

INSTRUCTION MANUAL

Orion® IntelliScope® Computerized Object Locator

#7880



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

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

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

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

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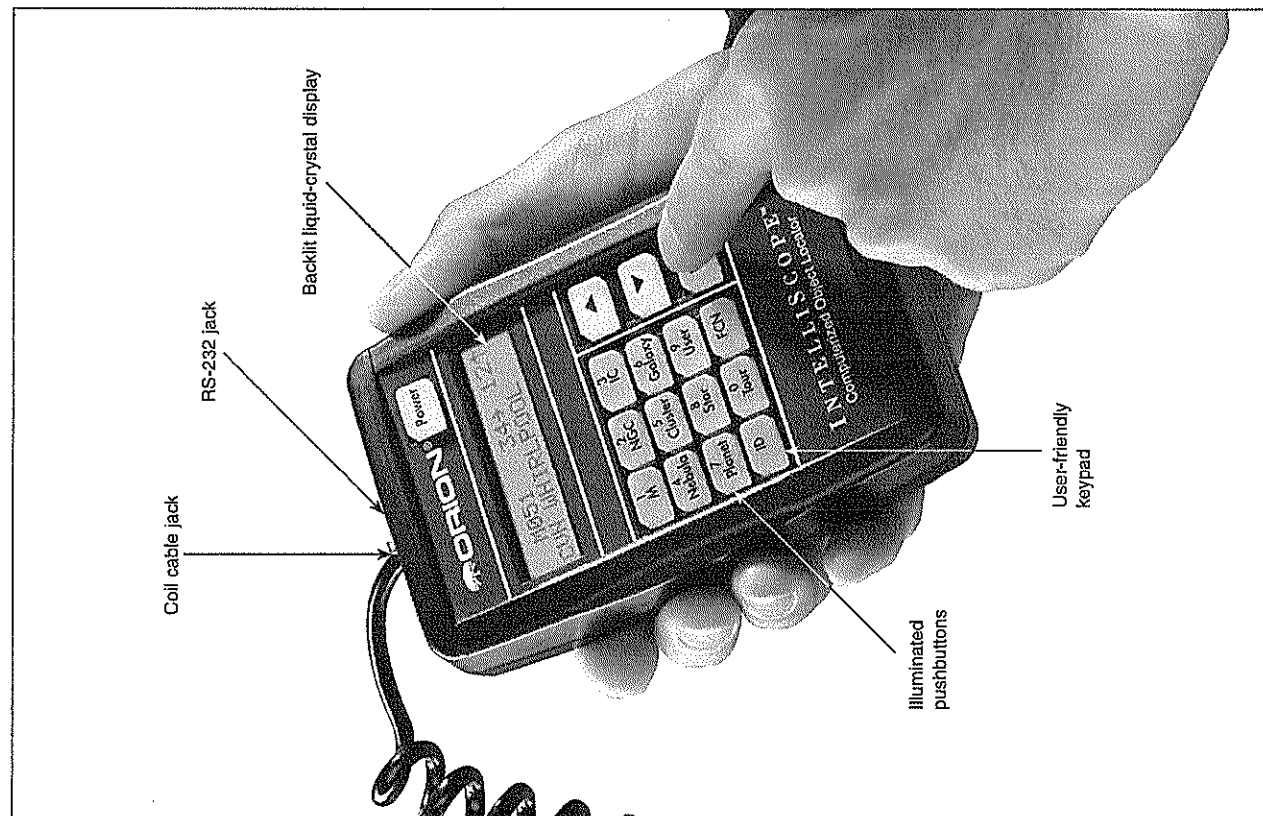


Figure 1. The IntelliScope Computerized Object Locator.

Parts List

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

Qty.	Description
1	Object locator computer (controller)
1	Altitude encoder assembly
1	Coil cable
1	Altitude encoder cable (53" long)
1	Azimuth encoder cable (24" long)
6	Wire retaining clips
2	Hook-and-loop strips (1 "hook" strip, 1 "loop" strip)
1	Plastic bumper
3	Wood screws
2	Nylon washers (1/8" thick)
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 only compatible with Orion SkyQuest XT IntelliScope Dobsonian. If you have another Dobsonian, or any other telescope, the IntelliScope system will not function properly.

1. Installation

- 1) Install the altitude encoder assembly onto the base's right side panel. This is the side of the base opposite the side with the IntelliScope Computerized Controller Port. Below the 5/8" through-hole in the panel, there are two pre-drilled 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.

Because there are two versions of the side bearings on the SkyQuest IntelliScope XT Dobsonian optical tube, we have supplied two sets of two nylon washers to assure best performance of the altitude encoder assembly.

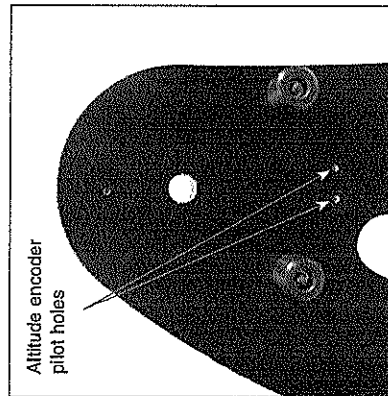


Figure 2. The two pilot holes used to mount the altitude encoder assembly are located on the interior surface of the right side panel of the base.

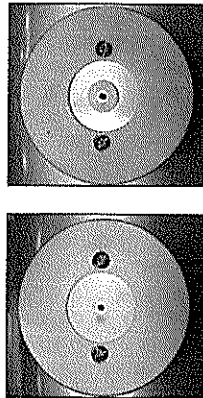


Figure 2.5a. If your optical tube has side bearings that look like this, then use the two thicker washers.

