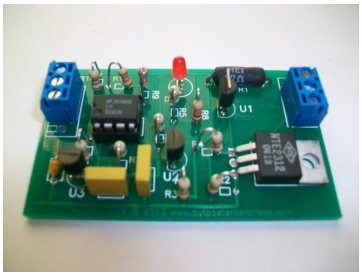

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Model Engine Electronic Buzz Coil Circuit Parts Kit

History:

"This buzz coil circuit was designed by Floyd Carter of Los Altos, CA. It powers an ordinary ignition coil producing about 200 sparks per second without vibrator points on the coil as was used on the Ford Model T. It can be used with conventional points, micro switch, or Hall effect magnetic pickup for ignition timing. It is intended to be used on slow running engines such as the hit-and-miss governed etc… Floyd does not want to make kits or boards, so I thank him here for the design, plus the help and advice he has freely given me to make this a better project." JEH

Disclaimer:

This kit is not difficult to assemble, but should be assembled by someone who is proficient at soldering PCB's (printed circuit boards) using a small pencil soldering iron not more than 50 watts in power. The PCB is a quality product made here in the USA, and the remaining components are manufactured by quality name brand suppliers, and they WILL be good when you receive them. Since there are lots of ways to destroy electronic components - overheating during soldering, wrong connections, short circuits, static electricity, magnetic fields, etc., please take care, but if you do damage a component, e-mail us and we can quote you the price for a replacement.

PCB Assembly Notes:

Please read these instructions in their entirety before proceeding! Use a small diameter (.032"-.060") rosin core solder and a small pencil iron of around 40 watts with a nice clean conical or pyramidal shaped tip. Excess heat can kill electronic components, so make each connection quick then get the iron off. The longer the iron is in contact, the more heat that can conduct into the component. Some builders find it easier to solder by cutting the leads to within 1/32" after inserting the component into the board.

The IC and Transistors: Orientation is extremely important for the 555 IC, transistors, and the LED. We suggest you install the 555 Timer IC first, making sure that the recessed "dot" on the IC is on the same end as the notch in the PCB diagram. Then install the other transistor components as this leaves room for using a heat sink on each lead while soldering. Before installing the large transistor, bend the leads down at a 90 degree angle where the lead changes width so that the metal tab will lay flat against the board. Position the smaller transistors so their flat side is aligned with the flat side of the symbol on the PCB. For these parts, grip the lead between the component and the board with a heavy pattern tweezer as each lead is soldered. This helps prevent the heat from conducting up the lead into the component, which could damage it. The solder pads for the small transistors are very close together, so be very careful when soldering to make sure there are no solder bridges. Use an X-acto knife and scrape the board between these pads to help insure there are no shorts.

The LED: The Light Emitting Diode is mounted directly on the board and a heat sink can't be used. These are heat sensitive also, so solder it quickly. It is polarized, so be sure the long lead is inserted in the + trace that runs along the edge of the board.

