

## LINEAR AIR TRACK – 2.5M, complete kit

Complete Air Track (Tube, ass'y kit, operational kit): MF0105Z-001

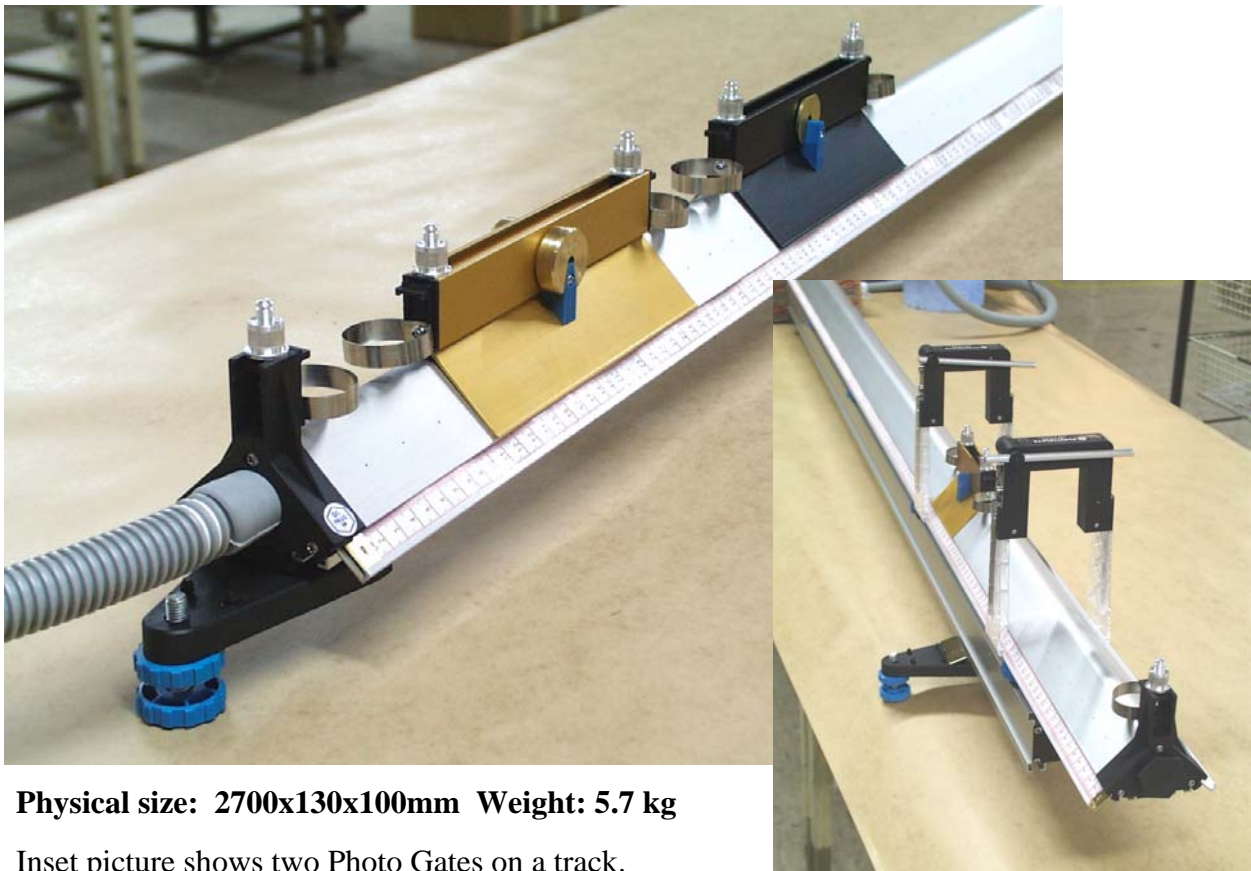
Includes: MF0105-001, MF0132-002, MF0133-001

**DESCRIPTION:** The IEC 'Linear Air Track' facilitates the study of mechanics, both quantitatively and qualitatively, by providing an almost friction free system on which a large range of experiments may be performed. A long straight 90° triangular shaped tube is mounted on three adjustable feet so that the tube can be made level. The sloping sides of this tube have small holes drilled and air is pumped into the tube from an air blower. Air passes out the small holes in the sloping sides.

