ECCT™

Electrically Cranked Coil Tester
Instruction Manual

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ECCT Contents

The ECCT contains the following items:

Quantity	Description
1	ECCT
1	ECCT AC/DC Power Supply: 12V, 8A
1	3ft. Magneto Test Cable
1	3ft. USB A to USB Mini-A/B PC Interface Cable

* Model T Coil Not Included

IMPORTANT! –It is the user's responsibility to verify proper ignition timing and ensure proper timing lever position before attempting to hand crank Model T engine. Failure to verify proper ignition timing may result in serious personal injury. Ignition coils produce high voltages capable of causing personal injury or death. Do NOT touch coil electrical contacts or points when coil testing is in progress. User assumes all risks and liabilities.

IMPORTANT!: Make sure there is no source of combustible fluid or gas anywhere near the ECCT or coil under test that could be ignited by electrical spark. Shock Hazard: Do NOT touch coil unit electrical contacts, coil points or coil Test Fixture Spark gap when coil test or multi-spark testing is in progress. Do NOT operate the ECCT with clear protective safety shield covering the spark gap removed. User assumes all risks and liabilities.

1 ECCT Description

1.1 Coil Tester and Alignment Tool

The Electronically Cranked Coil Tester (**ECCT**) is used to test and align Ford and K-W Model T coil units used on 1913 to 1927 model years. It is a unique electronic instrument capable of aligning coil points with ease and precision previously unachievable with previous tools. The ECCT permits point adjustment by coil dwell time to fire so that each coil can be precisely adjusted to minimize coil to coil (cylinder to cylinder) ignition timing variation for optimal engine performance.

1.2 Capacitor (Condenser) Tester

The ECCT can test the Model T coil internal capacitor (condenser) for proper value as well as leakage to ensure proper spark and maximum point life.

1.3 Magneto Tester

The optional magneto test function enables the ECCT to test the strength of the Model T magneto output to ensure proper coil operation.

1.4 Advanced Features Software

Numerical and graphical display of ECCT coil, capacitor and magneto test data is can be provided with the optional Advanced Features Software. Additional test capability is also provided including:

1. Display the coil inductance, coil firing current, spark energy and coil dwell time to fire
2. Ability to change the number of coil firings in Multi-Spark mode (2 to 250 firings)
3. Ability to change the coil firing rate in the Multi-Spark mode (375 to 5000 RPM)
4. Display engine RPM, Magneto RMS voltage and Magneto internal resistance in Magneto Test mode.

2 Test Modes and Results Display

This section describes the ECCT test modes and how to read test results on the ECCT display.

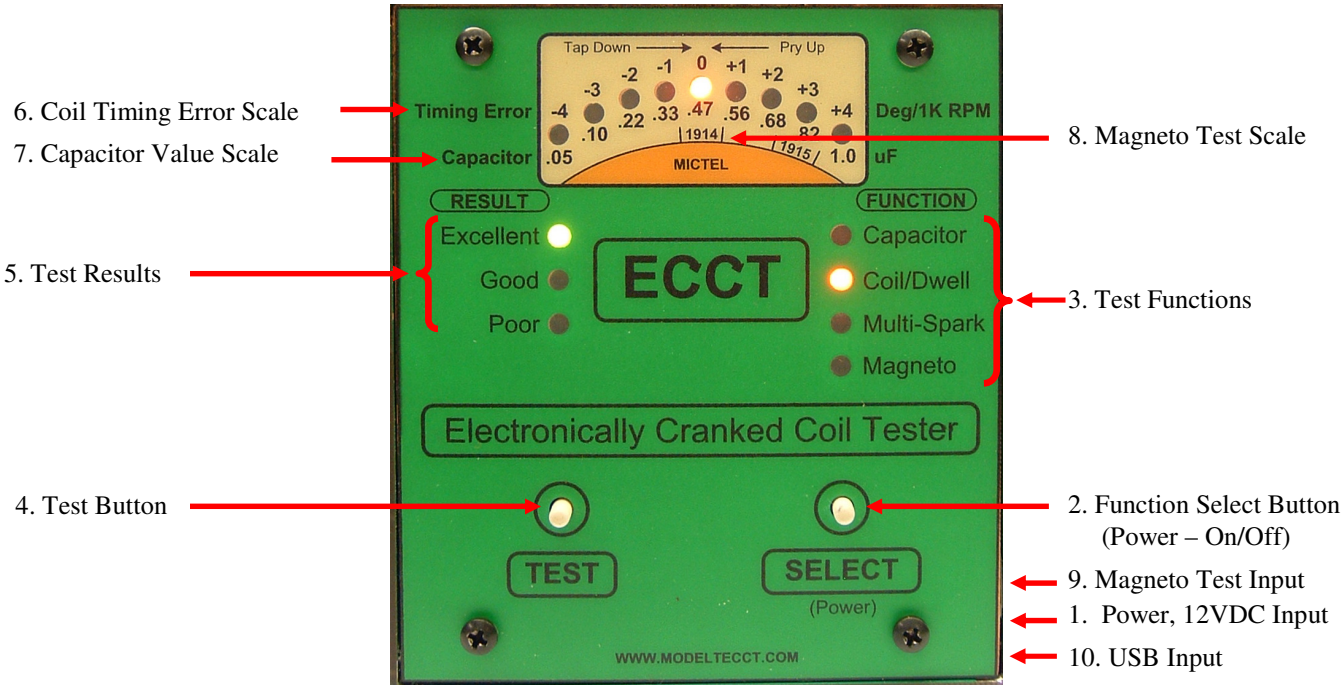


Figure 1 - ECCT Display and Buttons

2.1 ECCT Button and Display Description

2.1.1 Power Input

Supplies 12VDC power to the ECCT

2.1.2 Select Button (Power)

The Select button is used to turn ECCT power on/off and to select which test to run. Press and hold this button for 5 seconds to turn the ECCT On. Press this button momentary to select test function. Press and hold the select button for 5 seconds to turn the ECCT power Off. **Note:** Magneto Test Mode cannot be selected unless that optional test mode has been licensed.

2.1.3 Function Display

The selected test function is indicated by illuminated Red LED

2.1.4 Test Button

The Test button is used to start the selected test. Press and release the test button to run the selected test.

2.1.5 Test Result

Test results are categorized as Poor, Good and Excellent and indicated by illuminated LED display.

2.1.6 Timing Error Display

The LED display is used to indicate the coil dwell time to fire. That is; how long it takes the coil to fire spark measured from the time the test button is released. The dwell time to fire is displayed in crank shaft degrees assuming the engine is turning at 1,000 RPM. Coil points should be adjusted for 0 Timing Error (Center LED) which is considered ideal and indicated by the Excellent LED being lit. Coil points that fire within +/-1 degree of 0deg is considered acceptable and indicated by the Good LED being lit.

2.1.7 Capacitance Display

This display is used to indicate the value of the capacitor (Condenser) internally connected across the point terminals. The scale is calibrated in microfarads (uF) with standard values indicated. The proper value of capacitor connected across the coil points is 0.47uF**.**

2.1.8 Magneto Test Result Display (optional feature)

The strength of the magneto output is indicated by on the LED display upon completion of the magneto test. The regions marked 1914 and 1915 correspond to the magneto field strength measured by the St. Louis Magneto Tester. The magneto output is considered good if the reading reaches or exceeds the 1914 range. Few if any magnetos of later model years were capable of higher output. The 1915 range was included for consistency with the well known St. Louis Magneto Tester.

2.1.9 Magneto Test Input

Input port for magneto test leads. One lead is connected to the magneto output post, the other lead is connected to engine ground (NOT chassis ground!).

2.1.10 USB Connector

The ECCT can be connected to a PC or laptop via standard USB-mini A/B to USB-A data connector. Optional Advanced Features Software is available that provides additional test capability as well as numerical and graphical display of the ECCT test data.

3 Coil Test Preparation

Inspect coil unit points for proper mechanical alignment prior to electrical testing with the ECCT. Figure 2 illustrates proper point geometry with the Vibrator Spring pushed down to rest against the coil iron core with a pencil. Cushion Spring, A, should extend down below the Bridge Element by 0.005". Coil points more than 0.005" travel can be more difficult to adjust due to contact arcing.

The gap, B, between upper and lower point contacts should be 0.030" (~1/32"). The gap can be adjusted by loosening the lock nut and turning nut C clockwise to decrease the gap or counter clockwise to increase the gap as necessary then tighten the lock nut once the specified point gap is achieved. IMPORTANT: This is the initial point gap and may need to be changed if good coil firing consistency cannot be attained by adjusting cushion spring tension alone.

The point contacts should meet squarely when they come together. If not, loosen the Vibrator Spring mounting nuts and position the Vibrator Spring lower contact squarely under the upper point contact then tighten the Vibrator Spring mounting nuts.

Make sure the Bridge Element mounting nuts are tight. Do not over tighten vibrator spring mounting nuts or Bridge Element mounting nuts or they may sink into the coil unit wood body causing misalignment of point contacts preventing them from being square. Shims are often necessary to correct this problem. Place shims under upper bridge stand offs as necessary to correct for this problem **before** attempting point adjustment. **NEVER** bend the cushion spring contact to make contacts square.

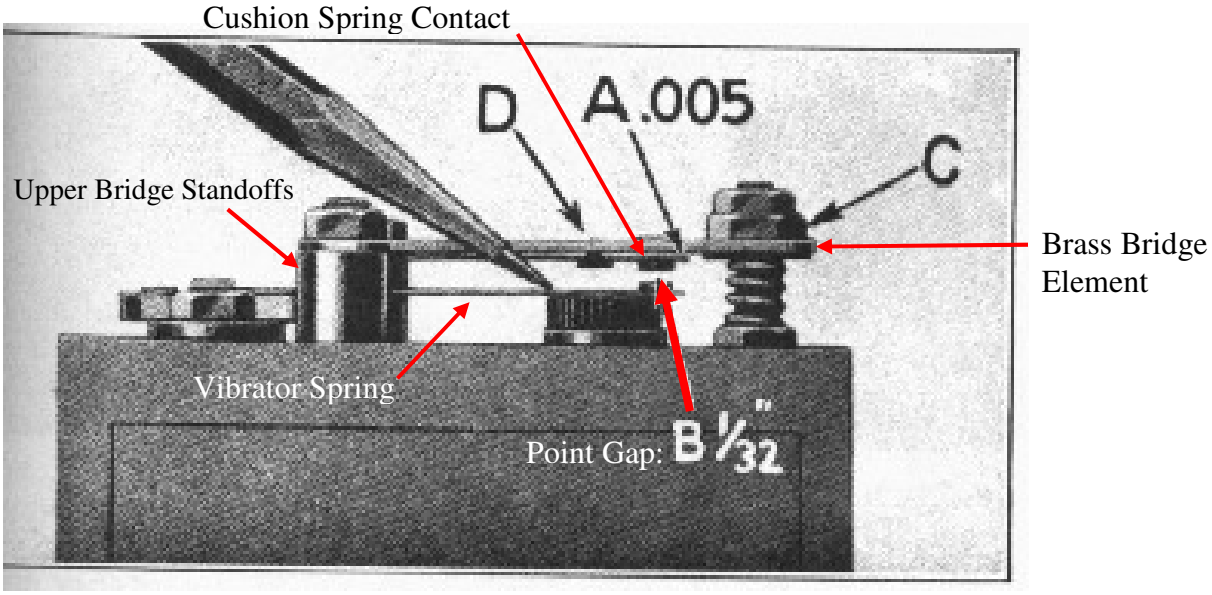


Figure 2 Illustration of Proper Point Geometry

4 Operation

4.1 Power

The ECCT requires 12VDC 8A to operate. 12VDC power is connected to the ECCT via 2.5mm x 5.5mm coaxial DC power jack connected to the 12VDC power connector located on the right side of the ECCT. Proceed as follows to begin testing a Model T coil unit:

1. Connect the 12VDC power connector to the ECCT 2.5mm connector labeled: POWER.
2. Install the coil unit to be tested in the ECCT.
3. Turn on ECCT power by pressing and holding the SELECT (Power) button for 5 seconds. The Capacitor test function LED should illuminate. **Note:** The POOR LED will light when the ECCT is powered up if the coil is not making good contact or there is no coil unit installed.

