

SUPPLEMENTARY INSTRUCTIONS

These instructions apply to the following components and accessories.

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|-----------------------------|--------------------------|
| * Motor Driven Clock Drive | * 60mm Eyepiece |
| * Weight Driven Clock Drive | * Rotary Eyepiece Holder |
| * Astro-Camera | * Double Eyepiece Holder |
| * Guide Telescope | |

POLAREX MOTOR DRIVEN CLOCK DRIVE

Two kinds of Motor Drives are available, one is included in the POLAREX Photo-Equatorial models as a standard component and another is to be installed on your older refractor which does not have a motor drive yet.

FOR ALL MODELS EXCEPT PHOTO-EQUATORIAL MODELS:

- 1) Equipment: The unit consists of (a) synchronous motor unit and (b) shelf and mounting bracket.
- 2) Installation: All numbers refer to Figure 1.
 - a. Install shelf and bracket by opening clamp(2) and placing around base of mounting at point indicated in illustration. Engage, but do not tighten, thumbscrew(3).
 - b. Insert chrome rod of shelf of motor into hole in the shelf bracket but do not tighten locking screw(4).
 - c. Insert the hexagonal output shaft of the motor into the hole in the center of the right ascension knob(1), and at the same time engage the bolt at (5) in the slot of the shelf. The gear box(6) may be revolved about the input shaft, as shown by arrows, to allow for ease of installation. When mounting the motor, the bracket(2) may be moved and the shelf raised as required for alignment. When entire assembly is in alignment, all thumbscrews should be tightened to hold the motor in operating position.
- 3) Operation: To prevent possible shock, especially when operating on damp ground, the wire(7) should be attached to any appropriate ground such as a water pipe or steel rod driven into the ground. To start motor, simply plug into any standard A.C. power source.

FOR ALL PHOTO-EQUATORIAL MODELS:

- 1) Equipment: The unit consists of (a) synchronous motor and (b) universal shaft.
- 2) Installation: All numbers refer to Figure 2.
 - a. The motor should be mounted on pier shelf or tripod shelf. Insert the mounting bolt(1) through the right hand hole in shelf.
 - b. Attach universal(2) to motor output shaft by screwing on in counter-clockwise direction.
 - c. Connect motor to refractor, using the rods(3).
- 3) Operation: Same as described above for other models.

Figure 1.

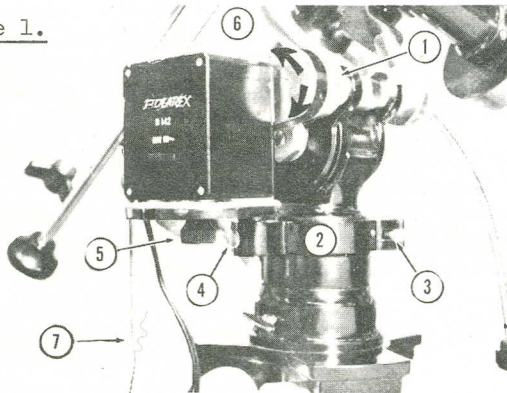
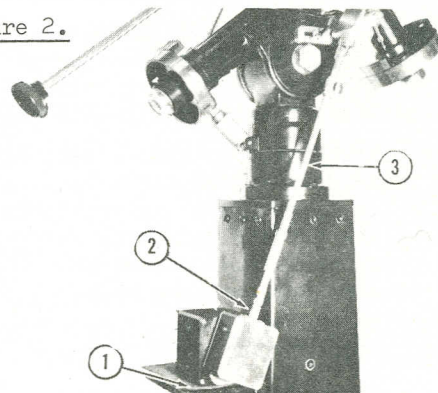


Figure 2.

POLAREX WEIGHT DRIVEN CLOCK DRIVE

The weight driven clock drive can be used with either the tripod or pier mounted model of the POLAREX Photo-Equatorial. (This type of drive can not be used with the other models.)

Connecting rods for coupling the clock to the right ascension mechanism of the telescope are available in two lengths. The short one is designed for use with the pier and the longer rod for the tripod. The proper rod will be furnished, depending upon the model of instrument ordered. If both the metal pier and wooden tripod are specified in the order then both rods will be supplied.

The wire cable which passes through the opening of the plexiglass housing should, in turn, be passed over the ball bearing roller on the inside of the pier or on the metal tripod shelf.