Anodised aluminium 'Gliders' with a 90° internal angle are placed on the air tube and they float on the air passing from the holes. They slide back and forth on the tube with almost zero friction. Spring bumpers are fitted to the ends of the gliders so that when they collide they rebound with almost zero lost energy. Various weights and attachments can be fitted to the gliders for performing various experiments. The motion of the gliders is measured and studied to understand the fundamental principles of motion, mass and direction.

The Air Source to run the IEC Air Tracks LB0115-002 is very compact and easy to use. It has a variable speed and is very quiet in operation. It is complete with an outer shroud of styrene foam to reduce noise to a minimum but can be used with or without this shroud.

### MF0105Z-001 2.5m Air Track with ass'y & operating kits



Physical size: 2700x130x100mm Weight: 5.7 kg

Inset picture shows two Photo Gates on a track.



**AIR TUBE ASSEMBLY KIT: MF0132-001**

**OPERATIONAL KIT: MF0133-001**



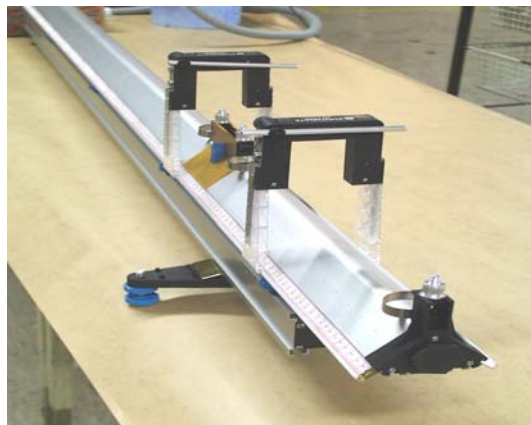
**AIR BLOWER: LB0115-002**

**PHOTO GATE KIT: MF0138-001**



**PHOTO GATES ON A TRACK**

**LED DISPLAY TIMER FOR GATES: LB4064-101**



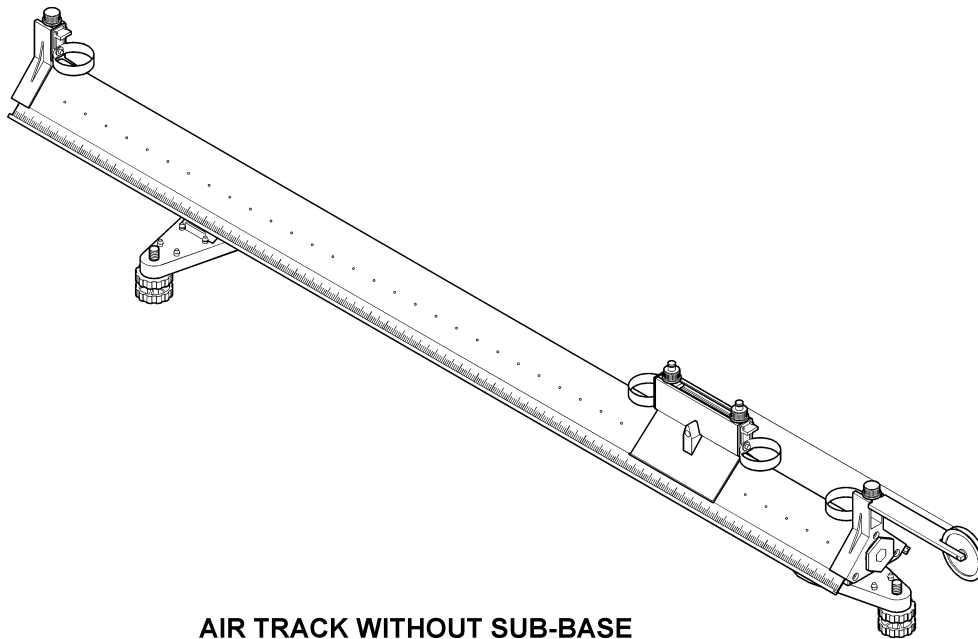
**Various other IEC timers can be used**

