Meade®

Deep Sky Imager: The Basics

Parts Listing

When first opening the packing box, note carefully the following parts:

- Deep Sky Imager camera
- Parfocal ring
- USB cable
- DB-9 to RJ-11 adapter
- LX200 serial cable
- Autostar #497 serial cable
- CD ROM, including the Operating Instruction in .pdf format

Recommended Minimum System:

PC running Windows 98SE with 96 MB and 100 MB free disk space.

To get the best view and resolution for the images in this manual, zoom in to 200% using the viewing controls in the Acrobat Reader control bar.

Install the Autostar Suite Software

The following procedure is also found on the printed Quick Start Guide supplied with this product.

Before you can operate the Deep Sky Imager camera, you must install the Autostar Suite software.

1. **Do not** plug the USB cable into your PC at this time. You will be asked to do so later in this installation.
2. Turn on your PC. Allow Windows to load.
3. Place the CD ROM into your PC's CD drive.
4. The Main Menu screen displays. Click "Install Autostar Suite."
5. You are prompted to choose a directory in which to install the driver. You may accept the default directory or create your own directory path. Click "Next" when done.
6. The "Select Components" window displays. This window allows you to choose whether or not to install the Guide Star Catalog.

   *Note: This is an **optional** catalog that may be used by the Planetarium program and contains all of the locations of the Hubble Space Telescope (HST) Guide stars. This file is very large and takes up a large amount of memory. Only download if you have enough memory or wish to use this amount of memory of your hard drive. Memory totals for the file and your hard drive are displayed in this window.*

   If you wish to install the catalog, check the GSC check box.

   If you do not wish to install the catalog, uncheck the GSC check box.

   Then click "Next."
7. The "Start Installation" window displays. The program is now ready to install the Autostar Suite. Click "Next" to begin installation.
8. The "Microsoft Text to Speech Engine" window displays. Click "Yes" to agree to the terms and to continue with the installation.
9. The "Microsoft .Net Framework installation" window displays. You must click "Yes" for the Deep Sky Imager to operate.
10. Once .Net Framework installs, the .Net Framework agreement displays. Click "OK" to continue.
11. A window displays that allows you to install Adobe Acrobat Reader if you do not already have it installed on your PC. Click "Yes" or "No."
12. The "InstallShield Wizard for the Meade Deep Sky Imager" displays. Click "Next."
13. A window displays prompting you to do a complete or custom install of InstallShield Wizard. Click on the "Complete" button and then click "Install" to begin installation.
14. (**XP versions only**) "Windows Logo Test" window displays. Clicking "Continue Anyway" will install a driver that should operate with most PC configurations.
15. InstallShield Wizard completes installation. Click "Finish."
16. A window displays that tells you that Autostar Suite has been installed. Click "Finish."

Connect The Deep Sky Imager Camera to Your PC

To connect the **Deep Sky Imager Camera** to your **PC**, you need to install the Deep Sky Imager device driver and connect the USB cable:

1. Connect one end of the **USB Cable** to the **Deep Sky Imager camera**.
2. Connect the other end of the **USB Cable** to your **PC** or to a **USB hub**.
3. "Found camera" displays at the bottom right of your PC screen.
4. The "Hardware Wizard" window displays. The "Install Software" selection is checked as the default choice. Click "Next." The Wizard searches for the driver.
5. (**XP versions only**) "Windows Logo Test" window displays. Clicking "Continue Anyway" will install a driver that should operate with most PC configurations.
6. The driver is installed. Click "Finish."

The camera driver is now installed and your PC will now be able to recognize the Deep Sky Imager whenever you connect it to the PC.

Start the Suite Software

If the Autostar Suite icon doesn't appear on your desktop, you can start the Autostar Suite program by going to Start/Program/Meade/Autostar Suite. The Planetarium program will display.
You can open other programs of the Suite by going to the Image menu and selecting the desired program.

You can open the Operating Instruction manuals or the Meade General Catalog by selecting them from the Main Menu screen of the CD ROM.

Click the word "Meade" in the Main Menu or in the General catalog to go **www.meade.com**.

Connect the Deep Sky Imager Camera to Your Telescope

To connect the Deep Sky Imager camera to an ETX Telescope:
- While looking at the back of the telescope, orient the Deep Sky Imager camera into the eyepiece holder so that the USB cable points to the left of the telescope's optical tube (see photo at right).
- If you are using the ETX in a "straight-through" configuration, orient the Deep Sky Imager camera in the holder so that the USB cable points downward.

To connect the Deep Sky Imager camera to an LX-200 or LX-90 Telescope:
- While looking at the back of the telescope, orient the Deep Sky Imager camera into the eyepiece holder so that the USB cable points to the right of the telescope's optical tube.

To connect the Deep Sky Imager camera to other telescopes:
- Move the Deep Sky Imager camera around in the eyepiece holder until the image on the Deep Sky Imager display screen (39) is upright.

To connect the Deep Sky Imager camera when using an autoguider:
- Attach the correct serial cable from the telescope's control panel RS-232 port to the comm port of your PC (see the Autoguider instruction sheet for more information). Also see "Autoguider and Telescope Controls," page 31, for more information.
- Click on the telescope tab (16). Enter the PC's comm port number or Netscape Server.
- Click the Connect button (27).

Open the Deep Sky Imager Program
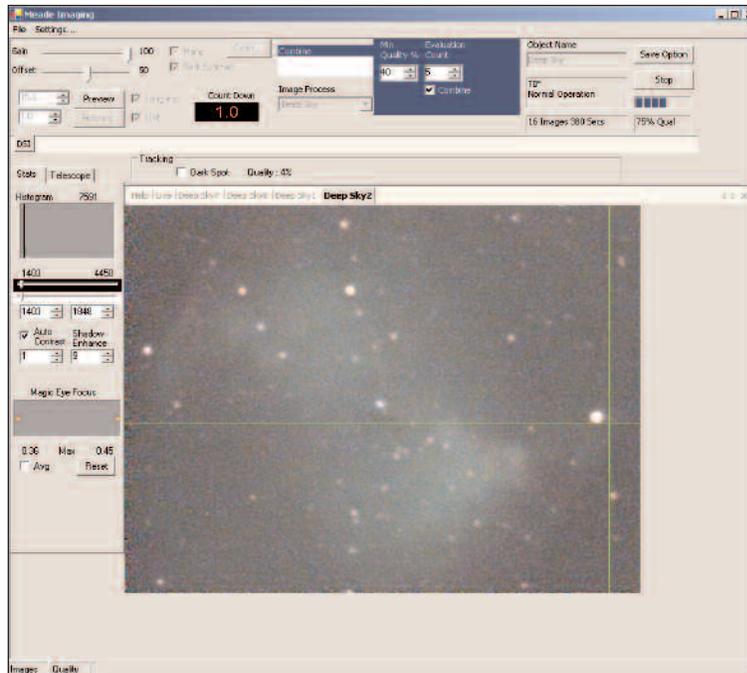
To open the Deep Sky Imager Imaging program, go to the Image menu of the Planetarium program and select Deep Sky Imager Imaging.

