INSTRUCTION MANUAL

Orion® StarBlast™ 80mm AutoTracker™

#8983

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TELESCOPES & BINOCULARS

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IN 488 Rev. A 05/13

Introduction

Congratulations on your purchase of the Orion StarBlast telescope!

Take time to read through this manual before embarking on your journey through the heavens.

Please read the separate AutoTracker Mount Manual (IN 489) for all information relating to the mount and its accessories.

Your StarBlast telescope is designed to give you years of fun and exciting astronomical observations. However, there are a few things to consider before using your telescope that will ensure your safety and protect your equipment.

Figure 1. In the box: Parts of the StarBlast 80mm.

Parts List

Optical Tube Assembly

EZ Finder II Reflex Sight (with bracket)

Super 25mm Eyepiece

Super 10mm Eyepiece

90 degree Star Diagonal

Telescope Dust Cap

Attaching the Diagonal

Attach the 90˚ star diagonal to the optical tube. First remove the caps from the diagonal and unthread the cover on the rear of the telescope . The knurled ring on the diagonal connects to the threads on the rear of the telescope. Tighten this ring firmly. If you wish to change the orientation of the diagonal for a more comfortable viewing angle, you must first loosen the knurled ring on the diagonal. Rotate the diagonal to the desired viewing angle, and retighten the knurled ring to lock the diagonal into place (**Figure 2**).

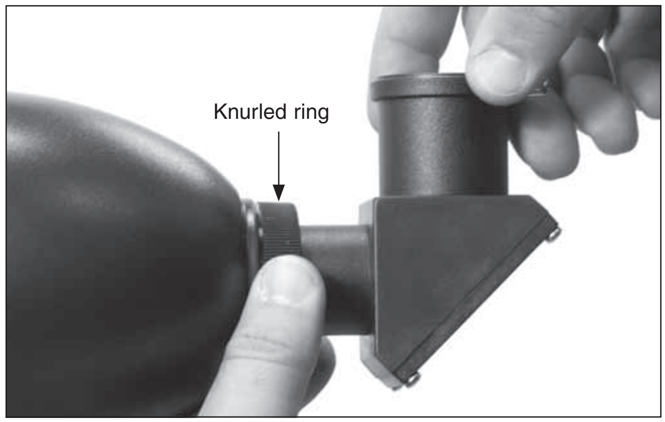


Figure 2. The knurled ring of the diagonal connects to the threads on the rear of the optical tube. To change the viewing angle, loosen the knurled ring, rotate the diagonal, and then retighten the ring.

The Eyepieces

The eyepiece, or ocular, is the optical element that magnifies the image focused by the telescope. The eyepiece fits directly into the diagonal. The 1.25" designation refers to the barrel diameter of the eyepieces.

To install one of the included eyepieces:

1. Loosen the two thumbscrews on the diagonal.
2. Slide the barrel of the eyepiece into the diagonal.
3. Tighten the thumbscrews to hold the eyepiece in place.

To remove the eyepiece, loosen the thumbscrews on the diagonal and slide the eyepiece out.

Eyepieces are commonly referred to by their focal length and barrel diameter. The focal length of each eyepiece is typically printed on the eyepiece body. For example this telescope ships with two 1.25" diameter eyepieces; a 25mm and a 10mm. The longer the focal length (i.e., the larger the number), the lower the eyepiece power or magnification; and the shorter the focal length (i.e., the smaller the number), the higher the magnification. Generally, you will use low-to-moderate power when viewing. For more information on how to determine power, see the section "Calculating Magnification."

WARNING:

- ***Never look directly at the Sun with the naked eye or with a telescope – unless you have a proper solar filter installed over the front of the telescope! Otherwise, permanent, irreversible eye damage may result.***
- ***Never use your telescope to project an image of the Sun onto any surface. Internal heat build-up can damage the telescope and any accessories attached to it.***
- ***Never use an eyepiece solar filter or a Herschel wedge. Internal heat build-up inside the telescope can cause these devices to crack or break, allowing unfiltered sunlight to pass through to the eye.***
- ***Never leave the telescope unsupervised, either when children are present or adults who may not be familiar with the correct operating procedures of your telescope.***

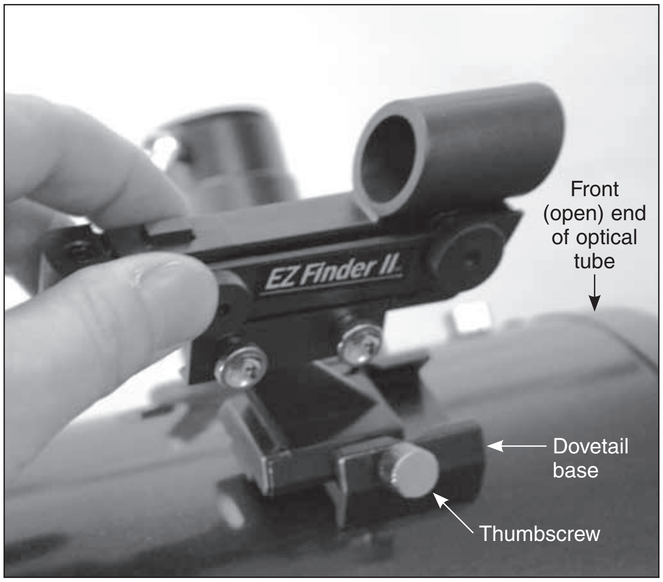


Figure 3. Insert the EZ Finder II in its dovetail base in the orientation shown and secure it with the thumbscrew.

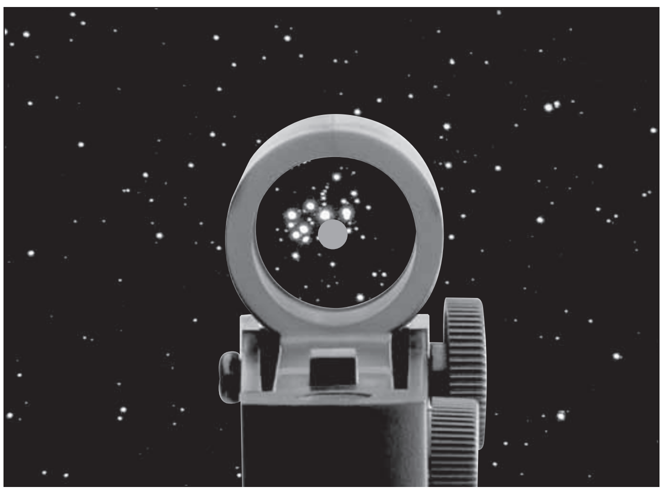


Figure 4. The EZ Finder II superimposes a tiny red dot on the sky, showing right where the telescope is aimed.

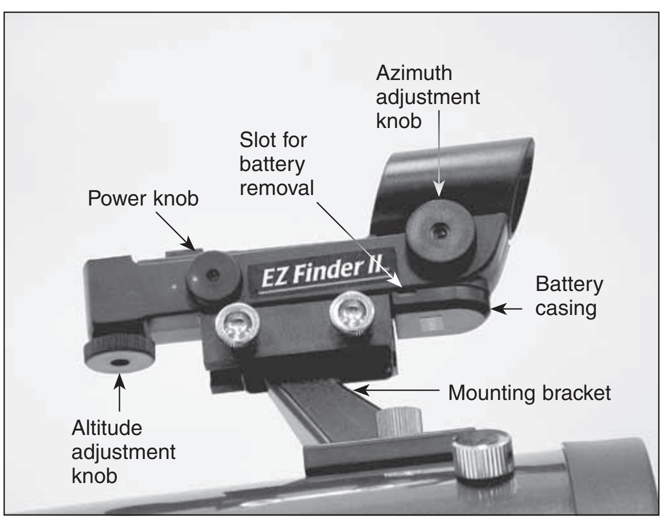


Figure 5. The EZ Finder II's On/Off and adjustment knobs.

