LUMASENSE® TECHNOLOGIES

MANUAL

M340

Blackbody Calibration Source

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Contents

1 General Information

1.1 Information about the user manual

Congratulations on choosing the high quality and highly efficient Mikron blackbody.

This manual provides important information about the instrument and can be used as a work of reference for installing, operating, and maintaining your blackbody. It is important that you carefully read the information contained in this manual and follow all safety procedures before you install or operate the instrument.

To avoid handling errors, keep this manual in a location where it will be readily accessible.

1.1.1 Legend

Note: The note symbol indicates tips and useful information in this manual. All notes should be read to effectively operate the instrument.

Warnings and Cautions: The general warnings and cautions symbol signifies the potential for bodily harm or damage to equipment.

1.2 Safety

This manual provides important information on safely installing and operating the M340 blackbody. Several sections of this manual provide safety warnings to avert danger. These safety warnings are specified with a warning symbol. You must read and understand the contents of this manual before operating the instrument even if you have used similar instruments or have already been trained by the manufacturer.

It is also important to continually pay attention to all labels and markings on the instrument and to keep the labels and markings in a permanent readable condition.

Warning: The blackbody is only to be used as described in this manual. It is recommended that you only use accessories provided by the manufacturer.

1.2.1 Safety Notifications/Warnings

- In addition to presenting a potential fire hazard, high voltage and high temperature can damage equipment and cause severe injury or death. When using this instrument, follow all instructions carefully.
- Do not use the M340 for any purpose other than the function for which it was designed: a blackbody radiance temperature source.
- Only replace the power cable with an equal, approved cable.
- Only remove cabinet covers after unplugging the unit.

Warning: High voltages and currents are present inside the enclosure.

- Do not attempt to operate with any of the safety features bypassed or disconnected.
- Do not place this unit where it will be subject to excessive shock, vibration, dirt, moisture, oil, or other liquids.

1.3 Limit of Liability and Warranty

All general information and notes for handling, maintaining, and cleaning this instrument are offered according to the best of our knowledge and experience.

All Mikron blackbodies from LumaSense Technologies have a regionally effective warranty period. Please check our website at http://info.LumaSenseinc.com/warranty for up-to-date warranty information. This warranty covers manufacturing defects and faults which arise during operation, only if they are the result of defects caused by LumaSense Technologies.

The warranty is VOID if the instrument is disassembled, tampered with, altered, or otherwise damaged without prior written consent from LumaSense Technologies; or if considered by LumaSense Technologies to be abused or used in abnormal conditions.

1.4 Unpacking the Instrument

When unpacking and inspecting your system components, you need to do the following:

1. Check all materials in the container against the enclosed packing list.

Note: LumaSense Technologies cannot be responsible for shortages against the packing list unless a claim is immediately filed with the carrier. Final claim and negotiations with the carrier must be completed by the customer.

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2. Carefully unpack and inspect all components for visible damage.
3. Save all packing materials, including the carrier's identification codes, until you have inspected all components and find that there is no obvious or hidden damage.

Note: Before shipment, each instrument is assembled, calibrated, and tested at the LumaSense Factory. If you note any damage or suspect damage, immediately contact the carrier and LumaSense Technologies, Inc.

1.5 Service Request, Repair, or Support

Contact LumaSense Technologies Technical Support in case of a malfunction or service request. Provide clearly stated details of the problem as well as the instrument model number and serial number. Upon receipt of this information, Technical Support will attempt to locate the fault and, if possible, solve the problem over the telephone.

If Technical Support concludes that the instrument must be returned to LumaSense Technologies for repair, they will issue a Return Material Authorization (RMA) number.

Return the instrument upon receipt of the RMA number, transportation prepaid. Clearly indicate the assigned RMA number on the shipping package exterior. Refer to Section 1.6, Shipments to LumaSense for Repair, for shipping instructions.

Technical Support can be contacted by telephone or email:

Santa Clara, California

- Telephone: +1 408 727 1600 or +1 800 631 0176
- Email: support@LumaSenseinc.com

Frankfurt, Germany

- Telephone: +49 (0) 69 97373 0
- Email: eusupport@LumaSenseinc.com

Erstein, France

- Telephone +33 (0)3 88 98 98 01

- Email: eusupport@LumaSenseinc.com

1.6 Shipments to LumaSense for Repair

All RMA shipments of LumaSense Technologies instruments are to be prepaid and insured by LumaSense assigned shipper. For overseas customers, ship units air-freight, priority one.

The instrument must be shipped in the original packing container or its equivalent. LumaSense Technologies is not responsible for freight damage to instruments that are improperly packed.

