ATCO

3 IN. ASTRONOMICAL TELESCOPE

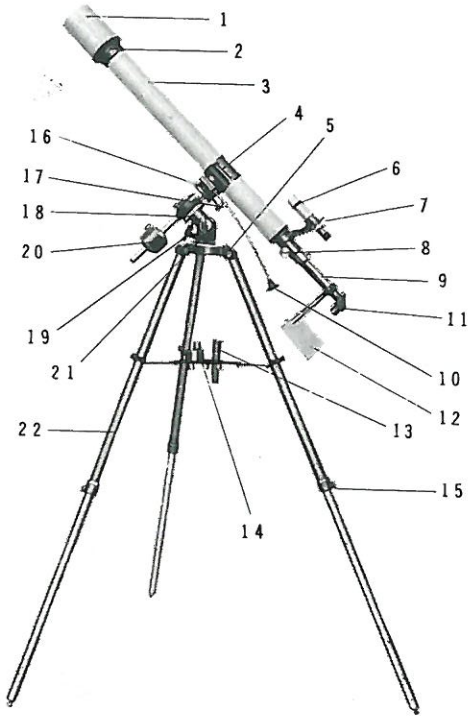
MODEL NO. 1280

INSTRUCTION PAMPHLET

AMERICAN THERMO-WARE COMPANY

3 in. Refractor No. 1280 Parts

1. Dew cap
2. Objective cell
3. Telescope tube
4. Trunnion
5. Spirit level
6. 6X Finder scope
7. Finder adjusting screw
8. Micro focusing knob
9. Focusing draw tube
10. Declination slow motion handle
11. Star diagonal prism
12. Sun projection screen
13. Barlow lens
14. Erecting prism
15. Tripod leg set screw
16. Declination circle
17. Declination clamp screw
18. Hour circle
19. Polar axis angle stop
20. Counter poise clamp
21. Polar axis clamp
22. Adjustable metal tripod



OPTICAL EFFECT

Objective : Achromatic, Fraunhofer type, Hard coated		
Lens clear aperture		76mm
Focal length		1200mm
Light collecting power for naked eye		118X
Resolving power with respect to double stars		1.5″
Faintest discernible star		11.2mm
Magnifications	Original	300X, 96X, 60X
	With barlow lens	600X, 192X, 120X

Accessories

3 Eyepieces (SR 4mm, HM12.5mm, H20mm) Star diagonal prism, Erecting prism, Barlow lens, Sun glass, Moon glass, Sun projection screen, Wooden carrying case

ASSEMBLING THE TELESCOPE

Open the carrying case and note the packing and arrangement of the telescope components. On replacing the telescope in its case after use, the various parts should always be returned to their proper places. The case is especially designed to enable the observer to transport the telescope without damage to the instrument or its accessories.

The telescope can be assembled without difficulty by adhering to the step-by-step procedure which follows:

1. Take the tripod legs from the case and adjust them all to the same length by sliding out the center shaft of each leg. Lock the sliding member of the tripod leg assembly by tightening the thumb screw that compresses the strap clamp.

2. The equatorial telescope mount is held in place in the cabinet with a retaining bar secured by a wing nut. Remove the telescope mount from the case in order to attach it to the tripod legs. Use the long chrome-finished bolts, and hexagonal nuts.

Position the top of each tripod leg in the openings in the base of the telescope mount. Pass the bolts through the tripod legs in the openings and through the base of the telescope mount. Position the washers on the outside of the tripod legs. Tighten the wing nuts on the bolts to fasten the tripod securely to the telescope base.

Open the tripod legs and set the tripod on a flat surface. Use the wing nuts on the telescope mount to adjust the tension sufficiently to maintain the telescope securely in position.

3. The triangular metal accessories tray, which is fastened to the cover of the inner compartment of the telescope case, is now attached to the supports on the tripod legs. Use the short round-head bolts provided and secure them with wing nuts. Note that the accessories tray supports are hinged for easy adjustment. The long slot in the support permits proper positioning of the equipment tray.

