4M Mayall Maintenance Manual

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4 Meter Mayall Lubrication

This manual section outlines the required lubrication and periodic maintenance requirements for the Mayall 4 Meter telescope.

Lubricants Used on 4 Meter Mayall Telescope

The following lubricants will be used unless specified beginning April -2014

**Multi-Purpose grease** -- CHEVRON -- RPM AUTOMOTIVE GREASE EP NLGI 2

**Worm Gear Grease** -- Mobilgrease XHP 461 to replace existing lubricant. Remove existing lubricant before changing (This grease is yellow metal safe)

**Dry Film Lube** — CRC Industrial Boron Nitride Mold Release (Spray)

**Open Gear Lubricant** -- Mobilgrease XHP 461 to replace existing lubricant. Remove existing lubricant before changing (This grease is yellow metal safe)

**S.A.E. 90** -- Top off existing with SAE90 Gear Lube; change all gear oil to -- Mobil Gear 600 XP 220

**Chain Lubricant** -- Any commercial chain lube

**Hydraulic Oil** -- Mobil 10W40 Motor Oil

**S.A.E. 20 Motor Oil** – Any commercial motor oil meeting API service “SE”

**S.A.E. 10W Motor Oil** – Any commercial motor oil meeting API Service “SE”

“Do not mix brands”
Declination Drive Lubrication

4m Mayall West Side Control Floor

West drawbridge deployment, telescope at Zenith.
Access point to declination gear box lubrication points.
Retract and stow after completion of tasks.

Brush grease onto exposed gears.

Lubrication: Mobile XHP 461
Frequency: Yearly

Five grease zerk points. The two denoted by the half visible arrow in upper right, are accessible from inside the West tube via cutout, see image below.

Lubrication: Multipurpose Grease
Frequency: Yearly

Access to declination gearbox lube points gained from West tube cutout.
Declination bull gear.
Access: West horse shoe door, West tube cutout.
Apply grease to gear teeth with brush while assistant moves telescope to North and South limits.
Lubricant: Mobil XHP 461
Frequency: Yearly

R.A Drive lubrication

R.A. bull gear
Location: Main floor
R.A. gear box cover shown installed, drip guard removal necessary for access.
(See Fig. 1)
Remove old grease and apply grease to gear teeth with brush while assistant moves telescope in R.A. ±6 hrs.
Lubricant: Mobil XHP 461 (See Figure 1)
Frequency: Yearly

Apply Mobil grease XHP 461 to gear teeth
Thrust Pads

Lubrication: (6 zerks/pad) apply 6 shots each, Multipurpose grease.

Frequency: Yearly

East and West thrust pads.

Access from Main floor at East side of R.A. bull gear or climb down gear from Mezzanine level.

R.A. Drive box, South side shown, covers removed.

Location: Main floor, South journal.

Grease gear box and tachometer bearings.

Lubrication: Multipurpose grease  (See Figure 1)

Two shots at each tachometer zerk

Frequency: Yearly

R.A. drive boxes, North side shown. Covers removed to access zerks on top inside of gear box.

Lubrication: Multipurpose grease

Frequency: Yearly

Thrust Pads

Lubrication: (6 zerks/pad) apply 6 shots each, Multipurpose grease.

Frequency: Yearly
Figure 1.

(FIGURE 1) Gearbox Lubrication Points
R. A. Trim Weight Lubrication

Ladder installation to access West horse shoe trim weight drives, Declination bull gear and Declination encoders.

NOTE: Telescope at Zenith.

West horse shoe access door opening.

R.A. Horizontal and Vertical trim weight system
Bearing zerk lubricant: Multipurpose grease
Ball Screw lubricant: Mobil XHP 461
Gear box lubricant: Unknown grease, not lubricated.
Weight slides: Permanent lube

Frequency: Yearly
Remove excess grease.
Cass. Cat Walk

Safety Net lubrication points: Pillow block zerks
Lubricant: Multipurpose grease
Frequency: Yearly

Catwalk Lubrication Points: Zerks
Lubricant: Multipurpose grease
Frequency: Yearly
Mirror Cover Deck

Figure 2.

(Figure 2) Mirror Cover Deck
Mirror Cover Gearbox

Figure 3.
Chain Drive gearbox

4m Mirror Cover Deck

Mirror Cover Chain Drive gearbox bearing
Lubricant: Multipurpose grease
Frequency: Yearly

Mirror Cover Petal Gearbox
Pillow Blocks zerks
Lubricant: Multipurpose grease
Frequency: Yearly
Declination Axial Counter Weight

Declination Axial Trim Weight Motor Gearbox Assembly

Screw Lubricant, See NOTE

Gearbox Lubricant: Lubriplate 930 AAA

Mirror cover deck

Declination Axial Trim Weight Screw

Lubricane: Multipurpose grease

Frequency: During mirror aluminizing.

