SAE International

SURFACE VEHICLE STANDARD

SAE J1885

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Superseding J1885 MAR2005

Accelerated Exposure of Automotive Interior Trim Components Using a Controlled Irradiance Water Cooled Xenon-Arc Apparatus

This document is equivalent to ISO/DIS 105-B06 option 5.

1. Scope

This test method specifies the operating procedures for a controlled irradiance, water cooled xenon-arc apparatus used for the accelerated exposure of various automotive interior trim components.

Test durations, as well as any exceptions to the sample preparation and performance evaluation procedures contained in this document, are covered in material specifications of the different automotive manufacturers.

This standard is limited to the models of xenon arc test apparatus specified in the Section on Equipment.

All other models of xenon arc test apparatus must use SAE J2412 to perform the test conditions specified in SAE J1885. SAE J2412 is the performance standard based on the test parameters of SAE J1885. Use of xenon arc test apparatus to perform SAE J2412 must be agreed upon by contractual parties.

1.1 Rationale

The SAE Committee on Textiles and Flexible Plastics Specifications is cancelling SAE J1885 due the fact it is equipment specific, and will be superseded by SAE J2412, on or about January 2008, per the policy outlined in TSB (Technical Standards Board) of SAE.

2. References

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1545—Instrumental Color Difference Measurement for Exterior Finishes, Textiles, and Colored Trim
SAE J1885—Accelerated Exposure of Automotive Interior Trim Components Using a Controlled Irradiance Water Cooled Xenon-Arc Apparatus
SAE J2412—Accelerated Exposure of Automotive Interior Trim Components Using a Controlled Irradiance Xenon-Arc Apparatus

2.1.2 ASTM PUBLICATION

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM G 26—Standard Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials

2.1.3 ISO PUBLICATION

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ISO 105 B06—Textiles—Tests for colour fastness—Colour fastness to artificial light at high temperatures: Xenon arc fading lamp test

2.1.4 OTHER PUBLICATIONS

AATCC Evaluation Procedure 1 (1987)—Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709, Tel: 919/549-8141, www.aatcc.org.
Polystyrene Plastic Lightfastness Standard Lot#1—Available from Test Fabrics, Inc., 415 Delaware Avenue, West Pittston, PA 18643.

3. Definitions

3.1 Black Panel Thermometer, n

A temperature measuring device, the sensing unit of which is a stainless steel panel coated with black material designed to absorb most of the radiant energy encountered in fade/weathering testing.

NOTE—This device provides an estimation of the maximum temperature a specimen may attain during exposure to natural or artificial light.

3.2 Blue Wool Lightfastness Standard, n

One of a group of dyed fabrics used to determine the amount of light, or combined light, heat, and moisture to which a specimen is exposed during fade/weathering testing.

3.3 Center Wavelength, n

The specified wavelength for bandpass filters; the wavelength midway between the half power points e.g., 340 nm ± 2 nm.

3.4 Color Change, n

As used in fade/weathering testing, a change in color of any kind (whether a change in hue, saturation, or lightness).

3.5 Half Power Bandpass, n

The interval between wavelengths at which transmittance is 50% of peak. (It should not exceed 20 nm for a narrow bandpass filter.)

3.6 Irradiance, Controlled, n

The maintenance by closed loop feedback of a preselected irradiance throughout a designated exposure interval.

3.7 Irradiance, Spectral, n

The radiant energy within a specified wavelength interval that falls upon a unit area of exposed surface ($W/m^2/nm$).

3.8 Irradiance, Total, n

Radiant energy integrated over all wavelengths falling upon a unit area of exposure at a point in time expressed in watts per square meter (W/m^2).

3.9 Irradiation, n

See radiant exposure.

3.10 Long-Arc Xenon, n

A xenon arc in which the length of the arc between electrodes is greater than the diameter of the envelope enclosing the arc.

3.11 Peak Wavelength, n.

The wavelength of peak transmission, e.g., 340 nm.

3.12 Radiant Exposure, n

The time integral of irradiance expressed in joules per square meter (J/m^2).

