



The model 7500 automotive goniometer manufactured by Lighting Sciences is a very high precision computer automated system meeting the testing requirements of the US DOT (FMVSS 108), SAE, JIS, ECE and EEC regulations.

Specifications for the standard system are provided below. Special equipment and modifications to meet customer's requirements are available and quoted upon request.

Main Components

- ◆ Test item rotation equipment for horizontal and vertical angles, equipped with motorized height adjustment. Rotation is achieved by two digital stepping motors with digital feedback verification for guaranteed angular setting.
- ◆ Photodetector, silicon with high precision spectral filter.
- ◆ Photodetector amplifier and analog-to-digital converter, operating under computer control, with LSI Signal Maximizer circuitry.
- ◆ Laser with optical collimator, and aiming device.
- ◆ Electronic control system, acting as computer interface for automated goniometer operation from software.
- ◆ Computer system.
- ◆ Electrical metering and power supply, single or double.
- ◆ Highly comprehensive software for US, JIS, EEC and ECE test procedures, including automatic scanning, maximum intensity searches and user-specified automatic re-aim.

Specifications

Rotation Equipment

Operation

Automatic under computer control,
or user-controlled from computer keyboard.

Horizontal rotation angle

90L to 90R

Vertical rotation angle

90U to 90D

Angular resolution (horizontal)

0.01 degrees

Angular resolution (vertical)

0.01 degrees

Motor accuracy (horizontal)

0.01 degrees

Motor accuracy (vertical)

0.01 degrees

Normal test item weight

up to 50 pounds (23kg)

Larger test item weight capacity by
quotation-up to 220 pounds (100kg) available.



Drive System

Horizontal and vertical drives using high torque digital motors coupled directly to rotation shafts. No gears. No system backlash is possible even after extended use because of direct coupling; no backlash or gear tolerance compensation is needed.

Motors

Digital pulsed motors under software control. The motor verifies its location to the computer after rotation by continuous feedback, to ensure exact positioning. Angular positions are automatically reset even if goniometer is accidentally bumped or rotated by hand.

Height control

Motorized, with dual precision linear drive systems, one at each side of horizontal table supporting framework. Elevation range = 0.25m (10 inches).

Construction

Massive aluminum and steel framework, mechanically designed for very high strength and capacity.

Dimensions

Width -- 2300mm (90 inches)

Depth -- 1600mm (63 inches) with inner
frame rotated to 90° (horizontal)

Base depth -- 965mm (38 inches)

Height (overall) -- 2000mm (79 inches)

Height to optical center -- 1200mm (47.3
inches)

Weight -- 181 Kg (400 pounds)

Test Item maximum width -- 1570mm (62
inches) centered. (Other sizes by special
order.)

Photodetector

- ◇ Silicon, high stability, hermetically sealed against humidity.
- ◇ High precision spectral correction, (CIE $f_1' < 2.0\%$)
- ◇ Additional spectral fine correction by software also provided for colored light source testing.
- ◇ Mounting—machined housing with internal baffles, black finish.
- ◇ Photodetector is removable from housing for preventative maintenance.

Photodetector Electronics

- ◇ Amplifier
Contained in same housing as photodetector to minimize noise.
- ◇ Amplifier ranges
Autoranging with LSI Signal Maximizer circuitry.
- ◇ System sensitivity. 0.001 to 106 lux (Equivalent to 0.1 to 10^8 candelas at 10 meters). Increased accuracy by LSI Signal Maximizer circuitry - the computer searches at each reading and sets to the maximum sensitivity for the amplifier, thus achieving maximum signal-to-noise ratio without amplifier saturation. (LSI exclusive software and electronics design)
- ◇ Analog-to-digital converter - 24 bit, providing extremely large dynamic range.
- ◇ Electronic filtering
- ◇ AC ripple removed by active filter circuit if test lamp is operated on AC.
- ◇ Electronic protection
- ◇ Separation of power electrical system and electronic system for prevention of electrical cross-talk.
- ◇ System linearity better than 1%.

