



SILVER SPORT *Transmissions*



FTE Style Bearing

FORD F-100 TRUCK 1967-79

HYDRAULIC TR-4050 INSTALLATION INSTRUCTIONS

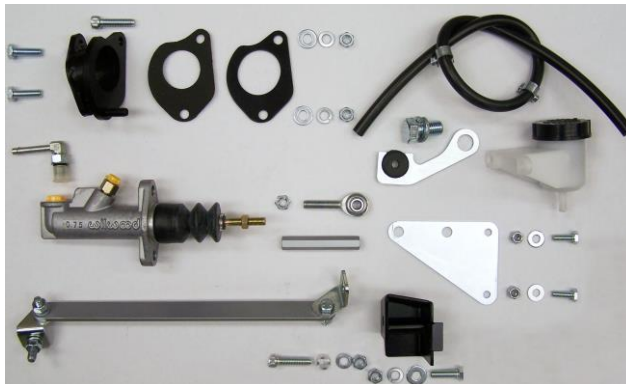
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KIT CONTENTS

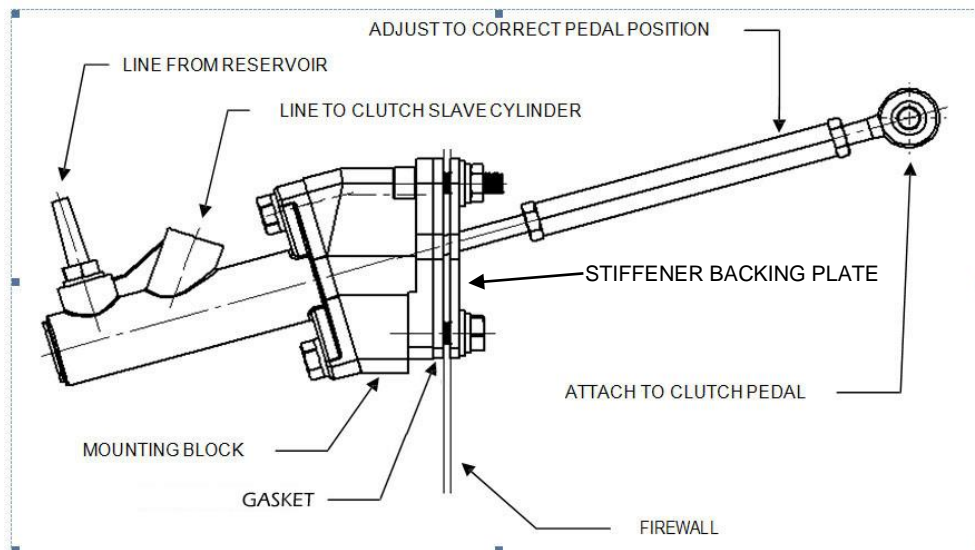
Please confirm that all parts have been received. The parts contained in your Master Cylinder kit will include:

- hydraulic mount, gasket, and hardware
- fluid reservoir, mount bracket, hose, and fittings
- rod end, attachment hardware
- master cylinder
- braided steel hose with bleeder
- bellhousing bracket, firewall stiffener bracket
- pedal bracket and hardware

If the hydraulic kit was ordered at the same time as the transmission, then your CSC will already be mounted on the front of the transmission.



Typical Master Cylinder Assembly:



DISASSEMBLY

Remove original clutch linkages, transmission and bellhousing components:

- Fork push rod, clutch pedal push rod assembly
- Z-bar retaining clip, Z-bar, ball stud and bracket assembly
- Fork boot
- Transmission and bellhousing
- Throw-out bearing, clutch fork and fork pivot
- Clutch pedal (must be modified for SST hydraulic system)

Master Cylinder Mounting 1967-1979

1. Cut master cylinder mount template from TMF-12000. Be sure to cut out the correct year there is one for 1967-72 and one for 1973-79. Position template next to steering column as shown in Fig. 3-1 and tape to floor.



2. Mark the location for the bolt holes and the center hole. Cut and deburr the holes. Reinstall firewall cover if removed in step 1.
3. Assemble mount block gasket to mount block, then insert the master cylinder and mount block assembly to the engine side of firewall.

4. From the engine compartment, install 5/16"-18 x1.25 Lg SHCS through the mount block assembly, the firewall and thru the stiffener plate mounted on interior side. Install flat washers, lock washers, and nuts to both the SHCS and the mount block stud. Tighten nuts to 15 ft.-lbs.
5. Assemble the 90° end of the braided steel pressure line to master cylinder port closest to firewall.
6. Assemble barb fitting for the rubber reservoir line to master cylinder at port located furthest from firewall. (See Fig.4-1).

Use caution not to over tighten and break fittings.



