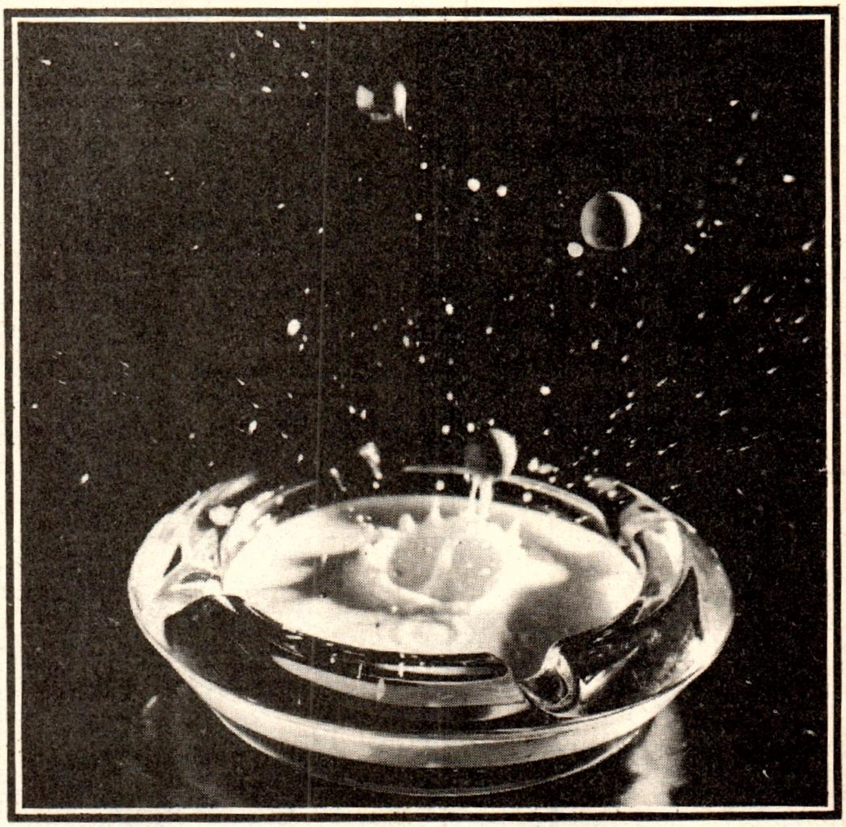
SOUND LIGHT FLASH TRIGGER

ETI project 514B

This flash trigger sets off any standard electronic flash unit a predetermined and adjustable time after a specific change in light or sound has occurred.



DURING the past few years we have received many requests to publish full constructional details of a light and sound operated photographic flash trigger that would be cheap to build, versatile in use and small enough to slip into the pocket or camera bag.

So here it is . . it can be triggered by any sudden change in light or sound to photograph any related transient phenomena. It has innumerable applications in specialised photography, science and industry.

The device will set off any standard electronic flash unit a pre-determined time (adjustable between five milli-seconds and 200 milli-seconds) after a sudden change in ambient light or sound. The magnitude of the change required to trigger the unit is also adjustable.

The light triggering facility enables the trigger unit to be used as a slave flash.

CONSTRUCTION

Solder all components on to the printed circuit board — with the exception of the LDR and potentiometers RV1 and RV2. Ensure that capacitors C1 and C3 are correctly orientated — see overlay drawing.

Solder short lengths of tinned copper wire on to the potentiometer terminals — insert ends into the pc board and locate as shown.

Don't solder the leads through until the final position of the potentiometers relative to the rest of the assembly has been established.

When assembling the potentiometers on to the front panel space the potentiometers away from the panel by two washers on each potentiometer.

Locate the LDR so that the light sensitive grid is lined up with the hole in the front panel of the unit.

Finally mount the switch and microphone socket on to the front panel and wire them to the pc board and battery clip as shown in the component overlay.

A synchronisation extension flash lead must be purchased to suit the camera in use. Remove the unused connector from the end of the lead and solder the lead to the board as shown in the overlay.

OPERATION

To use the unit in the sound operated mode simply plug the microphone into the socket provided and connect the unit's flash lead to the camera.

Switch on SW1 and adjust RV1 so that the flash is not triggered by ambient noise, but will be triggered by the event to be recorded — ie gun firing, hands clapping, glass breaking, etc.

In most circumstances the stop action photography must be done in a dark room with the camera shutter open, or if only black and white film is used — using a red safelight.

