

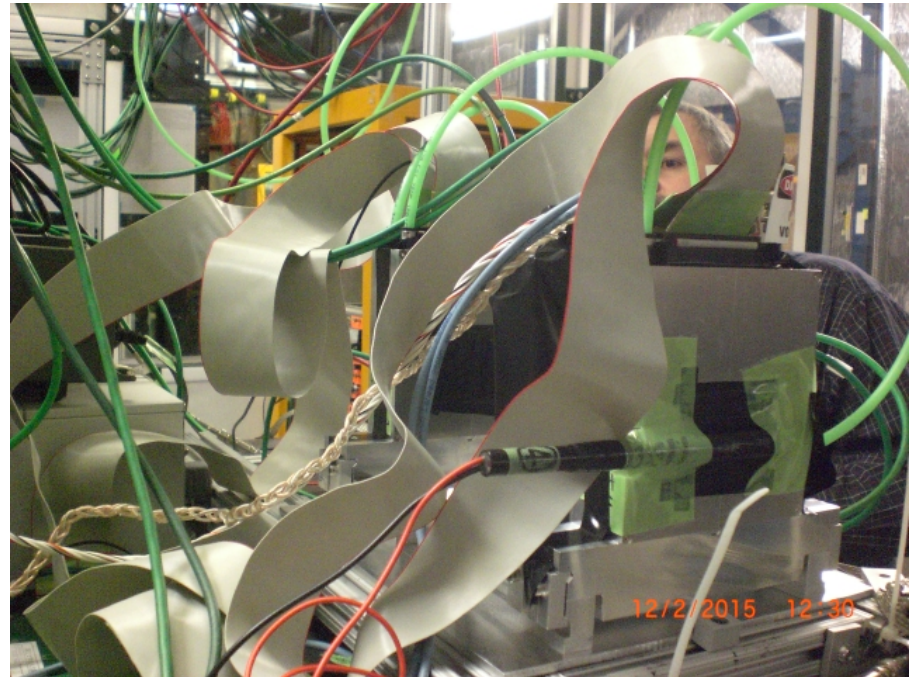
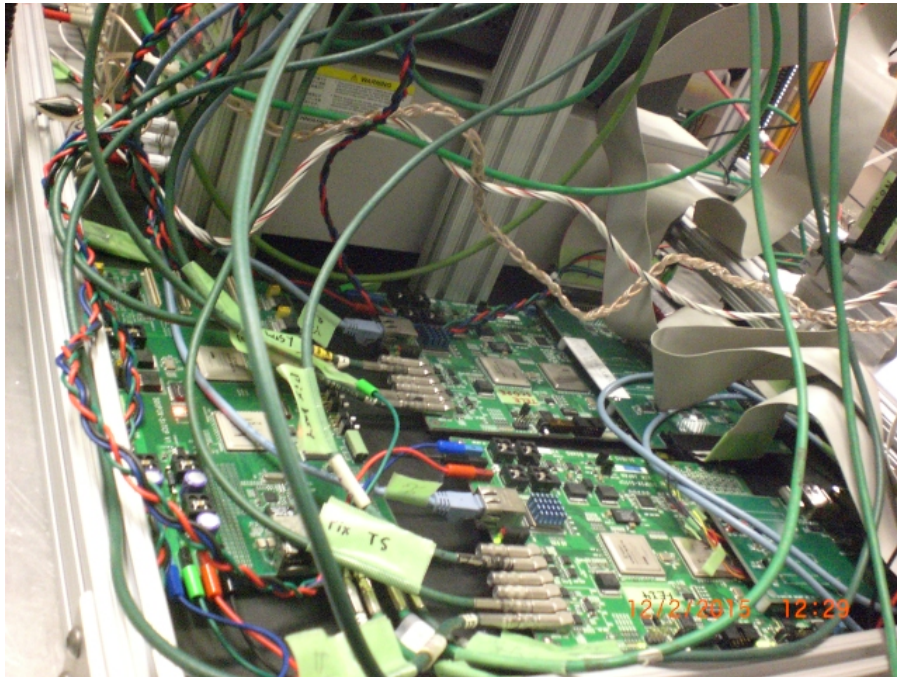
Electrical Top-level Diagram Example for ORC Reviews Uses information from the T1068 installation as an example, ORC Review Conducted 12-02-2015

