L-350

MECHANICAL INSTALLATION GUIDE

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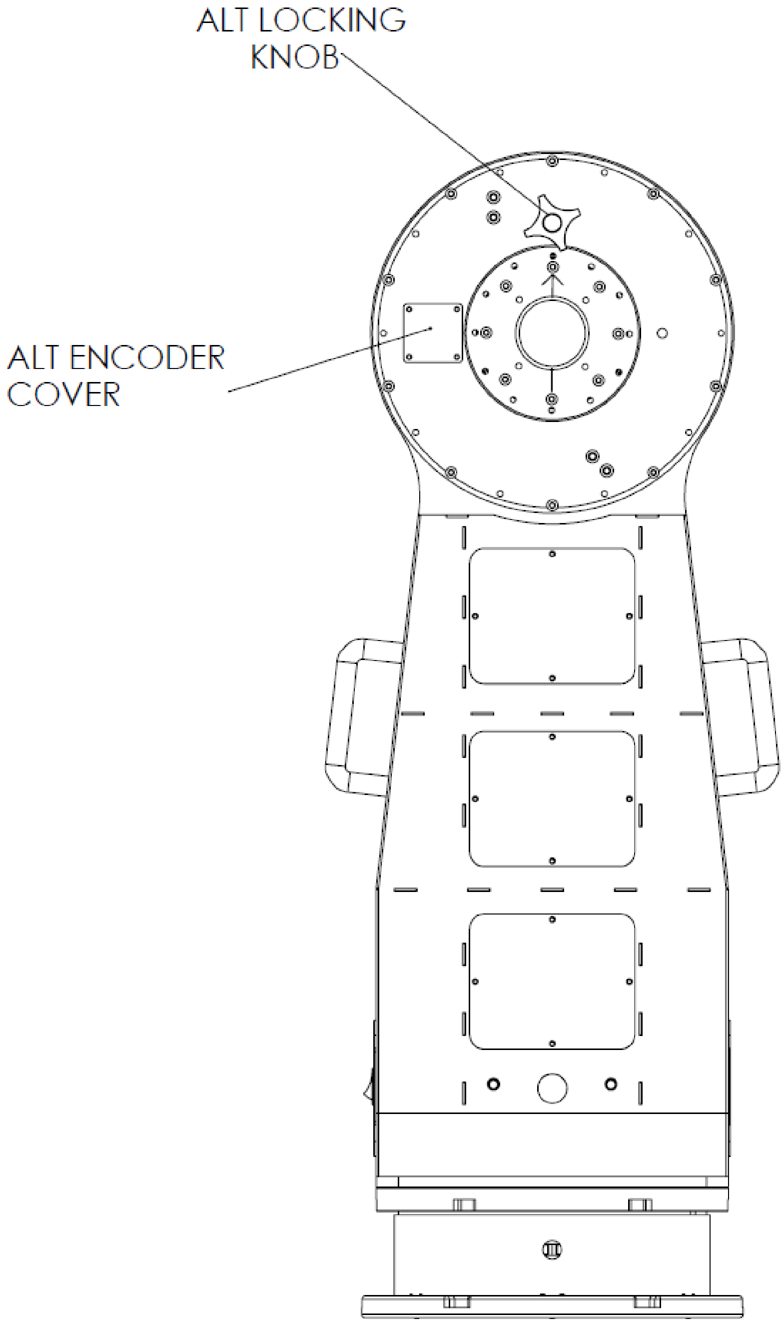
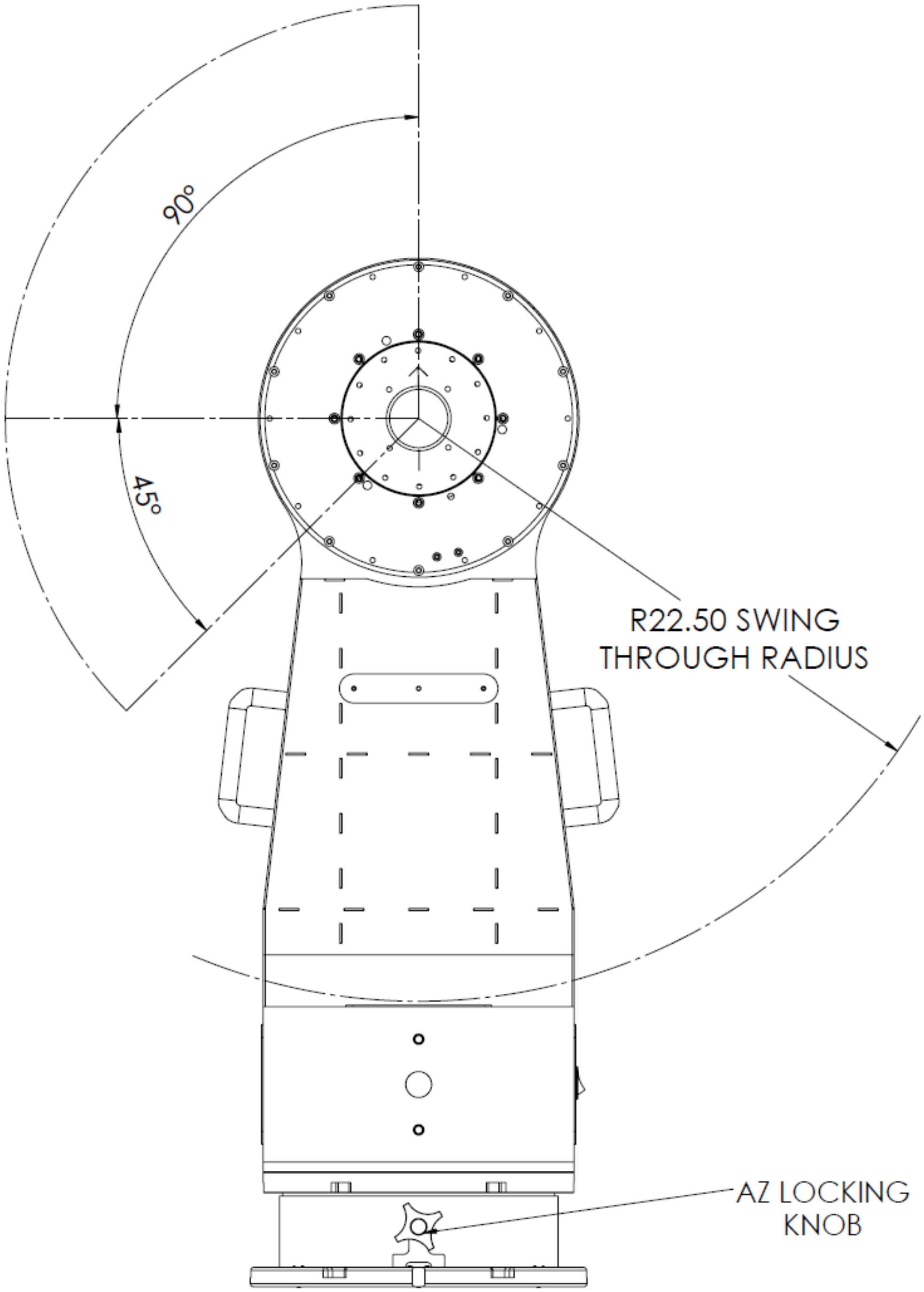
SIDE-VIEW (OUTSIDE OF FORK-ARM)



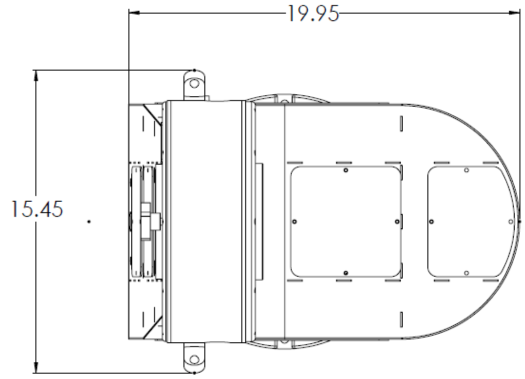
SIDE-VIEW (INSIDE OF FORK-ARM)

