VELVET DRIVE CONTROL VALVE

DISASSEMBLY AND CLEANING

Introduction

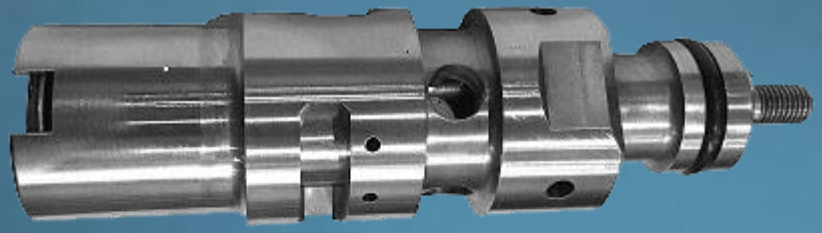
The control valve directs hydraulic fluid from the crescent pump to either the forward or reverse clutches and provides lubrication to all moving parts. The integral regulator valve relieves excessive oil pressure to the sump.

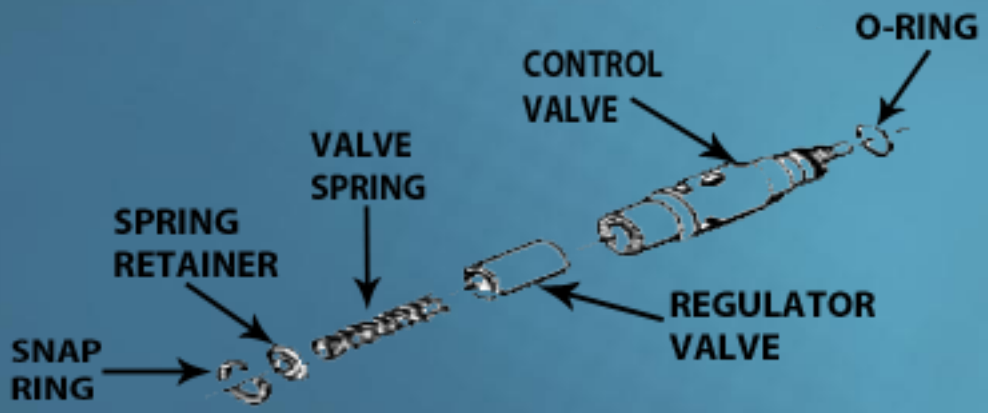
It is a simple and reliable component but if the shift linkage is not adjusted properly or the control valve becomes plugged with sludge, oil pressure may fall and the transmission may not shift smoothly if at all.

The following photographs depict a typical disassembly. Removal of the transmission is not required. The regulator valve is held in place by a snap ring so an arbor press or drill press is required to compress the internal spring in order to remove the snap ring. No other special tools are required.

Components

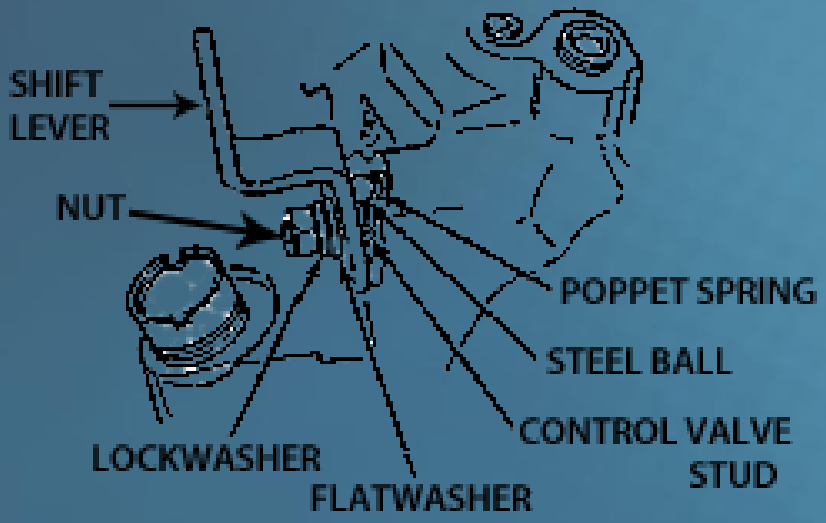
Control Valve:





