LIGHT CHASERS
and
SHOP DISPLAYS

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Talking Electronics

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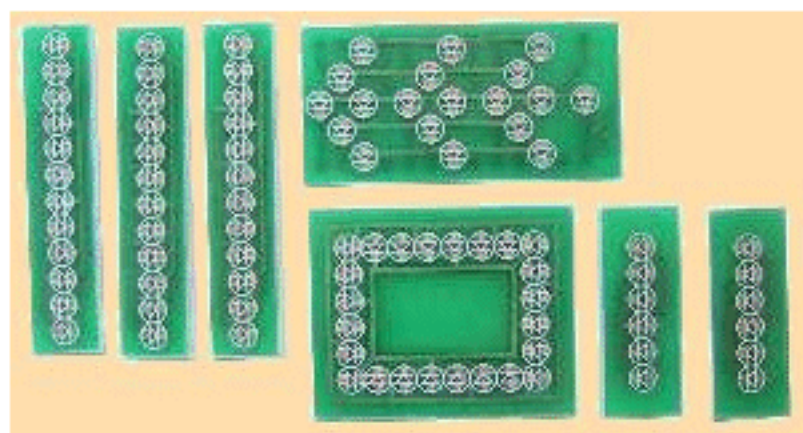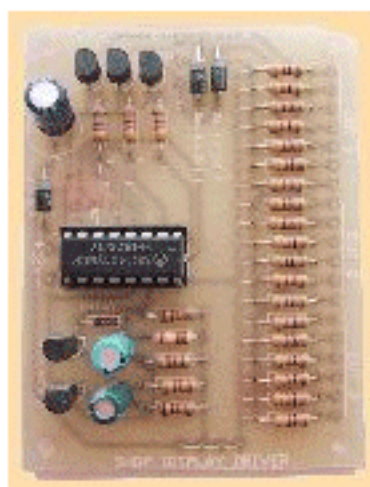# talking@tpg.com.au

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LIGHT CHASERS AND
SHOP DISPLAYS

The potential of flashing lights was seen by shop owners, and soon flashing lights were being employed as 'attention grabbers' in many shops and advertising signs.

Early signs used different coloured neon tubes twisted into the shape of letters or pictures.

Later, fluorescent tubes were used to back - light signs of coloured perspex. These signs did not flash, due to the nature of the fluorescent tube.

Then someone thought of the chaser.

By sequentially illuminating chains of bulbs, an illusion of movement could be generated. Chasers were soon being used around neon advertising signs, and shop windows.

The circuit described here is sure to attract attention from the people viewing your layout. Quite a number of variations are possible using the Shop Display PC board. These are a set of arrows, a window display and five straight lengths, which can be used individually or together.

The driver circuit is made on a separate printed circuit board and is connected to the display board via a set of wires. The project was designed this way so that the main bulk of the circuitry will not need to be mounted in the model shop, but can be placed under the layout with other circuitry.

How it works

Because the shop display driver PC board is designed to be used in several different arrangements, the circuit diagram is a little confusing, so we will look at it in several parts.

