FIBRE OPTICS

This kit is available from:

Talking Electronics

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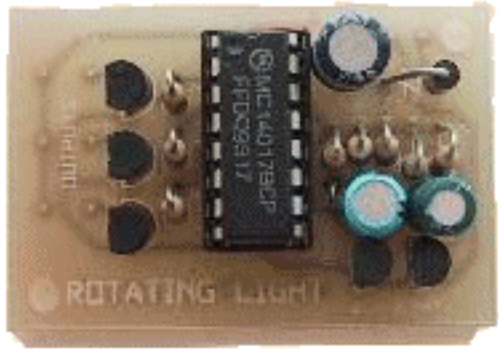
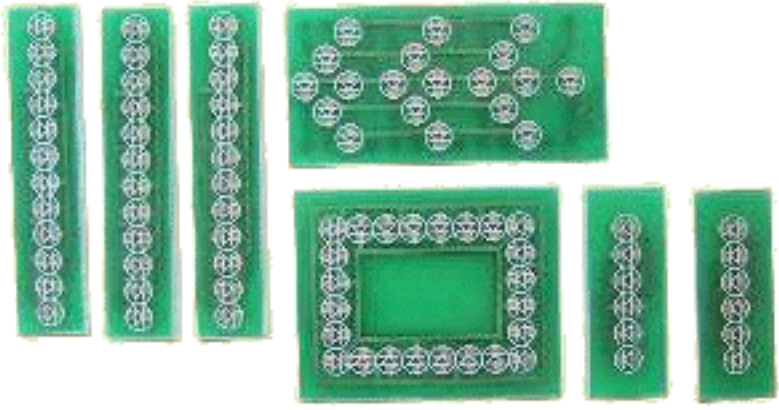
for pricing and postage.



Rotating Light



Shop Displays

FIBRE OPTICS

ON MODEL RAILWAYS

In a time when thin glass and plastic fibres are replacing wires in telecommunications, the potential of fibre optics is sure to be noticed by hobbyists. The most amazing thing about these optic fibres is that they can carry light around bends and over great distances, much like wire, yet without suffering from the electromagnetic interference to which wire is susceptible.

However it is not in communications that fibre optics are of interest to a railway modeller, but rather the optical effects than can be achieved using them. Some modellers may have seen the commercial N scale signals made with fibre optics. They looked a lot better that any lamp based N scale signals I've seen. They are not quite as easy to see as the lamp signals, unless you are looking directly at them, but this could be counted as a plus, as real searchlight signals are designed to be directional to stop false reading.

The use of optic fibre doesn't stop there for the railway modeller either. Those of you who built the advertising displays from Electronics for Model Railways volume #1 would no doubt have wished that the displays could have been closer to scale. Those who model OO scale would soon have realized that at three millimetres diameter, a LED becomes a scale nine inches or two hundred and twenty nine millimetres, and that is one hell of a big lamp! It is possible to achieve a much finer display using fibre optics, and the result could even be quite satisfactory in N scale. The optic fibre I used is half a millimetre in diameter. By the time the end of it has been spread a little to stop it pulling back through its mounting hole, it is very close to an OO scale sixty millimetres, exactly right for the common household light bulb.

The optic fibres could also be used for other simple effects, such as illuminating the torch of a night watchman, miner or a maintenance worker. If enough light is sent down the optic fibre, it is possible to achieve a beam. It is not very strong, but will cast a definite spot on something a few millimetres away. So the scale night watchman has forgotten to replace his torch's batteries...

Scale lamps could be arranged on the front of locomotives. Car headlights would be possible, even in N scale. In HO scale, car indicators would be easier to make than if you had to file down LEDs.

There are still a couple of problems using the optic fibres, and one of them is that any display is directional. In other words, unless you are looking directly at it, you can't see the lights. This can be overcome by putting a matt diffuser over the end of the fibres. Tracing paper or matt drafting film will both work. You could even try some non waxed lunch-wrap paper.

The other main problems are the loss of light down the length of the lower quality plastic fibres, and how to convince the light to go down the fibre in the first place.

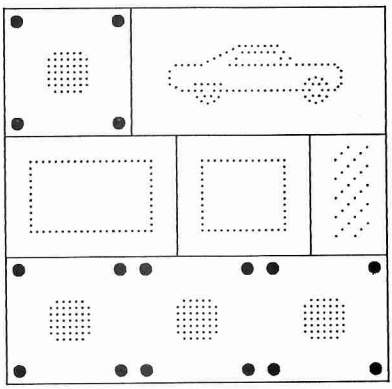
Due to the losses in the fibre itself, LEDs really are not bright enough to drive them. Some success can be had if the fibres are fairly short. Lamps are a much better proposition. You are not limited to grain of wheat bulbs either, as these lamps are going to be hidden under the layout. The small bayonet based 6W lamps, sometimes used for illuminating automotive licence plates, work well. Another problem does arise though. Without proper ventilation for the lamps, it is possible to melt the plastic fibres!

How do you mount the fibres? In the case of a simple advertising sign, fine holes are drilled in a piece of printed circuit board or polystyrene sheet plastic where required. A second piece of board or plastic is also drilled with the same number of holes, but in a different arrangement. This time the holes are arranged so that they are grouped in clusters, one for each lamp being used to drive the sign.

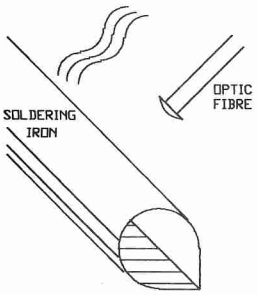
For this example, we will consider that the sign is to be mounted in the window of a plastic model shop, and that the lamps are going to be put under the layout, on the other side of the chipboard on which the building is to be mounted. First a sizable hole will need to be drilled to pass the fibres through. It is better to drill a hole that is too big because trying to enlarge it later will be impossible, and trying to drill a second hole is risky, as it would be easy to slip and destroy the fibres you have already installed. First you will need to work out exactly where the sign is going to be mounted. You can't attach it to the building, because the building will get in the way.

