

The TRIUMPH Corporation

SERVICE BULLETIN

October 23, 1967

67/14

TO ALL EASTERN TRIUMPH DEALERS:

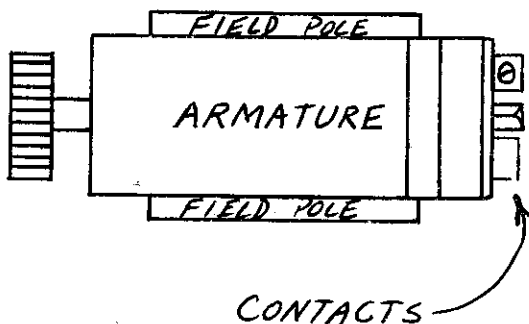
SUBJECT: A. C. Ignition (E. T.) & A. C. Lighting System - Lucas RM19 Equipment

A. C. Ignition (Energy Transfer)

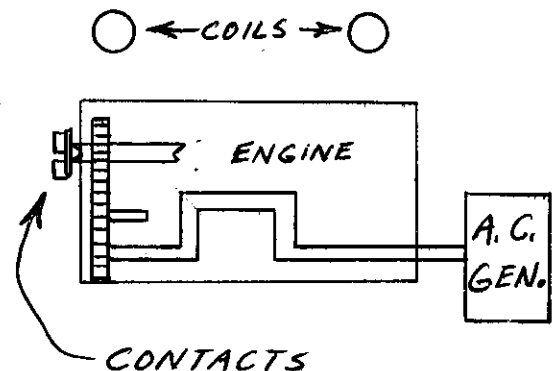
There are several important principles to remember when dealing with the A. C. ignition system:

1. A magneto is basically an A. C. Generator with a switch (the contacts) and a high tension coil connected to it.
2. On pre-1963 Triumph models, the Lucas magneto was a one-piece self-contained unit in which the contacts were directly connected to the A. C. generator part of the magneto. In the A. C. ignition system the A. C. generator part of the magneto is in the primary - i.e., the rotor and stator; and the contacts and high tension coils are respectively on the end of the exhaust camshaft and on the frame.

