Q-SUN

Q-SUN Xe-1
Xenon Test Chambers

For Serial Numbers:
20-XXXXX-79-X1SE
20-XXXXX-79-X1BCE
20-XXXXX-79-X1SCE
20-XXXXX-79-X1WE

Revision Date
02 Mar 2022

Q-LAB

Table of 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.
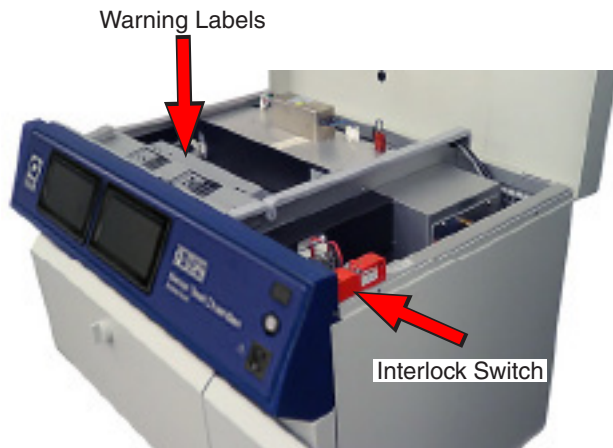
Figure 2a: "E" model testers warning label and interlock switch location (lamp access door open).

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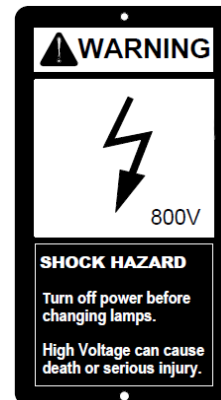
Figure 2c: Shock hazard warning label.

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: "E" model testers chamber door interlock switch location (test chamber and plumbing access door open).

3. General Description (Feb 2022)

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

Overview

- Q-SUN Xe-1 test chambers are laboratory simulators of the effects of indoor and outdoor light stability and weathering.
- The Q-SUN chiller option (Xe-1-BCE, Xe-1-SCE) allows testing at reduced temperatures by combining an air chilling system with a Q-SUN Xe-1 to reduce the temperature of the air entering the test chamber.
- The Q-SUN temperature-controlled water immersion option (Xe-1-WE) allows testing that requires samples to be submerged in water with precisely controlled temperature.
- This Technical Manual covers Q-SUN Xe-1 "E" models that feature enhanced performance, including dual touchscreen control and longer lamp life or higher irradiance capability.
- For the basic non-"E" Q-SUN Xe-1-B tester, see LX-5090B-TM Q-SUN Xe-1-B Technical Manual.

Xe-1 Models Description

Model	Configuration	Installation
Xe-1-SE	S: Water Spray	Tabletop
Xe-1-BCE	C: Basic + Chiller	Stand-Alone
Xe-1-SCE	Spray + Chiller	Stand-Alone
Xe-1-WE	W: Water Immersion	Tabletop

NOTE: All Q-SUN "E" models have enhanced performance over the basic tester, including longer lamp life, or higher irradiance capability.

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 <u>void</u> 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).
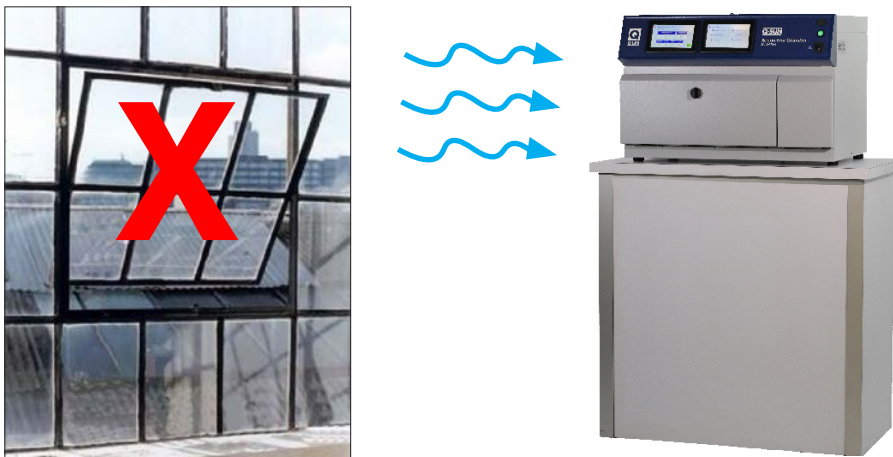- Do not locate tester near sources of cold or hot air (Figure 4.2d).

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 20 for contact information.**

5. Uncrating

5.1 Overview (Feb 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.

Shipping Weights (Approximate)	Xe-1-SE	Xe-1-WE	Xe-1-BCE, Xe-1-SCE
Tester On Skid With Wooden Frame	134 kg (296 lbs)	163 kg (359 lbs)	227 kg (500 lbs)
Tester On Skid With Carton Only	89 kg (195 lbs)	131 kg (288 lbs)	172 kg (380 lbs)
Tester Only*	50 kg (110 lbs)	89 kg (195 lbs)	124 kg (272 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	Stubby Screwdriver (Xe-1 chiller models)

*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 Models Without Chiller (Feb 2022)

Xe-1-SE, Xe-1-WE

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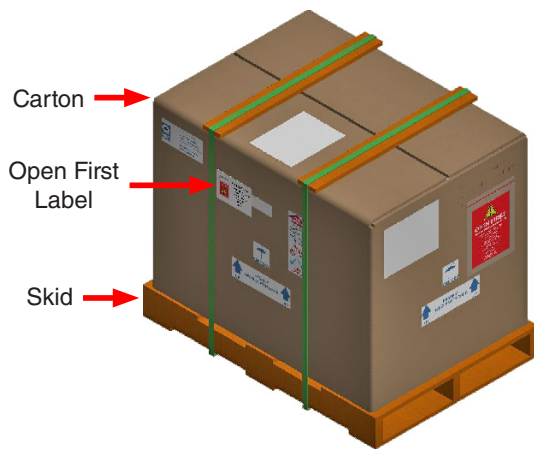

Figure 5.2a: This packaging has a carton banded to a wooden skid
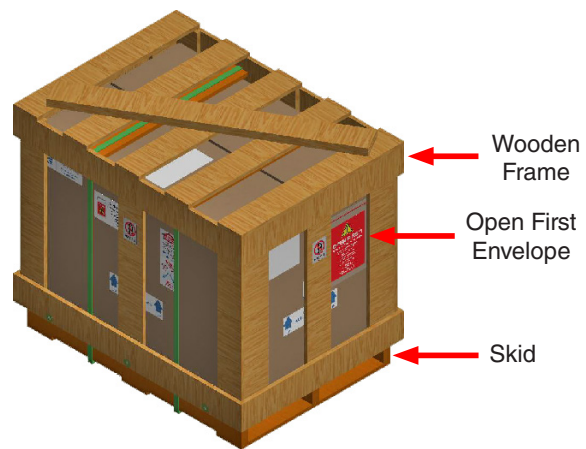

Figure 5.2b: This packaging has a carton surrounded by a wooden frame fastened to a wooden skid.

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

Figure 5.2d: 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.

13
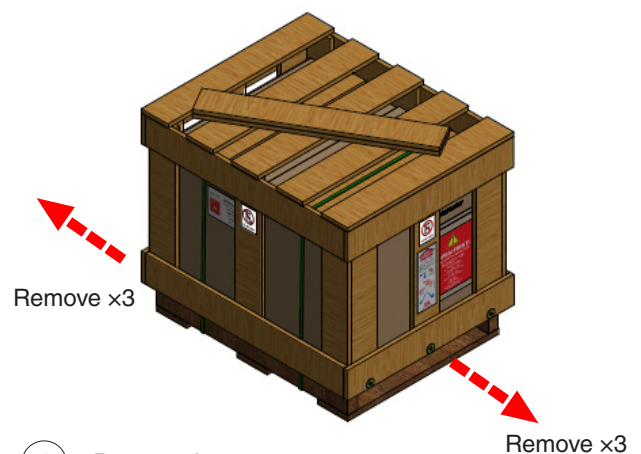
Use Fork Lift to
Remove Crate
in One Piece

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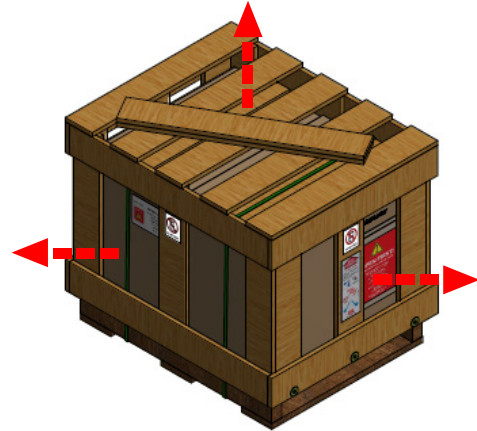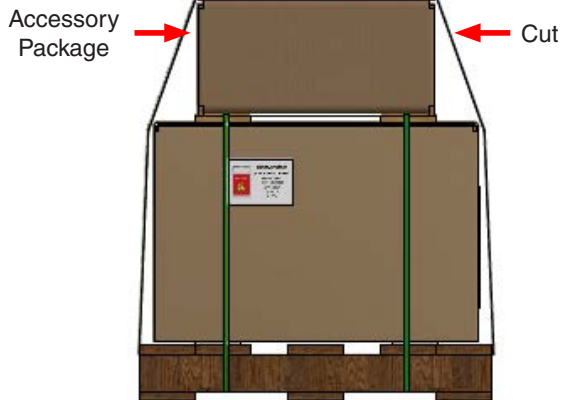
6. If a fork lift is not available, use a pry bar to carefully remove the horizontal and vertical wooden pieces off of the tester.

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.

Remove

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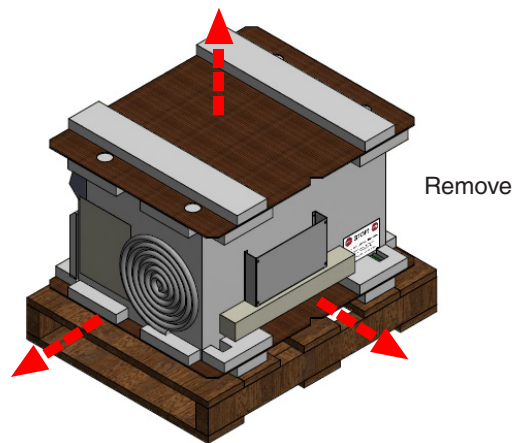
10. Remove all packaging materials from inside and outside the tester. Remove any accessory boxes.
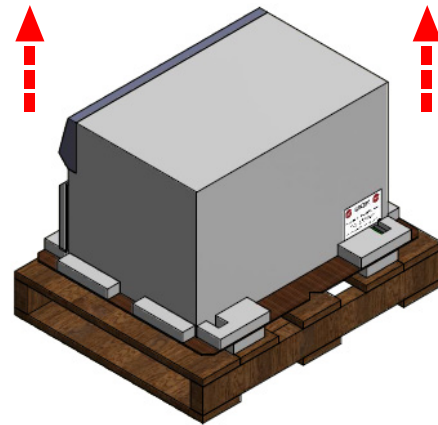
11. Q-Lab recommends that at least two people remove the Q-SUN from the skid.

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.

15

5.3 Models With Chiller (Feb 2022)

Xe-1-BCE, Xe-1-SCE

- Q-SUN Xe-1-BCE and Xe-1-SCE testers are shipped in one of two types of packaging (Figure 5.3a and Figure 5.3b).
- Labels on the carton indicate the location of the instructions to be opened first (Figure 5.3c).
- Instructions for uncrating and setting up the tester are located in the envelope shown in Figure 5.3d.
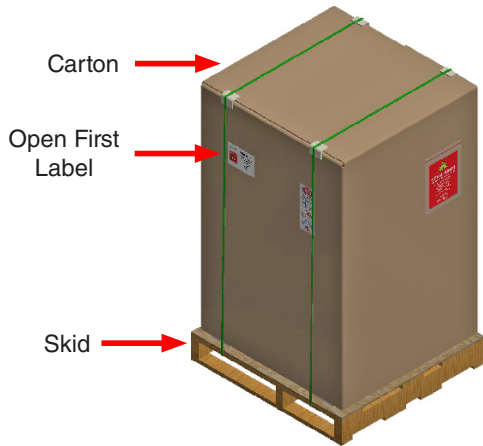

Figure 5.3a: This packaging has a carton banded to a wooden skid.

Figure 5.3b: This packaging has a carton surrounded by a wooden frame fastened to a wooden skid.

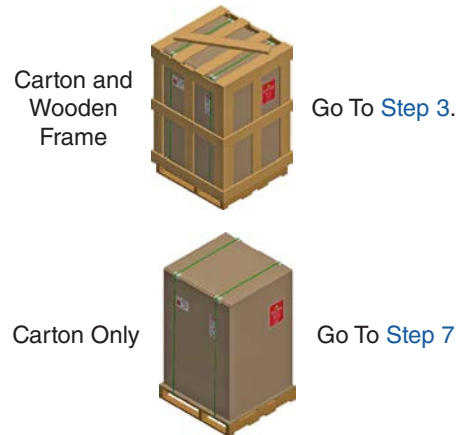Figure 5.3c: Labels on the carton indicate the envelope to be opened first.

Figure 5.3d: Open this envelope for important uncrating instructions.

Carton and Wooden Frame — Go To Step 3.

Carton Only — Go To Step 7

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

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

Screws in Front

Screws in Back

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

Remove ×3

Remove ×3

4. Remove the screws.

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.

Or Use Pry Bar to Remove Crate in Pieces

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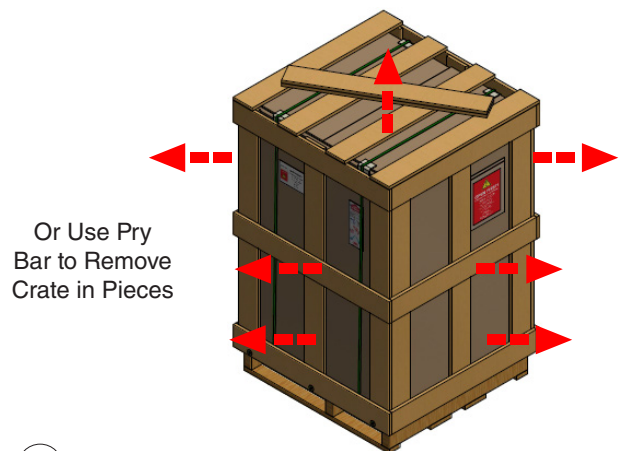
8. Cut the bands holding the carton to the skid. Remove the bands and boards.

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

Remove

Air Filter

10. Remove all packaging materials from inside and outside the tester.

Air Filter

11. Remove the air filter packaged at the side of the unit. Set aside.

12. Open the chiller front access door.
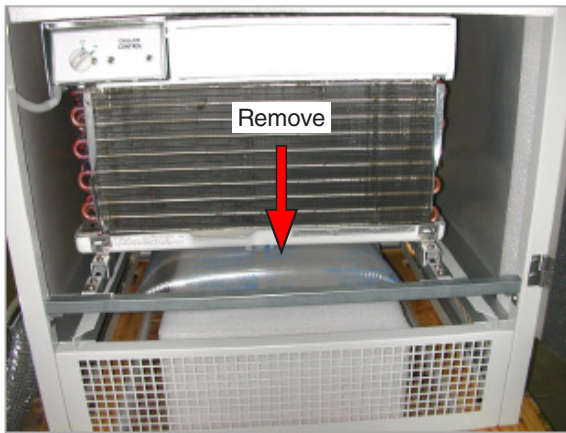
13. Remove the air bag from inside the chiller.
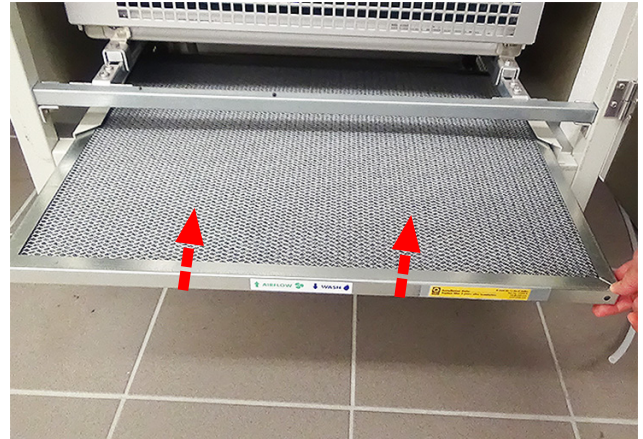
14. Install the air filter in the chiller.

15. Make sure the air flow arrow on the edge of the air filter frame points up. Close the door.

One Screw in Right Rear

Runner

Runner

Screws

16. Screws (2 each side) attach runners to skid.
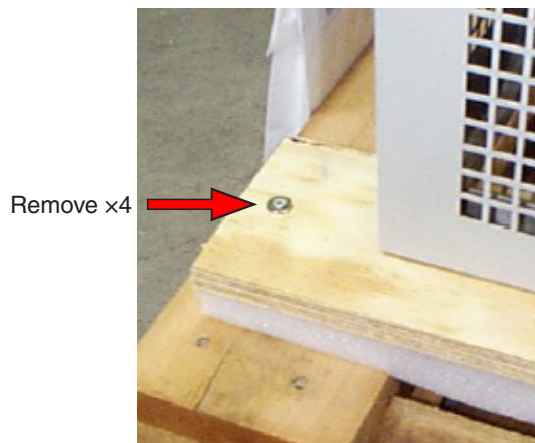
Remove ×4

17. Remove the four (4) screws.

At least two people are needed to remove the Xe-1 with chiller from the skid.

18. Follow Step 19 through Step 26 to remove the Xe-1 with chiller from the skid.
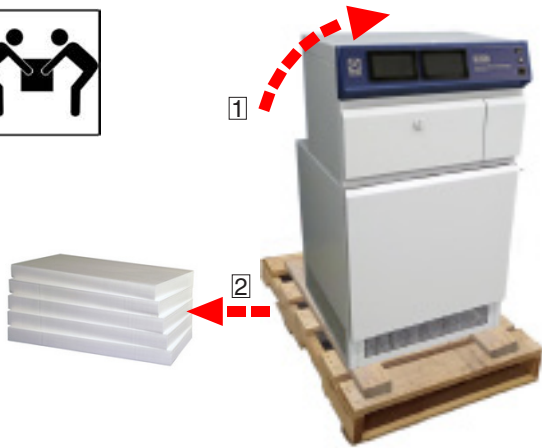
19. Two persons tilt the chiller. Pull the foam pieces out from under the bottom of the unit. Discard foam.

Slide Forward
100 mm Off Skid

20. Partially slide the unit off the skid so that the runners overhang the skid by about 100 mm (4").

Remove Screws

21. From the bottom of each runner, use a short screwdriver to remove the screw holding the runner to the unit.

Slide Backward 100 mm Off Skid

22. Slide the unit the opposite way, until it overhangs the skid about 100 mm (4").

Remove Screws

23. With a short screwdriver, remove the two (2) screws from the bottom of each wooden runner that secures the runner to the chiller.

Slide Off Skid

24. Slowly and carefully, slide the unit (and runners) off the skid onto the floor.

1

Runner

2
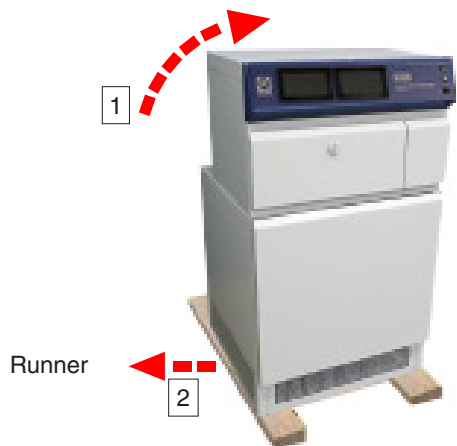
25. Tilt up one side of the chiller and remove the runner. Discard runner.

1

Runner

2
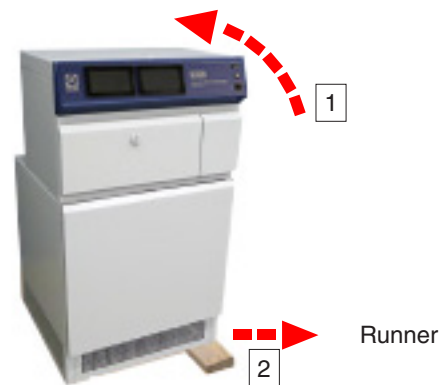
26. Tilt up the other side of the chiller and remove the other runner. Discard runner.
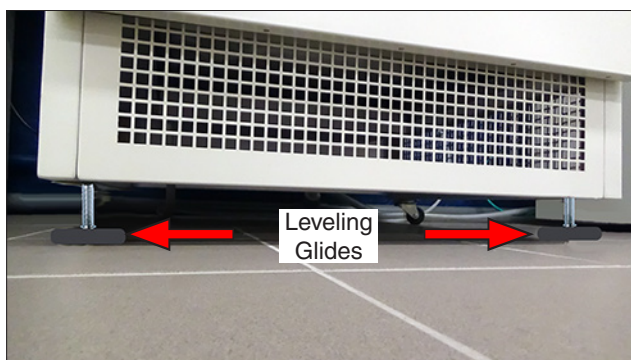
Leveling Glides

27. When moving a tester with leveling glides, do not hit floor drain, cracks, etc, as the glides may be damaged. If specified at the time of order, the chiller may be equipped with casters.

To complete tester installation see Section 6.1 through Section 6.4.

28. Go to the sections listed above.

NOTE: Optional casters may be install on chiller models.
The part number is X-10845-K.
Contact Q-Lab for more information.

6. Setup

6.1 Dimensions and Space Requirements (Mar 2022)

Model	Xe-1-SE	Xe-1-BCE, Xe-1-SCE	Xe-1-WE
External Dimensions With Leveling Pads (W × H × D)	78 cm × 52 cm × 65 cm 30.5" × 20.5" × 25.5"	78 cm × 138 cm × 79 cm 30.5" × 54.5" × 31.0"	99 cm × 72 cm × 65 cm 39.0" × 28.25" × 26"
External Dimensions With Casters (W × H × D)	No Casters	78 cm × 143 cm × 79 cm 30.5" × 56.1" × 31.0"	No Casters

- The Q-SUN Xe-1-SE is designed for tabletop or benchtop installation.
- Figure 6.1a shows external dimensions and space requirements.

Figure 6.1a: Q-SUN Xe-1-SE minimum clearance and counter space requirement.

- Q-SUN Xe-1-BCE and Xe-1-SCE models are designed for stand-alone installation.
- Figure 6.1b shows external dimensions and space requirements

Rear Clearance Required = 0 cm

Figure 6.1b: Q-SUN Xe-1-BCE, Xe-1-SCE minimum clearance and space requirement.

- Q-SUN Xe-1-WE is designed for tabletop or benchtop installation.
- Figure 6.1c shows external dimensions and space requirements

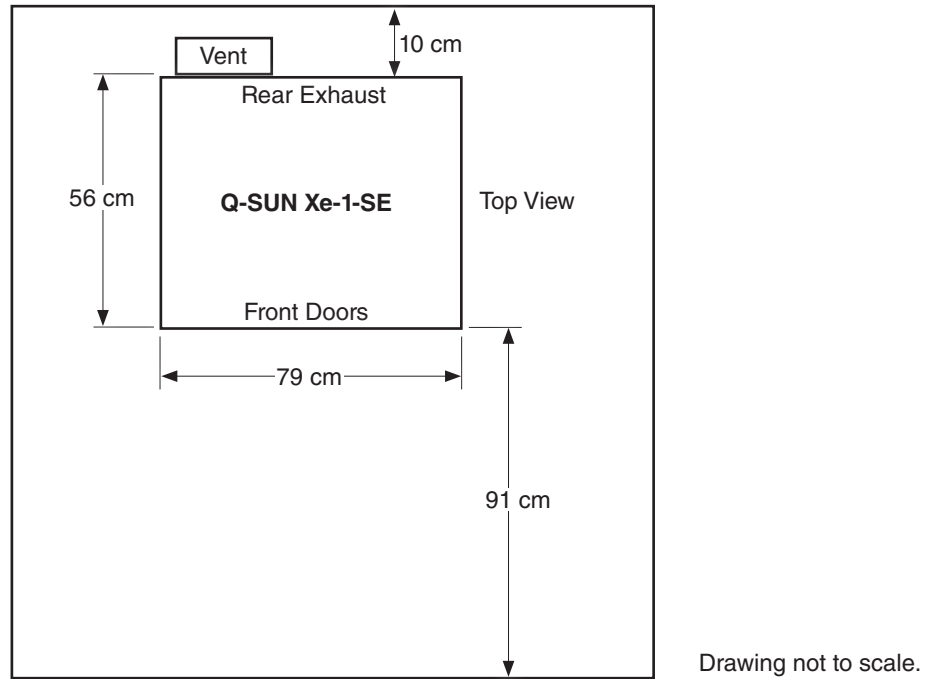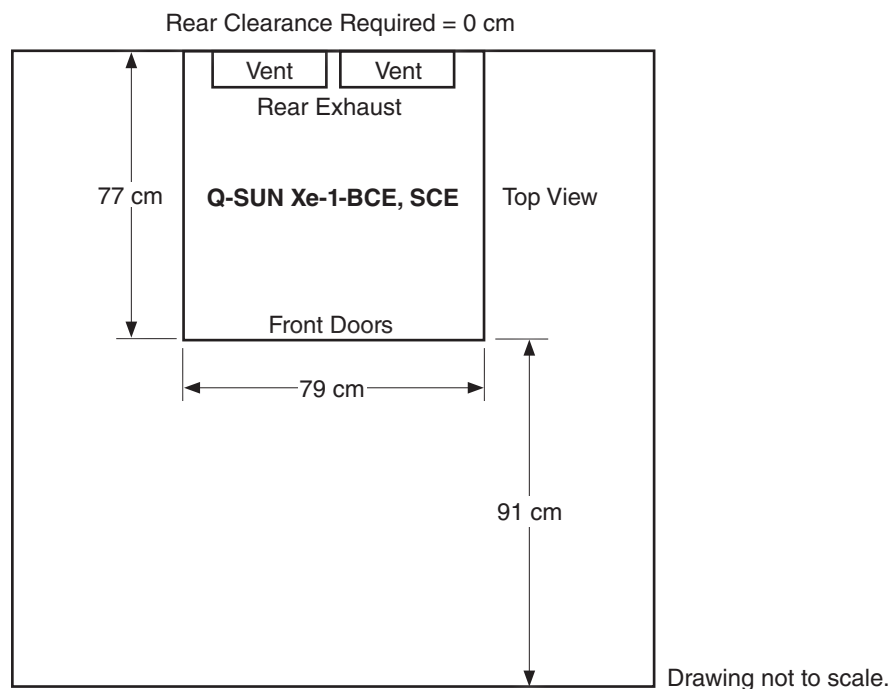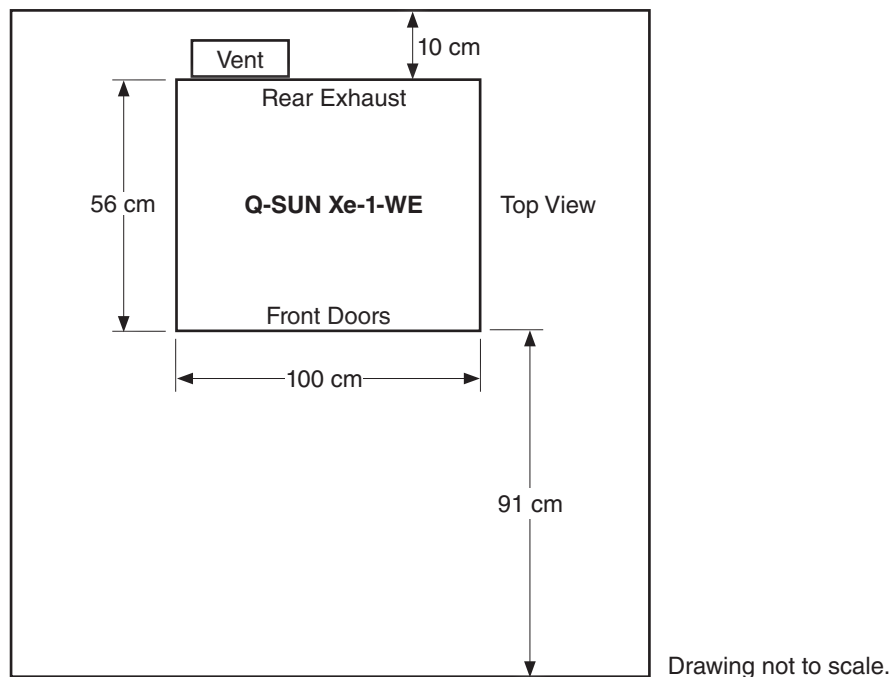Figure 6.1c: Q-SUN Xe-1-WE minimum clearance and counter space requirement.

6.2 Electrical (Aug 2020)

Specifications

Voltage	All Models	208 V or 230 V ± 10% - single phase
Current	Xe-1-SE	12 A @ 208 V, 11 A @ 230 V
	Xe-1-BCE, Xe-1-SCE	19 A @ 208 V, 16 A @ 230 V
	Xe-1-WE	13 A @ 208 V, 12 A @ 230 V
Frequency	All Models	50 or 60 Hz
Installation	Rated as Installation (Over voltage) Category II for transient over voltages.	

Figure 6.2a: Electrical specifications.

Connections

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

Figure 6.2b: Voltage and current shown on nameplate.

6.3 Water (May 2020)

Supply

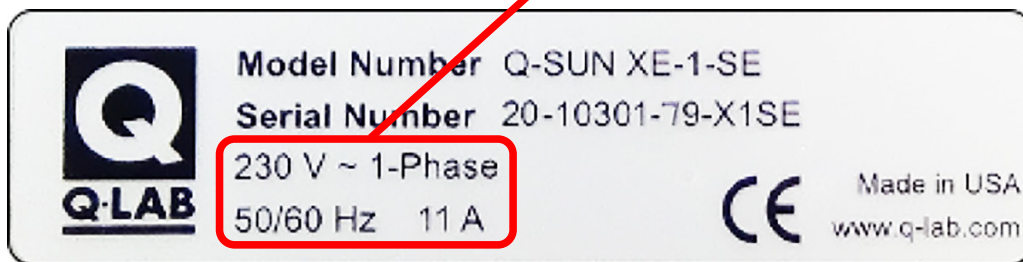| Xe-1-SE, Xe-1-SCE, Xe-1-WE	⚠️ Purified water is required for proper operation. The Q-SUN tester warranty is voided if this condition is not met.
Xe-1-BCE	No water is required.

System	Pressure	Flow Rate	Average Daily Volume	Resistivity	Conductivity	Silica	Total Dissolved Solids	pH
Spray*	207-620 kPa (30-90 PSI)	1.4 L/min	0.12 L/min × spray time**	>5M ohm•cm	<0.2 µS/cm	<0.1 ppm	<0.1 ppm	6-8
Water Immersion	69-620 kPa (10-90 PSI)	0.04 L/hr	1.0 L/day					

* A minimum of 30 PSI is needed continuously during spray steps to ensure all specimens are exposed to water spray uniformly. Failure to maintain adequate pressure for the duration of a spray step will cause the tester to produce a fault and interrupt the test. Q-Lab offers a water inlet pump for installations that do not have sufficient water pressure. See LX-5090-TM Q-SUN Xe-1 Technical Manual for more information.

** Average daily volume during a spray step is based on a spray on time of 5 seconds and a spray off time of 55 seconds. Adjusting the spray on/off time will change the average daily volume.

The reverse osmosis / deionized (RO/DI) water system shown in Figure 6.3a produces water pure enough for spray systems. **This type of RO/DI system is required for Xe-1-SE, Xe-1-SCE and Xe-1-WE testers.**

⚠️ **Important: Use Type I, not Type II anion in the mixed bed tanks of the RO/DI system.**

The Strong Base **Type I** Anion resin in the mixed bed tanks is the most important part of these systems to prevent water spotting. This is because strong base Type I anion resin is the only resin that can effectively remove suspended silica. **Suspended silica is the major cause of specimen spotting.** Type I anion is much better at removing suspended silica than Type II.

Unfortunately, Type II is the most common anion. So be sure to insist that your water purification supplier installs Type I, not Type II. The cost for Type I anion is about the same as Type II. Note that Type I anion is only necessary in the mixed bed "polishing" stages of the deionization, not in the initial "rough" purification stages.

Reverse Osmosis / Deionization System

- Figure 6.3a below shows an effective Reverse Osmosis / Deionized Water System with Anion Type I Resin for spray water silica removal.

- For information on water purification systems, contact the Life Science business of Merck KGaA, Darmstadt, Germany. The Life Science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the USA and Canada.
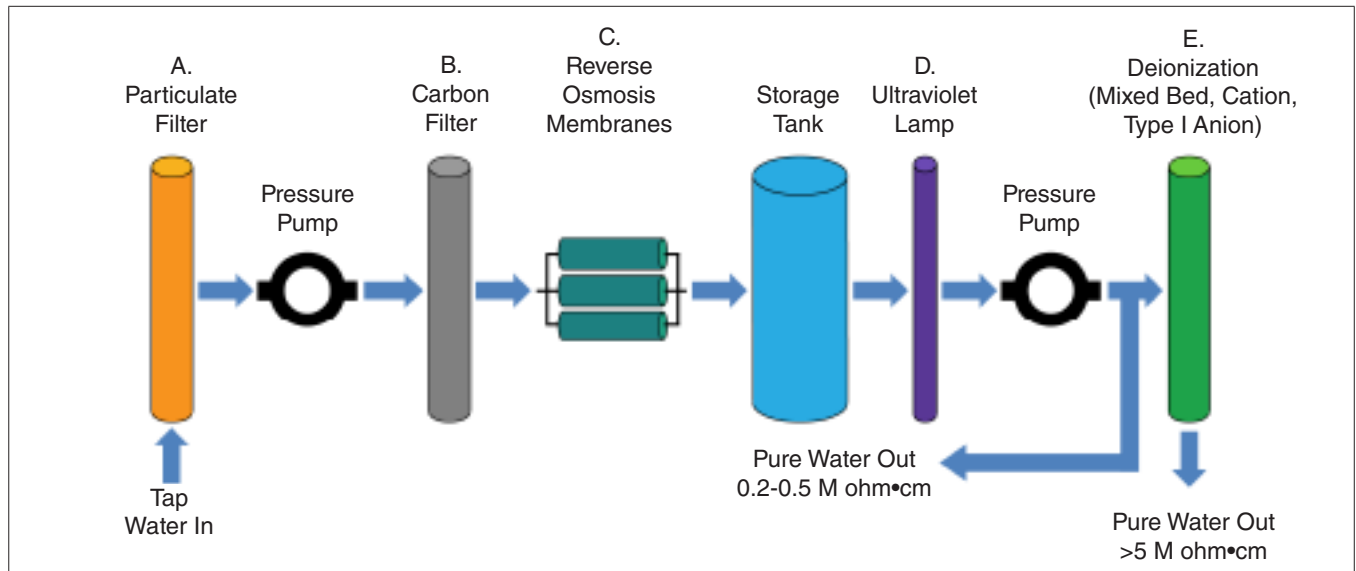

Figure 6.3a: Reverse osmosis / deionized water system.

- Additional RO/DI system information is shown below.

Stage	Purpose	Outgoing Purity	Notes
A. Particulate Filter	Remove small particles		Replace once per year
B. Carbon Filter	Remove chlorine		Replace once or twice per year
C. R/O Membranes	Remove dissolved solids, colloidal silica, organic and biological contaminates	0.2-0.5 M ohm•cm	Rough purification stage
D. Ultraviolet Lamp	Disinfect water		Rough purification stage
E. Mixed Bed Tank	Final polishing to remove positively and negatively charged ions	> 5 M ohm•cm	Final polished water purity

Water Repurification System

- Q-Lab offers an optional water repurification system for the Q-SUN to conserve purified water.

- The system re-circulates and re-purifies the spray water instead of letting it go down the drain and can save over 50 liters of purified water per day.

- See Specification Bulletin LW-6048 Water Repurification System for more information.

Connections

- Water supply and drain connection requirements for Xe-1 models are listed in Figure 6.3b below:

Connections	Xe-1-BCE	Xe-1-SE	Xe-1-SCE	Xe-1-WE
Water Supply Required	No	Yes	Yes	Yes
Drain Required	Yes			

Figure 6.3b: Xe-1 water connection requirements.

For Xe-1 Models Requiring Connections

- Water supply and drain connections are made at the lower rear of the tester (Figure 6.3c).
- Water inlet and drain fittings to meet various connection configurations are supplied (Figure 6.3e to Figure 6.3h).
- A 10 mm water fitting adapter (U-40817-X) for connecting the tester to a 10 mm inlet water supply is also supplied (Figure 6.3d).
- The water inlet tube is not supplied with the tester. Drain hose is supplied with the tester.
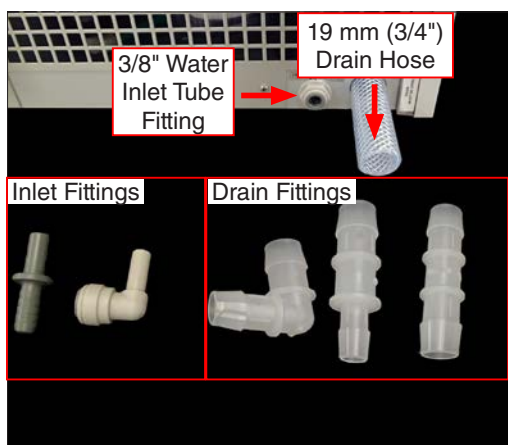- Refer to the diagrams included with the tester or visit Q-Portal for detailed plumbing information.

Figure 6.3c: Hose barbs and elbows supplied with models requiring supply and drain connections.
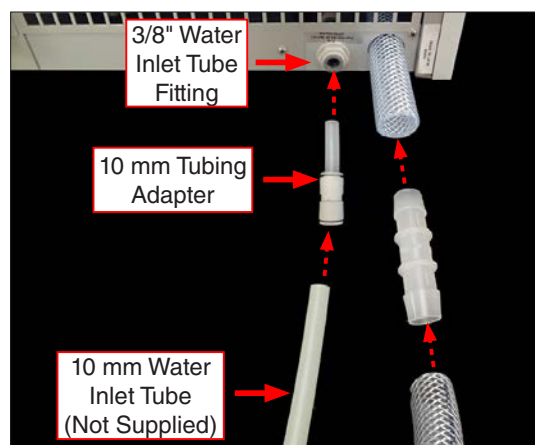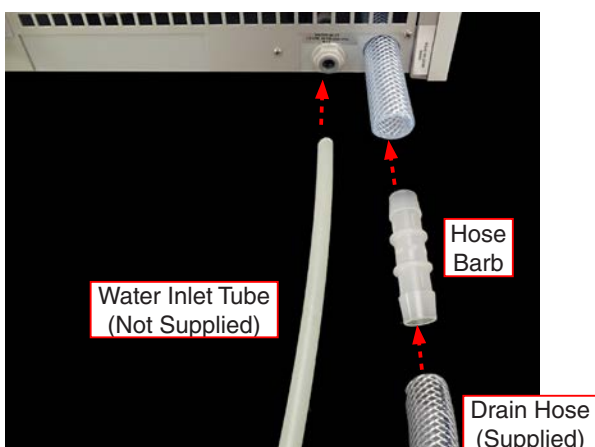

Figure 6.3d: Connect to 10 mm water inlet supply tubing.

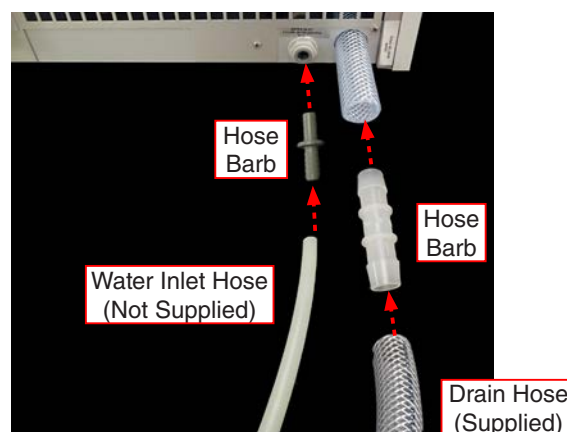Figure 6.3e: Water connections - Configuration 1.

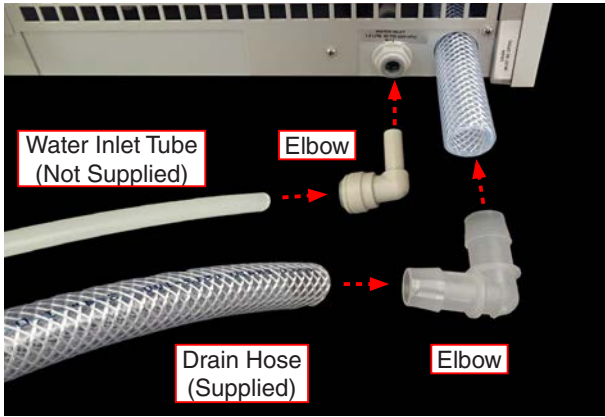Figure 6.3f: Water connections - Configuration 2.

27

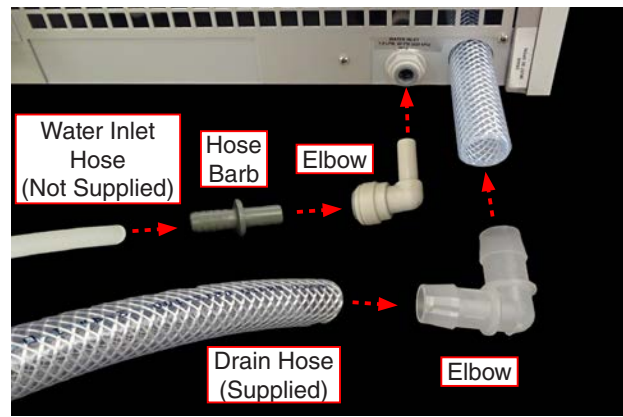Figure 6.3g: Water connections - Configuration 3.

Figure 6.3h: Water connections - Configuration 4.

Note: To disconnect inlet hose barb or elbow, push in on the dark gray gripper ring on the inlet connector.

For Xe-1 Chiller Models (Xe-1-BCE, Xe-1-SCE)

- The air chiller condenses water on its evaporator coil. This water must then be drained away.
- The chiller has a short piece of 1.3 cm (1/2") drain hose exiting below the rear panel. (Figure 6.3i).
- A reducer (Figure 6.3j) is supplied to connect the chiller drain hose to the 2 cm (3/4") supplied drain hose.
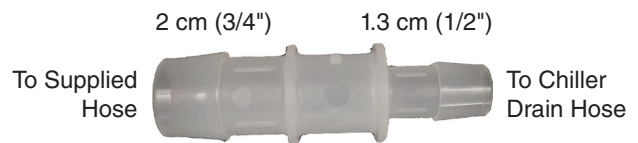

Figure 6.3i: Chiller drain hose.

Figure 6.3j: Chiller drain hose reducer.

For Raised Drain Installations

- If a drain hose must rise more than 100 mm (4.0") above the tester drain outlet at any point before reaching a drain, a pump is needed, or the tester must be elevated.
- An optional drain pump kit is available to pump drain water over obstacles or to an elevated drain (Figure 6.3k).
- Alternatively, for chiller models an optional lift kit is available to raise the entire tester up off of the floor (Figure 6.3k).
- See Section 15 for information on drain pumps and lift kits.
- Do not use concrete blocks, pallets, bricks, or other means to raise the tester to achieve proper drainage.

Raised Drain Options	Xe-1-BCE	Xe-1-SE	Xe-1-SCE	Xe-1-WE
Drain Pump	Available	Available	Available	Available
Lift Kit	Available	Not Available	Available	Not Available

Figure 6.3k: Raised drain options.

6.4 Venting (May 2020)

- Xe-1 models are designed to release warm exhaust air directly into the room (See Figure 6.4b,c,d).
- Xe-1 testers do not require a vent hood or ducting.
- Do not attach to a powered vent.

Model	Heat Load Dissipation
Q-SUN Xe-1-SE	1,200 watts (4,100 BTU/Hr)
Q-SUN Xe-1-BCE and Xe-1-SCE	2,400 watts (8,200 BTU/Hr)
Q-SUN Xe-1-WE	1,400 watts (4,800 BTU/Hr)

Figure 6.4a: Heat load dissipation by model.

⚠️ **IMPORTANT:** Air intakes and exhausts must not be obstructed. Keep filters clean. See Section 16.5 for more information on filter cleaning.
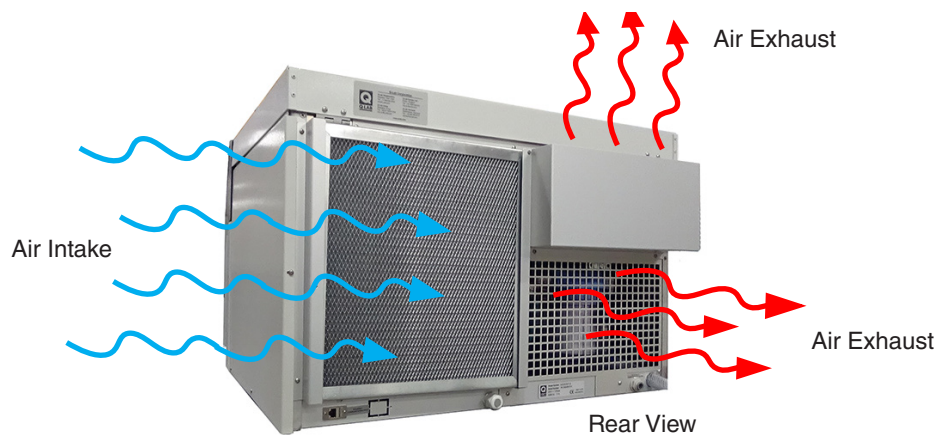
Q-SUN Xe-1-SE

Figure 6.4b: Q-SUN Xe-1-SE air intake and exhaust areas.

Q-SUN Xe-1-BCE, Xe-1-SCE

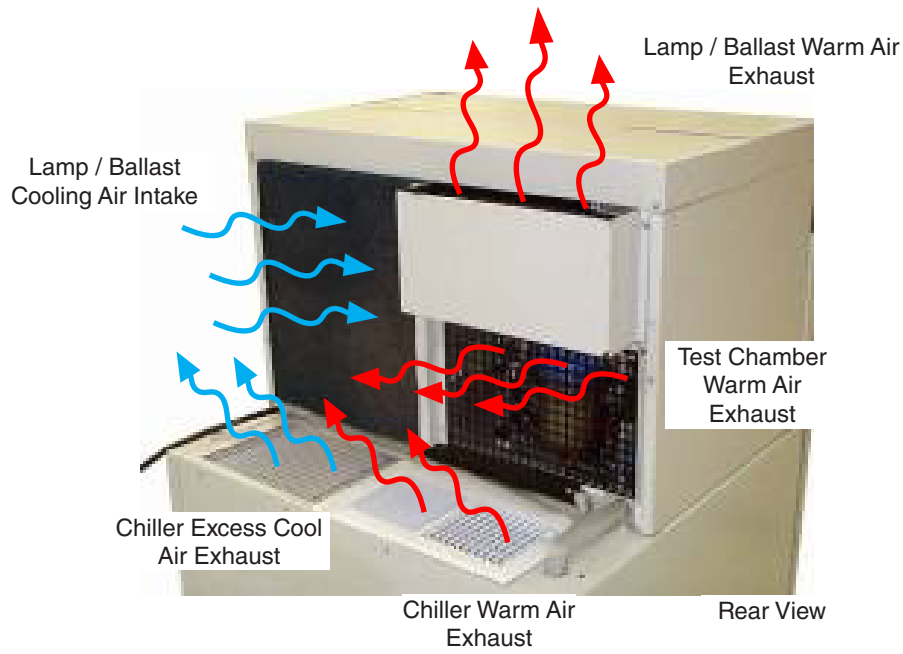Figure 6.4c: Q-SUN Xe-1-BCE and Xe-1-SCE chiller cooling air intake areas.

