Installation Manual–Belt Alt Drive (1993)

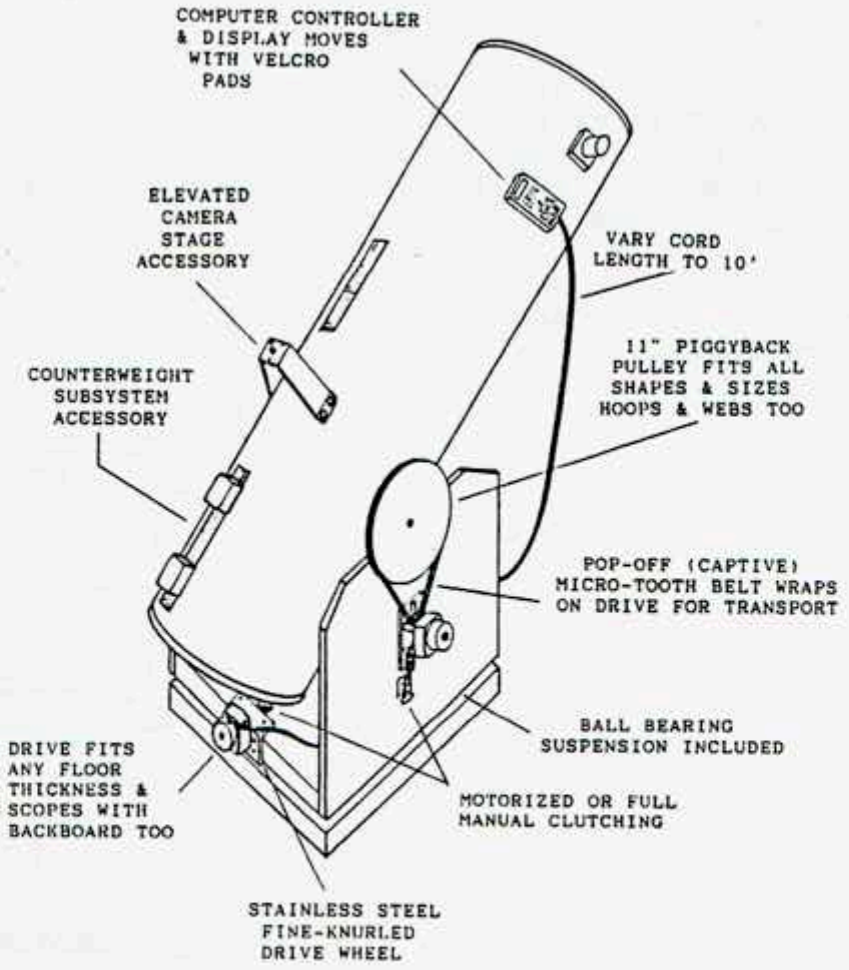
Operating manual begins on page 11.

DOB DRIVER INSTALLATION INSTRUCTIONS
Install.dd2

INTRODUCTION: Welcome to a new era in telescope utility. Your Dob Driver will allow you to vastly improve the use of your Dobsonian style mount and many other telescope mount types, if adapted properly. For best results at high magnification and/or photographic work, pay close attention to detail during the installation process, and check out the performance improvement section.

WE STRONGLY URGE YOU TO READ INSTRUCTIONS CAREFULLY FIRST--AND DETERMINE THAT YOU CAN INSTALL THIS EQUIPMENT ON YOUR TELESCOPE--AND INSTALL IT PROPERLY. TECH 2000 WILL NOT BE RESPONSIBLE FOR ANY DAMAGE OR ALTERATIONS TO YOUR EQUIPMENT.

TOOLS: Screwdrivers- flat tip & phillips
Small hand saw (a scroll saw with a "C" shape frame is especially useful if you have it)
Drill, bits... 1/2" (available with 1/4 drill shank)
1/4" 1/8" 5/32" 3/32" 1"wood bit



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----AZIMUTH INSTALLATION----

Refer to fig 1 and template 1. The azimuth drive motor installs in a cut out notch at the center rear of the base of the turret and rotates the turret clockwise or counter-clockwise with it's drive wheel. WHEN DONE, THE WHEEL AXLE OF THE DRIVE MUST POINT TO THE PIVOT BOLT OF THE BASE. MAKE SURE THE DRIVE WILL NOT INTERFERE WITH YOUR PARTICULAR SCOPE DURING MOVEMENT IN ALTITUDE.

1. Unbolt ground board. Remove any Teflon and any stapled or nailed on items that are between the bearing surfaces.

2. Line up template 1 on top of turret base and punch 4 points as instructed on template. If your turret base is round, you will need to cut off a straight section first to match the length of the drive mount cleat. Mark lines for cutting. IF YOU HAVE A BACKBOARD YOU MUST CUT A THIN SLOT FOR THE DRIVE BRACKET FIRST.

3. Drill 2 holes (any size) clear through the base at the inside corner marks to make it easy to cut around corners. Cut out the notch along your lines using a hand scroll saw, drilling a row of holes, or whatever means you have. It doesn't have to look pretty since the drive bracket will cover it. It should look like fig 1.

4. Place azimuth drive with wheel down into slot. Saw out a bit more wood if necessary to fit it in fully. A tight fit is not necessary nor desired.

5. While holding the drive unit tightly to the wood, deeply mark centers of the 8 screw holes with a nail or a phillips screwdriver. Wrap a piece of tape 1-1/4 inches from the tip of a 1/8 drill bit and drill 1-1/4 inches deep, as straight in as you can, all 8 screw holes. For 3/4" thick bases add a spacer block.

6. Install the drive with 8 1-1/2 inch stainless steel screws provided. 3/4" bases and scopes w/ backboard will leave 2 mount screw holes empty.