Laser System

- ◇ Laser. With complete optical collimator to eliminate spreading associated with lower quality lasers.
- ◇ Laser type. Helium-Neon, Melles Griot 05-LHR-151 or equivalent.
- ◇ Aiming devices for headlamps (set of 2). Hopkins Manufacturing Co.

Electronic Control System

- ◇ Full electronic interfacing between computer and digital motors is provided. Provision for fully automatic or manual operation.
- ◇ Motor controls—See rotation equipment specifications above.
- ◇ Keyboard arrow keys can be used to activate horizontal and vertical rotation.
- ◇ Operational modes
 - * Fixed point measurement with momentary pause and angle lock-in.
 - * Linear scan or area scan with user defined angular steps and angular range.
 - * Maximum search (and Minimum for ECE)

Computer System

LSI provides a Windows-based computer system, supplied as an integral part of the AutoGoni Photometric System. The system is configured to provide high speed and large capacity. Specifications change rapidly: Please contact Lighting Sciences for information on presently supplied computers.

Power Control System

Power input
Specify voltage; 110 or 240 volts standard, 50 or 60 hertz

DC power supply for test lamp

- * 0-35 volts
- * 0-15 amps
- * Voltage regulation 3mV
- * Current regulation .5mA

A second power supply is available as an option.

Computer interfaced power supplies optional. Power controlled from software or by operator.

DC metering

- * Ammeter/Voltmeter
- Volts 0 -1000 volts DC $\pm .005\%$
- + .0035% range
- Amps 0 - 20 amps DC $\pm .1\%$
- + .010% range

An emergency stop button shall be provided on the console.

Goniometer Software

- ◇ Windows™ user interface
- ◇ Supports US DOT/FMVSS, SAE, JIS, ECE and EEC specifications.
- ◇ LSI LampBook™ test library. LampBook is a unique Windows software package used to operate the LSI goniometers. Using LampBook, the user is able to select the desired type of lamp specification: SAE/FMVSS108, JIS, ECE, EEC or special user-defined specifications. Next, for the selected type, a further window allows selection of the lamp function: stop, tail, backup etc.. Then a list of all specifications meeting the selection criteria are displayed. The user can browse through the specifications. If desired, specification changes can be made and new library files can be created.
- ◇ LampBook contains over 500 specification files.
- ◇ Each test specification is stored in a separate data file on computer disk. The computer automatically calls up the correct specification when the user selects the item from the menu.
- ◇ Test specification file instructs the goniometer what form of test to run and how to process the results.
- ◇ Complete processing capabilities are provided, tabulating results versus maximum or minimum specifications.
- ◇ Failure points are indicated.
- ◇ For test specifications requiring group analysis, this is provided automatically.
- ◇ Ratio analysis, (tail and stop lamps), is automatically provided.

- ◇ Automatic re-aim capability is provided when the software detects a failure. Optional; user selects whether or not to perform re-aim. Re-aim points are 1/4 or 1/2 degree L, R, U and D. Readings at the center (specified) point and the best re-aim value are tabulated.
- ◇ System can operate in single point, scan (line) or area mode. Each is automatic as specified in the applicable test specification file. A single test may include any combination of single points, scans or areas.
- ◇ The number of test points in a scan or area is unlimited.
- ◇ Automatic search for maximum value is provided. Minimum intensity also is recorded for ECE headlamp tests.
- ◇ Test results are placed in a file and are processed for a printed report. Report can be text edited if desired.
- ◇ Isocandela measurements over user-specified ranges can be made.

