

CYLON VOICE



There you are, dawdling through the galactic flotsam and jetsam with your ragtag band of beat-up freighters and cruise ships, when you are suddenly attacked by a Cylon patrol. You shudder as you hear those metallic tones over the radio waves . . . Yes, you can indulge these fantasies when you build our Cylon voice module.

by LEO SIMPSON and GERALD COHN

During 1980 the program "Battlestar Galactica" was screened by the Seven network and while the series will probably not be continued in 1981, it was quite a popular program, especially amongst the science-fiction freaks. Naturally the most interesting characters were not the humans but the tyrannical Cylons, a bunch of metallic robots speaking in richly, resonant monotones.

It is odd, isn't it, that the most enduring characters from these science fiction series are not the humans but the aliens, the robots or the computers? Remember Zen from "Blakes 7" or K9 from "Doctor Who" or, going way back, Mister Spock from "Star Trek". By contrast, the humans in these series were often weak, ineffectual characters who muddled through to always succeed in the end. The baddies almost never get a look-in. (Even the coyote in the "Road-Runner" cartoons is always being mashed.)

Anyway, when a certain staff member who shall remain anonymous first saw and heard the Cylons in "Battlestar Galactica" he was entranced. He was even seen strutting around his family room, mouthing into a large decorative urn, calling out such nonsense as "Fire in three milli-centons", "Ship in Sector Three" or "By your Command". All this, while he menaced wife and children. (Now you see why he must remain anonymous.)

Clearly, this outlandish behaviour had to stop. There had to be an easier and more effective way of imitating the rich metallic resonances of a Cylon's voice. Short of having an injection of titanium into the vocal chords, that is!

We realised that the Cylon voice was probably being produced with an audio ring modulator. A ring modulator, or balanced modulator as it is also called, is a device more commonly found in single sideband transmitters and receivers. It is used to mix the carrier and audio modulation to produce the different fre-

quencies which become the upper and lower sidebands.

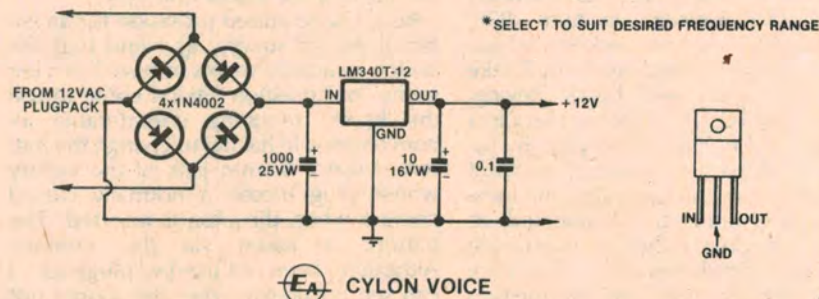
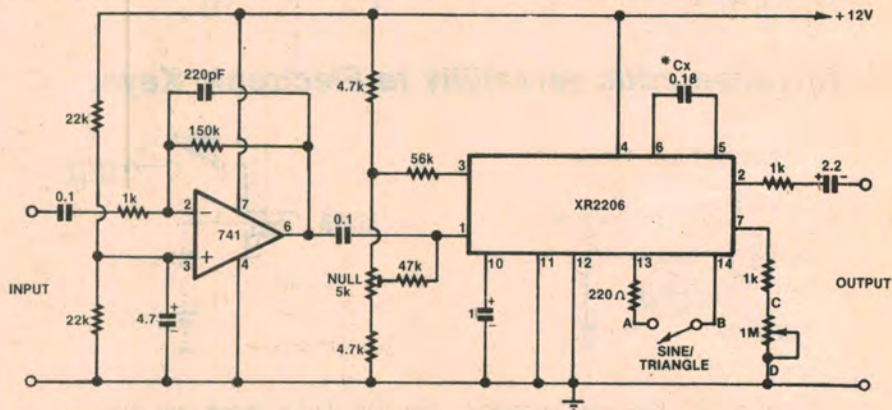
As used in this more trivial application, the audio modulation, which is the signal from a microphone, is mixed with another audio frequency to produce a modulated voice quite unlike the original.

