Handy Dandy Little Circuits

Handy Dandy Little Circuits #17

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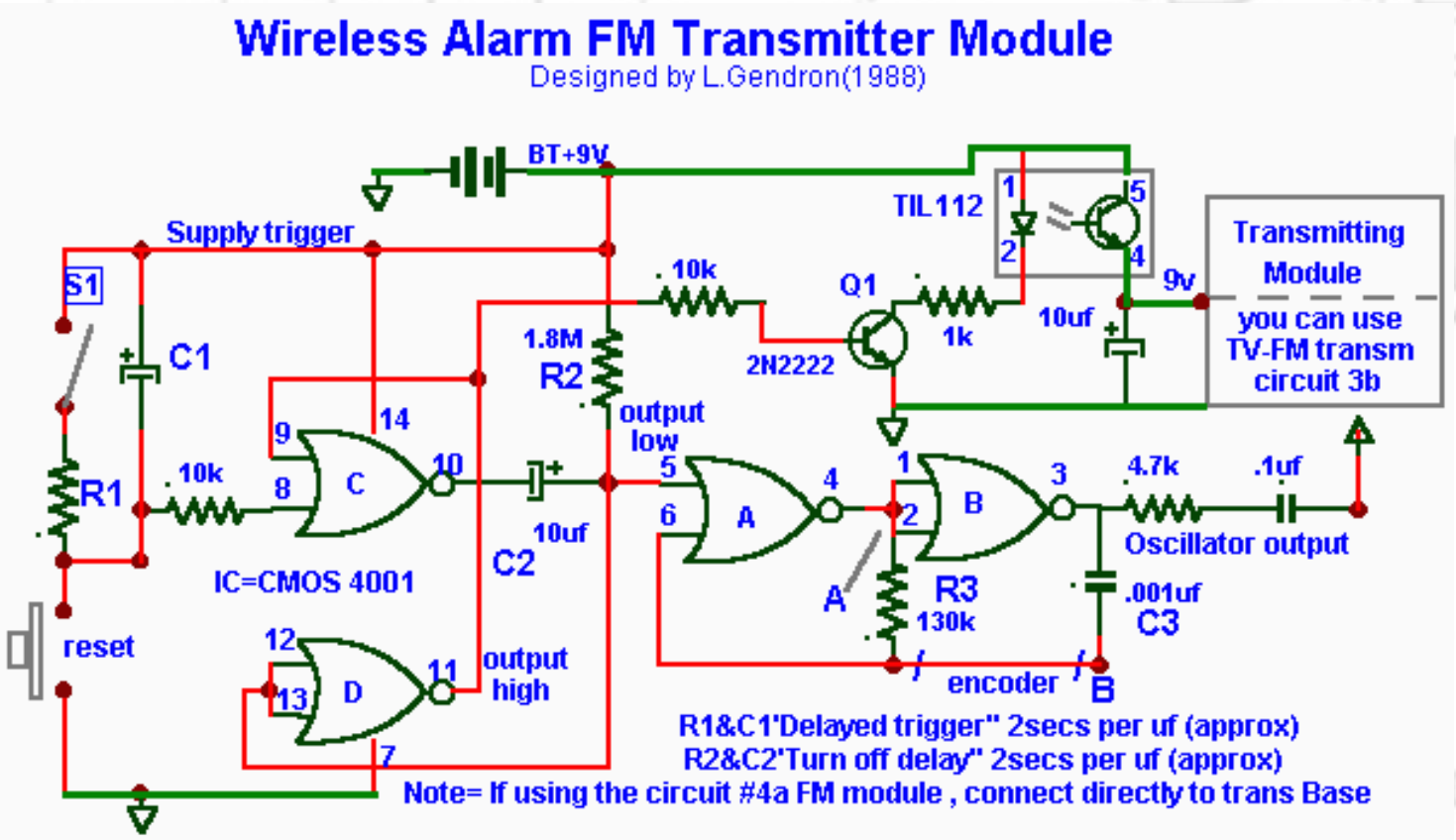
There are a lot of alarm systems on the market but you might be inclined to build your own. This little project can be put together using inexpensive parts readily available. The alarm transmitter module allows for a delayed trigger and auto turn-off as it is designed assuming that once the remote alarm has been triggered it will remain on until it is turned off manually.

