American Hakko Products, Inc.

HAKKO FG-101 Calibration Instructions

Revision 2013-10

Tools Required:

- Room Temperature Thermometer
- Yokogawa CA-71 Portable Calibrator or equivalent
- Yokogawa 2786 Decade Resistance Box or equivalent
- Fluke 87 Digital Multimeter or equivalent
- Phillips head screwdriver
- Calibration Trimmer Potentiometer screwdriver

Temperature Measurement Calibration

IMPORTANT: Be sure to attach the thermometer reference junction temperature detection sensor (For Yokogawa the part number is RJ Sensor B9638CR) and place it near the HAKKO FG-101 being calibrated. Failing to do so will result in a faulty calibration.

IMPORTANT: Be sure to allow the calibration tools and the HAKKO FG-101 being calibrated to acclimate to their environment for 30 to 40 minutes. The ideal environment for performing the calibration will be a room temperature of 23°C ±3°C and a relative humidity between 20% and 80%. The conditions in the room should be stable, specifically the temperature no fluctuating more than ±1°C during the calibration process.

1. Set the Yokogawa CA-71 Portable Calibrator or equivalent device for source operation and to output a Type-K Thermocouple signal.

2. Plug in the HAKKO FG-101 and turn the unit on.

3. Select the TEMP measuring mode on the HAKKO FG-101.

4. Remove the sensor wire from the HAKKO FG-101.

5. Open the HAKKO FG-101 by removing the 5 Phillips screws along the front and back of the casing.

6. Carefully separate the two halves of the unit, tipping the top half of the unit towards you and resting it upside down, revealing the PCB.

7. Press the CAL button (SW 2) located at the lower left-hand corner of the PCB from your view.

8. Carefully rotate the top half of the unit to re-assemble the two halves and give you a clear view of the LCD display. Verify that the LCD display shows 'CAL', 500, and °C. If the HAKKO FG-101 is

one that displays in Fahrenheit, the LCD display will show 'CAL', 932, and °F.

9. Attach the source leads from the Yokogawa CA-71 Portable Calibrator or equivalent device to the corresponding terminal posts on the HAKKO FG-101.

   NOTE: Be sure to insulate the clips on the lead wires to prevent them from heating while handling and making the connections to the posts. If the clips on the lead wires are heated, this could introduce measurement error.

10. Set the output value on the Yokogawa CA-71 Portable Calibrator or equivalent device to 500°C and start the source supply.

11. Press the MAX HOLD button on the HAKKO FG-101 and ensure the 'CAL' indication disappears from the display.

12. Stop the source supply on the Yokogawa CA-71 Portable Calibrator or equivalent device.

13. Verify the calibration by setting the output value on the Yokogawa CA-71 Portable Calibrator or equivalent device to the values in the table below and confirm that the display shows the standard values corresponding to each output setting.

Output Value (Type K, °C)	Standard Value (°C)
0	0 ±2
200	200 ±2
300	300 ±2
400	400 ±2
500	500 ±2
600	600 ±2

14. If there is any deviation outside the standard values, perform the calibration again.

15. When finished, turn off the HAKKO FG-101. Ensure the source supply is stopped on the Yokogawa CA-71 Portable Calibrator or equivalent device and remove the source leads from the HAKKO FG-101. Re-secure the two halves of the unit by installing the 5 Phillips screws along the front and rear of the casing, and re-install the sensor wire.

Millivolt Leakage Measurement Calibration

1. Plug in the HAKKO FG-101 and turn the unit on.

2. Select the mV measuring mode on the HAKKO FG-101.

3. Hold the AUTO ZERO button for at least 3 seconds until the LCD display shows 0, ‘mV’, and ‘Ω’, then release the button.

4. Press the AUTO ZERO button again and the LCD display will show ‘AC’, 0.0, and ‘mV’.

5. Open the HAKKO FG-101 by removing the 5 Phillips screws along the front and back of the casing.

6. Carefully separate the two halves of the unit, tipping the top half of the unit towards you and resting it upside down, revealing the PCB.

7. Connect the Fluke 87 Digital Multimeter or equivalent device to the PCB where the red test lead is connected to TP1 on the PCB, and the black test lead is connected to TP2 on the PCB.

8. Set the Fluke 87 Digital Multimeter or equivalent device to measure DC voltage.

9. Connect the Yokogawa CA-71 Portable Calibrator or equivalent device to the PCB where the black source lead is connected to the grounding terminal of the HAKKO FG-101, and the red source lead is connected to the screw used to secure the test plate of the HAKKO FG-101. The two screws that secure the test plate are visible underneath the PCB through a hole and notch that are in the PCB by design. It is recommended that you make the connection of the red source lead to screw that is on the right-hand side from your view, and is exposed by the notch designed into the PCB.

10. Set the switch on the PCB (SW 1) to the TEST position.

11. Set the Yokogawa CA-71 Portable Calibrator or equivalent device for source operation and to output a millivolt signal.

12. Set the output value on the Yokogawa CA-71 Portable Calibrator or equivalent device to 0 mV and start the source supply.

