Powerglide Pro / Full Tree Transbrake Kit Instruction Manual

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SAFETY WARNING

The modifications contained in this manual should be attempted only by an experienced transmission technician with the aid of an accomplished machinist. Machining of the transmission valve body will alter the hydraulic operation, and if not properly accomplished may cause ***serious injury or death. If you do not understand the theory behind the principles and operation of the Powerglide transmission, or lack the skills to follow instructions, do not make the modifications described in this manual.***

It should be noted that drag racing is a hazardous endeavor. Things can and do happen. The application of the information contained here-in is at the reader's discretion. The reader is not relying on the skill or judgment of the **author** or **TSR Racing Products LLC.** regarding the suitability of these modifications to the reader's transmission.

During the disassembly, cleaning, inspection, and assembly of the transmission, all applicable safety rules should be followed. Many cleaning solvents are hazardous; any label directions should be adhered to.

Safety glasses should be worn during all operations. Also, be aware that the initial disassembly can be messy, so an oil absorbent product should be on hand to minimize slipping hazards.

Adhere to all sanctioning body safety regulations. Never alter any safety equipment.

Introduction

The purpose of this manual is to instruct the racer in the modifications necessary to convert a stock Powerglide valve body into a TSR Pro/Full tree transbrake.

Along with the modifications to the valve body, there are several modifications that need to be performed on the case. Follow the instructions carefully. It is recommended that you read this entire booklet completely before beginning.

Technical Support

If you need help or have any questions about any of the modifications outlined in the booklet you can call our Tech Line at 1-603-355-4955 between 8:00 AM and 5:00 PM EST Monday - Friday.

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Caution!!

If you are unfamiliar with the types of procedures outlined in this instruction sheet do not attempt to install this kit. This kit should be installed by a qualified transmission technician familiar with high performance transmissions. Failure to install this kit correctly can lead to transmission failure. Transmission failure can lead to serious injury or death!

APG-28999PTK/FTK Transbrake Valve Body Kit Instruction Sheet

This kit should include the following:

- **Aluminum Transfer Plate**
- **Steel Governor Support Plate**
- **Reverse Spool Valve W/Spring**
- **¼" NPT Pipe Plug**
- **10-32 Set Screw**
- **Short Length of Aluminum Round Stock**
- **Plain Small Spring (Shift Valve)**
- **Yellow Large Spring (Pressure Regulator**
- **2 Wire Solenoid**

The Following Tools And Equipment Are Required:

- **Access To A Milling Machine**
- **¼" Endmill**
- **¼: NPT Tap**
- **10-32 Tap**
- **½" Wrench or Socket**
- **Small Inside Snap Ring Pliers**
- **Set of Allen Wrenches**
- **Machinist Dye**
- **Small Scribe**
- **#272 Loc-Tite**
- **Type "F" Transmission Fluid or "lube-Guard" Assembly Lube**
- **Brake Clean or Similar Degreaser**

Disassembly

Begin the project by removing the valve body from the transmission. Set aside a clean area to work and organize your parts. ***Do Not*** use shop rags or paper towels to clean transmission parts, the lint found on these materials can cause problems at a later date.

Refer To Figure 1 For The Location Of The Components Below:

Note: In figure 1, the valve body halves are shown reversed. Also, in figure 1 the top half of the valve body is illustrated on the bottom and vice-versa. *In this manual, top and bottom refers to the position of the components as they are located in the transmission; that is reversed from figure 1.*

1. Split the valve body halves by removing the ½" headed bolts holding the two halves together.
2. Remove the following components:
    - Transfer plate and gasket (Nos. 16,17,18-Fig. 1)
    - Modulator valve (No. 26-Fig. 1)
    - Upper valve body plate and gasket (Nos. 35,36-Fig. 1)
    - Throttle valve components (Nos.28-38 Fig. 1)
    - High speed downshift components (Nos. 21,22,23-Fig1)

<u>The components above will not be re-used</u>

Note: If your valve body was from an early (1962-1966) rear pump model, you will find two flat check valves, and small springs (Nos. 19,20-Fig 1.) located in the upper valve body. These can also be discarded.

Remove remaining valve body components, thoroughly clean all parts with a brake cleaning solvent and blow dry with compressed air.

Modifications

The following operations are not difficult to accomplish. Please read over the material several times until you are confident of your ability to perform the operations required. It is very helpful to refer to an actual valve body as you review these instructions.

The locations of the cuts involved are ***critical***! The exact dimensions do not have to be held to close tolerances. This does not imply that you can be careless, but do not be concerned if you deviate slightly. Proceed carefully; it can be very difficult to repair a valve body that has been cut in the wrong place.

