LU-8047-TM

Technical Manual

QUV
Accelerated Weathering Testers

For Serial Numbers:

XX-XXXXX-95-BASIC
XX-XXXXX-95-SE
XX-XXXXX-95-SPRAY
XX-XXXXX-95-SPRAY-RP
XX-XXXXX-95-CW
XX-XXXXX-95-UVC

Q-LAB

Revision Date
8 Nov 2024

Table Of Contents

1. Specifications, Classifications, Symbols

1.1. Specifications, Classifications

- The recommended laboratory ambient temperature and relative humidity (RH) is 23 ± 5 °C and 50 ± 25% RH.
- Operating outside these conditions can result in temperature, humidity, or other faults.
- Never operate in laboratory ambient conditions >36 °C or >80% RH
- Consult with Q-Lab for more specific information about achievable chamber temperature/humidity values based upon various ambient lab conditions.
- Operating Humidity: Non-Condensing
- Ventilation: The QUV adds 700 watts (2400 BTU/hr) and 5 liters of water per day to room air. Locate away from drafts.
- Weight: 136 kg (300 lbs).
- Installation Category II for transient over-voltages.
- Pollution Control Degree 2.
- Sound Pressure Level does not exceed 74 dBA.
- Altitude: 2000 meters or less.
- Operation: Continuous Rating
- Voltage: 120 V or 230 V (as stated on the nameplate) ± 10% - single phase (see Section 6.3).
- Current:
  - For all models except QUV/basic: 16 A for 120 V testers and 8 A for 230 V testers.
  - For QUV/basic: 14 A for 120 V testers and 7 A for 230 V testers.
- Frequency: 50 or 60 Hz.
- Supply Connection: Permanently connected or plug/socket connection (industrial type per IEC 60309 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).
- See Specification Bulletin LU-0819 for a complete list of QUV specifications.

1.2. Symbols

Electrical Shock Hazard

Hot Surfaces Hazard

Attention

Ultraviolet Light Hazard

Local Waste & recycling regulations per the WEEE Directive 2012/19/EU on Waste Electrical and Electronic Equipment

2. Safety Information

- 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.
- 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.
- Use only replacement parts that have been supplied or recommended by Q-Lab.
- The QUV meets the European Low Voltage Directive 2014/35/EU and complies with the requirements of EN61010-1: 2010 (Third Edition), "Safety of Electrical Equipment for Measurement, Control and Laboratory Use."
- The QUV meets the European Electromagnetic Directive 2014/30/EC and complies with the requirements of EN 55011:2007 Radiated and Conducted Emissions – class A.
- Components such as UV lamps, lithium batteries, or electronic assemblies may be restricted items for ordinary disposal.
- Follow the Waste Electrical and Electronic Equipment Directive (WEEE Directive) or applicable local regulations when disposing of UV lamps or QUV electronic components.

2.1. Electrical Shock Hazard

- The QUV uses 400 volts to operate its fluorescent ultraviolet (UV) lamps.
- This voltage is extremely dangerous.
- Interlock switches remove power to the UV lamps when end covers are removed (Figure 2.1).

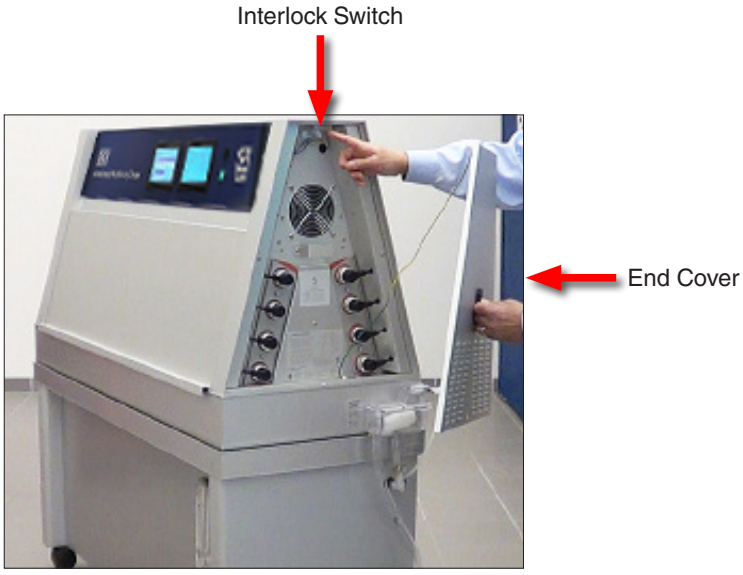


Figure 2.1: Power off to lamps when an end cover is removed.
Dual Touchscreen model shown.

2.2. Ultraviolet Hazards

- There is no Ultraviolet (UV) hazard from any QUV tester in normal operation with the doors closed.
- The QUV/uvc tester is equipped with additional light barriers to prevent any potentially-harmful stray UVC light from escaping the tester.
- QUV front and rear swing-up doors are equipped with interlock switches which shut off the UV lamps when either door is opened. The only exception to this safety feature is described in “Smart Sensor Disables Interlocks on SOLAR EYE Models Except QUV/uvc” on page 7.
- Always STOP the test before opening QUV doors and removing test panels.
- If exposure to UV lamps is necessary, wear UV-absorbing goggles. Protect skin with opaque clothing or a quality sunscreen lotion (e.g. 5 percent PABA).
- Sunburn and eye inflammation are delayed reactions. Symptoms (pain, redness, hot sensation) may appear 4 to 12 hours after UV exposure.
- Threshold Limit Values (TLV) for UV exposure are published by the American Conference of Governmental Industrial Hygienists. The Threshold Limit Values should be used as guides for control of UV exposure.
- Individuals with light complexion are more susceptible to UV, and some individuals are allergic to UV. Many common medications increase your sensitivity to UV (including sunlight).
- Do not use QUV UV lamps for any purpose except QUV testing. UV lamps are not useful for plant growth or similar purposes.
- For QUV testers equipped with optional quadrant boxes (Part Nos. V-60301-K and V-60292-K), an optional door interlock kit (Part No. V-60353-K) is available for the right front end of the QUV tester.
    - The door interlock shuts off the lamps if a quadrant box is removed from either end of the QUV tester.
    - The interlock is typically factory-installed with new QUV testers that have the 3D quadrant boxes.
- To disable lamps, remove two of the end-pins with a wire cutter or pliers (do not break lamps).
- When discarding the lamps, disable them to prevent unauthorized use.

Warning - Risk of Burns. Limit Exposure. Use Protective Gear.

Smart Sensor Disables Interlocks on SOLAR EYE Models Except QUV/uvc

The lamps can only be viewed like this if you have a UC10/UV or UC10/CW smart sensor connected to disable the interlocks on QUV/se, QUV/spray, QUV/spray/rp, and QUV/cw models. The UC10/UVC does not disable the interlocks on QUV/uvc testers (see Irradiance Calibration Procedure on page 100).

Threshold Limit Value (TLV) exposure limits:

- One sample holder removed.
- Hand 50 mm from lamps (same as sample).
- Allowable daily exposure is 1 minute.

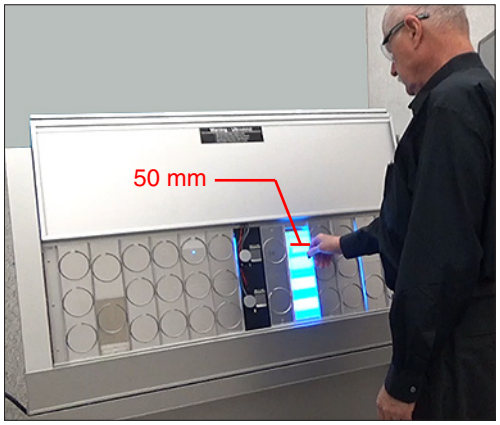


Figure 2.2a: Hand exposure, one holder removed.

- One sample holder removed.
- Hand 30 cm from lamps: allowable daily exposure 6 minutes.
- Face 1.0 m from lamps, allowable daily exposure 18 minutes.

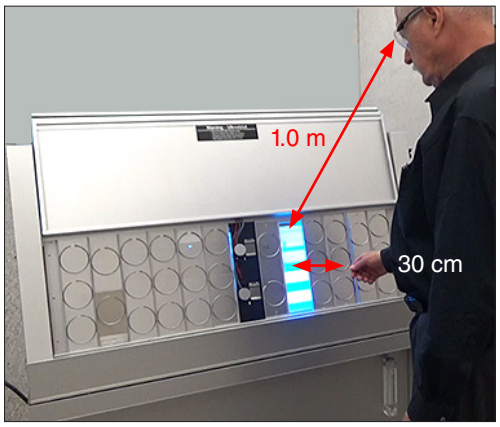


Figure 2.2b: Hand & face exposure, one holder removed.

- All sample holders removed.
- Hand 30 cm from lamps: allowable daily exposure 2 minutes.
- Face 1.0 m from lamps, allowable daily exposure 6 minutes.

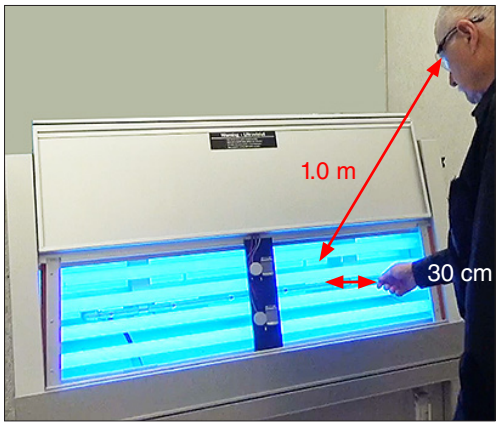


Figure 2.2c: Hand & face exposure, all holders removed.

3. General Description

- This LU-8047-TM QUV Technical Manual provides detailed information on the set up, operation, and maintenance of QUV/basic, QUV/se, QUV/spray, QUV/spray/rp, QUV/cw, and QUV/uvc models.

Overview

- QUV Accelerated Weathering Testers simulate the damaging effects of light, moisture, and temperature on test specimens.
- Fluorescent ultraviolet (UV) lamps simulate natural sunlight or artificial light sources, particularly in the UV region (see Section 8).
  - Specimen UV irradiance is automatically controlled in all QUV models except QUV/basic.
  - In QUV/basic testers, UV Irradiance is controlled by periodic lamp replacement and manual repositioning.
- Rain and dew are simulated by a condensation system and/or a water spray system in all QUV models except QUV/uvc (see Section 9).
- Specimen temperature is controlled in all QUV models (see Section 10).
- In days or weeks QUV testers can produce weathering effects that might occur over months or years of outdoor exposure.
- See Outdoor Weathering Must Verify Accelerated Testing for important considerations when conducting accelerated weathering tests.

QUV Models Description

- QUV/basic: UV light with periodic lamp replacement and manual repositioning, condensation, and single touchscreen user interface.
  - Sections of this manual include images of QUV models with dual touchscreens. Except where noted, all information applies to the single touchscreen QUV/basic as well.
- QUV/se: UV light with SOLAR EYE® irradiance control, condensation, and dual touchscreen user interface.
- QUV/spray: UV light with SOLAR EYE irradiance control, condensation, water spray, and dual touchscreen user interface.
- QUV/spray/rp: UV light with SOLAR EYE irradiance control, condensation, water spray, integrated water repurification system, and dual touchscreen user interface.
- QUV/cw: cool white visible light with SOLAR EYE irradiance control, condensation, and dual touchscreen user interface.
- QUV/uvc: narrowband UVC light with SOLAR EYE irradiance control and dual touchscreen user interface.

Major Components by QUV Model

Schematic drawings (Figure 3a through Figure 3d) point out the major components of each QUV model.

QUV/basic

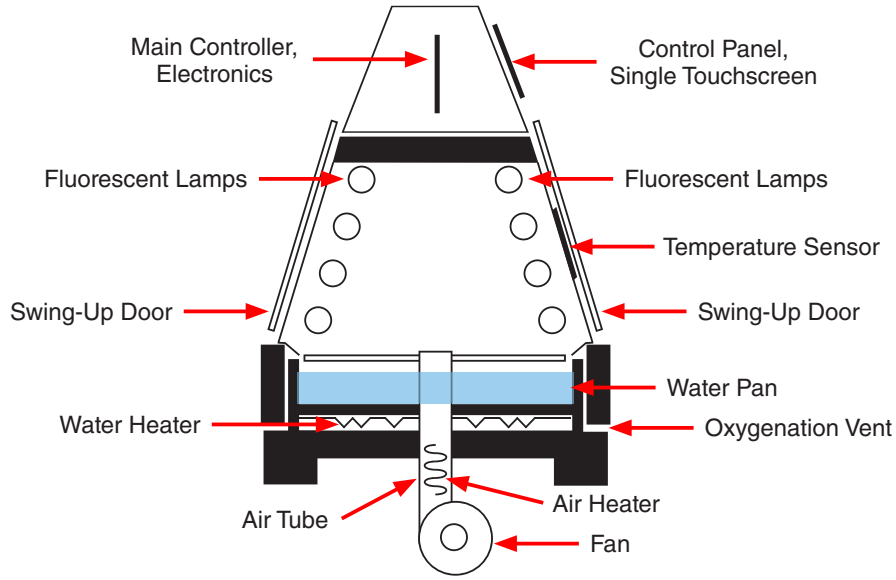


Figure 3a: QUV/basic top assembly cross section showing major components.

QUV/se, QUV/cw

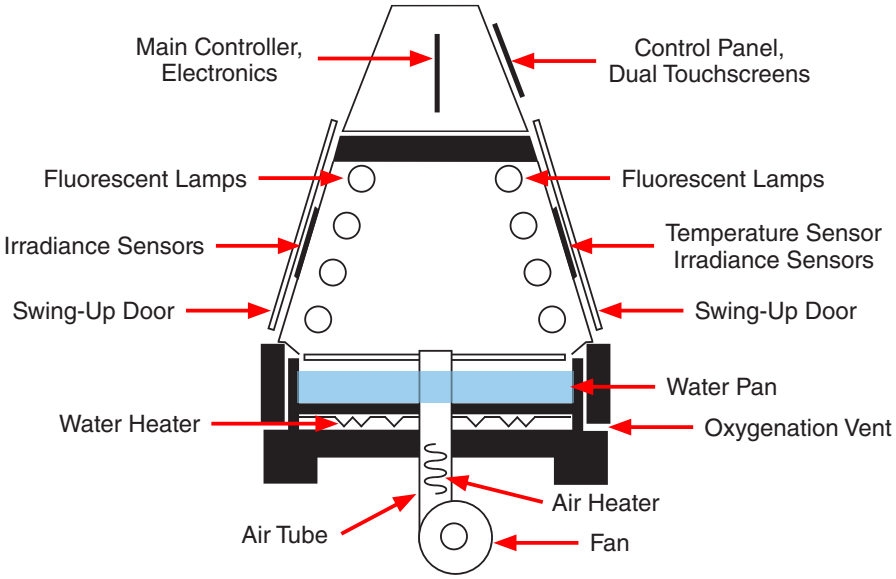


Figure 3b: QUV/se and QUV/cw top assembly cross section showing major components.

QUV/spray, QUV/spray/rp

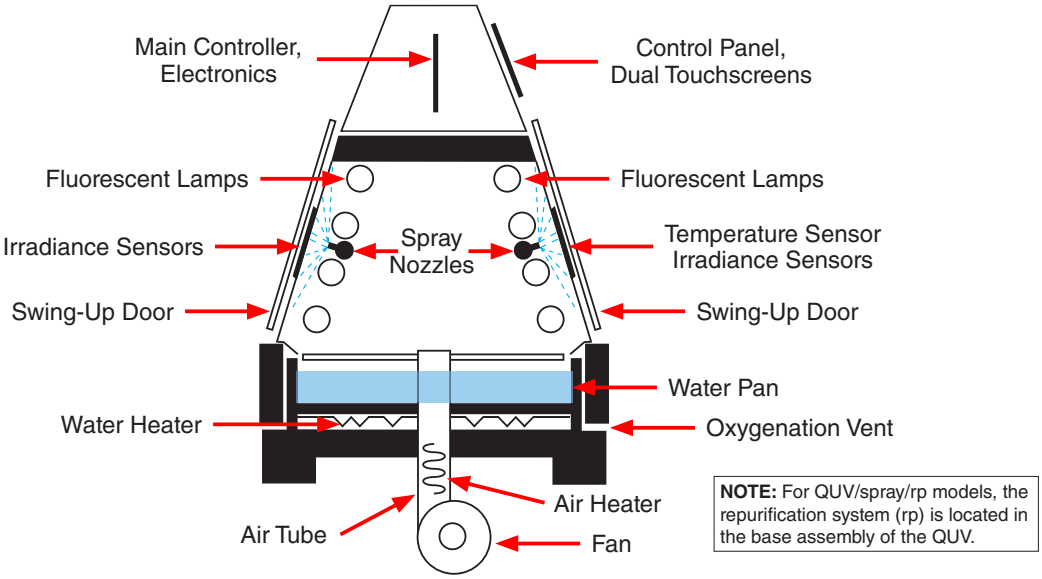


Figure 3c: QUV/spray and QUV/spray/rp top assembly cross section showing major components.

QUV/uvc

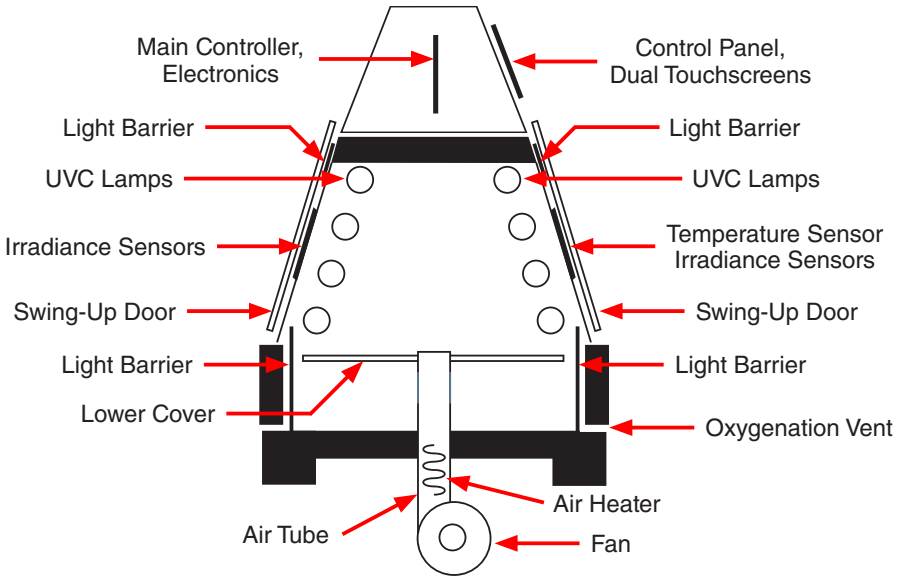


Figure 3d: QUV/uvc top assembly cross section showing major components.

