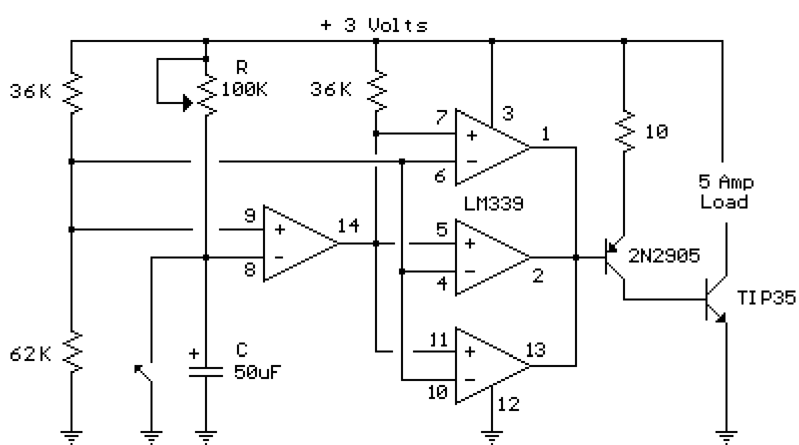
Low Voltage, High Current Time Delay Circuit

In this circuit a LM339 quad voltage comparator is used to generate a time delay and control a high current output at low voltage. Approximatey 5 amps of current can be obtained using a couple fresh alkaline D batteries. Three of the comparators are wired in parallel to drive a medium power PNP transistor (2N2905 or similar) which in turn drives a high current NPN transistor (TIP35 or similar). The 4th comparator is used to generate a time delay after the normally closed switch is opened. Two resistors (36K and 62K) are used as a voltage divider which applies about two-thirds of the battery voltage to the (+) comparator input, or about 2 volts. The delay time after the switch is opened will be around one time constant using a 50uF capacitor and 100K variable resistor, or about (50u * 100K) = 5 seconds. The time can be reduced by adjusting the resistor to a lower value or using a smaller capacitor. Longer times can be obtained with a larger resistor or capacitor. To operate the circuit on higher voltages, the 10 ohm resistor should be increased proportionally, (4.5 volts = 15 ohms).



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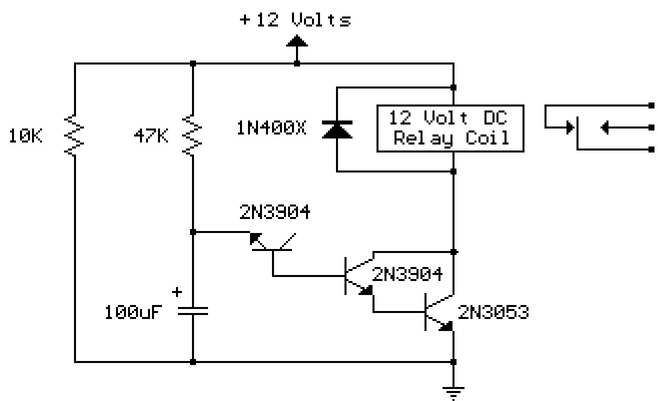
Power-On Time Delay Relay

Here's a power-on time delay relay circuit that takes advantage of the emitter/base breakdown voltage of an ordinary bi-polar transistor. The reverse connected emitter/base junction of a 2N3904 transistor is used as an 8 volt zener diode which creates a higher turn-on voltage for the Darlington connected transistor pair. Most any bi-polar transistor may be used, but the zener voltage will vary from about 6 to 9 volts depending on the particular transistor used. Time delay is roughly 7 seconds using a 47K resistor and 100uF capacitor and can be reduced by reducing the R or C values. Longer delays can be obtained with a larger capacitor, the timing resistor probably shouldn't be increased past 47K. The circuit should work with most any 12 volt DC relay that has a coil resistance of 75 ohms or more. The 10K resistor connected across the supply provides a discharge path for the capacitor when power is turned off and is not needed if the power supply already has a bleeder resistor.



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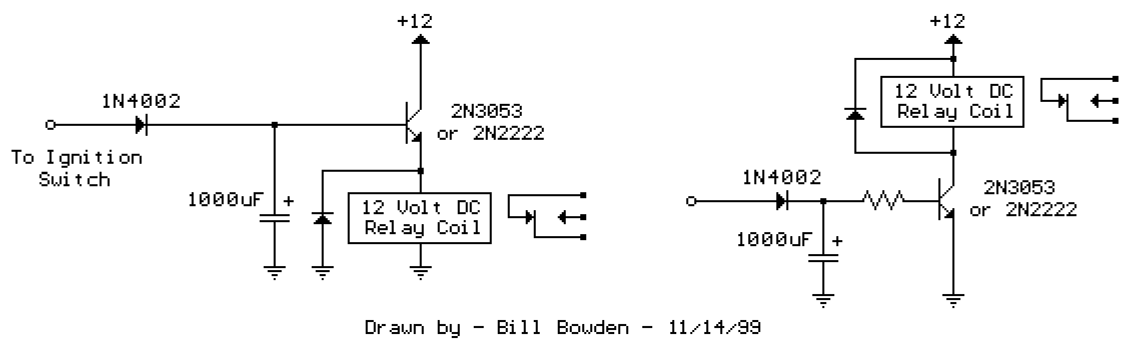
Power-Off Time Delay Relay