Figure 6.4d: Q-SUN Xe-1-BCE and Xe-1-SCE lamp / ballast air intake and air exhaust areas.
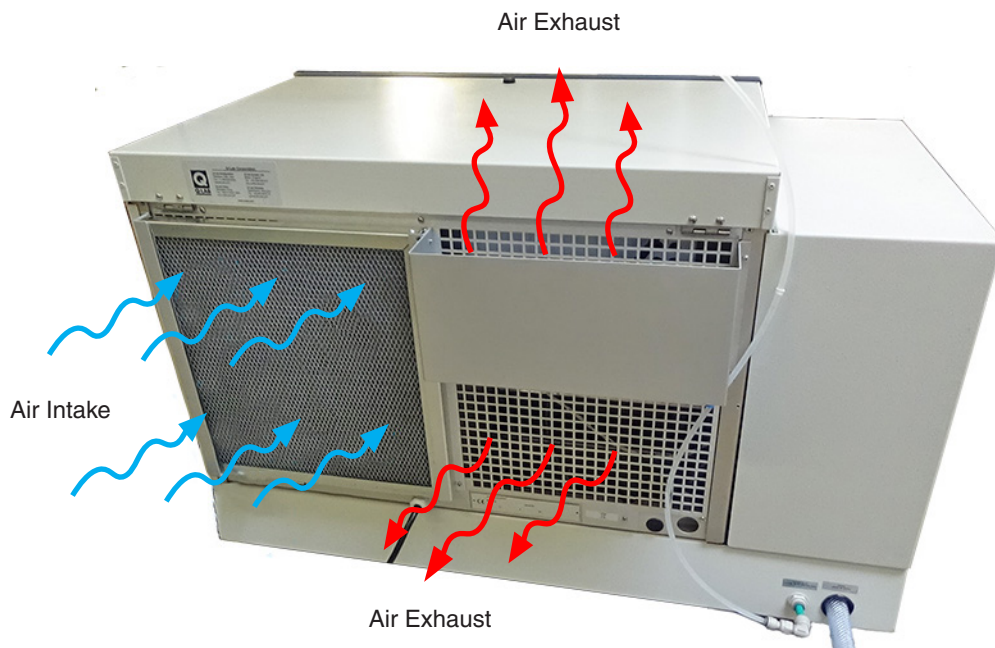
Q-SUN Xe-1-WE

Figure 6.4e: Q-SUN Xe-1-WE 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 16.1 and Section 18 for lamp replacement information.
- See Figure 7.1b for lamp location relative to the UV optical filter (see Section 7.4) and specimens mounted on the specimen tray (see Section 12.5).
- A schematic showing the lamp cooling system is shown in Figure 7.1c.
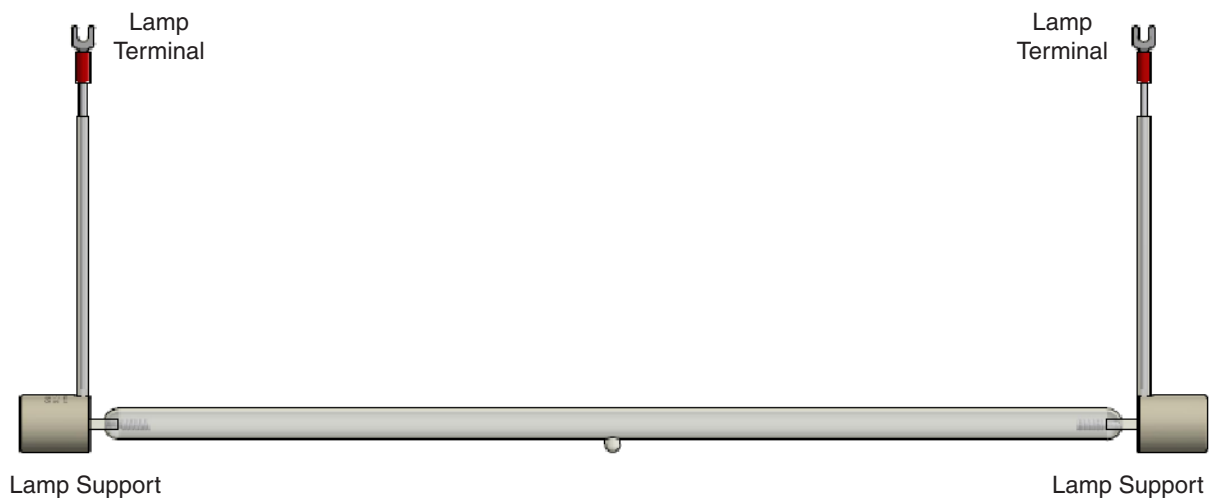

Figure 7.1a: Q-SUN xenon lamp.
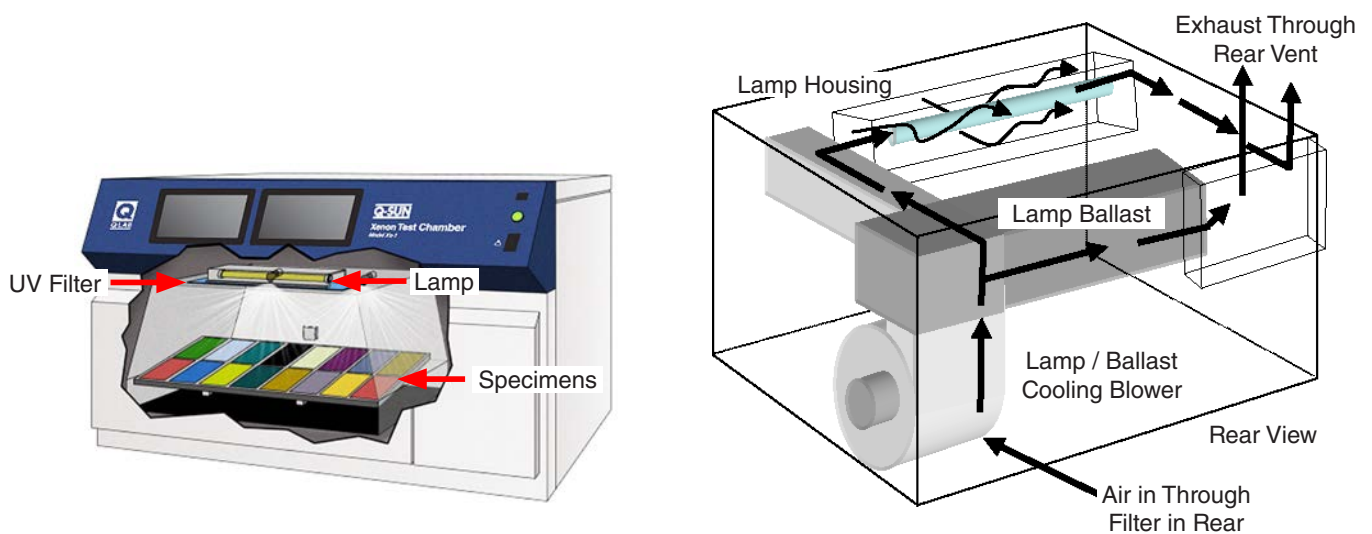
Figure 7.1b: Xe-1 Lamp and specimen geometry.

Figure 7.1c: Xe-1 Lamp cooling airflow.

7.2 SOLAR EYE Irradiance Control System (Jan 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 (Mar 2020)

- Three (3) irradiance sensor types are available:

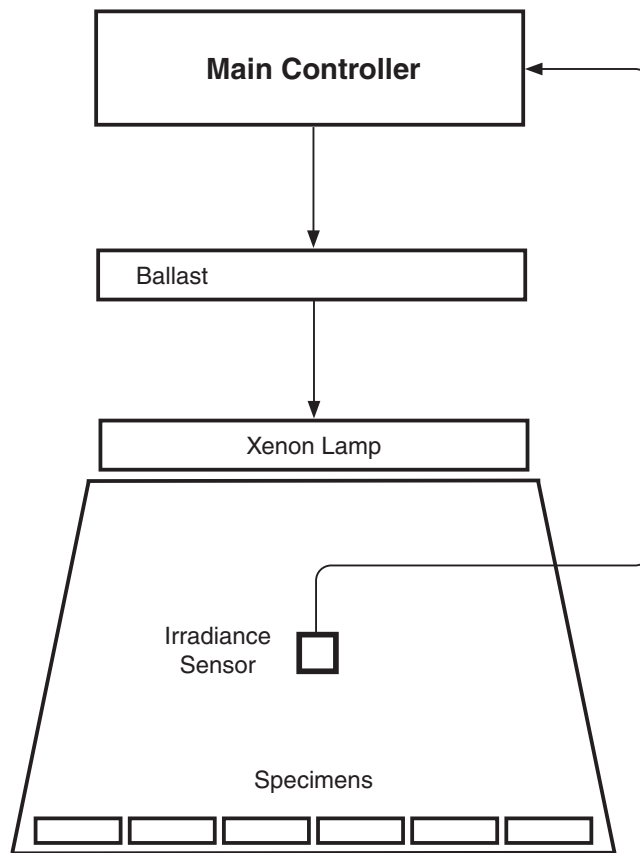| Irradiance Sensor Type	Part Number
340 nm	X-7515-K
420 nm	X-7522-K
TUV (Total UV, 300-400 nm)	X-7523-K

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

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

- Most common test methods specify the type of irradiance sensor needed to conduct the test (see Section 12).

- See Section 18 for sensor replacement part information.

- The irradiance control system must be re-calibrated whenever the sensor is changed. See Section 13 for calibration instructions.

NOTE: Contact Q-Lab Repair and Tester Support if irradiance stability issues occur when changing the irradiance sensor type. See Section 20 for Q-Lab contact information.

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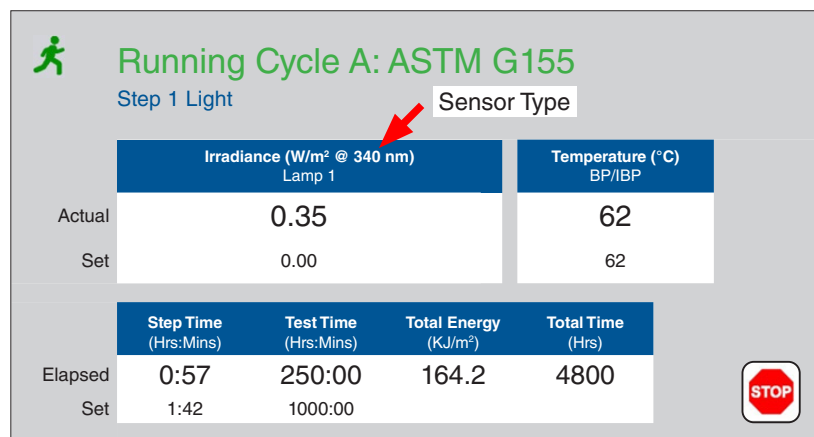

Figure 7.3b: Sensor type shown on Xe-1 Status Display.

7.4 UV Filters (Jan 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 18 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-IR filters absorb infrared energy, and therefore get very hot during use. Never use a Window-IR filter with a water spray cycle (note that no known standards require it). Water inadvertently sprayed onto hot filters can lead to cracking.**
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).
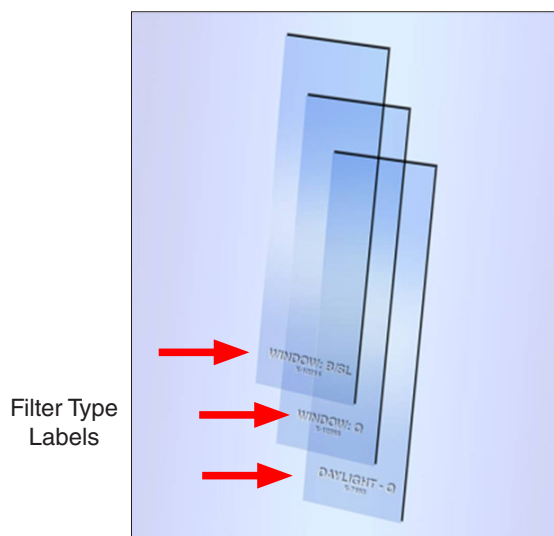
Filter Type Labels

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

Spectral Power Distributions (also called Spectral Irradiance)
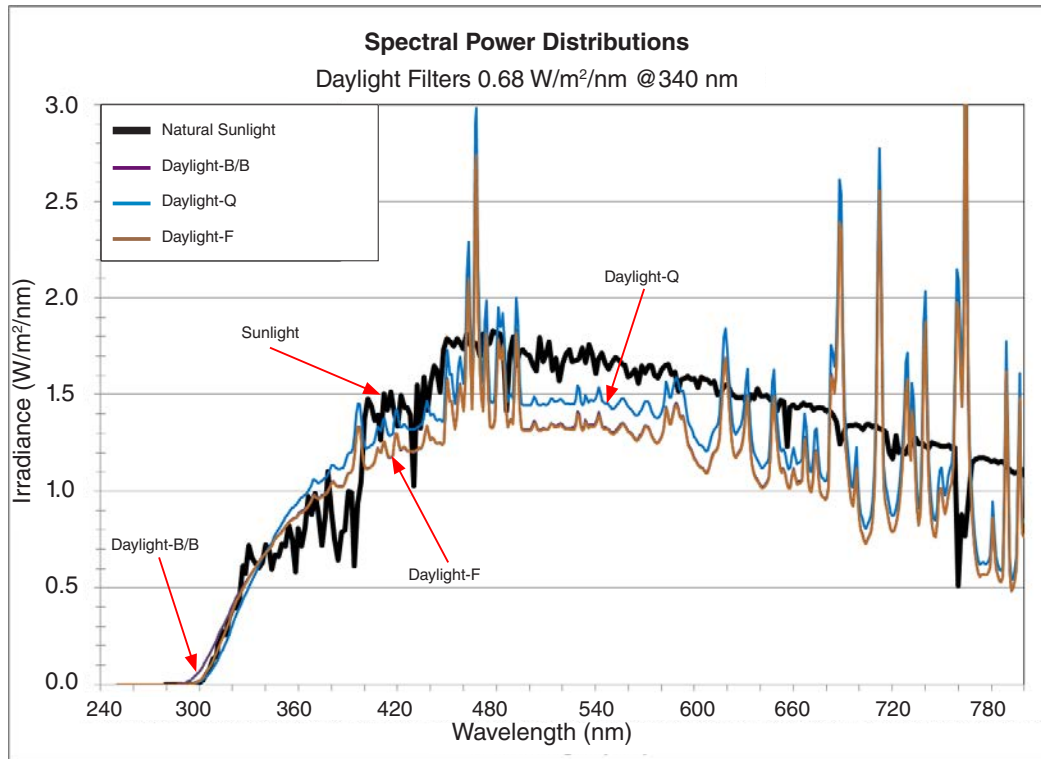

Figure 7.4b: Spectral power distributions of Daylight filters from 250-800 nm.
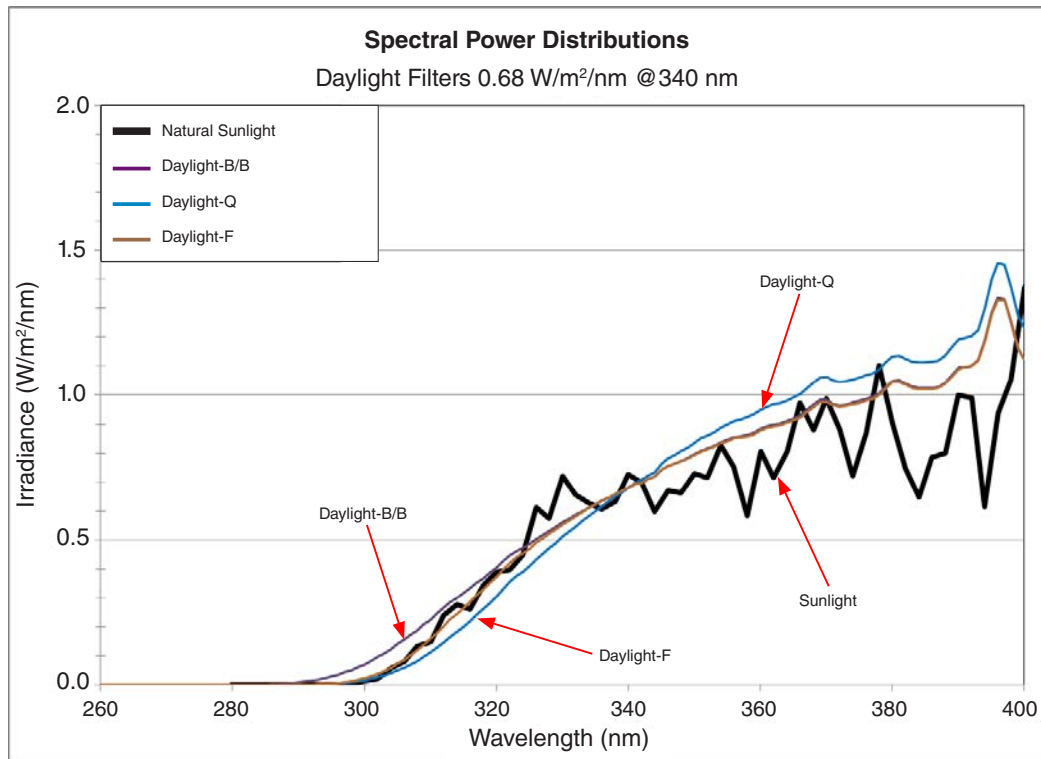

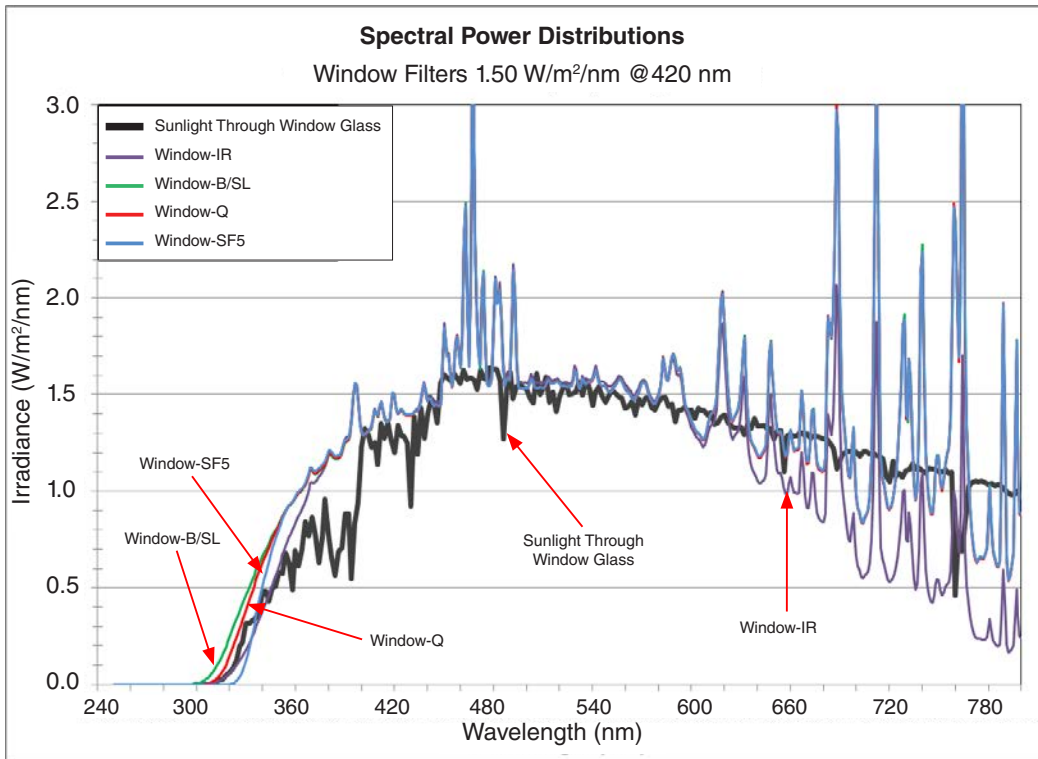Figure 7.4c: Spectral power distributions of Daylight filters from 260-400 nm.

Figure 7.4d: Spectral power distributions of Window filters from 250-800 nm.

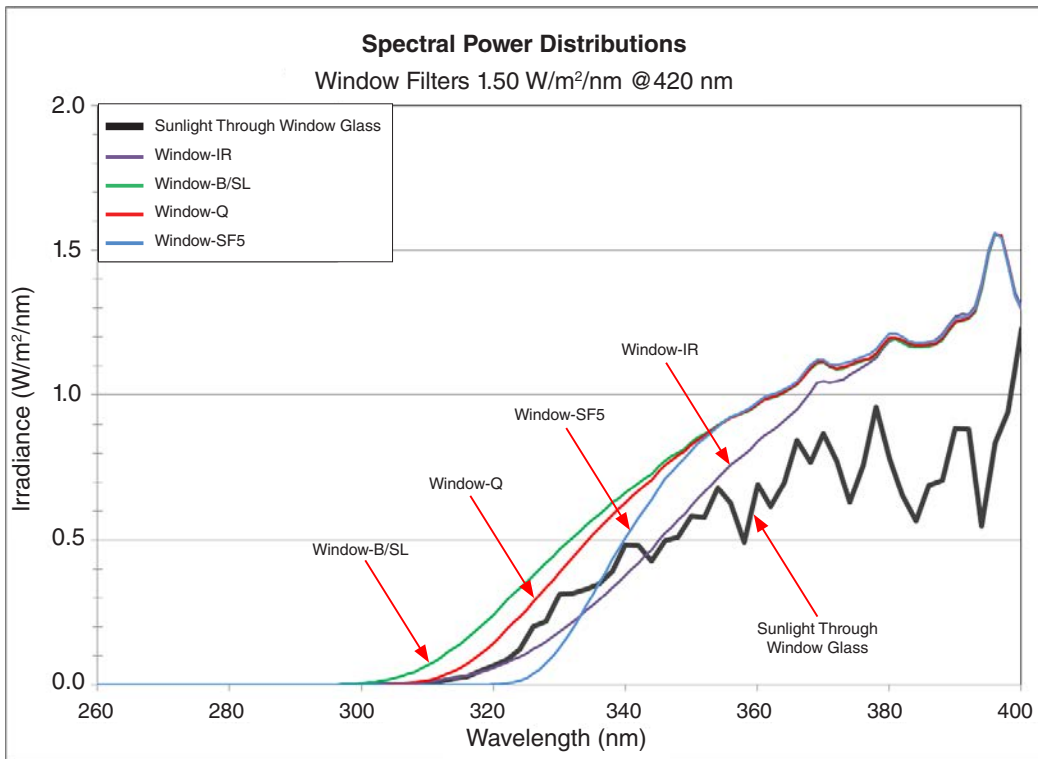**Figure 7.4e: Spectral power distributions of Window filters from 260-400 nm.**

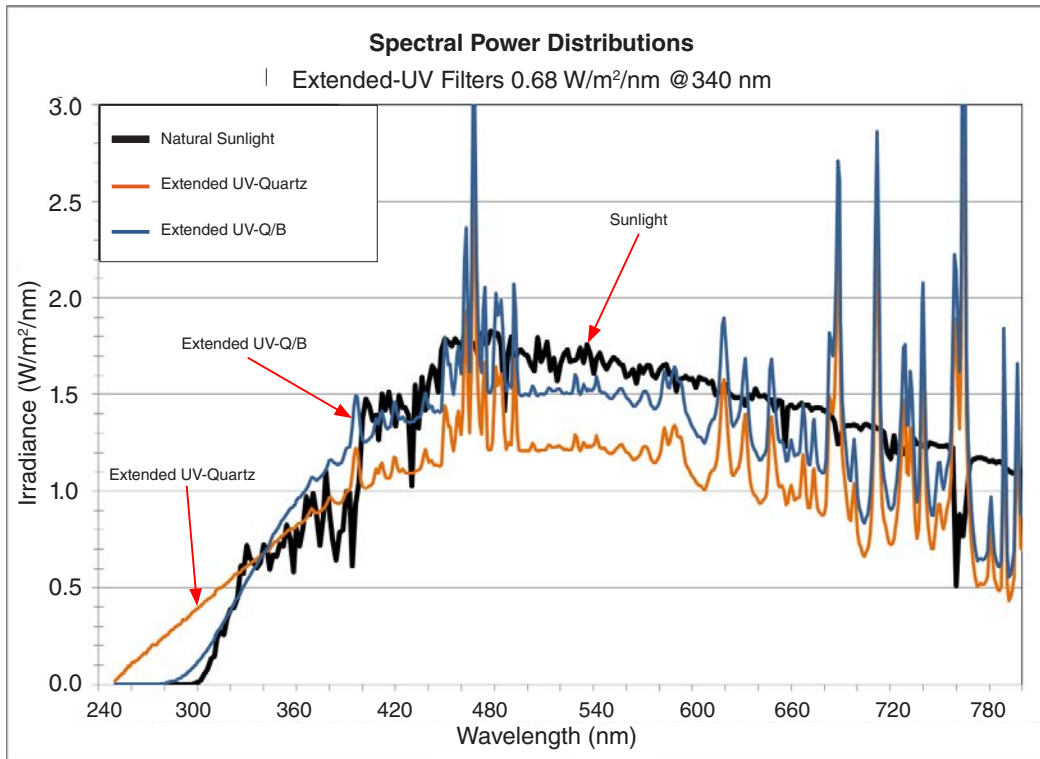**Spectral Power Distributions**

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
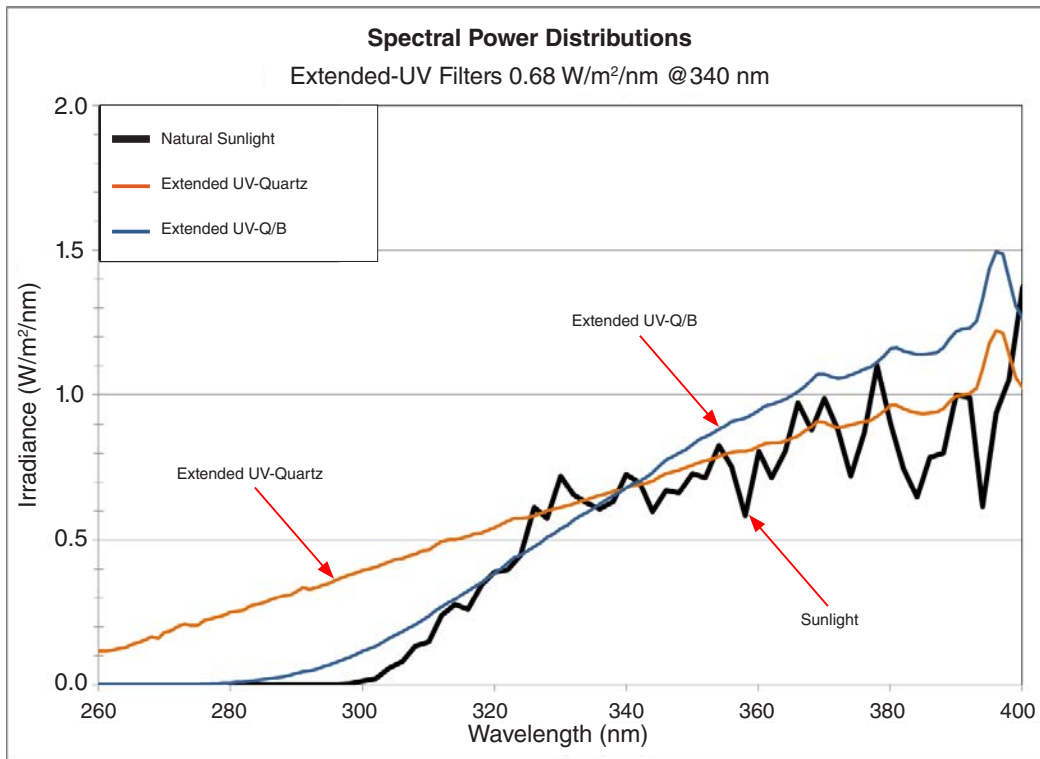
Figure 7.4g: Spectral power distributions of Extended-UV Filters from 260-400 nm.

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. Spray System (Mar 2019)

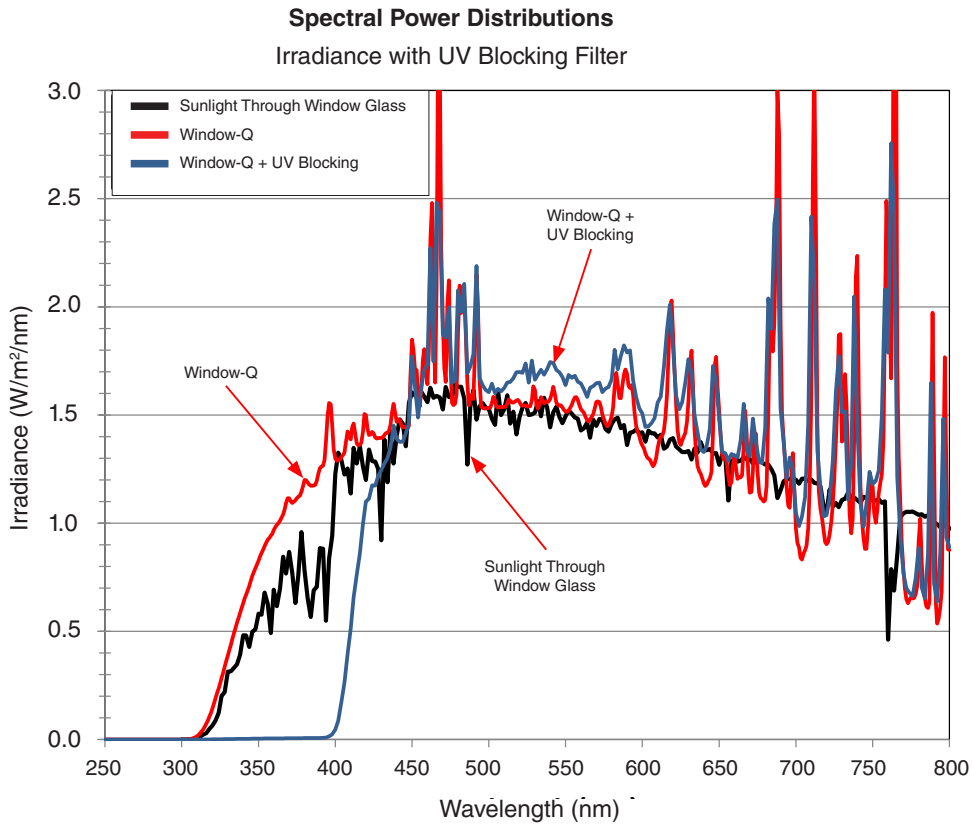### For Xe-1-SE, Xe-1-SCE Models Only

- The Q-SUN Xe-1-SE and Xe-1-SCE testers simulate outdoor moisture with water spray.
- The Q-SUN Xe-1-SE and Xe-1-SCE have two spray nozzles (Figure 8a).
- See LX-5090-SO Q-SUN Xe-1 System Overviews for detailed spray system information and diagrams.

⚠️ **Important:** Very high purity water is required. See Section 6.3 for water purity requirements.

0.89"
23 mm

Spray Nozzles

Specimens

Figure 8a: Spray nozzle.

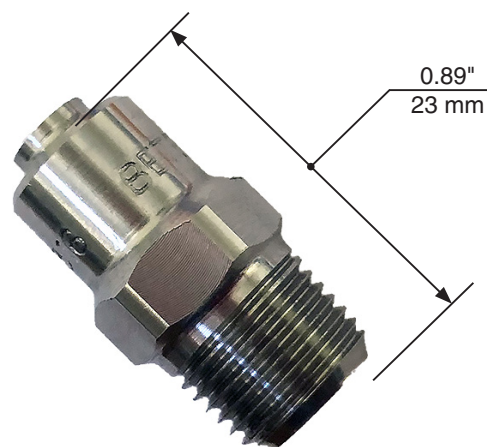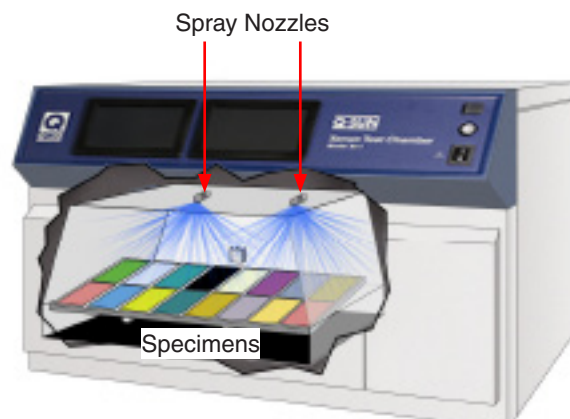Figure 8b: Cut-away drawing showing spray nozzle location in test chamber.

Spray System Components

- Located in test chamber (Figure 8b)
  - o   Spray nozzles
- Located in plumbing box (Figure 8c)
  - o   Pressure gauge
  - o   Pressure regulator
  - o   Flow meter
- Located behind test chamber (Figure 8d)
  - o   Shut-off valve
  - o   Water filter
  - o   Flow switch
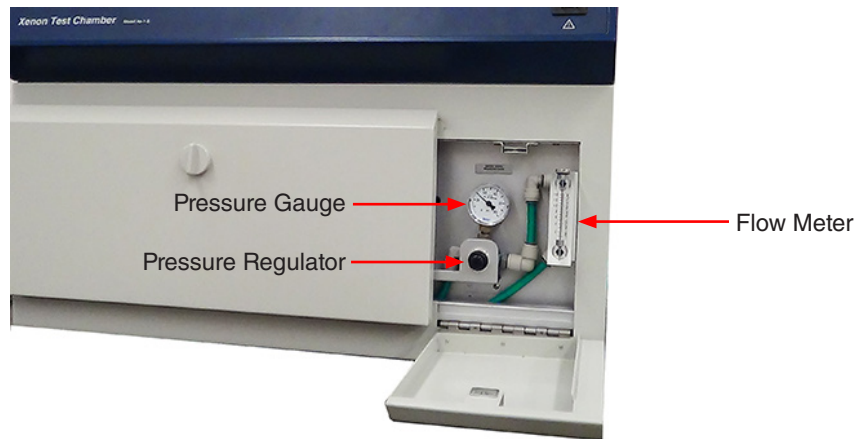 - o   Solenoid valve

For Xe-1-SE, Xe-1-SCE Models Only
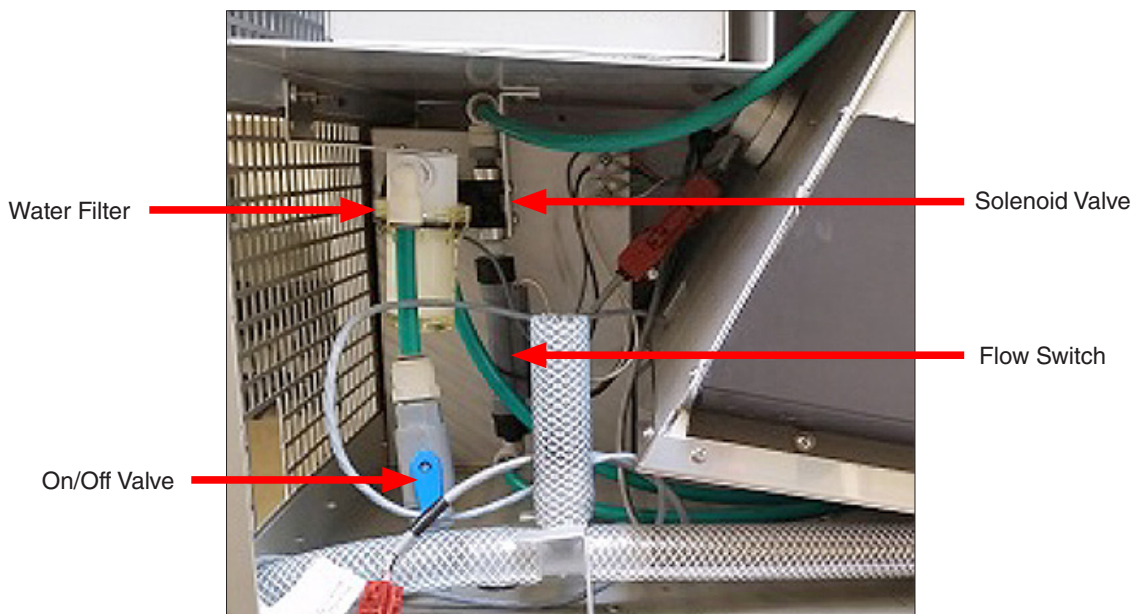

Figure 8c: Plumbing box inside right front door.

Figure 8d: Left side access panel removed to show
spray system components.

Operation

● Use the pressure regulator to set flow rate to 1.4 liter per minute when spray is ON.

● During normal operation, the pressure gauge should read approximately 138 kPa (20 PSI).

● For testers with water spray (Xe-1-S, Xe-1-SC) the spray is pulsed 5 seconds on and 55 seconds off.

● These spray pulses are adequate to keep test specimens wet during the entire spray step (they do not dry off during the spray off period) and water is conserved.

● The spray pulse rates can be changed (see Section 11.7, Machine Configuration).

● Contact Q-Lab Repair and Tester Support (Section 20) for more information on setting spray pulse rates.

9. Xe-1-WE Water Immersion System (Aug 2016)

Overview

- The Q-SUN Xe-1-WE is the only Xe-1 model capable of submerging test specimens in a temperature-controlled water bath and also draining the water when desired.
- This capability meets the requirements of standards such as ETAG 002.
- The wedge-shaped base tilts the Xe-1 tester so that the specimen tray is horizontal (Figure 8a).
- Specimens are placed in the ponding tray that sits on the specimen tray.
- Water heated in the reservoir is pumped through the deionization cartridge and the fill tubes into the ponding tray.
- Water fills the ponding tray and drains out through holes in the corners and also over the top edge of the tray.
- The water then drains back to the reservoir.
- The purity meter monitors the quality of the water.
- See LX-5090-SO Q-SUN Xe-1 System Overviews for additional information.

⚠️ **Important:** Very high purity water is required. See Section 6.3 for water purity requirements.

Water Immersion System Components

- Located on cabinet exterior
  - o Water purity meter (Figure 9a)
  - o Deionization enclosure (Figure 9a)
  - o Wedge shaped base (Figure 9a)
- Located in test chamber
  - o Fill tubes (Figure 9b)
  - o Ponding tray (Figure 9b)
  - o Specimen Tray (Figure 9b)

- Located in base
  - o Pump (Figure 9c)
  - o Water reservoir (Figure 9c)
  - o Water heater (Figure 9c)
- Located in Deionization Enclosure
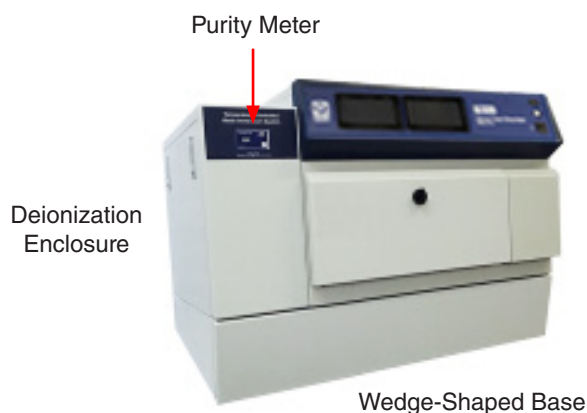 - o Deionization (DI) cartridge (Figure 9d)
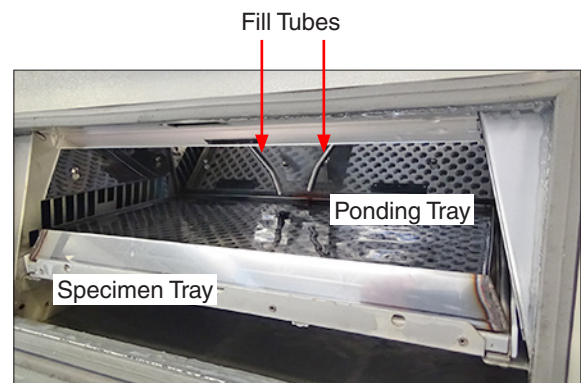

Figure 9a: Xe-1-WE exterior.

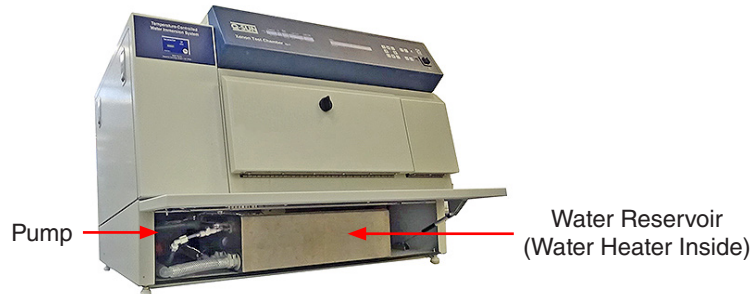Figure 9b: Xe-1-WE test chamber with ponding tray.

Figure 9c: Lower door open showing reservoir and pump.

Figure 9d: Deionization enclosure access panel removed showing DI cartridge.

Operation

- The Xe-1-W can run LIGHT, DARK, LIGHT + IMMERSION, and DARK + IMMERSION steps.

- For immersion steps the ponding tray will fill in 2.5 minutes in 50 Hz testers and 1.75 minutes in 60 Hz testers.

- It takes about one hour to heat the water to 45 °C.

- In an Immersion step, on initial startup, or if the DI cartridge has been emptied of water, the pump will begin pumping water through the immersion system.

- The water in the reservoir will be too low until the DI cartridge fills and water begins to refill the reservoir through the fill tubes. See LX-5090-SO Q-SUN Xe-1 System Overviews.

- Low water level in the reservoir will trigger an **M47 RESERVOIR WATER LEVEL TOO LOW** message and the tester will stop (see Section 17 for troubleshooting information).

- This message is normal when the DI cartridge must be refilled.

- Clear the message. Wait 10 minutes for the reservoir to refill.

- Press **RUN**.

- The tester should run normally.

- If **M47** reappears, see Section 17.2 for other possible **M47** causes.

   NOTE: When not running a test cycle with an immersion step, the ponding tray should be removed.

10. Temperature Control System

10.1 Panel Temperature Sensors (Feb 2022)

Overview

- Xe-1 testers use a temperature sensor to control operating temperature during a test.
- Black-painted temperature sensors (Figure 10.1a and Figure 10.1b) are found in nearly every test standard for the Q-SUN Xe-1. White-painted sensors (Figure 10.1d and Figure 10.1e) 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 10.1c).
- Uninsuated and unsulated 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 in the Xe-1-SE, Xe-1-BCE and Xe-1-SCE (Figure 10.1f).
- The panel sensor is attached to the mesh insert in the ponding tray in the Xe-1-WE (Figure 10.1g).
- In the Xe-1-WE the panel temperature sensor is immersed in water during immersion steps.
- 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 10.1a: Uninsulated black panel temperature sensor.   Figure 10.1b: 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 10.1c: 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 10.1d: Uninsulated white panel temperature sensor.

Figure 10.1e: Insulated white panel temperature sensor.

Sensor Location

- Securely mount the panel temperature sensor to the specimen tray or ponding tray (Xe-1-WE).
- Do not allow specimens to touch, cover, or shade the sensor (See Section 10.1).

Panel Temperature Sensor

2"×4" Specimen Holders

Figure 10.1f: Correct location of the Xe-1-SE, Xe-1-BCE and Xe-1-SCE panel temperature sensor.
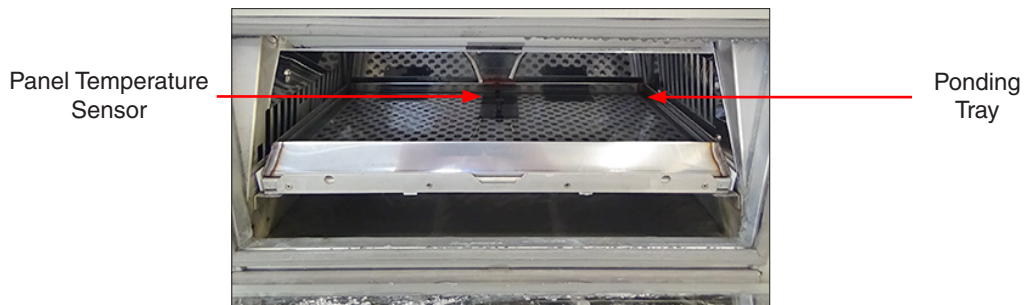

Panel Temperature Sensor

Ponding Tray

Figure 10.1g: Correct location of the Xe-1-WE panel temperature sensor.

10.2 Chamber Air Temperature Sensor (Aug 2020)

Xe-1-BCE and Xe-1-SCE Only

- In addition to the panel temperature sensor, Xe-1-BCE and Xe-1-SCE testers include a chamber air temperature sensor (Figure 10.2).
- A chamber air temperature sensor can also be installed in Xe-1-SE models as an option.
- Either the panel temperature or the chamber air temperature 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 11.6.4)

Figure 10.2: Chamber air temperature sensor location in Xe-1-BCE and Xe-1-SCE test chambers.

10.3 Temperature Control (Aug 2020)

Xe-1-SE

- The black panel temperature is controlled using a variable speed blower and an electric heater (Figure 10.3a).
- Air is pulled into the tester through a filter and exhausted through vents in the rear of the chamber (Figure 10.3b).
- 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.
- During Xe-1-SE and Xe-1-SCE spray steps, water spray reduces black panel temperature. As a consequence, black panel temperature is not controlled during spray steps.
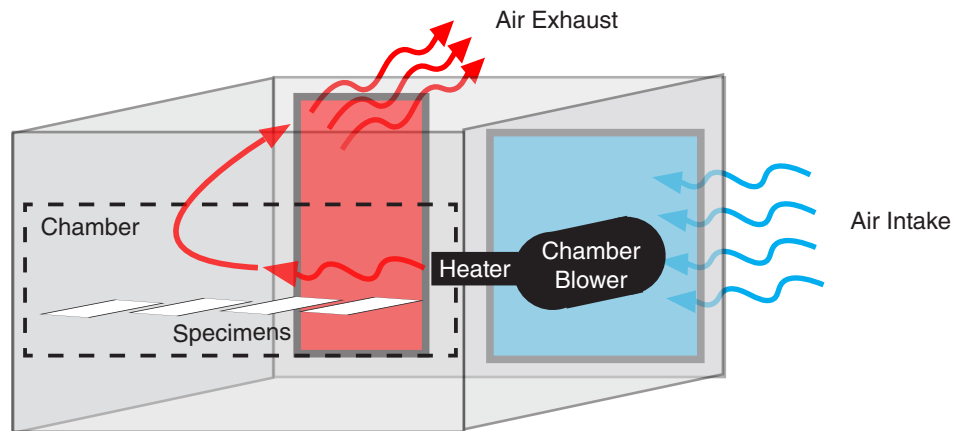
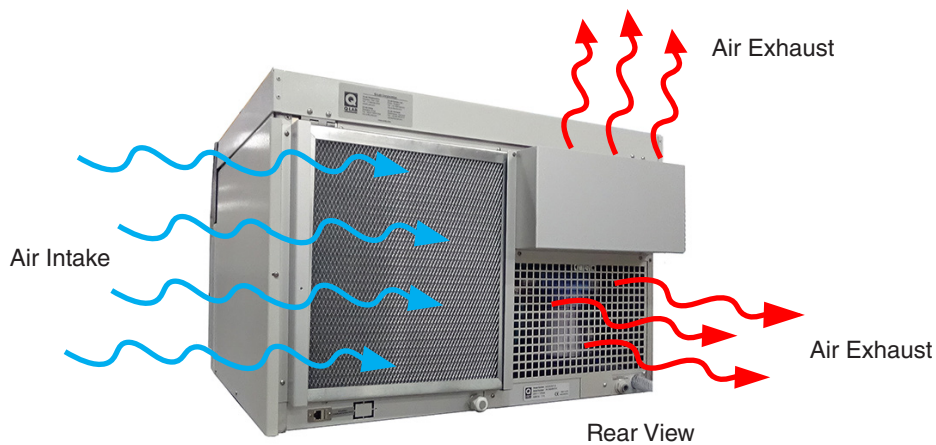Figure 10.3a: Schematic front view Xe-1-SE air circulation.

Figure 10.3b: Rear view Xe-1-SE air intake and exhaust areas.

Xe-1-BCE and Xe-1-SCE

- Q-SUN Xe-1-BCE and Xe-1-SCE models cool the test chamber by blowing either room air (if the chiller is off) or room air that has been cooled (if the chiller is on) into the chamber (Figure 10.3c).

- The Xe-1 automatically controls the chamber temperature by:

  o Turning the chiller on or off

  o Varying the amount of air blown into the chamber
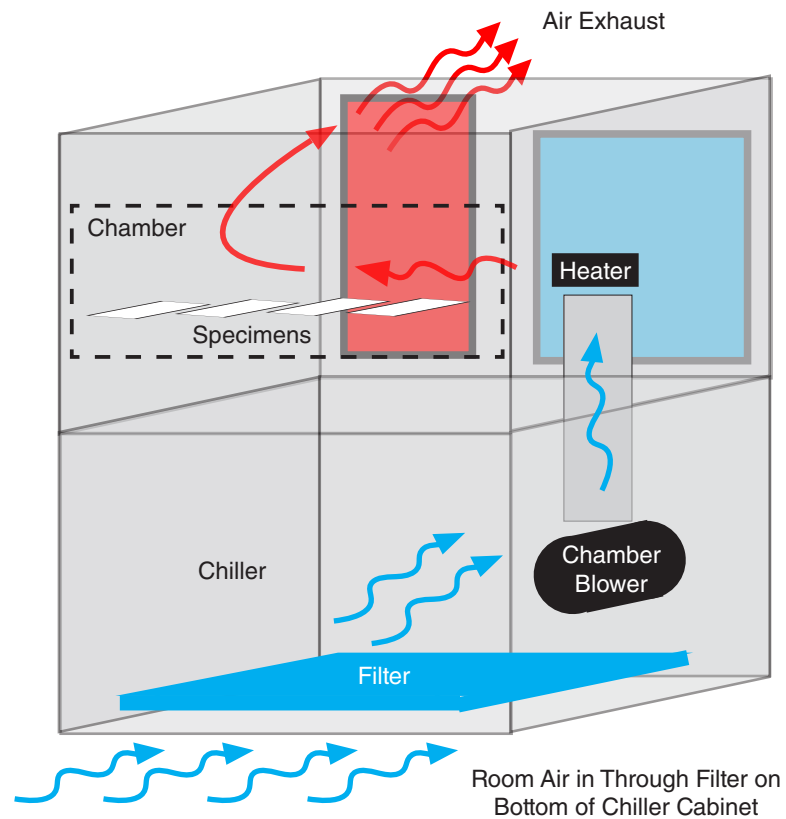
  o Heating the air if necessary

Figure 10.3c: Schematic front view of Xe-1-BCE and Xe-1-SCE air circulation.

Xe-1-BCE and Xe-1-SCE Damper Adjustment

● With most chiller systems, if the room temperature drops to about 20 °C (68 °F), the temperature of the cooling coil on the chiller can get below 0 °C (32 °F).

● Since significant quantities of water are condensed on this coil, ice can form, which then freezes and degrades the performance of the unit (and can ultimately ruin the chiller).

● The Xe-1-BCE and Xe-1-SCE chiller includes a manually-operated damper which is opened in a warm or normal temperature lab to allow maximum cooling efficiency, but is partially closed in a cool (20 °C / 68 °F or less) room to recirculate some of the exhausted heat (Figure 10.3d).

● This increases the air temperature going through the cooling coil, reducing the danger of freeze-up.

● A label (Figure 10.3e) listing the recommended damper adjustment levels is located near the damper adjustment lever.
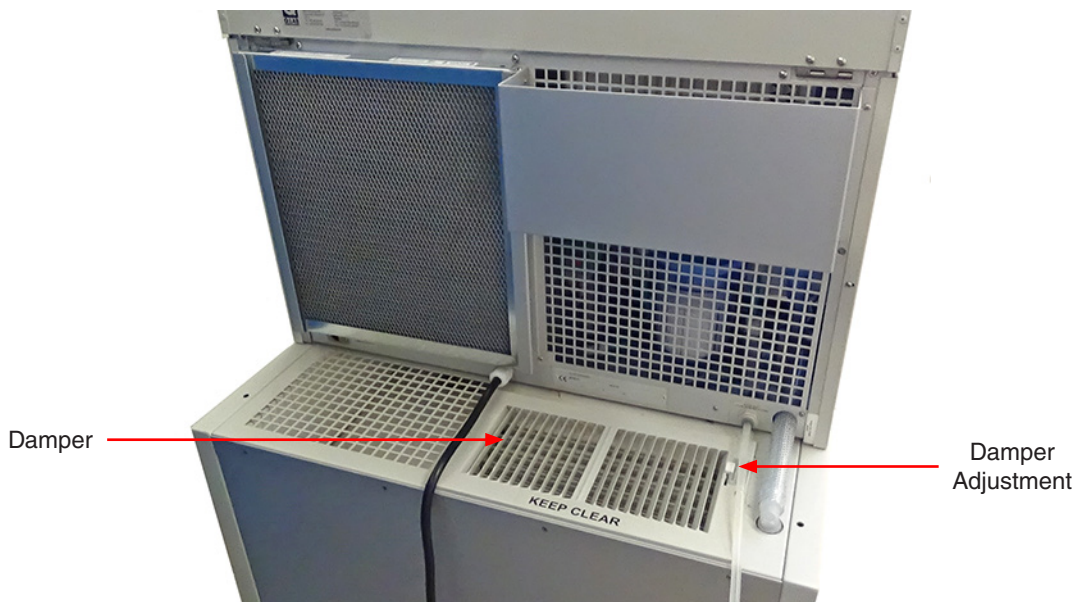
Damper

Damper
Adjustment

Figure 10.3d: Rear view of Xe-1-BCE or Xe-1-SCE showing damper.

SET DAMPER
FOR LOWEST
EXPECTED
ROOM TEMP.

◀ 20+ (68)
◀ 18 (64)
◀ 16 (61)
◀ 14 (57)
◀ 12 (54)
◀ 10 (50)
  °C °F

Figure 10.3e: Damper adjustment levels.

Xe-1-WE

- During LIGHT and DARK steps the panel temperature is controlled in the same way as the Xe-1-SE model.