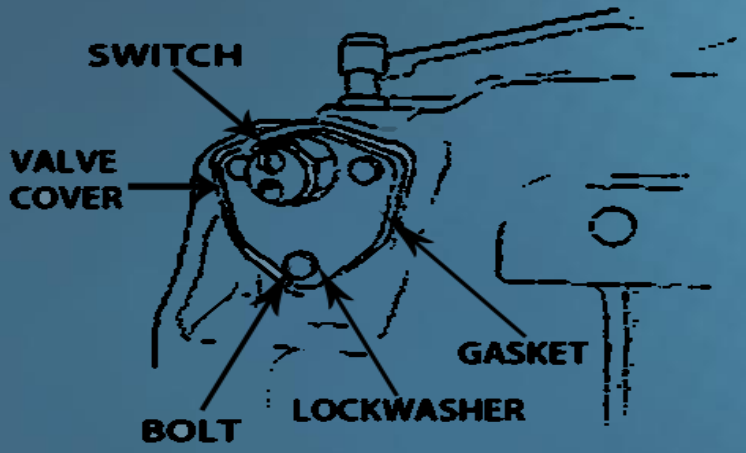
Components

Shift Lever Assembly



Components

Neutral Safety Switch



DISASSEMBLY

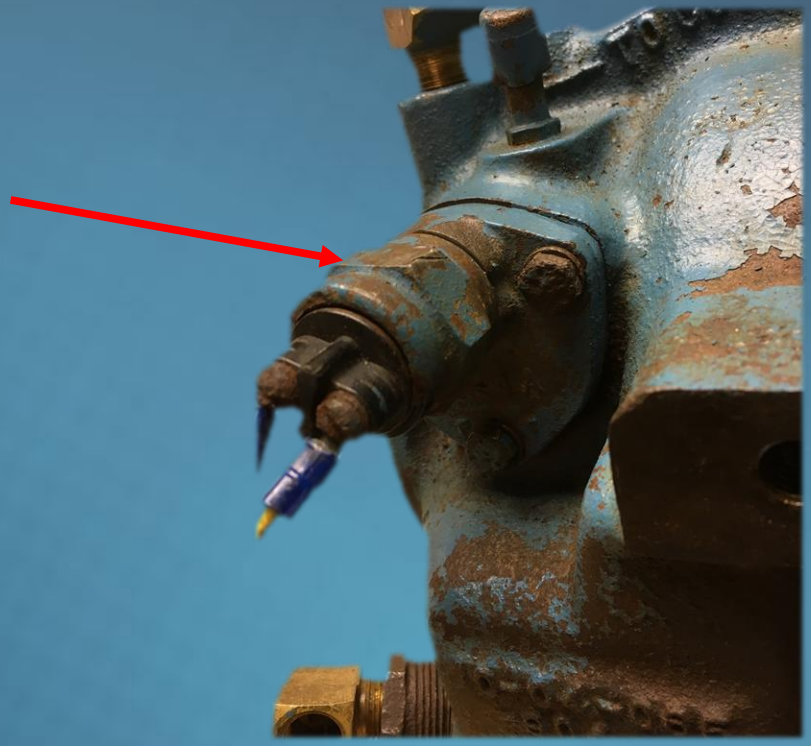
After removing the linkage from the top of the shift lever, remove the 7/16” nut.

Wiggle the shift lever off the stud. There is a poppet spring and steel ball behind the detent hole, so remove the lever slowly.

Remove the neutral safety switch next.

