Boyer Notes

Note: It is important to consider that just because your bike ran with a points ignition does not mean that it will run with an electronic ignition. The condition of the battery, coils, fuse holder, wiring harness, ignition switch, kill button, spark plug cables, charging system, etc. must be in good working order. If resistor spark plug caps are used they must not exceed 5,000 ohms.

The battery must be in good working condition capable of maintaining more than 11 volts with a 5 amp load (lights off - more if lights are wired to come on with ignition switch). If the bike is fitted with an electric starter, the battery must be able to maintain 11 or more volts with the additional load of the starter. If a fully charged battery drops below 11 volts when the circuit is loaded the battery must be replaced.

Measuring the "open circuit" voltage (a battery that does not have a load applied to it) does not indicate the condition of a battery. A DC digital volt meter with the leads on the battery terminals can read 12 plus volts and only be able to sustain this voltage for several seconds and immediately fall to near zero when a small load is applied.

Although a basic load test can be done on the battery by turning the head and brake lights on, the best way to load test a battery is with a battery load tester. With a digital volt meter across the battery terminals and the head and brake lights on, the battery voltage must not drop below 11 volts. In fact a good battery should maintain 12.6 volts for an extended period depending upon the ampere hour rating of the battery. If the battery voltage starts to fall in the first few minutes the battery is suspect. Just because your meter reads 12 volts when a load is applied to the battery doesn't mean your are "out of the woods" and the bike will run.

Further voltage drops in the circuit can be caused by dirty, loose or corroded connections or switches. Because resistance in the circuit is additive small resistances in the battery, battery connections, fuse holders, ignition switches, kill buttons, connectors, and grounds can lead to further voltage drops. They can reduce the voltage delivered to a Boyer box from the 12.6 volts of a fully charged battery to much less than the 11 volts we need to run an electronic ignition.

The laws that govern electricity tell us that we must have current flowing through the circuit to measure any voltage drops caused by resistance in the circuit. Because Boyer ignitions do not turn on until they receive impulses from the pick-up plate they present a problem. When you turn on the ignition key there is no load on the circuit and we cannot see any voltage drop. To overcome this on positive ground systems you can **remove the black wire from the negative terminal of the coil** and **connect the white wire from the ignition switch to that coil terminal**. On negative ground systems **remove the black wire from the negative coil terminal** and **connect a wire to ground from this coil terminal.** The load provided by the coils completes the circuit.

Now with a digital DC volt meter you can measure the DC voltage around the circuit. With one lead on the battery's ground terminal use the other lead to measure voltage around the circuit. The meter should show the same voltage as read at the battery's terminals until you get to the jumper between the two coils. At this point you will see a voltage drop from the resistance of the first coil. If you have less than the battery's voltage at any point up to the first coil you must find the cause. It could be a loose or corroded connection or switch. Placing one lead of the meter on the wire just before and the other just after a connection, fuse holder or switch the meter should show no voltage. If the meter shows any voltage there is a resistance in the connection or switch.

BATTERIES

A new battery is not always a good battery. There are many reasons a new battery will not run an electronic ignition. Sulphation or poor or broken internal connections can cause a new battery to be faulty. Internal connections can be poorly made during manufacturing or broken during shipping. Also the vent plug could have been accidently removed causing the battery's plates to sulphate during storage.

Sulphation can also be problem when modern batteries are put into service. Modern batteries come pre-charged with about 75% of their capacity. This means that they only need to be charged for a couple of hours rather than the 10 or more of older batteries. Although this is a real benefit for shop keepers if the instructions are not followed to the letter the battery will immediately start to sulphate.

If a battery is sulphated it will not be able to deliver the energy required by the motorcycle when a load is applied. If a fully charged new battery fails a load test it must be replaced. A new battery is not always a good battery.