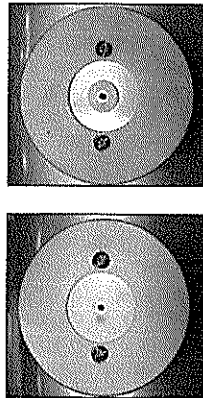


Figure 2.5b. If your optical tube has side bearings that look like this, then use the two thinner washers. Note the raised circular feature in the center.

bly. Therefore, the object locator comes with four nylon washers, but only two are required for installation. Note that two of the washers have a thickness of 1/8th of an inch, while the other two have a thickness of 1/16th of an inch.

If your SkyQuest IntelliScope XT Dobsonian optical tube has side bearings that appear as in Figure 2.5a, then use the two thicker (1/8th of an inch) nylon washers behind the altitude encoder assembly. If your SkyQuest IntelliScope XT Dobsonian optical tube has side bearings that appear as in Figure 2.5b, then use the two thinner (1/16th of an inch) nylon washers behind the altitude encoder assembly.

Once installation is complete, you will have two nylon washers left over. Feel free to discard these washers, as they will not be needed for use of the object locator.

Now, with the screws pushed through the encoder board, place a nylon washer on the end of each screw (Figure 3). Then, thread the screws into the starter holes in the side panel. The shaft on the altitude encoder assembly should protrude through the 5/8" through-hole in the side panel. It will take a bit of dexterity to keep the washers on the ends of the screws when installing, so don't get frustrated if it takes a couple tries. The screws should not be fully tightened; they should be tight, but not tight enough to prevent the altitude encoder from moving up and down within the slots in the encoder board.

- 2) There is a pilot hole above the 5/8 through hole in the right side panel's interior surface; this is where the plastic bumper that protects the altitude encoder assembly will be installed. Take the remaining wood screw, push it through the bumper, and thread it into the pilot hole until tight (Figure 4).

- 3) Connect one end of the azimuth encoder cable (the shorter of the two cables) to the encoder jack in the top baseplate of the Dobsonian base. Connect the other end to the encoder connector board that should be already installed on the base's left side

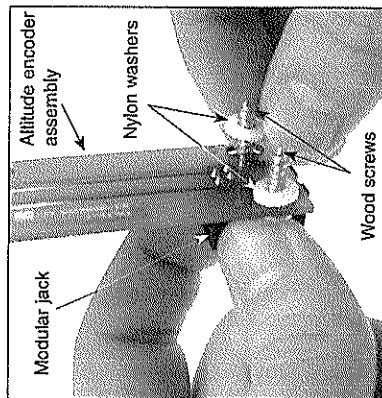


Figure 3. Place a nylon washer on the end of each screw after the screws are pushed through the altitude encoder assembly.

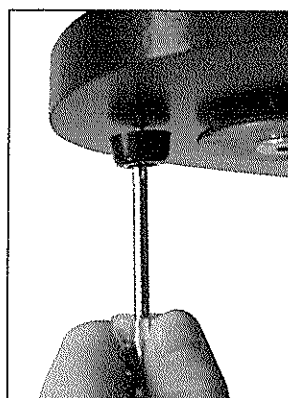


Figure 4. Install the bumper into the pilot hole above the altitude encoder assembly.

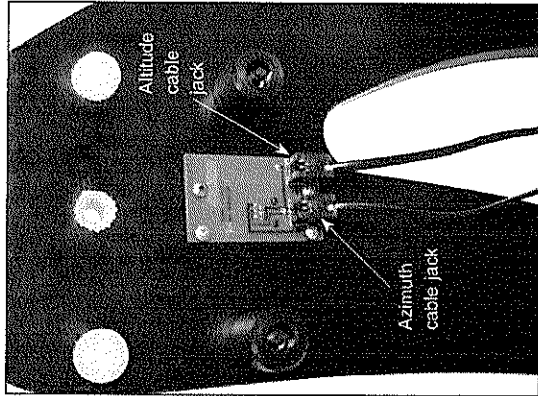


Figure 5. The azimuth cable plugs into the jack on the left of the encoder connector board. The altitude cable plugs into the jack on the right.

panel. The cable should plug into the jack on the left side of the encoder connector board (see Figure 5).

- 4) Connect one end of the altitude encoder cable to the modular jack on the altitude encoder assembly. Connect the other end of the cable to the jack on the right side of the encoder connector board (see Figure 5).
- 5) Use the provided wire clips to secure the altitude and azimuth cables neatly to the base. We recommend using two clips for the (shorter) azimuth cable, and four clips for the (longer) altitude cable (Figure 5.5a-b). The clips have adhesive backing; simply peel the paper off the back of the clip and press the adhesive back to the base where you want the clip to be located.

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

- 7) Reinstall the telescope's tensioning knob (the one with the Teflon and metal washers) through the base's left side panel (the side that has the IntelliScope Computerized Controller Port label) and into the threaded

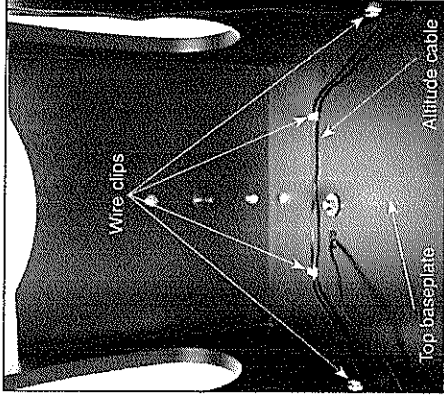
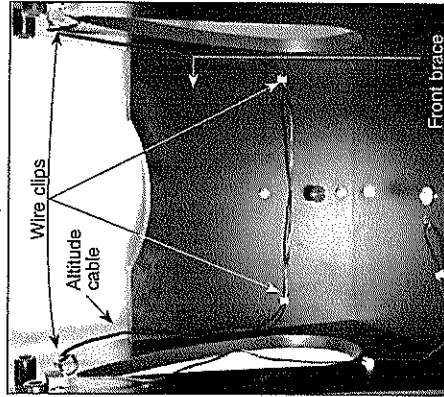


Figure 5a-b. Use the wire clips to secure the cables neatly to the base. (a.) For the XT6, XT8, and XT10 IntelliScopes, the altitude cable can be routed across the top baseplate. (b.) For the XT12 IntelliScope, the altitude cable is routed across the front brace.