The Deep Sky Imager program will display.

Deep Sky Imager Controls
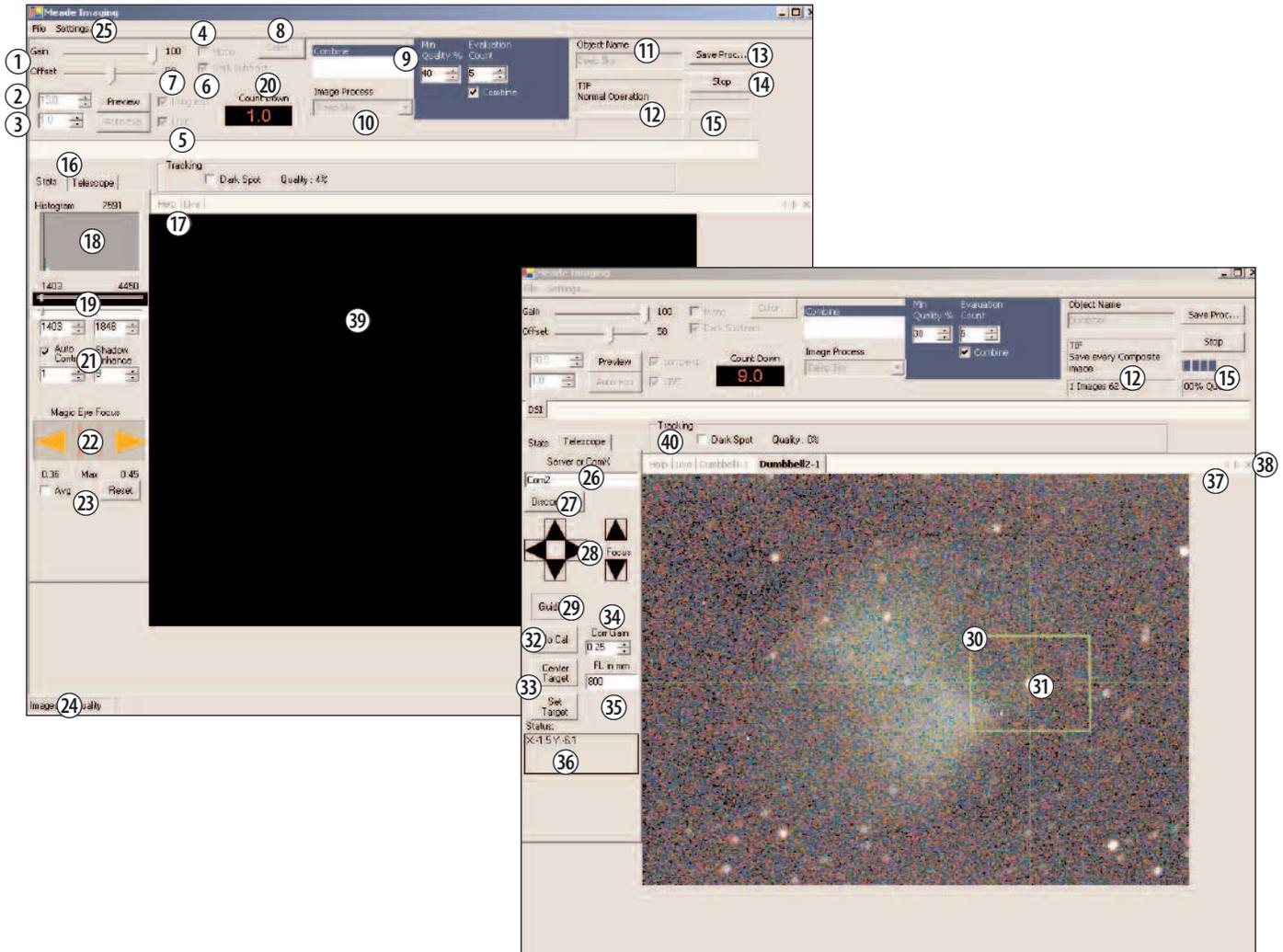
Key to Deep Sky Imager Controls

1. Gain and Offset sliders
2. Preview and Exposure controls
3. Auto Exp (Exposure) controls
4. Mono (Black and white) check box
5. Live Image check box
6. Dark Sub check box
7. Long Exp check box
8. Color button
9. Combine and Quality controls
10. Image Process box
11. Object Name box
12. File status box
13. Save Process button
14. Start/Stop button
15. Image Acquire status bars
16. Stats, Telescope tabs
17. Help, Live, File Names tabs
18. Histogram display
19. Histogram sliders and controls
20. Countdown display
21. Autocontrast, Shadow Enhance controls
22. Magic Eye Focus
23. Avg (Average), Reset check boxes
24. Status display
25. File Open and Settings menu
26. Comm port field
27. Connect/Disconnect button
28. Telescope controls (up, down, right, left, focus)
29. Autoguide/Guiding or Track/Tracking button (displays depending on whether scope can autoguide or track)
30. Tracking box
31. Centroid
32. Will Cal (Calibrate)/No Calibrate button
33. Center and Set Target buttons
34. Corr (Correct) Gain control
35. FL in mm (Focal Length in millimeters)
36. Target Status display
37. Tab scroll arrows
38. Close Tab control
39. Tracking box
40. Dark Spot check box

Throughout this manual, any number that is displayed in parentheses, refers to key above. For example, "(3)" refers to the Auto Exp button and "(14)" refers to the Start/Stop button.

Start Taking Pictures[1]

Once you have connected your camera to the computer and opened the Deep Sky Imager program, you'll want to start taking pictures. Follow the steps below to start taking simple pictures with your Deep Sky Imager camera. We recommend that the first time you take pictures, you do so during daylight hours. Point your telescope at a stationary landmark, such as a building, telephone pole or so forth—trees and other objects that move slightly are not the best objects to use during your first image tests.

