

**HARVARD
APPARATUS****BLANKET UNIT Iss 7. TEST PROCEDURE.****September 1997.****Equipment Required for Testing:**

Multimeter , Electronic Thermometer , Blanket Unit Input Test Module ,
Temperature probe , 3-4 Ohm Blanket , Insulation Tester.

1.0 Preliminary Checks.

- 1.1 Ensure the side panels of the unit are as close together as possible. This can be achieved by releasing slightly the 8 screws that secure the front and rear panels , also release the 4 screws that secure the 2 chassis bars slightly.

Retighten these screws whilst pressing the side panels together.

- 1.2 Ensure all the screws throughout the unit are fully secured.

The screw securing the toroidal transformer should not be over tightened (the PCB must not be bent beneath it) , seal the nut of this screw with threadlock.

Use threadlock to secure the screw retaining the SKB25/02 bridge rectifier and also the nuts on the earth stud.

- 1.3 Ensure all the cables within the unit are correctly connected and routed.

- 1.4 Ensure all terminal blocks are fully tightened.

- 1.5 Check the continuity between all terminal blocks and their relevant cable destinations.

- 1.6 Check the earth switch operation using a Multimeter set to test continuity when set to "1" the 0 Volt line should be common with the earth line and isolated from it when set to "0".

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3.5 Select 40 Degrees on the test unit, the display should now read 40 Degrees.

If it reads under adjust VR2 Anti-clockwise 1/4 turn.

If it reads over adjust VR2 clockwise 1/4 turn.

Reselect 37 Degrees on the test unit and repeat steps 3.4 and 3.5 until no further adjustment is possible.

3.6 Check all the settings as follows:

35 Degrees on the test unit	Display reads 34.8 Degrees (appr).
37 Degrees on the test unit	Display reads 37 Degrees.
40 Degrees on the test unit	Display reads 40 Degrees.

3.7 Select the 37 degree setting on the test unit and connect a Multimeter set to measure DC Volts between the blanket output fuse (6.3 Amp) on the PCB and the "Black" (negative) lead from the bridge rectifier BR2 (SKB25/02). Adjust the front panel mounted temperature adjust potentiometer for approximately 5.0 Volts output (This will set the unit to maintain a temperature of approximately 37 Degrees Centigrade.

3.8 Connect a 3-4 Ohm blanket to the blanket socket and set the test unit to 35 Degrees. Adjust VR3 open 4K7 trimmer, until all the leds of the front panel "HEAT INPUT" display are just illuminated.

3.9 Switch off the unit and isolate from the AC mains supply. Reset the units internal voltage selector to the opposite setting to that already selected and adjust the AC mains supply accordingly. Reapply the mains supply and switch on.

3.10 Recheck all the settings once again , before proceeding.

3.11 Switch off the unit and isolate from the AC mains supply. Reset the units internal voltage selector to the original setting and readjust the AC mains supply accordingly reapply power and switch on.

3.12 Select the "VARI" setting on the test unit and position the "VARI" control fully anti-clockwise.

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- 5.2 Connect the Temperature probe to the unit under test.
- 5.3 Connect the blanket to the unit under test.
- 5.4 Observe the unit whilst it heats the blanket, the operation should be similar to that of step 3.10.
- 5.5 The temperature of the blanket should be maintained at about 37 Degrees Centigrade.
The temperature readings between the unit under test and the electronic thermometer will differ, but should not be significantly different.
- 5.6 Disconnect the test unit and probe from the unit under test, the display should read approximately 43.8 Degrees with only 1 LED of the "HEAT INPUT" display illuminated.
- 5.7 Disconnect the blanket from the unit under test.
- 5.8 Set the voltage select switch to the correct operating voltage for the finished unit.
- 5.9 Disconnect the unit from the mains supply.

6.0 Final Inspection.

- 6.1 Apply voltage labels to the unit one to the rear panel under the mains switch and one inside the unit above the mains switch.
- 6.2 Apply a completed tested label to the inside of the rear panel near to the earth stud.
- 6.3 Fit the top and bottom covers to the unit, after having first secured the tilt feet assemblies to the bottom cover.

Use 8 M4 x 10 mm countersunk screws and 8 retention washers and black caps to fasten the covers.
- 6.4 Ensure the covers fit correctly **without any gaps** either where they meet each other or between them and the front and rear panels.

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- 6.5 All screw should be fully tightened with no worn or damaged heads, replace where necessary.
- 6.6 All fixings should be correct and secure.
- 6.7 Check the unit for any scratches or damage and repair or replace as necessary.
- 6.9 Each unit should be complete with the correct mains lead before leaving test.

