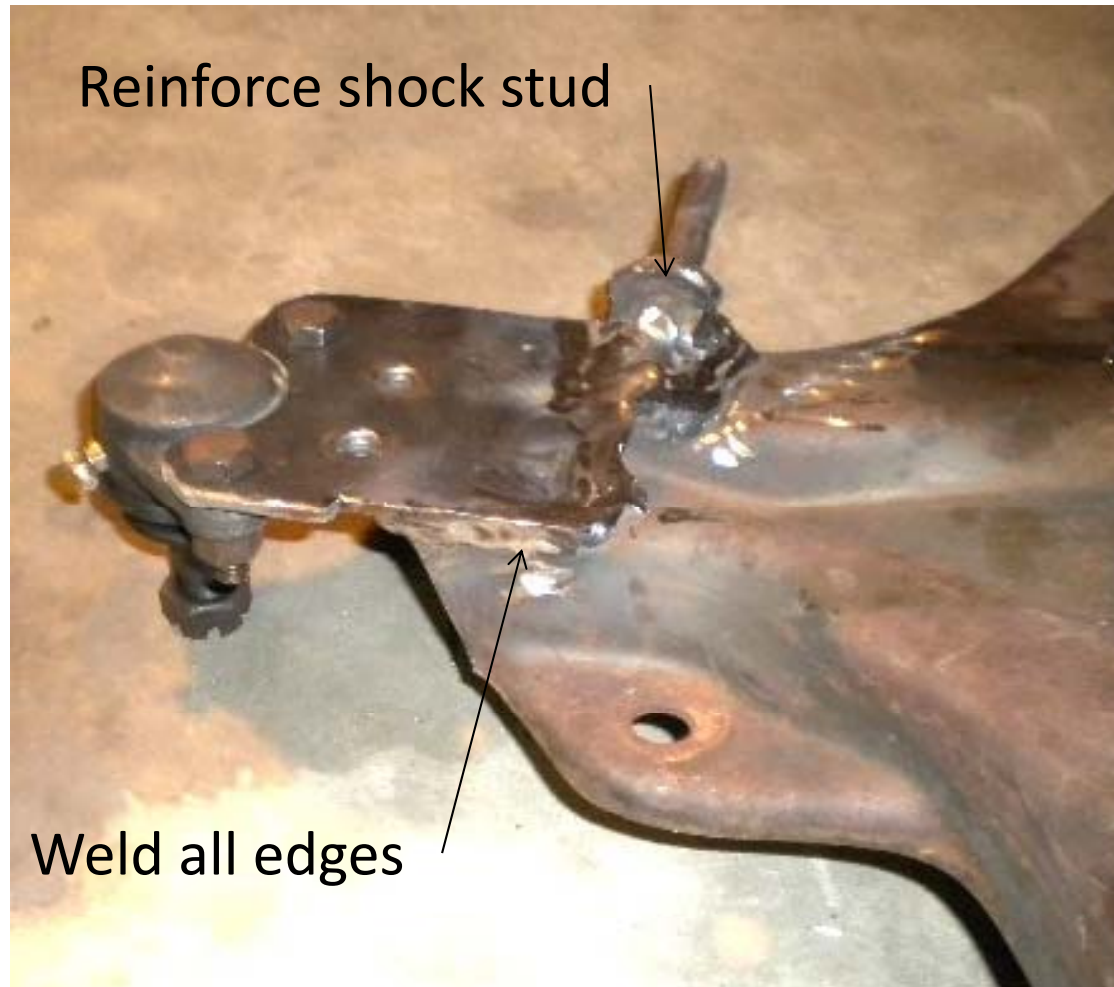
Test Fit Actual Ball Joint



- Used the old ball joint from the 1 ton truck.
- Grind the weld as required.
- You can see why the cut-off point and angle were moderately critical.
- If you move the ball joint out more than $\frac{3}{4}$ ", you will have more clearance here.