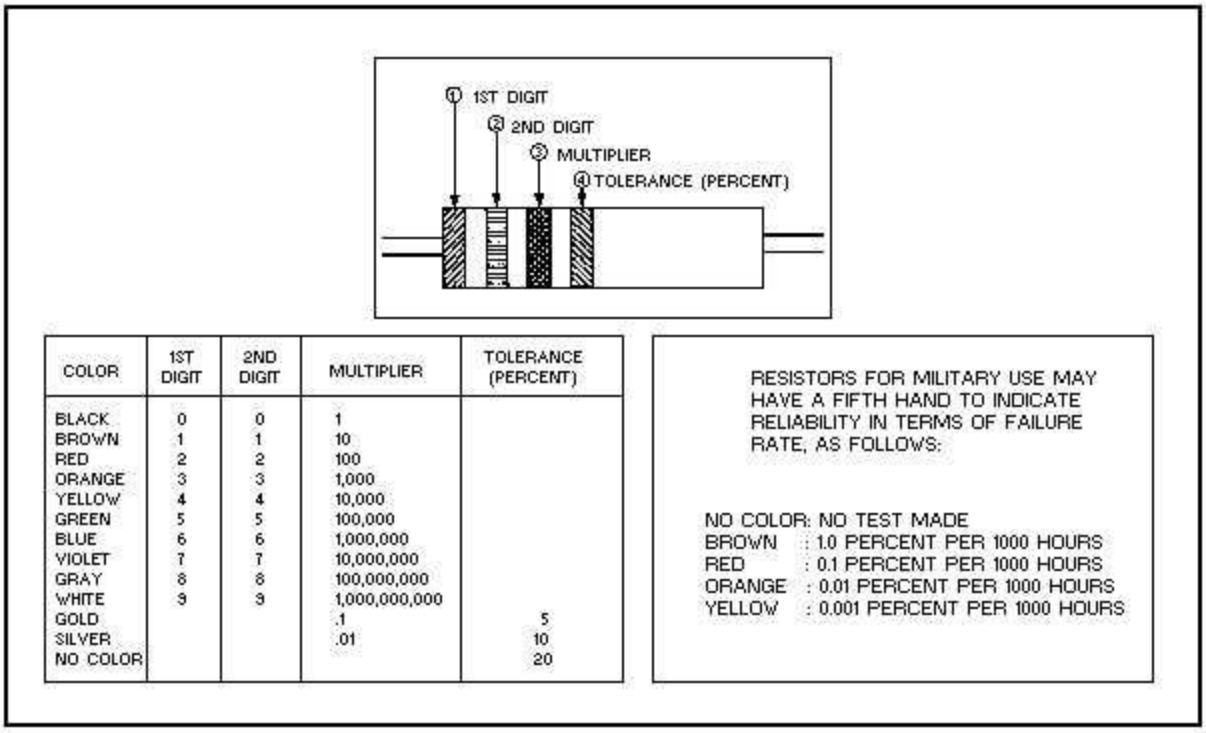
Remaining Parts: The 10 resistors and 3 capacitors are not harmed by normal soldering heat and the use of a heat sink is not required. Orientation does not matter. Resistors R2 through R12, if they're too long to lay horizontally, can be installed vertically per Diagram 6. The blue terminal blocks are not required, but they make wire hookup much easier. Solder the terminal blocks so that the openings for the wires are on the outer edge of the board. Note that the terminal blocks have positions for three wires, but the board has 4 holes for each. This is because one pair of wires will be shared on one terminal. Solder the Hall sensor block in alignment with the 1 2 3 symbols on the board. The GND position will remain uncovered, and when you connect the ground wire, you can solder it here, or share it with position 2 of the Hall terminal. Solder the Power/Coil block in alignment with the Coil+, Coil-, and -6v symbols on the board. The +6v position will remain uncovered, but this connection can be shared with Coil+.

Trim the component leads on the bottom of the board as close as possible with diagonal cutters. Carefully check the circuit traces and especially between component solder pads under magnification to make sure there are no solder bridges across them.

