The following information is found in GM service manuals and is reprinted here to assist you in diagnosis of suspected valve lifter assembly noises.

**Valve Lifter Operation**

Oil is supplied to the lifter assembly through a hole in the side of the lifter body which indexes with a groove and hole in the lifter plunger. Oil is then metered past the oil metering valve in the lifter assembly, through the pushrod assemblies to the rocker arm assemblies.

When the lifter assembly begins to slide up the cam lobe, the ball check is held against its seat in the plunger by the ball spring which traps the oil in the base of the lifter body below the plunger. The plunger and lifter body then raise as a unit, pushing up the pushrod assembly to open the valve. The force of the valve spring which is exerted on the plunger through the rocker arm assembly causes a slight amount of leakage between the plunger and lifter body. This “leakdown” allows a slow escape of trapped oil in the base of the lifter body. As the lifter assembly slides down the other side of the cam lobe and reaches the base circle or “Valve closed” position, the plunger spring quickly moves the plunger back (up) to its original position. This movement causes the ball check to open against the ball spring and oil from within the plunger is drawn into the base of the lifter assembly. This restores the lifter to zero lash.

**Valve Lifter Assembly Diagnosis**

If valve lifter assemblies are:

1. Momentarily noisy when engine assembly is started.
   
   This is normal. Oil drains from some of lifter assemblies when engine is not running. It takes a few seconds for lifter assemblies to fill after engine assembly is started.

2. Intermittently noisy when engine assembly is idling. Noise disappears when engine speed is increased.
   
   This is caused by dirt in lifter assembly or pitted or damaged check ball in lifter assembly. Remove, disassemble, and clean lifter assembly. If damaged check ball is found in any lifter assembly, replace lifter assembly.

3. Noisy when engine assembly is idling slowly or when engine assembly is hot. Lifter assemblies are quiet when engine speed is increased or when engine assembly is cold.
   
   This may be caused by high leakdown rate in one or more lifter assemblies. Replace any suspect lifter assemblies.

4. Noisy at high-speeds and quiet at low speeds.
   
   This is caused by incorrect oil level, either too high or too low, or improper oil flow at pump pickup. Check for the following:

   A) High oil level. Oil level above oil level indicator “FULL” mark allows crankshaft counterweights to churn oil into foam. When foam is pumped into lifter assemblies, they will become noisy. Solid column of oil is required for proper lifter operations. Drain oil to proper level.
B) Low oil Level. Oil level below oil level indicator “ADD” mark allows oil pump assembly to pump air at high-speed which results in noisy lifter assemblies. Add oil to proper level.
C) Damaged oil pan assembly, or loose/cocked oil pump screen. Repair or replace parts as necessary.

5. Noisy at idle, becoming louder as engine speed increased to 1500 rpm. Noise is most noticeable with vehicle at 16 to 24 km/h (10 to 15 mph) in “LOW” transmission drive range, or 48 to 56 km/h (30 to 35 mph) in “DRIVE” transmission range. Noise is best described as “hashy” sounding. At slow idle, it may be gone or may appear as light ticking noise in one or more valves. Noise is not caused by lifter assembly malfunction. It is caused by one or more of the following:
   - Badly worn or scuffed valve tip and rocker arm pad.
   - Excessive valve stem to guide clearance.
   - Excessive valve seat runout.
   - Off square valve spring.
      - Occasionally this noise can be eliminated by rotating the valve spring and valve.
      - Remove the valve rocker arm covers. Crank engine until noisy valve is off its seat.
      - Rotate spring. This will also rotate valve. Repeat until valve becomes quiet. If correction is obtained, check for an off square valve spring. If spring is off square more than 1/16 inch in free position, replace spring.
   - Excessive valve face runout.
   - Valve spring damper clicking on rotator.

   This is caused by foreign particles or excessive valve lash. Check for valve lash by turning engine assembly so the piston in that cylinder is on top dead center of firing stroke. If valve lash is present, the pushrod assembly can be freely moved up and down a certain amount with the rocker arm assembly held against the valve. Valve lash indicates one of the following:
   - Worn pushrod assembly.
   - Worn rocker assembly.
   - Lifter plunger stuck in down position due to dirt or carbon.
   - Faulty lifter assembly.

   When checking the above four items, look at the upper end of the pushrod assembly.
   Excessive wear of the special surface indicates one of the following conditions:
   - Improper hardness of the pushrod ball. The pushrod and rocker arm assemblies must be replaced.
   - Improper lubrication of the pushrod assembly. The pushrod and rocker arm assemblies must be replaced and the oiling system to the pushrod assembly should be checked.

   If the pushrod assembly appears in good condition and has been properly lubricated, replace rocker arm assembly and check valve lash. If the lash still exists and the pushrod and rocker arm assemblies are OK, the lifter assembly should be replaced.