1. Click on the "Auto Exp" button (3). See "Auto Exp Button," page 19, for more information.
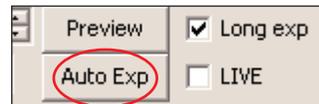
2. Click on the combo box controls in the "Image Process" field (10) to display a list of object types. Scroll down the list and select "Terrestrial." See "Image Process," page 21, for more information.

3. Type a name for the object in the "Object Name" box (11). This will be used as the image file name. See "Object Name," page 22, for more information.

4. Click "Save Process" button (13). Select "JPEG" and "Normal Operation." See "Save Process," page 22, for more information.
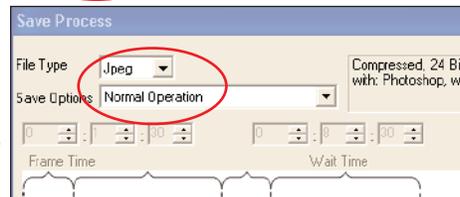
5. Click on the "Live" tab (17). See "Live Image Check Box," page 19, for more information.
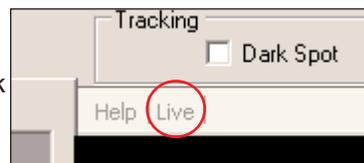
Start Taking Pictures[2]

6. An image should be already displayed on the screen (39). Use the focuser on your telescope to focus the object. Notice that in the Magic Eye Focus field (22), that two triangles are displayed and change their size. The Magic Eye Focus will help you focus your image; see "Magic Eye Focus," page 25, for more

   information. If you are having a lot of problems focusing your image, see "The Parfocal Ring," pages 17-18.

7. Click "Start (14)."

The camera begins taking pictures and will continue to do so until you click on "Stop." Watch the Status box (24). When "Images" reaches 50, click the "Stop" button (14).
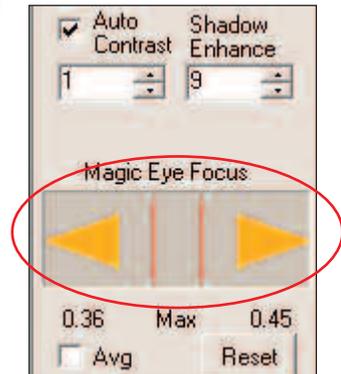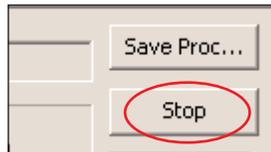
What Happens When You Press Start[1]

- The **live image** is displayed on the program's display screen if the Live box is checked and the Live tab is selected (these are the default settings).

- When you press Start, the Deep Sky Imager camera begins taking images and continues to take images until you press stop. The Deep Sky Imager program uses the first 10 images it takes as a baseline to compare with the images it takes subsequently. In other words, the program is always comparing images. Note: The user can change the amount of images that the program uses as a baseline. See "Evaluation Count," page 21, for more information.

- The program takes images with the best contrast and quality and assembles the best of these images (that is, the program "stacks the best images") into one image; this image is referred to as the **composite image** in this manual.

- After you press the Start button, the composite image is displayed as a new tab above the display screen. When you press Stop and select this tab, the final version of the composite image is displayed.

- After about 10 images are taken, the Deep Sky Imager program applies a sharpening filter to the composite image. You can choose which sharpening filter you wish to use from the most to the least sharp, or none. You **can** change the filter setting while the camera is taking pictures. See "Kernel Filter," page 21, for more information.

- Further image enhancement or filtering may be performed in other image editing software, such as the supplied Image Processing software or Adobe Photoshop. Make sure you select an image type that can be opened (such as JPEG or BMP) by the Image Editing software.

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What Happens When You Press Start[2]

- The Deep Sky Imager program is continually resaving the composite image. If the Save Every Composite Image box is checked, in the Save Option dialog the program will save every image that added to the composite image (see page 22 for more information). If your PC crashes or loses power, the images that have been taken up to the time of the crash or power loss will automatically be saved—the user does not need to save them manually.

- The Deep Sky Imager program continues to composite the image until you press the Stop button. Typically, about 50 images are needed to get a high quality composite image. After 50 images, the quality of the image increases only in small amounts; about 90% of the quality level will have been accumulated with about 50 images.

- When you press Start again, the Deep Sky Imager program begins to accumulate a new composite image and renames the image in a new tab. For example, if you named the first image "Building," the next images will be named "Building 2," then "Building 3" and so forth, so that it doesn't overwrite the previously saved images.

- If a name/number was previously saved as a file name, the program will choose the next available number. For example, if "Building 7" was previously saved, the next file will be named "Building 8."

- Note that controls that are not currently available are grayed out.

How to take a picture of a terrestrial object, the Moon or a planet

1. Insert camera into the telescope as previously described.
2. Click on the Live tab (XX).
3. Click Auto Exp (3). The program will find a good exposure automatically. Set the color balance according to your taste using the Contrast (21) and Color Balance (8) controls.
4. Use Shadow enhance if necessary. This control is excellent for the moons of Jupiter, craters of the Moon, some deep sky objects such as nebulae.
5. Go to the Image Process box (10) and select the process from the pop up menu you wish to image (e.g., moon, planet, etc.).
6. Click the Save Process button and a dialog box displays. Select file type. Typically you will select "jpeg." If you wish to perform image processing in another program such as Photoshop, select "tif."
7. Draw a box around the planet or a bright feature of the object you wish to image. Or if the object is bright, choose a dark area, and check the Dark Spot box (40).
8. Enter a name in the Object Name status.
9. Click Start (14). The program will now begin to take images.

# An example of taking a picture of a deep sky object

1. Insert camera into the telescope as previously described.
2. Click on the Live tab (17).
3. Set the Live Exp spin button to 1.0 second.
4. Click Mono box. You should see bright stars on the Live screen.
5. Before taking the first shot of the evening, leave the camera sit for 5 to 10 minutes until the temperature of the camera can stabilize.
6. In the Image Process dialog box, select "Take Darks." Use the default values.
7. Click the Start button.
8. A warning displays prompting you to cover the telescope. Cover the end of your telescope so that no light can get in. Click OK when it is covered.
9. The imager begins taking dark frames (see "Dark Frames" page 34, for more information). The Dark Frames are saved in the directory: C:Meade Images/Dark. The program will display how long the Dark Frame exposures will take. **Important Note: Do not take dark frames while the camera is cooling off.**
10. When the Dark Frame exposures are completed, a dialog displays prompting you to uncover the telescope. Click OK. The Dark Subtract box (6) should be checked now; if not, do so now.
11. Stars should be visible on the live tab screen.
12. Select a star to image. If the telescope is connected you can use the telescope control (Arrow keys) to help choose a star. See " Autoguiding and Telescope Controls," page 31, for more information.
13. Check the Long Exp box (7). Set exposure to 15 seconds. This will allow you to take a preview of a single image to view an example of how the camera is imaging.
14. Click Preview (2). The countdown timer counts down from 15 to zero seconds.
15. You can now tweak the image. Uncheck mono box. Click Auto (3). Color image controls display.