DISASSEMBLY

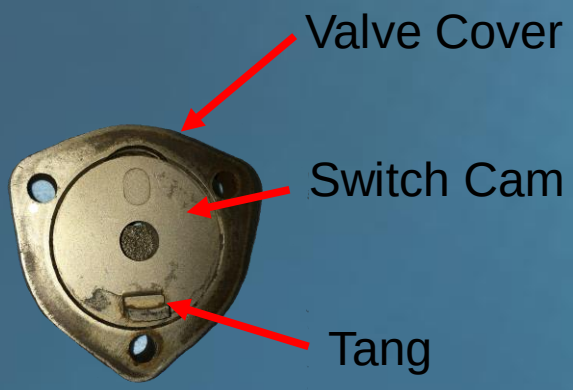
Remove the neutral safety switch with a 7/8” wrench. (Note: The larger 1 1/8” switch in the photo is used in Chrysler units only.)

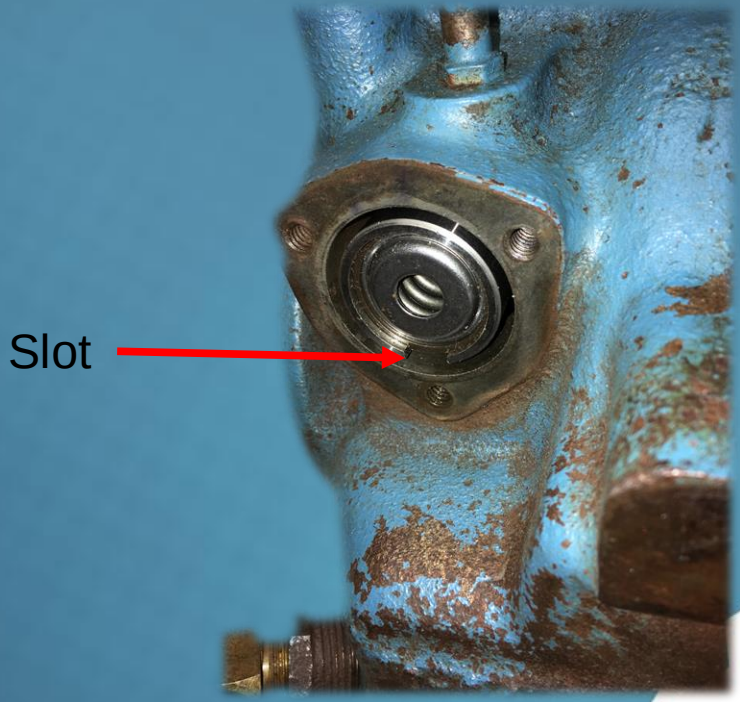


Use a 7/16” wrench to remove the 3 ¼” Dia. bolts holding the valve cover on. Take off the cover by gently tapping a screwdriver inserted between the cover and the transmission housing.

DISASSEMBLY

Once the valve cover is removed, the switch cam should drop out. The tang in the switch cam inserts into the slot in the bottom of the control valve. It only fits one way.