Looking at the circuit switch S1 can be a open contact switch, a magnetic switch or other normally open switch of your own choosing for the application you have in mind. As soon as S1 is closed there is a time delay determined by R1-C1. This provides an allowable reset time for exit and re-entry to deactivate the alarm with the " Reset button " before it is triggered by the CD4001 gates (C-D). If there is no reset the gates (C-D) trigger Q1 and the tone generator (A-B) set -up as an oscillator (the frequency of which is determined by R3/C3) . Q1 turns on the Opto-isolator (TIL112) which powers the Transmitter module via a 9V battery. It will remain on for the duration of the oscillation being transmitted.

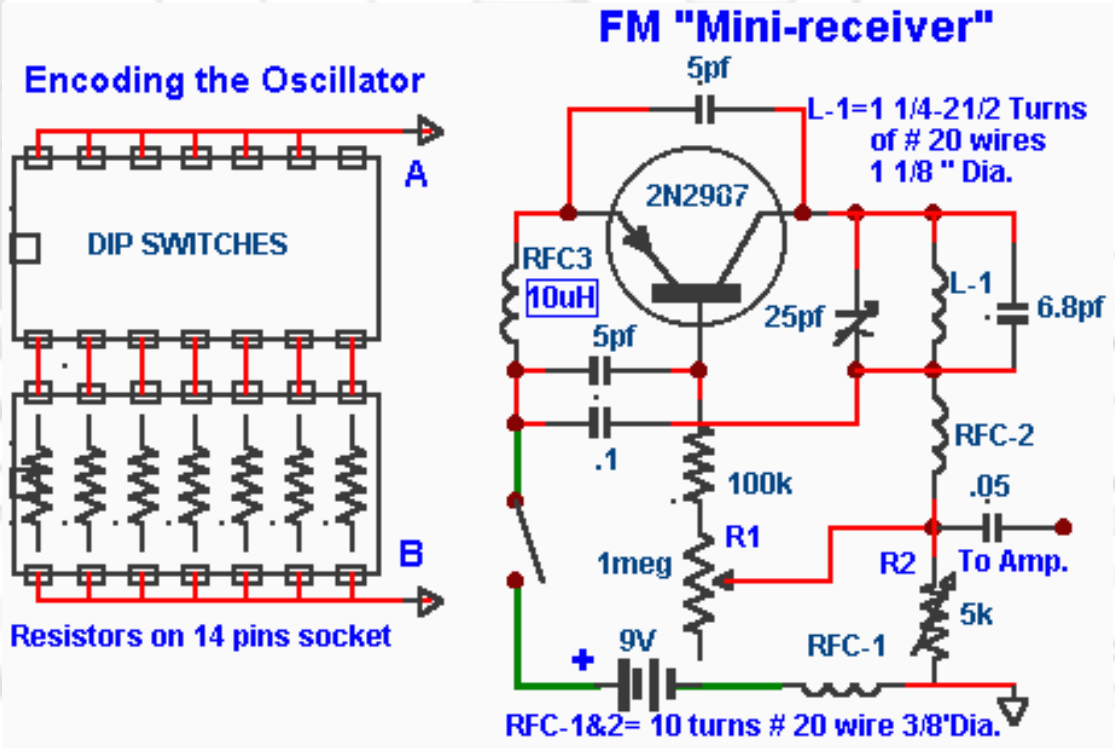
After a delay determined by R2-C2 charging up to the positive DC rail gates (C-D) trigger will shut off the oscillator (A-B) and Q1 which in turn will turn off the supply to the transmitter via the opto-isolator reverting to the monitor mode where only a fraction of a miliamp is used from the battery in that mode.
You may choose your own time delay by changing the values of R/C as noted on the schematic.

