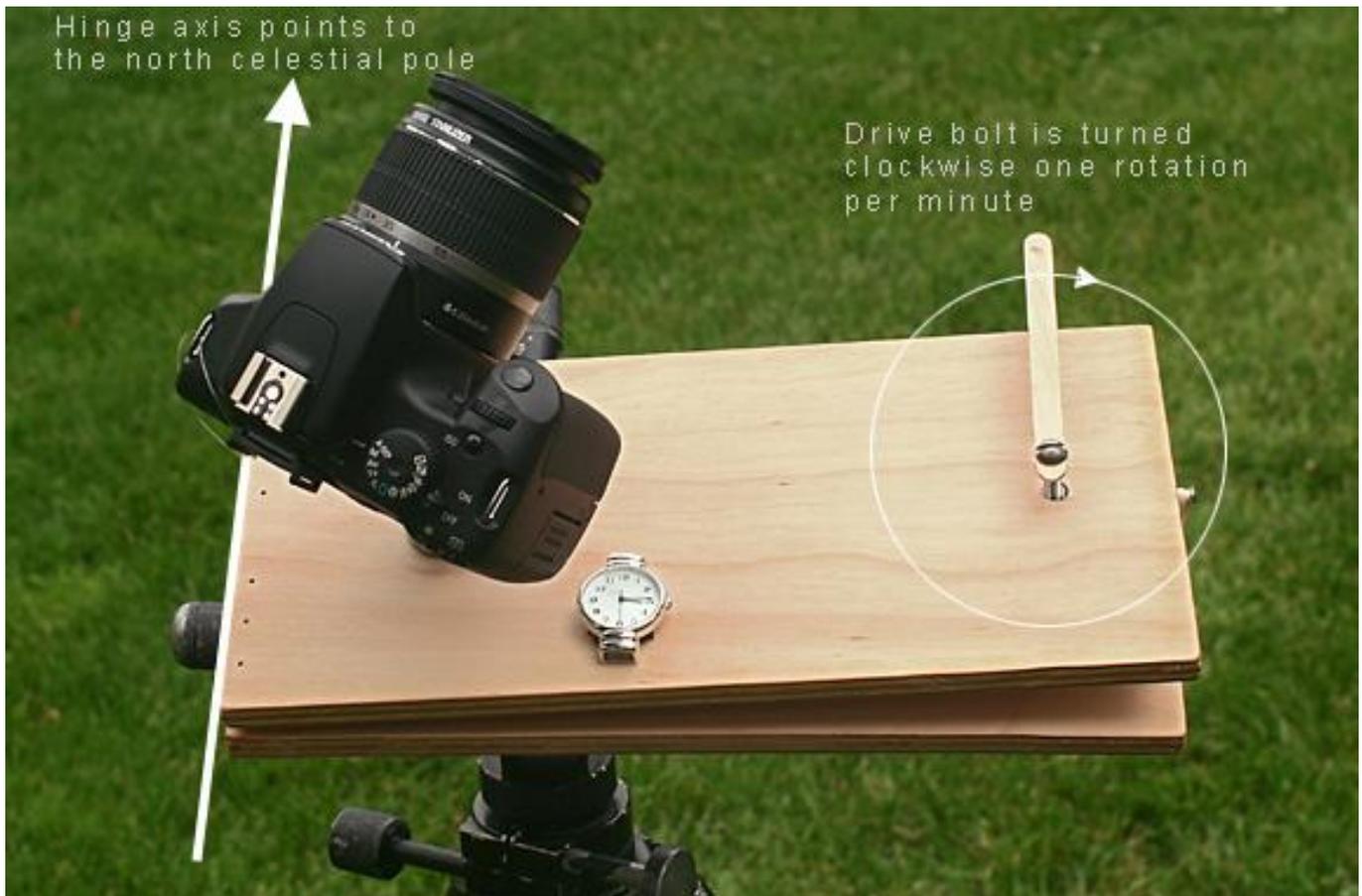


Constructing a Barn-Door Tracker

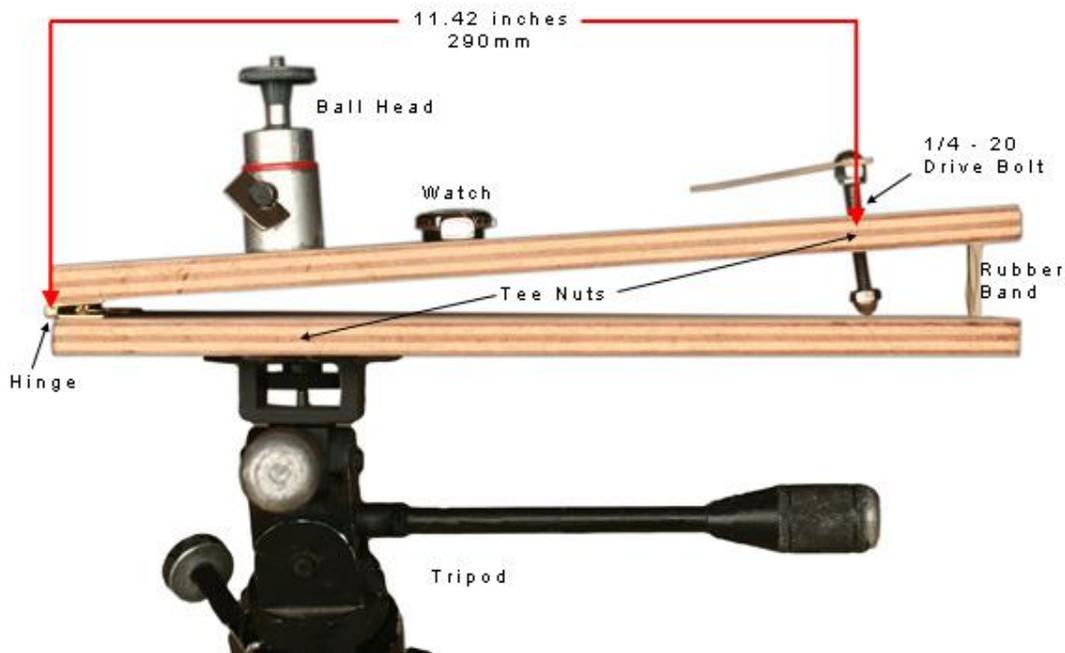


A simple barn-door tracker can be made for about \$15. The axis of the hinge on the left points to the north celestial pole near Polaris. The bolt on the right is turned one rotation per minute to drive the tracker to follow the stars.

A *barn-door* tracker is a very simple, home-made, device. It will allow you to shoot longer exposures and track the stars to compensate for the Earth's rotation.

Two pieces of wood are joined by a hinge. The hinge points at the north celestial pole near Polaris. The hinge acts as the right ascension axis of an equatorial mount. The bottom piece is fixed to your tripod. Your camera and lens is mounted on the top piece with a ball and socket head. A bolt raises the top piece of wood at the same rate that the Earth turns. You can turn the bolt by hand, or you can use a motor to turn it. A rubber band around a nail in the end of each board on the side opposite the hinge can stop the mount from coming apart accidentally if the weight of the camera is unbalanced. A round head nut is used at the end of the drive bolt for smoother movement, and a popsicle stick is used as a lever at the top of the drive bolt to make turning it easier. Tee nuts are used to mount the tracker to a tripod, and for the drive bolt. A 1/4 - 20 bolt is used to secure the ball head to the top board. The watch is held in place by velcro.

The distance from the hinge to the screw, and the number of threads on the screw determine the rate the bolt needs to be turned at. This spacing is critical. The easiest method is to use a common 1/4 - 20 bolt. Place it at exactly 11.42 inches (290mm) from the center of the pin of the hinge. Alternatively, a 10-32 bolt can be used at a distance of 7.14 inches (181mm) from the center of the hinge pin.



