

Variable Power for the Alinco DX-70TH

by Steve White, G3ZVW*

THE ALINCO DX-70TH is a miniature HF - 6m transceiver. It has a control that permits the user to switch between full power (100 watts output) and low power, which, as standard, is adjusted so that the transceiver delivers approximately 10 watts. The low-power setting is adjustable by means of a sub-miniature potentiometer inside the transceiver, but I felt that it would be useful if it could be equipped with an external control to vary the power continuously. The main criterion I placed upon the exercise was that I didn't want to modify the transceiver in order to do it! The way to achieve this is to apply a variable DC voltage to the ALC socket on the back of the rig.

ALC CHARACTERISTIC

THE ALINCO manual states "The ALC input voltage must be from 0 to -3V DC". I decided to put this statement to the test, so connected the transceiver to a dummy load, hooked up a 4.5V battery through a potentiometer to the ALC socket, and measured the output power as I cranked the pot back and forth.

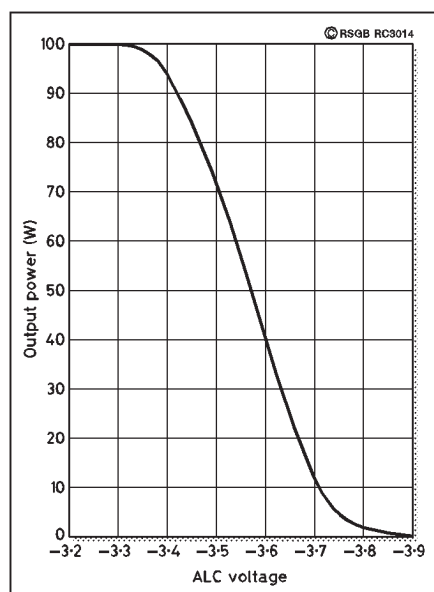


Fig 1: ALC characteristic of the Alinco DX-70TH. Half power is achieved by applying approximately -3.57V to the transceiver's ALC socket.

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A graph of the results can be seen in Fig 1. It shows that, up to about -3.3V, the transceiver delivers its full output power. At -3.4V the power is just starting to drop. Thereafter the power falls away quite rapidly, the half power mark being at about -3.57V. By the time you get to -3.9V, less than 1 watt emerges at the output.

Clearly the requirement was for a control with about -3.2V on the top end and about -4.0V on the bottom, but it occurred to me that the transceiver might represent a significant load and pull the voltage down. I measured the current drawn as just 3µA - an insignificant amount.

NEGATIVE FROM POSITIVE

THE SIGNIFICANT thing about ALC voltage is that it is negative with respect to ground, whereas the transceiver runs from +13.8V. Of course it would be possible to employ a separate mains power pack to provide a smooth, stable, negative supply; you could even use a battery; but I wanted to avoid both of these approaches. What I decided instead was to use the positive supply that was already being fed to the transceiver to generate a negative supply.

This may sound complicated, but all you need to generate a negative voltage from a positive voltage is an oscillator, capacitively coupled to a rectifier... simple as that.

INEXPENSIVE APPROACH

THERE ARE NUMEROUS circuits for oscillators. I decided to make one (Fig 2) based on an integrated circuit that costs no more than a few pence. It employs two of the gates in a 4011 CMOS quad NAND gate

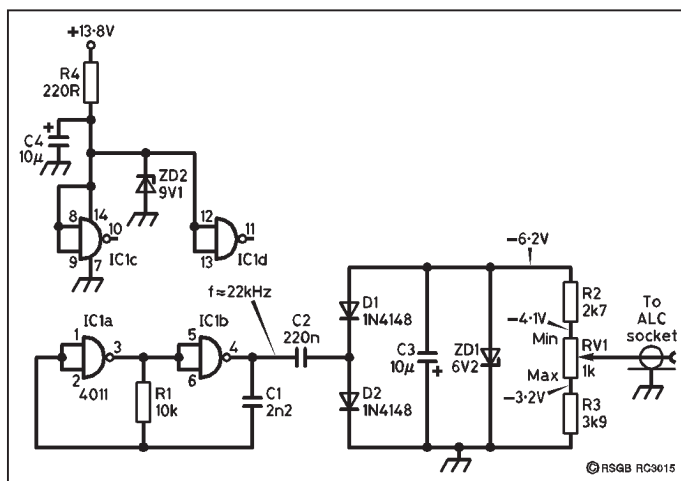


Fig 2: The power controller uses a cheap CMOS logic chip as an oscillator. Followed by a rectifier, smoothing and stabilising, it produces the negative voltage needed to operate the transceiver's ALC circuitry.

as an oscillator - very much a standard circuit. The values of R1 and C1 were chosen so that the frequency of oscillation was over 20kHz, so there would be no chance of ripple being heard if any got through to the output. C2 capacitively couples the oscillator to the rectifier part of the circuit, the oscillator's power supply being stabilised by ZD2 and R4.

Connected with the cathodes of the diodes facing ground, D1 and D2 form a half wave voltage doubler. The rectified voltage is smoothed by C3 and limited to -6.2V by ZD1.

The final part of the circuit is a potential divider, the object of the exercise being to place -3.2V on one end of RV1 and -4.0V on the other. The output is taken from the wiper to a phono plug that goes to the ALC socket of the transceiver.

One thing to note about the circuit is that the inputs of the unused gates (IC1c and IC1d) are connected to +9V. It is good practice to tie the unused inputs of logic gates to a supply rail (either rail would be OK in this instance), as it prevents the possibility of them floating to a point somewhere between and causing instability.

