



## REPORT OF CALIBRATION

**DESCRIPTION:** BINOCULAR TRANSMISSION

**MODEL:** XM-HD 8X42mm

**SERIAL NUMBER:** 0003146

**MANUFACTURER:** CARSON

**TECHNICIAN:** FLJ

**CALIBRATION DATE:** 01/06/2006

**RECALL DATE:** 01/06/2007

**CUSTOMER:** CARSON OPTICAL, INC

**SALES ORDER / RMN:** 23876/7282

**TEMP (°C):** 23

**REL. HUMIDITY (%):** 43

### PROCEDURE:

The transmittance of this Binocular was measured on a Gamma Scientific C-11 spectroradiometer configured with a Model NM-7DH double grating monochromator. A special fixture consisting of a RS-20-51 Collimated Projection Light Source, holder, and 4" diameter integrating sphere attached to DC-49C Thermoelectrically cooled Photomultiplier Detector was used to obtain the transmittance of the Binocular. The transmittance is determined by dividing the measured photocurrent values given in A to D counts of the source into the photocurrent values taken with the Binocular between the integrating sphere and the exit port of the RS-20-51 Light Source. The optical alignment of the binocular with respect to the measurement system's optical axis is directly related to measurement uncertainty.

### INCOMING INSPECTION: NEW UNIT

**RESULTS (Average Transmittance covering the spectral range from 400.0nm to 700.0nm in 5.0nm step increments.):**

**Left Transmittance (400-700 nm) = 84.78    Right Transmittance (400-700 nm) = 84.72**

The spectral transmittance values are given in the attached listing and shown in the attached plot. The data are also saved to disk file in two different ASCII text formats, EXCEL and LightTouch.

All calibrations are performed using internationally recognized standards calibrated by the National Institute of Standards and Technology (NIST) for use at Gamma Scientific. The NIST test numbers for each standard used are listed below. The test equipment used to determine acceptance of Gamma Scientific products is maintained at the level of accuracy to ensure complete compliance with ANSI/NCSL Z540-1-1994. The information shown on this certificate applies only to the instrument identified above and may not be reproduced, except in full, without prior written consent from Gamma Scientific.

**SPECIAL NOTES:** Calibrated to ISO 14490 and ISO 8478.

### Quality Assurance

A 3.00 percent variance in transmittance of the binoculars, including Left and Right optics, may be attributed to differences in optical components and the lens coatings applied.

**STANDARDS USED:** GS-1015 1000 WATT LAMP  
**NIST TEST#:** 844/269328-03  
DR-13 CANDELA STANDARD  
**NIST TEST #:** 844/271329-05/2

ACCEPT	REJECT

Title: CARSON XM HD 8X42MM LEFT TRANSMITTANCE FINAL 01/06/06  
Date/Time: 01-06-2006 / 14:16:47  
Standard/Reference Illuminant applied: 5000-16C 1000 W FEL LAMP S/N: GS-1015 / None  
Units: % Transmittance, N/A  
Hardware: NM-23 200-1700nm,RS-20-51,NM-7DH 290-1110nm,DC-49C 350-1010nm, (N/A)  
Notes:  
Number of points: 95  
X-Axis-Low,High,Step: 360, 830, 5 / Y-Axis-Low,High: 2.2175e+00, 9.0455e+01

(Ir)Radiance/Photon (Ir)Radiance/Integral  
Integral: 3.510e+02 / Photon Integral: 1.057e+15

Tristimulus (CIE 1931, 2° observer)  
X=8.723e+01 Y=8.620e+01 Z=8.330e+01

Chromaticity (CIE 1931 xy and CIE 1976 UCS u'v')  
x=0.3398 y=0.3358 u'=0.2140 v'=0.4759

Color Space (CIE 1976 L\*u\*v\* and CIE 1976 L\*a\*b\*)  
L\*=9.440e+01 u\*=4.319e+00 v\*=2.738e+00 a\*=1.888e+00 b\*=2.161e+00

(Il)Luminance  
No luminance or illuminance value.

