Q-SUN

Q-SUN Xe-1-B
Xenon Test Chambers

For Serial Numbers:

XX-XXXXX-79-Xe1B

Q-LAB

Revision Date
03 Mar 2022

Contents

1. Specifications, Classifications, Symbols

1.1 Specifications, Classifications (Mar 2019)

- The recommended ambient operating temperature and relative humidity (RH) for the Q-SUN tester is 23 ± 5 °C and 50 ± 25% RH.

- The maximum ambient operating temperature and humidity is 40 °C and 80% relative humidity.

- Temperatures outside the recommended range may cause chamber temperature and/or humidity faults.

- Transportation and Storage Temperature: -40 °C to 80 °C.

- Installation Category: Category II for transient over-voltages.

- Pollution Control: Pollution Degree 2.

- Sound Pressure Level: Sound Pressure Level does not exceed 75 dBA.

- Altitude: 2000 meters or less.

- Operation: Continuous Rating.

- Supply Connection: Permanently connected or plug/socket connection (industrial type per IEC 6309 or twist lock type in North America).

- External Disconnect: Required for all connections.

- External Over-Current Protection: Must be rated for not more than 40 A (USA, Canada) or 64 A (Europe).

1.2 Symbols (Aug 2020)

Electrical Shock Hazard

Hot Surfaces Hazard

Attention

Finger/Hand Crushing Hazard

Local waste & recycling regulations per the WEEE Directive 2002/96/EC on Waste Electrical and Electronic Equipment

2. Safety Information (Feb 2022)

Overview

Q-Lab accepts no responsibility for the consequences if the user fails to comply with the instructions in this Technical Manual. Q-Lab will accept responsibility for defective parts or components only if the machinery was defective at the time that the tester was shipped.

- **Warning:** If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- This manual does not claim to address potential safety issues, if any, associated with the use of this product.
- It is the responsibility of the user of this manual to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment safety devices may be impaired.
- The Q-SUN meets the European Low Voltage Directive 2014/35/EU and complies with the requirements of EN 61010-1: 2010 (Third Edition), "Safety of Electrical Equipment for Measurement, Control and Laboratory Use".
- The Q-SUN meets the European Electromagnetic Directive 2014/30/EC and complies with the requirements of EN 55011:2007 Radiated and Conducted Emissions – class A.
- Use only parts that have been supplied or recommended by Q-Lab.

Heat and Electrical Shock Hazards

Warning Labels

- All Q-SUN Xe-1 models are equipped with a lamp access door interlock switch that turns off the xenon lamps when the lamp access door is opened (Figure 2a).
- Warning labels (Figure 2b and Figure 2c) indicate heat and electric shock hazards inside the Q-SUN Xe-1 tester.
- Do not defeat the switch that turns off lamps when the lamp access door is open.
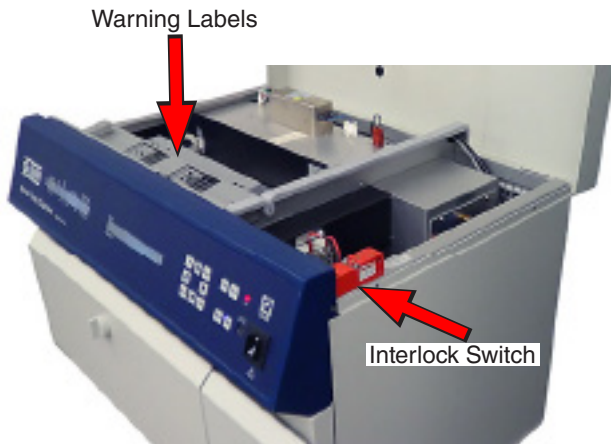
Figure 2a: Basic model tester warning label and interlock switch location (lamp access door open).

Figure 2b: Hot surface warning label.
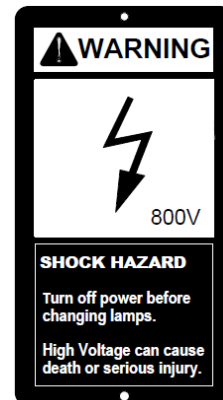
Figure 2c: Shock hazard warning label.

Ultraviolet and Infrared Hazards

Ultraviolet (UV) Light

⚠️

- The Q-SUN lamps produce UV light that can cause severe sunburn, eye inflammation, and damage to your vision.
- All Q-SUN Xe-1 models are equipped with a chamber door interlock switch that turns off the xenon lamps when the chamber door is opened (Figure 2d).
- Do not defeat the switch that turns off lamps when the chamber door is open.

Figure 2d: Basic model tester chamber door interlock switch location (test chamber and plumbing access door open).

3. General Description (Feb 2022)

The LX-5090B-TM Q-SUN Xe-1 Technical Manual provides information on the installation, operation, and maintenance of Q-SUN Xe-1-B test chambers.

Overview

- Q-SUN Xe-1 test chambers are laboratory simulators of the effects of indoor and outdoor light stability and weathering.
- This Technical Manual covers Q-SUN Xe-1 "B" model that features the Gen 3 main controller, touchpad controls and 2-line LCD display, calibration with UC1 Handheld Display..
- For the "E" Model Q-SUN Xe-1 testers, see LX-5090-TM Q-SUN Xe-1 Technical Manual.

4. Operating Environment

⚠️ **The Tester Must Be Located in a Suitable Environment**

- All Q-Lab test chambers are sophisticated scientific instruments.
- All tester models must be operated in a suitable controlled environment (Section 4.1).
- Operating the tester in an unsuitable environment (Section 4.2) will void the warranty.

4.1 Suitable Environments (May 2020)

Ambient Laboratory Temperature and Humidity

- The recommended ambient operating temperature and relative humidity (RH) for Q-SUN testers is 23 ± 5 °C and 50 ± 25% RH.
- Operating outside the recommended range (or in rare cases, even within it), certain standards or test cycle conditions may not be achievable.
- Operating outside the recommended range can result in the tester producing chamber temperature and/or humidity faults.
- Never operate your tester in lab temperatures >40 °C or >80% RH.
- Consult with Q-Lab for more specific information about achievable chamber temperature/humidity values based upon various ambient lab conditions.

Physical Environment

- A room that is dry, clean, and free of dust, particles, gases, or salt fog.
- A room with an HVAC (heating/ventilation/air-conditioning) system.
- A location away from windows or HVAC vents.
- A location that provides the necessary minimum clearances as specified in Section 6.1.

4.2 Unsuitable Environments (May 2020)

Salt Fog or Other Airborne Contamination

- Operating a Q-SUN tester in an unsuitable environment will void the warranty.
- DO NOT install Q-SUN testers in a room with corrosion chambers (Figure 4.2a).
- DO NOT locate a Q-SUN tester in a room with machines or processes that generate dust, particles, vapors, gases, etc (Figure 4.2b).

Figure 4.2a: Do not install testers in a room with corrosion chambers.

Figure 4.2b: Do not locate testers in a room with airborne dust, particles, or gases.

Uncontrolled Temperature and Humidity

- Do not operate the tester in a room with uncontrolled temperature and humidity (Figure 4.2c).
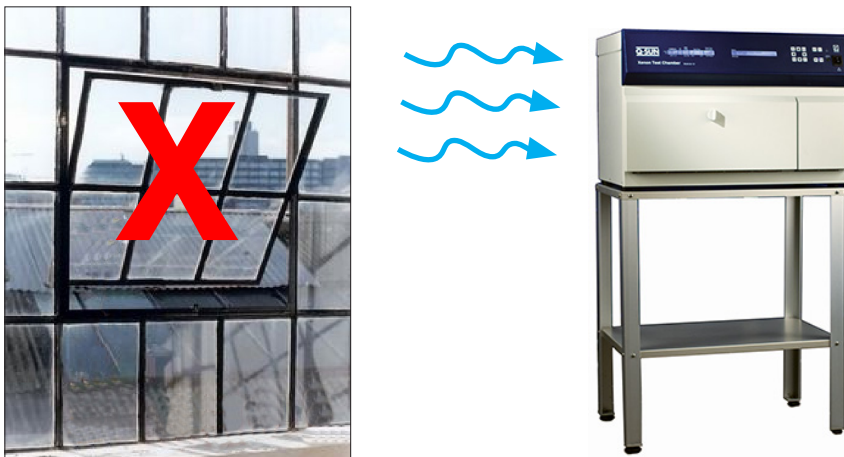- Do not locate tester near sources of cold or hot air (Figure 4.2d).

Figure 4.2c: Do not locate testers near open windows.

Figure 4.2d: Keep tester away from
sources of hot or cold air.

Other Unsuitable Environments

- **Outdoors:** Rain and dust will corrode or short out electrical components.

- **Metal Dust / Metal Chips:** Do not locate the tester near metal cutting machines or metal grinding machines. Conductive metal dust or metal chips in the air will damage electronic components.

- **Carbon Fibers:** Do not operate the tester where carbon fibers or carbon reinforced plastic are being cut. The conductive carbon fibers will damage electronic components.

- **Conductive Pigments:** Do not operate the tester where carbon black or other conductive pigment dust is in the air. The conductive dust will damage electronic components.

- **Other Corrosive Gases:** Do not expose the tester to acid fog, SO_2 gas, or other corrosive gases.

- **Excessive Voltage:** The electrical supply to the tester must be no more than 10% higher than the voltage listed on the nameplate.

- **Low Voltage:** Recurring "brown-outs" or voltages less than 90% of the rated voltage will damage electrical components.

- **Water Leaks from Ceiling:** Water leaking onto the tester will damage electrical components.

For further detail on laboratory environment requirements, please contact Q-Lab Repair and Tester Support. See Section 18 for contact information.

5. Uncrating

5.1 Overview (Jan 2022)

⚠️ **Carefully read these instructions before uncrating the tester. Follow all local, OSHA, EHS, and other applicable equipment operation and material handling safety requirements, recommendations, and practices.**

- Q-SUN Xe-1-B testers are shipped in one of two types of packaging (Figure 5.1a and Figure 5.1b).
- Labels on the carton indicate the location of the instructions to be opened first (Figure 5.2a).
- Instructions for unpackaging and setting up the tester are located in the envelope shown in Figure 5.2b.

Shipping Weights (Approximate)

Tester On Skid With Wooden Frame	134 kg (296 lbs)
Tester On Skid With Carton Only	89 kg (195 lbs)
Tester Only*	50 kg (110 lbs)

* Tester weight varies based on installed options and includes chiller, where applicable.

Tools Required

Phillips Screwdriver (Wooden Crate Only)	Flat Blade Screwdriver	Fork Lift*
Pry Bar (Wooden Crate Only)	Ratchet and 15 mm (9/16") Socket	Small Ladder or Step Stool
Band Cutter	Utility Knife	

*A fork lift or other mechanical lifting device is recommended for use in moving the crated tester to the installation location, and to lift the frame in one piece from wooden frame crates.
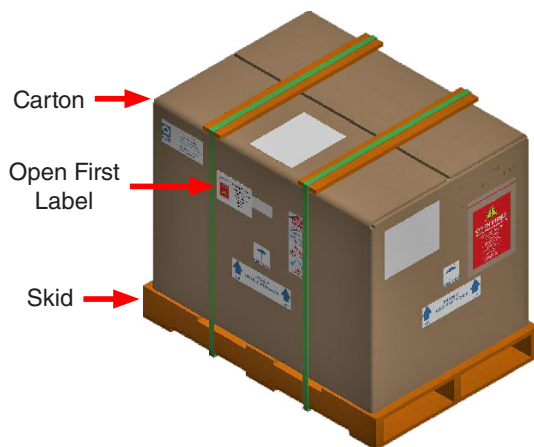
5.2 Crate Removal (Jan 2022)

Figure 5.1a: This packaging has a carton banded to a wooden skid
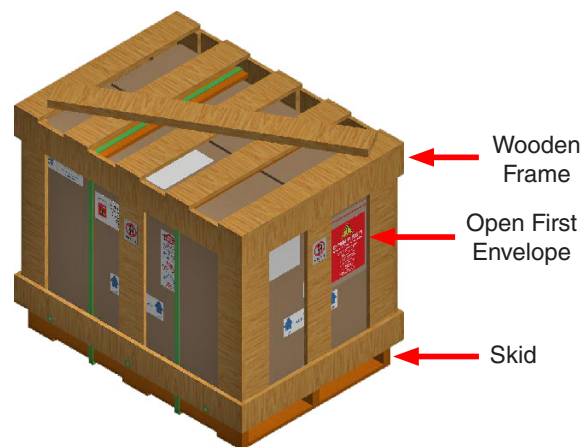
Figure 5.1b: This packaging has a carton surrounded by a wooden frame fastened to a wooden skid.

Figure 5.2a: Labels on the carton indicate the envelope to be opened first.

Figure 5.2b: Open this envelope for important uncrating instructions.

1. Uncrating instructions are located in this envelope. Remove and read the instructions.

Carton and Wooden Frame — Go To Step 3.

Carton Only — Go To Step 7.

2. Packaged with wooden frame continue with Step 3. Packaged with carton only, go to Step 7.

Screws in Back

Screws in Front

3. Locate the Phillips screws in the bottom front and back horizontal boards.
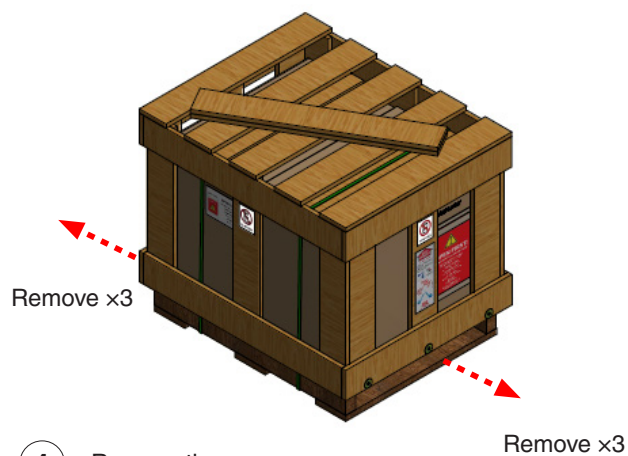
Remove ×3

Remove ×3

4. Remove the screws.

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Use Fork Lift to
Remove Crate
in One Piece

5. If a fork lift is available, use it to carefully lift the wooden frame up and off of the tester.
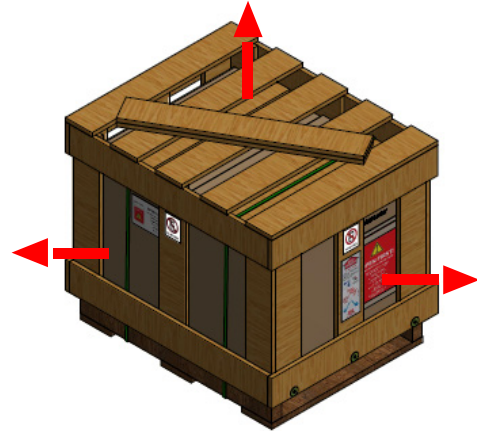
6. If a fork lift is not available, use a pry bar to carefully remove the horizontal and vertical wooden pieces off of the tester.

Accessory Package   Cut
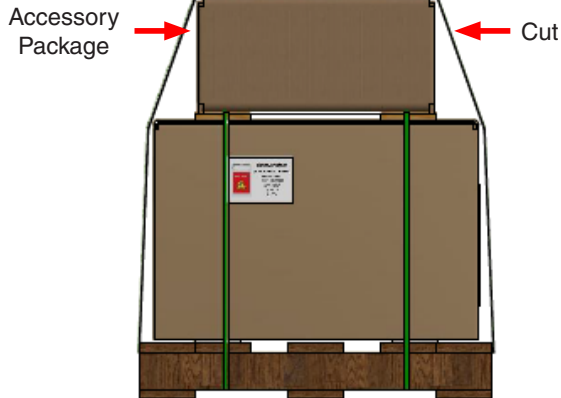
7. If there is an accessory package, cut the band and remove the plastic wrap. Set the package aside.

Cut
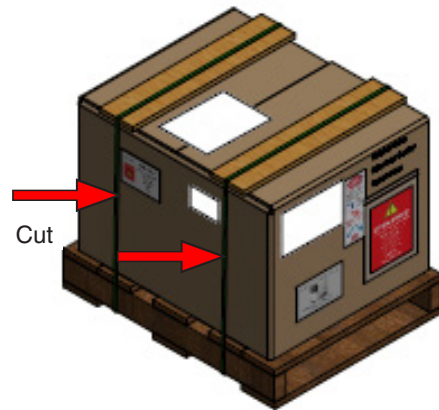
8. Cut the bands holding the carton to the skid. Remove the bands and boards.

9. Carefully lift the carton up and off of the tester.
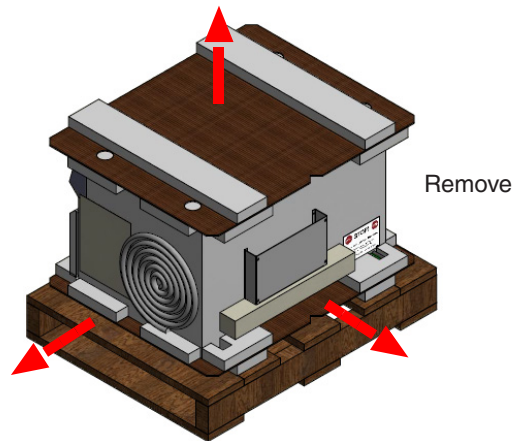
Remove

10. Remove all packaging materials from inside and outside the tester. Remove any accessory boxes.
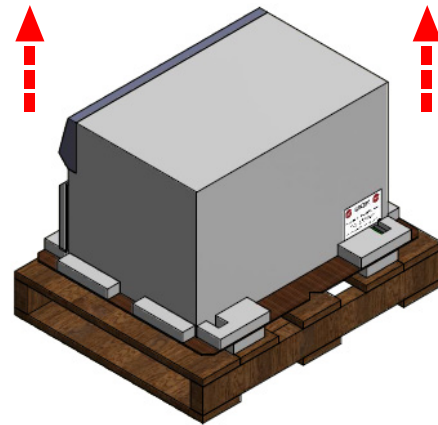
11. Q-Lab recommends that at least two people remove the Q-SUN from the skid.

12. Carefully lift the tester off of the skid

To complete tester installation see
Section 6.1 **through** Section 6.4**.**

13. Go to the sections listed above.

6. Setup

6.1 Dimensions and Space Requirements (Feb 2022)

- The Q-SUN Xe-1-B is designed for tabletop or bench top installation.
- Tester external dimensions are 78 cm × 52 cm × 65 cm (30.5" × 20.5" × 25.5").
- The tester has four adjustable leveling pads.
- Figure 6.1a shows external dimensions and space requirements.
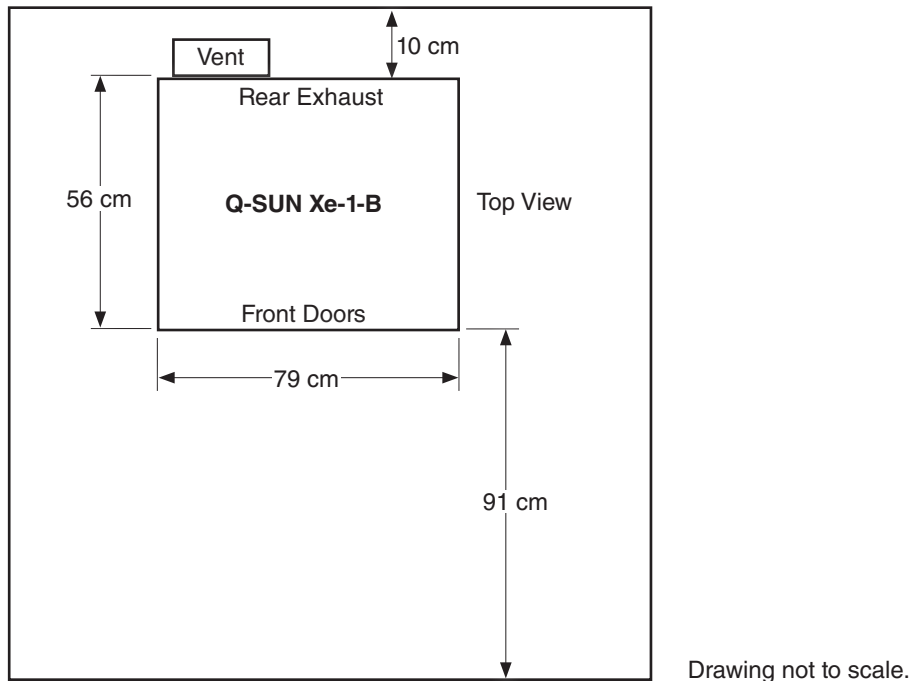
Figure 6.1a: Q-SUN Xe-1-B minimum clearance and
counter space requirement.

6.2 Electrical (Aug 2020)

Specifications

Voltage	208 V or 230 V ± 10% - single phase
Current	12 A @ 208 V, 11 A @ 230 V
Frequency	50 or 60 Hz
Installation	Rated as Installation (Over voltage) Category II for transient over voltages.

Figure 6.2a: Electrical specifications.

Connections

Step 1. The Q-SUN Xe-1-B model comes in 208 V single phase and 230 V single phase versions (Figure 6.2a).

- 208 V or 230 V is specified when the machine is ordered.
- The input voltage and current rating are shown on the nameplate attached to the rear of the unit (Figure 6.2b).

⚠️ The voltage supplied to the machine must be within ±10% of the voltage rating of the machine and the circuit must be capable of supplying the rated current.

- Q-SUN Xe-1-B models come with a 16 ft (4.9 m) power cord.
- A properly-sized plug must be supplied and attached by the user.

Rear View
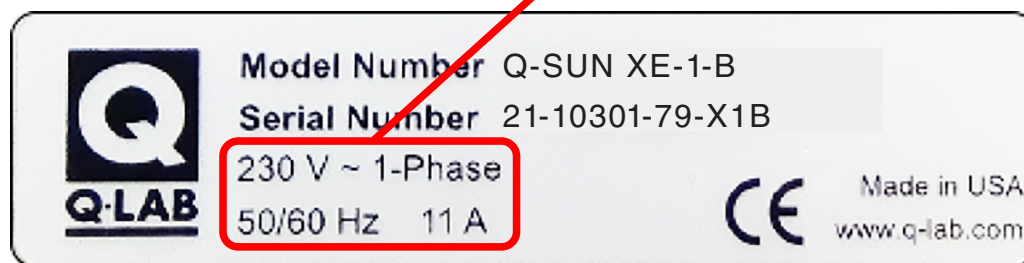
Figure 6.2b: Voltage and current shown on nameplate.

6.3 Water (Jan 2022)

- The Q-SUN Xe-1-B does not require water.

6.4 Venting (May 2020)

- Xe-1-B testers are designed to release warm exhaust air directly into the room and do not require a vent hood or ducting (Figure 6.4).
- Do not attach to a powered vent.
- Keep air intake and vent areas clean and free of debris and obstacles to air flow.
- Heat load dissipation is 1,200 watts (4,100 BTU) per Hr.

⚠️ **IMPORTANT:** Air intakes and exhausts must not be obstructed. Keep filters clean. See Section 14.5 for more information on filter cleaning.

Air Intake and Exhaust
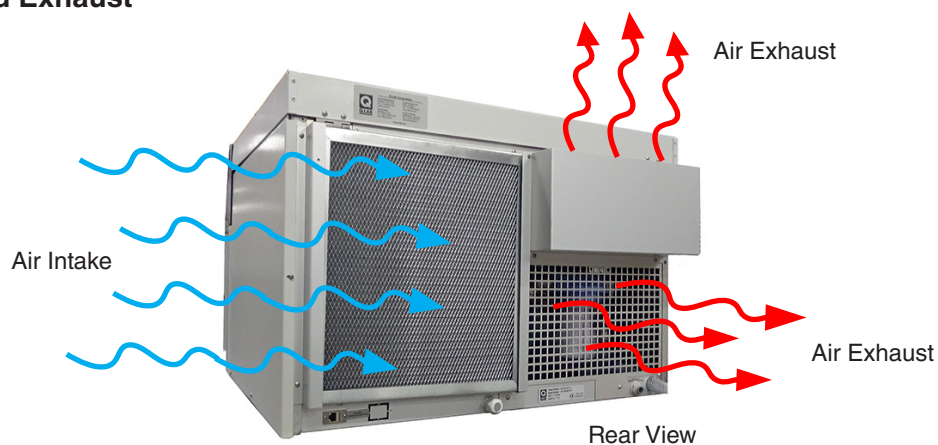
Figure 6.4: Q-SUN Xe-1-B air intake and exhaust areas.

7. Xenon Light System

7.1 Xenon Lamps and Specimen Geometry (Jan 2022)

Q-SUN Xe-1 testers use a xenon lamp to reproduce the damaging effects of sunlight. Read Section 2 on safety before operating the xenon lamps.

- Figure 7.1a shows a diagram of the xenon lamp. See Section 14.1 and Section 16 for lamp replacement information.
- See Figure 7.1b for lamp location relative to the UV filter (see Section 7.4) and specimens mounted on the specimen tray (see Section 10.3).
- A schematic showing the lamp cooling system is shown in Figure 7.1c.

Lamp Terminal

Lamp Terminal

Lamp Support

Lamp Support
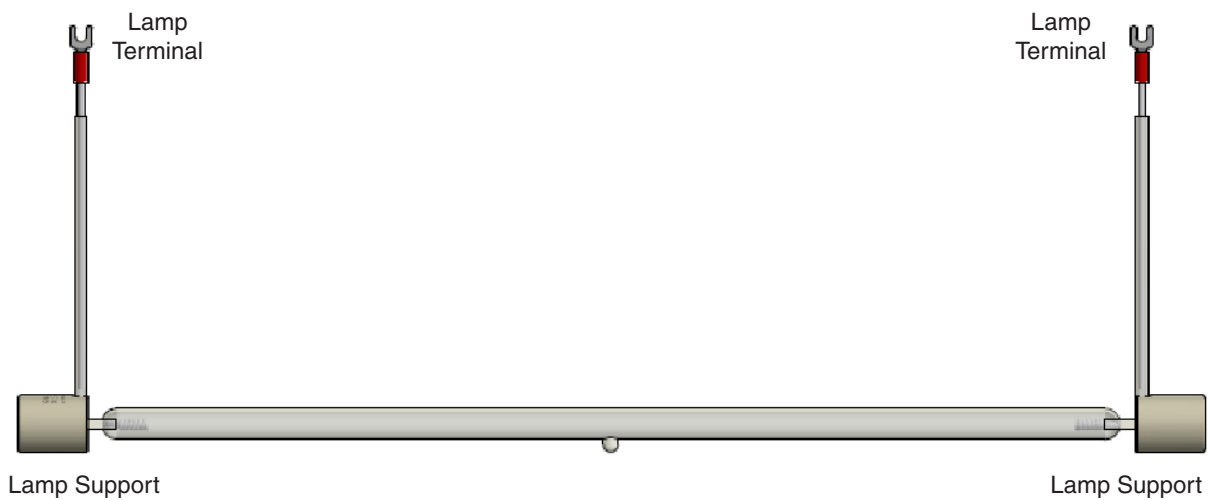
Figure 7.1a: Q-SUN xenon lamp.

Lamp Housing

Exhaust Through Rear Vent

UV Filter

Lamp

Lamp Ballast

Specimens

Lamp / Ballast Cooling Blower

Rear View

Air in Through Filter in Rear
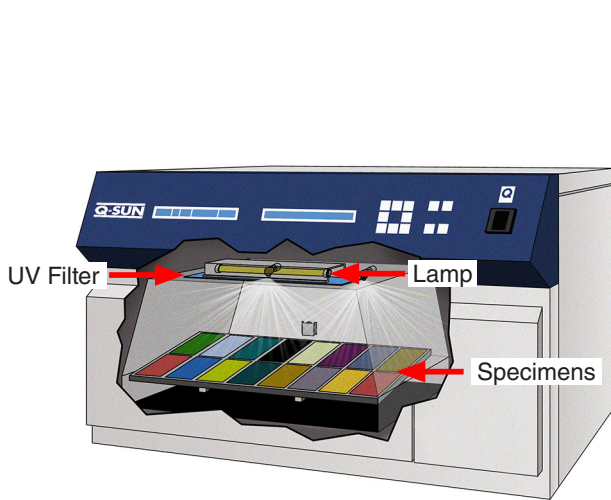
Figure 7.1b: Xe-1 Lamp and specimen geometry.
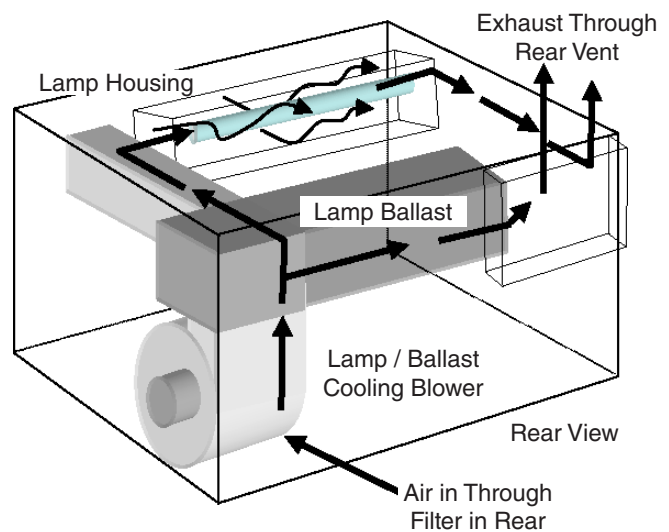
Figure 7.1c: Xe-1 Lamp cooling airflow.

7.2 SOLAR EYE Irradiance Control System (Feb 2022)

- The Q-SUN Xe-1 irradiance control system includes the main controller, an irradiance sensor, ballast, and the lamp (Figure 7.2).
- The irradiance sensor measures light intensity and sends information to the controller.
- The controller regulates the ballast, which determines the light intensity of the lamp.
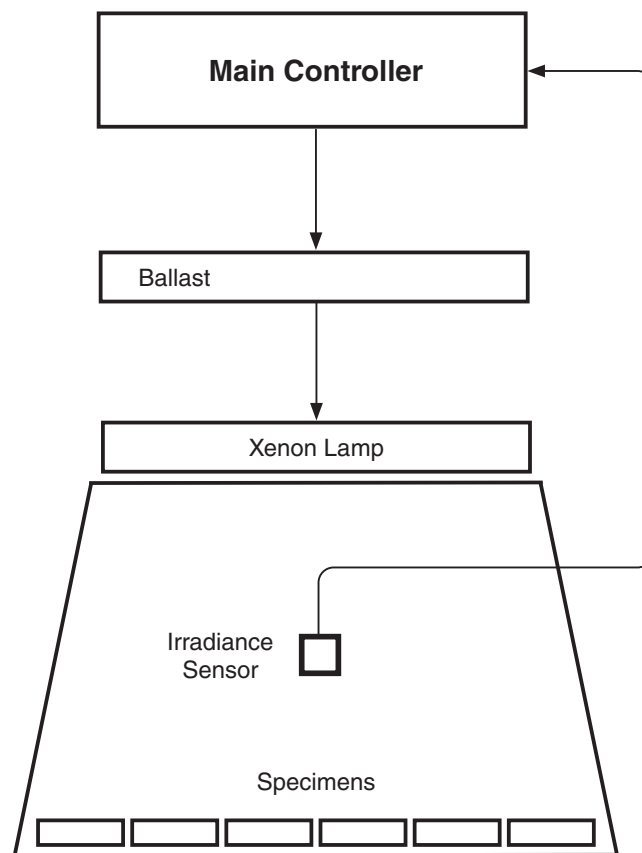
Figure 7.2: SOLAR EYE® feedback loop system.

7.3 Irradiance Sensors (Jan 2022)

- Three (3) irradiance sensor types are available:

Irradiance Sensor Type	Part Number
340 nm	X-7515-K
420 nm	X-7522-K
TUV (Total UV, 300-400 nm)	X-7523-K

- The irradiance sensor is attached to the rear chamber wall (Figure 7.3a).

- The installed sensor type is displayed on the tester control panel (Figure 7.3b).

- Most common test methods specify the type of irradiance sensor needed to conduct the test (see Section 10).

- See Section 16 for sensor replacement part information.

- The irradiance control system must be re-calibrated whenever the sensor is changed. See Section 11.1 for calibration instructions.

NOTE: Contact Q-Lab Repair and Tester Support if irradiance stability issues occur when changing the irradiance sensor type. See Section 18 for Q-Lab contact information.

Irradiance Sensor Location

Figure 7.3a: Xe-1 Irradiance sensor located on rear chamber wall (behind shield).

Figure 7.3b: Sensor type shown on Xe-1 Status Display.

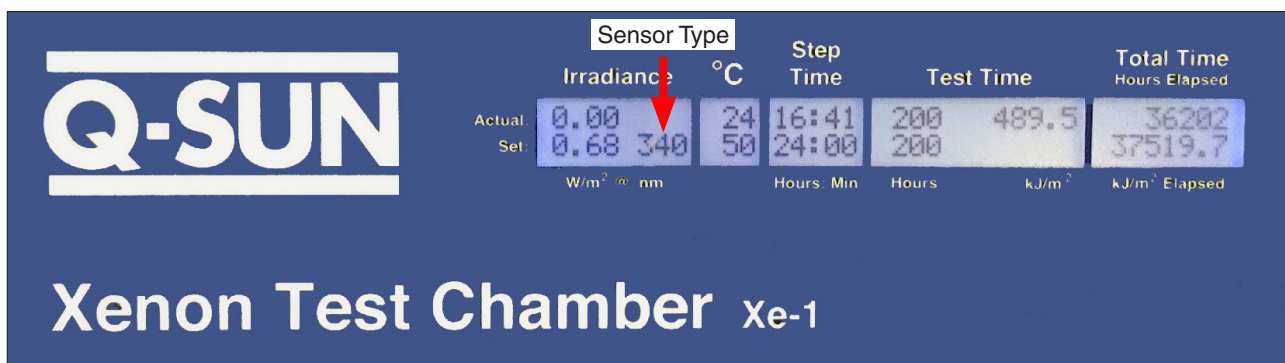## 7.4 UV Filters (Feb 2022)

- Because the radiation from an unfiltered xenon arc contains too much short-wave UV to allow useful correlation to natural exposures on the earth's surface, Q-SUN testers employ various types of optical filters to reduce unwanted radiation and achieve an appropriate spectral power distribution (Figure 7.4b through Figure 7.4h)
- The filter type name is etched on the filters for easy identification (see Figure 7.4a).
- See Section 16 for optical filter part numbers
- Consult Q-Lab Technical Bulletin *LX-5060 A Choice of Filters for Q-SUN Xenon Test Chambers* for more information on choice of filter for your application.

Filter Type	Description
Daylight-Q	Noon summer sunlight.
Daylight-F	Noon summer sunlight, with an even more realistic match to the solar spectrum.
Daylight-B/B	Matches the spectrum of rotating rack machines with borosilicate inner and outer filters. Passes shortwave UV that is not found in natural sunlight (harsher UV).
Window-Q	Noon summer sunlight through window glass.
Window-B/SL	Matches the spectrum of rotating rack machines with borosilicate inner and soda lime outer filters. For AATCC specifications that call for window glass filters.
Window-IR	Similar to Window-Q, but with reduced IR transmission (heat absorbing filter).
Window-SF5	Spectrum specified in Ford test method.
Extended UV-Quartz	Extremely harsh short wavelength UV.
Extended UV-Q/B	More UV than natural sunlight.
UV Blocking	Blocks all UV light. Used with another filter to meet ICH guidelines. See *X-10521-L ICH Guidelines Test Protocol for Q-SUN Xenon Arc Test Chambers* for more information (see Figure 7.4h).
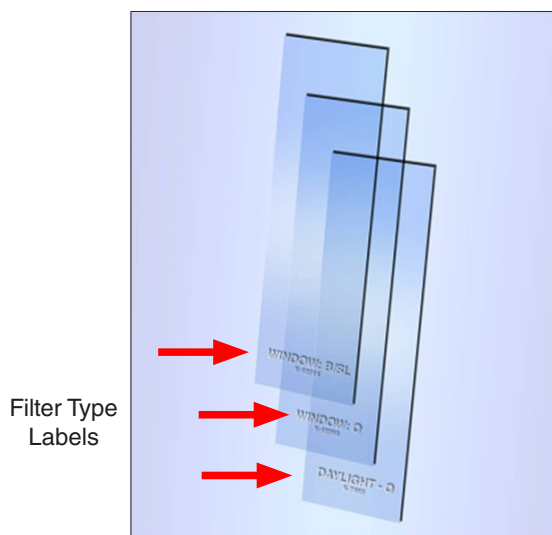
Filter Type Labels

Figure 7.4a: Q-SUN Xe-1 UV filters are labeled with filter type.

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Spectral Power Distributions (also called Spectral Irradiance)

Spectral Power Distributions
Daylight Filters 0.68 W/m²/nm @340 nm

Figure 7.4b: Spectral power distributions of Daylight filters from 250-800 nm.

