GLAST Large Area Telescope:

Electronics, Data Acquisition & Flight Software W.B.S 4.1.7

cPCI Connector tests

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Intro

• Test were performed to evaluate the quality of the connector pin assembly of cPCI boards
• Boards used on the test were
  – Crate Power Supply Board (CPS, LAT-DS-01670)
    • 3-u cPCI board
  – Storage Interface Board (SIB, LAT-DS-01675)
    • 6-u cPCI board
  – Crate Backplane
    • 4-slot cPCI backplane (CBP, LAT-DS-01663)
• Boards were loaded with a full set of cCPI connectors
• Boards used were from first attempt by AF assembling these connectors on bare boards
• Issues raised were under-fill and/or voids in the connector pin solder joints
• Solder-fills were subsequently improved to have dominantly >80% fill with very small percentage of down to ~65% fill
• However tests were performed with first-attempt boards without touch-ups to obtain results on average of smaller percentage solder fills.
• Xrays of boards used in the tests are at
  – Under “Pictures of sample-boards used in original qual connector testing, assembled by AF (non-flight) “
Pins used in the tests

- The estimates (by GSFC) of the fill of the joints of the boards used in the tests are posted at http://www-glast.slac.stanford.edu/Elec_DAQ/DAQ-Hardware/SIU-EPU/xray/xray.htm

- Summary
  - Backplane
    - 20-pins 50-60% fill
    - 75-pins 60-70% fill
    - 90-pins 70-80% fill
    - 90-pins > 80% fill
  - SIB
    - 5-pin 40-50% fill
    - 15-pins 50-60% fill
    - 120-pins 60-70% fill
    - 90-pins 70-80% fill
    - 100-pins > 80% fill
  - CPS
    - 20-pins 30-40% fill
    - 15-pins 40-50% fill
    - 30-pins 50-60% fill
    - 15-pins 60-70% fill
    - 15-pins 70-80% fill
    - 30-pins >80% fill
Tester

- Monitor connectivity of > 150 pins per board
- 2 each CableScan 512 for a total of 1,024 simultaneous test points
- Sensitivity: Short < 100 ohm
Environmental Tests

- Thermal Cycle -20C to +100C (1C/min, limits from EGSE hardware)
- 5 cycles on each boards (backplane, SIB, CPS) plugged individually into tester,
  - Continuously execute test while changing temperature
- 20 cycles while boards are plugged into backplane
- 5 cycles on each boards (backplane, SIB, CPS) plugged individually into tester,
  - Continuously execute test while changing temperature
- Vibrate to qualification levels while boards are plugged into backplane (in SIU enclosure)
- 5 cycles on each boards (backplane, SIB, CPS) plugged individually into tester,
  - Continuously execute test while changing temperature
Results (1)

- Results show that no opens were detected
- Flight boards have larger average fill and negligible number of pins down to 65% fill.
- Indicates that even below 65% fill looks sufficient
  - Backplane thickness: 0.115" +/-0.010"
  - Plug-in board thickness: 0.093" +/-0.005"
  - Finished hole size is 32 mil
  - Square Pin dimension is between 15 mil and ~27 mil around the press-fit eye (the pin is thicker around the eye of the press-fit pin)
Results (2)

• Proto-flight crate was assembled with backplane GLAT2412 and a set of flight SIB/CPS/LCB/RAD750
  – Passed all tests including TC, vibration, thermal-vacuum, proto-flight limits
• 1st Flight crate was assembled with backplane GLAT2414 and a set of flight SIB/CPS/LCB/RAD750
  – Passed all tests including TC, vibration, thermal-vacuum, flight acceptance limits
• Other flight crate are at various stages in assembly
Conclusion

- Although the solder connections seem to be fine in visual inspection:
  - Needed to touch-up several very low-fill pins (down to 10%) discovered via xray
- Still some concern about effects of voids, however there is no indication that these press-fit pins can be solder on 30+ boards and get reproducibly uniform 100% fill on all pins
- However, the tests so far showed:
  - Solder connections on our cPCI boards are reliable even those having only 30% fill