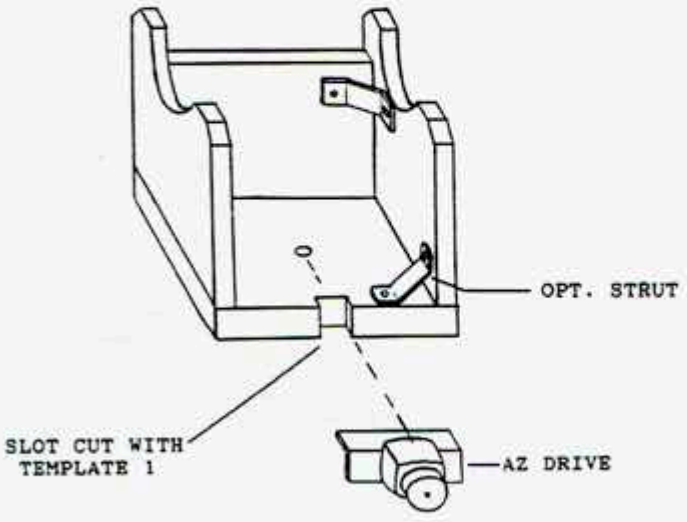


FIG 1 - AZ DRIVE INSTALL

--- AZIMUTH BEARINGS ---

Azimuth bearings replace and reduce the friction caused by the pads typically used on Dobsonian type mounts. These bearings will allow the drive unit to pull the turret around without slippage of the drive wheel, and allow a faster maximum speed adjustment for pan mode. Two bearings and the drive give a 3 point footing and let the weight of the scope apply maximum pressure to the drive wheel. Light scopes can use 1 roller 1 pad. ROLLERS MOUNT TO THE BOTTOM OF THE TURRET BASE ON THE SAME SURFACE AS THE DRIVE WHEEL -- NOT TO THE STATIONARY GROUND BOARD.

1. Refer to figures 2 and 3 for this operation. Draw 2 lines approximately 125 degrees from the drive wheel, passing through the center of the pivot bolt hole as in fig 2. Note: spacing 125 instead of an equidistant 120 deg will cause a bit more weight to rest on the drive wheel - a better bite for non-slip performance.

2. Measure the distance from the center of the pivot hole to the center of the drive wheel. Measure & mark the same distance LESS 1/2" along the 2 bearing lines you just drew. The 1/2" less lets the bearing wheels ride on their own smooth track, not on the same path as the drive wheel. If you have a round turret base, mark at a place that will not allow the bearing axle to stick out beyond the rim of the wood when the bearing is installed.

3. Refer to fig 3. Using the 1" wood bit, bore a hole a little more than 1/2 inch deep where the bearing-location-marks cross so as to form a well for the bearing wheel.

4. Drop the wheel into the wheel well. Line up axle center along your line to the pivot bolt hole. Draw a line around the shaft. With a wood chisel or sharp screwdriver, hammer out a narrow slot for the axle to sink down in. Work carefully so as not to sink the shaft too far in, nor allow the shaft any side-to-side or end movement. Start with a small V slot and keep checking the fit by lightly hammering the shaft (stay away from the wheel) until the wheel protrudes from the surface about the same height as the drive wheel. Keep the axle pointing directly to the pivot hole.

5. Hammer the 2 large 'U' nails over the axle to retain the assembly. Check that wheels roll smoothly under high pressure.

FIG 2 - BOTTOM VIEW OF TURRET BASE

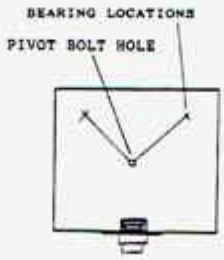
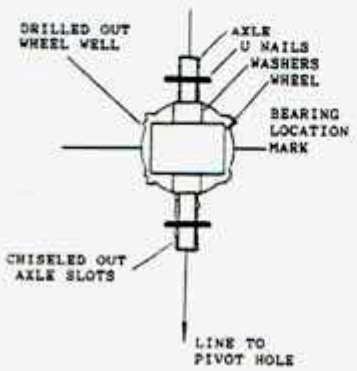


FIG 3 - BEARING INSTALL



--- QUICK-RELEASE INSTALLATION ---

The Quick-Release device installs near the AZ drive and is a fast method to lift the AZ drive wheel from the surface, allowing the scope to be moved in azimuth quickly by hand and for transport and storage of the scope without scraping the drive wheel against the ground board. See fig 4.

1. Mark a point about 3/4" away from the AZ drive mount cleat on the top of the turret base. Between the wheel and pivot hole is best and maybe a bit toward the eyepiece side for easy access but in any case, MAKE SURE THE SCOPE TUBE WILL NOT HIT THE HANDLE. Drill a 1/2" hole all the way through your mark.

2. From the bottom, screw in the threaded insert using a large screwdriver or the Quick-Release handle until it is just below the surface. If your equipment is over 100LBS it is advisable to smear a little epoxy on the walls of the hole for strength and moisture seal. Remove & reinstall threads for this.

3. Install handle as in fig 4. Place the UHMW strip centered on the tip. Line up the length of the strip in the direction it will travel during scope rotation, then mark and drill two holes and install the two brass screws until they are just below plastic surface (plastic should be loose).

4. Make sure that twisting the handle will lift the drive wheel off the ground board about 1/16" (the thickness of a penny), and retracting the handle does not allow the screw heads to drag on the ground board - if they do you may need to sink the plastic strip into the wood a little by chiseling.

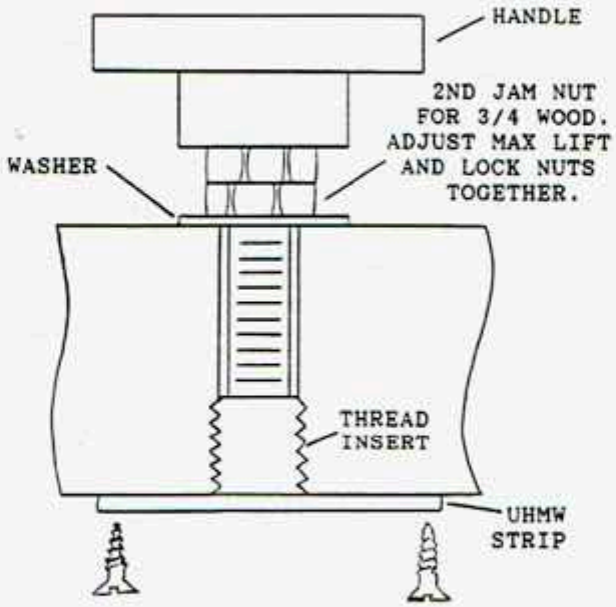
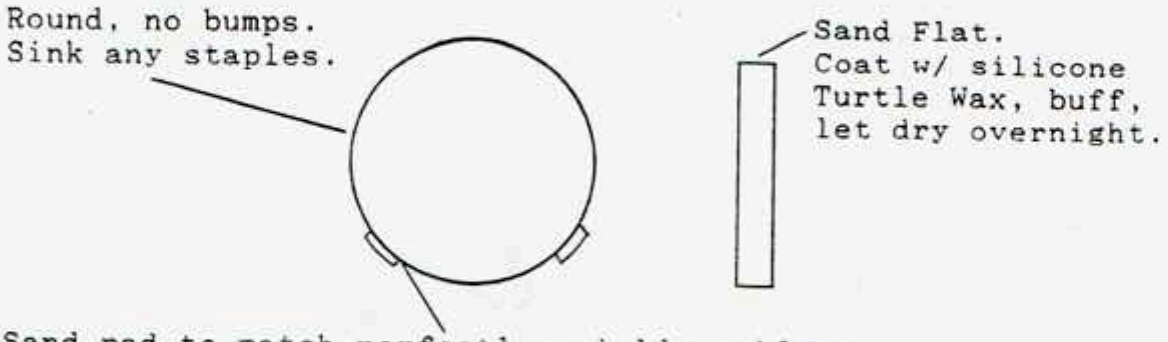