- During LIGHT + IMMERSION and DARK + IMMERSION steps the black panel temperature is controlled using the water heater instead of the air heater (Figure 10.3f).

- When the black panel is immersed in water the black panel temperature is the same as the water temperature.
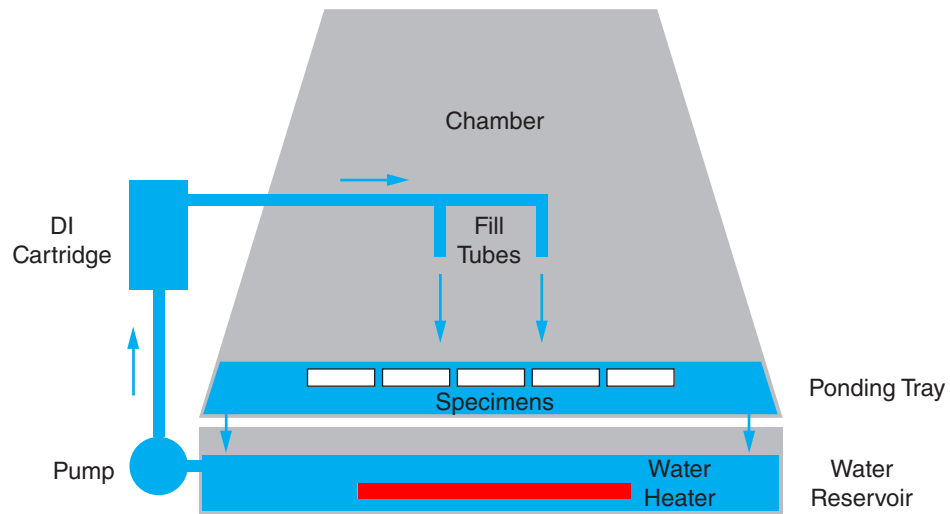

Figure 10.3f: Xe-1-WE water circulation schematic.

11. Main Controller Operation

11.1 Overview (Aug 2020)

Purpose

- The Q-SUN main controller controls all functions of the tester.
- Interactive software allows easy programming using dual, full-color touch-screen displays.
- Many common test cycles have been pre-programmed. Custom test cycles can be easily created.
- The main controller continuously displays all test status conditions and continuously monitors for errors. The main controller will automatically stop a test if an error is detected.
- New software revisions can easily be downloaded and installed.
- System configuration and performance data can be exported to assist in troubleshooting.

Display Screens

- Two touch-screen monitors mounted on the Q-SUN control panel are used to control tester operation and the display of test status (Figure 11.1a).
- The Status Screen is on the left and the Menu Screen is on the right (Figure 11.1b, Figure 11.1c)
- The Status Screen displays tester current running conditions.
- The Menu Screen is the main interface for operator control of the tester, including settings, programming, and calibration.
- The screens are activated when the tester is powered on.
- After an interval of inactivity, the screens will automatically deactivate. Just tap a screen to reactivate (Figure 11.1d).
- The touch-screens should be cleaned with a soft cloth and alcohol. Do not use water to clean the screens.
- The screens can be operated using a stylus. Many operators prefer using a stylus with the touch-screens.
- A large LED indicator, to the right of the menu screen and visible from a distance, changes colors to indicate current operational status of the test.

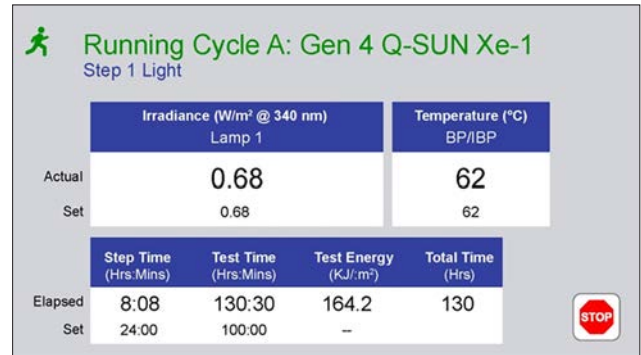Figure 11.1a: Touch-screens and LED location.

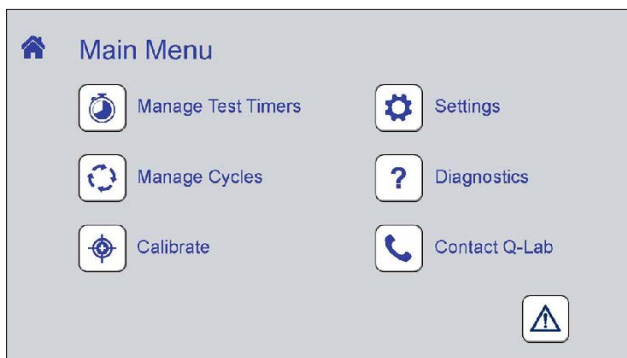Figure 11.1b: Status screen displaying typical operating conditions.

Figure 11.1c: Menu screen displaying the main menu.

Figure 11.1d: Touch to activate.

11.2 Status Screen (Aug 2020)

- The Status Screen (Figure 11.2a) displays:
  - o The status icon and state that indicates the overall status of the tester (see Overall Test Status).
  - o The cycle identification and the name of the test being run.
  - o The current test step number and type of step.
  - o Actual irradiance and set point irradiance values.
  - o Actual temperature and set point temperature of the panel temperature sensor.
  - o Elapsed and set step time and test time.
  - o Tester total operation time.
  - o RUN / STOP button. This button is the only operator control interface on the status screen.
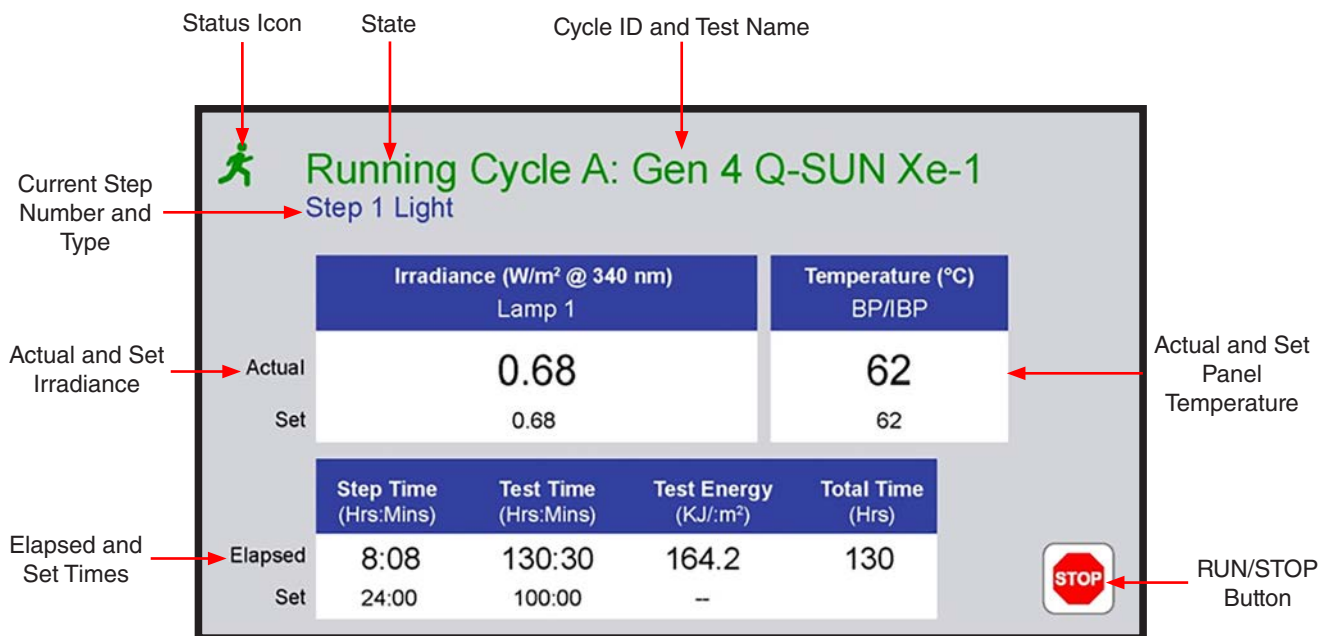
Figure 11.2a: Status screen components.

Overall Test Status

- A colored icon and title at the top of the screen indicate the overall status of the test (Figure 11.2b, Figure 11.2c).
- Icons in the lower right corner of the screen can be used to stop or run the test.
- The title also shows the test cycle letter and the name of the test cycle.
- The LED status indicator changes color corresponding to the icon and title status.
- The table below summarizes all status conditions.
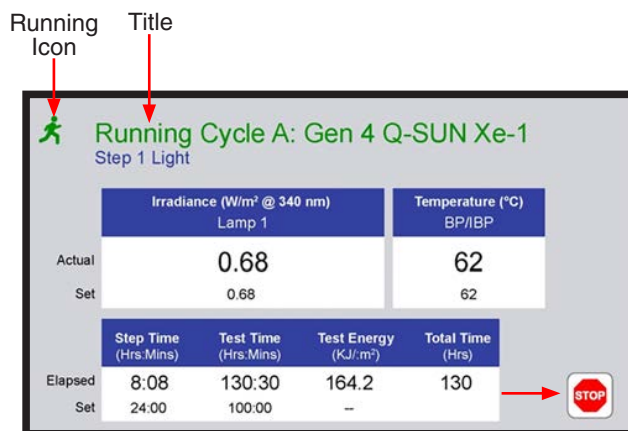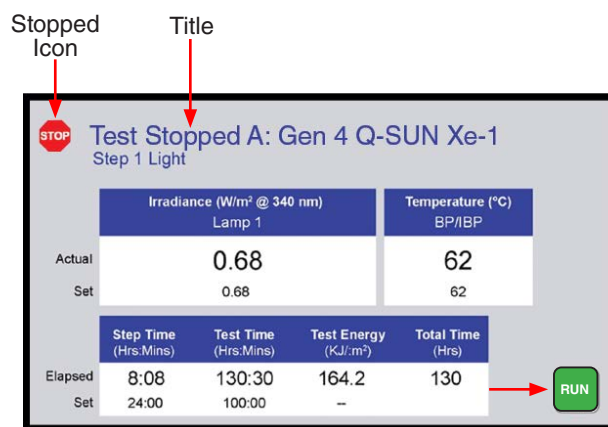

Figure 11.2b: Status icon and title when test running.

Figure 11.2c: Status icon and title when test stopped.

Icon	Title (color)	LED (color, condition)	Status
	Running Cycle (Green)	(Green, Static)	Test running normally, no active notifications.
	Test Completed (Blue)	(Blue, Flashing)	Test completed.
	Running Cycle (Green)	(Yellow, Flashing)	Test running, one or more notifications.
STOP	Test Stopped (Blue)	(White, Static)	Power on, stopped, no active notifications (standby).
	Test Suspended (Red)	(Red, Flashing)	Error, test stopped. Check Notifications on the menu screen.
Does not affect the icon.	Does not affect the title.	(Magenta, Static)	Software Install or VSC transfer using USB port.

11.3 Main Menu Screen (Aug 2020)

- The Main Menu is the home display for the menu screen (Figure 11.3).
- The Main Menu screen provides access to all other operator controls for the tester.
- The Main Menu displays icons to access these functions:
    - o Notifications (Section 11.4)
    - o Manage Test Timers (Section 11.5)
    - o Manage Cycles (Section 11.6)
    - o Calibration ()
    - o Settings (Section 11.7)
    - o Diagnostics (Section 11.8)
    - o Contact Q-Lab (Section 11.9)

Figure 11.3: Main Menu screen.

11.4 Notifications (Aug 2020)

- Notifications provide useful diagnostic information for technicians and repair personnel.
- Notifications show significant tester events and errors that occurred in the recent past.
- Up to 50 notifications are automatically stored by the Q-SUN main controller.
- On the Main Menu screen, touch the notification icon to display the Notifications Screen (Figure 11.4a).
- The type, information icon, identification code (ex. M49), and name are displayed for each notification (Figure 11.4b).
- "Active" and "Cleared" notifications are listed separately, in chronological order, most recent at the top of the list (Figure 11.4c, Figure 11.4d).
- Color-coded attention icons indicate the type of notification (Figure 11.4e).
  - o A red triangle indicates an error occurred that stopped the test.
  - o A yellow triangle indicates an event that did not stop the test, such as a maintenance reminder.
  - o A blue triangle indicates the successful completion of a test.
- Touch the notification information icon to display details (Figure 11.4f and Figure 11.4g).
- See Section 17.2 for a complete list of notification codes, description, and suggested actions..
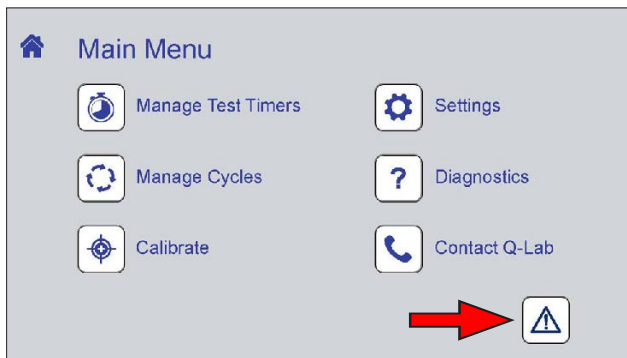
Figure 11.4a: The notifications icon. Icon color changes depending on notification status.
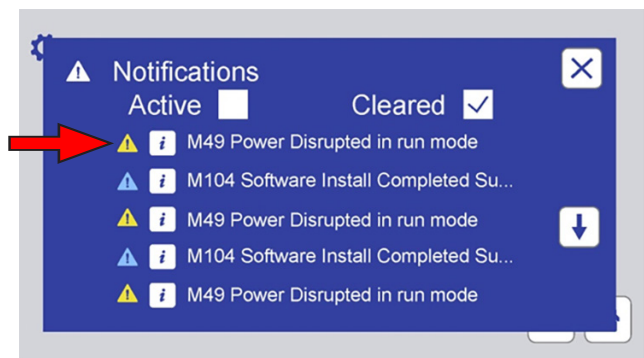
Figure 11.4b: The Notifications Screen lists notification information.
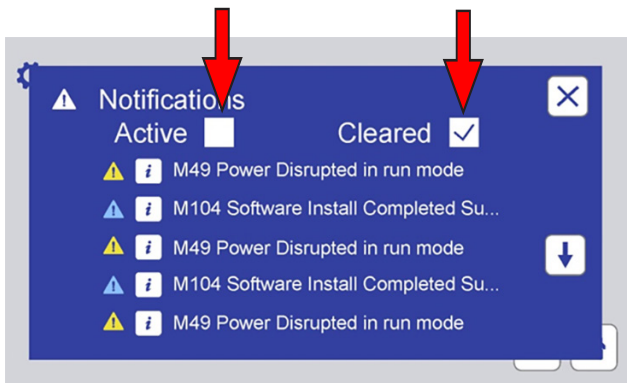
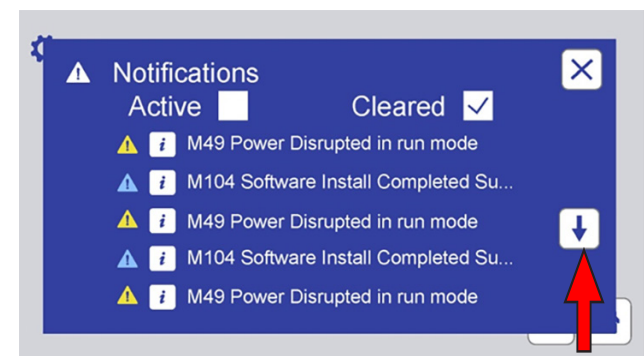Figure 11.4c: Touch the Active or Cleared check box to view active or cleared notifications.

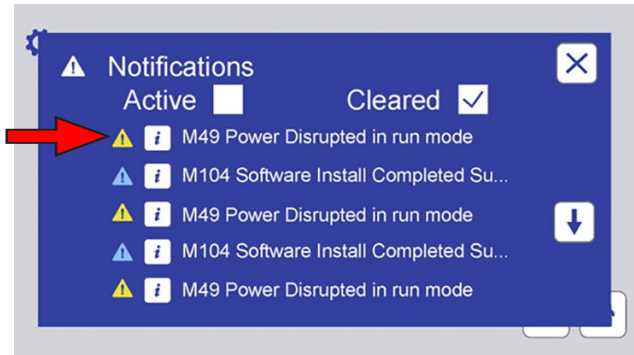Figure 11.4d: Touch the scroll button(s) to move down or up the notification list.

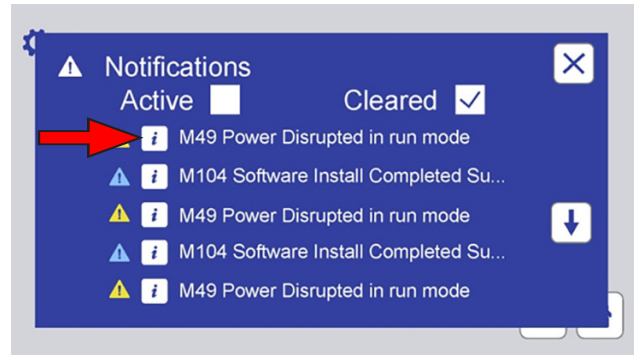Figure 11.4e: Color coded icons show notification type.

Figure 11.4f: Touch the information icon to display notification details.
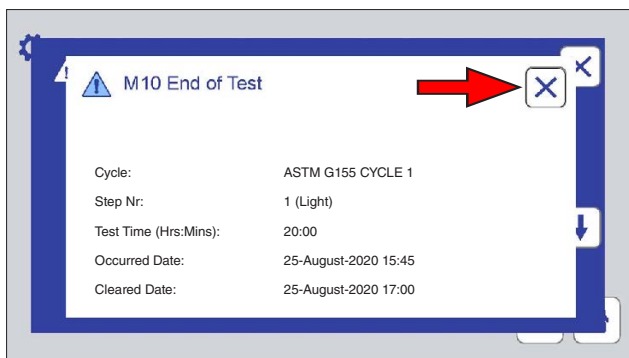

Figure 11.4g: Notification details. Touch the Close icon to return to the Notifications Screen.
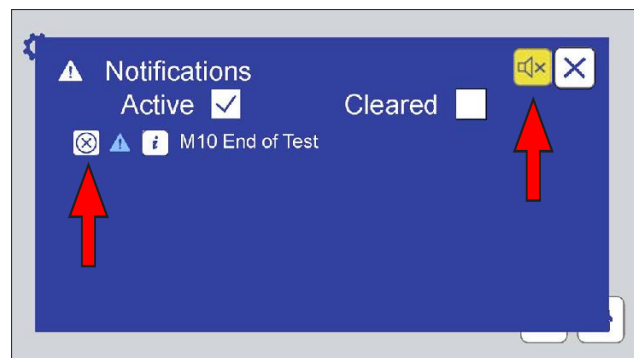

Figure 11.4h: If the alarm is active, touch the yellow mute icon to silence. When the notification has been resolved, touch the icon to the left of the notification to clear it.
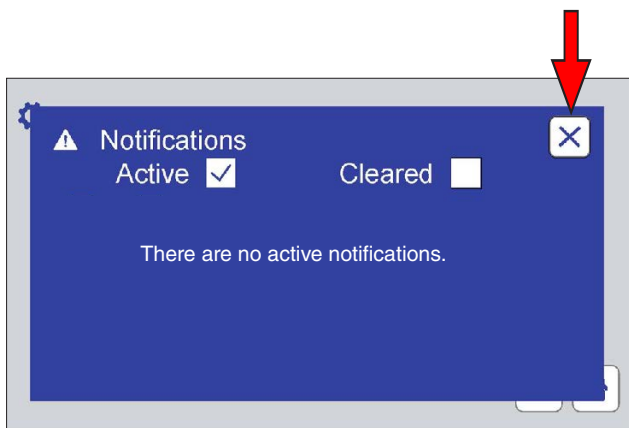

Figure 11.4i: Touch the Notification Screen close icon to re-display the main menu.

Figure 11.4j: A complete list of notifications and their meaning is given in Section 17.2.

11.5 Manage Test Timers (Aug 2020)

- On the Main Menu screen touch the Manage Test Timers icon to display the Manage Test Timers screen (Figure 11.5a).
- The Manage Test Timers screen provides three functions:
  1. Specify what action the tester should perform at the end of a test (Figure 11.5b and Figure 11.5c).
     - o Stop
     - o Message only
     - o Alarm only
     - o Stop and alarm
     - o None
  2. Set test duration units (Figure 11.5d through Figure 11.5f).
     - o Hours and minutes
     - o kJ/m^2
  3. Set the elapsed and/or duration in the selected units for the current test (Figure 11.5g through Figure 11.5i).
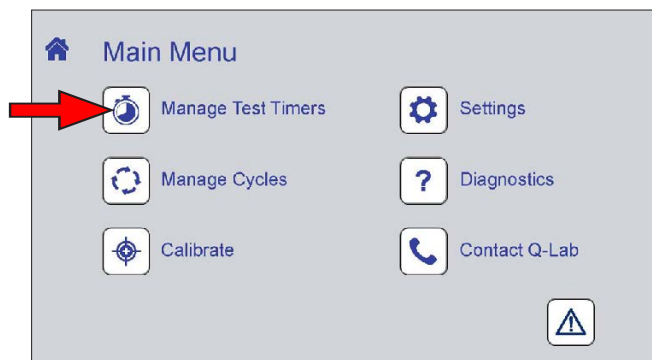

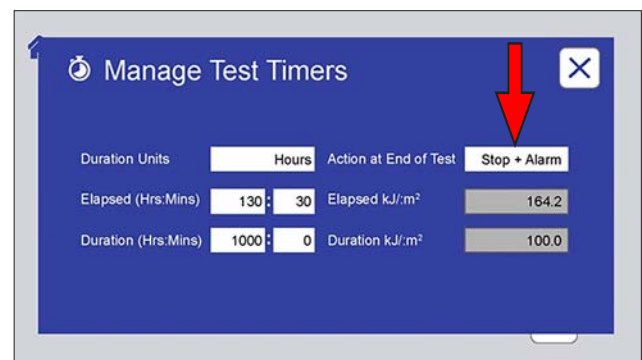
Figure 11.5a: Manage Test Timers icon.

Figure 11.5b: Manage Test Timers screen. Touch the Action at End of Test text box to specify the action.
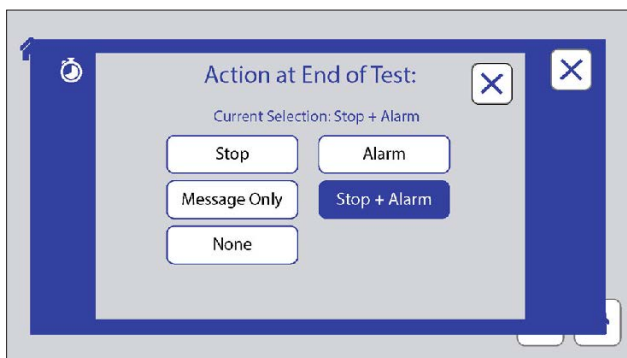

Figure 11.5c: Action at End of Test screen. Touch an action button to select that action.
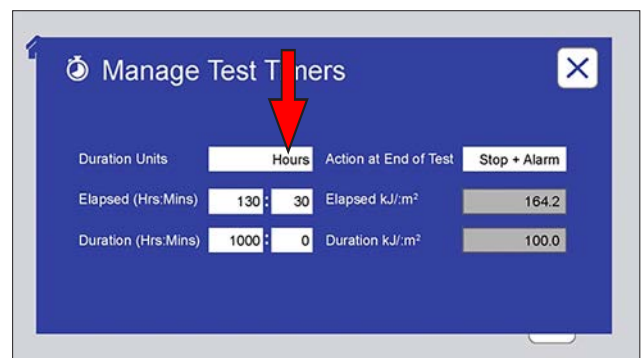

Figure 11.5d: Touch the Duration Units text box to set the test duration units in hours or in energy (kJ/m^2).
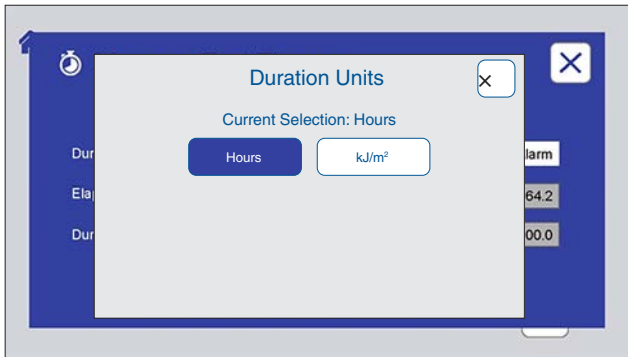
57

Figure 11.5e: Touch the Hours or kJ/m² text boxes to select the duration units.
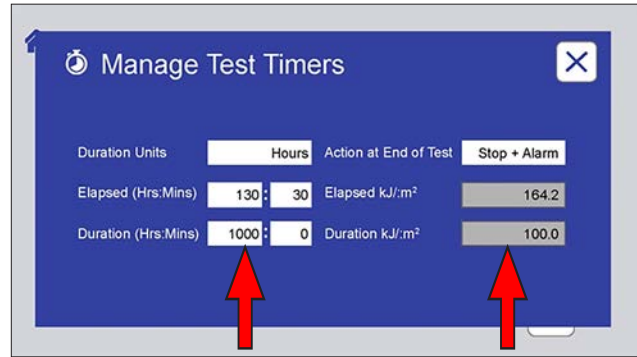
Figure 11.5f: The value text boxes for the selected duration unit are enabled. The text boxes for the unselected duration unit are disabled (grayed out).

Figure 11.5g: Touch the enabled text box(s) to enter the new values.

Figure 11.5h: Enter the new values using the numeric keypad. Touch the check mark to accept, or the X to cancel changes.

Figure 11.5i: If any changes have been made, touch the save changes icon or the cancel changes icon to re-display the Main Menu screen.

11.6 Manage Cycles (Aug 2020)

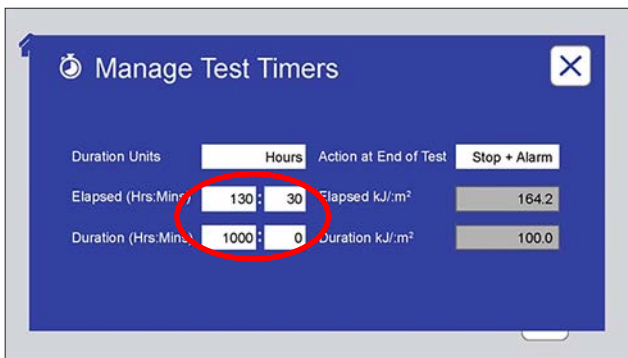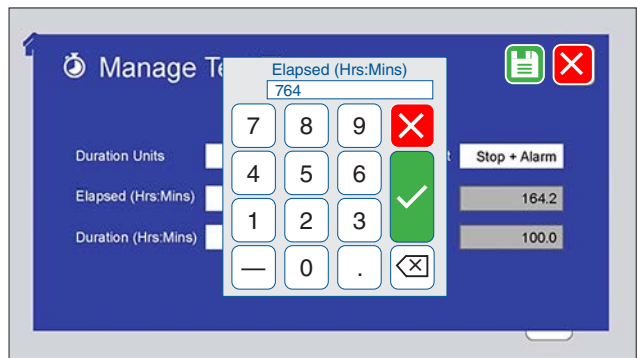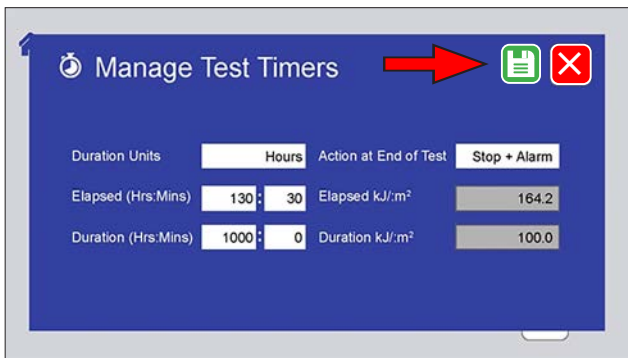- On the Main Menu screen touch the Manage Cycles icon (Figure 11.6.1a) to display the Manage Cycles screen.
- The Manage Cycles screen is displayed showing the active test cycle and the steps in the cycle, with the currently executing step indicated (Figure 11.6.1b).
- Each cycle is stored with an alphanumeric (A through J) identification tab (Figure 11.6.1b).
  - o Touch a tab to select a cycle.
    - • The cycle name (ex. ASTM G155) along with step number, function, irradiance and temperature set points, and time are shown for each step in the cycle.
- Each lettered cycle tab provides controls to:
  - o Delete a cycle (Figure 11.6.2a through Figure 11.6.2c).
    - • An actively running cycle cannot be deleted.
    - • Deleting an inactive cycle will create a blank cycle with only a final step.
  - o Lock a cycle to prevent unauthorized changes (Figure 11.6.3a through Figure 11.6.3e).
  - o Add, edit, or delete steps in a cycle (Figure 11.6.4a through Figure 11.6.6d). Pre-programmed test cycles cannot be edited (they can be deleted).
  - o Create a new cycle (Figure 11.6.7a through Figure 11.6.7e).
  - o Run a cycle from any of its steps (Figure 11.6.8a through Figure 11.6.8d).
- Pre-programmed test cycles cannot be modified. They can, however, be deleted.
- The Q-SUN main controller can store ten (10) test cycles.
- A test cycle can consist of up to twenty-five (25) steps.

11.6.1 Select a Cycle

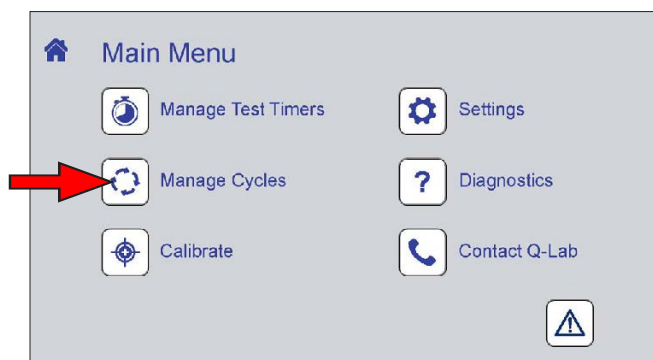Active Cycle   Cycle Identification Tabs
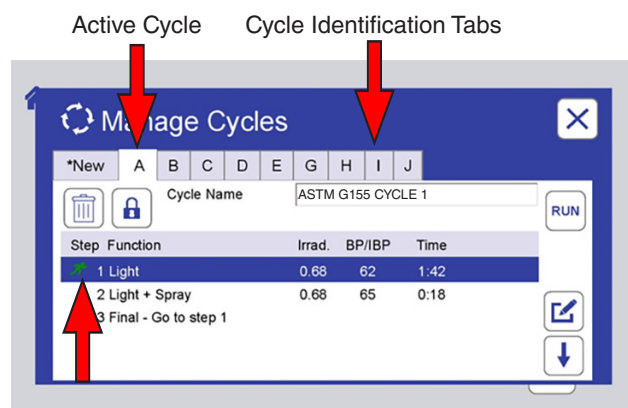

Figure 11.6.1a: Manage Cycles icon.

Figure 11.6.1b: Manage Cycles screen. The active cycle is displayed. The currently running step is indicated. From here you can run that cycle, or perform other actions as in the next sections
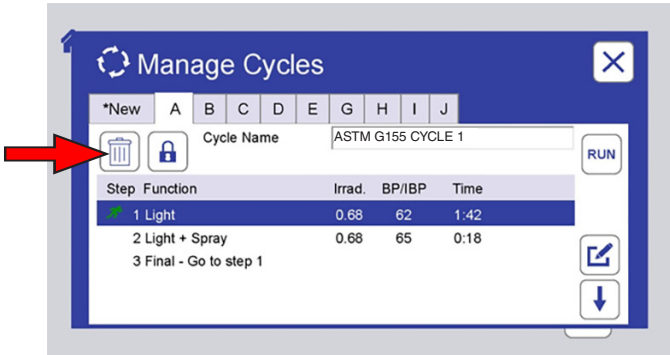
11.6.2 Delete a Cycle

Figure 11.6.2a: Touch the delete icon to delete the selected cycle.
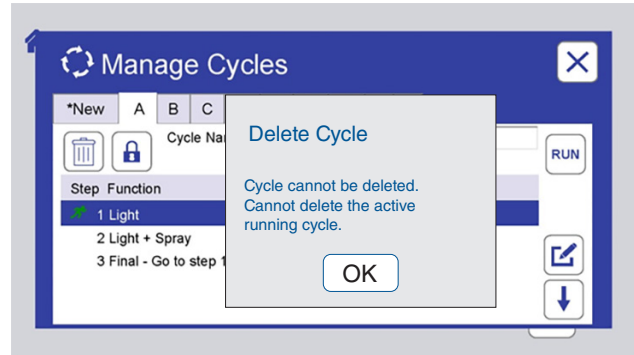
Figure 11.6.2b: The active running cycle cannot be deleted. Touch OK to clear message.
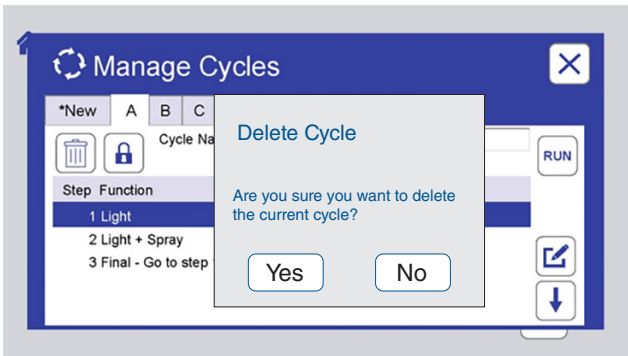
Figure 11.6.2c: To delete an inactive cycle, the operator is prompted for verification. Touch No to cancel delete. Touch Yes to create a blank cycle.

11.6.3 Lock a Cycle
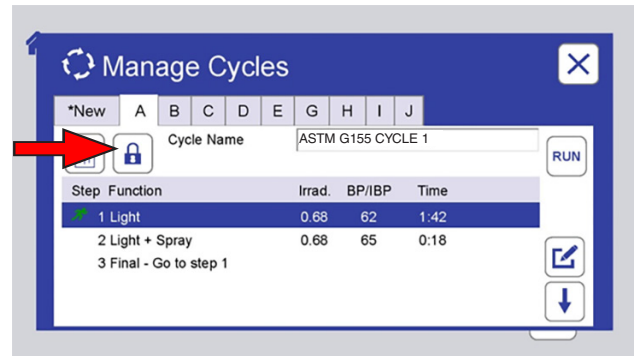
Figure 11.6.3a: Touch the lock icon to lock the cycle.
NOTE: Pre-programmed test cycles are locked by Q-Lab.
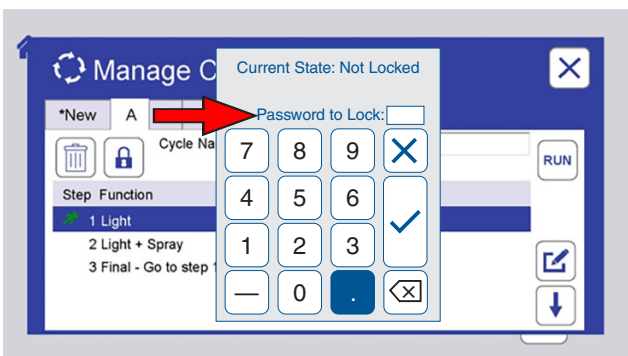
Figure 11.6.3b: The numeric keypad is displayed. A password must be entered to lock the cycle.
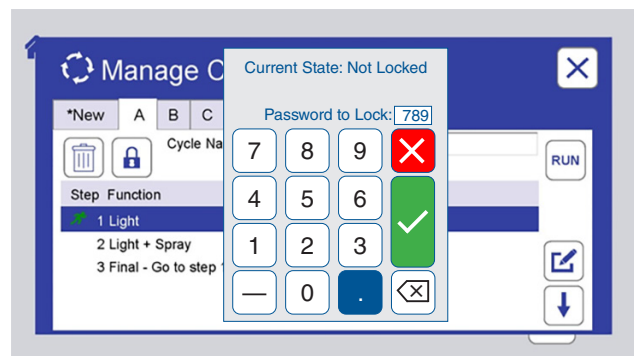
Figure 11.6.3c: Enter the numeric password. Touch the check mark button to save, or the X button to cancel setting the password.
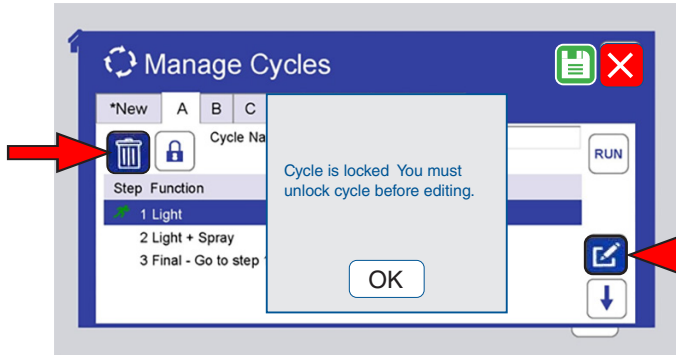
Figure 11.6.3d: This message is displayed if a delete or edit icon is touched on a locked cycle.
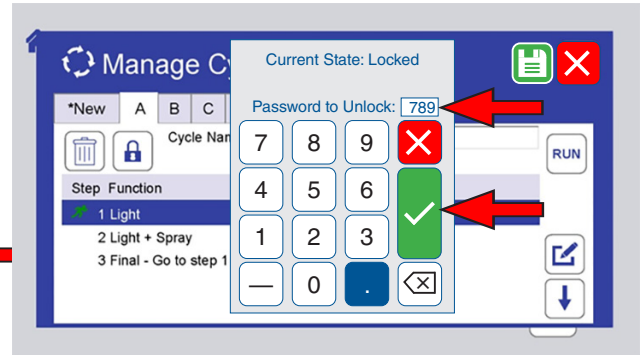
Figure 11.6.3e: To unlock a cycle, touch the lock icon, enter the password, then touch the check mark button.

11.6.4 Add a Step to a Cycle
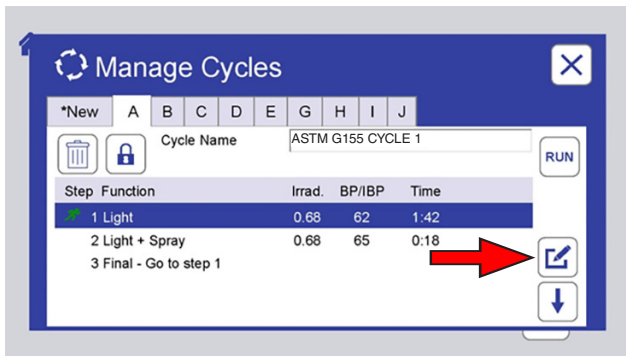
Figure 11.6.4a: For any cycle, a new step can be added before or after an existing step. Select the existing step then touch the Edit icon.
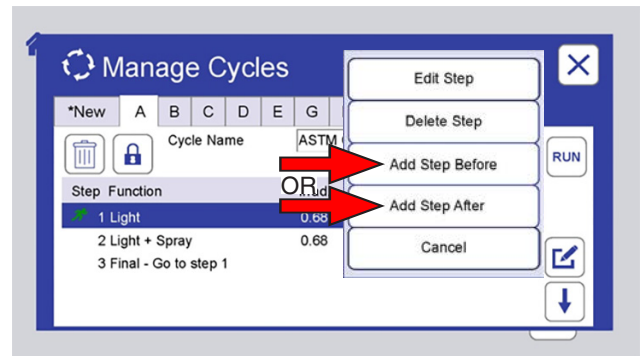

Figure 11.6.4b: The step revision control is displayed. Touch Add Step Before or Add Step After.
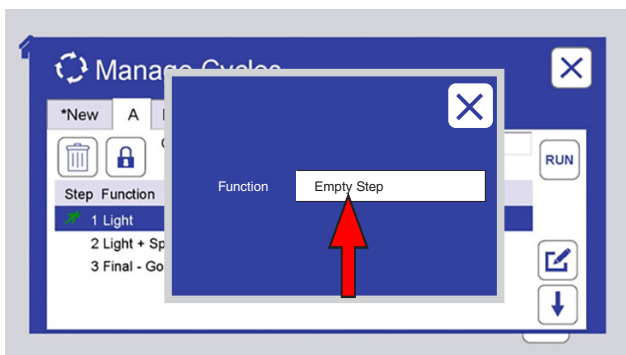
Figure 11.6.4c: Touch the function text box to select a function.
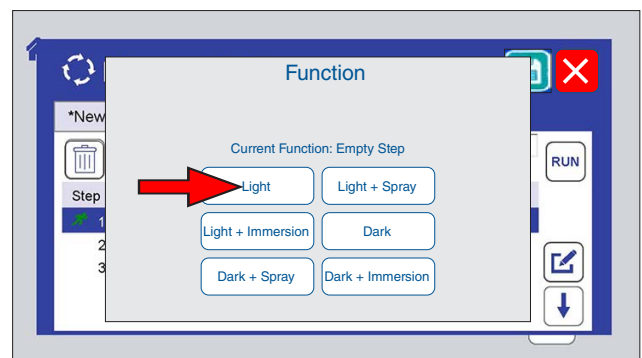
Figure 11.6.4d: Touch the desired function. Spray functions are displayed for spray (S) models only. Immersion functions are displayed for immersion (WE)models only.

61
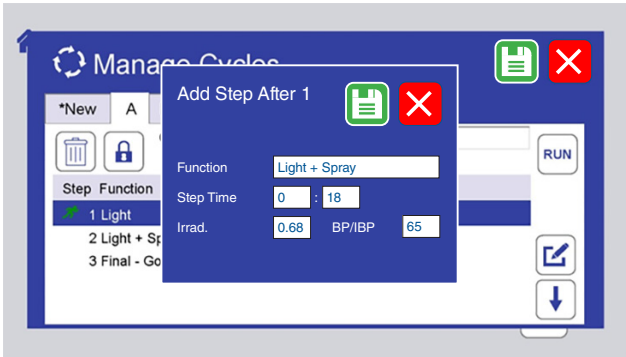
Figure 11.6.4e: Step values must be entered. Touch the Step Time (Hrs:Mins), Irrad(iance), and BP/IBP text boxes to select.

Figure 11.6.4f: Use the numeric keypad to enter the values for each parameter. Touch the check mark button to accept those values or the X button to cancel.
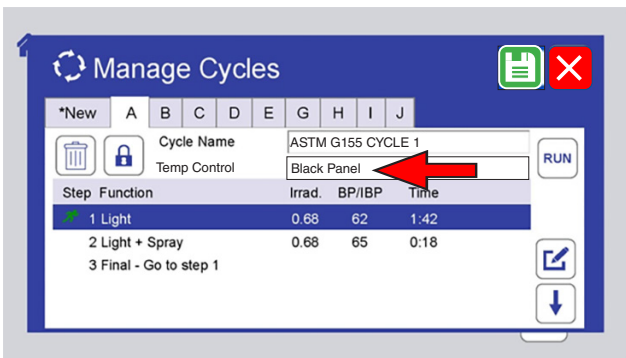
Figure 11.6.4g: For testers with chamber air temperature sensors, touch the Temp Control text box to select black panel or chamber air temperature control.
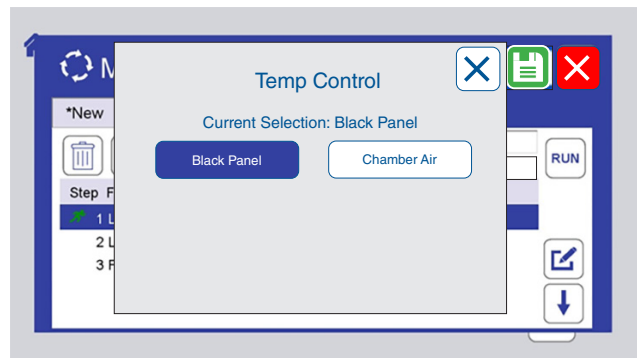
Figure 11.6.4h: Touch the Black Panel or the Chamber Air button to select that sensor for temperature control.
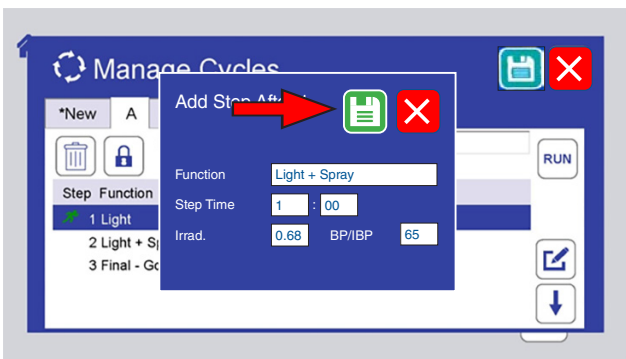
Figure 11.6.4i: The new step values are displayed. Touch the save icon to save the new step.
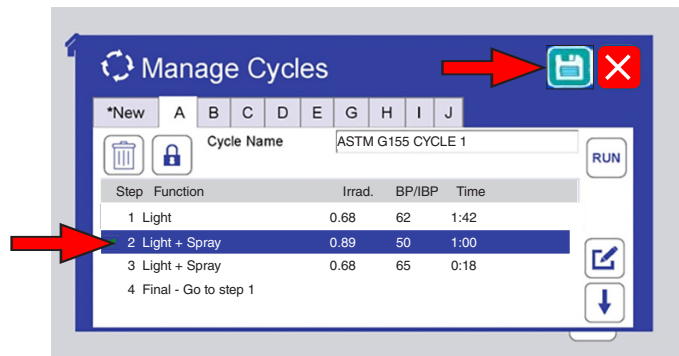
Figure 11.6.4j: The new step is shown for the cycle. Touch the save icon to save the modified cycle.

11.6.5 Edit a Step
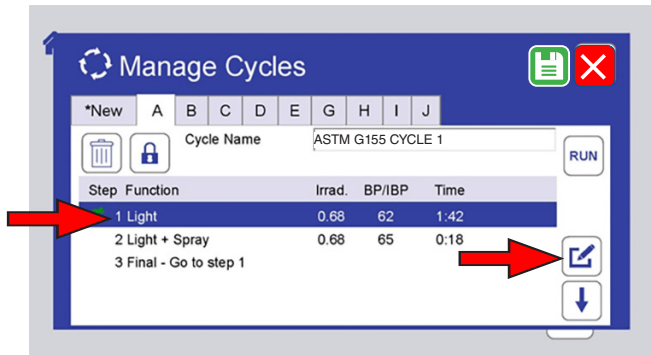
Figure 11.6.5a: To edit a step, touch the cycle ID tab, touch the step to select, then touch the pencil icon.
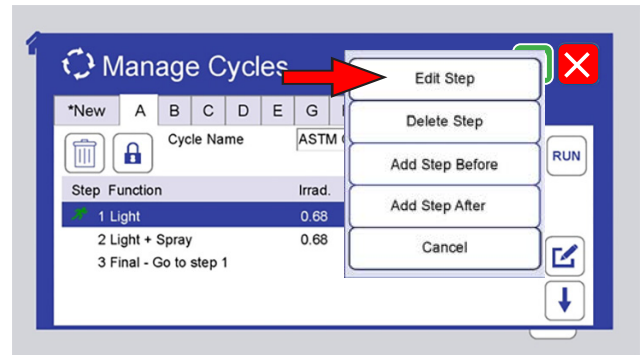
Figure 11.6.5b: Touch the Edit Step button.
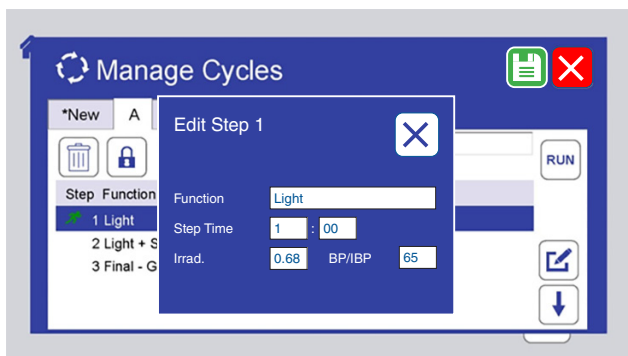
Figure 11.6.5c: Touch the Function, Step Time, Irradiance, or BP/IBP text boxes to select.
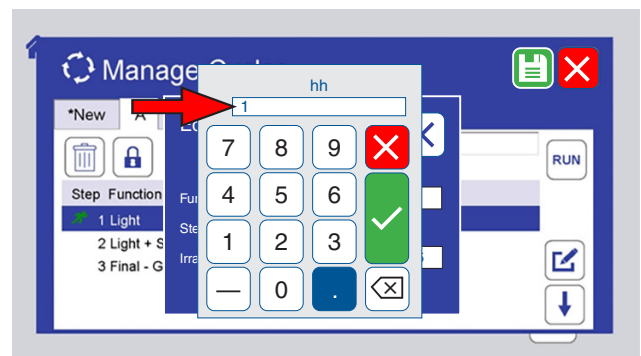
Figure 11.6.5d: Use the numeric keypad to enter the new values for the selected step. Touch the check mark button to accept those values or the X button to cancel.
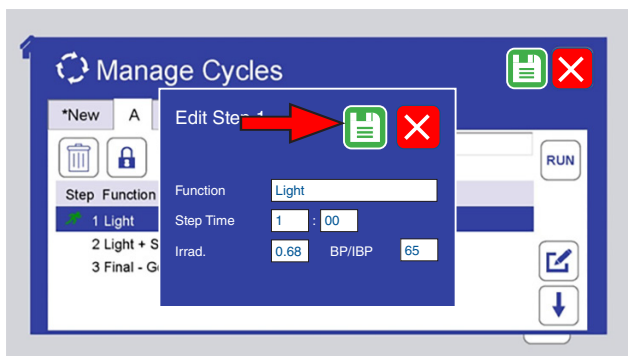
Figure 11.6.5e: Touch the save icon to save the edited step.
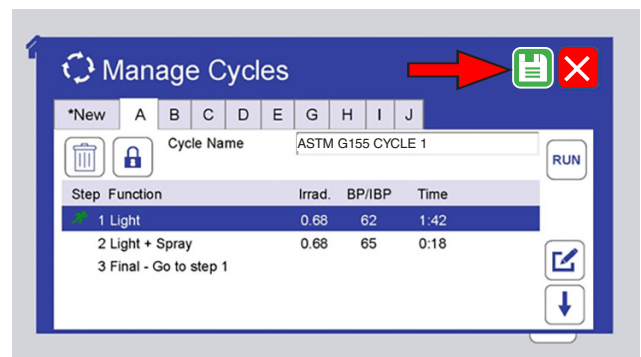
Figure 11.6.5f: The edited step is shown for the cycle.
Touch the save icon to save the edited cycle.
NOTE: pre-programmed test cycles cannot be edited.

