aLIGO OMC installation/commissioning notes

- Removal of the DCPD preamps from the eLIGO assembly:
  - An extremely small hex wrench is required to detach the mini-DB9 cables from the preamps.
  - Care should be taken not to strip the caps.
  - Note that the DCPD housing on the transmitted side of the OMC TRANS beamsplitter must be removed to gain access to 2 of the screws holding one of the two preamps to the breadboard.
  - The screws used to attach the preamps to the breadboard (and in turn to reattach them to the aLIGO OMCS preamp bracket) are rare METRIC screws. They should be removed along with the preamps and NOT LOST.
  - Ref: https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=7274 and https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=7299
- OMC/S and tip-tilt mechanics
  - Dogclamps
    - Due to a version mismatch, the dogclamps ordered for the OMCS had the wrong height. The temporary fix was to use the upper-mass-style (rectangular) steel balance weights between the OMCS base and the bite of the dogclamp. This is still what exists in L1-HAM6, but the proper, shorter clamps should be procured for H1.
    - No dogclamps were set aside for the tip-tilts. Some Al ISC clamps were found, but they buckled under the prescribed 100-lb.in torque. Ultimately, some spare HAUX and HXTS steel clamps were used (see https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=8245 and https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=8278)
  - Vibration absorber screws
    - The vibration absorber assemblies for the OMCS were found not to include the screws required to attach them to the OMCS weldment (see https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=7578). These are (fairly rare) 1/4x20 x 5/8" flat head cap screws and should be set aside before they're needed.
- HAM6 cabling:
  - In-vacuum:
    - The HAM6 routing diagram refers to a nonexistent 156"-length DB25 cable for OMC SUS, OMC ISC and OM2. These should be replaced with 180" cables in all cases.
    - The final cabling for the OMC/S can be found in https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=7631. The original cables for the TTs are in https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=7505, though the cables have been replaced for OM3 (see https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=7993) and OM1 (see https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=8245) due to malfunctions.
  - In-air:
    - Just a general comment here that all local and trans-CER cabling should be accounted for well in advance. We had many consecutive issues with absent cabling and in some cases are still operating with temporary equipment.
    - Originally, there was a discrepancy between the routing and flange diagrams for HAM6. This seems to have been corrected.
- Electronics:
  - A thorough account of all ISC electronics should be made long before they are all needed. To recap what happened at LLO:
    - PZT drivers: Were not finished upon OMC installation, but have since been installed.
    - Split interface for whitening chassis (for DCPD support): Same as above, though there was a pin frameshift that has been temporarily worked around with a patch cable. Rich has made a corrected version of this board, and this should be available in time for H1.
    - The OMC QPD (ASC-OMC_A and _B) signal chains from the feedthrough to the AA were completely absent from the diagrams, including the transimpedance amps and whitening boards. This has since been remedied at LLO.
  - We should not put more than 100V on the PZT. We know the story well by now, but here is what happened:
    - The drive PZT was observed to have failed in a low-impedance (~1 Mohm) state (see https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=8366)
    - Conversations with Noliac pointed to a relatively common failure mode made more likely by driving with over 100 V. The range of the PZT driver was therefore reduced to 0-100 V (see https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=8416)
    - To avoid having to a) replace the faulty PZT or b) use the faulty PZT for dithering, we modified the driver to put the dither and 10-V shutter offset on the low leg of the working PZT, and shorted the faulty one (see https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=8440)
- Digital control
  - Very minor issue: the pitch and yaw outputs of the OMC QPDs are reversed with respect to the rest of the ASC system. Therefore, the QPD input matrices need to be switched to reflect this.
  - ONGOING: High-level decisions about where things should be and what names channels should have.
    - So far, the only consequence of this is that the Beckhoff channels corresponding to the DCPDs have a different format (Beckhoff has L1:LSC-OMC_A and _B while the realtime system has L1:OMC-DCPD_A and _B reflecting their living in the l1omc model). I requested that these be changed in Beckhoff, but Daniel was strongly reluctant, so nothing has been done yet. As a solution, I have suggested that we can top-name the DCPD block within the OMC model so that it has the naming structure preferred by Daniel and Beckhoff. This would allow it to stay in the l1omc model, and would only require a little of my time to go back and rebuild the filters, etc. *I have since realized this is not so trivial and argued for keeping the L1:OMC-DCPD format.*
    - In the future, there is a possibility we will decide that the IPC delay between the l1omc and l1lsc models is unacceptable. Our simple calculations have indicated that this is not an issue for our target control bandwidth.