FIG 4
QUICK RELEASE

--- HEAVY DUTY ALTITUDE INSTALLATION ---

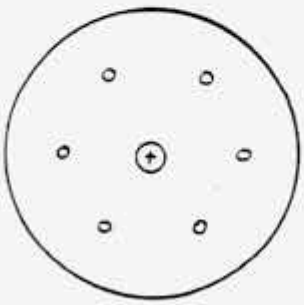
1. Perform altitude bearing improvements as described in 'Performance Improvement' section.

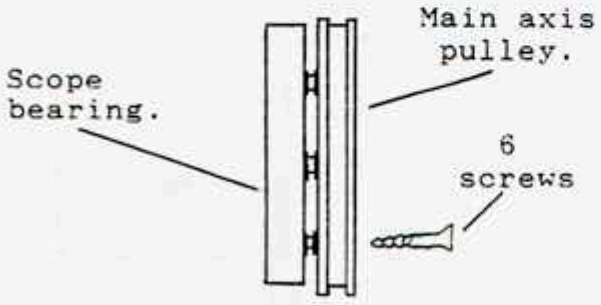


2. ATTACH MAIN AXIS PULLEY. Prepare to mount on eyepiece side of scope. Mark center of rotation on scope bearing. Mark how far out the screw holes will be on the concentric-circles template paper provided, center the template on the main axis pulley & poke the start location of 6 holes. The pulley is supplied undrilled to fit various bearing types including hoops & web styles - in which case you need to use self-tapping machine screws instead of the brass wood screws provided. Users with hoop bearings may place blocks of wood inside the hoop. Place the holes out as close to the rim of the main axis pulley as possible, but keep them 3/4" or more away from the rim of the pulley AND 3/4" or more away from the scope bearing rim if it is wood.

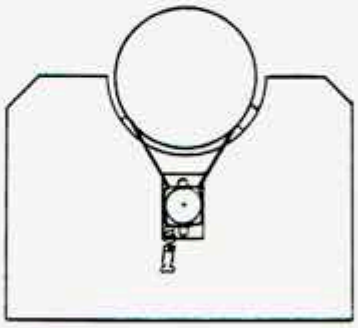
Drill through the pulley at your hole locations using a 5/32" drill. Countersink to fit the brass screw heads. Pop out center dust cap & line up pulley on your center of rotation mark on scope. Hold firmly and mark center points for screws on your scope bearing using a thick shank phillips screwdriver or similar method to maintain hole center accuracy. Keep this pulley as close to 'on-center' of scope rotation as you can - but dead accuracy is not critical.

Mount pulley using brass screws, spacers & washers as shown (if needed). Pop in hole cap.

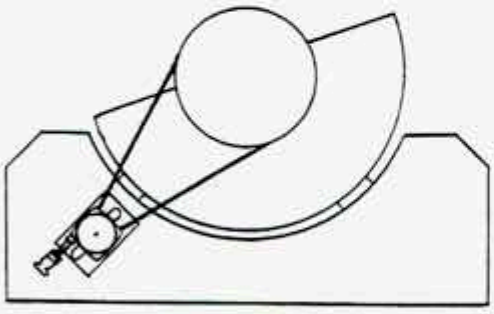




Step 3 - MOUNT DRIVE. Unfurl drive belt, wrap on pulleys, pull drive down to stretch belt taut. Keep the 2 slots of the slide plate lined up to point approximately at the center of main axis pulley (belt is spaced equally from left & right motor posts). Move the drive straight down or to any other position that will accommodate the drive unit and the adjustable spring-latch assembly.



Typical location - 38" belt



Alternate location
Up to 51.84" belts available

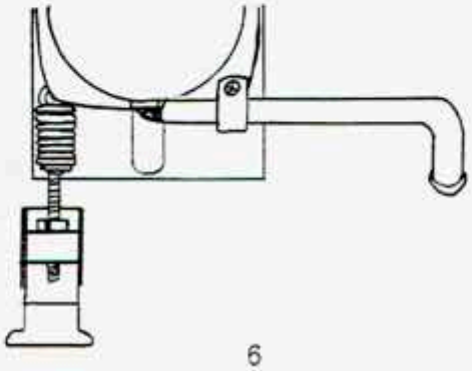
Mark centers of the two slots of the slide plate (remember marks should line up with center of main axis pulley).

Move drive unit aside, drill 1/16 pilot holes on your 2 marks, straight in. Drive in 2 #8 x 3/4 stainless steel screws and back them out again and remove. Slide the 1/8" long collars on the screws and this time mount the drive with them. The collar fills the slot width. Not too tight - the drive should slide full travel smoothly.

Add or delete washers supporting the main axis pulley until both small and main pulleys are in alignment.

Step 4 - MOUNT SPRING-LATCH ASSEMBLY.

MAKE SURE the adjustable screw on the latch has only about 8 threads visible on the tip where it protrudes out of the rotating nut. Pull the latch (& belt) taut. Line up the spring and latch until it is parallel to the imaginary line of the slide plate slots and can pull the drive to tension the belt - handle down! Hold firmly in place, flip up handle and mark through the 2 holes in the base of latch. Move latch aside and drill 2 1/16" pilot holes, run in 2 #6 x 3/4" stainless screws and remove again. Re-position latch with the spacer pad provided under it and install the screws.



5. ADJUST TENSION With latch open, loosen locking nut & turn screw until the spring expands about 1/16" (penny thickness) between coils when latched. Tighten locknut. Tension is adjustable - it is correct when an audible tone is heard when 'plucking' the belt. Very large scopes may need a bit more than 1/16" gap between coils. DO NOT OVERTENSION - IT WILL DECREASE LIFE OF THE SHAFT BEARINGS.