11.6.6 Delete a Step
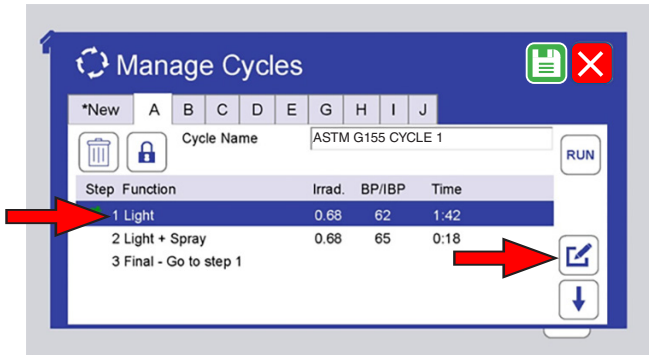
Figure 11.6.6a: To delete a step, touch the cycle ID tab, touch the step to delete, then touch the pencil icon.
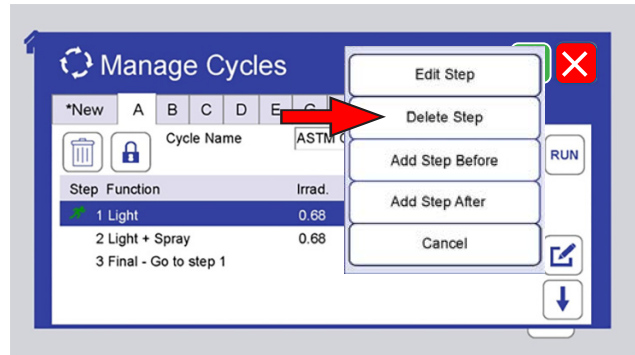
Figure 11.6.6b: Select Delete Step.
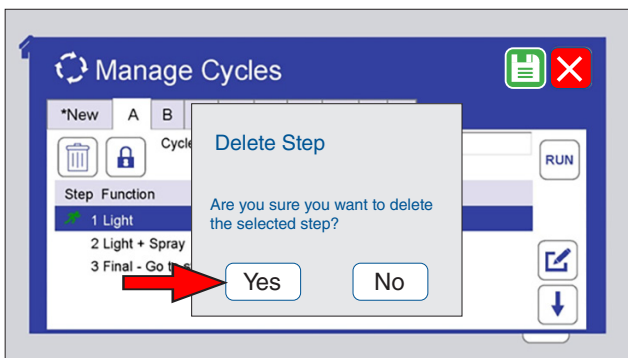
Figure 11.6.6c: Touch the Yes button to delete the step or touch No to cancel the delete.
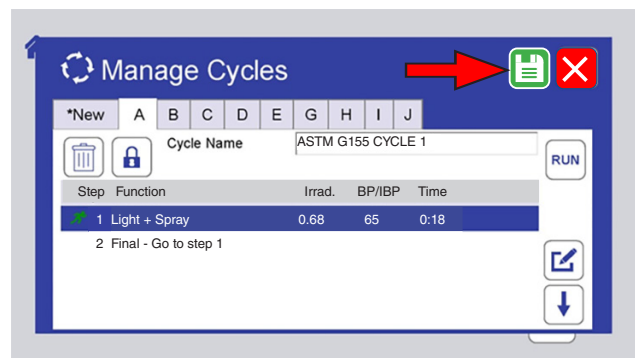
Figure 11.6.6d: Touch the save icon to save the edited cycle.

11.6.7 Create a New Cycle
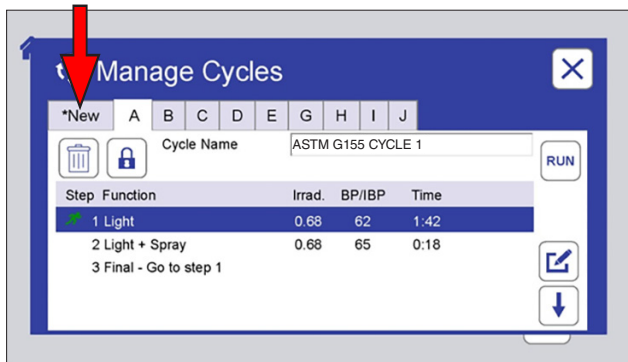
Figure 11.6.7a: To create a new cycle, touch the *New tab.
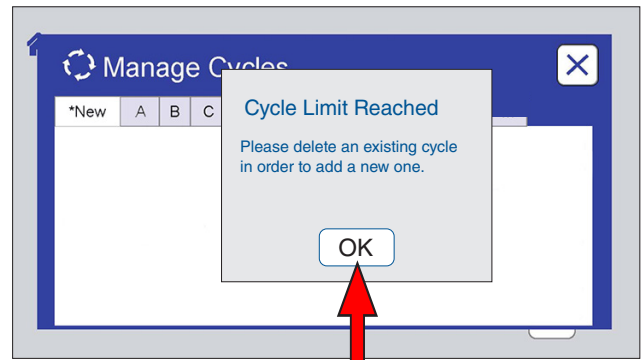
Figure 11.6.7b: If all available cycles are programmed, this message is displayed Touch OK.
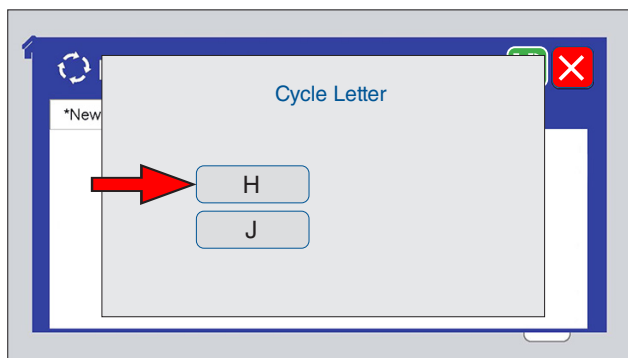
Figure 11.6.7c: If there are open cycles, the available cycle letters are displayed. Touch a letter to program that cycle.
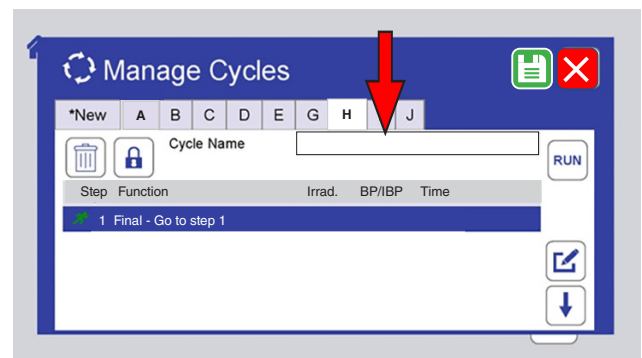
Figure 11.6.7d: An empty cycle is created with only a final step. Enter a name for the new cycle.
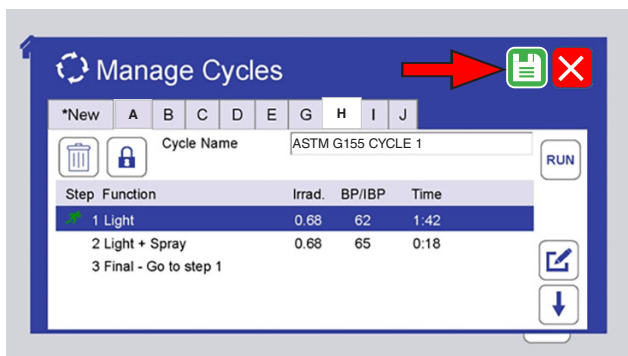
Figure 11.6.7e: Follow Figure 11.6.4a through Figure 11.6.4j to add steps and save the new cycle.

65

11.6.8 Run From Step
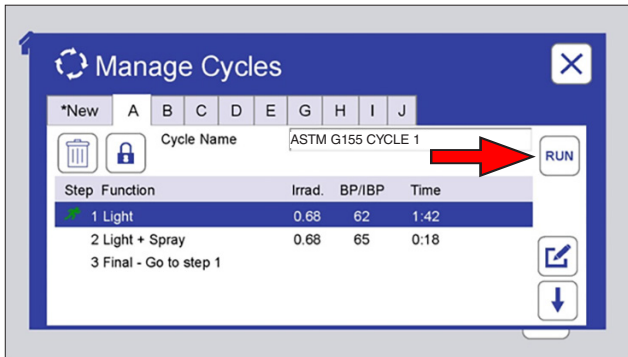
Figure 11.6.8a: A cycle can be run from a specified time in one of its steps. Select the step, then touch the Run icon.
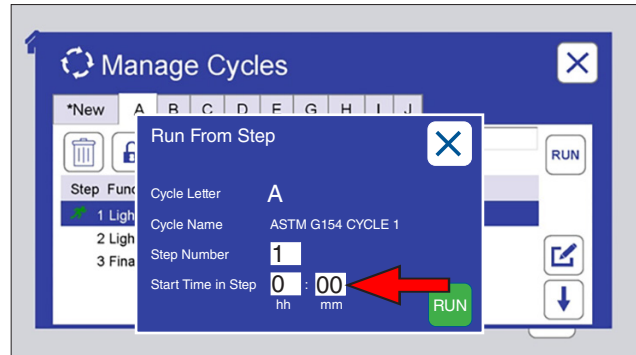
Figure 11.6.8b: Touch the start time hh (hours) text box or the mm (minutes) text box to set the time. Start time can be set to 0 to start at the beginning of the step
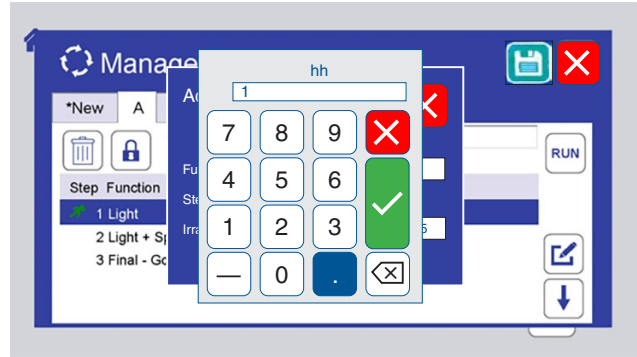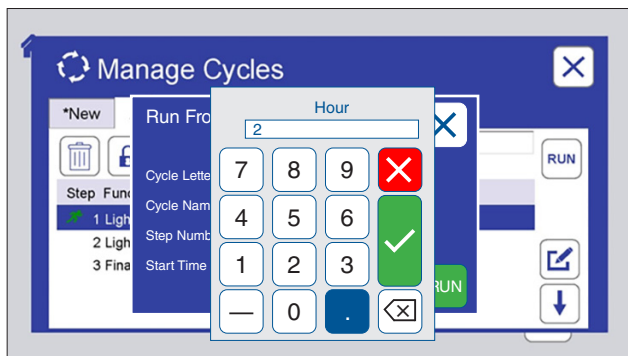

Figure 11.6.8c: Use the numeric key pad to set the time. Touch the check mark button to accept those values or the X button to cancel.
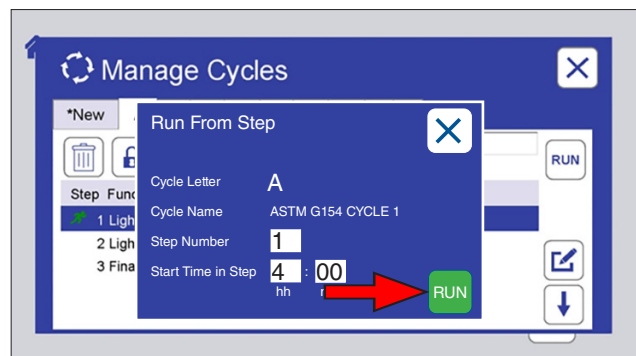

Figure 11.6.8d: Touch the Run icon to run the step from the time entered.

11.7 Settings (Jan 2022)

- On the Main Menu screen touch the Settings icon (Figure 11.7a) to display the Settings screen.

- The Settings screen displays user-selectable machine parameters (Figure 11.7b)

  o Volume (Figure 11.7c and Figure 11.7d).
    - Alarm
    - Touch

  o Display Options (Figure 11.7e through Figure 11.7h)
    - Status Screen Brightness
    - Main Menu Screen Brightness
    - Sleep Time

  o Language (Figure 11.7i through Figure 11.7l). Controls can be displayed in any of seventeen (17) different languages:
    - English, French, Spanish, German, Italian, Chinese, Japanese, Korean, Czech, Dutch, Polish, Portuguese, Russian, Swedish, Thai, Turkish, and Vietnamese

  o Date/Time (Figure 11.7m through Figure 11.7p).

  o Ethernet (Figure 11.7q through Figure 11.7t).

  o Machine Configuration (Figure 11.7u and Figure 11.7v). Contact Q-Lab Repair and Tester Support for more information on using this setting.

- The Q-SUN can be operated using just one screen.

  o In the event of the failure of either screen, the controller will automatically reconfigure to use just the functioning screen to maintain full operation of the tester. This will be indicated by the appropriate error message M900, M901, or M902 (see Section 17.2).

  o A button appears in the upper right corner of the screen to toggle the remaining screen between Main Menu and Status displays (see Figure 11.7x through Figure 11.7aa).
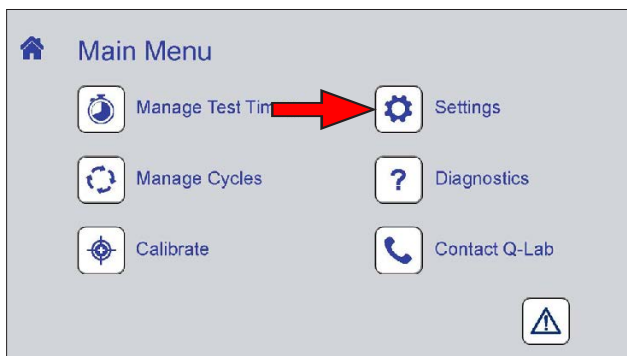
Settings

Figure 11.7a: Touch the Settings icon on the Main Menu screen to display settings controls.
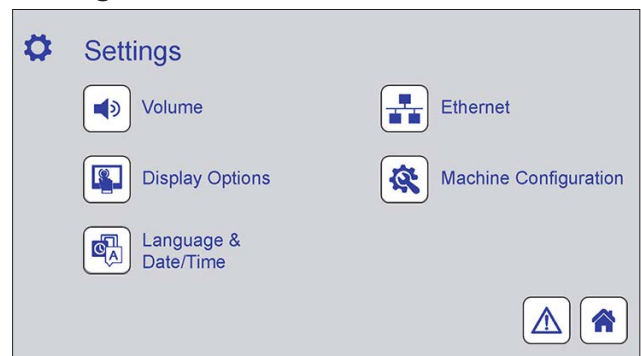
Figure 11.7b: Settings screen. Touch any icon to display controls for that function. The notification screen (Section 11.4) and the home screen can also be displayed.

Volume
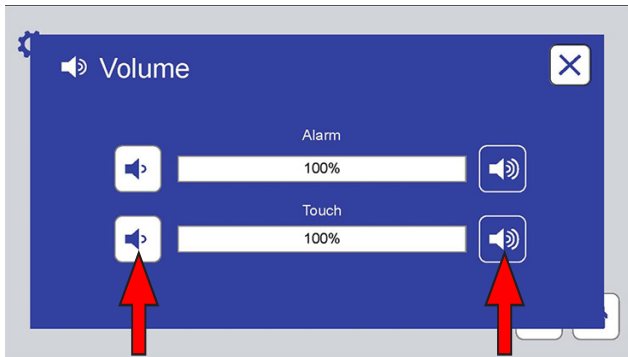
Figure 11.7c: The Volume screen provides controls to set volume (0 to 100) for machine alarms and for the screen touch indicator. Touch a volume icon to adjust.
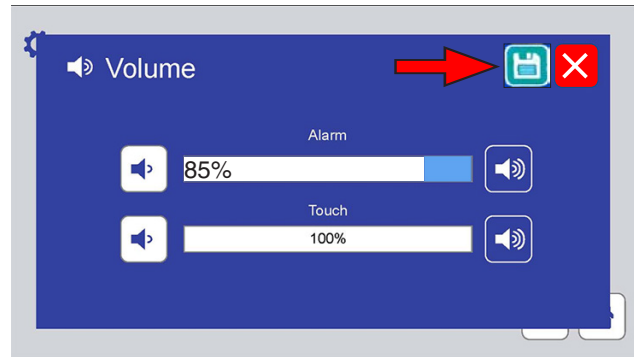
Figure 11.7d: If a volume is changed, touch the save icon to save the new volume level.

Display Options
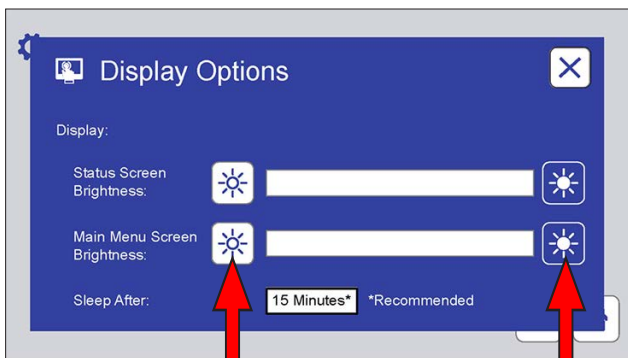
Figure 11.7e: The Display Options screen provides controls to adjust the brightness of the status and menu screens. Touch a brightness icon to adjust.
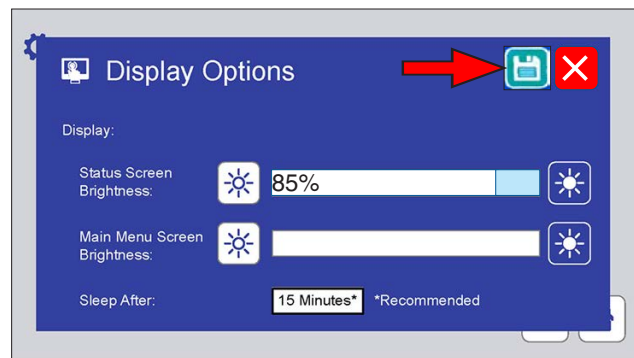
Figure 11.7f: If a brightness is changed, touch the save icon to save the new brightness level.
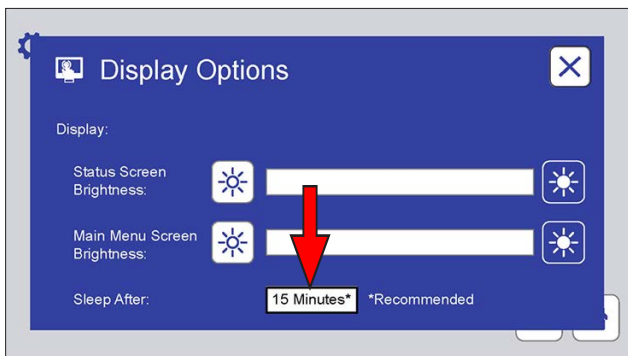
Figure 11.7g: The Display Options screen can also be used to adjust the inactive time that elapses before the screens "go to sleep" (i.e. deactivate). 15 minutes is recommended.
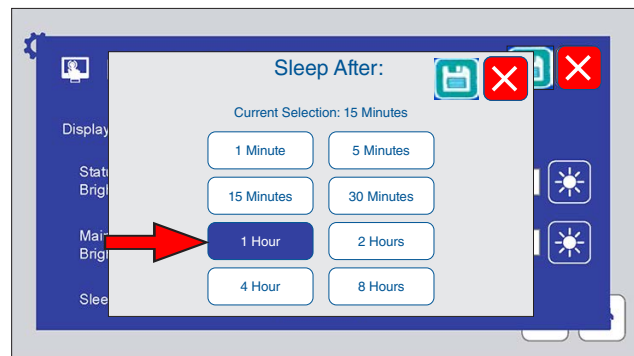
Figure 11.7h: Touch a time button to change the time before screens go to sleep. If changed, touch the save icon to save the new time.

Language
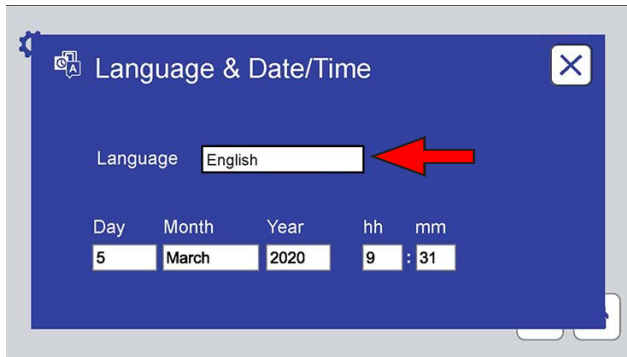
Figure 11.7i: This screen displays controls to select the control interface language.
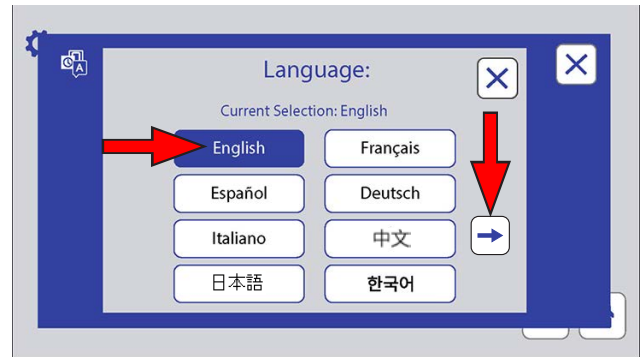
Figure 11.7j: Touch the language text box to select the control display language. Touch the Down Arrow icon to display additional available languages.

Figure 11.7k: Touch the text box for the desired language.

Figure 11.7l: All text on both screens will be in the selected language. Touch the save icon to save the selection.

Date/Time
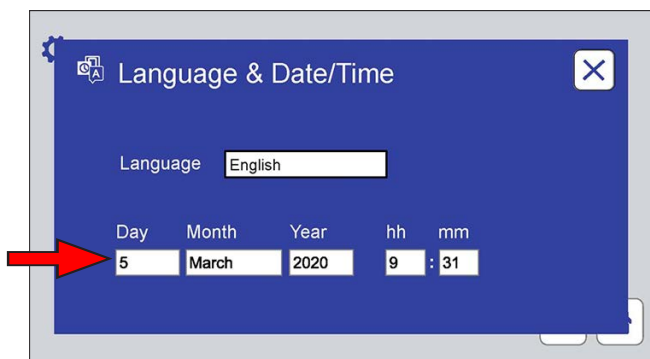
Figure 11.7m: This screen displays controls to set the date and time. Touch a text box to set Day, Month, Year, hh (hour) or mm (minute). hh display is always 24 hour time.
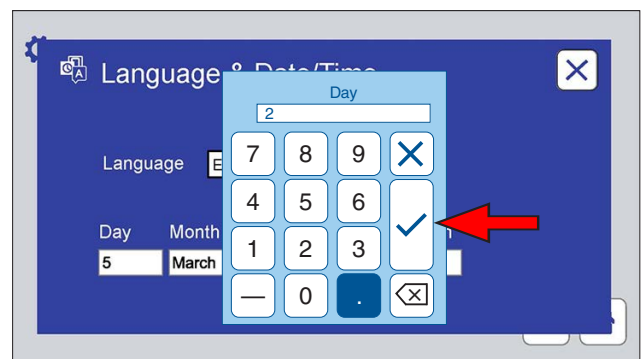
Figure 11.7n: The numeric keypad is used to set Day, Year, hh, and mm. Enter the number, then touch the check mark button.
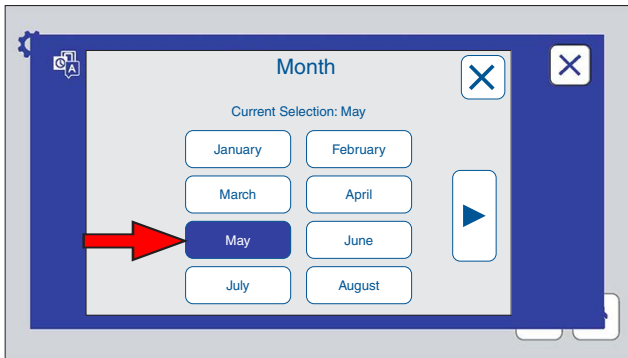
Figure 11.7o: Touch the month button to select the month on this display. Touch the right arrow button to display the remaining months.
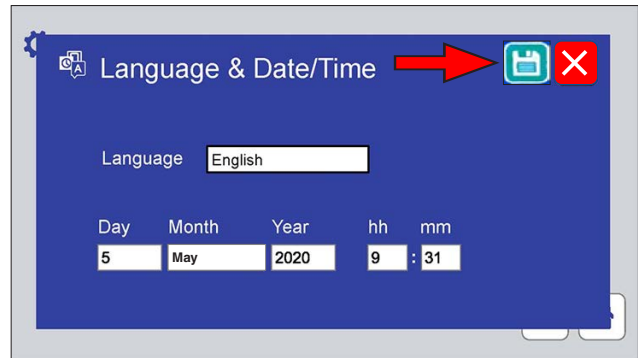
Figure 11.7p: Touch the save icon to save any changes to the Language & Date/Time.

Ethernet
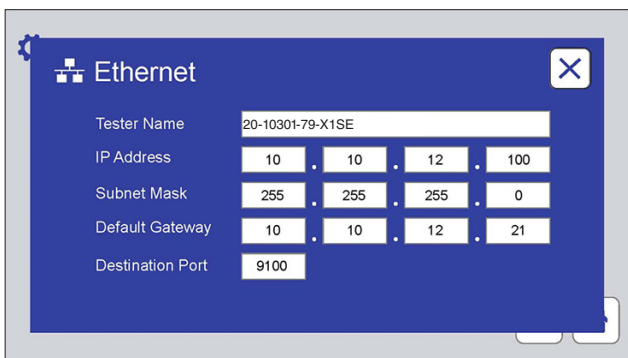
Figure 11.7q: This screen displays and provides text boxes to enter ethernet connection parameters.
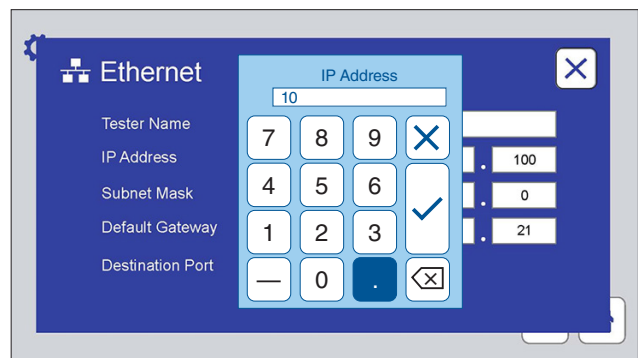
Figure 11.7r: Touch any text box to use the numeric keypad to input the parameter.
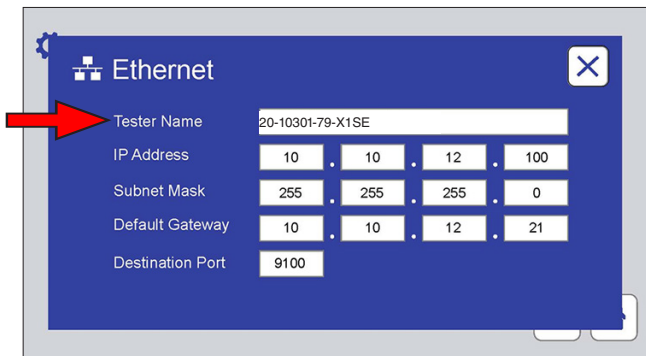
Figure 11.7s: Additionally, this screen has the name of the tester as it would appear on a network, if using the VIRTUAL STRIPCHART network version.
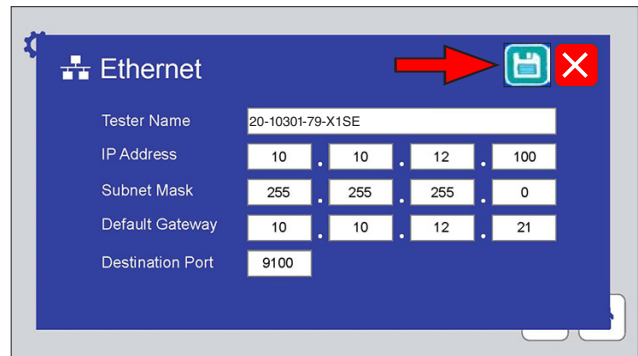
Figure 11.7t: Touch the save icon to save any changes to Ethernet parameters.

Machine Configuration
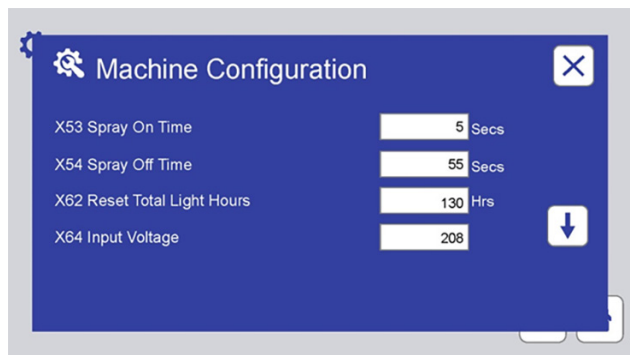
Figure 11.7u: Machine Configuration includes several customizable parameters. Contact Q-Lab Repair with questions about parameters. Touch the down arrow to display additional parameters.
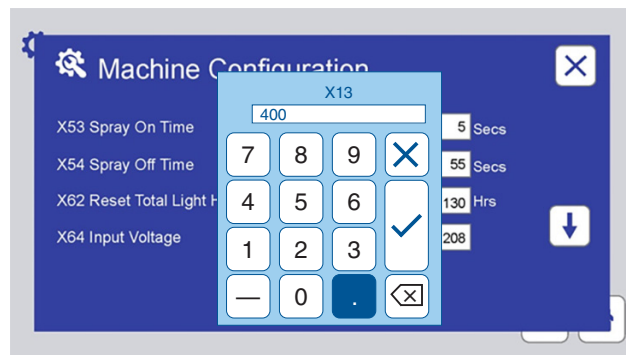
Figure 11.7v: Touch the parameter text box to use the numeric keypad to enter a value. Contact Q-Lab Repair and Tester Support (Section 20) for more information.

No.	Name	Unit	Range	Description
X53	Spray On Time	Secs		This sets the spray on time during Spray steps
X54	Spray Off Time	Secs		This sets the spray off time during Spray steps
X62	Reset Total Light Hours	Hrs	0-999,999	This allows the user to reset the total light hours timer. The timer only runs if the lamps are on.
X64	Input Voltage		208 or 230	This identifies the input voltage for the machine. The maximum duty cycle of the boiler heater is adjusted based on X64.
X104	Lamp Change Interval	Hrs	0-20,000	This is the length of time between "M14 Time to Replace Lamp" reminders.
X105	Routine Service Interval	Hrs	0-5,000	This is the time interval between "M14 Perform Routine Service" reminders.
X125	Reset Routine Service	Hrs	1-900	This sets the time until the next "M14 Perform Routine Service" reminder.
X167	Reset RH Sensor Time XXX Days	Days	Yes/No	This sets the RH sensor time (days) after replacing the RH sensor.
X185	Serial Number Year		##	Two-digit year of tester manufacture from serial number
X186	Serial Number Unique ID		#####	Five-digit unique tester ID from serial number
X187	Serial Number Series		###	Two- or three-digit tester series from serial number

Figure 11.7w: Complete list of accessible parameters.

Single Screen Operation
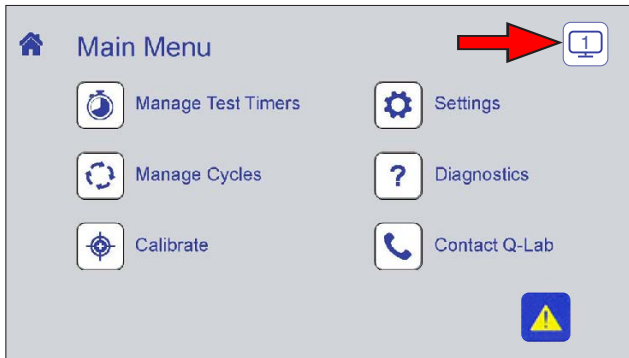
Figure 11.7x: Main Menu in single screen mode. Touch the screen icon.
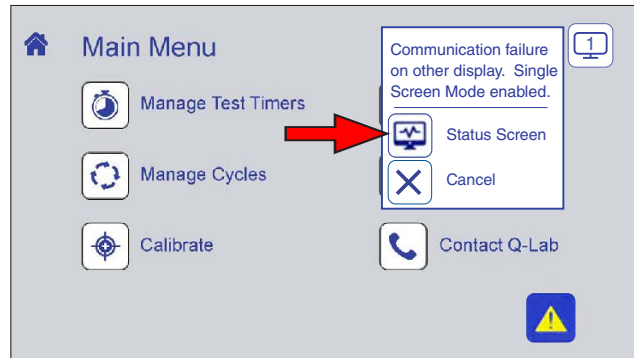
Figure 11.7y: Touch the Status Screen icon to display the Status Screen.
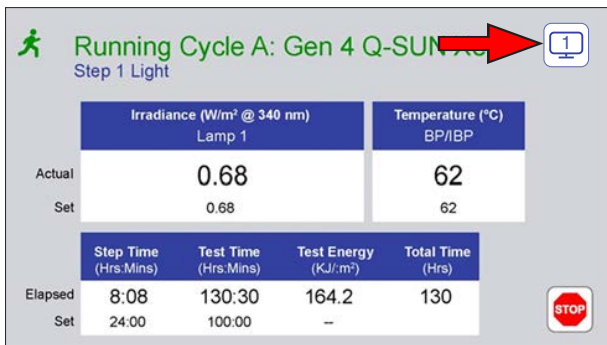
Figure 11.7z: Status Screen in single screen mode. Touch the screen icon.
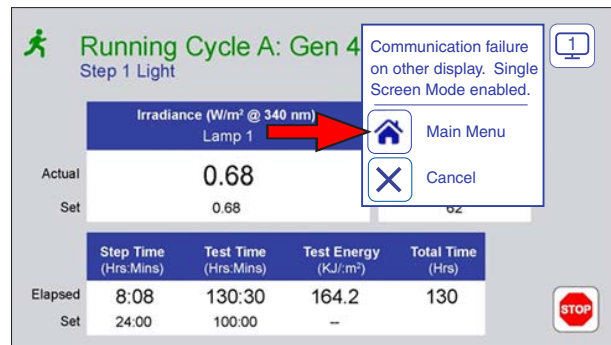
Figure 11.7aa: Touch the Main Menu icon to display the Main Menu.

11.8 Diagnostics (Jan 2022)

- Diagnostics are a list of tester current operating conditions (Figure 11.8a).
- Diagnostics are an important tool to assist in troubleshooting tester conditions.
- On the Main Menu screen, touch the Diagnostics icon (Figure 11.8a) to display the Diagnostics screen (Figure 11.8b).
- Press the UP or DOWN arrows to scroll through the diagnostics.
- There are no editable values on these screens.
- Checking the diagnostic information will not interrupt the test cycle in any way.
- See Figure 11.8c for a complete list of Diagnostics.
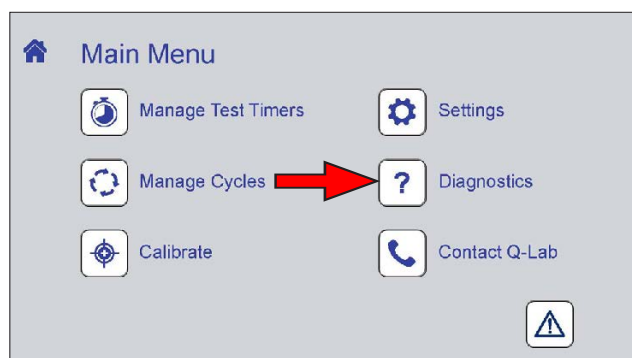
Figure 11.8a: Touch the Diagnostics icon on the Main Menu screen to display diagnostic information.
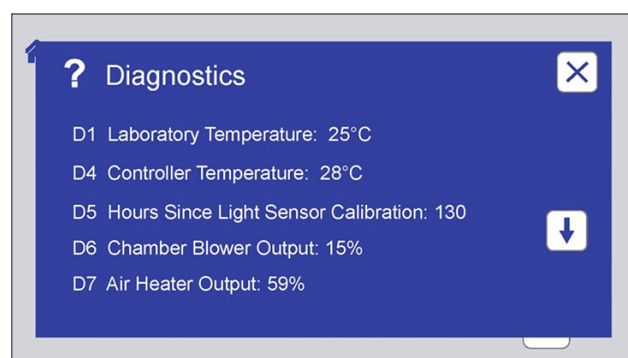
Figure 11.8b: The Diagnostics screen displays current machine operating conditions.

No.	Diagnostic Name	Diagnostic Description
D1	Laboratory Temperature= XXX°C	This shows the current lab temperature.
D4	Controller Temperature= XXX°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. The light calibration interval is set to X21. When the timer exceeds X21, the "M14 TIME TO REPLACE LAMP X X X" and the "M31 CALIBRATE LIGHT SENSORS" alarms occur. The M14 alarm is reset when all light channels are recalibrated.
D6	Chamber Blower On= XXX%	This shows the chamber blower output. X74 ("Max Fresh Air Blower Speed") sets the maximum DC blower speed. The chamber blower's speed is controlled using PWM of the DC voltage used to operate the chamber blower.
D7	Air Heater On= XXX%	This shows the air heater output. The air heater's output is dictated by PI control. As the chamber temperature nears the temperature set point, the air heater output is reduced.
D9	Version 4.00X CHECKSUM= XXXXh	This shows the software version and checksum. The checksum can be used by the software programmer to determine if there is a compiling error.
D10	Lamp Output: 1=XXX%	This shows the lamp output for the lamp in light steps.

No.	Diagnostic Name	Diagnostic Description
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.
D12	Auxiliary Panel Temperature= XXX°C	This shows the current temperature of the auxiliary panel. X6 must be set to Yes to activate the auxiliary panel temperature sensor.
D14	Total Lamp Hours Elapsed= XXXXXX	This shows the total time that the lamp has been on. This timer value can be reset with expert parameter X62.
D19	Lamp Hours: 1=XXXX	This shows the current value of the lamp change timer. When the lamp timer reaches X104 hours, then the "M14 TIME TO REPLACE LAMP" will be triggered.
D20	Hours Since Routine Service XXXXX	This shows the number of hours since the M15 PERFORM ROUTINE SERVICE alarm was last cleared.
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
D22	Chiller On/Off	This shows whether the chiller output is on or off. Expert parameter X139 enables the chiller function.
D23	Water Heater On= XXX%	This shows the reservoir water heater output for a Xe-1 immersion model when in an immersion step.
D24	Serial Number	Displays the tester's serial number as input either at Q-Lab or during a TEB replacement or Reset operation.
D25	MAC Address	Displays the media access control (MAC) address for the tester.
D26	Total Energy Elapsed	Displays the light energy delivered by the tester over its lifetime.
D27	UV Cal Factor	Displays the calibration factor being applied for the current optical filter selection.

Figure 11.8c: Complete list of diagnostic numbers, names, and descriptions.

11.9 Contact Q-Lab (Sep 2020)

- Touch the Contact Q-Lab icon on the Menu Screen (Figure 11.9a).
- The Contact Q-Lab screen (Figure 11.9b) displays the link to Q-Lab Repair and Tester Support on q-lab.com.
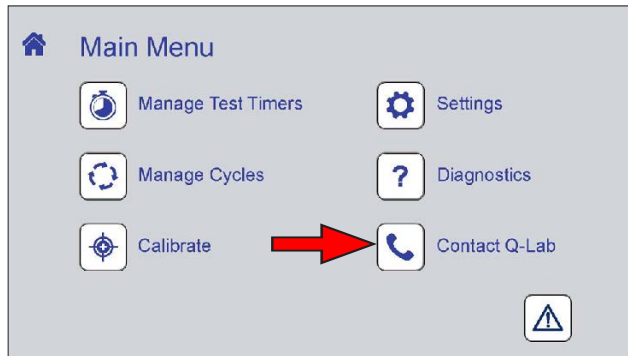
Contact Q-Lab

Figure 11.9a: Touch the Contact icon on the Main Menu screen to display Q-Lab contact information.

Figure 11.9b: Scan the code on this screen for Q-Lab contact information.

12. 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 11.6.
- Various methods for mounting test specimens are illustrated in Section 12.5.
- Recommendations for repositioning test specimens are provided in Section 12.6.

12.1 Partial List of Standard Test Methods Met by Q-SUN Xe-1 Testers (Jan 2022)

Standard	Met by
ASTM C1442 – Conducting Tests on Sealants Using Artificial Weathering Apparatus	Xe-1-SE, SCE
ASTM D2565 – Xenon Arc – Plastics for Outdoor Applications	Xe-1-SE, SCE
ASTM D3424 – Lightfastness of Printed Material	Xe-1-SE, BCE, SCE
ASTM D4303 – Lightfastness of Artists' Pigments	Xe-1-SE, BCE, SCE
ASTM D4798 – Xenon Arc – Bituminous Materials	Xe-1-SE, SCE
ASTM D5071 – Xenon Arc – Exposure of Photodegradable Plastics	Xe-1-SE, BCE, SCE
ASTM D6662 - Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards	Xe-1-SE, SCE
ASTM D6901 - Standard Specification for Artists' Colored Pencils	Xe-1-SE, BCE, SCE
ASTM G155 – Xenon Arc – Test Apparatus for Exposure of Nonmetallic Materials	Xe-1-SE, SCE
GB/T 2424.14 - Environmental testing for electric and electronic products Part 2:Test methods- Guidance for solar radiation testing	Xe-1-SE, BCE, SCE
GB/T 16422.2 - Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc sources	Xe-1-SE, BCE, SCE
IEC 60068-2-5 - Environmental Testing - Part 2-5: Tests - Simulated solar radiation at ground level and guidance for solar radiation testing	Xe-1-BCE, SCE
ISO 3865 - Rubber, vulcanized or thermoplastic - Methods of test for staining in contact with organic material	Xe-1-SE, BCE, SCE
ISO 4892-2 Plastics – Methods of Exposure to Laboratory Light Sources – Part 2: Xenon-Arc Sources	Xe-1-SE, BCE, SCE
ISO 11431 - Building Construction - Jointing Products	Xe-1-SE, SCE
ISO 12040 - Graphic technology - Prints and printing inks - Assessment of light fastness using filtered xenon arc light	Xe-1-SE, BCE, SCE
ISO 12311 - Personal protective equipment - Test methods for sunglasses and related eye wear.	Xe-1- BCE, SCE
ISO 16474-2 - Paints and varnishes - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps	Xe-1-SE, BCE, SCE
ISO 24443 - Determination of sunscreen UVA photo protection in vitro	Xe-1-BCE, SCE
ETAG 002 European Technical Approval Guidelines Part 1 Test A.	Xe-1-WE
JG/T 471 (2015) - Elastic sealants for insulating glass units of windows and curtain walls	Xe-1-SE
JG/T 475 - Structural silicon sealants for building curtain wall	Xe-1-WE

NOTE: Some standards include multiple test cycles, not all of which can necessarily be performed by Q-SUN Xe-1 testers. Please contact Q-Lab Repair and Tester Support for questions regarding specific test cycles.

12.2 Common Test Cycles (Aug 2020)

ASTM G155 (2013) Cycle 1
Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

Models: Xe-1-SE, Xe-1-SCE

Optical Filters: Daylight-Q, Daylight-BB		UV Sensor: 340 nm	Black Panel: Uninsulated	
		Spray: (Xe-1-S, Xe-1-SC) 5 sec on, 55 sec off		
Step	Function	Irradiance (W/m²/nm)	Black Panel Temp. (°C)	Step Time (hh:mm)
1	Light	0.35	63	1:42
2	Light + Spray	0.35	63	0:18
3	FINAL STEP – GO TO STEP 1			

ISO 4892-2 (2013) Cycle B1
Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps

Models: Xe-1-SE, Xe-1-SCE

Optical Filters: Daylight-Q, Daylight-BB		UV Sensor: 340 nm	Black Panel: Insulated	
		Spray: (Xe-1-S, Xe-1-SC) 5 sec on, 55 sec off		
Step	Function	Irradiance (W/m²/nm)	Black Panel Temp. (°C)	Step Time (hh:mm)
1	Light	0.51	65	1:42
2	Light + Spray	0.51	65	0:18
3	FINAL STEP – GO TO STEP 1			

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

Models: Xe-1-SE, Xe-1-BCE, Xe-1-SCE, Xe-1-WE

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			

ETAG 002 European Technical Approval Guidelines Part 1 Test A
Guideline for European Technical Approval for Structural Sealant Glazing Kits (SSGK), Part 1

Models: Xe-1-WE

Optical Filters: Daylight-BB, Daylight-Q   UV Sensor: TUV   Black Panel: Insulated

Step	Function	Irradiance (W/m²)	Black Panel Temp. (°C)	Step Time (hh:mm)
1	Light + Immersion	60.0	45*	24:00
2	FINAL STEP – GO TO STEP 1			

*45 °C is a water temperature specification. The Xe-1-WE black panel temperature indicates water temperature.

International Conference on Harmonization (ICH) Guidelines

ICH Guidelines for the Photostability Testing of New Drug Substances and Products

Models: Xe-1-BCE, Xe-1-SCE

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

Step	Function	Irradiance (W/m²)	Black Panel Temp. (°C)	Step Time (hh:mm)

See *X-10521-L ICH Guidelines Test Protocol for Q-SUN Xenon Arc Test Chambers* for detailed programming information.

12.3 Selecting Test Parameters (Sep 2020)

Optical Filters and Radiometers

- Q-SUN optical filters are very durable and all filters maintain the required spectrum indefinitely, lasting for years under normal use with proper maintenance (except Window-IR, see Section 16.4).

- The application or test standard dictates which filter to use.

	Xe-1 Irradiance Values		
	Typical (& Maximum) [A,B,C]		
	W/m²/nm @340 nm	W/m²/nm @420 nm	W/m² @TUV(300-400 nm)
Daylight-F	0.80 (1.30)	1.50 (2.40)	75 (125)
Daylight-Q	0.68 (1.10)		
Extended UV (-Q/B, -Quartz)			
Daylight-B/B			
Window (-Q, -B/SL)	0.55 (0.85)		70 (108)
Window (-SF5, -IR)	—		42 (68)
UV Blocking	—	Contact Q-Lab Repair and Tester Support [D]	

Notes:

A: Minimum irradiance 0.25 @340nm, 0.45 @420nm, and 20 @TUV.
B: Typical irradiance that can be obtained by using the X-1800+ lamp with a lamp life of 3000 hours.
C: Maximum irradiance that can be obtained by using the X-1800+ lamp with a lamp life of 1000 hours.
D: Tests with UV Blocking optical filters, including the ICH Guidelines test, are often calibrated and programmed in units of Lux.

Figure 12.3a: Irradiance ranges.

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

⚠ Calibrate the Q-SUN UV sensor whenever irradiance set point, lamp, UV sensor, or UV filter are changed.

Panel and Chamber Air Temperature Ranges

- The table below shows the panel temperature 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 can control temperature by either the panel temperature or the chamber air temperature, but not by both.

Models[1]	Xe-1-SE		Xe-1-BCE, Xe-1-SCE		Xe-1-WE	
Panel Temperature[2] (°C)	BP	IBP	BP	IBP	BP	IBP
Light Cycle	45-90	50-100	25-90	25-100	45-90	50-100
Light Cycle w/IR Filter	40-70	45-80	20-70	20-80	40-70	45-80
Dark Cycle	25-50	25-50	10-50	10-50	25-50	25-50
Light+Immersion Cycle	—	—	—	—	35-55	35-55
Dark+Immersion Cycle	—	—	—	—	30-50	30-50
Chamber Air Temp (°C)	CAT		CAT		CAT	
Light Cycle (any filter)	35-55		15-55		—	
Dark Cycle	30-45		10-40		—	

1. Model designations: Spray (SE), Chiller (BCE & SCE), Water immersion (WE).
2. 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.

Figure 12.3b: Panel and chamber air temperature ranges.

Xe-1-BCE and Xe-1-SCE Temperature Control and Display

- The Q-SUN Xe-1-BCE and Xe-1-SCE can control the temperature of either the black panel or the chamber air.
- The control method is selected when programming the test cycle (Section 11.6).
- Whichever temperature has been programmed, black panel or chamber air, is shown on the tester display.
- Both temperatures can be displayed in diagnostic mode (Section 11.8):
  - o D11 is the air temperature
  - o D21 is the black panel temperature
- Data from both temperature sensors are stored on the main controller secure digital (SD) card (Section 14.2).

Chiller Control

- Based on the type of step, temperature setpoint, and lab temperature, the Q-SUN will turn the chiller unit on and off as needed.
- A circuit breaker is located behind the chiller front door (Figure 12.3c).
- The circuit breaker controls the chiller compressor only – the fan will operate regardless of the circuit breaker switch position.
- The switch should always remain in the "**ON**" position.
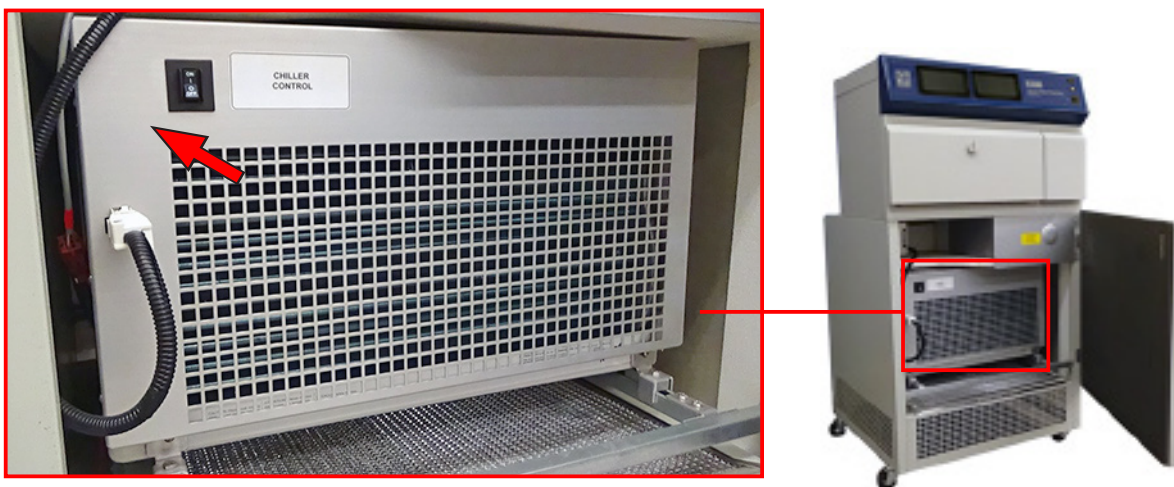
Figure 12.3c: Chiller circuit breaker switch location.

Xe-1-BCE and Xe-1-SCE Damper Adjustment

- The damper position must be set to the lowest temperature expected in the room where the Q-SUN is operating (see Section 10.3).

- Using the graduations on the damper as a guide, the damper louvers (Figure 12.3d) should be fully open if the room is 20 °C (68 °F) or warmer.

- In a room of 10 °C (50 °F) the damper should be almost closed.

Figure 12.3d: Xe-1-BCE and Xe-1-SCE damper adjustment.

Test Duration

- Test duration depends on the test material and the application:
- Air-dry alkyd paints may require only 250 hours (10 days).
- Some coil coatings may require 2,000 hours (12 weeks) or more.
- Roofing materials are commonly exposed for up to 5,000 hours.
- Plastics may be tested for hundreds to thousands of hours, depending upon the end use application.
- Textile fading tests commonly take only a few days.
- Beverages, cosmetics and pharmaceuticals are typically exposed for a few hours to a few days.

