

# Orion® IntelliScope® Computerized Object Locator

#7880

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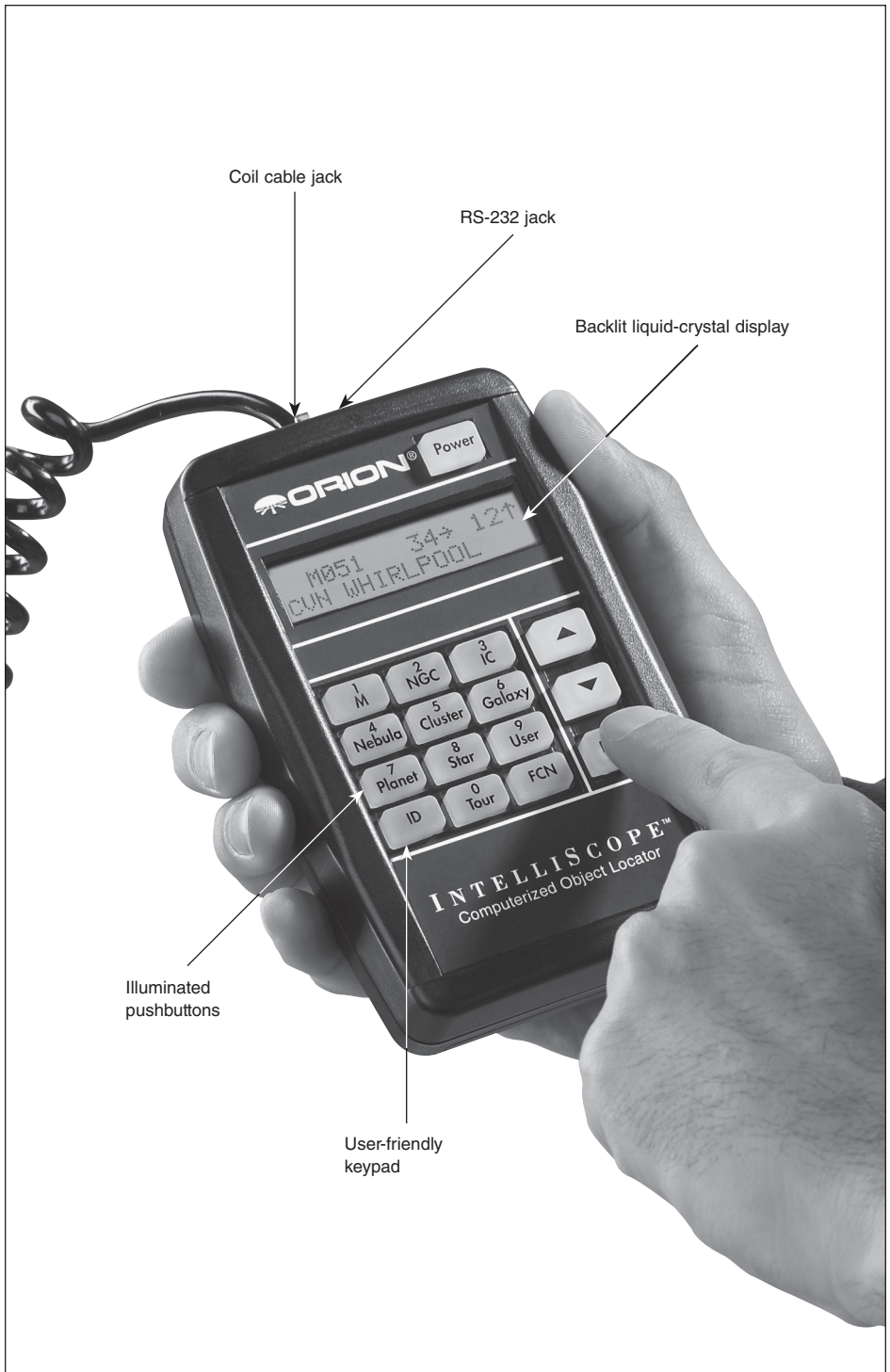
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**Figure 1.** The IntelliScope Computerized Object Locator.

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Congratulations on your purchase of the Orion IntelliScope™ Computerized Object Locator. When used with any of the SkyQuest XT IntelliScope 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 (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 (1/16" thick)
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.

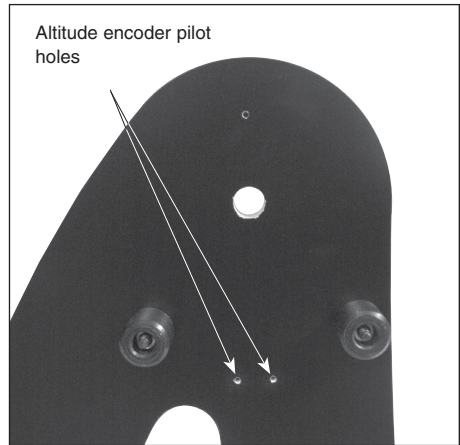
*Note: The IntelliScope Computerized Object Locator is compatible only with Orion Sky-Quest IntelliScope Dobsonians. For other brands of Dobsonian, or any other telescope, the IntelliScope system will not function properly.*

## 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

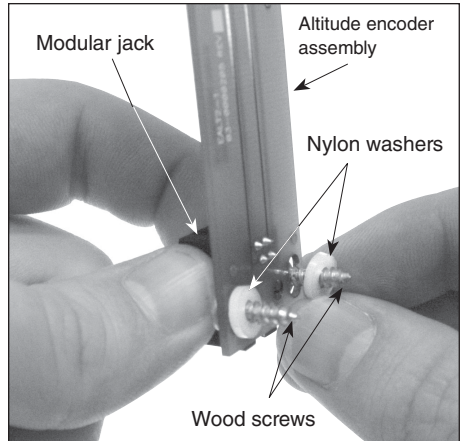
(**Figure 3**). Then, thread the screws into the starter holes in the side panel. The shaft on the altitude encoder assembly should protrude through the 5/8" through-hole in the side panel. It will take a bit of dexterity to keep the washers on the ends



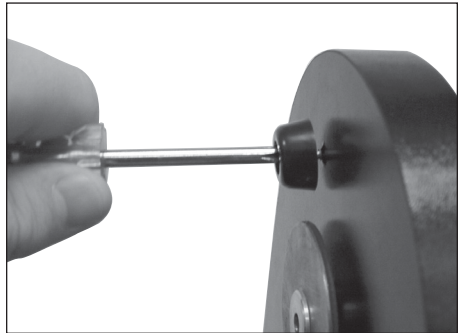
**Figure 2.** The two pilot holes used to mount the altitude encoder assembly are located on the interior surface of the right side panel of the base.

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 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 (**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 (**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 6**). 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 with 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, inserting the bolt through the altitude encoder's aluminum shaft (now protruding from the right side panel) and threading it into the right side bearing (**Figure 7**). Make sure this knob is fully tightened.

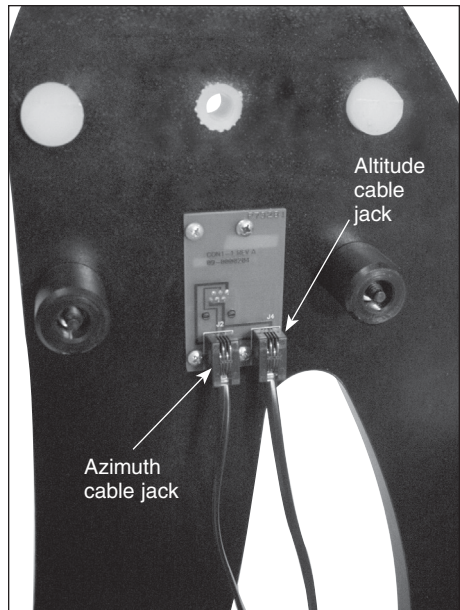


**Figure 3.** Place a nylon washer on the end of each screw after the screws are pushed through the altitude encoder assembly.



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

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 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 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.
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.



**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.

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

## 2. Alignment

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

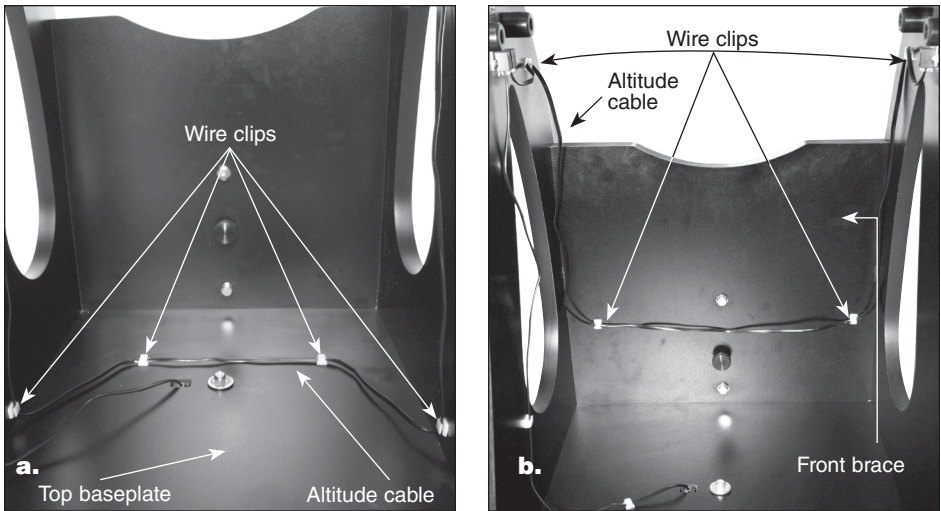
### Powering the Controller

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 50 minutes. So, make sure to press a button at least once every 50 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 button backlighting automatically begin to dim, it's time to change batteries.

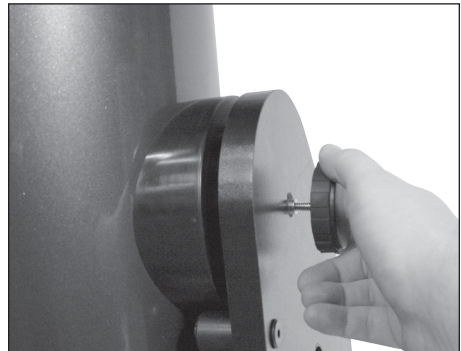


**Figure 6.** Use the wire clips to secure the cables neatly to the base. **(a.)** For the XT6i, XT8i, and XT10i IntelliScopes, the altitude cable can be routed across the top baseplate. **(b.)** For the XT12i, the altitude cable is routed across the front brace.

### Initial Vertical Alignment

After powering up the controller, the top line of the LCD display will read: “POINT VERTICAL.” If the top line reads “ALIGN DEC MARK,” simply press the up arrow button. The top line will now read “POINT VERTICAL” and you are set to use the object locator with your IntelliScope Dobsonian.

If the vertical stop you installed on the Dobsonian base during assembly of the telescope is properly adjusted (see below), simply rotate the telescope upward 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.



**Figure 7.** The retaining knob goes through the shaft of the altitude encoder assembly before threading into the side bearing on the telescope tube.

### 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 IntelliScope models, the vertical stop must use the two 1/16"-thick washers, and the 1/32"-thick washer to achieve this. These parts, plus an extra washer, are supplied with the Dobsonian base. If you do not have access to a carpenter’s level, then all three washers 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 8**). The level should indicate that the base is level through the entire rotation. If it isn't, then reposition the base on the ground, or place shims underneath the feet until the base stays level though a 180° rotation.

Next, place the 1/16"-thick washers 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 as shown in **Figure 9**, in the direction parallel to the base's side panels, perpendicular to the front panel. (Be sure to remove the dust cover from the front of the telescope before placing the carpenter's level on it.) 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.

### 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).



**Figure 8.** 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.



**Figure 9.** 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.



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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 the 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, 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 there, 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 briefly 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 great, but are less commonly achieved. 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 should 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.

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## 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 10**). 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 the object into your field of view. When both numbers reach 0.0, stop moving the telescope. The object should appear within the field of view of a medium-low power eyepiece (25mm focal length or longer).

For example, look at **Figure 11a**, which shows an LCD screen for someone trying to locate M51, 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 shown in **Figure 11b**. When the numbers reach 0.0 (**Figure 11c**), the telescope will be pointed right at the Whirlpool Galaxy.



**Figure 10.** 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.



**Figure 11.** 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).

It is easiest to move the telescope in one direction at a time (say altitude) until the corresponding number reaches 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 (we still include Pluto, for the sake of nostalgia!) 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 2012**
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.

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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 coordinates 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 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.

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## 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 109 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.

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 in the late 1800s. 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.

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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 **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

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constellations currently visible in your night sky, consult a planisphere or the monthly star chart at [www.orienttelesopes.com](http://www.orienttelesopes.com).