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- Example depicts the electrical information that is required to be displayed on a top-level diagrams. This information should concentrate on DC power distribution and usage, AC power distribution and usage, and experimental high-voltage usage.
- Key point: The ORC review's primary concern is safe operation while unattended in a test beam enclosure: Is there a potential shock hazard and is there a potential smoke or fire hazard.
- Electrical information:
 - DC power sources (crate backplanes, bench supplies, etc.)
 - DC power connectors used with maximum current rating
 - DC power conductors size (mm², AWG) and length, number of conductors
 - AC power and DC power fuse locations (if used), current and voltage ratings

T1065 Pictures

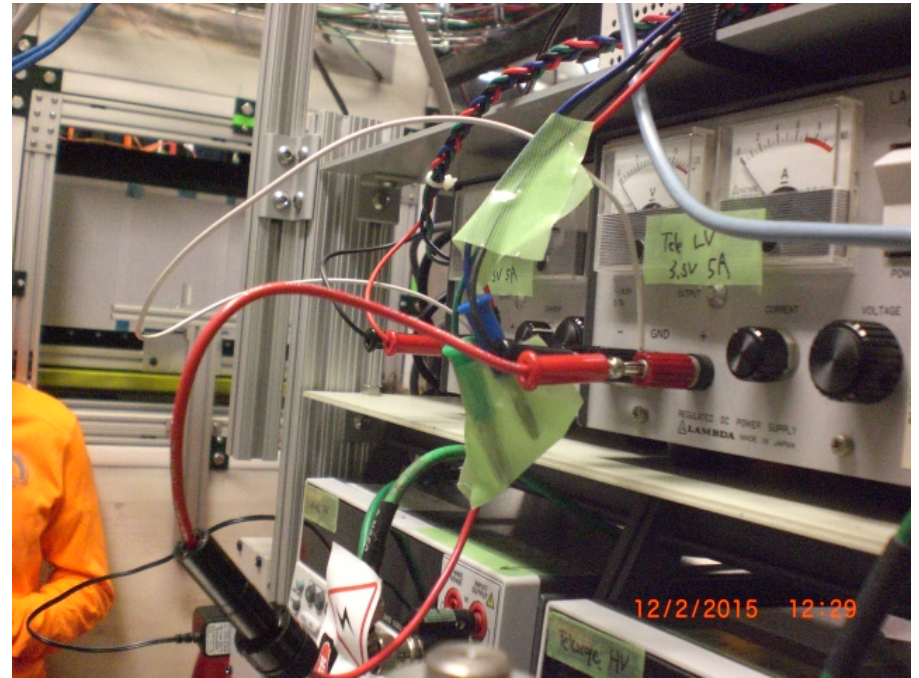
Shows the PC boards used



Notice the power supply connections are twisted wire pairs.