NOTE: Consult material specification sheets whenever appropriate.

12.4 Changing UV Optical Filters (Sep 2020)

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 to access the filter (see Figure 12.4a, Figure 12.4b).
- To change the filter, remove the four screws that secure the frame and gently remove the frame (Figure 12.4c, Figure 12.4d).
- The filter type name is etched into the filter surface for positive identification (Figure 12.4e).
- Multi-segment filters are permanently installed in frames and can not be removed from the frame (Figure 12.4f).
- The UV filter can now be lifted out and replaced.

⚠️ **IMPORTANT:** Never operate the tester without a glass UV filter below the lamp.

Figure 12.4a: Open the Xe-1 lid.

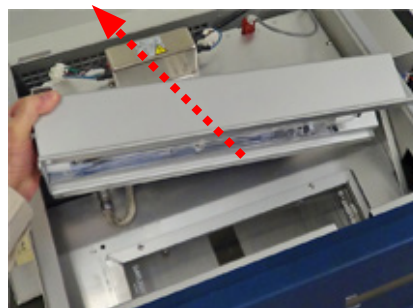Figure 12.4b: Remove the lamp housing.

Figure 12.4c: Unscrew UV filter frame.
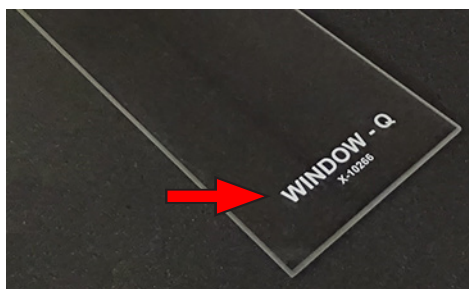
Figure 12.4d: Remove the UV filter.

Figure 12.4e: Optical filter type etched into filter.
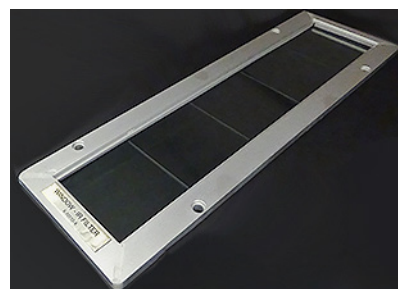
Figure 12.4f: Multi-segment optical filter in frame.

12.5 Mounting Test Specimens (Sep 2020)

Specimen Trays
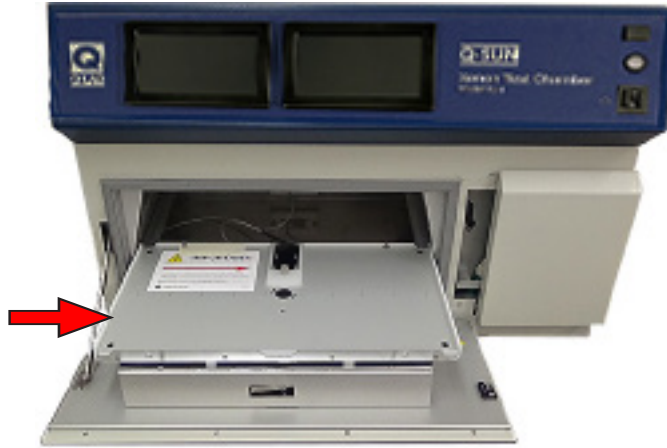
Figure 12.5a: Specimen tray without clips (X-10195-X).

Figure 12.5b: Xe-1-WE with ponding tray mounted on specimen tray.

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 12.5c).

- Mount three-dimensional specimens far enough away from the black panel to avoid casting a shadow on it (Figure 12.5d).
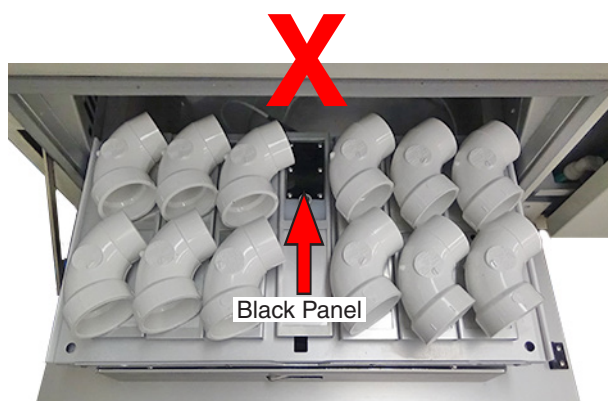
Figure 12.5c: Do not cover or shade black panel.
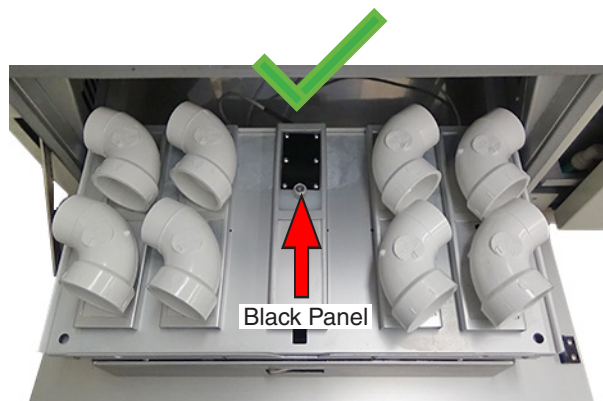
Figure 12.5d: Black panel must be uncovered.

Flat and Three-Dimensional Specimens

- Whenever possible, specimens should be mounted in a specimen holder (Figure 12.5e). If this is not possible specimens may be mounted directly on the tray.

- High air flow through the chamber and water immersion (Xe-1-WE) may make it necessary to secure lightweight specimens.
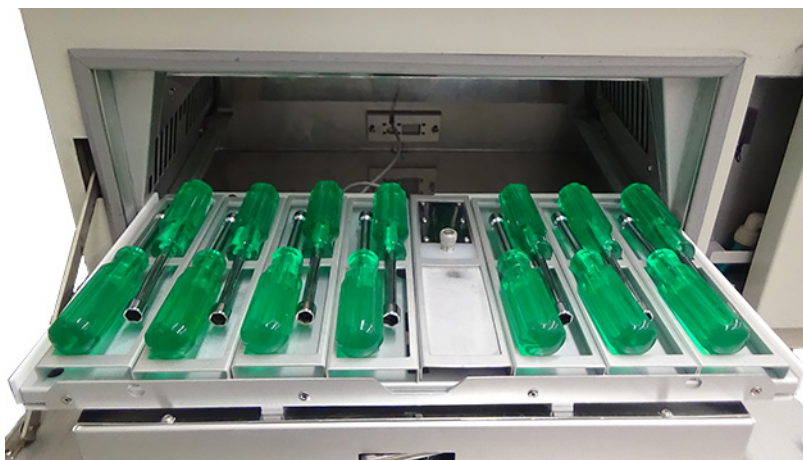
Figure 12.5e: Three-dimensional specimens mounted in specimen holders.

Panel Holders

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

- 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
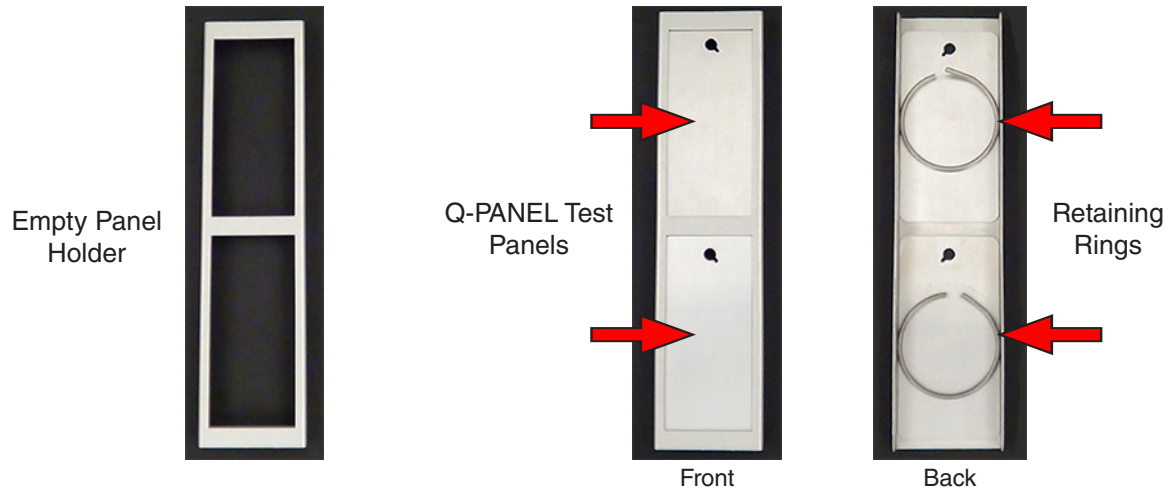
Figure 12.5f: 50×100 mm (2"×4") Panel holder assembly X-10115-X.

Figure 12.5g: Panel holder kit (X-10113-K) with eight (8) panel holders
holding fifteen (15) 50×100 mm (2"×4") specimens and one (1) black panel.

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

When using panel holders and an insulated black panel (IBP, or Black Standard), the IBP should be mounted on a special holder shown below (Figure 12.5h, i). 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 12.5j, k).

Figure 12.5h: Insulated black panel holders.

Figure 12.5i: Single panel holder assembly.

Single Panel
Holder Assembly

Insulated Black
Panel on Holder
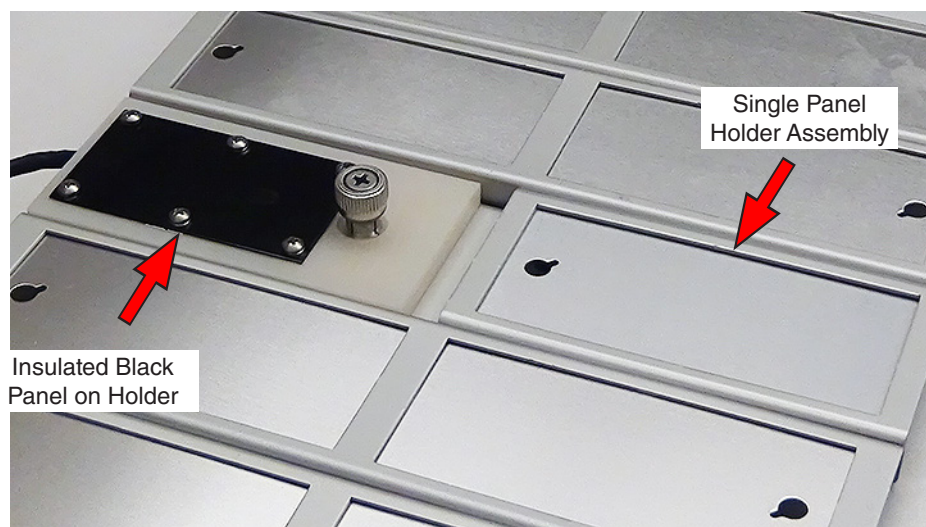
Figure 12.5j: Insulated black panel mounted on special holder and
single panel holder with (1) 50×100 mm (2"×4") specimen.

UC202/IBP
Insulated Black
Panel on Holder

Insulated Black
Panel on Holder
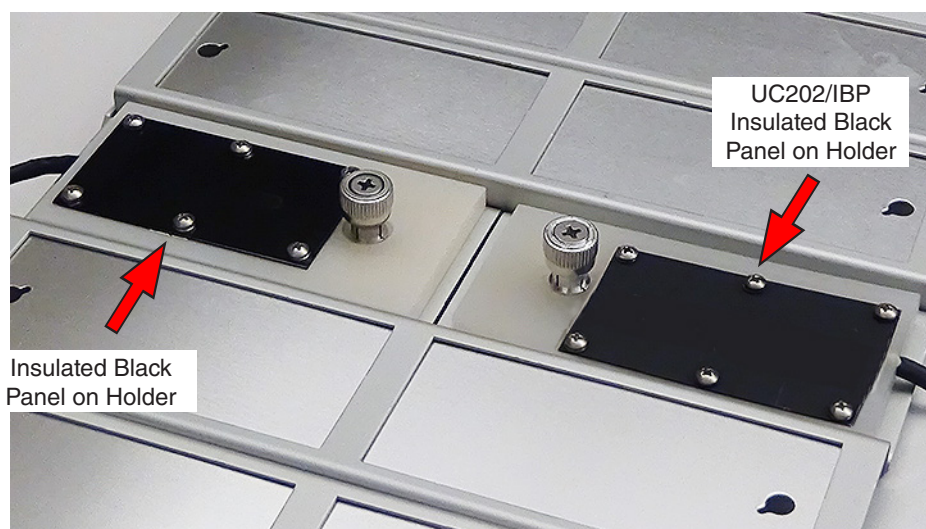
Figure 12.5k: Insulated black panel and UC202/IBP insulated black panel mounted on special holders.

87

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

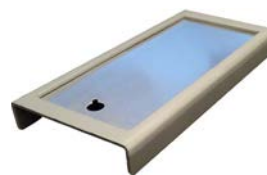When using panel holders and an uninsulated black panel (BP), the BP should be mounted on a standard 50×100 mm (2"×4") panel holder (Figure 12.5l). Use a retaining ring to hold the BP in place. Fill the panel holder with a 50×100 mm (2"×4") specimen (Figure 12.5m). When calibrating the BP, mount the UC202/BP in the same 50×100 mm (2"×4") holder and hold in place with a retaining ring (Figure 12.5n).

Figure 12.5l: Standard 50×100 mm (2"×4") panel holder.

50×100 mm (2"×4")
Specimen in Holder

Uninsulated Black
Panel on Holder
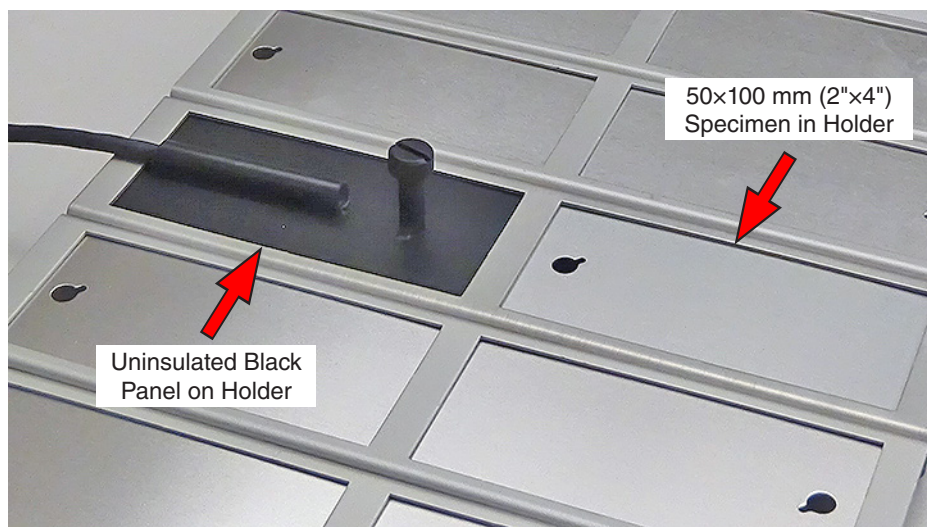
Figure 12.5m: Uninsulated black panel and one (1) 50×100 mm (2"×4") specimen
mounted on standard 50×100 mm (2"×4") holder.

UC202/BP Uninsulated
Black Panel on Holder

Uninsulated Black
Panel on Holder
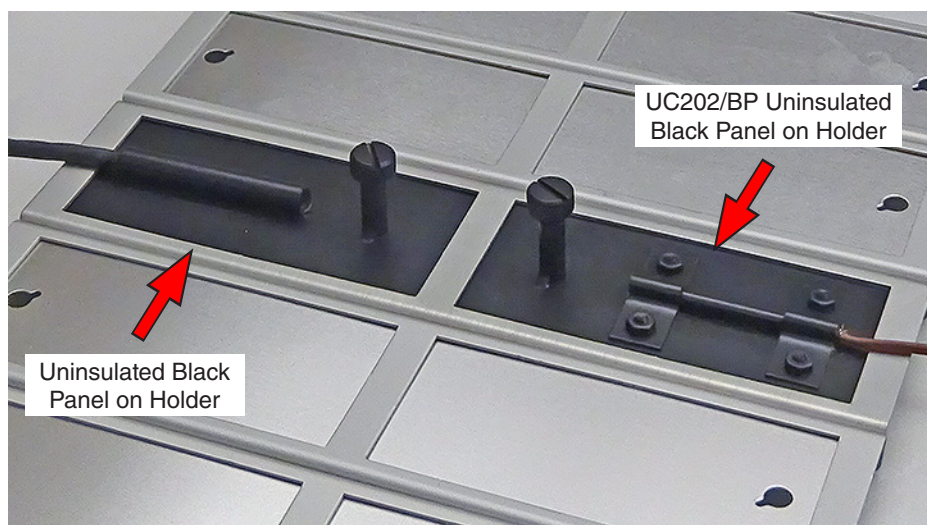
Figure 12.5n: Uninsulated black panel and UC202/BP uninsulated black panel
mounted on standard 50×100 mm (2"x4") holder.

Mounting Thin Films or Textile Specimens with Standard Panel

- Thin films and textile specimens can be wrapped around a standard panel and mounted in a holder (Figure 12.5o).
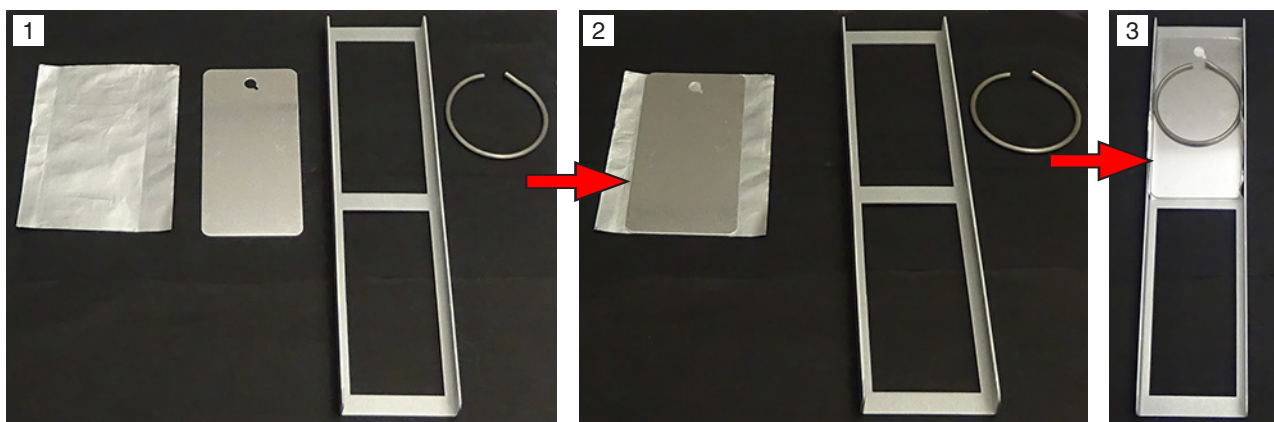
Figure 12.5o: Thin film mounted in panel holder.

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 12.5p.

- Notice that the solid backing panel is replaced with a backing panel that is open in the center.
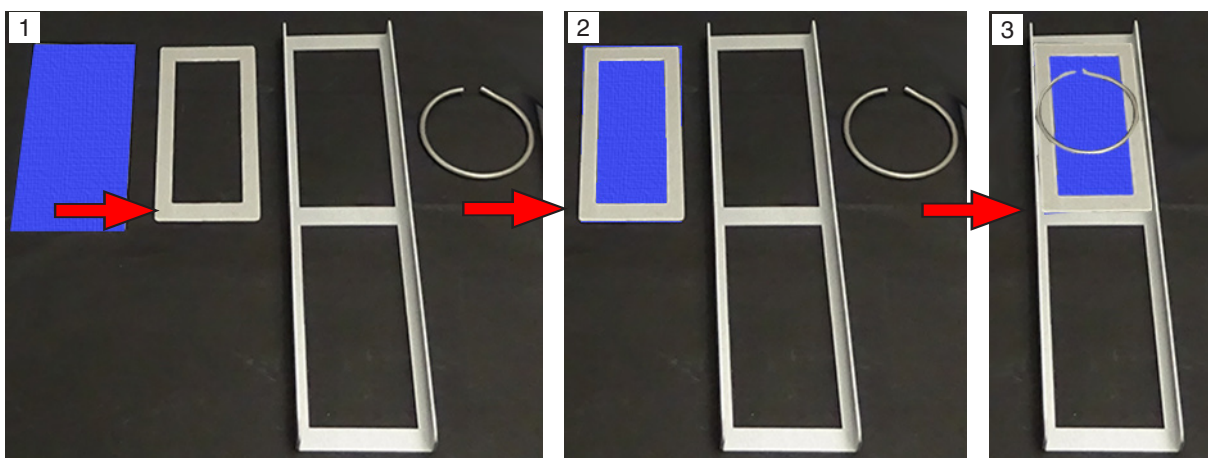
Figure 12.5p: Textile specimen mounted in textile/thin film holder.

Bottle Holders

- Special holders are available to mount cylindrical objects such as bottles (Figure 12.5q and Figure 12.5r).
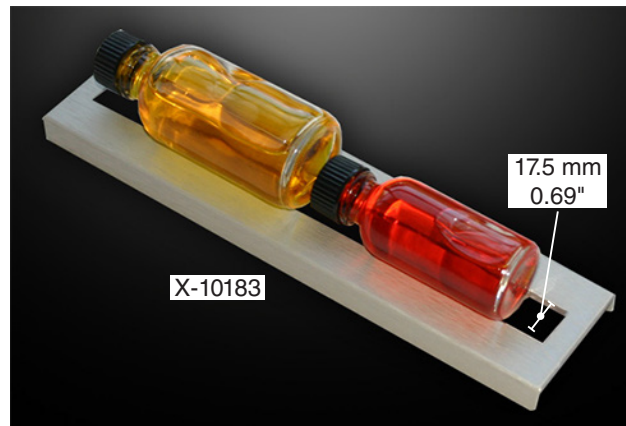
Figure 12.5q: Holder is slotted to hold narrow cylindrical specimens
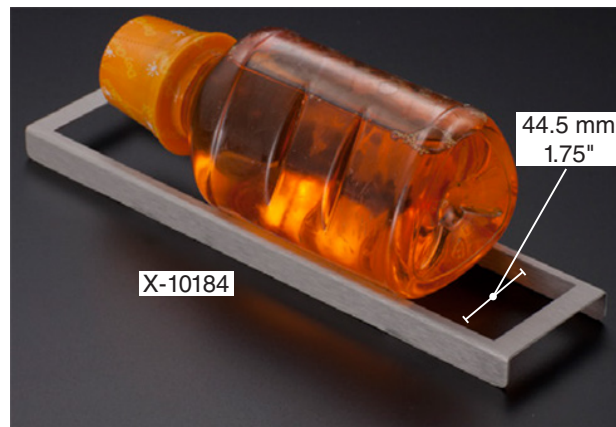
Figure 12.5r: Holder is slotted to hold wider cylindrical specimens

Xe-1- WE Specimen Immersion

- Specimens are placed on the mesh insert in the Xe-1-WE ponding tray (Figure 12.5s).

Figure 12.5s: Place specimens on the mesh insert.

3D Specimens

- The following graph (Figure 12.5t) shows the relationship between distance above the specimen tray and irradiance.

- Specimen surfaces above the specimen tray receive higher irradiance.

Distance Above Specimen Tray *
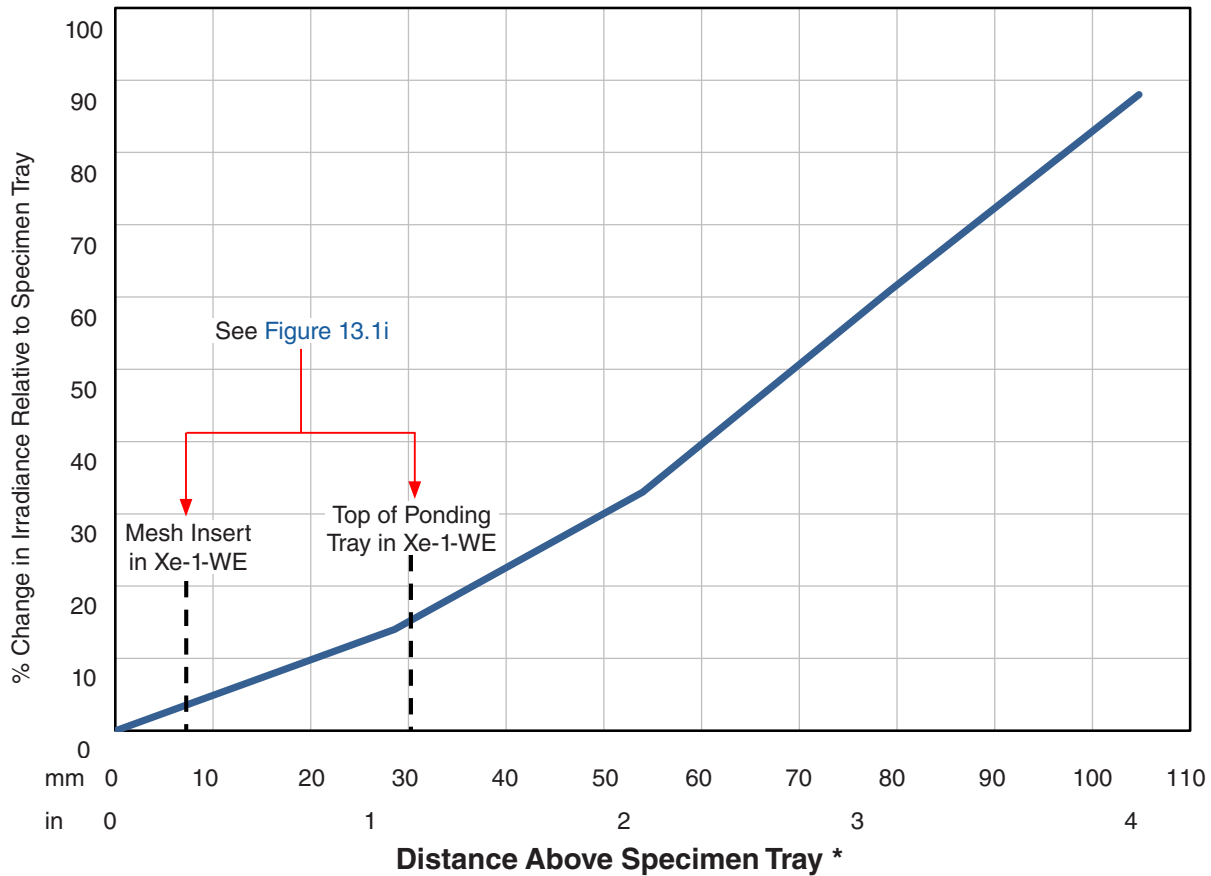
* The specimen tray is the base Xe-1 tray for any model, including the Xe-1-WE with the ponding tray removed.

Figure 12.5t: Distance above specimen tray vs. irradiance change.

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

12.6 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.
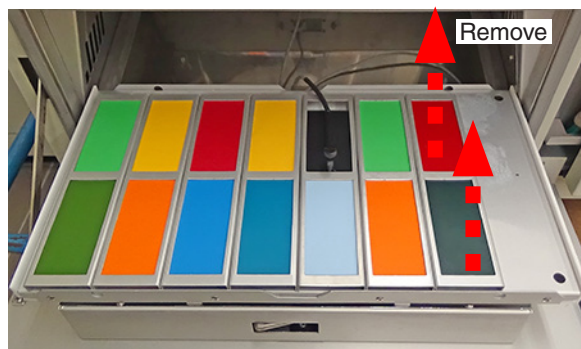
2. Remove the specimen holder on the right side of the tray.
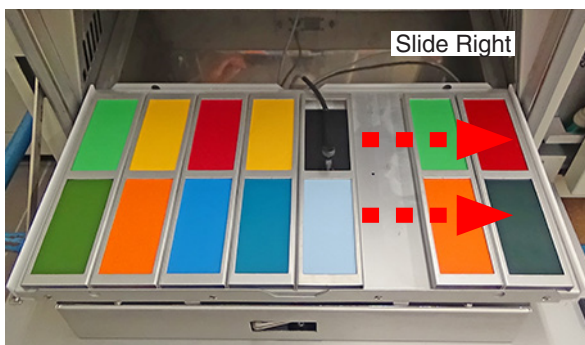
3. Slide the specimen holders to the right of the black panel to the right.
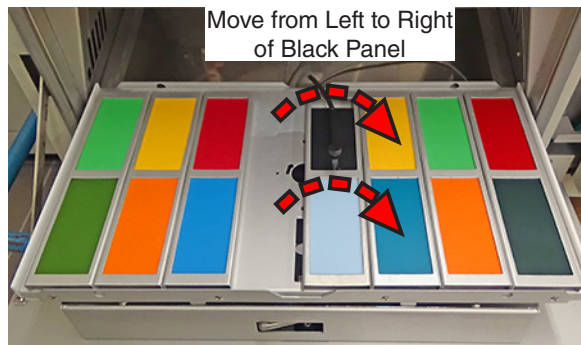
4. Move the specimen holder on the left of the black panel to the right of the black panel
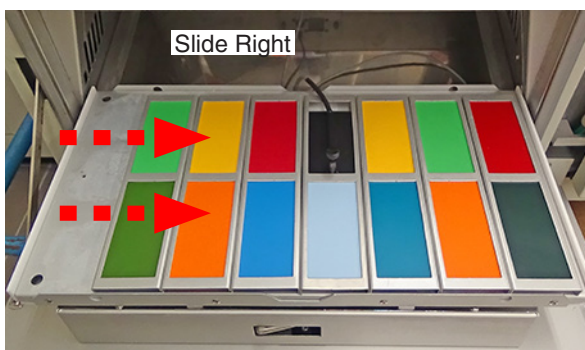
5. Slide the specimen holders on the left of the black panel to the right.
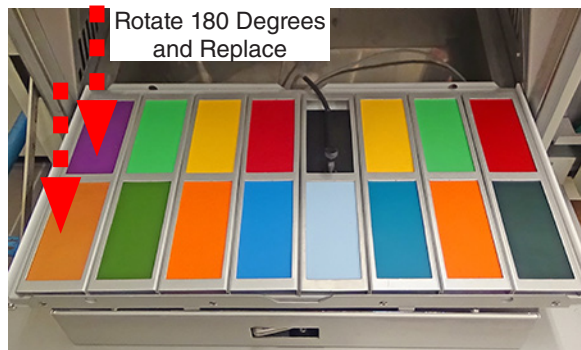
6. Rotate the specimen holder removed in **Step 2** 180° and place on the left end of the tray.

13. Calibration

- Irradiance for all models is calibrated with the UC20 Smart Sensor (Section 13.1).

- Xe-1-WE irradiance must be calibrated with no water in the ponding tray.

- The Panel temperature sensor for all Xe-1 models, except Xe-1-WE running in immersion mode, is calibrated with a UC202 Smart Sensor (Section 13.2).

- Panel temperature for Xe-1-WE running in immersion mode is calibrated with a calibrated reference thermometer

- Chamber air temperature is calibrated with a calibrated reference thermometer.

- The table below lists the Q-SUN Xe-1 on-board sensors that require periodic re-calibration or replacement.

- Please contact Q-Lab for more information (Section 20).

Sensor	Model	Calibration Frequency	Calibration Instrument
Irradiance	All[1]	500 hours[2]	UC20 Smart Sensor
Black Panel Temperature	All	6 months[3]	UC202 Smart Sensor[4]
Chamber Air Temperature	Xe-1-BCE, SCE	6 months	Calibrated Reference Thermometer

[1] For the Xe-1-WE, irradiance calibration can be done with or without the ponding tray in the test chamber, but never with water.

[2] Or whenever the lamp, irradiance sensor, or test cycle conditions are changed.

[3] Or whenever the lamp, panel temperature sensor, or test cycle conditions are changed.

[4] If the Xe-1-WE is not running in immersion mode, black panel calibration is done with a UC202 Smart Sensor and the ponding tray removed. If the Xe-1-WE is running in immersion mode, black panel calibration is done with a Calibrated Reference Thermometer and the ponding tray in place.

13.1 Irradiance Calibration (Jan 2022)

Smart Sensors

- Irradiance is calibrated with a UC20/340, UC20/420, UC20/LUX or UC20/TUV Smart Sensor (Figure 13.1a through Figure 13.1d).
    - o The UC20/LUX Smart Sensor is identical to the UC20/420 except that illuminance can also be displayed in units of LUX. The UC20/LUX Smart Sensor requires a 420 nm sensor in the tester.
    - o The UC20/340 Smart Sensor cannot be used with Window - IR or Window-SF5 filters.
    - o Smart Sensors are labeled and color coded for identification.
    - o The UC20 Smart Sensor must match the type of sensor (340 nm, 420 nm, LUX, or TUV) installed in the tester.
- Smart Sensors are calibrated at Q-Lab and the calibration information is stored in the Smart Sensor.
    - o Calibration information is shown on the sensor calibration certificate and on a Smart Sensor case label (Figure 13.1f and Figure 13.1g).
    - o Calibration information can also be displayed on the Xe-1 menu screen when the Smart Sensor is connected (Figure 13.1h).
- The UC20 Smart Sensor will give a notification on-screen when plugged-in if calibration is due in the next 90 days or overdue.
    - o Upon calibration expiration, Smart Sensors should be discarded and replaced with an inexpensive new sensor. See the Replacement Parts List, Section 18.
    - o Optionally, Smart Sensors can be returned to Q-Lab for recalibration. Contact Q-Lab Repair and Tester Support for more information.
- Clean the Smart Sensor face with 99% isopropyl alcohol and a soft cloth before calibrating irradiance (Figure 13.1e).
- Store the Smart Sensor in its case when not in use to avoid any contamination.

Figure 13.1a: UC20/340 Smart Sensor (Green Label)

Figure 13.1b: UC20/420 Smart Sensor (Red Label)

Figure 13.1c: UC20/LUX Smart Sensor (Brown Label)

Figure 13.1d: UC20/TUV Smart Sensor (Gray Label)

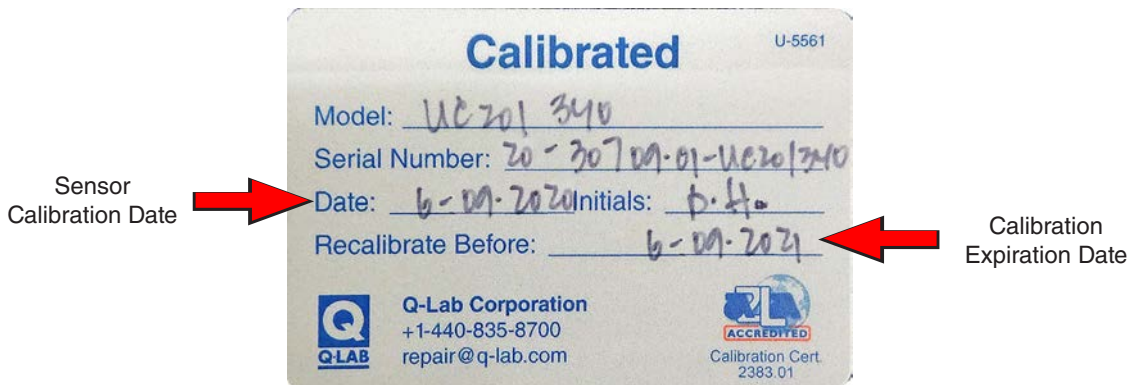Figure 13.1e: Clean the sensor face with 99% isopropyl alcohol and a soft cloth.

Figure 13.1f: UC20/340 calibration certificate.

Figure 13.1g: Smart Sensor calibration label on case.
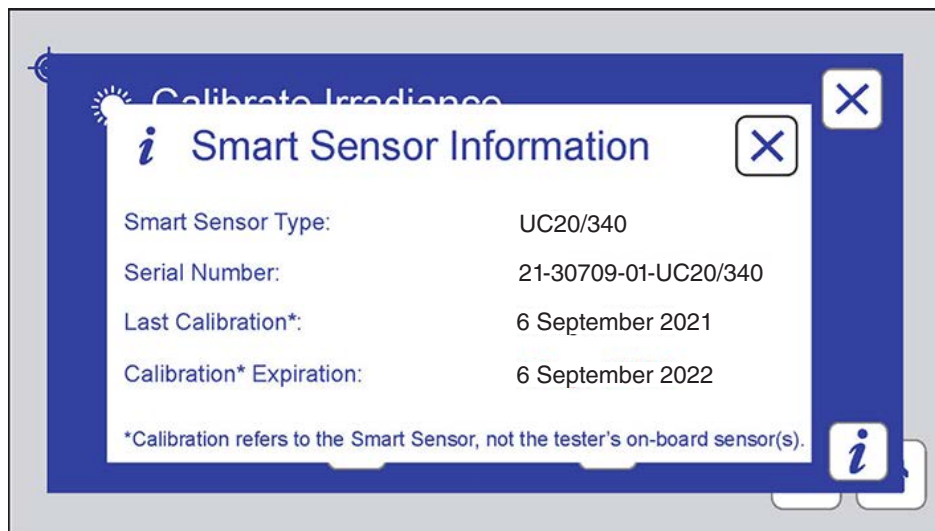
Figure 13.1h: Smart Sensor information displayed on Xe-1 menu screen.

Procedure

⚠️ Do not calibrate the irradiance sensor during spray or immersion steps. The Smart Sensor is not waterproof.

To calibrate Xe-1-WE running immersion tests there must be no water in the ponding tray (see Step 20).

- The calibration instructions are listed in the steps below.
- Calibrate the Q-SUN Xe-1 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.

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

2. Remove the UC20 Smart Sensor from the case.

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

4. Plug the Smart Sensor into USB connector on the Xe-1 control panel.

☀ Calibrate Irradiance

Cannot Calibrate: Sensors do not match.

Smart Sensor compatible with: 420 nm
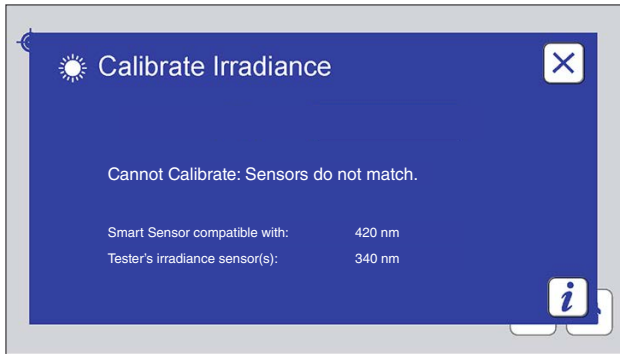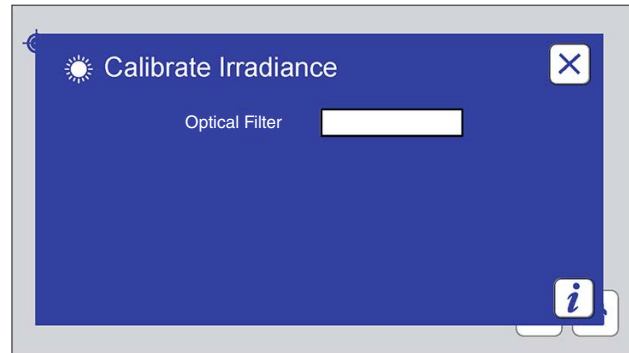
Tester's irradiance sensor(s):   340 nm

5. If the Smart Sensor does not match the Xe-1 irradiance sensor this message is displayed. Connect the Smart Sensor that matches the Xe-1 irradiance sensor.

☀ Calibrate Irradiance

Optical Filter

6. For testers with 340 nm or TUV sensors, this Calibrate Irradiance screen with a box to select the optical filter is displayed. For testers with a 420 nm sensor, go to Step 12.

☀ Calibrate Irradiance
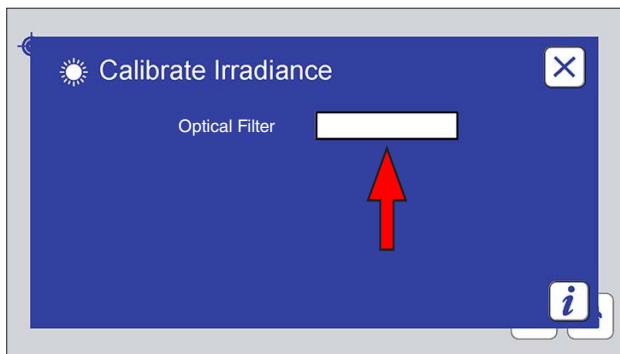
Optical Filter

7. Touch the Optical Filter text box. For 340 nm sensors continue with Step 8. For TUV sensors go to Step 10.

Optical Filter

Daylight-Q	Window-Q
Daylight-F	Window-B/SL
Daylight-BB	
Extended UV-Q/B	
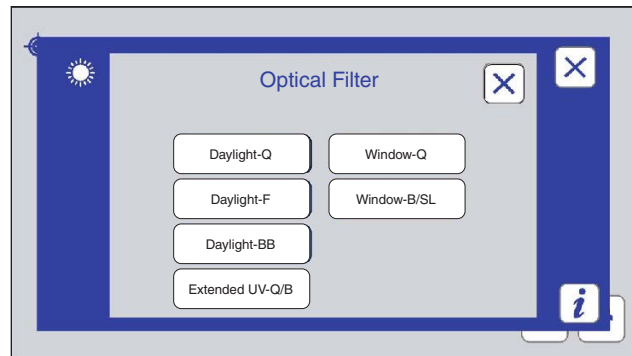
8. The Optical Filter screen for 340 nm sensors. Touch the optical filter button that matches the optical filters installed in the tester.

☀ Calibrate Irradiance

Optical Filter   Daylight-Q

0.67   W/m²/nm @340nm

1
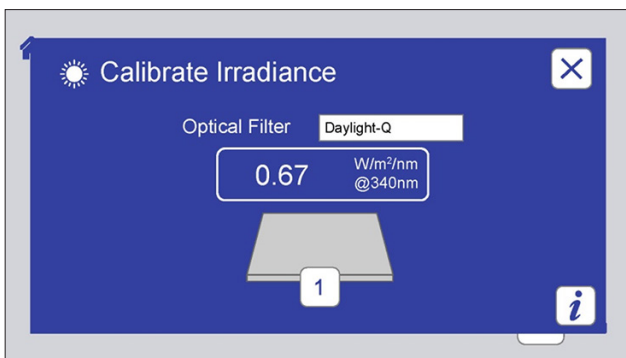
9. For testers with a 340 nm sensor, this screen is displayed. Go to Step 13.

Optical Filter

Daylight-Q	Window-Q
Daylight-F	Window-B/SL
Daylight-B/B	Window-SF5
Extended UV-Q/B	Window-IR
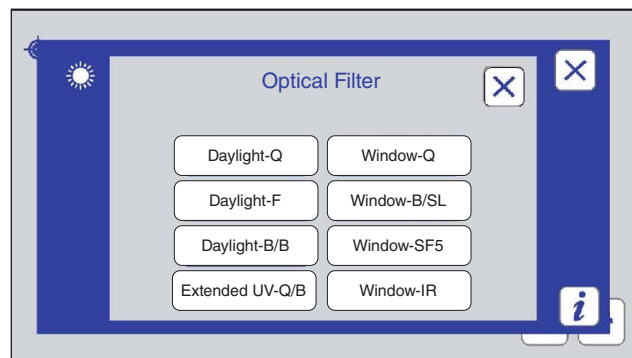
10. The Optical Filter screen for TUV sensors. Touch the optical filter button that matches the optical filters installed in the tester.
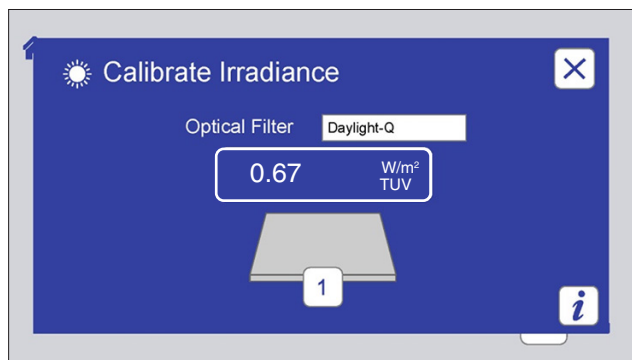
11. For testers with a TUV sensor, this screen is displayed. Go to Step 13.
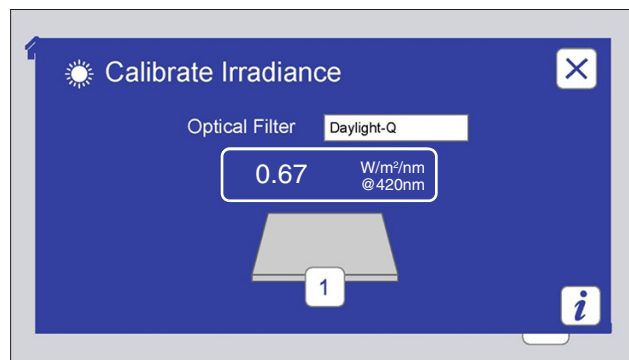
12. For testers with a 420 nm sensor, this screen is displayed.
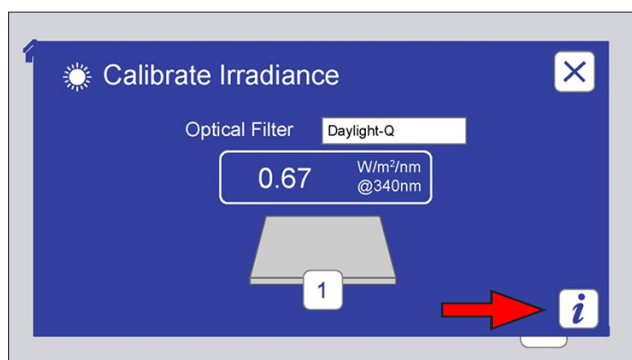
13. **Optional:** to display the Smart Sensor calibration information, touch the information icon.
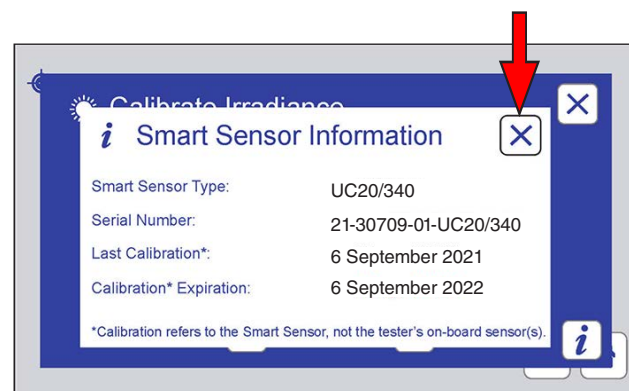
14. The Smart Sensor information screen is displayed (UC20/340 shown). Touch the close icon to close the information screen.
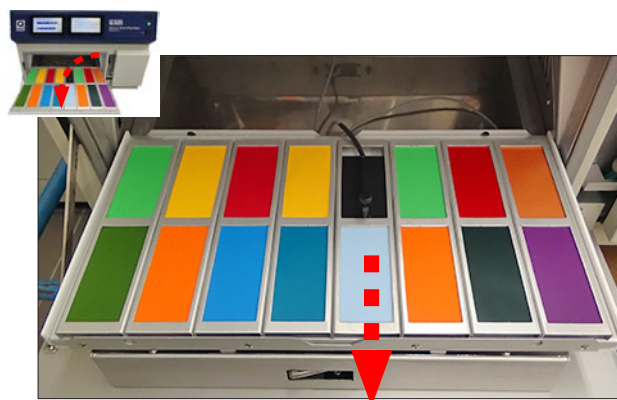
15. For all models except Xe-1-WE, open the test chamber door and pull the specimen tray out. Xe-1-WE go to Step 20.
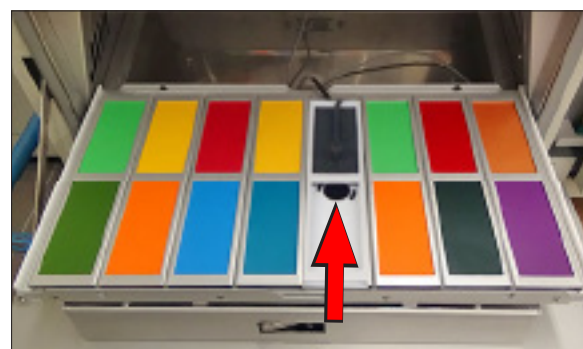
16. Locate the calibration port in the specimen tray.

Spring-mounted
Flange

Tray Bottom

17. The UC20 has a spring-mounted flange for docking in the tester calibration port.
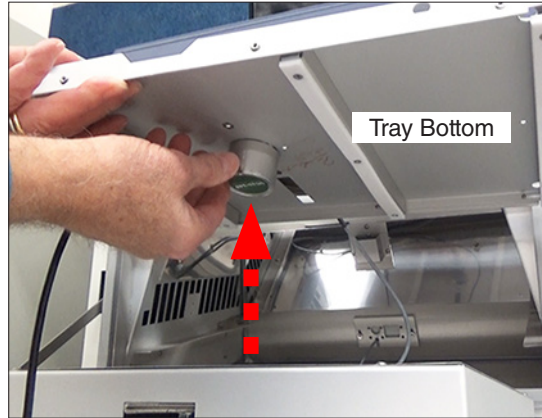
18. Lift the specimen tray. From the bottom of the tray press the UC20 Smart Sensor face-up into the calibration port compressing the flange.

UC20 as Seen from Top of Specimen Tray

Tray Top
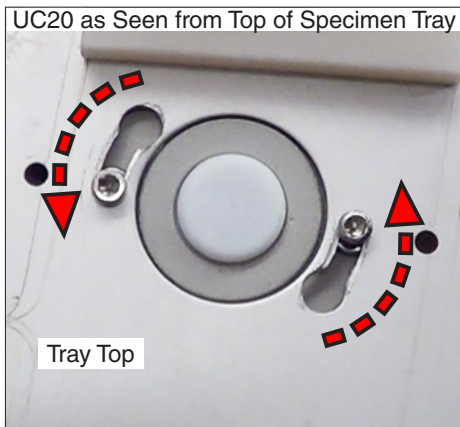
19. Rotate the UC20 to lock it in to the calibration port. Go to Step 23.

Xe-1-WE Only
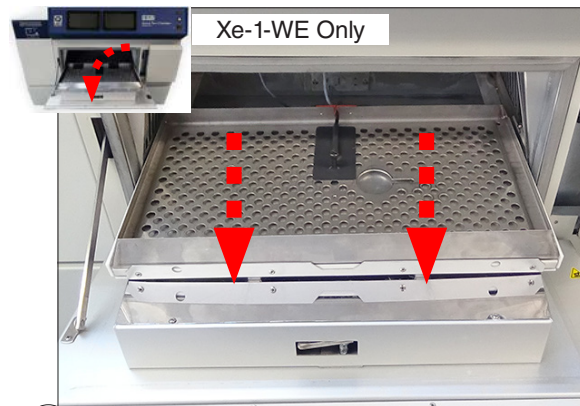
20. Open the test chamber door. Pull the ponding tray out. **IMPORTANT:** Make sure there is no water in the ponding tray. The irradiance sensor is not waterproof.

