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ASSEMBLY AND INSTRUCTION MANUAL for

SWIFT®

REFRACTOR

TELESCOPES

SWIFT®

INTRODUCTION

Your Swift refractor telescope was designed by Dr. Shusuke Kojima, of Tokyo, Japan, one of the World's foremost authorities on the design of observatory instruments.

The telescope was manufactured to the highest standards of optical and mechanical precision by one of Japan's leading optical instrument manufacturers.

Proof of the excellence of Swift telescopes can be found in their remarkable resolving power ··· or ability to show as separate objects distant pairs of lines or dots which inferior telescopes of equal magnifying power show as a single object.

We believe that your Swift telescope will equal or better the performance of any other telescope in its price and general performance bracket.

HOW TO ASSEMBLE YOUR SWIFT REFRACTING TELESCOPE

Naturally you are eager to get started. But please be careful. There is nothing complicated about these fine instruments and they are strongly made so that they will take their share of knocks without damage.

But accidents do happen and they happen just as often to people whose natural mechanical aptitude gives them too much confidence as they do to out-and-out beginners.

So please go slowly ··· step by step, referring to parts list and diagrams on fold-out sheet in the back of this booklet.

It is best, of course, to assemble your telescope indoors where there is a minimum of dirt and grit and where a carpeted floor can cushion the shock in case you drop anything. Having an upholstered chair and low table at hand may be useful, too.

(Note : Do not use wrenches or screwdrivers to tighten set screws. All adjusting and locking screws on Swift telescopes are **designed** so that finger-tight is tight enough.)

1. Remove the Tripod (32) from the cabinet and separate the legs from each other.
2. Remove the Main Tube (4) from the cabinet and put it on the carpeted floor or upholstered chair so that it won't roll around.
3. Remove the Tripod Head (29).
4. Undo the bolt and wing-nut at the head of each tripod leg and assemble the legs to the base of the tripod head as shown in fig. 1.
5. Loosen thumb screws at lower ends of legs and extend legs to a length that will place the tripod head at about chest height when the legs

are spread as shown in fig. 1.

6. Fasten the Accessory Tray (33) to each leg as shown in fig. 1.

7. Remove the Tripod Head Clamp (30) from the outside of the cabinet so that you can remove the Mounting Pillar (28) from inside. (Note: This applies only to model 831. Models 838 and 839 are provided with a simple set-screw in the base of the tripod head instead of a clamp.)

8. Mount the pillar by inserting the axle of the pillar through the hole in the tripod head. Then slip the Washer Ring (31) over the protruding end of the axle, screw the clamp on and tighten it (Model 831 only. on Models 838 and 839, simply insert the pillar axle and tighten the set screw ··· the tip of which travels in the groove around the axle so that the pillar can turn but will not fall out.)

9. (Model 831 only) Mount the Flexible Handles (17 and 23) of the Slow Motion Controls and be careful to align them properly as you start the threads. If they are hard to screw in, back them out and start again. In other words, you may damage the threads if the handles are not properly aligned.

10. Mount the Main Tube (4) in the Holding Band (12) and temporarily tighten the set screw on the Holding Band.

11. Mount the Finder Scope (40) and tighten its holding band in approximately the position shown in fig. 1. When a large number of people are using the telescope, you may find it convenient to move the Finder Scope further away from the eyepiece so that you can check the main tube's aim while others are observing through the main eyepiece.

12. You can now adjust the Main Tube for balance. Turn the Polar Axis (see fig. 1) to a vertical position so that the Main Tude is on one side and the Balance Weight (21) is on the other. Loosen the Main Tube Holding Band and push or pull the Main Tube gently through the Holding Band until it balances. Tighten the Holding Band. You will now find that the Main Tube balances at any angle of elevation and stays wherever you set it. Now, adjust the balance weight so that it counterbalances the weight of the Main Tude.

TERRESTRIAL OBSERVATION

You are now ready for terrestrial viewing because, when your Equatorial Mount is set up as shown in fig. 1, it can be used as a simple Altazimuth Mount. In other words, you can swing the telescope to right or left and up or down. This also permits casual celestial observation of any celestial object that can be located with the naked eye or with the Finder Scope. The only disadvantage of the Altazimuth system for celestial viewing is that you have to adjust for both altitude and azimuth when you want to **follow the movements** of a celestial body.

All you need to get started now is to mount the right eyepiece in the erecting eyepiece adapter (see fig. 18). Try them all and you will soon discover that the higher-powered eyepieces give you a comparatively dim view, particularly when you are trying to see an object that is not in direct sunlight. This is true of all telescopes and experienced observers simply use the power that is appropriate to the job to be done.

After you have taken a look at all the objects of interest within range at the moment, it's a good idea to take time out to align the Finder Scope with the Main Tube. This is easy enough to do but requires a little care and patience. Simply mount a medium-power eyepiece and line up one conspicuous object (a chimney, steeple, pole, tree or whatever) that is at least 1,000 yards away so that it is in the center of the main telescope's field of view. Now adjust the Finder Scope until the same object appears at the intersection of the cross-hairs in its eyepiece.

