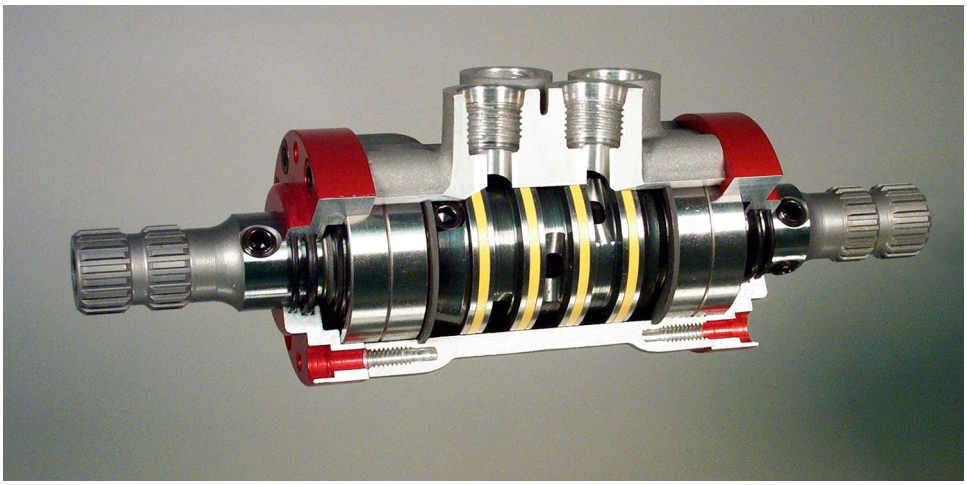
Woodward

VA800 and 900

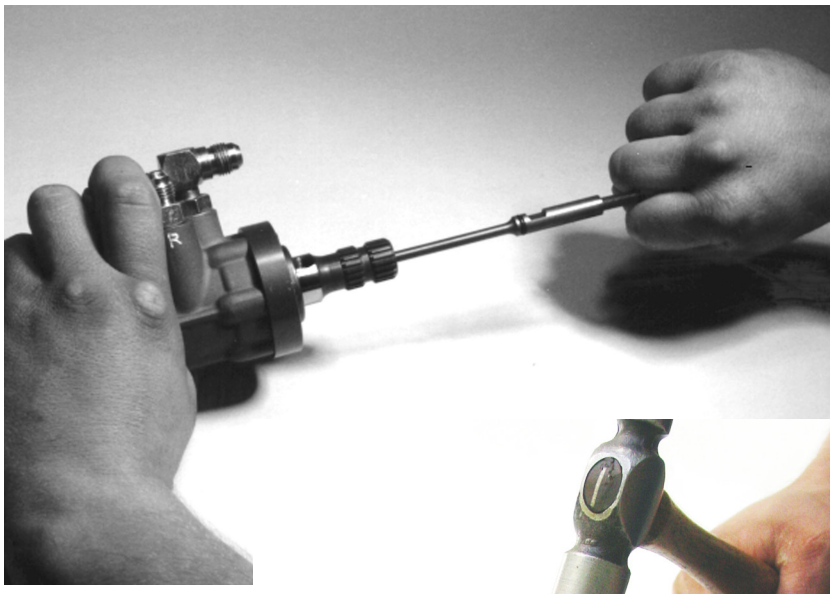
Power Steering Servo



Spool seal replacement
Spool assembly installation
Testing

1. Extracting the T-bar

Remove the set screws and the end plugs and screw the removal handle (or a 1/4-20 bolt) into the end. Pull the bar out of the unit.



