INSTRUCTIONS
UNITRON REFRACTOR

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UNITED SCIENTIFIC CO.
204-206 MILK STREET
BOSTON 9, MASS.

2.4" EQUATORIAL

Model 128

ASSEMBLY

Assemble the tripod by unfolding the legs and tightening the wing nuts on the leg joints. Attach the telescope tube to the mounting as shown in the illustration, using the thumbscrews or nuts (1). Make certain that when the tube is attached the control knobs (5, etc.) face the observer.

COMPONENTS and ACCESSORIES

Dewcap (2): The short section of tubing which extends beyond the objective lens is called a dewcap. It helps prevent the formation of dew on the lens, and keeps out stray light. In the 2.4" models the dewcap is packed separately, and should be slipped over the lens cap as shown in the illustration. In the other models it is packed already mounted in position, but it may be removed for cleaning the lens.

View Finder (3): This is a low power, wide field sighting telescope which aids in finding the celestial object to be viewed. It is focused by moving the black-capped eyepiece (4) in or out until a sharp view is obtained. When an object is sighted between the crosshairs of the viewfinder, it should also be centered in the field of view of the main telescope. Should any adjustment be needed, it may easily be made by shifting the position of the finder in its supporting brackets with the aid of the setscrews. Start with the lowest power eyepiece in the main telescope, and make the final test with the highest power.

Eyepieces (12): The eyepieces are inserted either into the star diagonal (11) as shown, or directly into the eyepiece tube in the drawtube (10). Each eyepiece gives a magnification equal to the focal length of the telescope divided by the focal length of the eyepiece.

Star Diagonal (11): This device permits convenience and comfort, especially when observing overhead objects, by deflecting the light to a more accessible vantage point. It may be removed from the eyepiece tube when objects nearer to the horizon are viewed.

Drawtube (10): The chrome drawtube slides in and out of the telescope to permit approximate focusing. When adding or removing the star diagonal, and in changing between some of the eyepieces, it will be necessary to readjust this. (Owners of the 1.6" UNITRON should note that the drawtube is found between the rack and pinion focusing and the main telescope tube.)

Rack and Pinion Fine Focusing Knob (9): After the approximate focus has been obtained with the drawtube, turn the fine focusing knob to obtain a sharp image.

Note: The chrome drawtube, as well as all tubes into which eyepieces are inserted, are provided with split rings which permit the internal tube diameter to be reduced. If there is any tendency for the eyepieces or accessories to slip, merely apply pressure to half of the split ring with the thumb, and thereby provide a tighter grip.

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Sunglass: This is a cap containing a dark filter which slips over the eyepiece for solar observing. Tighten the setscrew to secure a tight fit. When used, the telescope should be turned away from the sun at frequent intervals to prevent overheating the filter, which might cause it to crack. CAUTION: Never observe the sun through the view finder, or through the telescope without the filter.

Erecting Prism System: (Included in all models except the 1.6") An astronomical telescope inverts and reverses the image. For terrestrial observing, the prism system again erects the image for normal viewing. It is inserted into the eyepiece tube. The 25mm eyepiece is customarily placed in the prism system when packing for shipment. However, any of the eyepieces may be used with the prism system for terrestrial viewing.

CARE OF THE INSTRUMENT

Your UNITRON telescope has been constructed of the finest materials available and, with proper care, will give a lifetime of service. It is, however, a precision instrument, and should be handled with care. When not in use, the telescope and accessories are fully protected by the wooden carrying cases.

The objective lens has been coated with a special film for maximum brilliance of the image. Excessive and incorrect cleaning of the lens and the eyepieces may damage the delicate optical surfaces. Do not rub or polish the lenses, but instead gently remove any dust particles with a camel's hair brush or lens tissue. Frequent cleaning is unnecessary. The objective lens has been assembled at the factory with great care and should never be taken apart.

Moving parts of the telescope mounting should be occasionally oiled to insure smooth operation. Tighten the nuts on the screws which fasten the tripod legs to the mounting whenever necessary to insure proper rigidity.