Case Modifications:

To get the quickest release possible from this brake, several case modifications must be made. Begin with an empty, clean case. Do not rush this process, study the pictures carefully. Be sure you understand exactly what is required before you begin.

The first step in modifying the case involves drilling two holes in the rear of the case. Refer to figures, 2,3, and 4.

1. Drill a ¼" hole from the "horse shoe" shaped indentation in the rear of the case (under the governor support). Drill this hole all the way through the case into the area under the reverse piston. Refer to Figure 2.
2. Still using the ¼" drill, move to the hole to the left of the "horse shoe" and drill all the way through as in step 1. Refer to figure 2.
3. Turn the case around and look into the space normally occupied by the reverse piston. You should be able to see the holes drilled in steps 1 and 2. Refer to figure 3.
4. Drill these holes out to ⅜" to a **depth of ½"**. Do not drill all of the way through the case, as this will increase the chance of a leak around the governor support. Use a drill stop or wrap electrical tape around the drill bit to prevent drilling through the case. Refer to figure 3.
5. Turn the case upside down so you are looking at the area where the valve body attaches to the case. Refer to figure 4 for the location of the two intersection holes that need to be drilled. Drill these two holes out to ⅜" until the intersect with the holes drilled in step 4.
6. At this point the holes can be lightly chamfered to remove any burrs. Clean the case thoroughly to remove any chips.

Reverse Clutch Pack Modifications:

The reverse piston should be machined to provide between .080" and .100" clearance for the reverse clutch pack.

Drill a 1/16" hole in the outer edge of the reverse piston as shown in figure 5. When installing the piston, place the hole at the top. This will allow air to escape the cavity behind the piston as the reverse circuit fills. The seals will then start to bleed when the piston is applied.

Note: *Reid* and *JW* cases do not need to have the reverse piston drilled. These cases have an air bleed provided from the factory.

The stock reverse springs should be replaced with heavy duty springs. The reverse spring retainer should also be replaced with a hardened unit. These components are available through ***TSR Racing Products.***

Machining The Valve Body

Begin this section by coating the required areas with machinist dye. Refer to figure 9 and 10. Scribe the areas to be cut as a guide while machining.

Milling Instructions:

Lower Valve Body (Refer To Figure 9)

Place the lower half of the valve body on the milling machine table, level and clamp securely. Follow the milling instructions carefully, as to the location, length, and depth of cuts.

Reference Letter:	Operation:
A	Mill a slot ¼" wide, ⅜" long, and 3/16" deep.
B	Remove this wall 1 ¾" long and 3/16" deep.
C	Remove the wall ¾" long and 3/16" deep.
D*	Drill and install aluminum plug here. Drill below bottom of channel, press in plug, and mill flush.
E	Remove wall 1 5/16" long and 3/16" deep.
F	Remove wall ⅜" , ¼" wide, and 3/16" deep.
H	Remove wall ¾" long, ¼" wide, and 3/16" deep.

- "Mike" supplied alum. Stock. Drill and ream for a .001" press fit. Be sure you drill slightly below the floor of the passageway to ensure a leak free fit.

Upper Valve Body

Before beginning the milling operation on the upper valve body, there are several items that need to be addressed.

Check the size of the outer hole formally occupied by the modulator valve. (called the reverse spool valve bore in figure 6). The supplied reverse spool valve and spring should fit into this hole and bottom out in the bore.

There are some valve bodies in which *this hole* is too small. If *this* is the case with your valve body, the valve body should be drilled to accommodate the diameter of the supplied spool valve, *Do not* trim the spool valve to fit the valve body bore, trimming the spool valve will slow down the release of the brake.

The outer surface of the valve body surrounding this bore should be milled flush with the outer most land on the spool valve. Milling this area opens up the exhaust path for the fluid as reverse is released. Refer to figures 6, 7, and 8. Figure 6 shows the location of the hole on the edge of the upper valve body, and indicates the area to be milled out. Figure 7 is a cut-away side view showing the depth of the cut and indicating the flush fit of the finished cut. This area is also indicated again in figure 8 for reference only. Figure 8 is a top view of the upper valve body.

A 1" end mill is perfect for this operation, although it can be accomplished with multiple passes using a smaller end mill. Refer to figure 6 for the location, and figure 7 for the depth of the cut. *Do not* mill all of the way to the lower edge of the valve body. Refer to figure 6, *do not* mill below the area indicated. Lightly chamfer the hole after the milling is complete.

