Model A Ford

Diagnosing a Slow Start or No Start condition

By Willie Priaulx September 2021

When I was just 16, my mentor was an old fellow named Ray who worked for my father. He was an automotive mechanic that had been at his trade for what I figured must have been forever, the good old boy was at least 45 after all. As it turns out, Ray was not only a master mechanic but a great teacher who truly enjoyed what he did, and this student listened.

Ray's Rule: A car only needs 3 things to run; Spark, Fuel and Compression. Give her all 3 and she'll start.

For the purposes of this report let's narrow our discussion down to Spark. Assume we already determined that there is gas, it's getting to the cylinder, and there was adequate compression to get that done. So we can now re-word our discussion topic around spark only.

Diagnosing a Weak Starting Current or No Spark condition.

The sometimes confusing starting circuit on the Model A can be divided into segments for ease of discussion. This report will identify six main topics to be discussed in detail, identifying the components involved and the diagnostic tests available to check for any problems. These sections should be done in the order presented as one step may be dependent on a previous step. For example, we need a fully charged battery before we can test the starter current.

1. Fully charged battery in good condition, holds charge, charging system - 6.8V / 13.8V
2. Starter adequately turning over car. Current Draw - 160A to 220A
3. Check points in good condition, no short to ground, Gap = .018" - .022"
4. Condenser capacitance - .20 µF to .30 µF
5. Coil 20,000 volts with correct polarity.
6. Check Spark Gaps; Plug = .035", Rotor = .025"

Step 1. Battery

The first place to start evaluating a slow start / no start condition is the battery. All of the other tests depend on having sufficient power available, either 6 volts or 12 volts.

Check the battery voltage using a multi-meter set on DC Voltage, symbol DCV or V---. Use the lowest setting available that is greater than your charging voltage. My meter has V--- 5, 10, 50, 250… available, so I use the 10v setting for a 6 volt system and 50v with 12 volts.

The voltage of a fully charged battery should read slightly higher than its rating. Check the voltage in several locations with the car turned off. Start at the starter cable and a good ground like a head bolt. If this voltage is at or above rating value the battery is good. Go to step 2.

If the voltage is low at the starter we need to find out why.

a. Check for dirty/loose connections.
b. Give the battery a charge.
c. Check generator/alternator output.
d. Replace battery when needed.

By checking the voltage at the starter we were checking through the battery terminal connections. Now let's check the voltage at the battery posts. If this reading is higher than at the starter, or if the terminal connections are visibly dirty or loose then clean, lightly grease and tighten the connections and try again.

If the voltage is still low, check the fluid level and give the battery a full charge.

With the battery fully charged and the engine running, check the generator/alternator output.
The voltage regulator in the alternator has a factory set charging rate:

- 6.9v +- .2v for 6 volt systems.
  A 6 volt generator will produce similar output voltage.
- 13.8v +- .2v on a 12 volt alternator, double that of the 6 volt system.

Replace or repair an alternator that is out of specification.

If your battery won't hold a charge or is over 5 years old it's probably time for a new one.

Model A Ford
Battery Replacement Chart

BCI Group Number	L (inches)	W (inches)	H (inches)	Volts
Ford OEM	9-3/8	7-1/2	9-1/2	6
1	9-1/8	7-1/8	9-3/8	6
35	9-1/16	6-7/8	8-7/8	12

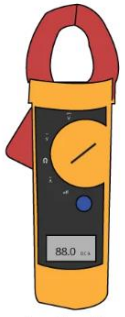
Step 2. Starter

A starter usually either works or it doesn't, there is not a lot of in between. When they turn over slowly it typically indicates a bad connection or a weak battery.

Not exactly the first place to look for a slow start problem, but possible of course. Excessive current draw could indicate a starter problem that is robbing the spark circuit of the current it needs to start the car.

To diagnose further perform a Current Draw test.

a. Place a DC Clamp Ammeter on the cable between the battery and the starter.
b. Turn off the key to prevent starting.
c. Measure the amperage while turning over the warm engine.
d. Starting current draw should be in the range of 160A to 220A.


Amp Clamp Meter

Note: Cold cranking amps (CCA) can be calculated by doubling the maximum current draw, in our case 220. A battery with a CCA rating of 440 or more is sufficient to start a Model A. That's low by today's standards, so you can save some money and go for that budget battery.

Step 3. Points

The points in the ignition system act as a switch to turn on and off the coil. Each time the power is turned off the field in the coil collapses and a spark is produced. This occurs 4 times for every revolution of the engine, once for each cylinder.

When evaluating a weak or no spark condition we simply need to check that points are working properly, turning the coil on and off to produce a spark. Making sure the spark is occurring at the correct time of the piston rotation is a separate discussion called Ignition Timing.

Check the general condition of the points. They should be visibly clean and not worn, scorched or pitted.

Check the Points Gap is set at .018" to .022". The point gap can affect the function of the points but not spark strength directly.

One side of the coil circuit is connected to a hot wire from the battery. The other side of coil goes to the points that open and close a connection to ground completing the coil circuit. See the Ignition Circuit wiring diagram below.

