TomcoTechtips
TM
ISSUE 36

FORD EGR VALVES

Lets review the DPFE EGR system and then continue in our discussion. This system contains a sharp edged orifice, the Delta Pressure Feedback EGR (DPFE) sensor and its hoses, the Electronic Vacuum Regulator (EVR) and the DPFE EGR valve (Fig. 1).

Exhaust Gas Recirculation System

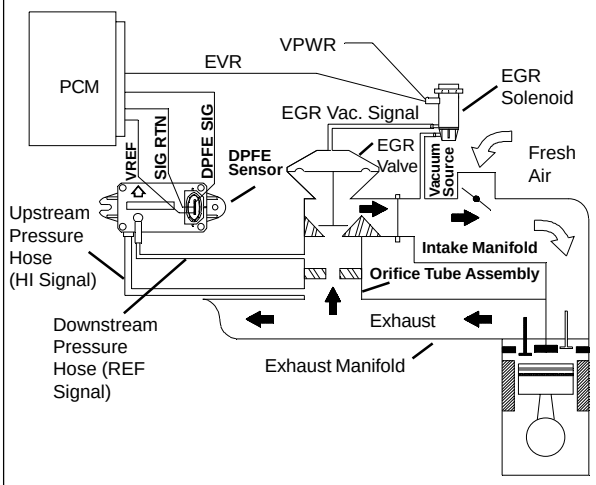


Figure 1

The EGR flow rate is controlled by monitoring the pressure above and below the sharp edged orifice. When the EGR Valve opens a pressure difference is created. The DPFE sensor monitors the pressure above and below the orifice and calculates the difference in pressure. This difference in pressure translates to a certain analog signal which is sent to the computer.

The computer reads this value and compares it to the values in its lookup tables. By comparing these values the computer can accurately calculate the EGR flow. It can then use the EVR to change the flow rate, if necessary. The computer adjusts the flow to match the operating conditions. This makes the DPFE EGR system a closed loop system.

TESTING THE DPFE EGR SYSTEM

The DPFE hoses should be examined carefully. These seem to be of higher quality and more rugged than the ones used on the PFE system, so at this time there is less of a problem with these style hoses (Fig. 2). Even so, a hole in either of these hoses can cause the exhaust pressure to bleed off giving an inaccurate reading to the DPFE sensor. A quick check can be to hook a vacuum pump to one side and plug the other side to see if it can hold vacuum.

DPFE Hoses

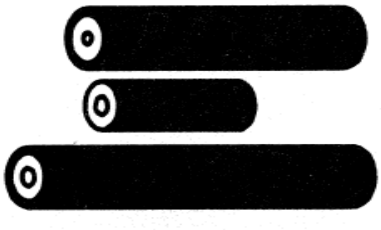


Figure 2

The hoses should also be checked for restrictions. Debris, sludge or moisture from the exhaust may clog the hoses also causing inaccurate readings.

The DPFE hoses, although some are different sizes, can be reversed causing an inaccurate reading and a code to be set. During diagnostics, check to make sure that someone has not crossed the hoses, creating a problem.

At this point it will also be wise to check the EGR tube, orifice opening and the ports on the tube that connect to the EGR valve. Make sure these are not coked up causing a restriction.

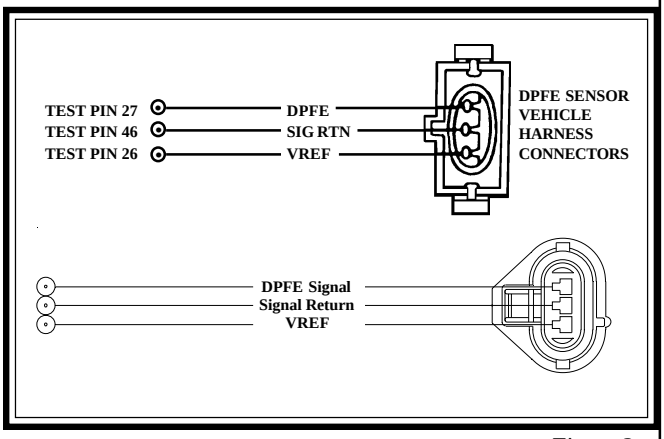


Figure 3

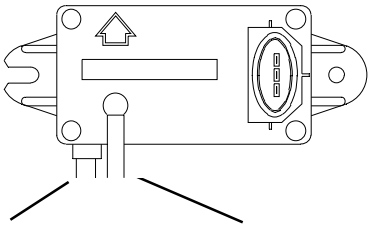
There are a few tests to perform on the DPFE itself. Backprobe into the DPFE signal wire (Fig. 3) and connect a DVOM set on the volts scale. Turn the Key On Engine Off (KOEO) and read the voltage. It should read 0.45 +/- 0.25 volts for the .55 volt at rest type sensor and 1.0 +/- .025 volts for the 1.0 volt at rest style sensor(Fig. 4). It is important to note that there are two styles of sensors. The aluminum ones can be either .55 or 1.0 volt at rest. The plastic ones only come in the 1 volt at rest style at this present time.