Spectral Power Distributions
Daylight Filters 0.68 W/m²/nm @340 nm
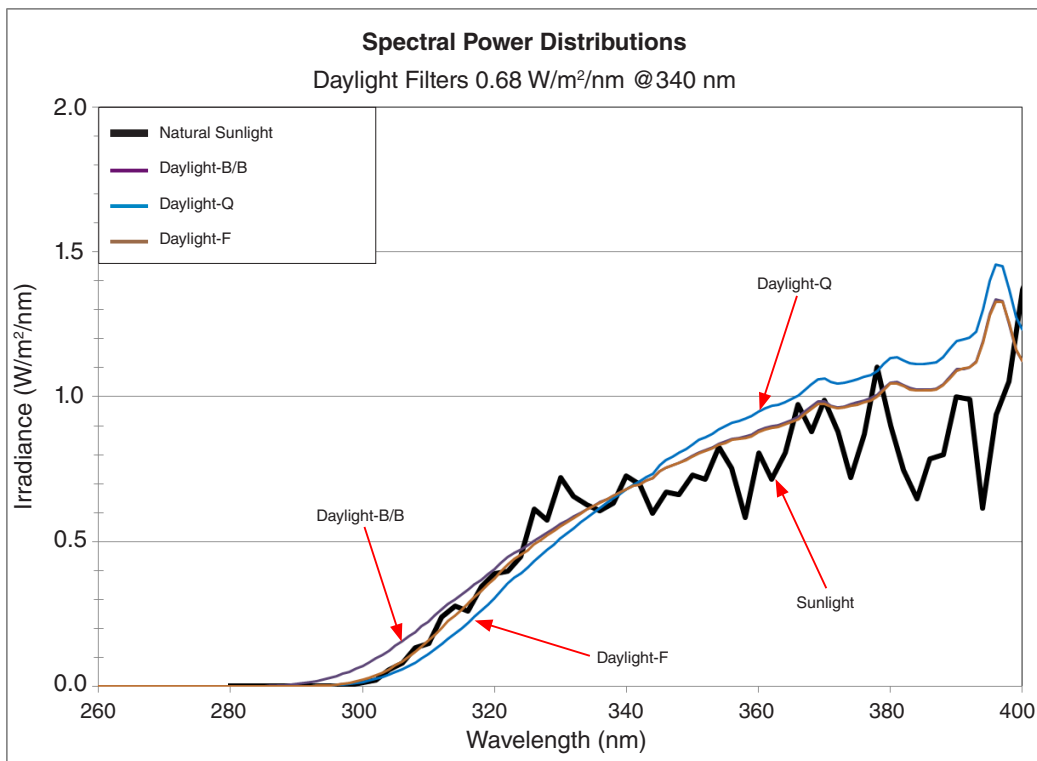
Figure 7.4c: Spectral power distributions of Daylight filters from 260-400 nm.
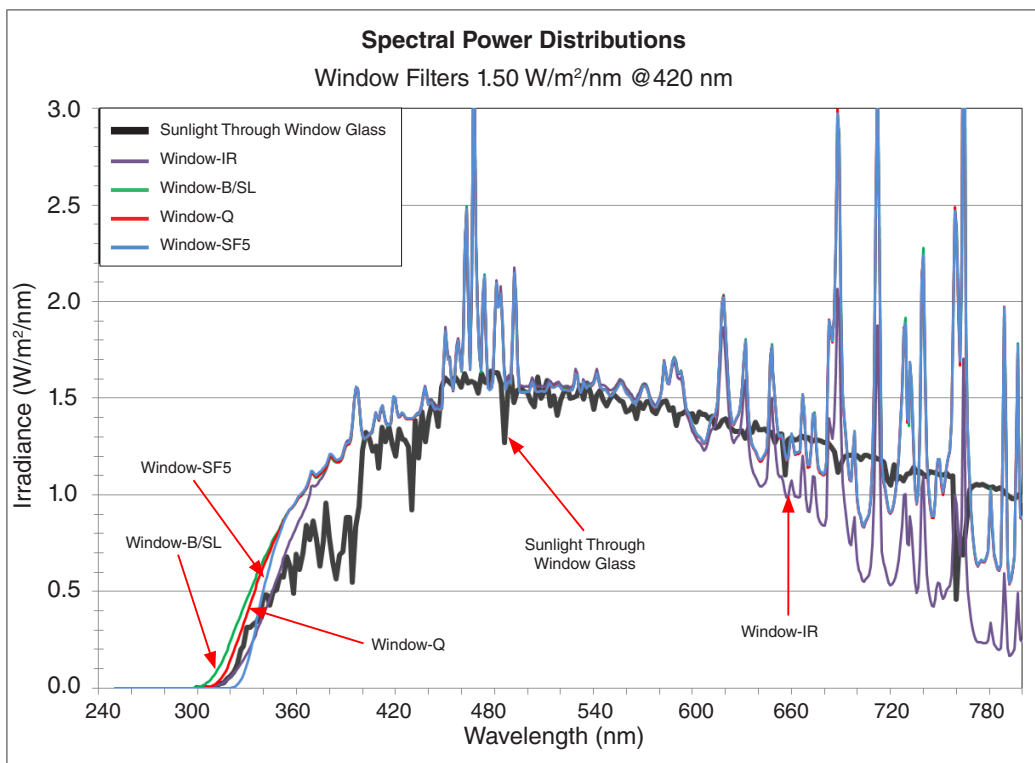
Figure 7.4d: Spectral power distributions of Window filters from 250-800 nm.
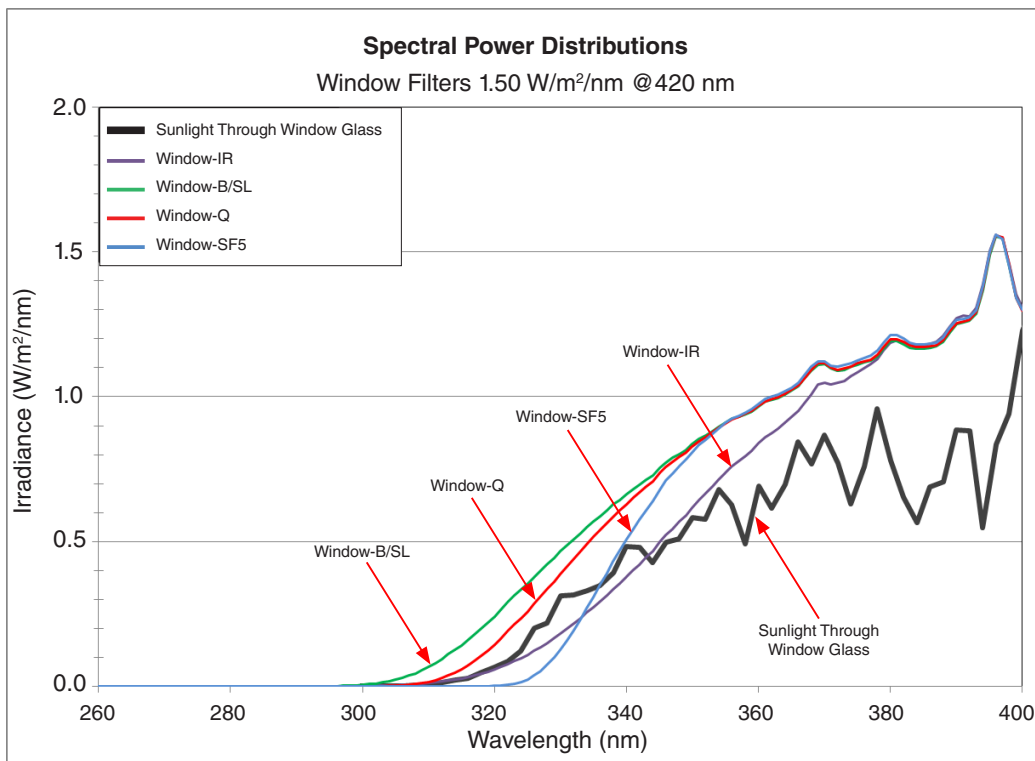
Figure 7.4e: Spectral power distributions of Window filters from 260-400 nm.

Spectral Power Distributions
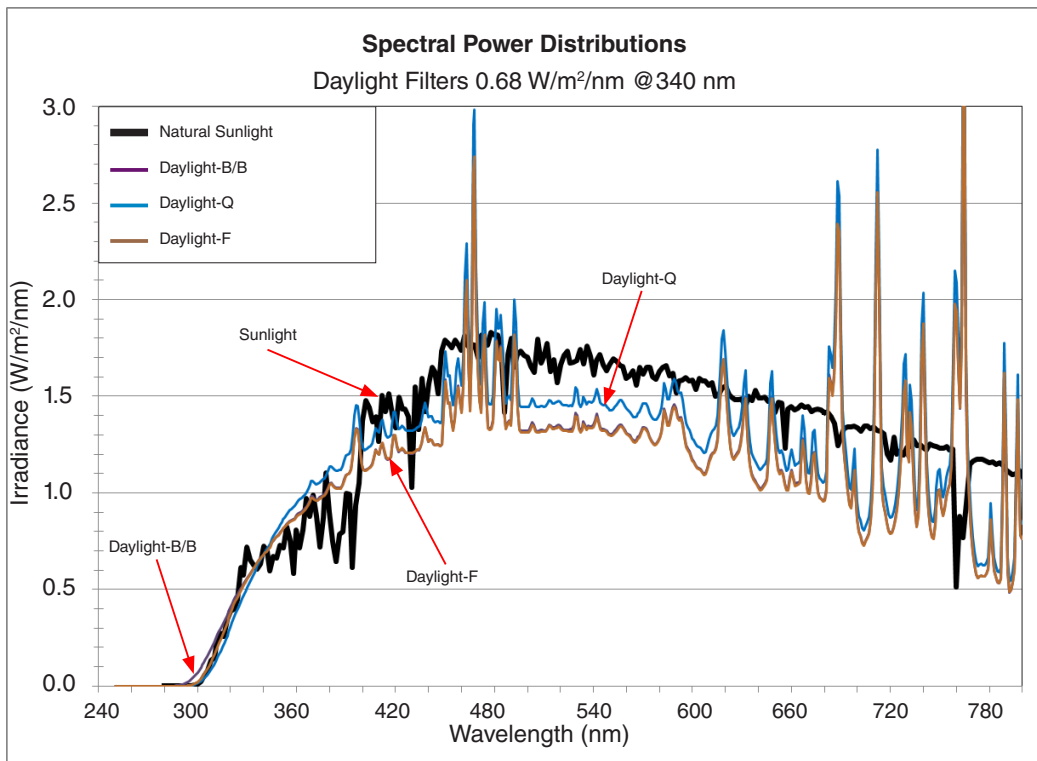
Extended-UV Filters 0.68 W/m²/nm @340 nm
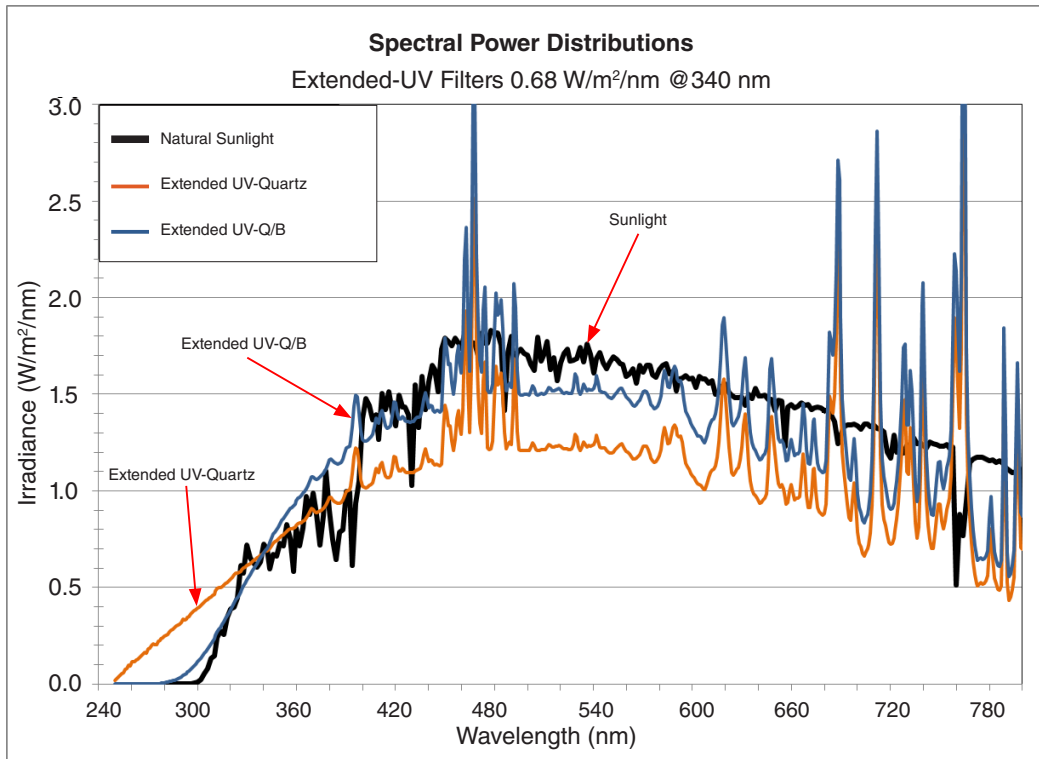
Figure 7.4f: Spectral power distributions of Extended-UV Filters from 250-800 nm.

Spectral Power Distributions

Extended-UV Filters 0.68 W/m²/nm @340 nm
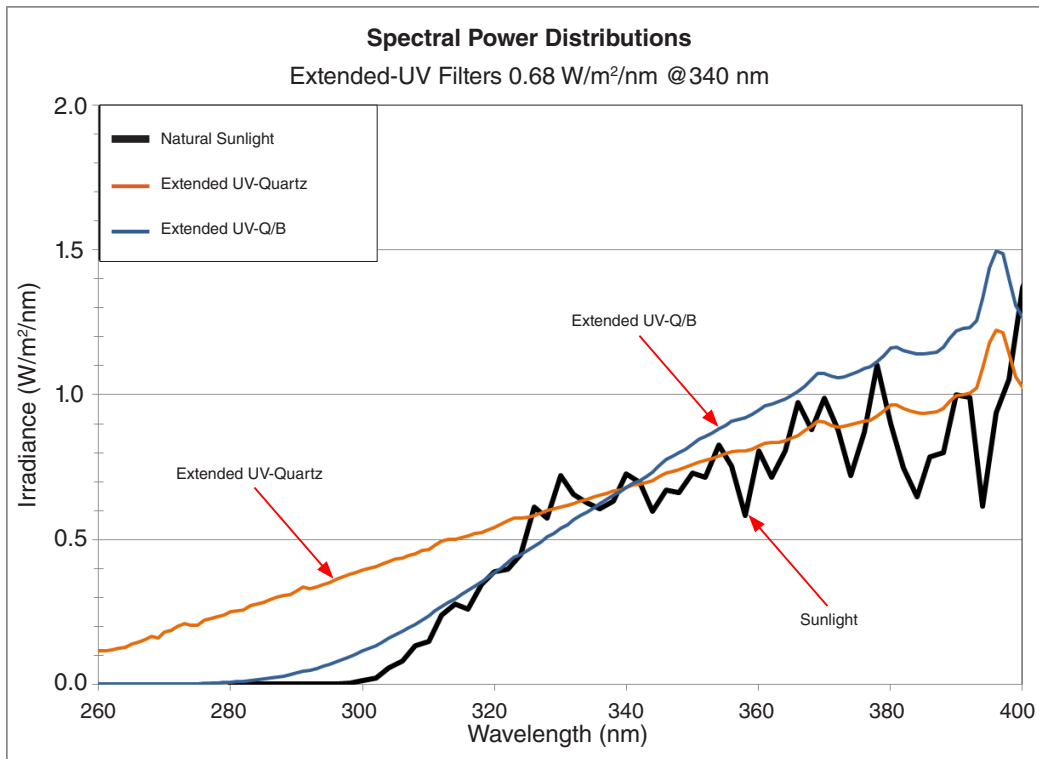
Figure 7.4g: Spectral power distributions of Extended-UV Filters from 260-400 nm.

Spectral Power Distributions

Irradiance with UV Blocking Filter
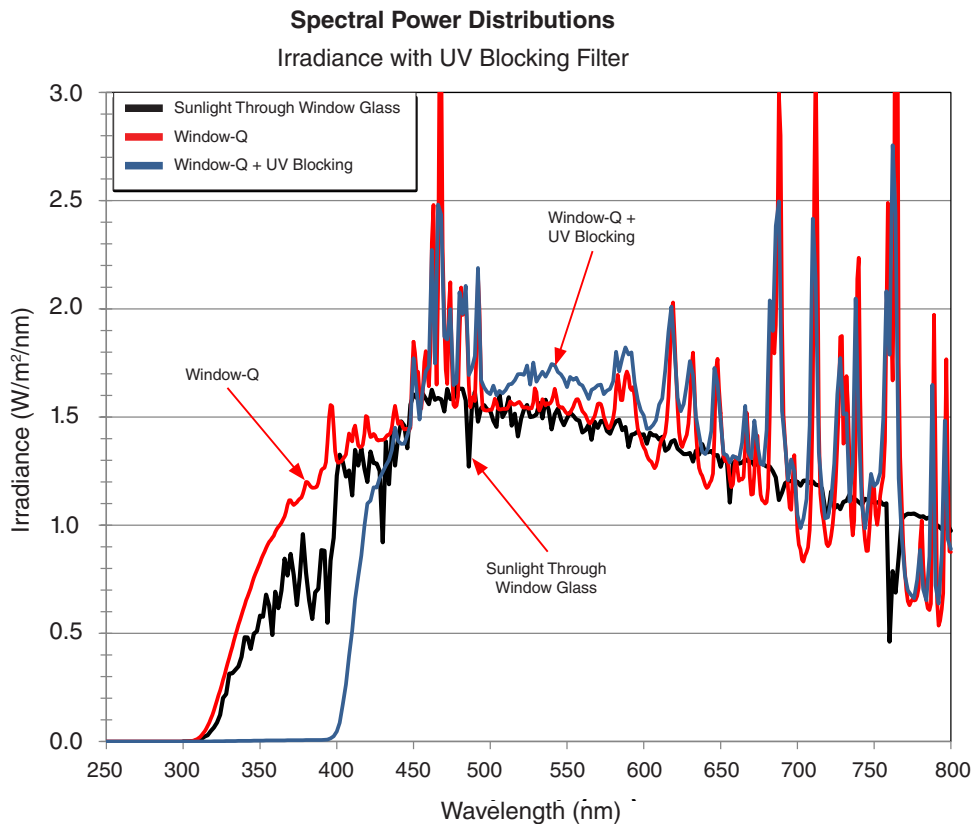
Figure 7.4h: Spectral power distributions for a Q-SUN with Window-Q filters (red) and Window-Q plus UV blocking filters (blue), plus the ASTM G177 reference Window glass spectrum (black line). **NOTE:** The Window-Q is set to 1.50 W/m²/nm @ 420 nm but the UV blocking filter is shown at 1.00 W/m²/nm @ 420 nm to best match the visible and IR to Window-Q.

8. Temperature Control System

8.1 Panel Temperature Sensors (Aug 2020)

Overview

- Xe-1 testers use a temperature sensor to control operating temperature during a test.
- Black-painted temperature sensors (Figure 8.1a and Figure 8.1b)are found in nearly every test standard for the Q-SUN Xe-1. White-painted sensors (Figure 8.1d and Figure 8.1e) are also occasionally specified.
- Both the black and the white sensors can be uninsulated or insulated.
- ASTM and ISO designations vary for uninsulated and insulated black panels (Figure 8.1c).
- Uninsulated and insulated sensors produce very different test temperatures for the same controller temperature setting.
- The panel temperature sensor can be attached to the specimen tray or preferably be mounted in a 2×4" specimen holder (Figure 8.1f).
- When running a standard test method, be sure to use the type of panel temperature sensor specified in the standard.

Black Panel Temperature Sensors

Figure 8.1a: Uninsulated black panel temperature sensor.

Figure 8.1b: Insulated black panel temperature sensor.

ASTM Designation:	Uninsulated Black Panel	Insulated Black Panel
ISO Designation:	Black Panel	Black Standard
Construction:	Black-painted Stainless Steel	Black-painted Stainless Steel with Plastic Insulating Backing

Figure 8.1c: ASTM vs. ISO designations for black panel temperature sensors.

White Panel Temperature Sensor

- White panel temperature sensors are identical to black panel temperature sensors, except painted white. White panel sensors are not used widely.
- Uninsulated and insulated white panels are available.
- A white panel can replace the black panel, or a white panel can be added to the tester with the black panel.
- Except where noted, references in this manual to black panel temperature sensors also apply to white panel temperature sensors.
- *See* X-15350-L *Q-SUN Xe-1 White Panel Installation* for detailed information on installing and operating white panel temperature sensors.

Figure 8.1d: Uninsulated white panel temperature sensor.

Figure 8.1e: Insulated white panel temperature sensor.

Sensor Location

- Securely mount the panel temperature sensor to the specimen tray.
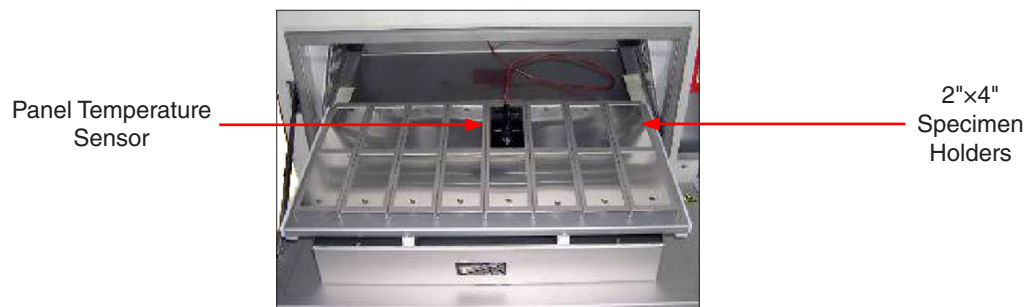- Do not allow specimens to touch, cover, or shade the sensor (See Section 8.1).

Figure 8.1f: Correct location of the panel temperature sensor.

8.2 Optional Chamber Air Temperature Sensor (Jan 2022)

- In addition to the panel temperature sensor, a Chamber Air Temperature (CAT) sensor is optional on the Xe-1-B (Figure 8.2).
- Either the panel temperature or the CAT can be controlled.
  - o   Both temperatures cannot be controlled simultaneously.
  - o   The temperature to control is specified when the test cycle is programmed (see Section 9).
- Contact Q-Lab Repair and Tester Support for more information.

Chamber Air
Temperature
Sensor

Figure 8.2: Optional CAT sensor location in the test chamber.

8.3 Temperature Control (Jan 2022)

- The black panel temperature is controlled using a variable speed blower and an electric heater (Figure 8.3a).
- Air is pulled into the tester through a filter and exhausted through vents in the rear of the chamber (Figure 8.3b).
- To lower black panel temperature, room air is circulated through the air duct into the chamber.
- The electric heater in the air duct is controlled to raise the black panel temperature.
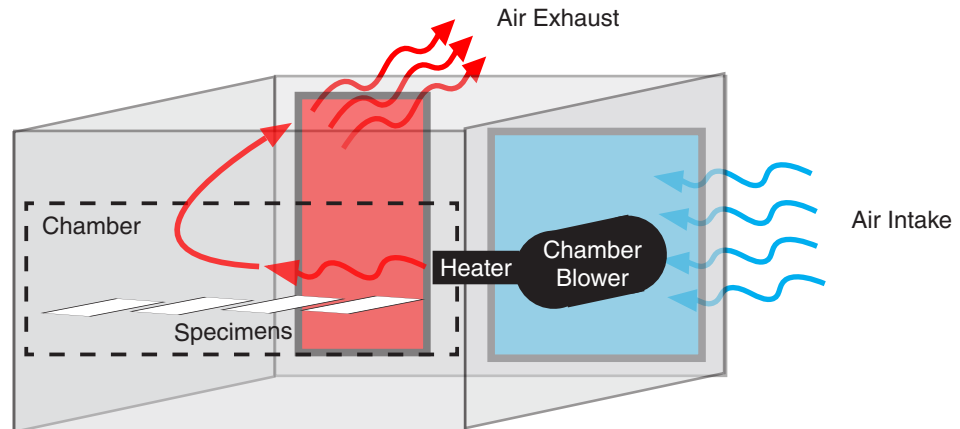

Figure 8.3a: Schematic front view Xe-1 air circulation.
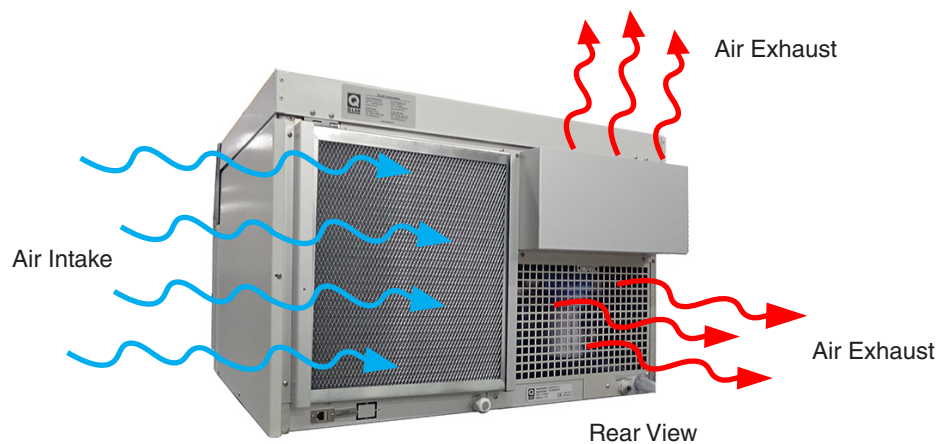
Figure 8.3b: Rear view Xe-1 air intake and exhaust areas.

9. Controller Operation

9.1 Summary (Jan 2022)

- The Q-SUN Xe-1-B tester is equipped with a Gen 3 main controller.
- The main controller monitors and controls all functions of the tester.
- Interactive software allows easy programming and operation using the keyboard and LCD displays.
- Irradiance, temperature, and test time are continuously displayed.
- Complete diagnostic and service information can be displayed.

9.2 Displays and Keypad (Jan 2022)

	Irradiance	°C	Step Time	Test Time		Total Time Hours Elapsed	
Actual:							
Set:							
	W/m² @ nm		Hours: Min	Hours: Min	kJ/m²	kJ/m²	Elapsed

Figure 9.2a: 10.2a: Xe-1 Irradiance, Temperature, Step Time, Test Time and Total Time Display

Figure 9.2b: 10.2b: Xe-1 Full Control Panel

Status

Message

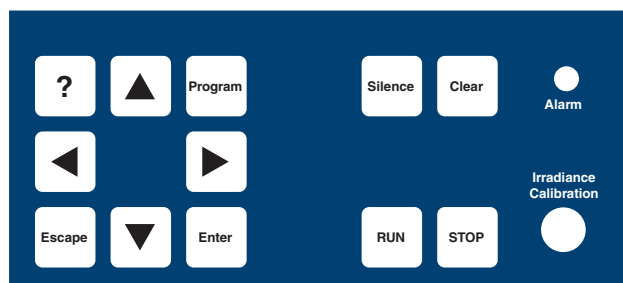Figure 9.2c: 10.2c: Xe-1 Status and Message Display

Figure 9.2d: 10.2d: Xe-1 Keypad

9.3 Programming (Jan 2018)

- Press the PROGRAM key to enter Program Mode (Figure 9.3).
- The Status display will show the current program mode.
- Use up/down arrow keys to select program modes P1 to P10.

ID	INFORMATION	NOTES
P1	SET TEST DURATION	
P2	SELECT CYCLE/STEP TO RUN	
P3	CREATE, MODIFY OR DELETE CYCLE	
P4	CALIBRATE TEMPERATURE SENSORS	
P5	SET ALARM VOLUME	
P6	SET ETHERNET ADDRESS	
P8	SELECT LANGUAGE	
P9	SET LAMP TIMERS	Used to reset the lamp timer when a lamp is changed before the normal 1500 hours.

See *X-10011-L Q-SUN Programming Flow Chart* for detailed programming instructions.

To navigate through the program menus;

- Press the **ENTER** key to move one level deeper into a program.
- Use the **ESCAPE** key to move up one level.
- Use the **ARROW** keys to change parameters.
- Use the **ENTER** key to move to the next level and to save the changes to any program.
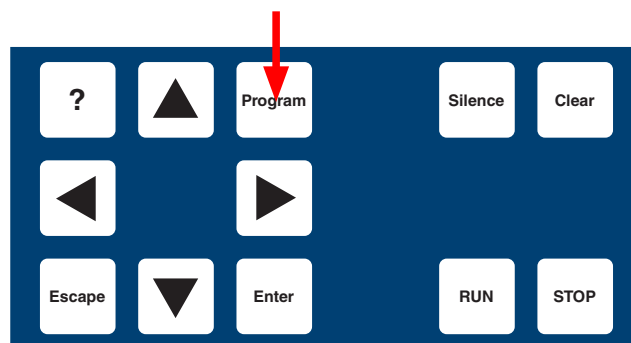

Figure 9.3: 10.3: Xe-1 Keypad - Program Key Indicated

9.4 Diagnostics (Feb 2022)

Diagnostic Messages

- Press the **?** key on the control panel keypad (Figure 9.4a) to display Diagnostic Messages.

- Diagnostics are a list of tester current operating conditions (Figure 9.4b).

- Diagnostics are an important tool to assist in troubleshooting tester conditions.

- Press the **UP** or **DOWN** arrows to scroll through the messages.

- Checking the diagnostic messages will not interrupt the test cycle in any way.

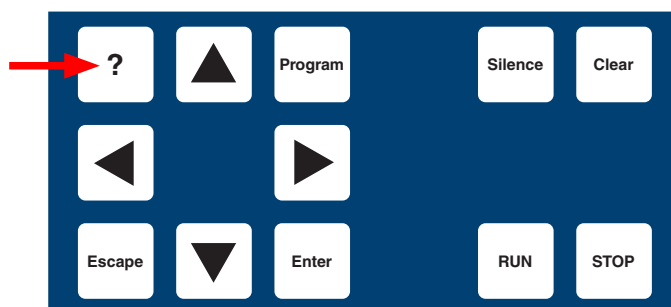- Press **ESCAPE** key to move back one level or to exit the diagnostic mode.

Figure 9.4a: Keypad - Diagnostics Key Indicated

No.	Diagnostic Name	Diagnostic Description
D1	LABORATORY TEMPERATURE = XX ^{o}C	This shows the current lab temperature.
D4	CONTROLLER TEMPERATURE = XX ^{o}C	This shows the current temperature of the controller
D5	HOURS SINCE LIGHT SENSOR CAL = XXXX	This shows the current value of the lamp change timer.
D6	CHAMBER BLOWER ON= XX%	This shows the chamber blower output.
D7	AIR HEATER ON= XX%	This shows the air heater output. As the chamber temperature nears the temperature set point, the air heater output is reduced.
D9	VERSION 3.XXX CHECKSUM = XXXX	This shows the software version and checksum. The checksum can be used to determine if there is a compiling error.
D10	LAMP OUTPUT: 1= XX%	This shows the lamp output for the lamp in light steps.
D11	AIR TEMPERATURE= XXX°C	This shows the current air temperature inside of the tester chamber. This is useful when the black panel is being used to control and a Chamber Air Temp (CAT) sensor is installed.
D14	TOTAL LIGHT HOURS ELAPSED= XXXX	This shows the total time that the lamps have been on.
D19	HOURS SINCE LAMP REPLACED = XXXX	This shows the current value of the lamp change timer. When the timer reaches X104 hours, the "M14 TIME TO REPLACE LAMP" will be triggered. See Section 14.1
D20	HOURS SINCE ROUTINE SERVICE = XXXX	This shows the number of hours since the M15 PERFORM ROUTINE SERVICE alarm was last cleared. See Section 14
D21	BLACK PANEL TEMPERATURE= XXX°C	This shows the current temperature of the black panel. This is useful when Chamber Air Temp (CAT) control is selected
D24	SERIAL NUMBER = XX-XXXXX-XX-XXXXX	Displays the tester's serial number as input either at Q-Lab or during a TEB replacement or Reset operation.
D25	MAC ADDRESS = XX-XX-XX-X-X-XX	Displays the media access control (MAC) address for the tester

Figure 9.4b: Diagnostic Messages

10. Running a Test

- Tests can be run using standard test cycles pre-programmed into the tester, or custom cycles can be constructed.
- Common test cycles that can be pre-programmed into the Q-SUN are shown in Section 12.2.
- Guidelines for selecting test parameters and choosing settings for custom cycles are given in Section 12.3.
  - o For instructions on modifying cycles or creating custom cycles see Section 9.3.
- Various methods for mounting test specimens are illustrated in Section 12.5.
- Recommendations for repositioning test specimens are provided in Section 12.6.

10.1 Selecting Test Parameters (Feb 2022)

Irradiance Range

	UV Sensor Type			
	340 nm	420 nm		TUV
UV Filter Type	**(W/m²)**	**(W/m²)**	**(lux)**	**(W/m²)**
DAYLIGHT - Q	0.25 – 0.68	0.45 – 1.50	40k – 140k	20 – 75
DAYLIGHT - BB	0.25 – 0.68			
DAYLIGHT - F	0.25 – 0.80			
EXTENDED UV - Quartz	0.25 – 0.68			
EXTENDED UV - QB				
WINDOW - Q	0.25 – 0.55			20 – 70
WINDOW - B/SL				
WINDOW – SF5	Not available			
WINDOW - IR				20 – 42
UV BLOCKING	Not available	0.35 - 1.00	40k - 140k	Not available

Figure 10.1a: Irradiance Ranges

- The approximate intensity of noon summer sunlight at 340 nm is 0.68 W/m^2.

⚠️ Calibrate the Q-SUN UV sensors whenever irradiance set point, lamps, UV sensors, or UV filters are changed.

Black Panel Temperature Range

- The table below shows the black panel and chamber air temperature ranges when the lab temperature is 23 °C.
- Higher or lower lab temperatures will change the temperature control range.
- For example, if the lab temperature is 33 °C, the temperature range will be raised by approximately 10 °C.
- The Xe-1-B can control temperature by either the black panel or the chamber air temperature, but not by both.

Black Panel Temp[1] (°C)	BP	IBP
Light Cycle	45-90	50-100
Light Cycle w/IR Filter	40-70	45-80
Dark Cycle	25-50	25-50
Chamber Air Temp (°C)	CAT	
Light Cycle (any filter)	35-55	
Dark Cycle	30-45	

Figure 10.1b: Black Panel Temperature Ranges

1. Minimum and maximum black panel (BP), insulated black panel (IBP), and chamber air temperatures (CAT) are dependent on ambient laboratory temperature and irradiance level. Interdependencies between these parameters limit achievable operating conditions in the tester.

Common Test Cycles

ISO 4892-2 (2013) Cycle B2 (same as ISO 16474-2, Cycle B2)
Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps

Optical Filters: Window-Q, Window-BSL   UV Sensor: 420 nm*   Black Panel: Insulated

Step	Function	Irradiance (W/m²/nm)	Black Panel Temp. (°C)	Step Time (hh:mm)
1	Light	1.10	65	24:00
2	FINAL STEP – GO TO STEP 1			

* This test cycle can be with run a TUV UV sensor and an irradiance of 50 W/m²/nm, all other parameters being the same.

ISO 4892-2 (2013) Cycle B3 (same as ISO 16474-2, Cycle B3)
Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps

Optical Filters: Window-Q, Window-BSL   UV Sensor: 420 nm*   Black Panel: Insulated

Step	Function	Irradiance (W/m²/nm)	Black Panel Temp. (°C)	Step Time (hh:mm)
1	Light	1.10	100	24:00
2	FINAL STEP – GO TO STEP 1			

* This test cycle can be run with a TUV UV sensor and an irradiance of 50 W/m²/nm, all other parameters being the same.

ISO 4892-2 (2013) Cycle B7 (same as ISO 16474-2, Cycle B5; JIS 7350-2 Cycle 14; GB/T 16422.2 Cycle 14)
Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps

Models: Xe-1-B

Optical Filters: Window-Q, Window-BSL   UV Sensor: 420 nm*   Black Panel: Uninsulated

Step	Function	Irradiance (W/m²/nm)	Black Panel Temp. (°C)	Step Time (hh:mm)
1	Light	1.10	63	24:00
2	FINAL STEP – GO TO STEP 1			

* This test cycle can be run with a TUV UV sensor and an irradiance of 50 W/m²/nm, all other parameters being the same.

ISO 4892-2 (2013) Cycle B8 (same as ISO 16474-2, Cycle B6; JIS 7350-2 Cycle 16; GB/T 16422.2 Cycle 16)
Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps

Optical Filters: Window-Q, Window-BSL   UV Sensor: 420 nm*   Black Panel: Uninsulated

Step	Function	Irradiance (W/m²/nm)	Black Panel Temp. (°C)	Step Time (hh:mm)
1	Light	1.10	89	24:00
2	FINAL STEP – GO TO STEP 1			

* This test cycle can be run with a TUV UV sensor and an irradiance of 50 W/m²/nm, all other parameters being the same.

ASTM D3424 (2011) Method 3
Standard Practice for Evaluating the Relative Lightfastness and Weatherability of Printed Matter

Optical Filters: Window-Q, Window-BSL   UV Sensor: 420 nm   Black Panel: Uninsulated

Step	Function	Irradiance (W/m²/nm)	Black Panel Temp. (°C)	Step Time (hh:mm)
1	Light	1.20	63	24:00
2	FINAL STEP – GO TO STEP 1			

ASTM D5071 (2013) Cycle 1
Standard Practice for Exposure of Photodegradable Plastics in a Xenon Arc Apparatus

Optical Filters: Daylight-Q, Daylight-BB   UV Sensor: 340 nm   Black Panel: Uninsulated

Step	Function	Irradiance (W/m²/nm)	Black Panel Temp. (°C)	Step Time (hh:mm)
1	Light	0.35	63	24:00
2	FINAL STEP – GO TO STEP 1			

10.2 Changing UV Optical Filters (Mar 2022)

Overview

All Q-SUN Xe-1 testers must have a glass UV filter (Section 7.4) installed below the lamp. The glass filter is required for proper operation of the tester. The Q-SUN is shipped with filters as ordered. The filters are easily replaced.

Changing the UV Optical Filter

> **IMPORTANT:** The Xe-1 MUST be OFF with main power DISCONNECTED before changing the filter. Always wear gloves when changing the optical filters.

- Remove the lamp housing as described in Section 14.1 to access the filter.
- The filter type name is etched into the filter surface for positive identification (Figure 10.2a).
- To change the filter, remove the four screws that secure the frame and gently remove the frame.
- Multi-segment filters are permanently installed in frames and can not be removed from the frame (Figure 10.2b).
- The UV filter can now be lifted out and replaced.
- Please contact Q-Lab Repair and Tester Support and request *Service Instructions X-7460-L* for UV filter installation details.

⚠️ **IMPORTANT:** Never operate the tester without a glass UV filter below the lamp.
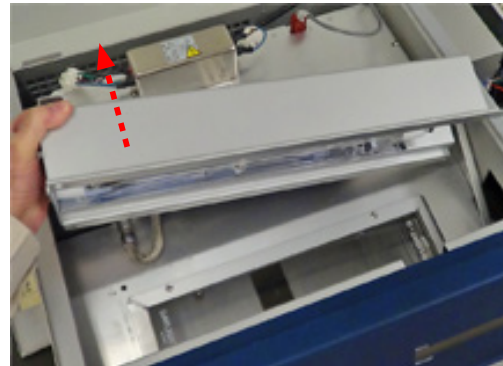
1. Open the Xe-1 Lid	**2.** Remove the Lamp Housing
3. Unscrew UV Filter Frame	**4.** Remove the UV Filter

Figure 10.2a: Optical Filter Type Etched into Filter
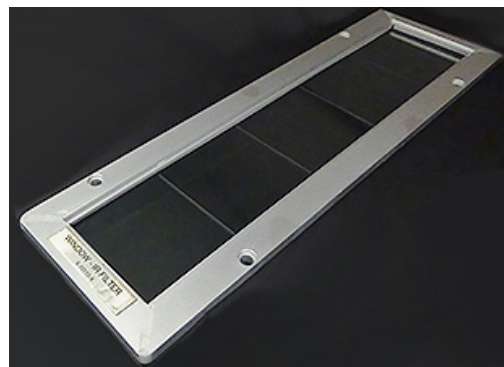
Figure 10.2b: Multi-Segment Optical Filter in Frame

10.3 Mounting Test Specimens (Feb 2022)

Specimen Tray

Figure 10.3a: Specimen Tray without Clips, X-10195-X

Do Not Cover Black Panel

⚠ **Caution:** Do not cover or shadow the black panel.

- Covering the black panel with specimens or shadow lowers its temperature and can cause the heater to stay on too long, overheating the specimens (Figure 10.3b and Figure 10.3c).

- Mount three-dimensional specimens far enough away from the black panel to avoid casting a shadow on it.
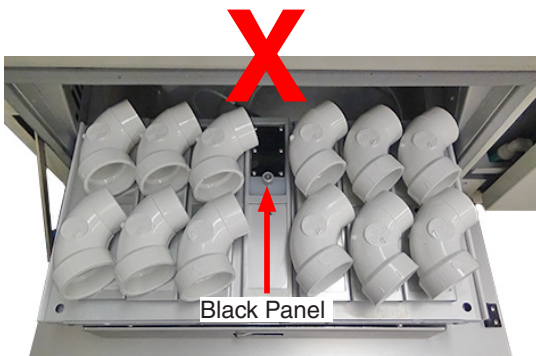
Figure 10.3b: Do Not Cover or Shade Black Panel
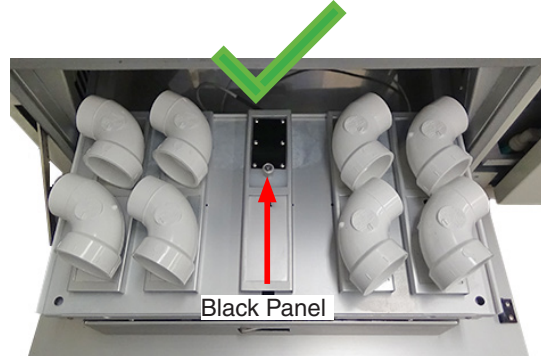
Figure 10.3c: Black Panel Must Be Uncovered

Flat and Three-Dimensional Specimens

- Whenever possible, specimens should be mounted in a specimen holder. If this is not possible specimens may be mounted directly on the tray. (Figure 10.3d).

- High air flow through the chamber may make it necessary to secure lightweight specimens.
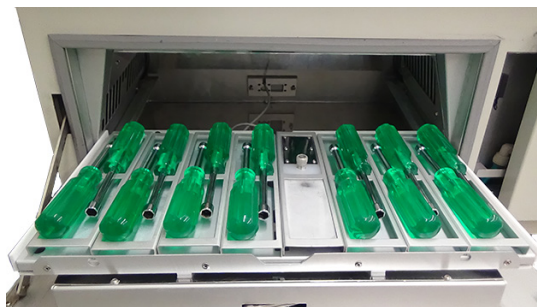
Figure 10.3d: Three-Dimensional Specimens Mounted in Specimen Holders

Panel Holders

- Panel holder assemblies are available to hold flat, 50×100 mm (2×4") specimens (Figure 10.3e and Figure 10.3f).

- The panel holder assemblies come with blank anodized aluminum Q-PANEL® test panels and retaining rings.

