



## **American Powertrain™ HYDRAMAX™ Hydraulic System Installation Instructions**

Thank you for purchasing your HYDRAMAX™ Hydraulic System from American Powertrain™. If installed properly, this system should give you years of reliable actuation. Please take the time to read all of the instructions before proceeding. We now have videos on [www.youtube.com/user/AmericanPowertrain](http://www.youtube.com/user/AmericanPowertrain) to help you with the bearing set up.  
Hydramax Components



**Hydramax Throat Bearing (HRB) with Bleed Line, Floating Stud Carrier  
(Ford & Chrysler Applications) Shim and stud(s) Pack**

## **IMPORTANT NOTES BEFORE YOU GET STARTED:**

Your hydraulic release bearing (HRB) works much like a brake caliper, pressing directly on the fingers of the pressure plate when exposed to fluid pressure. The HRB is installed directly onto the front of your transmission and does not require the use of a clutch fork or pivot stud.

This hydraulic bearing is designed to work with a .750 master cylinder. If you are installing a complete American Powertrain system then you have the right master cylinder for the job. If you are installing just the HRB kit, make sure you have the correct master cylinder. Volumetric fluid matching of components is essential to the success of your install.

Use only DOT3 or DOT4 high temperature non-silicone brake fluid. Use of other petroleum based fluids will result in o-ring seal failure. A high temp race grade DOT4 fluid is recommended to reduce heat absorption. We recommend EBC, Wilwood or Pentosin brands of high temp fluid for their high boiling point and excellent stability.

This HRB does not have a retraction mechanism and all measurements should be taken with the bearing manually retracted. **DO NOT OVERTRAVEL THE PISTON.** The piston can be pushed completely out of the bearing base which will cause leakage and possible damage to painted surfaces of your under-hood area.

### **Installation of Hydraulic Release Bearing (HRB):**

**NOTE: Instructions for HRB installation vary for GM, Ford and Chrysler applications. Please be aware of the instructions for your application.**

**Creating the proper Air Gap for your Hydraulic Release Bearing (HRB) requires two measurements: A & B.**

**It is highly recommended to use calipers that measure to 0.001 (thousandths)**

The **A** measurement is the distance between the bell housing face and the pressure plate (clutch) fingers.

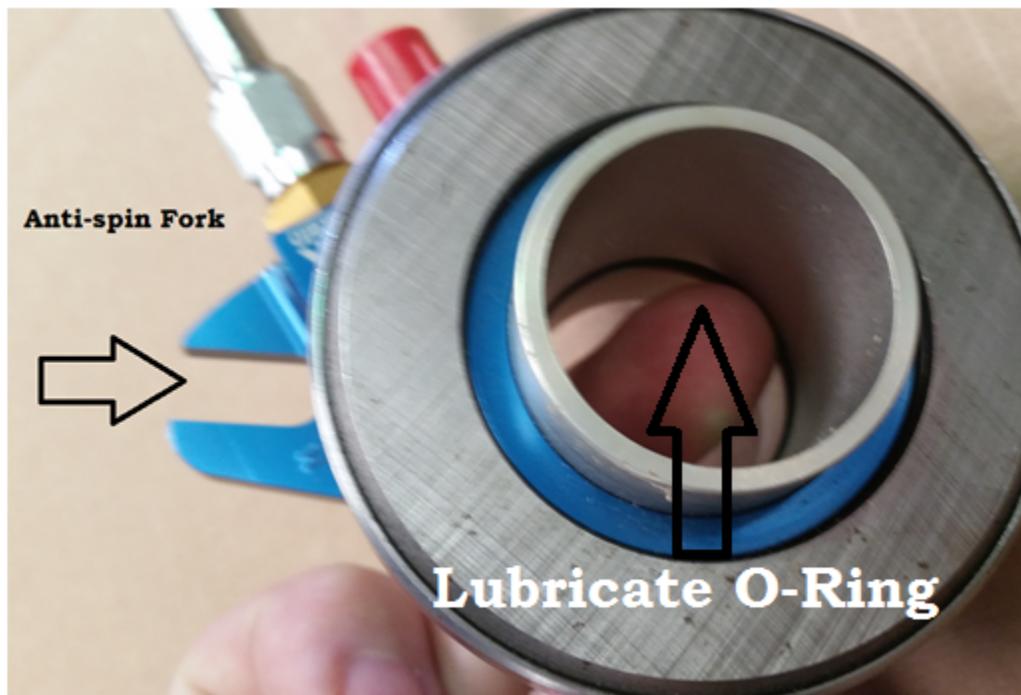
Finding your **A** measurement:

With the bell housing and clutch installed, measure the distance from the bell housing face (the outer surface where the bell touches the transmission) to top of the clutch fingers with a dial or electronic caliper. This is made much easier by placing a reliable straight edge across the back of the bell, especially for T56 and Magnum customers. Record this number here: **A** \_\_\_\_\_ for later reference in setting the bearing clearance.