Focusing

Using the lower power eyepiece (25mm) inserted and secured with the thumbscrews, aim the optical tube so the front end is pointing in the general direction of an object at least 1/4-mile away. With your fingers, slowly rotate the focus knob until the object comes into sharp focus. A good method to ensure you've hit the exact focus point is go a little bit beyond sharp focus until the image starts to blur again, then reverse the rotation of the knob and stop when sharp focus has been achieved again.

Installing the EZ Finder II

Slide the base of the EZ Finder II bracket into the dovetail holder that is pre-installed on the optical tube. The EZ Finder II should be oriented so that the sight tube is facing the *front* of the telescope (**Figure 3**). Tighten the thumbscrew on the dovetail holder to secure the EZ Finder II in place.

The EZ Finder II works by projecting a tiny red dot (it is not a laser beam) onto a lens mounted in the front of the unit (**Figure 4**). When you look through the EZ Finder II, the red dot will appear to float in space, helping you to pinpoint your target object. The red dot is produced by a light-emitting diode (LED) near the rear of the sight. A 3-volt lithium battery provides the power for the diode.

NOTE: If it is present, remove the thin plastic battery shield tab (not shown) from the battery compartment prior to use and discard it.

Turn the power knob (**Figure 5**) clockwise until you hear the "click" indicating that power has been turned on. Look through the back of the reflex sight with both eyes open to see the red dot. Position your eye at a comfortable distance from the back of the sight. In daylight you may need to cover the front of the sight with your hand to be able to see the dot, which is purposefully quite dim. The intensity of the dot is adjusted by turning the power knob. For best results when stargazing, use the dimmest possible setting that allows you to see the dot without difficulty. Typically a dimmer setting is used under dark skies and a brighter setting is needed under light-polluted skies or in daylight.

Aligning the EZ Finder II

For the EZ Finder II to work properly, it has to be aligned with the telescope. When the two are aligned, a celestial object that is centered on the EZ Finder II's red dot should also appear in the center of the telescope's eyepiece. Alignment of the EZ Finder II is easiest during daylight, before observing at night. Aim the telescope at a distant object such as a telephone pole or roof chimney and center it in the telescope's eyepiece. The object should be at least 1/4 mile away. Now turn on the EZ Finder II and look through it. Without moving the main telescope, use the EZ Finder II's azimuth (left/right) and altitude (up/down) adjustment knobs (**Figure 5**) to position the red dot on the object in the eyepiece. When the red dot is centered on the distant object, check to make sure that the object is still centered in the telescope eyepiece. If it isn't, re-center it and adjust the EZ Finder II's alignment again. When the object is centered in the eyepiece *and* on the EZ Finder's red dot, the EZ Finder II is properly aligned with the telescope.

Once aligned, EZ Finder II will usually hold its alignment even after being removed and remounted. Otherwise, only minimal realignment will be needed. At the end of your observing session, be sure to turn off the power knob on the EZ Finder II.

Replacing the EZ Finder II Battery

Should the battery ever die, replacement 3-volt lithium batteries are available from many retail outlets. Remove the old battery by inserting a small flat-head screwdriver into the slot on the battery casing (**Figure 5**) and gently prying open the case. Then carefully pull back on the retaining clip and remove the old battery. Do not over bend the retaining clip. Then slide the new battery under the battery lead with the positive (+) end facing down and replace the battery casing.

Telescope Basics

A telescope is an instrument that collects and focuses light. The nature of the optical design determines how the light is focused. Some telescopes, known as refractors, use lenses. Other telescopes, known as reflectors, use mirrors.

The StarBlast 80mm is a refracting telescope.

Focusing

Once you have found an object in the telescope, turn the focusing knob until the image is sharp. To achieve a truly sharp focus, never look through glass windows or across objects that produce heat waves, such as asphalt parking lots.

For astronomical viewing, out of focus star images are very diffuse, making them difficult to see. If you turn the focus knob too quickly, you can go right through focus without seeing the image. To avoid this problem, your first astronomical target should be a bright object (like the Moon or a planet) so that the image is visible even when out of focus. It can even be helpful to practice during the day on an object at least a mile away, i.e., at “infinity.”

Image Orientation

The image orientation of any telescope changes depending on its optical design and how the eyepiece is inserted into the telescope. A refractor used with a star diagonal, for astronomical viewing, will show an image that is right side up, but left-right reversed. When observing through a reflector such as the StarBlast 114mm, the image will appear upside down and backwards. For this reason reflectors are not recommended for daytime terrestrial observing. But since there is no “right side up” in space, a reflector is fine for astronomical viewing.

Calculating Magnification

You can change the power of your telescope just by changing the eyepiece (ocular). To determine the magnification of your telescope, simply divide the focal length of the telescope by the focal length of the eyepiece used.

Magnification is calculated as follows:

$$\frac{\text{Telescope Focal Length}}{\text{Eyepiece Focal Length}} = \text{Magnification}$$

For example, the StarBlast 80mm has a focal length of 350mm, which when used with the supplied 25mm eyepiece yields:

$$\frac{350\text{mm}}{25\text{mm}} = 14\text{x}$$

The magnification provided by the 10mm eyepiece is:

$$\frac{350\text{mm}}{10\text{mm}} = 35\text{x}$$

Although the power is variable, each instrument under average skies has a limit to the highest useful magnification. The general rule is 2x per millimeter of aperture. For example, the StarBlast 80mm is so named for its objective lens, which has a diameter of 80mm. So 80mm x 2 = 160. Thus, 160x is the highest magnification one can normally achieve under ideal seeing conditions. Although this is the maximum useful magnification, most observing will yield best results at lower powers.

Determining Field of View

Determining the field of view is important if you want to get an idea of the angular size of the object you are observing. To calculate the actual field of view, divide the apparent field of the eyepiece (supplied by the eyepiece manufacturer) by the magnification. In equation format, the formula looks like this:

$$\frac{\text{Apparent Field of Eyepiece}}{\text{Magnification}} = \text{True Field}$$

As you can see, before determining the field of view, you must calculate the magnification. Using the example in the previous section, we can determine the field of view using the same 25mm eyepiece.

The 25mm eyepiece has an apparent field of view of 49°. Divide 49° by the magnification, which is 14 power. This yields an actual field of view of 3.5°.

$$\frac{49}{14} = 3.5° \text{ True Field of view}$$

The 10mm eyepiece has an apparent field of view of 52°. Divide 52° by the magnification, which is 35 power. This yields an actual field of view of 1.49°.

$$\frac{52}{35} = 1.49° \text{ True Field of view}$$

To convert degrees to feet at 1,000 yards, which is more useful for terrestrial observing, simply multiply by 52.5.

The 25mm eyepiece produces a linear field width of 183.75 feet at a distance of one thousand yards (3.5° X 52.5).

The 10mm eyepiece produces a linear field width of 78.23 feet at a distance of one thousand yards (1.49° X 52.5).

General Observing Hints

When working with any optical instrument, there are a few things to remember to ensure you get the best possible image:

- Never look through window glass. Glass found in household windows is optically imperfect, and as a result, may vary in thickness from one part of a window to the next. This inconsistency can and will affect the ability to focus your telescope. In most cases you will not be able to achieve a truly sharp image, while in some cases; you may actually see a double image.

