American Powertrain™ HYDRAMAX™
Hydraulic System Installation Instructions

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

Hydramax Components

**Hydramax Throwout Bearing (HRB) with Bleed Line,
Floating Stud Carrier (Ford & Chrysler Applications)
Shims and Stud 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 .75" 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. The master cylinder has a max stroke of 1.12" and the HRB maximum extension is .700". This is a 2:1 system, so when the master moves 1.12", the HRB can move ~.550"-.600" with no air present. Use only DOT3 Fluid. Do not use High Temp Fluid or Silicone.

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)

FINDING THE A MEASUREMENT:

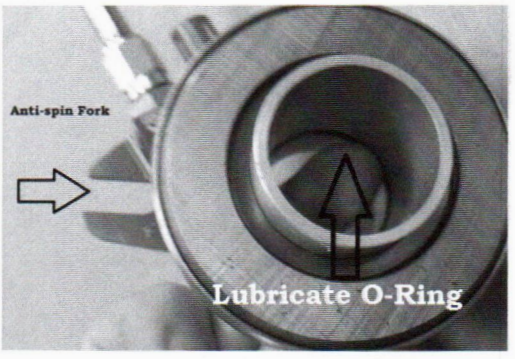
The **A** measurement is the distance between the bellhousing face and the pressure plate (clutch) fingers.

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 smallest number / highest finger should be used.

FINDING THE B MEASUREMENT:

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

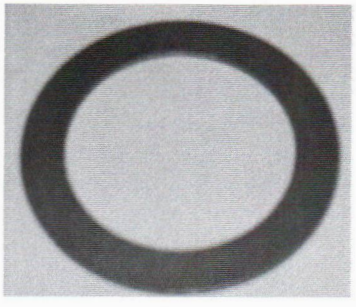
Wet the O-ring seal on the inside of the HRB with DOT 3 brake fluid. This will make it easier to slide the HRB on and off the bearing retainer. Position the anti-spin fork over the bearing retainer stud. The HRB will slide back and forth on the stud when the slave is operated. Seat the HRB against the 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 the measurement here: **B** _____



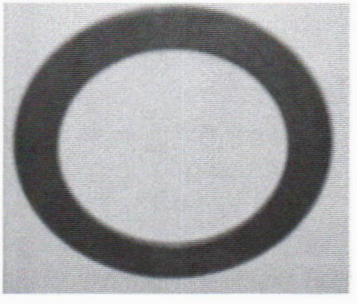
You will find a pack of shims in your HRB kit. The provided shims vary between GM, Ford, and Chrysler:

GM: .090", 8 each (The cone shape creates the .090 thickness)

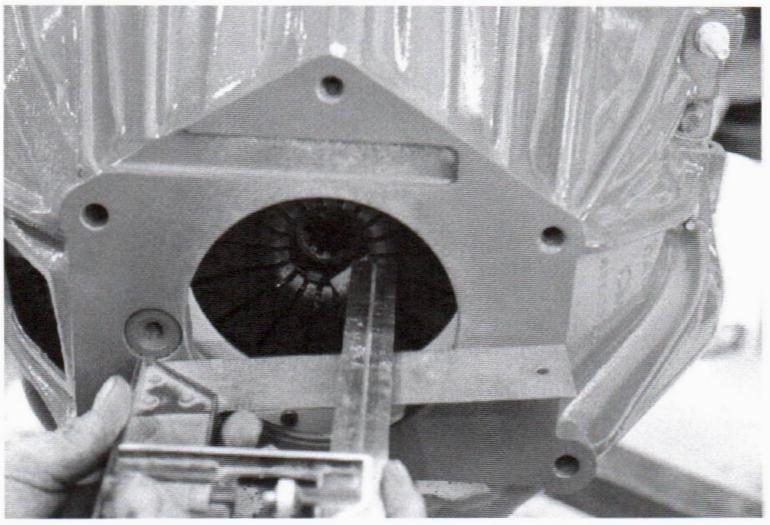
FORD: .057", 5 each (Flat)



CHRYSLER: .063", 5 each (Flat)



First, install your clutch and flywheel. Use a couple of bolts to secure the bell housing and then use a straight edge and ruler or caliper to measure the depth from the transmission mounting face to the diaphragm fingers. Measure three different places to get a good average. This is **measurement A.**



Next, measure the height of the release bearing to the transmission mounting flange. Fully seat the HRB on the bearing retainer and measure to the face of the transmission with no shims installed. This is **measurement B.**

1. Subtract **B** from **A.**
2. If your number is negative, you may require a spacer.
3. Determine the number of provided shims to place behind the bearing to achieve a .100" to .200" air gap to the fingers.

