Icom ICB-1050B Scanner

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ONCE readers have converted the Icom ICB-1050B to operate on 10 metres *(SWM,* Nov. '84), it will be found that at this point of the sunspot cycle, 'openings' do not occur as often as we would like, and do not last very long. It seems that the Virgin Islands repeater on 29.66 MHz becomes audible before anything else, and if the rig is set to the calling channel, 29.60, any brief openings will be missed. What is obviously needed is a scanner . . . *but* space is at a premium, both on the front panel for controls, and inside the case for extra PCBs, particularly if a noise-squelch board has been added as well as the conversion board! Consequently some limits on the scanner design have to be accepted.

The design offered here will scan over 10 channels, stopping on any busy channel. It can also be locked manually, and can be bypassed to return control to the channel-selector switch. Once locked, operation can commence on the scanner channel, but the display will not follow the scanner; rather it will continue to show the channel selected by the normal 40-way rotary switch. To incorporate a scanning display would have involved far too many ICs for the space available. In other words the scanner is intended primarily as a *monitor-receiver* only, and not for transmitting. Indeed if the repeater switch is in, transmitting on the scanner channel will produce some very odd results. The circuit is intended to operate only from 29.60 – 29.69 MHz, covering all the repeater channels, and though operation is possible elsewhere in the band, some odd things will happen, as will be explained later. It uses only two ICs, costs about £2.50 including the switch, and certainly makes monitoring a lot easier. Ideas are also given as to how adventurous readers can develop the system further.

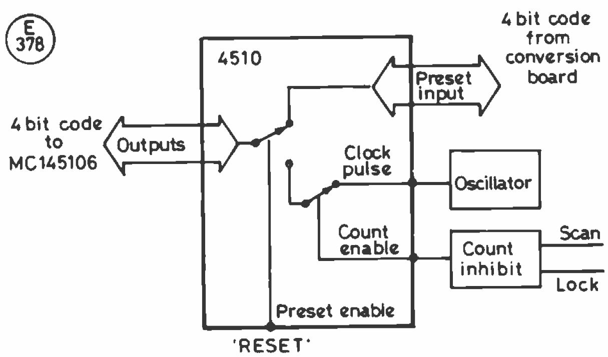

Fig.1 ICOM 1050B Scanner Block Diagram

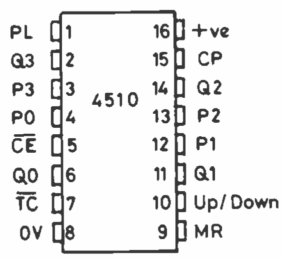

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Fig.2 BCD Up/Down Presettable Counter

How it Works

The block diagram of Fig. 1 helps to illustrate the principle of operation. The 4510 is a BCD up/down presettable counter, Fig. 2, and its preset inputs are connected to the four least-significant bits of the binary code coming from the conversion board design of *SWM,* Nov. '84. If the preset-enable pin 1 is brought high, then the code from the conversion board will be fed straight through the 4510 to the synthesizer IC, the MC145106. However with the switch in 'Scan' position, the preset inputs are disconnected from the outputs, and the counter circuitry takes over, counting up from 0 – 9, producing the appropriate binary code on the 4 output pins. Naturally there must be some way of stopping the count if a 'busy' channel is found, and the count-enable pin 5 will do this if brought high, either by the Scan/Lock switch, or by the 'Scan' output pin 13 of the IF processor IC, the MC3357. The output pins will then hold their present state until either counting recommences or pin 1 is brought high, switching control back to the channel-selector switch, *via* the conversion board.

Looking at the circuit in more detail, Fig. 3, one gate of a 4093 quad NAND Schmitt trigger IC is used as the scan oscillator, and the scan rate can be increased or decreased by reducing/increasing the value of R1. The oscillator output feeds the clock-pulse pin 15 of the 4510. Another gate is used to control pin 5. The truth table of a NAND gate is given below, and this shows that if either (or both) of the inputs is low then the output will be high.

