DELAY MODULE

This kit is available from:

Talking Electronics
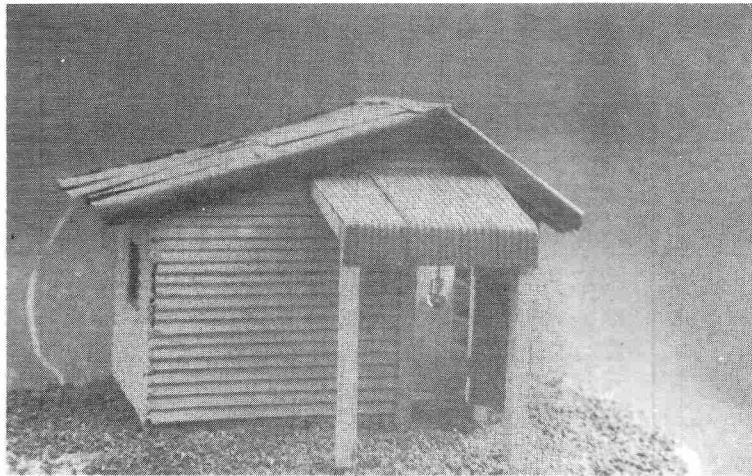
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DELAY MODULE

Although it can't do a great deal by itself, this accessory will come in handy any time you need a short delay in the control circuits of your layout, be it turning on lights, controlling crossing gates, or just stopping something from powering up before another part of the circuit is ready.

A trackside shed. Its lights come on a short while after all the street lamps. The small "light bulb" that hangs from the verandah roof is in fact a small LED.

This circuit is really just a building block or accessory. By itself, its uses are limited. All it does is to provide two delays with transistor buffered outputs, of several seconds. The delays are totally independent of each other though they can be cascaded. The outputs can be used to drive lamps, LEDs, or with the addition of a diode, relays. Each delay's turn off time is the same as its turn on time.

So what can it be used for? Remember my comment in the Dedicated Microcomputer System article on the use of personal initiative delays for switching on and off house and station lights when your street lights come on automatically. This board will do the job. It contains the transistor to CMOS interface required to connect it to the buffered transistor outputs of the DMS Output Module. In fact, it can be connected to the NPN transistor buffers on many of the circuits presented in this book.

The delays can also be used in conjunction with the Servo Driver circuit when a set of crossing gates (not boom gates) is being modelled. If the gates you have are across a double line, you probably won't have a problem, but if you have them across a single line, the gates must be opened or closed one at a time, or they will hit each other. If the delay is put between the driver for the servo on one gate and the driver for the servo on the other, it is possible

to have the gates open and close one at a time automatically.

ABOUT THE CIRCUIT

The delay module consists of two almost identical circuits. The only difference is the value of the delay resistor. In the upper delay it is 560k. In the lower one it is 470k. Of course another value can be substituted for this resistor if a different length delay is required.

The delays each have a dual input circuit, allowing them to be interfaced directly to a CMOS control signal or to a transistor buffered output. The input mode is selected by a link. If a CMOS control signal is being used, it is fed directly into the delay at the pad marked "N". The pad marked "C" is for the common or 0V line that must also be used unless the circuits are running on the same power supply.

If the delay is being driven by a transistor buffer such as an output on the DMS output module, the other input is used. It is the pad marked "T" (for transistor). When this input is used, a link must be soldered between the pads marked "N" and "L".