Contact us to obtain an RMA nµmber (if one has not already been assigned by Technical Support). Clearly indicate the assigned RMA nµmber on the shipping package exterior.

Send RMA Shipments to your nearest technical service center:

Santa Clara, California

LumaSense Technologies, Inc.
3301 Leonard Court
Santa Clara, CA 95054 USA
Telephone: +1 408 727 1600
+1 800 631 0176

Email: support@LumaSenseinc.com

Frankfurt, Germany

LumaSense Technologies GmbH
Kleyerstr. 90
60326 Frankfurt
Germany
Telephone: +49 (0)69-97373 0

Email: eusupport@LumaSenseinc.com

1.7 Transport, Packing, Storage

With faulty shipping, the instrument can be damaged or destroyed. To transport or store the instrument, please use the original box or a box padded with sufficient shock-absorbing material. For storage in hµmid areas or shipment overseas, the device should be placed in welded foil (ideally along with silica gel) to protect it from hµmidity.

The blackbody is designed for a storage temperature of -20 to 80 °C with non-condensing conditions. Storing the instrument out of these conditions can cause damage or result in malfunction of the blackbody.

1.8 Disposal / decommissioning

Inoperable Mikron blackbodies must be disposed of in compliance with local regulations for electro or electronic material.

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2 Introduction

2.1 Description

The M340 is a portable blackbody calibration source utilizing a digital indicating temperature controller that may be set to any temperature between -20 °C to 150 °C (-4 °F to 300 °F). A precision RTD temperature sensor is embedded in the blackbody emitter providing high accuracy and repeatability. The temperature controller uses the industry standard PID algorithms to control the emitter temperature to within +/-0.1 °C.

The blackbody emitter mechanism uses a solid state thermoelectric heating and cooling device that provides long life, short stabilization times and stable temperature control. The most important features of the M340 is the ability to achieve temperatures below ambient (cooling) and the fast response times between temperature setpoints.

Temperature setpoints are altered simply by pressing the ↑ or ↓ arrow buttons on the controller. The lower display (green) is the setpoint and the upper display (red) is the actual blackbody emitter temperature.

