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Revisions			
Rev.	Description	Date	Approved
D	Revised Per ECO 24-008	2/20/24	RG



Dodge Ram Adjustable Ball Joints Installation Instructions

Applications:

- 2003-2013 Dodge Ram 2500 4X4
- 2003-2012 Dodge Ram 3500 4X4
- 2006-2008 Dodge Ram 1500 4X4 Mega Cab



TITLE:
DODGE RAM 03-13 ADJUSTABLE BALL JOINT INSTALL INSTRUCTIONS

SIZE A	DWG NO: 4123-INST	REV D
	SCALE: N/A	PAGE 1 OF 14



DODGE RAM 03-13 ADJUSTABLE BALL JOINT INSTALLATION INSTRUCTIONS

Thank you for purchasing the best aftermarket products available for your vehicle. We strongly feel that the parts you are about to install should meet or exceed your expectations for performance. Proper assembly is critical to the performance of these components and the vehicle as a whole. Please take the time to carefully read these instructions and familiarize yourself with the installation procedure before working on your vehicle. If you have any questions, PLEASE contact Synergy Manufacturing BEFORE beginning installation. Thanks again for supporting Synergy – enjoy the performance benefits of the best aftermarket products available for your vehicle!

Synergy Manufacturing
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Now for the lawyer part:

Modifying or otherwise altering vehicle components may cause the vehicle to handle differently than originally designed. It is the driver's responsibility to familiarize themselves with the performance and handling characteristics of the modified vehicle. Vehicles with larger diameter than stock tires must be driven carefully and cannot be expected to perform as stock or meet OEM performance with regard to handling, braking or crash performance. Ensure all replacement components are compatible with vehicle capacities so as not to overload components, especially tires. It is up to the individual to ensure that the vehicle and all components are compatible with the intended vehicle use, including load ratings, road conditions, and driver abilities. Thorough and frequent vehicle inspections are recommended to ensure a safe and reliable state of readiness, especially after off-highway use.

PARTS LIST

4123 Dodge Ram 4X4 Non-Knurled Ball Joints		
QTY	Part Number	Description
2	412301-02	Adjustable/Rebuildable Lower Ball Joint
2	412301-01	Upper Ball Joint
1	412301-HDW	Hardware Kit
1	412303-04-PL	Ball Joint Adjuster Wrench

4123 Dodge Ram 4X4 Knurled Ball Joints		
QTY	Part Number	Description
2	412301-02KN	Adjustable/Rebuildable Lower Ball Joint
2	412301-01KN	Upper Ball Joint
1	412301-HDW	Hardware Kit
1	412303-04-PL	Ball Joint Adjuster Wrench



GENERAL NOTES

- These instructions are also available on our website; www.synergymfg.com. Check the website before you begin for any updated instructions and additional photos and videos for your reference.
- Worn front end components can quickly wear out other components. When replacing ball joints, check the condition of the tie rod ends in the steering and the track bar and suspension bushings, especially if ‘death wobble’ was ever experienced. Replace all worn components all at once.
- These Synergy ball joints are designed as a lifetime part. As they wear, the joint can be adjusted to accommodate for this wear. This adjustment can be performed with the vehicle on the ground without removing any parts from the vehicle. If no more adjustment is possible, the joints can be rebuilt without removing the ball joint body from the axle housing.
- Rebuild kits are available from Synergy Mfg. Part number 4123-100.
- Replacement hardware kits are available from Synergy Mfg. Part number 412301-HDW.
- While these ball joints are designed as a lifetime part, they are not maintenance free. The joints require lubrication with fresh grease occasionally. We recommend re-greasing the joints after every 20,000 road miles. If harsh conditions are encountered, such as a dusty, salty, or wet environment, then we recommend re-greasing the joints more frequently.
- Ball joint installation should be done by qualified professionals. Incorrect ball joint installation can cause severe problems and safety issues.
- The upper ball joints are a plunge type – the stud should move freely up and down. This is normal.
- These Synergy ball joints have a break in period. This can be from a couple hundred to a couple thousand miles, depending on the vehicle and driving conditions. Until the joints have properly broken in, the steering can feel ‘tight’ and the vehicle will not return to center well. This is a typical characteristic of metal on metal joints.
- If non-knurled ball joints are removed from the vehicle, they should be replaced with non-knurled ball joints unless the vehicle has had several replacement sets and the ball joints are no longer a press fit. Installing knurled ball joints into an axle that is brand new or has only had non-knurled ball joints can cause extremely tight steering or difficulties adjusting preload on the lower ball joints.