4.2 Capacitor Test

The ECCT tests the value and leakage of the capacitor (condenser). The capacitor is wired across the coil points so it is necessary to hold the points open for this test. Grip the outer edge of the vibrator spring only and press it down to hold the point contacts open as shown in Figure 3. **Do NOT** touch the brass point element with your fingers since it will be counted as capacitor leakage and could fail the leakage test. Press and release the **TEST** button **while holding the points open** as illustrated below in steps A, B and C. **Continue holding the points open until the capacitor test results are displayed.**

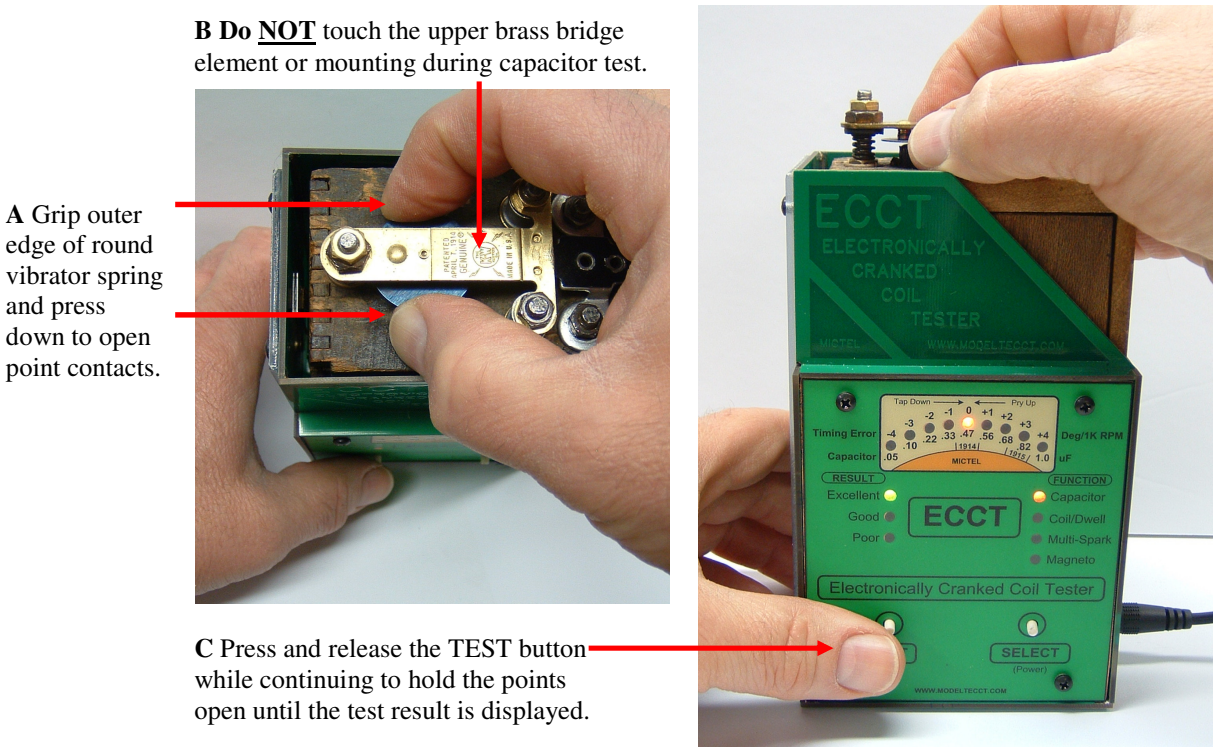


Figure 3. Hold open the points while testing the capacitor (condenser)

4.2.1 Capacitor Test Results Display

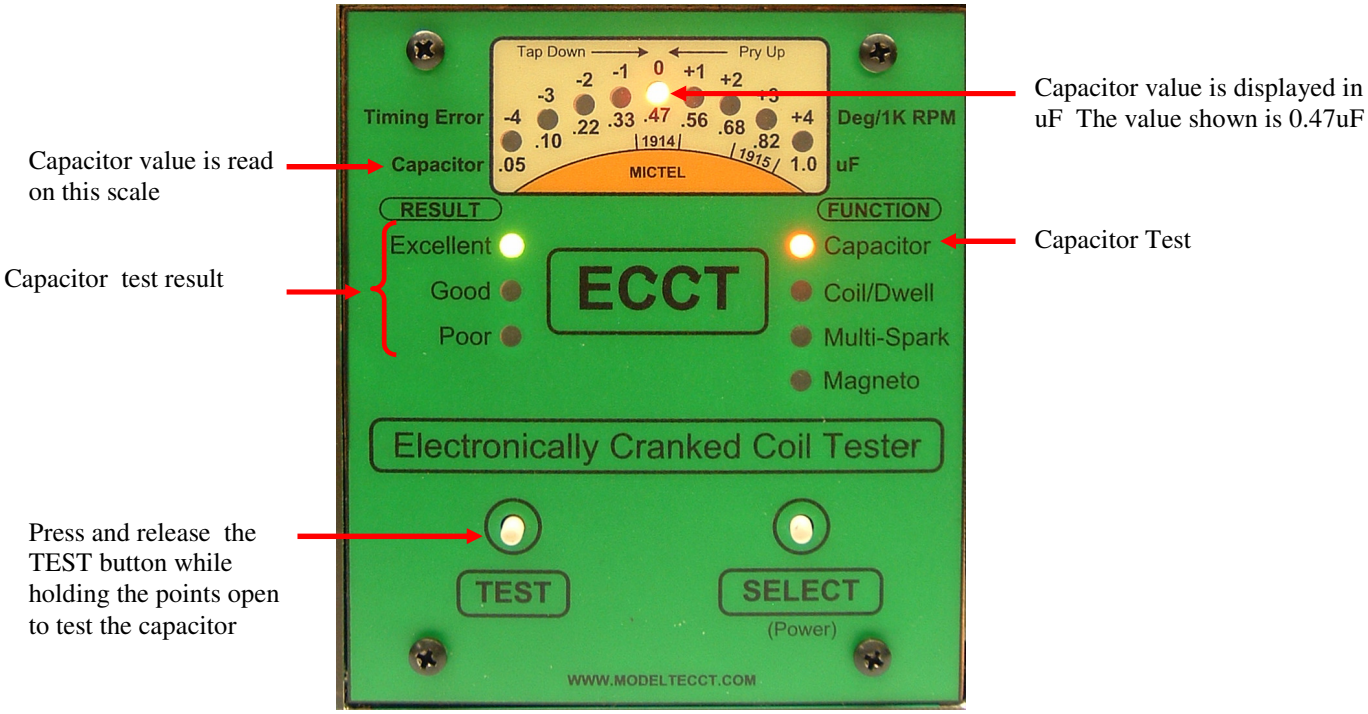


Figure 4. Capacitor Test Results for a Good Capacitor

4.3 Capacitor Test Results

The capacitor value **and** leakage must be within acceptable ranges for the capacitor to be considered acceptable for use. The capacitor value is displayed on the bottom scale of the LED meter in uF. The capacitor value displayed in Figure 4 is 0.47uF which is the correct value. The possible capacitor test results are as follows:

Result	Capacitor Value	Capacitor Leakage
Excellent	0.47uF +/- 20%	Greater than 50 Meg Ohms
Good	0.47uF +/- 20%	>10 Meg Ohms but < 50 Meg Ohms
Poor	Outside acceptable range	Less than 10Meg Ohms

Table 1. Capacitor Test Results

Flashing Poor LED – Indicates the coil is not making contact with the ECCT fixture.
The **Poor LED** will be illuminated if the capacitor value is correct but has high leakage.

IMPORTANT! - The most important Capacitor Test Parameter is the Capacitor Value. **Capacitors that test Low in value (0 to 0.33uF) should be replaced**. **Capacitors that test Poor but are in the range of 0.47uF to 0.56uF do NOT need to be replaced.** A Poor result can occur due to excessive leakage caused by finger contacting both point elements or vibrator spring to coil core contact. Insulate fingers with a glove and insert paper to insulate the coil core.

IMPORTANT! - Coil units with Low capacitor (condenser) Value (0 to 0.33uF) should have the capacitor replaced **BEFORE** proceeding with coil testing. Failure to do so can result in no spark or poor spark performance and/or excessive point wear. The process requires removing two small wire nails holding the side cover in place and carefully digging out the tar just under the point mounting nuts to remove the old capacitor and install a new 0.47uF 400V capacitor with dV/dt rating of 700V/us Minimum. More information on rebuilding coil units is available from the **Model T Ford Club of America** series 3 videos available on their web site at: http://modeltstore.myshopify.com/products/restoration-videos

4.4 Coil Test

Press the **SELECT** button to change to ECCT to Coil/Dwell test function. Press and release the **TEST** button to run the coil test. The ECCT will measure the coil dwell time to fire with respect to the nominal time in crank shaft degrees with respect to the nominal time and display the result in crank shaft degrees at 1000 RPM. An example display for a properly adjusted coil is illustrated in Figure 5.

4.4.1 Capacitor Test Results Display

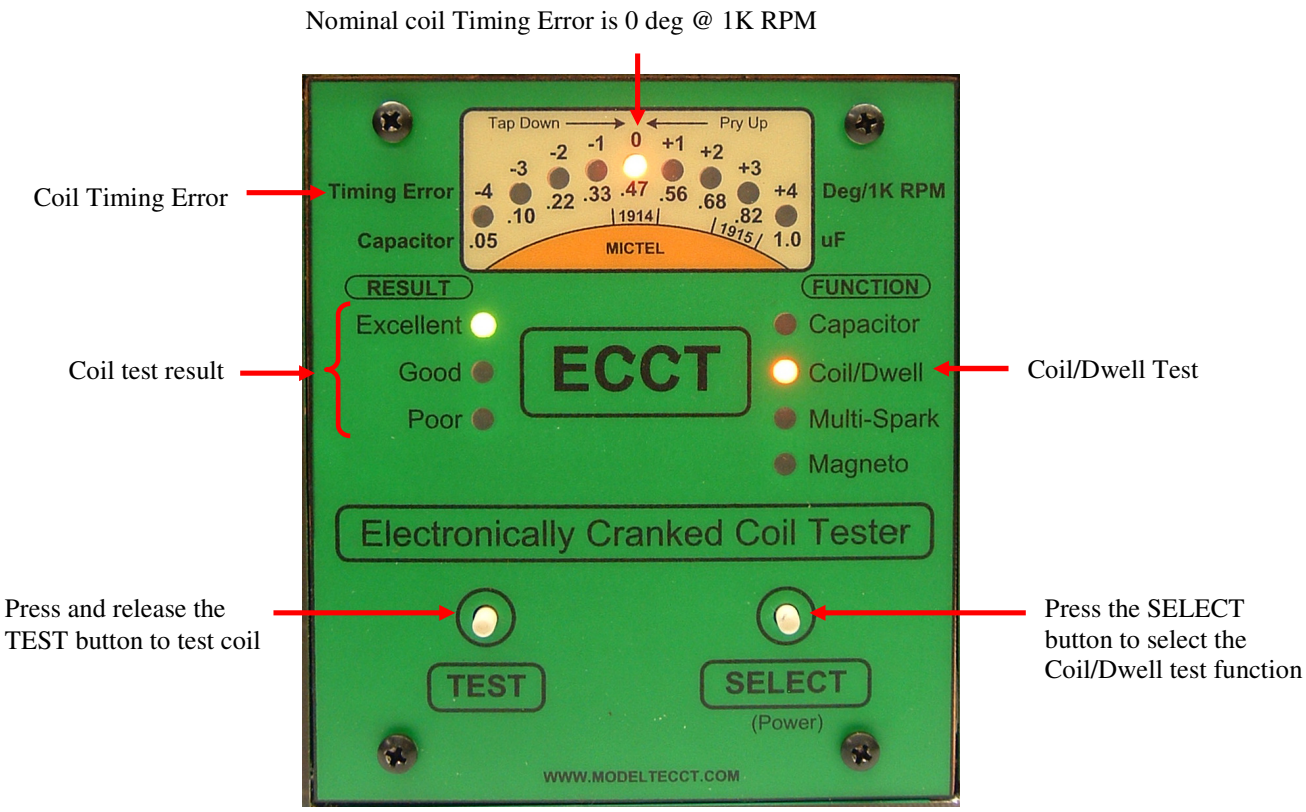


Figure 5. Coil Test Results for a Properly Adjusted Coil

4.4.2 Coil Test Results

The coil dwell time to fire and firing current must be within acceptable ranges for the coil to be considered acceptable for use. The dwell time to fire value is displayed on the top scale of the LED meter as Timing Error relative to a nominal value of 0 crank shaft degrees at 1000 RPM. The possible coil test results are as follows:

Result	Timing Error (Deg)	Coil Current
Excellent	0	Ideal firing range
Good	0 +/- 1	Within acceptable range
Poor	0 +/- 2 or more	Outside acceptable range

Table 2. Coil Test Results

IMPORTANT! – Good or Excellent Timing Error readings can still have a test result of Poor if the coil firing current was outside the acceptable range. The Poor (Red LED) indicator will be illuminated in this event even though Timing Error is 0 +/-1deg.

4.4.3 Coil Timing Error

The time required to charge the coil to the point of firing is known as dwell time to fire. Nominal coil dwell time is 0.002 seconds (2ms) operating on 12VDC. This dwell time is translated to ignition Timing Error and displayed on the ECCT lower scale calibrated in crank shaft degrees with center value set to the nominal dwell time labeled as 0 degree Timing Error. The scale is in 1 degree per division at 1000 RPM engine operation. **The acceptable range of Timing Error is 0 +/- 1 degree.** Coils with Timing Error outside this range require adjustment of the coil points covered in the next section.

4.4.4 Coil Point Adjustment

The coil dwell time to fire is determined by many variables. The main variables are:

1. Vibrator Spring Tension
2. Cushion Spring Tension
3. Cushion Spring Travel
4. Point Gap

Attaining the desired dwell time to fire and firing consistency depends upon setting these 4 variables in the proper proportion with respect to each other. The ECCT coil test quickly displays the Timing Error for a given set of these 4 variables. It is up to the operator to know which of these variables to adjust to achieve the desired Timing Error and firing consistency. Note that these 4 variables interact with each other which sometimes makes coil point adjustment challenging to achieve the desired performance. Coil point adjustment requires patience and experience for these reasons. It is highly recommended that new coil points be used when first learning how to adjust and balance these 4 variables to achieve the desired result by avoiding introduction of still more variables such as contact resistance and pitting. The next section provides an introduction to the basics of coil point adjustment.

IMPORTANT! **Small**, gentle adjustments to these 4 variables make **LARGE** changes in performance. It is easy to overshoot the desired adjustment goal if not careful.

4.4.5 Dwell Time to Fire Too Short

A coil firing too early results in negative timing error as illustrated in Figure 6.

