Fuel Injector Testing With a Lab Scope

Using voltage and current probes

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Part 1: Overview

In order to evaluate the injector performance, it is necessary to measure the voltage that turns it on and off as well as the amount of current the actuator draws. Once those readings are collected, they can be compared to each other on the lab scope to see the relationship of those signals in order to check for any problems.

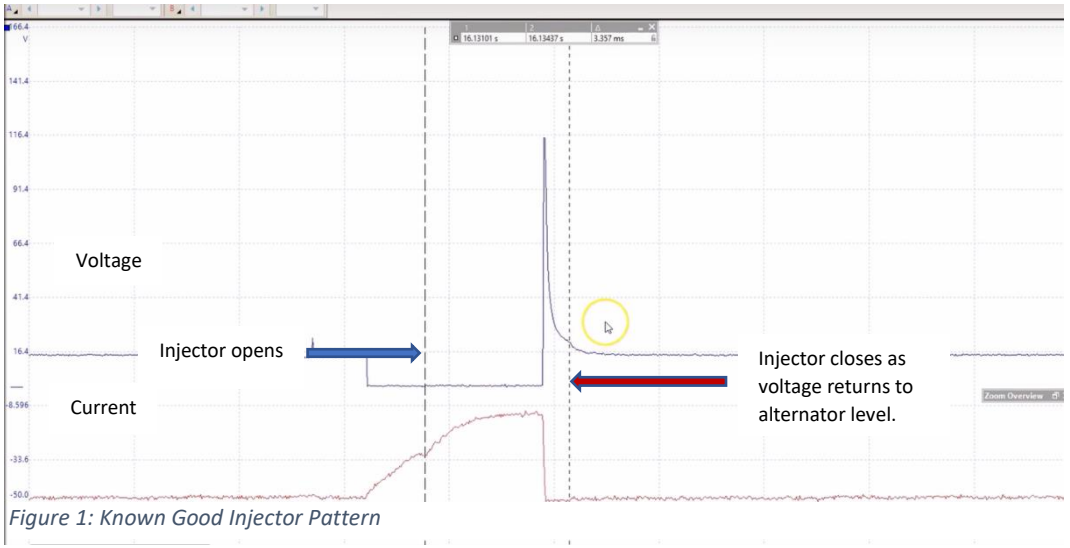


Figure 1: Known Good Injector Pattern

Figure 1 depicts a known good injector trace. The top trace is voltage and the bottom is current. When the PCM sends an ON signal, voltage drops from alternator voltage to near zero. At the same time, current starts flowing in the injector coil. However, the injector does not open right away.

Look at the blue arrow. Notice the little dip in the current? This is the point at which the injector coil has reached a point where it has enough energy to open the injector. So, you can measure the delay between when the voltage drops, and the injector opens. If this delay is not consistent across all injectors, you have a sticky injector.

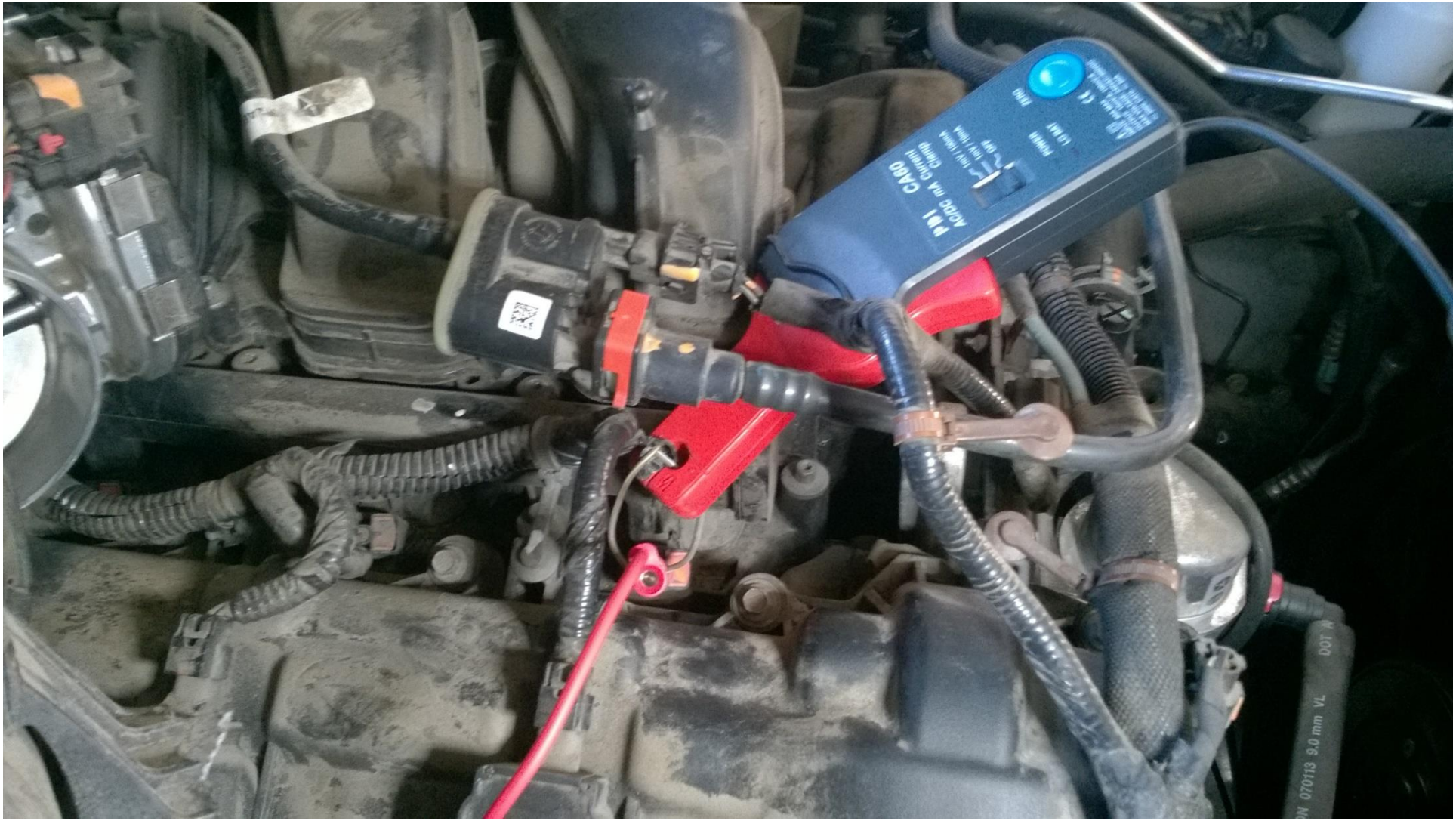
The trace also shows the overall time the injector is open. Fuel injectors responds to a magnetic field just as any coil does. Once the voltage signal is turned off, the current drops rapidly as the coil energy decays. However, the collapse of this magnetic field induces a high voltage spike of over 110 volts for a very short amount of time. Then the injector finally closes as this voltage decreases. You can see this by looking at the second small dip in the voltage noted by the red arrow.

