

Since becoming an avid internet junky, I find myself accessing the SWPC website several times a day to read the "Firewall Forward" and the "General Maintenance" bulletin forums. I also subscribe to the SWPC email list and look for other maintenance tidbits and posted problems by the members. Some topics seem to come around every year, sometimes a couple times a year.

One of these recurring questions is about stiff fuel selector movement or lack of feel for the positive detent in the valve handle. Another question frequently asked is that of cable tensions for primary flight controls. While I aim to discuss a possible fix for fuel valve problems, a recommendation to the SWPC news would be to post the cable tensions on the back cover of each issue. They could be displayed much like the magnetic compass correction card that seems to have taken up permanent residency on the back cover for as long as I have been receiving it. Something similar to:

RUDDER	SLACK
AILERONS	35 LBS
ELEVATORS	35 LBS
STAB. TRIM	10-14 LBS
FLAP ADJUSTED SO THAT THE FLAPS START MOVING WHEN THE FLAP HANDLE STARTS TO MOVE.	

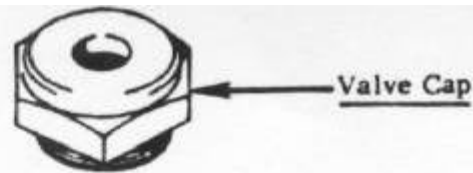
Now, on to curing the various problems one encounters with the fuel selector valve. The original fuel selector valve is a brass plug style valve (some after market valves, such as Jensen, could be plastic). The plug has machined holes 90 degrees apart that line up with two of the three holes in the valve body. One of the holes in the valve body connects to the engine, the other two holes in the valve body connect to each tank. While the fuel selector handle will rotate 360 degrees and have four detents, each 90 degrees apart, only two of these positions will permit fuel to reach the engine. The valve would work quite well without the built in detents, but one would have to have some visual means to assure the valve were positioned to provide unobstructed openings between the tank line and the line going to the engine. Considering the awkward position of the valve, the detents can be virtually life saving if you need to change position of the selector valve in a particularly stressful situation.

Lets look at how the detent is created. A special washer that has four notches on its inside circumference is pressed towards the tapered plug. The washer is held off the back of the tapered plug by a pin which passes through the back of the plug. The washer essentially rides against each end of the pin as the valve stem is turned. To prevent the washer from rotating within the valve body when turning the selector valve, a small tab sticks out beyond the outer circumference of the position washer (see point "A" on the diagram). This small tab fits into a small hole in the valve body to prevent the washer from turning. As the valve stem turns and the edges of the pin ride on the position washer surface, the washer, under pressure from the spring, will shift slightly toward the plug when the pin reaches a set of internal notches in the position washer. The movement of the washer against the pins creates the detent we feel.

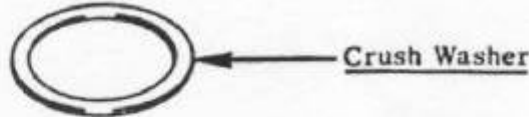
So what's the problem. There are several things that can make the detent feel weak or non-existent. Certainly a mechanical failure of the spring, position washer, pin, or valve stem are all possible reasons for not having the detent. Typically the culprit is just plain dirt and lack of lubrication or too much "Fuel Lube". The first time I disassembled my fuel selector valve, I found tiny grains of sand in the assembly. Most of the time the valve just needs some cleaning and lubricating. Most materials used for lubricating are petroleum based and will wash away with gasoline. The type lubricant to be used in the fuel selector valve is a product called "Fuel Lube". It is available at many aircraft parts and supply houses (Aircraft Spruce, Wicks, etc).

There are several precautions necessary during disassembly, cleaning, lubing and re-assembly to make this a satisfying experience. First off, we need to drain the fuel from the tanks and lines (this might not be necessary if you have a spare tapered plug to put in the valve body, but some fuel will come out during the transition). Opening up the fuel valve with fuel in the tanks or lines will not only dump fuel into the interior but creates a pretty good fire hazard. Study the diagram, which is part of Piper Service Bulletin No. 354, very carefully noting the order and orientation of each small component. The brass washer is counter-bored and must be positioned in accordance with the drawing or the pin edges will not enter the notches; therefore no detent.

