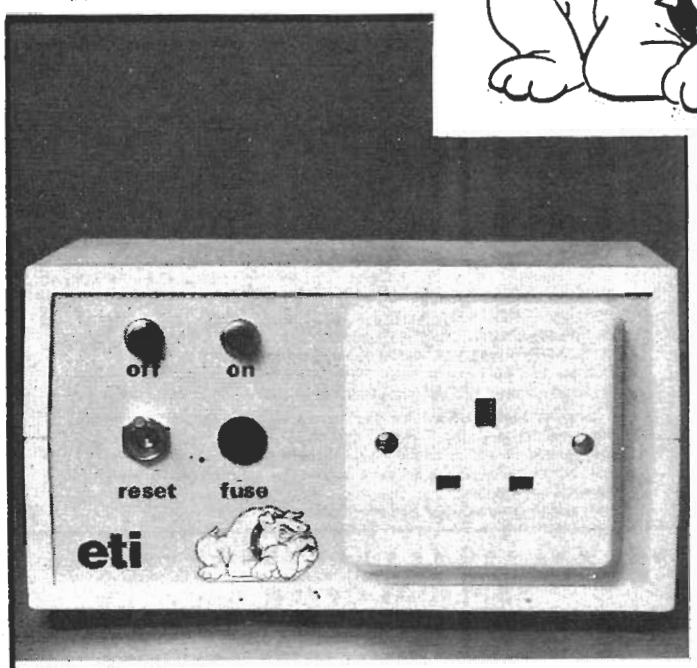
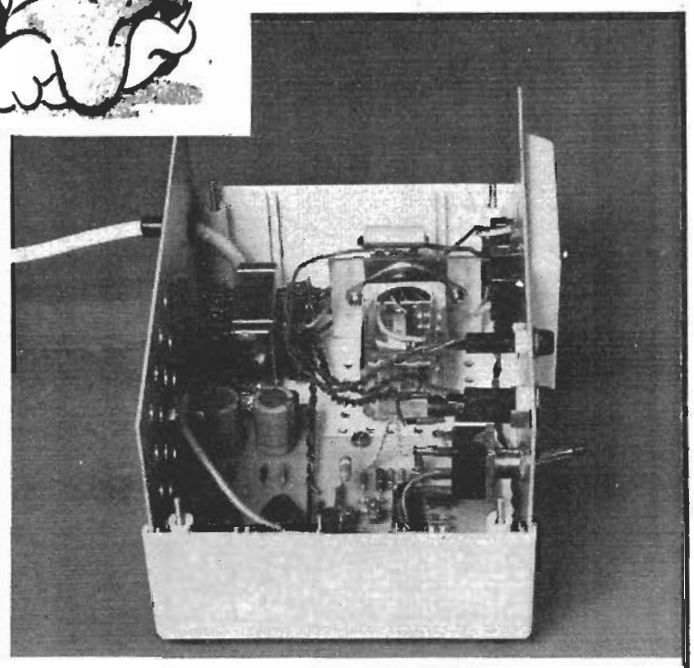




Keep an eye on what's left on, with our project team's . . .

ETI WATCHDOG

IN THESE DAYS of advancing (and shrinking) technology, it can't be long before we have a hi-fi system offered for sale which does everything automatically — even choose the material and listen to it for you. Naturally such a machine would turn itself off once it had finished the session.

Unfortunately the poor old relics we are forced to listen to music on nowadays do not possess this divine power of self termination and more watts are probably wasted keeping the power lights glowing through the night than actually thrilling the neighbours to Status Quo at five past midnight.