The **B** measurement is the distance between the HRB bearing face and the mounting surface of the transmission.

Finding your **B** measurement:

Wet the o-ring seal on the inside of the HRB with DOT 3 brake fluid. This will make it easier to slide the HRB on and off the bearing retainer. Positioned the anti-spin fork over the bearing retainer stud. The HRB will slide back and forth on the stud when the slave is operated. Seat the HRB against the base of the bearing retainer and measure from the bearing face of the HRB to the mounting surface of the transmission (where the transmission touches the bell housing). Record this measurement here: **B** \_\_\_\_\_



You will find a pack of shims in your HRB kit. The provided shims vary between GM, Ford, and Chrysler:

**GM:** .090", 10 each ( The cone shape creates the .090 thickness! )



**Ford:** .057", 5 each ( Flat )



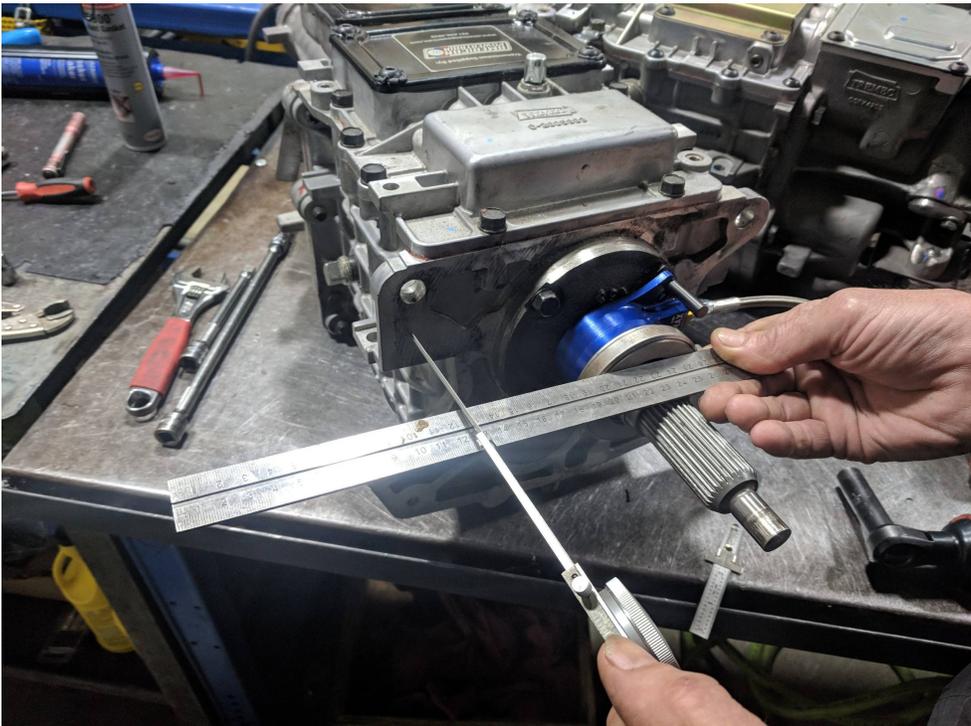
**Chrysler:** .063", 5 each ( Flat )



With the clutch installed. Use a couple of bolts to secure the bell housing and then use a straight edge and ruler or caliper to measure the depth of the transmission mounting pad to the diaphragm fingers. Measure in 3 different places to get a good average. This is **measurement A**.



Now measure the height of the release bearing to the transmission mounting flange. Make sure that you measure to the top of the bearing. This is **measurement B**.





### **For Ford 1-1/16" Input Toploader:**

Remove your original equipment bearing retainer and replace with the provided retainer. Some application may or may not use the floating stud carrier. It is only required if too much space remains with the shims provided in your kit. Remove the transmission bearing retainer bolt from the upper right side (2 O'clock position). Replace it with the appropriate retainer guide stud provided in the hardware kit using blue thread locker. Tighten against bearing retainer to 15 ft-lb's. Your HRB will ride back and forth on this stud when in operation.