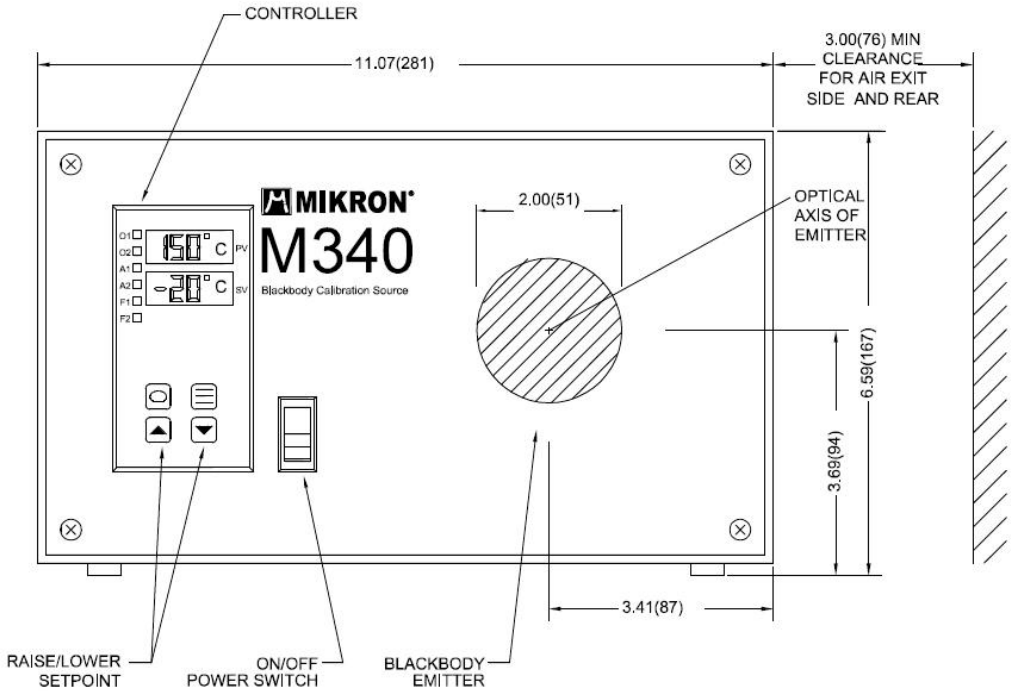
2.2 Technical Data

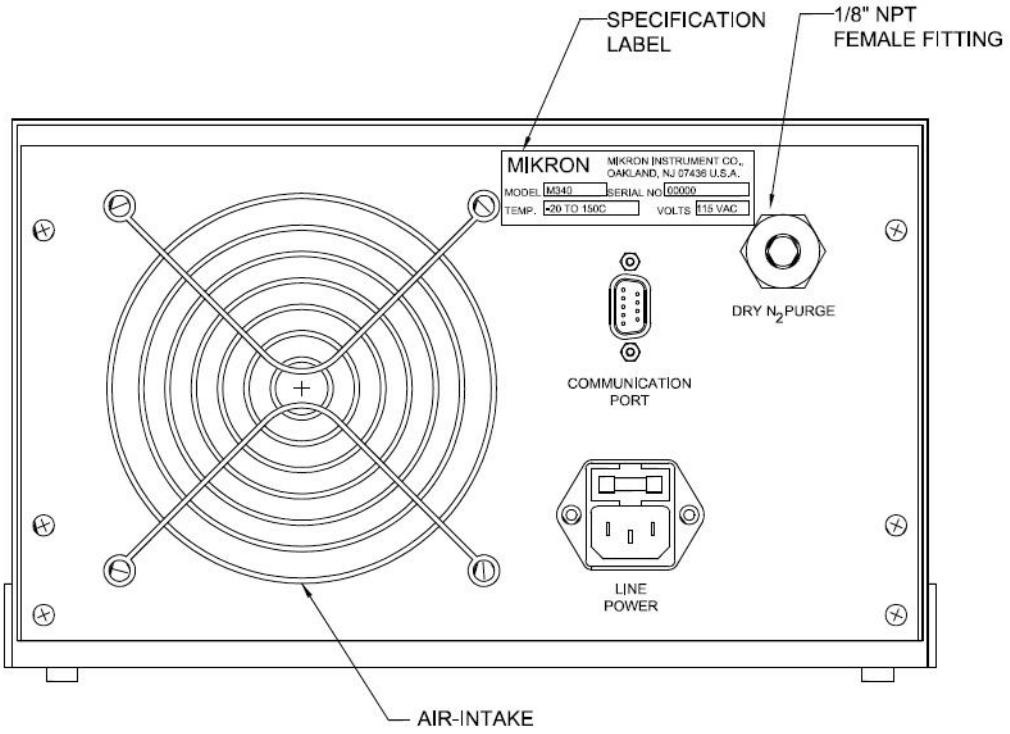
Temperature Range:	-20 °C to 150 °C
Temperature uncertainty (thermometric calibration):	±0.05 °C
Temperature uncertainty (radiometric calibration):	±1 °C at 8-14 µm
Temperature resolution:	0.1 °C
Stability:	0.1 °C per 8 hour period
Emitter Diameter:	2.00" (51 mm)
Emitter non-uniformity**:	±0.2 °C less than 100 °C, 0.4 °C greater than 100 °C
Apparent Emissivity[+]:	1.0 at 8-14 µm (if radiometrically calibrated) (standard M340)
Emissivity (if Thermometric calibration):	0.9756 +/- 0.0039 @ 8-15 µm 0.9713 +/- 0.0049 @ 3-5 µm (M340X)
Control method:	Digital Self-Tuning PID Controller
Warm-up Time:	6 minutes from ambient to –15 °C or 100 °C
Operating Ambient Temperature:	5 °C to 40 °C
Operating Humidity:	90% RH max, non-condensing in heating mode. RH and setpoint temperature must be less than environment dew point when in cooling mode.
Power Requirements:	115 VAC ±50% 50/60Hz, 300W maximum (optional 100 or 230 VAC)
Dimensions:	H: 6.5" (167mm) x W: 11.0" (280) x D: 11.0" (280)
Weight:	7.1kg (15.6 lbs)

* Accuracy is defined for ambient temperature of 18 °C to 23 °C
** Emitter uniformity is defined for 1.6" (40 mm) diameter of central area

[+] See Appendix for determining accuracy at wavelengths other than 8-14 µm region and types of calibration available.

2.3 Dimensions





Measurements are in Inches (mm)

3 Installation

3.1 Normal use

(20 °C to 150 °C and occasional short term from 0 °C to 20 °C)

Normal use means that for most occasions, the M340 will be set to temperatures above ambient or about 20 °C to 150 °C. No purge gas installation is required. Notice on the rear panel, there is a connection for DRY N2 PURGE. This is an inlet for a supply of dry nitrogen purge gas that is required only when planning to set the M340 at temperatures below the environment dew point (usually less than 10 °C in normal calibration labs depending on relative humidity) for extended times. Nitrogen purge gas is NOT required for normal use as mentioned above. Skip to Location section below.