Top Plate Welded





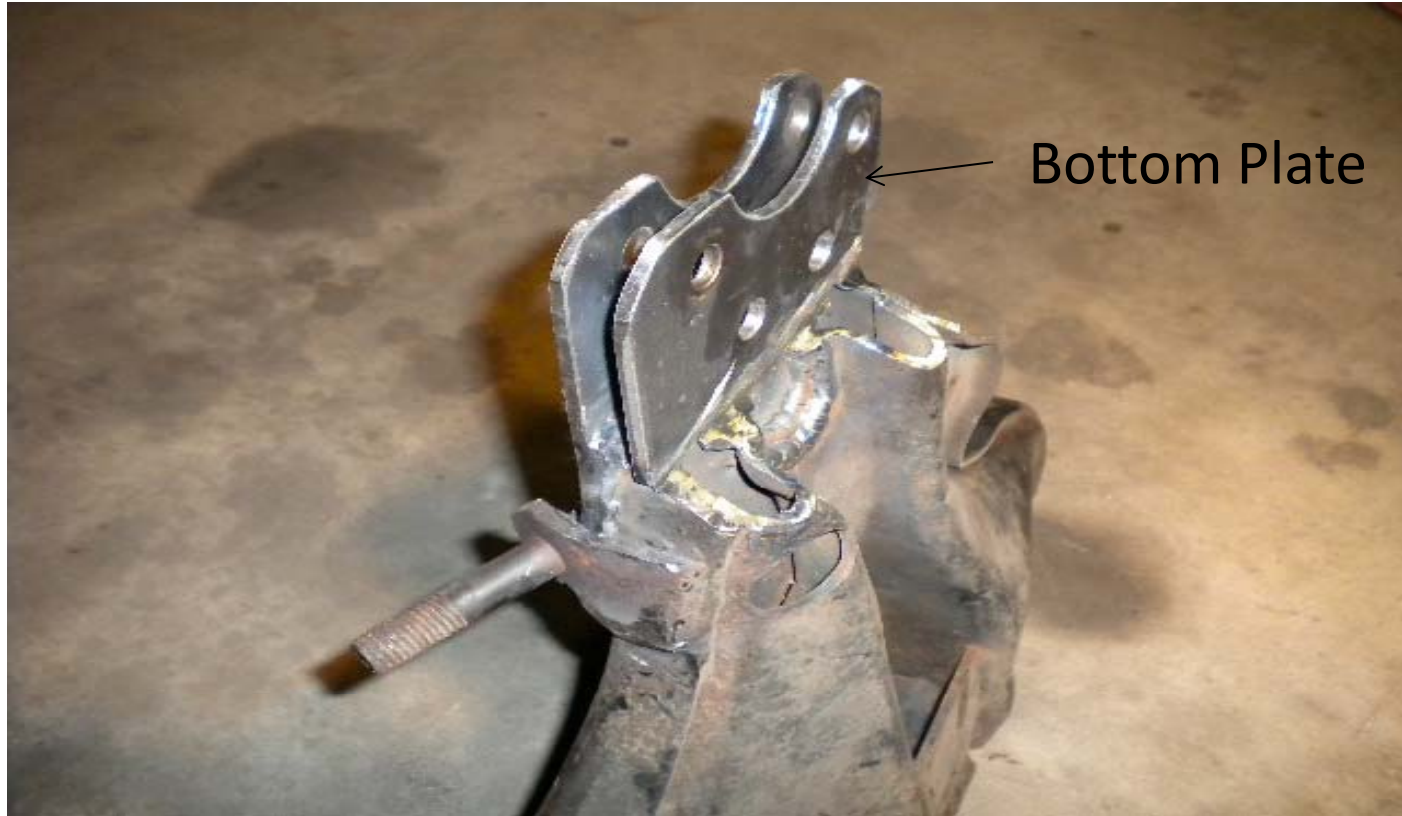
Bottom Plate Ready to Weld



- Bolt the dummy ball joint and bottom plate in place.
- You may have to grind the bottom plate a little to get it to fit.
- Weld the bottom plate in place.
- Remove the dummy ball joint, grind the welds.