6. ROUTE WIRE CABLE. Arch the wire cable through a 1/4" hole located about 2" from the slide plate as shown in step 1 diagram. Bend sharply on the inside toward the front wall & apply a cable nail provided to keep it away from the scope.

7. TEST FOR NO-SLIP OPERATION. When electric control is installed, jog the scope up & down in altitude at maximum speed in your worst case unbalanced condition at all elevation angles, scope should NEVER be unbalanced so as to nose-up or down by itself - that is a problem to watch for with any motor-driven telescope. Watch carefully for any slippage of the belt on the main axis pulley. If no slip is visible, your done for now. Do not exceed 1/8" gap on the spring coil adjustment.

If slip is visible, or if non-uniform speed is later seen in the eyepiece, make sure all your altitude bearing surfaces & support pads are flat and smooth and mated uniformly, no belt misalignment, and no staples or lumps interfere with uniformly smooth tube motion. Consider corrective balancing weights, the tube should NOT have a tendency to 'nose-down' or 'nose-up' by itself when the drive is disconnected.

Then only if necessary, add the friction strip supplied to the groove in the main axis pulley. Or consider replacing one or more teflon pads with a roller wheel in the case of very large instruments.

If using the friction strip, and if the drive as mounted does not unload its weight off the belt when fully unlatched, you may embed a screw in the wood just above the slide plate and adjust it so it will drag beneath the slide plate just enough to hold the drive in the full up position. This will keep the belt from abrading when moving the tube manually.

USAGE. Latch on to drive. Latch off to go manual. Stow the belt for transport by gently wrapping it around the motor posts and tuck the last bit in between the small pulley hub and a post. Be careful not to kink or pinch the belt as it is a low-elongation type and is therefore somewhat brittle.

--- PENDANT INSTALLATION ---

1. PENDANT LOCATIONS. The pendant attaches with Velcro to the scope. Place one piece on the scope tube near the eyepiece anywhere down the tube from the eyepiece (the pendant will be oriented with the eyepiece view during use). Check that the cord is long enough to reach as far as you plan it to go, else install the Velcro closer toward the mount. More Velcro is provided for convenient attachment of the pendant to the outside and inside of the mount itself when the scope is in transport. You may wish to round off the corners of these Velcro pieces with scissors, cut them into several pieces, or make them completely round, etc.

2. TERMINATIONS. Decide where the terminal connection strip will go. Usually on the inside of the mount where power connections can be made (power cords are usually left attached to the terminals and the power cable just coiled on the floor for transport). Make sure each drive motor cable will reach the terminal strip. Mount the terminal strip with the red Lexan label beneath it. The label shows where each wire color goes for PENDANT, AZ(RA) MOTOR, ALT(DEC) MOTOR, and +12vdc and Ground from your power source. Clamp each wire cable down firmly with the cable nails provided so the connections will not be stressed.

3. PENDANT ROUTING. The pendant control cord may enter the mount over the front wall, or drill a hole in the front or side wall. Coil up excess cable & nail in a cable clamp to restrict how much cord can be drawn out of the mount for your particular setup. To stow the pendant, push the cord back into the mount through the cord hole & stick the pendant to Velcro (inside or out depending on your taste and mount type).

--- PERFORMANCE IMPROVEMENT ---

Read the operating instructions and become familiar with the use of DOB DRIVER, making sure everything operates as it should. After this you may decide to perform some of these enhancements, which end up reducing the frequency of rate corrections during use at high magnifications. These enhancements are usually required for photo work, group viewing, and large equipment.

1. To provide continuous 360 degree rotation and simplified wiring the AZ motor and bearings were designed to be mounted on the moving portion of the turret (rocker box). This obsoletes whatever material was previously used on your turret bottom for a flat bearing surface. The top surface of the ground board where the azimuth drive and bearing wheels track needs to be FLAT. Minor bows in the surface are not a problem since they represent large periods of time - these errors are easily corrected out by Dob Driver. It is the small ridges, rilles and lumps that the wheel contact points encounter which can cause extra fussing with the corrector controls. Remove any major bows on the ground board where possible. Sand the path of the wheels with coarse sandpaper

using a large FLAT block. Use generally random stroke patterns (similar to making an astronomical mirror!) and go on for a long time. Apply a Formica scrap from your local lumberyard using thinned contact cement (walk all over it to place it in intimate contact with the surface of your ground board) or paint the surface with a hard paint if your instrument weighs less than roughly 30 lbs.

2. A similar requirement may be needed for the altitude bearing surface. Altitude bearings usually are surfaced with something already and sanding this surface with a 100 grit strip, holding only the ends of the strip (like buffing a shoe), can make dramatic improvements in smooth error-free tracking. A rough finish is better than a smooth one! It is surprising once you start sanding this way as peaks and valleys begin to become visible where they were not visible before.

3. Your azimuth pivot bolt should not be tight nor allow too much side-to-side motion, even if its nut is loosened. You possibly could use a better or larger smooth shank axle bolt with a bronze sleeve bearing to fit it (true axle bolts and sleeve bearings are available at hardware stores). Rigidly hold bolt vertical by embedding nuts on both sides of board. Be sure to have the AZ drive quick-release jacked up before tightening a pivot bolt. THIS BOLT CAN COCK SLIGHTLY & CAUSE BINDING - RESULTING IN THE AZIMUTH DRIVE WHEEL SLIPPING. YOU SHOULD BE ABLE TO ROTATE THE SHAFT EASILY WITH FINGERS WHEN THE DRIVE IS ENGAGED.

4. Most 'scopes have UHMW altitude bearing pads. Change these to larger (wide & long) VIRGIN TEFLON pads for better slow-motion smoothness at hi-mag. Cut a long strip of 100 grit sandpaper to match the bearing disk width (which you sanded true - remember?) & tape it to the proper location(s) with grit facing outward. Mount up the scope & rock it until teflon pads are sanded down to match the disk face. Amazing improvements in smoothness usually result from this simple exercise in PSI distribution. Apply **silicone** wax regularly to the surface of the altitude bearings - let dry 24 hours & buff. Heavy tube assemblies that still have a lot of friction may actually need a roller wheel in place of a pad or two to reduce friction further.

5. See fig 1. Metal bracing struts diagonally placed high in the front corners, and at the bottom rear near the drive, especially on larger/taller turrets can perform two beneficial functions...

