

The Ignition Current “Project”

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The idea of the Ignition project came after viewing and reading many posts on IATN showing various methods and views on current ramping the ignition system.

My thinking on this is that we (as a group) could really learn more if we could somehow collectively study and compare all from the same page of the same book at the same time. (this is what I call the project)

I started the discussion by email to all the “players” I knew that were using the ignition current ramp as an analysis tool to fix and repair vehicles each and every day.

My first batch of returned email showed that although many was in fact using the low current probe and a dso to find complex problems in the ignition system the viewing methods were very much different from each other and difficult to compare.

So with these thoughts behind us lets begin:

IGNITION SYSTEM CURRENT RAMPING

“the project”

MISSION STATEMENT :

The overall mission is to establish a useable “*standard* “ method of exploring the automotive ignition systems using a low current probe and a DSO hooked to the primary feed circuit.

This “standard” should include the utilization of any and all test equipment to enable the technician to use what they have in lieu of buying more test equipment.

Once properly viewed in all aspects the technician may then use this procedure as “direction” to further scope analysis or parts replacement.

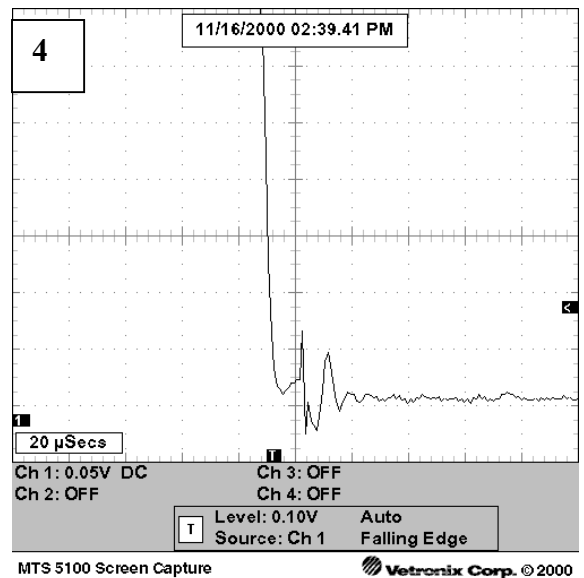
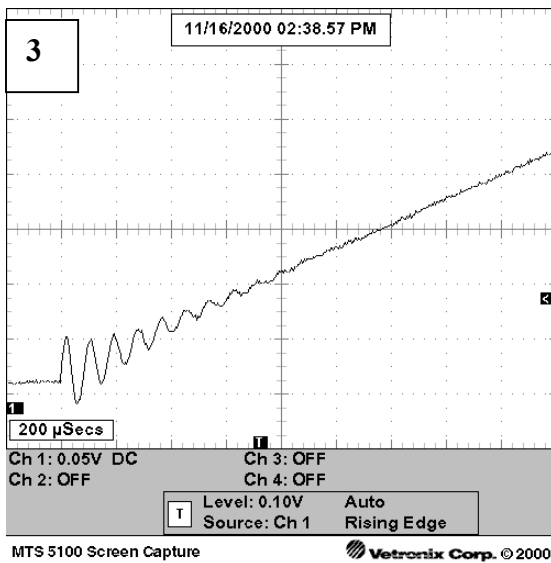
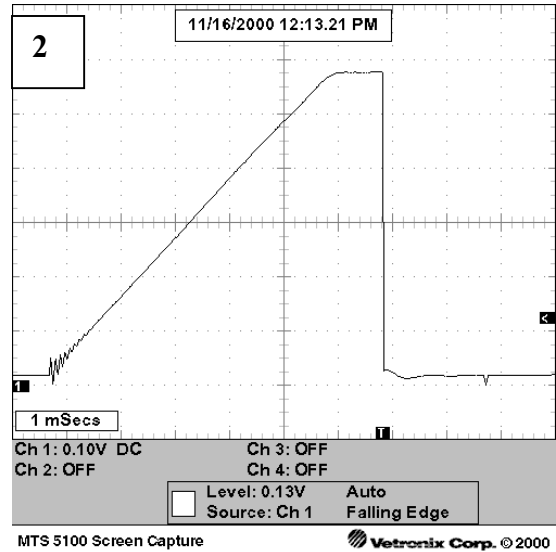
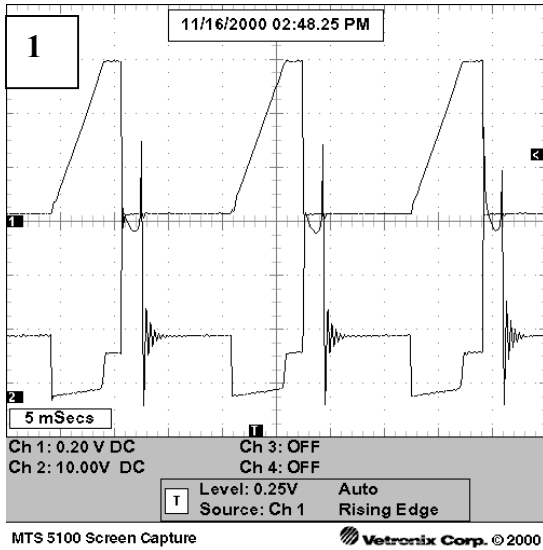
THE STANDARD :