NOTE: Normally weight assemblies are removed during mirror aluminizing to clean and grease. (See figure 5)

If the counterweights are not removed, apply spray lube to screw shaft via hole under limit switch.
Figure 5.

When disassembled, pack with Multi-purpose grease

Lubriplate 930 AAA

When disassembled, coat with Multi-purpose grease
Flip Lock Lubrication

Flip lock access point, Southeast Annex

S.E. Annex

Lubricate Major flip index cups.

Lubricant: CRC spray Boron Nitride Mold Release

Frequency: 6 months.

NOTE: Apply light coat of mold release to taper of locating cups.
Cass. Cage Wrap Up Motor

Figure 6.

Cass Cage
Wrap up gear motor: 80W90 gear lube.
Check level yearly.

Declination Transverse Trim Weight Gear Motor

Location: Cass Cage, behind electronics boxes, East and West sides.

Lubricant is unspecified. Item 7 of 2150.600-E002 states grease packed.
R. A. Drive Damper Assembly

NE horse shoe seismic clip

R.A. drive damper assembly

Grease zerks

North Cat Walk
R.A. Drive Damper Assembly
Lubricant: Multipurpose Grease
Frequency: Yearly

Grease zerks
Declination Bearing Lubrication

Need Photo and materials

Location: Declination Axils

Lubricant: Polyoil Grease, 4 zerks each bearing (8 oz. ea.). Rotate Dec. axis while adding grease.

Frequency: Yearly
4 Meter Mayall Periodic Maintenance

Seismic Clip Clearance Adjustment

Seismic restraint to telescope clearance.

Measured between Southeast restraint and South edge of horse shoe hydrostatic bearing.

Tools needed:

A. Hydraulic hand pump and oil. Located in 4m coude room telescope support locker, SE wall.
B. 1” travel dial indicator on magnetic base.

Southeast R.A. seismic clip to horse shoe clearance

Measure clearance between back of clip and bearing face, measurement envelope .200”-.250”

Adjustments and measurements are made with telescope on oil.

Frequency: 6 months.

4m Main floor, Coude Room
Pump and oil storage locker

Pump and Hydraulic oil used.
Attach hydraulic pump

Note pump orientation, hose down.

At this time close the hydraulic pump needle valve tightly.

Telescope hydraulic compensator bellows

Access point: South Journal, East side.

Mount dial indicator as shown on East wall electrical box.

Zero indicator.

Isolation valve

Hand pump quick disconnect
With hydraulic pump needle valve is closed, open the isolation valve.

Pump in oil to slide telescope North, to set required telescope/seismic clip space.

Open the hydraulic pump needle valve slowly to slide the telescope South as needed.

**CAUTION:** Close isolation valve before removing pump!

Never attempt to move telescope without telescope hydraulics pumps on and scope being up on oil.

Clean area, replace oil shields and return tools to proper storage location.
**Encoder Contact Surface Cleaning**

The drive surfaces for the incremental encoders are located on the inside lip of the bull gears. Periodic cleaning of these surfaces is necessary to ensure proper telescope pointing.

Access to the R.A. drive surface is from the Main floor, South journal room.

Access to the Declination drive surface is from the West horse shoe access door, thru the floor hatch and the West tube cutout.

This procedure requires two people to complete, one driving the telescope and one wiping the encoder surfaces.

The telescope should be cleaned in R.A. ±6 hrs., in Declination, to the North and South limits.

Materials: Rags or wipers and a suitable oil solvent.

South Journal area.

Remove oil drip shields to access encoder contact surface.

West horse shoe access, Declination encoder contact surface.

Encoder space and West tube cutout access.

Declination encoder and limit switch area. Encoder contact surface can be reached on either side of switch box and at the access space in the West tube via cutout.
R.A. and Declination Tachometer Cleaning

Remove oil shields to access the southeast R.A. tachometer

Remove tachometer cover.

Caution: Telescope drives need to be off.

Note: The exposed wires or the tachometer are fragile and are easily broken.

Fold a low lint wiper and apply electronic contact cleaner. Insert wiper between commutator and brushes and wipe in a clockwise direction. Repeat until wiper returns clean.

Re-install cover without pinching wires.

Clean area and replace drip shields when done.

Frequency: 3 months.
Declination Tachometer Cleaning, East Tachometer

Move telescope in Declination to 72° North as shown.

Install extension ladder to access Dec. tachometer as shown. Secure ladder while accessing tachometer.

Remove tachometer cover and clean commutator surface with low lint wiper and electronic contact cleaner. Wipe clockwise, change wiper until wiper returns clean.

Frequency: 2 months