Empty Panel Holder   Q-PANEL Test Panels   Retaining Rings

Front   Back
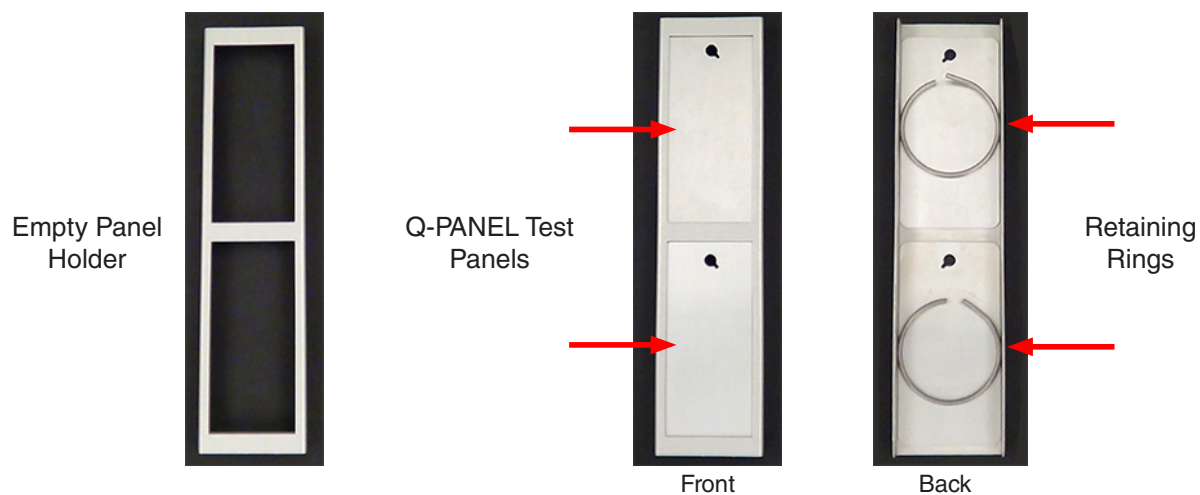
Figure 10.3e: X-10115-X, 50×100 mm (2×4") Panel Holder Assembly

Figure 10.3f: Panel Holder Kit (Part Number X-10113-K) with
(8) Panel Holders Holding (15) 50x100 mm (2×4") Specimens and (1) Black Panel

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Mounting an <u>Insulated</u> Black Panel When Using Panel Holders

When using panel holders and an insulated black panel (IBP), the IBP should be mounted on a special holder shown below (Figure 10.3g, i, j). These special holders are included in the specimen holder kits. The second IBP holder is used when calibrating with the UC202 IBP. A single panel holder assembly for mounting (1) 50×100 mm (2"×4") specimen next to the IBP is also included in the specimen holder kits (Figure 10.3h, i).

Figure 10.3g: Insulated Black Panel Holders
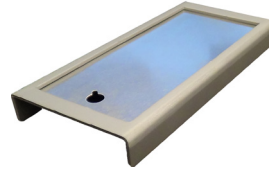
Figure 10.3h: Single Panel Holder Assembly

Single Panel
Holder Assembly

Insulated Black
Panel on Holder
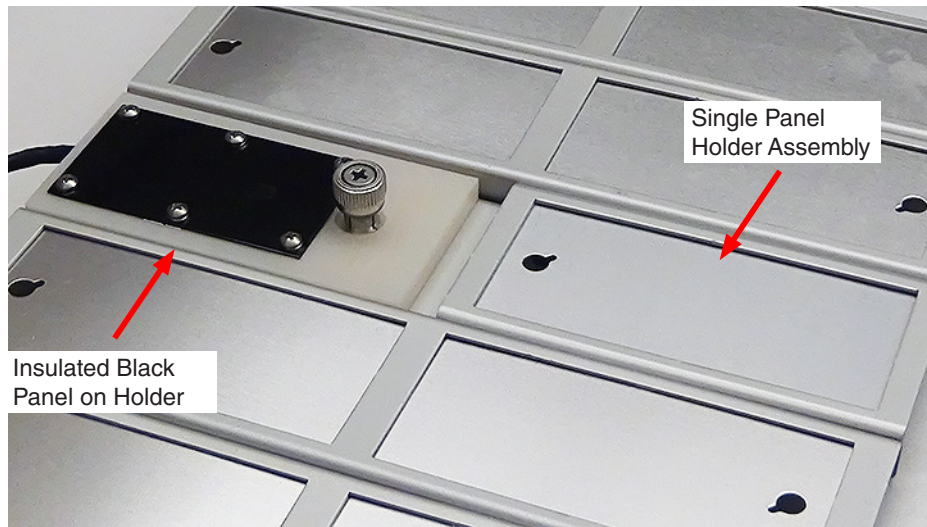
Figure 10.3i: Insulated Black Panel Mounted on Special Holder and
Single Panel Holder with (1) 50×100 mm (2×4") Specimen

UC202 Insulated
Black Panel on
Holder

Insulated Black
Panel on Holder
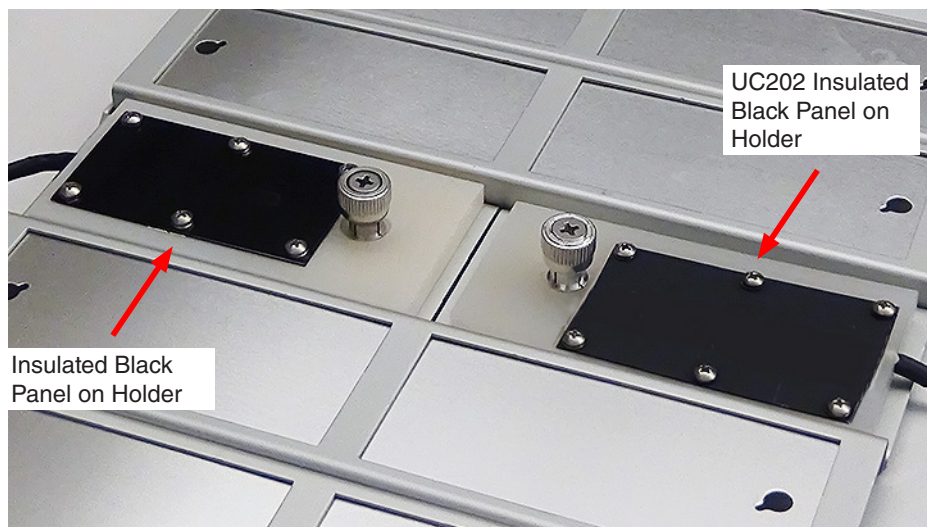
Figure 10.3j: Insulated Black Panel and UC202 Insulated Black Panel Mounted on Special Holders

Mounting an <u>Uninsulated</u> Black Panel When Using Panel Holders

When using panel holders and an uninsulated black panel (BP), the BP should be mounted on a standard 50x100 mm (2×4") panel holder (Figure 10.3k). Use a retaining ring to hold the BP in place. Fill the panel holder with a 50x100 mm (2×4") specimen (Figure 10.3l). When calibrating the BP, mount the UC202 BP in the same 50×100 mm (2×4") holder and hold in place with a retaining ring (Figure 10.3m).

Figure 10.3k: Standard 50×100 mm (2×4") Panel Holder

50×100 mm (2"x4")
Specimen in Holder

Uninsulated Black
Panel on Holder
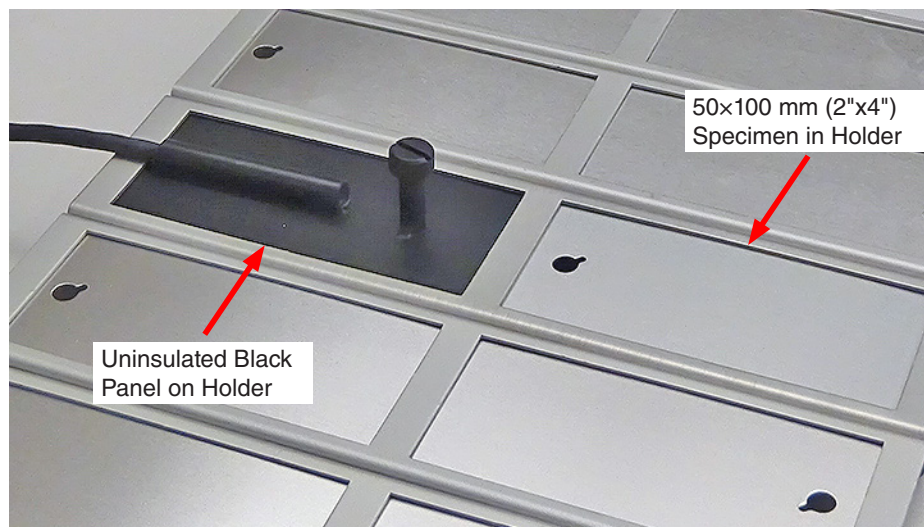
Figure 10.3l: Uninsulated Black Panel and (1) 50×100 mm (2×4") Specimen
Mounted on Standard 50×100 mm (2×4") Holder

UC202 Uninsulated
Black Panel on Holder

Uninsulated Black
Panel on Holder
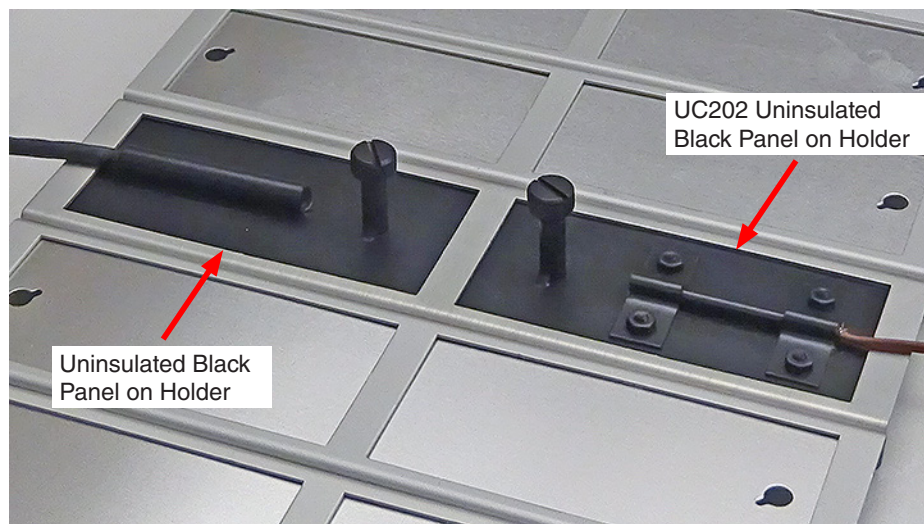
Figure 10.3m: Uninsulated Black Panel and UC202 Uninsulated Black Panel
Mounted on Standard 50×100 mm (2×4") Holder

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Mounting Thin Films or Textile Specimens with Standard Panel
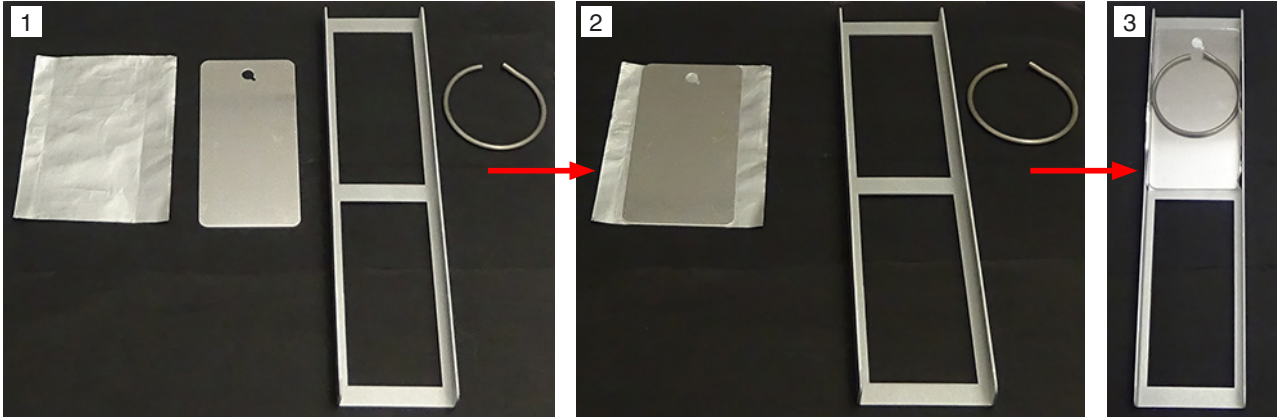
Figure 10.3n: Thin Film Mounted in Panel Holder

Mounting Thin Films or Textile Specimens with Open Panel

- To mount thin films or textile specimens without a panel backing (so both sides of the specimen are exposed to air), a special panel holder is available.

- The textile/thin film holder (Part Number X-10255-X) is shown in Figure 11.3p.

- Notice that the solid backing panel is replaced with a backing panel that is open in the center.
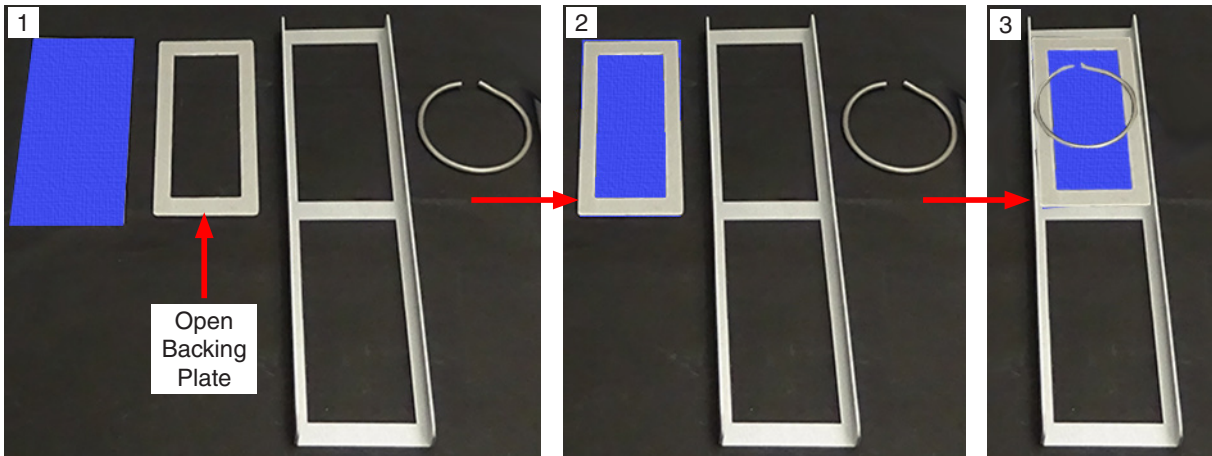
Figure 10.3o: Textile Specimen Mounted in Textile/Thin Film Holder

Bottle Holders

17.5 mm
0.69"

X-10183
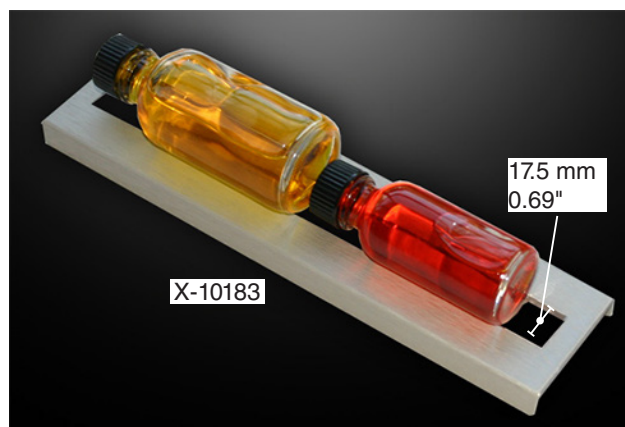
Figure 10.3p: Holder is slotted to hold narrow cylindrical specimens

44.5 mm
1.75"

X-10184
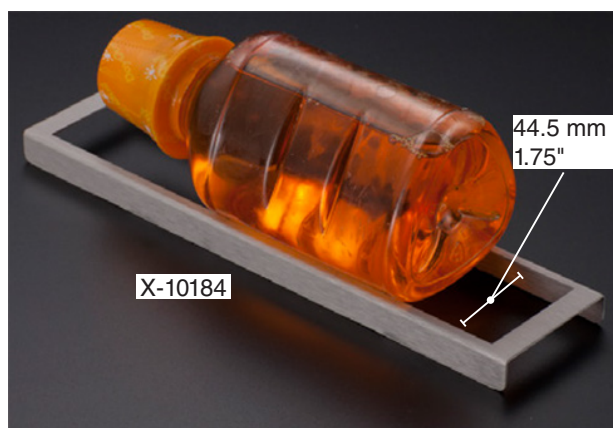
Figure 10.3q: Holder is slotted to hold wider cylindrical specimens

3D Specimens

- The following graph (Figure 11.3t) shows the relationship between distance above the specimen tray and irradiance.

- Specimen surfaces above the specimen tray receive higher irradiance.
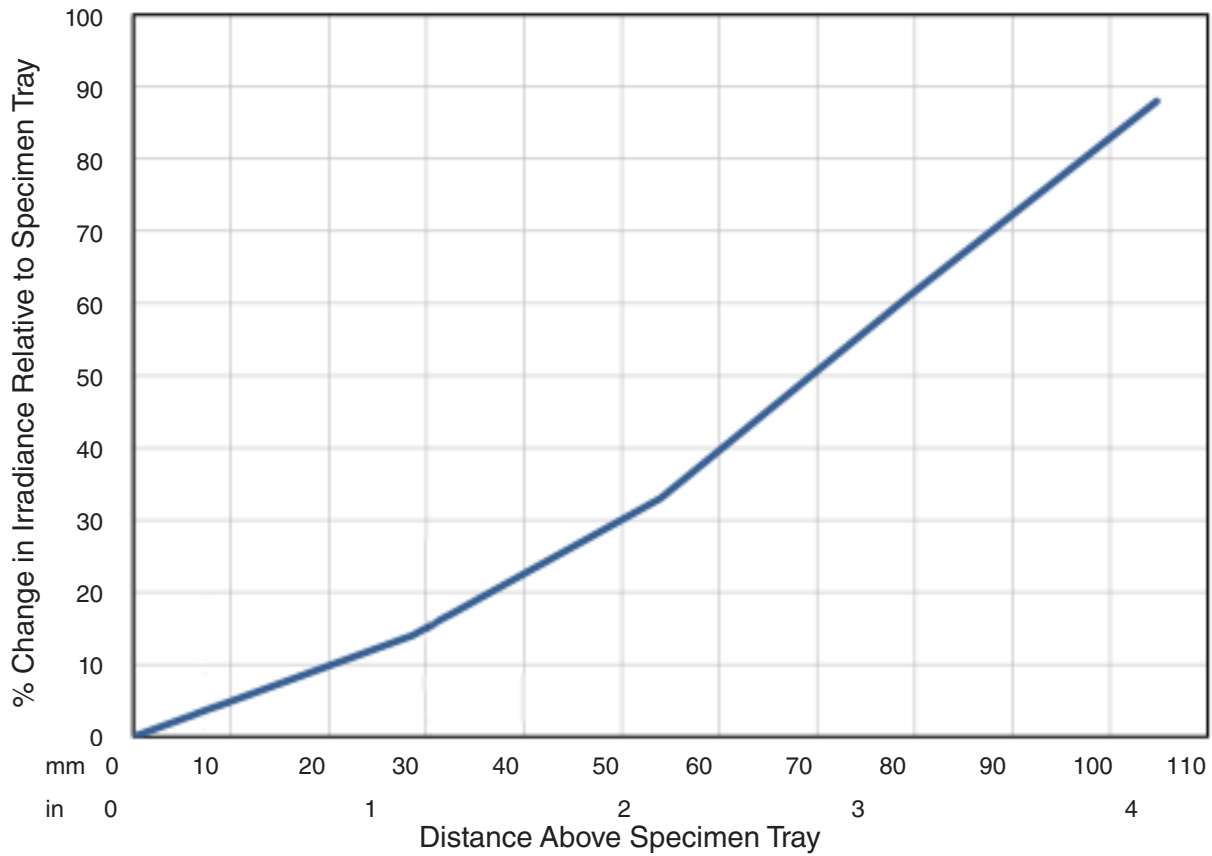
Figure 10.3r: Distance Above Specimen Tray vs. Irradiance for the Q-SUN Xe-1

NOTE: Having specimens closer than 100 mm from the lamp may result in burning of specimens and will significantly impact irradiance uniformity.

10.4 Repositioning Test Specimens (Sep 2016)

Regular repositioning of test specimens is recommended to obtain uniform exposures.

- Specimens to be tested for 2000 hours (12 weeks) should be repositioned weekly.
- Specimens to be tested for 100 hours should be repositioned daily.
- A suggested repositioning plan is shown below.
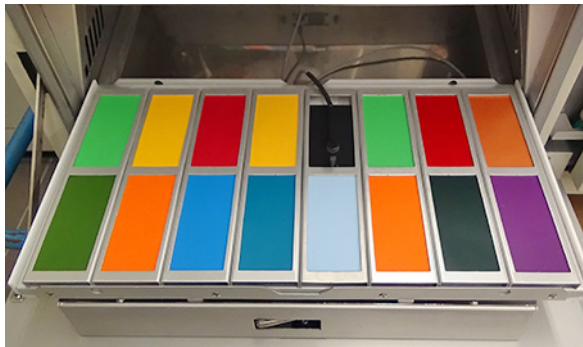
1. Specimens in specimen holders in the starting positions.
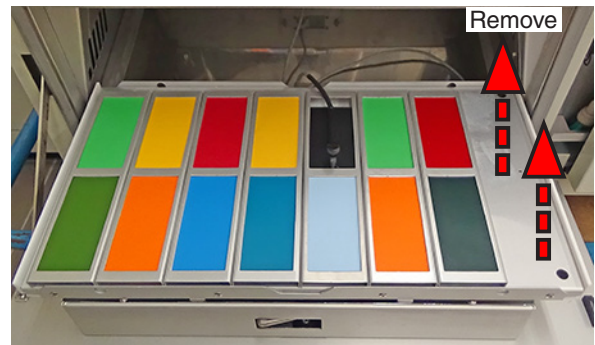
Remove

2. Remove the specimen holder on the right side of the tray.
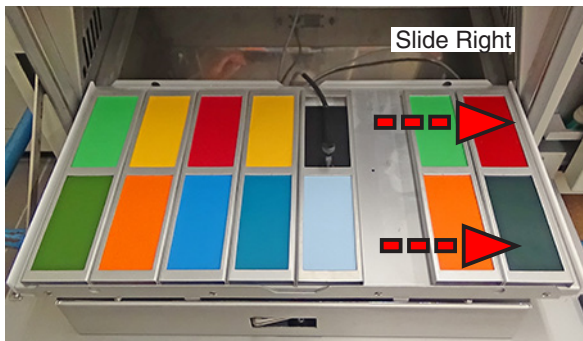
Slide Right

3. Slide the specimen holders to the right of the black panel to the right.

Move from Left to Right of Black Panel
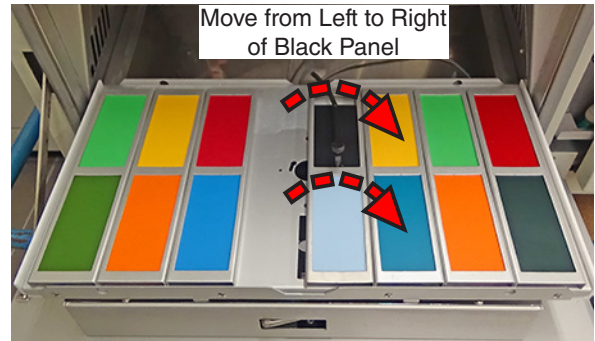
4. Move the specimen holder on the left of the black panel to the right of the black panel
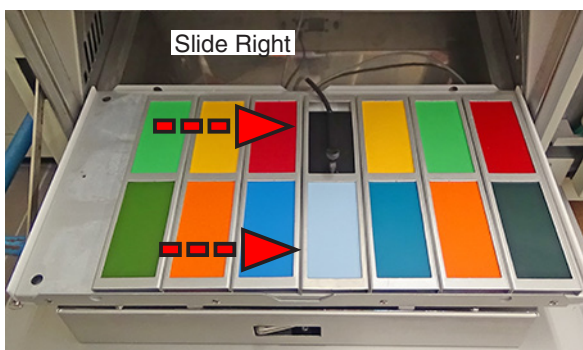
Slide Right

5. Slide the specimen holders on the left of the black panel to the right.

Rotate 180 Degrees and Replace
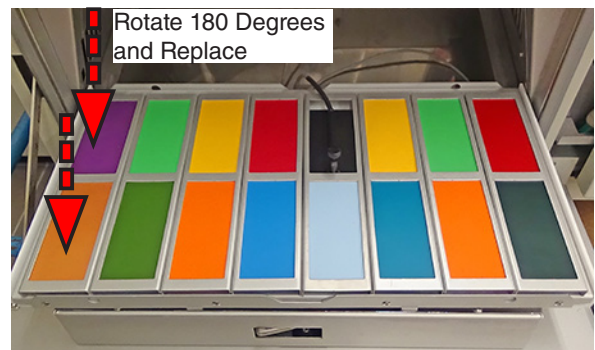
6. Rotate the specimen holder removed in **Step 2** 180° and place on the left end of the tray.

11. Calibration (Feb 2022)

- The table below lists the Q-SUN Xe-1-B onboard sensors which require periodic re-calibration or replacement.
- The following sub-sections provide step-by-step calibration instructions for the sensors.

Sensor	Calibration Frequency	Calibration Instrument
Irradiance	500 hours[1]	Universal Calibrator System or CR20 Calibration Radiometer[2]
Black Panel Temperature	6 months[1]	Universal Calibrator System or CT202 Calibration Thermometer[2]
Chamber Air Temperature[3]	6 months	Calibrated Reference Thermometer

[1] Or calibrate whenever the test cycle conditions or specimens are changed.

[2] Calibration devices require yearly recalibration or replacement.

[3] This sensor is optional. See Section 8.2.

11.1 Irradiance Calibration

11.1.1 Using the Universal Calibrator System (Feb 2022)

Overview

- The Universal Calibrator (UC) System includes the UC1 handheld display unit and a UC20/340, UC20/420, UC20/TUV or UC20/LUX Smart Sensor (Figure 11.1.1a).
- The UC1 is a display and control unit only – it cannot be calibrated.
- Smart Sensors are labeled and color coded for identification. (Figure 11.1.1a).
- Smart Sensors have a spring-mounted flange for docking in the specimen tray calibration port (Figure 11.1.1b).
- The UC20 Smart Sensor must match the type of sensor in the tester.
    - o   When the Q-SUN is powered on, the sensor type is displayed on the control panel. (Figure 11.1.1c)
    - o   If the UC20/340, /420 or /TUV Smart Sensor does not match the sensor in the Q-SUN, an alarm will sound and the M33 error message indicating the correct sensor will be displayed.
- The UC20/LUX Smart Sensor is identical to the UC20/420 except that measured illuminance is displayed in units of LUX.
    - o   The UC20/LUX Smart Sensor requires a 420 nm sensor in the tester.
- The UC20/340 Smart Sensor cannot be used with Window - IR or Window-SF5 filters.

Figure 11.1.1a: Universal Calibrator System - UC1 Handheld Display Unit and UC20 Smart Sensors

Figure 11.1.1b: UC20 sensors have a spring-mounted flange for docking in the tester calibration port.
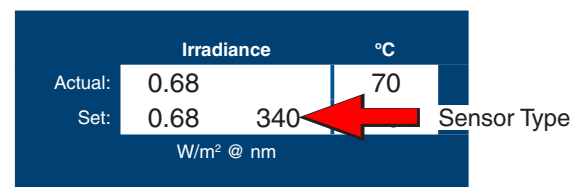
Figure 11.1.1c: Q-SUN Sensor Type Displayed on Tester Control Panel.

- Smart Sensors are calibrated at Q-Lab and the calibration date is stored in the Smart Sensor.
- Calibration information is on the sensor calibration certificate and on a Smart Sensor case label (Figure 11.1.1d, d).
- The calibration information can also be displayed on the UC1 when the Smart Sensor is connected (Figure 11.1.1f).
- Upon calibration expiration, the Smart Sensors should be discarded and replaced with an inexpensive new sensor. See the Replacement Parts List, Section 16.
- Optionally, Smart Sensors can be returned to Q-Lab for recalibration. Contact Q-Lab Repair and Tester Support for more information.
- A single UC1 display unit can be used with all Q-Lab Smart Sensors to calibrate Q-SUN (as well as Q-Lab QUV) testers.
- The UC1 is connected to and receives power from the tester calibration (DIN) port.
- Revisions to the UC1 software may periodically be available. See Section 14.8 for more information.
- Q-SUN testers can also be calibrated with the CR20 calibration radiometers (see 11.1.2).
- See Section 14.8 for additional information on Universal Calibrator System displays and messages.
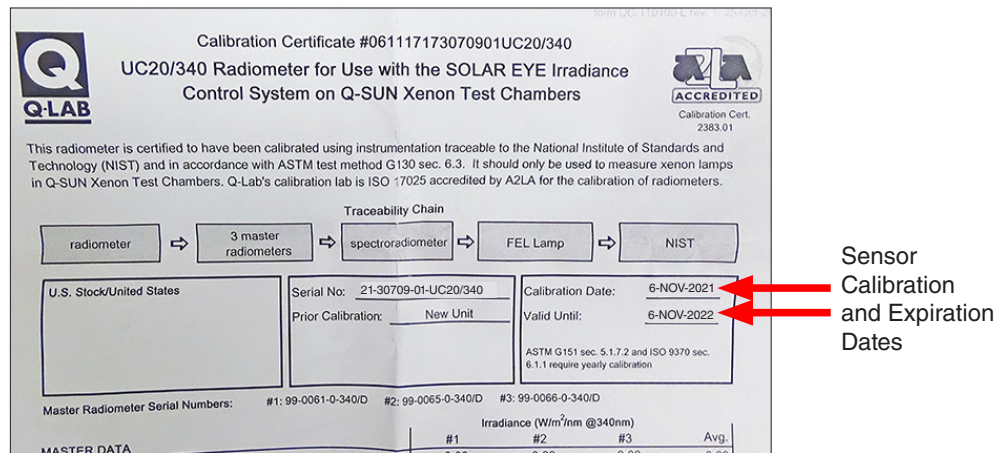
Figure 11.1.1d: UC20/340 Calibration Certificate
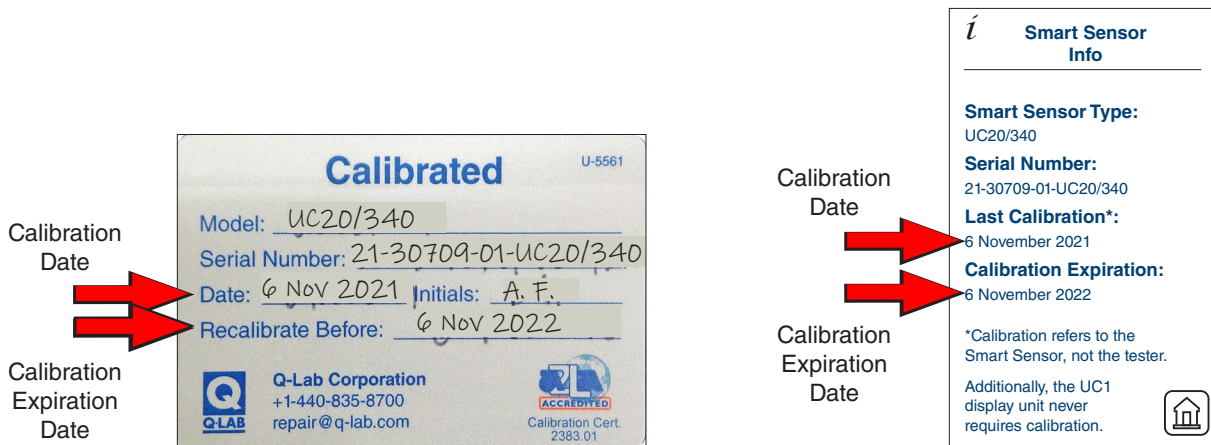
Figure 11.1.1e: Smart Sensor Calibration Label on Case
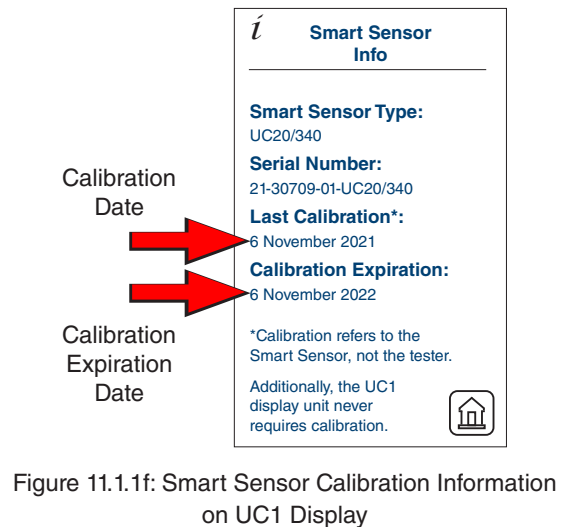
Figure 11.1.1f: Smart Sensor Calibration Information on UC1 Display

Irradiance Calibration Procedure

- The calibration instructions are listed in the steps below.
- Calibrate with test specimens in place.
- Irradiance calibration should always be done before black panel calibration.

Running Light Step

	Irradiance		°C
Actual:	0.68		70
Set:	0.68	340	70
	W/m² @ nm		

1. Run the Xe-1 in a Light Step. Make sure the black panel temperature and the irradiance are at the normal operating set points.

2. Remove the UC1 display unit from the case.

Clean

3. Remove the UC20 Smart Sensor from the case.

4. Clean the sensor face with 99% isopropyl alcohol and a soft cloth.

This symbol on the connector faces up

Smart Sensor Connector
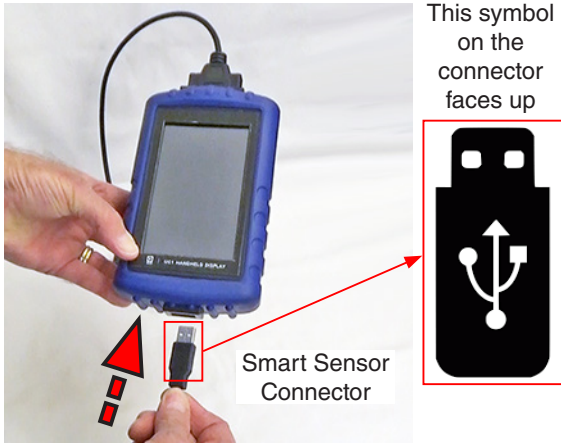
5. Plug the UC20 Smart Sensor USB connector into the USB port on the bottom of the UC1.
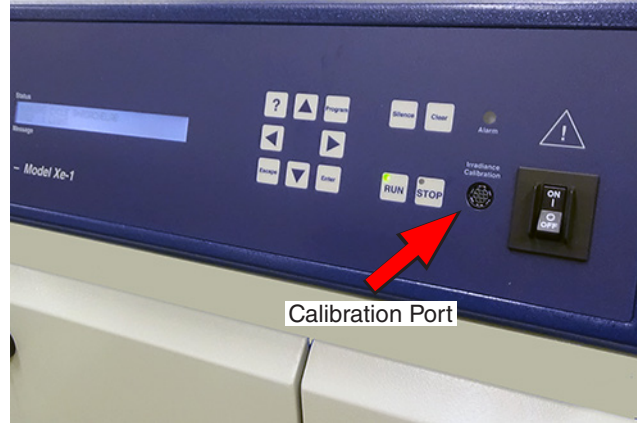
Calibration Port

6. Locate the irradiance calibration port on the Xe-1 control panel.

7. Plug the UC1 connection cable into the calibration port on the Xe-1 control panel. The UC1 gets power from the calibration port.

UC1 Mounting Strip
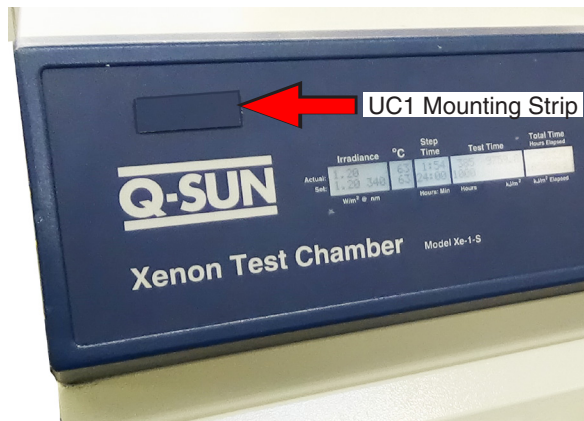
8. Locate the UC1 magnetic mounting strip on the Xe-1 control panel. Older models will not have this strip. A retrofit kit (UC-110067-K) is available.

Magnet

9. The UC1 unit has a magnet on the back.

10. When performing calibrations, the UC1 can be held in place by the magnet on the tester mounting strips.

Status

TEST SUSPENDED
M33 WRONG RADIOMETER SHOULD BE 340 nm
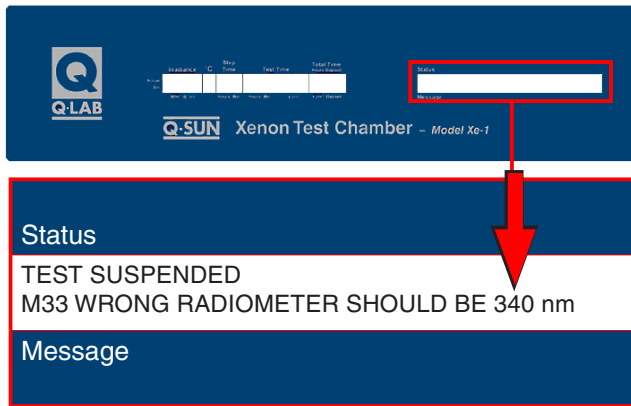
Message

▶ If the Smart Sensor does not match the sensor in the Xe-1, the M33 error message will appear indicating the correct sensor.

UC20/340   UC20/420

UC20/TUV   UC20/LUX

11. If M33 is displayed, disconnect the Smart Sensor. Clear the error message. Connect the Smart Sensor that matches the Xe-1 sensor. **NOTE:** The UC20/LUX requires a 420 nm sensor in the tester.
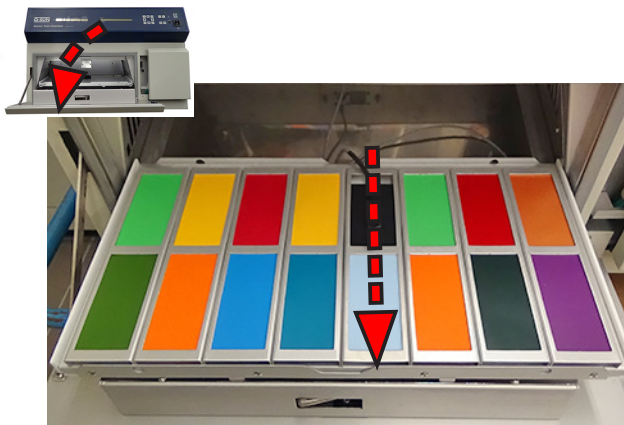
12. Open the test chamber door. Pull the specimen tray out.

13. Locate the calibration port in the specimen tray.

Tray Bottom
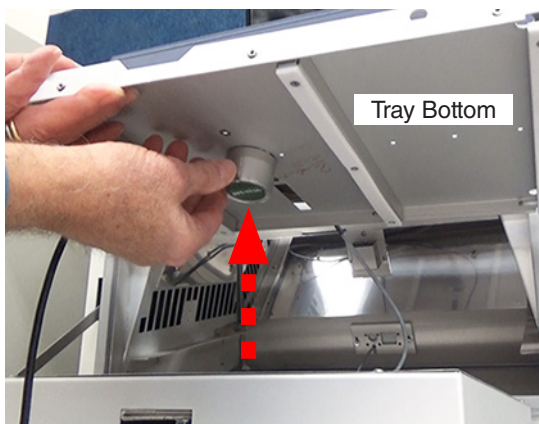
14. Lift the specimen tray. From the bottom of the tray press the UC20 Smart Sensor face-up into the calibration port compressing the UC20 flange.