A clock is fixed to the shelf by screwing the two thumbscrews into the threaded holes on the bottom of the clock. A cylindrical piece with a hook on one end is passed through the hole in the large weight and then hung from the loop at the end of the cable. The winder is slipped over the square stud extending from the left side of the clock housing. The winder is turned in a clockwise direction to raise the weight.

A speed regulating adjustment is provided on the top of the drive housing and, after the weight is wound, the clock is started by unscrewing the governor knob. If a faster driving rate is required than may be obtained by loosening the governor knob then merely add one or more of the extra weights. The extra weights are slotted and can be slid over the cable and seated on top of the large weight. The number of weights required will depend on the weight of the accessories being used on the tube as well as the care with which the tube has been balanced. Procedure for balancing is covered in the instrument instructions.

Care should be exercised to prevent kinking of the cable. Occasionally, if the weights are removed suddenly, the cable raises out of the grooves on the drum and overlaps. If not corrected, this situation can cause the clock mechanism to jam. To re-align the cable in the grooves unscrew the governor knob and remove it from the top of the clock. The plexiglass top can then be slid out of the grooves and the plexiglass at the rear of the clock removed by pulling it upward out of the slots. This will afford ready access to the drum and cable. The bearings at the end of the gear shafts should occasionally receive a very small drop of watch oil to assure smooth operation.

POLAREX ASTRO-CAMERA

INTRODUCTION: This light-weight camera has been designed especially for astronomical photography, using the objective (or mirror) of your telescope as the principle optical element. Attached to an altazimuth telescope, POLAREX Astro-Camera can be used for photographing the sun and sunspots, the moon, and solar and lunar eclipses. These subjects require only very short exposure times, during which the telescope may remain stationary. If your telescope is equatorially mounted, preferably with a clockdrive, many other celestial objects requiring longer exposures are within your reach; planets, comets, star fields, star clusters, and nebulae.

Taking first-class celestial photographs is an accomplishment in which you can feel pride. Become familiar with your Astro-Camera before using it so that you may operate it in the dark with ease. Take care to focus accurately. Since in astronomical photography the proper exposure time will depend on unpredictable factors such as atmospheric transparency, it is well to take a series of shots with varying exposures. You will find it most helpful to keep a careful record of the exposure time, type of film or plate, and development for each photograph. In this way, you can profit by your experience to find the most suitable combination for a particular subject.

LIST OF PARTS:

1. Camera with ground-glass focusing back.
2. Camera tube with eyepiece holder.
3. Extension tube. 4. Two clamps.
5. 30mm focal length eyepiece. 6. Yellow filter.
7. 3 double plateholders for 3-1/4" x 4-1/4" plates or cut film. 8. Cabinets.

THE PLATEHOLDERS: Three double plateholders are furnished with Astro-Camera. Extra double plateholders are available at an extra cost. The plateholders are designed to use either 3-1/4" x 4-1/4" glass plates or cut film. In the case of cut film, adapters must be used. Cut film adapters may be obtained from a photographic dealer.

To insert the plateholders in the camera, unlock the catch at the top of the camera, swing the ground glass frame downward on its hinges, and slip the plate-holders into position. Secure the plateholder in place using the two locks at the top. Prior to exposing the film with the camera shutter, the plateholder slide is pulled upward. Note that this slide is designed so that it cannot be completely removed from the plateholder; this makes it easy to replace the slide after the exposure has been made.

ATTACHING THE CAMERA TO YOUR TELESCOPE: Photographs may be taken with POLAREX Astro-Camera in the following two ways.

1. Photography at the prime focus: For this type of photography, the camera is positioned so that the plane of the film falls at the prime focus of the objective or mirror. A relatively small image is produced but exposure time will be less than with the method of photography by projection described in 2(next). In this case, only the shorter camera tube(B) is used, and without the camera eyepiece. The camera tube screws onto the end of the camera body as shown in the figure.

The camera tube is of the same diameter as the POLAREX drawtube and fits into the POLAREX rack and pinion focusing sleeve. Use of the clamps(C) to insure a tight connection between the camera tube and rack and pinion sleeve.

2. Photographs by Projection: With this method, an enlarged image is projected onto the film by the 30mm eyepiece. Place the eyepiece(E) in the eyepiece holder(F). (Other POLAREX eyepieces of relatively long focal length may also be used in the camera and you may wish to experiment with these.) Insert the camera tube(B) into the extension tube(D) and lock the two together using one of the clamps. Insert the extension tube into the POLAREX rack and pinion sleeve and fasten using the second clamp.

