

# RD400 Dyna Ignition

**Please!!! Before you begin, read these instructions *completely* in order to familiarize yourself with the installation!!! It will surely make the installation as easy and trouble free as possible. The “Some Basic Ignition Theory” page provided at the end of the instructions is optional reading, but we strongly believe that a basic understanding of *HOW* something works makes it easier to *MAKE SURE* it works...and works correctly!!**

Thank you for purchasing your new Vintage Smoke Dyna ignition kit!!!! Since Dyna Ignitions does not manufacture a kit specifically for the RD400, Vintage Smoke has put this kit together using a custom made mounting plate, rotor, and simple wiring just for the RD400. If you have any questions or problems, please contact us directly. While Dyna manufactures the modules used in this kit, WE designed and manufacture the rest of the kit and will be glad to help in any way we can!

This ignition will provide an easy to install replacement for the breaker point (points and condenser) ignition in your bike. You will no longer need to re-set the point gap and ignition timing regularly as the breaker points wear.

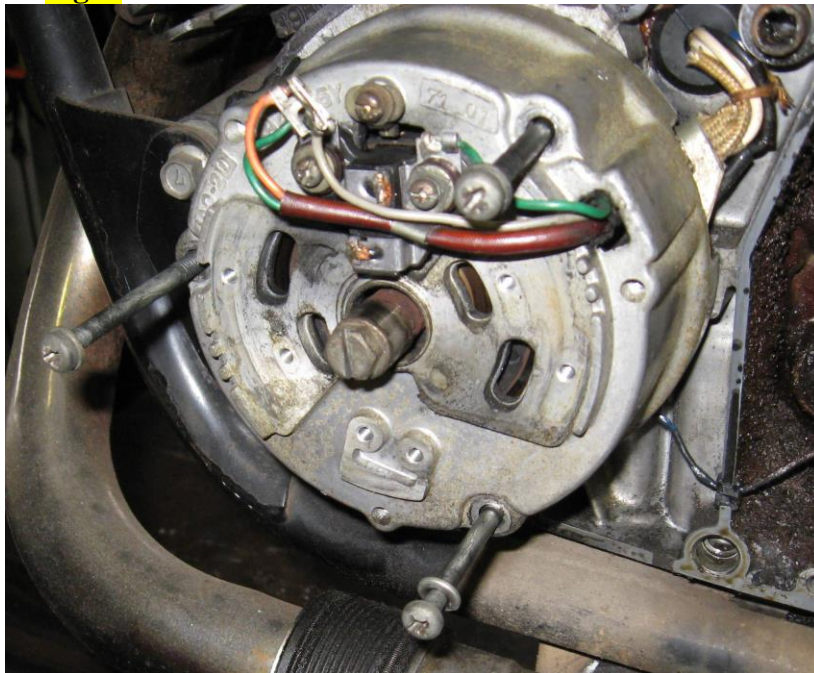
The modules manufactured by Dyna provide for a clean and consistent spark by eliminating the mechanical opening and closing of the breaker points. Ignition timing has the potential to stay set indefinitely with this kit, but should be *verified* every 10K miles or so as a part of your routine maintenance schedule.

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## Installation

- 1) Before you install the ignition please check the output of your charging system. If for some reason the charging system is charging at too high of a voltage it will cause the stator and charging rotor to run abnormally hot. This heat will then be transferred to the ignition modules and the ignition rotor. The heat can damage the modules and can actually cause the magnets in the ignition rotor to weaken. Charging output for an RD should be approximately 14V (+ or - 0.3V) at approximately 2000RPM. Anything over 15 volts is excessive and can cause an abnormal build up of heat. If your bike was not able to be started at the time the Dyna ignition was installed, please check the charging system output immediately when starting the bike for the first time.
- 2) Disconnect the battery. Safety first!!!!
- 3) Remove the shift lever, the alternator cover, and left side engine cover. (There is no need to disconnect the clutch cable from the cover. You can use a bungee cord or similar to tie the cover up out of the way.
- 4) Remove the condenser. One of the condenser screws will be used to secure the wiring for the new ignition once it is installed.
- 5) Remove the left and right point plates.
- 6) Remove the 3 Phillips head screws securing the alternator housing. Your bike should now look like **Fig. 1**.



