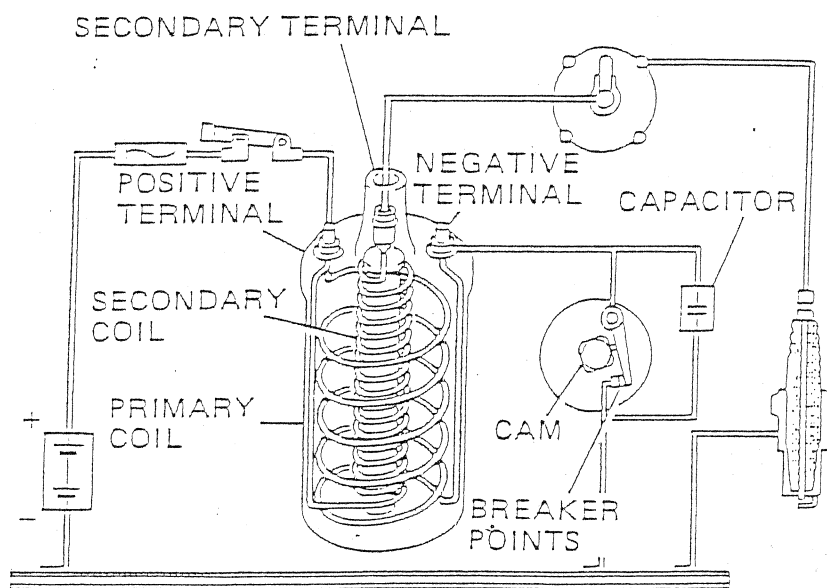


ELECTRONIC IGNITION SYSTEMS

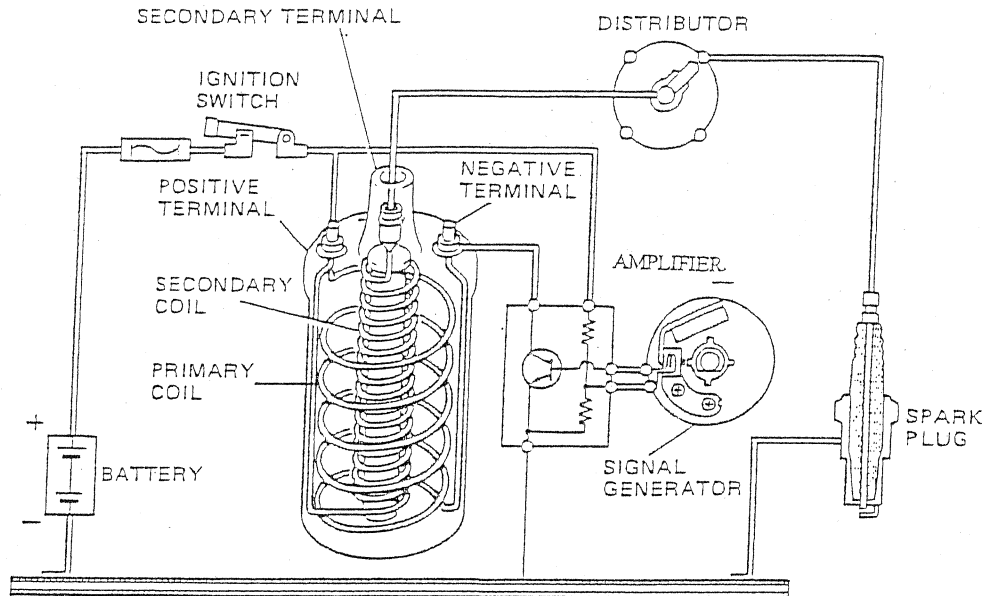
The contact breaker ignition system was not deemed suitable for meeting current emission legislation that was being introduced. This was because of the limitations of the contact breaker side of the system and not the transformer components. The limitations include:

1. Contact bounce at high engine rpm, causing misfire and emission increase.
2. Frequent servicing and replacement (approximately every 6000 miles).
3. Wear on the mechanical heel of the CB causing a shift in dwell angle and a subsequent shift in ignition timing.
4. A reduction in effective dwell angle at higher rpm.
5. A current capacity limit of 3 to 4 amps.



