

# ALL VIEW™

## Multi-Purpose Computerized Mount



## Instruction Manual

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## Introduction

Congratulations on your purchase of a Sky-Watcher™ AllView™ mount. This multi-purpose mount was designed to be used as:

- An alt-azimuth go-to computerized astronomical mount (using an optional telescope optical tube)
- A motorized platform for taking panoramic photographs
- A stable platform for panning while taking time lapse video or still images
- A motorized base for smooth panning video

Sky-Watcher mounts carry a two year limited warranty. For details see our website at [www.celestron.com](http://www.celestron.com)

Some of the many standard features of the AllView mount include:

- Multi-purpose mounting bracket for attaching an optical tube, still camera, or video camera
- Dual optical encoders - the mount never loses position even when moved by hand
- Sturdy stainless steel tripod
- Computerized mount can point to 42,900 astronomical objects
- Includes an electronic shutter release cable for most Canon DSLR cameras

Please read through this manual before using your new AllView mount. It may take a few sessions to become familiar with your mount, so keep this manual handy until you have fully mastered your mount's operation. This manual provides detailed information regarding each step as well as needed reference material and helpful hints guaranteed to make your experience as simple as possible.

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

### WARNING



- Never look directly at the Sun with the naked eye or with a telescope (unless you are using the proper solar filter). Permanent and irreversible eye damage may result.
- Never use your telescope to project an image of the Sun onto any surface. Internal heat build-up can damage the telescope and any accessories attached to it.
- Never use an eyepiece solar filter or a Herschel Wedge. Internal heat build-up inside the telescope can cause these devices to crack or break, allowing unfiltered sunlight to pass through to the eye.
- Never leave the telescope unsupervised, either when children are present or with adults who may not be familiar with the correct operating procedures of your telescope.

## Assembly

The AllView mount comes completely pre-assembled and can be operational in a matter of minutes. The mount is conveniently packaged in one reusable shipping carton that contains all of the following accessories:

- AllView mount
- SynScan hand control
- Mounting bracket (in 4 pieces)
- Steel tripod
- Tripod accessory tray
- Camera shutter cable (for most Canon Rebel cameras)
- RS-232 cable

### Assembling the AllView™ Mount

Start by removing the AllView mount from its shipping carton and removing all of the accessories from their individual boxes. Remember to save all of the containers so that they can be used to transport or store the mount.

#### Tripod and Mount Setup

The AllView mount is shipped with the tripod already attached. To set up the mount and tripod:

1. Slowly loosen the height adjustment screws and gently pull out the lower section of each tripod leg. Tighten the screws to hold the legs in place, as shown in **Fig. 1**.
2. Spread the tripod legs apart to stand the tripod and mount upright, as shown in **Fig. 2**.



Fig. 1



Fig. 2

3. Adjust the height of each tripod leg until the mount is properly leveled. There is a leveling bubble provided on the mount's base that you may use to check the mount's leveling. Note: the tripod legs may not be at same length when the mount is leveled.

4. Attach the accessory tray by sliding it along the primary locking shaft until it pushes against the tripod legs. Secure the locking knob, as shown in **Fig. 3**.

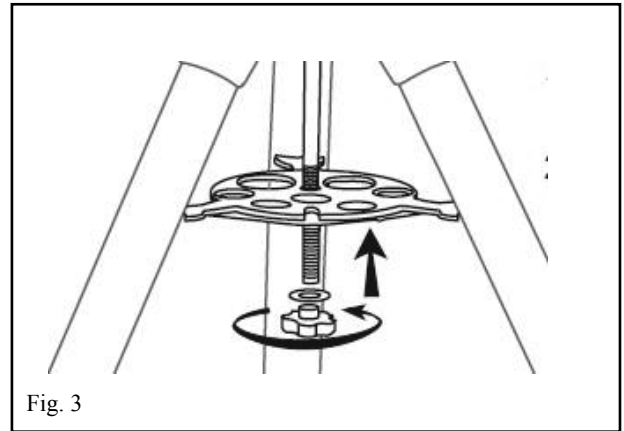


Fig. 3

5. Install the hand control holder by sliding it into the accessory tray notch as shown in **Fig 4**. Push until it locks in place.

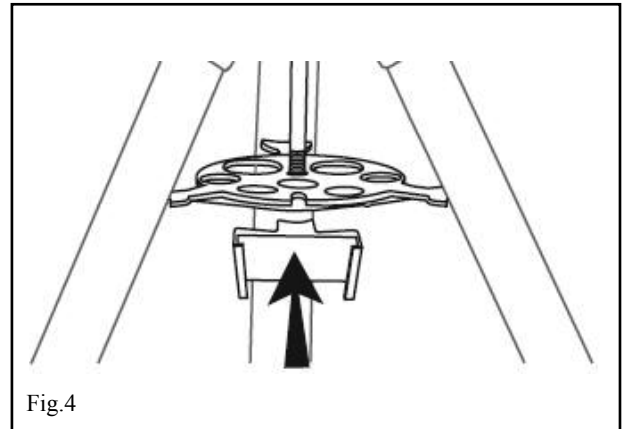


Fig.4

### Assembling and Installing the Mounting Bracket

The mounting bracket assembly includes four components: Dovetail Bar (a), Guiding Rail (b), Landscape Mounting Plate (c) and Portrait Mounting Plate (d) as shown in **Fig. 5**.

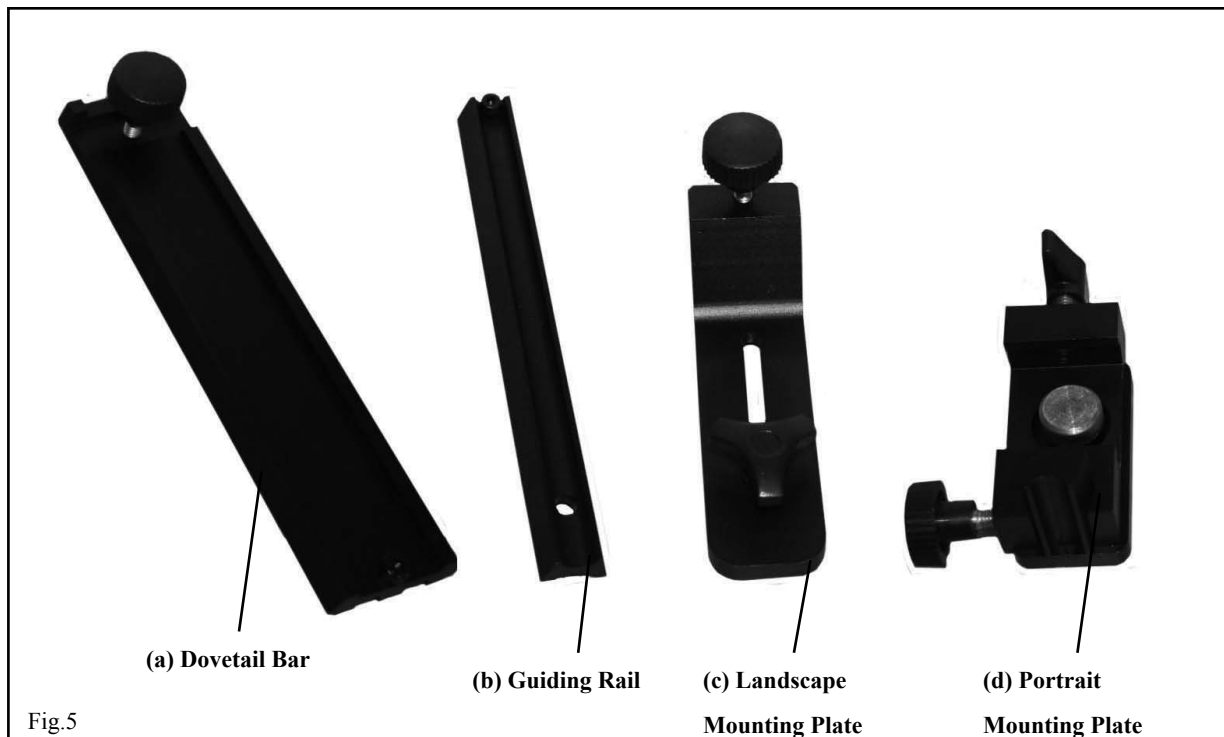
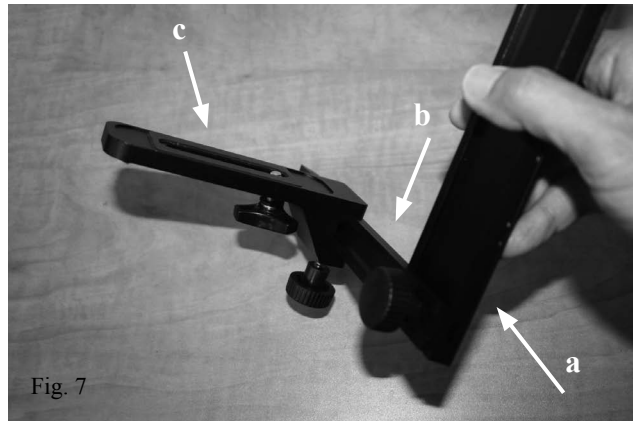
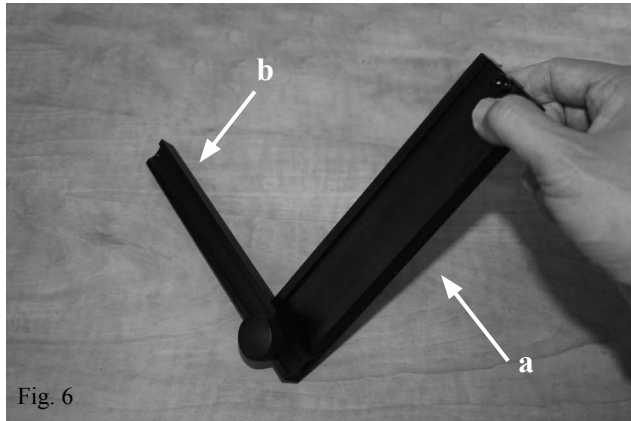


Fig.5

The mounting bracket can be configured in two ways to hold a camera in landscape or portrait orientation.

### Landscape Orientation:

1. Attach the Dovetail Bar (a) to the Guiding Rail (b) using the hand screw as shown in **Fig. 6**.
2. Now attach the Landscape Mounting Plate (c) to the Guiding Rail (b) as shown in **Fig. 7**.



3. Slide the Landscape Mounting Plate (c) along the Guiding Rail (b) back and forth to find a suitable position for the camera you are attaching. Tighten the hand screw on the Landscape Mounting Plate (c) to secure it in place.
4. Loosen the altitude clutch knob on the AllView mount's fork arm, as shown in **Fig. 8**, and turn the altitude axis, so the dovetail holder is in a vertical position. Retighten the clutch knob.
5. Loosen the Dovetail Holder's hand screw located on the fork arm and slide the mounting assembly into the dovetail holder. Tighten the hand screw. The mount should now look like **Fig. 9**.



