

PARTS LIST

RESISTORS (1/4W 5% carbon film, except where stated)

R1,3,12,14,18,19	1M0
R2,4,10,23-27, 29,30,39	100k
R5-8	100k 1% metal film
R9	220
R11,22	390k
R13	1M5
R15,16,28,31,32	47k
R17	4k7
R20,21	1k0
R33,34	820
R35,36	22k
R37	3M3
R38	680k
R40-60	not required for LCD.

CAPACITORS (See text for capacitor types)

C1-4,6,9,12	100n monolithic ceramic
C5	4n7 monolithic ceramic
C7	2 μ 2 3V tantalum or miniature electrolytic
C8	10 μ 6V3 tantalum or miniature electrolytic
C10	47n plate or monolithic ceramic or metalised film
C11	10 μ 10V tantalum or miniature electrolytic
C13,14	220p plate ceramic
C15	10p plate ceramic
C16	68p plate ceramic

SEMICONDUCTORS

IC1,2	LM324
IC3	4001
IC4,5	4013
IC6	4093
IC7,8,9	4527
IC10,14	4040
IC11,12,13	4510
IC15-17	4543
Q1	BC213 or equivalent
Q2-5	FS40,BC317,MPS3646, etc.
D1	OA47
D2-17	1N4148
LED1,2	LEDs any size, shape or colour
DISP1-3	LED or LCD 7-segment display (3 digits)

MISCELLANEOUS

B1	PP3 battery and clips
SW1-3	Push button SPST switch
SK1,2	3.5m stereo jack socket
X1	32.768kHz crystal

PCB's. 20-way SIL socket strips for LCD. Ribbon cable for connection between boards. Stereo screened wire for electrode/transducer board connections and leads. 1/4in plastic pillars and suitable screws. Hand-held instrument case with battery compartment and display cut-out. Plastic film. Nuts and bolts.

BUYLINES

The switches used are Preh 75120-008 low profile keyboard switches, available from Eardley Electronics, 182-4 Camden Hill Road, London W8.

A complete parts set for the project (including case and switches) is available Specialist Semiconductors Ltd, Founders House, Redbrook, Monmouth, Gwent for £39.57 incl. VAT. Individual components can be obtained from the same source -- send SAE for lists.

The PCB is available from the PCB Service -- see the back of this issue for details.

If the diode seems sometimes to miss out a breath (as shown by the LEDs, not by the display count) the solution is to increase the value of C7. The real test as to whether this is necessary is if there is a significant delay between your breath changing direction and the LEDs changing. If there isn't, it could just be that you were holding the diode in the wrong place when the breath was missed! Changes to R22 and C7 shouldn't be necessary at all -- I'm just trying to anticipate every problem that might conceivably turn up.

If you have enough patience to hold the diode beneath your nose for a while, press the 'breathing rate' button again and check that the monitor tracks up and down as you breathe faster or slower. If all the tests have worked so far then it certainly will but having gone to the trouble of building it you might as well play with it for a few minutes!

Now for the heart-rate section. Hold one of the coins against the palm of each hand, press the 'heart rate' button and watch the LEDs. The light should flick from one LED to the other and back a little more than once a second. If you are very fit, the rate could be less than once a second but in any case the pulse should be regular.

If you loosen your grip on one electrode or the other, the LEDs will flicker wildly since the input stage relies on having both electrodes connected for its noise immunity. Gripping both electrodes gently but firmly against the palm should restore the regular beat.

If there is no response when you have both electrodes in your hands, it could just be that your palms are unusually dry. If your hands are clean, licking them should overcome the problem. If they are not clean, licking them will still overcome the problem but I'd hate to think what you'll get in your mouth.

If dampening your palms doesn't produce any worthwhile results, it's time for a serious investigation of the problem. First of all, check that touching just one electrode will give rapid flashing of the LEDs. If not, the answer lies somewhere in your soldering, so check the PCB carefully.

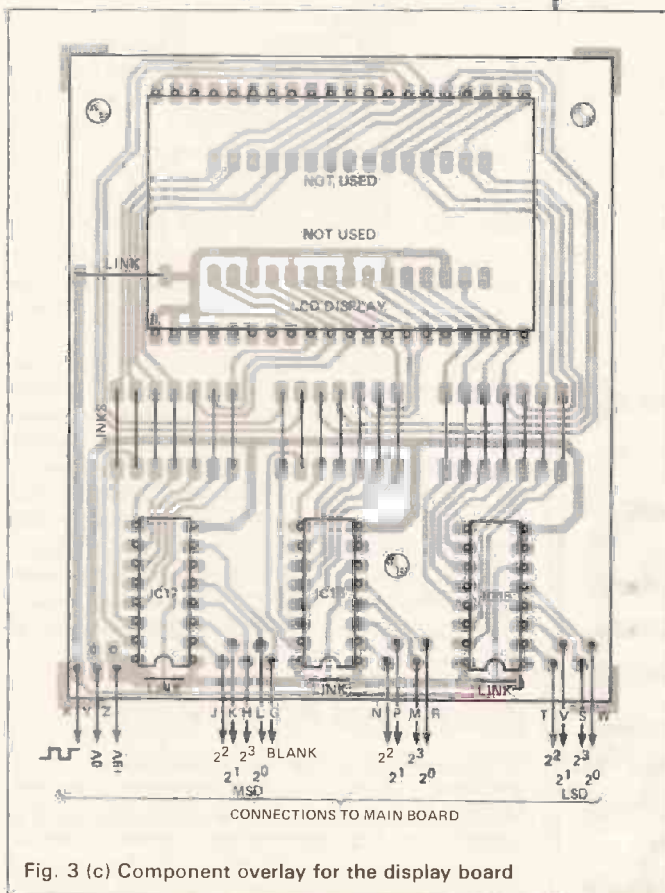


Fig. 3 (c) Component overlay for the display board