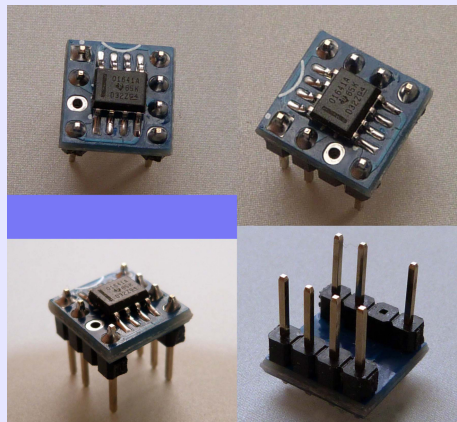
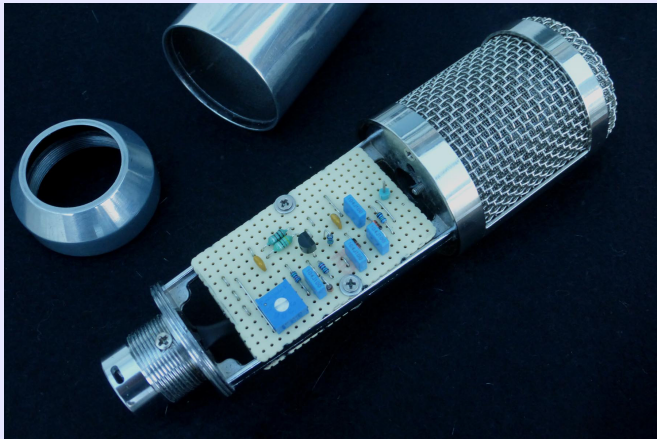
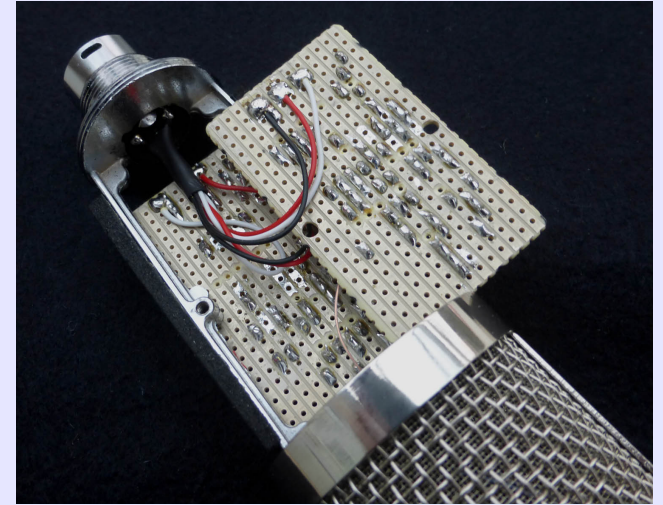
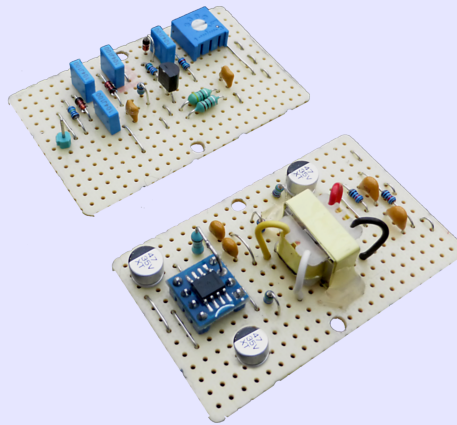