**Fig. 1**

- 7) Using a 12mm socket remove the bolt securing the “cam” that opens and closes the points. It is the hex head bolt (with a screwdriver slot) seen in the center of **Fig. 1**. DO NOT try to remove the cam just yet. Note: A flat washer (provided in the kit) will

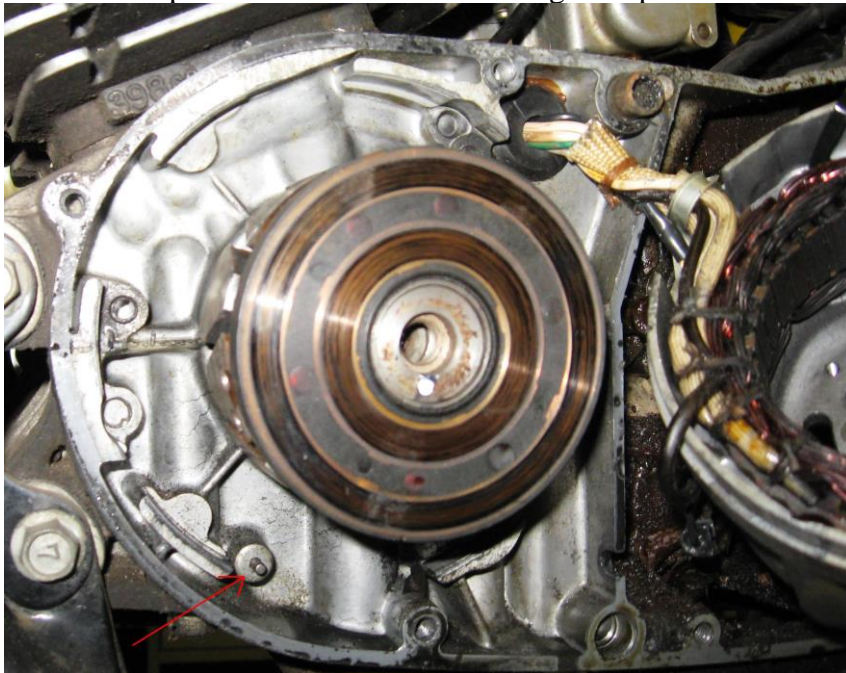
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be put under the lock washer that is on the bolt when the bolt is re-installed later. The magnetic trigger for the new ignition that replaces the point cam is made from aluminum and the lock washer by itself may damage the trigger.

- 8) Carefully remove the alternator housing. The alternator housing is the aluminum housing that the point plate and condenser were mounted to. It will still be connected to the engine by the wires for the charging and ignition system. Handle the housing carefully in order to prevent any damage to the wiring.

**VERY IMPORTANT:** Once you remove the housing you will see a small pin at approximately the 7 o'clock position protruding from the engine case. This pin has a corresponding notch in the alternator housing. Later, when the housing is re-installed, this pin **MUST** line up with the notch in the housing. The pin can be seen in **Fig. 2**.



**Fig.2**

- 9) Now remove the point cam. The cam is a snug fit in the alternator rotor. Depending on how long it's been since the cam has been removed (if ever) you may be able to wiggle the cam out by hand. If it is too tight to remove by hand, a couple of **VERY LIGHT** taps with a screwdriver handle should dislodge the cam. Anything more than very light taps can also loosen the alternator rotor. The alternator rotor is positioned on the shaft with a key and tightened down with the bolt that holds the point cam in place. If the alternator comes loose please refer to the proper section in the service manual to re-install it. Your bike should look like **Fig. 2** now.
- 10) Re-install the alternator housing remembering to line up the pin mentioned in step 7. Re-install the 3 Phillips head screws that secure the alternator housing.
- 11) Now the new timing plates (the plates that hold the two ignition modules) can be installed. The half circle holes in the center of the plate will index around a lip in the

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alternator housing. The plate should lay flat against the alternator housing. Note: I have found slight differences from housing to housing. Also if there are any burs or damage to the lip on the housing the plate may not rotate easily. Look for any burs or damage to the lip on the housing and clean them up with a small piece of sandpaper or emery cloth. This should only take a few seconds.

