**SD4 Multiple Aspect Signal Driver**           **June,1999**
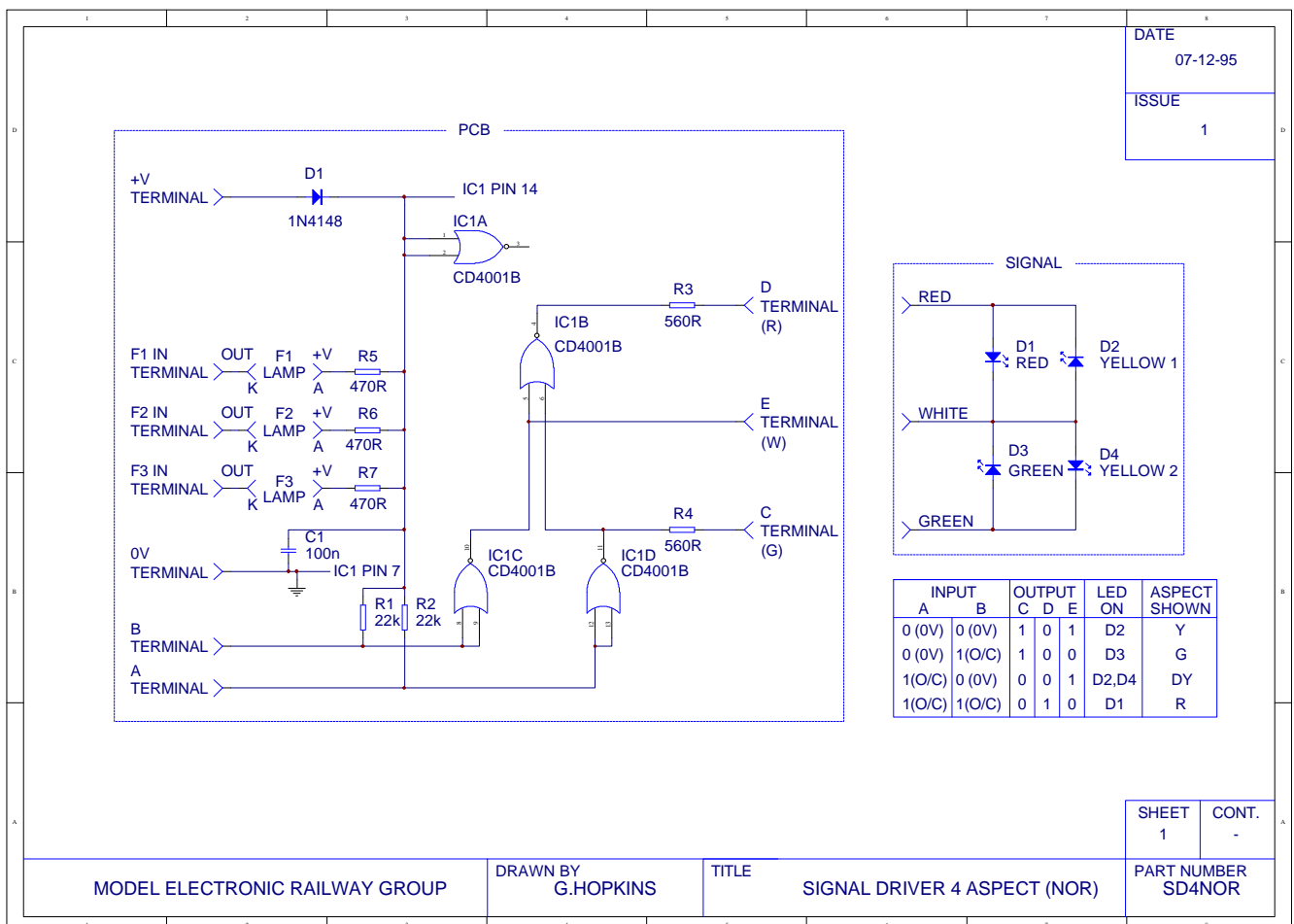
## Introduction.

This accessory is designed to be layout mounted, adjacent to the signal to be controlled. The signal aspect is coded as two bit binary for three and four aspect signals and one bit binary for two aspect signals. Provision is also made for driving up to three sets of feathers for route indication. The SD4 can also be used with systems other than the RPC if required.

