INTERVAL CONTROL FOR CAMCORDERS

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Prices of camcorders have shown a welcome reduction over the last year or so, and an increasing number of enthusiasts are using these successors to the 8-mm and 16-mm film camera. The circuit described here is an accessory that allows recordings to made of events that take a relatively long time. The opening of a flower, for instance, can be filmed at regular intervals and then played back in a few seconds.

The recording principle of the camcorder is basically the same as that of a film camera: a series of individual pictures is captured and subsequently played back to reproduce the original visual impressions. The camera of a camcorder has a range of shutter speeds, in economy models ranging from 1/50 to 1/1000 and in the more luxury models from 1/50 to 1/4000. Short shutter times allow the user to make recordings of relatively fast events as they occur in, for instance, sports. By contrast, long shutter times are required to ensure sufficient intensity of incident light on the recording element, which is usually a CCD (charge-coupled device). As in film cameras, these shutter speeds are not suitable for slow-motion filming, which therefore requires a different approach.

The usual method is to make short recordings at regular, adjustable, intervals. When these recordings are played back at the normal speed, the relatively slow event is reproduced at a much faster rate. In this manner, a slow event with gradual change that takes, for instance, an hour, may be shown in a few minutes or even a few seconds.

The circuit described here is switched on automatically during a predefined period of time. After each recording period, the camcorder is switched back to the stand-by state, the length of which is also defined by the user. The circuit effectively disables the interval switch (or pause switch) in the camcorder. This switch is usually of little use and offers a fairly crude control.

Practical use of the control is simple: fit the camera on a tripod or mount it on a table, aim and focus it on the flower, and switch on the interval control. After half an hour, or an hour, or even longer, depending on the flower, a perfect recording has been made of the flower opening.

