

Saturn Pit Stop Diagnosis, Repair and Using Resources



by Mike Van Dyke

It was just another day on the ATRA HelpLine, when an email came in from my wife. One of her coworkers had a Saturn that was acting funny. Last night she noticed the car seemed to jerk when she put it in gear. Then, when she pulled into her parking space at work this morning, it had no reverse, so she couldn't back up to straighten out her car.

The most common Saturn TAAT transaxle complaints we hear about on the HelpLine are related to reverse engagement. This prompted me to take this car into the ATRA transmission laboratory, diagnose and repair the problem, and document the process along the way. After a short discussion with ATRA Technical Director Lance Wiggins and the owner of the car, everything was set to go.

Saturn Identification

You call the Saturn dealer and say, "I need parts." The parts tech says, "Okay, what model Saturn are you working on?" You ask, "What do you mean? It's a Saturn. It has four tires and a steering wheel." Saturn is one of the few car companies that doesn't put shiny chrome letters on the back of the car to tell you what model it is. Unless you're familiar with Saturns, use the VIN to identify the car.

The 5th VIN character was H, making it an SL1 model. The 8th character was 8, so the engine was an RPO (Regular Production Option) code L24 (single overhead camshaft). The 10th VIN character was V, so the model year was 1997 (figure 1).

We opened the hood just to make

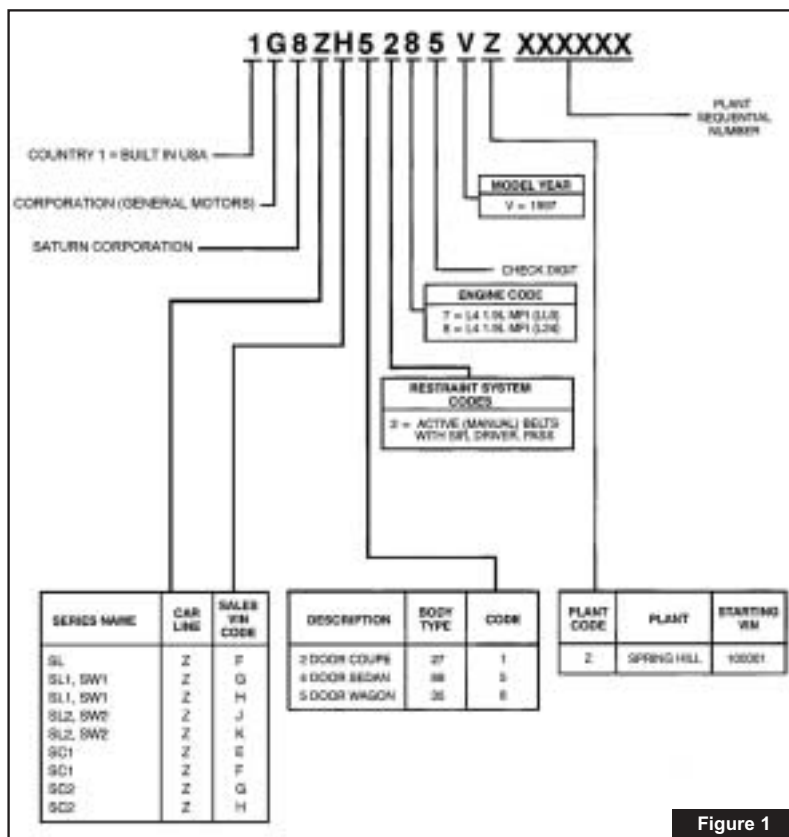


Figure 1

sure it had a SOHC engine. You never know: Some junk monkey may have worked on the car before you and pulled the old witcheroo on the engine. Mismatched engines, transmissions and computers have been known to cause many driveability problems, not only on Saturns, but many other makes too. I've spoken with many technicians who've slammed their heads against the wall for days on problems that turned out to be caused by mismatched powertrain

components. It doesn't hurt to check these things out first when you're faced with a new problem.

The transaxle model code is stamped on the top of the transaxle case, between the two top bellhousing bolts (figure 2). Just to make sure there wasn't any monkey business going on here either, we checked the transmission model code to make sure it matched the vehicle. The first digit was a 7, making it a 1997 transaxle; the 2nd,



Figure 2

3rd, and 4th digits were MP6, so it was the base transaxle for the single overhead camshaft engine (figure 3). So far, so good: It looks like the engine and transaxle belonged in this car.

of the engine compartment, and the MIL was on, which led to the next step: Scan testing the computer system.

A scan tool revealed three codes: P1620 (Low Coolant Level), P0326

(Knock Sensor Circuit; Excessive Knock), and P0732 (2nd Gear Ratio Error). Always investigate engine- and emissions-related codes first, because they can affect transmission performance. The coolant was low, probably because of the obvious water pump leak, so that explained the P1620. The water pump bearings were also in really bad shape, which was contributing to the ferocious noise on the passenger side of the engine compartment. At this point I had my suspicions that the P0326 may have been caused by the knock sensor being triggered by mechanical noise from the failed water pump bearings.