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16. Adjust contrast (21) and shadow enhance (21).

17. In the Image Process menu (10), choose "Deep Sky." Use the default values.

18. Once you have a reasonable color image, type in a name in the Object Name box (11)
Tip: If your object's name contains a number, such as M31, add a dash after the number. The program
Automatically saves each image with a number and the dash will allow your image names to be displayed as
M31-1, M31-2, M31-3, etc.

19. Click Start (the button is then displayed as "Stop"). The imager begins taking pictures.

20. The imager now takes 15 second images. Be patient. Take a number of pictures until your image looks good
and click Stop to abort. You will now have an image that you can post on the web or submit to one of the
Deep Sky Imager user groups.

Experiment with Contrast, Shadow Enhance, Histogram sliders and Dark Subtract, and you will begin to take
images like an expert.

Dark Frame Subtraction takes out a lot of "hot" pixels from the image. Play with this control to see what effect it
has on your image.
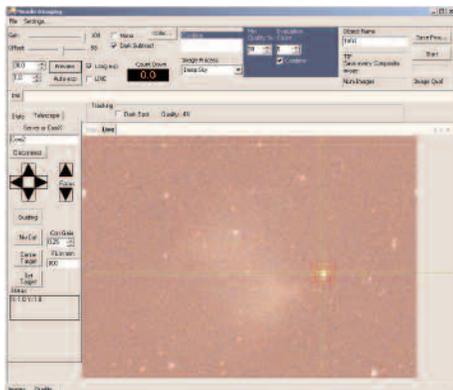
Preview image without color balance or contrast.
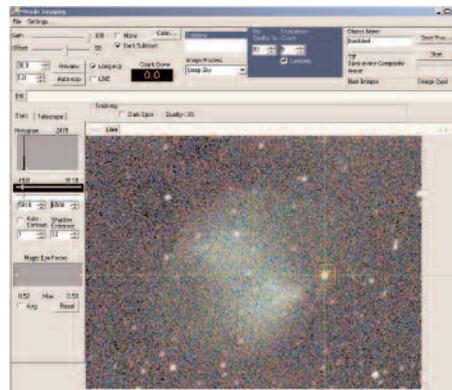
Preview image with color balance and contrast.
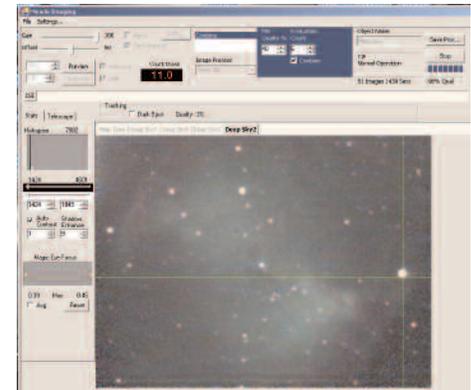
Final image after 50 combined images.

The Parfocal Ring[1]

It is extremely useful to have the Deep Sky Imager camera and a telescope eyepiece be parfocal—it will save you time when you need to refocus.

Parfocal means setting two or more eyepieces to the same focus. (In this case, one eyepiece is a camera.) In other words, if you focus one eyepiece in your telescope, then you remove it and replace it with a parfocal eyepiece, the parfocal eyepiece will require little, if any, refocusing.

The following procedure will show you how to make your Deep Sky Imager camera parfocal with a low-power wide-field 25mm or 26mm eyepiece (do not perform this procedure with a high-power eyepiece). Use the supplied parfocal ring and perform the procedure during the daytime.

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The Parfocal Ring[2]

1. Open the Deep Sky Imager program.
2. Insert the Deep Sky Imager camera into the telescope eyepiece holder. Do not tighten the eyepiece holder thumbscrew. Make sure the Deep Sky Imager camera slides down as far as it will go into the eyepiece holder.
3. Point the telescope at a terrestrial object that has a lot of contrast with the surrounding area and if possible, has a distinctive edge (like a building, for example).
4. If you have previously moved the histogram sliders, move the top slider to the 0 position (move all the way to the left) and move the bottom slider to the 256 position (move all the way to the right).
5. Click on the Auto Exp (3) button.
6. An image which may be or may not be focused appears on the display screen.
7. Use the telescope's focuser to get a rough focus of the object. Be patient. You may have to rotate the focuser back and forth until you can achieve focus of the image.
8. When the image is roughly in focus, remove the camera from the eyepiece.
9. Place the supplied parfocal ring over the bottom chrome tubing of the eyepiece. Do not tighten the ring.
10. Place the eyepiece and tubing into the eyepiece holder. Do not tighten any of the thumbscrews yet. See photo at right.
11. Do not use the telescope focuser in this step. Lift the eyepiece (but not the parfocal ring) until the object is focused.
12. When the object is focused, tighten the parfocal ring. The eyepiece is now parfocal with the Deep Sky Imager camera. Do not remove or change the position of the parfocal ring or you will need to repeat the procedure.

Now, instead of focusing the camera with the telescope focuser (which is somewhat difficult and time consuming), insert in the eye piece/parfocal assembly and focus the eyepiece as you normally would. Then remove the eyepiece and replace the camera. You'll find that the camera is focused and may need only minor

Automatic Adjustment Controls[1]
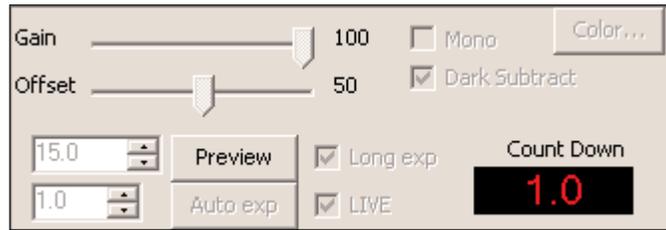
Gain and Offset sliders (1): Similar to a TV set's contrast and brightness controls. These controls are automatically set after you pick an Object (10) type and click on the Auto Exp button (3). Most users will seldom, if ever, need to set these controls manually.