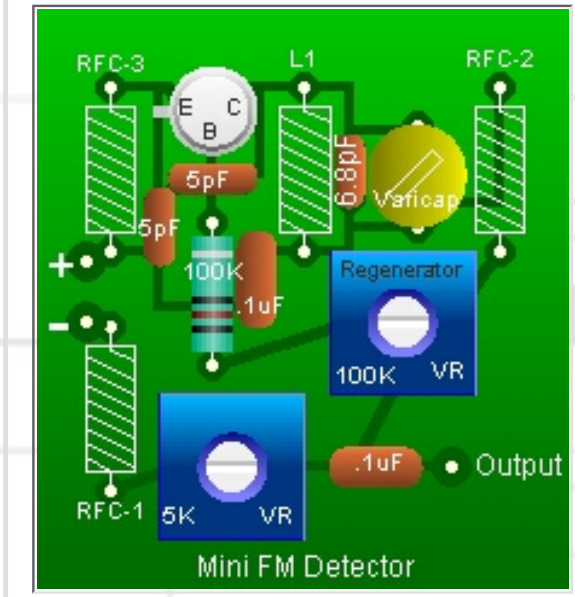


You may decide to build several small alarm units after your success with the first one. One way of identifying each of these transmitters is assigning a different tone for each unit by changing the frequency . To do this R3 at points (A) as shown on the oscillator portion of the CD4001 (A-B) must be changed . While using a fixed capacitor C3 at point B an encoder could be substituted at A and B in series with C3 instead of the present fixed R3 . Such an encoder is shown made up with a 14 pin DIP for seven switches, actually, four would probably suffice using parallel switching for different chosen resistor values for each frequencies . On the other hand , if each transmitter would be assigned its own frequency with fixed R3/C3 this would simplify the construction and do just as well.
As for the transmitter I have used the Radio/TV FM transmitter in **#3b** and a small portable FM radio taking the signal from the headphones output for processing and it worked very well. The transmitter doesn't need an antenna for close range and it tunes the lower FM band around 88mHz with the variable capacitor. There are now many new types of miniature Tx/Rx modules that can be had from electronic suppliers that could be used and greatly simplify the project.

The FM "Mini- receiver" on this page could be used , R1 (PC type) controls the regeneration and after adjusting for best reception it should be locked in place with a dab of silicon as you may need to readjust it later. The 25pF variable capacitor tunes the selected frequency and R2 provides the load and must be adjusted for maximum output to an amplifier stage without distortion. Another option worth considering is the RF Detector described in Handy Dandy Little Circuit **#15b**.

On page two I describe the application of the LM567 as tone decoder.





[See page #2 for more applications]

[See page #3 for PC layouts]

[Home]

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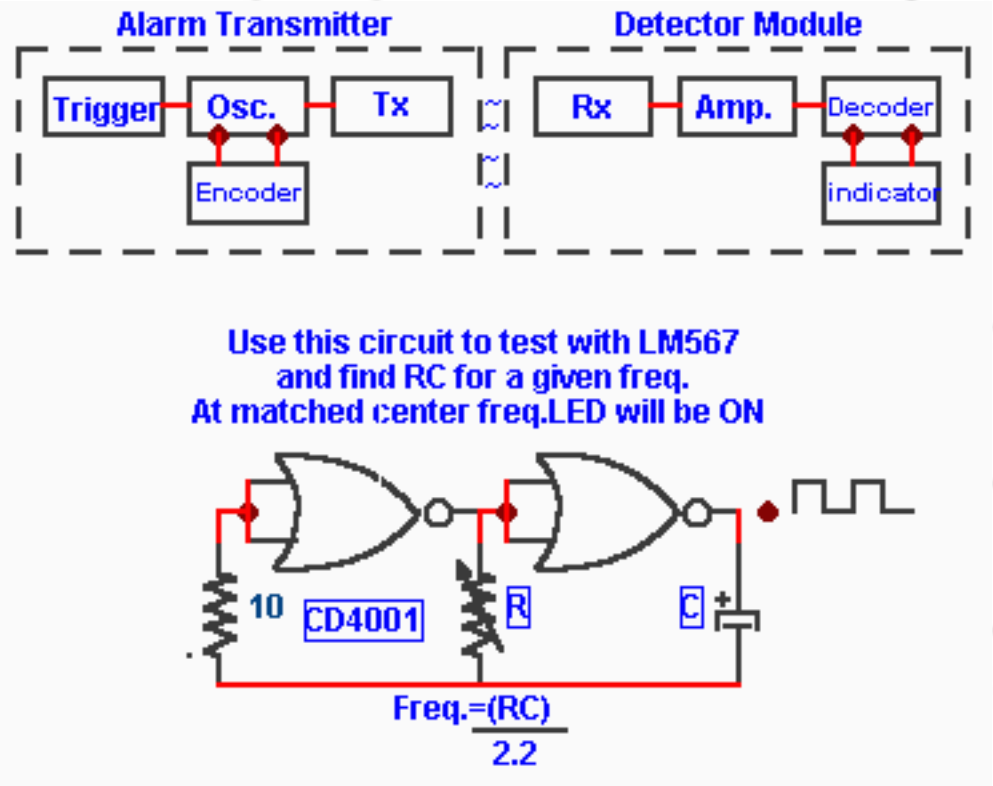
Handy Dandy Little Circuits

Handy Dandy Little Circuits #17-2

On page one I detailed the Alarm Transmitter functions and said that it could be combined with an Encoder so that the encoded received signal could be decoded for Alarm identification. The following function block shows how it is combined to form a complete system.



