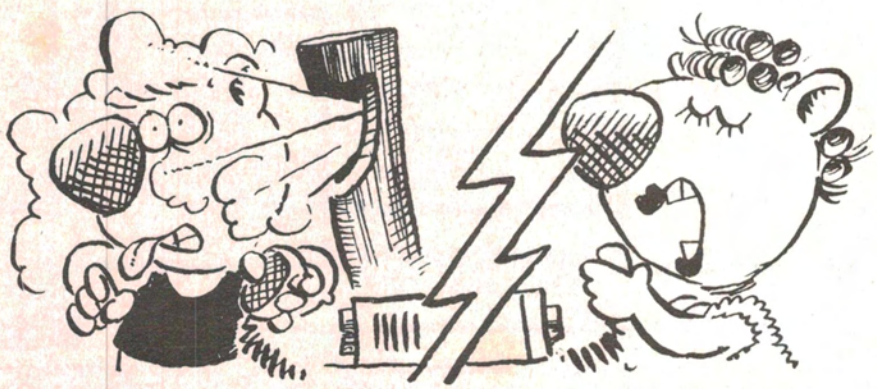
'Selectacall' add-on for ham/CB transceivers

Jonathan Scott VK2YBN

If you're listening on a channel for some particular station to call, but don't want to listen to the 'background chatter', then this simple accessory holds the mute shut until that 'certain party' calls — no tones or funny noises required.

ARRANGING occasional or regular contacts with a friend on-air is a pretty common practice, particularly on the VHF and UHF bands. The problem is that listening to the background chatter of other channel users — 'reading the mail', as they say — until the station you're listening for calls can be tedious. If your receiver could be muted until the wanted station calls, you wouldn't be distracted by the background chatter. Such a system was devised many years ago and became generally known as 'selective calling', which was abbreviated to 'selcall' or similar. The system employs a series of tones transmitted in a coded sequence. The listening station's receiver has a decoder fitted which detects that the correct tone code has been received and opens the mute. At least one commercially available CB rig has this as an optional extra (the Sawtron).

This project is a simpler version. No tones are employed. Instead, the 'calling' station simply keys his transmitter a pre-arranged number of times within a set period and the 'listening' station's receiver decodes this and triggers an alarm and an indicator. Optionally, the listening station's transceiver can be keyed by the decoder to indicate or acknowledge reception of the caller's code (QSL for the cognoscenti). As the decoder depends for its operation on the receiver mute detecting a carrier, it is only suited to AM or FM operation. ▶



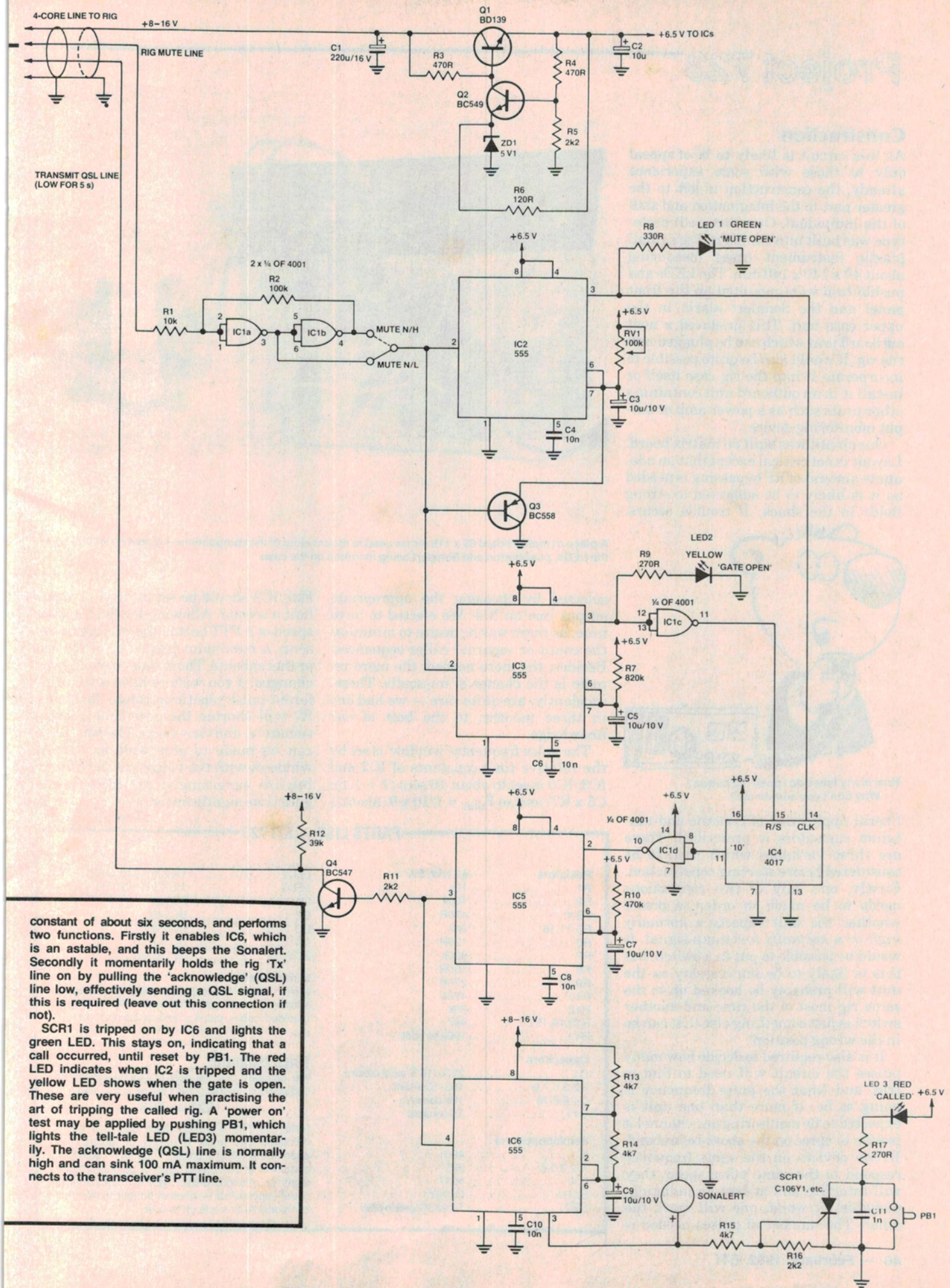
'Reading the mail' . . . can be tedious.