Balance the telescope carefully after attaching the camera. For POLAREX models in which the tube mounts in a saddle, this can be done by sliding the tube in the saddle until balance is obtained. Counterweights are available to attach to the tube for models using a different fastening arrangement, and these can be obtained as extra accessories.

OPERATING THE SHUTTER: Astro-Camera uses an air operated, curtain shutter of the Thornton Pickard type. Speeds of 1/15-1/90 second bulb and time may be obtained. As the speed selector knob(H) is turned, the tension on the curtain shutter mechanism is increased so that shorter exposures result. The actual shutter speed which will be obtained for any given setting of the knob is indicated by the dial(I). To set the shutter speed to a lower value than indicated by the dial, merely push the lever(K) to the right(which will unwind the shutter) and rewind to the desired speed.

The shutter release lever(L) may assume two positions. In the position shown in the figure, the shutter is used for taking instantaneous exposures between 1/15-1/90 second.

To move the lever to its second position, as indicated by the dotted lines in the figure, press the end of lever(L) and move it downward. This second position is used for taking "bulb" exposures.

To wind the shutter for an exposure, turn the knob(J) one complete revolution clockwise. Two clicks will be heard during the turning of the knob. When the lever(L) is in position for instantaneous photography, squeezing the rubber bulb shutter release will give a film exposure corresponding to the reading shown on the dial(I). When the lever(L) is the position for "bulb", squeezing the rubber bulb will open the shutter and it will remain open until pressure on the bulb is released.

For a "time" exposure, position the lever(L) in the position for instantaneous photography and turn the shutter winding knob(J) clockwise one-half a revolution until a single click is heard. This will open the shutter. Squeezing the rubber bulb will close the shutter and end the exposure.

Look into the opening in front of the camera and note that as you turn the shutter winding knob(J), the slit in the curtain moves across the opening and admits light into the camera. Therefore, the knob(J) should never be turned unless the plateholder slide is closed; otherwise, accidental exposure of the film will result. It is a good rule always to squeeze the rubber bulb before withdrawing the plateholder slide to insure that the shutter is closed.

FOCUSING THE CAMERA: The quality of your picture will depend critically on the pains taken in securing the sharpest possible image on the ground-glass screen. If the image is too faint for sharp focusing, as may be the case with stars, spread on a thin film of glycerin on the ground side of the glass screen to brighten the image.

When taking photographs with a refractor, remember that the optical correction of the objective is for visual(yellow) light with the result that without a filter the position of sharpest focus as seen on the ground glass is not necessarily the position of sharpest focus for the film. In this case, keep the yellow filter on the camera tube, and use a panchromatic emulsion. If a reflecting telescope is used, the filter may be removed except for solar photography.

PHOTOGRAPHING THE SUN: The sun is unique among subjects for astronomical photography in providing too much light, rather than too little. Therefore, use slow, fine grain film the shortest exposure time, and always use the yellow filter. A solar aperture diaphragm is provided as standard equipment with all POLAREX Photo-Equatorial models and should be used to reduce the amount of light entering the telescope.