PEDAL ATTACHMENT 1967-1972

NOTE: If you are changing from a three (3) finger style pressure plate to a diaphragm style pressure plate you should also remove the clutch pedal over center spring, if so equipped. Failure to remove the over center spring could result in the spring holding the clutch pedal down during normal operation. The over center spring will also tend to hold the pedal down while performing the bleeding operation, until the system is bled enough to return the pedal. An over center spring is not recommended for use with a diaphragm-style pressure plate, and the hydraulic system is not compatible with some three-finger style clutches. We strongly recommend a diaphragm-style pressure plate.

1. Assemble 2" extension rod to master cylinder pushrod. Install 5/16-18 jam nut on rod end and assemble into extension rod.
2. Using the template provided (TMF-00600), drill new 5/16" hole in the clutch pedal at the specified location. The clutch pedal will have to be removed to do this.
3. Before reinstallation of the clutch pedal attach the aluminum spacer to the pedal using the 5/16-18" x 1" socket head bolt provided with kit. Torque to 13 ft-lbs.
4. Assemble 5/16-18" x 1" bolt provided with kit through rod end on master cylinder pushrod. Torque to 13 ft-lbs.
5. Adjust rod end position to achieve proper pedal height with master cylinder pushrod **EXTENDED ALL THE WAY OUT**. Align the pedal bracket with clutch pedal and position with tab against front edge of pedal.
6. If the master cylinder is not fully extended when the pedal is at rest, the master cylinder can be difficult to bleed **and can overextend the CSC and cause it to fail**. Make sure the pushrod travels in and out of the master cylinder in a straight line and does not contact the firewall or mount block at any point during its travel.
7. **Make sure the pushrod is straight in line with the master cylinder!** When desired pedal height is achieved, tighten locknuts on pushrod. Tighten nut on clutch pedal arm rod end bolt to 6 ft.-lbs.
8. The kit includes a firewall stiffener bracket to reduce deflection when pedal is pressed. Install angle brackets to both ends of bracket with 5/16-18 x 1" hex head bolts, flat washers, lock washers, and nuts. (Use flat washer on slotted holes)
9. Attach lower end of bracket assembly angle to the left stud of the master cylinder mount. Attach upper end of bracket assembly angle to dash. See Fig.6-2.

DO NOT depress the pedal any more than necessary before fluid is added to the system.



Fig. 6-1

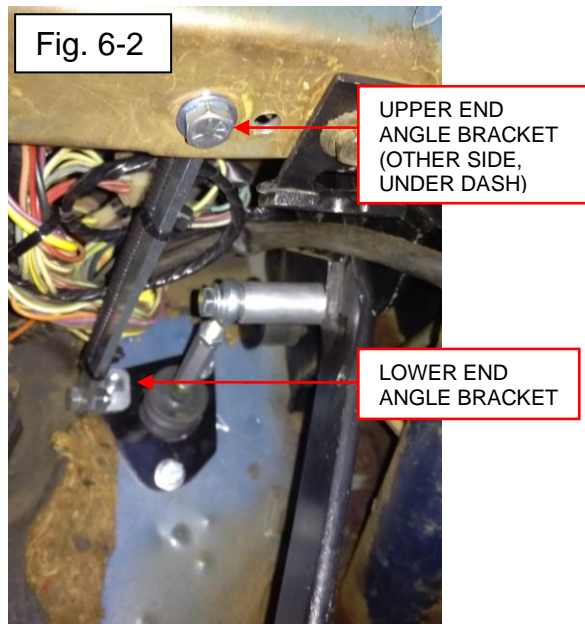


Fig. 6-2

UPPER END ANGLE BRACKET (OTHER SIDE, UNDER DASH)

LOWER END ANGLE BRACKET

PEDAL ATTACHMENT 1973-1979

NOTE: If you are changing from a three (3) finger style pressure plate to a diaphragm style pressure plate you should also remove the clutch pedal over center spring, if so equipped. Failure to remove the over center spring could result in the spring holding the clutch pedal down during normal operation. The over center spring will also tend to hold the pedal down while performing the bleeding operation, until the system is bled enough to return the pedal. An over center spring is not recommended for use with a diaphragm-style pressure plate, and the hydraulic system is not compatible with some three-finger style clutches. We strongly recommend a diaphragm-style pressure plate.