**For Ford HD Toploader with 1-3/8" Input:** Refer to HRB addendum for your McLeod style HRB installation.

### **For GM Magnum, GM T56 and Viper T56**

Slide the billet bearing retainer in your kit over the input shaft and bolt to the tapped holes using the provided hardware. Install the bearing retainer stud in the threaded hole on the billet retainer using blue thread locker. Tighten against bearing retainer to 15 ft-lb's.

NOTE: Some applications may require 1 to 2 bearing retainer spacer(s) CAGM-50003S; not included. This is especially true in Chrysler applications.

### **For Ford Magnum, Ford T56, T4, TR3650, Standard Input Ford or Mopar TKO and Mopar 4-Speed**

Some application may or may not use the floating stud carrier. It is only required if too much space remains with the shims provided in your kit. Install the stud with the shortest threads into the floating stud carrier; some may have the stud installed (see images below). Install any required shims and then install the floating stud carrier by sliding the piece over the bearing retainer tube with the stud facing away from the transmission, and tighten the set screw so that the stud is at the 2 O'clock position.



**NOTE: Some Chrysler and Ford applications will not require the floating stud carrier. If there is no clearance for the floating carrier, use the provided long thread stud and replace the upper right hand bolt in your retainer.**

**The position of the bearing retainer stud determines the direction of the line fittings. If the line fittings need to be rotated to a more convenient opening in the bell housing (generally on 6-speeds) rotate to a proper position and use set screw to fix position.**

**Do not trim the length of the bearing retainer stud unless it extends beyond the throwout bearing face after completing the shimming instructions and could possibly interfere with the clutch pressure plate fingers. Trim only the minimum amount to clear the pressure plate fingers or just behind the rotating bearing section of the HRB.**

Attach the supply line to the HRB and route it out of the clutch fork hole during installation of the transmission. The bleed line is already installed.

**IMPORTANT for GM and Standard Duty Toploader Customers: Your GM bell housing is very shallow. Due to the variances in flywheel and clutch stack-up heights, you may find that you do not have enough room for the release bearing. If you cannot achieve a minimum of .100", use washers at each of the transmission to bell housing bolts or a spacer to move the transmission back as much as .200". A turnkey .250" CNC machined aluminum spacer is available if you prefer. We keep them in stock.**

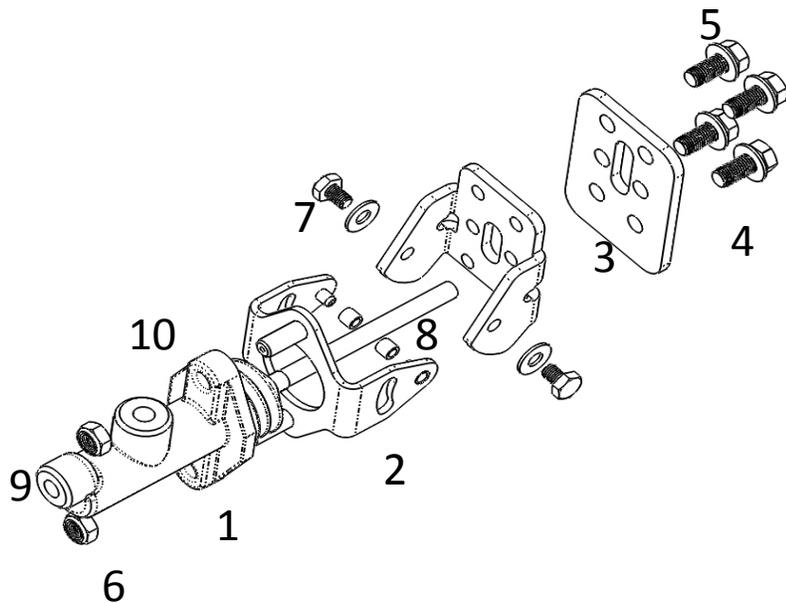
**While American Powertrain stocks several low profile clutches, this should be considered as a final option and is not generally necessary.**

**NOTE: Grasp the blue anodized area when removing. Your HRB is sealed and pre-filled with fluid and can easily be pulled apart. Use a small pry bar to gently push the assembly away from the front of the gearbox if needed.**

### **Master Cylinder Installation:**

#### **IMPORTANT NOTES BEFORE YOU GET STARTED:**

The master cylinder assembly in your American Powertrain hydraulic kit may feature our patented HYDRAMAX™ adjustable firewall mount. This mount allows you to emulate your car's factory original clutch rod angle.



