CELESTRON

NexStar™

INSTRUCTION MANUAL

NexStar 60 . NexStar 80 . NexStar 114

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Introduction

Congratulations on your purchase of the Celestron NexStar! Whether you have the NexStar ST for hands-on star hopping to the moon and planets or the NexStar GT with its database of 4,000 nighttime objects, the NexStar series of telescopes are designed to give you a lifetime of observing pleasure while growing as your interest in astronomy grows. No matter at what level you are starting out, the NexStar will unfold for you and your friends all the wonders of the Universe.

This manual is broken up into three major sections. The assembly section details all the steps necessary to assemble any of the NexStar series of telescopes. The assembly section covers the procedures that are common to the NexStar 60, 80 and 114 telescopes. No matter which NexStar you own, start with this section to properly assemble your telescope.

The next section of this manual gives detailed information about the specific NexStar models. There is a separate section for the operation of the NexStar ST, NexStar HC or NexStar GT. Each section describes the use of the manual motion controls, motor control and computerized hand control. Read the section that pertains to your model of NexStar.

The final section of the manual covers topics including telescope and astronomy basics, as well as celestial observing techniques. This section will also tell you the proper way to care for your telescope and the many optional accessories that can help you get the most out of your telescope.

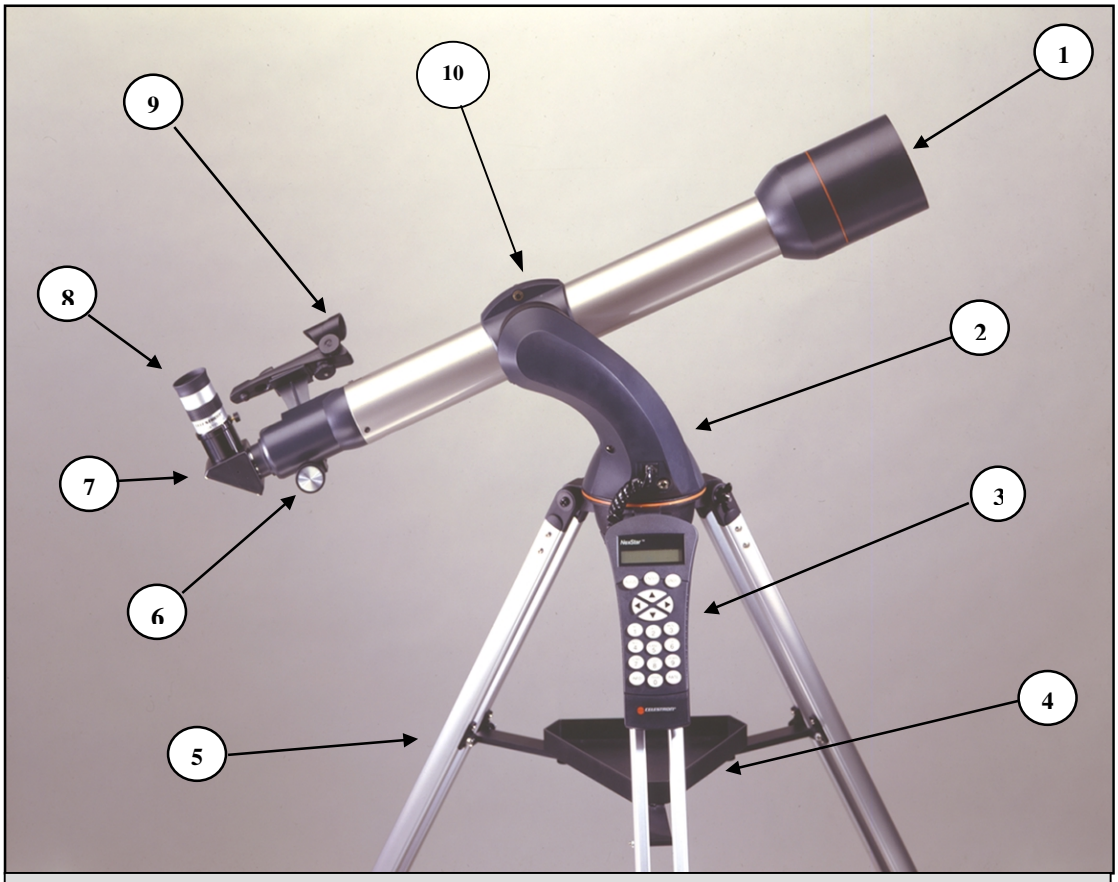
The NexStar's deluxe features combine with Celestron's legendary optics to give amateur astronomers one of the most sophisticated and easy to use telescopes available on the market today.

Take time to read through this manual before embarking on your journey through the Universe. It may take a few observing sessions to become familiar with your NexStar, so you should keep this manual handy until you have fully mastered your telescope's operation.

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

Warning

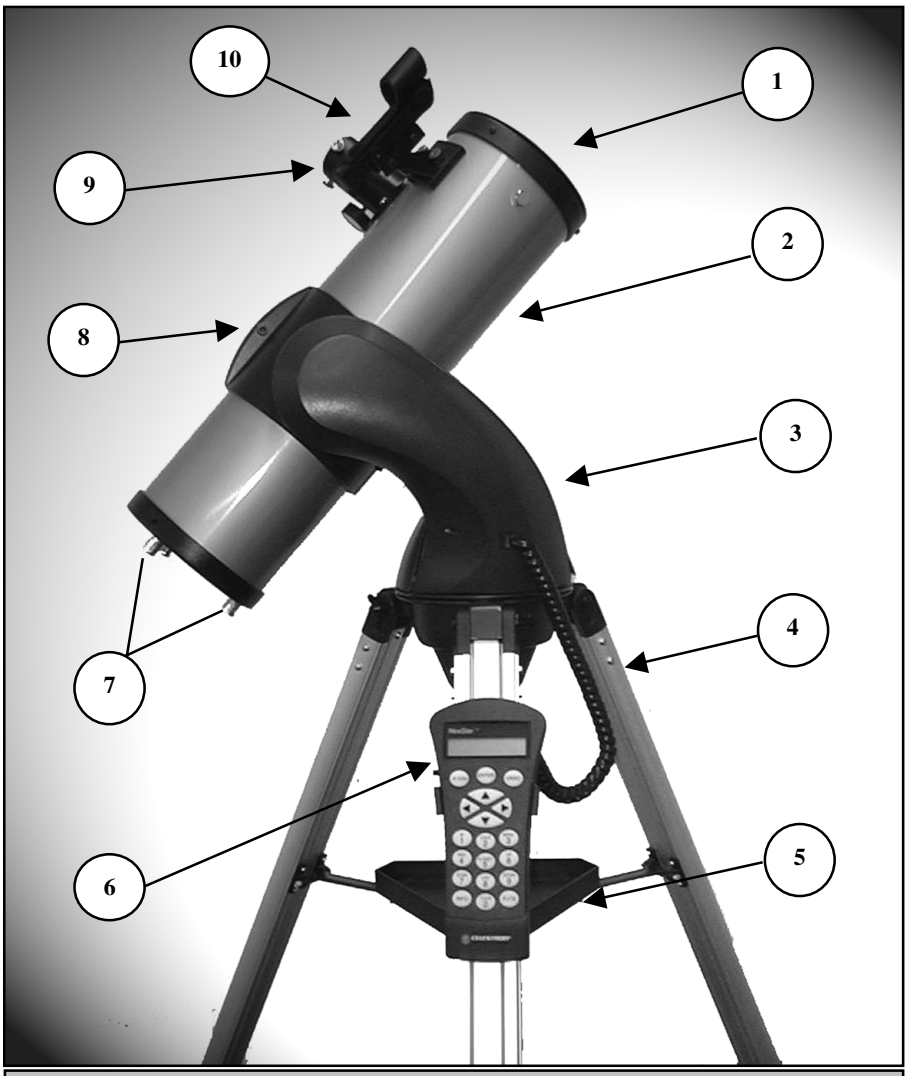
- **Never look directly at the sun with the naked eye or with a telescope (unless you have the proper solar filter). Permanent and irreversible eye damage may result.**
- Never use your telescope to project an image of the sun onto any surface. Internal heat build-up can damage the telescope and any 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.



The NexStar 60 GT

Refractor Telescope

1	**Objective Lens**	**6**	**Focuser Knob**
2	**Fork Arm**	**7**	**Star Diagonal**
3	**Hand Control (for GT model)**	**8**	**Eyepiece**
4	**Accessory Tray**	**9**	**Star Pointer Finderscope**
5	**Tripod**	**10**	**Tube Ring**



NexStar 114 GT

Reflecting Telescope

1	**Lens Cover**	**6**	**Hand Control (for GT Model)**
2	**Optical Tube**	**7**	**Collimation Adjustment Knobs**
3	**Fork Arm**	**8**	**Tube Ring**
4	**Tripod**	**9**	**Focuser**
5	**Accessory Tray**	**10**	**Star Pointer Finderscope**

Assembly

The NexStar comes partially assembled and can be operational in a matter of minutes. The NexStar is conveniently packaged in one reusable shipping carton that contains the following accessories:

NexStar 60	NexStar 80	NexStar 114
20mm, 10mm, 4mm M.A Eyepieces – 1¼"	25mm, 10mm SMA Eyepieces – 1¼"	25mm SMA Eyepiece – 1¼"
1¼" Star Diagonal	1¼" Star Diagonal	10mm SMA Eyepiece – 1¼"
Star Pointer Finderscope and Mounting Bracket	Star Pointer Finderscope and Mounting Bracket	Star Pointer Finderscope and Mounting Bracket
The Sky™ Level I Astronomy Software	*The Sky*™ Level I Astronomy Software	*The Sky*™ Level I Astronomy Software
Deluxe Accessory Tray	Deluxe Accessory Tray	Deluxe Accessory Tray
NexStar 60 HC	**NexStar 80 HC**	**NexStar 114 HC**
Hand Control	Hand Control	Hand Control
Battery Pack	Battery Pack	Battery Pack
GuideStar Telescope Control Software	*GuideStar* Telescope Control Software	*GuideStar* Telescope Control Software
NexStar 60 GT	**NexStar 80 GT**	**NexStar 114 GT**
NexStar Hand Control w/ Object Database	NexStar Hand Control w/ Object Database	NexStar Hand Control w/ Object Database

Assembling the NexStar

Your NexStar comes in two major sections: the optical tube with fork arm and the tripod. These sections can be attached in seconds using the quick release coupling screw located under the tripod mounting platform. Remove all of the accessories from their individual boxes. Remember to save all of the containers so that they can be used to transport the telescope. Before attaching the visual accessories, the telescope tube should be mounted to its tripod. First, install the accessory tray onto the tripod legs:

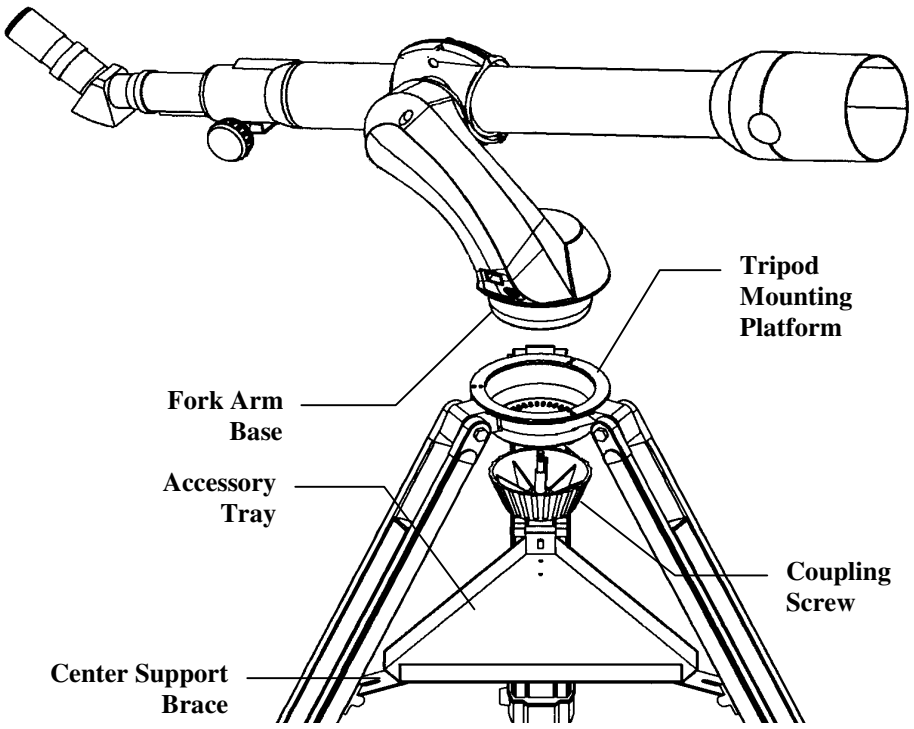


Figure 2-1

1. Remove the tripod from the box and spread the legs apart until the center leg brace is fully extended.

2. Locate the accessory tray, and place it on top of the tripod center support brace in between the tripod legs (see figure 2-1).

3. Insert the wing bolts through the holes from the bottom of the tripod leg brace and thread them into the holes in the accessory tray. Tighten all bolts to ensure proper stability to the mount.

It is a good idea to adjust the height of the tripod before attaching the fork arm and tube. Minor adjustments can be made later. To adjust the height of the tripod legs:

1. Loosen the tripod leg locking bolt located on the side of each leg.

2. Slide the inner portion of each leg down 6" to 8" inches.

3. Tighten the tripod locking bolts to hold each leg in place.

Attaching the Telescope to the Tripod

With the tripod properly assembled, the telescope tube and fork arm can easily be attached using the quick release coupling screw located underneath the tripod mounting platform:

1. Hold the telescope tube assembly by the fork arm and place the fork arm base inside the tripod mounting platform.

2. Thread the coupling screw into the hole at the bottom of the fork arm base and hand tighten.

Your NexStar is fully assembled and is ready to attach the accessories.

The Hand Control

The HC and GT versions of the NexStar come with a hand control that plugs into the side of the fork arm and can be stored in a holder that attaches to the side of any tripod leg (see figure 2-2). The back of the hand control has an opening that slides over the clip on the inside of the holder. To remove the hand control from its holder, gently lift the hand control upwards and remove it from the holder.

To attach the hand control holder to the tripod leg:

1. Orient the holder so that the flanges with the holes go on either side of the tripod leg with the flange facing the inside of the tripod. Note: the tripod legs should be extended to the desired height before installing the holder.

2. Insert the mounting bolt through the holes in the holder flange.

3. Thread the wing nut on the end of the bolt and tighten to secure the holder.

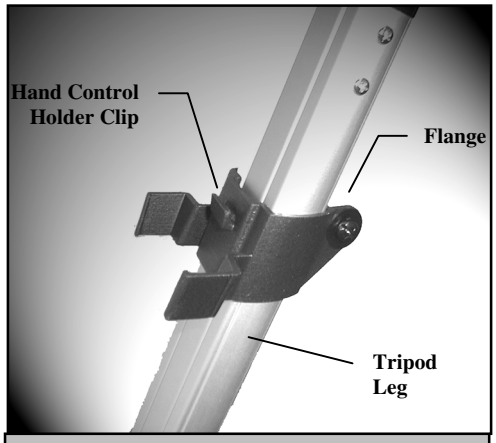


Figure 2-2 – The Hand Control Holder

The Star Diagonal

(For 60mm and 80mm Models Only)

The star diagonal diverts the light at a right angle from the light path of the telescope. For astronomical observing, this allows you to observe in positions that are more comfortable than if you were to look straight through. To attach the star diagonal:

1. Turn the thumbscrew on the eyepiece adapter at the end of the focuser barrel until it no longer extends into (i.e., obstructs) the inner diameter of the focus barrel. Remove the protective dust cap from the focuser barrel.

