Technical Bulletin TB 02 - 2020 FE2 Cam Position Sensor

During the 2020 June Sprints there was an FE2 that was surging and idling very poorly.

While the on-track engine performance seemed to be okay, the car was much more difficult to maneuver in and out of the pits and off grid. Also noted, fuel consumption seemed to be higher than normal.

I started the diagnostic procedure by looking at idle/track data, checking sensors and wiring pin to pin, all checks to confirm everything was in order.

I then performed a Trigger/Sync test with the PE Monitor software. Here I was able to see that the problem was there was no Sync signal. Neither the analog or digital converted signal were present. An OHM meter pin to pin test of the sensor showed there was no continuity, confirming that the cam sensor had failed.

The Crank and Cam sensors used on the FE2 engine are VR or Mag sensors. These normally have rock solid reliability and performance.

Short explanation of how the PE EFI system operates ....

When you start the engine, the ECU reads the 36-2 crank wheel and identifies the missing teeth to set crankshaft location. When it has locked on to the location of the crankshaft, coil and injectors are activated. Here is the tricky part, the engine starts in semi batch and runs in sequential fire injection.

That means under 600 rpm it fires the #1&4 injectors about half the programed open injector time every engine rotation and 180 degrees later it fires the #2&3 injectors the same way.

After 601 rpm the ECU reads the cam sensor, sets the engine firing order and starts sequential fire injection. Meaning 1 injector firing per a cylinder running cycle. Basically, on the intake stroke of each cylinder’s cycle.

The reason for this starting strategy is to provide fuel to all cylinders in the least number of engine revolutions as possible.

Dyno Performance test

We were testing a couple of new FE2 engines so Shannon set up a test to see if there was a significant performance difference with and without the cam sensor operation.

While we know they idle very poorly without the cam sensor, it also lost about 2.5 HP across the entire rev range as well.

Sensor Testing

There are two ways you can check the Cam sensor, with an OHM meter and with PE Monitor/Diagnostic feature, "Trigger / Sync" test.

OHM Meter: disconnect the harness connector, check the resistance pin to pin on the sensor, I checked all the sensors we have in stock. The average was about 645 ohms, at about 72 F. The resistance does change with temperature.

PE Monitor: Launch PE Monitor on you PC and establish a connection with the ECU while the engine is running. Next select "Diagnostics" then "Trigger / Sync" you will open a new screen, while holding the engine a little above idle rpm click "GET" and after 4 or 5 seconds the new screen will populate with the basic signals it takes for the engine to run. "Trigger" is the crank sensor and "Sync" is the cam sensor.

Under "Data" you can save the file you just logged, attach it to an email (Mdavies@scca.com) and send it to me if you would like. I can help explain the graph.

If the sensor has resistance and there is no "Sync" signal present after doing the "Trigger / Sync" test, then you will need to check wiring harness pin to pin from the cam sensor connector and the larger of the 2 ECU connectors. M-26 and M-33 should have continuity to the cam sensor connector. 1 cam sensor female pin to ECU pin M-26 and 1 female can sensor pin to ECU pin M-33.

No continuity between pins, also no continuity to a chassis ground when both are disconnected.

Mike Davies