Model 831 : This finder scope is adjusted in azimuth by moving the lever provided at the eyepiece end of the Finder's mounting base. Adjust for elevation by turning the set screw at the other end of the base after loosening the screw that locks it.

SPECIFICATIONS OF OBJECTIVE LENS

	Specifications / Models	Model No. 838	Model No. 839	Model No. 831
A.	Diameter of Objective	52mm (2.05″)	62.5mm (2.46″)	79mm (3.11″)
B.	Effective Aperture of Objective	50mm (1.97″)	60mm (2.36″)	77mm (3.03″)
C.	Focal Length	700mm (27.6″)	810mm (31.9″)	1,000mm (39.4″)
D.	Focal Ratio	F : 14	F : 13.5	F : 13
E.	Resolving Power at Infinity (Dowes' Limit) in degrees	2.32″	1.94″	1.51″
F.	Resolving Power at 100 yds. in degrees	1.50″	1.25″	1.02″
G.	Resolving Power at 100 yds. in inches	0.028″	0.023″	0.019″
H.	Limiting Average Disc (Airy Disc)	0.0085mm	0.0075mm	0.0051mm
I.	Light Condensing Power	51X	73.5X	122X
J.	Light Condensing Power	1	1.44X	2.4X
K.	Star of Limiting Magnitude	10.5mag.	11.1mag.	12.2mag.
L.	Effective Minimum Magnification Theoretical Vertual (with Huy. 50mm)	 6.25X 14X	 7.5X 16X	 9.63X 20X
M.	Effective Maximum Magnificaton	200X	240X	308X
N.	Extreme Maximum Magnification	350X	405X	500X

— continned —

Model 839 : Loosen the set screws at each end of the Finder's mounting base and adjust for elevation by turning the screw at the eyepiece end ··· and for azimuth by turning the screw at the objective end. Tighten screws to lock in position.

Model 838 : Simply loosen all three set screws in the clamp around the middle of the Finder Scope until you can wiggle the Finder Scope a little. When you have the Finder Scope properly aligned, tighten the set screws until you have it locked in position.

SPECIFICATIONS IN TERRESTRIAL OBSERVATION

	Specifications / Models	Model No. 838	Model No. 839	Model No. 831
A.	Standard Eyepiece	Huy. 20mm	Huy. 20mm	Ach. Huy. 40mm
B.	Standard Magnification	35X	40X	25X
C.	Exit Pupil	1.4mm	1.5mm	3.1mm
D.	Relative Brightness	1.96	2.25	9.61
E.	Actual Field of View in degrees	1°9′	60′	1°29′
F.	Actual Field of View at 1,000 yds.	61 ft.	52 ft.	78 ft.
G.	Minimum Width at 300 yds.	0.082″	0.072″	0.059″
H.	Minimum Width at 10 yds.	0.0028″	0.0023″	0.0019″

CELESTIAL OBSERVATION

The whole point of the equatorial mount is that, when you have it properly adjusted, you can easily locate celestial objects that are normally invisible to the naked eye and you can follow the movement of a celestial object in one plane only (that is, you do not have to adjust for both altitude and azimuth ··· you make only one adjustment, for declination.)

To start with, let's go outdoors. You may have noticed already that, while viewing through window glass is perfectly practical when you are looking at right angles to the window, distortions begin to be bothersome when you are viewing at smaller angles to the window glass than a right angle. Outdoors, of course, you have none of these distortions. You may find, however, that the wind will be a nuisance if it is strong enough to make the telescope quiver. That is why celestial viewing is at its best on clear, still nights. You can, however, see a great deal even on nights when there is a slight haze, if you stick to the lower-powered eyepieces.

The first step in celestial viewing is to re-align your telescope according to the equatorial system of aiming. This is simple enough, if you compare fig. 2 with fig. 1 and notice the difference.

One of the differences you will notice is that, in fig. 2, the telescope is fitted with a Star Diagonal (see fig. 15) instead of the erecting prism eyepiece adapter used for terrestrial viewing. The Star Diagonal is simply a convenience that enables you to observe without having to crouch or bend way down as you would have to if you used the erecting prism. You will notice, however, that the Star Diagonal gives you a mirror image of what you see with the naked eye. This is simply because it lacks the erecting prism and you will quickly get used to the fact that images appear to move backwards as you swing the telescope.

The Polar Axis (25), instead of being vertical, is lined up at about 40° to 45° so that, when you orient the telescope toward the Polaris (the pole star) the Polar Axis is pointing right at it. Fig. 3 shows you how to find Polaris by following the stars in the Big Dipper.

