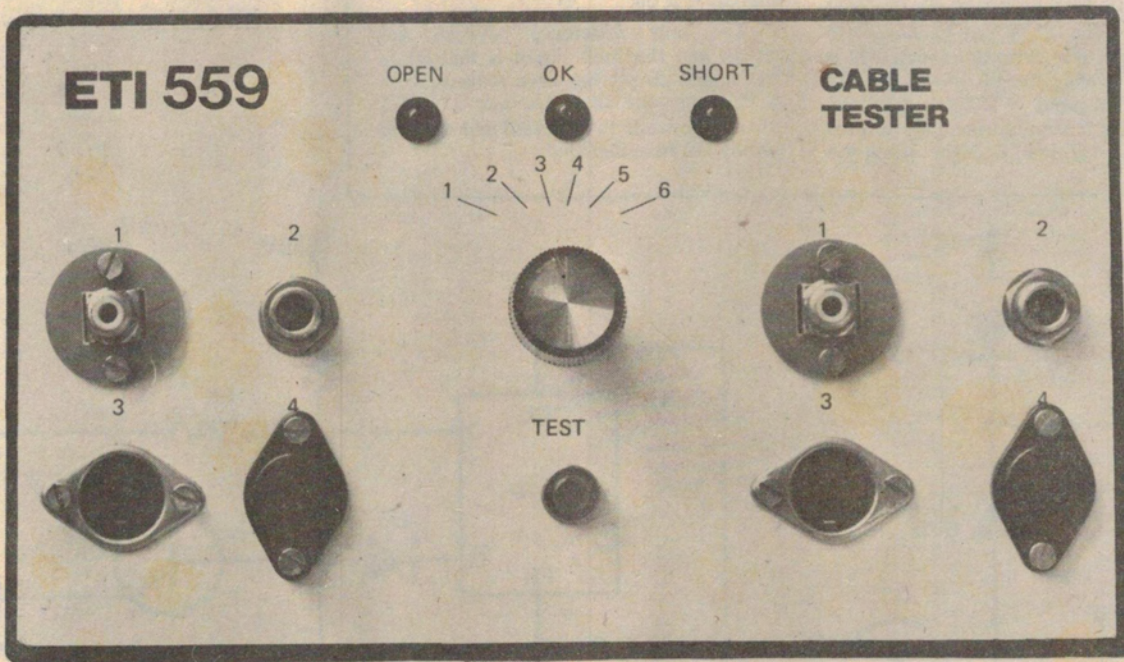


# Cable Tester

Quickly test audio cables with this ingenious project.



ALMOST ALL THE faults in an audio system are caused by cables. Have you ever tried to find which cable is broken among the many connections in a stage audio system, especially with anxious people looking over your shoulder?

The answer is to check each cable before the performance, a rather tedious business.

This Cable Tester checks each wire in turn for both open circuits and short circuits to earth. Each cable can then be thoroughly tested before use and hopefully faults can be found before they cause problems.

The circuit makes cunning use of a 7474 dual D flip flop to light one of three LED's after the test switch is pushed, indicating short, open, or OK.

### Construction

The unit is mounted on a standard plastic box measuring 196 x 113 x 60 mm. If it is to be used on-stage, then use the strongest box you can find, such as diecast aluminium.

Wiring the switch is the only difficult part of the construction. Note that some of the switch contacts are linked together as shown in table 1. The trans-

former we used is a commonly available Ferguson pcb mounting type.

The sockets we have chosen for the prototype are the most common type, however there is no reason why others can't be substituted. The jack plugs, J1, 2 and the RCA sockets SK1, 2 must be insulated from the metal front panel, or the earth connections will be permanently connected together through the panel. RCA sockets are available with insulating mountings, while insulating washers can be made from plastic sheet for mounting the jack sockets.

## HOW IT WORKS - ETI 559

To understand the operation of the cable tester refer to the simplified diagram and the truth table in fig. 1.

IC1 is a 7474 dual D flip-flop with its clock (CLK) and D inputs held at 0V.

