

## ACD X side Connector flip and LAT harness running space shortage status/trade study summary

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ACD current understanding of the ACD X side Connector status/trade

ACD wants to flip which connector hole it actually fills with a connector on one of our X side chassis. During this discussion LAT realized it had a variety of previously unrealized harness running challenges below ACD. Our request to move the connectors for one of our chassis on our X side has now been worked out, but not resolved. Initially a sketch which was put into the ICD as a temporary replacement for information which would be on our outline dwg was temporarily misinterpreted. The text above the figure is where the orientation is clarified. We should have put it on the figure itself also. It appeared as if we were moving the instrumentation connectors to the side LAT already thought they were. Now that has all been worked out via a number of sketch iterations between LAT and ACD, the latest sketches shows the new configuration on the X sides. For reference attached is one of George and Richs latest cartoons (I think it shows an early version of resolution option 1B with the crossing issue not fixed and the Instrumentation connector harness a but lower that it might have to be)

**The Chassis connectors ACD wants to move** - Because EMI skirt connectors are surrounded by other connectors, LAT can not rotate the shells and harness direction 45 deg to facilitate a path which was exactly the same as the original path, just in the other direction. It also turns out rearranging connectors on the EMI skirt is not impossible but involves rework of a congested area and has some impact the electronics subsystem, I&T, mechanical subsystem, and the possibly SC interface. If two of our chassis covers can handle the load of harness mounts for the two cables, the impact to LAT is almost none, the harness goes in its original path then bends back to the new connector location when the harness gets to the ACD BEA level (hence the need for supports on that chassis cover)

**A minor discovery** - LAT realized when going over this that they had placed the connectors on the EMI shield in a way requiring our harness from the unmoved connectors to have to cross. LAT has just checked and this is true on the Y sides as well. The fix of this misplacement on the EMI shield appears straightforward and amounts to relabeling connectors.

Solution option 1A - Change basically nothing on the LAT side just have the X side harness for those two chassis go left instead of right when it gets to the BEA. With this change The harness will need support on the chassis covers. This requires some analysis of the covers and possibly a reinforcement design modification. Probably increases the length of that harness by a small amount.

**The Instrumentation connectors, another discovery** - What appears to be an unrealized issue as LAT was getting into think about these harness runs was that one X side was going to require a long run of the instrumentation harness across the entire side in the old and new positions whether we requested this change or not. (again, the issue about LAT thinking for a while that the instrumentation connectors had always been in the slots we just proposed to move them to has been resolved). The problem is our change moved that issue from the +X to the - X side. My understanding is the corresponding connector on the LAT end on the +X side was on a bracket and probably movable ( requiring a change with the SC interface) to solve that unrealized harness running problem when LAT realized the issue. However on the -X side that corresponding instrumentation connector is on the EMI shield, where it is also very hard to move. LAT could ask us to try and move that instrumentation connector on the ACD side to the center location previously occupied by the chassis connectors, but this would require us to move the internal wall there, modify the bracket to handle incoming and outgoing instrumentation signals because there is no room on the top for the old

design to work, and we would not be sure we could route all of our instrumentation harness to that center location. LAT could also ask us to run that harness across the BEA to the other side. This may require that harness to run near the top of the BEA near the PMTs to avoid other harness, requiring ACD to modify 4 chassis covers for harness supports not just two. Any of these harnesses would have to be removed for us to get to remove our X side chassis covers.

Option 1B - This is option 1A with a second bigger change added to solve LATs problem with running this long harness. Do the same as 1A but also move the Instrumentation harness on the -X side to run along the top of the BEA across both chassis covers. Run across the top so we don't run over the chassis harnesses. This would require changes to both covers on that X side plus possibly some changes to the frame. There are also some minor concerns about running that harness so close to the PMTs. This options solves our problem and LAT's problem with no real changes on the LAT side.

**Why we think it is very hard to leave the connectors for these two X side chassis in the original location** - The original email notifying LAT about the connector move went into this. ACD has looked at several options to solving the configuration problem with the BEA chassis' in slots 1LA (-X) and 3LA (+X). There is only one totally internal to the BEA option that we might consider that would not involve the LAT and it is the second option described in Dave Thompson's email on 10/23/03, description below. Option 1A requires almost all of the change on ACDs part but

Option 2. Change the right FREE card design to allow the individual channels to be assigned by resistor values, so that a right FREE card could be numbered 17-00 from right to left like the left FREE card. The channel assignment to the GARC cannot be changed, however, and so the wiring of the VETO signals from the GARC to the signal connector would have to be changed. Because this connector is a tight fit, the proposed approach would be to switch from 24 gauge wire to 26 gauge wire and find some way to crimp the smaller wires into pins that were designed for 22/24 gauge wire. Changes would also be required in software for interpretation of the output signals. This approach entails higher risk and higher cost due to the need for a series of changes that would extend beyond the fabrication phase. The ACD team recommends it only if the first approach is not possible.

