



Vacuum to Hydro-Boost Conversion

'73-'87 GM C/K Series & '88-'91 GM R & V Series

Revision (08/06/18)

Notice

If you have purchased our Squaremax conversion and your Truck, Blazer or Suburban was not originally equipped with a Hydro-boost braking system then you will need to perform a vacuum to Hydro-boost conversion. This will also include the master cylinder and brake pedal since the heavy-duty applications use a much larger braking system. These can be found by searching online or possibly your local salvage yard.

Let's begin with explaining a bit of history on the Hydro-boost braking system. Hydro-boost power assist was introduced in 1973 by Bendix as an alternative to the vacuum booster. The hydro-boost uses the hydraulic pressure from the power steering system to provide the driver assist in applying the brakes. There are three reasons why a vehicle may be equipped with hydro-boost instead of a vacuum booster:

- 1. There is no vacuum source available, as in diesel engines, or the vacuum source available is too weak to adequately supply a vacuum booster.*
- 2. There is limited space available for the power assist device.*
- 3. The vehicle requires more assist than is available from a vacuum booster.*

Parts Required

1. '85-'91 GM Hydro-boost (new or good quality used).
2. '85-'91 GM Hydro-boost pressure hoses (new)
3. 3/8" I.D. x 3-4' return hose (new)
4. (2) 5/8" Stainless steel worm drive clamps
5. Year appropriate master cylinder for vehicle receiving this conversion (make sure the master cylinder is for a K30 or V3500 application if you are upgrading to a Dana 60 front and GM/AAM 10.5" or 11.5" differentials)
6. Hydro-boost Brake pedal from a factory equipped Truck, Blazer or Suburban.
7. DOT 3 or greater brake fluid.
8. Power steering fluid

Tools Required

1. Needle nose pliers
2. 3/8" box end wrench / 3/8" socket x 1/4" drive
3. 15mm box end wrench / 15mm socket x 3/8" drive
4. M10 x 1.5mm coupling nut or (2) heavy hex nuts
5. 1/4" ratchet
6. 3/8" ratchet
7. 24 oz. ball peen hammer
8. Brake & Clutch pressure bleed system

Installation

1. Remove the clip, flat washer and wave washer from the mounting stud on the brake pedal. This is under the steering column and behind the dash. Set aside for use later.
2. Remove the linkage from the mounting stud on the brake pedal.
3. Remove the brake pedal from the mounting bracket under the dash and discard.
4. Remove the (6) six 15mm flange headed nuts from the studs on the firewall. Next remove OEM vacuum booster and discard.
5. You will need to remove the (2) two middle mounting studs from the firewall in order to allow the Hydro-boost to bolt on. We highly recommend threading a coupling nut or two nuts and tighten them against one another. Make sure the nut or outer nut is flush with end of the mounting stud. Do not use the flange headed nuts that attach the Hydro-booster to the firewall.

- 6.** Using a 24 oz. ball peen hammer strike the stud and press it through the firewall. Take your time and do not use excessive force! You will damage the firewall.
- 7.** Once the (2) studs are removed clean the mounting surface to ensure proper seal of the Hydro-boost gasket. Install the Hydro-boost gasket on-to the back side of the Hydro-boost mounting bracket. Install the Hydro-boost on-to the (4) four mounting studs on the outside of the firewall. The two middle studs on the Hydro-boost mounting bracket will be inserted into the holes in the firewall where you just removed the middle mounting studs.
- 8.** Fasten the Hydro-boost using the OEM flange headed nuts you removed earlier and torque to manufactures specifications.
- 9.** Install the donor brake pedal in the bracket under the dash and fasten using the OEM hardware. Torque to manufactures specifications.
- 10.** Install the linkage on-to the brake pedal mounting stud and secure with the wave washer, flat washer and clip.
- 11.** Install master cylinder and stainless steel inner master cylinder mounting bracket if installing our Allison 1000 Series Transmission Shift Cable Bracket Kit at this time. Fasten using the OEM flange headed nuts and torque to manufacture specifications.

Bleeding Procedure #1

- 1.** Replace any hydraulic line showing external damage. Install new seals for all disconnected fittings (as required) and install an in-line power steering filter. Tighten all hose fittings to manufacture specifications.
- 2.** Flush the entire power steering system using the vehicle manufacturer's recommended fluid. Fill pump reservoir to the proper level.
- 3.** Disable engine to allow cranking without starting. Block wheels, put transmission in neutral or park and set parking brake, then crank engine 5 to 10 seconds (avoid overheating starter motor).
- 4.** Refill pump reservoir as necessary. Repeat step 3 until level is correct.
- 5.** Enable the engine to allow starting. Start engine and let idle. Slowly turn steering wheel from lock-to-lock a number of times.