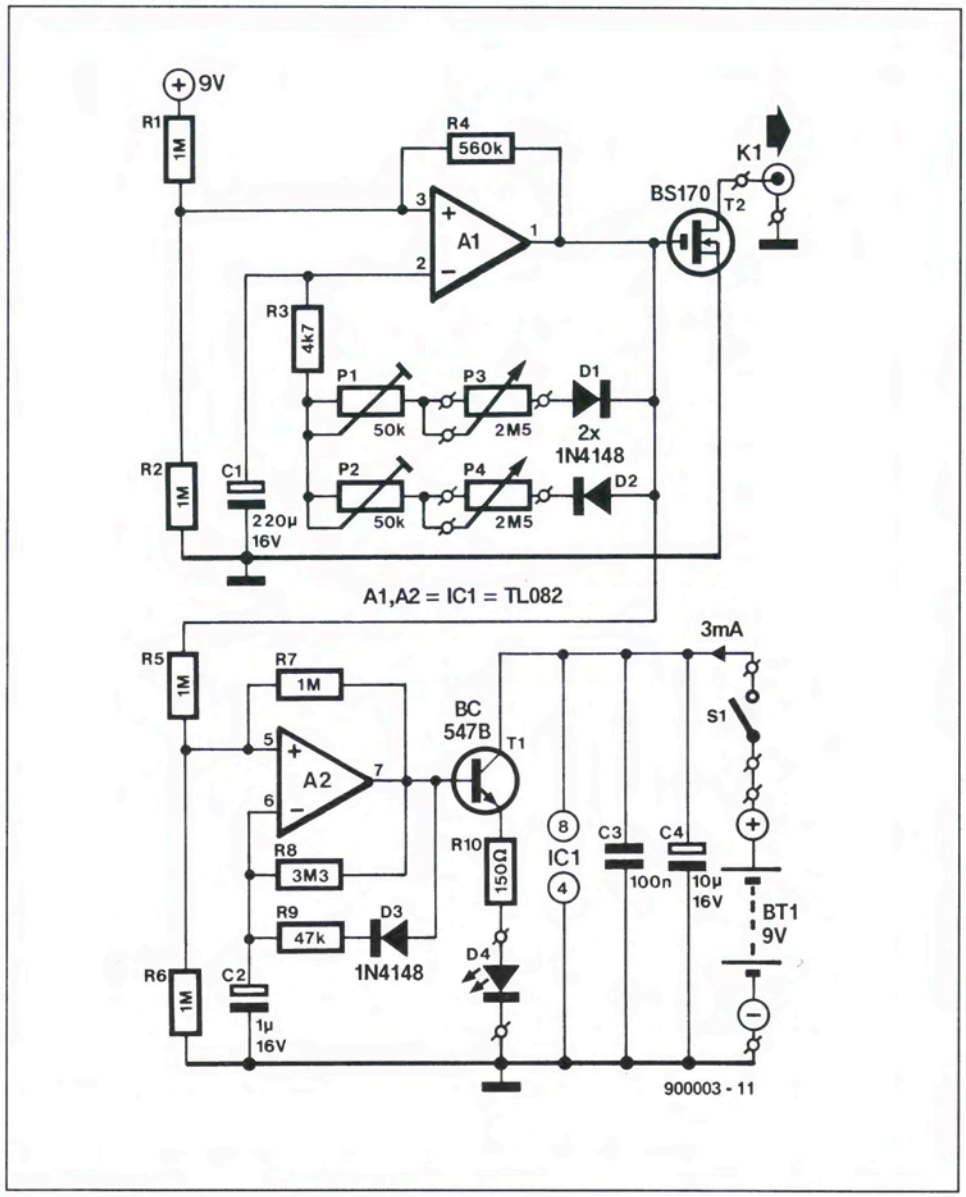

Fig. 1. Circuit diagram of the interval control, which is basically an astable multivibrator with adjustable on and off times.

The circuit

The circuit diagram shown in Fig. 1 could hardly be simpler. Note that only one IC is used, and that about half the circuit serves no other purpose than the control of an indicator LED. The result is a small circuit board for which a compact enclosure should be easy to find. A single 9-V PP3-size battery is used to power the interval switch. Since the circuit consumes little power, the battery should offer sufficient capacity for extended periods of operation.

The interval control is basically an astable multivibrator with adjustable frequency and duty ratio. Resistors R_1, R_2 and R_4 determine the voltage at the non-

inverting input of opamp A1. Because of feedback resistor R4, the voltage at the non-inverting opamp input is either ¼ or ¾ of the supply voltage, depending on the output voltage of the opamp. The hysteresis so created in the switching behaviour of the opamp causes it to function as a kind of Schmitt-trigger. The *R-C* combination between the inverting input and the output of the opamp extends this function to that of a multivibrator.

The opamp output is high if the voltage across C1 is lower than $0.25U_b$. The time needed to charge C1 from the low trigger threshold, $0.25U_b$, to the high trigger threshold, $0.75U_b$, is determined by preset P2 and potentiometer P4. The total resistance set with P2 and P4 is in direct proportion to the time the opamp output remains high. When the voltage across C1 exceeds the high threshold level, the opamp output goes low. As a result, C1 discharges until the lower trigger threshold is reached. Diodes D1 and D2 allow different times to be set for the charging and discharging of C1.

Transistor T2 conducts as long as the opamp output is high. In this condition, the remote control inputs of the camcorder are connected via MOSFET T2 so that the recording function is switched on. This lasts until C1 has discharged to the lower threshold level, when the opamp toggles and T2 is switched off.

The component values in the mutivibrator allow maximum recording-on and recording-off times of about 400 s to be set. A minimum setting is provided by preset P1 to ensure that the camcorder has sufficient time to produce a synchronized picture. This minimum recording interval is called the backspace time and is specified in the user manual with most camcorders. If the backspace time is not known, it is fairly simple to establish from a few experiments.