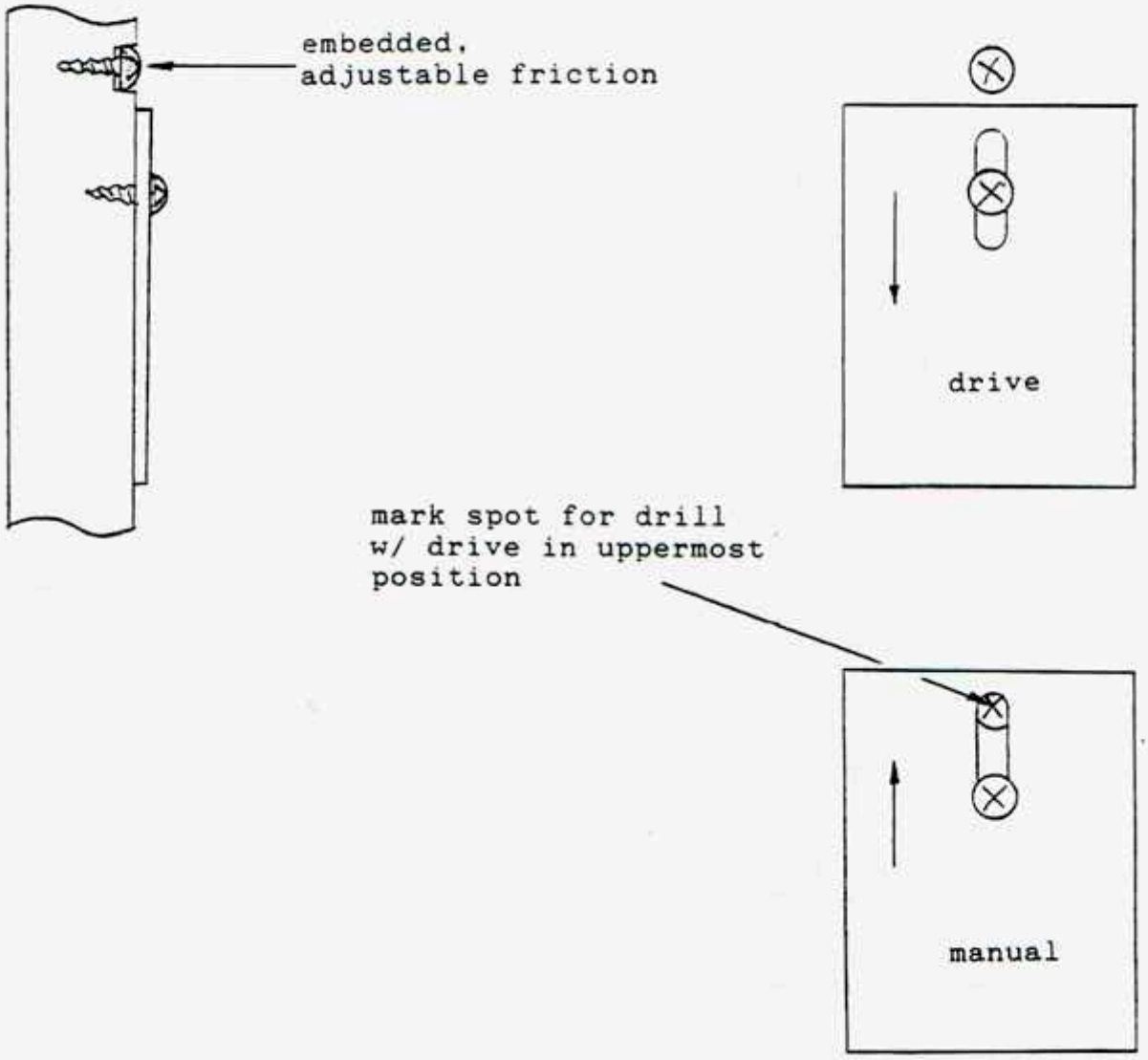
1. Allows side walls to be forced into position & held where desired, accurately aligning with the sides of the tube to minimize side-to-side motion while allowing free motion.

2. Stiffens the walls significantly which will reduce the spring-like twisting action of the mount during incremental movements of the tube mass in azimuth. This then reduces vibration sometimes visible in the eyepiece at resonant speeds and high magnifications.

HEAVY-DUTY INSTRUCTION SUPPLEMENT

When friction material is added to the large main axis pulley, the belt may not slide as easily as desired when moving the telescope manually simply due to the weight of the drive unit. In this instance the addition of a bit of friction above the top of the drive slide plate will allow the drive unit to be pulled up and stick there - easing the belt contact to a minimum.

One way to do this is by the addition of a rounded-head screw embedded just above the drive as shown below...



Operating Manual

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DOB DRIVER II - OPERATING MANUAL
DDR-OPER
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www.tech2000astronomy.com/dobdriver/

INTRODUCTION: "Dob Driver II" is a dual axis, micro-computer driven, quartz-locked clock drive system including a very wide range drive corrector for alt/az or equatorial telescope mounts. Though it is advertised as a system application for "Dobsonian" style mounts, this system can be adapted by talented users to operate just about any telescope mount ever made. Because of the engineering foresight of TECH2000, this modularized telescope control system has become a "de-facto" method of driving the movements of many types of equipment, meaning it adapts to all known situations of telescope mounting: fork/split-ring/altaz/dobsonians/GEMs,etc.-factors out backlash, maximizes slew speed, dynamically adapts to eyepiece magnification and gear reductions ratios, - a Dob Driver system has never been known to fail in its mission after customers have installed it on every mount type imaginable - even mammoth 30" dobsonians of which several are in use today! Set up and take down is extremely fast, making field portability a breeze. The handheld control pendant pre-calculates a large number of tracking rates automatically for each axis and this novel technique allows direct simulation of an equatorial mount WITHOUT ANY REQUIREMENT FOR ALIGNMENT OR STAR SIGHTING NOR LEVELING OF ANY SORT. Even your equatorial mounts do not need polar alignment - just plop them down in any crude manner you like! Limited duration astrophotography is now accessible to alt/az users too since any object can be closely guided with the guide mode dual axis drive-corrector, or the optional link to ST-4 autoguiders from Santa-Barbera Instrument Group (SBIG), and later, you can utilize the third axis field-rotation corrector already designed-in to Dob Driver II !

We have found it EXTREMELY useful to have new users force themselves to take the time to have a fully installed & functional Dob-Driver at their command and FOLLOW ALL OF THIS MANUAL by performing or testing each of the instructions with the real equipment - rather than just reading and trying it later. It helps greatly to actually see what is happening.

