ISSUE DEFINITION

Eaton received report of an unsafe situation occurring with the operation of a Xiria ring main unit. Mainpower safety announcement reference number 3066 dated 9 October 2009 refers.

The incident involved the non-operation of the changeover switch such that its true status was incorrectly indicated on the mimic diagram leading to an undesirable switching operation, enlivening a circuit that was earthed at the remote end. Protection schemes operated to avoid any dangerous situations arising albeit with resultant loss of supply.

ACTIVITIES AND OBSERVATIONS

Investigation by Mainpower revealed that the coupling collar key on the change-over switch mechanism shaft had dislodged, disengaging the mechanism. This allowed the operating handle to rotate freely and the mimic indication to change to the intended status, but without actually operating the mechanism to affect the actual switch status.

A significant causal factor was identified by Mainpower - the right-angle fixing bracket used to secure the mimic panels firmly into position by machine screws, was detached from the lid. The entire rivet fixing intended to secure the right-angle fixing bracket to the lid was missing.
As a consequence the mimic panels were not held firmly in position, allowing some longitudinal movement along the axis of the operating shaft. This meant that it was possible for the coupling collar key on the shaft of the changeover switch to be dislodged.

The exact reason for the absence of the rivet fixings is unclear although it is noted that rectification work had previously been performed on the unit to replace a cracked casting on one of the mimic panels.

Mainpower has issued instruction for personnel operating Xiria ring main units to check for missing rivets/screws prior to operation.

Reference original Mainpower safety announcement for details.

EATON RESPONSE

Eaton concurs with the conclusion reached by Mainpower in relation to the cause of the operational failure, as described in the safety announcement and summarised above.

However, we wish to highlight that this situation is not a normal operating condition. Under normal circumstances there would be no need to remove the lid of the unit or interfere with the fixtures in any way.
The XIRIA unit is theoretically a maintenance-free system; no specific components need to be maintained. All primary, live components are maintenance-free and are housed in a sealed gas-tight enclosure. All other components have also been designed to be maintenance free.
The following components can be inspected:
• correct fixing of cable and earth connections;
• enclosure for damage and contamination;
• protection relay;
• switching functions;
• voltage detection;
• the overcurrent indicator.
As such, checking of the unit for missing rivets/screws should only be necessary whenever rectification work has been undertaken on a unit as a final confirmation of fitness for return to service.

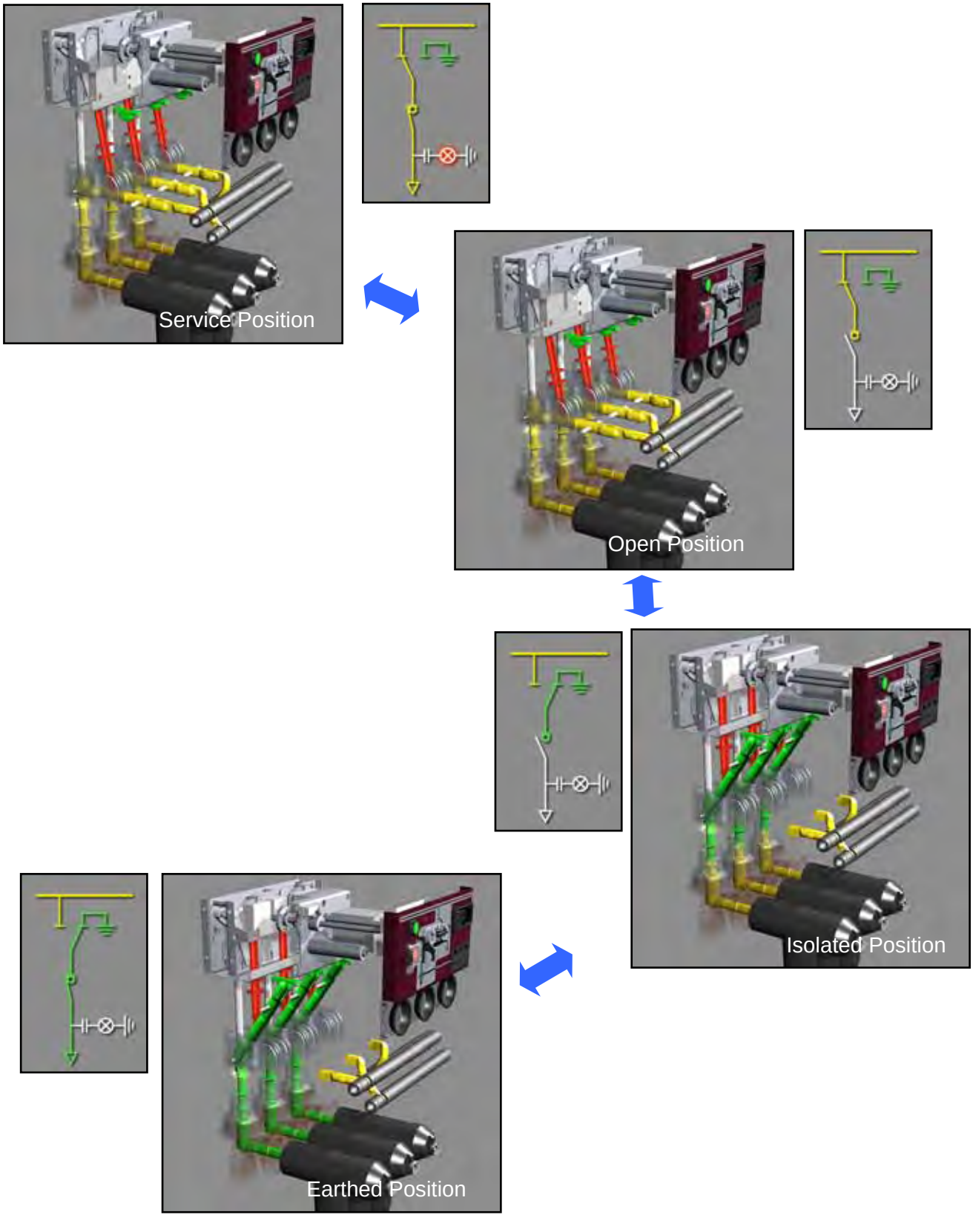
Also, such situations can occur with any equipment if the "as manufactured" status is altered. As such, Eaton believes that it does not merit classification as a product safety issue.