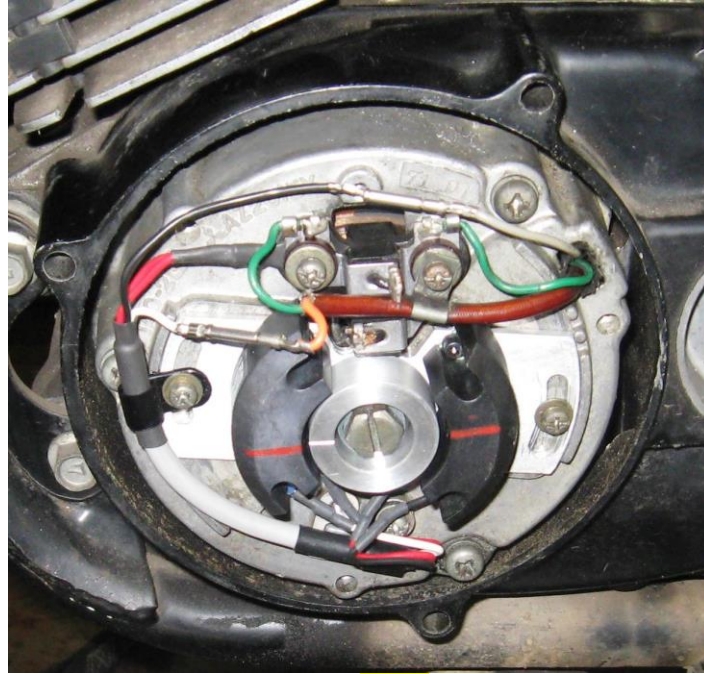
- 12) Insert one screw (saved when the point plates were removed) through each of the adjusting slots in the timing plate. Do not tighten at this time. The screw on the left side plate will also hold the small plastic cable clamp (provided in the kit) in place.

See **Fig. 3**

- 13) Insert the new magnetic trigger through the timing plate and into the alternator rotor. The new magnetic trigger has a notch cut in it that will slide over the pin in the alternator rotor. The notch is slightly larger than the pin and will allow for a slight rotation clockwise and counter clockwise. The magnetic trigger should be held firmly in place and rotated back and forth. This is done to ensure that the trigger sits square in the alternator rotor. You should “feel” the trigger seat flat into the alternator rotor. Rotate the trigger back and forth again and position it approximately in the middle of the available rotation. **Note:** The trigger may require re-adjustment later. Put the new flat washer on the bolt (after the stock lock washer) that previously secured the point cam and install the bolt. At this time remove both spark plugs (to make turning the motor easier) and rotate the motor by hand. The new trigger should spin true with NO wobble. Make sure that the trigger does not contact either of the ignition modules. If the trigger does not spin true loosen the bolt and make sure it is properly seated. Even when it is properly seated, the rotor may not spin 100% true. Any variation will be barely visible by eye. This can be caused by a crankshaft slightly out of true, a worn crankshaft outer bearing, or a slight variation in the outer diameter of the trigger. This will not cause any problems in the function of the ignition. If the variation is any more than “barely visible” please re-check the trigger installation. With the exception of completed wiring connections in the picture, your bike should now look like

**Fig. 3.**

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**Fig.3**

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## Wiring

Wiring your new ignition is simple and straight forward requiring only 3 connections to be made.

- 1) On the alternator housing you will see a **green** wire going to the left alternator brush. This **green** wire is powered whenever the key switch is in the on position and will provide power to the ignition modules. It is soldered to the tab that holds the top alternator brush in place. On your new ignition you will notice a pair of **red** wires that end in a ring terminal. This ring terminal will go under the plastic washer and sit on top of the brush tab and provide power to the modules. The plastic washer has a smaller “step” in it that will fit inside the hole in the ring terminal as well as inside the hole in the brush tab  
**Very Important:** If the ring terminal is put under the screw head, instead of under the plastic washer, it will be grounded when the key switch is turned on. The purpose of the plastic washer is to insulate the wiring from being grounded on the alternator housing. The order, from top to bottom, is as follows: Screw head, lock washer (if present), flat metal washer, plastic washer (with smaller step facing in towards motor), ring terminal (from red wires in new ignition), brush tab. Be sure small step in plastic washer sits **INSIDE** the hole in the ring terminal **as well as** inside the hole in the brush tab. Be careful that the step actually goes inside the holes and does not sit “on top” of the ring terminal and/or brush tab.
- 2) You will now be left with the **orange** and **grey** wires that were previously connected to the points. Each wire will have a “U” shaped connector on the end. Cut off each connector and replace it with the male pin connector provided in the kit. The connector can be crimped on or crimped **AND** soldered. If you do not have the correct crimper, the tabs can be folded over and “manually crimped” with a small pair of pliers and the connection **should be soldered**. A proper connection here is critical to a trouble free installation. Also, the **orange** and **grey** wires should be trimmed shorter to ensure a neat installation as well as prevent excess wire from getting damaged once the cover goes back on.
- 3) Slide the provided piece of heat shrink over the female pins coming from the modules and plug the **orange** wire into the **white** module wire and the **grey** wire into the **black** module wire. Shrink the heat shrink and the wiring connections are complete!
- 4) You will notice a smaller black plastic clamp included with the ignition unit. Use this clamp to secure the wiring coming from the modules with one of the screws (and screw holes) that previously secured the condenser. Make sure that the placement of the clamp does not bind or pull on the module wires when rotating the timing plate. Also be sure that none of the module wires (or any of the wires moved during the installation) contacts any metal which may rub through or otherwise damage the