Auto Exp. button (3): Automatically sets the Gain and Offset controls(1) for the camera. Before taking pictures, choose an Object (10) type and click on the Auto Exp button. This will adjust the camera to give you the typical contrast and brightness you need to take pictures for the type of object you have selected. You can further adjust the picture by adjusting the Histogram sliders (19), Filters (Kernel Filters, page 21, for more information) and focusing the telescope (see "Magic Eye Focus," page 25, for more information).

Mono check box (4): Check this box to take a black and white picture.

Live Image check box (17): Click to display live camera image in the Image Display (39).

Dark Subtract check box (6): See "Dark Frames," page 27, for more information.

Color (Color Balance) (8): Allows you to control your images' color. It is recommended that you click "Auto" and then make further adjustments using the other controls. Auto automatically sets a color balance, balancing the red and blue values in relation to the green. Note: Once Auto is pressed, the values selected by Auto remain do not change, unless changed by the user—they are not continually updated by the program. When you begin a new image, it is recommended that you reset the values in the Color dialog.

Automatic Adjustment Controls[2]

Color sliders. Experiment with these sliders to change to change the image color.

Sharp provides a sharper image, but the colors are less Saturated.

Soft provides more saturated colors.

Daylight provides a brighter image. Note that this may also be used for deep sky images. Experiment with this setting using the Preview Control (7).

Reset sets of the color sliders to midrange. This might be helpful if you wish to perform color correction in another image processing program, such as Adobe Photoshop.

Long Exposure check box. Check this box to set a long exposure. If your telescope is only crudely aligned, set a value of no more than 15 seconds (this is a good starting value for any telescope to use) in the spin box to the left of this check box.

How to take a long exposure:

Turn off mono and click "Preview."

A countdown displays and the live check is turned off.

An image displays.

You can now use the color balance, focus, contrast, shadow enhance and auto contrast to adjust and color correct the image.

Once you have the preview sets the way you want your image, click on Start (14) and an image will be composited using your Long Exposure settings.

Live check box. Check this box to set your live settings and focus. Check the Mono box and set the spin box to the left of this check box to 1 sec. You will now have an image that you can easily focus using the Magic Eye focus controls (see Magic Eye Focus, page 25).

Image Processing Controls[1]

Setting Menu (25): Click on the Setting Tab to display the Setting fields. These are field that may be filled in by the user, if so desired. It also contains the directory paths for the Images and Dark frames directories.

Combine (9): Selects a minimum quality level that is acceptable when images are added together to produce the composite image. Typically 50% is selected. You may wish to set it lower (e.g., 30%) if you have an image that has a lot of turbulence or other noise, but should try adjusting other controls first, such as the Histogram sliders (19). Also try refocusing the telescope.

Image Process (10): Displays a list of objects to view, such as Mars, the Moon, terrestrial, etc.   Adjusts some of the image processing settings to preset levels that will assist you in better quality images for the select object. Also "Take Dark" is on this list; see "Dark Frames," page 34, for more information.

Kernel Filter: The chosen sharpening filter is applied to the composite image as it is saved and is displayed in the live Display Image after about 10 images are accumulated. 3 levels of sharp filters, 1 edge only filter and "None" (no filter) are available. The settings for this filter appear when terrestrial or Moon is selected from the Image Process (10) list.

Click on the Min Quality % spin box (9) to change the minimum quality level.

Evaluation Count (9) allows you change number of images accumulated and evaluated to determine a quality baseline when the Start button is pressed. Normally, 10 images are evaluated (this is the default number). Click in the spin box to change the number of images used.

Combine check box: Normally, you will leave this box checked. If you wish to take raw images that are not combined into a composite image (you may wish to process the images yourself), uncheck this box and check the Save Every Image box. The Deep Sky Imager camera will take images and save them in the Image directory.
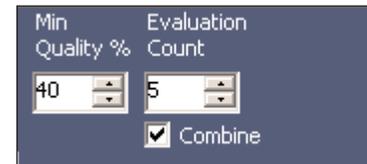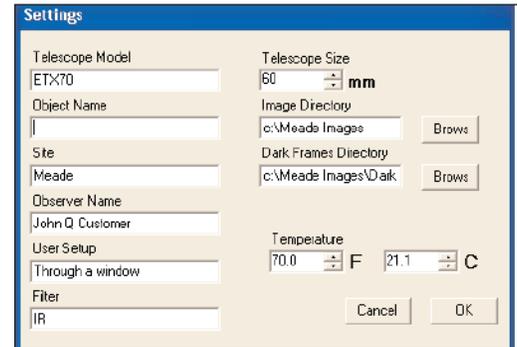
Image Processing Controls[2]

Object Name (11): Type in a name for the object. Each time the Deep Sky Imager program begins to accumulate a new composite image, it renumbers the image in a new tab, using your original name. For example, if you named the first image "Building," the next images will be named "Building 2," then "Building 3" and so forth, so that it doesn't overwrite the previously saved images. If a name/number was previously saved as a file name, the program will choose the next available number. For example, if "Building 7" was previously saved, the next file will be named "Building 8" and will not overwrite the file "Building 7."

Save Process (13): Click on this button to select the type of file format in which to save your picture. Beginners are recommended to save their pictures in "Jpeg" format. However, if you wish to perform further image processing, select "BMP" or "Fits." The last two formats, "Fits" and "Fits3P" are "raw" formats, are for use by advanced users. "Tif" files usually take up the most memory, but may be a useful format if you plan to use Adobe Photoshop. See "Time-Lapse Settings," page 27.
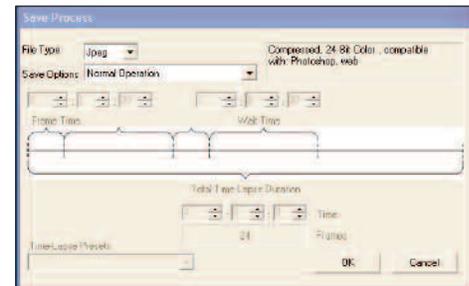
Save Every Composite Image (13): Normally images are added together make up a composite image or if they have too low of a quality level, they may be discarded. However, you may choose to save every composite image the camera creates by selecting Save Every Image Combine in the Save Options box.

These images are not displayed as separate images; only the last saved composite image is displayed. These files are stored in the directory you have chosen using the Image Directory field or the default directory chosen by the program during installation. If you wish to view any of these files, Click on the File Open button (25), and then choose the file from the directory.

If you set the Min Quality % box to zero (0), every picture will be saved.

The number of images the camera takes is displayed in the Status Displays (24) and the name on the File Name tabs (17) change with each new composite picture.

