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Abstract

Temperature control of the port detector had been lost. The Peltiers were replaced. I installed new Dec limit switches, upgraded the computer to Fedora 14, installed a new hard disk, and replaced the CPU fan in the computer.

1 Introduction

I visited Sutherland from 2011 March 21 to April 1. The primary purpose of the trip was to replace the Peltiers in the port detector.

2 Port Detector Peltiers

Removing the Port detector was quite tricky. You need to undo four screws and try and hold the detector at the same time to stop it falling out. I didn't have enough hands. Eventually I got it out and took it downstairs for repair. I put the cover back on the instrument so that it could continue collecting data on one detector alone.

It took most of the day to install the new Peltiers. It's a very tricky job because the wires are really thin. They only take a few bends before breaking off. Assuming that you get them in place it is then very easy to crush them when installing the photodiode on top. I had seven spares and needed to replace two of them. So potentially I had three goes at it, but given that they cost around 40 each writing them off is not a good thing to do.

I carefully removed the old coolers, cutting off the heatshrink that covered the splice in the power cables and unsoldering the joint. I cleaned off all the old heat sink compound and polished up the surfaces. After carefully connecting up two new Peltiers in series, and preparing them for splicing into the detector power supply whilst trying not to bend anything too much, I cleaned both surfaces of the coolers and applied a thin layer of heat sink compound.

The final job was to fix the photodiode module on top without screwing it down too hard and crushing the coolers, but tight enough for it to be secure and not move as the instrument swings on the mount.

I reinstalled the detector and connected everything back up. It worked! Both port and starboard detectors are easily holding 21 C at just 10% power.

3 Clutch

I noticed that the clutch was assembled totally incorrectly and could never work. I later discovered that it was broken beyond repair. I decided to have a go at repairing it anyway since there was nothing to lose.

I cleaned all the grease and dirt off the clutch as best I could, and also cleaned out all the old grease from the thrust bearings. I put a light coating of fresh grease on both sides of the bearings, and started to reassemble the clutch. This is where it got tricky because the clutch had broken in half. With no better options, I mixed up some Araldite and applied it to one half of the clutch, being very careful not to get any on the thrust bearings. I sandwiched the two halves together and fixed the whole clutch in a vice overnight while the glue hardened.

Next day I tentatively opened the vice. I wasn't holding out much hope. I wasn't sure how well Araldite worked on metal, and I was pretty sure I would never be able to degrease the thing well enough to get a good bond. To my surprise it worked. And the bearings still rotated too! Of course, when I tried to put it back on the gearbox shaft it would not fit since some of the Araldite had squished out of the joint and created a restriction on the internal diameter.

I spent some more time carefully filing out the inside of the clutch until it was clear. I also cleaned all the dirt from the gearbox shaft. Eventually I got it so that the clutch would slide up and down the gearbox shaft easily. I reassembled everything and gave it a try. It worked!

How long will it last? Araldite is strong but very brittle. The joint doesn't actually take that much stress, which does beg the question why it broke in the first place. Hopefully it will last, but we should plan on replacing either the clutch for a new component, or more likely installing a new mount controller and removing the clutch, as soon as possible.

On a previous trip the tracking motor was turned off it was seen to be behaving erratically. It would spontaneously start going backwards. I did not noticed that while I was in Sutherland, but it is very unlikely that it has fixed itself. I decided to leave the tracking motor off.

With this in mind, I permanently disengaged the clutch by disconnected the spring that pulls the clutch closed. If my repair on the clutch failed it would fail in the closed position for tracking, which we are not using, and it would prevent the slew motor working. By leaving the clutch disengaged the slew motor will always work.

While I was doing this a couple of the wires came off back of the MIL connector. It is very awkward to work on the tracking/slew assembly. The wires are not on connectors so you cannot disconnect them, and they are also not long enough to put the part on the floor or a chair. Without a second person here to hold the part while the other works on it, there is no option but to leave the motors and heavy aluminium brackets dangling on the wires. Clearly this is not a good situation but I had no other choice. Luckily it was a simple matter of soldering them back on once I had refitted the bracket.

4 Fedora Upgrade

The computer was upgraded from Fedora 8 to Fedora 14.

5 Dec Limit Switches

Some time ago the declination limit switches failed and were disabled. They were later removed, and a d-connector "jumper" used to bridge them out.

On this trip new microswitches were installed on the mount. Since the wiring had been removed, a new cable had to be made to connect them up. The connections are shown in Table 1.

Table 1: Declination Limit Switch Connections

Switch	*D-connector*	
Up	4 (red)	9 (black)
Down	5 (orange)	9 (brown)
Power	1 (yellow)	6 (green)

6 Hard Disk Replaced

I installed a new hard disk. There are now four disks in Sutherland: two are in the computer, one is on the shelf, and the last is in a USB external drive housing. I have made sure all four disks will boot.

The new disk is larger than the old one. The RAID array was made the same size as the existing drive, so there is lots of empty unpartitioned space at the end of the drive.

7 CPU Fan

The CPU fan had failed. It was replaced with a Rapid 37-0907 80 mm 12 V fan. It is slightly larger than the original AMD fan and so it is only held on with one screw, but it should be ok. It was also only a 2-wire fan and so the computer can no longer sense the fan-speed.

8 UPS

The UPS has failed. It does not even provide power for a few seconds. Piet Fourie is going to look at getting either a replacement unit or replacement batteries.

9 Extractor Fans

The extractor fan in the main room has failed. The fan blade has physically fallen off the motor. It is very difficult to get to the fan from either the inside or outside of the dome in order to repair it. Piet Fourie said they have been installing ducted-fan units from air conditioners in the other domes, and so he will organise for both of our extractor fans to be replaced.

10 Network Camera

The network camera is not working. The power supply is ok; but no lights on the camera come on. I took it apart. There is corrosion on the inside. It looks like water accumulates in the bottom. Or rather, it accumulates at the top of the camera because we mount it upside down. I suspect that it would have been ok if we had drilled holes in the top of the case to let the water run out.

A similar fate befell our network camera in Las Campanas too.