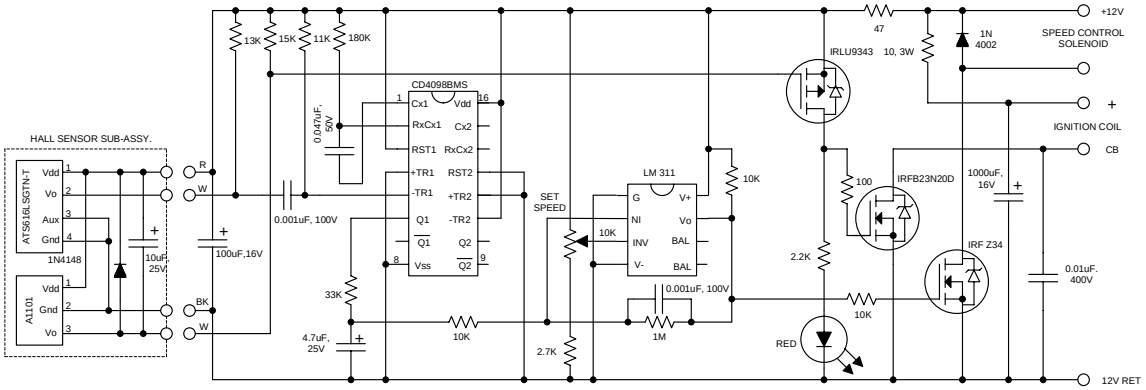
DESCRIPTION OF ELECTRONIC IGNITION AND SPED CONTROLCIRCUIT.



ELECTRONIC IGNITION AND SPEED CONTROL CIRCUIT

The above circuit is powered by a 12V battery and provides ignition pulses to any standard ignition coil and an output for controlling a solenoid (electro magnet) to prevent the exhaust valve of a hit ‘n miss engine from closing as the engine over-speeds above a predetermined speed setting.
With the exhaust valve held open, the engine will not fire and slows down until the speed control circuit senses an under-speed condition and allows normal exhaust valve operation. The net result is the typical hit ‘n miss operation that we want.

The ignition part of the circuit is quite simple and operates by sensing the magnetic field of a small but powerful magnet mounted to the steel cam gear. Actually it is not even mounted as its own magnetism is sufficient to hold it in place. This makes for a very easy way to change the ignition timing merely by moving the magnet around on the steel cam gear.
The output pulse from this sensor is amplified by a P-Channel MOSFET which drives a red LED that flashes at each ignition pulse and also drives an N-Channel power MOSFET which actually drives the primary of the ignition coil. The high voltage secondary of this coil is connected to the spark plug.

The speed control part of the circuit uses another Hall sensor that counts the teeth of the cam gear as it rotates. The output from this sensor is a square wave with a frequency directly proportional to engine speed. Using a 36 tooth cam gear, the frequency is 150 Pulses Per Second at 500RPM and 60 PPS at 200 RPM.
The negative transitions of the square wave are used to trigger a “one-shot” which produces a constant pulse width at each trigger. The output of the one shot is integrated into a DC voltage proportional to speed and it is this voltage that is compared with a reference voltage (the speed setting) in a comparator circuit.

The comparator output is low for under-speed and high for over-speed. This output drives another N-Channel power MOSFET that drives the exhaust valve control solenoid.

My engines both use cam gears with 36 teeth and the speed control range is from about 200RPM or less to about 500RPM (crankshaft). However, because of the lower flywheel momentum of the “Farm Type Hit ‘n Miss Engine”, the minimum speed is about 300RPM.

Note: In order to achieve low speeds (200 RPM or lower), the engine must be free running with excellent compression and no valve leakage. The flywheels must also have sufficient momentum to achieve the low speed.

I hope the above description was not too confusing but I couldn’t think of a simpler one. I tried to keep the cost of parts to a minimum by using only “off the shelf” parts which are readily available from suppliers such as Digikey.

The prototype was built on Vectorbord but eventually I hope to transfer the circuit to a printed wiring board using less expensive SMD components

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