Model T Ignition System Performance Comparison

By Tom Graham and Charlie Volkening

The dyno testing conducted during the 2011 Minnesota Tour generated considerable interest. A total of 83 cars were tested representing a broad range of engine and drive train configurations producing from 8.83 to 50.27 horse power at the wheels as documented in a previous article[1]. There were many good follow up comments and questions but one in particular caught my interest. What is the performance difference of the various Model T ignition systems with all else being equal? The various ignition methods summarized in Table 1 for example.

Configuration	Mag	6V Battery	12V Battery
Stock coils New day Timer	X		
Stock coils New day Timer		X	
Stock coils New day Timer			X
Distributor & Coil			X
Stock coils E-Timer		X	
Stock coils E-Timer			X

Table 1. Model T Engine Ignition Methods

An engine rebuild had already been planned with fairly stock configuration except for Z head and thought it would be a reasonable candidate for such a performance comparison. The engine had aluminum pistons .020 over, stock cam, stock reground crank, cast iron intake, stock exhaust with muffler, new valve seats with Chevy valves with a stock NH carburetor and Z head. Cooling was accomplished with a larger than normal radiator to keep the engine at a normal and steady temperature.

Coils

The same coils were used for all tests except the distributor test. The coils were Ford stock with K&W points and rebuilt by Ron Paterson and properly adjusted on a Hand Cranked Coil Tester (HCCT).

Magneto

The magneto coil ring was rebuilt by Wally Szumowski and magnets were recharged by myself. The voltage output was 26 Volts @ 800 RPM when loaded with the standard 1156 bulb.

Stock Timer

The timer selected was a NOS New Day and was tested for individual contact timing. (Contact every 90 degrees of camshaft rotation or 180 degree of crankshaft rotation) Timing was found to be within 2 degrees of each of the 4 poles. In past testing it has been found that contact timing in some of the new current production timers has been off as much as 13 degrees on one or more of the poles.

Distributor/Coil

The distributor was a Bosch 009 clip-on current production unit. The ignition coil was a standard 12 Volt unit purchased from the local auto store with a minimum of 3.0 ohms primary coil resistance. The distributor did have a centrifugal advance, however, testing was conducted by manually adjusting timing for optimal torque at each engine RPM so automatic advance had no impact on performance.

E-Timer

The E-Timer was provided by Mike Kossor and was operated in the manual timing mode for both 6VDC and 12VDC tests. The same coils were used with the E-Timer but the coil points were bypassed/shorted with jumpers.

Test Platform

The objective of the test was to focus on engine performance exclusive from the drive train so the test platform was an engine dynamometer (Dyno) as opposed to chassis dyno used for the Minnesota Tour testing. The same Eddy currant brake was moved from the chassis dyno used in Minnesota to the engine dyno in our shop.

Test Plan

The test plan was fairly simple. Operate the engine at Wide Open Throttle (WOT) then adjust the timing and fuel mixture for optimal engine torque at several defined engine speeds set by engine load provided by the Dyno. Two gauges were read for each recording, one being engine RPM, the other a weight gauge with a scale of 0-150# exactly 1 foot from the centerline of the brake giving a reading in foot pounds. Each gauge was verified for accuracy. Individual readings were taken only after the engine maintained load and speed for a few seconds eliminating inconsistency by inertia or surge reads. Record the results then repeat the test procedure for each of the engine RPM settings. Lastly, repeat the process for each of the various ignition system methods.

It was decided to limit test data to the range of 800 to 2000 RPM. Our test was cut off at 800 RPM because when running a model t engine at full throttle and full load at such a low speed, the engine becomes a bit unstable and the readings become unreliable. On the high end, we felt that 2000 rpm was high enough for the average model t on the road today.

Engine Performance Data

The resulting data taken is tabulated in Tables 2 through 7.