A	B	OUT
0	0	1
0	1	1
1	0	1
1	1	0

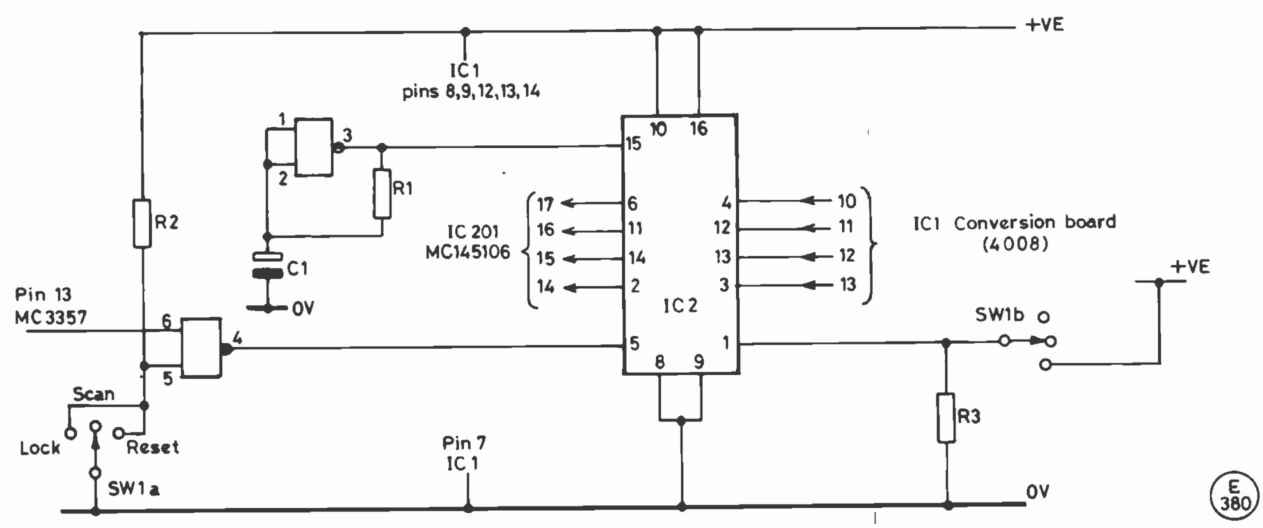

Fig. 3 ICOM 1050B Scanner Circuit

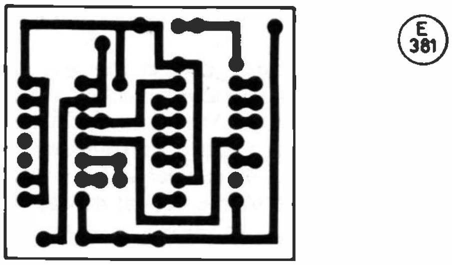

Fig. 4 PCB Track Layout

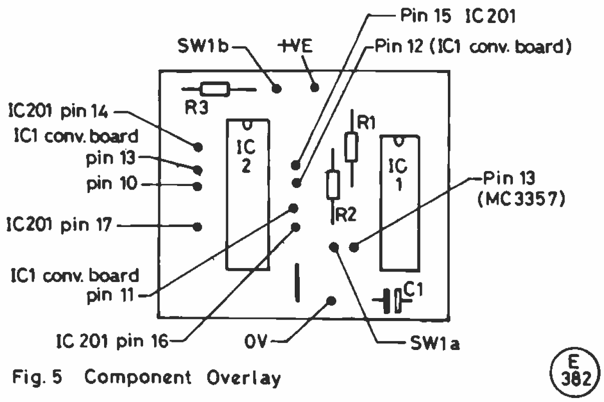

Fig. 5 Component Overlay

Table of Values

R1 = 470K	IC1 = 4093
R2, R3 = 100K	IC2 = 4510
C1 = 2μ2, tantalum.	PCB

Also DPDT centre-off miniature toggle switch, or 2-pole, 3-position slide-switch (RS 337-481), *see* text.

Thus in the 'lock' position pin 4 (IC1) and pin 5 (IC2) will be high, inhibiting the count. However in the 'Scan' position R2 holds pin 5 (IC1) high, and the output from the MC3357 is normally high, so the gate's output and the CE pin will be low, allowing the scanner to run. If a signal is heard, pin 13 of the MC3357 goes low, forcing the CE pin high, stopping the scan. Pin 1 of the 4510 is normally held low by R3 but if pulled high by the switch, then the scan circuitry is bypassed and the code from the conversion board is fed through.