First let's assume an open circuit cable. ZD1 conducts, as it has 12 V across it, and turns on Q2, which holds the preset (PR) input on IC1/1 low. The PR input of IC1/2 remains high because ZD2 is not biased. When the test switch is pressed, putting a 0 on the CLR input, the outputs of IC1/1 become: Q, high; Q, low. When the test switch is released, leaving both the CLR inputs high, the following outputs are obtained: IC1/1 - Q, high; Q, low; IC1/2 - Q, low; Q, high. Since the output of Q, IC1/1 is low, Q3 is turned off. Therefore LED1 is on, LED2 is off, and LED3 is off.

Now let's look at the 'short to earth' condition. The 12 V rail is shorted to earth through D1 (exit one diode). Q2 is turned off leaving the PR input of IC1/1 high. The PR input of IC1/2 is held low. When the test button is pressed the outputs of IC1/1 go: Q, low; Q, high. When the

button is released, placing a high on the CLR inputs, these outputs remain the same. The outputs of IC1/2 are: Q, high; Q, low. Therefore LED1 is off, LED2 is off because the base of Q3 is held low by IC1/2, and LED3 is on, indicating a short.

Finally, if the cable is OK, the voltage across ZD1 is held at 3.3 V by ZD2. Q2 is off because ZD1 (6.8 V) is not conducting. The PR input of IC1/1 is left high and the PR input of IC1/2 is also high. When the test button is released the outputs of IC1/1 go: Q, low; Q, high. The outputs of IC1/1 go: Q, low; Q, high, when the button is pushed and remain the same when it is released. Both the Q outputs are low so LEDs 1 and 3 are off and the Q outputs are high so Q3 is conducting and LED2 is on.

The only difference between this circuit and the final circuit is that D1 in the simple circuit has been replaced with a FET constant current source, Q1. SW1 selects the wires to be tested and a power supply has been included.

