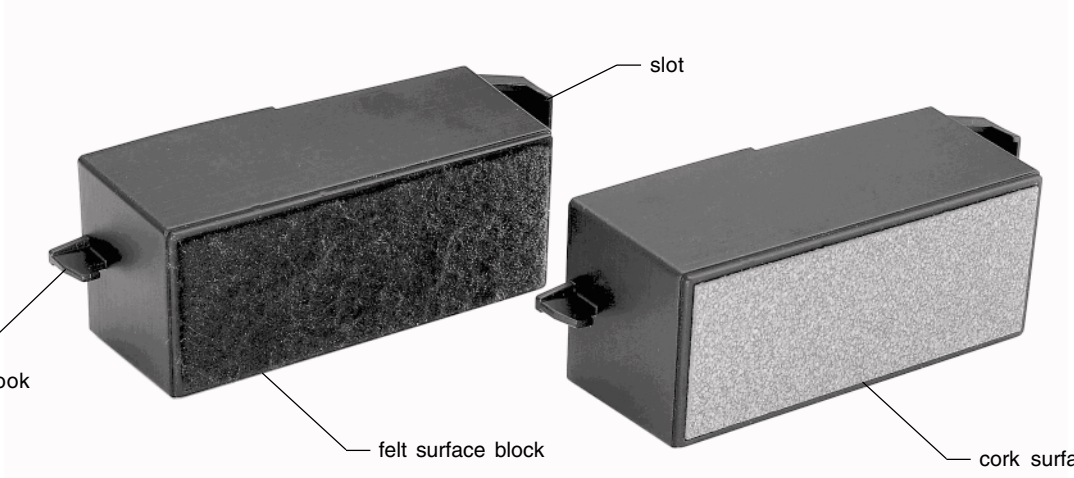
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Instruction Sheet for the PASCO Model ME-8574

DISCOVER FRICTION ACCESSORY



Introduction

PASCO's Discover Friction Accessory (ME-8574) is designed for use with Dynamics Carts, PAScars, GOcars, and Force Sensors to study the effects of friction on motion. It consists of four friction trays: one with a felt surface, one with a cork/ rubber surface, and two with a smooth plastic surface.

Discover Friction Accessory – 4 trays in all, two as pictured and two with a plain plastic bottom

The Discover Friction Accessory can be used to determine coefficients of friction for various surface combinations, and calculate the amount of work done by frictional forces. Each suggestion will be discussed briefly in this instruction sheet.

Specifications

Approximate dimension of trays are, 5 1/2" x 2 1/2" x 2 1/4".

Friction trays are stackable to allow for adjusting the pulling height and for storage.

Trays are provided with hook and slot for connecting in a series.

Additional Equipment Required

- Force Sensor
- 500 gram Bar Masses
- String

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10101 Foothills Blvd. • Roseville, CA 95747-7100
Phone (916) 786-3800 • FAX (916) 786-8905 • www.pasco.com

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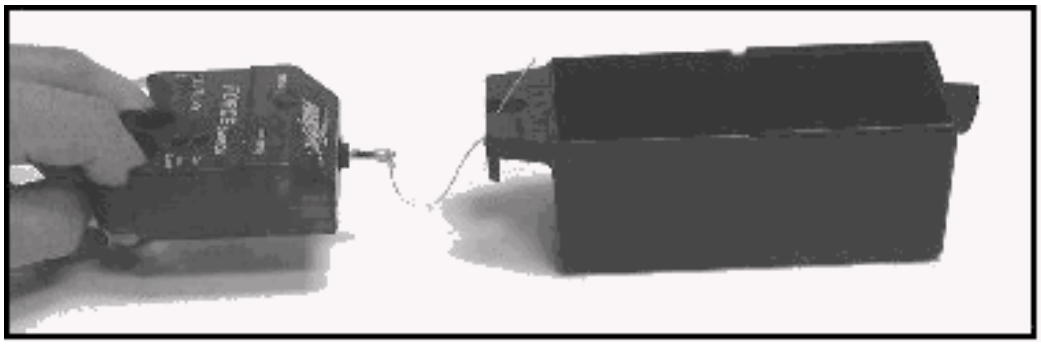


Figure 1: Discover Friction Accessory used with the PASport Force Sensor

Sliding Friction Equations

The purpose of this experiment is for students to construct the relationship between frictional forces and the normal force on an object. These general equations can then be used to predict both the static and kinetic frictional forces present in many situations.