- ◇ Isocandela graphs can be plotted in color, complete with angular coordinates.
- ◇ Isolux generation is incorporated on a user-specified plane, with an optional perspective view of the roadway.
- ◇ Output files are generated containing measured isocandela data in a standard format. These form input data for other software.
- ◇ Computer monitor provides a real-time display of horizontal and vertical angles, candelas and lux.
- ◇ Candelas-to-lux conversion is provided automatically when required by the specification.
- ◇ Compensation factors for spectral fine-tuning are provided for colored lamp testing, (although the photodetector has very high accuracy spectral correction).
- ◇ System is password protected.

Test Lamp - SAE(FMVSS108)/Headlamp/Dat0211w.she

Lamp to be tested

Specification No. : SAE J1383-JUN90
 Description of device type : "9004 REPLACEABLE BULB HEADLAMP, 2 LAMP
 No. of Compartments : ONE COMPARTMENT
 Lens color : WHITE
 Lamp name : SAE(FMVSS108)/Headlamp/Dat0211w.she

LampBooks>>

TEST
 Cancel
 Help

Test pattern

Vert	Horz	ScanType	ScanStop	MinCD	MaxCD	Order
-4.0	4.0	N	0.0	0.0	8000.0	1
-2.0	15.0	N	0.0	700.0	999999.0	2
-2.0	-15.0	N	0.0	700.0	999999.0	3
-1.5	-9.0	N	0.0	750.0	999999.0	4
-1.5	2.0	N	0.0	15000.0	999999.0	5

DC power supplies

Volts1 : 12.8 Volts2 : 0.0
 Current1 : 2.8 Current2 : 0.0

Reaim : 0.0
 Warmup time : 5

Test distance : 15

Other info

Output file : goni.out Test No. : G11875LB
 Header 1 : Device No. : 11875A
 Header 2 : DOT No. : 114A
 Report No. : 108-LSI-94-114-115A-F/G11875A-F Lamp ID : 9004A

Operator : Jim Wu

Goniometer
 User Patterns...

Lamp Books...
 Report ▶
 Graphics ▶

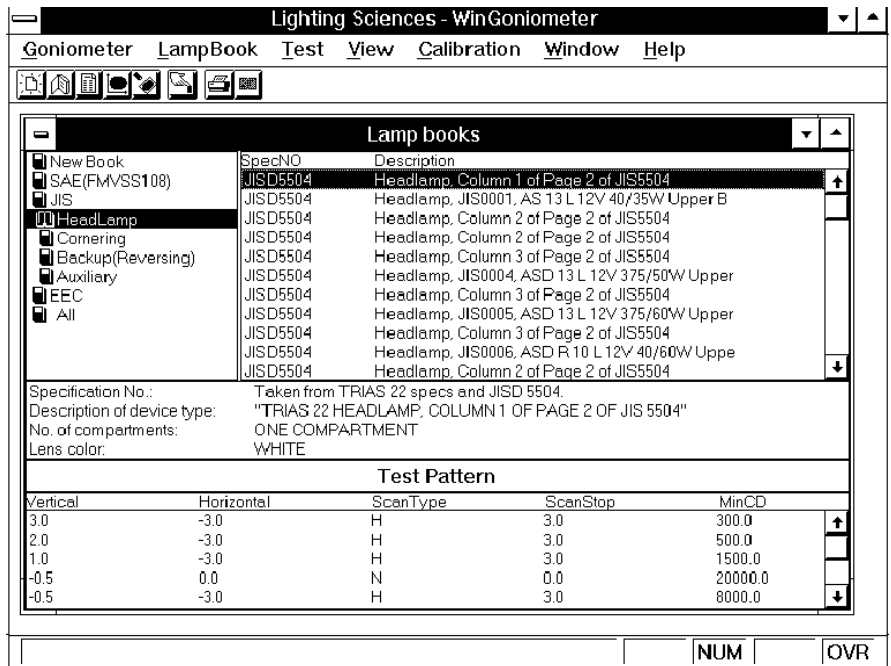
Print...
 Print Setup...

Exit Alt+F4

Test
Test...
Retest...