**OPTIONAL ADDITIONAL KITS AVAILABLE:****SUB BASE & KIT: MF0105-005****AIR TRACK WITH SUB BASE FITTED****SPARK RECORDING KIT: MF0105-401****SPARK GENERATOR: LB0118-001****THE COMPONENT PARTS OF 'M0105Z-001' LINEAR AIR TRACK ARE:**

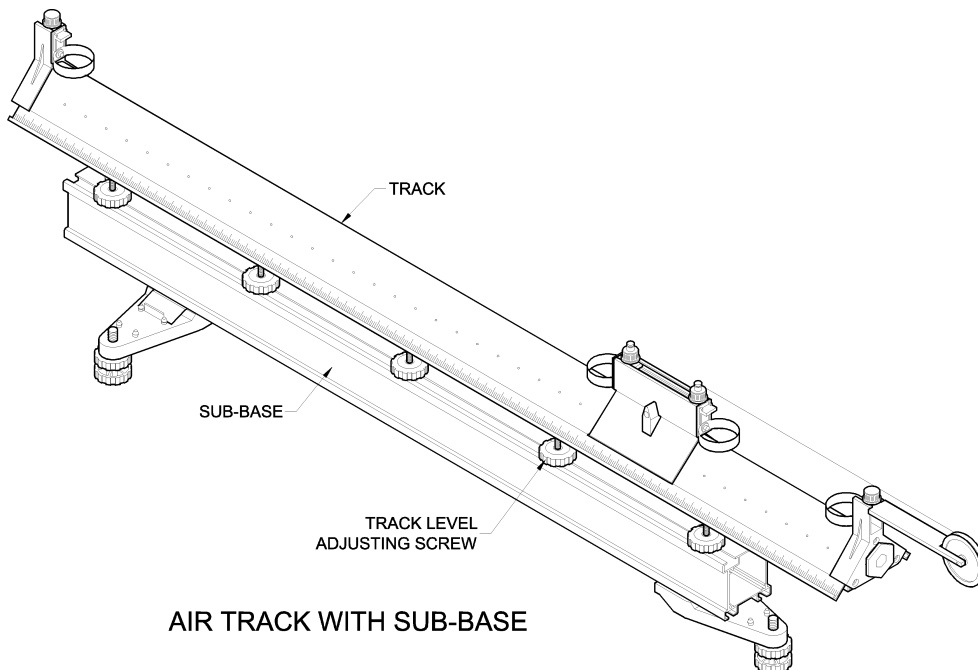
- **MF0105-001:** 2.5 metres long, Air Tube & end seals only.
- **MF0132-001:** Kit of parts to assemble the Air Tube: Scales, Plug, 3x feet etc..
- **MF0133-001:** Kit of components needed for operation and experiments.

IEC manufactures a range of Linear Air Tracks including 1.0 metre, 2.0 metres, 2.5 metres and 3.7 metres long. All track models use the same experiment kit and Photogate kit components. As an optional item, Sub Bases and mounting kits are available for all models 2.0 metres and longer.

**NORMAL AIR TRACK WITHOUT SUB BASE:** Showing metric scale, end pulley, blocking plug and one glider fitted.



**AIR TRACK WITHOUT SUB-BASE**



**AIR TRACK WITH SUB-BASE**

Sub Bases are used normally on long Air Tracks or where the track straightness must be exact. Sections of the track can be raised and lowered slightly by adjusting the special screws.