- Never look across or over objects that are radiating heat waves. This includes asphalt parking lots on hot summer days or building rooftops.
- Hazy skies, fog, and mist can also make it difficult to focus. The amount of detail seen under these conditions is greatly reduced.
- If you wear corrective lenses (specifically, glasses), you may want to remove them when observing with an eyepiece attached to the telescope. When using a camera, however, you should always wear corrective lenses to ensure the sharpest possible focus. If you have astigmatism, corrective lenses must be worn at all times.

Celestial Observing

With your telescope set up, you are ready to use it for observing. This section covers visual observing hints for both solar system and deep-sky objects as well as general observing conditions that will affect your ability to observe.

Observing the Moon

Often, it is tempting to look at the Moon when it is full. At this time, the face we see is fully illuminated and its light can be overpowering. In addition, little or no contrast can be seen during this phase.

One of the best times to observe the Moon is during its partial phases (at crescent phases and around the time of first or third quarter). Long shadows reveal a great amount of detail on the lunar surface. At low power you will be able to see most of the lunar disk at one time. Change to higher power (magnification) to focus in on a smaller area.

Lunar Observing Hints

- To increase contrast and bring out detail on the lunar surface, use eyepiece filters. A yellow filter works well at improving contrast while a neutral density or polarizing filter will reduce overall surface brightness and glare.

Observing the Planets

Other fascinating targets include the five naked eye planets. You can see Venus go through its lunar-like phases. Mars can reveal a host of surface detail and one, if not both, of its polar caps. You will be able to see the cloud belts of Jupiter and the great Red Spot (if it is visible at the time you are observing). In addition, you will also be able to see the moons of Jupiter as they orbit the giant planet. Saturn, with its beautiful rings, is easily visible at moderate power.

Planetary Observing Hints

- Remember that atmospheric conditions are usually the limiting factor on how much planetary detail will be visible. So, avoid observing the planets when they are low on the horizon or when they are directly over a source of radiating heat, such as a rooftop or chimney. See the “Seeing” section later in this section.
- To increase contrast and bring out detail on the planetary surface, try using color eyepiece filters.

Observing the Sun

Although overlooked by many amateur astronomers, solar observation is both rewarding and fun. However, because the Sun is so bright, special precautions must be taken when observing our star so as not to damage your eyes or your telescope.

Never project an image of the Sun through the telescope. Tremendous heat build-up may result inside the optical tube. This can damage the telescope and/or any accessories attached to the telescope.

For safe solar viewing, use a solar filter that reduces the intensity of the Sun’s light, making it safe to view. With a filter you can see sunspots as they move across the solar disk and faculae, which are bright patches seen near the Sun’s edge.

Solar Observing Hints

- The best time to observe the Sun is in the early morning or late afternoon when the air is cooler.
- To center the Sun without looking into the eyepiece, watch the shadow of the telescope tube until it forms a circular shadow. There are also special “solar viewing” finder devices available that are designed for aligning a telescope with the Sun.

Observing Deep-Sky Objects

Deep-sky objects are simply those objects outside the boundaries of our solar system. They include star clusters, planetary nebulae, diffuse nebulae, double stars and other galaxies outside our Milky Way galaxy. Most deep-sky objects have a large angular size. Therefore, low-to-moderate power is all you need to see them. Visually, they are too faint to reveal any of the color seen in long exposure photographs. Instead, they appear grayish. And, because of their low surface brightness, they should be observed from a dark sky location whenever possible. Light pollution around large urban areas washes out most nebulae making them difficult, if not impossible, to observe. Light Pollution Reduction filters help reduce the background sky brightness, thus increasing contrast.

Viewing Conditions

Viewing conditions affect what you can see through your telescope during an observing session. Conditions include transparency, sky illumination, and seeing. Understanding viewing conditions and the effect they have on observing will help you get the most out of your telescope.

Transparency

Transparency is the clarity of the atmosphere, which is affected by clouds, moisture, and other airborne particles. Thick cumulus clouds are completely opaque while cirrus can be thin, allowing the light from the brightest stars through. Hazy skies absorb more light than clear skies, making fainter objects harder to see and reducing contrast on brighter objects. Aerosols ejected into the upper atmosphere from volcanic eruptions also affect transparency. Ideal conditions are when the night sky is inky black.

Sky Illumination

General sky brightening caused by the Moon, aurorae, natural airglow, and light pollution greatly affects transparency. While not a problem for the brighter stars and planets, bright skies reduce the contrast of extended nebulae making them difficult, if not impossible, to see. To maximize your observing, limit deep-sky viewing to moonless nights far from the light polluted skies found around major urban areas. LPR filters enhance deep-sky viewing from light polluted areas by blocking unwanted light while transmitting light from certain deep-sky objects. You can, on the other hand, observe planets and stars from light polluted areas or when the Moon is out, due to their strong brightness.

Seeing

Seeing conditions refer to the stability of the atmosphere. "Seeing" directly affects the amount of fine detail seen in extended objects. The air in our atmosphere acts as a lens that bends and distorts incoming light rays. The amount of bending depends on air density. Varying temperature layers have different densities and, therefore, bend light differently. Light rays from the same object arrive slightly displaced creating an imperfect or smeared image. These atmospheric disturbances vary from time-to-time and place-to-place. The size of the air parcels compared to your aperture determines the "seeing" quality. Under good seeing conditions, fine detail is visible on the brighter planets like Jupiter and Mars, and stars are pinpoint images. Under poor seeing conditions, images are blurred and stars appear as blobs.

The conditions described here apply to both visual and photographic observations.

Telescope Maintenance

While your StarBlast telescope requires little maintenance, there are a few things to remember that will ensure your telescope performs at its best.

Care and Cleaning of the Optics

Any quality optical lens cleaning tissue and optical lens cleaning fluid specifically designed for multi-coated optics can be used to clean the exposed lenses of your eyepieces. Never use regular glass cleaner or cleaning fluid designed for eyeglasses. Before cleaning with fluid and tissue, blow any loose particles off the lens with a blower bulb or compressed air. Then apply some cleaning fluid to a tissue, never directly on the optics. Wipe the lens gently in a circular motion, then remove any excess fluid with a fresh lens tissue. Oily fingerprints and smudges may be removed using this method. Use caution; rubbing too hard may scratch the lens. On larger lenses,

clean only a small area at a time, using a fresh lens tissue on each area. Never reuse tissues.

To minimize the need to clean your telescope, replace all lens covers once you have finished using it. This will prevent contaminants from entering the optical tube.

Specifications

Optical Diameter:	80mm diameter
Focal Length:	350mm
Focal Ratio:	f/4.3
Eyepieces:	Super 25mm, Super 10mm
Magnification with supplied eyepieces:	14x, 35x

Glossary of Terms

A-

Absolute magnitude: The apparent magnitude that a star would have if it were observed from a standard distance of 10 parsecs, or 32.6 light-years. The absolute magnitude of the Sun is 4.8. at a distance of 10 parsecs, it would just be visible on Earth on a clear moonless night away from surface light.

Airy disk: The apparent size of a star's disk produced even by a perfect optical system. Since the star can never be focused perfectly, 84 per cent of the light will concentrate into a single disk, and 16 per cent into a system of surrounding rings.

Alt-Azimuth Mounting: A telescope mounting using two independent rotation axes allowing movement of the instrument in Altitude and Azimuth.

Altitude: In astronomy, the altitude of a celestial object is its Angular Distance above or below the celestial horizon.