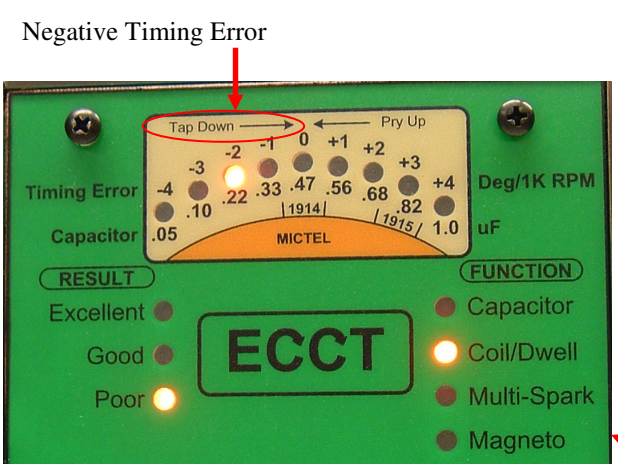


Figure 6
Negative Timing Error

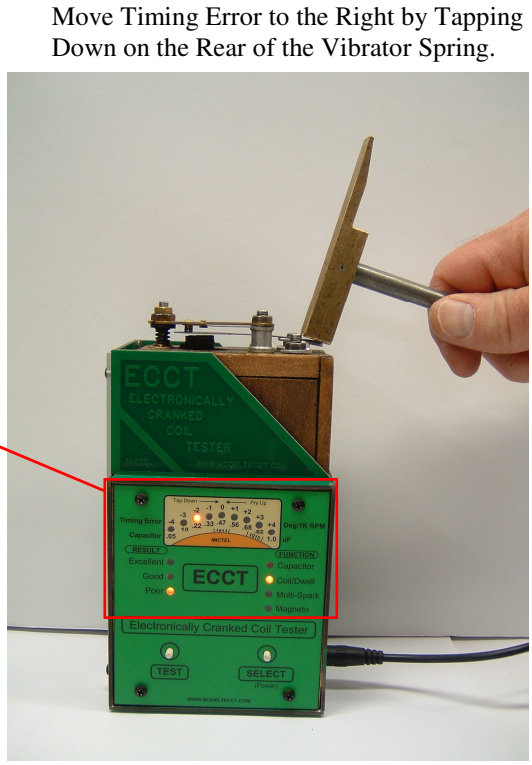


Figure 7
Correcting Negative Timing Error

Increase the coil dwell time to fire by tapping down gently on the rear of the vibrator spring as illustrated in Figure 7.

Repeat Vibrator Spring adjustment as necessary until the coil Timing Error moves to the center, 0 deg position. Note that the Vibrator Spring metal support has a tendency to relax after adjustment and may require re-adjustment after a few minutes.

Small taps on the Vibrator Spring support make Large changes in coil Timing Error so make small taps and re-test the Timing Error to see how your adjustments affected performance. Refer to the next section if you accidently over adjusted the Vibrator Spring to apply too much tension.

4.4.6 Dwell Time to Fire Too Long

A coil firing too late results in positive timing error as illustrated in Figure 8.

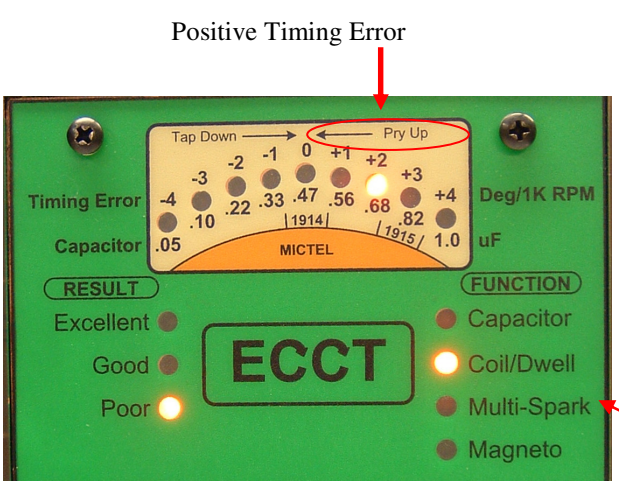


Figure 8
Positive Timing Error

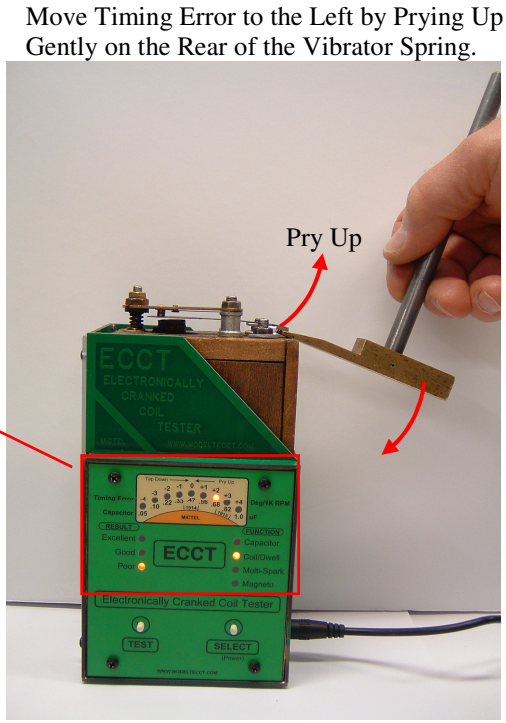


Figure 9
Correcting Positive Timing Error

Decrease the coil dwell time to fire by Prying up on the rear of the vibrator spring as illustrated in Figure 9

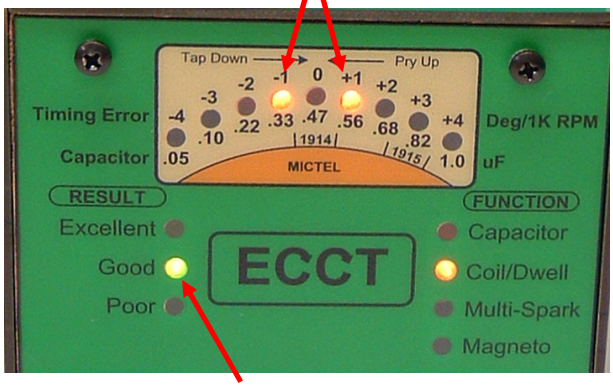
Repeat Vibrator Spring adjustment as necessary until the coil Timing Error moves to the center, 0 deg position. Note that the Vibrator Spring metal support has a tendency to relax after adjustment and may require re-adjustment after a few minutes.

A small pry up on the Vibrator Spring support makes Large changes in coil Timing Error so make pry gently up and re-test the Timing Error to see how your adjustment affected performance. Refer to the previous section if you accidently over adjusted the Vibrator Spring to apply too little much tension.

4.4.7 Double Sparking

Coil Double Sparking is a weak spark followed by a second weak spark. Double Sparking is undesirable because of the weak spark may not have enough energy to ensure efficient combustion and therefore is prone to fouling and misfire. The ECCT checks for Double Sparking during the Coil and illuminates two (2) LEDs on the Timing Error display if Double Sparking is detected as illustrated in Figure 10.

Double Sparking is Indicated by 2 LEDs Lit in the Display



Note: Timing Error may be Good but Spark is weaker than usual so corrective action is necessary

Figure 10
Coil Double Sparking

Stop Double Sparking by Increasing Cushion Spring Tension. This is Done by **Gently** Prying UP on the rear of the Upper Bridge. NOTE: A small adjustment makes a big difference.

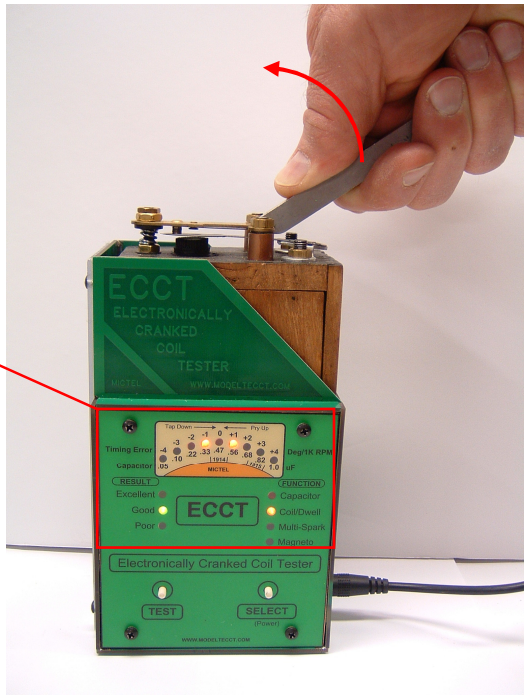


Figure 11
Correcting Double Sparking

4.4.8 Correcting Double Sparking

Double Sparking usually occurs if there is insufficient Cushion Spring tension necessary for the upper point contact to remain in physical contact with the lower Vibrator spring contact as they both travel down towards the coil core. Double Sparking can usually be corrected by increasing the Cushion Spring tension. This is accomplished by prying up gently on the rear of the Cushion Spring support with a small pliers or coil adjusting tool as shown in Figure 11.

4.4.9 Cushion Spring – Vibrator Spring Adjustment Interaction

Note that changing Cushion Spring tension will have the effect of reducing the dwell time to fire so will also reduce the Timing Error (Move it to the Left). Timing Error can be moved back to the center 0 deg position by increasing the Vibrator Spring tension as described in section 4.3.4 In some cases, it may be difficult to find the balance between Cushion Spring Tension and Vibrator Spring tension. In that case, it may be helpful to try a different point contact gap.

4.5 Multi-Spark Coil Firing Consistency Test

Coils that have passed the Capacitor and Coil tests with Good or Excellent results should then be tested for Coil firing consistency with the ECCT Multi-Spark test. This test fires the coil 100 times at the rate of 2,000 RPM while monitoring the Dwell Time to Fire for each spark.

A properly adjusted coil is capable of a Timing Error variation of 0 deg +/-1 deg 95% of the time or better. Points contacts that stick, are worn, oxidized, pitted or misadjusted Cushion Spring tension will result in greater Timing Error variation indicating the coil is not operating as consistently as it could and requires further action. It may be possible to clean or file the points to improve firing consistency. Points that continue to exhibit wide firing variation should be replaced.

4.5.1 Running the Multi-Spark Test

First run the Single Spark Coil test by pressing the ECCT test SELECT button until the Coil/Dwell Test LED is illuminated. Press and release the TEST button and verify the single spark coil test result is Good or Excellent. Repeating the Single Spark coil test multiple times should produce the same result. If not, it is a good indication the results of the Multi-Spark firing consistency test will also be poor.

Run the Multi-Spark test by pressing the ECCT Test **SELECT** button until the Multi-Spark test mode LED is illuminated. Press and release the **TEST** button to start the Multi-Spark Coil Test. The ECCT will begin firing the coil and monitoring the result of each spark.

4.5.2 Multi-Spark Test Result Display

Figures 12 and 13 illustrate acceptable Multi-Spark coil firing consistency results.

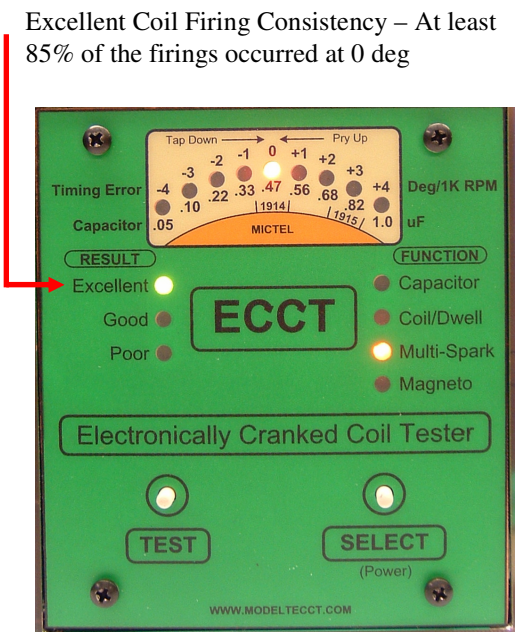


Figure 12 – Excellent Coil Firing Consistency

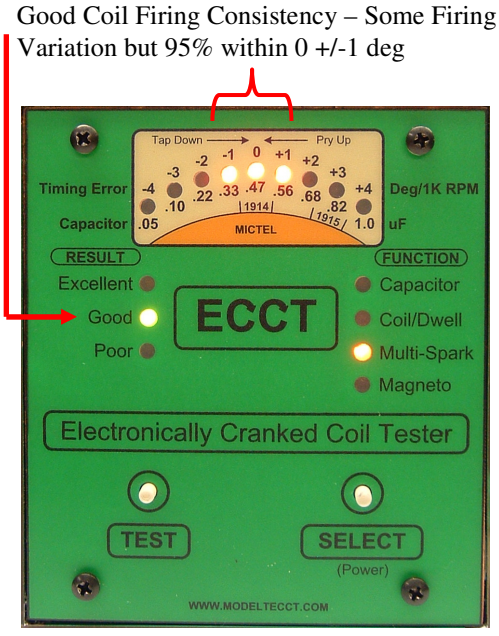


Figure 13 – Good Coil Firing Consistency

4.5.3 Multi-Spark Test Results

The ECCT illuminates a Timing Error LEDs if 5% or more of the firings occur in that timing bin. A summary of the Multi-Spark coil test results is provided in Table 3 below.

Result	Timing Error (Deg.)	Firing Consistency	Firing Current
Excellent	0	At least 85% of firings	Within ideal Range
Good	0 +/- 1	At least 95% of firings	Within acceptable Range
Poor	Outside 0 +/- 1	More than 5% of firings	Outside acceptable Range

Table 3. Multi-Spark Test Results

IMPORTANT! – Good or Excellent Timing Error consistency may still result in an overall test result of Poor if the coil firing current was outside the acceptable range. Repeat the Single Spark coil test to confirm and correct this condition.

