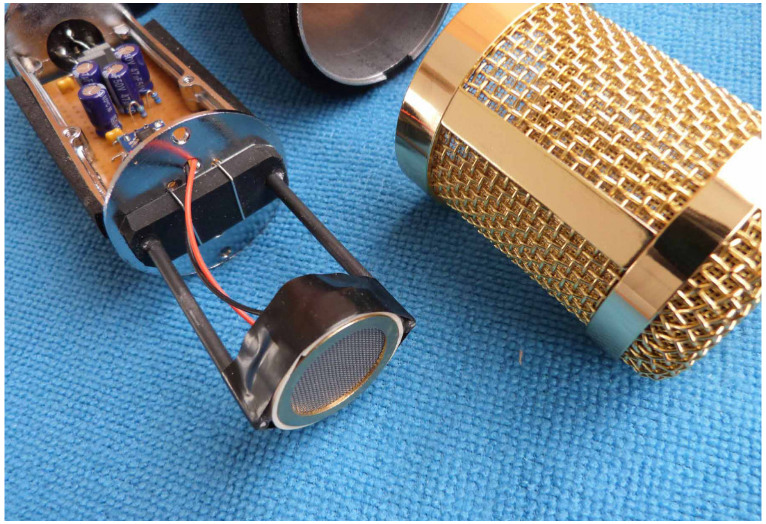
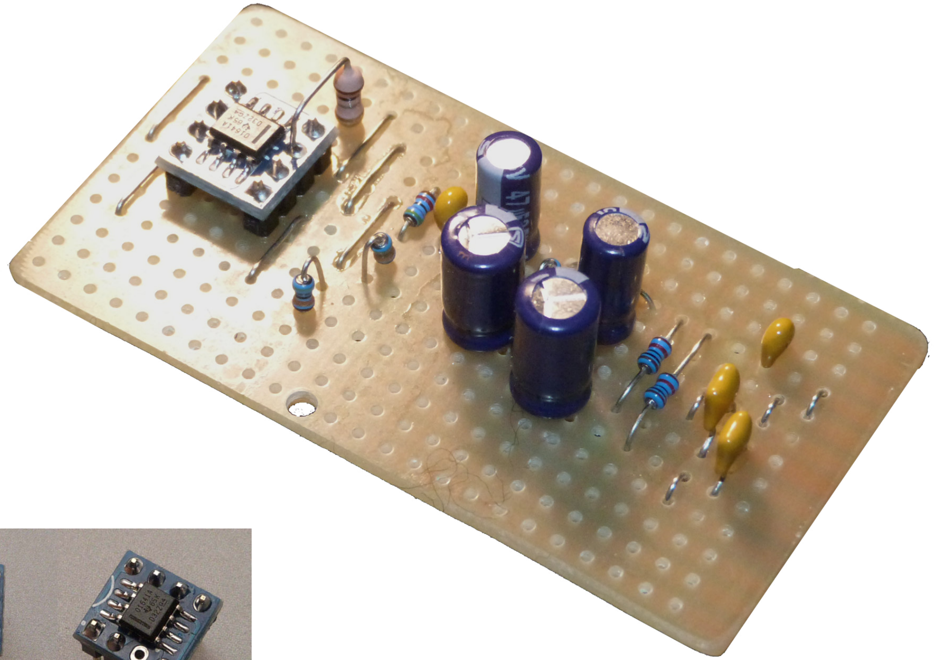
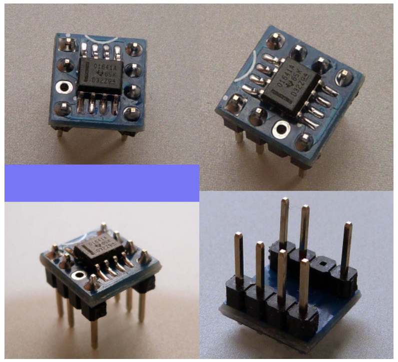
OPIC.41 – Impedance Converter

