

## INSTRUCTION MANUAL

# Orion StarSeeker™ III GoTo Telescopes

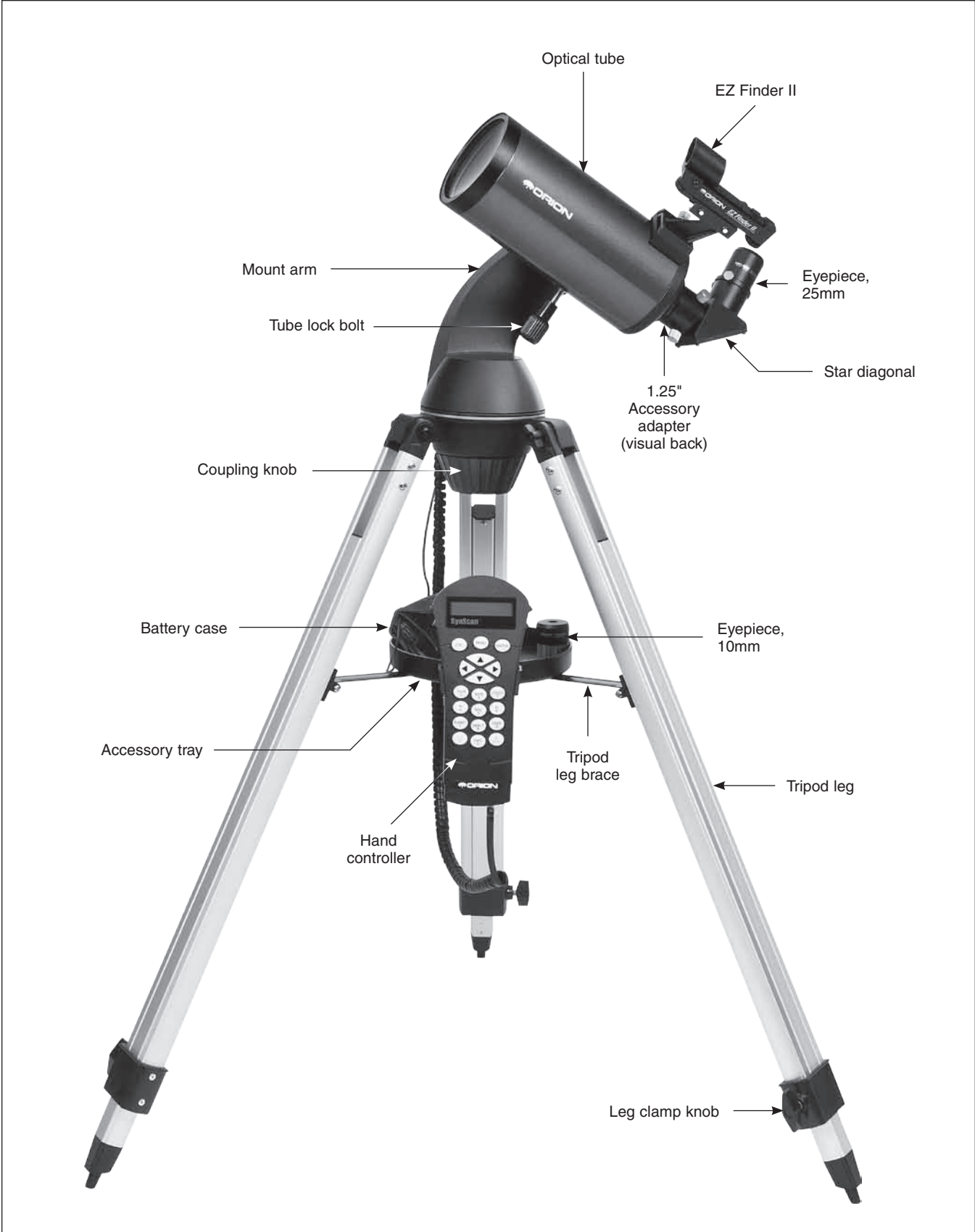
#10065 StarSeeker III 102mm Refractor, #10066 StarSeeker III 90mm Mak-Cass  
#10067 StarSeeker III 102mm Mak-Cass, #10069 StarSeeker III 127mm Mak-Cass  
#10068 StarSeeker III 114mm Reflector, #10070 StarSeeker III 130mm Reflector



#10066

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**Figure 1.** The StarSeeker III 90mm GoTo Telescope

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**WARNING:** *Never look directly at the Sun with the naked eye or with a telescope – unless you have a proper solar filter installed over the front of the telescope! Otherwise, permanent, irreversible eye damage may result.*

## Introduction

Congratulations on your purchase of an Orion StarSeeker III GoTo telescope! Simple and friendly to use, the StarSeeker combines state-of-the-art GoTo pointing technology with sharp optics in a portable package that makes observing the night sky both remarkably easy and wonderfully rewarding.

This manual covers a variety of different StarSeeker models. Some sections may be specific to a particular type of telescope, but most apply generally to features and procedures common to all of the telescopes.

Take time to read through this manual before embarking on your journey through the heavens. It may take a couple of observing sessions to become familiar with all of the StarSeeker’s features. The StarSeeker’s hand controller displays step-by-step instructions to guide you through the alignment procedures needed to get the telescope up and running in minutes. Use this manual in conjunction with the on-screen instructions provided by the hand controller. The manual gives detailed information regarding each step as well as needed reference material and helpful hints guaranteed to make your observing experience as easy and pleasurable as possible.

## Parts List

### Qty. Description

1	Optical Tube Assembly
1	Mount Arm
1	Tripod
1	Accessory Tray with Hand Controller Holder
1	GoTo Hand Controller
1	Hand Controller Cable
1	EZ Finder II Reflex Sight (with bracket)
1	25mm Explorer II Eyepiece
1	10mm Explorer II Eyepiece
1	Star Diagonal, 1.25" (Mak-Cass and Refractor models only)
1	Quick-collimation Cap (Reflector models only)
1	Battery Pack (batteries not included)
1	Objective Cover
1	2mm Allen Wrench (Reflector models only)
1	Serial RS-232 cable
1	Starry Night Software Digital Download Insert

Open the shipping box and, referring to the above Parts List and **Figure 2**, check that all the parts are present. Remove all of the accessories from their individual boxes and bags.



**Figure 2.** Components of the StarSeeker III GoTo telescope. (StarSeeker III 90mm Mak-Cass shown)

Remember to save all of the original packaging in case the scope needs to be returned to Orion for warranty repair, or should you wish to return the scope under the 30-day return policy. Especially in the latter case, the original packaging is required. If anything is missing, contact Orion Customer Service at (800) 676-1343, or [support@telescope.com](mailto:support@telescope.com).

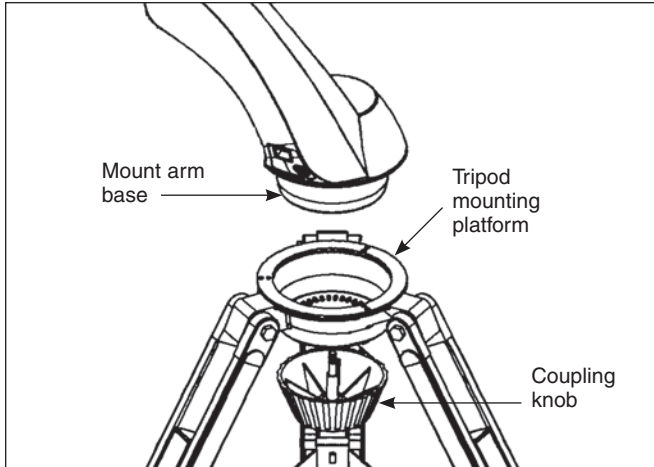
## Assembly

### Setting Up the Tripod

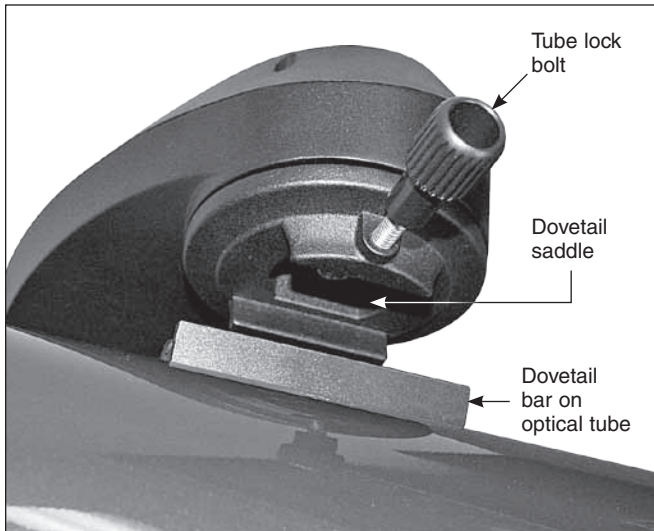
1. Remove the tripod from the box and spread the legs apart until the center leg brace is fully extended.
2. Locate the accessory tray and center it on top of the tripod center support brace (see **Figure 3**). Turn the tray attachment knob until the tray is securely attached. The



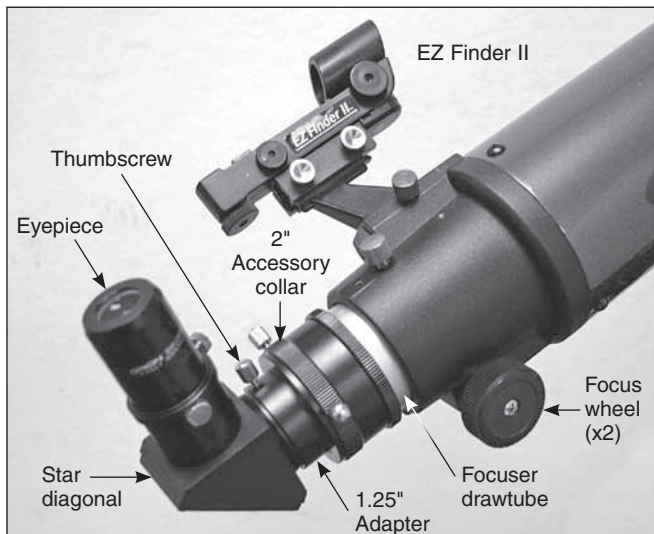
**Figure 3.** The round accessory tray attaches to the tripod leg brace with the captive screw on the brace.