1. Assemble extension rod to master cylinder pushrod. Install 5/16-18 jam nut on rod end and assemble into extension rod.
2. Assemble 5/16-18" x 1-1/2" socket head bolt provided with kit through rod end on master cylinder pushrod. Add 1/2" aluminum spacer, then install bolt thru left (driver) side of the pedal bracket and install flat washer, locker washer, and nut finger tight. See Fig. 8-1.
3. The master cylinder will not tolerate a side load, and will wear out very quickly if the pushrod is operating at an angle. **Make sure the pushrod is straight in line with the master cylinder!**
4. Adjust rod end position to achieve proper pedal height with master cylinder pushrod **EXTENDED ALL THE WAY OUT**. Align the pedal bracket with clutch pedal and position with tab against front edge of pedal.
5. Using the pedal bracket as a template, mark location for pedal attachment hole. Drill 0.32" dia hole thru clutch pedal arm.
6. Attach pedal bracket to pedal with 5/16-18 x 1" hex head bolt, flat washer, lockwasher, and nut. Tighten both pedal bracket attachment nuts.
7. If the master cylinder is not fully extended when the pedal is at rest, the master cylinder can be difficult to bleed **and can overextend the CSC and cause it to fail**. Make sure the pushrod travels in and out of the master cylinder in a straight line and does not contact the firewall or mount block at any point during its travel.
8. **Make sure the pushrod is straight in line with the master cylinder!** When desired pedal height is achieved, tighten locknuts on pushrod. Tighten nut on clutch pedal arm rod end bolt to 6 ft.-lbs.
9. The kit includes a firewall stiffener bracket to reduce deflection when pedal is pressed. Install angle brackets to both ends of bracket with 5/16-18 x 1" hex head bolts, flat washers, lock washers, and nuts. (Use flat washer on slotted holes)
10. Attach lower end of bracket assembly angle to the lower stud of the master cylinder mount. Attach upper end of bracket assembly angle to dash. See Fig.8-2.

DO NOT depress the pedal any more than necessary before fluid is added to the system.

