Woodward

Type MR and MRC

Power Steering Rack

Cylinder seal replacement
Cylinder/rackshaft reassembly
Testing

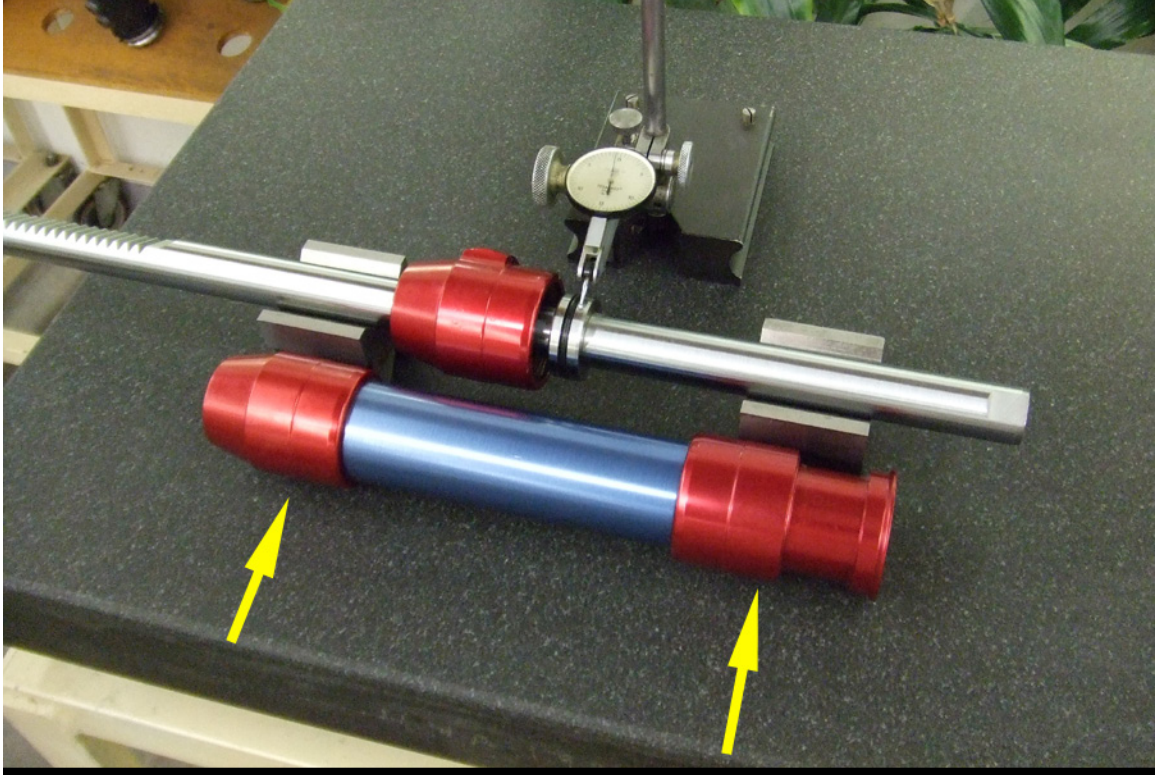
1

Protect the rack teeth and hold the rackshaft in a bench vise. Ease the inner end of the cylinder onto the rackshaft. Use lubricant to protect the rubber seal. Using blue Loctite 242 (or equivalent) on the threads, screw the stud partway into the rackshaft.