Standard Tests Conducted in QUV Weathering Testers

- The tables below list some of the standard tests that can be performed in a QUV tester.
- Not all QUV models can run all standards listed. Visit Q-Portal Standards Search for details.
- See LU-8012 Standards Met by QUV for additional information on standards met by QUV testers.
- See Section 12.1 for more information on common standard test cycles

General	Automotive	Adhesives & Sealants	Roofing
ASTM G151	Ford FLTM BI 104-02	ASTM C1184	ANSI/RMA IPR-1, -2, -5, -6
ASTM G154	GM 4367M (General Motors)	ASTM C1442	ASTM D3105
BS 2782	GM 9125P (General Motors)	ASTM C1501	ASTM D4434
GB/T 14522	JIS D 0205	ASTM D904	ASTM D4799
ASTM G224	NISSAN M0007	ASTM D5215	ASTM D4811
	RNES B-00107 (Renault, Nissan)	UNE 104-281-88	ASTM D5019
	SAE J2020		BS 903 Part A54 Annex A & D
			CGSB-37.54-M
			EN 534
			EN 1297
			EOTA TR 010

Paints & Coatings	Plastics	Other
ABNT NBR 15.380	ANSI A14.5	AATCC TM 186 (Textiles)
ASTM D4585	ANSI C57.12.28	ASTM E3006 (Photovoltaics)
ASTM D4587	ASTM D1248	ASTM F1945 (Printing Inks)
ASTM D5894	ASTM D4329	Colts Standard Test (Dyes)
EN 927-6	ASTM D4674	GSB AL 631 (Architectural)
GB/T 8013	ASTM D5208	IEC 61215 (Photovoltaics)
GB/T 16585	ASTM D6662	ISO 21898 (Packaging)
ISO 11507	DIN 53384	IEC 60335-1 (Photovoltaics)
ISO 15110	GB/T 16422.3	
ISO 12944-9	ISO 4892-1	
ISO 16474-1, -3	ISO 4892-3	
ISO 20340	JIS K 7350-3	
JIS K 5600-7-8	UNE 53-104	
KS M5982		

4. Operating Environment

The Tester Must Be Located in a Suitable Environment

- QUV Accelerated Weathering Testers 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

Ambient Laboratory Temperature and Humidity

- The recommended laboratory ambient temperature and relative humidity (RH) is 23 ± 5 °C and 50 ± 25% RH.
- Operating outside these conditions can result in temperature, humidity, or other faults.
- Never operate in laboratory ambient conditions >36 °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

Salt Fog or Other Airborne Contamination

NOTE: Figures in this section show QUV models with dual touchscreens.
All information applies to the single touchscreen QUV/basic as well.

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

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

Figure 4.2b: Do not locate QUV 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 the QUV 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

NOTE: Figures in this section show QUV models with dual touchscreens.
All information applies to the single touchscreen QUV/basic as well.

- All QUV testers are shipped in one of two types of crates (Figure 5a and Figure 5b).
- Labels on the crate indicate the location of the instructions to be opened first (Figure 5c).
- Instructions for uncrating and setting up the tester are located in the envelope shown in Figure 5d.

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.

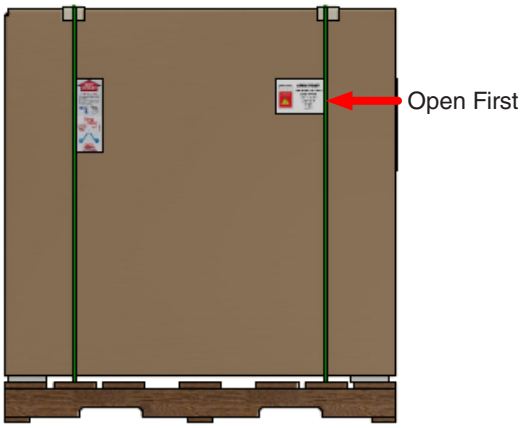


Figure 5a: This Crate has a Carton Banded to a Wooden Skid.

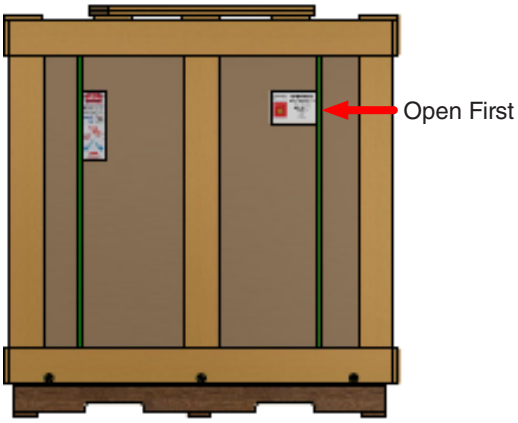


Figure 5b: This Crate has a Wooden Frame Surrounding the Carton.

Figure 5c: Labels on the crate indicate the envelope to be opened first.

Figure 5d: Open this envelope for important uncrating instructions.

Shipping Weight (Approximate)

Packaging	QUV
On Skid With Wooden Crate	181 kg (400 lbs)
On Skid With Carton Only	136 kg (300 lbs)

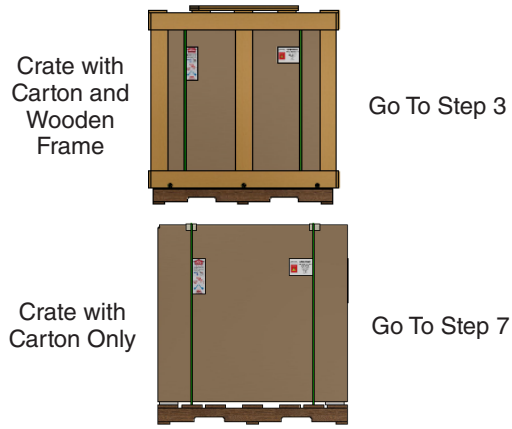
Tools Required

Phillips Screwdriver (Wooden Crate Only)	Flat Blade Screwdriver	Fork Lift*
Pry Bar (Wooden Crate Only)	Utility Knife	Band Cutter

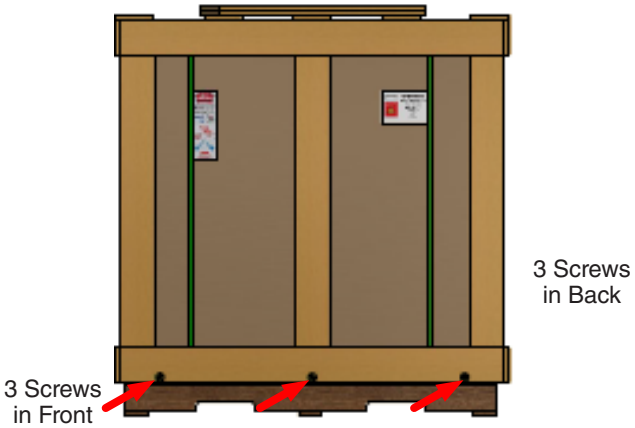
*A fork lift or other mechanical lifting device is recommended for use in moving the crated tester to the installation location, and to lift the frame in one piece from the crate with wooden frame.

Follow the steps below to uncrate the tester.

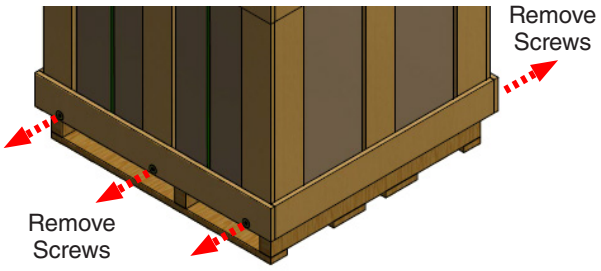
1. Uncrating instructions are located in this envelope. Remove and read the instructions.



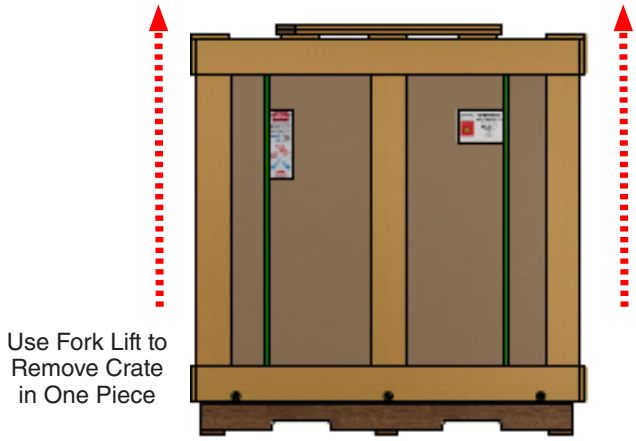
2. For crate with wooden frame continue with Step 3. For crate with carton only, go to Step 7.



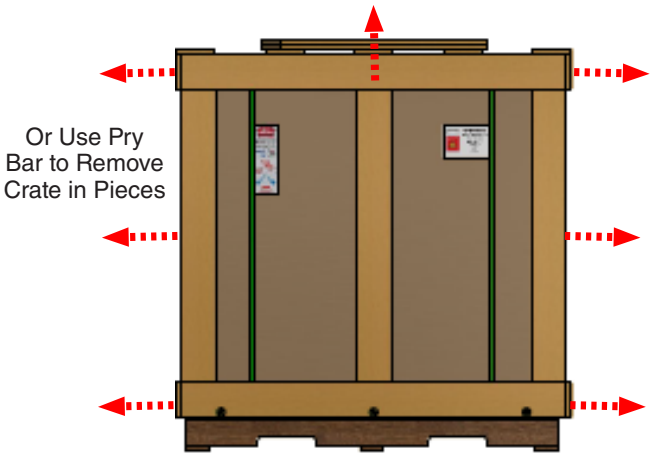
3. Locate the three (3) Phillips screws in the bottom front and three (3) screws back horizontal boards.



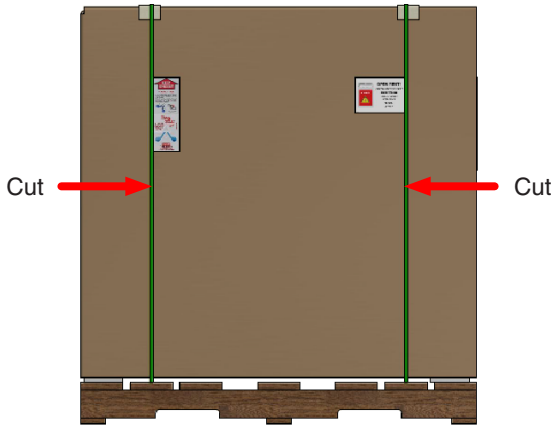
4. Remove all six (6) screws.



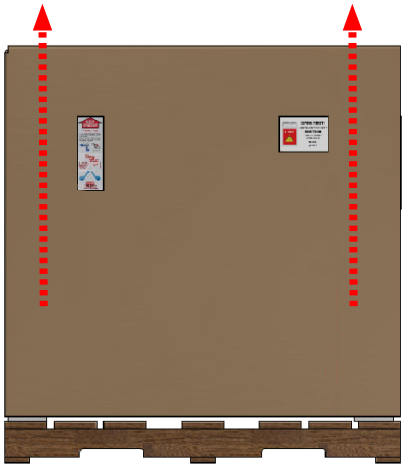
5. If a fork lift is available, use it to carefully lift the wooden frame up and off of the tester.



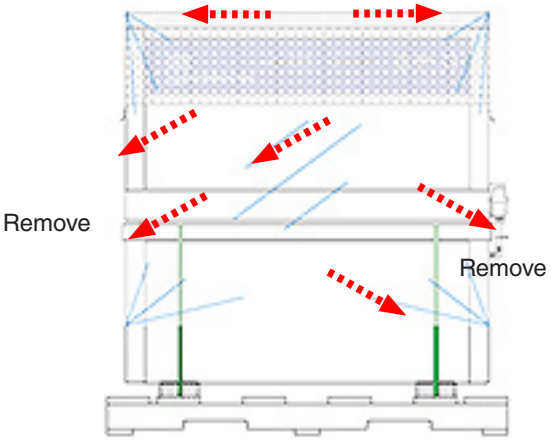
6. If a fork lift is not available, use a pry bar to carefully remove the horizontal and vertical wooden pieces from the tester.



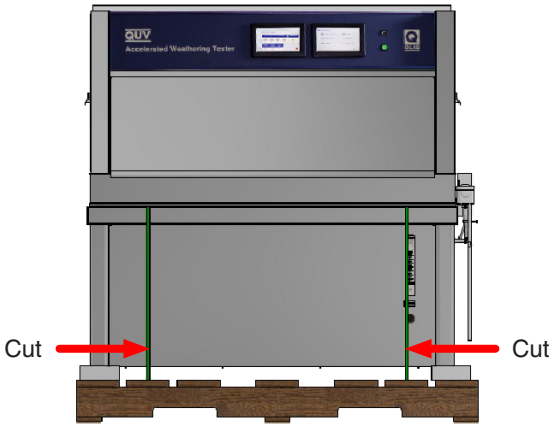
7. Cut the straps holding the carton to the skid. Remove the bands.



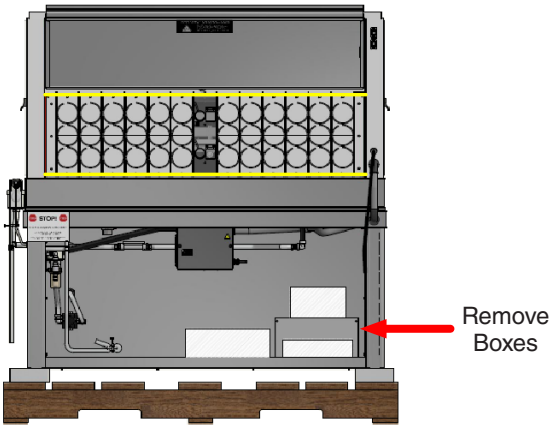
8. Carefully lift the carton up and off of the tester.



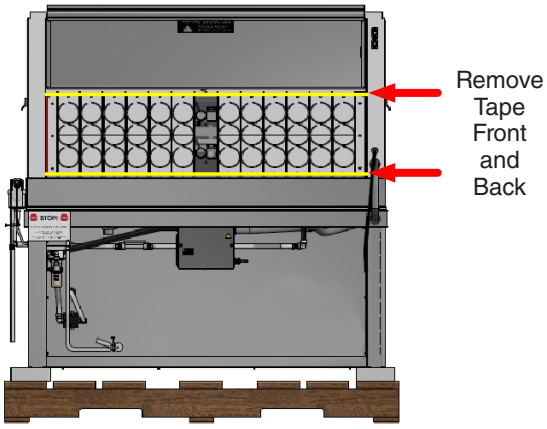
9. Remove all plastic wrap and foam from around the tester.



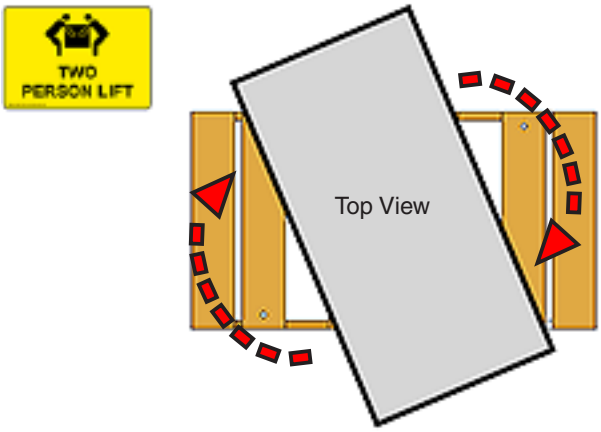
10. Cut the straps holding the tester to the skid. Remove the bands.



11. Remove boxes of accessories in the bottom of the tester.



12. Remove the tape from the specimen holders in front and back of the tester.



13. Use 2 persons to rotate the tester diagonally on skid as shown.

14. Locate four (4) leveling casters in the boxes.

15. Thread the casters into the caster inserts in the four (4) tester legs.

16. Use 2 persons to carefully remove the tester from skid. Continue with Section 6 for tester setup.

6. Setup

- Figures in this section show QUV models with dual touchscreens. Except where noted, all information applies to the single touchscreen QUV/basic as well.

6.1. Dimensions and Space Requirements

Dimensions

- The external dimensions for QUV testers are shown in Figure 6.1a.
- Dimension A does not apply to the QUV/uvc because it doesn't have the water feed assembly.
- Dimension D, tester height, can vary slightly (< 2.5 cm) due to adjustment to the tester leveling casters or feet.

A	137 cm (54.0")
B	131 cm (51.5")
C	52 cm (20.5")
D	136 cm (53.5")

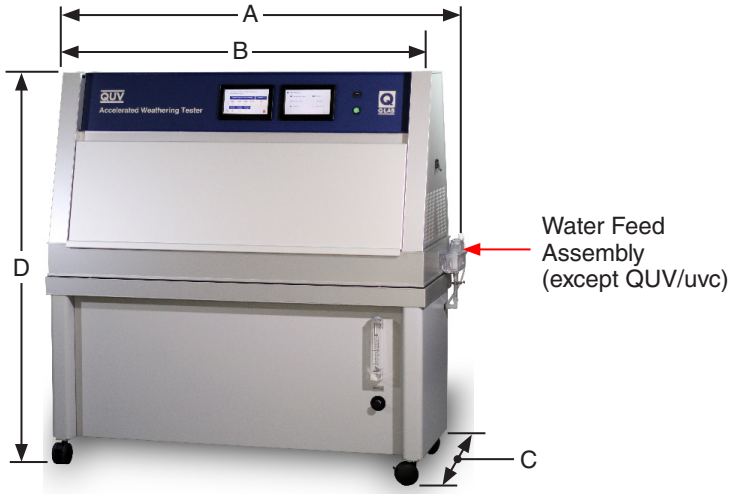


Figure 6.1a: External dimensions.

Space Requirements

- The testers should be positioned as shown in the Figure 6.1b schematic.
- Positioning testers as shown will allow sufficient room to operate each unit, gain access to service areas, and provide proper ventilation through the air intake and exhaust vents.

A	60 cm (24.0")
B (minimum)	15 cm (6.0")
B (recommended)	30 cm (12.0")

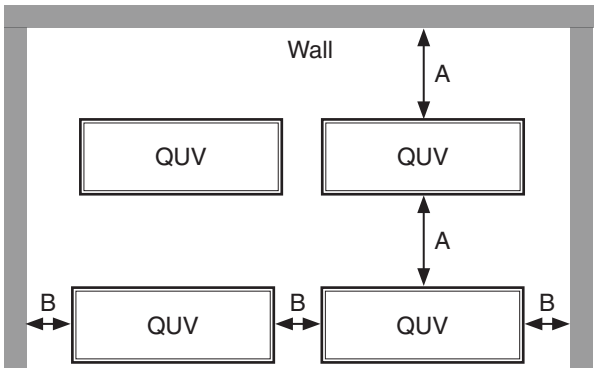


Figure 6.1b: Tester space requirements (top view).

6.2. Leveling

Casters

- For optimal specimen testing, it is important for the QUV tester to be level.
- Leveling casters are supplied as standard equipment on all QUV testers (Figure 6.2a)
- The casters are installed on the tester during uncrating (see Section 5).
- Each leveling caster can be adjusted up to 1.6 cm (5/8"). A locknut is included to lock the leveling caster in place.
- A bubble level is located on the top of the tester to make leveling easier (Figure 6.2b).

Figure 6.2a: Leveling casters are standard.

Figure 6.2b: Bubble level location.

Optional Leveling Feet

- The leveling casters can be replaced with the leveling feet field replacement kit (F-8977-K) (Figure 6.2c).
- The leveling feet fit in the same insert as the leveling casters and have an adjustment range of approximately 4 cm (1.56").
- Contact Q-Lab for more information.

Figure 6.2c: Optional leveling feet.

Optional Earthquake Restraints

- An optional earthquake restraint kit (CV-60450-K) is available to secure the QUV tester to the floor (Figure 6.2d).
- The restraints must be used in conjunction with the optional leveling feet (F-8977-K).
- The restraints fit around the threaded stem of the leveling feet and are bolted to the floor. See **NOTE** below.

