

Vocal Canceller

You don't have to be a star

If you have ever imagined yourself as lead vocalist with a famous band, here is your chance to "audition". You can cancel out the lead vocal on almost any stereo record and substitute your own voice or musical instrument.

by COLIN DAWSON

In a stereo record of a band or group, the lead vocalist normally appears to be at centre-stage, ie, midway between the two loudspeakers. This is achieved by directing equal amounts of the vocal signal to the left and right channels during the recording process.

Our Vocal Canceller takes advantage of this fact by feeding the left and right channel signals of a stereo record to the inverting and non-inverting inputs of an operational amplifier. The resultant output signal from the op amp is mono (since there is only one output signal) with the common components of the original left and right channels cancelled out. Ergo, the lead vocalist virtually disappears.

You can substitute your own voice by plugging a microphone into the input provided on the canceller. Alternatively, you could plug in a guitar instead.

The success or otherwise of this cancellation will depend upon the particular record. Some records have more reverberation applied to the lead vocalist and so this cancellation process will tend to produce a "disembody" effect rather than a disappearance. Still, the effect can be reasonably satisfying as your substituted voice is "backed" by the original lead vocalist. In fact, you may prefer this.

Our Vocal Canceller is housed in a standard plastic utility case measuring 158 x 95 x 50mm and which is fitted with two knobs and two switches. On one end of the case are four RCA phono sockets. Two of these are inputs and two are outputs. The Canceller is intended to be connected into the Tape Monitor loop which is available on most stereo amplifiers and thus it works at Line Output levels, ie, at several hundred millivolts.

Therefore, when connecting the Vocal Canceller to a typical stereo amplifier, the "Tape Rec" signals from the amplifier go to the inputs of the Canceller while its

outputs are connected to the "Tape Mon" inputs on the amplifier.

The two switches on the Canceller are for Power (labelled ON) and Mode which has two positions, Cancel and Normal. In the Normal mode, the canceller circuitry is bypassed and normal stereo reproduction occurs. In the Cancel mode, the depth of the null (or cancellation) can be adjusted by the appropriate knob. The other knob provides a gain control for the microphone input which is suitable for any high impedance dynamic or electret microphone (with in-built battery and buffer circuitry).

How it works

A look at the circuit will show that it is quite simple and uses just two low-noise op amps. Our circuit is based on an article in "Popular Electronics" for May 1981. One op amp, IC1, provides the cancellation mode already discussed while the