UC20 as Seen from Top of Specimen Tray

Tray Top
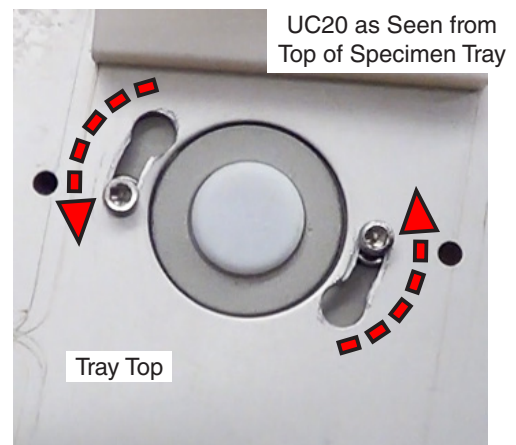
15. Rotate the UC20 to lock it in to the calibration port.
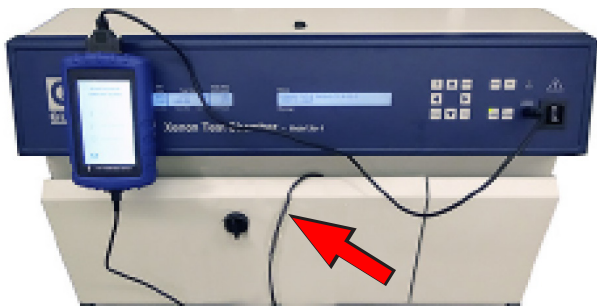
16. Push the specimen tray into the chamber. Close the door. Keep the sensor cord away from the door latch.
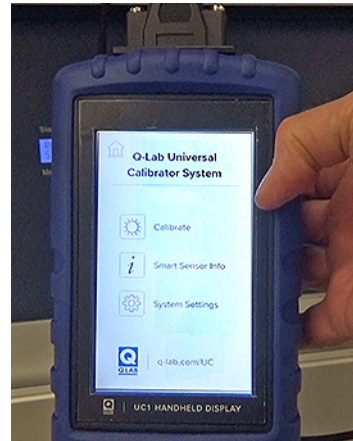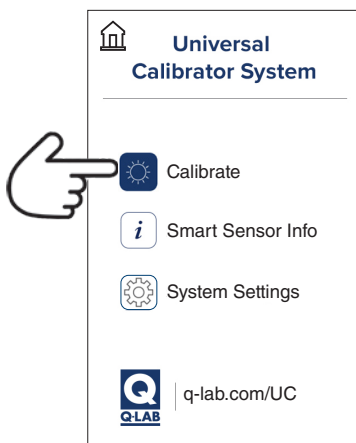

17. When connected to the Xe-1 the UC1 display unit home screen will appear.
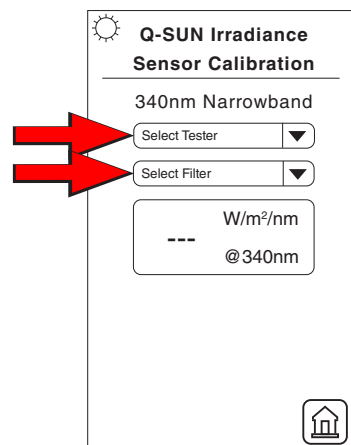

UC1 Screen Display
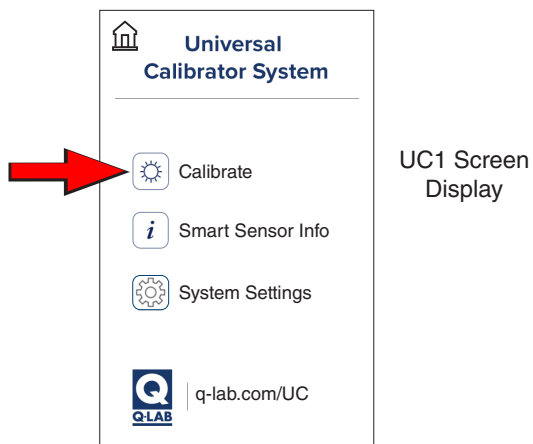
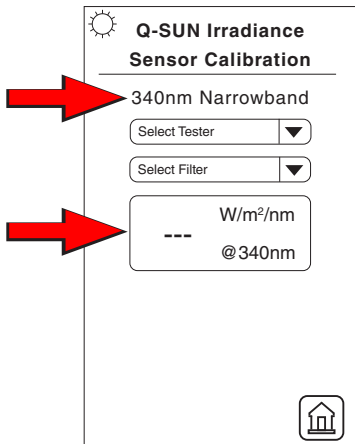▶ The UC1 "home" screen showing the calibrate icon when the correct Smart Sensor is connected.
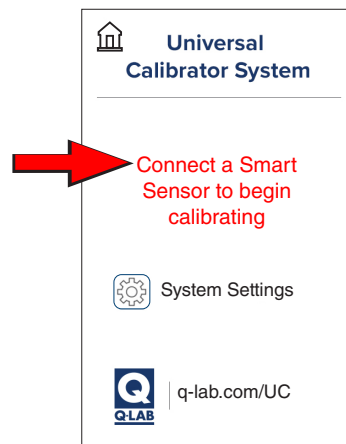
▶ The UC1 "home" screen when a Smart Sensor is not connected. Connect Smart Sensor as in **Step 5.**
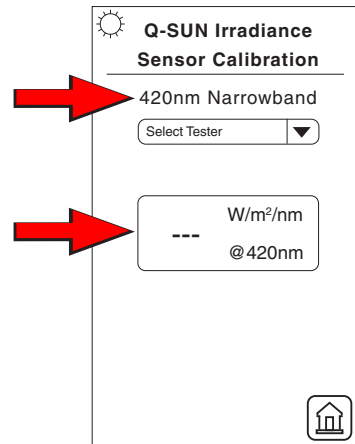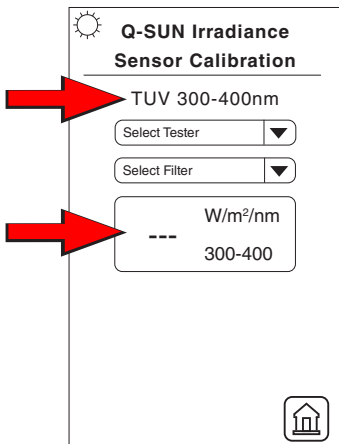

18. Press ☼ on the UC1 display screen.

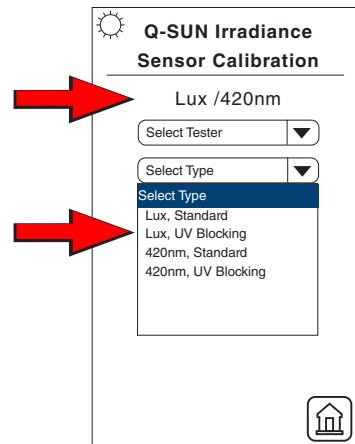▶ The sensor calibration screen is displayed.

56

**Q-SUN Irradiance
Sensor Calibration**

340nm Narrowband

Select Tester ▼

Select Filter ▼

W/m²/nm

@340nm

▶ The connected smart sensor type is displayed. This is the UC20/340 smart sensor display.

**Q-SUN Irradiance
Sensor Calibration**

420nm Narrowband

Select Tester ▼

W/m²/nm

@420nm

▶ This is the UC20/420 smart sensor display.

**Q-SUN Irradiance
Sensor Calibration**

TUV 300-400nm

Select Tester ▼

Select Filter ▼

W/m²/nm

300-400

▶ This is the UC20/TUV smart sensor display.

**Q-SUN Irradiance
Sensor Calibration**

Lux /420nm

Select Tester ▼

Select Type ▼

Select Type
Lux, Standard
Lux, UV Blocking
420nm, Standard
420nm, UV Blocking

▶ This is the UC20/LUX smart sensor display.

**Q-SUN Irradiance
Sensor Calibration**

Lux /420nm

Select Tester ▼

Select Type ▼

Select Type
Lux, Standard
Lux, UV Blocking
420nm, Standard
420nm, UV Blocking
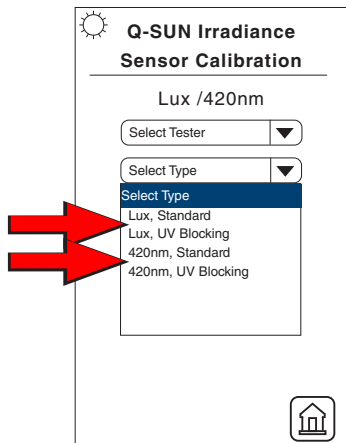
▶ The UC20/LUX will work for calibrating in Lux or W/m² at 420nm.

**Q-SUN Irradiance
Sensor Calibration**

Lux /420nm

Select Tester ▼

Lux, UV Blocking ▼

x100,000
---
lux

**Q-SUN Irradiance
Sensor Calibration**

Lux /420nm

Select Tester ▼

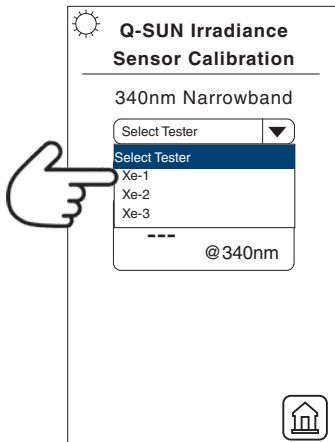420nm, UV Blocking ▼

W/m²/nm

@420nm
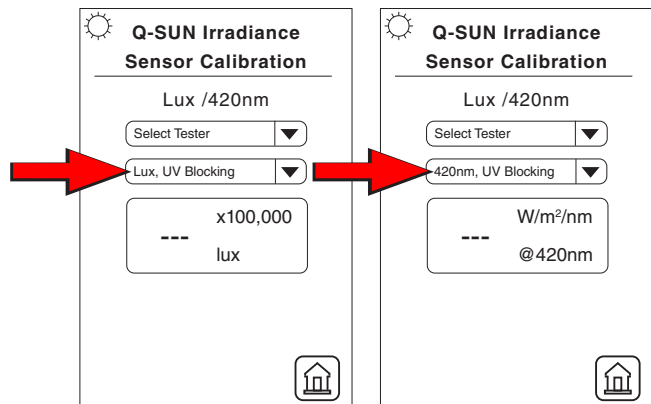
▶ The UC20/LUX can calibrate testers with and without UV blocking filters. See *X-10521-L ICH Guidelines Test Protocol for Q-SUN Xenon Arc Test Chambers* for information on the use of blocking filters.
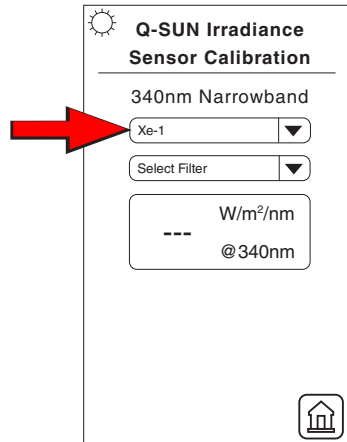
57

☼ **Q-SUN Irradiance Sensor Calibration**
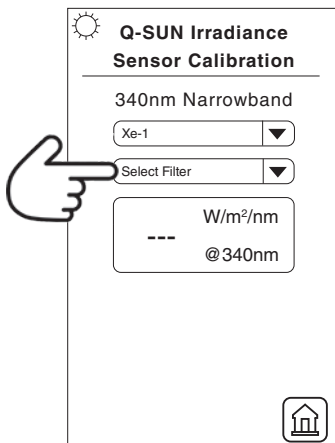
340nm Narrowband

Select Tester ▼

Select Filter ▼

W/m²/nm
--- @340nm
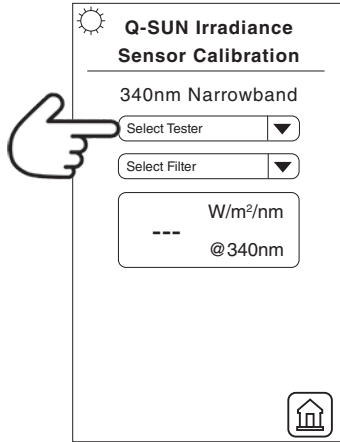
19. Press the **Select Tester** box.

☼ **Q-SUN Irradiance Sensor Calibration**

340nm Narrowband

Select Tester ▼

Select Tester
Xe-1
Xe-2
Xe-3
--- @340nm
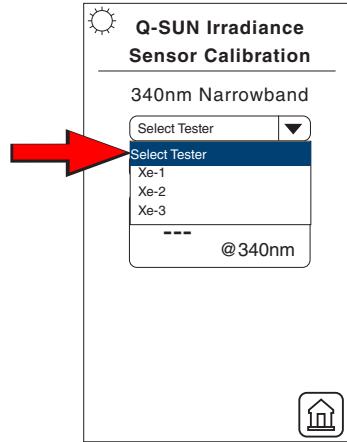
▶ The **Select Tester** list is displayed.

☼ **Q-SUN Irradiance Sensor Calibration**

340nm Narrowband

Select Tester ▼

Select Tester
Xe-1
Xe-2
Xe-3
--- @340nm

20. Press Xe-1.

☼ **Q-SUN Irradiance Sensor Calibration**

340nm Narrowband

Xe-1 ▼

Select Filter ▼

W/m²/nm
--- @340nm

▶ Xe-1 is displayed.

☼ **Q-SUN Irradiance Sensor Calibration**

340nm Narrowband

Xe-1 ▼

Select Filter ▼

W/m²/nm
--- @340nm

21. Press the **Select Filter** box.

☼ **Q-SUN Irradiance Sensor Calibration**

340nm Narrowband

Xe-1 ▼

Select Filter ▼

Select Filter
Ext. UV-Quartz
Extended UV-QB
Daylight-BB
Daylight-F
Daylight-Q
Window-B/SL
Window-Q
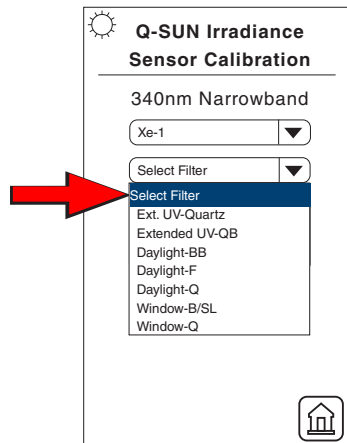
▶ The **Select Filter** list is displayed.

**Q-SUN Irradiance
Sensor Calibration**

340nm Narrowband

Xe-1 ▼

Select Filter ▼

Select Filter
Ext. UV-Quartz
Extended UV-QB
Daylight-BB
Daylight-F
Daylight-Q
Window-B/SL
Window-Q

Filter Selected
Must Match
Filter in the Xe-1
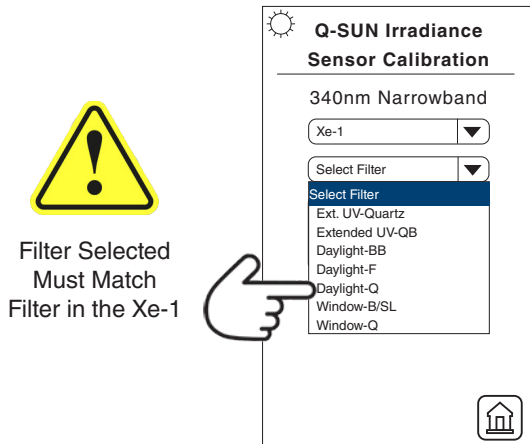
22. Press the filter in the list that matches the filter installed in the Xe-1.

**Q-SUN Irradiance
Sensor Calibration**

340nm Narrowband

Xe-1 ▼

Daylight-Q ▼

0.68 W/m²/nm
@340nm

1
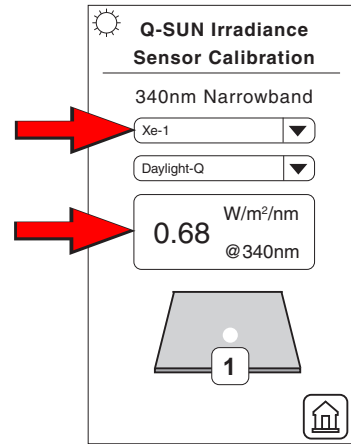
▶ The selected filter name and measured irradiance is displayed.

**Q-SUN Irradiance
Sensor Calibration**

340nm Narrowband

Xe-1 ▼

Daylight-Q ▼

0.68 W/m²/nm
@340nm

1
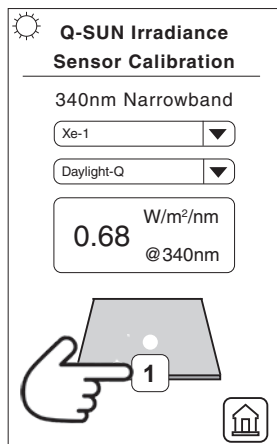
23. Press and hold the # 1 button until the button turns green, a check mark is displayed and the tester beeps.

**Q-SUN Irradiance
Sensor Calibration**

340nm Narrowband

Xe-1 ▼

Daylight-Q ▼

✔

1
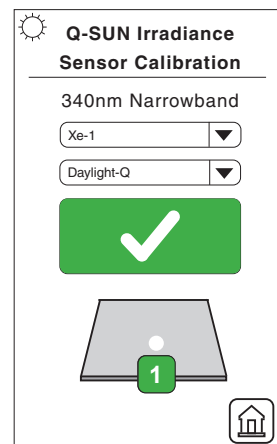
▶ The green button and check mark indicate the sensor is calibrated.

**Q-SUN Irradiance
Sensor Calibration**

**Press and hold
calibrate button
until tester beeps.**

⚠
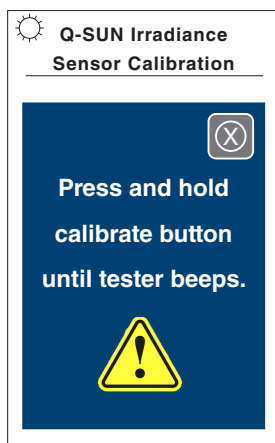
▶ If the button is not held long enough this screen is displayed.

**Q-SUN Irradiance
Sensor Calibration**

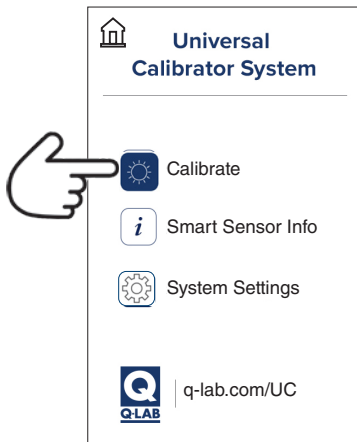**Press and hold
calibrate button
until tester beeps.**

⚠
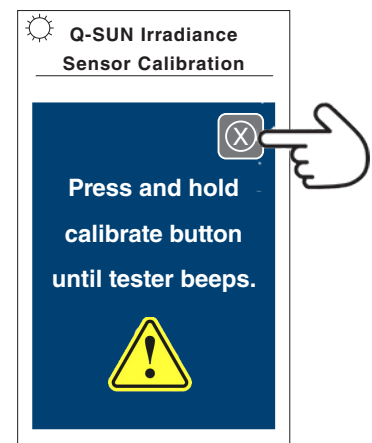
24. Press ⊗ to return to the **Calibrate** screen. Press and hold the #1 button until it turns green.

- A green button is still active for calibration. Just unplug and replug the Smart Sensor to reset the buttons to white.

- Complete the calibration within approximately 5 minutes.

- If you are unable to complete the procedure in this time frame due to interruption, remove the Smart Sensor from the calibration port, wait 5 minutes, and repeat the calibration procedure.

- Never leave the UC20 Smart Sensor in the calibration port for more than 5 minutes.

Q-SUN Irradiance Sensor Calibration

340nm Narrowband

Xe-1

Daylight-Q

0.68 W/m^2/nm @340nm

1

25. Press [home] to display the home screen.

Universal Calibrator System

☀ Calibrate

i Smart Sensor Info

⚙ System Settings

Q·LAB | q-lab.com/UC
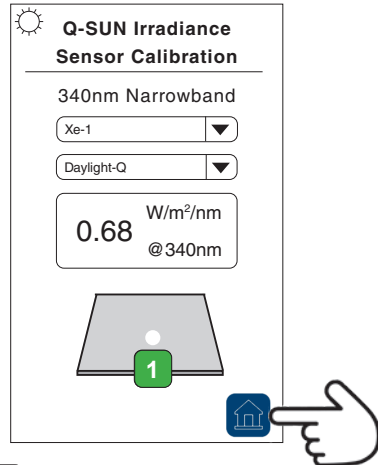
▶ Repeat **Step 23** to make sure that the UC20 Smart Sensor and the Xe-1 actual irradiance values have stabilized.
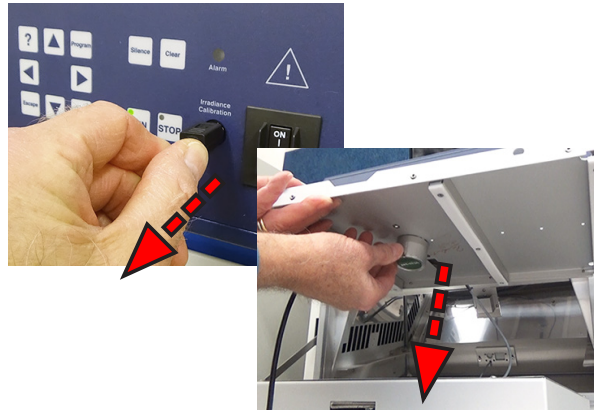
**26.** Disconnect the UC1 from the tester. Remove the UC20 Smart Sensor from the test chamber.

27. Slide the specimen tray into the test chamber. Close the test chamber door. Close the latch.
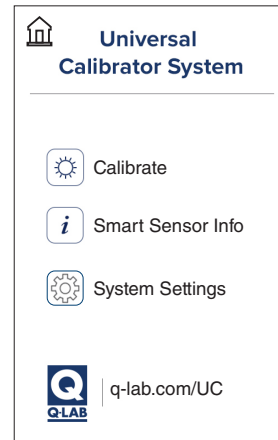

28. Store the UC1 and UC20 in the cases.

Smart Sensor Info and System Settings

Optionally, the UC1 can be used to view Smart Sensor information, select the display language, and set the calibration date. Displays will vary slightly depending on type of Smart Sensor connected.
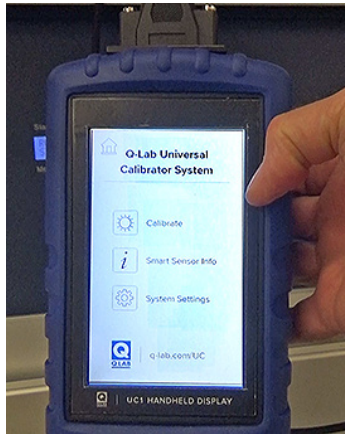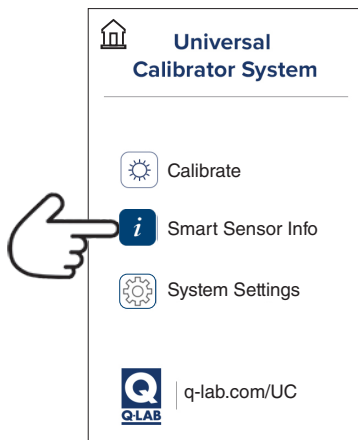

1. Follow **Steps 2 through 7 in Section 12.1.1** to connect the Smart Sensor to the UC1 and UC1 to the tester.
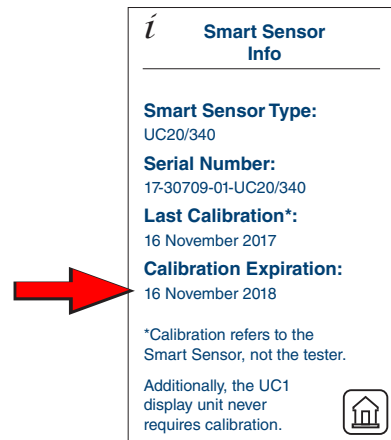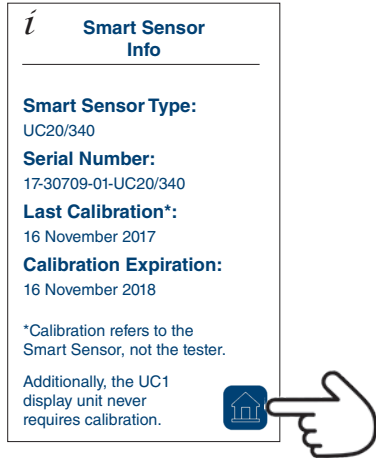

⌂ **Universal Calibrator System**

☼ Calibrate

i Smart Sensor Info

⚙ System Settings

Q·LAB q-lab.com/UC

UC1 Screen Display

▶ The UC1 "home" screen is displayed.

⌂ **Universal Calibrator System**

☼ Calibrate

i Smart Sensor Info

⚙ System Settings

Q·LAB q-lab.com/UC

2. Press *i* to display Smart Sensor data.

i **Smart Sensor Info**

Smart Sensor Type:
UC20/340
Serial Number:
17-30709-01-UC20/340
Last Calibration*:
16 November 2017
Calibration Expiration:
16 November 2018

*Calibration refers to the Smart Sensor, not the tester.

Additionally, the UC1 display unit never requires calibration. ⌂

▶ Smart Sensor Info is displayed.
IMPORTANT: Notice the calibration expiration date.

i **Smart Sensor Info**

Smart Sensor Type:
UC20/340
Serial Number:
17-30709-01-UC20/340
Last Calibration*:
16 November 2017
Calibration Expiration:
16 November 2018

*Calibration refers to the Smart Sensor, not the tester.

Additionally, the UC1 display unit never requires calibration.

3. Press 🏠.

Universal Calibrator System

☼ Calibrate

i Smart Sensor Info

⚙ System Settings

Q·LAB | q-lab.com/UC

▶ The home screen is displayed.

Universal Calibrator System

☼ Calibrate

i Smart Sensor Info

⚙ System Settings

Q·LAB | q-lab.com/UC

4. Press ⚙.

System Settings

Select Language
[English ▼]

Set Date
Month [February ▼]
Day [15]
Year [2018]

Software Version 1.000

▶ The system settings are displayed. Use this screen to select language and set the date.

System Settings

Select Language
[English]

Set Date
Month [February ▼]
Day [15]
Year [2018]

Software Version 1.000
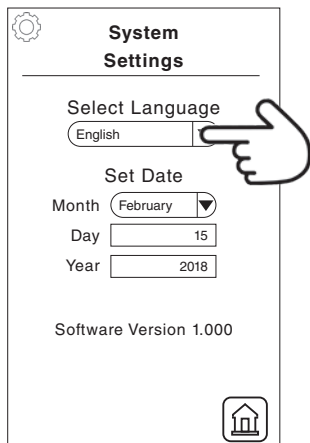
5. Press the Select Language box.

System Settings

Select Language
[English ▼]
English
French
M Spanish
German
Italian
Chinese
Japanese
Korean

Software Version 1.000
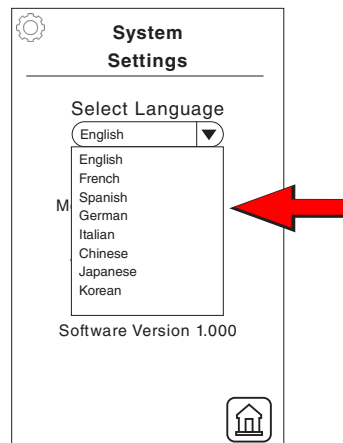
▶ The language list is displayed.

System Settings

Select Language

English ▼

English
French
Spanish
German
Italian
Chinese
Japanese
Korean

Software Version 1.000
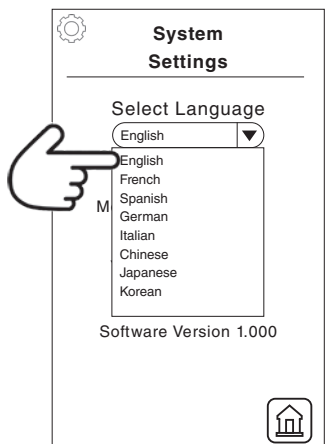
6. Press to select a language from the list.

System Settings

Select Language

English ▼

Set Date

Month February ▼
Day   15
Year   2018

Software Version 1.000

► The selected language is displayed.

System Settings

Select Language

English ▼

Set Date

Month February
Day   15
Year   2018

Software Version 1.000

7. Press the month box.

System Settings

Select Language

English ▼

Set Date

Month February ▼
Day
Year

January
February
March
April
May
June
July
August
September

Softwa   00
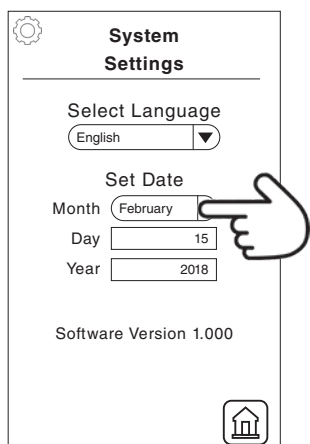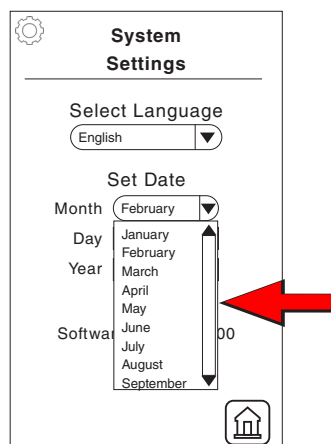
► The month list is displayed.

System Settings

Select Language

English ▼

Set Date

Month February ▼
Day
Year

January
February
March
April
May
June
July
August
September

Softwa   00
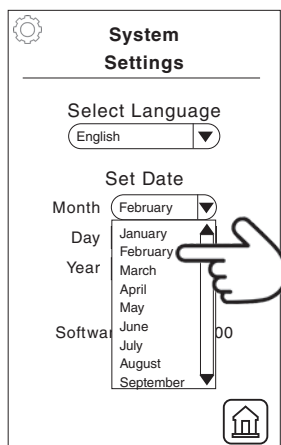
8. Press to select the month.

System Settings

Select Language

English ▼

Set Date

Month February
Day   15
Year   2018

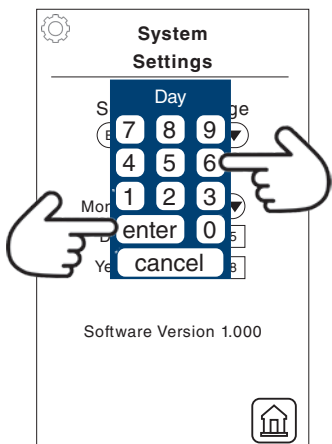Software Version 1.000
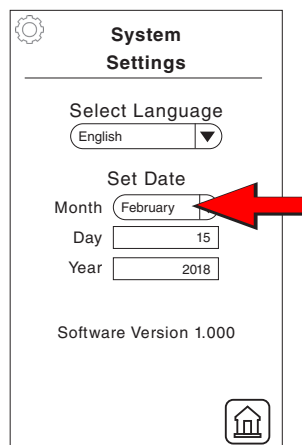
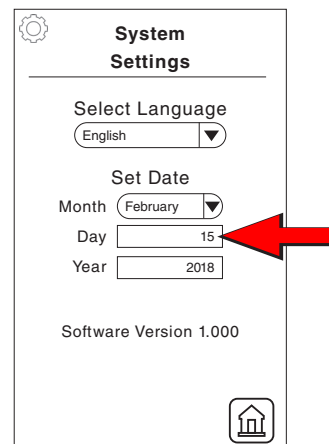► The selected month is displayed.
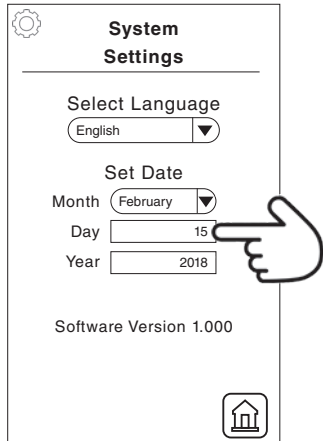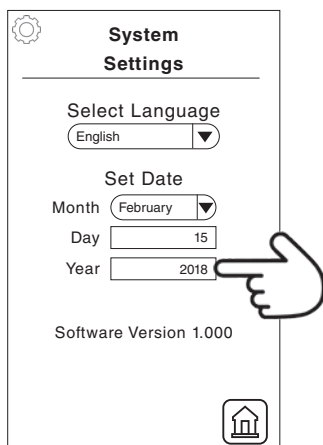
9. Press the day box.
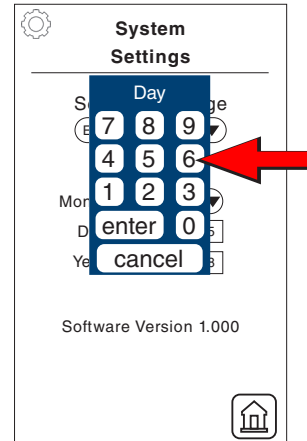
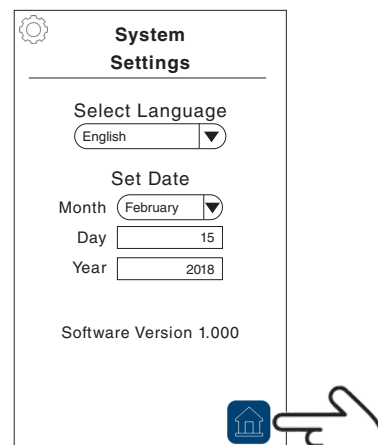▶ The day number pad is displayed.

10. Press the numbers then **ENTER** to set the date.

▶ The selected day is displayed.

**11.** Repeat **Steps 9 and 10** to set the year.

12. Press 🏛 to display the home screen.

## Universal Calibrator System Messages

In addition to the screen displays shown in the procedures above, the UC1 can display several informational messages. Displays will vary slightly depending on type of Smart Sensor connected.
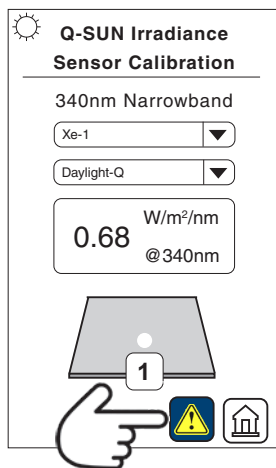
Smart Sensor Calibration Expiration

- When a Smart Sensor is connected to the UC1, the displays shown below alert the user to the need for sensor replacement (or re-calibration) when the calibration expiration date has passed or is less than 90 days in the future.
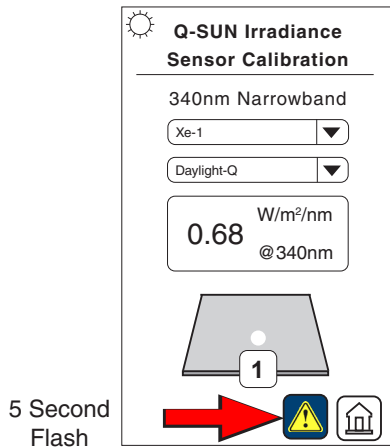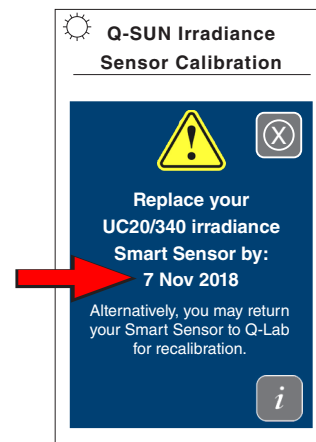

5 Second Flash

▶ When Smart Sensor replacement is due in 30- 90 days this attention icon will display and flash every 5 seconds.
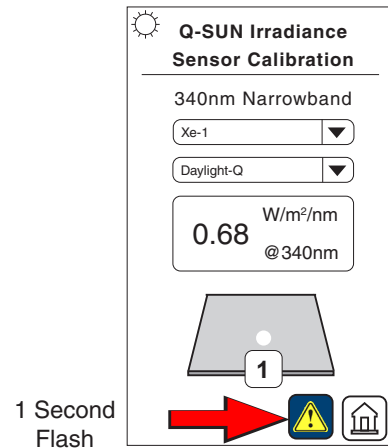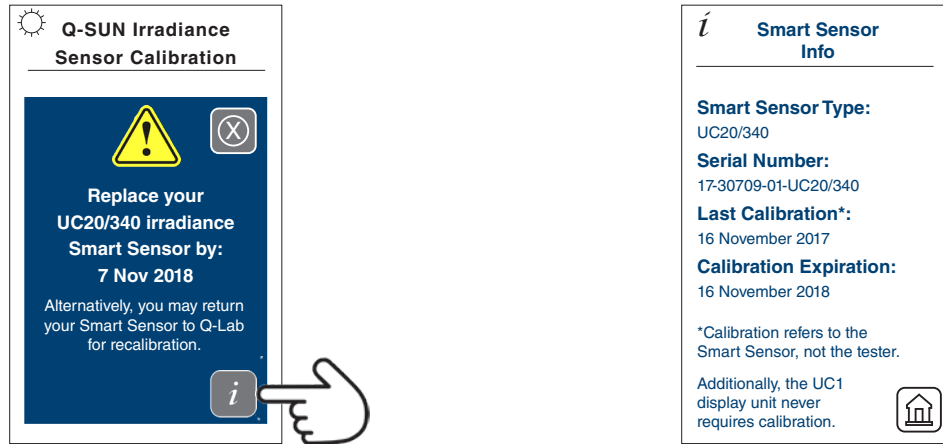

1 Second Flash

▶ When Smart Sensor replacement is due in less than 30 days or has passed this attention icon will display and flash every 1 second.

▶ Press ⚠

▶ This screen displays the Smart Sensor replacement date.

▶ Press [i] to display the **Smart Sensor Info** screen.

▶ Smart Sensor Info screen.

- Normally when the calibration expires, the Smart Sensor should be disposed of and a new one purchased from Q-Lab.
- The old sensor can be re-calibrated, however the cost of a new sensor is generally less than the cost of sending the old sensor back to Q-Lab for recalibration and receiving it after calibration.
- Some customers may still want to have the sensor recalibrated. In this case two options are available:
  - o Q-Lab will recalibrate and return the sensor along with a new calibration certificate.
  - o Q-Lab will recalibrate and dispose of the sensor. A new calibration certificate will be returned to the customer to document the "as received" and "after calibration" values.
- Replacement Parts, Section 16, lists part numbers for ordering sensor replacement or re-calibration.
- Contact Q-Lab Repair and Tester Service Section 18 for more information.

UC1 Battery Low

- If the UC1 battery is low, the screen below will be displayed over the Home or Calibrate screen every time the unit is connected to the tester.
- The UC1 can work without a battery since it's powered by the tester. However, the date will not be stored and calibration alerts will not be displayed.
- Replace the battery with part number V-4086. See Replacement Parts, Section 16.
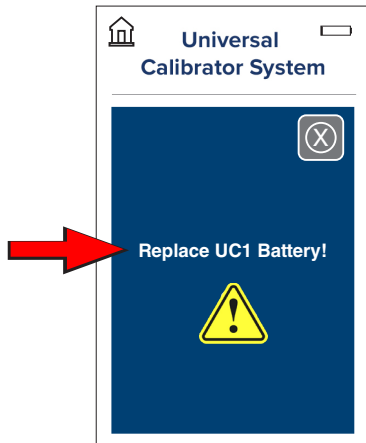
▶ Replace UC1 battery screen.
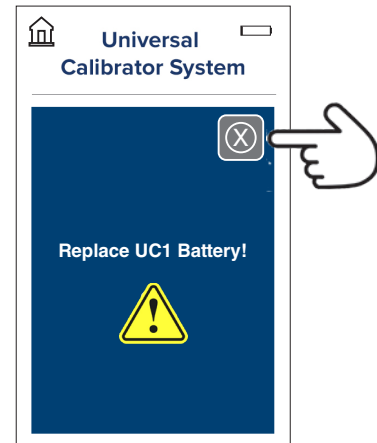
▶ Press ⊗ to return to **Home** or **Calibrate** screen.

11.1.2 Using the CR20 Calibration Radiometer (Feb 2022)

Overview

- The CR20 radiometer measures irradiance in units of watts per square meter (W/m^2).
- The CR20 comes with a 340 nm, 420 nm, or TUV (300-400 nm) sensor (Figure 11.1.2a and Figure 11.1.2b).
- When the Q-SUN is powered on, the sensor type is displayed on the control panel (Figure 11.1.1c).
- If the CR20 sensor does not match the sensor in the Xe-1, an alarm will sound and the M33 error message indicating the correct sensor will be displayed.

⚠️ **Use the Calibration Radiometer shown below to match the UV filter and sensor installed in the Q-SUN tester.**

UV Optical Filter	CR20 for 340 nm Sensors	CR20 for 420 nm Sensors	CR20 for TUV Sensor
EXTENDED UV - Q/B	CR20/340/QB		
EXTENDED UV - Quartz	CR20/340/QZ		
DAYLIGHT - Q	CR20/340/D		
DAYLIGHT - F	CR20/340/BBF		
DAYLIGHT - B/B	CR20/340/BBF	CR20/420	CR20/TUV
WINDOW - Q	CR20/340/W		
WINDOW - B/SL	CR20/340/BSL		
WINDOW – SF5	Not Available		
WINDOW - IR	Not Available		CR20/TUV/IR
UV BLOCKING	Not Available	Not Available	Not Available

Figure 11.1.2a: CR20 for Xe-1 Optical Filter/Sensor Combinations
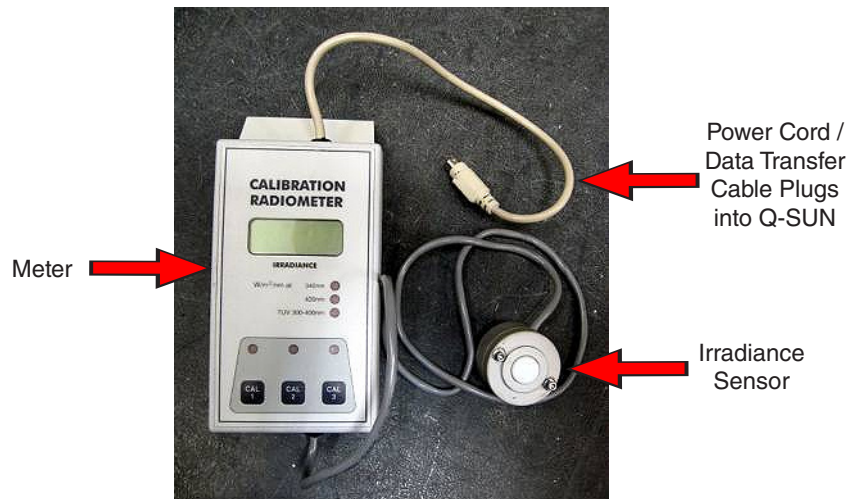

Figure 11.1.2b: CR20 Components
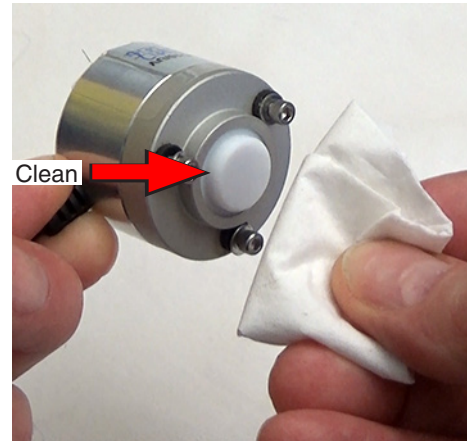
CR20/lux Calibration Radiometer

- A special CR20 is available to measure luminance in the units of lux.
- The CR20/lux meter requires 420 nm sensors in the Q-SUN.