View
Test Results...
User Patterns...
Lamp Files...
Reports...

Calibration
Photocell...
Dark Current...
Align Axes...



Comparison of LSI Automotive Goniometers to Standard Goniometers

Lighting Sciences' Automotive Goniometer offers features that far surpass or are completely unavailable in competitive systems. This section compares the features of the LSI Goniometer system versus typical goniometers and points out the benefits of using Lighting Sciences' system.

Feature	LSI Goniometer	Standard Goniometer
Motor Drives (Vertical & Horizontal Rotation)	Precision digital stepper motors ensure exact computer-monitored positioning.	DC gear motors coupled to an angle encoder may cause inaccuracies due to misalignment, wear, and deterioration with time.
Drive Train	Direct coupling; no gears, no backlash	Gear systems can cause backlash inaccuracies.
Mechanical Design	Massive framework for high reliability. Stable platform results in high-speed tests without errors caused by mechanical design.	Mechanical design may limit measurement angles and accuracy.
Angular Range	90U to 90D - 90L to 90R	Vertical range may be limited to approximately 30U to 30D. Unsuitable for FMVSS-108 and SAE.
Angle Lock-In	Exact horizontal and vertical angles are entered via the computer and positioned by the digital stepper motors and then verified by computer.	DC-driven motors may be difficult to position at an exact angle given variable speed control and inertia of these systems.
Angular Resolution	±0.001 degrees - An important factor where intensity changes rapidly with angle.	±0.1 degrees - Can lead to serious errors in narrow beam, high-intensity situations.
Photodetector	Extremely fast response time, excellent linearity and low temperature coefficient. No need for elaborate individual cooling options.	Many systems require the use of an individually cooled photodetector because thermal stability is inadequate.
Photodetector Electronics	"Signal Maximizer" circuitry automatically sets the amplifier gain and adjusts it throughout the test run ensuring optimum gain for each intensity reading taken during the test.	Amplifier gain setting for the photodetector is adjusted manually by the test operator and may remain the same throughout the test. Large errors and loss of resolution can occur.
Intensity Accuracy	"Signal Maximizer" system ensures optimum accuracy at all intensity levels..	Accuracy can vary depending on test lamp's intensity level from 0.25% to as much as 20%.
Dark Current Compensation	The amplifier's signal when no light is on the photodetector is automatically read and stored for each gain setting. Values are automatically applied during testing, eliminating this error.	No automated way to compensate for the amplifier's signal during test sequence. Since each amplifier gain setting has a different "dark current" value, errors up to 20% are possible.

Computer System	Equipped with a Windows-based system with a complete selection of high-quality peripheral equipment. Parts and service for components are available world-wide.	May have limited features, speed and standard peripherals such as plotters or backup systems. Name brands vary widely leading to potential parts and service problems.
Software	Routines are all Windows-based. Data collection, reduction and report generation software is unparalleled in its features. No other manufacturer can offer a range of software comparable to that of Lighting Sciences.	Standard photometric software cannot compete. Many systems produce proprietary data files which are not usable by other lighting design and analysis software.
LampBook Specification Files	Huge range of test specification files contained in library. User can browse and select.	Supported test specifications may be limited.
Data table output	Supports all SAE, FMVSS 108, JIS, ECE and EEC reporting.	Test Reporting may be limited.
Comparison Lamp Reports	Automatic ratio tables available for stop and tail lamp combinations.	Manual comparisons may be needed.
Tabulations of Zone Candela totals	Supported fully and automatically	May not be supported.
Re-aim	User selectable ability. Re-aim angle also selectable.	May not be supported. May require manual re-aim.
Isocandelas	Full color capability	May not be available.
Isolux	Full color capability, including driver's eye perspective	May not be available.

NOTE: The unprecedented capabilities for high speed data collection, and extensive Windows software with LampBook can be used with existing goniometers. LSI offers a retrofit service such that older machines of any manufacturer can be brought to state-of-the-art.