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wires. You will also see a larger black clamp that should be put under the left screw securing the timing plate. Your bike should now look like [Fig. 3](#).

## Ballast Resistor

**This ONLY applies to you if you are using aftermarket or universal ignition coils. This also ONLY applies to the RD400 and NOT the RD350. I have been asked for advice on this subject a bunch of times so I am including it as a helpful reference.**

The stock RD400 coils are of a very low resistance (approximately 2 Ohms). If these coils were used without a ballast resistor, they would quickly become very hot and fail during normal use. To prevent this from happening Yamaha used a ballast resistor. It is a small silver metal box that measures roughly 1.5" X 2.5". Its purpose is to limit the amount of current flowing through the ignition coils and prevent them from overheating and failing.

The stock RD400 coils have an internal resistance of roughly 2 Ohms. The ballast resistor has a resistance of roughly 2 Ohms. When you add the two together you get roughly 4 Ohms. This is a workable limit to keep the coils from overheating. Strangely enough the stock coils on an RD350 measure roughly 4 Ohms and therefore don't need a ballast resistor. Why Yamaha chose to go the more complicated route, instead of continuing to use the same coils as the RD350, is a mystery. Both set ups more or less do the same thing.

If you use AFTERMARKET coils (not stock coils) the ballast resistor will most likely need to be eliminated. This is a fairly simple process. Please keep in mind that the possible need to eliminate the ballast resistor has to do with the COILS you are using and NOT the Dyna ignition you have just purchased. Any aftermarket coils with a primary resistance of 3 Ohms to 5 Ohms will work just fine with either the stock points OR the Dyna ignition. The requirements for coils are the same for both ignitions.

### REMOVAL

The ballast resistor is a small box with one wire going in and 2 wires coming out. The simple reason for two wires coming out of the box is that the bike uses 2 coils. The ballast resistor also serves as a "Y" to split power from the ignition switch to both coils. If you need to remove the ballast resistor you simply need to make a "Y" connector to go in place of the ballast resistor. Three six inch pieces of wire connected together will work just fine. Connect all 3 wires together at one end. At two of the other ends use a female bullet connector and on one end use a male bullet connector. Make sure the bullet connectors are the same size and type as what are on the ballast resistor and your "Y" harness will simply plug in place of the ballast resistor. If you are unsure what the ballast resistor looks like, look at [Fig.4](#) for a picture of a stock RD400 ballast resistor.