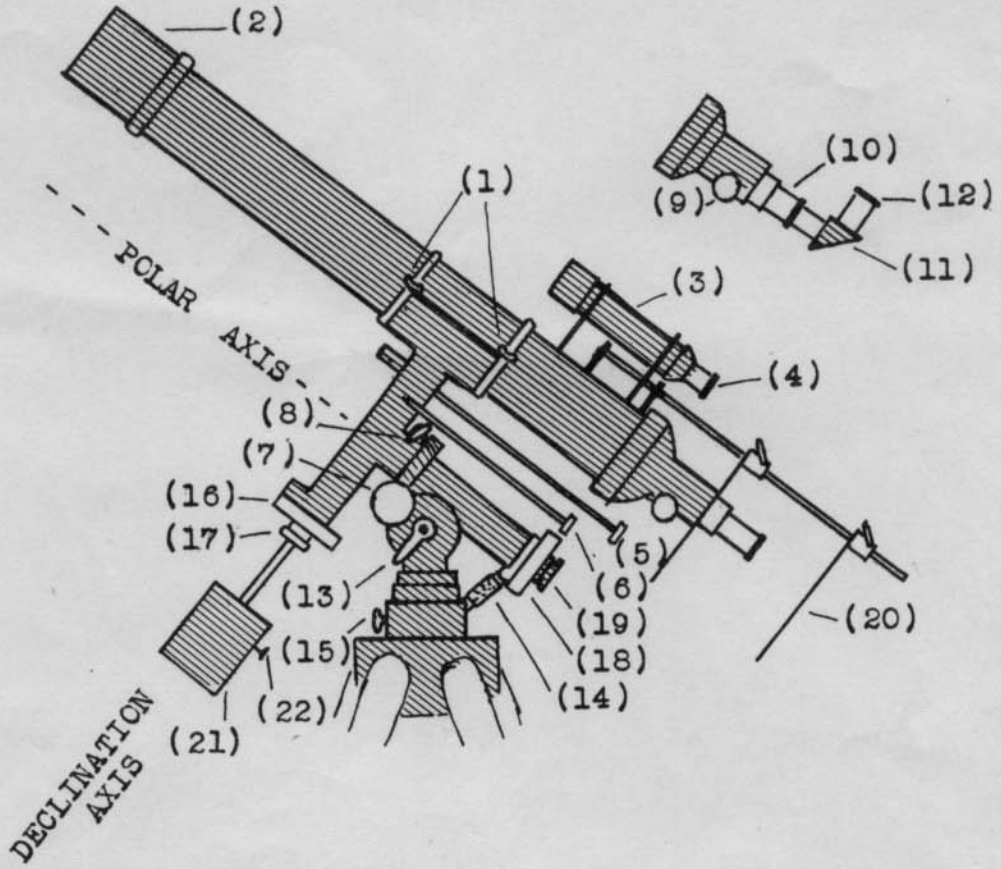
HINTS ON OBSERVING

1) Use the telescope outdoors. Window glass and the air currents in a heated room will spoil the clarity of the image.

2) Astronomical telescopes invert and reverse the image as seen with the naked eye. Therefore star maps must be turned upside down when comparing them with a telescopic view. In addition, the diagonal flips the image again left and right. This corresponds to looking at a star map in a mirror.

3) Use the viewfinder first to locate the general region of the object. Always start out with lower powers in the main telescope. After you have found the object it is possible to use higher powers with their more limited fields of view. The highest power eyepieces will perform to best advantage only under favorable atmospheric conditions and therefore it is very often the lower and medium powers which will give the most satisfactory views.

4) A useful adjunct to observing will be an atlas or an almanac. A star atlas will be of assistance in locating double stars, clusters, etc. Two excellent atlases, Norton's, or Skalnate Pleso, are available from Sky Publishing Corp., Harvard Observatory, Cambridge 38, Mass. For the sun, moon, and planets, refer to the Observer's Handbook of the Royal Astronomical Society of Canada, 15 Ross Street, Toronto, Ontario, Canada. (50¢)



The CLAMPS AND SLOW MOTIONS of the UNITRON EQUATORIAL MOUNTING

Clamps have been provided on both axes to hold the telescope in position. When the clamps are engaged, it is possible to use the slow motions.