CONVENTIONAL IGNITION SYSTEM

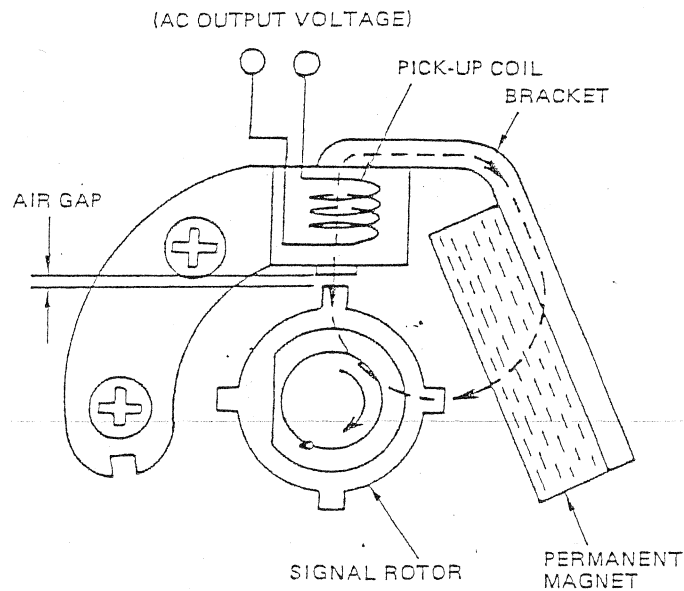
ELECTRONIC IGNITION



TRANSISTOR IGNITION SYSTEM

SIGNAL GENERATOR

In an electronic ignition system, a signal generator replaces the contact breaker points. It generates a voltage that is used to switch off the primary circuit. The primary circuit goes to earth via a power transistor. The permanent magnet (reluctor) signal generator produces an AC voltage. It consists of a permanent magnet, a pick-up coil and a signal rotor.



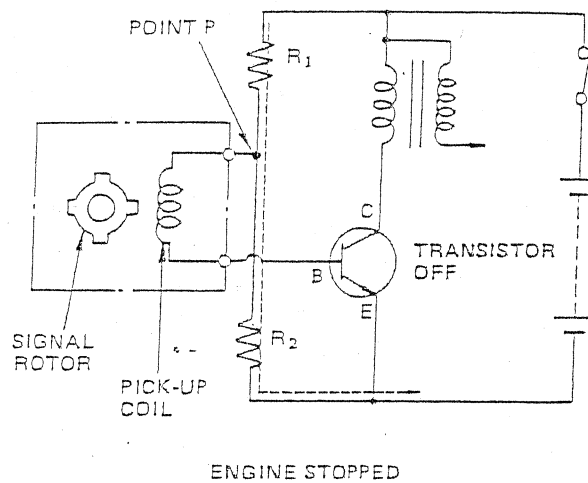
SIGNAL GENERATOR

OPERATION

a. Engine Stopped

A voltage is applied at point P when the ignition is switched on. The voltage is kept below the base threshold voltage required for transistor operation by voltage dividers R_1 and R_2 .

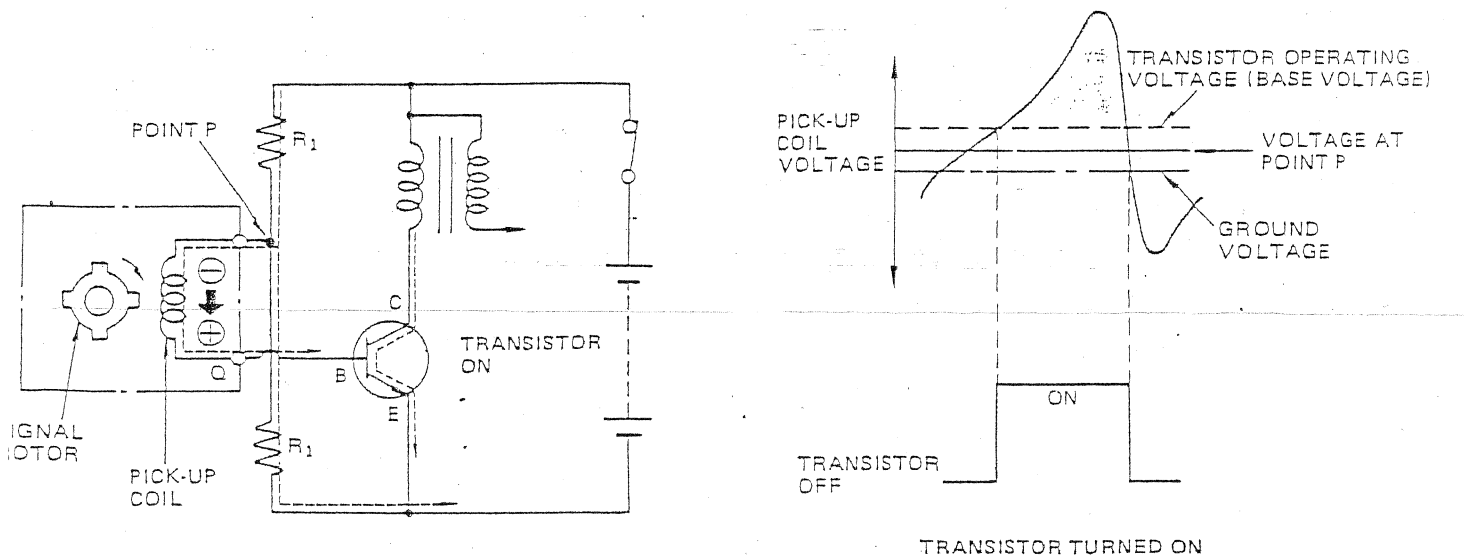
As a result, the transistor remains off while the engine is stopped and no primary current flows through the ignition coil.



