

..... IGNITIONS

Flathead engines do not require as much initial advance as OHV engines. This is because a flathead's incoming fuel/air mixture has considerably more turbulence. Which is caused by the many turns and sharp bends the fuel/air mixture makes getting into the combustion area. Consequently the mixture ignites easier and burns more uniformly than an OHV.

***** SPARK PLUGS *****

OIL FOULING PLUGS: For any four stroke engine. Ever had an engine that oil fouled the plugs? Often times you have intentions of rebuilding it, but don't have time right now. Or you've broken rings on a trip and just need to get it home. Here's a trick I learned going in circles in Texas back in '54. Flatheads ruled and they would load up the right bank's plugs because of oil flooding the cylinder walls in the corners. We all ran plugs that were 3 to 4 steps hotter on the right bank, but without a lot of help. The pistons on the right bank were taking a beating on the long straightaways on 1/2 mile tracks from the increased heat (oil burns hotter than gas). A really sharp old timey mechanic I worked with showed me a neat trick. After performing his simple modification, the plugs wouldn't foul no matter what was done to them! He showed me on a plug tester a new plug would break down at less than 140 psi. Any one of these modified plugs fired past 200 psi! And do it in oil, water, gas or any combination thereof!

The plug doesn't need to be new..... just as long as it'll fire under compression (a tester will show a blue spark). I don't even clean them. Heat range doesn't matter either. The ground electrode is the one we'll be messing with. Cut this back far enough so it clears the center electrode after it's bent towards the center electrode. I use a hacksaw to cut the ground electrode, but diagonal cutters and a file have worked in a pinch. Bend the ground electrode so it faces directly at the side of the center electrode. Just be sure there is a gap of about 0.020" minimum. That's all there is to it. A drawback is it's relatively short life. As the electricity arcs, it eats away the ground electrode until the gap gets too wide for the spark to jump. Usually 0.075" or so. Then the plug is junk. The plugs usually last a couple thousand miles on the street.

Story time again: The first time I tried these plugs at the Corpus Christi track, I used a mix of H-10, H-11, and H-12 plugs only because they happened to be in the handful of plugs I grabbed out of the trash barrel. At the track, the other racers wanted to know why the different heat ranges. Seems they'd noticed right away that our engine wasn't blubbering like theirs in and off the banked turns. All of theirs used half of the straightaway before they would clean out. Ours was crisp whenever it was punched. I told them the cylinders had gotten all screwed up and we had to use different heat ranges just to get it to run at all (first liar doesn't have a chance). Then each week I'd mix the plugs and put them in different cylinders. Sure had them going. They didn't find out about the cut plugs until near the end of the next season!

INCREASING PLUG GAP: Increasing gap from 0.025" to 0.045" will increase low end engine torque.

DECREASING PLUG GAP: Decreasing gap from 0.025" to 0.020" will increase upper rpm's.

***** **MALLORY DISTRIBUTORS** *****

Initial advance on Mallory distributors for '48 and earlier V8's is done by rotating the distributor housing in the direction of crankshaft rotation.

MALLORY YH DISTRIBUTOR: The parts number for an older (thin casting) dual point distributor for the 59 series flathead is PN 2571501. Mallory dual point distributors work on either 6V or 12V. The only difference between a 6V and 12V point distributor is the coil's input voltage. The points and condensers are the same for both voltages.

MALLORY SPEC'S: Point gap 0.022" for each set of points. Or 26 degrees for each set of points with 33 degrees total.

MALLORY COIL: Mallory has dual voltage (12/6V) 40,000 volt coils, #29217. I've had no experience with these coils. Mallory does not list a 6V coil. I still use NOS 6V Mallory coils (voltage resistor not used). I get these from Bert's Model "A" Parts in Denver, CO @ 303-293-3673 for about \$24.

MALLORY CONDENSER: Condensers are neither polarity nor voltage sensitive (same for both 6V and 12V). A Mallory Tech Advisor said to go to a condenser with 0.32mfd (micro farad) rating if you're going through a lot of condensers. Most point condensers are rated in the 0.24mfd range (ones for 1968 Chryslers with 318" engines are rated at 0.32mfd).

Currently, Mallory condensers are rated at 0.26mfd. (Ford condensers for the 8BA work even though they're rating is less..... rated from 0.21 to 0.25mfd).

The early Mallory brass shelled condensers are 1-1/16" diameter by 1-7/8" long. These are rated at 0.34mfd (they're stamped on the bottom). They also made one with an aluminum shell rated at 0.25mfd.

An interesting side note: I've noticed my flathead starts faster with a higher rated condenser, but it's harder on the points.