Aperture: The diameter of a telescope's primary lens or mirror; the larger the aperture, the greater the telescope's light-gathering power.

Apparent Magnitude: A measure of the relative brightness of a star or other celestial object as perceived by an observer on Earth.

Arc minute: A unit of angular size equal to 1/60 of a degree.

Arc second: A unit of angular size equal to 1/3,600 of a degree (or 1/60 of an arc minute).

Asterism: A small unofficial grouping of stars in the night sky.

Asteroid: A small, rocky body that orbits a star.

Astrology: The pseudoscientific belief that the positions of stars and planets exert an influence on human affairs; astrology has nothing in common with astronomy.

Astronomical unit (AU): The distance between the Earth and the Sun. It is equal to 149,597,900 km., usually rounded off to 150,000,000 km.

Aurora: The emission of light when charged particles from the solar wind slams into and excites atoms and molecules in a planet's upper atmosphere.

Azimuth: The angular distance of an object eastwards along the horizon, measured from due north, between the astronomical meridian (the vertical line passing through the center of the sky and the north and south points on the horizon) and the vertical line containing the celestial body whose position is to be measured. .

B -

Binary Stars: Binary (Double) stars are pairs of stars that, because of their mutual gravitational attraction, orbit around a common center of mass. If a group of three or more stars revolve around one another, it is called a multiple system. It is believed that approximately 50 percent of all stars belong to binary or multiple systems. Systems with individual components that can be seen separately by a telescope are called visual binaries or visual multiples. The nearest "star" to our solar system, Alpha Centauri, is actually our nearest example of a multiple star system, it consists of three stars, two very similar to our Sun and one dim, small, red star orbiting around one another.

C -

Celestial Equator: The projection of the Earth's equator on to the celestial sphere. It divides the sky into two equal hemispheres.

Celestial pole: The imaginary projection of Earth's rotational axis north or south pole onto the celestial sphere.

Celestial Sphere: An imaginary sphere surrounding the Earth, concentric with the Earth's center.

Collimation: The act of putting a telescope's optics into perfect alignment.

D -

Declination (DEC): The angular distance of a celestial body north or south of the celestial equator. It may be said to correspond to latitude on the surface of the Earth.

E -

Ecliptic: The projection of the Earth's orbit on to the celestial sphere. It may also be defined as "the apparent yearly path of the Sun against the stars".

Equatorial mount: A telescope mounting in which the instrument is set upon an axis which is parallel to the axis of the Earth; the angle of the axis must be equal to the observer's latitude.

F -

Focal length: The distance between a lens (or mirror) and the point at which the image of an object at infinity is brought to focus. The focal length divided by the aperture of the mirror or lens is termed the focal ratio.

J -

Jovian Planets: Any of the four gas giant planets that are at a greater distance form the sun than the terrestrial planets.

K -

Kuiper Belt: A region beyond the orbit of Neptune extending to about 1000 AU which is a source of many short period comets.

L -

Light-Year (ly): A light-year is the distance light traverses in a vacuum in one year at the speed of 299,792 km/ sec. With 31,557,600 seconds in a year, the light-year equals a distance of 9.46 X 1 trillion km (5.87 X 1 trillion mi).

M -

Magnitude: Magnitude is a measure of the brightness of a celestial body. The brightest stars are assigned magnitude 1 and those increasingly fainter from 2 down to magnitude 5. The faintest star that can be seen without a telescope is about magnitude 6. Each magnitude step corresponds to a ratio of 2.5 in brightness. Thus a star of magnitude 1 is 2.5 times brighter than a star of magnitude 2, and 100 times brighter than a magnitude 5 star. The brightest star, Sirius, has an apparent magnitude of -1.6, the full moon is -12.7, and the Sun's brightness, expressed on a magnitude scale, is -26.78. The zero point of the apparent magnitude scale is arbitrary.

Meridian: A reference line in the sky that starts at the North celestial pole and ends at the South celestial pole and passes through the zenith. If you are facing South, the meridian starts from your Southern horizon and passes directly overhead to the North celestial pole.

Messier: A French astronomer in the late 1700's who was primarily looking for comets. Comets are hazy diffuse objects and so Messier cataloged objects that were not comets to help his search. This catalog became the Messier Catalog, M1 through M110.

N -

Nebula: Interstellar cloud of gas and dust. Also refers to any celestial object that has a cloudy appearance.

North Celestial Pole: The point in the Northern hemisphere around which all the stars appear to rotate. This is caused by the fact that the Earth is rotating on an axis that passes through the North and South celestial poles. The star Polaris lies less than a degree from this point and is therefore referred to as the "Pole Star".

Nova: Although Latin for "new" it denotes a star that suddenly becomes explosively bright at the end of its life cycle.

O -

Open Cluster: One of the groupings of stars that are concentrated along the plane of the Milky Way. Most have an asymmetrical appearance and are loosely assembled. They contain from a dozen to many hundreds of stars.

