

Investigating the motion of a model dragster - Technicians' Guide

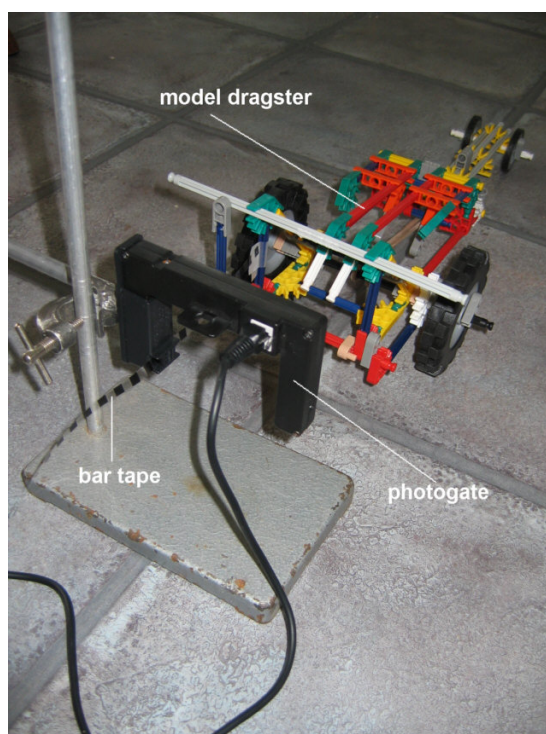


Figure 1 Set up of model dragster, photogate and bar tape

Equipment required

Vernier *LabQuest* and associated power adaptor/charger

photogate VPG-BTD

bar tape TAPE

bar tape adaptor for photogate (see construction details)

sensor cable

retort stand

bosshead

K'Nex[®] rubber band racer/dragster *

sticky tape

ruler

plastic construction card, black, 1.5 mm thick Hobby ref: PS0160B (W Hobby or local model shop)

liquid polystyrene cement Hobby ref: GLU8 (W Hobby or local model shop)

Araldite epoxy resin glue rapid setting

length of pine stripwood 2.5cm x 2.5cm B&Q ref: FB997 or 1.25cm x 1.25cm

B&Q ref: FB1006 (B&Q or other DIY)

spray can of matt black paint

reel of black pvc sticky tape

*From K'Nex Forces, energy and motion kit Rapid ref: 70-0950 (Rapid Electronics)

Construction details

Rubber band racer/dragster:

Assemble a K'Nex rubber band racer/dragster ensuring that it has a ratchet and pawl mechanism, and quick release, incorporated as shown in Figures 2a and 2b. Also put a silver mark on one of the large wheels – this will be used to aid the counting of winds.

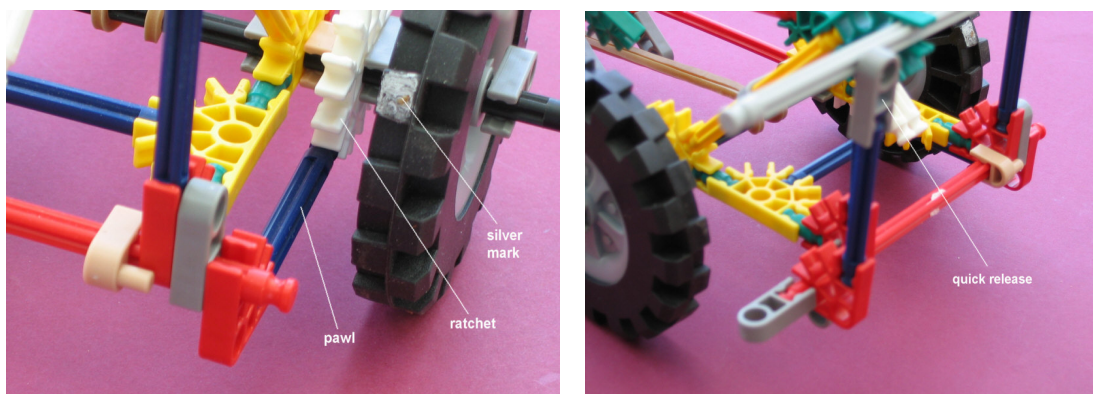


Figure 2 (a) Ratchet and pawl mechanism, and (b) quick release

Bar tape adaptor for photogate:

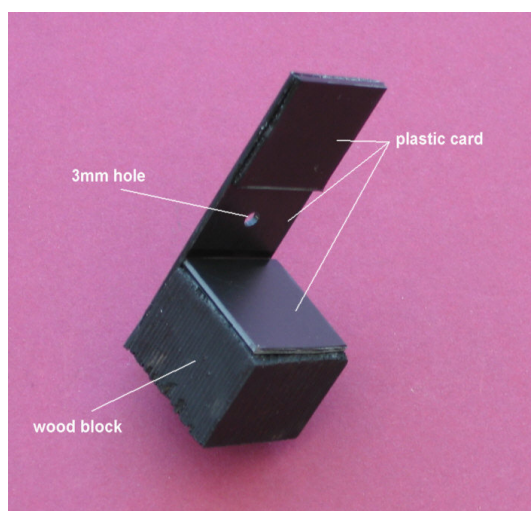


Figure 3 Bar tape adaptor

Notes for current version of photogate:

Saw off a 2cm length of the 2.5cm x 2.5cm stripwood. Spray this piece of wood matt black. Cut off the following lengths of plastic construction card: 6cm x 2.3cm, 2.5cm x 2.3cm, and 2.3cm x 2.3cm,.