### **Locating Nebulas**

Among 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: emission nebulas, which are where star systems form; planetary nebulas, which are the result of a star dying; and reflection nebulas, caused by dust reflecting starlight. Most have low surface brightness, so a dark sky free of light-pollution is best for viewing them.

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 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 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.

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## 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.

## 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 gravi-



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tationally 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, 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.”*

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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.

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

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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.

### 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,

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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 to 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 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

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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. 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 hid-

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den 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 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.

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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.

## **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.oriontelescopes.com](http://www.oriontelescopes.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.

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# 13. Specifications

Objects in database:

- 110 Messier objects
- 7840 New General Catalog objects
- 5386 Index Catalog objects
- 8 Major planets (including Pluto)
- 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.

*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 Intelli-Scope 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 only 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.

### **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 selected on the controller? Consult the finder charts in Appendix B 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.
16. Check that the altitude encoder disk rotates as the telescope tube is moved up or down. If it doesn't, then either you need to tighten the retaining knob more, or the encoder is too tight on the encoder board itself (a manufacturing defect), in which case it will need to be replaced.

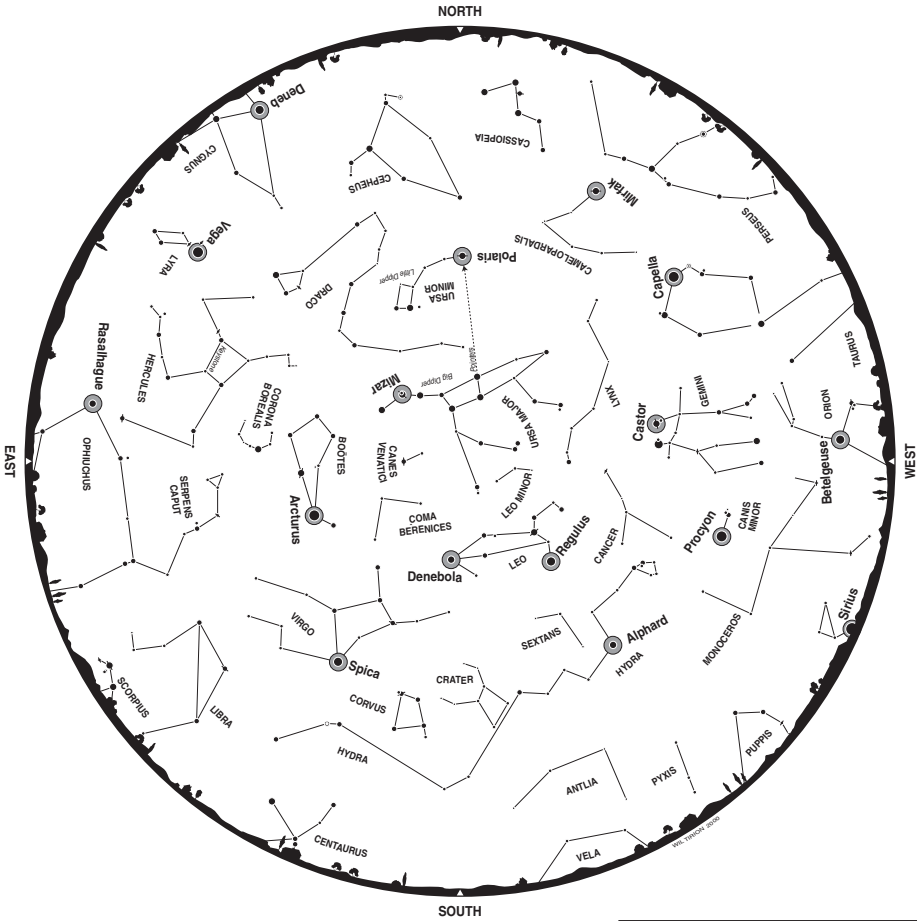
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**Azimuth readouts do not change when you move the scope  
(during “ALT AZM TEST”)**

17. Check the azimuth cable's connections.
18. 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.
19. Try disassembling then reassembling the azimuth encoder by disassembling the top and bottom groundboards of the base.

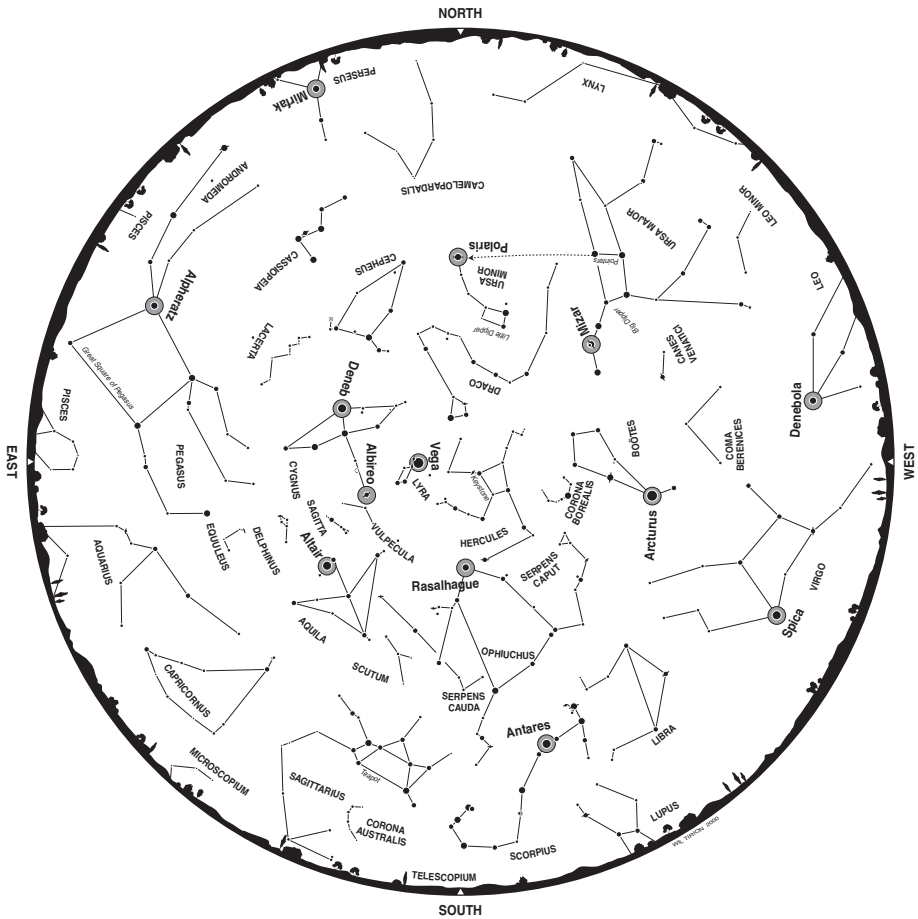
If you need to contact Orion Technical Support, email [support@telescope.com](mailto:support@telescope.com) or call (800) 676-1343.

# Appendix B: Alignment Star Finder Charts



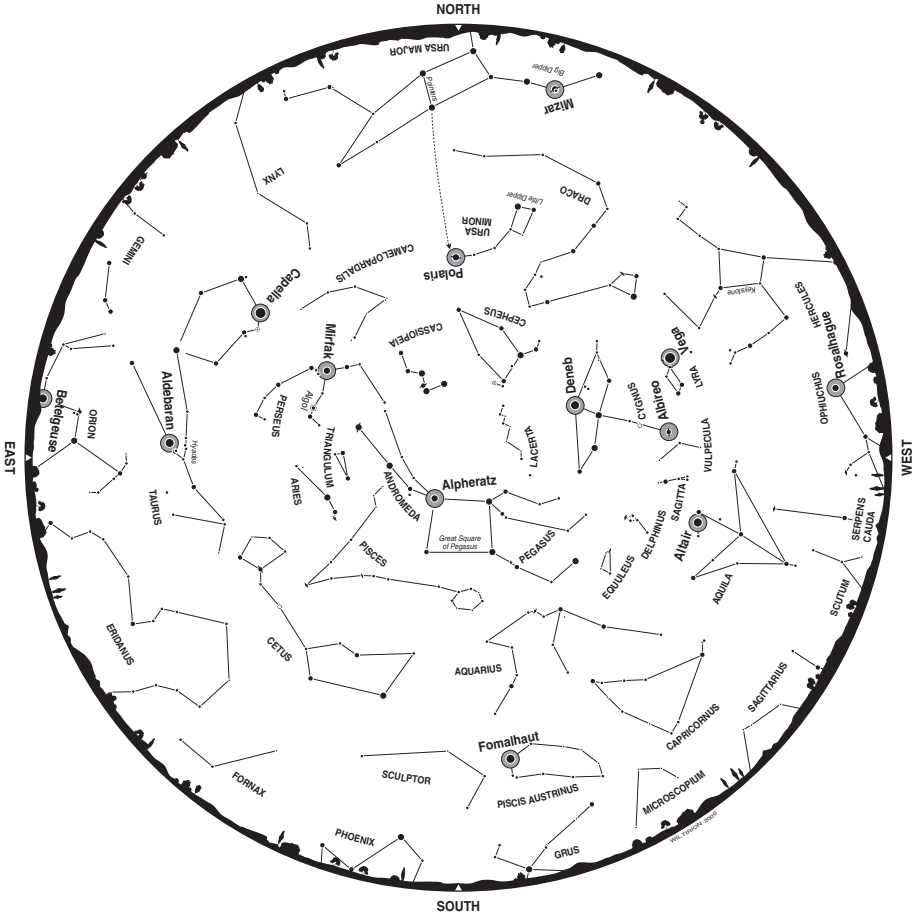
SPRING	
Early March	1:00 AM
Late March	12:00 AM
Early April	12:00 AM*
Late April	11:00 PM*
Early May	10:00 PM*
Late May	9:00 PM*
Early June	8:00 PM (dusk)*

\*Daylight saving time



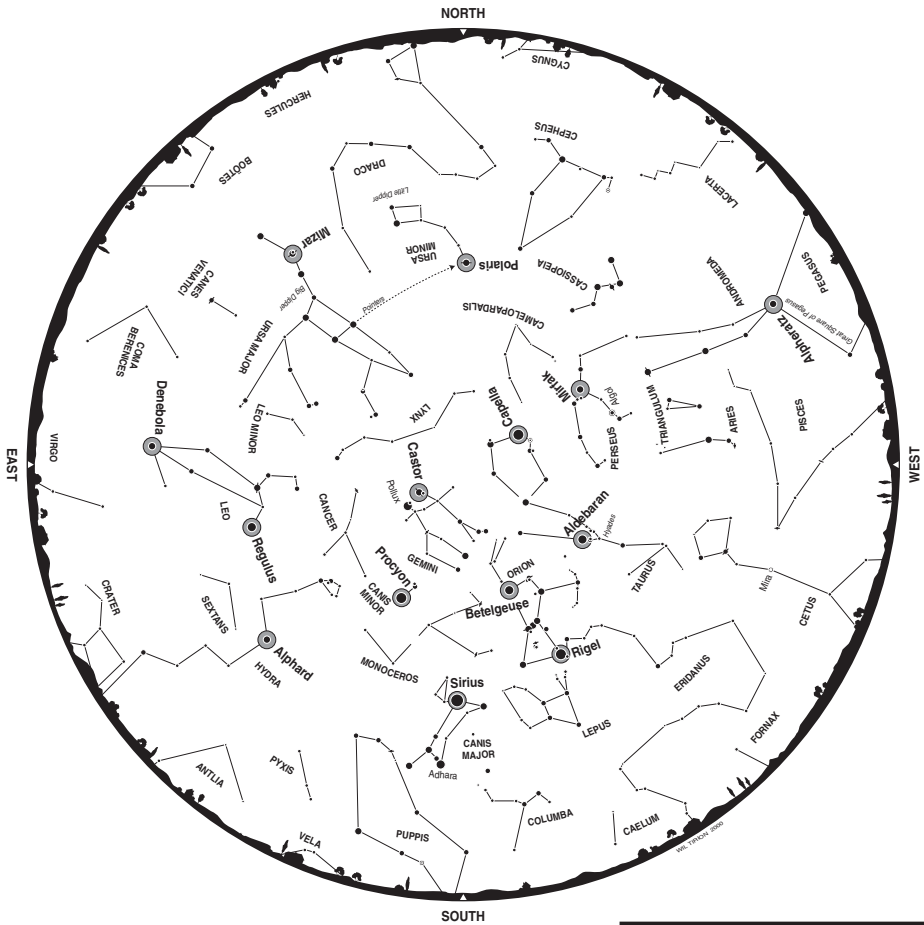
SUMMER	
Early June	2:00 AM*
Late June	1:00 AM*
Early July	12:00 AM*
Late July	11:00 PM*
Early August	10:00 PM*
Late August	9:00 PM*
Early September	8:00 PM (dusk)*