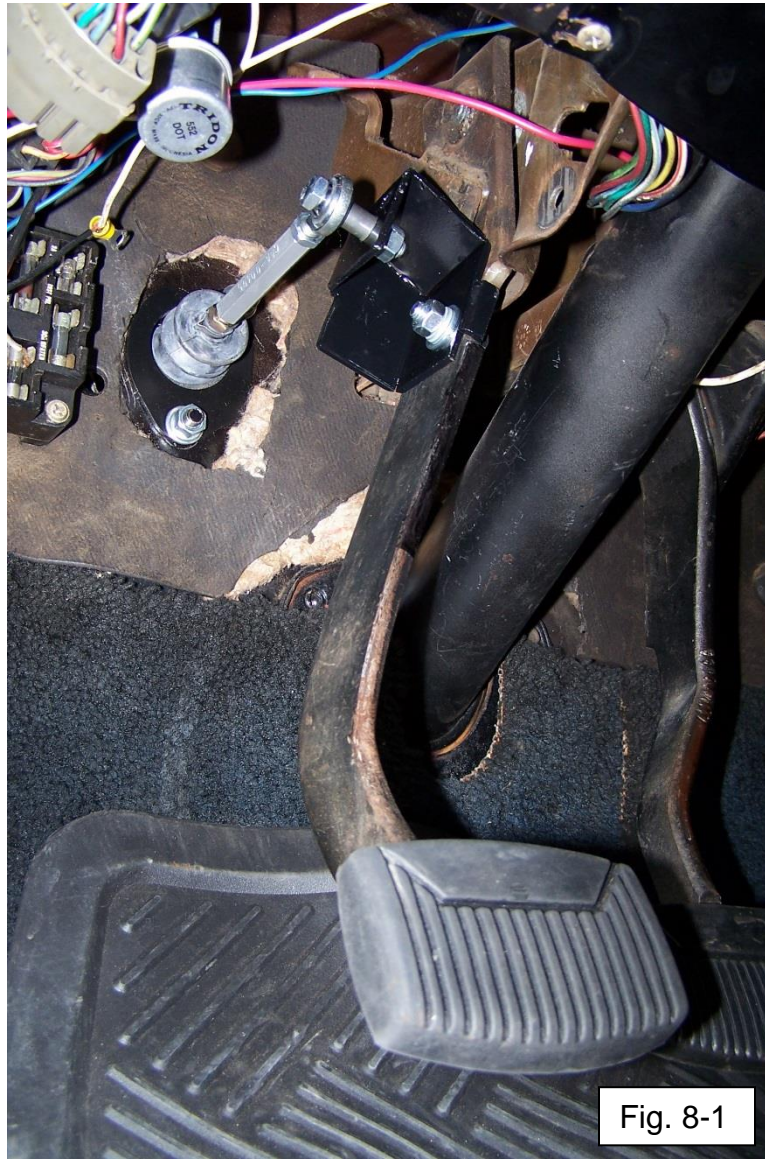


Fig. 8-1

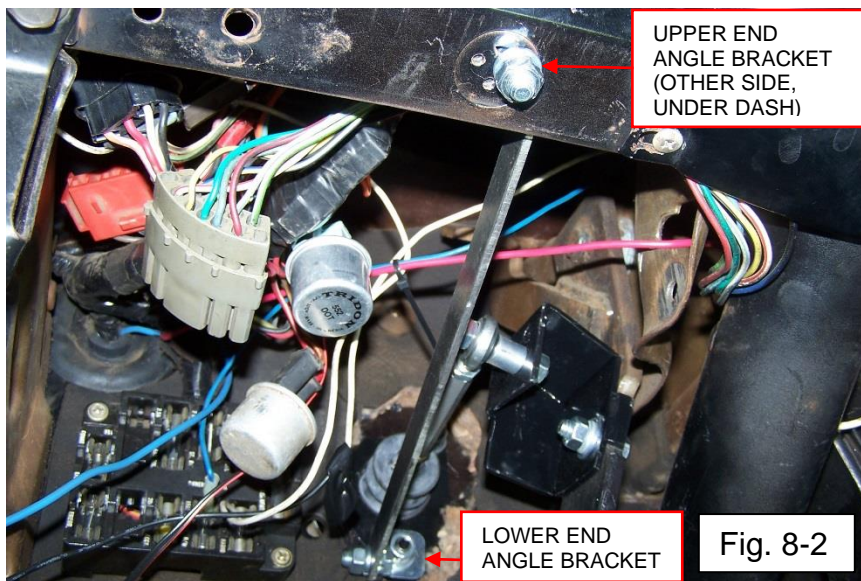


Fig. 8-2

FLUID RESERVOIR MOUNTING

1. Remove the studs or nuts on the left hand (driver) side of the brake master cylinder.
2. Place reservoir bracket over the two holes or studs in the brake master cylinder, replace the original studs or nuts and tighten completely. Alternatively, the reservoir may be attached directly to firewall or cabin sidewall.
3. Assemble reservoir to the bracket using hardware supplied (part # CAA-PACK A).

HYDRAULIC LOW PRESSURE HOSE MOUNTING

1. Run the rubber supply hose from the bottom of the reservoir nipple to the barb fitting in the clutch master cylinder, and determine the exact length for the supply hose. The hose should be neither tight nor excessively loose, and should clear all moving steering gear and exhaust components. Take care to prevent foreign debris from entering hose.
2. Cut the line to desired length, ensure that no foreign matter is in the hose. Then, loosely assemble hose clamps.
3. Install hose to the master cylinder, then to the reservoir. When installing hose to the reservoir, hold the top of the reservoir to prevent overloading and damaging the mounting ears.

HYDRAULIC HIGH PRESSURE HOSE MOUNTING

1. After bolting the transmission/bellhousing unit to the engine, attach the remaining end of the braided steel line to the clutch master cylinder and tighten. Use caution not to over tighten and break the fitting.
2. Final tighten all transmission mounting bolts (4 pcs).
3. Inspect the supply line inside bellhousing and confirm the hoses have ample clearance to the rotating clutch plate. It is extremely important that the hydraulic clutch hose **DOES NOT** come into contact with the clutch plate, as serious damage could result.

SLAVE CYLINDER MOUNTING

NOTE : On these transmissions, the “bearing retainer” is solely used as a mount for the CSC. It is completely external to the transmission and does not contain the input shaft bearing or oil seal.

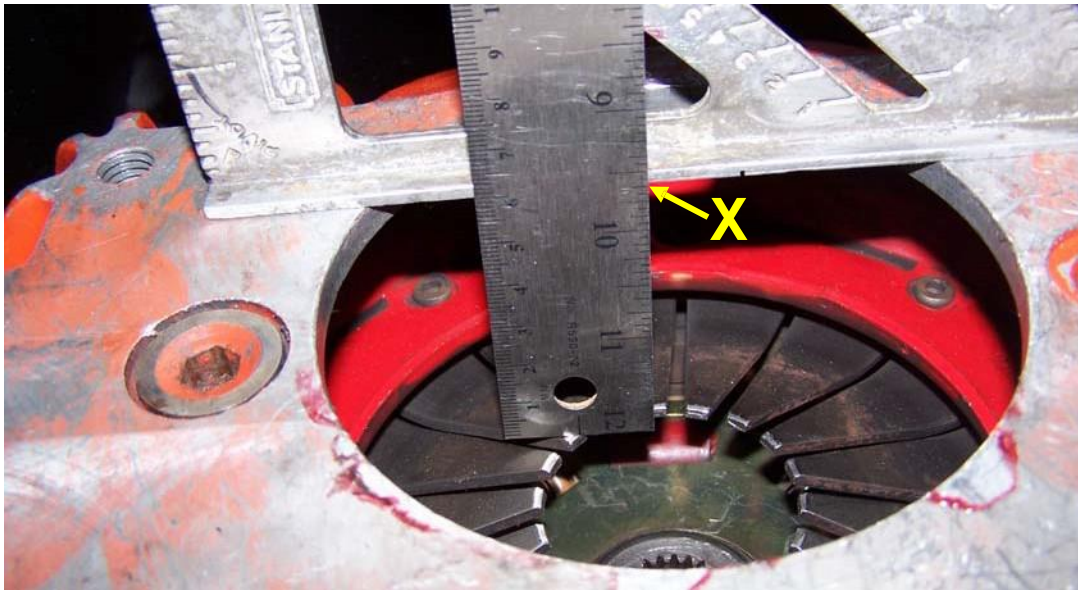
1. Position the new bearing retainer so that the locating stud is at the top (12 o'clock) position and attach it to the transmission using two (2) M6-1X16mm socket head cap screws. Torque the socket head cap screws to 92 in lbs.
2. Install bellhousing to engine in order to perform the crankshaft alignment check and make corrections if required per instructions MAA-00101.
3. Remove the bellhousing, install the clutch disk along with the pressure plate.
4. Continue with the remainder of your hydraulic clutch kit installation.