Even if the MIL isn't lit, it's still a good idea to scan the computer. Some vehicles will have codes stored, especially transmission codes, and not light the MIL. Or there may be codes stored in history that can help you diagnose an intermittent problem.

At this point I decided to do a line pressure test, as reverse problems with Saturn transaxles are often the result of low line pressure rise or poor line pressure control. The line pressure tap is located at the front of the unit, next to the spin-on transmission filter. To attach your gauge, remove the air filter box, then remove the transmission fluid temperature sensor and screw your gauge fitting into the temperature sensor hole (figure 4).

VIN CODE	LITERS DISP.	ENGINE TYPE	FUEL SYSTEM	ENGINE OPTION CODE	TRANSAXLE CODE	DISCRIPTION
7	1.9	L4	MFI	LL0 (DOHC)	MP7	PERFORMANCE AUTOMATIC 4 SPEED
8	1.9	L4	MFI	L24 (SOHC)	MP6	BASE AUTOMATIC 4 SPEED

Figure 3

Testing the Trans

The first step with any diagnosis is to verify the complaint. On a cold start-up, reverse would engage with about a 2-second delay. On the road test, the transmission seemed to upshift normally at first, but after about 5 minutes of driving the 1-2 shift started to get longer. Pretty soon it would just drop into neutral when the 1-2 shift was supposed to occur. At this point the vehicle also had no reverse.

So we were able to verify the customer's complaint. It's very likely that our 2nd gear and reverse problems were related, because Saturn TAAT transaxles use the 2nd clutch for reverse, much like Honda transaxles use the 4th clutch for reverse. These units are very similar in design to Honda transaxles. I also noticed a loud whirring noise from the passenger side



Figure 4



Figure 5



Figure 6

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Saturns let you control line pressure with a scan tool, but for a quick test I watched the commanded line pressure through the scan data and compared it to the actual pressure on the gauge (figure 5). The actual line pressure was within range when compared to the commanded pressure, but during the 2nd gear command, the computer would command maximum line pressure (222 PSI) at any throttle position. This meant the computer recognized a problem with 2nd gear and was trying to compensate. This narrowed the problem down to three possibilities:

- A faulty 2nd gear actuator

- A hydraulic leak in the 2nd clutch circuit

- A mechanical problem with the 2nd clutch

Here's a handy actuator test you can perform on Saturns. Using a scan tool, you can have the computer pulse each actuator while you listen. If one actuator sounds different than the others, it could be faulty. The actuators should all sound about the same.

At this point we knew there was an internal problem in the transaxle, so I looked up the case passage ID in the ATRA 2000 seminar manual (available through ATRA Online). 10 minutes later I had the valve body off and was air testing the 2nd clutch circuit through the case (figure 6). Major leak. It wouldn't hold pressure, and there was a lot of clearance in the 2nd clutch. The 2nd clutch clearance specification is 0.060" - 0.086". We measured over 0.100". Time to pull the unit and assess the damage.



Figure 8

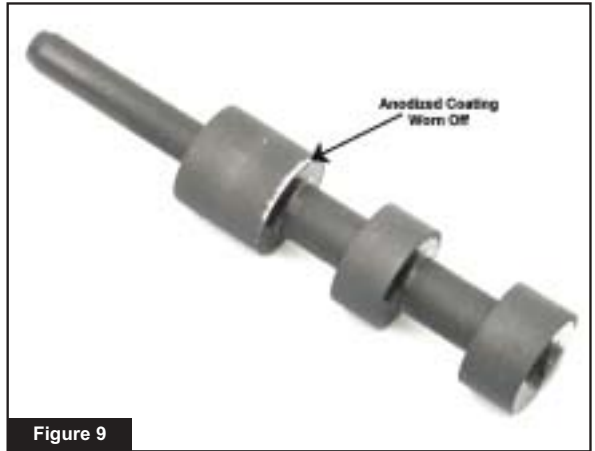


Figure 9

Internal Examination

The cause of failure was the input shaft nut had become loose. When the input shaft nut is loose, it allows 2nd clutch oil to leak around the nut and exhaust through the 1st clutch drum splines (figure 7, see page 10). The 2nd clutches were worn, and the plastic cage was coming apart on the input shaft 2nd gear bearing. That was the extent of the geartrain damage. New clutch plates restored the 2nd clutch clearance to 0.075”.

We disassembled and inspected the valve body, paying extra attention to the pressure regulator bore. This is a common area for wear on these valve bodies, and with 132,000 miles it was no surprise that the pressure regulator bore was worn. I could see the valve move side to side in the bore when I wiggled it with two scribes (figure 8). There was also wear evident on the valve: The anodized coating was worn off the edge of one of the valve lands (figure 9). This anodized coating is much harder than the valve bore it rides in, so if the anodizing shows signs of wear, more than likely the valve bore is severely worn. We installed a Saturn valve body service kit (P/N 21005813), which includes the upper valve body section, separator plate, gaskets, and both styles of top pan gasket (figure 10).

