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 the instructions before proceeding. We have videos now on www.youtube.com/user/AmericanPowertrain **to help you with the bearing set up. They are also available on your mobile device via QR Codes at the end of these instructions.**

Installation of Hydraulic Release Bearing (HRB):

MOPAR AND FORD 5-SPEED/6-SPEED CUSTOMERS: See addendum to this instruction sheet covering the installation of your McLeod style hydraulic release bearing. Read Important notes in box below, install your release bearing by following the instructions on the addendum then continue to page 3, Master Cylinder Installation Instructions.

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 .70 - .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 DOT3 high temperature non-silicone brake fluid. Use of other petroleum based fluids will result in o-ring seal failure. A high temp race grade DOT3 fluid is recommended to reduce heat absorption.

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 underhood area.

HRB Spacing: All Transmissions except TREMEC T56 and Magnum 6-Speeds

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. Record this number for later reference in setting the bearing clearance.

Remove the transmission bearing retainer bolt from the upper left side opposite the fork opening in the bell housing. Replace it with the appropriate stud provided in the hardware kit, using blue thread locker. Tighten against bearing retainer. Your HRB will ride up and down on this stud when in operation.

Slide the HRB over the bearing retainer with the fittings aligned to the fork hole in the bell. The slot in the bearing will slide over the stud and will float on the stud when the slave is operated. Seat the HRB against the base of the bearing retainer and measure from the face of the HRB to the face of the transmission where it touches the bell housing.

Using the following formula, determine the number of provided **..**063" (1/16") shims to place behind the bearing to achieve a .150-.200" clearance to the fingers:

$$\frac{\textbf{Bell Face to Fingers – HRB face to Transmission Face - .150"}}{\textbf{.063}} = \textbf{Number of Shims}$$

For example: If you have 2.450" from the **Bell Face to the Fingers**, and 2.125" from the **HRB Face to the Transmission Face**, then you would plug these in as follows:

$$\frac{2.450 - 2.125 - .150}{.063} = 2.8 \text{ Spacers}$$

In this case, if you use 3 spacers you will end up with an air gap of .136", which is within the proper tolerances for the system. While .150-.200" is ideal, you can safely run with as little as .100".

Remove the HRB and install shims as necessary. Lightly lubricate the o-ring on the inside of the bearing assembly base with DOT3 brake fluid. Attach the bell housing to the transmission and then replace the HRB on the transmission. Attach the supply line to the HRB, The bleed line is already installed. **NOTE: Your HYDRAMAX HRB is pre-bled and filled with fluid to make bleeding the system easier. When you uncap the fitting a few drops of fluid may escape.** At this point you can install the transmission.

IMPORTANT for GM Customers: Your GM bell housing is very shallow. Due to the variances in flywheel and clutch stack-up height you may find that you do not have enough room for the release bearing. If you cannot achieve a minimum of .080" of air gap between the bearing at rest and the clutch fingers, use a small washer or spacer at each of the bolts between the bell housing and the transmission to move the transmission back as much as .200". A turnkey .250" CNC machined aluminum spacer is available for $49 if you prefer.

NOTE: Do not pry pull the HRB apart when removing for shimming. Your HRB is sealed and prefilled with fluid. Use a small prybar to gently push the assembly away from the front of the gearbox if needed.

If this is not sufficient American Powertrain stocks several low profile clutch pressure plates that will reduce stack-up height on the clutch by as much as ½". This should be considered as a final option and is not generally necessary.

HRB Spacing: GM TREMEC T-56, GM Magnum and Viper 6-Speeds

With the clutch installed on the flywheel measure the distance from the block face (the surface where the bell touches the block) to top of the clutch fingers. This is best achieved by putting a straight edge across the fingers and measuring from the block to the straight edge. Record this number here _____ for later reference in setting the bearing clearance.

Install the guide stud in the bearing retainer base using blue thread locker. Bolt the bearing retainer base to the transmission with the pin on the driver's side. Your HRB will ride up and down on this stud when in operation.