2. Slide the chrome portion of the star diagonal into the eyepiece adapter.

3. Tighten the thumbscrew on the eyepiece adapter to hold the star diagonal in place.

   If you wish to change the orientation of the star diagonal, loosen the thumbscrew on the eyepiece adapter until the star diagonal rotates freely. Rotate the diagonal to the desired position and tighten the thumbscrew.

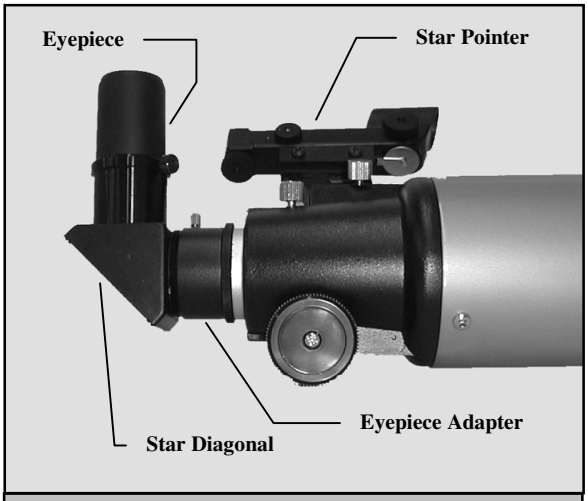


Figure 2-3– Visual accessories for 60mm and 80mm models

The Eyepiece

The eyepiece, or ocular, is the optical element that magnifies the image focused by the telescope. The eyepiece fits either directly into the focuser (114mm model) or into the star diagonal (60mm and 80mm models). To install the eyepiece:

For 60mm and 80mm models:

1. Loosen the thumbscrew on the star diagonal so it does not obstruct the inner diameter of the eyepiece end of the diagonal. Remove the protective dust cap from the star diagonal's barrel.

2. Slide the chrome portion of the eyepiece into the star diagonal.

3. Tighten the thumbscrew to hold the eyepiece in place.

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

For 114mm model:

1. Loosen the thumb screw on the eyepiece adapter at the end of the focuser barrel and remove the protective dust cap from the focuser barrel.

2. Slide the chrome portion of the eyepiece into the eyepiece adapter

3. Tighten the thumbscrew to hold the eyepiece in place.

   To remove the eyepiece, loosen the thumbscrew on the eyepiece barrel and slide the eyepiece out.

   Eyepieces are commonly referred to by focal length and barrel diameter. The focal length of each eyepiece is printed on the eyepiece barrel. 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 on "Calculating Magnification."

   Barrel diameter is the diameter of the barrel that slides into the star diagonal or focuser. The NexStar uses eyepieces with a standard 1-1/4" barrel diameter.

The Star Pointer Finderscope

The Star Pointer is the quickest and easiest way to point your telescope exactly at a desired object in the sky. It's like having a laser pointer that you can shine directly onto the night sky. The Star Pointer is a zero magnification pointing tool that uses a coated glass window to superimpose the image of a small red dot onto the night sky. While keeping both eyes open when looking through the Star Pointer, simply move your telescope until the red dot, seen through the Star Pointer, merges with the object as seen with your unaided eye. The red dot is produced by a light-emitting diode (LED); it is not a laser beam and will not damage the glass window or your eye. The Star Pointer comes equipped with a variable brightness control, two axes alignment control and mounting brackets. Before the Star Pointer is ready to be used, it must be attached to the telescope tube and properly aligned:

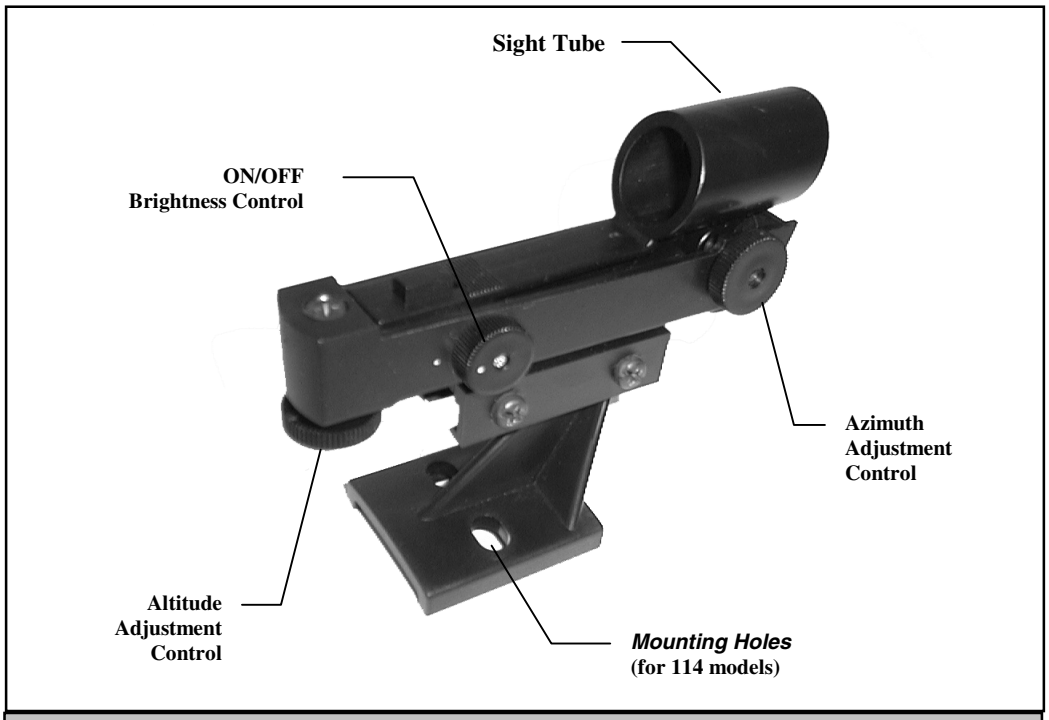


Figure 2-4 – The Star Pointer Finderscope with Bracket

Star Pointer Installation

For 114mm model:

1. Remove the nuts from the studs where the Star Pointer will mount.

2. Mount the Star Pointer bracket by placing the bracket over the studs protruding from the tube and tightening it down with the supplied nuts. Orient the Star Pointer so that the sight tube is facing towards the front of the tube.

For 60mm and 80mm model:

1. Slide the Star Pointer bracket into the dovetail mounting platform on top of the focuser assembly.

2. Orient the Star Pointer so that the sight tube is facing towards the front of the tube.

3. Secure the Star Pointer bracket by tightening the thumb screw on the mounting platform.

Star Pointer Operation

The star pointer is powered by a long life 3-volt lithium battery (#CR2032) located underneath the front portion of the Star Pointer. Like all finderscopes, the Star Pointer must be properly aligned with the main telescope before it can be used. This is a simple process using the azimuth and altitude control knobs located on the side and bottom of the Star Pointer. The alignment procedure is best done at night since the LED dot will be difficult to see during the day. Note: Before using the StarPointer, you must first remove the protective plastic cover over the battery.

1. To turn on the Star Pointer, rotate the variable brightness control (see figure 2-4) clockwise until you here a "click". To increase the brightness level of the red dot, continue rotating the control knob about 180º until it stops.

2. Locate a bright star or planet and center it in a low power eyepiece in the main telescope.

3. With both eyes open, look through the glass window at the alignment star.

   If the Star Pointer is perfectly aligned, you will see the red LED dot overlap the alignment star. If the Star Pointer is not aligned, take notice of where the red dot is relative to the bright star.

4. Without moving the main telescope, turn the Star Pointer's azimuth and altitude alignment controls until the red dot is directly over the alignment star.

If the LED dot is brighter than the alignment star, it may make it difficult to see the star. Turn the variable brightness control counterclockwise, until the red dot is the same brightness as the alignment star. This will make it easier to get an accurate alignment. The Star Pointer is now ready to be used **. Remember to remove the plastic cover over the battery, and always turn the power off after you have found an object. This will extend the life of both the battery and the LED.**

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NexStar ST

The NexStar ST is a precision scientific instrument designed to grow as your interest in astronomy grows. Equipped with manual altitude and azimuth motion controls, your standard model NexStar can be used to quickly star hop to the stars and planets. As your interest in astronomy grows, your NexStar ST can be expanded into a fully automated, computerized telescope with a database of over 4,000 celestial objects and high speed motors capable on slewing across the sky is a matter of seconds.

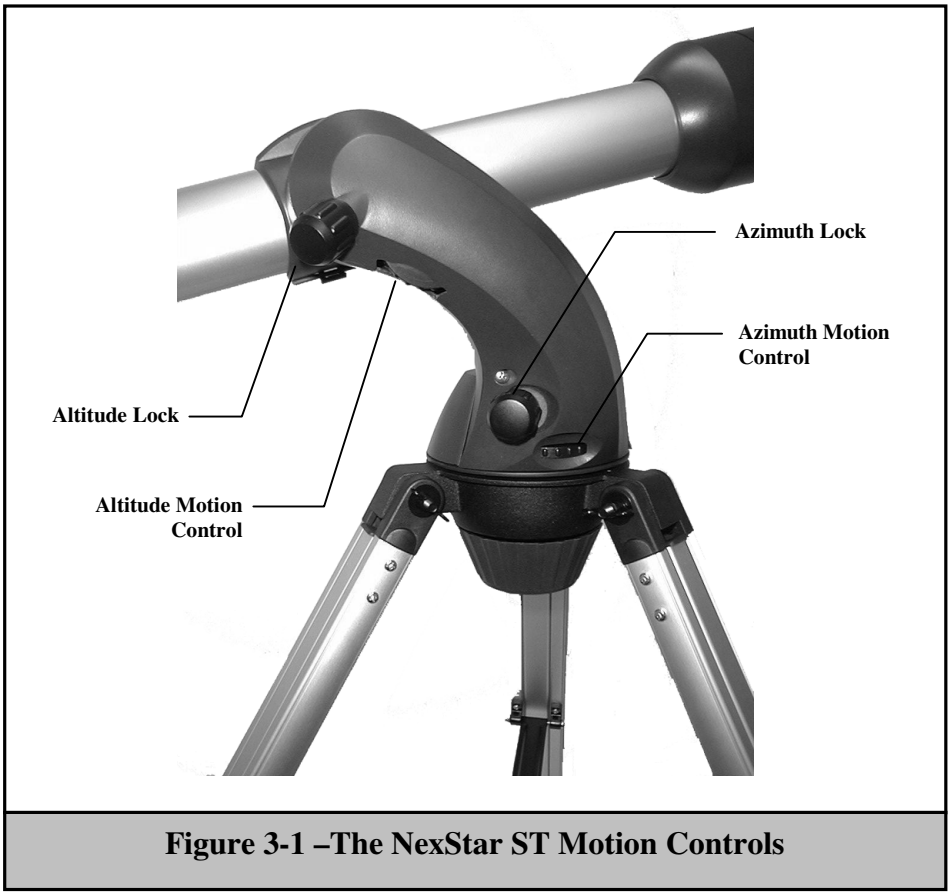

Figure 3-1 –The NexStar ST Motion Controls

Moving the NexStar ST

The NexStar ST has built-in motion controls for both the altitude (up and down) and azimuth (side-to-side) located on the side of the fork arm (see figure 3-1). Additionally, there is a clutch knob on each axis that locks the telescope in place once the desired object has been located.

To move the telescope towards a desired object in the sky there are two options.

1. For large and quick movements, loosen the altitude and azimuth locks by rotating the knobs counterclockwise and manually moving the telescope tube towards your desired object. You should roughly align the selected object with the red dot as seen through the Star Pointer finderscope. (For further instruction on using the Star Pointer, see the Assembly section earlier in this manual). Tighten the locking knobs when you are near the position you want. Do not tighten down the locking knob all the way; only enough so that the telescope tube will not move on its own.

2. For very small movements and fine adjustments, use the motion control wheels on each axis. Hold the telescope fork arm with your hands and rotate each motion control wheel slowly with your thumbs. If the wheel is tight and difficult to move, loosen the clutch knobs slightly until the telescope moves freely.

3. Move the telescope until the desired star or object is aligned with the Star Pointer and visible in the eyepiece. Tighten down the locking knobs completely to secure the telescope on the object.

The telescope should be properly balanced in order for it to move smoothly in both axes:

1. To balance the telescope tube in altitude, loosen the altitude locking knob completely.

2. If the front (objective lens) end of the telescope tube moves downward, then the tube needs to be moved backwards in the tube ring. If the back (focuser) end of telescope tube moves downward, then the tube needs to be moved forwards in the tube ring.

3. To adjust the position of the telescope tube in the tube ring, loosen the screw that connects the two sides of the tube ring and slide the telescope tube up or down until properly balanced. Tighten the tube ring screw to secure the tube in place.

What Next…

Now that you are familiar with the motion and operation of your NexStar ST, the Celestial Observing section of this manual offers numerous tips on selecting and viewing your first celestial objects as well as techniques on how to find them.

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NexStar HC

The NexStar HC telescope is a precision scientific instrument that will allow you to enjoy viewing numerous objects in the night sky — planets, nebulae, star clusters, galaxies and more. Equipped with high speed motors and hand control, the NexStar HC allows you to remotely move your telescope to desired objects quickly and accurately. At a touch of a button, you can slew your telescope across the sky in a matter of second and track objects remotely as the Earth rotates beneath them. The NexStar HC is fully upgradeable and can be equipped with the optional NexStar Hand Control with a database of over 4,000 objects (see the Optional Accessories section of this manual).

Powering the NexStar

The NexStar HC can be powered by the supplied battery pack or an optional 12v AC adapter. The power pack requires 8 user supplied AA size alkaline batteries. To power the NexStar, insert the batteries into the battery pack and plug the round post into the 12v outlet located on the side of the fork arm. Once the battery pack is plugged in, the NexStar will power on and one of the slew rate indicator lights will light up.

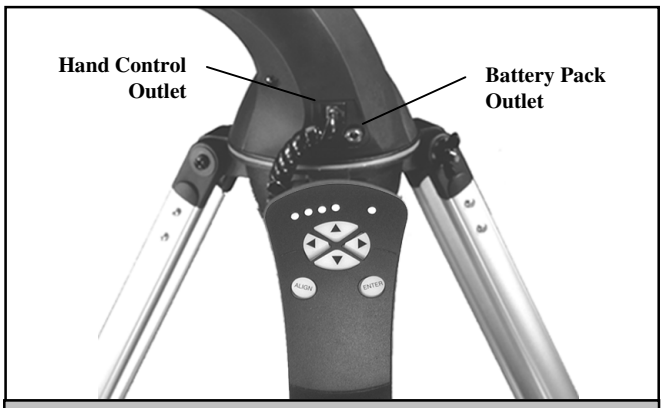

Figure 4-1 The NexStar HC Outlets

The Hand Control

The NexStar HC has a removable hand control that gives the user quick access to all the motion controls the NexStar HC offers. Below is a brief description of the individual components of the NexStar HC hand controller:

1. **Star Key Activation Light:** Indicates that the **Star** button has been pressed and the utility functions on the hand control are active.
2. **Direction Buttons:** Allows complete control of the NexStar in any direction. Use the direction keys to move the telescope from object to object or for centering objects in the eyepiece.
3. **Rate:** Instantly changes the rate of speed of the motors when the direction buttons are pressed. Press this button repeatedly to cycle through the speeds of the motors.
4. **Star Key:** Gives the user access to the utility functions of the hand control, such as changing the direction of the arrow keys and backlash compensation.
5. **Hand Control Slew Rate Indicator Lights:** Displays the speed at which the telescope will move when each direction button is pressed.