4.5.4 Poor Multi-Spark Test Results

Examples of poor Multi-Spark firing consistency test results

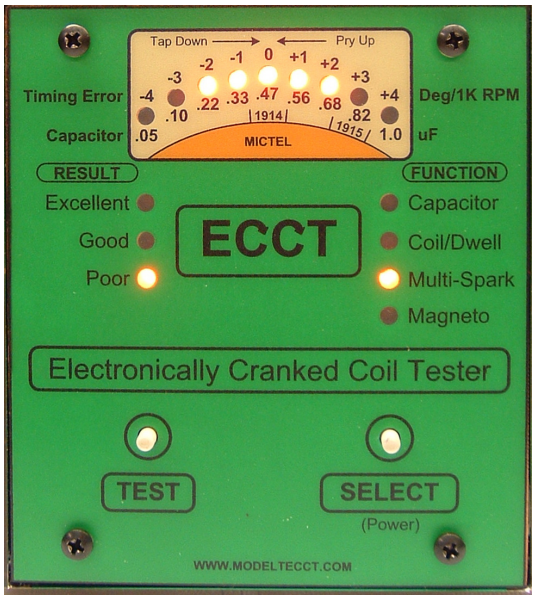


Figure 14 - Excessive Timing Error Variation

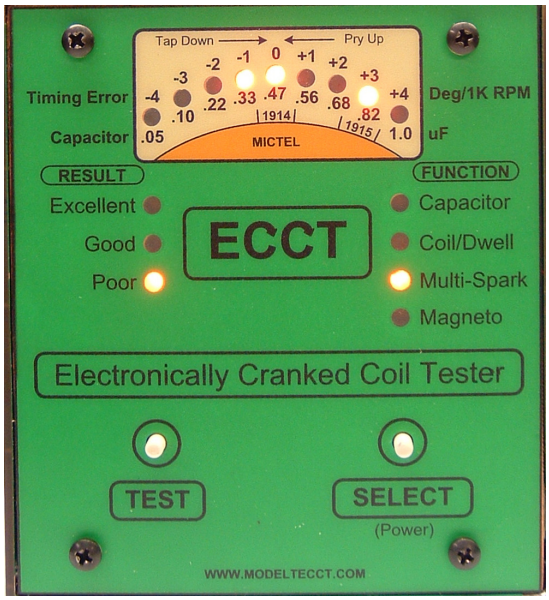


Figure 15 – Excessive Timing Error Variation

4.6 Magneto Test

The ECCT magneto test is an optional feature which tests the magnetic field strength of the Model T magneto and displays the result similar to way the legacy St. Louis Magneto Tester does; a recognized accurate method of assessing the magneto function. **The Magneto test is done while operating on battery** by measuring the Magneto output at normal engine idle and again at moderate engine speed with load applied to the Magneto. The change in Magneto output voltage is directly proportional to the Magneto magnetic field strength.

4.6.1 Enabling the Magneto Test Feature

The ECCT Magneto test is an optional feature. The Red Magneto Test LED will only illuminate when pressing the **SELECT** button if the Magneto test feature has been enabled on the ECCT.

The Magneto test feature can be enabled at time of purchase or any time after by purchasing a software key that can be e-mailed and entered by the user using a PC or Laptop. For more information about enabling the Magneto test feature, please visit www.modeltecct.com.

4.6.2 Running the Magneto Test

The ECCT Magneto test is run by following these steps:

1. Plug the 2.1mm x 5.5mm Magneto test cable into the Magneto input on the ECCT.
2. Connect the Red alligator clip to the Magneto output post and the Black alligator clip to **Unpainted Engine Ground or Frame** (Not body which can be insulated from ground).
3. Power up the ECCT by pressing and holding the **SELECT** (Power) button for 5 seconds
4. Press the ECCT **SELECT** button until the Red Magneto Test LED is illuminated. (Please refer to section 4.6.1 above if the Red Magneto Test LED does not illuminate).
5. Start the Model T engine **operating on battery** and let idle (500 – 700 RPM)
6. Press and release the ECCT **TEST** button, the Magneto Test LED will blink once.
7. Raise the engine idle within 10 sec until the Red Magneto Test LED begins flashing on the ECCT then wait (~ 5 sec) for the test to complete. **NOTE**: The idle only needs to be raised by about 500 RPM, **No need to race the engine!** The POOR LED will flash if no magneto output is detected or does not increase with RPM after 5 seconds. Check test cable connections to the magneto post and unpainted engine ground are good.
8. Lower the engine speed back to idle after the Magneto test results are displayed. The test takes about 5 seconds to complete.

IMPORTANT! - Raising the engine speed to higher RPM will not affect the Magneto test results. The engine speed only need be raised moderately until the Magneto test LED begins flashing. **The engine must be operating on Battery Power during magneto testing**.

4.6.3 Magneto Test Result Display

The ECCT Magneto test result display functions differently than previous tests. Two LEDs may be lit indicating the reading is in between values. Examples of Magneto test results are provided below for reference:

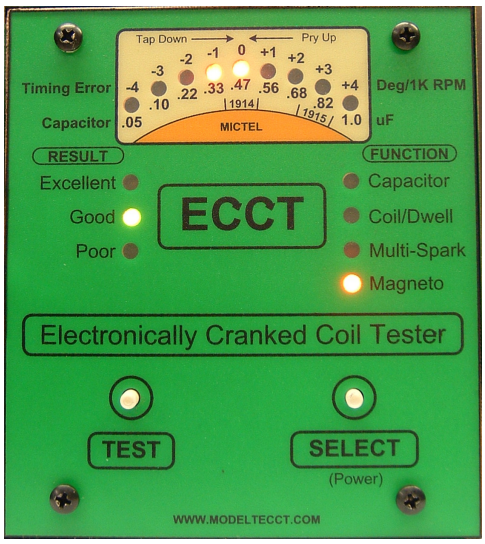


Figure 16 – Good Magneto Output

Figure 17 – Good Magneto Output

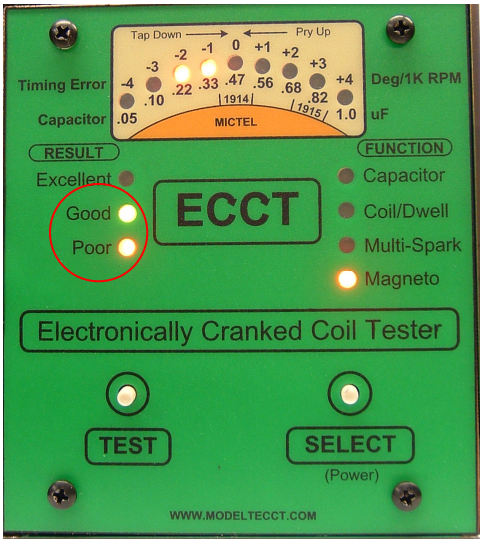


Figure 18– Weak Magneto Output

Both LEDs Lit

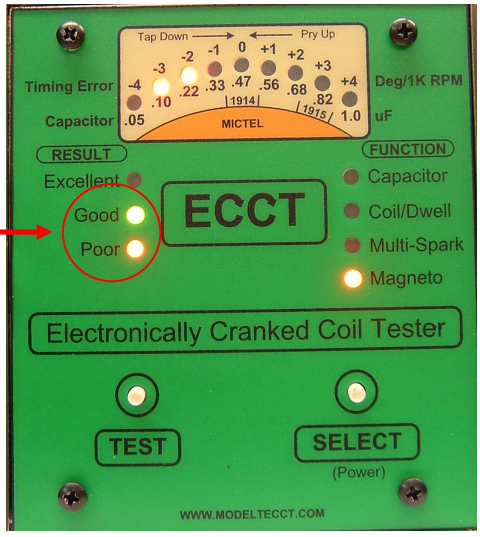


Figure 19 – Weak Magneto Output

Good Output - Magneto output strength is considered good if it is at or above the 1914 region on the strength display as illustrated in figures 16 and 17.

IMPORTANT: Engine must be operating on battery during magneto testing

Weak Output - Weak Magneto output is considered weak if the strength is just below the 1914 region. Both Good and Poor LEDs are illuminated to signal weak output as illustrated in figures 18 and 19.

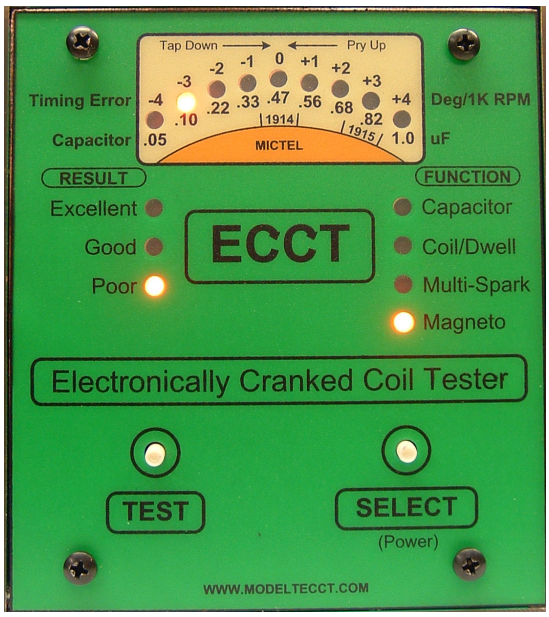


Figure 20– Poor Magneto Output

No Strength LED Illuminated

Flashing

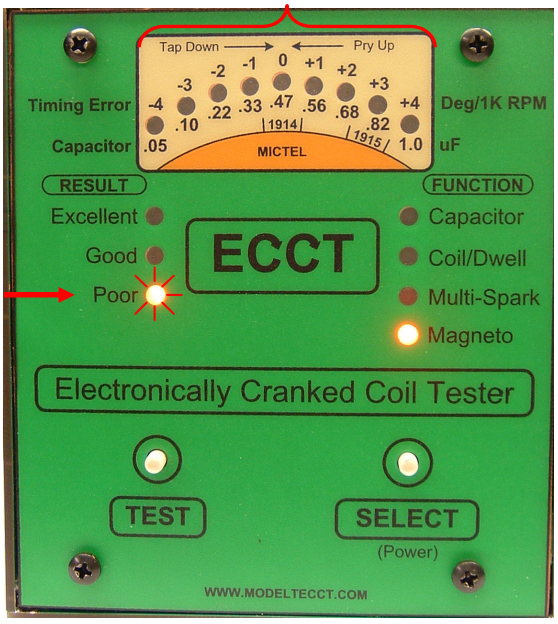


Figure 21 – No Magneto Output

Poor Output - Low Magneto output results in just the Poor LED being illuminated as illustrated in Figure 20.

No Output - No Magneto output results in no strength LEDs illuminated and a flashing Poor LED. Check the connections between the ECCT, Magneto post and Engine Ground. Make sure the Alligator clips are firmly attached and making good electrical connection especially the engine ground connection. Avoid attaching the alligator ground clip to painted surfaces which can provide electrical isolation.

4.6.4 Magneto Test Results

A summary of the Magneto test results is provided in Table 4 below.

Result LEDs	Magneto Strength	Comment
Excellent	Excellent	Magneto strength sufficient to properly operate coils
Good	Good	Magneto strength sufficient to properly operate coils
Good & Poor	Weak	Coil operation possible but may be marginal on magneto
Poor	Poor	Coil operation may not be possible on magneto
Poor Flashes 5 Times	No Output	No strength displayed, no magneto output detected
Poor Flashes 10 Times		High Internal Resistance, > 3.5 Ohms. Check Mag post contact to magneto coil

Table 4. Magneto Test Results

IMORTANT: Few, if any, Model T Magnetos will register in the EXCELLENT region. Magnetic Field Strength Factor of GOOD is sufficient to properly operate Model T coils.

5 ECCT - Advanced Features Software

The ECCT Advanced Features Software is an optional feature that provides additional test capability including numerical and graphical display of test results. Detailed coil data and fine tuning is possible with the software. The ECCT connects to a PC or Laptop computer running Windows using a standard USB cable. The ECCT Software communicates with the ECCT providing full control of all tests and displays the following information.

Capacitor Test:

- Capacitor value in microfarads, uF
- Leakage resistance in Ohms

Coil Test

- Coil dwell time to fire in milliseconds, ms
- Coil current at the time of firing in Amperes, A
- Spark Energy, mJ
- Coil Inductance in milli-Herrys, mH
- Precise timing error in crank shaft degrees at 1000 RPM
- Graphical display of dwell time to fire

Multi-Spark Coil Test:

- Coil firing consistency and repeatability
  - Number of times the coil fires in each timing error range
  - Ability to change the number of sparks fired from 2 to 250
  - Ability to change the spark firing rate from 375RPM to 5000RPM
  - Graphical display of statistical distribution of spark timing

Magneto Test: (if so equipped)

- Numerical display of the Magneto magnetic field strength factor
- Real time engine tachometer with numerical display of engine RPM
- Numerical display of the Magneto RMS output voltage under load and no load conditions
- Numerical display of the Magneto internal resistance

Other features include:

- Status window explaining test results and suggested actions
- Time and date stamp of all measurements
- Snap screen captures of test results to document performance and for future reference.

