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BiSON Birmingham Solar-Oscillations Network

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Abstract

A digital autoguider (the "mount controller") was installed.

1 Introduction

Steven Hale visited Sutherland from 2013 November 26 to December 10. A new digital autoguider — our forth mount controller — was installed on this trip.

2 New Autoguider

The autoguider and mount control system were upgraded on this visit. The following items were changed:

1. Four modules in the main electronics crate were replaced by the mount controller [1]. These four modules are now no longer needed; they are the autoguider module, the RA and DEC stepper modules, and the mount encoder module.
2. The RA and DEC stepper motors were replaced.
3. The cabling to the motors, limit switches, and the autoguider telescopes was replaced.

The following items were not changed:

1. The autoguider telescopes,
2. The encoders and cables,
3. The mount limit switches.

Motors: Installing the new stepper motors was the most difficult part of the replacement. The new motors were chosen so that they were physically similar in size to the stepper motors we used originally.

The mount in Sutherland is similar to the one in Las Campanas, but there are some small, undocumented, differences. Motor mounts were made in Birmingham by Barry Jackson, but we could not be absolutely sure they would fit. The brackets were very close to providing correct alignment of the motor and mount shafts. The brackets were adjusted by John Stoffels in Sutherland to allow correct alignment.

Guider Head: The autoguider telescope was not replaced. A new wye-cable was made in order to branch out the coarse and fine guider signals from the MIL connector to two D-connectors. The wiring of the guider quadrants was not known in advance, and had to be determined by connecting the signals through some breadboard and watching to see what the guider did given a range of error signals. The resulting wiring configuration is the same as the guider in Carnarvon and Narrabri.

Limits: Each axis on the mount in Sutherland has three limit switches. These are one for each direction, and an "Armageddon" switch that trips in both directions and physically cuts power to the motors should either of the first two switches fail. However, the switches are badly configured and the mount can't actually move far enough to ever trip the Armageddon switch. For this reason, only the four main limit switches were connected to the mount controller. The mount controller has inputs for eight limit switches. The remaining four secondary switch inputs were shorted together to make them permanently closed.

Gain: The original gain for the coarse and fine guiders as specified in the mount controller documentation was sufficient and did not need to be adjusted.

3 Tuning

3.1 Guider Alignment Scans

Only one autoguider scan was performed. The RA micrometer was scanned while the cell was hot. The Dec micrometer was not scanned because it is completely seized and could not be rotated no matter which position the locking ring was adjusted. The results from the RA scan are shown in figures 1 and 2.

Initially the RA micrometer was set to 7.0 mm and the Dec micrometer set to 7.5 mm. The guider scans from this instrument are not that clear, but it appears that the ideal alignment is when the RA micrometer is at 7.0 mm as currently configured.

There is no reason to believe the spectrometer or telescope alignment would have changed, and so the micrometers were left in their initial positions and no further guider scans were performed.

The alignment of the coarse guider was adjusted to match the fine guider. This was done by looking at the values from each quadrant when the mount was on fine lock.

Once everything was set, the guider thresholds were set on the computer to define when the switching takes place from seeking, to coarse guiding, and to fine lock.