Bell to Fingers (A) – HRB face to Transmission Face (B)
= number of shims plus air gap (.100 to .200)

EXAMPLE: If the **A** measurement is 2.450" and **B** measurement is 2.125" then you would calculate as follows:

A. 2.450
B. – 2.125 = .325 This is the room you have.

GM .325-.090 = .235 No – too large, subtract another shim thickness.
.235-.090 = .145 – WINNER. This number is between .100 and .200

Ford .325-.057 = .268 No, subtract another.
.268-.057 = .211 No, subtract another
.211-.057 = .154 - WINNER. This number is between .100 and .200

For **GM** subtract 090 (cone thickness, not material thickness)
For **FORD** subtract .057
For **CHRYSLER** subtract .063

In this example, your result would be: GM = 2 Shims
FORD = 3 Shims
CHRYSLER = 3 Shims

IMPORTANT INFORMATION

Do not shim to less than .100
(This will leave no room for expansion as the disc wears and may cause slipping.)

Do not leave an air gap of more than .200
(The HRB may not travel enough to release the clutch.)

Your target is around .150 final air gap

MODEL SPECIFIC TRANSMISSION NOTES:

For GM TKO, Muncie, T10, Richmond, Saginaw, LENCO 1200, GM Jerico, Ford and GM T5 and Short Input Ford TKO, and GM T56 with Maglink Adapter:

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-lbs. Your HRB will ride up and down on this stud when in operation.

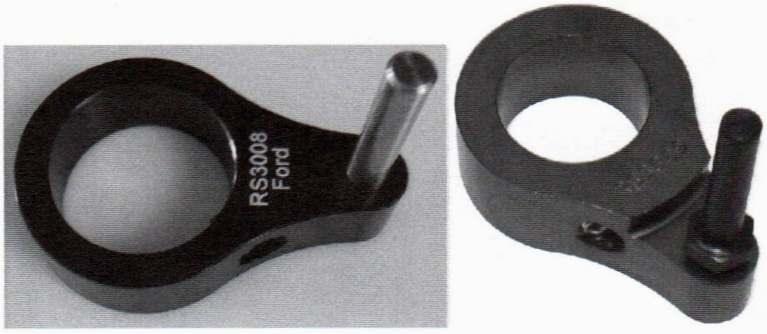
For Ford 1-1/16" Input Top loader:
Remove your original equipment bearing retainer and replace with the provided retainer. Some application may or may not use the floating stud carrier. It is only required if too much space remains with the shims provided in your kit. Remove the transmission bearing 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-lbs. Your HRB will relocate on this stud when in operation.

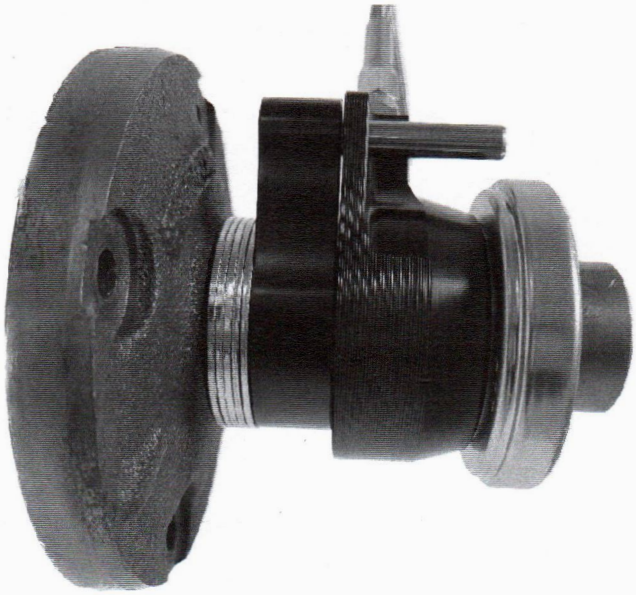
For Ford HD Top loader with 1-3/8" Input: Refer to HRB addendum for your McLeod style HRB installation.