HYDRAULIC BEARING CUSHION MEASUREMENT

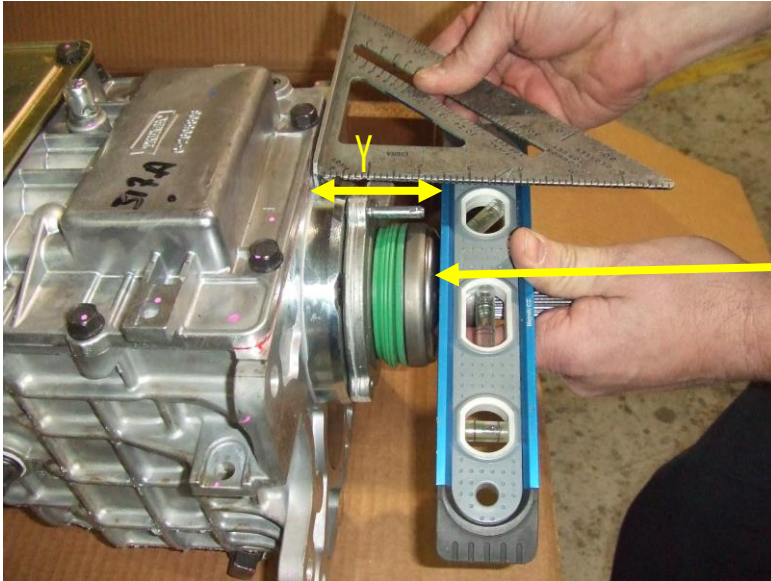
The CSC is designed to be compressed by more than $\frac{1}{2}$ " by the pressure plate fingers when at rest. The CSC needs a minimum of $\frac{1}{8}$ " cushion beyond that to allow for clutch disc wear and expansion from heat. Clutch slippage will result if the CSC bottoms out and is partially depressing the pressure plate fingers at rest. The cushion measurement procedure below tells you how far the CSC is away from being completely bottomed out. The acceptable range for the CSC cushion is **between $\frac{1}{8}$ " (0.125") and $\frac{3}{8}$ " (0.375")**.

1. With the correct clutch pressure plate and clutch disc mounted and torqued to the flywheel, install the bellhousing to the engine with two (2) bolts.
2. Use a straight edge and a steel rule to measure from the transmission mounting face of the bellhousing to the surface of the clutch fingers that contacts the release bearing. Record this depth measurement (**X**). Then, remove the bellhousing.

FIG. K



3. Next, with the slave cylinder mounted on the transmission, compress the CSC against its internal spring pressure back towards the transmission. With the CSC compressed to its internal stop (completely bottomed out), hold a straight edge across the face of the throw-out bearing and measure the distance from the face of the bearing to the bellhousing mounting face of the transmission. Record this dimension (**Y**).



MEASURE FROM THE FRONT OF THE TRANSMISSION CASE TO THE SURFACE OF THE FULLY COLLAPSED BEARING FOR YOUR "Y" DIMENSION.

BEARING FULLY COLLAPSED

4. Your depth measurement (X) minus the compressed bearing height (Y) is your bearing cushion:

$$(X) - (Y) = \text{CUSHION}$$

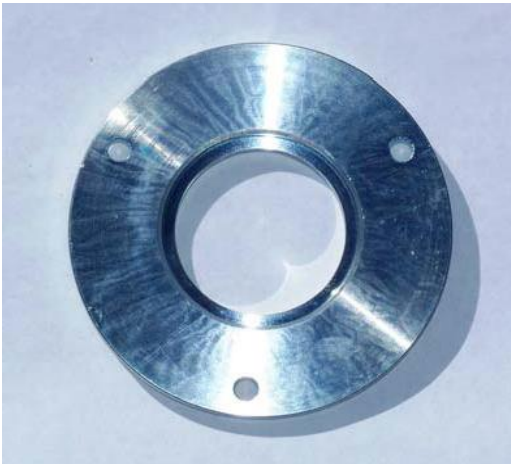
5. The resulting cushion dimension should be **at least 1/8" (0.125"), but no more than 3/8" (0.375")**. Anywhere within this range is acceptable. There is no advantage or disadvantage to being at the upper or lower end of the range, or even in the middle. The CSC will function exactly the same way, no matter where it lies within this range.

If your cushion measurement is outside of this range, you will need one or more spacers to adjust the position of the CSC.

