

PARKING SONAR

It works on the sonar principle, sending an ultrasound burst and listening for first echo. The burst generated by the oscillator built around U4D (you must set the frequency using TR2 to have 40 kHz or the maximum sensitivity), U4E buffers the output and U4F boost the signal doubling the voltage span across the TX piezo transducer.

A new burst is generated each time the decade counter (4017 in the circuit diagram) is in its reset state, that is output 0 is selected. The other outputs (1 to 9) are scanned sequentially following burst generation, until an echo strikes back the RX receiver. It is then amplified by the transistor input stage, triggering the monostable built around U4A - U4B. The monostable stops temporarily the scanning, and a led corresponding to the obstacle distance appears as continuously lit. The buzzer bleeps when the first led (minimum distance) is lit.

When the monostable expires, scanning is resumed and restarting the send-and-listen sequence. If no echo is received, the scanning never stops and all the leds are slightly lit.

To set up:

Set TR2 for maximum sensitivity (usually 40 kHz for most commercially available ultrasonic transducer pairs).

Set TR1 for your preferred range. Setting it to minimum resistance shortens the distance for each led (minimum range). I suggest a range of 90 cm (10 cm each led).

Hints:

First of all, be careful not to exchange the ultrasonic transmitter with the receiver: they look very similar, and I suggest you to mark them very clearly from the moment you buy them.

Use a CD40106B (note the "B" suffix) for U4. Pin 12 of U3 is unconnected (depicted by the 'X' symbol).

Pin 2 of U10 goes to pin 16 of 4017 AND to pin 14 of 40106 (Vcc), pin 3 of U10 goes to pin 8 of 4017 AND to pin 7 of 40106 (GND). Please note that the pin numbering for U10 could be misleading, use the pin labelling (Vin, GND, Vout=+8V) instead.

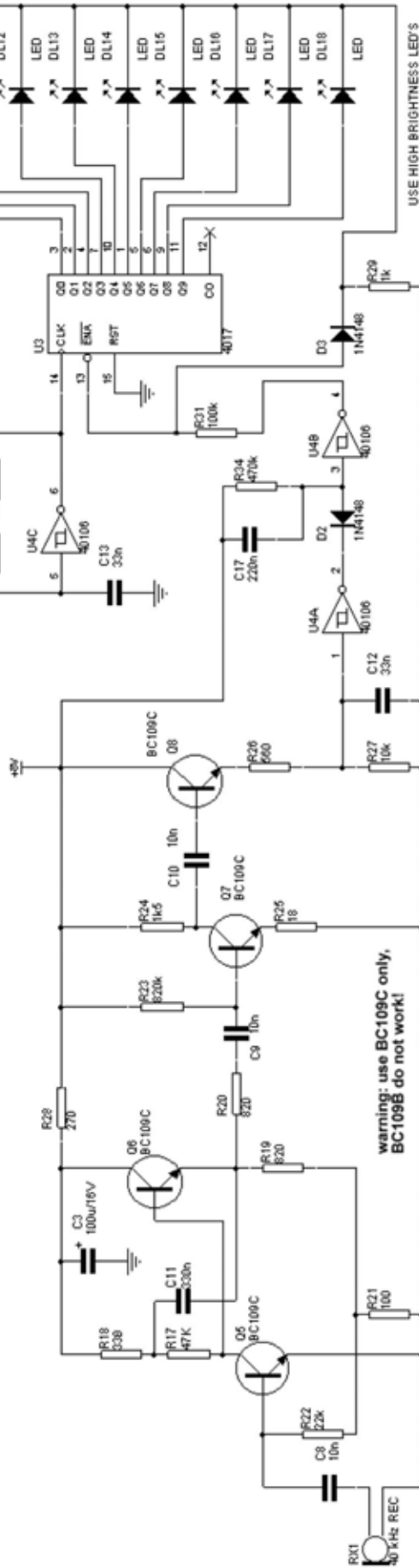
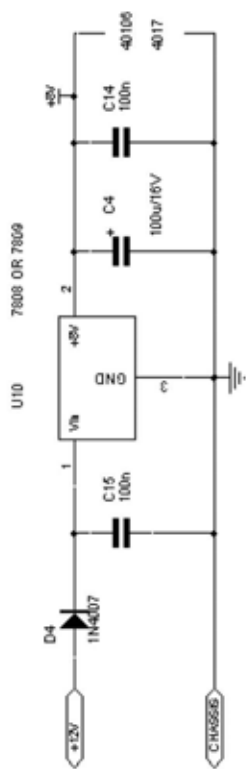
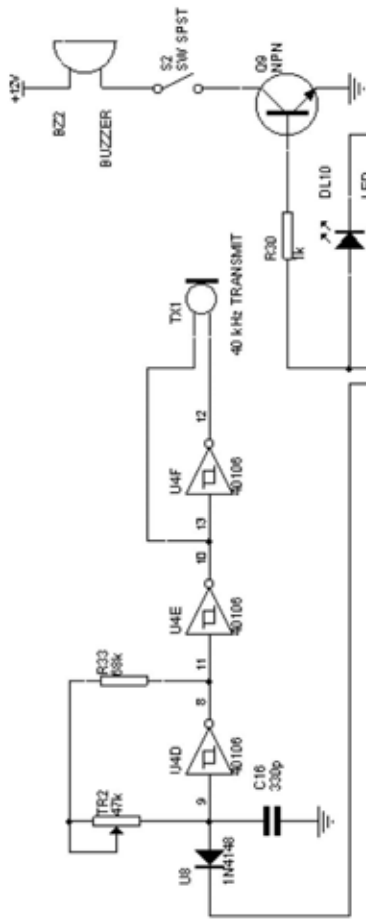
During setup, place the ultrasonic transducers over a soft surface, near the border of a table, 10 cm apart of each other pointing outwards the table. Then adjust TR1 and TR2 using a rigid surface (for example a metal sheet) placed in front of sensors, at a variable distance.

I enjoyed the sonar for many years. It was installed below the car's rear bumper in a plastic case. Do not choose an enclosure too small: always separate the transducers by 7-10 cm and plenty of sound-absorbing material, otherwise the receiver will reveal the direct sound instead of the reflected one. The same applies if the sound travels through a rigid fixture, so it is a good idea to fix them with separated supports.

And remember not to mount the transducers exposed to direct sunlight nor rain.

Modifications:

Here are a few improvements and tips I received from readers. Add a 470 kilohm resistor from the base of Q8 to the negative pole (ground). Use a BC109C for Q8 and Q9 too. Do NOT use BC109B or BC109A transistors: the gain is not enough. Some readers have reduced the capacitor C12 to 3.3 nF or even 330 pF. And by the way, yes, the polarity of D3 is correct as shown and the LEDs have only one resistor because only one LED is active at any time.



warning: use BC109C only,
BC109B do not work!

USE HIGH BRIGHTNESS LEDs

