Appendix C – JCR75 Cruise Report
WS Ocean Systems - ESM1 Logger test

As three of the units had blown an internal (3A) fuse for no apparent reason I decided to conduct a few tests to see if anything obvious was going wrong. Logger 2339 was dismantled and two wires were soldered to the ruptured fuse (surface mount, socketed) which then connected to an external fuse holder. A 2A fuse was thought to be enough as the overall load was quite small.

The battery supply +ve lead was re-routed through an ISO Tech DVM which features an RS232 data output for logging readings to a PC. The meter was set to DC 4A fsd and the software to its maximum rate of 2 samples /second. Resolution at this range is 100μV.

Several runs were tried and, although the fuse did not rupture, the meters peak detector showed occasional surges to over 1A. This always happened at switch-on. Generally the current would rise to 100mA (ish) as the board powered up and then up to 120mA when the Fluorometer was enabled. These tests were run for many hours with the logger set to 1 sample an hour and then 1 sample every 6 minutes.

During the latter stages I switched the meter to 400mA fsd (accuracy 1μA) and noted that the logger overloaded at each start up. Standby current was a consistent 150μA.

These results are collected in XLS files attached to this document. I have provided quick graphs for some of the runs and these demonstrate the initial current pulse.

I was concerned that having the DVM in circuit may be affecting the readings. It is possible that the additional (small) series resistance provided sufficient current limiting to prevent the surges that caused fuse failures. I hooked up the system to a DSO via an HP Current Probe which is a non contact device. The DVM was removed so any observed readings would be "real". The system was calibrated but not terribly accurately, the Current Probe requires a long warm up period and I just did not have the time. I doubt that the results would be much different and, as we had already established what the steady state currents were, a visual calibration would suffice.

The first thing I noticed was that the initial power-on surge was not a single pulse but 2 pulses separated by about 300mS. The DVM test only showed one pulse but with a resolution of 500mS (logging speed) it is unlikely to catch two.

Initial scope trials were with a battery (same one as used for DVM tests) and a current limited (2A) power supply – both at around 12V. The results were very similar and a typical trace is shown in screen 1. Screens 2 & 3 are time

base expansions of the two peaks. Screen 4 is the same trace but with an expanded Y axis. This shows the current difference between sleep and operational modes.

Screen 5 shows the switch-on pulse with a brand new battery pack. Just a single pulse of about 10mS duration.

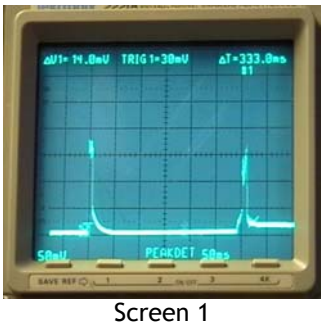
I started to think that this change between a single and double pulse was related to battery capacity which may cause current limiting. I hooked up a precision high current power supply, and limited the current. Screens 6,7 & 8 illustrate what happens and show the pulse start to split as the current limit is reduced. Logger 2338 showed the same characteristics.

Conclusion:

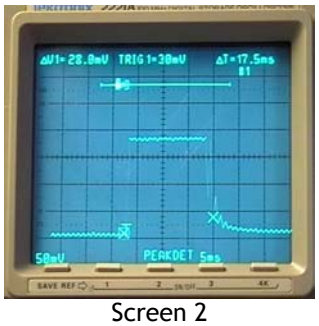
I realise that whilst all this is fascinating it may not have any bearing on the actual cause of the fuse failures. There are probably several switched mode power supplies on the power board and the observed characteristics may be par for the course. However I would worry if one of my designs required a 2A current pulse for a good 10mS to start up. This can only add to the problems.

Please be aware that I do not have access to any form of documentation or technical details for the Logger. Hopefully these results will help to sort the problems.

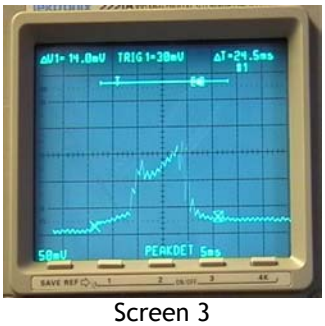
Pat Cooper, BAS, ETS, July 2002



Screen 1
Current Trace, 1 cm = 500 mA
Battery Power
Peaks are about 300mS apart.



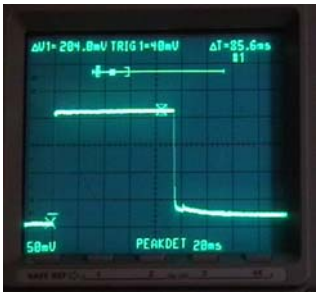
Screen 2
Current Trace, 1 cm = 500 mA
Battery Power
Expanded left hand peak



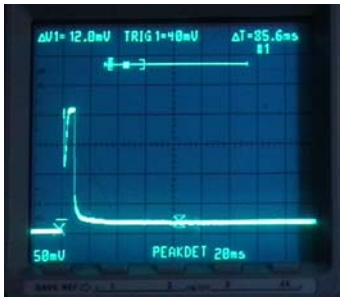
Screen 3
Current Trace, 1 cm = 500 mA
Battery Power
Expanded right hand peak

Screen 4
Current Trace, 1 cm = 50 mA
Battery Power
Expanded vertical scale

Screen 5
Current Trace, 1 cm = 500 mA
Battery Power
New Battery Pack



Screen 6
Current Trace, 1 cm = 500 mA
Mains PSU
Current limited at 8A
Power on pulse expands from about 10mS to about 90mS
Cursor positions maintained



Screen 7
Current Trace, 1 cm = 500 mA
Mains PSU
Current limited at 7A
Power on pulse starts to split
Cursor positions maintained

Screen 8
Current Trace, 1 cm = 500 mA
Mains PSU
Current limited at 2A
Power on pulse splits into two
Cursor positions maintained