Once you have located Polaris, simply point the Polar Axis approximately at the star. (If you are on about the same latitude as Swift's Boston headquarters, this will mean setting the Polar Axis so that it points North in azimuth and about 42° above the horizontal in elevation. If you are as far South as Key West, your latitude, and consequently the elevation, will be about 26°. In Seattle or Bangor, latitude and elevation will be closer to 50°.) Then center Polaris through the telescope Main Tube and line the Polar Axis up exactly with the Main Tube. By adjusting and re-adjusting, you will soon have both Main Tube and Polar Axis pointing directly at Polaris. This will give you an alignment with Celestial North that is accurate to within about 1° because Celestial North is actually about 1° away from Polaris in the direction of Cassiopeia (see fig.3). For even greater accuracy, refer to any handbook on astronomy.

Once you have locked the Polar Axis at the appropriate angle, it is a simple matter to set the Declination circle. Simply loosen the set-screw that holds the Declination indicating scale and set the scale to your latitude (which can easily be found by reference to an atlas). Keep the Declination Axis and balance-weight shaft horizontal throughout this operation (see fig.4). You can check this vertical alignment with a spirit level or with a simple plumb line made from a piece of string and a coffee cup, bolt, jack-knife or any other suitable weight. If the Main Tube is not vertical after you have set the Declination Axis and balance-weight shaft horizontal, it shows that the Polar Axis is incorrectly aligned. To correct such an error, loosen the Polar Axis clamp and adjust until the Main Tube is vertical. Then, re-lock the clamp and return the telescope to its original position toward Polaris.

You are now ready, with the aid of a nautical or astronomical almanac, to locate any object in the heavens.

First, look up a visible object (e. g. the moon) in the almanac and find out what its right ascension is for the date of your observation. Aim the telescope at the moon and set the right ascension scale for the reading you found in the almanac. Now look up in the almanac the right ascension of the object you want to find and turn the telescope until that reading appears on the Right Ascension scale. Now look up in the almanac the declination of the object and turn the telescope until that reading appears on the Declination scale.

If your settings and readings have all been accurate, the object you were looking for should now appear in the field of a low-powered eyepiece.

You can now follow the object of your observation simply by turning the telescope (either manually ··· Models 838 and 839 ··· or with the slow motion controls ··· Model 831) in the plane of declination. It is easy enough to change eyepieces without upsetting your aim if you are careful not to jog the telescope.

DAYTIME OBSERVATIONS

It is well worth your while to observe the sun (for sun spots and solar flares) and such very bright objects as the planet Venus in the daytime. In this case, you use the sun instead of the moon to set your right ascension scale ··· **but it is absolutely essential to avoid looking at the sun through the telescope without the special solar filter** in place. (see fig. 14.) This filter is specially designed to protect your eyes and make visible the sunspots and solar prominences that are of such vital interest to astronomers and long-range weather forecasters.

Another way to observe the sun is by projection onto a solar screen ··· a fascinating accessory for which separate instructions are provided. The sun diagonal prism is another useful accessory which facilitates observation of sun spots (with sun filter installed) and permits observation of the moon at low mognifications without using the moon filter.

HOW TO DETERMINE THE X-POWER OF AN EYEPIECE

This is a matter of simple arithmetic. Simply divide the focal length of the eyepiece (which is marked on the eyepiece itself in millimeters) into the focal length of the objective lens (which is marked on the top of the tube, above the rack and pinion focusing mechanism). For example, a 20 mm eyepiece used with the 700 mm objective of the Swift Model 838 telescope, gives you a magnification of 35X or 35 diameters ··· or it brings the object 35 times closer than it actually is.

THE BARLOW LENS

This is a device that doubles the effective focal length of the objective lens. By inserting it before you mount the eyepiece, it doubles the magnification of any eyepiece you then mount. Your Swift refractor is supplied with two eyepieces and one Barlow lens so that you actually have four different magnifications to choose from.

RESOLVING POWER

The following table shows the resolving power (ability to show details clearly) of the different models of Swift refractors.