**Figure 4.** The mount arm attaches to the tripod mounting platform with the large coupling knob.



**Figure 5.** Insert the dovetail bar on the optical tube into the saddle on the mount arm.



**Figure 6.** The focuser and installed accessories. (StarSeeker III 102mm Refractor shown)

bracket on the side of the tray is a holder for the GoTo hand controller.

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

3. Loosen the tripod leg clamp knob located on the side of each leg (**Figure 1**).
4. Extend the inner portion of each leg to the desired length.
5. Tighten the tripod leg clamp knobs to secure each leg in place.

Also, be sure to tighten the large wingnuts at the top of each leg, where it attaches to the tripod mounting platform.

#### **Attaching the Mount Arm to the Tripod**

1. Place the mount arm base inside the tripod mounting platform. See **Figure 4**.
2. Thread the coupling screw into the hole at the bottom of the mount arm base and tighten with the large coupling knob.

#### **Attaching the Telescope Tube to the Mount Arm**

1. Unthread the tube lock bolt until the bolt tip is not protruding into the saddle slot.
2. Slide the tube dovetail bar into the saddle on the mount arm as shown in **Figure 5**, and secure it by tightening the tube lock bolt.

**WARNING: NEVER ATTEMPT TO MOVE THE TELESCOPE BY HAND!** Otherwise, the gears and motors may be damaged. Move the telescope only electronically with the hand controller.

#### **Inserting the Star Diagonal (Mak-Cass and Refractor) and/or Eyepiece**

A star diagonal is used with the Maksutov-Cassegrain and refractor models to divert the light at a right angle from the light path of the telescope. This allows you to observe in positions that are more comfortable than if you were to look straight through. A diagonal is not used with Newtonian reflectors; none is included with the StarSeeker reflector models.

To attach the star diagonal:

1. Remove the protective dust cap from the 1.25" accessory adapter.
2. Loosen the two thumbscrews on the 1.25" adapter and slide the chrome portion of the star diagonal into the adapter (see **Figure 6**).

3. Tighten the thumbscrews to hold the star diagonal in place.

The eyepiece, or ocular, is the optical element that magnifies the image focused by the telescope.

The eyepiece fits directly into the 1.25" accessory adapter or star diagonal. To install one of the included eyepieces:

1. Loosen the thumbscrew on the 1.25" adapter or star diagonal.
2. Slide the chrome barrel of the eyepiece into the adapter or diagonal (**Figure 7**).
3. Tighten the thumbscrew to hold the eyepiece in place.

### Installing the EZ Finder II

Before installing the EZ Finder II (**Figure 8**) on the telescope, you may need to insert the included CR2032 3V lithium button cell battery. In some cases, the battery may have been installed at the factory. If there is a small plastic tab sticking out from the battery compartment cover, you must remove it for the battery to make contact with the EZ Finder's electronic circuitry. The tab can then be discarded. If the battery was not installed at the factory and is provided separately, you will have to install it, as follows:

1. Insert a small, flat-blade screwdriver into the notch in the battery compartment cover and gently pry it off (**Figure 8**).
2. Slide the battery under the retaining clip with the positive (+) side facing down (touching the clip).
3. Then press the battery compartment cover back on.

Should the battery die, replacement CR2032 batteries are available at many stores where small batteries are sold or online.

To attach the dovetail mounting bracket to the EZ Finder II, loosen the two thumbscrews on the bottom rail of the EZ Finder II. Slide the EZ Finder II onto the bracket and tighten the two thumbscrews (See **Figure 8**). Then simply slide the mounting bracket's foot into the dovetail mounting shoe as shown in **Figure 9** and tighten the thumbscrew on the shoe to secure the mounting bracket.

The EZ Finder II should be oriented so that the sight tube is facing the front of the telescope, as shown. Tighten the thumbscrew on the dovetail shoe to secure the EZ Finder II in place.

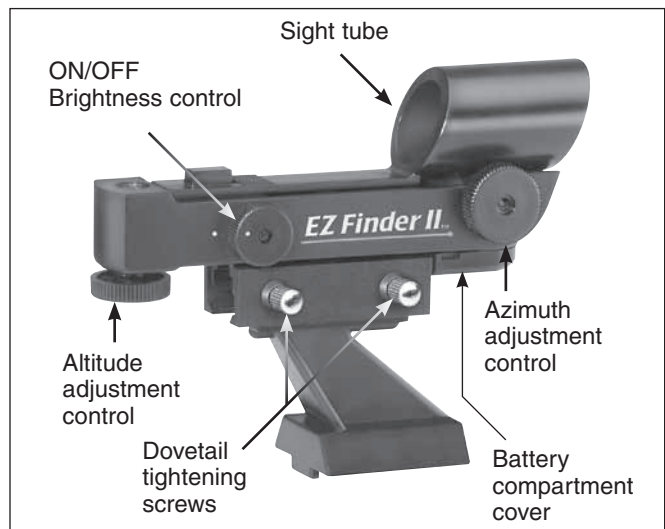
## Learning to Use the EZ Finder, Eyepieces, and Focuser

### The EZ Finder II

The EZ Finder II works by projecting a tiny red dot (it is not a laser beam) onto a lens mounted in the front of the unit. When you look through the EZ Finder II, the red dot will appear to float in space, helping you to pinpoint your target object



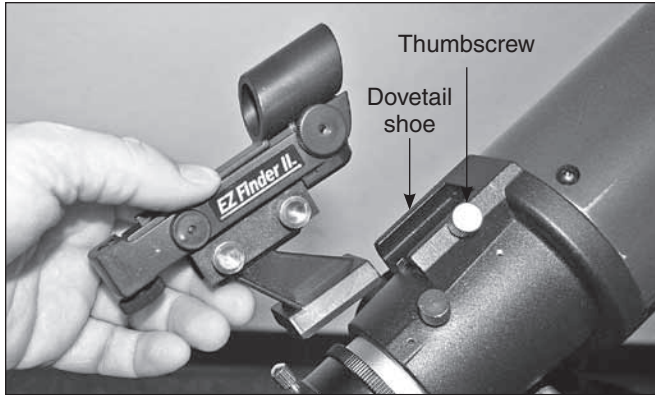
**Figure 7.** Insert the chrome barrel of the eyepiece into the diagonal and secure with the two thumbscrews. For the StarSeeker III reflector models, the eyepiece is inserted directly into the focuser's accessory adapter.



**Figure 8.** The EZ Finder II's On/Off and adjustment knobs.

(**Figure 10**). The red dot is produced by a light-emitting diode (LED) near the rear of the sight. The 3V lithium battery provides the power for the diode.

For the EZ Finder II to work properly, it has to be aligned with the telescope. When the two are aligned, a celestial object that is centered on the EZ Finder II's red dot should also appear in the center of the telescope's eyepiece. Alignment of the EZ Finder II is easiest during daylight, before observing at night. Aim the telescope at a distant object such as a telephone pole or roof chimney and center it in the telescope's eyepiece. The object should be at least 1/4 mile away. Now turn on the EZ Finder II and look through it. Without moving the main telescope, use the EZ Finder II's azimuth (left/right) and altitude (up/down) adjustment knobs (see **Figure 8**) to position the red dot on the object in the eyepiece. When the red dot is centered on the distant object, check to make sure that the object is still centered in the telescope eyepiece. If it isn't, re-



**Figure 9.** Insert the EZ Finder II into its dovetail shoe in the orientation shown and secure it with the thumbscrew.



**Figure 10.** The EZ Finder II superimposes a tiny red dot on the sky, showing right where the telescope is aimed.

center it and adjust the EZ Finder II's alignment again. When the object is centered in the eyepiece *and* on the EZ Finder's red dot, the EZ Finder II is properly aligned with the telescope. Once aligned, EZ Finder II will usually hold its alignment even after being removed and remounted. Otherwise, only minimal realignment will be needed.

Turn the ON/OFF knob (see **Figure 8**) clockwise until you hear the "click" indicating that power has been turned on. Look through the back of the reflex sight with both eyes open to see the red dot. Position your eye at a comfortable distance from the back of the sight. In daylight you may need to cover the front of the sight with your hand to be able to see the dot, which is purposefully quite dim. The intensity of the dot is adjusted by turning the ON/OFF knob. For best results when stargazing, use the dimmest possible setting that allows you to see the dot without difficulty. Typically a dimmer setting is used under dark skies and a brighter setting is needed under light-polluted skies or in daylight.

At the end of your observing session, be sure to turn off the ON/OFF knob on the EZ Finder II.

### **Eyepieces and Magnification**

Eyepieces are commonly referred to by their focal length and barrel diameter. The focal length of each eyepiece is typically printed on the eyepiece body. For example, StarSeeker

telescopes include two 1.25" diameter eyepieces; one with 25mm and the other with 10mm focal length. 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, low or moderate power will produce the sharpest images when viewing.

You can change the magnifying 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.