The long rod (6) parallel to the tube clamps the instrument in declination, when turned clockwise. The rod beside it with the round knurl knob (5) can then be used to make fine adjustments. When the telescope is moved between two objects reasonably far apart, the clamps should be loosened and the telescope swung by hand rather than attempting to move the telescope considerable distances with the slow motions.

The wing nut clamp for the right ascension (8) is found on the polar axis near where the polar axis joins the declination axis. The collar which the wing nut tightens may be turned around the declination axis to make it most accessible to reach. The slow motion (7), commonly called the "hand drive", is located just below this. When the mounting has been properly adjusted, it is possible to follow a star or planet by the adjustment of the slow motion in right ascension alone.

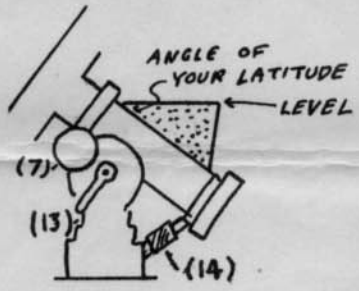
The slow motion controls will work most smoothly for a given orientation of the telescope, when the telescope tube is properly balanced. With the clamp (8) loose, adjust the position of the large counterweight (21) on the rod so as to obtain the best balance with respect to rotation about the polar axis; tighten the wing nut (22) to hold the counterweight in place. To obtain the best balance with respect to rotation about the declination axis, loosen clamp (6) and proceed as follows — 3" and 4" Models: loosen the wing nuts (1) and position the tube in the cradle for best balance; 2.4" Model: adjust the small counterweight on the telescope tube. It may be desirable to alter this latter adjustment when heavy accessories are attached to the eyepiece end of the tube.

THE EQUATORIAL MOUNTING

Due to the earth's rotation, any astronomical object will slowly drift from the field of view of a stationary telescope. By placing one of the axes parallel to the earth's axis, it is possible to compensate for the earth's rotation by moving the telescope about this axis alone. Such a mounting is called an equatorial. The axis parallel to the earth's axis is called the polar axis, while the other at right angle to it is called the declination axis (see drawing). For the equatorial mounting to function properly, the polar axis must be inclined to correspond with your geographical latitude and oriented so as to point in a North-South direction. The following two sections outline a simple procedure for making these adjustments. For still greater accuracy refer to the section "Precision Adjustment from Polaris". Once these adjustments have been made, actual positioning of the telescope tube to locate celestial objects is made using the declination and right ascension clamps and slow motion controls as described in a preceding section.

THE LATITUDE ADJUSTMENT

Once this has been adjusted, it will not be necessary to change it, provided the telescope is leveled each time it is used. As long as the telescope is used as a portable, any effort to set the latitude angle with extreme precision is wasted, as the ultimate accuracy will depend on how well the polar axis is linedup north and south.



First, cut a triangle out of a piece of cardboard, so that one angle is the same as your latitude. (Your latitude can be found with sufficient accuracy from any good atlas) Make the tripod head level by adjusting the angle of the tripod legs or by placing a few thin blocks of wood under one or two of the tripod legs. A spirit level is useful for this and the following operation. Place the triangle along the top of the polar axis casing, as shown. Note that you may have to notch the triangle to make it fit. Loosen the latitude adjustment clamp (13) by turning counter-clockwise, and adjust the angle of the polar axis until the top of the cardboard is horizontal, i.e., level. On the 3" and 4" models this adjustment is made by turning the knurled collar (14) below the polar axis at the south end of the mounting. Then fix the latitude clamp (13) securely. It will not be necessary to change this again unless the telescope is moved to another latitude or further refinements are desired.