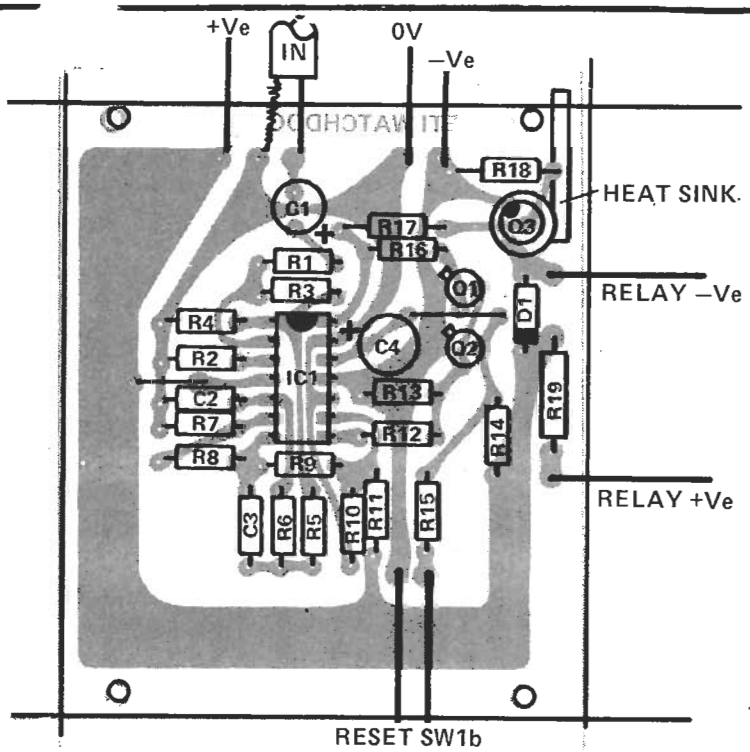
Most, if not all, of us here are guilty of this transgression ourselves, and after many months of *vowing* to do something about — we have. And so we present the Watchdog. It's sole purpose in existing at all is to make sure you CANNOT leave the hi-fi or television running away with the power while you're not using it.

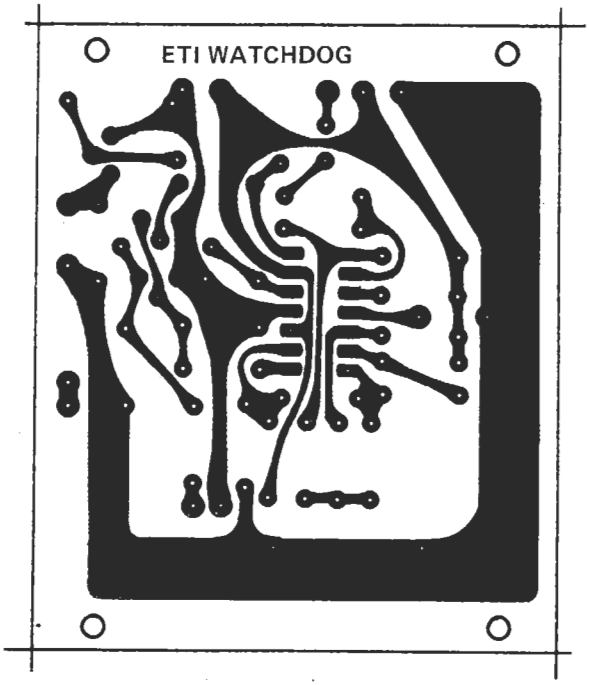
The Watchdog sits in between the mains supply and the equipment, and keeps a monitoring paw on the audio output of whatever is drawing mains supply from it. Once the audio signal has ceased, a (pre-set) time period is allowed to elapse, and then your hi-fi is closed down for you. A filter is included in the circuit such that 'Rover' will ignore white noise such as is generated by a closed-down television or FM station.

Canine Construction

The circuit consists physically of two boards, a relay, transformer and box with front panel components. Assembly of the boards should pose no problems and the layout of the bits within the box is not critical. There will be mains present at many points inside, so please be careful — we don't wish to lose our readers as easily as that. The relay does not have to be bracket mounted, once you're sure the circuit works you could glue the body to the box — but heaven help you in future if it should fail!