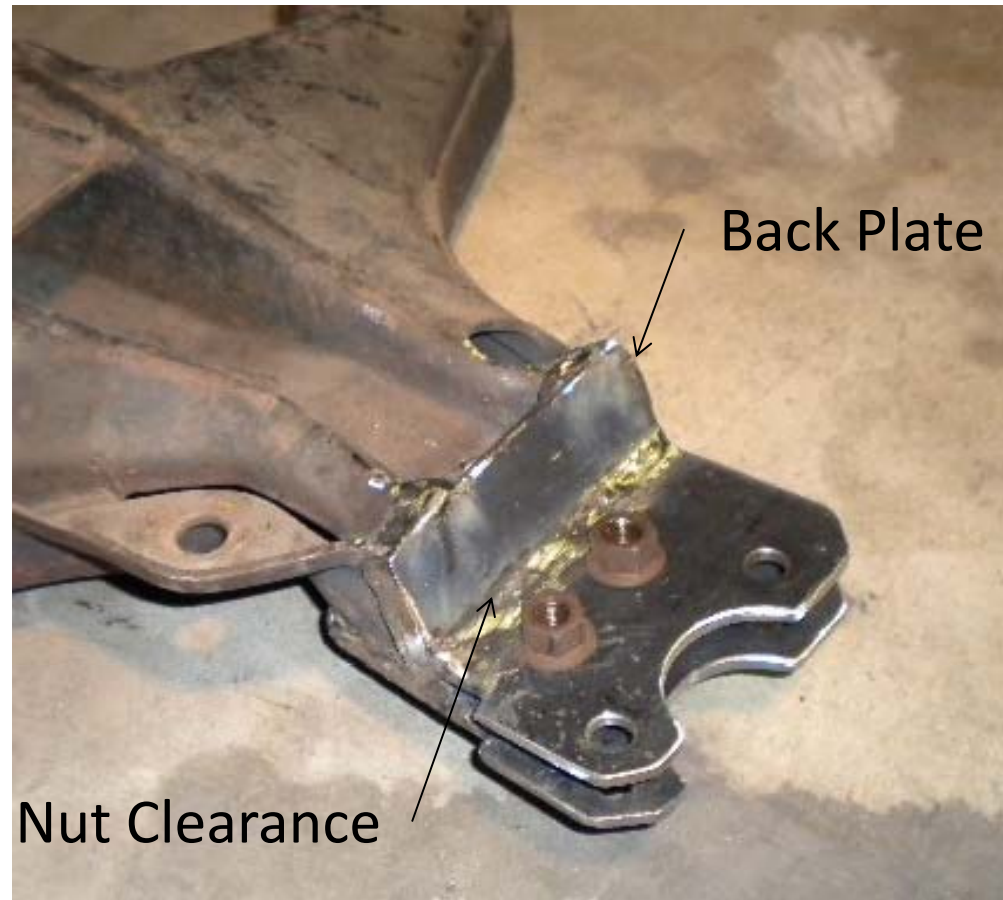
Bottom Plate Welded





Back Plate Welded

- Weld with dummy ball joint in place – outer two bolts only.
- Check nut clearance for inner two bolts.
- Grind as necessary.





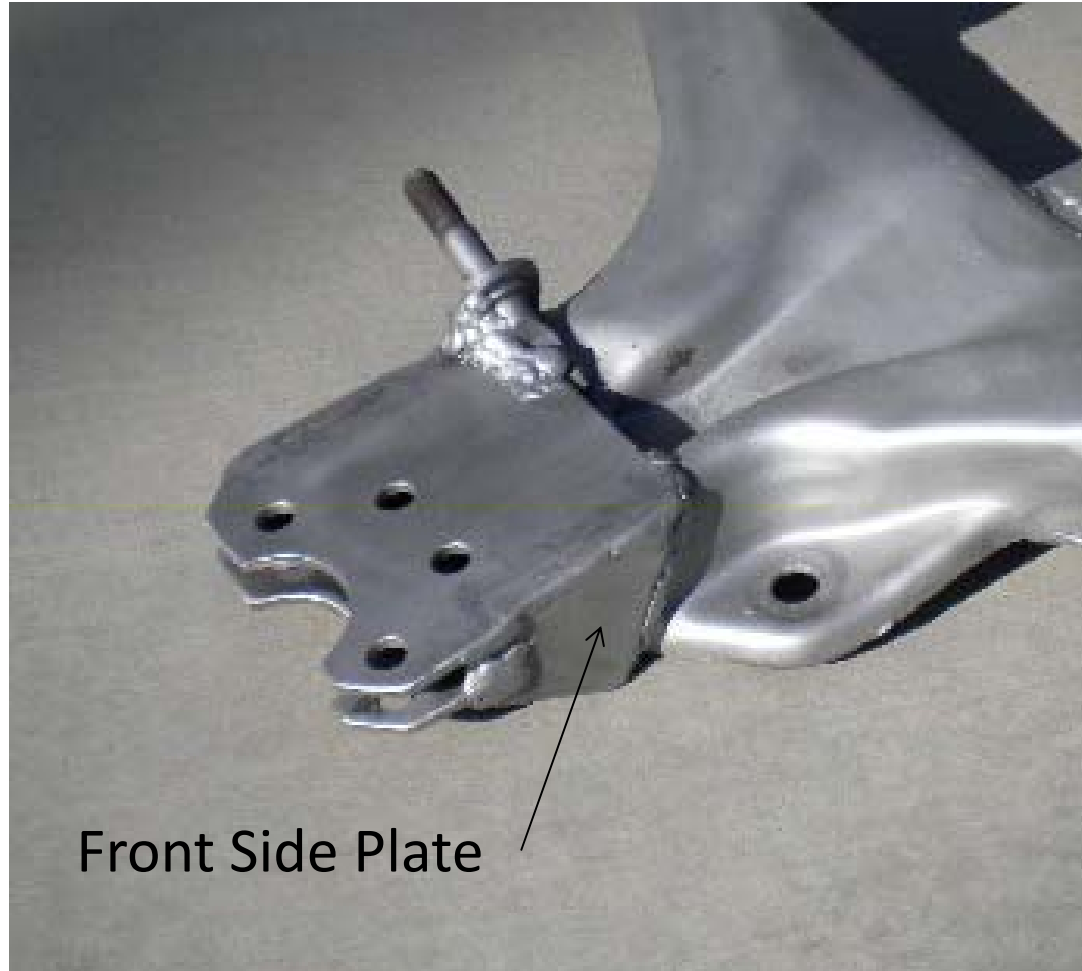
Rear Side Plate Welded

- Weld side plates with dummy ball joint bolted in.