3.2 Low Temperature Use

(-20 °C to 0 °C even for short term (purge gas required)

Every blackbody source requires knowledge of and maintaining of the emitter surface in order to keep the emissivity at a known, controlled value. When operating at temperatures below the room's dew point, moisture will condense (and freeze if set below 0 °C) on the emitter surface which will cause the emitter emissivity to change drastically. Once the emissivity changes, the integrity of the measurement disappears making calibration results erroneous. To prevent moisture or ice from forming on the emitter at these temperatures, clean, dry instrument air (dew point <-21 °C) or nitrogen (preferred) must flow as a protective "blanket" across the emitter surface.

Notice on the rear panel, there is a connection for DRY N2 PURGE. This is the inlet for a supply of dry nitrogen purge gas that is required only when planning to set the M340 at temperatures below the environment dew point which is usually less than 10 °C in normal calibration labs depending on relative humidity. Nitrogen purge gas is required when operating at setpoints below 0 °C even for short periods and is recommended if planning to operate lower than 0 °C.

3.3 Purge Gas Requirements

Supply pressure: No more than 10 PSI into a needle valve rotameter (flow indicator with adjustment valve)

Flow rate: 6 to 8 CFH (cubic feet per hour) adjusted using a needle valve rotameter

Connection: 1/8 NPT female on rear panel

Read type of usage section above. You may not require purge gas installation.

3.4 Location

Select a stable location on which to place the M340. Since any blackbody source stability can be affected by moving air currents near the emitter, avoid locations where air currents are active such as near vents, walkways for people, etc.

3.5 Air Inlet/Outlet Clearance

The thermoelectric system requires constant air flow across the internal heat sink for proper operation. The air inlet (fan) on the rear panel must not be obstructed as well as the air outlet screen on the right side of the M340. Allow at least 3 inches clearance for both inlet and outlet regions. Blocking either of these ports will degrade performance and cause failures. If clearance

is tight around these openings, ensure that the air leaving the outlet does not have a path to the inlet (fan). This will cause the cooling/heating system to be inefficient and prevent achieving the extreme setpoints. This would be similar to running a room air conditioner without installing it in a window!

3.6 Line Voltage

Read the specification label on the rear panel to ensure the AC LINE voltage you are about to use matches the voltage on the M340 label (100 or 115 or 230 VAC).

3.7 RS-232C Communication

The M340 has optional serial communication port for automating the calibration process using a PC. Wiring to this port is covered in the section on Serial Communications.

4 Operation

4.1 Power ON

1. Allow the M340 to warm-up to room temperature for at least **two hours** after unpacking and prior to applying power to remove any condensation.
2. Connect the power cable to a VAC service that matches the power requirement specification noted in the **Technical Data** section and on the **Specification Label** located on the rear of the M340.
3. Power the M340 by turning on the power switch.

   The upper RED display is the current emitter temperature. The lower GREEN display is the setpoint temperature.

Warning: Do not connect or disconnect while power is on. Do not attempt to operate without cables connected.

4.2 Changing the Setpoint

To change the temperature setpoint (green display), Press either the  or  buttons on the controller. Each press will advance the setpoint 0.1 degree. To advance faster, press and hold for 5 seconds until it advances a few degrees/second. Let go when it is near the desired setpoint. Press again to bring it to the exact value desired. Note that this setpoint will be retained when power is turned off.

4.3 Power OFF

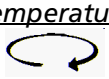
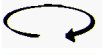
To power down, simply turn the power switch off. If the emitter was running below 0 °C, and purge gas was not used, it is a good idea to raise the setpoint to 80 °C and let it soak for about 10 minutes prior to turning off. This removes moisture that may have built up on the emitter and surrounding surfaces prior to shutting down. If purge gas was used, leave it on for several minutes (10) after turning power off for the same reason.

4.4 Additional Controller Functions

The temperature controller has been factory set for optimum performance. Any attempt to alter the set-up routines within may render the M340 inoperable. Below are some changes that you may desire.

4.4.1 Changing Temperature Units (C-F, F-C)

To change temperature units:

1. Press  and hold for 5 seconds
2. Press  until **05** appears in the lower display
3. Press  11 times until **UNIT** appears in the lower display
4. Press  to change **C** to **F** or **F** to **C**
5. Press  to exit

Note: It is important to lock out the controller after making setting changes to prevent tempering.

To lock out the controller:

1. Press  to enter setup again
2. Press  until **01** appears in lower display
3. Press  to exit, the controller is locked out

4.4.2 Using Serial Communications

Your serial communication package (not supplied) may require some settings that are different from how the M340 was shipped.

To change temperature units:

1. Press  and hold for 5 seconds
2. Press  until **04** appears in the lower display
3. Press  Id.no Device ID number
4. Press  to set unit ID number 00 to 99
5. Press  bAUd Baurd, Parity, bits selection
6. Press  to select according to chart below
7. Press  to exit

Note: It is important to lock out the controller after making setting changes to prevent tempering.