b. Engine Running (positive voltage generated in pick-up coil)

When the engine is cranked, the signal rotor rotates and generates an AC voltage in the pick-up coil.

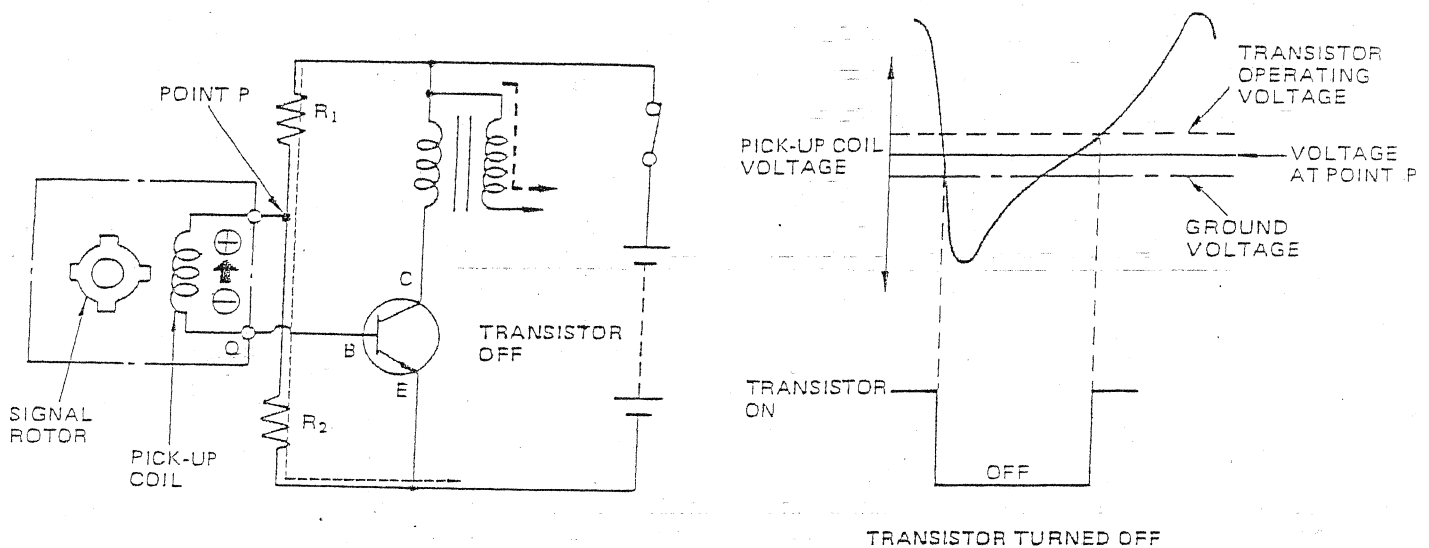
If the generated AC voltage is positive, it is added to the voltage applied at point P raising the voltage at point Q (transistor base voltage) above the threshold and thus turning it on.



c. Engine Running (negative voltage generated in pick-up coil)

When the AC voltage generated in the pick-up coil is negative, this voltage is also added to point P, however this time the voltage at point Q falls below the transistor operating voltage, thus turning the transistor off.

As a result the ignition primary current is turned off and a high voltage is induced into the secondary circuit.



DWELL CONTROL

The length of time available for primary current flow decreases at higher engine speeds. This can lead to less induced voltage into the secondary circuit. At low engine speeds the dwell period is reduced to prevent excessive primary current flow. The dwell is increased with a rise in engine speed to maintain sufficient time for the coil to fully charge.