TOOLS NEEDED

- Ball Joint Press
- Retaining Ring Pliers
- Basic Hand Tools (5mm allen wrench, 18mm wrenches and sockets, 30mm wrench or socket, 21mm wrench or socket)
- ¼ Drive Torque Wrench (For preload adjustment)

ESTIMATED INSTALLATION TIME

4-6 Hours

LOWER BALL JOINT OVERVIEW

1. These ball joints are adjustable for preload and are rebuildable. **Figure 1** identifies the components of the ball joint and the assembly order.

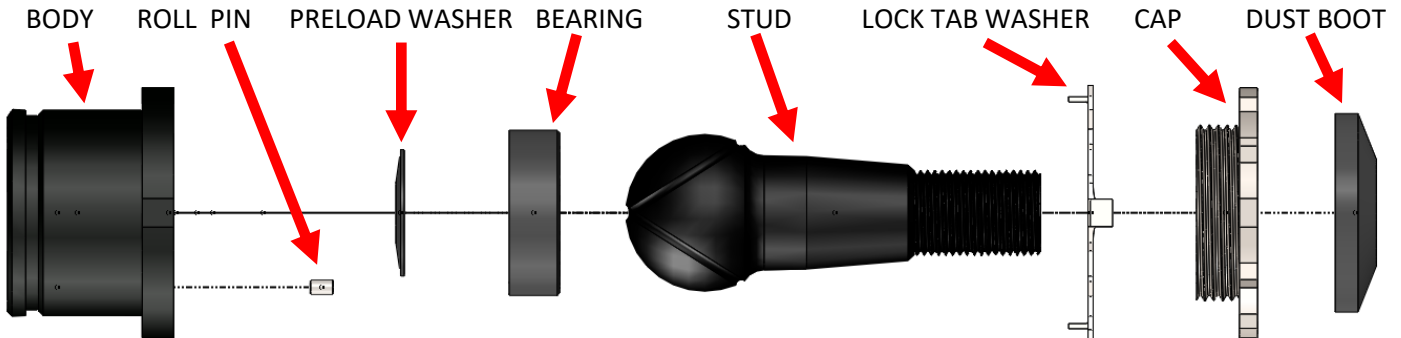


Figure 1. Ball Joint Components and Assembly Order

2. We recommend installing the joints assembled.
3. If the joint is to be disassembled for any reason, it is important to keep all the parts of specific joints together. We recommend only disassembling one joint at a time or keeping them in separate left/right trays or boxes. See separate instructions for Synergy Rebuild Kit Part Number 4123-1000 for disassembly and re-assembly.

INSTALLATION

1. Park the truck on a flat, level surface, or safely raise the vehicle on a lift. Chock the rear wheels, make sure the vehicle is in park or in gear, and set the parking brake. Raise the front end, place the front axle housing on jack stands and remove the front wheels.
2. Unhook the abs sensor lines from the flexible brake lines. Remove the brake calipers from the knuckles (18mm) and hang them from the frame with caliper hangers or straps of some sort. **See Figure 2.** Do not allow the calipers to hang by the brake lines.



Figure 2. Removing Brake Caliper Carrier Bolts

3. Remove the brake rotors.
4. Remove the ABS sensors by unscrewing the 5mm allen head bolt and then pulling the sensor carefully up and out. **See Figure 3.**