For the sake of discussion this current waveform will be viewed in four distinct patterns and viewpoints.

(voltage and time may need to be changed based on equipment used)

1. **MULTIPLE CYCLES OF IGNITION**... a setting that displays all the ignition coil firing events on a single screen...i.e. : a six cylinder distributor equipped engine would display six current events, a four would show four etc. A late six cylinder would show three coils on a distributorless system .
2. **SINGLE CYLINDER CYCLE OF IGNITION**....a setting that displays the single coils firing event of the ignition system. This waveform should fill the entire screen for best overall viewing of the total cycle of ignition coil operation.
3. **ON SIGNAL –ZOOMED**-....a setting that would positive trigger a very much-enlarged view of the actual ON signal of the ignition cycle. Again maximum equipment viewing should be used.
4. **OFF SIGNAL – ZOOMED** ...a setting that will negative slope trigger the OFF signal of the ignition cycle, again for maximum viewing .

EXAMPLES OF PROPOSED STANDARD VIEWING ONE THROUGH FOUR:

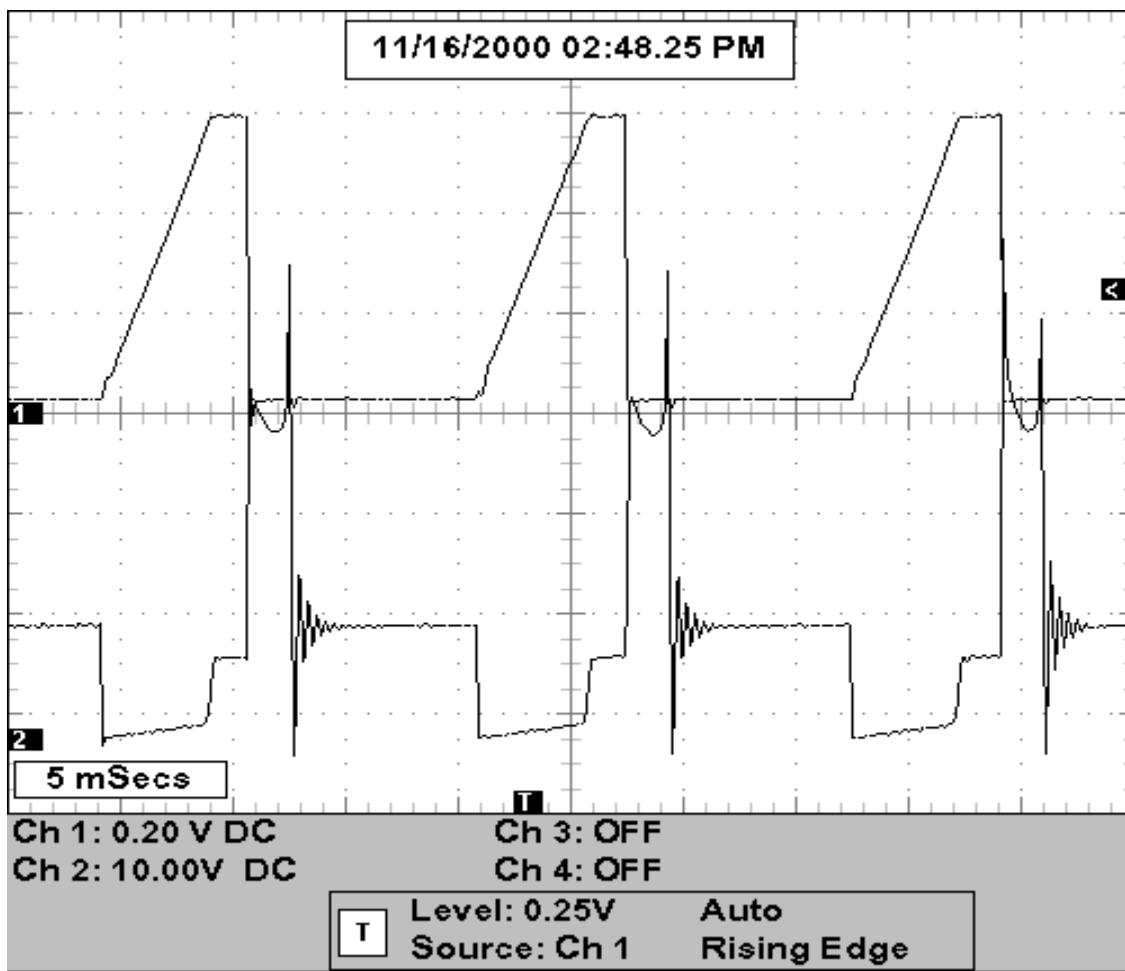


1. MULTIPLE CYCLE EVENTS
2. SINGLE CYCLE EVENT
3. ON SIGNAL ZOOM
4. OFF SIGNAL EVENT

1-MULTIPLE CYCLE EVENTS

Multiple cycle events should show a current ramp from each cylinder (distributor ignition) or from each single coil (distributorless ignition).

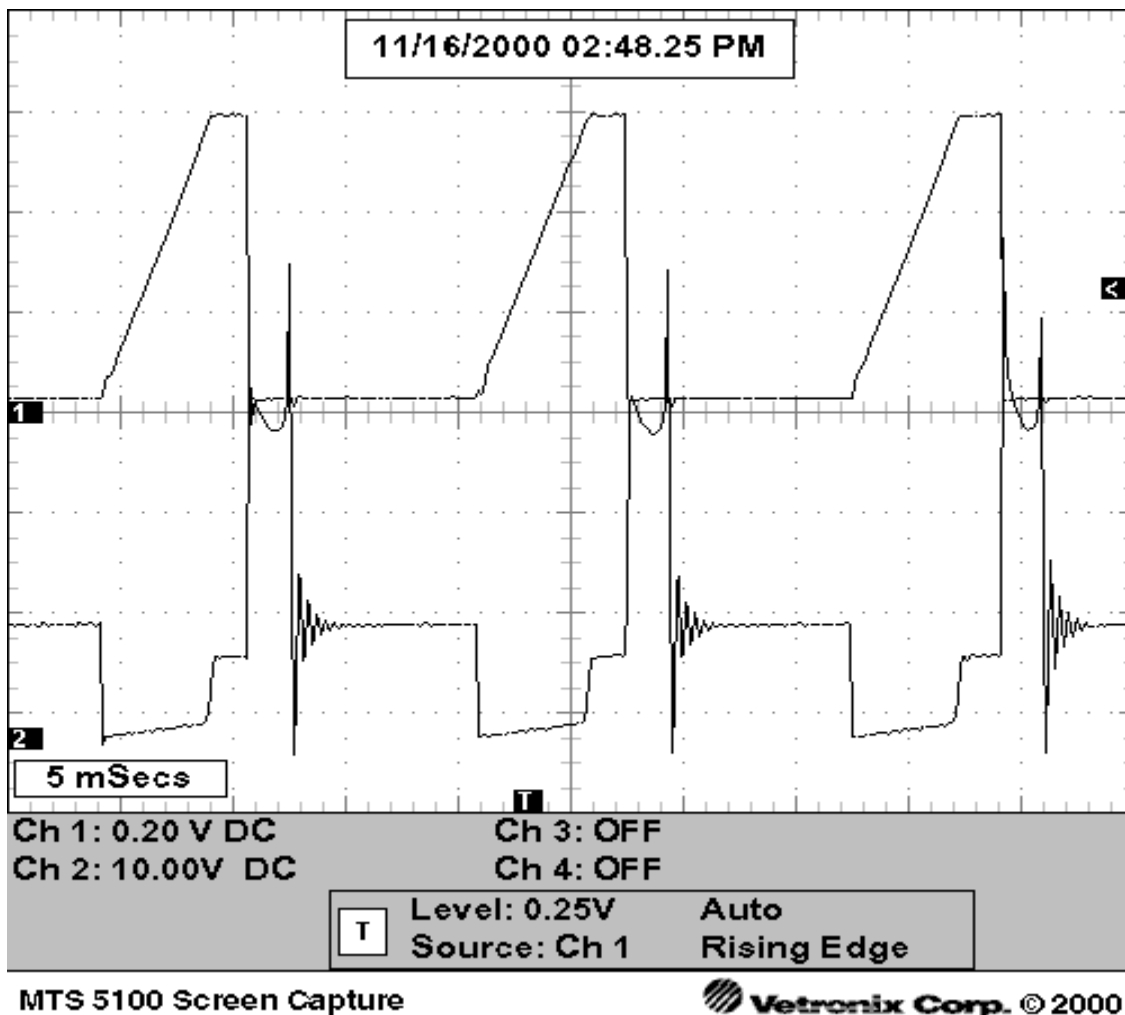
Using this waveform (with added primary voltage for better understanding) the technician must deal with what he DOES KNOW not what he DOESN'T !