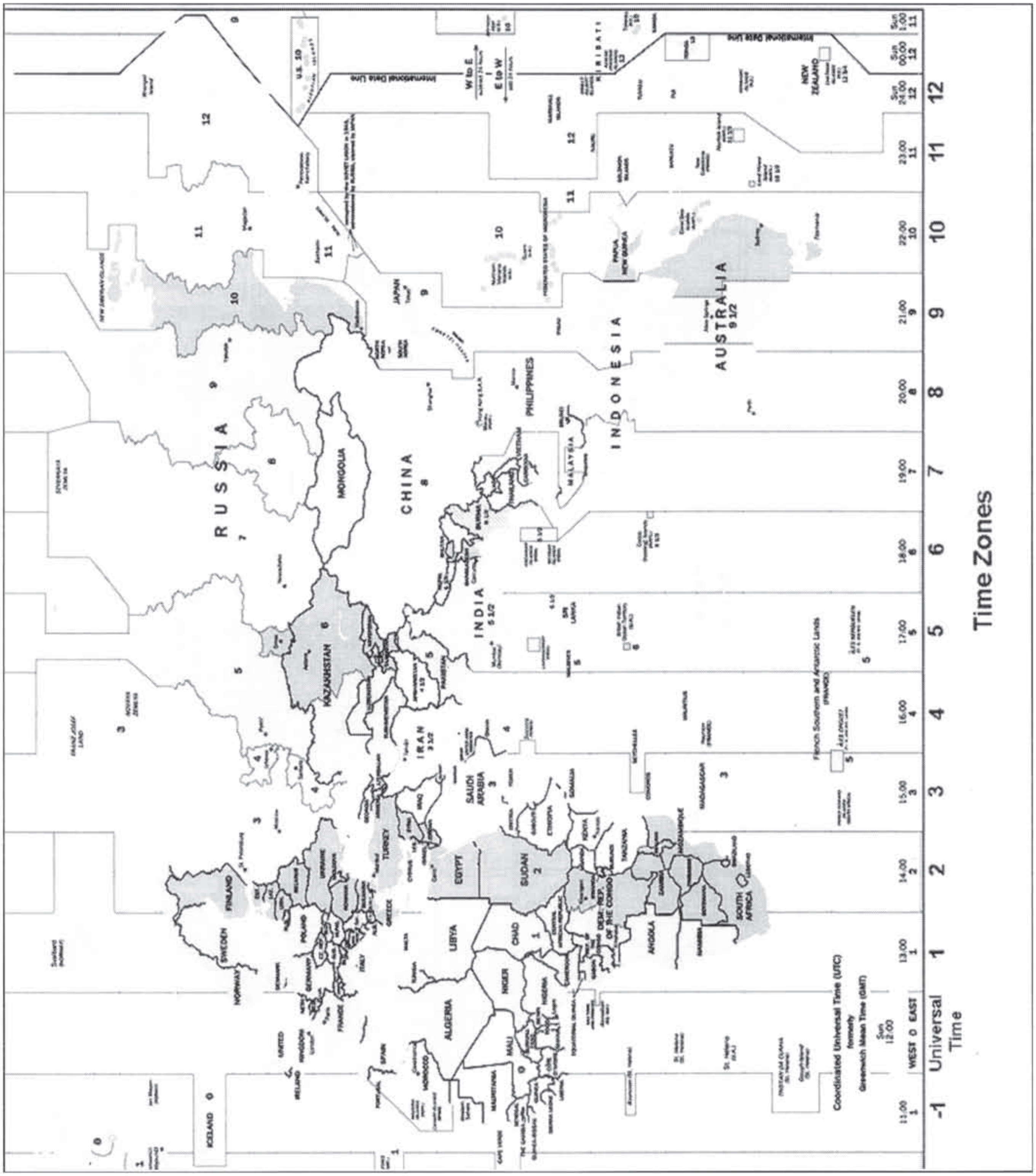
P -

Parallax: Parallax is the difference in the apparent position of an object against a background when viewed by an observer from two different locations. These positions and the actual position of the object form a triangle from which the apex angle (the parallax) and the distance of the object can be determined if the length of the baseline between the observing positions is known and the angular direction of the object from each position at the ends of the baseline has been measured. The traditional method in astronomy of determining the distance to a celestial object is to measure its parallax.

continued on back page

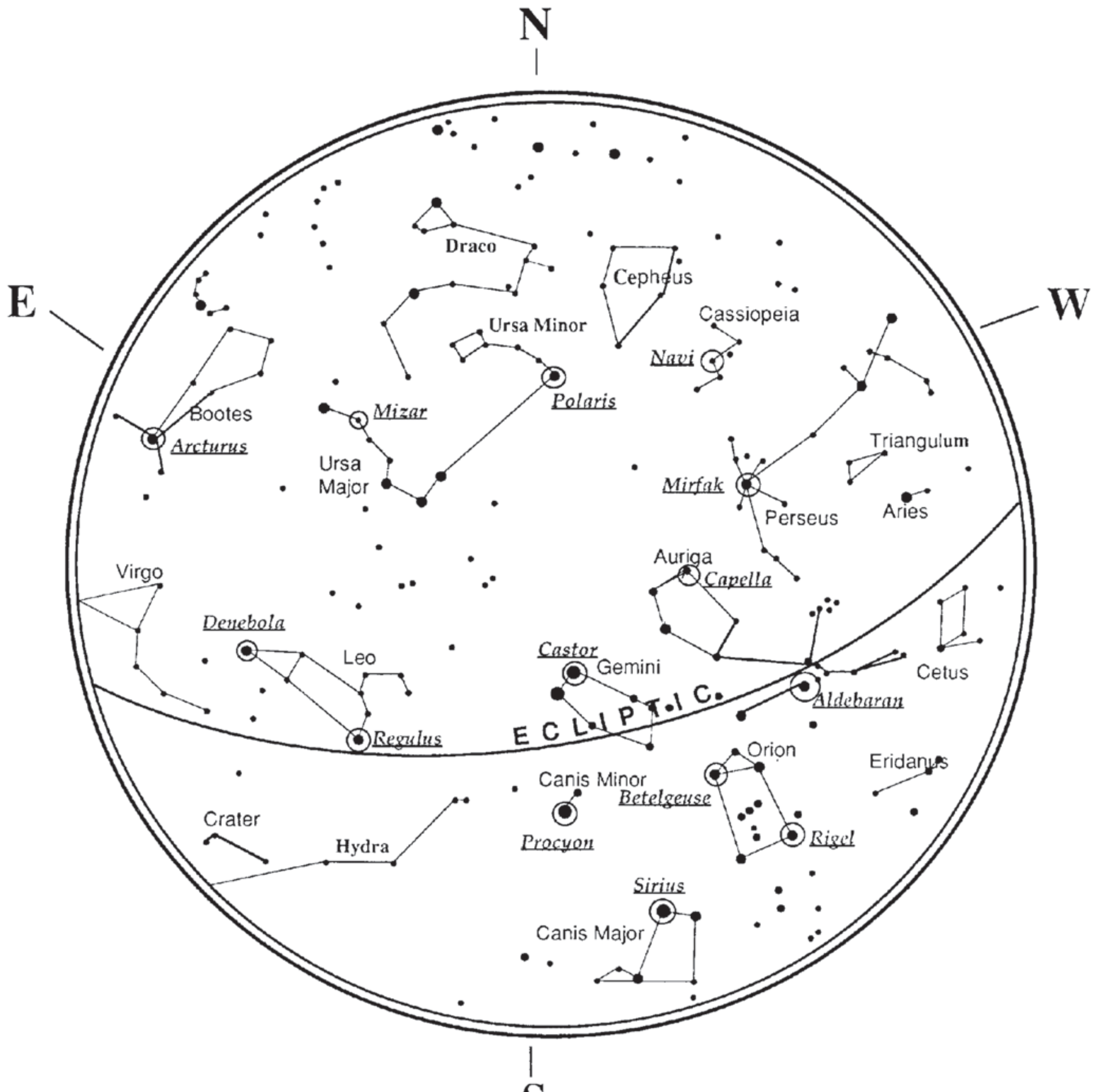
Time Zones


ARCTIC OCEAN
Greenland
(DENMARK)
-3
-2
-1
U.S.
-9
CANADA
-8
-7
-6
-5
-4
NORTH PACIFIC OCEAN
UNITED STATES
-8
-7
-6
-5
NORTH ATLANTIC OCEAN
MEXICO
U.S.
-10
KIRIBATI
COLOMBIA
VENEZUELA
-5
PERU
-4
BRAZIL
BOLIVIA
SOUTH PACIFIC OCEAN
-10
French Polynesia
(FRANCE)
-3
ARGENTINA
CHILE
Scale 1:85,000,000 at 0°
Miller Cylindrical Projection
Sun 1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
Hawaii
Alaska
Pacific
Mountain
Central
Eastern