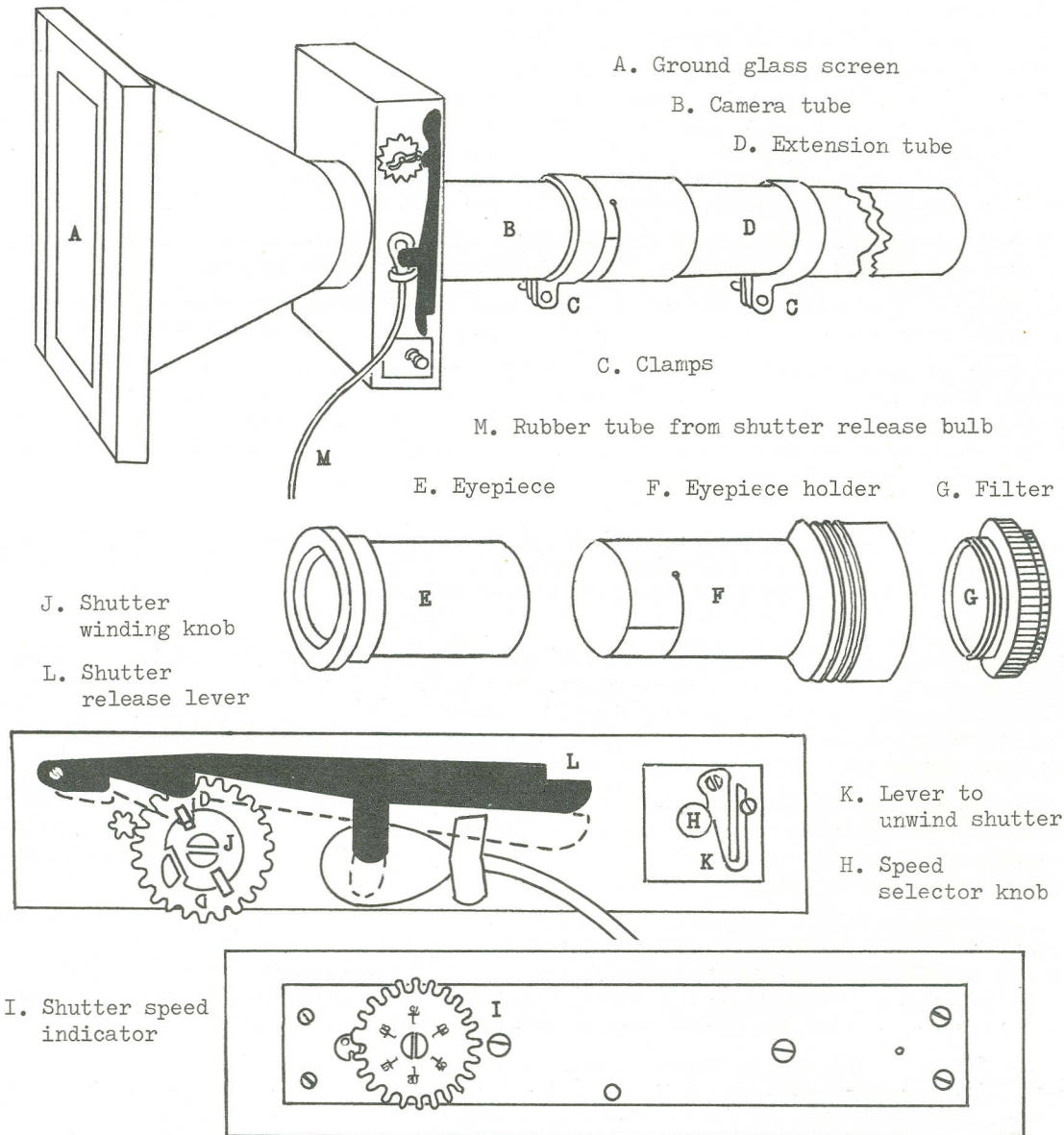
The solar heat concentrated at the focus of your telescope is so great that care must be taken not to damage the cloth curtain of the shutter. The practical rule is never to let the sun's heat fall on the shutter for more than a few seconds at a time. Keep the dustcap on the objective until you are ready to focus.

Open the shutter, remove the dustcap and focus. Replace the dustcap and close the shutter. Insert the plateholder and withdraw the plateholder slide. Replace the dustcap by the solar aperture diaphragm, if one is used. Then, as rapidly as possible, make the exposure and replace the solar aperture diaphragm by the dustcap. Close the plateholder slide.

LUNAR PHOTOGRAPHY: Whether you use prime focus photography or take an enlarged picture through the eyepiece, it is advisable to use the fastest available emulsion. Since the surface brightness of the moon changes very markedly with phase, no simple rule for exposure time can be given, although this will usually be in the range between 1/15 and 1/90 second. For best results, make a series of shots with different exposure lengths.

STELLAR AND PLANETARY PHOTOGRAPHY: The chief consideration here is that the objects are faint light sources. The fastest available emulsion should be used, together with long exposures, often 30 minutes or longer. For long exposures, only an equatorially mounted telescope can be used, and preferably it should have a clockdrive. For good results, careful and continuous guiding is necessary. This means, a guide star must be kept on the crosshairs in the guiding telescope throughout the exposure. Whenever the guide star drifts perceptibly from the intersection of the crosshairs, the star is brought back with the aid of the telescope slow motions.