The red neon to inform you of the fact that the Watchdog has operated, and is starving the inert system of current, is optional. If omitted it means that the system is entirely 'fail-safe' and once tripped draws no mains current at all. Somehow though the vision of a harassed enthusiast frantically tugging and probing at a piece of persistently dead hi-fi, whilst the Watchdog lurks forgotten and guilty to one side,





Above: component overlay for the watchdog circuitry. Relay and switches are all mounted off-board within the box. Foil pattern is shown full size at 83 x 70mm.

PARTS LIST

RESISTORS (All ¼ W 5% except where stated)

R1	220k (see text)
R2	100k
R3	1M
R4,8,10	10k
R5,6,	8k2
R7,9	39k
R11	4M7
R12	2k7
R13	470R
R14	see text
R15,17	100R
R18	27k
R19	47R ½ W 5%
R20,21	1k ½ W 5%

CAPACITORS

C1,7,8	10u 16V electrolytic
C2	10n polyester
C3	22n polyester
C4	100u 16V tantalum
C5,6	1000u 16V electrolytic
C9,10	10n 1000V mixed dielectric

SEMICONDUCTORS

Q1,2	BC108
Q3	AC128 (fit with heatsink)
Q4	AD161
Q5	AD162
IC1	LM348 (Quad 741)
D1	IN4148
BR1,2	100V 1A Bridge rectifiers
ZD1,2	9V1 400mW zener diode

RELAY

RLA	12V 110R type (octal base) with two S.P.C.O contacts with 7.5A 250vA.C rating (min) Doram: 72-710-3 + octal socket 67-552-3

TRANSFORMER

T1	240V - two 12V windings 0-12, 0-12. 500mA per winding

FUSE

F1	Panel fuse holder and 500mA fuse to suit.

NEONS

N1,2	240V type one red (off) one green (on)

SWITCH

SW1 a,b,	Double pole on-off (biased off) R.S.: 316-614

SOCKET

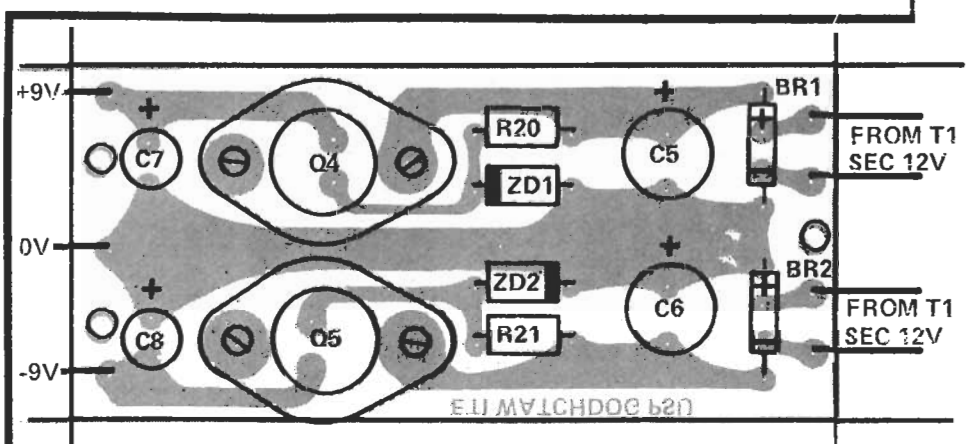
SK1	Panel mounting phono or din socket.

