EDITION 1

Assembly Manual

UHF 80 Channel Upgrade

K-6301

DICK SMITH ELECTRONICS PTY LTD

KIT

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More channels for Explorer UHF transceiver

Extend the frequency coverage of your DSE 'Explorer' UHF amateur transceiver. This simple circuit is based on a single CMOS IC and adds 40 channels in the region from 439 to 440MHz.

In Victoria and, no doubt, in other States, a number of commonly used channels exist in that portion of the amateur UHF band from 439.000 to 440.000MHz. As it stands, the Dick Smith *Explorer* cannot easily take advantage of these channels due to the restricted coverage provided in the original design (438.025 to 439.000MHz).

To overcome this limitation, it was decided to modify the circuit to provide full coverage of the UHF FM Amateur band while still retaining the original 40-channel switch, as an 80-channel switch would be unprocurable. Thumbwheel switches were rejected on the grounds of cost, fitting difficulties and more complex interfacing requirements.

The method adopted involves combining two user-selectable ranges with the original 40-channel switch, thus providing the full 80 channels (ie. from 438.025 to 440.000MHz). The two ranges are selected by a new SPDT toggle switch mounted in a convenient position on the front panel of the *Explorer*. This switch is connected to a 4008B 4-bit binary adder CMOS IC which is interposed between the 40-channel switch and the PLL IC (PLL02A) in the *Explorer*.

HOW IT WORKS

The simplest method of explaining the operation of the adder is to calculate the binary input required to the PLL02A PLL IC in the *Explorer*. This binary number represents the division ratio, usually referred to as 'n', and in the *Explorer* may be derived from the formula:

$$n = \frac{(f/3)-143.58333}{0.008333}$$

For example, if we choose channel 1, or 438.025MHz, then n = 291. In binary, this is 100100011. This is the bit pattern required from the 40-channel switch in the channel 1 position. If we now wish to select 439.025MHz, or channel 41, we obtain a value for 'n' of 331 or 101001011 in binary. The channel switch should thus be set to channel 1 where n = 291 and 40 must be added, ie. 291 + 40 = 331.

In other words, we must add the binary equivalent of 40, or 0101000, to the output of the 40-channel switch and then present this new binary number to the PLL:

Ch1 = 291	100100011	
plus 40	0101000	
=	101001011	= 331

THE EXPLORER UHF AMATEUR TRANSCEIVER ORIGINALLY COVERED 40 CHANNELS FROM 438.025 TO 439.00MHZ.

The two most significant bits are actually hardwired to the PLL02A in the *Explorer*, so we are left with 1001011. The three least significant bits to be added are all 'zeros'. We may delete them, to simplify the circuitry, since the 4008B IC used is only a 4-bit adder. Hence, in the circuit, it can be seen that these lower three bits are in fact passed straight through to the PLL and only the upper four bits are manipulated to obtain the additional 40 channels.

Since this adder circuit is always connected between the 40-channel switch and the PLL02A, you may ask how we obtain the standard 40 channel output from the switch. What we do, in fact, is to simply add "0" or 0000 in binary to the 40-channel switch.

Switch S1 is used to select between the lower and upper 40-channel ranges by switching +5V to pins 3 and 7 of the 4008B adder. In the lower 40-channel position, pins 3 and 7 are pulled low by a 100kΩ resistor and 0000 is added to the 40-channel switch. In the upper 40-channel position, pins 3 and 7 are pulled high and 0101 (40) is added.

CONSTRUCTION

Although the extra circuitry involved is minimal, practical implementation requires access to the output pins of the 40 channel switch to isolate them from the PLL02A IC and connect them instead to the Adder circuitry. In the prototype, this was achieved by carefully removing the switch from the PCB, rotating it by 90 degrees and soldering a new, small PCB, containing the circuitry, to the 40 channel switch. The front panel should be desoldered first to allow removal of the 40 channel switch. Solderwick or a solder sucker will simplify the removal of the switch. Also remove capacitor C155 from the top of the printed circuit board and re-solder it to the underside.