To ease the burden of testing and finding the resistance values to use for each frequency I include a small oscillator to feed the decoder (LM567) , use a 9 volts supply or battery for both units while testing.

Some points to observe

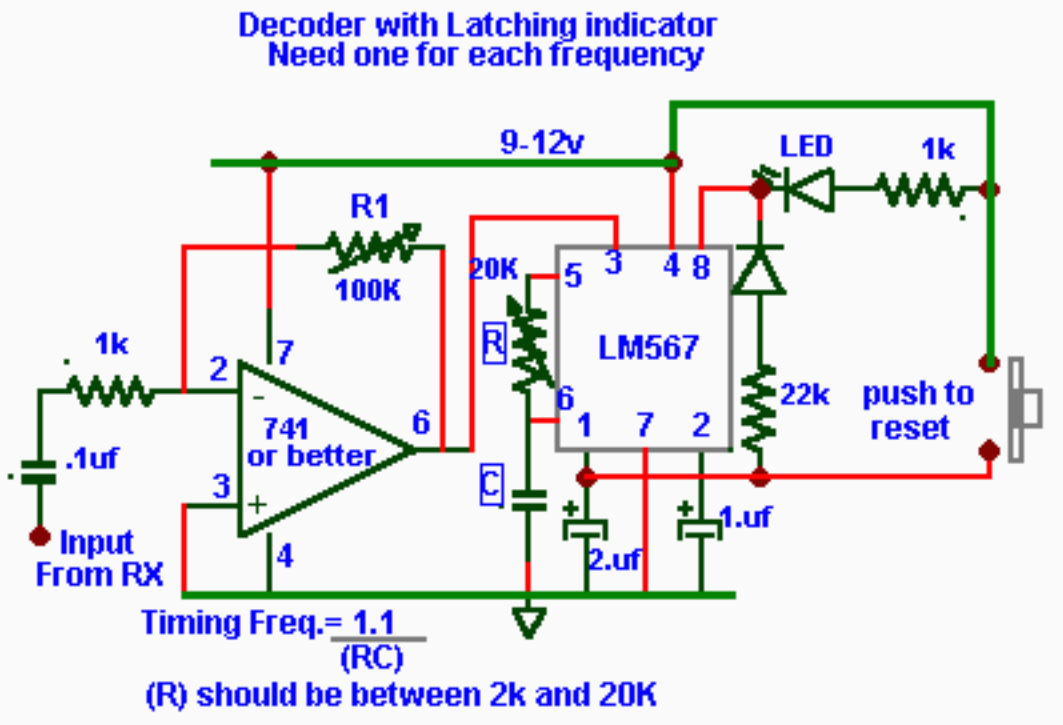
1- Keep R between 2K and 20K
2- calculate R/C so that frequencies are at least 500hz apart for a good distinctive detection.
3-So that we can use a fixed Cap. C and enable you to change only the R value use freq.below 50khz.

After assembly of the test oscillator and decoder select the lowest frequency you want

to use and calculate R/C for the values to be used for the decoder and install C . Next calculate R/C for the oscillator for the exact same frequency but use a variable resistor for R within the found values and install . Thereafter you may use the fixed capacitor values for the oscillator and decoder within the frequencies limit you want to use.

Next with a scope or a frequency counter check that the oscillator is working and adjust R to obtain the frequency you want . Turn power off and measure the resitance of R and make note of it with the freq . Do not readjust R . Connect the oscillator to the decoder input, turn the feed-back gain resistor R1 (100K) of the op-amp to one third , turn power on , if you have a scope check for a signal (square wave) at the op-amp output and adjust amplification for a good signal (~ 5vdc) then slowly vary the detector resistance R while observing that the LED turns on , STOP right there and measure the detector R and make note of the resistance value at the time the LED is turned on.

Next ,assuming you already have built your first alarm transmitter module and it is working apply the same values of R/C with the closest standard fixed value for "R" as found for the test oscillator to the alarm oscillator. Disconnect the test oscillator from the detector and with a common power supply to the alarm module and the detector use a jumper from the alarm oscillator output and connect to the decoder input and fire up the circuits. If the LED does not turn on readjust first R1 then the detector R until it does and lock in place with a dab of silicon .



P.S. The frequency for the above decoder with values of R = 10K and C = .1uf is 110Hz.