NOTE: Requires installation of eight (8) threaded studs (not supplied) in floor. Contact Q-Lab for information.

Figure 6.2d: Optional earthquake restraints.

6.3. Electrical

Voltage:

- Shown on the nameplate, tester operating voltage is 120 V or 230 V, ± 10% (Figure 6.3).
- To accommodate Japanese incoming power supplies, testers can be equipped to run on non-standard 100 V and 200 V input voltages
  - o Transformer kits to boost 100 V and 200 V input power to tester standard 120 V and 230 V are available as factory-installed or field-installed options.
  - o Electrical characteristics of 100 V and 200 V models are the same as the respective 120 V and 230 V models except, as shown in the tables below, current is 20% higher and wiring colors vary.

Voltage Transformer Kits:

Voltage		Part Number *	
Input	**Output**	**Field Installed**	**Factory Installed**
100 V	120 V	V-149-K	V-149-INST
200 V	230 V	V-149.1-K	V-149.1-INST

***** Contact Q-Lab for information on 100 V and 200 V transformer kits.

Transient Over Voltage: Installation Category II of transient over-voltages.

Current:

QUV Model	100 V	120 V	200 V	230 V
SOLAR EYE models	19 A	16 A	9 A	8 A
/basic	17 A	14 A	8A	7 A

Short Circuit Current Rating 1000 A

Frequency: 50/60 Hz

Circuit Protection: Built-in breaker, 20 A for 100/120 V machines and 10 A for 200/230 V machines.

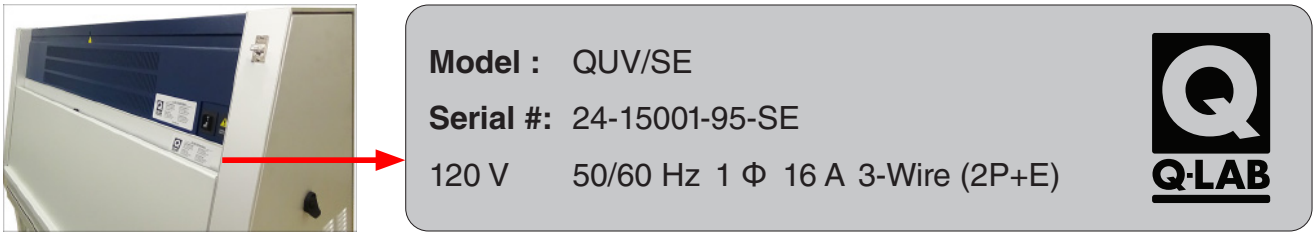


Figure 6.3: The nameplate located at the QUV rear right lists tester electrical specifications.

Power Cable:

- A power cable **with** 3-prong grounding plug is provided for 120 V testers.
- A power cable **without** plug is provided for 230 V testers. See table below.
- For 230 V testers the customer must supply the appropriate plug.
- 100 V and 200 V power cables are provided **without** plugs.
- A qualified electrician should make all electrical connections to the tester.

QUV Model	Voltage	Plug Included	Length	Wire Gauge	Part #
/basic	120 V	Yes	4.877 m 16.0 ft.	12	V-60128-X
	230 V	No		16	V-60048-X
All Except /basic	120 V	Yes		12	V-60047-X
	230 V	No		16	V-60048-X

Wire Color:

	Voltage	
	100 / 120 / 200 V	**230 V**
Power	Black	Brown
Neutral	White	Blue
Safety Earth Ground	Green	Green/Yellow

Electrical Connection:

- Although a Main Power Switch is provided at the rear of the unit, the specified means for disconnecting the AC Main supply circuit is the plug on the power supply cord.
- If the plug is not easily accessible for this purpose, then an external Disconnect Switch must be provided in the installation.
- To avoid nuisance tripping, Q-Lab does not recommend the use of Ground-Fault Circuit Interrupters (GFCI) circuit breakers with QUV testers.
- Contact Q-Lab for situations where local regulations require GFCI or other external electrical protection.

6.4. Water

- Water in the form of condensation and spray is used extensively in accelerated weathering testing.
- This section details QUV water supply connections, purity and drainage requirements.
- The QUV/basic, QUV/se, QUV/cw, QUV/spray, and QUV/spray/rp models all produce condensing humidity.

o QUV/basic, QUV/se and QUV/cw models can be supplied with normal tap water.

o Some tap water may produce mineral deposits in the water pan, requiring more frequent cleaning and maintenance. To reduce any deposits, a reverse osmosis / deionized (RO/DI) water system may be necessary. See Purity on page 28 for more information on effective RO/DI systems.

- QUV/spray and QUV/spray/rp models also deliver water spray to specimens.

o QUV/spray and QUV/spray/rp models require a purified water supply. See Purity on page 28.

- The QUV/uvc model does not require a water supply.

QUV/se, QUV/cw

Supply Connections

- The water supply connects to the water feed assembly at the right rear side of the tester (Figure 6.4a and Figure 6.4b).
- Connect the water supply to the QUV water feed valve with 1/4" plastic tubing (included in CV-255-K), or 6 mm plastic tubing (included in CV-60131-K). See Figure 6.4b.
- Alternatively, 6 mm (1/4") copper tubing can be used.
- The water supply line should be equipped with a shutoff valve.

Figure 6.4a: QUV water supply connection location.
NOTE: QUV/uvc does not have a water connection.

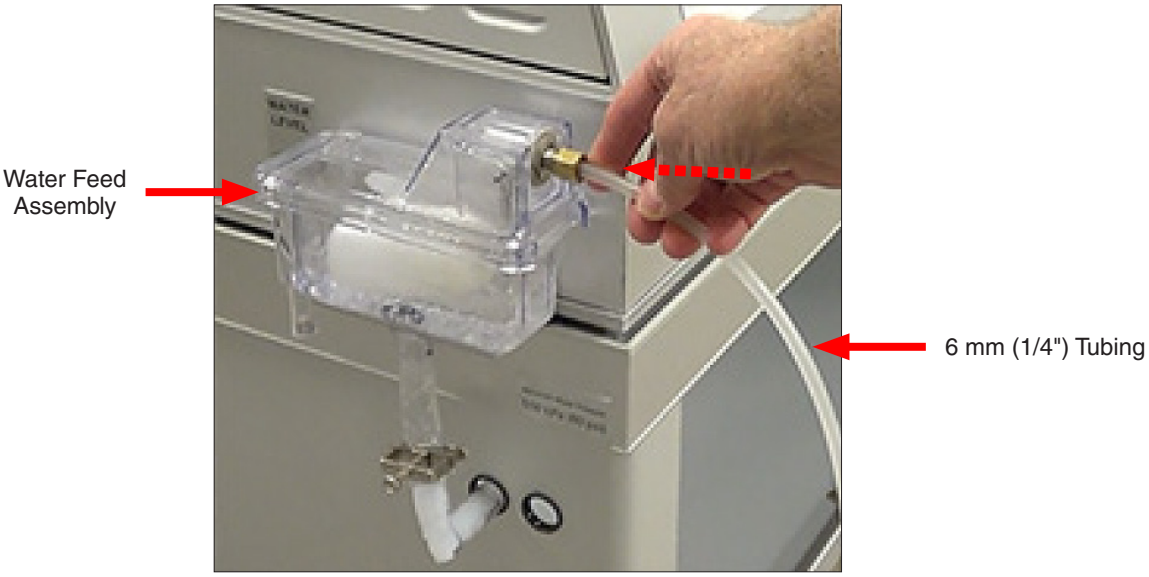


Figure 6.4b: Water supply connection.

Water Level Adjustment

- Level the QUV tester.
- The water level in the water pan should be 10 mm to 15 mm high (Figure 6.4c).
- At this level, the water pan holds approximately 9 liters of water.
- See CV-222-L for information on adjusting the water level.

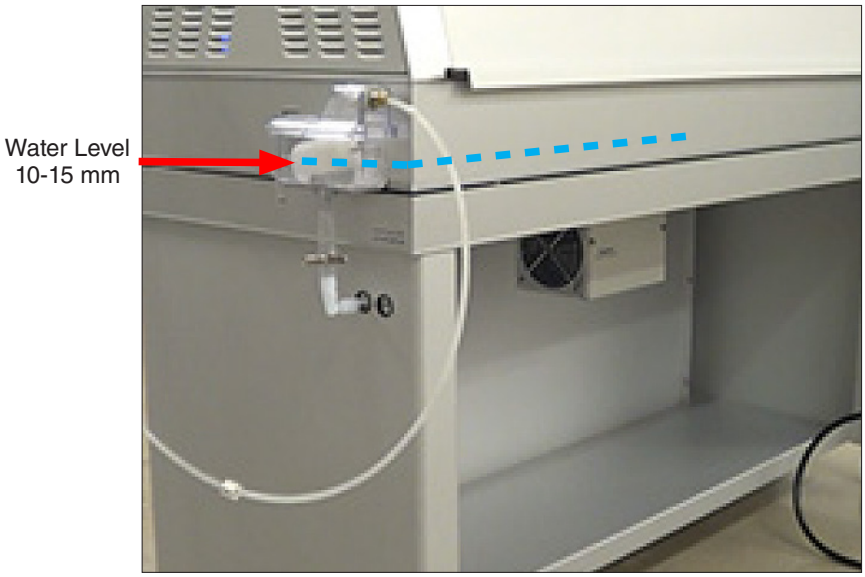


Figure 6.4c: Water level for all models without spray.

QUV/spray

Supply Connections

- The QUV/spray water supply connects to the solenoid valve assembly at the left rear of the tester.
- Three options are available to connect the water supply to the QUV/spray (see Figure 6.4d through Figure 6.4f).
  1. Connect a ½" supply hose over the supplied hose barb and secure it with a hose clamp.
  2. Connect a ½" supply tube into the push lock elbow.
  3. Connect a ½ mm supply tube using the supplied tube adapter (Part # U-40816-X, 230 V testers only).
- Connections between QUV/spray and the water supply should be stainless steel or plastic.

Connection Location

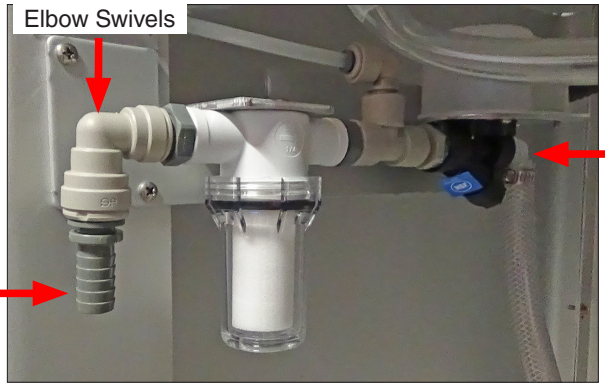


Figure 6.4d: Hose barb for ½" inch water supply hose.

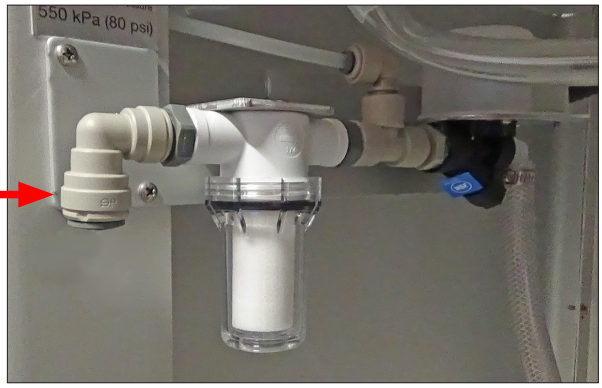


Figure 6.4e: Push lock elbow for ½" water supply tube

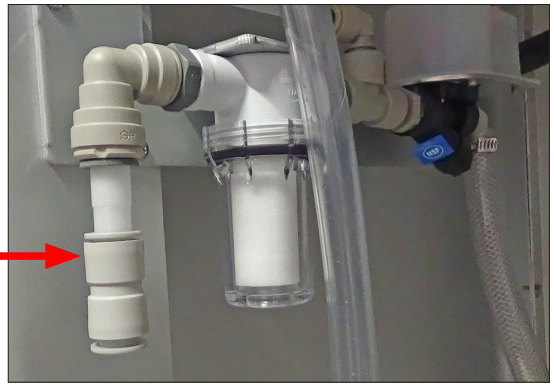


Figure 6.4f: Tube adapter for 12 mm water supply tube.

QUV/spray/rp (Integrated Repurification System)

Supply Connections

- Connect a 6 mm (1/4") water supply tube to the union tee on the water feed assembly (Figure 6.4g).
- Connections between QUV/spray and the water supply should be stainless steel or plastic.

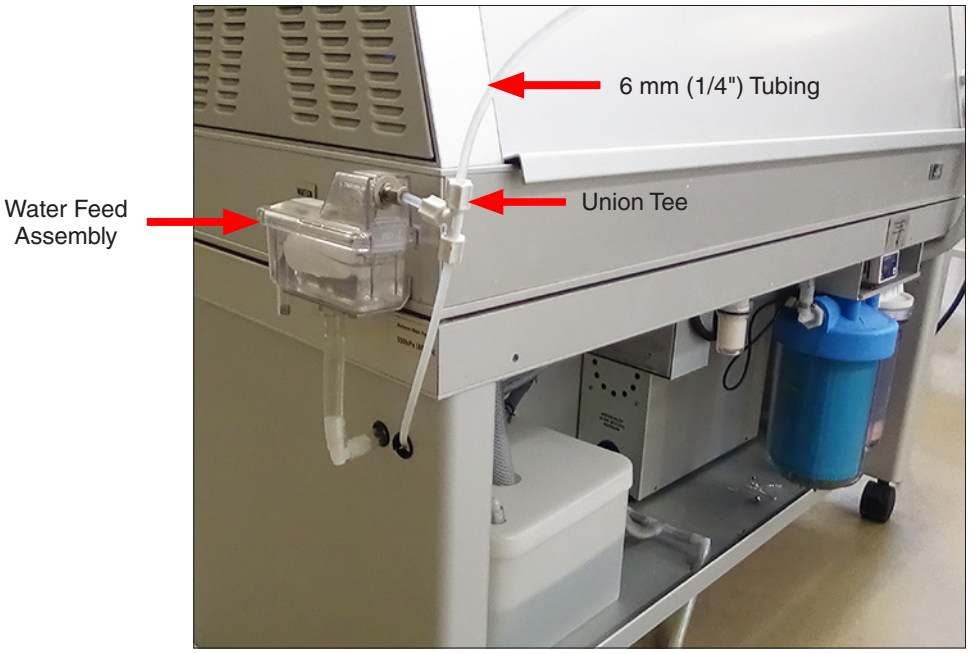


Figure 6.4g: Water supply connection for QUV/spray/rp testers.

Water Level Adjustment - All Spray Models

- Level the QUV tester.
- The water level in the water pan is normally 10 mm to 15 mm, except after a spray step when it will be 25 mm (Figure 6.4h).
- See CV-222-L for information on adjusting the water level.

Figure 6.4h: Normal and after spray water levels.

Purity

- **IMPORTANT** The tester **warranty is voided** if water purity requirements are not met.
- QUV models with water spray require much higher water purity than testers with no water spray.
- Figure 6.4i lists purity requirements for QUV models requiring a water supply. The QUV/uvc does not require water.

Model	Pressure	Condensation Volume	Spray Volume	Resistivity	Conductivity	Total Dissolved Solids	pH
QUV/spray	2.8-5.5 bar (40-80 psi)*	5.0 liters/day	7.0 liters/min	>200 kΩ•cm	<5.0 µS/cm	<2.5 ppm	6-8
QUV/spray/rp	0.2-5.5 bar (2-80 psi)		7.0 liters/min**				
QUV/basic QUV/se QUV/cw			NA	Tap Water***			

Figure 6.4i: Water Purity Requirements

* The system pressure must be ≥ 45 psi when a spray step is running.
The system pressure is typically higher when there is no flow and then drops when the flow is on.

** For QUV/SPRAY/RP systems actual water use is 0 liters/min because all the spray water is recirculated.

*** Hard tap water, which has a high concentration of heavy ions, or tap water treated with a 'water softener', which replaces heavy ions with sodium ions, will produce mineral deposits in the water pan, requiring more frequent cleaning or possible replacement. To reduce these deposits, a RO/DI water system may be necessary.

- The reverse osmosis / deionized (RO/DI) water system shown in Figure 6.4j produces water pure enough for spray systems.
- T**his type of RO/DI system is required for water spray in QUV 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 6.4j 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.

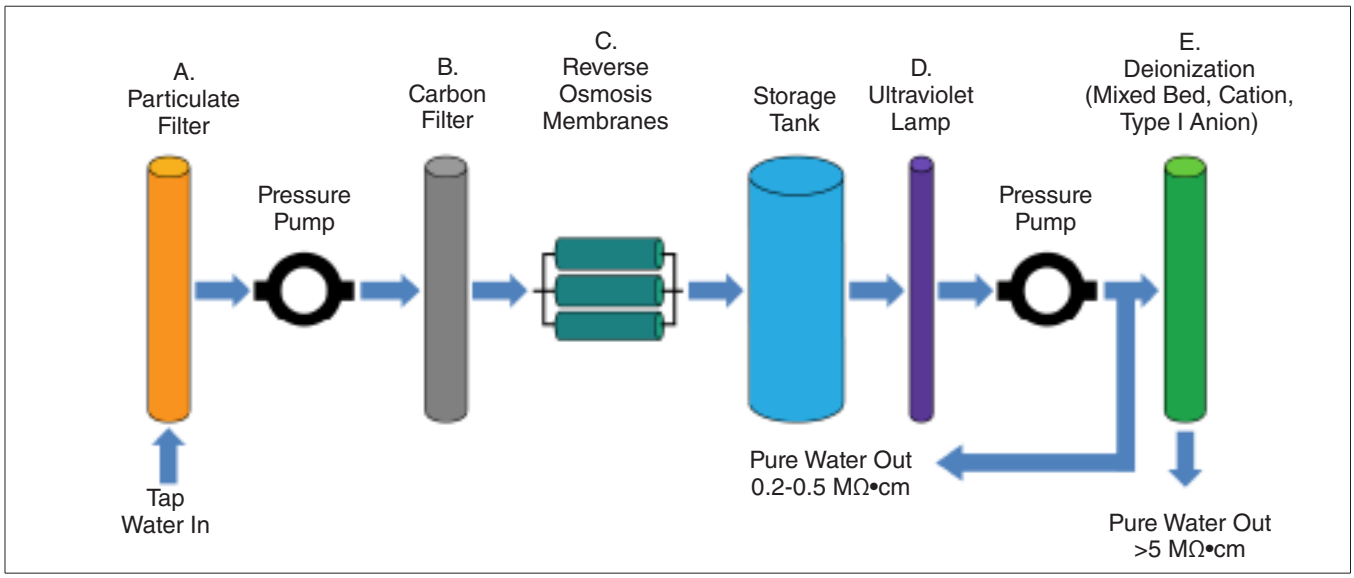


Figure 6.4j: Reverse Osmosis / Deionized water system.

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 MΩ•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 MΩ•cm	Final polished water purity

Drains

Water Pan Cleaning Drain (All Models Except QUV/uvc)

Turn off water supply and unclamp the water pan cleaning drain to empty the water pan (Figure 6.4k).

Water Feed Overflow Drain (All Models Except QUV/uvc)

The 12 mm (1/2") supplied hose should be connected to the water feed overflow drain and run to a floor drain (Figure 6.4k).

Water Pan Drain (QUV/spray)

32 mm (1-1/4") drain hose supplied.

Connect to the fitting under the water pan and secure with a hose clamp (Figure 6.4l).