This approach has the following negative impacts to the ACD/LAT:

We have added another FREE card variation: Left FREE, Right FREE, new Right FREE. We would need to spend some time verifying that we can wire the connector in the way described above.

We will need to carry a different set of spares, but this should not increase the number of spares needed.

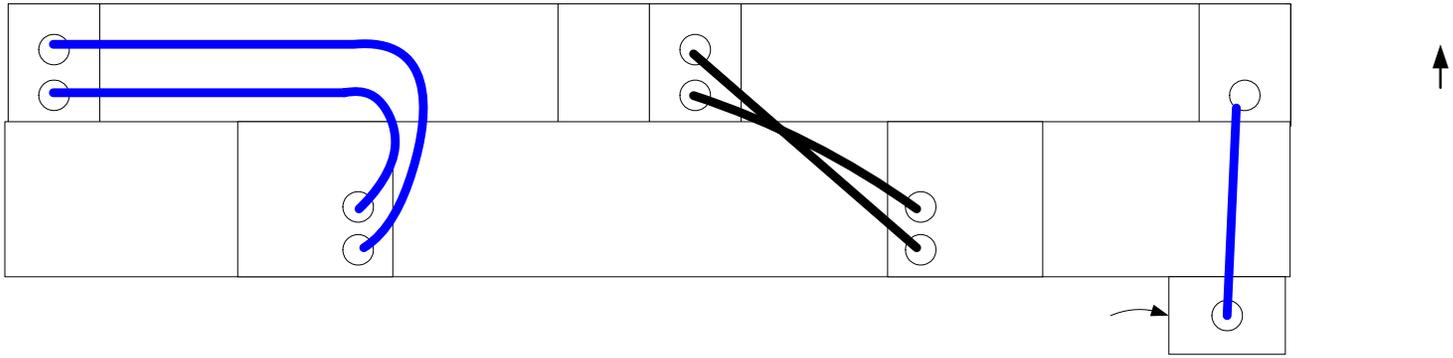
Several documents need to be changed such as drawings, spares plan and assembly procedures.

Since the wiring of the VETO signals to the GARC cannot be changed, the posttest software analysis will need to accommodate the different channel assignments for the two new FREE cards. This change will affect the ground software design and coding and has the potential to cause some confusion. There is also the risk that sometime later in the mission that the software will be changed and this different configuration will be a source of confusion. In general, the approach can be done internally by the ACD, but it still will affect those who will write the ground posttest software.

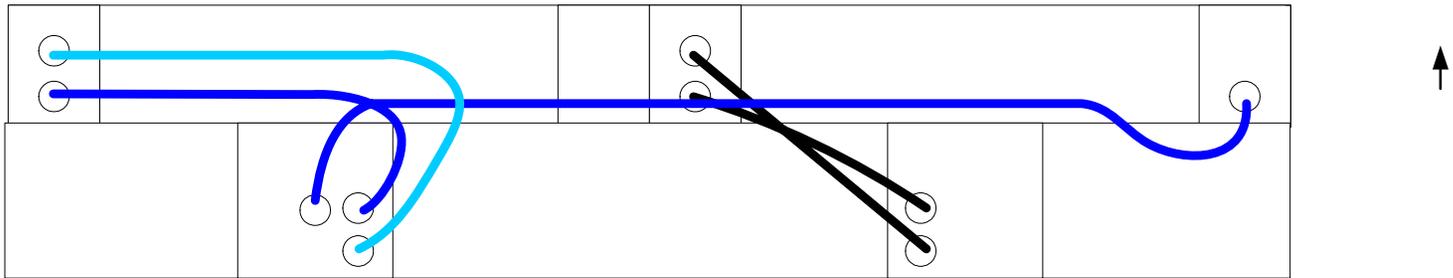
Option 3. Renumbering the signal channels from the PMTs. Needs two changes. In software (not sure if this is easy or hard). Some potential hardwire changes (unknown amount of work). Requires no connectors to move. This originally sounded harder to us than the option 1 at first which is why we originally ruled it out. Maybe it is easier than thought.

**Resolution** - we have gained a few days by allowing the X side frame parts to go a little farther into fabrication. We need to know if we can swap these connectors. If we decide rotating the shell direction or swapping the corresponding connectors on the EMI shield is harder than modifying and reanalyzing our chassis covers, ACD might have to do that. I think the harder thing is to decide what, if anything, to do about the instrumentation harness long run on one side. Running it across lower sounds like some work according to Martin, running across the ACD BEA sounds like work, swapping the connectors may have eliminated the bracket moving solution, moving that instrument connector the center of ACD is a potentially delaying change also. My implication with the word ' work ' is that it may not be resolvable in time to prevent a delay in the Frame parts (although they are not on the critical path) and it requires more than a few hours of effort to work out the details.

Update 12/03 - LAT has stated it has a variety of harness running challenges below ACD and if we can run harness along ACD on the X side they are requesting we do so on our y sides also. This complicates post I&T access to ACD. The cover analysis is still not done but we don't expect a change in the cover to be needed.



BEA



Option 1 ?