PROJECT

Bicycle ALARM

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FEATURES

- Low cost
- Low standby power consumption
- Compact
- Easy to build and use
- Optional anti-tamper switch

APPLICATIONS

- Protecting bicycles and motorcycles
- Loop alarm for shops, rooms, sheds and garages

The statistics for the theft of bicycles is alarming, amounting to many thousands a year in the UK alone. With the replacement cost of even a used bike being rather steep, it makes sense to take precautions to safeguard the one you have. The obvious priority is to lock it securely whenever and wherever you leave it, even if you are only popping into a shop for a moment (which is all it takes for a thief to leap on and pedal off, never to be seen again. Another worthwhile measure is to add a suitable alarm to your two-wheeled transport, so that it alerts attention if tampered with, hopefully making a thief look elsewhere instead for an easier target.

The Bicycle Alarm described in this article is based on the Loop Alarm project previously featured in Issue 70 of *Electronics*. This makes for easier construction, since a ready-made PCB is available. However, the original design is adapted to fit into a more compact casing suitable for attaching to a bike frame or for storing in a saddlebag, handlebar bag pocket or pannier.

The alarm will also protect the wheels and other valuable components of a bicycle (the saddle for instance!) if the loop is made of sufficient length to be threaded through these parts. The alarm can also be used as a normal Loop Alarm, to protect items in shops, rooms, sheds, garages, etc.

Circuit Description

Refer to Figure 1, showing the circuit diagram. The project is based around the Loop Alarm circuit, which utilises half the gates of a 4001 CMOS quad 2-input NOR IC, connected to form a latch. The output of the latch goes high when the input is triggered by breaking the loop, and can only be reset by switching off the circuit via the keyswitch.

The loop must have a total resistance of no more than 90kΩ, which allows for a very long loop indeed, using normal low-resistance wire.

Capacitor C3 is included to prevent false triggering of the alarm that could otherwise be caused by the loop picking up stray RF bursts from nearby CB/taxi radio transmitters, etc.

Transistor TR1 drives the piezo sounder, which gives out a piercing 90dB wail when the alarm is set off. A single 9V PP3 battery is used to power the alarm, and the circuit's low power consumption in standby state will ensure a long life.

For additional security, an optional anti-tamper microswitch can be installed within the casing (details provided), so that if the lid is removed with the alarm armed and the loop intact, the alarm will sound.

SPECIFICATION

Operating voltage:	4-12V DC (9V nominal (single PP3 battery)
Operating current:	70(A (standby)
	60mA (triggered)
Sounder output:	90dB approximately
PCB dimensions:	27 × 93mm
Case dimensions:	114 × 76 × 38mm

The completed Bicycle Alarm unit.