Start/Stop button (14): Press to start or stop the camera taking pictures. See "What Happens When You Press Start," page 12, for more information.

Image Processing Controls[3]

Image Acquire Status bars (15): Display while the Deep Sky Imager camera is taking pictures. Also a box displays the images format (e.g., jpeg), type of operation, time-lapse sequence or other pertinent information..
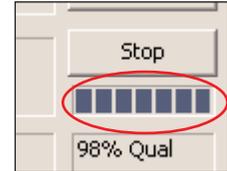
Image Directory field and Browse button: Click on the Settings menu (25) to display a dialog box. In this box, click on the Browse button to locate a directory or type in a directory path in the field. Or you may just type in the directory name in the field. If you type in a new directory, the directory will be created when the first image is saved.

Dark Frames Directory field and Browse button: You may select the directory in which to save your Dark Sub. images. Click on the Browse button to locate a directory or type in a directory path in the field. Or you may just type in the directory name in the field. If you type in a new directory, the directory will be created when the first image is saved.
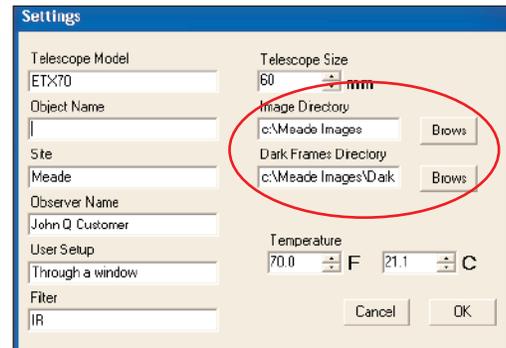
Settings dialog allows you to enter user information (name, location, Autostar model, etc). This information is saved as a FITs file.

Tracking Status Bar. Provides tracking information.

Dark Spot check box. Click to center the on a dark area instead of a light area when using a centroid box. A quality measurement displays, which shows the difference between the central pixel and the threshold.

Time-Lapse. Contains some common presets and allows you to choose your own time-lapse settings as well. See page 27 for more information.

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File Settings Tab

File Open menu (25): Allows you to open a file you have previously created. Click on this button and your directory list displays. Choose the desired file and it opens as a tab above the Image Display window. See diagram below.
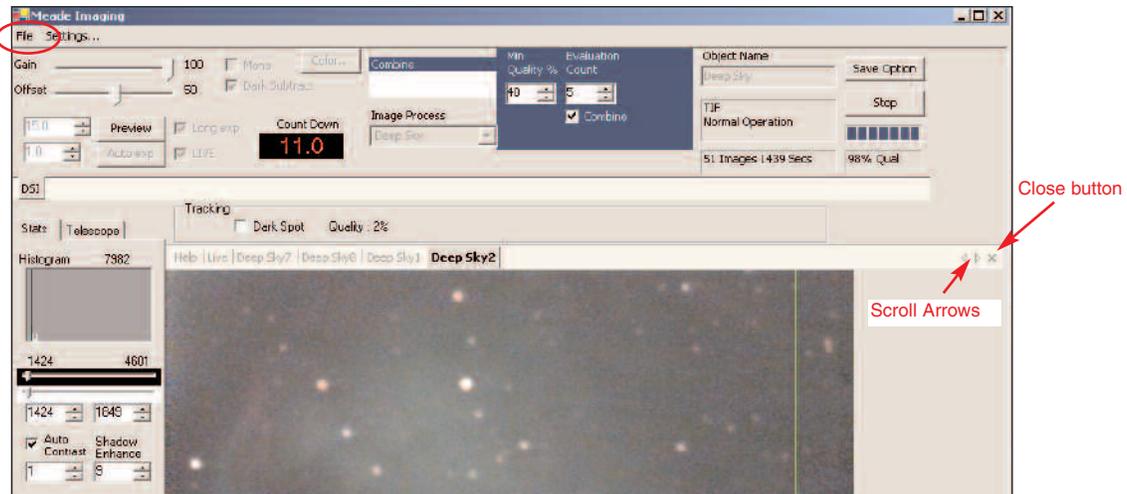
Notice that there are scroll arrows (37, see diagram above) at the end of the tab row. Click on these arrows to display more composite image file tabs. You can also close a

Close (38): Allows you to close a composite image file tab. First click on the tab you wish to close, then click on the Close button to close the file. Cannot close the live or Help tabs.

Magic Eye Focus

The Magic Eye Focus (22) displays a graphic representation of the focus as you adjust your telescope's focuser. The orange triangles "grow" together to indicate better focus. The red lines indicate maximum focus levels.
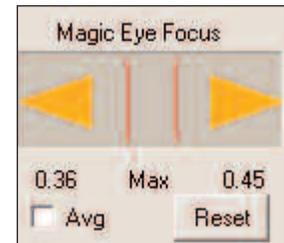
Avg (Average) check box: Check to average the last 5 focus values to smooth out noisy images. Note, however, that this makes the focus response more sluggish.

Reset button: Resets the red maximum indicators.

Connecting your Telescope and Telescope Controls

To connect to your telescope, see the printed instruction sheet that was including with Autostar Suite.

Once the telescope is connected, you may use the following controls (28):

Use the Arrow keys to move the telescope.

Click on an Arrow to move in that direction at Guide Speed. Hold and drag on an Arrow in the direction you wish to move to increase the speed. Hold and drag an arrow in the opposite direction to decrease speed. Release to stop.

If your telescope has motorized focus, use the focus button to focus on the object (only one focus speed is available).
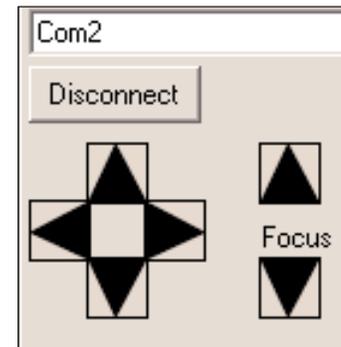
Time-Lapse Settings

Envisage software allows you to take time-lapse images of an object of an object. This means you can set the software to take an image, wait and then take another image after a period of time goes by, and continue the process for however long you desire. This is ideal for taking images of clouds moving through the sky or creating an animation that shows the rotation of Jupiter (see "Making a Movie of the Rotation of Jupiter," page 36, for more a procedure on that topic.

When you begin a time-lapse sequence, you can perform other tasks or go inside and catch up on your sleep. Envisage does all the work for you automatically.

The setting for Time-Lapse sequencing are found in the Save Process dialog box. Choose "Save a Time-Lapse" Sequence" to use this feature.