Test and Inspection Complete

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The display should read approximately 27 Degrees with all off the "HEAT INPUT" LEDS illuminated, rotate the VARI control clockwise, the display should start to increase.

LEDS should start to extinguish at around 36.3 Degrees. All leds should be off at about 37.4 Degrees and display should reach a maximum reading of about 44 Degrees.

4.0 Calibration of the Analogue Output.

- 4.1 Disconnect the blanket from the unit under test and connect a Multimeter, set to measure DC milli-volts, to the front panel mounted "OUTPUT" BNC socket.
- 4.2 Set the test unit to 40 Degrees, and adjust VR4 multi turn top trimmer fully anti-clockwise until the meter registers the highest output.
- 4.3 Set the test unit to 35 Degrees, and adjust VR5 multi turn top adjust trimmer for 125 mV.
- 4.4 Set the test unit to 40 Degrees and adjust VR4 for 150 mV.
- 4.5 Check the output voltages correspond with the following:
Test unit set to 35 Degrees, output = 46 mV (approx).
Test unit set to 37 Degrees, output = 90 mV.
Test unit set to 40 Degrees, output = 150 mV.
- 4.6 Use VR5 if necessary to adjust the 37 Degrees / 90 mV output settings.
Use VR4 if necessary to adjust the 40 Degrees / 150 mV output settings.
- 4.7 Recheck the analogue output voltages before proceeding.

5.0 Final Tests.

- 5.1 Tape the temperature probe and the probe of an electronic thermometer together and place into a fold of the blanket. Weigh the blanket down to keep the probes contained within it.

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- 2.2 Set the unit for the correct mains voltage (110 or 230 Volts), and connect to a appropriate power source and switch the unit ON.
Check that the power LED is illuminated and the LCD is functioning correctly.
- 2.3 Measure the voltage across the output of the bridge rectifier "BR2" (SKB25/02) (Black and White Leads) it should be approximately 16.7 Volts D.C.
- 2.4 Measure the voltage at the input of IC2 (7815) this should be approximately 23 Volts D.C.

The previously measured voltage should also be found at the input of IC4 (7815).

- 2.5 Measure the output of IC2 this should be 15 Volts DC.
- 2.6 Measure the output of IC4 this should be 15 Volts DC.
- 2.7 Measure the input of IC 5 this should be 15 Volts DC.
- 2.8 Measure the output of IC5 this should be 5 Volts DC.
- 2.9 Measure the input of IC1 (Note that this device utilises a separate 0 Volt line, which can be found on the Negative side of C1) this should be approximately 25.7 Volts.
- 2.10 Measure the output of IC1 this should be 12 Volts.

3.0 Temperature Calibration.

- 3.1 Connect the test unit to the probe input socket on the front of the unit under test and set it to 37°.
- 3.2 Adjust VR1 multi turn top adjust trimmer fully anti-clockwise until the display reaches a maximum point.
- 3.3 Adjust VR2 multi turn top adjust trimmer until the display reads 44.3 - 44.4 Degrees.
- 3.4 Adjust VR1 until the display reads 37 Degrees.

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- 1.7 Check earth continuity from inlet socket to ALL exposed metal / conducting parts of the unit, this should be less than 1 Ohm.
- 1.8 Check the PCB for soldering faults.
- 1.9 Check the PCB for component layout (type, polarity, value).
- 1.10 Ensure the 2 LED arrays on the front panel PCB assembly fit into the aperture in the front panel correctly.
- 1.11 Ensure the temperature set potentiometer on the front panel is correctly fitted and connected.
- 1.12 Fit the following as required :

- 2 x 2 Amp Anti-Surge fuses to the mains inlet.
- 1 x 6.3 Amp Fuse to the PCB mounted fuseholder.
- 2 x Clip on heatsinks to IC2 (7815) & IC5 (7805).

- IC3 CA 3140 OP-AMP.
- IC6 LM 747 DUAL OP-AMP.
- IC1 LM 3914N LED DRIVER (FRONT PANEL).

- 1.13 Remove the centre pin of the Blanket Output and Probe Input sockets.

2.0 Preliminary Electrical Tests.

- 2.1a Before connecting to the AC mains supply , measure the input impedance using a Multimeter set to measure Ohms connected between the Live and Neutral pins of the mains inlet socket. Ensure that the mains switch is in the ON position for this test.

Unit set for 230 Volts input impedance = 20 Ohms (appr)

Unit set for 115 Volts input impedance = 5.3 Ohms (appr)

- 2.1b Check the insulation between the Live and Neutral connections and earth using a insulation tester.