Use the epoxy resin glue to fix the piece of wood to the bottom end of the longest piece of plastic construction card. With the same glue fix the 2.5cm x 2.3cm piece of card to the top surface of the piece of wood butting up against the other piece of plastic card. Using liquid polystyrene cement, stick the 2.3cm x 2.3 cm piece of plastic card to the inside surface of the longer piece of plastic card so that there is a gap of 1.7cm between it and the smallest piece of car

which had been glued to the wood block. This should leave a 'groove' through which the bar tape can slide. Finally drill a 3mm hole in this 'groove' to match with the hole in the photogate behind which is the photodiode.

Notes for older version of photogate:

Saw off a 1cm length of the 1.5cm x 1.5cm stripwood. Spray this piece of wood matt black. Cut off the following lengths of plastic construction card: 5cm x 1.4cm, 2.3cm x 1.4cm, and 1.5cm x 1.0cm.

Use the epoxy resin glue to fix the piece of wood to the bottom end of the longest piece of plastic construction card. With the same glue fix the 1.5cm x 1.0cm piece of card to the top surface of the piece of wood butting up against the other piece of plastic card. Using liquid polystyrene cement, stick the 2.3cm x 1.4cm piece of plastic card to the inside surface of the longer piece of plastic card so that there is a gap of 1.7cm between it and the smallest piece of card which had been glued to the wood block. This should leave a 'groove' through which the bar tape can slide. Finally drill a 3mm hole in this 'groove' to match with the hole in the photogate behind which is the photodiode.

The adaptor then fits over the photodiode end of the photogate and is secured in place with a piece of black pvc tape as shown in Figure 4.

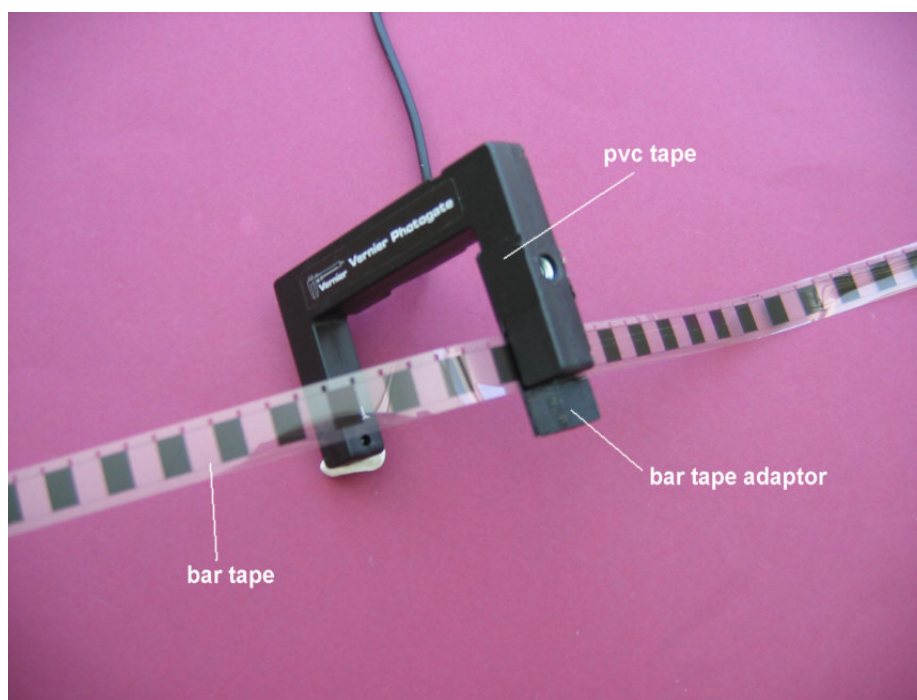


Figure 5 Bar tape adaptor in place on photogate

The bar tape, with the sprocket holes at the top, should slide easily through the groove.

Suppliers

W Hobby Limited
Knight's Hill Square
London SE27 0HH
Tel: 020 8761 4244
Web: <http://www.hobby.uk.com>
E-mail: mail@hobby.uk.com

Rapid Electronics Limited
Severals Lane
Colchester
Essex CO4 5JS
Tel: 01206 751166
Fax: 01206 751188
Web: <http://www.rapidonline.com>
E-mail: sales@rapidelec.co.uk

Key setup details

Sensor: Photogate in port DIG 1
LabQuest Settings: Number of points for derivative calculations 15
Mode: Photogate Timing, Motion, Bar Tape or User defined, with stop button