

A Call Button for the Lovell Earth Return Telephone

The Single Wire Telephone designed by Nigel Lovell works well but lacks a call facility. **Chris Ross** describes a simple modification to introduce a button allowing the user to be alerted to an incoming call.

This earth return telephone developed by Nigel Lovell has extremely high line impedance and is hence able to cover quite long distances. A detailed description is given in Nigel's original article (Lovell, 1993).

Although being an excellent design and operating perfectly, it suffers from not having a call button.

I discussed this problem with various 'electronic experts' who came up with complicated designs involving digital chips for generating square waves and lots of other complicated ideas even including the use of a microprocessor. Apart from being overkill, my experience has taught me that modern 'electronic experts' often think too digitally and tend to use unbelievably complicated circuitry for really simple things.

As a result, I set to thinking how easy it

would be to make the opamp oscillate (normally avoided) without all this extra complication. I also wanted to keep the design as simple as possible for reasons of reliability.

The result was the simple addition of two capacitors and a two pole two position (DPDT) spring loaded push button switch as shown in *Figure 2*.

The modifications are as follows:

- A 5.8nF capacitor has been added between R4 and ground to provide a path for the inverting input (pin 2) of the opamp.
- A 33nF capacitor is switched between the output pin 1 of the opamp and its non inverting input (pin3) to cause it to oscillate when calling.
- The DPDT push button (Call) switches the 33nF capacitor in and out and also connects the transmit opamp to the line when calling.

board layout to that shown in the original article. The volume will, of course, be limited by the use of telephone earpieces as loudspeakers, but is sufficient in most cases.

The DPDT pushbutton switch that I used was one from Conrad Electronics (part number 701890-05) with a rubber cap (RS Components part number 1193692 - sealing hood), which works to more or less protect the switch from contamination. This was the smallest DPDT push button I could easily find (space was at a premium), but there are, of course, others available which are probably better and no doubt water-resistant.

Additional Modification

In addition to the above, I made another minor modification to avoid the problem of a slight delay (lock up) which sometimes happens when switching from 'Talk' to 'Listen'. This was to change the value of the two capacitors C5 and C6 from 2.2 μ F to 0.47 μ F.

This had no negative effect on the operation of our devices, which use magnetic telephone earpieces (old style from dial telephones) as the microphone and 'loudspeaker'.

The modified earth return telephone is shown in *Figure 1*.

Reference

Lovell, N (1993), *Practical Earth Return Telephone Design Part 1*, CREGJ 13, pp9-12
Part 2, CREGJ 14, pp3-6

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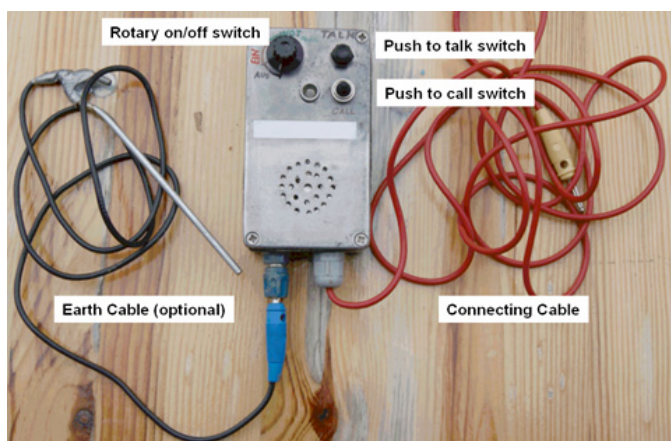


Figure 1 – The Modified Earth Return Telephone
Showing call button

The pitch of the call tone may vary slightly from one unit to another, probably due to parasitic capacitances, and it may be necessary to slightly vary the capacitance values, especially if you use different opamps. The values I have given here were satisfactory for all of our four devices; however, we used a slightly different printed circuit

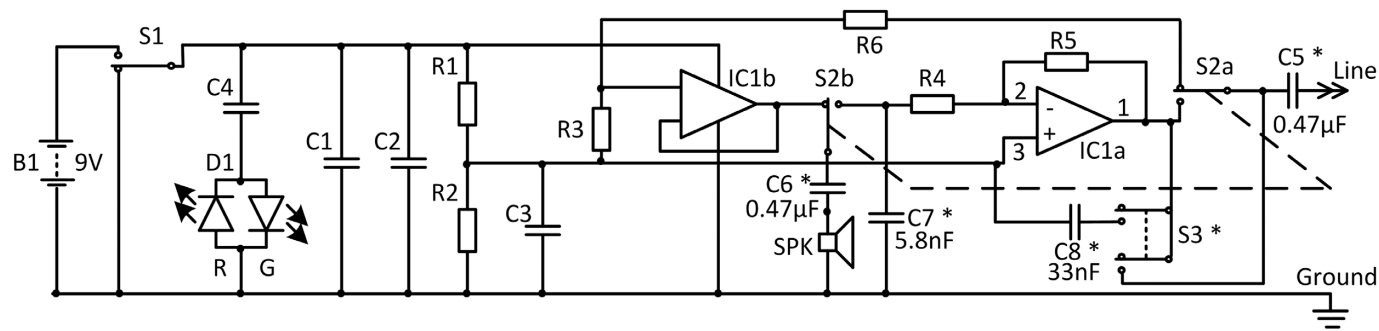


Figure 2 – Lovell Earth Return Telephone
Note the addition of three components; C7, C8 & S3 and changes to C5 & C6.
(Only the values of changed or new components are shown)