MAGNETO



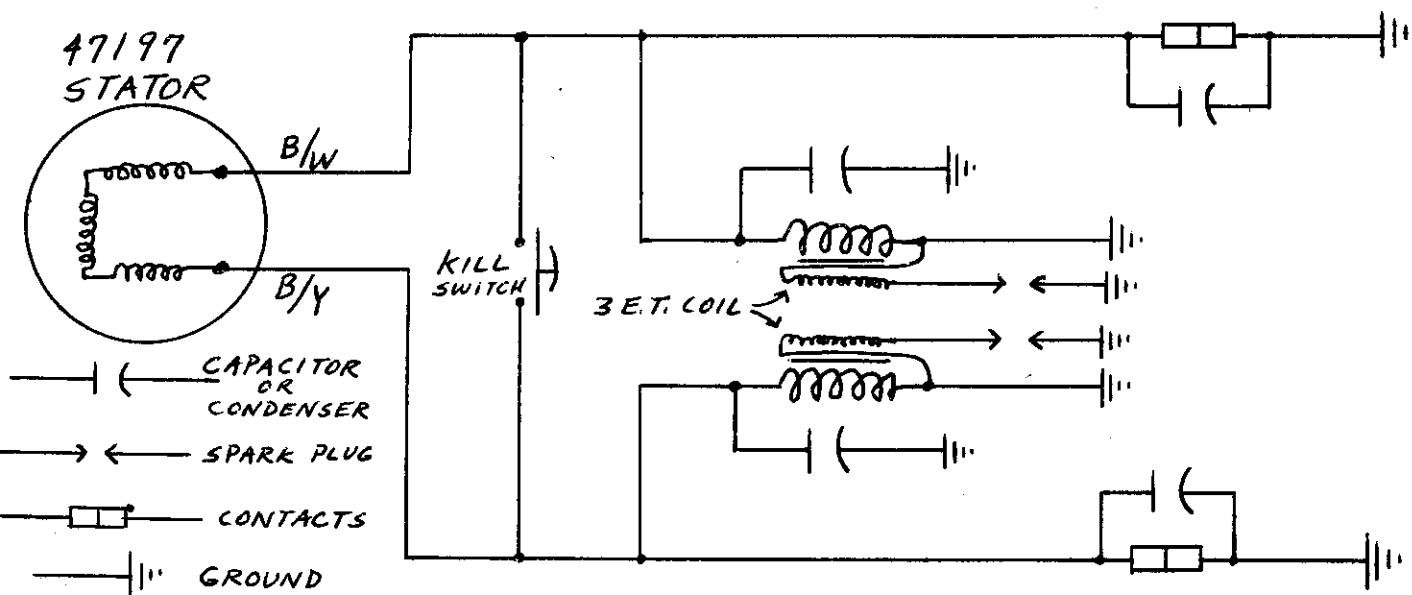
A.C. IGNITION



The point is that the relationship between the A. C. generator part of the A.C. ignition system and the contacts is variable. These parts are not directly connected in a self-contained unit as is the case with Lucas or other magnetos. By changing the relative position of the rotor and stator or the timing between the contacts and rotor/stator unit, the performance of the A.C. ignition system can be drastically altered. The manufacturer of the motorcycle and electrical system specify the relationship of these parts and it is **EXTREMELY IMPORTANT** that this relationship not be altered for proper performance of the ignition system.

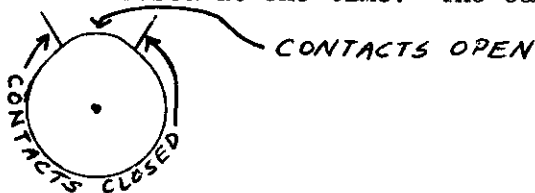
Now let us examine an A.C. ignition circuit using the latest encapsulated stator #47197 for our example:

A.C. IGNITION SCHEMATIC

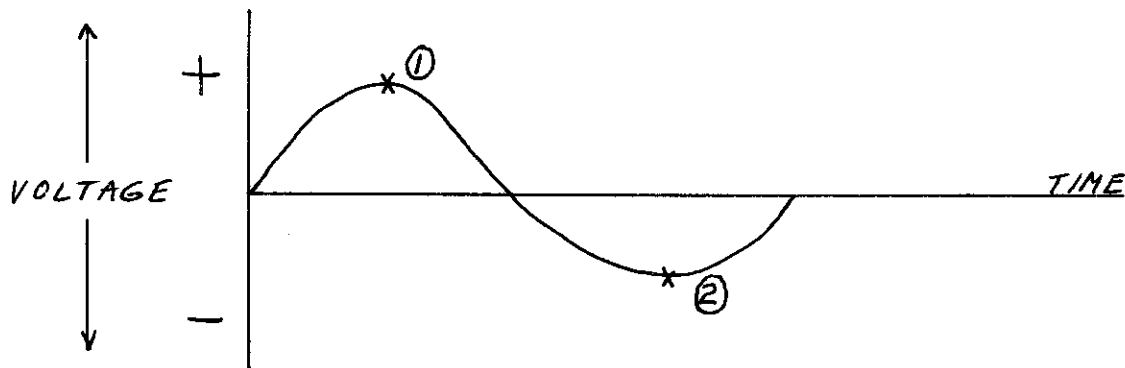


The stator windings must form a closed circuit (thru ground) in order that the rotor/stator can generate an A.C. voltage output. Remember a basic rule of electricity - electric current always takes the path of least resistance.

Bear in mind that the A.C. ignition cam has a very short "open" time and it is possible for both sets of contacts to be closed at one time. The cam is shaped approximately as shown:



When a complete path thru ground is created (both contact sets closed), an A.C. voltage is generated by the alternator (rotor/stator unit). A voltage versus time graph of this A.C. voltage output is shown below:



For maximum efficiency, the rotor/stator and the ignition contacts must be timed so that the points open very close to the point where the generated A.C. voltage is a maximum, i.e., points 1 & 2. This correct timing is assured if the rotor is timed to the engine crankshaft correctly.