Component Placement Chart

PCB Label	Component	Notes
U4	555 Timer IC	Align dot or notch on IC with notch on PCB diagram
Q1	NTE2315 Transistor (Large)	May be substituted with MJE13007G
U1	NTE24 Transistor	Align flat side of transistor with PCB diagram
U2	2N2907A Transistor	“
U3	2N2907A Transistor	“
C1	.01uF Capacitor 100v 10%	Mylar Film 103 or square 10nJ100
C2	.1uF Capacitor 100v 10%	Square .1J100
C3	.1uF Capacitor 100v 10%	Square .1J100
R1	27 Ohm 3 Watt Resistor 5%	Large, no color bands
R2	470 Ohm ¼ Watt Resistor 5%	Yellow-Violet-Brown
R3	150 Ohm ¼ Watt Resistor 5%	Brown-Green-Brown
R4	470 Ohm ¼ Watt Resistor 5%	Yellow-Violet-Brown
R5	180 Ohm ¼ Watt Resistor 5%	Brown-Gray-Brown
R6	10K Ohm ¼ Watt Resistor 5%	Brown-Black-Orange
R7	1K Ohm ¼ Watt Resistor 5%	Brown-Black-Red
R8	330 Ohm ¼ Watt Resistor 5%	Orange-Orange-Brown
R9	27K Ohm ¼ Watt Resistor 5%	Red-Violet-Orange
R10	4.7K Ohm ¼ Watt Resistor 5%	Yellow-Violet-Red
R11	12K Ohm ¼ Watt Resistor 5%	Brown-Red-Orange
R12	470 Ohm ¼ Watt Resistor 5%	Yellow-Violet-Brown
D1	Light Emitting Diode	Make sure long lead (+) is soldered on trace along PCB edge
Hall/Points	3 Position Screw Terminal Block	Align with 1 2 3 symbols
Coil/Batt	3 Position Screw Terminal Block	Align with Coil+, Coil- and -6v symbols

Resistor Color Codes



COLOR	1ST DIGIT	2ND DIGIT	MULTIPLIER	TOLERANCE (PERCENT)
BLACK	0	0	1	
BROWN	1	1	10	
RED	2	2	100	
ORANGE	3	3	1,000	
YELLOW	4	4	10,000	
GREEN	5	5	100,000	
BLUE	6	6	1,000,000	
VIOLET	7	7	10,000,000	
GRAY	8	8	100,000,000	
WHITE	9	9	1,000,000,000	
GOLD			.1	5
SILVER			.01	10
NO COLOR				20

RESISTORS FOR MILITARY USE MAY HAVE A FIFTH HAND TO INDICATE RELIABILITY IN TERMS OF FAILURE RATE, AS FOLLOWS:

NO COLOR: NO TEST MADE
BROWN : 1.0 PERCENT PER 1000 HOURS
RED : 0.1 PERCENT PER 1000 HOURS
ORANGE : 0.01 PERCENT PER 1000 HOURS
YELLOW : 0.001 PERCENT PER 1000 HOURS

Buzz Coil Module Installation Notes:

Wiring: Place the buzz coil module, coil and battery as close to the engine as possible to reduce current losses in the connecting wires. Battery and coil wire should be from #20 to #18 gauge - a medium size stranded wire that will carry 4 amps of current. Jerry used red for +, black for -, and yellow or white for the coil leads. The wiring distance and wire size from the points or Hall sensor (whichever you use) to the PCB can be small -- wire as small as #28 a foot long has been successfully used.

Points: If you use conventional points, you don't need a capacitor across them. You can use a tiny micro-switch instead of conventional points and the contacts will not burn because the current through the contacts is only .0035 amps and there is no arcing. Again, no condenser is used. Connect to the PCB as per Diagram 3. Unlike with conventional ignition, the plug will fire when the points are closed instead of when they open. The LED on the board will be of help in setting the timing. If you use standard ignition points where one contact is grounded to the engine frame (normal practice), connect a ground wire from the engine frame to the GND pad on the PCB (or #2 Hall screw block) as shown in the diagram.