Front Side Plate Welded

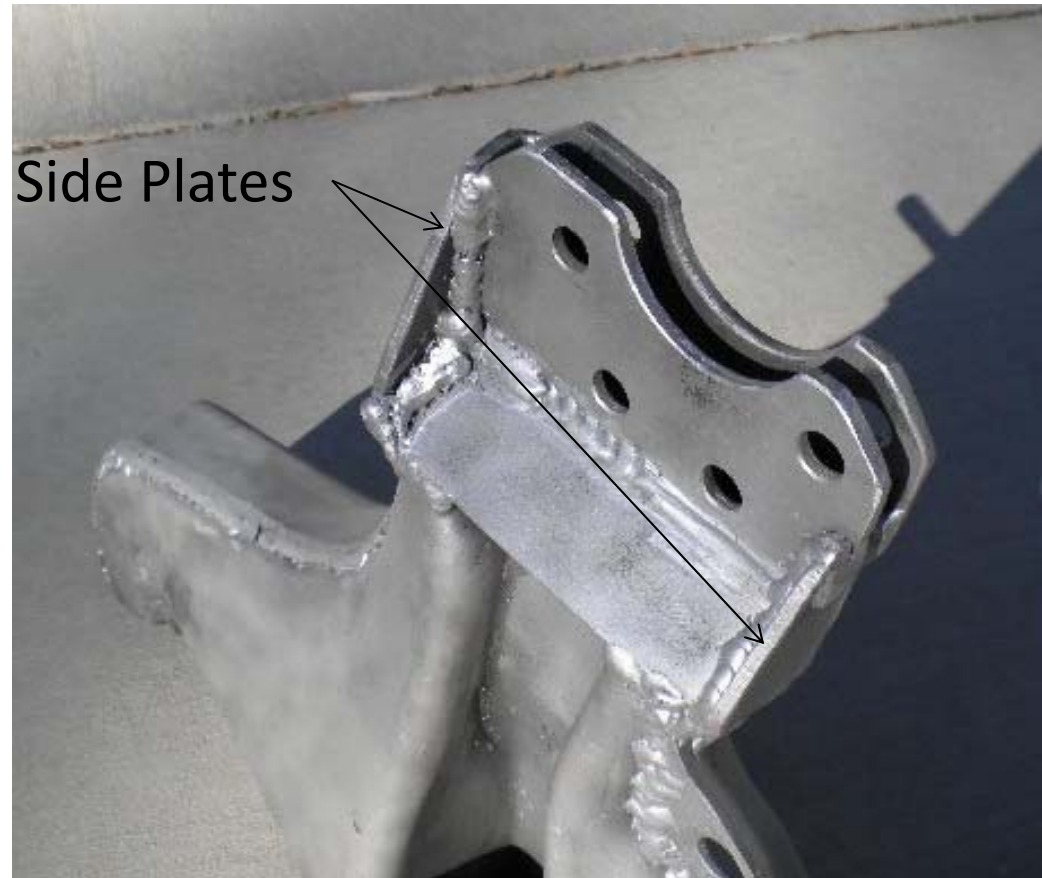


Front Side Plate



Finished Ball Joint End, Bottom View

The side plates really tie it all together and add a lot of rigidity.





Corner Gussets and Torsion Bar Socket Reinforcing





All Seams on the A Arm are Fully Welded





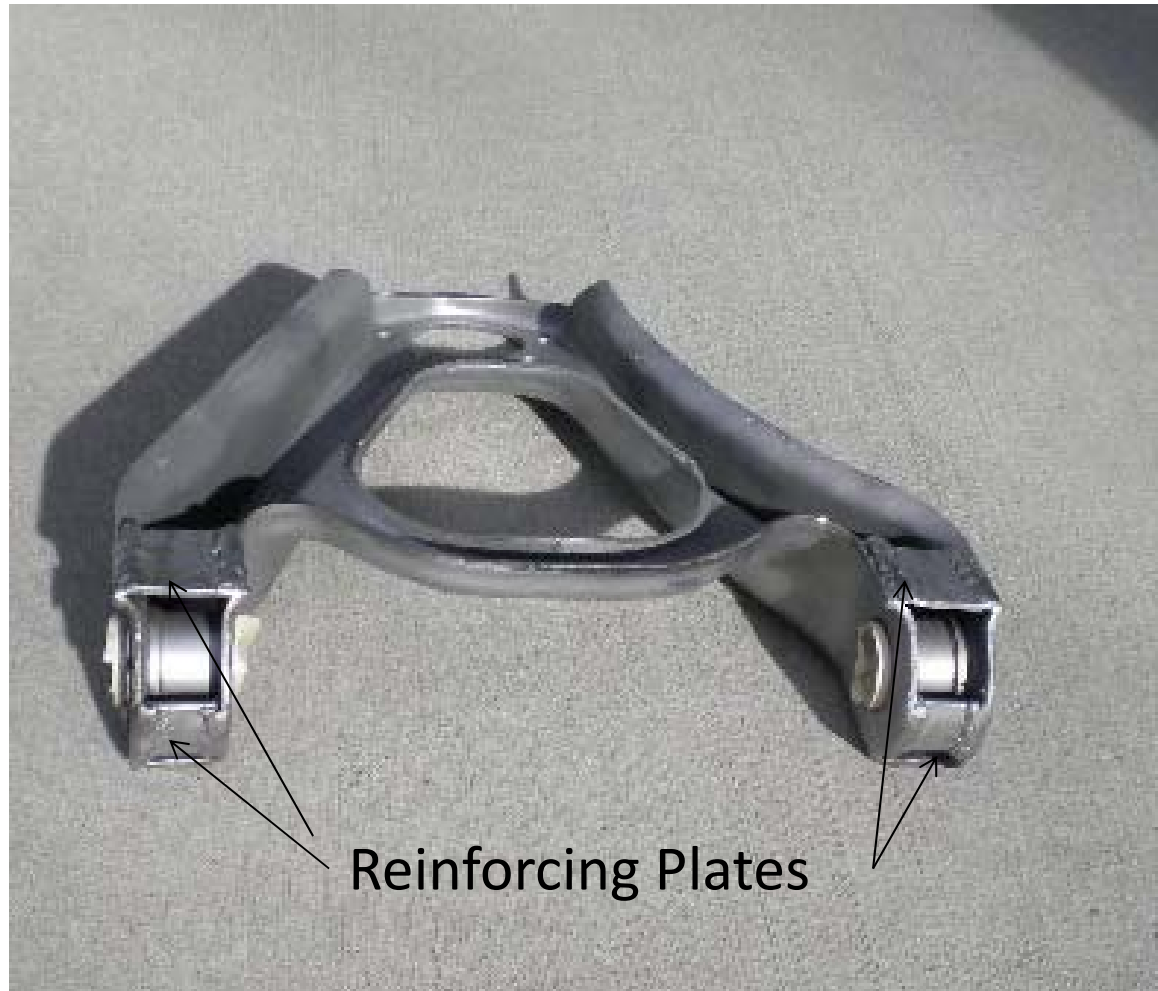
Do You Really Want to Modify Your Own A Arms?