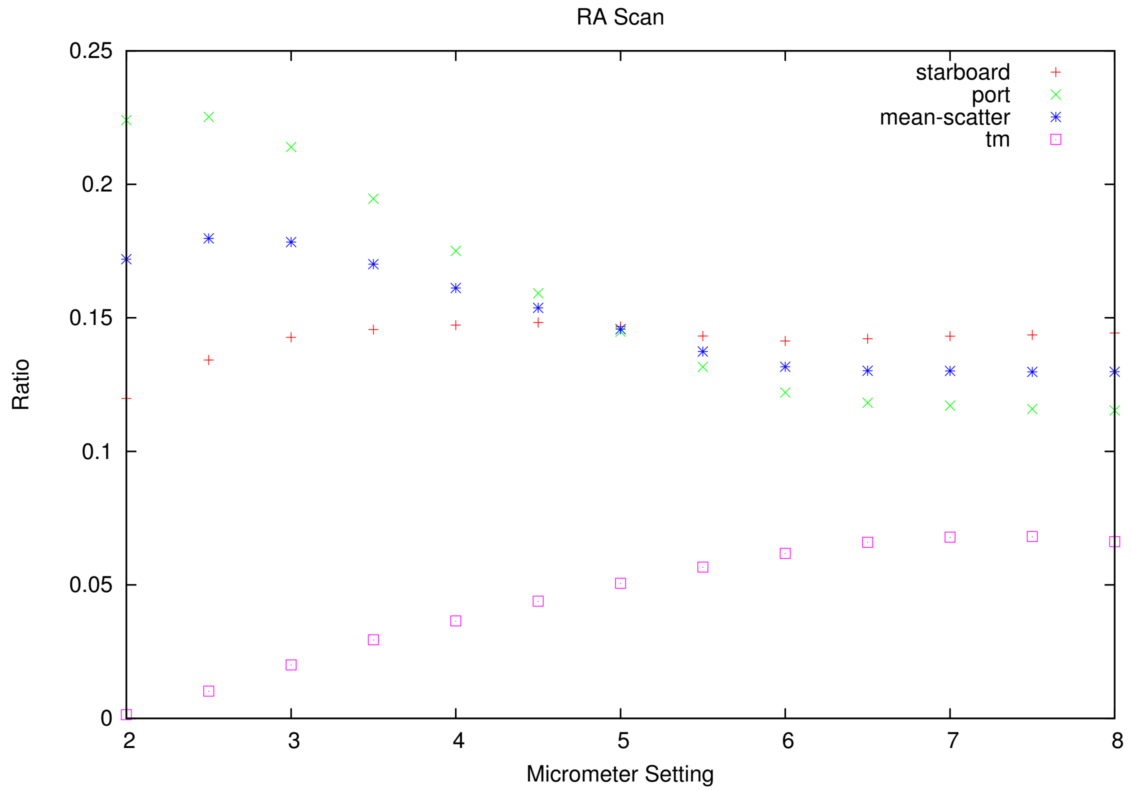

Figure 1: RA Ratio.

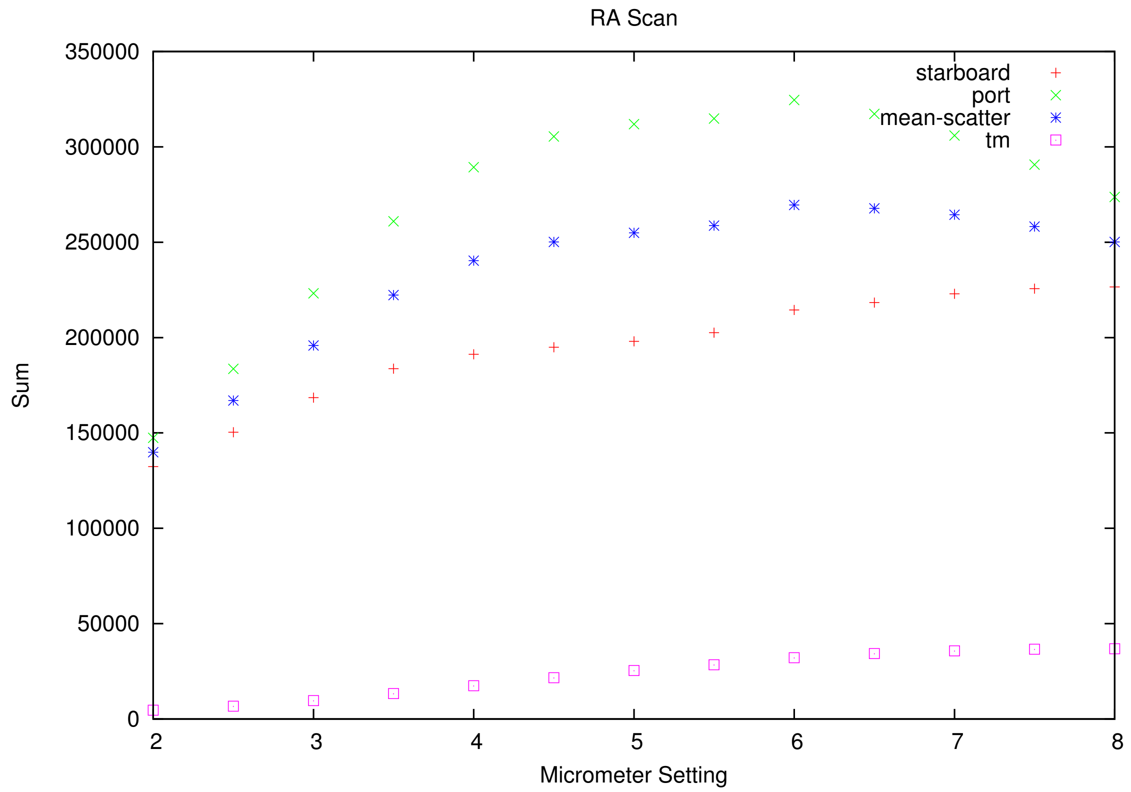

Figure 2: RA Sum.

4 General Maintenance

4.1 Computer

The power supply in the computer was full of dust, and the fan was ready to fail. The whole PSU was replaced. The front case fan was replaced. The rear case fan and the CPU fan were cleaned.

4.2 Temperature Controller

One of the heat sink fans inside the temperature controller unit had failed resulting in the heat sink running very hot. All three fans were replaced.

4.3 Coarse Filter Cleaned

The front filter was cleaned, providing a very noticeable increase in counts.

4.4 Weather Sensing

The rain and cloud detectors were cleaned. The rain detector was tested and is operating correctly.

The anemometer has been removed since the bearings had failed and it no longer rotated. The wind sensor is on override. The dome currently has no protection against excessive wind speeds.

4.5 UPS

The UPS was tested to ensure the dome could close from fully open in the event of a power failure. It didn't work. The UPS was operating correctly since it continued to power the computer, but the dome did not close when the main power to the relay box was removed.

Luckily the problem was a simple blown fuse. The power from the UPS goes to a plug board where the computer and relay box plug in using standard UK 13 A plugs. The fuse in the plug that connects to the relay box had blown. It was replaced and then the dome closed successfully when the main power was removed.

References

[1] Ian Barnes and Brek A. Miller. The Mount Controller: A digital autoguider for Carnarvon. *BISON Technical Report Series,* Number 349, High-Resolution Optical-Spectroscopy Group, Birmingham, United Kingdom, January 2012.