

## Investigating Force and Acceleration with an Action Man® Bungee Jumper – Technicians' guide



Figure 1 Bungee jump setup with Force sensor and the ALBA Ranger ultrasonic motion sensor

### Equipment required

computer, monitor etc.

ALBA software

ALBA interface and logger S1-1000.00 and associated power supply

ALBA Ranger (Ultrasonic Motion sensor) B1-2000.00 and associated power supply

Dual range force meter 33-1100.00

retort stand and bosshead

BluTack® or Plasticene®

G-clamp

Action Man® toy (Try charity shops if you do not have one readily available.)

jumping platform (see construction note)

Flat strip elastic 3/16" ELA316 (W Hobby Ltd\* or local model shop)

pvc covered single core 28swg wire

220mm x 320mm x 1.5mm black plastic sheet PS0160 (W Hobby Ltd\* or local model shop)

Sticky pads

**Note:** The elastic needs to be selected for reasonable elasticity. If bare rubber strip cannot be obtained try hat or knicker elastic, the last of these can be cut length-wise to increase its 'stretchability'. Use the pvc covered wire to firmly attach the elastic to the Action Man®. Cut the black plastic sheet to form a 6cm x 6cm square and attach to the Action Man's head/helmet with a sticky pad. The length of the elastic needs to be such that, on the model bungee jumper falling from immediately beneath the Force sensor hook, it falls to within not less (but close to) 25cm of the motion sensor.

## Supplier

W Hobby Limited\*  
Knight's Hill Square  
London SE27 0HH  
Tel: 020 8761 4244  
Fax: 020 8761 8796  
E-mail: mail@hobby.uk.com  
Web: <http://www.hobby.uk.com>

## Construction note: Jumping platform

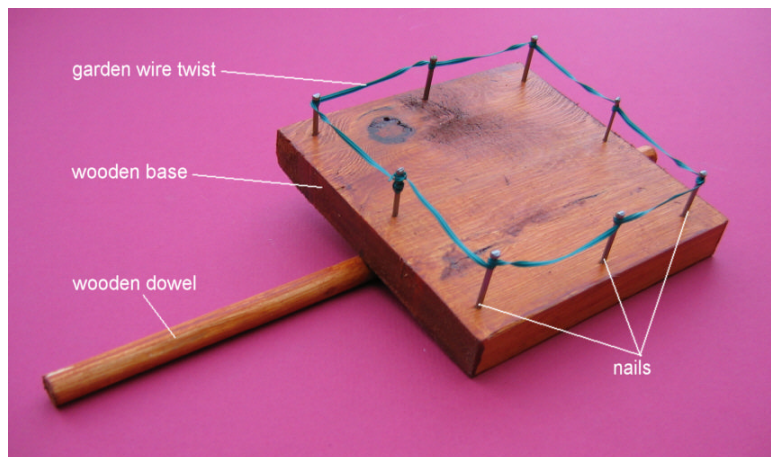


Figure 2 Jumping platform

Wood 15cm × 15cm × 1.5cm or near (B&Q or local DIY store)  
Wooden dowel 30cm × 1cm diameter or near (B&Q or local DIY store)  
Nails (B&Q or local DIY store)  
Cup hook (B&Q or local DIY store)  
Garden wire twist (B&Q or garden centre)  
Wood stain (B&Q or local DIY store)

Hammer nails round the top edge of the wood base to make 'railing supports' and then wind garden wire twist round these to make the 'railings'. Nail the wooden dowel to the underside so that one end of it can support the force sensor and its other end can fit into a boss. Stain the wood to give it a more professional finish. Screw the cup hook to the underside of the platform for use without the force sensor in place.

Whilst the construction of a jumping platform may seem 'over the top', it does provide a more realistic context for the activity and also is a useful place on which to rest the Action Man<sup>®</sup> before release.

The ALBA Ranger will need support on its underside with BluTack<sup>®</sup> or Plasticene<sup>®</sup> in order to make its ultrasonic sensor point vertically upwards.

Both the ALBA interface and ALBA Ranger can be set up on one computer so that half the screen shows the Force-time graph and the other half the Acceleration-time graph. Whilst Serial/USB converters can adapt the serial versions of this hardware to USB ports, new direct USB versions are shortly to be released.

## Key setup details

### Motion sensor

Shown During Logging: Graph  
Measure and Record: Acceleration  
Run Parameters: Logging Interval 100ms  
Use Reference Point setting

### Force sensor

Plug into Analogue Input 3  
Range:  $\pm 10\text{N}^*$   
Interface Connection: Live (Connected to PC)  
Shown During Logging: Graph  
Run Parameters: Continuous, Logging Interval 100ms, Smooth Data setting '2'  
Edit graphs afterwards to X-axis of 0-10s.

\*If your bungee jumper model is more massive then use the  $\pm 50\text{N}$  range on the Force sensor.