- If you have welding/fabrication experience, and want to do this, by all means, have at it!
- Requires about 2 sq ft of 3/16 steel plate per pair of A arms. Remember the welding, grinding, cutting supplies.
- My first pair took 40+ hours, the second pair about 25 hours.
- If you take it to a fabrication shop, you will have to give them very good instructions, and watch them closely.
- If you build your own, you can chose what alignment spec's to build for.
- Jim Kanomata will sell you a pair built by Bill Hubler for approx. \$900.



Upper A arm – reinforcement of bushing area

- Reinforcing the bushing ends of the upper A arm is not necessary, I just couldn't resist .



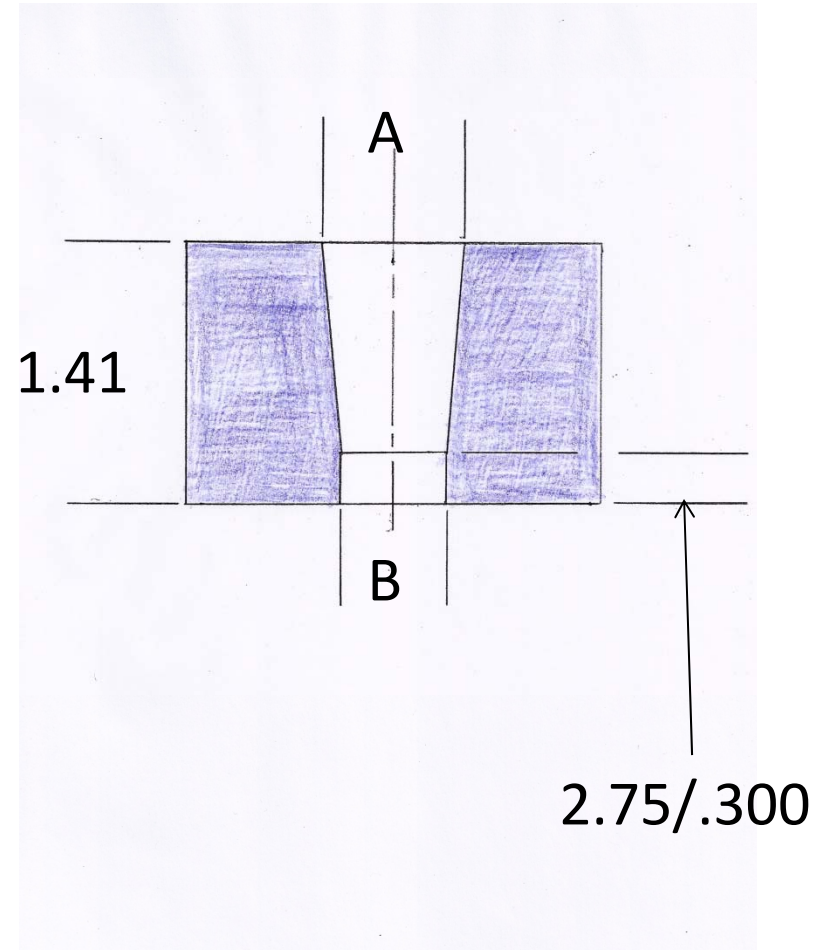


Steering Knuckle – 1988 vs 1989 - 91

Tapered hole for the upper ball joint.

Year	A	B
1988	.770	.570
89 - 91	.875	.670

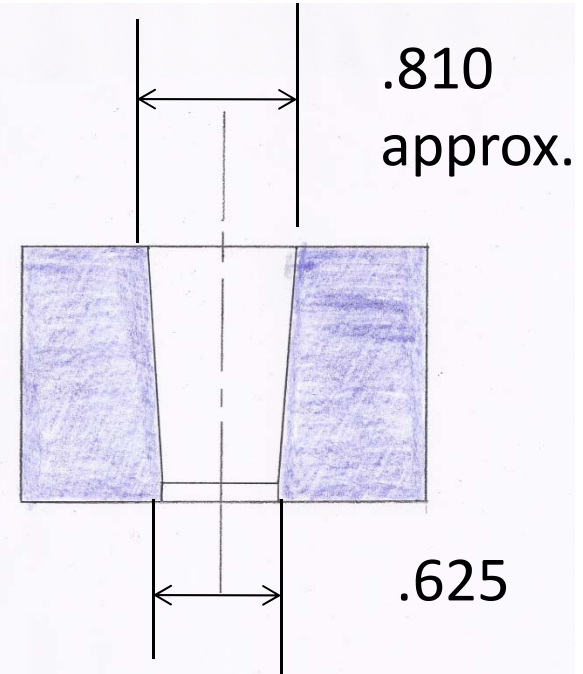
Taper angle is 10 degrees on both.





