

CAT7 cable problem

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DAQ meeting

KB-FL7 — problematic product

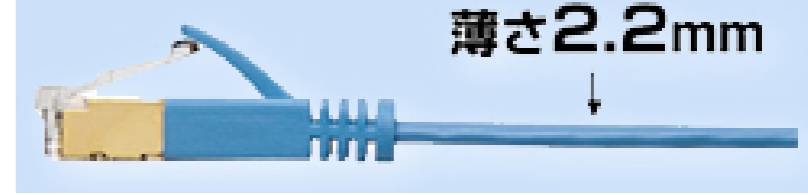
● SUNWA-SUPPLY KB-FL7

- Flat CAT7 cable, 2.2mm thick
- My first choice, heavily used in many places, including DESY VXD test
- Clock jitter and various specs were tested before choosing this
- Later, another flat CAT7, SUNWA-SUPPLY KB-FLU7, 1.9mm thick, is more widely adopted

● What I found

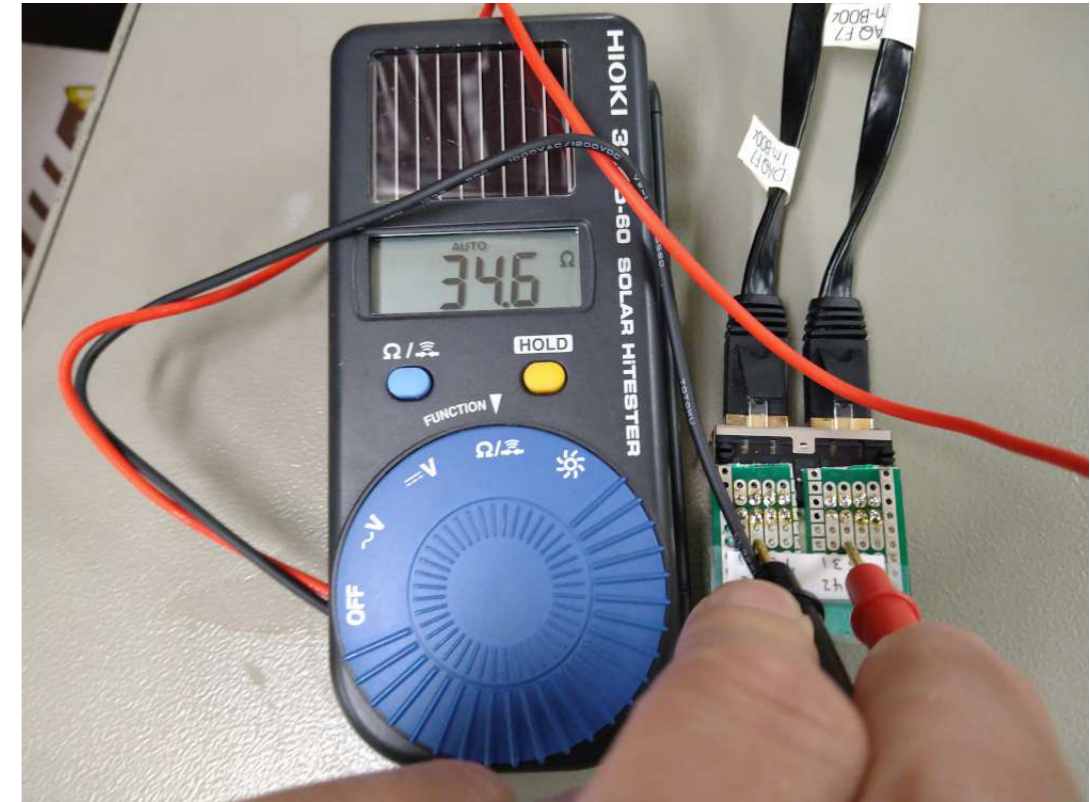
- There was a suspicious signal shape when I was testing a spare FTSW in B2
- I decided to measure the cable resistance in a systematic way
- **I found large resistance in all of the KB-FL7 cables that I tested (!)**

