BiSON Birmingham Solar-Oscillations Network

TECHNICAL REPORT NO. 380

Autoguider repairs at Mount Wilson in 2016 April

Steven J. Hale
The University of Birmingham, Edgbaston, Birmingham B15 2TT

2016 June 17

This technical report series is published by:

THE UNIVERSITY OF BIRMINGHAM

High-Resolution Optical-Spectroscopy Group

School of Physics and Astronomy
The University of Birmingham
Edgbaston, Birmingham B15 2TT, United Kingdom
Telephone: +44-121-414-4551

Autoguider repairs at Mount Wilson in 2016 April

Steven J. Hale

The University of Birmingham, Edgbaston, Birmingham B15 2TT

2016 June 17

Abstract

The 60-foot tower services were restarted for the summer. The mechanical actuator for the east/west axis on the second flat had almost seized, and so this was disassembled and cleaned. Some diagnostic work was performed on the guider module which indicated a fault due to loose interface cards, particularly the guider level threshold cards for both axes. No attempt has yet been made to secure the cards and improve their reliability.

1 Introduction

Steven Hale visited Mount Wilson from 2016 April 28 to May 10. The last visit to Mount Wilson was in 2015 December in order to shut down everything for the winter [1]. The purpose of this visit was to restart the system and check the performance in preparation for the summer observing campaign.

2 Second-flat Guider Module

The second-flat auto-guider at the 60-foot tower has been misbehaving. A previous site visit in 2014 April [2] identified some corroded and possibly broken cables from the second-flat motors to the patch-panel below the mirror mount. These were replaced, producing some improvement in performance. The guider module itself was not inspected due to lack of electrical schematics and little knowledge of how it was supposed to operate.

Subsequently, a selection of schematics were found and scanned [3], and so on this visit some diagnostic of the guider module was attempted. The servo-amplifier boards [3, p. 14–15] which drive power to the motors were inspected and found to have some dry and cracked solder joints. All solder was removed as well as possible, and the joints remade. It was also found that the interface cards in the module were quite loose and had poor connectivity. The *threshold* card [3, p. 12] proved to be particularly troublesome. If the card is not connected properly, then it can never indicate that the light level is sufficient and allow the auto-guider to begin operation. This is the cause of the auto-guider failing to work on some days, on either or both channels. Simply touching the card and applying some lateral pressure to force a better connection with

the interface slot was often enough to enable guider operation to begin. This fault was not rectified since it requires some mechanical design work. Ideally a bracket of some sort should be fitted to the cards to ensure they are firmly held in place and cannot move.

When guide mode was disabled, a relay could be heard buzzing. This was isolated to relay K-7 whose function is simply labelled as "Off" on the circuit diagram [3, p. 4]. This relay was removed to stop the buzzing, and appears to have no detrimental effect to the guider operation.

The guider limit switches were tested, and confirmed to be operative. When any limit switch is active, both motors are stopped. However, only one limit switch warning light works on the front panel. The system is safe to operate since the motors will stop when a limit is reached, but there will not always be a warning of this condition on the front panel. No further inspection was attempted. The limit switches themselves, including the centering switches, have old and corroded wiring. This should be replaced at a convenient time.

The guider head itself does not move when commanded by the module and hand-controller. This means that the position of the beam in the shaft can not be adjusted. Further diagnostic was unsuccessful due to the huge amount of knotted cabling at the back of the electronics rack and the limited amount of space in the observing room. It was impossible to trace exactly where the cables from the guider head motors are connected. Many of the cables provide connectivity for hardware no longer in use. It is recommended that any decommissioned hardware is removed in order to clear space and somewhat tidy the cables. This will allow further diagnostic and inspection to be much easier.

It is unfortunate that no one particular fault has been isolated and fixed. The guider system remains temperamental. However, it is at least a little more reliable than previously.

3 Second-flat Drive Mechanism

The mechanical drive for the east/west axis on the second-flat had almost seized. The whole assembly was removed and cleaned with engine degreaser, shown in Figure 1. It was reassembled with a light application of general purpose grease, and the tilt-cam had a much smoother action upon re-installation. This should improve the guiding performance in the east/west axis. The north/south axis already turned freely and was not disassembled.

4 Spectrometer Alignment

The spectrometer alignment was checked using the standard technique of removing the interference filter to enable the beam to be visible through the system. The fifth-mirror (the final mirror in the optical path that sends light into the spectrometer) was then adjusted to ensure the beam passed centrally along the spectrometer optic axis.

Figure 1: The east/west drive cam for the second-flat.

References

[1] Hale, S. J. Aft-oven removed from Klaus at Mount Wilson in 2015 December. *BiSON Technical Report Series,* Number 376, High-Resolution Optical-Spectroscopy Group, University of Birmingham, UK, 2015. URL `http://epapers.bham.ac.uk/2099/`. [page 1]

[2] Hale, S. J. Autoguider repairs at Mount Wilson in 2014 April. *BiSON Technical Report Series,* Number 365, High-Resolution Optical-Spectroscopy Group, University of Birmingham, UK, 2014. URL `http://epapers.bham.ac.uk/2060/`. [page 1]

[3] Hale, S. J. Schematics for the 60-foot/150-foot tower auto-guider at Mount Wilson Observatory. *BiSON Technical Report Series,* Number 379, High-Resolution Optical-Spectroscopy Group, University of Birmingham, UK, 2016. URL `http://epapers.bham.ac.uk/3131/`. [page 1, 2]