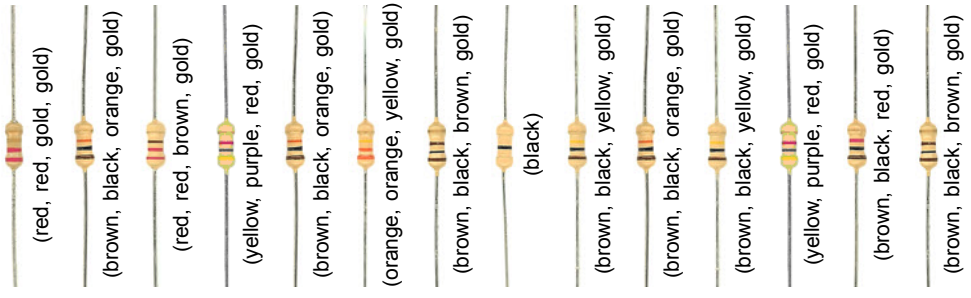
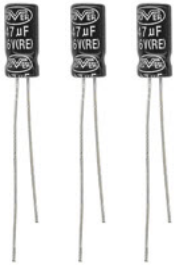
E-Lock

a mobile phone-activated combination lock

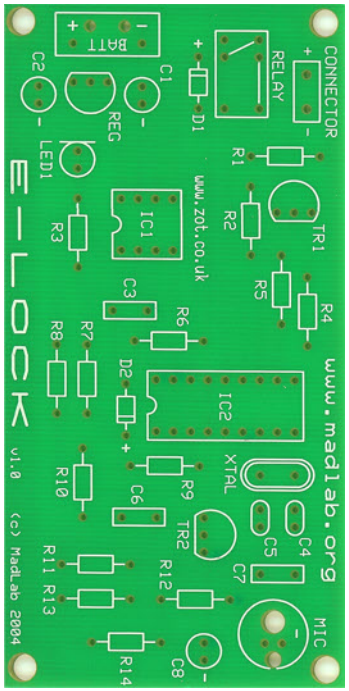


R1 (2R2) R2 (10k) R3 (220R) R4 (4k7) R5 (10k) R6 (330k) R7 (100R) R8 (0R) R9 (100k) R10 (10k) R11 (100k) R12 (4k7) R13 (1k) R14 (100R)

D1 (1N4148) D2 LED1 (red)



C1 C2 C8 (47u electrolytic)



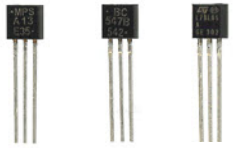
IC1 (PIC12F629)

IC1 socket

IC2 (HT9170B)

IC2 socket

Battery snap



TR1 (MPSA13) TR2 (BC547) REG (78L05)

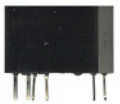
Screened cable

C4 (22p) C5

C3 C6 (100n) C7

Circuit boards

MIC



RELAY

Terminal block

XTAL (3.579MHz)

1. Identify the different components using the spotter chart.
2. Fit and solder all the resistors (R1 to R14) to the circuit board. Identify the resistors by the coloured stripes on the body. They can be fitted either way around.
3. Solder the diodes (D1 and D2) matching the black stripe to the 'k' sign on the board.
4. Solder the chip sockets (IC1 and IC2) matching the notch in the socket to the notch on the board. **Do not solder the chips directly to the board.**
5. Fit and solder the electrolytic capacitors (C1, C2 and C8) to the board putting the shorter leg into the hole with the – sign. The shorter leg also has a stripe on the side of the body. Fit and solder the other capacitors (C3 to C7) either way around.
6. Solder the light (LED1) to the board putting the shorter leg into the hole with the line. The shorter leg also has a flattened edge on the rim.
7. Solder the crystal (XTAL) to the board either way around.
8. Solder the transistors (TR1 and TR2) matching the half-circle shape of the transistor to the half-circle shape on the board (flat side against flat side). Be careful not to mistake the regulator for a transistor.
9. Solder the regulator (REG) matching the half-circle shape of the regulator to the half-circle shape on the board (flat side against flat side).
10. Solder the terminal block (CONNECTOR) so that its screw holes face outwards.
11. Solder the relay (RELAY) to the board within the marked outline. Alternatively, if driving a small solenoid directly, omit the relay and solder wire links (cut component legs) in its place on the board. The points to connect within the relay outline are marked by lines.

continued overleaf

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12 Solder the microphone (MIC) to the main circuit board so that it fits within the circle. Alternatively solder the microphone to the small circuit board (again so that it fits within the circle). Connect one end of the screened cable to the small board by feeding it through one of the large holes then soldering the inner core to the + hole and the outer braid to the – hole. Solder the other end of the screened cable to the MIC holes on the main board. Feed the cable up through one of the large holes from the metal side of the board and then down the solder holes. Solder the outer braid to the – hole and the inner core to the other hole. The microphone can then be positioned a short distance away from the main circuit board (for example on one side of a door with the main circuit board on the other).

13 Push the battery snap leads up through the larger holes in the board from the metal side of the board. Fit the metal tip of the red lead into the BATT + hole and the metal tip of the black lead into the BATT – hole. Solder the metal tips to the tracks on the board then pull the wire loops back.

14 Carefully bend the legs of the chips inwards a little with your fingers. Fit the chips into their sockets matching the small notch in the chip to the notch in the socket.

15 Connect a battery **(9V PP3)** to the battery snap. If *E-Lock* is working properly the light should flash twice.

16 Hold a mobile phone close to the microphone and press the hash key (#) on its keypad a few times. The light on *E-Lock* should flash each time the key is pressed.

17 Finally, connect a solenoid (not supplied) to the terminal block.

Note

If necessary, the gain of the microphone amplifier can be increased by making R9 larger, say 1M.

HOW TO USE

E-Lock is a *Touch Tone*-activated electronic combination lock controlled by the keypad on a mobile phone. When the correct combination is entered the relay on the circuit board is activated. The relay can be connected to a solenoid controlling the lock on a door or cupboard etc. (it can switch up to 1A of current).

Initially the combination is **1234*** (i.e. one two three four star). This can be changed to a combination known only to you.

The hash key (#) is not used in combinations. Precede all combinations with a few hash keys to make sure *E-Lock* is recognising the *Touch Tones* from your mobile phone. The light on the circuit board will flash on each key press.

Combinations are always terminated with the star key (*). The light flashes four times when the correct combination is entered and the relay is then activated.

Hold your mobile phone close to the microphone on *E-Lock*. High levels of background noise will interfere with it working.

The combination can be changed when *E-Lock* is in setup mode. It is in setup mode for the first 10 seconds after the battery is connected. (You'll see a single short flash on the light when setup mode ends.)

The current combination must first be entered before it can be changed. Then the new combination is entered. The combination can be up to 10 digits long and is terminated with the star key.

A new combination must be verified by immediately entering it again. The light flashes four times after a combination has been entered and then again when correctly verified. Wait until the flashes have finished before pressing the next key.

Setup mode also allows the relay activation period to be changed. This is the time that the relay remains engaged (and the door is unlocked). To set the activation period, press the star key twice on your phone keypad followed by the digit key corresponding to the number of seconds you want. For example, to set the period to 4 seconds press ****4** (i.e. star star four). Note that ****0** sets the period to be 10 seconds. The light flashes four times when the relay activation period is changed.