

## INSTRUCTION MANUAL

# Orion® IntelliScope™ Computerized Object Locator

#7880



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*Providing Exceptional Consumer Optical Products Since 1975*

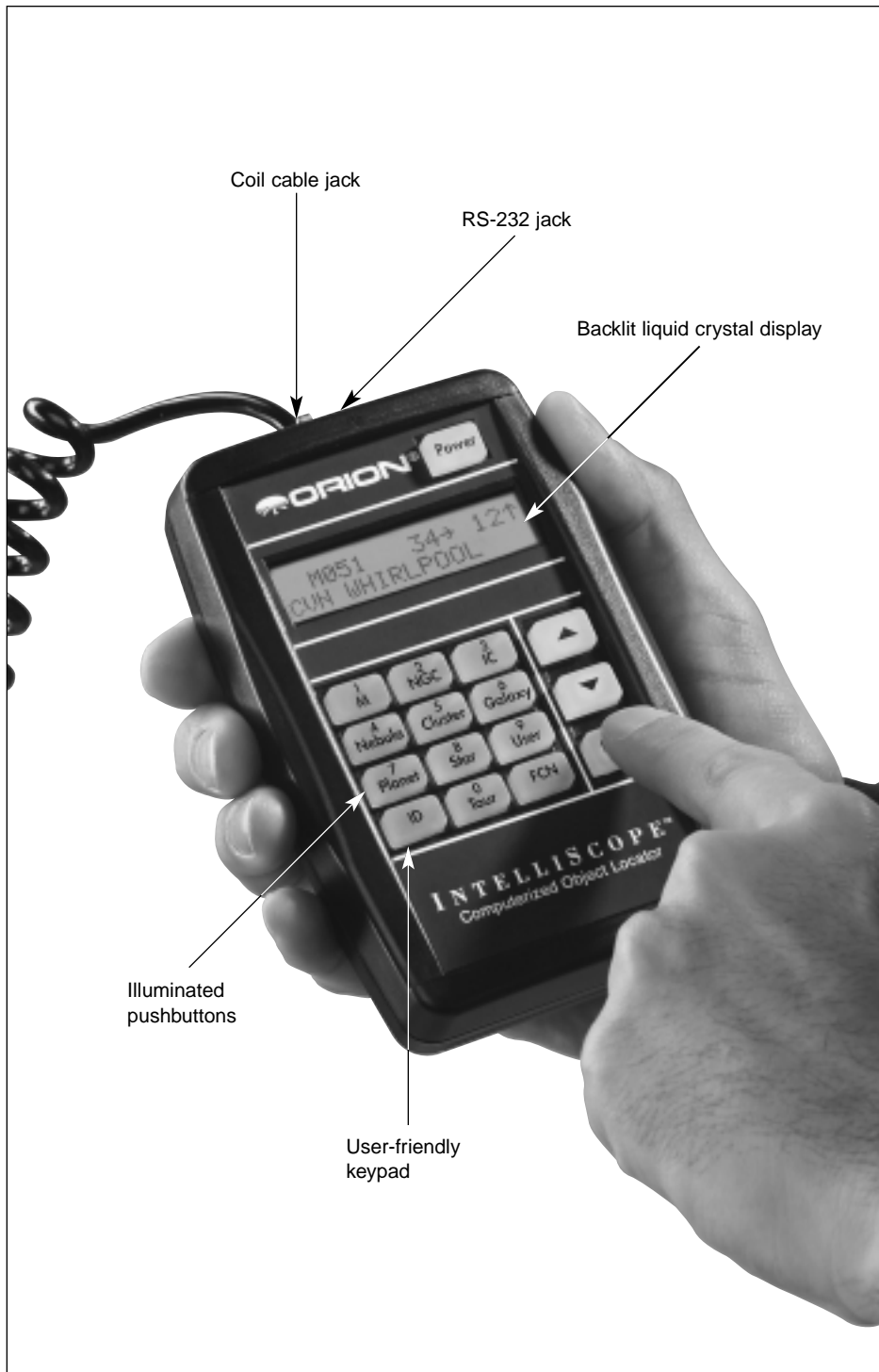
**Customer Support (800) 676-1343**

**E-mail: [support@telescope.com](mailto:support@telescope.com)**

Corporate Offices (831) 763-7000

P.O. Box 1815, Santa Cruz, CA 95061

IN 229 Rev. B 3/11/04



**Figure 1.** The IntelliScope Computerized Object Locator.

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*Congratulations on your purchase of the Orion IntelliScope™ Computerized Object Locator. When used with any of the SkyQuest IntelliScope XT Dobsonians, the object locator (controller) will provide quick, easy access to thousands of celestial objects for viewing with your telescope.*

The controller's user-friendly keypad combined with its database of more than 14,000 celestial objects put the night sky literally at your fingertips. You just select an object to view, press Enter, then move the telescope manually following the guide arrows on the liquid crystal display (LCD) screen. In seconds, the IntelliScope's high-resolution, 9,216-step digital encoders pinpoint the object, placing it smack-dab in the telescope's field of view! Easy!

Compared to motor-dependent computerized telescopes systems, IntelliScope is faster, quieter, easier, and more power efficient. And IntelliScope Dobs eschew the complex initialization, data entry, or "drive training" procedures required by most other computerized telescopes. Instead, the IntelliScope setup involves simply pointing the scope to two bright stars and pressing the Enter key. That's it — then you're ready for action!

These instructions will help you set up and properly operate your IntelliScope Computerized Object Locator. Please read them thoroughly.

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## Parts List

Your IntelliScope™ Computerized Object Locator comes with the following parts:

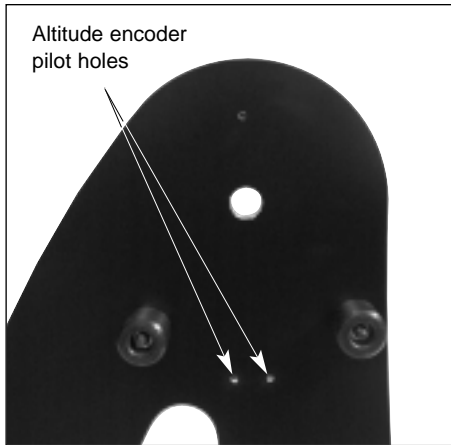
Qty.	Description
1	Object locator computer (controller)
1	Altitude encoder assembly
1	Coil cable
1	Altitude encoder cable (53" long)
1	Azimuth encoder cable (24" long)
6	Wire retaining clips
2	Hook-and-loop strips (1 "hook" strip, 1 "loop" strip)
1	Plastic bumper
3	Wood screws
2	Nylon washers
1	9-volt battery

The only tool needed for installation is a Phillips-head screwdriver. Remove the optical tube from the base to begin installation.

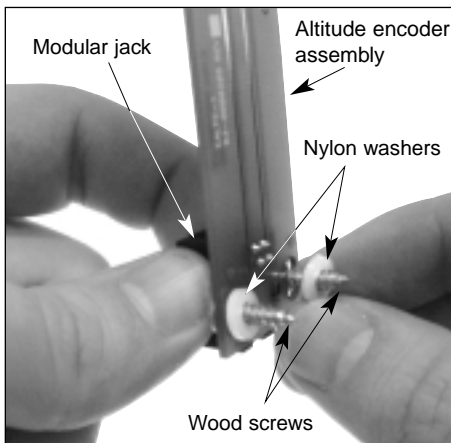
*Note: The IntelliScope Computerized Object Locator is only compatible with Orion Sky-Quest XT IntelliScope Dobsonians. If you have another Dobsonian, or any other telescope, the IntelliScope system will not function properly.*

## 1. Installation

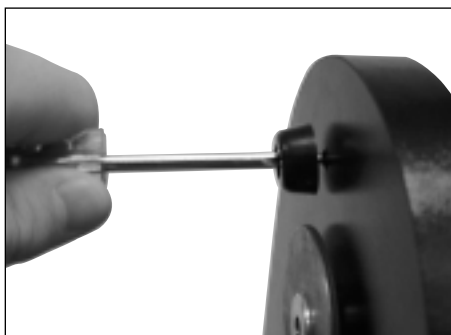
- 1) Install the altitude encoder assembly onto the base's right side panel. This is the side of the base opposite the side with the IntelliScope Computerized Controller Port. Below the 5/8" through-hole in the panel, there are two predrilled starter holes in the inward-facing surface (Figure 2). Take two of the supplied wood screws and push them through the two slotted holes in the bottom of the altitude encoder's computer board. The screw heads should be on the same side as the altitude encoder's modular jack. Now, with the screws pushed through the encoder board, place a nylon washer on the end of each screw (Figure 3). Then, thread the screws into the starter holes in the side panel. The shaft on the altitude encoder assembly should protrude through the 5/8" through-hole in the side panel. It will take a bit of dexterity to keep the washers on the ends of the screws when installing, so don't get frustrated if it takes a couple tries. The screws should not be fully tightened; they should be tight, but not tight enough to prevent the altitude encoder from moving up and down within the slots in the encoder board.
- 2) There is a pilot hole above the 5/8" through hole in the right side panel's interior surface; this is where the plastic bumper that protects the altitude encoder assembly will be installed. Take the remaining wood screw, push it through the bumper, and thread it into the pilot hole until tight (Figure 4).
- 3) Connect one end of the azimuth encoder cable (the shorter of the two cables) to the encoder jack in the top baseplate of the Dobsonian base. Connect the other end to the



**Figure 2.** The two pilot holes used to mount the altitude encoder assembly are located on the interior surface of the right side panel of the base.



**Figure 3.** Place a nylon washer on the end of each screw after the screws are pushed through the altitude encoder assembly.



**Figure 4.** Install the bumper into the pilot hole above the altitude encoder assembly.

encoder connector board that should be already installed on the base's left side panel. The cable should plug into the jack on the left side of the encoder connector board (see Figure 5).

4) Connect one end of the altitude encoder cable to the modular jack on the altitude encoder assembly. Connect the other end of the cable to the jack on the right side of the encoder connector board (see Figure 5).

5) Use the provided wire clips to secure the altitude and azimuth cables neatly to the base. We recommend using two clips for the (shorter) azimuth cable, and four clips for the (longer) altitude cable (Figure 5a.). The clips have adhesive backing; simply peel the paper off the back of the clip and press the adhesive back to the base where you want the clip to be located.

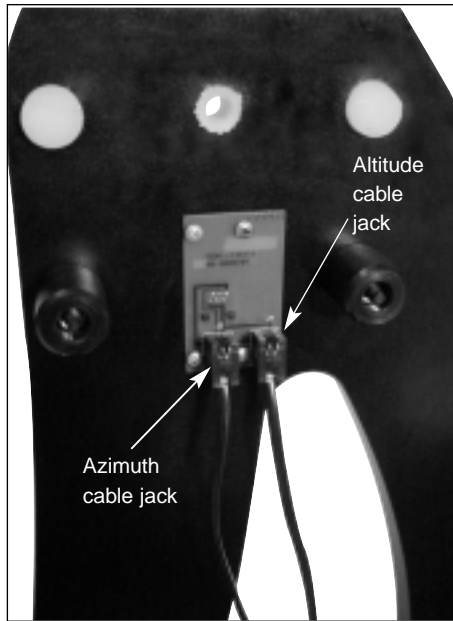
6) Place the telescope optical tube into the base. Be very careful not to hit the altitude encoder with the side bearing on the tube when doing this or damage to the encoder could result. The bumper helps to prevent such contact.

7) Reinstall the telescope's tensioning knob (the one with the Teflon and metal washers) through the base's left side panel (the side that has the IntelliScope Computerized Controller Port label) and into the threaded hole in the center of the tube's side bearing.

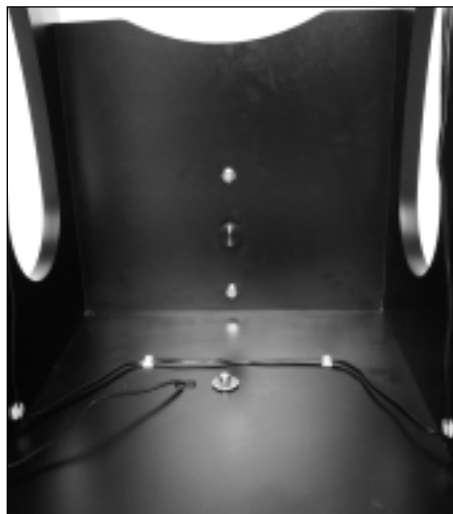
8) Reinstall the telescope's retaining knob, without its black nylon bushing, through the altitude encoder's aluminum shaft (now protruding from the right side panel) and into the tube's side bearing (Figure 6). Make sure this knob is fully tightened.

9) Insert one end of the coil cable into the larger of the two jacks on the top of the IntelliScope controller (Figure 1). Insert the other end into the "IntelliScope Computerized Controller Port" on the left side of the Dobsonian base.

10) Two hook-and-loop strips (one strip of "hooks" and one strip of "loops") have been provided to hang the IntelliScope controller in a convenient location on the base when not in use. Place the "hooks" strip on the



**Figure 5.** The azimuth cable plugs into the jack on the left of the encoder connector board. The altitude cable plugs into the jack on the right.



**Figure 5a.** Use the wire clips to secure the cables neatly to the base



**Figure 6.** The retaining knob now goes through the shaft of the altitude encoder assembly before threading into the side bearing on the telescope tube.

back of the controller, and the “loops” strip on the base in a convenient spot. Make certain the location of the strip on the base will not cause the controller to interfere with the motions of the mount. You may want to consider using the optional holster instead of the supplied hook-and-loop strips. The holster is a metal holder custom-designed to fit the IntelliScope controller. When installed at the top of the Dobsonian base, it provides a firm mounting for the controller at a convenient position for easy access. The controller can be removed from the holster when needed or kept in the holster during use.

11) Slide the battery cover off the back of the hand control and insert the 9-volt alkaline battery. Make sure the positive and negative terminals of the battery are oriented as shown in the bottom of the battery compartment. Replace the battery cover.

Your IntelliScope Computerized Object Locator is now installed and ready to be used.

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## 2. Alignment

This section will familiarize you with the alignment procedure for the IntelliScope system.

### Powering the Controller

To turn the controller on, firmly press the **Power** button. The LED lights will activate and the LCD screen will display its introduction message. The intensity of the illumination can be adjusted by repeatedly pressing the **Power** button. There are five levels of LED brightness. Choose a brightness level that suits your conditions and needs. (Dimmer settings will prolong battery life.)

To turn the controller off, press and hold the **Power** button for a few seconds, then release it.

To conserve battery life, the controller is programmed to shut itself off after being idle for 15 minutes. So, make sure to press a button at least once every 15 minutes if you do not want the controller to turn off. If the controller does turn off, you will need to perform the initial alignment procedure again.

If the LCD screen and the buttons' backlighting automatically begin to dim, it's time to change batteries.

### Initial Vertical Alignment

After powering up the controller, the top line of the LCD display will read: "POINT VERTICAL." If the vertical stop you installed on the Dobsonian base during assembly of the telescope is properly adjusted (see below), simply rotate the telescope upwards in altitude until the bottom of the tube comes into contact with the vertical stop. Once the telescope tube is in the vertical position, press the **Enter** button to start the two-star alignment procedure.

### Adjusting the Vertical Stop

In order for the IntelliScope system to work accurately, the vertical stop must be precisely adjusted so that the optical tube is truly perpendicular to the azimuth axis of the base when the controller says "POINT VERTICAL." For most IntelliScopes, the vertical stop must use the nylon spacer, one of the 1/16"-thick washers, and the 1/32"-thick washers to achieve this. These parts, plus an extra 1/16"-thick washer are supplied with the Dobsonian base. If you do not have access to a carpenter's level, then using the spacer, 1/16"-thick washer, and 1/32"-thick washer will be the best you can do to adjust the vertical stop.

For the most precise adjustment of the vertical stop (which will allow the best pointing accuracy to be achieved), you should use a carpenter's level. Any hardware store will have one. First, make sure the base itself is level. Place the carpenter's level on the top ground board and rotate the base 180° in azimuth (Figure 7). The level should indicate that the base is level through the entire rotation. If not, then reposition the base on the ground, or place shims underneath the feet until the base stays level through a 180° rotation.



**Figure 7.** Place a carpenter's level on the base as shown. The base should stay level through a 180° rotation in azimuth. Once the vertical stop is set, the base does not need to be level to function properly.

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Next, place the nylon spacer, the 1/16"-thick washer, and the 1/32"-thick washer on the vertical stop screw, and thread the entire assembly into the insert in the base's front brace. Now, rotate the telescope upwards in altitude until the mirror cell of the telescope comes into contact with the vertical stop. Place the carpenter's level across the top of the telescope (see Figure 8). Is the top of the tube level? If so, you are finished adjusting the vertical stop. If not, add or remove a washer to the vertical stop screw until the top of the tube is level when the mirror cell comes into contact with the vertical stop.

Once the vertical stop is accurately adjusted, it should not need adjustment again. The base does not need to be level for the IntelliScope system to function properly; the base only needs leveling when initially setting the vertical stop.



**Figure 8.** Once the base is leveled, point the tube up until the mirror cell comes into contact with the vertical stop. Then, place the carpenter's level across the top of the tube as shown. If the vertical stop is set properly, the top of the tube should also be level.

### Simple Two-Star Alignment

After setting the vertical position of the optical tube, a simple two-star alignment process is all that is needed to ready the IntelliScope system for operation. This is a great simplification from other computerized systems, which require you to enter data such as your longitude, latitude, and time zone. For the IntelliScope controller to accurately find objects, you only need to center two bright stars in your telescope and indicate to the controller which two stars you have centered. This is quite easy to do. For your convenience, we have provided finder charts for the alignment stars in Appendix B. Use the finder chart to locate and identify two bright stars in your current night sky. For best results, choose two stars that are at least 60° apart from each other. (The width of your fist at arm's length is about 10°, so you want the stars to be at least six fist-widths apart.)