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Cable Resistance

- Handmade cable checker
 - Just to secure the multimeter probe contact
 - Amphenol RJ45 connector for FTSW is used
- KB-T7 0.5m (thick CAT7)
 - 0.2–0.3 Ω for any of 1–8 pins (very good)
- KB-FLU7 1m (good flat CAT7)
 - 0.6–0.7 Ω for any of 1–8 pins (good enough)
- KB-FL7 0.5 and 1m (bad flat CAT7), 6 cables
 - 7 and 8 pins are typically around 1–2 Ω (best one: 0.5 Ω , worst: 8.7 Ω)
 - 1 and 2 pins are somewhat worse, typically around 1–5 Ω (best one: 0.8 Ω , worst: 19.6 Ω)
 - 3, 4, 5, 6 pins are **much worse**, typically one or two pins have $O(10 \Omega)$, and sometimes up to **2 k Ω (!)**



Why such a large resistance found now?

● Why it was not found earlier?

- Signal swing was compared when choosing the cable 10 years ago
- Static resistance might have been measured, but not in a systematic way
- 7-8 pins are not so problematic, and thus not found by clock jitter measurements

● Cable degraded over years?

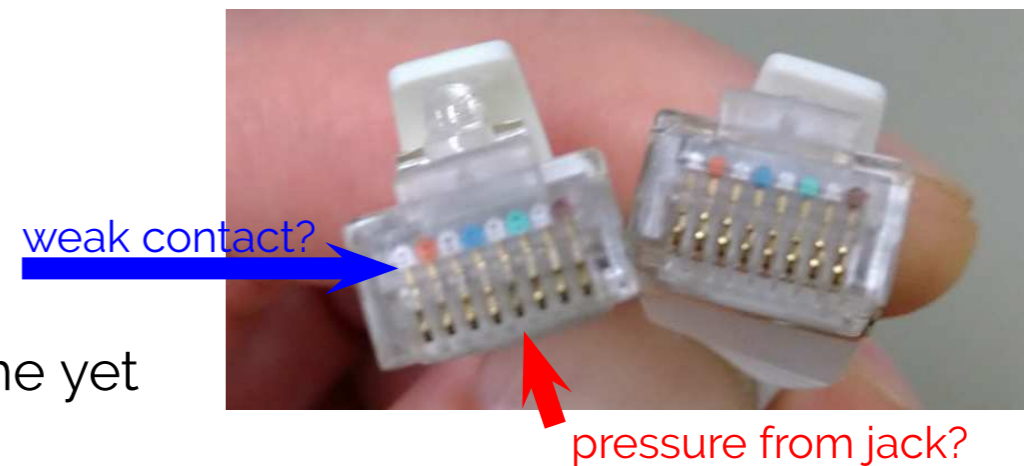
- Freshly unpacked KB-FL7 (5m) also had this problem (but bought many years ago)

● Is it only for the FTSW's Amphenol connector?

- A similar checker made with Hirose connector (used in CDC FEE) was tested ⇒ similar results

● Probably the contact between the wire and blade?

- There must be some push from the jack pin to the blade
- Swapping the connectors changes the result
- It also explains why replugging sometimes fixes a problem
- I should have tried to press the connector, but have not done yet



Actions to be made

● Make a list of used KB-FL7

- Many 0.5m or 1m cables are used in the FTSW crate
- Probably most of the 1m cables for TT-RX is KB-FL7 (~200 cables)
- Some of the long span (10m or 7m) cables to COPPER crates
- Need to check the FTSW-to-FTSW cables of on-detector CDC FTSW crates
- Fortunately, CDC and ARICH cables into the detector is the other one

● Do we like to replace them?

- It costs 300-400k yen (?) if KB-FLU7 (flat CAT7) is used
- Probably twice more for KB-T7 (thick CAT7)
- Better to use the thick CAT7 for long cables, but no need for the short ones

● Any help as the summer work while E-hut is down?

- If nobody can help me, I won't probably do it