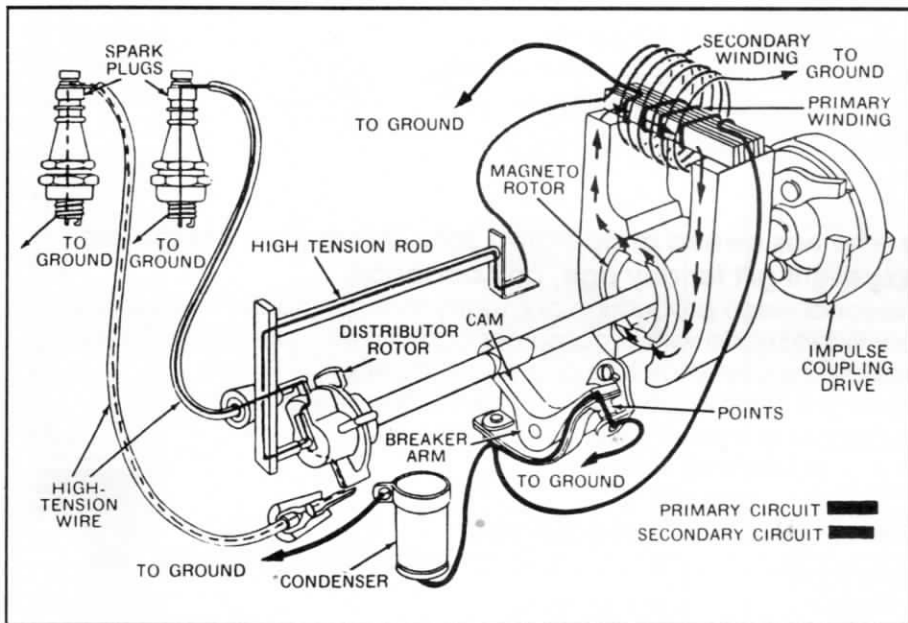


Restoration

Magneto Repair Basics

By Dan Brotzman



The word "magneto", "mag" or "electricity" many times will send a lot of good mechanics in search of something else to work on. With a little basic knowledge, working on electrical components is quite easy and frankly much easier on the back than splitting a tractor, or pulling an axle, or wrestling with tires that are full of fluid. Lets review just a couple electrical basics that allow a magneto to do its job.

- Passing an electrical current through a coil of wire produces a magnetic field. (Remember your science class back in grade school? Boy, was that a long time ago!)

- Putting a metal core in the center of a wire coil will increase the strength of the magnetic field.

- Passing a wire through a magnetic field will produce a voltage and current flow in the wire.

- Collapsing a magnetic field from a coil of heavy wire through a coil of fine wire with more turns of wire will increase the voltage generated.

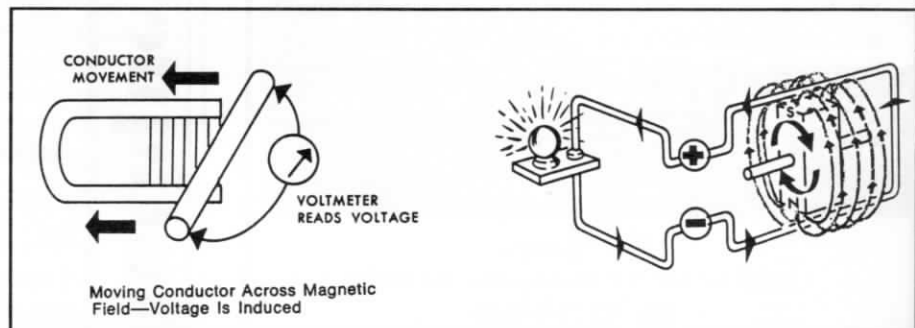
With these four (4) simple facts we can easily understand what makes a magneto work and this will give us a foundation to base some simple diagnostics on. If you are interested in more detail John Deere printed a good text manual #FOS-20 that covers electrical basics, batteries, generators, alternators, starters including series/parallel switches, ignition systems, lighting, and general diagnostics and repair. John Deere also has a very good service manual on electrical systems #SM-2029 that covers magnetos and electrical wiring for two cylinder tractors. Both books

are well worth their purchase cost.

The majority of magnetos for John Deere two cylinder tractors fall into two categories; Wico type X and type C. The Wico AP and Edison-Splitdorf type CD were also used and their basic operating principle is the same as the Wico Type X and C magnetos. There are variations within each type but that is not what we want to look into at this time.