To lock out the controller:

1. Press  to enter setup again
2. Press  until **01** appears in lower display
3. Press  to exit, the controller is locked out

Available Communication Settings

Display	Baud Rate	Parity	Data Bits	Stop Bits
3.o.7	300	odd	7	2
6.o.7	600	odd	7	2
12.o.7	1200	odd	7	2
24.o.7	2400	odd	7	2
3.n.8	300	none	8	1
6.n.8	600	none	8	1
12.n.8	1200	none	8	1
24.n.8	2400	none	8	1

4.4.3 PID Tuning Constants

The PID tuning constants have been factory set for optimum performance. Altering these parameters will void the warranty and will require assistance from LumaSense to restore it.

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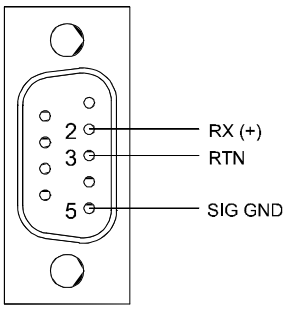
5 Communications Port

5.1 RS232C

This blackbody may have the option to communicate with the temperature controller via a PC or similar device. The DB-9 male connector is on the rear panel. Wiring is shown below. It is wired to operate with a standard through cable (not null modem). This method allows bi-directional data transfer via a three conductor cable consisting of signal ground, receive input and transmit output. It is recommended for communication distances less than fifty feet between the computer terminal and the instrument. Note: Multiple instruments can not be connected to the same port.

The RS232 port is optically isolated to eliminate ground loop problems. Typically, "DATA OUT" of the computer/terminal connects to the "RCV" terminal on the instrument. "DATA IN" connects to the "XMT" terminal. If shielded cable is used, it should be connected to the frame ground at one end only. Signal ground is to be connected at appropriate ground terminals. A cable and sample software are included.



RS232 Wiring

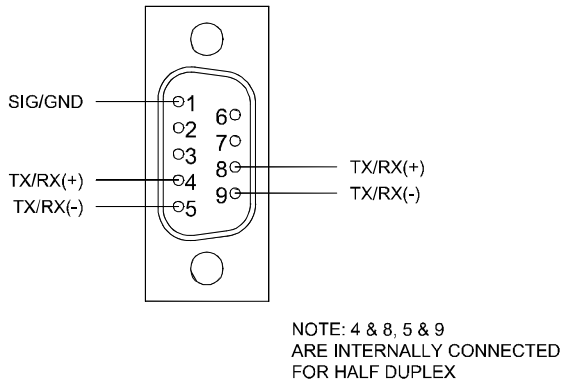
The blackbody was shipped with the controller set at the following com port parameters:

- Baud: 1200
- Data Bits: 7
- Stop bits: 2
- Parity: odd

To alter these parameters, see Section 4.4.

5.2 RS485

The RS485 multipoint capability allows up to 32 controllers to be connected together in a half-duplex network. This method allows bi-directional data transfer over a shielded twisted pair cable. The twisted pair cable is a transmission line; therefore, terminating resistors are required at the most distant ends of the line to minimize reflections (typically 60 ohms from each line to signal ground). The RS485 circuit is fully optically isolated, eliminating ground loop problems. Parallel drops from the transmissions lines should be kept as short as possible; however, the line may be daisy-chained at each controller. The polarity of the line is important and each device will specify an "A" (+) and "B"(-) connection.



RS485 wiring

The blackbody was shipped with the controller set at the following com port parameters:

- Baud: 1200
- Data Bits: 7
- Stop bits: 1
- Parity: odd

To alter these parameters, see Section 4.4.

5.3 Communication Command Set

The complete command set is extensive. For the purpose of brevity, only a few important ones are shown here. For more information, the controller instruction manual may be requested from LumaSense.

Command line to read current blackbody temperature:

#01R00<CR>

Controller response:

<LF>#01R00=20.0C

Command line to read current blackbody setpoint:

#01R01<CR>

Controller response:

<LF>#01R01=20.0C

Command line to change blackbody setpoint:

#01M01 0200C<CR>

In the Appendices, there is a typical QBASIC program that reads current temperature and increments setpoint at 10 °C intervals:

6 Maintenance

6.1 Emitter Life

The life expectancy of the cavity depends on the time and temperature of operation. The higher the temperature, the shorter the life span. At temperatures near the upper end of the range, the life expectancy is shortened by approximately 30%. Do not try to clean the emitter surface.