CONSTRUCTION

THERE SEEMED little point in designing a printed circuit board for a project with so

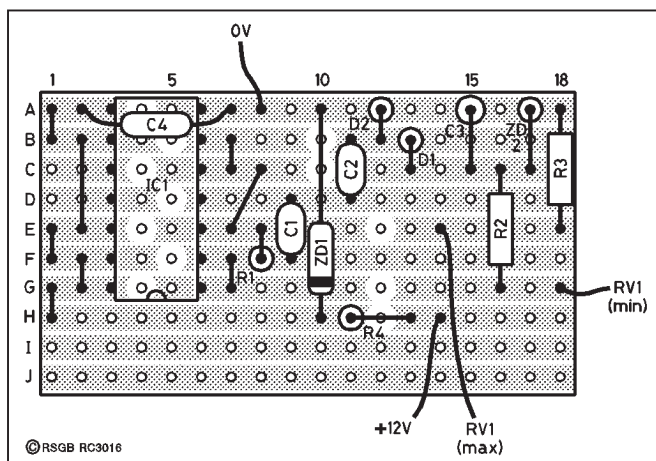


Fig 3: Veroboard layout of the power controller.

few components, so I elected to use Veroboard. The layout is shown in **Fig 3** and the completed project in the photo above right. The tracks should be cut in the 12 places shown. The important thing to remember when placing components is the orientation of C3, C4, and all the semi-conductors.

If you have the special plug for the accessory socket located at the top right corner of the back of the DX-70TH, good. Otherwise, take two 25mm lengths of 2.5mm 'twin and earth' mains cable, strip back about 10mm of the sleeving from one end and 5mm from the other, solder the

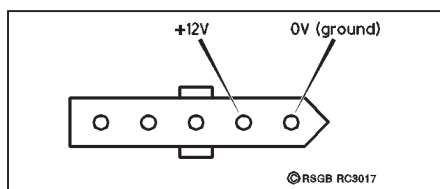


Fig 4: How to connect the power controller onto the accessory socket of the Alinco DX-70TH.

power leads from the power controller to them, cover the soldered joints with rub-

ber sleeves or self-amalgamating tape, then insert them into the accessory socket as shown in **Fig 4**. The photo below right shows this. You'll find these makeshift pins a snug fit in the socket, but they are not so large as to damage it and you can easily pull them out if required.

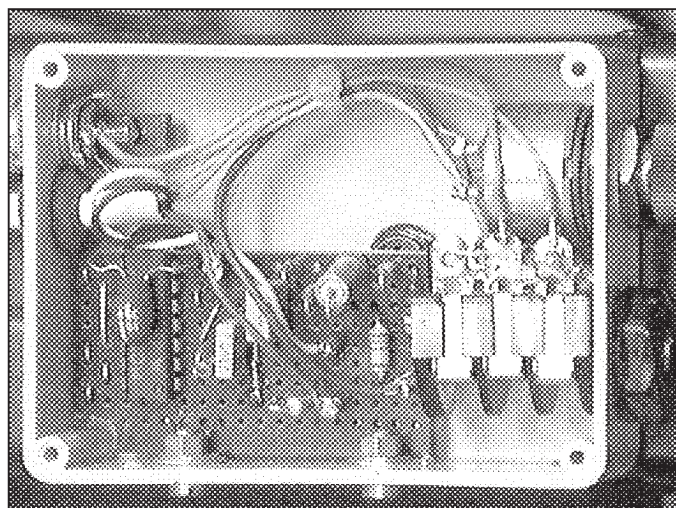
In the photo below left, the power controller is seen fitted to the left side of the transceiver using two of the M4 screws that would otherwise be used by the mobile mounting bracket, the third threaded hole in the side of the transceiver being used to mount a cable tie strain relief pad. The power controller could just as easily be fitted to the right side of the transceiver or allowed to sit on the shack bench.

COMMISSIONING

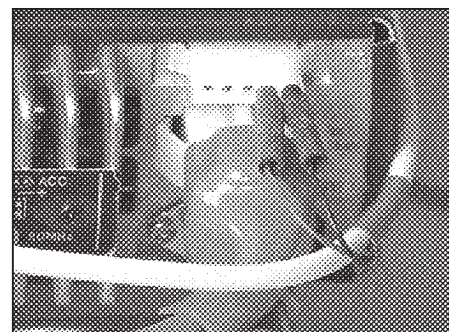
ONCE YOU HAVE finished building the power controller, I advise that you check the voltage that appears on the pin of the phono plug, *before* you insert it into the ALC socket of the transceiver. With the power controller connected to the accessory socket and the transceiver powered

on, you should get about -4.1V when RV1 is set fully anticlockwise and about -3.2V when RV1 is set fully clockwise. This being the case, the phono plug can now be inserted into the ALC socket.

You should now find that, on transmit, the output power can be continuously adjusted from milliwatts up to 100 watts - very useful if you enjoy QRP operation or if you have a linear amplifier that requires a specific drive level. ♦



Inside the power controller. The two jack sockets are for more convenient connection of headphones and extension speaker.



The improvised connections to the accessory socket.



The Alinco DX-70TH with the power controller in position. It presents the operator with a handy extra control.

COMPONENTS LIST

Resistors

(all 1/4W, 5%)

R1 10k
R2 2k7
R3 3k9
R4 220R
RV1 1k linear

Capacitors

C1 2.2nF
C2 0.22µF
C3, 4 10µF, 16V

Semiconductors

IC1 4011
D1, 2 1N4148

ZD1 6.2V, 1W
ZD2 9.1V, 1W

Miscellaneous

Veroboard
Veropins
Wire
Phono plug
Project box
5-pin Alinco accessory plug (or see text for alternative)
Cable ties
Strain relief pad
Miniature control knob