CONDENSER CAPACITANCE AND IT'S AFFECT ON POINTS: When changing to a condenser with a different mfd rating, expect to shorten point life because of increased pitting and burning. If the condenser has too little capacity, the grounded point will have a pit burned into it. If the condenser has too much capacity, the insulated half of the point will have a pit burned into it.

MALLORY PARTS: Cap \$34.50, rotor \$20.50, points \$17.40 each (PN 25042), condenser \$5.70 (PN 400), old style thin casting dual point type distributor were \$225.00. Prices are June 1999. If you're

running one of their dual point distributors, I suggest you stock up on some of these parts since they're becoming scarce due to Mallory being absorbed by another company who is ceasing production of parts!

Stock Ford crab caps fit perfectly and are less money. The same points were used in most early Chev dual point distributors so they're still around. Condensers for a '49 Ford work fine. Rotors for the early style (thin) distributors are the big problem. They have a large insulating disc to prevent shorting to the shaft. However, a rotor for the newer style (thick) Mallory distributors work after a few simple modifications. Measure the depth of the early rotor and grind off the excess of the newer rotor. Put the insulating disc off the early (thin) rotor on the modified newer (thick) rotor using some silicone.

MALLORY YH ADVANCE LIMIT ADJUSTING: The YH distributor is for the '42-'48 flathead. The number of degrees of centrifugal weight advance (often called mechanical advance) is adjusted by rotating the advance plate which is directly beneath the breaker plate. Place the distributor in a vise to facilitate work. Remove the breaker plate by first removing the screw and nut holding the incoming low voltage wire from the coil. Then loosen the two screws holding the distributor cap clips. You only need to loosen these about two turns. Lift out the breaker plate intact. Now the adjustment plate is visible and is what you're looking for. It has two elongated slots with a vertical tab sticking out of each one. Also note the two elongated slots are different in length. Now position the distributor in the vise with the flat side (indexes the rotor) of the distributor shaft faces you. THIS IS VERY IMPORTANT as it positions the two elongated slots in their correct locations for setting purposes. Next is to determine which direction your distributor turns. On '48 and all earlier front mount distributors, the shaft rotates counter clockwise looking down on at the top of the shaft. With this rotation, counter clockwise, you set ONLY the gap on the LEFT side as you're looking at the flat side of the shaft. Note the other gap on the right side is elongated more than the one on the left. This is used only when setting the gap on a distributor which rotates clockwise and has nothing to do with the one we're discussing here.

Loosen the two Torx head screws about a turn or so to permit moving the vertical tabs. Notice they have elongated slots under them. These Torx screws tighten to hold the adjusting plate to the advance plate. When loose, they permit the plate to be rotated to set the gap between the tab and the end of the elongated slot in the adjusting plate. This gap determines the amount of mechanical advance. Select the amount of advance you want according to the following table.....

16 degrees gap is 0.144"
18 degrees gap is 0.162"
20 degrees gap is 0.181"
22 degrees gap is 0.201"

Or you can pop for your very own set of Mallory adjusting keys for about \$35. Your choice.

This gap is pretty narrow and the usual feeler gauge is too thick. (a side note: When BillB and I did his, we used an allen head wrench with the right thickness since a narrow feeler gauge wasn't available.) Put the feeler gauge (or allen head wrench) in the elongated slot and push the vertical tab firmly (clockwise) so it presses the feeler gauge hard against the upper end of the elongated slot. Maintain this pressure and tighten the nearest Torx headed screw. Then tighten the other Torx screw without trying to set the gap on the right side. It will NOT be the same as the gap on the left side. Remember, it's used only when the distributor rotates clockwise. So all you have to do is tighten it... my kind of work!

Reassemble everything and road test it. Cruise it along at a steady 35 mph in high gear. Floor it to about 50 mph. If it pings (detonation), decrease the amount of advance two degrees and road test it again. If it doesn't ping. increase the amount of advance two degrees and road test it again. Ideally you'd like it to ping exactly two times when you first punch it, but it takes too much dinking around to get this.

Remember... the more advance (without pinging) the more hp, better performance, and better gas mileage.

MALLORY DIST. SPRINGS: Their spring/advance kit comes with 9 springs: 1 Purple, 2 Pink, 2 Gray, 2 Brown, and 2 Orange.

The Mallory distributors for the 59 series (Mallory YH distributor) flathead come with 1 purple and 1 brown spring.

The purple spring is termed two stage because the slope of it's advance curve changes about 1500 rpm. If a purple spring is not used, the distributor single stages and will have erratic performance at low RPM. Note that a single stage setup can have different colored springs, but NOT a purple one. The purple spring is loose when installed and it doesn't become a primary factor until about 1500 RPM. Full advance should be no later than 3500 RPM for good top end power.