There is also an exhaust hole that should be plugged. The location of this hole is indicated in figure 8. This hole does not need to be drilled, tap the hole for 10-32 threads. *Do not* tap completely through this hole. Install supplied 10-32 set screw using red "loc-Tite" on the threads.

Tap the hole formally occupied by the high speed downshift timing valve (number 23, fig. 1). This hole does not need to be drilled, tap with ¼" NPT and install the supplied pipe plug. Tap this hole deep enough so the pipe plug will fit flush with the surface of the casting. Test fit the valve body into the case. If this plug sticks out it will be difficult or impossible to install the valve body into the case. It may be helpful to grind the head of the plug flush after installation.

Milling Instructions:

Upper Valve Body (Refer To Figure 10).

Place the lower half of the valve body on the milling machine table, level and clamp securely. Follow the milling instructions carefully, as to location, length, and depths of cuts.

Reference Letter:	Operation:
J	Mill ¼" deep in area indicated.
K	Remove wall 3/16" wide, 3/16" deep.
L*	Drill & install alum. Plug here. Drill below bottom of channel, press plug, and mill flush.
M	Remove wall ¾" long, and ½" deep
N	Remove wall ¼" wide, 3/16" deep

*Be careful when milling off the top of the installed plug. Do not mill below the machined surface of the valve body.

*"Mike" supplied alum. Stock, drill and for a .001" press fit. Be sure you drill slightly below floor of passageway to ensure a leak free fit.

This completes the machining operations. The valve body halves should be thoroughly cleaned with a spray brake cleaning solvent and blown out with compressed air. *You must ensure that no chips or other debris are left in the valve body.* ***Do not*** *use rags or paper wipes to clean the valve body. This may leave lint behind that can cause problems at a later date.*

Assembly of Valve Body

Assemble the valves into the valve body as follows:

Note: Lubricate all components with ATF or "Lube Guard" assembly lube before assembly.

Refer to Figure 1

1. Re-install numbers 1 through 8 into the lower valve body. Replace the original pressure spring with the supplied (yellow) long spring.
2. Install the supplied (plain) short spring into the bore that houses the low-drive shift valve. (Number 10, Fig 1)
3. Install the low-drive shift valve on top of the spring installed in step 2.

4. *Do not* re-install springs 11 or 12, figure 1. Install low-drive regulator valve (number 13, Fig 1) into low-drive regulator sleeve (number 14, Fig 1). Install cap (number 14, Fig 1) and secure it with the snap ring. *Note: If the snap ring cannot be re-installed you will need to slightly grind the ends of the regulator valve (number 13, Fig 1). Grind only enough to allow the installation of the snap ring.*
5. Place the supplied transfer plate between the valve body halves, being careful of alignment. Install bolts and tighten to specifications. Refer to torque specifications chart. ***Do not use valve body gaskets!***
6. Install manual valve (number 25, Fig 1)
7. Install valve body into transmission. Be sure the valve body does not rock on the mounting surface of the case. The mounting surface must be flat!
8. Occasionally there is an interference between the upper portion of the valve body and the bottom of the case. Any interference must be corrected before final installation. Tighten to specifications.
9. Lube reverse spool valve and install through modulator hole. Using needle nose pliers, check for free operation.
10. Install oil pan. If using a cast aluminum pan, check for interference with the separator plate and the inside of the pan. Also check for interference with the separator plate and the pan flange in the area of the solenoid. File or grind pan for clearance as required.
11. Install the supplied steel governor support plate under the governor support, no gasket is required. The steel plate is not required with the use of a shorty cover or when using a ***TSR Racing Products*** billet aluminum governor support. When using a shorty cover or billet governor support, install governor support gasket.
12. Wire solenoid to switch or delay box.

Shifter Adjustment

Because of the variation in shifter style, cable arrangements, etc. It is impossible to give exact instructions on a specific unit. The reader should follow the instructions for his particular unit. One area of interference may be the bracket that holds the shift cable to the pan rail. This bracket may need to be trimmed to clear the transmission shield.

After installation and adjustment, the shifter/detent position in the transmission must coincide with the shifter position. To double check this, place the shifter in low, remove the cable/linkage at the transmission and ensure that the transmission lever is firmly in its detent inside the transmission. The above should be repeated for each shifter position. This will ensure that the transmission is not partially engaged in two gears at once.

Operation of Transmission

After the modifications outlined in this manual the transmission will exhibit much different characteristics than stock.

There will no longer be any automatic functions. You must start in low and manually up-shift into high. The shift pattern will remain forward pattern (normal).

