

General circuit board troubleshooting

1. Check the card.
 - a. Note the serial number and other designations.
 - b. Note oddities (damage to cards or components, component stuck crooked, hole in component).
 - c. Are there repairs on the board or components that look new or replaced since before so note this, they can be possible error causes.
 - d. Note heat development (somewhat burned on the card, nuance differences in color, traces of smoke, smell the card).
 - e. Note possible shorts or interruptions.
 - f. Check any glass fuses.
 - g. Check any cooling elements that they are seated properly.
 - h. Check large/heavy standing hole mounted components for proper fit
- will. Check pads and solder tracks around them.
 - i. If the card is varnished, check that it looks good.
 - j. If the card has any mechanical connections, for example with another card, check how it is stuck
2. Measure the inputs (measure the resistance), especially the supply input (missing base, so one can assess/decide what is to be measured).
3. Measure the outputs (measure the resistance) (if there is no basis, then you must judge/decide what is to be measured).
4. Try to identify local supply levels (outputs from DC/DC etc.) and measure that they are not shorted to signal ground.
5. Try to identify any isolated parts on the board and resistance measure signal ground and voltage levels above the insulation limit.
6. Try to identify any fuses and measure that they are not open.
7. Measure locally on the card, where there are notes from the inspection that something deviates or where it can be considered justified for other reasons.
 - a. Look for shorts or breaks.
 - b. Resistance measurement resistors.
 - c. Measure capacitors to make sure they are not shorted.
 - d. Measure across diodes that they conduct forward and block reverse.
 - e. Check that IC supply pins are not shorted.
8. If there is sufficient support, power up the board (make sure you have tuned this with the project manager first, so that there is no obstacle to testing the card).
 - a. Make sure to set current limit on power supply first.
 - b. Measure current and voltage on the supply to the board, when voltage is applied.
 - c. Check that applied voltage maintains its level after voltage application and note power consumption.
 - d. Look, feel and smell for heat development.
 - e. Note the status of LEDs.
 - f. Check with a thermal imaging camera for hot components.
 - g. If possible, check the different functions of the card (this easily becomes a waste of time and difficult task). For example.:
 - i. Measure levels out from AC/AC, DC/DC, etc.
 - ii. Measure signals, check level, frequency, rise times, etc.
 - iii. Proceed with relevant measurements for that particular one the construction.

9. Where components can be removed without risk of damage.

- a. Unsolder components suspected of causing a short, open (or on other way fails) and re-apply voltage, alternatively replace first with a new one component before energizing.
- b. Measure the unsoldered components to see if they are intact.
 - i. The tip here might be to unsolder one leg on components with two legs and then check measure on the component to see if it appears to be whole.
- c. Feel free to clean the circuit board (and its components) if it is dirty, then it further facilitates troubleshooting and identification of individual components.

Points of view for troubleshooting and repair

When a circuit board has undergone troubleshooting, cleaning or repair, the customer should be informed things that may affect the function of the circuit board in the future even if the board has been cleaned and repaired and probably working. This is, among other things:

10. Aged components - Capacitors

- a. Capacitors age, especially electrolytic capacitors that dry out with the years. Therefore, they should be replaced after 20 years, even if the capacitors which sitting on the circuit board works.
- b. If there are old capacitors, inform the customer that we recommend that these are replaced.

11. Damaged components

- a. Some components or for that matter the printed circuit board may be damaged as they have been exposed to some form of impact, such as mechanical impact, short-term overheating, too high a temperature for a long time, power surges, etc.
- b. All damaged components must be informed to the customer in troubleshooting or the repair report and get information that these are damaged and that we recommend that they should be replaced (depending on the damage) alternatively only inform the customer about this so that the customer can make a decision.

12. Damaged cabling

- a. The customer must be informed of damaged cabling. Simpler, superficial injuries we recommend that they be prepared.

- b. In case of major damage, we recommend that the wiring be replaced.
- c. If the wiring appears to be undersized (melted plastic, burnt contacts ets) we recommend that the cable be resized to a thicker one and replaced to a rougher one.

13. Damaged connectors

- a. Damaged connectors are always recommended to be replaced.
- b. Burnt or melted connectors, which may indicate under sizing /overflows, should be re-dimensioned. However, this does not only affect themselves the connector but also the circuit board and associated cabling.

14. Single layer cards

a. Single-layer cards are worse from a quality point of view than multi-layer cards. Therefore, if there is a single-layer card in the unit, we should point this out to the customer.