As stated earlier, Mallory delivered these YH distributors with a purple and brown spring. I retain the purple spring, but change the brown spring to an orange spring (for the 5000' altitude I live in). This starts advance about 200 RPM sooner (@800 RPM) and reaches maximum advance at a higher RPM than the purple/brown combination.

MALLORY 12V UNILITE DISTRIBUTORS: Mallory is aware of voltage spikes and their destruction of electronic distributors. They have a filter (part #293521) to prevent these voltage spikes from getting into the electronics. An electronic whiz I know says the use of a wire high tension coil conductor on electronic distributors will injure/destroy most electronic ignitions... use a carbon/graphite for the coil wire. This is what Petronix now says to use with their electronic distributors..... after I went through about a half dozen of these in a 12 month period! And no, I don't use electronic distributors. I want to be able to repair a distributor on the road rather than call for the local "Happy Hooker" tow truck.

***** **STOCK DISTRIBUTORS** *****

EARLY MODEL FRONT MOUNTED DISTRIBUTORS: All of the '48 and older Ford distributors are removed from the engine whenever work is required.... even something as simple as adjusting their points. The distributors are identified by their case (model number). Model 40A was used on '34 Fords. Model 40B was used on '35 Fords. Model 68 was introduced on '36 Fords. Ford continued using the Model 68 case from '36 through '41. But they made a major internal change beginning in '37. A different breaker plate was introduced in '37 to give more degrees of advance and increase performance. Previous to '37, the breaker plate advance was 15-17 degrees. In '37 the new breaker plate increased advance to 21-24 degrees and is usually referred to as an 11A breaker plate. Ford used the 11A breaker plate through '48. Distributor case identification numbers were changed in '42 to 21A and again in '46 to 59A.

The model 68 distributor is often referred to as the helmet type because of it's appearance. All point adjusting is done through the two side distributor cap openings.... which is a pain. The model 68 breaker plate assembly was used thru '36. Spec's are 15-17 degrees mechanical advance at 3000 rpm. Initial advance spec was 4 degrees BTDC (Before Top Dead Center). If setting points using a feeler gauge, set new points at 0.015" and used points at 0.013". Condensers are being repo'd in the USA for these distributors. The plug wires are bent and trained around the inside of the two caps to get to their correct terminal. Then the caps are assembled. Hopefully, the plug wires stay plugged in, but it's impossible to verify because of the design. If they didn't you'll have a miss and you'll get to take it apart again. Bundled wires can cause cross firing. Should a rotor or points fail, the distributor has to be removed and torn down.

From '37 thru '41, this same helmet type design was continued except it now used the new 11A breaker plate assembly. Their identification number was changed to 11A. The new breaker plate assembly has a much better ignition curve with more advance and is preferred over a model 68. Point adjusting is done through the side openings. Spec's for these breaker plates are 21-24 degrees mechanical advance at 3450 rpm. Initial advance specification remains at 4 degrees BTDC. If setting points using a feeler gauge, set new points at 0.015" and used points at 0.013". The plug wires in the caps have the same problems as the Model 68 distributors. Like the Model 68, if the points or rotor fail the distributor has to be removed and torn down.

In '42, Ford changed the distributor housing design and used an identification number of 21A. It no longer used the same housing as the previous helmet models. Instead the housing is flat with the point adjustment/replacement completely exposed, and easy to work on, once the single front mounted distributor cap is removed. It used the same 11A breaker plate. However, the distributor cap is unique in that it resembles a crab.... hence it's nickname "crab distributor". The rotor is unique as well as are the distributor cap holding clips. This is the most widely used early Ford distributor since it's easy to change and adjust points. And one can easily see and/or feel if the plug wires are snug in their distributor cap terminals. Spec's are the same as for all 11A breaker plates..... 21-24 degrees mechanical

advance at 3450 rpm and 4 degrees BTDC initial advance. If setting points using a feeler gauge, set new points at 0.015" and used points at 0.013".

From '46 thru '48, Ford retained the exact same distributor as in '42, but changed the identification number to 59A. However, the cap, rotor, and the cap clips were changed for some reason or another (they returned to one of Ford's poorer ideas). The distributor cap has two "ears" at the top with a single hoop type cap clip. Each ear holds the wires from the ear's side of the engine. Spec's are the same as previous 11A breaker plates..... 21-24 degrees mechanical advance at 3450 rpm and 4 degrees BTDC initial advance. New points spec's are 0.015" and used points are 0.013".