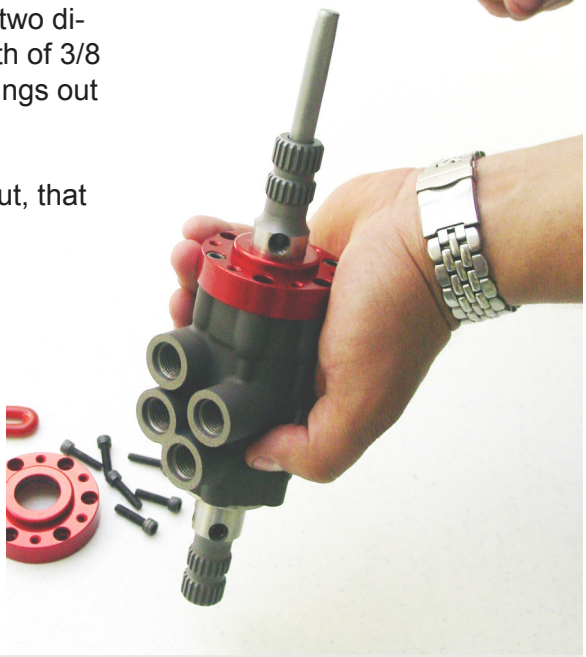
2a. Removing the input shaft

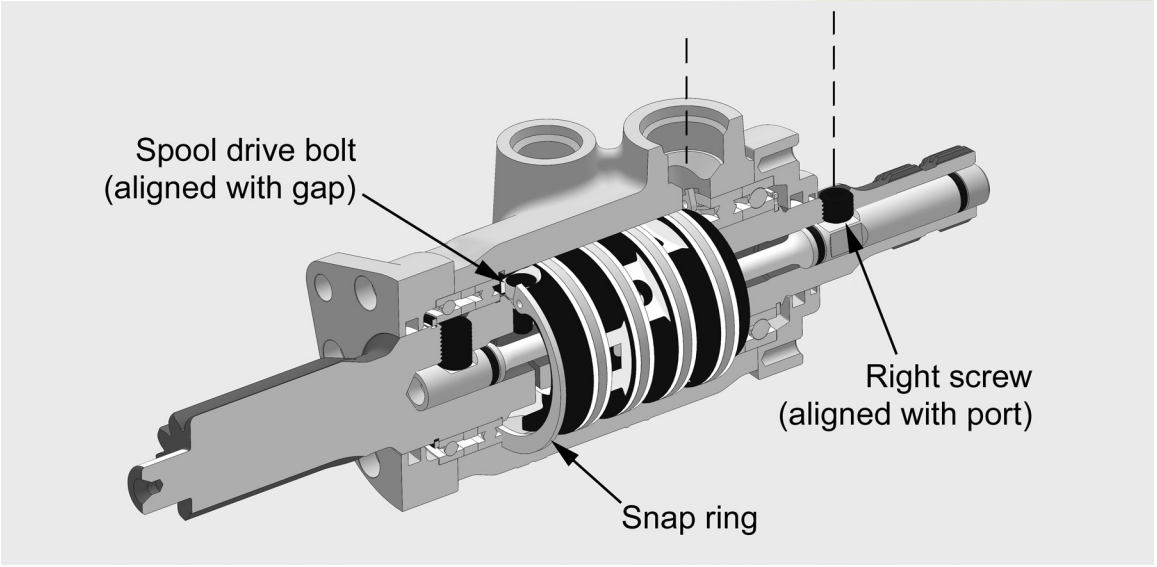
On an inline servo with a splined shaft at each end, use the two directional adjusting screws at the INPUT end to retain a length of 3/8 rod. Remove the end cap and drive the valve core and bearings out of the housing.

NOTE: On an integral-type servo having a pinion as its output, that end must be driven out first; reverse steps 2a and 2b.

2b. Removing the output shaft

Whether the output is a splined shaft or a pinion, the set screws must be aligned parallel with the ports to ensure the drive bolt will pass through the gap in the snap ring. Keep this alignment while driving out the pinion or input shaft. If the drive bolt cannot pass through the gap it will damage the housing.



