Dark Dragons Astronomy

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DragonLAIR Installation

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Tools Needed

- Drill
- 1/8 inch drill bit
- 4x 1/4 inch lag screws or hanger bolts with washers (galvanized if mounted outside the building)
- Ratchet and sockets
- Hammer
- 5/16” drift pin punch for setting gear/sprocket

Step 1 - Gear Rack

Note: If you plan to use a Rack and Pinion to move your roof it is important to understand that the Rack needs to be mounted in the same plane as the gear. If not the gear lash can become large enough to allow the system to skip gears. Make sure the rack will have full length clearance and that the motor’s shaft and pinion gear also have clearance under any portion of the moving roof.

Locate a place to install the gear rack on your roof. The teeth should be facing down and should have clearance over any walls. You can use angle iron as a mounting surface. Angle iron can be obtained to span the full length of your roof and will help ensure the rack sections are mounted linearly and limit gear lash. Standoffs can be used to attach the rack to the angle iron and also allow for adjustments. NOTE: The rack needs be level along its whole length in relation to the

gear locaton. Also, the rack needs to be aligned with the roof movement across the entire length of the roof. The Rack has oblong holes for fine adjustments.

Close the roof. On the rear wall mark the desired lateral (left to right) position of the pinion gear. Make another mark above that on the roof itself. Open the Roof. Now make another mark on the roof above the desired pinion position. Determine the setback from those roof marks. Measure the chrome bushings included in the rack set. Add that distance to the same side of the roof marks. This is the edge line to mount the brace for attaching the rack. If angle iron is used, pre-drill the holes in the angle to match the rack's slotted holes. Attach the angle iron to the roof using the setback marks as the guide. Attach the rack using the included chrome bushings. Adjust the rack in the middle of the slotted holes. This will allow movement in either direction to ensure proper gear mesh.

NOTE: Depending on roof design and size you may need to add braces to ensure there is no flex in the rack as it moves along the pinion gear.

Step 2 - Motor and Bracket

Attach the motor to the bracket using the included bolts. The motor has a ¾" shaft with cross drilled mounting holes. Both sprockets (for chain drive) and pinion gears (for rack and pinion drive) can be used on this motor. Chain drive requires the optional DragonLair Chain drive mount as idler wheels are needed. Rack and Pinion uses the standard L bracket mount.

About Rack and Pinion: Any pitch or modulus rack can be used with DragonLAIR as long as the rack matches the pinion's specs. For help identifying these specs contact support.

For Dark Dragons provided rack and pinion: There are two mounting positions on the motor shaft. Carefully determine your installation requirements and choose the appropriate position. Slide the gear on the motor shaft. Tip: use a thin layer of anti-seize compound on the shaft to ensure easier removal for service later. Using the select mounting position line up the gear so the cross drilled hole lines up with the hole on the shaft. The pinions we provided have been overboard slightly on one side of the gear for easier line up. The opposite hole has a tight fit allowing the ROLL PIN to secure itself against the pinion. You can use a drift pin or 5/16" bolt to

temporarily line up the holes from the opposite side. If the ROLL PIN deforms during placement file or grind it to match the slope of the gear tooth.

Find a place to mount the bracket to the wall so that the gear meshes with the rack. Once the bracket and motor are in position, mark the wall in the center of the long channels where the bracket will be installed. Drill 1/8 inch holes in the wall (be sure there is a 2x4 behind it so the bracket is secure) where you marked the center of the channels. Place the bracket on the wall and use 2x 1/4 inch lag screws to attach the bracket to the wall, but do not tighten all the way. Double check that the lag screws are seated in solid wood, not just the wall paneling. It may be necessary to reinforce the mounting location, ¾ plywood can be used as a mounting surface. Reattach the bracket to the wall, mesh the gear to the rack, and tighten the lag screws.

Step 3 - DragonLAIR Controller

Find a place to mount the DragonLAIR Controller near the motor, but inside the building. A place on the wall near the motor is ideal.

Using the included cable with ring terminals on one end and Anderson PowerPole connectors on the other, plug the cable into the Motor port on the DragonLAIR and connect the ring terminals to the motor. Polarity doesn't matter at this point, once we test, if the roof moves in the wrong direction, just swap the terminals on the motor.

Optional. For remote operation or control through your favorite imaging software, connect an ethernet cable from the DragonLAIR to your router or network switch.

Connect the hand controller to the port on the side of the DragonLAIR.

The DragonLAIR comes with 4 Safety Sensor ports, which are all enabled by default. These safety sensors are designed to prevent the roof from moving unless there are no obstructions. You can place them at any "pinch points" where the roof meets the wall or, if any part of your telescope can move where the roof can hit it, you can place the reflector on the end of your telescope and point a safety sensor at the reflector. This will prevent the roof from moving unless your telescope is moved back to that location.

If you are not using the safety sensors, you must manually disable them by opening the top of the DragonLAIR enclosure and move the jumper for the sensors you do not want to use from “Enabled” to the empty space beside them. The jumpers must be on the board to operate. If you are using the included E3Z-R61 sensors, connect the leads from the safety sensors to the DragonLAIR as follows:

Sensor Wire	DragonLAIR Safety Sensor Port
Brown	12V
Black	Signal
Blue	Ground

You can use any NPN style sensor that operates on 12 volts.

Once your safety sensors are configured, connect the power supply or battery to the Power port on the DragonLAIR. After a few seconds, you should hear a beep indicating that the DragonLAIR is ready to operate.

Use the top buttons on the hand controller to move the roof in the open and close directions. If the roof moves in the opposite direction as the button, disconnect power to the DragonLAIR and swap the wires on the motor. Reconnect the power and test again.

Manually move the roof to the fully open position. Place one of the included limit switches so that the switch is activated when the roof is in this position. Connect the wire from the limit switch to the “Open Limit” port on the DragonLAIR. Polarity does not matter.

Manually move the roof to the fully closed position. Place the other limit switch so that the switch is activated with the roof in this position. Connect the wire from the limit switch to the “Closed Limit” port on the DragonLAIR. Polarity does not matter.

Now move the roof to the fully open position. The roof should stop automatically once the limit switch is activated. Do the same by closing the roof. If you need to move the limit switches to adjust the fully open or closed positions, do so now. Once you have tested that the roof stops at each position, you are ready for automation.

Step 4 - Automation (Optional)

Once you have verified that manual operation is working, you are ready to automate your system using your favorite ASCOM imaging software. The DragonLAIR does not need any drivers installed, because we leverage the latest ASCOM Alpaca framework. You can setup the device by following the instructions on our forum: https://forum.darkdragonsastro.com

Help

If you hear a double beep when you try to move the roof, it is because one of the safety sensors is not reporting a safe condition. You will need to fix the placement of the sensor, or disable it completely by moving the jumper from “Enable” to the blank space beside it.

If you have any issues or questions about the installation of the DragonLAIR, please contact us at support@darkdragonsastro.com, visit our forum at https://forum.darkdragonsastro.com, or give us a call at either 803-701-0167 or 980-206-0043.