DEGREES OF ADVANCE ON 11A DISTRIBUTOR PLATES: On 11A breaker plate distributors, the stock specification for the mechanical advance begins at 400 rpm. Keep this 400 rpm in mind when you're setting the timing with the engine running. Maximum total advance (initial plus centrifugal) is 24 degrees at 3000 rpm (includes 4 degrees initial advance). All spec's are crankshaft degrees.

INITIAL ADVANCE SPEC'S: Ford spec's call for an initial (or static as it's sometimes called) advance of 4 degrees BTDC at idle (less than 400 rpm since the mechanical advance begins).

DIRECTION FOR ADVANCING TIMING: Initial advance of a distributor mounted directly to the front of the cam ('48 and earlier V8's) is done by rotating the plate lockdown screw the same direction as crankshaft rotation. Ford spec's say each mark on all early distributor plates is 2 degrees.

VACUUM ADVANCE: For '48 and earlier distributors. Engine vacuum operates a "brake" to limit the amount of advance generated by the centrifugal weights. When engine vacuum drops, the vacuum brake spring overcomes the vacuum which is holding the "brake" away from the rotating centrifugal advance mechanism. This spring pushes the brake against the centrifugal weight advance mechanism. As can be visualized, the stronger the spring, the sooner the brake is activated and the sooner the centrifugal advance mechanism stops any further advance. This effectively limits the amount of advance. This is adjusted by means of an adjusting screw and it's locking nut located in the distributor's tower. To increase the amount of advance, decrease the spring tension by unscrewing the adjusting screw. After setting the timing, any pinging (detonation) is eliminated by screwing this adjustment downward.

'49-'53 DISTRIBUTORS: These use a balance between the carb venturi velocity (a vacuum) and a coiled type tension spring to advance and retard the timing. Only carburetor venturi velocity is connected to the distributor's vacuum diaphragm.

A single vacuum line runs from the single carburetor to the sealed vacuum diaphragm housing located on the distributor. This diaphragm attaches to the distributor breaker plate by means of linkage. Coiled

tension springs are also connected to the breaker plate and are there to resist vacuum force to retard the spark advance.

When carburetor velocity (vacuum) exerts enough force to the diaphragm to overcome the spring tension, it causes the diaphragm to operate which moves the breaker plate and increases the timing. The carburetor's vacuum orifice (in the throttle bores in the base of the carburetor) is almost in line with the carburetor's throttle plates when the throttle is closed..... so the throttle plates must be partially open to uncover this orifice.

At idle or low speeds the venturi velocity is very low and cannot make the diaphragm operate and the springs rule and retard the spark. But at increased engine speeds there is considerable venturi velocity which overcomes the springs and advances the spark.

Increasing the rate of advance requires springs with less tension. Reducing the maximum amount of advance can be done by installing an eccentric washer on the breaker plate to limit the amount of plate travel. Location of this eccentric washer should be adjacent to the bottom of the condenser

***** **MISC. IGNITION** *****

FORD VOLTAGE RESISTORS: These consist of a winding of a high resistance (nichrome) wire wound around a porcelain type insulator. This reduces the incoming 6 volts to between 3 and 4-1/2 volts (early Ford literature states it's reduced to 4-1/2 volts). The thinking at time was this decrease voltage would increase the life of the distributor's points by reducing arcing. And with the difficulty in replacing the points in these front mount distributors, it was a good idea. But it required a special 4-1/2 volt coil.

Bypassing, or removing, this resistor from the circuit, overloads the internally wound primary circuit in the coil and causes premature coil failure. However, it's quite common to bypass these resistors when racing (circle track is a good example) to increase the spark at the spark plugs. Because the car is moving (more air circulation around the coil) and combined with less idling, the coils were less prone to overheating and melting their tar insulation. They usually survived a couple of seasons of racing.

When the '49 was introduced, Ford discontinued the voltage resistor for their newly designed ignition system and began using coils rated at 6 volts.

SUN DISTRIBUTOR MACHINES PARTS AND SERVICE: Mark Saunders in Grand Rapids, Michigan @ 616-878-9734 restores and sells parts.

ELECTRONIC DISTRIBUTORS: I neither run nor recommend these since I experienced failures with several 6V Petronix units on my flathead in less than one year. **Flathead Jack**, in his new parts book, states he has carbon fiber core coil wires in stock that will protect electronic distributors. If you're running an electronic ignition, I'd sure

investigate further into these. (Sure beats having the ignition crap out in the middle of rural Kansas on a Sunday morning in a 3.20" downpour..... been there 'n' done that in my roadster and no side curtains! I've been drier in the middle of a swimming pool!)

