Modding The Robin

Based on the original PW Robin frequency counter but with added functionality, this is Ken Ruiz's version.

Ken Ruiz G4SGF/ZB2MD shows you how to get faster display updates and a frequency offset reading on the PW Robin counter.

The modifications I'm describing are to the Robin Frequency Counter (*PW* July-August '91), which while preserving its original specification also permits more frequent display updates. I've also suggested a way of getting a frequency offset, so as to use it for displaying the received frequency when reading the local oscillator of a superhet receiver.

Please refer to the original PW Robin article. In order to update the display more often, the gating frequency (input to pin 5, IC3) must be increased. The easiest way to achieve this is by changing the timing crystal to 3.2768MHz and then taking the output from pin 7 instead of pin 12 of IC2. (The frequency at this pin is 50Hz).

The 50Hz frequency is then divided by 10 (5Hz) or by 100 (0.5Hz) to give display updates of five times per second or once every two seconds as originally. The resolutions respectively are on h.f. 1 or 10Hz, or on v.h.f. they are 10 and 100Hz.

The output from pin 7 IC2 is fed to an extra IC (IC20), a 74HC390 in a symmetrical divide by ten (biquinary) mode. Using one stage gives an output of 5Hz, two stages 0.5Hz, as shown in **Fig. 1**. Assembly of this small circuit can be on stripboard or you could add it to the p.c.b. as I did when creating my own board.

The Modification

If you attempt the modification on first assembly, it's a good idea to modify the decimal point display at the same time. The method used is similar to the original circuit when using the higher gating frequency to count for 0.1sec.

Moving the decimal point to the right one place gives a 'correct number of MHz' display. Shown in **Fig. 2** is the arrangement I used with a four-way switch. The switch assembly only replaces S1b in the original circuit - a separate switch is needed for S1a (original circuit), the power switch.

You may think that taking the 50Hz signal as the gating frequency would update the display 50 times per second with a 100Hz resolution on h.f. and 1kHz resolution on v.h.f. This state of affairs doesn't work because the latch and reset pulses are too long.

You might make it work by reducing R26 and R27 (in Fig. 1.2, p27 *PW* July '91) to about 100k, but these shorter pulses may not be long enough to perform their original functions. I haven't tried this because the five times per second update is fast enough to track tuning the v.f.o. on my transceiver to look like an instantaneous display.

Using the original circuit PW Robin as a digital frequency read-out is fine while the radio in question is a direct conversion receiver. If the receiver is a superhet receiver or a transmitter is used, problems may arise. In these circumstances just reading the frequency of the local oscillator will give the frequency of operation offset by the i.f.

Offset Frequency

It's a relatively simple modification to permit the counter to be used as an offset frequency read-out. All that's needed is add to (or subtract) the i.f. to (from) the local oscillator frequency. This is easily achieved using eight 4560B b.c.d. adder integrated circuits

The 4560B adder i.c.s has two sets of input lines and one set of output lines. The b.c.d. number appearing at the outputs is the sum of the numbers appearing as the inputs. The i.c. also has 'carry in' and 'carry out' facilities.

Carry out means that the sum of the input numbers plus the carry in (1 or 0) was more than 9 in total. Carry in means add one more to this count. It might help to think back to the 'carry one' tick on the simple sums we all started out on at school!

In the Robin, the connections between the counters (i.c.s. 7-10) and the display drivers (i.c.s. 11-18) are broken. The outputs of the counters are taken to the 'A' inputs of the eight 4560Bs. The value of the i.f. is programmed into the 'B' inputs and the sum of these two is presented to the display drivers, see **Fig. 3**.

The connections between (original) i.c.s 7-10 to IC11-18 are all by wires on the top of the board. Because of this the modification can be carried out on an existing Robin without removing it from its case or modifying the board (assuming the case is large enough to accommodate the extra circuitry).

As there are few interconnections between the new adder i.c.s, it doesn't seem worthwhile to create a p.c.b. You could make up your own layout using perforated board instead.

There are few problems when the i.f. is to be added to the local oscillator frequency (i.e. the l.o is below the received signal), but what if the l.o. is above the received signal. Now we need to subtract the i.f.

Subtraction Cheating

Well, subtraction can still be done with the circuitry described here, as long as we don't mind cheating a little! Let me give the example as I solved it for my transceiver (the G2DXK rig published in *RadCom* June-October '84).