The type C is recognized by the external coil wire going from the top of the magneto to the top center of the distributor cap. The type X is easily recognized by its smooth, rounded distributor cap. The distributor cap for both types attaches to the side of the magneto. A serial number should be attached to the magneto housing and can be very helpful when purchasing parts.

It seems that over the years many people have tinkered with your magneto and for some unknown reason they discard the gaskets or do not bother to replace torn or missing magneto gaskets. The result doesn't take a rocket scientist to figure out. The magneto is not very well protected from the weather so water and moisture find their way inside the magneto and corrode the internal parts, or provide a path for the spark to follow back to the magneto housing.





57N1

Wico Type "C"
Magneto



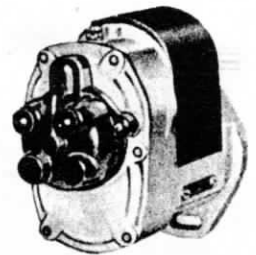
57N4

Wico Type "X"
Magneto



9732

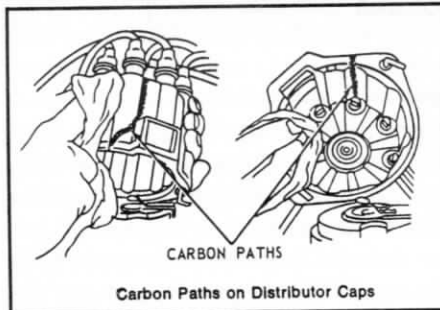
Wico Type "AP"
Magneto



Edison-Splitdorf Type
"CD" Magneto

Testing

When you start to work on a magneto the first check you would probably want to make is to see if the magneto will make a spark. Insert a "U" shaped wire from the spark plug tester into both terminals where the spark plug wires attach. Attach the ground lead to the metal housing of the magneto. Rotate the magneto in the direction it normally rotates on the tractor. The magneto must be held in the same position it normally does when it is attached to the tractor. The magneto should turn a short ways and resistance should be felt trying to prevent you from turning it any farther, continue to turn the magneto rotor until the magneto "snaps" or the resistance to turning is released quickly. At this point a spark should be observed at your spark tester. If the magneto rotates freely in both directions the impulse unit needs to be worked on. (If it rotates freely both directions, make sure you have a magneto, not a distributor). If



a good blue spark is observed, you can give a sigh of relief, but you may still have problems with carbon tracking inside the cap and rotor area or bad plug wires, or bad spark plugs. At least the magneto is capable of producing a spark. A good magneto should be able to produce a spark with a .25" gap at the spark tester. Many magnetos will jump a 3/8" gap with no problem. You may wish to still give the internal parts a thorough inspection, cleaning, and lightly lubricate the bushing(s).

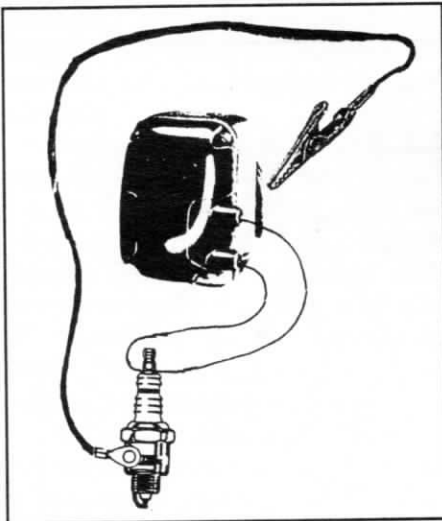
If the magneto "snaps" but no spark is observed then we need to dig a little deeper. Check the impulse end for bushing wear by trying to move the rotor and impulse up-and-down. No noticeable up-and-down movement should be felt. Remove the black bakelite cap and check this end of the rotor for bushing/bearing wear. Again, no noticeable wear should be felt. Now that the cap is off, look for signs of rust, dirt, moisture, and corrosion. Rust and moisture usually indicates a damaged or missing gasket, or a plugged vent hole.