Back to Page #1

See page #3 for PC layouts

Home

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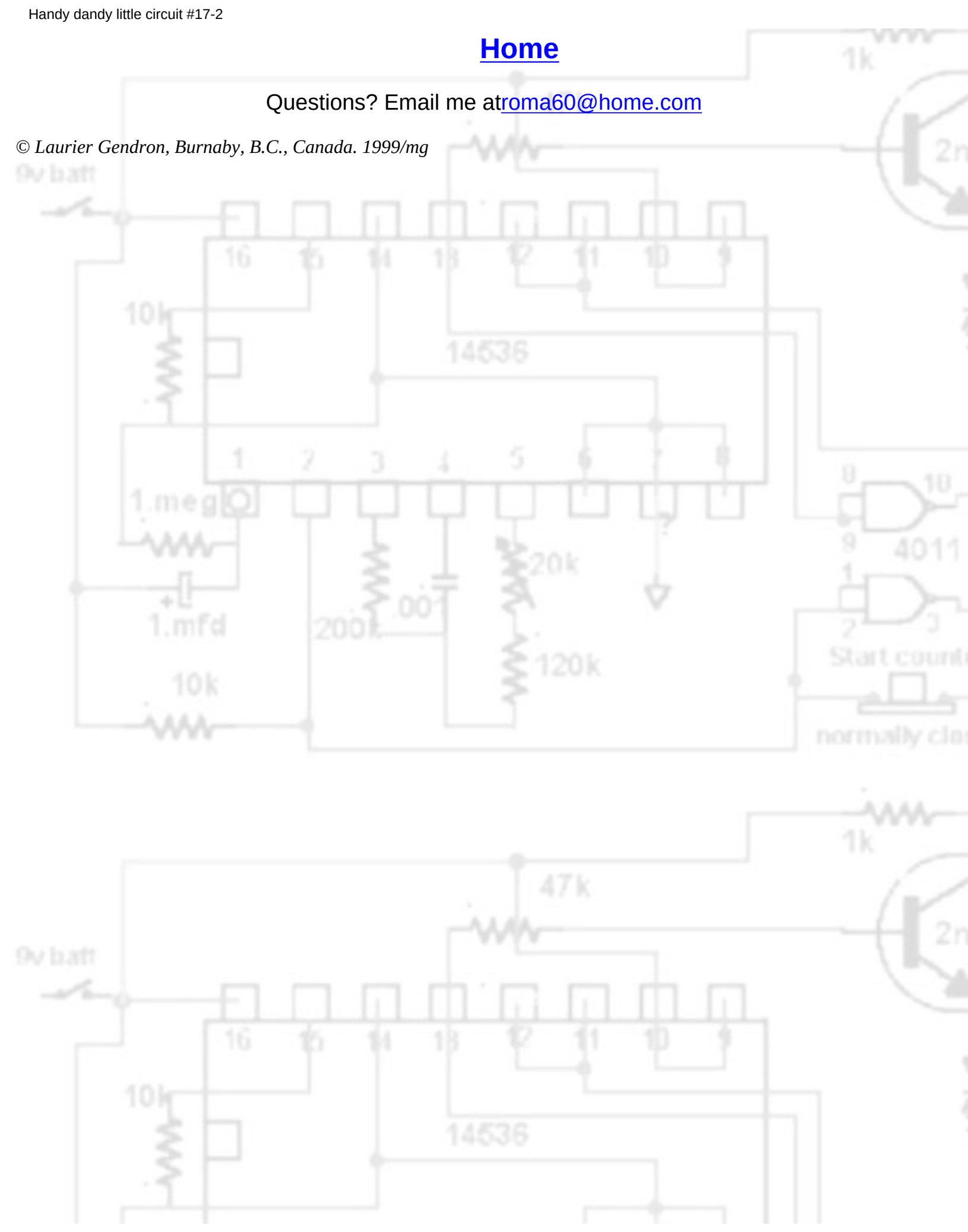