4. The counter weight, which is bolted in place in the carrying case, should be attached to the equatorial mount. It is needed to balance the weight of the telescope tube which is to be installed in the following step.

Slide the balance weight over its chrome-finished shaft and secure it with a turn of the set screw. The shaft is threaded at one end to fit the tapped hole in the declination axis. Screw the shaft in place as shown in the figure on the front page. When the telescope is completely assembled adjust the position of the balance weight until the telescope moves smoothly through its several motions.

5. Open the main telescope clamp by turning the knurled knob of the locking screw. Carefully lift the telescope tube into position, close the clamp, and secure the assembly by tightening the knurled head screw.

6. It will be noted that the objective lens is covered with a friction fit dust cover which has a small handle. This dust cap may be left in place until actual telescope observations begin. Just below the objective cell there are three chrome-finished screws with protruding heads. Do *not* tighten or change the position of these screws as they control the alignment of the objective lens. They have been precisely adjusted at the factory and should only be touched when it is necessary to correct the alignment or "squaring on" of the telescope.

7. The metal collar below the objective cell is threaded to take the metal dew cap which protects the objective lens. Take the dew cap from the case and carefully screw it into position.

8. Take the eye end focusing draw tube assembly from the case. The threaded end of the draw tube assembly is to be fitted into the eye end of the telescope tube and screwed into place. Note that part of the length of the chrome-finished draw tube protrudes in front of the threaded collar of the assembly. This is normal and no harm will result when it is inserted into the open end of the main telescope tube.

The draw tube has an extensible shaft which may be locked in any desired position by tightening the set screw on top of the draw tube focusing unit.

9. Find the threaded eyepiece holder and screw it into the open end of the extensible draw tube. Note the set screw designed to lock in place any of the different components which may be positioned in the ocular holder.

10. Place the various telescope accessories (eyepieces, star diagonal prism, sun and moon filters, image erecting prism, etc.) in the accessories tray, using the openings provided. Make certain that the accessories are returned to the special compartment in the carrying case before disassembling the telescope.

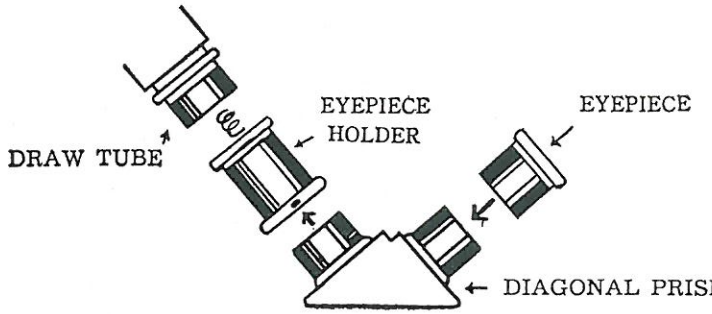
11. A pair of flexible shaft control handles are supplied to permit the observer to enjoy easy access to the telescope controls while he is looking through the eyepiece. The handles are fastened to the slow motion control shafts as shown in the figure. Note that the flexible shafts have different diameter ends. The larger diameter opening is connected to the polar axis slow motion shaft while the smaller diameter opening is connected to the declination axis slow motion shaft. Be sure that the set screw is positioned on the flat part of the control shaft. With the telescope so equipped the observer does not need to look away from the eyepiece to operate the telescope controls.

PREPARING FOR OBSERVATIONS

1. Remove the dust cap from the objective lens by pulling gently on the small handle. Make it a practice to replace the dust cap at the conclusion of every observing session.

2. Insert the star diagonal prism into the open end of the eyepiece holder which is screwed into the draw tube as shown in the accompanying diagram. Use the set screw on the holder to lock the star diagonal in place. Note that one end of the star diagonal prism has a tube diameter that fits only the holder in the draw

tube and that the tube at the other end of the prism has a diameter that only fits the eyepieces.