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

For example, the StarSeeker III 114mm reflector has a focal length of 500mm, which when used with the supplied 25mm eyepiece yields 20x magnification:

$$\frac{500\text{mm}}{25\text{mm}} = 20\text{x}$$

The magnification provided by the 10mm eyepiece is:

$$\frac{500\text{mm}}{10\text{mm}} = 50\text{x}$$

Although the power can be varied, each instrument under average skies has a limit to the highest *useful* magnification. The general rule is 2x per millimeter of aperture is as high as you can reasonably go (with optional eyepiece and possibly a Barlow lens). For example, the StarSeeker III 114mm reflector has a primary mirror that's 114mm in diameter. So 114mm times 2x per millimeter = 114 x 2 = 228. Thus, 228x is the highest useful magnification one can normally achieve under ideal seeing conditions with this telescope. (Trying to go higher would likely just result in dim, blurry images.) Although this is the maximum useful magnification, most observing will yield best results at lower powers.

### **Focusing**

To focus, if you have a StarSeeker III Newtonian reflector or refractor telescope, simply turn either of the two focus wheels on the focuser (see **Figure 6**, for example) until the image looks sharp. For the Maksutov-Cassegrain models, the focus knob resides to the right of the visual back, or accessory adapter. Make sure you're aimed at something far off in the distance. If you don't see an image at first, keep turning the focus knob in one direction while looking through the eyepiece; if you reach the end of the focuser travel start turning the focus knob in the other direction. Eventually, you should see the object you're aimed at come into view. After going just past the focus point in one direction, and then in the other direction, you will then be able to home in on the exact focus point, at which the image looks sharpest.

### **Powering the StarSeeker III**

Your StarSeeker III mount can be powered by the supplied battery pack, or by an optional AC-to-DC adapter or Dynamo Pro 12V DC field battery. The battery pack requires 8 user-sup-

plied AA alkaline batteries. To power the StarSeeker III mount, insert the plug of your desired power supply into the 12V jack located on the mount arm (**Figure 11**). Once the power supply is plugged in, the LCD on the StarSeeker's hand controller will light up and display the opening message. To turn the StarSeeker III mount off, simply disconnect the power supply cable from the jack on the mount. (There is no On/Off switch.)

## The SynScan GoTo Hand Controller – Overview

The “command center” of the StarSeeker telescope is the SynScan GoTo hand controller. In conjunction with the precision servo motors built into the mount, the user-friendly SynScan controller allows automated, pinpoint slewing of the telescope to any celestial object in its 42,900-object database, saving you the trouble of manually searching for them. You can even tour a pre-selected list of the finest showpiece objects visible in tonight's sky with just a few button pushes. Once your target object has been acquired, the mount tracks its motion across the sky to keep it in the field of view.

### Keypad Layout and Connection Ports

The hand controller's two-line liquid crystal display (LCD) is backlit for comfortable viewing. The contrast of the text and the brightness of the red backlight are both adjustable.

There are four categories of control keys on the hand controller (**Figure 12A**):

- 1) Mode keys
- 2) Directional keys
- 3) Scroll keys
- 4) Dual Purpose keys

### Mode Keys

The three mode keys are ESC, ENTER, and SETUP.

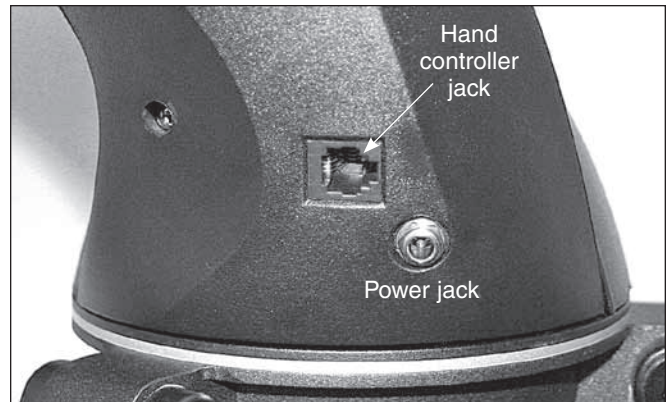
- ESC is used to escape from a certain command or go back a level in the menu tree.
- SETUP is a quick hot key that takes you to the Setup submenu.
- ENTER is used to select the functions and submenus in the menu tree, and to confirm certain functional operations.

### Direction Keys

The direction keys (Up, Down, Left, Right) allow the user to have complete control of the mount at almost any step in operation. These controls are locked out when the telescope is slewing to an object. The direction keys are very helpful when initially aligning the mount, centering objects in the eyepiece field of view, slewing, and manually guiding. The left and right direction keys can also be used to move the text cursor when entering data on the hand controller.

### Scroll Keys

The Up and Down scroll keys allow you to scroll up and down within the menu tree or selections displayed on the hand controller screen.



**Figure 11.** Jacks for the power cable and hand controller cable are located at the bottom of the mount arm.

### Dual Purpose (Shortcut) Keys

The Dual Purpose keys serve two distinct purposes. They are used for data entry and as quick-reference (shortcut) keys.

- TOUR: Takes you on a preset tour of the best night sky objects visible
- RATE: Changes the speed of the motors when the directional buttons are pressed. There are 10 slew speeds to choose from, with 0 being the slowest and 9 being the fastest.
- UTILITY: Displays functions such as “Show Position”, “Display Time”... etc.
- USER: Gives access to up to 25 user-defined coordinates
- INFO: Identifies the object(s) the mount is currently pointing to
- NGC, IC, M, PLANET, and OBJECT: Allows direct access to database of thousands of objects

### Connecting the SynScan Hand Controller

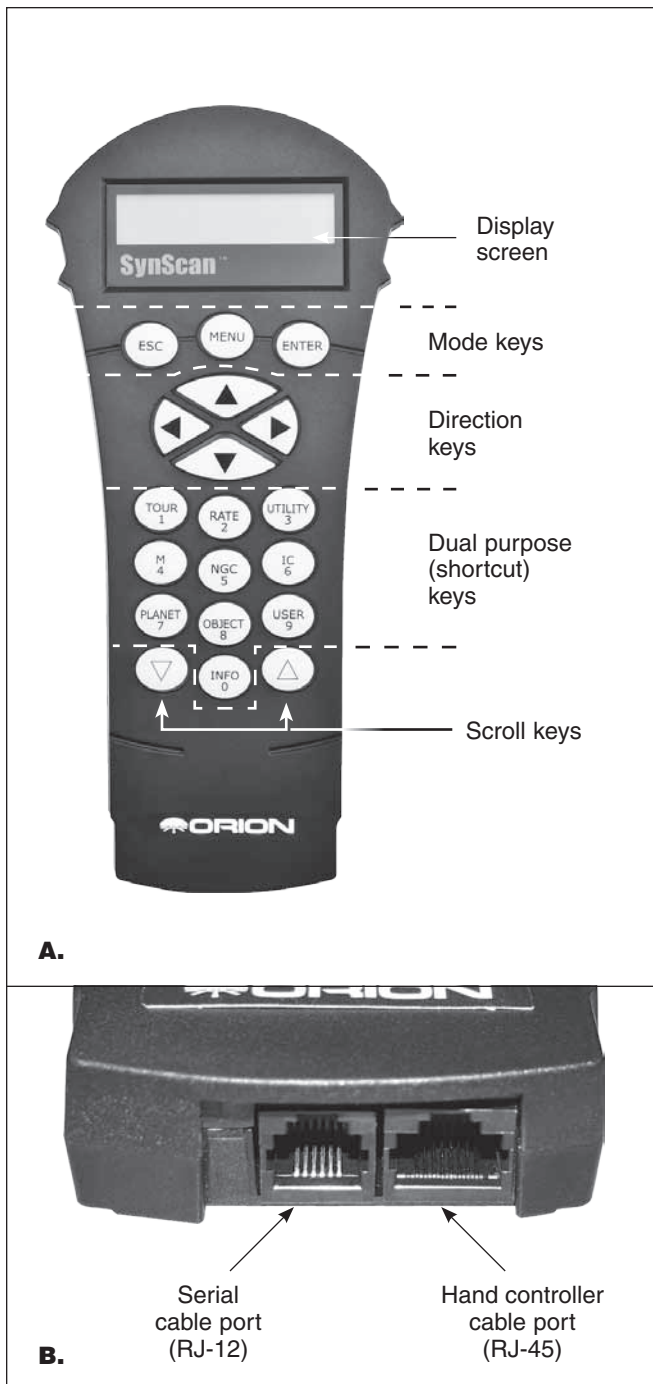
1. Plug the larger of the two connectors on the coil cable into the RJ-45 jack on the bottom of the SynScan hand controller (**Figure 12B**).
2. Then plug the smaller connector into the RJ-12 port at the base of the mount arm (**Figure 11**).

**NOTE:** The other, RJ-12 jack on the bottom of the hand controller is a serial port used for controlling the telescope via a computer running a compatible astronomy software program, or for updating the SynScan's firmware, both of which are covered later.

## Initial Setup

1. Make sure the mount is level to the ground.
2. After installing eight AA batteries into the battery case, plug the power cable from the battery pack into the power jack on the mount arm (**Figure 11**). The hand controller will issue a long beep and display the firmware version. Press ENTER.





**Figure 12. A)** The SynScan GoTo hand controller, **B)** Hand controller cable and serial cable ports on the bottom end of the controller

3. The hand controller will scroll a warning message about the danger of viewing the Sun with a telescope without a properly fitted solar filter. Press ENTER to confirm you have read the warning message and proceed to the next step. Press ESC to return to the previous step.
4. The LCD screen will display “Enter Location” on the first line, and longitude and latitude values on the second line.