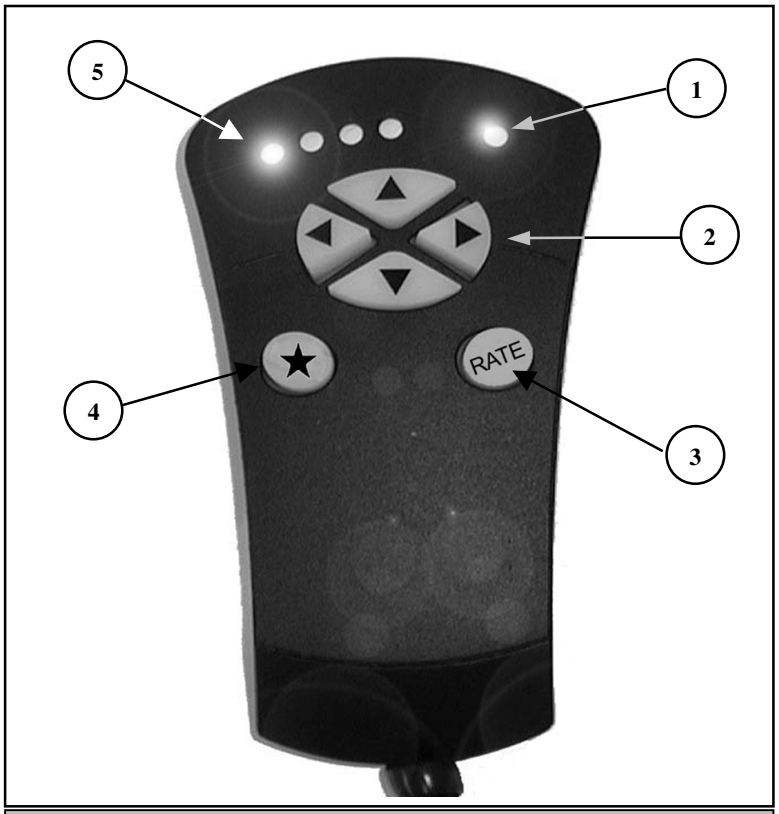

Figure 4-2
The NexStar HC Hand Control

Attaching the Hand Control

The NexStar HC hand control has a phone jack type connector at the end of its cord. Plug the phone jack connector into the outlet at the base of the telescope's fork arm. Push the connector into the outlet until it clicks into place and put the hand control into its holder on the tripod as described previously in the Assembly section of the manual.

Rate Button

Pressing the RATE key (3) allows you to instantly change the speed rate of the motors from high speed slew rate to precise centering rate or two speeds in between. Each rate corresponds to one of the indicator LED lights (5) on the hand control. From left to right, the corresponding speeds are as follows:

Rate	
1	**For fine centering of objects in the eyepiece**
2	**For scanning around for objects in the eyepiece**
3	**For centering bright stars in the Star Pointer**
4	**For slewing around the sky from object to object**

The hand control has a "double button" feature that allows you to instantly speed up the motors without having to choose a speed rate. To use this feature, simply press the arrow button that corresponds to the direction that you want to move the telescope. While holding that button down, press the opposite directional button. This will increase the slew rate to approximately 1.5º per second (equal to the third rate on the hand control). This feature will only function if the telescope is currently set at a speed rate of 1 or 2.

Utility Features

The NexStar HC hand control comes with a *Star* function key that allows you to change certain parameters of the hand controls functions, such as the directional logic of the arrow keys, backlash compensation of the motor gears and azimuth tracking.

Direction Buttons: When looking at a star through an eyepiece or star diagonal, the direction that the star moves when the Up and Down arrow buttons are pressed will be reversed from when the same object is being centered in the Star Pointer Finderscope. For example, when a star is being centered in the telescope's eyepiece, it may appear to move upward when the down arrow button is pressed (and visa-versa) even though the telescope tube is actually moving downward. This is why it is convenient to be able to change the arrow button direction when switching from using the Star Pointer to the eyepiece. To reverse the direction of the Up and Down arrow buttons:

1. Press the **STAR** key on the hand control. The activation light (1) on the hand control will light up to indicate that the button has been pressed. When the button has been pressed, the four direction buttons (2) will be non-operational until the button is pressed again.
2. Press the **RATE** button on the hand control.
3. Press the **STAR** key on the hand control to activate the direction buttons.

Anti-backlash – All mechanical gears have a certain amount of backlash or "play" between the gears. This play is evident by how long it takes for a star to move in the eyepiece when the hand control arrow buttons are pressed (especially when changing directions). The NexStar's anti-backlash feature allows the user to compensate for backlash by having the hand control quickly rewinding the motors just enough to eliminate the play between gears. The amount of compensation needed depends on the slewing rate selected; the slower the slewing rate the longer it will take for the star to appear to move in the eyepiece. To change the backlash compensation:

1. Press the **STAR** key on the hand control.
2. Use the Right and Left arrow keys to speed up or slow down the initial speed of the azimuth motors when the arrow buttons are pressed. For example, if it takes a star too long to move in the eyepiece when the hand control arrow buttons are pressed, then press the Right arrow button to speed up the initial motor speed. The buttons can be pressed repeatedly to increase the initial motor speed even more.
3. Use the UP and Down arrow keys to speed up or slow down the initial speed of the altitude motors when the arrow buttons are pressed.
4. Press the **STAR** key on the hand control again to activate the direction buttons again.

RS-232 Connection

The NexStar HC has an RS-232 port on the back of the hand control, allowing it to be controlled using the *GuideStar* telescope control software. Linking the NexStar to a computer requires the use of a RS-232 cable (included in the HC models of the NexStar, and an optional accessory for the GT models). The *GuideStar* software gives you all the "Go To" features of the NexStar GT hand control including a 4,000 object database, *AutoAlign* based on date and location, and helpful information for hundreds of objects.

To interface the NexStar with your computer, follow these steps:

1. Connect the phone jack end of the RS-232 cable to the port in the back of the hand control and the 9-pin connector to the back of your computer.
2. Install the *GuideStar* CD-ROM onto your computer and follow the on-screen instructions.
3. Plug in power to the NexStar and start the *GuideStar* program.
4. From the Setup Screen you can test communication by clicking on the Test Port button after selecting a Comm port (see Fig 4-3). If you receive a communication error message, select a different Comm port and click Test Port until communication is successful.
5. Once communication is established, update the following information on the Setup Screen:

- Telescope Model – Select your telescope model from the drop-down list.
- Location – Click the Change Location button to choose the city closest to your location.
- Time – The software will use the current time setting from your computer, however you must indicate your time zone and whether Daylight Savings is in effect.

6. Click the Save button to save these parameters.

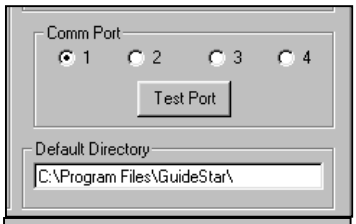

Fig 4-3 – Testing Communication

Press the Align button to begin the alignment procedure. Follow the on-screen instructions for aligning the NexStar on two stars in the sky. For information on using many of the *GuideStar* features, refer to the *AutoAlig*n instructions in the NexStar GT section of your manual. The *GuideStar* software also has help buttons to explain many of the commonly used fields.

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NexStar GT

The NexStar GT ushers in a whole new generation of computer automated technology. Simple and friendly to use, the NexStar GT (GOTO) is up and running after centering just two alignment stars selected by the NexStar. If you are new to astronomy, you may wish to start off by using the NexStar's built-in Sky Tour feature, which commands the NexStar to find the most interesting objects in the sky and automatically slews to each one. Or if you are an experienced amateur, you will appreciate the comprehensive database of over 4,000 objects, including customized lists of all the best deep sky objects, bright double stars and variable stars. No matter at what level you are starting out, the NexStar will unfold for you and your friends all the wonders of the Universe.

Attaching the Hand Control

The NexStar GT hand control has a phone jack type connector at the end of its cord. Plug the phone jack connector into the outlet at the base of the telescope's fork arm. Push the connector into the outlet until it clicks into place and place the hand control into its holder as described previously in the Assembly section of the manual.

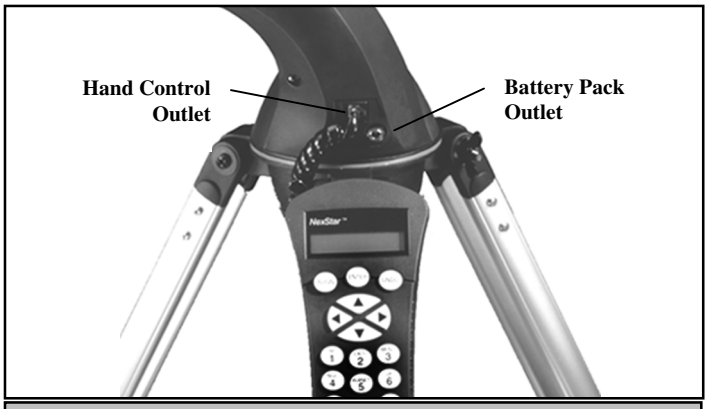


Figure 5-1 – The NexStar GT Outlets

Powering the NexStar

The NexStar GT can be powered by the supplied battery pack or an optional 12v AC adapter. The power pack requires 8 user supplied AA size alkaline batteries. To power the NexStar, insert the batteries into the battery pack and plug the round post into the 12v outlet located on the side of the fork arm. Once the battery pack is plugged in, the NexStar will power on and the hand control will display the message **`NexStar Ready`**.

Note

In case of a loss of power, the optical tube can be moved by hand. However, when powered on, the telescope should always be controlled via the hand control. The NexStar will lose its star alignment if moved by hand when powered on.

The Hand Control

The NexStar GT's hand controller is designed to give you instant access to all the functions the NexStar has to offer. With automatic slewing to over 4,000 objects, and common sense menu descriptions, even a beginner can master its variety of features in just a few observing sessions. Below is a brief description of the individual components of the NexStar GT hand controller:

1. **Liquid Crystal Display (LCD) Window:** Has a dual-line, 16 character display screen that is backlit for comfortable viewing of telescope information and scrolling text.
2. **Align:** Instructs the NexStar to use a selected star or object as an alignment position.
3. **Direction Keys:** Allows complete control of the NexStar in any direction. Use the direction keys to move the telescope to the initial alignment stars or for centering objects in the eyepiece.
4. **Catalog Keys:** The NexStar has keys on the hand control to allow direct access to each of the catalogs in its 4,000+ object database. The NexStar contains the following catalogs in its database:

   Messier – Complete list of all Messier objects.
   NGC – Many of the brightest deep sky objects from the Revised New General Catalog.
   Caldwell – A combination of the best NGC and IC objects.
   Planets - All 8 planets in our Solar System plus the Moon and Sun.
   Stars – A compiled list of the brightest stars from the SAO catalog.
   List – For quick access, all of the best and most popular objects in the NexStar database have been broken down into lists based on their type and/or common name:

Alignment Stars	Common name listing of the brightest stars in the sky.
Named Objects	Alphabetical listing of over 50 of the most popular deep sky objects.
Double Stars	Alphabetical listing of the most visually stunning double, triple and quadruple stars in the sky.
Variable Stars	Select list of the brightest variable stars with the shortest period of changing magnitude.
Asterisms	A unique list of some of the most recognizable star patterns in the sky**.**

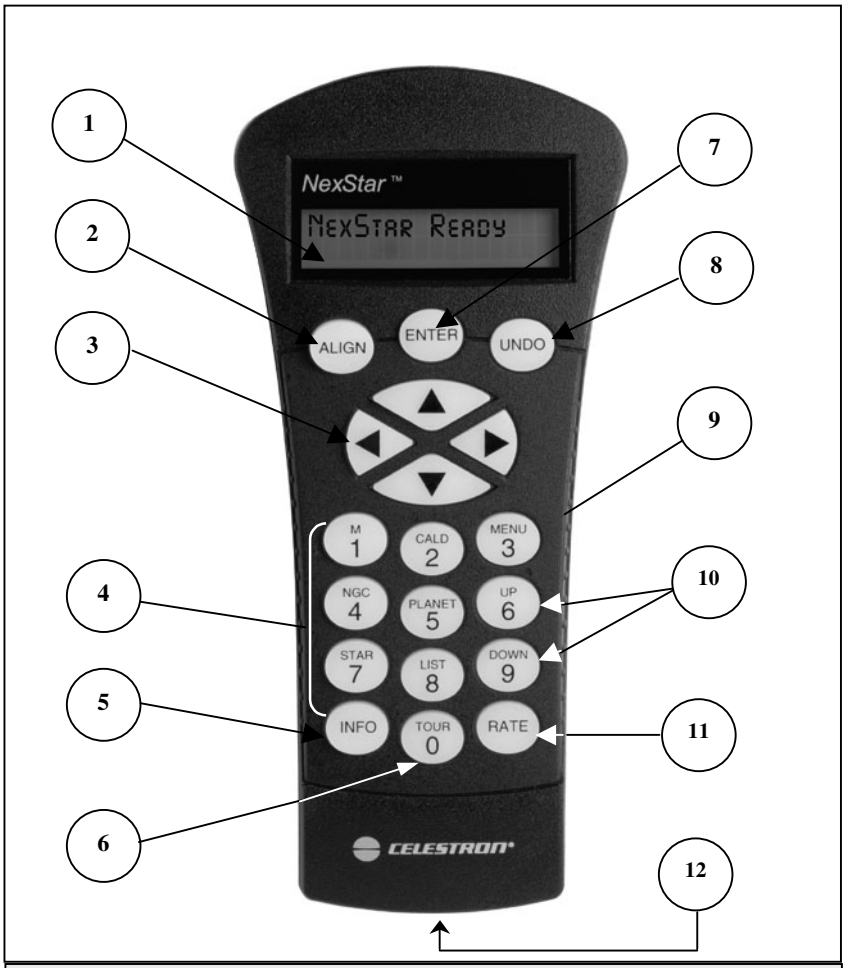


Figure 5-2
The NexStar GT Hand Control

5. **Info***:* Displays coordinates and useful information about objects selected from the NexStar database.
6. **Tour:** Activates the tour mode, which seeks out all the best objects for a given month and automatically slews the NexStar to those objects.
7. **Enter:** Pressing *Enter* allows you to selects any of the NexStar functions and accept entered parameters.
8. **Undo:** *Undo* will take you out of the current menu and display the previous level of the menu path. Press *Undo* repeatedly to get back to a main menu or use it to erase data entered by mistake.
9. **Menu:** Displays the many setup and utilities functions such as tracking rate and user defined objects and many others.
10. **Scroll Keys:** Used to scroll up and down within any of the menu lists.
11. **Rate:** Instantly changes the rate of speed of the motors when the direction buttons are pressed.
12. **RS-232 Jack**: Allows use with a computer and software programs for point and click slewing capability.

Hand Control Operation

This section describes the basic hand control procedures needed to operate the NexStar. These procedures are grouped into three categories: Alignment, Setup and Utilities. The alignment section deals with the initial telescope alignment as well as finding objects in the sky; the setup section discusses changing parameters such as tracking mode and tracking rate; finally, the last section reviews all of the utilities functions such as activating the cord wrap feature and backlash compensation.

The first time that the NexStar is used, it will request information to help identify the model of telescope. Once initialized (powered on), the hand control will display the message **`Select Model`**. Use the Up and Down menu keys (10) to scroll through the different NexStar models. Press ENTER when your NexStar model is displayed on the hand control. This information will be retained for future use and will not be displayed again. **Note: your hand control may have been pre set at the factory to operate with your NexStar model. If so, there will be an addendum packaged with the hand control. If your hand control has been pre-set, the display will momentarily read `NexStar Ready - Custom`, and you can simply press ENTER and continue to follow the Auto Align procedures below. If the telescope model has been changed on a factory set hand control you can return it to its factory default settings by using the *Model Select* function. (See *Model Select* under the *Utility Features* section later in this chapter).**

Alignment Procedure

In order for the NexStar to accurately point to objects in the sky, it must first be aligned to two known positions (stars) in the sky. With this information, the telescope can create a model of the sky, which it uses to locate any object with known coordinates.

