RJ45 'Running-Lights' Cable Tester

By Flemming Jensen
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Remarkably, it has no microcontroller (hooray!) and no common ground lead (huh?).

This cheap & cheerful circuit is indispensable if you are suspicious about a defective RJ45 cable in the patch cabinet or anywhere else for that matter. Connect the Master (sender) to one end of the cable under test (C.U.T.) and the Slave (receiver) to the other end. If the LEDs light up in succession then the cable is okay. If not, flaunt the cable to the IT Manager, drop it in His trash bin (with a fanfare) and ask a raise as a reward for keeping the company in business.

Let's look at this clever money making gadget then. Remarkably, it has no microcontroller (hooray!) and no common ground lead (huh?).

Each of the 4017's counter outputs CT0–CT7 has its own LED and wire in the cable under test but no wire is required for the ground return current. When one of the 4017 counter's outputs is logic High due to the clock pulses from IC1 a current flows through the corresponding LED and normally returns to ground (GND) via diodes D1-D8 or the reverse connected LEDs, by way

of the Low outputs of the 4017. You either fit eight dual colour LEDs in positions D11-D18, or eight diodes in positions D1-D8 and eight high efficiency LEDs in positions D11-D18.

No buffers are needed between the 4017 and the LED array at the other end of the C.U.T. considering the IC is capable of sourcing the necessary current. Current limiting resistors R4–R11 are required though in view of the 9-volt supply voltage. The speed of the running lights is adjustable on preset P1 within a certain range.

The LEDs tells a thing or two on the cable under test, as follows.

- RJ45 cable all right and straight through: LEDs light in succession like a small running lights.
- One or several wires are shorted: one or several LEDs light all the time.
- One or several wires broken: one or several LEDs off permanently.
- One or several wires connected to a wrong pin: running lights erratic (jumping around).

D1...D8 = 1N4148
D9...D16 = Duo LED

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IC1 = CD4011
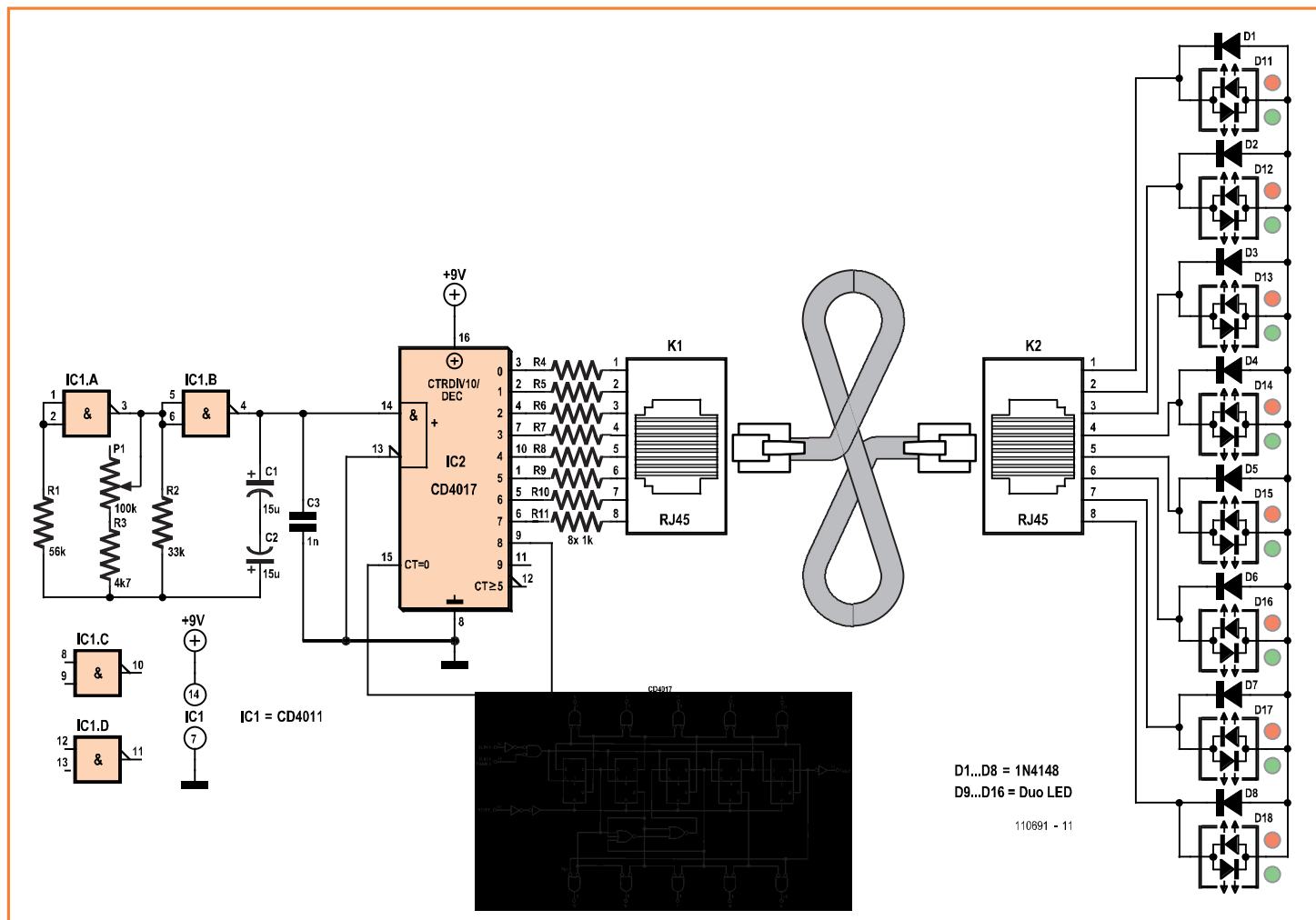
The Master and Slave circuits are built as separate units pictured here. The two boards are separated by sawing along the dashed line on the component overlay. Note again that on the Slave board you fit either the dual LEDs or the single color LEDs and diodes D1-D8. The photograph shows the first option.

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COMPONENT LIST

Resistors
R1 = 56kΩ
R2 = 33kΩ
R3 = 4.7kΩ
R4–R11 = 1kΩ
P1 = 100kΩ preset, vertical

Capacitors
C1,C2 = 15µF 16V radial
C3 = 1nF

Semiconductors
IC1 = CD4011 or HEF4011
IC2 = CD4017 or HEF4017
D1–D8 = 1N4148*
D9–D16 = LED, dual-colour low-current, or single colour LED*

Miscellaneous
K1,K2 = RJ45 CAT5E socket, PCB mount, e.g. Farnell # 2060718

PCB # 110691

* either/or (see text)