MTS 5100 Screen Capture

 Vetronix Corp. © 2000

What do you now know about this ignition system ?

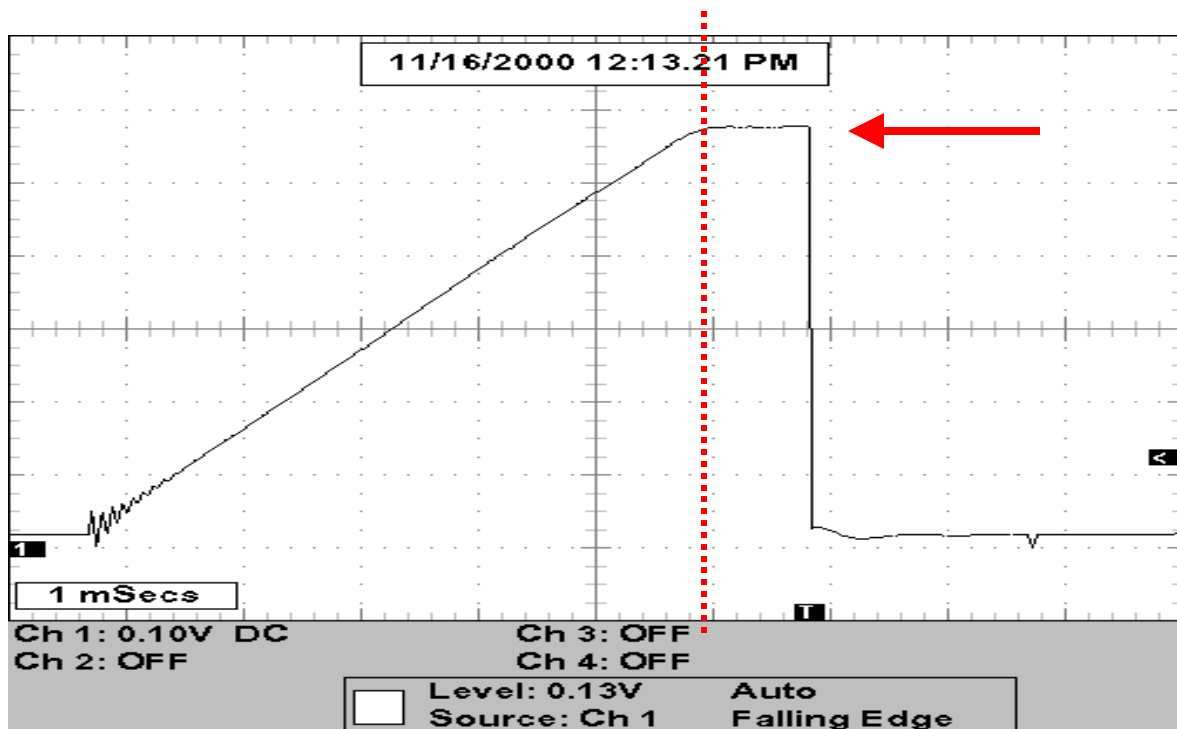


1. Using a six cylinder EI (distributorless) ignition system with three separate ignition coils, we see three equally spaced firing events of the coils.
2. They all three appear to have an equal current draw and upward ramp.
3. They show no abnormal spikes (tail section) and appear to have a very even steady current control.
4. The sync provided by the voltage waveform also is very steady with no shown defects.
5. All ignition events appear to be very smooth and proper.

2- SINGLE CYCLE EVENT

A single cycle event shows a different look and a much viewable waveform of a single event. This waveform tells us a lot about the coil itself with 4.8 ms rise time and 5.5 amps current limit. We now know that the system is current limited by the control module at 5.5 amps and the resistance and inductance design features of the primary allows this to happen in 4.8 ms (more than likely the intent of the designer or oem) Note... a lower primary resistance (incorrect or damage parts) will quicken this rise time and higher primary resistance (like green stuff on fuse feed or even battery cables) will lengthen this rise time)

A vehicle like this one with a rise time of say 6.5ms either has excessive primary resistance or defective /incorrect parts. These are known issues. The lack of a bow in the upward ramp shows that the coil is single bobbin wound (expected for this vehicle) not multiple wound (with a inward bow) like some coils.