\*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	O32254		00 01.2	+60 2.1	7.6	59"	Cas	5
ST002	30		00 02.0	-06.0	4.4	*	Psc	1
ST003	33053		00 02.6	+66 06	5.9	15"	Cas	5
ST004	SU		00 04.6	+43.5	8	*	And	1
ST005	Ced214		00 04.7	+67.2	7.8	30"	Cep	130
ST006	33062.4		00 06.3	+58.4	6.4	1.5"	Cas	4
ST007	Alpheratz	ADS 61	00 08.4	+29 05	2.1	*	And	21
ST008	Alpheratz	Alpha	00 09.3	+79.7	6.6	0.8"	Cep	4
ST009	Kappa	ADS 102	00 09.4	+15.2	6.2	2"	Peg	21
ST010	Gamma	Gamma	00 13.2	+15.2	2.8	1.5"	Cep	1
ST011	AD	ADS 180	00 14.5	-07.8	4.9	1.5"	Cep	1
ST012	7		00 14.6	-16.9	4.4	12"	Psc	5
ST013	312	"35, UU"	00 15.0	+08 49	5.8	12"	Psc	5
ST014	S		00 15.4	-32.1	5.5	*	Sci	22
ST015	S		00 16.2	+76.9	7	0.9"	Cep	4
ST016	SI		00 17.6	+50.3	9	*	Cas	1
ST017	Enoobridge34	ADS 246	00 18.1	+44.0	6	39"	And	2
ST018	224		00 18.5	+26 08	7.6	5"	And	2
ST019	ota		00 19.4	-06.5	3.5	*	Cet	21
ST020	VX		00 19.9	+44.7	6	*	Sci	21
ST021	R		00 24.0	+38 55	5.8	Stellar	And	22
ST022	330		00 27.2	+49 59	6.9	15"	Cas	2
ST023	AG		00 27.6	+35.6	6.9	4.4	And	1
ST024	Beta	Lacaille 119	00 31.5	-63.0	4.4	27"	Tuc	2
ST025	336	ADS 449	00 32.4	+66.9	5.7	6"	Psc	2
ST026	Zeta		00 37.0	+33.9	3.7	*	Cas	51
ST027	Peta	17	00 39.3	+01.9	3.3	*	And	51
ST028	S		00 39.3	+21.6	5.4	6"	Psc	2
ST029	Schedar	Alpha	00 41.3	+61.5	7.2	*	Cas	21
ST030	ADS 688	ADS 688	00 41.3	+61.5	7.2	15"	Psc	2
ST031	U18		00 42.1	+75.2	5.9	36"	Cas	2
ST032	H1122	ADS 624	00 45.7	+75.0	5.7	36"	Cas	2
ST033	Peta		00 48.7	+03.0	3.4	*	Psc	21
ST034	E6		00 49.1	+57 49	3.4	12"	Cas	5
ST035	65	ADS 663	00 49.9	+27 49	3.4	4.4"	Psc	5
ST036	O13		00 50.0	+64.1	11	13"	Cas	120
ST037	Limbod41	Dunlop 2	00 52.4	+69.1	6.5	21"	And	2
ST038	36	ADS 755	00 55.0	+23.6	6.5	0.8"	Tuc	2
ST039	Nav1	"Gamma, Tsh"	00 56.7	+60.7	2.5	*	Cas	21
ST040	Y80		00 59.4	+00 47	6.4	26"	Cas	3
ST041	Y79		01 00.1	+44 43	6	8"	And	3
ST042	Y88		01 02.3	+61 51	6.8	Stellar	Cep	22
ST043	Y90	74	01 05.6	+21 28	5.3	30"	Psc	3
ST044	Zeta	77	01 05.8	+04 55	6.3	33"	Psc	2
ST045	Zeta	Rumker 2	01 08.4	+55 35	3.9	6.4"	Phe	2
ST046	Eta		01 08.6	+10.2	3.5	*	Cet	21
ST047	Lux Lydlae	SAO 181	01 08.7	+86.3	2	*	Cep	21
ST048	Mirach	Beta	01 09.7	+35.6	4.3	*	And	21
ST049	ADS 996	ADS 996	01 13.7	+07.6	5.6	23"	Psc	2
ST050	Kappa	h3423	01 15.8	-68.9	5.1	5.4"	Tuc	2
ST051	Z		01 16.2	+25.8	8.8	*	Psc	21
ST052	Y113	42	01 19.8	-00 31	6.4	1.6"	Cet	4
ST053	Psi	ADS 1129	01 25.9	+68.1	4.7	25"	Cas	9



**Number Name Other RA Dec Mag Sep Con Code**

ST053	R		01 27.0	-32.5	6.1	*	Scl	22	variable star
ST054	Gamma		01 28.4	-43.3	3.4	4'	Phe	21	star
ST055	Achernar	Alpha	01 37.7	-57.14	0.5	*	Eri	21	star
ST056	51		01 38.0	+48.6	3.6	*	And	21	star
ST057	UV		01 38.8	-18.0	7	*	Cet	22	variable star
ST058	p	Dunlop 5	01 39.8	-56.2	5.8	11.5"	Eri	21	double star
ST059	Nu	106	01 41.4	+05.5	4.4	*	Psc	21	star
ST060	44	Burmann 1103	01 43.3	+60.6	5.8	1.6"	Cas	2	double star
ST061	Phi		01 43.7	+50.7	4.1	2"	Per	21	star
ST062	1162		01 49.3	+47.54	5.8	2"	Per	8	triple star challenge
ST063	1174	1	01 50.1	+22.3	6	2.6"	Ari	2	double star
ST064	1163		01 51.3	+64.51	6.6	35"	Cas	5	colored double star
ST065	Baten Kaitos	Zeta	01 51.5	-10.3	3.7	3"	Cet	2	double star
ST066	1178		01 52.0	+10.48	8.5	3"	Ari	3	double star equal magnitude
ST067	1180	Gamma	01 53.5	+19.3	4.5	8"	Ari	3	double star equal magnitude
ST068	Psi		01 53.6	+66.3	4.4	6"	Phe	1	red variable star
ST069	Epsilon	45	01 54.4	+63.7	3.4	4"	Cas	21	star
ST070	1186	ADS 1538	01 55.9	+01.9	6.9	1"	Cet	4	double star challenge
ST071	56	ADS 1534	01 56.2	+37.3	5.7	3"	And	2	double star
ST072	Lambda	ADS 1563	01 57.9	+23.6	4.8	37"	Ari	2	double star
ST073	Upsilon		02 00.0	-21.1	4	*	Cet	21	star
ST074	202	Alpha	02 02.0	+02.6	4	1.6"	Psc	4	double star challenge
ST075	Almach	Gamma	02 03.9	+42.3	2.2	10"	And	5	colored double star
ST076	Fomal	Alpha	02 07.2	+23.5	2	*	Ari	21	star
ST077	59		02 10.9	+39.02	5.6	16"	And	5	colored double star
ST078	ota	ADS 1697	02 12.4	+30.3	5	3.8"	Tri	5	colored double star
ST079	231	66	02 12.8	-02.4	5.7	6.5"	Cet	4	double star
ST080	226		02 14.0	+47.3	6.6	1.1"	And	4	double star challenge
ST081	232	ADS 1709	02 17.7	+30.4	9	7"	Tri	2	double star equal magnitude
ST082	239		02 19.1	+28.44	7	14"	Tri	2	double star
ST083	Mira		02 19.3	+57.0	2	*	Cet	22	variable star
ST084	248		02 20.1	+67.0	4	2.2"	Cas	2	triple star
ST085	258		02 50.1	-55.51	6.9	3"	Per	2	double star
ST086	274		02 51.5	-40.05	7.3	14"	Per	3	double star equal magnitude
ST087	Polaris	Alpha	02 31.8	+89.06	2	18"	UMi	2	double star
ST088	Omega	h 3506	02 33.9	-29.15	5	11"	For	2	double star
ST089	0		02 37.9	+34.38	6.5	39"	For	5	colored double star
ST090	R	Tri	02 37.0	-54.38	6	*	Tri	22	variable star
ST091	299	Gamma	02 43.3	+03.2	3	2.7"	Cet	22	triple star
ST092	305		02 47.5	+19.22	7	3"	Ari	4	double star challenge
ST093	62		02 48.9	+69.58	6.2	Stellar	Cas	22	variable star
ST094	Df		02 49.3	+17.28	5.2	3"	Ari	6	triple star
ST095	307	Eta	02 50.7	+55.53	3.9	28"	Per	9	double star magnitude contrast
ST096	R		02 53.9	-49.9	4.7	*	Hor	22	variable star
ST097	330	ADS 2237	02 57.2	-00.8	7.3	9"	Cet	2	double star
ST098	Acamar	Theta	02 58.3	+40.3	3.5	8"	Eri	2	double star
ST099	333	Epsilon	02 59.2	+29.3	4.6	1.4"	Ari	4	double star challenge
ST100	Epsilon		02 59.2	+21.20	4.6	1"	Ari	4	double star challenge
ST101	331		03 00.8	+52.20	5.4	12"	Per	2	double star
ST102	Menkar	Alpha	03 02.3	+04.1	2.5	*	Cet	21	star
ST103	Rho	25	03 05.2	+38.8	3.4	*	Per	1	red variable star
ST104	320		03 06.2	+79.24	5.8	5"	Cep	5	colored double star
ST105	h3568		03 07.5	-79.0	5.6	15"	Hyl	2	double star
ST106	Algol	Beta	03 08.2	+41.0	2.2	*	Per	22	variable star
ST107	Alpha	ADS 2402	03 12.1	-29.0	4	5"	For	2	double star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST108	h3556		03 12.4	-44.4	6	3.5"	Eri	2
ST109	χ362		03 16.3	+60 02	8.5	7"	Cam	3
ST110	χ369		03 17.2	+40 29	6.7	3"	Per	5
ADS2446			03 17.7	+38.6	7.8	0.9"	Per	4
ST111	Zeta		03 18.2	-62.5	5.2	5"	Ret	2
ST112	Tau4		03 19.5	-21.8	3.7	*	Eri	21
ST113	ADS 2472		03 20.3	+29.0	4.5	9"	Per	21
ST114	Tom's Topaz		03 20.3	+49 52	1.8	*	Per	21
ST115	Mirak	Alpha	03 24.3	+44.2	1.8	*	Per	22
ST116	Y		03 27.7	+44.2	8.1	7"	Per	22
χ394		ADS 2544	03 28.0	+20 27	7.1	7"	Cam	2
ST117	χ385		03 29.1	+59.9	4.2	2.4"	Cam	2
ST118	χ389		03 30.1	+59 21	6.5	2.7"	Cam	2
ST119	Sigma		03 30.6	+48.0	4.4	11"	Per	21
ST120	Epsilon		03 31.3	+27 34	6.4	11"	Tau	3
ST121	χ401		03 32.9	-09.5	3.7	1.4"	Eri	21
ST122	χ400	ADS 2612	03 35.0	+60.0	6.8	46"	Cam	2
ST123	χ406	ADS 2650	03 40.0	+63.9	6.3	46"	Cam	2
ST124	χ436		03 41.6	+62.6	8.1		Cam	22
ST125	Omicron	ADS 2726	03 44.3	+32.3	3.8		Per	21
ST126	π	26	03 46.1	-12.1	4.4	*	Eri	1
ST127	Gamma		03 47.2	-74.2	3.2	8"	Hy	1
ST128	χ52	30	03 46.3	+11.2	5	9"	Tau	2
ST129	δ 16		03 46.6	-37 37	4.9	6"	Eri	3
ST130	BE	SAO 12916	03 49.3	+65.5	4.5	*	Cam	21
ST131	Alk	Zeta	03 84.1	+31.9	2.9	*	Per	21
ST132	Zeta	ADS 2850	03 84.3	-03.0	5	7"	Eri	5
ST133	22		03 87.9	+40 01	2.9	0"	Per	5
ST134	Epsilon	Gamma	03 86.0	-13.9	3		Eri	21
ST135	Laurak	35	04 00.7	+12.5	3.3	*	Tau	22
ST136	Lambda	ADS 2995	04 07.6	+68.1	7.4	1.4"	Per	2
ST137	χ2931		04 07.6	-82.0	9"	90"	Cam	3
ST138	χ485	SZ	04 07.2	+62 20	4.5	83"	Eri	8
ST139	Omicron2	40	04 18.2	-56.3	4.5	*	Eri	21
ST140	Epsilon	Rumker 3	04 17.7	-63.3	6.2	4"	Ret	2
ST141	Theta	ADS 3137	04 20.4	+27.3	8.4	52"	Tau	2
ST142	π		04 22.0	+19 82	5.4	Stellar	Tau	22
ST143	χ528	Chi	04 22.6	+25.6	5.4	19.4"	Tau	22
ST144	ADS2169		04 22.7	+15.6	7.3	1.4"	Tau	4
ST145	χ 184		04 24.0	-34.0	4.4	*	Tau	1
ST146	χ 184	Upsilon3	04 24.0	-34.0	4.4	*	Tau	1
ST147	χ552		04 27.9	-21 30	7.3	1.4"	Eri	4
ST148	1		04 32.0	+53 55	5.4	10"	Per	3
ST149	χ559		04 33.9	+18 01	6.9	3"	Cam	5
ST150	χ559	ADS 3305	04 33.9	+18 01	6.9	3"	Tau	3
ST151	46	Alpha	04 35.9	-06.7	5.7	4"	Eri	2
ST152	Aldebaran		04 36.3	+16.5	0.9	30"	Tau	5
ST153	Nu	48	04 36.3	-03.4	3.9	11"	Eri	21
ST154	χ3		04 38.2	-14.3	3.9	*	Eri	21
ST155	χ572		04 38.5	+26 56	7.3	4"	Tau	3
ST156	54		04 40.4	-19.7	1	*	Eri	1
ST157	R		04 40.5	-38.2	6.7	*	Cam	22
χ590			04 43.6	-08 48	6.7	9"	Eri	3
ST158	Iota	Dunlop 18	04 50.9	-53.5	5.6	12"	Pic	2
ST159	RV		04 51.2	+68 10	9.2	Stellar	Cam	1
ST160	ST	3	04 51.2	+05.6	3.7	*	Orn	21
ST161	P4		04 51.6	+28.5	8	*	Tau	22
ST162	TT							