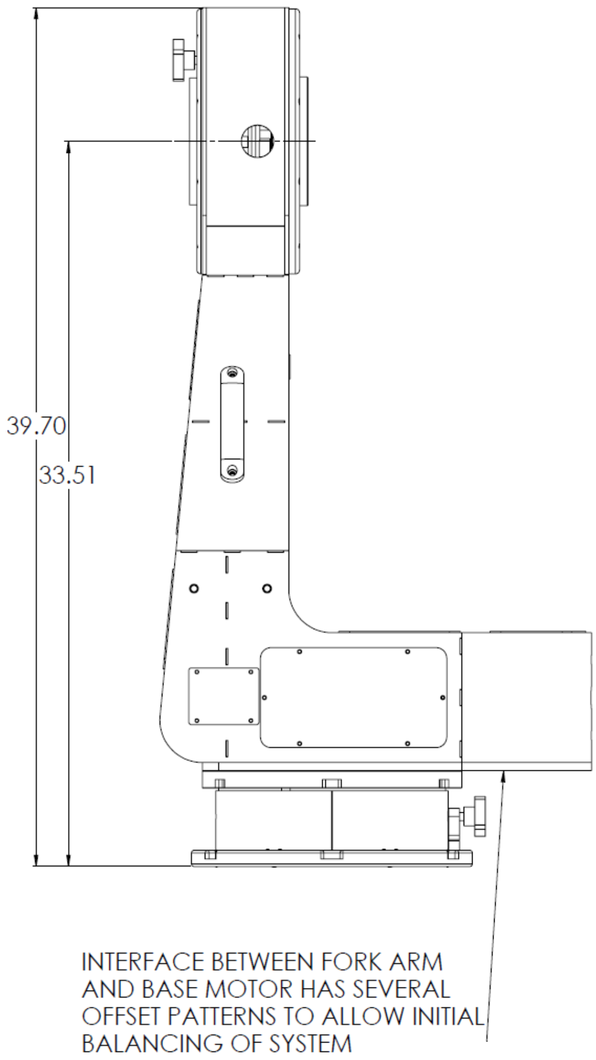


SYSTEM DIAGRAMS 3

REAR AND OVERHEAD VIEWS

FORK ARM AND ALT/DEC MOTOR: 70LBS
BASE/RA MOTOR: 40LBS
TOTAL MOUNT WEIGHT: 110LBS
POWER INPUT: 85-260VAC 50-60HZ
MAX POWER USAGE: 650 WATTS
MAX LOAD RATING: 100LBS
ALT/AZ OR EQUATORIAL WITH OPTIONAL WEDGE





INTRODUCTION

Direct-drive motion systems offer a number of advantages over the more traditional systems used in astronomy:

1) Direct-drive systems do not use gears:

Traditional, gear-based motion systems can only move as precisely as their gears are cut. Surface imperfections in gears inevitably result in periodic tracking-errors.

Gears require lubrication, and consequently require routine cleaning and relubrication. This is exacerbated in dusty environments, where lubrication rapidly contaminates.

2) Without gears, there is no PE:

Direct-drive systems are effectively free of periodic error.

To be completely accurate, there is a small amount of periodic error in the motion of each of the individual bearings in the system. However, due the number of bearings in each assembly, there is negligible effect to motion of the total system. Additionally, each axis is equipped with high-resolution encoders reading at 8Mhz, that are more than capable of detecting miniscule deviations from the proper tracking-rate.

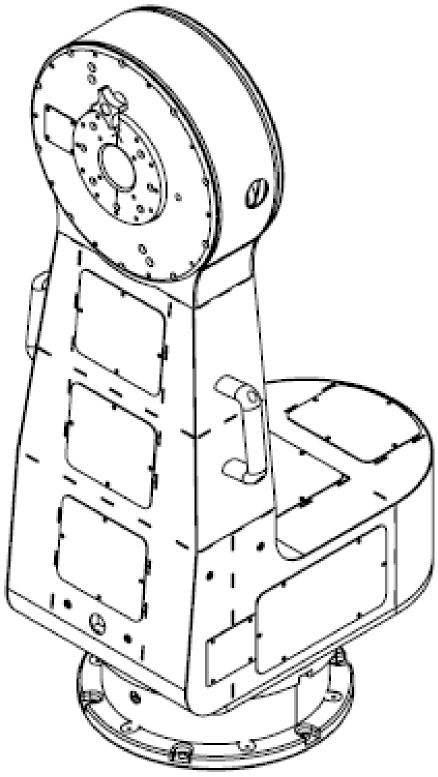
3) Lower hysteresis:

Mechanical hysteresis (the difference between where something was, when measured, and where it is now) is greatly reduced in a system that does not use gears. Remember all of that advice about how to properly balance by being out of balance, to keep gears engaged? None of that applies to direct-drive, and tracking is equally good on both sides of the meridian.

Total hysteresis of the L-Series mount is further reduced by the use of high-resolution encoders (18.8M counts/axis, 0.069 arc-second/count). These on-axis encoders allow the control-electronics to know precisely where the mount is pointed, more than 100 times per second. No auto-guider provides that volume of feedback.

4) Faster response:

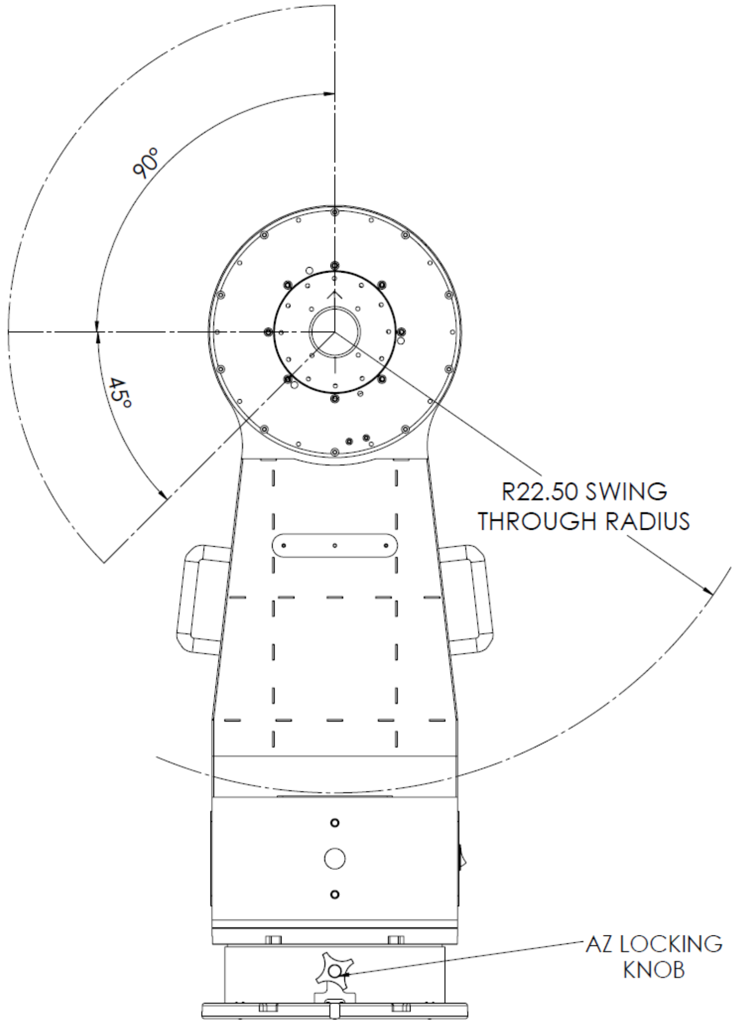
Not only are the L-Series drives capable of far greater rates of speed, their response-times are also much faster. Consider all of the sources of backlash in a traditional system (planetary-gears, elasticity in belts, and the worm/worm-gear interface itself), and know they are not present with direct-drive. As soon as an L-series motor moves, your telescope moves.



RANGE OF MOTION

L-350 mounts offer +/- 350 degrees of rotation in the Azimuth/RA axis, measured from the "No Wrap" position. The proper "No Wrap" position is found by aligning the related marks on the drive-base section of the mount (due the +/- 350 degree motion, these marks only line up at the correct position).

The Altitude/DEC axis has a fixed limit at the zenith (Alt-Az) or pole (EQ). The lower limit is located 45 degrees below the horizon when in Alt-Az configuration, and 45-degrees below the celestial equator when in mounted on an equatorial wedge.



UNPACKING

Safely unpacking your L-350 mount will require at least 2 people capable of comfortably lifting 60 pounds or more, if you prefer to leave the unit fully assembled. One person can unpack the L-350 by removing the fork-arm from the base motor and moving them separately.

When using a crane/fork-lift or 2(+) people for unpacking and lifting:

- All steps relating to disassembly of the mount should be skipped. The L-series mounts are capable of being lifted while fully-assembled (refer to "lifting points" section of this manual, below).

