



MISSION BOOKLET

Slot Cars

A switch gives you one speed. A trigger gives you every speed, and the trigger gets hot.

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Slot Cars

A switch gives you one speed. A trigger gives you every speed, and the trigger gets hot.

A slot car controller is a pistol grip with a rod of resistance wire inside it, and that rod is the only part of a slot car set that is not obvious. Four circuits get to it: a switch, which gives you one speed and is useless on a corner; the rod, which gives you every speed between 3,785 turns a minute and 1,067 and gets hot doing it; a light cell at the start line that counts a lap by watching a shadow; and two lanes off one battery, where the surprise is that the other driver's trigger cannot touch you at all.

Flat Out or Nothing

BEFORE

Two rails, a switch and a motor. That is a slot car track before anybody adds a controller, and it is no good on a corner.

AFTER

Closed, the loop settles at 3,813 turns a minute and 58 mA. Open, there is no loop. A switch has two states and so does the car.

HOW PEOPLE GOT THERE

1957 Fred Francis showed Scalextric at the Harrogate Toy Fair in 1957: tinsplate cars with a pin riding in a slot and two rails either side of it feeding the motor. The slot did the steering, so the only thing left for a driver to decide was how fast.

Minimodels Ltd, Scalextric, launched at the Harrogate Toy Fair, 1957.

The Trigger

BEFORE

To have any speed between stopped and flat out, something in the loop has to take volts away from the motor. A switch cannot: it is a wire or it is a gap.

AFTER

A hundred ohms of resistance wire on a rod, with a slider: 3,785 turns a minute wide open, 1,067 at the bottom. The current never moves off 58 mA, so what the rod takes is volts, and volts times amps is heat — which is why it is rated five watts and the kit's knob is rated a quarter.

HOW PEOPLE GOT THERE

1888 Frank Sprague's Richmond streetcars ran on the same idea at ten thousand times the size. The motorman's handle cut resistance out of the motor circuit notch by notch, and banks of iron grids under the car got rid of the surplus as heat. A controller that throttles by burning what it takes is not a compromise; for fifty years it was how anything electric got going.

Frank J. Sprague, Richmond Union Passenger Railway, in service 1888.

The Start Line

BEFORE

A race needs a referee that can count. Nobody watching two cars at seventeen centimetres a second is going to do it honestly.

AFTER

A cell under a 10 kΩ resistor: lit it is about 1.9 kΩ and the clock pin sits at 1.4 V, and a car in the beam takes it to 300 kΩ and 8.7 V. That swing is one edge, and one edge is one lap.

HOW PEOPLE GOT THERE

1873 Willoughby Smith was testing Atlantic cable with selenium resistors when he found they would not hold still: the resistance dropped whenever light fell on them. He had not been looking for it and it ruined the test set, but it is the whole reason a shadow can be a signal.

Willoughby Smith, "Effect of Light on Selenium during the passage of an Electric Current", Nature, 20 February 1873.

Two Lanes

BEFORE

Two cars, two triggers, one battery. If one driver can reach across and slow the other down, it is not a race.

AFTER

They cannot. Each lane draws 58 mA whatever its trigger is doing, so the battery sees the same 115 mA all race long. What a second car does cost is real and is not the trigger: joining the race drops lane one from 3,785 turns a minute to 3,772, through the half ohm inside the cell.

HOW PEOPLE GOT THERE

1882 Edison's Pearl Street station lit its first square mile in 1882, and the problem that nearly sank it was this one: every lamp shared one supply, and the resistance of the mains meant the lamps at the far end dimmed as the near ones came on. His answer was feeders and mains — thicker copper where the current adds up — which is the same answer a slot car set gives when it runs heavy rails.

Thomas Edison, Pearl Street Station, New York, in service 4 September 1882.

Colophon

Generated from the modules the bench runs on; every circuit in this booklet is the circuit the simulator solves, and every word beside it is the word the manual panel prints.

Built 2026-09-19 from commit 4bb5c80.

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