FIGURES OF ASTRO-CAMERA:



POLAREX GUIDE TELESCOPE FOR ASTRO-PHOTOGRAPHY

SPECIFICATIONS:

- Objective, air-spaced, Fraunhofer design
- 1) D 60, F 700
 - 2) D 75, F 1000
 - 3) D 100, F 1500
- with 9mm crosshaired eyepiece.

The POLAREX Photographic Guide Telescopes are supplied with collimating brackets and a pair of clamps to permit mounting on the main tube of your refractor. If the guide telescope is to be mounted on instruments having other main tube diameters then the radius of curvature of the collimating bracket base can be locally adjusted to conform to the tube surface. If desired, the collimating brackets can be mounted directly on the tube of the refractor by drilling holes in the tube to match those drilled through the base of the brackets.

The optical axis of the guide telescope is aligned with the optical axis of the main refractor tube by adjustment of the six collimating screws. The lock nuts should be backed off all the way to permit maximum movement of these screws. When alignment is complete the lock nut should be turned down against the bracket ring to retain the position of the scope in the brackets. When attaching the brackets to a refractor tube care should be exercised to space them at a distance equal to the space between the black bearing rings which surround the guidescope tube. The collimating screws should rest in the channels of these bearing rings when the guidescope has been mounted.

ALIGNMENT PROCEDURE: During daylight hours select a well defined distant object such as a church steeple or flagpole. Transfer the crosshaired eyepiece from the guidescope to the main telescope and, with reference to the crosshairs, center the object in the main tube. Transfer the crosshaired eyepiece to the photographic guidescope and, by moving the collimating screws, center the object, again, with reference to the crosshairs. To improve this adjustment, select a well defined celestial object, such as a prominent star, and repeat the procedure outlined for daylight alignment.

POLAREX 60MM EYEPIECE

The POLAREX 60mm Kellner Eyepiece is designed for use in either the Super Rack and Pinion equipped in the POLAREX Photo-Equatorial Refractors or the Super Rotary Eyepiece Holder available at an extra cost for the same models.

To afford maximum light transmission the optical surfaces of the eyepiece have been coated. Extreme care must be taken when cleaning the optical surfaces to prevent scratching or removal of the coating.

POLAREX ROTARY EYEPIECE HOLDER

The Rotary Eyepiece Holder(R.E.H.) is a multiple eyepiece holder which contains a 90° prism to permit comfortable viewing at all angles of elevation. In addition, it holds six eyepieces simultaneously which permits rapid changes of magnification by simply rotating the turret. This eliminates the inconvenience and possible damage to eyepieces resulting from the use of conventional eyepiece holders which permit using only single eyepieces.

Type A: For use with POLAREX Refractors. This type has eyepiece holders for five 24.5mm eyepieces and one 1-1/4" eyepiece. The 1-1/4" eyepiece holder is provided to accommodate the POLAREX 40mm low powered, widefield eyepiece. Dustcaps are provided for all eyepiece holders and should be left in place unless an eyepiece is inserted in the holder. The type A has a drawtube of 36.2mm O.D.

Type B: Is offered for use with all instruments equipped with a 1-1/4"(32.0mm) drawtube receptacle. The turret is equipped with six 1-1/4" eyepiece holders.

Super Rotary Eyepiece Holder: This type has six eyepiece holders for four 24.5mm eyepieces, one 1-1/4" eyepiece and one 2" eyepiece. The POLAREX 60mm eyepiece can be used in this type.

ASSEMBLY: (The following is applicable to all types) Refer to Fig. 1.

- 1) Screw the threaded end of the chromium drawtube(1) into the turret(2) of the Rotary Eyepiece Holder(R.E.H.).
- 2) Remove the regular drawtube supplied with the telescope by sliding it out of the rack and pinion.
- 3) Insert the R.E.H. drawtube(1) into the rack and pinion sleeve in place of the regular drawtube.

OPERATION:

- 1) Eyepiece holders are of various lengths(See Fig. 2 (1)). The eyepieces should be arranged in the holder in order of focal length with the longest focal length eyepiece in the longest holder. This arrangement will require the minimum focus adjustment when changing powers.
- 2) The index arrow(2) indicates the position of the prism. The eyepiece holder in line with the index arrow is the one which is in position for viewing. The entire R.E.H. may be rotated in the rack and pinion, repositioning the prism, if viewing from either side of the telescope is more comfortable.
- 3) Focus initially by sliding the entire R.E.H. in or out of the rack and pinion sleeve, using a low power eyepiece. When an approximate focus has been obtained slide the clamp (Fig. 1 (3)) over the rack and pinion sleeve and tighten the wing nut. This will prevent the R.E.H. from sliding out of the instrument and will retain the coarse focus position. Refine the focus by using the rack and pinion mechanism.
- 4) To change powers rotate the turret in a clockwise direction so that the desired eyepiece is in line with the index arrow(2). Clickstops are provided at each of the six positions assuring positive alignment of the selected eyepiece with the prism. If the eyepieces have been arranged by focal length only a minor adjustment of the rack and pinion should be required to bring each eyepiece into sharp focus.