- Proceed to the "Remove the Drive-Base" segment of this section, below, and uncouple the mount from the crate. The mount will then be ready for lifting.

Required tools/supplies:
- Drill/driver, for removal of crate's wood-screws
- SAE Hex-Key Set

Opening the crate:

- Begin by finding the "front" panel of the crate, which will be marked, by removing the wood-screws attaching it to the bottom, top, and side panels.

- Remove the front-panel.

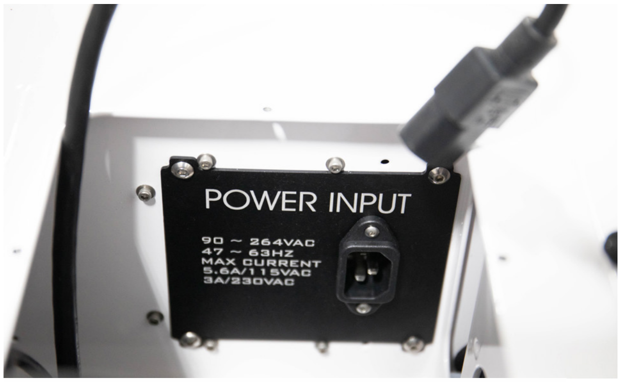
- Next, remove the woodscrews that attach the remaining 3 wall-panels to the bottom.

- Finally, slide the side/top panels (still assembled) off of the bottom of the crate.

Removing the fork-arm:

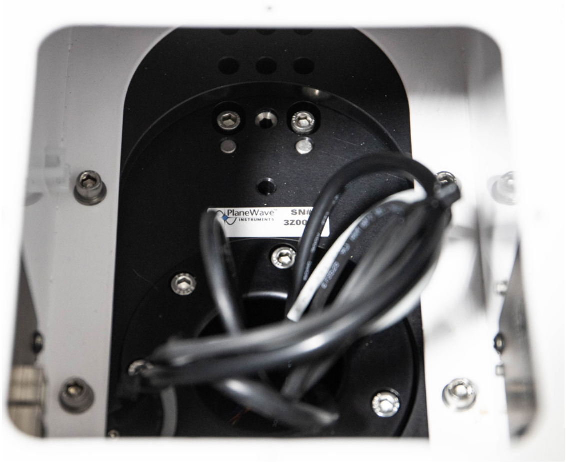
To simplify packaging, your mount has been shipped with the drive-base and fork attached. While it is possible to lift the system in this assembled state with a fork-lift, crane or multiple people, we highly recommend that the two assemblies are separated if only one person is lifting..

1) Begin by detaching the cables within the main cavity of the fork arm. These will include all of the cables plugged into the main electronics panel (USB, encoder signal cable, and base-motor power), shown in the top-right photograph.



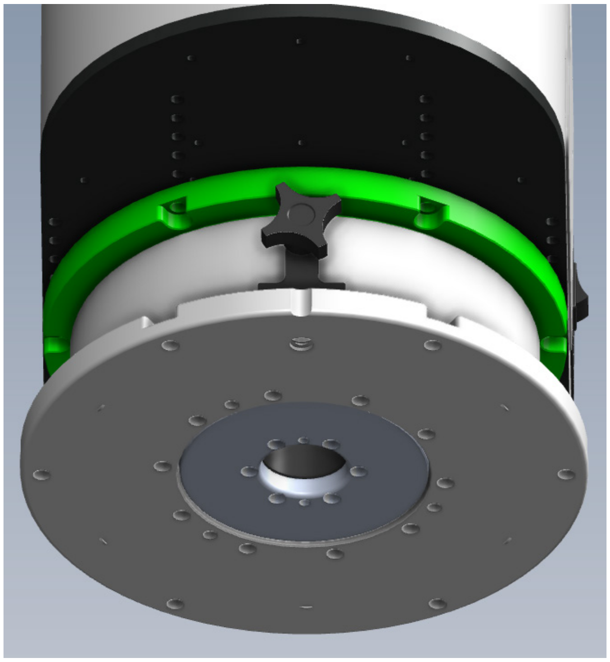
2) The power cable should also be detached from the power input panel, shown in the middle-right photograph.

3) The cables that have been detached should now be carefully fed into the base-motor's passthrough, so that the will not be caught or pulled when the fork-arm is removed from the base-motor.



4) Before removing any of the bolts securing the fork-arm to the base-motor: A) be sure that the Azimuth/RA locking knob is engaged, and B) it is helpful to make a reference mark for later realignment of the two assemblies. Both are shown in the top-right image.

5) Now the bolts holding the fork-arm to the base-motor can be removed. There are a total of 6, at evenly spaced intervals, around the upper perimeter of the base-motor. For reference, 4 of the 6 are shown in the highlighted part of the drawing to the middle-right.



Be careful not to bump or jostle the mount while these bolts are removed. The fork-arm is still being held in place by two shoulder-bolts, but can be knocked over if one is careless.

6) Before lifting the fork-arm, it is recommended that you place something on the ground, nearby, onto which the fork can be set without being scratched. This could be a tarp, old blanket, sheet of cardboard, or even the front-panel of your crate.

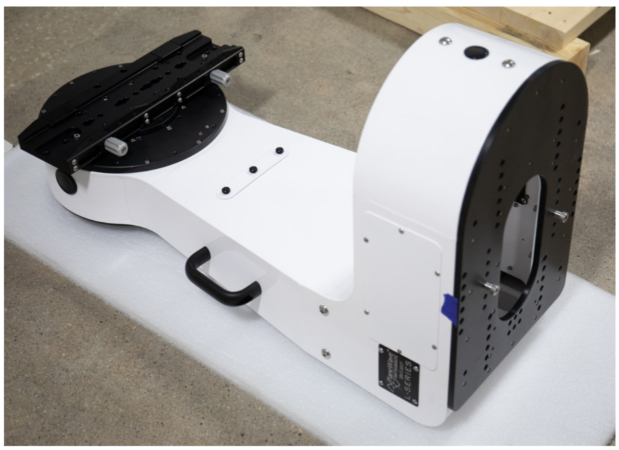
7) See "lifting points" under the Installation chapter.

8) Stand on the fork-arm side of the mount, and slide the fork-arm laterally so that fork-tine moves closer to the base-motor's center of rotation. This is shown in the image to the bottom-right.

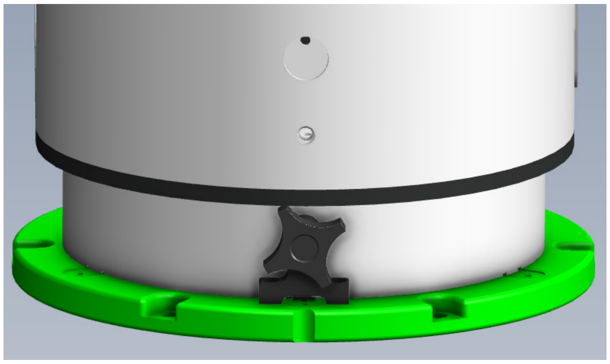
8) The fork-arm is now ready to be lifted from the drive-base. With a good grip on the fork-arm's handles, begin tipping the fork-tine toward you (you should still be standing on the fork-tine side of the mount), as shown to the right.

9) It should now be possible to lift the fork-arm away from the base-motor. Do so carefully, to be sure that none of the cables you addressed previously are snagged or pinched.

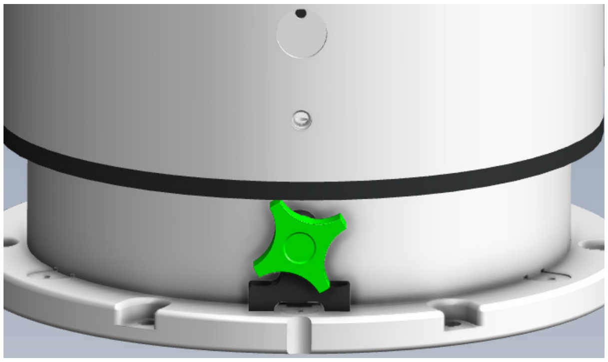
10) Lift the fork-arm away from the drive-base and set it on the surface you just prepared. You should allow the long-side of the "L" to rest on the ground, as it is otherwise possible for the fork-arm to tip over.



