Installation Instructions
for
Cam-to-Shim Conversion Kit

Purpose:

Convert cam-aligned Hummer to shim-aligned at a fraction of the cost of new control arm buckets.

Applies To:

1998 and newer Hummer/H1 vehicles. In 2004 - 2006, the cam alignment system was used only on the front. For these years, only one kit is required per vehicle. For 1998 – 2003, two kits are required per vehicle.

Kit Contents:

8 conversion plates, Illustrated instructions. Contains enough for one axle (two control arms), front or rear.

Picture 1 – Kit Contents

Picture 2 – Single Conversion Plate

It is assumed that the installer can use basic hand tools. Welding is required. If the installer cannot weld competently, please take the control arm buckets and the conversion plates to a reliable shop for welding. Improper welding can damage the control arm buckets.

Control Arm Hardware:

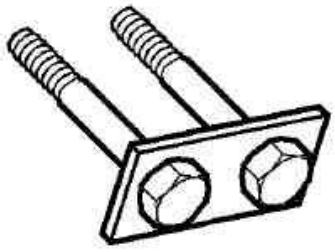
The control arm mounting / cam alignment bolt with the flat on it can be reused during assembly. It is the correct length if the original washer under the nut is reinstalled. However, it is recommended that a washer be installed under the head of the bolt as well as under the nut. This is not required for safety, but it will protect the appearance and rust resistance of the conversion plates. If you opt to add the extra washer, a slightly longer bolt is needed. This bolt should be ¾-10 x 5-1/2 grade 8 corrosion resistant. The washer should be a ¾ SAE washer, grade 8 corrosion resistant. The locknut can be reused ONLY if it still provides sufficient friction to reliably secure the nut. If you are not sure, replace the nut. ¾-10 grade 8 corrosion resistant, distorted-thread-type (all-metal) locknut. 4 bolts, 4 nuts, and 8 washers are required per kit. Do not use locknuts with nylon or plastic inserts. Heat can damage these nuts and compromise the locking capability.

Control Arm Buckets & Hardware:

There may already be some shims and/or spacers between the upper control arm buckets and the frame. Make note of the numbers and thicknesses of these parts. For initial reassembly, reuse the same spacer & shim configuration for each bucket. After conversion, the number of shims will be adjusted to perform the alignment.

AMG specifies two possible lengths of bolts, depending upon the final number of shims required. The bolts are ½-13 grade 8 corrosion resistant. For the front the bolts are either 3-3/4" or 4" in length, and 16 are required. For the rear the bolts are either 4-1/4" or 4-1/2" in length, and 16 are required.

Tip: In later-year Hummers, the two lower mounting bolts for the control arm buckets are welded to a flat strap so that the nuts can be removed and installed without needing a wrench on the heads of these bolts. These bolt heads can be difficult to access when the control arm is in place, as must be done to perform the shim-type alignment. When the strap is used the washers under the heads may be omitted.



Picture 3 – Bolts with Strap

There should be an SAE washer (or a strap) under the head of each bolt and another washer under each nut. The nuts are distorted-thread-type (all metal) locknuts. Locknuts with nylon or plastic inserts should not be used since heat can compromise the locking capability. The locknuts can be reused only if they provide sufficient locking action to keep them secure. If you are not sure, replace them with new nuts of the correct type.

Note: The front and rear control arm buckets are not the same. The front control arm buckets are bolted through the air lift bracket mounts, spacing them slightly out from the frame. The rear control arm buckets are taller to make up for the missing thickness of the air lift brackets.