Handy Dandy Little Circuits

Handy Dandy Little Circuits #17-3

FM Receiver

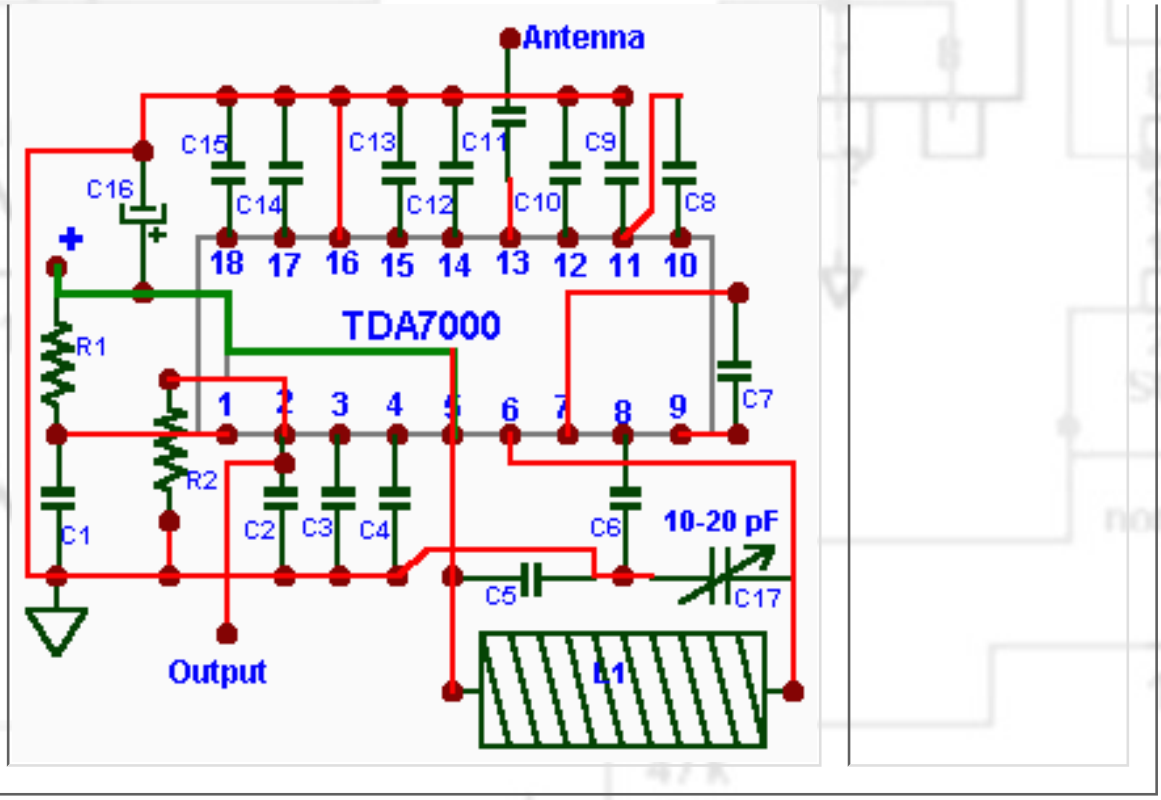
You could use a small FM receiver for convenience taking the output signal from the headphone connector connected to an external volume control (about 10K ohms) then to the decoder.

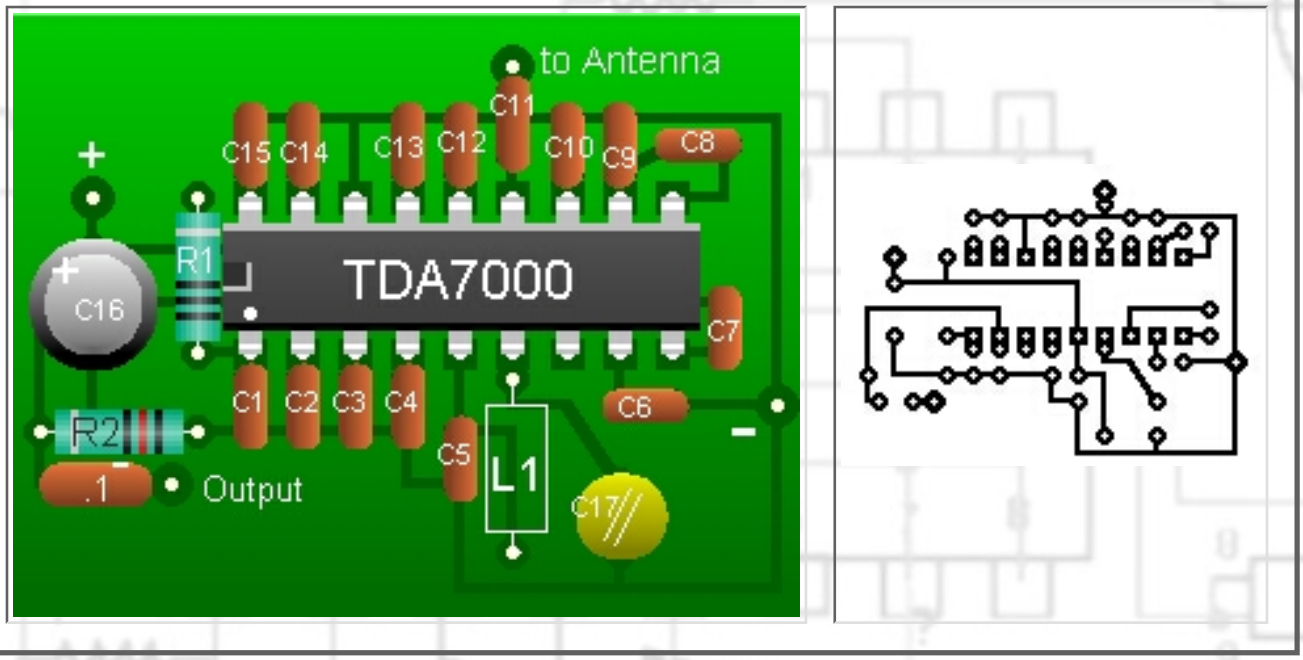
If you have something smaller in mind then the following FM receiver can be constructed with the TDA7000 IC which is still available from some distributors . No special skill is required except care must be taken that all the capacitors all wired as close as possible to the pins. The recommended supply voltage is 4.5 volts but up to 9 volts can be used .