So, the optical tube is now in the vertical position and you've chosen two bright stars in the sky to use for alignment. The telescope should have a high power eyepiece, such as the 10mm Sirius Plössl, in the eyepiece holder and the finder scope should be properly aligned with the telescope (these procedures are described in your telescope's manual). The LCD screen will state on its top line "ALIGN STAR 1," with the name of a star flashing on the second line.

Use the arrow buttons to scroll through the names of the alignment stars. The up arrow button scrolls through the stars alphabetically from A to Z. The down arrow button scrolls alphabetically backwards, from Z to A. When you arrive at the name of the star you wish to align on, you can begin to move the telescope so that it is pointing at that star (but don't press the **Enter** button yet).

*Note: The controller will not accept Polaris as the first alignment star. This helps prevent the pointing accuracy from decreasing over time. It is OK to use Polaris as the second alignment star, however.*

Take hold of the "navigation knob" on the optical tube and move the telescope so that it is pointing in the general area of the alignment star. Aim the telescope so the alignment star appears in finder scope. Be careful not to confuse the alignment star with other stars in the area when doing this. (It will likely be the brightest star in the field of view.) Now,



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move the telescope until you have centered the star on the crosshairs of the finder scope. Look into the eyepiece of the telescope, and you should see the alignment star in the field of view of the eyepiece. If it isn't, then your finder scope is out of alignment with your telescope and will need to be adjusted. Once the alignment star is in the eyepiece's field of view, center it in the eyepiece as best you can by making small movements to the telescope. (If you have one, an illuminated reticle eyepiece is great for centering alignment stars). Once this is done, press the **Enter** button on the controller. You have now completed one-half of the two-star alignment.

The LCD screen will now read "ALIGN STAR 2" on the first line with an alignment star's name flashing on the second line. As before, scroll through the names of the stars with the arrow buttons until you reach your second chosen alignment star. Repeat the procedure described above for your second alignment star. When you have aligned on the second star, press the Enter button. The LCD will then display a number. It is the alignment error factor, or "warp" (W) factor.

#### **The Alignment Error (Warp) Factor**

The "warp" alignment error factor essentially lets you know if your alignment was accurate or not. Ideally, this number should be as low as possible, but any "W" of 0.5 or smaller is acceptable (regardless of + or - sign). Warp factors of  $\pm 0.3$  and  $\pm 0.4$  are the most common. Warp factors under  $\pm 0.2$  are typically not achievable. If you complete an alignment and the warp factor is larger than  $\pm 0.5$  (e.g., +0.6, -0.6, +0.7, -0.7, etc.), then you must turn the controller off (by holding down the **Power** button) and begin the alignment procedure again. Otherwise, there is no guarantee that the controller will consistently place objects within the field of view of a medium-low power eyepiece.

An unacceptable warp factor may indicate that you aligned on the wrong star or did not have the telescope initially in a precisely vertical position. If you are having problems getting the warp factor at or below  $\pm 0.5$ , see the troubleshooting section in Appendix A.

Your IntelliScope Computerized Object Locator is now ready to find objects. Replace the high-powered eyepiece you used for centering the alignment stars with a low-power, wide-field eyepiece, such as the 25mm Sirius Plössl.

## **3. Overview of Controller**

The IntelliScope Computerized Object Locator has been specifically designed for ease of use. This section will help familiarize you with the basic layout and operation of the controller.

#### **Pushbuttons**

Besides the **Power**, **Enter**, **ID**, **FCN**, and up/down arrows, all pushbuttons have letters on them with numbers above them. The letters designate the function of the pushbutton. The numbers above them are used for entering numerical data only; the numbers are never active until a function is first chosen. The numbers are arranged like a telephone keypad for ease of number entry. None of the function buttons will work properly until an initial alignment, as outlined previously, is completed. If you press a function button before the two-star alignment is completed, the controller will display "MUST STAR ALIGN." Turn the unit off, then on again (by using the **Power** button), to begin the alignment routine again.

#### **The Guide Arrows**

The controller leads you to astronomical targets with guide arrows displayed on the LCD screen. After an object is selected to view, you will see two guide arrows, one that points

left or right, and one that points up or down. Move the telescope tube in the corresponding direction of the guide arrows. If you are standing to the left of the telescope and facing the same direction the telescope is pointed, the guide arrows will exactly correspond with the direction you should move the telescope (Figure 9). Otherwise, if an up arrow is displayed, move the telescope tube upward, if a down arrow is displayed, move the telescope tube downward, if a left arrow is displayed, rotate the telescope counterclockwise, and if a right arrow is displayed, rotate the telescope clockwise. There is a number next to each guide arrow that indicates how far the telescope needs to be moved to reach the selected object. As you move the telescope toward the object, this number will decrease. When the number goes below ten, the figure will be displayed in tenths; this helps to make small, precise movements to the telescope tube in order to bring your field of view. When both numbers reach zero, stop moving the telescope. The object will be within the field of view of a medium-low power eyepiece (25mm focal length or longer).



**Figure 9.** If you stand to the left of the telescope, and face the direction the tube is pointing, the guide arrows will correspond exactly with the direction you should move the telescope in order to find the selected object.

For example, look at Figure 10a, which shows an LCD screen for someone trying to locate M51, otherwise known as the Whirlpool Galaxy. The first arrow is pointing right and gives a number of 34. The second arrow is pointing up and displays the number 12. This means that the telescope tube should be moved to the right (clockwise) and up. When you are close to M51, the numbers will be displayed in tenths, as is shown in Figure 10b. When the numbers reach zero (Figure 10c), the telescope will be pointed right at the Whirlpool Galaxy.



**Figure 10a-c.** This sequence of pictures illustrate how the controller's guide arrows will look as you are finding an object. (a.) When you are far away from the object, there will be a number (from 10 to 179) to the left of the guide arrows. (b.) When you are close to the object, each guide arrow will display a number on its immediate left (from 0 to 9) and immediate right (from 0 to 9); the number on the left is whole number increments, while the number on the right is in increments of tenths. This helps in making small movements to the telescope to pinpoint the object's location. (c.) When the guide arrows display "0.0 0.0", the object will be within the field of view of the telescope (with a 25mm or longer focal length eyepiece).

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It is easiest to move the telescope in one direction at a time (say altitude) until the corresponding number reached "0.0". Then move the scope in the other direction (azimuth) until that number also reads "0.0".

If the object selected to view is currently located below the horizon, the word "HORIZON" will flash before the guide arrows are displayed. Choose another object to view.

## 4. Locating the Planets

By far the most popular objects for viewing, after the Moon, are the planets. Since the other eight planets in our solar system are also orbiting the Sun, they do not appear in fixed positions in the night sky like deep-sky objects and stars do. Because of this, the controller requires you to input the date before it can find the planets.

To find planets with your IntelliScope Computerized Object Locator, use the following procedure:

- 1) Press the **Planet** button on the controller.
- 2) The LCD screen will display a date similar to the following:

**DATE 01 JUN 2003**

- 3) The number after the word "DATE" will be flashing and represents the day of the month. Input the two-digit day using the number buttons.
- 4) The three-letter month will now be flashing. Use the arrow buttons to scroll to the present month and then press the **Enter** button.
- 5) Now the year will flash. Input the year using the number buttons.

If you make a mistake while inputting the date, press the **Enter** button at any time while still within the **Planet** button function. The LCD screen will then display the last date input, with the two-digit day after the word "DATE" flashing. Input the correct date as outlined above.

Now, to choose a planet to view, press the arrow buttons and scroll through the planets. The planet's name will be displayed in the upper left section of the LCD screen, with the guide arrows on the upper right of the LCD screen. Move the telescope in the corresponding direction shown by the guide arrows.

The lower left screen shows the constellation that the planet appears in, with its present co-ordinates given in right ascension and declination. When you are finished viewing the planet, you may scroll to another planet by using the arrow buttons.

The features and details you can see will vary from planet to planet. The following descriptions give a brief overview of what to expect when viewing them:

**MERCURY** Mercury is often so close to the Sun that it cannot be seen. Sometimes it is visible for a brief period after the Sun sets, and sometimes it's visible in the morning just before the Sun rises. Mercury does not really show any detail, but is quite bright. With your telescope, you will be able to investigate this planet's orange-colored hue. Like Venus, Mercury sometimes appears as a crescent, rather than as a full disk.

**VENUS** At its brightest, Venus is the most luminous object in the sky, excluding the Sun and the Moon. It is so bright that sometimes it is visible to the naked eye during full daylight! Ironically, Venus appears as a thin crescent, not a full disk, when at its peak brightness. Because it is close to the Sun, it never wanders too far from the morning or evening

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horizon. No surface markings can be seen on Venus, which is always shrouded in dense clouds.

**MARS** The Red Planet makes its closest approach to Earth every two years. During close approaches you'll see a red disk, possibly some light and dark regions, and maybe the polar ice cap. To see surface detail on Mars, you will need a high power eyepiece and very steady air!

**JUPITER** The largest planet, Jupiter, is a great subject for observation. You can see the disk of the giant planet and watch the ever-changing positions of its four largest moons — Io, Callisto, Europa, and Ganymede. Higher power eyepieces should bring out the cloud bands on the planet's disk and maybe even the Great Red Spot.

**SATURN** The ringed planet is a breathtaking sight when it is well positioned. The tilt angle of the rings varies over a period of many years; sometimes they are seen edge-on, while at other times they are broadside and look like giant "ears" on each side of Saturn's disk. A steady atmosphere (good seeing) is necessary for a good view. You will probably see a bright "star" close by, which is Saturn's brightest moon, Titan.

**URANUS** Uranus is a faint planet, and requires high powers (at least 100x) before it starts to show any detail that distinguishes it from stars. Uranus will appear as a pale, blue-green disk.

**NEPTUNE** Like Uranus, Neptune will require high powers before showing anything to distinguish itself from stars. Neptune will appear as a bluish-colored disk, possibly with a very faint moon nearby if you are using a larger-aperture IntelliScope.

**PLUTO** Smaller than our own Moon, Pluto is very, very faint and shows little more than a point of light similar to a star. Even the Hubble Space Telescope is unable to show much detail on Pluto. Many amateur astronomers note how Pluto moves with respect to background stars (over several nights) in order to confirm their observation of our most remote planet.

## 5. Locating Deep-Sky Objects by Catalog

Catalogs are groups of deep sky objects of interest that have been assembled and given designations. Very often a deep-sky object will have a catalog number, as well as a "common" name. For example, the Orion Nebula is listed in the Messier catalog as "M42." The controller has three catalogs built-in: The Messier catalog (M), the New General Catalog (NGC), and the Index Catalog (IC). Many of the objects in the Messier catalog also have NGC catalog designations.

### The Messier Catalog

The Messier catalog contains 110 galaxies, nebulas, and star clusters identified by the famous French astronomer Charles Messier and his colleagues in the late 1700's. These are some of the most popular celestial attractions observed by amateur astronomers.

To view an object from the Messier catalog, press the **M** button. Then enter the number of the Messier object you wish to view using the numeric buttons and press the **Enter** button. For example, to view Messier 57, also known as "the Ring Nebula," you would press the **M** button, then press the "5" button, then press the "7" button, followed by the **Enter** button. If the number of the Messier object you wish to view contains three digits, it is not necessary to press **Enter** after inputting the third digit.

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The object's catalog designation will be shown in the upper left corner of the display screen, with the guide arrows in the upper right. The lower left will display the constellation the object resides in and the object's common name (if it has one) or a brief description of the object. Move the telescope in the corresponding directions shown by the guide arrows to locate the object.

You can get more information about the selected object by pressing the **Enter** button. The second line of the LCD display will then cycle information about the object you are viewing such as its celestial coordinates (R.A. and Dec.), magnitude (brightness), size (in arc-minutes or arc-seconds), and a brief scrolling text description.

When you are finished viewing the selected Messier object, you may scroll to another Messier object by using the arrow buttons, or you can select another Messier object to view by pressing the **M** button again.

### **The New General Catalog**

The New General Catalog, or NGC, is a catalog of some 7,840 deep-sky objects compiled by the Danish astronomer J. L. E. Dreyer more than 100 years ago. It contains hundreds of excellent examples of each type of deep-sky object and is the most well known and used catalog by amateur astronomers beyond the already mentioned Messier catalog. To be more precise, the version of the New General Catalog used in the IntelliScope Computerized Object Locator is an improved version known as the "Revised New General Catalog"; this version has many corrections from Dreyer's original list.

To view an object from the NGC catalog, press the **NGC** button. Then enter the number of the NGC object you wish to view using the numeric buttons and press **Enter**. For example, to view the Andromeda Galaxy, which is listed as NGC224, you would press the **NGC** button, then the "2" button twice, then the "4" button, followed by the **Enter** button. If the number of the NGC object you wish to view contains four digits, it is not necessary to press **Enter** after inputting the fourth digit.

The object's catalog designation will be shown in the upper left corner of the LCD screen, with the guide arrows in the upper right. The lower left will show the constellation the object resides in, and the object's common name (if it has one) or a brief description of the object will be shown in the lower right. Move the telescope in the corresponding directions shown by the guide arrows.

You can get more information about the selected object by pressing the **Enter** button. The second line of the LCD display will then cycle information about the object you are viewing such as its celestial coordinates (R.A. and Dec.), magnitude (brightness), size (in arc-minutes or arc-seconds), and a brief scrolling text description.

When you are finished viewing the selected NGC object, you may scroll to another NGC object by using the arrow buttons, or you can select another NGC object to view by pressing the **NGC** button again.

### **The Index Catalog**

The Index Catalog, or IC, contains 5,386 objects discovered in the decade or so after the NGC catalog was first published. This list contains objects similar to the NGC, but IC objects are typically fainter and more difficult to observe.

To view an object from the IC catalog, press the **IC** button. Then input the number of the IC object you wish to view using the numeric buttons and press the **Enter** button. For example, to view the Flaming Star Nebula, which is listed as IC405, you would press the **IC** button, then the "4" button, then the "0" button, then the "5" button, followed by the

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**Enter** button. If the number of the IC object you wish to view contains four digits, it is not necessary to press **Enter** after inputting the fourth digit.

The object's catalog designation will be shown in the upper left corner of the LCD screen, with the guide arrows in the upper right. The lower left will show the constellation the object resides in, and the object's common name (if it has one) or a brief description of the object will be shown in the lower right. Move the telescope in the corresponding directions shown by the guide arrows.

You can get more information about the selected object by pressing the **Enter** button. The second line of the LCD display will then cycle information about the object you are viewing such as its celestial coordinates (R.A. and Dec.), magnitude (brightness), size (in arc-minutes or arc-seconds), and a brief scrolling text description.

When you are finished viewing the selected IC object, you may scroll to another IC object by using the arrow buttons, or you can select another IC object to view by pressing the IC button again.

## 6. Locating Deep Sky Objects by Object Type

Rather than trying to select objects by catalog numbers, you may wish to simply view certain types of objects. This is where the **Nebula**, **Galaxy**, and **Cluster** buttons come in handy. These buttons will access a selection of the best and brightest nebulas, galaxies, and star clusters in the night sky.

The **Nebula**, **Cluster** and **Galaxy** buttons are organized by constellation. So, before using these buttons, decide in which constellation you would like to view an object. Choose a constellation that is at least 40° high in the sky to get a good view. If you are unsure of the constellations currently visible in your night sky, consult a planisphere or the monthly star chart at [telescope.com](http://telescope.com).

### Locating Nebulas

Amongst the most beautiful objects in the night sky, nebulas are clouds of dust and gas that are lit by a nearby stellar source. There are several different types of nebulas; emission nebulas, which are where star systems form, planetary nebulas, which are the result of a star dying, and reflection nebulas, which are caused by dust reflecting starlight. Most have low surface brightness, so a dark sky free of light-pollution is best for a night of viewing nebulas.

To view a nebula, press the **Nebula** button on the controller. The LCD screen will then display the word "NEBULA" with a flashing three-letter constellation designation after it. Now, select the constellation in which you would like to view a nebula. Use the arrow buttons to scroll through the list of constellations. If you are unsure which constellation the three-letter designation represents, refer to Appendix C. Once you have selected the constellation, press **Enter**. A nebula in that constellation will now appear on the LCD screen, along with the guide arrows to lead you to the nebula. The current constellation is shown in the lower left, and the nebula's proper name or catalog number is in the lower right. For more information about the nebula selected, press the **Enter** button.

To go to the next nebula in the selected constellation, simply press the up arrow button. The guide arrows will now direct you to the next nebula in the constellation. If there are no more nebulas available in that constellation, a nebula from the next constellation (in

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alphabetical order) will be displayed. To select another constellation in which to view nebulas, press the **Nebula** button again.

### **Locating Star Clusters**

Star clusters are just what their name implies; groupings of stars. Star clusters come in two main types, open and globular. Open star clusters reside within our Milky Way galaxy and usually contain a handful of stars clustered together because they were spawned from the same gas cloud. Globular clusters are more like miniature galaxies, with hundreds or thousands of stars packed into a spherical shape by mutual gravity. Globular clusters reside outside the disk of the Milky Way galaxy and orbit the galaxy's center. It is believed that globular clusters are formed as a natural consequence of galaxy formation. Star clusters, in general, are somewhat bright compared to other deep-sky objects, so many will appear quite spectacular, even in the smaller telescopes.

To view a star cluster, press the **Cluster** button on the controller. The LCD screen will then display the word "STAR CLUSTER" with a flashing three-letter constellation designation after it. Now, select the constellation in which you would like to view a star cluster. Use the arrow buttons to scroll through the list of constellations. If you are unsure which constellation the three-letter designation represents, refer to Appendix C. Once you have selected the constellation, press **Enter**. A star cluster in that constellation will now appear on the LCD screen, along with the guide arrows to lead you to the star cluster. The current constellation is shown in the lower left, and the star cluster's proper name or catalog number is in the lower right. For more information about the star cluster selected, press the **Enter** button.