Assume for example that you wanted to photograph a bottle at the instant it is broken by a stone from a catapult. The equipment, catapult and bottle are set up initially in the light and tested to confirm correct function and sequence.

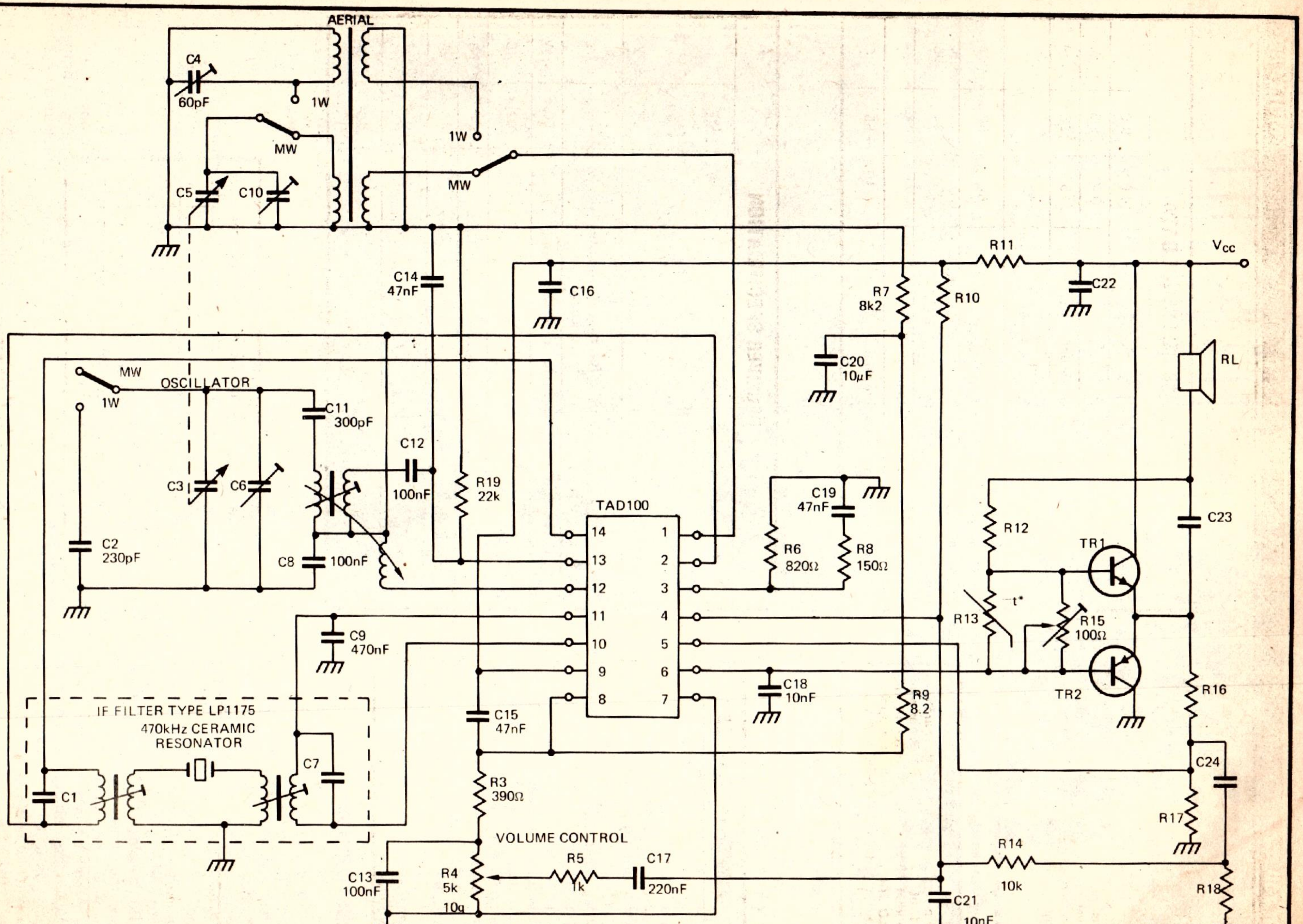
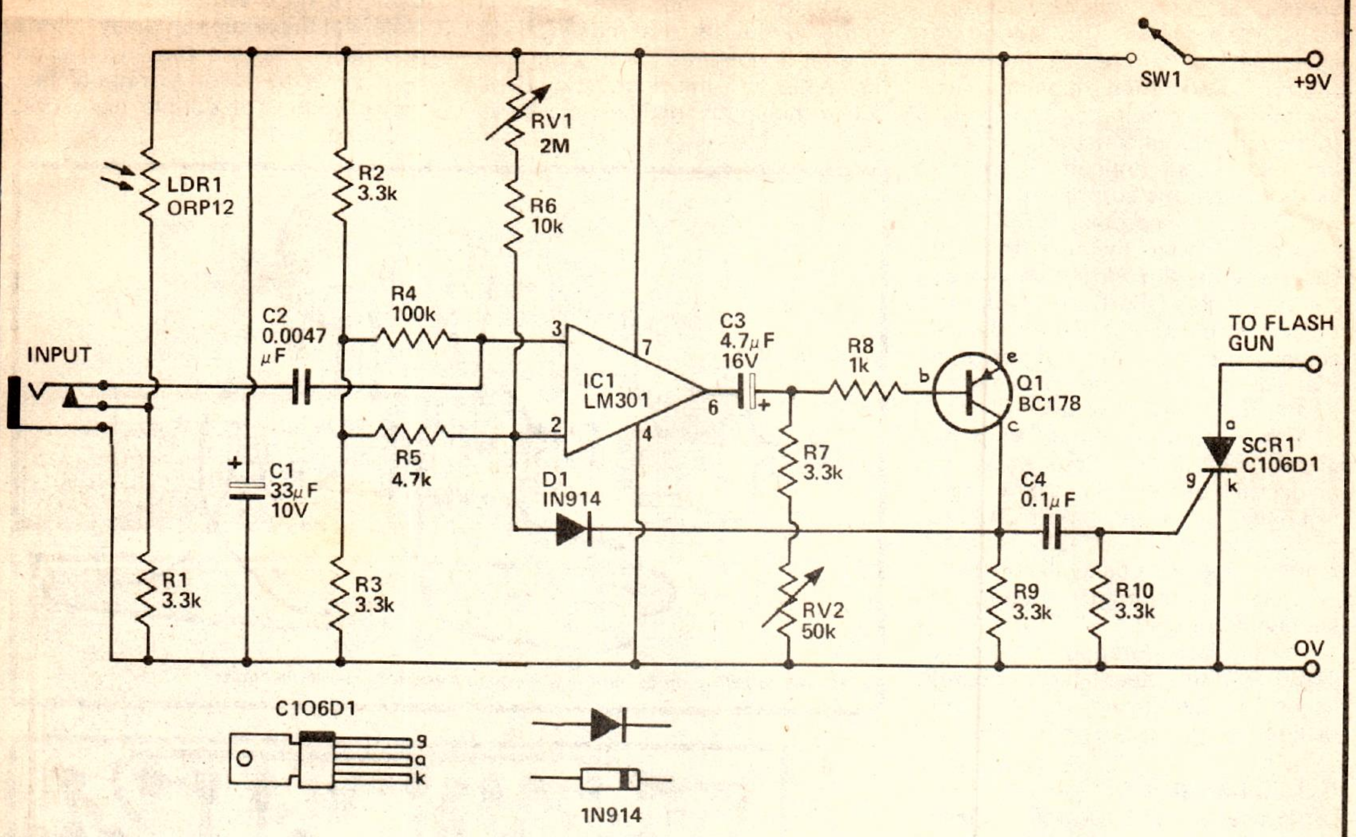