The transmission will not back up unless the transbrake button is engaged. When backing up, you must stop, place the shifter into reverse, press the transbrake button, and then the transmission will engage reverse. If you are running a delay box, remember the solenoid will not disengage immediately upon release of the button. For this reason, your delay box should be wired with a safety switch. After a pass this switch should be tripped to disengage the delay box; this allows the transbrake button to release reverse immediately.

Caution: *Be very careful not to activate the transbrake while in motion!!*

To operate the transbrake, place the shifter in low, come to a complete stop, and activate the transbrake button. Then raise the engine RPM to the desired level. When the button is pushed, the transmission is in both low and reverse, which effectively locks the vehicle in place. When the button is released, the reverse pressure is relieved and the car moves forward.

If you have never used a transbrake, you should approach its use with caution the first several times you use it. You may find it necessary to vary your delay and starting line RPM slightly from time to time to match changing track conditions, but overall, there is no starting system in drag racing that is more consistent.

It is recommended that before operating this transmission under racing conditions that the transmission be fully warmed up. This can be accomplished several ways. The simplest way is to drive around the pit area at low speeds, warming the engine, transmission, and rear end.

Many times it is impractical to drive around as stated above. In this case, raise and support the rear wheels, start the engine and shift through gears allowing the wheels to spin until the engine and transmission reach optimal operating temperatures.

Burn-Outs

On vehicles with line-loc, the burn out can be started in low gear, and then shifted into high. Dragsters and altereds can use just high gear.

Band/Clutch Application

When the shifter is in park:

The front clutch is off.
The reverse clutch is off.
The band is off.

When the shifter is in reverse:

The front clutch is off.
The reverse clutch is on.
The band is off.

When the shifter is in neutral:

The front clutch is off
The reverse clutch is off
The band is off

When the shifter is in low:

The front clutch is off.
The reverse clutch is off.
The band is on.

When the shifter is in drive:

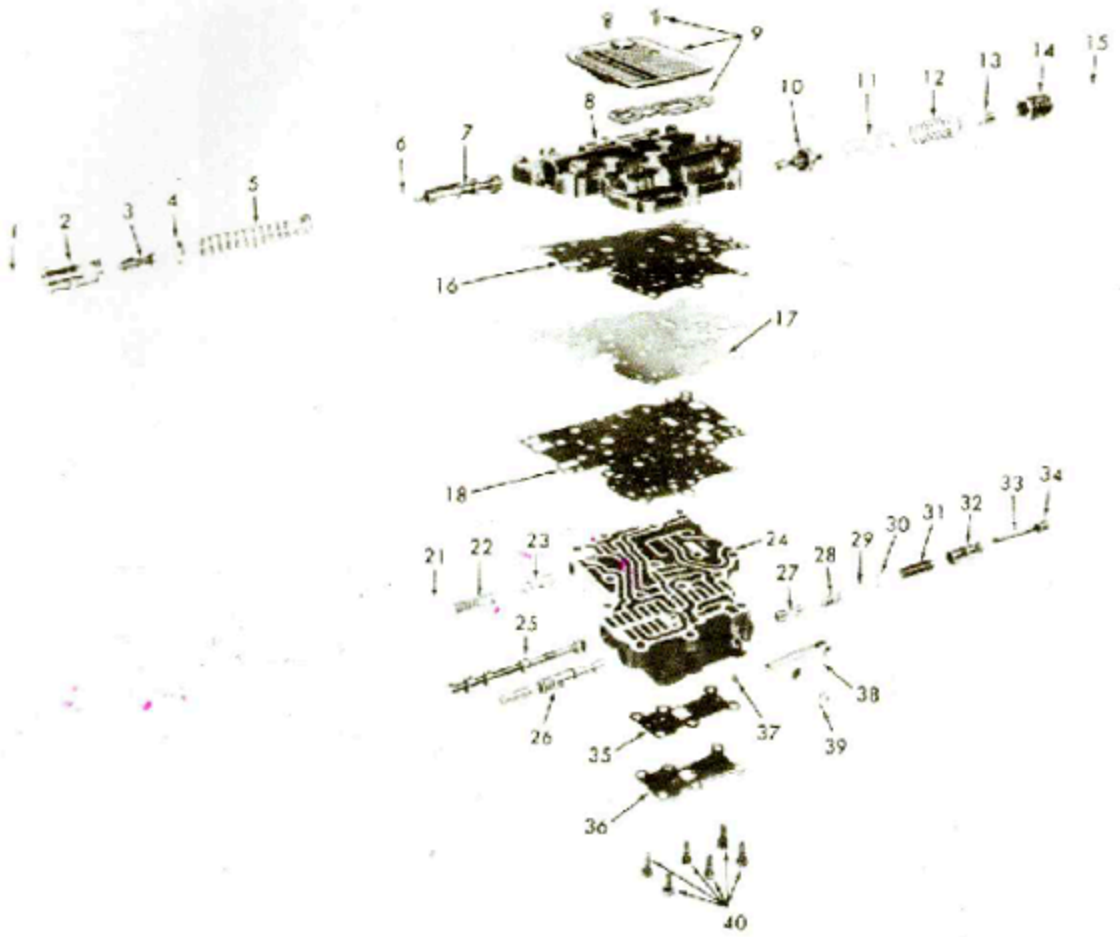
The front clutch is on.
The reverse clutch is off.
The band is off.