Stripboard version for a 'FETless' electret capsule

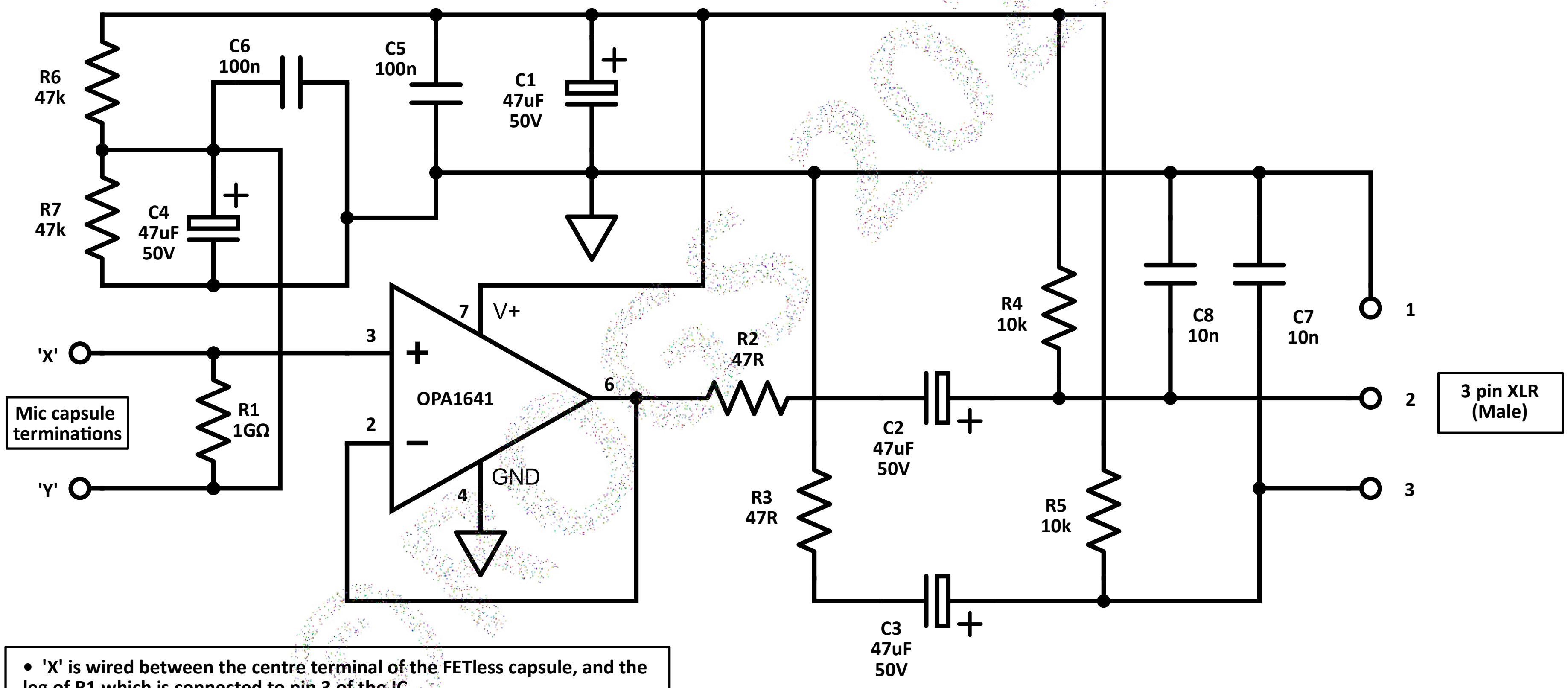
Designed to fit into a BM800 body







• Op Amp Impedance Converter (OPIC.41.FETless) STRIPBOARD SCHEMATIC •



- 'X' is wired between the centre terminal of the FETless capsule, and the leg of R1 which is connected to pin 3 of the IC.
- 'Y' is wired between the negative (edge) termination of the FETless capsule and the stripboard hole adjacent to the other leg of R1 ('half rail')

OPIC.41.FETless: Circuit description

Overview:

The circuitry shown in the schematic uses a Texas Instruments OPA1641 JFET op-amp as an impedance converter for a condenser microphone capsule.
This is a simple alternative to the more conventional use of a discrete JFET device for the task.