SETUP
- Assure scope does not "nose-up" or "nose-down". Balanced.
- Pull up belt from altitude drive & wrap on altitude pulley.
- Connect power.

TAKEDOWN
- Screw in AZ quick-release knob. One turn more after resistance is felt.
- Pop altitude belt off & wrap around drive, tuck in end.
- Unplug & stow power source in the base or hung on the side.

MANUAL OPERATION (DRIVE CLUTCHED OFF)
- Twirl in the AZ Quick-Release until resistance is felt (drive wheel lifts off ground board). Go 1 turn more.
- Pull up altitude tensioner lever.

MOTORIZED OPERATION (DRIVE CLUTCHED ON)
- Back out AZ Quick-Release until it turns freely (wheel is on ground board). Go 1 turn more.
- Flip down the altitude tensioner lever.

IMPORTANT GENERAL INFORMATION
- Pushbuttons have gold plated contacts and are a very low-force type. This allows pushing buttons gently while the pendant is attached to Velcro on the tube assembly, without shifting the image in the eyepiece significantly. The pushbuttons do not have to "bottom out" - they will make contact well before the button has moved full travel.
- When NOT LOOKING through the eyepiece, pushbuttons control up/down left/right movements corresponding to the pendant layout. ie- if you push the right button, scope should move right, if you push the up button, scope should move up. IF THIS IS NOT SO, swap the wires to reverse the motor response for the errant axis. The instructions for which wire colors to reverse is printed on the terminal label.
- When LOOKING through the eyepiece (image inverted), the pendant controls still operate in exactly the same directions if you imagine CONTROLLING THE DIRECTION YOU WANT THE OBJECT TO MOVE - not the field of view. Try it! Move the OBJECT up/down/left/and right.
- Determine the Up/Dn and Left/Right directions through the eyepiece and affix the pendant on the tube to match.
- If you use a battery option place it in the turret box, preferably near the drive wheel (increases traction).
- The maximum AZ track rate will limit how close you can get to zenith. Avoid photography around the zenith (you can still shoot objects approaching or leaving zenith as long as the AZ rate is reasonably slow or exposures are short).
- If azimuth drive wheel appears to slip during track or pan, check that no binding is occurring from the pivot bolt, turret bottom, etc. Check the diamond cut on the wheel tread and the track surface for excessive debris or clogging. No power wires holding turret back. If this

binding occurs when new, and can't seem to be corrected, you may have to add some weight over the drive wheel to increase traction, or decrease bearing friction.
- Once a year, unbolt ground board and clean track surface. Clear the diamond wheel tread with a stiff brush. Wax altitude bearing disk with SILICONE wax.
- When power is connected, display is tested & version level displays. PAN mode is turned on & awaits your next move.
- The LED readout displays speed (when not using DSC mode) in steps-per-second. Note that the resolution of the numbers displayed (nearest tenth in the case of tracking speeds) are much coarser than the computer's internal speed representation. We don't need to see 1000ths of a step!
- Speed of each axis is displayed alternately. Small indicator lights on the sides of the display show which axis is being displayed. ALT/AZ (RA/DEC if equatorial mnt)

CAUTIONARY INFORMATION
- **CAUTION: ELECTRIC SHOCK** can result if you use AC in a dew or rain environment. AC wall transformers must plug in to a weather-protected wall socket in a sheltered area or home
DO NOT EXPOSE AC ADAPTORS TO RAIN OR DEW.
- Be careful when tracking objects setting near the horizon or rising near the zenith as leaving the scope for a time may allow the ALT motor to pull the tube into the turret front wall. However this will probably stall the motor before sufficient power is delivered to damage the tube.
- Do not leave your equipment unattended at star parties without having de-clutched the drive. Since it is expected that Dobsonians usually don't have such controls, someone may attempt to push the scope to a new target - perhaps scratching your base wheel track (not serious) or stressing the altitude drive. However, this system is designed to allow slippage to occur before damage is done when forcing.

MODE CHANGING
There are 8 primary modes printed on the pendant panel. At power-on PAN mode is activated. To exit any mode, push the left & right buttons simultaneously. This can be done with just one thumb as most all controller actions can. When the mode has exited, the led mode indicator will blink to prompt you to select a mode. Move the blinking light left or right to the mode you wish to select using the L/R buttons. Select the new mode with the UP (SEL) button.

PAN MODE
Pan mode uses the least power and is referred to as "parking" the scope. Use pan mode to slew rapidly under motor control

or for slow-motion control. Both axes can be slewed simultaneously by holding two buttons. The motor speed will start out slow and quickly accelerate to maximum. Tap the button or hold it down for short periods to pan in small increments. The longer you hold a button, the faster the pan speed will go.

TRACK MODE

Track mode is the main mode you will spend most of your observing time in. An object you wish to track SHOULD (not must) be reasonably centered in the view PRIOR to entering track mode. All you have to do is observe the object for awhile. As the object under view drifts off center, recenter it using the pushbuttons. Take your time - be lazy. After 32 seconds (since entering track mode or since the last correction) the computer will obtain a "lock" on the new track speed. The object will appear to freeze its position in the view. The most accuracy is obtained when the object is well-centered by you each time you finish correcting and sufficient time has passed for the object to move a distance in the sky. After your first correction, a LOT of time will pass before you need to make another. Additional recenterings will be deciphered by the computer. If a curved path is present the computer will make these corrections for you!

EXAMPLE TRACKING SESSION

- Center object in PAN mode with Drive engaged.
- Exit PAN mode. Enter TRACK mode.
- Begin your observations!
- Re-center object anytime appreciable drift has occurred. Computer will assign correct vector & velocity. When a correction is made after at least 32 seconds, object will "freeze" apparent motion.
- Further corrections will establish curved paths.

TRACK MODE NOTES

- If at high power you wish to move to another close-by object and track it, as in a companion galaxy or shifting observation on the lunar surface at high power for example, EXIT TRACK MODE AND USE PAN MODE! Else the computer will think the subject you have been tracking has moved to a new location, and the tracking info will obviously be wrong!
- When tracking an object, exiting track mode will not erase the tracking information. Motors will continue to operate at the established speed, direction, and curve parameters until a mode is selected that does not use tracking. When track mode is re-entered, this previously used data is re-installed! Of course when re-entering track mode to follow

a NEW object, this re-installed data will be invalid, and will be corrected out at your first move after 32 seconds.
- Equatorial mount users will have the RA track rate stored in permanent memory whenever track mode is exited. It will be installed automatically next power-on time. So first establish your standard rate and exit TRACK at least once!
- As in pan, motor velocity increases to a specified maximum when making pushbutton corrections. See config for selection of maximum correcting (maximum track) speeds.
- A correction (re-centering) is assumed to be completed 7 seconds after you have stopped pushing buttons.