Picture 4 – Rear (L) and Front (R) Buckets

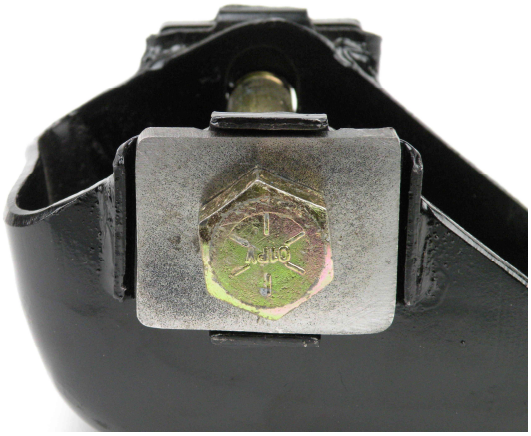
In the front, all of the control arm bucket upper mounting bolts are installed with the heads on the inside of the frame. The lower mounting bolts on the front and all mounting bolts on the rear are installed with the heads on the outside of the frame.

During disassembly, carefully note the locations and orientations of all the various bolts, spacers, brackets, mounts, etc. This will aid in correct reassembly.

Conversion Plate Fitment:

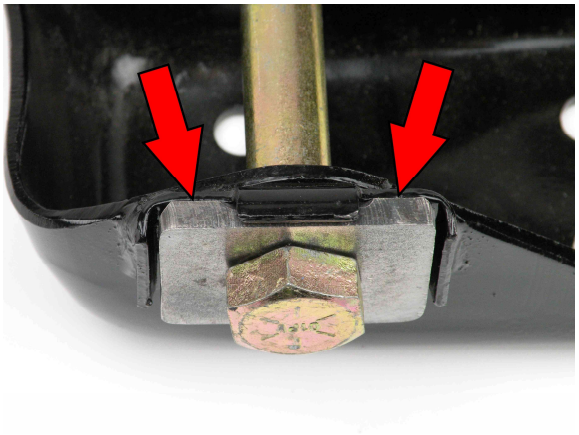
It is important that the flat side of the conversion plate fit snugly against the side of the mounting bucket. It may be necessary to chamfer the conversion plates near the bases of some or all of the cam alignment tabs. Some of the tabs may be bent, cracked, or broken off. The tabs are only used for aligning the plate. With a little care, the plate can be aligned without using the tabs.

Picture 5 – Plate Chamfer

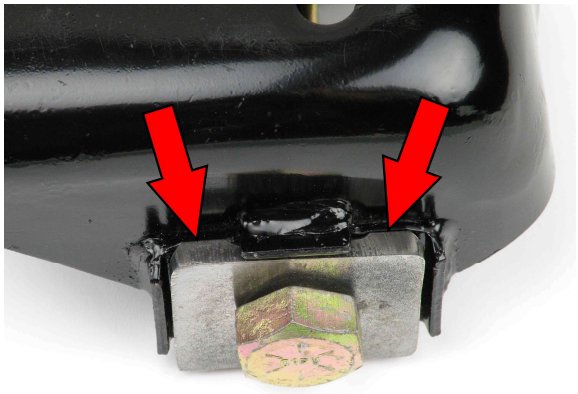


Picture 6 – Plate Fitment

The conversion plate should be welded to the side of the mounting bucket around the perimeter of the plate. It is not necessary to weld the plate to the tabs themselves, though doing so usually improves the appearance of the installation.



Picture 7 – Weld Locations



Picture 8 – Weld Locations

The areas being welded should be clean and rust-free. The plate should be tightly clamped to the bucket. A bolt can be used for this, though the threaded portion of the bolt should be protected from weld splatter.

After welding, the bucket and plate should be painted to deter corrosion.

Alignment Shims:

The shims come in two thicknesses (0.060” and 0.120”). Without actually performing the alignment, there is no easy way to determine the number of shims that will be required. Assuming proper alignment before installing the kit, you can use the pre-removal position of the cams to predict which buckets might require more shims than others.

Picture 9 – Few Shims Required

Picture 10 – More Shims Required

After reassembly, the Hummer must be aligned. To preserve tire life, minimize driving before the alignment is completed.

Control Arm Buckets and Bushings:

Before beginning, examine all control arm buckets. They can develop cracks around the mounting holes. Any cracked buckets should be replaced.