6. Turn engine off and inspect fluid level and condition. Add or remove fluid as necessary. If fluid is foaming, wait one hour then recheck level. Repeat step 5 and 6 until fluid level is correct and shows no sign of air problem.

Bleeding Procedure #2

1. Remove return line from hydro-boost and plug end with appropriate size plug or bolt.

2. Connect two- to three-foot piece of clear hose to return port on hydro-boost unit. Place end of hose into empty container at least 1 gallon in capacity.

3. Fill power steering pump reservoir with correct fluid.

4. Disable engine to allow cranking without starting. Block wheels, put transmission in neutral or park and set parking brake, then crank engine 5 to 10 seconds (avoid overheating starter motor) while applying and releasing brake pedal slowly.

5. Refill pump reservoir as necessary. Repeat step 4 until no air is seen in return line from hydro-boost.

6. Remove clear hose from return port and reconnect return line from pump.

7. Enable the engine to allow starting. Start engine and let idle. Slowly turn steering wheel from lock to lock a number of times.

8. Turn engine off and inspect fluid level and condition. Add or remove fluid as necessary. If fluid is foaming, wait one hour then recheck level. Repeat step 7 and 8 until fluid level is correct and shows no sign of air problem.

Procedure

Use either of these bleeding procedures whenever replacing or servicing any component in a hydro-boost system. Normal driving conditions will remove air that remains trapped within the system when components are properly installed and there are no flow restrictions in the system. Always refer to the vehicle service manual for specific installation and testing procedures.

Power Steering Flush

In addition to requiring the correct pressure, it is also critical that the fluid be clean. The tolerances in the moving parts inside the hydro-boost are such that only a small amount of contaminates can cause a malfunction. This is especially true of the spool valve. The tolerances necessary to form a metal-to-metal seal are quite small and any contaminates or tarnish buildup can prevent smooth operation of the spool valve. Since the spool valve controls the flow of fluid into and out of the power chamber, it is critical it functions properly.

Any vehicle equipped with a hydro-boost power assist will benefit from a periodic power steering flush. The only thing is you have to perform an additional step to ensure the hydro-boost power chamber and internal parts are flushed. When performing the flush, apply and release the brake pedal slowly to allow the new fluid into the hydro-boost. If you skip this step you will have the large quantity of old fluid in the hydro-boost that will mix with the new fluid once the brake is applied and released a couple of times.

Hydro-boost diagnosis and service is not difficult especially when you know how the system works. Applying this knowledge with a systematic approach will enable fast and accurate diagnosis of these systems.

Noisy Booster

1. *Confirm complaint making sure to note type of noise and when it occurs. If the noise occurs during high brake pedal efforts or quick pedal release, go to step 2. If the noise occurs during low brake pedal effort, engine idle – no pedal effort, or normal driving conditions, go to step 3.*

2. *Noise occurs during high brake pedal efforts or quick pedal release: See normal operation noises listed below. Most likely the noises being heard are normal based on the type of conditions.*

3. *Operate the vehicle until the engine is at normal operating temperature. Duplicate the operating conditions above and listen for the noise.*

- 4. Compare results with the normal noises listed under the more info section and with a known acceptable system.**

Normal Operation Noises

Properly operating hydro-boost units will produce certain noises. These noises occur, for the most part when the brake pedal is manipulated in a manner not associated with everyday driving habits. The general categories of normal operating noises are (1) hissing noises and (2) clunk/clatter noises.

The hydro-boost will emit normal hissing noises when above-normal brake pedal efforts are applied (40 lbs. and up). The hiss sounds particularly noticeable with the vehicle motionless and will increase in intensity as pedal pressure increases above 40 lbs. and system operating temperature increases. Loud hissing sounds at or below normal (20 to 25 lbs.) pedal effort warrants investigation.

Clunk, clatter or clicking noises will be heard when the brake pedal is quickly released from hard (50 to 100 lbs.) pedal efforts.