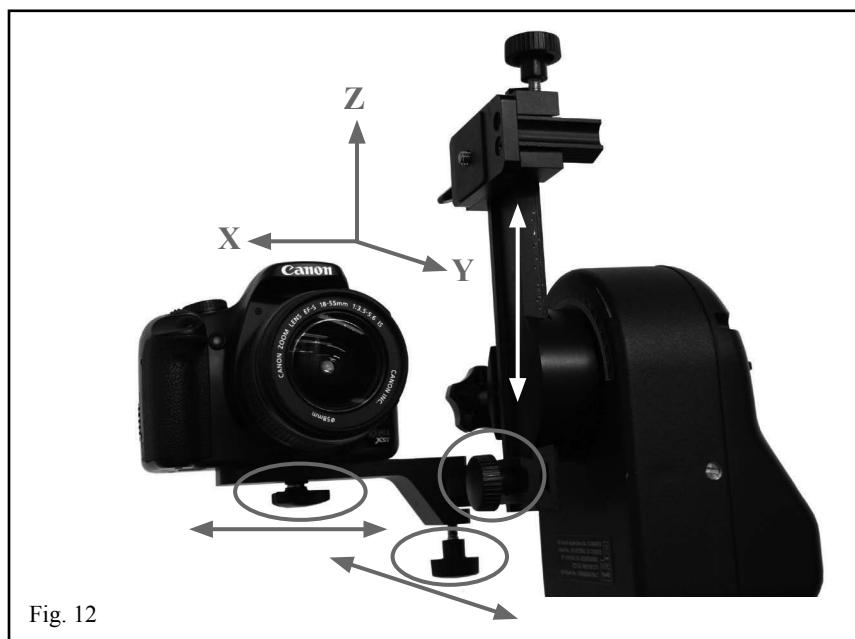
6. Use the 1/4-20 mounting screw on the Landscape Mounting Plate to attach your camera, camcorder or telescope optical tube as shown in **Fig. 10** and **Fig. 11**.

**WARNING**

Do not over tighten the 1/4-20 mounting screw or it may cause damage to the screw or camera body



7. The camera position may be adjusted in 3-dimensions on the mounting bracket, as shown in **Fig. 12**, by:
- Up and down (Z axis) – adjust the Dovetail Bar in the fork arm dovetail holder
  - Forward and backward (Y axis) – adjust the Landscape Mounting Plate along the Guiding Rail
  - Left and right (X axis) – adjust the camera mounting bolt on the Landscape Mounting Plate





## Portrait Orientation:

1. The Portrait Mounting Plate Assembly (d) is made up of two pieces – the Mounting Plate (d1) and the Dovetail Bar Clamp (d2). To separate them, loosen the hand screw as shown in **Fig. 13** and **Fig. 14**.

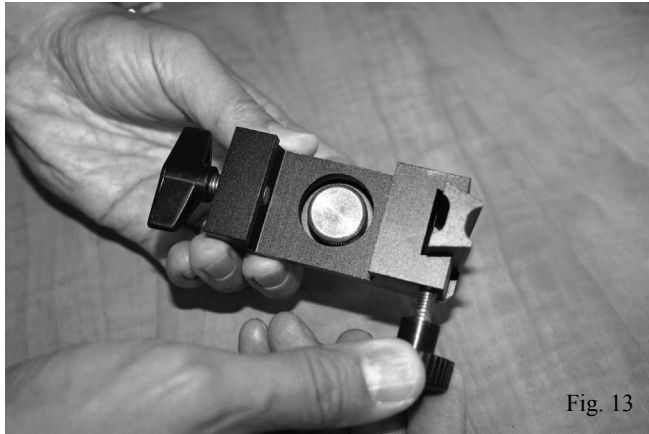


Fig. 13



Fig. 14

2. Slide the Mounting Plate (d1) and the Dovetail Bar Clamp (d2) apart as in **Fig. 15**.

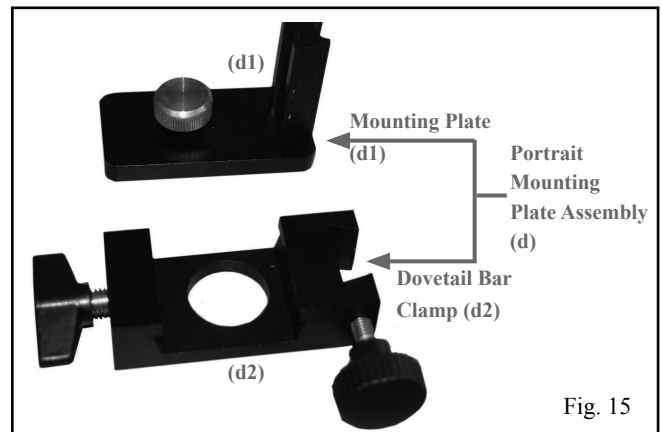


Fig. 15

3. Attach the Mounting Plate (d1) to your camera using the 1/4-20 screw as shown in **Fig. 16**.

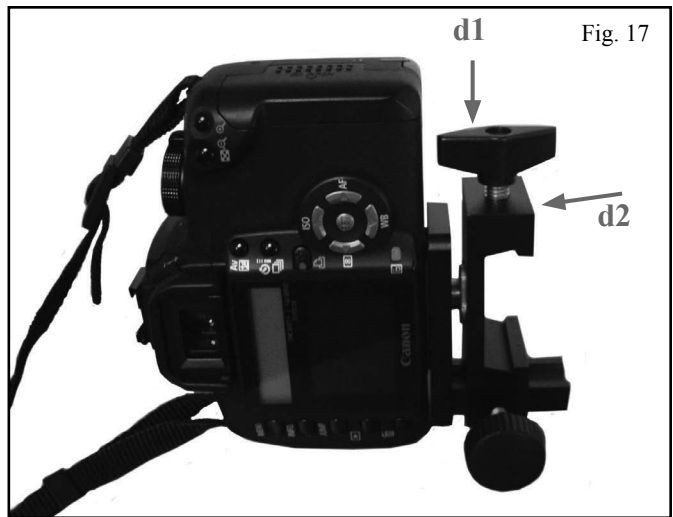


Fig. 16

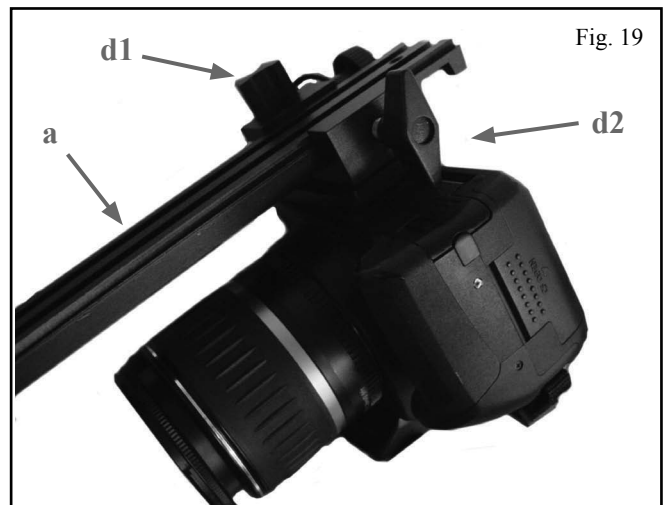
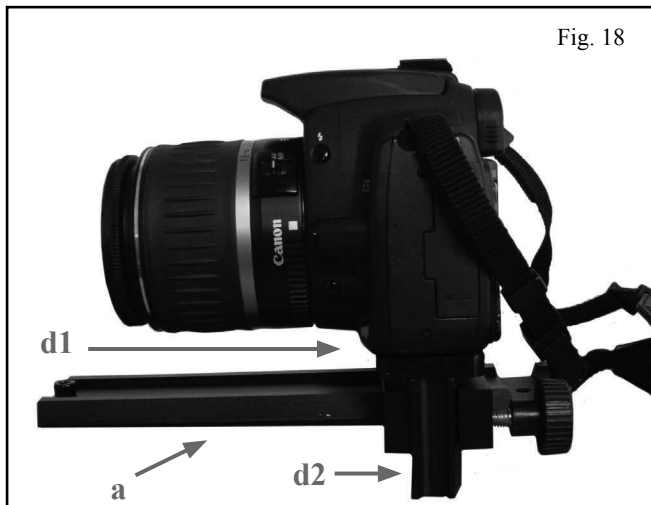
### **WARNING**

Do not over tighten the 1/4-20 mounting screw or damage may occur to the screw or camera body

4. Slide the short guiding rail on the Mounting Plate (d1) into the guiding rail slot on the Dovetail Bar Clamp (d2) and secure it in place using the hand knob as shown in **Fig. 17**.



5. Slide the Dovetail Bar (a) into the Portrait Mounting Plate (d) and secure using the hand screw as shown in **Fig. 18** and **Fig. 19**.



*Note: When assembling the Portrait Mounting Plate (d), make sure that the Mounting Plate (d1) is positioned high enough to prevent the 1/4-20 screw from obstructing the Dovetail Bar's (a) path when you assemble the two pieces. Once the Dovetail Bar (a) is attached, you can re-adjust this distance as needed.*

6. Loosen the altitude clutch knob located on the AllView mount's fork arm, and turn the altitude axis so that the dovetail holder in parallel to the ground. Retighten the clutch knob.

7. Loosen the dovetail holder's hand screw on the fork arm and slide the Dovetail Bar (a) into the dovetail holder. Secure using the hand screw. The mount should now look like **Fig. 20** and **Fig. 21**.



8. The camera's position may be adjusted in 3-dimensions on the Portrait Mounting Bracket, as shown in **Fig. 22**.
- Forward and backward (X axis)– adjust the Portrait Mounting Plate (d) along the Dovetail Bar (a)
  - Left and right (Y axis) – adjust the Mounting Plate (d1) on the Dovetail Bar Clamp (d2)



## Fork Arm Configuration

There are two configurations for the Fork Arm which are useful for both astronomy and photography.

### Inner Mounting Configuration:

The inner fork arm configuration, as shown in **Fig. 23**, is designed to be used when attaching a camera to the AllView mount for panoramic photography. This allows the camera to be set up at a nodal point, where it is close to the intersection of the altitude and azimuth axes.

A telescope optical tube may also be used in this configuration, but long telescope optical tubes may be limited in their altitude movement as they may strike the mount. For long tubes and camera lenses, you should use the Outer Mounting Configuration described below.

- When using a camera for panoramic photography, a video camera for video coursing, or a compact short tube telescope with the fork arm in the inner configuration, the fork arm should be at your left hand side while you are standing behind the mount as shown in **Fig. 23**.
- When using a telescope or binocular for astronomical observing with the fork arm in the inner configuration, the fork arm should be at your right hand side while you are standing behind the mount as shown in **Fig. 24**.



### Outer Mounting Configuration:

The outer fork arm configuration, as shown in **Fig. 25**, was designed primarily for astronomical use because of its greater range in altitude movement range without the telescope striking the mount. In the outer mounting configuration, the fork arm should be at your LEFT hand side while you are standing behind the mount, as shown in **Fig. 25**.



Fig. 25

## Changing the Fork Arm Configuration

To change the fork arm configuration, loosen the hand screw, located near the base of the fork arm, rotate the fork arm 180° until it stops and tighten the set screw as shown in Fig 26 through Fig 29.

Fig. 26



Fig. 27

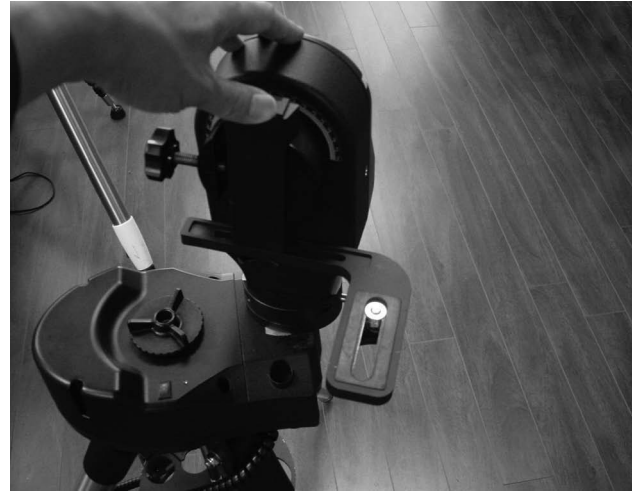


Fig. 28



Fig. 29



**Note:** When a camera or telescope optical tube is attached with the fork arm on the incorrect side as described above, the camera or telescope's UP and DOWN movement will be reversed and the mount will not function correctly.