HOW IT WORKS — ETI-723

Basically, the device monitors the mute-lift signal in the receiver, searching for a string of nine (or other preset number) discrete mute-lift pulses occurring within a fixed period. The pulses must not occur too frequently (as set by a trimpot) nor may they be of too low a frequency, as they would not all be registered in the fixed period. With only a brief amount of practice, these pulses can be generated by manual depressions of the PTT button of another rig, and thus the unit will respond to a 'select-call' made without any specific hardware. The unit emits a distinctive beeping tone and sets a LED when it detects a valid call.

Initially, let us consider the idle state of the unit. ICs 2, 3 and 5 are monostable multivibrators, all of which are resting in their stable (reset) states. IC4, which is a decade counter/decoder, is held reset to 0. IC6 is disabled, and all LEDs are extinguished. IC1a and b form a Schmitt input buffer. Q1 and Q2 and associated components form a power supply regulator delivering 6-7 volts.

When the mute line shifts out of its 'closed' or 'reset' state (be this high or low, as set by an internal connection) IC1a and b send a low pulse to IC2 and IC3. Both of these monostables send their outputs high. IC3 has a time constant of about nine or ten seconds, and commences timing immediately. IC2 has a time constant of up to one second (set by RV1) and starts timing only when the mute line returns to its rest state, as a result of Q3 shorting C3. When IC2 times out as a result of the mute closing, and the period of its cycle passing, its output falls. Its cycle may be repeated by further openings and closings of the mute. Each time this occurs, IC4 is incremented by one count. Provided IC2 is triggered the required number of times before IC3 times out, IC4 will trigger IC5. IC5 has a time



constant of about six seconds, and performs two functions. Firstly it enables IC6, which is an astable, and this beeps the Sonalert. Secondly it momentarily holds the rig 'Tx' line on by pulling the 'acknowledge' (QSL) line low, effectively sending a QSL signal, if this is required (leave out this connection if not).

SCR1 is tripped on by IC6 and lights the green LED. This stays on, indicating that a call occurred, until reset by PB1. The red LED indicates when IC2 is tripped and the yellow LED shows when the gate is open. These are very useful when practising the art of tripping the called rig. A 'power on' test may be applied by pushing PB1, which lights the tell-tale LED (LED3) momentarily. The acknowledge (QSL) line is normally high and can sink 100 mA maximum. It connects to the transceiver's PTT line.