HYDRAMAX Master Cylinder  
assembly guide:

1. Master Cylinder
2. Master Bracket
3. Firewall Mount
4. Firewall Inner Backing  
Plate
5. Firewall Fastener Bolts
6. Master Fastener Nuts
7. Master Mount Stud
8. Pin Pivot Sleeves
9. Feed Line Port
10. Reservoir Port

When placing the master cylinder on the firewall, only two fasteners need to penetrate the sheet metal of the firewall, however at least three holes should be bolted through. The clamping action of the inner and outer mounting plates will secure the assembly and reduce firewall flex.

This master cylinder is volume matched to our hydraulic release bearing. If you are installing just our master cylinder kit, please make sure that the displacement of our master cylinder meets the requirements of your release bearing.

**Use only DOT3 or DOT4 non silicone brake fluid.** Use of other petroleum based fluids will result in o-ring seal failure. A high-temp racing grade DOT4 fluid is recommended to reduce heat absorption.

Your HYDRAMAX Master Cylinder system has been pre-assembled to demonstrate proper assembly. You will need to remove some of the components during installation

First remove the Firewall Inner Backing Plate (4) by removing the upper clutch rod assembly, heim joint (spherical rod end) and Firewall Fastener Bolts (5). Set the inner plate and bolts aside. Loosen the bolts on the side of the bracket to make sure it adjusts freely. Now set the assembly on the firewall and approximate the positioning of the master, with the rod aligned with the hole in your pedal. This can be an approximation as you are checking clearance to under-hood components and making room if needed. Using a Sharpie or paint pen, mark the firewall at the top corners of the bracket.

Once you have mocked up your system and checked clearance, set the master assembly aside and, using the Inner Backing Plate as a template, align the rod hole of the plate with the center of your clutch rod hole on the outside of your firewall using your guide marks for positioning. If your clutch rod sits at an extreme angle it may be necessary to lower or raise the position of the mount to accommodate the rod. This should have been determined when doing mockup. Mark at least three holes with a Sharpie or pin punch. The more holes you bolt through the more stable the firewall will be.

**NOTE:** The clamping action of the two plates will hold the bracket fast to the firewall. It is OK to bolt through the original clutch rod hole in your firewall. We suggest using at least two additional bolts.

Drill 5/16" holes to accommodate through bolts where necessary.

You can choose to mount the reservoir locally or remotely, using the provided nipple and line. Using approved DOT 3 or DOT 4 brake fluid, lubricate the o-ring seal on the Reservoir Port (10) on the Master Cylinder but DO NOT install reservoir. If you have removed it, mount the Master Cylinder to the Outer Firewall Bracket using 5/16" x 3/4" bolts. This should be left loose for angle adjustment.

Locate the 4 ea- 5/16" bolts you removed from the assembly. The bracket is designed to accept these from inside the car, through the inner backing plate and into the threaded holes in the Firewall Mount (3).

Place the Master Cylinder Assembly on the firewall, sliding the master cylinder rod through the center hole in the firewall. Line up the Inner Backing Plate with the pre-drilled holes and the Master Cylinder Assembly and install 5/16" bolts. Leave the adjustment bolts on the Outer Mounting Bracket finger tight so the angle of the Master Cylinder can be adjusted later.

Install the Reservoir or Reservoir Nipple on the Master Cylinder body. If you are using the Remote Reservoir, install the neoprene hose on the nipple.

**ALERT!!!: The Reservoir MUST be above the Master and HRB to bleed the system. Once bled, the Reservoir can be placed below the system if desired.**

Using the provided Remote Reservoir Base and sheet metal screws, install the Reservoir on the firewall in a convenient location. Keep in mind that you will have to pour fluid into this reservoir, so try to leave clearance to the opening.