To go to the next star cluster in the selected constellation, simply press the up arrow button. The guide arrows will now direct you to the next star cluster in the constellation. If there are no more star clusters available in that constellation, a star cluster from the next constellation (in alphabetical order) will be displayed. To select another constellation in which to view a star cluster, press the **Cluster** button again.

### **Locating Galaxies**

Nebulas may be beautiful and star clusters impressive, but nothing has quite the breathtaking power of observing a galaxy. Galaxies are collections of billions of stars that come in a variety of shapes and sizes. Viewing a galaxy always gives the observer a revelation of just how vast our universe truly is. Keep in mind, however, that most galaxies are quite faint, and may be challenging to identify, especially in smaller telescopes.

To view a galaxy, press the **Galaxy** button on the controller. The LCD screen will then display the word "GALAXY" with a flashing three-letter constellation designation after it. Now, select the constellation in which you would like to view a galaxy. Use the arrow buttons to scroll through the list of constellations. If you are unsure which constellation the three-letter designation represents, refer to Appendix C. Once you have selected the constellation, press **Enter**. A galaxy in that constellation will now appear on the LCD screen, along with the guide arrows to lead you to the galaxy. The current constellation is shown in the lower left, and the galaxy's proper name or catalog number is in the lower right. If you wish to have more information about the galaxy selected, press the **Enter** button.

To go to the next galaxy in the selected constellation, simply press the up arrow button. The guide arrows will now direct you to the next galaxy in the constellation. If there are no more galaxies available in that constellation, a galaxy from the next constellation (in alphabetical order) will be displayed. To select another constellation in which to view galaxy, press the **Galaxy** button again.

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## 7. Locating Stars

The IntelliScope database contains 837 stars. Stars always appear like tiny points of light. Even powerful telescopes cannot magnify a star to appear as more than a point of light! You can, however, enjoy the different colors of the stars and locate many pretty double and multiple stars. You can also monitor variable stars from night to night to see how their brightness changes over time.

To view a star, press the **Star** button on the controller. The LCD screen will then display the word "STAR" with the word "NAMED" flashing next to it. From this screen, use the arrow buttons to choose from "NAMED," "DOUBLE," "VARIABLE," and "CATALOG."

### Named Stars

The named stars are the brightest in the night sky. These are the stars that the ancients gave proper names to, like "Arcturus" or "Mizar."

To select a named star, press **Enter** after selecting "NAMED" from the **Star** button choices. You can now use the arrow buttons to scroll through the list of named stars. The stars are listed in alphabetical order. Once you have found the named star you would like to observe, the guide arrows will direct you to move the telescope to the star's position. The upper left corner of the LCD screen will show the named star's ST catalog number (the IntelliScope's entire ST catalog is printed in Appendix D for easy reference), and the lower left shows the constellation in which the star resides. Pressing **Enter** again will display the star's R.A. and Dec. coordinates, its magnitude, and a brief description.

To find another named star to observe, simply continue scrolling through the list of named stars.

### Double (and Multiple) Stars

Many stars in the night sky appear to be single stars, but they are not. They are actually double or multiple star systems. Some of these systems comprise two or more stars gravitationally bound to each other, while others are just two (or more) stars in the same line of sight. At high magnifications, it is possible to "split" many double (and multiple) stars into their individual components. It can also be interesting to contrast and compare the different colors and magnitudes of the stars in the system. Be aware, however, that good seeing conditions are critical for separating close components of a double or multiple star.

To select a double (or multiple) star to observe, press **Enter** after selecting "DOUBLE" from the **Star** button choices. The LCD screen will then display the word "DOUBLE" with a flashing three-letter constellation designation after it. Now, select the constellation in which you would like to view a double star. Use the arrow buttons to scroll through the list of constellations. If you are unsure which constellation the three-letter designation represents, refer to Appendix C. Once you have selected the constellation, press **Enter**. A double star in that constellation will now appear on the LCD screen, along with the guide arrows to lead you to the double star. The current constellation is shown in the lower left, and the double star's name is in the lower right.

*Note: Double stars typically have names like "Zeta" (Greek letter designation) or a number like "36" (Flamsteed number). The full names for these double stars are actually linked to the constellation they reside in. For example, in the constellation Andromeda, these stars would be "Zeta And" and "36 And."*

For more information about the double star selected, press the **Enter** button. (The "S=" now refers to the separation, in arc-seconds, between the double stars. For multiple stars,



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the “S=” refers to the separation between the two brightest stars. The “M=” now refers to the magnitude of the brightest star.) To go to the next double star in the selected constellation, simply press the up arrow button. The guide arrows will now direct you to the next double star in the constellation. If there are no more double stars available in that constellation, a double star from the next constellation (in alphabetical order) will be displayed. To select another constellation in which to view a double star, press the **Star** button, select “DOUBLE”, and press **Enter**.

### **Variable Stars**

Variable stars are stars that change their brightness, also called magnitude, over time. The period of brightness change varies greatly from star to star; some variable stars change brightness over several days while others may take several months to noticeably change. It is fun and challenging to watch a star’s magnitude change over time. Observers typically compare the current brightness of the variable star to other stars around it (whose magnitudes are known and do not change over time).

To select a variable star to observe, press **Enter** after selecting “VARIABLE” from the **Star** button choices. The LCD screen will then display the word “VARIABLE” with a flashing three-letter constellation designation after it. Now, select the constellation in which you would like to view a variable star. Use the arrow buttons to scroll through the list of constellations. If you are unsure which constellation the three-letter designation represents, refer to Appendix C. Once you have selected the constellation, press **Enter**. A variable star in that constellation will now appear on the LCD screen, along with the guide arrows to lead you to the variable star. The current constellation is shown in the lower left, and the variable star’s name is in the lower right.

*Note: Variable stars typically have names like “Eta” (Greek letter designation) or a letter designation like “R.” The full names for these variable stars are actually linked to the constellation they reside in. For example, in the constellation Aquila, these stars would be “Eta Aql” and “R Aql.”*

For more information about the variable star selected, press the **Enter** button. (The “M=” refers to the mean magnitude of the variable star.) To go to the next variable star in the selected constellation, simply press the up arrow button. The guide arrows will now direct you to the next variable star in the constellation. If there are no more variable stars available in that constellation, a variable star from the next constellation (in alphabetical order) will be displayed. To select another constellation in which to view a variable star, press the **Star** button, select “VARIABLE,” and press **Enter**.

### **Catalog (ST) Stars**

The “ST” catalog contains all of the stars in the IntelliScope Computerized Object Locator’s database. This catalog has 837 of the most interesting stars to view in the night sky. The full list of stars appearing in the ST catalog is printed Appendix D. Generally, the best way to use the ST catalog to observe stars is first to peruse Appendix D, and then note the catalog number of the star you wish to observe.

To select an ST catalog star to observe, press **Enter** after selecting “CATALOG” from the **Star** button choices. The LCD screen will then display the letter “ST” with three digits blinking after it. Now, input the ST catalog number of the star you wish to observe, and press **Enter**. If the ST catalog number of the star you wish to view contains three digits, it is not necessary to press **Enter** after inputting the third digit.

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The object's ST catalog designation will be shown in the upper left corner of the LCD screen, with the guide arrows in the upper right. The lower left will show the constellation the object resides in and the star's name.

You can get more information on the star selected by pressing the **Enter** button. The second line of the LCD screen will then cycle information about the object you are viewing, such as its celestial coordinates (R.A. and Dec.), magnitude (brightness), and a brief description.

When you are finished viewing the selected star, you may scroll to another star in the ST catalog by using the arrow buttons, or you can select another ST catalog star to view by pressing the **Star** button, and pressing **Enter** once "CATALOG" is selected.

## 8. Tours of the Best Objects

The IntelliScope controller offers guided tours of the best and brightest celestial objects visible in the sky each month. There are 12 monthly tours, each consisting of 12 pre-selected objects. The tours are an easy and fun way to locate and observe the finest wonders of the heavens. They are a great place to start for a beginner who is unfamiliar with the night sky, or for a more experienced observer who wants to revisit some old favorites or show friends or family "what's up" on a given evening.

### Starting a Tour

To start an IntelliScope tour, press the **Tour** button at any time after you have aligned the IntelliScope system. The LCD screen will display "SKY TOUR" and a flashing three-letter designation for the month. Scroll through the months by using the arrow buttons until you reach the present month, then press the **Enter** button.

The LCD screen will then display the first tour object for the selected month in the lower right of the screen, with the guide arrows in the upper right. Use the guide arrows to point the telescope, and you will soon be observing the first astronomical showpiece of the month.

You can get more information about the current tour object by pressing the **Enter** button. The second line of the LCD screen will then cycle the following information about the object you are viewing: its celestial co-ordinates (R.A. and Dec.), magnitude (brightness), size (in arc minutes or seconds), and a brief text description.

When you have finished viewing the first tour object for the selected month, you can continue the tour by pressing the up arrow button to find the next object. You can exit the tour at any time by pressing any one of the other function buttons on the controller.

Since several months' tour objects are visible in the night sky at one time, feel free to select a month before or after the current month. These tour objects will likely be visible also. Remember, however, that viewing objects below 40° or so from the horizon will not give the best view due to atmospheric distortion (and usually light pollution). If you are finding that objects in the selected tour month are too close to the horizon, you should choose a month following the selected month, or you can wait a few hours for the objects to rise higher in the sky!

## 9. The Identify Function

There may come a time in your observations when you spot an unidentified deep-sky object or star in the eyepiece and want to know what it is. With the IntelliScope Computerized Object Locator, a simple press of a button will tell you.

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### Using the ID Button

When you locate an object and center it in the eyepiece, you can identify it by simply pressing the **ID** button. The LCD screen will display "IDENTIFY" with the word "ANY" flashing. You can then use the up/and down arrow buttons to scroll through several more specific options ("STAR", "DOUBLE", "CLUSTER", "NEBULA", and "GALAXY"). If you know which one of these object types you are looking at, selecting the object type will make the identification quicker and more accurate. This is because the computer will search through a shorter list of potential object matches, and will allow proper identification if there are several objects within the same field of view. If you are unsure of the object type you are looking at, simply select "ANY" from the list of choices. Once you have selected the object type (or "ANY"), press the **Enter** button.

The identity of the object centered in the eyepiece will now be displayed in the lower right area of the LCD screen. The constellation in which the object resides is shown in the lower left. As always, to get more information about the object, press the **Enter** button.

An interesting feature of the **ID** function is that once initiated, it is continually active. So, if you press the ID button, and choose "STAR", for instance, you can move your telescope from star to star in the sky, and the controller will automatically display the star's identity when you center the star in the eyepiece. This can be a fun and easy way to identify the stars in the sky. In fact, you can even make a "Name That Star" game out of it! Point your finger at a bright star in the sky and see if you can name it. Then, just point the telescope at the star to see if you were correct or not. If the centered star is not in the controller's database, it will display the identity of the closest star that is in its database.

To exit the identify function, simply press any other of the controller's function buttons. If you would like to identify another object type, press the **ID** button again.

## 10. Adding User-Defined Objects

Not only does the IntelliScope's database contain over 14,000 fascinating objects to view, you can even add your own! Up to 99 user-defined objects can be entered into the database by means of the **User** button. These user-defined objects can be random stars, a faint object not contained in the controller's database, or just a pretty object that you would like to come back to at some point in the future.

To enter a user-defined object into the database, you must have the right ascension (R.A.) and declination (Dec.) coordinates for the object. If you are currently observing an object that is not in the controller's database and you wish to add it, but don't know its coordinates, you can use the **FCN** button to obtain its coordinates (described in next section).

To input a user-defined object, begin by pressing the **User** button. The LCD screen will display the word "NEW" with a two-digit number flashing after it. Since no user-defined objects currently exist, press **Enter** to create user-defined ("NEW") object number 01. The LCD will display the R.A. and Dec. coordinates for the "NEW" object selected in the lower left. Since no data has been input yet, these coordinates will be 00:00 +00.0. The first four digits indicate the R.A. coordinate (in R.A. hours and minutes), and the remaining digits (and the  $\pm$  sign) indicate the Dec. coordinate (in degrees). Now, press the **Enter** button, and the first two digits of the R.A. coordinate (R.A. hours) will begin flashing. Press the two numerical buttons on the keypad that correspond the hours value of the R.A. coordinate. If the value of the R.A. hours is less than 10, make sure to enter a zero first. Then the second two digits of the R.A. coordinate (R.A. minutes) will begin flashing. Press the two numerical buttons that correspond to the minutes value of the R.A. coordinate. If the R.A. minutes are less than 10, make sure to enter a zero first. Next, the sign

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of the Dec. coordinate will be flashing. Use the arrow buttons to select “+” or “-” for the Dec. coordinate. Then, the first two digits of the Dec. coordinate will begin flashing. Press the two numerical buttons that correspond to the degrees value of the Dec. coordinate. Then the tenth of a degree value for the Dec coordinate will begin flashing. Press the numerical button that corresponds to the tenths of a degree value for the Dec. coordinate.

You have now input the data for your first user-defined object. Remember that this object is now “NEW01”. If you wish to view this object in the future, press the **User** button, and press Enter once “NEW01” is selected. The guide arrows will then tell you where to point your telescope to find the user-defined object.

If you wish to input another user-defined object, select “NEW02” (by using numerical buttons or the arrow buttons) after pressing the **User** button and input the data as outlined previously. If you select a “NEW” object number that you have already entered coordinates for and attempt to input new data, you will lose the data that was input previously. You may find it convenient to keep a written log of the “NEW” objects so that you can easily keep track of them.

## 11. The FCN Button

The IntelliScope Computerized Object Locator has several other useful functions, a couple of which can be accessed by using the **FCN** (function) button.

### **R.A. and Dec. Coordinates**

By simply pressing the FCN button, the controller will give a continuous readout of the telescope’s current R.A. and Dec. coordinates. This can be helpful and powerful in a number of ways. You can easily find any object in the night sky if you know its right ascension and declination coordinates. Grab any star atlas, choose any object you wish to view, be it faint galaxy or random star, and jot down its coordinates. Then, once you have aligned the IntelliScope system, you can point the telescope to that location by simply pressing the **FCN** button and moving the telescope until the R.A. and Dec. coordinates displayed match the coordinates of the object you wish to view. You can also press the **FCN** button at any time to display the current R.A. and Dec. coordinates of whatever you are currently viewing.

A common use for the **FCN** button is to locate “transient” objects, such as comets and asteroids. To find these objects you will need to learn their coordinates from astronomy resources, such as Astronomy, Sky & Telescope or a reliable astronomy website. Comet and asteroid positions will change from night to night, so entering the current coordinates into the user-defined database is generally not useful.

After pressing the **FCN** button, the R.A. and Dec. coordinates corresponding to the center of the telescope’s field of view are displayed on the first line of the LCD screen. The lower left of the screen indicates the current constellation the telescope is pointing to. The lower right numbers are the current azimuth (“AZ”) and altitude (“ALT”) coordinates of the telescope; this information is generally not useful.

### **The Realignment Function**

This function is useful for obtaining a new alignment fix during an observing session to correct for small pointing errors. Use this function only when pointing accuracy for a certain area of the sky appears to be poor compared to other areas of the sky. This is evident when objects in one area of the sky consistently fall at the edge or just outside the field of view (of the 25mm eyepiece) when the numbers on the LCD screen read 0.0 0.0.

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This can happen if the alignment stars initially chosen during setup are somewhat close to each other (less than 60° apart) or if the area of sky being viewed is a considerable distance away from the alignment stars chosen.

To improve pointing accuracy in a specific area of the sky, select an object in the locator's database from that region, and use the guide arrows to find the object. Precisely center the object in the eyepiece (preferably a high-powered one). Now, press the **FCN** button, and the R.A. and Dec. coordinates of the centered object will be displayed. Then, press the **Enter** button. The LCD screen will now display "ALIGN OBJECT 3" on the first line, and will be flashing the object currently centered in the telescope on the second line. Pressing **Enter** again then realigns the IntelliScope system to the object centered in the telescope. The LCD screen will display a new "warp factor" associated with the new alignment. If this number is greater than  $\pm 0.5$ , you may want to consider resetting the controller to perform another two-star alignment. Turn the controller off, then on again (with the **Power** button), to do this.

If, instead of pressing **Enter** a second time after pressing the **FCN** button, you press one of the arrow buttons, the list of initial setup alignment stars will be displayed. If you wish, you can select one of these alignment stars to realign on. Do this by scrolling to the desired alignment star using the arrow buttons, center the star in the telescope, and press **Enter**.

In general, it will not be necessary to use the realignment function, but it is a handy feature to have at your disposal. Also, be aware that while pointing accuracy will increase in the area of sky around the object realigned on, it may decrease in other areas of the sky.

## 12. The "Hidden" Functions

All of the active functions of the IntelliScope Computerized Object Locator have been outlined. There are, however, some additional "hidden" functions that may be of some use to you. To access the hidden functions, press the **Enter** button while pressing the **Power** button to turn the controller on. The LCD will display its introduction screen (with software version number) and then show the words "ALT AZM TEST." This is the first hidden function. Scroll to the other hidden functions by using the arrow buttons. The other hidden functions are "ENCODER TEST," "DOWNLOAD," "CHECKSUM," "REWRITE," and "CLOCK." When the hidden function you wish to use is displayed, press **Enter** to select it. To exit the currently chosen hidden function, press any button except for the **Enter** or arrow buttons. To completely exit the hidden functions section of the controller, you will need to hold the **Power** button down until the controller turns off.

The rest of this section gives the details and purpose of each hidden function.

### Altitude and Azimuth Test

The altitude and azimuth test ("ALT AZM TEST") is a diagnostic test that gives relative altitude and azimuth positions for the telescope. This test will allow you to easily see if the encoders are "talking" to the controller, and if the encoders are accurately monitoring the telescope's motions. To effectively use this test, make sure the telescope optical tube is in the horizontal position when pressing the **Enter** and **Power** buttons to access the hidden functions.