Removing the Drive-Base:



1) Remove the 6 bolts from the lower perimeter of the drive-base, which are currently securing the drive-base to the bottom of the crate. The motor flange through which the anchor bolts are attached is highlighted in the model to the right.



2) Verify installation and proper tightening of the Azimuth/RA axis locking-knob (shown in System Diagram 2, at the beginning of the manual, and the model to the right). Not doing so will allow the lifting surface (black-anodized mounting plate for the fork-arm) to rotate, and may make it difficult to lift and maneuver the drive-base.

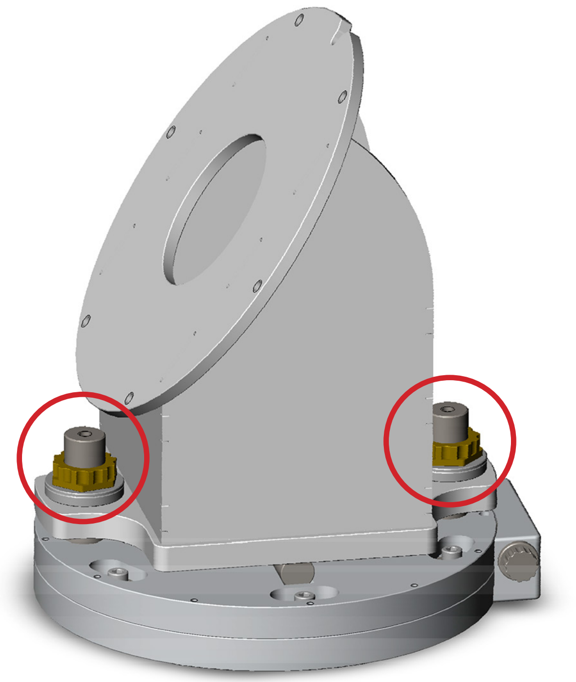
3) Ensure that the cables which connect the drive-base electronics/motor to the main electronics in the fork-arm are safely-positioned, and not at risk of being snagged or sheared.

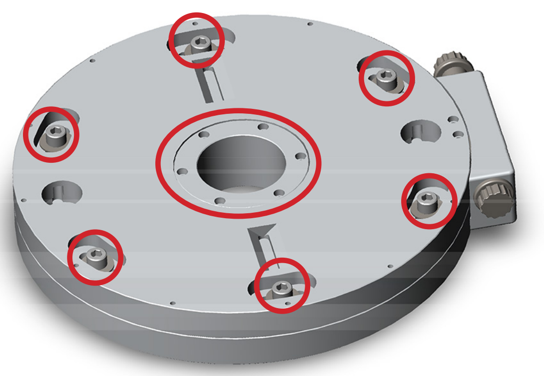
4) The drive-base is now ready for removal from the crate's mounting-plate. However, there is no need to lift it until the pier or optional wedge are ready to receive the drive-base.

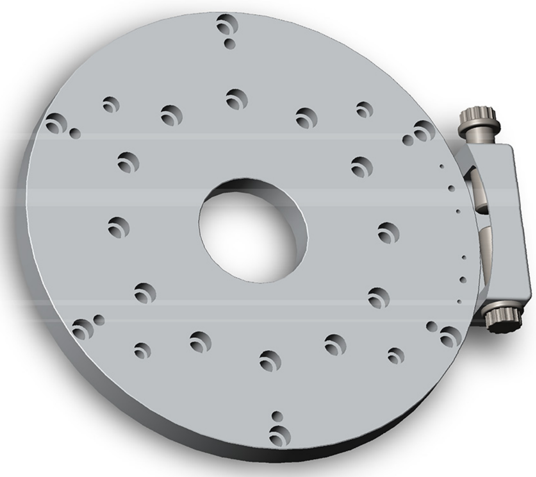
Dovetails / other accessories:

The dovetail saddle and other accessories may be packed within boxes mounted to the floor of the crate. Be sure to open any boxes and inventory the contents.

Unpacking the optional EQ Wedge:







The optional equatorial wedge is fully assembled for shipment. Unpack and separate the sub-assemblies and move them near your pier.

The EQ wedge weighs approximately 100 pounds. While it may be possible for it to be moved while fully assembled, the unit will need to be disassembled to be installed.

The wedge is comprised of three major sub-assemblies: the angled wedge section, the upper mounting plate (attaches the wedge to lower mounting plate), and the lower mounting plate (attaches upper mounting plate to pier)

1) Remove the altitude-adjustment bolts on the north and south side of the wedge, and remove the wedge section.

2) Remove the bolts that secure the un-anodized rotation-hub (located around the center of the upper mounting plate), and remove the hub from the center-holes of the two plates.

3) Remove the six bolts that join the perimeter of the upper and lower mounting plates, and remove the upper mounting plate.

Installation will be addressed below, and should be completed prior to re-assembling the mount after its unpacking.

Important note on the gear-ratio of the L-350 wedge:

- Altitude Adjustment is 0.55 degrees/turn
- Azimuth Adjustment is 0.41 degrees/turn

PREPARING FOR INSTALLATION

Necessary tools, equipment and people:

- SAE Hex wrenches / T-handle wrenches with key sizes up to 3/8". Almost all of the fasteners you will have need to remove, install, or adjust will require these hex-keys.

- An SAE socket-wrench set, with several inches of extension length is required for adjustment of the RA/Azimuth balancing mechanism.

- At least 2 people able to lift 60 pounds comfortably. Please consider the component weights (below) and the weight of your telescope (possiblly with instrumentation attached) before assembling your team. It is important to note the orientation in which the telescope will be loaded, as it is

Alternatively, a crane or fork-lift may be used to lift and place the mount, depending upon accessibility of the observatory and pier to such equipment.

Component weights:

L-350 System: 110 LBS

L-350 Fork-Arm: 70 LBS

L-350 Base-Motor: 40LBS

EQ Wedge (Optional): 100 LBS

Lifting points for people:

Your L-350 mount should not be lifted by one person when fully-assembled. It is reasonably lifted by two people, if the 110LB system-weight is accabltable.

Lifting the full-system:

With two people lifting, each person can grip one of the handles on the fork-arm, placing their other hand underneath the lower sectrion of the base-motor. The image to the top-right shows an L-500 being lifted in a similar fashion.

Lifting the system in parts:

Fork-arm:

The black handles on the fork-arm assembly are excellent lifting points for that segment of the mount. When being lifted by two people, each should grab a handle, using their other hand to support the bottom of the shorter length of the "L".

Do not lift by the access-panel cover handles!

Drive-base:

There are no handles available to lift the drive-base. Instead, the black-anodized mounting-plate that attaches to the fork-arm assembly should be used to lift. It is a good idea to confirm that the Azimuth lock is properly engaged before lifting the motor.

Lififing Points for crane/lift:

Nylon straps should be used to make lifting contact with the mount, when a crane, fork-lift, or other mechanical lift is used.

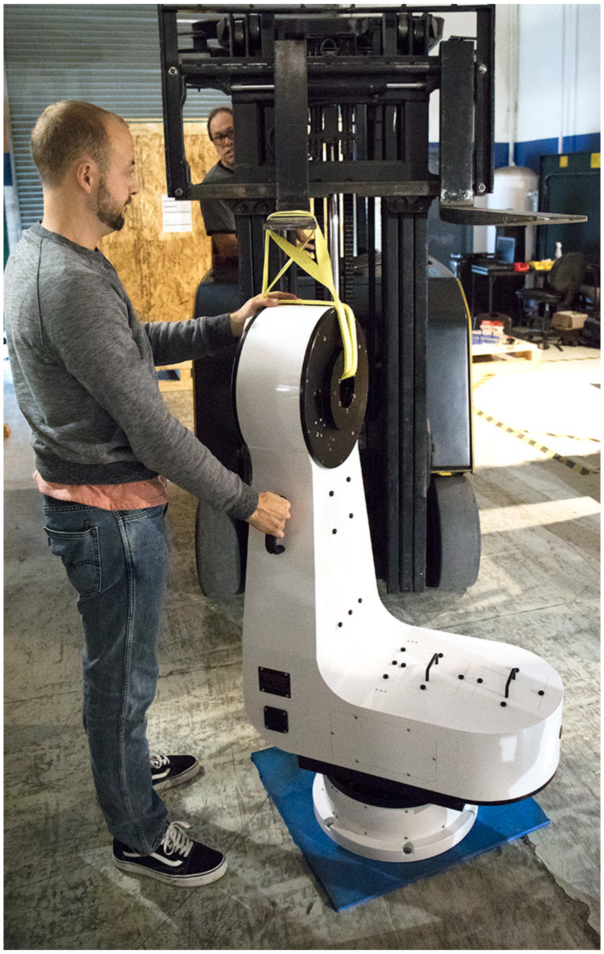
For Alt-Az installation:

Use a single strap, looped through the Altitude-Axis pass-through. This can only be done when the saddle-plate is not installed.

