KOHLER ENGINES *in Action*

SERVICE BULLETIN

KOHLER CO., KOHLER, WIS.

BULLETIN NO. 55

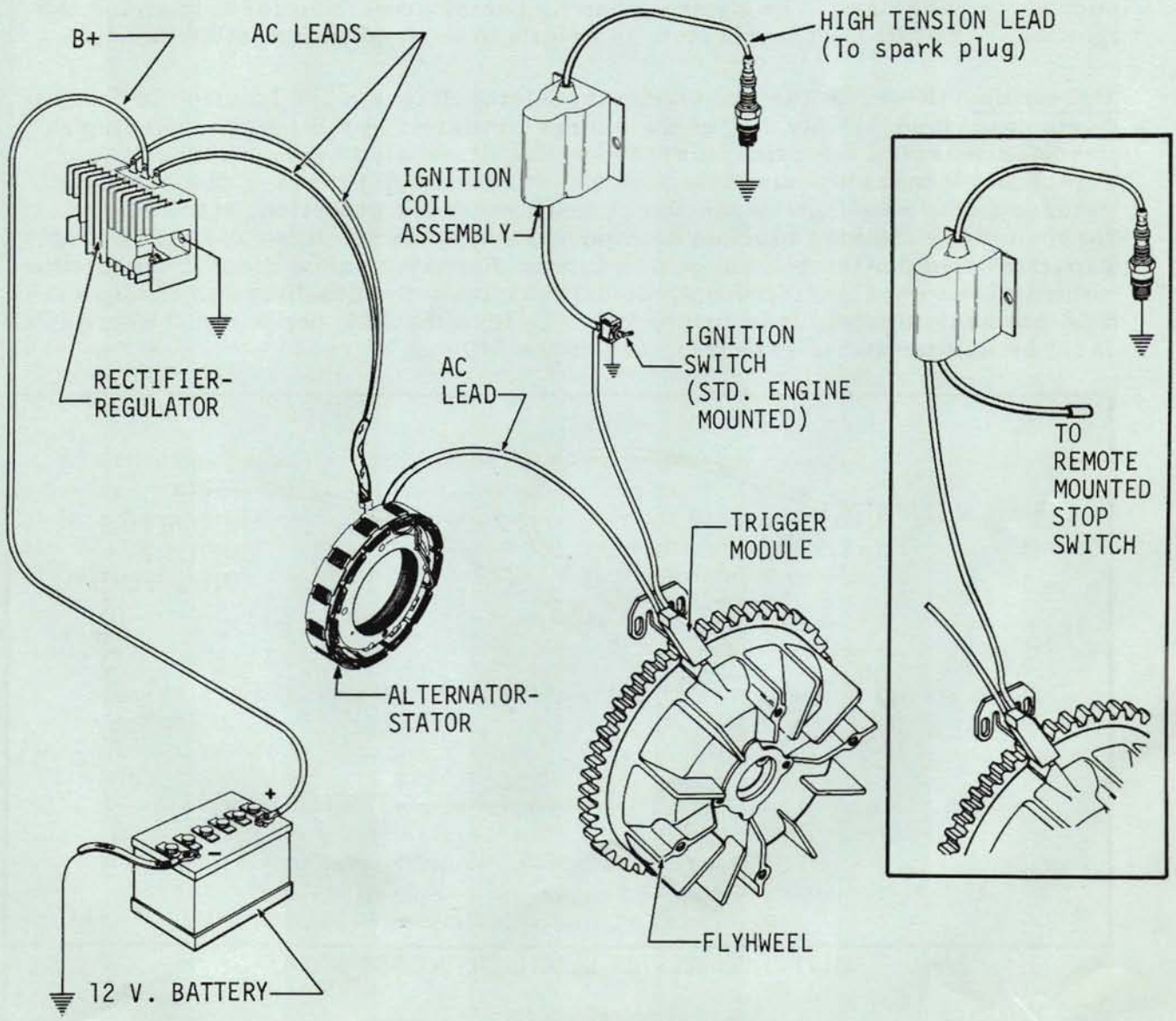
MODEL: K321

SUBJECT: Breakerless-Alt. Ign.

July, 1968

BREAKERLESS-ALTERNATOR IGNITION SYSTEMS

Kohler Breakerless-Alternator Ignition is now standard on the Model K321 and is also available as an option on some other models. This system uses solid state devices which eliminate the need for mechanically operated breaker points. With breakerless ignition, timing is permanently set for the lifetime of the engine. With the exception of the spark plug, the entire system is virtually service-free. The system provides an instantaneous, high energy spark which not only prolongs the service life of the plug but makes spark gap and even condition of the plug less critical.