Call Silver Sport Transmissions to obtain spacers if needed. **Damage WILL result from an incorrect cushion dimension.**

If your cushion measurement is **MORE** than 3/8", you will need one or more CSC spacers to move the CSC closer to the engine block. The spacers are 1/4" thick, and are mounted between the CSC and the input shaft bearing retainer. This is somewhat common with LS series engines.

CSC SPACER



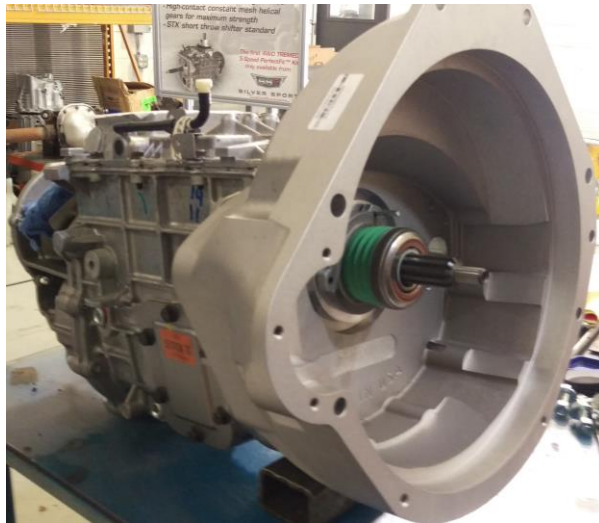
INSTALL SPACERS IF NEEDED



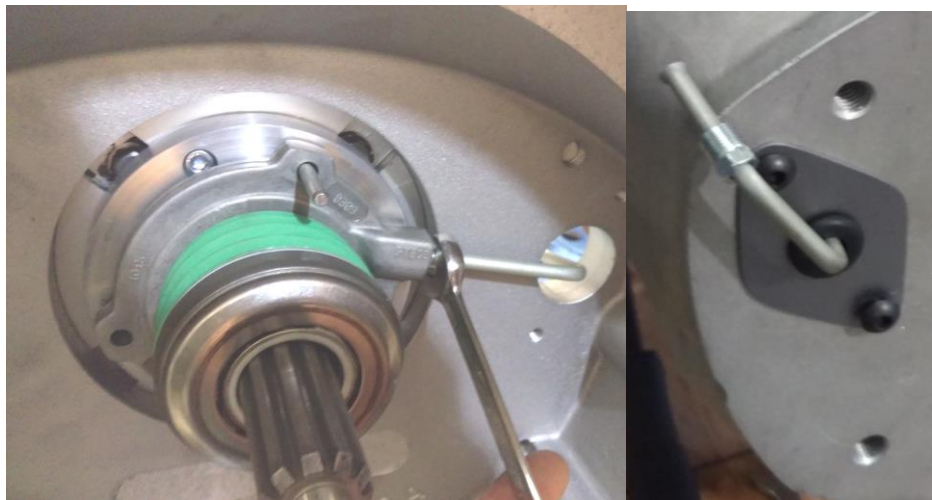
******* NOTE: The bearing cushion will also need to be re-measured and recalculated after resurfacing or replacing the flywheel, or changing the bellhousing, engine, or clutch. Different clutches have different stack-up heights, and a scattershield is often deeper than a factory GM bellhousing.**

TRANSMISSION MOUNTING

1. Place bellhousing onto the transmission while it is setting upright. Install four (4) mounting bolts to align bellhousing with the transmission mounting face.



2. Insert hydraulic line from outside of bellhousing and start threading into the throw-out bearing.



NOTE: Be very careful not to cross-thread the fitting when doing this!

3. Tighten the line with it centered in the opening of the bellhousing. Install the cover plate on the outside of the bellhousing with the grommet and 2 mounting screws.
4. Install the bellhousing and transmission with the attached hydraulic bearing and assembled line to the engine. Torque the bolts to factory service manual specifications.

5. After assembly make sure the bearing is seated by checking it through the inspection window.



6. Connect the flexible hydraulic line to the hard line.

HYDRAULIC HIGH PRESSURE HOSE MOUNTING

1. After bolting the transmission/bellhousing unit to the engine, attach the remaining end of the braided steel line to the clutch master cylinder adaptor and tighten. Use caution not to over tighten and break the fitting.
2. Final tighten all transmission mounting bolts (4 pcs).
3. Inspect the supply line inside bellhousing and confirm the hoses have ample clearance to the rotating clutch plate. It is extremely important that the hydraulic clutch hose **DOES NOT** come into contact with the clutch plate, as serious damage could result.

NOTE: DOT 4 BRAKE FLUID STRONGLY RECOMMENDED, (even though the lid says DOT 3).

HYDRAULIC FLUID FILL & BLEED – ON CAR

You will need two people to bleed this clutch system when installed on the vehicle. Use caution to prevent brake fluid from contacting paint, as damage will likely occur. If your vehicle has an over-center spring installed, it will tend to hold the clutch pedal to the floor until the system is bled enough to return the pedal itself. Remove reservoir cap from the reservoir.