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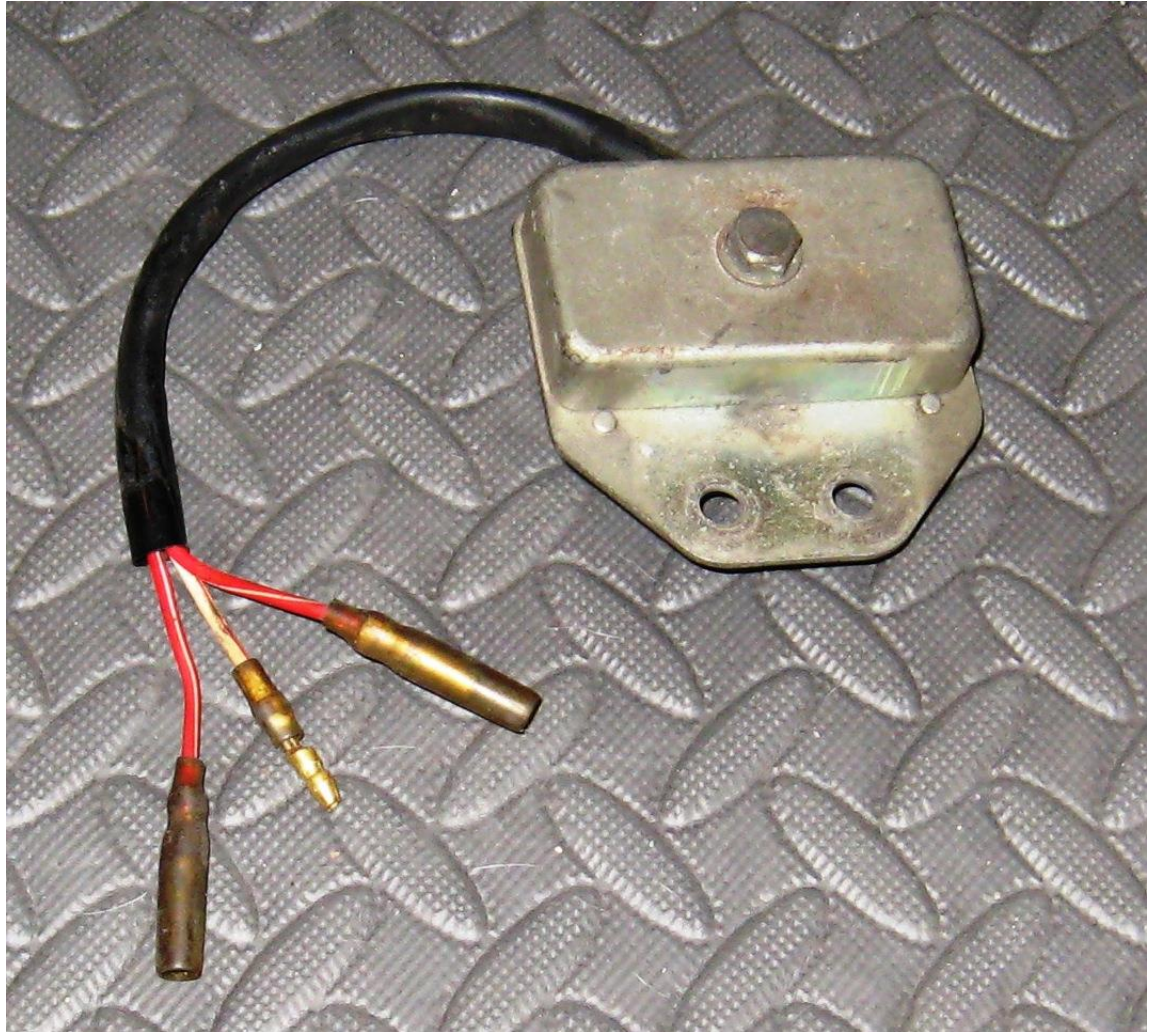


Fig.4

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## Timing

Where to set your timing varies from bike to bike. While Yamaha originally recommended 2.3mm BTDC, factors such as the quality of gas available today and any modifications made to your motor (porting, head modifications, carburetion, exhaust, etc.) may require less advance to avoid engine damage. Most riders set their timing somewhere between the stock recommendation of 2.3mm BTDC and 1.8mm BTDC. Ensuring the proper setting is **YOUR** responsibility. We can not possibly recommend a setting that will work for every bike. The timing required for your bike will not change with the installation of this ignition.

- 1) Gently snug down the screw securing the timing left plate to the alternator housing. The plate should be flat against the housing, but still easy to rotate. It takes a surprisingly light amount of pressure to lock down the timing plate for now.
- 2) If you have not done so already, remove both spark plugs from the engine. Replace the spark plug for the left cylinder into the end of the spark plug wire. Lay the spark plug on top of the cylinder head. Install your dial indicator in the left cylinder spark plug hole and rotate the motor **COUNTER CLOCKWISE** until the left piston is at your desired setting. For example: 2mm BTDC (Before Top Dead Center).
- 3) Reconnect the battery, turn on the ignition key, and turn on the run/stop switch.

**WARNING: Do not leave the ignition key on for more than a minute or two at a time when setting timing. Besides draining the battery, leaving the key on too long will overheat the ignition coils as well as the pick up modules. Pick up modules that fail from over heating will NOT be covered under warranty.**

- 4) You will now notice that there is a notch machined in the magnetic trigger. This notch marks the *approximate* point where the trigger will pass the sensor in the module and fire the ignition coil. The sensor in the module can be seen as a small raised section on the inside of the module. A small red paint line has also been applied on top of the module for reference. Remember: These lines are for reference **ONLY!!** They will make it easier to see when the rotor is coming around to the point where it triggers the module. These lines **SHOULD NOT** be used as timing marks.
- 5) Rotate the timing plate fully **COUNTER CLOCKWISE**.
- 6) **SLOWLY** rotate the timing plate back **CLOCKWISE**. When the marks on the trigger just come into range of the sensor on the module the spark plug laid on top of the cylinder head will spark. You should not only be able to see the spark, but hear a “crack” when the plug fires.
- 7) Repeat steps 5 and 6. Get a feel for “nudging” the timing plate in small increments until you *just* get the plug to fire.