Once "ALT AZM TEST" is chosen from the hidden function options, the LCD screen will display the telescope's current relative altitude and azimuth position (in degrees); the relative altitude is in the upper right, while the relative azimuth is in the lower right. To begin

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with, both of these numbers will be +000.0. The first two sets of numbers on the upper and lower lines of the LCD screen are meaningless for the purposes of this test.

If you move the telescope counter-clockwise in azimuth, the number in the lower right should increase, while if you move clockwise in azimuth, the number will decrease. If you rotate the telescope exactly 360° in azimuth, the readout should return to the original +000.0 reading.

If you move the telescope upwards in altitude, the number in the upper right should increase, while if you move downwards in altitude, the number will decrease. If the telescope tube was perfectly horizontal when you enabled the hidden functions of the controller, then the altitude will read +090.0 when the telescope is pointed precisely vertical.

If one, or both, of the encoders are not behaving properly when performing this diagnostic test, there may be a problem with the assembly of the system, or a problem with one of the encoder boards or discs. Also, be sure to check that all cable connections are secure.

### **Encoder Test**

The encoder test is another diagnostic test that gives information about the performance of the encoders themselves. Select "ENCODER TEST" from the list of hidden functions using the arrow buttons and press **Enter**.

The LCD screen will now display two lines of data. The top line of data corresponds to the altitude encoder, while the lower line of data corresponds to the azimuth encoder. The first two digits on each line denote the amplitude of the signal from one of the magnetic sensors on the encoder board, the second two digits represent the amplitude from the other sensor on the encoder board. The numbers are in hexadecimal (base 16) digits. Therefore "A" in hexadecimal represents "11" in decimal, "B" represents "12" in decimal, "C" represents "13," "D" represents "14," "E" represents "15," and "F" represents "16." When moving the telescope in altitude or azimuth, you will note that each of the digit pairs rises and falls. None of the digit pairs should ever go above "F3." If they do, then the encoder disk is too close to the sensors on the encoder board. This will generally not happen in altitude, but can happen in azimuth.

If you notice that the first or second digit pair on the second line of the display goes above "F3," then try loosening the lock nut on the azimuth nut of the base by about 1/16 turn. If this does not work, you will need to disassemble the azimuth encoder (azimuth encoder disk, brass bushing, and azimuth encoder board) and reassemble it carefully according to the instructions that came with the IntelliScope Dobsonian telescope itself.

If you notice that the two digit pairs on the first line are going above "F3," then there is a problem with your altitude encoder assembly. More than likely, the altitude encoder disk is bent.

The three-digit number displayed after the digit pairs on each line is the "radius" for each encoder. This number should not go above about 125 or below about 30. If it does, performance may be compromised for the corresponding encoder. If the number goes above 125, then the encoder disk and magnet may be too close to each other. If the number goes below 30, then the encoder disk and magnet may be too far away from each other. Also, if the radius varies by more than 30 counts in a cycle, encoder performance may not be optimal, and you should contact Orion's Customer Service Department.

The four-digit number at the end of each line is the raw encoder "ticks" in hexadecimal numbers. This information will generally not be useful for diagnostic testing of the encoders.

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### **Download**

This function allows downloading of software changes and upgrades available from Orion's website. To use this option, you must have the optional IntelliScope-to-PC cable, available from Orion. Check [www.telescope.com](http://www.telescope.com) for more information about available software downloads for the IntelliScope Computerized Object Locator.

### **Checksum**

The checksum function is used to make sure that software has loaded into the controller properly. It has no purpose until a new software version is downloaded. Check the IntelliScope download section on [www.telescope.com](http://www.telescope.com) to see what the proper checksum should be for each new software version.

### **Rewrite**

Rewrite is also only used after a new software version has been downloaded. It rewrites the new software into its memory in order to prevent any potential problems from arising after the software transfer.

### **Clock**

This function allows use of the IntelliScope system with equatorial platforms for Dobsonian telescopes. If you are using your IntelliScope with a Dobsonian equatorial platform, press **Enter** when the selection "CLOCK" is displayed from the available "hidden" function choices. The LCD screen will then show the word "ON" blinking. For normal operation of the IntelliScope system, the controller's internal clock should be on. For use with a Dobsonian equatorial platform, use the up or down arrow button to change "ON" to "OFF," and press **Enter**. The controller is now ready to be used with a Dobsonian equatorial platform. Now, when you press **Power** to turn the controller on, the LCD screen will state "CLOCK IS OFF" on the second line of its introduction screen.

To turn the controller's internal clock back on, access the hidden functions, select "CLOCK," press **Enter**, change the "OFF" back to "ON," and press **Enter** again.

## **13. Specifications**

Objects in database:

- 110 Messier objects
- 7840 New General Catalog objects
- 5386 Index Catalog objects
- 8 Major planets
- 99 User-defined objects

Computer interface: RS-232 port

Power: Requires one 9V battery

This device complies with Part 15 of the FCC Rules. 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 operation.

Changes of modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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*Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an output on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.
- A shielded cable must be used when connecting a peripheral to the serial ports.

## **Appendix A: Troubleshooting the IntelliScope System**

This section is intended to help you if you are encountering any problems with your IntelliScope system. If this information is not useful to you in determining the source of the problem, contact Orion Technical Support via phone or email.

### **Azimuth encoder, in general**

1. Is the azimuth axis screw's hex lock nut tight enough? Is it too tight? Remember, it should be tightened 3/16 to 1/4 turn past when the fender washer is no longer loose under the nut.
2. Does the brass bushing extend slightly above the top surface of the top baseplate? If not, the bushing or top baseplate may need replacement, or there may be an assembly problem.
3. Is the azimuth encoder disk (magnet) bent? If so, you will need to flatten it by bending.
4. Is the azimuth encoder board trimmed flush on the side in contact with the top baseplate? If not, the board will not seat flat against the baseplate and this may cause the encoder's sensors to come too close to the encoder disk.
5. Is the brass bushing properly registered with the azimuth encoder disk? The feature on the front of the bushing needs to seat into the hole in the disk.

### **Altitude encoder, in general**

6. Is the altitude encoder disk significantly bent? If so, the altitude encoder assembly will need replacement. Also, if the altitude encoder mounting screws are loose, there is an increased chance of the user bending the altitude encoder disk.



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**Warp factor consistently above  $\pm 0.5$  but below  $\pm 2.0$** 

7. Check accuracy of vertical stop. Use a carpenter's level to do this.
8. Are alignment stars being centered with reasonable precision? A high-power eyepiece (at least 10mm focal length), or an illuminated reticle eyepiece (preferred) is recommended.
9. Check encoders as outlined previously.
10. Try to use alignment stars that are well above the horizon. Light from stars is refracted as it travels through the atmosphere and starlight near the horizon has to travel through the greatest amount of atmosphere before reaching your telescope. Stars near the horizon can appear as much as  $2^\circ$  away from their actual position.
11. Avoid long delays between aligning on the first and second alignment stars. The stars in the night sky appear to move due to the rotation of the Earth. If you take more than a few minutes to align on the second star, this stellar motion will result in an increase in the warp factor (and decrease the resultant pointing accuracy). This is because the controller does not yet have a frame of reference to tell which way the stars should appear to be moving before the second star is aligned on.

**Warp numbers larger than 2.0**

12. Are the stars you aligned on actually the stars you select-ed on the controller? Consult the finder charts in Appendix A if you are unsure.
13. The encoder sensors may be coming into contact with the encoder disks. Check both the altitude and azimuth encoders as outlined above.

**Altitude readouts do not change when you move the scope (during "ALT AZM TEST")**

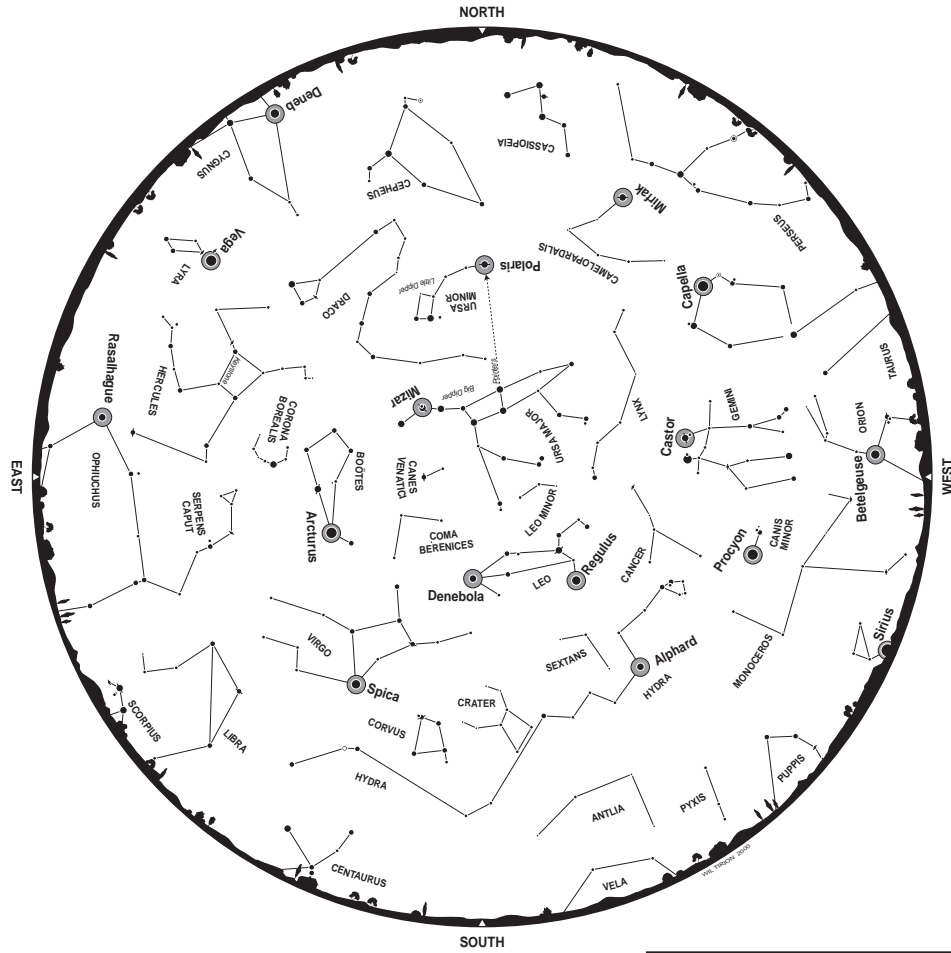
14. Check the altitude cable's connections.
15. Make sure the knob that goes through the altitude encoder is tight.

**Azimuth readouts do not change when you move the scope (during "ALT AZM TEST")**

16. Check the azimuth cable's connections.
17. Make sure the hex lock nut on the azimuth axis screw is tight. The fender washer underneath the hex lock nut should not be able to move. Remember, the hex lock nut should be tightened about  $3/16$  to  $1/4$  turn beyond the point where the washer cannot move any longer.
18. Try disassembling then reassembling the azimuth encoder by disassembling the top and bottom groundboards of the base.

If you need to contact Orion Technical Support, email [support@telescope.com](mailto:support@telescope.com) or call (800) 676-1343.

# Appendix B: Alignment Star Finder Charts



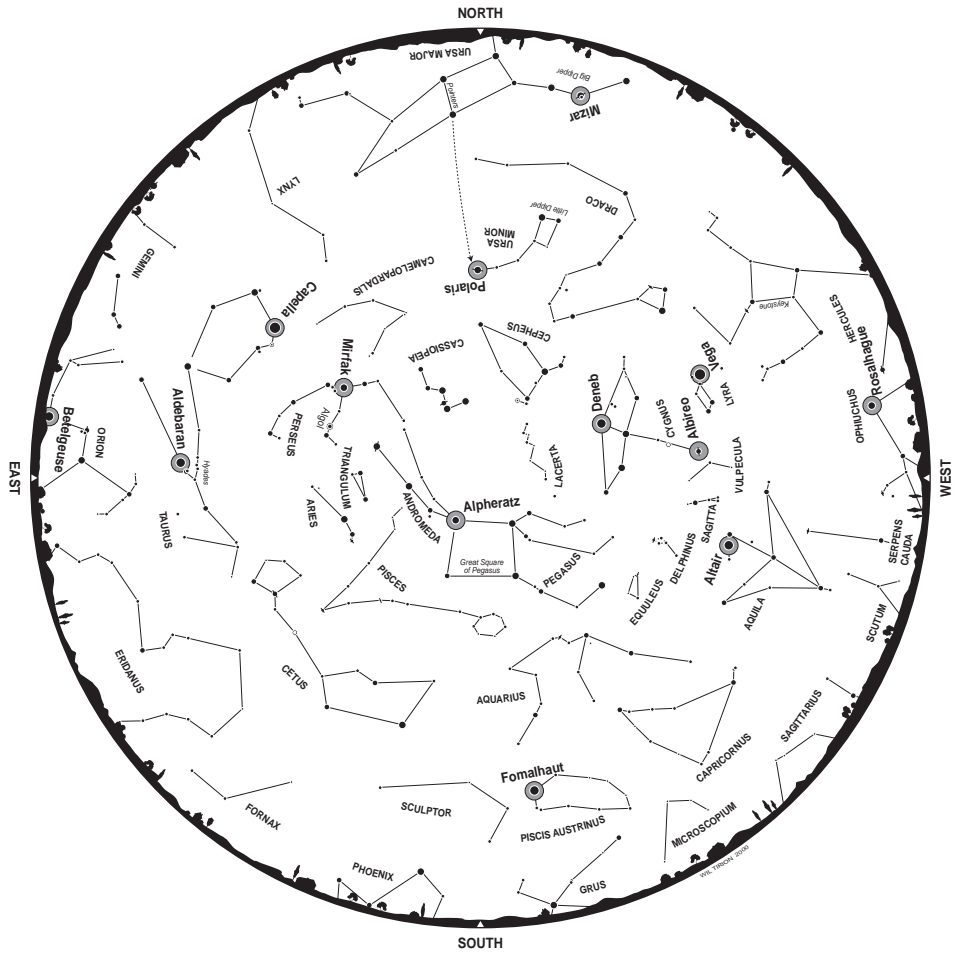
SPRING	
Early March	1:00 AM
Late March	12:00 AM
Early April	12:00 AM*
Late April	11:00 PM*
Early May	10:00 PM*
Late May	9:00 PM*
Early June	8:00 PM (dusk)*

\*Daylight saving time



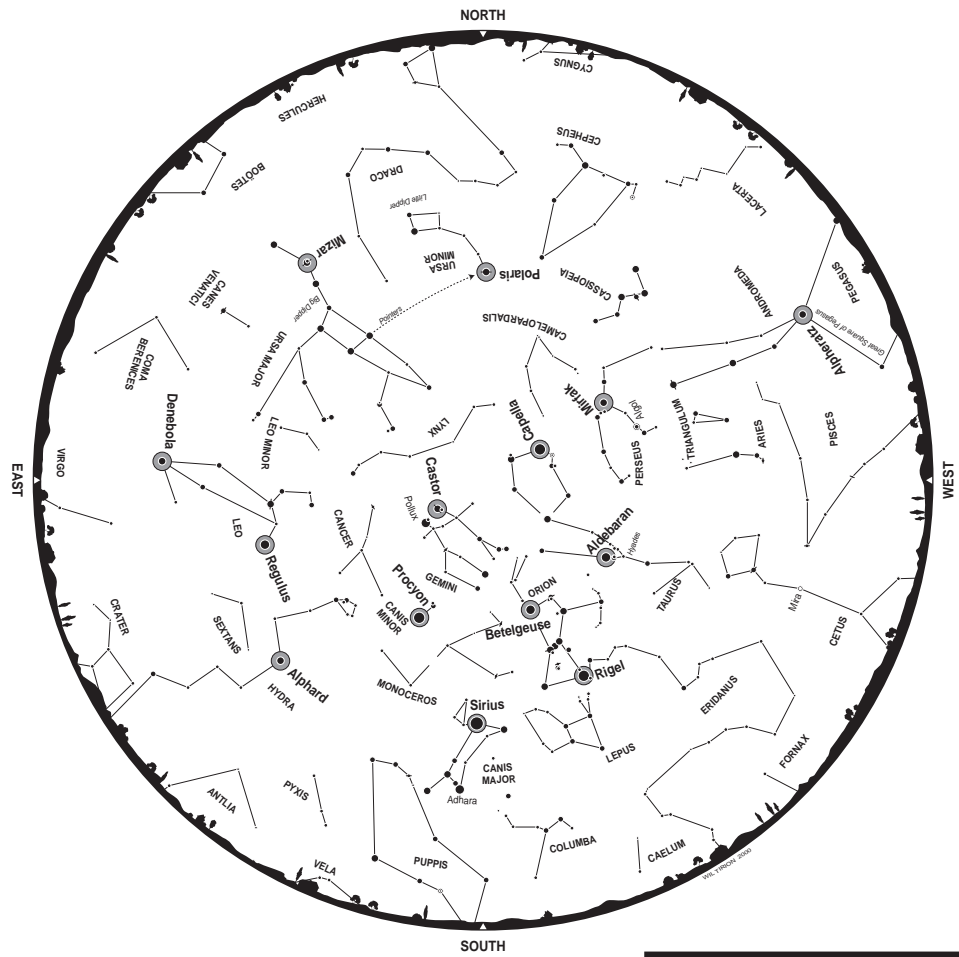
SUMMER	
Early June	2:00 AM*
Late June	1:00 AM*
Early July	12:00 AM*
Late July	11:00 PM*
Early August	10:00 PM*
Late August	9:00 PM*
Early September	8:00 PM (dusk)*

\*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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## Appendix C: Constellation Abbreviations