When an NPN transistor buffer is switched on, the collector of the transistor is very close to 0V. This means that we
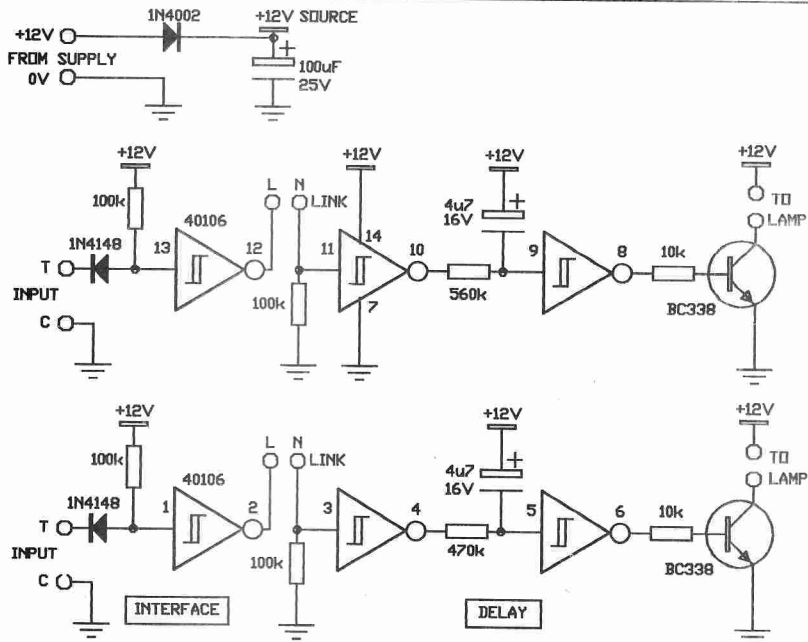
The **Delay Module Circuit.**

have a 0V level for the "ON" condition, which is back to front for the positive logic (HIGH = ON) that the delay uses. This negative logic "ON" state is converted to positive logic by the "interface" inverter before being fed to the delay. The diode and 100k pull-up resistor allow the module to be used in conjunction with drivers that are running off a supply voltage greater than 12V. However if the voltage the driver is being run off is less than about 9V, the interface will not work in some cases, seeing the input as a constant LOW.

When a HIGH is put on the "N" input of the delay by either an external source or the interface, the output of the first delay inverter will go low and start to charge the 4u7 electrolytic capacitor via the 560k resistor. When the voltage across the capacitor reaches about 8V, the output of the second inverter in the delay will go HIGH, switching on the output transistor. The capacitor will continue to charge until it has almost 12V across it but no further changes will occur at the output.

When input "N" of the delay goes LOW again, the output of the first inverter in the delay will go HIGH. The capacitor will now discharge through the 560k resistor. When the voltage at the input of the second inverter in the delay reaches about 8V, its output will go LOW again and switch off the output transistor. C1 will continue discharging until there is almost 0V across it.

The reason the capacitor is connected between the 12V rail and the input, rather than the more common 0V to input arrangement is to do with how the circuit starts when power is first applied. The input to the delay is most likely to be LOW on power up, and thus the output of the first inverter in the delay will initially be HIGH. This would normally discharge the capacitor but since the capacitor will not yet have been charged, it will already be holding the input to the second inverter HIGH. All this means is that the delay will start in the OFF condition. If the capacitor was referenced to the 0V rail, there would be strange occurrences, such as crossing gates opening and closing, while the capacitor charged.

CONSTRUCTION.

The delay module is built on a printed circuit board measuring 56mm by 48mm. Start construction with the lower components such as the resistors and the socket. Take care withe the orientation of the capacitors, diodes and the chip, when you finally insert it in the socket. The 40106 is CMOS, so try to avoid handling the pins of the device as it is susceptible to static. If you intend to connect the Delay Module inputs to the transistor buffered outputs of another project, make sure you remember to link the "L" and "N" pads in each delay.

TO DMS OUTPUT MODULE

TO DMS

LINK
LINK

+12V
0V

o C
o T
o N
o L
o L
o N
T o
o C

LAMP LAMP

DELAY MODULE

PARTS LIST

2- 10k
4- 100k
1- 560k
1- 470k

2- 4u7 16V electro
1- 100uF 25V electro

1- 1N4002
2- 1N4148
2- BC338 Transistors
1- 40106 Hex Schmitt Inverter
1- 14 pin IC Socket
1- DELAY MODULE PCB

This diagram shows how to wire the Delay Module for use with the DMS. As is shown, you can connect the input of one delay to the output of the other to cascade them.

The printed circuit artwork for the Delay Module.