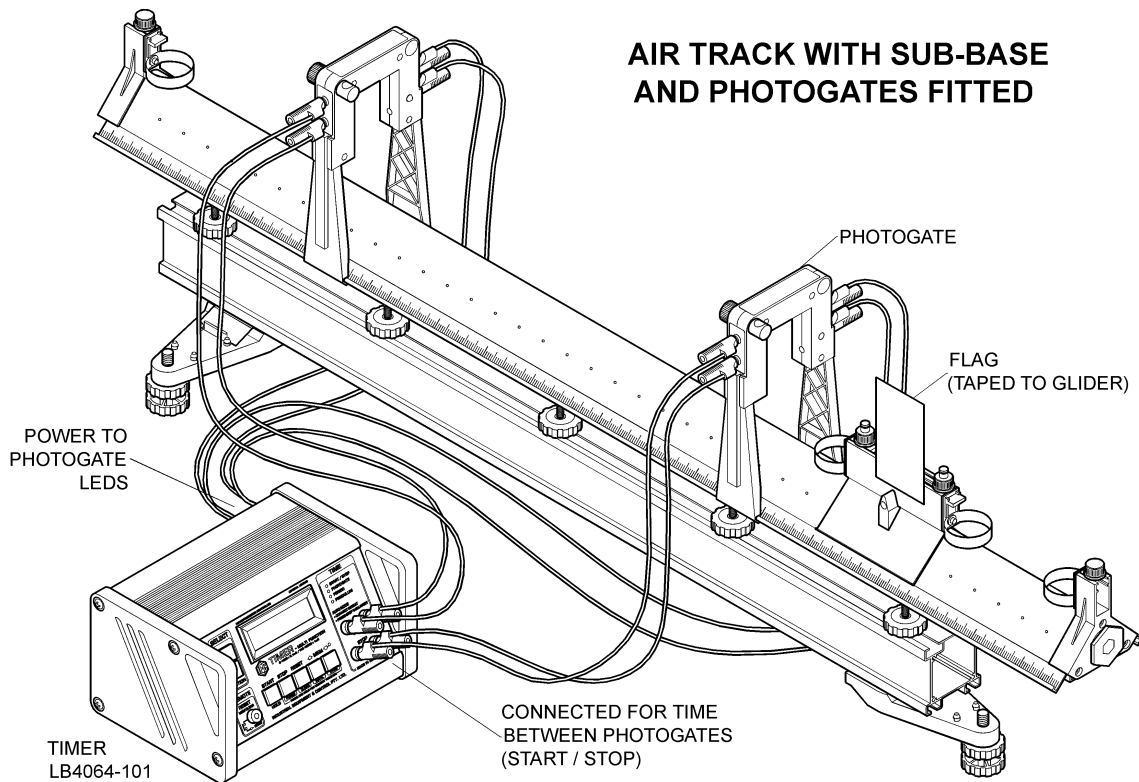
**PHOTOGATES:** Photogates can be used of tracks either with or without a Sub Base. Illustration shows an Air Track with a Sub Base and the LB4064-101 LED display Timer.

A Photogate is a device that supports a small light source in line with a small light sensitive cell. A space between them permits a moving object to pass and break the light beam. On the Air Track, the Photogate sits directly on the track and permits a glider with a 'flag' taped to the side pass through the light beam.

To measure and display the time between breaking two gates, connect the gates to the timer as shown in the illustration and perform "AutoMode" on the timer (see timer instructions). Select "Start/Stop" mode on the timer. When the glider flag breaks the first gate, the timer starts and when it breaks the second gate, the timer stops.

To measure the time the flag is passing through each gate, connect both gates in parallel to the STOP sockets. Perform AutoMode on the timer (see timer instructions). Select "Photogate" mode. When the flag passes through the first gate, the first time will be displayed and recorded in memory. When the flag passes through the second gate, the second time will be displayed and recorded in memory. In "Photogate" mode, as the glider breaks the light beam, a timer is started. When the light beam is restored, the timer stops.

IEC has several timers suitable for Air Track experiments. Both the battery operated LCD display timer LB4057-001 and the mains operated LED display timer LB4064-101 have 20 memories which can store sequential measurements such as before and after collisions or simple harmonic motion experiments.



**IDENTIFICATION OF KIT PARTS:** EACH BAG OF PARTS IS COMPLETE WITH IDENTIFICATION SHEETS. Refer to these sheets during the assembly of the Sub Base and Air Track. Also refer to drawings in this book showing an assembled Air Track.