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

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

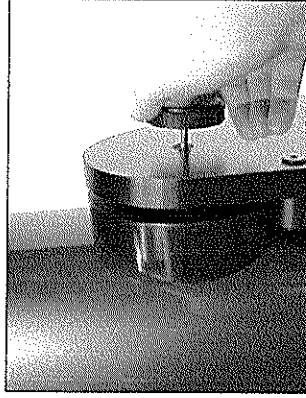


Figure 6. The retaining knob now goes through the shaft of the altitude encoder assembly before threading into the side bearing on the telescope tube.

- 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. You may want to consider using the optional holster instead of the supplied hook-and-loop strips. The holster is a metal holder custom-designed to fit the IntelliScope controller. When installed at the top of the Dobsonian base, it

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 upwards in altitude until the bottom of the tube comes into contact with the vertical stop. Once the telescope tube is in the vertical position, press the **Enter** button to start the two-star alignment procedure.

Adjusting the Vertical Stop

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

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

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

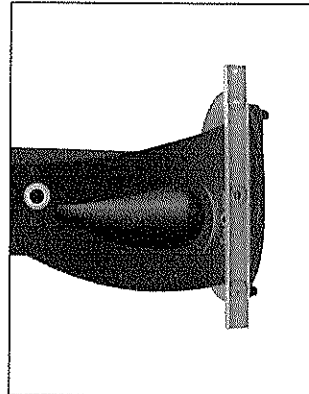


Figure 7. Place a carpenter's level on the base as shown. The base should stay level through a 180° rotation in azimuth. Once the vertical stop is set, the base does not need to be level to function properly.

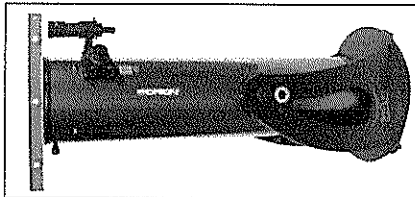


Figure 8. Once the base is leveled, point the tube up until the mirror cell comes into contact with the vertical stop. Then, place the carpenter's level across the top of the tube as shown. If the vertical stop is set properly, the top of the tube should also be level.

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). The LCD screen will state on its top line "ALIGN STAR 1," with the name of a star flashing on the second line.

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

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

Take hold of the "navigation knob" on the optical tube and move the telescope so that it is pointing in the general area of the alignment star. Aim the telescope so the alignment star appears in finder scope. Be careful not to confuse the alignment star with other stars in the area when doing this. (It will likely be the brightest star in the field of view.) Now, move the telescope until you have centered the star on the crosshairs of the finder scope. Look into the eyepiece of the telescope, and you should see the alignment star in the field of view of the eyepiece. If it isn't, then your finder scope is out of alignment with your telescope and will need to be adjusted. Once the alignment star is in the eyepiece's field of view, center it in the eyepiece as best you can by making small movements to the telescope. (If you have one, an illuminated reticle eyepiece is great for centering alignment stars). Once this is done, press the **Enter** button on the controller. You have now completed one-half of the two-star alignment.

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

The Alignment Error (Warp) Factor

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

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

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

3. Overview of Controller

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

Pushbuttons

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

The Guide Arrows

The controller leads you to astronomical targets with guide arrows displayed on the LCD screen. After an object is selected to view, you will see two guide arrows, one that points left or right, and one that points up or down. Move the telescope tube in the corresponding direction of the guide arrows. If you are standing to the left of the telescope and facing the same direction the telescope is pointed, the guide arrows will exactly correspond with the direction you should move the telescope (Figure 9). Otherwise, if an up arrow is displayed, move the telescope tube upward, if a down

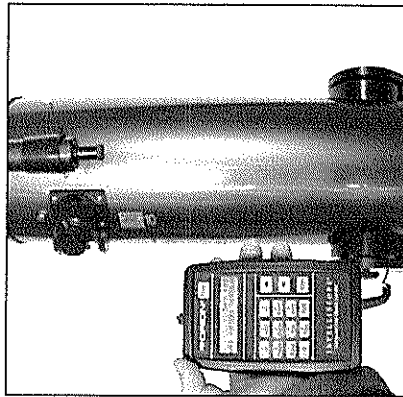


Figure 9. If you stand to the left of the telescope, and face the direction the tube is pointing, the guide arrows will correspond exactly with the direction you should move the telescope in order to find the selected object.



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

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 zero, stop moving the telescope. The object will be within the field of view of a medium-low power eyepiece (25mm focal length or longer).

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

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

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

4. Locating the Planets

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

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

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

DATE 01 JUN 2003
- 3) The number after the word "DATE" will be flashing and represents the day of the month. Input the two-digit day using the number buttons.
- 4) The three-letter month will now be flashing. Use the arrow buttons to scroll to the present month and then press the **Enter** button.
- 5) Now the year will flash. Input the year using the number buttons.

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

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

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

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

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

VENUS At its brightest, Venus is the most luminous object in the sky, excluding the Sun and the Moon. It is so bright that sometimes it is visible to the naked eye during full daylight! Ironically, Venus appears as a thin crescent, not a full disk, when at its peak brightness. Because it is close to the Sun, it never wanders too far from the morning or evening horizon. No surface markings can be seen on Venus, which is always shrouded in dense clouds.

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

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

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

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

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

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

5. Locating Deep-Sky Objects by Catalog

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

The Messier Catalog

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

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

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

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

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

The New General Catalog

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

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

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

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

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

The Index Catalog

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

To view an object from the IC catalog, press the **IC** button. Then input the number of the IC object you wish to view using the numeric buttons and press the **Enter** button. For example, to view the Flaming Star Nebula, which is listed as IC405, you would press the **IC** button, then the "4" button, then the "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 constellations currently visible in your night sky, consult a planisphere or the monthly star chart at www.ortotelescopes.com.