Hall Sensor: Jerry liked the Hall Effect setup and used it on most of his engines. There are no mechanical contacts at all and therefore no adjustments once set and no wear ever. Connect the Hall sensor to the PCB as per Diagram 2. By trial, determine which pole (south) of the magnet activates the Hall sensor and mark it. Drill a shallow pocket in the side of the cam gear for the magnet so it will be flush with the gear surface and the marked side up. JB Weld can be used for this. If the cam gear is iron or steel (magnetic), you will need to separate the magnet from the iron by about 3/32" or so with a non-magnetic spacer material such as aluminum, brass or plastic. If there is room, drill or mill a ¼" or 5/16" diameter pocket for the plug and mount the magnet in the plug. The Hall sensor should be mounted so that it will be within about 1/32" of the magnet when it passes by. The printed side of the Hall sensor faces the magnet as per Diagram 5. If you mount the sensor on an arm that pivots around the cam shaft, you will have adjustable spark advance and retard. The larger the circle the magnet is mounted in relation to the camshaft center, the shorter the time the coil will be energized (dwell). Too short a time may cause a weak spark or no spark at all, too long a time is a waste of battery power and may over heat the circuit and coil, resulting in damage. For info on correct dwell angles, see: http://www.model-engine-plans.com/partskits/ignitionsystems/howtobuildtransistors.htm#dwell. The Q1 transistor should never get more than "luke" warm in use. If it gets really warm, try attaching an aluminum plate heat sink between it and the PCB to help dissipate heat. ALWAYS DISCONNECT POWER TO THE CIRCUIT WHEN THE ENGINE IS NOT RUNNING!

VERY IMPORTANT - Hall Effect sensors and Micro Switches do not have electrical ground contact with the engine frame. If you are using one of these for ignition, AND using a 4-wire coil with isolated grounds, then provide a ground wire from the engine frame to the GND pad (or #2 Hall screw block) on the PCB. Without a ground, the Hall sensor and possibly the circuit board may be destroyed by the coil high voltage.

Coil: You could probably use just about any 6/12 volt ignition coil with a primary resistance of 1 to 3 ohms. Against all advice to the contrary, Jerry has used old style Briggs & Stratton lawn mower magneto coils and 6 volt sealed lead-acid batteries on several of his earlier engines. Newer Briggs coils will not work because they contain solid state devices that trigger the coil when the flywheel magnet is in position, thus eliminating the points. A far better choice is the Modelelectric ignition coils Jerry used exclusively for several years. They are very small in size, low in current draw and have proved to be very rugged and reliable.

IMPORTANT NOTES: Do NOT use an ignition coil with a primary resistance of less than 1 ohm. Do NOT ground your battery to the engine frame as it will short out the coil and burn up. Do NOT exceed 12 volts. The ideal operation and coil voltage is 6 volts.

UPDATE: Modelelectric, "Exciter", and other suitable small coils are getting harder, if not impossible, to find. We have found several alternative coils that work fine in our testing. See http://www.model-engine-plans.com/partskits/ignitionsystems/coil.htm