Enter the latitude and longitude of your current location using the numeric keypad and scroll buttons. If you do not know the latitude and longitude coordinates of your viewing location, consult an atlas or look them up on the internet (i.e., search “[your location] coordinates”).

- Use the scroll keys to choose between E or W (for longitude) and N or S (for latitude).
- Press ENTER to confirm the entered coordinates and proceed to the next step.

**NOTE: Latitude and longitude coordinates must be entered in degrees and arcminutes. If your atlas or other reference source provides coordinates in decimal values (i.e., latitude = 36.95 N), you must convert that into degrees and arcminutes (i.e., latitude 36.95 N = latitude 36°57' N). There are 60 arcminutes in 1 degree.**

5. Enter the current time zone in which you are observing in hours (see **Appendix B**), using the scroll keys and numeric keypad (+ for East, – for West) The “+” sign is used for time zones in the Eastern Hemisphere (Europe, Africa, Asia, Oceania), while the “-” sign is used for time zones in the Western Hemisphere (North and South America). So for Pacific Standard Time (PST) you would enter -08:00. Press ENTER to confirm.
6. Enter the date in the format mm/dd/yyyy using the numeric keypad. Press ENTER to confirm your choice.
7. Enter your current local time using the 24 hour time mode (e.g., 2:00 p.m. = 14:00). Press ENTER to view the time you entered. If the time is incorrect, press ESC to go back to the previous screen. If the time is correct, press ENTER to confirm.
8. When “Daylight Saving?” is displayed, use the scroll keys to select “Yes” or “No”. “YES” indicates the time entered in the previous step is Daylight Saving time, while “NO” indicates the time entered is Standard time. Press the ENTER key to confirm and proceed to the next step.
9. Now the screen will display “Begin Alignment?” and ask you to select 1) YES or 2) NO. Press “1” or ENTER to start the alignment process. Press “2” or ESC to skip the alignment process.

**NOTE: The hand controller LCD’s red illumination will dim and the keypad backlighting will turn off if idle for 30 seconds. Pressing any key turns the lighting back on.**

## GoTo Star Alignment

In order for your StarSeeker III GoTo telescope to accurately locate and point to objects in the sky, it must first be aligned on known positions (stars) in the sky. With that information, the mount can create a model of the sky and of the movements of astronomical objects.

There are two methods for aligning your StarSeeker III telescope, and they are very similar: Brightest Star Alignment and 2-Star Alignment. Both involve identifying and pointing the telescope to two different bright stars in the night sky. Both

alignment methods provide the same level of precision. The only difference is that for the Brightest Star alignment, the hand controller will prompt you to select the first alignment star from a directional region of the sky and will provide a short list of the brightest stars in that region. With the 2-Star alignment procedure the list of eligible stars is not grouped by region of sky.

For the novice stargazer unfamiliar with the night sky or the names of brighter stars, some might find the Brightest Star Alignment to be the easier of the two methods. The 2-Star method is for users who know the names of at least some stars in the night sky. To assist you in performing the alignment by either method, we have included in **Appendix C** a set of star charts with the names of some bright alignment stars indicated for easy reference.

**Note: Before performing any of the alignment methods, be sure that your finder scope is precisely aligned with the telescope tube.**

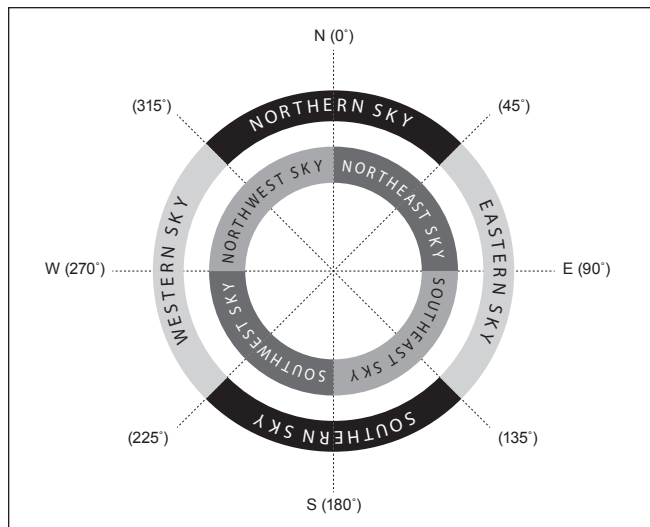
**To get the most accurate star alignment:**

- The two alignment stars you choose should be at least 60 degrees apart. (For reference, your fist held at arm's length spans about 10 degrees.)
- The two stars should be roughly at the same altitude.
- Use a high-power eyepiece, such as the 10mm focal length eyepiece included with the StarSeeker III.
- When centering an alignment star in the eyepiece, always end the procedure by using the UP and RIGHT direction keys.
- If there is overshoot when centering an alignment star in the eyepiece with the UP and RIGHT keys, use the LEFT or DOWN keys to pull the star back to the edge of the field of view and then use the RIGHT and UP keys to center the star again.

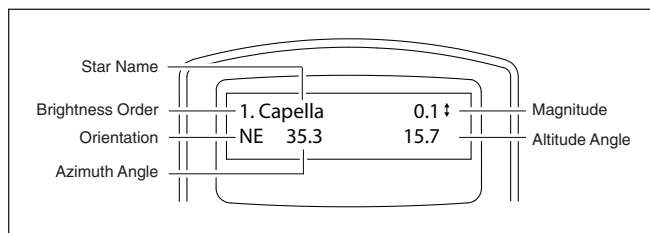
**Brightest Star Alignment**

**Aligning the 1st Star**

1. Select "Brightest Star" as your Alignment Method. Press ENTER.
2. The hand controller will prompt you to "Select Region." Referring to **Figure 13**, choose the region that corresponds with where you see the brightest star in the sky. There are eight overlapping regions to choose from, each covers a 90-degree span in azimuth. The direction you choose will only affect your alignment star selection; you will still be able to choose objects to view across the entire sky once the alignment is complete. Referring to the included compass may be helpful during this process. The red portion of the pointer points North, so orient the compass so that the "N" (0 degrees) is directly under the red tip.
3. After you have selected a region of the sky, the hand controller will generate a list of the brightest stars in that region. Only stars or planets brighter than magnitude 1.5 will appear in the list, and only if they are between 10 and 75 degrees in elevation. If none is found meeting



**Figure 13.** Directional regions of the sky used in the "Brightest Star" alignment method.



**Figure 14.** Alignment star information displayed on LCD.

those criteria, the hand controller will display "No object found in this region." Press ENTER or ESC and select another region of sky.

4. Now, use the Scroll keys to scroll through the list of bright stars. There will only be a few stars, at most, on the list, and sometimes only one star. The hand controller will display the name and magnitude of the bright star on the first line, and its position on the second line (**Figure 14**). On the second line, the first number is the star's azimuth angle, or E-W coordinate, in degrees, and the second number is its altitude above the horizon in degrees. These coordinates provide a simple way to identify the bright star you have chosen. When you are confident the hand controller is displaying the name of the bright star you wish to align on, press ENTER.
5. The mount will NOT slew to the first selected bright star automatically. Instead, you will use the direction keys to slew the telescope to the 1st alignment star selected in the previous step. Center the 1st alignment star in the field of view of the EZ Finder II first, then center it in the telescope eyepiece. Press ENTER to proceed to the next step.

**NOTE: You can change the slew speed by pressing the RATE key, and then select a number between 0 (slowest) and 9 (fastest). Generally, a slewing rate of 5 or 6 is best for centering the star in the EZ Finder II, and a rate of 2**

*or 3 works best for centering the star in the telescope's eyepiece.*

**NOTE:** *The SynScan will beep once when the mount has finished slewing to a target object. Do not try to move the telescope using the directional keys before you hear the beep. SynScan will only respond to the ESC key while slewing.*

### **Aligning the 2nd Star**

1. Once the first alignment star has been centered in the eyepiece, the SynScan will prompt you to "Choose 2<sup>nd</sup> Star." If the first alignment "star" was actually a planet, you'll be prompted to re-select a first alignment star.
2. Scroll through the list using the Scroll keys and refer to the appropriate star chart in the back of this manual to choose a second alignment star, then press ENTER. The mount will now automatically slew to the selected star, which should land in or near the field of view of the EZ Finder. After the mount stops, the hand controller will give a long beep and display "Use dir. keys to center object." After you've centered it in the finder scope and then in the telescope's eyepiece, press ENTER. If both alignment stars were properly aligned, the LCD will display "Alignment Successful." Press ENTER to complete the alignment process. If the message "Alignment Failed" displays, it usually means the star positions do not correspond with the location and date/time information input during setup. Please check your user initialization settings before starting again.

### **Cancellation During Alignment Process**

1. While the mount is slewing during the alignment, you may press the ESC key to stop the mount. The hand controller screen will display "Mount stopped. Press any key..."
2. Press any key and the SynScan hand controller will ask you to select another alignment star.
3. Press the ESC key again, and the LCD screen will display "Exit Alignment? 1) YES 2) NO." Press key 1 to exit the alignment process; press key 2 to go back to choose an alignment star.

### **2-Star Alignment**

To perform the two-star alignment, follow the same steps described for the Brightest Star alignment, except that the hand controller will not prompt you to select a directional region for a bright star. Instead, you'll be presented with a list of stars available in your current sky to choose from, for each of the two alignment stars. Refer to the appropriate star chart in **Appendix C** to identify a star to select.

## **Locating Objects**

### **SynScan's Object Database**

The SynScan hand controller boasts a vast database of over 42,900 stars and other celestial objects. Once the telescope has been GoTo aligned, you can easily access and view any one of them. The database contains the following catalogs:

**Deep-Sky Tour:** Takes you on a preset tour across the night sky, stopping at the brightest and most beautiful deep-sky objects visible in your sky at the current time/date.