13. Adjust VR1 on the PCB so that the display on the Fluke 87 Digital Multimeter or equivalent device is showing a value between -0.2 and 0.2 mV.

14. Stop the source supply on the Yokogawa CA-71 Portable Calibrator or equivalent device.

15. Set the switch on the PCB (SW 1) to the WHITE (X) position.

16. Set the output value on the Yokogawa CA-71 Portable Calibrator or equivalent device to 0 mV and start the source supply.

17. Adjust VR2 on the PCB so that the display on the HAKKO FG-101 is showing a value of 0.0 mV

18. Stop the source supply on the Yokogawa CA-71 Portable Calibrator or equivalent device.

19. Set the switch on the PCB (SW 1) to the TEST position.

20. Set the output value on the Yokogawa CA-71 Portable Calibrator or equivalent device to 40 mV and start the source supply.

21. Adjust VR3 on the PCB so that the display on the HAKKO FG-101 is showing a value of 40 mV.

22. Remove the source leads of the Yokogawa CA-71 Portable Calibrator or equivalent device from the PCB.

23. Remove the test leads of the Fluke 87 Digital Multimeter or equivalent device from the PCB.

24. Carefully rotate the top half of the unit to re-assemble the two halves and give you a clear view of the LCD display.

25. Connect the source leads of the Yokogawa CA-71 Portable Calibrator or equivalent device to the HAKKO FG-101 where the red source lead is connected to the test plate of the HAKKO FG-101 and the black source lead is connected to the grounding terminal of the HAKKO FG-101.

26. Verify the calibration by setting the output value on the Yokogawa CA-71 Portable Calibrator or equivalent device to the values in the table below and confirm that the display shows the standard values corresponding to each output setting.

Output Value (DC mV)	Standard Value (mV)	Switch Position (SW 1)
No Connection	0.0 to 0.1	--
0	0.0 to 0.1	TEST
2	1.9 to 2.1	
40	39.5 to 40.5	
46	-1	
40	0.0 to 0.1	WHITE (X)

27. If there is any deviation outside the standard values, perform the calibration again.

28. When finished, turn off the HAKKO FG-101. Ensure the source supply is stopped on the Yokogawa CA-71 Portable Calibrator or equivalent device and remove the source leads from the HAKKO FG-101. Ensure the switch on the PCB (SW 1) is set to the WHITE (X) position and turn off the HAKKO FG-101. Re-secure the two halves of the unit by installing the 5 Phillips screws along the front and rear of the casing.

Ground Resistance Measurement Calibration

1. Plug in the HAKKO FG-101 and turn the unit on.

2. Select the OHM measuring mode on the HAKKO FG-101.

3. Hold the AUTO ZERO button for at least 3 seconds until the LCD display shows 0, 'mV', and 'Ω', then release the button.

4. Press the AUTO ZERO button again and the LCD display will show -1, '.' and 'Ω'.

5. Open the HAKKO FG-101 by removing the 5 Phillips screws along the front and back of the casing.

6. Carefully separate the two halves of the unit, tipping the top half of the unit towards you and resting it upside down, revealing the PCB.

7. Connect the Yokogawa 2786 Decade Resistance Box or equivalent device to the PCB where one test lead is connected to the grounding terminal of the HAKKO FG-101, and the other test lead is connected to the screw used to secure the test plate of the HAKKO FG-101. The two screws that secure the test plate are visible underneath the PCB through a hole and notch that are in the PCB by design. It is recommended that you make the connection of the red source lead to screw that is on the right-hand side from your view, and is exposed by the notch designed into the PCB.

8. Set the Yokogawa 2786 Decade Resistance Box to a resistance value of 0.

9. Adjust VR5 on the PCB so that the display on the HAKKO FG-101 is showing a value of 0.0 Ω.

10. Set the Yokogawa 2786 Decade Resistance Box to a resistance value of 40.

11. Adjust VR4 on the PCB so that the display on the HAKKO FG-101 is showing a value of 40.0 Ω.

12. Remove the test leads of the Yokogawa 2786 Decade Resistance Box from the PCB.

13. Carefully rotate the top half of the unit to re-assemble the two halves and give you a clear view of the LCD display.

14. Connect the test leads of the Yokogawa 2786 Decade Resistance Box or equivalent device to the HAKKO FG-101 where the one test lead is connected to the test plate of the HAKKO FG-101 and the other test lead is connected to the grounding terminal of the HAKKO FG-101.

15. Verify the calibration by setting the output value on the Yokogawa 2786 Decade Resistance Box or equivalent device to the values in the table below and confirm that the display shows the standard values corresponding to each output setting.

Output Value (Ω)	Standard Value (Ω)
0	0.0 to 0.1
2	1.9 to 2.1
40	39.5 to 40.5

16. If there is any deviation outside the standard values, perform the calibration again.

17. When finished, turn off the HAKKO FG-101. Remove the test leads of the Yokogawa 2786 Decade Resistance Box or equivalent device from the HAKKO FG-101. Re-secure the two halves of the unit by installing the 5 Phillips screws along the front and rear of the casing.