3.13 Radiant Exposure, Spectral, n

The integration of spectral irradiance with respect to time.

3.14 Reference Fabric, n

One or more blue wool lightfastness standards selected for exposure as a check on a test apparatus and operating conditions.

3.15 Reference Plastic, n

A clear polystyrene plastic standard selected for exposure as check on a test apparatus and operating conditions. This reference material is normally used for long-term exposures.

3.16 Sample, Laboratory, n

A portion of material taken to represent the lot sample, or the original material, and used in the laboratory as a source of test specimens.

3.17 Specimen, n

A specific portion of a material or a laboratory sample upon which a test is performed or which is selected for that purpose.

3.18 Spectral Power Distribution, n

The variation of energy due to the source over the wavelength span of the emitted radiation.

4. Significance and Use

4.1 This test method is designed to simulate extreme environmental conditions encountered inside vehicle due to sunlight, heat, and humidity for the purpose of predicting the performance of automotive interior trim materials**.**

5. Equipment

5.1 A more complete description of the following equipment may be found in ASTM G 26.

5.2 The equipment employed utilizes a water cooled xenon-arc lamp as the source of radiation and should be one of the following:

5.2.1 TYPE AH[1]

A controlled irradiance apparatus in which the radiant energy source is vertically located at the center axis of a specimen rack. The specimen rack shall rotate at 1 rpm ± 0.1 rpm and shall be of the three-tiered, inclined type having a center segment of 648 mm ± 6 mm (25.5 in ± 0.25 in) outside diameter centered on the xenon-arc lamp. The top and bottom segments shall be 511 mm ± 6 mm (20 in ± 0.25 in) outside diameter, positioned 28 degrees ± 2 degrees from the vertical. Each segment shall accommodate 152 mm (6 in) specimen holders. The apparatus shall provide for automatic control of temperature, relative humidity, and irradiance at 340 nm.

5.2.2 TYPE BH[1]

A controlled irradiance apparatus in which the radiant energy source is vertically located at the central axis of the following two racks:

5.2.2.1 The specimen rack shall rotate at 1 rpm ± 0.1 rpm and shall be of the three-tiered, inclined type having a center segment of 965 mm ± 6 mm (38 in ± 0.25 in) outside diameter centered on the xenon-arc lamp. The top and bottom segments shall be 842 mm ± 6 mm (33.16 in ± 0.25 in) outside diameter, positioned 22 degrees ± 2 degrees from the vertical. Each tier shall accommodate 152 mm (6 in) specimen holders. The apparatus shall provide for automatic control of temperature, relative humidity, and irradiance at 340 nm. All specimen exposure openings may be used.

5.2.2.2 The specimen rack shall rotate at 1 rpm ± 0.1 rpm and shall be of the two-tiered, inclined type, 965.2 mm ± 6 mm (38 in ± 0.25 in) outside diameter in the center. The top and bottom segments shall be 872.5 mm ± 6 mm vertical. The rack shall be positioned so that the exposure area is centered on the xenon lamp. Each tier shall accommodate 254 mm (10 in) long specimen holders. The apparatus shall provide for automatic control of temperature, relative humidity, and irradiance at 340 nm. When using this two-tiered specimen rack, test specimens shall not be placed in positions 1 and 8. (See Figure 1.)

5.2.3 The xenon-arcs employed shall be of the "long-arc" water cooled type. They shall employ cylindrical inner and outer optical filters to direct the flow of cooling water and to provide a selected spectral power distribution.

5.2.4 Distilled or deionized water (solids content less than 20 ppm) shall be recirculated past the burner at a flow rate sufficient to remove excess heat. Passing water through a cartridge demineralizer installed in the recirculation line just ahead of the lamp minimizes contamination of the quartz envelope of the burner. A heat exchange unit shall be used to cool the recirculated lamp water.