1. Fill the reservoir full with **DOT 4 brake fluid**. During the next steps check regularly to **make sure that the reservoir does not run out of fluid**. If this happens you will have to start the process over.
2. Open the line at the bell housing to allow air to escape from the system. Give the fluid a few minutes to make its way down to the fitting, while watching the fluid level in the reservoir and refilling as necessary. Allow fluid to drip from the fitting into a suitable container.
3. It may be necessary to prime the master cylinder by removing the high pressure hose at the master cylinder and block the fitting outlet to draw fluid into the cylinder when stroking the pedal. When the cylinder is primed, reattach the pressure line and continue the bleeding procedure. Take care not to spill brake fluid on any painted surfaces.
4. When the drip becomes a steady stream, close the fitting. Refill the fluid reservoir. Open the fitting slightly and have your helper depress the pedal **slowly**. Close the fitting as soon as the pedal reaches the floor. Then have your helper **slowly** release the pedal. **Pressing or releasing the pedal too quickly will cause brake fluid to squirt from the top of the reservoir**. The pedal may need to be manually pulled up from the floor during these steps. Repeat this process several times, refilling the reservoir every 3 strokes or so.
5. When the fitting stops spitting air, close and tighten the fitting. Pump the pedal several times to check for proper feel. Repeat the process if the pedal is not firm throughout its travel, or if it seems that the clutch is not releasing fully. Make sure that the master cylinder pushrod is traveling its full stroke of 1.5" (1-1/2") and that **the master cylinder is fully extended when the clutch pedal returns to its home position (no tension on the pushrod with the clutch pedal all the way up)**.
6. **VACUUM BLEEDING PROCEDURE:** If bleeding proves difficult for one reason or another, a manual vacuum bleeder can be used to draw a vacuum on the reservoir and thereby the entire system and pull trapped air into the reservoir. With the rubber baffle removed from the reservoir and the cap installed, apply vacuum to the vent hole in the center of the cap. You may try stroking the pedal while vacuum is being applied. Repeat until the system is bled. It may take 20-30 minutes or even more in order for the vacuum method to get all the air out of the system.
7. Upon successful bleeding, fluid level will need to be lowered to approximately 1/3 full. Excess fluid may be removed from the reservoir by siphoning with a hand-held vacuum pump or with a spoon or medicine cup. Reinstall rubber baffle and cap.
8. Inspect for leaks, and replace the bellhousing inspection cover.
9. Check fluid level and add if necessary after the first test drive or after vehicle sits overnight.

NOTE: It may be necessary to bleed the clutch again after minimal use, as operation may dislodge some trapped air.

INSPECTION AND TESTING

**USE EXTREME CAUTION WHEN TESTING CLUTCH RELEASE SYSTEM.
DO NOT TEST IN HIGH TRAFFIC OR PUBLIC AREAS.**

ENGINE-OFF TEST

With the parking brake set, test the release and engagement of the clutch mechanism. Check for the following:

1. Clutch pedal completely up at its home position when released, and that the **master cylinder pushrod is fully extended** when the pedal is all the way up.
2. Clutch pedal does not hit brake lamp bracket or other bracket.
3. Low resistance for initial travel when depressing clutch pedal. Clutch resistance increasing at 1/3 of full stroke and remaining approximately constant through full travel to the floor.
4. Clutch pedal travel to floor without over-travel of clutch plate. Over-travel is characterized by a sudden hard pedal. This should not be a problem if the "Hydraulic Bearing Cushion Measurement" was accurately made.
5. Clutch pedal travel to floor without bottoming out hydraulic bearing. Bottoming out is characterized by a sudden high pressure required to exert further pedal stroke. If this condition occurs, damage to the master cylinder seals or slave cylinder may result from continued operation. **NOTE: The hydraulic slave cylinder has approximately 7/8 inch total stroke, minus the cushion that was measured earlier. Most clutches release within 1/2 inch travel.**
6. Smooth system operation with no abnormal noises.

ENGINE-ON TEST:

Hold brake, place transmission in neutral, start engine. Achieve idle of 1000 rpm or less.

1. Depress clutch pedal.
2. Ease shifter into first gear. **CAUTION:** If grinding occurs, pull back to neutral and stop engine. Repeat bleeding process and verify that the master cylinder pushrod is moving a full 1.5" (1-1/2").
3. Slowly release clutch pedal while maintaining brake pedal pressure. Confirm engine is being loaded as clutch pedal is released.
4. Repeat test step 1-3 through all gears, including reverse.

CARE AND MAINTENANCE

Your SST hydraulic clutch actuator system is designed to give you years of trouble-free service. In order to maximize the life of the system:

- Periodically check fluid level, hose clamps and hoses for damage.
- Flush the hydraulic fluid every 2 years with new, clean **DOT 4** brake fluid.