3. Place a low power eyepiece (ocular) into the open end of the ocular holder. The holder is fitted with a locking set screw to hold the eyepiece securely in the tube. The telescope is now ready for use.

4. At this point, the adjustment of the viewfinder telescope should be checked. The reticle (cross-hairs) of the finder should be exactly centered on the object that is being viewed.

It is best to make adjustments of the viewfinder telescope in daylight. The finder should be aligned by first sighting the main telescope on some well-illuminated vertical object such as a fence post, telephone pole, or the corner of a building. The vertical line of the object that is sighted upon should split the very center of the telescope's field. The telescope controls are then locked tightly in position to prevent movement of the main telescope. Now the position of the object is checked in the field of the viewfinder telescope. If it is not "dead center" in the cross-hairs, the finder is loosened in its mounting and shifted carefully until the object is centered.

The finder telescope is adjusted by manipulation of the three retaining screws in the upright ring mounts of the finder tube. The viewfinder telescope may be focused by simply rotating the eyepiece until the image is sharp, clear, and in focus. The image in the viewfinder telescope is, of course, inverted.

When the telescope is to be used for terrestrial viewing, the main tube may be aligned by swinging the declination axis until it is parallel to the ground.

TELESCOPE CONTROLS

1. On the base of the telescope mount an azimuth circle has been affixed. It is graduated from 0° to 360° and has engraved compass points. The circle is especially valuable when orienting the telescope for terrestrial observations.

The telescope is able to swing in a complete circle around the azimuth disc while the pointer at the base of the telescope indicates the direction of the line of sight. The locking lever at the base of the mount can be set to fix the telescope at any determined position.

Note the spirit level incorporated in the base of the mount. The observer should use the level to ascertain if he has properly set up his instrument.

2. The declination axis is equipped with a setting circle that is graduated from 0° to 90° in four quadrants. One of the two principal movements of the telescope is about this axis. The angle of declination, as indicated by the setting circle, is a measure of the angular distance north or south of the celestial equator of the object on which the telescope is sighted.

The movement of the telescope about this axis may be halted by twisting the locking clamp lever which is located just above the declination circle. The pointer indicates the angle of declination at which the telescope has been fixed.

3. The polar axis is equipped with a setting circle graduated from 0 to 24 hours at five minute intervals. The other principal movement of the telescope is around the polar axis.

The hour circle, as it is called, indicates the sidereal hour angle from the meridian through which the telescope must be turned to sight the object desired. The movement of the telescope about this axis may be stopped at any point by tightening the locking clamp lever which is located on the circular face of the polar axis opposite the setting circle. The pointer marks the sidereal hour angle at which the telescope has been fixed.

The angle of the polar axis with respect to the base of the telescope mount may be adjusted by using the large locking lever to be found on the main axis of the telescope mount.

4. The telescope slow motions which are activated by the flexible shaft drive handles permit the observer to move the telescope smoothly and effortlessly through small distances. This is especially useful in "tracking" a star as it drifts slowly across the telescope's field of view.

The slow motion controls are used *after* the telescope has been locked in position on an object to be observed. Small adjustments in position are then made by operating the slow motion controls.

FOCUSING THE TELESCOPE

1. The telescope is focused by first turning the knurled micro-focusing knob until the draw tube is racked *out* as far as it will go. Looking through the eyepiece, the observer slowly turns the knob to gradually rack in the draw tube. At some point the object sighted upon will come into focus. Adjustments are made until the image is sharp and clear.

2. For observers who wear glasses, it is best that they be removed when using the telescope. If the glasses are worn for the correction of astigmatism, however, it is advisable that they be worn during telescope observations.