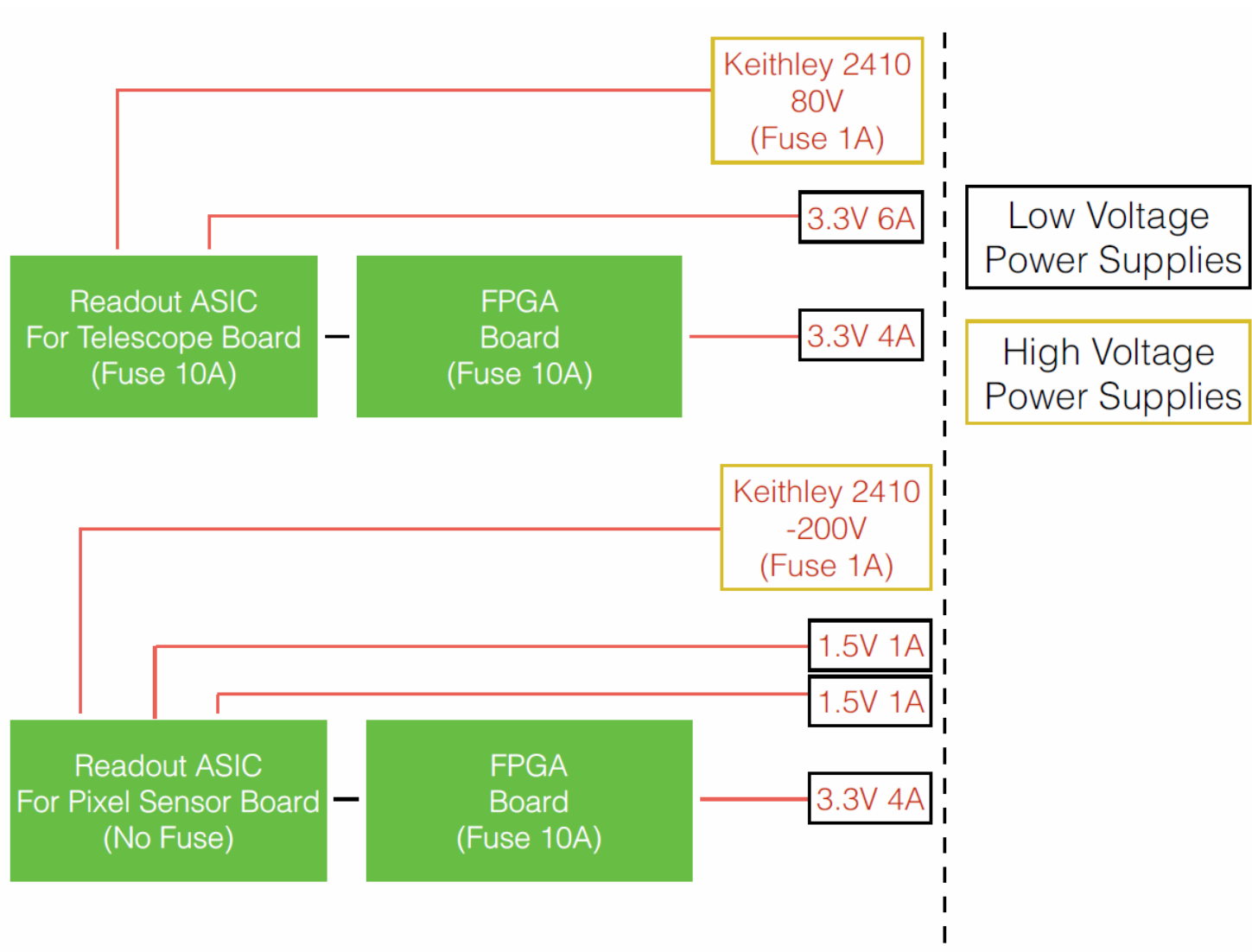
T1065 Pictures

Shows the DC power supplies used



Notice that some power supplies have inline fuses installed at the output terminals.

Drawing Supplied by Installers/Users



Insufficient information. This drawing can describe either a satisfactory installation (safety-wise) or an incorrect installation.

Given the previous diagram, several questions will need to be answered during the course of an ORC review.

- What are the sources of the DC power used?
The supplied diagram does not indicate if the power supplies are bench type, AC-DC “brick” style with terminal connections, etc. Can they supply voltages over 50 VDC?
- What are the type/size of the DC conductors used?
The supplied diagram does not describe these conductors as wires, cables, twisted pair, etc.
- Where/How are the power supplies connected to the AC power?
Not shown. Are AC power cords plugged directly into a wall outlet, or power strip(s)? Are modules mounted in a crate? In a relay rack? Any rack protection used?
- What are the DC power supplies’ output ratings?
The supplied diagram does show a voltage and current. In this context, the current needs to be the maximum available output, NOT the usage current as determined by the load.
- Is DC power supplied to any load, either from the power supply or from one PC board to another PC board, over a ribbon cable?
The supplied diagram indicates what may be a cable connection from the ASIC PC board to an FPGA PC board. However, there is no description of this connection.

Given the previous diagram, several questions will need to be answered during the course of an ORC review.

- Are there DC or AC experimental or bias high-voltages (HV, defined as any voltage over 50 volts) used or produced?

The supplied diagram does indicate two supplies with voltage sources over 50 volts plus a PMT that used about 1 kV DC (experimental high voltage).

- What, if any, fuse protection is used?