Auto-Align

Auto-Align is the easiest way to get the NexStar aligned and ready to observe. Even if you do not know a single star in the sky, the NexStar will align itself by guiding the user through the alignment procedure by asking for basic information about the date, time and location. The NexStar will then automatically choose two stars for alignment and roughly center the stars in the field of view of the Star Pointer. Before the telescope is ready to be aligned, it should be set up in an outside location with all accessories (eyepiece, diagonal and Star Pointer) attached and lens cover removed as described in the *Assembly* section of the manual.

1. Once the NexStar is powered on , Press ENTER to begin alignment.
2. Use the Up and Down scroll keys to select *AutoAlign* if it is not already displayed, and press ENTER.
3. The telescope will then ask you to use the direction keys (3) to level the telescope tube and point the front of the telescope towards north. North can be found by finding the direction of the North Star (Polaris) or by using a compass. You do not need to point at the North Star, only the north horizon. Alignment only needs to be approximate, however a close alignment will make the auto alignment more accurate. Once the telescope is in the north and level position, press ENTER.
4. The hand control display will then ask for the following information:

   Date - Enter the month, day and year of your observing session. The display will read: `mm/dd/yy`
   Time - Enter the current local time for your area and use the scroll buttons (10) to select PM or AM.
   - Choose between Standard time or Daylight Savings time. Use the Up and Down scroll buttons (10) to toggle between options.

Helpful Hint

- Select the time zone that you are observing from. Again, use the Up and Down buttons (10) to scroll through the choices. To enter a numeric time zone, select *Zone* and enter the number for the appropriate time zone. For time zone information, refer to the Time Zone map in the appendix of this manual.

If the wrong information has been input into the hand control, the UNDO button will act as a backspace allowing the user to re-enter information.

Finally, you must enter the location of your observing site. The NexStar will display a list of cities to choose from. Choose the city from the database that is closest to your current observing site. The city you choose can be saved in the hand controls memory so that it only has to be entered once from any given location. Alternatively, if you know the exact longitude and latitude of your observing site, it can be entered directly into the hand control and remembered for future use as well. To choose a location city:

1. When **Select Method** is displayed on the hand control screen, use the Up and Down scroll keys to select **Choose City** if it is not already displayed, and press ENTER.
2. The hand control will allow you to choose from either U.S. or international locations. For a listing of U.S. locations by state and then by city, press ENTER while **United States** is displayed. For international locations, use the Up or Down scroll key to select **International** and press ENTER.
3. To display a list of local cities, first select your state from the alphabetical listing (or a list of countries if International locations was selected) and press ENTER.
4. Choose the closest city to your location from the displayed list and press ENTER.

The display will then ask if you would like to save this city for future use. If you press "Yes", the next time you AutoAlign the telescope, you can select **User Defined** instead of the **Choose City**. When **User Defined** is selected, the hand control will allow you to choose from either the location cities that were saved or any individual longitude/latitude that was saved. Use the UP and DOWN arrow keys to scroll through the stored cities, when the desired city is displayed, press ENTER. For saved locations (longitudes/latitudes), enter the number (1-9) of the location coordinates that were saved.

Based on this information, the NexStar will automatically select a bright star that is above the horizon and slew towards it. At this point the telescope is only roughly aligned, so the alignment star should only be close to the field of view of the Star Pointer finder. Once finished slewing, the display will ask you to use the arrow buttons to align the selected star with the red dot in the center of the Star Pointer. If for some reason the chosen star is not visible (perhaps behind a tree or building) you can press UNDO to select and slew to a different star. Once centered in the finder, press ENTER. The display will then instruct you to center the star in the field of view of the eyepiece. When the star is centered, press ALIGN to accept this star as your first alignment star. (There is no need to adjust the slewing rate of the motors after each alignment step. The NexStar automatically selects the best slewing rate for aligning objects in both the Star Pointer and the eyepiece). After the first alignment star has been entered the NexStar will automatically slew to a second alignment star and have you repeat this procedure for that star. When the telescope has been aligned to both stars the display will read **Alignment Successful**, and you are now ready to find your first object.

Trouble Shooting

If the wrong star was centered and aligned to, the NexStar display will read **Bad Alignment**. Should this occur, the display will automatically ask you to re-center the last alignment star and press ALIGN. If you believe that the wrong star may have been centered (remember the alignment star will always be the brightest star nearest the field of view of the finder), then re-center the star and press ALIGN. If you wish to try aligning on a different star, press UNDO and the NexStar will select two new alignment stars and automatically slew to the first star.

Helpful Hint

In order to accurately center the alignment star in the eyepiece, it will be necessary to decrease the slew rate of the motors for fine centering. This is done by pressing the RATE key (11) on the hand controller then selecting the number that corresponds to the speed you desire. (9 = fastest , 1 = slowest).

Third Star Alignment

The NexStar has a third star alignment feature which allows you to replace either of the two original alignment stars with a new star. This can be useful in several situations:

- If you are observing over a period of a few hours, you may notice that your original two alignment stars have drifted towards the west considerably. (Remember that the stars are moving at a rate of 15º every hour). Aligning on a new

star that is in the eastern part of the sky will improve your pointing accuracy, especially on objects in that part of the sky.

- When trying to locate a very faint or small object that may be difficult to find in the eyepiece, you can improve your pointing accuracy by aligning to a third star that is nearest to the object you are trying to find.

To replace an existing alignment star with a new alignment star:

1. Locate and center the desired star in the eyepiece.
2. Select the centered star from the list of named stars in the hand control.
3. When the name of the centered star is displayed, press the ALIGN key on the hand control.
4. The display will then ask you which alignment star you want to replace.
5. Use the UP and Down scroll keys to select the alignment star to be replaced. It is usually best to replace the star closest to the new star. This will space out your alignment stars across the sky.
6. Press ENTER to make the change.

Object Catalog

Selecting an Object

Now that the telescope is properly aligned, you can choose an object from any of the catalogs in the NexStar's database. The hand control has a key designated for each of the catalogs in its database. There are two ways to select objects from the database; scrolling through the named object lists and entering object numbers:

- Pressing the LIST key on the hand control will access all objects in the database that have common names or types. Each list is broken down into the following categories: Named Stars, Named Object, Double Stars, Variable Stars and Asterisms. Selecting any one of these options will display an alpha-numeric listing of the objects under that list. Pressing the Up and Down keys (10) allows you to scroll through the catalog to the desired object.
- Pressing any of the catalog keys (M, CALD, NGC, or STAR) will display a blinking cursor below the name of the catalog chosen. Use the numeric key pad to enter the number of any object within these standardized catalogs. For example, to find the Orion Nebula, press the "M" key and enter "042".
- Pressing the PLANET button will allow you to use the UP and DOWN arrow keys to scroll through and select the eight planets as well as the moon and sun.

Slewing to an Object

Once the desired object is displayed on the hand control screen, you have two options:

- **Press the INFO Key**. This will give you useful information about the selected object as well as the R.A. and declination, magnitude and most importantly, altitude above the horizon. (If a star alignment has not yet been performed, the altitude will not be displayed).

The speed at which information scrolls across the hand control display can be changed while the information is being viewed:

Hold down the "1" key to speed up the scroll speed.
Hold down the "4" key to slow down the scroll speed.
Hold down the "7" key to freeze the information on the display.

- **Press the ENTER Key**. This will automatically slew the telescope to the coordinates of the object. While the telescope is slewing to the object, the user can still access many of the hand control functions (such as displaying information about the object). Once the telescope is centered on the object the hand control buttons will blink on and off to notify you that the telescope has stopped slewing.

Caution!

Your NexStar has the ability to slew to objects that are below the horizon. This could result in the telescope tube coming into contact with the fork arm base. While this should not damage the telescope in any way, it will nullify your star alignment causing you to have to realign the telescope. To avoid having to do this, the NexStar allows you to check the

altitude of any object before slewing to it. To do this simply select the object you wish to observe and press the INFO button while the object is displayed. The hand control screen will display the altitude of the selected object. If the altitude is a negative number the object is still below the horizon and not visible. Pressing UNDO will return you to the catalog menu where you can select another object. If you do begin slewing to an object that is below the horizon, pressing any of the four direction buttons will stop the slew allowing you to choose another object to view.

Never slew the telescope when someone is looking into the eyepiece. The telescope can move at very fast slew speeds and may hit an observer in the eye.

Object information can be obtained without having to do a star alignment. After the telescope is powered on, press the UNDO key. Pressing any of the catalog keys allows you to scroll through object lists or enter catalog numbers as described above. However, information such as R.A. and declination of planets and altitude above the horizon will not be displayed unless the telescope is first properly aligned.

Tour Mode

The NexStar includes a tour feature which automatically allows the user to choose from a list of interesting objects based on the month in which you are observing. The Tour mode is activated by pressing the TOUR key (6) on the hand control. Once activated, simply use the scroll keys to select the current month and press ENTER. The NexStar will display from a list of the best objects to observe based on the month entered.

- To see information and data about the displayed object, press the INFO key.
- To slew to the object displayed, press ENTER.
- To see the next tour object, press the Up key.

Observing Tip

When going through any of the object catalogs in the database, you can easily find out which objects are above the horizon and visible simply by pressing the INFO button when the desired object is displayed. This will display the objects altitude above the horizon based on the date and time entered. Pressing the UP button once will display any scrolling text associated with that object. The scrolling text can be viewed even if a star alignment has not been performed.

Direction Buttons

The NexStar has four direction buttons in the center of the hand control which controls the telescope motion in altitude (up and down) and azimuth (left and right). The telescope can be controlled at nine different speed rates.

Rate Button

Pressing the RATE key (11) allows you to instantly change the speed rate of the motors from high speed slew rate to precise guiding rate or anywhere in between. Each rate corresponds to a number on the hand controller key pad. The number 9 is the fastest rate (approximately 4º per second, depending on power source) and is used for slewing between objects and locating alignment stars. The number 1 on the hand control is the slowest rate (1x sidereal) and can be used for accurate centering of objects in the eyepiece and photographic guiding. To change the speed rate of the motors:

- Press the RATE key on the hand control. The LCD will display the current speed rate.
- Press the number on the hand control that corresponds to the desired speed. The LCD will display "NexStar Ready" indicating that the rate has been changed.

The hand control has a "double button" feature that allows you to instantly speed up the motors without having to choose a speed rate. To use this feature, simply press the arrow button that corresponds to the direction that you want to move the telescope. While holding that button down, press the opposite directional button. This will increase the slew rate to approximately 1º per second (equal to rate 7 on the hand control). This feature will not function if the telescope is currently set at a speed rate of 8 or 9.

1 = 2x *2 = 4x* *3 = 8x* *4 = 16x* *5 = 32x*	*6 = .5º / sec* *7 = 1º / sec* *8 = 2º / sec* *9 = 4º / sec*
Nine available slew speeds	

Set Up Procedures

The NexStar contains many user defined setup functions designed to give the user control over the telescope's many advanced features. All of the set up and utility features can be accessed by pressing the MENU key and scrolling through the options:

Tracking Mode

Once the NexStar is aligned the tracking motors will automatically turn on and begin tracking the sky. However, the tracking can be turned off for terrestrial use:

Alt-Az This tracking mode is used when the telescope has been properly aligned. The telescope must be aligned with two stars before it can track in Alt-Az.

EQ North Used to track the sky when the telescope is polar aligned using an equatorial wedge in the Northern Hemisphere.

EQ South Used to track the sky when the telescope is polar aligned using an equatorial wedge in the Southern Hemisphere.

Off When using the telescope for terrestrial (land) observation the tracking can be turned off so that the telescope never moves.

Note: The EQ North and EQ South tracking modes are only needed with telescopes that can be polar aligned, such as the NexStar 4, 5 and 8. The NexStar 60, 80 and 114 are exclusively Alt-Az mounted telescopes and do not require equatorial tracking.

Tracking Rate

In addition to being able to move the telescope with the hand control buttons, the NexStar will continually track a celestial object as it moves across the night sky. The tracking rate can be changed depending on what type of object is being observed:

Sidereal This rate compensates for the rotation of the earth by moving the telescope at the same rate as the rotation of the earth, but in the opposite direction. When tracking in Alt-Az mode, the telescope must make corrections in both altitude and azimuth.

Lunar Used for tracking the moon when observing the lunar landscape.

Solar Used for tracking the Sun when solar observing.

King As light passes through our atmosphere, atmospheric refraction affects the apparent motion of objects across the sky. The King rate takes this into account and compensates for the refraction of the atmosphere.

User Defined Objects

The NexStar can store up to 20 different user defined objects in its memory. The objects can be daytime land objects or an interesting celestial object that you discover that is not included in the regular database. There are several ways to save an object to memory depending on what type of object it is:

.

Save Sky Object: The NexStar stores celestial objects to its database by saving its right ascension and declination in the sky. This way the same object can be found each time the telescope is aligned. Once a desired object is centered in the eyepiece, simply scroll to the "**Save Sky Obj**" command and press ENTER. The display will ask you to enter a number between 1-9 to identify the object. Press ENTER again to save this object to the database.

Save Land Object: The NexStar can also be used as a spotting scope on terrestrial objects. Fixed land objects can be stored by saving their altitude and azimuth relative to the location of the telescope at the time of observing. Since these objects are relative to the location of the telescope, they are only valid for that exact location. To save land objects, once again center the desired object in the eyepiece. Scroll down to the "**Save Land Obj**" command and press ENTER. The display will ask you to enter a number between 1-9 to identify the object. Press ENTER again to save this object to the database.

GoTo Sky Object: To go to any of the user defined sky objects stored in the database, scroll down to "**GoTo Sky Obj**" and enter the number of the object you wish to select and press ENTER. NexStar will automatically retrieve the RA and DEC and slew to the object.

GoTo Land Object: To go to any of the user defined land objects stored in the database, scroll down to "**GoTo Land Obj**" and enter the number of the object you wish to select and press ENTER. NexStar will automatically retrieve the altitude and azimuth and slew to the object.

To replace the contents of any of the user defined objects, simply save a new object using one of the existing identification numbers; NexStar will replace the previous user defined object with the current one.

Get RA/DEC - Displays the right ascension and declination for the current position of the telescope.

Get Alt-Az - Displays the relative altitude and azimuth for the current position of the telescope.

Goto R.A/ Dec - Allows you to input a specific Right Ascension. and declination and slew to it.

Goto Alt-Az - Allows you to enter a specific altitude and azimuth position and slew to it.

Helpful Hint

To store a set of coordinates (R.A./Dec) permanently into the NexStar database, save it as a *User Defined Object* as described above.

Utility Features

Scrolling through the MENU options will also provide access to several advanced utility functions such as cord wrap and anti-backlash compensation.

Cord Wrap – Cord wrap safeguards against the telescope slewing more than 360º in azimuth and wrapping the power cord around the base of the telescope. Cord wrap can be set for either Power Cord (on) or Batteries (off).

Anti-backlash – All mechanical gears have a certain amount of backlash or play between the gears. This play is evident by how long it takes for a star to move in the eyepiece when the hand control arrow buttons are pressed (especially when changing directions). The NexStar's anti-backlash feature allows the user to compensate for backlash by inputting a value which quickly rewinds the motors just enough to eliminate the play between gears. The amount of compensation needed depends on the slewing rate selected; the slower the slewing rate the longer it will take for the star to appear to move in the

eyepiece. Therefore, the anti-backlash compensation will have to be set higher. You will need to experiment with different values; a value between 20 and 50 is usually best for most visual observing, whereas a higher value may be necessary for photographic guiding.

