



SBIR N211-038

Phase 1 Supplementary Data

Rev 0



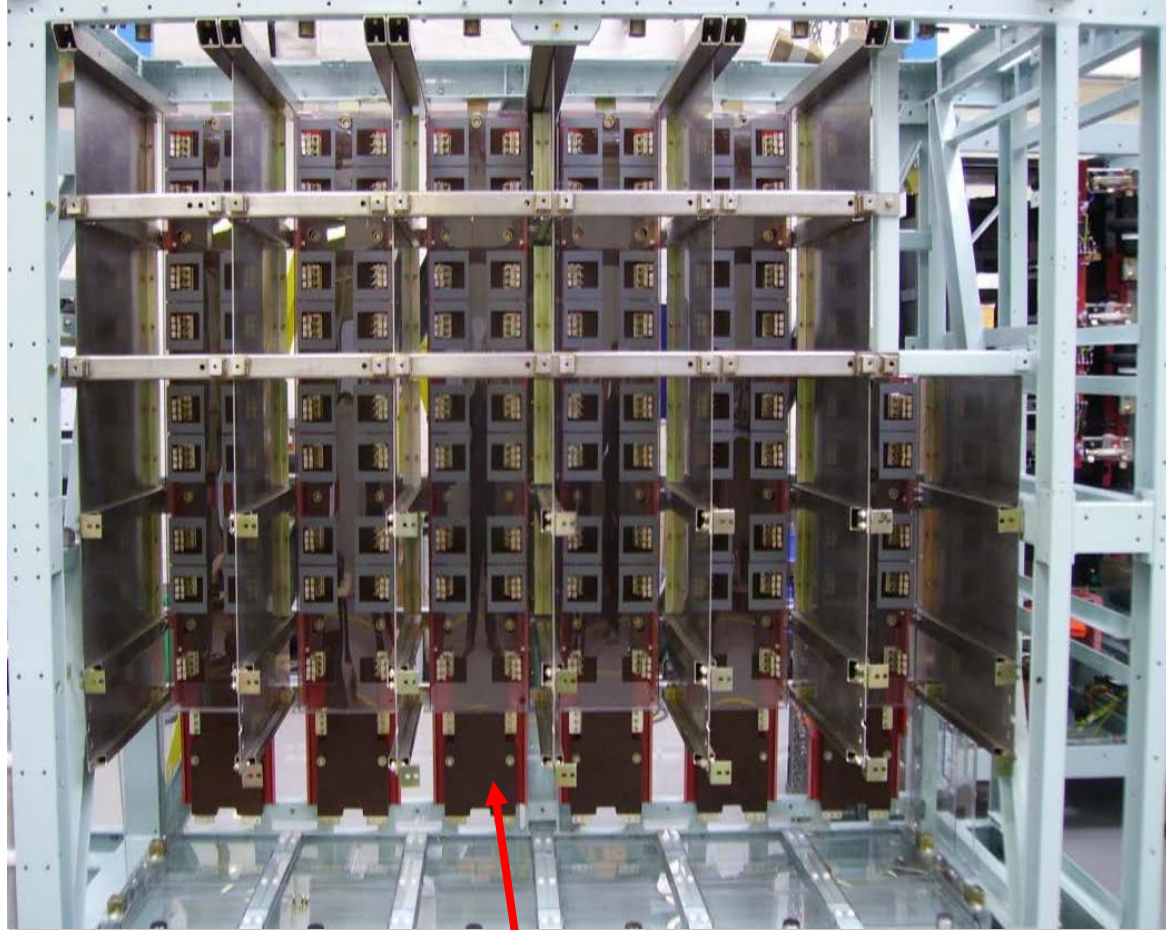
Environment



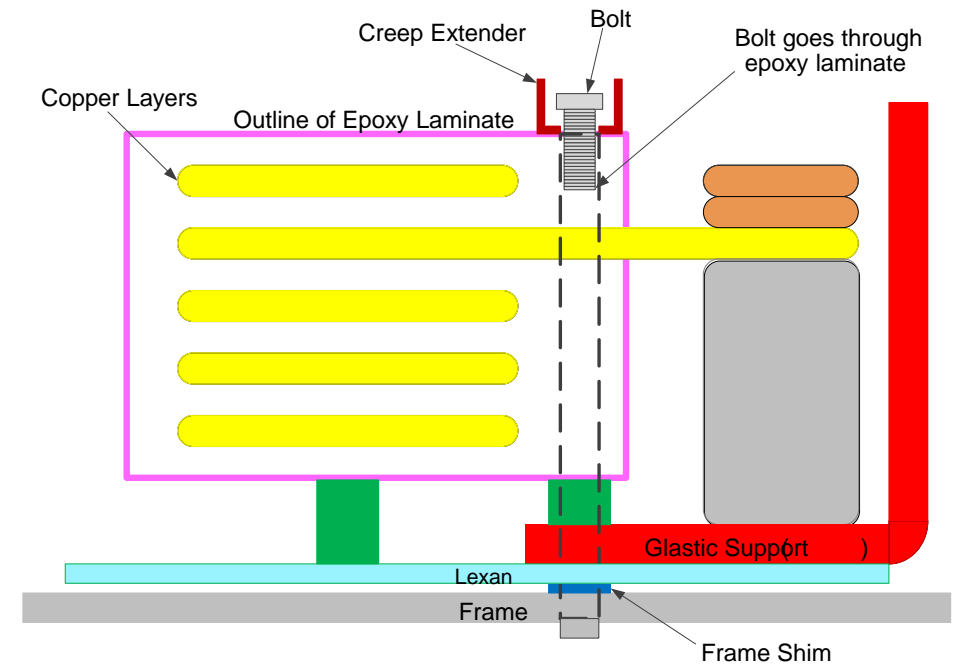
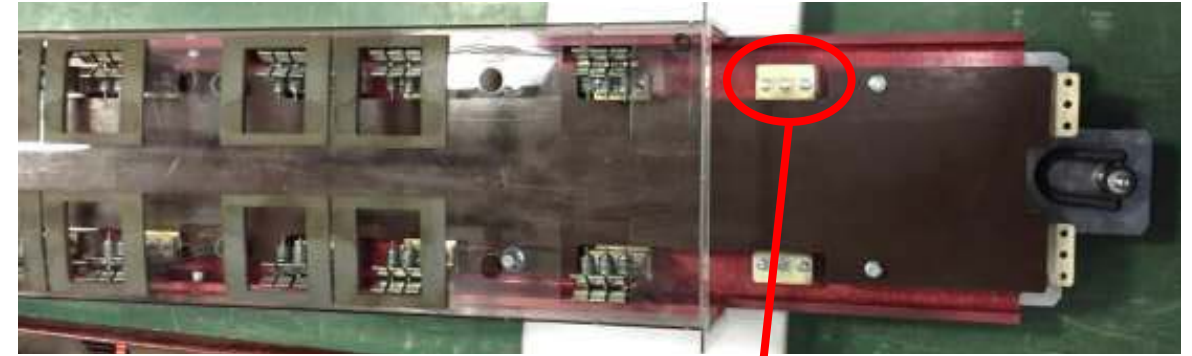
- **Additional Electrical Information:**
 - Possible voltages = 4160V AC, 13.8kV AC, 8500V DC, 3500V AC
 - Corresponding currents = ~1000amps, ~500amps, ~1200amps, 500amps
- **Physical Environment:**
 - Expect exposure to dust in conjunction with the previously stated requirements for operation within a shipboard environment.



Example of DDG1000 Laminate Bus Bar



Additional Bus Bar assembly mounts overtop the 6 seen above





Laminated Bus Bar Issues - Cracking



- **In certain cases, Laminated bus bars in use on the DDG1000 program have been shown to develop cracks due to installation environment.**
 - Primary Root Cause = Stresses from irregular mounting surfaces and alignment with adjoining electrical interfaces often results in bus bar cracking.
- **Examples of bus bar cracks extending across multiple copper layers can be seen on the next slide.**
 - Are their materials or design methods which could be employed to reduce the probabilities of stress induced cracks from forming?



Bus Bar Issues - Cracking





Laminated Bus Bar Issues – Internal Failure



- **Bus bar failure seen on the following slides had failed shortly after being in service and had passed all established factory test criteria.**
 - Sectioning of additional bus bars from the same lot revealed the presence of contamination/voids that was not detected by OEM. It has been assumed that similar contamination/voids likely caused the failure seen.
 - OEM used partial discharge and tan-delta testing to assess layer to layer insulation integrity prior to shipment.
- **What alternative/enhanced NDT tests could have detected anomalies within the insulation system?**
 - Factory tests? Shipboard in service tests?



Bus Bar Issues – Internal Failure