## Dual Encoders and Mount Axis Clutches

The AllView mount is engineered with a patented Dual-Encoder design on both axes of the mount. This means that the mount will not lose its alignment or positional information on either axis, even if the scope is moved by hand. The mount has two large clutch knobs, one on each axis, which can be loosened in order to move the mount by hand. Once the mount is in the desired position, tighten the clutch knobs in order to engage the motors. Do not over tighten the knobs or damage to the motors may occur.

### WARNING

You must be careful not to use an optical tube that is too heavy or too big, as the motor assembly will not be able to operate properly and you may damage the mount. This mount was rated to carry an instrument of no more than 9 pounds.

## Powering the AllView™ Mount

The AllView mount requires 12 Volts DC nominal, but it can use 8 – 16 Volts. Never use a power supply that varies beyond this range or damage to the electronics may occur. An optional AC adapter can be attached using the power port on the base of the mount or you can use ten (10) AA alkaline batteries in the built-in battery compartment.

The battery compartment is located inside the bottom of the AllView mount head. To access the battery compartment:

1. Separate the mount from the tripod by loosening the three tripod mounting bolts underneath the tripod head (see Fig. 30)
2. Turn the mount over and locate the two knurled thumb screws.
3. Completely remove the two knurled thumb screws and pull open the battery compartment.
4. Insert 10x AA batteries into the battery holder and place the holder back into the mount.
5. Replace the door and secure it using the two knurled thumb screws.



## Using the AllView™ Mount for Panoramic Photography

### AllView Mount Panoramic Control

The AllView mount is a multi-functional camera mount and tripod. Not only can it be used as a computer controlled telescope mount, it can also be used as a motorized tripod for photography or video recording as well. The AllView mount and the panoramic functionality of the SynScan AZ hand control will work as a panoramic controlled mount and head. There are three methods for shooting panoramic images – Easy Pano Mode, Preset Pano Mode and Time Lapse Mode.

#### Easy Pano Mode

This is a simple and straightforward method for people just getting started in panoramic photography.

1. Attach a camera to the AllView mount. If you are using a Canon DSLR camera, use the supplied electronic shutter release cable to connect the SNAP output socket on the mount and the SNAP input socket of the camera. This will enable you to automatically control the camera's shutter snap (working in auto mode). The minimum duration of the snap time, from turn on to turn off, is 0.1 second and the maximum duration of the snap time will be more than 60 seconds. If you are using other brands of digital cameras, manual-mode is necessary.
2. Turn the power on. The firmware version will display on the LCD screen, as shown in **Fig. 31**.

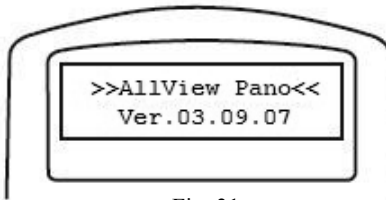


Fig. 31

3. Press **ENTER**, the hand control will prompt you to select one of the operating modes, as shown in **Fig.32**. Use the scroll keys to select **Panoramic Mode**. Press **ENTER**.

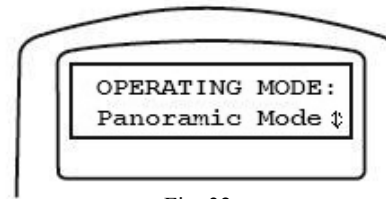


Fig. 32

4. Use the scroll buttons to select the **Easy Pano Mode** and press **ENTER**.

5. The hand control will display “**Step 1: Set Camera FOV...**” and “**Already know the FOV?**”
  - If you already know the field of view of the camera lens you are using, Press **1**. The hand control will then ask you to use the numeric keypad to enter the field of view (in degrees) of the horizontal axis first. When you are done, press **ENTER** and edit the field of view of the vertical axis.
  - If the field of view is unknown, press **2**. The hand control will walk you through the steps on measuring the field of view of your lens in both the horizontal and vertical axes. If your camera is so equipped, turn on the LCD’s live preview mode, otherwise use your viewfinder. The mount will ask you to use the directional keys to move the mount in the following manner:
    - Align the top frame of the camera’s view with the horizon and press **ENTER**
    - Align the bottom frame of the camera’s view with the horizon and press **ENTER**

The hand control will now display the measured field of view for the vertical axis of your lens. To continue, press **3**. If you wish to go back and perform the measurement again, press **1**. The hand control will now prompt you to do the same for the horizontal axis:

    - Align the left frame of the camera’s view with the initial center of the view and press **ENTER**
    - Align the right frame of the camera’s view with the initial center of the view and press **ENTER**

The hand control will now display the measured field of view for the horizontal axis of your lens. To continue, press **3**. If you wish to go back and perform the measurement again, press **1**. The hand control will show both values and save the field of view information for future use.
6. The hand control will display “**Step 2 HOME Position**” and will instruct you to use the directional keys to move the camera to the central point of the panoramic photo you wish to take and press **ENTER**.
7. The hand control will display “**Step 3 Set Pict Range.**” Use the scroll buttons to choose between 360° Panoramic or Wide Angle modes.
8. The hand control will again prompt “**Set Pict. Range:**” Use the scroll buttons to select “**by Editing**” or “**by Measuring**” the range. Press **ENTER** once you have made your choice.
  - When “**by Editing**” is selected, the hand control will ask you to use the numeric keypad to enter the following limits (in degrees):
    - o **RGT LMT** - How far to the right of the center point you want the panoramic image to go
    - o **LEFT LMT** – How far to the left of the center point you want the panoramic image to go
    - o **UP LMT** - How far above the center point you want the panoramic image to go
    - o **DOWN LMT** – How far below the center point you want the panoramic image to go

***Note:** When working in 360° Panorama, the hand control will only ask for UP LMT and DOWN LMT*

- When “**by Measuring**” is selected, the hand control will prompt to use the directional buttons to move the camera head to measure the range of panorama. Move the mount to the upper right corner of the panorama you wish to take and press **ENTER**. Next, move the mount to the lower left corner of the panorama you wish to take and press **ENTER**. Confirm your settings by pressing **1** (Yes).

***Note:** If in 360° Panorama mode, you will only need to move the mount upward and downward to measure the limits of the picture range.*



9. The hand control will display “**Step 4 Set Shooting**” and “**Set Time Halt.**” Using the numeric keypad, enter the number of seconds you would like to halt the mount between shots and press **ENTER**.
10. The hand control will ask if you want to continue with Auto Shooting.
  - By pressing the **1** key, AllView will work in auto-shooting mode, which will send signals via the electronic shutter release cable to the camera to automatically release the shutter for each shot in the panorama. The mount will slew to its proper picturing position, take the image and move to the next picture point without any intervention from the user. This auto-shooting function is especially suitable for Canon EOS DSLR cameras using the shutter release cable (included). After selecting the auto-shooting function, the hand control will prompt you to set exposure control time. Use the numeric keys to input the appropriate time setting. This can be between 0.1 seconds to 999.9 seconds.

***Note:** The mount's exposure time does not refer to the camera's exact shutter speed. This refers to the timing of the ON and OFF shutter release signal sent from the mount to the camera. Usually the exposure time setting of this snap signal should be longer than the exposure time setting on the camera. The actual shutter speed and aperture adjustments should be made on the camera itself. The mount does not control this.*

- By pressing the **2** key, you will be shooting the exposures manually. The mount will prompt you to start the alignment. When you do, the mount will slew to the first picture position. The display will be similar to that in **Fig. 33**, which displays Picture Position 1 of 33. You would then take the picture using the camera's shutter release button. Press **3** on the hand control to slew to the next picture position and manually take the image. Continue this process until all images have been taken. At any time, if you want to go back and reshoot any of the picture points, you can press **1** to go through the points in reverse.

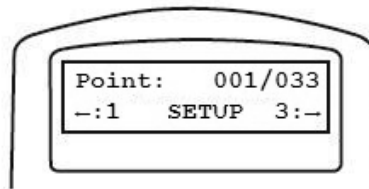


Fig. 33

11. After the AllView mount goes to the last picture point and takes a picture, the hand control will ask if you want to repeat the panorama using the same picture points. If you select **Yes**, the mount will ask if you want to shoot the images in the reverse direction. If you choose **Yes**, the mount will take the same images as before, but starting at the ending point and working through them to the first point. If you choose **No**, the mount will slew back to the first photo point and will run through the positions in the correct order.
12. If you wish to escape Easy Pano Mode, you may press **ESC** when the mount stops moving. You will be asked if you wish to abort Pano Mode. Press **1** to return to the main menu.

## Preset Pano Mode

This method is for more advanced users that want to edit and preset user defined picture points. You will do this by creating a series of layers. Each layer will specify the altitude angle that you want to shoot and how many images you want the mount to take in a 360° panorama at that altitude setting. By adding additional layers at different altitudes, you have the ability to take a full 360° panorama from straight overhead to the base of the mount!

1. Select Preset Pano Mode and press **ENTER**. The hand control will prompt you to select a camera. There are two preset memory locations available for you to customize with name or model and field of view parameters. If this is your first time using the mount, or you have not configured your camera information into these memory locations, you can simply select one of the two undefined **CAM #1** or **CAM #2** and press **ENTER**.
2. The hand control will ask if you want to edit the preset layers. Press **1** to continue to the editor. The hand control will display the existing preset layers. The top line will show the number of the layers you are in, and how many total layers are being used. The second line shows the number of images to be taken in one full 360° rotation of the mount at the altitude angle displayed. In the example in **Fig. 34**, you are viewing layer 2 out of 5 total layers and the mount will take 3 images at an altitude angle of 5° above the home position. You can use the scroll keys to see each layer. When you are ready to make changes to the layers, press **ENTER**.

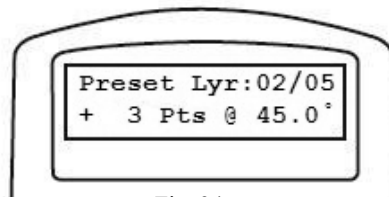


Fig. 34

3. The hand control will ask you if you want to add or delete a layer. Press **1** to add or delete a layer or press **2** to accept the preset layers as they are.
4. If you pressed **1**, the hand control will ask you to select between adding a new layer and deleting the current layer you were viewing.
  - **Adding a layer:** Press **1** to add a layer. Use the directional keys and the numeric keypad to enter the number of images and the altitude angle. To change the +/- sign of the altitude angle, highlight the sign and use the scroll keys to change it. A positive number will be an angle above the home position. A negative angle will be below the home position. Press **ENTER** when you are done.
  - **Deleting a layer:** Press **2** to delete the layer you are currently viewing. Once you press two, the layer will be deleted.

**Note:** You cannot edit a layer once it is saved. If you need to change the parameters of a layer, you will need to create a new layer and delete the incorrect one.

5. The hand control will ask if you wish to exit the layer editor. Press **1** to exit the editor and press **2** to continue adding or deleting layers.
6. Once you exit the layer editor, the hand control will ask if you want to save your current layer configuration for use in the future, Press **1** to save the changes you made.

***Note:** There are two layers called Zenith and Nadir. Zenith refers to the point straight overhead, while Nadir refers to the spot directly below the mount. You can include these layers if you choose, or you may delete them if you do not want images taken straight up or straight down. If you delete these layers and attempt to save your changes, the hand control will ask if you want to add these layers back in.*

7. The hand control will now ask you to level the scope and move it to the home position. The altitude layers defined in the previous steps are measured from the home position, so make sure you have the mount set correctly before you press **ENTER** to continue.
8. You will be prompted to set the Time Halt. Using the numeric keypad, enter the number of seconds you want the mount to halt between the time the mount stops moving and capturing the image. Press **ENTER**.
9. The hand control will ask if you want to continue with Auto Shooting.
  - By pressing the **1** key, AllView mount will work in auto-shooting mode, which will send signals via the electronics shutter release cable to the camera to automatically release the shutter for each shot in the panorama. The mount will slew to its proper picturing position, take the image and move to the next picture point without any intervention from the user. This auto-shooting function is especially suitable for Canon EOS DSLR cameras using the shutter release cable (included). After selecting the auto-shooting function, the hand control will prompt you to set exposure control time. Use the numeric keys to input the appropriate time setting. This can be between 0.1 seconds to 999.9 seconds.