For EQ installation:

Use two straps to hold from both the DEC-axis pass-through and around the top of the drive base. When wrapping the strap around the drive-base, have it extend toward the lift on the side of the drive-base that is opposite the fork-arm, and wrapped at least once around the side of the drive-base adjacent to the fork-arm.

The relative lengths of these straps should be adjusted so that the mount becomes suspended at an angle approximately equal to the inclination of the wedge's mounting surface, simplifying the process of bolting the drive-base onto the wedge.



Hole pattern and pier-interface advice:

In drawing to the right, the interface pattern is described as a 12” bolt circle, with 60-degree separation between holes. These holes should be tapped through with 3/8-16 threads. The mounting surface should be oriented so that North/South align at the midpoint between holes in the pattern, and so that there are bolt-holes directly aligning to East and West.

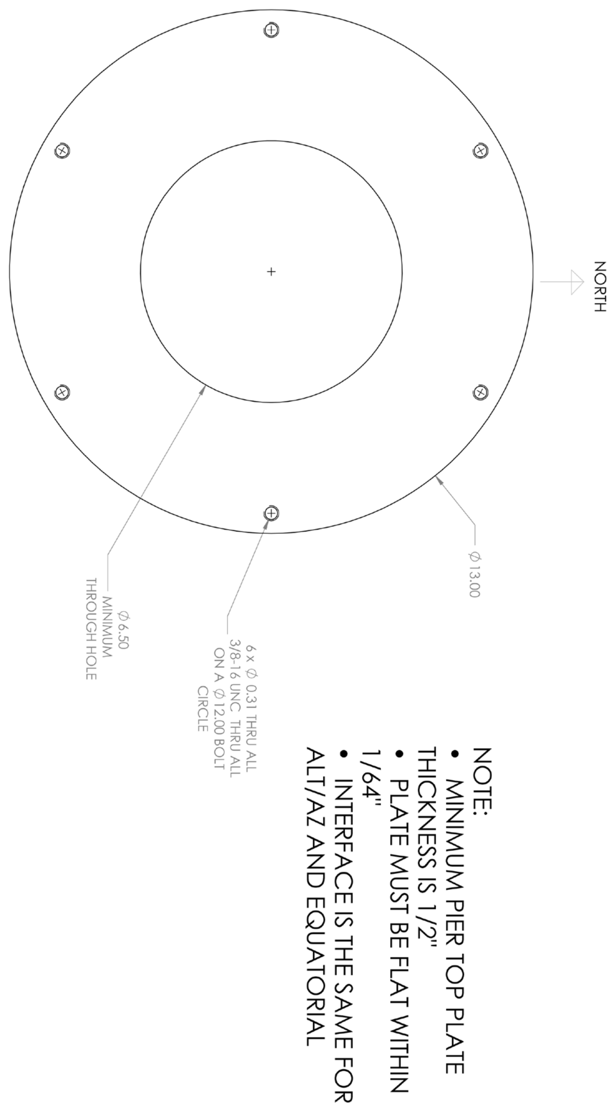
The interface between the pier and drive-base (or equatorial wedge, using the same pattern) should follow one of two approaches:

1) Metal piers or extensions should have their top-plates machined so as to offer threaded-holes that correspond to the drive-base’s hole-pattern.

2) Concrete piers should use an intermediary interface-plate. This plate will have threaded-holes matching the drive-base’s hole-pattern, and then a secondary pattern meant to accept the anchor-bolts placed in the concrete.

While it is possible to place the anchors in the concrete so as to match the drive-base’s hole-pattern (offering threaded rod that would pass through the lower-flange of the drive-base’s perimeter), the tolerances involved will make this difficult and mistakes will be difficult to fix.

The top-plate of the metal-pier or interface-plate mounted to the concrete-pier needs to be level while firmly secured to the retaining-bolts in the concrete. This should not occur through stacking washers, as increased separation of these contact surfaces risks loss of the rigidity your pier-anchoring should provide.



MOUNTING DRIVE-BASE TO PIER

Mounting (Alt-Az-specific concerns):

Leveling:

L-series mounts are fully capable of operating in Alt-Az when not well leveled. However, the drive-base being off level will result in the following challenges (which increase with the extent to which it is off level):

- Pointing and tracking, prior to building a model, will be incorrect and complicate the process of building an initial model.

- Balancing in Azimuth becomes more critical, to prevent this axis from wanting to rotate.

Leveling should ideally be achieved through proper construction of the pier, not through uneven elevation of the drive-base over a non-level mounting surface.

Orientation of NoWrap position:

Please note that accuracy of the NoWrap position to the cardinal directions noted below will effect tracking, prior to building a model. The L-350's NoWrap marker is a notch in the base-flange, adjacent to the Azimuth Lock (visible in the models on page 12).

Northern-hemisphere:

The "NoWrap" mark on the Aziuth-Motor/Base should face true-south.

Southern-hemisphere:

The "NoWrap" mark on the Aziuth-Motor/Base should face true-north.

Before beginning, be sure that cable-routing has been addressed. The power and communication (USB/Ethernet) cables are meant to exit through the bottom-center of the drive-base.

If a metal pier or extension is being used, it should have holes available for both entry and exit of these cables.

If a concrete pier is being used, it should have had a conduit placed at its top-center (exiting out some position on the side of the pier) or a channel in the top (from center to edge) allowing the drive-base to sit firmly and flush on the pier without interference from the cabling.

Installing the base motor onto the pier:

1) Lift the drive-base onto the pier (or interface plate), making sure that the "No-Wrap" marker is correctly oriented (see above), and that cables are properly routed into/over the pier.

2) Secure the drive-base, inserting the bolts through the hole-pattern around its bottom flange and lightly tightening them. To ensure that all go in easily, wait until all are engaged before fully tightening any of the bolts.

INSTALLING EQ WEDGE

Leveling:

Leveling of the wedge, while not critical to the system's operation, needs to be reasonably close to ensure polar-alignment can be reached. This is particularly important if your observatory is at a latitude that is near either limit of your wedge.

Leveling should be achieved through proper construction of the pier, not through uneven elevation of the equatorial-wedge over a non-level mounting surface.

Installing the wedge:

The L-Series equatorial wedge should be assembled on the pier, to prevent its full weight from needing to be lifted.

1) Begin by bolting the lower mounting plate onto the mounting surface of your pier. In the northern-hemisphere, the azimuth adjustment-mechanism will be on the south side of the pier. In the southern-hemisphere, the adjustment mechanism will be on the north side of the pier.

2) Place the upper mounting plate onto the lower mounting plate, and slide the azimuth-adjustment tab into the azimuth-adjustment mechanism.

3) Locate the azimuth-rotation hub and apply a small amount of grease, to prevent galling or unnecessary resistance to motion in the wedge's azimuth axis.

4) Insert the hub through the top-plate, so that it extends into the base-plate, and then bolt it onto the top-plate.

5) Now, attach the top-plate to the base-plate with the 6 bolts passing through the top-plates slotted pattern.

6) Now lift the wedge assembly onto the assembled base/top plates, and set the rocker-pins into the corresponding detents in the upper surface of the top-plate.

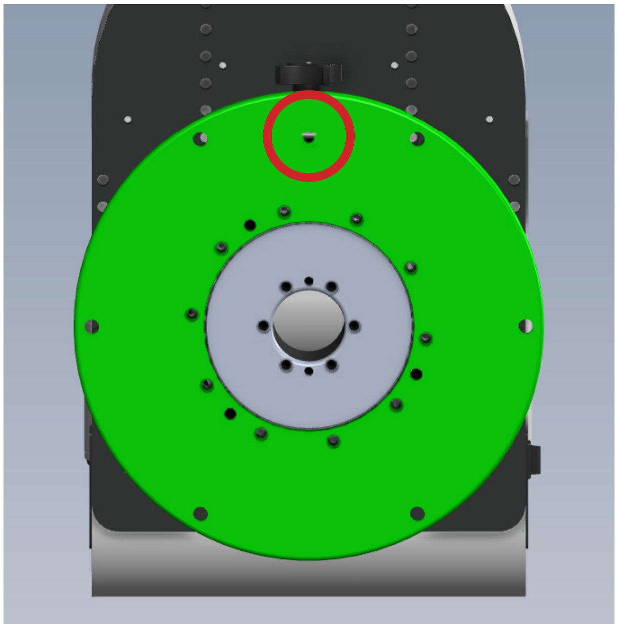
7) Finally, secure the upper wedge assembly to the top-plate using the 2 altitude-adjustment bolts. These should be fully tightened prior to installation of any part of the mount.