6.2 Periodic Inspections

Check periodically and upon every start up the following items:

1. Unusual noises and smells when applying power.

6.3 Fuse Locations

The M340 has one or two fuses. Refer to the table below.

Fuse Number	Amps/volts	Location	Description
F1 (120V)	2A / 250 VAC Fast	External-Controller Rear Panel	Integral with IEC power connector
F1 and F1a (230V version only)	1A / 250 VAC Fast (230V versions only)	Internal (230V versions only)	Separate fuse block (230V versions only)

6.4 Cleaning

Clean the outside of the cabinet with mild soapy solution and water only. Do not attempt to clean the emitter plate.

6.5 Heater Element Replacement

The M340 heating element is **not** field replaceable since the cavity and elements are an integral assembly. Contact LumaSense for service if the heating element fails.

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Appendix A: PC Communications sample

This is a typical QBASIC program that reads current temperature and increments setpoint at 10C intervals:

This program is provided for example only for extraction of code lines for your use. It is not intended to be an attractive user interface program. It is, however, a working program.

```
'ATHNSET.BAS RS232 mgm 12/11/97 rev 1/9/98 mgm added switch for no decimal

CLS
OPEN "COM1:1200,O,7,1,RS,CS,DS" FOR RANDOM AS #1 'uses com1 12.o.7 setting
'----set up screen, draw box with MIKRON name in it
SCREEN 13
WIDTH 40
PRINT "ATHNSET: RS232 TEST MIKRON VER 1.1"
PRINT "rs232 com1 1200,O,7,1 ID#01"
INPUT "Does it have decimal point (Y/N)"; dp$
PRINT
LOCATE 23, 5
PRINT "Press space bar to quit."
LINE (70, 30)-(170, 30), 3 '
LINE (70, 30)-(70, 150), 3
LINE (170, 30)-(170, 150), 3
LINE (70, 150)-(170, 150), 3
LOCATE 18, 13
COLOR 3
PRINT "MIKRON"

'------set up loop for with or without decimal points, initialize starts & ends
dp$ = UCASE$(dp$)
IF dp$ = "N" THEN beginsp = 30: endsp = 140: dpswitch = 0: readlen = 6
IF dp$ = "Y" THEN beginsp = 30.1: endsp = 140.1: dpswitch = 100: readlen = 7
LOCATE 6, 1

'-------main setpoint stepping loop---------------------------------------
setpointloop:
FOR sp = beginsp TO endsp STEP 10
BEEP

'-------put setpoint writing string in correct format for decimal or no decimal
IF sp < dpswitch THEN
sp$ = " 0" + RIGHT$(STR$(sp), 4)
ELSE
sp$ = STR$(sp)
END IF

'-------create reading and setpoint output strings
reading$ = "#01R00" + CHR$(13) + CHR$(10) 'grab a reading string
setpoint$ = "#01M01" + sp$ + "C" + CHR$(13) + CHR$(10) 'change setpoint string

'-------display and send setpoint value to controller
COLOR 2
LOCATE 9, 15
PRINT sp
PRINT #1, setpoint$ 'send sp to controller

'------wait some time
FOR y = 0 TO 200000
```

```
NEXT y

'-------get blackbody temperature readings
PRINT #1, reading$ ' send get reading command string to controller
INPUT #1, getread$ ' ignore first controller response (echo)
INPUT #1, getread$ ' grab controller temperature response
pv = VAL(RIGHT$(getread$, readlen)) 'convert ascii string to a number

'-------display the process variable (blackbody temperature)
LOCATE 7, 15
COLOR 4 + 8
PRINT pv

'-------escape loop to end program
mg$ = INKEY$
IF mg$ = " " THEN CLOSE : END

'--------wait some time
FOR z = 0 TO 200000
NEXT z
NEXT sp 'go to the next setpoint value and repeat

'----------done
LOCATE 23, 5
PRINT "TEST IS COMPLETE. "
```

Appendix B: Calibration Methods

There are two distinctly different methods of calibration, each with its own application advantages. These methods are described as follows:

Thermometric Method:

In this method, the surface temperature of emitting surface is precisely measured and controlled. The sensor is an ultra precision platinum RTD that closely monitors the temperature of the emitting surface. This method is widely used in aerospace industries, since it provides an easy method of periodically verifying calibration. A deep hole with a 0.16" (4 mm) diameter is provided for customer insertion of calibration RTD. Knowledge of emitter emissivity characteristic is needed for correct radiated energy computation.