***Note:** The mount's exposure time does not refer to the camera's exact shutter speed. This refers to the timing of the ON and OFF shutter release signal sent from the mount to the camera. Usually the exposure time setting of this snap signal should be longer than the exposure time setting on the camera. The actual shutter speed and aperture adjustments should be made on the camera itself. The mount does not control this.*

- By pressing the **2** key, you will be shooting the exposures manually. The mount will prompt you to start the alignment. When you do, the mount will slew to the first picture position. You would then take the picture using the camera's shutter release button. Press the **3** key on the hand control to slew to the next picture position and manually take the image. Continue this process until all images have been taken. At any time, if you want to go back and reshoot any of the picture points, you can press **1** to go through the points in reverse.

## Time Lapse Mode

This feature allows you to collect a series of still images over a long period of time while the mount slowly pans. You can then use your favorite image processing software to merge these frames into a time lapse video.

1. From the Panoramic Function menu, use the scroll keys to select **Time Lapse Mode**. Press **ENTER** to continue.
2. It is recommended that you use your camera's "Live Preview" mode to use the LCD display as the viewfinder. If your camera does not have this option, you may use the optical viewfinder. Use the directional keys to move the camera to the point where you wish to start your slow pan. Press **ENTER** to continue.
3. Use the directional keys where you want the slow pan to end and press **ENTER**.
4. The display will prompt you to set the amount of time you want between each picture point in your time lapse pan. You may enter the information using the directional keys and the numeric keypad in the following format: h:mm:ss. The time interval you can enter is 9:59:59. Once you have entered the proper time interval, press **ENTER**.
5. You will now be prompted to enter the exposure time. The mount's exposure time does not refer to the camera's exact shutter speed. This refers to the timing of the ON and OFF shutter release signal sent from the mount to the camera. The exposure time setting of this snap signal must be shorter than the interval you set in step 4. The actual shutter speed and aperture adjustments should be made on the camera itself. The mount does not control this.
6. The display will prompt you to enter the number of pictures you want to take during the pan from the starting point to the ending point of the slew. You can choose any number up to 65,535 images. Press **ENTER**.

***Note:** The number of images you can take during your time lapse slew will be dependent on the image quality setting in your camera, the amount of memory your camera has available and the amount of power left in your camera's battery. The larger the image size, the fewer pictures you will be able to store on your memory card.*

7. The display will ask if you are ready to start shooting. Press **1** for yes and **2** for no.
8. The mount will now slew to the starting point and start capturing your images. The status of the time lapse will be shown on the hand control. The top line will show the number of the last picture taken and the total number of pictures you selected. If you have selected a large time interval between images, a countdown timer will show the time remaining until the next shutter release.
9. You can stop the time lapse at any time by pressing the **ESC** key. The hand control will ask if you wish to resume the time lapse. Press **1** to resume or **2** to exit the time lapse mode.

## Configuration Menu

Under the main Panoramic Functions menu, you can use the scroll keys to select the Configuration menu to set up two cameras with their model number and parameter settings.

1. Select the Camera Setting submenu and press **ENTER**. The hand control will prompt you to select one of the two camera presets that you want to configure. Use the scroll keys to select the one you want and press **ENTER**.
2. The hand control will ask if you wish to edit the model name. Press **1** to access the model name editor.

3. Press **ENTER** to bring up the letter choices on the top line of the display. Use the directional buttons to select the letter you want and press **ENTER**. Press **ENTER** again to select the second letter. Continue until you have finished. You can press the scroll buttons to change the case of the letters to choose from or select numbers or special characters. When you are done entering the name, press **SETUP**.

The display will now show a list of parameters that you can change for your camera

- o Field of View (Horizontal)
- o Field of View (Vertical)
- o Mode of Mounting (Portrait or Landscape)
- o Exposure Time

Use the scroll keys to cycle through this list. To change any one of the parameters, simply press **ENTER** to edit. Use the scroll keys or the numeric keypad to make the appropriate changes and press **ENTER** to accept. When you are done with all of the changes, press **ESC**.

4. The hand control will ask if you wish to save your changes. Press **1** to save.

## Slew to Home

The slew to home function tells the telescope to slew back to its home position (or the zero position of both encoders). By pressing **ENTER**, the mount will move to this position.

## Video Coursing

The video coursing feature allows you to use the AllView take a video clip with a constant slewing speed from one point to another. The user does not need to calculate the speed in either axis of the mount. Instead, you specify the starting and ending points and the amount of time you wish to take to slew between the two.

1. From the Panoramic Function menu, use the scroll buttons to select Video Coursing and press **ENTER**.
2. Use the directional keys to slew the video camera to the point where you want your panning shot to start and press **ENTER**.
3. Use the directional keys to slew the video camera to the point where you want your panning shot to end and press **ENTER**.  
slew at the mount's maximum speed. Use the numeric keypad to enter the duration in hours, minutes and seconds. Press **ENTER**.  
The maximum time you can enter is 9 hours, 59 minutes, and 59 seconds.
5. The hand control will ask if you are ready to start the coursing. Press **1** to start and the mount will automatically move to the starting position and will then start the video coursing.

***Note:** When the mount starts the coursing, the mount's shutter release cable outlet will short to ground until the course has been completed. You may use this useful signal to activate your camera or camcorder. Please refer to the documentation that came with your camera or camcorder for information on utilizing this signal.*

6. Once the slew has been completed, the hand control will ask if you wish to run the slew again. Press **1** to continue or **2** to exit Video Coursing and return to the Panoramic Function menu.

## Using the AllView™ Mount for Astronomy

### The SynScan™ AZ System

The AZ GOTO MODE provides extensive computerized GO-TO function to assist you in finding and enjoying the treasures of the night sky, such as planets, nebulae, star clusters, galaxies and much more. The hand control allows you to point your telescope to a specific object or even tour the skies at the touch of a button. The user-friendly menu system allows automatic slewing to over 42,900 objects. Even a beginning amateur astronomer can master its variety of features in a few observing sessions.

### The SynScan AZ Hand Control

The SynScan AZ hand control has three ports on its bottom edge as pictured in **Fig. 35**. The hand control cable has a RJ-45 with 8 connecting pins on one end and a RJ-12 connector with 6 pins on the opposite end. Plug the RJ-45 end into the port on the base of the hand control and plug the opposite end into the drive base port marked “Hand Control.” The center port on the bottom of the hand control is used for RS-232 communications between the SynScan AZ and a computer or other device (see “Linking with a Computer” for more details). The DC power port allows independent use of the SynScan AZ hand control for users who wish to browse the database or update the firmware without connecting to the telescope.

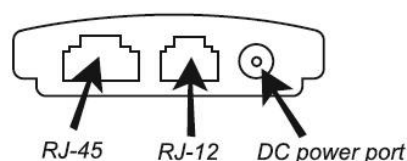


Fig. 35

#### **WARNING**

The DC power port is for hand control stand-alone application only. For telescope application, use the 12V DC port on the mount.

#### **WARNING**

To connect the SynScan AZ to a PC, use only the RS-232 cable provided with the mount.

The SynScan AZ hand control allows direct access to all the motion controls of the telescope and a database with a range of preset objects. The hand control comes with a dual-line, 16-character display that is backlit for comfortable viewing of telescope information and scrolling text. To explore the many functions the SynScan AZ has to offer, there are 4 main groups of keys on the hand control (**Fig. 36**).

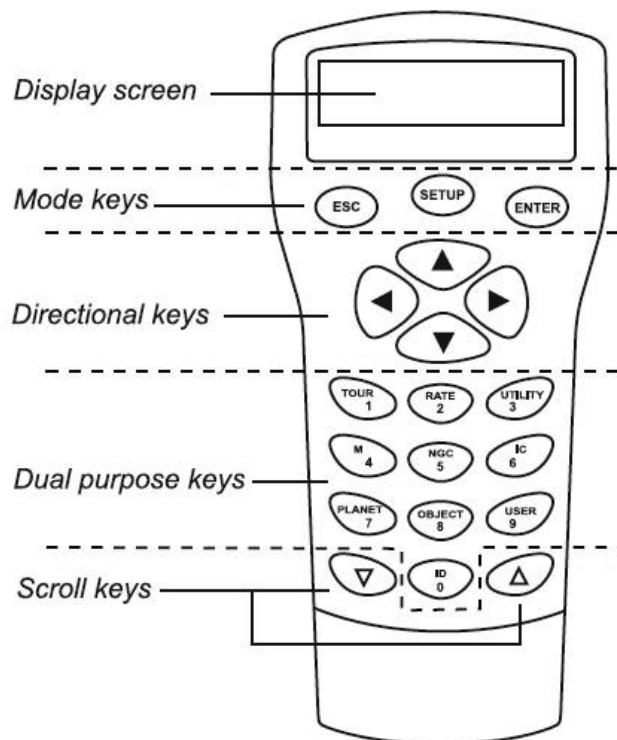


Fig. 36

### Mode Keys:

The mode keys are located near the top, close to the LCD display. They include:

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

### Directional Keys:

The directional keys allow complete telescope control at almost any step in SynScan's operation. These controls are locked out when the telescope is slewing to an object. They are normally used to initially align, center objects in the eyepiece and when manually guiding. The left and right directional keys can also be used to move the text cursor when entering data into the hand control.

### Scroll Keys:

The up and down scroll keys, shown in **Fig. 37**, allow you to scroll up and down within the menu tree or selections.

## Dual Purpose Keys:

These keys, pictured in **Fig. 38** and **Fig. 39**, range from the middle to the bottom of the hand control. They serve two distinct purposes – data entry and quick reference hot keys:

- **TOUR** key takes you on a preset tour across the sky you are currently under
- **RATE** key changes the speed rate of the motors when the directional keys are pressed. There are 10 speeds to choose from: 0 (slowest) to 9 (fastest)
- **UTILITY** shows functions such as Show Position, Display Time... etc
- **USER** key gives access to up to 25 user-defined coordinates
- **ID** key identifies the object the telescope is currently pointing to
- **NGC, IC, M, PLANET** and **OBJECT** keys allow direct access to SynScan database of over 42,900 objects

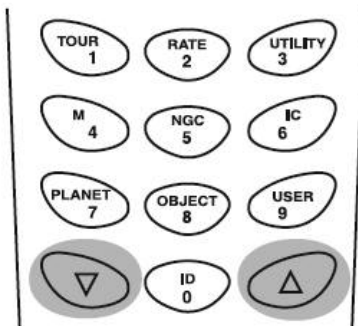


Fig. 37

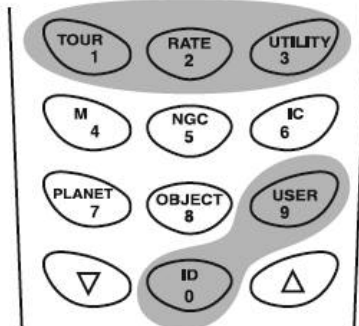


Fig. 38

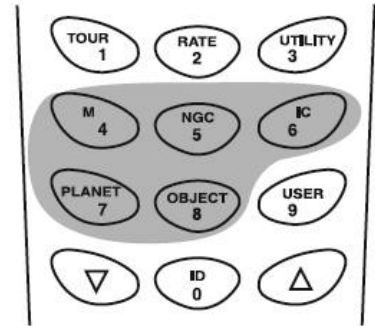


Fig. 39

## AZ GoTo Operation

### Initial Setup

1. Make sure the mount is level to the ground. There is a bubble level built into the base to help level the mount.
2. Point the telescope roughly to the brightest star in the sky seen by your naked eyes.
3. Make sure the hand control and power supplies are plugged in correctly and toggle the power switch located on the top of the mount to the “on” position.
4. The initial screen displayed on the hand control is the Version Screen. Press **ENTER** to proceed. The hand control will display “**OPERATING MODE:**” Use the scroll keys to select “**Astronomical Mode**” and press **ENTER**.
5. The hand control will display a warning to not point the telescope at the Sun without proper equipment. If you have read the message already, pressing **ENTER** will bypass the message and skip to the next step.