There are three holes drilled in all latest rotors (#54213901) to accurately time the rotor to the stator. For optimum performance, the position in which the rotor is fitted MUST correspond with the number of degrees before top center that you wish to time the ignition at. Referring to the figures below:

"S" --- 37° B. T. D. C.
 "M" --- 39° B. T. D. C.
 "R" --- 41° B. T. D. C.

Looking at the A.C. Ignition schematic, the ignition system functions as follows:

With both sets of contacts closed, A.C. is generated in the stator windings. This A.C. flows thru one set of contacts, thru ground, and thru the other set of contacts back to the stator to complete the circuit. Notice that the current takes the path of least resistance (in theory) and does not flow thru the relatively high impedance primary winding of the coil when the contacts are closed.

When one cylinder's contacts open the only path thru which the current can travel to ground and complete the circuit is thru the primary winding of that cylinder's coil. With the one set of contacts open, current leaves the stator, flows thru the coil's primary winding to ground; thru ground back thru the other set of contacts and back to the stator. The current flowing in the primary of the 3 E.T. coil induces a high voltage in the secondary winding of the coil. It is this high secondary voltage that is dissipated across the spark plug gap as a spark. An important point to remember here that applies to any ignition system is that the coil will only develop as much voltage as is necessary to "fire" the spark plug. The other cylinder fires in a similar manner when its contacts open.

When the kill button is pushed, current will again take the path of least resistance and flow from the stator thru the kill button and back to the stator. In effect, the coils and contacts are short circuited and the engine will not fire.

From the above explanation, it is obvious that the contacts play a critical role in the ignition system's efficiency. Indeed, the efficiency of one cylinder's ignition depends heavily on the other cylinder's contact set! As a result of this, it is **EXTREMELY IMPORTANT** that both sets of contacts be clean and properly gapped. Current must flow thru one or both sets of contacts at all times; therefore these contacts must offer as little resistance to current flow as possible. **MAKE SURE YOUR FEELER GAUGE IS CLEAN** when gapping contacts. Also, all the wiring and connections in the ignition system must be good. There can be no frayed or pinched wires, or dirty or poorly soldered connections any where in the wiring.

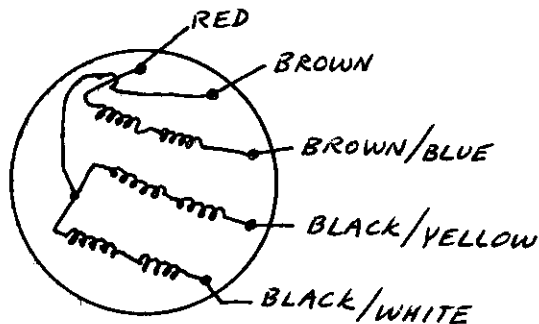
Troubleshooting A.C. Ignition is remarkably easy once you understand how the system functions. It is more involved than battery ignition troubleshooting however because you must run the engine from another ignition source while you check the alternator's (ignition winding) A.C. voltage output. Proceed as follows:

1. Be sure the rotor/stator timing (S, M, or R) corresponds with the ignition timing (37° , 39° , or 41° B.T.D.C.) you desire.
2. Check that the range of the auto-advance mechanism is the proper 5° (10 crankshaft degrees). This 5° will always be stamped on the back of the proper sleeve and action plate for A.C. ignition (#54415747). Do not try to use an auto advance mechanism with over a 5° range as the A.C. ignition system is not designed to function properly over a larger advance range.
3. Be sure that the contacts are clean and gapped properly (.016-.014"). Check that the spark plugs in the engine are clean and properly gapped (.020"). Time the contacts to open at either 37° , 39° , or 41° B.T.D.C. corresponding to the way the rotor is timed. Check that excessive runout or wobble of the ignition cam is not opening the contacts prematurely. The contacts should be closed all the way around the heel of the cam.