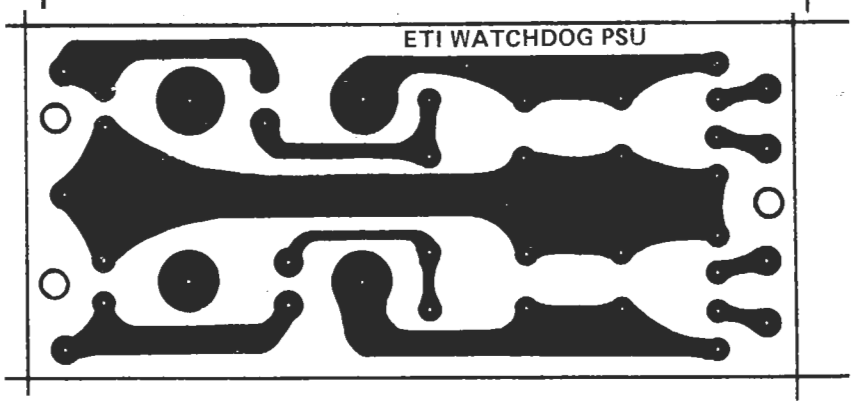
CASE

Verocase	75-1412k

MISCELLANEOUS

BA Socket to suit, 3core mains flex aluminium for heat sink and relay bracket, P.C Boards as pattern, grommet, cable grip, nuts, bolts etc. screened wire, connecting wire.





On the right are the power supply overlay and (full size 103 x 46mm) foil pattern for the watchdog device. Q4 and Q5 are smaller than the usual power type, so even though it looks a bit odd — it isn't!

keeps haunting the editorial mind.

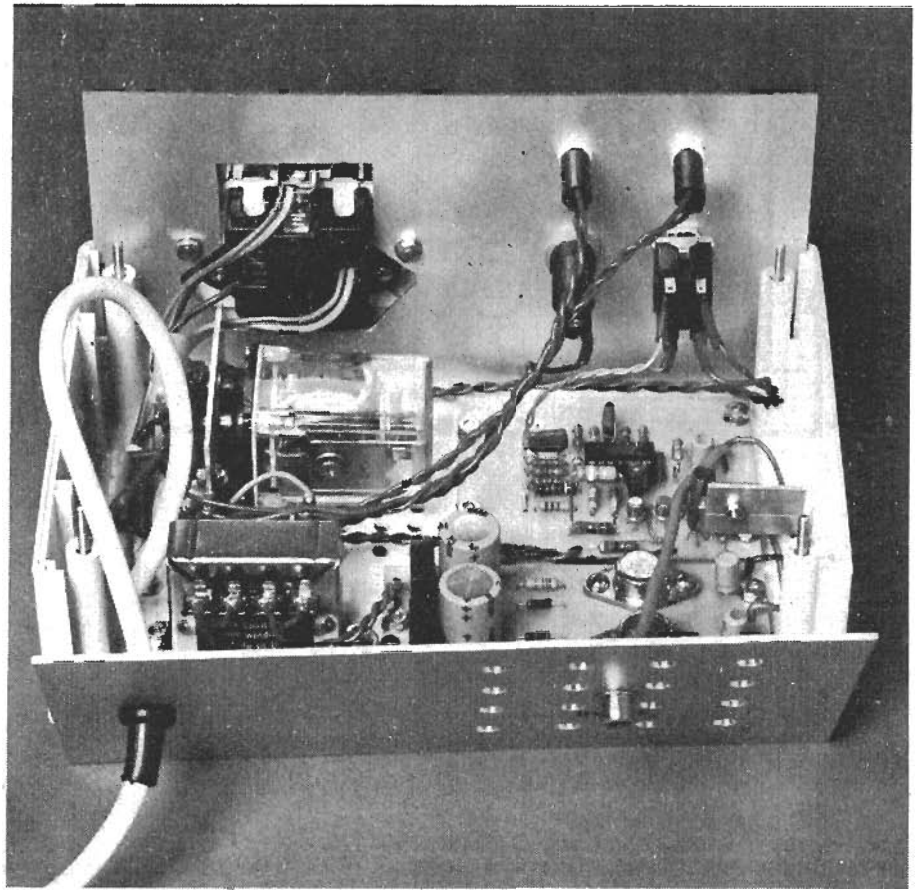
Since the relay is normally operational, current drawn is normally quite high, and so Q3 which drives RLA1 *must* be heatsinked. No options offered. Some ventilation in the back panel would not be wasted effort either, we feel.

House Training

Operation will normally be from a tape output socket or line output in the case of a tape recorder. Sensitivity is about 50mV which proved to be more than adequate in use. As the input filter will reject high frequency energy above about 800Hz thereby eliminating hiss etc, the device will not shut-down on normal signal sources. We would suggest that a delay of about 5 mins, is more than sufficient. A value of 4M7 for R14 gives around this value of delay.