**FOR AIR TRACKS WITHOUT SUB BASE: ASSEMBLY PROCEDURE TO ATTACH FEET TO AIR TUBE:**

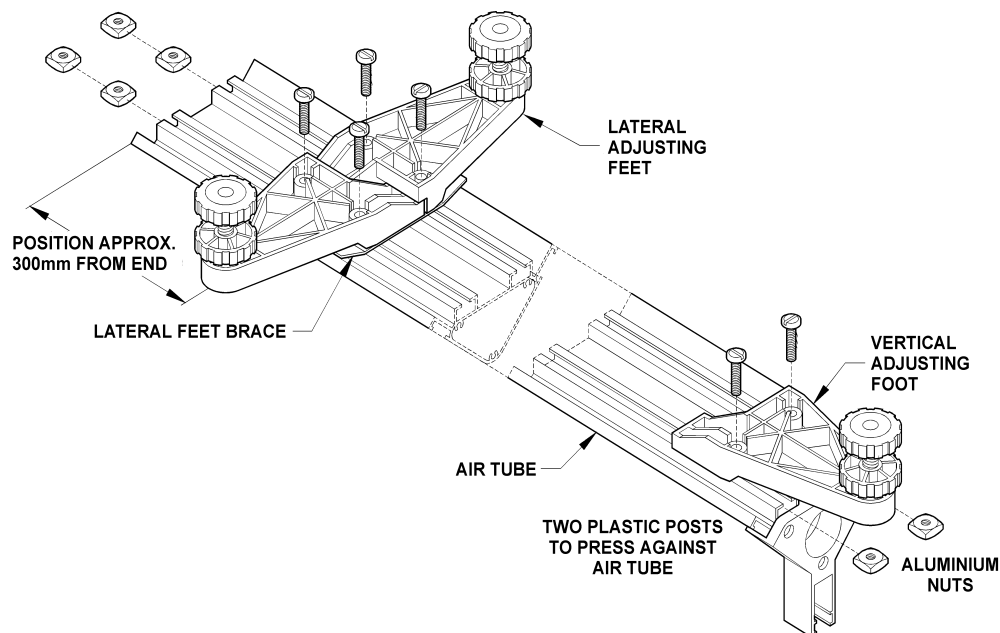
**NOTE:** The lateral feet are already assembled as a pair with the mounting screws, the square nuts, the adjusting screws and the metal brace. Also, the single foot is fitted with mounting screws, square nuts and adjusting screw.

Lay the air tube upside down. Take the pair of feet assembled back to back with the metal brace plate and 4 screws. Loosen the square nuts and engage them into the slots provided in the underside of the track with each foot pointing sideways. Slide the foot assembly to about 300mm from one end of the track and tighten the screws firmly. See illustration.

Take the third foot and slide the two square aluminium nuts along the slots at the opposite end of the track so that the foot protrudes directly from the end of the track. Be sure the small upstanding rail fits between the two channels to prevent the foot from swinging sideways. Tighten the two screws firmly. Invert the track so it rests on the table on its 3 adjustment screws.

Slide the 2 metric tapes up the grooves provided in each side of the track. If they are 3 metre tapes, cut them with scissors at the length desired. Fit the plastic end plug into one end of the air tube and fit the Air Source hose fitting to the other end of the air tube. The air can be used into either end, but it is normal to apply the air hose into the end closest to the lateral feet.

The air source (air blower) is designed to supply sufficient air to float a fully laden glider on the air tube. In the case of long Air Tracks of around 3.7 metres, the air requirement is much higher and sometimes two air sources would be required (one connected to each end of the air tube).



**FOR AIR TRACKS WITH SUB BASES: ASSEMBLY PROCEDURE TO ATTACH THE SUB-BASE TO AIR TUBE:**

Firstly, check off all components with the parts list packed with each instrument. Lay the Sub Base upside down and fit the feet to the Sub Base in exactly the same way they were fitted to the air tube as described on the previous section.

Invert the Sub Base so it rests on its 3 feet. Take the special adjustment screws and slide the square heads into the slots in the underside of the air tube. Be sure that half of the quantity is placed into each slot.

Turn the adjustment knobs on the screws with the serrated end closest to the air tube. Screw them on so that the sides of the knobs with the groove are all exactly flush with the tip of the screw (all exactly the same distance from the underside of the track).