The G2DXK rig uses an i.f. of 4.432MHz using cheap TV crystals. The l.o. for the 14MHz band runs from 9.567 to 10.167MHz. So I need to add 4.432(MHz) This operation only needs simple addition.

On the 7MHz band, the l.o. covers 11.432 to 11.932MHz. On this band I need to subtract 4.432(MHz) to give 7.000 to 7.500 on the display.

Now, instead of subtracting 4.432000(MHz), I add 95.568000(MHz) instead. The effect is for the 4560 i.c.s to add 95.568000 and 11.432000 to give 107.000000.

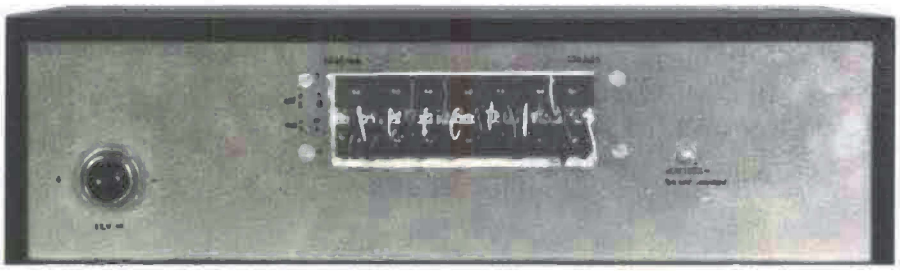
The leading '1' is not displayed as it 'falls' off the left hand end of the display. All I see is 07.000000MHz. See **Table 1** for the binary values of the offsets I used.

Fine, so now we can add or 'subtract' the i.f. but what if we need to do both and quickly, as on changing bands? The answer comes in an extra switch on the front panel.

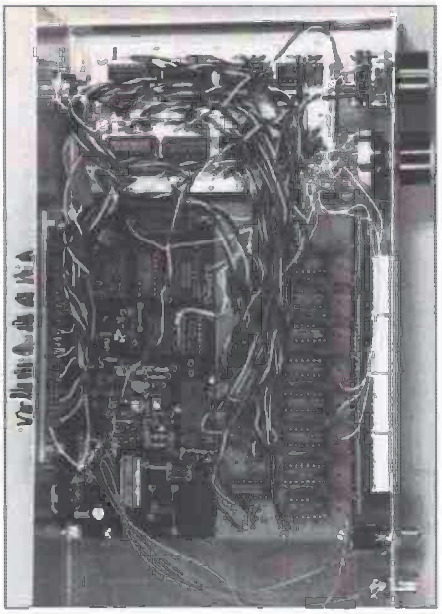
Looking at the BCD equivalents on 4.432 and 95.567 as required over the eight digits of the display you will see that some lines are permanently on logic level '0' and some are permanently on logic '1'.

Others are at logic 1 for 4.432 offset to become 0 for 95.567 offset, and vice versa. The problem is solved using a 3p-3w switch, as in **Fig. 4**.

The 'B' inputs to the adder i.c.s that are permanently at logic '0' are permanently grounded. Those that are to be permanently logic 1 are connected to S1c wiper. Those which are to be logic '1' for 4.432 (and 0 for 95.567) are connected to (new) S1a wiper, and



On the back panel is a patch panel to allow any offset to be quickly programmed into the adder inputs.



The offset p.c.b. is mounted above the original PW Robin board, and is connected to it by the mass of wires. Perhaps not so pretty, but, it is very useful!

those which are for '0' for 4.432 and '1' for 95.567 to (new) S1b.

The upshot of this is that when (new) S1 is moved to the far left, all the 'B' inputs are at logic '0', and the output of the adders i.c.s is exactly that which appears on the 'A' inputs. In other words the Robin display is unmodified.

On moving to the central position, the 'B' inputs see 04.432.000 and the i.f. is added to the l.o. signal. At the far right, the 'B' inputs see 95.567.000 and the i.f. is 'subtracted' from the l.o. signal. (The extra work needed to the transceiver is a socket on the back panel, an output for the l.o.).

On my Robin, I took all the 'B' inputs to the back panel and by means of jumper wires I can hard-wire program any offset that I require. For each 'B' input line I have four value 'buss' lines I can connect them to. I have lines labelled, 1, 1-0, 0-1 and 0.

The four buss lines are: permanent '1', '1' going to '0', '0' going to '1' and permanent '0' respectively. These are the four different input to the various 'B' input that are required to give offset readings above (or below), when changing the readings to above or below the count.