The coil (L1) is made of 6 turns of # 20 insulated wire on a 1/4 " form . Tuning is simple enough once you have your transmitter operating simply tune the variable capacitor with a non-metallic screw driver very slowly until the signal is detected anywhere on the FM band .

The signal output is very small , only suitable for crystal headphone and must be amplified if you want to hear it . The LM386 amplifier is well suited for that purpose .
See LM386

Parts list
C1 = .15 uF
C2 = .002 uF
C3 = .022 uF
C4 , C5 = .01 uF
C6 = 180 pF
C7 , C9 = .003 uF
C8 , C14 = 330 pF
C10 = 150 pF
C11 = 100 pF
C12 , C15 = 220 pF
C13 = .1 uF
C16 = 47 uF /15v
C17 = 10 -20 pF Var.
R1 = 10K
R2 = 22K
L1 = see text

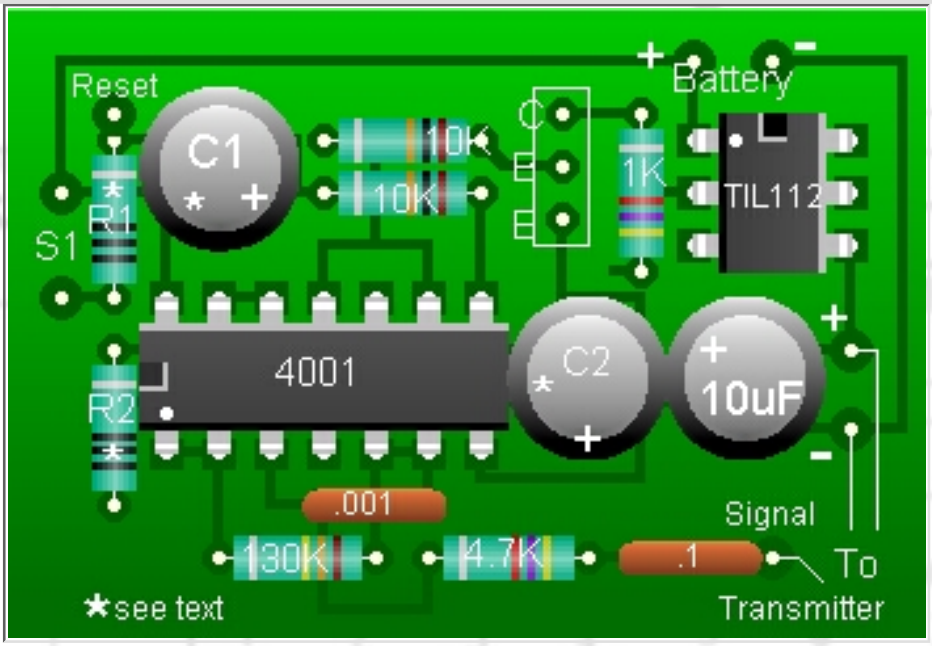