For normal servicing of an A.C. ignition equipped motorcycle, the above 3 steps are all you should have to do to the ignition for the engine to run properly. If the engine will not fire at all or misfires when running, you must proceed as follows:

1. Disconnect all 5 stator leads from the alternator side of the connector under the engine. Using an ohmmeter or Tricor #233 test light, check the stator for shorts or opens as follows:

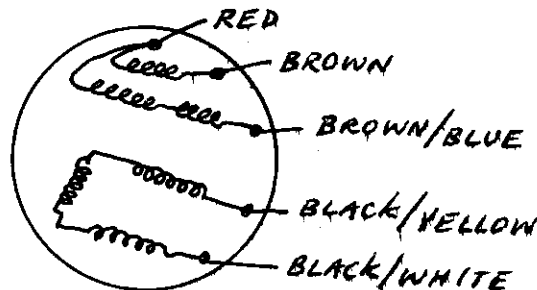
47188 STATOR



SHORTED WINDING TEST:

1. There should be no continuity between any stator lead and the metal stator frame or a good clean ground on the engine.
2. There should be no continuity between the Red or Brown/Blue lead and any of the other 3 leads (Brown, Black/Yellow, or Black/White).

47197 STATOR



SHORTED WINDING TEST:

1. There should be no continuity between any stator lead and the metal stator frame or a good clean ground on the engine.
2. There should be no continuity between a Black/Yellow or Black/White lead and any of the other 3 leads (Brown, Brown/Blue, or Red).

OPEN WINDING TEST:

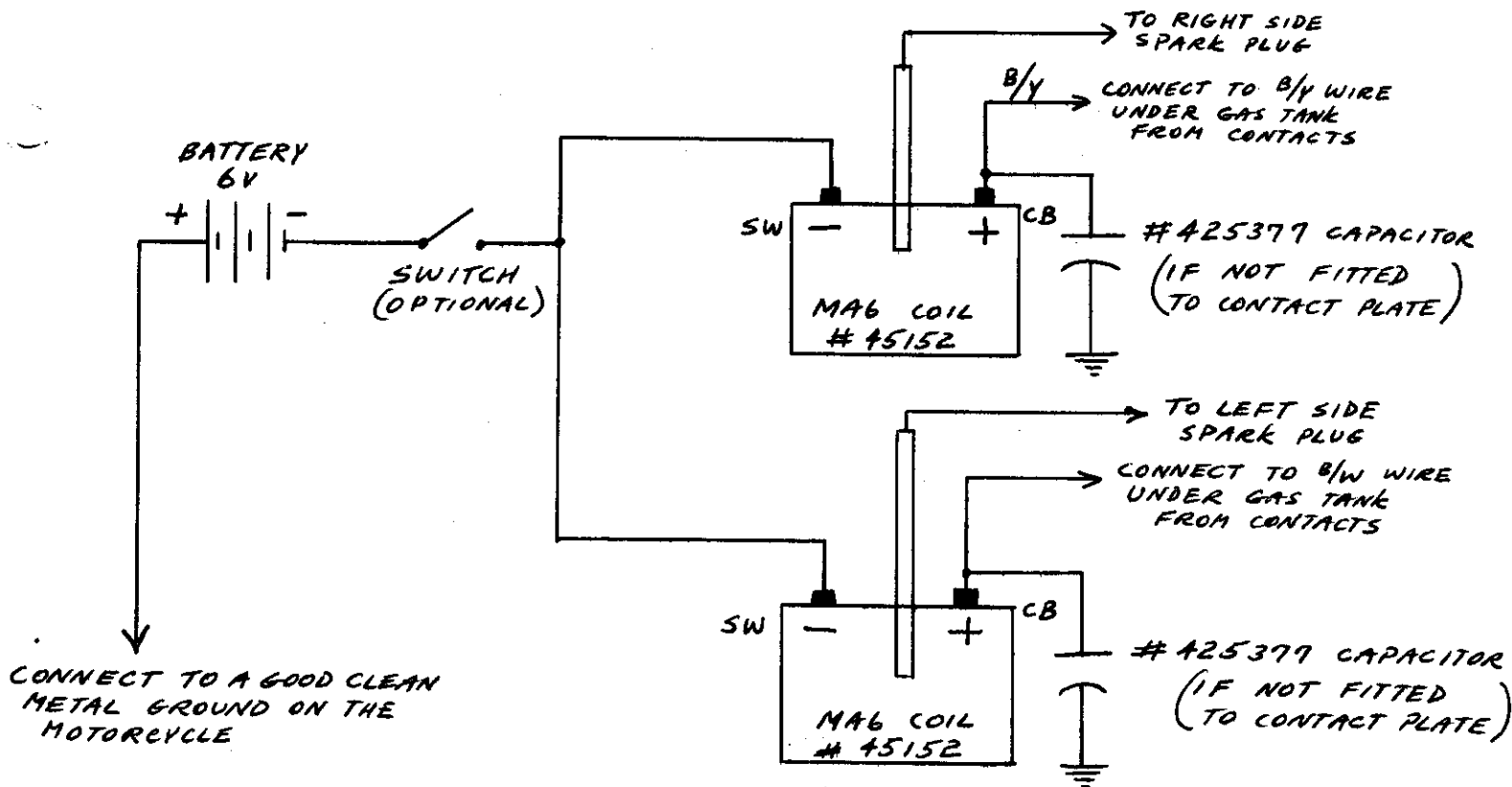
1. There should be continuity between any combination of the Brown, Black/Yellow, or Black/White leads.