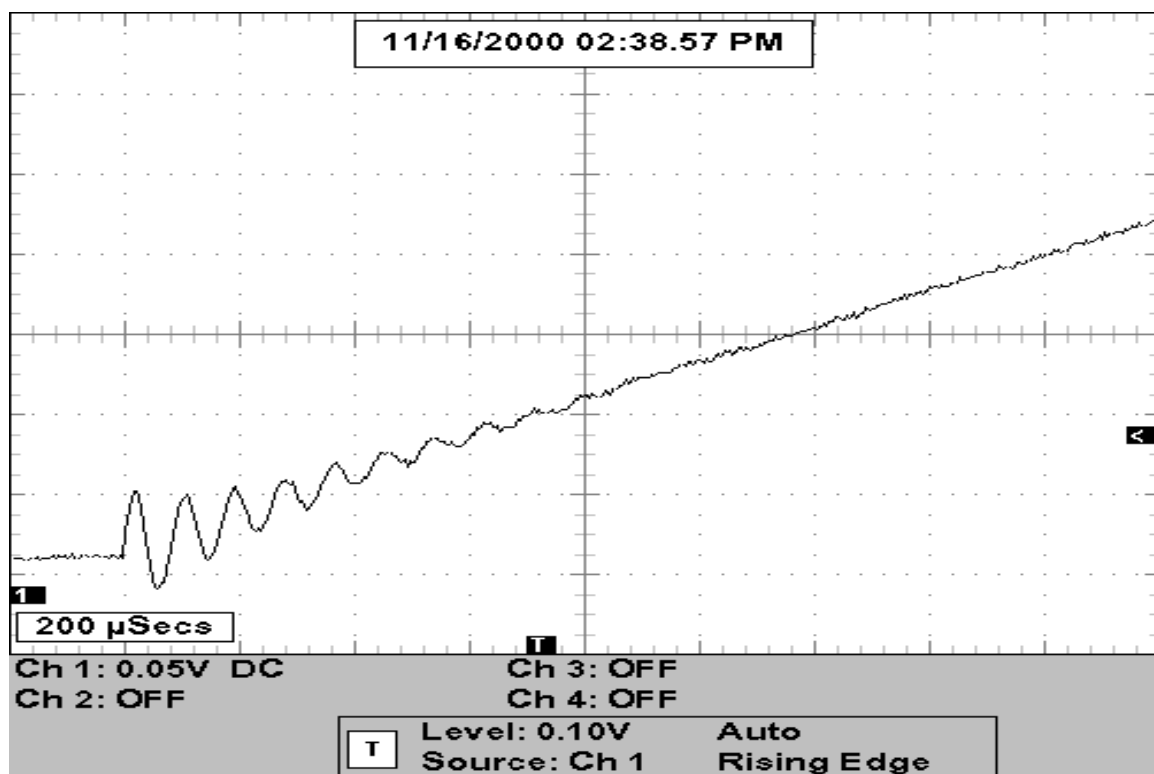
3-ON SIGNAL ZOOM

Shows the detail in the on signal of the primary circuit going to ground allowing ignition coil saturation. This is very similar to the old days of coil waves on a standard scope. The first hump must be higher than the last (*showing a even diminishing signal*). My vote at this time is with John Thornton's explanation that this is caused by the magnetic field starting into the secondary windings and a problem may be seen here with either the secondary windings or a defective control unit.

MacVandenbrink states that this section is

" when the magnetic field changes from nothing into something"

We have many case studies of this section showing erratic humps etc and they almost always have been a secondary ignition winding or a defective control module (*including defective grounds*). Any change in magnetic field opposes current flow. Once there is no more change in direction it becomes a steady ramp.



4-OFF SIGNAL ZOOMED

Now to the OFF section of the primary current waveform. This again shows the expected view of a sloping turn off. (many different looks at this based on equipment and different probes, each tech must know his probe on good and bad vehicles) This area is (using the laws of inductance) is shown to drop off in a slope. (not a straight line off as many believe) Inductance laws state that a magnetic field (inductance) will drop off at a time factor of five, with each time factor dropping a little more than the last. The first time factor is 37% and then more and more until the fifth time factor is complete. (this is based on the mh (mili-henry) rating of the ignition coil, which is published on the delphiautoparts.com web site)This waveform shows this diminishing signal and is representing the magnetic field collapse and spark output in this case to the secondary. I think some mis-construe our thoughts here , as most are not claiming this to be a exact measure of secondary , but instead a very good tool and indicator of a secondary problem. The fact is that secondary is mirrored in the Primary and primary is mirrored in the secondary. A problem seen here (quickly inmost cases) should lead the technician,(direction is given as Randy Dillman would say)

