

General Service Bulletin (GSB):	2011-2017 6.7L Voltage Reference (VREF) Guide
GSB Overview:	This bulletin provides the basic theory and operation of (VREF) for the 6.7L diesel engine. This bulletin includes tips to assist with intermittent faults associated with VREF and how to properly identify them.
<p>NOTE: This information is not intended to replace or supersede any warranty, parts and service policy, Work Shop Manual (WSM) procedures, Powertrain Control Emission Diagnostic (PC/ED) procedures, technical training or wiring diagram information.</p>	



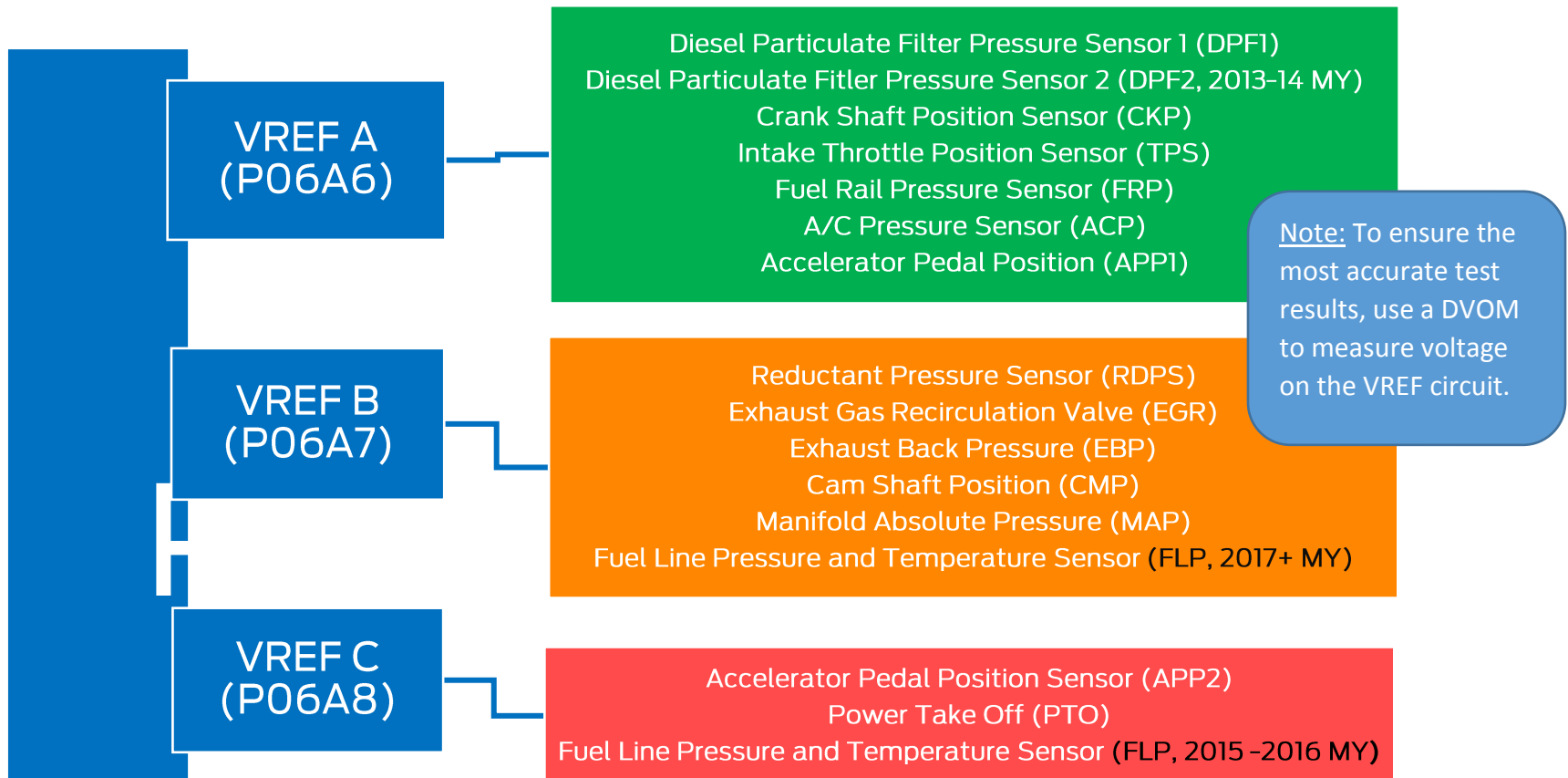
Theory of Operation:

On 2011-2017 F-Series vehicles equipped with a 6.7L diesel engine, the powertrain control module (PCM) uses three different VREF sources that are referred to as “VREF Legs”. VREF is used to provide a steady stable voltage supply to an appropriate engine sensor. This steady voltage supply improves engine sensor reliability. By providing a steady stable voltage to the sensor, the voltage received back from the sensor is more accurate and stable. The PCM uses this voltage feedback as the sensor signal and will determine the sensors value based on the PCM calibration.

Basic Operation:

In Figure 1, the related engine sensors have been divided up into three sections. When the PCM detects a VREF circuit fault, one or more of the following Diagnostic Trouble Codes (DTC)s could set (P06A6, P06A7, or P06A8). Within the VREF leg the sensors may not all be on the same circuit. It will be necessary to consult the online wiring diagrams to determine if any sensors share the same circuit. With most Ford vehicles, the voltage reference will range between (4.5-5.5 volts). The VREF Parameter Identification (PID) within the PCM does not display the actual output voltage for the VREF sensors. For Diagnostic purposes, the VREF PID is for internal module Voltage Reference and will not be accurate.