ACHROMATIC AMPLIFIER(Barlow Lens):

The achromatic amplifier is a two-element Barlow-type negative amplifying lens and doubles the magnification of any eyepiece with which it is used. The achromatic amplifier special for R.E.H. is available in Type A only at an extra cost.

The amplifier(Fig. 1 (4)) is located in the threaded end of the drawtube and can be removed by a "pulling-twisting" motion. When inserted in the tube, it will double the magnification of all eyepieces in the R.E.H.

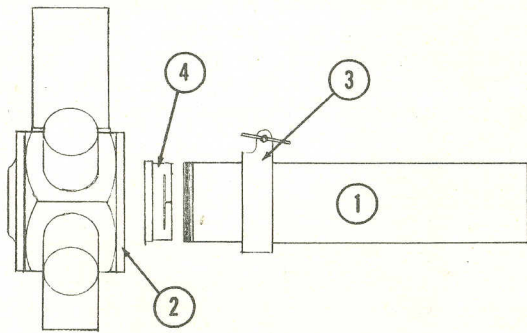


Figure 1

- 1. Drawtube
- 2. Turret
- 3. Drawtube Clamp
- 4. Achromatic Amplifier (Type A only)

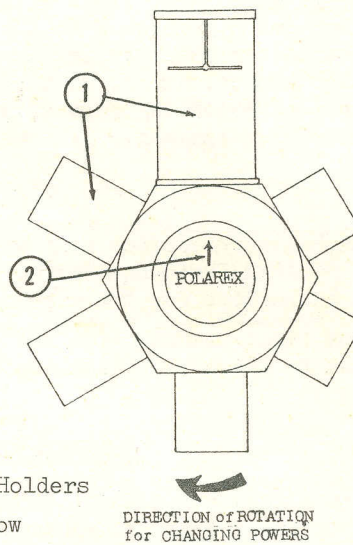


Figure 2

- 1. Eyepiece Holders
- 2. Index Arrow

DIRECTION OF ROTATION
for CHANGING POWERS

POLAREX DOUBLE EYEPIECE HOLDER

The Double Eyepiece Holder (D.E.H.) permits simultaneous viewing by two observers through the same telescope. It is an indispensable aid to the instructor in astronomy. Eyepieces used with D.E.H. do not necessarily have to be of the same focal length.

Type A: For use with POLAREX Refractors. This type has eyepiece holders for 2-24.5mm eyepieces. The drawtube is 36.2mm O.D. and can be used in any POLAREX Refractor except "Junior Series" instruments. The type A is not available with 1-1/4" eyepiece holders.

Type B: Is offered for use with all instruments equipped with 1-1/4" drawtube receptacle. This type has 2-1-1/4" eyepiece holders. Adapter bushings are available to permit the use of 24.5mm eyepieces in this type.

ASSEMBLY: (The following is applicable to both types)

- 1) Screw the threaded end of the chromium drawtube over the male threads on the body of the D.E.H.
- 2) Remove the regular drawtube supplied with the telescope by sliding it out of the rack and pinion.
- 3) Insert the D.E.H. drawtube into the rack and pinion sleeve.

OPERATION:

- 1) Insert an eyepiece in each of the eyepiece holders. They do not have to be of the same focal length but it is desirable to select eyepieces close in focal length to obtain similar magnifications and fields of view in both holders.
- 2) The front eyepiece holder can be positioned by rotating the drawtube in the instrument. The rear eyepiece holder can then be independently rotated to a comfortable viewing position for the second observer.
- 3) Focus the rear eyepiece first by sliding the entire D.E.H. in or out of the rack and pinion. When approximate focus is obtained slide the clamp forward and tighten over the rack and pinion sleeve. Refine the focus by using the rack and pinion knob. Focus the front eyepiece by rotating the focusing collar in the appropriate direction.