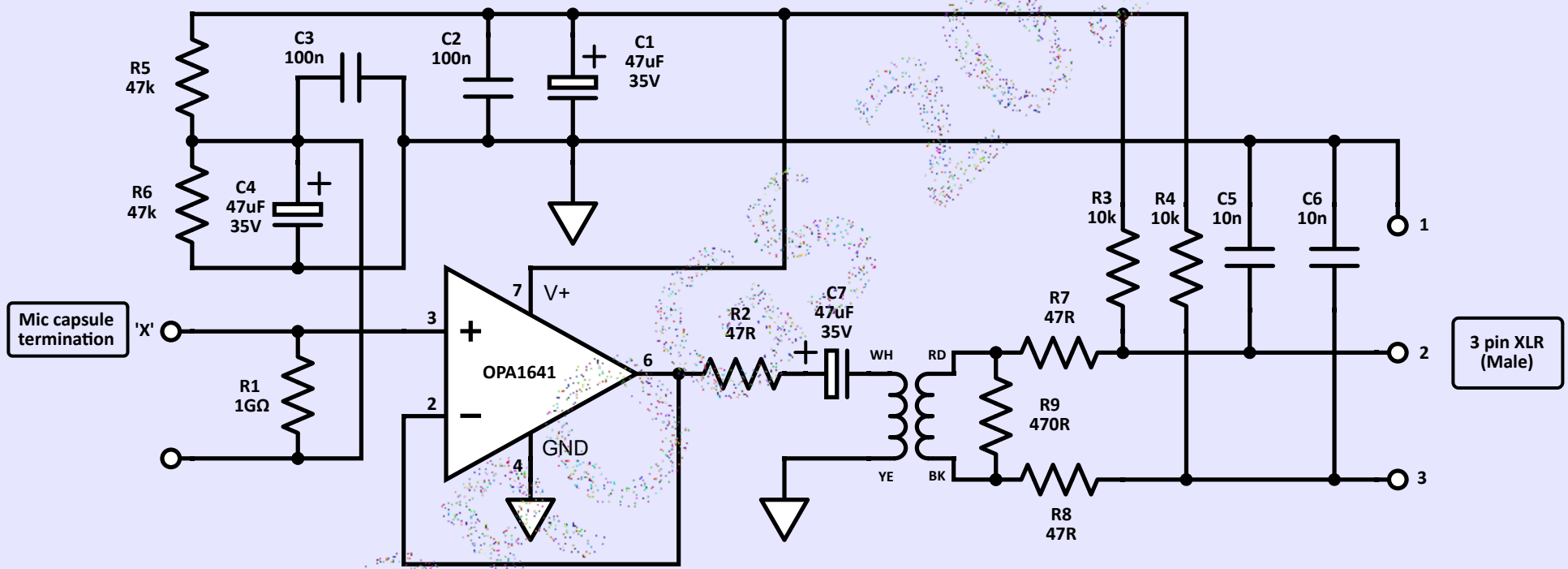
OPIC.TX

- OPA1641 Impedance Converter with transformer coupled output
 - 'Schoeps style' adjustable Voltage Multiplier



© rogs 11.24

• Op Amp Impedance Converter (OPIC.TX) Schematic •



- The 'X' connection is made to the capsule membrane termination.
- The second capsule backplate termination is taken from the Voltage Multiplier output

TX 1
NTE 1
(Neutrik)

© rogs 01.25

OPIC.TX 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.

The circuit offers a simple alternative to the more conventional use of a discrete JFET device to perform this function..

The OPA164* series of op-amps offer both low noise and low quiescent current, making them ideal for this task. There is also no need for any bias adjustments to be included, which further simplifies construction.

A single OPA1641 op-amp is used here to provide a single sided audio output. This output is connected to a Neutrik transformer type NTE1, to provide an isolated balanced audio output - via pins 2 and 3 of the XLR connector - to the attached mic preamp.

Circuit description:

The OPA1641 is configured as a unity 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 R3 and R4 - together with the decoupling capacitors C1 and C2 - will allow a smoothed supply voltage of around 22v to be presented to pin 7 of the op-amp. The actual value of the supply voltage to the op-amp is not critical, and the values selected for R3 and R4 will ensure the maximum permitted value is not exceeded.

The op-amp requires a 'dual' voltage supply, and this is provided by the creation of a 'half rail' voltage of around 11v by the voltage divider R5 and R6, together with the decoupling capacitors C3 and C4.

This 'half rail' voltage is required to bias the op-amp, 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 LDC capsule used in this version requires an externally generated polarising DC voltage. (See the 'VM' schematic description for more details.)