GUIDE MODE

Generally, before entering GUIDE mode you must establish a rough velocity-vector in TRACK mode! This mode performs tracking functions just like TRACK mode. Guide mode is useful for gentle tracking corrections at very high powers as in planet & lunar observation, and is used for guiding the drive during photo exposures or electronic imaging. The difference in guide mode is that button corrections are very gentle, adding a small amount of speed (in excess of sidereal) on the given axis or subtracting a small amount as depends on the current motor speed & direction and the direction commanded by the button being pressed. See CONFIG for options on selection of correcting rates, which are the gentelest in the industry!

PHOTO GUIDE NOTES

- Photography on an ALT-AZ mount is a more involved business than on equatorials due to field-rotation over time. The RATE of field rotation varies continuously with object position and causes the image on film to rotate AROUND THE GUIDE STAR, which of course causes the image, as you look progressively farther away from the guide star, to leave longer and longer trails on the film.
- For this reason, you should guide ON AXIS - meaning that you should use a guide star for your drive correcting that is close to or in the object being photographed. This is why off-axis guiders are generally unsuitable for ALT-AZ guiding (unless you use ROTACALC or similar calculations) since off-axis guiders sight guide stars that are OUTSIDE THE FILM FRAME. A piggybacked guide telescope is the best way to be sure you are guiding on a star that is near the center of your film frame. And of course, piggybacking a zoom lense camera is easy because you can center the camera view on your guide star and guide the drive controller by looking through the telescope at high magnification.
- Field rotation will not be visible with short exposures as in planets, planet conjunctions, lunar, solar photography. However, VERY large magnifications will require the HRG drive for sub-arcsecond resolution to result.

- Field rotation will be minimal and many times undetectable for short-duration photography in the range of 1-8 minutes. For this we like Ektar-1000 and Konica-3200 films.
- Beyond these basic principles in ALT-AZ photography, there are ways to get longer exposures. Since the field rotation rate of an object varies continually in a very slow manner, you can calculate the time when the field rotation for a given object decreases to zero, and reverses direction! This turns out to leave very small trails on film, many times no trails at all!
  The ROTACALC program runs on the IBM PC in BASIC and is designed to assist in identifying optimum times and durations to photograph. Up to 50 minutes has been done with excellent results. Also keep an eye open for the third axis stage to be available for Dob-Driver equipment. The controller you have is already designed with a third axis motor drive capability. This will allow photography anytime by counter-rotating the camera to compensate exactly for the field rotation present at the time of the exposure.

ELAPSED TIMER

Surprise! There is also an elapsed timer function in Dob-Driver II. First note that the small LED indicators, showing which axis is being displayed, toggle their state at one second intervals. You can use this for initiating and counting short periods of time - like opening a camera shutter for a precise few seconds. The actual elapsed timer function is accessible anytime from TRACK or GUIDE modes. Just press the UP and DOWN buttons simultaneously and release them. The timer starts at zero and reads out on the display in minutes & seconds and has a maximum limit of 99 minutes 59 seconds. You can use this handy feature to time transits & occultations, eclipses, or photo exposures. We find it much handier (and because of the LED display much more visible) than a separate timer. To shut off the timer, simply exit the current mode & re-enter it.

SEEK MODE

A new way to find tough objects or one you can't seem to find otherwise fast enough. Don't despair - use SEEK mode! Aim your telescope in the general direction of an object. Enter SEEK mode. The display requests field diameter-1. Hold the RIGHT button down until the field of view moves about 3/4 or so of your current field diameter. This will specify your current field diameter regardless of the eyepiece you have in and you can specify any scanning overlap you want in this way. Release the button. The display requests field diameter-2 (because the second axis may have a different gear ratio). So hold the DOWN button for about 3/4 field distance. Release button. Immediately the telescope will begin scanning a square-spiral radiating outward from your

exact start point (the start point before entering field diameters so watch for your object then also). By the way, we find that square spirals are better than circular spirals due to the difficulty in following a circular path with your head at the eyepiece! Each sweep of this imaginary spiral will move outward the distance you specified when you gave the field diameters.
INCREASE scan speed by holding the UP button.
DECREASE scan speed by holding the DOWN button
PAUSE by holding the LEFT or RIGHT button.
RESUME by releasing the LEFT or RIGHT button.
EXIT just like any other mode by holding LEFT AND RIGHT (one is already held down if you paused & see your object). EXIT dumps directly to pan mode for centering the object.

BLASH MODE
Calibrate out any backlash for each axis, and get instant response when using the pushbuttons. BLASH parameters make any mount & drive train arrangement act like a far more expensive precision mount. So you can have the best! Sight an object. It doesn't have to be a stationary one but that is preferable as in a near-pole star or the top of a tree trunk in the daytime. A bright object is best since it is easier to see movement. Enter BLASH mode. Watch the object carefully while you hold a (any) button down, until you see the object move. Release button immediately. Hold the OPPOSITE button down until the object begins to move the other way. Release button immediately. Your done! You can perform this calibration anytime you wish for the UP/DN or the LEFT/RIGHT axis or both. The computer subtracts a small amount to compensate for your overshoot & reaction time. The display counts how many microsteps the motor is moving while your holding the button down so you do have the freedom to watch this and add more, or less, backlach compensation. The BLASH parameters are stored in a permanent memory and re-install themselves each time power is turned on. They can be changed anytime.

MAXSPEED MODE
This is another calibration allowing you to define the mount parameters without getting too technical. MAXSPEED mode lets the computer know the mass of the instrument being driven, impacting the maximum slewing speed allowed for each INDIVIDUAL direction of travel without a motor stalling or losing knowledge of its position. Speed may be different in each direction of a given axis motor because of imbalance or differences in friction. Enter MAXSPEED mode. Hold a button down and wait for speed to increase to the point the scope stops moving (stall). Release the button immediately (or hold it until the display increments to the next higher speed if you are willing to set this again when your battery goes low). Init. Perform this calibration for all 4 direction

buttons. Change it anytime you like. Do this if a motor stalls while panning in a given direction (low battery or change in balance from heavy barlows, cameras, etc.). The computer subtracts a bit from your maximum setting in case of low battery voltage later. Again the parameters are automatically re-loaded when power is applied.