SETTING INITIAL TIMING USING A VACUUM GAUGE: I use this method on all 4 stroke engines (OHV and flathead). Vacuum varies with the amount of advance... nothing new here. Vacuum also varies from engine to engine even though they're manufactured by the same company. It'll vary as modifications are made and according to the condition of the engine and quality of gas. We can use this vacuum reading to set the initial timing quite accurately.

Connect a vacuum gauge to the intake manifold vacuum (not to the carburetor vacuum). Watch the vacuum reading and advance or retard the distributor to obtain the maximum vacuum reading. When it shows the maximum amount of vacuum, retard the distributor until vacuum drops 1" from the maximum reading. Tighten the adjusting screw. This is the maximum initial timing the particular engine and it's various engine modifications will tolerate.

SETTING INITIAL TIMING ON 59AB AND EARLIER DISTRIBUTORS USING A STRAIGHT EDGE: The following works, but it's a mite confusing until a person gets the hang of it.

Mechanically setting a two hole Ford/Merc distributor. Remove the distributor's condenser. Set the point gap. Connect one lead of a battery powered test light to the terminal for the small coil wire. Ground the other lead of the test light to the distributor case. Measure 3/8" from the topmost edge of the driver's side distributor's mounting bolt hole to a straight edge held against the wide side of the distributor's drive offset tang. This should position the tang so it's at the 10:00-4:00 position with the wide side being closest to the coil wire terminal. Rotate the timing adjusting screw slightly until the test light just flickers without moving the distributor drive. The driver's side breaker points should just be breaking contact (starting to open). Remember, only the driver's side points control the timing. Back off the distributor drive (counterclockwise) and verify it is just breaking open when the tangs 3/8" measurement is reached. Adjust as necessary. This is 4 degrees BTDC. Always rotate the distributor drive clockwise as viewed facing the back of the distributor. (Told you it was confusing... or did I just make it that way?)

SETTING TIMING USING #1 CYLINDER: This is only if you've already established #1 piston's TDC. With #1 piston at TDC, remove #1 plug wire and position it so you'll be able to see a spark jump. I suggest you remove ALL of the plug wires since you'll have your hand in the fan area. Turn ignition key on. Watch for spark jump as you advance (move the advance plate in direction of crankshaft rotation) the distributor by moving the advance plate screw. When the spark jumps, it will then be timed to fire at TDC. On all '48 and earlier front mounted distributors, advance is always in the direction of crankshaft rotation. Ford spec's say each mark on the distributor plate is two degrees. Set advance at 4 degrees (two marks) initial advance.

DEGREES OF INITIAL ADVANCE: From JWL on 11/22/00. "Most modified flathead engines perform best with between 4 and 8 degrees initial advance and a total of 22 to 26 degrees. Light cruising can use up to 30 degrees total. These spec's are at sea level." Thanks to JWL for this tip. People I've talked with say his engines run really hard.

Bob McKay, of Speedway Motors, recommends setting distributors for 22 degrees total advance @ 2500-3000rpm. He says this is the maximum advance and shouldn't be exceeded on street engines.

THE THREE DIFFERENT TYPES OF ADVANCE: Total advance is the total degrees of initial (static) advance, plus the number of degrees of centrifugal weight advance (mechanical), plus the number of degrees of vacuum advance. Initial advance is the amount set by rotating the distributor point plate on 59AB distributors (or the complete distributor on 8BA and most OHV engines). Centrifugal advance is controlled by the distributor's internal weights, springs, and stops. Vacuum advance is controlled by the engines vacuum and a vacuum advance mechanism.

Example: An engine which has 12 degrees static advance, 15 degrees centrifugal advance, and 17 degrees vacuum advance has $12+15+17=44$ degrees total advance.

On '48 and older Ford V8 distributors, there is no vacuum advance per se. Engine vacuum (intake manifold vacuum... not carb vacuum) and a spring control a brake that limits the centrifugal advance mechanism. Some flatheaders disconnect the vacuum line and are happy with the results (the spring pushes the brake against the centrifugal advance mechanism constantly and slows or stops centrifugal advance). I always run with the vacuum connected.

DETERMINING THE DEGREES OF VARIOUS TYPES OF ADVANCE: There are several methods to determine the degrees for each type of advance. The method I use requires the crank pulley be marked off in degrees (or else use a degree wheel) to +10 degrees TDC on flatheads (-10 to +20 on OHV), a dial type power timing light (these have a control on the back of the light to adjust delay in the firing of the strobe light), and a vacuum pump. The dial type timing light gives you the ability to move the strobe timing flashes around without actually changing the timing. The vacuum pump permits you to apply measured vacuum to the distributor vacuum control. Using these tools and common sense we can use the degrees marked on the crank pulley to accurately measure and determine each of the distributor's different advances. The following example is for an engine with a vacuum advance system like an OHV, but is also used on pre-'49 Ford engines by ignoring vacuum advance.