To set the anti-backlash value, scroll down to the **Azm Backlash** or **Alt Backlash** and press ENTER. Enter a value from 0-100 for both azimuth and altitude and press ENTER after each one to save these values. NexStar will remember these values and use them each time it is turned on until they are changed.

Demo and Approach Length - These features are only used at the factory as diagnostic tools for quality control purposes and although they appear on the hand control display they can not be accessed by the user.

Light Control – This feature allows some NexStar models to turn off both the red key pad light and LCD display for daytime use to conserve power and to help preserve your night vision. This feature is not activated on the NexStar 60, 80 and 114 models.

Model Select – The first time the NexStar is powered on, the hand control display allows you to select your NexStar from a list of different models. If for some reason the incorrect model was selected, the *Model Select* utility feature allows you to re-set the hand control to its factory default settings.

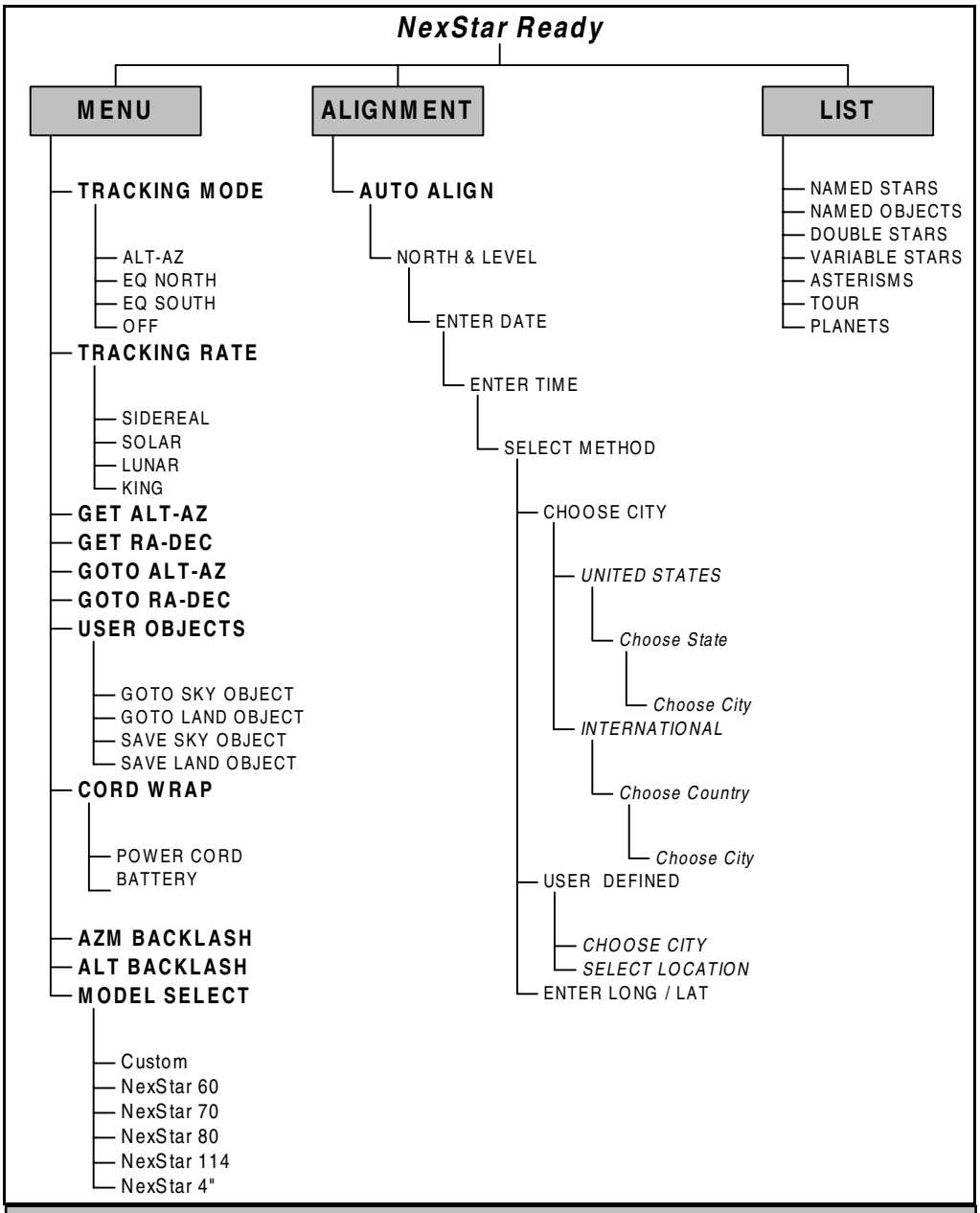
The *Model Select* feature has a *Custom* option that allows you to enter the exact encoder-gear ratio for your individual NexStar model. For best possible pointing accuracy, this numeric gear ratio should be entered into the hand control should you ever need to re-select the telescope model. To enter the custom encoder-gear ratio for your NexStar model, follow the steps below:

1. When the hand control is turned-on, the display will read NexStar Ready, press the UNDO button to by-pass the AutoAlign procedure.
2. Press the MENU button and use the Up and Down scroll keys until Model Select is displayed on the screen, and press ENTER.
3. Use the Up and Down scroll keys to select *Custom* and press ENTER.
4. The display will read Azm = ??????? . If you have a **NexStar 60 or 80**, enter the number **0726559** and press ENTER. If you have a **NexStar 114 or 4",** enter the number **1059334** and press ENTER.
5. Now enter the same number for altitude as you did for azimuth, Alt = 0726559 (for NexStar 60 or 80) or Alt = 1059334 (for NexStar 114 or 4") and press ENTER.
6. The hand control will now say Recycle Power. Re-start the power to the telescope to save the changes.

The telescope will now recognize your NexStar model as long as the custom setting is not changed.

RS-232 Connection

The NexStar has an RS-232 port (12) at the bottom of the hand control, allowing it to be controlled using the *GuideStar* telescope control software. Linking the NexStar to a computer requires the use of an optional RS-232 cable (see the Optional Accessories section of the manual). Connect the phone jack connecter to the RS-232 port in the hand control and the 9-pin connector to the back of your computer. Once connected, install the telescope control software CD-ROM into your computer and follow the on-screen instructions.



NexStar GT Menu Tree

This figure is a menu tree showing the sub-menus associated with the primary command functions.

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 NexStar 60 and NexStar 80 telescopes are refractor telescopes that use an objective lens to collect its light. The NexStar 114 is a reflecting telescope with a primary and secondary mirror to gather and focus light.

Focusing

Once you have found an object in the telescope, turn the focusing knob until the image is sharp. To focus on an object that is nearer than your current target, turn the focusing knob toward the eyepiece (i.e., so that the focusing tube moves away from the front of the telescope). For more distant objects, turn the focusing knob in the opposite direction. To achieve a truly sharp focus, never look through glass windows or across objects that produce heat waves, such as asphalt parking lots.

Image Orientation

The image orientation of any telescope changes depending on how the eyepiece is inserted into the telescope. When observing through the NexStar 60 or 80 using a diagonal, the image will be right side up, but reversed from left to right. When observing straight through, with the eyepiece inserted directly into the telescope, the image will be inverted.

Reversed from left to right, as viewed with a Star Diagonal

Inverted image, as viewed with the eyepiece directly in telescope

When observing through the NexStar 114, a reflecting telescope, the image will appear up-side-down when looking through the eyepiece.

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.

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. In equation format, the formula looks like this:

$$\text{Magnification} = \frac{\text{Focal Length of Telescope (mm)}}{\text{Focal Length of Eyepiece (mm)}}$$

Let's say, for example, you are using the 25mm eyepiece. To determine the magnification you simply divide the focal length of your telescope (for example, the NexStar 114 has a focal length of 1000mm) by the focal length of the eyepiece, 25mm. Dividing 1000 by 25 yields a magnification of 40 power.

Although the power is variable, each instrument under average skies has a limit to the highest useful magnification. The general rule is that 60 power can be used for every inch of aperture. For example, the NexStar 80 is 3.2" (80mm) in diameter. Multiplying 3.2 by 60 gives a maximum useful magnification of 192 power. Although this is the maximum useful magnification, most observing is done in the range of 20 to 35 power for every inch of aperture which is 64 to 112 times for the NexStar 80 telescope.

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:

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

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 52°. Divide the 52° by the magnification, which is 40 power. This yields an actual field of view of 1.3°.

To convert degrees to feet at 1,000 yards, which is more useful for terrestrial observing, simply multiply by 52.5. Continuing with our example, multiply the angular field 1.3° by 52.5. This produces a linear field width of 68.3 feet at a distance of one thousand yards. The apparent field of each eyepiece that Celestron manufactures is found in the Celestron Accessory Catalog (#93685).

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 producing heat waves. This includes asphalt parking lots on hot summer days or building rooftops.

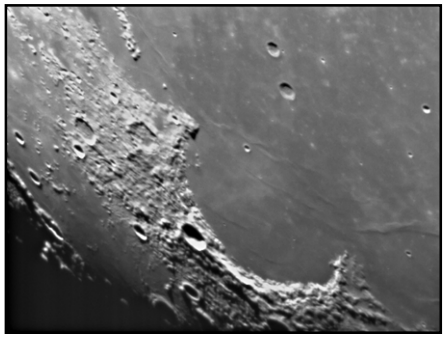
- Hazy skies, fog, and mist can also make it difficult to focus when viewing terrestrially. The amount of detail seen under these conditions is greatly reduced. Also, when photographing under these conditions, the processed film may come out a little grainier than normal with lower contrast and underexposed.

- 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 which 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.

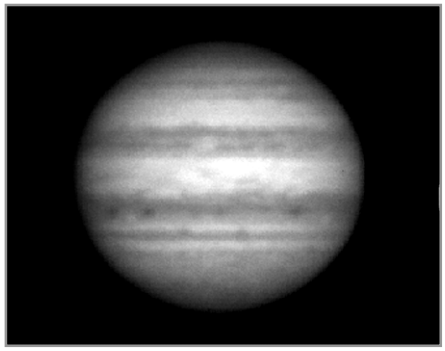
One of the best times to observe the Moon is during its partial phases (around the time of first or third quarter). Long shadows reveal a great amount of detail on the lunar surface. At low power you will be able to see most of the lunar disk at one time. Change to higher power (magnification) to focus in on a smaller area. Choose the *lunar* tracking rate from the NexStar's (GT models) MENU tracking rate options to keep the moon centered in the eyepiece even at high magnifications.

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 Conditions*" section later in this section.
- To increase contrast and bring out detail on the planetary surface, try using Celestron 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 Celestron 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.
- To ensure accurate tracking on GT models, be sure to select solar tracking rate.

Observing Deep Sky Objects

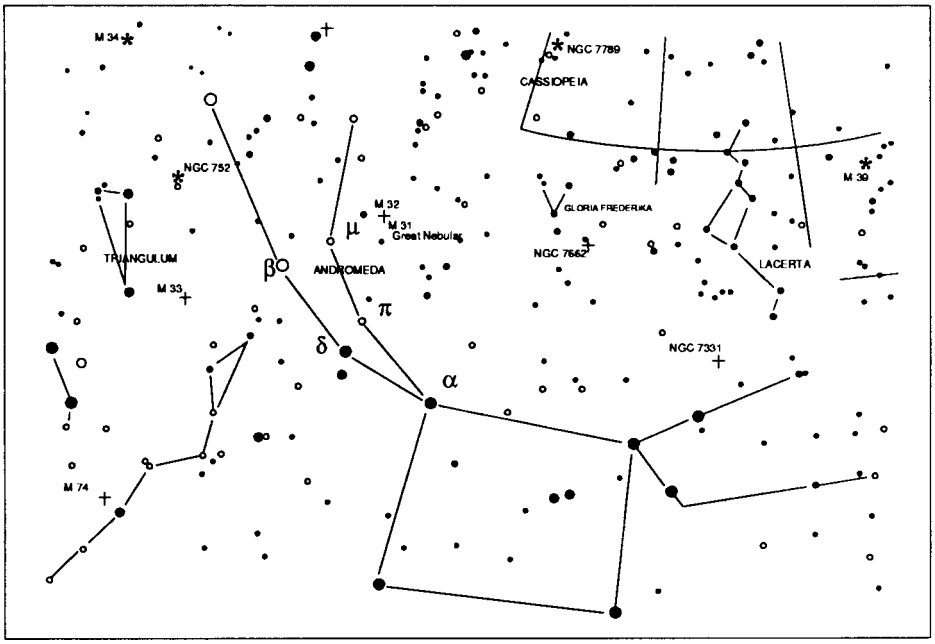
Deep sky objects are simply those objects outside the boundaries of our solar system. They include star clusters, planetary nebulae, diffuse nebulae, double stars and other galaxies outside our own Milky Way. Most deep sky objects have a large angular size. Therefore, low-to-moderate power is all you need to see them. Visually, they are too faint to reveal any of the color seen in long exposure photographs. Instead, they appear black and white. And, because of their low surface brightness, they should be observed from a dark sky location. 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.

Star Hopping

One of the best ways to find celestial objects while learning your way around the nighttime sky, is star hopping. Star hopping is done by using bright stars to "guide" you to an object. Here are directions for one popular object.

The Andromeda Galaxy, M31, is an easy target. To find M31:

1. Locate the constellation of Pegasus (see illustration below), a large square visible in the fall (in the eastern sky moving toward the point overhead) and winter months (overhead moving toward the west).
2. Start at the star in the northeast corner—Alpha (α) Andromedae.
3. Move northeast approximately 7°. There you will find two stars of equal brightness—Delta (δ) and Pi (π) Andromeda—about 3° apart.
4. Continue in the same direction another 8°. There you will find two stars—Beta (β) and Mu (μ) Andromedae—also about 3° apart.
5. Move 3° northwest—the same distance between the two star—to the Andromeda galaxy. It is easily visible in the finder.



Seeing 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 affect 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.

Seeing

Seeing conditions refers to the stability of the atmosphere and directly affects the amount of fine detail seen in extended objects. The air in our atmosphere acts as a lens which 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.

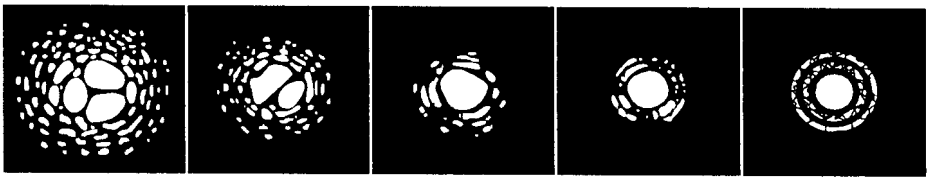


Figure 6-1
Seeing conditions directly affect image quality. These drawing represent a point source (i.e., star) under bad seeing conditions (left) to excellent conditions (right). Most often, seeing conditions produce images that lie some where between these two extremes.

Telescope Maintenance

While your NexStar 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

Occasionally, dust and/or moisture may build up on the lens of your telescope. Special care should be taken when cleaning any instrument so as not to damage the optics.

If dust has built up on the corrector plate, remove it with a brush (made of camel's hair) or a can of pressurized air. Spray at an angle to the lens for approximately two to four seconds. Then, use an optical cleaning solution and white tissue paper to remove any remaining debris. Apply the solution to the tissue and then apply the tissue paper to the lens. Low pressure strokes should go from the center of the corrector to the outer portion. **Do NOT rub in circles!**

You can use a commercially made lens cleaner or mix your own. A good cleaning solution is isopropyl alcohol mixed with distilled water. The solution should be 60% isopropyl alcohol and 40% distilled water. Or, liquid dish soap diluted with water (a couple of drops per one quart of water) can be used.