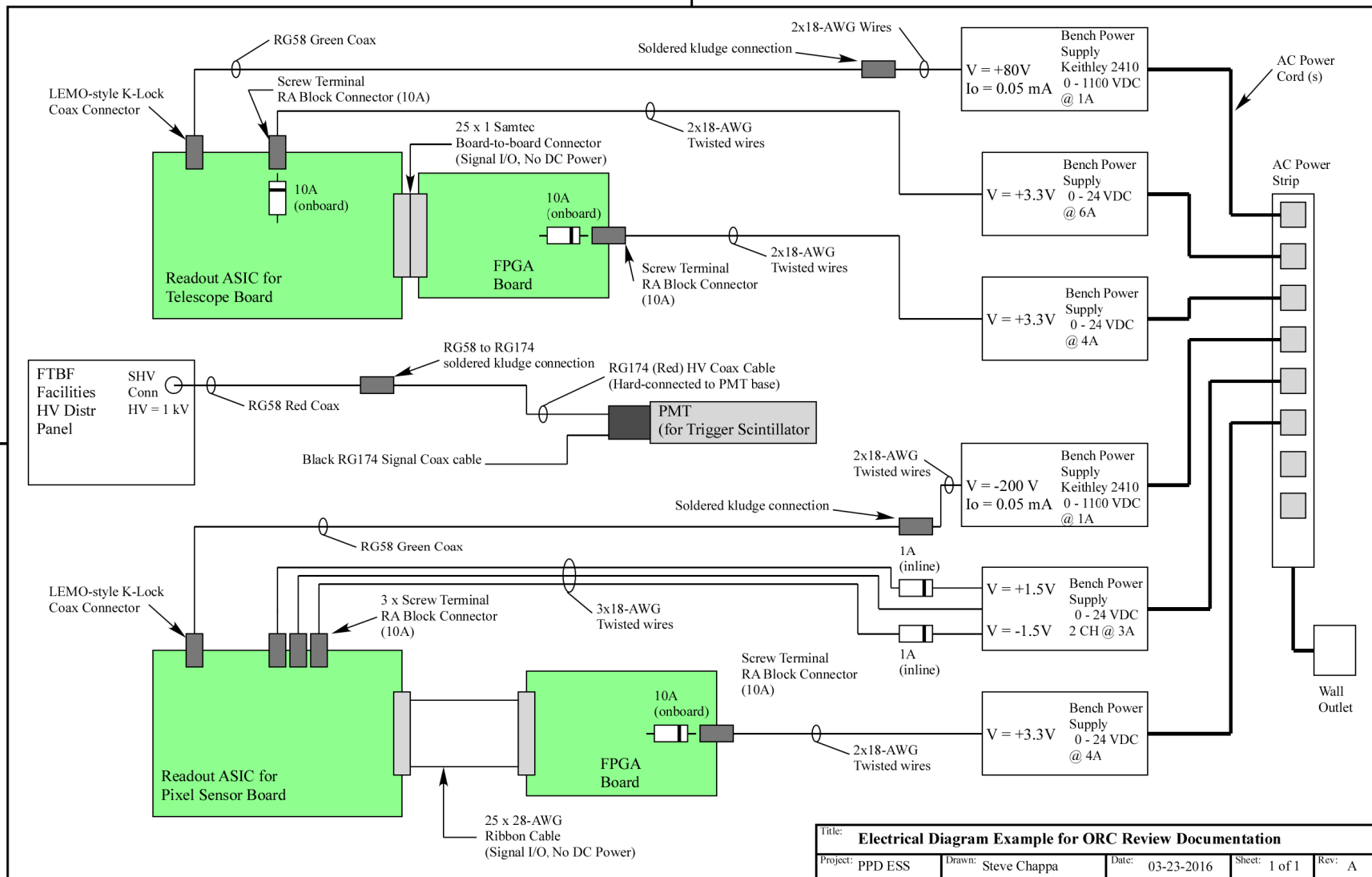
There are fuse values indicated. However, the location of these fuses is unclear (at the power supply output terminals, inside the supply, etc.?)

There also are fuse values shown on the PC board block symbols.

- What type of connectors/connection is used to connect the PC boards (or other loads) to the DC power conductors, part numbers (if available), and current ratings?

The supplied diagram does not describe any DC power connector/connection type used.

Modified Drawing that Depicts the Required Information for an ORC Review



This diagram for the DC and AC power usage can now answer the questions as listed previously. Having this information while visually inspecting an installation allows the ORC review to proceed more efficiently.