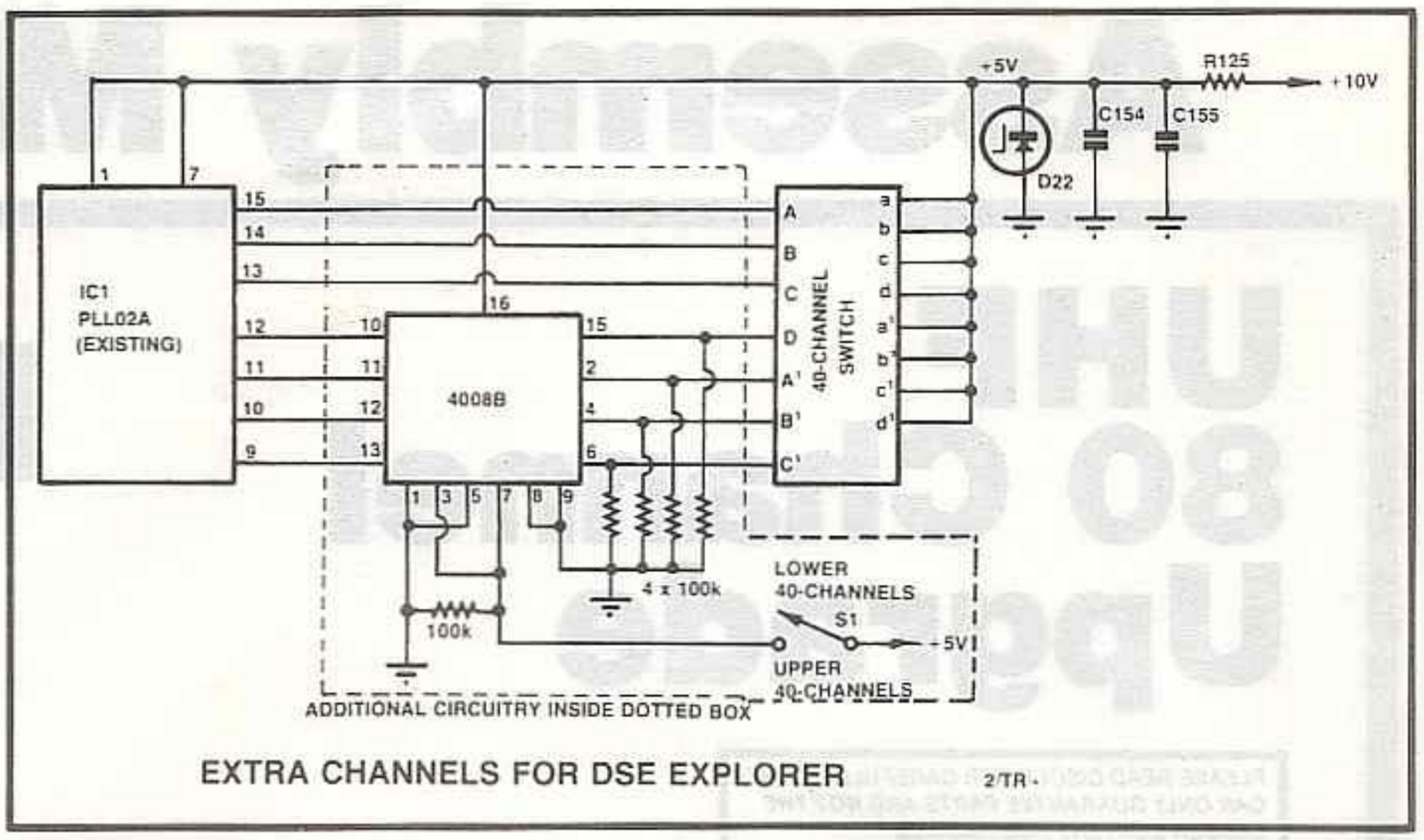
If the repeater upgrade is used, disconnect the repeater switch from the front panel. Desolder and remove the three leads which terminate the repeater switch to the printed circuit board. A longer piece of rainbow cable is required to terminate the repeater switch to the printed circuit board. It will be necessary to re-route the wiring over the switch assembly, due to the repositioning of the channel switch and the additional upgrade board.