THE NORTH-SOUTH ADJUSTMENT

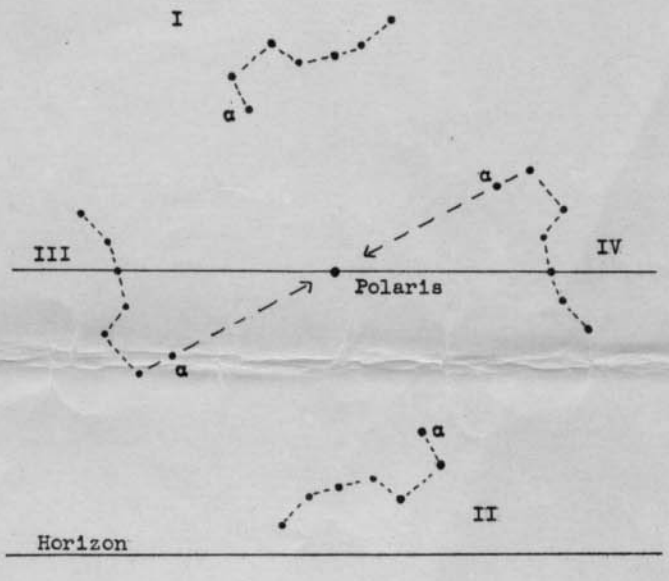
The UNITRON telescope may be turned in azimuth (through a horizontal plane) without shifting the tripod, in order to line up the polar axis north and south. This adjustment is fixed with an azimuth clamp (15) on the tripod head. You must know the north direction, of course, in order to set up your telescope in the daytime. If observations of the sun or planets during the daytime are planned, it may be possible to set up the telescope at night and leave it in position. Or it may be possible to mark the position of the tripod legs with pipes or bricks set into the ground, etc.

At night-time the direction of north can be determined from Polaris, the north pole star. Loosen (8), place the declination axis horizontal (using a spirit level if available), and then tighten (8). Loosen (15) and (6) and move the telescope in azimuth and altitude until Polaris is in the center of the field of view. Clamp (15). This adjustment of the North-South position is accurate to about a degree.

PRECISION ADJUSTMENT FROM POLARIS

When the UNITRON telescope is generally used from the same location, it is convenient to set three bricks or pipes into the ground, with positions for the tripod legs marked on them. In this case a more refined adjustment might be practical. Although it is not necessary to place the bricks or pipes so the telescope will be perfectly level, it is best to do so in order that the best possible positioning may be made quickly at some other spot of observation.

One of the easiest methods for this refined adjustment is to use the north pole star Polaris. Unfortunately, Polaris is not exactly at the north celestial pole, but by choosing appropriate times of observation, this difficulty will not interfere. The chart shows Polaris with respect to the Big Dipper. No serious errors will be made if the observations are done within a half hour or so of the positions shown. The method is in two parts.



1) At positions I and II, Polaris is exactly on the north-south line. Turn the telescope so that the declination axis is horizontal, and the tube is pointing at the star. Unclamp the azimuth adjustment (15), and swing the telescope in a horizontal plane until Polaris can be seen in the field of view. Greater accuracy can be gained by now switching to a higher-powered eyepiece. Clamp the azimuth adjustment (15) in the correct position.

2) Six hours later, when the Big Dipper is at positions III or IV, the altitude of Polaris is equal to the latitude, and the latitude adjustment can be made. Turn the telescope so that the tube is directly above the polar axis and nearly parallel to it. Release the latitude adjustment clamps (13) and move the polar axis until Polaris comes into view. (It may be necessary, of course, to change the declination some). On the 3" and 4" equatorials the latitude adjustment is made by turning the knurled collar (14). Then clamp the latitude adjustment in position.

For UNITRON 3" and 4" equatorials

The declination circle can be set precisely at this time from Polaris, but there will be less chance of error in using Duhbe , the pointer star of the Big Dipper marked a. Loosen the tightening nut (17) on the declination circle (16) and set the circle at exactly 60° 00' with Duhbe in the center of the field, preferably with a high-powered eyepiece.