Fig 1

1. Forehead rest locking screw
2. Forehead rest
3. Doubling prism
4. Prism holder
5. Filter sleeves
6. Illumination bulbs
7. Battery handle securing buttons
8. Battery handle
9. Forehead rest stem
10. Viewing lens
11. Milled thumb-wheel
12. Scale

13. Setting block
14. Spare bulb
15. Batteries
16. Two-gram weight
17. Five-gram weight
Introduction
Following the popular Mark 1 Perkins tonometer, comes the technically advanced and attractive Mark 2 model. Its increased sensitivity, better illumination and convenience are some of the many features which maintain the reputation of Perkins hand-held instruments in the forefront of tonometry. Because the Perkins tonometer is capable of being used in all positions, the mass of the doubling prism must be controlled accurately. Only prisms supplied by the manufacturer should be used. Other prisms may give a false reading if used on the Perkins tonometer.

Technical Description
A pair of spiral wound flat springs connected in series are progressively tensioned by rotation of the operator's calibrated thumb-wheel. The resulting force stored in the spring is transmitted through a balanced arm to the Goldmann doubling prism mounted at its end. The tonometer is fitted with two 2.5V May lens bulbs to provide illumination. These are powered by four standard type AA batteries (1.5V). Alternatively two mercury batteries type RM12R may be used. The tonometer is classed as internally powered equipment type B as defined in BS 5724 Part 1 and IEC 601-1. The optional rechargeable handle model uses a 2.4V Ni-Cd battery. The battery charger unit is a Class 2 type B fully insulated unit as defined in BS 5724 Part 1 and IEC 601-1. It is suitable for use on 110-240V A.C., 50-60 Hz supplies. It is rated at 8VA and has an output of 2.5V D.C.

Preparation for use
Removal from case
Remove the tonometer from the carrying case by holding the black portion of the handle. Under no circumstances should it be lifted by the prism holder (4 Fig 1).

Doubling Prism
The doubling prism (3 Fig 1) should, under normal circumstances, be prepared for use by washing in warm soapy water and wiping dry. Where eye infection is
present, immerse the prism in a solution of *Savlon, Pantacert or aqueous hibitane, diluted 1:5000, for a minimum of five minutes and then wipe dry.

To guard against transmission of HIV, firstly rinse in saline solution then immerse for 5-10 minutes in: a) a solution of 3% hydrogen peroxide, or b) a solution of Sporicidin, or c) a solution of 1% sodium hypochlorite (common household bleach), or d) a solution of Pantacert. Wash and wipe dry.

At the time of printing it is uncertain as to the long-term effects of these sterilising agents on acrylic.

To insert the prism (3 Fig 1) into the prism holder (4 Fig 1) gently press prism cone downwards into the prism holder (A Fig 2) and push into position along horizontal axis (B Fig 2).

*Over-immersion in antiseptic solutions can lead to the prism swelling, with moisture appearing on the inner surfaces, or breakdown of the bonding material. Use only safe solutions of a type similar to those quoted above.

**Batteries**
The battery handle will accept four standard size AA batteries. To fit them in the instrument proceed as follows:- Press the two battery handle securing buttons (7 Fig 1) simultaneously and withdraw the battery case (8 Fig 1), which forms the handle portion of the tonometer. Place the batteries into the battery handle (8 Fig 1) ensuring they are positioned as indicated by the symbols on the base (Fig 3).

**N.B. Failure to follow these instructions could result in severe damage being caused to the instrument.**

Replace the handle and advance the thumb-wheel to check that both bulbs are switched on.
Alternatively, two RM12R mercury batteries can be used. They should be placed in opposite corners of the case, both lying in the correct direction according to the symbols on the handle. Note that the corner cavities in the handle are not of equal size and the batteries must be placed in the larger diagonally opposite pair.

![Fig 3](image)

**Note:** All batteries are subject to slow deterioration. *Under no circumstances should batteries be left indefinitely in the instrument as this could result in the instrument becoming damaged. They should be removed after use and stored in the carrying case.*

**Rechargeable Battery Model**
Users having a tonometer with the alternative rechargeable battery handle will simply have to place the instrument in the re-charging stand after use. When the charger is switched on check that the “mains” light comes on and also the “charge” light which indicates that the instrument is correctly seated and the batteries are under charge.

**Bulbs**
The bulbs, two in number, are “lens” lamps (6 Fig 1). They are clear and require the blue filter sleeves to be fitted over them (5 Fig 1). The bulbs are fixed in position to create maximum fluorescent effect during measurement. Bulbs must be screwed fully and firmly in and periodically inspected for discolouration.