***Hint:** The hand control's red light will become dimmer and the keypad's backlight will turn off if idle for 30 seconds. Pressing any key turns it back on.*



6. The hand control will prompt “**SET LOCATION:**” on the display. There are two methods of performing this function. Use the scrolling keys to select the method you wish to use and press **ENTER**.
  - **Select City:** The hand control will ask you to select a database of cities, either in the United States or an International city. In the United States database, you will first select your state and then the closest city to you in alphabetical order. In the International database, you will first select the country and then the city in alphabetical order. If your exact city is not listed, choose the nearest city in the database. As long as you are within 75 miles of the city you choose, you should still be able to easily align the telescope.
  - **Edit Coordinates:** You may directly enter your longitude and latitude into the hand control using the numeric keypad. First you will be asked for your longitude, followed by your latitude. You can change the cardinal direction (N, S, E or W) by selecting it using the arrow keys and changing it by using the up and down scroll keys. You should enter the coordinates in degrees, minutes and seconds, for example (123° 04' W 49° 09' N).
7. If you used the “Select City” option in the previous step, you will not need to enter a time zone, as it has already been entered automatically. If you used the “Edit Coordinates” option in the step above, the hand control will now ask you to “Set Time Zone.” You can use the up and down scroll keys to select one of the two following options and pressing **ENTER** to continue.
  - **Select Time Zone:** You can choose your time zone from a list.
  - **Enter Time Zone:** You may enter the time zone in hours and minutes by yourself (see Appendix B). When editing the time zone, use the scroll keys and numeric keypad to input digits and the sign (+ for East, - for West). Press **ENTER** to confirm. The format you enter should appear like this if you are in Pacific Standard Time (PST): -08:00.
8. The hand control will now ask you to enter the date using the numeric keypad in the following format: MM/DD/YYYY. Press **ENTER** to confirm.
9. Enter your current local time using the 24 hr time mode (e.g. 2:00PM = 14:00). Press **ENTER** to view the time you just entered. If it is incorrect, press **ESC** to go back to the previous screen. If correct, press **ENTER** again to proceed to the next step.
10. The hand control will ask for your Daylight Savings setting. If your location is currently following Daylight Savings, choose yes. If your location does not currently follow Daylight Savings time, select no.

**Hint:** *If a mistake was entered into the SynScan AZ hand control, press the ESC key to go back to the previous menu and press ENTER to start again.*

11. After setting the Daylight Savings, SynScan AZ will display, “**Begin alignment?**” Press “1” to start the alignment procedure.

## Star Alignment

In order for the SynScan AZ to correctly point to objects in the sky, it must first be aligned to two or three known positions (stars) in the sky. As the Earth rotates on its axis every 24 hours, astronomical objects appear to move through the sky following an arc. With the supplied information, the telescope can replicate a model of the sky and the movements of astronomical objects. Star alignment can be done anytime during the observing session by choosing **Alignment** under **Setup Menu**.

There are three methods to align the SynScan AZ – Brightest Star alignment, 2-Star alignment and Daytime alignment. If you are using the SynScan AZ for the first time, and you are not familiar with celestial objects in the sky, we recommend that you begin with the Brightest Star alignment.

***Note:** Before performing either alignment method, make sure that your finderscope is well aligned with the telescope tube.*

### Brightest Star Alignment

1. In the alignment screen, select Brightest Star alignment using the scroll keys and press **ENTER** to confirm.
2. Locate the brightest star in the sky that is far away from other bright stars. Point the telescope roughly to the star you chose using the hand control or by loosening the clutches and moving the telescope by hand.
3. The hand control will prompt “**Select Region.**” Using the scroll keys, you will need to identify the region of sky the star you chose is currently in. Each region covers a 90-degree span in azimuth. The table below explains the range of the eight directional divisions.

Directional division	Span range in azimuth
The northern sky	315 ° ~ 45 °
The northeast sky	0 ° ~ 90 °
The eastern sky	45 ° ~ 135 °
The southeast sky	90 ° ~ 180 °
The southern sky	135 ° ~ 225 °
The southwest sky	180 ° ~ 270 °
The western sky	225 ° ~ 315 °
The northwest sky	270 ° ~ 360 °

4. The hand control will generate a list of stars located within this region that are brighter than magnitude 1.5, starting from the brightest to the dimmest. Stars and planets below 10 degrees or higher than 75 degrees above the horizon will be filtered out. The name and magnitude of the alignment star will be displayed on the first line of the LCD. The approximate position will be prompted on the second line. For example, if Arcturus is displayed as an alignment star, its magnitude (0.0) and its location (88.1 ° east and 24.1 ° above the horizon) will appear as shown in **Fig. 40** Press **ENTER** to continue.

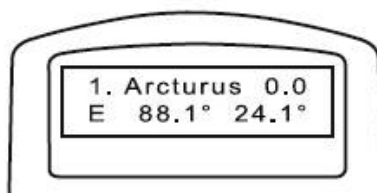


Fig. 40

5. Use the directional buttons on the hand control to center the star in your finderscope and press **ENTER**. Now center the star in the telescope's eyepiece and press **ENTER**. To make it easier to center the star in the eyepiece, you may change the slewing speed by pressing the **RATE** button and then choose a number between 0 (slowest) – 9 (fastest).

***Note:** For the best accuracy, the SynScan AZ recommends that you align on a star and not a planet. If the first star you selected for alignment is actually a planet, the hand control will ask you to center the planet in your eyepiece and press ENTER. The scope will then present a list of stars that are visible. Select one from the list and the scope will move to it automatically. You will be asked to center this star in the eyepiece and press ENTER to continue the alignment process.*

6. The LCD display will now show a list of other bright stars that you can use as your second alignment star. Use the scroll keys to move through the list and press **ENTER** to confirm your choice. The scope will automatically slew towards the second alignment star. Use the hand control to center the star in your finderscope and then your eyepiece, adjusting the rate of the slew motors as needed. Press **ENTER** to complete the alignment. If you see multiple stars in the eyepiece's field of view, your alignment star will be the brightest among them.
7. If every alignment star was centered up correctly, the hand control display will read "**Alignment Successful.**" If there were any errors, the warning "**Alignment Failed**" will show on the display and the alignment will have to be repeated. You may exit the alignment procedure any time by pressing the **ESC** key.

***Hint:** To ensure the accuracy of the star alignment, make sure to end the movement with the UP and RIGHT directional keys when centering the first and second alignment stars in the eyepiece.*

***Hint:** SynScan AZ will beep once when it has finished slewing to an object. Do not try to adjust the telescope before you hear the beep. The SynScan AZ hand control will only respond to the ESC key while slewing.*

### **Two-Star Alignment**

1. In the alignment screen, use the scroll keys to select Two-Star Alignment and press **ENTER** to confirm.
2. The SynScan AZ will display a list of stars available in the current sky for you to choose as the first alignment star. Using the scroll keys, choose a star that you are familiar with and press **ENTER**. You will need to use the directional buttons on the hand control to slew the telescope to point to the star you chose.

3. Center the star in your finderscope and then center in the eyepiece, adjusting the rate of the slew motors as needed. Press **ENTER** once the star has been centered in the eyepiece.
4. SynScan AZ will now provide a list of stars available for the second alignment star. Choose a star using the scroll keys and press **ENTER**. The telescope will start slewing towards the chosen object. When the slewing stops, center the star in the finderscope and then center in the eyepiece, adjusting the rate of the slew motors as needed. Press **ENTER** to complete the alignment.
5. If the alignment stars were centered up correctly, the hand control display will read “**Alignment Successful.**” If there were any errors, the warning “**Alignment Failed**” will show on the display and the alignment procedure will have to be repeated. You may exit the alignment procedure any time by pressing the **ESC** key.

***Hint:** For best results, select two stars that are at least 60 degrees apart in azimuth. The more distance between the two alignment stars, the more accurate your alignment will be. Choosing two stars with similar height above the horizon will also create better results.*

***Hint:** Your alignment is stored in the hand control even after the power has been turned off. You will only need to perform the star alignment once as long as these two requirements are met:*

*The telescope is moved to a home position (park the telescope) before turning off the power:*

*The telescope setup, including the mount has not been moved. Changing the accessories is acceptable as long as it is done with great caution. When the hand control is turned on again, make sure the time entered during the initial setup is based on the same source as when the alignment was originally completed.*

### **Daytime Alignment**

1. In the alignment screen, use the scroll keys to select Daytime Alignment and press **ENTER** to confirm. The solar warning will appear on the hand control. When you are done reading it, press **ENTER** again to continue.
2. The display will show you a list of the brightest objects to use, such as the Moon, bright planets, and the brightest stars above your horizon. Use the scroll keys to select the object you want to align to and press **ENTER**.
3. You will be prompted to slew the telescope to that object and press **ENTER**. Once you have the object centered in your eyepiece, press **ENTER** again to complete the alignment.

***Note:** Since the Daytime Alignment only uses one object as a reference, your go-to pointing accuracy will not be as accurate as with the other two alignment methods, but it will give you the ability to track objects such as the Moon and bright planets. Go-to commands will probably not place objects in your eyepiece field of view, but should get them in a wide finderscope field of view. Note that the visibility of planets in the daytime will depend on the transparency of the atmosphere, as well as the angle between the object and the Sun.*

## Pointing Accuracy Enhancement (PAE)

Both the star alignment methods provide alignment adequate for any visual observing purpose. For applications that require extra high precision in a particular part of the sky, the SynScan AZ provides a Pointing Accuracy Enhancement (PAE) function to further improve accuracy.

1. Use a go-to command to slew the telescope to a target in the area of sky where you want increased accuracy.
2. Center the object in the eyepiece using the hand control directional keys.
3. Press and hold down the **ESC** key for 2 seconds. The hand control will display “**Re-center**” and the name of the reference object will appear on the LCD and blink three times. If the go-to command is sent from an external planetarium software through the RS-232 cable, the hand control will display “**Last goto object**” instead of the name of the object.
4. Make sure that the object is still in the center of the view and press **ENTER**. The SynScan AZ will record the amount of correction required and will recalculate its model of the sky. The pointing accuracy in this particular part of the sky should be greatly improved.

***Hint:** The result of the PAE is stored in the hand control even if the power has been turned off but will be erased if a new alignment procedure is performed.*

## Object Databases in the SynScan AZ

The SynScan AZ comes with a vast database with over 42,900 celestial objects all in the palm of your hand. This database includes selections from the following popular catalogs:

- **Solar System** – The 7 planets of our solar system, plus the Moon and Pluto.
- **Named Star** – A list of 212 best known stars from the SynScan AZ database
- **NGC** – 7,840 of the brightest deep sky objects from the Revised New General Catalog
- **IC** – 5,386 of standard stars and deep sky objects from the Indexed Catalog
- **Messier** – Complete list of 110 Messier objects
- **Caldwell** – Complete list of 109 Caldwell objects
- **Double Stars** – Includes 55 well-known double stars
- **Variable Stars** – Includes 20 well-known variable stars
- **SAO** – Includes 29,523 stars

## Selecting an Object

Once the telescope has been aligned, you can now access and view the 42,900 different objects in the SynScan database. There are three method choices to select a celestial object to view: the shortcut keys (**Fig 41**), the object key (**Fig. 42**) or the menu system (**Fig. 43**).