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 **silver** bearing retainer stud in the threaded hole on the billet retainer using blue thread locker. *Threads may be tight and have to be chased for the stud to be threaded in by hand.* Tighten against bearing retainer to 15 ft-lbs.
(Black studs included in kits are 4 and 5 speed only)

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 applications 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. A .700" thick spacer is included. A thinner .350" spacer is available if needed.





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 Top loader 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 bellhousing bolts or a spacer to move the transmission back as much as .200". A .250" CNC aluminum spacer plate is available if you prefer.

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

NOTE: DO NOT grasp the blue anodized area when removing. Your HRB is sealed and prefilled 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-2™ adjustable firewall mount. This mount allows you to retain your cars factory original clutch rod angle.

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 (no high temp fluid or silicone). Use of other fluids will result in O-ring seal failure.
Your brackets have a powder coated finish that should be durable and attractive for the life of the car. Do not use abrasives on the finished surface.

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 DOT3 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 4ea- 5/16" bolts you removed from the assembly. The bracket is designed to accept these from inside the car, though 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 hose barb on the bottom of the reservoir tank and tighten, then screw the tank back into the mount.

ALERT: YOU MUST SET A 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. If you bottom out the clutch fingers and you still have pedal travel you will either bend your clutch fingers or blow the seals out of your release bearing. The master cylinder provided with your kit has a **MAXIMUM** stroke of 1.12".

OVER-STROKING THE MASTER CYLINDER WILL DAMAGE THE INTERNAL COMPONENTS AND VOID THE WARRANTY

NOTE: DO NOT ADD A PEDAL STOP IF YOU ARE USING A MALWOOD UNDERDASH KIT THEY ARE NOT REQUIRED AS THE PEDAL ROD RATIO IS BUILT IN

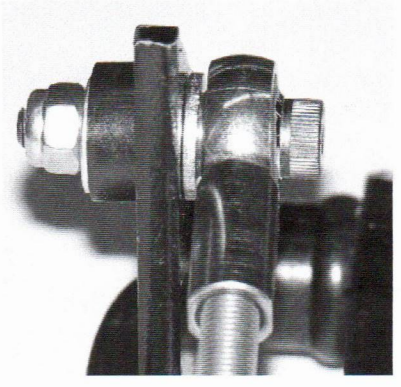
Exposing your clutch and painted surfaces to the destructive nature of brake fluid will cause further damage. This is why we insist that a pedal stop be employed. Over-stroking the fingers on your pressure plate can cause irreversible damage to the fingers and disc hub springs.

If you have questions, call.

NOTE: If you are installing a Malwood Underdash Pedal Assy you can move on from this step!

PEDAL ROD TO PEDAL:

Move to the under dash area and adjust the jam nuts to the recommended stop points. Attach the Heim joint and pedal rod assembly to the pedal using the provided shoulder bolt and spacers. The stack up of the components should consist of a Heim joint, flat washer, pedal, flat washer and nylock nut. When complete, the Heim joint should move freely.



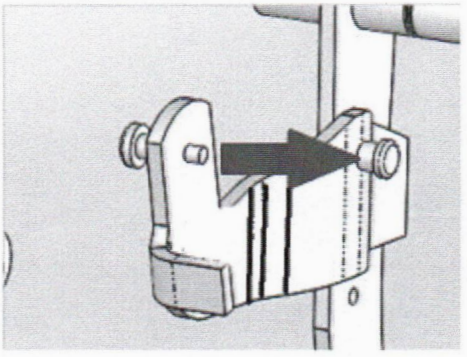
Move the pedal to the home position and line up the Master Cylinder rod to the Heim joint on the pedal. There are several points on the rod assembly where adjustments in the length can be made to set the pedal height. Gently push the pedal to the floor, making sure that the rod moves in a linear fashion 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.

