

TROUBLESHOOTING GUIDE: E32 – LOW FIL AMPS ERROR

=====

PRELIMINARY INFORMATION:

Process:

- Follow the step-by-step instructions until the faulty component is found.

Tools Required (No further assistance will be provided if these tools are not available):

- A **known good** set of HV cables
- True RMS Multimeter with the following capabilities (recommend Fluke 83, 87, 89, 175, 177, 179, 187, 189, 287 or 289):
 - Auto-Ranging
 - Min/Max Mode
 - Ohm
 - VDC
 - VAC
 - AmpDC
 - AmpAC
 - Frequency (Hz)
- Jumper wires [Alligator clips, and Mini-grabbers (ex. Pomona 5523)]
- An ESD wrist strap
- Stopwatch (or equivalent APP on phone)
- A tablet with picture and email capability [or a laptop (for emails) and phone (for pictures)]

Tools Optional (May be required if testing below does not find issue):

- Digital Storage Oscilloscope
- mAs meter

Minimum FSE (Field Service Engineer) knowledge base:

- Must have already read the manual and is familiar with all the safety precautions.
- Multimeter operation with the following:
 - Range
 - Ohms, KOhms, MOhms (and know the multi-meter message for Open Circuit and Short Circuit)
 - Amps, mAmps
 - Volts, mVolts

=====

TROUBLESHOOTING INSTRUCTIONS:

1. Check basic connections (with generator OFF)

- a. K904 Connections: See Service Manual sections 2.5.3 and 2.10.2
- b. Incoming Line voltage: See Service Manual section 2.10.3
- c. Accessory Transformer: See Service Manual section 2.10.4
- d. Main GND: See Service Manual section 2.10.5

2. Check DIP SWITCHES on System Controller Board (with generator OFF and FSE grounded with ESD strap)

- a. **DIP1:**
 - i. **-1, -2, -3, -5, -6, -7, -8** must be OPEN/OFF/LEFT
 - ii. **-4** must be CLOSED/ON/RIGHT
- b. **DIP3:**
 - i. **300mA** Generator: **-1 & -2** must be OPEN/OFF/LEFT
 - ii. **500mA** Generator: **-1 & -2** must be CLOSED/ON/RIGHT
 - iii. **-3 & -4** must be OPEN/OFF/LEFT

3. Check for loose components/connections (with generator OFF and FSE grounded with ESD strap)

- a. System Controller Board (01003, 01700 or 08020):
 - i. Push in U24, U33, U13, U17 chips if IC sockets employed.
 - ii. Remove and reseal all connectors. Tighten wires at connectors, if needed.
 - iii. Be sure to apply pressure on the back of all ribbon cable connectors.
- b. Filament Driver Board (02850):
 - i. Remove and reseal all connectors. Tighten wires at connectors, if needed.
 - ii. Be sure to apply pressure on the back of the ribbon cable connector.

4. Check for open fuses (with generator OFF and FSE grounded with ESD strap)

- a. Filament Driver Board (02850):
 - i. Shut off generator.
 - ii. Verify resistance across fuse **F1** to be ≤ 1 Ohm.
 - iii. If resistance is out of range, replace **F1** (2A, 250V, Slo-Blo, 5x20mm).
If **F1** opens again, replace **Filament Driver Board** with **Kit 03035-***.
 - iv. Verify resistances across fuse **F3** & across fuse **F4** to be ≤ 22.0 Ohms.
 - v. If resistance is out of range, replace **F3/F4** (50mA, 250V, Slo-Blo, 5x20mm).
If **F3/F4** opens again, replace **Filament Driver Board** with **Kit 03035-***.

5. Check Filament Load Circuits (with generator OFF and FSE grounded with ESD strap)

- a. Check HV Tank's Filament Transformer, Primary Coils:
 - i. Disconnect cable from **J2** of HV Tank.
 - ii. At **J2** of HV Tank: Verify resistance from **Pin 1** (has a dot) to **Pin 2** (next pin counterclockwise) to be **2.0-3.0 Ohms**.
 - iii. At **J2** of HV Tank: Verify resistance from **Pin 3** to **Pin 2** to be **2.0-3.0 Ohms**.
 - iv. If either value is out of range, the **HV Tank** (K904-*) needs to be replaced.
 - v. Reconnect cable to **J2** of HV Tank.
- b. Check Filament Primary Cable:
 - i. From Filament Driver Board (02850), **J1** connector:
 - 1. Verify resistance from **J1-1** (Black) to **J1-3** (White) to be **2.0-4.0 Ohms**.
 - 2. Verify resistance from **J1-2** (Red) to **J1-3** (White) to be **2.0-4.0 Ohms**.

- ii. If either value is out of range, the **Filament Primary Cable** (00509-000) needs to be replaced.
- c. Check HV Cathode Cable and Tube:
 - i. **Warning! Lethal voltage** (up to 62,500VDC) may be present on cathode cable. Follow instructions below.
 - ii. Remove HV cathode cable from the HV Tank. Discharge filament pins on the Cathode HV Tank Receptacle Ring.
 - iii. Verify resistances from the cathode cable's end:
 - 1. SM Focus: **S to C** to be **< 2.0 Ohms**
 - 2. LM Focus: **L to C** to be **< 2.0 Ohms**
 - iv. If both values are in range, **go to step 6**.
 - v. If either value is out of range, either the HV cable has a bad conductor or the X-ray tube has an open filament. Continue as stated below.
 - vi. Replace the HV cable on Cathode side and **repeat step 5.c.iii**.
 - vii. If both values are in range, the **HV cable** needs to be replaced.
 - viii. If either value is out of range, then the **X-ray tube** needs to be replaced.

6. Check voltages in idle (with generator ON, be careful not to cause any short circuit)

- a. System Controller Board (01003, 01700 or 08020)
 - i. Connect VDC meter Black (-) to TP2 (GND), **RED (+) to TP3 (+12V)**.
Verify voltage to be: **11.4VDC to 12.8VDC**
If out of range, check Power Supply Board **K650-00**, fuse **F4** and cables.
 - ii. Connect VDC meter Black (-) to TP2 (GND), **RED (+) to TP6 (-12V)**.
Verify voltage to be: **-11.4VDC to -12.8VDC**
If out of range, check Power Supply Board **K650-00**, fuse **F5** and cables.
 - iii. Connect VDC meter Black (-) to TP2 (GND), **RED (+) to TP1 (+5V)**.
Verify voltage to be: **4.9VDC to 5.1VDC**
If out of range, check Power Supply Board **K650-00**, fuse **F4** and the +5VDC Power Supply Board **04260** (if present).
- b. Filament Driver Board (02850)
 - i. Connect VDC meter Black (-) to TP3 (PCOM), **RED (+) to TP2 (PVOLT)**.
Verify voltage to be: **14.2VDC to 15.8VDC**
 - ii. Connect VDC meter Black (-) to TP5 (NCOM), **RED (+) to TP4 (NVOLT)**.
Verify voltage to be: **14.2VDC to 15.8VDC**
 - iii. Connect VDC meter Black (-) to TP1 (GND), **RED (+) to TP11 (+12VDC)**.
Verify voltage to be: **11.4VDC to 12.8VDC**
 - iv. Connect VDC meter Black (-) to TP1 (GND), **RED (+) to TP12 (-12VDC)**.
Verify voltage to be: **-11.4VDC to -12.8VDC**
 - v. If any value is out of range, replace **Filament Driver Board** with **Kit 03035-***.

7. Additional replacement parts to be considered

- a. The **System Controller Board** (06357-*) may need to be replaced as a last resource.