And	Andromeda	CVn	Canes Venatici	Ori	Orion
Ant	Antlia	Cyg	Cygnus	Pav	Pavo
Aps	Apus	Del	Delphinus	Peg	Pegasus
Aql	Aquila	Dor	Dorado	Per	Perseus
Aqr	Aquarius	Dra	Draco	Phe	Phoenix
Ara	Ara	Equ	Equuleus	Pic	Pictor
Ari	Aries	Eri	Eridanus	PsA	Piscis Austrinus
Aur	Auriga	For	Fornax	Psc	Pisces
Boo	Boötes	Gem	Gemini	Pup	Puppis
Cae	Caelum	Gru	Grus	Pyx	Pyxis
Cam	Camelopardalis	Her	Hercules	Ret	Reticulum
Cap	Capricorn	Hor	Horologium	Scl	Sculptor
Car	Carina	Hya	Hydra	Sco	Scorpius
Cas	Cassiopeia	Hyi	Hydrus	Sct	Scutum
Cen	Centaurus	Ind	Indus	Ser	Serpens
Cep	Cepheus	Lac	Lacerta	Sex	Sextans
Cet	Cetus	Leo	Leo	Sge	Sagitta
Cha	Chamaeleon	Lep	Lepus	Sgr	Sagittarius
Cir	Circinus	Lib	Libra	Tau	Taurus
Cnc	Cancer	LMi	Leo Minor	Tel	Telescopium
CMa	Canis Major	Lup	Lupus	TrA	Triangulum Australe
CMi	Canis Minor	Lyn	Lynx	Tri	Triangulum
Col	Columba	Lyr	Lyra	Tuc	Tucana
Com	Coma Berenices	Men	Mensa	UMa	Ursa Major
CrA	Corona Australis	Mic	Microscopium	UMi	Ursa Minor
CrB	Corona Borealis	Mon	Monoceros	Vel	Vela
Crt	Crater	Mus	Musca	Vir	Virgo
Cru	Crux	Nor	Norma	Vol	Volans
Crv	Corvus	Oct	Octans	Vul	Vulpecula
		Oph	Ophiuchus		

# Appendix D: ST Catalog

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST001	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST001	OY2254		00 01.2	+60 21	7.6	59"	Cas	colored double star
ST002	30		00 02.0	+66 0	4.4	*	Psc	red variable star
ST003	Y3053		00 02.6	+66 06	5.9	15"	Cas	retired double star
ST004	SU		00 04.6	+43 5	8	*	And	red variable star
ST005	Ced214		00 04.7	+67 5	7.8	30"	Corp	emission nebula
ST006	Y3062		00 06.3	+58 4	6.4	1.5"	Cas	double star challenge
ST007	Alpheratz	ADS 61	00 08.3	+29 05	2.1	*	And	double star challenge
ST008	Alpha 102	ADS 102	00 09.4	+79 7	6.6	0.8"	Corp	double star challenge
ST009	Beth	Gamma	00 09.4	+28 00	6.6	2"	And	double star challenge
ST010	Kappa	Gamma	00 13.2	+15 2	2.8	*	Peg	star
ST011	Algenib	ADS 180	00 14.5	+07 8	4.4	1.5"	Cet	red variable star
ST012	AD		00 14.6	+18 9	4.4	*	Cet	red variable star
ST013	Y12		00 15.0	+08 49	5.8	12"	Psc	red variable star
ST014	S	"35_UU"	00 15.4	+32 1	7.5	*	And	variable double star
ST015	Y13		00 16.2	+76 9	6	0.9"	Corp	variable star
ST016	ST		00 17.6	+50 3	6	*	And	double star challenge
ST017	Groombridge34	ADS 246	00 18.1	+44 0	8	39"	Cas	double star
ST018	Y24		00 18.5	+26 08	7.6	5"	And	double star
ST019	Iota		00 19.4	+08 8	3.5	*	And	star
ST020	VX		00 19.9	+44 7	8	*	And	star
ST021	R		00 24.0	+38 55	5.8	Stellar	And	variable star
ST022	Y30		00 27.2	+49 59	6.9	15"	And	double star
ST023	AO		00 27.6	+35 6	6.9	*	Cas	double star
ST024	Beta	Lacaille 119	00 31.5	+63 0	4.4	27"	Tuc	red variable star
ST025	Y36	ADS 449	00 32.4	+06 9	5.7	28"	Psc	double star
ST026	Zeta	17	00 37.0	+53 9	3.7	*	Cas	star
ST027	Delta		00 39.3	+30 9	3.3	*	And	star
ST028	55		00 39.9	+21 26	5.4	6"	Psc	colored double star
ST029	Schedar	Alpha	00 40.5	+56 5	2.2	*	Cas	star
ST030	OY18	ADS 588	00 42.4	+04 2	7.8	1.5"	Psc	double star challenge
ST031	HN122	ADS 624	00 45.7	+07 6	5.7	36"	Cas	double star
ST032	Delta		00 48.7	+07 6	4.4	*	Psc	star
ST033	Epsilon		00 49.1	+57 49	3.4	12"	Cas	colored double star
ST034	65	ADS 683	00 49.9	+27 7	6.3	4.4"	Psc	colored double star
ST035	Do13		00 50.0	+64 1	11	13"	Cas	scattered group of stars
ST036	Lambda1	Dunlop 2	00 52.4	+69 5	6.5	24"	And	double star
ST037	36	ADS 755	00 55.0	+23 6	6.5	0.8"	Tuc	double star challenge
ST038	Navii	"Gamma, Tsit"	00 59.7	+60 7	2.5	*	And	star
ST039	Y80		01 00.1	+40 47	6.4	26"	Cas	double star equal magnitude
ST040	U		01 02.3	+81 51	6.8	8"	And	double star equal magnitude
ST041	Y88	74	01 05.6	+21 28	5.3	30"	Corp	variable star
ST042	Y90	77	01 05.8	+04 55	6.8	39"	Psc	double star equal magnitude
ST043	Y90		01 05.8	+04 55	3.9	6.4"	Psc	double star
ST044	Zeta	Rumker 2	01 08.4	+10 3	3.5	*	Phe	star
ST045	Eta	SAO 181	01 08.7	+86 3	4.3	*	Cet	star
ST046	Lambda Lyridae		01 09.7	+35 6	4.3	*	And	star
ST047	Mirach	ADS 996	01 13.7	+07 6	5.6	23"	Corp	star
ST048	Zeta		01 13.7	+07 6	5.6	23"	Psc	double star
ST049	Kappa	h3423	01 15.8	+68 9	5.1	5.4"	Tuc	double star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST050	Z		01 16.2	+25.8	8.8	*	Pec	star
ST051	Y113	42	00 31	+00.31	6.4	1.6"	Cet	double star challenge
ST052	Psi	ADS 1129	+68.1	-6.1	4.7	25"	Cas	double star magnitude contrast
ST053	R		01 27.0	-32.5	6.1	*	Sgr	variable star
ST054	Gamma		01 28.4	-42.3	3.4	4'	Phe	star
ST055	Achernar	Alpha	01 37.7	-57.14	3.4	*	Eri	star
ST056	51		01 38.0	+48.6	3.6	*	And	stable star
ST057	UV		01 38.8	-18.6	7	*	Cet	variable star
ST058		Dunlop 5	01 39.8	+56.2	5.8	11.5"	Pec	double star
ST059	Nu	106	01 41.4	+05.5	4.4	*	Eri	star
ST060	44	Bunham 1103	01 43.3	+50.7	4.4	1.6"	Cas	double star
ST061	Phi		01 43.7	+50.7	4.4	*	Pec	star
ST062	Y162		01 49.3	+47.54	5.8	2"	Pec	triple star challenge
ST063	Y174	1	01 50.1	+22.3	6.8	2.6"	And	double star
ST064	Y163		01 51.1	+64.51	6.6	35"	Pec	colored star
ST065	Batei	Zeta	01 51.5	-10.3	3.7	3'	Cas	double star
ST066	Y178		01 52.0	+10.48	8.5	3"	And	double star
ST067	Y180	Gamma	01 53.5	+19.3	4.2	8"	And	double star equal magnitude
ST068	Psi		01 53.6	+63.7	4.2	5"	Phe	double star equal magnitude
ST069	Epsilon	45	01 54.4	+63.7	3.4	*	Phe	red variable star
ST070	ADS 1538		01 55.9	+01.9	6.8	1"	Cas	variable star challenge
ST071	56	ADS 1534	01 56.2	+37.3	5.7	3'	Cet	double star
ST072	Lambda	ADS 1563	01 57.9	+23.6	4.8	37"	And	double star
ST073	Lambda		02 00.0	-21.6	4.8	*	And	double star
ST074	Y202	Alpha	02 02.0	+02.8	4	1.6"	Pec	star
ST075	Himach	Gamma	02 03.9	+42.3	2.2	10"	And	double star challenge
ST076	59	Alpha	02 07.2	+23.5	2	*	And	colored double star
ST077	59		02 10.9	+39.02	5.6	16"	And	star
ST078	Iota	ADS 1697	02 12.4	+30.92	5.6	3.8"	And	star
ST079	Y231	66	02 12.8	-02.3	5.7	16.5"	And	star
ST080	Y228		02 14.0	+47.5	6.6	1.1"	And	star
ST081	Y232	ADS 1709	02 14.7	+30.24	8	7"	And	double star challenge
ST082	Y239		02 17.4	+28.44	7	14"	And	double star equal magnitude
ST083	Mira	Omicron	02 19.3	-03.04	2	*	Cet	double star
ST084	Iota		02 29.1	+67.4	4	2.2"	Cas	variable star
ST085	Y268		02 29.4	+55.31	6.9	3"	Cas	triple star
ST086	Y274		02 31.8	+89.16	7.3	14"	Cet	double star
ST087	Polaris	Alpha	02 31.8	+89.16	2	18"	UMi	double star equal magnitude
ST088	Omega	h.3506	02 33.9	-28.13	5	18"	Eri	double star
ST089	30		02 37.0	+24.38	6.5	39"	Eri	colored double star
ST090	R	R TRI	02 37.0	+24.38	5.4	*	And	colored double star
ST091	Y299	Gamma	02 43.3	+03.2	3.6	2.7"	Cet	variable star
ST092	Y305		02 47.5	+19.22	7	3"	And	double star
ST093	RZ		02 48.9	+69.58	6.2	Stellar	Cas	double star challenge
ST094			02 49.3	+17.28	5.2	3"	And	variable star
ST095	Y307	Eta	02 50.7	+55.53	3.6	28"	Pec	triple star
ST096	R		02 50.7	+55.53	4.7	*	Pec	double star magnitude contrast
ST097	Y330	ADS 2237	02 57.2	+00.6	7.3	9"	Hor	variable star
ST098	Acamar	Theta	02 58.3	-40.3	3.5	8"	Cet	double star
ST099	Y333	Epsilon	02 59.2	+29.3	4.6	1.4"	Eri	double star
ST100	Fusion		02 59.2	+21.20	4.6	1.4"	And	double star challenge
ST101	Y331		03 00.8	+52.20	5.6	12"	Pec	double star
ST102	Menkar	Alpha	03 02.3	+04.8	3.2	*	Cet	star
ST103	25		03 05.2	+38.8	3.4	*	Pec	red variable star
ST104	Y320		03 06.2	+79.24	5.8	5"	Cep	colored double star



Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST106	h3568		03 07.5	-79.0	5.6	15"	Hvi	double star
ST106	Algeni	Beta	+41.0	2.2	*	*	Per	variable star
ST107	h3569	ADS 2402	03 12.1	-29.0	6	5"	Err	double star
ST108	h3566		03 12.4	-44.4	6	3.5"	Err	double star
ST109	h362		03 16.3	+60.02	8.5	7"	Cam	double star
ST110	h369		03 17.2	+40.29	6.7	3"	Cam	colored star, equal magnitude
ST111	ADS2446		03 17.2	+38.6	7.8	0.9"	Per	colored double star
ST112	Zeta		03 18.2	-62.5	5.2	5"	Per	double star, challenge
ST113	Roda	ADS 2472	03 19.5	-21.8	3.7	*	Ret	star
ST114	Topas, Topaz	SAO 75871	03 20.3	+29.0	4.5	9"	Err	star
ST115	Mirfak	Alpha	03 24.3	+49.52	4.8	*	Per	star
ST116	Y		03 27.7	+44.2	4.8	*	Per	star
ST117	h394		03 28.0	+20.27	7.1	7"	Per	variable star
ST118	h385	ADS 2544	03 29.1	+59.6	4.2	2.4"	Per	double star
ST119	h389		03 30.1	+59.21	6.5	2.7"	Cam	double star
ST120	Sigma		03 30.6	+48.6	4.2	*	Cam	double star
ST121	Epsilon		03 31.3	+27.34	6.4	11"	Per	star
ST122	Epsilon		03 32.9	+09.5	3.7	*	Tau	double star, equal magnitude
ST123	h400	ADS 2612	03 35.0	+60.0	6.8	1.4"	Err	star
ST124	OY36	ADS 2660	03 40.0	+63.9	6.8	46"	Cam	double star
ST125	U1		03 41.6	+62.6	8.4	*	Cam	variable star
ST126	Omicron	ADS 2726	03 44.3	+32.3	3.8	*	Per	star
ST127	Pi	26	03 46.1	-12.1	4.8	*	Per	red variable star
ST128	Gamma		03 47.2	-14.2	3.2	*	Hvi	star
ST129	h52	30	03 48.3	+11.2	5.2	9"	Hvi	double star
ST130	A 16	SAO 12916	03 48.6	-37.37	4.9	8"	Tau	double star, equal magnitude
ST131	BE		03 49.5	+65.5	4.5	*	Err	star
ST132	Afik	Z68	03 54.1	+31.5	2.9	*	Per	star
ST133	32	ADS 2860	03 54.3	+03.0	5.9	7"	Per	star
ST134	Epsilon		03 57.9	+40.01	2.9	9"	Per	colored double star
ST135	Zaurak	Gamma	03 58.0	-13.5	3.3	*	Per	double star, magnitude contrast
ST136	Lambda	35	04 00.7	+12.5	3.3	*	Tau	variable star
ST137	OY31	ADS 2995	04 07.6	+38.1	7.4	1.4"	Per	double star, challenge
ST138	Y485	SZ	04 07.8	+62.20	7	90"	Cam	double star
ST139	Omicron2	40	04 15.2	+07.7	4.5	83"	Err	triple star, challenge
ST140	Epsilon		04 16.5	-59.3	4.5	*	Ret	variable star
ST141	Theta	Rumpker 3	04 17.7	-63.3	6.2	4"	Ret	double star
ST142	Pi	ADS 3137	04 20.4	+27.4	5.2	4"	Tau	double star
ST143	h528	Chi	04 22.6	+19.32	8.4	Stellar	Tau	variable star
ST144	ADS3169		04 22.7	+25.6	5.5	19.4"	Tau	double star
ST145	h 184	Upsilon3	04 24.0	-34.0	7.3	1.4"	Tau	double star, challenge
ST146	h 184		04 24.0	-34.0	7.3	1.4"	Tau	double star, challenge
ST147	h 184		04 27.9	-21.30	7.3	1.7"	Err	double star, challenge
ST148	h 184		04 31.4	+40.01	5.4	10"	Per	double star, equal magnitude
ST149	h 184		04 32.0	+53.55	5.4	3"	Cam	colored double star
ST150	h 184		04 33.5	+18.01	6.9	3"	Tau	double star, equal magnitude
ST151	h 184	ADS 3305	04 33.9	+08.7	5.7	4"	Err	double star, equal magnitude
ST152	h 184	Alpha	04 35.9	+16.5	0.6	30"	Tau	double star
ST153	h 184	48	04 36.3	+03.5	3.9	11"	Err	colored double star
ST154	h 184		04 38.2	-14.3	3.9	*	Err	star
ST155	h 184		04 38.5	+26.56	7.3	4"	Tau	variable star, equal magnitude
ST156	h 184		04 40.4	-19.7	4.3	*	Tau	red variable star
ST157	h 184		04 40.5	-38.2	6.7	*	Err	variable star
ST158	h 184	55	04 43.6	+08.48	6.7	9"	Cae	double star, equal magnitude
ST159	h 184	Dunlop 18	04 50.9	-53.5	5.6	12"	Pic	double star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST160	ST		04 51.2	+68 10	9.2	Stellar	Cam	1
ST161	ST	RV	04 51.2	+68 10	3.7	*	Orl	21
ST162	TT	3	04 51.6	+28 6	3.7	*	Thu	22
ST163	PI5	8	04 54.2	+02.3	8	*	Orl	21
ST164	Omicron2	9	04 56.4	+13.5	4.1	*	Orl	21
ST165	Iota		04 57.0	+33.2	2.7	*	Aur	21
ST166	Pi6	10	04 58.5	+01.7	4.5	*	Orl	21
ST167	Theta	ADS 3572	04 59.3	+37.9	5.9	5.4"	Aur	2
ST168	Hings Crimson Star	R	04 59.6	-14.8	6.9	*	Lep	22
ST169	Y627		05 00.6	+03.36	6.6	21"	Orl	3
ST170	Y631	ADS 3606	05 00.7	-13.5	7.6	5.5"	Lep	2
ST171	Y630	ADS 3623	05 02.0	+01.6	6.3	15"	Orl	2
ST172	Epsilon		05 02.0	+43.49	2.9	Stellar	Aur	22
ST173	Zeta	8	05 02.5	+41.2	3.8	*	Orl	21
ST174	Zeta		05 05.4	+01.2	8.6	*	Orl	22
ST175	Epsilon		05 05.4	-22.4	3.9	*	Lep	21
ST176	Epsilon		05 06.5	+41.2	3.2	*	Orl	21
ST177	O398	10	05 07.9	+08.29	5.6	0.7"	Orl	4
ST178	TX	14	05 09.1	+39.0	8.5	*	Aur	22
ST179	SY		05 09.8	-05.8	9	*	Orl	22
ST180	Y644		05 10.4	+37.17	6.8	2"	Aur	4
ST181	Y655	Iota	05 12.3	-11.9	4.5	13"	Lep	2
ST182	Rigel		05 14.5	+02.52	4.5	7"	Orl	5
ST184	Beta ORI		05 15.4	-08.2	5.1	9.4"	Orl	9
ST185	Y653	14	05 15.4	+32.7	5.1	11"	Aur	6
ST186	Castella	Alpha	05 16.7	+46.00	0.1	*	Aur	21
ST187	S 476		05 19.3	-18.30	6.2	39"	Lep	3
ST188	h3750		05 20.5	-21.14	4.7	4"	Lep	9
ST189	UV		05 21.8	+32.5	7.4	*	Aur	22
ST190	ADS3954		05 21.8	-24.8	5.5	3.2"	Lep	2
ST191	Y696	ADS 3962	05 22.8	+03.6	6	32"	Orl	2
ST192	Y701	ADS 3978	05 23.3	-08.6	6	6"	Orl	2
ST193	Iota		05 24.5	-02.24	3.4	1.5"	Orl	4
ST194	Sigma	ADS 3984	05 24.7	+37.24	5	9"	Aur	2
ST195	Dunlop 20		05 24.8	-52.3	6.8	38"	Pic	2
ST196	Bullatrix	Gama Ori	05 25.1	+06.3	1.6	*	Orl	21
ST197	Y698	ADS 4000	05 25.2	+34.9	6.6	31"	Aur	2
ST198	Y716	118	05 29.7	+25.09	5.8	5"	Thu	2
ST199	Y725	318	05 29.7	-01.1	4.7	*	Orl	21
ST200	TL9	KBC Group	05 30.0	+17.0	5.7	5°	Thu	0
ST201	Delta	ADS 4134	05 32.0	-00.3	2.2	53"	Orl	2
ST202	119	CE	05 32.2	+18.6	4.7	*	Thu	21
ST203	Y718		05 33.2	+07.24	7.5	8"	Aur	3
ST204	RT		05 33.2	+07.24	7.5	8"	Orl	22
ST205	Y747	ADS 4182	05 35.0	-06.2	4.8	36"	Orl	9
ST206	Lambda		05 35.1	+09.56	3.4	4"	Orl	2
ST207	Y752 Iota		05 35.3	-05.23	5.4	13"	Orl	9
ST208	Y752 Iota		05 35.3	-05.55	2.9	11"	Orl	9
ST209	Alhiam		05 36.2	-01.2	4.7	*	Orl	21
ST210	Phi2	Epsilon	05 36.9	+09.3	1.7	*	Orl	21
ST211	Zeta	123	05 37.6	+21.1	3	*	Thu	21
ST212	Sigma		05 38.7	-02.36	3.7	11"	Orl	7
ST213	Rheta	Alpha	05 39.6	-34.1	2.6	*	Orl	21
ST214	Alnitak	Zeta	05 40.8	-01.9	2.6	2.4"	Orl	9
ST214	UZ		05 42.2	+62.5	7.7	*	Cam	22