We can test that the points are providing a good circuit to ground with a test light.

a. Disconnect the ground side wire from the coil.
   It's the red wire that goes from the coil to the key switch and then to the distributor.
b. Attach a test light between the ground side wire and a hot battery source.
   The brass wing nuts on the terminal box are hot. The starter cable is another source.
c. With the key switch turned on and the points closed the test light should be on.
d. As you manually open and close the points, the light will turn off and on.

Remember: The job of the points is to open and close an electrical path to ground.

- If the test light stays on the circuit is shorted to ground. This is a common problem.
  Look for a frayed wire or other potential short.
- If the test light stays off the circuit is open.
  Look for the broken connection and repair.

Step 4. Condenser

The only way to test a condenser is with a capacitance meter, which is not to be found in the typical mechanics toolbox. For this reason, and the fact that condensers are fairly cheap, many condensers are routinely replaced and discarded. The problem is that some replacement condensers may be bad to begin with and you just replaced a perfectly good condenser with a bad one.

Capacitance Meters are available as dedicated handheld devices for around $30, or some high end multi-meters have a capacitance function already included, symbol -|(-.

Capacitance is measured in Microfarads, symbol μF. It can also be expressed as Nanofarads, symbol nF.

- The condenser capacitance range is .20 μF to .30 μF or 200 nF to 300 nF.
  Almost all automotive coils use a 0.25-0.29 microfarad condenser.

How big is a Farad? Noah says it's considerably smaller than a Cubit.

Step 5. Coil

The ignition coil is a step-up transformer that converts the vehicle's low voltage battery power (6v or 12v) to high voltage in the neighborhood of 22,000 volts. This high voltage is capable of reliably arcing across the gap on a spark plug to ignite the fuel/air mixture in a cylinder.

Assuming a fully charged battery, the main cause of a weak spark is low coil output voltage.

To check the coil output voltage we can use a 'C' Spark tester.
It mounts between distributor cap and coil wire to test ignition voltage.

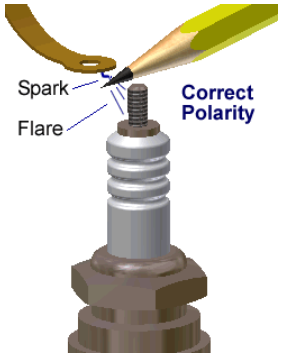
A current of 10,000 volts is probably sufficient for most Model A situations. Running under heavy loads and higher compression engines may benefit from more, up to 20,000 volts. Higher voltage can also compensate for many adverse conditions; a weak battery, corroded connections, 90 year old wiring, and the like.

Coil Polarity is important. The wrong coil polarity can require an additional 5,000 volts of current to jump the spark gap, as compared to the correct polarity. At idle this may not show as a problem, but ignition misfires can occur under load and at high RPM.

For the correct coil polarity, connect the wire leading from the distributor to the coil terminal that matches the system ground.

- On Positive ground systems, connect the coil terminal marked (+) to the distributor.
- On Negative ground systems, connect the coil terminal marked (-) to the distributor.

To check coil polarity hold a pencil lead in the spark gap with the plug wire about a third of an inch away from the plug. You'll see a Flare on one side of the pencil lead. The flare should be on the spark plug side of the lead. If the flare is on the plug wire side, reverse the two wires on the coil.



Another option is the Sparklite Polarity Tester. The test lights indicate if the polarity is correct or reversed.

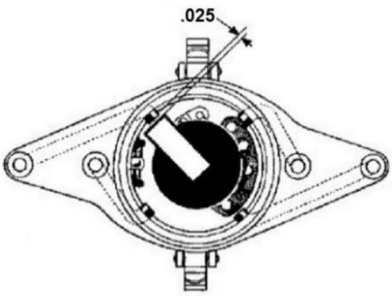
Step 6. Spark Gap

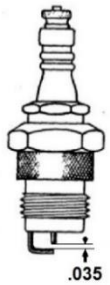
Spark gaps are important. A wider spark gap equals a hotter spark, up to a point. There must be enough current to efficiently jump the gap.

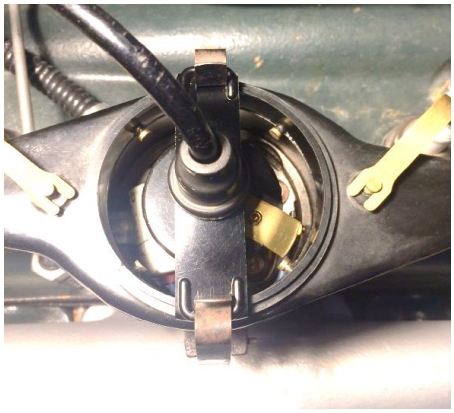
Without sufficient juice from your ignition system the long spark can be weak and yellow in color. A small intense spark is better than a big weak spark.

- Set Spark Plug gaps to .035.
- Set the rotor at all four distributor contact points to .025.

To adjust the rotor gap, flatten or arch the brass rotor bar. This action will narrow or widen the overall gap respectively. File down the contacts on the distributor housing to widen individual gaps as needed.







We can get a good visual inspection of the distributor and spark efficiency with a Cut-Away Distributor Cap.

This is an excellent way to evaluate your ignition system, plus this very useful addition to your tool box is essentially free. You can make your own by cutting the sides off an old distributor cap with a hack saw.

Enjoy the ride and keep the rubber side down – Willie

Ignition Circuit