Radiometric Method:

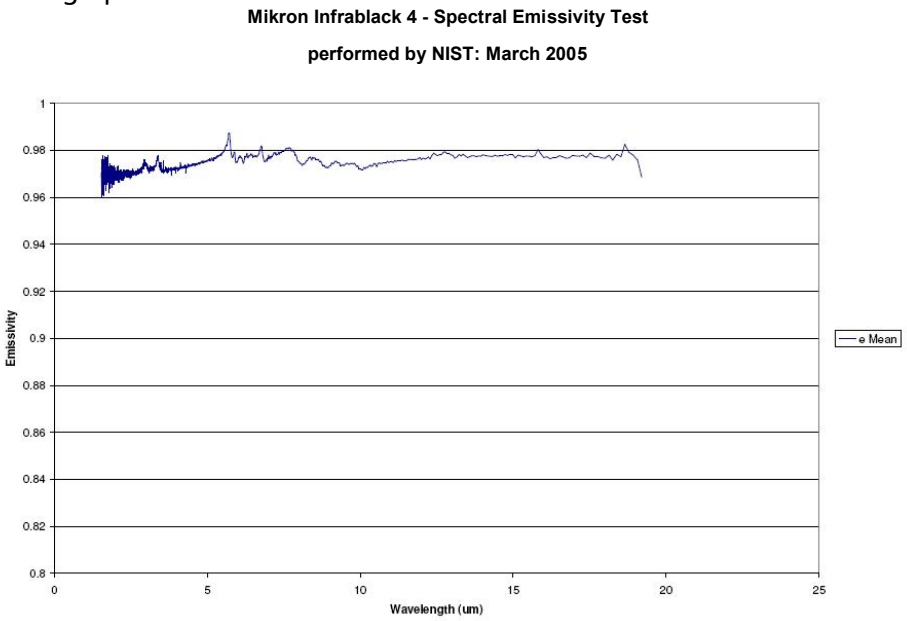
In this method, calibration is based on the energy radiated from the emitter surface at a desired spectral band. This emitted radiation is compared with the primary blackbody calibration source with emissivity of greater than 0.998, using a precision transfer standard. The advantage of this technique is that the characteristic of emitter emissivity has already been calibrated into the system. An apparent emissivity of greater than 0.995 can be achieved. Recalibration or field calibration using this technique is more difficult and elaborate since highly precision primary blackbody calibration sources and transfer standard are needed.

This blackbody was calibrated:

[ ] radiometrically (pyrometrically) [ ] thermometrically

Emissivity

When measurements are required at wavelengths other than the one used for factory radiometric calibration, or if the calibration was done thermometrically (see above), the graph below provides emissivity vs. wavelength for this model. Integrating over the wavelength region of interest will provide the average emissivity for your measurement. If the blackbody was calibrated radiometrically, the apparent emissivity at 8-14um was normalized to 1.0. If the blackbody was calibrated thermometrically, the target emissivity vs. wavelength can be read directly from the graph.



For convenience, the tables below show the expected radiance output vs. temperature (setpoint) for two popular wavelength regions (emissivity at 2 decimal places). These tables assume the ambient and background are at 23 °C and apply ONLY if your blackbody was calibrated thermometrically.

TEMPERATURE IN DEGREES C T AT e=1.0	 T AT e= .97	8 - 14 microns ERROR DEG.C
-40.0	-37.1	2.9
-35.0	-32.5	2.5
-30.0	-27.8	2.2
-25.0	-23.1	1.9
-20.0	-18.3	1.7
-15.0	-13.6	1.4
-10.0	-8.8	1.2
-5.0	-4.0	1.0
0.0	0.8	0.8
5.0	5.6	0.6
10.0	10.4	0.4
15.0	15.2	0.2
20.0	20.1	0.1
25.0	24.9	-0.1
30.0	29.8	-0.2
35.0	34.7	-0.3
40.0	39.5	-0.5
45.0	44.4	-0.6
50.0	49.3	-0.7
55.0	54.2	-0.8
60.0	59.0	-1.0
65.0	63.9	-1.1
70.0	68.8	-1.2
75.0	73.7	-1.3
80.0	78.6	-1.4
85.0	83.5	-1.5
90.0	88.4	-1.6
95.0	93.3	-1.7
100.0	98.2	-1.8

TEMPERATURE IN DEGREES C T AT e=1.0	 T AT e= .97	3 - 5 microns ERROR DEG.C
-40.0	-32.5	7.5
-35.0	-29.0	6.0
-30.0	-25.2	4.8
-25.0	-21.2	3.8
-20.0	-17.0	3.0
-15.0	-12.6	2.4
-10.0	-8.2	1.8
-5.0	-3.6	1.4
0.0	1.0	1.0
5.0	5.7	0.7
10.0	10.5	0.5
15.0	15.3	0.3
20.0	20.1	0.1
25.0	24.9	-0.1
30.0	29.8	-0.2
35.0	34.7	-0.3
40.0	39.6	-0.4
45.0	44.5	-0.5
50.0	49.4	-0.6
55.0	54.4	-0.6
60.0	59.3	-0.7
65.0	64.2	-0.8
70.0	69.2	-0.8
75.0	74.1	-0.9
80.0	79.1	-0.9
85.0	84.0	-1.0
90.0	89.0	-1.0
95.0	93.9	-1.1
100.0	98.9	-1.1

To force the radiance output of a thermometrically calibrated blackbody to desired temperature, simply invert the sign of the ERROR DEG.C and add this number to the blackbody controller setpoint. Again, note that this only applies at ambient and background temperatures of 23 °C.