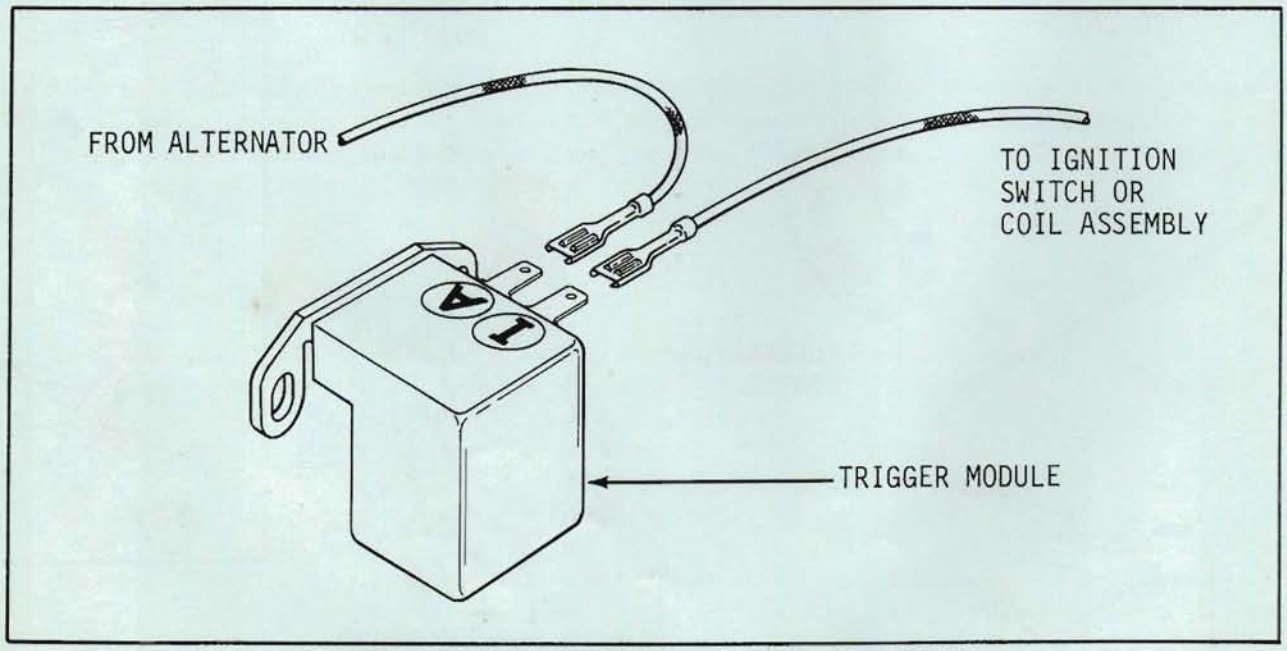
SCHEMATIC DIAGRAM, TYPICAL BREAKERLESS-ALTERNATOR SYSTEM

As shown in the schematic diagram on page 1, the breakerless ignition system includes four major components which are: ignition winding (on alternator stator), trigger module, ignition coil assembly and special flywheel with trigger projection. The system also includes the conventional spark plug and lead, plus an ignition switch on blower housing of engine or a remote mounted stop switch as shown in the inset. The ignition winding is separate from the other AC windings on the alternator stator--the other windings are used for battery charging and other purposes (discussed in Service Bulletin #49).

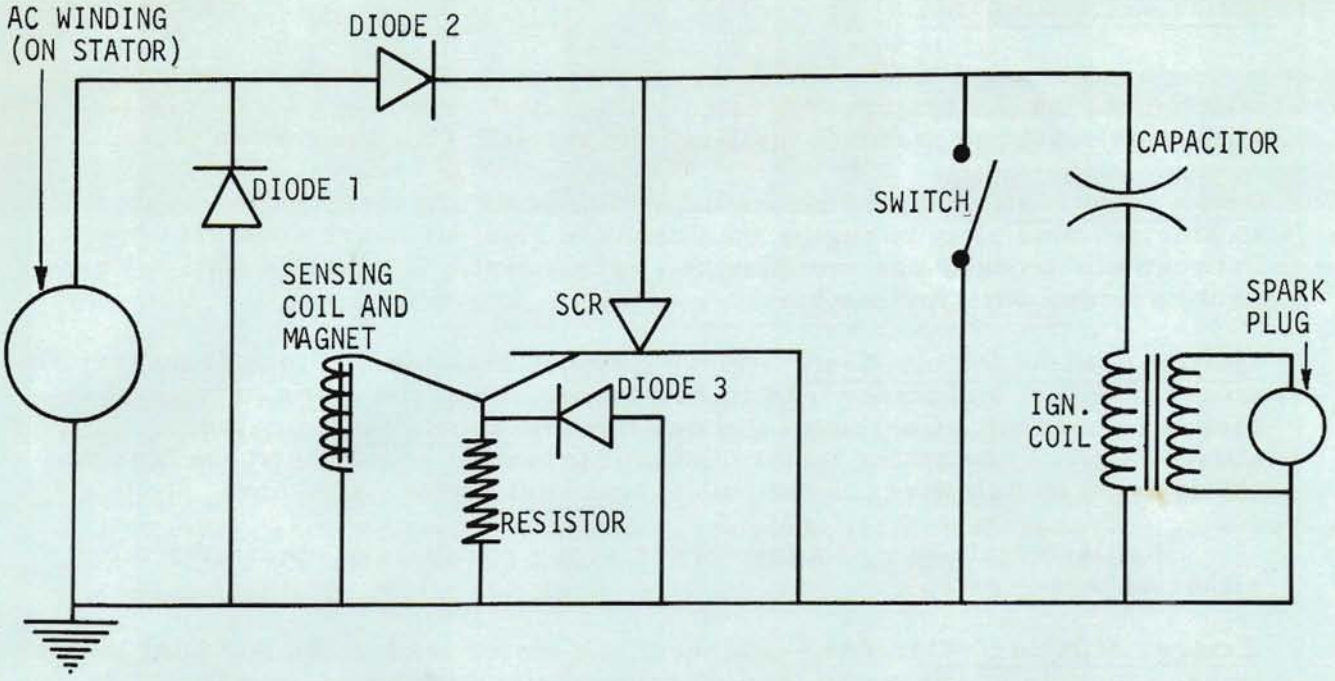
The trigger module includes three diodes, a resistor, a sensing coil and magnet, plus an electronic switch called an SCR. The trigger module has two clip-on type terminals. The terminal marked A must be connected to the alternator while the I terminal is connected to the ignition coil--improper hook-up will cause damage to the solid state devices.