You will need to set three parameters for a time-lapse sequence:

Frame Time: How long the image takes to acquire an image (be sure you know how your telescope can image an object—some telescopes can track for long periods, other will get a fuzzy image after perhaps 5 minutes—set your frame time accordingly).

Wait Time: The amount of time the imager waits before taking the next picture; this is the amount of time it remains idle between images. It can be set to zero.

Total Time: How long do you want the entire sequence to run.
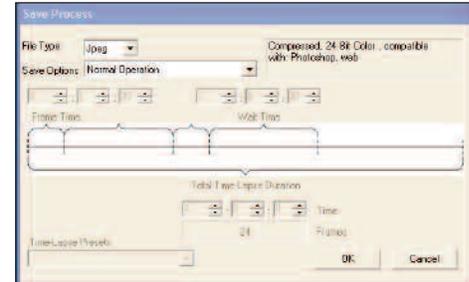
Deep Sky Imager Camera Program
Advanced Concepts
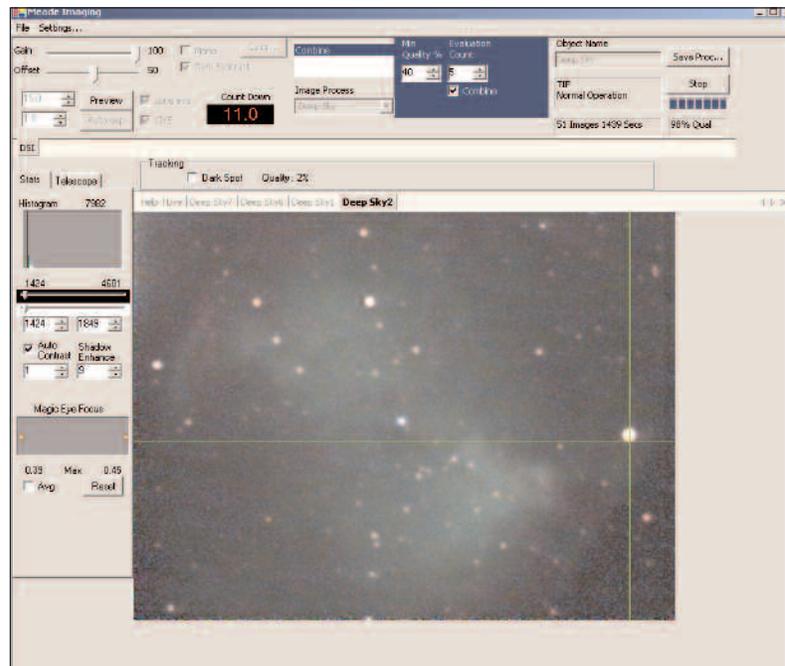
Tracking Boxes and Centroids

Drawing a tracking box allows you to track (that is, to follow) a bright spot that is surrounded by a dark area. This is very much like your telescope's tracking feature.

A centroid is the spot where the crosshairs meet. You can use the centroids to help you center an object in a box. The centroid is used for shifting an image before it is combined in a composite image, and also is used for autoguiding.

To create a tracking box, just use the cursor to draw a box around an object. For your first tests of this feature, try to choose an object that is bright and has a dark area surrounding it. You can experiment with this as you get familiar with the function.

If you're tracking a crater on the moon, draw the box about the center or a bright spot in a crater.

Histogram Display and Controls

The Histogram controls allow you more control of the brightness, contrast and mid-range tones of your Deep Sky Imager camera.

Experiment with these controls. Select an easily focused terrestrial image and adjust the Histogram sliders. You will notice the Live image growing brighter or darker, and even notice mid-tones becoming more visible. You will have to adjust these sliders differently for each object and can adjust the sliders "on the fly" as you are creating a composite image.

You can also use these control when you select Preview. When you return to the live image, it will apply the setting you choose while in the preview mode.

Note: The effect of the sliders is saved in all file types, except fits and fits3P.

Autocontrast: Automatically sets the sliders for the best contrast. You can move the sliders from 1 through 5 to set more contrast. Each number provides a higher level of contrast than the last; 5 is good for very dim objects.

Shadow Enhance: Helps bring out details in the shadows.
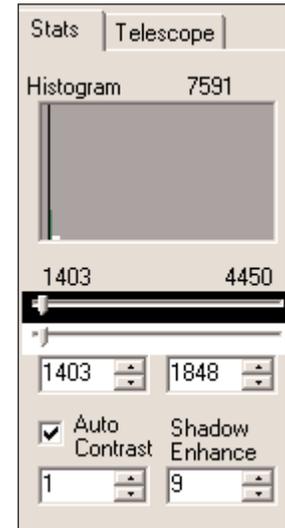
Autoguider and Telescope Controls [1]

For users familiar with the product, the Deep Sky Imager camera functions in a manner similar to the Meade Pictor 201XT CCD Autoguider.

An autoguider helps keep an object centered so that a 35mm camera can take long exposures of an image. Note that you do not have to set the Deep Sky Imager camera for a long exposure using Exposure controls (2). Autoguiding is used typically with telescope mounted in the equatorial mode, although it can also be used with LX200GPS Telescope mounted in the alt/az mode.

To use the Deep Sky Imager camera as an autoguider, perform the following procedure. You will need an off-axis guider (see the Meade General Catalog for more information) and the supplied serial cable that is appropriate for your model telescope. You will also need to know the focal length of your telescope.

1. Attach the off-axis guider and your 35mm camera to your telescope as described in that product's instruction manual. Insert and tighten the Deep Sky Imager imager into the eyepiece holder.

2. Click on the Telescope tab.

3. Attach one end of the serial cable to one of your PC's comm ports and the other end to the telescope's RS-232 port.

4. Type in the Comm port number into Comm Port box.

5. Click the Connect button (it will then display "Disconnect"). The buttons below the Connect button become active and status data is displayed, such as which version of Autostar is connected, whether your telescope can Autoguide or just track, and so forth. If the telescope is capable of autoguiding, "Can AutoGuide" will display.

6. Check to make sure your cable is properly attached, that you have the correct port number selected and so forth. If the telescope connection is verified, you will receive a "passed" message.