The TI OPA164* series of op-amps offer both low noise and low quiescent current, making them ideal for this task.

A single OPA1641 op amp is used here to provide a single sided audio output, which is balanced passively to optimise the common mode rejection ratio (CMRR).
For a fully differential output balanced version, the OPA1642 dual op-amp can be used. This is the option selected by US based mic builder Jules Ryckebusch for his 'OPA Alice' project, and it does provide an extra 6dB of output signal - but at the expense of extra current drain, and a marginally worse signal/noise ratio.

Both options are valid – the single sided version is used here.

Circuit description:

The OPA1641 is configured as a zero gain non-inverting buffer. The op-amp output is connected directly to the inverting input to achieve this.

The amplifier draws around 1.8mA of quiescent current, and this is provided by the 48v phantom power supply from the mic preamp.
The resistor summing network R4 and R5 - together with the de-coupling capacitors C1 and C5 - will allow a smoothed supply voltage of around 24v to be presented to pin 7 of the opamp.
The actual supply voltage is not critical, and the circuitry will automatically adjust the half rail reference to suit the supply voltage.

The op-amp requires a 'dual' voltage supply, and this is provided by the creation of a 'half rail' voltage of around 12.5v by the voltage divider R6 and R7, together with the decoupling capacitors C4 and C6.

This 'half rail' voltage is required to bias the opamp, so that the output can swing symmetrically around this reference voltage.
It is fed to the non-inverting input of the op-amp via R1, the high value 1GΩ resistor required to bias the purely capacitive capsule for effective function.

The capsule fitted is a 'FETless' electret, this is connected between points 'X' and 'Y' on the schematic ('X' is normally the centre terminal).

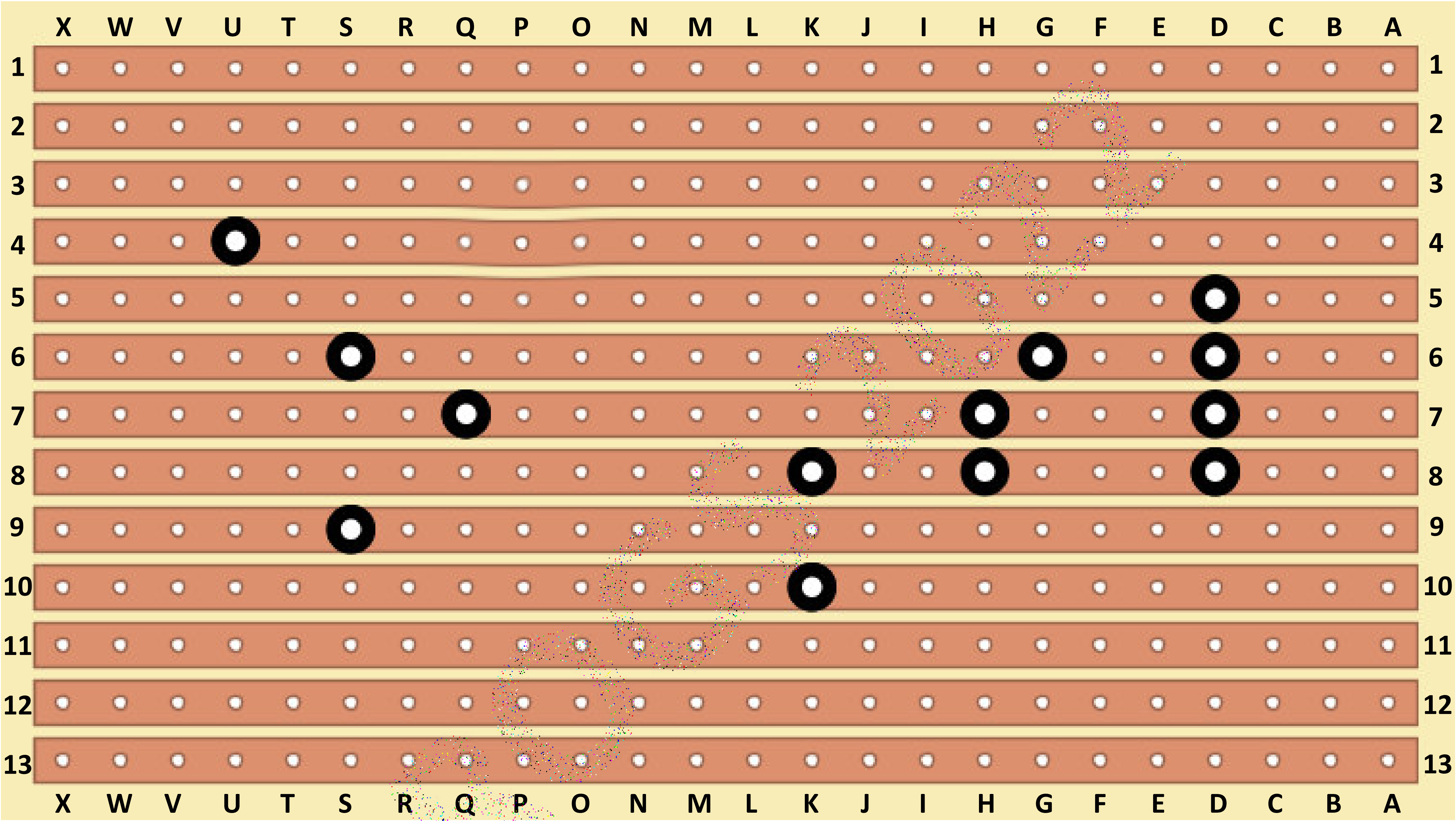
It is important to remember that this circuit is not intended for use wth electret capsules fitted with internal FETs.