Correlated Color Temperature/MPCD  
1.935e+02 Mk<sup>-1</sup> 5.169e+03 Kelvin / 16.9 MPCDs

Tristimulus (CIE 1964, 10° observer)  
X=8.700e+01 Y=8.602e+01 Z=8.302e+01

Chromaticity (CIE 1964 xy)  
x=0.3398 y=0.3360

LED - Illuminant E  
Dominant WL 589.8 / Peak WL 635.00 / Luminous Intensity @ 10 cm (cd) 0.000e+00

Title: CARSON XM HD 8X42MM LEFT TRANSMITTANCE FINAL 01/06/06

Date/Time: 01-06-2006 / 14:16:47

Standard/Reference Illuminant applied: 5000-16C 1000 W FEL LAMP S/N: GS-1015 / None

Units: % Transmittance, N/A

Hardware: NM-23 200-1700nm,RS-20-51,NM-7DH 290-1110nm,DC-49C 350-1010nm, (N/A)

Notes:

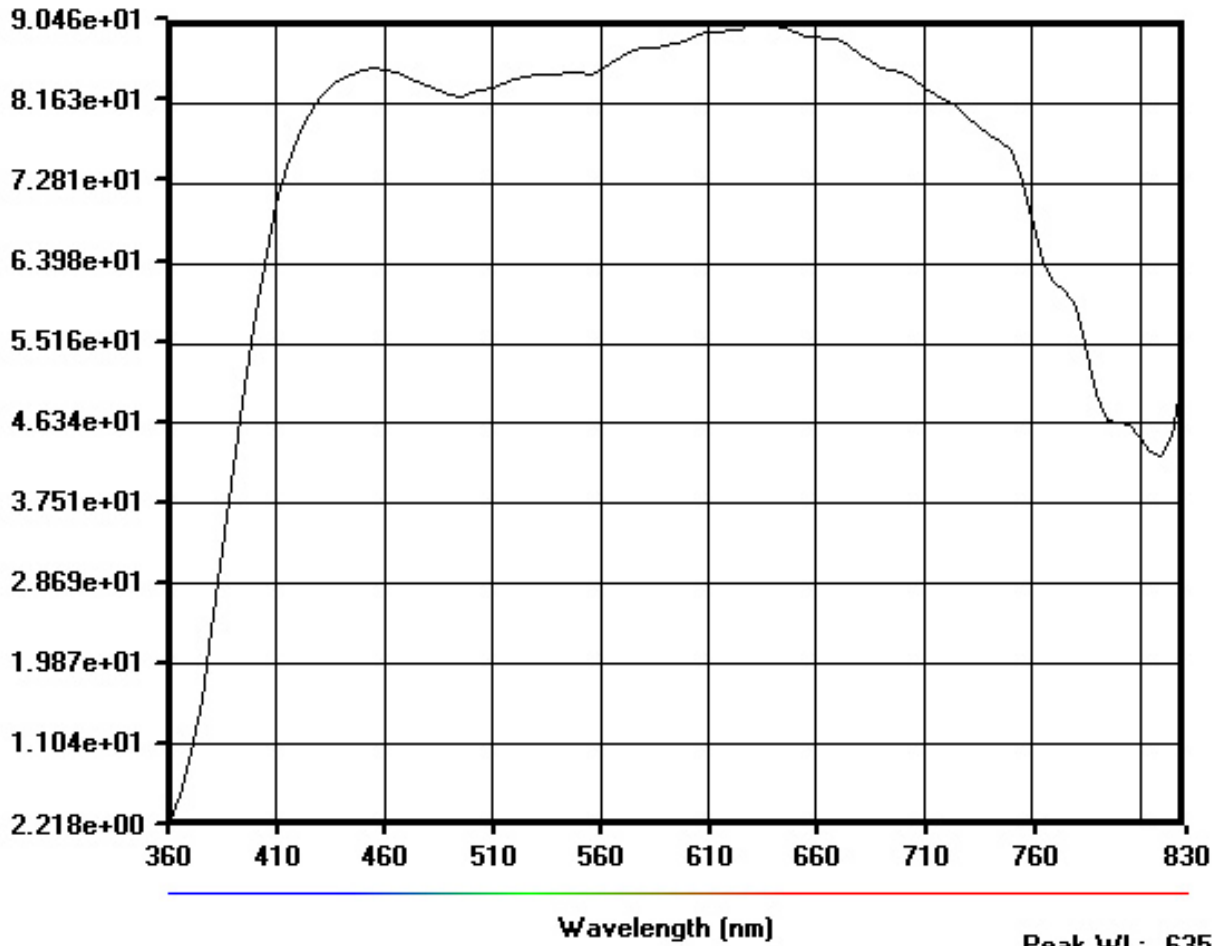
Number of points: 95

X-Axis-Low,High,Step: 360, 830, 5 / Y-Axis-Low,High: 2.2175e+00, 9.0455e+01

0360.0 nm	2.2175e+00	0610.0 nm	8.9367e+01
0365.0 nm	5.3975e+00	0615.0 nm	8.9591e+01
0370.0 nm	1.0048e+01	0620.0 nm	8.9806e+01
0375.0 nm	1.6083e+01	0625.0 nm	8.9749e+01
0380.0 nm	2.3581e+01	0630.0 nm	9.0344e+01
0385.0 nm	3.2341e+01	0635.0 nm	9.0455e+01
0390.0 nm	4.1469e+01	0640.0 nm	9.0095e+01
0395.0 nm	5.0414e+01	0645.0 nm	8.9850e+01
0400.0 nm	5.8481e+01	0650.0 nm	8.9429e+01
0405.0 nm	6.5047e+01	0655.0 nm	8.8864e+01
0410.0 nm	7.0430e+01	0660.0 nm	8.8938e+01
0415.0 nm	7.4819e+01	0665.0 nm	8.8824e+01
0420.0 nm	7.8034e+01	0670.0 nm	8.8758e+01
0425.0 nm	8.0492e+01	0675.0 nm	8.7993e+01
0430.0 nm	8.2233e+01	0680.0 nm	8.7002e+01