Slow or incomplete pedal return

- 1. Run pump at fast idle.**
- 2. Pull the brake pedal rearward with approximately 10 lbs. force and release. Measure the distance to the floorboard.**
- 3. Make 100-lb. brake application. Release brake pedal and measure distance to floorboard. The brake pedal should return to its normal position (step 2). If measurements are the same, go to step 5.**
- 4. If the brake pedal does not return properly, check the pedal to be sure it is operating freely. Correct any sticking or binding as necessary.**
- 5. If brakes are self applying and pedal is free, check for obstruction in the return line or a kinked connection between hydro-boost and pump reservoir. If obstruction or kink is found, go to step 6, otherwise go to step 7.**

6. Remove obstruction or replace line as required. If condition remains, check for a damaged reaction end. If damaged the hydro-boost should be replaced or repaired.

7. If brake pedal is free of any binding conditions and return line is free of obstructions, remove the master cylinder cover.

8. Observe the brake fluid in the reservoir while rapidly depressing the brake pedal one inch.

9. Fluid surface should have some movement or spout in the forward reservoir section. Minor spouting may occur in the rearward reservoir. If no movement or spouting of fluid occurs in forward reservoir, the hydro-boost unit is defective and must be replaced or repaired.

Excessive pedal effort – brake pedal chatter – pulsation and/or leaks

Perform Basic Test

1. Engine (pump) off, depress and release the brake pedal four times to deplete all hydraulic pressure from hydro-boost.

2. Depress brake pedal and hold with light pressure then start the engine. If the power section is operating properly the pedal will fall slightly and then hold. Less pressure will be needed to hold the pedal in this position. If the power section is NOT operating, go to step 3, otherwise go to step 4.

3. If power section is not operating properly, check pump reservoir level. If level is low, add fluid and repeat basic test plus Hydraulic Leak Test (Steps 4 to 5). If fluid level is good, go to step 6.

4. Steering Hydraulic Leak Test: Thoroughly clean the hydro-boost unit and all hose connections. Start the engine and run at idle speed. If the hose fittings do not leak go to step 5.

5. Check the hydro-boost for leaks. Apply the brake pedal with approximately 100 lbs. force and hold while checking hydro-boost hose fittings for leaks. Do not hold brake pedal at 100 lbs. effort for more than five seconds at a time. If the hydro-boost leaks, it is defective and should be replaced or repaired. If no leaks are found in the hydro-boost or hoses, do not repair or replace them.

6. Fluid level good: Check tension and condition of drive belt. If the drive belt is loose or damaged, tighten or replace as required and repeat the basic test (Steps 1-2). If pump speed is slow, adjust and repeat basic test. If pump speed is OK, perform pump flow and relief pressure test.

7. If pump output is below minimum specification, replace and repeat basic test. If all test and checks are OK, the booster is defective and should be replaced or repaired.

8. If power section is operating, perform the following steps in order.

9. Hydro-boost accumulator pressure retention test: Run pump to medium speed, apply brake pedal force to 100 lbs. for not more than five seconds and then stop engine.

10. Wait 90 seconds and apply the brakes. Two or more applications should be power assisted. If applications are not power assisted the hydro-boost is defective and should be replaced or repaired. If applications are power assisted, go to next step.

11. Thoroughly clean the hydro-boost unit and all hose connections. Start the engine and run at idle speed. If the hose fittings do not leak, go to step 5.

12. Check the hydro-boost for leaks. Apply the brake pedal with approximately 100lbs force and hold while checking hydro-boost hose fittings for leaks. Do not hold brake pedal at 100 lbs. effort for more than five seconds at a time. If the hydro-boost leaks, it is defective and should be replaced or repaired. If no leaks are found in the hydro-boost or hoses, do not repair or replace them. Perform the brake hydraulic leak test.

13. Brake Hydraulic Leak Test – Depress and release brake pedal several times, then hold pedal depressed with medium pressure of 25 to 35lbs. If pedal does not fall away, hydraulic system is not leaking. If pedal falls away, go to next step.

Pedal falls away under constant pressure – hydraulic brake system is leaking. Check for external leaks at wheel cylinders, calipers, hoses and lines. If no leaks are found, additional diagnostic steps are necessary.

Service

The hydro-boost is not serviceable in the field. If the unit is not functioning properly, it must be replaced. The replacement process is straight forward, but bleeding can sometimes be tricky. I am offering a choice of techniques in this area. Hydro-boost brake systems are supposed to be self-bleeding, but this does not always prove to be true.