



Background

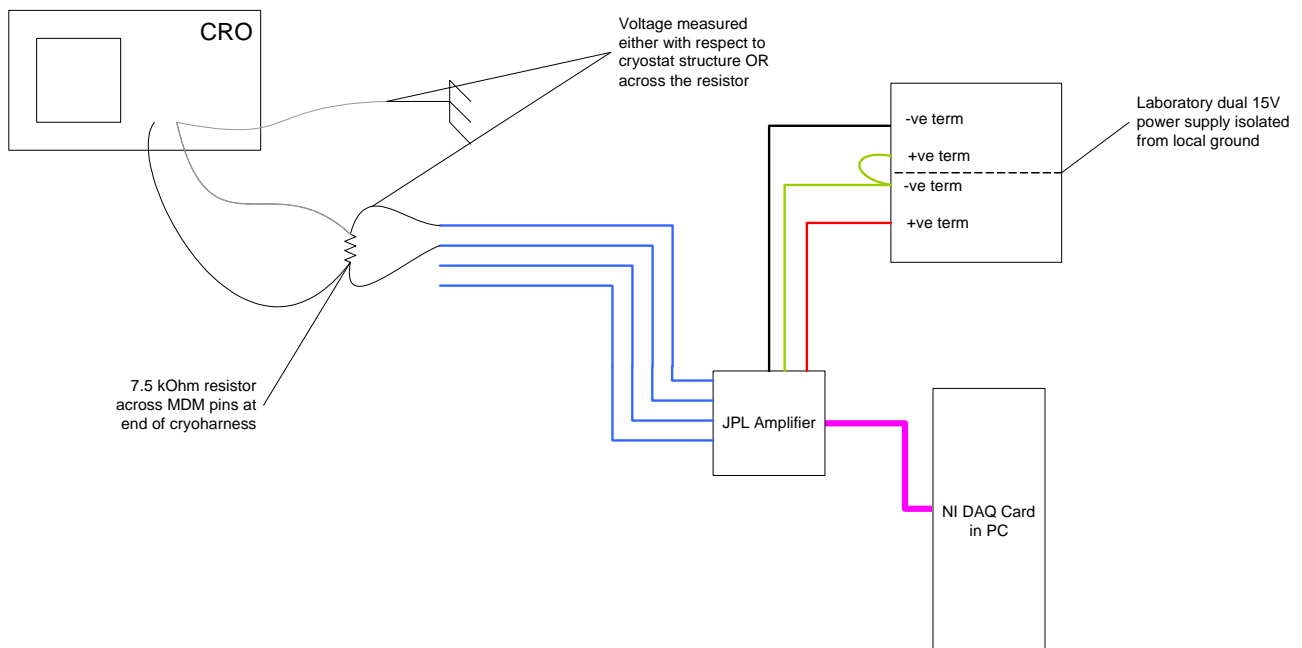
A failure of a JFET membrane occurred during the CQM Test 2 – see NCR-087. Part of the test equipment in use around the time the failure occurred was an amplifier supplied by JPL for conducting DC biased tests on the CQM BDA arrays connected to the cold JFET unit. We have investigated the behaviour of this unit during switch on and off to see if any transient voltages are induced that might have caused the JFET failure.

First Look

Our initial investigation looked at whether there was any induced voltage between the amplifier 0V and the local chassis ground. Using a DVM we measured the potential between the amplifier case and the 0V at the amplifier supply. When switched on this was no more than a few mV. However during switch on and off there was a large, if rapid, transient spike between the amplifier case and 0 V; the size of the spike appears to vary (randomly?) each time the unit is switched on or off. This led us to investigate what was happening at the input of the amplifier – i.e. whether transients could have appeared across the JFETs themselves. A similar spike was seen on the input pins of the amplifier during switch on and off; the presence of the spike was independent of whether the 0V was connected to the PSU ground.