2. There should be continuity between the Red and Brown/Blue leads.

By performing the above tests, you have checked the complete stator (both ignition and lighting windings) for shorts and opens. If the stator fails any one of these tests, you must replace it before proceeding further.

It is extremely unlikely that there is anything wrong with the alternator if the stator passes the above tests. To be dead certain however, you must make the following test of the alternator's A.C. voltage output.

To perform this test, you must make up a "power pack" to run the engine on while the stator is disconnected from the ignition system. Complete instructions are to be found in the CD411 or CD446 workshop manuals; however, the simple diagram for this "power pack" is shown below. It will be easy to construct the "power pack" from this diagram.



USE 16ga WIRE

OPEN WINDING TEST:

1. There should be continuity between any combination of the Red, Brown, or Brown/Blue leads.

2. There should be continuity between the Black/Yellow and Black/White leads.

IMPORTANT -- Run the engine only long enough to make the necessary test readings with this "power pack." The MA6 ignition coils are not designed to be run with such a long dwell ignition cam as the A.C. ignition cam. The long dwell will cause excessive current in, and overheating of the primary winding of the 6V coils.

ALTERNATOR IGNITION WINDING OUTPUT TEST:

Using a Tri-Cor "750" electrical test set or an equivalent test set that MUST contain a 1 ohm at least 100 watt resistor in it, do the following:

1. Turn the voltmeter switch to A.C.
Turn the load resistor ON.
2. Connect one voltmeter lead to the Black/Yellow lead from the stator.
3. Connect the other voltmeter lead to the Black/White lead from the stator.
4. Start the engine and run it at 3000 rpm (approximately 45 mph in 4th gear). Note the A.C. voltmeter reading. For both 47188 and 47197 stators, you must have a minimum output of 2.0 volts A.C.
5. If you have a 47188 stator, change one voltmeter lead from the Black/Yellow lead to the Brown lead. The reading obtained here should also be a minimum of 2.0 volts A.C.

If you have the required readings, the stator is positively good.

If you do not have a minimum of 2.0 volts A.C., then this indicates a faulty stator, demagnetized rotor, or that the rotor is not turning with the crankshaft. It will be necessary to remove the primary cover and check the rotor at this point. If it is turning with the crankshaft and is not demagnetized, then the stator must be replaced.

With the "power pack" removed and the good stator's ignition leads (B/Y, B/W) connected back into the motorcycle's wiring system, the ignition system should perform well at this point. If it does not, then further testing will be necessary to isolate the bad coil or capacitor that is causing the problem.

There are only 3 possible troubles a capacitor can have: it can be shorted, open, or leaky. Test as follows using an ohmmeter or, for the short test, a Tri-Cor #233 test light.

CAPACITOR SHORT TEST:

There should be no continuity between the lead and metal case of the capacitor.

CAPACITOR OPEN TEST: Using only an ohmmeter

Place one ohmmeter lead against the capacitor case and connect the other ohmmeter lead to the capacitor lead. Reverse the connections and you should see the ohmmeter needle "kick" slightly as the capacitor discharges. Use the highest resistance range of your ohmmeter for this test -- i.e., R x 10k.

CAPACITOR LEAKINESS TEST:

This test can only be made with a capacitor tester. It is highly unlikely the capacitor is leaky.