When the shifter is in low with the transbrake button depressed:

The front clutch is off.
The reverse clutch is on.
The band is on.

Torque Specifications

Transmission Case to Engine	35 FT. - LB.
Oil Pan to Case	8 FT. - LB.
Extension Housing to Case	25 FT. - LB.
Valve Body to Case	15 FT. - LB.
Lower to Upper Valve Body	15 FT. - LB.
Governor Support to Case	15 FT. - LB.



1. Snap Ring
2. Hydraulic Modulator Valve Sleeve
3. Hydraulic Modulator Valve
4. Pressure Regulator Spring Retainer
5. Pressure Regulator Spring
6. Pressure Regulator Spring Seat
7. Pressure Regulator Valve
8. Lower Valve Body
9. Suction Screen, Gasket and Attaching Screws
10. Low and Drive Valve
11. Low and Drive Valve Inner Spring
12. Low and Drive Valve Outer Spring
13. Low and Drive Regulator Valve
14. Low and Drive Regulator Valve Sleeve and Cap
15. Snap Ring
16. Transfer Plate to Lower Valve Body Gasket
17. Transfer Plate
18. Transfer Plate to Upper Valve Body Gasket
21. High Speed Down Shift Timing Valve Stop Pin
22. High Speed Down Shift Timing Valve Spring
23. High Speed Down Shift Timing Valve
24. Upper Valve Body
25. Manual Control Valve
26. Vacuum Modulator Valve, Plunger and Spring (exc. L-4)
27. Throttle Valve
28. Throttle Valve Spring
29. Throttle Valve Spring Seat
30. Throttle Valve Spring Regulator Guide Washer
31. Detent Valve Spring
32. Detent Valve
33. Throttle Valve Spring Regulator
34. Throttle Valve Spring Regulator Nut
35. Upper Valve Body Plate Gasket
36. Upper Valve Body Plate
37. Detent Valve and Spring Retaining Stud
38. Range Selector Detent Lever
39. Snap Ring
40. Upper Valve Body Plate to Upper Valve Body Attaching Bolts and Washers

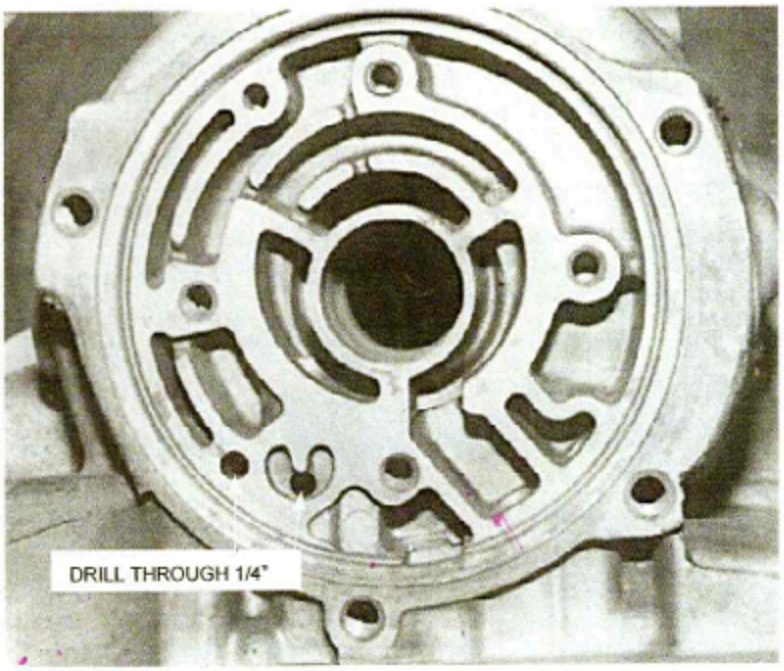


Figure 2: Location of holes in the rear of the case.