Test Setup

The figure shows the basic setup for measuring the switch on transients at the input of the JPL amplifier during turn on. To simulate the presence of the JFETs a 7.5 kΩ resistor was placed across the input pins of the amplifier on the MDM at the end of the cryoharness. The voltage on either side of the resistor was first monitored with respect to local chassis (the cryostat structure) and then the voltage across the resistor was monitored. The scope was run in single shot mode and the traces saved to screen dump files as shown in the next section.



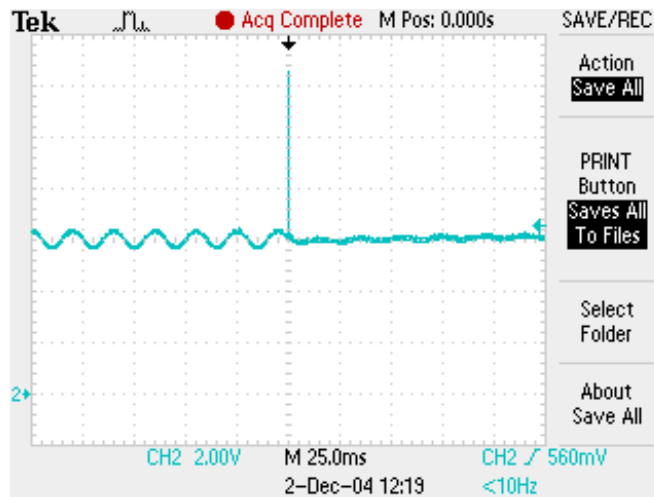


Results

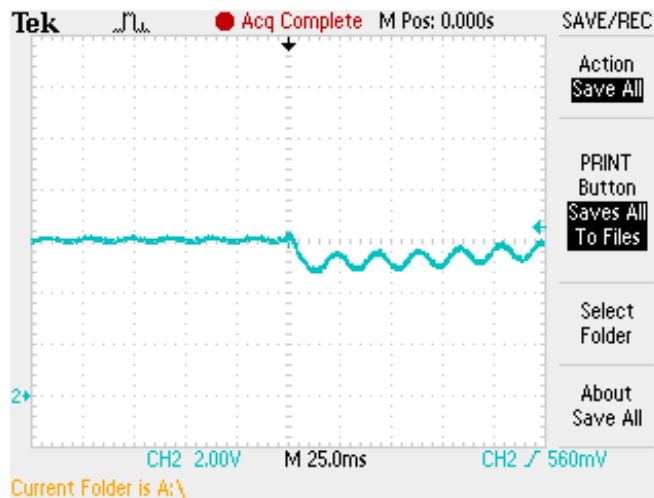
The images displayed here are for the following cases:

1. Amplifier **switch off** monitoring JFP P13 signal + with respect to cryostat structure
2. Amplifier **switch on** monitoring JFP P13 signal + with respect to cryostat structure
3. Amplifier **switch off** monitoring JFP P13 signal - with respect to cryostat structure
4. Amplifier **switch on** monitoring JFP P13 signal - with respect to cryostat structure
5. Amplifier **switch off** monitoring JFP P13 signal + to signal - i.e. across resistor
6. Amplifier **switch on** monitoring JFP P13 signal + to signal - i.e. across resistor

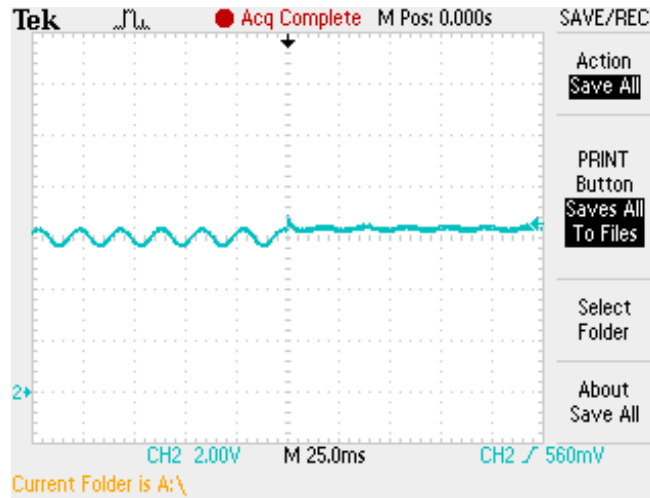
It should be noted that the height of the spike varied considerably but was never more than a few volts and was always rapid – inspection of the figures for cases 5 and 6 (where we increased the timebase) shows that the duration of the spike was ~2.5 msec at most. Whether these turn transients could have caused the failure is for further investigation.



