

Encoder Tape Cleaning Procedure: NAOC 1m Telescope

Introduction

The encoder tapes are laser engraved steel rings that have been gold plated. It is very easy to scratch the gold or remove it, which will permanently damage the tape. Replacing the tape after delivery is very difficult, requiring extensive disassembly of the telescope. Great care must be taken, therefore, to respect the delicate tape surface during maintenance operations.

This sequence describes the access to the encoder tapes, the materials used, the process of cleaning, and the need to recalibrate the encoder heads if they are removed. Every protective measure should be applied in dusty conditions to extend the time between tape cleaning operations, as they will eventually degrade the laser engraved surface despite all care. Sliding seals may be appropriate in extreme installations.

Materials and Tools

- Metric Allen Keys
- Dentists mirror
- Heidenhain PWM 8 Calibration Unit
- Cotton wool
- Rubber gloves
- Pure denatured ethanol or isopropanol
- Squirt bottle for application of fluid
- Dry compressed nitrogen if available

Procedure

1. Lay out tools and materials, comparing against the list above.
2. Switch off the telescope control cabinet, including the DIOP controller power.
3. If access to the tape can be achieved without removing read heads, this should be done
4. Beware of pinch points for hands and fingers. This is a slow and careful operation. Take your time.
5. Establish, before proceeding with any of the following steps, whether an adequate angular coverage will be possible for cleaning. If only, say, 130 degrees can be covered then part of the encoder will remain dirty and the process is largely redundant. Either cease attempt or devise a way to access the entire dirty part of the encoder tape (usually 180 degrees).
6. If possible, use a dental mirror to view the tape location inside the encoder drum. This is possible for the derotators, but only after removing a read head. Elevation tape access is harder, but the drum design is the same, so the tape position can be assumed.
7. If read head removal is necessary, disconnect the read head cable and loosen **one** of the alignment screws that clamp one of the four holding bolts. Take note of which screw is loosened so that it can be tightened later on to achieve realignment to its original state.
8. Remove the four screws holding the head in its alignment ring.
9. Be very careful when withdrawing the head as it is very close to the tape and may touch it after the screws are removed. Handle the head very gently, like thin glass.
10. With gloves, feel the tape surface very gently via your preferred access point. Do NOT rub the tape, just become familiar with its location. You may not be

able to see the tape while cleaning it (blind operation) depending on the configuration.

11. Devise a starting and finishing point for cleaning the tape. Mark, possibly with electrical tape, these places on the metal casing ring to keep track of what proportion has been covered. Some parts will be hard to access, but any part of the tape which is facing down will not be dirty (assuming that the telescope rest position is fairly consistent). Consider each tape for the areas which will need most attention. Do not work harder than is necessary to achieve the result.
12. Move the drum to the starting point. With rubber gloves, wet a cotton wool pad with alcohol and touch it gently to the tape surface. Move the drum 100mm. Remove the pad, observing dust level, and turn it to a clean area or replace. **Use as much cotton wool as necessary: NEVER risk rubbing dust from the pad onto the tape. Cotton wool and alcohol are much cheaper than disassembling the telescope to replace the tape.**
13. Continue as above until the finish point is reached. Now repeat in the reverse direction of movement back to the starting point. The pads should now look cleaner when they are discarded. The tape is now clean.
14. Gently replace the read head if it was removed for tape access. Reconnect the read head, and follow the normal calibration procedure documented separately.

Note: In some scenarios, such as in lcestorm, removal of side panels may be required to access additional read heads.