2

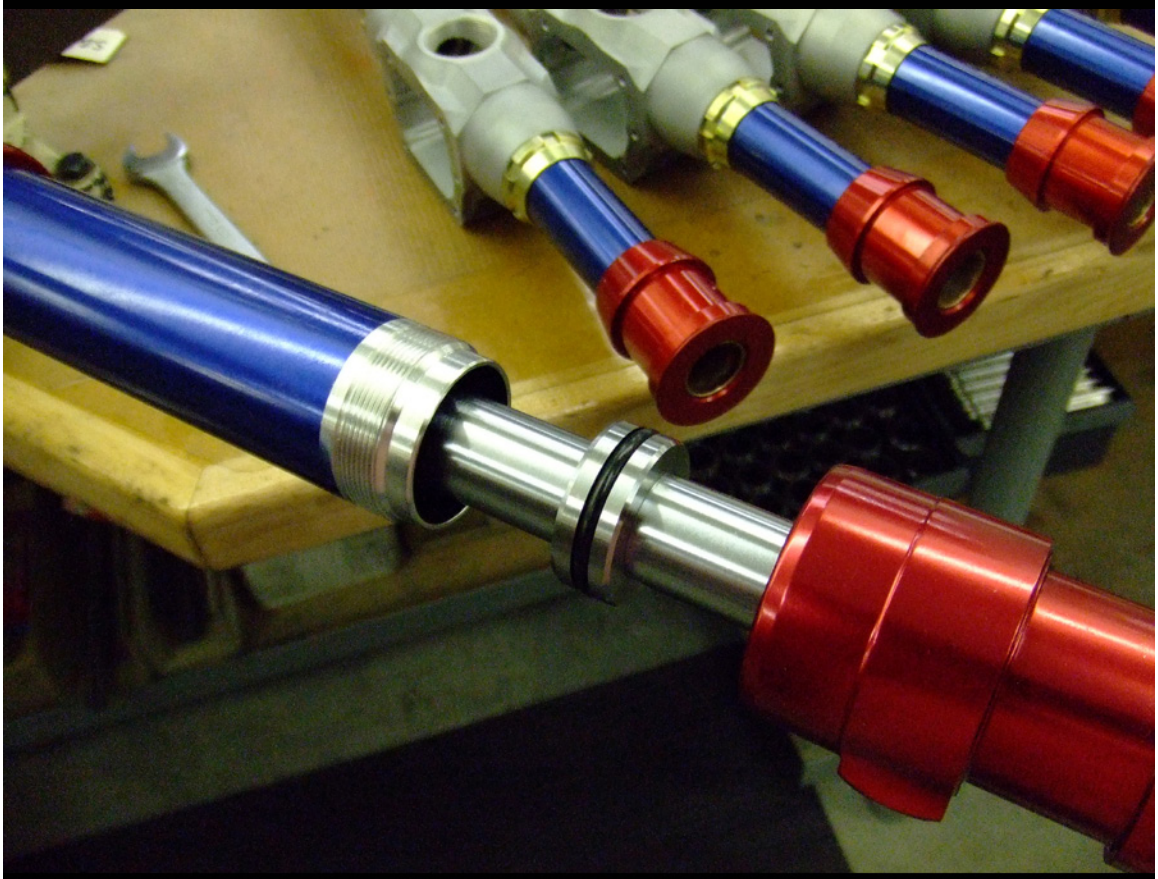
Install the piston and apply Loctite to the exposed end of the stud. Avoid spreading Loctite into the contact surfaces of rackshaft and piston. With a large adjustable wrench, tighten the joint to 60 lb/ft or 80 NM.

3



Test for straightness by supporting the assembled rackshaft in V-blocks on a surface plate. SPACE THE V-BLOCKS THE SAME DISTANCE APART AS THE BEARINGS IN THE CYLINDER.
The piston must run true within .0025 inch/.064 mm. If it runs out, immediately break the joint loose and rotate the piston to reseat it, then retighten the joint and retest.

4



Coat the inside of the tube and all o-rings with petroleum jelly. Slip the tube over the piston. Apply anti-seize lubricant to the threads and screw both ends onto the tube. Install -6 fittings in the ports. Tighten the ends using rods inserted in the fittings. Be sure the tube will seat positively into the ends.

