

Instructions For Setting Up The Meade 8" Telescope To Image Saturn/Jupiter

Follow these instructions to set up the Meade 8" telescope to image Saturn or Jupiter. Below we give you some general information about operating the Meade 8" telescope, a set-by-step list of instructions for setting up the telescope and CCD camera, and a step-by-step list of instructions on taking the ST7 CCD images with the computer software called CCDOPS.

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General Notes on Meade 8" Telescope

- Scan through menu items using the Up/Down arrows at the bottom of the keypad. The Up/Down/Left/Right arrows near the middle of the keypad are used to move the telescope and change the focus.
- Select a menu item by hitting **ENTER**.
- Move up one menu level by hitting **MODE**.
- To the telescope's slew speed, hit **SPEED** (1 on the keypad) and then a **number**, where 1 is the slowest (normal guiding) speed and 9 is the fastest speed. For centering an object that is in the eyepiece, a speed of 3-5 is best. For large movements, such as when trying to center an alignment star that is far off of the current telescope pointing, a speed of 9 is appropriate. Fine adjustments to center an object on the imaging CCD should be made with a speed of 3.
- The higher the focal length of the eyepiece (e.g., 40 mm), the smaller the magnification and the larger the visible field of view. Most star clusters and galaxies are best viewed with the 26 mm eyepiece, while objects like Jupiter and Saturn are best viewed with a 13 mm eyepiece. Larger objects, like the Orion Nebula and some open clusters, are best viewed with the 40 mm eyepiece. When you begin setting up the telescope, use the **40 mm eyepiece** for aligning the finder scope and centering the telescope on Jupiter or Saturn.

Telescope Setup

1. Set the telescope up out back behind the Observatory next to the benches because you will want to use a bench as a table for the laptop. Set the telescope up in **Alt/Az mode**. First set up the **tripod**. Make sure the legs are fully extended otherwise the screw and spreader will not fit properly.
2. Put the telescope on top of the tripod with the **Control Panel facing South**. Screw in the **spreader** until the telescope is mounted firmly to the tripod. Note that the flat face of the spreader should face upward.

The easiest way to position the telescope over the hole in the tripod is by looking from beneath with a flashlight to get good alignment between the holes in the mount and telescope. Then insert the screw. If it is not grabbing as you screw, then have a partner slowly move the base of the telescope around until you catch the hole. Be very careful not to strip the threads! You can test to make sure you are actually screwing into the base by tugging down on the screw. If it does not hold, pull out the screw, look up from the bottom and realign. Screw in until the telescope is firmly secure to the mount. Do not over tighten.

3. **Align the finderscope** and the telescope + 40mm eyepiece, which has the widest field of view. This can be done during the daytime and works best using objects on the horizon.
4. Place the telescope tube **horizontal** with the opening facing **North**. Take the cover off the tube. **Lock** the RA and DEC **drives**. The DEC drive lock should be turned until firm, but do not over tighten it. This is the **Alt/Az home position**.
5. Make sure the **power switch** is in the **OFF position** before plugging in the electrical cord, otherwise you can seriously damage the electronics. Plug in the power supply to an outlet and the **12vDC IN** hole on the telescope. Plug in the handpaddle into the HBX port and install the paddle holder on the handle of the telescope. Plug the microfocuser into the **Focus** port.
6. Turn the telescope on. The hand paddle should say **Welcome to Autostar**. After a few seconds, a screen will come up telling you to press zero to align, or Mode to view the menu. Press **Mode** so that you can choose the best alignment method.
7. Using the up and down arrows on the bottom of the hand paddle, select **Two Star** alignment.
8. A message will scroll across the screen, telling you whether it is set for Alt/Az or Polar alignment. Make sure it is set to **Alt/Az** mode. If the hand paddle says it is set to polar mode, press Mode to exit, then go to **Setup** → **Telescope** → **Mount** → **Alt/Az** to change to Alt/Az mode. The message will remind you to put the telescope in the home position before starting. Once in the Alt/Az home position, press enter to continue.
9. At this point, you must wait for the telescope to search for a GPS signal. When it has calculated your position, the hand paddle will beep and prompt you to pick a star for alignment.
10. Choose the first of your two alignment stars by consulting the Sky Maps at the back of the manual. Double check to be sure you've correctly identified the stars. It is an easy mistake to make! Use the up/down keys at the bottom of the keypad to scroll through the star names. Hit **ENTER** to select a star, and the telescope will automatically slew to the star you selected. The hand paddle will beep when it has finished moving and prompt you to center the star in the field of view. Use the up/down/left/right arrows in the middle of the keypad to center the star in the eyepiece, keeping in mind you can change the slew speed. Once the star is centered, hit **ENTER** to go to the next star and repeat. If alignment was not