I think you will agree, this makes an already excellent counter even better. So get busy and get 'modding' your Robin.

PW

The original PW Robin article (by Mike Rowe G8JVE) was in the July and August 1991 issues of *PW*. Errors & Updates appeared in September and October of that year.

In the September 1993 issue of *PW* Mike Hughes showed us how to lower the power requirements of the counter.

Over a year later (October '94) Mike Rowe put a thermal oven into the PW Robin. In the same month George Fidler G3TDV extended the Robin to count time and capacitance.

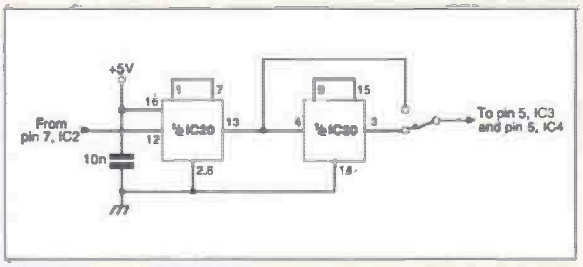


Fig. 1: An additional counter has to be added if you follow Ken Ruiz's mod for faster updated display. The i.c. has been given the number IC20 to distinguish it from the original Robin circuitry. The single switch allows normal or f/10 resolution for a faster update. This circuit does not alter the decimal point l.e.d.

Table 2

Dec	D	C	B	A
	8	4	2	1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

Table 2: The binary representations of the decimal numbers 0-9 to be used when setting your own i.f. offset. Check these with the values shown in Table 1.

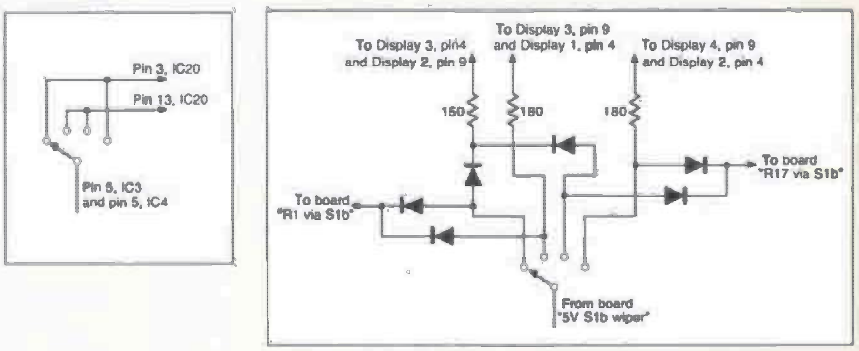


Fig. 2: A new range and resolution switch. Made by combining the simple switch of Fig. 1 and the function of the original Robin range switch.

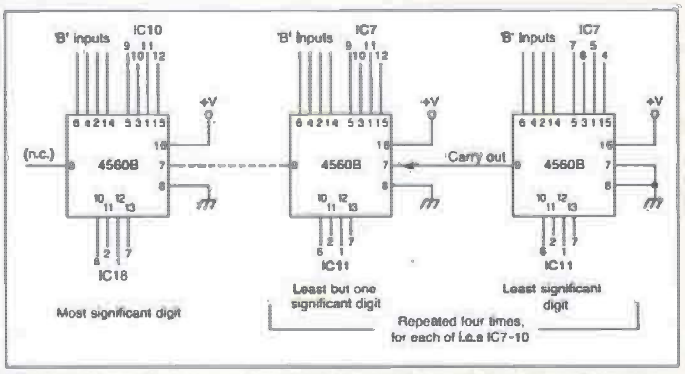


Fig. 3: The skeleton circuit of the adder circuit to give a frequency offset. The right hand pair must be duplicated for each of the counter i.c.s in the original PW Robin.

Fig. 4: The new count control switch. As shown, it is in the direct counting position. In the middle is 'offset-1', and to the right is the position for 'offset-2'.

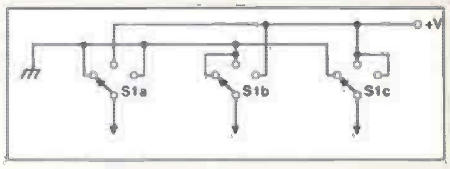


Table 1

0	4	4	3	2	0	0
0000	0100	0100	0011	0010	0000	0000
9	5	5	6	7	0	0
1001	0101	0101	0110	0111	0000	0000

Table 1: The binary representations of the two example numbers to be 'added' to the count. See text for more detail.