The exhaust flange gasket was in bad shape, so we replaced it (figure 11). The leaking water pump was also very accessible with the frame down (figure 12), so we replaced that, too (literally a 20-minute job while the transaxle is out).

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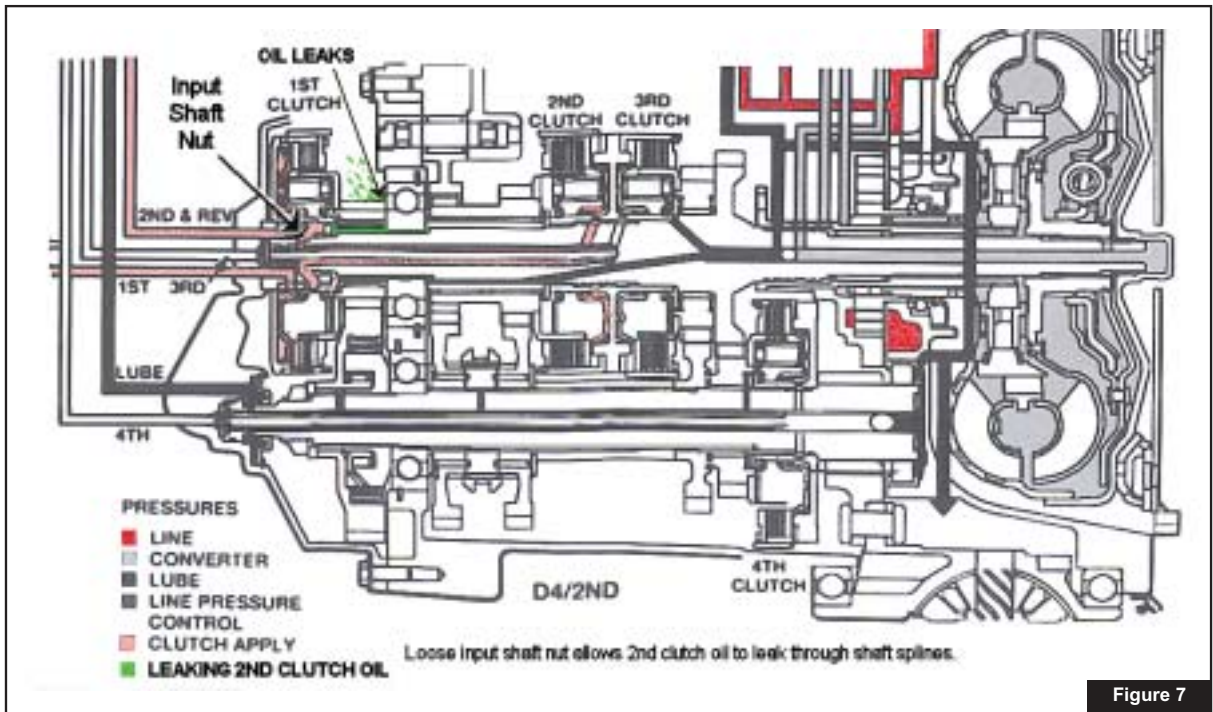


Figure 7

After Installing the Trans...

On the road test, it was obvious the computer had retained the adaptive parameters from before the repair; the 1-2 shift was very harsh. After the transaxle warmed up to operating temperature, we performed the learn-in driving procedure (ATRA bulletin #635). That took care of it: The 1-2 shift was just right, and reverse engagement was flawless.

We kept the car and drove it for a day just to make sure the cooling system was full and nothing was leaking. No DTCs set, and the transaxle performed great.

There was still a loud whirring noise coming from the accessory belt area. The belt tensioner and idler pulley

bearings seemed a little loose, so I recorded these items and mentioned them to the owner of the car.

This Saturn was a nice driving car, considering the mileage. With a little preventative maintenance the owner should get many more miles of service out of it.

Just remember to keep your eyes open when you're working on a vehicle. You may work in a specialty shop, but sometimes little things, such as an exhaust flange gasket, will help with customer satisfaction. Replacing a water pump can make all the difference, too: After all, the customer won't be very happy if the engine melts down a week after spending \$2500 on a transmission!



Join Mike Van Dyke on Sunday, September 21st at this year's Powertrain Expo in Nashville for his seminar, *Honda and Acura "New Generation CVT" Automatic Transaxles, What you need to know about diagnosis and repair of late model Honda and Acura units.*

A complete schedule of events and information on how to register for this year's Powertrain Industry EXPO is available in this issue of *GEARS*.



Figure 10



Figure 11



Figure 12