After cleaning any solder dags from the switch pins, the 40 channel switch should be put aside and the PCB should be assembled.

Assembly of the PCB should commence with the fitting of the insulated link, the resistors and finally the IC. Standard precautions should be taken since this is a CMOS device. Finally, the connecting wires should be fitted and the PCB fitted to the channel switch.

A 6mm hole should now be drilled in the front panel for the 40/80CH toggle switch. This may be in any clear position on the panel. In the prototype, it was mounted adjacent to the microphone socket.

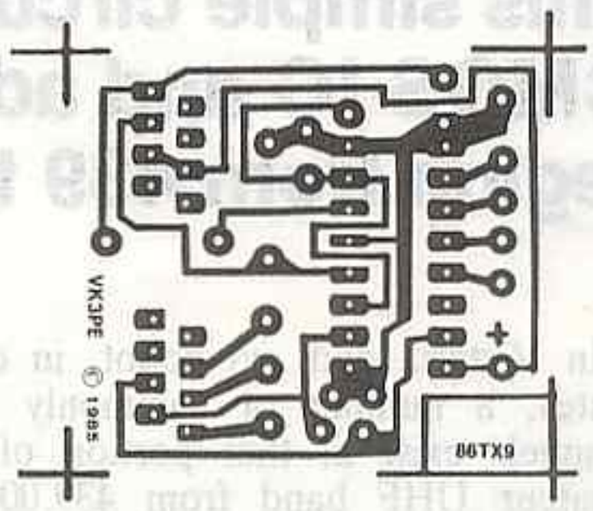
The front panel may now be fitted to the Explorer. Secure the 40 channel switch assembly containing the PCB to the front panel. It may be necessary to bend the PCB pin located at TP1 so