COIL TESTS:

As a quick check on the coils, use an ohmmeter to determine if the primary or secondary winding is open.

1. Primary Open Test:

There should be continuity between the Lucar terminal and the bare ground wire.

2. Secondary Open Test:

There should be continuity with some resistance between the bare ground wire and the metal pin in the spark plug wire hole of the coil.

At this time it is a good idea to insert the spark plug wire back into its coil hole and check for continuity again between the plug end of the spark plug wire and the coil ground wire. If, or once you have continuity between these points, 3M or flexseal the lead to the coil.

It is improbable that the coil will pass these tests and the bike still run poorly due to ignition trouble. As a final check however, if necessary substitute a new coil if one cylinder of the engine still fires erratically.

One final possibility of trouble lies at the kill button. Remove it from the electrical system by disconnecting the B/Y and B/W wires at the connectors under the gas tank. There should be no continuity thru the switch when the button is released and continuity thru the switch when it is depressed. The battery ignition kill switch (brown button, instead of black as on the A.C. ignition models) grounds the two leads in addition to connecting them together, and can be used on the A.C. ignition system if need be.

A.C. LIGHTING SYSTEM

A.C. lighting is straightforward once the system is understood.

ALTERNATOR LIGHTING WINDING OUTPUT TEST:

Again, the first thing to check is the A.C. voltage output of the stator's lighting windings. Proceed as follows using the Tri-Cor "750" test set:

1. Disconnect the lighting winding leads under the engine from the alternator side of the connector. These 2 or 3 leads are the Red, Brown on the 47197 stator, and Brown/Blue leads. (You have already checked the Brown lead on the previous alternator output test if you have the 47188 stator.)
2. Turn the voltmeter switch to A.C.
Turn the load resistor ON.

3. Connect one voltmeter lead to the Red stator lead.
4. Connect the other voltmeter lead to the Brown/Blue stator lead.
5. Start the engine and run it at 3000 rpm. On the 47197 stator, switch the voltmeter lead from the Brown/Blue to the Brown stator lead after taking the first voltage reading. You should observe the following minimum A.C. voltage readings;

Red - Brown/Blue -- 5.0 volts A.C.
(47197) Red - Brown -- 5.0 volts A.C.

If these minimum voltages are obtained, the stator's lighting winding output is O.K. Any lighting fault must lie in a short or open somewhere in the motorcycle's wiring system. By following the wiring diagrams in the workshop or owner's manuals, you can easily isolate and repair the fault.

If you have not already done so in the previous tests, check the stator for opens or shorts. Look for a non-rotating or demagnetized rotor if the stator checks O.K. If the rotor is magnetized and turning with the crankshaft and you still have no or low A.C. voltage output, the stator will have to be replaced.

GENERAL COMMENTS ON A.C. LIGHTING

Generally, two problems arise with the A.C. lighting system - either too much A.C. voltage output which blows bulbs or too little A.C. voltage output which results in dim lighting. Unfortunately, for a given load, the A.C. output of the alternator is solely dependent on engine RPM in the Lucas direct lighting system.

The most important thing to remember when working with the A.C. lighting system is to make sure that the correct wattage light bulbs are being utilized in the electrical system. These are:

6V Headlight	-- 24/24 watts Lucas #166
6V Stop & Taillight	-- 6/18 watts Lucas #384

Use of higher wattage light bulbs than these above will result in dimmer lighting throughout the engine's rpm range.

On the non-encapsulated 47188 stators, use of a higher wattage stop light than the Lucas #384 will place an additional load on the stator's ignition windings and may cause stalling or misfiring of the engine when the stop light is on. Additionally, on these 47188 stators it should be obvious that any short to ground in the stop light circuit will cause ignition trouble. The electrical advantage of the 47197 encapsulated stator is that the stop light winding is no longer connected to the ignition windings.

Faster and better service to your customer and increased profits will result from an understanding of the preceding description of the A.C. ignition and lighting systems. Study the descriptions and diagrams until the operating and testing PRINCIPLES are committed to memory.

Very truly yours,

THE TRIUMPH CORPORATION

Rod Coates

Service Manager

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