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.

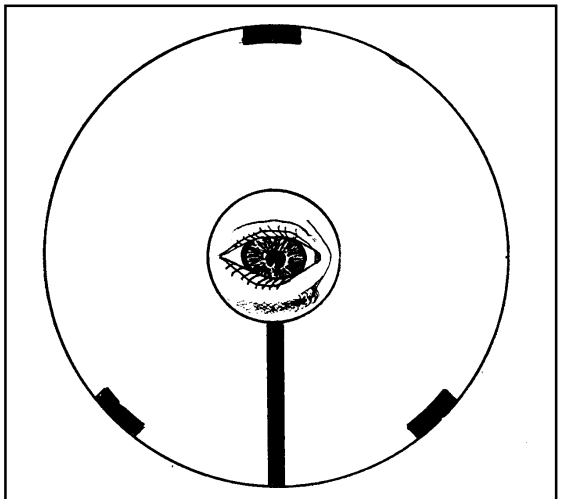
Collimation

(For NexStar 114)

The optical performance of your NexStar telescope is directly related to its collimation, that is the alignment of its optical system. Your NexStar was collimated at the factory after it was completely assembled. However, if the telescope is dropped or jarred severely during transport, it may have to be collimated. The NexStar 60 and NexStar 80 are refractor type telescopes that have fix optical systems that should not come out of collimation. The NexStar 114, however has three collimation screws that can be used to adjust the alignment of the primary mirror.

To check if your telescope is in collimation the following diagram will help you. If you look into the eyepiece adapter (without an eyepiece) at the top of the focuser, this is what you should see. If the reflection of your eye is off center, then collimation is necessary.

Adjustments to the collimation of the telescope can be made by turning the collimation adjustment knobs located at the rear of the optical tube. First loosen the three Phillips head screws on the rear cell of the tube. Turn each collimation knobs, one at a time, until the reflected image of your eye in the secondary mirror is centered in the primary mirror. Once the telescope is collimated, tighten the Phillips head screws until you feel a slight resistance. Do not over tighten the screw.



The view of a collimated telescope as seen through the focuser of the NexStar 114 reflector

If your telescope is out of collimation, the best way to re-collimate it is with a good collimation tool. Celestron offers a Newtonian Collimation Tool (#94183) with detailed instructions that make it an easy chore.

Optional Accessories

You will find that additional accessories enhance your viewing pleasure and expand the usefulness of your telescope. For ease of reference, all the accessories are listed in alphabetical order.

Adapter, AC (#18770) – Allows DC (battery) powered telescopes to be converted for use with 120 volt AC power. The adapter attaches to any standard wall outlet.

Adapter, Car Battery (#18769) - Celestron offers the Car Battery Adapter that allows you to run the NexStar drive off an external power source. The adapter attaches to the cigarette lighter of your car, truck, van, or motorcycle.

Carrying Case (#302070) - This rugged case is constructed of space age resin, making it waterproof, unbreakable, airtight and extremely durable. The case is lined with die cut foam for custom fitting. It features large handles and is equipped with wheels, for easy transportation. Weight: 17 lbs. (31.5"x 21.75"x 11.5").

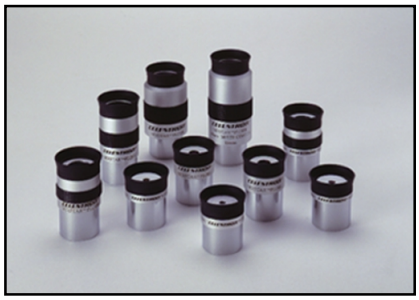
Erect Image Diagonal (#94112-A) - This accessory is an Amici prism arrangement that allows you to look into the telescope at a 45° angle with images that are oriented properly (upright and correct from left-to-right). It is useful for daytime, terrestrial viewing.

Eyepieces - Like telescopes, eyepieces come in a variety of designs. Each design has its own advantages and disadvantages. For the 1-1/4" barrel diameter there are four different eyepiece designs available:

- **Super Modified Achromatic (SMA) Eyepieces: $1^1/_4$"**
  The SMA design is an improved version of the Kellner eyepiece. SMA's are very good, economical, general purpose eyepieces that deliver a wide apparent field, good color correction and an excellent image at the center of the field of view. Celestron offers SMA eyepieces in 1-1/4" sizes in the following focal lengths: 6mm, 10mm, 12mm, 17mm and 25mm.

- **Ultima -** Ultima is not really a design, but a trade name for our 5-element, wide field eyepieces. In the 1-1/4" barrel diameter, they are available in the following focal lengths: 5mm, 7.5mm, 12.5mm, 18mm, 30mm, 35mm, and 42mm. These eyepieces are all parfocal.

- **NexStar Plössl -** Plössl eyepieces have a 4-element lens designed for low-to-high power observing. The Plössls offer razor sharp views across the entire field, even at the edges! In the 1-1/4" barrel diameter, they are available in the following focal lengths: 3.6mm, 6mm, 8mm, 10mm, 13mm, 17mm, 25mm, 32mm and 40mm.



- **Lanthanum Eyepieces (LV Series)** - Lanthanum is a unique rare earth glass used in one of the field lenses of this new eyepiece. The Lanthanum glass reduces aberrations to a minimum. All are fully multicoated and have an astounding 20mm of eye relief — perfect for eyeglass wearers! In the 1-1/4" barrel diameter, they are available in the following focal lengths: 2.5mm, 4mm, 5mm, 6mm, 9mm, 10mm, 12mm and 15mm. Celestron also offers the LV Zoom eyepiece (#3777) with a focal length of 8mm to 24mm. It offers an apparent field of 40º at 24mm and 60º at 8mm. Eye relief ranges from 15mm to 19mm.

Filters, Eyepiece - To enhance your visual observations of solar system objects, Celestron offers a wide range of colored filters that thread into the 1-1/4" oculars. Available individually are: #12 deep yellow, #21 orange, #25 red, #58 green, #80A light blue, #96 neutral density - 25%T, #96 neutral density - 13%T, and polarizing. These and other filters are also sold in sets.

Flashlight , Night Vision - (#93588) - Celestron's premium model for astronomy, using two red LEDs to preserve night vision better than red filters or other devices. Brightness is adjustable. Operates on a single 9 volt battery (included).

Flashlight, Red Astro Lite – (#93590) – An economical squeeze-type flashlight fitted with a red cap to help preserve your night vision. Remove the red cap for normal flashlight operation. Very compact size and handy key chain.

Filter, Light Pollution Reduction –LPR (#94126A) - These filters are designed to enhance your views of deep sky astronomical objects when viewed from urban areas. LPR Filters selectively reduce the transmission of certain wavelengths of light, specifically those produced by artificial lights. This includes mercury and high and low pressure sodium vapor lights. In addition, they also block unwanted natural light (sky glow) caused by neutral oxygen emission in our atmosphere.

Filter, Moon (#94119-A) - Celestron's Moon Filter is an economical eyepiece filter for reducing the brightness of the moon and improving contrast, so greater detail can be observed on the lunar surface. The clear aperture is 21mm and the transmission is about 18%.

Hand Control, Upgrade (#93961) – Plugs into your NexStar 60 HC, NexStar 80 HC or NexStar 114 HC to give you instant access to over 4,000 celestial objects. Combined with your telescope's built-in slew motors, your NexStar will have the ability to automatically find all the Messier objects, dozens of double stars and all the planets at a touch of a button. Hand control comes with built-in RS-232 communication port capable of interfacing with popular astronomy software.

Hand Control Upgrade Kit with Motors (#93960) – Easy to install, this upgrade kit gives you everything you need to convert your NexStar 60 ST into a completely automated "GoTo" system. Kit includes both altitude and azimuth high speed slew motors plus the NexStar hand control containing over 4,000 object database.

Planisphere (#93720) - A simple and inexpensive tool for all levels of observers, from naked eye viewers to users of highly sophisticated telescopes. The Celestron Planisphere makes it easy to locate stars for observing and is a great planet finder as well. A map of the night sky, oriented by month and day, rotates within a depiction of the 24 hours of the day, to display exactly which stars and planets will be visible at any given time. Ingeniously simple to use, yet quite effective. Made of durable materials and coated for added protection. Celestron Planispheres come in three different models, to match the latitude from which you're observing:

For 20° to 40° of latitude	#93720-30
For 30° to 50°of latitude	#93720-40
For 40° to 60° of latitude	#93720-50

Polarizing Filter Set (#93608) - The polarizing filter set limits the transmission of light to a specific plane, thus increasing contrast between various objects. This is used primarily for terrestrial, lunar and planetary observing.

RS-232 Cable (#93920) – Allows your NexStar telescope to be controlled using a laptop computer or PC. Once connected, the NexStar can be controlled using software programs like *GuideStar* computer control software by Celestron.

Sky Maps (#93722) - Celestron Sky Maps are the ideal teaching guide for learning the night sky. You wouldn't set off on a road trip without a road map, and you don't need to try to navigate the night sky without a map either. Even if you already know your way around the major constellations, these maps can help you locate all kinds of fascinating objects.

Vibration Suppression Pads (#93503) - These pads rest between the ground and tripod feet of your telescope. They reduce the amplitude and vibration time of your telescope when shaken by the wind or an accidental bump.

A full description of all Celestron accessories can be found in the Celestron Accessory Catalog (#93685).

APPENDIX A - TECHNICAL SPECIFICATIONS

Optical Specification

	NexStar 60mm	NexStar 80mm	NexStar 114mm
Design	Refractor	Refractor	Reflector
Aperture	60mm	80mm	114mm
Focal Length	700mm	400mm	1000mm
F/ratio of the Optical System	12	5	9
Objective Coatings	Multi Coated	Multi Coated	Aluminum
Highest Useful Magnification	175x (~ 4mm eyepiece)	189x (~2.5mm eyepiece)	269x (~4mm eyepiece)
Lowest Useful Magnification	20x (~ 32mm eyepiece)	11x (~40mm eyepiece)	16x (~55mm eyepiece)
Resolution: Rayleigh Criterion Dawes Limit	2.31 arc seconds 1.93 arc seconds	1.73 arc seconds 1.45 arc seconds	1.21 arc seconds 1.02 arc seconds
Light Gathering Power	73x unaided eye	131x unaided eye	265x unaided eye
Field of View: Standard Eyepiece	1.43º	3.25º	1.3º
Linear Field of View (at 1000 yds)	55 feet	131 feet	68 feet
Eyepiece Magnification:	35x (20mm) 70x (10mm) 175x (4mm)	16x (25mm) 40x (10mm)	40x (25mm) 100x (10mm)
Optical Tube Length	28 inches	15.5 inches	18 inches

Electronic Specifications (for NexStar GT Models)

Input Voltage Maximum Minimum	12 V DC Nominal 18 V DC Max. 8 V DC Min.
Batteries Required	8 AA Alkaline
Power Supply Requirements	12 VDC-750 mA (Tip positive)

Mechanical Specifications (for NexStar GT Models)

Motor: Type Resolution	DC Servo motors with encoders, both axes .26 arc sec
Slew speeds	Nine slew speeds: 4º /sec, 2º /sec, 1º/sec, .5 /sec, 32x, 16x, 8x, 4x, 2x
Hand Control	Double line, 16 character Liquid Crystal Display 19 fiber optic backlit LED buttons
Fork Arm	Cast aluminum

Software Specifications (for NexStar GT Models)

Software Precision	16 bit, 20 arc sec. calculations
Ports	RS-232 communication port on hand control
Tracking Rates	Sidereal, Solar, Lunar and King
Tracking Modes	Alt-Az, EQ North & EQ South
Alignment Procedures	AutoAlign, 2-Star Alignment
Database	25 user defined programmable object. Enhanced information on over 100 objects
Total Object Database	**4,033 Objects**

APPENDIX B - 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.
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.