Construction

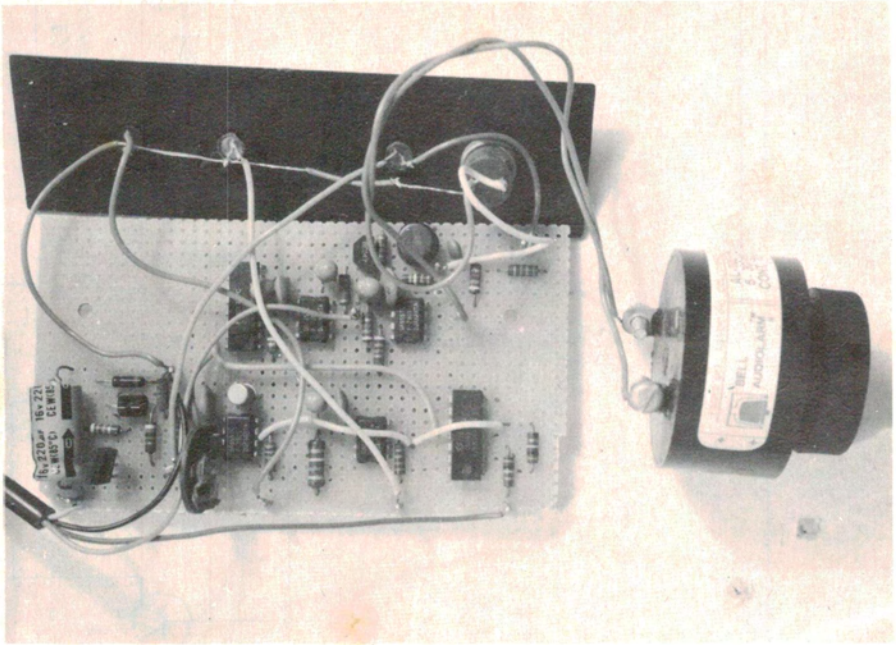
As this circuit is likely to be of appeal only to those with some experience already, the construction is left to the greater part to the imagination and skill of the individual. Our (pictured) prototype was built into one of PacTec's small plastic instrument cases measuring about 40 x 140 x 140 mm. The LEDs and pushbutton were mounted on the front panel and the Sonalert alarm in the upper case half. This produced a neat outboard unit which can be plugged into the rig. It would also be quite possible to incorporate it into the rig case itself or install it in an outboard unit containing other units such as a power amp or output monitoring device.

Our circuit was built on matrix board. Layout is not critical except that an adequate amount of RF bypassing is needed as it is likely to be subjected to strong fields in the shack. If trouble occurs,

How many times do I push the button?
. . . Why don't you answer me?

liberal application of ceramic and tantalum capacitors is prescribed. There are three variables which need to be considered before starting construction. Firstly, one only of two connections needs to be made in order to preset whether the unit expects a *normally high* or a *normally low* mute signal. It would be possible to put in a switch, but this is likely to be unnecessary as the unit will probably be hooked up to the same rig most of the time and another switch is just something else that can be in the wrong position.

It is also required to decide how many pulses the circuit will need to find to trip, and what the pulse frequency is going to be. If more than one unit is expected to be monitoring one channel it is wise to agree on the above beforehand. If two devices on the same frequency respond to the same pulse speed, they will interfere and at best be indistinguishable; at worst, one will mask the other. The number of pulses needed is



A piece of matrix board 63 x 115 mm is used to mount most of the components — layout is not critical — the LEDs, pushbutton and Sonalert being mounted on the case.

selected by choosing the appropriate output line on IC4. We elected to have nine, as there was no desire to minimise the count or separate caller sequences. Besides, the more needed, the more remote is the chance of misscalls. These, incidently, are quite rare — we had one in three months, to the best of our knowledge.

The pulse frequency 'window' is set by the relative time constants of IC2 and IC3; IC3 is set to about 10 secs ($T = 1.1 \times C5 \times R7$) and so $F_{min} = 1/10 \times 9$ (about 1 Hz). IC2 should be set by RV1 to about half a second. Allowing for the limiting speed of a PTT button finger, this represents a maximum frequency of 1½ Hz, or thereabouts. These must obviously be changed if you wish to have a very different pulse repetition range. Reducing R7 will shorten the gate time proportionately, and vice-versa. The pot., RV1, can be made to give wide or narrow windows with the values given but may require increasing if you increase the gate time significantly. ●

PARTS LIST — ETI 723

Resistors — **all ½W, 5%**

R1	10k
R2	100k
R3,4	470R
R5,11,16	2k2
R6	120R
R7	820k
R8	330R
R9,17	270R
R10	470k
R12	39k
R13,14,15	4k7
RV1	100k trimpot

Capacitors

C1	220u/16 V axial electro.
C2,3,5,7,9	10u/10 V tant.
C4,6,8,10	10n ceramic
C11	1n ceramic

Semiconductors

IC1	4001
IC2,3,5,6	555
IC4	4017
SCR1	C106Y1
LED1	TIL220G green LED
LED2	TIL220Y yellow LED
LED3	TIL220R red LED
Q1	BD139
Q2	BC549
Q3	BC558
Q4	BC547
ZD1	5V1 zener

Miscellaneous

Matrix board; piezoelectric alarm (Sonalert, or similar); case to suit; pushbutton (PB1); 4-core shielded cable; cable clamp or clamp grommet, etc.

Price estimate

We estimate that the cost of purchasing all the components for this project will be in the range:

$21 — $28

Note that this is an **estimate** only and **not** a recommended price. A variety of factors may affect the price of a project such as — quality of components purchased, type of pc board (fibreglass or phenolic base), type of front panel (if used) supplied etc — whether bought as separate components or made up as a kit.