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Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST215	Gamma	ADS 4334	05 44.5	-22.5	3.7	97"	Lep	double star
ST216	Y		05 45.7	+20.7	7.1	*	Tou	variable star
ST217	Mu	SAO 196149	05 46.0	-32.3	5.2	*	Col	star
ST218	Saiph	Kappa	05 47.8	-39.7	5.2	*	Orl	star
ST219	Y795	57	05 48.0	+06.27	6.1	"1.3"	Orl	double star challenge
ST220	Beta	Wazn	05 51.0	-35.6	3.1	*	Col	double star
ST221	Delta		05 51.3	-20.9	3.8	*	Lep	star
ST222	Nelta		05 51.5	+39.1	3.8	30"	Lep	star
ST223	Y817		05 54.9	+07.02	8.8	19"	Orl	double star equal magnitude
ST224	Beteigeuse	Alpha	05 55.2	+07.24	0.5	Stellar	Orl	star
ST225	U		05 55.2	+20.24	5.3	*	Orl	star
ST226	Theta		05 59.7	+37.13	2.6	3.5"	Aur	variable star
ST227	Pi		05 59.9	+45.9	4.3	1"	Aur	double star magnitude contrast
ST228	A23		06 04.8	-48.27	7	2.7"	Pup	double star
ST229	Y865		06 09.0	+02.30	6	30"	Gem	double star
ST230	TU		06 10.9	+26.0	7.5	*	Gem	double star
ST231	Y845	41	06 11.7	+48.42	7	8"	Aur	double star
ST232	SS		06 13.4	+47.0	10	*	Aur	variable star
ST233	Gamma		06 14.9	-06.3	4	8"	Mon	star
ST234	Pi	Eta	06 14.9	+22.5	3.3	*	Gem	star
ST235	Y872	ADS 4849	06 15.6	+36.2	6.9	11"	Aur	double star
ST236	KS		06 19.7	-05.2	9.5	*	Mon	variable star
ST237	Zeta	Furud	06 20.3	-30.1	3.5	8.5"	Orl	star
ST238	V		06 22.7	-02.2	6	*	Orl	variable star
ST239	Mirzam	Beta	06 22.7	-18.0	2	*	Orl	star
ST240	Mu		06 23.0	+22.5	2.9	*	Gem	star
ST241	8		06 23.0	+04.36	4.3	13"	Gem	star
ST242	Canopus	Alpha	06 24.0	-52.42	-0.7	*	Mon	star
ST243	BL		06 25.5	+14.7	8.5	27"	Orl	variable star
ST244	15		06 27.8	+20.47	6.6	27"	Orl	variable star
ST245	Beta		06 28.8	-07.02	3.8	3"	Gem	double star
ST246	ADS150		06 31.8	+39.6	11.5	4.5"	Mon	triple star
ST247	Y924		06 32.3	+17.8	6.7	20"	Aur	double star
ST248	ADS188	20	06 34.3	+38.8	6.7	43"	Gem	double star
ST249	CR		06 34.4	+16.1	8.5	*	Aur	double star
ST250	Y928		06 34.7	+38.4	7.6	3.5"	Gem	double star
ST251	ADS5201	ADS 5191	06 35.1	+37.1	7.4	2.6"	Aur	double star
ST252	Y929		06 35.4	+37.7	7.4	6"	Aur	double star
ST253	Y939	ADS 5208	06 35.9	+05.3	8.3	30"	Mon	double star
ST254	ADS5221		06 36.2	+38.0	8.5	1.3"	Aur	double star challenge
ST255	Nu1		06 36.4	-18.7	8.5	17.5"	Orl	colored double star
ST256	UU		06 36.5	+38.5	5.1	*	Orl	variable star
ST257	ADS5240		06 36.9	+38.2	9.7	2.2"	Aur	double star
ST258	ADS5245		06 37.3	+38.4	8.8	10"	Aur	double star
ST259	Solaris29		06 37.6	+12.2	7.6	70"	Gem	double star
ST260	Inns		06 38.0	-61.2	6.6	2.4"	Pic	double star
ST261	ADS5265		06 38.4	+38.8	9.4	4.6"	Aur	double star
ST262	Inns1156	ADS 5311	06 39.1	-29.1	8.6	0.7"	Orl	double star challenge
ST263	SAO172106		06 39.5	+30.0	7.8	2.5"	Orl	double star
ST264	Y953		06 41.2	+08.89	7.4	7"	Mon	double star
ST265	VW		06 42.2	+31.5	8.7	*	Orl	double star
ST266	Sirius	Alpha	06 45.1	-16.7	8.7	9"	Gem	double star
ST267	Y948	12	06 46.1	+59.27	4.9	2"	Orl	double star magnitude contrast
ST268	Y958		06 46.2	+59.27	4.9	2"	Lyn	triple star challenge
ST269	Y958		06 48.2	+55.42	5.5	5"	Lyn	double star equal magnitude
ST269	Kappa	13	06 49.8	-32.5	4	*	Orl	star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST270	X963	14	06 53.1	+59.5	5.7	0.4"	Lyn	double star challenge
ST271	GY		06 53.2	-04.6	9.4	*	Mon	variable star
ST272	X987		06 54.1	-05.51	7.1	1.3"	Mon	double star challenge
ST273	Omicron1	16	06 54.1	-24.2	3.9	*	Cma	star
ST274	Theta	14	06 54.2	-12.0	4.1	*	Cma	star
ST275	38		06 54.6	+13.11	4.7	7"	Gem	star
ST276	X997	Mu	06 56.1	-14.02	5.3	2.8"	Cma	colored double star
ST277	BG		06 56.4	+07.92	9.2	*	Mon	double star magnitude contrast
ST278	O380		06 58.1	+14.2	7.3	2"	Gem	variable star
ST279	RV		06 58.4	+06.2	7.7	*	Mon	variable star
ST280	Epsilon	21	06 58.6	-29.0	1.5	7.5"	Cma	double star
ST281	Sigma	22	07 01.7	-27.9	3.5	*	Cma	star
ST282	Dunlop2	24	07 03.0	-23.8	3.5	*	Cma	star
ST283	Dunlop38		07 04.0	-43.6	5.6	20.5"	Pup	double star
ST284	Mekada	Zeta	07 04.1	+20.6	3.7	*	Gem	variable star
ST285	Y1009		07 05.7	+52.95	6.9	*	Lyn	double star equal magnitude
ST286	R		07 07.4	+22.7	6	*	Gem	variable star
ST287	W		07 08.1	-11.55	6.4	Stellar	Cma	red star
ST288	Gamma	Dunlop 42	07 08.8	-70.5	4.4	13.6"	Vol	variable star
ST289	Theta	ADS 5846	07 11.1	+30.2	4.4	1.9"	Gem	double star
ST290	Y1035		07 12.0	+22.17	8.2	4"	Gem	double star
ST291	Y1037	ADS 5871	07 12.8	+27.2	7.2	1.3"	Gem	double star equal magnitude
ST292	Omicron	28	07 14.8	-26.8	3.6	*	Gem	double star challenge
ST293	h3945		07 16.6	-23.19	4.3	27"	Cma	colored double star
ST294	Delta	h 3948	07 18.7	-24.57	4.3	15"	Cma	triple star
ST295	55		07 20.1	+21.59	3.5	6"	Cma	double star magnitude contrast
ST296	Y1062	19	07 22.9	+55.17	4.3	15"	Gem	triple star
ST297	Gamma	4	07 28.2	+08.9	4.3	*	Lyn	star
ST298	Sigma		07 29.2	-43.3	3.3	22"	Pup	double star
ST299	Y1093	ADS 6117	07 30.3	+50.0	8.8	0.8"	Lyn	double star challenge
ST300	Castor	"HN19, h269"	07 34.3	-23.28	5.1	10"	Pup	double star equal magnitude
ST301	Upsilon	Alpha	07 34.6	+31.9	2.1	1.8"	Gem	double star challenge
ST302	Upsilon	69	07 35.9	+26.9	4.1	2.5"	Gem	red star
ST303	Y1121		07 36.6	-14.29	7.9	7"	Pup	double star
ST304	K		07 38.8	-26.48	3.8	10"	Pup	double star equal magnitude
ST305	Procyon	Alpha	07 39.3	+05.14	3.8	10"	Pup	double star equal magnitude
ST306	O3179	Kappa	07 44.4	+24.23	3.7	7"	Chi	double star magnitude contrast
ST307	Y1138	2	07 45.5	-14.41	6.1	17"	Gem	double star equal magnitude
ST308	Y1127		07 47.0	+64.03	7	5"	Pup	triple star
ST309	Y1149		07 49.4	+03.13	7.9	22"	Cma	double star
ST310	Chi	V	07 55.1	+22.00	8.2	Stellar	Gem	variable star
ST311	Dunlop59		07 56.8	-52.0	3.5	4"	Gem	star
ST312	S-h66		07 59.2	-50.0	6.5	16"	Csr	double star
ST313	Nacos		08 02.5	+63.1	6.5	48"	Cma	double star
ST314	RT	Zeta	08 03.6	-40.1	2.3	4"	Pup	double star
ST315	RU		08 05.4	-36.8	6.5	*	Pup	variable star
ST316	RU		08 07.5	-22.8	8.3	*	Pup	variable star
ST317	Epsilon	Runkler 7	08 07.9	-66.6	4.3	6"	Vol	variable star
ST318	Gamma	Dunlop 65	08 09.5	+47.3	4.9	41"	Vol	double star
ST319	Zeta		08 12.2	+17.39	4.5	0.6"	Crc	double star
ST320	c	Runkler 8	08 15.3	+67.9	5.3	4"	Crc	triple star challenge
ST321	Beta	17	08 16.5	+09.2	3.5	*	Crc	double star
ST322	R		08 16.6	+11.7	6.4	*	Crc	variable star
ST323	Kappa		08 19.8	-71.7	5.4	65"	Vol	double star
ST324	AC		08 22.7	-15.9	8.3	*	Pup	variable star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST325	31		08 22.8	+43.2	4.3	15°	Lyn	star
ST326	Beth		08 25.7	+66.1	6°	6°	Vni	star
ST327	h4903		08 26.3	+39.1	6.5	8°	Pup	double star
ST328	Y1224	24	08 26.7	+24.32	7.1	6°	Crc	double star
ST329	Y1223	Phi	08 26.7	+26.56	6.3	5°	Crc	double star equal magnitude
ST330	h4104		08 29.1	+47.9	5.5	3.6°	Vni	double star
ST331	A70		08 29.5	+44.44	5.5	5°	Vni	double star
ST332	h4107		08 31.4	+39.04	6.4	4°	Vni	triple star
ST333	Y1245		08 35.8	+06.37	6.4	10°	Crc	double star
ST334	Sigma3	5 HYA	08 38.8	+03.3	4.4	*	Hya	double star challenge
ST335	h4128		08 39.2	+60.3	6.9	1.4°	Crc	double star
ST336	Y1254		08 40.4	+19.40	6.4	2.1°	Crc	quadruple star
ST337	Alpha		08 43.6	+32.2	3.7	*	Pvk	double star
ST338	Delta	Innes 10	08 44.7	+54.7	2.1	2.6°	Vni	double star
ST339	Y1270	ADS 6977	08 45.3	+02.6	6.4	5°	Crc	double star
ST340	Y1268	Iota	08 46.7	+28.46	4.4	30°	Hya	double star
ST341	Epsilon		08 46.8	+06.25	3.4	3°	Crc	double star
ST342	X		08 50.8	+35.03	7.5	4°	Hyd	double star magnitude contrast
ST343	Y1282		08 55.4	+17.2	5.6	4°	Crc	variable star
ST344	Y1298	66	09 01.4	+32.15	5.6	5°	Crc	double star
ST345	Rho		09 02.5	+67.6	4.8	1°	Uma	double star equal magnitude
ST346	Y1311		09 07.5	+22.59	6.6	8°	Crc	double star equal magnitude
ST347	Suhail	Lambda	09 08.0	+42.26	2.2	Stellar	Vni	double star magnitude contrast
ST348	Sigma2		09 10.4	+67.08	4.6	4°	Uma	double star
ST349	h4188		09 11.0	+59.0	3.6	50°	Crc	double star
ST350	h4189		09 12.5	+43.6	6.7	2.7°	Vni	double star
ST351	Y1321		09 14.4	+43.13	5.2	6°	Vni	double star magnitude contrast
ST352			09 14.9	+52.42	8.1	18°	Uma	double star equal magnitude
ST353			09 16.2	+57.42	4.3	5°	Crc	double star
ST354	RT		09 18.4	+51.4	8.6	*	Uma	variable star
ST355	Y1334	38	09 18.8	+36.48	3.6	3°	Uma	double star challenge
ST356	Y1338		09 21.0	+38.11	6.8	4°	Lyn	double star challenge
ST357	Alpha	40	09 21.1	+34.4	3.4	1°	Lyn	double star challenge
ST358	Kappa		09 22.1	+55.0	2.5	*	Vni	star
ST359	Y1347		09 23.3	+03.20	7.2	21°	Vni	double star
ST360	Kappa5	ADS 7351	09 24.7	+26.2	4.5	2.1°	Hya	triple star
ST361	Y1355		09 27.3	+08.14	7.5	2.3°	Hyo	double star equal magnitude
ST362	Alphard	Alpha	09 27.6	+09.4	2.5	Stellar	Hya	double star equal magnitude
ST363	Y1356	Omega	09 28.5	+09.4	5.9	0.5°	Hya	double star challenge
ST364	Dunlop76		09 28.6	+45.1	7.8	64°	Vni	double star
ST365	Y1360		09 30.6	+10.35	8.3	14°	Leo	double star equal magnitude
ST366	Zeta		09 30.8	+15.35	5.8	8°	Leo	double star
ST367	Neta		09 31.2	+57.0	3.4	*	Vni	star
ST368	Y1351	23	09 31.5	+63.03	3.8	23°	Uma	double star magnitude contrast
ST369	Alferr	Lambda	09 31.7	+23.0	4.3	*	Leo	double star
ST370	R		09 32.2	+62.8	3.8	*	Crc	variable star
ST371	Y1369	ADS 7438	09 35.4	+40.0	3.6	25°	Crc	double star
ST372	Iota		09 39.9	+01.0	3.5	*	Lyn	double star
ST373	Upsilon		09 47.1	+65.1	3.4	5°	Hya	double star
ST374	R	Runkner 11	09 47.6	+11.26	4.4	Stellar	Crc	double star
ST375	W	RV	09 51.0	+02.0	9.4	*	Leo	red variable star
ST376	Y		09 51.1	+23.0	8.3	*	Sex	variable star
ST377	Rasalas	Mu	09 52.8	+26.0	3.9	*	Hya	variable star
ST378	h4262	ADS 7571	09 54.5	+12.9	8.7	8°	Hyo	variable star
ST379	Regulus	Alpha	10 08.4	+11.58	1.4	Stellar	Leo	double star



Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST435	Y1633		12 20.6	+27.03	6.3	9"	Com	3
ST436	Epsilon		12 21.4	+60.4	9.6	*	Ura	21
ST437	M0	Winnicke 4	12 22.4	+58.95	9	50"	Vir	2
ST438	17	ADS 8591	12 22.5	+05.6	5	21"	Vir	2
ST439	Y1639	ADS 8599	12 24.4	+25.8	6.8	1.6"	Com	4
ST440	S		12 24.6	+49.6	9.2	*	Com	22
ST441	SS	RV	12 25.3	+00.48	9.2	Stellar	Vir	1
ST442	Acux	Alpha	12 26.6	+63.1	1	4.4"	Cru	2
ST443	3C273		12 29.1	+02.0	12.8	*	Vir	0
ST444	Algorab	Delta	12 29.9	+16.5	1	24"	Crv	2
ST445	Gamma	Gamma	12 31.2	+57.1	1.6	10"	Vir	2
ST446	X		12 31.6	+11.1	8	15"	Vir	2
ST447	Y1649	ADS 8585	12 35.1	+18.23	5	20"	CvN	5
ST448	24		12 37.2	+69.1	2.7	*	Mus	21
ST449	Alpha		12 37.7	+27.1	5.5	1.3"	Hya	1
ST450	ADS8612		12 41.3	+11.01	5.3	5"	Crv	3
ST451	Y1669		12 41.5	+49.0	2.2	1"	Crv	4
ST452	Gamma	h4539	12 41.7	+01.4	3.5	3"	Com	4
ST453	Porrima	Gamma	12 45.1	+45.26	4.7	Stellar	Vir	2
ST454	Y	RV	12 45.6	+61.0	4.7	27"	CvN	1
ST455	Iota	h4547	12 46.3	+69.1	3.7	1.4	Mus	4
ST456	Beta		12 47.7	+59.7	1.3	*	Cru	2
ST457	Mimosa	Beta	12 49.2	+83.25	5.3	22"	Com	21
ST458	Y1694	32	12 53.3	+21.14	5.1	26"	Com	3
ST459	Mu	Dunlop 126	12 54.6	+57.2	4.3	35"	Com	9
ST460	Delta		12 55.6	+03.4	3.4	*	Cru	2
ST461	Caroli	Alpha	12 56.0	+68.3	3	19"	Cru	2
ST462	RV		12 56.4	+68.0	6.8	*	Dra	22
ST463	Y1699		12 58.7	+27.28	8.8	1.5"	Com	4
ST464	Delta		13 02.3	+71.5	3.6	8"	Mus	21
ST465	Theta	Rumpker 16	13 08.1	+65.3	4.7	5.3"	Mus	2
ST466	Y1724	"51, Theta"	13 09.9	+05.32	4.4	7"	Vir	8
ST467	Alpha		13 10.0	+17.32	5	0.5"	Com	4
ST468	54		13 13.4	+16.50	6.8	5"	Vir	2
ST469	J	Dunlop 133	13 22.6	+61.0	4.7	1"	Com	2
ST470	Mizar		13 23.9	+54.56	2.3	14"	Uma	2
ST471	Shiva	Zeta	13 25.2	+11.2	6.7	*	Vir	21
ST472	O2, Y23	Alpha	13 27.1	+64.43	6.7	68"	Dra	5
ST473	R		13 29.7	+23.17	4	Stellar	Hyd	22
ST474	Y1755	ADS 8934	13 32.3	+36.8	7	4.4"	Cru	2
ST475	S		13 33.0	+07.2	6	*	Vir	22
ST476	25	ADS 8974	13 37.5	+36.3	5	1.8"	Cru	9
ST477	Y1763	ADS 8972	13 37.6	+07.9	7.9	2.8"	Vir	2
ST478	Epsilon		13 39.9	+53.9	2.3	*	Vir	2
ST479	Y1772	1	13 40.7	+19.57	5.7	5"	Com	21
ST480	Dunlop141		13 41.7	+54.6	5.3	5.3"	Com	9
ST481	T		13 41.8	+34.6	5.5	*	Com	22
ST482	Alkaid	Eta	13 47.5	+49.3	3.5	*	Uma	21
ST483	Y1785	ADS 9031	13 49.1	+27.0	7.8	3.4"	Com	2
ST484	2		13 49.4	+34.5	4.5	*	Boo	2
ST485	Upsilon		13 49.5	+15.8	4.1	*	Com	21
ST486	3		13 51.8	+33.0	4.5	8"	Com	2
ST487	Zeta	k	13 55.5	+47.3	2.6	5"	Com	21
ST488	Hadar	Beta	14 03.8	+60.4	3.6	*	Cen	21
ST489	Pi		14 06.4	+26.7	3.3	*	Hya	21

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST490			14 12.9	-10.3	4.2	*	Vir	star
ST491	Kappa		14 13.5	+51.47	4.4	13"	Boo	colored double star
ST492	Y1819		14 15.3	+03.08	7.8	0.8"	Vir	double star challenge
ST493	Arcturus		14 15.7	+19.11	4.9	Stellar	Vir	star
ST494	Iota	Alpha	14 16.2	+51.4	4.9	39"	Boo	double star
ST495	R	ADS 9198	14 16.6	+59.9	5.3	*	Boo	variable star
ST496	Y1834		14 20.3	+48.5	8.1	1.3"	Con	double star challenge
ST497	Y1833	ADS 9229	14 20.6	+07.66	7.6	6"	Vir	double star equal magnitude
ST498	Dunlop159		14 22.6	+56.56	5	9"	Con	colored double star
ST499	Y1835		14 23.4	+08.26	5.1	6"	Boo	double star
ST500	SHU 179		14 25.5	+19.58	6.4	35"	Lib	double star
ST501	5	ADS 9286	14 27.5	+75.37	4.3	*	Umi	star
ST502	Proxima		14 29.9	+62.7	10.7	*	Con	variable star
ST503	Rho	ADS 9296	14 31.8	+30.4	3.6	*	Boo	star
ST504	h4690		14 37.3	+68.08	5.4	19"	Lup	double star magnitude contrast
ST505	Right Centaurus		14 39.6	+60.50	5.4	20"	Con	double star
ST506	Alpha		14 40.7	+16.4	5	5.6"	Con	double star
ST507	ADS 9338		14 40.7	+16.25	4.9	6"	Boo	double star
ST508	Y1864	pi	14 41.1	+13.44	3.8	1"	Boo	double star challenge
ST509	Zeta		14 41.9	+47.4	4.3	*	Lup	star
ST510	Alpha		14 42.0	+37.8	3.2	16"	Con	double star
ST511	Alpha	Dunlop 166	14 42.5	+65.0	3.2	17"	Con	star
ST512	epsilon		14 43.7	+35.2	4	3"	Con	star
ST513	Icar	Epsilon	14 45.0	+27.04	2.4	4"	Con	star
ST514	Dunlop	Dunlop 169	14 45.2	+56.6	6.2	68"	Boo	colored double star
ST515	5.4	H 97	14 46.0	+25.26	5.2	8"	Vir	double star
ST516	Alpha		14 47.9	+79.0	3.8	10"	Hya	double star
ST517	Y1883		14 48.9	+05.57	7.6	0.7"	Vir	star
ST518	Theta		14 49.3	+14.09	5.4	2"	Vir	double star challenge
ST519	39		14 49.7	+48.43	5.7	3"	Boo	double star
ST520	58		14 50.3	+28.0	4.4	*	Hya	double star
ST521	Kochab	Beta	14 50.7	+74.2	2.1	*	Umi	star
ST522	ZubeneIgenubi	Alpha	14 50.9	+16.0	2.8	4"	Lib	double star
ST523	X	37	14 51.4	+19.06	4.6	7"	Lib	colored double star
ST524	h4715		14 56.5	+47.9	6.9	2.4"	Boo	double star
ST525	33	H 28	14 57.3	+21.22	5.9	23"	Lup	double star
ST526	Beta		14 58.5	+41.1	2.6	*	Lup	double star
ST527	Peta		14 58.5	+41.1	2.6	*	Lup	double star
ST528	44		15 03.8	+83.2	5.7	18"	Orl	double star
ST529	Sigma		15 04.1	+47.39	4.8	1.5"	Boo	double star challenge
ST530	Dunlop178		15 04.1	+25.3	3.2	32"	Lib	red variable star
ST531	X		15 11.6	+45.3	6.7	27"	Lup	double star
ST532	Kappa	Dunlop 177	15 11.9	+48.3	3.9	27"	Lup	double star
ST533	Y1932		15 14.3	+70.1	8.1	*	Tri	variable star
ST534	Mu		15 18.3	+26.50	6.6	1.5"	CrB	double star challenge
ST535	Y1931	h4753	15 18.5	+47.9	5.1	1.2"	Lup	double star challenge
ST536	S		15 21.4	+10.26	7	13"	Sgr	double star
ST537	Phi1		15 21.4	+31.4	5.8	*	CrB	variable star
ST538	Eta		15 21.8	+36.3	4	50"	Lup	star
ST539	Mu		15 23.2	+30.17	5.6	1.0"	CrB	double star challenge
ST540	Edsich	Iota	15 24.5	+37.23	3.3	*	Boo	triple star
ST541	Y1927	Pi	15 24.9	+59.6	6.9	31"	Dra	star
ST542	Lambda123		15 29.2	+80.26	6.9	9"	Umi	double star
ST543	Y1959	Delta	15 34.8	+10.29	7.5	9"	Ser	double star equal magnitude
ST544	Gamma		15 35.1	+41.2	2.8	3.9"	Lup	double star



Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST545	h4788	d	15 35.9	-45.0	4.7	2.2"	Lup	double star
ST546	Upsilon	ADS 9705	15 37.0	-28.1	3.6	3"	Lup	colored double star
ST547	Omega		15 38.1	-47.6	4.3	*	Lib	red variable star
ST548	Y1962a		15 38.7	-08.47	5.8	12"	Lib	double star equal magnitude
ST549	Tau	40	15 38.7	-29.8	3.7	2"	Lib	double star
ST550	Zeta		15 39.4	+36.6	5	6.3"	Crb	double star
ST551	Gemma		15 42.7	+26.3	4.2	0.3"	Crb	double star challenge
ST552	Y1967	Alpha	15 44.3	+06.4	2.7	*	Sco	double star
ST553	Mu-kathai		15 48.6	+28.09	5.7	Stellar	Crb	stable star
ST554	Rho	35	15 48.7	+18.7	4.1	*	Crb	red variable star
ST555	Rho		15 50.7	+15.1	5.2	*	Ser	red variable star
ST556	Xi		15 56.9	-33.58	5.2	10"	Lup	double star
ST557	Rho	5	15 56.9	-29.2	3.6	*	Sco	double star
ST558	Epsilon	13	15 57.6	+26.9	4.2	*	Sco	double star
ST559	Pi	6	15 58.9	+26.9	2.9	*	Crb	double star
ST560	Tau		15 59.5	+25.55	2.9	*	Crb	double star
ST561	Eta	Rmk 21	16 00.1	-38.24	3.6	15"	Crb	double star
ST562	Delta	7	16 00.3	-22.64	2.9	*	Lup	double star magnitude contrast
ST563	Xi		16 04.4	-11.22	4.2	1"	Sco	double star
ST564	Graffias	Beta	16 05.4	-19.8	2.5	*	Sco	triple star challenge
ST565	Omega	9	16 06.8	-20.7	2.5	*	Sco	double star
ST566	Kappa		16 08.1	+17.03	5	14"	Ser	double star
ST567	Yed Prior		16 12.0	-19.28	4	1"	Her	colored double star
ST568	Yed Prior	Delta	16 14.3	-03.7	2.7	*	Oph	quadruple star
ST569	Y2032	"17. Sigma"	16 14.7	+33.52	5.2	7"	Oph	double star
ST570	Delta		16 20.3	-78.7	4.7	*	Crb	double star
ST571	Sigma	H 121	16 21.2	-25.35	2.6	20"	Sps	double star
ST572	Rho	ADS 10049	16 25.6	-23.5	5.3	3.1"	Sco	double star magnitude contrast
ST573	Yed Prior		16 26.7	-12.4	7.3	*	Oph	double star
ST574	h4853		16 27.2	-47.6	4.8	28"	Oph	variable star
ST575	Epsilon		16 28.0	-64.1	5.3	20"	Nor	double star
ST576	Y2052	Dunlop 201	16 28.9	+18.4	7.7	20"	Tra	double star
ST577	Alpha	ADS 10075	16 29.4	+28.4	4	3"	Her	double star
ST578	Antares		16 30.9	+26.0	4.2	1.4"	Sco	double star challenge
ST579	Lambda	ADS 10087	16 32.7	+66.8	6.7	*	Oph	double star challenge
ST580	H		16 36.2	+52.55	5.1	3"	Dra	variable star
ST581	H		16 36.4	-35.3	4.2	*	Dra	triple star
ST582	SU	13	16 37.2	-10.6	2.6	*	Sco	double star
ST583	Zeta		16 40.6	-32.4	6	*	Oph	double star
ST584	Zeta	ADS 10157	16 41.3	+31.6	3	1.4"	Sco	stable star
ST585	Alpha		16 48.7	-59.0	1.9	*	Her	colored double star
ST586	Eta		16 49.8	-34.3	3.8	*	Tra	double star
ST587	Eta	26	16 50.2	-34.3	2.3	*	Ara	double star
ST588	Mu		16 52.3	-38.0	3	*	Sco	double star
ST589	Y2118		16 56.4	+65.0	7.1	1.4"	Sco	double star challenge
ST590	RR	20	16 56.6	-30.6	5.1	*	Dra	double star
ST591	Kappa		16 57.7	+09.4	3.2	75"	Sco	variable star
ST592	Eta	27	16 58.6	-56.0	3.1	*	Oph	double star
ST593	Mu		16 59.6	-59.2	4.1	40"	Ara	double star
ST594	Mu		17 05.3	+54.28	4.9	2"	Dra	double star equal magnitude
ST595	Sabik	Eta	17 10.4	-15.7	2.4	0.6"	Oph	double star challenge
ST596	Rasalgethi	Alpha	17 14.6	+14.4	3	4.6"	Oph	double star equal magnitude
ST597	Delta		17 15.0	+24.50	3.2	10"	Her	double star magnitude contrast
ST598	Pi	67	17 15.0	+36.8	3.2	7"	Her	double star
ST599			17 15.3	-26.36	4.3	5"	Oph	double star equal magnitude