Locating Nebulas

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

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

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

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 a 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 gravitationally bound to each other, while others are just two (or more) stars in the same line of sight. At high magnifications, it is possible to "split" many double (and multiple) stars into their individual components. It can also be interesting to contrast and compare the different colors and magnitudes of the stars in the system. Be aware, however, that good seeing conditions are critical for separating close components of a double or multiple star.

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

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

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

Variable Stars

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

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

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

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

Catalog (ST) Stars

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

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

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

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

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

8. Tours of the Best Objects

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

Starting a Tour

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

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

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

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

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

9. The Identify Function

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

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/down arrow buttons to scroll through several more specific options ("STAR", "DOUBLE", "CLUSTER", "NEBULA", and "GALAXY"). If you know which one of these object types you are looking at, selecting the object type will make the identification quicker and more accurate. This is because the computer will search through a shorter list of potential object matches, and will allow proper identification if there are several objects within the same field of view. If you are unsure of the

object type you are looking at, simply select "ANY" from the list of choices. Once you have selected the object type (or "ANY"), press the **Enter** button.

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

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

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

10. Adding User-Defined Objects

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

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

To input a user-defined object, begin by pressing the **User** button. The LCD screen will display the word "NEW" with a two-digit number flashing after it. Since no user-defined objects currently exist, press **Enter** to create user-defined ("NEW") object number 01. The LCD will display the R.A. and Dec. coordinates for the "NEW" object selected in the lower left. Since no data has been input yet, these coordinates will be 00:00 +00.0. The first four digits indicate the R.A. coordinate (in R.A. hours and minutes), and the remaining digits (and the $\pm$ sign) indicate the Dec. coordinate (in degrees). Now, press the **Enter** button, and the first two digits of the R.A. coordinate (R.A. hours) will begin flashing. Press the two numerical buttons on the keypad that correspond 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 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 ± 0.5 , you may want to consider resetting the controller to perform another two-star alignment. Turn the controller off, then on again (with the **Power** button), to do this.

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

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

12. The "Hidden" Functions

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

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

Altitude and Azimuth Test

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

Once "ALT AZM TEST" is chosen from the hidden function options, the LCD screen will display the telescope's current relative altitude and azimuth position (in degrees); the relative altitude is in the upper right, while the relative azimuth is in the lower right. To begin 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 "1" in decimal, "B" represents "2" in decimal, "C" represents "3," "D" represents "4," "E" represents "5," and "F" represents "6." When moving the telescope in altitude or azimuth, you will note that each of the digit pairs rises and falls. None of the digit pairs should ever go above "F3." If they do, then the encoder disk is too close to the sensors on the encoder board. This will generally not happen in altitude, but can happen in azimuth.

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

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

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

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

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 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 to see what the proper checksum should be for each new software version.

Rewrite

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

Clock

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

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

13. Specifications

Objects in database:

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

Computer interface: RS-232 port

Power: Requires one 9V battery

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

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

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a

particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

Appendix A: Troubleshooting the IntelliScope System

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

Azimuth encoder, in general

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

Altitude encoder, in general

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

Warp factor consistently above ± 0.5 but below ± 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° 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 A if you are unsure.
13. The encoder sensors may be coming into contact with the encoder disks. Check both the altitude and azimuth encoders as outlined above.

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

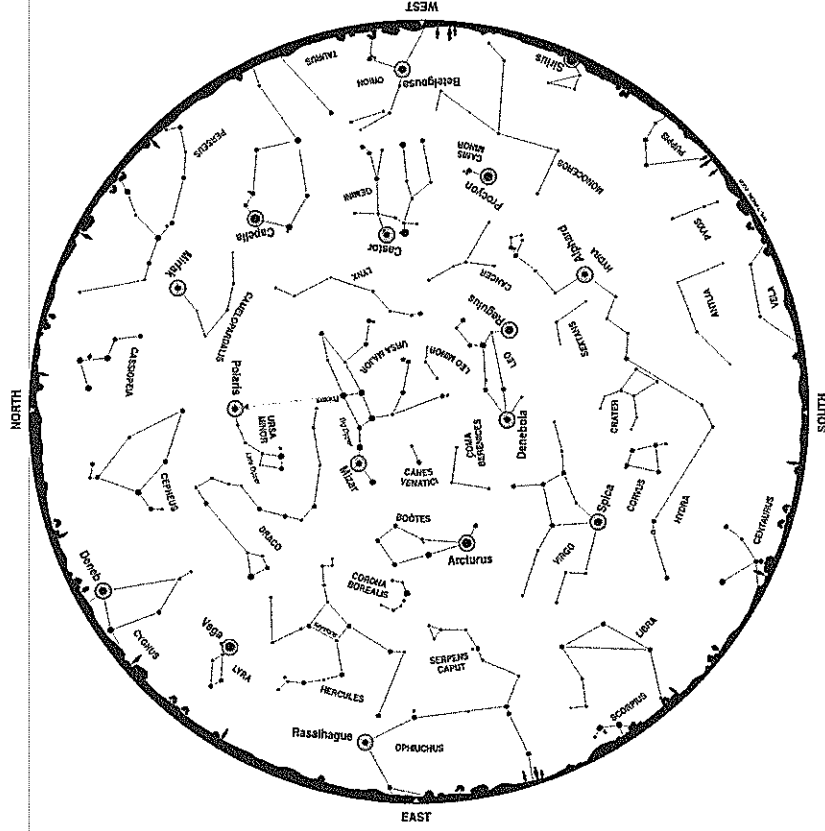
14. Check the altitude cable's connections.
15. Make sure the knob that goes through the altitude encoder is tight.