**Forehead Rest**
This is the concave disc (2 Fig 1) which snaps on to the rounded end of the forehead rest stem (9 Fig 1). To adjust the stem, loosen the locking screw (1 Fig 1), slide the stem to the required position as described in **Method of Use** and tighten the locking screw. The adjustment allows for considerable variation in the size and shape of a subject’s physical features. The disc of the forehead rest should be cleaned regularly.
Method of Use

The eye is anaesthetised with two or three drops of Novesine (Dorsacaine) 0.2% to 0.4%. A drop of sodium fluorescein 0.5% is then instilled into the eye, or a fluorescein strip placed in the lower conjunctival sac at the outer canthus for a few seconds.

The Perkins tonometer should be held so that the thumb rests on the milled wheel (11 Fig 1) controlling the spring. The light is switched on by turning the thumb-wheel until the scale reading (12 Fig 1) is above zero.

If the forehead rest (2 Fig 1) is to be used, the stem (9 Fig 1), should be extended after loosening the locking screw (1 Fig 1). When the forehead rest is correctly positioned, tighten the locking screw and the instrument can then be brought towards the patient so that the face of the prism cone comes into contact with the cornea.

It is usually easier to hold the tonometer obliquely with the handle slanted away from the nose (Figs 5 & 6). Care should be taken to prevent the prism touching the eyelid margin.

If the prism touches the cornea without any force applied, the pressure arm can vibrate and may disturb the patient. For this reason, the scale is set to read 1 before applying the prism face to the cornea. When seen through the viewing lens (10 Fig 1) the semicircles of fluorescein should now be clearly visible and appear equal in size, denoting that the contact point is central on the cornea.

Note: The lighting is designed to give optimum fluorescence only when the prism cone is at its calibrated position i.e. when the rim of the prism holder is level with, or not more than 1 mm above, the case surface.

Fig 4

Adjust the force by turning the thumb-wheel (11 Fig 1) until the inner margins of the semicircles coincide (Fig 4).
The tonometer is removed from the eye and the reading noted. The large divisions of the scale represent grams and the small divisions 0.2 gram.

The reading is multiplied by ten to give the tension in millimetres of mercury (mm Hg). Readings should be repeated until a steady value is obtained; this will usually be slightly lower than the initial reading.

If the semicircles appear large and are not reduced by diminishing the force of the spring, the tonometer has been pushed too close to the eye and withdrawing it slightly will bring the prism within the range of free movement.

If it is desired to use the Perkins tonometer without any forehead rest, the instrument can be steadied by resting the fingers against the patient’s malar region while the prism is in contact with the cornea.

Instruction to the patient
Instruct the patient to look straight ahead and if necessary use a fixation light for the purpose. It is essential for the patient to keep the eye wide open during the examination. If it is necessary to hold the lids open, care should be taken not to exert pressure on the globe.

Astigmatism
If the cornea is spherical, measurements can be made on any meridian but it is most convenient to do it on the 0° meridian. This is not so when eyes with corneal astigmatism higher than 3 dioptres are examined, as the flattened areas are not circular but elliptical. It has been found that in cases of high astigmatism measurements
made in a direction of 43° to the meridian of the lower power ensure the optimum flattened area of 7.354 mm² (Ø 3.06 mm).

To use the instrument on animals
Unfortunately most animal eyes have a cornea which behaves differently from the human cornea and the Fick-Maklakov law does not apply for the standard diameter of applanation. It is necessary to remove the patient's forehead rest and calibrate the tonometer for each species used. This can be done quite simply by connecting the anterior chamber to a reservoir and taking tonometer readings at different pressure levels. In most cases, it will be found that the tonometric reading is lower than that obtained for the human eye. The eyes of rhesus and cynomolgus monkeys behave very similarly to the human eye, but those of the rabbit and cat give lower readings.

Special Precautions
The Perkins hand-held tonometer is a delicate precision instrument, carefully inspected and certified. Each instrument has been tested and the readings at the zero, 2-gram and 5-gram positions on the scale found to be correct within the limits specified on the certificate accompanying each tonometer, when checked on the applanation tonometer Calibration Rig certified by P.T.B. West Germany, manufactured by P. Korber. It is desirable to clean the calibrating weights, as well as the prism, in an antiseptic solution, before checking the instrument, to minimise the risks of cross-infection (see under - Preparation for Use).

Calibration Check (Fig 7)
The calibration of the tonometer should be checked at regular intervals or at any time when the practitioner feels that an immediate spot check is desirable.