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST600	39		17 18.0	-24.17	5.2	10"	Oph	colored double star
ST601	Theta		17 22.0	-25.0	3.3	*	Oph	double star
ST602	Σ2161	42	17 23.7	+37.09	4.2	4"	Her	double star
ST603	Beta	"75, Rho"	17 25.3	+57.5	2.6	*	Ara	star
ST604	Gamma		17 25.4	+56.3	3.3	*	Ara	star
ST605	Sigma	49	17 26.5	+04.1	4.3	4"	Oph	star
ST606	η4919	Dunlop 2.16	17 26.9	+45.9	4.3	2.2"	Ara	double star
ST607	Σ2173		17 30.4	-01.04	6	1.1"	Oph	double star challenge
ST608	Lambda	76	17 30.7	+26.1	4.4	*	Her	star
ST609	Lesath	Upsilon	17 30.8	-37.3	2.7	*	Ara	star
ST610	Alpha		17 31.8	+46.9	3	*	Ara	star
ST611	Alpha		17 32.2	+55.11	4.9	62"	Dra	double star equal magnitude
ST612	Shaula	Lambda	17 33.6	-37.1	2.1	35'	Sco	star
ST613	Rasalhague	Alpha	17 34.9	+12.34	2.4	*	Oph	star
ST614	Io	85	17 39.5	+46.0	3.8	*	Her	star
ST615	Σ2241	Psi	17 41.9	+72.09	4.8	30"	Dra	double star
ST616	Kappa		17 42.5	-36.0	2.4	2.5"	Sco	star
ST617	V		17 43.3	+57.7	5.7	*	Pav	variable star
ST618	Cehalrai	Beta	17 43.5	+04.6	2.8	*	Oph	star
ST619	Σ2202		17 44.6	+02.34	6.2	21"	Oph	double star equal magnitude
ST620	SZ	61	17 45.0	-16.6	9	*	Spr	variable star
ST621	SX		17 47.5	-35.7	8.5	*	Sco	variable star
ST622	Y		17 49.9	-37.0	3.2	2"	Sco	variable star
ST623	G		17 52.6	-06.2	6	*	Oph	star
ST624	Grumium	Xi	17 53.5	+56.9	3.8	*	Dra	star
ST625	Etramnis	Gamma	17 56.6	+51.5	2.2	*	Dra	star
ST626	Brinnids Star		17 57.8	+04.34	6.5	Stellar	star	
ST627	h5003		17 59.1	-30.15	5	6"	Oph	star
ST628	40-41		18 00.1	+80.0	5.7	20"	Spr	colored double star
ST629	95		18 01.5	+21.36	4.3	6"	Dra	double star equal magnitude
ST630	Ts	ADS 11005	18 03.1	-08.2	5.2	1.8"	Oph	double star equal magnitude
ST631	Σ2276	70	18 05.5	+02.30	4.2	1.5"	Oph	double star challenge
ST632	Theta		18 06.6	-50.1	3.7	*	Ara	star
ST633	Σ2280	100	18 07.6	+26.06	5.9	14"	Her	double star equal magnitude
ST634	W		18 14.9	+36.7	7.3	*	Lyr	variable star
ST635	Eta		18 17.6	-36.8	3.1	*	Spr	star
ST636	Kappa	1	18 19.9	+36.1	4.3	*	Spr	star
ST637	Kappa Media	Delta	18 21.0	-29.8	2.7	*	Spr	star
ST638	Xi		18 22.2	-15.05	7.0	10"	Spr	double star
ST639	Gale 2	39	18 23.2	-61.5	4.4	*	Pav	star
ST640	Σ2323		18 24.0	+58.48	4.9	4"	Dra	triple star
ST641	Alpha		18 25.3	-20.5	3.5	6"	Spr	double star challenge
ST642	Alpha	ADS 11325	18 27.0	-46.0	5.2	4"	Spr	star
ST643	59		18 27.2	+00.12	2.6	*	Spr	colored double star
ST644	Kaus Borealis	Lambda	18 30.4	-25.4	2.8	*	Spr	variable star
ST645	SS		18 30.4	-16.9	5	11"	Her	double star
ST646	Delta		18 31.8	+45.9	7.8	*	Lyr	double star
ST647	T		18 32.3	-37.0	5	21"	Her	double star
ST648	Σ22	Kappa	18 33.4	-38.44	5.8	26"	C/A	double star equal magnitude
ST649	Σ2348		18 33.9	+52.18	6.9	*	Dra	double star
ST650	Alpha		18 35.2	-08.2	3.9	0.7"	Spr	star
ST651	OJ359		18 35.5	+23.36	6.3	0.7"	Her	double star challenge
ST652	OJ358	ADS 11483	18 35.9	+17.0	6.8	1.6"	Her	double star challenge
ST653	Vega	Alpha	18 36.9	+38.47	1	Stellar	Lyr	star
ST654	X		18 38.3	+08.8	5.9	*	Oph	variable star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST655	HK		18 42.8	+37.0	9.5	*	Lyr	variable star
ST656	Σ2398		18 43.0	+59.6	8	13"	Dra	double star
ST657	Double-Double	Epsilon	18 44.3	+39.40	4.7	2"	Lyr	quadruple star
ST658	Z649		18 44.8	+37.36	4.4	4"	Sgr	double star
ST659	Σ2375		18 46.5	+05.30	6.2	2"	Sgr	double star, equal magnitude
ST660	Σ2379	5	18 46.5	+05.30	6.2	2"	Sgr	triple star
ST661	R	V	18 47.5	+05.42	4.5	Stellar	Sct	variable star
ST662	Beta		18 50.0	+33.24	3.5	47"	Sct	double star, magnitude contrast
ST663	Σ2404	ADS 11726	18 50.3	+07.9	6.8	14.3"	Sct	double star
ST664	Σ2420		18 50.8	+10.59	6.8	4"	Sct	double star
ST665	Delic2	Omicron	18 51.2	+59.22	4.9	35"	Dra	double star
ST666	Delic2	ADS 11825	18 54.5	+36.6	4.3	*	Dra	double star
ST667	OS225		18 54.9	+33.58	6.5	*	Cyg	star
ST668	Niki	Sigma	18 55.3	+26.3	2	45"	Lyr	colored double star
ST669	13	R	18 55.3	+43.9	3.9	4"	Sgr	star
ST670	Σ2417	"63, Theta"	18 56.3	+04.11	4.1	22"	Lyr	star
ST671	ADS11871		18 56.3	+04.11	4.1	22"	Ser	double star, challenge
ST672	Σ2422		18 57.1	+26.1	5.4	1"	Lyr	double star, challenge
ST673	UV	ADS 11869	18 57.1	+26.1	8	0.7"	Lyr	double star, challenge
ST674	Σ2426		18 58.6	+14.4	8.6	*	Lyr	variable star
ST675	BrsO14		19 00.0	+12.53	7.1	17"	Aql	colored double star
ST676	h5082		19 03.1	-37.03	6.6	13"	Cra	double star, equal magnitude
ST677	V	RV	19 04.4	-05.41	6.6	7"	Sgr	triple star
ST678	15		19 05.0	+04.02	5.4	38"	Aql	red-variable star
ST679	Gamma	RV	19 06.4	-37.00	6.6	38"	Aql	double star
ST680	Σ2449		19 06.4	+08.14	5.5	Stellar	Aql	double star, equal magnitude
ST681	Σ2474		19 09.1	+07.09	7.2	8"	Aql	red-variable star
ST682	Σ2486		19 12.1	+34.95	6.5	16"	Lyr	double star
ST683	OS178		19 15.3	+49.51	5.7	80"	Cyg	double star, equal magnitude
ST684	Trv	60	19 15.5	+73.4	4.5	*	Aql	double star
ST685	RY		19 16.5	-33.5	6.6	*	Dra	star
ST686	U	V	19 18.8	+19.37	6.6	Stellar	Sgr	variable star
ST687	V1942		19 19.2	-15.9	6.6	*	Sge	variable star
ST688	LX		19 21.6	+76.34	5.9	Stellar	Sgr	variable star
ST689	RR	RV	19 25.5	+42.47	7.1	Stellar	Dra	red-variable star
ST690	Σ2525		19 26.6	+27.3	8.1	2"	Lyr	variable star
ST691	h5114	ADS 12447	19 27.8	+54.3	5.7	70"	Vul	double star
ST692	Alpha	6	19 28.7	+24.7	4.4	*	Tau	double star
ST693	Albireo	Beta	19 30.7	+28.0	3	35"	Vul	star
ST694	AQ	38	19 34.1	+07.4	4.5	*	Cyg	colored double star
ST695	HN84		19 34.3	-16.4	9.1	*	Aql	star
ST696	R		19 36.8	+50.2	6.1	*	Sgr	variable star
ST697	HN84		19 39.4	+16.34	6.4	28"	Cyg	variable star
ST698	54	ADS 12767	19 40.7	-16.3	5.4	38"	Sge	colored double star
ST699	TT		19 40.9	+32.6	7.8	*	Sgr	double star
ST700	16		19 41.8	+50.92	6.8	39"	Cyg	variable star
ST701	Σ2579	"18, Delta"	19 45.0	+45.08	2.9	2"	Cyg	double star, equal magnitude
ST702	OS1181	H V 137	19 46.3	+35.01	6.9	39"	Cyg	double star, magnitude contrast
ST703	Tweed	Gamma	19 46.3	+10.6	2.7	*	Cyg	colored double star
ST704	Σ2580	17	19 46.4	+33.64	3.8	26"	Aql	star
ST705	Delic3	7	19 47.4	+18.5	3.8	*	Cyg	double star, magnitude contrast
ST706	Epsilon	Pi	19 48.2	+70.16	3.8	3"	Sge	star
ST707	Σ2583		19 48.7	+11.8	6.1	1.4"	Aql	double star, magnitude contrast
ST708	Zeta		19 49.0	+19.09	5	9"	Sge	double star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST710	Chi	V	19 50.6	+32.55	3.3	Stellar	Cyg	variable star
ST711	Altair	Alpha	19 50.8	+08.52	0.8	*	Aql	variable star
ST712	19	55	19 52.5	+01.84	3.7	*	Aql	variable star
ST713	51		19 54.6	+08.14	5.7	36"	Aql	double star
ST714	O5332	Beta	19 55.3	+06.41	3.7	13"	Aql	double star
ST715	Psi		19 55.6	+52.26	4.9	3"	Cyg	double star, magnitude contrast
ST716	RU		19 55.9	-29.2	5.4	*	Sgr	variable star
ST717	RU		19 58.7	-41.9	6.4	*	Sgr	variable star
ST718	Gamma	12	19 58.8	+19.5	3.5	*	Sgr	variable star
ST719	BF		20 02.4	+21.1	8.5	*	Sge	colored double star
ST720	h1470		20 03.6	+38.19	7.6	29"	Cyg	variable star
ST721	X		20 05.1	+20.7	7.6	*	Sge	variable star
ST722	WZ		20 07.6	+17.7	7.7	*	Sge	variable star
ST723	Y2675	Kappa	20 08.9	+77.43	4.4	7"	Cep	double star, magnitude contrast
ST724	Y2637	Theta	20 09.9	+20.55	6.4	12"	Sge	triple star
ST725	RY		20 10.4	+36.85	9.5	*	Cyg	variable star
ST726	FG		20 11.9	+20.9	9.5	*	Sge	variable star
ST727	RS		20 12.6	+00.52	6.5	3"	Cyl	planetary nebula irregular
ST728	Y2644		20 13.4	+38.2	6.5	3"	Cyl	double star, equal magnitude
ST729	Y2658		20 13.6	+53.07	7.1	5"	Cyg	variable star
ST730	Omicron1	"ADS 13554, V 695"	20 13.6	+46.7	3.8	*	Cyg	double star
ST731	RT		20 17.1	-21.3	8.9	*	Cep	variable star
ST732	Alpha		20 17.6	-12.5	4.2	44"	Cap	variable star
ST733	RT		20 17.7	-36.1	6.2	*	Sgr	variable star
ST734	P		20 17.8	+38.02	3	Stellar	Cyg	variable star
ST735	Alpha		20 18.0	-12.32	3.8	7"	Cap	variable star
ST736	Y2671		20 18.4	+55.23	6	4"	Cyg	quadruple star
ST737	U		20 19.6	+47.9	5.9	*	Cyg	variable star
ST738	Dabih	Beta	20 21.0	-14.8	3.4	3'	Cap	double star
ST739	39		20 23.9	+32.2	4.4	*	Cyg	star
ST740	Peacock	Alpha	20 25.6	-56.7	1.9	*	Pav	star
ST741	phi		20 27.3	-18.13	5.3	3"	Cap	double star, magnitude contrast
ST742	Omicron	SHJ 324	20 29.9	-18.35	6.1	18"	Cap	double star
ST743	Y2716	49	20 41.0	+32.18	5.5	3"	Cyg	double star, magnitude contrast
ST744	V		20 41.3	+48.2	1.7	*	Cyg	variable star
ST745	Deneb	Alpha	20 41.4	+45.17	1.2	*	Cyg	variable star
ST746	Y2728	52	20 45.7	+30.7	4.2	6"	Cyg	double star
ST747	Gamma		20 46.7	+16.07	4.3	10"	Del	double star
ST748	Lambda	ADS 14296	20 47.4	+36.5	4.4	0.9"	Cyg	double star, challenge
ST749	3		20 47.7	-05.0	4.4	*	Aqr	red, variable star
ST750	763		20 48.4	-18.11	6.7	16"	Cap	double star
ST751	4	ADS 14360	20 51.4	-05.6	6.4	0.8"	Cap	double star, challenge
ST752	Omega	18	20 51.8	-26.9	4.1	*	Cap	double star, challenge
ST753	Epsilon	1	20 59.1	+04.18	5.2	1"	Eru	triple star, challenge
ST754	Y2751	ADS 14575	21 02.1	+56.7	6.1	1.5"	Cap	double star, challenge
ST755	Y2742	2	21 02.2	+07.11	7.4	3"	Eru	double star, equal magnitude
ST756	Delta236		21 02.2	-43.0	6	57"	Mic	double star
ST757	Lambda	ADS 14556	21 02.2	+07.2	7.4	3"	Eru	double star, challenge
ST758	xi		21 04.1	-05.49	5.9	3"	Cyg	double star, challenge
ST759	XI	62	21 04.9	+43.9	3.7	*	Cyg	variable star
ST760	Y2758	61	21 06.9	+38.39	5.2	29"	Cyg	stellar, planetary nebula
ST761	24	ADS 14632	21 07.1	-26.0	4.5	*	Cap	variable star
ST762	T		21 09.5	+68.5	5.2	*	Cap	variable star
ST763	Gamma		21 10.3	+10.1	4.7	6"	Eru	double star
ST764	Y2780	ADS 14749	21 11.8	+60.0	5.6	1.0"	Cep	double star, challenge

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST765	Delta		21 14.5	+10.00	4.6	48"	Ecl	double star magnitude contrast
ST766	Beta		21 19.9	-53.5	4.5	6"	Icd	double star
ST767	γ	h5258	21 20.3	-10.8	8	*	Apr	variable star
ST768	Y		21 24.3	-69.7	8.6	*	Apr	variable star
ST769	Beta		21 38.7	+70.33	3.3	13"	Prv	double star
ST770	γ	RV	21 35.2	+78.37	7.3	Stellar	Prv	double star magnitude contrast
ST771	γ2816		21 39.0	+57.29	5.6	12"	Corp	triple star
ST772	V460		21 42.0	+35.6	5.5	*	Corp	variable star
ST773	SS		21 42.7	+43.35	8.5	*	Cvg	variable star
ST774	RV		21 43.3	+58.07	3.4	Stellar	Cvg	variable star
ST775	Herschel's Garnet Star	Mu	21 43.5	+58.07	3.4	Stellar	Corp	double star magnitude contrast
ST776	Epsilon		21 44.2	-82.52	5.5	83"	Prv	double star
ST777	Lambda		21 51.0	+12.6	6.4	3"	Oct	variable star
ST778	AC	h5278	21 52.0	+55.47	5.5	18"	Prv	double star
ST779	γ2840		21 54.3	+19.7	6.4	22"	Corp	double star
ST780	γ2841		21 56.4	+22.9	8	*	Prv	double star
ST781	RX	ADS 15431	21 58.4	+62.51	7.1	14"	Prv	variable star
ST782	γ2873		22 00.8	-26.27	5.8	1.9"	Prv	double star equal magnitude
ST783	Epsilon	β, 276	22 02.5	-16.58	7.2	4"	Apr	double star
ST784	29	S 802	22 03.8	+64.38	4.3	8"	Corp	double star equal magnitude
ST785	OS 263	-17, X"	22 03.9	+59.8	6.7	11.1"	Corp	double star
ST786	OS 261	ADS 15601	22 06.1	-39.5	4.5	*	Corp	double star
ST787	Lambda		22 08.2	-46.58	4.7	*	Gru	star
ST788	Al Nair	Alpha	22 10.7	+70.07	5.7	Stellar	Gru	double star
ST789	γ2883		22 10.9	+58.2	3.4	15"	Corp	double star
ST790	Z68		22 13.9	+39.7	4.5	28"	Corp	variable star
ST791	h1746	ADS 15758	22 14.3	-21.04	5.3	28"	Lac	double star
ST792	41		22 16.0	+37.7	4.1	*	Apr	colored double star
ST793	1		22 18.5	-60.3	2.9	5"	Luc	star
ST794	Alpha		22 18.5	-60.3	6.1	16"	Lac	colored double star
ST795	γ2894		22 23.1	-45.9	5.8	2.7"	Lac	double star
ST796	PI		22 26.1	-48.3	5.8	*	Gru	double star
ST797	S		22 26.6	-16.45	6.4	3"	Gru	variable star
ST798	53		22 27.3	-65.0	4.5	7"	Apr	double star equal magnitude
ST799	Delta	h5334	22 28.1	+57.7	9.8	3"	Luc	double star
ST800	Krugner60	ADS 15972	22 28.2	+00.01	4.3	2"	Corp	double star
ST801	Zeta		22 29.2	+58.25	3.8	20"	Corp	double star challenge
ST802	Delta		22 29.5	+47.7	4.1	5"	Corp	colored double star
ST803	5		22 29.5	+47.7	4.1	5"	Lac	colored double star
ST804	Delta2		22 30.0	-43.7	4.1	15"	Lac	star variable star
ST805	γ2912		22 30.0	+04.4	5.8	1"	Gru	double star challenge
ST806	Ros47	37	22 32.5	+39.46	5.8	43"	Prv	double star challenge
ST807	8		22 35.9	+39.38	6.5	22"	Lac	quadruple star
ST808	11		22 40.5	+44.3	4.5	*	Lac	triple star
ST809	Beta		22 42.7	-46.9	2.3	*	Star	star
ST810	Tau1		22 47.7	-14.1	5.7	23"	Gru	double star
ST811	γ2947	ADS 16291	22 49.0	+68.6	7	4.3"	Apr	double star
ST812	Tau2	71	22 49.6	-13.6	4	40"	Corp	double star
ST813	γ2950	ADS 16317	22 51.4	+61.7	6.1	1.7"	Corp	double star
ST814	h1823		22 51.4	+41.19	7.1	82"	Corp	double star
ST815	Lambda	73	22 52.6	-07.61	3.7	*	Lac	quadruple star
ST816	Fomalhaut	Alpha	22 59.2	-29.37	1.2	*	Prv	star
ST817	52	ADS 16428	22 59.2	+11.7	6.1	0.7"	Prv	double star challenge
ST818	Scheat	Beta	23 03.8	+28.1	2.4	*	Prv	star
ST819	Dunlop246		23 07.2	-50.7	6.1	9"	Gru	double star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST1920	Σ2978		23 07.5	+32.49	6.3	8"	Peg	double star
ST1921	Phi	ADS 16538	23 07.9	+75.4	4.6	1.2"	Cep	double star challenge
ST1922	Psi	90	23 14.3	06.0	4.2	*	Aqr	red star
ST1923	Psi3		23 19.0	-09.6	5.1	1.5"	Aqr	double star
ST1924	93		23 19.1	-13.28	5.1	13"	Aqr	double star
ST1925	Dunlop249		23 23.9	-53.8	6.5	27"	Gru	colored double star
ST1926	99		23 26.0	-20.6	4.4	*	Aqr	double star
ST1927	Z		23 33.7	+48.49	9	*	And	variable star
ST1928	Erri	Gamma	23 39.3	+77.6	3.2	*	Cep	double star
ST1929	Theta	Dunlop 251	23 39.5	-46.6	6.6	4"	Phe	double star
ST1930	R		23 43.8	-18.17	5.8	Stellar	Aqr	double star
ST1931	107		23 46.0	-18.41	5.3	7"	Aqr	double star
ST1932	TX	19	23 46.4	+03.29	6.9	Stellar	Peg	double star equal magnitude
ST1933	Υ3042		23 51.8	+27.03	7.8	5"	And	double star
ST1934	Lal192		23 54.4	-27.03	6.9	7"	And	double star equal magnitude
ST1935	R		23 58.4	+51.24	4.7	Stellar	Sgr	double star
ST1936	Sigma		23 59.0	+55.45	4.9	3"	Cas	variable star
ST1937	Υ3050		23 59.5	+33.43	6.6	1.5"	And	colored double star
								double star challenge

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## **One-Year Limited Warranty**

This Orion IntelliScope Computerized Object Locator 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 to: Orion Warranty Repair, 89 Hangar Way, Watsonville, CA 95076. If the product is not registered, proof of purchase (such as a copy of the original invoice) is required.

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, and you may also have other rights, which vary from state to state. For further warranty service information, contact: Customer Service Department, Orion Telescopes & Binoculars, P. O. Box 1815, Santa Cruz, CA 95061; (800) 676-1343.

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