A 1/4 - 20 bolt is placed at exactly 11.42 inches, or 290mm, from the center of the hinge pin. When this bolt is turned at one rotation per minute, the camera will track the stars as they move across the sky. The tripod's adjustments are used to aim the axis of the hinge pin at the north celestial pole.

At these distances, the bolt needs to be turned at one revolution per minute. This is an easy task to accomplish by simply mounting an old-fashioned watch with a second hand next to the bolt. The bolt is then turned at the same rate of sweep as the watch's second hand. This will track the stars at the sidereal rate. The sidereal rate is the speed at which the stars seem to move across the sky due to the Earth's rotation.

When you set up the barn-door tracker you simply sight along the hinge and aim it about 3/4 of a degree from Polaris to Kochab. You can use the altitude and azimuth adjustments of your tripod to aim the hinge. You can even put a plastic drinking straw parallel to the hinge and aim through it.

Then aim your camera and lens at the constellation or section of sky you want to photograph. Focus on infinity and open the shutter. Then turn the bolt at the correct rate. Be sure to turn it in the correct direction.



The Big Dipper was shot with a Canon 1000D (Digital Rebel XS) and an 18-55mm zoom lens at 20mm of focal length with a 2-minute exposure at ISO 1600 at f/3.5 on this barn-door tracker, driven by hand. Clouds obscure stars in the upper right corner of the frame.

You will be able to take exposures of about 5 minutes with a wide-angle lens with this simple device.