USING TELESCOPE ACCESSORIES

1. Barlow Lens

The Barlow lens is mounted in a tube which is open at both ends. One end of the Barlow lens barrel is the precise diameter

to fit into the eyepiece holder of the telescope draw tube. Remove the star diagonal and insert the Barlow lens. Select an eyepiece and insert it into the open end of the Barlow lens tube, securing it in place with the locking set screw.

The Barlow lens will approximately double the magnifying power of any eyepiece selected. The use of this accessory, in effect, doubles the complement of eyepieces available to the observer.

2. Sun Filter

When observing the Sun directly with the telescope, *it is absolutely necessary* to protect the eyes by using the sun filter which is included as an accessory. The heavily tinted filter reduces the intensity of the rays striking the observer's eye. Under these conditions, safe viewing of the Sun can occur. The metal collar of the sun filter is threaded to screw securely into any of the eyepieces as shown in the illustration that follows.



3. Moon Filter

Attached to the telescope eyepiece in the same manner as the sun filter, the moon filter is of value when observing the brightly illuminated face of the Moon. The filter helps to improve the contrast of the image and to reveal surface detail that might be lost as a result of reflection and glare. The observer should view the lunar scene both with the aid of the filter and without it.

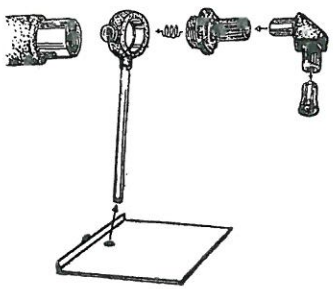
4. Erecting Prism

Because the telescope's image is inverted and reversed, it is necessary to provide some device that corrects the image when using the telescope for terrestrial observations. The image erecting prism performs this function most effectively. One end of the erecting prism is inserted into the open end of the eyepiece holder of the draw tube and an eyeyiece is inserted in the open end of the erecting prism. Now the telescope image is oriented just as the scene appears in actuality.

5. Sun Projection Screen

Observing the Sun indirectly by using the sun projection screen has certain advantages. It is by far the safest method, it permits the observer to plot and chart the movement of sunspots, and it can be used to demonstrate the solar phenomena to a group of observers.

The accessory is attached as shown in the accompanying diagram. Focusing is done by normal movement of the rack and pinion draw tube as well as by moving the screen along its extension rod. Taping a piece of paper (white drawing paper) to the metal screen will permit easier viewing and it is possible to make drawings of solar phenomena.



6. Setting Circles

Setting circles can be a great help in finding obscure of unfamiliar sky objects. A relatively simple method of using the circles is here outlined. The declination circle is the easiest to use and many observers use this circle only.

Choose a bright, well-known star, Arcturus, in the constellation Boötes, for instance. Focus on Arcturus, keeping it directly in the center of the telescope's field. Lock all motions of the telescope. The declination of Arcturus (readily obtained from any star chart) is 19° 28' North. With the telescope locked in position on the star, turn the declination circle until the pointer indicates 19 1/2 degrees. Now a simple swing of the telescope in declination will bring the observer to the area of any desired sky object.

For instance, it is desired to find the "Ring Nebula" in Lyra. A glance at the star atlas shows its declination to be 32° 58' North. Swing the telescope around the declination axis until the pointer rests on 33° (approximately) and then clamp the telescope. Now by sweeping in right ascension around the polar axis, it will be easy to find the "Ring Nebula."

Hour circles are, in general, more difficult to use than declination circles. Calculation of sidereal time is necessary and this requires some mathematical insight. Many observers, therefore, use the hour circles in conjunction with a reference or pilot star. No special knowledge of sidereal time is required when using this method.

This technique merely requires centering any well-known star in the telescope's field. Both declination and hour circles are turned, while the telescope is stationary, to indicate the precise right ascension and declination of the reference star. Nearby unknown stars, then, can be found by simply moving the telescope until the circle pointers indicate the position (as determined from the star chart) of the star that is being sought.

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