Heavenly Bodies	Model No. 838 (50mm)	Model No. 839 (60mm)	Model No. 831 (3")
Sun	*Dark Parts of Sunspots. *Existence of Solar Photosphere. *Existence of Faculae. *Dia. of Minimum Sunspots : 1,050 miles. *Projection Image : 4" in dia., 5 ft. in max.	*Existence of Solar Granulation (Rice Grain). *Details of Sunspots. *Dia. of Minimum Sunspots : 890 miles. *Projection Image : 4–3/4" in dia., 6.5 ft. in max.	*Details of Solar Granulation (Rice Grain). *Details of Sunspots and its eruption. *Dia. of Min. Sunspots : 680 miles. *Projection Image : 6" in dia., 8.2 ft. in max.
Moon	*Approx. 5,000 craters. *Dia. of Minimum spot : 4.5 miles. *Width of Minimum crevice : 550 yds.	*Approx. 10,000 craters. *Dia. of Minimum spot : 3.7 miles. *Width of Minimum crevice : 460 yds.	*Approx. 20,000 craters. *Details of craters. *Dia. of Minimum spot : 3.1 miles. *Width of Minimum crevice : 360 yds.
Mercury	*Disc image can be seen.	*Can be seen in a crescent shape, when near the Earth.	*Can be seen in a crescent shape.
Venus	*Eclipse can de seen. Ordinarily appears as a crescent shape.	*Can be seen at noon under good conditions.	*Details of the crescent shape. Easy to see at noon, when far away from the Sun.
Mars	*Polar Cap and Lake Sirutis are visible when near the Earth.	*Polar Cap and Lake Sirutis can be seen clearly when near the Earth.	*Principal patterns and variation of Polar Cap are visible and rotation can be seen when near the Earth.
Jupiter	*Looks elliptical. 2 bands can be seen.	*4 bands or 6 are visible under good conditions.	*6 bands can be seen. The Great Red Point also observable.
Saturn	*The ring can be seen. Satellites Titan and Rhea are also visible.	*The ring is clearly visible. The Cassini Division can be seen under good conditions. *Satellites, Tethys, Dione, etc. are visible.	*The Cassini Division looks clear. At least 6 Satellites, Mimas, Enceladus, etc. are visible.
Uranus	*Distinguishable by its characteristic light.	*Distinguishable by its characteristic light.	*Appears as a disc approx. one tenth of the full moon, at the highest magnification.
Neptune	*Looks greenish blue.	*Looks greenish blue.	*Appears as a disc with the highest magnification, under good conditions.

DOUBLE STARS

Double stars are particularly interesting in that they enable you to check the resolving power of your telescope very accurately. A star atlas and some handbooks on astronomy list double stars and indicate the separation between them in fractions of a degree of arc. The better the telescope, the closer the pairs of double stars it can reveal as doubles. At low magnifications or with the naked eye, of course, double stars look like single stars.

In order to observe double stars successfully, you will have to wait for a clear, cool night without too much wind. Then you should let the telescope itself cool to the temperature of the atmosphere (which may take as long as half an hour) and you should let your eyes become thoroughly accustomed to the darkness. Be sure your lenses are clean, too. One further point: In some of the more widely separated doubles, you may be fooled into thinking they are not doubles at all. You have only to note the formation of stars in the main telescope's field and compare it with those you can see through the Finder Scope. You will almost certainly see that one of the stars in the Finder separates into two when you return to the main telescope.

NEBULAE AND CLUSTERS

It is quite difficult to see some of the fainter nebulae and star clusters in a still or motionless field. You can often pick them up, however, by jogging the telescope lightly so that it trembles. You will then see those fascinating assemblies of stars which are the fantastically distant galaxies like our own milky way galaxy. To locate nebulae and star clusters, refer to an astronomical atlas and locate them by means of the appropriate right ascension and declination readings.

LIST OF PRINCIPAL DOUBLE STARS

Name	Right Ascension	Declination	Magnitude		Angular Distance	Color	Model No. 838	Model No. 839	Model No. 831
			Main Star	Accompanying Star					
Ursa Minor α	1h49′	+89°	2	9	18″	Green	—	D	D
Draco ψ	17h43′	+72°	4	5	32″	Yellow & Purple	—	D	B
Draco 40-41	18h4′	+80°	6	6	20″	White	C	B	B
Andromeda γ	2h1′	+42°	3	5	10″	Yellow & Blue	C	B	A
Cygnus 61	21h4′	+38°	5	6	25″	Yellow	B	B	A
Lynx 38	9h16′	+37°	3.9	6.6	3″	White	—	—	C
Canes Venatici α	12h54′	+39°	3	5	20″	Yellow & Light Brown	A	A	A
Ursa Major ζ	13h22′	+55°	2	4	15″	White	B	A	A
Corona Borealis ζ	15h38′	+37°	4	5	6.5″	White & Blue	C	B	B
Lyra ε^1	18h43′	+40°	4	5	2.9″	Blue	C	C	B
Lyra ε^2	18h43′	+40°	4	5	2.3″	Blue	D	C	C
Aquarius γ	1h51′	+19°	4.2	4.4	8.4″	White	C	C	B
Aquarius ζ	22h26′	0°	4	4	2.5″	White	D	C	B
Orion β	5h12′	− 8°	1	7	9.5″	White	D	C	B
Virgo γ	12h39′	− 1°	3.6	3.7	5″	White	C	C	B
Bootes ζ	14h49′	+19°	5	7	5.1″	White	C	C	B
Cygnus β	19h29′	+28°	3	5	23″	Yellow & Blue	B	B	A
Scorpius β	16h3′	−20°	2.9	5.2	20″	Yellow & Violet	B	B	A
Canelo Paraalis 12	4h59′	+61°	5.3	6.2	1.8″	White	—	—	C
Lynx 12	6h41′	+59°	5.3	6.2	1.7″	White	—	—	C
Bootes μ^2	15h21′	+37°	7.2	7.8	1.6″	White	—	—	C
Hercules ζ	16h40′	+32°	3.0	6.0	1.6″	White	—	—	C
Pisses α	2h0′	+ 3°	4.3	5.2	2.6″	Green	—	C	C