TIP:

Before installing the base-motor assembly, it is helpful to intentionally set the wedge too high in elevation, so that the resulting polar-alignment correction will be in the direction of gravity.

DRIVE-BASE ATTACHMENT TO WEDGE

1) While ensuring that power and signal cables (stashed in the motor-passtrough earlier in dissassembly) are safely out of the way, flip the drive-base over, so that its lowest surface is facing up.



2) You will now be able to see a bolt-hole near the perimeter of the drive-base's bottom that is non-symmetrical with the rest of the hole-pattern and is threaded (the location is shown in the model to the right). Insert and tighten the wedge-mounting shoulder-bolt into this hole. It is an important part of positioning the drive-base on the wedge.

3) Lift the drive-base onto the wedge, oriented so that the shoulder-bolt that was just installed settles into the notch at the top of the wedge. (bottom image, right)

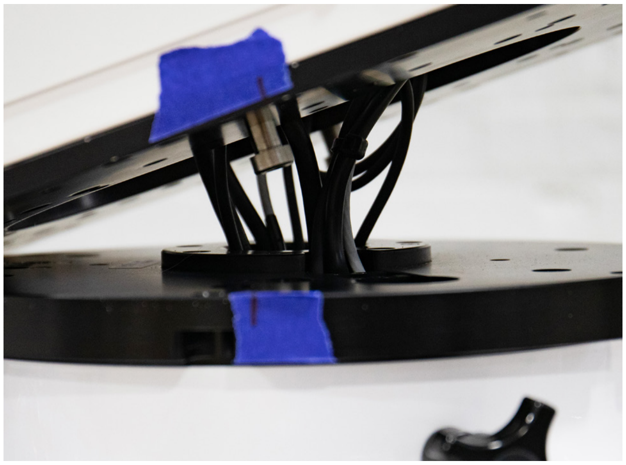
4) Now, shift the drive-base, as needed, to line up the pass-through holes in the drive-base with the corresponding threaded-holes in the wedge.

5) Beginning with the pair of holes nearest the top of the wedge, begin inserting and threading the bolts. To ensure that all go in easily, wait until all are engaged before fully tightening them.

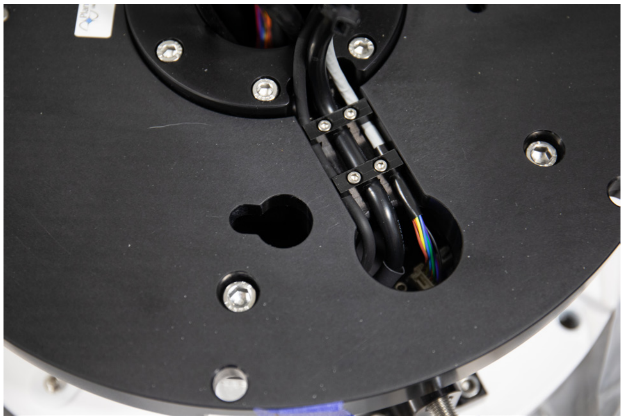
INSTALLING FORK-ARM

The procedure for installing the fork-arm onto the drive-base is common to both ALT/AZ and EQ configurations. This is most easily done with a second person.

For Equatorial installations, please read the section on balancing, installing the fork-arm and instrumentation.



1) First, confirm proper orientation of the fork-arm, relative to the drive-base. Essentially, you are going to do the reverse of the disassembly process that occurred during unpacking.



2) Check tensioning of the azimuth locking-knob. If properly engaged, it will prevent unwanted rotation of the drive-base's interface-plate. (refer to model on page 12, UNPACKING)

3) Make sure that the power/com cables for the Azimuth/RA motor are safely out of the way, and will not be snagged or sheared during mounting of the fork-arm.

5) With the help of another person, lift the fork-arm onto the drive-base. Pay careful attention to the position of the slotted holes in the interface-plate and the corresponding shoulder-bolts on the bottom of the fork-arm.

Place the the shoulder bolts into the larger portion of the slotted-holes.

6) Slide the fork-arm relative to the drive-base to engage both shoulder-bolts in the narrower portion of the slotted-holes. This should re-align the marked tape references you placed earlier.

7) Reinstall the 6 bolts you had removed and set aside during the unpacking process. Refer to bottom image on page 10, UNPACKING.

MOUNTING SADDLE

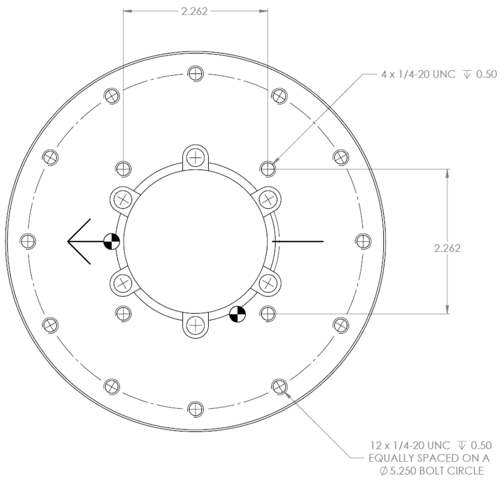
Installing equipment for mounting the main optical-system:

Your L-350 mount has been shipped with a dovetail saddle. Installation is done by bolting the saddle to the hole-pattern on the interior of the Altitude/DEC axis mounting assembly:

1) First, make sure Alt/Dec axis is oriented correctly. The mounting surface for the saddle features an engraved arrow (drawing top, right). This arrow should always indicate the pointing direction of the telescope. So the saddle should be attached with its longer dimension parallel to the arrow. It may be helpful to use a small piece of tape to mark the end of the saddle that corresponds to the arrow's direction.

2) Now, use a hew-key to insert and tighten the bolts that were included with the saddle. The holes for the centered alignment of the saddle to the mounting hub are highlighted in the drawing below.

TIP: If you ever lose "sight" of the sky-side of the saddle, note that this edge of the saddle will be the one pointing up, when the Altitude/DEC axis is against the zenith/pole hard-stop. This position is achieved by rotating the Alt/DEC axis fully clockwise when viewed from the interior side of the fork-arm.



PREPARING OTA

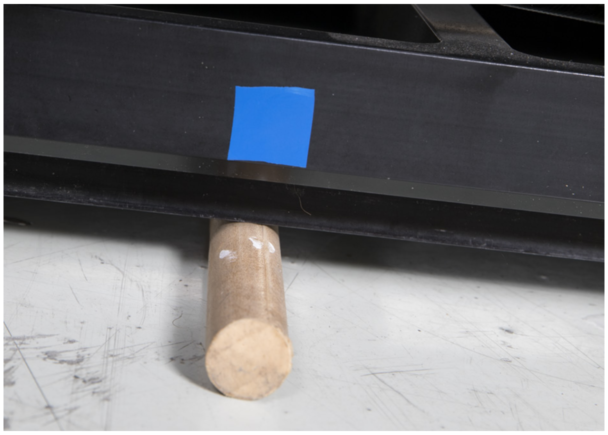
If you have access to equipment (crane or fork-lift) or a sufficient number of assistants, there are advantages to pre-installing your camera and other instrumentation onto the telescope. This will increase the overall weight of the OTA, and the expense of the equipment being lifted at one time. However, you will see significant savings of time and effort when later adjusting balance in the Alt/DEC axis.

Locate the OTA's center-of-mass and the corresponding position on the dovetail. This is most easily done through use of a wooden dowel, or other small, sturdy cylinder:

1) Place the dowel on the ground (or table), next to the OTA. It should be perpendicular to the length of the dovetail and the tube's optical-axis. (image top, right)

2) Have a friend help lift the OTA and set it down, dovetail first, onto the dowel. You should now be able to roll the dovetail atop the dowel, and have created a "seesaw". The position on the dovetail that corresponds to the OTA's center-of-mass has been found where the system balances on dowel. (image middle, right)

3) Use a piece of tape (or white grease-pencil) to mark the dovetail at this position, so that it will be easily visible while loading the OTA. If only marking one side of the dovetail, this should be done on the side that is to your left when looking down the front-end of the telescope. (image bottom, right)



PREPARING SADDLE FOR OTA

1) Rotate the saddle so that it is ready to receive the OTA. This will have it turned at a right-angle relative to the length of the fork-arm. The side you previously marked to indicate the “sky side” of the saddle should be pointed opposite of the mount’s power-switch.