0435.0 nm	8.3453e+01	0685.0 nm	8.6315e+01
0440.0 nm	8.4301e+01	0690.0 nm	8.5659e+01
0445.0 nm	8.4836e+01	0695.0 nm	8.5356e+01
0450.0 nm	8.5221e+01	0700.0 nm	8.5170e+01
0455.0 nm	8.5426e+01	0705.0 nm	8.4212e+01
0460.0 nm	8.5267e+01	0710.0 nm	8.3366e+01
0465.0 nm	8.4948e+01	0715.0 nm	8.2680e+01
0470.0 nm	8.4667e+01	0720.0 nm	8.1967e+01
0475.0 nm	8.4170e+01	0725.0 nm	8.1248e+01
0480.0 nm	8.3616e+01	0730.0 nm	8.0198e+01
0485.0 nm	8.3131e+01	0735.0 nm	7.9105e+01
0490.0 nm	8.2637e+01	0740.0 nm	7.8057e+01
0495.0 nm	8.2443e+01	0745.0 nm	7.7381e+01
0500.0 nm	8.2767e+01	0750.0 nm	7.6565e+01
0505.0 nm	8.3017e+01	0755.0 nm	7.3678e+01
0510.0 nm	8.3326e+01	0760.0 nm	6.9192e+01
0515.0 nm	8.3908e+01	0765.0 nm	6.4495e+01
0520.0 nm	8.4295e+01	0770.0 nm	6.1830e+01
0525.0 nm	8.4470e+01	0775.0 nm	6.0851e+01
0530.0 nm	8.4866e+01	0780.0 nm	5.9322e+01
0535.0 nm	8.4767e+01	0785.0 nm	5.5009e+01
0540.0 nm	8.4878e+01	0790.0 nm	4.9715e+01
0545.0 nm	8.5053e+01	0795.0 nm	4.6627e+01
0550.0 nm	8.4995e+01	0800.0 nm	4.6422e+01
0555.0 nm	8.4858e+01	0805.0 nm	4.6233e+01
0560.0 nm	8.5319e+01	0810.0 nm	4.4851e+01
0565.0 nm	8.5993e+01	0815.0 nm	4.3274e+01
0570.0 nm	8.6721e+01	0820.0 nm	4.2655e+01
0575.0 nm	8.7562e+01	0825.0 nm	4.5079e+01
0580.0 nm	8.7785e+01	0830.0 nm	5.2137e+01
0585.0 nm	8.7790e+01		
0590.0 nm	8.7917e+01		
0595.0 nm	8.8129e+01		
0600.0 nm	8.8592e+01		
0605.0 nm	8.9137e+01		