5

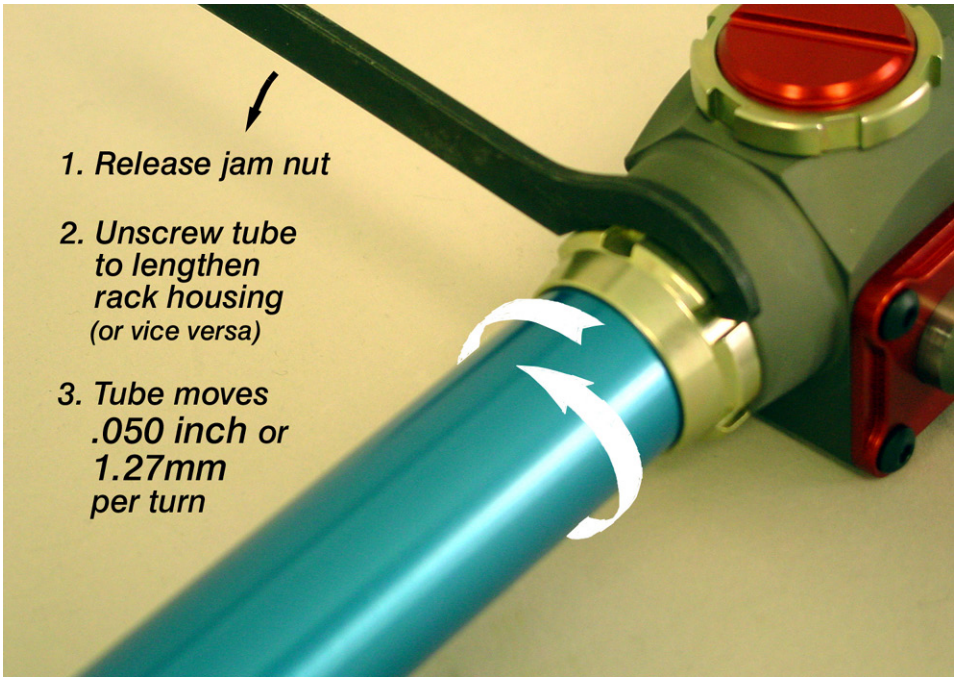
Hold the cylinder and move the rackshaft full travel by hand. Even with new seals it should be movable. With a rubber-tipped blowgun, apply shop air pressure (120-175psi / 8-12 bar) to each end alternately. The rackshaft should respond instantly without sticking. Any leakage will be audible. As a general rule, if the assembly can be operated with air, it will operate with hydraulic fluid.

6

The cylinder and rackshaft can now be joined to the rack housing. Apply blue Loctite (or equivalent) and seat the housing tube all the way into the cylinder end. To adjust the position of the ports, loosen the jam nut and rotate the tube in the housing. This will also adjust the cylinder closer to or farther away from the housing by .050 inch / 1.27 mm per turn.