The 'X' input connection on the schematic is normally connected to the membrane capsule termination, the other backplate termination being connected to the output of the VM voltage multiplier. Reversing these connections will reverse that polarity of the output, if required.

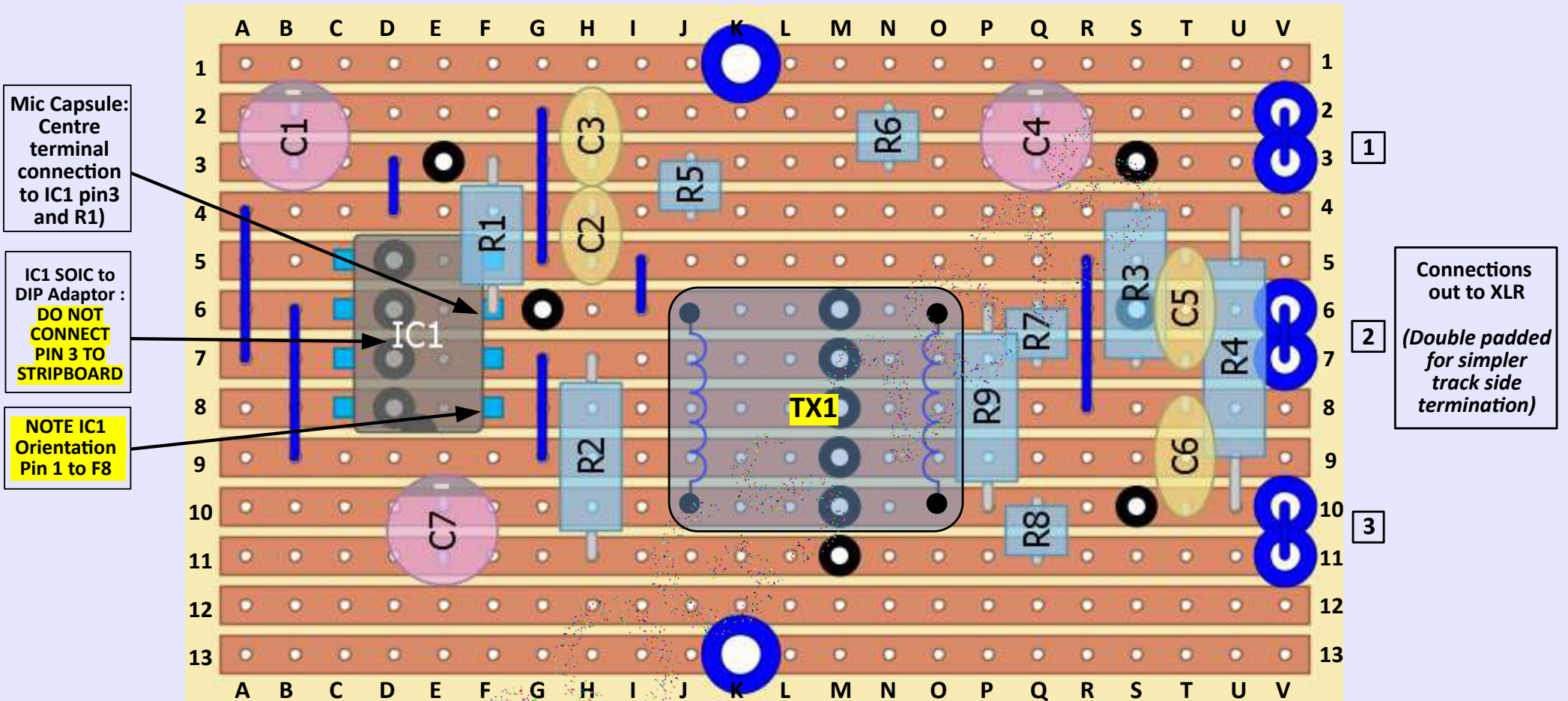
It is important to remember that the 'X' input is biased at positive 'half rail' (c.11v), and that DC value needs to be added to any selected voltage multiplier DC output, to determine the actual polarisation voltage applied to the capsule.