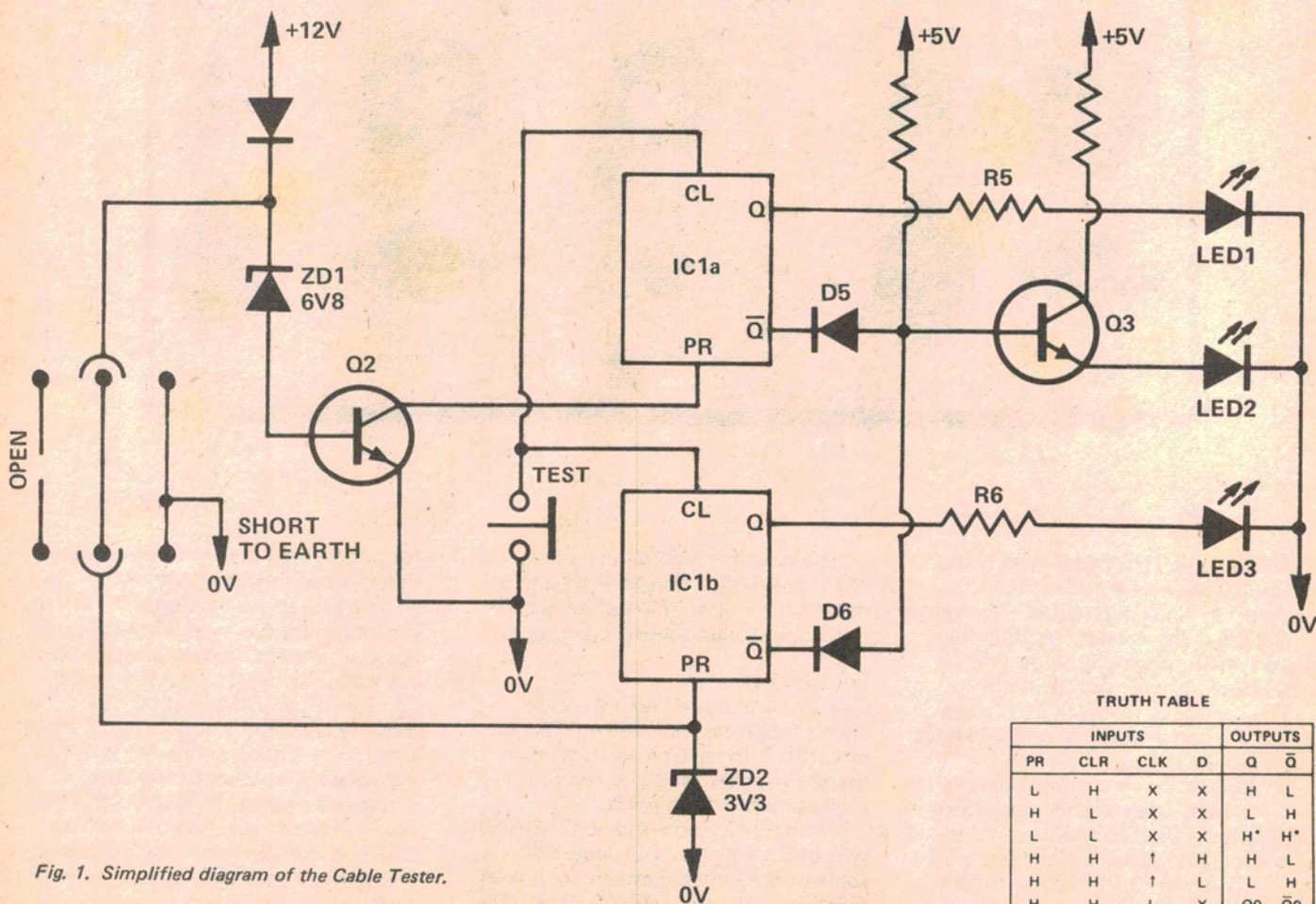


Fig. 1. Simplified diagram of the Cable Tester.

INPUTS				OUTPUTS	
PR	CLR	CLK	D	Q	Q̄
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H*	H*
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q0	Q̄0