Slide the HRB over the bearing retainer with the stud slot over the stud. Seat the HRB against the base of the bearing retainer. Install the bell housing on the transmission. Measure from the face of the HRB to the face of the bell housing where it touches the block. This is most easily accomplished by setting a straight edge across the face of the bell and measuring from the bearing face to the straight edge. Record measurement here: _____. **NOTE: If using a Scattershield with a block plate, add the thickness of the block plate to your measurement. See example below.**

Using the following formula, determine the number of provided **.**063" (1/16") shims to place behind the bearing to achieve a .150-.200" clearance to the fingers:

Magnum/T56 Retainer Base with Guide Pin

Magnum/T56 Retainer with HRB

Without Block Plate:

Bell Face to HRB Face – Block to Fingers - .150"= Number of Shims
.063

No block plate example: If you have 3.650" from the **Block Face to the Fingers**, and 4.125" from the **Bell Face to the HRB Face**, then you would plug these in as follows:

4.125 – 3.750 -.150 = 3.6 Spacers
.063

In this case, if you use 3 spacers you will end up with an air gap of .125", which is within the proper tolerances for the system. While .150-.200" is ideal, you can run with as little as .100".

With Block Plate:

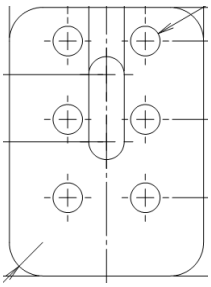
(Bell Face to HRB Face + Block Plate Thickness) – Block to Fingers - .150" = Number of Shims
.063

Block plate example: If you have 3.850" from the **Block Face to the Fingers**, and 4.650" from the **Bell Face to the HRB Face**, and a **.1875" (3/16") thick block plate** then you would plug these in as follows:

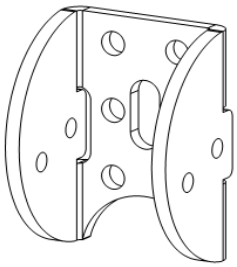
$\frac{(4.125 + .1875) – 3.750 -.150}{.063}$ = 6.5 Spacers

In this case, if you use 6 spacers you will end up with an air gap of .185", which is within the proper tolerances for the system. While .150-.200" is ideal, you can safely run with as little as .100".

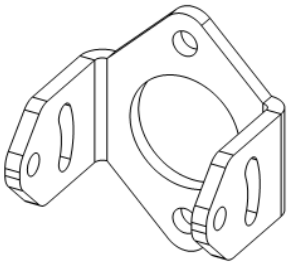
Remove the HRB and install shims as necessary. Lightly lubricate the o-ring on the inside of the bearing assembly base with DOT3 brake fluid. Attach the bell housing to the transmission and then replace the HRB on the transmission. Attach the supply line to the HRB, The bleed line is already installed. **NOTE: Your HYDRAMAX HRB is pre-bled and filled with fluid to make bleeding the system easier. When you uncap the fitting a few drops of fluid may escape.** At this point you can install the transmission.



Inner Backing Plate



Outer Mounting Bracket



Master Cylinder Mount

Master Cylinder Installation:

IMPORTANT NOTES BEFORE YOU GET STARTED:

The master cylinder assembly in your American Powertrain hydraulic kit features our patent pending HYDRAMAX™ adjustable firewall mount. This mount allows you to emulate your car's 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 non silicone brake fluid. Use of other petroleum based fluids will result in o-ring seal failure. A high-temp racing grade DOT3 fluid is recommended to reduce heat absorption.

Your brackets have a matte chrome plated 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 the fasteners and rubber dust boot before you get started.

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. 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. Mark at least three holes with a permanent marker or pin punch. The more holes you bolt through the more stable the firewall will be. Drill 5/16" holes to accommodate through bolts.

Locate the 4ea- 5/16" bolts provided with the kit. The bracket is designed to accept these bolts in one of two ways. They can be threaded through the bracket and used as studs, protruding through from the engine compartment and fastened with the provided nuts, or they can be slipped through the Inner Backing Plate and threaded directly into the bracket. When using this method you will not use the four nuts.

You can choose to mount the reservoir locally or remotely, using the provided nipple and line. Using silicone paste or WD40, lubricate the o-ring seal on the reservoir mount on the Master Cylinder but DO NOT install reservoir. You will do this after the Master Cylinder is secured to the Outer Mounting Bracket. Mount the Master Cylinder to the Outer Firewall Bracket using 5/16" x 3/4" bolts. This should be left loose for angle adjustment.