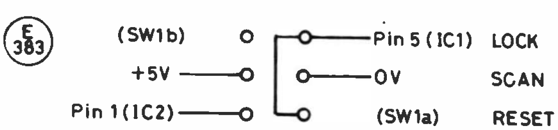

Fig. 6

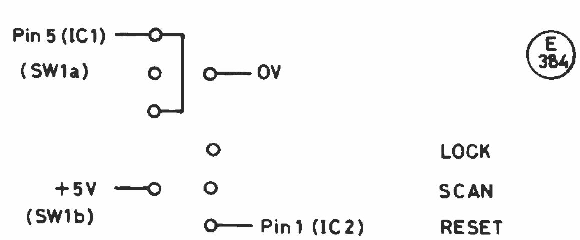

Fig. 7

Input	Output	Call	Location
29.51	29.61	DB0RU	Duisburg, W. Germany (1750Hz)
29.52	29.62	KE4IO	Atlanta, Georgia
		K3SP	Freeland, Maryland
		WB7CAG	Glendale, Arizona
		WD0ALH	Newton, Kansas
		W1BHD	Malden, Massachusetts
		WD8CIY	Brady, Texas
		W0JZY	Hillsboro, Missouri
		WA2TMZ	Toms River, New Jersey
		W4ZJM	Memphis, Tennessee
29.53	29.63	N6AHW	Monterey, California
29.54	29.64	WB3FKQ	NE Pennsylvania
		W3DID	Baltimore, Maryland
		WD8DPA	Ann Arbor, Michigan
		KE4QC	Mobile, Alabama
		WA6ZOI	Mount Wilson, California
		K0LKH	Boone, Iowa
		K0GBZ	Quinter, Kansas
		WA0YUA	Bridgeton, Missouri
		WB7DRU	Sioux Falls, S. Dakota
		WB5ITT	Port Neches, Texas
		K5TYV	San Antonio, Texas
		W7ZFX	Sedro Woolley, Washington
29.55	29.65	K3SLG	Pine Grove, Pennsylvania
		KB2DQ	Buffalo, New York
29.56	29.66	WP2IBJ(?)	St. Thomas, US Virgin Is
		WR2ABA	Huntington, New York
		AE0N	Bloomington, Minnesota
		W0IA	Boulder, Colorado
		N9PL	Palomar Mt., California
		N3AUY	Silver Spring, Maryland
		W0TQ	Concordia, Kansas
		K8YPW	Hastings, Michigan
		WR5ARS	Houston, Texas
29.57	29.67	DB0QK	Mainz, W. Germany (1750Hz)
29.58	29.68	W4MM	Albany, Georgia
		WB6IGH	Palos Verdes, California
		WB9STA	Pendleton, Indiana
		KD4DN	Sterling, Maryland
		W2SEX	Buffalo, New York
		K2YBW	Setauket, New York
29.51	29.69	W3EDU	York, Pennsylvania (YL Ident)*
29.60	145.15	N4AHN	Bessemer, Alabama
29.60	224.74	WA2NCB	Cambria Heights, New York
29.60	144.94	K2TKE	Setauket, New York
29.54	145.45	K2KLN	Manhattan, New York (Metroplex)
29.54	443.95	K2KLN	Manhattan, New York

**Note the unusual frequency shift of this repeater, which announces itself with a female voice.*

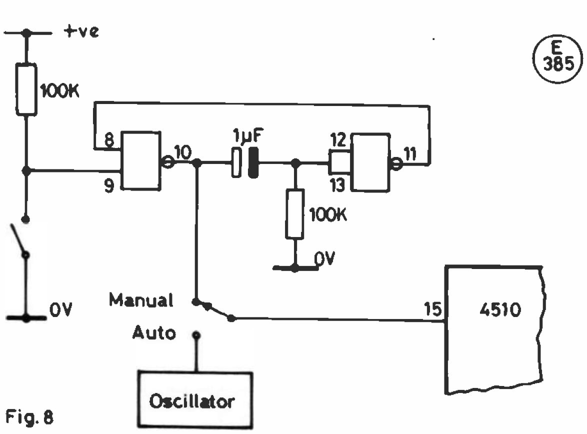

Fig. 8

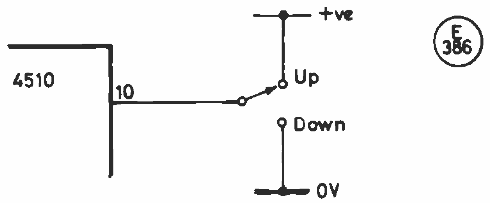

Fig. 9

Construction

A small PCB had been designed and is given in Fig. 4, with the overlay in Fig. 5. Mount the components, making sure the polarity of the tantalum capacitor and the orientation of the ICs are correct; don't forget the small wire link. Insert veropins for the various interconnections, and leave some blank PCB material untrimmed on one edge so that a small aluminium bracket can be bolted on. The board will eventually be mounted behind the channel switch. Connect +5ve and 0ve from the conversion board and check that the oscillator output (pin 3, IC1) is switching high and low. Connect the wires from pins 10, 11, 12, and 13 of the first 4008 (ICI) on the conversion board to pins 4, 12, 13, and 3 respectively of the 4510, and then connect pins 6, 11, 14, and 2 (4510) to pins 17, 16, 15, and 14 of the synthesizer IC, (MC145106). Connect a lead from IC3 pin 6 to pin 13 of the MC3357 on the main rig PCB. In the prototype this was soldered direct to the actual IC pin.