**Number Name Other RA Dec Mag Sep Con Code**

ST163	Pi5		04 54.2	+02.4	3.7	*		Ori	21	star
ST164	Omicron2		04 56.4	+13.5	4.1	*		Ori	21	star
ST165	Iota		04 57.0	+33.2	2.7	*		Aur	21	star
ST166	Pi6		04 58.5	+01.7	4.5	*		Ori	21	star
ST167	Omega		04 59.3	+37.9	5.5	5.4*		Aur	2	double star
ST168	Hydra Crimson Star	R	04 59.6	-14.8	5.9	*		Lep	22	variable star
ST169	3627		05 00.6	+03.36	6.6	21*		Ori	3	double star equal magnitude
ST170	3631	ADS 3606	05 00.7	-13.5	7.5	5.5*		Lep	2	double star
ST171	3630	ADS 3623	05 02.0	+01.6	6.5	15*		Ori	2	double star
ST172	Epsilon		05 02.0	+43.49	2.9	Stellar		Aur	22	variable star
ST173	Zeta	8	05 02.5	+41.1	3.8	*		Aur	21	star
ST174	W		05 05.4	+01.2	8.6	*		Ori	22	variable star
ST175	Epsilon		05 05.5	-22.4	3.2	*		Lep	21	star
ST176	Eta	10	05 06.5	+41.2	3.2	*		Aur	21	star
ST177	Theta	14	05 07.9	+08.29	5.9	0.7*		Ori	4	double star challenge
ST178	Xi		05 09.1	+39.0	8.5	*		Aur	22	variable star
ST179	Yi		05 09.8	-09.6	9	*		Eri	22	variable star
ST180	3644		05 10.4	+37.17	6.8	2*		Aur	4	double star challenge
ST181	3655	Iota	05 12.3	-11.9	4.5	3*		Lep	2	double star
ST182	Rho		05 13.3	+02.52	4.5	7*		Ori	5	colored double star
ST183	Pieta	Beta ORI	05 14.5	-06.2	0	9.4*		Ori	9	double star magnitude contrast
ST184	3653	14	05 15.4	+32.7	5.1	11*		Aur	6	triple star
ST185	Capella	Alpha	05 16.7	+46.00	0.2	39*		Lep	3	double star equal magnitude
ST186	S 476		05 19.3	-16.30	6.2	39*		Lep	3	double star magnitude contrast
ST187	U3750		05 20.3	-21.14	4.7	4*		Lep	22	variable star
ST188	Upsilon		05 21.8	+32.5	7.4	3.2*		Lep	2	double star
ST189	ADS3954		05 21.8	-24.6	5.5	3.2*		Lep	2	double star
ST190	3696	ADS 3962	05 22.3	+03.6	6	6*		Ori	2	double star
ST191	7101	ADS 3978	05 22.3	-06.4	6	6*		Ori	2	double star
ST192	Eta		05 24.7	+37.24	3.4	5*		Ori	4	double star
ST193	Sigma	ADS 3984	05 24.7	-37.3	3	8*		Pic	2	double star
ST194	Tau	Dumlop 20	05 24.7	+37.3	6.8	38*		Pic	2	double star
ST195	Pieta		05 25.3	-06.3	6.6	31*		Aur	21	star
ST196	Gamma	ADS 4000	05 25.2	+05.3	6.6	31*		Aur	2	double star
ST197	3728		05 26.5	+25.89	3.9	5*		Tau	2	double star
ST198	3726	18	05 26.7	-61.1	4.7	4*		Aur	21	star
ST199	Upsilon	KBC Group	05 30.0	-17.0	5.7	5*		Ori	0	asterism
ST200	Delta	ADS 4154	05 32.0	+01.3	2.2	53*		Ori	2	double star
ST201	119		05 32.2	-18.6	4.7	*		Tau	21	double star
ST202	3718		05 32.4	+49.24	7.5	8*		Aur	3	double star equal magnitude
ST203	Eta	ADS 4182	05 33.2	+07.2	4.8	8*		Ori	22	variable star
ST204	Lambda		05 35.0	-06.0	4.8	36*		Ori	2	double star
ST205	Lambda		05 35.1	+09.56	3.4	4*		Ori	9	double star magnitude contrast
ST206	Trapezium		05 35.3	-05.23	5.1	13*		Ori	7	quadruple star
ST207	3752	Iota	05 35.4	-05.55	2.9	11*		Ori	9	double star magnitude contrast
ST208	Alnilam		05 36.2	+01.2	1.7	*		Ori	21	star
ST209	Phi2	Epsilon	05 36.9	+09.3	4.7	*		Ori	21	star
ST210	Zeta		05 37.6	+21.1	3	*		Tau	21	star
ST211	Sigma	123	05 38.7	-02.36	3.7	11*		Ori	7	quadruple star
ST212	Phieta	Alpha	05 39.6	-34.1	2.6	*		Ori	21	star
ST213	Phieta		05 39.6	-34.1	2.6	*		Ori	9	double star magnitude contrast
ST214	Upsilon	Zeta	05 40.8	+01.9	2	2.4*		Ori	22	variable star
ST215	Gamma	ADS 4334	05 42.2	+62.5	7.7	*		Cam	22	variable star
ST216	Y		05 44.5	-22.5	3.7	97*		Lep	2	double star
ST217	Mu	SAO 196149	05 45.7	+20.7	7.1	*		Tau	22	variable star
ST217	Mu		05 46.0	-32.3	5.2	*		Ori	21	star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST218	Saiph	Kappa	05 47.8	-09.7	2	*	Ori	21
ST219	Σ795	52	05 48.0	+06 27	6.1	"-1.3"	Ori	4
ST220	Beta	Wazn	05 51.0	-35.8	3.1	*	Col	21
ST221	Delta		05 51.3	-20.9	3.8	*	Lep	21
ST222	Nu		05 51.5	+39.1	4	30°	Aur	21
ST223	Σ317		05 54.9	+07 02	8.8	19°	Ori	3
ST224	Belelgause	Alpha	05 55.2	+07 24	0.5	Stellar	Ori	21
ST225	U		05 55.8	+20.2	5.3	*	Ori	22
ST226	Theta		05 59.7	+37 13	2.6	3.5°	Ori	9
ST227	Pi		05 59.9	+45.9	4.3	1°	Aur	1
ST228	Δ23		06 04.8	-48 27	7	2.7"	Pup	3
ST229	Σ855		06 09.0	+02 30	6	30°	Ori	3
ST230	TU		06 10.9	+26.0	7.5	*	Gem	22
ST231	Σ231	41	06 11.7	+48 42	6.1	8°	Aur	22
ST232	Σ845		06 13.4	+47.0	10	*	Aur	22
ST233	Gamma		06 13.4	-06.3	4	6°	Mon	21
ST234	Eta		06 14.9	-06.3	3.3	*	Gem	21
ST235	Σ872	ADS 4849	06 15.6	+22.5	6.9	11°	Gem	21
ST236	KS		06 19.7	-06.3	9.5	*	Mon	22
ST237	Zeta	Furud	06 20.3	-30.1	3	8.5°	Cma	22
ST238	V		06 22.7	-02.2	6	*	Mon	22
ST239	Mirzam	Beta	06 23.0	+22.9	2.9	*	Cma	21
ST240	Wiu		06 23.0	+04 36	4.3	13°	Gem	21
ST241	6		06 23.8	-16.0	2.9	*	Car	5
ST242	BL	Alpha	06 24.0	-32 42	-0.7	*	Ori	21
ST243	BL		06 25.3	+14.7	8.5	*	Gem	22
ST244	BL		06 27.8	+20 47	6.6	27°	Gem	2
ST245	Theta		06 28.8	-02 02	3.8	6"	Mon	2
ST246	Σ951	Σ150	06 31.6	+38.9	1.5	4.5°	Aur	9
ST247	Σ952	20	06 32.3	+17.8	6.5	20°	Gem	2
ST248	Σ955	188	06 34.3	+38.1	6.7	43°	Aur	2
ST249	CP		06 34.3	-38.1	6.5	*	Gem	22
ST250	Σ928	ADS 5191	06 35.1	-39.4	7.0	3.5°	Aur	2
ST251	ADS201		06 35.7	-37.1	7.4	2.6°	Aur	2
ST252	Σ929	ADS 5208	06 35.4	-37.1	7.1	6°	Aur	7
ST253	Σ930		06 35.9	-30.5	6.3	90°	Mon	2
ST254	ADS5221		06 36.2	-18.0	6.5	13°	Mon	4
ST255	Nu1		06 36.4	-18.7	6.9	17.5°	Cma	5
ST256	Uu1		06 36.5	-18.7	5.1	*	Aur	22
ST257	ADS5240		06 36.9	-38.5	9.7	2.2°	Aur	2
ST258	ADS5245		06 37.3	-38.4	8.8	10°	Aur	2
ST259	South59		06 37.6	+12.2	7.8	70°	Gem	2
ST260	Imes5		06 38.0	-61.5	6.4	2.4°	Pic	2
ST261	ADS5265		06 38.4	-38.8	9.6	4.6°	Aur	2
ST262	Imes1166	ADS 5311	06 39.1	-29.1	8	0.7°	Cma	4
ST263	SAO172106		06 39.5	-30.0	7.8	2.5°	Cma	1
ST264	Σ953		06 41.2	+08 59	7.1	7°	Mon	2
ST265	VW		06 42.2	-31.5	6.7	*	Gem	22
ST266	Σ954	Alpha	06 45.1	-16.7	-1	9°	Ori	9
ST267	Σ948	12	06 46.2	+59 27	4.9	2°	Lyn	8
ST268	Σ958		06 48.2	+55 42	5.5	5°	Lyn	3
ST269	Kappa	13	06 49.8	-32.5	4	*	Cma	21
ST270	Σ963	14	06 53.1	+59.5	5.7	0.4°	Lyn	4
ST271	GY		06 53.2	-04.6	9.4	*	Mon	22
ST272	Σ987		06 54.1	-05 51	7.1	1.3°	Mon	4