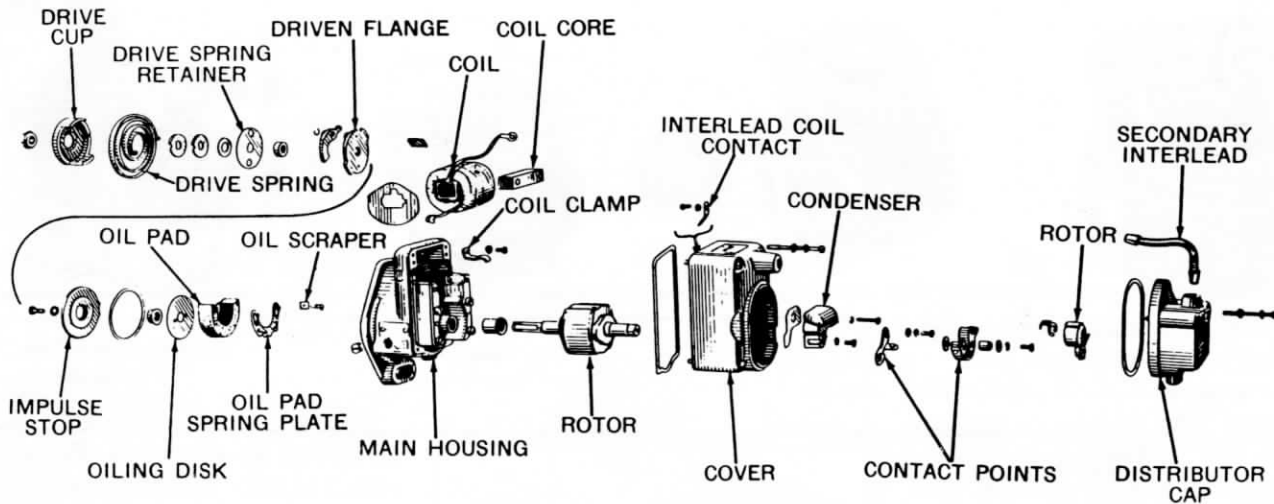
If you were not "one of the lucky ones" and your magneto does not produce a good spark, the first place to start is filing the points to remove

oxidation or corrosion. Filing the points is only done for testing purposes. Points that need to be filed or sanded to make the magneto work should be replaced since any success you get will only be a short term remedy. If you get a spark after cleaning up the points consider yourself with the "lucky ones". If you get a spark as described above, the points and condenser should be replaced and the bushings/bearing should be checked as described above. If you did not get a spark as described above, cheer up! There are other simple checks to make that may get you some results. At this point since the magneto does not work any way, you might as well continue searching for the cure.

Repair

If you still do not have a spark, check the back bakelite distributor cap for carbon tracking. Carbon tracking will look like a very thin pencil line going from one terminal to another, from a terminal to the edge of the cap, from a terminal to an attaching screw, or any other place. These tracks can be inside the cap or on the outside. Replace the cap and rotor if this condition exists. If the terminals inside the cap or rotor appear white, greenish, or gray colored this indicates corrosion of the terminals. The cap and rotor should be replaced. Maybe by now you are starting to wonder how much these parts are going to lighten your wallet. In rough numbers about \$15 for points, \$10 for a condenser, \$7 for a rotor, \$25-30 for a cap, \$4 for a distributor cap gasket, \$15 for each bushing or bearing and





lets hope you do not need any other parts! I usually figure to shoot a hundred dollar bill to rebuild a magneto if nothing major is wrong.

Replacing the points and condenser is a very simple task. Just a couple of hints to make the job go smoothly, the moving portion of the points have a spacing washer underneath to keep the fixed half of the points and the moving half of the points in alignment. Be sure to put the washer over the point post before installing the new points. Another very helpful tool is a spring loaded screw starter. This tool will hold the screws by the screw slot allowing you to easily get the screws started.



Coil

Testing the coil for an open circuit or a grounded circuit can be done with an ohm meter or test light. Before testing the coil it should be removed from the magneto. Simply remove the points, condenser, and two coil clamps, then remove the coil. Connect the ohm meter leads by attaching one lead to each of the fine wires on the coil. You should read "0" ohms or no resistance. If you are using a test light, connect one terminal of a 6 or 12 volt power source to one coil lead and connect the test light from the other coil lead to the remaining terminal on your

6 or 12 volt power source. The light should light. If the ohm meter does not read "0" or very close to it, or the test light does not light, the coil has an open in the wire and needs to be replaced. That's pretty straight forward, right?