The op-amp output (pin 6) is connected via R2 and C7 to one end of the output transformer (TX1) primary winding. The other end of that winding is connected to 0v (gnd).

The secondary winding is connected to pins 2 and 3 of the XLR connector, which provides a balanced output signal to the attached mic pre-amp.

R7 and R8 are included in series with the transformer secondary to allow for output impedance adjustments, if required. The indicated value of 47R is nominal, and can be changed to suit specific requirements if necessary. R9 is included to minimise any high frequency output 'ringing' that may be present at the transformer secondary output.

C5 and C6 are included to decouple any stray RF interference which may be present.



Mic Capsule:
Centre
terminal
connection
to IC1 pin3
and R1)

IC1 SOIC to
DIP Adaptor :
**DO NOT
CONNECT
PIN 3 TO
STRIPBOARD**

**NOTE IC1
Orientation
Pin 1 to F8**

Connections
out to XLR
*(Double padded
for simpler
track side
termination)*

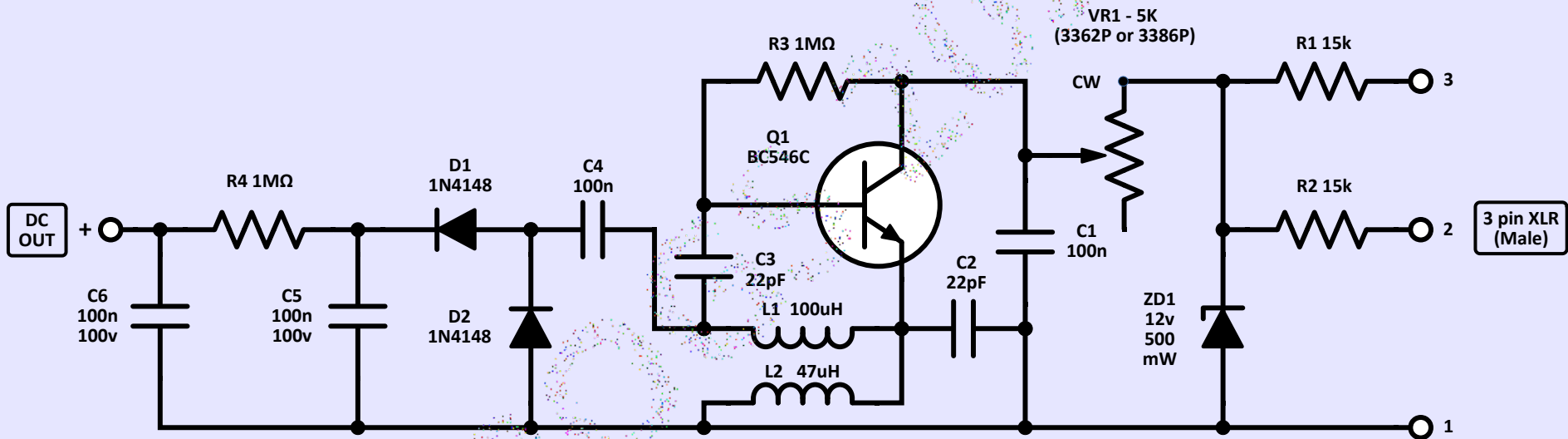
OPIC.TX – stripboard
Complete stripboard component layout
• **VIEWED FROM COMPONENT SIDE** •

- K1 and K13 are mounting holes
- 8 x TCW links (marked as blue lines)
- 15 x 'spin off' track cuts (marked as black and white dots)

- Fit the components listed below:**
- C1 47uF 35V
 - C2 100n 63V mlc
 - C3 100n 63V mlc
 - C4 47uF 35V
 - C5 10n 63V mlc
 - C6 10n 63V mlc
 - C7 47uF 35V
 - R1 1GΩ (10%) (RGP0207CHK1G0 or similar)
 - R2 47R
 - R3 10k
 - R4 10k
 - R5 47k
 - R6 47k
 - R7 47R
 - R8 47R
 - R9 470R
 - All resistors (except R1) are MF12 1/8th watt
 - IC1 OPA1641 (via adaptor) **(Pin1 - F8)**
 - TX1 NTE-1 (Neutrik)

