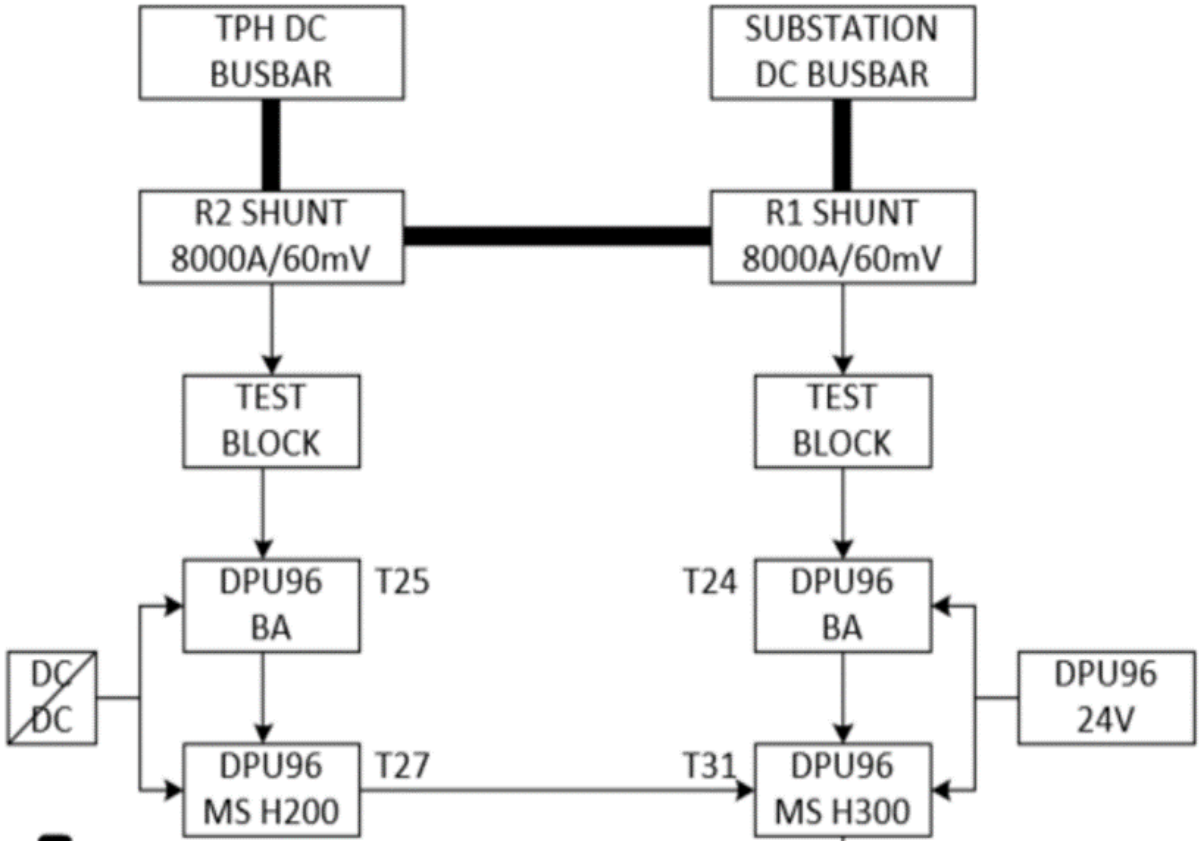
SHEERWATER SHUNT TEST POINT FAULT

Sheerwater substation was upgraded from a Track Paralleling Hut (TPH) to substation c2005. The AC module and transformer/rectifier set are located approximately 350m north of the original TPH. Six 750V 1000mm^2 interconnector cables were installed to extend the DC busbar from the TPH to the new substation. Due to the length of these cables, a Siemens DC differential system was installed to protect the DC interconnector. The basic protection system as below.

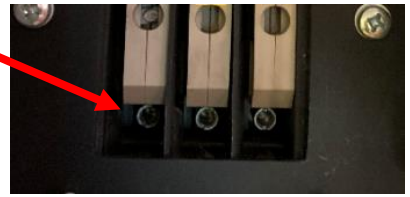


The test blocks used in the circuit are of the type shown below. The 750V shunt wiring enters at the top. Links are removed to isolate the shunt wiring. Test points are provided at the bottom. A yellow cover is raised and secured, permitting access to the test points and enabling milli volt injection of the buffer amplifier circuit.