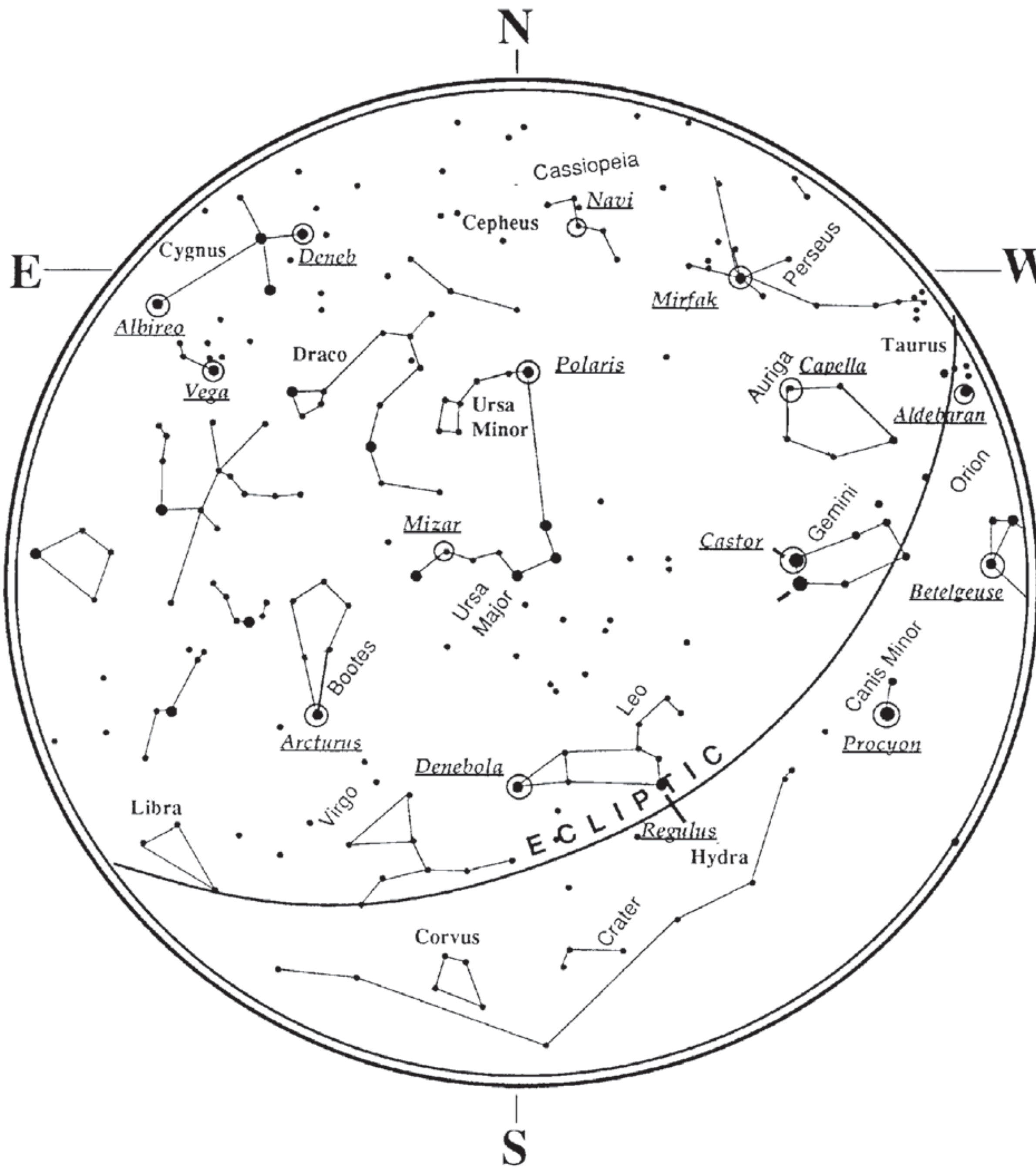

Time Zones
RUSSIA
CHINA
MONGOLIA
KAZAKHSTAN
INDIA
5 1/2
INDONESIA
AUSTRALIA
9 1/2
PHILIPPINES
JAPAN
MALAYSIA
IRAN
3 1/2
SAUDI ARABIA
TURKEY
GREECE
EGYPT
SUDAN
LIBYA
ALGERIA
NIGER
CHAD
MALI
ANGOLA
SOUTH AFRICA
MADAGASCAR
FINLAND
SWEDEN
NORWAY
ICELAND
Universal Time
WEST 0 EAST
Coordinated Universal Time (UTC)
formerly
Greenwich Mean Time (GMT)
International Date Line
W to E
E to W
-1
1
2
3
4
5
6
7
8
9
10
11
12