With the engine idling and the timing light hooked up, set the dial on the timing light to 0 degrees. Point the strobed beam at the timing mark on the crank pulley (we've all done this on various engines). The number of degrees on the crank pulley is the number of degrees of initial advance... let's say it's 8 degrees for example purposes. With the strobe light still flashing on the crank pulley, increase the engine speed until the timing mark on the crank pulley

ceases to show any increase. Now, without changing engine rpm, turn the dial on the back of the timing light until the strobe light shows it firing at TDC. Check the number on the rear dial of the timing light. This is the number of degrees of centrifugal advance less 8 degrees of static advance. Let's say the dial was rotated 22 degrees. The distributor has 14 degrees centrifugal advance (22 less 8 is 14 degrees).

Mallory and stock Ford pre-'49 distributors do not have a vacuum advance and the following is not needed. With no vacuum advance to be concerned with, the total advance is initial plus centrifugal. Or in the preceding example, 22 total degrees advance.

On engines with vacuum advance (and most OHV engines), we can determine exactly how many degrees the vacuum advance makes easily the vacuum pump and timing light. Let the engine return to idle and connect a vacuum pump to the distributor advance diaphragm fitting. Adjust the dial on the timing light so the timing marks show it's firing at 0 degrees. With the engine idling and with the strobe light flashing on 0 degrees on the crankshaft, pump the vacuum pump to around 20 inches Mercury (Hg) or whatever vacuum your engine has at your altitude. This will operate the vacuum advance fully. The vacuum needle has to remain at 20 in/Hg while you rotate the dial on the timing light to make the strobe light show it's firing at 0 degrees. Read the dial. This is the amount of vacuum advance. Let's say it's 22 degrees. Total advance for this particular engine and distributor is:

8 degrees + 14 degrees + 22 degrees = 44 degrees total.

Let's use a Ford OHV 289 engine for further talking. They like not more than 35-36 degrees advance without the vacuum advance. When the total advance (including vacuum advance) exceeds 36 degrees, it's not a cause for worry because vacuum advance only occurs when high vacuum conditions exist.... like under de-acceleration or cruising..... and won't cause detonation or pinging. Vacuum advance mostly affects only gas mileage. Most OHV Ford small blocks run great with 55-58 degrees total advance.

DETONATION OR PINGING: Detonation is the uncontrolled burning of fuel mixture during combustion. It can lead to pre-ignition, "running on", burned pistons, cracked piston skirts, deformed piston ring grooves, broken ring lands, broken rings, and engine over heating. At times it's hard to hear light detonation due to road noise etc.(and my old age). However, detonation will leave its mark on the inside of the spark plugs. This appears as a dark brownish colored ring around the inside porcelain. It'll be located about 2/3 of the way down the inside of the shell. Flatheads will usually ping after being souped up. If severe, it'll be heard during acceleration above 35 mph in high gear. Richening the fuel mixture, increasing the gasoline's octane, lowering the compression ratio, retarding the timing, and/or changing to colder plugs will eliminate pinging.

On stock 59AB distributors: Increasing the vacuum brake setting drastically (screw it nearly all the way down) will usually eliminate pinging with an accompanying sacrifice in performance and gas mileage. This restricts the centrifugal advance. I prefer to restrict the amount of centrifugal advance on these early distributors by changing

springs and/or altering the stops in the distributor. This requires a distributor machine to get accurate results. Most of these mechanisms have become worn out over the years and permit excessive advance.

On Mallory distributors, they use adjustable stops to limit the amount of centrifugal advance in addition to springs with different tensions. These are a breeze to set without the need for special equipment. This is discussed earlier in the Mallory section.

SETUP TO USE A TIMING LIGHT ON '48 AND EARLIER: I establish and mark #1 piston's TDC on the crank pulley during engine rebuild.

Make a permanent pointer and attach it securely to a right side water pump bolt. Locate the tip of this pointer close to the crankshaft pulley sheave. Keep in mind when making the pointer and determining it's location, it has to be visible when the engine is in the car. This is tough in some of the deeper engine bays like a '37 Ford.