If you want a shorter period, lower the value of R14 — it is very approx 1 minute per Meg with C4 set at 100µF. Too low a value may well affect operation, we have not tried it below 1M, so if you do you're into the dark realms of the unknown. (Incidentally how do you manage to change L P s so quickly?)

An input could be provided from the loudspeakers of your system if you're unable to give doggy his low level audio. A potential divider will be needed to reduce the voltage at the input to stop you knocking the Watchdog's teeth out. For an 8 ohm loudspeaker and amplifier around 20-30W, try 10k and 1k in series across the speaker, with the circuit fed from the junction of the two resistors.



Another internal view of the unit, which shows clearly how to mount all the components into the box. This Verobox we employed is now almost certainly only available in two-tone plastic, with the bottom bit grey. Some shops may have stocks of the albino lurking about somewhere, but it could be an exception.

Note that on the PCB in the photo you can see where we paralleled another resistor across R14 to change the timing. This was to adjust the value to exactly what we wanted.

Fitting the Leash

Initial setting up will be subject to the delay period, and so may confuse at first glance. Connect the audio input to SK1, and the Watchdog to the mains outlet. The equipment to be dogged is plugged into the mains socket on the front panel. The red neon should now be on (if you fitted it!) but nothing *else* will be!

Pressing down the reset switch should energise the hi-fi, and bring on the green neon to prove it. You now have however many minutes you allowed yourself with R14 to feed some audio down that wire before Fido gets upset and turns off the system again.

With the variation in level between

say an off-air television and an FM tuner, the sensitivity may be just too high for your application and if this is so R1 is the component to alter. Raising this in value will reduce the sensitivity of the device.

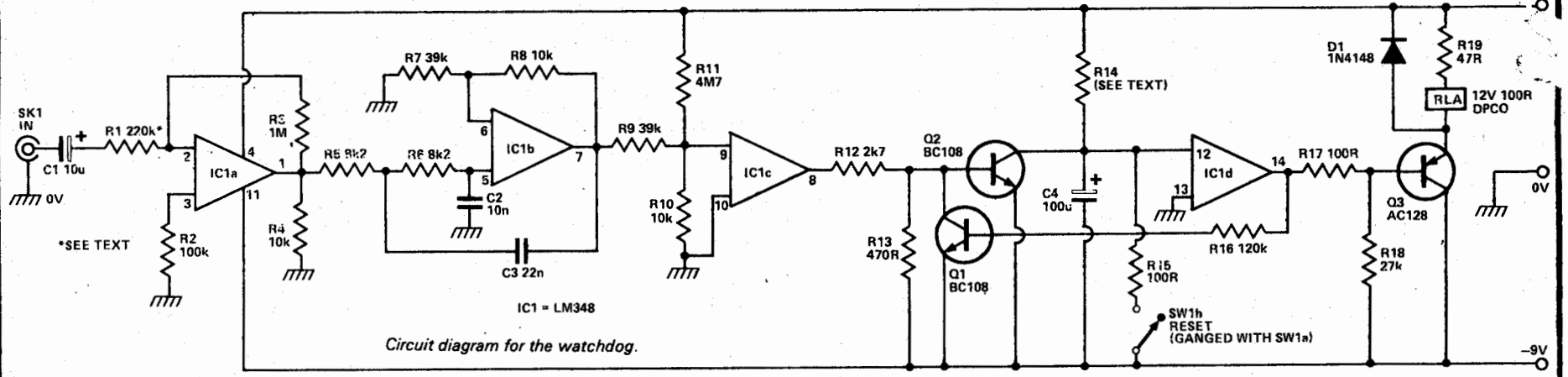
However, this does limit the versatility, and we don't think it will apply to many of you. It might arise say where a television, tuner and record system are all equally likely to be the source under control.