The first stage is a two transistor multivibrator operating at 6HZ. The signal from this is fed into the 4017 counter decoder.
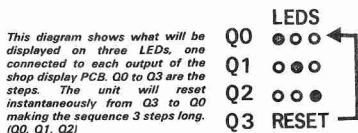
This is where the first decision has to be made. The reset line of the counter can be connected by a link to either output 'Q3' or output 'Q6'. When connected to output 'Q3' the counter will reset after every third pulse, and when connected to output 'Q6' it will reset after every sixth pulse.
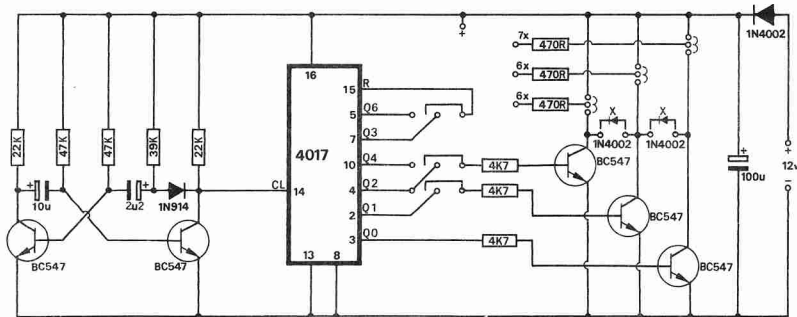
The first two sections of this diagram are self explanatory; the third section has been designed to cater for several different types of display, and is covered in the text. If you wish to change the speed of the oscillator, replace the 10 mfd with an electrolytic of different value.
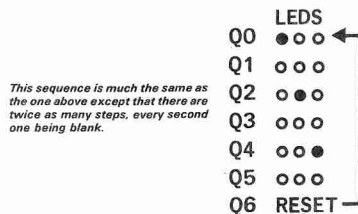
The first output, 'Q0' drives the first buffer transistor. The second buffer transistor can be driven by either output 'Q1' or 'Q2' and the third buffer transistor can be driven by either output 'Q2' or 'Q4'.

When making an ordinary sequencer, the reset pin is connected to 'Q3' and the buffer transistors are driven by outputs 'Q0', 'Q1' and 'Q2'. Wired like this, only one of the three driven outputs will be on at a time, but immediately one output switches off, the next will switch on.

This diagram shows what will be displayed on three LEDs, one connected to each output of the shop display PCB. Q0 to Q3 are the steps. The unit will reset instantaneously from Q3 to Q0 making the sequence 3 steps long. (Q0, Q1, Q2)

LEDS

Q0 ● ○ ○ ◀───
Q1 ○ ● ○
Q2 ○ ○ ●
Q3 **RESET** ───┘

When the reset line is connected to 'Q6' and the buffer transistors are driven by outputs 'Q0', 'Q2' and 'Q4', there will be a blank step between each driven output.

If a LED is connected to each of the driven outputs, this is what you would see.

This sequence is much the same as the one above except that there are twice as many steps, every second one being blank.

LEDS

Q0 ● ○ ○ ◀───
Q1 ○ ○ ○
Q2 ○ ● ○
Q3 ○ ○ ○
Q4 ○ ○ ●
Q5 ○ ○ ○
Q6 **RESET** ───┘

This second type of display would be good with the arrow sign.

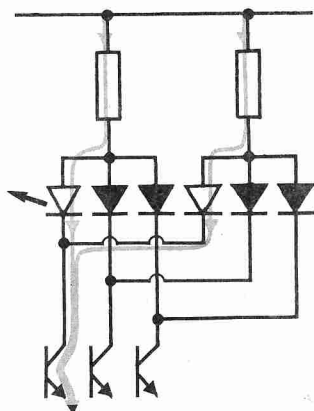Q1   Q2   Q3   Q4   Q5   Q6

By adding the two diodes marked 'X' on the circuit diagram, we achieve this:

Q1   Q2   Q3   Q4   Q5   Q6

Of course it looks much better than these diagrams can possibly show.

Depending on whether you build the arrow sign or the chaser, a different arrangement is needed for the current limiting resistors.

With the chaser, only one LED in three is on at a time, so three LEDs can share each resistor as shown in the diagram above. This reduces not only the number of resistors needed, but also the number of wires between the display and the driver board.
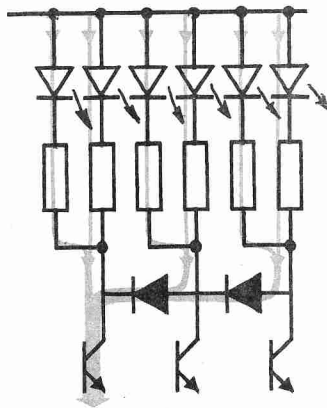

On the arrow sign, there is a cycle when all LEDs are lit, so every LED will need its own resistor.