Engine RPM'S	Foot pounds of torque	Horse power
800	94	14.318
1000	98	18.660
1200	94	21.478
1400	86	22.925
1600	72	21.935
1800	60	22.620
2000	48	18.279

Table 2 Stock Coils, New Day Timer Mag

Engine RPM'S	Foot pounds of torque	Horse power
800	92	14.014
1000	92	17.517
1200	88	20.107
1400	80	21.325
1600	58	17.669
1800	42	14.395
2000	16	6.093

Table 3 Stock Coils, New Day Timer, 6VDC

Engine RPM'S	Foot pounds of torque	Horse power
800	92	14.014
1000	92	17.517
1200	92	21.021
1400	84	22.391
1600	76	23.153
1800	64	21.935
2000	58	22.087

Table 4 Stock Coils, New Day Timer, 12VDC

Engine RPM'S	Foot pounds of torque	Horse power
800	94	14.318
1000	96	18.279
1200	95	21.706
1400	88	23.458
1600	76	23.153
1800	66	22.620
2000	58	22.087

Table 5 Distributor, 12VDC Coil

Engine RPM'S	Foot pounds of torque	Horse power
800	99	15.080
1000	97	18.469
1200	94	21.478
1400	87	23.191
1600	76	23.153
1800	68	23.305
2000	60	22.848

Table 6 Stock Coils, E-Timer, 6VDC

Engine RPM'S	Foot pounds of torque	Horse power
800	98	14.928
1000	96	18.279
1200	92	21.021
1400	87	23.191
1600	76	23.153
1800	70	23.991
2000	61	23.229

Table 7 Stock Coils, E-Timer, 12VDC

Performance Charts

Performance data was plotted on the same chart to provide a visual comparison between the various ignition system methods. Horse power is plotted on chart 1 and torque is plotted on chart 2.

Test Results Summary

All ignition systems preformed fairly well and similar from 800-1400 Rpm except the stock ignition system operating on a 6volt battery. It was down somewhat from the top five. Above 1400 RPM there was more separation in performance. They are as follows. #1 E-timer operating on 12Volts. #2 E-timer operating on 6 Volts. #3 Distributor operating on 12 volts. #4 Stock ignition system operating on 12volts #5 Stock ignition operating on magneto. #6 stock ignition system operating on 6volt battery.

The stock ignition system operating on 6V battery clearly provided the worst performance above 1400 RPM as illustrated in the charts. This is not surprising to anyone who has attempted to operate their stock ignition system on 6V battery.

The poor performance of the stock ignition system operating on 6V is due to timer contact variation during the longer coil dwell time (longer coil charge time ~3.5ms). In other words, a slow charging coil with coil current interruptions caused by timer contact bounce/variability delays coil charging requiring longer time to charge to the same value. Delaying coil charging also delays (retards) ignition timing. The time necessary to charge the coil operating on 12V battery is much faster (about half the time) so effects of timer contact variation on coil charge will not be as significant as demonstrated by the data.

One significant observation not evident from the test data was engine vibration during testing. The engine notably operated much smoother with the E-Timer ignition. Engine torque measurements were much more stable and well controlled compared with the other ignition control methods.

Footnotes:

1. "Follow up on Dyno Testing at the Minnesota Tour", By Tom Graham, Charlie Volkening Model T Times, Sept-Oct 2011s.