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

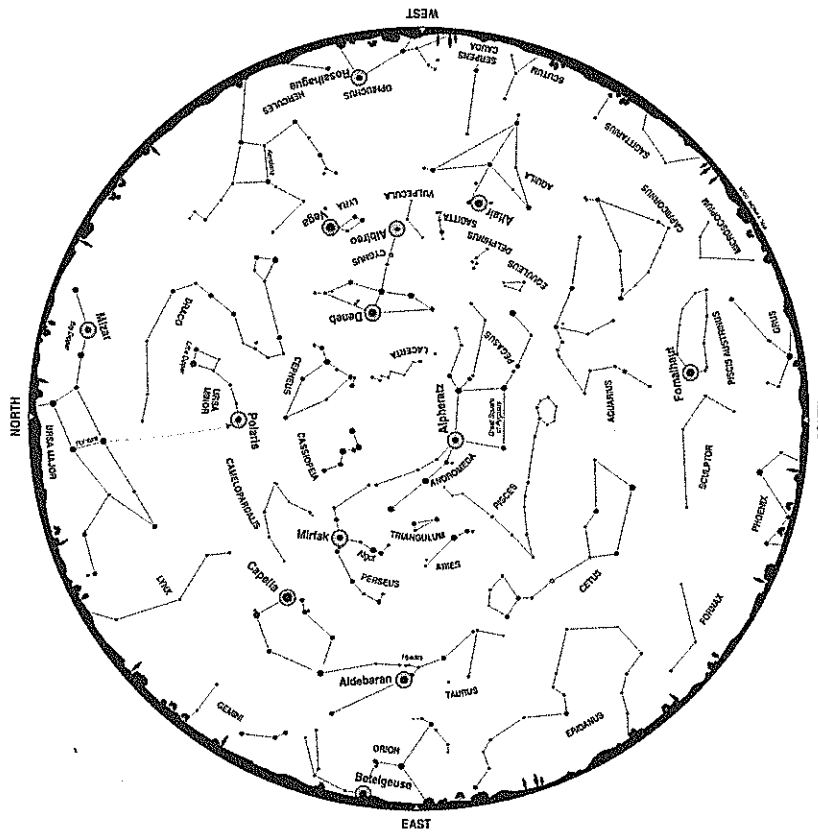
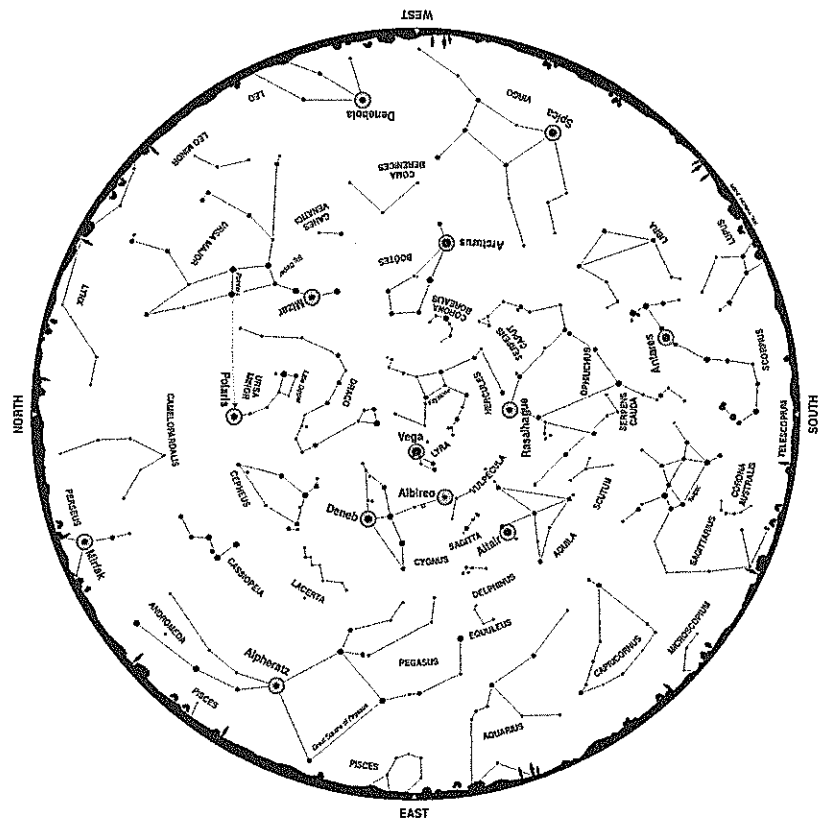
16. Check the azimuth cable's connections.
17. Make sure the hex lock nut on the azimuth axis screw is tight. The fender washer underneath the hex lock nut should not be able to move. Remember, the hex lock nut should be tightened about 3/16 to 1/4 turn beyond the point where the washer cannot move any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

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

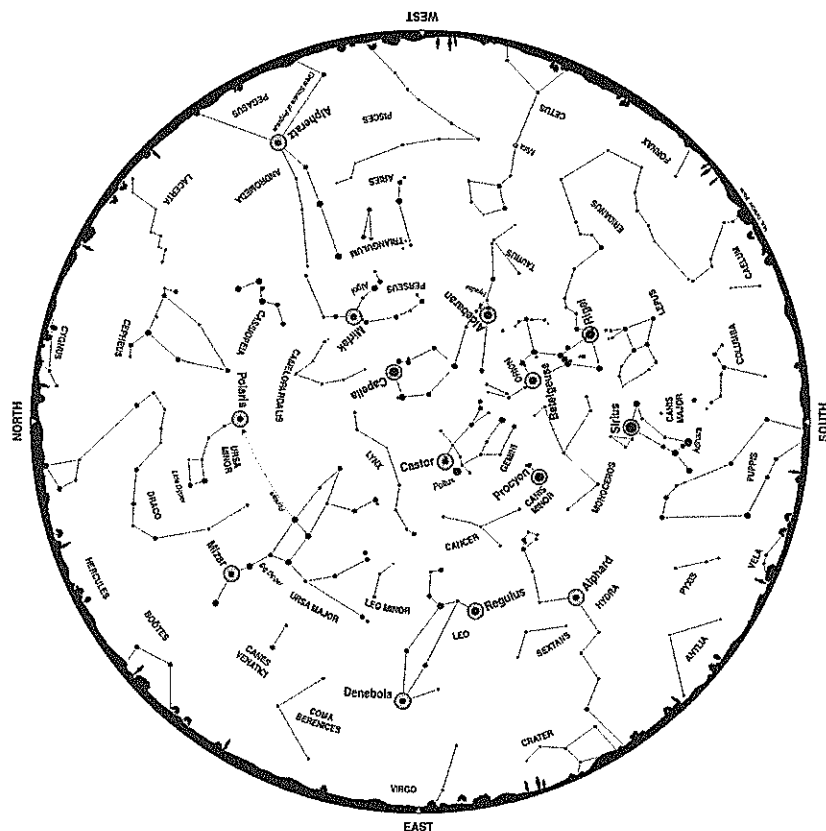
Appendix B: Alignment Star Finder Charts