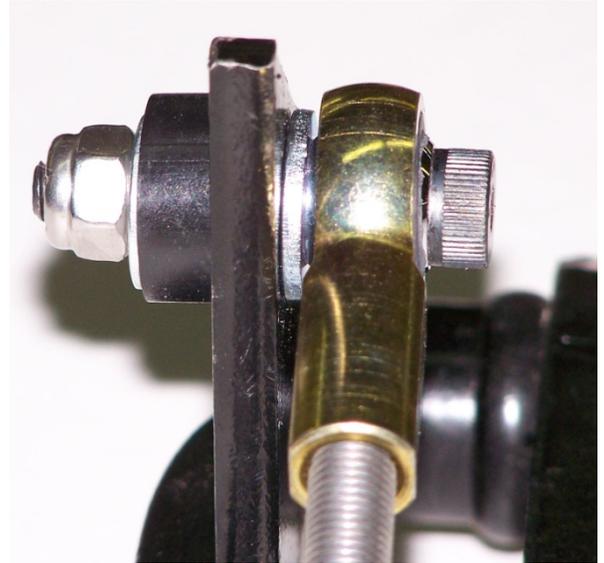
**OPTIONAL BILLET RESERVOIR:** If you have opted for our Billet Reservoir, remove it from the package now. Find a suitable location for the reservoir and check clearances. Now, unscrew the tank from the mounting bracket (the whole tank turns counterclockwise for removal) and set it aside.

To install the bracket, mark the holes in the firewall with a pin punch and drill 1/8" holes. Install the bracket using sheet metal screws. Install the o-ring hose barb on

the bottom of the reservoir tank and tighten, then screw the tank back into the mount.

### **PEDAL ROD TO PEDAL:**

Move to the under dash area and attach the heim joint and pedal rod assembly to the pedal using the provided should bolt and spacers. The stack up of the components is as follows: heim Joint, Flat Washer, Pedal, Flat Washer, Nylock Nut. When complete the heim joint should move freely on its bearing.



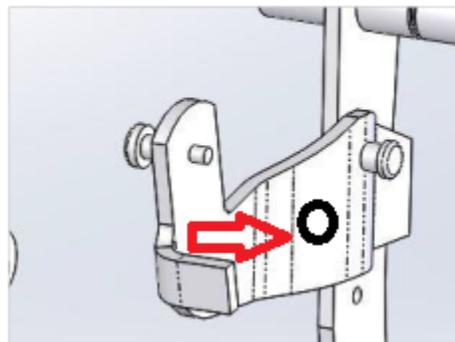
Move the pedal to the home position and line up the Master Cylinder rod to the heim joint on the pedal. There are several points on the rod assembly where adjustments in the length can be made to set the pedal height. Gently push the pedal to the floor, making sure that the rod moves in a linear fashion and does not interfere with the firewall or pedal pivot. Tighten the bolts on the Firewall Mount to fix the angle of the Master Cylinder.

Once the pedal height has been adjusted attach the feed line from the HRB to the Master Cylinder to complete the system. If you are using your own release bearing you will need a feed line that couples to an -3AN Inverted Flair fitting.

**ALERT!!! DO NOT use a clutch pedal return spring. The Pressure from the clutch fingers along with the internal spring on the master cylinder will return your pedal.**

**NOTE FOR MOPAR E-Body Customers:** The spot on your original pedal assembly sucks for mounting the hydraulic line. We prefer to aim the assembled rod to the center of the extension bracket on the pedal, mark a spot and drill a 5/16" hole to accept the shoulder bolt.

## **E-Body Applications Drill Here**



**ALERT!!!** When adjusting your pedal rod, the master cylinder rod must come all the way up as far as it can (home position) when the pedal is up. If the rod is partially depressed the one-way valve in the master will pull air into the cylinder on each pedal stroke, making bleeding impossible.

**TECH TIP:** The pedal ratio is the distance that your foot moves vs. the distance the rod move. Pedal ratio is an important component in maintaining a good pedal feel and good clutch modulation. One of the biggest mistakes made in hydraulic conversions is creating a low pedal ratio. Ideally, you want between a 5:1 to 6:1 ratio. This means essentially that if your master cylinder rod moves 1", your foot moves 5-6". Most stock pedal pivot points give an excellent pedal ratio, however, if you move the rod lower on the pedal or you are building a custom car and you have a ratio lower than 4:1 you may consider artificially raising the point at which the Heim joint connects to the pedal arm to increase this ratio. If this is not possible, you can also consider moving the bracket assembly lower on the firewall to increase the rod angle and therefore the pedal ratio. If your pedal effort is extraordinarily stiff this is the first thing to check. The Wilwood master cylinder in your kit has a 1.12 maximum stroke. 6 to 7 inches of pedal travel (at the pedal pad) should be your goal.