Establish #1 cylinder TDC (Top Dead Center). Install #1 piston and bolt a piece of steel strap across the top of #1 cylinder. Rotate the crank until the piston hits this stop. Mark the position on the crank pulley directly under the pointer using wax pencil or soap stone. Then rotate the engine the opposite direction until the piston again hits the stop. Again mark the position on the crank pulley directly under the pointer using chalk or soap stone. Measure the distance around the pulley between these two marks. Divide this in half and file a notch in the crankshaft pulley sheave (paint it white). Rotate the pulley until the white mark is directly under the pointer. This is #1 TDC. Beginning at this point, file two additional marks (and paint them too) clockwise on the crank pulley at 11/64" intervals. Each mark represents 4 degrees advance. You can now use a timing light to set the initial timing providing you don't move the timing pointer or change pulleys.

TIMING MARKS ON CRANK PULLEYS: Determining spacing around the crank pulley. Measure the outside diameter of the crank pulley. Circumference (C) is the distance around the outside of a circle and is always measured in the same unit (inches) of measure as the diameter (inches). There are 360 degrees in a circle and pi is 3.1416. We need to figure the number of inches in a degree:

$$\text{Circumference} = \frac{(\pi)(\text{diameter in inches})}{360 \text{ degrees}} = \frac{(3.1416)(d)}{360}$$

Assuming a front crank pulley diameter is 5". Then using the formula above:

$$C = \frac{(\pi)(d)}{360} = \frac{(3.1416)(5)}{360} = \frac{15.71}{360} = 0.0436"/\text{degree}$$

Since it's nearly impossible to make accurate marks that close together (using my usual rock and bent screwdriver method), I use the 0.0436"/degree and calculate a distance between marks I can see:

- (5 degrees)(0.0436")= 0.218" or 7/32" between marks.
- Or (4 degrees)(0.0436")= 0.170" or 11/64" between marks.
- Or (3 degrees)(0.0436")= 0.130" or 1/8" between marks.
- Or (2 degrees)(0.0436")= 0.087" or 11/128" between marks.

Mark the pulley with what you figure you can best read starting at TDC. I usually use 4 degrees or 11/64".

***** **COILS** *****

COIL POLARITY: When a coil is connected wrong, the coil's output will be decreased 14% at idle. As rpms are increased, this decreases to 30%. It often results in hard starting and poor engine performance.

Some coils are marked + and - instead of **bat.** and **dist.**

If you're running a positive ground system (like our 6V flatheads came with), the ignition switch to coil wire connects to the - terminal on the coil.

If you're running a negative ground system (like 12V Fords came with), the ignition switch to coil wire connects to the + terminal on the coil.

COIL TESTING USING OHMS: Primary and secondary coil windings have different resistances. These can be tested with some accuracy using a VOM to determine the coil's condition. Each is tested differently.

Primary resistance. Most genuine 6V Ford coils have a primary resistance of 0.7 and 0.8 Ohms. To check the primary resistance of a coil at 75 degrees temperature, connect one lead of a VOM (Voltage/Ohm Meter) to the ignition switch terminal of the coil and the other to the distributor terminal of the coil. Set the selector to ohms (resistance). Read the meter. If this test is not within these limits, the coil is bad or getting weak and needs replacement.

Secondary resistance. Most genuine 6V Ford coils have a secondary resistance of 6500-7500 Ohms. To check the secondary resistance, connect one lead of the VOM to either the distributor or ignition switch terminal. Insert the other lead down inside the coil tower and make contact with the metal in the bottom of the tower. Set the selector to ohms (resistance). Read the meter. If this test is not within these limits, the coil is bad or getting weak and is need of replacing.

Note specifications are for genuine Ford coils only. Each manufacturer has their own values for their coils.

RESISTORS: A resistor with excessive voltage reduction may cause hard starting and/or poor performance. Ford uses a wire type resistor to reduce the voltage to both the coil and distributor to 4.0 Volts. This lower voltage considerably extends point life by reducing arcing when points are opening and closing. (Some old Ford memos say the reduced voltage will have less voltage variation and will, therefore, increase engine performance in the upper rpm's! Doesn't make much sense to me.) Removing the resistor will increase the voltage produced by the coil and it will shorten coil life as well as points.... especially if the ignition switch is left on or the engine is idled for long periods (stop lights and traffic jams). Watch for tar seeping out of the coil. This happens when the coil becomes overheated. It's a sure sign the coil is on it's way to the trash bin.

CURRENT DRAW FOR AFTERMARKET COILS: The current draw of a 6V rated aftermarket coil should be less than 7-8 amps with the engine running (no resistor in the circuit or coil).

CURRENT DRAW FOR STOCK FORD COILS: The current draw for a 4.0V rated coil should be 2.8 amps with the engine running. This is for a stock Ford ignition system using the stock resistor.

***** **CONDENSERS** *****

CONDENSER RELOCATING: Relocating the condenser takes all the fun out of removing or replacing a condenser on a blistering hot stock distributor on a hot day.