Housing length adjustment

7



Functional testing procedure and equipment

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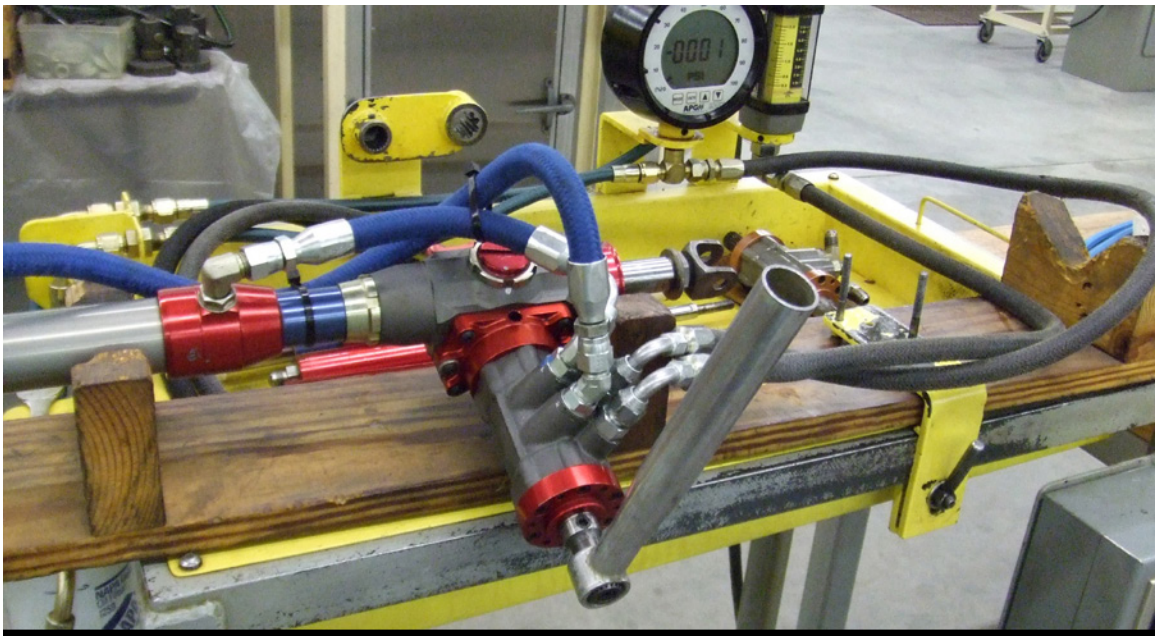
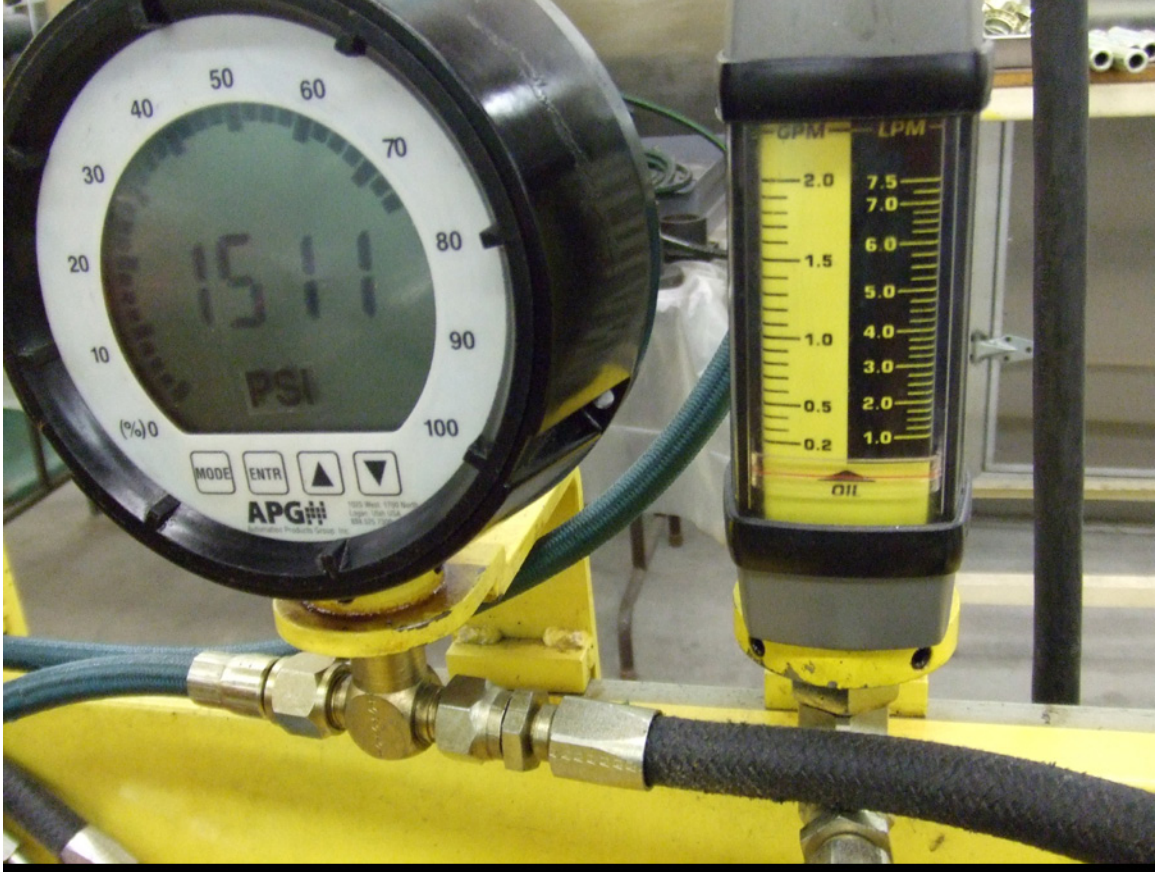


Testing for pressure and leakdown can be done with a gauge and flow meter. Install the gauge in the pressure line and the flow meter in the return line. The rack must be equipped with TRAVEL STOPS to prevent the pinion from reaching the end of the rack teeth under power. Using a tool to simulate a steering 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.

9



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.

10

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.