**Named Star:** A list of 100 popular, known stars

**Solar System:** The other 8 planets of our solar system (includes Pluto) and Earth's Moon

**NGC:** 7,840 of the brightest deep-sky objects from the Revised New General Catalog

**IC:** 5,386 of standard stars and deep sky objects from the Indexed Catalog

**Messier:** Complete list of 110 Messier objects

**Caldwell:** Complete list of 109 Caldwell objects

**SAO:** 29,523 stars brighter than magnitude 8, a small subset of the 259,000-star SAO catalog

**Double Stars:** 55 well-known double stars

**Variable Stars:** 20 famous variable stars

**User Objects:** Up to 25 user-defined objects can be saved

### **Selecting an Object**

There are several ways to select a celestial object to view. Many involve pressing one of the Dual Purpose, or Shortcut, keys on the hand controller (**Figure 12**).

### **Take a Guided Tour!**

This is a great feature for backyard astronomers with minimal observing experience! The hand controller's built-in Deep Sky Tour feature commands the mount to find the best deep-sky objects in the currently visible sky and automatically slews the telescope to each one, at your prompt.

**TOUR** – The TOUR shortcut key takes you to the Deep Sky Tour submenu, where you can tour a preselected list of the best and brightest deep-sky objects in your current sky. Use the down scroll key to browse the objects. Choose an object by pressing *ENTER*. The display will show the coordinates of the chosen object. Pressing *ENTER* again will prompt the telescope to slew to the object, then track it.

You can also access the tour function from the SETUP menu, by scrolling to DEEP SKY TOUR and pressing ENTER.

### **Select Using the Object Type Shortcut Keys**

**M, NGC, IC** – These shortcut keys give you access to these popular celestial object catalogs. Use the numeric keys to select an object by entering its number. Pressing *ENTER* will display its coordinates. Pertinent information such as size, magnitude, and constellation are obtained by pressing the scroll keys. Pressing *ENTER* again will prompt the telescope to slew to the selected object, then track it.

**PLANET** – This shortcut key takes you to the Solar System submenu in the database. Use the scroll keys to cycle through the list of planets in our solar system (including Pluto!) and the Moon. Press *ENTER* to view an object's coordinates, and *ENTER* once more to slew to the object and track it.

**USER** – This key will take you to the database of User Objects that you can define for yourself. You can enter a new

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location or recall objects that have been previously saved (see “Saving and Accessing User-Defined Objects”).

### Select Using the Object or Menu Shortcut Keys

**OBJECT** – The OBJECT key takes you to the Objects catalog, where you have complete access to over 42,900 celestial objects in the database.

**MENU** – Press the MENU key, then the ESC key and you will see CHOSE MENU:. Scroll down to OBJECT LIST and press ENTER. Similar to the OBJECT key, this gives you access to all 42,900 celestial objects in the database.

- If the selected object is below the horizon at this time, the SynScan hand controller will display “Below horizon” for 2 seconds; otherwise, it will display the object’s current azimuth and altitude.
- By using the scroll keys, you can browse the following information of the object: J2000 celestial coordinates, magnitude (MAG= ), rising time (Rise: ), transit time (Transit: ), setting time (Set: ), size (Size= ) and associated constellation (Constellation: ).
- Once the mount has located the selected object, it will automatically start tracking it.
- You can press the ESC key to stop the mount if needed. The screen will display “Mount stopped. Press any key...” Then press any key to return to the previous step.

**NOTE: The mount will not slew if:**

- The object is below the horizon.
- The object’s altitude exceeds the limit set in the hand controller. (The screen will display “Target over slew limit” in this case.)

### Identifying an Unknown Object

After aligning the mount for GoTo operation, the SynScan hand controller can be used to identify any object at which the telescope is pointing.

1. Center the object to be identified in the telescope’s eyepiece.
2. Press the “INFO” shortcut key, or from the CHOOSE MENU screen, scroll to “UTILITY FUNCTION” and press ENTER, then to IDENTIFY and press ENTER. The screen will display “Identify: Searching...” The SynScan hand controller will look up the named stars, planets, Messier objects, NGC objects, and IC objects within a 5 degrees range of the object centered in the eyepiece.
3. The screen will display “No object found” if the SynScan hand controller cannot identify the object.
4. If an object is found within the 5-degree range, the screen will display the object’s name in the top row, and its distance from center of the eyepiece.
5. If multiple objects are found, use the scroll keys to browse through the list of identified objects.
6. Press the ENTER key to select an identified object and then use the scroll keys to read its data, such as the J2000 celestial coordinates, magnitude (MAG= ),

rising time (Rise: ), transit time (Transit: ), setting time (Set: ), size (Size= ) and associated constellation (Constellation: ).

7. Press the ESC key to exit.

## Other Features & Functions

### Utility Functions

Utility functions are useful tools that are accessed by pressing the UTILITY key on the keypad.

**Show Position** – Displays the coordinates of the location where the telescope is currently pointed.

**Show Information** – Under this submenu, you may check local time, local sidereal time, hardware version, firmware version, and database version of the SynScan hand controller. If the hand controller is connected to the mount, this menu will also display the firmware version of the motor control (MC) board.

**Identify** – Identifies any object at and near which the telescope is pointing (see “Identifying an Unknown Object” above).

**Park Scope** – Moves the telescope to the Home position or parks the telescope at the current or previously stored parking position.

**PAE** – Pointing Accuracy Enhancement function. (See “Pointing Accuracy Enhancement” section below.)

**Clear PAE data** – Clears all PAE calibration data.

**GPS** – This allows you to obtain information from the optional SynScan GPS receiver.

**PC Direct Mode** – Allows the SynScan hand controller to work with a personal computer. Under this mode, the hand controller becomes a repeater between the PC and the telescope mount. The software running on the PC controls the mount directly (see “Controlling Your StarSeeker III via Computer and Astronomy Software”). PC direct mode is also used to update the motor controller’s firmware (see “Updating Firmware”).

**Polariscope LED** – Not applicable to StarSeeker III.

**PEC Training** – Not applicable to StarSeeker III.

**Camera Control** – Not applicable to StarSeeker III.

### Setup Functions

The Setup functions allow you to change any system variable or information regarding location, time, date, and alignment configurations. To access the Setup Functions, either press SETUP key on the keypad or scroll to SETUP under menu option using the scroll keys. Below are the different functions available to you, and their purposes.

**Date** – Allows you to change the date entered at the initial setup.

**Time** – Allows you to change the current time.

**Observing Site** – Allows you to change your current location.

**Daylight Saving** – Allows you to turn On or Off Daylight Saving Time.

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**Alignment** – Allows you to perform the GoTo star alignment.

### Alignment Stars

**Adv. Filter** – When this option is chosen, the hand controller will filter out any stars not suitable for star alignment.

**Sort by** – This allows the hand controller to generate a list of alignment stars and display them alphabetically or by their magnitude.

**Backlash** – Not applicable to StarSeeker III.

### Tracking

**Sidereal Rate**: This activates tracking in Sidereal rate (for viewing stars and deep-sky objects).

**Lunar Rate**: This activates tracking in Lunar rate (for viewing the Moon).

**Solar Rate**: This activates tracking in Solar rate (for viewing the Sun).

**Stop Tracking**: This stops the tracking instantly.

**Auto Guide Speed** – Not applicable to StarSeeker III.

**Elevation Limits** – Allows you to set a slew limit for the mount's altitude axis, causing it to stop when it reaches the set altitude. Setting the slew limit prevents the optical tube from colliding with mount. The slew limit range will vary depending on the optical tube installed on the mount.

**Auxiliary Encoder** – Not applicable to StarSeeker III.

**Sync. Encoder** – Not applicable to StarSeeker III.

**Handset Setting** – This submenu allows adjustments of the brightness of the LCD backlight, the darkness of the LCD text, the brightness of the button backlighting, and the beeper volume. Press the RIGHT or LEFT directional key to increase or decrease the value.

**Factory Setting** – This submenu allows you to reset the hand controller to its default setting.

### Pointing Accuracy Enhancement (PAE)

Both of the star alignment methods provide accurate GoTo alignment for most visual purposes. The pointing accuracy enhancement (PAE) function enables the telescope mount to achieve enhanced pointing accuracy in specific areas of the sky. The PAE can be performed in up to 85 different zones in the sky. The area(s) where the chosen alignment stars are located should already be mapped out accurately by the SynScan, so further accuracy enhancement is not necessary. For other areas, here's how to perform the PAE:

1. Use the direction keys to center the last GoTo object in the eyepiece field of view.
2. Press and hold down the ESC key for 2 seconds. The hand controller will display "Re-center" and the name of the reference objects will blink three times. (If the GoTo command was sent by a computer running planetarium software, the LCD will read "Last goto object" instead of the object's name.)
3. Make sure that the reference object is still in the center of the field of view and press ENTER. If you do not wish to

record the result, press ESC to abort the operation. After pressing ENTER, the SynScan will record the amount of pointing inaccuracy and recalculate the model of the sky. Now the pointing accuracy of this particular region of the sky should be greatly improved. To improve pointing accuracy in another region of the sky, perform the PAE function again, this time choosing a bright star in the new region of interest.

**NOTE: Whenever the SynScan hand controller locates an object, it will automatically check whether PAE calibration data is available, and apply the compensation accordingly. No manual intervention is required. If more than one PAE calibration is performed in the same zone, the previous calibration data will be overwritten.**

### Saving and Accessing User-Defined Objects

The SynScan hand controller allows you to save up to 25 objects in the User-Defined database. You can save currently unknown objects, unidentifiable objects, current comet and/or asteroid positions, or you can make a custom list of your favorite objects to view.