Relocating condensers for easier replacement on front mounted distributors with isolated coils ('42-'48 models). Remove the condenser from the distributor and relocate the condenser's lead to the small terminal on the coil that connects to the distributor. Ground the condenser shell by screwing it to the coil mounting bracket. This will receive cooler air than when it was on the front mounted distributor and increase it's life and performance. The increased distance will change the condenser's capacitance slightly, but will not affect point life to any degree that I've been able to determine. Relocating the condenser can also be done to the helmet type distributor with a little thinking and using a condenser with a pig tail (8BA type). This is especially true for Mallory dual point distributors since the condenser on these puppies is located at the very bottom of the front mounted distributor.... which means you have to remove one to replace the condenser.

WEAK OR BAD CONDENSERS: When condensers go bad they will often cause an engine to run poorly when the engine gets up to operating temperature. Usually the coil is blamed when it's the condenser. A new coil may cure the problem, but often it will only be a temporary cure. Try replacing the condenser first.

CONDENSER VOLTAGE/POLARITY: Condensers are neither voltage nor polarity sensitive. This means a condenser for a 12V system (either positive or negative ground) works just fine on a 6V system (either positive or negative ground)..... and vice versa. Just watch the mfd rating of the condenser and you'll be okay.

CONDENSER FAILURES & VOLTAGE SPIKES: High rate of condenser failures can often be traced to voltage spikes. These spikes get inside the condenser and quickly short through the mylar insulation (they used to use wax or oil soaked paper) which separate the turns of foil. This predominantly happens only on engines running 6V generators (not alternators nor 12V generators). The 6V generators will produce voltage spikes in the range of 150-155 volts D-C for a micro-second or so. These can be detected using an oscilloscope. The condenser shell used to be anodized to prevent these voltages from penetrating the shell. But the EPA no longer permits this (big brother protecting us again). Instead the manufacturers are spraying a thin coat of insulation (something that doesn't last long when subjected to stray voltages, engine vibrations, and engine heat).

These voltage spikes can get into other electronics (radios etc.) and cause problems.

However there is a solution. Use a Metal Oxide Varistor (MOV) from an electronic shop. A Harris parts catalog lists them in their ZA series..... part number V68ZA10. It's 14mm in diameter and is smaller than a dime. It has a continuous RMS voltage of 40V and a DC voltage of 68V. Others may work just as well if your supplier doesn't have this exact part. There are two leads. Connect one lead (either one) to the armature post on the generator. The remaining one is grounded by attaching it to a generator through-bolt. I put one of these on my flathead and condenser life went from 400 miles to 20,000 miles! Don't forget voltage spikes are also caused by generators with worn/bad brushes, worn commutators, or poor electrical connections. The MOV works to stop voltage spikes from all of them.

TESTING CONDENSERS: CAUTION: To prevent damaging the Volt-Ohm Meter (VOM) internally always discharge a condenser (by shorting it's wire lead to the condenser's metallic shell) BEFORE connecting either VOM lead to a condenser.

From Fred on the Flathead Forum 6/15/99. "Use an analog type (not digital) volt-ohm-meter (VOM). Set the VOM on its most sensitive continuity setting. Touch the black VOM negative lead to the body and the red VOM positive lead to the wire. The meter needle should quickly show an increase in resistance before dropping back to zero. This indicates a good condenser. If it shows continuity through the condenser, or falls very quickly, the condenser is bad. If you're having trouble only when the engine is up to temperature, heat the condenser with a hair dryer until it's too hot to touch and repeat the test." I use this test frequently. You just have to be fast. If you miss the first part (the needle moves quickly), let the condenser set a minute or so before you try again.

CONDENSER AVAILABILITY AND QUALITY. Condensers are being reproduced in the USA for '32 thru '41 distributors as well as '49 thru '53 models.

Condensers for the '42 thru '48 models are not being made in the USA. These are being made mostly in Argentina and are junk. They're stamped Argentina in very faint gray letters on the butt end of the condenser. Don't waste your money and time on these (I've experienced about 70% failure rate right out of the box!). You're better off to use a USA made condenser for '49 thru '53. With a little thinking you can bolt these up in the stock location. NOS condensers aren't much good either due to their age and being bounced around. Newly manufactured USA condensers are your best bet.

FORD/MERC CONDENSER CAPACITANCE: Stock Ford condensers for '32-'41 are rated at 0.33-0.36 mfd (microfarads). For '42-'48 they're 0.25-0.32 mfd. For '49-'53 they're 0.21-0.25 mfd. (For Mallory condensers, see earlier in this section).