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A MEDIUM WAVE LOOP BOOSTER

by Nigel Robins

Those using the increasingly popular loop for Medium Wave DXing will recognise that the loop has less gain than the normal longwire, although its directional properties and low noise make it excellent in all other respects.

In order to make up for the loss in sensitivity, a good high gain RF amplifier is needed. While most communications receivers have an RF amp. in their circuit, these sets are expensive and in many instances the DXer may not feel that the expense on such a set is justified. This article concerns an inexpensive, low noise, high gain amplifier that will turn a mediocre five valve set into a really sensitive receiver. This booster is essentially a wide band amplifier. It is installed between the receiver's aerial/earth sockets and the loop. It can be made up in a metal box and mounted next to the receiver, or on the loop itself. As is usual with high gain boosters it is necessary to keep leads short, especially between the booster and the receiver, and if the loop cannot be used in such close proximity to the set then it is advisable to increase the length of feedline between booster and loop rather than between the booster and the receiver.

CONSTRUCTION

The circuit is a normal amplifier with a simple emitter-follower providing the necessary low imped--ance output to the receiver, which means that there is better matching of the loop to the receiver than the loop's link turn normally provides.

All the parts are obtainable in New Zealand, and although prices may vary, most suppliers should stock them.

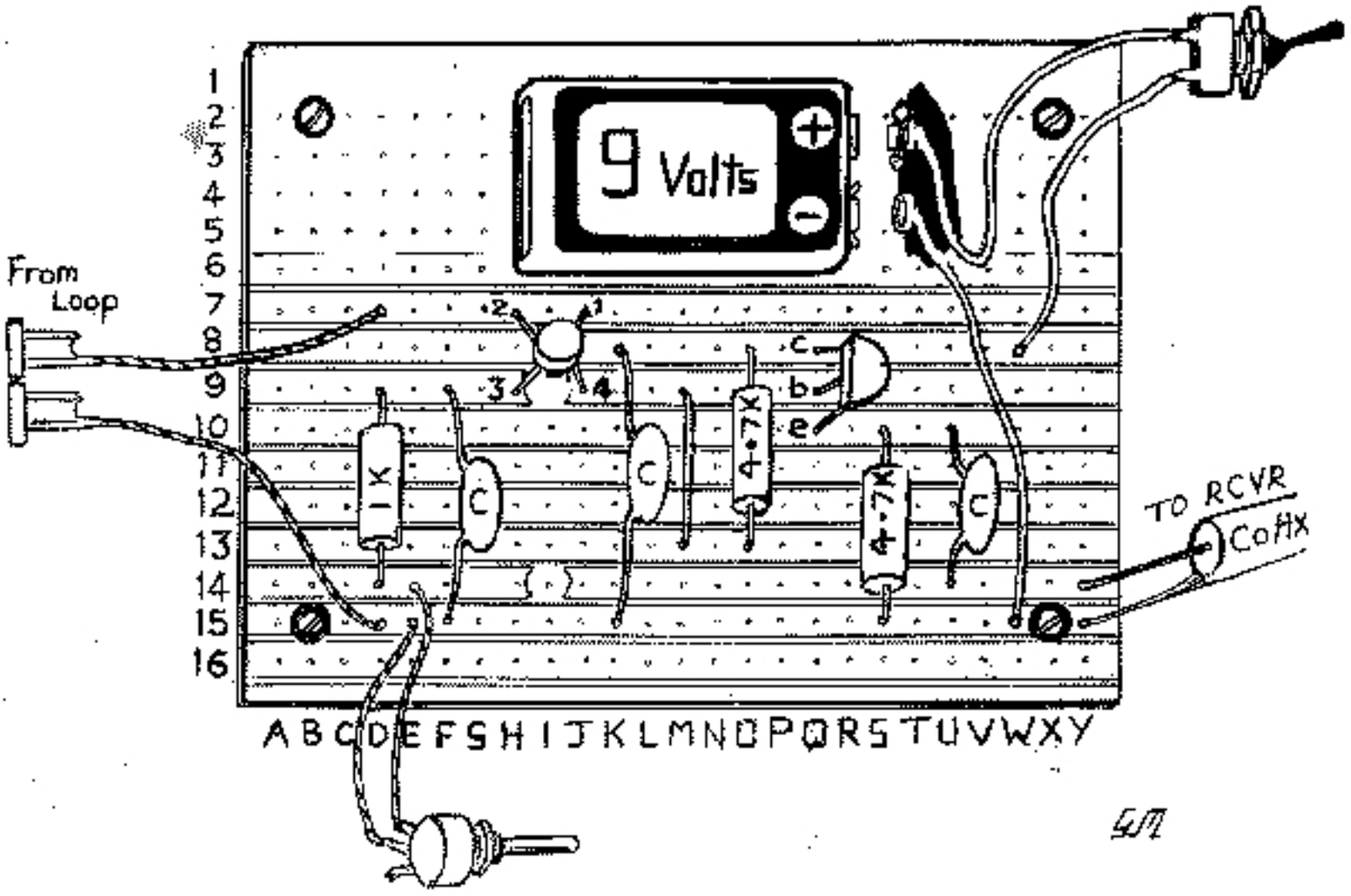
The method of layout that I use is in no way critical, but unless you are sufficiently experienced in laying out components I would advise you to keep to the layout illustrated. Using Veroboard ensures goof-proof construction, and provides rigid mounting of the components. Veroboard is an insulated board (paxolin)with a network of holes. On one side of the board parallel strips of copper link the holes in rows. The copper strips are on the UNDER face of the construct-ion and components are mounted from the plain side. The holes in the Veroboard are spaced 10, 15 or 20 etc to every two inches and are known as 0.2 0.15 and 0.1 matrix respectively. Veroboard is readily available and simple to use. The actual size piece of board will depend on the size of the metal box you choose to contain your booster. I have used a 2" x 3" x 4" 'Minibox'. These are attractively finished in hammerglaze and have adequate space inside. The booster can however be housed in a cheap 'lunchbox' without any drop in performance.