Repurification System Drain (QUV/spray/rp)

12 mm (1/2") drain hose supplied. Connect to the repurification system drain and run to a floor drain (Figure 6.4m).

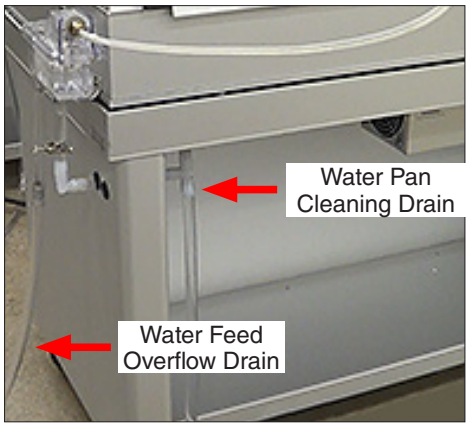


Figure 6.4k: QUV/basic, QUV/se, QUV/cw

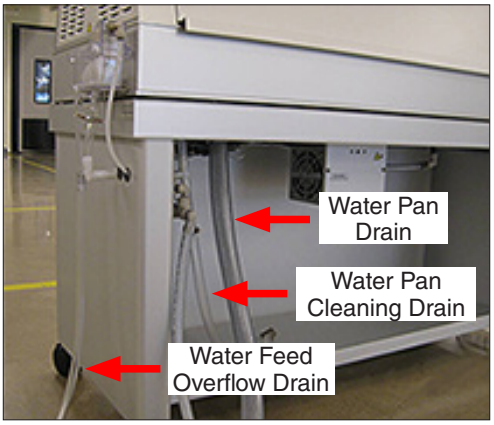


Figure 6.4l: QUV/spray

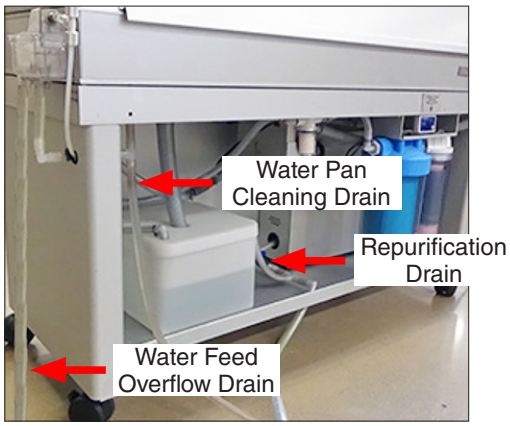


Figure 6.4m: QUV/spray/rp

7. Functions

- In QUV accelerated weathering testers, specimens are exposed to a series of different weathering functions in a repetitive cycle that emulates natural environments.
- Environments are simulated via a set of user-programmable function steps in a test cycle.
- Test cycles can include one or more steps of these weathering functions:
  - Ultraviolet (UV) Light, Section 7.1
  - Condensation (except QUV/uvc), Section 7.2
  - UV + Condensation (except QUV/uvc), Section 7.3
  - Spray (QUV/spray and QUV/spray/rp Only), Section 7.4
  - UV + Spray (QUV/spray and QUV/spray/rp Only), Section 7.5
  - Dark, Section 7.6
- In addition to weathering functions, the following test cycle functions are provided by the main controller:
  - Repeat Steps (Subcycle), Section 7.7
  - Final Step, Section 7.8
- A test cycle can have multiple subcycles; however, the total number of steps, including the step (or steps) that defines the subcycle (or subcycles), is limited to 25.
- All function test conditions, timing, and cycle repetition are controlled by the QUV main controller (Section 11).
- Dual full-color touchscreens (single touchscreen for QUV/basic) provide for easy tester programming and operation (Section 11.3 and Section 11.4).
- The operator can quickly create new cycles by specifying functions (Figure 7), or run any of the programmed cycles.
- See *LF-8047-SO QUV System Overviews* for additional information on QUV functions.
- Visit Q-Lab.com for a detailed overview of QUV capabilities as well as a complete catalog of available QUV documentation.

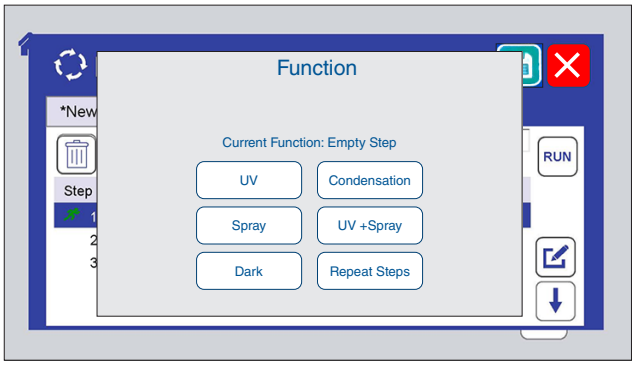


Figure 7: Touchscreen display for selecting test cycle function.
Spray and UV+ Spray functions available for QUV/spray and QUV/spray/rp only.
See Section 11.7.4 for detailed programming instructions.

7.1. UV Light

- During UV steps, the UV lamps (Section 8.1) and the ballast cooling fans are on at all times.
- The panel temperature is maintained at the UV temperature set point by control of the air heater. The air heater fan runs continuously during a UV step.
- The panel temperature sensor (Section 10.4) monitors the panel temperature.
- All QUV models except QUV/basic have SOLAR EYE® UV irradiance control.
  - Four irradiance sensors (Section 8.2) are used to monitor UV intensity generated by the lamps. Each sensor monitors two lamps.
  - The main controller adjusts the power to the lamps to keep the irradiance at the set point.
  - The main controller generates Notifications (Section 11.5) if irradiance deviates from the acceptable range.
- QUV/basic tester UV Irradiance is controlled by periodic lamp replacement and repositioning (see Section 16.1).
  - QUV/basic UV irradiance can be measured using an optional UC-110070-K UV Measurement Kit and a UC1 Handheld Display. Contact Q-Lab Repair and Tester Support for more information.

7.2. Condensation

- During Condensation steps, the water heater heats the water in the water pan to generate water vapor (Section 9.1).
- Water is supplied to the tester through the water feed assembly. Ordinary tap water can be used for condensation in models without spray (QUV/basic, QUV/se, and QUV/cw).
- Models with the Spray function (QUV/spray and QUV/spray/rp) must use purified water (Section 6.4).
- QUV/uvc testers do not have a condensation function and do not require a water supply (see Section 3, Figure 3d).
- The test panels form the chamber walls; the back sides of the panels are exposed to room temperature air.
- Room air on the back side of the panels cools the panels so that they are cooler than the vapor temperature generated inside of the QUV tester.
- The temperature difference causes the water vapor to condense on the test panels, which produces liquid water that runs off the test panels and returns to the water pan.
- The panel temperature is maintained at the condensation temperature set point by control of the water heater.
- Water temperature is monitored by the water temperature sensor (Section 10.3) to ensure that the water temperature remains in the specified range.

7.3. UV + Condensation

The UV + Condensation function is not available by default, but can be activated setting the X53 Machine Configuration parameter to “Yes”. See Machine Configuration on page 73.

- UV + Condensation steps are the same as Condensation steps except that the lamps and ballast fans are on.
- During UV + Condensation steps, irradiance control is identical to that used in a UV step.
- Panel temperature control is identical to that used in a Condensation step.

7.4. Spray

- The Spray function is available only in QUV/spray and QUV/spray/rp models (Section 9.2).
- During Spray steps, purified water (see Section 6.4) is sprayed into the test chamber through twelve spray nozzles (six nozzles on either side of the tester).
- Water pressure is set by a pressure regulator and a flow meter monitors the water flow rate. A water spray flow switch will detect when the water is being sprayed into the test chamber.
- During a spray step water may be pulsed instead of run continuously in order to reduce water usage. Tester parameters X49 (Spray On time) and X50 (Spray Off time) describe the water pulse operation (see Section 11.7, Machine Configuration).
  - A water repurification system (Section 15.3) is available to conserve spray water by re-purifying and re-circulating the purified water.
- There is no temperature control and no UV light in a Spray step. The water and air heaters are shut off.

7.5. UV + Spray

The UV + Spray function is not available by default, but can be activated by setting the X36 Machine Configuration parameter to “Yes”. See Machine Configuration on page 73.

- The UV + Spray function is available only in QUV/spray and QUV/spray/rp models.
- UV + Spray steps are the same as Spray steps, except that the lamps and ballast fans are on.
- During UV + Spray, irradiance control is identical to a UV step.
- There is no temperature control during a UV + Spray step. The air heater and water heater are off.

7.6. Dark

- During Dark steps, the lamps and ballast fans are turned off.
- The chamber blower is on during this step and the panel temperature is maintained at the UV temperature set point by control of the air heater.

7.7. Repeat Steps

- A Repeat Steps (subcycle) step specifies that two or more subsequent steps will be repeated two or more times before the cycle proceeds beyond them.
- A subcycle can not be placed within another subcycle.

7.8. Final Step

- Every test cycle must have a “Final - Go to step 1” step (Figure 7.8).
- The final step function indicates where the test cycle should loop back and repeat.
- When a new (empty) cycle to created, the “Final - Go to step 1” is automatically inserted in the cycle

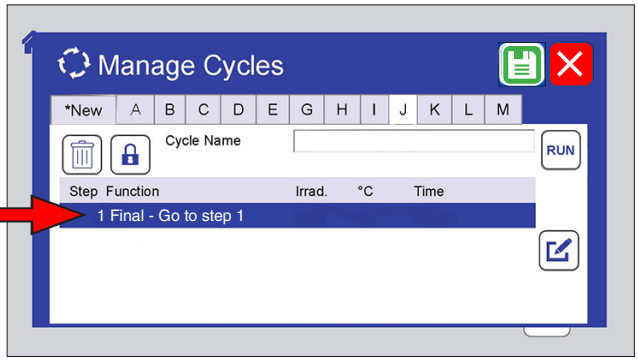


Figure 7.8: An empty cycle is created with only a final step (Section 11.7.7).

8. Ultraviolet (UV) Light System

8.1. Lamp Types

Q-Lab offers the lamp types listed below for QUV testers:

- **UVA-340:** The UVA-340 provides the best possible simulation of sunlight in the critical short wavelength region from 365 nm down to the solar cutoff of 295 nm.
  - Its peak emission is at 340 nm.
  - These lamps are recommended for use at typical and low irradiances.
- **UVA-340+:** The UVA-340+ lamp delivers the same light spectrum as the UVA-340 lamp, plus extended lifetime at high irradiance.
  - These lamps are recommended for use at typical and high irradiances.
  - These lamps are not recommended for use in the QUV/basic.
- **UVA-351:** The UVA-351 simulates the UV portion of sunlight filtered through window glass.
- **UVB-313EL+:** Substantially higher UV than UVA-340 and UVA-340+ lamps, with wavelengths as short as 275 nm and peak emission at 313 nm. The UVB-313EL+ lamp delivers nearly the same light spectrum as the discontinued UVA-313EL lamp, plus extended lifetime at high irradiance. See Section 12.2.
  - The UVB-313EL+ often delivers faster test results than UVA-340 and UVA-340+ lamps.
  - Some QUV/basic users who need to match historical results may require UVB-313EL lamps. Contact Q-Lab.
- **QFS-40:** Also known as FS-40 or F40 UVB, the original QUV lamp. FS-40 lamps are still specified in some automotive test methods, but UVB-313EL+ lamps can deliver the same performance.
- **TUV-421:** TUV-421 lamps deliver an extended spectrum from long-wavelength UV to short-wavelength visible light.
  - These lamps match natural sunlight well up to about 450 nm.
  - TUV-421 lamps may deliver results that correlate well with full-spectrum xenon arc testing and outdoor weathering.
  - For materials sensitive to longer-wavelength UV and shorter-wavelength visible light, TUV-421 lamps may offer an alternative to xenon arc testing for those materials.
- **UVC-254:** *For use in QUV/uvc models only*, UVC lamps deliver high-intensity, monochromatic, short-wave UV light at 254 nm, which is well below the solar cut-on.
  - This wavelength represents the most common type of UVC emission used for disinfection of surfaces exposed to harmful bacteria and viruses.
  - While it can kill these pathogens effectively, UVC light can also cause photodegradation of plastics, coatings, and fabrics.
  - UVC lamps reproduce this damaging irradiance, in order to evaluate durability of materials exposed to UVC light.
- **Cool White Lamps:** Cool white lamps are commonly used in commercial, retail, and office environments. The same cool white lamps can be used in the QUV/cw but at much higher intensities to test for indoor photostability of materials.

Do Not Mix Different Types of Lamps: All 8 lamps installed in a QUV tester must be of the same type.

NOTE: Irradiance values will vary between testers and decrease over the lifetime of the lamps.

- See LU-0819 QUV Specification Bulletin for the most recent QUV lamp irradiance ranges and warranty information.
- See LU-8160 A Choice of Lamps for the QUV Accelerated Weathering Tester for additional information on QUV lamps.

Figure 8.1a through Figure 8.1e show the spectral power distribution for QUV lamps as compared to sunlight.

UVA Lamps

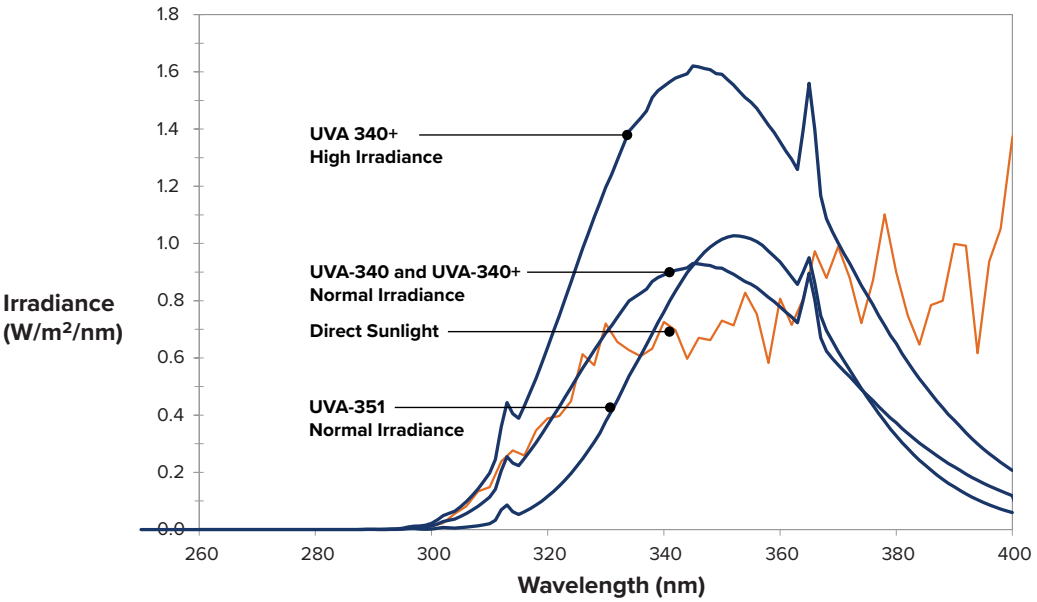


Figure 8.1a: UVA-340, UVA-340+, and UVA-351 lamps compared to sunlight.

UVB Lamps

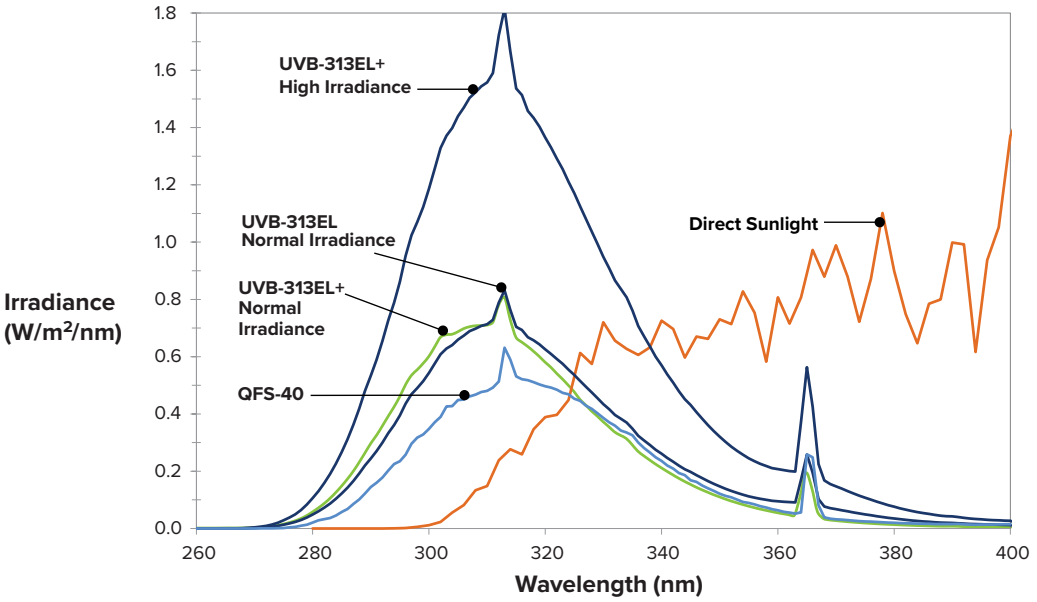


Figure 8.1b: UVB-313EL+ (and legacy QFS-40) lamps compared to sunlight.

TUV-421 Lamps

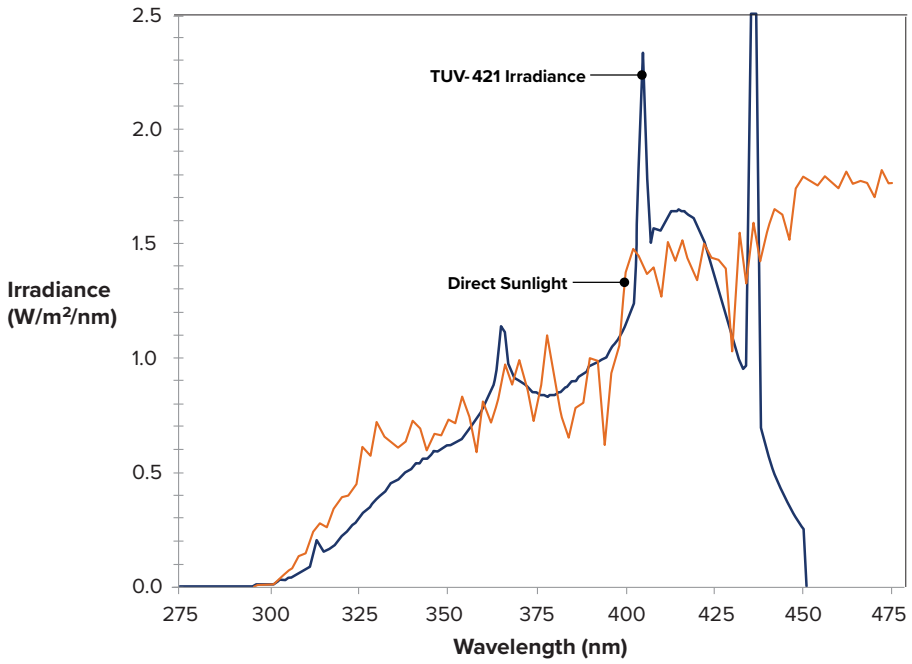


Figure 8.1c: TUV-421 lamps compared to sunlight.