Important . . . the new switch must be a double-pole double-throw switch with a *centre-off* position. Whilst the obvious answer is a miniature toggle, it will be found that the RS 337 – 481 miniature slide switch will fit perfectly the aperture that is already partially prepared in the front panel (behind the word 'Icom'). A hole needs to be drilled and filed in the front fascia panel, and this is quite fiddly, so take time and care. Wire the switch according to Fig. 6 or 7, depending on what type is used. Mount the new switch, and then place the PCB behind the channel-selector switch. Mark the position of the small aluminium bracket, and drill two holes in the side panel with 6BA clearance. After a final check mount the PCB, ensuring that it won't foul the top plate.

No adjustment is necessary, and in the central 'Scan' switch position the rig will scan up to 29.69, (assuming that the selector switch is set to 29.60). In the 'Reset' position the channel switch will act as normal, and in the 'Lock' position the rig will stop on the frequency being scanned at the moment. Always let the scanner run for a couple of seconds before stopping, because, depending on what the selector switch is on, it needs a couple of seconds to settle into the 0 – 9 cycle.

Further Developments

It was mentioned at the beginning of the article that if the channel switch is on a different frequency to 29.60, some strange but logical scans will take place as shown below.

Channel Selected	Scans from
60 – 70	60 – 69
44 – 59	44 – 53
31 – 43	28 – 37

This is because only the 4 least significant binary bits are being interrupted and added to. If readers would like a 16-channel scanner, this can be done very simply by replacing the 4510 with a 4516. This IC is pin-for-pin compatible, and if inserted the scan will be as follows:—

Channel Selected	Scans from
60 – 70	60 – 75
44 – 59	44 – 59
31 – 43	28 – 43

However the author chose not to do this because (a) the inconvenience of it going below 29.31 MHz, (b) the illegality of transmitting above 29.70, something which would be very easy to do by mistake because the display would not register it, and (c) most people will only want to scan 29.60 – 29.69 MHz to monitor the various repeater outputs, so the 4510 is preferable.

Readers may wonder why a 4093 was used instead of the cheaper 4011. This was because only one Schmitt trigger 4093 gate is needed to produce a clean square-wave oscillator, consequently leaving two gates free. These are at the moment connected to the +ve line following good CMOS practice, and these tracks will have to be interrupted if the following changes are made.

Those who are adventurous can extend the scanner's functions by using these gates to provide, for example, single-channel scanning *via* a pushbutton. The scan can also be made to go up or down. A normal pushbutton is very 'noisy', and may produce several pulses at once, causing the scanner to jump a few channels, but by building a monostable circuit as shown in Fig. 8, using the two spare gates, and adding a switch and pushbutton, a clean single pulse will be sent to the clock pin, thereby advancing the scanner one channel at a time with each pushbutton press. The track between the oscillator and pin 15 will have to be interrupted to insert the changeover switch.

Pin 10 decides whether the 4510 counts up or down, depending on whether it is high or low respectively. On the PCB it is connected to the +ve line, but if this track was interrupted with a changeover switch inserted as in Fig. 9 the scanner will work in either direction. Before readers contemplate these additions

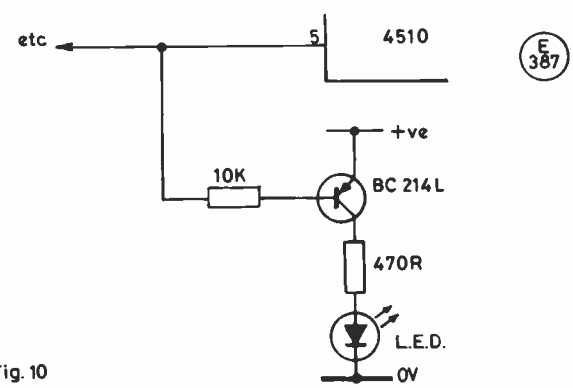

Fig. 10

however, it is worthwhile trying to figure out where the extra switches will go!

It will be remembered that pin 5 (4510) only goes low when scanning, so if desired readers can easily include a scan LED using a couple of resistors and a *pnp* transistor, Fig. 10. This will light when scanning, but go out when:

(a) a busy channel is found,
(b) the scanner is locked,
(c) control goes back to the channel rotary selector switch.

Conclusion

This article has been written to attempt to make monitoring the repeater outputs easier. The design is necessarily limited, and it would have been nice to include, for example, 'hold' on a busy channel for five seconds before moving on, etc., but space restrictions prevented this. No doubt further developments are possible, and the author (QTHR) would be very interested to hear about them from readers.

Finally, with thanks to G4TZB and G4MKT for providing the original information, and G3VNQ and G3SUI for permission to reprint it from the Bury Radio Society "Feedback" magazine, included is a list of the known 10-metre repeaters.

(See page 483)