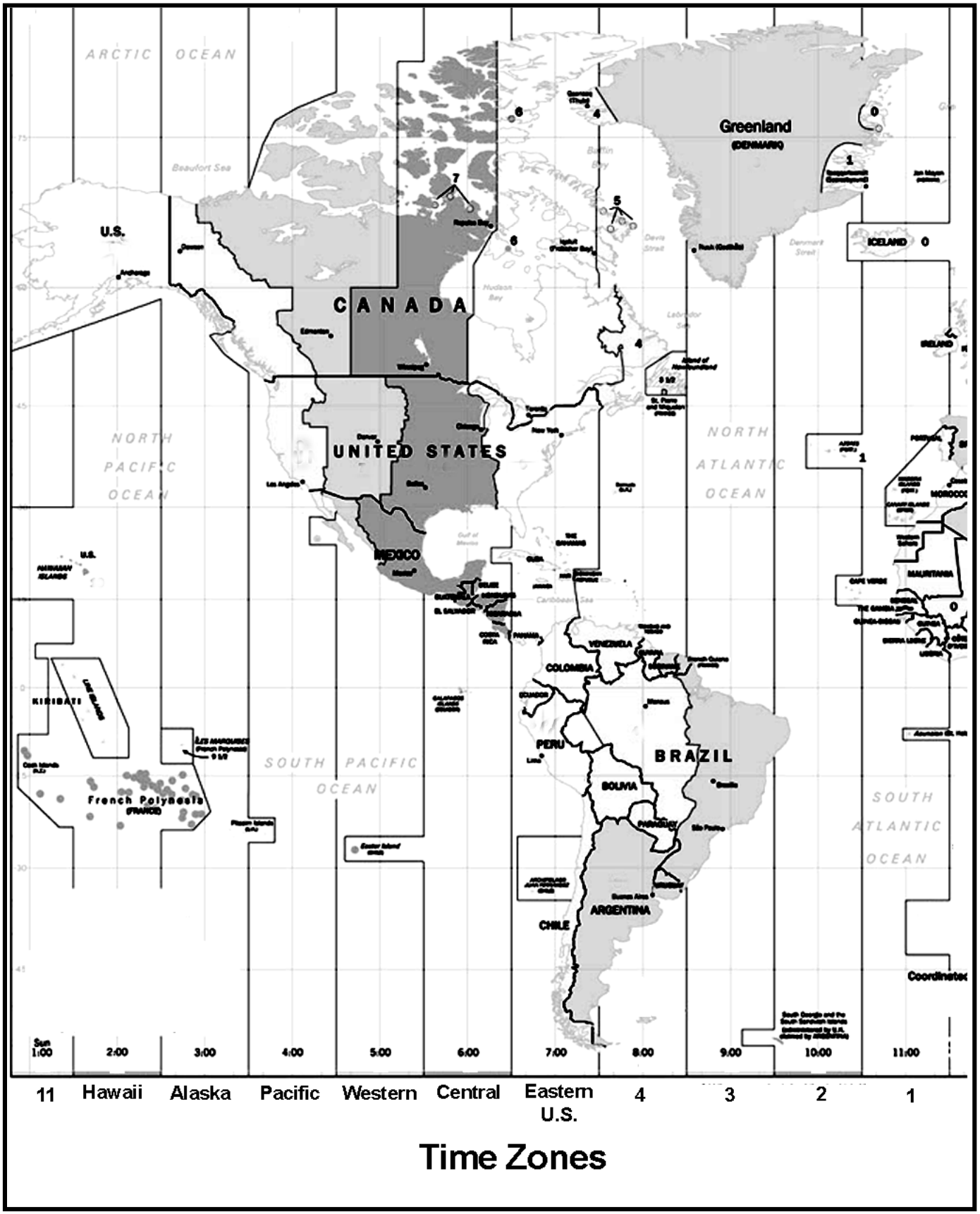
W -

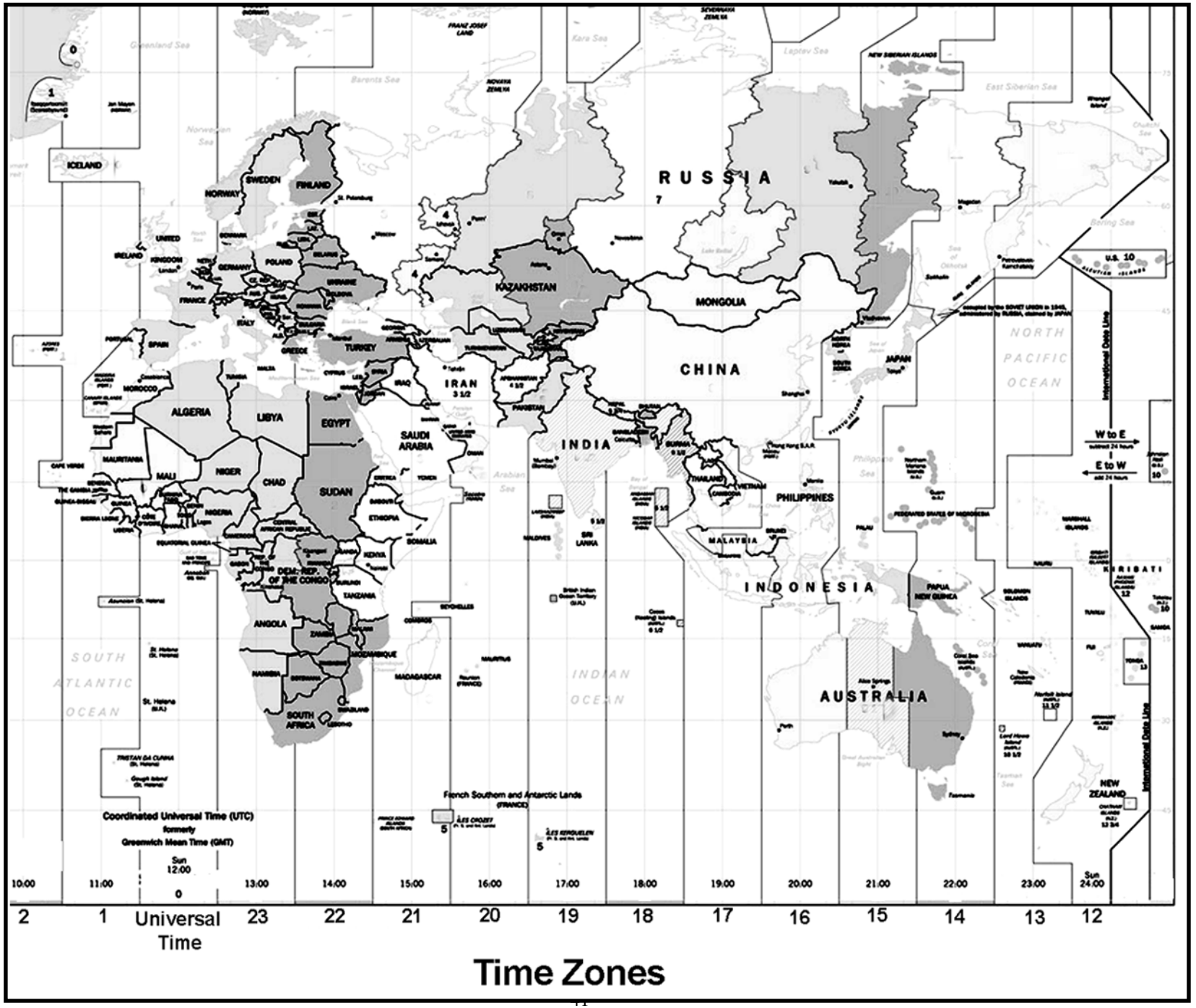
Waning Moon	The period of the moon's cycle between full and new, when its illuminated portion is decreasing.
Waxing Moon	The period of the moon's cycle between new and full, when its illuminated portion is increasing.

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.

APPENDIX C – MAPS OF TIME ZONES




RUSSIA
CHINA
INDIA
KAZAKHSTAN
MONGOLIA
IRAN
SAUDI ARABIA
INDONESIA
AUSTRALIA
PHILIPPINES
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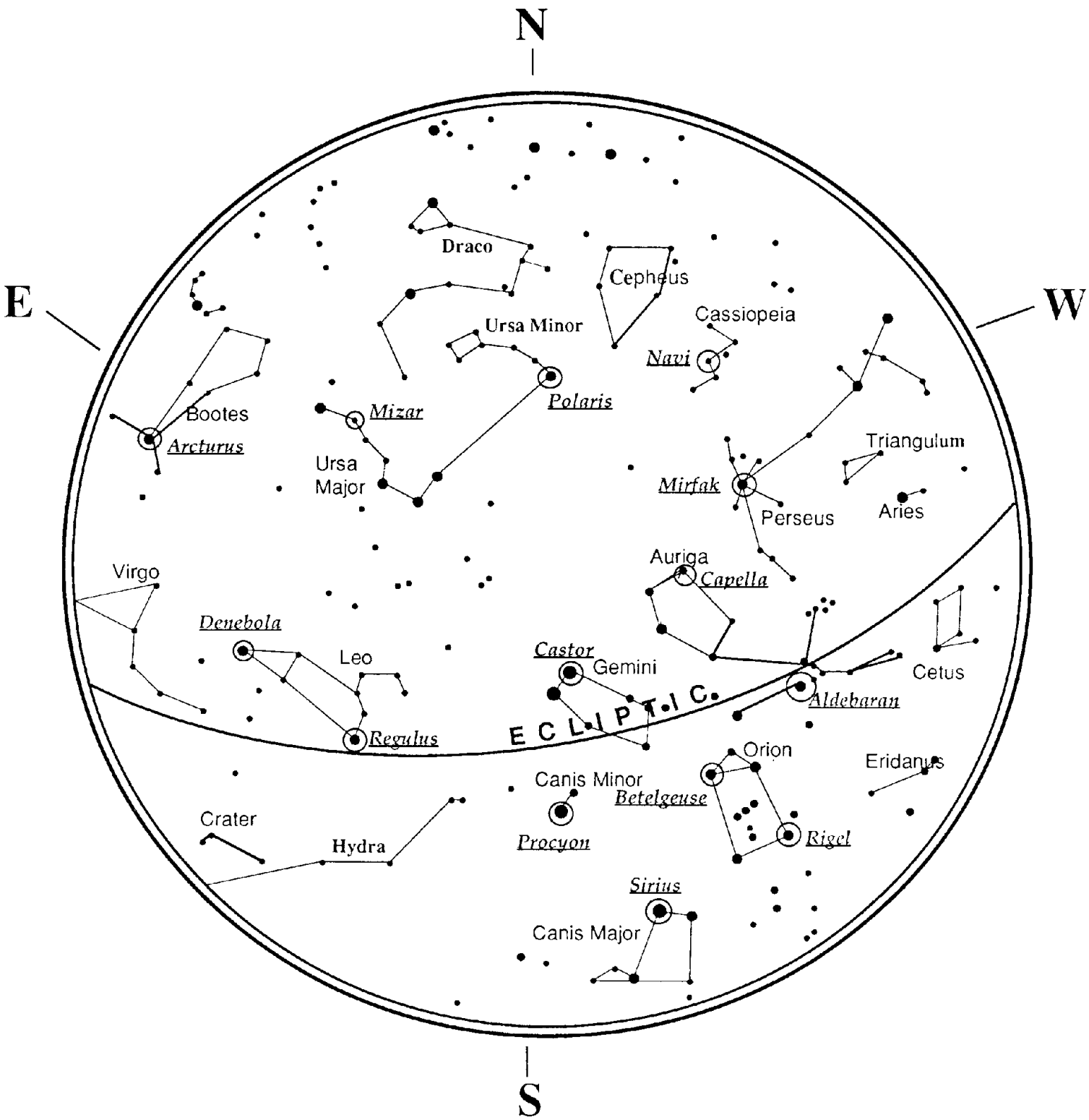
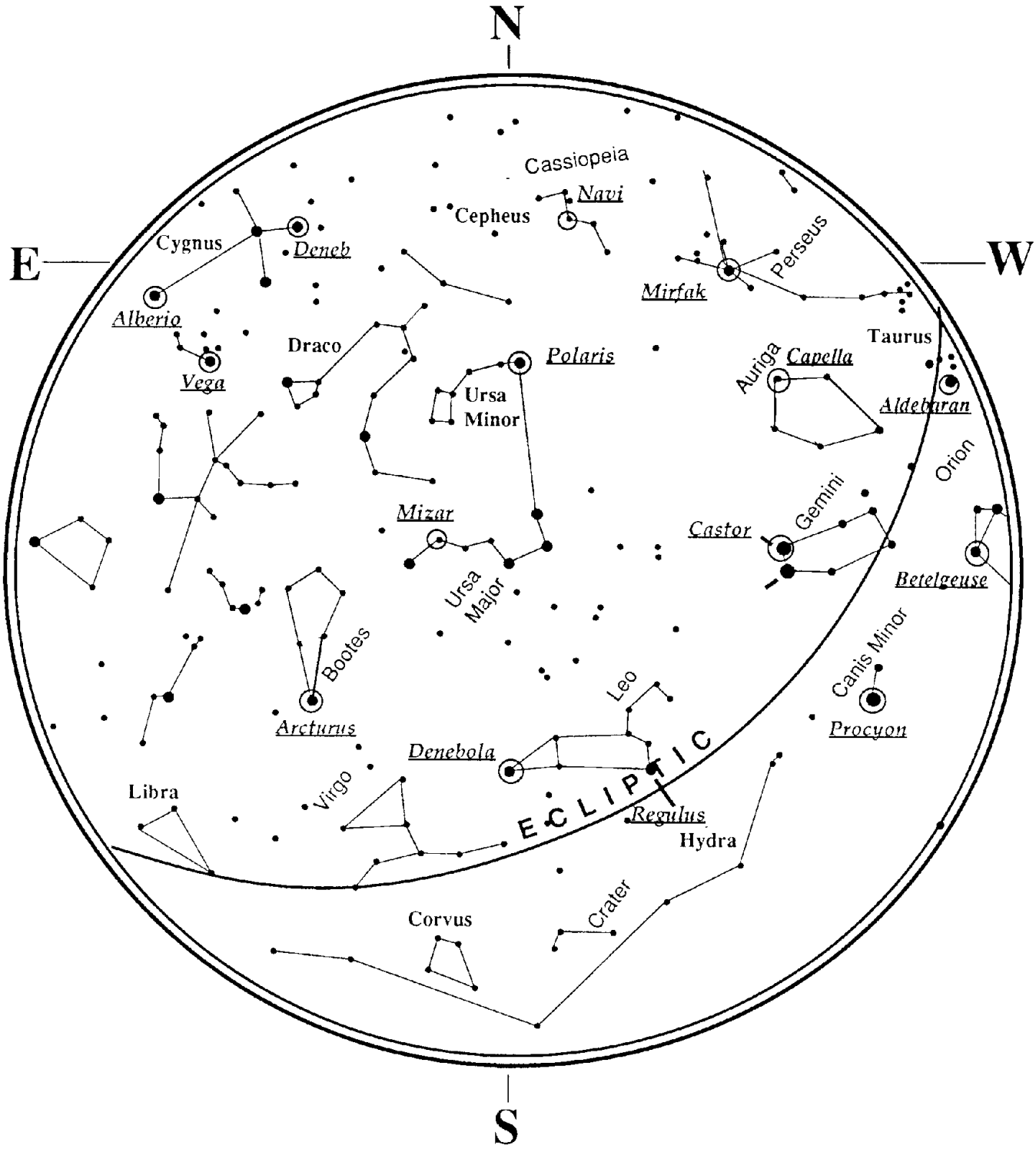
ICELAND
SWEDEN
FINLAND
NORWAY
GERMANY
POLAND
FRANCE
SPAIN
ITALY
GREECE
TURKEY
ALGERIA
LIBYA
EGYPT
SUDAN
MALI
NIGER
CHAD
NIGERIA
ETHIOPIA
SOMALIA
KENYA
TANZANIA
ANGOLA
MOZAMBIQUE
MADAGASCAR
SOUTH AFRICA
DEM. REP. OF THE CONGO
MOROCCO
MAURITANIA
THAILAND
VIETNAM
MALAYSIA
PAPUA NEW GUINEA
NEW ZEALAND
SOUTH ATLANTIC OCEAN
INDIAN OCEAN
NORTH PACIFIC OCEAN
Coordinated Universal Time (UTC)
formerly
Greenwich Mean Time (GMT)
Universal Time
W to E
E to W
International Date Line
French Southern and Antarctic Lands (FRANCE)
Time Zones