Calibrating fixed emissivity pyrometers

To use this blackbody to calibrate pyrometers (infrared thermometers) that are factory set at 0.95 emissivity, use the table below to find the proper M340 controller setpoint temperature that will provide the correct output radiance for e=0.95. Please review all notes provided below the table.

TEMPERATURE IN DEGREES C 8 - 14 microns
T AT e=1.0 T AT e= .95 ERROR DEG.C
Reference (ambient) temperature = 23 C

NOMINAL TEMP	CONTROLLER SP	
-20.00	-17.25	2.75
-15.00	-12.65	2.35
-10.00	-8.03	1.97
-5.00	-3.38	1.62
0.00	1.29	1.29
5.00	5.98	0.98
10.00	10.69	0.69
15.00	15.41	0.41
20.00	20.15	0.15
25.00	24.91	-0.09
30.00	29.67	-0.33
35.00	34.44	-0.56
40.00	39.21	-0.79
45.00	44.00	-1.00
50.00	48.79	-1.21
55.00	53.59	-1.41
60.00	58.39	-1.61
65.00	63.20	-1.80
70.00	68.01	-1.99
75.00	72.82	-2.18
80.00	77.64	-2.36
85.00	82.46	-2.54
90.00	87.29	-2.71
95.00	92.11	-2.89
100.00	96.94	-3.06
105.00	101.77	-3.23
110.00	106.60	-3.40
115.00	111.44	-3.56
120.00	116.27	-3.73
125.00	121.11	-3.89
130.00	125.94	-4.06
135.00	130.78	-4.22
140.00	135.62	-4.38
145.00	140.46	-4.54
150.00	145.29	-4.71

Note:
1. Assumes ambient temperature and sensor temperature in pyrometer under calibration is at 23°C.

2. "NOMINAL TEMP" above is expected pyrometer under calibration display when BB controller is set to "CONTROLLER SP".

3. Above note 2 applies to Mikron Blackbodies that have been Radiance calibrated at 8-14um to provide an effective emissivity = 1.0 at 8-14um.

4. Applies only to pyrometers with preset emissivity of 0.95. All other pyrometers with adjustable emissivity and operating wavelength 8-14um should be set at 1.0 and disregard this table.

Background Influence On Apparent Emissivity

When using a blackbody source at temperatures near ambient and above, common sense dictates how the blackbody will behave. When using a source below ambient temperatures, different things happen. Since the background such as the room, wall, and you are warmer than the blackbody emitter, the energy emitted from the emitter is the sum of the background reflection and the emitter temperature. When emitter emissivity is less than 1.0, the background energy times (1-emissivity) reflects to the device under calibration. When the source is set a low temperatures such as -10 and -20 °C, this additional reflection component can become quite influential. For more information on this subject, contact LumaSense directly.

Appendix C: CE Certification

MIKRON INFRARED

Declaration of Conformance

Application of Council Directives:

European Community 89/336/EEC, 73/23/EEC

Issued by: Mikron Infrared, Inc.
Oakland, NJ

Date of Issue: 10/28/04

Type of Equipment: Blackbody Calibration Source

Brand Name: Mikron M340 Series

Standards to Which Conformance is Declared:

EN61326-1, Class A Emissions
EN55022 Radiated Emissions 30MHz to 1GHz
IEC 61000-3-2 (2001-10) Line Conducted Emissions

EN61326-1 Immunity
EN61000-4-2, Electrostatic Discharge Susceptibility
EN61000-4-3, Radiated Electromagnetic Field susceptibility
EN61000-4-6, Conducted Disturbances Induced by RF Fields
EN61000-4-11, Voltage Dips and Short Interruptions Susceptibility
EN61010-1: 2001, Safety requirements for Electrical Equipment
EN61010-2-10: 2003, Safety requirements for Electrical Equipment Part 2-010 for the heating of materials.

I, The Undersigned, Hereby Declare That The Equipment Specified Above Conforms to the Directives and Standards As Specified

K. Irani, CTO

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