Note: A: Seen in Low Magnification (With 20*mm* or longer Eyepiece)
B: Seen in Medium Magnification (With approx. 12*mm* Eyepiece)
C: Seen in High Magnification (With 6*mm* or shorter Eyepiece)
D: Seen in Maximum Magnification (With 6*mm* or shorter Eyepiece in combination with 2X Barlow Lens)

COMETS

Every now and again, the newspapers are full of news about a comet that is due to appear in this or that part of the sky. When comets are big enough to be visible to the naked eye, it is easy to locate them and, of course, you can locate them before they become visible to the naked eye simply by sweeping the area in which they are reported. Always use a low power eyepiece because it will reveal what details there are without magnifying the image so much that it appears as simply a faint luminosity.

HOW TO CARE FOR YOUR SWIFT REFRACTING TELESCOPE

No elaborate care is required. The most important thing to remember is that your telescope is a precision instrument so you should not bang it around, knock it against door posts, etc., but should always handle it with the care and respect any precision instrument deserves.

Do not rub or vigorously polish the lenses. Keep them covered when the telescope is not in use and gently remove any dust that may accumulate on the surface of a lens by flicking it with a soft cloth, or a soft brush (a water color paint brush for example). **Never** take lenses apart.

Occasionally oil the moving parts of the mount and focusing mechanism with light lubricating oil so that they will always work smoothly. If you apply too much oil, wipe off the surplus so that it doesn't get sticky.

TELEPHOTOGRAPHY

Camera

It is perfectly possible to use ordinary 35 mm. cameras for telephotography as long as they have a removable back and a means of inserting a ground glass focusing screen. Even without the focusing screen, you can line up the object you want to photograph in your Finder Scope and be reasonably sure that you will get it in the picture as long as you use low magnification.

Twin-lens reflex cameras can also be used by sighting through the viewing lens first and then raising the camera so that you can make your photograph through the main lens.

Single-lens reflex cameras with removable lenses however, are much to be preferred because they facilitate all finding and focusing operations. They can be used in three different ways (see below) simply by attaching them to the telescope with the appropriate camera adapter tube.

Before you start, be sure that all clamps and screws on your telescope are tight so that vibration is reduced to a minimum. Use a cable release to actuate the shutter and use the fastest shutter speed you can in order to reduce the effect of any vibration that may occur during exposure. Choose a shady site during the day and preferably a cool day (or night) so that you minimize distortions due to heat waves in the air. Flat, hard surfaces in the foreground (roadways, concrete areas, flagstone areas, etc.) are particularly productive of this type of distortion if they are hot.

Mounting the camera

Screw the special Adapter into the Secondary Draw Tube (9) in Model 831 or into the Focusing Draw Tube (6) in Models 838 and 839 ··· after removing Eyepiece Adapter (10). Then remove the lens of the single-

lens reflex camera and mount it as shown in Fig. 20. You are now ready to take photographs by the Focal Plane method. This simply means that the film in the camera is located in the focal plane of the telescope objective lens.

If you are telephotographing terrestrial objects, you may want to insert a yellow or ultra-violet filter in the special adapter. For celestial work, no filter is necessary.

Focusing

Focusing is accomplished in the usual manner, by looking through the camera's view-finder and focusing just as if the standard camera lens were in place instead of the telescope.

Lens aperture

With the foregoing arrangement, Model 831 telescope gives you a lens aperture of F-13, Model 839 gives you F-13.5 and Model 838 gives you F-14.

Shutter speed

For terrestrial work in daylight, you can use any exposure meter to give you the proper speed for the aperture indicated in the paragraph above. If you want to cut down the aperture to increase depth of focus or because you are using an extremely fast film, the easiest way to do this is to cut a hole of appropriate size in a piece of cardboard (ordinary shit cardboard will do) and insert it inside the Lens Hood (2).

Indirect Telephotography

By this method, you take photographs through the eyepiece of the telescope. It has the advantage of enabling you to mount filters on the camera itself and to reduce the aperture accurately by using the camera's own iris diaphragm.

You mount whichever eyepiece you choose on the telescope and leave the camera's standard lens mounted on the camera. It is preferable to use a low-power eyepiece on the telescope because it gives you the largest possible aperture and enables you to use higher shutter speeds. The more you increase the power of the eyepiece, the more you reduce the aperture and the more you have to increase the length of the exposure to make up for it.

The reason for this is simply that the effective aperture of the telescope, eyepiece, camera combination is a function of the combined focal lengths of telescope and camera. For example, if you use a 25X eyepiece and the focal length of the camera lens is 50mm., the combined focal length is the product of these two quantities i. e. 25 X 50 = 1250. To get the aperture (or focal ratio) you divide the combined focal length by the effective aperture of the telescope's objective lens. For the Model 831, this gives you 1250mm ÷77mm which is about F-16.