CONFIG MODE

This is a "software switch" bank that allows some more customizing of the Dob-Driver II system. Enter CONFIG mode. The 8 mode letters will display the state of 8 switches. The first one is blinking and is the current location of the pointer. When a lamp is on, the switch is considered on. When a lamp is off, that switch is considered off.
To select a switch, move the blink pointer with L/R buttons.
To turn ON a switch press UP button.
To turn OFF a switch press DOWN button.
To EXIT this mode, press L/R buttons simultaneously.

Use this table to decide your selections...

P	ON = Equatorial mounting. OFF= Altazimuth mounting (Dobsonians).
T	ON = Drive corrector rate 3x in guide mode. OFF= Drive corrector rate 1.5x in guide mode.
G	ON = Maximum track panning & track speed is 400 steps/sec OFF= Maximum track panning & track speed is 200 steps/sec
S	Reserved function
B	Reserved function
M	Reserved function
C	Reserved function
D	Reserved function

DSC MODE

This optional-cost mode is not yet available.

WARRANTY

TECH2000 products are warranted against defects in material and workmanship for a period of 90 days from the date of shipment. If during this period the warranty is exercised, TECH2000 will at their option repair or replace any part or product found to be defective. The part or product must be returned to us with return shipment prepaid for adjustment under this warranty. Excluded in this warranty are cases where the product has been misused, misapplied, or abused. Your rights under this warranty are specific and may vary in different states.

★ These directions better than previous that I received.

PAN MODE

Pan mode uses the least power and is referred to as "parking" the telescope. Use pan mode to slew rapidly under motor control or for slow motion control. Both axes can be slewed simultaneously by holding two buttons at the same time. The motor speed will start out slow and quickly accelerate to maximum speed (see MAXSPEED MODE to set speed). Tap the button or hold it down for short periods to pan in small increments. The longer you hold down a button, the faster the pan speed will go. A few seconds pass before maximum speed is reached.

TRACK MODE

Track mode is the main mode you will spend most of your observing time in. An object you wish to track should be reasonably centered in the view using pan mode prior to entering the track mode. Once in track mode, recenter the object anytime using the buttons (remain in track mode) and the computer will obtain an improved "lock" on the speed and direction. Each time you enter track mode, the computer takes about 45 seconds to get enough data to establish a reasonable heading. The most accuracy is obtained when the object is well centered by you and sufficient time has passed for the object to move a distance in the sky. Much time will pass before another correction will be needed. Additional corrections will be deciphered by the computer. If a curved path is present (always in Dobsonian mounts), the computer will make these periodic corrections for you!

A typical tracking procedure is as follows:

1)Center the object using pan mode
2)Exit pan mode and enter track mode
3)Begin observing
4)Recenter the object anytime you wish while still in track mode
5)The computer monitors your activity and will take over the job when the initial 45 seconds have passed
6)Make additional corrections anytime you need to

TRACKING NOTES:

1)If at high power you wish to move to another close by object and track it (a companion galaxy, for example), *exit track mode and use pan mode.* Otherwise, the computer will think the original object has moved to a new location and the tracking information will be wrong.

2)When tracking an object, exiting track mode will *not* erase the tracking information. The motors will continue to operate at the previously established speed, direction and curve parameters (until a mode is selected which doesn't use tracking). When track mode is re-entered, the previous data is re-installed. If moved to a new object, this data will be wrong but will be corrected with your first correction 45 seconds after re entering track mode.

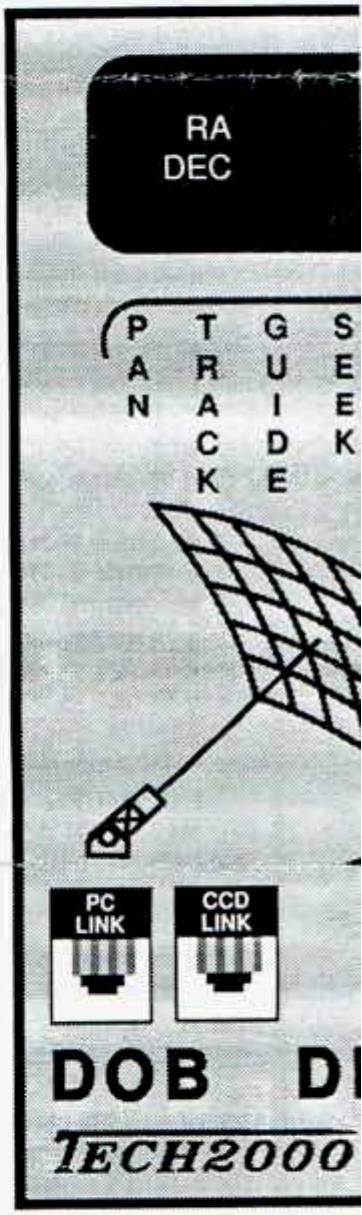
3)Equatorial mount users will have the RA track rate stored in permanent memory whenever track mode is exited. It will be installed automatically the next time the unit is turned on. So it is important to first establish your standard rate and exit track at least once.

4)Like pan mode, motor velocity increases to a fixed maximum speed when making push button corrections (see CONFIG MODE to set limits).

5)A correction (re-centering of an object) is assumed to be completed 7 seconds after you have stopped pushing buttons.

GUIDE MODE

Generally, before entering guide mode you must establish a rough velocity-vector in track mode. Guide mode performs tracking functions just like track mode. Guide mode is useful for gentle tracking corrections at very high powers as in planet and lunar observing and is used for guiding the drive during photographic or CCD exposures. The difference in guide mode is that button corrections are very gentle, adding a small amount of speed (in excess of sidereal) in the given axis or subtracting as needed. See CONFIG MODE for options on selecting correction rates - *which are the gentlest in the industry!*



ELAPSED TIMER

A unique feature of the DOB DRIVER II is the elapsed timer function. This is accessible anytime in the track and guide modes. Press the up and down buttons simultaneously and release. The timer immediately starts at zero and reads out on the display in minutes and seconds up to a maximum of 99 minutes 59 seconds. This is a very handy feature for timing transits, occultations, eclipses and photographic exposures. To shut off the timer, exit and re-enter the current mode (curve data will be lost, but is no problem since an exposure or event will be