CURRENT LIMITING

The current limiting circuit helps to protect the coil and associated wiring from overloading at low engine speeds. It can also compensate for a fall in battery voltage during engine cranking. The current flowing in the primary circuit will always be sufficient to produce the H.T. required for the combustion process to be initiated within the cylinder.

When the rotor teeth are positioned as shown in A, the air gap with regard to the pick-up is at its greatest, so the flux density is weak. Until the next tooth passes the pick-up coil, the flux change is zero and no EMF is generated.

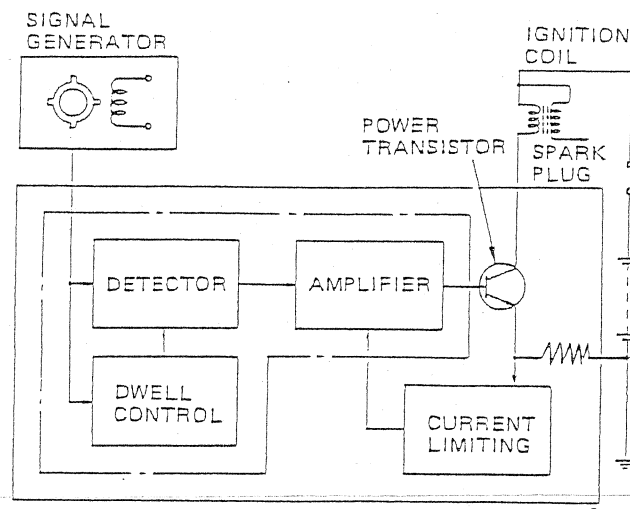
At position B, the flux change is the greatest and the maximum EMF is generated.

Between positions B and C, the flux change decreases and the generated EMF is reduced.

Since the EMF in the pick-up coil is induced in the direction obstructing a change in the flux, the directions are reversed when the signal rotor tooth approaches the pick-up coil as shown in B (when the air gap decreases to increase the flux) and when the signal rotor tooth moves away from the pick-up coil as shown in D (when the air gap increases and the flux decreases), so AC output occurs.

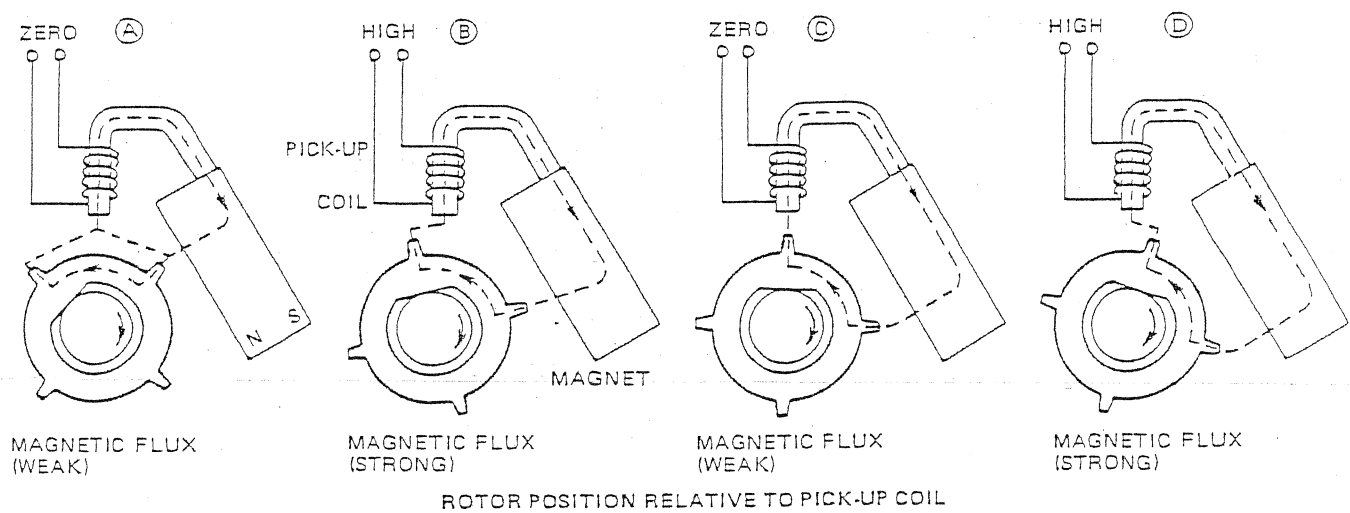
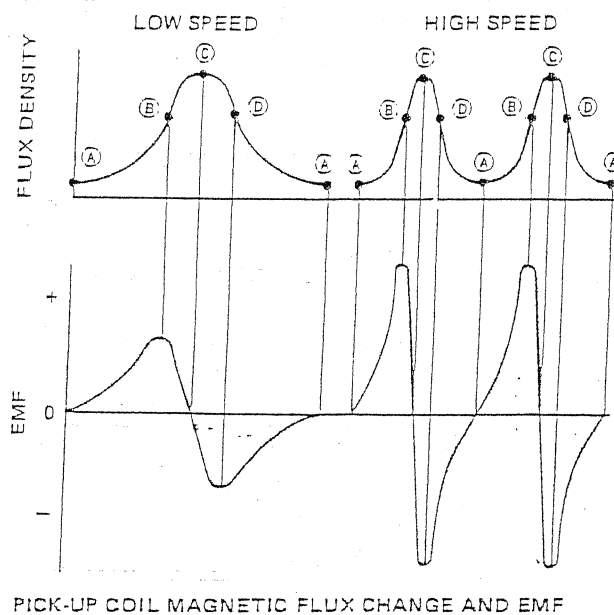
AMPLIFIER