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ST273	Omicron1	16	06 54.1	-24.2	3.9	*	Cma	21	star
ST274	Theta	14	06 54.2	-12.0	4.1	7"	Cma	21	star
ST275	38		06 54.6	+13.11	5.3	2.8"	Gem	5	colored double star
ST276	3997	Mu	06 56.1	-14.02	5.3	*	Cma	9	double star magnitude contrast
ST277	BG		06 56.4	+07.1	9.2	*	Mon	22	variable star
ST278	OJ80		06 58.1	+14.2	7.3	2'	Gem	0	asterism
ST279	RV		06 58.4	+06.2	7	*	Mon	22	variable star
ST280	Epsilon	21	06 58.6	-29.0	1.5	7.5"	Cma	2	double star
ST281	Sigma	22	07 01.7	-27.9	3.5	*	Cma	21	star
ST282	Omicron2	24	07 03.0	-23.8	3	*	Cma	21	star
ST283	Dunlop38		07 04.0	-43.6	5.6	20.5"	Pup	2	double star
ST284	Mikbuda	Zeta	07 04.1	+20.6	3.7	*	Gem	22	variable star
ST285	1009		07 05.7	+52.45	6.9	4.1"	Lyn	3	double star equal magnitude
ST286	R		07 07.4	+22.7	6	*	Gem	22	variable star
ST287	RV		07 08.1	-11.95	6.4	Stellar	Cma	1	red variable star
ST288	Gamma		07 08.8	-70.5	4.4	13.6"	Vol	2	double star
ST289	Iau		07 11.1	+30.2	4.4	1.9"	Gem	2	double star
ST290	1035		07 12.0	+22.17	6.2	4	Gem	3	double star equal magnitude
ST291	1037		07 12.8	+27.2	7.2	1.3"	Gem	4	double star challenge
ST292	Omega	28	07 14.8	-26.6	3.9	*	Cma	21	star
ST293	13945		07 16.5	-23.19	4.5	27"	Cma	5	colored double star
ST294	Iau	h 3948	07 16.7	-24.57	4.4	15"	Cma	6	triple star
ST295	Delta	35	07 20.1	+21.99	3.5	6	Gem	8	double star
ST296	1062		07 22.9	+35.17	5.6	15"	Lyn	6	double star magnitude contrast
ST297	Gamma	4	07 26.2	+08.9	4.3	*	Cmi	21	triple star
ST298	Sigma		07 29.2	+5.3	3.3	22"	Pup	2	double star
ST299	1093	ADS 6117	07 30.3	+50.0	8.8	0.6"	Lyn	4	double star challenge
ST300	n	"HN 19, 1269"	07 34.3	-23.28	5.1	10"	Pup	4	double star equal magnitude
ST301	Castor	Alpha	07 34.6	+31.9	2	1.8"	Gem	4	double star challenge
ST302	Upsilon	69	07 35.8	+46.9	4.1	2.3"	Gem	4	red variable star
ST303	1121		07 36.6	+4.28	7.8	7'	Pup	3	double star equal magnitude
ST304	k		07 36.8	-26.44	3.8	10"	Pup	3	double star equal magnitude
ST305	Paveion	Alpha	07 36.9	+4.4	3.8	Stellar	Cmi	21	double star equal magnitude
ST306	OJ79	Kappa	07 39.3	+03.4	3.7	7"	Gem	6	double star magnitude contrast
ST307	Y179	2	07 44.3	-14.73	8.7	17"	Pup	3	double star equal magnitude
ST308	1129		07 45.5	+64.03	7	5"	Cem	6	double star
ST309	1149		07 49.4	+03.93	7.9	22"	Cem	2	double star
ST310	U	V	07 55.1	+22.00	8.2	Stellar	Gem	22	variable star
ST311	Chi		07 56.8	+53.0	9.5	4'	Cem	0	double star
ST312	Dunlop59		07 59.2	-50.0	6.5	16"	Pup	21	double star
ST313	S186		08 02.5	+63.1	6.5	49"	Cem	2	double star
ST314	Nages	Zeta	08 03.6	-40.0	2.3	4'	Pup	21	star
ST315	RT		08 05.4	-38.8	8.5	*	Pup	22	variable star
ST316	RU		08 07.5	-22.9	8.9	*	Pup	22	variable star
ST317	Epsilon	Rumker 7	08 07.9	-68.6	4.4	6"	Vol	2	double star
ST318	Gamma	Dunlop 65	08 09.5	-47.3	1.9	41"	Vol	2	double star
ST319	Zeta		08 12.2	+17.39	4.7	0.6"	Cnc	8	triple star challenge
ST320	c		08 15.3	-62.9	5.3	3	Cnc	2	double star
ST321	Beta	Rumker 8	08 16.5	+09.2	3.5	*	Cnc	21	star
ST322	R	17	08 16.6	+11.7	6.1	*	Cnc	21	variable star
ST323	Kappa		08 19.8	-71.5	5.4	65"	Vol	2	double star
ST324	AC		08 22.7	-15.9	8.9	*	Pup	22	variable star
ST325	31		08 22.8	+43.2	4.3	15"	Lyn	21	variable star
ST326	Beta		08 25.7	-66.1	3.8	6"	Vol	21	star
ST327	h4903		08 26.3	-39.1	6.5	8"	Pup	2	double star

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ST328	χ1224		08 26.7	+24 32	7.1	6"	Cnc	2	double star
ST329	χ1223	24	08 26.7	+26 56	6.3	5"	Cnc	3	double star equal magnitude
ST330	h4104	Phi	08 29.1	-47.9	5.5	3.6"	Vel	2	double star
ST331	χ70		08 29.5	-44 44	5	5"	Vel	2	double star
ST332	h4107		08 31.4	-39 04	6.4	4"	Vel	6	triple star
ST333	χ1245		08 35.8	+06 37	6	10"	Cnc	2	double star
ST334	Sigma	5 HYA	08 36.8	+03 3	4.4	*	Hya	21	star
ST335	h4128		08 39.2	-60.3	6.9	1.4"	Car	4	double star challenge
ST336	χ1254		08 40.4	+19 40	6.4	21"	Cnc	7	quadruple star
ST337	Alpha		08 43.6	-33.2	3.7	*	Pyx	21	star
ST338	Delta	Imnes-10	08 44.7	-54.7	2.1	2.6"	Vel	2	double star
ST339	χ1270	ADS 6977	08 45.3	-02.6	6.4	5"	Hya	2	double star
ST340	χ1268	iota	08 46.7	+28 46	4	30"	Cnc	5	colored double star
ST341	Epsilon		08 46.8	+06 25	3.4	3"	Hyd	9	double star magnitude contrast
ST342	χ1282		08 50.8	+35 03	7.5	4"	Lyn	3	double star equal magnitude
ST343	X		08 55.4	+17.2	5.6	*	Cnc	22	variable star
ST344	χ1298	66	09 01.4	+32 15	5.9	5"	Cnc	2	double star
ST345	Rho		09 02.5	+67.6	4.8	6"	Uma	21	star
ST346	χ1311		09 07.5	+42 59	6.9	8"	Cnc	3	double star equal magnitude
ST347	Sigma1	Lambda	09 08.0	-43 26	2.2	Stellar	Vel	21	star
ST348	Sigma2		09 10.4	+67 08	4.3	4"	Uma	9	double star magnitude contrast
ST349	δ		09 11.0	-59.0	3.4	50"	Car	21	star
ST350	h4166		09 12.5	-43.6	6.7	2.7"	Vel	2	double star
ST351	h4191		09 14.4	-45 13	5.2	6"	Vel	9	double star magnitude contrast
ST352	χ1321		09 14.9	+52 42	6.1	16"	Uma	5	double star equal magnitude
ST353	ρ		09 16.2	-37.9	4.3	5"	Car	21	star
ST354	χ1334	38	09 16.4	+31 44	8.6	*	Uma	22	variable star
ST355	χ1336		09 16.8	+36 46	3.9	3"	Lyn	4	double star challenge
ST356	χ1338		09 21.0	+38 11	6.6	1"	Lyn	4	double star challenge
ST357	Alpha	40	09 21.1	+54 4	3.1	*	Lyn	21	star
ST358	Kappa		09 22.1	-53.9	2.5	*	Vel	21	star
ST359	χ1347		09 22.3	-03 30	7.2	21"	Hya	2	double star
ST360	Kappa	ADS 7351	09 24.7	+28 34	7.5	2 1/2"	Leo	6	triple star
ST361	χ1355		09 27.3	+68 14	7.5	2 1/2"	Leo	3	double star equal magnitude
ST362	χ1362		09 27.8	+08 40	4.9	Stellar	Hya	21	star
ST363	χ1365	Alpha	09 28.5	+09 4	5.9	0.5"	Leo	2	double star challenge
ST364	χ1366	Omega	09 28.6	+45 1	6.1	61"	Leo	7	double star
ST365	χ1369	χ1369p76	09 30.6	+10 35	8.9	14"	Leo	2	double star equal magnitude
ST366	Zeta		09 30.8	-31 53	3.9	8"	Ant	21	double star
ST367	η		09 31.2	-57.0	3.9	*	Via	21	star
ST368	χ1351	23	09 31.5	+63 03	3.8	23"	Uma	9	double star magnitude contrast
ST369	Alverr	Lambda	09 31.7	+23 0	4.3	*	Leo	21	star
ST370	R		09 32.2	+62 8	3.8	*	Car	22	variable star
ST371	χ1369	ADS 7438	09 35.4	+40 0	6.5	25"	Lyn	2	double star
ST372	iota		09 39.9	-01 1	3.9	*	Hya	21	star
ST373	Upsilon	Rumker 11	09 47.1	+65 1	3.1	5"	Car	2	double star
ST374	R	RV	09 47.6	+11 26	4.4	Stellar	Leo	1	red variable star
ST375	W		09 51.0	-02 0	9	*	Sex	22	variable star
ST376	Y		09 51.1	-23 0	8.3	*	Hya	22	variable star
ST377	Rasalas	Mu	09 52.8	+26 0	3.9	*	Leo	21	star
ST378	h4262	ADS 7571	09 54.5	-12 9	8.7	8"	Hya	2	double star
ST379	Regulus	Alpha	10 08 4	+11 58	1.4	Stellar	Leo	21	star
ST380	S		10 09 4	-61.6	4.5	*	Car	22	variable star
ST381	ADS704		10 16.3	+177	7.2	1.4"	Leo	4	double star challenge
ST382	Adhatera	Zeta	10 16.7	+23.4	3.4	5.5"	Leo	2	double star

