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Temperature control repairs in Narrabri in 2015 October

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2015 December 4

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Abstract

The temperature drive cable was replaced, a new water-loop motor and pump was installed, and an air conditioner was replaced. The current-limit on the mount motors was increased, and the mount gears cleaned and re-lubricated.

1 Introduction

Steven Hale visited Narrabri from October 15 to October 26. The last visit to Narrabri was in 2013 April [1], when the new digital autoguider was installed. The site has been operating very well since the last visit, and only now required work to investigate some unusual noise in the data at high frequency.

2 Temperatures

The high frequency noise in the data was isolated to a problem with temperature control. The interference filter was not being well controlled, particularly in the afternoon. The IF unit was removed and it was noticed that the heating elements had an in-line thermostat, a Honeywell NC-10-A (RS339-291). Presumably this was used to control the temperature when only a basic constant-current power-supply was used to drive the heating elements. This thermostat was bypassed in order to ensure the new digital temperature controller had full control of the unit. Unfortunately it did not help.

The fault was eventually found to be an intermittent temperature drive cable. The drive cable connectivity was verified as matching the pin-out detailed in Figure 12 of BTR333 [2], and a new cable was made to this specification. The original 12-core (7/0.2) screened black cable (FEC 119-0267) has been discontinued, and so FEC 244-0102 was used as a suitable equivalent replacement.

3 Water Coolant Pump

The water coolant pump used in Narrabri is a brass rotary vane type made by Procon and supplied by Grainger in the USA, part number 6XE83 with model number 111A100F11AA 250. The driving motor is made by Marathon Motors and also supplied by Grainger, part number 5U257 with manufacturer model number 5KH33GNA444X.

A rotary vane pump has consumable parts and eventually needs to be replaced. This pump and motor combination are also used in Las Campanas, where the pump failed and seized causing the motor to fail as well [3]. In Narrabri, the pump failed free-running and so the motor is fine. A new pump was ordered from Grainger, but it did not arrive before the end of the site visit.

Mike Hill installed the new pump when it arrived, but unfortunately it still did not work. On November 18 it was determined that the shaft of the motor has worn and it no longer turns the pump. A new motor was ordered on November 19. John Wilson was able to make a modification to the existing motor shaft that is a good temporary repair, and this was installed on November 23. The new motor will be installed when it arrives.

The spectrometer temperatures are now stable again, and combined with the new temperature drive cable there have been no further temperature problems.

The float switch used to disable the pump when the water level becomes too low has become unreliable and has been bypassed. This is a somewhat dangerous situation since it means that if a leak begins near the spectrometer, the system will continue to pump all the water out causing it to rain down into the room and electronics below. In Sutherland we now use ball floats (RS339-5244) and these seem to be more reliable, and so it is recommended at least one of these be installed soon.

4 Air conditioner

The Narrabri dome has two air conditioners. At any one time, usually only one of them is powered and running. Typically the newest one is used, with the older one left as a backup. The current newest unit is already having problems maintaining the temperature, and will likely be overwhelmed in the summer months. A new air conditioner was purchased and installed to replace the oldest unit, and again the current unit left as a spare. The cooling radiator has been moved in front of the new air conditioner, which will hopefully provide further improvements in spectrometer temperature control.

5 Mount Controller

There was some noticeable slop in the mount RA motor gearbox. The new motors were installed with the new guiding system in 2013 April [1]. The spare motor and gearbox were installed. The Declination motor was not showing similar wear and has been left in service.

The current limit for the motors was increased from 0.7 A to 1.2 A. This is a modification required at all sites. Las Campanas was corrected in 2014 June [3], and Carnarvon in

2014 November [4]. Sutherland has yet to be corrected, but is not showing any guiding problems. The initial default current limit matches the single-coil motor limit. However, the motor coils are configured in the parallel configuration, and so the maximum current limit is doubled.

The brass worm wheels were coated with thick dried grease. This was cleaned and the thicker sections scraped out with screwdriver. A light coat of fresh grease was applied. There have been no further problems with mount control.

References

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[2] Ian Barnes. The Narrabri temperature controller. *BiSON Technical Report Series,* Number 333, High-Resolution Optical-Spectroscopy Group, University of Birmingham, UK, November 2010.

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[4] Steven J. Hale. A check on Carnarvon in 2014 November following NBN construction. *BiSON Technical Report Series,* Number 367, High-Resolution Optical-Spectroscopy Group, University of Birmingham, UK, December 2014.