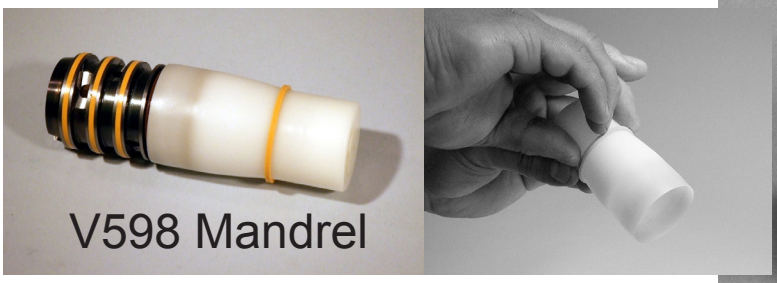


3. Replacing spool seals

With both input and output assemblies removed, the spool will slide out of the housing. However, reinstallation will be more difficult because new seals will be somewhat expanded, like the piston rings in an engine.


R800 Seal kit

The spool seals are a PTFE/glass composite which is semi-rigid. Their installation requires considerable care and should not be attempted without the service tools. They are backed up by fluorocarbon O-rings which are easily snapped into the grooves by hand.


V598 Mandrel

Expand the PTFE rings onto the spool with the mandrel.

Push the ring over the mandrel and into one of the inner grooves of the spool.
NOTE: The ring is glass-reinforced PTFE and its elasticity is limited. While pushing, support it as evenly as possible to keep it round.
Lubrication is not necessary at this point.

Note the spool rings will not snap back to their pre-installed diameter but must be “helped.”

Immediately squeeze the ring in place to help it return to its original diameter.

V599 Sleeve

As soon as possible, install the assembled spool in its guide sleeve and let the rings “set” for 30 minutes.

With all four rings in place, carefully push the spool into the installation sleeve. Push from the end with the two drive bolt slots.

4. Reinstalling the spool in the housing

Extend the edge of the spool so that it will start into the housing bore.

Extrude the first land from the sleeve by about 75% of its width. This will act as a pilot for insertion of the spool into the servo housing. Keep the assembly in the sleeve for at least 30 minutes to allow the rings to conform.

Position the servo housing with its return port toward the bench. Coat the inside of the housing with petroleum jelly. Install a snap ring in the lower groove. Completely fill the upper groove with petroleum jelly. This will allow the spool rings to slip over it without catching. Using a wooden or plastic tool, rapidly push the spool into the housing until it stops against the lower snap ring.

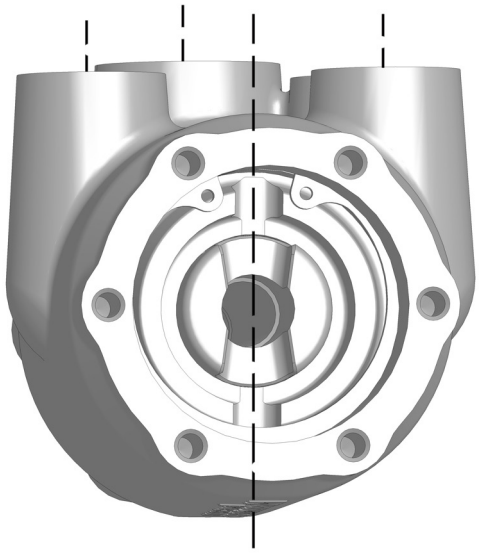
5a. Reinstalling the input shaft and bearing assembly

With the spool installed in the housing, slide the valve section of the input shaft into the spool. Verify that the ball bearings are started in the bore and press until they bottom against the snap ring.