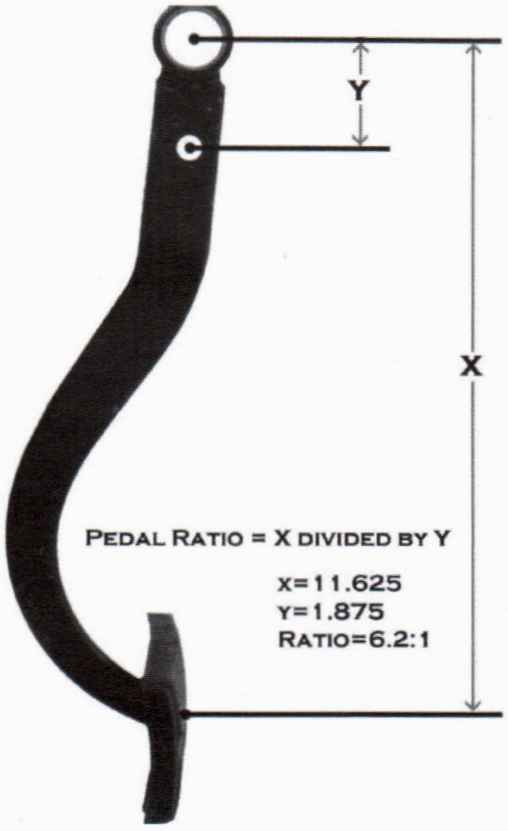
NOTE FOR MOPAR E-BODY: The Pin closest to the pedal on the welded arm can be removed by grinding the weld and pressing it out. This provides a good 5.5:1 pedal ratio.

E-Body Applications



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 operation. One of the biggest mistakes made in hydraulic conversions is creating a low pedal ratio. Ideally, you want in between a 5:1 to 6:1 ratio. This means that if your master cylinder rod moves 1", your foot moves 5-6". Most stock pedal pivot points give an excellent pedal ratio. 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 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 to hard the ratio is going to be 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 ideal pedal feel you may want to target your mounting hole for a 6:1 Ratio

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

ALERT: Do not use DOT5 SILICONE 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 Vacula (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!**
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 12-Month warranty for defects due to improper workmanship. Please contact American Powertrain for any warranty issues. We are dedicated to your satisfaction with our system.

NOTE: FAILURE TO FOLLOW THESE INSTRUCTIONS MAY CAUSE DAMAGE AND WILL VOID YOUR 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 to compensate for clutch wear.

STORAGE: The Buna-N seals in your HYDRAMAX HRB are made to stay soft 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 operation.

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

NOTE: We now have Hydramax installation videos on our YouTube channel. You can use your mobile device with a QR scanner to scan the codes below to watch the set up video. QR scanner apps are free in Android or Apple app stores. The videos are split up into two parts for the HRB set up. Make sure to watch both.

If you would like to check out our videos please scan the QR Code below or visit www.youtube.com/user/AmericanPowertrain **to help you with the bearing set up.**

TROUBLE SHOOTING GUIDE		
ISSUE:	CHECK POINT:	SUGGESTIONS:
Hard Pedal Feel	Check Pedal Ratio	Ideal pedal ratio is between 4:1 and 6:1
	Check Pedal Stop	Over stroking the pressure plate fingers will feel like a high effort pedal
Clutch Will Not Release	Check Bleeding	Air in the system will diminish HRB throw
	Check Seals	Fluid escaping from the system will diminish HRB throw and will allow air to return to the system. Check all line fittings for seepage.
	Verify Spacing	Your HRB has a limited stroke and must be sitting close enough to the fingers for proper release. Check your math or use finger gauge to check air gap.
Fluid Leak	Verify Seals	Check fittings are tight and that all line clamps are holding. Master cylinder seals rarely fail internally.
	Set Pedal Stop	Failure to set your pedal stop may allow the HRB to 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!
	Wrong Fluid	Using anything other than DOT3 or standard DOT4 high temp brake fluid can cause seal failure.
Pedal Not Returning	Remove Clutch Spring	If your car is equipped with an over center spring on the clutch pedal, remove it. It is not necessary and may stick you pedal to the floor.
	Check Bleeding	Air in system may cause pedal dive.
Binding Pedal Rod	Re-adjust Bracket	If your pedal rod binds or scrapes on the body of the master cylinder, loosen the bracket bolt to allow the HYDRAMAX bracket to be adjusted. Stroke your pedal once to set master angle and re-tighten bolts.
	Check Shoulder Bolt Assembly	Make sure your pedal hardware is moving freely at the heim joint.
Darkened Fluid	No Correction Required	Some brake fluids will leach color from the reservoir line making the fluid noticeably darker. This will not hurt the system.