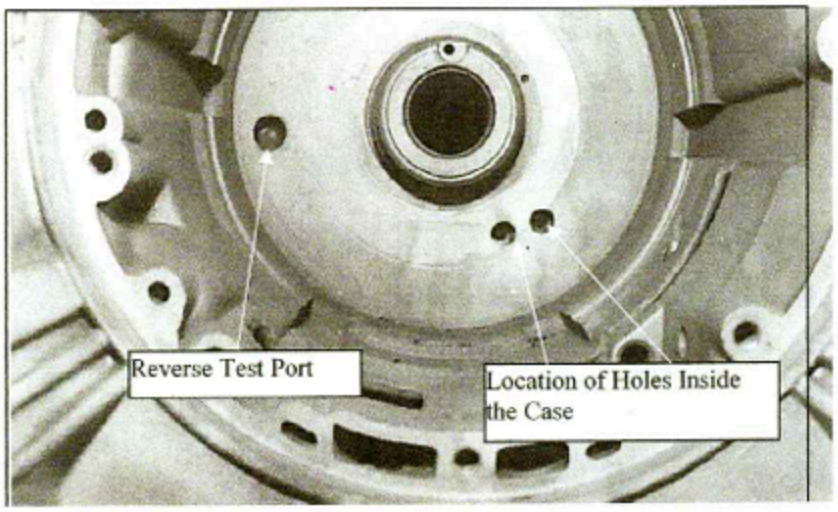


Figure 3: Holes Inside of Case

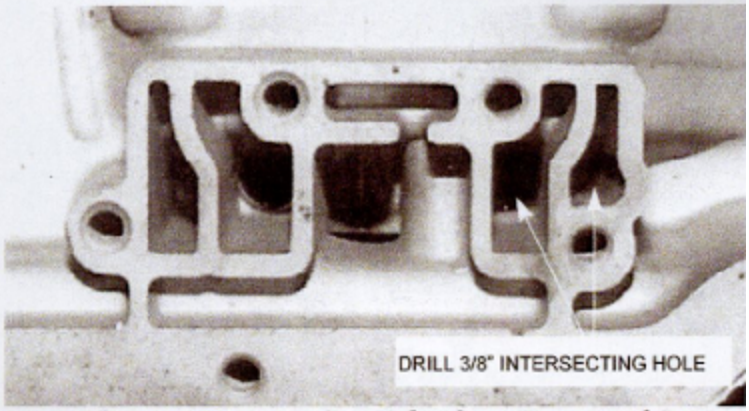


Figure 4: Intersecting Holes from Bottom of Case

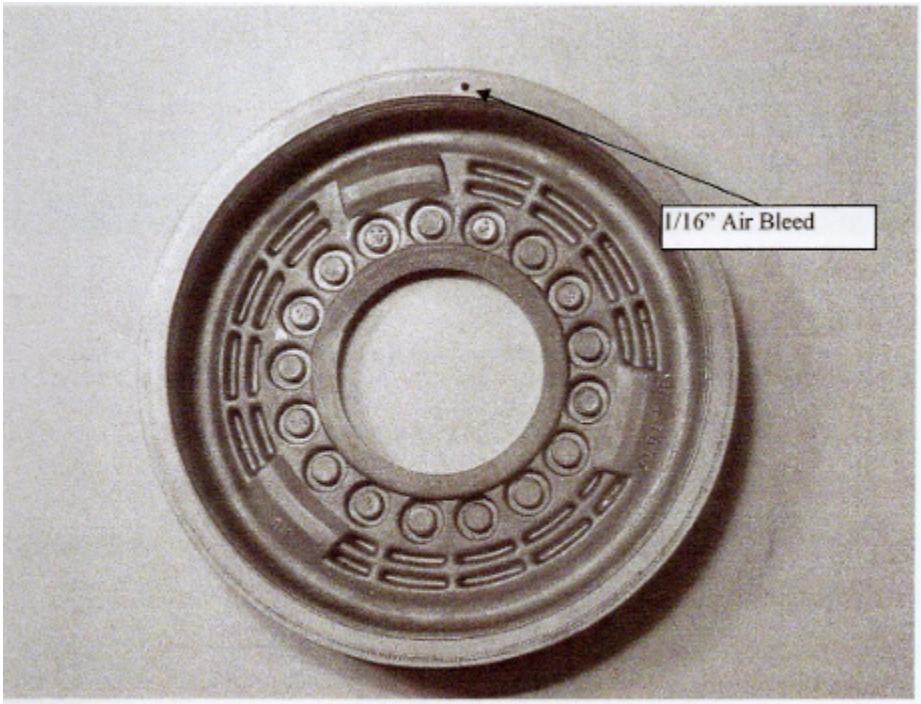


