

CIRA Engineering Technical Memo

Receiver Earthing Modifications

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1 Introduction

In previous years (2012-2015), lightning has caused significant damage to MWA receivers. It was suspected that the earthing setup was insufficient to drain such high surge currents, and an improvement was designed to prevent damage to the delicate and expensive components within a receiver.

2 Main Body

2.1 Earthing Setup as Installed in 2012

The earthing setup in receivers consisted of a standard 10A power cord connected to a 'caravan post' style supply outlet. This outlet is locally earthed to a copper ground stake in compliance with Australian Standards. Lightning induced surges arriving on the coaxial antenna cables may have induced large currents, and correspondingly large potential differences, across this $\sim 1\text{mm}^2$ earth conductor. Due to the earth path in this setup, this could have caused the failure of MOV devices within the four-outlet power boards located inside the receiver.

2.2 Earthing Improvements Installed late 2015

The new setup involved installation of thick (90mm^2) solid copper earth wire directly from the receiver foot, to the earth of the caravan post, effectively wired in parallel with the thin power cable. This provided a much heavier surge path directly to ground instead of through the internal components of a receiver.

3 Conclusion

The MWA has only suffered minor lightning damage since November 2015. This was after the earthing modifications had been made, and caused significantly less damage to the telescope compared to previous lightning activity. Previous strikes showed damage through multiple components of the receiver signal chain, whereas the only components damaged in this strike were the data-over-coax (DoC) cards. We suspect that it will be difficult to reduce damage to these components, as they are the first thing connected to the long coaxial cables which carry surge currents. A separate lightning protection system will be trialled in 2016 to prevent DoC card damage.

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4 Pictures



Figure 1: New and improved thick copper earth wire