Xe-1-WE Only

Xe-1-WE Only
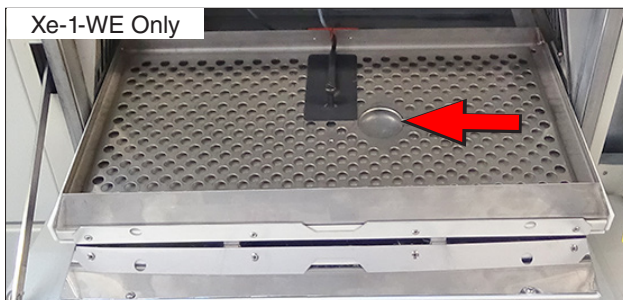
21. Locate the calibration sensor cutout in the ponding tray mesh insert.
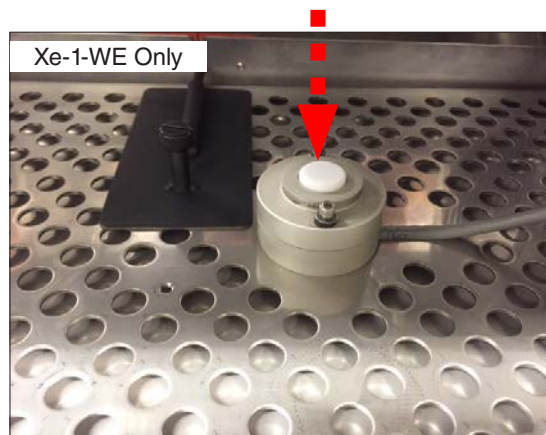
22. Place the UC20 Smart Sensor in the calibration cutout in the mesh insert. In this position, the top of the sensor is at the same height as the top of the ponding tray. See Section 9 for more information.

23. Slide the tray back into the chamber and close the door with the Smart Sensor cord routed out of the chamber. Keep the cord away from the door latch.

⚠️ Wait for the irradiance to stabilize.
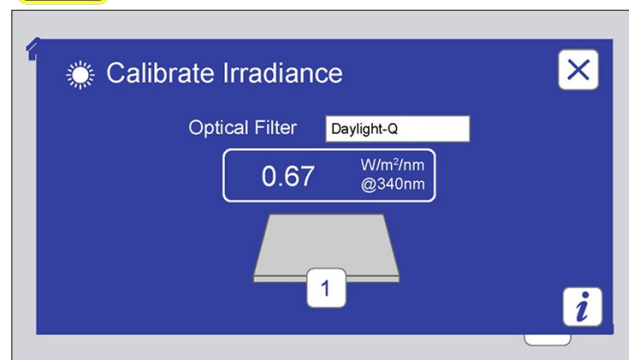
24. Wait a few seconds to allow the irradiance to stabilize.
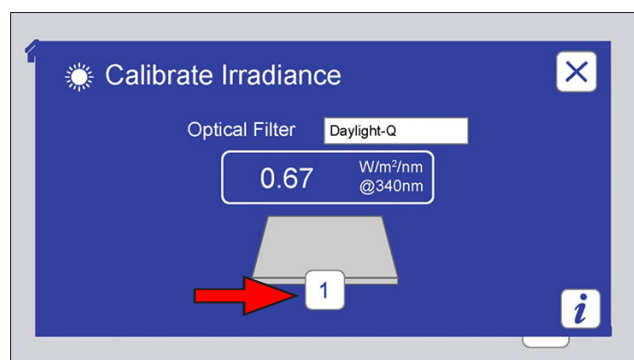
25. Press and hold the channel 1 calibration button until the tester beeps.
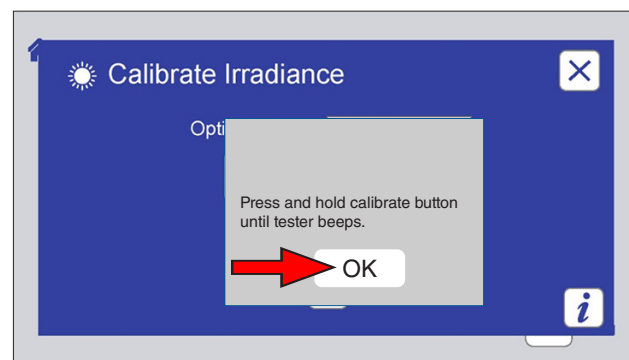
26. If the button is not pressed long enough, this message is displayed. Touch the OK button to close the message. Press and hold the channel 1 button again until the tester beeps.
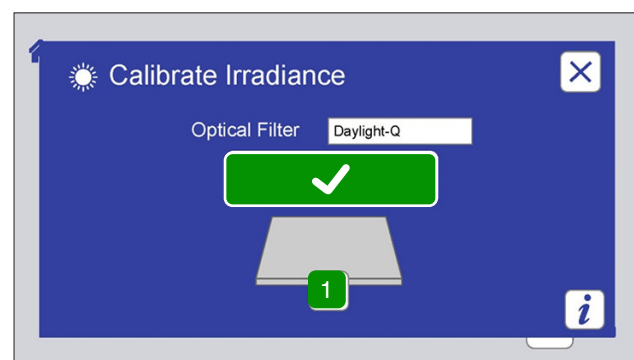
27. The channel button turns green and a check mark is displayed indicating successful calibration.

⚠️

- 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 Smart Sensor in a calibration port for more than 5 minutes.

Additional information on Calibration for Immersion Testing

- The immersion calibration procedure provides accurate irradiance readings for 25 mm (1") tall specimens, that is a specimen plane at the same vertical position as the top of the ponding tray.

- The irradiance level recieved by specimens from 0 mm to 25 mm high is a percentage less than 100% as shown on the vertical axis in Figure 13.1i.

- To obtain the required irradiance on specimens less than 25 mm tall, the test irradiance set point must be adjusted upward by dividing the desired irradiance set point by the height of the specimen as a percentage of 25 mm. See examples below:

    1. To obtain 0.55 W/m²/nm on a very thin specimen (specimen plane very close to mesh insert), the irradiance set point must be set to 0.61 W/m²/nm. This is the calculation: 0.55 W/m²/nm ÷ 90% = 0.61 W/m²/nm.

    2. To obtain 1.10 W/m²/nm on a specimen 16 mm thick, the irradiance set point must be set to 1.14 W/m²/nm. This is the calculation: 1.10 W/m²/nm ÷ 96% = 1.14 W/m²/nm.
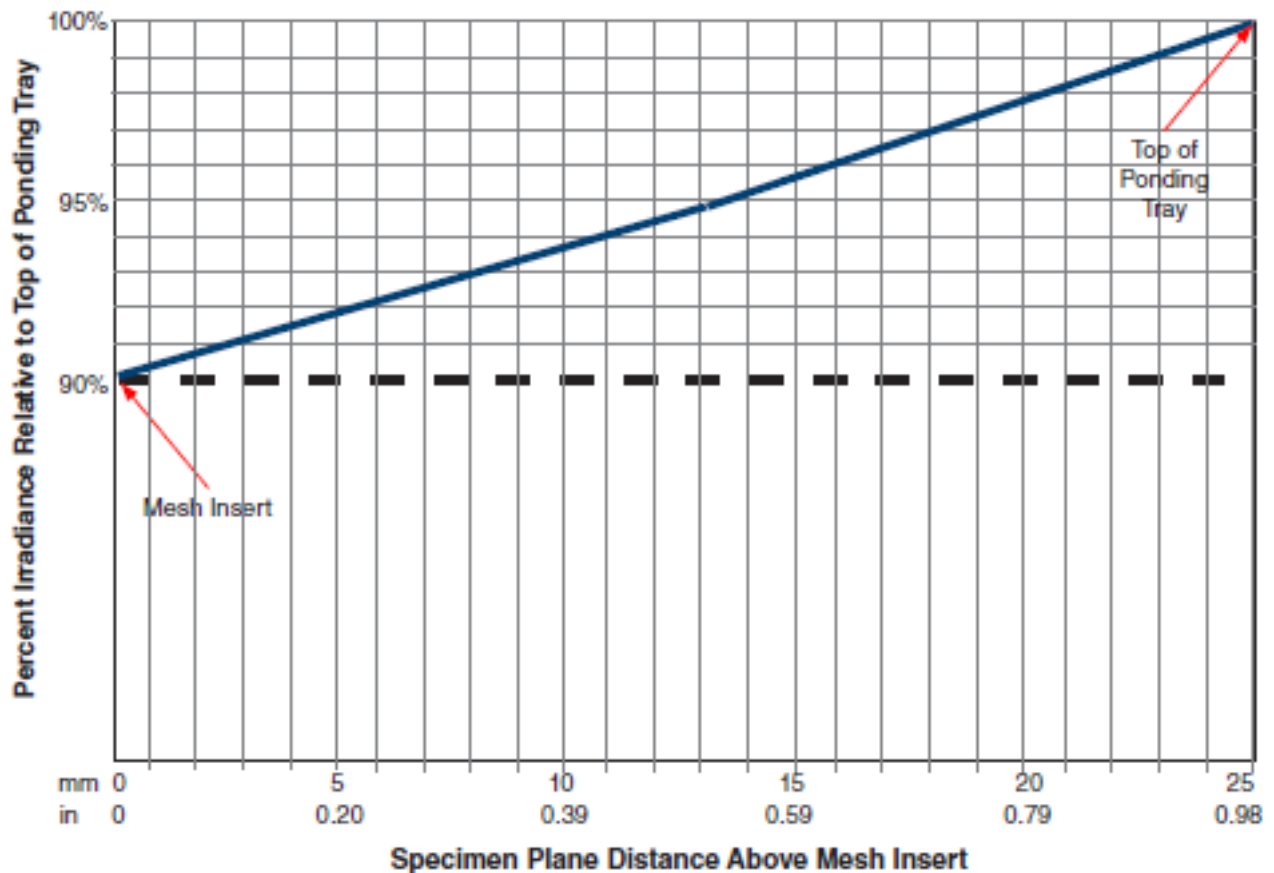
- Note that this entire graph is between the dashed lines in Figure 12.5t.

Figure 13.1i: Distance above mesh insert vs. irradiance for the Xe-1-WE.

Access Calibrate Functions Through the Main Menu

● The calibrate screens can also be accessed through the Main Menu.
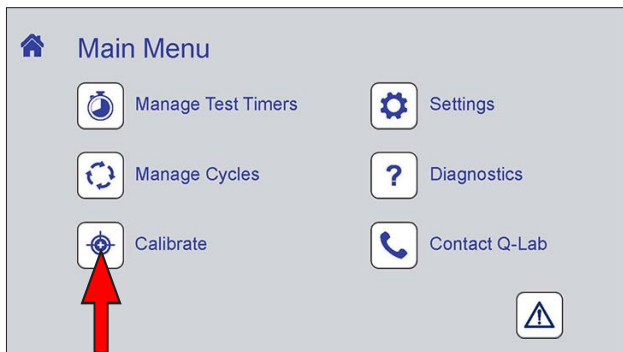
▶ Calibrate functions can also be accessed by touching the calibrate icon on the Xe-1 main menu screen.

▶ The calibrate screen is displayed.

▶ Touch the Calibrate Irradiance icon.

13.2 Black Panel Temperature Sensor (Feb 2022)

Overview

- For accurate temperature readings, calibrate the black panel temperature sensor every six months in accordance with ASTM E220.
- The black panel panel temperature sensor should also be recalibrated whenever the panel temperature sensor, optical filters, UV sensor, or test cycle conditions are changed.
- A UC202/BP or UC202/IBP Temperature Smart Sensor is used to calibrate the panel temperature sensor.
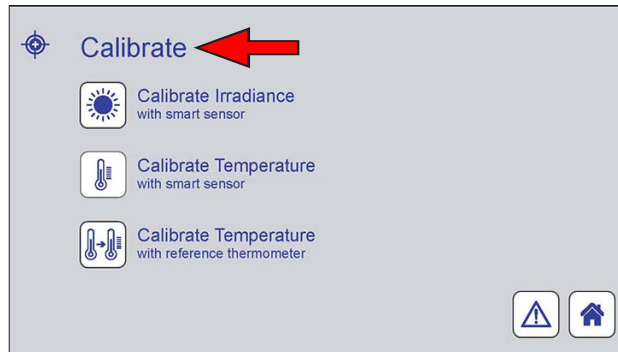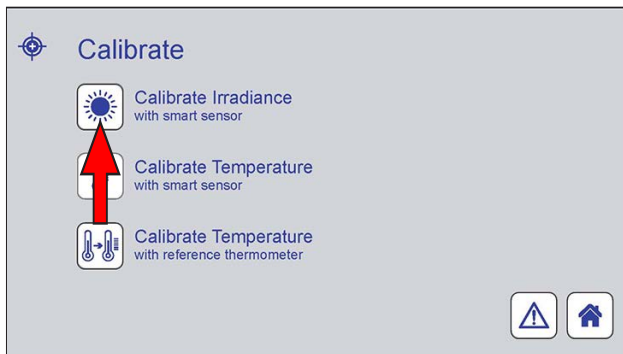- The UC202 Temperature Smart Sensor must match the type of panel temperature sensor in the Q-SUN.
  - o Use the UC202/BP with uninsulated black panel (also known as "black panel"), Figure 13.2a.
  - o Use the UC202/IBP with insulated black panel (also known as "black standard"), Figure 13.2b.

Uninsulated

Insulated

Figure 13.2a: UC202/BP Temperature Smart Sensor with Uninsulated Black Panel (Black Panel)
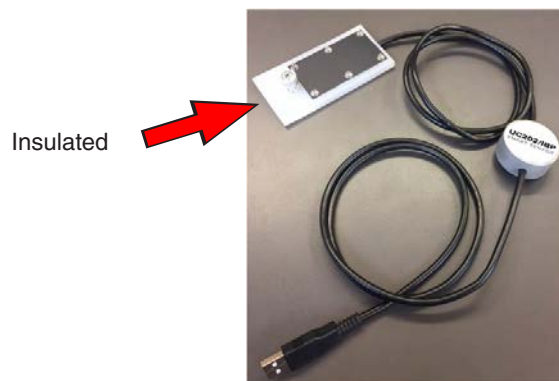
Figure 13.2b: UC202/IBP Temperature Smart Sensor with Insulated Black Panel (Black Standard)

- Smart Sensors are calibrated at Q-Lab and the calibration information is stored in the Smart Sensor.
  - o Calibration information is shown on the sensor calibration certificate and on a Smart Sensor case label (Figure 13.2c and Figure 13.2d).
  - o Calibration information can also be displayed on the Xe-1 menu screen when the Smart Sensor is connected (Figure 13.2e).
- The UC202 Smart Sensor will give a notification on-screen when plugged-in if calibration is due in the next 90 days or overdue.
  - o Upon calibration expiration, Smart Sensors should be discarded and replaced with an inexpensive new sensor. See the Replacement Parts List, Section 18.
  - o Optionally, Smart Sensors can be returned to Q-Lab for recalibration. Contact Q-Lab Repair and Tester Support for more information.
- Store the Smart Sensor in its case when not in use to avoid any contamination.

For Testers Equipped with a White Panel Temperature Sensor

- If the white panel is installed without a black panel, the temperature sensor calibration is exactly the same as for a black panel.
- If the white panel is installed with a black panel it is not calibrated directly. The D12 Auxiliary Panel Temperature diagnostic value is used to calculate the white panel temperature offset. See Section 11.8 and X-15350-L Q-SUN Xe-1 White Panel Installation for more information.

Figure 13.2c: UC202 Calibration Certificate

Sensor Calibration and Expiration Dates
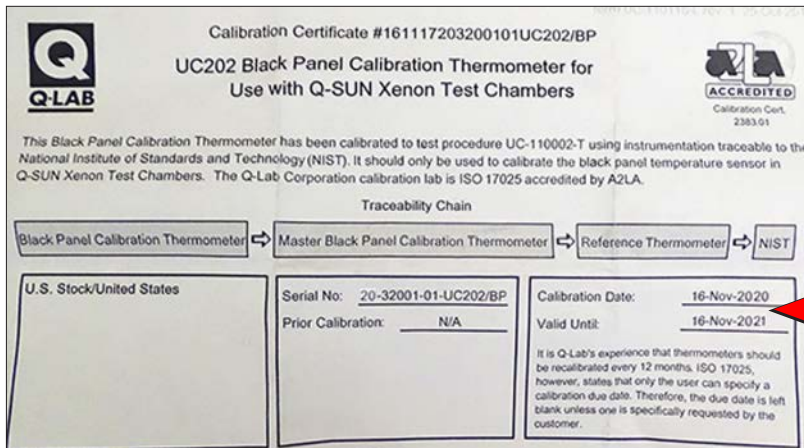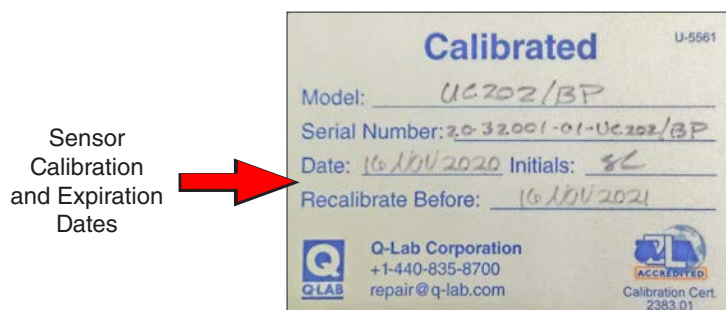
Sensor Calibration and Expiration Dates

Figure 13.2d: UC202 Temperature Smart Sensor Calibration Label on Case
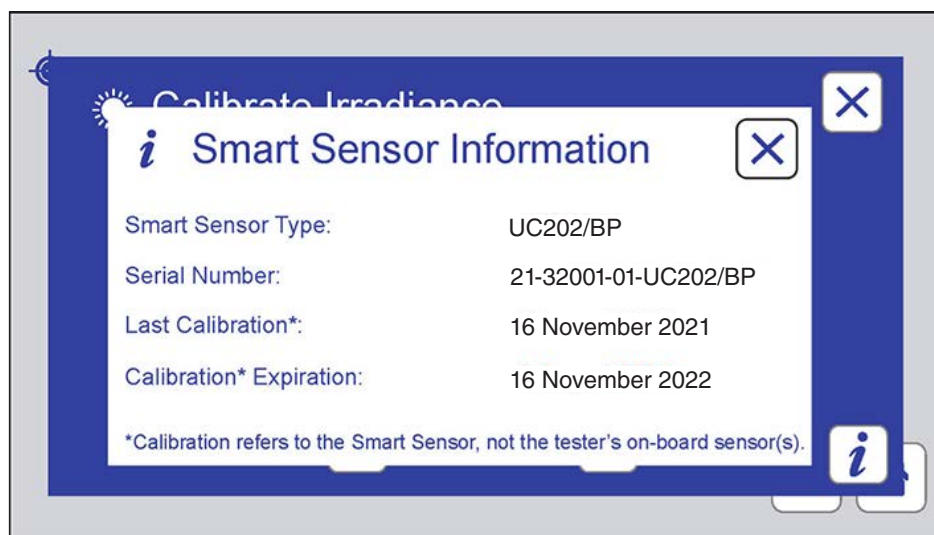
Figure 13.2e: Smart Sensor information displayed on Xe-1 menu screen.

Calibration Procedure (all Models except Xe-1-WE in immersion mode)

- The Q-SUN panel temperature sensor and UC202 Smart Sensor should be mounted the same way the Q-SUN panel temperature sensor 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 to be mounted in a specimen holder during testing, then both the onboard and calibration black panels should be mounted in a specimen holder for calibration.

- Special insulated black panel and UC202/IBP insulated black panel holders are available in specimen holder kit X-10113-K.

- To calibrate the Xe-1-WE temperature sensor not in immersion mode follow these instructions. The ponding tray must be removed.

- To calibrate the Xe-1-WE temperature sensor in immersion mode, use a calibrated reference thermometer, not a Smart Sensor. See Calibration Procedure for Xe-1-WE in Immersion Mode.

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

2. Remove the UC202 Temperature Smart Sensor from the case.

3. Plug the UC202 Smart Sensor into USB connector on the Xe-1 control panel.
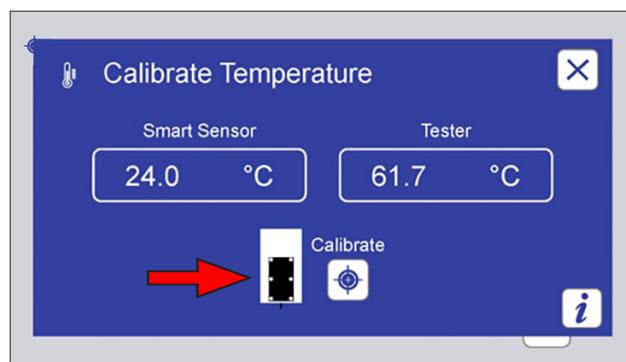
▶ The calibrate temprature screen is displayed. The Smart Sensor type (BP or IBP) is recognized by the tester. UC202/BP in this example.

4. For all models except Xe-1-WE, open the test chamber door and pull the specimen tray out. Go to Step 6.
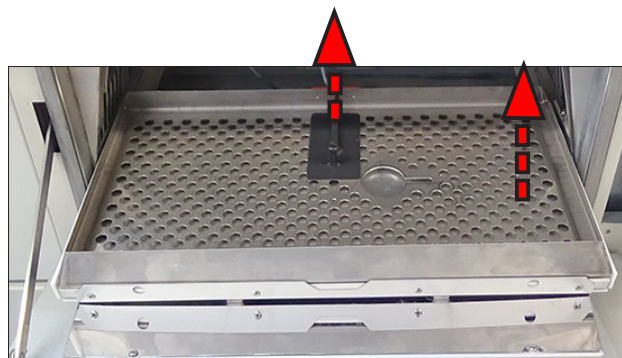
5. For Xe-1-WE, remove the panel temperature sensor from the ponding tray. Remove the ponding tray from the tester. Go to Step 9

UC202/BP
Uninsulated
Black Panel

Q-SUN
Uninsulated
Black Panel
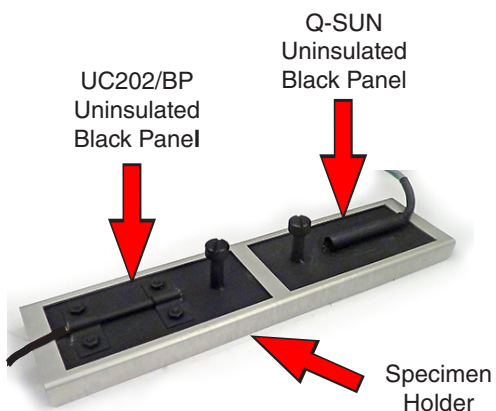
Specimen
Holder

6. 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
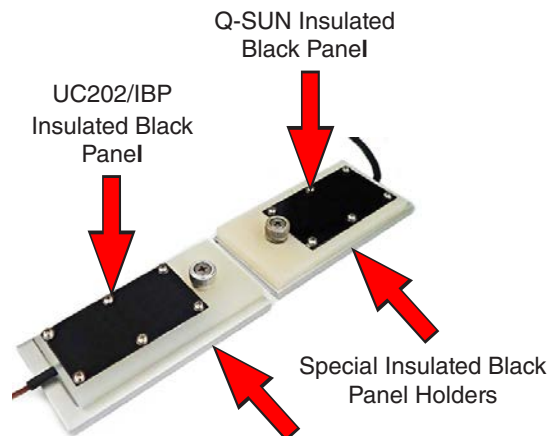
7. If specimens and Q-SUN Insulated Black Panel are in holders, mount UC202/IBP in a holder.
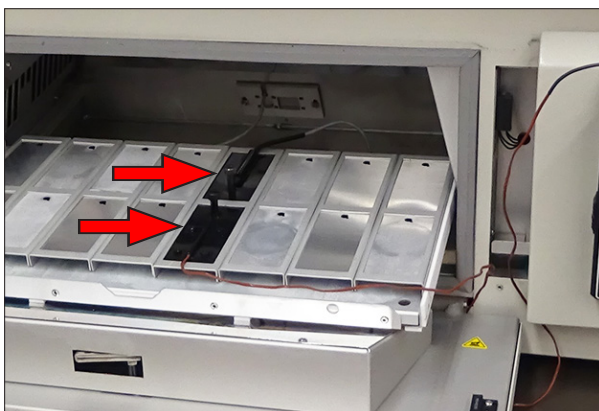
8. Place Q-SUN and UC202 black panels in holders on the tray with specimens in holders.

9. Or place Q-SUN and UC202 black panels directly on the specimen tray with specimens on the tray. No specimens for Xe-1-WE.

10. Slide the tray back into the chamber and close the door with the Smart Sensor cord routed out of the chamber. Keep the cord away from the door latch.
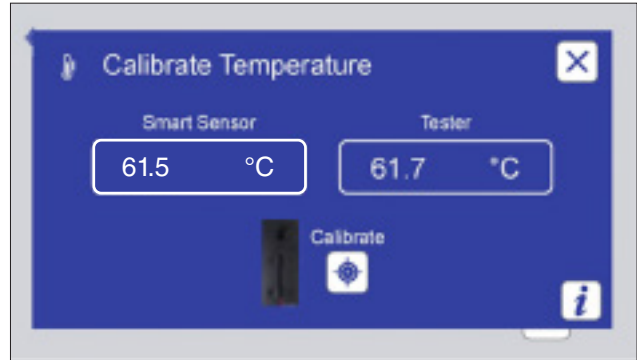
11. Wait a few seconds to allow the sensors temperature to stabilize.
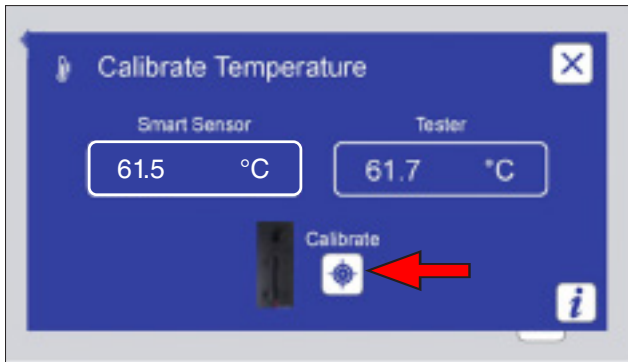
12. Press and hold the calibration button until the tester beeps.
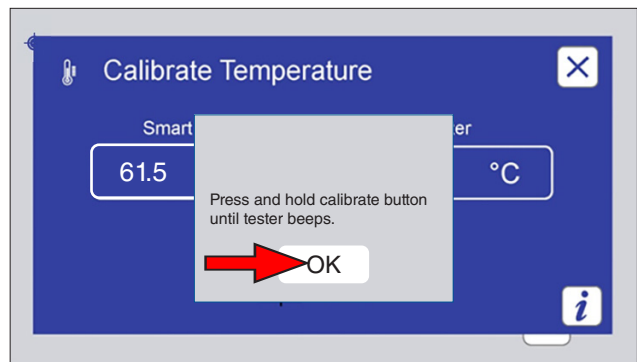
13. If the button is not pressed long enough, this message is displayed. Touch the OK button to close the message. Press and hold the calibrate button again until the tester beeps.
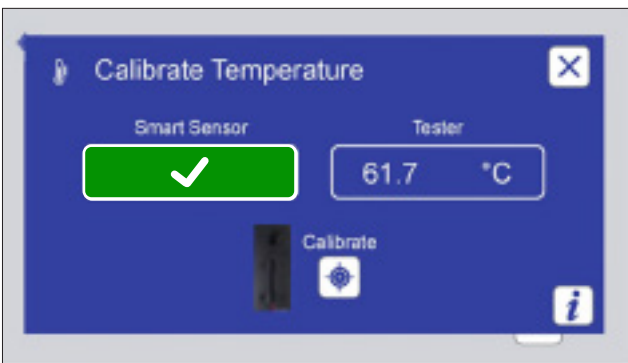
14. The Smart Sensor button turns green with a check mark indicating successful panel temperature sensor calibration.

15. Disconnect the UC202 Smart Sensor from the USB connector on the Xe-1 control panel.
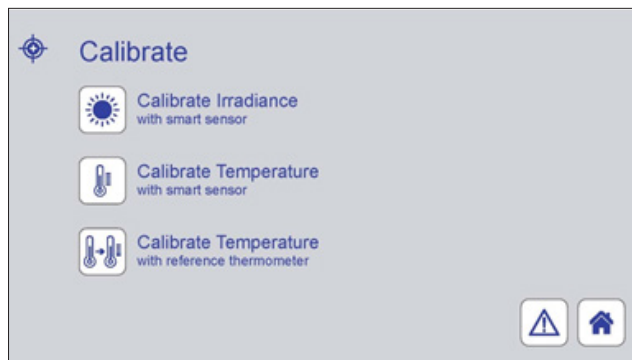
▶ The calibrate screen is displayed.

Calibration Procedure for Xe-1-WE in Immersion Mode

- For calibrating the Xe-1-WE in immersion mode use a calibrated reference thermometer to calibrate the panel temperature sensor.
- **DO NOT** use a Smart Sensor to calibrate the Xe-1-WE in immersion mode.
- The following tools are needed to calibrate the panel temperature sensor:
    - o   Calibrated reference thermometer
    - o   Insulated container. **IMPORTANT:** The opening of the insulated container must be at least 5.5 cm wide to insert the Xe-1- WE panel temperature sensor.
    - o   Hot water
- Q-Lab offers an optional Temperature Calibration Kit, U-41085-K (see Figure 18az) which includes an easy-to-use insulated container.
- Fill the container with water at approximately the highest temperature called for in the test cycle.
- The calibrated reference thermometer sensor and the Xe-1-WE panel temperature sensor can be banded together before placing in the hot water.
- Place the panel temperature sensor and a calibrated reference thermometer sensor in the insulated container (Figure 13.2f).
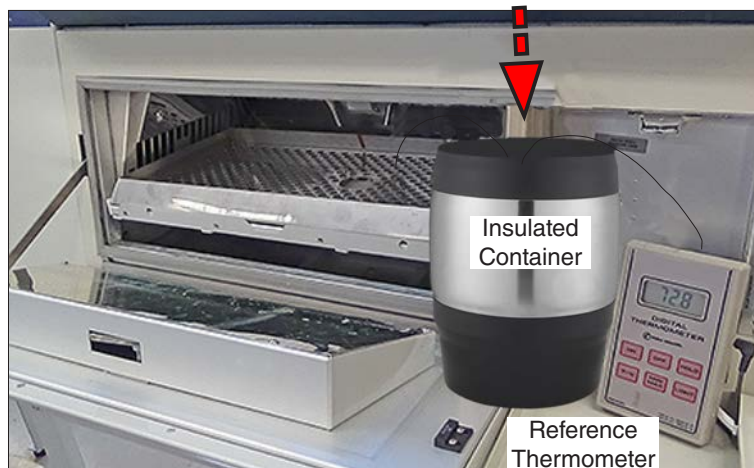
Figure 13.2f: Place the Xe-1-WE panel temperature sensor and the reference thermometer in an insulated container of water.

1.   Wait 10 minutes for the sensors to stabilize.

2. Touch the calibrate icon on the Main Menu screen.
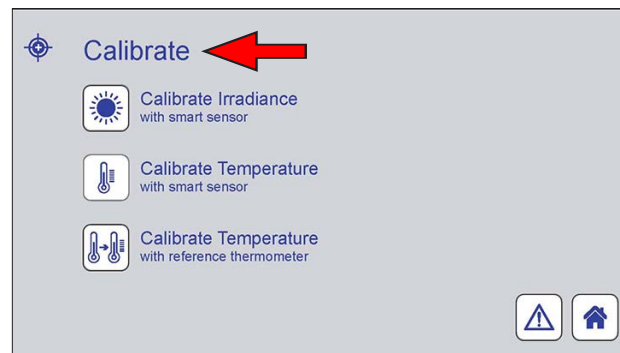
▶ The calibrate screen is displayed.
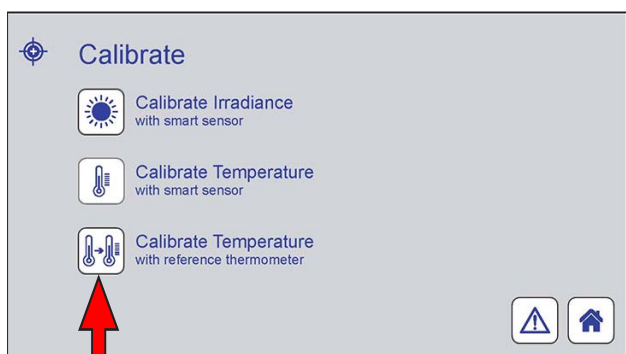
3. Touch the Calibrate Temperature with reference thermometer icon.
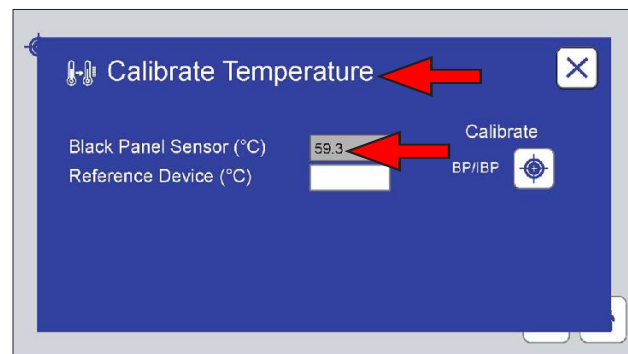
▶ The Calibrate Temperature screen is displayed. The current reading of the black panel temperature sensor is shown. The CAT will be shown too if it's installed.

4. Touch the Reference Device text box.
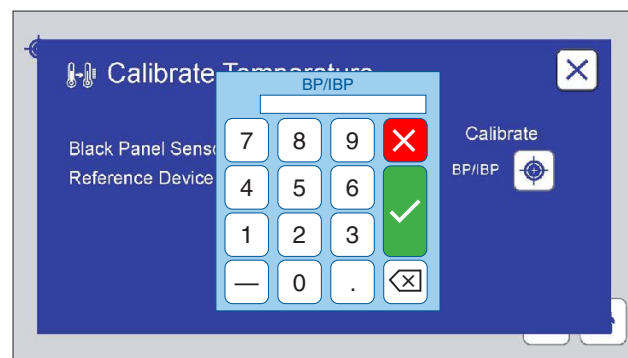
▶ The BP/IBP temperature enter keypad is displayed.

5. Read the temperature displayed on the reference thermometer.

6. Use the keypad to enter the reference temperature into the reference device text box.
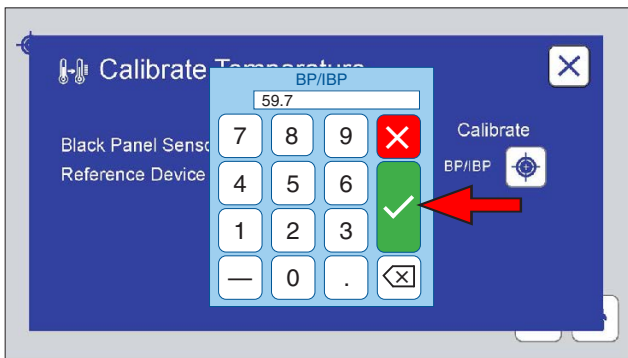
7. Touch the check mark button.
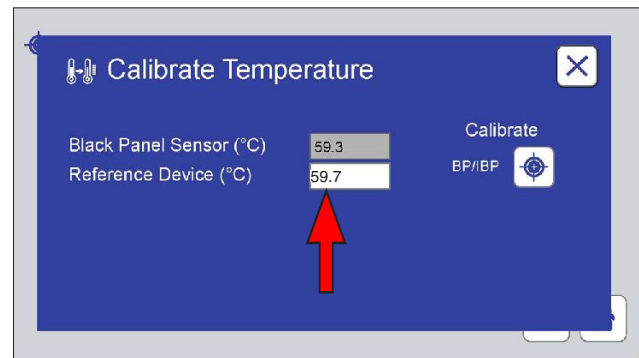
▶ The keypad is removed. The reference temperature is displayed in the reference device text box.
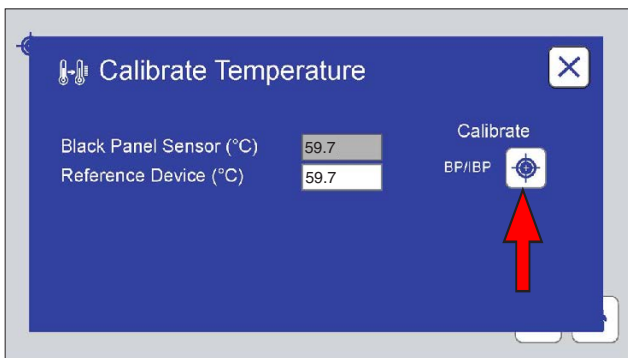
8. Touch the calibrate icon to complete the calibration process.
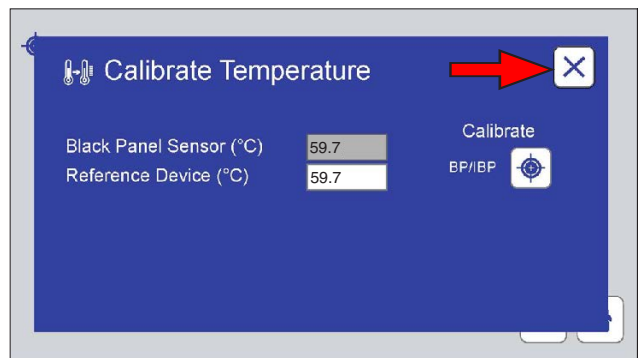
9. Touch the close icon to complete the calibration process.

112
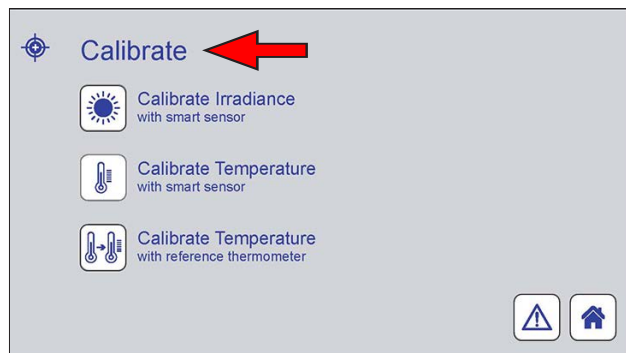
▶ The calibrate screen is displayed.

13.3 Chamber Air Temperature (CAT) Sensor Calibration (Sep 2020)

Xe-1-BCE and Xe-1-SCE Models, and Xe-1-SE with Optional Chamber Air Temperature Sensor

- A chamber air temperature sensor is standard for Q-SUN Xe-1-BCE and Xe-1-SCE models.
- A chamber air temperature sensor is optional for Q-SUN Xe-1-SE models.
- 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 18az) which includes an easy-to-use insulated container.

1. Touch the **STOP** icon on the Status Screen.
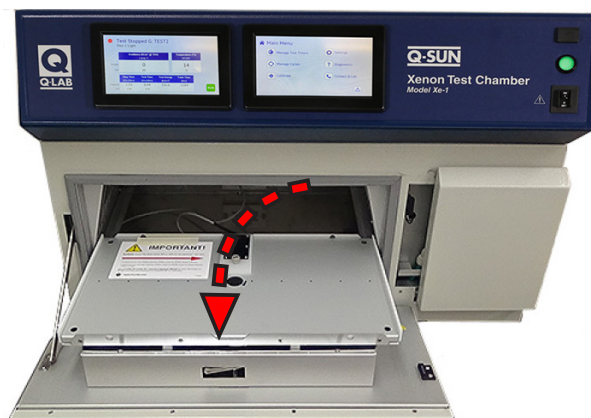
2. Open the test chamber door.

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.

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

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

115

Reference Thermometer Probe

Chamber Air Temp Sensor

Sensor and Probe

Reference Thermometer

Insulated Container
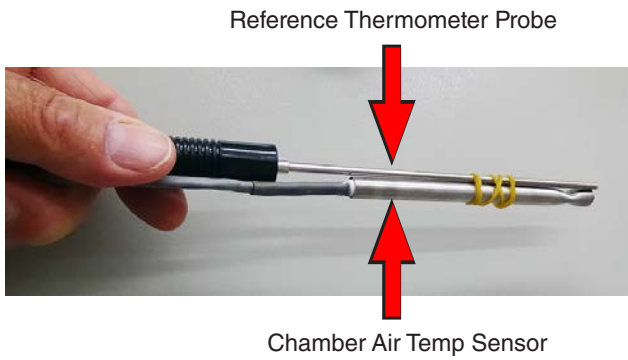
6. Tie the chamber air temperature sensor and the reference thermometer probe together using string or a rubber band.
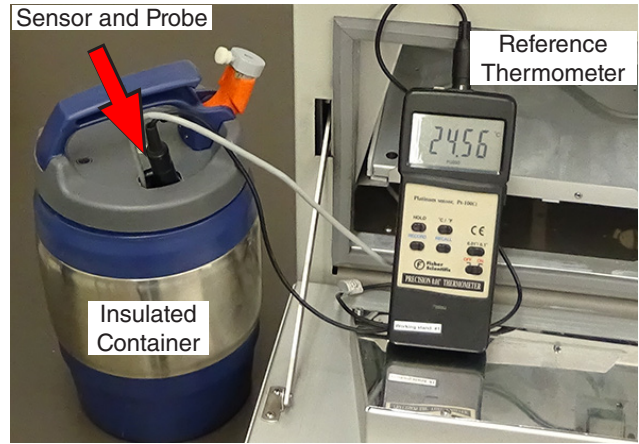
7. Place the probes into the container of water and stir the water frequently.

**8.** Wait 10 minutes for the sensors to stabilize.
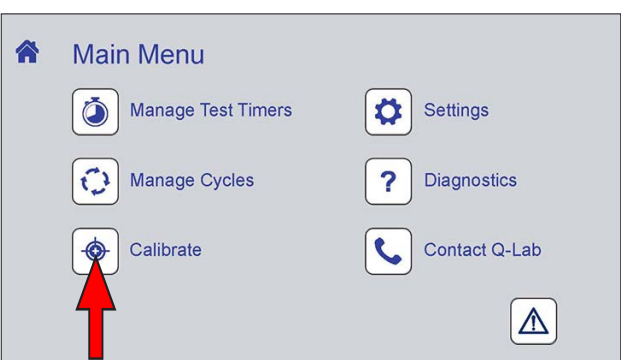
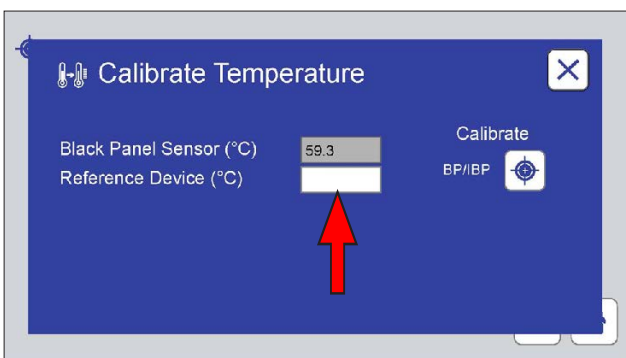**9.** Touch the calibrate icon on the Main Menu screen.
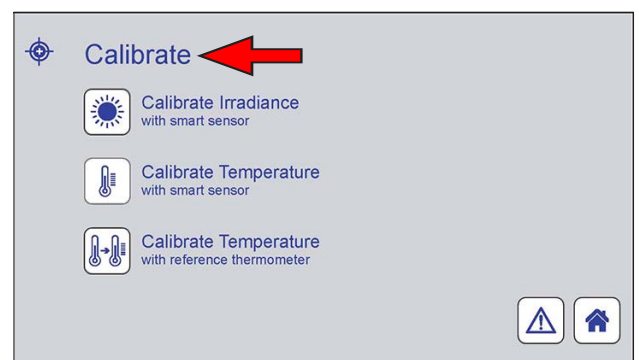
▶ The Calibrate screen is displayed.
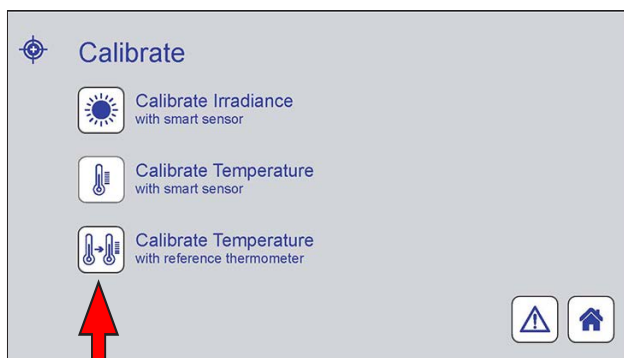
10. Touch the Calibrate Temperature with reference thermometer icon.
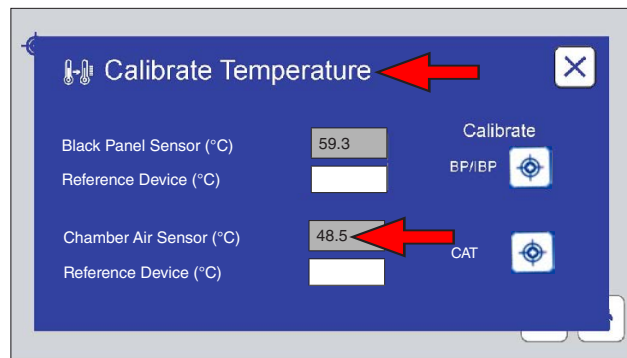
▶ The Calibrate Temperature screen is displayed. The current reading of the chamber air temperature sensor is shown.
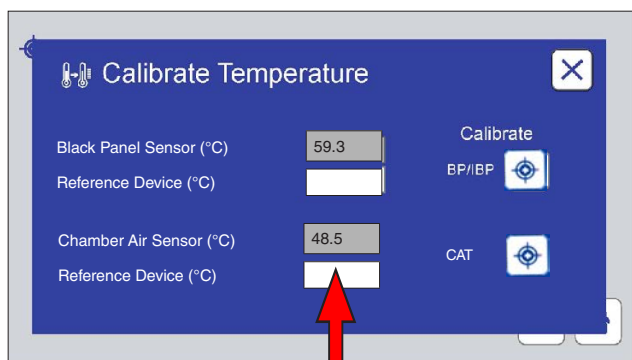
11. Touch the Reference Device text box.
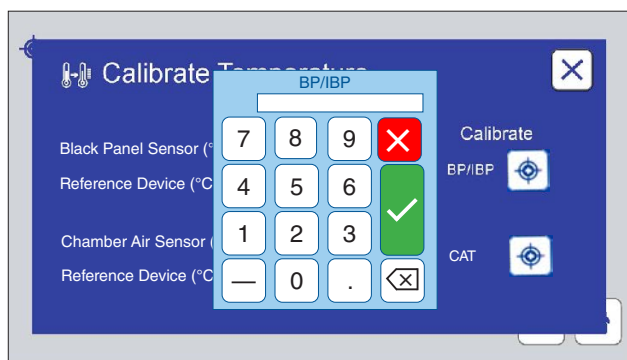
▶ The BP/IBP temperature enter keypad is displayed.

12. Read the temperature displayed on the reference thermometer.
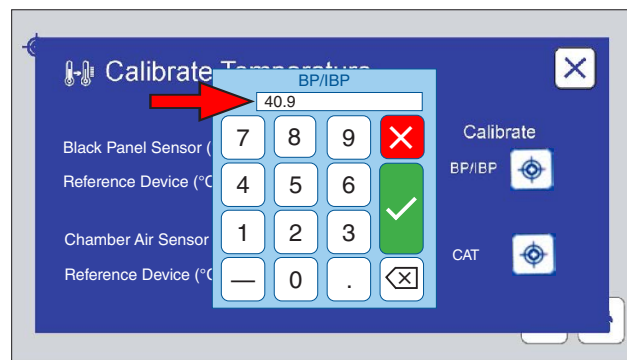
13. Use the keypad to enter the reference temperature into the reference device text box.

117
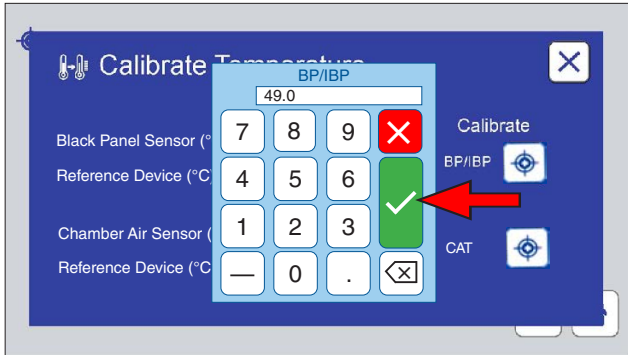
14. Touch the check mark button.
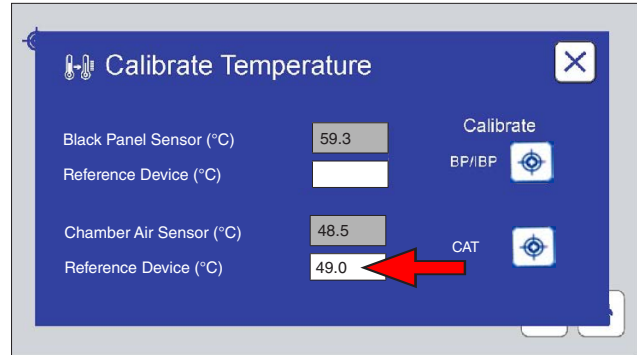
▶ The keypad is removed. The reference temperature is displayed in the reference device text box.
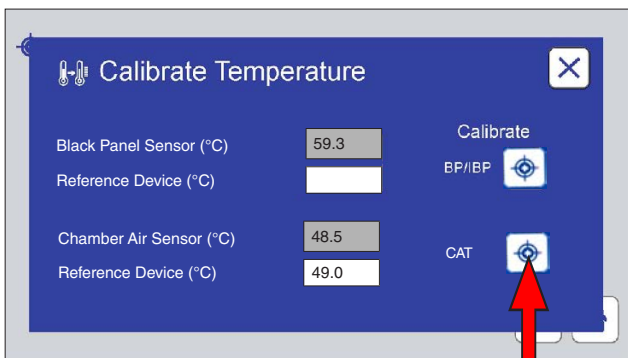
15. Touch the calibrate icon to complete the calibration process.
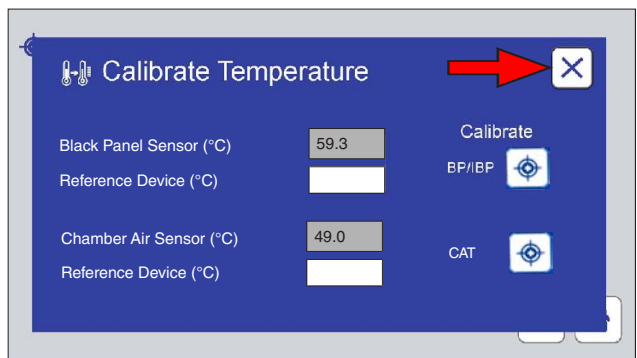
16. Touch the close icon to complete the calibration process.
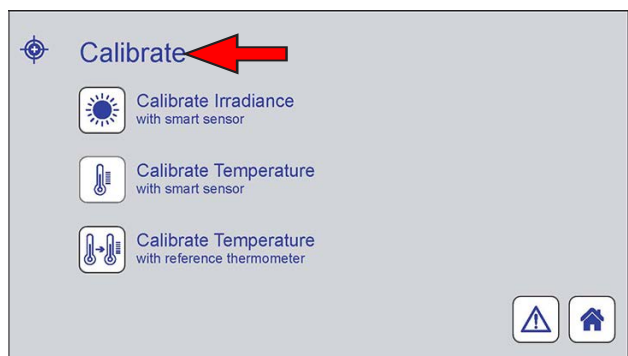
▶ The calibrate screen is displayed.