UVC-254 Lamps

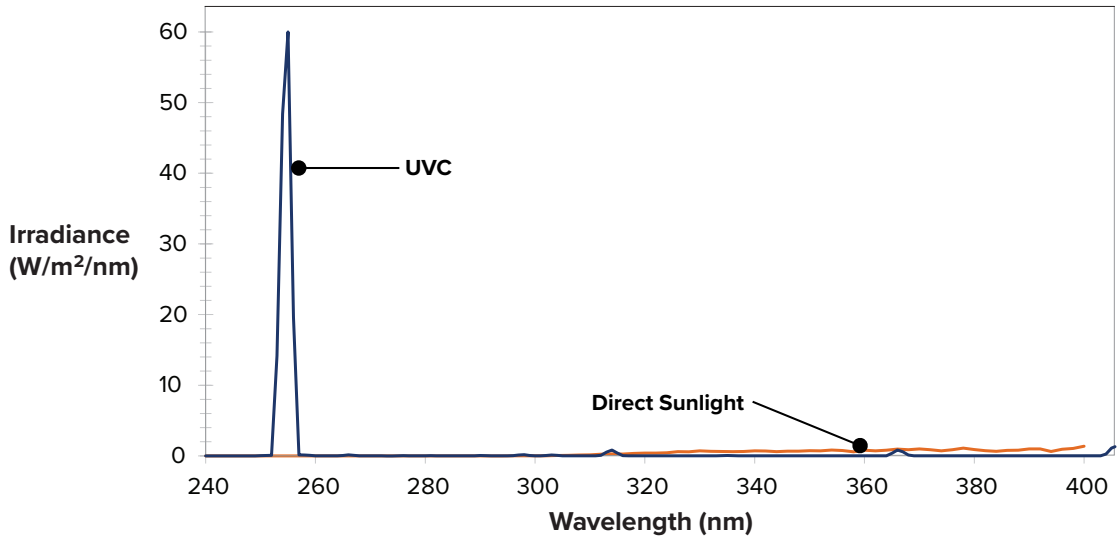


Figure 8.1d: UVC-254 lamps compared to sunlight.

Cool White Lamps

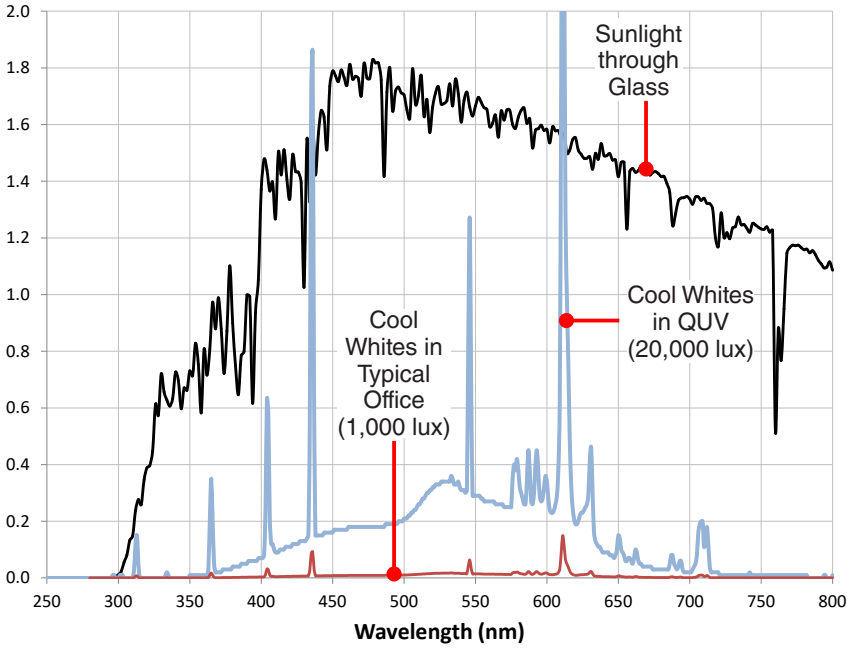


Figure 8.1e: Cool White lamps compared to sunlight.

8.2. Irradiance Control

- For all models except QUV/basic, an irradiance control system (SOLAR EYE) monitors and maintains the UV intensity via four sensors in the specimen plane (Figure 8.2a and Figure 8.2b).
- There are two sensors on the front and two sensors on the back of the QUV tester. Each sensor monitors the irradiance of two lamps
- The UV sensors are located on black panels in the center of the specimen exposure area (Figure 8.2b).
- A four-channel feedback loop system compensates for any irradiance variability by adjusting the power to the lamps.
- The main controller adjusts the power to each pair of lamps to maintain the programmed irradiance (see Section 11).
- For more information see Q-Lab Bulletin LU-8010, Controlled Irradiance in Laboratory Weathering.
- QUV/basic tester is not equipped with SOLAR EYE; irradiance is controlled by periodic lamp replacement and repositioning (see Section 16.1).
- Each sensor must be calibrated separately. See Section 13.1 for calibration instructions.

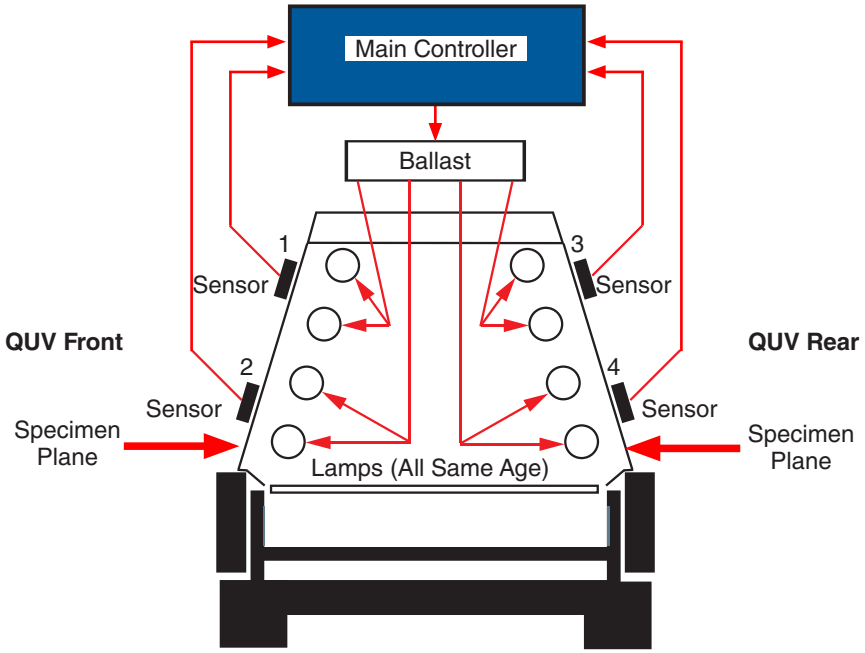


Figure 8.2a: Irradiance control system schematic.

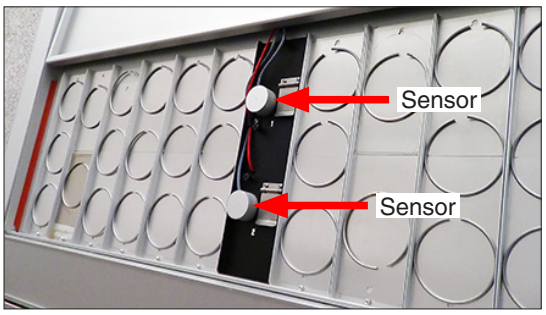


Figure 8.2b: UV sensor locations: two (2) in front specimen exposure area and two (2) in rear (not shown)

8.3. Lamp Cooling

- Fans at each end of the control housing cool the ends of the lamps for maximum efficiency (Figure 8.3).
- The figure shows a QUV model with dual touchscreens; lamp cooling in the single touchscreen QUV/basic model is exactly the same.

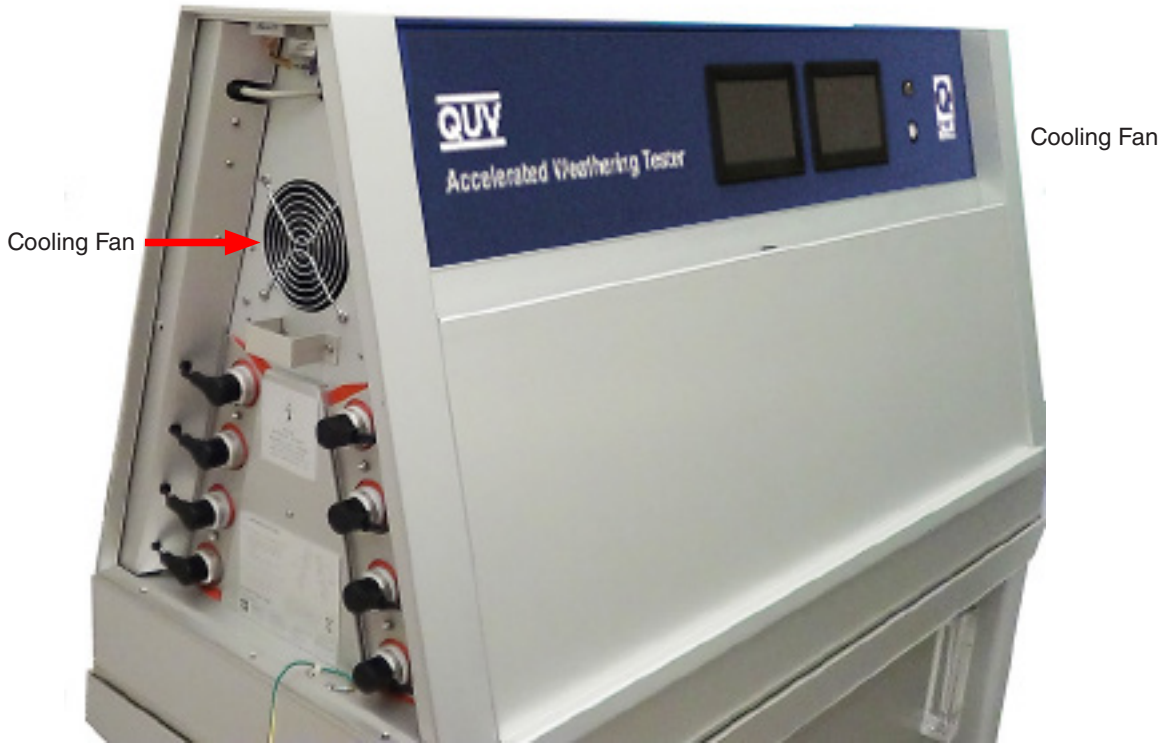


Figure 8.3: QUV left end cover removed showing cooling fan. Identical fan located at right end.

9. Moisture System

9.1. Condensation

- All QUV testers except the QUV/uvc reproduce the effects of outdoor moisture by condensation.
- Figure 9.1 shows the major components of the QUV condensation system.
- Panel holders form the side walls of the test chamber holding water vapor inside.
- Room air on the back side of the specimens cools them below the vapor temperature causing liquid water to condense on the specimens.
- The swing-up doors allow room air to reach the backs of the test panels and shields them from drafts and room temperature changes.
- During the condensation function, a heating element located under the water pan is turned on. Water vapor fills the test chamber, condenses on the test panels and drains back to the water pan.

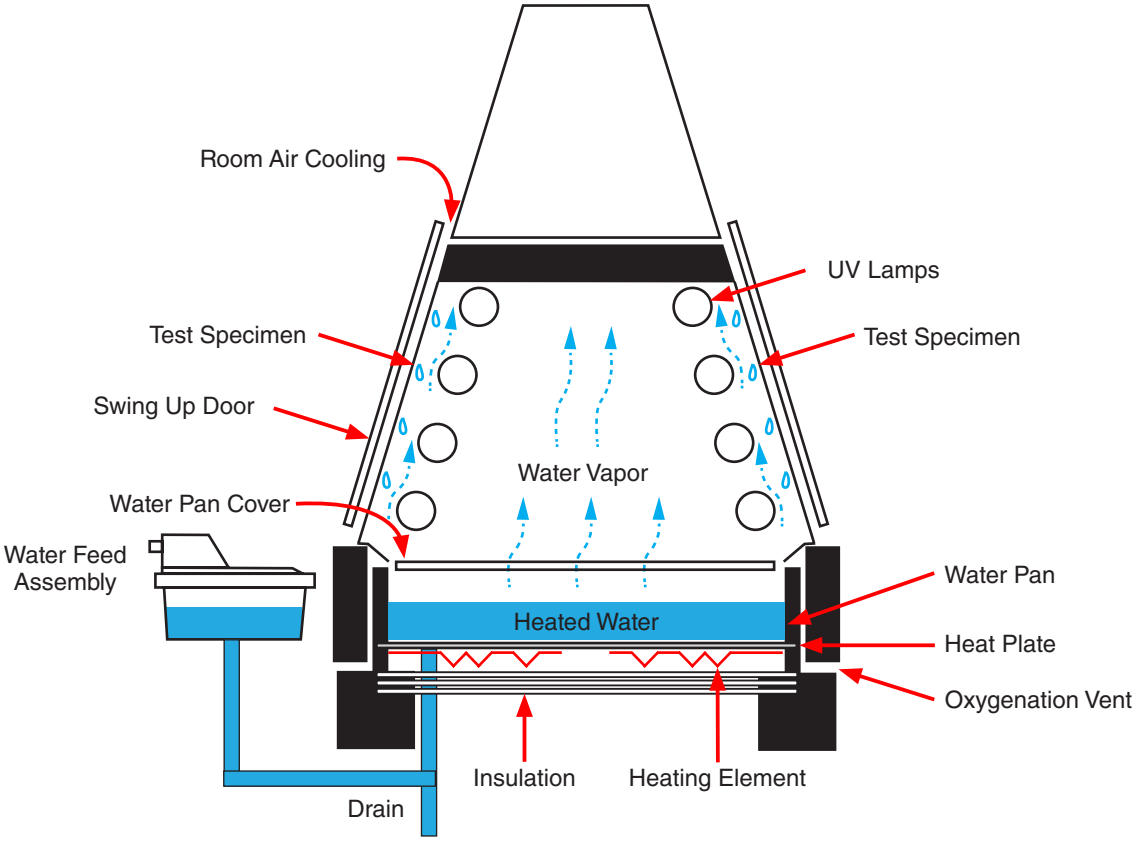


Figure 9.1: QUV condensation system schematic.
NOTE: QUV/uvc does not have water.

9.2. Water Spray

- QUV/spray and QUV/spray/rp models can also spray water on test specimens.
- The system consists of 12 spray nozzles (6 for QUV front and 6 for QUV rear specimen exposure areas) and the associated piping, controls, and drain.
- The nozzles are mounted between the UV lamps.
- When running a SPRAY step (see Section 11.7), the UV lamps are turned off.

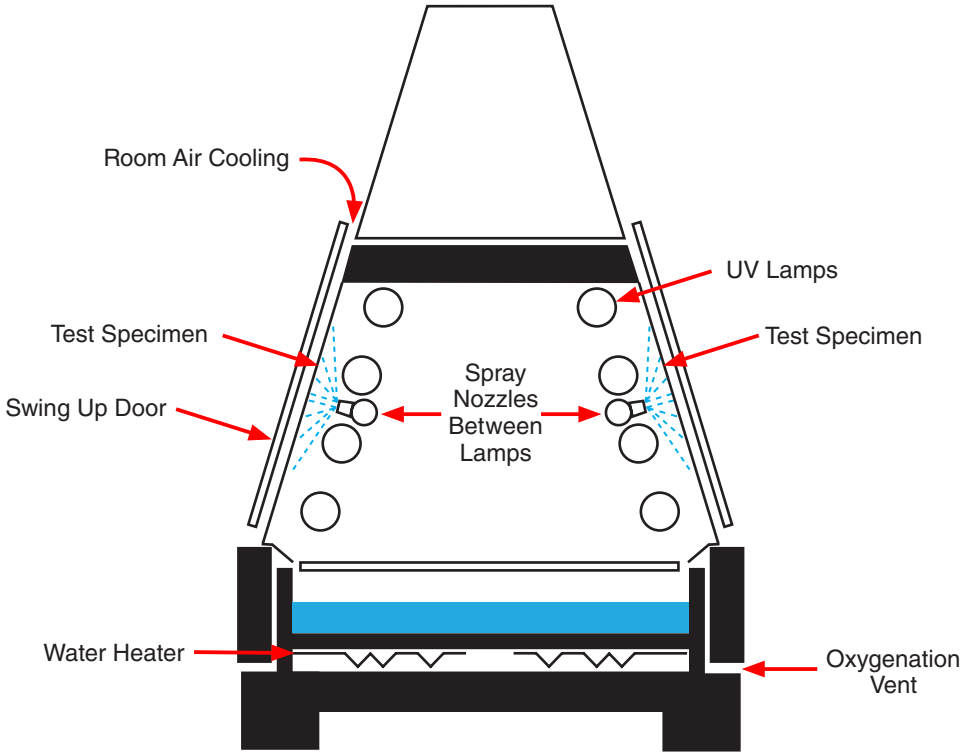


Figure 9.2a: QUV spray system schematic.

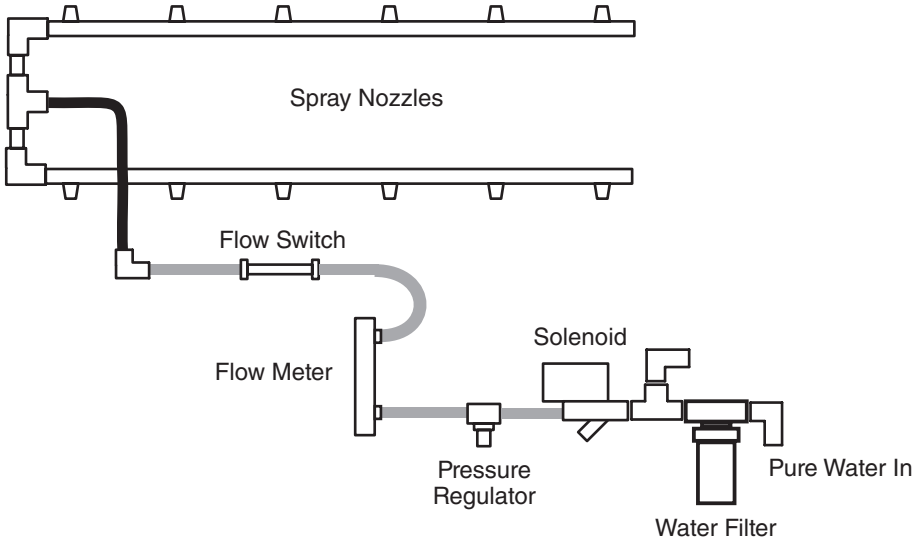


Figure 9.2b: QUV spray system plumbing diagram.

10. Temperature System

- The main controller software controls panel (test specimen surface), chamber air, and water temperatures during test functions using a combination of sensors, heaters, and fans.
- The sub-sections below provide details on tester temperature sensors and temperature control systems.
- See *LU-8047B-SO System Overviews and Diagrams* (supplied with the tester) for detailed information on temperature systems.
- **NOTE:** Figures in this section show various QUV models. Except as noted, the information presented on temperature systems applies to all QUV models.