[1] The Ci35 Xenon-Arc Weather Ometer® or equivalent with factory installed air heater meets the requirements of Type AH. The Ci65 Xenon-Arc Weather-Ometer® or equivalent with factory installed air heater meets the requirements of Type BH. These apparatuses are available from Atlas Electric Devices Company, 4114 North Ravenswood Avenue, Chicago, IL 60613.

6. *Apparatus Set-Up*

6.1 To insure repeatability of tests, maintain and calibrate the apparatus to manufacturer's specifications, and as described in Appendices A, B, and C. Appendix A contains additional maintenance instructions and replacement schedules, and Appendix A and C describe the use of reference materials to determine if the xenon-arc apparatus is operating within the desired range. Appendix C provides an alternative to the method described in Appendix B using a polystyrene reference plastic suitable for use during long-term exposures and requires less frequent interruption of machine operation. Contractual agreement will determine which method(s) will be used.

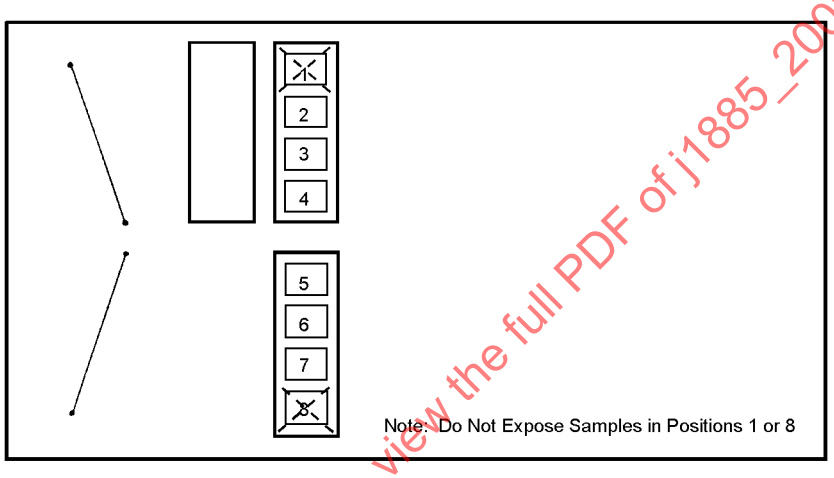

FIGURE 1—TWO-TIER INCLINED SPECIMEN RACK C165

6.1.1 The input voltage must be between 215 to 250 V.

6.1.2 Water for humidification and lamp cooling must be purified so that it is free of silica and has no more than 20 ppm total dissolved solids.

6.1.3 Remove and cap the specimen spray unit. Turn off the rack spray unit with the valve provided.

NOTE—While the specimen spray can be turned off through a switch on the control panel, it is recommended that the specimen spray assembly be removed and the pipe capped to prevent accidental spraying of the test samples.

6.1.4 Fit the xenon-arc burner with quartz inner filter and Type S borosilicate outer filter.

6.1.5 Set the operation switches as follows in Table 1:

TABLE 1—OPERATION SWITCH SETTINGS

Switch	Setting
Black Panel Ambient Air	Black Panel
Wattage Adjustment	Automatic
Countdown Switch	Irradiation
Lamp Ignition	On
Fixed Air Valve	Off
Humidifier	On
Water Heater	On
Air Heater	On[1]
Specimen Spray	Off
Rack Spray	Off

1. The Air Heater selector switch, under the cover labeled "Circuit Breakers/ Mode Switches," should be set to Light/Dark Cycle. If proper humidity during the light cycle cannot be maintained, set to Dark Cycle. Only one air heater should be used on devices equipped with two air heaters. The test chamber High Temperature Adjust switch should be set to 72 °C.

6.1.6 Set the thumb wheel controls as follows in Table 2:

TABLE 2—THUMB WHEEL CONTROL SETTINGS

	Dark Cycle	Light Cycle
Automatic Irradiance	—	0.55 w/m^2 at 340 nm
Black Panel Temperature	38 °C	89 °C
Wet Bulb Depression[1]	0 °C	12 °C (Nominal)
Conditioning Water	40 °C	63 °C
"A" Series Equipment		
Automatic Dry Bulb Temperature[2]		62 °C
Cycle Programmer		Program 2 or 3

1. NOTE—The wet bulb depression setting indicated is a suggested setting to obtain the specified humidity level. It may be necessary to adjust this setting due to ambient conditions in the room containing the equipment.
2. Set Light Cycle dry bulb control switch to automatic.