2) Make sure the locking-knob for the Altitude/DEC axis is installed and snug. While you will remove the lock during the balancing process, it is safest to have this in place during initial mounting of the OTA.

3) If using an equatorial wedge, be sure the Azimuth/RA axis is rotated so that the shoulder (or corner) of the fork-arm is nearest to the ground. For reference, the image to the right shows the L-500 in this same orientation.

4) Securely tighten the Azimuth/RA axis locking cleat.

5) Loosen the EZ-Saddle’s clamps (hand-knobs) so that the chucks/jaws open as shown in the drawing below.

6) Check proper orientation of the stability-bar for the EZ-Saddle (covered in it’s instruction sheet). For CDK12.5 and CDK14 systems, the recessed side should face the dovetail.

POSITIONING OTA

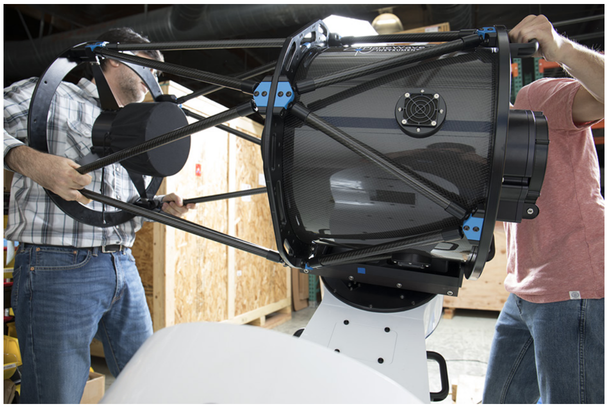
The reference images to the right show a CDK17 being loaded onto a L-500, but this process is identical for the L-350.

1) Lift the OTA up and onto the saddle. This process is safest with 2 or more people. Additional people will be needed for larger optical-tubes, and where weight/person considerations require more for a comfortable and safe lift. (image top, right)

Be sure that the rear-cell of the telescope is on the same side of the mount as the power-switch located on the fork-arm.

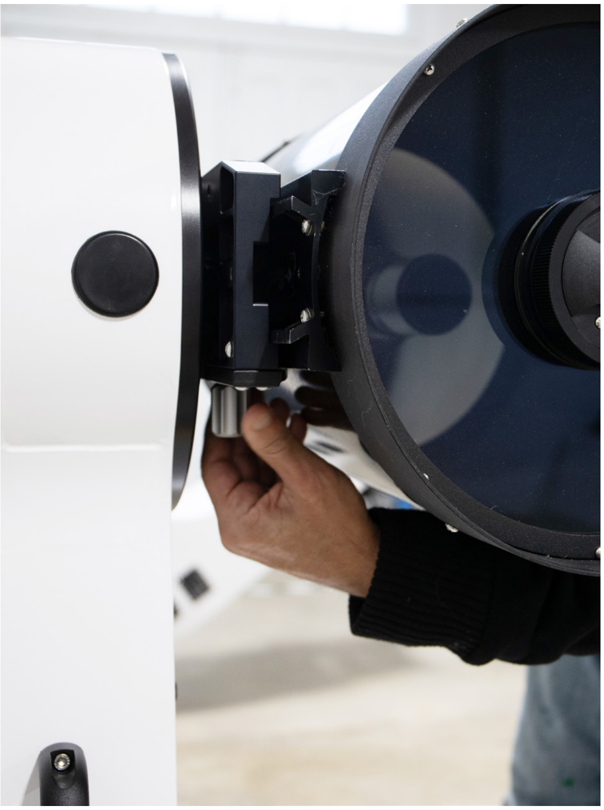
2) Rest the lower edge of the telescope's dovetail on the saddle's attached jaw, so that the two are fully mated. (image middle, right) Make sure that the OTA's dovetail is actually seated in the dovetail-groove of the saddle, and not being supported by the stability bar.

3) Slide the dovetail along the saddle's jaw until the tape or mark you used to reference the Alt/DEC balance-point (page 23, PREPARING OTA) is positioned directly above or below the saddle's rotational axis while the saddle is square to the length of the fork-arm. (image bottom, right)



SECURING THE OTA

It is recommended that you have another person assist you with lifting and holding the OTA during this process.



1) Lift the OTA up into the saddle. The EZ-Saddle's stability bar can be used as a location reference, but it is important to visually confirm that the dovetail is properly seated in the saddle.

2) With the OTA naturally wanting to roll away from the fork-arm, it is necessary for one person to continue holding the OTA, applying pressure upward and toward the saddle. Otherwise, the dovetail may not fully seat in the saddle.

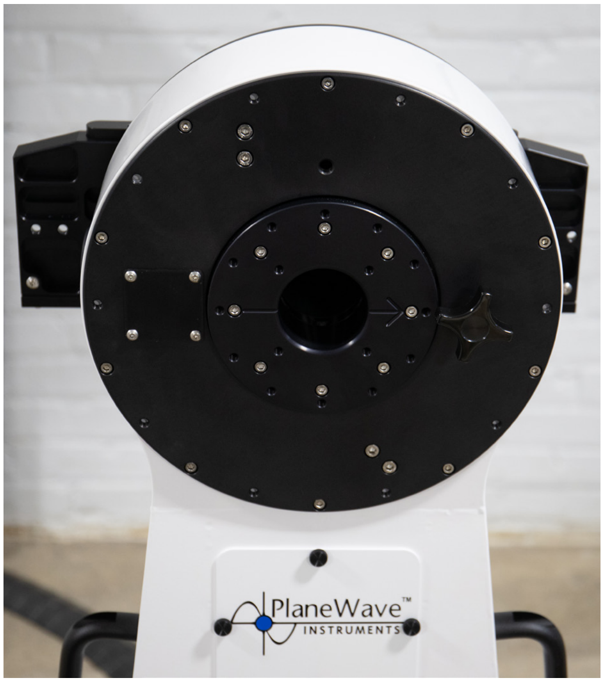
3) Being sure that the dovetail is properly seated in the saddle, proceed in fully tightening the saddle-jaw's bolts. It is recommended for this to be done using a hex-key.

4) Double-check that the dovetail is fully seated and secured in the saddle before everyone lets go.

5) You can now remove the Altitude/DEC axis locking-knob to check balance, covered in detail on page 28-29.

INSTALLING SECOND SADDLE

The basic principles of attaching the secondary saddle are the same as for the primary.



Both mounting surfaces of the Altitude/DEC axis feature bolt-patterns that will accomodate the Keller EZ-Saddle (for the CDK12.5, CDK14 and compatible with Losmandy D-series style dovetails, and similar from Celestron, Meade, ect.).

Before mounting the saddle, the Altitude/DEC locking knob will need to be removed. This means that the primary OTA/system needs to be relatively well balanced.

Mount the saddle:

1) Ensure that the hole-pattern used causes the secondary-saddle to point at the same angle as the main OTA's saddle.

2) Fully assemble and install the secondary telescope's instrumentation (if possible).

3) Find the secondary OTA's center of mass, and accordingly mark the dovetail for reference of balance during mounting.

4) Prepare the saddle to receive the telescope's dovetail (varies by saddle).

5) Lift the telescope into the saddle.

6) Slide the dovetail within the saddle to place the balance-mark above the rotational-axis.

7) Engage the saddle, ensuring that the dovetail is properly seated and secure before letting go.

BALANCING: ALTITUDE/DEC

First, roughly balance the Altitude/DEC axis of the system. If you followed the preceding guidance regarding finding, marking, and placing the center-of-mass reference, rough balance should already be achieved. Any additional adjustment to balance must be made similarly:

1) Slightly loosen the bolts on the saddle's jaw.

2) Adjust the position of the dovetail/OTA as follows:

If the back of the telescope is heavier:
It is recommended that two people are involved. Push/pull the telescope so that it slides forward in the saddle. With care, the telescope can be pointed slightly downward, allowing gravity to help slide the telescope within the saddle.