Sky Maps

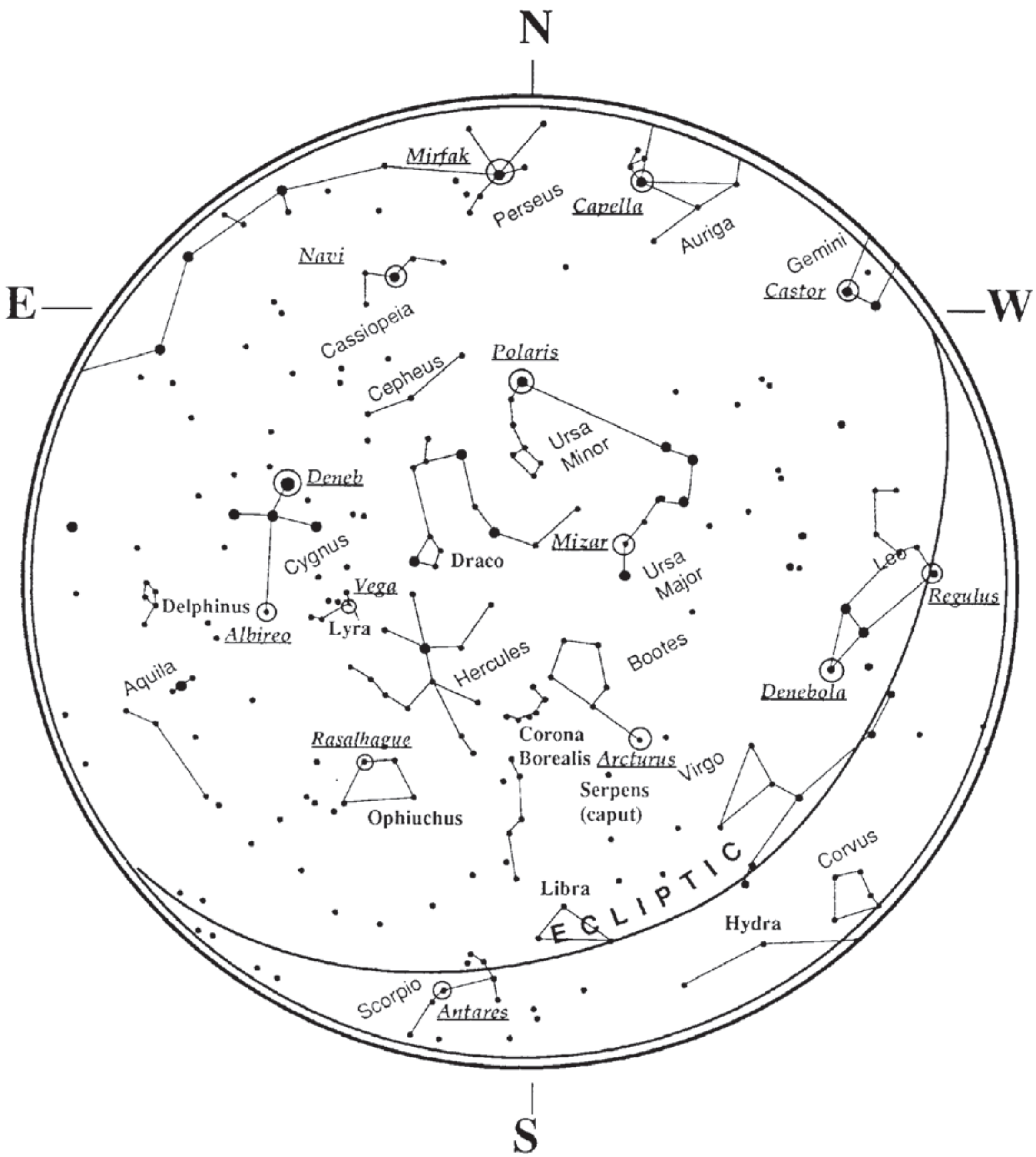
January - February Sky



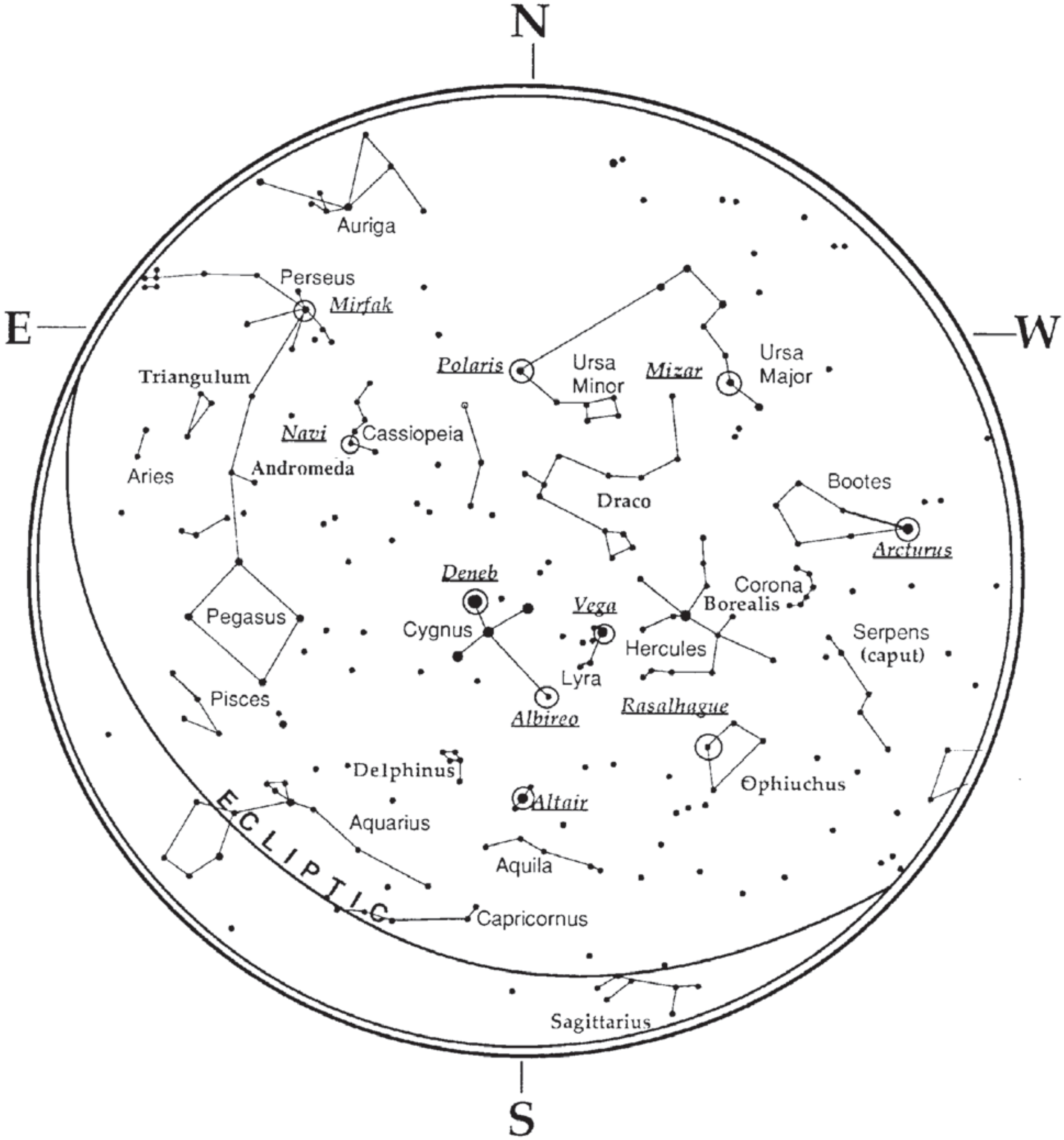
March - April Sky



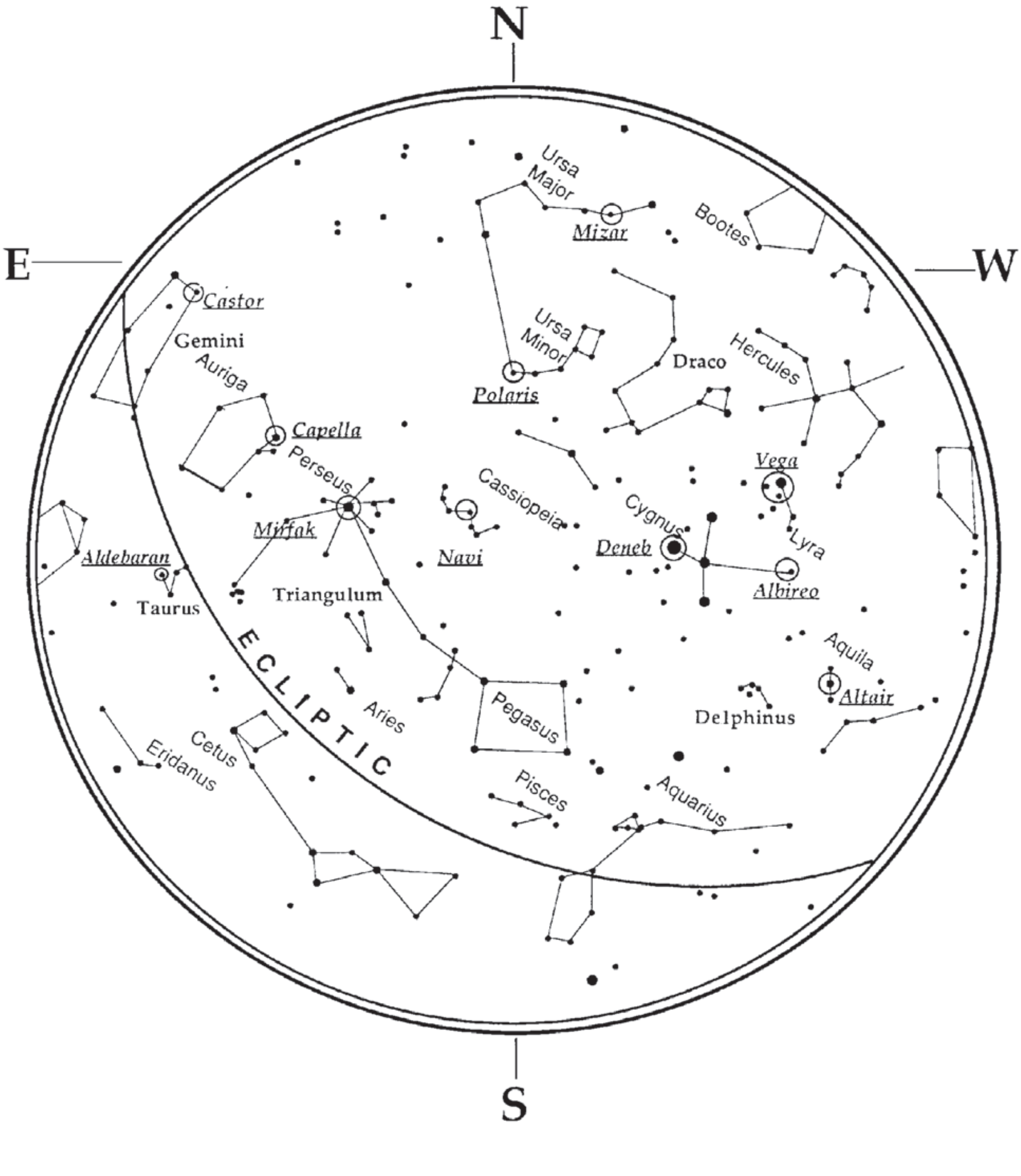
May - June Sky


N
E
W
S
Mirfak
Perseus
Capella
Auriga
Gemini
Castor
Navi
Cassiopeia
Cepheus
Polaris
Ursa Minor
Deneb
Cygnus
Draco
Mizar
Ursa Major
Delphinus
Albireo
Vega
Lyra
Leo
Regulus
Aquila
Hercules
Bootes
Denebola
Rasalhague
Corona Borealis
Arcturus
Virgo
Serpens (caput)
Ophiuchus
ECLIPTIC
Corvus
Libra
Hydra
Scorpio
Antares