6.1.7 Set cycle that provides 3.8 h light and 1.0 h dark.

6.1.8 Operate the equipment to maintain the conditions inTable 3. If the actual operating conditions do not agree with the machine settings after the equipment has stabilized, discontinue the test and identify the cause of the disagreement.

TABLE 3—EQUIPMENT OPERATING CONDITIONS

	Dark Cycle	Light Cycle
Automatic Irradiance		0.55 w/m^2 ± 0.01 w/m^2 at 340 nm
Black Panel Temperature	38 °C ± 2 °C	89 °C ± 3 °C
Dry Bulb Tolerance[(1)]	38 °C ± 2 °C	62 °C ± 2 °C
Relative Humidity	95% ± 5%	50% ± 5%
Conditioning Water	40 °C ± 4 °C	63 °C ± 4 °C
Radiant Exposure	See Applicable Specification	See Applicable Specification

1. Note—It may be necessary to adjust the blower speed to maintain the specified dry bulb temperature.

6.1.9 Adjust the temperature of the lamp cooling water to provide sufficient cooling, but prevent condensation from forming on the lamp assembly. Suggest 60 °C for cooling water, and 70 °C for high temperature water cut-out.

7. Test Procedure

7.1 Prepare the specimens to be exposed to fit the specimen holder being used.

7.2 Specimen sizes must conform to the size of the specimen holder(s)[2] supplied by the manufacturer for use with the equipment. Specimens that exceed these sizes may not give proper exposure results. Instructions for mounting parts or portions of a part can be obtained from the responsible engineering group.

7.3 Back interior textiles (body cloth, carpet, vinyl coated fabrics, etc.) with white cardboard.[3] Specimens other than interior textiles that do not completely fill the exposure area of the specimen holder are also backed with white cardboard.

7.4 Insert specimen in holder and secure. Under no circumstances should the face side of the sample be closer to the arc than the front side of the specimen holder**.**

7.5 Fill all unused slots with specimen holders filled with white cardboard[3] to maintain desired air flow. Cardboard blanks should be changed when noticeable physical distortion occurs.

7.6 Expose specimens, beginning at the end of a dark cycle, for the required radiant exposure (kilojoules per square meter [kJ/m^2]) measured at the central wavelength of 340 nm. See applicable material specification.

2 Specimen holders SL-3T, CD-3T, SL, CD, and CD-4 have been found to be suitable. Frames other than these can be agreed upon between the contractual parties.

3 Franklin, Grain Long-Felt Side Up, 110/500 White Index or 9016 White Bristol Card Stock Have Been Found Suitable For This Purpose. Franklin White Index Is Usually Available From Local Office Supply or Art Supply Stores.

NOTE—Care should be taken to avoid mixing potentially incompatible specimens in the same machine load, i.e., textiles should not be exposed together with foam backed textiles, foams, or plastics.

Once exposure has been initiated, equipment operation should not be interrupted more than once daily. Additional interruptions, e.g., opening the chamber door during the course of daily operation, may cause variation in test results.

8. Evaluating and Reporting the Degree of Fade

8.1 The degree of fade should be evaluated and reported as specified between the contractual parties. One or more of the following methods may be specified:

8.1.1 INSTRUMENTAL MEASUREMENT

8.1.1.1 Color difference values in CIELAB units are obtained by instrumentally measuring the specimen before and after a specified amount of radiant exposure. The procedure used for specimen measurement will conform to that specified in Appendix B.

8.1.2 VISUAL ASSESSMENT

8.1.2.1 Assign colorfastness ratings using the AATCC Gray Scale for Color Change in accordance with AATCC Evaluation Procedure 1 (1987).