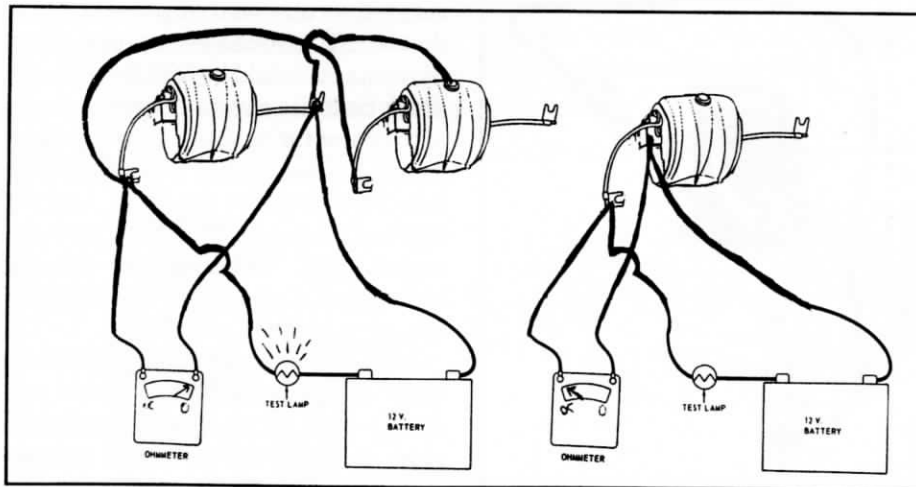
If the above test checks out okay we need to check for a possible "ground" in the coil. Using the same ohm meter or test light keep one lead on one of the coil wires and move the other lead to the iron bar through the center of the coil. The ohm meter should read infinity or the test light should not light. If you get a "0" reading or the test light lights, then you have a grounded coil and it needs to be replaced.

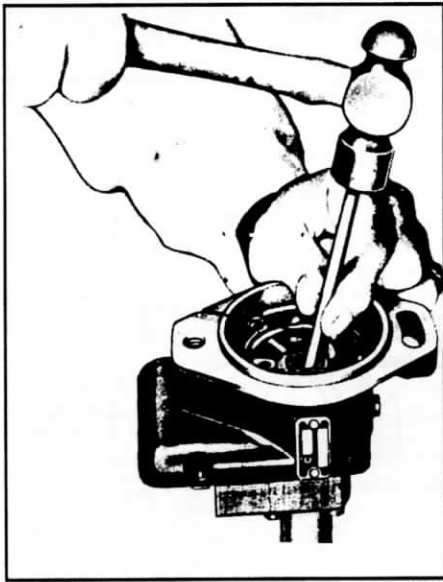
To check the high voltage side of the coil connect the ohm meter or test light to the coil wire that attaches to ground (often double wire with one eyelet) and the other lead to the high

voltage post. The ohm meter should read "0" or close to "0", or the test light should light. If not, replace the coil.

Impulse

The impulse assembly is usually easiest to work on before the impulse and rotor are removed from the magneto. **Before** any attempt is made to remove the impulse/rotor there are timing marks on the drive side of the rotor that must be noted. Also mark where the impulse stop is positioned. These timing marks and position of the impulse stop determine "magneto lag" as the manual says. Magneto lag is actually the same thing as retarded timing or delayed spark. This retards the ignition timing while the engine is being started making it easier to start the engine. Once the engine is running the bell crank arms that catch on the impulse stop will retract back into the impulse assembly by centrifugal force.



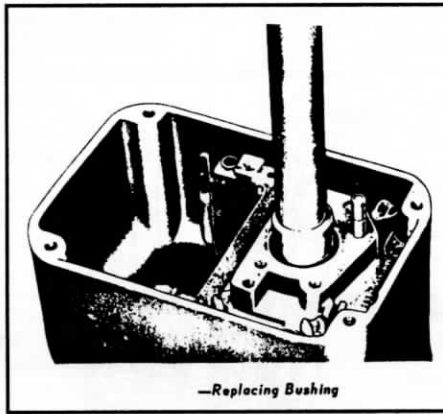


Remove the four screws that hold the impulse stop plate to the magneto housing. Did you remember to mark the position of the impulse stop and timing/witness marks? The rotor can now be removed by pulling it out the driven end of the magneto.