10.1. Panel (Specimen Surface) Temperature Sensor

- All QUV models have a black panel, located in the center of the front specimen exposure area, on the inside of which the panel temperature sensor is mounted (Figure 10.1a).
- Test standards typically specify the use of an *uninsulated* panel temperature sensor (Figure 10.1b and Figure 10.1c). This sensor is sometimes referred to as a black panel (BP) sensor.
- An optional *insulated* panel temperature (IBP) sensor is available (Figure 10.1d and Figure 10.1e). The insulated sensor is designed to:
  - Make the temperature of specimens mounted in 3D boxes (with doors removed) nearly the same temperature as when mounted in a standard panel holder.
  - Make the temperature of plastic specimens mounted in standard panel holders closer to the set point.
  - Q-Lab recommends an IBP only for use with 3D specimen boxes, and/or plastic specimens.
- Temperature sensors should be calibrated every six (6) months. See Section 11.2 for calibration instructions.
- For mounting very long specimens, an optional sensor panel relocation kit (V-60371-K) is available that allows the panel to be mounted near the end of the specimen exposure area rather than in the center.
- **NOTE:** For QUV tester models with SOLAR EYE irradiance control, two Irradiance sensors are also mounted on the black panel (see Section 8.2). SOLAR EYE testers also have a black panel on the rear specimen exposure area for mounting the other two irradiance sensors (but no temperature sensor).

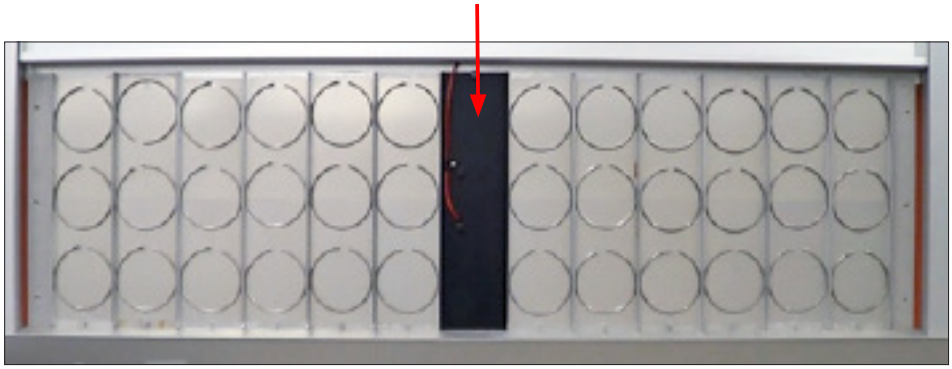


Figure 10.1a: Black Panel location (front specimen exposure area, door raised).

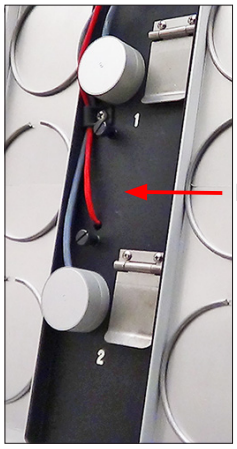


Figure 10.1b: Exterior of black panel with uninsulated temperature sensor (BP).

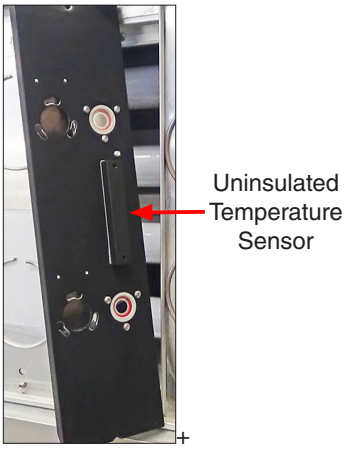


Figure 10.1c: Interior of black panel showing uninsulated temperature sensor.

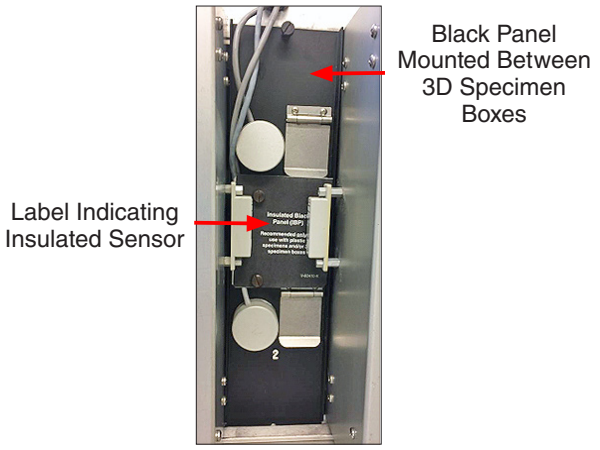


Figure 10.1d: Exterior of black panel with insulated temperature sensor (IBP).

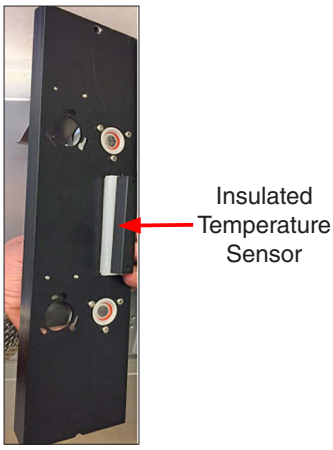


Figure 10.1e: Interior of black panel showing insulated temperature sensor.

10.2. Laboratory Temperature Sensor

- The laboratory air temperature sensor is mounted on the fan enclosure in the base of all QUV models (Figure 10.2).
- Laboratory air temperature is monitored by the main controller and can be displayed in controller diagnostics (see Section 11.9).
- Extreme laboratory temperatures can generate a notification (see Section 11.5) and cause the test to stop.

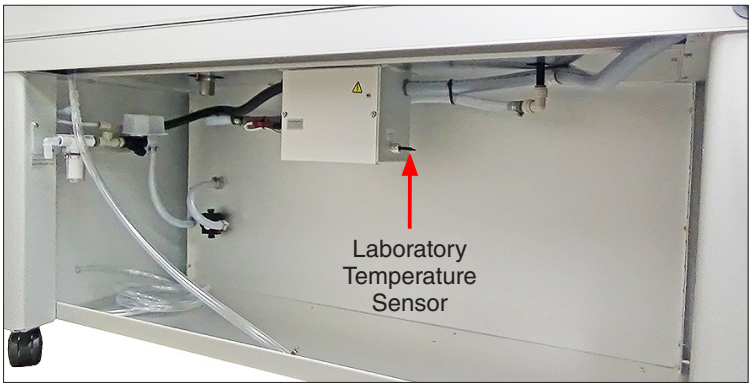


Figure 10.2: QUV laboratory temperature sensor location.
QUV/spray model shown, sensor location the same in all other models.

10.3. Water Temperature Sensor

- The temperature of the water in the water pan is monitored and displayed in the controller diagnostics (see Section 9.8).
- Extreme water temperatures can generate a notification (see Section 11.5) and cause the test to stop.
- **NOTE:** The QUV/uvc does not use water and so does not have a water temperature sensor.

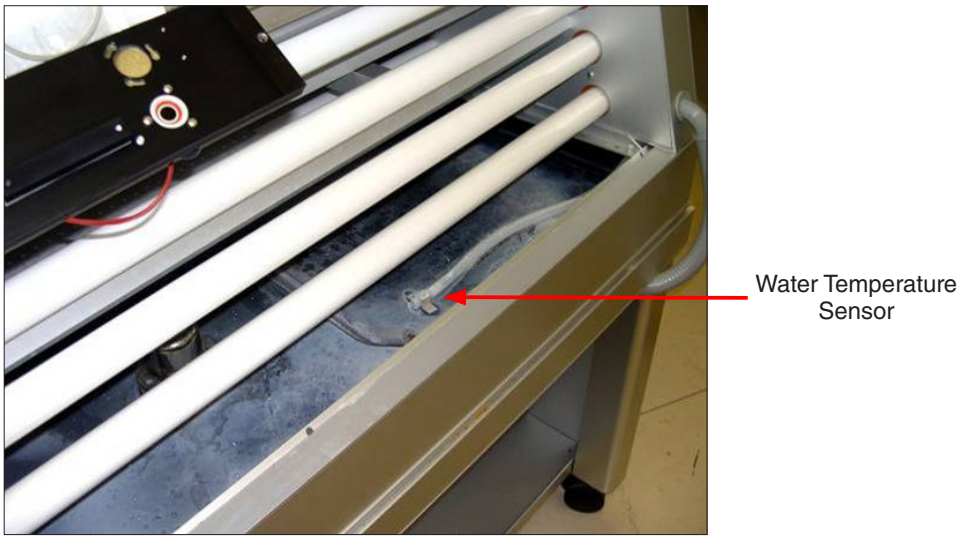


Figure 10.3: Water temperature sensor location (shown with specimens and water pan cover removed).

10.4. Temperature Control

For QUV/basic, QUV/se, QUV/cw, QUV/spray, and QUV/spray/rp

- Figure 10.4a shows the major components used to control temperature during a test.
- Vents around the water pan allow air to circulate into and out of the test chamber.
- Descriptions following the figure provide additional information on component states during functions.
- Achievable minimum and maximum temperatures depend on irradiance settings and laboratory conditions.
- See *LU-8047-SO QUV System Overviews* for temperature control system details.

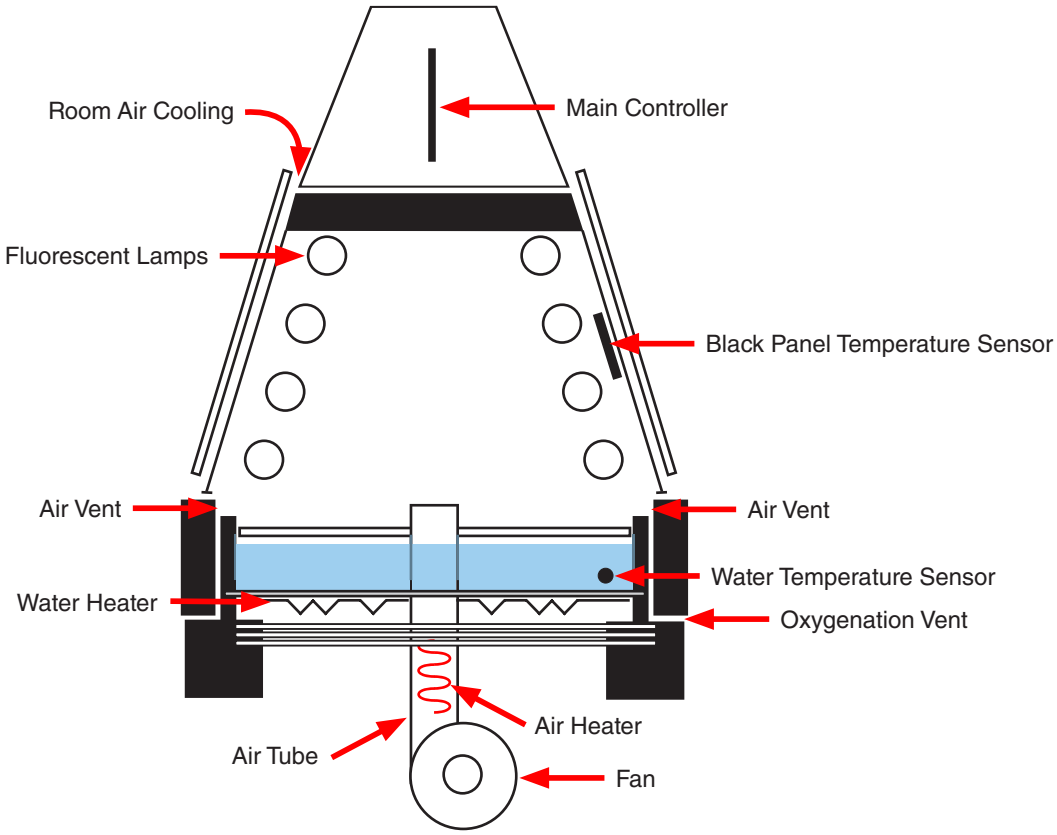


Figure 10.4a: Temperature control schematic.

UV Function

- **Main Controller:** Controls the **Air Heater** to maintain the panel temperature set point.
- **Black Panel Temperature Sensor:** Monitors the panel temperature for input to the **Main Controller.**
- **Water Heater**: Off during UV Function.
- **Fan:** Runs continuously to circulate air into the test chamber through the **Air Tube**.
- The minimum panel temperature that can be reached is about 35 °C due to the heat from the lamps.
- The maximum panel temperature that can be reached is about 80 °C.
- For more information on the UV System see Section 7.1 and Section 8.

Condensation Function

- **Main Controller:** controls **Water Heater** to maintain panel temperature set point
- **Water Heater**: Heats water pan to generate water vapor.
- **Water Temperature Sensor:** Monitors water temperature for input to **Main Controller.**
- **Air Heater:** Off during Condensation Function.
- **Fan:** Runs for the first few minutes of the condensation function to cool test chamber to temperature setpoint.
- The minimum panel temperature that can be reached is about 40 °C.
- The maximum panel temperature that can be reached is about 60 °C.
- For more information on the Condensation System see Section 7.2 and Section 9.1.

Spray Function (QUV/spray and QUV/spray/rp only)

- **Main Controller:** The panel temperature is displayed but not controlled during spray steps.
- **Water Heater:** Off during Spray Function.
- **Air Heater:** Off during Spray Function.
- **Fan:** Can be turned on or off in Machine Configuration during Spray Function.
- For more information on the Spray System see Section 7.4 and Section 9.2.

Dark Function

- **Main Controller:** Controls **Air Heater** to maintain panel temperature set point.
- **Black Panel Temperature Sensor:** Monitors panel temperature for input to **Main Controller.**
- **Water Heater:** Off during Dark Function.
- **Fan:** Runs continuously to circulate air into the test chamber through the **Air Tube**.
- The maximum panel temperature that can be reached is about 60 °C.
- For more information on the Dark Function see Section 7.6.

For QUV/uvc

- Figure 10.4b shows the major components used to control temperature during a test.
- Vents around the bottom of the test chamber allow air to circulate into and out of the chamber.
- Descriptions following the figure provide additional information on component states during functions.
- Achievable minimum and maximum temperatures depend on irradiance settings and laboratory conditions.
- See *LU-8047-SO QUV System Overviews* for temperature control system details.

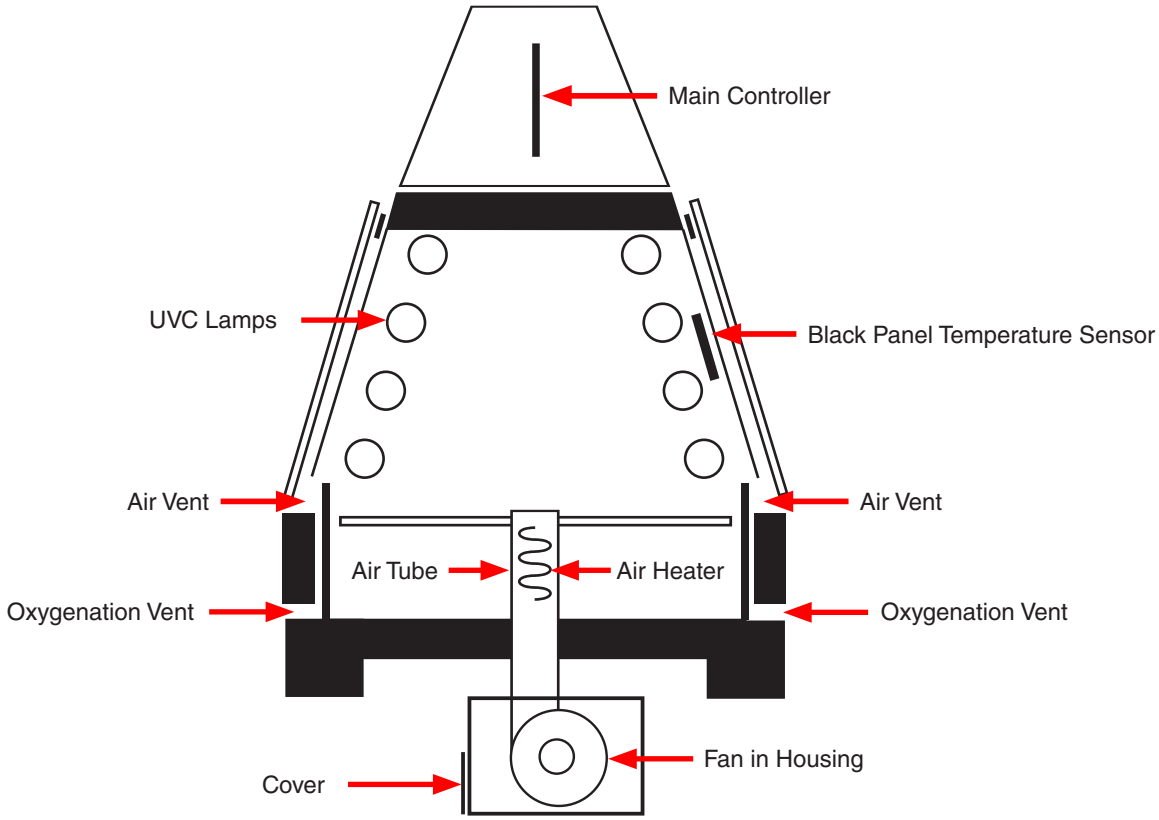


Figure 10.4b: QUV/uvc temperature control schematic.

UV and DARK Functions

- **Main Controller:** Controls the **Air Heater** to maintain the panel temperature set point.
- **Black Panel Temperature Sensor:** Monitors the panel temperature for input to the **Main Controller.**
- **Fan:** Runs continuously to circulate air into the test chamber through the **Air Tube**.
- **Fan Housing:** The fan housing (Figure 10.4c) has an air vent on the left side with a spring-loaded cover that can be opened or closed to control air flow.
- **Fan Housing Cover:** The cover (Figure 10.4c and Figure 10.4d) is manually opened and closed to achieve minimum and maximum black panel temperature set points.
- When the cover is closed, air is drawn in through holes on the right side of the blower housing (Figure 10.4e).
- The minimum panel temperature that can be reached is about 28 °C.
- The maximum panel temperature that can be reached is about 73 °C

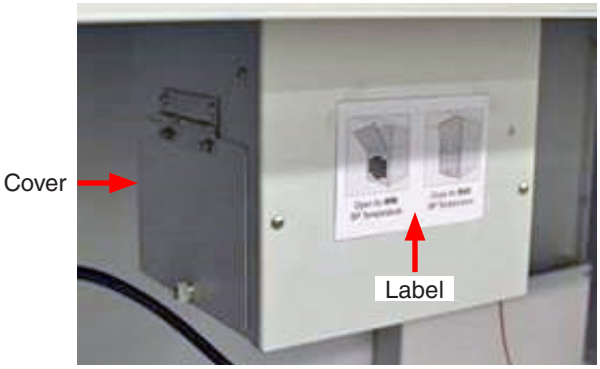


Figure 10.4c: Fan housing under test chamber. Label shows correct cover positions for running high and low-temperature tests. The housing should be closed when running tests with a temperature set point above 45 °C.

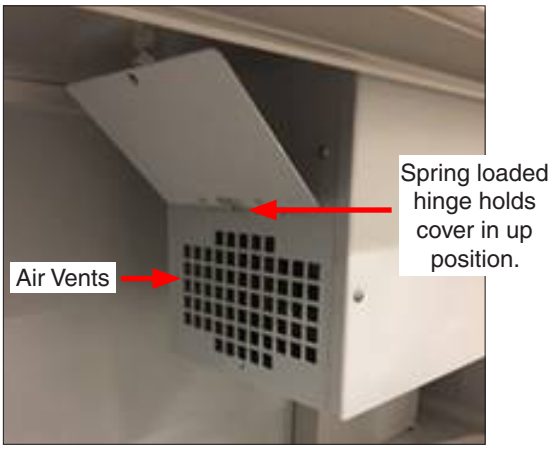


Figure 10.4d: The housing should be open when running tests with a temperature set point at 45 °C and below.

Figure 10.4e: Air holes on the right side of the fan housing.