Irradiance Calibration Procedure

- Calibrate the Q-SUN in a light cycle and at normal operating temperature and irradiance.

- Calibrate with test specimens in place.

- Irradiance calibration should always be done before black panel calibration.

- Do not calibrate the irradiance sensor during a dark step.
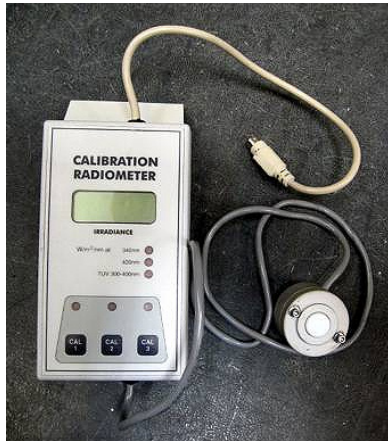
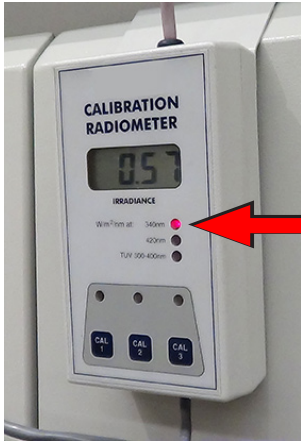**1.** Remove the CR20 calibration radiometer from the case.

4. Clean the sensor face with 99% isopropyl alcohol and a soft cloth.

**2.** Hang the CR20 radiometer from the door as shown.

3. Plug the CR20 into the irradiance calibration port on the Q-SUN control panel.

If the CR20 (340 nm, 420 nm or TUV) sensor does not match the sensors in the Q-SUN, an error message will appear and calibration will not be performed. The controller, however, DOES NOT identify a mismatched filter and sensor combination (See Figure 11.1.2a).

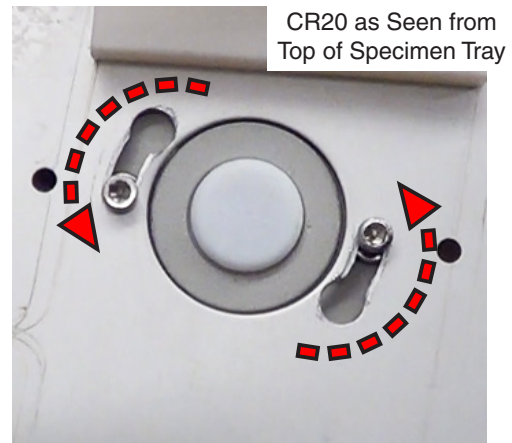**5.** The CR20 will indicate which wavelength is being measured.
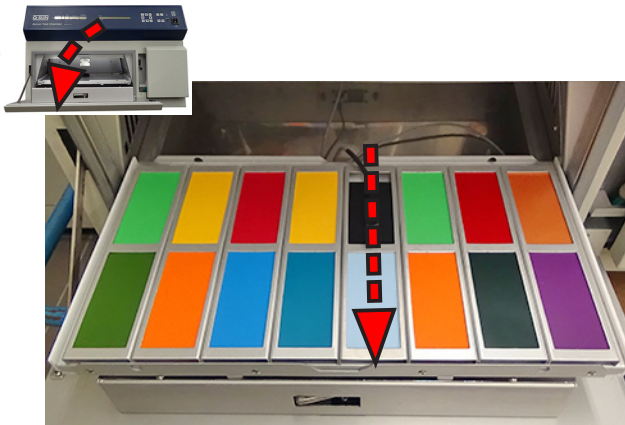
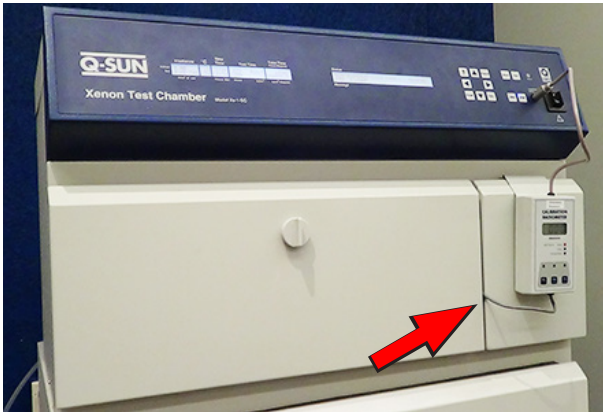**6.** Open the test chamber door. Pull the specimen tray out.

7. Locate the calibration port in the specimen tray.

8. Lift the specimen tray. From the bottom of the tray insert the CR20 face-up into the calibration port.

CR20 as Seen from Top of Specimen Tray

9. Rotate the CR20 to lock it in to the calibration port.

10. Close the chamber door with the CR20 UV detector cord routed out of the chamber. Keep the cord away from the door latch.

Running Light Step

	Irradiance		°C
Actual:	0.68		70
Set:	0.68	340	70
	W/m² @ nm		

11. Run the Xe-1 in a Light Step. Make sure the black panel temperature and the irradiance are at the normal operating set points.

12. Hold down the CR20's "CAL 1" button until the Channel 1 calibration light flashes. The CR20 value is transferred to the Q-SUN controller.

13. Once the actual irradiance reaches the set point, look at the CR20 value. If the value does not match the Q-SUN irradiance display, push the "CAL" button again. Repeat until all irradiance values match.

- Complete the calibration within approximately 5 minutes.

- If you are unable to complete the procedure in this time frame due to interruption, remove the Smart Sensor from the calibration port, wait 5 minutes, and repeat the calibration procedure.

- Never leave the CR20 calibration radiometer in the calibration port for more than 5 minutes.

11.2 Black Panel Calibration

11.2.1 Using the Universal Calibrator System (Feb 2022)

Overview

The black panel temperature sensor should be recalibrated every six months and whenever the black panel, UV filters, UV sensor, or test cycle conditions are changed.

- The Universal Calibrator (UC) System includes the UC1 handheld display unit and a UC202/BP or UC202/IBP, Temperature Smart Sensor (Figure 11.2.1a through Figure 11.2.1c).
- The UC1 is a display and interface unit only – it cannot be calibrated.
- The UC202 Temperature Smart Sensor must match the type of black panel temperature sensor in the Q-SUN.
  - o Use the UC202/BP with uninsulated black panel (also known as "black panel"), Figure 11.2.1b.
  - o Use the UC202/IBP with insulated black panel (also known as "black standard"), Figure 11.2.1c.
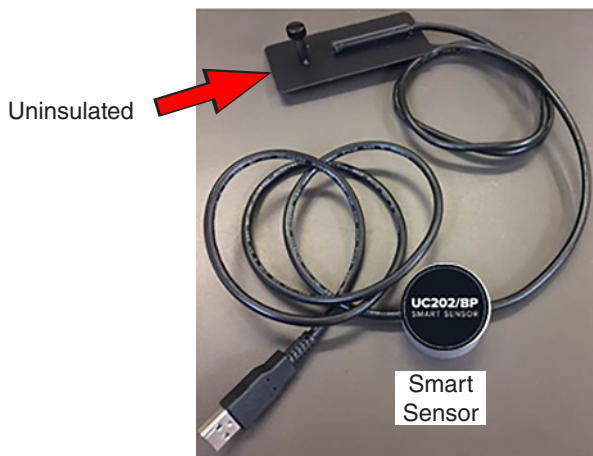

Figure 11.2.1a: UC1 Handheld Display Unit

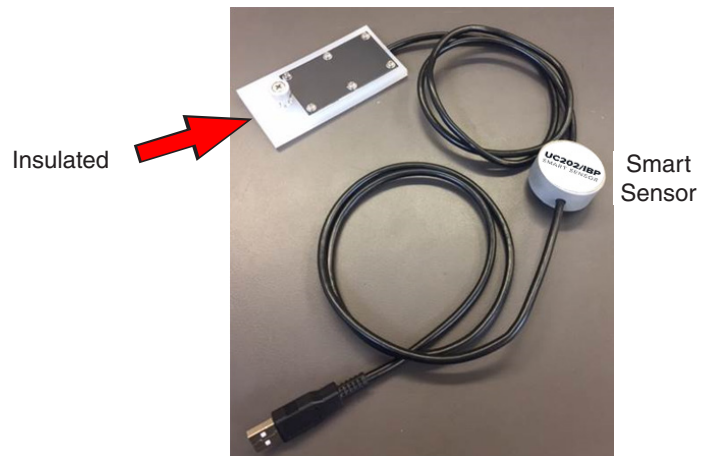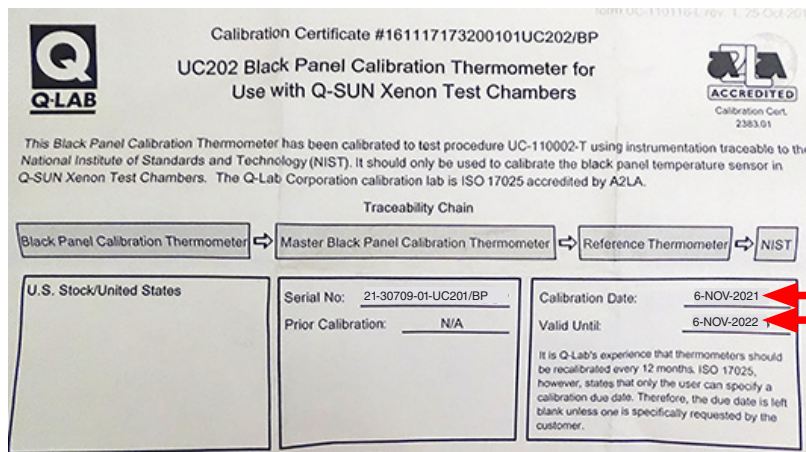Figure 11.2.1b: UC202/BP Temperature Smart Sensor with Uninsulated Black Panel (Black Panel)
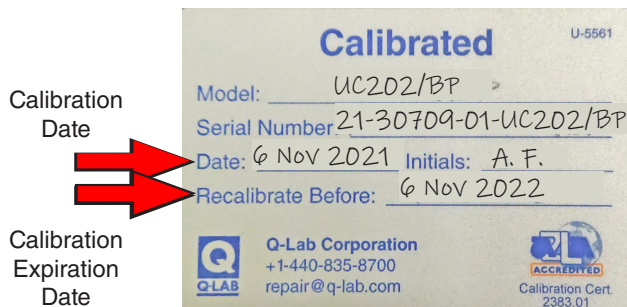
Figure 11.2.1c: UC202/IBP Temperature Smart Sensor with Insulated Black Panel (Black Standard)

- Smart Sensors are calibrated at Q-Lab and the calibration date is stored in the Smart Sensor.
- Calibration information is on the sensor calibration certificate and on a Smart Sensor case label (Figure 11.2.1d and Figure 11.2.1e).
- The calibration information can also be displayed on the UC1 when the Smart Sensor is connected (Figure 11.2.1e).
- Upon calibration expiration, the Smart Sensors should be discarded and replaced with an inexpensive new sensor. See the Replacement Parts List, Section 16.
- Optionally, Smart Sensors can be returned to Q-Lab for recalibration. Contact Q-Lab Repair and Tester Support for more information.
- A single UC1 display unit can be used with all Q-Lab Smart Sensors to calibrate Q-SUN (as well as Q-Lab QUV) testers.
- The UC1 is connected to and receives power from the tester calibration (DIN) port.
- Revisions to the UC1 software may periodically be available. See Section 14.8 for more information.
- Q-SUN testers can also be calibrated with the CT202 calibration thermometer (see Section 11.2.2).
- See Section 14.8 for additional information on Universal Calibrator System displays and messages.
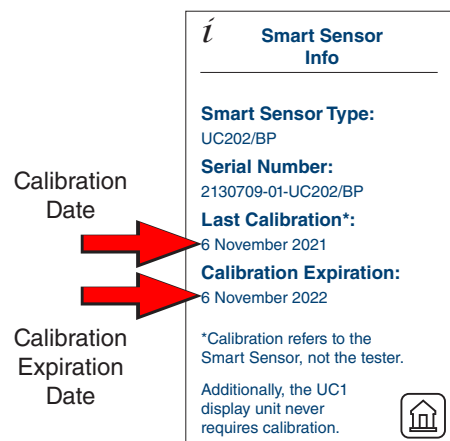
Figure 11.2.1d: UC202 Calibration Certificate

Figure 11.2.1e: UC202 Temperature Smart Sensor Calibration Label on Case

Figure 11.2.1f: Temperature Smart Sensor Calibration Information on UC1 Display

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Calibration Procedure

- The Q-SUN black panel and UC202 black panel should be mounted the same way the Q-SUN black panel will be mounted during testing.
    - o If the black panel will be attached to the specimen tray during testing, then both the onboard and calibration black panels should be attached to the specimen tray during calibration.
    - o If the black panel will be mounted in a specimen holder during testing, then both the onboard and calibration black panels should be mounted in a specimen holder during calibration.
- Special insulated black panel and UC202/IBP insulated black panel holders are available in specimen holder kit X-10113-K.
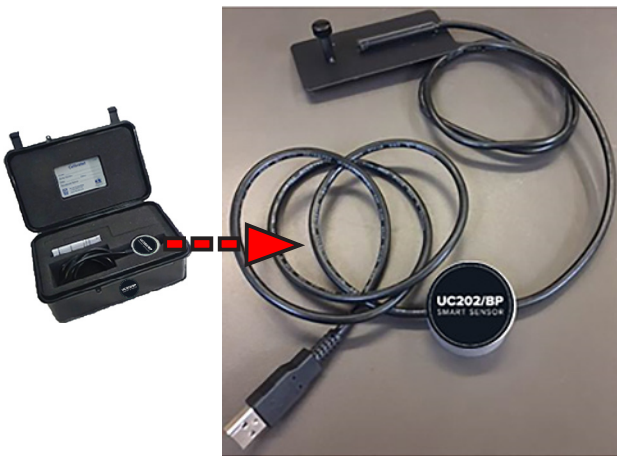

Running Light Step

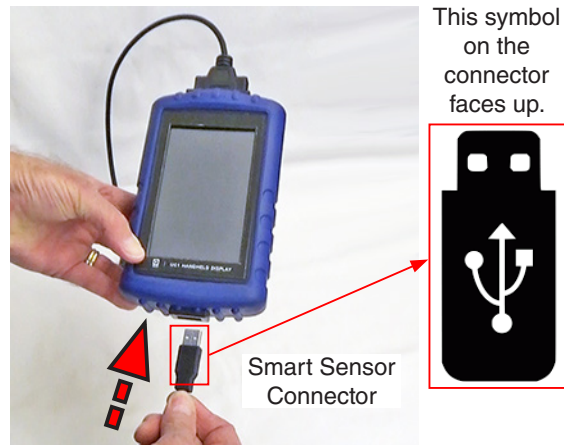|	Irradiance		°C
Actual:	0.68		70
Set:	0.68	340	70
	W/m² @ nm		

1. Run the Xe-1 in a Light Step. Make sure the black panel temperature and the irradiance are at the normal operating set points.

2. Remove the UC1 display unit from the case.
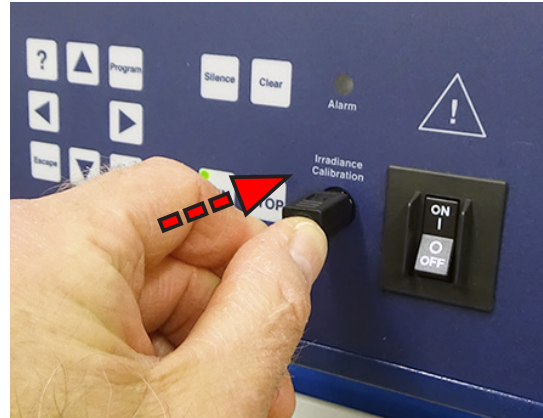
**3.** Remove the UC202 Temperature Smart Sensor from the case.

This symbol on the connector faces up.

Smart Sensor Connector

4. Plug the UC202 Smart Sensor USB connector into the USB port on the bottom of the UC1.
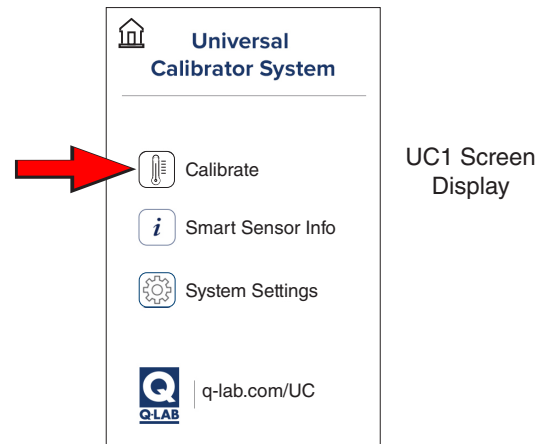
Calibration Port

**5.** Locate the irradiance calibration port on the Xe-1 control panel.

6. Plug the UC1 connection cable into the calibration port on the Xe-1 control panel. The UC1 gets power from the calibration port.

7. When connected to the Xe-1 the UC1 display unit home screen will appear.

UC1 Screen Display
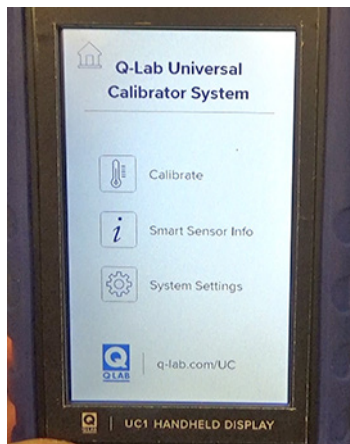
▶ The UC1 "home" screen showing the calibrate icon when a Temperature Smart Sensor is connected.
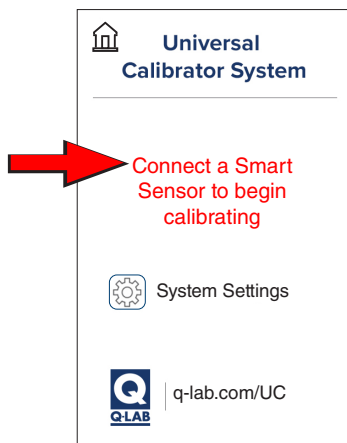
▶ The UC1 "home" screen when a Smart Sensor is not connected. Connect Smart Sensor as in **Step 4**
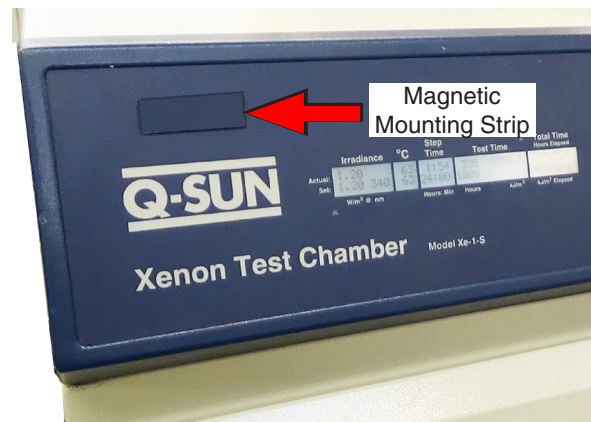
Magnetic Mounting Strip

8. Locate the UC1 magnetic mounting strip on the Xe-1 control panel. Older models will not have this strip. A retrofit kit (UC-110067-K) is available.

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Magnet

9. The UC1 unit has a magnet on the back.

10. When performing calibrations, the UC1 can be held in place by the magnetic mounting strip.
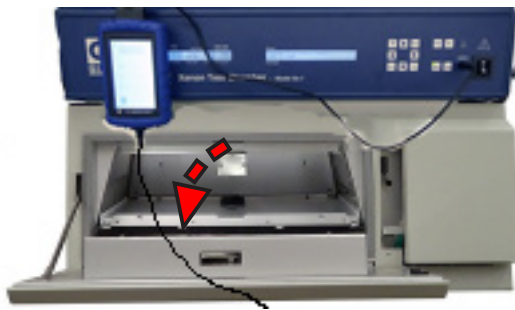

11. Open the Xe-1 Chamber door. Pull out the specimen tray.

Q-SUN Uninsulated Black Panel

UC202/BP Uninsulated Black Panel
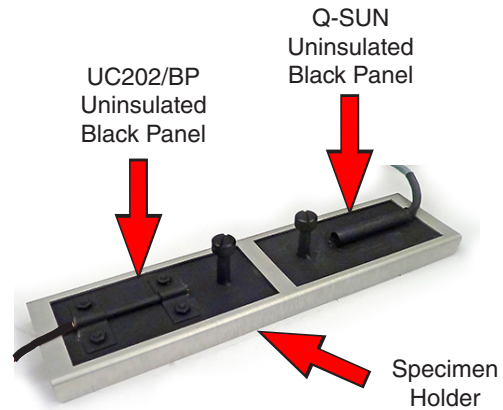
Specimen Holder

12. If specimens and Q-SUN Uninsulated Black Panel are in holders, mount UC202/BP in a holder.

Q-SUN Insulated Black Panel

UC202/IBP Insulated Black Panel

Special Insulated Black Panel Holders
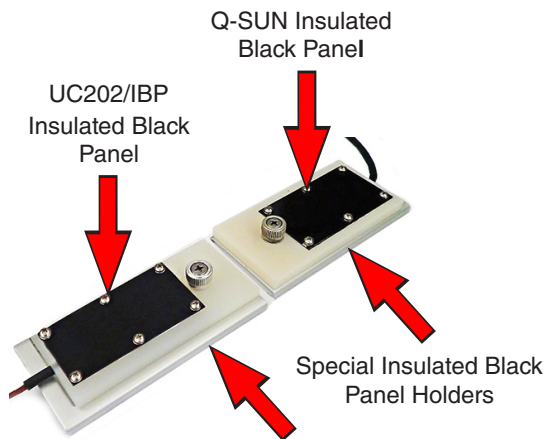
13. If specimens and Q-SUN Insulated Black Panel are in holders, mount UC202/IBP in a holder.

14. Place Q-SUN and UC202 black panels in holders on the tray with specimens in holders.

15. Or place Q-SUN and UC202 black panels directly on the specimen tray with specimens on the tray.

Keep This Circular
Housing Out of
the Test Chamber

16. Push the specimen tray into the chamber. Close the door. Keep the sensor cord away from the door latch.
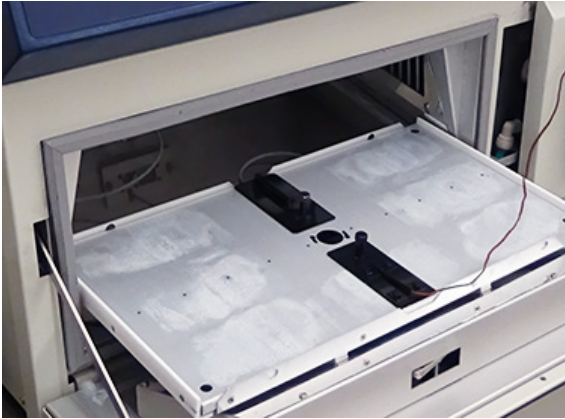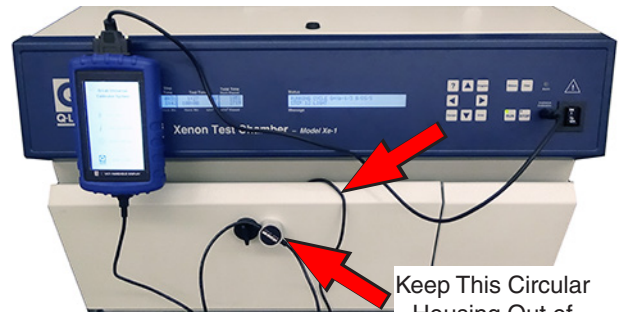

**Universal
Calibrator System**

Calibrate

i Smart Sensor Info

System Settings

q-lab.com/UC

17. Press [sensor] on the UC1 display.

**Q-SUN Temperature
Sensor Calibration**

Uninsulated Black Panel

70.0 ° C

▶ The black panel temperature is displayed.

**Q-SUN Temperature
Sensor Calibration**

Uninsulated Black Panel

70.0 ° C
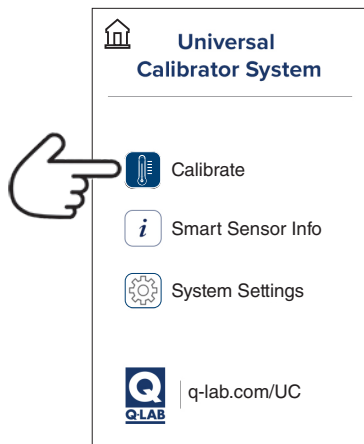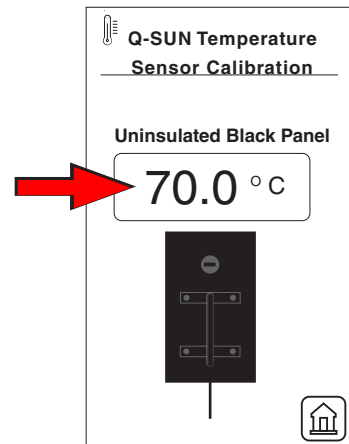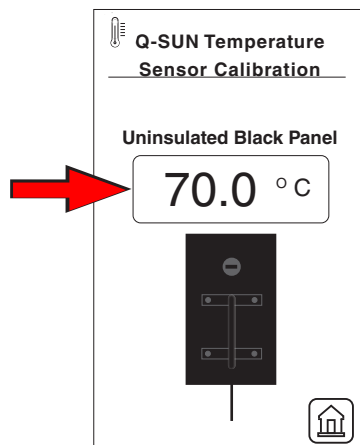
18. The black panel temperature is displayed on the UC1.

The UC202 temperature must be entered into the Q-SUN controller using the control panel keypad.

19. Go to Section 11.4 for instructions on entering the temperature into the Q-SUN controller.

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11.2.2 Using the CT202 Calibration Thermometer (Feb 2018)

Overview

The black panel temperature sensor should be recalibrated every six months with a CT202 calibration thermometer and whenever the black panel, UV filters, UV sensor, or test cycle conditions are changed.

- Use the CT202/BP with uninsulated black panel (also known as "black panel"), Figure 11.2.2a.
- Use the CT202/IBP with insulated black panel (also known as "black standard") Figure 11.2.2b.
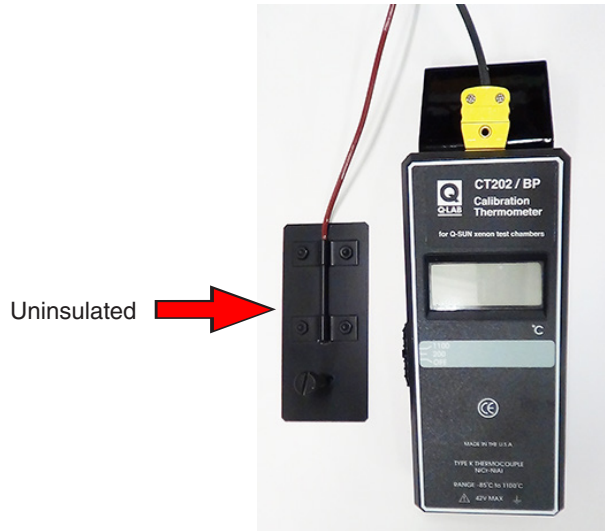
Figure 11.2.2a: CT202/BP Calibration Thermometer with Uninsulated Black Panel
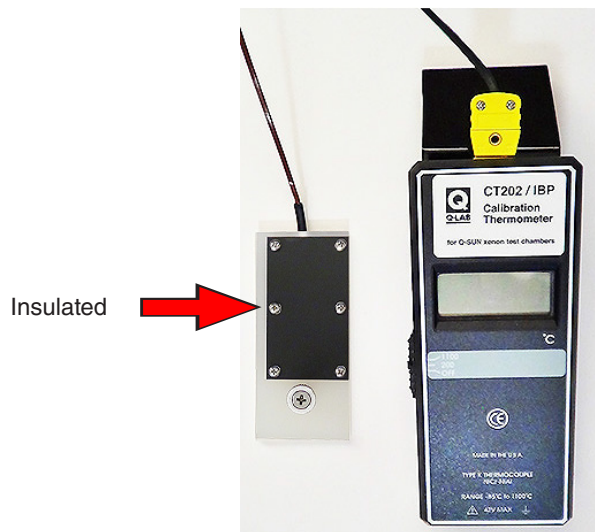
Figure 11.2.2b: CT202/IBP Calibration Thermometer with Insulated Black Panel

Calibration Procedure

- The Q-SUN black panel and CT202 black panel should be mounted the same way the Q-SUN black panel will be mounted during testing.
  - o If the black panel will be attached to the specimen tray during testing, then both the onboard and calibration black panels should be attached to the specimen tray during calibration.
  - o If the black panel will be mounted in a specimen holder during testing, then both the onboard and calibration black panels should be mounted in a specimen holder during calibration.
- Special insulated black panel and CT202 insulated black panel holders are available in specimen holder kit X-10113-K.

Running Light Step

	Irradiance		°C
Actual:	0.68		70
Set:	0.68	340	70
	W/m² @ nm		
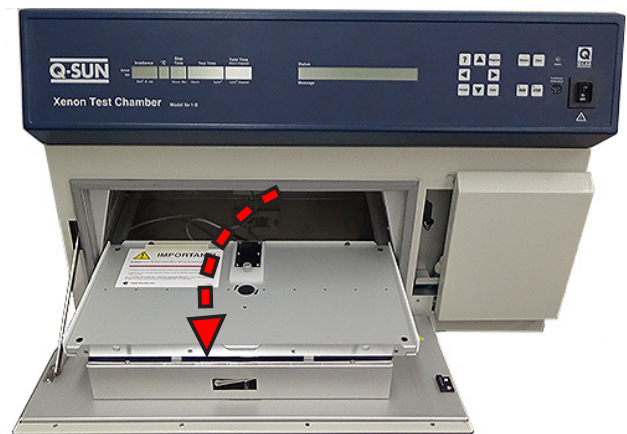
1. Run the Xe-1 in a Light Step. Make sure the black panel temperature and the irradiance are at the normal operating set points.

2. Open the Xe-1 Chamber door. Pull out the specimen tray.

3. Remove the CT202 from the case.

Q-SUN Uninsulated Black Panel

CT202/BP Uninsulated Black Panel
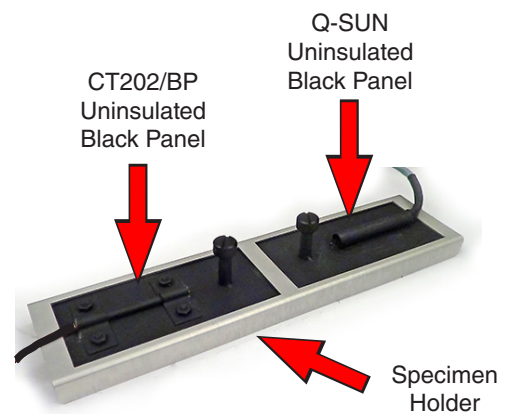
Specimen Holder

4. If specimens and Q-SUN Uninsulated Black Panel are in holders, mount the CT202/BP in a holder.

CT202/IBP Insulated Black Panel

Q-SUN Insulated Black Panel

Special Insulated Black Panel Holders
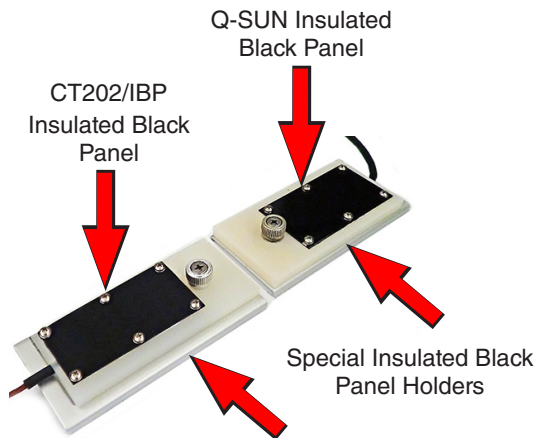
5. If specimens and Q-SUN Insulated Black Panel are in holders, mount CT202/IBP in a holder.

6. Place Q-SUN and CT202 black panels in holders on the tray with specimens in holders.

7. Or place Q-SUN and CT202 black panels directly on the specimen tray with specimens on the tray.
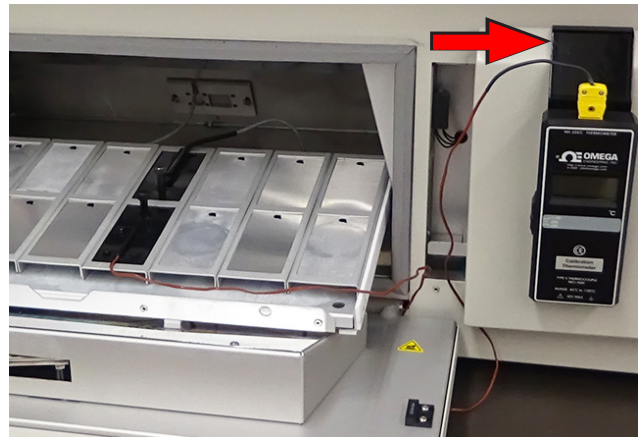

8. Hang the CT202 on the Xe-1 plumbing door.

9. Close the chamber door. Make sure the CT202 cable is not crimped.

10. Turn the CT202 **ON** to the 200 mark.
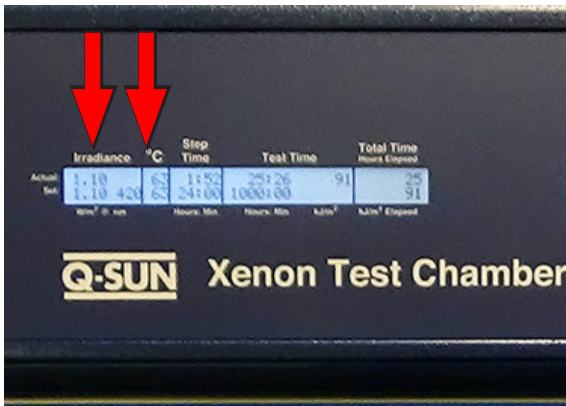
11. Allow the Q-SUN to stabilize at the irradiance and temperature set points.

12. The black panel temperature is displayed on the CT202.

The CT202 temperature must be entered into the Q-SUN controller using the control panel keypad.

13. Go to Section 11.4 for instructions on entering the temperature into the Q-SUN controller.

11.3 Chamber Air Temperature (CAT) Sensor Calibration (Feb 2022)

- A chamber air temperature sensor is optional for the Q-SUN Xe-1-B model.
- The chamber air temperature sensor should be calibrated every 6 months.
- The following tools are needed to calibrate the chamber air temperature sensor:
  - o Calibrated reference thermometer
  - o Insulated container
  - o Hot water
- Q-Lab offers an optional Temperature Calibration Kit, U-41085-K (see Figure 16aa) which includes an easy-to-use insulated container.
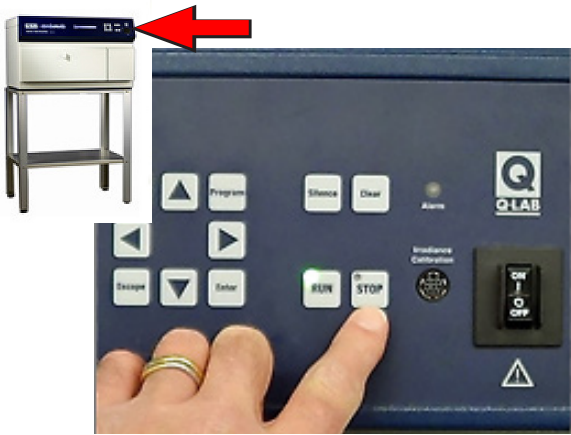
1. Press **STOP**.
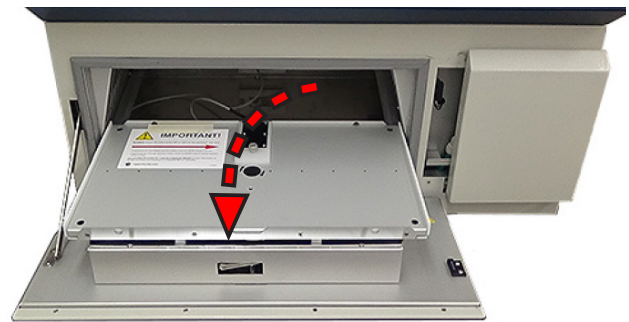
2. Open the test chamber door.

3. Locate the air temperature sensor mounted on the grill in the left side of the chamber.
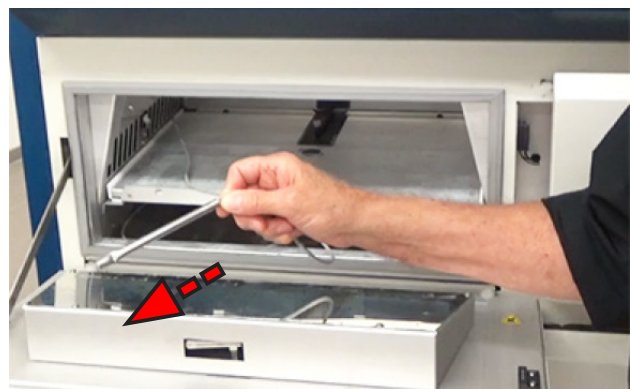
4. Lift the sensor out of the clip and carefully pull the sensor and cable out to the front of the machine.

The Water Should be at Approximately
the Same Temperature as the
Chamber Air Temperature Set Point.

5. Fill an insulated container with water of approximately the same temperature to which the chamber air temperature will be set.

Reference Thermometer Probe

Chamber Air Temp Sensor
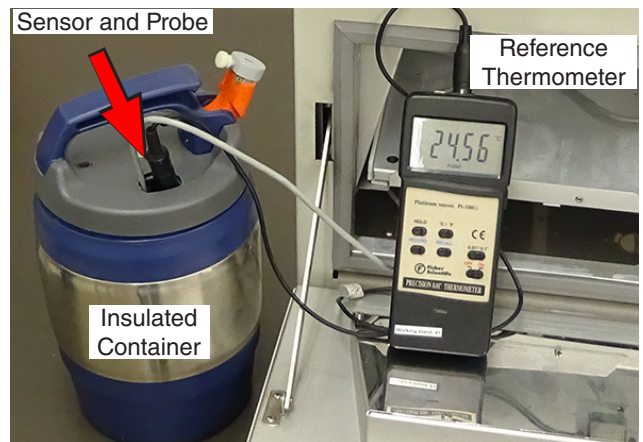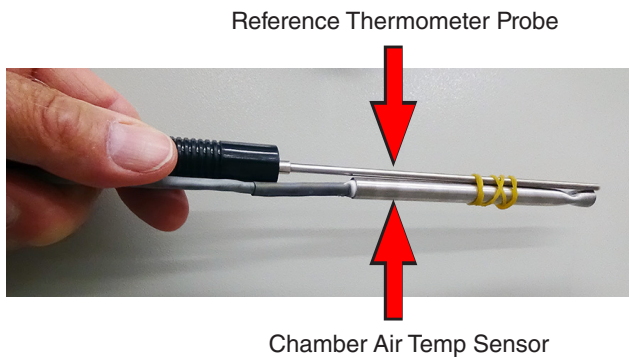
6. Tie the chamber air temperature sensor and the reference thermometer probe together using string or a rubber band.

Sensor and Probe

Reference Thermometer

Insulated Container

7. Place the probes into the container of water and stir the water frequently.

10 min

The CAT temperature must be entered into the Q-SUN controller using the control panel keypad.