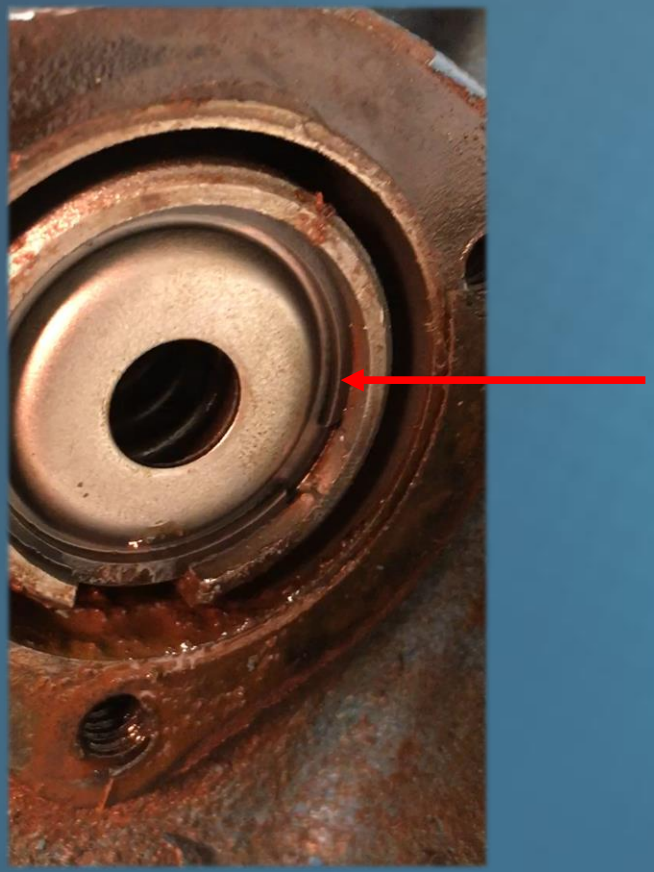


DISASSEMBLY

The neutral safety switch is normally closed. A spring pushes the ball into the cam detent slot. Current from the ignition switch passes through the neutral safety switch to the solenoid relay.

If the control valve rotates the switch cam to the forward or reverse position, the ball is pressed in and the switch opens preventing engine start when the transmission is in gear.

DISASSEMBLY



Removal of the cover plate and cam reveals the end of the control valve. Note the rust and buildup of sludge.

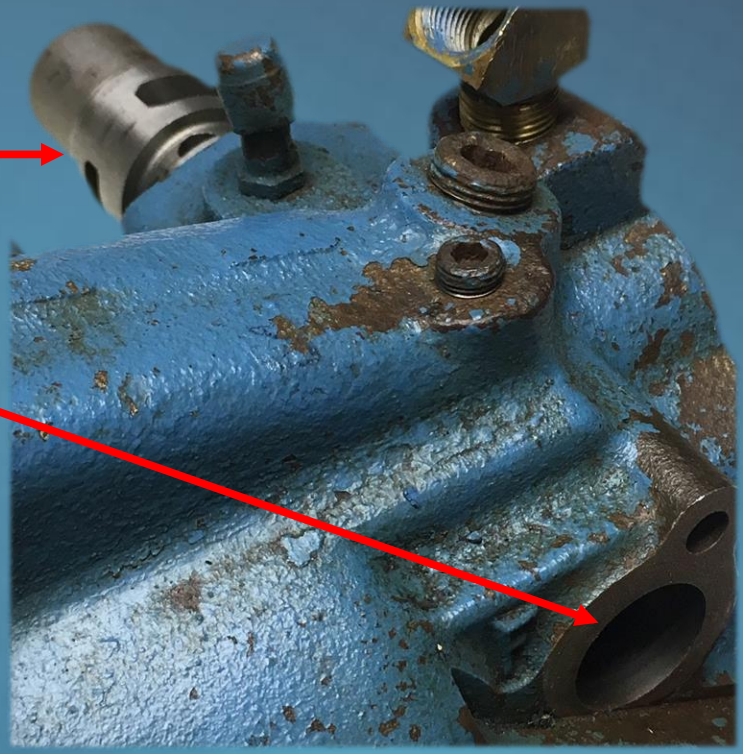
The spring retainer is held in by a snap ring. You will need an arbor press or drill press to compress the internal spring in order to remove the snap ring.

It is a good idea to have spares on hand in case they are ruined during removal.
Spring Retainer, PN 71-246
Snap Ring, PN 4821

DISASSEMBLY

Remove the control valve by tapping on the threaded stud with a brass hammer. (Or thread a nut onto the end and tap the nut with a hammer.)

There is an O-ring inside that increases resistance. Once you have it started, you can remove it by hand.



DISASSEMBLY

View of a removed control valve. The regulator valve was frozen so this transmission would not have been able to relieve excess pressure into the sump.