Proceed as follows:–
1. Remove the battery handle (8 Fig 1) from the tonometer by pressing the two handle securing buttons (7 Fig 1) and withdrawing it from the body portion. Insert the prism (3 Fig 1) into the holder (4 Fig 1).

Check for zero position
2. Adjust the milled thumb-wheel (11 Fig 1) so that the scale reading is below zero by the full thickness of one scale line. Whatever the attitude of the instrument in the hand the prism should tend towards its backward position.
3. Set the scale reading above zero by the full thickness of one scale line. The prism should tend towards its forward position regardless of the attitude of the tonometer.

**Check at the 2 g position**

4. To make a rough check adjust the milled thumb-wheel (11 Fig 1) so that the scale reading is below the 2 mark by the full thickness of one scale line. Place the instrument on a flat horizontal surface with the setting block (13 Fig 1) under the body and the prism cone upwards as shown in Fig 7. Place the 2 g weight, recess downward, centrally on the prism cone and check that it carries the prism positively down to its lowest position.

5. Also, as a rough check, set the scale reading above the 2 mark by the full thickness of the scale line and place the instrument on the setting block as before. Place the 2 g weight on the prism and check that it remains in its highest position. *(If the prism is accidentally pushed down to its lowest position with the weight on the prism, it should rise again to its highest position and freely remain there).*

If desired the **Actual** point of balance can be established by adjusting the milled thumb-wheel until the prism floats at the calibration-position *(rim of prism holder level with, or not more than 1 mm above the case surface)*.

**Check at the 5 g position**

6. Repeat the process as described in 4. and 5. above, but using the 5 mark on the scale and a setting one-and-a-half line's width above and then below the 5 mark and with the 5 g weight on the prism cone. The actual point of balance can again be found if required.

**Note:** The tolerances in the zero, 2 g and 5 g tests above represent ±0.05, ±0.05 and ±0.075g respectively. If the tonometer is found to be outside the stated limits it should be returned to your supplier for attention.
Storage of Prism and Tonometer
The doubling prism must always be removed from the
-tonometer and inserted, cone downwards, into the hole
in the foam interior of the carrying case (Fig 1). The
tonometer should then be returned to the carrying case.

Do not pack the Perkins tonometer with the prism still
in the instrument.

Never store the instrument with the spring under load
- i.e. return the milled thumb-wheel to below zero.

Warning
Always remove the batteries and store in the carrying
case when the instrument is not in use.
Discharged non-rechargeable batteries should be
disposed of and not stored in the carrying case or
instrument. If the instrument is not frequently used,
batteries should be checked each month for
deterioration.
Ni-Cd rechargeable batteries require no maintenance
and should give substantial use before replacement is
required. Battery replacement should only be carried
out by the supplier.
Recharging of batteries should only be carried out
using the charger supplied with the handle unit.
Exterior cleaning of the tonometer case and charger
unit should be carried out using a cloth moistened in
a mild soap solution.
Solutions containing alcohol, benzene etc., should
not be used.

Note
Repairs
In the event of damage do not attempt local repairs
but return the tonometer in its case, carefully
packed, to your supplier for attention.

Warranty
Unauthorised attempts at repair will immediately
nullify the warranty.

The suppliers cannot accept responsibility for the perform-
ance, reliability or safety of this equipment if it is used,
serviced or modified by unauthorised persons. Only the
approved batteries are to be fitted and the instrument
must be used in accordance with this instruction manual.
References


Catalogue Number
5805001 Standard combination comprising - The Perkins hand-held tonometer, with extra bulb, doubling prism, patient's forehead rest, batteries, instruction manual and Certificate of Accuracy. The setting block and weights (5g and 2g) are also carried in the case provided.

Replacement components:
5805030 Carrying case
5801004 Five-gram weight
5801005 Two-gram weight
1146005 Bulb, 2.8V May lens
5805350 Sleeve, blue filter
1158001 *Battery, mercury, RM12R (pair)
5805009 Setting block
5805081 Patient's forehead rest
1902100 User's instruction manual
5801068 Doubling prism

Optional Accessories
5805380 Rechargeable battery handle, complete
5805490 Battery charging unit

*Four standard type AA batteries can be fitted as an alternative to the two RM12R.

Whilst the information is provided in good faith and is based on the latest information available at the time of issue, this booklet gives only a general indication of product capacity, performance and suitability. Such information must not be taken as establishing any contractual or other commitment on the part of the manufacturer and in no way should be construed as a warranty or representation concerning the product.
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