## Interface Specifications.

- **Power Requirements** +5V to +15V DC Regulated Supply (CMOS Operating Range).
- **Binary Aspect Inputs** Open Collector Compatible (Connect to 0V or leave O/C).
- **Signal Lamp Outputs** Current Limited for direct LED connection.
- **Feather Inputs** Open Collector Compatible (Connect to 0V or leave O/C).
- **Feather Outputs** Current Limited for direct LED or bulb connection.

## Circuit Diagram.



| INPUT | | OUTPUT | | | LED ON | ASPECT SHOWN |
|---|---|---|---|---|---|---|
| A | B | C | D | E | | |
| 0 (0V) | 0 (0V) | 1 | 0 | 1 | D2 | Y |
| 0 (0V) | 1(O/C) | 1 | 0 | 0 | D3 | G |
| 1(O/C) | 0 (0V) | 0 | 0 | 1 | D2,D4 | DY |
| 1(O/C) | 1(O/C) | 0 | 1 | 0 | D1 | R |

DATE 07-12-95

ISSUE 1

MODEL ELECTRONIC RAILWAY GROUP

DRAWN BY G.HOPKINS

TITLE SIGNAL DRIVER 4 ASPECT (NOR)

PART NUMBER SD4NOR

SHEET 1    CONT. -

## Circuit Description.

The binary coded inputs are connected to IC1c and IC1d via pull-up resistors R1 and R2. IC1c and IC1d are connected as inverters and also act as buffers for LED driving. The outputs of IC1c and IC1d are also connected to the inputs of IC1b. The output of IC1b is used for LED driving. The circuit exploits a feature of the 'NOR' gate, which is demonstrated in the Truth Table shown on the circuit diagram, i.e. with the LED arrangement shown, all four aspect combinations required are created for the two bit binary input. This arrangement also reduces the number of wires required to connect to the signal head to three. It can be shown that a similar effect can be achieved with a 'NAND' gate, with an altered LED arrangement. The (slight) advantage of the 'NOR' version is that if the inputs become disconnected, the signal goes to Red. Similarly, when the RPC System is initialised, this will default the signals to Red. Current limiting resistors R3 and R4 are provided on board rather than fitting them to the signal itself. Two resistors are used rather than a single one in the Common (White) lead to balance the current between the Yellow LEDs when Double Yellow is shown. For three aspect signals, omit the upper Yellow LED (D4), and only apply the appropriate binary input combinations. For two aspect signals, replace the lower Yellow LED (D2) with the Green LED, do not fit D3 and D4, and connect the single input to both A and B.

Feathers are connected to the terminals as shown. R5,6,7 provide current limiting for these LEDs. Each Feather input must be driven from a separate Open Collector driver or switch. Grain-of-Wheat bulbs could also be used for the Feather illumination, but lower value resistors may be required to allow for their higher current consumption. This may also affect the choice of D1 which is provided to give reverse polarity protection, but whose rating is only 75mA. A 1N4001 could be fitted instead if necessary. C1 provides supply decoupling for IC1.

The values of the current limiting resistors may be varied to suit the supply voltage and rating of LED used. The values shown are suitable up to around +8V. Higher values must be used if the supply voltage is greater than this.

## PCB Layout and Overlay
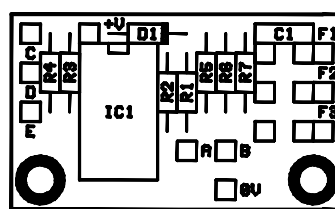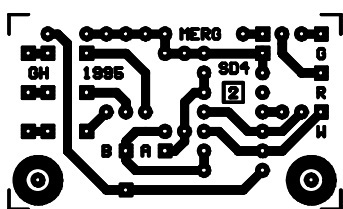


## Parts List

| Resistor  | 470Ω ¼W      | 3 off  | R5, R6, R7 | *see text |
|-----------|--------------|--------|------------|-----------|
| Resistor  | 560Ω ¼W      | 2 off  | R3, R4     | *see text |
| Resistor  | 22k ¼W       | 2 off  | R1,R2      |           |
| Capacitor | 100n         | 1 off  | C1         |           |
| Diode     | 1N4148       | 1 off  | D1         | *see text |
| IC        | CD4001BE     | 1 off  | IC1        |           |
| Veropins  | 1mm single   | 16 off |            |           |
| Spacers   | M3 x 3mm     | 2 off  |            |           |