8.1.2.2 Using the viewing conditions specified in AATCC Evaluation Procedure 1 (1987), quantify the color change using the following terminology:

a. NONE—No change in hue, lightness, or saturation.
b. SLIGHT—A change in lightness and/or saturation which can be determined only upon close examination but no change in hue.
c. NOTICEABLE—A change in lightness and/or saturation which can easily be seen and/or a change in hue.
d. SEVERE—An extreme change in lightness, saturation, and/or hue.

9. Exposure Report

9.1 A copy of the Exposure Control/Report Form (Figure 2)[4] indicating the color change of the exposed reference material in CIELAB color difference units must accompany each exposed specimen being submitted for approval. If any one of the color difference data points is outside the specified tolerance (control limits), the cause and corrective action must be indicated in the space provided.

[4] Copies of the exposure control/report form can be obtained from any automotive company using this procedure.

9.2 The Exposure Control/Report Form shall include the following additional information:

9.2.1 Laboratory Name

9.2.2 Type and serial number of exposure equipment

9.2.3 Month and Year of equipment operation represented by the control chart

9.2.4 Test method

9.2.5 Reference material(s) used

9.2.6 Frequency of operation verification, e.g., daily, three, or seven day intervals

9.2.7 Color change, target value, and tolerance, in CIELAB color difference units for the reference material(s) used

9.2.8 The monthly average color difference for the reference material(s)

9.2.9 Measured color change, in CIELAB color difference units, for reference material 1

9.2.10 Measured color change, in CIELAB color difference units, for reference material 2 (if more than one material is used)