Gamma Scientific Test No: N/A

CARSON XM HD 8X42MM LEFT TRANSMITTANCE FINAL 01/06/06



Title: CARSON XM HD 8X42MM RIGHT TRANSMITTANCE FINAL 01/06/06  
Date/Time: 01-06-2006 / 14:40:09  
Standard/Reference Illuminant applied: 5000-16C 1000 W FEL LAMP S/N: GS-1015 / None  
Units: % Transmittance, N/A  
Hardware: NM-23 200-1700nm,RS-20-51,NM-7DH 290-1110nm,DC-49C 350-1010nm, (N/A)  
Notes:  
Number of points: 95  
X-Axis-Low,High,Step: 360, 830, 5 / Y-Axis-Low,High: 2.4617e+00, 9.0416e+01

(Ir)Radiance/Photon (Ir)Radiance/Integral  
Integral: 3.510e+02 / Photon Integral: 1.057e+15

Tristimulus (CIE 1931, 2° observer)  
X=8.724e+01 Y=8.606e+01 Z=8.302e+01

Chromaticity (CIE 1931 xy and CIE 1976 UCS u'v')  
x=0.3404 y=0.3358 u'=0.2145 v'=0.4760

Color Space (CIE 1976 L\*u\*v\* and CIE 1976 L\*a\*b\*)  
L\*=9.434e+01 u\*=4.818e+00 v\*=2.842e+00 a\*=2.163e+00 b\*=2.272e+00

(Il)Luminance  
No luminance or illuminance value.

Correlated Color Temperature/MPCD  
1.944e+02 Mk<sup>-1</sup> 5.144e+03 Kelvin / 17.6 MPCDs

Tristimulus (CIE 1964, 10° observer)  
X=8.700e+01 Y=8.588e+01 Z=8.275e+01

Chromaticity (CIE 1964 xy)  
x=0.3403 y=0.3360

LED - Illuminant E  
Dominant WL 590.8 / Peak WL 625.00 / Luminous Intensity @ 10 cm (cd) 0.000e+00

Title: CARSON XM HD 8X42MM RIGHT TRANSMITTANCE FINAL 01/06/06  
 Date/Time: 01-06-2006 / 14:40:09  
 Standard/Reference Illuminant applied: 5000-16C 1000 W FEL LAMP S/N: GS-1015 / None  
 Units: % Transmittance, N/A  
 Hardware: NM-23 200-1700nm,RS-20-51,NM-7DH 290-1110nm,DC-49C 350-1010nm, (N/A)  
 Notes:  
 Number of points: 95  
 X-Axis-Low,High,Step: 360, 830, 5 / Y-Axis-Low,High: 2.4617e+00, 9.0416e+01