### Defining and Saving an Object to the Database

Press the "USER" shortcut key. Or, in the main menu scroll to the Object List, press ENTER, then scroll to User Objects.

1. Scroll to "New Object," then press the ENTER key. The screen will display "Coordinates Type 1) RA-Dec 2) Axes." Press "1" to enter R.A.-Dec. coordinates; press "2" to enter Alt-azimuth coordinates. If "R.A.-Dec." coordinates is chosen, the screen will display the R.A. and Dec. coordinates to which the telescope is currently pointing. If "Axes" is chosen, the screen will display the current altitude and azimuth coordinates of the mount.
2. Edit the coordinates using the numeric keys and scroll keys.
3. To store an object/location in Alt-AZ format, first point the telescope to the desired object to obtain its Alt/AZ values.
4. The screen will display "Save?"
  - Press the ENTER key to start saving the coordinates. (Or press the ESC key to proceed to the next step without saving the coordinates.)
  - The hand controller will prompt you to choose a storage space index number between 1 to 25 for your chosen object. Select the number you wish to represent the coordinates, using the scroll buttons. Press ENTER to confirm.
  - Once the object coordinates are represented by a number, the hand controller will display "View Object?" Press ENTER to slew the telescope to the coordinates. Press ESC to exit.

### To call up a previously saved object

1. Press the "USER" shortcut key. Or, in the main menu scroll to the Object List, press ENTER, then scroll to User Objects.

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- Use the scroll keys to browse through the User Object numbers until the number associated with the object you wish to view is present. Press ENTER to show its coordinates. Press ENTER again to slew to it. The hand controller will not respond if a vacant User Object is selected. Use the scroll keys to choose another number and try again.

### **Controlling Your StarSeeker III via Computer and Astronomy Software**

There are several commercially available planetarium software programs that allow you to control a GoTo telescope such as the StarSeeker III with a laptop computer, essentially bypassing the hand controller's interface. This is a great way to control the telescope because it allows you to use the software program's planetarium-type visual interface to command the telescope – an exciting step up from the little two-line LCD screen and keypad of the SynScan hand controller! You'll still need to keep the SynScan hand controller connected, though. It will act as a relay between the computer and the telescope mount.

For instructions on how to control your StarSeeker III telescope from a computer running astronomy software, refer to the page on our website ([www.OrionTelescopes.com](http://www.OrionTelescopes.com)) for your particular telescope and click on the Product Support icon.

### **Updating Firmware**

From time to time the internal software (firmware) of the SynScan hand controller may be upgraded to add new features and/or to fix bugs. You can find the latest firmware version on Orion's website and easily update the hand controller.

Refer to the page on our website ([www.OrionTelescopes.com](http://www.OrionTelescopes.com)) for your particular telescope and click on the Product Support

icon. There you will find the instructions and files for updating the SynScan firmware.

### **Collimation of StarSeeker III Reflectors**

Collimation is the process of adjusting the telescope's optical elements so they are aligned with one another and with the optical tube. Well collimated optics are critical for achieving the sharpest possible images with your telescope. Precise collimation of StarSeeker III telescopes is done at the factory, and for the StarSeeker III refractor and Maksutov-Cassegrains, it should never need any further adjustment. For reflectors, on the other hand, occasional collimation of the mirrors may be necessary.

For details on the collimation procedure for the StarSeeker III 114mm and 130mm reflectors, refer to the page on our website ([www.OrionTelescopes.com](http://www.OrionTelescopes.com)) for your particular telescope and click on the Product Support icon. There you will find collimation instructions.

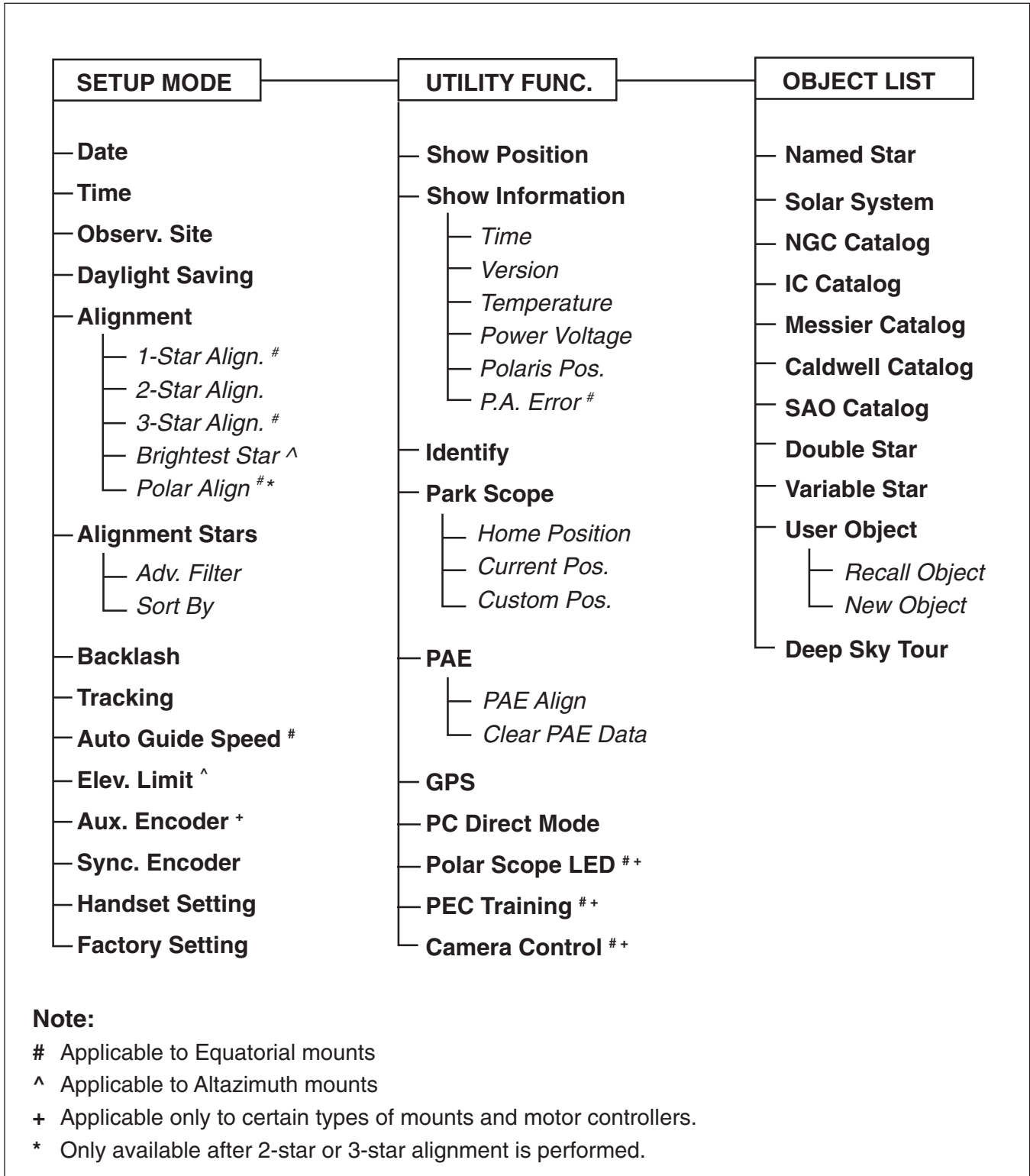
Note that the StarSeeker III reflectors come with a "quick collimation cap" (shown in **Figure 2**), which is used in the collimation procedure. Also, you'll notice that the primary mirror of the StarSeeker III reflector has a tiny ring (sticker) marking its center. This "center mark" allows you to achieve a very precise collimation; you don't have to guess where the exact center of the mirror is.

***NOTE: The center ring sticker need not ever be removed from the primary mirror. Because it lies directly in the shadow of the secondary mirror, its presence in no way adversely affects the optical performance of the telescope or the image quality. That might seem counter-intuitive, but it's true!***