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**NOTE: In order to get the plug to spark each time, the plate must be moved far enough out of range of the module. If you don't have enough travel in the plate to rotate it COUNTER CLOCKWISE far enough, you may have to loosen the bolt holding the magnetic trigger in place and rotate it the opposite direction (CLOCKWISE).**

**Also, if you don't have enough travel in the plate to rotate it far enough CLOCKWISE and bring the module's sensor close enough to the marks in the trigger (making the plug fire), you may need to loosen the bolt and rotate the trigger the opposite direction (COUNTER CLOCKWISE).**

- 8) Once you have the timing set you should double check the accuracy of your setting. Tighten down the screw securing the timing plate being careful not to move the plate. Slowly rotate the motor over **COUNTER CLOCKWISE** while watching the dial gauge. The plug should fire as the gauge reaches your desired setting on the gauge. Note: **DO NOT** use a screwdriver, wrench, or socket on the trigger bolt to turn the engine over. Either use the kick starter or raise the rear wheel off of the ground, put the bike in high gear, and use the rear wheel to rotate the engine. Using the trigger bolt to turn over the engine can either loosen the trigger bolt or cause a change in the timing.
- 9) Repeat steps 1 through 8 for the right plate.

## Some Important Notes

Be sure to shut off both the run stop switch AND the key switch when the bike is not running. While shutting off the *run/stop* switch disconnects power to the *coils*, the *modules* are powered whenever the *key switch* is on. Leaving the key switch on will eventually overheat the modules and leaving both the key switch AND run/stop switch on will overheat both the modules and ignition coils. If it is necessary to leave the key switch on for more than a couple of minutes (like when performing electrical testing) the run stop switch should be off and the power should be disconnected from the modules by unhooking the ring terminal from the brown wire.

## Warranty

- Vintage Smoke warrants to the original purchaser that the product shall be free from defects in parts and workmanship under normal use for 90 days from the date the product was shipped.
- Vintage Smoke's obligation under this warranty is limited to the repair or replacement of any part found to be defective when returned post paid to Vintage Smoke with evidence of date and place of purchase, detailed description of the problem, and a **return authorization number**.

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- The warranty will NOT apply if the product has been installed incorrectly, repaired or damaged in any way such as modification, misuse, negligence, or accident. This specifically includes, but is not limited to, removing the modules from the mounting plate, cutting of any wires, splicing of any wires, replacing any connectors on any wires, and breaching the wire insulation during any circuit testing. Also to be included is ANY evidence of physical damage as well as ANY evidence of circuit polarity being reversed.
- If a product is found to be defective AND at the time of inspection is NOT covered under warranty, a rebuild service will be offered to the original purchaser only and will be at the discretion of Vintage Smoke.

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## SOME BASIC IGNITION THEORY

The breaker point ignition used in RD400s sold in the USA uses what is called a “collapsing field” ignition. Very simply the ignition switch provides **power** to the ignition coil and the breaker points provide the coil with a path to **ground**. When the breaker points are **closed**, electricity flows from the battery, through the coil, and back to ground through the closed breaker points completing the circuit. This creates a magnetic field in the **primary** side of the coil.

When the breaker points **open** and electricity stops flowing through the primary side of the coil. The magnetic field created in the primary side of the coil now “collapses”. This creates a surge of current in the **secondary** side of the coil which is connected to the spark plugs. The surge of current is enough to jump the gap in the spark plug and light the air fuel mixture. The condenser is simply an “add on” that absorbs any current that attempts to flow back to the coil through the points.

So...how is the Dyna system different? Well, it is not a “true” electronic ignition. It has no computer or processor to control timing or dwell (how long current is applied to the coil). It is simply a magnetic switch (with no moving parts) that replaces the points and condenser. This switch is open and closed as a magnet passes close by the pick up. It does have 2 distinct benefits though. First, because it does not rely on mechanical points to open, it creates a clean “break” when “firing” the coil. You get maximum energy to the plugs and spark plug gap can be safely increased up to about .040” depending on the quality of the coil used. And second, since there are no moving parts, there is no need to worry about timing or quality of spark changing as the points wear.