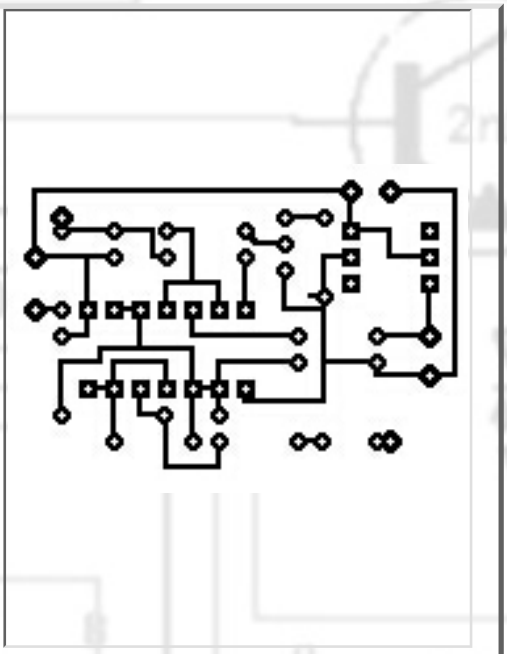


Layouts and PCBs

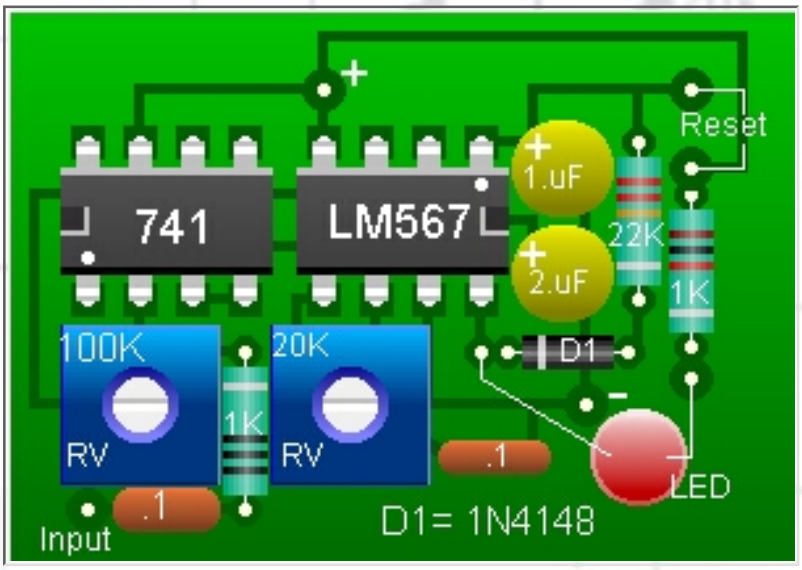
The following shows PC layouts for each circuits on page one and two. For clarity the PCB layouts are illustrated about twice the size than the actual PC board would be. On a standard perforated board , point to point wiring using #24 size wire or smaller can be used with the same layout instead of a printed circuit board .

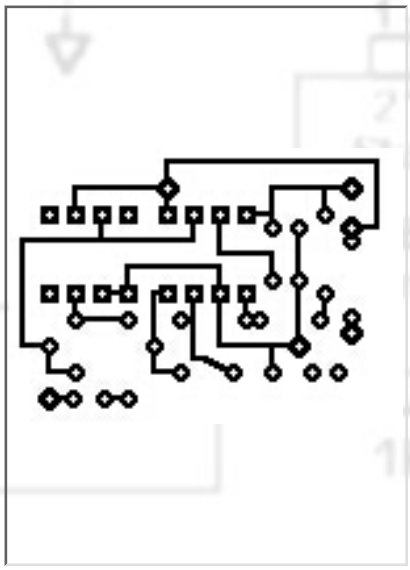
Detecting Module



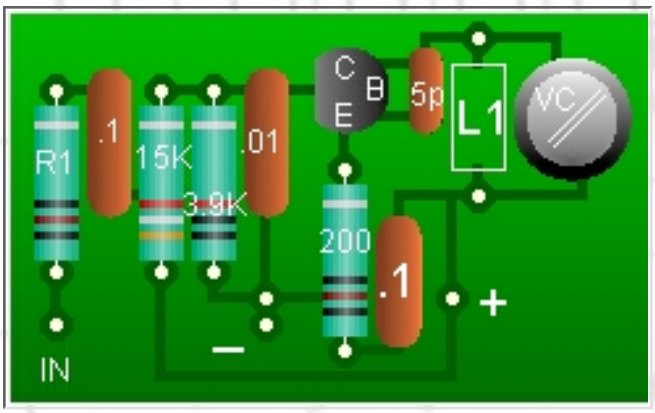


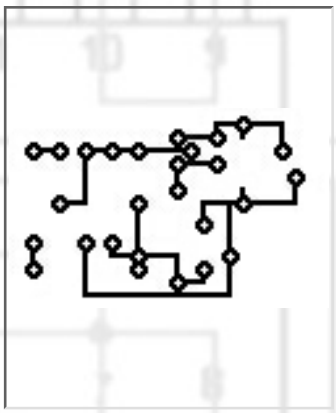
Decoder Module





FM Transmitter Module





[Back to Page #1]

[Back to Page #2]

[Home]

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