Once you have figured out the aperture and exposure or shutter speed, all you have to do is hold the camera to the eyepiece. If you use fast film and have plenty of light (as on an early summer morning before the heat waves have started) you should be able to get reasonably good pictures without using a mount. If you have to cut down your shutter speed, however, you may be able to line the telescope up with a table or other support for the camera ··· by adjusting the height of the telescope tripod ··· or by mounting the camera on a separate tripod and setting it so that the camera lens is as tight as possible against the telescope eyepiece. A piece of black adhesive tape (electrician's tape) wrapped around at the junction of these two lenses will help exclude stray light.

Telephotography by projection

With this method, you remove the lens from the camera and mount the camera on the telescope with the telescope eyepiece in place. The telescope then projects its image through the eyepiece directly onto the film

in the camera. The enlarging ratio of the projected image is directly proportional to the distance of the eyepiece from the camera's focal plane.

For example, if you photograph the moon with an enlarging ratio of 5X, you get an image of the moon on your film that is approximately 45mm. in diameter (with the Model 831).

This method is satisfactory for bright celestial objects such as the sun (with red filter) and moon but the brighter planets can be captured with fast film.

ACCESSORIES

The following accessories are available for your Swift refractor and separate instructions for using them are included with each accessory that has not already been described in this manual.

TABLE OF ACCESSORIES AVAILABLE

*Eyepiece :	Orth.	4 mm
	Tri.	6 mm
	Ach. Huy.	40mm
	Kellner	12mm
	Kellner	20mm
	Kellner	26mm

*Moon Filter

*Sun Diagonal Prism
*Sun Projection Screen
*Eyepiece turret with 4 openings
*Telephotography adapter for Model Nos. 838 and 839 (for Direct Telephotography)
*Telephotography adapter for Model No. 831 (for Direct Telephotography)
*Camera Holder for Projection Telephotography



Swift Instruments, Inc.

PARTS LIST

1. Dust Cap
2. Lens Hood
3. Objective Head
4. Main Tube
5. Eye-end
6. Focusing Drawtube
7. Focusing Pinion Handle
8. Retaining Ring for Secondary Drawtube
9. Secondary Drawtube
10. Eyepiece Adapter
11. Retaining Ring for Eyepiece Adapter
12. Holding Band
13. Nut for Holding Band
14. Base for Holding Band
15. Declination Clamp
16. Slow-motion Device in Declination
17. Flexible Handle in Declination
18. Declination Axis
19. Declination Circle
20. Shaft for Balance Weight
21. Balance Weight
22. Slow-motion Device in Right Ascension
23. Flexible Handle in Right Ascension
24. Right Ascension Circle
25. Polar Axis
26. Right Ascension Clamp
27. Polar Axis Clamp
28. Mounting Pillar
29. Tripod Head
30. Tripod Head Clamp
31. Washer Ring for Tripod Head
32. Tripod
33. Accessory Tray
34. Holding Band for Finder Scope
35. Finder Scope Base
36. Finder Scope Leg
37. Elevation Adjusting Screw
38. Retainer for Elevation Adjusting Screw
39. Windage Adjusting Screw (or Lever)
40. Finder Scope Tube
41. Retaining Ring for Finder Eyepiece
42. Eyepiece for Finder Scope



Fig. 1

Shows Model 831 completely assembled in position suitable for terrestrial use.

Fig. 2

Shows Model 831 in position for celestial observation with polar axis at about 40°—45°.

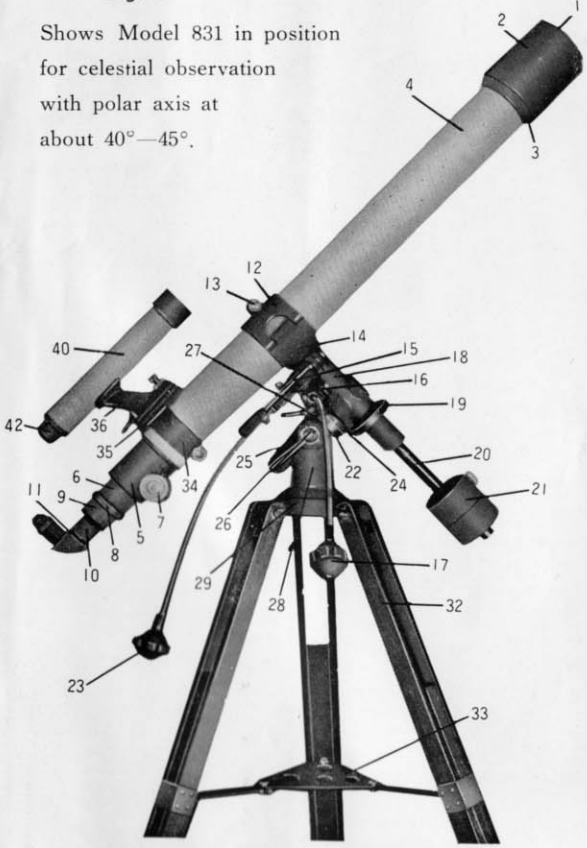


Fig. 3

Area around Polaris.