Because we are dealing with Radio Frequency (RF) signals, the variations in signal voltage are

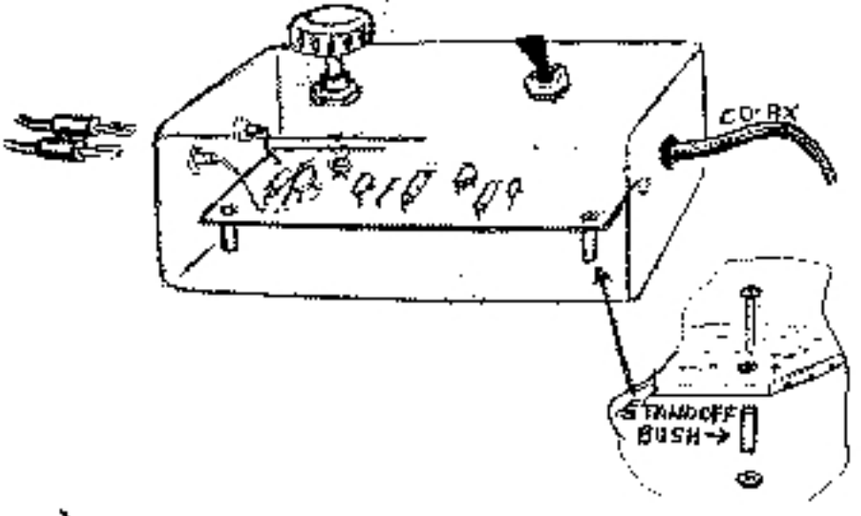
PARTS LIST

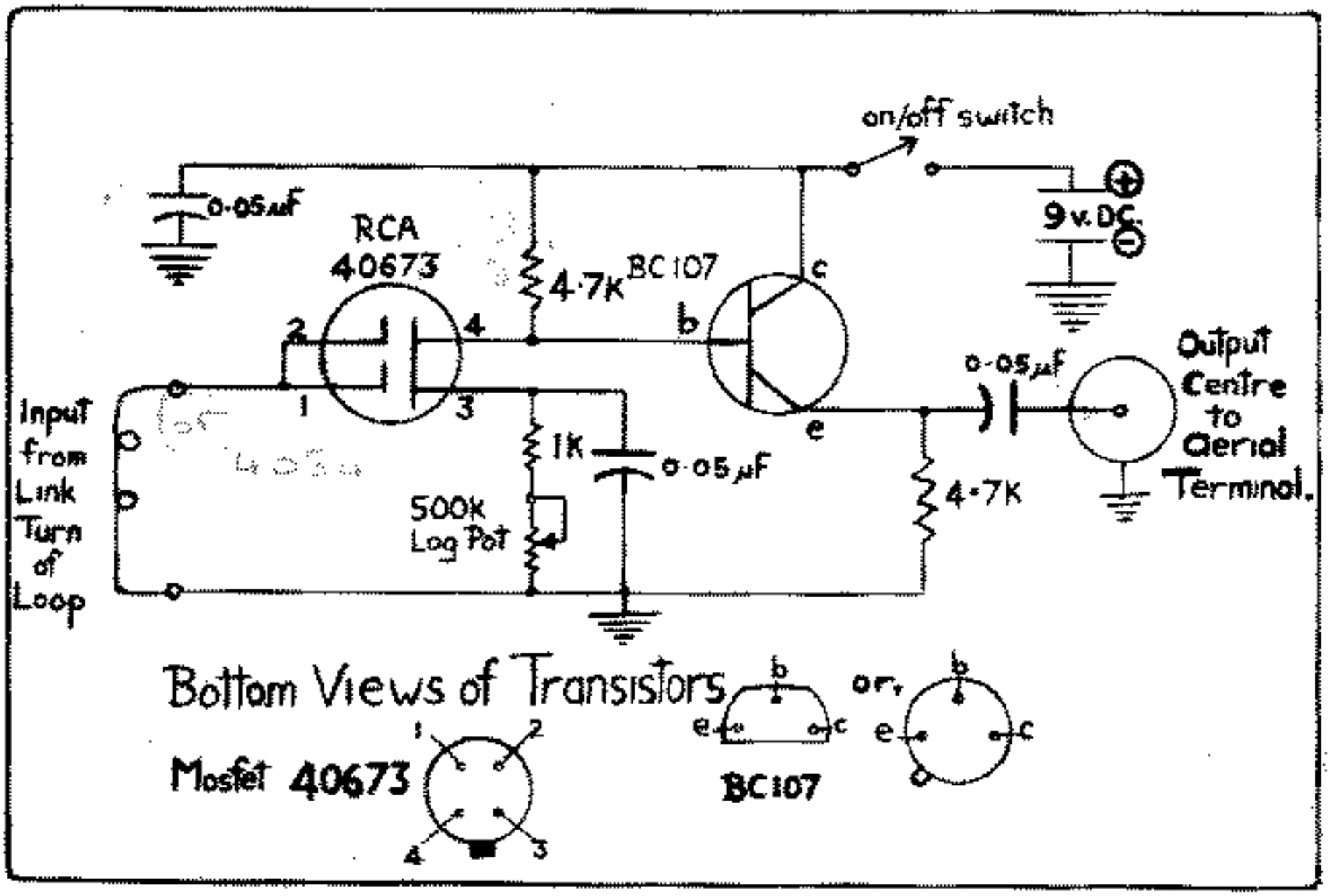
1 RCA Mosfet 40673
1 NPN transistor BC107
2 4.7K resistors 10% tolerance ¼w
1 1K resistor 10% tolerance ¼ watt
3 Disc ceramic capacitors 0.05 mfd 50 volt.
1 battery clip to suit.
1 9v miniature battery
4 sets bolts ½" nuts, standoffs ⅜"
Minibox
Veroboard 2½" x 3⅜" 0.15 matrix
1 variable resistor 500K log.
1 toggle on/off switch
2 banana plugs and sockets
4' twin lead mains flex. Knobs.
1 pc coax (50-70 ohms and plug.

The copper strip must be 'broken' at 9I (between legs 3 & 4 of the transistor) and 14I. Place a drill bit in the hole and rotate with the fingers to break the continuity of the line.



Components are shown on this diagram as though they are mounted on the copper striped side of the Veroboard. This is purely for illustration purposes.