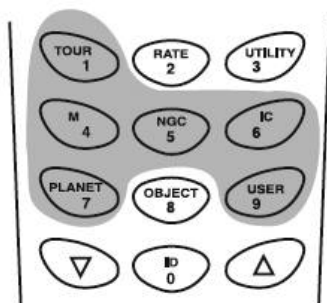


Fig. 41

### Shortcut Keys

- **TOUR:** The hand control presents you with highlights of what is in the sky at that moment. It will show you the brightest and most beautiful objects for your viewing pleasure. Use the scroll keys to view through the list. Choose the desired object by pressing **ENTER**. The hand control will then display the coordinates of the object. You may use the scroll buttons to display additional information about the object, such as magnitude, size, and the constellation it resides in. Pressing **ENTER** will prompt you with “**View Object?**” Pressing **ENTER** one more time will cause the telescope to slew to that object.
- **M, NGC, IC:** These shortcut keys give you access to the most popular celestial catalogues to date. Each catalog has a set number of objects to choose from. Use the numeric keys to select an object by entering its catalog number. Pressing **ENTER** will display its coordinates. Primary information such as size, magnitude, and constellation are obtained by pressing the scroll keys. Pressing **ENTER** once more will cause the telescope to slew to the object.
- **PLANET:** This allows you to select the planets, the Moon, or Pluto. Use the scroll keys to find the solar system object you want to view and press **ENTER** to view its coordinates. Press **ENTER** once more to slew to the planet.
- **USER:** This allows you to select and go-to any user definable objects.

***Note:** If you have not completed an alignment and you attempt to slew the scope with a go-to command, the scope will respond with an error message saying: “System needs alignment.”*

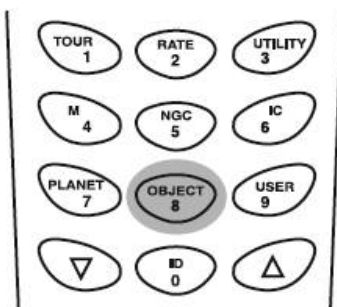


Fig. 42

### Object Key

The OBJECT key takes you directly to the Objects Catalog Menu, where you have complete access to over 42,900 celestial objects separated by catalog name. (See the SynScan AZ menu tree for details.)

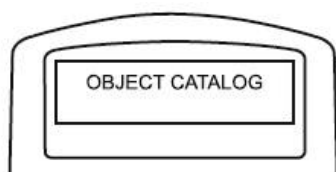


Fig. 43

## Menu System

To access the Object Catalog menu without using the **OBJECT** key, simply go to the main menu and use the scroll keys until you find the Object Catalog menu. Press **ENTER** to see the list of catalogs to choose from. (See the SynScan AZ menu tree for details.)

## Utility Functions

Utility functions are useful tools that provide simple, one-step processes to your SynScan AZ. They include:

- **Show Position** – This displays the coordinates of where the telescope is currently pointed.
- **Show Information** – Allows you to check local time, and local sidereal time, plus hardware, firmware, and database versions of the SynScan hand control. If the hand control is connected to the mount, the menu will also display the firmware version of the motor control board.
- **Park Scope** – This moves the telescope to the Home position or parks the telescope at the current or previously stored parking position.
- **PAE** – Pointing Accuracy Enhancement function. See “Pointing Accuracy Enhancement (PAE)” section on page 21.
- **Clear PAE data** – This allows you to clear all previously stored PAE data.
- **GPS** – This allows you to obtain information from the optional SynScan GPS receiver.
- **PC Direct Mode** – This allows you to control the telescope with a computer running optional planetarium programs. See “Connecting to a Computer” section on page 35.

## Setup Functions

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

- **Date** – Allows you to change the date entered at the initial setup
  - **Time** – Allows you to change the current time.
  - **Observing site** – Allows you to change the current observing location
  - **Daylight Savings** – Allows you to change the Daylight Savings option
  - **Alignment** – Allows you access to the alignment screen
  - **Alignment Stars:**
    - o **Auto Select** – When this option is chosen, the hand control will filter out the star not suitable for star alignment
    - o **Sort by** – This feature allows the hand control to generate a list of alignment stars and display them alphabetically or by their magnitude
  - **Backlash** – This feature allows you to insert a value for each axis to compensate for its backlash. For better pointing accuracy, it is important that the backlash value is set to be equal or greater than the real amount of backlash between the gears. The default setting of the backlash is **0°00'00"** (0 degree, 0 arc min, and 0 arc second). Use the numeric keys to enter the desired value and press the **RIGHT** directional key to move the cursor to the next digit. First set the value for the azimuth axis. Then press **ENTER** to set the altitude axis.
  - **Tracking:**
    - o **Sidereal Rate** – Activates tracking in sidereal rate for tracking stars and deep sky objects
    - o **Lunar Rate** – Activates tracking in lunar rate (for tracking of the Moon)
    - o **Solar Rate** – Activates tracking in solar rate (for the tracking the Sun using a proper solar filter)
    - o **Stop Tracking** – Stops the tracking instantly
- Note:** The mount does not track until it is aligned. After alignment, it tracks at the sidereal rate unless you change the tracking setting.*
- **Set Slew Limits** – Allows you to set the slewing limits of the mount's altitude axis. Setting the slew limit prevents the optical tube from colliding with the mount. The slew limit range is dependent on the fork arm configuration and the optical tube installed on the mount.
    - o **Re-align Encoder** – Allows you to choose one of the alignment stars you used in the alignment procedure to re-align the encoder
    - o **Handset Setting** – Allows adjustment of the brightness of the LCD backlight, the darkness of the LCD lettering, and the volume of the hand control beep. Use the **RIGHT** or **LEFT** directional key to increase or decrease the value
    - o **Factory Setting** – Allows you to reset the hand control to its default setting



## Using the User Defined Database

SynScan AZ allows you to save up to 25 objects in the user-defined database.

### Saving an Object to the Database

1. Point the telescope at the object you want to save in your user database.
2. From the main menu use the scroll keys to find Object Catalog and Press **ENTER**.
3. Use the scroll keys to select User Objects in the list and press **ENTER**.

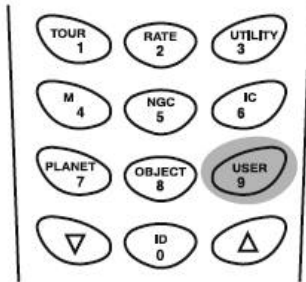


Fig. 44

***Hint:** The User Objects menu can also be accessed directly by pressing the quick reference hot key #9 on the hand control numeric keypad, as pictured in Fig. 44*

4. Select **Edit Objects** and press **ENTER**.
5. Choose to save your user objects' coordinates as RA and Dec (Right Ascension and Declination - useful for astronomical objects) or Alt/Az (useful for terrestrial objects). Press **1** for RA/Dec and **2** for Alt/Az formats.
6. The hand control will display the coordinates of the object the telescope is currently pointing at. In RA/Dec mode, the RA coordinates will be displayed first in hours and minutes, followed by the Dec coordinate in degrees. In Alt/Az format, the azimuth coordinate will be displayed first, followed by the altitude coordinate, both in degrees and minutes.

***Hint:** If you desire, you may change the coordinates displayed by using the numeric keypad and the **LEFT** and **RIGHT** directional keys to move the cursor. Press **ENTER** to save the results. If the coordinates you enter do not exist, the hand control will not respond. Check the coordinates you entered for errors and re-enter the correct coordinates.*

7. Press **ENTER** to save your object. The hand control will display a User Object number as shown in **Fig. 45**. Use the scroll keys to change to the number you wish to represent your new user object and press **ENTER**.

### WARNING

The User Object number displayed may already have an object associated with it. Reusing this number will erase the old coordinates previously associated with it. It is recommended that you review the user object list prior to saving a new one to verify which numbers are still available.

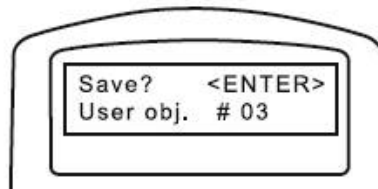


Fig. 45

8. The SynScan AZ hand control will display "**View Object?**" and the user object number you just entered. Press **ENTER** to slew to the object or **ESC** to return to the Edit Object menu.

### Recalling a User Defined Object

1. From the User Object menu, use the scroll keys to select Recall Object and press **ENTER**.
2. Use the scroll keys to browse through the User Object numbers until you locate the object you want to view. Press **ENTER** to show its coordinates. Pressing **ENTER** will prompt you with “View Object?” Press **ENTER** again to slew to the object.
3. If a vacant number is selected, the hand control will not respond. Choose another number and try again.

**Hint:** If the recalled object is below the horizon, the hand control will display the “Below Horizon” warning and automatically return to the Recall Object menu.

### Identify an Unknown Object

SynScan AZ has the ability to identify an unknown astronomical object that the telescope is currently pointing at. To do so, simply:

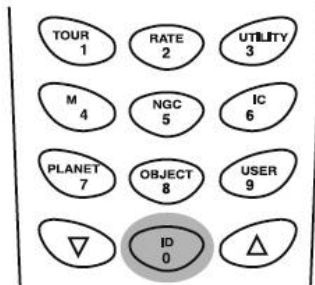


Fig. 46

1. Center the unknown object in the field of view of the eyepiece.
2. Press the **ID** key, as pictured in **Fig. 46**.
4. The hand control will display a list containing the closest known object in each M, IC, NGC, and Named Star catalogs and its distance from the exact location where the telescope is pointed. Use the scroll keys to view the objects in this list.
5. Press **ESC** to exit from this function.

## Connecting to a Computer

Another feature of SynScan AZ is the ability to connect to a computer via a serial communication cable. Many commercially available planetarium software programs can be used to control the mount. Any SynScan AZ hand control version 3.00 and later is compatible with the Celestron® NexStar™ 5i/8i and NexStar™ GPS command protocol.

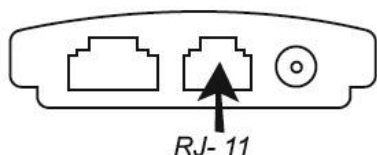


Fig. 47

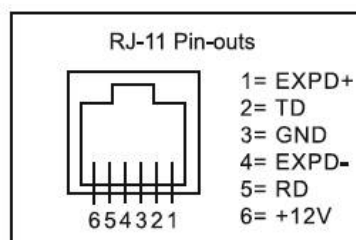


Fig. 48

1. Make sure your mount has been astronomically aligned.
2. Connect the RS-232 cable to the RJ-11 connector on the bottom of the hand control, shown in **Fig. 47**, and to a serial communication COM port on your computer.
3. With the planetarium software of your choice, choose “**Sky-Watcher Mount,**” “**Celestron NexStar 5i/8i**” or “**Celestron 8/9/11 GPS**” in the driver setup menu. Follow the instructions provided with your software to establish the connection with the telescope. The SynScan AZ should be under full control of your computer once the connection is successfully established.

### WARNING

Do not use an RS-232 cable other than the one provided to connect between the hand control and your computer, or damage may occur to your computer or hand control. If you are making your own cable based on the information provided in Appendix A, make sure that only pin 2, 3 and 5 connect to the COM connector on your computer.

**Hint:** If you don't have a traditional DB9 serial COM port, but only have USB ports on your computer, you may need to use a USB to Serial adapter to connect between your computer and the RS-232 cable. You may need to install the adapter's driver on your computer. Please check the instruction provided by the manufacturer for the adapter you are using.

4. When you are finished, follow the instructions provided with the planetarium software.

### WARNING

Do not disconnect the SynScan AZ hand control before closing the planetarium program on your computer. Doing so may cause the program to freeze.

## Updating the SynScan™ Firmware

SynScan AZ hand control version 3.0 or later has firmware that is user upgradeable. Users can download the latest version of SynScan AZ firmware from the Sky-Watcher website and easily update their hand control.