Construction

Decide which display you are making. This will determine which way you assemble the Shop Display Driver PC board. Look at the two photographs of the assembled Driver board. You will notice some resistors can be mounted in two locations. This is because the PC board is designed to cater for both the arrow sign and the chaser.

If you are making the arrow sign, solder all resistors into the closer holes, and solder a link between the holes marked 'R' and '6'. Mounting the rest of the components is straight forward. Use the diagrams and photographs for part locations. Be careful with the orientation of the 4017 chip. The two 1N4002 diodes in the lower corner are stood on end so they will fit. If you feel like experimenting, try reversing one or both of these two diodes. They are the diodes marked 'X' on the circuit diagram.

For the shop display and chaser bars, the resistors should be mounted between the outer holes. A link should be soldered between the holes marked 'R' and '3'. The two 1N4002 diodes in the lower corner are omitted.
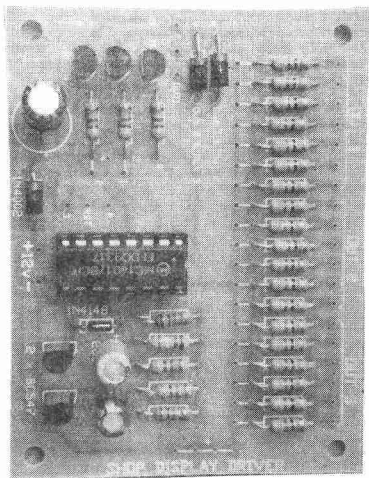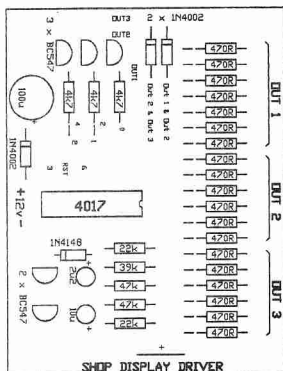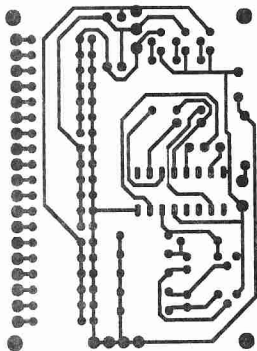
This photograph shows component layout for the Arrow sign. Note the spacing of the resistor leads and the position of the link.
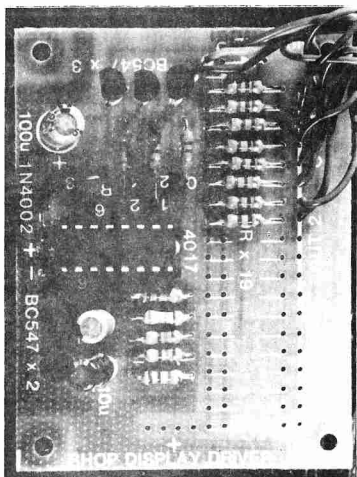
This is the layout used for the shop display and chaser bars. The number of 470R resistors used is determined by the number of leds used, in this case (the shop display) 8 resistors are used for 24 LEDs.

To increase the speed of the chaser, the 2.2mfd electrolytic has been replaced with a 1 mfd.

SHOP DISPLAY DRIVER

The display board

To minimise the wiring needed, the displays are constructed on a double sided PC board. This board measures 9cm x 5,5cm and can be cut into seven smaller boards as needed.

Select the display you want, and cut it from the PC board. Smooth the edges with a file. Insert the LEDs as shown in the diagram. Solder them in, making sure that they are in straight lines and all at the same height. A good way of doing this is to place the board on a piece of expanded polystyrene foam and push the wires of the LED through the PC board and into the styrene.