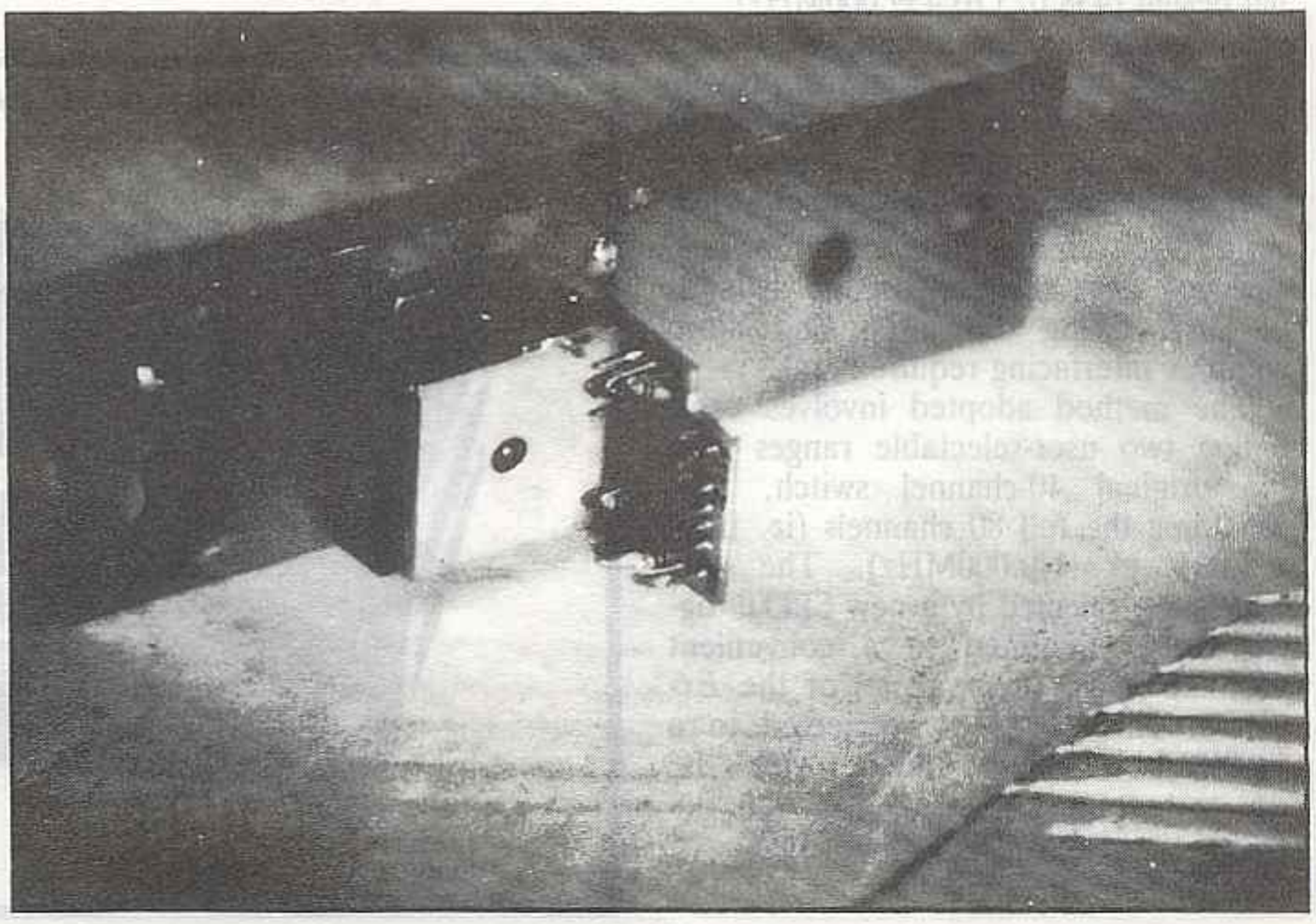
EXTRA CHANNELS FOR DSE EXPLORER 2TR-

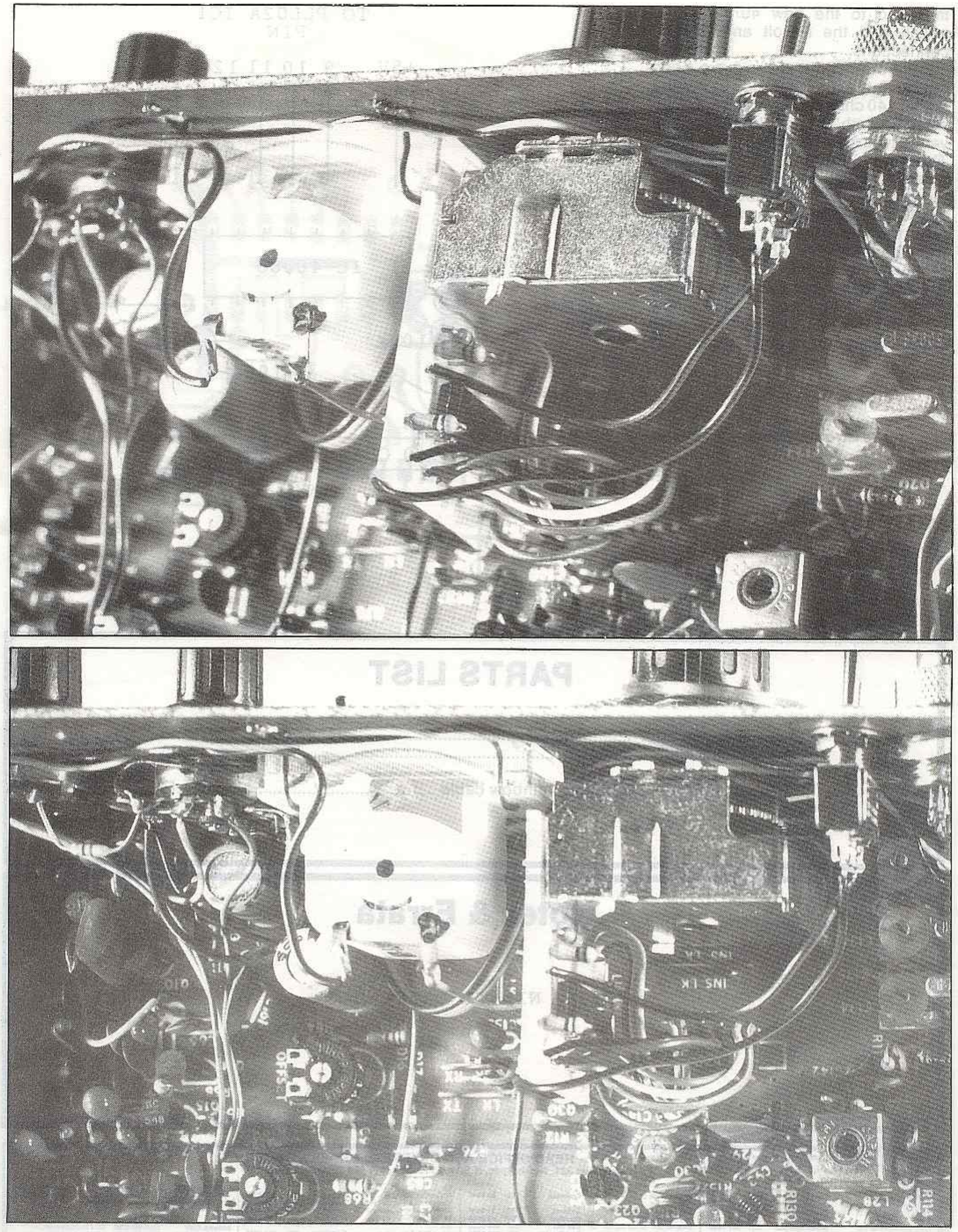
THE EXTRA CHANNELS ARE OBTAINED BY INSTALLING A 4008 BINARY ADDER IC BETWEEN THE PLL IC IN THE 'EXPLORER' AND THE EXISTING 40-CHANNEL SWITCH.

HERE IS AN ACTUAL SIZE PC ARTWORK



THIS PHOTOGRAPH SHOWS HOW THE PCB IS SUPPORTED ON THE 40-CHANNEL SWITCH.





