FORD MASS AIR FLOW SENSOR (MAF)

SHIFT TIMING & FEEL CONCERNS

COMPLAINT: Long drawn out shifts, intermittent harsh shifts, or soft early shifts. Poor engine performance, knock or lack of power under heavy engine loads. Fuel system running rich at idle and lean during higher Rpms. Barometric pressure (BARO) sensor readings higher than normal for present area altitude. May or may not store codes, see figure 1.

CAUSE: Incorrect Mass Air Flow (hot wire type) sensor (MAF) signal. Caused by dirty or contaminated Mass Air Flow sensor. No Mass Air Flow sensor signal or failed MAF sensor.

CORRECTION: Check air filter and container for dirt and debris. Replace filter if necessary and clean container. Clean or replace MAF sensor if necessary. The Mass Airflow Sensor measures the volume of airflow into the engine, past a thin heated wire. This wire is kept at a temperature of approximately 392 degrees. The increase of airflow will cool the sensor wire. The amount of voltage required to keep the wire at 392 degrees is the signal the PCM calculates to determine engine load. This signal greatly affects line pressure and shift timing. This sensor also affects the engines Long Term Fuel Trim and may not set any codes. A contaminated MAF sensor can over estimate air flow at idle causing the fuel system to go rich and under estimate airflow at high air flows and cause the fuel system to go lean. What this means is Long Term Fuel Trim will learn lean (negative) corrections at idle and rich (positive) corrections at higher air flows. This would be most noticeable at wide-open throttle or high engine load conditions, with symptoms of engine knock and/or lack of power. If the sensor fails the vehicle will go into Failure Mode and Effects Management (FMEM). The PCM will use the TPS sensor to create a MAF signal and the TPS and RPM sensors will determine engine load. Which is why it is better to check the signal at the sensor using a DVOM. The sensor output should read 0.8 to 1.0 volt at idle and increase smoothly to approximately to 4.5 volts at wide open throttle. An air filter that isn't changed often enough might be contaminating the sensor signal wire. Some after market air filters require an oil to be sprayed onto the filter. If an excessive amount of oil is used an oily film can develop on the thin wire affecting the performance of the sensor. The sensor can be cleaned with isopropyl alcohol, carburetor cleaner or brake clean. Make sure that any rubber gaskets or seals are removed prior to cleaning. An incorrect MAF sensor reading will also affect the signal from the Barometric Pressure sensor (BARO). At high air flows, a contaminated MAF sensor will under estimate airflow and cause the PCM to believe the vehicle is operating at a higher altitude. The BARO Sensor PID can be viewed with a scan tool. The correct BARO sensor reading can be viewed in the chart provided in figure 2. The Barometric pressure for your area can also be found on the Internet at Weather.com.

FORD MASS AIR FLOW SENSOR (MAF)

OBDI DTCs
181, 189 (Fuel system lean Bank 1 or 2)
179, 188 (Fuel system rich Bank 1 or 2)
171, 172, 173 (HO2S11 lack of switching Bank 1)
175, 176, 177 (HO2S21 lack of switching Bank 2)
184, 185 (MAF higher/lower than expected)
186, 187 (Injector pulse width higher/lower than expected)

OBDII DTCs
P0171, P0174 (Fuel system lean, Bank 1 or 2)
P0172, P0175 (Fuel system rich, Bank 1 or 2)
P1130, P1131, P1132 (HO2S11 lack of switching Bank 1)
P1150, P1151, P1152 (HO2S21 lack of switching Bank 2)

Figure 1

BAROMETRIC PRESSURE REFERENCE

BAROMETRIC PRESSURE (In. Hg.)	BAROMETRIC PRESSURE (kPa)	BARO/MAP PID (Hz)	ALTITUDE ABOVE SEA LEVEL (Ft.)
3.5	11.8	89.3	↑
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (Sea Level)
31	104.7	162.0	
31.87	107.7	164.7	↓

Figure 2