14. Data Storage and Transfer

14.1 Ethernet Communications (Sep 2020)

- The Q-SUN main controller has the capability to transfer data via Ethernet.
- A Ethernet port is located at the rear lower left corner of the tester (Figure 14.1a and Figure 14.1b).
- Q-Lab can supply a VIRTUAL STRIPCHART (VSC) program that runs on a PC.
    Contact Q-Lab Repair and Tester Support.
- The strip chart program will be able to setup communications, request data groups, and save and display that data.
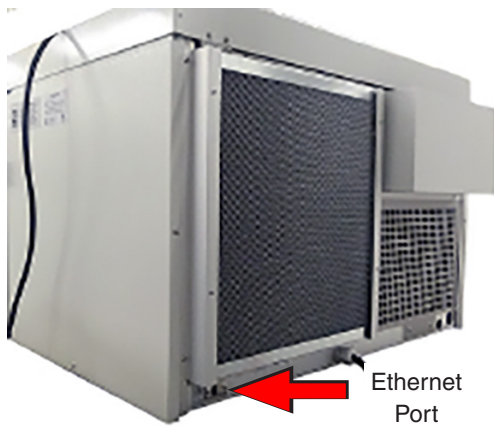
Figure 14.1a: Ethernet port located on lower left rear of tester.
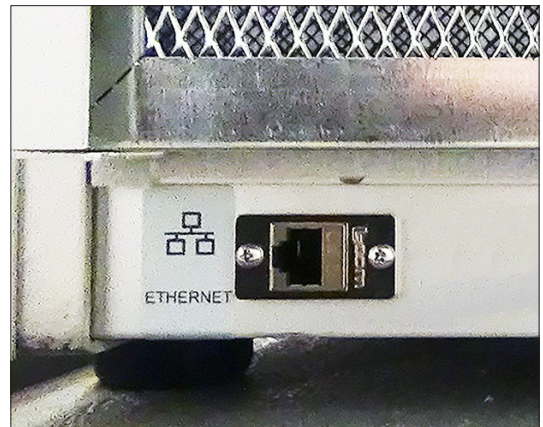
Figure 14.1b: Ethernet port.

14.2 Secure Digital (SD) Card (Sep 2020)

- All tester information, i.e. timers, expert parameters, error messages, setpoints, actuals, test cycles, and other system configuration information is written to an SD card every minute.
- The operating parameters can be viewed by the customer or by Q-Lab Repair and Tester Support (see Section 20) using the export features later in this section.
- If the main controller fails, the SD card can be transferred to a new controller and all tester information will be preserved.
- The user does not have to reenter the serial number and date/time, test cycles, expert parameters, or timer values.
- The information on the SD Card can also be copied and emailed to Q-Lab Repair and Tester Support.
- That information can be copied to another SD Card so the original tester's configuration can be "cloned" by Q-Lab Repair and Tester Support for analysis.

14.3 Export Diagnostics

- The Export Diagnostics function transfers the full set of VSC parameters.

- These include the most recent two weeks (tester time) of data, recorded every minute as a .vsc file.

- The complete system configuration is also transferred in this operation.

- This includes tester operational information like timers, expert parameters, setpoints, actuals, heater and blower percentages, calibration factors, test cycles, and error messages.

- A USB flash drive is used to export diagnostic parameters (Figure 14.3a)

- Connect the USB drive to the USB port on the Q-SUN control panel (Figure 14.3b).

- The USB Options screen will be displayed (Figure 14.3c).

- Touch the Export Diagnostics button to begin the export process (Figure 14.3d).

- The exported files (Figure 14.3g) can be uploaded to the Q-Portal Asset Center where customers can view basic operational data (Figure 14.3h and Figure 14.3i) and Q-Lab personnel can view extended operational data.

Figure 14.3a: USB drive needed to export diagnostics.

Figure 14.3b: Connect the drive to the USB port on the Q-SUN control panel.

Figure 14.3c: USB Options screen showing the Export Diagnostic button.
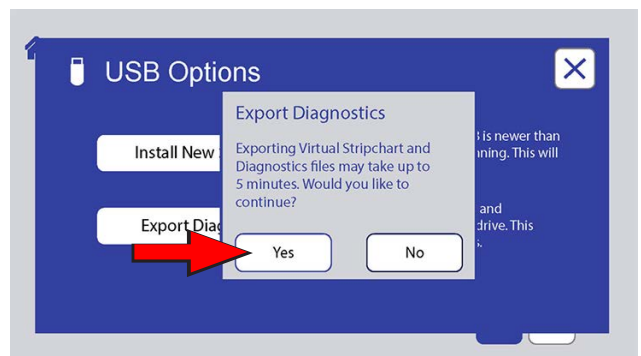
Figure 14.3d: Touch Export Diagnostics then the Yes button to begin export.
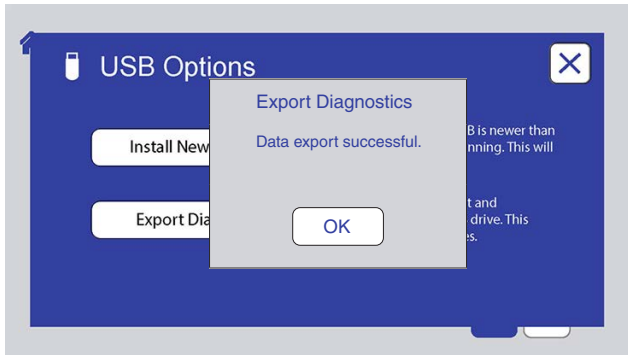
Figure 14.3e: When the Export Diagnostics data transfer is complete, this message is displayed. Touch OK.

Figure 14.3f: Insert the USB drive into a Windows computer to display the list of files

Diagnostics 22-20801-79-SE 227071405343

Cycle0.dat

Cycle1.dat

Cycle2.dat

Cycle3.dat

Cycle4.dat *

EP_Compare (22-20801-79-SE 222071405343).dat

ExpertParameters.dat

SystemConfig.dat

VirtualStripChart.vsc

Tester Serial Number

Time Stamp
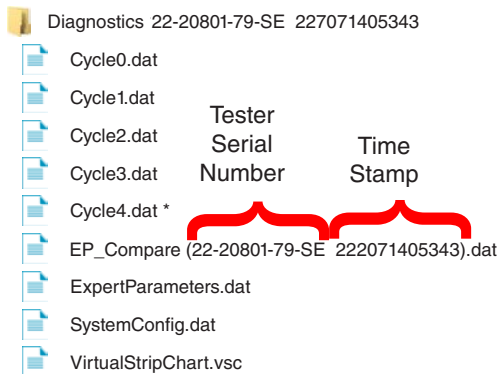
* The number of Cycle files will vary depending on tester configuration.

Figure 14.3g: 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. Do not try to open the other files on a PC.

- The .vsc file is the most important file because it contains the actual tester operational data.
- See Section 14.4 or contact Q-Lab Repair and Tester Support for instructions on importing .vsc files to the Q-Portal Asset Center for analysis.

Figure 14.3h: Example stripchart view of Q-SUN operational data.

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	0:0		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	8:16	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	8:17	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	0.56	0.54	50
111	111	8:17	4/17/06	F	Run	9	0:3		1	LIGHT	89	54	53	0.55	0.56	0.55	0.56	50
111	111	8:17	4/17/06	F	Run	9	0:3		1	LIGHT	89	55	54	0.55	0.55	0.54	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	8:18	4/17/06	F	Run	9	0:3		1	LIGHT	89	59	57	0.55	0.57	0.55	0.56	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	0:4		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	8:19	4/17/06	F	Run	9	0:4		1	LIGHT	89	66	65	0.55	0.55	0.55	0.56	50
111	111	8:19	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	0:5		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		4/17/06	F	Run	9			1	LIGHT	89	72	70	0.55	0.55	0.55	0.55	50
111	111		4/17/06	F	Run	9			1	LIGHT	89	73	72	0.55	0.56	0.56	0.55	50

Black panel set point — Actual Irradiance, channel 1
Black panel actual temp — Actual Irradiance, channel 2
Irradiance set point — Actual Irradiance, channel 3
Laboratory temperature — Actual Air Temperature
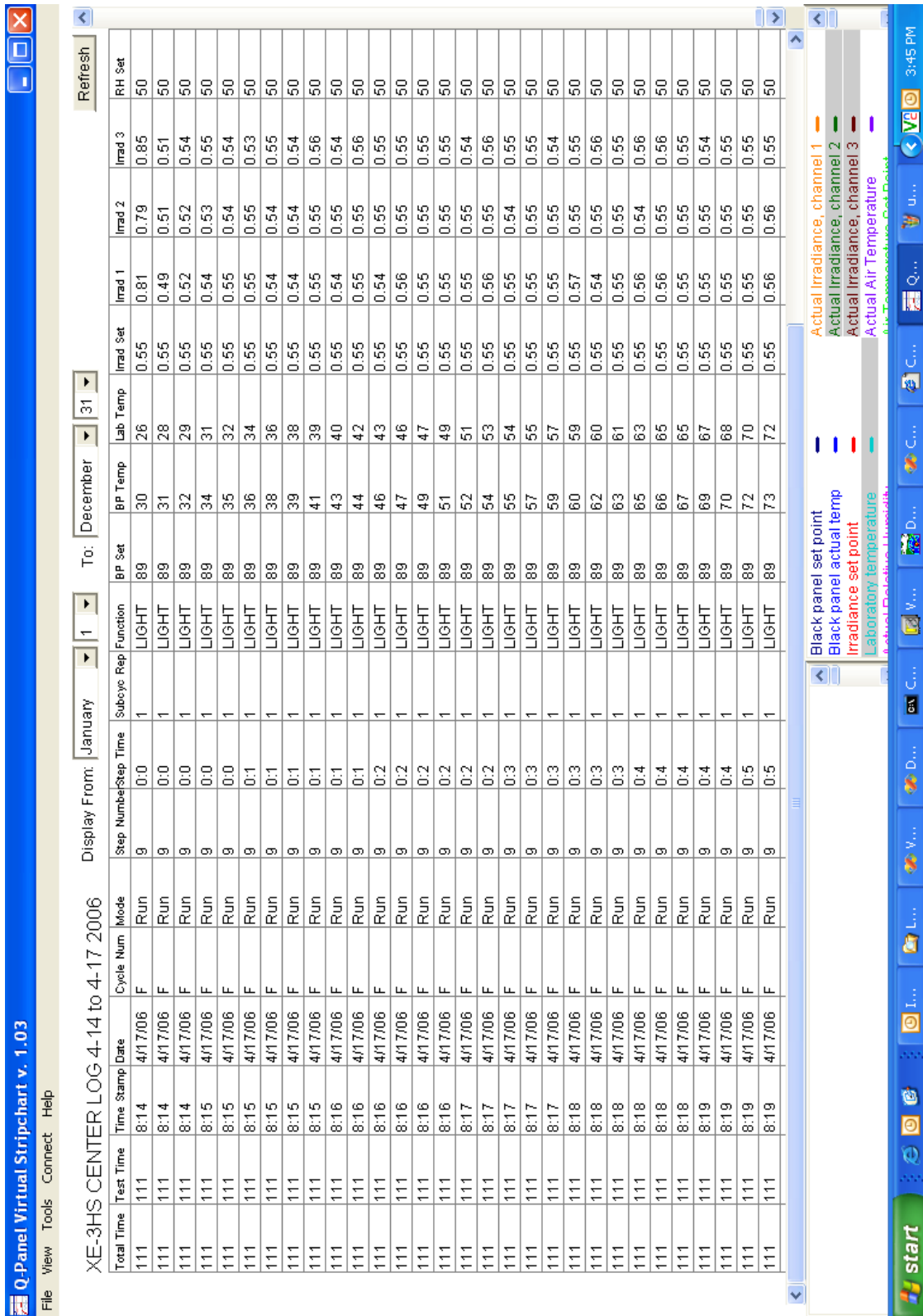
Figure 14.3i: Example table view of Q-SUN operational data.

14.4 Import VIRTUAL STRIPCHART Data (Aug 2020)

- At the Q-Lab Q-Portal Asset Center, customers can register their Q-SUN Xe-1 testers.

- Once a tester is registered, customers can access important information relating to the tester as well as view, customize, export, and create .pdf files of their virtual stripchart data .

- The .vsc files must first be downloaded using the Export Diagnostics function (see Section 14.3). Contact Q-Lab Repair and Tester Support (Section 20) for more information.

15. Options

15.1 Drain Pump (Mar 2019)

- A drain pump is required if the drain tube must rise more than 100 mm (4 ") above the floor before reaching the drain.

- The drain pump is powered from a wall outlet.

- The drain pump kit includes necessary hoses and fittings.

- The drain pump maximum lift is 5.8 m (19 ft).

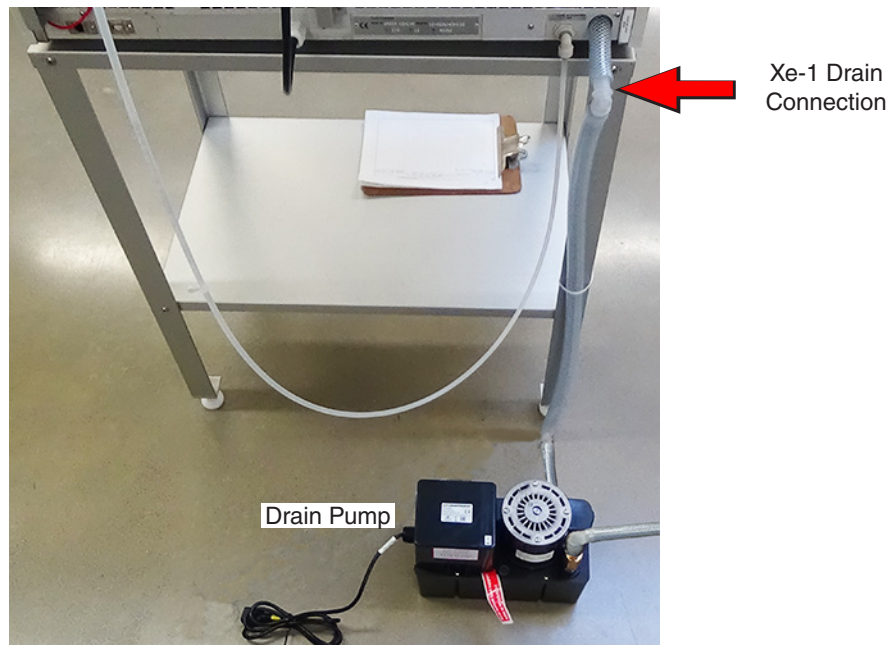| Drain Pumps	
Part Number	**Description**
X-6955-K	Drain Pump Kit, 120 volt
X-6956-K	Drain Pump Kit, 230 volt

Figure 15.1: Drain Pump

15.2 Lift Kit (Sep 2020)

For Q-SUN Xe-1-BCE and Xe-1-SEC models

- If the laboratory drain is above floor level, or the drain hose from the tester with chiller has to rise over an obstruction before it reaches a floor drain, an optional lift kit (part number X-15416-K) can be used to raise the entire tester up to enable proper drainage.
- The lift kit includes four (4) square aluminum risers (Figure 15.2a) and necessary hardware.
- A leveling foot comes installed on each riser (Figure 15.2b).
- If the chiller unit is on casters, the casters can be installed on the risers (Figure 15.2c), raising the tester by 15 cm (6").
- Do not use concrete blocks, pallets, bricks, or other means to raise the tester to achieve proper drainage.
- A lift kit can also be used to raise a water repurification system (see Section 15.4) to the correct drainage height.
- Contact Q-Lab Repair and Tester Support (Section 20) with any questions about tester drainage requirements.

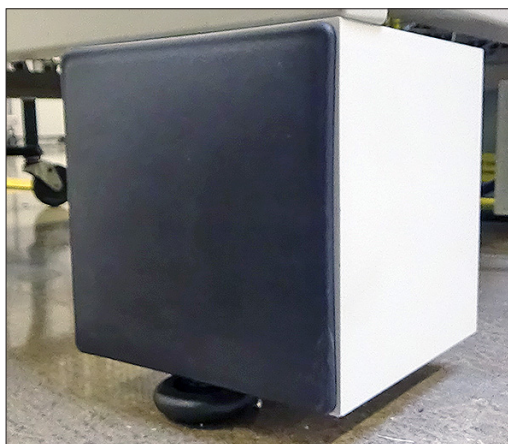Figure 15.2a: Lift kit includes four (4) risers.

Figure 15.2b: Riser installed with leveling foot.

Figure 15.2c: Riser installed with caster.

15.3 Water Inlet Pump (Sep 2020)

For Xe-1-SE, Xe-1-SCE, and Xe-1-WE Models

- Q-Lab offers a water inlet pump kit (Part Number X-10570-K) for Xe-1-SE, Xe-1-SCE and Xe-1-WE installations that do not have sufficient water pressure (Figure 15.3).

- See *X-10564-L, Water Pump Installation* for details.

- The water pump is for applications where low water pressure causes insufficient flow and water spray.

- The pump will boost low pressure or draw water from a reservoir.

- The pump operates automatically and supplies water to the Q-SUN on demand.

- The pump is controlled by a pressure switch – starting when pressure is less than 275 kPa (40 PSI) and stopping when pressure reaches a maximum pressure of 413 kPa (60 PSI).

- The pump is installed between the water supply source and the tester, then plugged into an electrical power source.
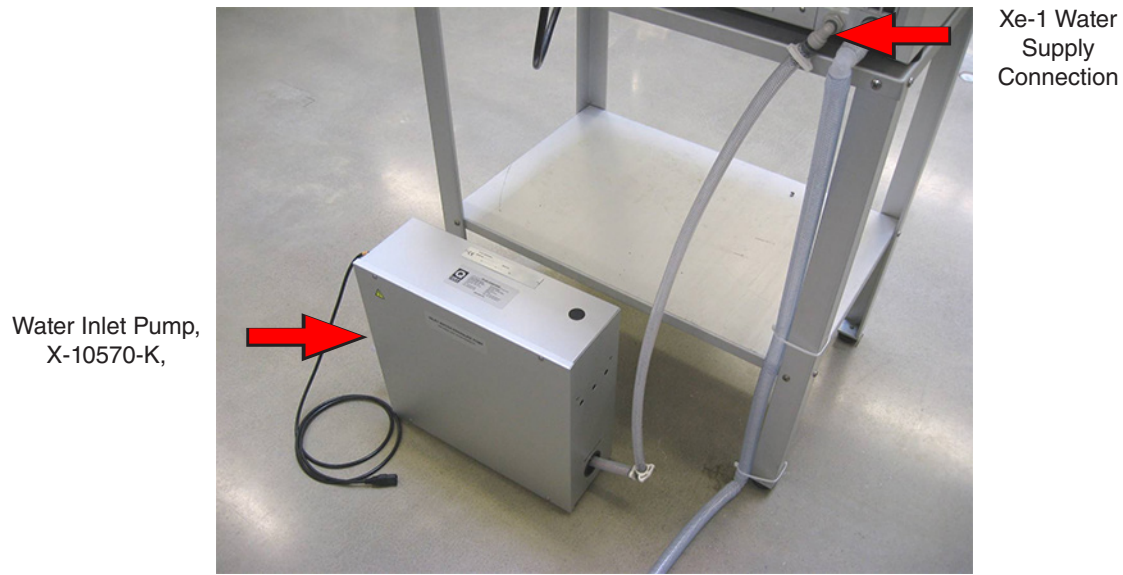

Figure 15.3: The water inlet pump connects to the Q-SUN water supply.

15.4 Water Repurification System (Sep 2020)

For Xe-1-SE and Xe-1-SCE Models

- Q-Lab offers an optional water repurification system for the Q-SUN to conserve water (Figure 15.4).

- This system re-circulates and re-purifies the spray water instead of letting it go down the drain.

- This can save over 50 liters of purified water per day.

⚠️ The repurification system is not a primary purification system. It is a repurification system. You still must supply purified water to the Q-SUN. Purified water is required for proper operation. The Q-SUN tester **warranty is voided** if this condition is not met.

- During a spray step the pump turns on and draws water out of the reservoir.

- The water first goes through a repurification cartridge (filter) to remove any contaminants. It is then sprayed on the test specimens (or fills the ponding tray) and drains back into the reservoir.

- A float valve automatically adds water to the reservoir to replenish water lost to evaporation – no manual filling is needed.

- The system has built in water purity monitor which should be checked once a month.

- When the Q-SUN Xe-1 is supplied with pure water the repurification cartridge should last several months.

   o Impurities that are introduced into the water (for example, particles dislodged from specimens) may significantly reduce the life of the repurification cartridge.

   o The repurification cartridge should be changed when the Total Dissolved Solids exceed 1 ppm.

   o To replace cartridge order part number V-4979-K, Demineralizer Cartridge Kit.

NOTE: The water repurification system requires a drain. If needed, a lift kit (see Section 15.2) can be used to raise the water repurification system to the correct drainage height.

Water Repurification System	
Part Number	**Description**
X-10897-K	Water Repurification Kit for Q-SUN

The Water Repurification System needs to be at floor level and not mounted higher than the base of the Xe-1 tester.

Water Repurification System

Figure 15.4: Q-SUN Xe-1 with water repurification system.

NOTE: The Xe-1-WE has a built-in repurification system; an optional water repurification system is not necessary.

15.5 0° Adapter Wedge for Xe-1 (Sep 2020)

For Xe-1-SE, Xe-1-BCE and Xe-1-SCE Models

- 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 15.5a and Figure 15.5b).
- The specimen tray in a horizontal position keeps soft, viscous specimens from running down a sloped tray and keeps liquid specimens level.
- A horizontal tray is also needed to keep water on the specimens instead of running off.

NOTE: The Xe-1-WE includes the adapter wedge in its standard configuration.

Adapter wedge tilts the Q-SUN so that the specimen tray is horizontal
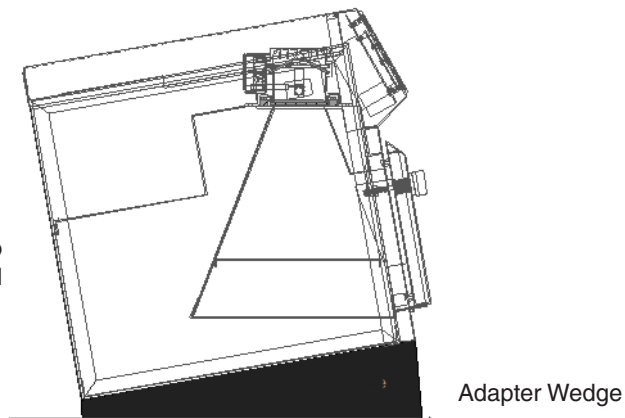
Adapter Wedge

Figure 15.5a: Side view Xe-1 with adapter wedge showing horizontal specimen tray.

Adapter Wedge

Figure 15.5b: Xe-1 with adapter wedge. Part Number X-10551-K.

16. Maintenance

16.1 Lamp Replacement (Feb 2022)

- The Xe-1 Xenon lamp must be replaced at regular intervals.
- The notification "M14 TIME TO REPLACE LAMP" (Figure 16.1a) will be displayed on the control panel indicating that the lamp should be replaced (see Section 11.4).
- The D19 diagnostic (Figure 16.1b) can also display the lamp age (see Section 11.8).

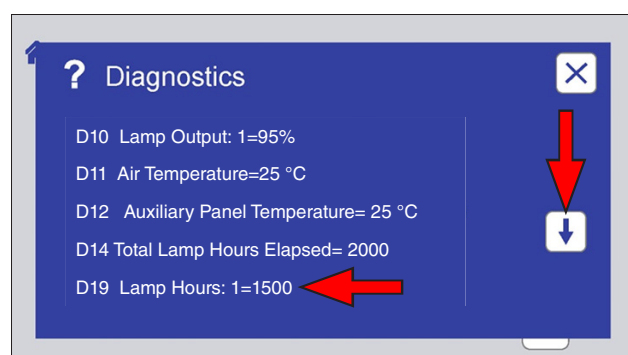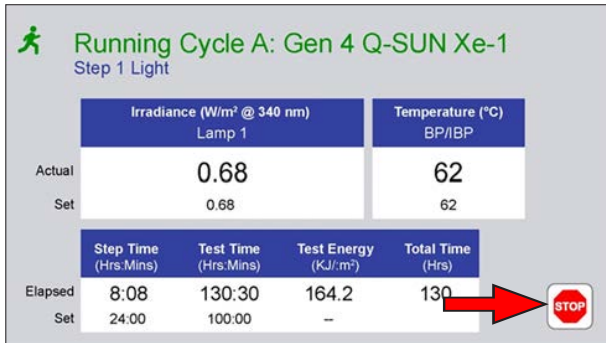Figure 16.1a: M14 Time to Replace Lamp displayed on the Notifications Screen.

Figure 16.1b: Use the scroll icon to display D19 lamp hours.

Follow these steps to replace the lamp.

- The lamp should be replaced every 3000 hours when operated at Typical irradiance values, and every 1000 hours when operated at Maximum irradiance values, as listed in Figure 12.3a.

1. Touch the Stop icon on the Status Sceeen.
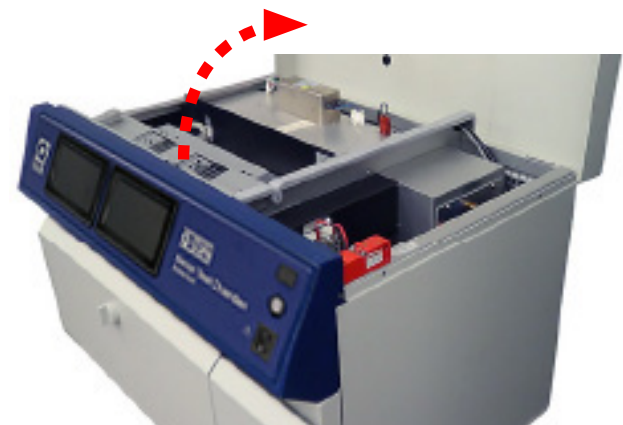

2. Power the Xe-1 **OFF**.

3. Main power **OFF**.
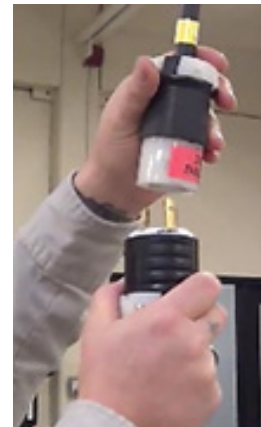
4. Disconnect power.

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
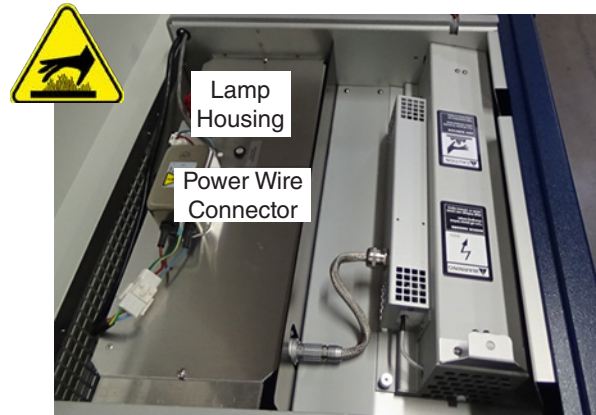
8. Locate the lamp housing and power wire connector.

9. Disconnect the power wire.

Loosen

10. Loosen the captive stud in the left corner of the lamp housing.
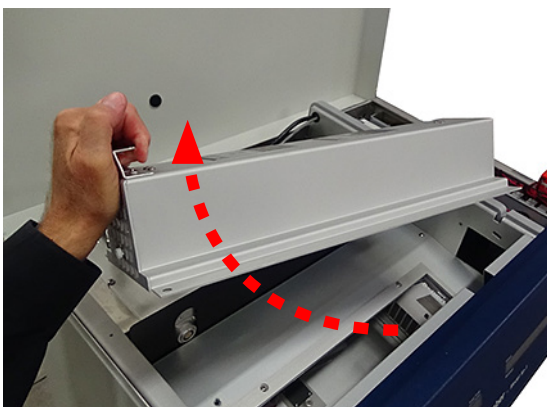
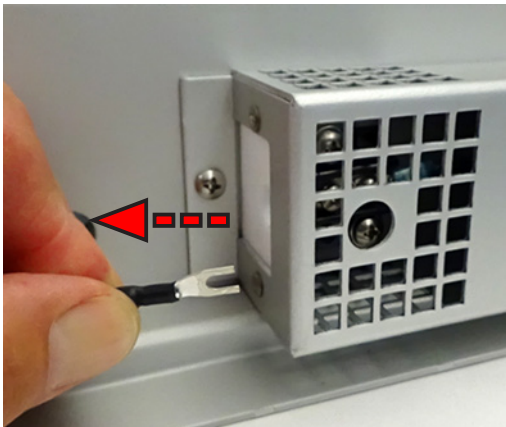**11.** Carefully remove the lamp housing from the Xe-1 cabinet.

12. Place the housing on a flat surface.

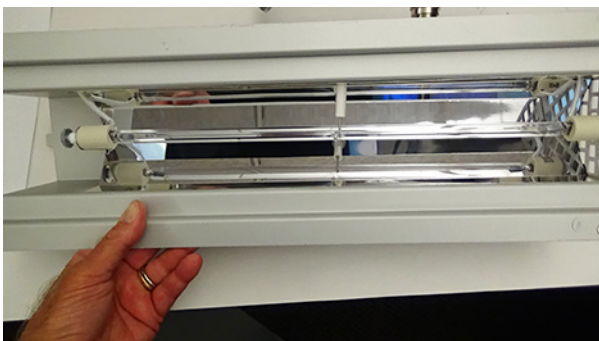**13.** Locate the center hole in each end of the lamp housing cover.

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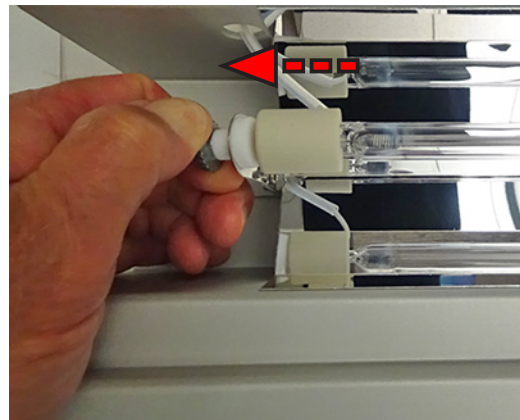

15. Pull the lamp wire through the hole to disconnect.
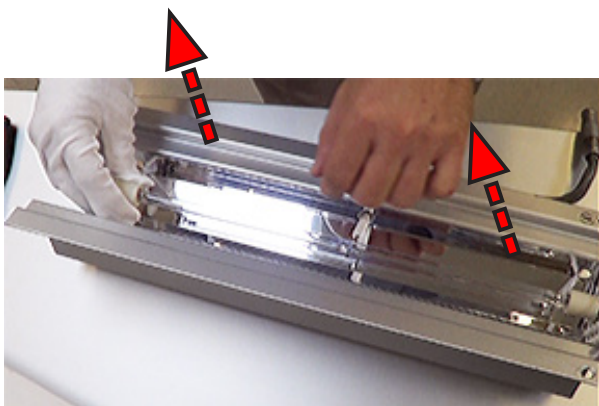

16. Disconnect wire at opposite end of lamp housing cover.

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.
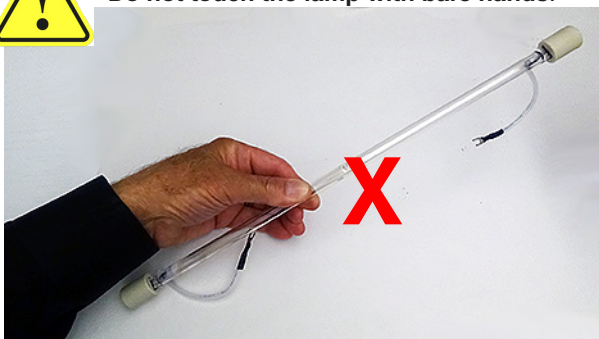
19. Remove the old lamp from the housing. Discard the old lamp.

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.

⚠️

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.

135

 Before reinstalling the lamp housing clean the UV filter. See Section 16.3 for more information.
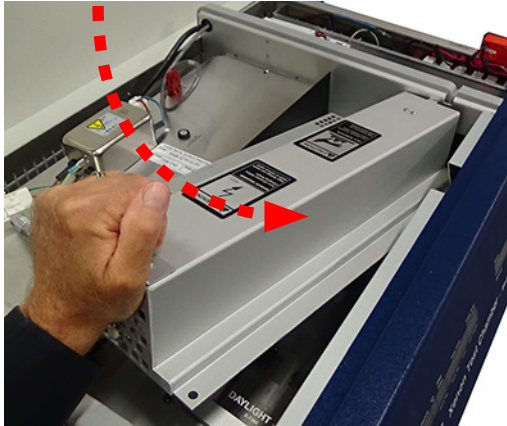
24. Reinstall the lamp housing in the Xe-1.

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:
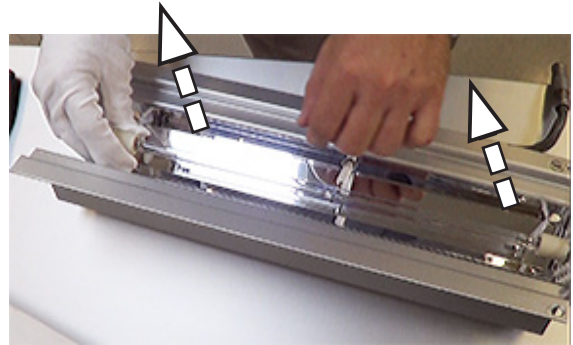Irradiance must be re-calibrated
after the lamps are changed.

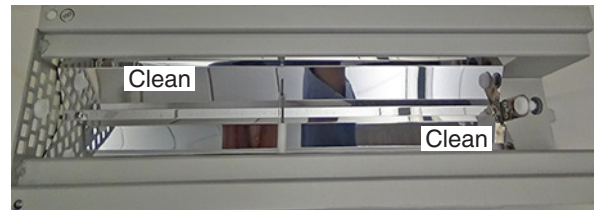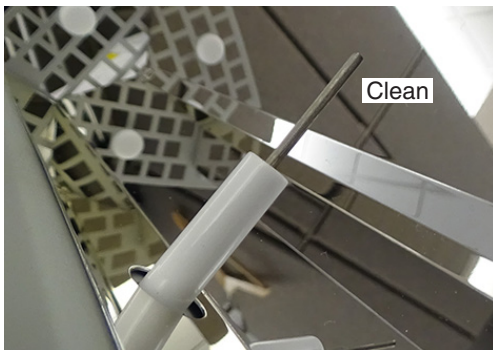**29.** See Section 13.1 Irradiance Sensor Calibration for more information.

## 16.2 Lamp Trigger Wire and Reflector Cleaning (Sep 2020)

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 15.1, Step 1 through Step 11 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.

3. Clean the trigger finger.

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

5. Follow Section 16.1, Step 24 through Step 28 to reinstall the lamp housing in the Xe-1 tester.
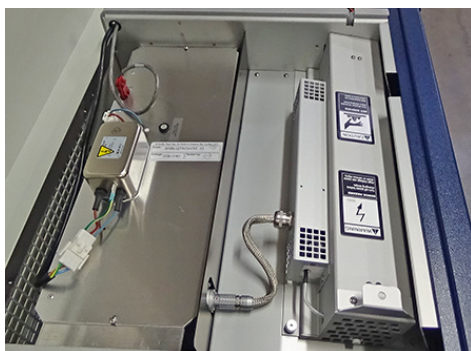
IMPORTANT:
Irradiance must be re-calibrated
after the trigger is cleaned.

6. See Section 13.1 Irradiance Sensor Calibration for more information.
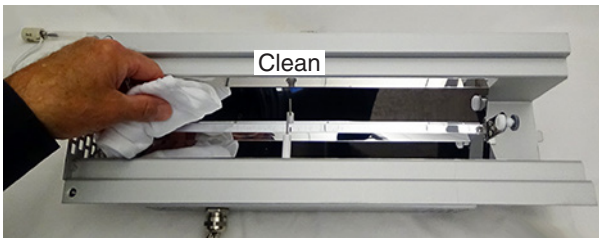
Lamp Reflector Cleaning

- If the lamp reflector is discolored or cloudy it should be cleaned as detailed in the steps below.
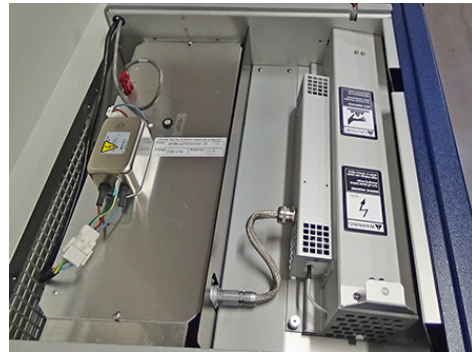

1. If necessary, follow Section 16.1, Step 1 through Step 11 to remove the lamp housing from the Xe-1 tester.
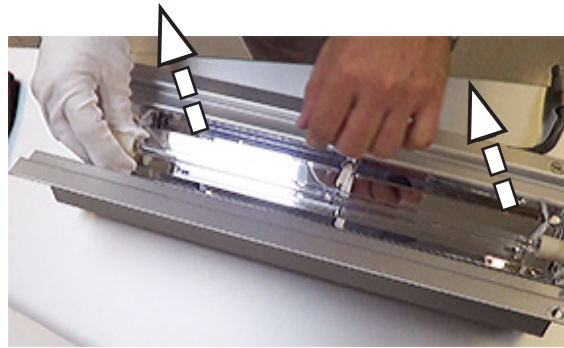
2. Remove the lamp from the housing. Use gloves, do not touch the glass with your bare hand. Set the lamp aside.

3. Clean any dust and debris from the lamp reflector. Wipe the reflector with isopropyl alcohol and a soft cloth.

4. Follow Section 16.1, Step 24 through Step 28 to reinstall the lamp housing in the Xe-1 tester.

⚠️

IMPORTANT:
Irradiance must be re-calibrated after the reflector is cleaned.

5. See Section 13.1 Irradiance Sensor Calibration for more information.

16.3 UV Filter Cleaning (Mar 2022)

- The UV filter may be cleaned without being removed from the tester (follow steps below).

- For information on performing a more complete cleaning, contact Q-Lab Repair and Tester Support and request *Service Instruction X-10940-L, Xe-1 and Xe-3 Optical Filter Cleaning.*

1. Follow Section 16.1, Step 1 through Step 11 to remove the lamp housing from the Xe-1 tester.
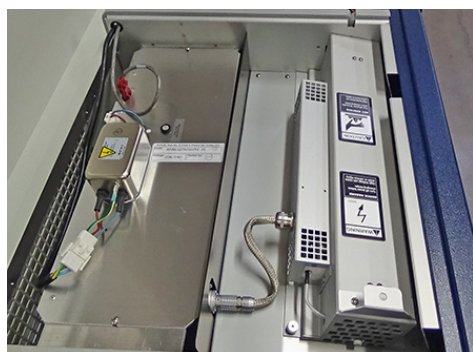

Clean

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.

Clean

4. Reach into the chamber and clean the bottom surface of the UV filter with glass cleaner and soft cloth.

5. Follow Section 16.1, Step 24 through Step 28 to reinstall the lamp housing in the Xe-1 tester.

IMPORTANT:
Irradiance must be re-calibrated
after the filter is cleaned.

6. See Section 13.1 Irradiance Sensor Calibration for more information.

16.4 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 16.4) 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.

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 16.4: UV filter, Window-IR, part number X-10110-K.

16.5 Monthly Maintenance (Aug 2020)

For All Models - Air Filters

- Remove and inspect the air filter every month (Figure 16.5a).

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

    o 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 Section 18 for part numbers).

- Washable air filters in service for more than three (3) years must be replaced (see Section 18 for part numbers).

- 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 16.5d).
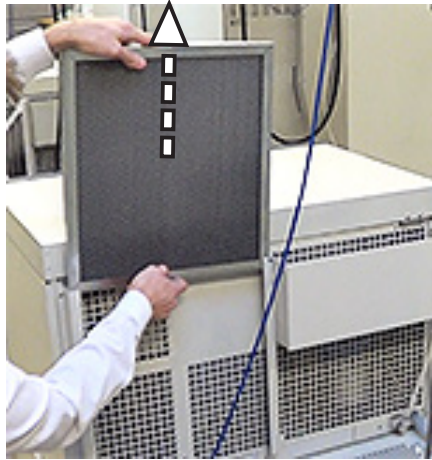
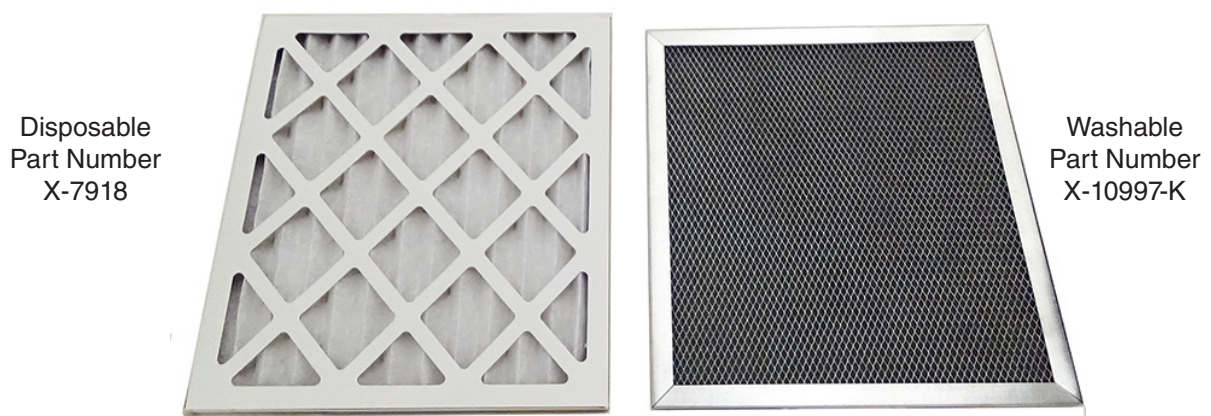

Figure 16.5a: Q-SUN Xe-1 Air Filter Removal

Disposable
Part Number
X-7918

Washable
Part Number
X-10997-K

Figure 16.5b: Xe-1 Air Filters

For Xe-1-BCE and Xe-1-SCE Models - Chiller Air Filter

- Remove and inspect the chiller air filter every month (Figure 16.5c).
  - o Washable air filters (part number X-10998-K) are standard on chillers.
  - o Disposable air filters (part number X-6658) 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 Section 18 for part numbers).
- Washable air filters in service for more than three (3) years must be replaced (see Section 18 for part numbers).
- 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 up (Figure 16.5d).
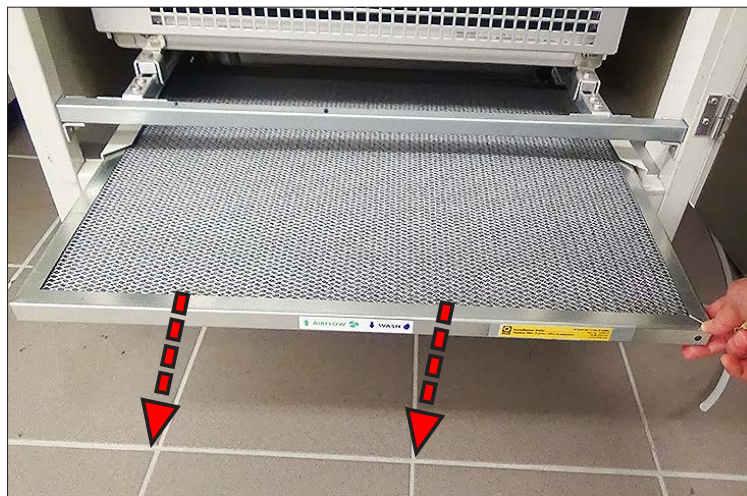
Open Chiller Door
to Access Air Filter
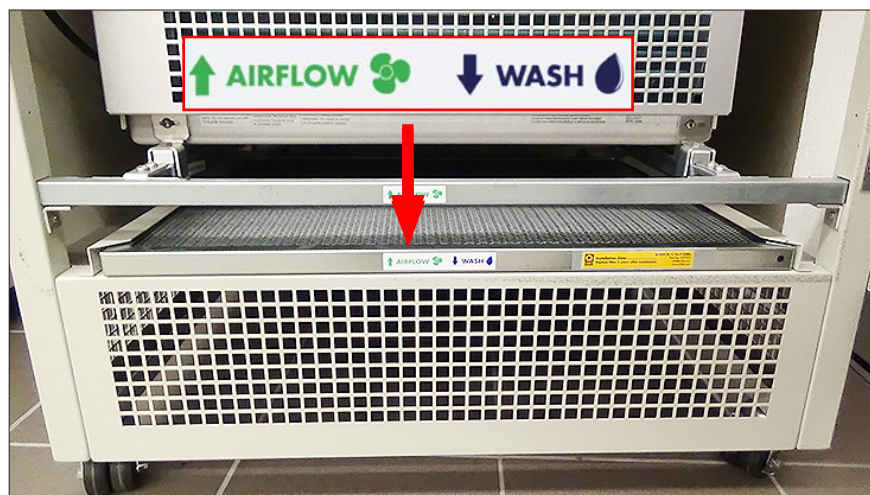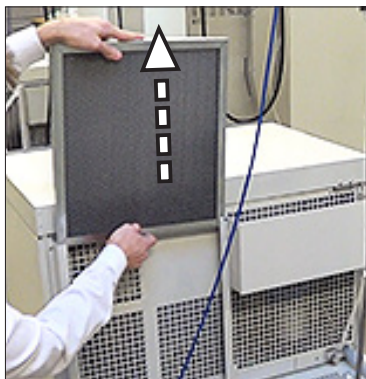
Figure 16.5c: Remove Air Filter to Inspect

Figure 16.5d: Make Sure the AIRFLOW Arrow Points Up

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 Sep 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.
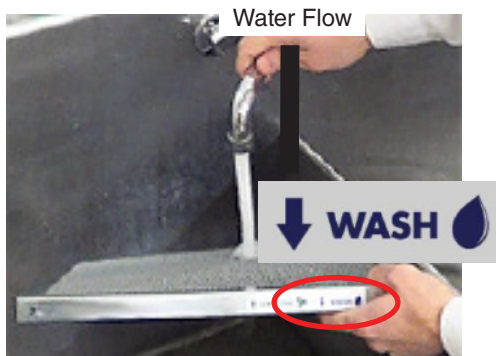
Greater Than 3 Years Old - Discard

Installation Date: 17 Sep 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 Section 18 for part numbers.

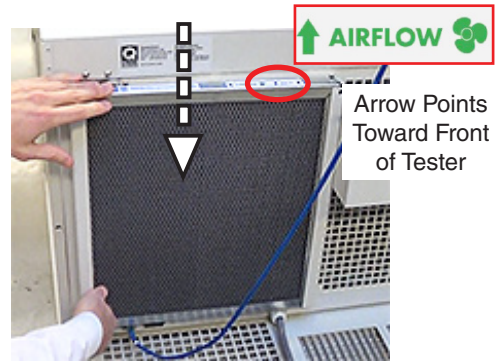4. Locate the **WASH** label on edge of filter.

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.

143

7. Allow water to drain from the air filter.

Arrow Points Toward Front of Tester

8. Reinstall the washable air filter (Xe-1 air filter shown). **IMPORTANT:** Make sure arrow on the airflow label is in direction shown.

9. Reinstall the washable air filter (Xe-1 chiller air filter shown). **IMPORTANT:** Make sure arrow on the airflow label is in direction shown.

For Xe-1-WE, Xe-1-SE and Xe-1-SCE Models with Repurification Systems - Water Repurification Cartridge

- The water purity meter on the repurification system should be checked once a month (Figure 15.5e, f).

- The water purity meter shows the Total Dissolved Solids (TDS) in the repurified water.

- Press the ON/OFF button on the meter to display the TDS (Figure 15.5g).

- The water filter should be changed when TDS is $\geq$ 1 parts per million (PPM).

- To replace the filter, order part number V-4979-K, Demineralizer Cartridge Kit. The Demineralizer Cartridge Kit includes instructions for replacing the filter.

Water Purity Meter →

Figure 16.5e: Xe-1-WE Purity Meter

← Water Purity Meter

Figure 16.5f: Xe-1-SE and Xe-1-SCE Purity Meter
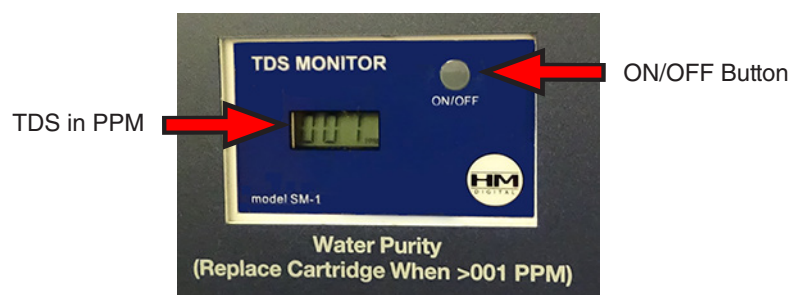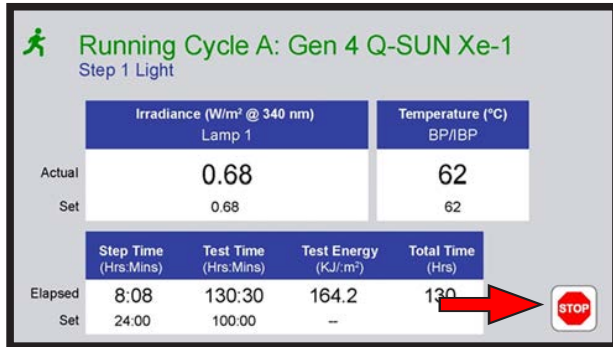
ON/OFF Button

TDS in PPM →

Figure 16.5g: Water Purity Meter

145

Replace Xe-1-WE Water Filter

To Replace the Xe-1-WE Water Filter Use V-4979-K, Demineralizer Cartridge Kit

- Tools Required
    - o Bucket or sink to empty water.
    - o Paper Towels

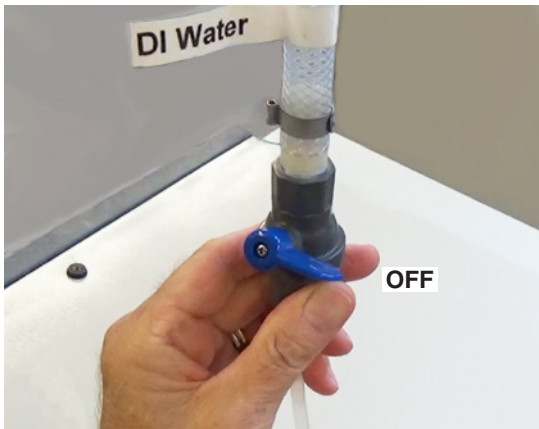

1. Touch the Stop icon on the Status Sceeen.

2. Power the Xe-1 **OFF**.

3. Main power **OFF**.

4. Disconnect.

5. Turn the main water supply **OFF**.

6. Open the latches on the left side access panel.

7. Remove the access panel. Set aside.

8. Place paper towels in the Xe-1-WE below the filter housing to absorb any spilled water.

9. Locate the filter wrench (V-60003) supplied with the Xe-1-W.

10. Place the wrench on the housing.

⚠️ CAUTION: The housing will be filled with water.