Fig 1. Portable LW/MW Receiver using TAD 100 . . .



Circuit diagram of complete unit.

PARTS LIST ETI 514B

Resistors				
R1	–	3.3 k	5%	¼ W
R2	–	3.3 k	"	"
R3	–	3.3 k	"	"
R4	–	100 k	"	"
R5	–	4.7 k	"	"
R6	–	10 k	"	"
R7	–	3.3 k	"	"
R8	–	1 k	"	"
R9	–	3.3 k	"	"
R10	–	3.3 k	"	"
Potentiometers				
RV1	–	2 M log rotary		
RV2	–	50 k lin "		
Capacitors				
C1	–	33 μF 10 V electro		
C2	–	0.0047 μF polyester		
C3	–	4.7 μF 16 V electro		
C4	–	0.1 μF polyester		
Seniconductors				
Q1	–	transistor BC178 or similar		
D1	–	diode IN914 or similar		
IC1	–	integrated circuit LM301		
SCR1	–	SCR C106 D1		
Miscellaneous				
LDR1	–	ORP12		
PCB	–	ETI 514B		
SW1	–	switch spst		

3.5 mm phone jack
plastic box, flash cord, microphone, battery and battery clip.

HOW IT WORKS

Basically the microphone triggers the IC monostable circuit which subsequently triggers an SCR, and hence the flash, after a time delay. This delay is adjustable — by varying a monostable on-time — from 5 milliseconds to 200 milliseconds.

Integrated circuit IC1 is an LM301A. This is a dc differential amplifier with a high gain — typically 25 000. The output swing of the IC with a 9 volt dc supply is of the order of 6 volts, and this is obtained with an input swing of only 24 microvolts. This makes the IC ideally suited for use as a comparator and is the mode of operation utilised in our circuit.

Due to the very high gain and the relatively large output signals normally encountered, the IC is almost always either fully cut off or fully saturated. The linear region is very narrow and is not utilized in this circuit.

The two inputs of the IC (pins 2 and 3) would be at the same potential were it not for the bias current supplied through RV1. This raises the voltage at pin 2 of the IC by 10 mV or more above pin 3 depending on the setting of RV1. The IC will therefore normally be fully saturated and the output voltage will be low.

Transistor Q1 is normally held on by the current through RV2, and its collector is high.

When an audio signal from the microphone produces at pin 3 a level exceeding that set on pin 2 by RV1, the IC will rapidly change state and its output will go high.

The front edge of this transition turns off Q1 via C3. The collector of Q1 will fall, D1 becomes forward biased and pulls down pin 2 to about one volt — the IC output is maintained in its high state.

After a time — determined by the time constant of C3 and RV2 — Q1 turns on again allowing the IC to revert to its normal low output.

The output signal from Q1 is differentiated by C4 and R10. The positive pulse which occurs at the end of the delay period, triggers the SCR and fires the flash.

When the microphone is pulled out LDR1 and R1 are placed in circuit. When the light falling on the LDR suddenly increases, the resistance of the LDR falls and the voltage across R1 increases. This increase is passed via C2 to pin 3 of the IC triggering it if it is above that on pin 2.

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A test film is then shot using an arbitrary setting of the delay in the now darkened room. This is done by opening the shutter, firing the catapult and then closing the shutter before turning on the lights. (Although shooting a bottle in the dark may seem difficult — with a little practice it is surprisingly easy. But do wear eye protection).

A run through the test film will show whether the chosen delay was correct. If too short, the bulb or bottle will be photographed before actually breaking up — if too late the action will have progressed further than needed or wanted.

Further pictures should then be taken, varying the time delay to bracket the actual delay that is now estimated as correct. With a little experience you'll be able to estimate the required delay accurately.

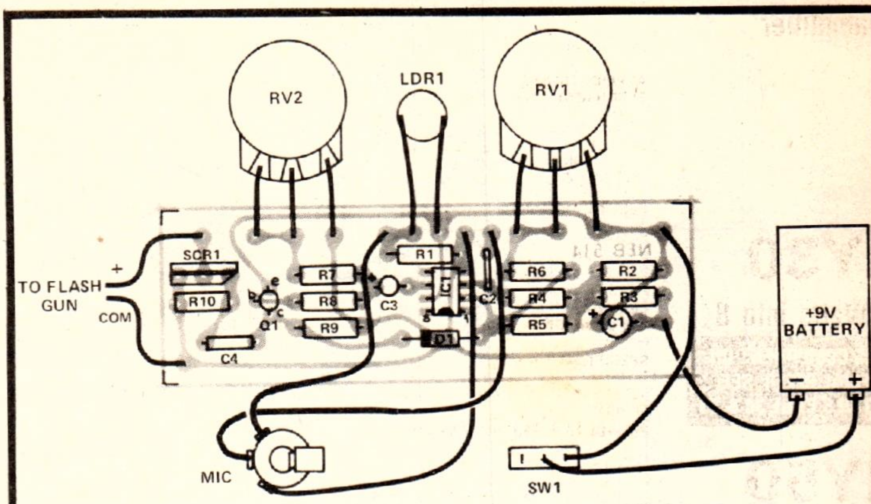
(Don't forget to get in a good supply of bottles).

As the flash duration is typically 1000-2000th sec, high speed action can be frozen as our lead picture shows.

SLAVE LABOUR

To use the unit as a slave flash simply unplug the microphone. This automatically places the built-in light sensor in circuit — adjust the sensitivity so that the unit is triggered out by the master flash when it is operated. In this particular application the delay should be set to minimum for use as a slave flash.

Or some delay may be used to obtain a time sequence exposure. Note that the minimum delay is 5ms and hence the unit cannot be used as a slave flash for extremely fast action without a double exposure occuring. ●



Follow this diagram to mount components and for interconnections.