0360.0 nm	2.4617e+00	0610.0 nm	8.9842e+01
0365.0 nm	5.8024e+00	0615.0 nm	9.0227e+01
0370.0 nm	1.0618e+01	0620.0 nm	9.0367e+01
0375.0 nm	1.6809e+01	0625.0 nm	9.0416e+01
0380.0 nm	2.4514e+01	0630.0 nm	9.0411e+01
0385.0 nm	3.3262e+01	0635.0 nm	9.0411e+01
0390.0 nm	4.2321e+01	0640.0 nm	9.0398e+01
0395.0 nm	5.1304e+01	0645.0 nm	9.0137e+01
0400.0 nm	5.9303e+01	0650.0 nm	8.9588e+01
0405.0 nm	6.5712e+01	0655.0 nm	8.9132e+01
0410.0 nm	7.0928e+01	0660.0 nm	8.8934e+01
0415.0 nm	7.5073e+01	0665.0 nm	8.8649e+01
0420.0 nm	7.8076e+01	0670.0 nm	8.8558e+01
0425.0 nm	8.0301e+01	0675.0 nm	8.8173e+01
0430.0 nm	8.1919e+01	0680.0 nm	8.7376e+01
0435.0 nm	8.3055e+01	0685.0 nm	8.6488e+01
0440.0 nm	8.3864e+01	0690.0 nm	8.5662e+01
0445.0 nm	8.4389e+01	0695.0 nm	8.4842e+01
0450.0 nm	8.4860e+01	0700.0 nm	8.4301e+01
0455.0 nm	8.5074e+01	0705.0 nm	8.3910e+01
0460.0 nm	8.4935e+01	0710.0 nm	8.3194e+01
0465.0 nm	8.4631e+01	0715.0 nm	8.2336e+01
0470.0 nm	8.4304e+01	0720.0 nm	8.1459e+01
0475.0 nm	8.3808e+01	0725.0 nm	8.0668e+01
0480.0 nm	8.3404e+01	0730.0 nm	7.9527e+01
0485.0 nm	8.2892e+01	0735.0 nm	7.8385e+01
0490.0 nm	8.2520e+01	0740.0 nm	7.7509e+01
0495.0 nm	8.2449e+01	0745.0 nm	7.6791e+01
0500.0 nm	8.2741e+01	0750.0 nm	7.5984e+01
0505.0 nm	8.3194e+01	0755.0 nm	7.3661e+01
0510.0 nm	8.3487e+01	0760.0 nm	6.9666e+01
0515.0 nm	8.3649e+01	0765.0 nm	6.5256e+01
0520.0 nm	8.3774e+01	0770.0 nm	6.2522e+01
0525.0 nm	8.4000e+01	0775.0 nm	6.1134e+01
0530.0 nm	8.4388e+01	0780.0 nm	5.9484e+01
0535.0 nm	8.4585e+01	0785.0 nm	5.5634e+01
0540.0 nm	8.4456e+01	0790.0 nm	5.0654e+01
0545.0 nm	8.4259e+01	0795.0 nm	4.7343e+01
0550.0 nm	8.4187e+01	0800.0 nm	4.6477e+01
0555.0 nm	8.4605e+01	0805.0 nm	4.6195e+01
0560.0 nm	8.5471e+01	0810.0 nm	4.4917e+01
0565.0 nm	8.6132e+01	0815.0 nm	4.3622e+01
0570.0 nm	8.6785e+01	0820.0 nm	4.2817e+01
0575.0 nm	8.7209e+01	0825.0 nm	4.4670e+01
0580.0 nm	8.7315e+01	0830.0 nm	5.0703e+01
0585.0 nm	8.7475e+01		
0590.0 nm	8.7882e+01		
0595.0 nm	8.8260e+01		
0600.0 nm	8.8914e+01		
0605.0 nm	8.9487e+01		

Gamma Scientific Test No: N/A

CARSON XM HD 8X42MM RIGHT TRANSMITTANCE FINAL 01/06/06