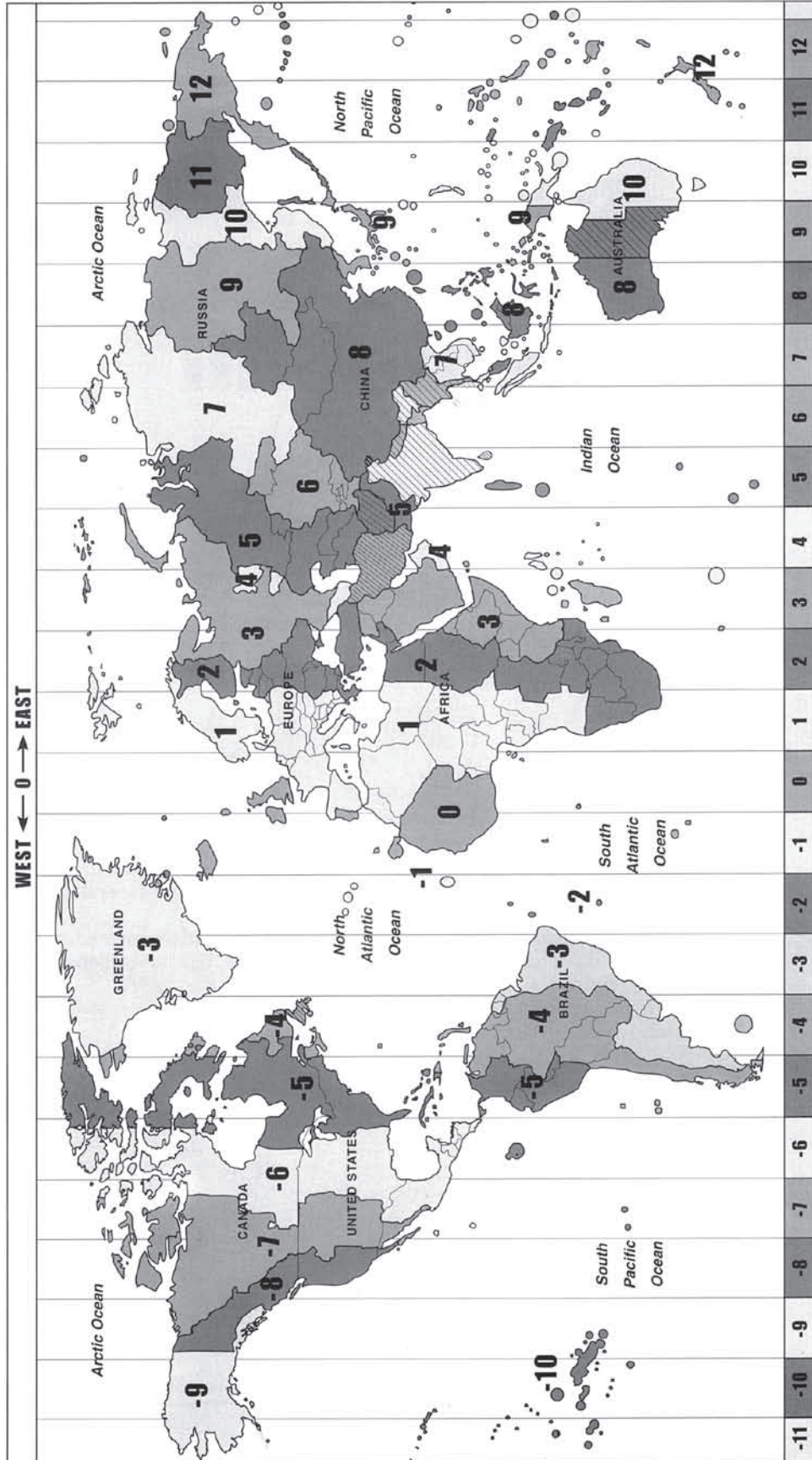
# Appendix A – SynScan Menu Tree

## Accessing Menus

The SynScan hand controller's menu is only accessible after the initialization, or after the GoTo alignment routine is completed (if it is chosen at startup). Users can use the ESC key, the ENTER key, and the two scrolling keys to access the menu.

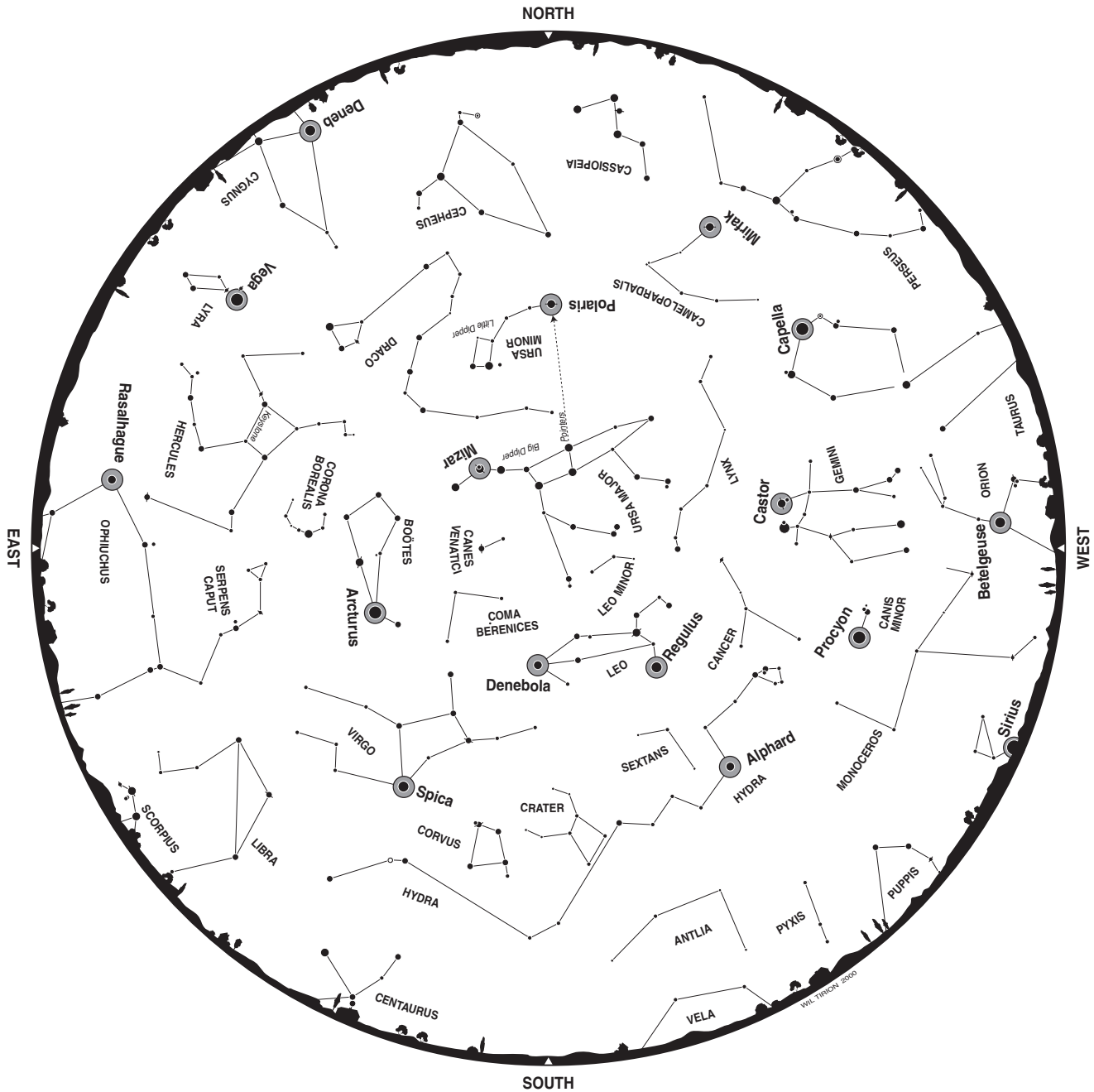


# Appendix B – Time Zone Map





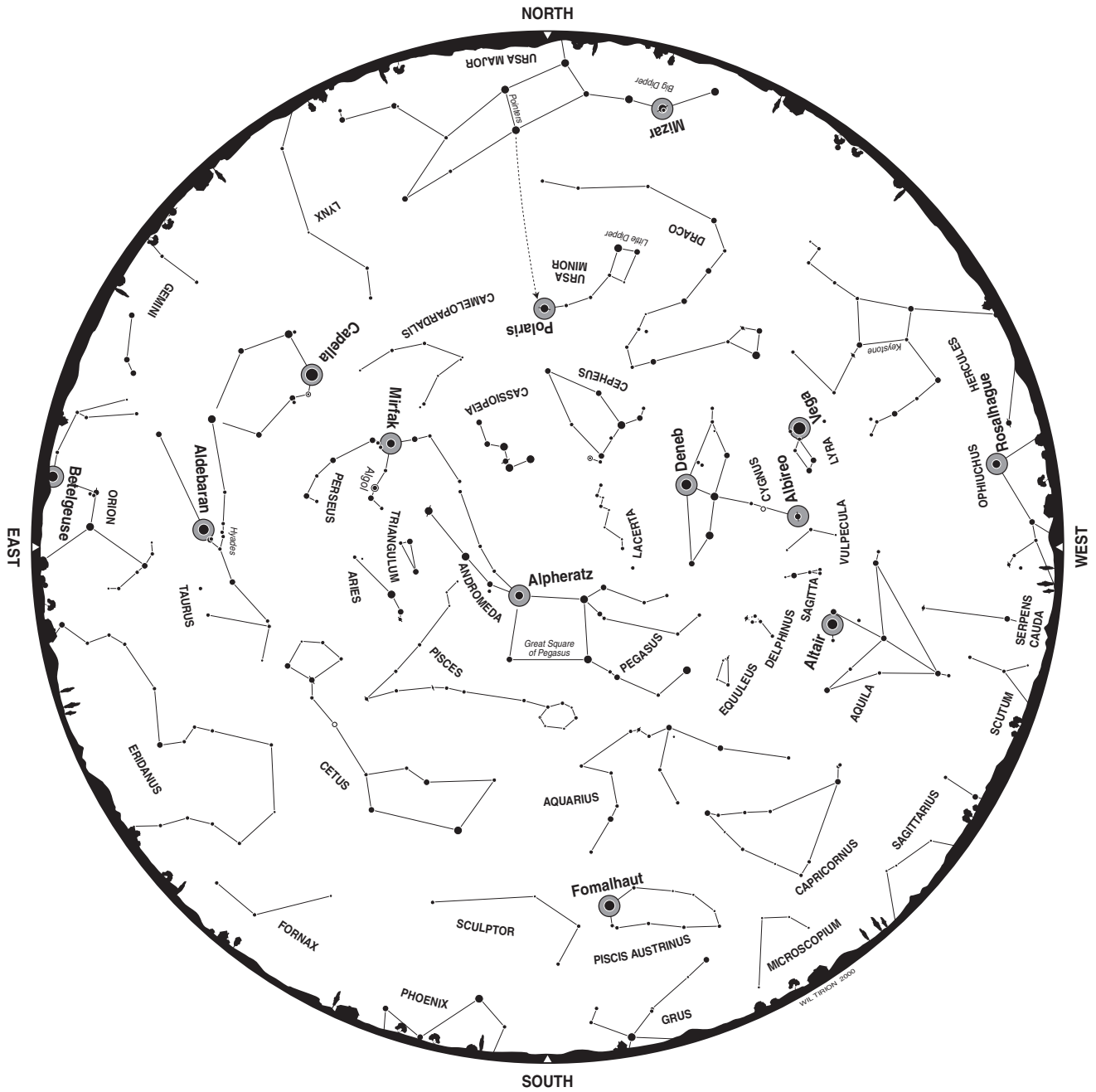
# Appendix C – Sky Maps (for selection of alignment stars)