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	



Appendix C: Constellation Abbreviations



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

And	Ant	Aps	Aql	Aqr	Ara	Ari	Aur	Boo	Cae	Cam	Cap	Car	Cas	Gen	Cep	Cet	Cha	Cir	Cnc	CMA	CMI	Col	Com	CrA	CrB	Crt	Cru	Crv	CVn	Cygnus	Del	Dor	Dra	Equ	Eri	For	Gem	Gru	Her	Hor	Hya	Hyi	Ind	Lac	Leo	Lep	Lib	LMI	Lup	Lyn	Lyr	Men	Mic	Mon	Mus	Nor	Oct	Oph	Canes Venatici	Cygnus	Delphinus	Dorado	Draco	Equuleus	Eridanus	Fornax	Gemini	Grus	Hercules	Horologium	Hydra	Hydrus	Indus	Lacerta	Leo	Lepus	Libra	Leo Minor	Lupus	Lynx	Lyra	Mensa	Microscopium	Monoceros	Musca	Norma	Octans	Ophiuchus	Orion	Pav	Peg	Per	Phe	Pic	PSa	Psc	Pup	Pyx	Ret	Scl	Sco	Sct	Ser	Sex	Sge	Sgr	Tau	Tel	Tri	Tri	Tuc	UMa	UMi	Vel	Vir	Vol	Vul	Orion	Pavo	Pegasus	Perseus	Phoenix	Pictor	Piscis Austrinus	Pisces	Puppis	Pyxis	Reticulum	Sculptor	Scorpius	Scutum	Serpens	Sextans	Sagitta	Sagittarius	Taurus	Telescopium	Triangulum Australe	Triangulum	Tucana	Ursa Major	Ursa Minor	Vela	Virgo	Volans	Vulpecula
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Appendix D: ST Catalog

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST001	Q 254		00 01.2	+90 21	7.6	59*	Cas	5
ST002			00 02.0	+60 0	4.4		Psc	1
ST003	NGC 593		00 02.6	+66 06	5.9	35*	Cas	5
ST004	SV		00 04.6	+43 5	8		And	1
ST005	CG 214		00 04.7	+67 2	7.6	30*	Cep	130
ST006	ADS 61		00 06.3	+64 4	6.4	1.5*	Cas	4
ST007	NGC 102		00 06.5	+69 05	6.6	0.8*	And	4
ST008	R 301		00 09.4	+39 00	6.2	2*	Scl	2
ST009	NGC 102		00 10.5	+69 05	6.6	0.8*	And	4
ST010	Algenib		00 13.2	+52 2	2.6		Peg	21
ST011	AD	ADS 160	00 14.5	+07 8	4.9	1.5*	Cel	1
ST012	7	35, UV	00 14.6	+16 9	4.4		Cel	1
ST013	5		00 15.4	+32 1	5.5		Scl	22
ST014	13		00 16.2	+76 3	7	0.9*	Cep	4
ST015	Greenwich 34	ADS 246	00 16.3	+40 1	8	39*	And	2
ST016	224		00 16.5	+26 06	7.6	5*	And	2
ST017	ST		00 16.7	+50 0	9		Cas	1
ST018	10		00 17.0	+50 0	8		And	2
ST019	VX		00 19.3	+44 7	8		And	21
ST020	10		00 19.4	+08 8	3.5		Cel	21
ST021	10		00 24.0	+38 35	5.9		And	22
ST022	10		00 27.2	+46 59	6.9	19*	Cas	1
ST023	AD		00 30.3	+30 9	3.3		Cas	21
ST024	Beta	ADS 449	00 31.5	+69 0	4.4	27*	Tuc	2
ST025	10		00 32.4	+69 9	5.7	26*	Psc	2
ST026	Zeta		00 37.0	+53 0	3.7		Cas	21
ST027	Delta		00 39.3	+30 9	3.3		And	21
ST028	55		00 39.9	+21 26	5.4	6*	Psc	5
ST029	Scheat	Alpha	00 40.5	+56 5	2.2		Cas	2
ST030	0116	ADS 568	00 42.4	+64 2	7.6	1.5*	Psc	4
ST031	HD 122	ADS 624	00 46.7	+76 0	4.4	30*	Cas	2
ST032	Delta		00 48.7	+07 6	4.4		Psc	21
ST033	Eta		00 49.1	+27 7	3.4	12*	Cas	5
ST034	65	ADS 663	00 49.8	+27 7	6.3	4.4*	Psc	5
ST035	Do 13		00 50.0	+64 1	11	13*	Cas	120
ST036	Lambda 1	Dunlop 2	00 52.4	+69 5	6.5	21*	Tuc	2
ST037	36	ADS 755	00 55.0	+23 6	6	0.8*	And	4
ST038	NGC 1	Gamma, Teb	00 59.4	+09 47	6.4	26*	Cel	3
ST039	U		01 00.1	+44 3	6	8*	And	3
ST040	U		01 02.3	+41 31	6.6		Cep	22
ST041	74		01 05.8	+21 28	5.3	30*	Psc	3
ST042	390		01 05.8	+04 55	6.6	33*	Psc	3
ST043	Zeta	Hummer 2	01 05.4	+55 3	3.9	6.4*	Phe	2
ST044	Eta		01 06.9	+10 2	4.9		And	21
ST045	NGC 161		01 08.3	+56 3	2.5		And	21
ST046	Mach		01 09.7	+56 6	4.2		And	21
ST047	Zeta	ADS 996	01 13.7	+07 6	5.6	23*	Psc	2
ST048	Kappa	h3423	01 15.6	+60 9	5.1	5.4*	Tuc	2