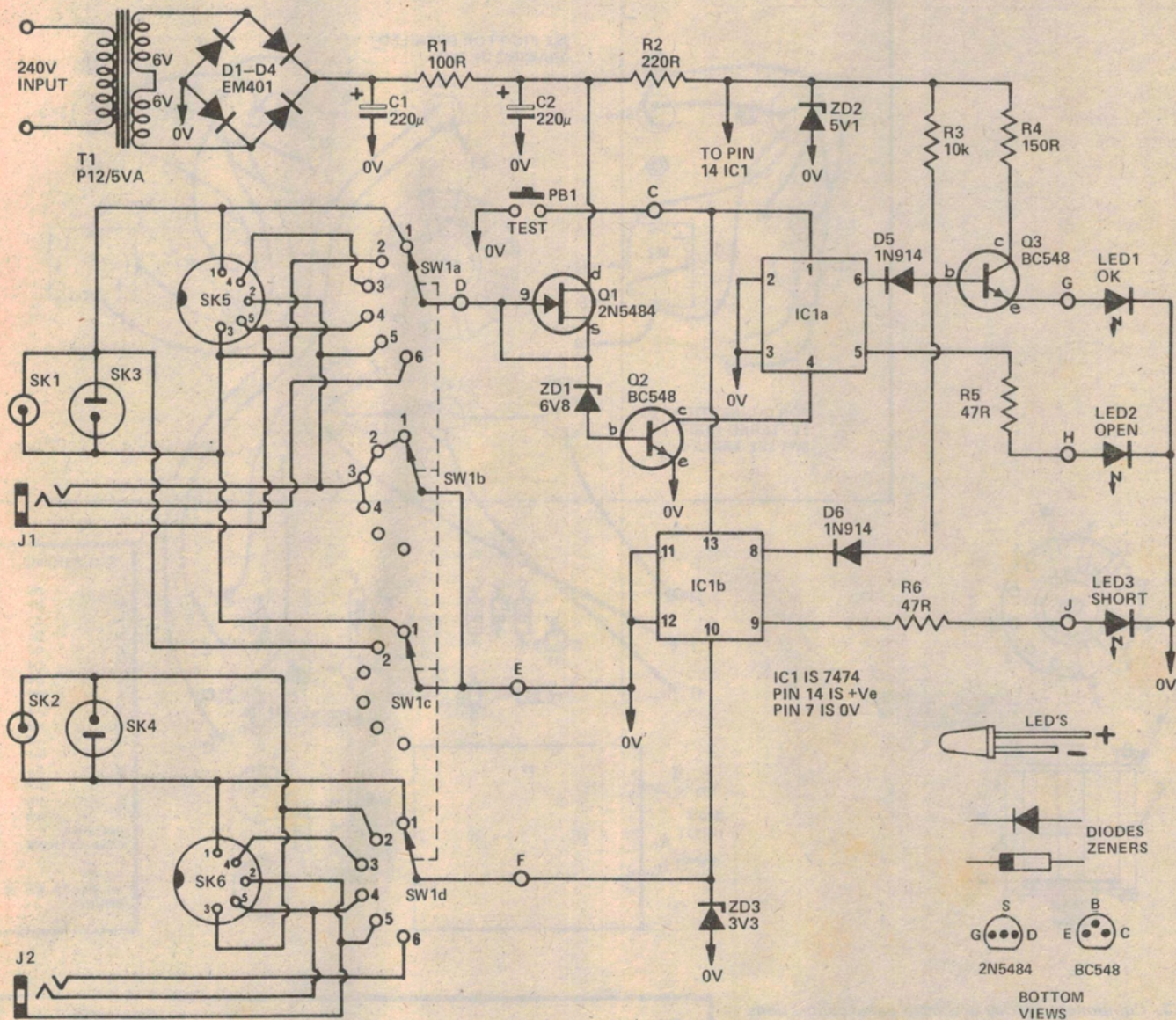


Fig. 2. Final circuit of the Tester.

### PARTS LIST - ETI 559

**Resistors** all 1/4W, 5%

- R1 ..... 100R
- R2 ..... 220R
- R3 ..... 10k
- R4 ..... 150R
- R5 ..... 47R
- R6 ..... 47R

**Capacitors**

- C1 ..... 220µ 25VW
- C2 ..... 220µ 25VW

**Semiconductors**

- IC1 ..... 7474
- Q1 ..... 2N5484 FET
- Q2, 3 ..... BC548 or equivalent
- D1-D4 ..... EM401 or equivalent
- D5-D6 ..... 1N914 or equivalent

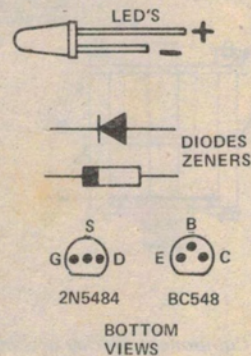
- ZD1 ..... 6V8 400 mw zener
- ZD2 ..... 5V1 400 mw zener
- ZD3 ..... 3V3 400 mw zener
- LED1-LED3 ..... Red LEDs

**Sockets**

- SK1, SK2 ..... RCA Socket
- SK3, SK4 ..... 2 pin DIN socket
- SK5, SK6 ..... 5 pin DIN socket
- J1, J2 ..... Stereo jack socket

**Miscellaneous**

- SW1 ..... 4 pole 6 pos OAK switch
- T1 ..... Ferguson P12/5VA transformer
- PB1 ..... miniature momentary contact pushbutton
- pcb ..... ETI 559
- Box to suit (195 x 110 x 60 mm); Power cord, plug, etc.