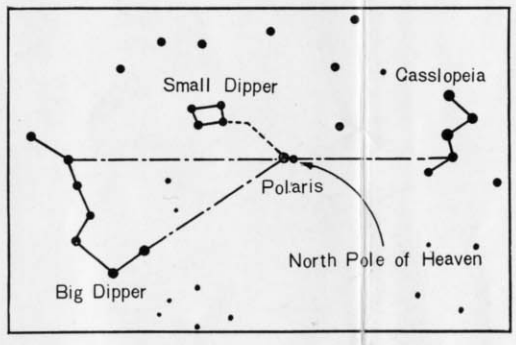


Fig. 4

Shows telescope in position for setting of declination circle. Tube points straight up and down.

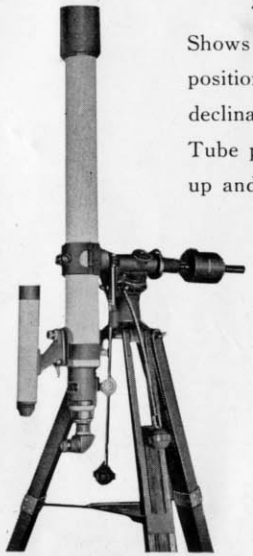


Fig. 5

Shows Model 839 (or 838) packed in the carrying case.

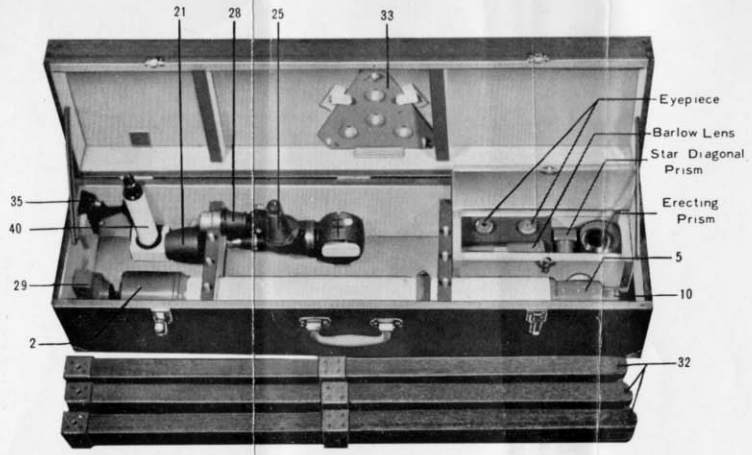


Fig. 6

Shows Model 831 packed in the carrying case.

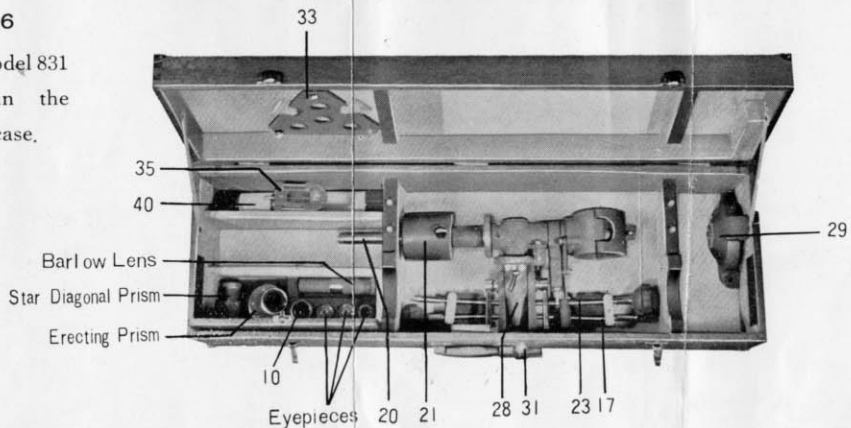


Fig. 7

Finder Scope of Model 838.

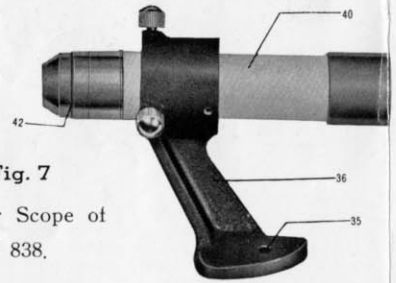


Fig. 8

Finder Scope of Model 839.

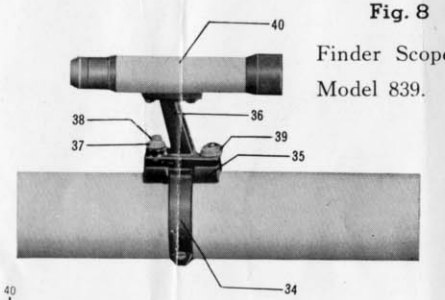
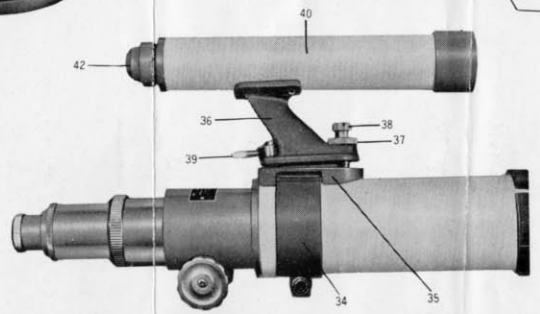


Fig. 9

Finder Scope of Model 831.