BUY LINES

The only special parts to be bought are (i) the relay which is available from Doram (together with an octal base). This is a 12V coil 110R with two C/O contacts rated at 7.5 amps at 250Vac. The transformer although specified as 500mA per winding can be as low as 300mA per winding. The reset switch must be biased off so once "reset" has been activated, releasing it returns it back to the off state (R.S. stockists can supply it).

The LM348 quad 741 op amp should now be available from most stockists, but if trouble is experienced Marshalls should be able to supply.

The 13A mains socket can be purchased from most electrical retail shops including Woolworths etc. The Vero case used is widely available although colours may vary (s being grey/white). Price: aro £15-£17 depending on "shop around."



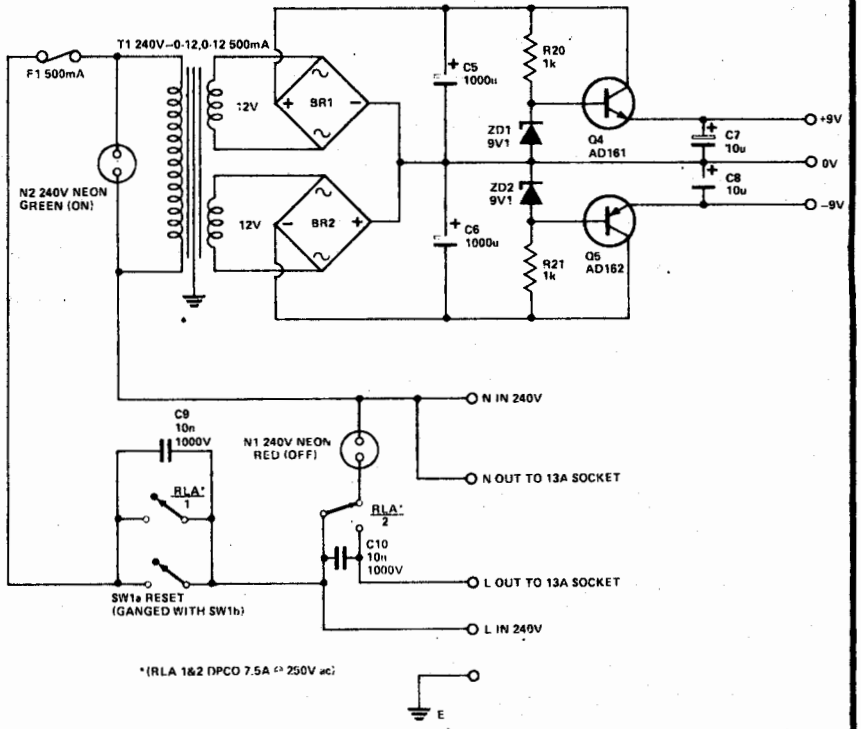
Circuit diagram for the watchdog.

HOW IT WORKS

SK1 feeds the input audio of around 50mV minimum to the buffer amp formed by IC1a and associated components. The gain of this stage is determined by the ratio of R3 to R1, and may be changed to vary the unit's sensitivity. IC1b is a second order Bessel low pass filter with break frequency set around 800Hz (when loaded). This is to cut the response to high frequencies such that continuous white noise will not keep the unit switched on.

IC1c and the potential divider R12, R13, square the incoming audio signal and feed this to the base of Q2, keeping it switched on as long as audio is present at SK1. IC1c is an op-amp working at its full open-loop gain such that it will 'clip' any input into a square-wave.

While Q2 is turned on, C4 cannot charge up above earth potential. Once the pulse train is no longer present at the base of Q2, C4 begins to charge via R14. IC1d acts as a comparator, and after the time-delay has elapsed, the output swings high, turning off the relay driver Q3, and disabling the relay which controls the mains to the equipment under consideration. D1 is protection against back EMF generated in the coil. Q1 is wired across Q2 as a 'shut-down' component, in such a way that as soon as the output goes high, this turns on Q1 which then prevents any transient audio, such as switch-off 'thumps' etc re-triggering the Watchdog and keeping it from closing down indefinitely.



Power Supply Circuitry to drive watchdog and power switching relay.