The op amp output (pin 6) is connected via R2 and C2 to pin 2 (hot) of the XLR connector. C2 is required to isolate the DC 'half rail' voltage present on the output of the op-amp from the XLR output.

R3 and C3 provide an equivalent 'passively balanced' output to pin 3 (cold) of the XLR connector. There is no audio on this pin, R3 and C3 are fitted to improve CMRR, which can be important when the mic is connected to the preamp via a long cable run.

C7 and C8 are included to decouple any stray RF interference which may be present.

•• Viewed from COPPER TRACK SIDE ••



OPIC.41 - stripboard

•• TRACK CUTS VIEWED FROM COPPER SIDE ••

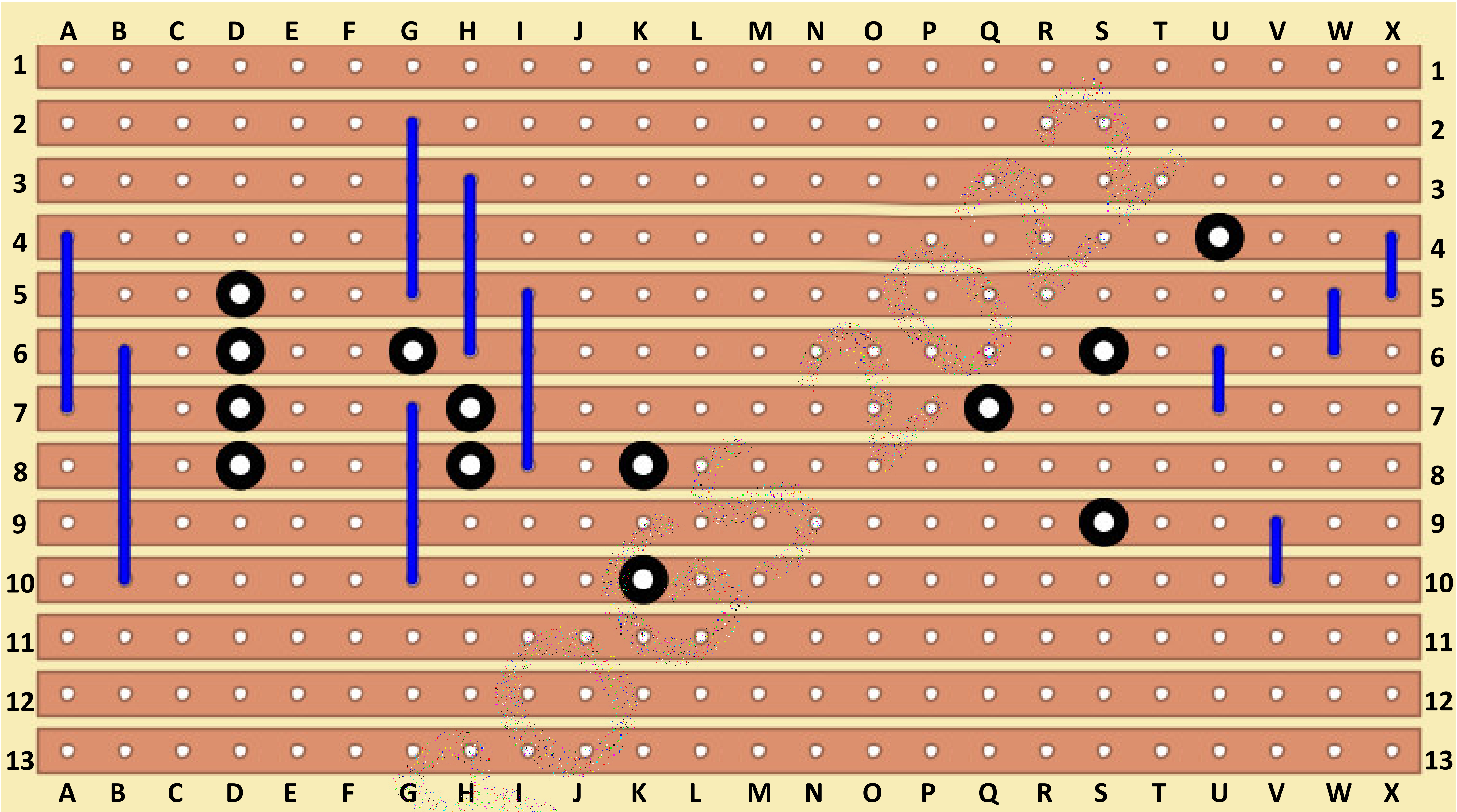
'Spin off' copper with a stripboard track cutter (or drill bit)..

• ensure each 'spin off ' cuts the track completely •

'Spin off' the copper track at the following 13 locations:

- D5
- D6
- D7
- D8
- G6
- H7
- H8
- K8
- K10
- Q7
- S6
- S9
- U4

●● TRACK CUTS AND WIRE LINKS VIEWED FROM COMPONENT SIDE ●●



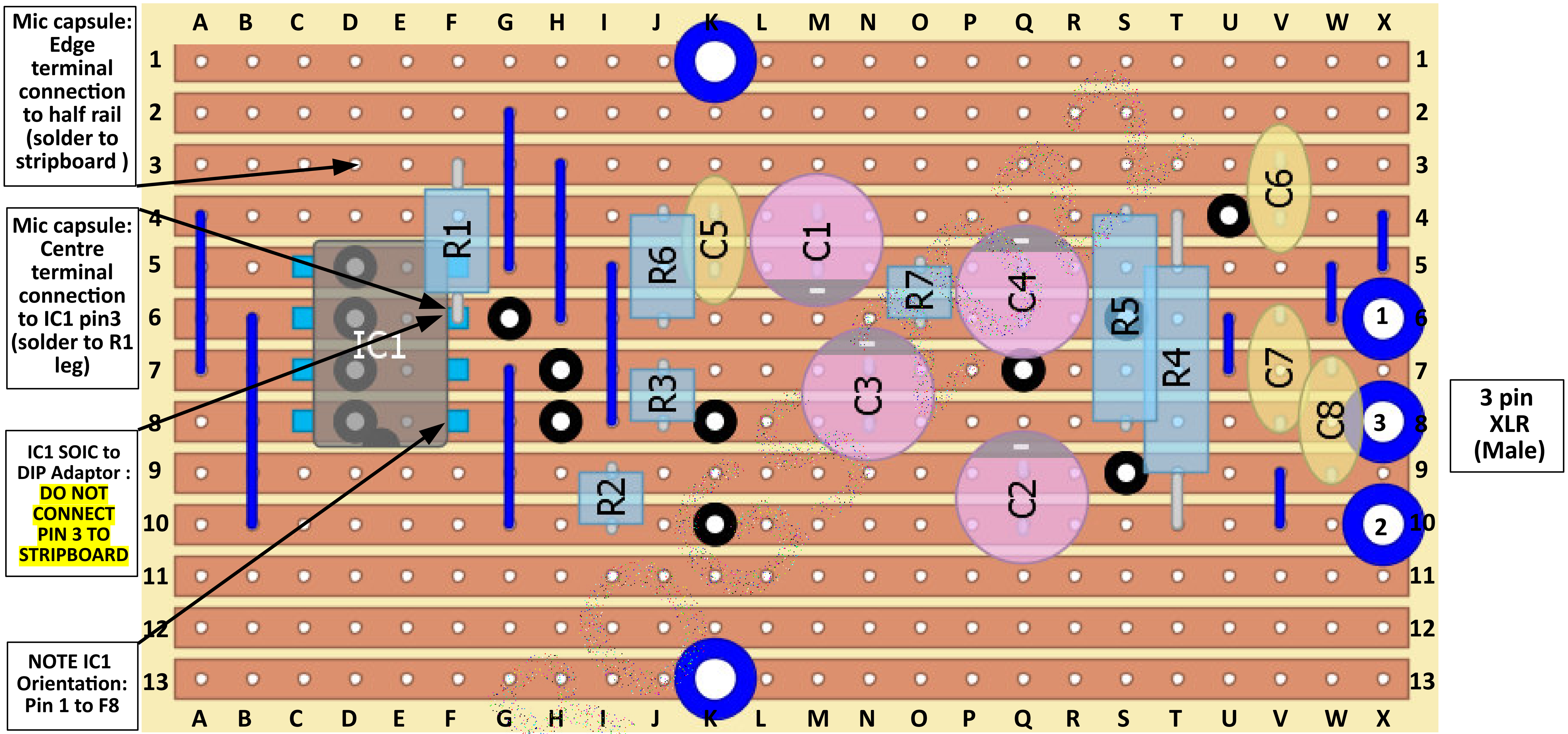
OPIC.41 - stripboard

●● TRACK CUTS AND WIRE LINKS VIEWED FROM COMPONENT SIDE ●●

Make links from 0.56swg (or equivalent) tinned copper wire, and fit to the locations shown in blue above

Fit wire links to the 10 locations listed below:

- A (4,7)
- B (6,10)
- G (2,5)
- G (7,10)
- H (3,6)
- I (5,8)
- U (6,7)
- V (9,10)
- W (5,6)
- X (4,5)



OPIC.41.Fetless – stripboard

Complete stripboard component layout

•• VIEWED FROM COMPONENT SIDE ••

K1 and K13 are PCB mounting holes

Fit the components to the locations listed below:

- C1 47uF 50V (M4+, M5)
- C2 47uF 50V (Q10+, Q9)
- C3 47uF 50V (M8+, M7)
- C4 47uF 50V (Q6+, Q5)
- C5 100n mlc (K4, K5)
- C6 100n mlc (V3, V4)
- C7 10n mlc (V6, V8)
- C8 10n mlc (W7, W9)
- **C5-C8 are X7R 63V mlc**

All resistors (except R1) are MF12 1/8th watt MF

- R1 1GΩ (10%) (F3, F6)

- R2 47R (I9, I10)
- R3 47R (J7, J8)

- R4 10k (T4,T10)
- R5 10k (S4,S8)
- R6 47k (J4, J6)
- R7 47k (O5, O6)

- IC1 OPA1641 (via adaptor) **(Pin1 - F8)**