© rogs 01.25

• OPIC.TX: HARTLEY OSCILLATOR ADJUSTABLE VOLTAGE MULTIPLIER •



Typical results with component values shown:

- Output voltages: c. +55v to +95v (*Adjust using VR1*)
- Max volts: CW 3362P or CCW 3386P (CW= clockwise)
- Oscillator frequency: c. 2MHz
- Current: c. 2.5mA

OPIC.TX - Adjustable Voltage Multiplier

Overview:

The circuitry shown in this schematic is designed to generate a high voltage DC output - adjustable between c.55v and c.95v - to be applied as the polarisation voltage required to bias a conventional large diameter condenser microphone capsule.

DC power to the circuitry is supplied from the 48v phantom power of the attached mic pre-amp. About 2.5mA will be drawn by this circuit.

Circuit description:

This particular circuit is based on a Hartley oscillator, the sine wave output of which is AC coupled to a voltage doubling circuit, which produces the required positive high voltage.

There are a number of alternative possible configurations for a Hartley oscillator. The one chosen for this project follows the format used by Schoeps, in their famous 'CMC5' microphone schematic.

There are many online technical items on Hartley oscillators. The notes here:

<https://learnabout-electronics.org/Oscillators/osc21.php>

provide some interesting insights, particularly regarding mutual coupling of the inductors, which can play an important role in the layout of the oscillator components.

In this schematic, a Hartley oscillator running at c.2MHz is formed by the components connected to Q1. The amplitude of the oscillator output, which is taken from the junction of L1 and C3, will be a sine wave that will vary in amplitude between c.55v and c.95v (p-p), depending on the position of VR1.

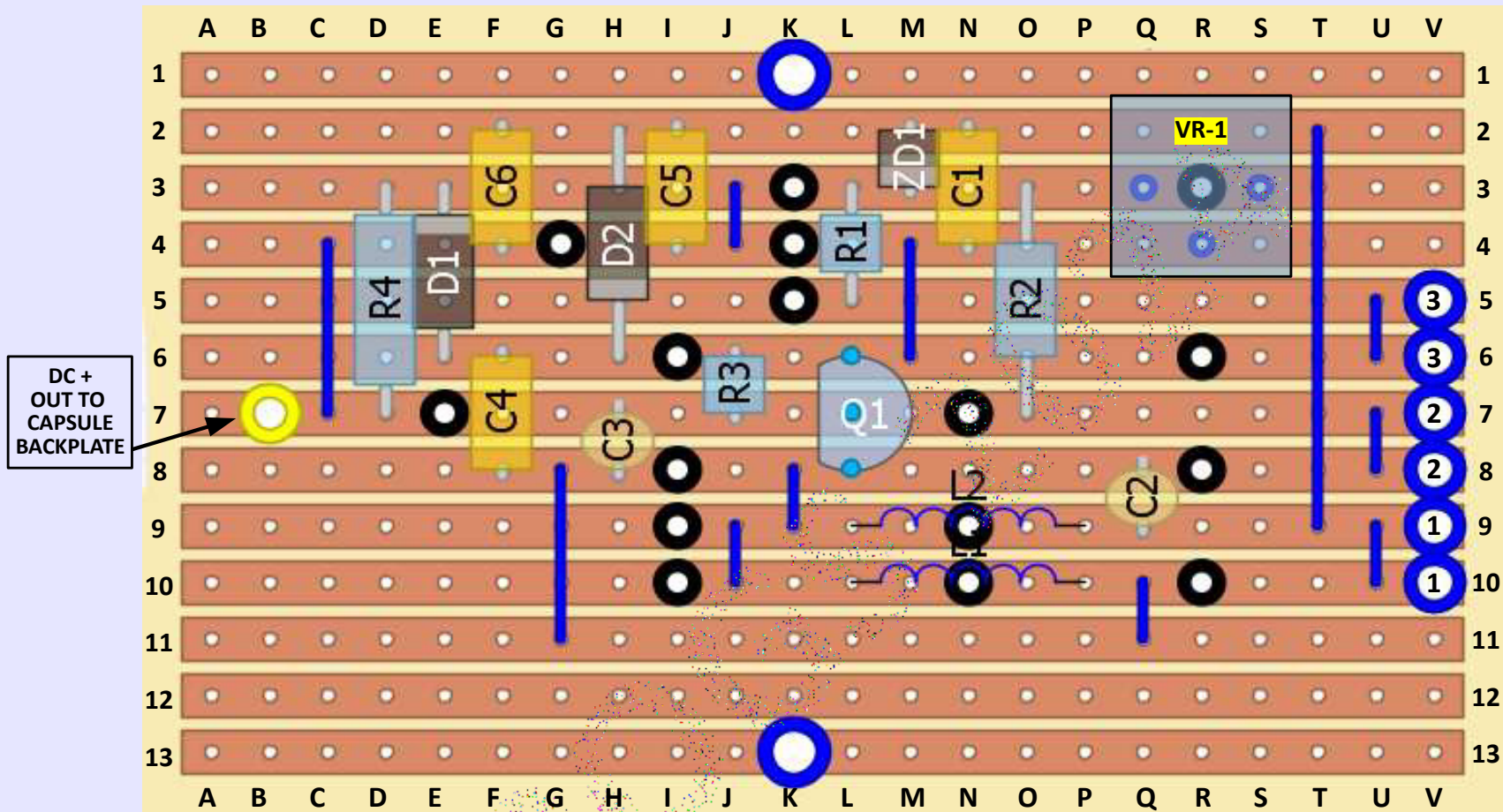
Notice the positions of the 2 inductors L1 and L2 on the stripboard. Although not critical, it is recommended that the inductors are laid with the same orientation, in adjacent 0.1" stripboard rows. That should provide for an appropriate level of mutual inductive coupling between the inductors, for reliable oscillator operation.