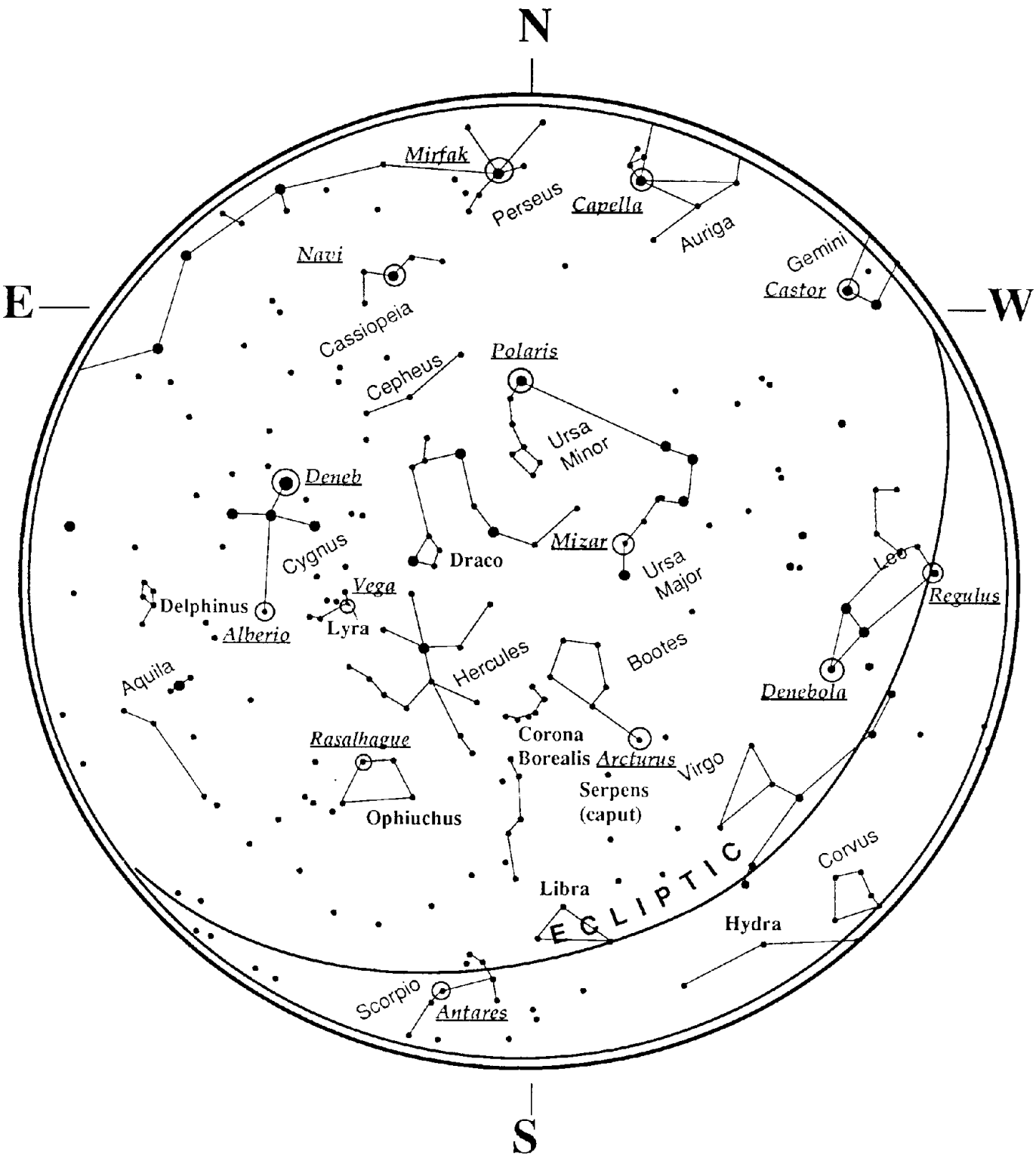
January - February Sky



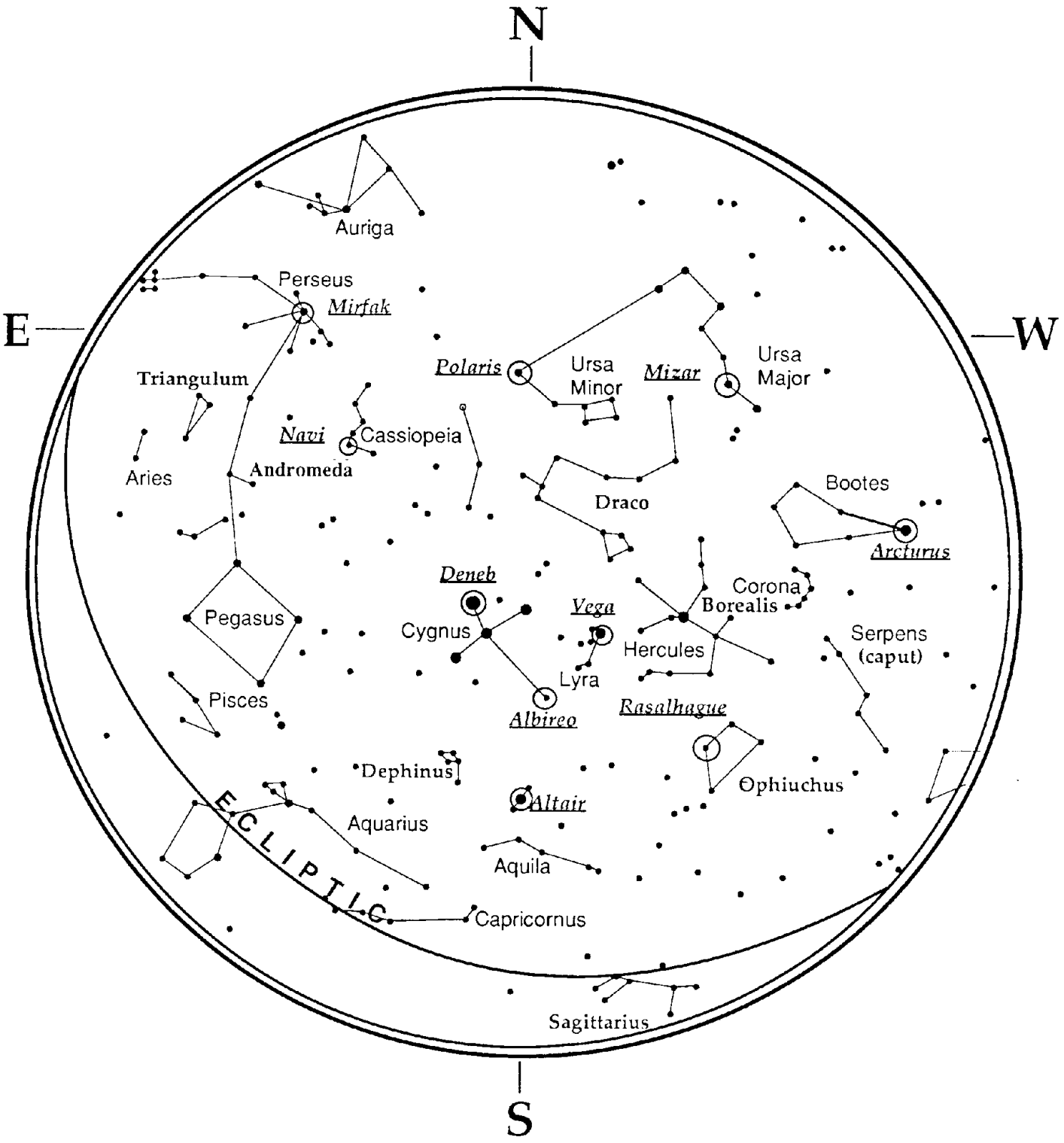
March - April Sky



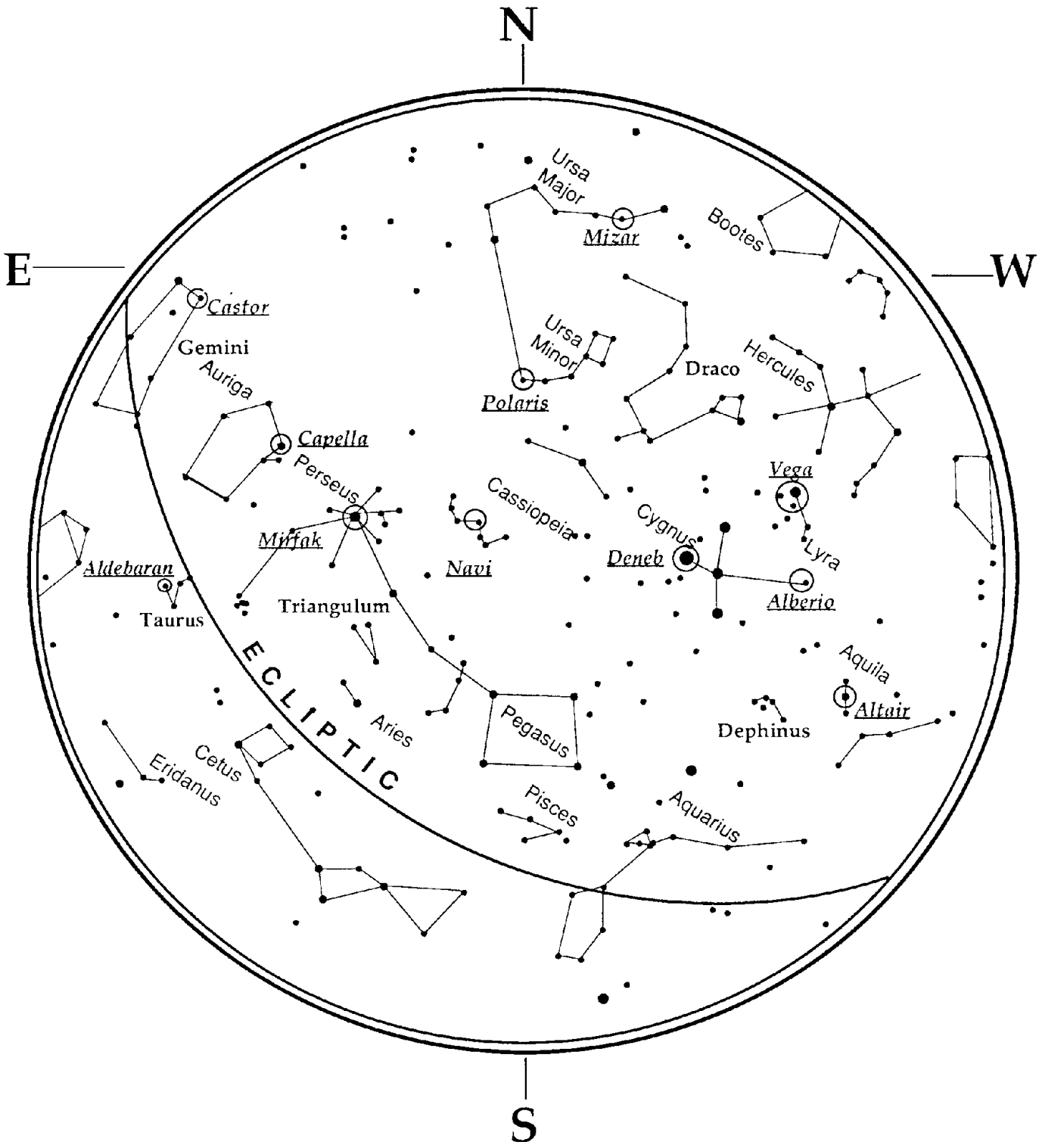
May - June Sky


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

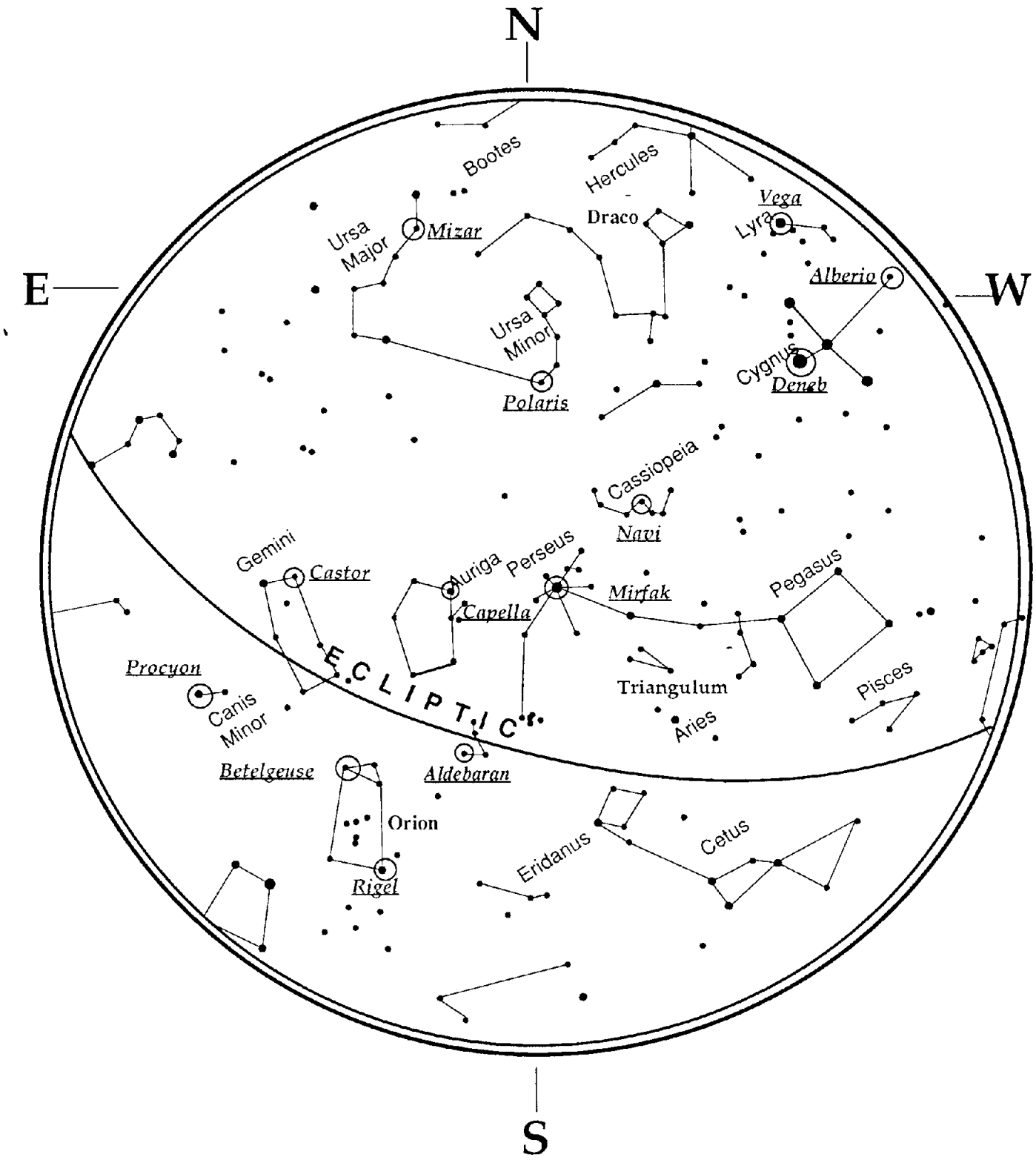
July - August Sky



September - October Sky



November - December Sky



CELESTRON ONE YEAR WARRANTY

A. Celestron International (CI) warrants this telescope to be free from defects in materials and workmanship for one year. CI will repair or replace such product or part thereof which, upon inspection by CI, is found to be defective in materials or workmanship. As a condition to the obligation of CI to repair or replace such product, the product must be returned to CI together with proof-of-purchase satisfactory to CI.

B. The Proper Return Authorization Number must be obtained from CI in advance of return. Call Celestron at (310) 328-9560 to receive the number to be displayed on the outside of your shipping container.

All returns must be accompanied by a written statement setting forth the name, address, and daytime telephone number of the owner, together with a brief description of any claimed defects. Parts or product for which replacement is made shall become the property of CI.

The customer shall be responsible for all costs of transportation and insurance, both to and from the factory of CI, and shall be required to prepay such costs.

CI shall use reasonable efforts to repair or replace any telescope covered by this warranty within thirty days of receipt. In the event repair or replacement shall require more than thirty days, CI shall notify the customer accordingly. CI reserves the right to replace any product which has been discontinued from its product line with a new product of comparable value and function.

This warranty shall be void and of no force of effect in the event a covered product has been modified in design or function, or subjected to abuse, misuse, mishandling or unauthorized repair. Further, product malfunction or deterioration due to normal wear is not covered by this warranty.

CI DISCLAIMS ANY WARRANTIES, EXPRESS OR IMPLIED, WHETHER OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR USE, EXCEPT AS EXPRESSLY SET FORTH HEREIN.

THE SOLE OBLIGATION OF CI UNDER THIS LIMITED WARRANTY SHALL BE TO REPAIR OR REPLACE THE COVERED PRODUCT, IN ACCORDANCE WITH THE TERMS SET FORTH HEREIN. CI EXPRESSLY DISCLAIMS ANY LOST PROFITS, GENERAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM BREACH OF ANY WARRANTY, OR ARISING OUT OF THE USE OR INABILITY TO USE ANY CI PRODUCT. ANY WARRANTIES WHICH ARE IMPLIED AND WHICH CANNOT BE DISCLAIMED SHALL BE LIMITED IN DURATION TO A TERM OF ONE YEAR FROM THE DATE OF ORIGINAL RETAIL PURCHASE.

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitation on how long an implied warranty lasts, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

CI reserves the right to modify or discontinue, without prior notice to you, any model or style telescope.

If warranty problems arise, or if you need assistance in using your telescope contact:

Celestron International
Customer Service Department
2835 Columbia Street
Torrance, CA 90503
Tel. (310) 328-9560
Fax. (310) 212-5835
Monday-Friday 8AM-4PM PST

This warranty supersedes all other product warranties.

NOTE: This warranty is valid to U.S.A. and Canadian customers who have purchased this product from an Authorized CI Dealer in the U.S.A. or Canada. Warranty outside the U.S.A. and Canada is valid only to customers who purchased from a CI International Distributor or Authorized CI Dealer in the specific country and please contact them for any warranty service.

Celestron International
2835 Columbia Street
Torrance, CA 90503
Tel. (310) 328-9560
Fax. (310) 212-5835
Web site at http//www.celestron.com

(Products or instructions may change
without notice or obligation.)

This device complies with Part 15 of the FCC Rule. Operation is subject to the following two conditions: 1) This device may not cause harmful interference, and 2) This device must accept any interference received, including interference that may cause undesired operations.

11-00
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