Figure 5: Air Bleed in Reverse Piston

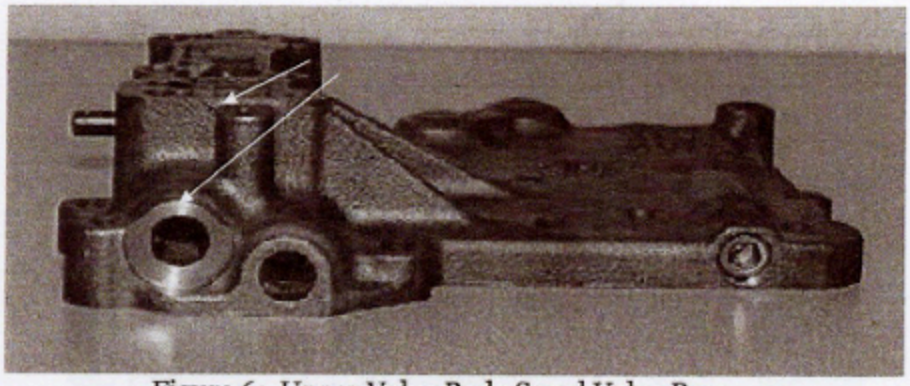


Figure 6: Upper Valve Body Spool Valve Bore

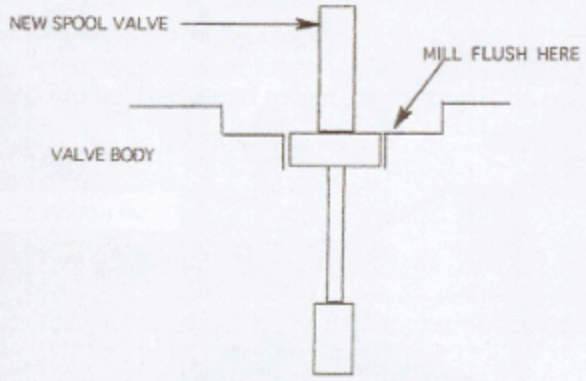


Figure 7: Reverse Spool Valve