DISASSEMBLY

Inside view of a control valve bore showing buildup of rust and sludge.

DISASSEMBLY

This control valve still shifted the transmission, although the front seal was blown. This is a good example of what happens when you do not change zincs in the heat exchanger. When the oil cooler corrodes, the transmission fills with water and starts rusting out.

It is a simple and quick process to remove it for inspection and cleaning, requiring nothing more than a valve cover gasket and standard tools found in any toolbox. Inspection should be part of a 1000 or 2000 hour maintenance schedule.

DISASSEMBLY

Put the control valve in an arbor press. Insert a 3/8” or 7/16” hex nut on top of the spring retainer. Lower the press ram to compress the spring and lower the spring retainer below the snap ring slot.

Insert a screwdriver into the control valve slot with the blade against the snap ring. Twist up and out. Keep pressure on the ram during the whole process.

You may bend the snap ring during removal. Have a spare on hand or twist the old one back into shape.

CLEANING

Clean the control valve components with carb cleaner, toluene, or whatever concoction you prefer. If the control valve bearing surfaces are rusty, then polish them lightly with a fine grit emery cloth along with a light oil.

The regulator valve is a sliding fit and should be polished with fine emery cloth. It doesn't require lapping but should be round and free of all burrs, gouges, and rust build up.

Scotch Brite can be used on the rest of the surfaces.

CLEANING

Clean out the bore with Scotch Brite, scrape off the old gasket, and you're ready for reassembly.

It may be helpful to remove all of the pipe plugs on top of the transmission. It will make it easier to clean oil passages. (If oil passages are plugged, you may need a complete overhaul.)

REASSEMBLY

Drench everything in ATF. Insert regulator valve and control spring. Place spring retainer and snap ring on top.

In this photo I am using a drill press with a socket on top of the spring retainer.

REASSEMBLY

Compress the spring so that the spring retainer is below the snap ring slot. Start one end of the snap ring into the slot; then work around the valve forcing the ring down as you go.

It helps to have three hands. I used a shock cord to hold the drill press handle down to maintain pressure on the spring.

REASSEMBLY

Cover the control valve and bore with ATF. Insert the valve into the bore with the slot down. Install the gasket. Hold it in place with a dab of petroleum jelly or soft Permatex.

Install the switch cam with the tang fitted into the control valve slot, then put the valve cover on.

I use anti-seize compound on all bolts in the ER. The 3 bolts are torqued to 10 ft. lbs. Insert the neutral safety switch, and torque it to 25 ft lbs.

REASSEMBLY

Clean out the bore for the poppet spring with Q-Tips soaked in toluene or isopropyl alcohol. Lubricate the spring with 30W oil and insert.

If you have trouble keeping the poppet ball in place during reassembly, a dab of petroleum jelly on the end of the spring will help. Attach the shift lever and torque the nut to 10 ft. lbs.

Check the operation of the shift lever for any binding or resistance. If it works reinstall the linkage. Check operation again from the helm.

NOTES:

MANUALS:
https://www.correctcraftfan.com/Downloads/Velvet_Service_Manual.pdf
(Good photos)
https://sbo.sailboatowners.com/downloads/Hunter_gen_61323794.pdf
(Good line drawings)

PARTS:
http://bpi.ebasicpower.com/shop/index.php
http://www.halemarine.com

WEB SITES:
http://www.themalibucrew.com/index.php?/forums/topic/53673-rebuilding-and-increasing-torque-capacity-of-velvet-drive-71c/
https://www.mastercraft.com/teamtalk/showthread.php?s=218ef14bb4d5b90d29856282fd12819d&t=53874

Created by: Garrett Colson, Boston. IG30 “SoWhat”

NOTES:

Interesting to note the improvements made to the control valve over the years. More and larger ports for better lubrication and more flow to the clutch pistons.

NOTES:

A subtle change in an angle means the shift lever can't go past the forward position ensuring full flow of ATF to the forward piston.