One wire of each LED can then be soldered on the top side of the PC board, to hold each LED in place. Remove the board from the styrene. Solder all the connections on the bottom of the PC board and trim the leads.

Follow the wiring diagrams and photographs to connect the Display board to the Driver board.

How the display is to be mounted can be determined by you as each model it is to be mounted in will differ. It is possible to cut the centre out of the Shop Display board to give the model more depth.

The arrow sign could be used to indicate the entrance of a multi - storey car park or could be built using orange LEDs and fixed to a trailer to represent a scale road works sign.
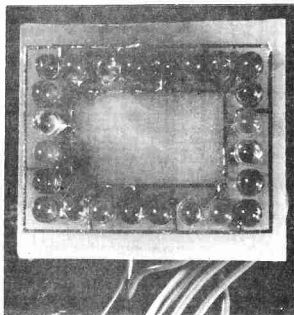
Experiment with this project; many variations are possible.
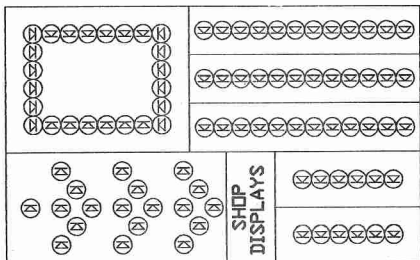
The polarity of each LED on the Shop Display PC board is shown in this diagram.
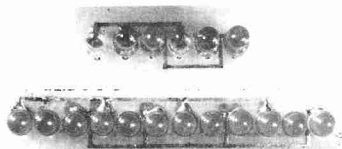

These are the two types of chaser bar provided on the Shop Display PC board. They use the same driver PC board layout as the shop display.


This is the shop display. Make sure all LEDs are mounted in straight rows and are at an even height. See the text above for an easy way of doing this. The centre of the board may be cut out to add more depth to a model if care is taken not to cut the PC tracks.
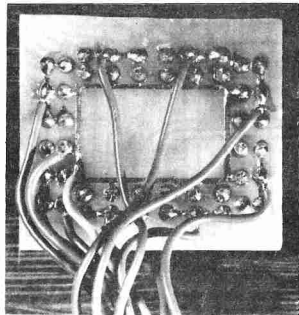