successful, then double check that you've correctly identified the stars, turn off the telescope power, and start over.

11. Point to a bright star, and **focus** the telescope. Either of the two alignment stars you used in the previous step will work well. First focus with the silver knob on the telescope, then use the hand paddle and microfocuser to make finer adjustments. To use the microfocuser, hit **Focus** (number 4) on the hand paddle. To adjust the focus speed, use the up and down arrows on the bottom of the paddle. Use the arrow keys at the top of the paddle to change the focus. When finished, hit the **Focus** key again to exit focus mode.
12. To move to Jupiter or Saturn, hit **SS** for solar system objects then scroll through the solar system menu to find the planet you want. Then hit **Enter**, and once the position is calculated hit the **GoTo** button and the telescope will slew to that planet. Use the Up/Down/Right/Left buttons to center it in the field of view.
13. If it is humid, use the Kendrick heating strips + controller + power supply to keep the telescope and optics from fogging up. You can place the strips around the top and bottom of the telescope tube. The controller can be secured to the telescope using the velcro on the side of the arms.

Setting Up the CCD Camera

1. Place the laptop computer on a bench near the telescope and power it up.
2. Open the **CCDOPS** program from the computer's Start Menu.
3. Connect the USB cable and power cable to the ST7 camera, but do not plug the other ends of the cords into the computer or power supply yet.
4. Take out the eyepiece, and insert the CCD Camera. Make sure you tighten the set screws firmly so that the camera does not rotate while you're observing, but don't tighten it too much and scratch up the barrel.
5. Plug the other end of the USB cord into the computer. Make sure the switch on the power supply is **OFF**, then connect the other end of the power cord into the CCD power supply.
6. Turn on the switch located on the camera's power supply. The computer should now indicate that a device has been attached.
7. In CCDOPS, click the **Setup** button. **Activate** the cooling fan, and set the temperature to no less than 25 degrees Celsius below the ambient temperature.

Obtaining CCD Images with CCDOPS

1. Click the **Grab** button. All images are taken with this button.
2. Select the appropriate exposure time. For imaging Jupiter, the images should be taken with the minimum exposure time, 0.12 seconds. (If an exposure time less than the minimum is chosen, it will default to a time of 0.12 seconds.)
3. The computer screen will go dark while the CCD takes both a dark and a light frame.
4. Basic analysis of the image can be done by bringing up different tools from the **Display** menu. The **Show Cursor** tool will show the pixel value and position of any point you click on the image. If you click on an object, this will also display the **Seeing**, in both the x- and y-directions. This can be used on a moon of either Jupiter or Saturn to test the focus, but make sure that you are not attempting to focus on a saturated object.
5. When observing Jupiter or Saturn, it is possible that the moons will be far enough away that you will not be able to see them all at once. Move the telescope around in the area near the planet to make sure you are not missing any distant moons.
6. If you need to rotate the camera to try to get all the moons into view, be sure to loosen the set screw that holds the camera to the telescope before doing this to avoid scratching the barrel. If the moons are still too far away to be seen in a single image, you will need to take two sets of images.
7. When you have a good, well-focused image, save it by hitting the **Save** button. Select a directory to save the images to, preferably one labeled with the date. Make sure to save all images as **FITS formatted** images so that you can analyze them later. The default is to save the images as SBIG format, so you will need to change this option each time you save an image.
8. Once you are finished, turn off the temperature regulation for the CCD then turn off the CCD inside CCDOPS. Carefully pack up all the equipment and store it safely in the Observatory.