The two circuits below illustrate opening a relay contact a short time after the ignition or ligh switch is turned off. The capacitor is charged and the relay is closed when the voltage at the diode anode rises to +12 volts. The circuit on the left is a common collector or emitter follower and has the advantage of one less part since a resistor is not needed in series with the transistor base. However the voltage across the relay coil will be two diode drops less than the supply voltage, or about 11 volts for a 12.5 volt input. The common emitter configuration on the right offers the advantage of the full supply voltage across the load for most of the delay time, which makes the relay pull-in and drop-out voltages less of a concern but requires an extra resistor in series with transistor base. The common emitter (circuit on the right) is the better circuit since the series base resistor can be selected to obtain the desired delay time whereas the capacitor must be selected for the common collector (or an additional resistor used in parallel with the capacitor). The time delay for the common emitter will be approximately 3 time constants or 3*R*C. The capacitor/resistor values can be worked out from the relay coil current and transistor gain. For example a 120 ohm relay coil will draw 100 mA at 12 volts and assumming a transistor gain of 30, the base current will be

100/30 = 3 mA. The voltage across the resistor will be the supply voltage minus two diode drops or 12-1.4 = 10.6. The resistor value will be the voltage/current = 10.6/0.003 = 3533 or about 3.6K. The capacitor value for a 15 second delay will be 15/3R = 1327 uF. We can use a standard 1000 uF capacitor and increase the resistor proportionally to get 15 seconds.



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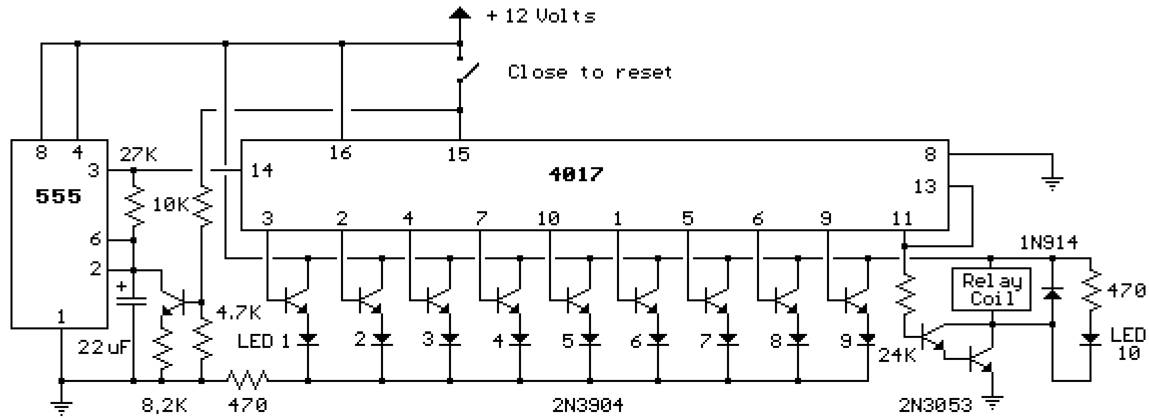
9 Second LED Timer and Relay Circuit

This circuit provides a visual 9 second delay using 10 LEDs before closing a 12 volt relay. When the reset switch is closed, the 4017 decade counter will be reset to the 0 count which illuminates the LED driven from pin 3. The 555 timer output at pin 3 will be high and the voltage at pins 6 and 2 of the timer will be a little less than the lower trigger point, or about 3 volts. When the switch is opened, the transistor in parallel with the timing capacitor (22uF) is shut off allowing the capacitor to begin charging and the 555 timer circuit to produce an approximate 1 second clock signal to the decade counter. The counter advances on each positive going change at pin 14 and is enabled with pin 13 terminated low. When the 9th count is reached, pin 11 and 13 will be high, stopping the counter and energizing the relay. Longer delay times can be obtained with a larger capacitor or larger resistor at pins 2 and 6 of the 555 timer.



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9 Second Digital Readout Countdown Timer

This circuit provides a visual 9 second delay using a 7 segment digital readout LED. When the switch is closed, the CD4010 up/down counter is preset to 9 and the 555 timer is disabled with the output held high. When the switch is opened, the timer produces an approximate 1 second clock signal, decrementing the counter until the 0 count is reached. When the zero count is reached, the 'carry out' signal at pin 7 of the counter moves low, energizing the 12 volt relay and stopping the clock with a low signal on the reset line (pin 4). The relay will remain energized until the switch is again closed, resetting the counter to 9. The 1 second clock signal from the 555 timer can be adjusted slightly longer or shorter by increasing or decreasing the resistor value at pin 3 of the timer.

The CD4510 is a CMOS Presettable BCD Up/Down counter which can be preset to any number between 0 and 9 with a high level on the PRESET ENABLE line, (pin 1) or reset to 0 with a high level on the RESET line (pin 9). Inputs for presetting the counter (P1, P2, P3, P4) are on pins (4, 12, 13, 3) respectively. The counter advances up or down on each positive-going clock transition (pin 15) and the counting direction (up or down) is controlled by the logic level on the UP/DOWN input (pin 10, high=up, low=down). The CARRY-IN signal (pin 5) disables the counter with a high logic level.

The CD4511 is a CMOS BCD to 7 segment latch decoder capable of sourcing up to 25 mA which allows it to drive LEDs and other displays directly. A LATCH-ENABLE line (pin 5, active low) stores data from the

BCD input lines. A LAMP-TEST input (pin 3, active low) can be used to illuminate all 7 segments, and a BLANKING input (pin 4, active low) can be used to turn all segments off. The LED display must be a common cathode type so that the segments are illuminated with a positive voltage on their respective connections. Complete data sheets for the CD4510 and CD4511 can be obtained by answer fax from
Harris Semiconductors (search)