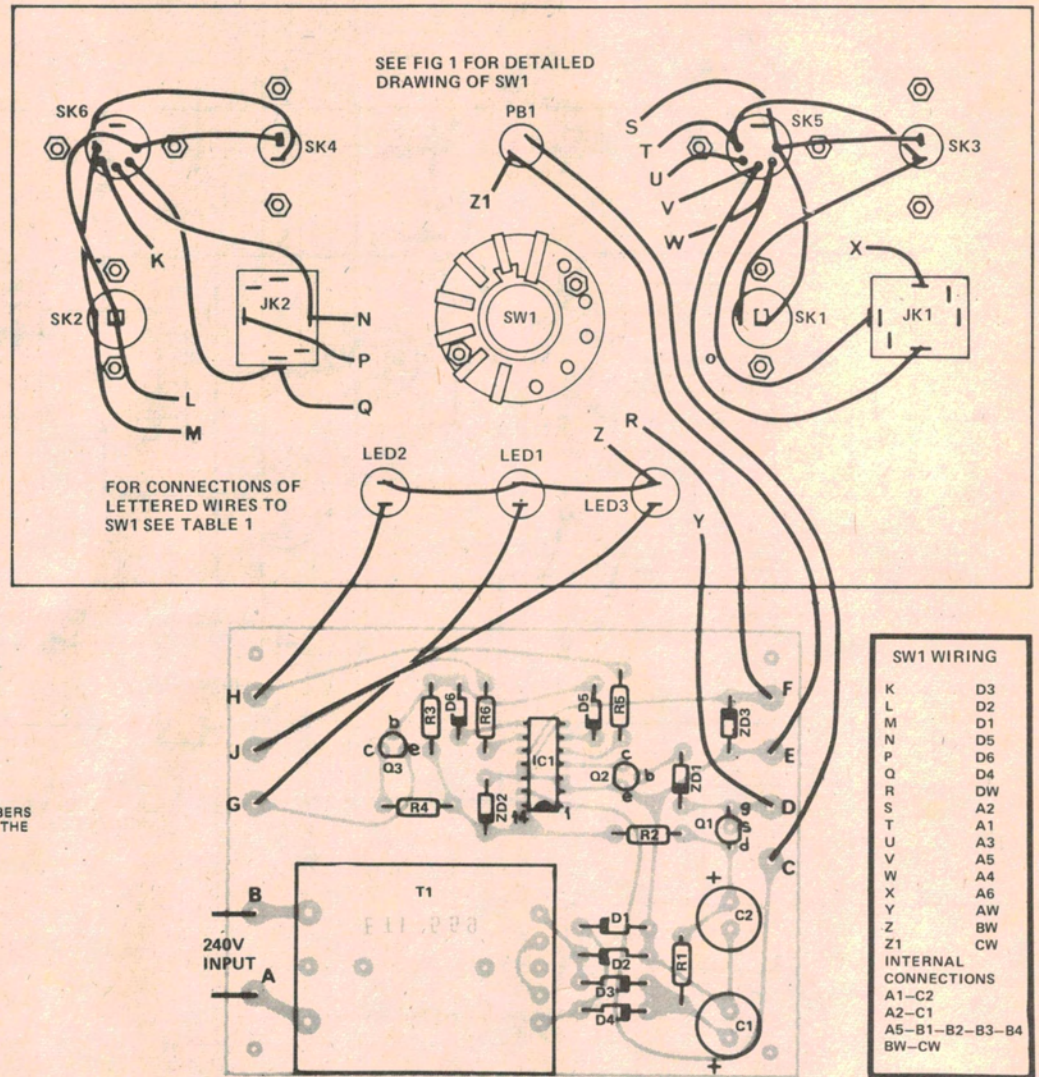


Fig. 3. Component overlay and front panel connections.

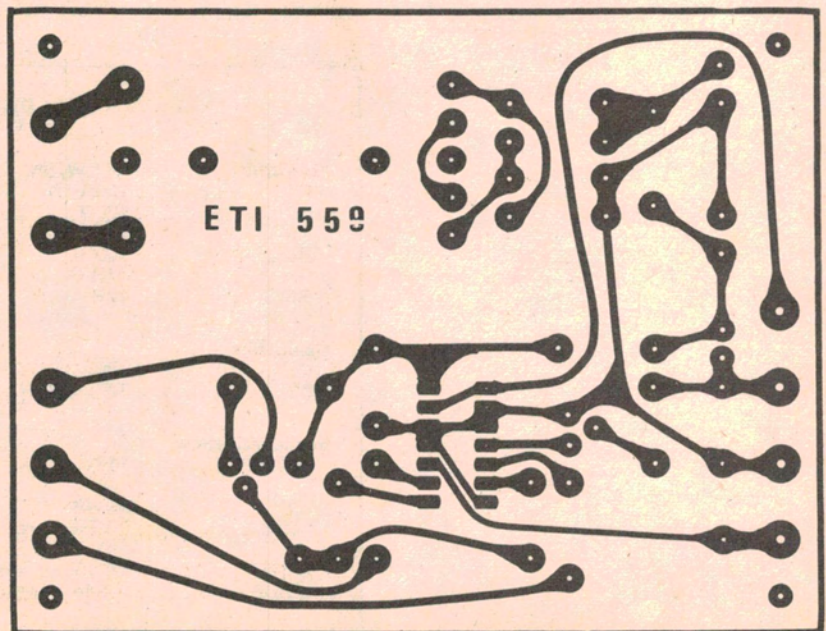


Fig. 4. Printed circuit board pattern (full size).