Figure 1:



Intermittent Faults:

A VREF DTC may not set, but often times multiple sensor faults will set for circuit high, circuit low, or sensor performance. A VREF circuit fault can be suspected when a group of circuit DTCs is setting when the only common point with each other is a VREF leg. Referencing the online wiring diagrams may be necessary.

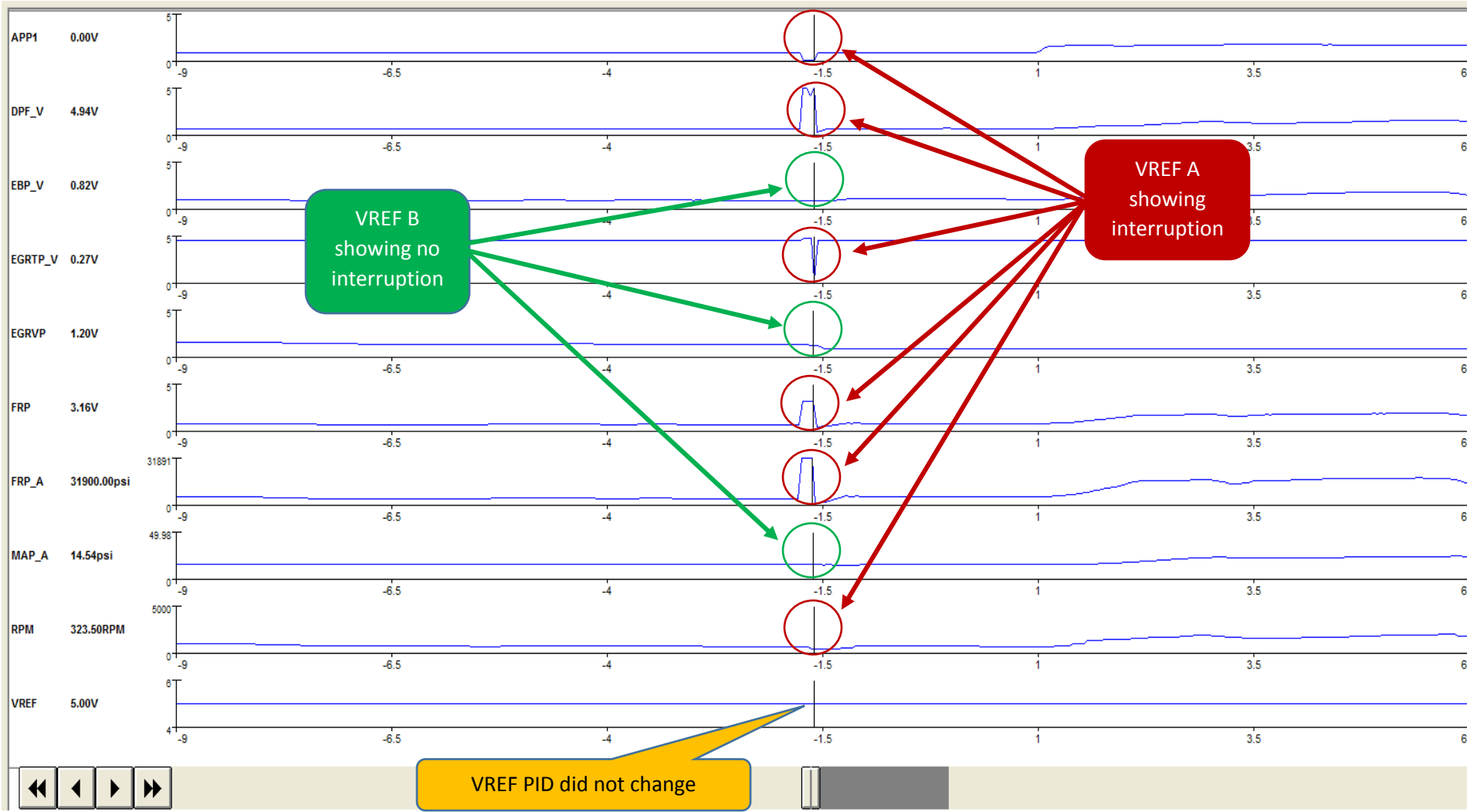
NOTE: On “VREF Leg A”, the PCM monitors the Fuel Rail Pressure (FRP) and Crank Shaft Position (CKP) circuits for faults more closely. As a result, it may detect faults and set DTCs for these before the other sensors on Leg A.

If an intermittent VREF fault is suspected, best practice is to make a recording using the Integrated Diagnostic System (IDS) scan tool. Select PIDs that are related to the VREF list and display voltage readings (e.g. FRP_V, DPF_V). Start the recording and test drive the vehicle to duplicate the customer concern. VREF circuit shorts on VREF “Leg A” typically cause the FPR_V reading to spike or drop suddenly and return to normal operation. Figure 2

Once a VREF fault is identified, performing an initial inspection of the harness for chafing or other concerns is recommended. Refer to page #5 for common points of concern. If no chafing or other harness concerns are found begin removing sensors from the circuits and continue to duplicate the fault. Refer back to figure 1 for related sensors, along with online wiring diagrams for circuit schematics.

Pictured below is an IDS screen shot of multiple PIDs affected at the same time. Due to the group of affected sensors, VREF A indicates a fault by isolating the group of associated sensors and circuits.

Figure 2:



Common Wire Chafe Fault Examples:

The pictures below are some examples of possible chafe points found relating to VREF circuit faults on 2011-2016 F-Series Super Duty.