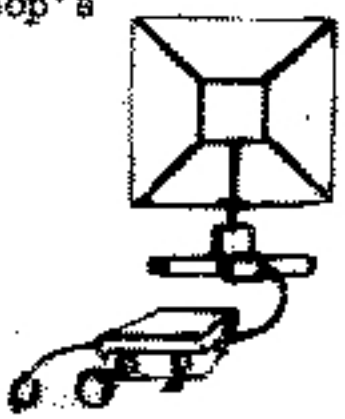




very small and consequently there is very little current drawn from the battery, and it should last for three to four months at least, left running, while the addition of a switch will extend its life further.
The Veroboard with your booster assembled on it may be mounted in the case with standoffs and bolts.

OPERATING THE BOOSTER

Connect the twin lead between the banana plugs and sockets, and the link turn. Adjust the variable resistor to one extreme and 'back it off' if the signal is too strong. Tune the loop as normal. It may be necessary to instal a dial on the loop's variable capacitor.



HINTS ON CONSTRUCTION

Be careful not to overheat the transistors when soldering. Use a 25-30 watt iron with a fine tip and solder quickly. Make sure the iron has had time to reach a good heat before using. Hold the transistor 'leg' being soldered with pliers to 'shunt' heat away from the transistor itself.
The holes in the Veroboard to take the mounting bolts can easily be made by using a tapered pair of scissors as a reamer and then drill by hand.
Your Veroboard will not have an A to Z, 1 to 16 grid printed on it. To ensure that your components are correctly placed it is suggested you draw up a grid on paper around your piece of board. Mark on the 'plain' side with a pencil the holes through which components are to be mounted. Your grid can then be discarded and the components placed on the board.

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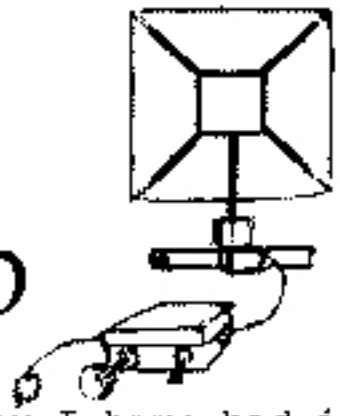
A BOOSTER REVIEWED



Since receiving a sample of Nigel Robins' mosfet loop booster I have had it in fairly constant use, alternating between too very dissimilar receivers. One is a slightly modified Heathkit Mohican 12 volt transistorised set with one tuned RF stage, and a mechanical filter fitted to the IF to improve the selectivity. However as a broadcast band receiver its performance falls well short on the score of sensitivity, and clearly some form of booster is needed to make it perform. I also used the booster with my RCA AR88D 14 tube receiver. This has two tuned RF stages and three IF stages and is a first class receiver for medium and shortwave DX having low receiver noise and very good sensitivity. It should be stressed that this particular boost -er is designed specifically for use with a loop and when used in this way is tuned by the loop tuning circuit acting virtually as an extra tuned RF stage.

It is important that the loop is carefully peaked to the wanted frequency as the loop-booster combination gives a strong degree of preselection ahead of the receiver input stages. Make sure therefore, that you are peaking up the wanted station and not some nearby local.

With my 36" loop, the booster was connected to the Heathkit, and the increase in sensitivity was quite dramatic, with even the low end of the band - usually dead - coming to life. The loop 'peaked' beautifully and the booster did everything it should do. i.e. plenty of gain and low noise. I then connected the loop and booster to the RCA AR88 and again the unit worked perfectly.

I have been convinced for some time that a good low noise booster is a distinct advantage when using a loop, no matter how good you think your receiver is. If nothing else, it corrects the mismatch which a loop presents to the input of most receivers. Certainly a good receiver will work well with a loop on its own, and indeed my AR88 does work very well. However I believe that the ultra low noise characteristics of this unit will allow the very good signal-to-noise performance of a good loop to be fully exploited, especially if you can operate away from power noise, say, with a battery set on the beach.

If you experience any problems of instability, such as 'birdies' and noisy operation, you will probably find that the leads between the receiver and the booster are too long. Shorten them as much as you can, and if this doesn't work, try reversing the connections between the receiver and the booster. I have mounted my unit just under the loop windings on my support pole with all the leads as short as possible. No problems have been experienced using this combination with the AR88, the Heathkit, and a Philips transistor portable, and I can heartily recommend this simple-to--build unit as a very worthwhile and efficient DX aid.

-- George Masson

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