Remove the impulse nut and **carefully** remove the impulse cover. You will find this cover is spring loaded by a coil spring similar to a starter recoil spring. Pay close attention to the order that the levers, spacers, and washers come out. It is a good idea to lay them out on a bench in the sequence they are removed. Inspect the coil spring and replace if it is broken. If you find some of the spring coils rusted together, the spring should also be replaced. If the spring shows any signs of rust pitting, replace the spring. Inspect the pawls and pivot pins on the driven flange of the impulse assembly for excessive wear and replace them if necessary.

Inspect the impulse stop for wear. This can be replaced if necessary or the worn surface could be welded and ground to its original contour. Sometimes this stop will wear enough that the impulse pawls will not catch on the stop which will prevent the magneto from making a spark while trying to start the engine.

When reassembling the impulse unit the only part that can be a bit challenging is putting the impulse



—Replacing Bushing

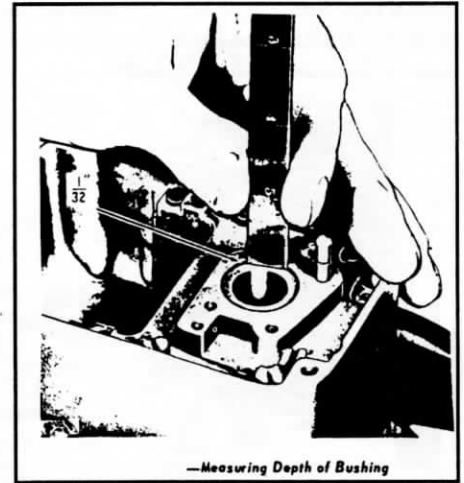
drive cup on. The impulse spring engages a slot on the spacing washers and a slot on the drive cup. The difficult part is putting tension on the spring by rotating the drive cup clockwise or counterclockwise depending on the model of your magneto, and keeping the impulse pawls inside the drive cup while pushing the drive cup into position. You will know if you have done the job correctly if you put the rotor and impulse assembly in the magneto, screw the stop plate into position, place the magneto in position as it would be on the tractor, and rotate the rotor in the direction of normal rotation. The impulse pawls should contact the stop, then the spring will wind up until the impulse “snaps” or quickly releases. The first time you assemble one of these impulse assemblies will require a little trial and error, but the second one will be a “breeze”.

Bearing/Bushing

With the rotor removed you can easily drive or press the bearing or bushings out depending on whether your magneto is equipped with two bushings, or a bearing and a bushing. Inspect the rotor shaft for excessive wear on the surfaces that are in contact with the bushing(s) or bearing. Replace the rotor if excessive wear is found. If you are replacing any bushings they need to be aligned with the slots provided in the magneto housing and they need to be positioned 1/32" below the housing surface.

Cleaning/Lubricating

Use a 100 to 180 grit sand paper to clean up all metal to metal contacts in the magneto. This includes



—Measuring Depth of Bushing

the iron core of the coil where it contacts the magneto housing, the coil mounting or retaining clips, the ground screw for the coil, etc. Lightly lubricate the rotor bushings with engine oil, and dampen the oil wiper for the points with oil. Lubricate the impulse spring with a light coating of grease along with the impulse pawls and pivot pins.