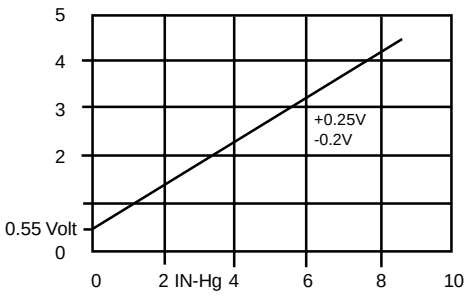
If the voltage is off from the spec, check to make sure the reference voltage and ground are okay. If all else is okay the DPFE needs to be replaced.

Next with the key off, apply no more than 9 inches of vacuum to the downstream port of the DPFE sensor. It should hold this vacuum for at least a minute. Then apply no more than 9 inches of vacuum to the upstream port of the DPFE sensor with the KOEO. It should also hold vacuum for at least a minute. If the sensor does not hold vacuum at either or both ports, it needs to be replaced.

If the vacuum leak test is okay, test the voltage output of the DPFE sensor at different vacuums. Apply varying amounts of vacuum to the downstream port of the DPFE and monitor the voltage at the DPFE signal line. The voltage should match the corresponding vacuum as shown on the chart in Figure 4. If they are not

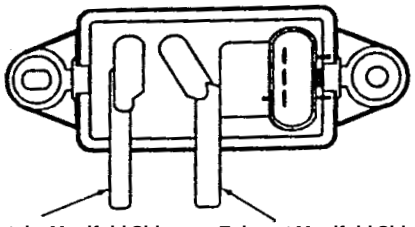
ALUMINUM HOUSING
(.055 OR 1.0 VOLT NULL OUTPUT)

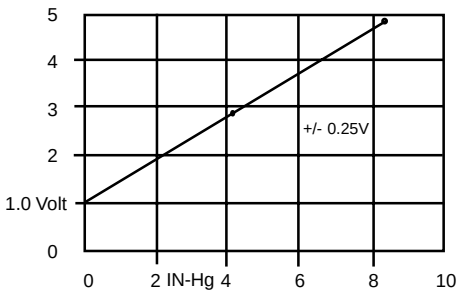




Differential Pressure			
IN-H20	IN-Hg	kPa	Volts
120	8.83	29.81	4.66
90	6.62	22.36	3.64
60	4.41	14.90	2.61
30	2.21	7.46	1.58
0	0	0	0.55

PLASTIC HOUSING
(1.0 VOLT NULL OUTPUT)





Differential Pressure			
IN-H20	IN-Hg	kPa	Volts
116	8.56	28.9	4.95
58	4.3	14.4	2.97
0	0	0	1.0

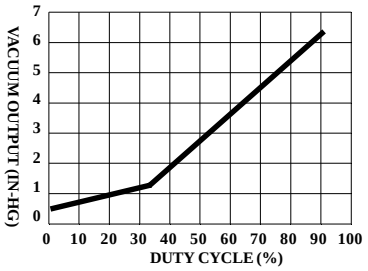
Figure 4

in spec, replace the DPFE. Also the change in voltage when the vacuum is released should take less than 3 seconds. If not, the sensor is too slow to respond and needs to be replaced.

Next reconnect everything and start the vehicle. Recheck the DPFE and verify that the at rest voltage is in spec. If the voltage is off now, make sure the EGR Valve is not stuck open a small bit, creating a higher DPFE voltage. Exercise the EGR valve by applying 2 to 3 inches of vacuum (just enough so the vehicle doesn't stall) to the valve. The voltage of the DPFE should increase while vacuum is applied and it should return back to its at rest voltage when the vacuum is released. If the voltage falls slowly or does not go back to rest voltage, this may be an indication of a sticking EGR valve.

If all the above checks okay, tee a vacuum gauge into the line to the EGR valve. Start the vehicle and monitor the vacuum gauge. It is not unusual to see some vacuum in the line even with the Electronic Vacuum Regulator (EVR) at 0% duty cycle (Fig. 5). Typically it should be less than 1 inch of vacuum. If it is higher than that, remove the vent cover and filter from the EVR. If the vacuum drops the filter is dirty and needs to be cleaned.

If the vacuum is still high with the filter removed, check the vent hole for icing in the cold weather or a clog. To do this, shut the engine off and remove the vacuum lines to the EVR. Attach a vacuum pump to the vent side of the EVR and apply 10 inches of vacuum. If the vacuum does not release quickly, the EVR vent is plugged. Replace the EVR if this is the case.



