TROUBLESHOOTING GUIDE: E33 – HI FIL AMPS ERROR

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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

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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 reseat 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 reseat all connectors. Tighten wires at connectors, if needed.
      ii. Be sure to apply pressure on the back of the ribbon cable connector.

4. **Check mA feedback circuit (with generator OFF and FSE grounded with ESD strap)**
   a. Check the Feedback Cable (00510-000) and HV Tank (K904-*):
      i. Disconnect **H9** from the System Controller Board.
      ii. At **H9** cable end, verify resistance from pin **5** to pin **4** to be **66.8-69.5 Ohms**.
      iii. At **H9** cable end, verify resistance from pin **6** to pin **4** to be **66.8-69.5 Ohms**.
      iv. If any of the values are incorrect, the Feedback Cable or the HV Tank is defective.
      v. Verify the continuity of the **Feedback Cable** (00510-000) & replace if defective.
      vi. If the Feedback Cable is in good condition, replace the **HV Tank** (K904-*).
   b. Check the System Controller Board (01003, 01700 or 08020):
      i. Keep **H9** cable disconnected from the System Controller Board.
      Note: If your meter can't read these resistances, you may need a better meter.
      ii. At **H9** header of System Controller Board:
      Verify resistance from pin **5** to pin **4** to be **102-114 KOhms**.
      iii. At **H9** header of System Controller Board:
      Verify resistance from pin **6** to pin **4** to be **181-203 KOhms**.
      iv. If any of the values are incorrect, replace **System Controller Board** with **Kit 06357-***.
      v. Reconnect **H9** cable to System Controller Board.

5. **Check for open fuses (with generator OFF and FSE grounded with ESD strap)**
    a. Filament Driver Board (02850):
        i. Shut off generator.
        ii. Verify resistances across fuse **F3** & across fuse **F4** to be **≤ 22.0 Ohms**.
        iii. 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-***.

6. **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 6.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.

7. **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-***.

8. **Additional replacement parts to be considered**
   a. The **System Controller Board** (06357-*) may need to be replaced as a last resource.