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ST383	q		10 17.1	-61.3	3.4	*		Car	21	star
ST384	h4306		10 19.1	-64.7	5.6	2.1*		Car	2	double star
ST385	Algieba	Gamma	10 20.0	+19.8	2.5	4.4*		Leo	20	double star
ST386	Tania Australis	Mu	10 22.3	+41.5	3	*		Uma	21	star
ST387	Mu	42	10 26.1	-16.8	3.8	*		Hya	21	star
ST388	Alpha		10 27.2	-31.1	4.3	*		Ant	21	star
ST389	45		10 27.6	+09.8	6	3.8*		Leo	20	double star
ST390	Delta	HN 50	10 29.6	-30.36	5.7	11*		Ant	9	double star magnitude contrast
ST391	p		10 32.0	-61.7	3.3	*		Car	21	star
ST392	Rho	47	10 32.8	+09.3	3.9	2*		Leo	20	double star challenge
ST393	49		10 35.0	+08.39	5.7	*		Leo	4	double star challenge
ST394	Gamma		10 35.2	-39.6	8.1	*		Ant	22	variable star
ST395	Gamma		10 35.5	-78.6	4.1	*		Hya	22	variable star
ST396	U		10 37.6	-13.4	7	52*		Vel	2	variable star
ST397	Dunlop95	X	10 39.3	-55.6	4.3	52*		Sex	22	double star
ST398	z1466	35	10 43.4	+04.44	6.3	7*		Sex	22	double star
ST399	R		10 44.6	+68.6	7.5	*		Uma	22	variable star
ST400	Y		10 45.1	+67.4	5.9	*		Uma	22	variable star
ST401	Delta		10 45.8	-80.5	4.5	4.5*		Cha	2	double star
ST402	z1476		10 49.3	-04.01	6.9	2.5*		Sex	2	double star
ST403	Nu		10 49.6	-16.2	3.1	16.2		Hya	21	star
ST404	84	ADS 7979	10 55.6	+24.6	4.5	6.8*		Leo	2	double star
ST405	SAO25 (342)		11 17.5	-63.5	4.5	1.3*		Car	9	double star magnitude contrast
ST406	Xi	ADS 8119	11 18.2	+31.5	4.5	1.3*		Uma	4	double star challenge
ST407	Alia Borealis	Nu	11 18.5	+33.1	3.5	7*		Uma	2	double star
ST408	U		11 19.4	-01.38	7	10*		Leo	2	double star
ST409	h4452		11 23.4	-65.0	5.1	23*		Mus	2	double star challenge
ST410	ota		11 23.9	+10.5	4	4.3*		Leo	4	double star
ST411	z1540		11 23.9	+03.00	6.2	29*		Leo	4	triple star
ST412	Tau	83	11 26.8	-03.00	6.2	29*		Leo	5	triple star
ST413	Grauser	Lambda	11 27.9	+62.9	3.5	15*		Leo	2	double star
ST414	88		11 31.6	+69.1	3.8	20*		Dra	1	red variable star
ST415	U	X	11 32.3	-04.4	6.4	16*		Leo	2	double star
ST416	Ines78		11 35.3	-20.16	3.8	0*		Hyd	3	double star equal magnitude
ST417	Y		11 37.7	+16.68	6	3*		Cen	4	double star challenge
ST418	Nu		11 45.9	+06.48	9	*		Vro	6	triple star
ST419	Borebola	Beta	11 49.1	+13.34	4.1	Stellar		Leo	21	star
ST420	Borebola		11 49.9	-33.03	2.1	0.9*		Hya	5	colored double star
ST421	Oy112		11 54.6	-19.4	8.4	73*		Hya	2	colored double star
ST422	Y1576	65	11 55.1	+46.29	6.7	4*		Uma	2	double star
ST423	Epsilon	h4486	11 59.6	-78.2	5.4	0.9*		Cha	5	colored double star
ST424	z1593		12 03.5	-02.26	8.7	1.3*		Vro	4	colored double star
ST425	Zeta	2	12 04.3	+21.5	6	3.6*		Com	2	double star challenge
ST426	Delta		12 08.4	-50.7	2.6	4.5*		Cen	2	double star
ST427	Y1604		12 09.5	-11.51	6.6	10*		Crv	6	triple star
ST428	Epsilon		12 10.1	-22.6	3	*		Crv	21	star
ST429	Rumker14		12 14.0	-45.7	5.6	2.9*		Cen	2	double star
ST430	Delta		12 15.1	-58.7	2.8	*		Cru	21	star
ST431	2	ADS 9489	12 16.1	+40.7	6	11.5*		Crv	5	colored double star
ST432	Epsilon		12 17.6	-68.0	4.1	*		Mus	1	red variable star
ST433	R		12 18.1	-03.56	6.6	20*		Vro	3	double star equal magnitude
ST434	R		12 19.6	-19.3	6.7	*		Crv	22	variable star
ST435	Y1633		12 20.6	+27.03	6.3	9*		Com	3	double star equal magnitude
ST436	Epsilon		12 21.4	-60.4	3.6	*		Cru	21	star
ST437	M40	Winnecke 4	12 22.4	+58.05	9	50*		Uma	2	double star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST438	17	ADS 8531	12 22.5	+05.3	6.5	21*	Vrv	double star
ST439	Σ1639	ADS 8539	12 24.4	+25.6	6.8	1.6*	Com	double star challenge
ST440	S		12 24.6	-49.4	9.2		Cen	variable star
ST441	SS	RV	12 25.3	+00.48	6	Stellar	Vrv	red variable star
ST442	AcruX	Alpha	12 26.6	-63.1	6	4.4*	Cru	double star
ST443	3C273		12 29.1	+02.0	12.8	*	Vrv	asterism
ST444	Algorab	Delta	12 29.9	-16.5	3	24*	Crv	double star
ST445	Gacrux	Gamma	12 31.2	-57.1	1.6	10*	Cru	double star
ST446	Σ1649	ADS 9585	12 31.6	-11.1	8	15*	Vrv	double star
ST447	24		12 35.1	+18.23	5	20*	CVn	colored double star
ST448	Alpha		12 37.2	-69.1	2.7	*	Mus	star
ST449	ADS8612		12 37.7	-27.1	5.5	1.3*	Hya	double star challenge
ST450	Σ1669		12 41.3	-13.01	5.3	5*	Crv	double star equal magnitude
ST451	Gamma	h4539	12 41.5	-49.0	2.2	1*	Cen	double star challenge
ST452	Porrina	Gamma	12 41.7	-01.4	3.5	3*	Vrv	double star
ST453	Y	RV	12 45.1	+45.26	7.4	Stellar	CVn	red variable star
ST454	Iota		12 45.6	-61.0	4.7	27	Cru	double star
ST455	Beta		12 46.3	-56.1	3.7	1.4	Mus	double star challenge
ST456	Mimosa	Beta	12 47.7	-59.7	1.3		Com	star
ST457	Σ1694		12 49.2	+63.25	5.3	22*	Cdm	double star equal magnitude
ST458	Σ1687	S	12 53.3	+21.14	5.1	29*	Com	double star magnitude contrast
ST459	Dunlop 126		12 54.6	-57.2	4.3	35*	Cru	double star
ST460	Delta		12 55.6	+03.4	3.4	19*	Vrv	red variable star
ST461	Cor Caroli	Alpha	12 56.0	+38.3	3		CVn	double star
ST462	RY		12 56.4	+66.0	6.8		Dra	variable star
ST463	Σ1689		12 56.7	-47.28	8.8	1.5*	Com	double star challenge
ST464	Delta		13 02.3	-71.9	3.6	8*	Mus	star
ST465	Theta	Runkler 16	13 06.1	-65.3	5.7	6.3*	Mus	double star
ST466	Σ1724	"Σ1, Theta"	13 09.9	-09.92	4.4	7*	Vrv	triple star challenge
ST467	Alpha		13 10.0	+16.52	5	0.5*	Com	double star challenge
ST468	94		13 12.6	-61.60	6.8		Vrv	double star
ST470	Mizar	Dunlop 133	13 25.6	-51.6	4.7	1*	Cen	double star
ST471	Zeta	Alpha	13 55.6	-51.56	2.3	14*	Uma	double star
ST472	QZ 123		13 57.2	-11.2	6.7	69*	Dra	star
ST473	V		13 59.7	-23.17	3.2		Hyd	colored double star
ST474	Σ1755	ADS 8934	13 52.3	-36.6	7	4.4*	CVn	variable star
ST475	S		13 39.0	+07.2	6	*	Vrv	double star
ST476	26	ADS 8974	13 37.5	-36.3	5	18*	Cru	variable star
ST477	Σ1763	ADS 8972	13 37.6	-07.9	7.9	2.8*	Vrv	double star magnitude contrast
ST478	Epsilon		13 39.9	-53.5	2.3		Cen	double star
ST479	Σ1772	1	13 40.7	+19.57	5.7	5*	Boo	double star magnitude contrast
ST480	Dunlop141		13 41.7	-54.6	5.3	5.3*	Cen	double star
ST481	T		13 41.8	-33.6	5.5	*	Cen	variable star
ST482	Alkaid	Eta	13 47.5	-49.3	1.9	*	Uma	star
ST483	Σ1785	ADS 9031	13 49.1	+27.0	7.8	3.4*	Boo	double star
ST484	2		13 49.4	-34.5	4.2	*	Cen	double star
ST485	Upsilon	k	13 49.5	+15.8	4.1	*	Boo	star
ST486	3		13 51.8	-33.0	4.5	8*	Cen	double star
ST487	Zeta		13 55.5	-47.3	2.6	5*	Cen	star
ST488	Hadar	Beta	14 03.8	-60.4	0.6	*	Cen	double star
ST489	Pi		14 06.4	-26.7	3.3	*	Hya	star
ST490	Kappa		14 12.9	-10.3	4.2	*	Vrv	star
ST491	Kappa		14 13.5	+51.47	4.4	13*	Boo	colored double star
ST492	Σ1819		14 15.3	+03.08	7.8	0.8*	Vrv	double star challenge



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ST493	Arcturus	Alpha	14 15.7	+19 11	0	Stellar	Boo	21	star
ST494	Iota	ADS 9198	14 16.2	+51.4	4.9	39"	Boo	2	double star
ST495	H		14 16.6	-59.9	5.3		Cen	22	variable star
ST496	χ1834	ADS 9229	14 20.3	+48.5	8.1	1.3"	Boo	4	double star challenge
ST497	χ1833		14 22.6	-07 46	7.6	6"	Vir	3	double star equal magnitude
ST498	Dunlop 159		14 22.6	-58.5	5	9"	Cen	5	colored double star
ST499	χ1835		14 23.4	+08 26	5.1	6"	Boo	2	double star
ST500	SHJ 179		14 25.5	-19 58	6.4	35"	Lib	2	double star
ST501	5	ADS 9286	14 27.5	+7 57	4.3		Umi	21	star
ST502	Proxima		14 29.9	-62.7	10.7	*	Cen	22	variable star
ST503	Rho	ADS 9296	14 31.8	+30.4	3.6		Boo	21	star
ST504	η4690		14 37.3	-46 08	5.4	19"	Lup	9	double star magnitude contrast
ST505	Rigel Kentaurus	Alpha	14 39.6	-60 50	0	20"	Cen	2	double star
ST506	π1	ADS 9338	14 40.7	+16.4	5	5.6"	Boo	2	double star
ST507	χ1864	π1	14 40.7	+16 25	4.9	6"	Boo	2	double star
ST508	Zeta		14 41.1	+13 44	3.8	1"	Lup	4	double star challenge
ST509	Alpha		14 41.9	-47.4	2.3	*	Lup	21	star
ST510	η		14 42.0	-37.6	4		Cen	21	star
ST511	Alpha	Dunlop 166	14 42.5	-65.0	3.2	16"	Cir	2	double star
ST512	ε1		14 42.5	-35.2	4	17"	Cen	21	star
ST513	ζair	Epsilon	14 45.0	+27 04	2.4	3"	Boo	5	colored double star
ST514	Dunlop 169		14 45.2	-55.6	6.2	68"	Cir	2	double star
ST515	34	H 97	14 46.0	-25 26	5.2	8"	Hya	2	double star
ST516	Alpha		14 47.9	-79.0	3.8	10"	Aps	21	star
ST517	χ1883		14 48.9	+05 57	7.6	6.7"	Vir	4	double star challenge
ST518	ηiu		14 49.3	-14 09	5.4	2"	Lib	4	double star challenge
ST519	39		14 49.7	+48 43	5.7	8"	Boo	5	double star
ST520	36	Kochab	14 50.3	-26.0	4.4	*	Hya	21	star
ST521	β	Beta	14 50.7	+74.2	2.1	4"	Umi	21	star
ST522	χ	Alpha	14 50.9	-16 06	4.8	7"	Lib	5	double star
ST523	χ	Zubelmeigumbi	14 51.4	-19 06	4.6	2.4"	Boo	2	colored double star
ST524	η4715		14 51.5	-41 52	6	23"	Lup	2	double star
ST525	33	H 28	14 57.3	-21 22	5.9	23"	Lib	2	double star
ST526	β		14 56.5	-43 22	5.9	23"	Lup	2	double star
ST527	4		15 06.8	89 2	5.9		Cir	21	star
ST528	44		15 03.9	-47 39	3.6	15"	Boo	4	double star challenge
ST529	β	Sigma	15 04.1	-25 3	3.5	*	Lib	2	double star
ST530	Dunlop 178		15 11.9	-48 3	6.5	32"	Lup	1	red variable star
ST531	χ	Kappa	15 11.9	-48 3	3.9	27"	Lup	2	double star
ST532	χ		15 14.3	-70 1	8		Vir	22	variable star
ST533	χ1932		15 14.3	-70 1	6.6	1.5"	Cir	4	double star challenge
ST534	μ	η4753	15 18.5	-26 50	5.1	1.2"	Lup	4	double star challenge
ST535	χ1931		15 18.7	+10 26	7	13"	Cen	22	double star
ST536	5		15 21.4	-31 4	5.8	*	Vir	2	variable star
ST537	φ11		15 21.8	-36 3	3.6	50"	Lup	4	star
ST538	ε1a		15 23.2	-30 17	5.6	1.0"	Cir	21	double star challenge
ST539	μ		15 24.5	-37 23	4.3	2"	Boo	6	triple star
ST540	ε1a2	Iota	15 24.9	-45 0	3.3	*	Dra	21	double star
ST541	χ1972	π1	15 29.2	+80 26	6.9	31"	Umi	2	double star
ST542	λ1123		15 33.1	-24 29	7.3	9"	Lib	3	double star equal magnitude
ST543	χ1954	Delta	15 34.8	+41.5	4	3.9"	Vir	2	double star
ST544	Gamma		15 35.1	-41.2	2.8	*	Lup	21	star
ST545	η4788	d	15 35.9	-45 0	4.7	2.2"	Lib	2	double star
ST546	Upsilon	ADS 9705	15 37.0	-28.1	3.6	3"	Lup	5	colored double star
ST547	Omega		15 38.1	-42.6	4.3	*	Lup	1	red variable star