The amplifier consists of a detection circuit which detects and processes the EMF generated by the signal generator. The EMF signal is amplified and used to switch off the power transistor carrying the ignition primary current. Variable dwell control is also carried out by the amplifier. Certain types of amplifier also have current limiting features.



OPERATION

The magnetic flux path of the permanent magnet runs from the signal rotor, through the pick-up coil. Since the air gap varies with the position of the rotor tooth relative to the pick-up coil, the flux density through the pick-up coil changes. This change in flux density generates an EMF (electro-motive force (Voltage)) in the pick-up coil.



DWELL ANGLE

DWELL ANGLE:- The angle through which the distributor cam turns while the points remain closed.

:- The period during which the FULL strength magnetic field is built up in the coil PRIMARY windings.

REDUCED DWELL:- Reduced strength magnetic field.

:- Reduction in coil output and possible engine misfire under certain conditions.

(INCREASED POINTS GAP)

INCREASED DWELL:- Excess arcing at the points due to insufficient points gap.

:- Insufficient points gap will cause poor or difficult starting since arc may continue across the points using energy that would normally create a spark at one of the plugs.

(INSUFFICIENT POINTS GAP).

DWELL VARIATION:- Change of AVERAGE (all cylinders) dwell angle with engine speed.
MAX. variation 3° or spec. (Autolite 6°)

FAULTS:-

1. Worn distributor shaft and/or bushes.
2. Worn action (moving) plate or pivot.
3. Worn points pivot.
4. Base plate loose.

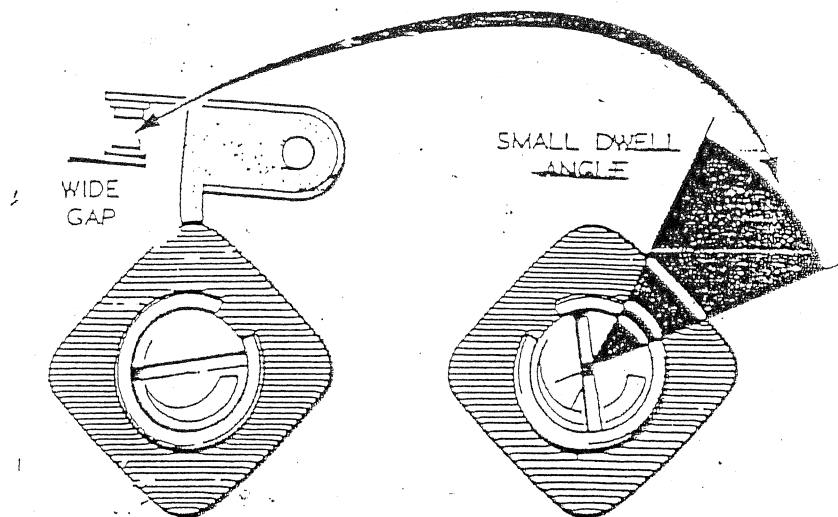
CAM LOBE ACCURACY:- The difference between ignition timing points for individual cylinders.
(Dwell Overlap)

MAX. difference 3° or spec, between points open signals (scope, superimposed pattern).

FAULTS:-

1. Badly ground or worn distributor cam.
2. Bent distributor shaft.
3. Worn timing chain or tensioner.
4. Worn distributor drive gear.

A wide gap results when the fixed point is adjusted too near cam centre (inwards). Later closing and earlier opening reduces dwell angle and advances ignition timing.



A narrow gap results when the fixed point is adjusted too far from cam centre (outwards). Earlier closing and later opening increases dwell angle and retards ignition timing.