Take the Sub Base, invert it and with somebody assisting you, slide the end of each adjustment knob into the 2 larger slots provided in the Sub Base. Gradually work all the knobs down the slots until they are all engaged into the Sub Base slots. Then slide the screws individually along the slots in the track and base until they are evenly spaced in pairs along the tube. See Illustration of the Air Track with Sub Base.

If the Air Track model you have chosen is without Sub Base, the horizontal and lateral levelling feet are attached directly to the underside of the air tube as described in the previous section. No further alignment is required.

**THE ALIGNMENT PROCEDURE OF THE SUB-BASE AND THE AIR TUBE**

With the Air Track attached to the Sub Base, apply the air at a low speed so that a glider will just float on the track. Adjust the knobs on the 3 feet on the Sub Base until the track is close to level where the glider almost rests without sliding.

Try the glider at different places along the track and decide which parts of the track are slightly high or slightly low.

Where the track is slightly low, slightly adjust the knobs joining the track to the base so that the low part of the track is pushed **slightly** upwards. Readjust the main foot at the end of the Sub Base to make the glider rest without sliding either direction.

Again find any places that are either high or low and adjust the knobs again to either **slightly** push the track upwards or **slightly** pull the track downwards.

When this procedure is finished, the glider should be close to not sliding either direction at all places along the track. Once the track is held straight, this procedure should not ever require repeating.

Be sure that all the adjustment screws are either slightly pushing or pulling and do not leave loose knobs anywhere along the track.



**FITTING SPRING BUMPERS TO GLIDERS:** Take the spring bumper with the plastic holder and grooved screw and slide the tab holding the screw up into the spine of the glider. As you tighten the screw to lock it into place, push the holder firmly against the end of the glider to be sure the buffer spring loop is firmly against the end of the glider.

**THE 'IEC' GLIDER SYSTEM:**

**BASIC SHORT GLIDER** - Fitted with: 2x buffers with holders and 2x knurled and grooved screws. The total weight of the short glider is very close to 100g.

**BASIC LONG GLIDER** - Fitted with: 2x buffers with holders and 2x knurled and grooved screws. Note that a special weight is fixed into the spine of the long gliders to make the total weight close to 200g.

**WEIGHTS:** The gliders have special supports on each side to carry slotted weights. Each kit contains 4x 50g weights, 4x 25g weights and 4x 10g weights. When wedged on the supports, the weights cannot move.

**MAGNETS:** Any magnet fitted to a glider and clamped by a knurled and grooved screw increases glider weight by 50g. It is normal to have a magnet at each end for balanced weight distribution.

**SPRING HOLDERS:** These plastic holders with screws are used to fit loop springs and other devices to the end of gliders.

**NON ELASTIC COLLISIONS:** One pair of 'Spring Holders' have a self adhesive 'velcro' face so that they can create 'non-elastic' collisions. Spare 'velcro' is supplied in the kit.

**LOOP SPRINGS:** These flat spring steel strips are bent into loops of about 30cm diameter and attached to the 'spring holders' by the small screws and nuts provided. When attached, experiments on oscillations may be performed. The smaller loop spring of 15cm. diameter can be used for applying preset forces to gliders for acceleration.

**COIL SPRINGS:** These are hooked into the groove of knurled attachment screws to connect gliders to one another or to the end stops for Simple Harmonic Motion and other experiments. Both long and short springs are supplied.

**PULLEY:** This pulley fits into an end fitting mounted to the end of the Air Tube and brings a cord to the correct level in respect to the groove in a knurled attachment screw on a glider. See the illustration on previous page.

**CARE OF YOUR LINEAR AIR TRACK:**

- Protect the track from dust and dirt by covering with a cloth or some other protective cover. Do not slide gliders or devices on the air tube while the air is off.
- Do not allow heavy objects to drop upon the track surface. This can cause dinging and damage which will spoil the smooth gliding.
- Do not exert excessive pressure on buffer springs or damage or distortion may occur.

**Designed and manufactured in Australia**

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