The oscillator output is fed - via C4 - to the junction of D1 anode and D2 cathode. D1 and D2 - in conjunction with C4 and C5 - form a voltage doubling circuit, which will produce a rectified DC output of between +55v and +95v at D1 cathode. R4 and C6 act as a low pass filter, to allow a smoothed DC voltage to be present at the junction of those two components. This DC output is connected to backplate of the capsule.

Note that capacitors C4, 5 & 6 need to be rated at 100v rather than the more common 63v type that can apply to other capacitors in this circuit.

R1 and R2 will feed both legs of the 48 v phantom power from the mic pre-amp to the cathode of ZD1. The regulated 12v DC supply from this point is fed - via the adjustable resistor VR1 - to the collector of Q1. C1 serves to decouple this supply. The variable DC available at this point will determine the amplitude of the oscillator output, and the value of the final voltage multiplier output as a result.

To determine the actual value of DC being supplied to the output, it is recommended that DMM measurements are taken from D1 cathode, and not from the actual output termination itself. This will minimise the effect the impedance of the DMM has on the observed voltage readings.



Connections out to XLR
(Double padded for more reliable track side termination)

DC+ OUT TO CAPSULE BACKPLATE

OPIC.TX Voltage Multiplier – stripboard
Complete stripboard component layout
• **VIEWED FROM COMPONENT SIDE** •

- K1 and K13 are PCB mounting holes
- 11 x TCW links (marked as blue lines)
- 16 x 'spin off' track cuts (marked as black and white dots)

- Fit the components listed below:**
- | | | |
|--------------------|--|-------------------|
| • C1 100n 100V PET | All resistors are MF12 1/8th watt | • Q1 BC546C |
| • C2 22p 63V mlc | • R1 15k • R2 15k | • D1 1N4148 |
| • C3 22p 63V mlc | • R3 1M • R4 1M | • D2 1N4148 |
| • C4 100n 100V PET | | • ZD1 12V 500mW |
| • C5 100n 100V PET | • VR1 5K | • L1 100uH |
| • C6 100n 100V PET | Bourns 3362P or 3386P | • L2 47uH |
| | (or similar) | Bourns 78F series |
| | | (or similar) |

© rogs 11.24