Duty Cycle (%)	Vacuum Output					
	Min		Nom		Max	
	In-hg	kPa	In-Hg	kPa	In-Hg	kPa
0	0	0	.38	1.28	.75	2.53
33	.55	1.86	1.3	4.39	2.05	6.9
90	5.69	19.2	6.32	21.3	6.95	23.47
EVR SOLENOID DATA						

Figure 5

If the exercising the EGR valve does not result in a change in rpm, then the passages may be clogged. There are "U" shaped passages (Fig. 6) under the throttle body adapter that get clogged with carbon. Remove the adapter, clean the passages and reinstall with a new gasket.

Just because the vehicle you are working on is not listed in the TSB doesn't mean you may not have a clogging problem. Make sure you check the passages and be sure they are clean. Just a slight restriction can cause a flow code to be set, and you may still have an rpm drop that can mislead you.

We have run into many situations where a code for insufficient flow has been set and the system is functioning correctly. Then it is time to check the EGR passages. There is a Ford Technical Service Bulletin (TSB 96-23-4) that addresses this for some vehicles. This TSB includes:

1992-1995 Crown Victoria
1994-1995 Thunderbird
1991-1995 Town Car
1992-1995 Grand Marquis
1994-1995 Cougar

The concerns have to do with intermittent MILs; DTCs 332, P1407 and P1408; or detonation.

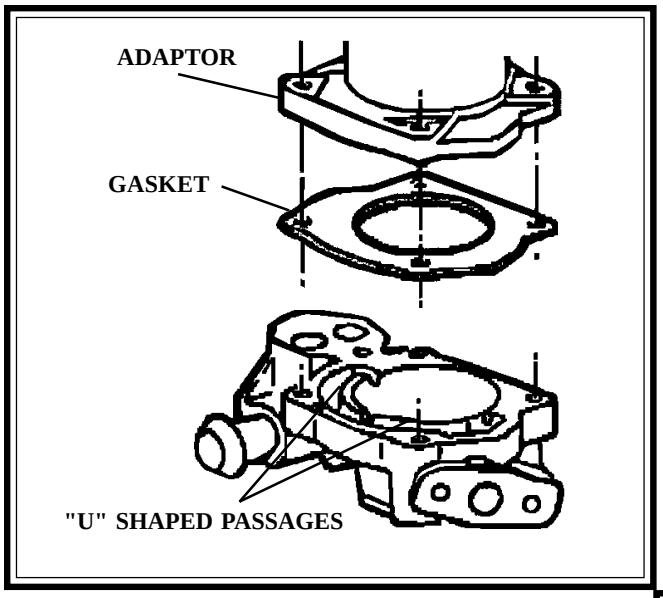


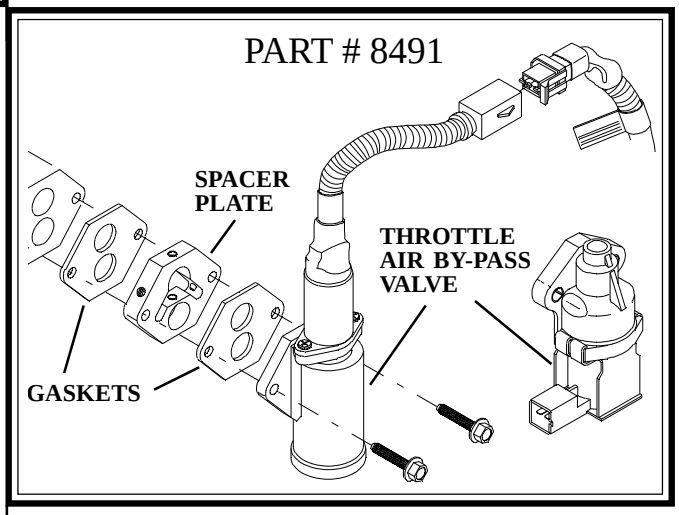
Figure 6

STRANGE BUT TRUE

A 1986 Ranger with a 2.9L engine came in with a continuous memory code 32. We applied vacuum to the EGR valve to do a functional test. The valve operated smoothly and caused a noticeable drop in rpm. We checked the PFE sensor, hose and EGR tube. All of these checked okay. Next we removed the EGR valve. The inlet port on the intake manifold was clogged. As a matter of fact, it was so clogged that we could start the engine without creating a severe vacuum leak that affected the engine running. It was packed solid for the entire length, almost two inches, with carbon. The incredible thing was that when we first exercised the EGR valve, it created a rpm drop.

We mention this to make a point. Just because opening the EGR creates a rpm drop does not mean there is enough EGR flow. We have seen many instances where a code for insufficient EGR flow has been set and the passages have been restricted. They don't always have to be as clogged as the Ranger. As a matter of fact, in some of the newer models, we have seen just some slight restrictions causing these codes. If all else checks good, clean the passages to make sure you have an unrestricted path.

FORD THROTTLE AIR BYPASS SPACER KIT



The Throttle Air Bypass Valve and Throttle Blades have been known to coke up on Ford vehicles. This spacer plate will reduce the carbon build-up. This kit will also cure idle problems.

The kit comes with the spacer plate, two gaskets, 2 screws and an instruction sheet on how to install and adjust the spacer plate.