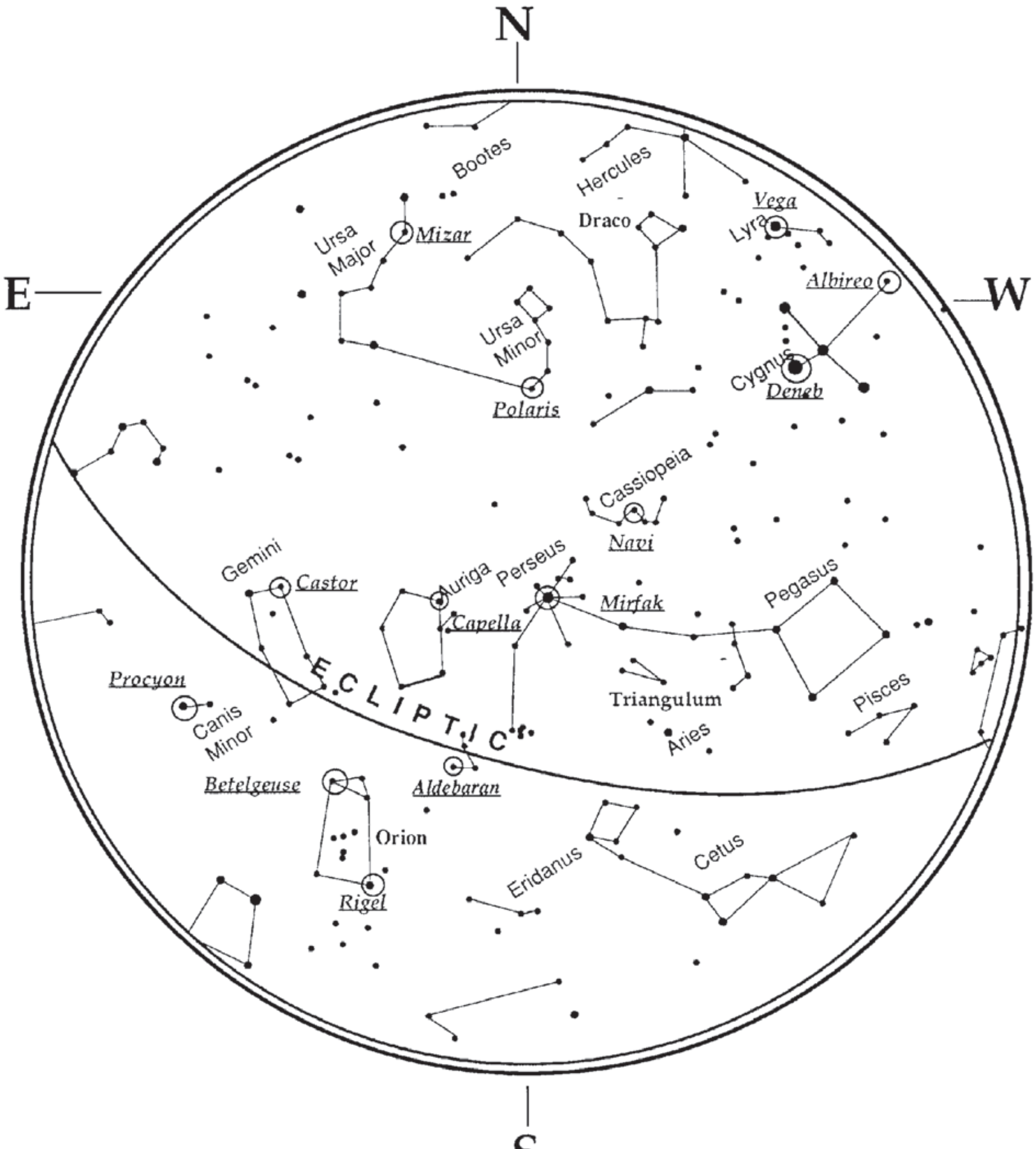
July - August Sky



September - October Sky



November - December Sky



Parfocal: Refers to a group of eyepieces that all require the same distance from the focal plane of the telescope to be in focus. This means when you focus one parfocal eyepiece all the other parfocal eyepieces, in a particular line of eyepieces, will be in focus.

Parsec: The distance at which a star would show parallax of one second of arc. It is equal to 3.26 light-years, 206,265 astronomical units, or 30,8000,000,000,000 km. (Apart from the Sun, no star lies within one parsec of us.)

Point Source: An object which cannot be resolved into an image because it to too far away or too small is considered a point source. A planet is far away but it can be resolved as a disk. Most stars cannot be resolved as disks, they are too far away.

R -

Reflector: A telescope in which the light is collected by means of a mirror.

Resolution: The minimum detectable angle an optical system can detect. Because of diffraction, there is a limit to the minimum angle, resolution. The larger the aperture, the better the resolution.

Right Ascension (RA): The angular distance of a celestial object measured in hours, minutes, and seconds along the Celestial Equator eastward from the Vernal Equinox.

S -

Sidereal Rate: This is the angular speed at which the Earth is rotating. Telescope tracking motors drive the telescope at this rate. The rate is 15 arc seconds per second or 15 degrees per hour.

T -

Terminator: The boundary line between the light and dark portion of the moon or a planet.

U -

Universe: The totality of astronomical things, events, relations and energies capable of being described objectively.

V -

Variable Star: A star whose brightness varies over time due to either inherent properties of the star or something eclipsing or obscuring the brightness of the star.

W -

Waning Moon: The period of the moon's cycle between full and new, when its illuminated portion is decreasing.

Waxing Moon: The period of the moon's cycle between new and full, when its illuminated portion is increasing.

Z -

Zenith: The point on the Celestial Sphere directly above the observer.

Zodiac: The zodiac is the portion of the Celestial Sphere that lies within 8 degrees on either side of the Ecliptic. The apparent paths of the Sun, the Moon, and the planets, with the exception of some portions of the path of Pluto, lie within this band. Twelve divisions, or signs, each 30 degrees in width, comprise the zodiac. These signs coincided with the zodiacal constellations about 2,000 years ago. Because of the Precession of the Earth's axis, the Vernal Equinox has moved westward by about 30 degrees since that time; the signs have moved with it and thus no longer coincide with the constellations.

One-Year Limited Warranty

This Orion product is warranted against defects in materials or workmanship for a period of one year from the date of purchase. This warranty is for the benefit of the original retail purchaser only. During this warranty period Orion Telescopes & Binoculars will repair or replace, at Orion's option, any warranted instrument that proves to be defective, provided it is returned postage paid. Proof of purchase (such as a copy of the original receipt) is required. This warranty is only valid in the country of purchase.

This warranty does not apply if, in Orion's judgment, the instrument has been abused, mishandled, or modified, nor does it apply to normal wear and tear. This warranty gives you specific legal rights. It is not intended to remove or restrict your other legal rights under applicable local consumer law; your state or national statutory consumer rights governing the sale of consumer goods remain fully applicable.

For further warranty information, please visit **www.OrionTelescopes.com/warranty**.

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