When you have worked out it's exact position, the display board should be securely mounted to the base-board using a couple of small brackets. These can be made of printed circuit board, plastic or even metal.

Once that is done, you can mount the boards that will hold the fibres in front of the lamps. These can be mounted in



The artwork for the display boards. It can be made of any material. If you use plastic, take care not to melt it with your lamps.



Use a hot item such as a soldering iron to flatten the ends of the fibres. Do not actually touch the fibre with the iron. Let the radiated heat do the work.

several ways, depending on which you feel the most suitable. They can be mounted at right angles to the bottom of the base board using brackets. Alternately, if you wish to drill three large holes in the base-board, you can fix the lamp boards directly over the holes, saving yourself the effort of making brackets. The fibres will be shorter this way too, but there is more chance that the light from the lamps will leak into the building itself, through unused holes in the lamp boards.

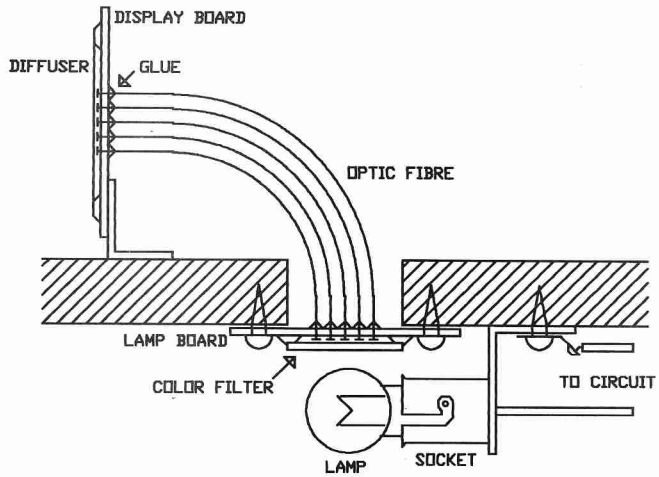
Now that both boards are securely mounted in their final locations, a length of fibre is passed first through the hole on the lamp board then run up to the display board and through the correct hole.

Now you need to stop the fibre from pulling back through the hole. If you hold the end of the fibre close to the side of your soldering iron, it will flatten out or thicken, depending on the fibre. Take care not to touch the iron. Also try to make the "knobs" on the ends of all the fibres the same. Now pull the fibre back so that no excess is sticking out from the front of the display. A small dab of glue can now be applied to the back of the display to hold it in position. Test your glue first. It must not react with the plastic of the fibre. PVA or "white" glue is suitable. You may like to leave the gluing step until you have a few fibres ready, to save time and effort.

Be careful not to pull the fibre too tight around any sharp corners, as it will break. With most of the slack removed, snip the fibre off in the other side of the lamp board, and once again hold the soldering iron near it to flatten its end. Glue the fibre where it passes through the board near the lamp. The process is fairly simple, but repetitive. You will have to do the same thing for every other fibre in the display.

The board artwork given is for a three step running light pattern, much like the ones done with LEDs in the Shop Displays Article in the last book. In fact the circuit can be used to drive this display. Replace the transistors with more suitable ones if you choose to use heavier lamps. Either BC338's or BD139's would do the job. BD139's can be heatsinked, which may be advantageous.

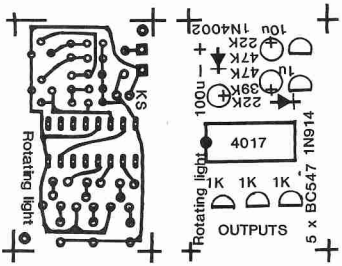
When you are running the fibres, take them in turn to each of the three lamps. Take care not to foul up the order as it will leave a hiccup in the display. The display can be colored very easily. Simply slip a colored filter between the lamp and the ends of the optic fibres.



This is how you could set up the lamps and dispay boards. Of course, if you are making a running light display, there will be three lamps. The rectangular display boards are arranged so that the number of holes can be divided by three so that the pattern will look correct.

The exact shape and size of your display will depend on where you plan to mount it and what you intend to advertise. The artwork I have provided includes two simple rectangular signs, an angular pattern and a stylized car. With the latter, I illuminated the outline of the car with one constantly lit lamp, and used the three step sequencer to make the wheels look as if they were rotating. It's a great way to indicate the entrance to an underground car park. As the wheels of the car require few fibres, there are plenty of spare holes left to drive another of the signs. The car can be made facing either direction too.

When you have finished running all the fibres, the shop building can be positioned over the display again. If you find you require a light shield inside the building, one can easily be made from some opaque cardboard. Light shields will also be needed between the lamps under the layout.



The rotating Light board and circuit diagram. Replacing the output transistors with BC338s or BD139s will allow larger lamps to be switched. As each lamp is on for only a third of the time, there should not be too much dissipation.

PARTS LIST

Rotating Light

3- 1k
2- 22k
1- 39k
2- 47k

1- 1uF 16V Electro
1- 10uF 16V Electro
1- 100uF 25V Electro

1- 1N4002
1- 1N4148
2- BC547 Transistors
3- BC338 Transistors
1- 4017 Decade Counter

1- 16 pin IC socket

1- **ROTATING LIGHT PCB**

PARTS LIST

FIBRE OPTIC DISPLAY

10 metres of 0.5mm Optic fibre

FIBRE OPTIC DISPLAY BOARD