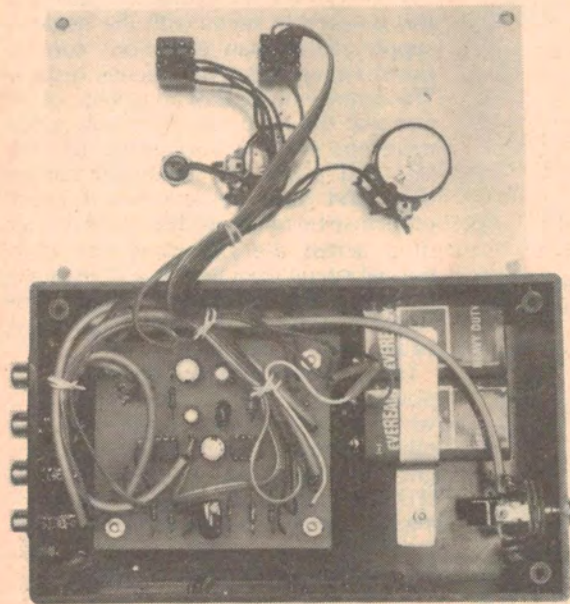
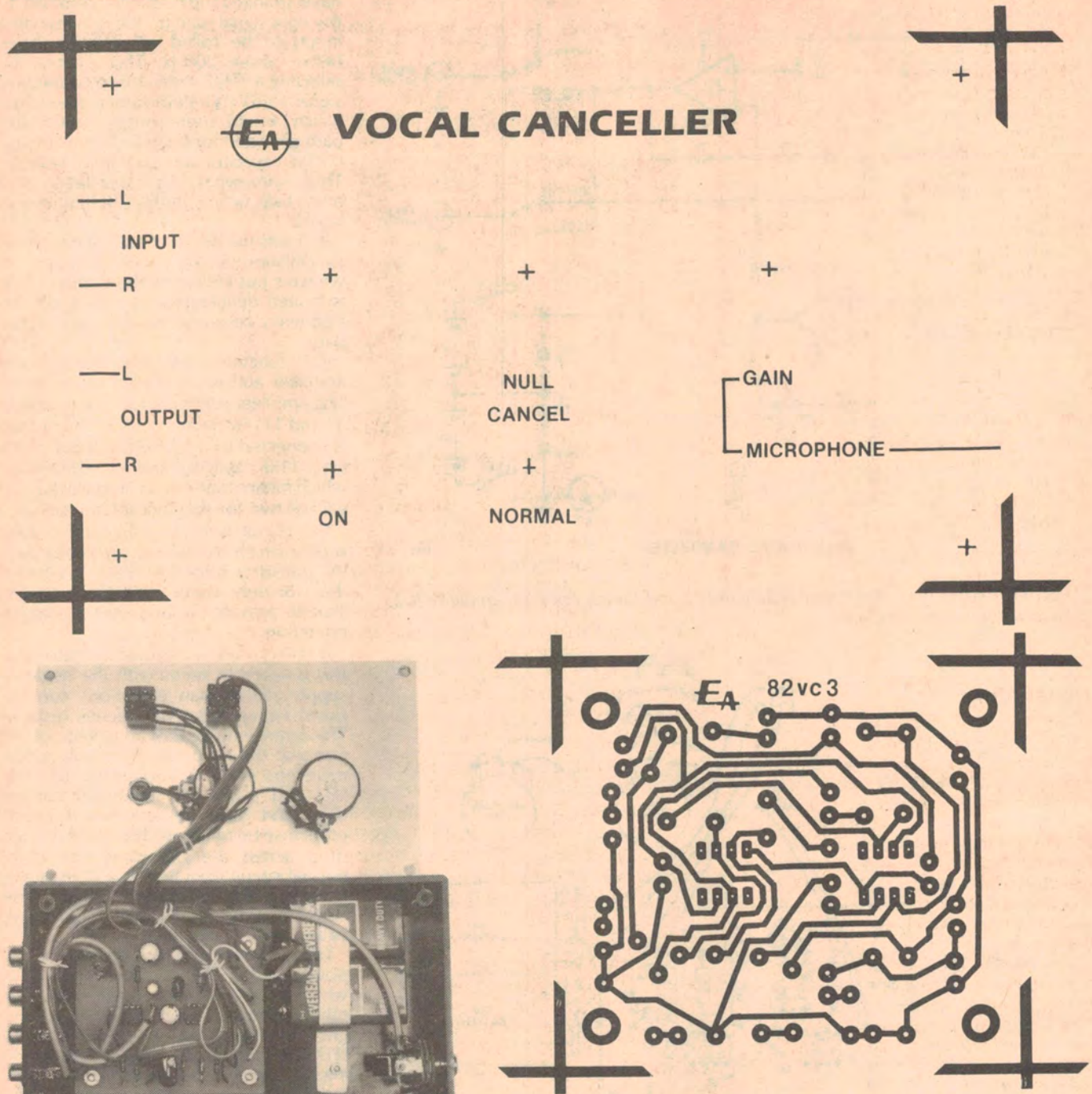
other, IC2, provides a microphone preamplifier.

IC1 is arranged in what looks like a conventional inverting amplifier with the left channel signal applied to the inverting input, pin 2, via a 47kΩ resistor and 0.22μF capacitor while DC bias is applied to the non-inverting input, pin 3, via RV1, a 100kΩ potentiometer. However, the circuit departs from normal practice in that a signal is also applied to the non-inverting input via RV1 and a .01μF capacitor. Thus IC1 functions as a differential amplifier and whenever the two signals applied to it are equal in phase and in amplitude they are cancelled out.