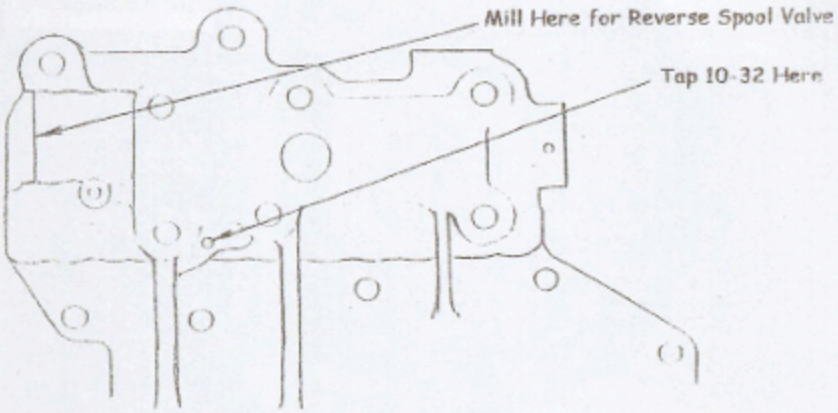


Figure 8: Top View of Valve Body

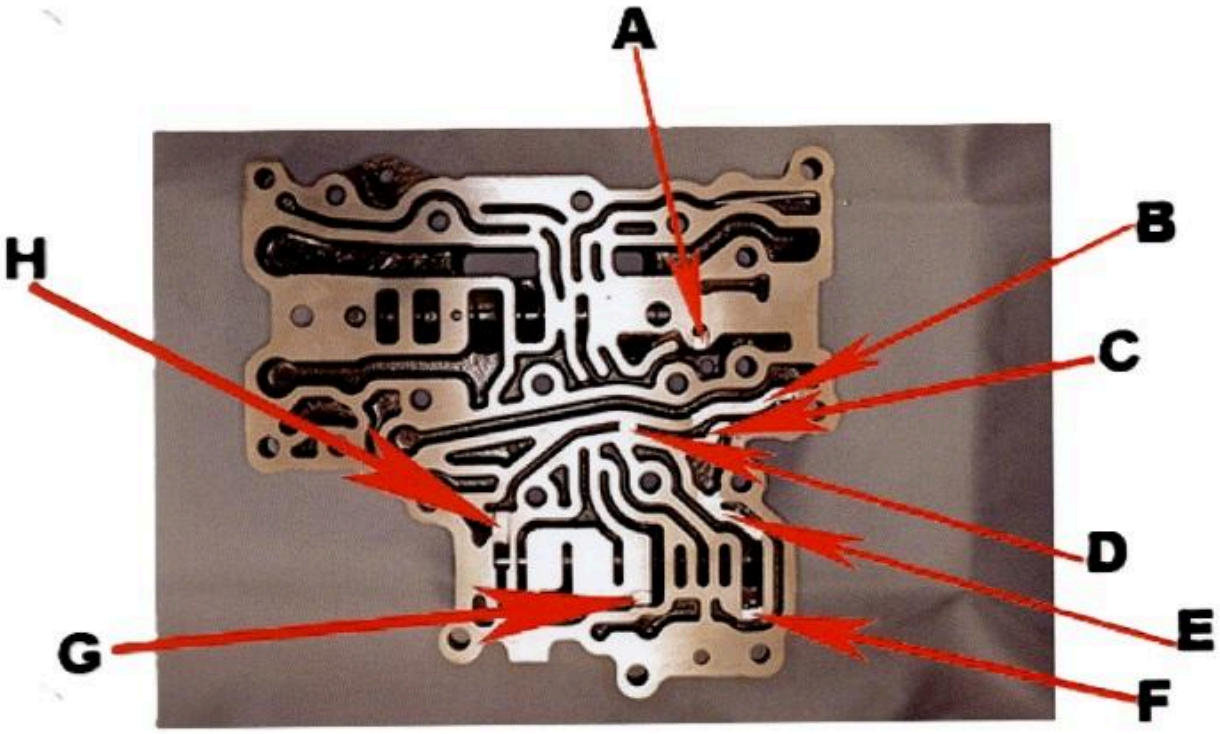


Figure 9: Lower Valve Body

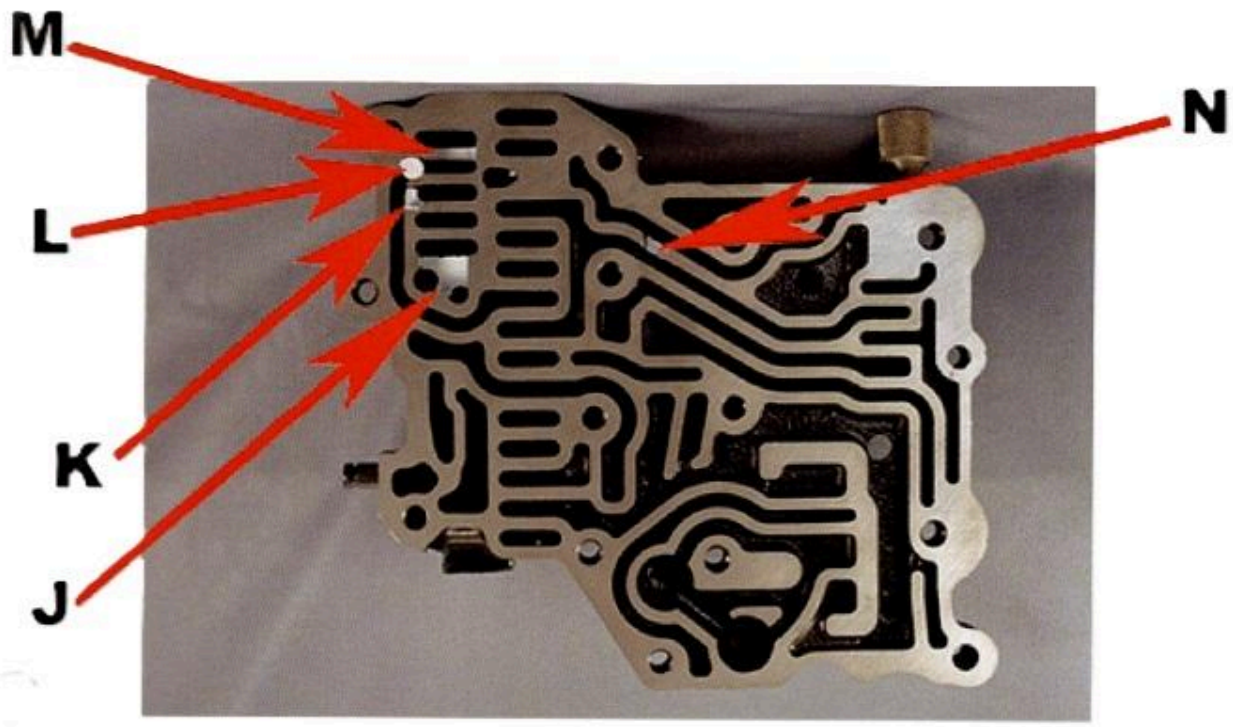


Figure 10: Upper Valve Body