8. Wait 10 minutes for the sensors to stabilize.

9. Go to Section 11.4 for instructions on entering the temperature into the controller.

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11.4 Entering Temperature Calibration Values (Feb 2018)

Status

P1 SET TEST DURATION

Message
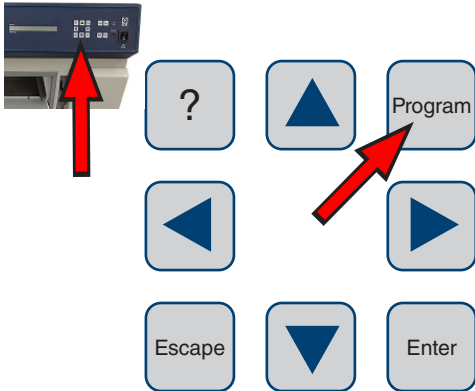
1. Press **PROGRAM** on the Xe-1 control panel keypad.
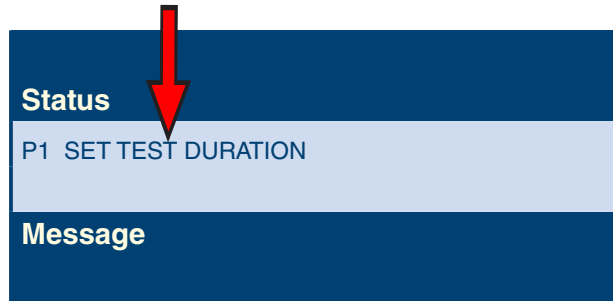
▶ **P1 SET TEST DURATION** is displayed.

Status

P4 CALIBRATE TEMPERATURE SENSORS

Message
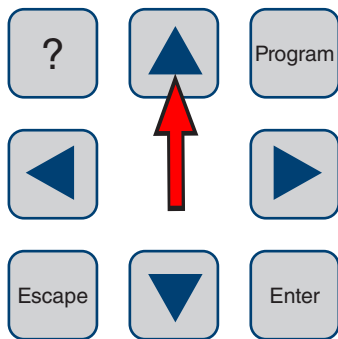
2. Press **UP ARROW** repeatedly to select **P4.**
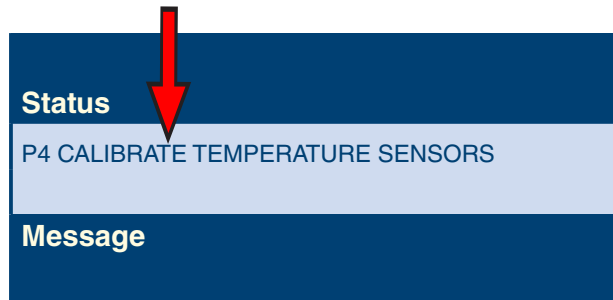
▶ **P4 CALIBRATE TEMPERATURE SENSOR** is displayed.

Status

WHICH SENSOR?   BLACK PANEL

Message
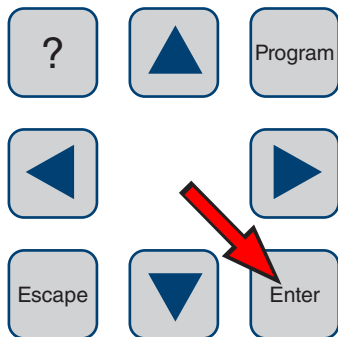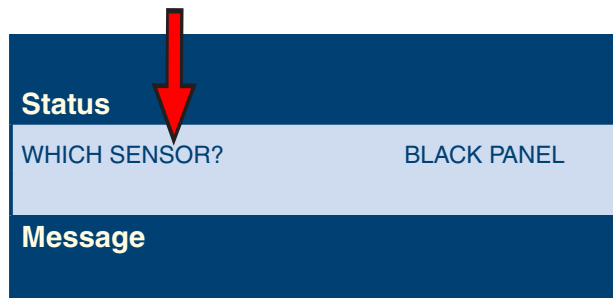
▶ **WHICH SENSOR? BLACK PANEL** is displayed. If calibrating a chamber air sensor, press up or down arrow to display **AIR**.

3. Press **ENTER.**

Status

IS CALIBRATION REFERENCE IN PLACE?

Message
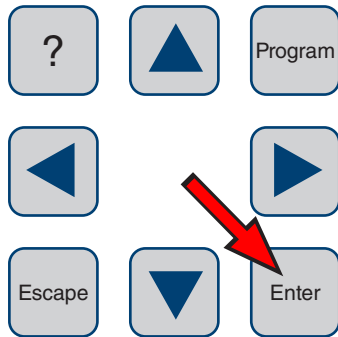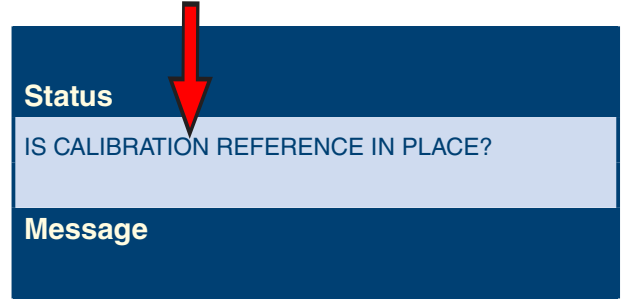
4. Press **ENTER.**

▶ **IS CALIBRATION REFERENCE IN PLACE?** is displayed.

Status

REFERENCE TEMPERATURE =   XX.X

Message
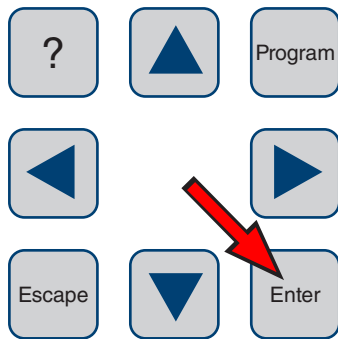
5. Press **ENTER.**
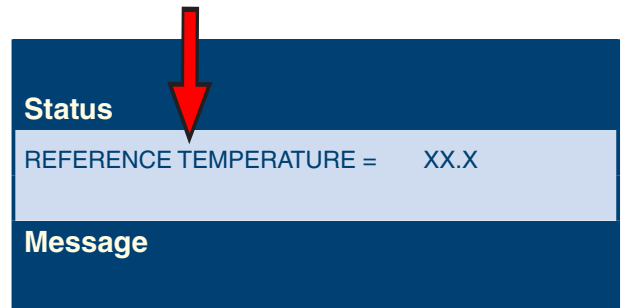
▶ **REFERENCE TEMPERATURE = XX.X** is displayed.

Same as Reference Thermometer

Status

REFERENCE TEMPERATURE =   XX.X

Message

OR
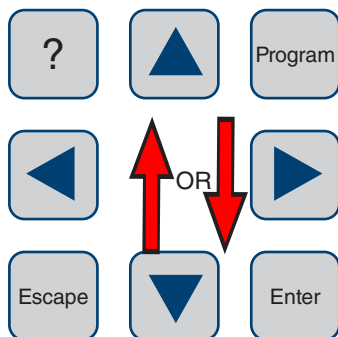
6. Press **UP** or **DOWN ARROWS** until the **REFERENCE TEMPERATURE** matches the temperature displayed on the UC1, CT202 or reference thermometer.
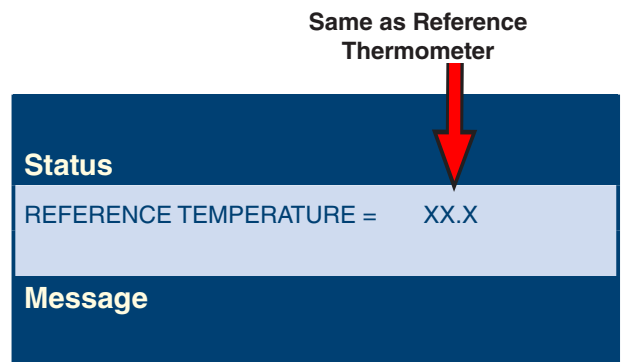
▶ **REFERENCE TEMPERATURE =** same as shown on UC1, CT202, or reference thermometer.

Status

ENTER=ACCEPT CHANGES; ESCAPE=CANCEL
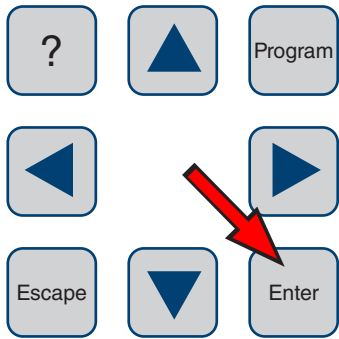
Message

7. Press **ENTER.**

▶ This message is displayed.

Status

SAVING CHANGES

Message
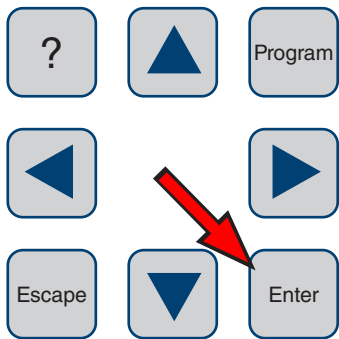
8. Press **ENTER.**
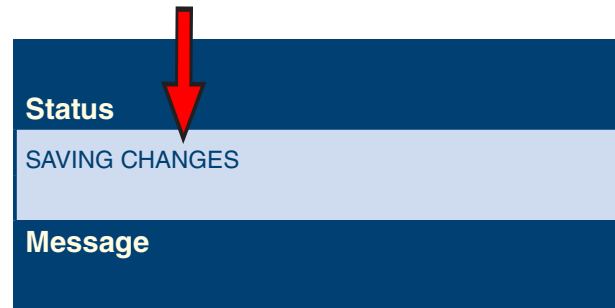
▶ **SAVING CHANGES** is displayed.
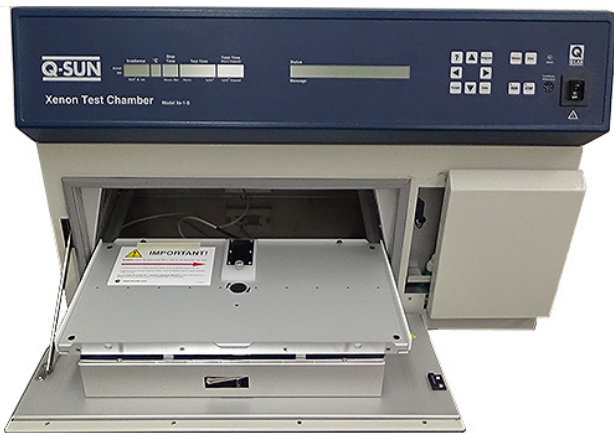
9. Remove the calibration device from the tester.

10. Close the test chamber door. Black panel calibration is complete.

12. Data Logging - VIRTUAL STRIPCHART

- The Q-SUN Xe-1 tester may be connected by Ethernet cable to a computer or a network to continuously log operating information during a test (see Section 12.1).

- VIRTUAL STRIPCHART™ data logging software records operating information automatically.

- A simplified version of VIRTUAL STRIPCHART data in .csv (comma separated value) format can also be exported to a USB drive (see Section 12.4).

- To use VIRTUAL STRIPCHART the tester must be connected to a computer running the Microsoft Windows XP, Vista, Windows 7, Windows 8 or Windows 10 operating system.

- Contact the Q-Lab Repair or Sales department to obtain the VIRTUAL STRIPCHART data logging software and instructions. See Section 18.

- You can also visit our website at www.q-lab.com to register your tester to access additional useful troubleshooting guides, operating manuals, and technical information.

12.1 Connecting the Tester to a Computer (Jan 2018)

- An Ethernet port is located on the bottom left corner of the tester back panel (Figure 13.1a, b).

- Contact Q-Lab Repair for VIRTUAL STRIPCHART software required to read and log data from the Q-SUN Xe-1 tester.

Figure 12.1a: Ethernet Port Location on Rear of Xe-1 Tester

Figure 12.1b: Xe-1 Ethernet Port

12.2 Viewing the Data on the Computer (Nov 2014)

Screen Shots

Figure 12.2a: VIRTUAL STRIPCHART Graphic Display

Q-Panel Virtual Stripchart v. 1.03

File   View   Tools   Connect   Help

XE-3HS CENTER LOG 4-14 to 4-17 2006   Display From: January ▶ 1 ▶   To: December ▶ 31 ▶   Refresh

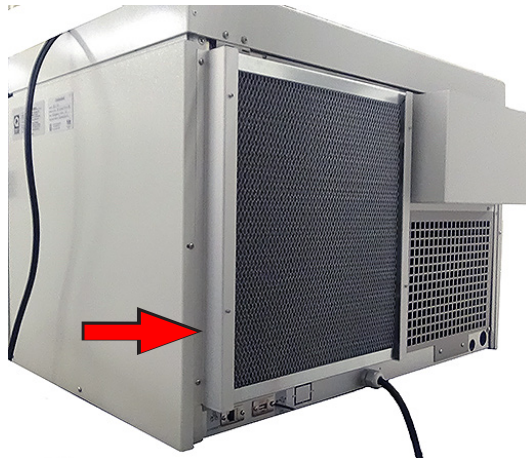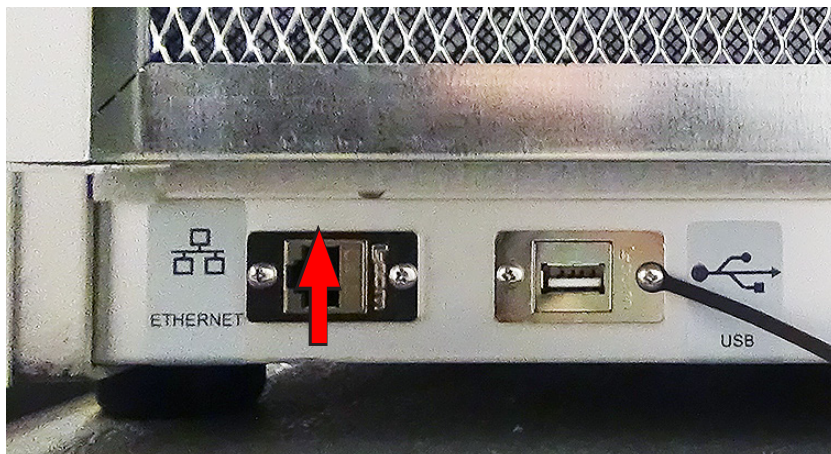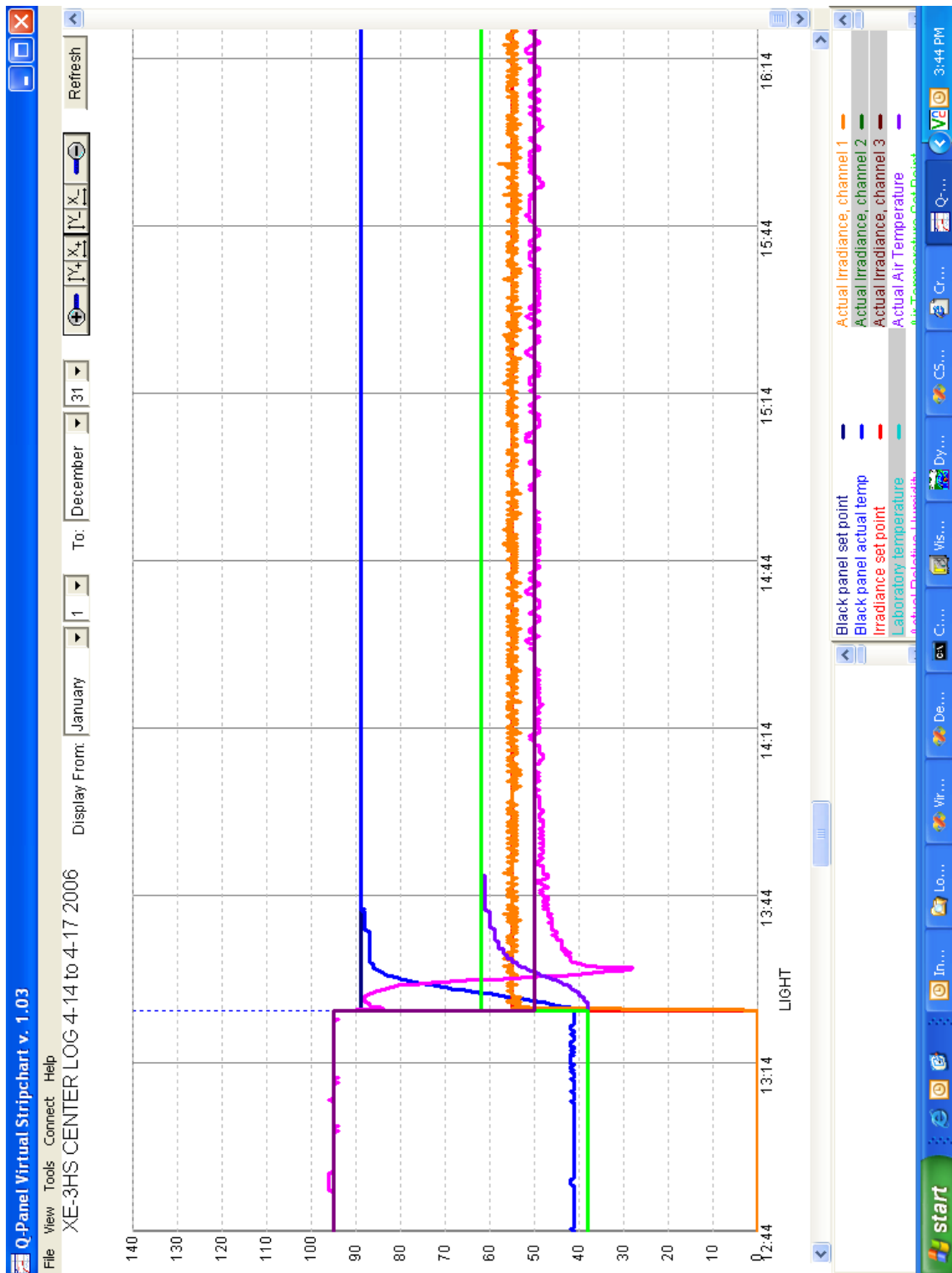| Total Time	Test Time	Time Stamp	Date	Cycle Num	Mode	Step Number	Step Time	Subcyc	Rep	Function	BP Set	BP Temp	Lab Temp	Irrad Set	Irrad 1	Irrad 2	Irrad 3	RH Set
111	111	8:14	4/17/06	F	Run	9	0:0	1		LIGHT	89	30	26	0.55	0.81	0.79	0.85	50
111	111	8:14	4/17/06	F	Run	9	0:0	1		LIGHT	89	31	28	0.55	0.49	0.51	0.51	50
111	111	8:14	4/17/06	F	Run	9	0:0	1		LIGHT	89	32	29	0.55	0.52	0.52	0.54	50
111	111	8:15	4/17/06	F	Run	9	0:0	1		LIGHT	89	34	31	0.55	0.54	0.53	0.55	50
111	111	8:15	4/17/06	F	Run	9	0:0	1		LIGHT	89	35	32	0.55	0.55	0.54	0.54	50
111	111	8:15	4/17/06	F	Run	9	0:1	1		LIGHT	89	36	34	0.55	0.55	0.55	0.53	50
111	111	8:15	4/17/06	F	Run	9	0:1	1		LIGHT	89	38	36	0.55	0.54	0.54	0.55	50
111	111	8:15	4/17/06	F	Run	9	0:1	1		LIGHT	89	39	38	0.55	0.54	0.54	0.54	50
111	111	8:15	4/17/06	F	Run	9	0:1	1		LIGHT	89	41	39	0.55	0.55	0.55	0.56	50
111	111	8:16	4/17/06	F	Run	9	0:1	1		LIGHT	89	43	40	0.55	0.54	0.55	0.54	50
111	111	8:16	4/17/06	F	Run	9	0:1	1		LIGHT	89	44	42	0.55	0.55	0.55	0.56	50
111	111	8:16	4/17/06	F	Run	9	0:2	1		LIGHT	89	46	43	0.55	0.54	0.55	0.55	50
111	111	8:16	4/17/06	F	Run	9	0:2	1		LIGHT	89	47	46	0.55	0.56	0.55	0.55	50
111	111	8:16	4/17/06	F	Run	9	0:2	1		LIGHT	89	49	47	0.55	0.55	0.55	0.55	50
111	111	8:16	4/17/06	F	Run	9	0:2	1		LIGHT	89	51	49	0.55	0.55	0.55	0.55	50
111	111	8:17	4/17/06	F	Run	9	0:2	1		LIGHT	89	52	51	0.55	0.56	0.55	0.54	50
111	111	8:17	4/17/06	F	Run	9	0:2	1		LIGHT	89	54	53	0.55	0.55	0.54	0.56	50
111	111	8:17	4/17/06	F	Run	9	0:3	1		LIGHT	89	55	54	0.55	0.55	0.55	0.55	50
111	111	8:17	4/17/06	F	Run	9	0:3	1		LIGHT	89	57	55	0.55	0.55	0.55	0.55	50
111	111	8:17	4/17/06	F	Run	9	0:3	1		LIGHT	89	59	57	0.55	0.57	0.55	0.54	50
111	111	8:18	4/17/06	F	Run	9	0:3	1		LIGHT	89	60	59	0.55	0.54	0.55	0.55	50
111	111	8:18	4/17/06	F	Run	9	0:3	1		LIGHT	89	62	60	0.55	0.55	0.55	0.56	50
111	111	8:18	4/17/06	F	Run	9	0:4	1		LIGHT	89	63	61	0.55	0.56	0.54	0.55	50
111	111	8:18	4/17/06	F	Run	9	0:4	1		LIGHT	89	65	63	0.55	0.56	0.55	0.56	50
111	111	8:18	4/17/06	F	Run	9	0:4	1		LIGHT	89	66	65	0.55	0.56	0.55	0.56	50
111	111	8:18	4/17/06	F	Run	9	0:4	1		LIGHT	89	67	65	0.55	0.55	0.55	0.55	50
111	111	8:19	4/17/06	F	Run	9	0:4	1		LIGHT	89	69	67	0.55	0.55	0.55	0.54	50
111	111	8:19	4/17/06	F	Run	9	0:5	1		LIGHT	89	70	68	0.55	0.55	0.55	0.55	50
111	111	8:19	4/17/06	F	Run	9	0:5	1		LIGHT	89	72	70	0.55	0.55	0.55	0.55	50
111	111	8:19	4/17/06	F	Run	9		1		LIGHT	89	73	72	0.55	0.56	0.56	0.55	50

Black panel set point
Black panel actual temp
Irradiance set point
Laboratory temperature

Actual Irradiance, channel 1
Actual Irradiance, channel 2
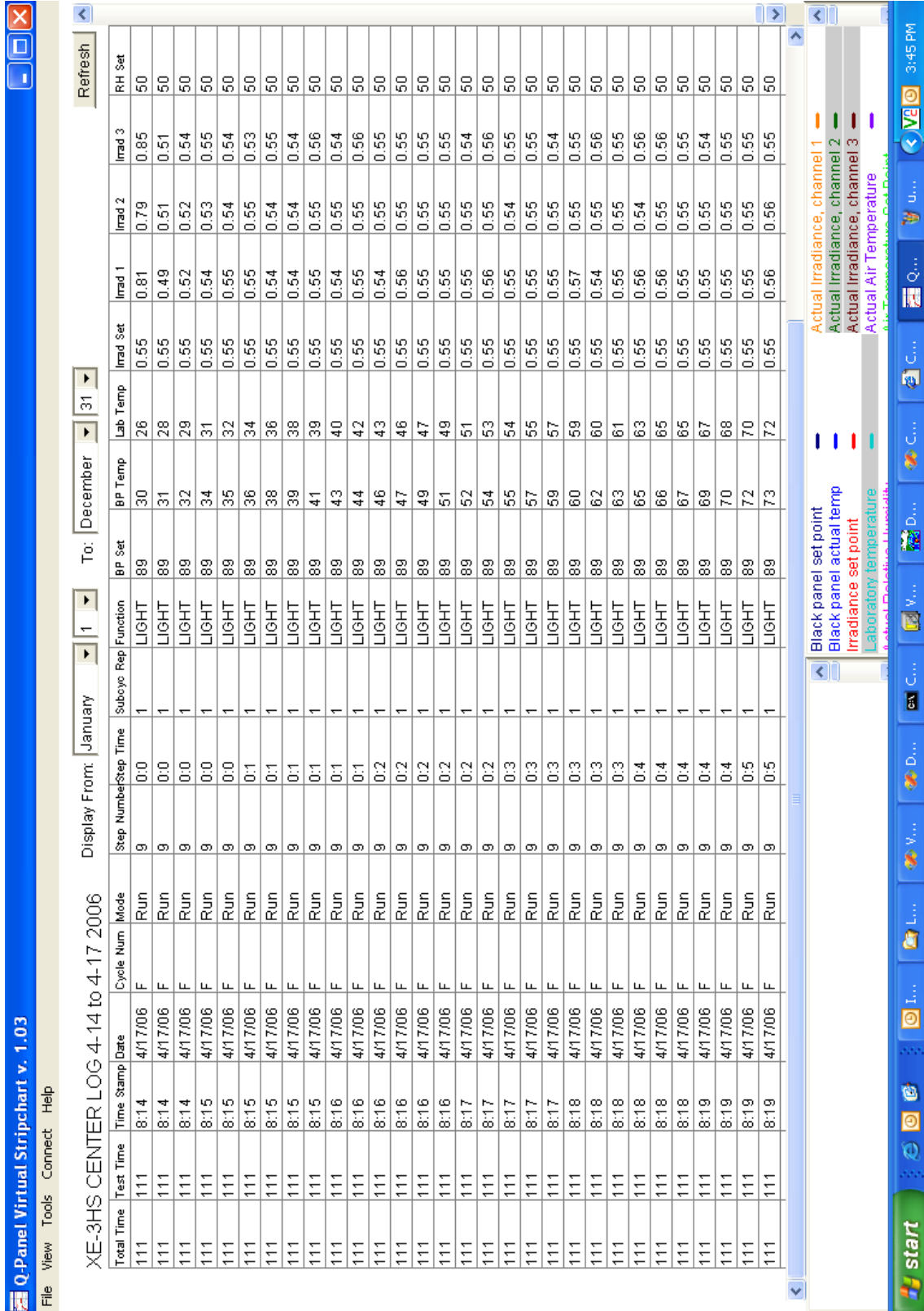Actual Irradiance, channel 3
Actual Air Temperature

Figure 12.2b: VIRTUAL STRIPCHART Table Display

12.3 Export VIRTUAL STRIPCHART Data (Jan 2018)

For a quick look at tester performance in a convenient file format, a simplified version of VIRTUAL STRIPCHART (VSC) data in .csv (comma separated value) format can also be exported.

The Export VSC Data function is used to copy a set of VSC data files from the Gen 3 software to a USB drive.

Two files with VSC data are exported to the USB drive. One file has up to the last two weeks of tester history, recorded every minute. The other file has up to two years of tester history, recorded every 10 minutes.

- 22-17801-79-X1B (10 MINUTE)-20220721145710.csv
- 22-17801-79-X1B (1 MINUTE)-20220721145816.csv

Figure 12.3a: Example File Names

Follow the instructions below to export the VIRTUAL STRIPCHART data to a USB drive.

**1.** The Q-SUN Xe-1 USB port is located on the bottom left rear of the tester near the Ethernet connection port.
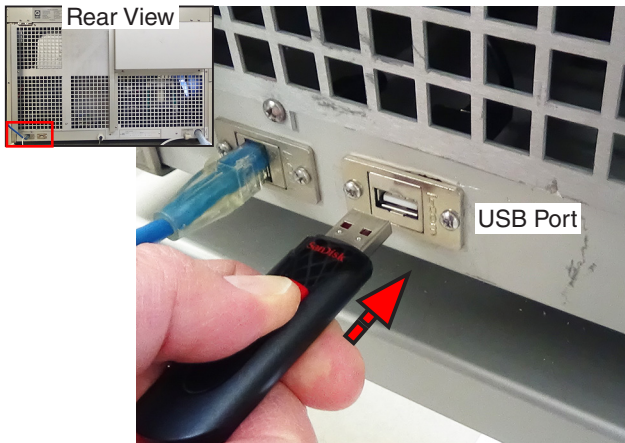
Tester Control Panel

Status

USB DETECTED: EXPORT VSC DATA
ENTER=YES, ESCAPE=CANCEL

Message

2. Insert the USB drive in the tester USB port.

▶ Go to the tester control panel. ... EXPORT VSC DATA is shown on the status and message display.
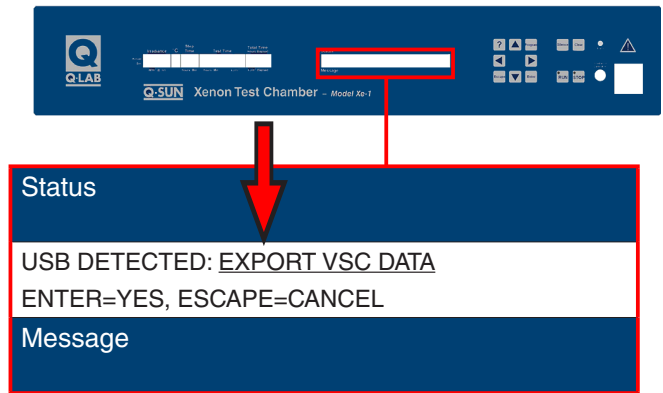
Status

TRANSFERRING VSC DATA
THIS MAY TAKE UP TO 30 MINUTES
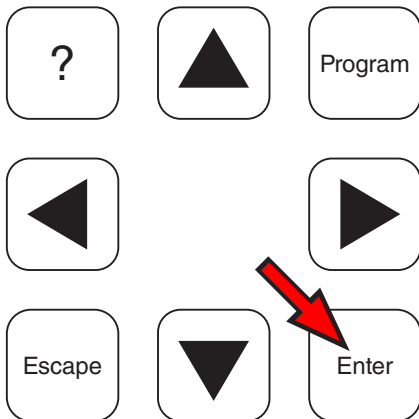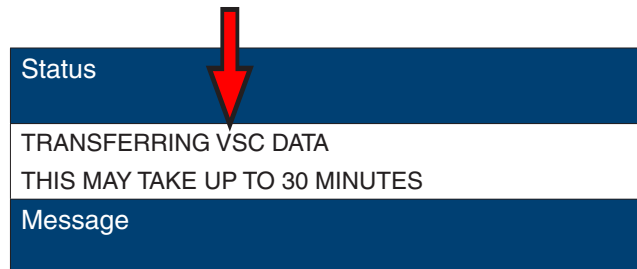
Message

▶ TRANSFERRING VSC DATA... is displayed. The data is written to the USB drive. **NOTE:** Although data transfer can take up to 30 minutes, it will typically take much less than 30 minutes.
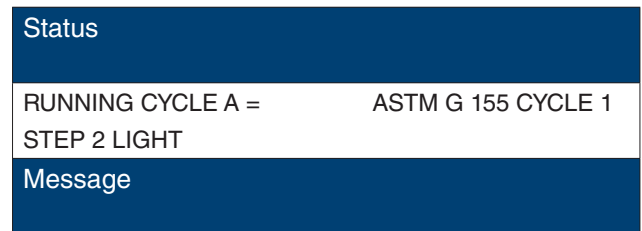
3. Press **Enter**.

Wait

30 min

4. Wait until transferred successfully message is displayed.

Status
VSC TRANSFERRED SUCCESSFULLY TO USB PLEASE REMOVE USB DRIVE
Message

▶ TRANSFERRED SUCCESSFULLY... is displayed.

5. Remove the USB drive from the tester.

Status
RUNNING CYCLE A =   ASTM G 155 CYCLE 1 STEP 2 LIGHT
Message

▶ Test cycle information is displayed.

6. Insert the USB drive into a computer to display the list of files.

Tester Serial Number

Time Stamp

22-17801-79-X1S(10 MINUTE)-20220721145816.csv
22-17801-79-X1S(1 MINUTE)-20220721145710.csv
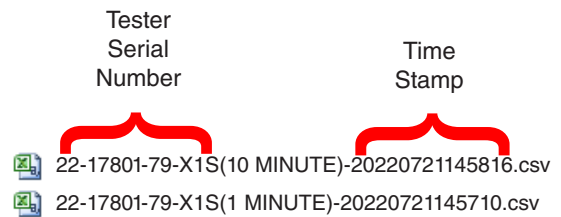
▶ The USB drive will have the .csv files exported from the tester.

12.4 Import VIRTUAL STRIPCHART Data (Mar 2020)

Q-Lab has provided an Excel template file that the .csv data can be imported into to generate graphs of key tester parameters. A copy of the template file can be downloaded from Q-Lab.com. Instructions for using the template are included.

1. Visit Q-Lab.com/VSCImport to download the VIRTUAL STRIPCHART template.

2. Complete the short information form. Click "Submit".

3. Click "Download" to download a template (Example: Q-SUN).

4. The Excel template file: VSC_Q-SUN.xlsx is downloaded. Instructions for using the template are included.

13. 0° Adapter Wedge for Xe-1 (Feb 2022)

- Q-Lab offers a 0° adapter wedge kit (Part Number X-10551-K) to tilt the Q-SUN Xe-1 backward, so that the specimen tray is in a horizontal or 0° position (Figure 13a and Figure 13b).
- The specimen tray in a horizontal position keeps soft, viscous specimens from running down a sloped tray and keeps liquid specimens level.
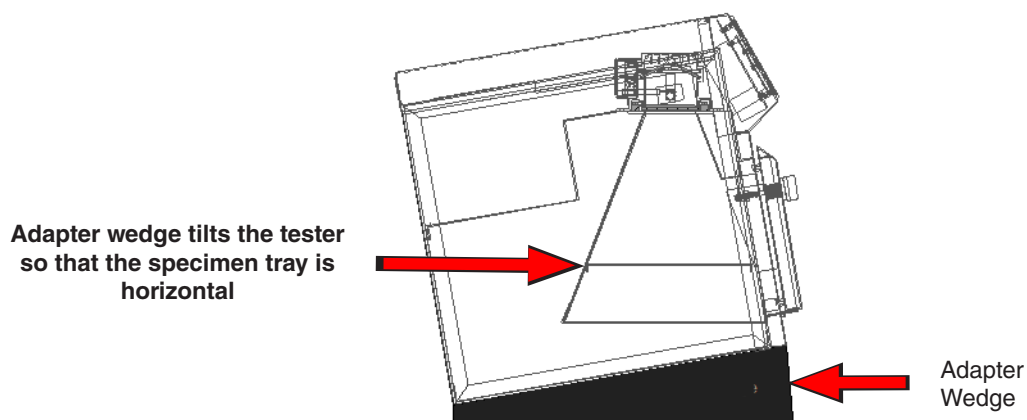
Adapter wedge tilts the tester so that the specimen tray is horizontal

Adapter Wedge

Figure 13a: Cut-away side view of Xe-1 with adapter wedge showing horizontal specimen tray.

Adapter Wedge

Figure 13b: Xe-1 with adapter wedge.

14. Maintenance

14.1 Lamp Replacement (Feb 2022)

- After 1500 hours of lamp use the message " M14 TIME TO REPLACE LAMP" (Figure 14.1a) will be displayed on the control panel indicating that the lamp should be replaced (see Section 15.3).
- The D19 diagnostic (Figure 14.1b) can also be used to display lamp age (see Section 9.4).

Lamp Age

Status

RUNNING

M14 TIME TO REPLACE LAMP

Message

Status

D19 HOURS SINCE LAMP REPLACED=   XXXX

Message

Figure 14.1a: M14 TIME TO REPLACE LAMP

Figure 14.1b: D19 shows the number of hours since the lamp was last replaced
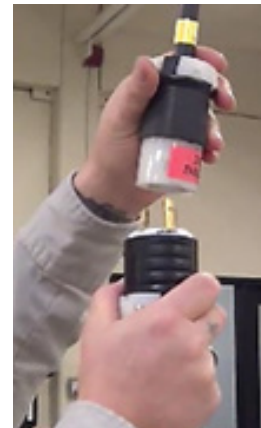
Follow these steps to replace the lamp.
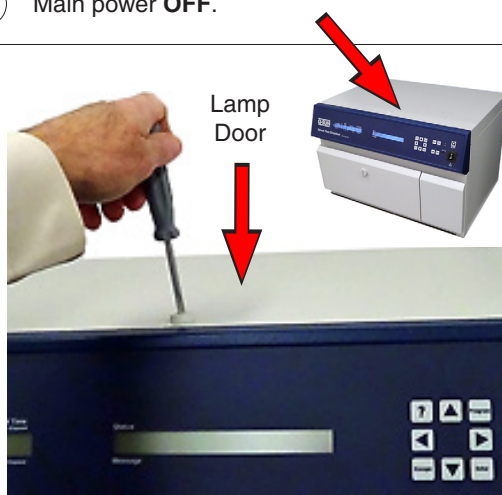

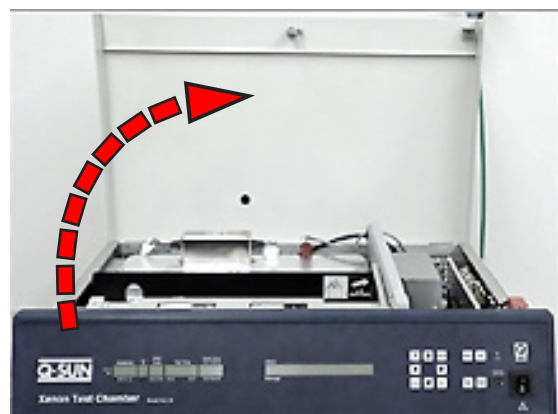1. Press **STOP**.

2. Power **OFF**.

3. Main power **OFF**.

4. Disconnect power.

Lamp
Door

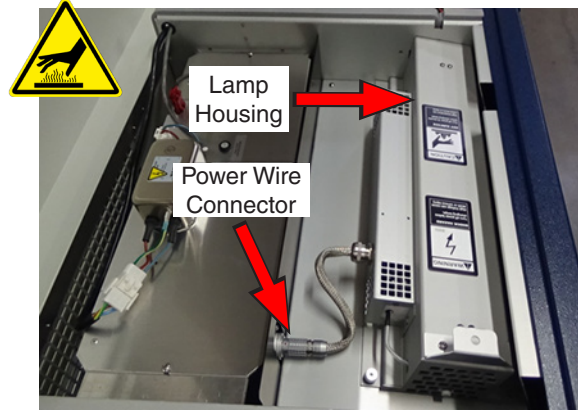5. Use a flat blade screwdriver to open the latch on the lamp door.

6. Open the lamp door.

7. **CAUTION:** Lamp is hot. Wait 15 minutes for lamp to cool.

Lamp Housing
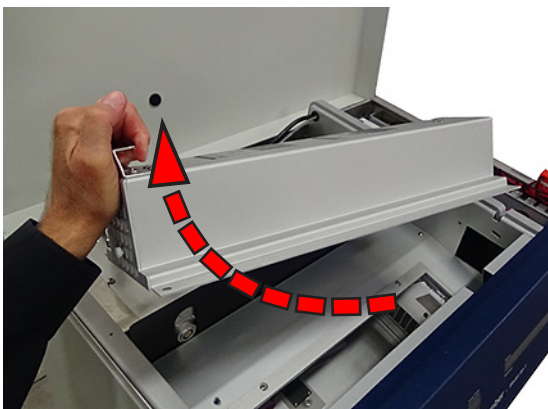
Power Wire Connector

8. Locate the lamp housing and power wire connector.

9. Disconnect the power wire.

Loosen

10. Loosen the captive stud in the left corner of the lamp housing.

11. Carefully remove the lamp housing from the Xe-1 cabinet.
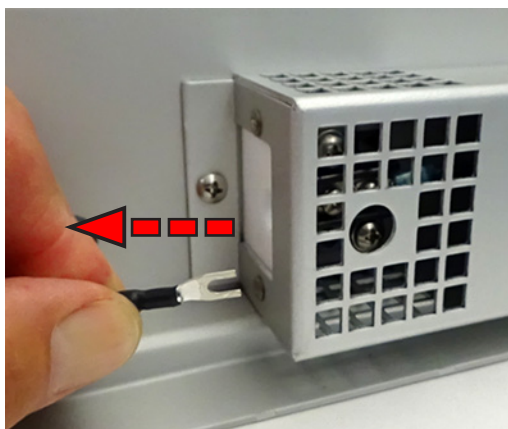

12. Place the housing on a flat surface.

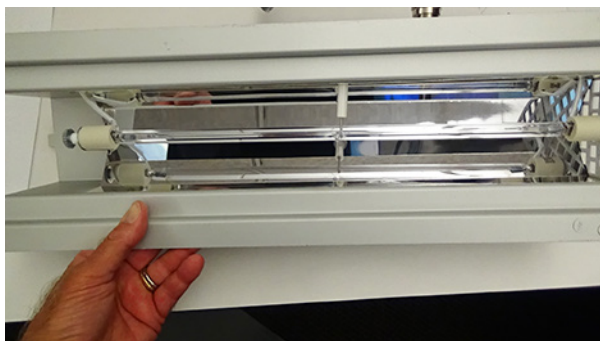**13.** Locate the center hole in each end of the lamp housing cover.