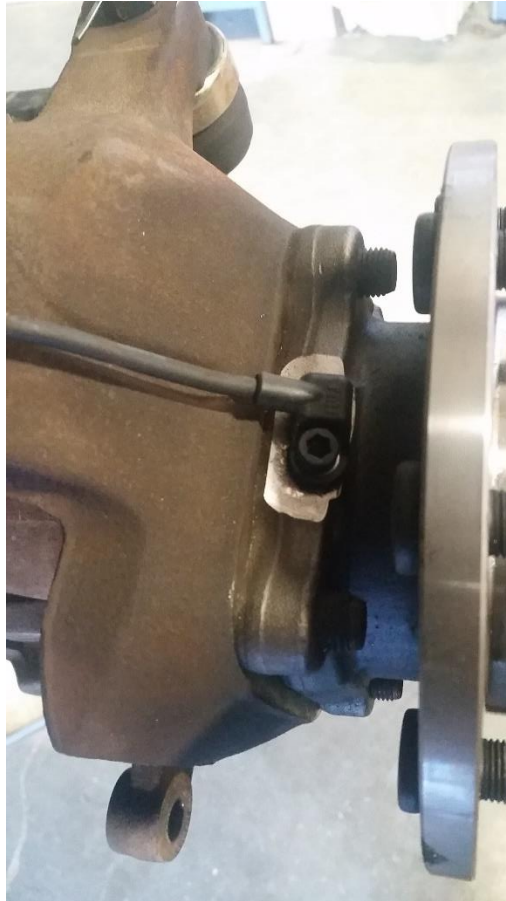


Figure 3. ABS Sensor in Knuckle

5. Remove the tie rod from the steering knuckles and hang it out of the way. **See Figure 4.**



Figure 4. Tie Rod Removed

6. Remove the wheel bearing bolts from the back side of the steering knuckle. It can be helpful to rotate the axle shafts to orient the u-joint so that you have access to the bolt heads. **Figure 5** shows two of the four bolts on the back side of the knuckle.



Figure 5. Unit Bearing/Hub Bolts on Back Side of Knuckle

7. With the wheel bearing bolts removed, remove the wheel bearing unit assembly and the axle shaft as one piece. Carefully knock the assembly loose from the knuckle with a soft mallet. Older trucks may require some penetrating lube like PB Blaster or a large pry bar to get the unit bearing out of the knuckle. Carefully pull the axle shaft out and through the knuckle. The complete assembly is **heavy**. Be careful not to damage the splines on the inside of the axle shaft. **See Figure 6.**



Figure 6. Removing Unit Bearing/Hub and Axle Assembly from Axle

8. Remove the brake backing plates.

9. Loosen the nuts on the old ball joints. Knock the knuckles loose by either striking the knuckle with a ball peen hammer in the area of the ball joint studs or using an air hammer. Separate the lower ball joint taper first, then the upper. Remove the nuts and the knuckles. **See Figure 7.**



Figure 7. Knuckle Removed

10. Remove c-clip from lower ball joints. Remove dust boots from all the ball joints and wipe up all old grease. Press out the old ball joints. The lower ball joints are pressed out 'down' and the uppers are pressed out 'up'. **See Figures 8 and 9.**



Figure 8. Pressing Out Lower Ball Joint



Figure 9. Pressing Out Upper Ball Joint

11. Inspect knuckle tapers and inner c bores. Ensure they are not deformed and are clean and free of burrs. Damaged parts should be replaced or repaired as necessary.
12. Remove the dust boots from the Synergy ball joints prior to installation so that they are not damaged during installation.
13. The lower ball joints should be pressed in assembled. It is important that the press adapters do not rest on the locking tabs on the outside of the cap. If the press adapters are too large, they may damage the locking tabs machined into the cap. Most ball joint presses should have an adapter that fits the lower ball joint correctly.
14. Orient the Synergy lower ball joints - Depending on the wheel offset, axle trusses and gussets, axle shaft size and other factors, the orientation of the zerk will need to be decided by the installer. We recommend orienting the zerk fitting so that it is pointing towards the front of the vehicle, slightly toward center. **See Figure 10.**

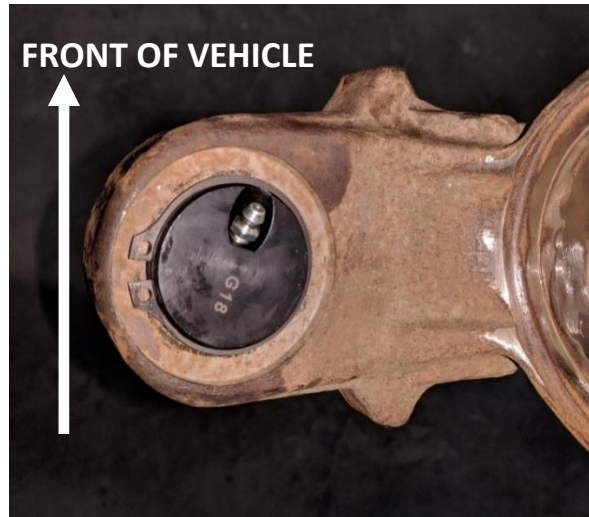


Figure 10. Lower Ball Joint Orientation

15. Once the lower ball joints are correctly oriented, press the joints into the axle housing. It is critical that the body is pressed in evenly and smoothly. Grease is not necessary but can be used if desired. The joint must sit flat and flush against the lower surface of the inner c. **See Figure 11.**