9.2.11 Daily record of black panel temperature

9.2.12 Daily record of dry bulb temperature

9.2.13 Sample identification

9.2.14 Total radiant exposure applied to the specimen

9.2.15 Date specimen exposure was initiated

9.2.16 Date specimen exposure was completed

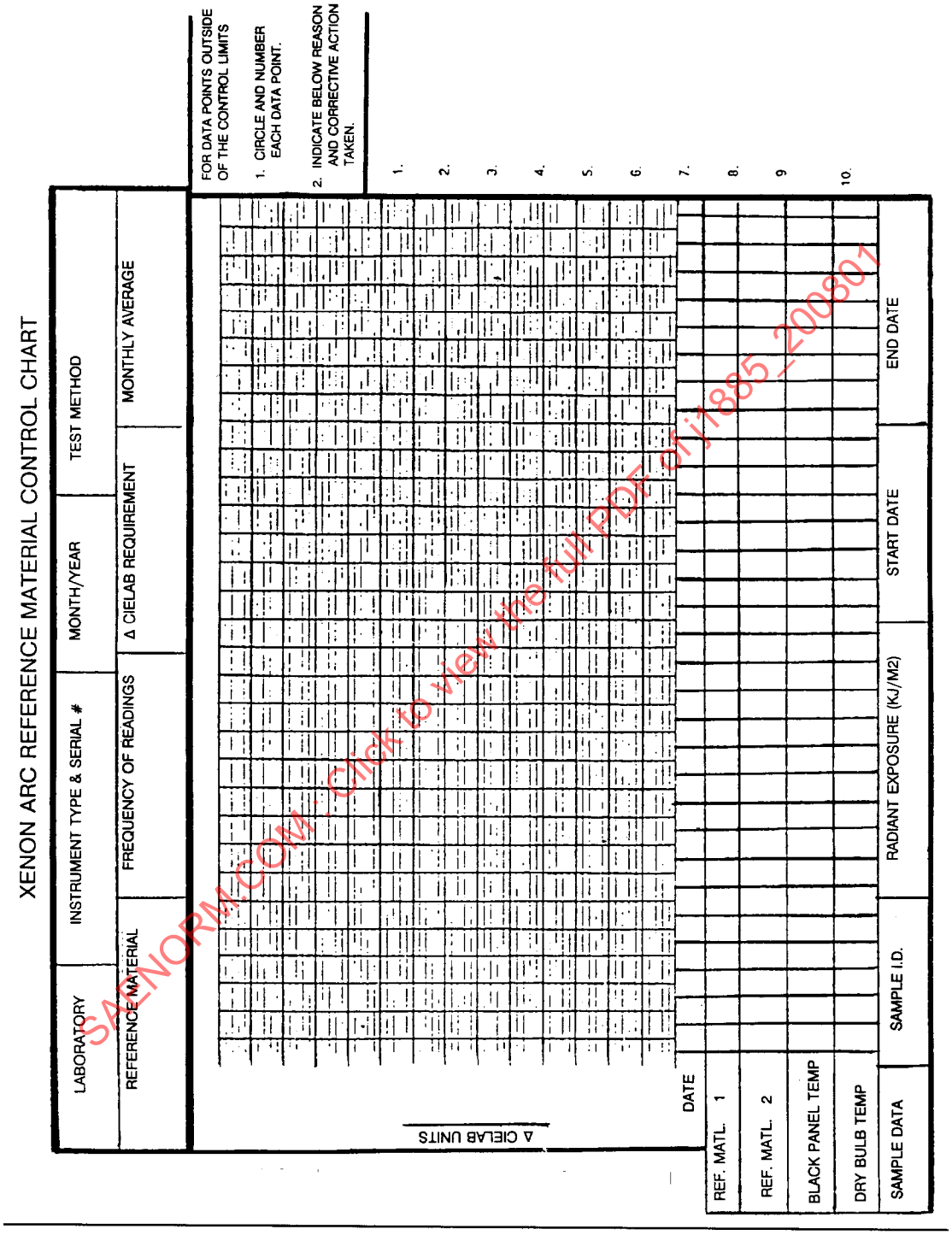

FIGURE 2—EXPOSURE CONTROL/REPORT FORM

10. Notes

10.1 Marginal Indicia

The change bar (|) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE TEXTILE AND FLEXIBLE PLASTICS COMMITTEE

APPENDIX A

A.1 Maintenance

A.1.1 Test Chamber

The frequency of cleaning will vary with water quality. However, the chamber must be cleaned at least once a month with a stainless steel cleaning agent and flushed with deionized water. Do NOT use cleaning agents containing chlorine.

A.1.2 Conditioning Chamber

The frequency of cleaning will vary with water and air quality in the laboratory. However, the chamber must be drained once a month and flushed with deionized water to remove sediment.

A.1.3 Lamp Assembly

Frequency of cleaning will vary with water quality. However, at least once each week wipe the outer surface of the outer filter with alcohol and a soft cloth. If deposits cannot be removed, replace the filter.

A.1.4 Quartz Light Rod

Clean weekly the end of the light rod with alcohol and soft cloth.

A.1.5 Black Panel Sensor

Polish weekly using a good quality automotive polish.

A.2 Replacement Schedule

A.2.1 Lamp Assembly and Related Parts

A.2.1.1 Replace the inner filter when the specified irradiance level can no longer be achieved or after a maximum of 1000 h of operation, and also whenever the burner tube is replaced.

A.2.1.2 Replace the outer filter when the specified irradiance level can no longer be achieved or after a maximum of 1000 h of operation.

A.2.1.3 Replace the burner tube when the specified irradiance level can no longer be achieved even after the outer filter has been replaced.

A.2.1.4 Replace the interference filter located in the light monitoring system after 9000 light-on hours or 18 months of use, whichever comes first. The interference filter may require replacement sooner if the wattage level does not return to "normal" after the burner tube and outer filter have been replaced.

A.2.2 Replace the black panel sensor when local surface luster can no longer be maintained, or when bare metal can be seen.

A.2.3 Inspect wet bulb wick weekly and replace when discoloration or mineral deposits are observed.

A.3 Calibration Checks

A.3.1 Check the switches and thumb wheel controls daily to insure proper settings.

A.3.2 Calibrate the apparatus once each week following the procedures detailed in the operating manual provided by the manufacturer. If contractual agreement is to use L-4 Blue Wool as the reference material, Thursday is the suggested calibration day.