SPRING	
Early March	1:00 AM
Late March	12:00 AM
Early April	12:00 AM*
Late April	11:00 PM*
Early May	10:00 PM*
Late May	9:00 PM*
Early June	8:00 PM (dusk)*

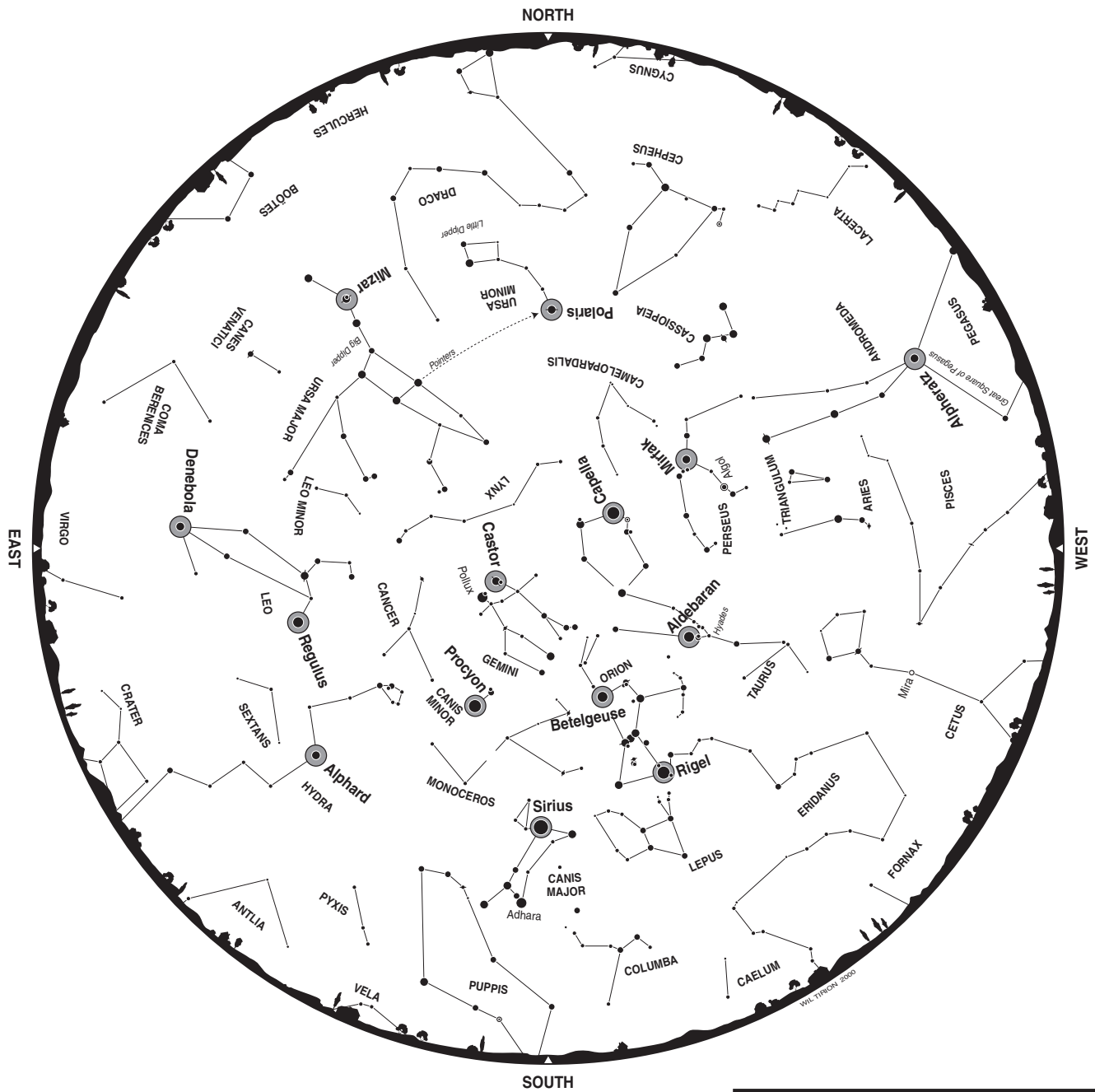
\*Daylight saving time





AUTUMN	
Early September	2:00 AM*
Late September	1:00 AM*
Early October	12:00 AM*
Late October	11:00 PM*
Early November	9:00 PM
Late November	8:00 PM
Early December	7:00 PM

\*Daylight saving time



WINTER	
Early December	2:00 AM
Late December	1:00 AM
Early January	12:00 AM
Late January	11:00 PM
Early February	10:00 PM
Late February	9:00 PM
Early March	8:00 PM

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# Specifications

## SynScan GoTo

Object Database	42,900 objects
Object catalogs	Messier, NGC, IC, SAO, Caldwell, Double Star, Variable Star, Named Star, Planets
Motor type	DC Servo
Resolution:	0.8923 arcsec
Slew Speeds	Rate 0 = 1.0x (sidereal) Rate 1 = 2.0x Rate 2 = 8x Rate 3 = 16x Rate 4 = 32x Rate 5 = 200x Rate 6 = 400x Rate 7 = 600x Rate 8 = 800x Rate 9 = 1000x
Tracking Rates	Sidereal, Lunar, Solar
Hand controller	Double line, 16-character LCD; 19 fiber optic backlit buttons
Alignment method	Brightest Star, Two Star
Ports	RS-232 on Hand Controller
Pointing Accuracy	Up to 10 arc-minutes
Power Requirements:	12V DC (11-15V), 1A (Tip positive)
Battery Pack	Requires 8 AA batteries (not included)

## StarSeeker III 102mm Refractor

Objective Lens	102mm diameter doublet
Focal Length	660mm
Focal Ratio	f/6.5
Focuser	1.25" Rack-and-Pinion
Lens Coatings	Multi-coated
Eyepieces	25mm & 10mm Explorer II
Magnification with supplied Eyepieces	26.4x, 66x
Diagonal	Star diagonal, 90-degree, mirror
Tube Length	24.5"
Tube Material	Aluminum
Weight, assembled:	13.4 lbs.

## StarSeeker III 114mm Reflector

Primary Mirror:	130mm diameter, parabolic
Focal Length:	500mm
Focal Ratio:	f/4.4
Focuser:	1 25" Rack and Pinion
Mirror Coatings:	Aluminum with SiO <sub>2</sub> overcoat
Eyepieces:	25mm & 10mm Explorer II
Magnification with supplied Eyepieces	20x, 50x
Tube Length:	16.5"
Tube Material:	Rolled steel
Weight, assembled:	12.4 lbs.

## StarSeeker III 130mm Reflector

Primary Mirror:	130mm diameter, parabolic,
Focal Length:	650mm
Focal Ratio:	f/5
Focuser:	1.25" Rack and Pinion
Mirror Coatings:	Aluminum with SiO <sub>2</sub> overcoat
Eyepieces:	25mm & 10mm Explorer II
Magnification with supplied Eyepieces	26x, 65x
Tube Length:	24.25"
Tube Material:	Seamed steel
Weight, assembled:	16.1 lbs.
Input Voltage:	12V DC

## StarSeeker III 90mm Mak-Cass

Primary Mirror:	90mm diameter, spherical
Focal Length:	1250mm
Focal Ratio:	f/13.9
Focuser:	Internal, helical knob
Mirror Coatings:	Aluminum with SiO <sub>2</sub> overcoat
Eyepieces:	25mm & 10mm Explorer II
Magnification with supplied Eyepieces	50x, 125x
Tube Length:	10.25"
Tube Material:	Aluminum
Weight, assembled:	10.7 lbs.
Input Voltage:	12V DC

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**StarSeeker III 102mm Mak-Cass**

Primary Mirror: 102mm diameter, spherical  
Focal Length: 1300mm  
Focal Ratio: f/12.7  
Focuser: Internal, helical knob  
Mirror Coatings: Aluminum with SiO<sub>2</sub> overcoat  
Eyepieces: 25mm & 10mm Explorer II  
Magnification with supplied Eyepieces 52x, 130x  
Tube Length: 12.5"  
Tube Material: Aluminum  
Weight, assembled: 13.4 lbs.  
Input Voltage: 12V DC

**StarSeeker III 127mm Mak-Cass**

Primary Mirror: 127mm diameter, spherical  
Focal Length: 1540mm  
Focal Ratio: f/12.1  
Focuser: Internal, helical knob  
Mirror Coatings: Aluminum with SiO<sub>2</sub> overcoat  
Eyepieces: 25mm & 10mm Explorer II  
Magnification with supplied Eyepieces 61.6x, 154x  
Tube Length: 14.5"  
Tube Material: Aluminum  
Weight, assembled: 16.7 lbs.  
Input Voltage: 12V DC

## One-Year Limited Warranty

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

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

For further warranty information, please visit [www.OrionTelescopes.com/warranty](http://www.OrionTelescopes.com/warranty).

### Orion Telescopes & Binoculars

89 Hangar Way, Watsonville CA 95076

**Customer Support Help Line (800) 676-1343 • Day or Evening**

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