Check the buckets for wear in the areas of contact with the control arm bushing. Excess wear suggests replacing the bucket.

Bent or deformed buckets should also be replaced.

Control Arm Bushings are wear items. Check for signs of wear or excess movement. Plan to replace any worn bushings. Consider replacing all of them when you have the control arms removed from the truck.

On-Vehicle Installation:

On-vehicle installation of this kit is not recommended for the following reasons:

- It is very difficult to access some parts of the buckets and plates for proper welding.
- Installation of this kit requires removal of the control arm mounting bolts.
- Welding the bucket with the control arm installed will likely damage the control arm bushing.

The upper control arms really should be removed for proper installation. Once this is done it is relatively simple to remove the buckets and do a proper job.

Basic Procedure:

1. Remove upper control arms
2. Remove upper control arm buckets
3. Examine buckets for wear, rust, and damage
    a. Repair or replace as needed
4. Fit the conversion plates to the buckets
    a. Make sure they fit flush with the surface of the bucket
    b. Chamfer the edges as needed (Picture 5, Page 3)
5. Clamp the plates to the buckets
6. Securely weld the plates to the buckets (Pictures 7 & 8, Page 4)
7. Paint the buckets and plates for corrosion protection
8. Reinstall control arm buckets
9. Reinstall control arms
10. Perform full alignment

Work safely, and double-check everything.

Appendix A:

Hardware Specifications and Requirements

Location	Size	Torque	Wrench Size
Control Arm	¾-10 x 5-½	300 lb-ft	1”
Front Bucket	½-13 x 3-¾ or ½-13 x 4 *	172 lb-ft	¾”
Rear Bucket	½-13 x 4-¼ or ½-13 x 4-½ *	172 lb-ft	¾

* Bucket mounting bolt length depends upon total shim thickness required. The locking portion of the nut must be fully engaged by the threads of the bolt. In most cases, more than ¼” of shim thickness requires the longer bolt length.

All hardware should be Grade 8. All bolts should have two SAE washers, one for the head and one for the nut. All nuts are distorted-thread-type (all-metal) lock nuts.

Following are the AM General part numbers for related items.

12338226-1 - Shim, Camber Adjustment (0.060”)

12338226-2 - Shim, Camber Adjustment (0.120”)

12338270 - Bushing, Control Arm

EC12338245B1 - Brkt-Upr Control Arm (front bucket)

EC12338240B1 - Brkt-Upr Control Asm (rear bucket, 1997 and earlier)

12469408-1 - Bracket Assy,Rear Upr C (rear bucket, 2004 and later)

Appendix B:

Alignment Specifications

Current AM General procedures list two sets of alignment specifications. The “Service Checking” specs are used to determine whether an alignment is necessary, and the “Service Setting” specs are used to set the alignment if needed. The Service Checking specs have a wider range than the Service Setting specs. The alignment should be the same on the left and right sides within the listed amount (“must be same within”).

Also note that the vehicle should be loaded as it typically is when driven. Vehicle load changes the suspension geometry somewhat, which needs to be accounted for when aligning the Hummer.

Service Checking				
	Caster (degrees)	**Camber (degrees)**	**Toe (total, degrees)**	**Toe (total, inches) ***
Front	+1.5 to +4.0	0 to +1.75	0 to +0.50	0” to +5/16”
Rear	n/a	-0.1 to +1.0	-0.50 to 0	-5/16” to 0”
(must be same within)	1.0	1.0	0.10	1/16”

Service Setting				
	Caster (degrees)	**Camber (degrees)**	**Toe (total, degrees)**	**Toe (total, inches) ***
Front	+2.5 to +3.5	0 to +0.50	0 to +0.38	0” to +1/4”
Rear	n/a	+0.25 to +0.75	-0.38 to 0	-1/4” to 0”
(must be same within)	0.50	0.50	0.10	1/16”

* Toe-in (in inches) measured with original size tires