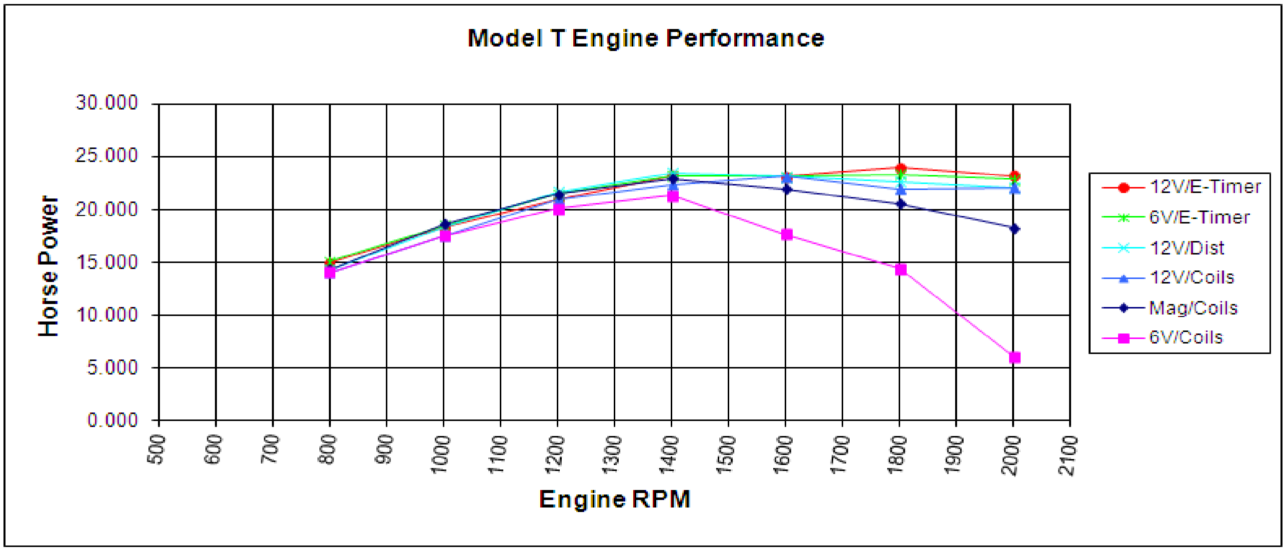

Chart 1 Maximum Horse Power Versus RPM

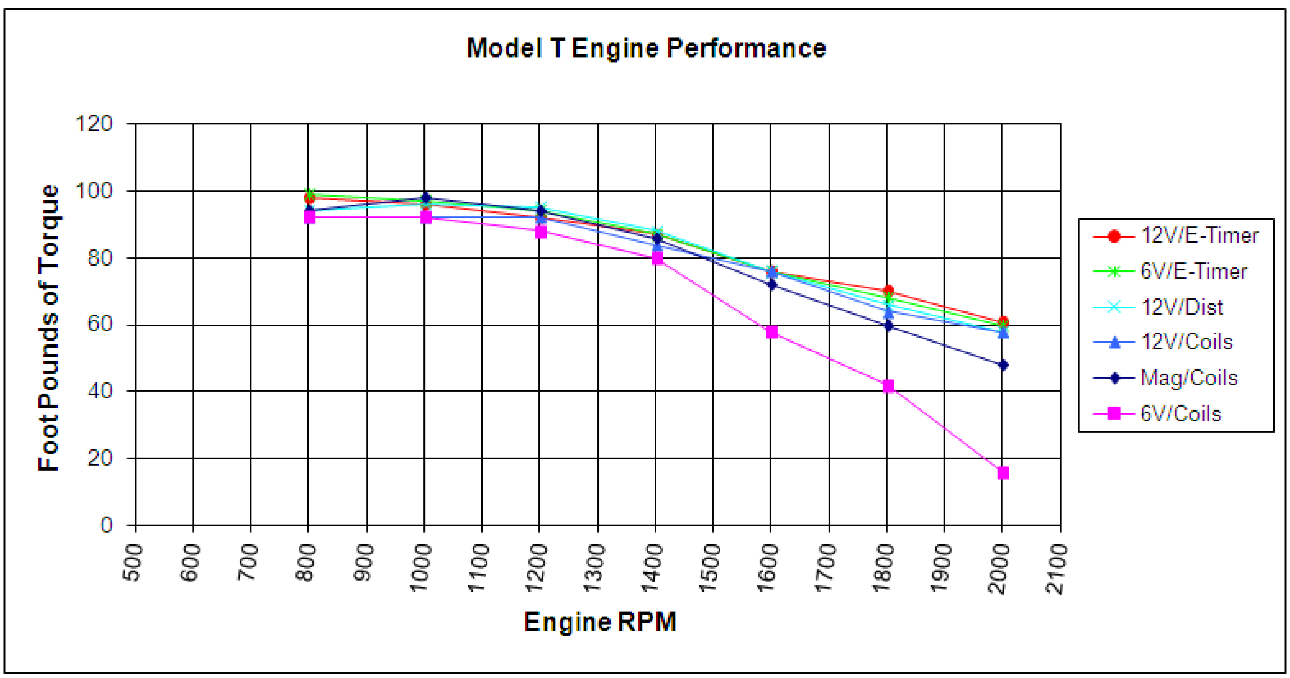

Chart 2 Maximum Torque Versus RPM