Master Samurai Tech
LEADING APPLIANCE EXPERTS

Troubleshooting 10-Step Tango

The Master Samurai Tech Academy
MasterSamuraiTech.com

1. Formulate the basic problem statement

2. Do a schematic overview, initial observations, talk to the board

3. Identify the Load of Interest (LOI)

4. LOI circuit analysis

5. Formulate the troubleshooting hypothesis

6. Identify electrical measurements to confirm the hypothesis and the expected readings for those measurements

7. Identify EEPs at which to make the electrical measurements

8. Perform the electrical measurements

9. Compare the electrical measurements with expected readings or specifications

10. Make the repair and check for proper operation

1. Formulate the basic problem statement

- Should be a short statement you can say to yourself and remember while troubleshooting. Two questions:
  - What is the appliance **doing** that it ***should not*** be doing?
  - What is the appliance ***not*** **doing** that it **should** be doing?
- If you can't put the problem in a short statement based on these two questions, you have not thought about it enough or need more information.

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2. Schematic Overview, Observations, Talk to the Board

- Review the schematic to get an idea of what you're dealing with

    - Pay special attention to any notes written on the schematic

        - Take note of the technology being shown (VFD systems, control boards, etc.)

- Initial observations at the service call: error codes, sounds, confirm complaint, etc.

- Talk to the board: Diagnostic mode, self test, etc.

3. Identify the Load of Interest (LOI)

- “The thing that ain’t doing it’s thang”

- Most troubleshooting situations come down to figuring out why a particular load isn’t functioning at all or is functioning incorrectly.

  - This doesn’t necessarily mean the load itself is “bad”

  - Troubleshooting starts with loads

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3. Identify the LOI: Rules of Thumb

- In any given service call, there will generally be **only one actually *failed* component**. This one failed component **could affect multiple loads**.

- Where multiple loads are affected, **select any inop load as your LOI** and work the problem. You'll end up at the **same root cause**.

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4. LOI circuit analysis

- How is that load getting its power supply? AC or DC? Digital or analog?

- What other switches are in the LOI power supply circuit that could be interrupting it?

- Is the LOI power supply controlled by a microprocessor?

    - Sensors, algorithms, etc.

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5. Formulate the troubleshooting hypothesis

- This is an **electrical measurement** that pertains to the **LOI**
  - Only three measurements to choose from: V, A, Ohms
    - Will *usually* be a Voltage measurement
- Requires knowing three things: 1) basic electricity & circuits, 2) technology being used, 3) theory of operation of the appliance
- You will go on to the next steps to prove or disprove your hypothesis
  - It's okay to be "wrong"! Iterative process

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6. Electrical measurement selection

- Identify and select electrical measurement that can prove or disprove your hypothesis.

- What are you comparing those measurements against?

    - You can’t know what the measurement means unless you have something to compare it to.

- Compare expected measurement to explicit and implicit specifications.

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7. Identify EEPs at which to make the electrical measurements

- EEPs - Electrically Equivalent Points
- How do you identify EEPs?
- Why do this?
  - Avoid unnecessary disassembly
  - Minimize liability
  - Save time

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8. Perform the electrical measurements

- Instrument selection: **Loading meter** vs. non-loading meter
- Access to desired test points - disassembly
- Measurement techniques: back probing molex connectors; **Pomona leads**
- **Law for Ohms Testing:** Only used to prove “bad”
  - If something tests “bad” on ohms (out of spec), it’s bad. Diagnostically conclusive.
  - If something tests **“good” on ohms it can *still* be bad**- failing under load. **Not diagnostically conclusive! Ohms lie!**

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240
240
600
480
600
A.C.
CATALOG NO. 61-065
BLK
TO
RED
IDEAL


VoltAlert
FLUKE
117 TRUE RMS MULTIMETER
LoZ
600.0
V
AC
0
Auto Volts
6 00
Lo / Hi
HOLD
MINMAX
RANGE
AUTO-V
LoZ
OFF
Hz
V
mV
Ω
Volt
Alert
A
A
Hz
A
COM
V Ω
10 A
FUSED
CAT III
500 V

9. Compare the electrical measurements with expected readings or specifications

- Is the hypothesis proven or disproven?
- If hypothesis proven, determine the cause (more measurements, schematic) proceed to Step 10
- If hypothesis disproven, go back to Step 5 and repeat.

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10. Make the repair and check for proper operation

- Checking for proper operation is 100% mandatory!

- Make sure the customer sees it and is satisfied.

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