PROJECT RATING 1

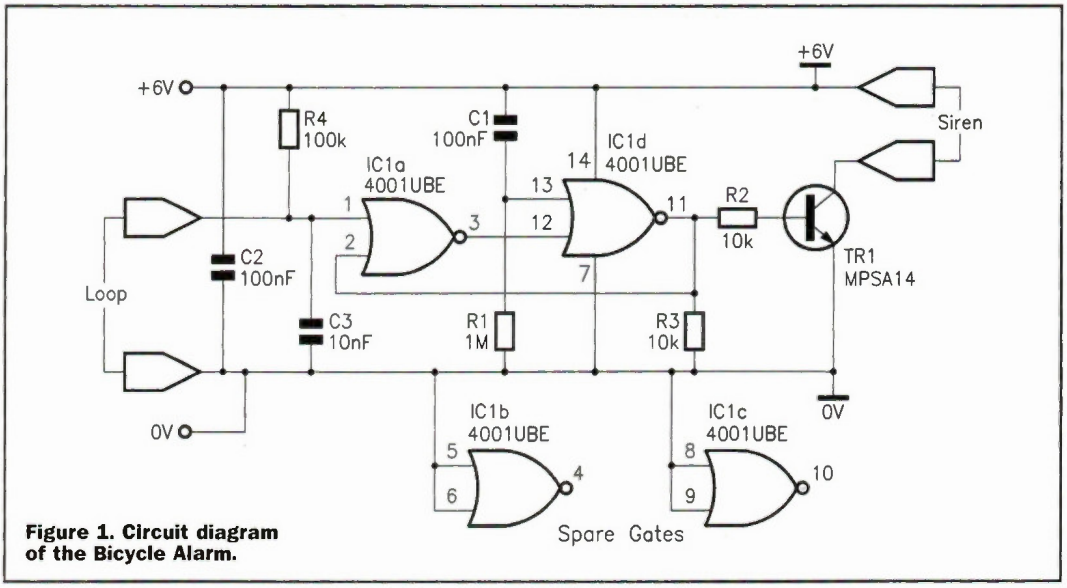
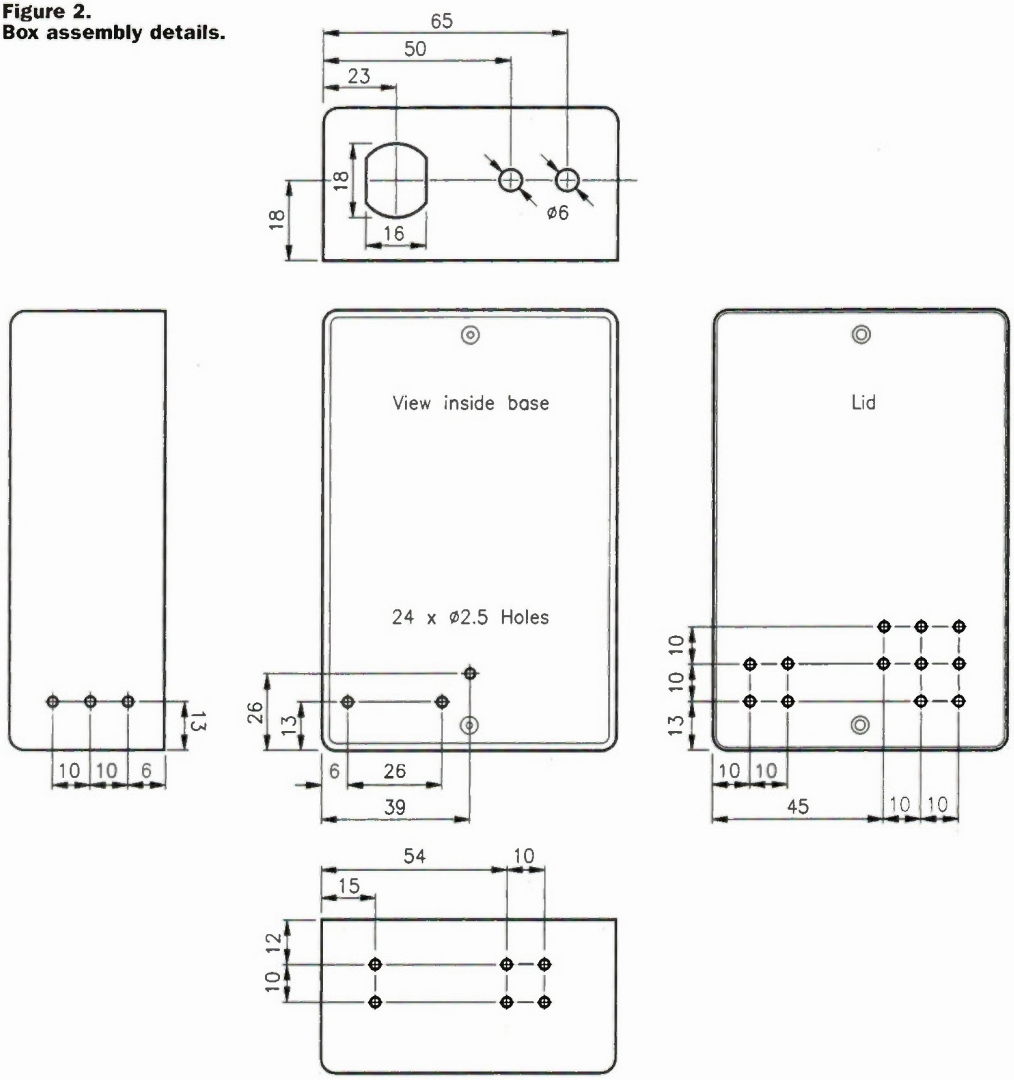


Figure 1. Circuit diagram of the Bicycle Alarm.