Wiring the shop display. The wiring between the shop display and the driver PC board is shown on the next page.
*Use this photograph as a guide.*
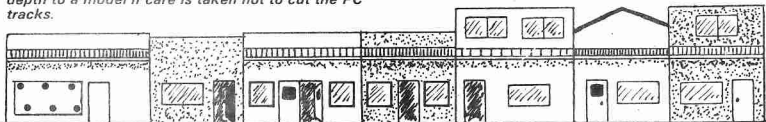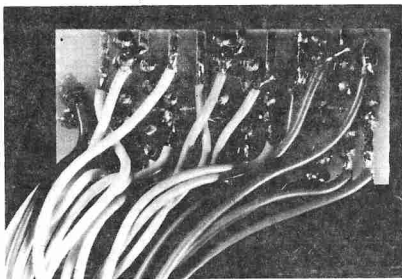
There are twenty wires between the arrow sign and the Shop Display Driver PC board. To avoid wiring errors it is a good idea to use colour coded wires. On this board wire colours corresponded to the colours of the LEDs to which they were connected.
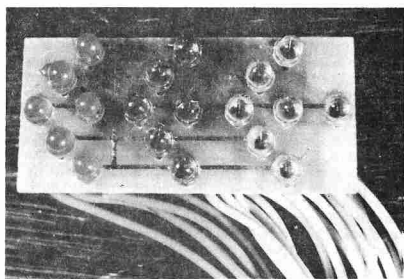
Each arrow head can be made with a different coloured LED. The one shown here uses red, orange and yellow LEDs. If all the LEDs are orange, a model roadworks sign can be made.
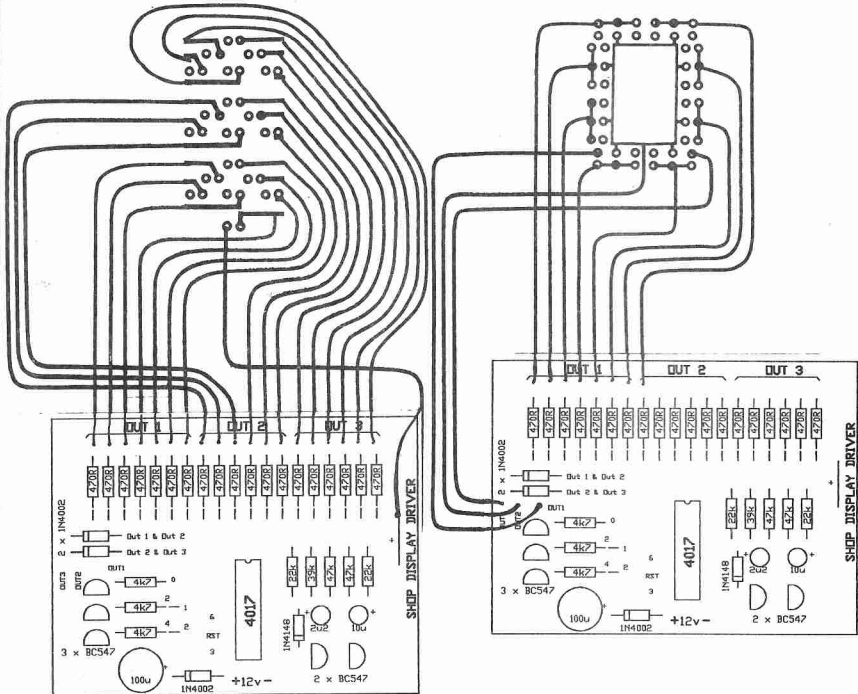
To wire the arrow sign, follow this diagram. The Shop Display Driver PC board must be made as shown in the photograph at the top of page 30.

This is the wiring diagram of the shop display. The Shop Display Driver PC board is made as shown in the photograph at the bottom of page 30.
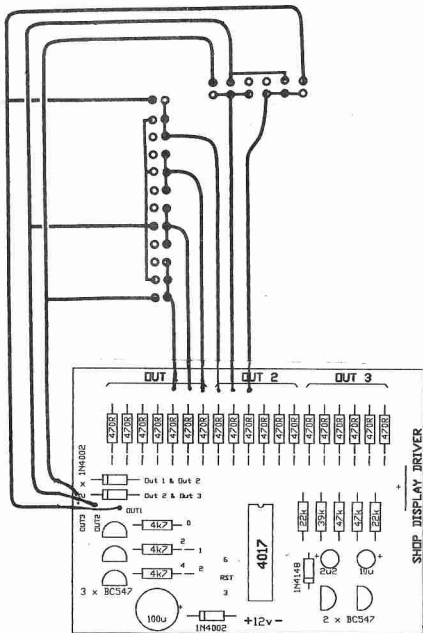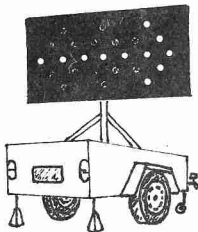
Shop Display Driver Parts List

19 - 470R
3 - 4K7
2 - 22K
1 - 39K
2 - 47K

1 - 2.2mfd electro
1 - 10 mfd electro
1 - 100 mfd electro

1 - 1N914 diode
3 - 1N4002 diodes
5 - BC547 transistors
1 - CD4017

1 - 16 pin IC socket
1 - Shop Display Driver PCB

SHOP
DISPLAYS

The wiring for the chaser bars is essentially the same as that of the shop display. The Driver PC is also made the same way. The board is not limited to driving only two bars as shown, but can drive as many bars as can be supplied by the resistors provided.