11. Rotate the wrench to loosen the filter housing.

⚠️ CAUTION: The housing will be filled with water.

12. Continue rotating the housing by hand to remove it from the filter cap.

⚠️ CAUTION: The housing will be filled with water.

13. Carefully remove the housing from the Xe-1-WE. Keep the housing vertical to avoid spilling water.

14. Empty water from the housing into a bucket or a sink.

⚠️ CAUTION: The filter may contain water.

15. Remove old filter from the housing. Discard the filter.

16. Locate the new filter in the kit.

Gasket

17. Make sure the end of the filter marked "THIS END UP" is up and the filter gasket is in place.

18. Insert the new filter in the housing.

Gasket

19. Make sure the housing gasket is in place.

20. Carefully thread the housing back into the cap. **Hand tighten only. Do not over-tighten**.

21. Wipe up any spilled water with the paper towels. Discard the towels.

22. Reconnect the main power.

23. Main Power **ON**.

24. Xe-1-WE power **ON**.

DI Water **ON**

25. Main water supply **ON**.

26. Touch the Run icon on the Xe-1 Status Screen.

27. Allow the filter housing to fill with water.

28. Check for water leaks around the housing cap. If any leaks, re-tighten the housing.
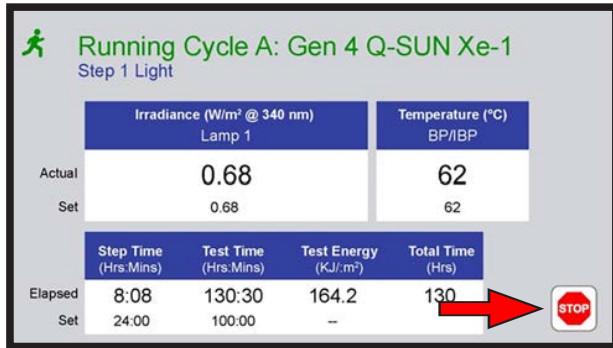
29. Replace the access panel.

30. Close the access panel latches.

16.6 Six Month Maintenance (Sep 2020)

For Xe-1-SE and Xe-1-SCE Check Water Filter, Replace if Dirty

1. Touch the Stop icon on the Status Sceeen.

2. Power the Xe-1 **OFF**.

3. Main power **OFF**.

4. Disconnect.

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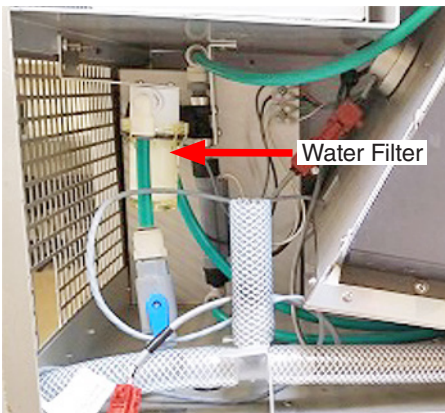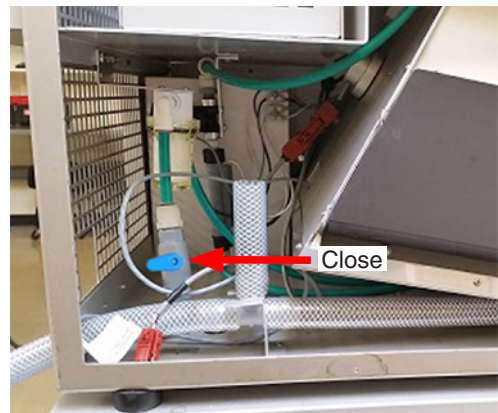

6. Open the lamp door.
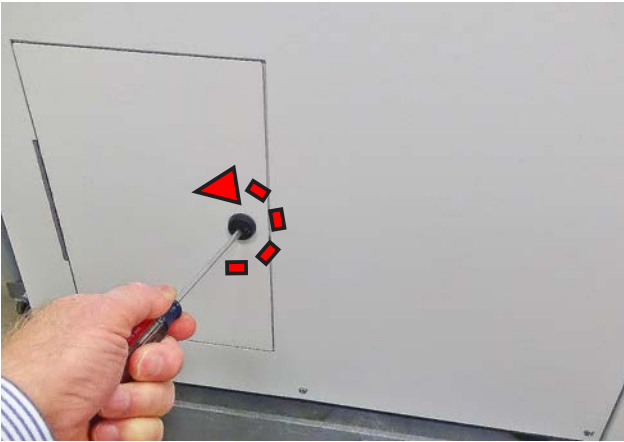
7. Use a flat blade screwdriver to open the access door latch.

8. Open the access door.

Water Filter

9. Locate the water filter inside the Xe-1 enclosure.
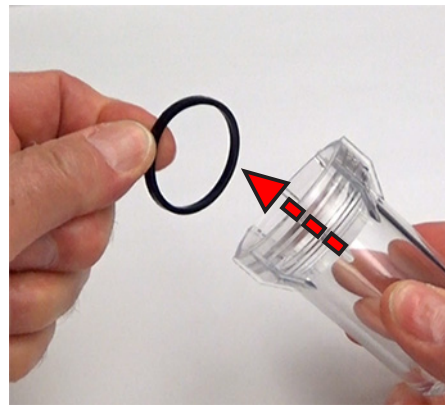

Close

10. Close the water valve.

11. Unscrew the filter housing.

12. Remove the filter housing from the filter cap.

153

13. Remove the old filter from the filter cap. If the filter is dirty it should be replaced. Discard the old filter. If not dirty, just reinstall.

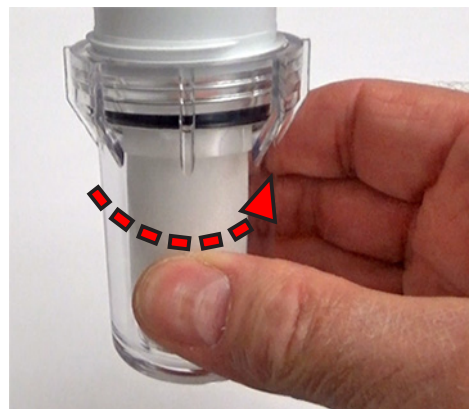**14.** Remove the gasket from the filter housing. Wipe the gasket clean.

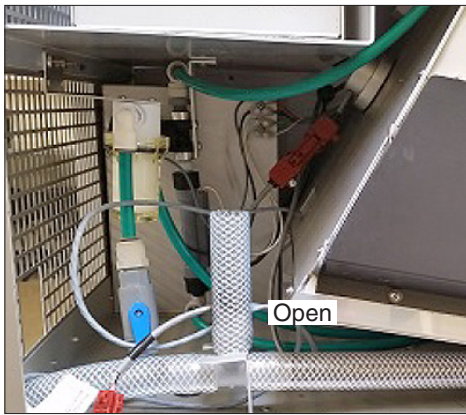**15.** Clean the inside of the filter housing. Clean the gasket groove.
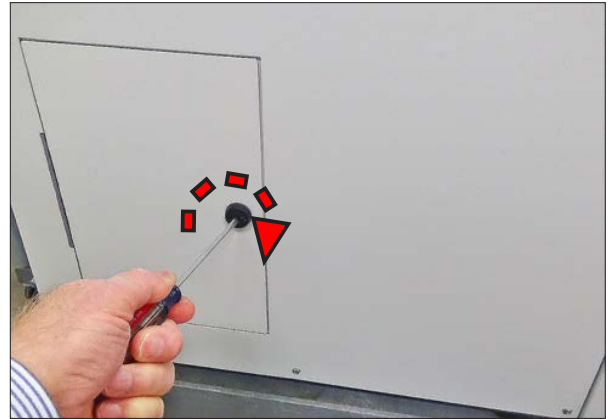
16. Replace the gasket in the filter housing.

17. Install a new filter (F-8066.5) in the filter cap.

18. Reinstall the filter housing on the cap. **Do Not Over-Tighten**.

19. Open the water valve. Allow housing to fill with water.

20. Close and latch the access door.

21. Close and latch the lid.

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

For Xe-1-S and Xe-1-SC Check Spray Uniformity

- Observe spray operation by opening the chamber door while the unit is operating in a spray cycle (Figure 16.6a).
- The unit will spray for one minute.
- While the spray is on, examine the spray pattern.
- The spray should be symmetrical and steady.
- Also check to see that the spray distribution is even over the specimen tray.
- If irregularities in the spray are found, remove the nozzle (Figure 16.6b and Figure 16.6c).
- Clean with a decalcifying agent (such as lemon juice), a small brush, and compressed air.
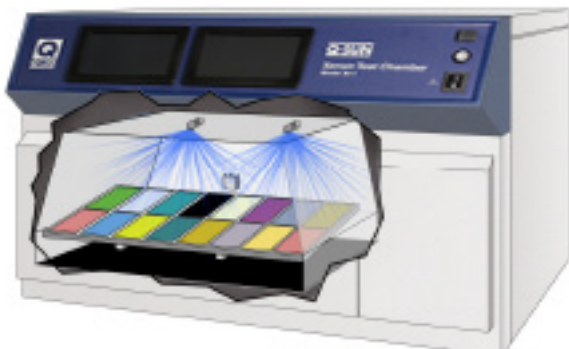

Figure 16.6a: Cut-away drawing showing spray nozzle location in test chamber.

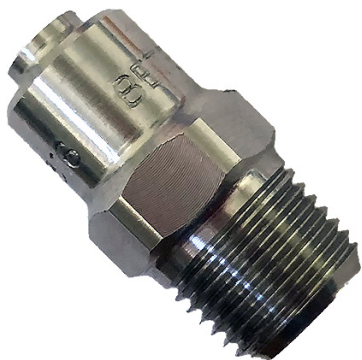Figure 16.6b: Interior of chamber showing right-side spray nozzle.

Figure 16.6c: Spray nozzle.

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 cannot 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 (Figure 16.6d).
- If the reflectors are cloudy, have stains, or have any deposit that degrades the mirror finish (Figure 16.6e); 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 18 for replacement parts.
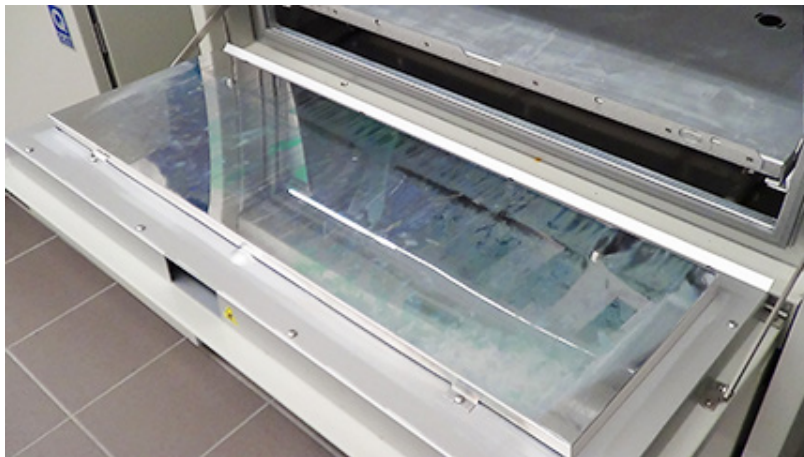

Figure 16.6d: Clean Reflector - OK

Figure 16.6e: Cloudy Reflector - Replace

16.7 Q-SUN Xe-1 Software Updates (Sep 2020)

- 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 11.8 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. 5.101 and 5.200 would both be more recent than 5.100).
  - 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.

Software Update

- The appropriate software update file can be obtained either by contacting Q-Lab Repair directly or by filling out the web-based form on www.q-lab.com/software.
- Q-Lab Repair and Tester Support personnel will contact you to discuss your situation and, when applicable, provide you with necessary software files and instructions to perform an update.
- Copy the software files (file format must be .ff4) to a USB flash drive (Figure 16.7a).
- Connect the drive to the tester USB port on the control panel (Figure 16.7b).
- If a valid software file is on the USB drive, the controller will determine if that version is newer, the same as, or older than the software installed on the tester.
- On the USB Options screen, the software button label will reflect the relative software version (Figure 16.7c).
  - o *Install New Software* means the software version on the USB drive is newer than the version on the tester
  - o *Install Current Software* means the software version on the USB drive is the same as the version on the tester.
  - o *Install Older Software* means the software version on the USB drive is older than the version on the tester.
- Touch the software install button to begin the software update process.
- Touch OK to confirm software installation (Figure 16.7d).
- If at any time during the software upgrade process a problem occurs with the USB drive or the data storage card on the main controller board, an error message will be displayed on the tester control panel.
- See for Q-Lab Repair and Tester Support contact information.

Figure 16.7a: Copy the software files from Q-Lab to a USB drive.

Figure 16.7b: Connect the drive to the USB port on the Q-SUN control panel.
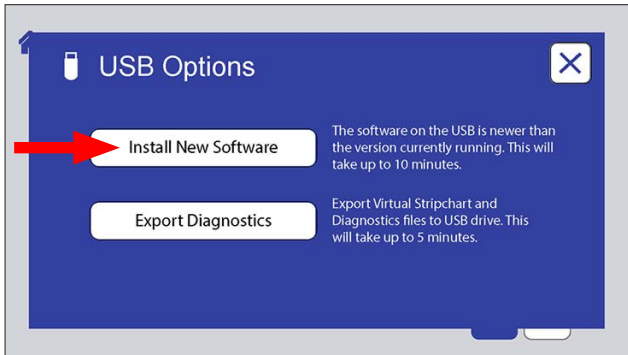
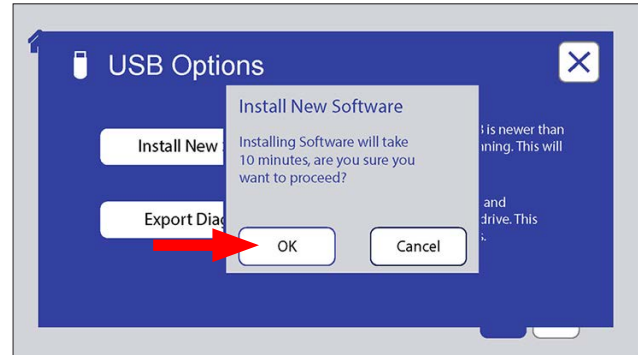Figure 16.7c: The USB Options screen displays the software installation button.

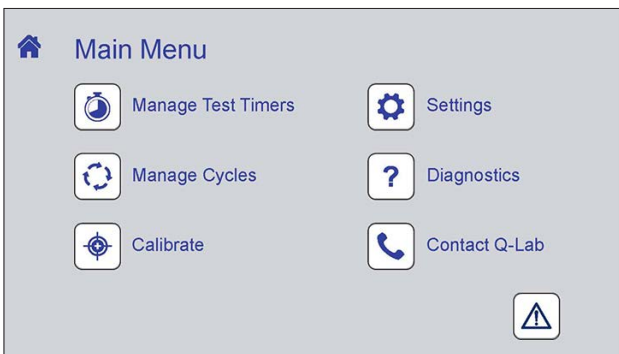Figure 16.7d: Touch OK to proceed with software installation.

Figure 16.7e: After software installation, the tester will restart automatically. Following that restart, the tester can be operated normally.

17. 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.

17.1 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

17.2 Notification Descriptions and Suggested Actions (Jan 2022)

- Notifications provide useful diagnostic information for technicians and repair personnel.
- Notifications show significant tester events and errors that occurred in the recent past.
- See Section 11.4 for more information on displaying and clearing Notifications.
- 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	Icon	Test Status	Description Suggested Action
M1	Chamber Door is Open	⚠️	Stopped	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	⚠️	Stopped	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	⚠️	Complete	Test completed successfully. No alarm is generated. *No action required*
M11	End of Test	⚠️	Complete	Test completed successfully. An alarm, as set in Section 11.5, is generated. *No action required*
M12	End of Test Shutdown	⚠️	Complete & Stopped	Test completed successfully. No alarm is generated. *No action required*
M13	End of Test Shutdown	⚠️	Complete & Stopped	Test completed successfully. An alarm, as set in Section 11.5, is generated. *No action required*
M14	Time to Replace Lamp	⚠️	Running	3000 light hours have elapsed since this message appeared previously. Replace the Xenon lamp. See Section 16.1 for more information. Recalibrate irradiance (Section 13.1).
M15	Time for Routine Service - See Manual	⚠️	Running	2000 operation hours have elapsed since this message appeared previously. See Section 16 for maintenance information.

Code	Message	Icon	Test Status	Description ● Suggested Action
M20	Chamber Temp Too Hot XXX °C	⚠️	Stopped	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.
M21	Chamber Temp Too Cold XXX °C	⚠️	Stopped	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	⚠️	Running	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	⚠️	Stopped	The controller temperature is greater than the controller temperature limit. (55 °C). ● Check room temperature. ● Check overheating of relays.
M26	Lamp / Ballast Blower Failure	⚠️	Stopped	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	⚠️	Stopped	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	⚠️	Running	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	⚠️	Running	The lamps have been on for 500 hours since the onboard irradiance sensor was last calibrated. ● Recalibrate the irradiance sensor (see Section 13.1).
M33	Wrong Radiometer Should be UC20/340	⚠️	Stopped	The radiometer being used for calibration is a 420 nm or TUV type, but the tester has 340 nm sensors installed. ● Calibrate irradiance with a UC20/340 radiometer (see Section 13.1).
M34	Wrong Radiometer Should be UC20/420	⚠️	Stopped	The radiometer being used for calibration is a 340 nm or TUV type, but the tester has 420 nm sensors installed. ● Calibrate irradiance with a UC20/420 radiometer (see Section 13.1).

Code	Message	Icon	Test Status	Description ● **Suggested Action**
M35	Wrong Radiometer Should be UC20/TUV	⚠️	Stopped	The radiometer being used for calibration is a 340 nm or 420 mm type, but the tester has TUV sensors installed. ● Calibrate irradiance with a UC20/TUV radiometer (see Section 13.1).
M41	Immersion Water Off: Should be On	⚠️	Stopped	Xe-1-WE only, water is not flowing from the reservoir to the immersion tray when in an immersion step. ● Check the water pump. ● Check the water pump relay. ● Check the water filter. ● Check the flow switch.
M42	Immersion Water On: Should be Off	⚠️	Stopped	Xe-1-WE only, water is flowing from the reservoir to the immersion tray when not in an immersion step. ● Check the flow switch. ● Check the water pump relay.
M43	Spray Water Off: Should be On	⚠️	Stopped	The tester is running a spray step, but the spray is off. ● Make sure the water supply is turned on. ● Check the solenoid valve. ● Check the flow switch.
M44	Spray Water On: Should be Off	⚠️	Stopped	The tester is not running a spray step, but the spray is on. ● Check the solenoid valve. ● Check the flow switch.
M47	Reservoir Water Level Too Low	⚠️	Stopped	Xe-1-WE only, in an immersion step. The water level in the reservoir is low. ● DI cartridge is empty. Clear Message. Wait 10 minutes for the reservoir to fill then press START. ● Make sure the water supply is turned off. ● Check the flow switch (X-15250-X). ● Check the water level sensor (X-15195-X). ● Check the water pump (X-15244-K).
M49	Power Disrupted	⚠️	Running	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.
M54	Chamber Temp Runaway XXX °C	⚠️	Stopped	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.

Code	Message	Icon	Test Status	Description ● **Suggested Action**
M60	Low Irradiance: Change Lamp	⚠️	Running	Irradiance of the lamp is more than 5% below set point. ● Replace the lamp and recalibrate irradiance (see Section 13.1).
M61	Lamp Out	🔺	Stopped	Irradiance of the lamp is more than 30% below the set point. ● The lamp burned out, replace the lamp and recalibrate irradiance (see Section 13.1). ● Check the ballast. ● Check the lamp relay. ● Check the lamp trigger finger.
M63	Irradiance Too High	🔺	Stopped	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	Lamp On: Should Be Off	🔺	Stopped	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	⚠️	Running	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	🔺	Stopped	The irradiance is above 0.05 W/m^2 during the "Relay Check". ● Replace the lamp relay.
M68	Run Relay Stuck On	🔺	Stopped	The irradiance is above 0.05 W/m^2 during the "Relay Check". ● Replace the run power relay.
M70	Black Panel Temp Sensor Fail XXX °C	🔺	Stopped	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.
M72	Air Temperature Sensor Fail	🔺	Stopped	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	⚠️	Running	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	🔺	Stopped	Checksum test on program failed. ● Contact Q-Lab Repair.

Code	Message	Icon	Test Status	Description ● **Suggested Action**
M81	Flash Memory Corrupt	⚠️	Stopped	Parameter and setup data corrupted. ● Contact Q-Lab Repair.
M82	RAM Corrupted, RAM Reloaded	⚠️	Stopped	Error in RAM data. ● Contact Q-Lab Repair.
M101	SD Card is Missing	⚠️	Running	The SD card is missing from the main controller. ● Contact Q-Lab Repair.
M103	System Auto-Reboot	⚠️	Running	System restarts because of fail-safe intended to prevent system locking up. ● *No action required.*
M104	Software Install Completed Successfully	⚠️	Running	Software has been installed without issue. ● *No action required.*
M900	Status Screen Communications Failure	⚠️	Running	Communication lost between main controller and Status Screen. Tester will enter single-screen mode. ● Check for loose cable between main controller and the display. Re-seat cable.
M901	Main Menu Screen Communications Failure	⚠️	Running	Communication lost between main controller and Menu Screen. Tester will enter single-screen mode. ● Check for loose cable between main controller and the display. Re-seat cable.
M902	Main Controller Communications Failure	⚠️	Running	Message that appears on a screen that has experienced M900 or M901. ● *No action required.*

See Section 11.4 **for information on viewing and clearing notifications.**
See Section 20 **for Q-Lab Repair and Tester Support contact information.**

17.3 Lamp Does Not Light (Sep 2020)

For All Xe-1 Models

Symptom - Lamp Does Not Light

- Trigger finger is not in good contact with lamp, or requires cleaning. See Section 16.2.
- Faulty trigger/transformer assembly. See Section 18 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 16.2.
- Reverse lamp (Figure 17.3a and Figure 17.3b).
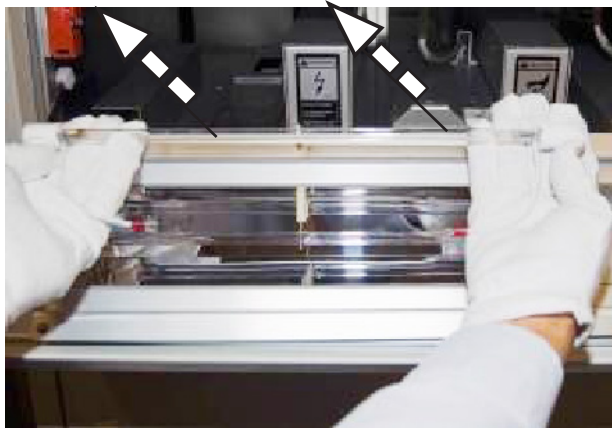- Replace lamp. See Section 16.1.

Figure 17.3a: Remove the lamp.

Figure 17.3b: Swap ends to reverse the lamp and reinstall.

17.4 Water Flow (Sep 2020)

For Xe-1-SE and Xe-1-SCE Models

- Water low controls for the spray system are located in the plumbing enclosure at the front lower right corner of the Xe-1 cabinet (Figure 17.4a and Figure 17.4b).

- During the 5 seconds per minute of a spray step, when the water spray is on, the flow rate should be 1.4 Liter/minute.

- During the 55 seconds per minute of a spray step, when the water spray is off, the flow rate should be 0 Liter/minute.

- The pressure gauge should read about 104-155 kPa (15-25 PSI).

- Refer to the following table for troubleshooting water flow problems.

Flow Rate Symptom	Pressure Gauge Symptom	Probable Cause(s)
< 1.4 L/min	< 15 PSI	Pressure regulator not adjusted. Water supply is shut off. Water pressure is too low. Clogged water filter.
< 1.4 L/min	> 25 PSI	Clogged nozzle. Bad solenoid.
= 1.4 L/min	< 15 PSI	Nozzles leaking. Fitting leak.
> 1.4 L/min	> 25 PSI	Pressure regulator not adjusted. Bad pressure regulator.

Figure 17.4a: Pressure Gauge, Pressure Regulator, and Flow Meter Location

Pressure Gauge
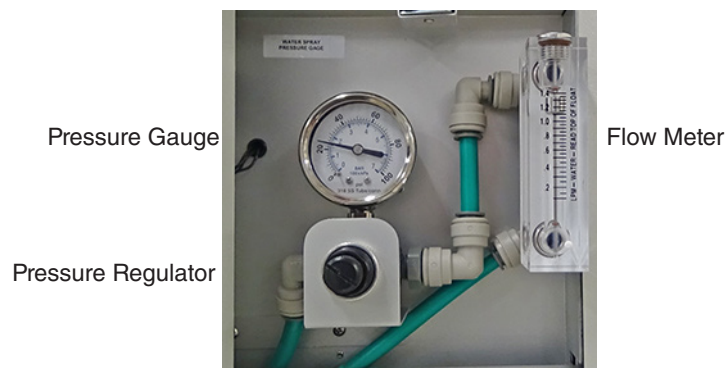
Flow Meter

Pressure Regulator

Figure 17.4b: Pressure Gauge, Pressure Regulator, and Flow Meter Detail

18. Replacement Parts List (Sep 2020)

- Use only parts that have been supplied or recommended by Q-Lab. See Section 20 for contact information.
- When ordering parts; specify Q-SUN model, serial number, Volts, Hz and Part Number.

Replacement Parts

Part Number	Description	Where Pictured
X-7918	Air Filter, Disposable, Xe-1	Figure 16.5a
X-10997-K	Air Filter, Washable, Xe-1	Figure 16.5a
X-6658	Air Filter, Chiller, Disposable (Xe-1-BCE, Xe-1-SCE Models Only)	Figure 18ag
X-10998	Air Filter, Chiller, Washable (Xe-1-BCE, Xe-1-SCE Models Only)	Figure 18ah
X-7916-K	Air Heater, Xe-1	Figure 18aa
X-15411-K	Ballast with Integrated BAM Kit, Xe-1	Figure 18s
UC202/BP	Black Panel Temperature Smart Sensor, Uninsulated	Figure 12.2a
UC202/IBP	Black Panel Temperature Smart Sensor, Insulated	Figure 12.2b
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 18a
X-6673-K	Chamber Blower Kit (Xe-1-BCE, Xe-1-SCE Models Only)	Figure 18an
X-15117	Chamber Blower Motor Driver, Xe-1	Figure 18ar
X-7979-K	Chamber Wall Replacement Kit, Xe-1	Figure 18t
X-10131-K	Chiller Cooling Unit (Xe-1-BCE, Xe-1-SCE Models Only)	Figure 18ae
X-6681-K	Chiller Relay & Low Temperature Switch Kit (Xe-1-BCE, Xe-1-SCE Models Only)	Figure 18af
V-4086	Controller Battery	Figure 18y
X-10315-K	Controller, DC Blower Power Supply Board, Xe-1	Figure 18v
TEB-105015-K	Controller, Main	Figure 18p
V-4979-K	Demineralizer Water Filter, Xe-1-WE	Figure 18o
TEB-105016-K	Display Complete Kit	Figure 18bc
X-6955-K	Drain Pump (120 V)	Figure 15.1
X-6956-K	Drain Pump (230 V)	Figure 15.1
F-8066.5	Filter PE cartridge, 80 µm	Figure 18c
X-7628	Flow Meter	Figure 18g
X-10818-X	Flow Switch, Air	Figure 18r
X-15250-X	Flow Switch Assembly, Xe-1-WE	Figure 18ak
X-7631-X	Flow Switch, Water	Figure 18d
U-6431	Fuse (Transformer Primary, Lamp Cooling Blower, Chamber Blower, Xe-1 Air Heater) – 3.15 A	Figure 18u
U-6427	Fuse (Transformer Secondary) – 6.3 A	Figure 18u
X-7245	Fuse (Power Supply) – 12 A	Figure 18u
X-10424-K	Interlock Switch Assembly, Chamber Door	Figure 2b
X-7123	Interlock Switch, Lamp Door	Figure 2a
UC20/340	Irradiance Smart Sensor, 340 nm	Figure 12.1a
UC20/420	Irradiance Smart Sensor, 420 nm	Figure 12.1b
UC20/LUX	Irradiance Smart Sensor, LUX	Figure 12.1c

Replacement Parts

Part Number	Description	Where Pictured
UC20/TUV	Irradiance Smart Sensor, TUV	Figure 13.1d
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 18aq
X-7509-K	Lamp Trigger Assembly Kit	Figure 18x
X-7927-K	Lamp/Ballast Blower, Xe-1	Figure 18b
X-15416-K	Lift Kit	Figure 15.2a
TEB-105043-K	Panel Mount LED Indicator Assembly	Figure 18bb
TEB-105040-K	Panel Mount USB Port	Figure 18bd
X-10905-X	Ponding Tray Assembly	Figure 18ao
X-7777-X	Power Cord	Figure 18k
V-2202	Power Switch, Xe-1	Figure 18q
X-7641	Pressure Gauge	Figure 18f
X-6918-K	Pressure Regulator Kit	Figure 18ac
X-10434-X	Relay, Run Power	Figure 18j
F-8385-K	Relay Kit, Solid State, 25 A	Figure 18m
X-15510-K	Relay Kit, Solid State, 50A	Figure 18l
X-15190-X	Reservoir Assembly, Xe-1-WE	Figure 18ai
X-10774-K	Solenoid Valve Kit, Xe-1	Figure 18e
X-10115-X	Specimen Holder Assembly with (1) 2×4" panel holder, (2) 50×100 mm (2×4") panels & (2) retaining rings	Figure 12.5f
X-10113-K	Specimen Holder Kit with (8) 50×100 mm (2×4") specimen holder assemblies, (1) 2"x4" single panel holder assembly and (2) insulated black panel holder assemblies	Figure 12.5g
X-7973-X	Specimen Tray with clips, Xe-1	Figure 18w
X-10195-X	Specimen Tray without clips, Xe-1	Figure 12.5a
X-10304-K	Spray Nozzles (set of 2)	Figure 8a
U-41085-K	Temperature Calibration Kit	Figure 18az
X-10235-X	Temperature Sensor, Black Panel	Figure 10.1a
X-7778-X	Temperature Sensor, Insulated Black Panel	Figure 10.1b
X-10255-X	Textile/Thin Film Sample Holder	Figure 12.5o
X-10259-K	Textile/Thin Film Sample Holder Kit, 8 pieces	No Picture
X-15246-K	Thermal Fuse Replacement Kit, Xe-1-WE	Figure 18al
X-10545-X	Transformer, Power Supply	Figure 18i
X-7515-K	UV Detector, 340 nm	Figure 18n
X-7522-K	UV Detector, 420 nm	Figure 18n
X-7523-K	UV Detector, TUV	Figure 18n
X-10271-K	UV Filter, Daylight-B/B	
X-7460-K	UV Filter, Daylight-Q	
X-10586-K	UV Filter, Daylight-F	Figure 7.4a
X-6502-K	UV Filter, Extended UV-Q/B	
X-10180-K	UV Filter, Extended UV-Quartz	

Replacement Parts

Part Number	Description	Where Pictured
X-10521-K	UV Filter, UV Blocking	Figure 7.4a
X-10214-K	UV Filter, Window-B/SL	
X-10110-K	UV Filter, Window-IR	
X-10266-K	UV Filter, Window-Q	
X-10857-K	UV Filter, Window–SF5	
X-10710	Voltage Phase Monitor	Figure 18ad
X-7654-K	Water Drain Kit, ¾"	Figure 18z
X-15247-K	Water Heater Replacement Kit, Xe-1-WE	Figure 18am
X-10570-K	Water Inlet Pump	Figure 15.3
X-15195-X	Water Level Sensor, Xe-1-WE	Figure 18aj
X-10732-K	Water Pump Accumulator Kit	Figure 18as
X-10819-K	Water Pump and Isolation Relay Kit	Figure 18at
X-10821-K	Water Pump Fan Kit	Figure 18au
X-10843-K	Water Pump Isolation Relay Kit (Including Wire Harness)	Figure 18av
X-10820-K	Water Pump Power Supply Kit	Figure 18aw
X-15244-K	Water Pump Replacement Kit, Xe-1-WE	Figure 18ap
X-10897-K	Water Repurification Kit	Figure 15.4
F-8609	Water Shut-Off Valve	Figure 18h
X-6568-K	Wedge Adapter for 0°, Xe-1	Figure 18ab
X-15350-K	White Panel Kit, Uninsulated	Figure 18ax
X-15351-K	White Panel Kit, Insulated	Figure 18ay
X-1800+	Xenon Arc Lamp, 1800 W	Figure 18ba
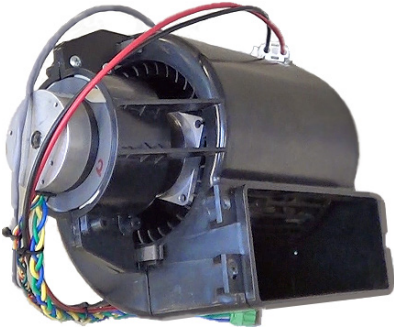
Figure 18a: X-15118-X Blower, Chamber, Xe-1

Figure 18b: X-7927-K Blower, Lamp/Ballast, Xe-1

Figure 18c: F-8066.5 Filter PE cartridge, 80 µm

Figure 18d: X-7631-X Flow Switch, Water

Figure 18e: X-10774-K Solenoid Valve Kit, Xe-1

Figure 18f: X-7641 Pressure Gauge
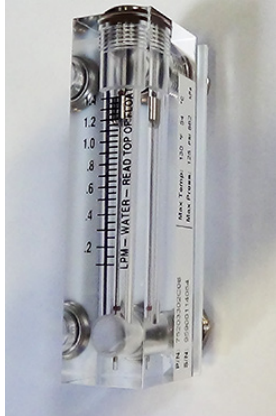
Figure 18g: X-7628 Flow Meter

Figure 18h: F-8609 Water Shut-Off Valve
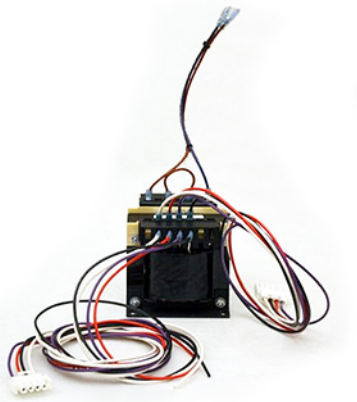
Figure 18i: X-10545-X Transformer, Power Supply

Figure 18j: X-10434-X Relay, Run Power Xe-1

Figure 18k: X-7777-X Power Cord, Xe-1

Figure 18l: X-15510-K Relay Kit, Solid State, 50A
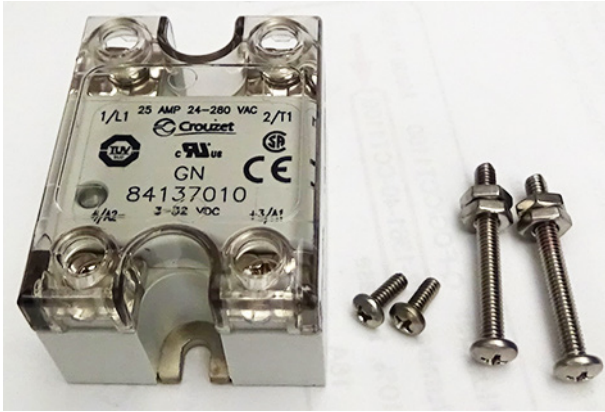
Figure 18m: F-8385-K Relay Kit, Solid State, 25A

Figure 18o: V-4979-K Water Re-Purification Demineralizer Cartridge Kit

Figure 18p: TEB-105015-K Main Controller

Figure 18q: V-2202 Switch Main Power

Figure 18r: X-10818-X Flow Switch, Air
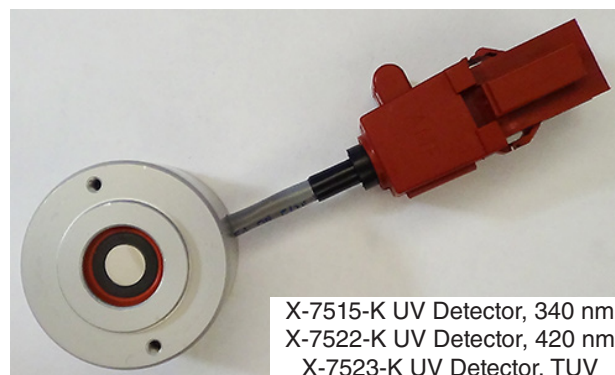
X-7515-K UV Detector, 340 nm
X-7522-K UV Detector, 420 nm
X-7523-K UV Detector, TUV

Figure 18n: UV Detectors
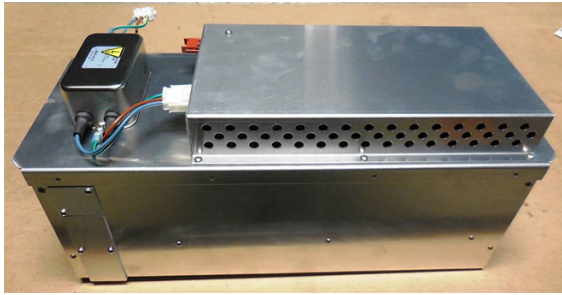
Figure 18s: X-15411-K Ballast with integrated BAM
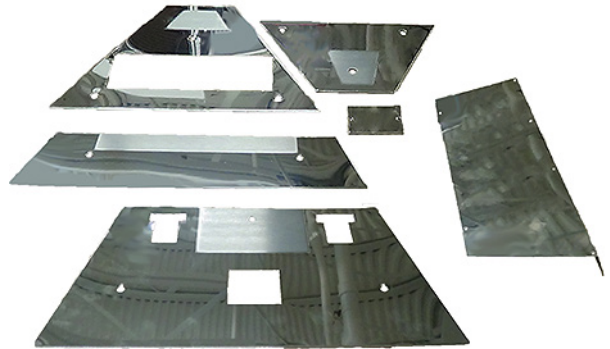
Figure 18t: X-7979-K Chamber Wall Replacement Kit

U-6431 Fuse, 3.15 A
U-6427 Fuse, 6.3 A
X-7245 Fuse, Power Supply, 12 A

Figure 18u: Fuses
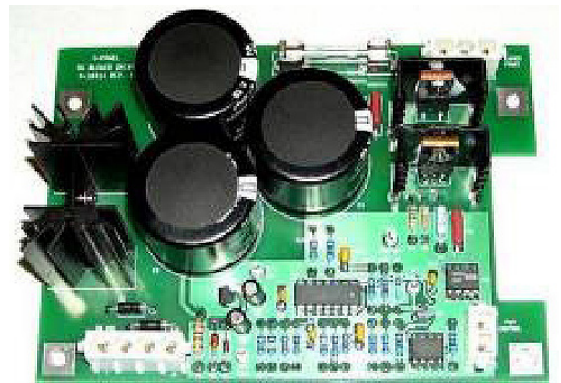
Figure 18v: X-10315-K Controller, DC Blower Power Supply Board Kit
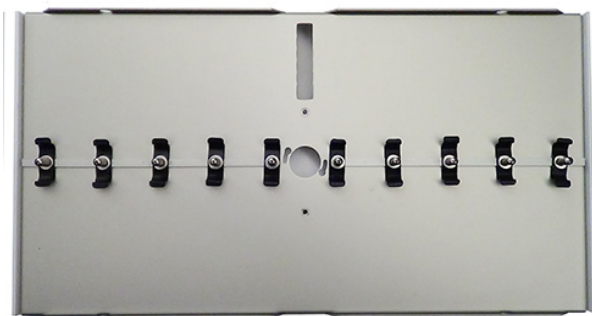
Figure 18w: X-7973-X Specimen Tray with Clips
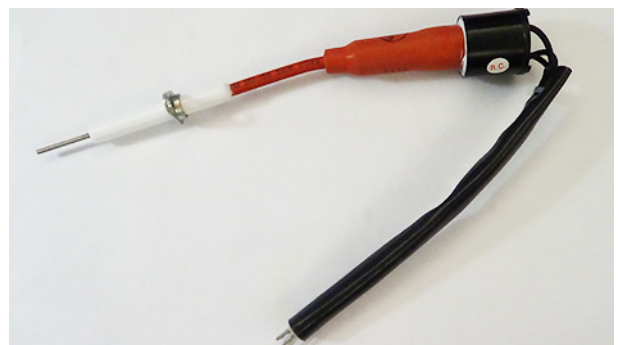
Figure 18x: X-7509-K Lamp Trigger Assembly Kit

Figure 18y: V-4086 Controller Battery

4.9 m (16.5') of 19 mm (¾") Hose

Figure 18z: X-7654-K Water Drain Kit, ¾"
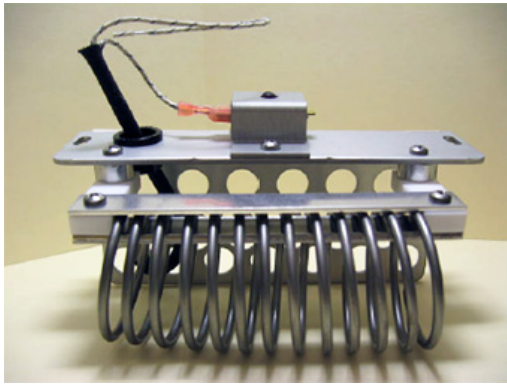
Figure 18aa: X-7916-K Air Heater

Figure 18ab: X-6568-K Horizontal Specimen Tray Base, Xe-1 without Chiller
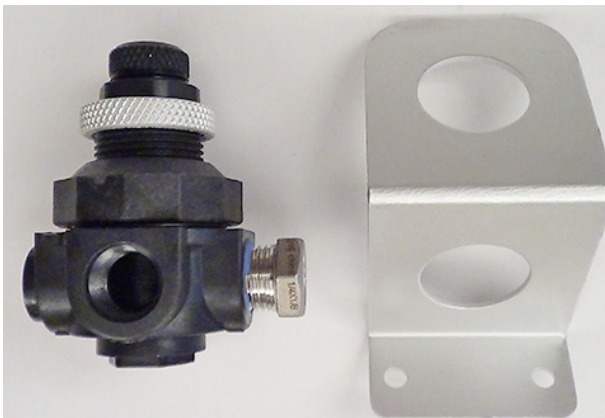
Figure 18ac: X-6918-K Pressure Regulator Kit

Figure 18ad: X-10710 Voltage Phase Monitor
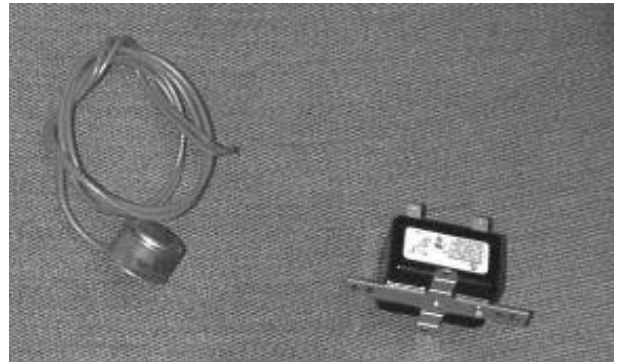
Figure 18ae: X-10131-K Chiller Cooling Unit

Figure 18af: X-6681-K Chiller Relay and Low Temperature Switch Kit

Figure 18ag: X-6658 Air Filter, Chiller, Disposable

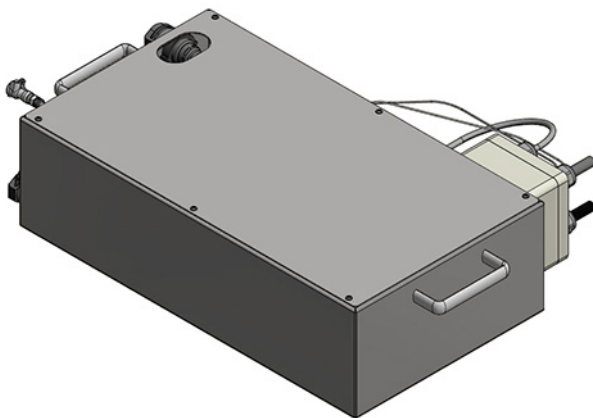

Figure 18ah: X-10998-K Air Filter, Chiller, Washable

Figure 18ai: X-15190-X Reservoir Assembly, Xe-1-W

Figure 18aj: X-15195-X Water Level Sensor, Xe-1-W

Figure 18ak: X-15250-X Flow Switch Assembly, Xe-1-WE
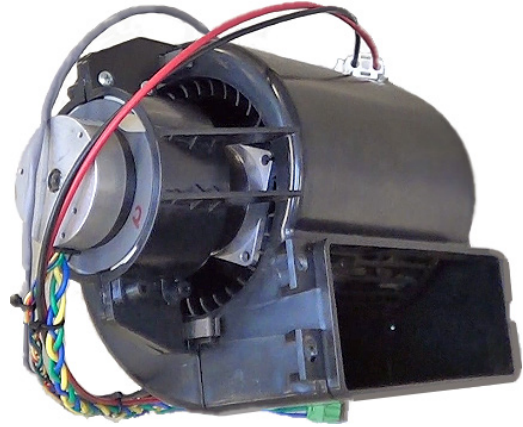
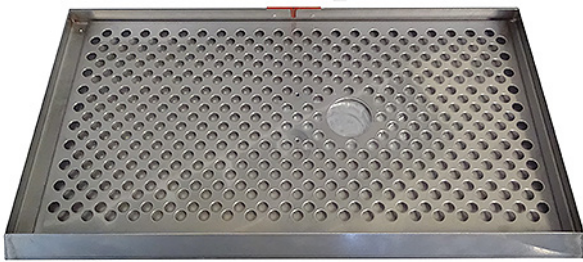Figure 18an: X-6673-K Blower, Chamber, Xe-1 Chiller

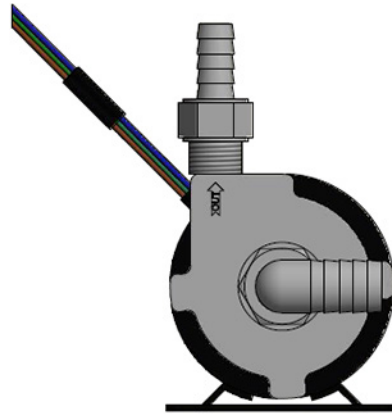

Figure 18ao: X-10905-X Ponding Tray Assembly

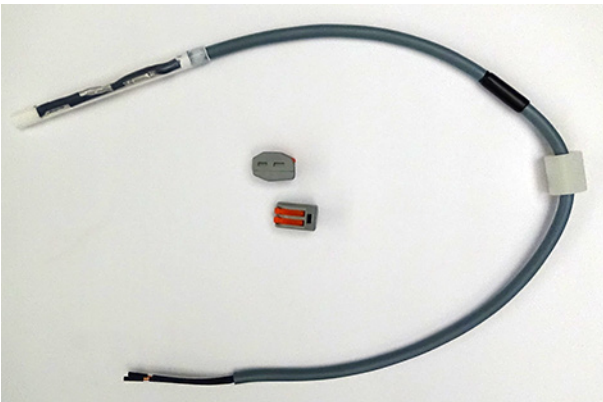Figure 18ap: X-15244-K Xe-1-WE Water Pump Replacement Kit

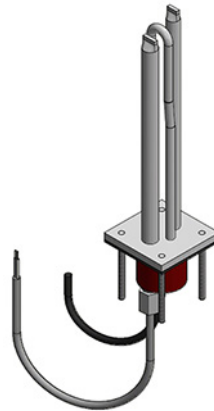Figure 18al: X-15246-K Xe-1-W Thermal Fuse Replacement

Figure 18am: X-15247-K Xe-1-W Water Heater Replacement Kit

Figure 18aq: X-7866-K Lamp Housing, (Lamp Not Included), Xe1

Figure 18ar: X-15117 Brushless DC Motor Driver, Xe-1

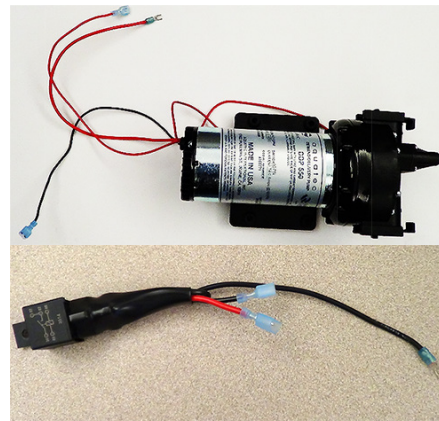Figure 18as: X-10732-K Water Pump Accumulator Kit

Figure 18at: X-10819-K Water Pump and Isolation Relay Kit

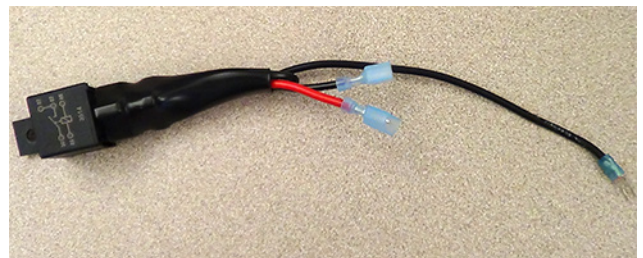Figure 18au: X-10821-K Water Pump Fan Kit

Figure 18av: X-10843-K Water Pump Isolation Relay Kit

Figure 18aw: X-10820-K Water Pump Power Supply Kit

Figure 18ax: X-15350-K White Panel Kit, Uninsulated

Figure 18ay: X-15351-K White Panel Kit, Insulated

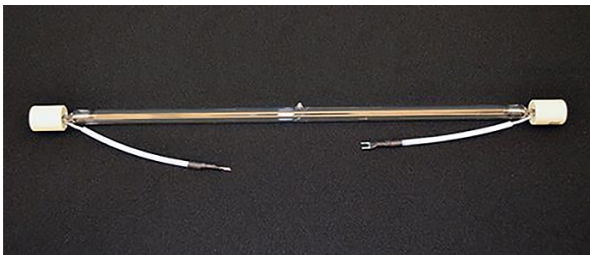Figure 18az: U-41085-K Temperature Calibration Kit

Figure 18ba: X-1800+ Xenon Arc Lamp 1800 W

Figure 18bb: TEB-105043-K Panel Mount LED Indicator Assembly

Figure 18bc: TEB-105016-K Display Complete Kit

Figure 18bd: TEB-105040-K Panel Mount USB Port

19. 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 and travel costs are 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.

20. 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.