Upper Ball Joint – 1988 Hardware

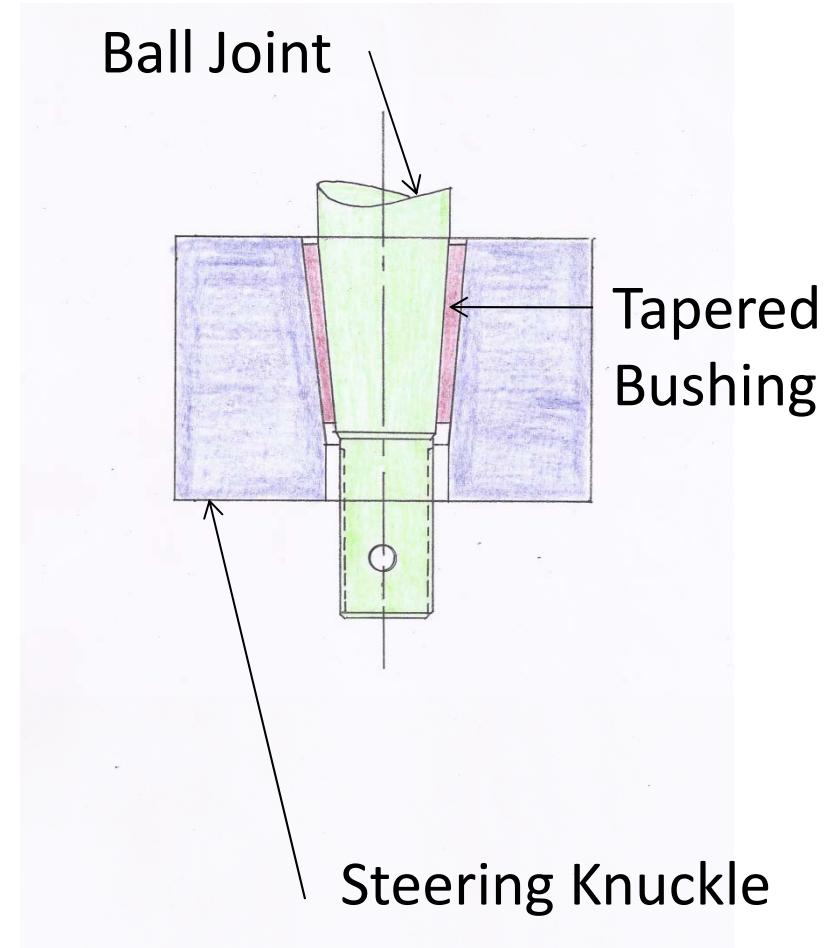
- Drill thru bottom hole with 5/8" drill.
- Ream with a 7 ½" degree reamer until the new ball joint fits such that the nut threads on far enough to install the cotter pin.
- This will result in approx. .810" at top.
- Use the upper ball joint from a 1970 C-30 Chevy truck – MOOG K680, Autozone Duralast FA 548.
- This ball joint bolts directly into the motorhome upper A arm.
- Jim Kanomata has the Moog K680.





Upper Ball Joint, 89 – 91 Hardware

- No machining required.
- Buy tapered bushing from Jim Kanomata.
- Use your original GMC upper ball joint.
- If necessary, file notches in castle nut deeper to install cotter pin.





A Word About Tapers

- Ball joints and tie rod ends seem to use either of two different tapers – $7\frac{1}{2}$ (sometimes called 7) or 10 degrees.
- Both are actually misnomers.
 - $7\frac{1}{2}$ degree taper is actually $1\frac{1}{2}$ in/ft, or 7.12 degrees.
 - 10 degree taper is actually 2 in/ft, or 9.48 degrees.
- All of the ball joints and tie rod ends on the motorhome and the one ton truck have 10 degree taper. The 1970 C-30 has $7\frac{1}{2}$.
- Was this done to make the taper easier to remove?
- Do not use the C-30 ball joint (Moog K680) directly into the one ton knuckle. The tapers will be mismatched – $7\frac{1}{2}$ into 10 degree, and the fit will be sloppy. You will not be able to hold alignment.



Tapered Reamer Source



www.speedwaymotors.com

Paul Leavitt will loan a reamer, 10 degree, I believe.