It should be noted that the use of a changeover switch in series with vacuum interrupters provided full making safety and ensuring optimal operator safety under the given circumstances.

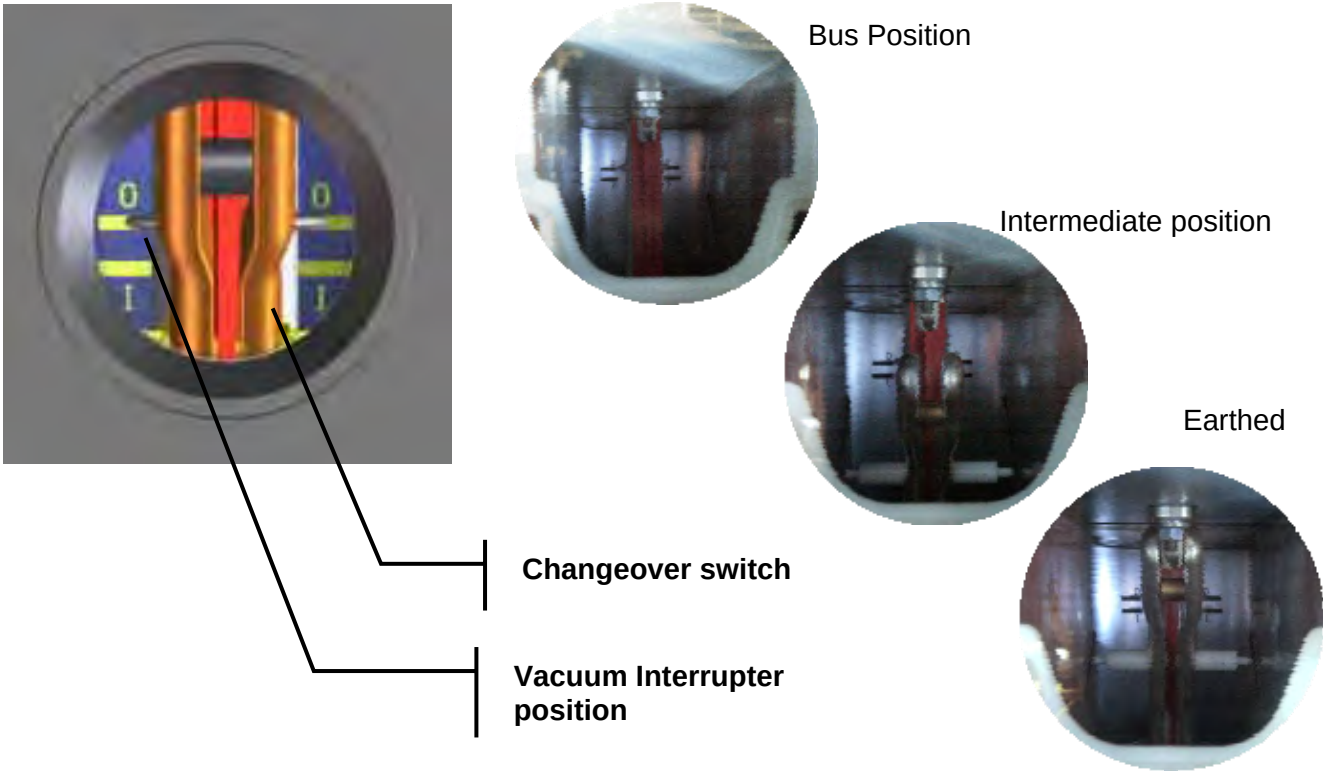
Regardless, the view of introducing additional safeguards should be encouraged.
Our opinion is that it may be more beneficial to incorporate into operating procedures the use of one of the key features on a Xiria ring main unit, that of the viewing windows for verification of switching status.
This provides positive indication of the switch positions and optimal reassurance.

To illustrate,

The possible switching positions of the changeover switch and the vacuum interrupters are shown in the illustrations below:



The position of the vacuum interrupters and the changeover switch can be confirmed visually through the viewing ports as in this pictorial representation.



SUMMARY

In summary, the cause of the failure in the unit under investigation must be attributed to human error in the failure to restore the unit to its intended service condition following rectification work.

Eaton concurs with the merit of inspection for missing fixing hardware, however only in the event that rectification work is performed on the unit in question. Our recommendation is to incorporate visual checks of the switching status as part of the normal operating procedure. This utilises the key benefit of visible isolation/earthing through the viewing ports, specifically developed to meet the demands of the industry for personnel safety in operation.

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