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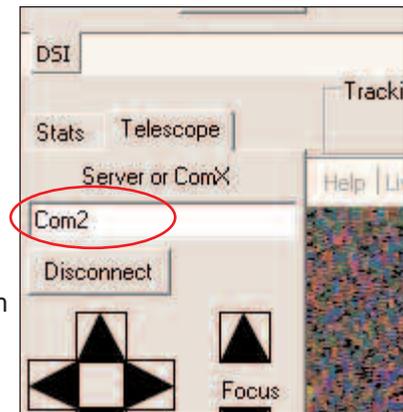
Autoguider and Telescope Controls[2]

6. In the "FL IN MM" field (focal length in millimeters), type in the focal length, in millimeters, of your telescope.

7. Locate a star using your telescope's alignment and Go To procedures. Focus and prepare the imager as described earlier in this manual. You may now using the Arrow keys (28) to center the object you have chosen. Click on an Arrow to move in that direction at Guide Speed. Hold and drag on an Arrow in the direction you wish to move to increase the speed. Hold and drag an arrow in the opposite direction to decrease speed. Release to stop.

8. If your telescope has motorized focus, use the focus button to focus on the object (only one focus speed is available).

9. Draw a tracking box around the star.

10. Click the Track button (the button then displays "Tracking"). Will Cal displays on the Calibrate button.

11. When you click on the Track button (you do not need to press the Will Cal button), the program begins to calibrate. It then begins to autoguide your telescope and displays X and Y error coordinates in the Status Display box (24). When the program is done calibrating, it will start tracking and a yellow circle will appear on your target object.

12. Click the Tracking button (the button then displays "Track" again) to stop tracking.

If you don't move your telescope or rotate the guider assembly, you do not need to recalibrate. However, if you wish to recalibrate, click on the No Cal button to force it to calibrate (which will then display "Will Cal").

Autoguider and Telescope Controls[3]

Other Features

Center Target: Click Center Target to move the yellow circle to the center of the screen. The telescope models will follow (some telescopes will move more slowly than others).

Set Target: Click Set Target and click on a position on the screen. The target will move to the this position.

Corr (Correction) Gain: Sets how aggressive the correction operates. Default setting is 0.5. .01 is the lowest and 1.0 is the highest setting.

If your telescope takes too long to reach to the yellow circle, increase the gain.

If you telescope keeps overshooting the yellow circle, moving back and forth, decrease the gain.

If the telescope never reaches the yellow circle, recalibrate: Click the Tracking and No-Cal buttons. Then click the Track button again.

Dark Frames[1]

Dark Frames is a useful feature for if you're taking exposures longer than 1 second.

Longer exposures and temperature can create noise in your Deep Sky Imager camera called dark current artifacts. The Dark Frames feature allows you to subtract out some of this noise from your pictures.

Delete Existing Dark Frames. Deletes and overwrites previously imaged dark frames. This is box is left unchecked as a default.

Total Time. Displays how long it will take to create all the dark frames using the Dark Frame settings chosen by the user

Perform the Dark Frames features at night. If the temperature changes significantly during your observing session, you should repeat this procedure.

To perform the dark Frames procedure:

1.   Select "Take Dark" in the Image Process combo box (10). The Dark Frame Exposure controls display.

2.   Select a range of exposure time. For example, if the length of your exposures will be between 2 and 5 seconds, set the First Exp (Exposure) box for 2 seconds and the Last Exp box for 5 seconds. The Deep Sky Imager program will then take a series of dark frames image files between 2 seconds and 5 seconds in length at approximately 1 f/stop intervals. Later, when you set your camera exposure time (see Step 6 below), the Deep Sky Imager program will automatically select the Dark Frame file with the closest exposure length, scale it to the actual exposure time and apply it to the image you are taking. In effect, it subtracts out the dark current
artifacts.

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Dark Frames[2]

3. Select a value for the Avg Exp box. This is the number of expo-sures that are averaged together to create each composite Dark Frame exposure. Typically, set this value to 10.

4. Click on the Setting menu (25). The Dark Frames directory field displays. The Dark Frames will be saved to this directory. You may change the directory if you wish.

5. Click the Start button (14). A message displays that tells you to cover up your telescope or Deep Sky Imager camera. Replacing the lens cap on your telescope is sufficient.

    The program erases all the old Dark Frames files in the directo-ry, and takes and saves the new Dark Frames series. When all the Frames are taken, "Done" displays in the Status Display (24). Notice the Histogram display; it will reflect the Dark Frames that are being imaged.

6. Select an exposure in the Exposure Controls (2). The Dark Frames feature is used with Longer exposures, so your exposure time should typically be longer than 1 second.

7. Check the Dark Sub check box (6). The Dark Frames feature is automated, so Dark Frames will automatical-ly be applied to any pictures you now take.

8. Remove the lens cap from your telescope or uncover your Deep Sky Imager camera. Begin taking pictures as previously described in "Start Taking Pictures." (See page 12 for more information.) The Dark Frames fea-ture is automated, so Dark Frames will automatically be applied to any pictures you now take.

Note that if you are taking longer exposures, better results will be achieved with black and white (mono) images: Check the Mono check box (4).

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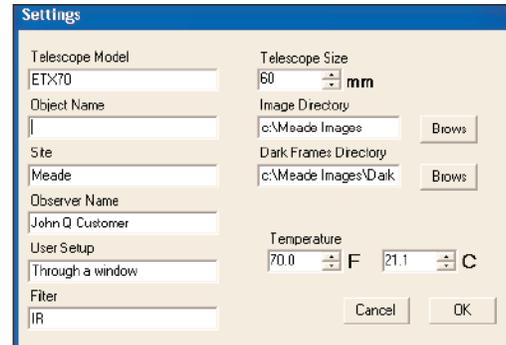
Make a Movie of the Rotation of Jupiter

You should become familiar with autoguiding/auto tracking and calibration procedures as described in "Autoguider and Telescope Controls," page 31.

1. Click on the Save Process button to open the dialog box.

2. Set the file type. Choose "jpeg" if just wish to create a movie, or select "tif" if you wish to process the frames in another image editing software program, such as Photoshop.

3. In the Save Option, select "Save as a Time-Lapse Sequence."

4. Select "Jupiter Time Lapse" in the Time-Lapse presets. This preset is set up to watch the Red Spot travel across the face of Jupiter. The sequence takes about 4 hours and takes 24 images.

5. Follow the procedures for Autoguiding or auto tracking as described in "Autoguider and Telescope Controls," page 31. Draw box around Jupiter so that the telescope will track Jupiter.

6. Click OK.

7. Select "Planet" in the Image Process dialog.

8. Click Auto Exp (3), so that color will be automatically be balanced. You can tweak the color, contrast, shadow enhancement and so forth. as described earlier in this manual.

9. Type in "Jupiter" in the Object name box.

10. Click Start to begin the time-lapse sequence.