

## Energy Transfer (ET) Electrical Systems

If you bought a "competition" version of one of the many British bikes built between 1963 and 1967, then the bike probably came with a special ignition system that Lucas called "Energy Transfer". ET is nothing more than an AC ignition system, very similar to what's on your lawn mower. Think of ET as being the equivalent of the earlier model's K2F magneto, but spread over the entire bike instead of being a single lump. Indeed, the inability to adapt a magneto to the "unit construction" engines introduced by Triumph and BSA about 1963 was the whole reason for ET. The object of ET was to allow you to ride your bike off-road without the weight and complexity associated with battery ignition. ET came to an end about 1967-68 due to the DOT mandate that all motorcycles sold in the USA have battery powered lighting systems.

In order to operate an ET ignition system your motorcycle must have all these items:

- ET alternator rotor and location pin
- ET alternator stator (usually the 5-wire type, but some singles used a 4-wire)
- an AC ignition coil for each cylinder
- ET auto advance unit (marked 5°)
- ET wiring harness (or "loom")
- 6V lighting (if present)

Note also that the points plate is the about only device common to both an ET system and the DC "battery-coil" system used on road bikes. So the electrical system must be either all AC ignition or all DC ignition. You cannot mix and match the various parts.

If you are checking out a mid-60's Brit bike, the easiest way to spot an ET electrical system is to check under the seat. An ET bike has no battery box, battery, or rectifier. Of course, the bike could always be running one of several brands of "battery eliminators". The second check is to count the number of wires coming off the alternator. ET alternators will typically have a 5-wire stator on a twin cylinder bike. The wire colors will be: Blk/Yel, Blk/Wht, Brn/Blu, Brown, and Red.

The ET ignition system works by matching the power pulse generated by the ET alternator to the points opening and the piston position. The AC power pulse coming out of the alternator has to be timed to the points opening so that there will be enough energy to fire the coil. Lucas accomplished timing the alternator by installing a pin between the engine sprocket and the ET alternator rotor. On the backside of the ET rotor there are 3 holes, marked "R", "M" and "S", which allow you to set your stator impulse timing. The square crankshaft-to-rotor key is not used on the ET system.

Timing the ignition to the piston position is accomplished in the same manner as with normal DC systems, using the same tools. However, since one set of points serves as the return wiring for the other, a special low duration ignition cam profile was used. And since the energy pulse from the alternator was of very short duration, the auto advance unit is only

allowed 5° of advance travel. This often means that ET bikes can kick back and be generally cantankerous during cold starting. This is one reason ET is not favored for general use riding.

ET lighting was only intended to meet the bare requirements of the racing rules for enduro and other off-road riding. The AC headlamp used a puny 25W bulb, and the system shares the same woes and pitfalls as any 6V electrical system. Additionally, because the entire electrical system output depended solely on the engine, whenever the RPM dropped, the lights went from dim to dimmer. At night, seeing and being seen with ET lighting is simply out of the question. You'd be better off with a candle. The lights were clearly meant for daytime use only.

To convert a competition bike from ET to the newer 12V DC system requires the purchase of a lot of parts, but is definitely worth the effort. All the parts mentioned above must be swapped out for their standard road model counterparts. If you converted your bike to a newer "road model" alternator to get the safety of bright lights and possibility of electronic ignition, then use the standard crankshaft-to-rotor key. So it's either the AC ignition system (ET) or the road model DC ignition system ("battery & coil ignition"). Choose one or the other.

Hope this helps!

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