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ST548	Σ1962		15 38.7	-08 47	5.8	12"	Lib	3	double star equal magnitude
ST549	Tau	40	15 38.7	-29.8	3.7	2"	Lib	21	star
ST550	Σ1965	Zeta	15 39.4	+36.6	5	6.3"	Crb	2	double star
ST551	Σ1967	Gamma	15 42.7	+26.3	4.2	0.3"	Crb	2	double star challenge
ST552	Unukalhai	Alpha	15 44.3	+06.4	2.7		Ser	21	star
ST553	R		15 48.6	+28 09	5.7	Stellar	Crb	22	variable star
ST554	Kappa	35	15 48.7	+18.1	4.1	*	Ser	1	red variable star
ST555	R		15 50.7	+15.1	5.2	*	Ser	22	variable star
ST556	Xi		15 56.9	-33 58	5.2	10"	Lup	2	double star
ST557	Rho	5	15 56.9	-29.2	3.9	*	Sco	21	star
ST558	Epsilon	13	15 57.6	+26.9	4.2	*	Crb	2	star
ST559	Pi	6	15 58.9	-26.1	2.9	*	Sco	21	star
ST560	T		15 59.5	+25 55	2	Stellar	Crb	22	variable star
ST561	Eta		16 00.1	-38 24	3.6	15"	Lup	9	double star magnitude contrast
ST562	Delta	Rmk 21	16 00.3	-22.6	2.3	4"	Sco	21	star
ST563	Xi		16 04.4	-11 22	4.2	1"	Sco	8	triple star challenge
ST564	Graffias	Beta	16 05.4	-19.8	2.5	14"	Sco	21	star
ST565	Omega1	9	16 06.8	-20.7	4	14"	Sco	21	star
ST566	Kappa		16 08.1	+17 03	5	28"	Her	5	colored double star
ST567	Yed Prior		16 12.0	-19 28	4	1"	Sco	7	quadruple star
ST568	Ued Prior	Delta	16 14.3	-03.7	2.7		Ohh	21	star
ST569	Σ2032	17. Sigma*	16 14.7	+33 52	5.2	7"	Crb	2	double star
ST570	Delta		16 20.3	-76.7	4.7		Abz	2	double star
ST571	H 121		16 21.2	-25 35	2.9	20"	Sco	9	double star magnitude contrast
ST572	Sigma		16 23.6	-23.5	5.3	*.1"	Ohh	2	double star
ST573	Rho	ADS 10049	16 25.7	-12.4	7.3		Ohh	22	variable star
ST574	Epsilon	h4853	16 27.2	-47.6	4.8	28"	Nor	2	double star
ST575	Theta	Dunnop 201	16 28.0	-64.1	5.3		Tra	2	double star
ST576	Σ2052	ADS 10075	16 28.3	+18.4	7.7	17"	Sco	4	double star
ST577	Antares		16 29.4	-6.4	1.6	3"	Ohh	4	double star challenge
ST578	Lambda		16 30.7	-62.0	4.2	1.4"	Ohh	4	double star challenge
ST579	Pi		16 32.7	-56.5	6.7		Dra	22	variable star
ST580	Upsilon		16 36.2	-42.3	9.1	3"	Sco	21	triple star
ST581	H		16 37.2	-32.9	2.2	*	Sco	2	star
ST582	Zeta	13	16 37.2	-30.9	2.6	*	Ohh	21	star
ST583	Sigma		16 37.6	-30.9	2.6	*	Sco	22	variable star
ST584	Zeta	ADS 10157	16 41.3	-31.6	3	1.4"	Sco	22	colored double star
ST585	Eta	Alpha	16 48.7	-50.0	1.9	*	Tra	2	star
ST586	Eta		16 49.8	-54.3	3.8	*	Ara	0	star
ST587	Epsilon		16 50.2	-34.3	2.3	*	Sco	21	star
ST588	Mu	26	16 52.3	-38.0	2.3	*	Sco	0	star
ST589	Σ2118		16 56.4	-65.0	7.1	1.4"	Dra	4	double star challenge
ST590	RR		16 56.6	-30.3	5.1	*	Sco	22	variable star
ST591	Kappa		16 57.7	-40.4	3.2	75"	Ohh	21	star
ST592	Zeta		16 58.6	-56.0	3.1	*	Ara	21	star
ST593	Epsilon1		16 59.6	-53.2	4.1	*	Ara	21	star
ST594	Mu		17 05.3	-54 28	4.9	2"	Dra	2	double star equal magnitude
ST595	Sabik	Eta	17 10.4	-15.7	2.4	0.6"	Ohh	4	double star challenge
ST596	Rasaigethi	Alpha	17 14.6	+14.4	3	4.6"	Her	3	double star equal magnitude
ST597	Delta		17 15.0	+24 50	3.2	10"	Her	9	double star equal magnitude
ST598	Pi		17 15.0	+36.8	3.2	7"	Her	21	double star magnitude contrast
ST599	36		17 15.3	-26 36	4.3	5"	Ohh	2	double star equal magnitude
ST600	39		17 18.0	-24 17	5.2	10"	Ohh	5	colored double star
ST601	Theta		17 22.0	-25.0	3.3	*	Ohh	21	star
ST602	Σ2161	**75, Rho*	17 23.7	+37 09	4.2	4"	Her	2	double star

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ST603	Beta		17 25.3	-55.5	2.9	*	Ara	21	star
ST604	Gamma		17 25.4	-56.4	3.3	*	Ara	21	star
ST605	Sigma	49	17 26.5	+04.1	4.3	4°	Oph	21	star
ST606	h4949	Dunlop 216	17 26.9	-45.9	6	2.2°	Ara	2	double star
ST607	z2173		17 30.4	-01.04	6	1.1°	Oph	21	double star challenge
ST608	Lambda	76	17 30.7	+26.1	4.4	*	Her	21	star
ST609	Lesath	Upsilon	17 30.8	-37.3	2.7	*	Sco	21	star
ST610	Alpha		17 31.8	-49.9	3	*	Ara	21	star
ST611	Nu		17 32.2	+59.11	4.9	62°	Dra	21	double star equal magnitude
ST612	Shaula	Lambda	17 33.6	-37.1	1.6	35°	Sco	21	star
ST613	Rasalhague	Alpha	17 34.9	+12.34	2.1	*	Oph	21	star
ST614	Iota	85	17 39.5	+46.0	3.8	*	Her	21	star
ST615	z2241	Psi	17 41.9	+72.09	4.9	30°	Dra	21	double star
ST616	Kappa		17 42.5	-39.0	2.4	2.5°	Sco	21	star
ST617	V		17 43.3	-57.7	5.7	*	Pav	22	variable star
ST618	Cebairai	Beta	17 43.5	+04.6	6.2	21°	Oph	21	star
ST619	z2202	61	17 44.6	+02.34	6.2	21°	Oph	3	double star equal magnitude
ST620	SZ		17 45.0	-18.6	9	*	Sgr	22	variable star
ST621	SA		17 47.5	-35.7	8.5	2°	Sco	22	variable star
ST622	G		17 49.9	-37.0	3.2	2°	Sco	21	star
ST623	Y		17 52.6	-06.2	6	*	Oph	22	variable star
ST624	Grumium	Xi	17 53.3	+56.9	3.8	*	Dra	21	star
ST625	Eltanin	Gamma	17 56.6	+51.9	9.2	*	Dra	21	star
ST626	Barnards Star		17 57.6	+04.34	9.5	Stellar	Oph	21	star
ST627	RS003		17 59.1	-30.15	5	6°	Sgr	5	colored double star
ST628	z2038	40-41	18 00.0	+80.0	5.7	20°	Dra	3	double star equal magnitude
ST629	Iota	95	18 01.5	+21.36	4.3	6°	Oph	4	double star equal magnitude
ST630	tau	ADS 11005	18 05.1	-06.2	5.2	18°	Oph	4	double star challenge
ST631	z2276	70	18 05.3	+02.30	4	15°	Oph	4	double star challenge
ST632	Theta		18 09.6	-02.06	3.7	*	Ara	21	star
ST633	z2280	100	18 07.6	-28.06	5.9	14°	Her	21	double star equal magnitude
ST634	Upsilon		18 17.8	-36.7	7.3	*	Lyr	22	variable star
ST635	Eta		18 19.6	-36.6	3	*	Sgr	21	star
ST636	Kappa	1	18 21.3	-28.3	2.2	*	Lyr	21	star
ST637	Kaus Media	Delta	18 21.3	-28.3	2.2	*	Sgr	21	star
ST638	z2306		18 22.2	-16.05	7.4	10°	Sgr	21	double star
ST639	Y		18 55.2	-61.5	4	*	Pav	21	star
ST640	z2223	Gale 2	18 54.0	-58.48	4.6	4°	Dra	6	double star
ST641	22223	38	18 55.3	-20.5	4.9	18°	Sgr	4	double star challenge
ST642	Alpha		18 57.0	-48.0	3.2	6°	Dra	21	star
ST643	59		18 57.2	+00.12	5.2	4°	Sgr	5	colored double star
ST644	Kaus Borealis	Lambda	18 58.0	-25.4	2.6	*	Sgr	21	star
ST645	S.S.		18 50.4	-18.9	9	*	Sgr	22	variable star
ST646	Delta		18 31.8	-45.9	5	11°	Tel	2	double star
ST647	T		18 32.3	-37.0	7.8	*	Lyr	2	red variable star
ST648	z222	Kappa	18 33.4	-38.44	5.9	21°	Cra	3	double star equal magnitude
ST649	z2348		18 33.9	-52.18	6	26°	Dra	2	double star
ST650	Alpha		18 35.2	-08.2	3.9	*	Sco	21	star
ST651	OY359		18 35.5	+23.36	6.3	0.7°	Her	4	double star challenge
ST652	OY358	ADS 11483	18 35.9	+17.0	6.8	1.6°	Her	4	double star challenge
ST653	Vega	Alpha	18 36.9	+38.47	0	Stellar	Lyr	21	star
ST654	X		18 38.3	+08.8	5.9	*	Oph	22	variable star
ST655	HK		18 42.8	+37.0	9.5	*	Lyr	22	variable star
ST656	z2398		18 43.0	+59.6	8	13°	Dra	2	double star
ST657	Double-Double	Epsilon	18 44.3	+39.40	4.7	2°	Lyr	7	quadruple star

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ST658	Zeta		18 44.8	+37 36	4.4	44*	Lyr	double star
ST659	$\zeta_1$		18 45.5	+05 30	6.2	2*	Ser	double star equal magnitude
ST660	$\zeta_2$		18 46.5	-00 58	5.8	13*	Aql	triple star
ST661	R	5	18 47.5	-05 42	4.5	Stellar	Scr	variable star
ST662	Beta		18 50.0	+33 24	3.5	47*	Lyr	double star magnitude contrast
ST663	S	ADS 11726	18 50.3	-07 9	6.8	14.3**	Scr	double star
ST664	$\zeta_3$		18 50.8	+10 59	6.9	4*	Aql	double star
ST665	$\zeta_4$		18 51.2	+59 22	4.9	35*	Dra	double star
ST666	Delta2		18 54.5	+36 9	4.5	*	Cyg	double star
ST667	$\zeta_5$		18 54.9	+33 56	6	45*	Lyr	colored double star
ST668	Nunki		18 55.3	-26 3	2		Sgr	star
ST669	$\zeta_6$		18 55.3	+43 9	3.9	4*	Lyr	star
ST670	$\zeta_7$		18 55.3	+40 11	4.1	22*	Ser	double star
ST671	ADS11871	'63, Theta*	18 57.0	+32 9	5.4	1	Lyr	double star challenge
ST672	$\zeta_8$		18 57.1	+26 1	8	0.7*	Lyr	double star challenge
ST673	$\zeta_9$		18 58.6	+14 4	8.6		Aql	variable star
ST674	$\zeta_{10}$		19 00.0	+12 53	7.1	17*	Aql	colored double star
ST675	BisO14		19 01.1	-37 03	6.6	13*	Cra	double star equal magnitude
ST676	V		19 03.1	-19 14	6	7*	Sgr	triple star
ST677			19 04.4	-05 41	6.6	Stellar	Aql	red variable star
ST678			19 05.0	-04 02	5.4	36	Aql	colored double star
ST679	Gamma		19 06.4	-37 00	5	3	Aql	double star equal magnitude
ST680	R		19 06.4	+09 14	5.5	Stellar	Aql	red variable star
ST681	$\zeta_{11}$		19 06.4	+07 09	7.2	6	Aql	double star
ST682	$\zeta_{12}$		19 09.1	+34 35	6.5	16*	Lyr	double star
ST683	$\zeta_{13}$		19 12.1	+49 51	6.6	8*	Cyg	double star equal magnitude
ST684	$\zeta_{14}$		19 15.3	+15 1	5.7	80*	Aql	double star
ST685	Tau	60	19 15.3	+73 4	4.5	*	Dra	star
ST686	$\zeta_{15}$		19 16.3	-33 53	6		Sgr	variable star
ST687	U		19 16.3	+19 37	6.6	Stellar	Ser	variable star
ST688	V1942		19 17.2	-15 36	6.4	*	Sgr	variable star
ST689	UX		19 17.2	-15 36	6.4	*	Sgr	variable star
ST690	RR		19 15.5	+16 34	9.9	Stellar	Dra	red variable star
ST691	$\zeta_{16}$		19 15.3	+27 47	6.1	Stellar	Lyr	variable star
ST692	$\zeta_{17}$	ADS 12447	19 17.8	+27 3	6.1	2*	Lyr	double star
ST693	$\zeta_{18}$		19 17.8	+27 3	6.1	2*	Lyr	double star
ST694	Alpha		19 17.8	+27 3	6.1	2*	Lyr	double star
ST695	Beta		19 17.8	+27 3	6.1	2*	Lyr	double star
ST696	Mu		19 34.1	+67 0	3.4	35*	Cyg	colored double star
ST697	AO		19 34.1	+67 0	3.4	35*	Cyg	colored double star
ST698	R		19 34.3	-16 4	4.5	*	Sgr	stable star
ST699	M		19 36.8	-50 2	6.1	*	Sgr	variable star
ST698	HN84		19 39.4	-16 34	6.4	28*	Sgr	variable star
ST699	54		19 40.7	-16 34	6.4	28*	Sgr	colored double star
ST700	TT	ADS 12767	19 40.9	-32 6	7.8	5.4	Sgr	colored double star
ST701	16		19 40.9	-32 6	7.8	5.4	Sgr	colored double star
ST702	$\zeta_{19}$		19 41.8	-50 32	6	39*	Cyg	variable star
ST703	OY1191	'18, Delta*	19 45.0	+45 08	2.9	2*	Cyg	double star equal magnitude
ST704	Tarazed		19 45.9	-35 01	6	39*	Cyg	double star magnitude contrast
ST705	$\zeta_{20}$		19 46.3	+10 6	2.7	*	Aql	colored double star
ST706	Delta		19 46.4	+33 44	5.7	26*	Cyg	double star
ST707	Epsilon		19 47.4	+18 5	3.8	*	Sgr	double star magnitude contrast
ST708	Zeta		19 48.2	+70 16	3.8	3*	Dra	double star magnitude contrast
ST709	Theta		19 48.7	+11 8	6.1	1.4*	Aql	double star challenge
ST710	Chi		19 49.0	+19 09	5	9*	Ser	double star
ST711	Alpha		19 50.6	+32 55	3.3	Stellar	Cyg	variable star
ST712	Eta		19 50.8	+08 52	0.8	*	Aql	star
ST712	Eta		19 52.5	+01 0	3.4	*	Aql	variable star