Number	Name	Other	RA	Dec	Mag	Sep	Con	Code
ST050	Z	42	01 16.2	+25 8	6.8		Psc	4
ST051	ST113	ADS 1129	01 23.9	+66 1	4.7	47*	Cas	5
ST052	Gamma		01 25.9	+66 1	4.7		Cas	5
ST053	Acenar	Alpha	01 37.2	+57 14	0.5		Phe	21
ST054	51		01 38.0	+48 6	3.6		And	22
ST055	UV		01 38.6	+18 0	7		Cel	22
ST056	P	Dunlop 5	01 39.8	+56 2	5.8	11.5*	Eri	2
ST057	106		01 41.4	+05 5	4.4		Psc	21
ST058	44	Burnham 1103	01 43.3	+00 6	5.8	1.6*	Cas	2
ST059	1		01 43.7	+50 7	4.1		Psc	21
ST060	1762		01 49.3	+47 54	5.8	2*	Psc	8
ST061	174		01 50.3	+22 3	5.6	2*	Psc	8
ST062	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST063	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST064	56		01 58.2	+37 3	5.7		And	2
ST065	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST066	45		01 58.3	+40 9	6.8	1*	Cel	4
ST067	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST068	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST069	1175		01 52.0	+10 48	8.5	3*	And	3
ST070	Zeta		01 51.5	+10 3	3.7		Cel	2
ST071	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST072	1		01 50.3	+22 3	5.6	2*	Psc	8
ST073	174		01 50.3	+22 3	5.6	2*	Psc	8
ST074	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST075	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST076	56		01 58.2	+37 3	5.7		And	2
ST077	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST078	45		01 58.3	+40 9	6.8	1*	Cel	4
ST079	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST080	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST081	1175		01 52.0	+10 48	8.5	3*	And	3
ST082	Zeta		01 51.5	+10 3	3.7		Cel	2
ST083	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST084	1		01 50.3	+22 3	5.6	2*	Psc	8
ST085	174		01 50.3	+22 3	5.6	2*	Psc	8
ST086	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST087	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST088	56		01 58.2	+37 3	5.7		And	2
ST089	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST090	45		01 58.3	+40 9	6.8	1*	Cel	4
ST091	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST092	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST093	1175		01 52.0	+10 48	8.5	3*	And	3
ST094	Zeta		01 51.5	+10 3	3.7		Cel	2
ST095	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST096	1		01 50.3	+22 3	5.6	2*	Psc	8
ST097	174		01 50.3	+22 3	5.6	2*	Psc	8
ST098	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST099	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST100	56		01 58.2	+37 3	5.7		And	2
ST101	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST102	45		01 58.3	+40 9	6.8	1*	Cel	4
ST103	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST104	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST105	1175		01 52.0	+10 48	8.5	3*	And	3
ST106	Zeta		01 51.5	+10 3	3.7		Cel	2
ST107	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST108	1		01 50.3	+22 3	5.6	2*	Psc	8
ST109	174		01 50.3	+22 3	5.6	2*	Psc	8
ST110	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST111	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST112	56		01 58.2	+37 3	5.7		And	2
ST113	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST114	45		01 58.3	+40 9	6.8	1*	Cel	4
ST115	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST116	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST117	1175		01 52.0	+10 48	8.5	3*	And	3
ST118	Zeta		01 51.5	+10 3	3.7		Cel	2
ST119	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST120	1		01 50.3	+22 3	5.6	2*	Psc	8
ST121	174		01 50.3	+22 3	5.6	2*	Psc	8
ST122	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST123	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST124	56		01 58.2	+37 3	5.7		And	2
ST125	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST126	45		01 58.3	+40 9	6.8	1*	Cel	4
ST127	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST128	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST129	1175		01 52.0	+10 48	8.5	3*	And	3
ST130	Zeta		01 51.5	+10 3	3.7		Cel	2
ST131	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST132	1		01 50.3	+22 3	5.6	2*	Psc	8
ST133	174		01 50.3	+22 3	5.6	2*	Psc	8
ST134	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST135	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST136	56		01 58.2	+37 3	5.7		And	2
ST137	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST138	45		01 58.3	+40 9	6.8	1*	Cel	4
ST139	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST140	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST141	1175		01 52.0	+10 48	8.5	3*	And	3
ST142	Zeta		01 51.5	+10 3	3.7		Cel	2
ST143	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST144	1		01 50.3	+22 3	5.6	2*	Psc	8
ST145	174		01 50.3	+22 3	5.6	2*	Psc	8
ST146	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST147	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST148	56		01 58.2	+37 3	5.7		And	2
ST149	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST150	45		01 58.3	+40 9	6.8	1*	Cel	4
ST151	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST152	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST153	1175		01 52.0	+10 48	8.5	3*	And	3
ST154	Zeta		01 51.5	+10 3	3.7		Cel	2
ST155	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST156	1		01 50.3	+22 3	5.6	2*	Psc	8
ST157	174		01 50.3	+22 3	5.6	2*	Psc	8
ST158	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST159	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST160	56		01 58.2	+37 3	5.7		And	2
ST161	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST162	45		01 58.3	+40 9	6.8	1*	Cel	4
ST163	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST164	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST165	1175		01 52.0	+10 48	8.5	3*	And	3
ST166	Zeta		01 51.5	+10 3	3.7		Cel	2
ST167	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST168	1		01 50.3	+22 3	5.6	2*	Psc	8
ST169	174		01 50.3	+22 3	5.6	2*	Psc	8
ST170	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST171	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST172	56		01 58.2	+37 3	5.7		And	2
ST173	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST174	45		01 58.3	+40 9	6.8	1*	Cel	4
ST175	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST176	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST177	1175		01 52.0	+10 48	8.5	3*	And	3
ST178	Zeta		01 51.5	+10 3	3.7		Cel	2
ST179	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST180	1		01 50.3	+22 3	5.6	2*	Psc	8
ST181	174		01 50.3	+22 3	5.6	2*	Psc	8
ST182	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST183	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST184	56		01 58.2	+37 3	5.7		And	2
ST185	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST186	45		01 58.3	+40 9	6.8	1*	Cel	4
ST187	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST188	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST189	1175		01 52.0	+10 48	8.5	3*	And	3
ST190	Zeta		01 51.5	+10 3	3.7		Cel	2
ST191	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST192	1		01 50.3	+22 3	5.6	2*	Psc	8
ST193	174		01 50.3	+22 3	5.6	2*	Psc	8
ST194	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST195	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST196	56		01 58.2	+37 3	5.7		And	2
ST197	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST198	45		01 58.3	+40 9	6.8	1*	Cel	4
ST199	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST200	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST201	1175		01 52.0	+10 48	8.5	3*	And	3
ST202	Zeta		01 51.5	+10 3	3.7		Cel	2
ST203	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST204	1		01 50.3	+22 3	5.6	2*	Psc	8
ST205	174		01 50.3	+22 3	5.6	2*	Psc	8
ST206	1534	ADS 1534	01 56.2	+37 3	5.7		And	2
ST207	Lambda	ADS 1563	01 57.9	+23 6	4.8	37*	And	2
ST208	56		01 58.2	+37 3	5.7		And	2
ST209	ADS 1538		01 58.3	+40 9	6.8	1*	Cel	4
ST210	45		01 58.3	+40 9	6.8	1*	Cel	4
ST211	Psi		01 58.6	+46 3	4.1	8*	Phe	1
ST212	1180	Gamma	01 53.5	+13 9	4.5	6*	And	3
ST213	1175		01 52.0	+10 48	8.5	3*	And	3
ST214	Zeta		01 51.5	+10 3	3.7		Cel	2
ST215	1563		01 51.3	+64 51	6.6	35*	Cas	5
ST216	1		01 50.3	+22 3	5.6	2*	Psc	8
ST217	174		01 50.3	+22 3	5.6	2*	Psc	8
ST218	1534	ADS 1534	01 56.2	+37 3	5.7		And	2