It was while pondering this problem that we came across a device which seemed to be tailor-made for our purpose. It is the Exar XR2206 function generator IC. This contains a voltage-controlled oscillator which can be used to provide the "carrier" while it also has a "multiplier and sinewave shaper". This is basically two sets of complementary

transistors which can be used to shape a triangle waveform into a sinewave or operate as ring modulator.

Voila! The very thing! We quickly whipped up a simple microphone preamplifier using a 741 op amp IC and wired the XR2206 to provide the ring modulator function, according to the information from Exar. This we connected to an amplifier and loudspeaker. With a microphone bunged into the input we soon had a variety of weird-sounding voices. Some would say that they were not all due to the ring modulator!

The complete circuit shows the final result of our fun and games. The circuit is



Use this circuit with microphone, amplifier and loudspeaker to imitate the voice of a Cylon. (Photo above by courtesy of Channel 7, Sydney).

suitable for typical low impedance dynamic or electret microphones and may be connected to the high level (typically 150mV) input on a domestic stereo amplifier. Since the Exar 2206 chip has a relatively high current drain of about 20 milliamps maximum, we elected to provide a mains power supply. Alternatively, you could run the device from batteries, preferably rechargeable.

As a further alternative, the device could be made completely self-contained with its own amplifier and loudspeaker system. A suitable low power amplifier circuit could be adapted from the Playmaster 3W + 3W described in January 1980 issue of "Electronics Australia".

The microphone preamplifier has a nominal gain of 150 and an input impedance of 1kΩ. The two 22kΩ resistors connected to pin 3 set its output at pin 6 to the half supply point. A 220pF capacitor in parallel with the 150kΩ feedback resistor roll off the frequency response above 5kHz which is desirable for this application.

Output from the 741 is coupled via a

PARTS LIST

- 1 Printed circuit board 100 x 56mm (80RM12)
- 1 Single-pole single-throw switch
- 4 x 1N4002 rectifier diodes
- 1 x LM340T-12 three terminal regulator
- 1 x uA741 operational amplifier IC
- 1 x XR2206 function generator IC
- 1 x 1MΩ linear potentiometer
- 1 x 5kΩ trimpot

CAPACITORS

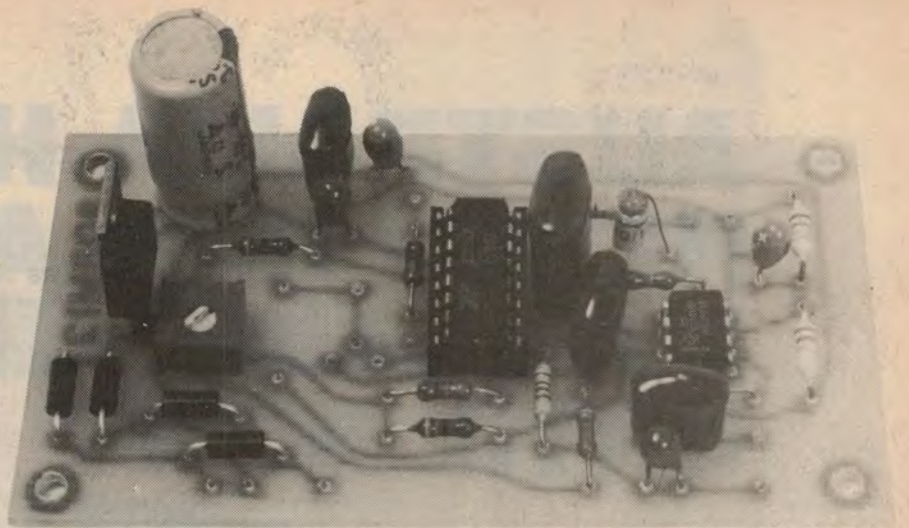
- 1 x 100μF 25VW aluminium electrolytic
- 1 x 220pF polystyrene
- 1 x 10μF 16VW tantalum
- 1 x 4.7μF 25VW tantalum
- 1 x 2.2μF 25VW tantalum
- 1 x 1μF 25VW tantalum
- 1 x 0.18μF greencap
- 3 x 0.1μF metallised polyester