### System Requirements

- SynScan AZ hand control version 3.0 or later
- Windows95 or later
- Available RS-232C communication port on PC
- PC link cable supplied with the SynScan AZ hand control
- DC power supply with 7.5~15V/100mA output. Power plug should be 2.1 mm diameter, tip positive

### Preparing for the Update

1. Create a folder for all SynScan AZ related files on your computer and name it **SynScan**. Visit the Support Page of the Sky-Watcher website at: [http://www.Sky-Watcher.com/swtinc/customer\\_support.php?class1=1&class2=110](http://www.Sky-Watcher.com/swtinc/customer_support.php?class1=1&class2=110)
2. Download and save the SynScan Firmware Loader to the SynScan folder on your computer. You may create a shortcut on the desktop for quick access in the future. You will only need to download this software once. Once it is saved on your computer, only the firmware data file is needed for future updates.
3. Download and save the firmware data file named **SynScanVnnnnnAZ.ssf** to the **SynScan** folder. (The nnnn indicates the version number of the firmware.)

### Updating the SynScan AZ Hand Control

1. Plug the RJ-11 end of the PC link cable into the jack in the middle socket on the hand control. Push the connector into the hand control until it clicks into place. Plug the opposite end of the cable, the DB9 connector, to the RS-232 port on your PC.
2. Press and hold down the key “0” and “8” simultaneously, and plug the power cord into the hand control, as shown in **Fig. 49**.
3. The hand control will beep, indicating a successful start up. The SynScan AZ will display: “SynScan Update Ver.1.x” on the LCD screen.
4. Run the **SynScanFirmwareLoader.exe** software on your PC. Once the program is launched, you should see a window as shown in **Fig. 50**. The “HC. Version” button provides the version number of the hardware, firmware and database of your hand control. It is for your reference only and not required for the update.

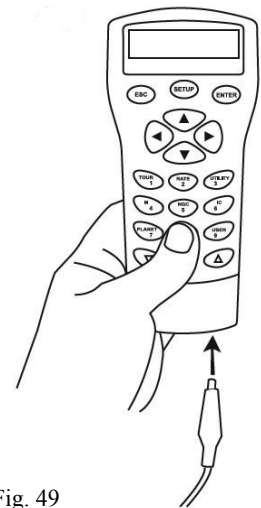


Fig. 49

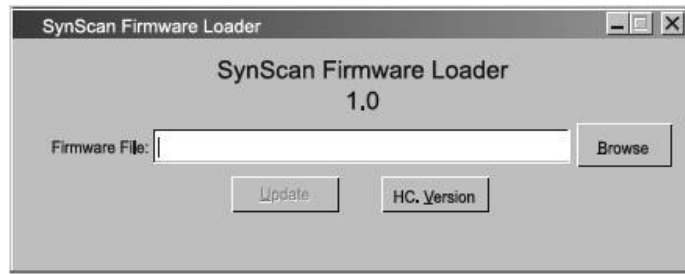


Fig. 50

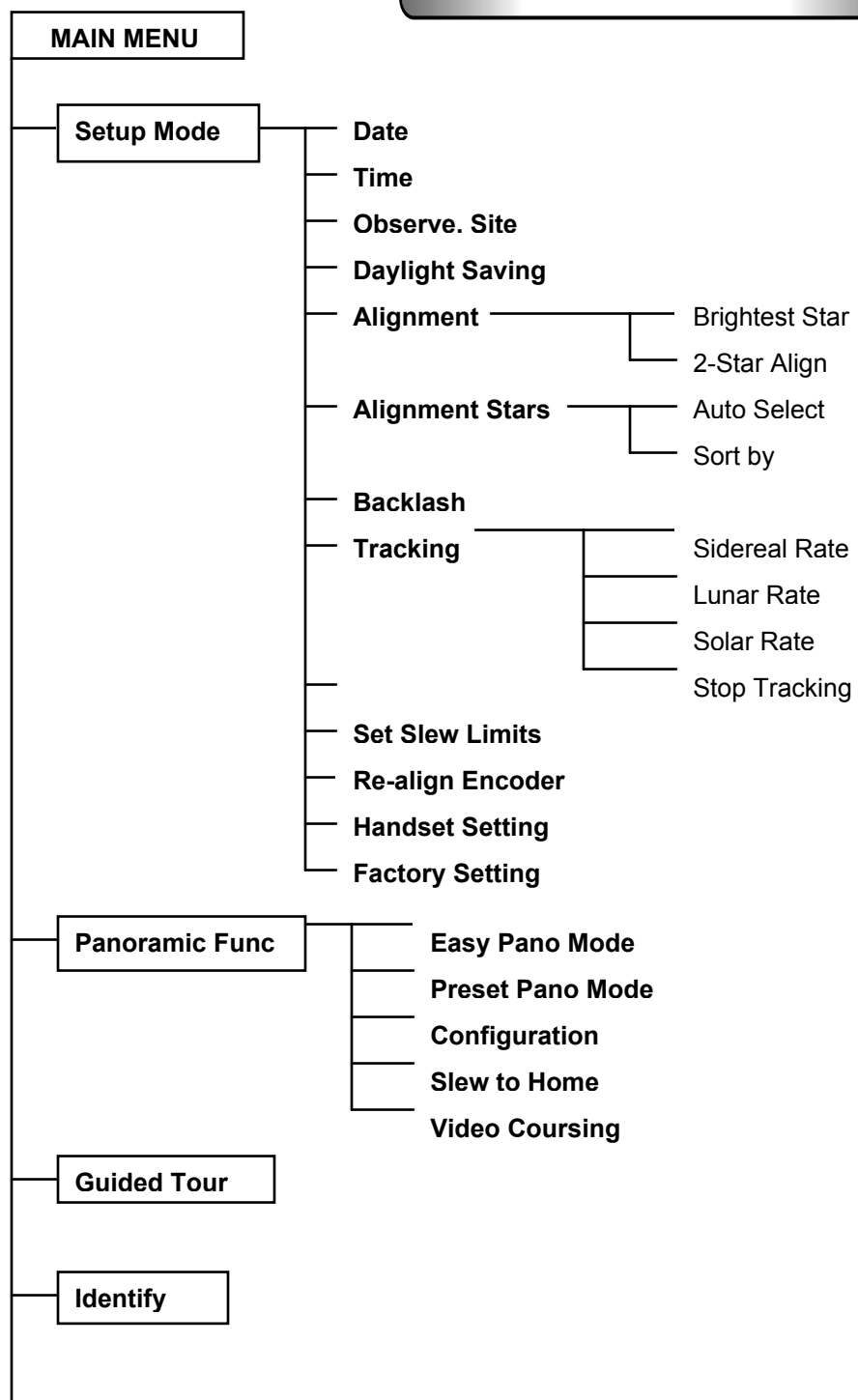
5. Click “Browse” to select the **SynScanVnnnnnAZ.ssf** file in the **SynScan** folder. Click “Update” to start downloading the new firmware into your SynScan AZ hand control. You will see the status of the update below the “Update” and “HC. Version” buttons.
6. When the download is complete, the status will show “Update Complete.” The SynScan hand control is now updated to the newest firmware. Generally it takes approximately 30 seconds to update the firmware. It may take longer if you are using a USB to serial (RS232) converter.

**Help:** If the error message “**Cannot connect to a SynScan hand control**” is shown, check the cable connections and the PC link cable. Make sure the cables and connections are all in good working condition. Close all applications that may be occupying the RS-232 port and try again.

**Help:** If you receive the error message “**Firmware update failed...**,” reset the hand control by removing the power plug and re-connecting it. Repeat the update procedure.

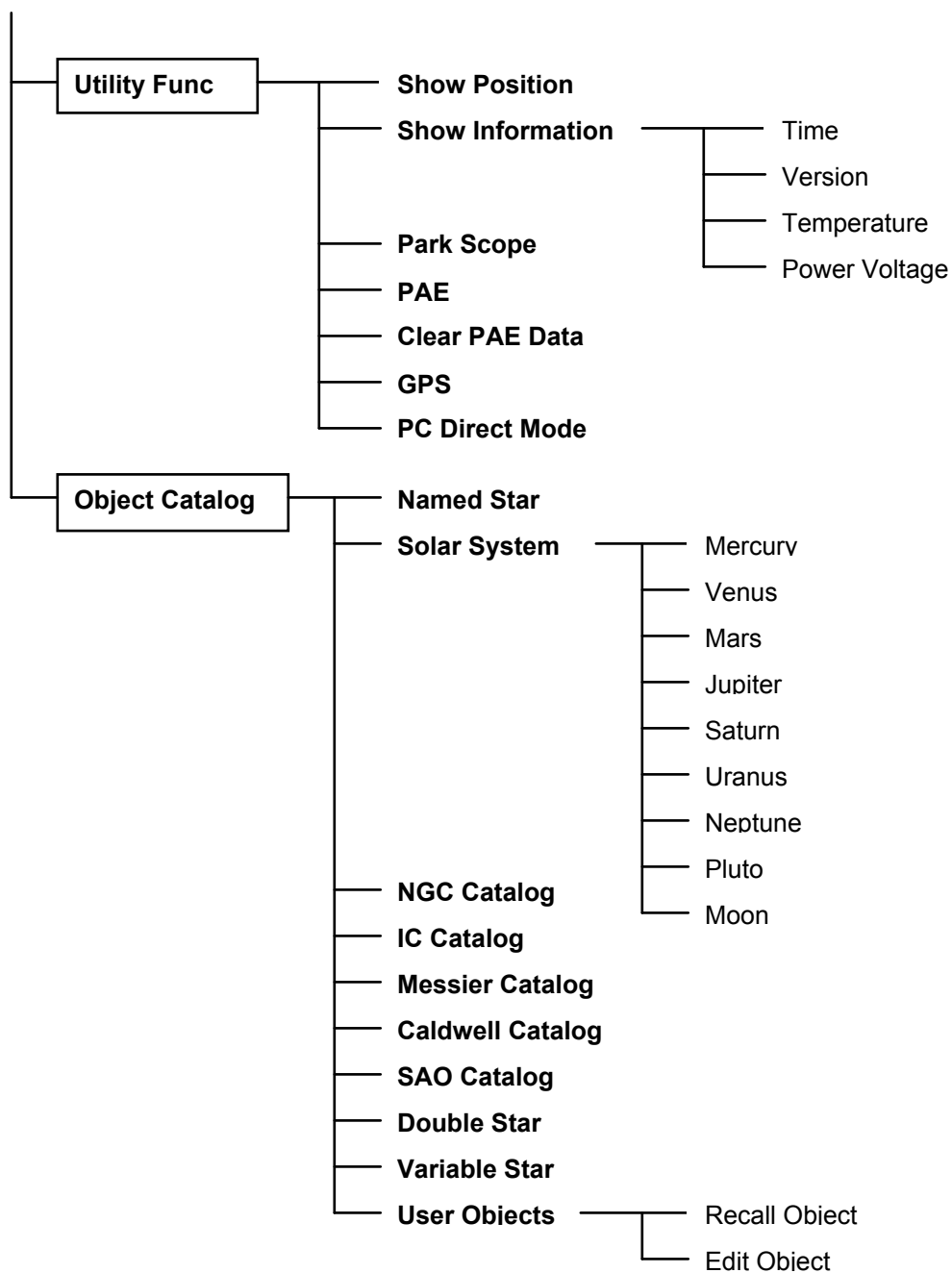
**Hint:** By default, the data communication rate between the SynScan hand control and the PC is set to be 115kbps. The RS-232 port on some PCs may not support such a high rate by pressing the SETUP key on the hand control after the power supply is plugged in. This will reduce the data rate to 9.6kbps. The LCD display will show the word “Lo” in the lower right hand corner to indicate that it is now in the low communication rate. The steps for updating the firmware remain the same except that now it takes longer to complete (about 4 minutes).