Test point

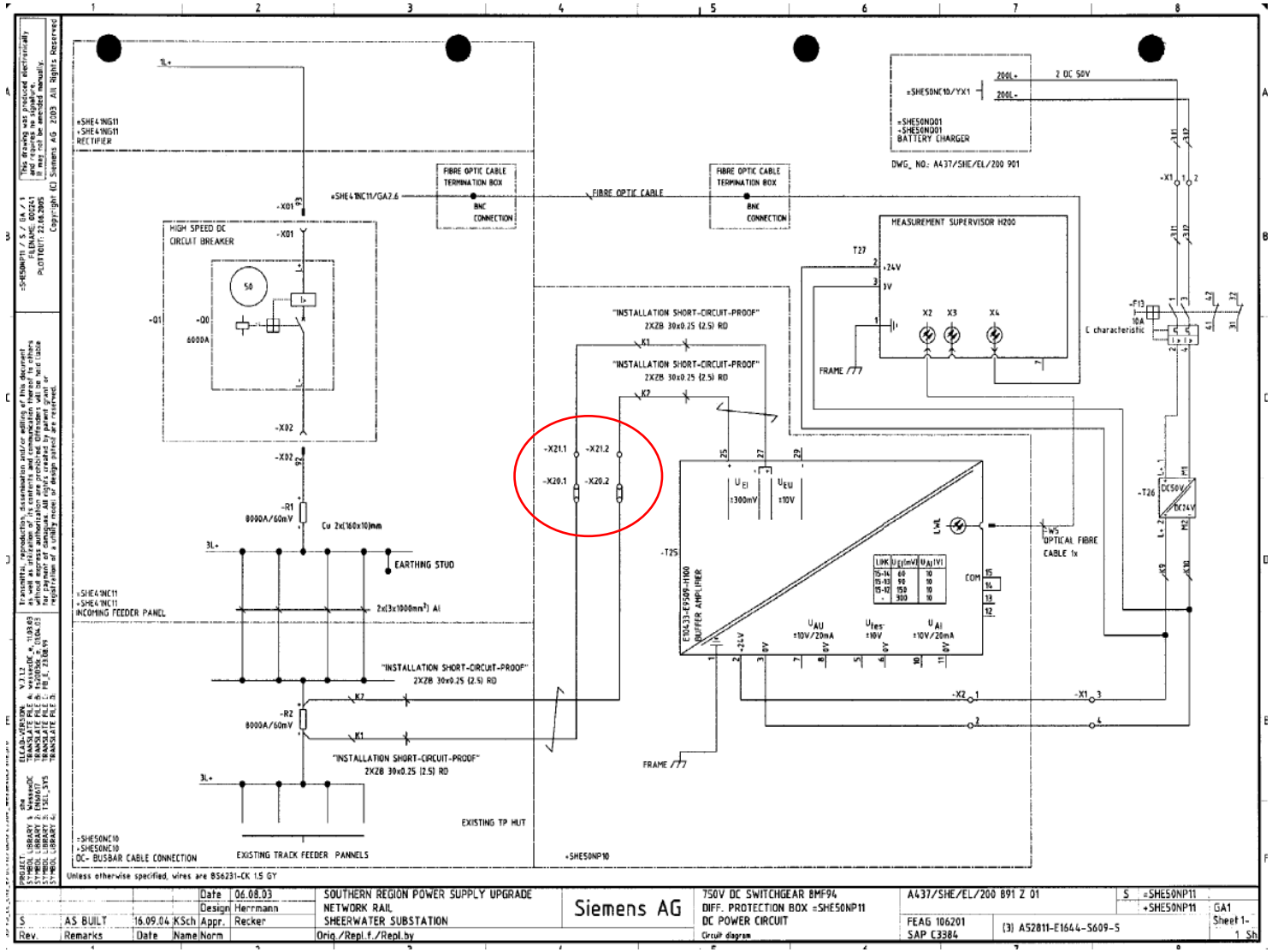
Links

Test points



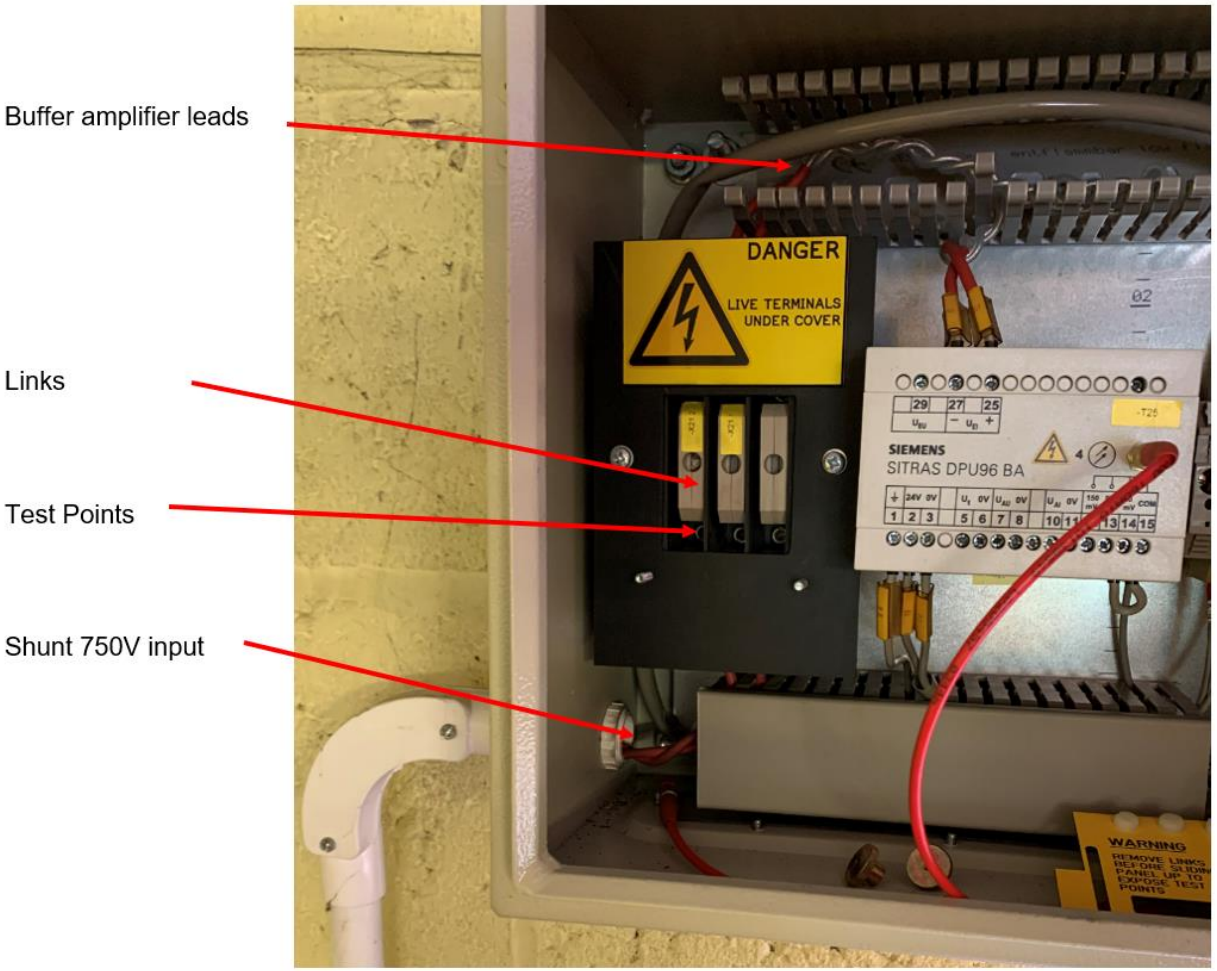
Test point with injection leads

The arrangement of the test blocks can be seen in the schematic below, with the links disconnecting the shunt and providing a safe, isolated test point.

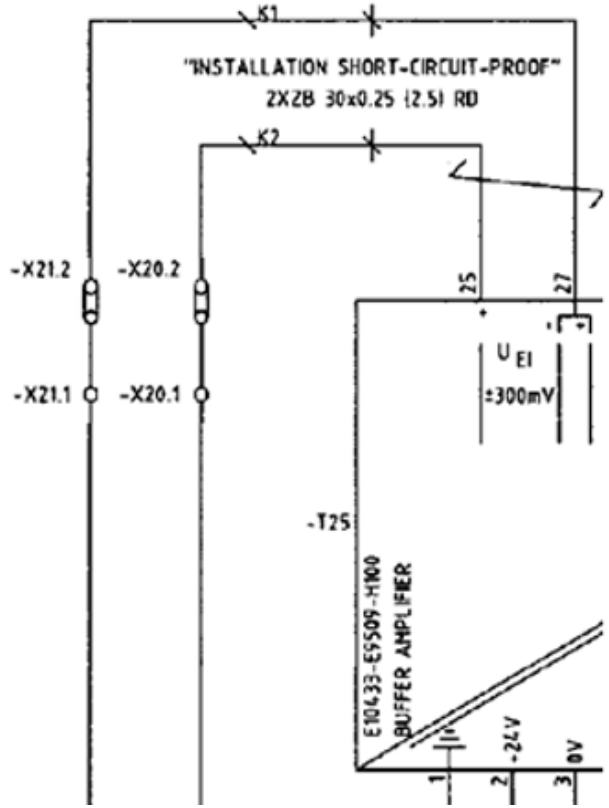


In preparation for testing the buffer amplifier, the operative correctly withdrew the links and connected the millivolt generator leads. Whilst completing the set up, a disconnected lead came into contact with the frame of the DC switchboard and flashed over to earth. The test point was checked and found to be live at 750V although the links had been removed.

On investigation the shunt and buffer amplifier connections were found to be reversed on the test block. The modified schematic shows the arrangement as installed, with the test points connected directly to the shunt and the links disconnecting towards the buffer amplifier.



Wiring as installed on site



Learning points

The wiring error could not have reasonably been foreseen. The intent of the lifesaving rule "*Never assume equipment is isolated – always test before touch*" is not directly applicable to the activity of connecting test leads to an isolated protection circuit. It is however, best practice and a reasonable extension of the principle. Staff are therefore reminded to always test isolated protection circuits for dead before applying test leads or equipment.

The leads being used were "open" and therefore unprotected. This caused to the flashover to earth when the lead came into contact with the switchboard. Staff are reminded to use shrouded leads when testing.