11. Main Controller Operation

11.1. Overview

- The QUV Gen 4 main controller monitors and controls all tester functions.
- The main controller circuit board, along with other QUV electronic components, is located in the control top above the test chamber (Figure 11.1a and Figure 11.1b).
- Interactive software allows for easy programming of all test functions.
- 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 monitors for errors.
- The main controller will automatically stop a test if an error is detected.
- System configuration and performance data can be exported to assist in troubleshooting.
- New software revisions can easily be downloaded and installed.
- Except where noted, information in this section applies to testers with the SOLAR EYE® irradiance control system (QUV/se, QUV/cw, QUV/spray, QUV/spray/rp, and QUV/uvc) and non-SOLAR EYE (QUV/basic) testers.

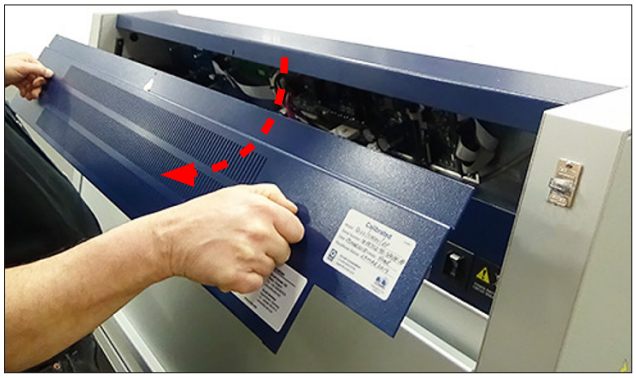


Figure 11.1a: Remove the QUV rear access panel from the control top to access the main controller and electronics.

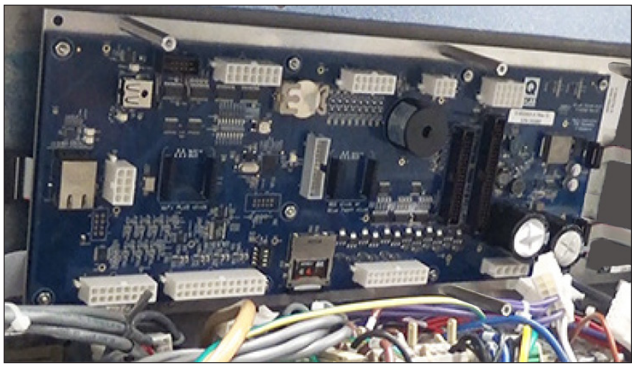


Figure 11.1b: QUV main controller circuit board and associated electronics mounted inside control top.

11.2. Controls

- The main power switch is located at the right rear of the QUV control top (Figure 11.2a). Before powering the tester **ON**, make sure the correct electrical connections have been made (see Section 6.3).
- Full-color touchscreen monitors mounted on the front of the QUV control top are used to control tester operation and to display test status. Touchscreens are activated when the tester is powered on.
  - The QUV SOLAR EYE irradiance control models are equipped with two (2) touchscreen displays (Figure 11.2b). The Status Screen (Figure 11.2e) is on the left and the Main Menu Screen (Figure 11.2f) is on the right.
  - The QUV/basic is equipped with one (1) touchscreen display (Figure 11.2c). The single touchscreen display can be toggled back and forth between the Status Screen (Figure 11.2g) and the Main Menu Screen (Figure 11.2h).
- 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.
- After an interval of inactivity, the screen(s) will automatically deactivate. Just tap a screen to reactivate (Figure 11.2d).
- The touchscreens 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 touchscreens.
- A large LED indicator, to the right of the screen, and visible from a distance, changes colors to indicate current operational status of the test.

Figure 11.2a: Power switch location.

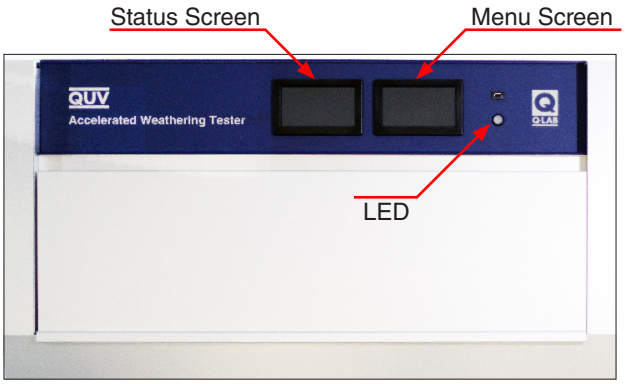


Figure 11.2b: Touchscreens and LED on SOLAR EYE irradiance controlled testers.

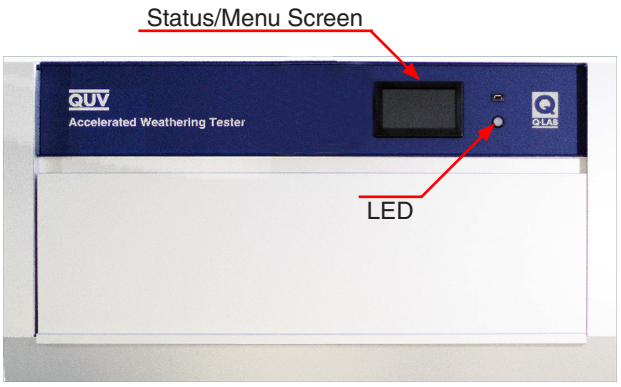


Figure 11.2c: Touchscreen and LED on QUV/basic control panel.

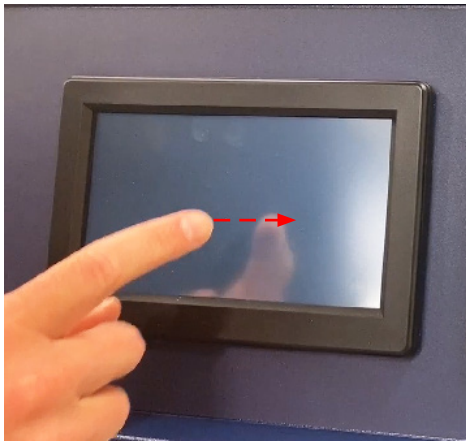


Figure 11.2d: For all models touch a screen to reactivate.

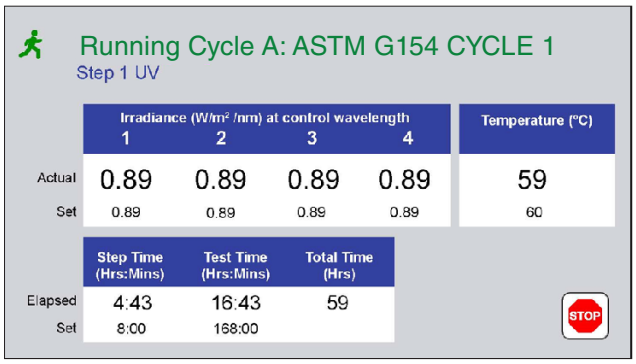


Figure 11.2e: SOLAR EYE tester Status screen displaying typical operating conditions.

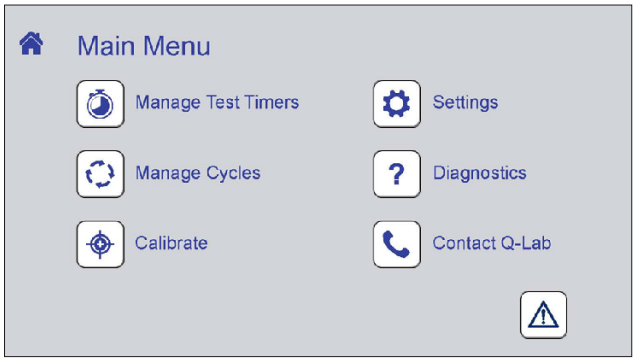


Figure 11.2f: SOLAR EYE tester Menu screen displaying the main menu.

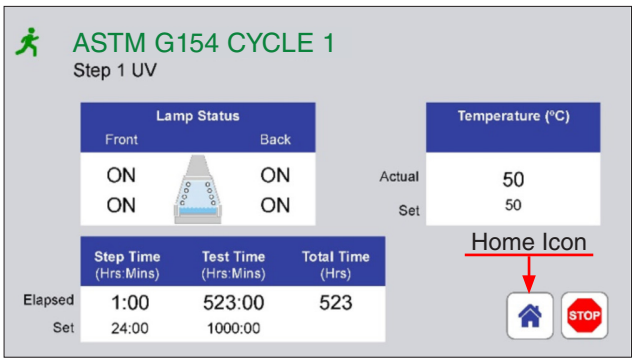


Figure 11.2g: QUV/basic Status Screen. Touch the Home icon to display the Main Menu Screen.

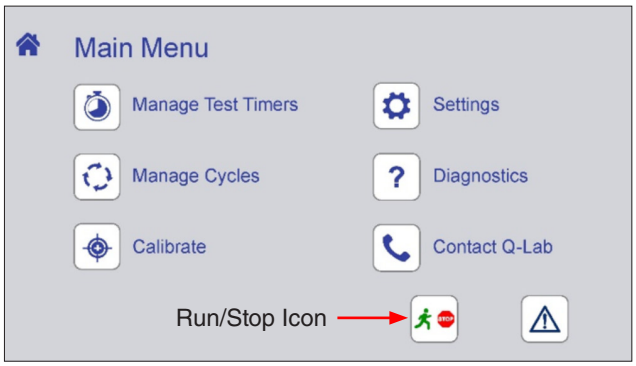


Figure 11.2h: QUV/basic Main Menu Screen. Touch the Run/Stop icon to display Status Screen.

11.3. Status Screen

- The Status Screen (Figure 11.3a) displays:
- The status icon and state that indicates the overall status of the tester (see Overall Test Status).
- The tester state (Running or Stopped), cycle identification, and the name of the test being run. If this information is longer than can be displayed on one line, it will be alternately displayed in sections, for example:
  - *Running Cycle A:* alternating with *ASTM G154 Cycle 1*
- The current test step number and type of step.
- If Machine Configuration parameter *X69 Lamps Specified in Cycle Management* is set to "Yes", and a lamp type has been selected (see Section 11.7) the lamp type is displayed after the step type, for example:
  - *Step 1 UV (requires UVA-340/UVA-340+ lamps)*
- Actual irradiance and set point irradiance values for all four sensor channels for SOLAR EYE testers.
- Irradiance is not monitored or controlled in the QUV/basic, but irradiance can be measured using the *UC-110070-K UV Measurement Kit for UC1*, a *UC10/UV QUV Irradiance Smart Sensor*, and a *UC1 Universal Calibrator Handheld Display*. See Section 18. Replacement Parts. Contact Q-Lab Repair and Tester Support for more information.
- Actual temperature and set point temperature of the panel temperature sensor.
- Elapsed and set step time and test time.
- Tester total operation time.
- RUN / STOP button. This button is the only operator control on the Status screen for SOLAR EYE testers.
- QUV/basic also has the Home icon on the Status Screen for displaying the Main Menu Screen (see Figure 11.2g).

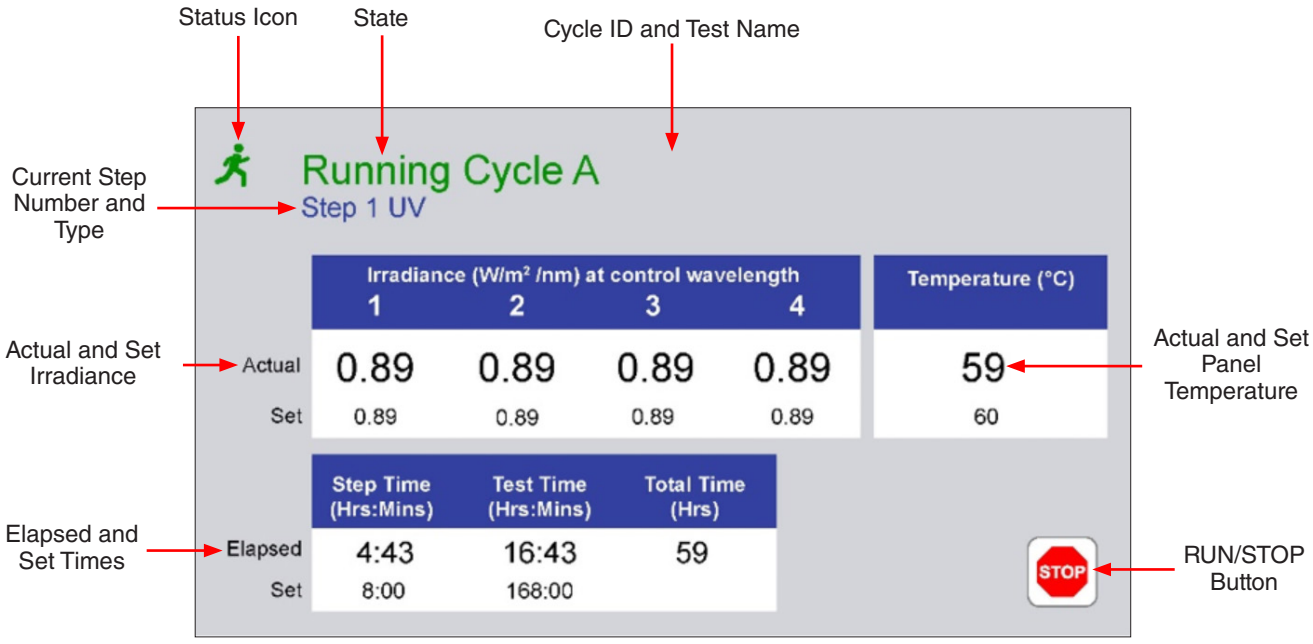


Figure 11.3a: Status screen components. Display for models with SOLAR EYE irradiance control shown

Overall Test Status

- A colored icon and title at the top of the screen indicate the overall status of the test: running or stopped (Figure 11.3b, Figure 11.3c). These figures show testers with SOLAR EYE irradiance control. QUV/basic has the same icons.
- The title also shows the test cycle letter and the name of the test cycle.
- Icons in the lower right corner of the screen can be used to stop or run the test. QUV/basic has additional icons (see Figure 11.2g and Figure 11.2h).
- The LED status indicator changes color corresponding to the icon and title status.
- The table below summarizes all status conditions.

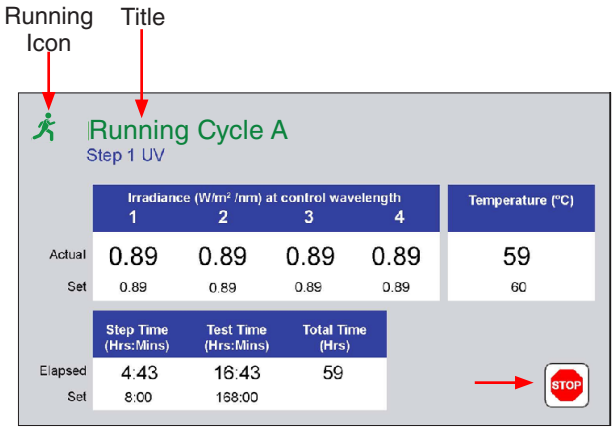


Figure 11.3b: Status icon and title when test running.

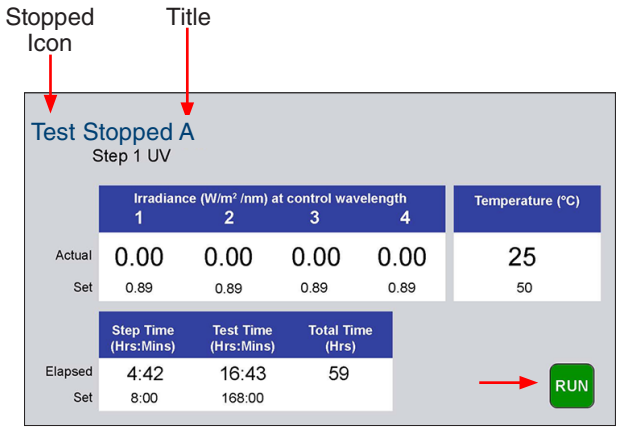


Figure 11.3c: Status icon and title when test stopped.

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.
	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.

11.4. Main Menu Screen

- The Main Menu is the home display for the menu screen (Figure 11.4).
- The Main Menu screen provides access to all other operator controls for the tester.
- The Main Menu displays icons to access these functions:
  - Main Menu
  - Notifications (Section 11.5)
  - Manage Test Timers (Section 11.6)
  - Manage Cycles (Section 11.7)
  - Calibrate (Section 13)
  - Settings (Section 11.8)
  - Diagnostics (Section 11.9)
  - Contact Q-Lab (Section 11.10)
- QUV/basic also has the Run/Stop icon on the Main Menu Screen for displaying the Status Screen (see Figure 11.2h).

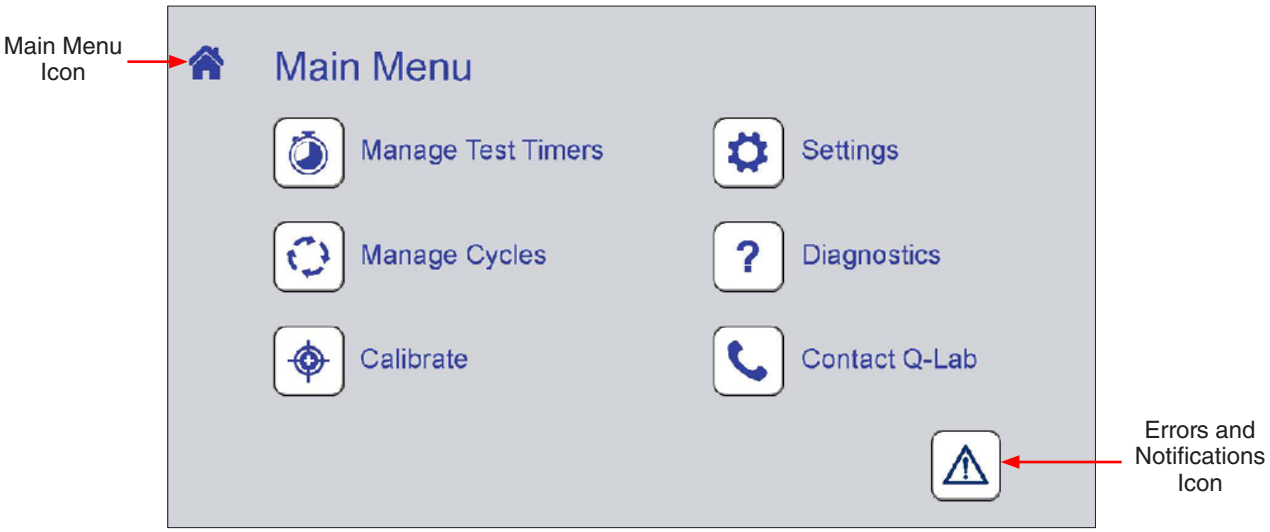


Figure 11.4: Main Menu screen.

11.5. Notifications

- 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 QUV controller.
- On the Main Menu screen, touch the notification icon to display the Notifications Screen (Figure 11.5a).
- The type, information icon, identification code (ex. M10), and name are displayed for each notification (Figure 11.5b).
- "Active" and "Cleared" notifications are listed separately, in chronological order, most recent at the top of the list (Figure 11.5c, Figure 11.5d).
- Color-coded attention icons indicate the type of notification (Figure 11.5e).
  - A red triangle indicates an error occurred that stopped the test.
  - A yellow triangle indicates an event that did not stop the test, such as a maintenance reminder.
  - A blue triangle indicates the successful completion of a test or a software update.
- Touch the notification information icon to display details (Figure 11.5f and Figure 11.5g).
- See Section 17.1 for a complete list of notifications.