If the front of the telescope is heavier:
It is recommended that two people are involved. Push/pull the telescope so that it slides backward in the saddle. With care, the telescope can be pointed upward and allowed to slide within the saddle.

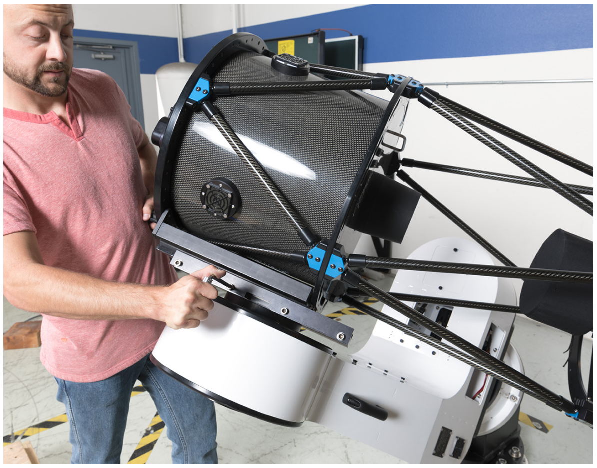
3) Retighten the saddle.

4) Check balance and repeat the above as needed, until the Altitude/DEC axis is balanced well enough to not settle with the brake engaged.

5) Install any other instrumentation (cameras, filter-wheels, finders, focusers, guide-scopes, etc.) that will be part of the system, and then rebalance.

Be sure that all planned cable-runs have been completed (for power/com to instrumentation and accessories) before determining final balancing. Recommendations on cable-routing are covered later in this manual.

6) Now refine balance as needed. The process will be identical to the process of achieving rough-balance, except the adjustments will be smaller. Continue refining balance until the system does not "settle" (i.e. move without force applied) in the Altitude/DEC axis.



BALANCING: AZIMUTH/RA

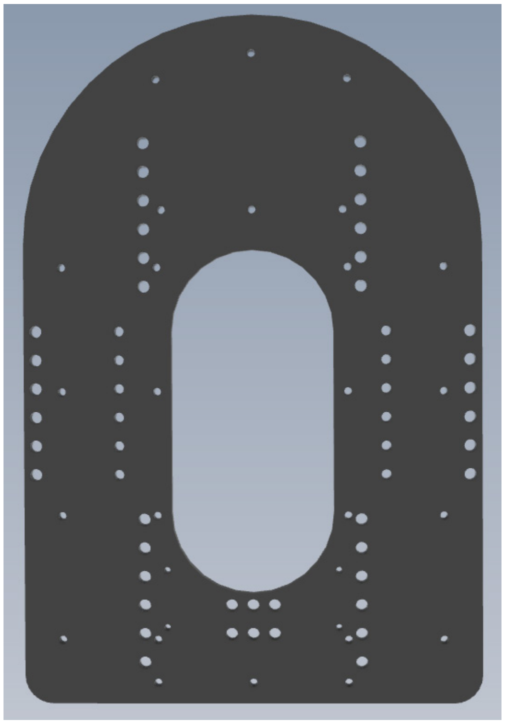
Balancing the Azimuth/RA Axis currently involves two forms of adjustment::

1) Shifting the fork-arm, relative to the Azimuth/RA motor, on the bolt-patterns that join the two assemblies.

2) Attaching counterweights to the 1/4-20 threaded holes on the fork-arms interface plate (to the base-motor), shown to the right.

In the near future, PlaneWave will offer an optional balancing accessory system for the L-350. In the meantime, please start from the general recommendations below, add weight as needed and call our technical support staff for guidance, if needed.

In the photo to the right, the shoulder bolts are visible. This photo corresponds directly to the drawing below it. Against the position references for the shoulder bolts, noted below, top-hole in the row of 6 is #6, and the bottom hole is #1. In the photo, the shoulder bolts are installed in hole #4. Recommended shoulder bolt starting points for balance:



L-350 with CDK12.5 & Standard Focuser:
- Shoulder bolts in #3

L-350 with CDK12.5, Standard Focuser, and 5LB Camera/CFW combo:
- Shoulder bolts in #4

L-350 with CDK14 & Standard Focuser:
- Shoulder bolts in #4

L-350 with CDK14, Standard Focuser, and 5LB Camera/CFW combo:
- Shoulder bolts in #5

L-350 with CDK14, IRF90, and 5LB Camera/CFW combo:
- Shoulder bolts in #5

POWER/COM CABLING FOR MOUNT

The L-Series mounts are shipped with the USB cable and internal wiring for motors and encoders pre-installed. However, the main AC power-cord (and optional Ethernet) cable are not installed prior to shipment. Both AC and communication cables must be connected before the mount can be opperated.

Connecting the AC power-cord and USB cable:

1) Plan the path:

The AC power-cord socket and USB cable socket are located within the mount cavity below the access-panel that is centered on the top of the lower section of the fork-arm. They will be fed through the cable pass-through at the RA/Azimuth Axis center-of-rotation. Whether it will be more convenient to drop through from above, be pushed up from below, or pulled up from below by a tether is ultimately related to the cable-routing that will take place through the pier and beyond.

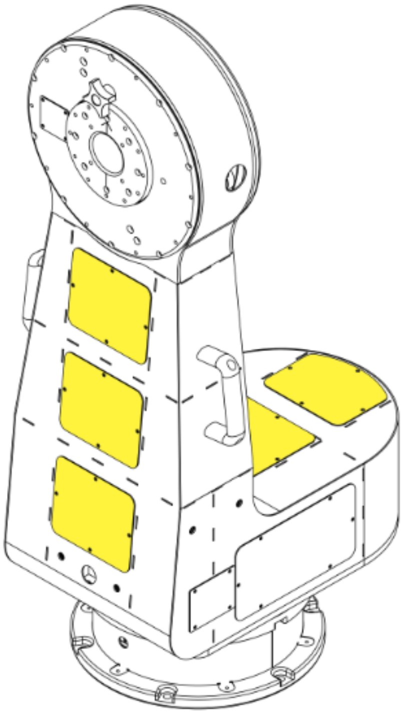
2) Plug in:

Plug each cable into its respective socket, inside the mount. Then attach to the AC source and USB port on your PC or hub.

If Ethernet will be used for PC/mount communication, instead of USB, cable-routing will proceed identically. The Ethernet socket is located on the same electronics panel as the USB socket.

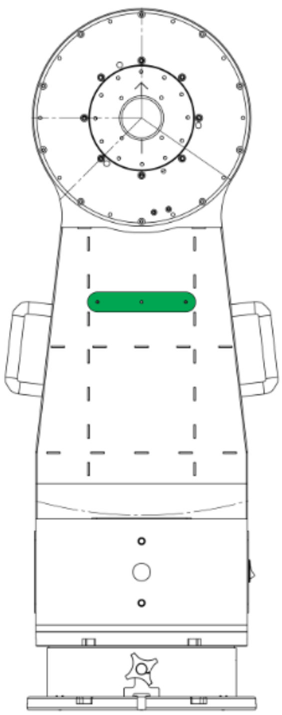
CABLE ROUTING FOR ACCESSORIES

The L-350 offers an appreciable volume of storage space within the fork arms' cavities. The resulting compartments offer routes back to the RA/Azimuth motor pass-through, and allow the storage of accessory power supplies, USB hubs/extenders, network switches, and other small devices. Cabling that needs to run between these peripheral devices and the outside world will be routed through the RA/Azimuth pass-through, as described for the mount's power/com cabling on the previous page.



In the highlighted drawings to the right, you will see views of top and outside fork-arm surface, and inside fork-arm surface, in descending order. The green-highlighted, smaller panel should be used to pass cables from within the mount to instruments on the telescope. The yellow-highlighted panels can be used to place items, such as power-supplies (for camera, EFA, etc.), within the compartments.

The compartments that stow the mount's electronics have access-panels attached with button-head screws. Compartments meant for accessory storage use panels attached with thumb-screws.



Before placing power-supplies or other peripheral electronics within the mount, plan out your cable runs to be sure you have enough length in the right places. Remember that when using the suggested (green) panel for your cable-runs to the rear of the telescope, the longest distance will be required when telescope is pointed at the horizon (Alt-Az) or the horizon opposite the celestial pole (EQ).

Caution: Unnescessarily long cable runs between the mount and OTA increases the chance of snags. Also, be certain your cable runs avoid the area of the fork-arm that can be covered by the dovetail/saddle, to avoid "scissoring".