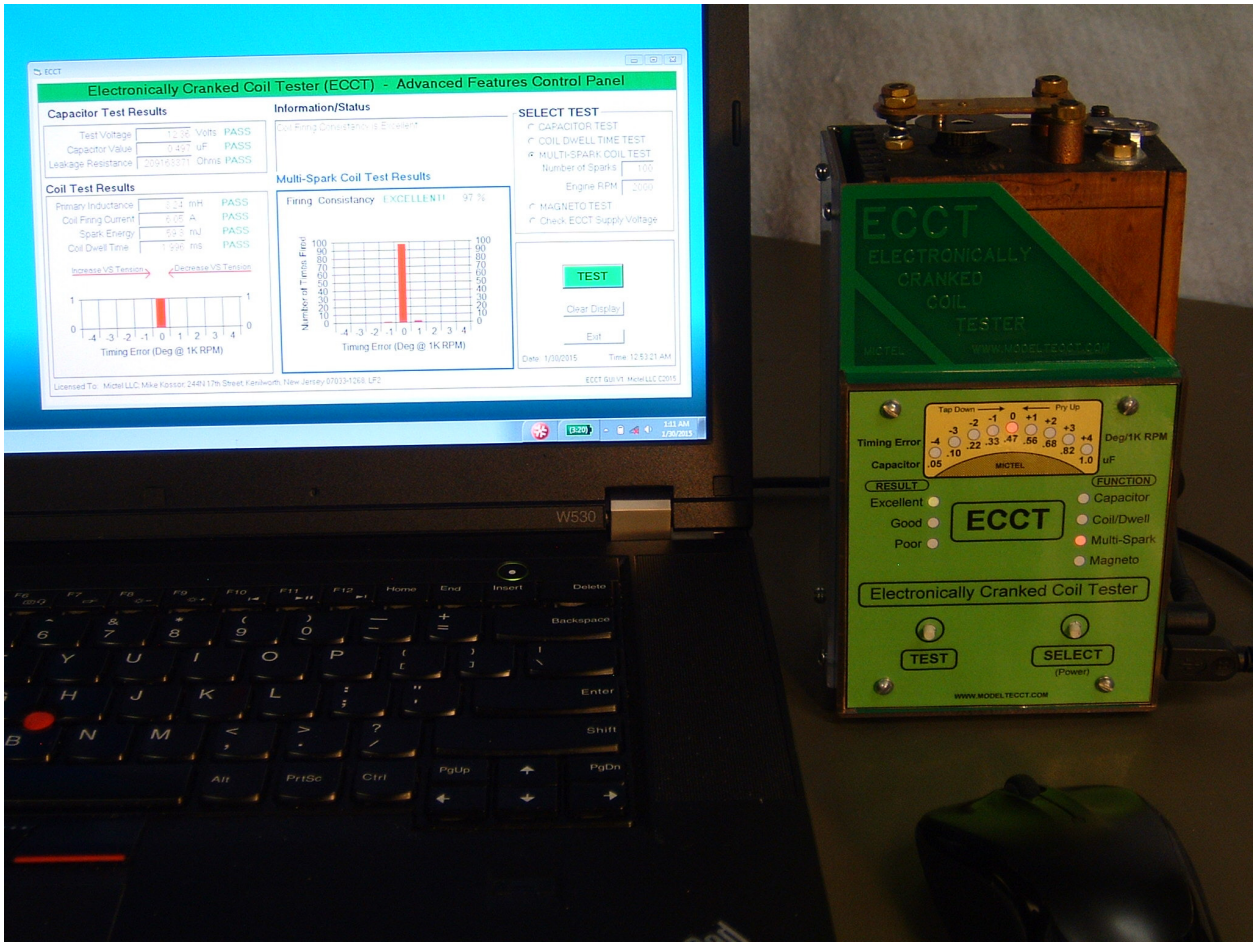
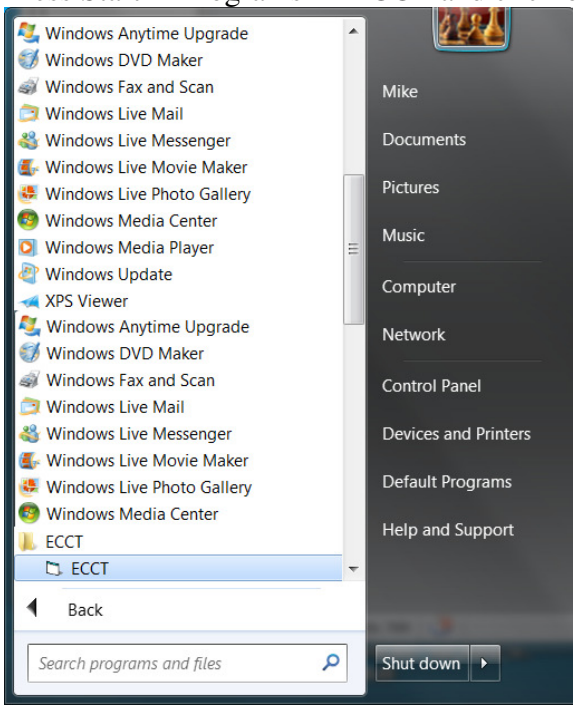


Figure 22 ECCT Operation with Advanced Features Software

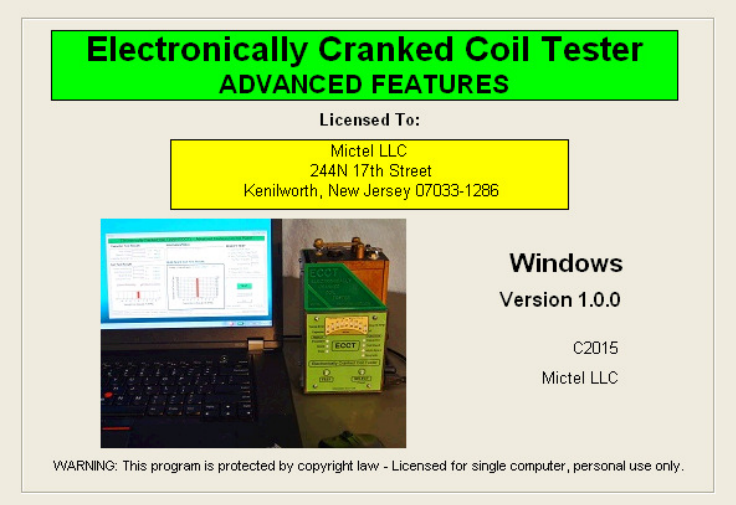
6 ECCT Advanced Features Operation

1. Connect ECCT to coil test fixture. Install coil to be tested in test fixture and turn on ECCT power. **Note: The program will not start if the ECCT is not powered.**

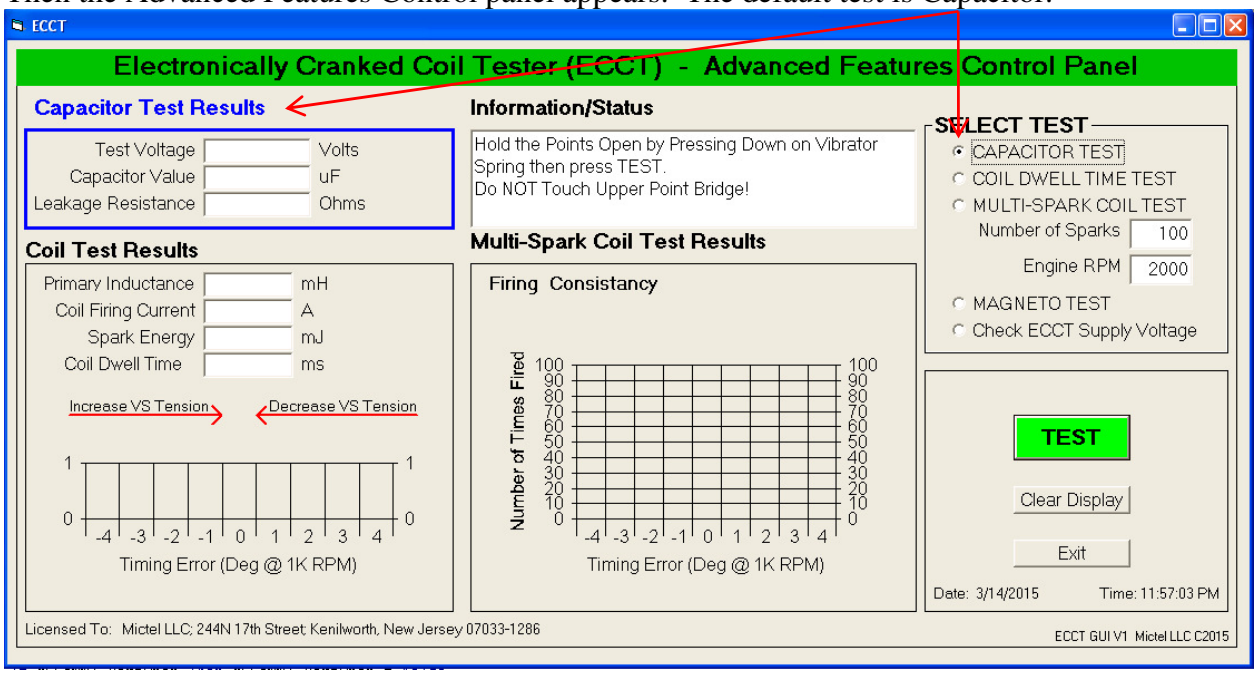
2. Press Start→ Programs → ECCT and click on the ECCT program tab



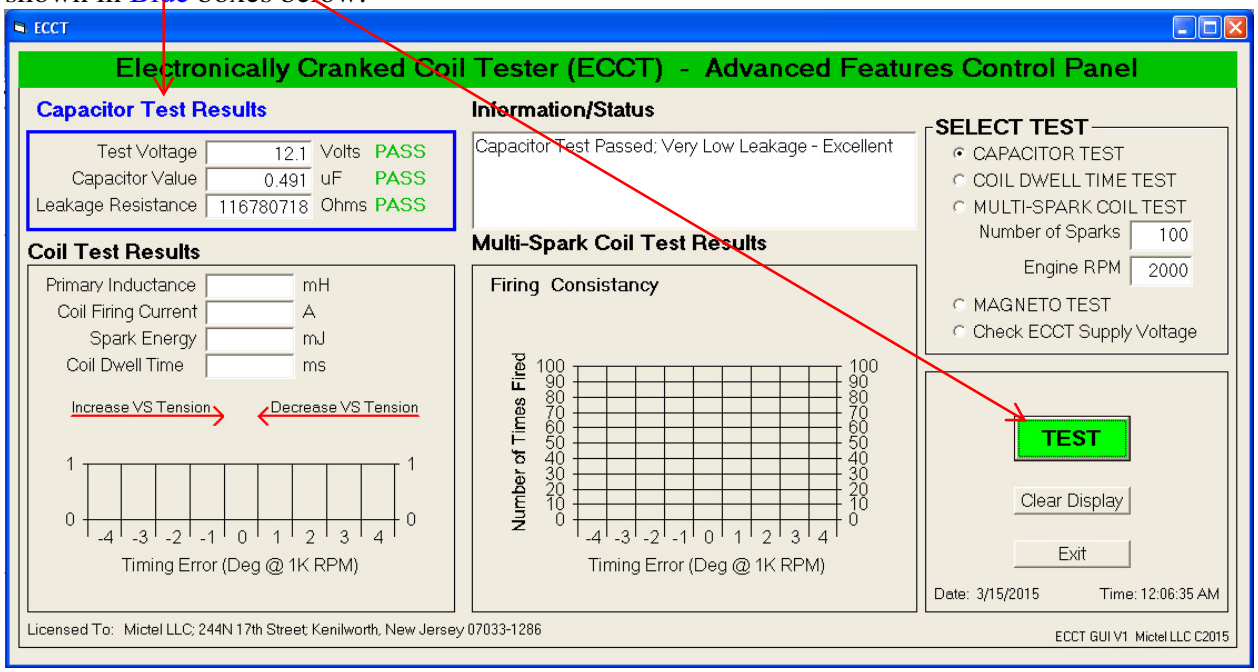
3. The welcome screen appears



4. Then the Advanced Features Control panel appears. The default test is Capacitor.



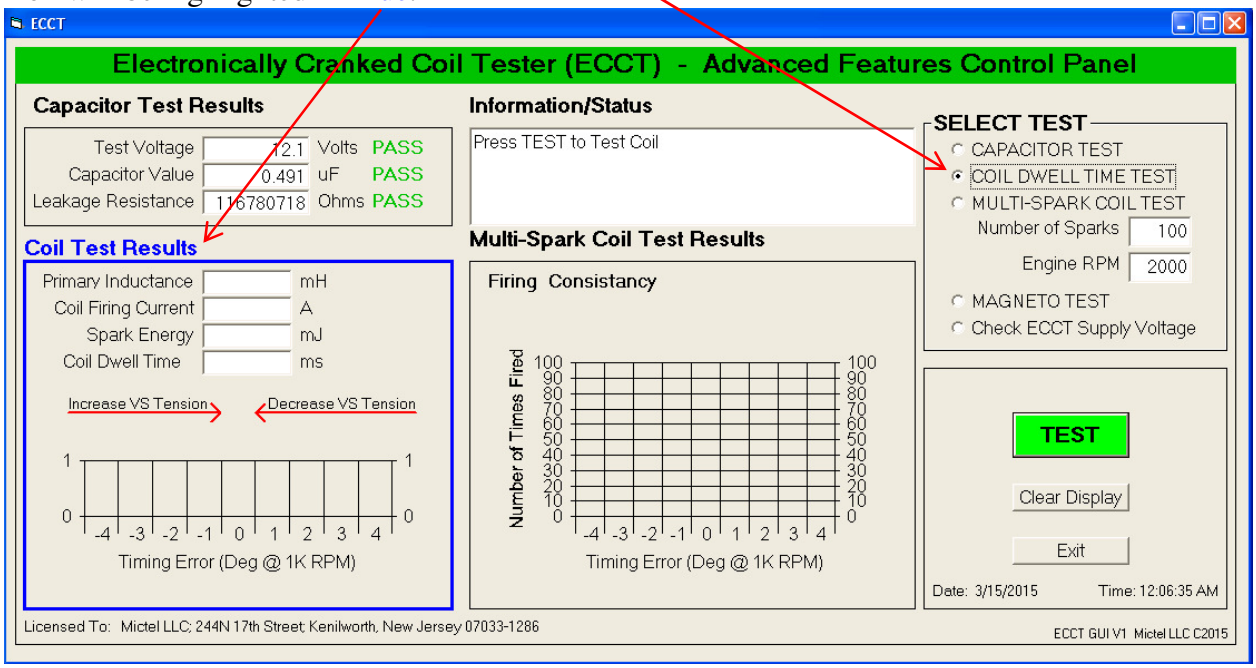
5. Hold open the coil points by pressing down on only the vibrator spring and click on the Green TEST button to test to test the internal condenser (capacitor). Test results are shown in Blue boxes below:



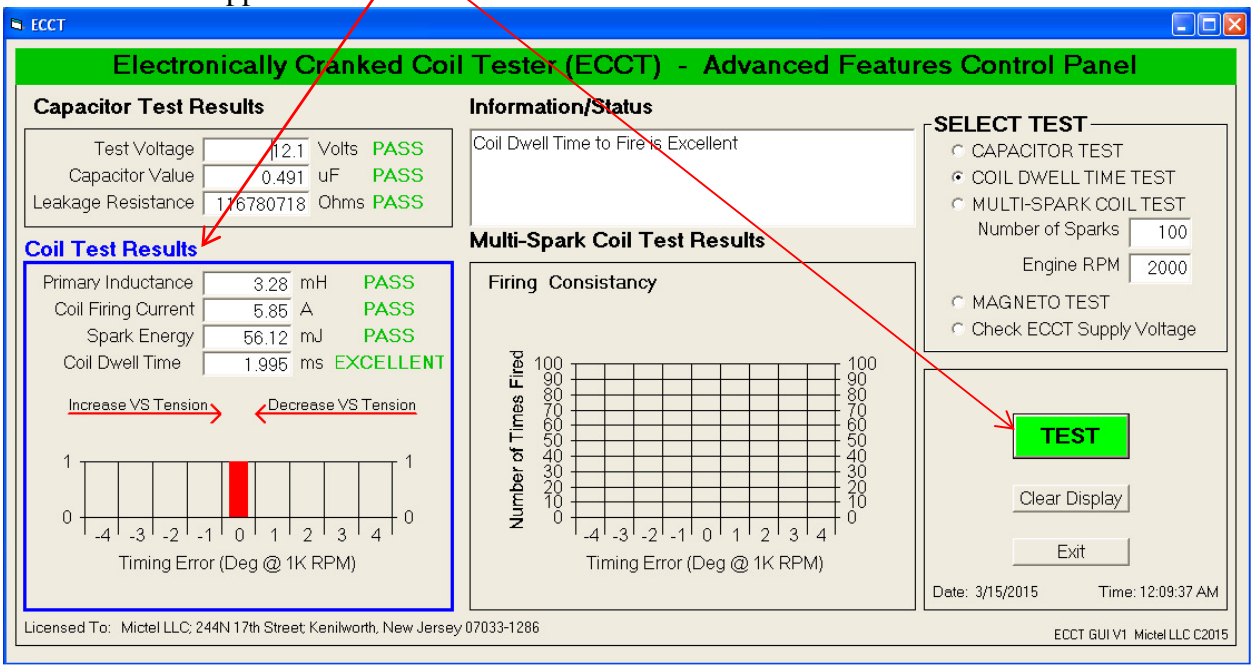
Note: Be careful not to touch the upper point bridge during the capacitor test because your fingers can provide a leakage current path which will be detected by the ECCT and could result the capaictor leakage test to fail.