14. Insert a Phillips screwdriver in the center hole. Loosen the screw.
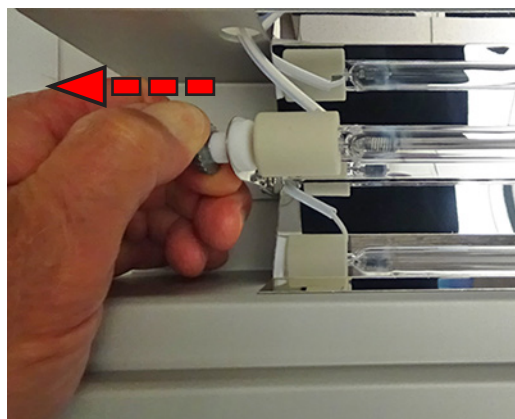

15. Pull the lamp wire through the hole to disconnect.
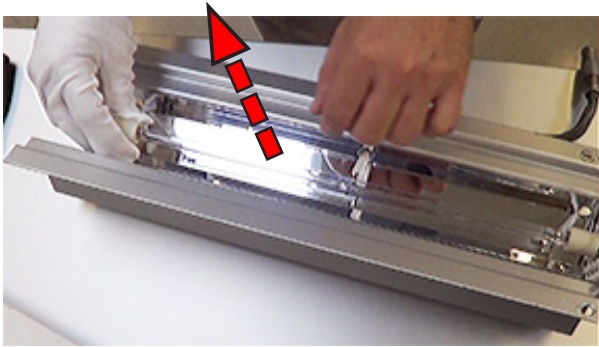

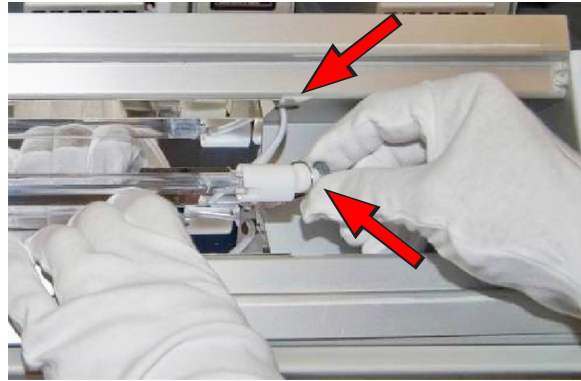**16.** Disconnect wire at opposite end of lamp housing cover.

17. Turn the lamp housing over to show the lamp.

18. Release the lamp from the lamp housing by pulling lamp release lever away from the lamp.
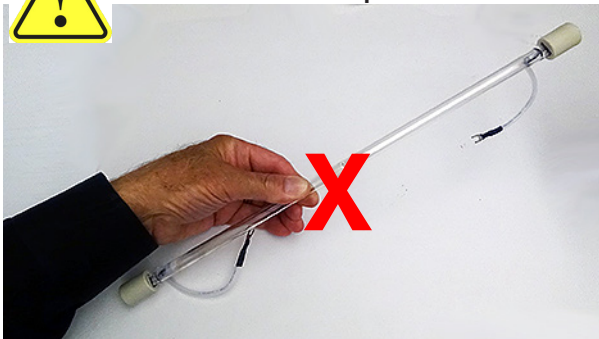
**19.** Remove the old lamp from the housing. Discard the old lamp.

20. Install the new lamp in the housing. Guide the wires through the holes in the housing. Pull back the release lever to seat the lamp.

⚠ **Do not touch the lamp with bare hands**.

21. If you accidentally touch the lamp, clean it with alcohol and a clean cloth. Oil from your skin will shorten the life of the lamp.

Trigger
Finger
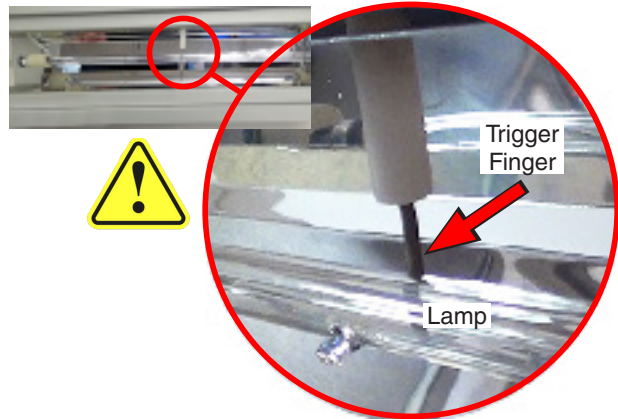
Lamp

22. Make sure the trigger finger is in contact with the lamp but **is not exerting excessive force.**

⚠

- If the trigger finger is exerting excessive force on the lamp, the lamp may break.

- If the trigger finger is not in good contact with the lamp:
  - o The lamp may not start.
  - o The lamp may fail prematurely due to arcing between the lamp and the finger.
- The trigger finger can be adjusted by gently bending the metal rod.
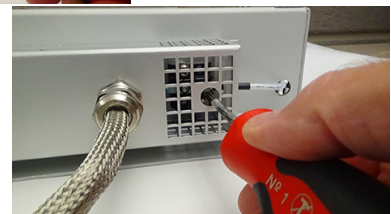
23. Reconnect the lamp wires. Tighten the screws.

⚠️ **Before reinstalling the lamp housing clean the UV filter.**
See Section 15.3 for more information.
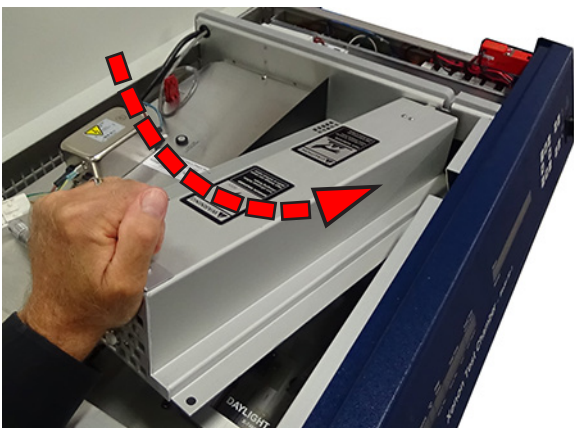
24. Reinstall the lamp housing in the Xe-1.

Tighten

25. Tighten the captive stud.

26. Reconnect the power wire.

27. Close and latch the lid.

28. Reconnect Power. Power **ON.** Xe-1 power **ON.**

IMPORTANT:
The Q-SUN must be re-calibrated
after the lamps are changed.

29. See Section 11.1 Irradiance Sensor Calibration
for more information.

14.2 Lamp Trigger Wire and Reflector Cleaning (Jun 2016)

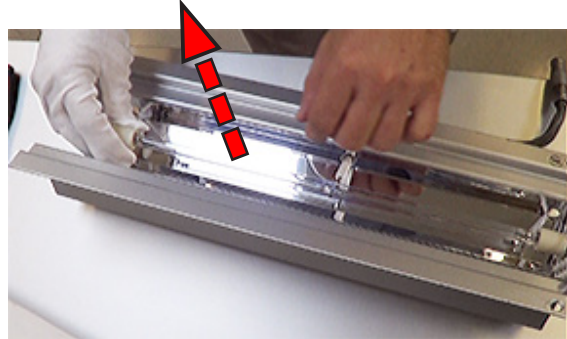### Trigger Wire Cleaning

If the trigger wire is discolored or corroded it should be cleaned with fine emery cloth, sandpaper, or steel wool.

1. If necessary, follow Section 14.1, Steps 4 through 21 to remove the lamp housing from the Xe-1 tester.

2. Remove the lamp from the housing. Use gloves, do not touch the glass with your bare hand. Set the lamp aside.
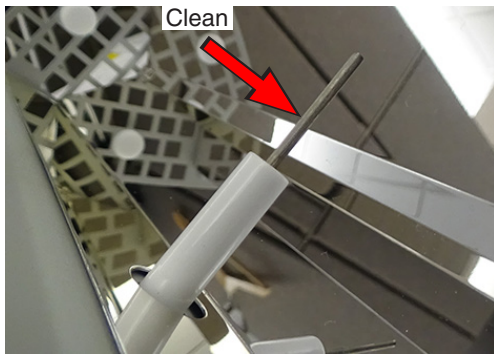
Clean

3. Clean the trigger finger.

Clean

Clean

4. Wipe the trigger clean. Clean any dust and debris from the lamp reflector. See **Lamp Reflector Cleaning** on following page.

5. Follow Section 14.1, Steps 23 through 32 to reinstall the lamp housing in the Xe-1 tester.

IMPORTANT:
The Q-SUN must be re-calibrated
after the trigger is cleaned.

6. See Section 11.1 Irradiance Sensor Calibration for more information.

Lamp Reflector Cleaning

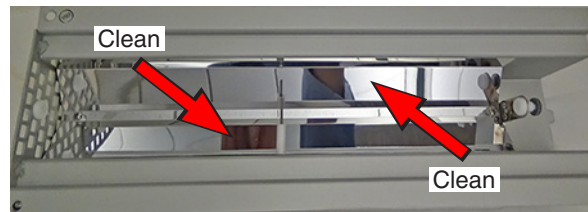**1.** If necessary, follow Section 14.1, Steps 4 through 21 to remove the lamp housing from the Xe-1 tester.

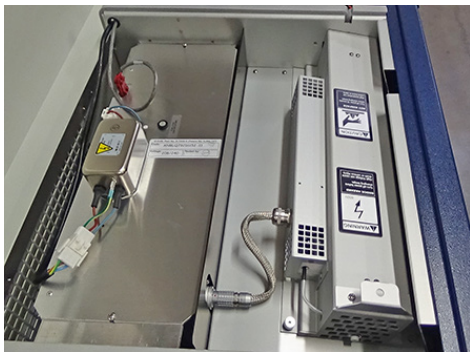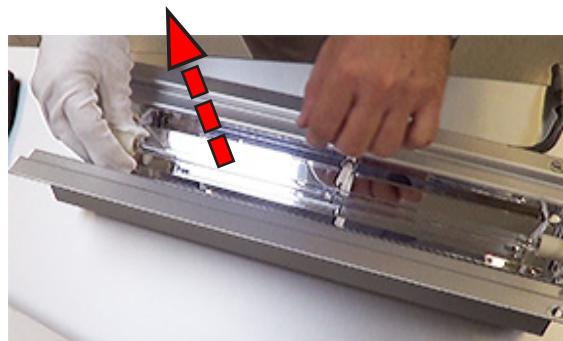**2.** Remove the lamp from the housing. Use gloves, do not touch the glass with your bare hand. Set the lamp aside.
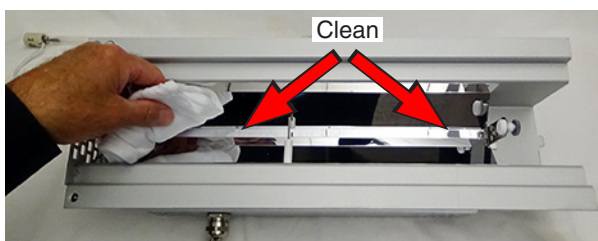
Clean

3. Clean any dust and debris from the lamp reflector. Wipe the reflector with isopropyl alcohol and a soft cloth.
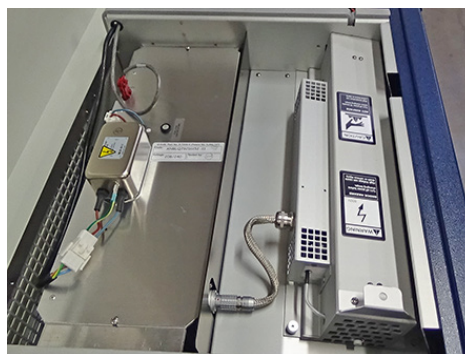
4. Follow Section 14.1, Steps 23 through 32 to reinstall the lamp housing in the Xe-1 tester.

IMPORTANT:
The Q-SUN must be re-calibrated
after the reflector is cleaned.

5. See Section 11.1 Irradiance Sensor Calibration for more information.

14.3 UV Filter Cleaning (Feb 2022)

- The UV filter may be cleaned without being removed from the tester.

- For a more complete cleaning, please contact Q-Lab Repair and Tester Support and request *Service Instruction X-10940-L, Xe-1 and Xe-3 Optical Filter Cleaning* for detailed instructions for removing, cleaning and reinstalling the optical filters.

1. Follow Section 14.1, Steps 4 through 15 to remove the lamp housing from the Xe-1 tester.

2. Clean the top surface of the UV filter with an ammonia glass cleaner and soft cloth.
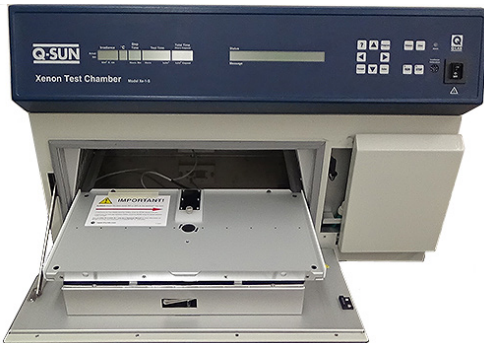
3. Open the test chamber door. Slide the specimen tray out of the chamber.

4. Reach into the chamber and clean the bottom surface of the UV filter with glass cleaner and soft cloth.
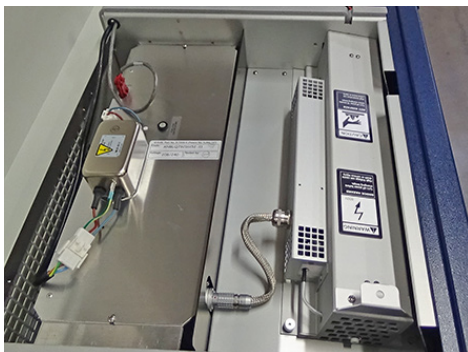
5. Follow Section 14.1, Steps 27 through 31 to reinstall the lamp housing in the Xe-1 tester.

IMPORTANT:
The Q-SUN must be re-calibrated after the filter is cleaned.

6. See Section 11.1 Irradiance Sensor Calibration for more information.

14.4 Window – IR Filter Replacement (Mar 2022)

The Spectral Transmission of Window – IR UV Filters Changes With Age

- For consistent results over time, Window – IR optical filters (Figure 14.4) should be replaced every 8400 hours.
- This is only necessary with Window – IR optical filters.
- The spectral transmission of all the other Q-SUN filters does not change with age.
- Please contact Q-Lab Repair and Tester Support and request *Service Instruction X-10110-L Q-SUN Window - IR Filter Installation* for detailed information on Window - IR filter replacement.

NOTE: Window - IR optical filters are permanently mounted in the frame.

Figure 14.4: UV Filter, Window - IR, Part Number X-10110-K

14.5 Monthly Maintenance (Mar 2020)

Air Filters

- Remove and inspect the air filter every month (Figure 14.5a).

- Washable air filters (part number X-10997-K) are standard on Xe-1 testers.

- Disposable air filters (part number X-7918) can be ordered as an option.

- Also inspect the air intake and exhaust areas (See Section 6.4) to make sure they are not plugged or obstructed with dust or debris.

- If dirty, disposable air filters must be replaced (see Figure 14.5b).

- Washable air filters in service for more than three (3) years must be replaced (see Figure 14.5b).

- Washable air filters in service for less than three (3) years can be cleaned as shown in the Washable Air Filter Cleaning instructions.

- **IMPORTANT:** When reinstalling the chiller air filter, make sure the air flow direction arrow on the filter points toward the front of the tester.
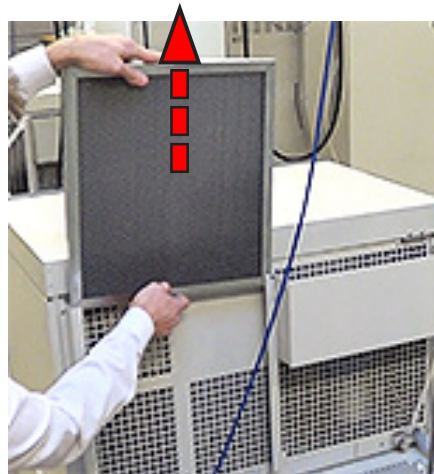

Figure 14.5a: Q-SUN Xe-1 Air Filter Removal

Disposable
Part Number
X-7918

Washable
Part Number
X-10997-K
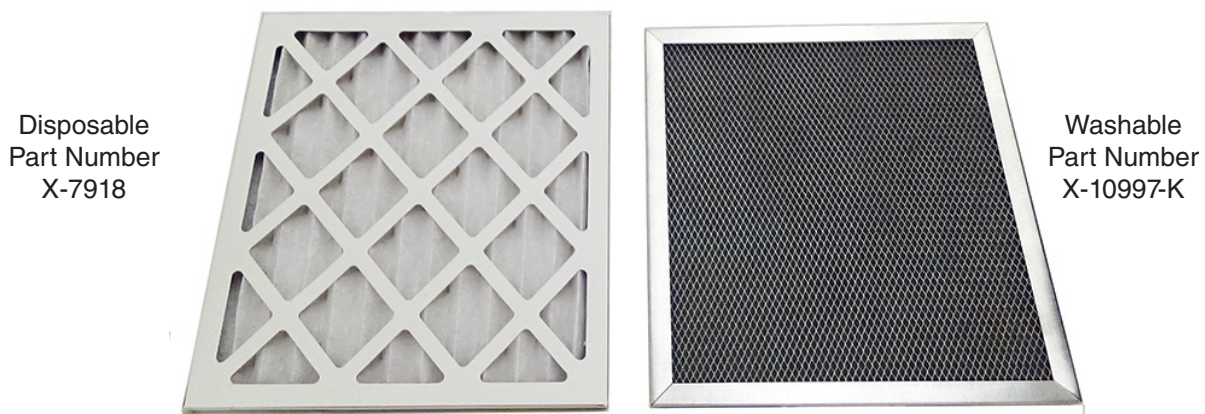
Figure 14.5b: Xe-1 Air Filters

Washable Air Filter Cleaning
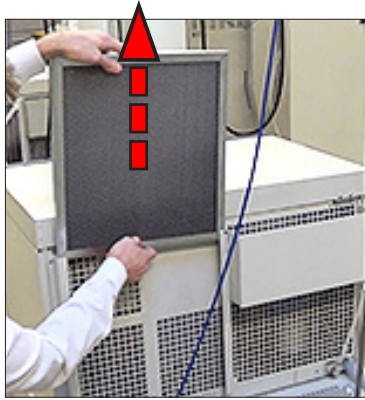
1. Remove the washable filter from the rear of the Xe-1 tester.

Less Than 3 Years Old - Wash

Installation Date: *17 Feb, 2021*
Replace filter 3 years after installation.
Q-SUN Xe-1/Xe-3
Part No: X-10997-K
Q-Lab.com
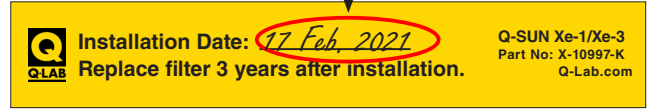
2. **IMPORTANT:** Check the date on the filter date label. If the date is less than 3 years older than the current date, the filter can be washed and reinstalled. See Step 4 through Step 8.

Greater Than 3 Years Old - Discard

Installation Date: *17 Feb, 2018*
Replace filter 3 years after installation.
Q-SUN Xe-1/Xe-3
Part No: X-10997-K
Q-Lab.com
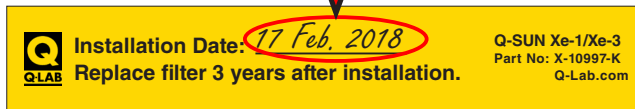
3. If the date is greater than 3 years older than the current date, discard the filter. Replace with new air filter. See Figure 14.5b or Section 16 for part numbers.

4. Locate the **WASH** label on edge of filter.
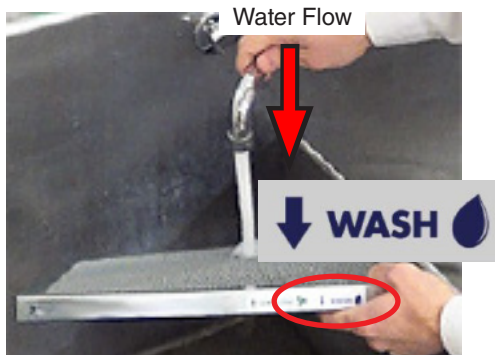
Water Flow

5. Hold filter under **CLEAN** running water. **IMPORTANT:** Water flow MUST BE in direction of **WASH** arrow.
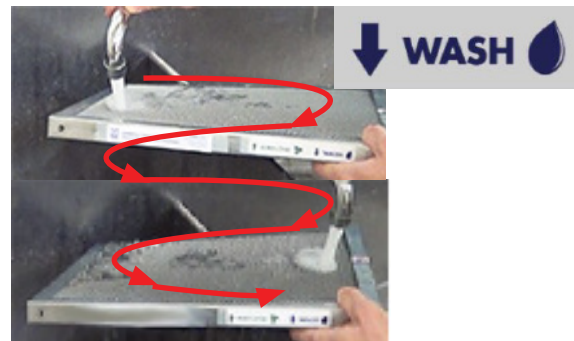
6. Wash all of filter. **NOTE:** If rinsing with water does not remove dirt, use an electrostatic air filter cleaner spray.
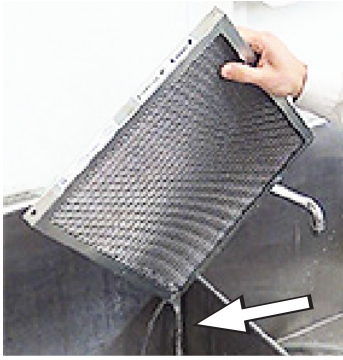
7. Allow water to drain from the air filter.

Arrow Points Toward Front of Tester
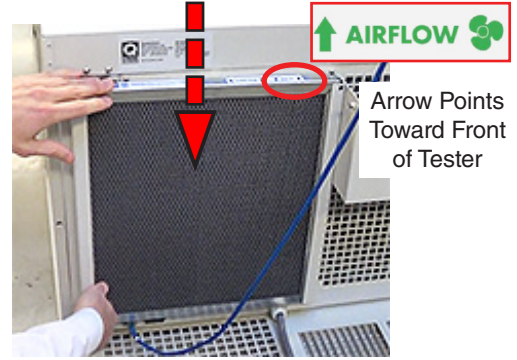
8. Reinstall the washable air filter. **IMPORTANT:** Make sure arrow on the airflow label is in direction shown.

9. **IMPORTANT:** Make sure arrow on the airflow label is in direction shown.

Check Chamber Wall Reflectors

The mirror-like finish of the chamber wall reflectors helps to maintain irradiance uniformity across the test specimens. The reflectors should be inspected periodically. The reflectors can not be cleaned. If there are deposits on the reflectors they must be replaced.

- Open the test chamber door.

- Inspect the reflectors on the sides, rear and door of the chamber.

- The reflectors must be clean and shiny like mirrors.

- If the reflectors are cloudy, have stains, or have any deposit that degrades the mirror finish; the chamber reflectors must be replaced.

- Part Number X-7979-K, Chamber Wall Replacement Kit, Xe-1 includes replacement reflectors and installation instructions. See Section 16 for replacement parts.

Figure 14.5c: Clean Reflector - OK
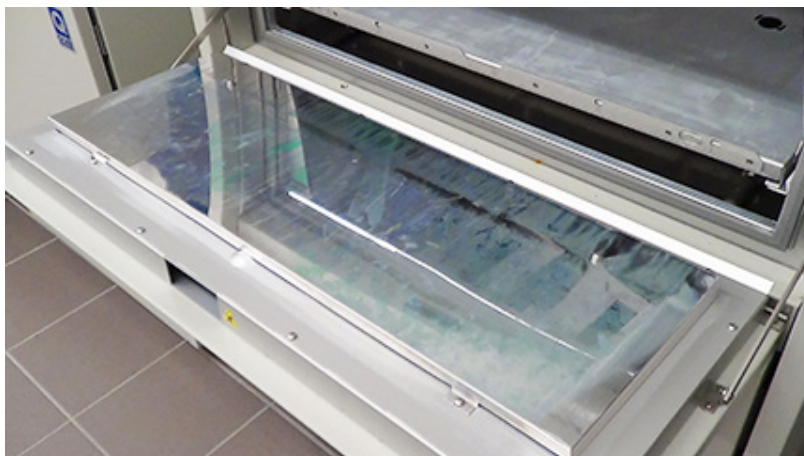
Figure 14.5d: Cloudy Reflector - Replace

14.6 Q-SUN Xe-1 Software Updates (Jan 2018)

Q-Lab periodically updates the software that runs the Q-SUN to improve tester performance.

- Q-Lab recommends that customers check www.q-lab.com/software for new software versions every year to determine if any mandatory software updates have been released and should be installed.

- The files required to perform software updates can only be obtained by contacting Q-Lab.

14.6.1 Determine Tester Software Version

- The currently-installed Q-SUN software version number and tester serial number are required to determine if a software update needs to be performed.

- Follow the instructions below to display the Q-SUN serial number and the software version currently installed.

Tester Control Panel

ON

1. Power the tester **ON**.

RUN OR **STOP**

▶ The tester may be in **RUN** or **STOP** mode.

? Program
◀ ▶
Escape ▼ Enter

2. On the tester control panel Press the **? key.**

Tester Control Panel

Q·LAB **Q·SUN** Xenon Test Chamber – Model Xe-1

Status	
D1 LABORATORY TEMPERATURE=	20°C
Message	
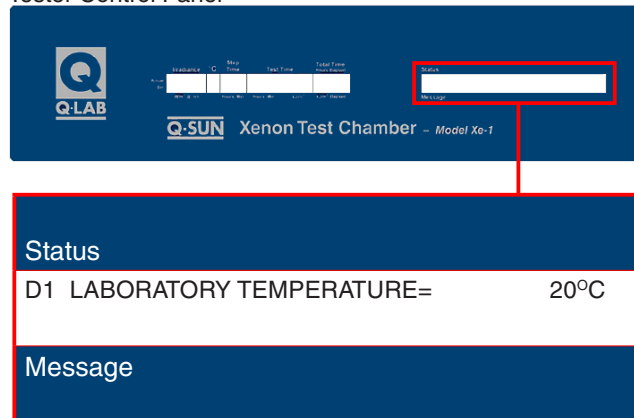
▶ The D1 diagnostic data menu is displayed. **NOTE:** a diagnostic other than D1 may be displayed first.

?	▲	Program
◀	OR	▶
Escape	▼	Enter

Status

D9 VERSION 3.XXX   CHECKSUM=   856h

Message
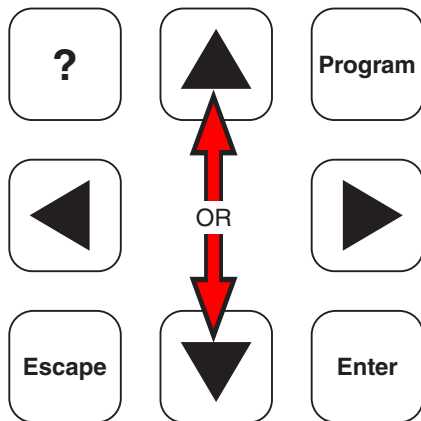
3. Repeatedly press the **Up Arrow** or **Down Arrow** to display the D9 diagnostic.
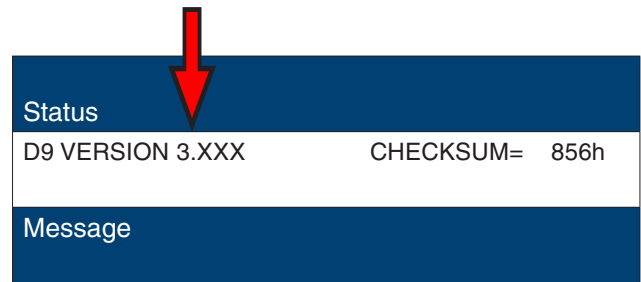
▶ D9 VERSION is displayed.
Record the software version number.

?	▲	Program
◀		▶
Escape	▼	Enter

Status

D24 SERIAL NUMBER=   17-34501-72-X1S

Message
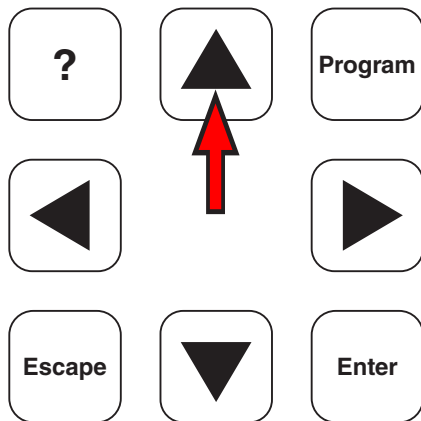
4. Repeatedly press the **Up Arrow** to display the D24 diagnostic.
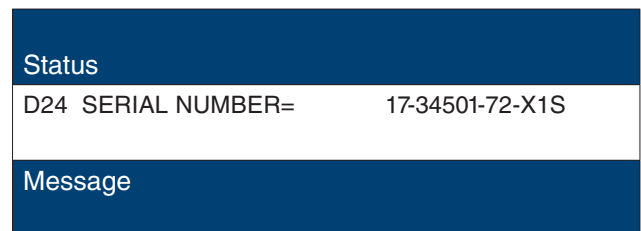
▶ D24 SERIAL NUMBER is displayed.
Record the tester serial number.

?	▲	Program
◀		▶
Escape	▼	Enter

Status

RUNNING CYCLE A =   ASTM G 155 CYCLE 1
STEP 1 LIGHT

Message
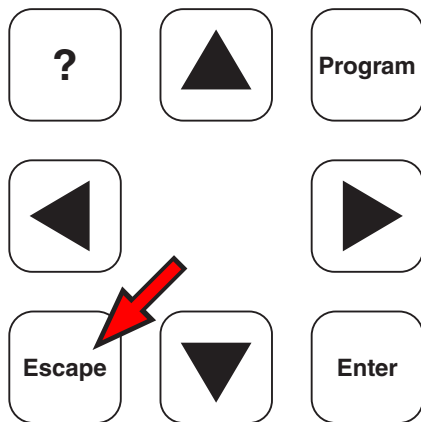
5. Press **Escape**.

▶ Test cycle information is displayed.

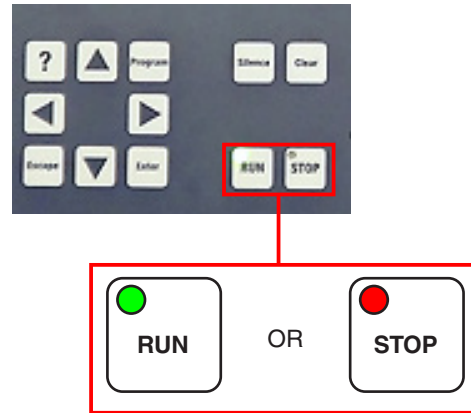## 14.7 Q-SUN Xe-1 Software Updates (Feb 2022)

- Q-Lab periodically updates the software that runs the Q-SUN to improve tester performance.
- Q-Lab recommends that customers check www.q-lab.com/software for new software versions every year to determine if any mandatory software updates have been released and should be installed.
- The files required to perform software updates can only be obtained by contacting Q-Lab.

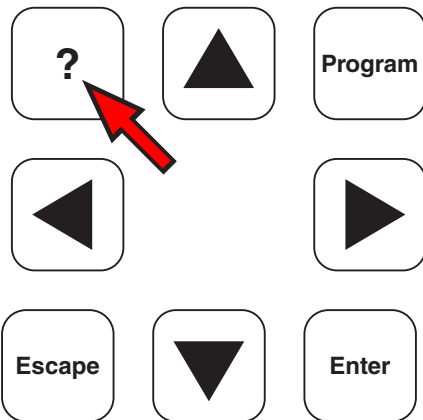### Software Version and Tester Serial Number

- The currently-installed Q-SUN software version number and tester serial number are required to determine if a software update needs to be performed.
- The Q-SUN serial number and the software version are listed in the diagnostics screen accessed from the controller main menu.
- See Section 9.4 for instructions to display the tester serial number (diagnostic D24) and software version (diagnostic D9). The serial number can also be found on the nameplate attached to the rear of the Xe-1 cabinet.

Software Types

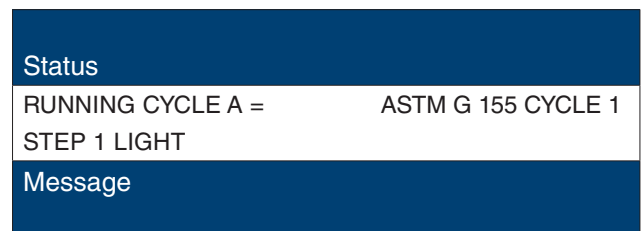- Once you have the tester serial number and software version number, visit www.q-lab.com/software.
- The most recent versions of Q-SUN software will be listed and identified as either **Required**, **Recommended,** or **Optional**.
  - o **Required** updates must be installed immediately, as they address issues that may strongly affect tester performance and/or pose a safety concern.
    - › If a Required software version is more recent than the version currently installed on the Q-SUN (see previous section), that software needs to be installed.
    - › More recent software versions are indicated by a higher version number (e.g. 3.201 and 3.300 would both be more recent than 3.200).
  - o **Recommended** updates should be installed as soon as possible, as they offer a significant improvement and/or make an important correction.
  - o **Optional** updates should not be installed unless Q-Lab personnel have directed you to do so.

14.8 UC1 Software Updates (Feb 2022)

- Q-Lab may occasionally update the software that runs the UC1 Handheld Display Unit to improve performance.
- Q-Lab recommends that customers check www.q-lab.com/software for new software versions every year to determine if any required software updates have been released and should be installed.
- The files required to perform software updates can only be obtained by contacting Q-Lab.
- The currently-installed UC1 software version number is required to determine if a software update needs to be performed.
- Follow the instructions below to display the UC1software version currently installed.

1. Remove the UC1 display unit from the case.

2. Plug the UC1 connection cable into the calibration port on the Xe-1 control panel. The UC1 gets power from the calibration port.
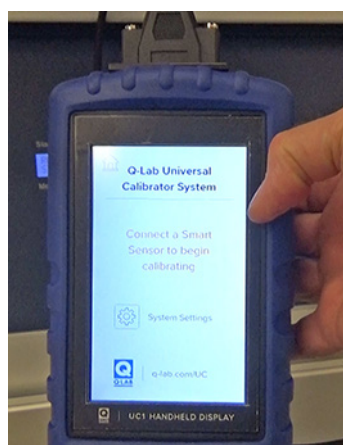
3. When connected to the Xe-1 the UC1 display unit home screen will appear.

▶ The UC1 home screen when a Smart Sensor is not connected. **NOTE:** It is not necessary to connect a Smart Sensor to the UC1.

Universal Calibrator System

Connect a Smart Sensor to begin calibrating

⚙ System Settings

Q | q-lab.com/UC

6. Press ⚙.

System Settings

Select Language
English ▼

Set Date
Month February ▼
Day   15
Year   2018

Software Version 1.000
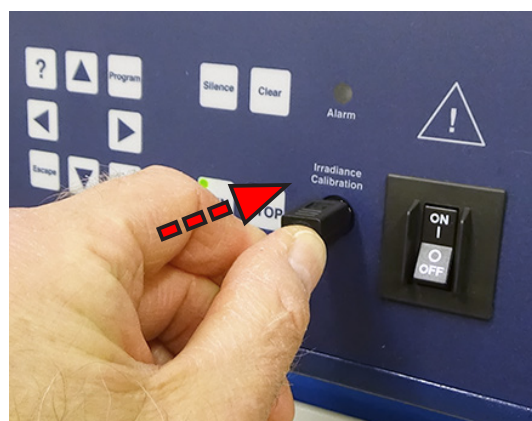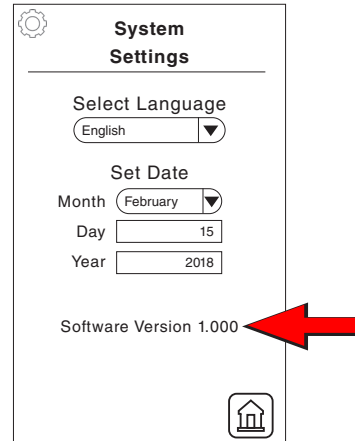
▶ The system settings are displayed. The UC1 software version is shown.

- Once you have the UC1 software version number, visit www.q-lab.com/software.
- The most recent versions of UC1 software will be listed and identified as **Required**, **Recommended,** or **Optional**.
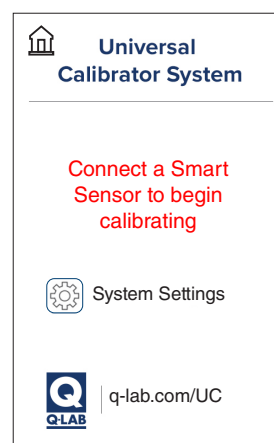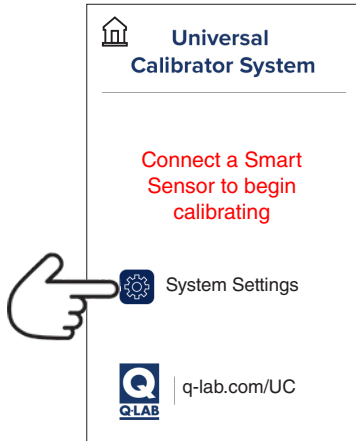- All **Required** upgrades should be installed. If a **Required** software version is more recent than the version currently installed on your UC1, that software needs to be installed.
- More recent software versions are indicated by a higher version number (e.g. 1.101 and 1.200 would both be more recent than 1.100).
- Unless Q-Lab Repair has recommended that an **Optional** software version be installed, Q-Lab recommends that **Optional** software upgrades NOT be installed.

COMPLETE THIS FORM TO OBTAIN SOFTWARE FILES OR FOR ADDITIONAL INFORMATION.

COMPANY NAME*   EMAIL*

FIRST NAME*   LAST NAME*

PHONE NUMBER*   CITY*   COUNTRY
                              Please Select ▼
QUESTIONS OR PROBLEMS:

REQUEST SOFTWARE

4. Fill out the form on www.q-lab.com/software or contact Q-Lab Repair directly to get the software.
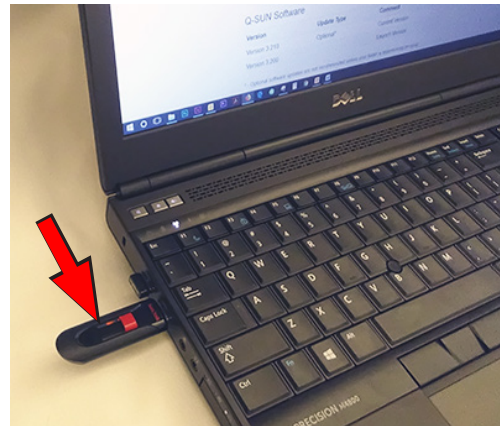
5. Download the UC1 update software to a Windows computer USB drive. The .ffg file must be in the drive root directory, not in a subfolder.

Install USB
Drive

7. If a Smart Sensor is connected to the UC1, disconnect it. Insert the USB drive into the UC1 USB port.
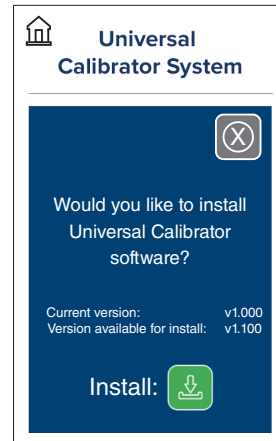
▶ If the USB drive has a valid software file, this screen will be displayed on the UC1.
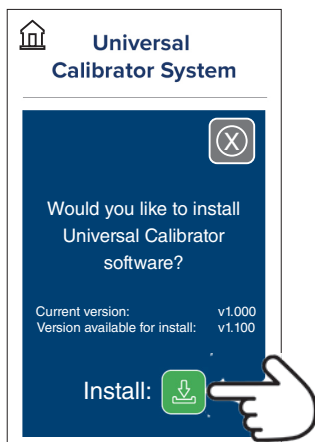
8. Press ⬇ to begin the update process.
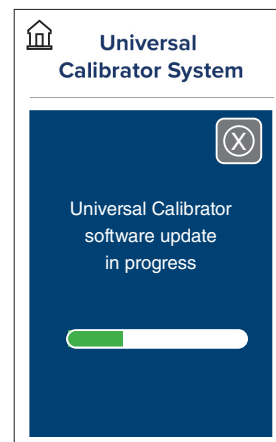
▶ This screen is displayed while the UC1 software is being updated.
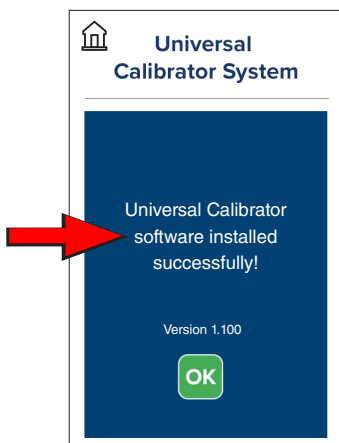
▶ When the software update is complete, this screen is displayed.
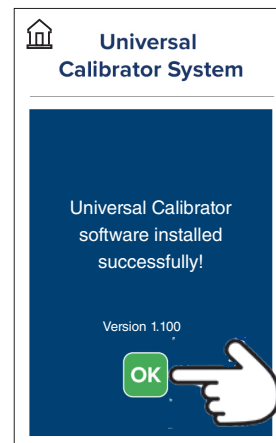
9. Press OK.

