

Diagnosing an Engine Misfire
1997 Chrysler Intrepid, 3.5L V6



My name is David Gorth and I recently experienced an engine misfire problem which may of interest to some of the AutoTap users. To make a long story short, the PCM on my 1997 Chrysler Intrepid, 3.5L V6, reported a P0301 code through the AutoTap, which indicated a cylinder number 1 misfire. The troubleshooting process I went through to finally repair the problem was extensive. I have described it in detail below however, if you simply want to know the exact cause up front, it was a gasket failure between the intake manifold and the cylinder head. A vacuum leak, to be more precise, was the cause of my frustration.

Around mid January 2003, my problems began with the symptom of “a constant rough idle” with the transmission both in drive and neutral/park. This was also accompanied by the Malfunction Indicator Lamp (MIL) or Check Engine light code of 43. As I own the Chrysler Service Manual for the vehicle, I was able to retrieve the code from the vehicle by simply counting the number of “Check Engine” light flashes. I knew I was in trouble at this point as the manual defined code 43 as a multiple engine misfire, a misfire in any one of the 6 cylinders, or a malfunction of any one of, or all 3 of the primary ignition coils. At this point I did not own the AutoTap 123 which would have made life much easier.

I decided to start with the “easy to check” items first. This meant changing the spark plugs, checking the resistance of all the spark plug wires and finally, checking the ignition coil primary and secondary circuits with an ohmmeter. All these components were found to be serviceable. I also visually verified that all the spark plugs were firing and made sure that none of the original spark plugs were fouled or discoloured. They all appeared normal with a brownish tint on the insulator. In my mind, I had pretty much ruled out the ignition system as the cause of the misfire but I wasn’t completely convinced.

After checking the ignition components, I was now quite sure that the MIL code 43 indicated a misfire rather than an ignition coil failure. The next area I decided to check was the fuel delivery system. A quick verification of the fuel pressure at the fuel rail indicated that the fuel system, up to the point of the fuel injectors, was working properly. I could therefore rule out the fuel filter, pump, regulator and seals as the cause of the misfire.

It was at this point that a new MIL code showed up. Code 24 (I still didn’t have the AutoTap) indicated that the Throttle Position Sensor (TPS) signal voltage was either too high or too low and/or the TPS signal did not correlate to the Manifold Absolute Pressure (MAP) sensor signal. Now I was convinced that it either had to be the TPS or the MAP sensor that was causing my misfire. I checked the TPS input voltage as well as the idle and wide open throttle voltage output with a digital voltmeter. The TPS signals were within specification. At idle, I found the MAP sensor output voltage to be 0.2 volts below specification. I thought I had found the problem! I changed the MAP sensor (about \$125 Cdn) and the vehicle did run a bit better, for a short while. To add to the confusion, following the MAP sensor replacement, I found that that the idle speed had increased from 700 rpm to approximately 850 rpm with the transmission in drive and up to 1300 rpm in park/neutral.

Around the end of January, I received my AutoTap 123. This was timely because after changing the MAP sensor and clearing the MIL codes (disconnected the battery), code 43 returned within 2 outings with the vehicle. The AutoTap reported Diagnostic Trouble Codes (DTC’s) of P0300 (engine misfire) and P0301 (misfire detected in cylinder #1). That was the code I was looking for! I could now focus my attention on finding the cause of the #1 misfire.

I knew that the problem had to be caused by the ignition system, the fuel delivery system or something mechanical. I started with a double check of the ignition system. As the ignition coils for cylinders #1 and #4 fire at the same time, I swapped ignition wires and coil towers from cylinder #1 to #4. No improvement. That is,

cylinder #4 continued to fire normally while cylinder #1 did not. I simply disconnected the spark plug wire boot from each of the spark plugs in turn. Engine rpm was not affected when cylinder #1 was disconnected. Conclusion, the ignition system was fine.

I then went back to the fuel delivery system. I checked the internal resistance of all the injectors as well as the voltage signal coming from the PCM to open the injectors. The #1 cylinder injector resistance and the signal voltage from the PCM were within specification and found to be similar to all the other injectors. The audible "click" from all the injectors was also present. I reasoned that if I did not find a mechanical cause for the misfire, the problem would most likely be caused by a dirty or blocked injector.

I then performed a compression test on the engine. The results indicated that cylinder #1 was sealing as well as all the others. I went as far as setting cylinder #1 at Top Dead Centre (TDC) and putting about 30 lbs of air pressure into the combustion chamber using a spark plug adapter. The idea was to listen for air escaping from the tail pipe (exhaust valve), the throttle bodies (intake valve) or the oil filler cap (rings). A small amount of air could be heard coming from the oil filler however, the same noise level was apparent from all other cylinders as well. Conclusion, the combustion chamber was sealing fine. The only other mechanical problems I could think of that would cause the misfire were either a worn camshaft lobe (unlikely – 130,000 kilometers) or a mis-timed camshaft sprocket. I verified that the timing belt was set properly.

Since I had ruled out the ignition system and knew that it was highly unlikely that I had a worn camshaft lobe, I decided to change the #1 cylinder injector. This was a time consuming job and parts were expensive. I replaced all the fuel rail O-rings and gaskets and cleaned out the 2 throttle bodies and made sure all vacuum hoses and electrical connectors were in good shape. I figured I had the problem beat this time! I was wrong. In fact, not only did I still have the cylinder #1 misfire, but I also picked up a new one, MIL 25 or P1294 which is Target Idle Not Reached which means that the actual idle speed doesn't meet the target idle speed. The idle speed was now up to approximately 950 rpm from 850 rpm with the transmission in drive and up to 1600 rpm from 1300 rpm in park/neutral.

I now believed that I had induced a vacuum leak somewhere when I removed the intake plenum. I was correct this time. The Exhaust Gas Recirculation (EGR) tube, which is essentially a "Y" pipe coming from the EGR valve (positioned on the right side cylinder head) and connecting to both sides of the intake plenum, was leaking at the EGR valve. This allowed extra air to be drawn into the intake plenum. Not knowing it was only the gasket between the EGR valve and the Y pipe that was disturbed, I changed the complete EGR unit. Another \$130 Cdn and about 3 hours to complete the work. The idle speed came back down to the 850 rpm and 1300 rpm numbers which was better however, I still had the cylinder #1 misfire!

At this point I was out of tricks. I swallowed my pride and took the vehicle to the Chrysler garage. For \$95 they connected the PCM to their diagnostic tool and determined that I had a cylinder #1 misfire and that all the electronic components were operating within set parameters. They also determined that my Intrepid did not have the latest version of software from Chrysler installed in the PCM. For an additional \$95, they updated the software (ie. the trip wasn't a total loss). The next bit of news took me by surprise, they found a vacuum leak at the intake manifold gasket around cylinder #1. They used the "propane test" to find it. This means that they opened the valve on a simple shop propane torch, directed the gas toward the gasket area under suspicion and the idle rpm picked up substantially. Naturally the propane torch remained "unlit" throughout the test.

After all that, for another \$90 I purchased the gaskets I needed and resealed the intake manifold to the heads. This job was also extensive but this time, the reward was worth it. The engine has smoothed out (it has never run so well), no more codes and yes, it idles at about 700 rpm.

- A user article contributed by David Gorth, Canada - February 21, 2003

AutoTap – OBDII Automotive Diagnostic Tool
<http://www.autotap.com>