Capacitors that test Poor but with Capacitor Value in the range of 0.47uF to 0.56uF do NOT need to be replaced.

6. Click on **COIL DWELL TIME TEST** to test and adjust the coil. The Coil Test Results Box will be highlighted in Blue.



7. Press the Green **TEST** button to test the coil. The coil will fire a single spark and the coil test results will appear in the Blue Coil Test Results window. A summary of the test results will also appear in the Information/Status window.



Coil Test Results Description

A. Primary Coil Inductance measured in milli-Henrys (mH)
B. Coil Firing Current in Amperes (A). This is the actual current flowing in the primary winding when the points open to generate spark.
C. Spark energy in milli-Joules (mJ). Spark energy can be estimated using the formula:

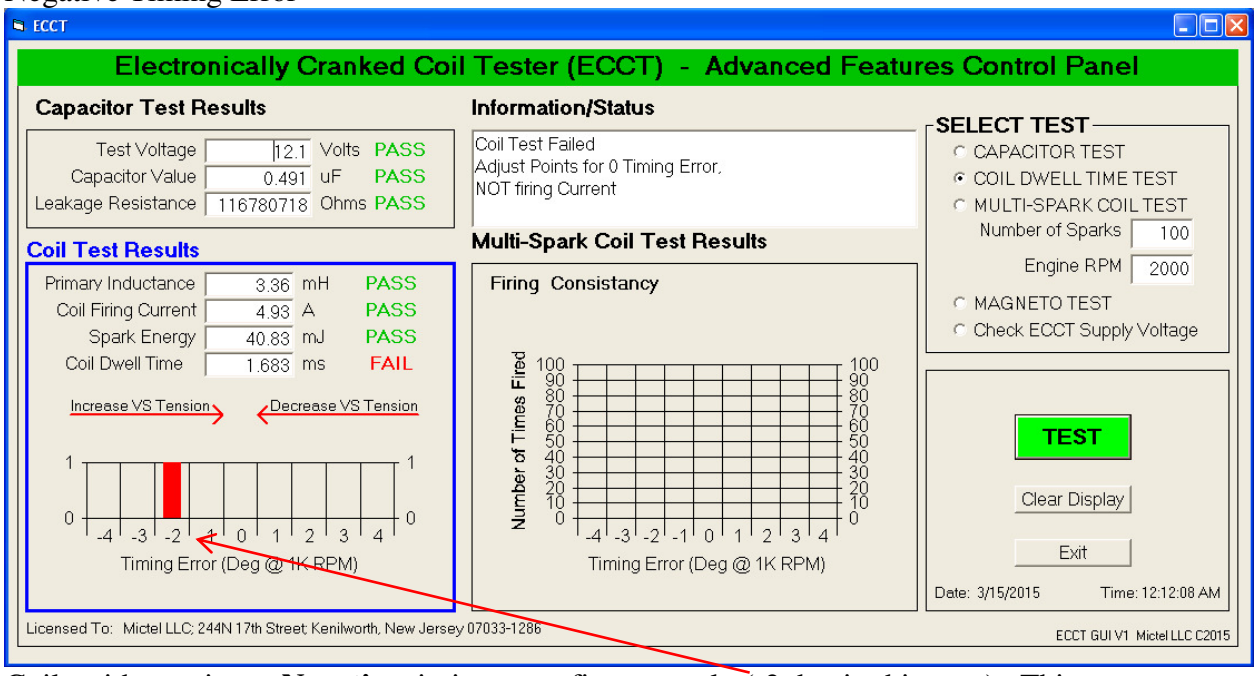
   $E = ½ * L * I^2$ Where: E is the spark energy in Joules, L is the coil inductance in H and I is the coil firing current in A. The energy of the spark produced by the coil in the example is:

   $E = ½ * (0.00324) * 5.53^2 = 0.04954$ Joules (49.54mJ)

D. The Coil Dwell Time. This is the time it took for the coil to build up a magnetic field strong enough to pull open the points to produce the spark. The nominal value is 2.0ms (0.002 seconds) operating at 12V DC which is approximately 1000 RPM. The time scale is calibrated in crank shaft degrees relative to 0 timing error at 1000RPM. Properly adjusted coils should fire consistently 0 +/- 1 degree at 1000 RPM at least 95% of the firings.

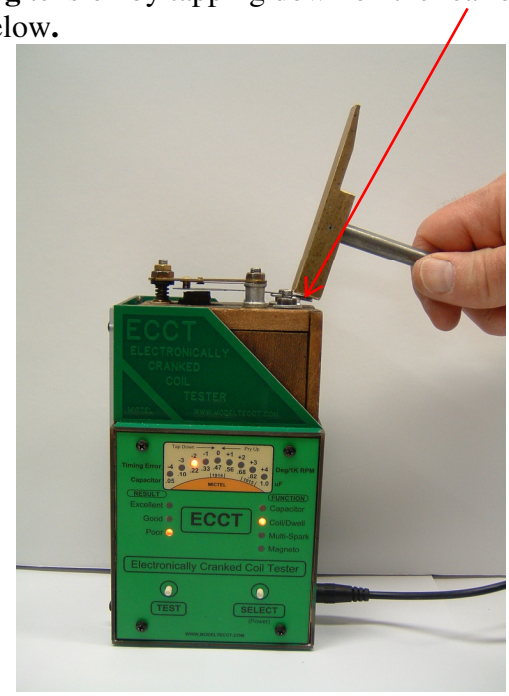
What to do when the coil dwell time is not at Zero timing Error

Negative Timing Error



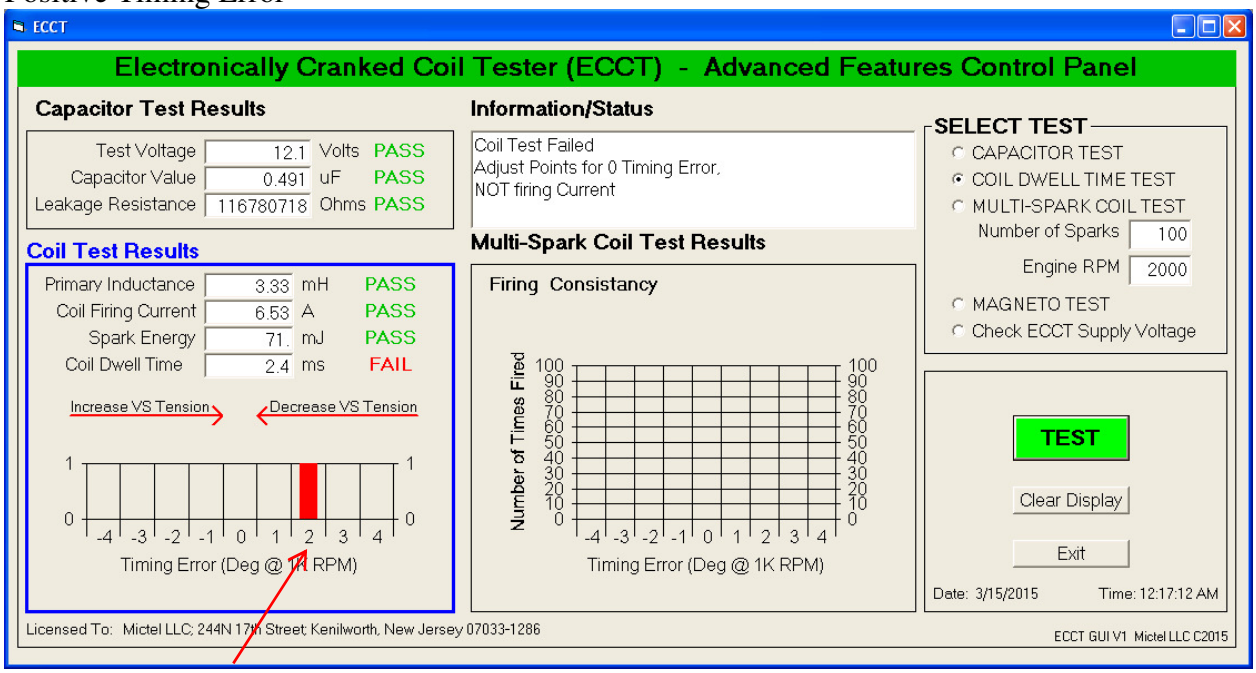
Coils with consistent **Negative** timing error fire too early (-2 deg in this case). This indicates the need **Increase Vibrator Spring** tension which is indicated by the red arrow above the display.

Increase **Vibrator Spring** tension by tapping down on the rear of the **Vibrator Spring** as shown in the example below**.**



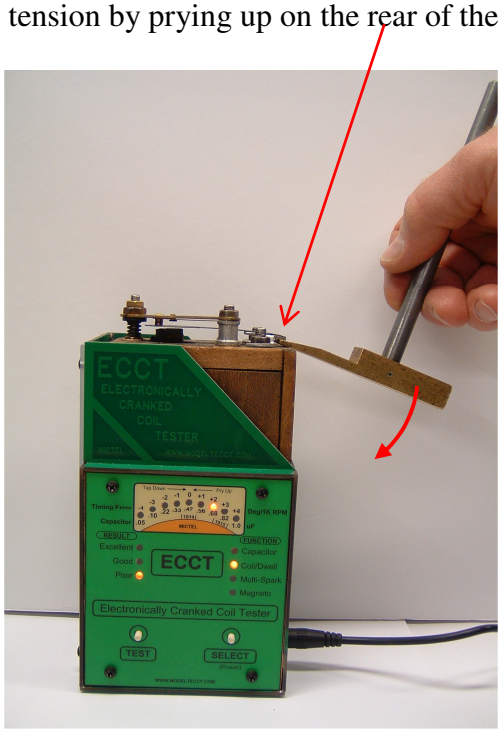
Tapping down on the rear of the Vibrator Spring increases Vibrator Spring Tension. This increases the coil dwell time to fire and moves the timing error to the right.

Positive Timing Error



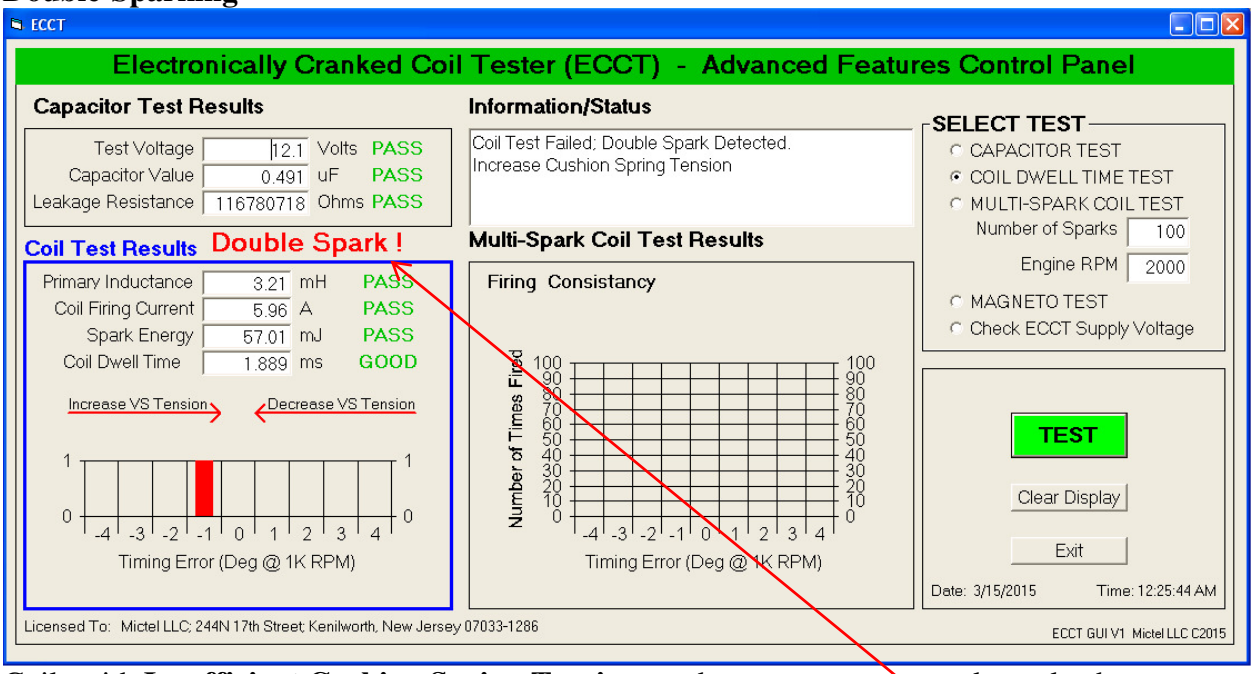
Coils with **Positive** timing error fire too late, (+2 deg in this example). This indicates the need for **Less Vibrator Spring** tension. An occasional positive deviation indicates the coil points are arcing. Increasing the cushion spring tension slightly may be necessary if positive deviations (point arcing) occurs frequently.