**Number Name Other RA Dec Mag Sep Con Code**

ST1713	57		19 54.6	-08 14	5.7	36"	Aql	2	double star
ST1714	O2532	Beta	19 55.3	+06.4	3.7	13"	Aql	9	double star
ST1715	Psi		19 55.6	+52.26	4.9	3"	Cyg	2	double star magnitude contrast
ST1716	RR		19 55.9	-29.2	5.4	*	Sgr	22	variable star
ST1717	RU		19 58.7	-41.9	6	*	Sgr	22	variable star
ST1718	Gamma	12	19 58.8	+19.5	3.5	*	Sge	21	star
ST1719	BF		20 02.4	+21.1	8.5	22	Sge	22	variable star
ST1720	h1470		20 03.6	+38.19	7.6	29"	Cyg	5	colored double star
ST1721	X		20 05.1	+20.7	7	*	Sge	22	variable star
ST1722	WZ		20 07.6	+17.7	7	*	Sge	22	variable star
ST1723	z2875	Kappa	20 08.9	+77.43	4.4	7"	Cep	9	double star magnitude contrast
ST1724	z2837	Theta	20 09.9	+20.55	6.4	12"	Sge	6	triple star
ST1725	RY		20 10.4	+36.0	8.5	*	Cyg	22	variable star
ST1726	FG		20 11.9	+20.3	9.5	3"	Sge	35	planetary nebula irregular
ST1727	z2844		20 12.6	+00.52	6.8	3"	Aql	3	double star equal magnitude
ST1728	FS		20 13.4	+38.7	6.5	22	Cyg	22	variable star
ST1729	z2858		20 13.6	+53.07	7.1	5"	Cyg	2	double star
ST1730	Omicron1	*ADS 13554, V 695*	20 13.6	+46.7	3.8	*	Cyg	21	star
ST1731	R1		20 17.1	-21.3	8.9	*	Cap	22	variable star
ST1732	Alpha		20 17.6	-12.5	4.2	4.4"	Cap	22	star
ST1733	R1		20 17.7	-39.1	6	22	Sgr	21	variable star
ST1734	P		20 17.8	+38.02	3	Stellar	Cyg	22	variable star
ST1735	Alpha		20 18.0	-12.32	3.8	7"	Cap	7	quadruple star
ST1736	z2871		20 18.4	+35.23	6	4"	Cyg	2	double star
ST1737	U		20 19.6	+47.9	5.9	*	Cyg	22	variable star
ST1738	Dabih	Beta	20 21.0	-4.6	3.4	3'	Cap	2	double star
ST1739	39		20 23.9	+32.2	4.4	*	Pav	21	star
ST1740	Peacock		20 25.6	-36.7	1.9	*	Cyg	21	star
ST1741	Phi	Alpha	20 27.3	-18.13	5.3	3"	Cap	3	double star magnitude contrast
ST1742	Omicron	SHJ 324	20 29.9	-15.33	6.1	19"	Cap	3	double star
ST1743	z2716	49	20 41.0	+32.16	9.5	3"	Cyg	6	double star magnitude contrast
ST1744	V		20 41.3	+48.7	1.7	*	Cyg	22	variable star
ST1745	Donab	Alpha	20 45.7	+30.7	4.2	6"	Cyg	2	double star
ST1746	z2726	52	20 46.7	+36.07	4.3	10"	Del	2	double star
ST1747	Gamma		20 47.1	+36.0	4.9	0.9"	Del	4	double star
ST1748	Lambda	ADS 14296	20 47.7	+36.0	4.9	0.9"	Agr	1	double star challenge
ST1749	3		20 47.7	+36.0	4.9	*	Agr	1	red variable star
ST1750	z763		20 48.4	-18.11	6.7	16"	Cap	2	double star
ST1751	4	ADS 14360	20 51.4	-08.1	6.4	0.8"	Cap	4	double star challenge
ST1752	Omega	18	20 51.8	-28.9	4.4	*	Agr	21	star
ST1753	Epsilon	1	20 59.1	+04.18	5.2	1"	Eru	3	triple star challenge
ST1754	ADS 14575	ADS 14575	21 02.1	+56.7	6.1	1.5"	Cap	4	double star challenge
ST1755	z2742	2	21 02.2	+07.11	7.4	3"	Eru	3	double star equal magnitude
ST1756	Dunlap236		21 02.2	-43.0	6	5.7"	Mic	2	double star
ST1757	Lambda	ADS 14556	21 02.2	+07.2	7.4	3"	Eru	2	double star
ST1758	12		21 04.1	-05.49	5.9	3"	Agr	4	double star challenge
ST1759	Xi	61	21 04.9	+43.9	3.7	*	Cyg	21	star
ST1760	z2758	62	21 06.9	+38.39	5.2	29"	Cyg	2	double star
ST1761	24	ADS 14632	21 07.1	-25.0	4.5	*	Cap	39	stellar planetary nebula
ST1762	T		21 09.5	+68.5	5.2	*	Cap	22	variable star
ST1763	Gamma		21 10.3	+10.1	4.7	6"	Eru	4	double star
ST1764	z2780	ADS 14749	21 11.8	+60.0	5.6	1.0"	Cap	2	double star challenge
ST1765	Delta		21 14.5	+10.00	4.6	48"	Eru	9	double star magnitude contrast
ST1766	Theta		21 19.9	-53.5	4.5	6"	Ind	2	double star
ST1767	RY	h5258	21 20.3	-10.8	8	*	Agr	22	variable star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST768	Y		21 24.3	-69.7	8.6	*	Pav	variable star
ST769	Beta		21 28.7	+70 33	3.3	13*	Cep	double star magnitude contrast
ST770	S	RV	21 35.2	+78 37	7.4	Stellar	Cep	red variable star
ST771	22816		21 39.0	+57 29	5.6	12*	Cep	triple star
ST772	V460		21 42.7	+35.5	5.6		Cyg	variable star
ST773	SS		21 42.7	+43 35	8.2	Stellar	Cyg	variable star
ST774	RV		21 43.3	+38.0	7.1		Cyg	variable star
ST775	Herschel's Garnet Star	Mu	21 43.5	+58 47	3.4	Stellar	Cep	red variable star
ST776	Epsilon		21 44.2	+09 52	2.5	83*	Peg	double star magnitude contrast
ST777	Lambda	h5278	21 50.9	-82.7	5.4	3*	Oct	double star
ST778	AG		21 51.0	+12.6	6		Peg	variable star
ST779	22840		21 52.0	+55 47	5.5	18*	Cep	double star
ST780	22841	ADS 15431	21 54.3	+19.7	6.4	22*	Peg	double star
ST781	PX		21 56.4	+22.9	8		Peg	double star
ST782	22873		21 56.4	+82 51	7.1	14*	Peg	variable star
ST783	Eta	B 276	22 00.8	-28 27	5.8	1.9*	Psa	double star equal magnitude
ST784	29	S 802	22 02.5	-16 58	7.2	4*	Aqr	double star
ST785	22863	17.XI"	22 03.8	+64 36	4.3	8*	Aqr	double star equal magnitude
ST786	OJ461	ADS 15601	22 03.9	+59.6	6.7	1.1*	Cep	double star
ST787	Lambda		22 06.1	-39.5	4.5		Gru	double star
ST788	Al Nair	Alpha	22 06.2	-46 58	1.7	Stellar	Gru	star
ST789	22883		22 10.7	+70 07	5.7	15*	Cep	double star
ST790	Zeta		22 10.9	+58.2	3.4		Cep	double star
ST791	h1746	ADS 15758	22 13.9	+39.7	4.5	28*	Lac	double star
ST792	41		22 14.3	-21 04	5.3	2*	Aqr	colored double star
ST793	Alpha		22 16.0	+37.7	4.1	5*	Lac	star
ST794	22894		22 16.5	-60.3	2.9		Tuc	double star
ST795	Pi		22 16.9	+37 46	6.1	9*	Lac	colored double star
ST796	5		22 23.1	-45.9	5.8	2.7*	Gru	double star
ST797	S3		22 26.1	-18 44	6		Gru	variable star
ST798	Delta	h5934	22 27.6	-16 45	6.4	3*	Aqr	double star equal magnitude
ST799	Krieger60		22 28.3	-57.0	4.8		Tuc	double star
ST800	Delta	ADS 15972	22 28.9	+07 01	9.8	3*	Aqr	double star challenge
ST801	Zeta		22 28.8	+07 01	3.8	20*	Cep	double star challenge
ST802	5		22 29.2	+58 25	3.8	20*	Cep	colored double star
ST803	Delta2		22 30.5	+47.5	4.4	5*	Lac	star
ST804	Delta2		22 30.8	-43.7	4.4	15*	Gru	red variable star
ST805	22912	37	22 30.0	+04.4	5.8	1*	Peg	double star challenge
ST806	Roe47		22 32.5	-39 46	5.8	43*	Lac	double star challenge
ST807	11		22 35.9	-39 38	6.5	22*	Lac	quadruple star
ST808	Beta		22 40.5	+44.3	4.3	*	Lac	triple star
ST809	Beta		22 42.7	-46.3	2.3	*	Gru	star
ST810	Tau1		22 47.7	-14.3	5.7	23*	Aqr	double star
ST811	ADS 16291		22 49.0	+68.6	7	4.3*	Cep	double star
ST812	Tau2	71	22 49.6	-13.6	4	40*	Aqr	double star
ST813	Y2950	ADS 16317	22 51.4	+61.7	6.1	1.7*	Cep	double star
ST814	h1823		22 51.8	+41 19	7.1	82*	Lac	double star
ST815	Lambda	73	22 52.6	-07 61	3.7	*	Aqr	quadruple star
ST816	Fomalhaut	Alpha	22 57.6	-29 37	1.2	*	Aqr	star
ST817	52	ADS 16428	22 59.2	+11.7	6.1	0.7*	Psa	double star challenge
ST818	Scheat	Beta	23 03.8	+28.1	2.4	*	Peg	star
ST819	Dunlop246		23 07.2	-50.7	6.1	9*	Gru	double star
ST820	Y2978		23 07.5	+32 49	6.3	8*	Peg	double star
ST821	Pi	ADS 16538	23 07.9	+75.4	4.6	1.2*	Cep	double star challenge
ST822	Phi	90	23 14.3	-06.0	4.2	*	Aqr	red variable star

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST823	Psi3		23 19.0	-09.6	5	1.5°	Acr	2
ST824	94		23 19.1	-13.28	5.1	13"	Acr	5
ST825	Dunlop249		23 23.9	-53.8	6.5	27"	Gru	2
ST826	99		23 26.0	-20.6	4.4	*	Acr	21
ST827	Z		23 33.7	+48.49	8	Stellar	And	22
ST828	Errai	Gamma	23 39.3	+7.76	3.2	*	Cep	21
ST829	Theta	Dunlop 251	23 39.5	-46.6	6.6	4"	Phe	2
ST830	R		23 43.8	-15.17	5.8	Stellar	Acr	22
ST831	107		23 46.0	-18.41	5.3	7"	Acr	3
ST832	TX	19	23 46.4	+03.29	6.9	Stellar	Fsc	1
ST833	χ3042		23 51.8	+37.53	7.8	5"	And	3
ST834	Lair192		23 54.4	-27.03	6.9	7"	And	2
ST835	R		23 56.4	+51.24	4.7	Stellar	Cas	22
ST836	Sigma		23 59.0	+55.45	4.9	3	Cas	5
ST837	χ3050		23 59.5	+33.43	6.6	1.5°	And	4

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