example:

X = 11.625" Y = 1.875" Ratio = 6.2:1

For optimum pedal effort you want target your mounting hole for a 6:1 Ratio



**ALERT!!! YOU MUST SET THE INTEGRATED PEDAL STOP TO MAINTAIN YOUR WARRANTY.**

Although the master cylinder is volumetrically matched to our release bearing, it is possible to over stroke the release bearing if the fingers of the clutch have less travel than the limitations of the bearing. Essentially, if you bottom out the clutch fingers and still have pedal travel you will either bend your clutch fingers or blow the seals out of your release bearing.

To prevent this you must adjust the provided jam nuts on the Master Cylinder Push Rod to limit rod travel. **The master cylinder provided with your kit has a maximum stroke of 1.12". Over-stroking the master cylinder will damage its internal components and void the warranty.**

To determine the level of the stop actuate your clutch to the full release point and record the position of the pedal or rod. You can simply use a permanent marker to place a mark on the pedal rod where it meets the firewall at full clutch release. This should be your target stop. Simply thread the jam nut closest to the firewall down to your mark, then run the second jam nut down and lock it against the first nut. On cars with very short pedal rods, remove one jam nut and use the rod coupler nut to limit travel.

**Over-stroking the master cylinder can over extend the HRB and will void your warranty. Exposing your clutch and painted surfaces to the destructive nature of brake fluid will cause further damage. This is why we insist that a pedal stop be employed. Likewise, over stroking the fingers on your pressure plate can cause irreversible damage to the fingers and disc hub springs. If you have questions, call.**

**BLEEDING THE SYSTEM:**

Once all of your lines have been fastened and you have checked that all fittings and hose clamps are tight, fill your system with DOT3 or High Temp DOT4 fluid. We recommend Wilwood EXP DOT4 or Pentosin DOT4LV high temp fluids.

**ALERT!!! Do not use DOT5 brake fluids in this system. They can damage the seals and cause failure of the master and/or slave.**

HYDRAMAX systems are designed to self bleed quickly and easily **WITHOUT USING THE BLEEDER LINE.** Your HRB is already filled with fluid and machine bled to get any air out. Once your system is plumbed and full of fluid the only air in the system will exist in the supply line and the master cylinder. By slowly depressing and pulling your pedal back to home, the air will rise out of the fluid in the reservoir. This generally takes about ten minutes. You will need to manually lift the pedal to home until you have feedback from the system. Once you have about half pedal you

will want to stroke the pedal slowly halfway down and then back up to bleed the remaining air out of the lines. It's that simple.

**ALERT!!! Do not let reservoir run dry while bleeding. This will allow more air to enter the system and will prolong the bleeding process.**

### **ALTERNATIVE BLEEDING FOR CUSTOMERS WHO PULL THEIR BEARING**

**APART:** There is a bleeder line integrated into the HRB for two reasons. One, we use it to pre-bleed the HRB and two, enough customers pull their HRB apart out of curiosity or by mistake that we have to give them a way to get the air out. If you managed to empty your HRB of fluid or you have a system that will not pump bleed after ten to fifteen minutes, follow these alternative bleeding instructions:

Open the bleeder fitting on the end of the bleed line to allow fluid to flow freely through the system. Place a catch bottle or jar around the bleeder line to catch excess fluid. Slowly fill the system with approved brake fluid until fluid runs without interruption from the bleeder, then shut bleeder.

**NOTE:** A clear glass bottle placed around the bleeder line will provide protection for painted surfaces when air and fluid exit the system while bleeding. A clear line, like those found in brake bleeder kits can also keep the mess to a minimum. This also allows you to observe the flow of fluid. You can also run the clear line back into the reservoir.

Press the clutch pedal three times **making sure the pedal comes all the way up to the Master Cylinder's home or full up position.** On the third stroke, hold the pedal to the floor and open the bleeder line, being careful to catch the excess fluid. After a few cycles you should start to feel resistance from the clutch pedal as it begins to actuate the pressure plate. When no more air is in the system, top off and cap the reservoir.