Prior to disassembly, I will always have a shop rag on the cabin floor to lay the pieces in as I disassemble the valve. I try to lay the parts out in the proper order and orientation that they must be re-assembled in. The first step in disassembly is to remove the fuel selector handle (see drawing). Once the handle and associated washers are off, the metal plate that has the fuel selector placard on it will likely have to be removed. A couple screws usually hold this on. After removal of the plate the valve cap will be accessible. I typically use a good size crescent wrench. Depending on when and how this valve cap was tightened, it could take a fair amount of torque to loosen it. Once loose, you can usually remove it with your fingers. The "O" ring will likely come off with the valve cap. If so, carefully remove it for cleaning and coating with "Fuel Lube". This seal has to be good to keep fuel from seeping out around the valve stem. The washer, spring and brass washer will usually come out easily with a pick or small screw driver. The position washer will have to tilt away from the tab on the outer circumference to come out easily. I usually use a small pick or bent safety wire to pull at the washer from side opposite the tab. The tab is usually in the top right quadrant of the valve body as viewed looking into the valve open end. It is important to remove the position washer prior to pulling the plug and valve stem out to prevent damage to the position washer (been there, done that). Remember the position washer has a tab that fits in a small hole in the outer circumference of the valve body.



Valve Cap



Crush Washer



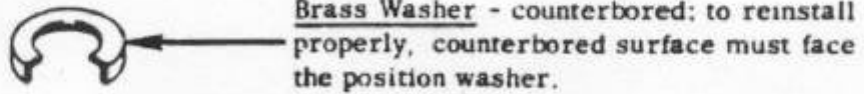
O Ring



Washer

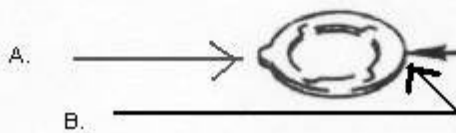


Spring



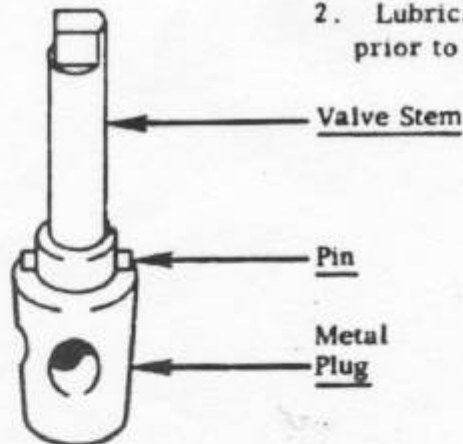
Brass Washer - counterbored; to reinstall properly, counterbored surface must face the position washer.

**"O" Ring
Piper 752 822
(MS29513-011)**



Position Washer

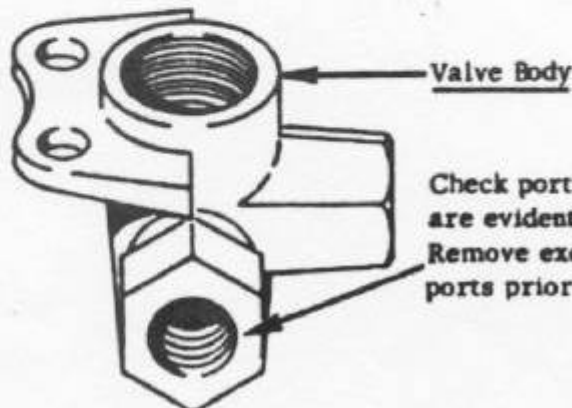
1. Check inside perimeter for indication of extreme wear; if wear is readily apparent, replace position washer.
2. Lubricate with MIL-G-6032 (Type I) prior to reinstallation.



Valve Stem

Pin

Metal Plug



Valve Body

Check ports for cracks; if cracks are evident, replace valve. Remove excess grease from ports prior to reinstallation.

Fuel Selector Valve

Drain fuel system before disassembly. Keep track of the order and orientation of parts during disassembly. The Position Washer has an outside tab ("A") which fits in a slot or hole in the internal of the valve body. When removing the position washer, use a pick or bent safety wire to pull it out at point opposite the tab (point "B"). Re-installing the position washer, align the tab with the slot/hole that is in the internal bore of valve body. Insert washer at an angle such that the tab is going in the bore first. Once the tab is in the slot the remainder of the washer will seat easily against the plug. If washer does not fit easily, tab is probably not in internal slot/hole and forcing it may bend the tab or the washer. Use thin film fuel lube on plug, o-ring and valve cap threads.