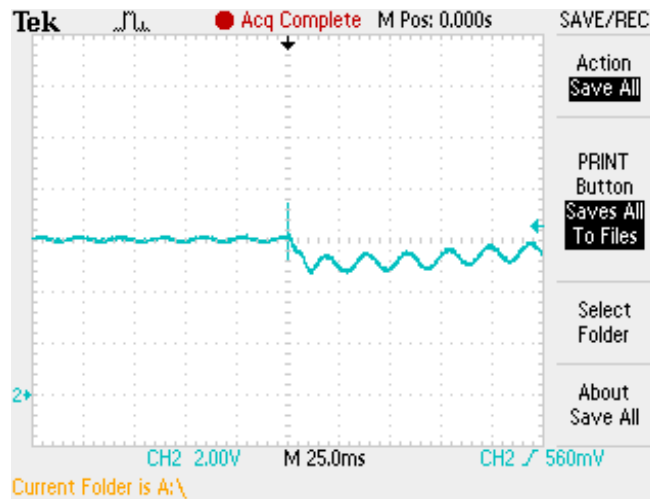
Case 1: S+ to ground on to off



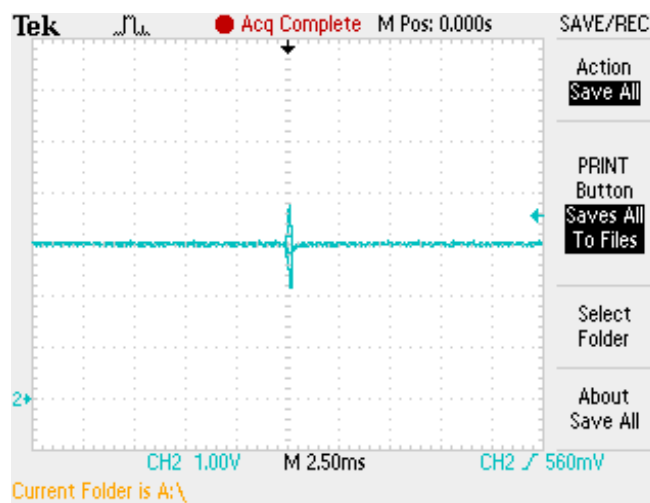
Case 2: S+ to ground off to on



Case 3: S- to ground on to off



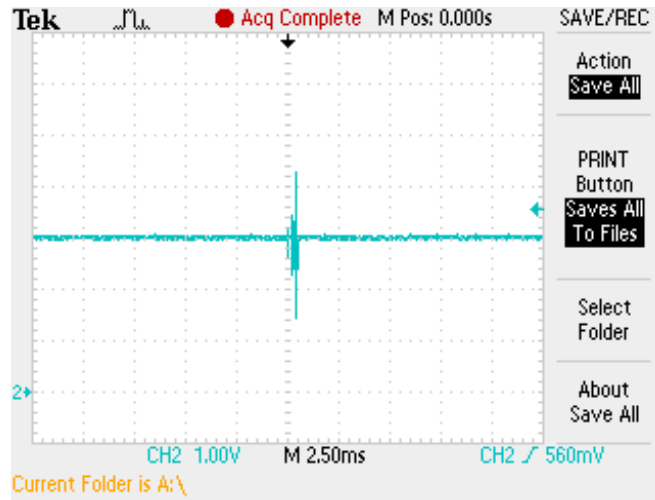
Case 4: S- to ground off to on



Case 5: S+ to S- on to off



JPL DC Amplifier Turn On Transient Investigation
B. Swinyard



Case 6: S+ to S- off to on