5b. Reinstalling the output shaft and bearing assembly

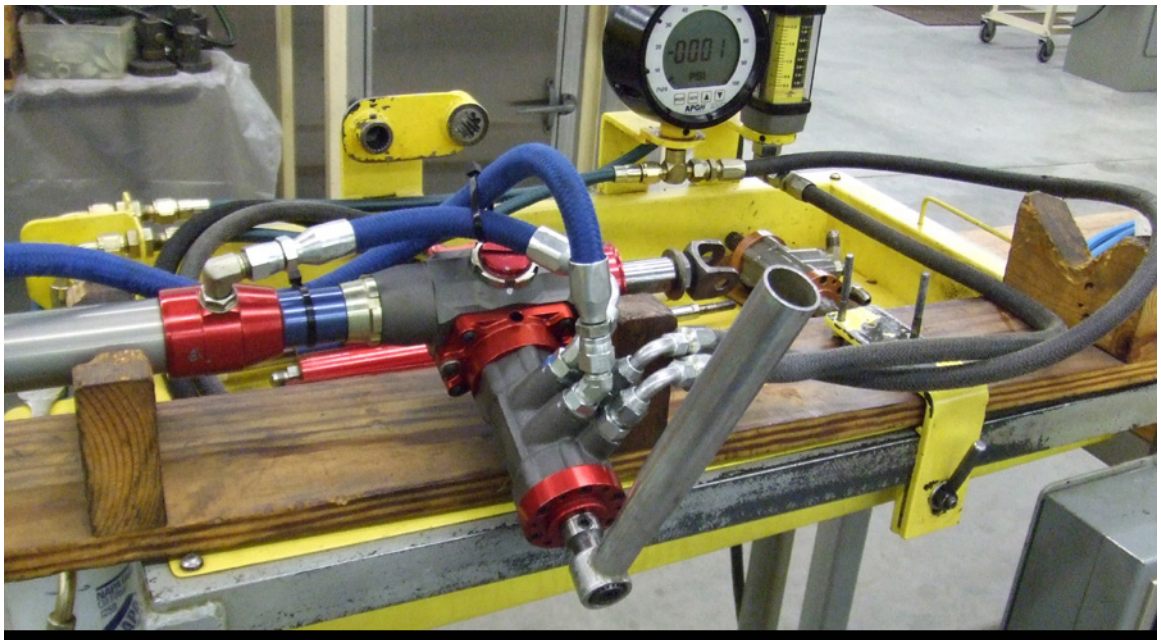
First verify that the drive bolt slot in the end of the spool and the slot in the end of the input shaft are both aligned with each other and are parallel to the fluid ports. They should also be approximately centered on the gap in the snap ring. Maintain this alignment while pressing the output assembly into the housing.

When the bearing is seated against the snap ring, the drive bolt on the output shaft or pinion will be fully engaged in the slot in the spool. Note that if this slot is worn, the spool can be turned 180 degrees and the other slot used. At this point the end caps can be reinstalled (the procedure for installing the torsion bar and adjusting the hydraulic balance is covered separately).



6. Suggested testing procedure and equipment

While obvious leaks can be seen by simply applying pressure, it is less easy to detect internal leakage (in, for example, the spool seals) that causes weak assist and overheating. A test rig, basically consisting of a power steering pump and reservoir, with a pressure gauge in the working side of the circuit and a flow meter in the return side, is the only way to absolutely verify the performance of your reseal job short of actually installing the rack and test driving it.



Testing for pressure and leakdown can be done with a gauge and flow meter. Install the gauge in the pressure line and the flow meter in the return line. The rack must be equipped with TRAVEL STOPS to prevent the pinion from reaching the end of the rack teeth under power. Using a tool to simulate a steering wheel, turn the steering to full lock. Apply varying torque and observe the gauge; the pressure should rise instantaneously and in direct proportion to the torque.
At a certain point the pump will go into relief and the pressure will rise no higher. At this point the flow should instantaneously drop below 0.05 gpm / .2 lpm. Although it may not be noticeable in a race car, a higher value indicates leakage in the servo or cylinder and the unit should be serviced at the next opportunity.

To closely simulate driver input, a steering wheel can be adapted to the input spline and used in lieu of a torque wrench.

Rack at full left lock. The pump has reached its relief point, in this case a pressure of approximately 1500 psi / 103 bar. The flow is zero, indicating that all the seals function perfectly when steering to the right.

The same rack at full right lock. The pump hits relief at a point within 1% of left lock, which is well within normal variation, and the leakdown is zero.

An inconsistent relief point can indicate pump wear or debris in the system.