SYSTEM SPECIFICATIONS

Master cylinder: Bore = 0.75"
Stroke = 1.500"

CSC: Stroke = .910" total available travel

Fluid: DOT 3 brake fluid is acceptable, **DOT 4** is strongly recommended. **DO NOT USE DOT 5 FLUID.**

CONTACT INFORMATION

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TROUBLESHOOTING GUIDE

If you are having any sort of problem with the hydraulic system, the first step is to **review the “Hydraulic Bearing Cushion Measurement”** procedure starting on page 7, and verify that you have the correct amount of cushion (1/8” – 3/8”). Do this before going ANY further into the installation.

DIFFICULTY BLEEDING, FLUID WILL NOT FLOW, CAN'T GET ALL THE AIR OUT, CLUTCH WON'T FULLY RELEASE:

Review the bleeding procedure. Verify:

- That the master cylinder pushrod is **fully extended** when the clutch pedal is all the way up. If there is any tension on the pushrod and the pushrod does not come all the way out, it can close off the fill port in the master cylinder, and fluid will not be able to flow from the reservoir to the master cylinder. **This condition can also cause the CSC to overextend and fail.**
- That you are getting a full 1.5” (1-1/2”) of stroke out of the pushrod itself. If not, then the pushrod extension may need to be adjusted, the master cylinder may need to be repositioned on the firewall, or it may be that the pushrod needs to be connected to a different spot on the pedal. If you change the mount position or connection point, make sure that the pushrod still ends up traveling in a straight line into the master cylinder.
- Make sure the firewall is not flexing. If you measure at the pedal arm and the pushrod is moving 1-3/8”, but the firewall is flexing 1/4”, then you are actually only getting 1-1/8” of stroke.
- If you are using a reservoir that did not come from us, make sure the lid is vented. Some aftermarket reservoirs do not have a vented lid, and this will prevent the system from self-adjusting or bleeding properly.
- If you are using a master cylinder that didn't come from SST, it may be too small. Any master cylinder you use must displace nearly the same amount of fluid as ours in order for it to work properly. Our master cylinder has a 0.750” bore and a 1.4” stroke. If you go with a larger diameter bore, it will INCREASE the amount of pedal effort required and require a shorter stroke; a smaller bore will DECREASE the pedal effort, but require a longer stroke.
 - A master cylinder with a 5/8 (0.675)” bore needs a 2.1” stroke to be compatible with our CSC
 - A master cylinder with a 7/8 (0.875)” bore needs a 1.1” stroke to be compatible with our CSC
- Other, non-hydraulic problems can prevent the clutch from releasing. If the clutch disc is too large in diameter for the pressure plate, it could be pinched. The tip of the input shaft could be bottomed out in the crankshaft. The clutch disc could have gotten contaminated and could be stuck to the pressure plate or flywheel. The pilot bearing could be frozen.

HIGH PEDAL EFFORT

- The most common cause for a high pedal effort is having the pushrod connected too low on the pedal. Moving the pushrod connection point up closer to the pedal pivot point will reduce the pedal effort. Doing this may also require that the master cylinder be repositioned.
- If the pushrod is not straight in line with the master cylinder, that will also cause increased pedal effort and will wear the master cylinder prematurely.
- Make sure there are no kinks in the braided steel line.

BLACK FLUID

- If the fluid in the system turns black or has debris in it, that typically means that the pushrod is not straight with the master cylinder. If the pushrod is at an angle to the master cylinder, this will cause the master cylinder to wear prematurely. The black specks are actually oxidized aluminum particles.

CLUTCH WON'T DISENGAGE WHEN HOT, PEDAL GETS SPONGY

- If the fluid gets too hot, it can boil and create bubbles in the system. Route hydraulic lines as far away from the exhaust as possible, and shield them if needed. Make sure you are using **fresh hi-temp DOT4 brake fluid** in the system. Brake fluid that has been sitting on the shelf for a long period of time will absorb moisture from the atmosphere, even if the container is closed. Moisture in the fluid can lower the boiling point significantly.

CLUTCH SLIPS OR DISENGAGES PREMATURELY

- You may be “upside down” on the hydraulic bearing cushion measurement. If your “X” measurement is smaller than your “Y” measurement, this will give you a negative cushion, and the pressure plate fingers are actually being depressed all the time. Double check your hydraulic bearing cushion measurements and your math.

CSC FAILURE, CSC LEAKING FLUID, CSC HAS COME APART

- Your hydraulic bearing cushion measurement is likely too big (greater than 3/8”) OR the master cylinder pushrod is adjusted too tight and is not allowing the master cylinder to return to the fully extended position. Recheck your cushion measurements and your math, as well as the pushrod adjustment. The CSC is not able to be rebuilt. It is an OE part that we modify so that it will work with our transmissions.

If you are still having issues, call Silver Sport Transmissions' Customer Service and Technical Support at (888) 609-0094.