The ignition coil assembly includes the capacitor and a pulse transformer arrangement similar to the conventional high tension coil with primary and secondary windings. The flywheel has a special projection for triggering the ignition. Operation of the system is briefly described in the following.

Operation: (Refer to the accompanying wiring diagram for location of components described.) Only 1/2 of the energy produced in the ignition winding is used for charging the capacitor. When the alternating current flows in one direction, it takes the shortest path (least resistance) through diode 1 and returns to the winding. When the current reverses direction, it travels through diode 2 (being blocked by diode 1) and flows into the capacitor. The capacitor thus builds up charge and cannot discharge since diode 2 blocks the return of the current. The only circuit available for discharge is through the SCR but at this point, it is turned off. To turn the SCR on, a small current must be applied to the gate terminal of the SCR.



WIRING CONNECTION DETAIL ON TRIGGER MODULE



WIRING DIAGRAM, BREAKERLESS IGNITION

When the projection on the flywheel is rotated adjacent to the sensing coil, it interrupts the magnetic field of the permanent magnet located inside this coil. The small current induced in the coil is applied to the gate which switches the SCR on to complete the circuit from the charged side of the capacitor through the high tension coil to the negative side of the capacitor. This instantaneous discharge of energy induces a very high density magnetic field around the primary winding which cuts the secondary winding and thus creates sufficient energy to fire the spark plug. Unlike the conventional system, there is no build up time nor does the sudden collapse of the magnetic field create the spark.

When the capacitor discharges completely and current through the SCR drops to 0 value, the SCR again switches off ready for the next ignition cycle. Diode 3 functions to block reverse current from reaching and damaging the gate of the SCR. The resistor prevents transient voltage from entering the gate circuit which could turn the SCR on at the wrong moment.

AIR GAP

The air gap between trigger assembly and projection on the flywheel is usually set at about .015" (± .005). Although the actual gap setting is not critical to operation at normal speeds, decreasing the gap to .010" may promote faster starting under certain conditions. If a closer gap is desired, rotate flywheel until projection is adjacent to the trigger assembly. To adjust, loosen capscrews on trigger bracket and move trigger closer to projection until .010" gap is measured on feeler gauge. Do not set closer than .010, and make sure flat surfaces on trigger and projection are parallel to each other. Retighten capscrews after gap is readjusted.

(concluded on page 4)

TROUBLE ANALYSIS

In case of ignition trouble, make the following tests in the sequence listed until the faulty part is located. Use an ohmmeter or flashlight type continuity tester to perform the Ignition Coil and Trigger Module tests.

Spark Plug Test: Remove plug from head, leave high tension lead connected to plug, ground plug on engine then crank engine--if spark does not appear between electrodes, use new plug and repeat test. If spark is still not evident, proceed with further tests.

Ignition Coil Assembly Tests: (A) -- Remove high tension lead from terminal on coil. Insert one tester lead in coil terminal and the other to the coil mounting bracket. Continuity through the coil should be indicated.
(B) -- Connect one tester lead to the coil mounting bracket and the other to the ignition switch wire. Continuity should not be indicated here.

Replace ignition coil assembly if wrong results are obtained from either of these tests.

Trigger Module Tests: (A) -- Connect one tester lead to the AC inlet lead on trigger module and other to lead on trigger side of ignition switch. This should show continuity in one direction but not in the other--reverse leads to check this. (B) -- Connect one tester lead to the trigger module mounting bracket and the other to the AC inlet lead to the module. Continuity should be indicated in one direction but not in the opposite--reverse leads to check this. (C) -- Connect positive lead of tester to outlet (coil side) wire on ignition switch, connect other lead to the trigger module mounting bracket. Crank engine--when trigger projection on flywheel passes the trigger module, the flashlight tester should turn on, or if an ohmmeter is used, a 5 to 10 ohm resistance should be indicated. Before being triggered, an open circuit should be indicated.

Replace the trigger module if wrong results are obtained from any of these tests.

AC Leads and Winding: If ignition trouble persists after the system checks out in each of the foregoing tests, the AC leads or ignition windings are probably faulty. Replace stator assembly in this event.