SWIFT® **LENSES**

Construction of SWIFT Eyepieces

Fig. 10

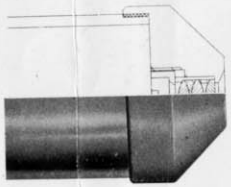
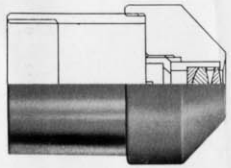
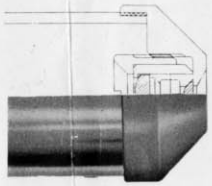
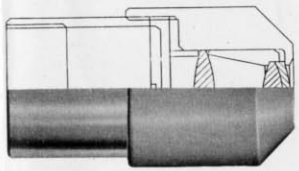
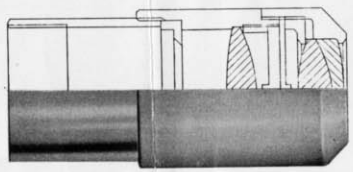
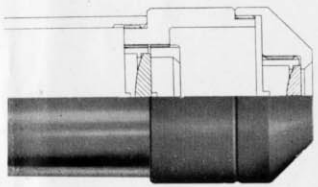
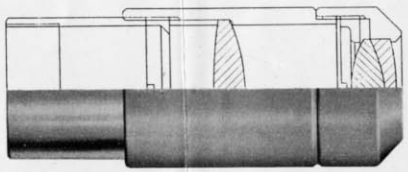
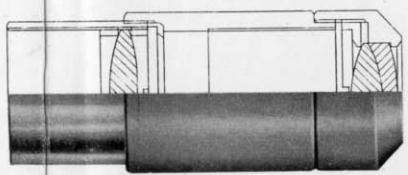
Orthoscopic 4 mm 	Triplane 6 mm 
Huy. Mit. 6 mm 	Kellner 12 mm 
Kellner 20 mm 	Huygenian 20 mm 
Kellner 26 mm 	Ach. Huy. 40mm 

Fig. 11 — Eyepiece Adapter.

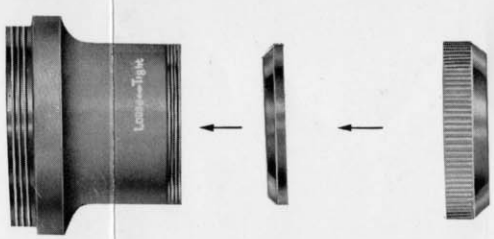


Fig. 12 — Sun Filter or Moon Filter.

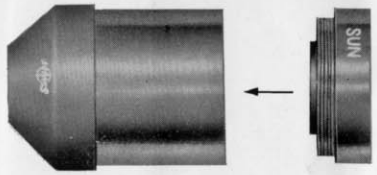


Fig. 13 — Erecting Prism.

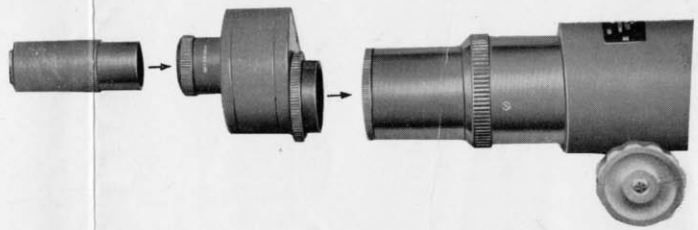


Fig. 14 — Barlow Lens.



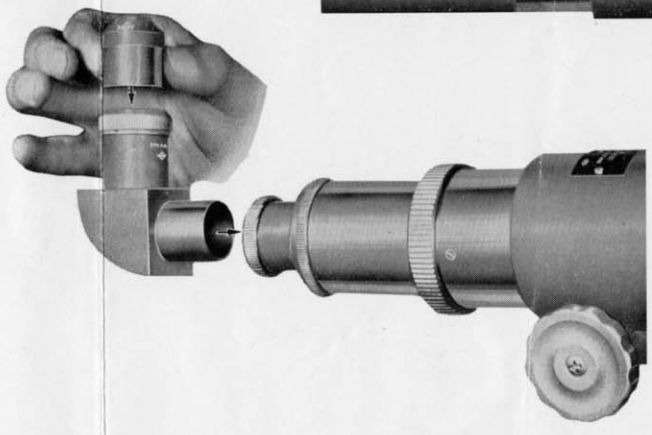


Fig. 15
Star Diagonal Prism.

Fig. 16 — Camera Adapter.