Reassembly

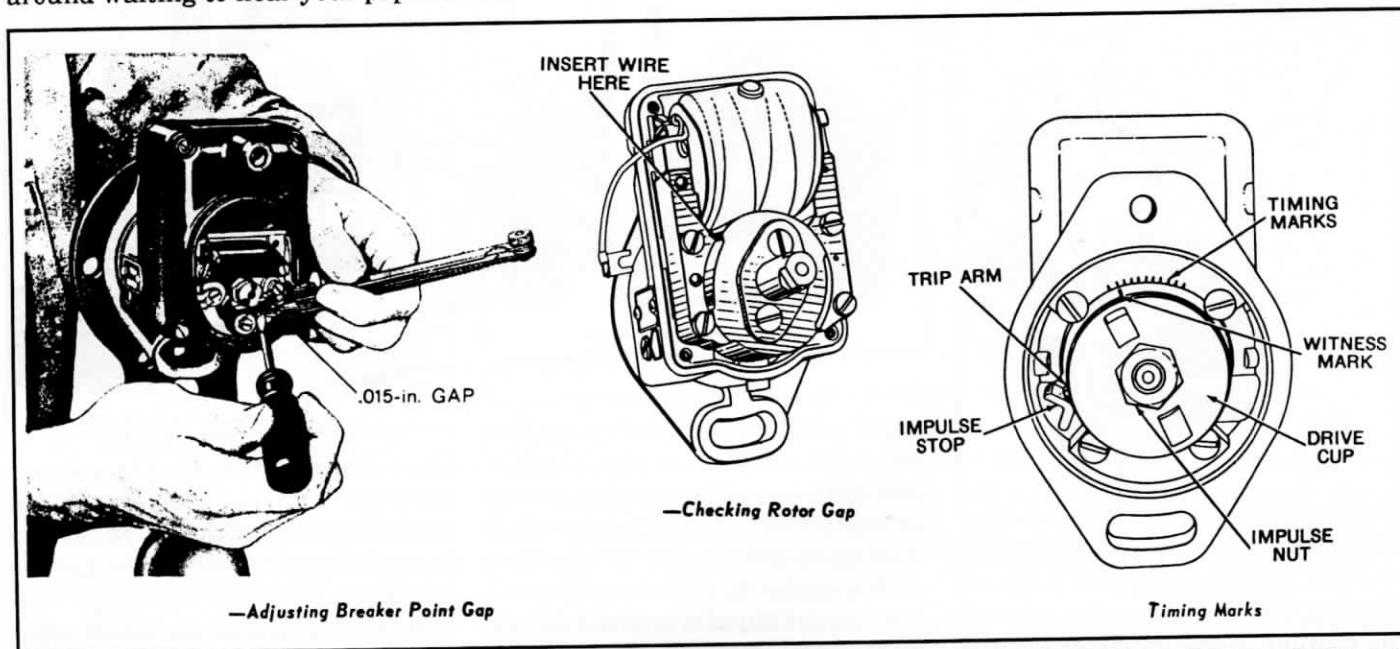
Position the coil and secure with the retaining clips. Remember to attach the ground wire to one of the retaining screws. Place the rotor assembly in the magneto housing and position the timing marks and impulse stop in the same position as they were before disassembly. Install the points and condenser. Adjust the point gap to .015" and recheck the gap after tightening the screws down.

With the points adjusted to .015" place a number 9 wire (.090 or 3/32") under the coil between the trailing edge of the rotor and the laminated field shoe to check the rotor gap. At this time the points should just begin to open. If the points do not start to open, the rubbing cam for the points is worn and needs to be replaced.

When the distributor arm and cap are reinstalled be sure to use a new gasket.

This should give you enough information to tackle about 90% of the magneto problems you will run into. There is nothing magical about a magneto and they are actually very reliable when taken care of properly. A good job restoring a magneto gives

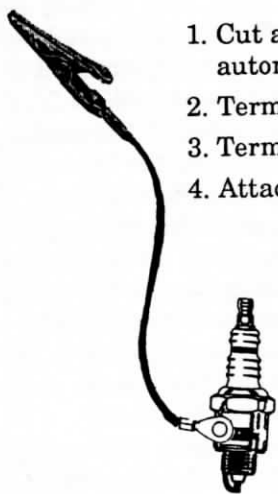
you a real feeling of satisfaction when you can be confident your tractor will start when a group of people are standing around waiting to hear your pop'n John!



Tip of the Month Build Your Own Spark Tester *By Dan Brotzman*

Many times while diagnosing an engine the question comes up if you have any "spark". You can make a reliable, inexpensive tester from a spark plug, short piece of electrical wire, and a small electrical clamp.

1. Cut a piece of 12, 14, or 16 gauge insulated electrical wire about 12 inches long. Standard automotive wiring works good.
2. Terminate one end of the wire with a 3/16 inch eyelet or spade connector.
3. Terminate the other end with a small "alligator" clamp or any other type of spring loaded clamp.
4. Attaching the wire to the spark plug metal body can be done a few different ways.
 - A. Drill an 11/64 hole into the metal body of the spark plug. Drill to a depth of about 1/8 to 3/16 inch, do not drill all the way to the center of the spark plug.
 - B. Tap the hole for a #10 screw. Shorten a #10 screw to prevent it from bottoming in the tapped hole.
 - C. Fasten the wire eyelet to the spark plug with a #10 screw.
 - D. An alternate method of attaching to the spark plug metal body is to solder the wire to the plug base.



To use your tester simply install the engine spark plug wire on your tester. Clamp the wire clamp to a good ground and observe the test spark plug electrode as the engine is cranking. You may wish to open the test spark plug gap up to about .080 to .100 inch to make sure you have a good spark.