$$F_S = \mu_S F_N$$

$$F_k = \mu_k F_N$$

The resulting graph will reveal that the frictional force increases to a maximum, and then levels off at a constant value as the tray moves. Both the maximum static frictional force and kinetic frictional force can be obtained from the graph. Repeat this procedure three more times increasing the mass of the friction tray by 500 grams each time. Finally, a graph of static frictional force vs. normal force can be created. The slope of this graph is the coefficient of static friction. In a similar manner, a graph of the kinetic frictional force vs. normal force can be created and analyzed. For more repeatable results, the Motorized Cart (ME-9780 – ME-9781) can be used to pull the friction trays from rest.

A small piece of string should be tied between one of the friction trays and the force sensor. With no force on the sensor, the zero (tare) button should be pressed. This should only be performed once! Next, place the friction tray on a fairly rough surface such as carpet or a sidewalk and load it with one 500 gram mass bar. Click on the Start button to begin collecting data, then pull on the force sensor until the friction tray breaks free. Continue to pull, such that the friction tray moves with constant speed.

Coefficients of Friction for Various Surface Combinations

Students can repeat the above experiment with different surface combinations to determine the relationship between coefficient of friction and surface roughness. The surfaces on the bottom of the Discover Friction Accessory were chosen to provide a wide variety of friction coefficients.

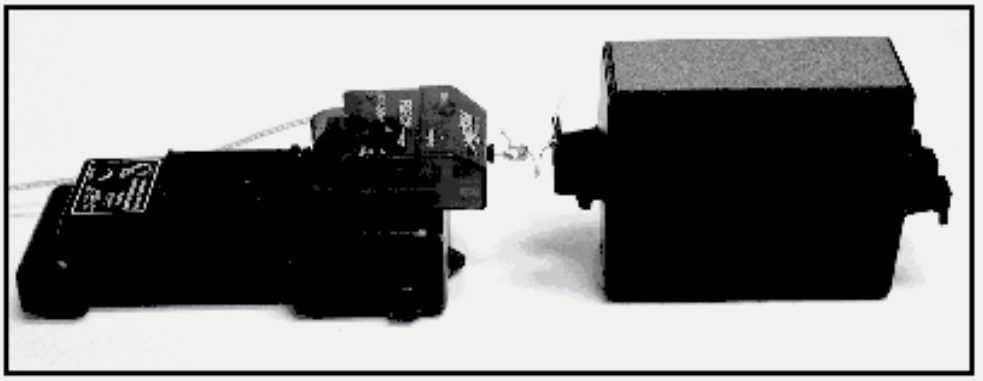


Figure 2: Stacking Discover Friction Accessory for varying heights

Work Done by Frictional Forces

Using a Cart Launcher (ME-9488) or the cart plunger, Dynamics Carts or PAScars can be launched toward a motion sensor to determine the motion of the cart under the influence of friction. After determining the launch velocity of the cart without the friction tray, the tray can be attached to the cart and launched again. As the tray causes considerable sliding friction, students will observe constantly accelerated motion. By measuring the distance over which the friction tray slides, students can determine the coefficient of friction between the tray and Dynamics Track or other surface. The following equation can be used to solve for the coefficient of friction:

Kinetic Energy = Force x Distance

$$1 / 2mv^2 = \mu_k F_N x$$

Technical Support

Feedback

If you have any comments about the product or manual, please let us know. If you have any suggestions on alternate experiments or find a problem in the manual, please tell us. PASCO appreciates any customer feedback. Your input helps us evaluate and improve our product.

To Reach PASCO

For technical support, call us at 1-800-772-8700 (toll-free within the U.S.) or (916) 786-3800.

fax: (916) 786-3292

e-mail: techsupp@pasco.com

web: www.pasco.com

Contacting Technical Support

Before you call the PASCO Technical Support staff, it would be helpful to prepare the following information:

➤ If your problem is with the PASCO apparatus, note:

- Title and model number (usually listed on the label);
- Approximate age of apparatus;
- A detailed description of the problem/sequence of events (in case you can't call PASCO right away, you won't lose valuable data);
- If possible, have the apparatus within reach when calling to facilitate description of individual parts.

➤ If your problem relates to the instruction manual, note:

- Part number and revision (listed by month and year on the front cover);
- Have the manual at hand to discuss your questions.