IC1 can therefore be considered as an ideal demonstration of a differential amplifier in that it only amplifies signals which have a "difference" between them while signals which are the same (ie, common mode) are rejected. The



Vocal Canceller cancels the lead vocal and lets you substitute your own voice.



Above are actual size artworks for the PCB and front panel, while at right is a view inside the unit.

RCA socket strip at one end and the microphone socket at the other. We have prepared a Scotchcal front panel

We estimate that the current cost of parts for this project is approximately

\$20

This includes sales tax.

for the Vocal Canceller, and if this is to be used, make sure you mount the sockets to correspond with the Scotchcal. The microphone socket may need to be either 6.5 or 3.5mm, depending on the particular microphone you use. If you intend to use the microphone from a portable cassette recorder, you will most likely require a 3.5mm socket.

You will need to drill the front panel to accept the LED, two switches and two pots. These positions are marked on the Scotchcal design. The front panel will also need to be earthed to minimise

hum in the circuit. This can be done by linking the case of RV1 to its "earthy" side.

For the connections to the input and output sockets, use shielded wire. All the other connections can be made with unshielded hook-up wire. Be careful of the polarity of the LED as a wrong connection will prevent the circuit from working.

Having completed and checked the construction, turn the Canceller on and check that the LED illuminates. If it does, you are ready to install the Canceller.

PARTS LIST

- 1 printed circuit board, 82vc3, 75 x 66mm
- 1 4-way RCA socket strip
- 1 microphone socket, 6.5mm or 3.5mm (see text)
- 1 plastic utility box, 158 x 95 x 50mm
- 2 DPDT switches
- 2 9V batteries
- 2 clips for 9V batteries
- 2 knobs for front panel
- 5 screws and nuts for mounting PCB and battery holder
- Shielded and unshielded hook-up wire
- 2 LF351, TL071 FET input op amps
- 1 LED bezel

CAPACITORS

- 2 100 μ F 10VW electrolytic
- 1 10 μ F 10VW electrolytic
- 1 1 μ F 10VW electrolytic
- 1 0.22 μ F metallised polyester (greencap)
- 1 0.047 μ F greencap
- 1 0.01 μ F greencap

RESISTORS ($\frac{1}{2}$ W, 5%)

- 2 x 470k Ω , 1 x 100k Ω , 2 x 47k Ω , 1 x 22k Ω , 1 x 10k Ω , 2 x 1k Ω , 2 x 100k Ω linear pots.

Installation

The first part of the setting up procedure does not require the Cancellor to be switched on. Connect its inputs to the "Tape Rec" sockets on your stereo amplifier and its output to the "Tape Monitor" sockets. Switch the Cancellor to the normal position and turn the stereo system on. You should hear normal stereo with the "Tape Monitor" button in or out. If the stereo is distorted, or you can't hear it at all, there is a fault in the wiring.

Now, switch the Cancellor on but do not connect a microphone. With S1 still in the "Normal" mode there should be no change from the previous test. Switch the Cancellor to the "Cancel" position. Immediately, the stereo should be replaced with mono sound. There will be a decrease in the volume — especially of the lead vocal. Adjust RV1 until the vocal cancellation is maximum. The amount of cancellation possible will vary from record to record, but you should at least be able to put the lead vocal well into the background.

If the circuit is operating properly, connect a pair of headphones to the amplifier, set the microphone gain to minimum and connect a microphone. It is preferable to use headphones rather than speakers until you are familiar with the gain control, otherwise some most unpleasant acoustic feedback may result. With the amplifier set to "Tape monitor" and the Cancellor set to

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cancel, speak into the microphone and gradually increase the gain until your voice blends realistically.

If you now want to demonstrate your vocal talent with the speakers, bear in mind that if you turn the microphone gain up too high or put the microphone near one of the speakers, the resulting feedback is not only unpleasant to listen to but may, in extreme cases, damage the amplifier or loudspeakers. 