A.3.2.1 Weekly calibration records are maintained using the recording form provided (Figure A1). Set points may differ depending on the model of apparatus used. Refer to the operating manual provided with the equipment for the exact requirements.[5]

A.3.2.2 The use of the "substitution temperature calibration PC board" is a requirement for the weekly calibration of the apparatus. This method of temperature calibration replaces the use of the hot and cold water method which may be detailed in the operating manual provided with the equipment at the time of purchase. Complete adherence to the manufacturer's instructions for calibration using this "PC Board" is mandatory.

[5] Copies of the calibration record chart can be obtained from any automotive company using this procedure.

RECORD OF EQUIPMENT CALIBRATION

Company/Area: _____ Equipment Type: _____

Model Number: _____ Serial Number: _____

Calibration Lamp Serial Number: _____ Calibration lamp Calibration Date: _____

DATE									
XENON LAMP OPERATING HOURS									
INNER FILTER OPERATING HOURS									
OUTER FILTER OPERATING HOURS									
CALIBRATION LAMP OPERATING HOURS									
CALIBRATION POINTS	Set Point	First Value	Final Value	First Value	Final Value	First Value	Final Value	First Value	Final Value
WATTAGE REGULATOR	Min: Max:								
LIGHT ROD ADJUSTMENT									
IRRADIANCE ZERO	0.00								
IRRADIANCE THUMBWHEEL SPAN	-0.10vdc								
INTEGRATOR ZERO									
INTEGRATOR REFERENCE									
INTEGRATOR SPAN									
IRRADIANCE THUMBWHEEL (LOW AND SPAN ADJUST)	Min: Max:								
CALIBRATION LAMP	Irradiance Wattage								
BLACK PANEL TEMPERATURE	Min: 0.0 Max:100.0								
DRY BULB TEMPERATURE	Min: 0.0 Max:100.0								
WET BULB TEMPERATURE	Min: 0.0 Max:100.0								
DEPRESSION	Min: 0.0 Max:100.0								
CONDITIONING WATER	Min: 0.0 Max:100.0								

FIGURE A1—EQUIPMENT CALIBRATION RECORD

APPENDIX B

B.1 Scope

B.1.1 This Appendix describes the procedure for using AATCC Blue Wool Lightfastness Standards as reference fabrics for the purpose of determining whether the xenon-arc apparatus is operating within the desired range.

B.1.2 Color difference values in CIELAB units are obtained by instrumentally measuring the reference fabrics before and after a specified amount of radiant exposure.

B.1.3 AATCC L-2 Blue Wool Lightfastness Standards shall be exposed daily and/or an AATCC L-4 Blue Wool Lightfastness Standard shall be used to monitor a continuous three day operating cycle as agreed upon between contractual parties.

B.2 Procedure

B.2.1 Instruments used to determine color difference for this procedure require capability for providing CIELAB color values using illuminant D-65, 10 degree observer data. If an instrument with diffuse geometry is used, the specular component of reflectance shall be included in the measurement. (Refer to SAE J1545, 3.6 for details).

NOTE—An aperture diameter smaller than 20 mm cannot be used for these measurements.

B.2.2 Calibrate the instrument to be used for the color measurements to the manufacturers recommendations.

B.2.3 Back the reference fabric to be measured with white cardboard[6]. Condition the backed reference fabric in a standard atmosphere (50% RH ± 5% RH and 21 °C ± 1 °C) for a minimum of 2 h. Insert one layer of unexposed material of the lightfastness standard between the reference fabric and cardboard backing prior to measurement.

NOTE—The reference fabrics are light sensitive. Therefore, the piece used as the backing layer during measurement will need to be replaced when noticeable color change has occurred (after approximately 50 uses).

B.2.4 Place the reference fabric against the sample port of the instrument in such a way that a smooth surface of the face of the fabric is presented for measurement.

[6] Franklin, Grain Long-Felt Side Up, 110/500 White Index or 9016 White Bristol Card Stock Have Been Found Suitable For This Purpose. Franklin White Index Is Usually Available From Local Office Supply or Art Supply Stores.