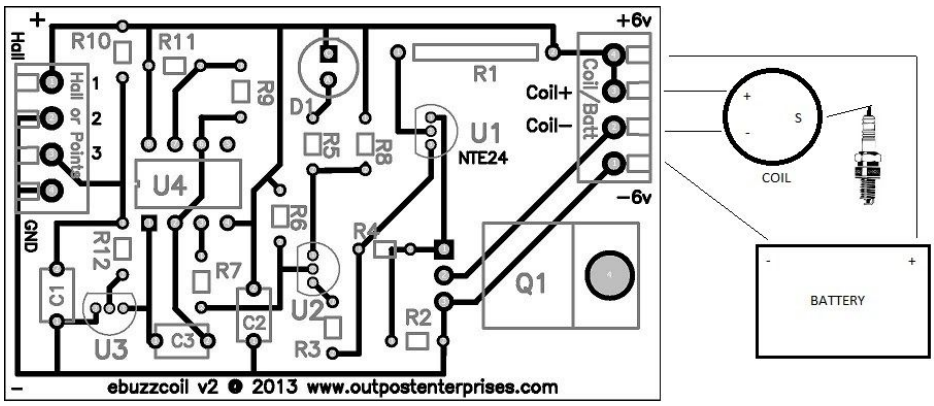


Diagram 1 - Coil and Battery Connections

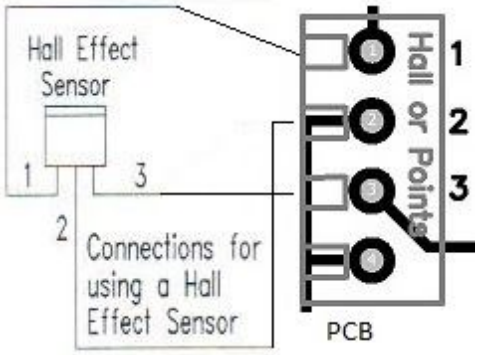


Diagram 2

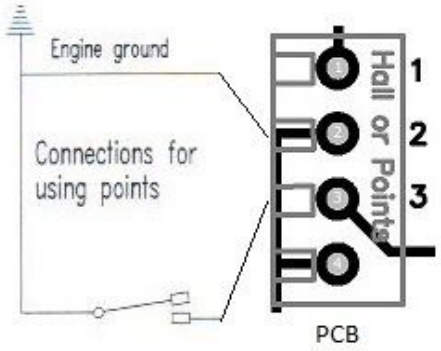


Diagram 3

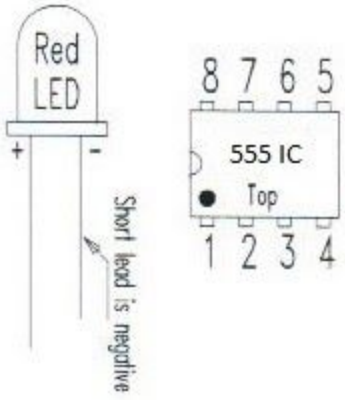


Diagram 4

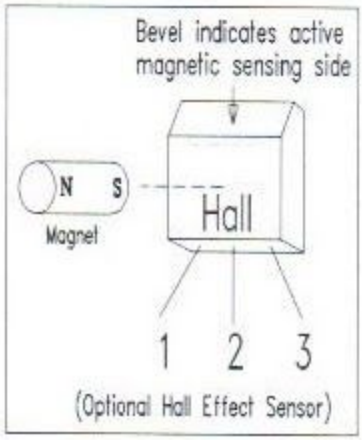


Diagram 5

Vertical Resistor

Resistor standing on end with the top lead going to the next solder post.

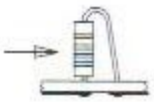
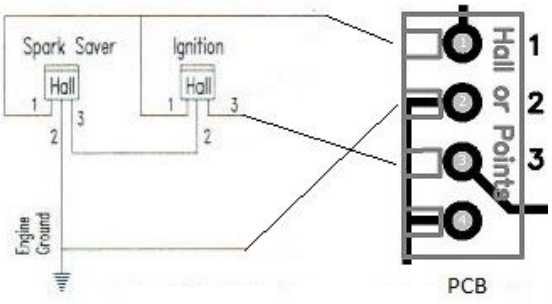


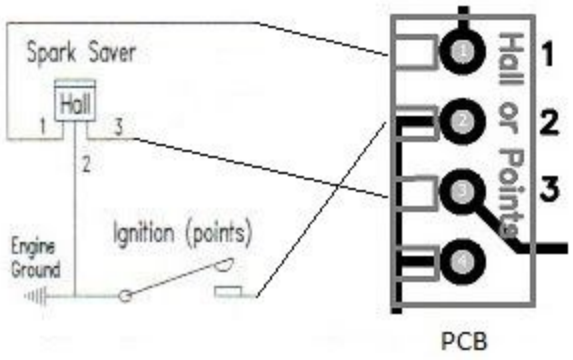
Diagram 6

Many of the old hit-n-miss engines used spark saver switches. They extend running time between battery charges. The spark saver switch is mounted so that when the exhaust valve is being held open and the engine is coasting, the switch (Hall Sensor) is open and preventing a spark. You can mount the spark saver magnet on a brass post affixed to the exhaust valve push rod. Mount the Hall sensor stationary so the sensor is only "on" when the valve is closed.



Spark Saver Using (2) Hall Effect Sensors

(Use two optional Hall Effect Kits)



Spark Saver Using (1) Hall Effect Sensor & (1) Micro-Switch or Conventional Points Set

(Use one optional Hall Effect Kit)