Number	Name	Other	RA	Dec	Mag	Con	Code
S1715	Gamma	ADS 4334	05 44.5	-22.5	3.7	Lop	2
S1716	Y		05 49.7	+20.7	7.1	Tau	2
S1717	Mu	SAO 086148	05 46.0	-32.3	5.2	Chi	21
S1718	Sigma	Kappa	05 47.8	-09.7	2	Chi	21
S1719	Chi	52	05 48.0	+00.27	6.1	Chi	4
S1720	Beta	Wega	05 51.0	-35.8	3	Chi	21
S1721	Delta		05 51.5	-35.5	3	Lop	21
S1722	Nu		05 54.5	+39.1	4	Chi	21
S1723	Gamma		05 54.9	+07.02	8.8	Chi	3
S1724	Beta	Alpha	05 55.2	+07.24	0.5	Chi	21
S1725	U		05 55.8	+20.2	5.3	Chi	22
S1726	Theta		05 59.7	+37.13	2.6	Aur	1
S1727	Gamma		05 59.8	+45.9	4.3	Aur	1
S1728	Gamma		06 00.0	+27.7	7	Peg	2
S1729	Delta		06 00.9	+26.0	7.5	Gem	22
S1730	Tau		06 01.0	+26.0	7.5	Gem	22
S1731	Chi		06 11.7	+48.42	6.1	Aur	2
S1732	Chi		06 14.0	+47.0	10	Aur	2
S1733	Chi		06 15.3	+42.5	3.3	Gem	21
S1734	Gamma	Eta 4440	06 18.6	+54.2	8.9	Aur	22
S1735	Gamma		06 19.3	+50.3	4	Gem	21
S1736	Kappa		06 19.7	+50.3	9.5	Chi	21
S1737	Zeta	Fund	06 20.1	-30.1	3	Chi	21
S1738	Chi		06 22.7	-20.2	5	Chi	22
S1739	Chi	Beta	06 22.7	-19.0	2	Chi	21
S1740	Chi		06 22.8	-22.5	2.3	Gem	21
S1741	Chi	Alpha	06 23.0	-35.4	0.7	Chi	21
S1742	Chi		06 27.8	+20.47	6.6	Gem	22
S1743	Chi	Beta	06 28.8	-07.02	3.8	Chi	22
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S1900	Chi		06 28.8	-07.02	3.8	Chi	22
S1901	Chi		06 28.8	-07.02	3.8	Chi	22

One-Year Limited Warranty

This Orion IntelliScope Computerized Object Locator is warranted against defects in materials or workmanship for a period of one year from the date of purchase. This warranty is for the benefit of the original retail purchaser only. During this warranty period Orion Telescopes & Binoculars will repair or replace, at Orion's option, any warranted instrument that proves to be defective, provided it is returned postage paid to: Orion Warranty Repair, 89 Hangar Way, Watsonville, CA 95076. If the product is not registered, proof of purchase (such as a copy of the original invoice) is required.

This warranty does not apply if, in Orion's judgment, the instrument has been abused, mishandled, or modified, nor does it apply to normal wear and tear. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state. For further warranty service information, contact: Customer Service Department, Orion Telescopes & Binoculars, 89 Hangar Way, Watsonville, CA 95076; (800) 676-1343.

Orion Telescopes & Binoculars

89 Hangar Way, Watsonville, CA 95076

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

www.OrionTelescopes.com