[Home](#) > Tapered Ball Joint Reamer

← Refine Your Results by Selecting a Category

Enter Key Word or Part # **SEARCH WITHIN RESULTS>>**

Pages: 1 (total 1 pages)



Tapered Ball Joint Reamers - 10 Degree
Price: \$79.99 - \$127.99



Tapered Ball Joint Reamers - 7 Degree
Price: \$79.99 - \$127.99



Ream the Tie Rod End Hole

- Ream the tapered hole in the steering knuckle that the tie rod end fits into.
- Ream 10 degrees until the GMC motorhome tie rod end fits such that the nut threads on far enough that the cotter pin can be installed.
- One person can hold the knuckle on the table of a drill press while another operates the drill press to ream the hole.
- Use oil frequently while cutting.
- Trial fit the tie rod end frequently. Do not cut too deep.
- On the one ton conversion, the tie rod end comes up from the bottom, opposite to how it mounts on the motorhome.



Rebuild CV Axles

- You will need to use the axle assemblies from the one ton truck, with the axle shafts replaced with longer ones from Jim Kanomata.
- Do not purchase after market axle assemblies, planning to replace the axle shafts.
 - They may be good quality, and may fit the one ton truck .
 - The splines where the axle shaft fits into the CV hub are of a totally different specification.
 - The longer axle shafts required for the motorhome will not fit properly with these aftermarket axle CV hubs.



Rebuild CV Axles

- Jim's axle shafts measured larger over the OD of the splines than the axles from my one ton truck.
 - Axle shafts from the one ton truck – all four ends measured the same dimension.
 - Jim K's axles – all four ends measured the same slightly larger dimension.
 - Yet Jim K's axles fit into the splines of both inner CV joint hubs.
 - One axle fit one outer CV joint hub very tightly, one would not fit .
- On another set of axles (Bob Peltzer's) both GMC and one ton axles measured the same dimensions over the splines as mine, but all four CV joint hubs fit Jim K's axles without any rework.
- There is a surprising amount of variability in the parts from GM!



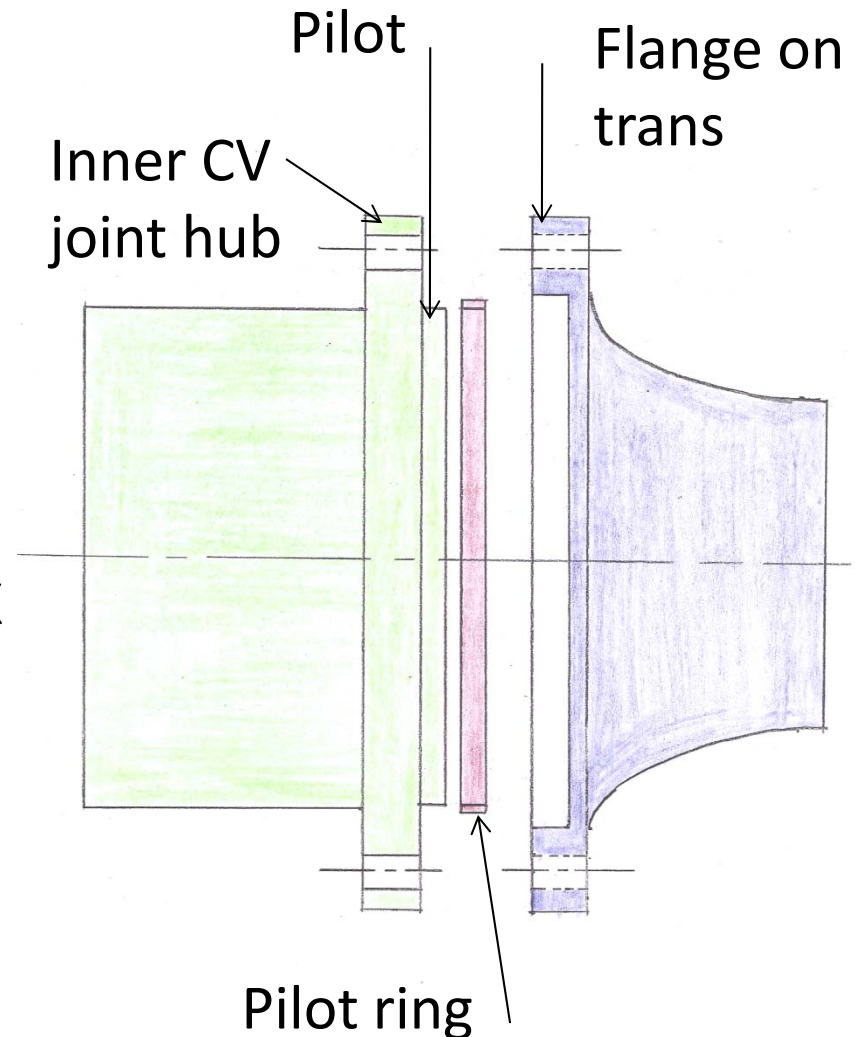
Rebuild CV Axles

- On the outer ends of both of my axles from Jim K, I used a 1 ½" dia X 1 ½ long sanding drum in an electric drill, moving both axially along the splines and around the splines to remove material until the OD measured the same as the one ton truck splines.
- One axle then fit one outer CV joint hub, the other was still too tight.
- On the other axle, I then used a Dremel tool with a 1" dia X .040" thick abrasive disc. I carefully went over the root between spline teeth, and with the side of the disc against the side of every tooth of the spline
- Careful cleaning, then trial fit, then look for witness marks, and work these areas again until spline fits the hub easily.



