RESOURCES:

Dave Richards: [daver@brightideassoftware.com](mailto:daver@brightideassoftware.com) Seems to be most recent NSO person with telescope? ~2013-2015ish?

Wayne Jones: Worked on the telescope a lot before Dave Richards did; rumor has it there was a feud between the two of them regarding the telescope.

Grad students (2 MEngineering, 1 IT?): I think they are the most recent people to work on the telescope (2016); we do not have their names, but I would really like to contact them if I can. They apparently had a notebook with information kept in a plastic case; we have a plastic case, but the notebook in it appears to be mostly IBIS/FIRS related.

Geoff Roberts: Oversaw last effort by grad students. (Telescope has not worked properly since before he started working here over six years ago.)

WHAT WE KNOW:

Telescope has power.

Telescope handbox works when plugged into manual test module outside. Both telescope axes function.

-Note that the sharpie marks on the manual motor test module indicate the maximum motor speed before stalling; the leftmost mark is the max speed of the elevation motor, and the rightmost is the max speed for the azimuth motor.

-Do limits function? They do - they’re not software limits, but rather hardware capabilities. The telescope turret literally hits a physical stop

(Confirmed that limits (and reporting them to the manual test card inside the VC) work.)

Telescope handbox plugged into manual test module in the VC cabinet does *not* control the telescope- signals are not making it outside.

* Slight correction - signal makes it outside, fiber optic connections are functioning as intended. I tested them with a kit I borrowed from Chris. It turns out that the green LED indicator on the card is wired such that the current produced by a good signal directly powers the LED indicator. When I looked at it with Chris, the LED showed green for a good signal, but was extremely faint, indicating a weakly received signal. Assuming there isn’t some issue with the fiber connections, it’s likely corrosion on the card contacts. Chris has offered to clean it. If it *is* the fiber, we could diagnose using a fiber loopback test. If it is a fiber problem (personally I think that to be unlikely, considering signal *is* received), Chris has the materials to run new fiber into the VC

UPDATE: Problem solved.

Fiber optics must be switched between outside and inside; the front of the cards are marked to identify which color cable goes into which port.

When pointed correctly, image does make it into the VC display (although the optics are absolutely filthy). Spectrograph diffraction grating is stored in the cabinet, and the dispersing prism is in the TV cabinet nearby. At some point we’ll get that stuff set up, but not a priority right now. Somewhat problematically, the grating that is in the display is also filthy, and impossible to clean without destroying it. Some idiot didn’t think about that. When we replace it with the spare grating, we may want to consider adding a thin sheet of plexi over the surface. Maybe a small box of some kind, that we could clean without touching the grating. Other problem, it looks like the only way to access it is by unscrewing a panel on the side. We’ll have to figure out a way to clean it through that opening, including the unreachable parts. Rag ‘n’ stick method, I guess.

Corrosion/oxidation on the outside fiber optic card contacts. Have been cleaned.

Documentation: Hardware binder stored in VC cabinet. Missing a notebook in a small plastic tote from previous grad students? Found one in the DST electronics shop, but appears to be mostly IBIS related. Probably not what we’re looking for, but that plastic box did have a few Antarctic-related papers, mostly circuit diagrams.

Operation: Run Virtual Handbox.exe on the computer.

-Where does it find ephemeris?

-Why are we not getting signal from guider?

-Azimuth goes to ephemeris fine; elevation is ~90degrees off.

-Light sensor?

WHAT WE DON’T KNOW

We have very little information on how the computer system and software works. Geoff Roberts says that the major issue is the software, or it was for the previous grad students. He thinks we may need to rewrite control software entirely...I wonder how difficult it would be to interface these motors with a commercial telescope control software. That small brown-covered notebook indicates that the original control software *was* commercial - some previous version of The Sky, which I’ve used before. It seems like it worked, but at some point they switched over, and I’m not entirely sure *why*. If we have to rewrite it from scratch, we’ve got some problems. Like, a lot of problems. If that program on the PC doesn’t work (it compiles at least), we should definitely see if we can get some commercial software. Although an email to the previous teams may let us know why they switched away.

We do not know how to operate the computers; assuming everything was working, what would be the procedure to start up the telescope, run the software, and get the telescope tracking?

The one program in the start menu - can’t remember what it’s called, but it’s the only non-standard program that shows up - has a routine that connects to the interface box, and seems to have the routines installed. Were it working, it would be as simple as logging in, starting that program, and loading the script. If it isn’t well……. Again, bigger problems. The Sky is fairly user friendly - Heidi could definitely figure it out, and we could probably write a python routine wrapper for it that could automate it. That’s long term though.

As far as I can tell, while that program connects to the motor controller card, the real program is Virtual Handbox.exe, which we have found and gotten (mostly) working.

What is the purpose of the small PC next to the Vector cage inside the VC cabinet? How can we access it? Actually have the answer to this one - it’s not a PC, it’s a portable UPS box. I guess they were worried about power surges. The batteries are probably ancient, but it still works, and I’d guess it’s more for the purpose of smoothing out the frequent surges we get, rather than an actual holdover for a blackout. Shouldn’t require any interactions. Should just be fine to leave where it is.

(Good to know.)

LOGBOOK:

7/17/18: Cleaned contacts on exterior fiber optic cable card. Discovered an error in the manual motor test instructions; the instructions say to unplug a cable from the back of the Vector cage in the VC cabinet, but the manual motor test will not work unless that cable is plugged in.

We have a reliable connection now...I think software is probably our next hurdle.

7/18/18: Cleaned out exterior telescope cabinet. Reseated cards with loose connections. Added an insulator on the jumper card, as the metal was very close to the fiber optic card and may have had a risk of short-circuits. Found Virtual Handbox.exe; this is the computer control of telescope. Has ephemeris (where does it find them?). Controls motors accurately and finds home positions properly. When told to go to ephemeris, azimuth is correct, but elevation is ~90 degrees off. Does not appear to have a connection to guider or light sensor.

7/25/18: Vacuumed interior of the display cabinet. Removed optics and cleaned the glass with ammonia/water. The thing we thought was a broken grating isn’t a grating at all. It’s just a flat mirror. Adjustable optics (things we can reach/aren’t fixed in place) consist of:

-Focusing lens mounted on a black rail (adjustable)

-Flat slit mirror mounted on a black rail (adjustable)

~I’m not entirely sure what the slit orientation should be - when I draw out

The optical setup, I’ll see if I can figure out a ray tracing (or just trial and

Error figure it out)

-Flat mirror below the slit (the thing I thought was a grating, bolted down, slightly

adjustable)

-Collimating mirror (in the dvd cabinet - might want to rethink the mount on this

one)

-Elliptical projection lens (big piece of plexi in the cabinet)

I’m not 100% sure of the various focal lengths/placements - no one ever wrote them down. I’ll try and figure out the focal lengths of our optics, and the first order grating angle - I’m assuming the case just uses the 1st order of the grating. I doubt it went to higher orders. If I can borrow a laser, it’ll go much faster.

Optical Component Parameters:

**Grating:**

Spacing: 2160 grooves/mm

Blaze angle: 32.683 degrees

**Focusing Lens:**

Focal Length:~35 in/88 cm

Diameter ~ 8cm

Focal ratio ~ f/11 lens

**Curved Mirror:**

Focal Length: ~67 in/170 cm

Diamter ~10 cm

Focal Ratio ~ f/17 collimator