PHOTOGRAPHS OF THE UPGRADE BOARD AND HOW IT SITS IN THE UNIT

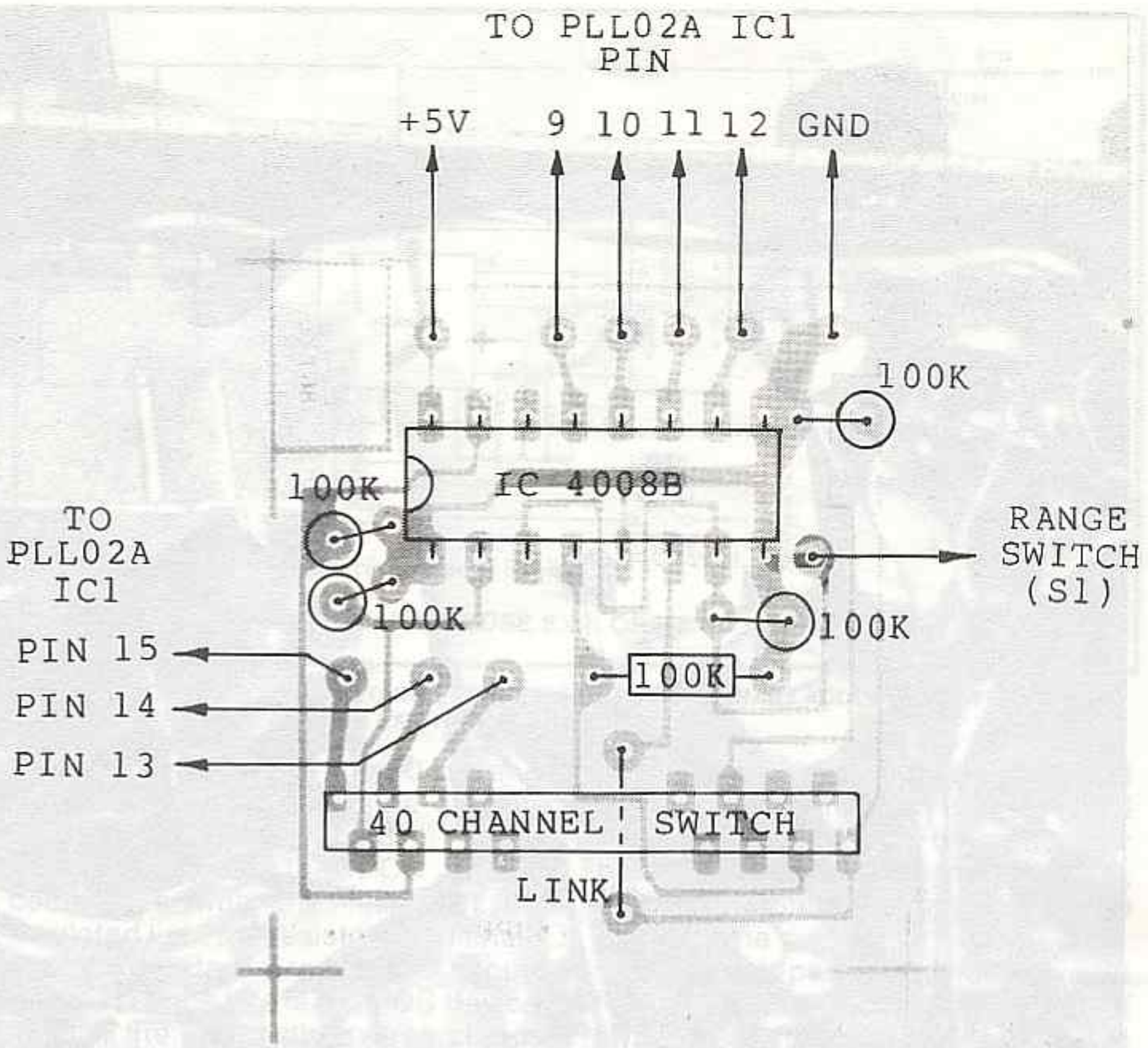
that it does not foul the positioning of the board. It is also necessary to add several flat washers (on the SW. shaft) between the switch body and the front panel, for correct switch spacing.

When tightening the channel switch (nut) to the front panel, ensure that the switch shaft or body does not pinch and short the wiring of the LED to the front panel.

Connections to the Explorer PLL02A may be either direct to the pins or for the purist, new holes may be drilled closer to connect the tracks leading to the PLLO2A. Wires should

then run to the new 40/80 toggle switch and the 5 volt and ground connections.

Once all connections have been checked, the Explorer may be turned on. The 40 channel position should be selected with the toggle switch and your favourite channel may be tried. This should function normally, if not check connections and 5 volt power to the new board. When all is okay, select the 80 channel range. You may have to enlist the help of another Ham who has these channels available. Some slight readjustment to the VCO coil may be required to maintain PLL lock over the extended frequency range now provided. No problems were experienced on two units tested. ●



PARTS LAYOUT DIAGRAM FOR THE PCB.

PARTS LIST

5 x 100K Resistor ..... ☐
1 x 4008 IC ..... ☐

Toggle switch, PCB, solder, rainbow cable ..... ☐

Notes & Errata

NIL TO DATE

Text and Illustrations courtesy of Electronics Australia

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