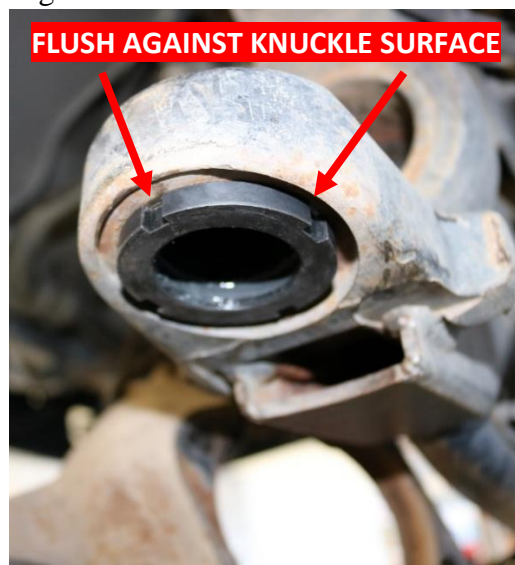


Figure 11. Lower Ball Joint Body Pressed In. Joint Shown Disassembled for Clarity, Recommend Pressing in Assembled.

16. Press the upper ball joints into the axle housing. It is critical that the body is pressed in evenly and smoothly. Grease is not necessary but can be used if desired. The press tool should sit on the lip on the outside of the ball joint body. The joint must sit flat and flush against the upper surface of the inner c. **See Figure 12.**



Figure 12. Upper Ball Joint Pressed In

17. At this time on the lower ball joints, bend **out** the locking tabs that interface with the cap so that the cap may be rotated. The threaded cap should be left hand tight for now. **Important** - If the threaded cap will not thread in by hand, it is possible that the ball joint is too tight of a press fit in the 'C'. This can be caused by using knurled joints when non-knurled joints should have been used or if the 'C's have been damaged or in some cases deformed by welding on gussets. In general, if the press fit is too tight, it may be remedied by removing and reinstalling the lower ball joint housing a couple times in order to 'resize' the bore in the 'C's. If there are questions or concerns, please contact Synergy Manufacturing before proceeding.
18. Install the zerk fittings and dust boots onto the ball joints. Double check to ensure a grease gun can fit into the recessed area of the lower ball joint and lock onto the traditional straight zerk fittings. If the grease gun cannot fit, install the provided needle type zerk fittings. Install circlip on lower ball joints.
19. Note the orientation of the cotter pin holes in the ball joint pins. We recommend aligning the cotter pin holes so that they are perpendicular to the axle, aligned front to back on the vehicle. **See Figure 13.** If the cotter pin holes need to be relocated, spin the ball studs with a pin through the cotter pin hole. This will make cotter pin installation easier.



Figure 13. Cotter Pins Aligned Front to Back

20. Install steering knuckles. Tighten lower ball joint nut slightly (no more than 50 lb-ft).
21. Re-install abs line clips under upper ball joint nut if so equipped. Torque upper ball joint castle nuts to 70 lb-ft.
22. Torque lower ball joint castle nuts to 150 lb-ft.
23. Rotate the knuckles from lock to lock by hand. They should be stiff, but able to rotate by hand. Ensure there are no clearance issues anywhere. Potential problems may arise with worn knuckles; the lower ball joint taper could sit too deep in the knuckle and cause the knuckle to interfere with the ball joint or inner C. If this is the case, the vehicle will need new knuckles.
24. Install cotter pins. If the castle nut slots do not line up with the cotter pin holes, continue to tighten the castle nuts until they align. Never loosen a castle nut to align the cotter pin. If the cotter pin hole is above the top of the castle nut, remove the castle nut and place a washer under the castle nut to make sure the pin engages with the nut. Usually this is an indication that the knuckle taper has been worn out and the knuckles should be replaced. **See Figure 14.**



Figure 14. Cotter Pin Installed

25. Set preload on the lower ball joints. See the **ADJUSTING LOWER BALL JOINT PRELOAD** section on page 13.
26. With the joints preloaded, bend down two tabs from the lock ring into the cap. Be sure the tabs bent down will be accessible when the vehicle is re-assembled and back on the ground. If the tabs do not align with slots on the cap be sure to tighten the cap in order to make them align. Do not loosen the cap to align the tabs.