Remove USB Drive

10. Remove the USB drive from the UC1.

Universal Calibrator System

Universal Calibrator software installation failed.

Please contact Q-Lab.
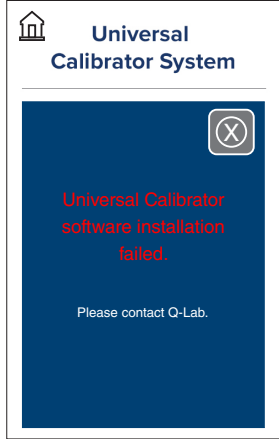
11. If the software update could not be completed, this screen is displayed. Contact Q-Lab Repair, see Section 18.
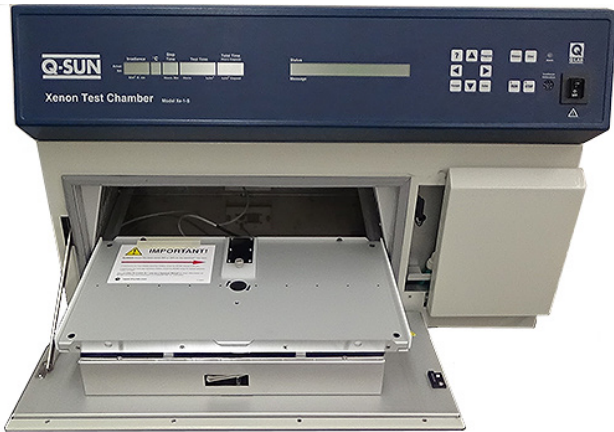
12. Remove the UC1 from the tester.

13. Store the UC1 in the case.

15. Troubleshooting and Repair

- Q-SUN Xe-1 testers are designed so that the user can make virtually all repairs.
- Only use parts that have been supplied or recommended by Q-Lab.

15.1 Main Power and Short Circuits (Nov 2014)

Problem - No Power At All

Possible Cause

- Power cord disconnected, or no power being supplied to the Q-SUN
- Power switch is broken
- Transformer is broken
- Fuse(s) blown on the main terminal strip

Problem - Power Switch/Circuit Breaker Trips

Possible Cause

- Power switch is broken
- Short Circuit

15.2 Export Diagnostics (Jan 2018)

- The Export Diagnostics function is used to copy a set of diagnostic data files from the Q-SUN Gen 3 software to a USB drive.
- Customers in remote locations can use this function to collect a set of files which provide a complete snapshot of the tester configuration. These files can be used by Q-Lab Repair personnel for troubleshooting.

Follow the instructions below to export tester diagnostic data to a USB drive.

Tester Control Panel
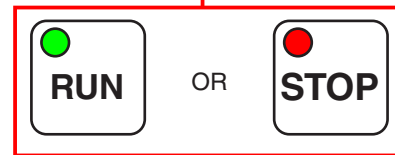
1. Power the tester **ON**.

▶ The tester may be in **RUN** or **STOP** mode.

Q-SUN Xe-1 Rear View

USB Port

2. Locate a USB flash drive.
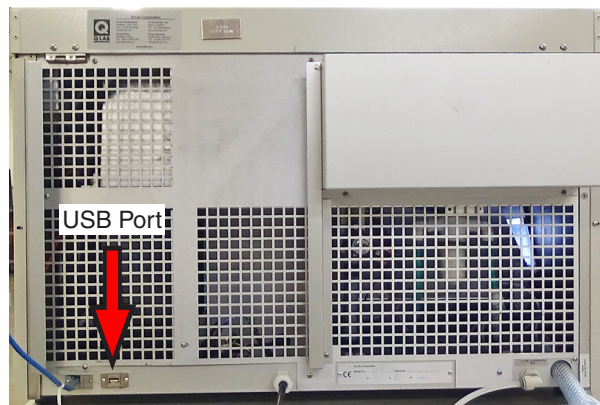
3. Locate the USB port on the bottom left rear of the tester near the Ethernet connection port.
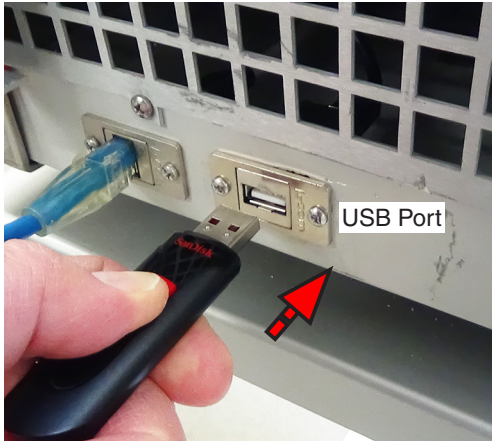
Tester Control Panel

Status

USB DETECTED: <u>EXPORT VSC DATA</u>
ENTER=YES, ESCAPE=CANCEL

Message

4. Insert the USB drive in the tester USB port.

▶ Go to the tester control panel. ... EXPORT VSC DATA is shown on the status and message display.

Status

USB DETECTED: <u>EXPORT DIAGNOSTICS</u>
ENTER=YES, ESCAPE=CANCEL
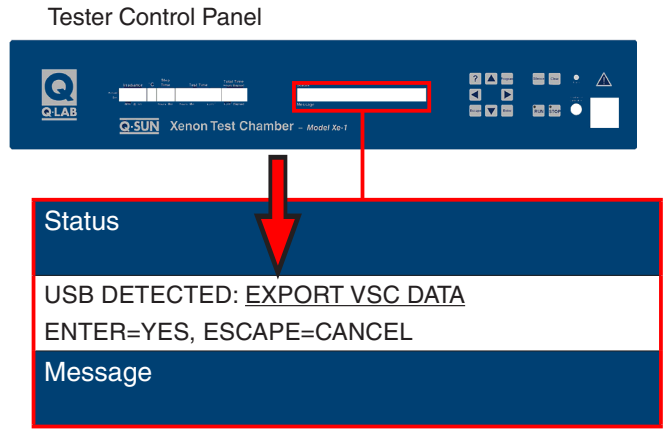
Message
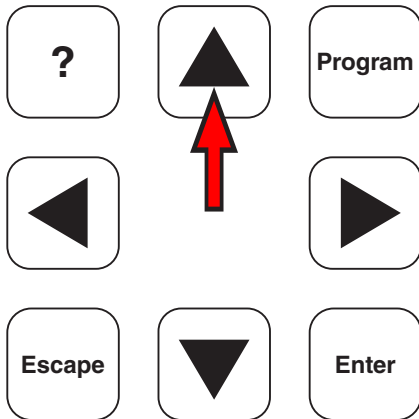
5. Press the **UP Arrow** ON THE TESTER KEYPAD to display EXPORT DIAGNOSTICS.

▶ EXPORT DIAGNOSTICS... is displayed.

Status

TRANSFERRING DIAGNOSTIC DATA
THIS MAY TAKE UP TO 5 MINUTES
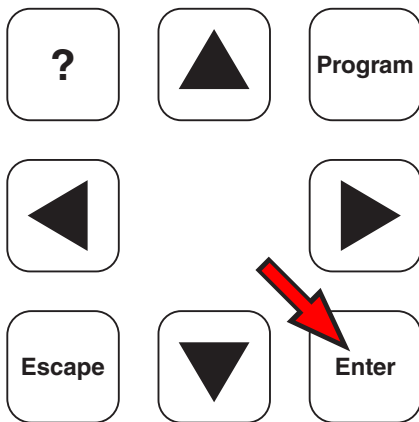
Message

6. Press **Enter**.
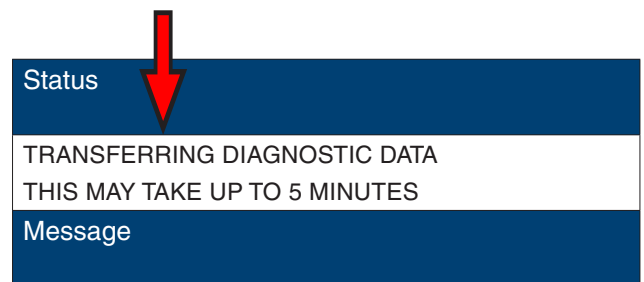
▶ TRANSFERRING DIAGNOSTIC DATA... is displayed. The data is written to the USB drive.

Wait

5 min

Status
VSC TRANSFERRED SUCCESSFULLY TO USB PLEASE REMOVE USB DRIVE
Message

7. Wait until the transferred successfully message is displayed.

▶ TRANSFERRED SUCCESSFULLY... is displayed.

Status
RUNNING CYCLE A = ASTM G 155 CYCLE 1 STEP 1 LIGHT
Message

8. Remove the USB drive from the tester.

▶ Test cycle information is displayed on the tester control panel.

📁 Diagnostics 22-14501-72-X1S 2022071405343

- 📄 Cycle0.dat
- 📄 Cycle1.dat
- 📄 Cycle2.dat   Tester
- 📄 Cycle3.dat   Serial   Time
- 📄 Cycle4.dat *   Number   Stamp
- 📄 EP_Compare (22-34501-79-X1S 2022071405343).dat
- 📄 ExpertParameters.dat
- 📄 SystemConfig.dat
- 📄 VirtualStripChart.vsc
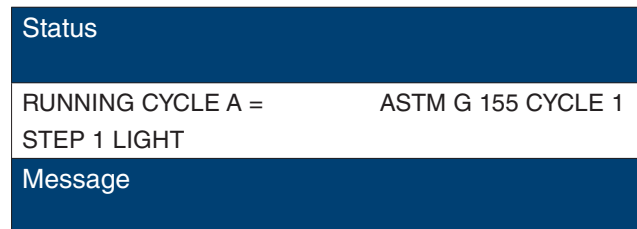
* The number of Cycle files will vary depending on tester configuration.
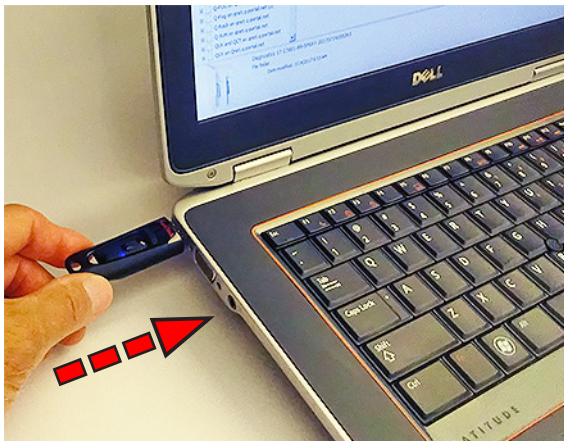
9. Insert the USB drive into a Windows computer to display the list of files

▶ The USB drive will have a folder with the diagnostic data files exported from the tester.

IMPORTANT NOTE: All files except EP_Compare are readable only by the tester.

These files are for backing up the system configuration. <u>Do not open these file</u>s:

● All Cycle Files.dat	● SystemConfig.dat
● ExpertParameters.dat	● VirtualStripChart.vsc

- Contact Q-Lab Repair for instructions on transmitting the diagnostic files for analysis (see below).
- Repair and Tester Support is available over the telephone Monday through Friday from 8:30 AM to 5 PM.
- You can also visit our website at www.q-lab.com to register your tester to access additional useful troubleshooting guides, operating manuals, and technical information.

For sales, technical, or repair support, please visit:

Q-Lab.com/support

Westlake, Ohio USA • Homestead, Florida USA • Buckeye, Arizona USA
Bolton, England • Saarbrücken, Germany • Shanghai, China

15.3 Notification (Feb 2022)

- Notifications provide useful diagnostic information for technicians and repair personnel.
- Notifications show significant tester events and errors that occurred in the recent past.
- The table below lists all Xe-1 Notification descriptions along with suggested diagnostic actions.
- For some suggested actions a part number is listed, see Section 18 for replacement part information.

⚠️ If there are no Suggested Actions for a message description, you don't feel comfortable performing the Action,or you've tried unsuccessfully, then please contact Q-Lab Repair and Tester Support (Section 20).

Code	Message	Description ● Suggested Action
M1	CHAMBER DOOR IS OPEN	The chamber door is open. ● Close the test chamber door. ● If the chamber door is closed and this message appears, the door interlock is defective or needs adjustment.
M2	LAMP DOOR IS OPEN	The lamp door is open. ● Close the lamp door. ● If the lamp door is closed and this message appears, the lamp door interlock is defective or needs adjustment.
M10	END OF TEST	Test completed successfully. No alarm is generated. ● *No action required.*
M11	END OF TEST	Test completed successfully. An alarm, as set in Section 9.3, is generated. ● *No action required.*
M12	END OF TEST SHUTDOWN	Test completed successfully. No alarm is generated. ● *No action required.*
M13	END OF TEST SHUTDOWN	Test completed successfully. An alarm, as set in Section 9.3, is generated. ● *No action required.*
M14	TIME TO REPLACE LAMP	1500 light hours have elapsed since this message appeared previously. ● Replace the Xenon lamp. See Section 16.1 for more information. Recalibrate irradiance (Section 11.1).
M15	TIME FOR ROUTINE SERVICE - SEE MANUAL	2000 light hours have elapsed since this message appeared previously. ● See Section 14 for maintenance information.
M20	CHAMBER TEMP TOO HOT XXX°C	Chamber air temperature is greater than the setpoint by more than the allowable value. ● Check the air heater relay, air heater thermal switch, and the air heater. ● Check the chamber blower.

Code	Message	Description ● Suggested Action
M21	CHAMBER TEMP TOO COLD XXX°C	Chamber air temperature is less than the setpoint by more than the allowable value. ● Check the air heater relay, air heater thermal switch, and the air heater. ● Check the chamber blower.
M24	LAB TEMPERATURE AT ALARM XXX°C	This notification is not an error by itself; it notes what the laboratory temperature was at the time a different, stopping fault occurred. ● *No action required*
M25	CONTROLLER TOO HOT XXX°C	The controller temperature is greater than the controller temperature limit. (55 °C). ● Check room temperature. ● Check overheating of relays.
M26	LAMP/BALLAST BLOWER FAILURE	The lamp or ballast blower is supposed to be on AND the airflow switch is open. The lamp or ballast blower is off but should be on. ● Check the lamp / ballast blower. ● Check the lamp / ballast relay. ● Check the lamp / ballast airflow switch.
M27	LAMP/BALLAST BLOWER ON: SHOULD BE OFF	The lamp or ballast blower is on but should be off. ● Check the lamp / ballast blower relay. ● Check the lamp / ballast airflow switch.
M30	REPLACE BATTERY	The battery voltage is less than the low voltage limit. ● Replace the battery (V-4086) on the main controller circuit board (see Section 18). ● **CAUTION:** Dispose of the old Lithium battery according to local regulations and ordinances.
M31	CALIBRATE LIGHT SENSOR	The lamps have been on for 500 hours since the onboard irradiance sensor was last calibrated. ● Recalibrate the irradiance sensor (see Section 11.1)
M33	WRONG RADIOMETER SHOULD BE CR20/340	The radiometer being used is a 420 nm or TUV type, but the Q-SUN has 340 nm sensors installed. ● Calibrate irradiance with a CR20/340 radiometer.
M34	WRONG RADIOMETER SHOULD BE CR20/420	The radiometer being used is a 340 nm or TUV type, but the Q-SUN has 420 nm sensors installed. ● Calibrate irradiance with a CR20/420 radiometer.
M35	WRONG RADIOMETER SHOULD BE CR20/TUV	The radiometer being used is a 340 or 420 nm type, but the Q-SUN has TUV sensors installed. ● Calibrate irradiance with a CR20/TUV radiometer.
M49	POWER DISRUPTED	This message indicates power was off and then came back while the tester was in Run mode. The message appears if power goes out for any reason, including if the user turns power OFF when the tester is in RUN mode. ● Always press STOP before powering the Xe-1 off to prevent the M49 message from being displayed when the tester is powered back on.

Code	Message	Description ● Suggested Action
M54	CHAMBER TEMP RUNAWAY XXX°C	The black panel or air temperature sensor is above the highest set point + the chamber temp runaway deviation temperature. ● The test step set point is too low for the lab temperature. ● Check air heater relay (failed on). ● Check the chamber blower.
M60	LOW IRRADIANCE: CHANGE LAMP	Irradiance of the lamp is more than 5% below set point. ● Replace the lamp and recalibrate irradiance (see Section 11.1).
M61	LAMP OUT	Irradiance of the lamp is more than 30% below the set point. ● The lamp burned out, replace the lamp and recalibrate irradiance (see Section 11.1). ● Check the ballast. ● Check the lamp relay. ● Check the lamp trigger finger.
M63	IRRADIANCE TOO HIGH	Irradiance of the lamp is greater than 5% above the set point. ● Make sure the dimming cable from the ballast to the controller is properly connected. ● Check the ballast.
M64	LAMPS ON: SHOULD BE OFF	The tester is running a dark step, but the main controller senses the irradiance is above 0.05 W/m^2. ● Replace the lamp relay.
M65	AC VOLTAGE OUT OF RANGE	For 208 V testers, the input voltage has gone below 187 V or above 228 V. For 230 V testers, the input voltage has gone below 207 V or above 253 V. ● Check the main power supply.
M67	LAMP RELAY STUCK ON	The irradiance is above 0.05 W/m^2 during the "Relay Check." ● Replace the lamp relay.
M68	RUN RELAY STUCK ON	The irradiance is above 0.05 W/m^2 during the "Relay Check." ● Replace the run power relay.
M69	RELAY CHECK IN PROCESS	Displayed normally when the M67 & M68 diagnostic sequence is in process. This is not a fault, it is a status message indicating that the diagnostic is in progress. ● *No action required.*
M70	BLACK PANEL TEMP SENSOR FAIL XXX°C	The black panel temperature is less than 5 °C or greater than 150 °C. ● Make sure black panel cable connector is firmly seated. ● Replace the Black Panel Temperature sensor.

| Code	Message	Description
		● Suggested Action
M72	AIR TEMPERATURE SENSOR FAIL	The chamber air temperature sensor is activated and the temperature is less than 3 °C or greater than 180 °C. ● Make sure the sensor cable connector is firmly seated. ● Replace the air temperature sensor.
M74	LAB TEMPERATURE SENSOR FAIL	The lab temperature sensor is activated and the temperature is less than 3 °C or greater than 99 °C. ● Make sure the sensor cable connector is firmly seated. ● Replace the lab temperature sensor.
M80	FLASH MEMORY FAILURE	Checksum test on program failed. ● Contact Q-Lab Repair.
M81	FLASH DATA CORRUPT	Parameter and setup data corrupted. ● Contact Q-Lab Repair.
M82	RAM CORRUPTED, RAM RELOADED	Error in RAM data. ● Contact Q-Lab Repair.
M101	SD CARD MISSING	The SD card is missing from the main controller. ● Contact Q-Lab Repair.
M103	SYSTEM AUTO REBOOT: SEE TECH MANUAL	System restarts because of fail-safe intended to prevent system locking up. ● *No action required.*
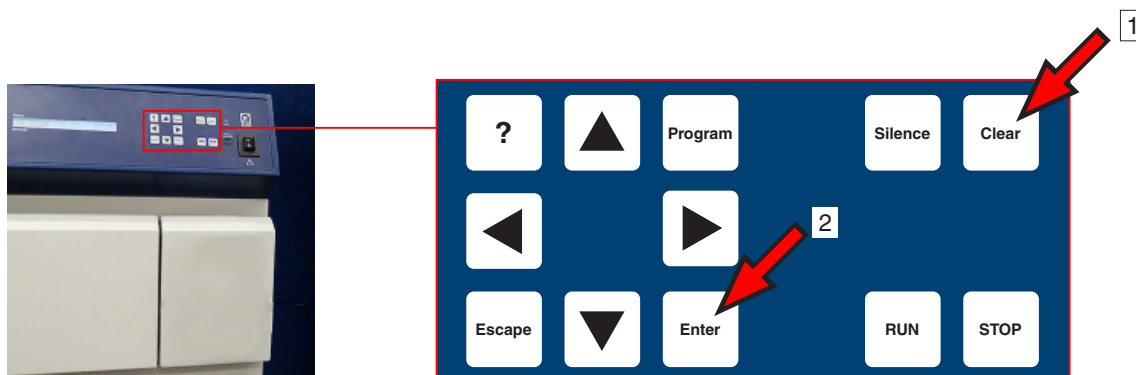
Figure 15.2: Keypad - Clear and Enter keys indicated.

15.4 Data Transfer Error Messages (Feb 2022)

The E series of error messages report problems when using a USB drive or SD card to export tester diagnostic data or load software updates. Contact Q-Lab Repair.

See Section 18 for Q-Lab Repair contact information.

Code	Message	Action
E01	ERROR READING USB DRIVE	Remove the USB drive from the tester and insert another USB drive.
E02	NOT ENOUGH STORAGE SPACE ON USB REPLACE USB. ENTER=CONTINUE	Remove the USB drive from the tester and insert another USB drive.
E03	NO FIRMWARE FILE EXISTS ON USB PLEASE UPDATE USB. ENTER=CONTINUE	Download a new software update file. See Section 14.6.
E04	USB DISCONNECTED, PLEASE TRY AGAIN	Make sure that the USB drive is firmly seated in the tester USB port.
E05	SD CARD DISCONNECTED	Contact Q-Lab Repair and Tester Support.
E06	SD CARD DISK FULL	Contact Q-Lab Repair and Tester Support.
E07	VIRTUAL STRIP CHART COPY FAILED	Re-export the VIRTUAL STRIPCHART data.

15.5 Lamp Does Not Light (Feb 2022)

Symptom - Lamp Does Not Light

- Trigger finger is not in good contact with lamp, or requires cleaning. See Section 14.2.
- Faulty trigger/transformer assembly. See 7 for replacement parts.
- Faulty ballast.
- Faulty lamp relay.
- Replace lamp.

Lamp Flickers During Operation

- Trigger finger is not in good contact with lamp, or requires cleaning. See Section 14.2.
- Reverse lamp (Figure 15.5a and Figure 15.5b).
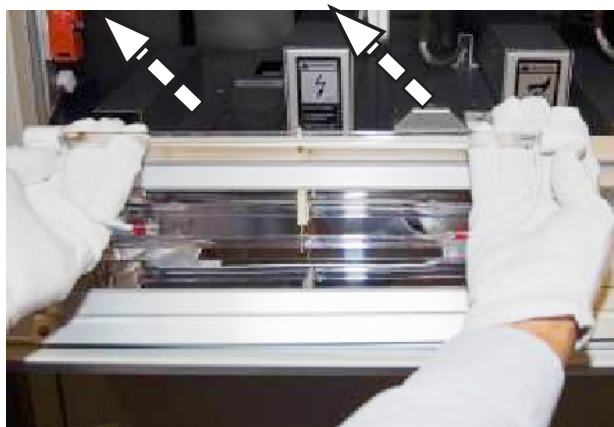- Replace lamp. See Section 14.1.

Figure 15.5a: Remove the Lamp

Figure 15.5b: Swap Ends to Reverse the Lamp and Reinstall

16. Replacement Parts List (Feb 2022)

Replacement Parts

Part Number	Description	Where Pictured
X-7918	Air Filter, Disposable, Xe-1	Figure 14.5b
X-10997-K	Air Filter, Washable, Xe-1	
X-7916-K	Air Heater, Xe-1	Figure 16t
X-7359-K	Ballast, Xe-1	Figure 16l
UC202/BP	Black Panel Temperature Smart Sensor, Uninsulated	Figure 8.1a
UC202/IBP	Black Panel Temperature Smart Sensor, Insulated	Figure 8.1b
UC202/RECAL	Black Panel Temperature Smart Sensor, Recalibrate and Return	No Picture
UC202/RECALDISP	Black Panel Temperature Smart Sensor, Recalibrate and Dispose	No Picture
X-15118-X	Chamber Blower Assembly, Xe-1	Figure 16a
X-15117	Chamber Blower Motor Driver, Xe-1	Figure 16x
X-7979-K	Chamber Wall Replacement Kit, Xe-1	Figure 16m
V-4086	Controller, Battery (Also used in UC1)	Figure 16r
X-10315-K	Controller, DC Blower Power Supply Board, Xe-1	Figure 16o
V-4041-K	Controller, Keypad/Radiometer Interface Board	Figure 16s
V-4051-X	Controller LCD Assembly	Figure 16d
TEB-105014-K	Controller, Main	Figure 16i
U-6431	Fuse (Transformer Primary, Lamp Cooling Blower, Chamber Blower, Xe-1 Air Heater) – 3.15 A	Figure 16n
U-6427	Fuse (Transformer Secondary) – 6.3 A	Figure 16n
X-7245	Fuse (Power Supply) – 12 A	Figure 16n
X-10424-K	Interlock Switch Assembly, Chamber Door	Figure 2d
X-7123	Interlock Switch, Lamp Door	Figure 2a
UC20/340	Irradiance Smart Sensor, 340 nm	Figure 11.1.1a
UC20/420	Irradiance Smart Sensor, 420 nm	
UC20/LUX	Irradiance Smart Sensor, LUX	
UC20/TUV	Irradiance Smart Sensor, TUV	
UC20/RECALDISP	Irradiance Smart Sensor, Recalibrate and Dispose	No Picture
UC20/RECAL	Irradiance Smart Sensor, Recalibrate and Return	No Picture
X-7866-K	Lamp Housing, (Lamp Not Included), Xe-1	Figure 16w
X-7509-K	Lamp Trigger Assembly Kit	Figure 16q
X-7927-K	Lamp/Ballast Blower, Xe-1	Figure 16b
X-7777-X	Power Cord	Figure 16f
V-2202	Power Switch, Xe-1	Figure 16j
CR20 RECAL	Re-Calibrate CR20 Radiometer (recommended 1×/yr.)	No Picture
CT202 RECAL	Re-Calibrate CT202 Thermometer (recommended 1×/yr.)	No Picture

Replacement Parts

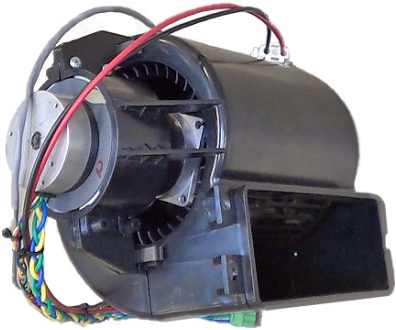| Part Number	Description	Where Pictured
X-10434-X	Relay, Run Power	Figure 16e
F-8385-K	Relay Kit, Solid State, 25 A	Figure 16h
X-15510-K	Relay Kit, Solid State, 50A	Figure 16g
X-10115-X	Specimen Holder Assembly with (1) 2"×4" panel holder, (2) 50×100 mm (2"×4") panels & (2) retaining rings	Figure 10.3e
X-10113-K	Specimen Holder Kit with (8) 50×100 mm (2"×4") specimen holder assemblies, (1) 2"×4" single panel holder assembly and (2) insulated black panel holder assemblies	Figure 10.3f
X-7973-X	Specimen Tray with clips, Xe-1	Figure 16p
X-10195-X	Specimen Tray without clips, Xe-1	Figure 10.3a
X-10235-X	Temperature Sensor, Black Panel	Figure 8.1a
X-7778-X	Temperature Sensor, Insulated Black Panel	Figure 8.1b
X-10255-X	Textile/Thin Film Sample Holder	Figure 10.3n
X-10259-K	Textile/Thin Film Sample Holder Kit, 8 pieces	No Picture
X-10545-X	Transformer, Power Supply	Figure 16c
UC1	Universal Calibrator Handheld Display Kit	Figure 11.2.1a
X-7515-K	UV Detector, 340 nm	Figure 16k
X-7522-K	UV Detector, 420 nm	Figure 16k
X-7523-K	UV Detector, TUV	Figure 16k
X-10271-K	UV Filter, Daylight - B/B	Section 7.4
X-7460-K	UV Filter, Daylight - Q	Section 7.4
X-10586-K	UV Filter, Daylight - F	Section 7.4
X-6502-K	UV Filter, Extended UV - Q/B	Section 7.4
X-10180-K	UV Filter, Extended UV - Quartz	Section 7.4
X-10521-K	UV Filter, UV Blocking	Section 7.4
X-10214-K	UV Filter, Window - B/SL	Section 7.4
X-10110-K	UV Filter, Window - IR	Section 7.4
X-10266-K	UV Filter, Window - Q	Section 7.4
X-10857-K	UV Filter, Window – SF5	Section 7.4
X-10710	Voltage Phase Monitor	Figure 16v
V-4118	VIRTUAL STRIPCHART Software	Section 12.3
X-6568-K	Wedge Adapter for 0°, Xe-1	Figure 16u
X-15350-K	White Panel Kit, Uninsulated	Figure 16y
X-15351-K	White Panel Kit, Insulated	Figure 16z
X-1800	Xenon Arc Lamp, 1800 W	Figure 7.1a

Replacement Parts

Figure 16a: X-15118-X Blower, Chamber, Xe-1

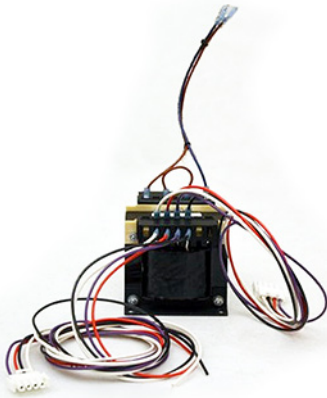Figure 16b: X-7927-K Blower, Lamp/Ballast, Xe-1

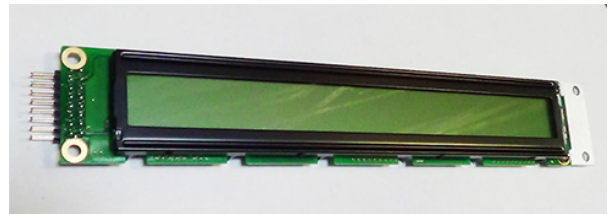Figure 16c: X-10545-X Transformer, Power Supply

Figure 16d: V-4051-X LCD Assembly

Figure 16e: X-10434-X Relay, Run Power Xe-1

Figure 16f: X-7777-X Power Cord, Xe-1

Replacement Parts
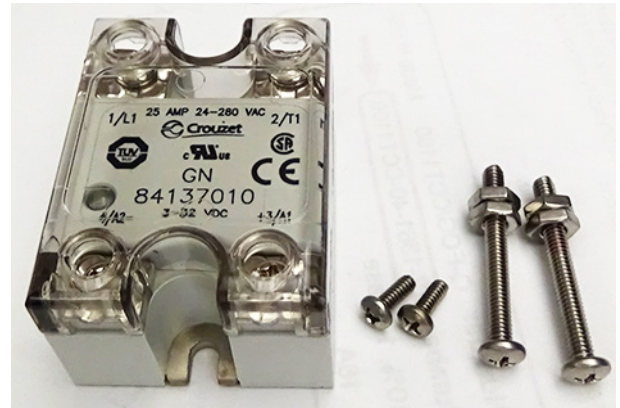

Figure 16g: X-15510-K Relay Kit, Solid State, 50A

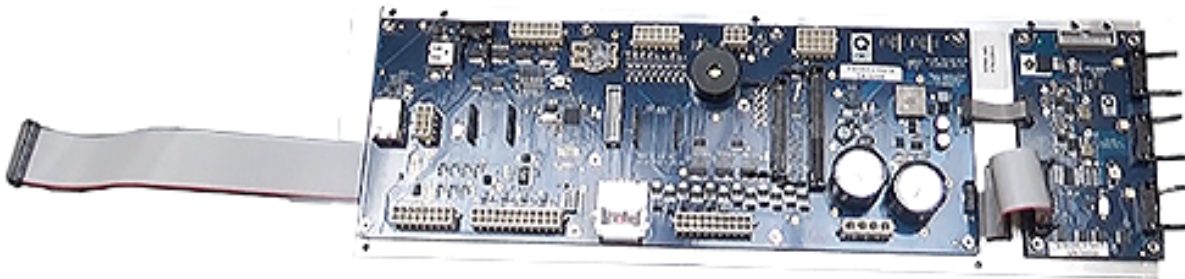
Figure 16h: F-8385-K Relay Kit, Solid State, 25A

Figure 16i: TEB-105014-K Controller, Main

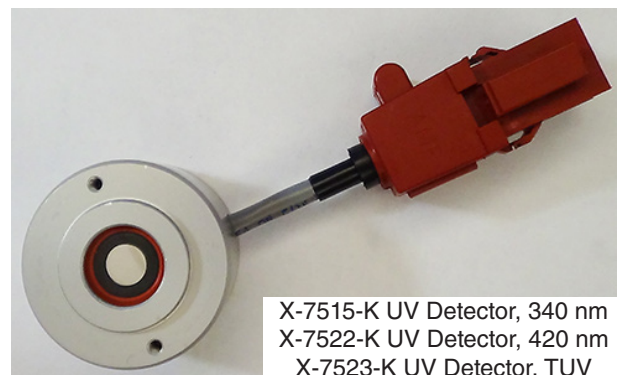
Figure 16j: V-2202 Switch Main Power

X-7515-K UV Detector, 340 nm
X-7522-K UV Detector, 420 nm
X-7523-K UV Detector, TUV

Figure 16k: UV Detectors

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Replacement Parts

Figure 16l: X-7359-K Ballast
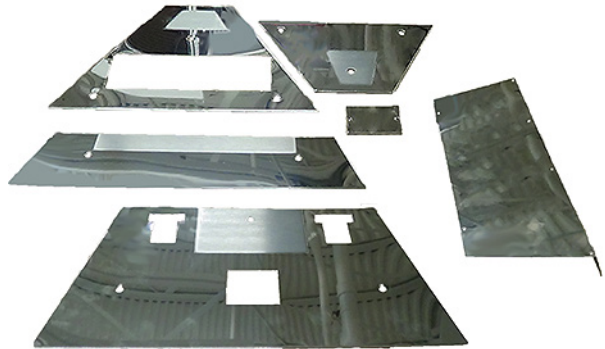
Figure 16m: X-7979-K Chamber Wall Replacement Kit

U-6431 Fuse, 3.15 A
U-6427 Fuse, 6.3 A
X-7245 Fuse, Power Supply, 12 A
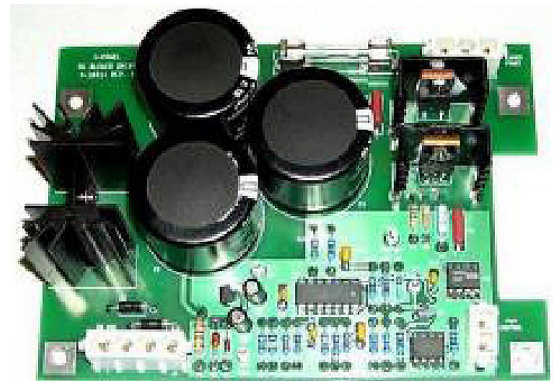
Figure 16n: Fuses

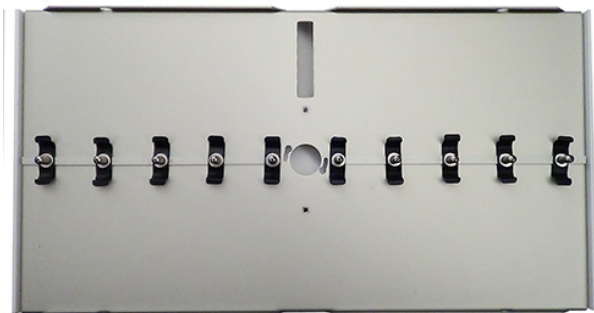Figure 16o: X-10315-K Controller, DC Blower Power Supply Board Kit
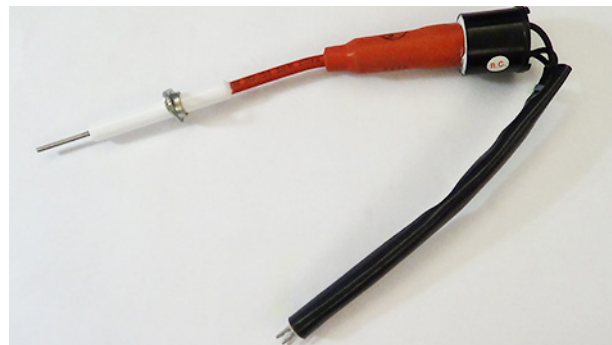

Figure 16p: X-7973-X Specimen Tray with Clips

Figure 16q: X-7509-K Lamp Trigger Assembly Kit

Replacement Parts
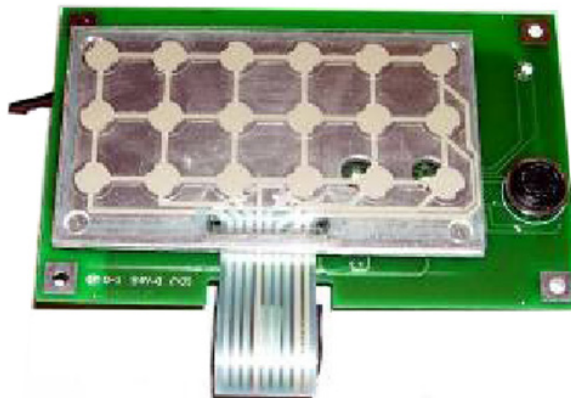

Figure 16r: V-4086 Controller Battery

Figure 16s: V-4041-K Controller, Keypad/Radiometer Interface Board
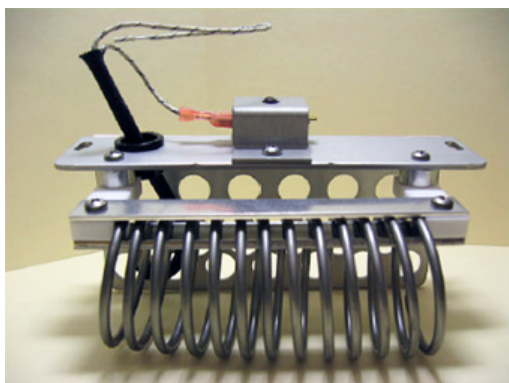

Figure 16t: X-7916-K Air Heater

Figure 16u: X-6568-K Horizontal Specimen Tray Base, Xe-1 without Chiller

Figure 16v: X-10710 Voltage Phase Monitor

Figure 16w: X-7866-K Lamp Housing, (Lamp Not Included), Xe1

Replacement Parts

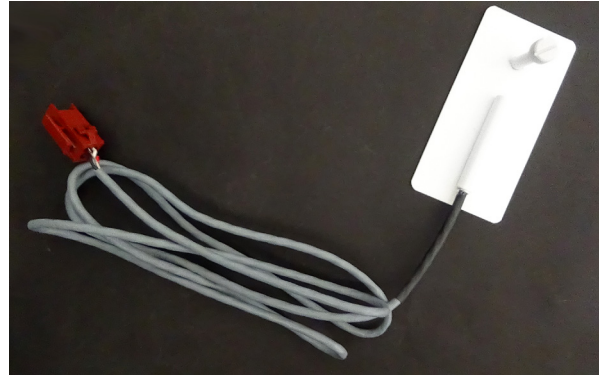Figure 16x: X-15117 Brushless DC Motor Driver, Xe-1

Figure 16y: X-15350-K White Panel Kit, Uninsulated

Figure 16z: X-15351-K White Panel Kit, Insulated

Figure 16aa: U-41085-K Temperature Calibration Kit

17. Warranty (Oct 2020)

- All Q-SUN Xe-1 Xenon Test Chambers and components are guaranteed against defects in workmanship or materials for one year.
- Liability is limited to replacing or repairing any part or parts that are defective in materials or workmanship.
- Liability in all events is limited to the purchase price paid.
- Damage due to accident or abuse is not covered.
- Labor cost is not covered.
- Q-Lab Corporation makes no other warranties, including implied warranties of merchantability or fitness for a particular purpose, except as may be expressly provided by the Q-Lab Corporation in writing.
- Q-Lab Corporation shall not be liable for any incidental, consequential, special or contingent damages arising out of the sale or use of any product.
- Q-SUN test chambers are made in the USA.

18. Repair and Tester Support (Mar 2019)

Contact

- Q-Lab Repair and Tester Support is available Monday through Friday from 8:30 AM to 5 PM (international office time).

- Please contact the nearest Q-Lab international office by phone or email (see contact information below).

- You can also visit our website at www.q-lab.com to register your tester to access additional useful troubleshooting guides, operating manuals, and technical information.

For sales, technical, or repair support, please visit:

Q-Lab.com/support

Westlake, Ohio USA • Homestead, Florida USA • Buckeye, Arizona USA
Bolton, England • Saarbrücken, Germany • Shanghai, China

Additional Information

- Visit Q-Lab.com for additional information.