General Data

1. The Triumph, BSA or Norton twin Boyer electronic ignitions can run in positive or negative ground systems. See appropriate wiring diagram.
2. The battery or battery eliminator must be able to supply between 11 and 16 Volts under load (brake and head light on).
3. The charging system (stator, rectifier, diode and rotor) must be in good condition. They must be able to sustain battery charging at the speed you ride your motorcycle.
4. The maximum current draw through the Boyer box must not exceed 5 amps!
    a. The 5 Amp current capacity of the box will be exceeded and the box permanently damaged if:
        — The black wire from the box is shorted to ground.
        — The black wire between the coils is shorted to ground.
        — The coils short internally to ground.
        — The resistance of the coil, or coils in series, is less than 2.4 ohms (12 Volts divided by 2.4 Ohms is 5 Amps).
5. For most applications two standard Lucas style 12 Volt coils (3.7 Ohm each) in good condition wired in series will work just fine. But for a bike that is carrying a heavy load, is used for racing or the engine fitted with high compression pistons, two six volt coils (1.9 Ohm each) in series or one 12 Volt double lead coil (4.3 Ohm) should be fitted. Be sure the coils are design to be used in a dwell type ignition. As a practical matter the total coil, or coils in series, resistance should be between 3 and 7.5 ohms.
6. The Boyer ignitions can be used on motors with twin plug heads. On singles use two single lead coils. On twins use two dual lead coils. On twins it is important to cross the leads having one lead of each coil going to each cylinder. This has one of each coil's leads on the cylinder under compression and the other lead on the cylinder that is not.
7. The resistance of the coils on the stator plate should be 66 Ohms each or 130+ Ohms total.
8. Typical working advance 20° advance at 5,000 rpm.
9. The power required to run the black box is only 0.5 Amps over the normal coil consumption. Primary peak coil voltage is regulated to 400 Volts.
10. The unit must always be wired with the frame or chassis acting as an electrical ground. Also if the motor is rubber mounted, a ground strap must be provided between the frame and engine.
11. If the bike is operated without a battery a storage capacitor (Lucas 54170009 or equivelent) must be installed in the system. Boyer Power Box has a capacitor in it.
12. For racing a kill button can be installed on negative ground systems. Using a grounding style kill button wire it to the black wire at the negative terminal of ignition coil #2. Alternatively a grounding kill button can be connected to the black/yellow wire from the stator plate (this will work with either positive or negative ground systems).
13. All wiring must be trimmed to correct length. Spare wire should never be coiled up as this can interfere the correct running of the ignition system. The black/yellow and black/white wires must never be run near or parallel to the alternator's wires. It is recommended that the Boyer's stator wires be run away from the motorcycle's wiring harness. Triumph/BSA Triples should not use the black/yellow and black/white wires in the harness to run the stator plate wires to the coils.. These wires run parallel to the alternator's wires in the harness.
14. With a Boyer system fitted to twin or triple cylinder motors all plugs fire at the same time. If one cylinder is misfiring it cannot be caused by the ignition control box. It will be a problem with the carburetor, coil, coil wire or mechanics of that cylinder.
15. The black (red or blue) box must never be wrapped in foam or anything that would insulate it. Ignition coils must never be wrapped in foam. Both the box and coils need some air flow over them for cooling. Even partial covering of the box or coil with foam can lead to premature failure.
16. Care has been taken with the selection of male and female wire connectors used on the box to pre-

vent burning up the box if the wires are connected up improperly. If you replace these connectors follow the male and female pattern used by Boyer.

17. 5000 Ohm resistor spark plug covers must be used on Micro-Digital (red box) and Micro-Power (blue box) ignitions. Resistor spark plug caps can be used on MKIII (black box) without any adverse effects.

18. Many Boyer Tech Tip articles on the web indicate that if you scratch the black/yellow and black/white wires together and you do not get spark at the plugs the box is bad. Although it is true that a failed box will not spark when the wires are scratched together, there are a lot of other factors that can keep the good box from working. Conversely just because there is spark when you scratch the wires doesn't mean the box is good and the bike will run.

19. On Nortons it is important to "J-loop" the black/yellow and black/white wire from the motor to the frame. If the wire is pulled taught between the motor and the frame the constant tugging on the wire as the motor moves in the frame will break one of the wires where it is attached to the pick-up plate. If a Norton stops the first thing I would check is continuity of the wires at the connection on the plate. There should be 130 plus ohms between the B/W and B/Y wires. If it is zero a wire has broken.

SOME OF THE WEIRD STUFF

1. On Triumphs the original wiring harness terminals sat flat on the tops of the battery terminals. Modern batteries have the battery terminal so the harness terminal mounts vertically. Modern batteries are also a bit taller and the top of the wiring terminal can hit the bottom of the seat grounding out the battery. The problem of battery height is compounded when seat rubber buffers are not installed leaving the seat lower. If the wire terminal comes up solid on the bottom of the seat it will blow the fuse or worse, burn up the harness. If it just touches as the bike vibrates it will cause the ignition to miss fire.

2. A faulty rectifier may let AC from the alternator pass directly into the wiring harness. The harness, acting as an antenna can pick up stray RF signals from the alternator wires or spark plug wires. These will interfere with the workings of the box and make it fire randomly or not at all.

3. If the black/yellow and black/white wires are swapped the unit will fire, but the firing will not be at the proper time. It is possible to change the timing by moving the magnet plate on the taper, but now the unit will not advance and retard properly. If the bike seems out of time after setting the magnet rotor according to Boyer's instructions check the black/yellow and black/white wires.

4. All new Boyer ignitions will not turn on until they receive several signals from the pick-up plate. There will be no voltage at the black wire going to the coils until pick-up plate turns the box on.

IMPORTANT PLEASE READ

The gas coming out of a battery is hydrogen, a very explosive gas!