Figure 15. Tabs Bent Into the Cap

27. Re-install brake backing plates, being sure to orient them correctly. Insert two of the unit bearing bolts through the knuckle to hold the backing plate in place.
28. Re-install the unit bearing/hub/axle shaft assembly, being very careful when installing the axle shaft to ensure the splines line up in the differential and not to damage the inner axle seals. We recommend cleaning all the hub bolts with brake cleaner and a wire brush, and then using high strength thread locker on installation. Torque unit bearing/hub bolts to 150 lb-ft.
29. Re-install the ABS sensors. **See Figure 16.**



Figure 16. Backing Plates, Hubs and ABS Lines Re-Installed



30. Re-install the tie rod. Torque OEM hardware to factory spec of 40 lb-ft, then an additional 90 degrees. If using a Synergy Tie Rod, torque castle nut to 70lb-ft. If the cotter pin does not line up with the castle nut further tighten the nut until it aligns. Never loosen a castle nut to align a cotter pin. If using an aftermarket tie rod, torque tie rod ends to manufacturer's specification.
31. Re-install the brake rotors and calipers. We recommend cleaning all the brake caliper bolts with brake cleaner and a wire brush, and then using high strength thread locker on installation. Tighten caliper mounting bolts to 130 lb-ft.
32. The joints come pre-greased. If you are going to grease them after installation, use no more than one 'pump' of grease from a grease gun. We recommend Synergy Lithium Complex Extreme Pressure grease. If this is not available, be sure to use an extreme pressure grease designed for metal on metal joints.
33. Re-install wheels and tires and torque lug nuts.

Installation is Complete

Table 1. Dodge Ram Bolt Torques

Bolted joint Location	Torque
ABS Sensor Bolt	45 lb-in (Inch!)
Unit Bearing Bolt	150 lb-ft
Lower Ball Joint Stud	150 lb-ft
Upper Ball Joint Stud	70 lb-ft
Tie Rod TRE Stud (Factory)	40 lb-ft + 90deg
Tie Rod TRE Stud (Synergy)	70 lb-ft
Caliper Mounting Adapter Bolts	130 lb-ft

ADJUSTING LOWER BALL JOINT PRELOAD

1. It is important to periodically check the lower ball joints for play. The easiest way to check for a loose joint is to place a jack under the axle housing on one side. Raise the jack so that the tire is just off the ground. Place a jack stand just behind the axle housing, next to the tire. Using a prybar or other lever, try and 'push' the steering knuckle upwards. **See Figure 17.** Per factory spec, there is up to .090" of vertical play allowable. We recommend keeping this number as close to zero as possible.



Figure 17. Checking Preload

2. If there is movement found in step one, or upon initial installation, the joints must be adjusted. In order to adjust the joint you must first bend back any tabs on the lock washer that are engaged with the slots on the cap. **See Figure 18.**



Figure 18. Bending Locking Tabs Back

3. We highly recommend setting preload by using a ¼” drive torque wrench, see step 4. If no torque wrench is available, tighten the joint until there is no vertical play while using a large prybar to pry up on the steering knuckle as shown in **Figure 17**.
4. With the tabs bent out of the way, slowly turn the cap clockwise (threads are right hand) using the provided adjuster tool and a ¼” drive torque wrench. Tighten the joints until 120lb-in (10lb-ft) is shown on the torque wrench. Our adjustment torque spec is the torque at the wrench, not at the joint (due to the included crows foot type adapter). It is important that the torque wrench is oriented parallel to the crows foot adapter, as seen in **Figure 19**. **Figure 20** shows the wrench oriented incorrectly, at a 90 degree angle to the adapter. Once the torque spec is achieved, bend the tabs from the lock ring to engage with the cap. We recommend at least two tabs bent into the cap. Only bend up locking tabs that are accessible so that the joint may be adjusted again in the future.



Figure 19. Correct Wrench Orientation



Figure 20. Incorrect Wrench Orientation