### **ALTERNATIVE REVERSE BLEEDING:**

It is possible to reverse bleed the system with the use of a vacuula (compressor vac) or hand operated vacuum pump (MightyVac, an auto parts retailer). **DO NOT USE A SHOP OR HOME VACCUUM TO REVERSE BLEED THIS SYSTEM!** (Yes, there is at least one guy who tried it.) To reverse bleed, place the bleeder line in a bottle of brake fluid with the bleeder open. Place a vacuum pull on the reservoir to pull fluid up through the system.

When the reservoir is partially full close the bleeder line and pull to a static 6 Barr of vacuum. Continue to pull 6 Barr of vacuum for ten minutes. You can then remove the vacuum pump and top off the reservoir. Assuming no air was introduced at the bleeder, your system should be ready to go. If you do not have pedal pressure, follow the final steps of the traditional bleeding process to burp the system of any remaining air.

Use only a compressor based or hand operated fluid vacuum. If you do not have access to one of these devices follow the traditional bleeding instructions above.

## WARRANTY, CARE, STORAGE AND TECH SUPPORT:

**WARRANTY:** Your HYDRAMAX system is covered by a 24-Month warranty for defects due to improper workmanship. Some of the components may be separately covered by the various manufacturers of the sub-assembly parts, namely the master cylinder. Please contact American Powertrain for any warranty issues. We are dedicated to your satisfaction with our system. **NOTE THAT FAILURE TO FOLLOW THESE INSTRUCTIONS AND THE SUBSEQUENT DAMAGE THAT MAY OCCUR TO YOUR COMPONENTS IS NOT COVERED BY WARRANTY UNDER ANY CIRCUMSTANCES.**

**CARE:** Once your system is successfully installed you should have years of uninterrupted performance. You should not have to change the fluid in this system for the life of the car.

Your clutch fingers will get taller as the clutch disc wears. It may be necessary at a later date to re-set the HRB spacing if the fingers begin to permanently contact the release bearing.

**STORAGE:** The Buna-N seals in your HYDRAMAX HRB are made to stay supple during extended storage. However, if you plan to store your car for several months it is recommended that you press the clutch pedal once a month to keep the fluid seals wet. Simply press the pedal several times. This will ensure years of reliable clutch actuation. Failure to do this will generally not cause component seal issues, we are just a careful bunch.

**TECH SUPPORT:** American Powertrain is proud to offer our Customer First Tech Support line. Simply dial 931.646.4836 or send us your questions and images to [support@americanpowertrain.com](mailto:support@americanpowertrain.com) if you need help

**Note: We now have Hydramax installation videos on our YouTube channel and Facebook. simply go to [americanpowertrain.com](http://americanpowertrain.com)**

TROUBLE SHOOTING GUIDE:		
ISSUE:	CHECK POINT:	SUGGESTIONS:
Hard Pedal Feel 6:1	Check Pedal Ratio	Ideal pedal ratio is between 4:1 and 6:1
fingers will pedal	Check Pedal Stop	Over stroking the pressure plate feel like a high effort
Clutch Will Not Release	Check Bleeding	Air in system will diminish HRB throw
diminish allow air to return to the Check all line fittings for seepage.	Check Seals	Fluid escaping from system will HRB throw and will system.

must be to the fingers for proper Check your math or use finger gauge to check air gap.	Verify Spacing	Your HRB has a limited stroke and sitting close enough release.
Fluid Leak line Master cylinder seals internally.	Verify Seals	Check fittings are tight and that all clamps are holding. rarely fail
stop may stroke passed its internal seals, damaging the seals and rendering the part useless until it is rebuilt. FAILURE TO SET YOUR PEDAL STOP WILL VOID YOUR WARRANTY!	Set Pedal Stop	Failure to set your integrated pedal allow the HRB to
	Wrong Fluid	Using anything other than DOT3 or standard DOT4 high temp brake fluid can cause seal failure.
Pedal Not Returning it. It is stick you pedal to the	Remove Clutch Spring	If your car is equipped with an over center spring on the clutch pedal, remove not necessary and may floor.
	Check Bleeding	Air in system may cause pedal dive.
Binding Pedal Rod on the loosen the to allow the HYDRAMAX bracket to be adjusted. Stroke your pedal once to set master angle and re-tighten bolts.	Re-adjust Bracket	If your pedal rod binds or scrapes body of the master cylinder, bracket bolt
moving	Check Shoulder Bolt Ass'y	Make sure your pedal hardware is freely at the pedal joint.
Darkened Fluid noticeably hurt the system.	No Correction Required	Some brake fluids will leech color from the reservoir line, making the fluid darker. This will not