RESISTORS

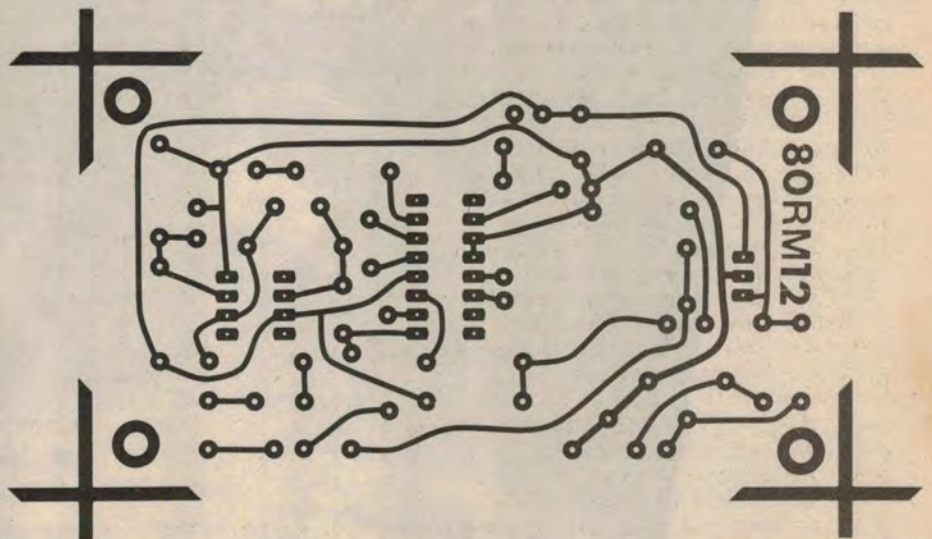
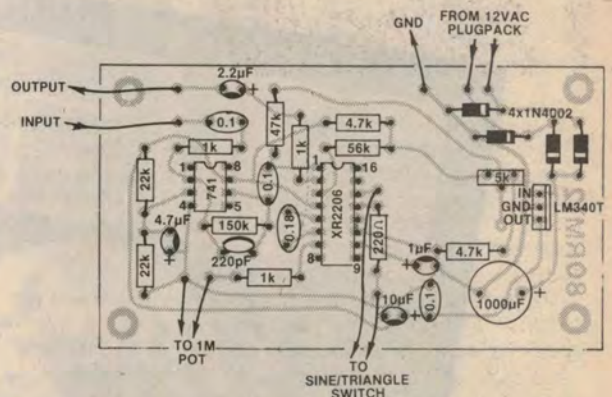
- 1 x 150kΩ, 1 x 56kΩ, 1 x 47kΩ, 2 x 22kΩ, 2 x 4.7kΩ, 3 x 1kΩ, 1 x 220Ω.

0.1μF capacitor to the modulation input on the 2206. The internal voltage controlled oscillator is varied in frequency by a variable resistance connected to pin 7 and is set to the desired frequency range by the capacitor between pins 5 and 6. The "carrier" waveform from the VCO can be set to triangle (sawtooth) or sinewave by the resistor and switch between pins 13 and 14.

The power supply is quite straightforward and uses a 12VAC plugpack or equivalent transformer to drive a bridge rectifier and 1000μF capacitor. The



At right is the PC layout while above is a completed PCB. Below is the actual size artwork for the PC board.



filtered DC is then fed to a 12-volt three terminal regulator which is desirable for best performance from the 2206.

Construction of the unit should only take an hour or so, this being made simple through the use of a printed circuit board which measures 100 x 56mm and is coded 80rm12.

When all the components have been mounted, all that remains to do is to connect the external potentiometer and switch to the board. The microphone input should be fitted with a socket suitable for the plug on the end of microphone lead.

If you have not already done so, connect the output lead from the plugpack to the PCB. Now connect the unit to an amplifier and connect a microphone to the input of the unit. Now, apply power to the unit and you should hear the VCO frequency in the speakers. If you don't then chances are that you have a frequency that is beyond 18kHz, or else you have been lucky enough to have a null condition from switch on.

If you are able to hear a tone, then it will have to be nulled out by the trimpot. Having done this you can proceed to turn your voice into that of an invading Cylon warrior.