Now let's look at some samples. I will compare this "standard" scope pattern to the one I recorded on the 2014 Jeep.

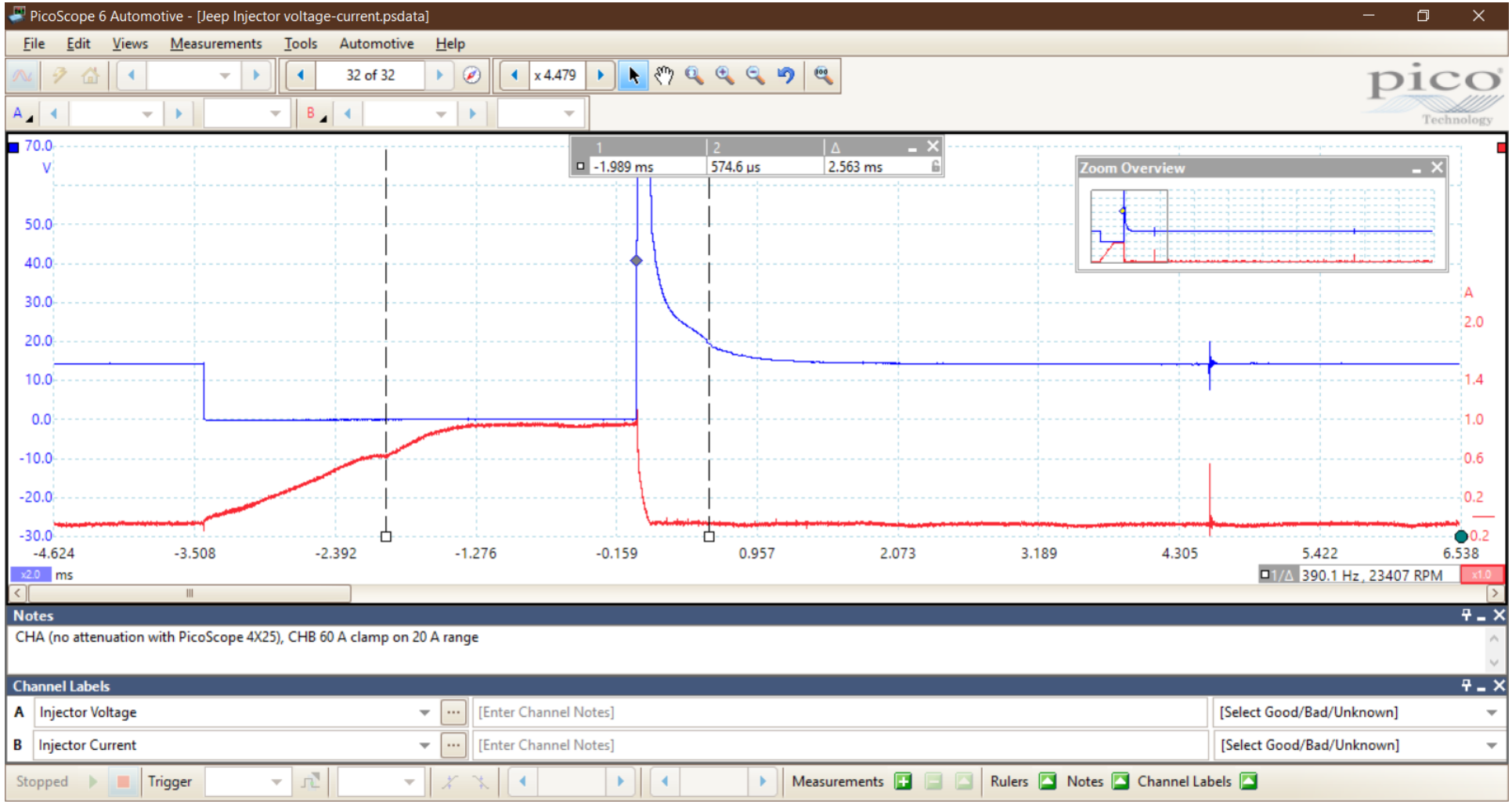
<u>Test Setup</u>

- Lab Scope (I am using the PicoScope 4225)
- A voltage probe with back probe pin on Channel A
- A low current inductive probe on Channel B

Part 2: ***Test Setup for the Jeep***



Actual Images of Injector #2 on Jeep



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