Figure 2. Box assembly details.



Construction Details

The specified PB1-type box should be drilled as shown in Figure 2. The sounder is attached to the case using M3 bolts, while self-adhesive Velcro pads are recommended for fixing the battery holder and PCB in place. If fitted, the optional anti-tamper microswitch should be bolted in position such that its operating lever is held shut with the lid on the box.

The PCB should be assembled in the usual order of ascending component size/height, ensuring that polarised components are orientated correctly. If required, refer to the Loop Alarm project article or its construction leaflet for further details. A DIL-holder allows for easy replacement of IC1, should it be necessary. On completion, check carefully for mistakes, solder whiskers, bridges and dry joints, then

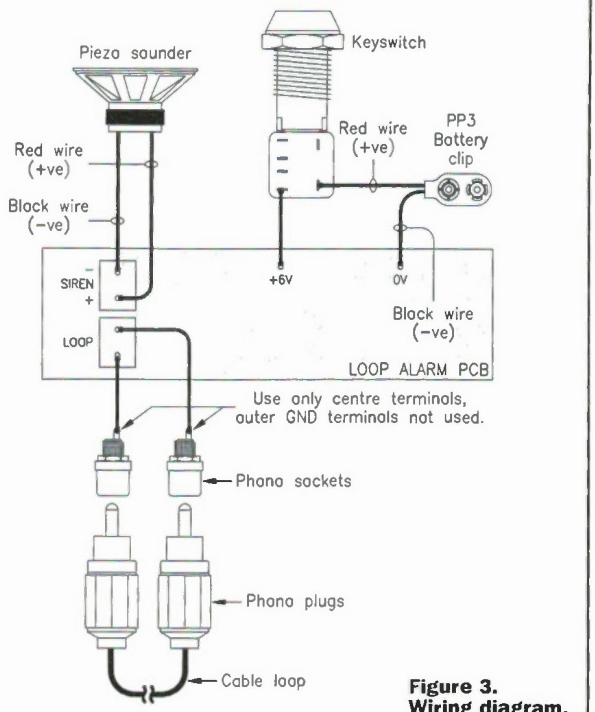


Figure 3. Wiring diagram.

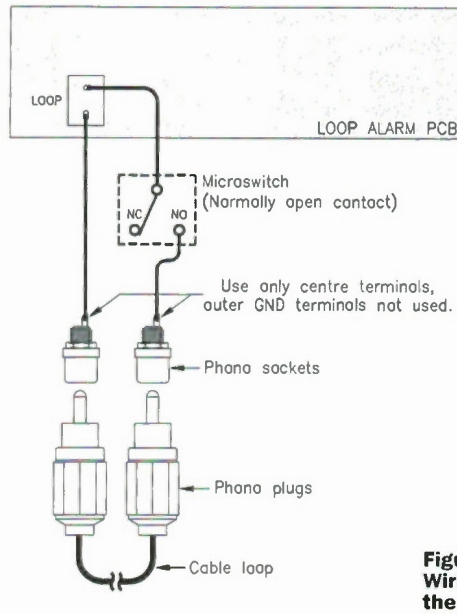


Figure 4. Wiring for the optional anti-tamper microswitch.

clean excess flux off the board using a suitable solvent.

Wire up the completed board in accordance with the wiring diagram shown in Figure 3. Figure 4 shows how to connect the optional anti-tamper microswitch.