About Lighting Sciences, Inc.

Founded in 1979 by Dr. Ian Lewin, Ph.D. FIES, Lighting Sciences Inc. is the leader in technological photometric advancements. Only LSI has the technical staff capable of solving problems and providing products and services in all of the following areas.

- Lighting Test Equipment
- Illuminating Engineering (Design and Performance analysis)
- Independent Testing Services

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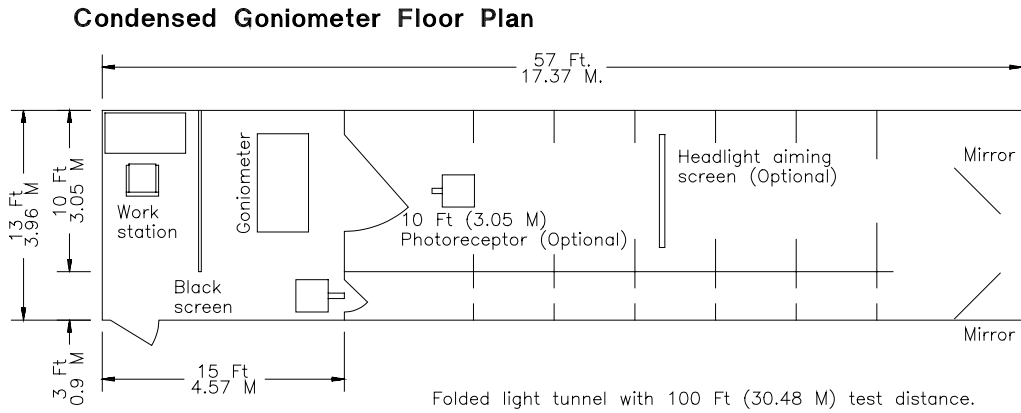
Windows™ is a trademark of Microsoft®.

LampBook™ and AutoGon™ are trademarks of Lighting Sciences Inc.

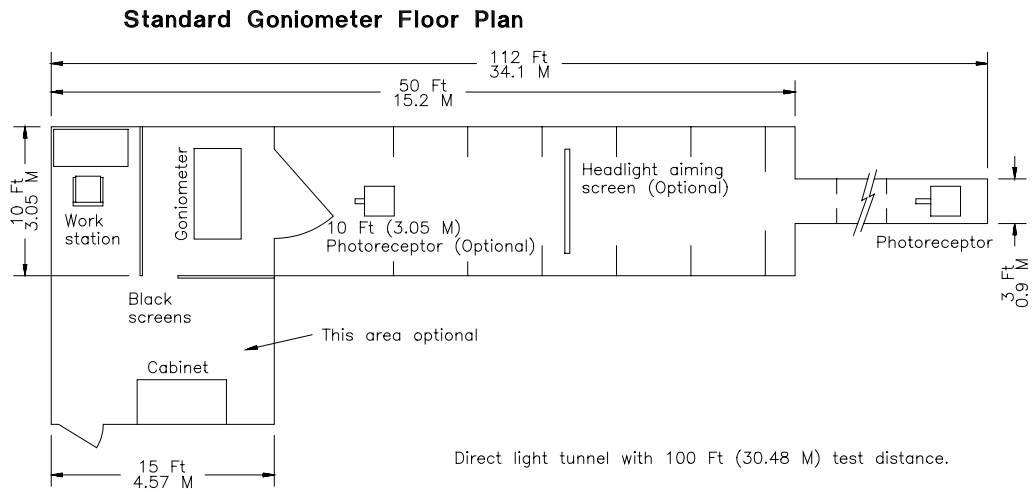
Recommended Laboratory Configurations

Lighting Sciences Inc. will be pleased to provide advice regarding your specific laboratory configuration.

Condensed Goniometer Floor Plan



Standard Goniometer Floor Plan



AUTOGONI-7-06