Inner CV Hub Pilot Ring

- The fit at this pilot on the MH is approx. .010 clearance, allowing the inner CV joint hub to be at most .005" off center.
- Pilot on one ton is approx. .060 smaller.
- My first pair of rings from Jim K were about .012 interference fit on hub pilot. Could not be driven on.





Inner CV Hub Pilot Ring

- I provided Jim with dimensions resulting in approx. .002 interference fit over the one ton pilot (could even be a slip fit) and about .006 clearance to the pilot in the drive flange.
- These fit nicely.
- I can't say how much variability there is in the dimensions of the parts from GM.
- It is easiest to drive this ring on the hub pilot before you assemble the hub to the axle.



Continue Rebuilding CV Joint Axles

- Inspect the CV joint boots, replace if they show age.
- Fit outer boot to the axle first, then assemble the outer CV joint using grease specifically for CV joints.
- Install boot clamps. I reused my old ones since they seemed better quality than the new ones I bought.
- NAPA sells a boot clamp tool – approx. \$35.
- Fit inner boot on axle, grease and assemble inner CV joint.
- I suggest leaving the inner boot clamp off until after the axle is installed and the suspension is together.
- Haynes Manual for the one ton truck gives a dimension for the length of the inner boot at final clamping.
- Cut approx .150” off length of drive flange bolts, or the left side bolts may interfere with the transmission case.



Assemble A Arms and Axles to Coach



Special Tool
2 X 4 Cedar



With Steering Knuckle

Note tie rod
reversed





With Hub & Bearings, Brake Rotor



Torque axle nut with a screw driver in the rotor slots.



With Caliper and Spacer



← Brake
Caliper



With Brake Hose

- Front brake hoses for 1988 Chev K3500 from Advance Auto Parts.
 - Left H38622
 - Right H38623
- Straighten out bracket, cut off, drill hole, drill hole in upper A arm.

Brake Hose





See How Pretty it Can Be!

Paul Leavitt's front suspension





Alignment Procedure

- Park on a flat surface, preferably concrete.
- Set rear ride height to the proper level, adjust front ride height at torsion bar porkchops. A change at any corner will affect the other corners, so repeat the process until levels are OK at all corners.
- Adjust camber. This can be done with a carpenter's T square.
- Set toe (zero to 1/8" toe out.)
- If concrete surface has slope, level coach by driving the low side onto boards. Recheck camber with a bubble gage.
- Check caster. If close, test drive the coach. Adjust as necessary.
- Have a professional alignment done if it makes you comfortable.



Torque Values

Description	Torque - Ft. Lb.
Lower ball joint to A arm bolts	52
Upper Ball joint to A arm bolts	20
Lower ball joint to knuckle nut	94
Upper ball joint to knuckle nut	40 – 60
Lower A arm bushing bolts	85
Upper A arm alignment adjuster nuts	90
Hub and bearing assy. to knuckle bolts	66
Steering tie rod nut	40 – 50
Axle to hub nut	173



Torque Values

Description	Torque - Ft. Lb.
Brake caliper bolts	28
Shock absorber nuts	90
Inner CV joint to drive flange bolts	75
Wheel spacer to hub nuts	(150)
Wheel lug nuts	(150)
Sway bar bracket to frame bolts	28
Torsion bar cross member to frame	25

- Confirm all torque values before relying on them.
- Values in parenthesis are not documented.



Caution – SAE vs Metric Threads

Our coaches were built using all inch dimension (SAE) fasteners. The 1988 – 91 one ton truck was built using primarily metric fasteners. In many cases there are metric threads that are close enough in diameter and thread spacing that you can thread metric nuts onto SAE bolts, and visa versa. The result may be galling of the threads, and/or weakening of the joint.

If you chase a metric bolt with an SAE die, the resulting threads will be unsuitable for either.

Be very careful not to mix up your nuts and bolts, and to keep clear which threads are which.



What Were My Costs?

Description	Cost - \$
1988 one ton truck suspension parts	200
Pair of wheel spacers, nut, lug nuts	110
Lower A arm modification, mat'l & supplies	142
Polyurethane bushing set, Applied GMC	90
Lower ball joints Raybestos 5051135	72
Upper ball joints, Autozone Duralast FA548	78
Hub seals, Timken 710103, RockAuto	10



What Were My Costs?

Description	Cost - \$
Axle shafts, Applied GMC	330
Hub pilot adapter rings, Applied GMC	23
Ball joint reamer, 7 ½ degree, Speedway Motors	80
Alignment adjuster cam bolts, NAPA NCP 264-3620	56
Brake hoses, Advance Auto Parts, H38622, H38623	36
CV joint grease, Autozone	10
CV joint pliers, NAPA	35
Total	1272

A vintage green and white GMC motorhome is parked on a paved surface. The vehicle features a spare tire mounted on the rear, a ladder on the side, and a chrome bumper. A circular emblem on the side of the rear window reads "FAMILY MOTOR * 367089 COACH ASSOC". The background shows a light-colored building and some trees.

**“That’s all Folks”
Thank You for Your
Time**

Stan Edwards