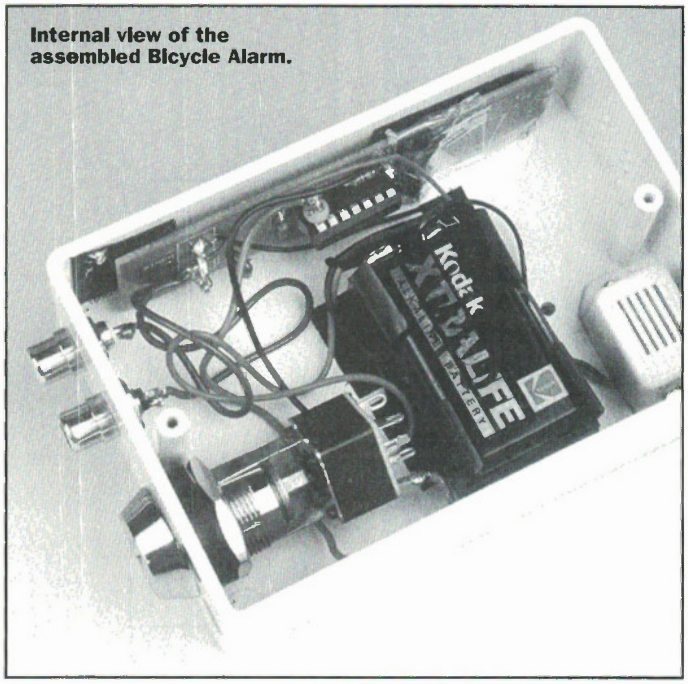
Testing and Use

With the kewswitch in the OFF position, and the loop made, install a fresh PP3 battery (observing polarity). The casing lid will then need to be shut if the optional anti-tamper switch is fitted. Arm the alarm by turning the keyswitch to the ON position, and the alarm should remain quiet. However, breaking the loop or removing the lid (if the microswitch is installed) should set off the sounder. Remaking the loop and/or shutting the box lid should not have any effect – the only way to turn off the alarm once triggered (other than disconnecting the battery or subjecting the unit to a severe beating!) will be to turn the keyswitch back to the OFF position.

Note that the specified casing is NOT waterproof. The alarm should therefore be mounted so as to protect it from moisture ingress. If a degree of water-resistance is required, the assembled circuit board can be protected by spraying it with lacquer/varnish or encapsulating it in resin – the latter measure would also improve its tamper-resistance considerably.

The battery should be checked and replaced periodically, say once a year, preferably using an alkaline type for long life and leak resistance.

Internal view of the assembled Bicycle Alarm.



PROJECT PARTS LIST

RESISTORS: All 0·6W 1% Metal Film (Unless Stated)			
R1	1M	1	(M1M)
R2,3	10k	2	(M10K)
R4	100k	1	(M100K)
CAPACITORS			
C1,2	100nF 16V Ceramic Disc	2	(YR75S)
C3	10nF 50V Ceramic Disc	1	(BX00A)
SEMICONDUCTORS			
IC1	4001UBE	1	(QL03D)
TR1	MPSA14	1	(QH60Q)
MISCELLANEOUS			
	DC Piezo Buzzer	1	(CR34M)
	Box Type PB1 (Black)	1	(LH14Q)
OR	Box Type PB1 (White)	1	(LF01B)
	Keyswitch (Round Key)	1	(CJ92A)
OR	Keyswitch (Flat Key)	1	(CJ98G)
	14-pin DIL Socket	1	(BL18U)
	PP3 Battery Clip	1	(HF28F)
	PP3 Battery Box	1	(CK65V)
	2-way 5mm PCB-mounting Terminal Block	1	(JY92A)
	Chassis-mounting Phono Socket	2	(YW06G)
	Screw-cap Phono Plug Black	2	(HQ54J)
	Single-core Cable Grey	As Req.	(XR13P)
	7/0·2 Wire Red	10m	(BL07H)
	1mm Single-ended PCB Pins	1 Pkt	(FL24B)
	M3 16mm Bolts	1 Pkt	(JY24B)
	M3 Nuts	1 Pkt	(JD61R)
	Loop Alarm PCB	1	(GH46A)
	Loop Alarm Instruction Leaflet		(XU32K)
	Constructors' Guide	1	(XH79L)
	Alkaline PP3 9V Battery	1	(AR46A)
OPTIONAL			
	Microswitch	1	(FP44X)

The Maplin 'Get-You-Working' Service is not available for this project.

The above items are not available as a kit.