The second part of the circuit is the recording-on indicator set up around opamp A2. This is configured as an astable multivibrator of which the duty factor and output frequency are fixed. It is started the moment A1 supplies a high level. Diode D3 causes the on-time of A2 to be much shorter than the off-time so that LED D3 flashes. This is done to reduce the average current consumption of the circuit to about 3 mA whilst ensuring a clear indication that a recording is being made.

Building the control

Figure 2 shows the component mounting plan and the mirror image of the track side of the small PCB. Construction of the circuit is straightforward. Start by fitting the solder pins, followed by the resistors, presets and capacitors. Next, mount the diodes, the integrated circuit and the transistors. Use little solder and work accurately.

Potentiometers P2 and P4 are either soldered direct to the board, or connected to it via short lengths of insulated wire.

Finally, fit the circuit into a small ABS enclosure with a battery compartment. The timing controls, the on/off switch and the indicator LED should be fitted on the top panel for easy access.

The interval control is connected to the camcorder by a short length of 2-wire cable. A 3.5 mm jack plug is used at the side of the interval control, and a 3- or 5-pin DIN plug at the side of the camcorder. ■

COMPONENTS LIST

Resistors:

5	1M0	R1;R2;R5;R6;R7
1	4k7	R3
1	560k	R4
1	3M3	R8
1	47k	R9
1	150Ω	R10
2	50k preset H	P1;P2
2	2M5 lin. potentiometer	P3;P4

Capacitors:

1	220µ 16V	C1
1	1µ0 16V	C2
1	100n	C3
1	10µ 16 V	C4

Semiconductors:

3	1N4148	D1;D2;D3
1	LED	D4
1	BC547B	T1
1	BS170	T2
1	TL082	IC1

Miscellaneous:

1	3.5 mm jack socket	K1
1	miniature SPST switch	S1
1	PCB	900003

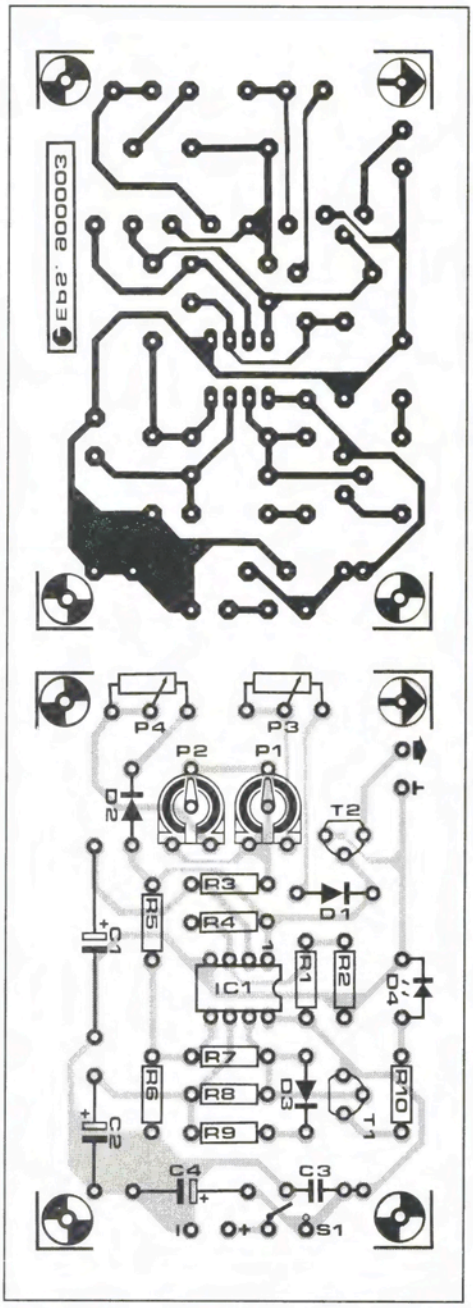

Fig. 2. Single-sided printed circuit board for the interval control. The time controls, P3 and P4, may be soldered direct to the board.