Reduce **Vibrator Spring** tension by prying up on the rear of the **Vibrator Spring**.

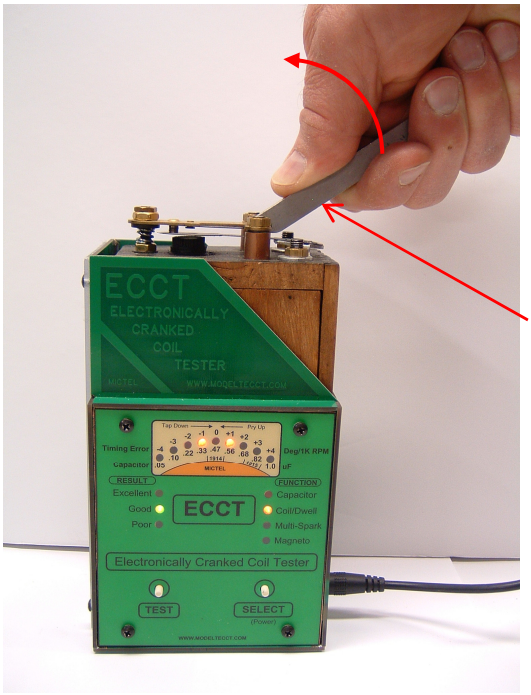


Prying up on the rear of the Vibrator Spring decreases Vibrator Spring Tension. This decreases the coil dwell time to fire and moves the timing error to the left.

Double-Sparking



Coils with **Insufficient Cushion Spring Tension** produce two or more weak sparks that result in poor spark energy, poor combustion and consequently poor engine performance. The ECCT carefully monitors for double sparking and alerts the user if the condition is detected with the **Double Spark!** warning message above the Coil Test Results box. Correct the double sparking condition by increasing Cushion Spring Tension with a special tool (5008CST) shown.

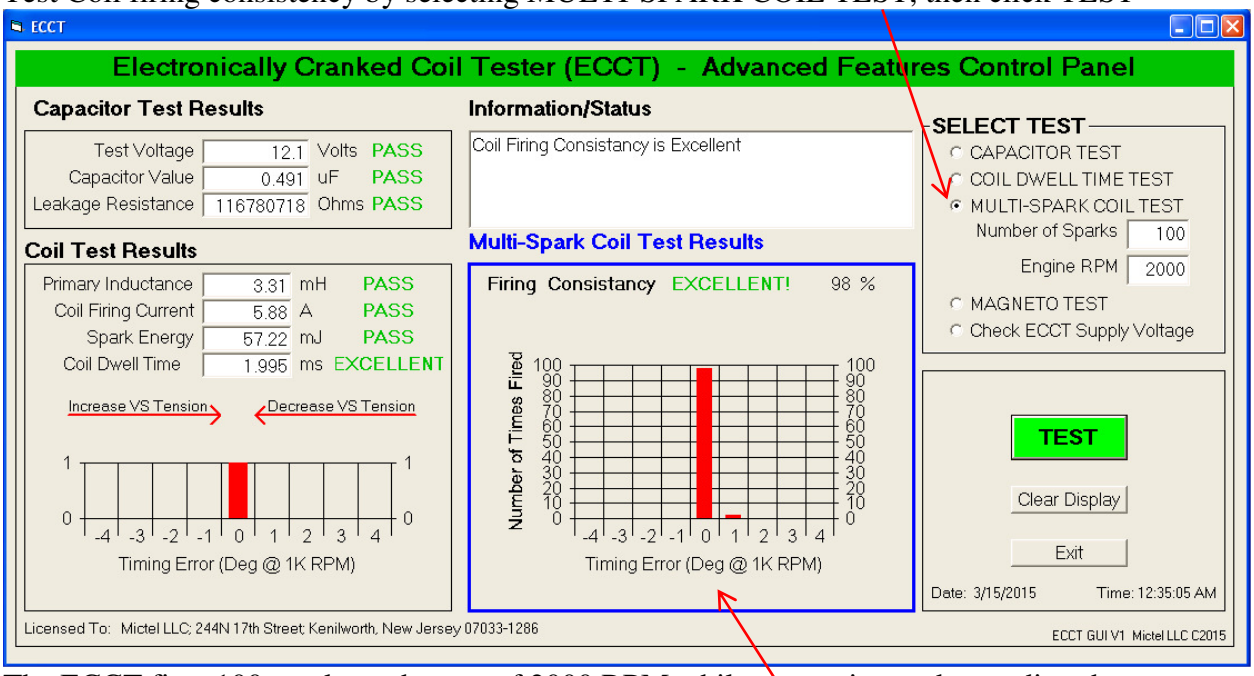


Pry UP **gently** to increase **Cushion Spring** Tension.

This is a sensitive adjustment that does not take much force using the 5008CST tool

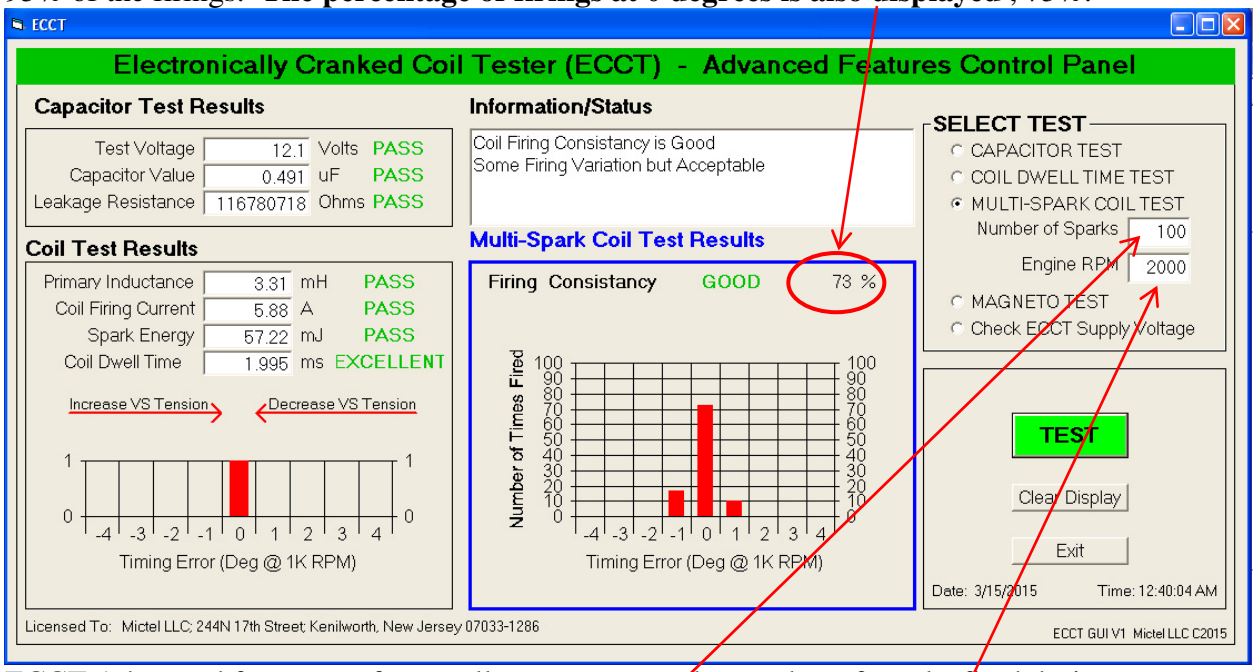
Too much tension will also cause poor firing consistency

8. Test Coil firing consistency by selecting MULTI-SPARK COIL TEST, then click TEST



The ECCT fires 100 sparks at the rate of 2000 RPM while measuring and recording the coil dwell time of every spark. The results are displayed graphically to show the distribution of firings expressed as timing error in crank shaft degrees at 1000RPM.

A good set of properly adjusted points can fire spark at 0 +/-1 degree timing error at least 95% of the firings. **The percentage of firings at 0 degrees is also displayed** , 73%.

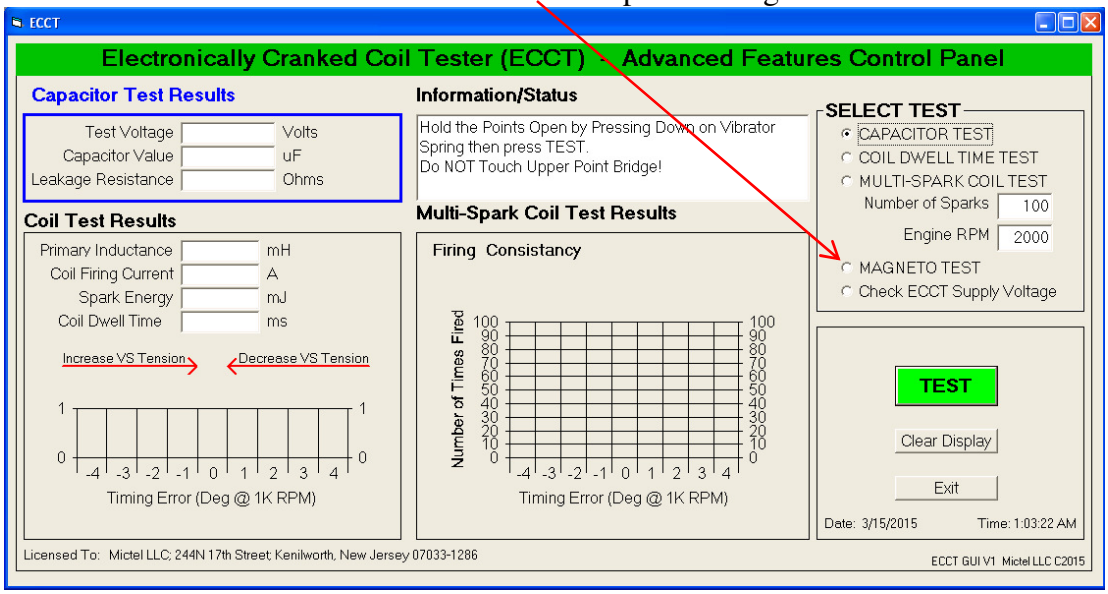


ECCT Advanced features software allows you to set the number of sparks fired during the coil multi-spark consistency test from 2 to 250 and change the firing rate from 475 to 5000 RPM

Magneto Test (if ECCT is so equipped)

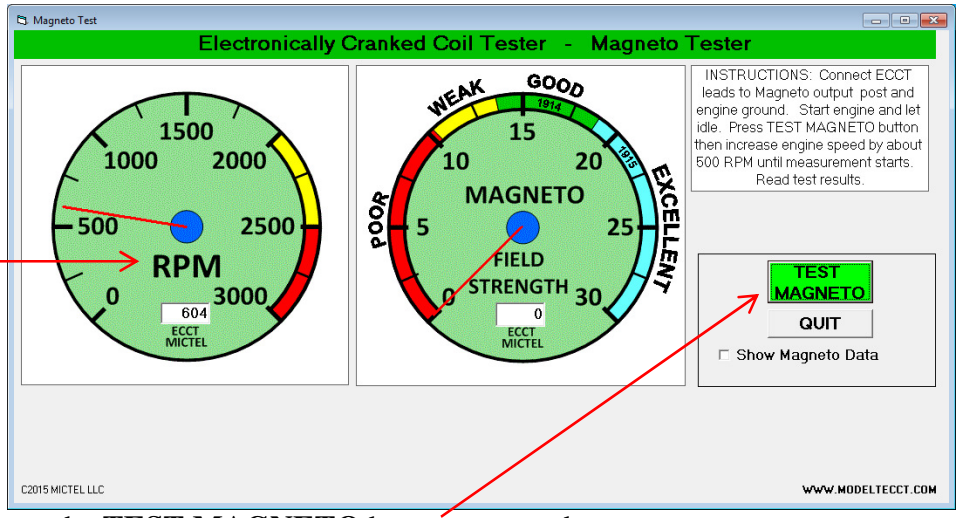
The ECCT Magneto test is run by following these steps:

1. Plug the 2.1mm x 5.5mm Magneto test cable into the Magneto input on the ECCT.
2. Connect the Red alligator clip to the Magneto output post and the Black alligator clip to **Engine Ground or Frame** (Do **NOT** connect the ground clip to the car body which can is insulated from engine/magneto ground).
3. Connect the ECCT up to the PC or Laptop using a USB mini-A/B to USB A cable
4. Connect ECCT 12VDC power and Power up the ECCT by pressing and holding the SELECT (Power) button for 5 seconds
5. Run the Advanced Features Software on the PC (Start->Programs->ECCT)
6. Start the Model T engine to be tested **on Battery** and let idle (500 – 700 RPM)
7. Click on the **MAGNETO TEST** button to open the magneto test window.