## SynScan™ AZ Menu Tree



Continued on page 39

Continued from page 38

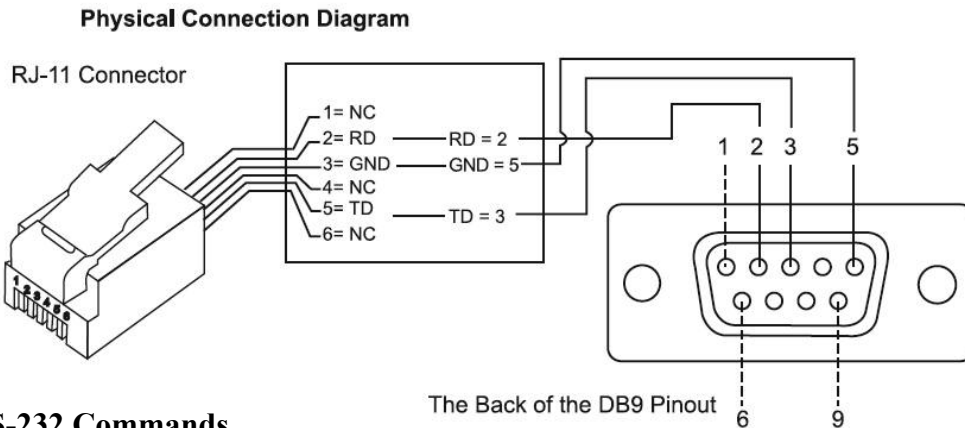


## Appendix A – RS-232 Connection

The SynScan AZ telescopes are designed to receive control commands set from a computer via the RS-232 port and RS-232 cable. Once connected, the SynScan AZ can be controlled by most popular planetarium software programs. The SynScan AZ will communicate with the personal computer at 9600 bits/sec, no parity and stop bit. All angles are communicated with 16-bit angle and communicated using ASCII hexadecimal.

Description	PC Command ASCII	Hand Control Response	Notes
<b>Echo</b>	<b>Kx</b>	<b>x#</b>	<b>Useful to check communication</b>
<b>Goto Azm-Alt</b>	<b>B12AB,4000</b>	<b>#</b>	<b>10 characters sent B = Command, 12AB = Azm, Comma, 4000 = Alt. If command conflicts with slew limits, there will be no action</b>
<b>Goto Ra-Dec</b>	<b>R34AB,12CE</b>	<b>#</b>	<b>Scope must be aligned. If command conflicts with slew limits, there will be no action</b>
<b>Get Azm-Alt</b>	<b>Z</b>	<b>12AB,4000#</b>	<b>10 characters returned, 12AB = Azm, comma, 4000 = Alt, #</b>
<b>Get RA-Dec</b>	<b>E</b>	<b>34AB,12CE#</b>	<b>Scope must be aligned</b>
<b>Cancel Goto</b>	<b>M</b>	<b>#</b>	
<b>Is Goto in Progress</b>	<b>L</b>	<b>0# or 1#</b>	<b>0 = No, 1 = Yes: "0" is ASCII character zero</b>
<b>Is Alignment Complete</b>	<b>J</b>	<b>0# or 1#</b>	<b>0 = No, 1 = Yes</b>
<b>HC Version</b>	<b>V</b>	<b>22</b>	<b>Two bytes representing V2.2</b>
<b>Stop/Start Tracking</b>	<b>Tx</b> x=0 (Tracking off) x=1 (Alt-Az on) x=2 (EQ-N) x=3 (EQ-S)	<b>#</b>	<b>Alt-Az tracking requires alignment</b>
<b>32-bit goto RA-Dec</b>	<b>r34AB0500,12CE0500</b>	<b>#</b>	
<b>32-bit get RA-Dec</b>	<b>e</b>	<b>34AB0500,12CE0500#</b>	<b>The last two characters will always be zero</b>
<b>32-bit goto Azm-Alt</b>	<b>b34AB0500,12CE0500</b>	<b>#</b>	
<b>32-bit get Azm-Alt</b>	<b>z</b>	<b>34AB0500,12CE0500#</b>	<b>The last two characters will always be zero</b>





## Additional RS-232 Commands

### Sending a track rate through RS-232 to the hand control

1. Multiply the desired tracking rate (arc seconds / second) by 4. For example: if the desired track rate is **120** arc seconds/second (approximately 8 times of sidereal rate), then the **TRACKRATE = 480**.
2. Separate **TRACKRATE** into two bytes, such that ( **TRACKRATE = TrackRateHighByte\*256 + TrackRateLowByte**). For example **TRACKRATE = 480**, then **TrackRateHighByte = 1**, **TrackRateLowByte = 224**.
3. To send a tracking rate, send the following 8 bytes:
  - Positive Azm tracking: **80, 3, 16, 6, TrackRateHighByte, TrackRateLowByte, 0, 0**
  - Negative Azm tracking: **80, 3, 16, 7, TrackRateHighByte, TrackRateLowByte, 0, 0**
  - Positive Alt tracking: **80, 3, 17, 6, TrackRateHighByte, TrackRateLowByte, 0, 0**
  - Negative Alt tracking: **80, 3, 17, 7, TrackRateHighByte, TrackRateLowByte, 0, 0**
4. The number **35** is returned from the hand control.

### Sending a slow-Goto command through RS232 to the hand control

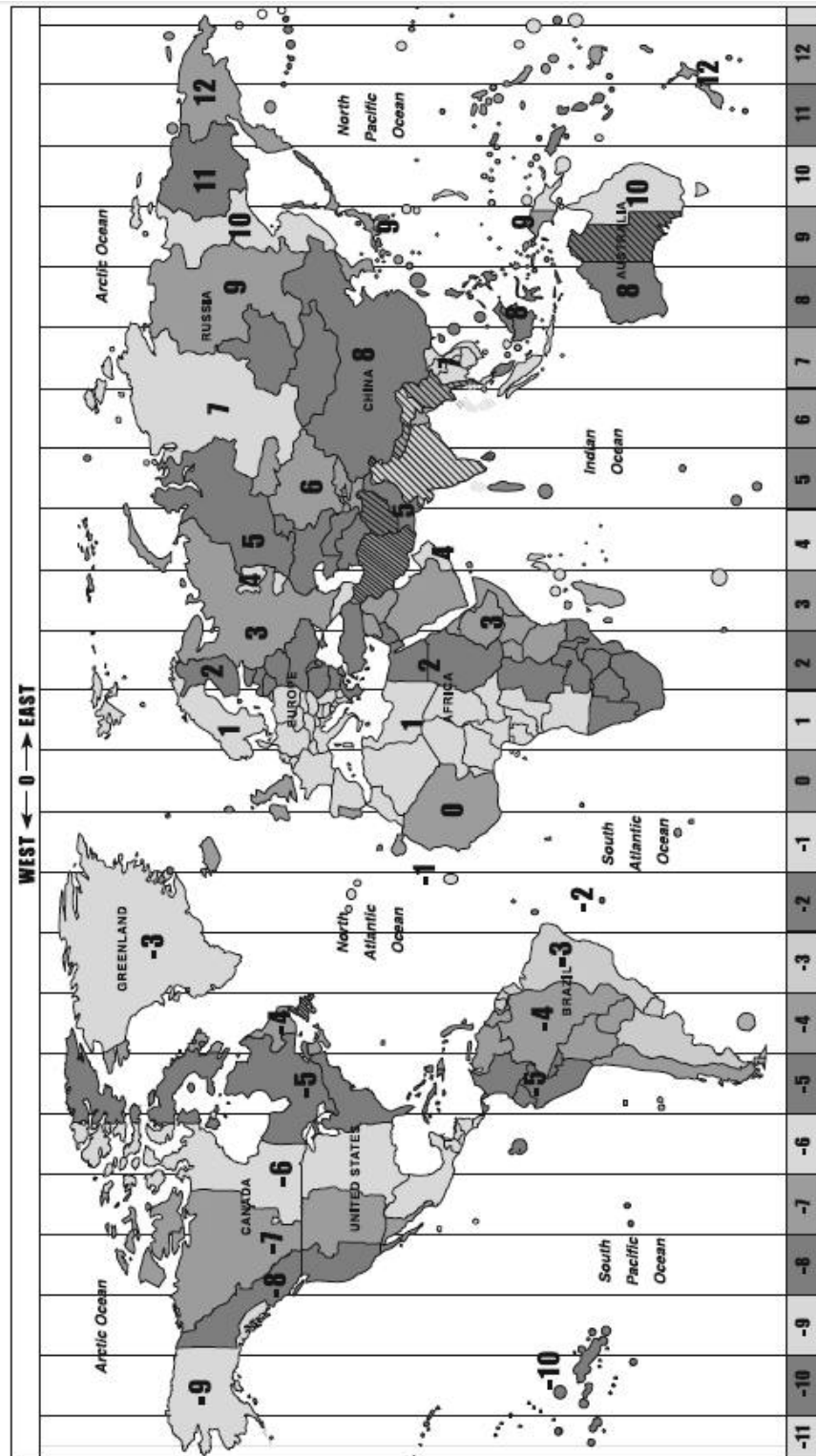
1. Convert the angle position to a 24-bit number. Example: if the desired position is 220, then **POSITION\_24BIT = (220/360)\*224 = 10,252,743**.
2. Separate **POSITION\_24BIT** into three bytes such that (**POSITION\_24BIT = PosHighByte \* 65536 + PosMedByte \* 256 + PosLowByte**). Example: **PosHighByte = 156**, **PosMedByte = 113**, **PosLowByte = 199**.
3. Send the following 8 bytes:
  - Azm Slow Goto: **80, 4, 16, 23, PosHighByte, PosMedByte, PosLowByte, 0**
  - Alt Slow Goto: **80, 4, 17, 23, PosHighByte, PosMedByte, PosLowByte, 0**
4. The number **35** is returned from the hand control.

### Resetting the position of Az or Alt

1. Convert the angle position to a 24-bit number, same as Slow-Goto example.
2. Send the following 8 bytes:
  - Azm Set Position: **80, 4, 16, 4, PosHighByte, PosMedByte, PosLowByte, 0**
  - Alt Set Position: **80, 4, 17, 4, PosHighByte, PosMedByte, PosLowByte, 0**
3. The number 35 is returned from the hand control.

## Appendix B – Standard Time Zones of the World

### APPENDIX B-STANDARD TIME ZONES OF THE WORLD



## Appendix C – Technical Specifications

### AllView™ Mount and SynScan™ AZ SPECIFICATIONS

<b>Rated Instrument Weight:</b>	<b>9 lbs (4 kg)</b>
<b>Power Supply:</b>	<b>8V to 15V DC 1Amp (Tip positive)</b>
<b>Motor Type and Resolution:</b>	<b>DC Servo Motors</b>
<b>Slew Speeds:</b>	<b>Rate 0 = 1.0x</b> <b>Rate 1 = 2.0x</b> <b>Rate 2 = 8x</b> <b>Rate 3 = 16x</b> <b>Rate 4 = 32x</b> <b>Rate 5 = 200x</b> <b>Rate 6 = 400x</b> <b>Rate 7 = 600x</b> <b>Rate 8 = 800x</b> <b>Rate 9 = 1000x</b>
<b>Tracking Rates:</b>	<b>Sidereal, Lunar, Solar</b>
<b>Tracking Mode:</b>	<b>Dual Axes Tracking</b>
<b>Alignment Method:</b>	<b>Brightest-Star Alignment, Two-Star Alignment</b>
<b>Database:</b>	<b>25 user defined objects. Complete M, NGC, IC and SAO catalogues - total 42,900 objects</b>
<b>Go-To Pointing Accuracy:</b>	<b>Up to 5 arc min</b>

***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 outlet on a circuit different from that to which the receiver is connected*
- *Consult the dealer or an experienced radio/TV technician for help*



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