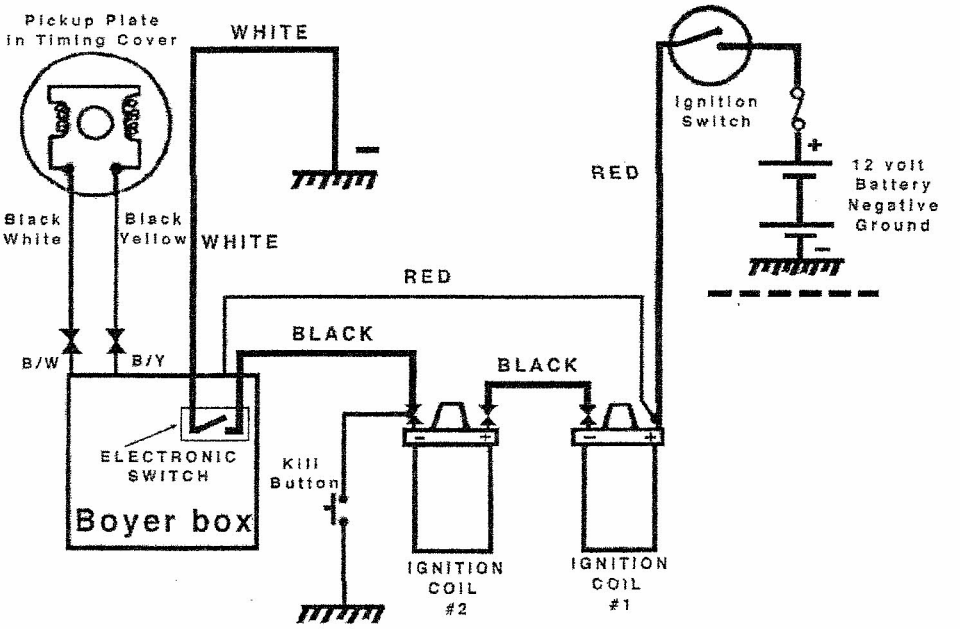
Installing and trouble shooting electronic ignitions requires that you work around your battery. It is important to remember that the fluid and gasses in and around a battery are very dangerous. Keep all sparks and open flame away from yo/ur battery. Also the battery acid itself is corrosive and can cause blindness and death if swallowed. The wearing of safety glasses and rubber gloves is strongly suggested.

When attaching battery charger leads to a battery it is important that the battery connections be made first and then the battery charger be plugged in. When removing the charger leads unplug the charger first. The resulting spark caused by the connecting or disconnecting the battery charger, while the charger is plugged in, can cause the battery to explode. The resultant spray of battery acid can lead to severe burns and or blindness. If you have ever seen a battery explode, as we have, you already learned this one.

Battery tenders work well for long term storage of batteries, but you cannot just hook up the tender and forget it. Over long periods of time the fluid level in the battery will drop exposing the plates. Exposed plates will sulphate and ruin the battery. So be sure to check the fluid level in the battery every couple of months while the battery is in storage.

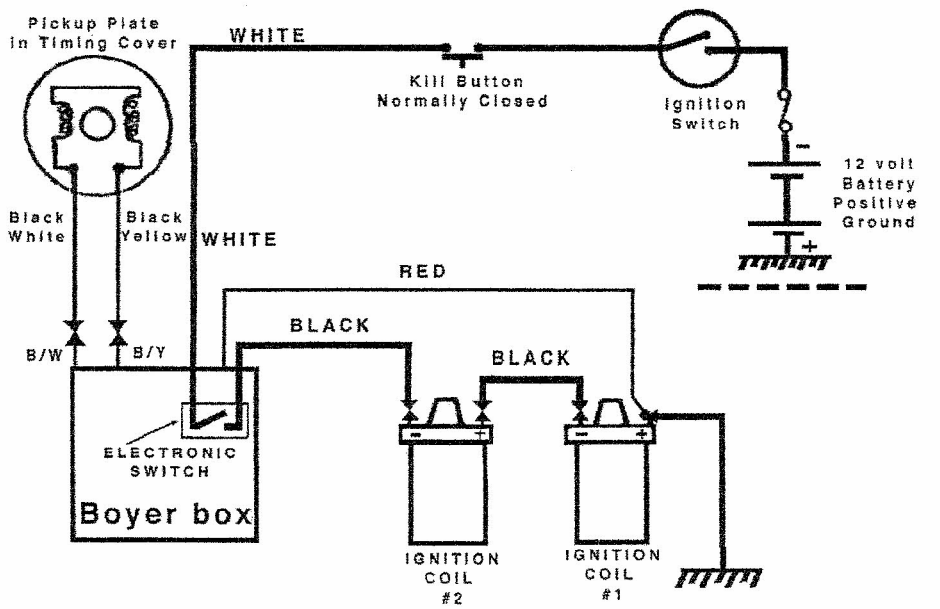
If you are ever connecting two batteries together, as you would when you jump start your car, make sure you make the connections to the discharged battery first. Then connect one of the leads directly to the HOT side of the charged battery and the last connection to Ground **away from the battery.**

WIRING DIAGRAM
Negative Earth



The kill button shown above is optional

WIRING DIAGRAM
Positive Ground



KILL BUTTONS

In addition to the optional kill button illustrated on the positive ground wiring diagram above you can use a grounding kill button attached to the black/yellow wire on either a positive or negative ground system. **NEVER put a grounding kill button on the black wire on a positive ground systems.**