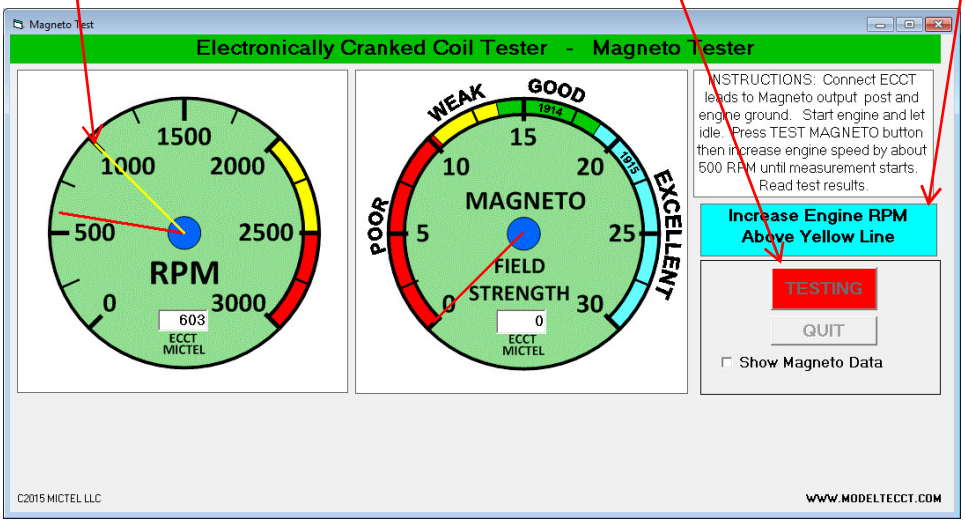
8. The Magneto Test window appears and starts monitoring the Magneto output

Engine tachometer displays engine RPM

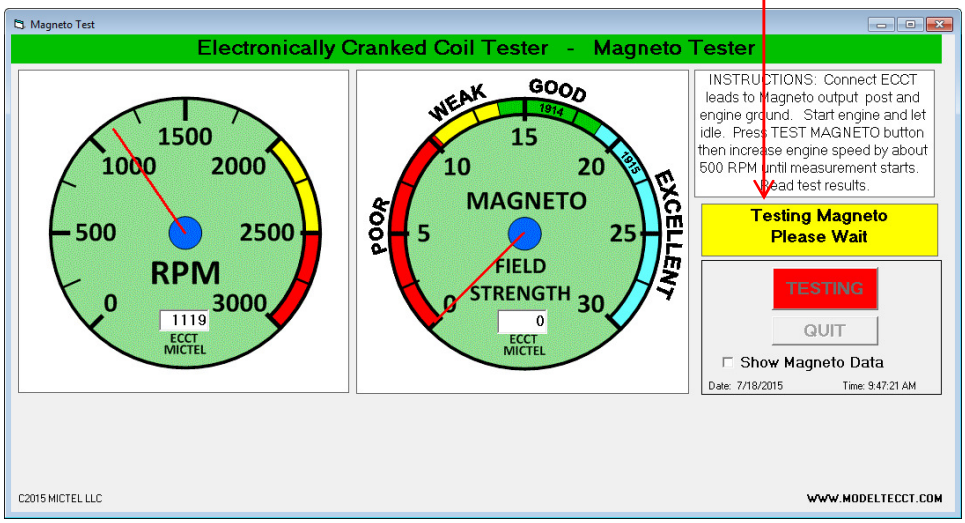


9. Click on the **TEST MAGNETO** button to start the magneto test.

10. The **MAGNETO TEST** button changes to **TESTING** in red indicting testing is in progress. **Increase the engine RPM** (about 500 RPM) as prompted in Blue box. A Yellow line appears on the tachometer to indicate about how high to raise the RPM.

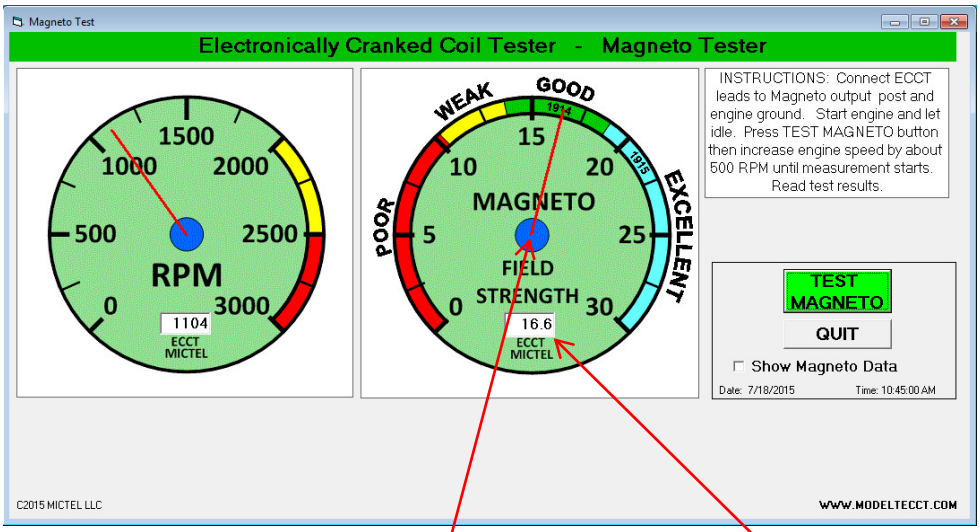


11. The message changes to "**Testing Magneto – Please Wait**" in Yellow when the engine RPM has been raised enough to complete the magneto test. The yellow line on the tach disappears. **STOP** adjusting engine speed at this point and let the magneto test finish (~4 sec).



IMPORTANT! - Raising the engine speed to higher RPM will not improve the Magneto test results, in fact, there may be a slight reduction in magnetic field strength indication due to the weakly non-linear behavior of the magneto output. The engine RPM only need be raised just above the tachometer yellow line until the test starts and the status message changes to "**Testing Magneto – Please Wait**" in yellow.

12. The Magneto test is complete and the **TEST MAGNETO** button returns to Green.



Magneto Test Results

The Magneto Magnetic Field Strength Factor will be displayed numerically and by the Magneto Field Strength meter pointer. The scale around the meter perimeter provides indication of magneto field strength from POOR to EXCELLENT. The 1914 and 1915 markings correspond to the legacy St. Louis Magneto Tester meter scale for reference.

Summary of the Magneto test results:

Magneto Strength	Field Strength Value	Comment
Excellent	18.75-30.0	Magneto strength sufficient to properly operate coils
Good	13.75-18.75	Magneto strength sufficient to properly operate coils
Weak	10.5-13.75	Coil operation possible but may be marginal on magneto
Poor	0-10.5	Coil operation may not be possible on magneto

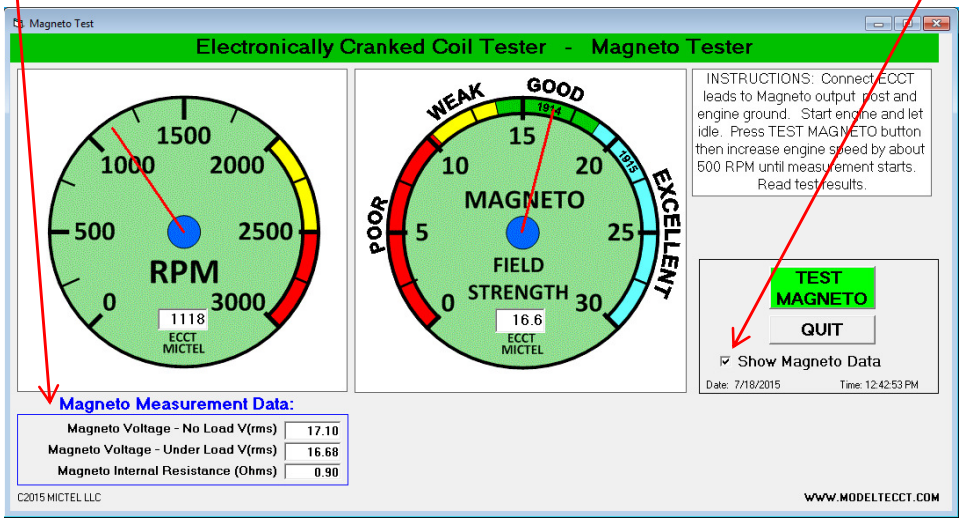
IMPORTANT: Engine must be operating on battery during magneto testing

IMPORTANT: Check test cable connections to the magneto post and unpainted engine ground are good and tight if the Magneto Strength test result is Weak or Poor.

IMORTANT: Few, if any, Model T Magnetos will register in the EXCELLENT region. Magnetic Field Strength Factor of GOOD is sufficient to properly operate Model T coils.

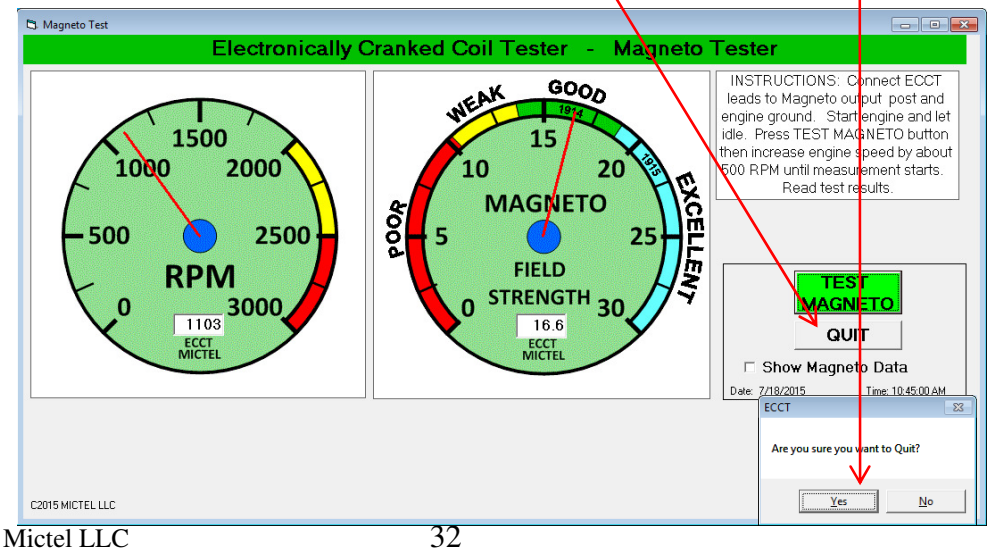
IMORTANT: Only use the supplied magneto test cable when testing the magneto. Using longer cable lengths or different gauge wire may cause inaccurate magneto internal resistance measurements.

The **ECCT Advanced Features Software** will display the measured magneto output voltage under load and no load conditions as well as the magneto internal resistance while the engine is running by clicking on the **Show Magneto Data** check box.



IMPORTANT: The magneto internal resistance is important because high internal resistance can result in significant voltage drop that prevents proper Model T coil operation. Knowing the magneto internal resistance can be a useful troubleshooting tool since it includes the magneto post contact resistance. The ECCT provides an alert when the magneto internal resistance is above the normal range (>2 Ohms) signaling it is appropriate to remove and inspect the magneto post for proper contact with the magneto coil. Unnecessary removal of the magneto post is avoided knowing the magneto internal resistance is within the normal range. A POOR or WEAK magneto magnetic field strength reading with normal internal resistance suggests the problem is elsewhere such as weak magnets or damaged magneto coil.

13. The ECCT software will resume monitoring the Magneto output and display engine RPM on the tachometer. Click on the **QUIT** button and answer **YES** to exit the program.



7 Portable Operation

7.1 Battery Operation

You can test and adjust Model T coils anytime, anywhere with the ECCT rechargeable battery option. The rechargeable battery is affixed to the rear of the ECCT housing using hook/loop fastener that permits easy installation for portable operation and easy removal for bench operation. The battery plug is inserted into the ECCT 12VDC power jack in place of the AC adapter plug.

Figure 23 - ECCT Battery Operation

7.2 Battery Re-charging

Recharging the ECCT battery requires a balance charger. The balance charger is powered by the ECCT AC power adapter. Simply plug the battery balance plug into the corresponding charger port to safely recharge the ECCT battery.

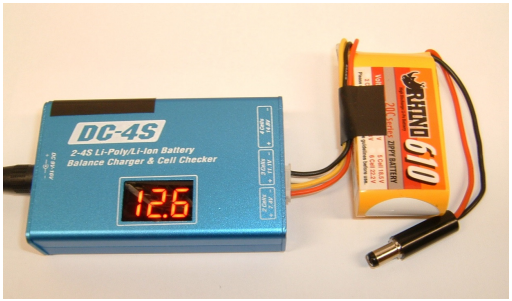


Figure 24 - ECCT Battery Re-charging

7.3 Car Adapter

A cigarette lighter power cable is available that enables the ECCT to be powered and operated from any car equipped with a 12VDC cigarette lighter jack.

8 Glossary

A – Amperes; unit of measure of electrical current
Capacitor – An electrical component connected across the coil point contacts inside the coil unit used to increase spark performance and limit arcing across the point contacts reducing wear.
Condenser – An old name for a Capacitor.
DC – Direct Current
Dwell Time to Fire - The time required for the coil to build up current sufficient to pull open the points causing the spark plug to fire a spark.
ECCT – Electronically Cranked Coil Tester
LED – Light Emitting Diode; indicator light produced by a small solid state device much more efficient than incandescent bulbs consuming less power and generating less heat.
RMS – Root Mean Square; This is the effective value in the sense of the value of the direct current (DC) that would produce the same power dissipation in a resistive load.
RPM – Revolutions Per Minute
Timing Error – The position of the crank shaft when the coil unit causes the spark plug to spark relative to the nominal firing position measured in degrees with engine operating at 1,000 RPM. The timing error will be double the displayed value when the engine is operating at 2,000 RPM.
uH – microHenry; unit of measure of an inductor (primary and secondary windings of a coil).
uF – microFarad; unit of measure of a capacitor
V – Volt; unit of measure of electrical potential

9 Maintenance

The ECCT requires no maintenance. There are no user serviceable parts inside the ECCT. Malfunctioning units should be returned to the manufacture for repair.

10 Warranty

The ECCT is warranted against defects due to faulty workmanship or materials for a period of one year from the date of purchase. Units found to be defective during the warranty period will be repaired or replaced, at the discretion of the manufacturer, without charge, excluding shipping. Proof of purchase and a Return Authorization are required.

11 Safety Warning

It is the user's responsibility to verify proper engine ignition timing and ensure proper timing lever position before attempting to hand crank a Model T engine. Failure to verify proper ignition timing may result in serious personal injury or death. Ignition coils produce high voltages capable of causing personal injury or death. Do NOT touch coil unit electrical contacts, points, or test fixture spark gap when coil test or multi-spark test is in progress. Do NOT remove the clear protective safety shield covering the spark gap. Do NOT operate the ECCT with clear safety shield covering the spark gap removed.

Make sure there is no source of combustible fluid or gas anywhere near the ECCT that can be ignited by electrical spark during operation of the ECCT. **User assumes all risks and liabilities.**