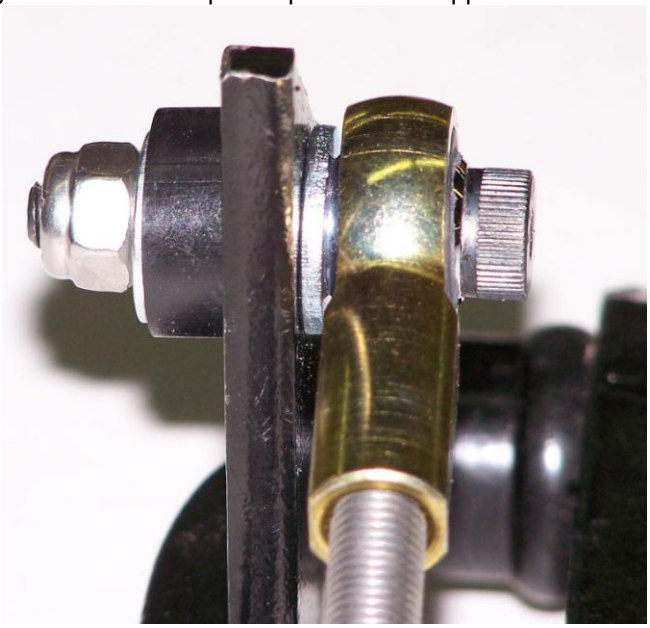
Place the Outer Mounting Bracket on the firewall, sliding the master cylinder rod through the center hole in the firewall. Slide the Inner Backing Plate over the studs on the inside of the firewall and install 5/16" nuts. Leave the adjustment bolts on the Outer Mounting Bracket finger tight so the angle 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. Using the provided Remote Reservoir Base, 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.

TECH TIP: The Reservoir MUST be above the Master and Release Bearing to bleed the system. Once bled, the Reservoir can be placed below the system if desired.

Move to the under dash area and attach the heim joint to the pedal using the provided should bolt and spacers. The stack up of the components is as follows:

Heim Joint, Flat Washer, Pedal, Nylon Spacer, Flat Washer, Nylock Nut. NOTE: The soft black spacer allows you to change the stack-up to allow for different pedal designs. You can swap the spacer to the opposite side of the pedal if needed.



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 Outer Mounting Bracket 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.

TECH TIP: The pedal ratio, that is the distance that your foot moves vs. the distance the rod moves, is extremely important to maintain a good pedal feel and good clutch modulation. One of the biggest mistakes made in hydraulic conversions is causing a low pedal ratio. Ideally, you want between a 4:1 to 6:1 ratio. This means essentially that if your rod moves 1", your foot moves 4-6". 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 pedal rod hits 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 you pedal effort is extraordinarily stiff this is the first thing to check.

IMPORTANT: 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.

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.

Keep in mind that as your clutch wears, the fingers of the pressure plate will rise a bit, causing you to re-adjust the stop. **Over stroking the bearing will not only void your warranty on the release bearing, but will also expose your clutch and painted surfaces to the destructive nature of brake fluid. This is why we insist that a pedal stop be employed.**

BLEEDING THE SYSTEM:

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. This also allows you to observe the flow of fluid. Do not let reservoir run dry while bleeding. This will allow more air to enter the system and will prolong the bleeding process.

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 or hand operated vacuum pump. DO NOT USE A SHOP OR HOME VACCUUM TO REVERSE BLEED THIS SYSTEM! To do this, 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, reduce the pull to a static hold and close the bleeder line. 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: If you plan to store your car for extended periods of time, it is recommended that you press the clutch pedal once a month to keep the fluid seals wet and supple. Simply press the pedal several times. This will ensure years of reliable clutch actuation.

TECH SUPPORT: American Powertrain is proud to offer our 24-Hour Customer First Tech Support line. We are available to answer your installation questions any time you are under your car. Simply dial 931.646.4836 and choose extension 103 for help after hours.

NOTE: Due to the constraints of mobile phone service there may be times when we are inadvertently unavailable. Messages will be returned ASAP when these unfortunate occurrences arise. This is only an issue after hours, when our phones are forwarded from our land line to our mobile tech phone.

Note
We now have Hydramax set up 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 on Android or Apple app stores. The videos are split up into two parts for the throw out bearing set up. Make sure to watch both.

Hydramax set up video 1 overview and bell housing measurement

Hydramax set up video 2 throw out bearing measurement

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 system will diminish HRB throw**
	Check Seals	**Fluid escaping from 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 integrated 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 standard or 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 Ass'y	**Make sure your pedal hardware is moving freely at the pedal joint.**
Darkened Fluid	**No Correction Required**	**Some brake fluids will leech color from the reservoir line, making the fluid noticeably darker. This will not hurt the system.**