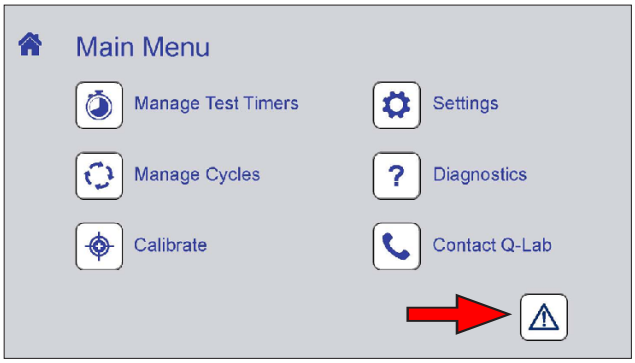


Figure 11.5a: The notifications icon. Icon color changes depending on notification status.

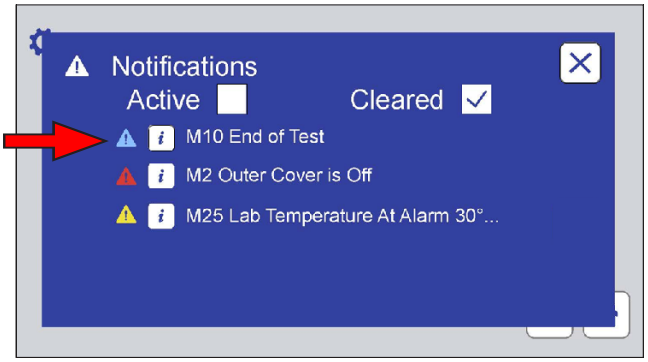


Figure 11.5b: The Notifications Screen lists notification information.

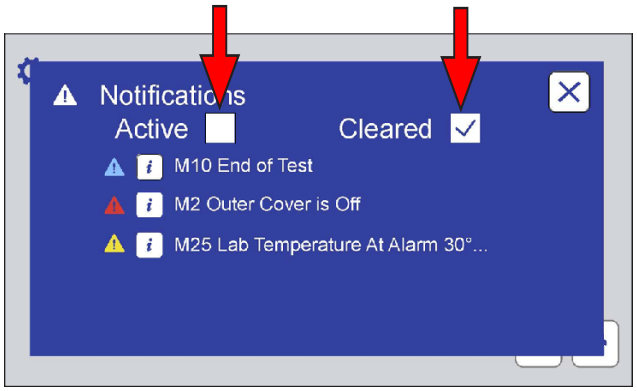


Figure 11.5c: Touch the Active or Cleared check box to view active or cleared notifications.

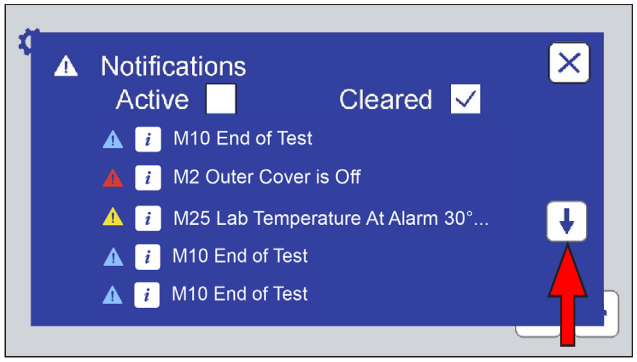


Figure 11.5d: If there are more notifications than can be displayed on one screen, scroll button(s) will be displayed to move down or up the notification list.

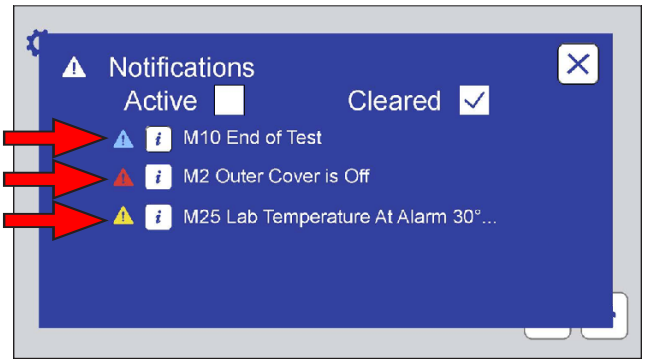


Figure 11.5e: Color coded icons show notification type.

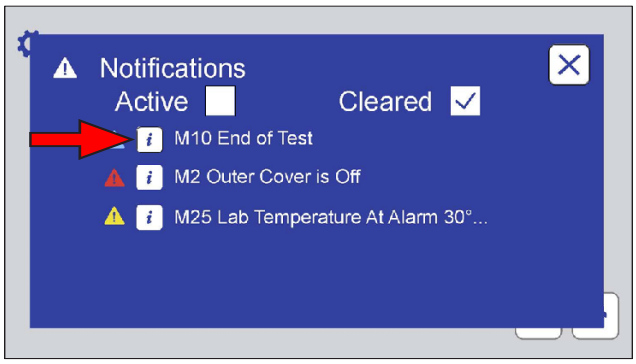


Figure 11.5f: Touch the information icon to display notification details.

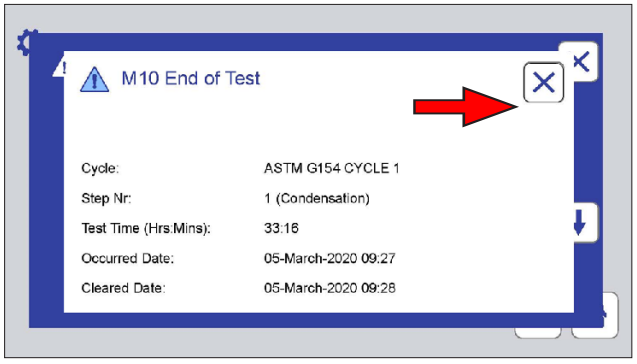


Figure 11.5g: Notification details. Touch the Close icon to return to the Notifications Screen.

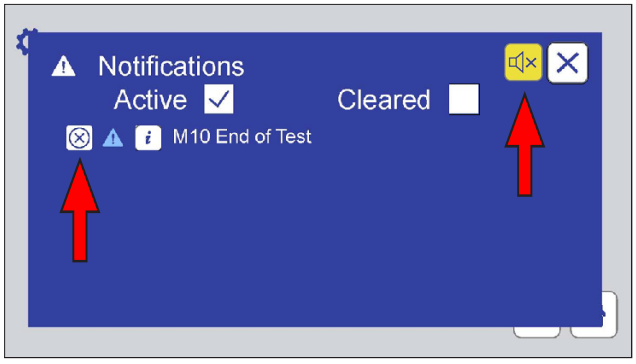


Figure 11.5h: If the alarm is active, touch the yellow mute icon to silence. When the notification has been resolved, touch the icon to the left of the notification to clear it.

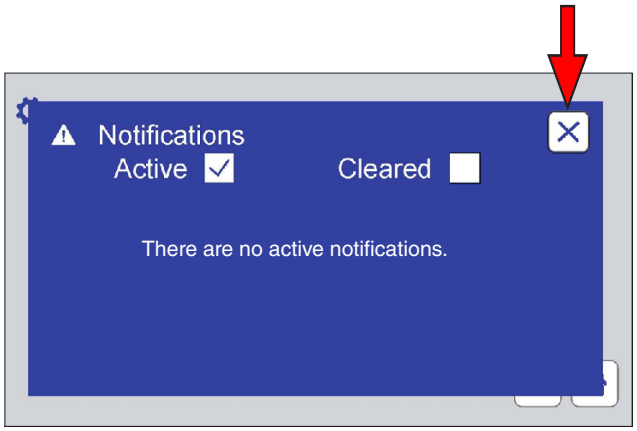


Figure 11.5i: Touch the Notification Screen close icon to re-display the main menu.

No.	Notification Message	Icon/ Test Status	Description • Suggested Action	Appears in QUV Model		
				basic	uvc	se, spray, spray/rp, cw
M1	Door is open	Stopped	The front or back specimen door is open. • Close the door. • If the doors are closed and this message appears, the door interlock is defective or needs adjustment.	•	•	•
M2	Outer Cover is Off	Stopped	One of the outer (end) covers is off. • Replace the outer cover • If the outer covers are in place and this message appears, the a 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 11.6, is generated. • *No action required*	•	•	•
M12	End of Test Shutdown	Complete & Stopped	Test completed successfully. No alarm is generated. • *No action required*	•	•	•

Figure 11.5j: A complete list of notifications and their meaning is given in Section 5.

11.6. Manage Test Timers

- On the Main Menu screen touch the Manage Test Timers icon to display the Manage Test Timers screen (Figure 11.6a).
- The Manage Test Timers screen provides three functions:
  1. Specify what action the tester should perform at the end of a test (Figure 11.6b and Figure 11.6c).
     - Stop
     - Message only
     - Alarm only
     - Stop and alarm
     - None
  2. Set test elapsed time.
     - Change the elapsed time in hours and minutes for the current test (Figure 11.6d).
  3. Set test duration.
     - Set the duration in hours and minutes for the current test (Figure 11.6e).
- If any changes are made to Manage Test Timers, the operator can accept or cancel the changes (Figure 11.6f and Figure 11.6g)

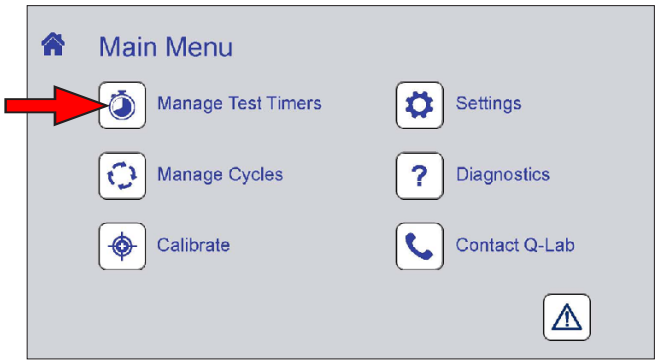


Figure 11.6a: Manage Test Timers icon.

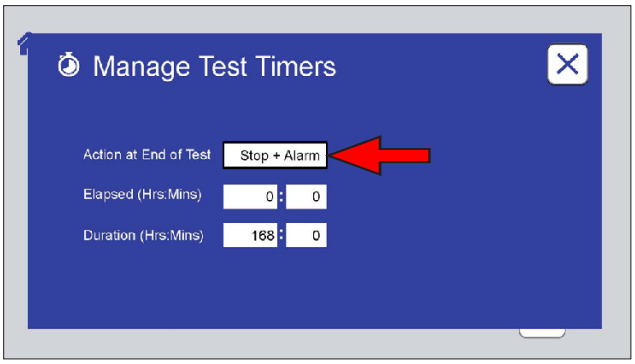


Figure 11.6b: Manage Test Timers screen. Touch the Action at End of Test text box to specify the action.

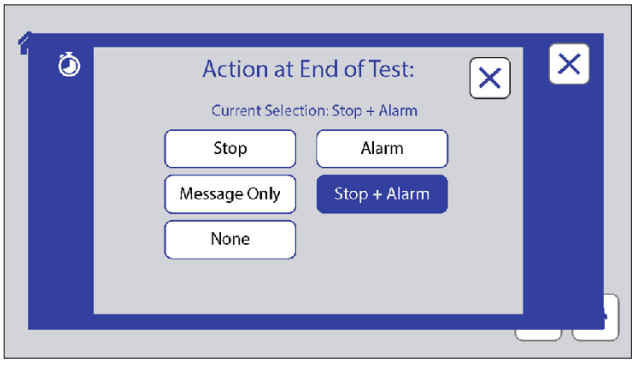


Figure 11.6c: Action at End of Test screen. Touch an action button to select that action.

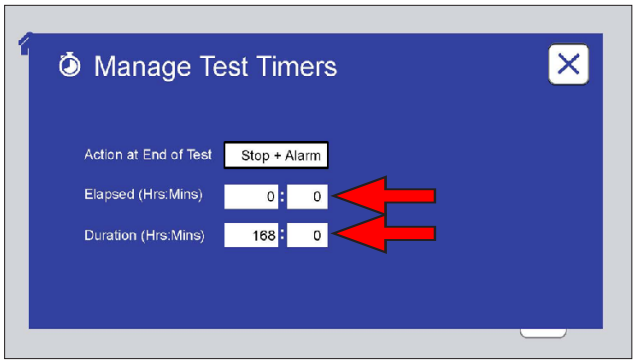


Figure 11.6d: Touch the Elapsed or Duration text boxes to reset the elapsed or duration time of the current test. A numeric keypad will be displayed.

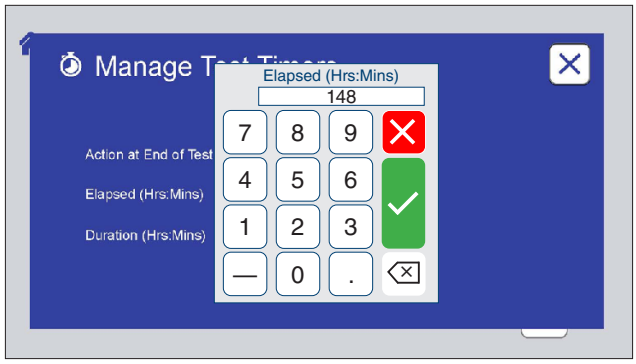


Figure 11.6e: Enter the desired hours and minutes. Touch the check mark to save, or the X to cancel changes.

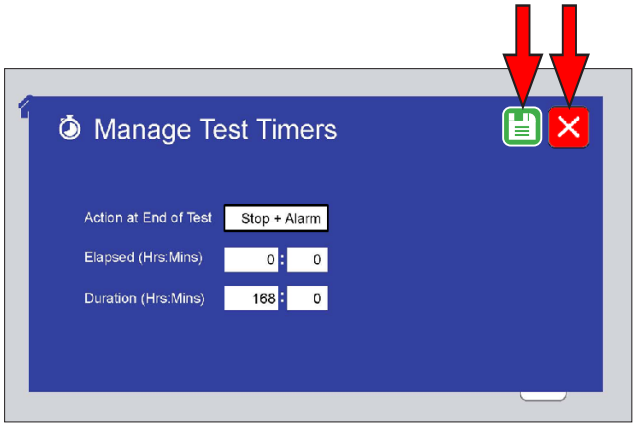


Figure 11.6f: If any changes have been made, touch the save changes icon or the cancel changes icon to re-display the Main Menu screen.

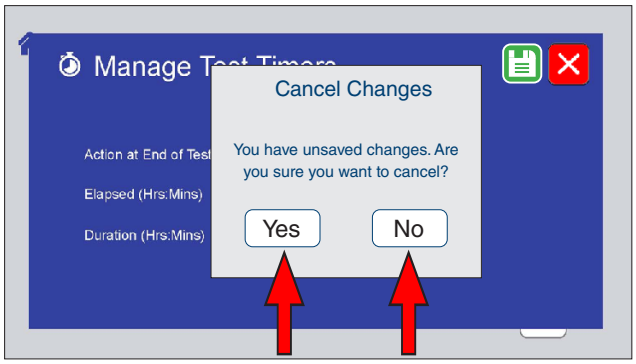


Figure 11.6g: If the cancel changes icon is touched, the operator is prompted for verification. Touch Yes or No.

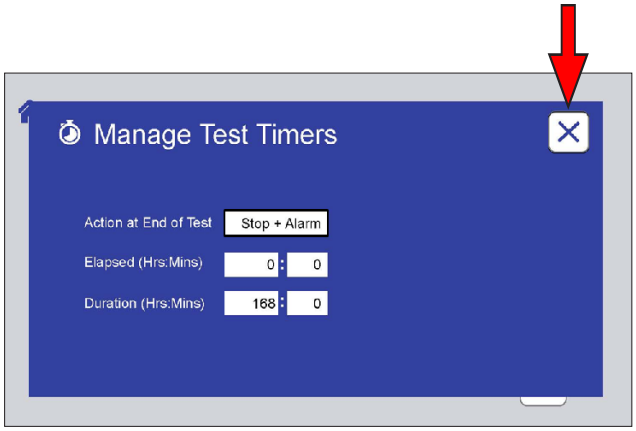


Figure 11.6h: Touch the Manage Test Timers screen close icon to re-display the main menu.

11.7. Manage Cycles

- On the Main Menu screen touch the Manage Cycles icon (Figure 11.7.1a) 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 11.7.1b).
  - If Machine Configuration parameter *X69 Lamps Specified in Cycle Management* is set to "Yes", the Lamp Type is displayed and can also be selected on the Manage Cycles screen (Figure 11.7.1c and Figure 11.7.1d).
  - The X69 default setting is "No". X69 must be set to "Yes" to use TUV-421 lamps. For all other lamp types the "No" setting is appropriate.
- Each cycle is stored with an alphanumeric (A through M) identification tab (Figure 11.7.1b).
  - Touch a tab to select a cycle.
    - The cycle name (ex. ASTM G154 CYCLE 1) 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:
  - Delete a cycle (Figure 11.7.2a through Figure 11.7.2c).
    - An actively running cycle cannot be deleted (Figure 11.7.2b).
    - Deleting an inactive cycle will delete all cycle data. The lettered tab will be available to create a new cycle (see Section 11.7.7).
  - Lock a cycle to prevent unauthorized changes (Figure 11.7.3a through Figure 11.7.3d).
  - Add, edit, or delete steps in a cycle (Figure 11.7.4a through Figure 11.7.6d). Pre-programmed test cycles cannot be edited (they can be deleted).
  - Create a new cycle (Figure 11.7.7a through Figure 11.7.7d).
  - Run a cycle from any of its steps (Figure 11.7.8a through Figure 11.7.8e).
- The QUV main controller can store thirteen (13) test cycles.
- A test cycle can consist of up to twenty-five (25) steps.

11.7.1 Select a Cycle

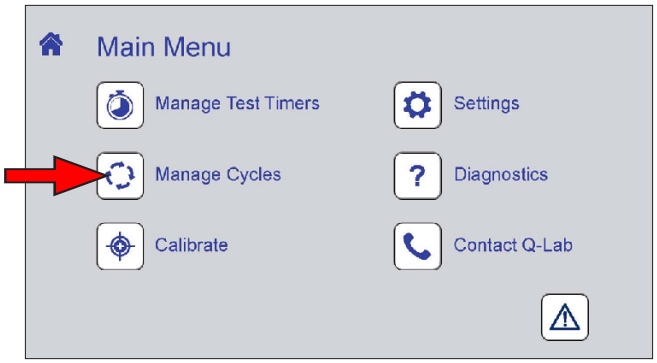


Figure 11.7.1a: Manage Cycles icon.

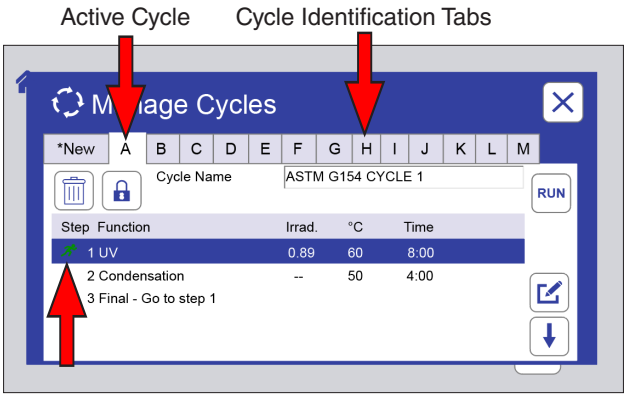


Figure 11.7.1b: Manage Cycles screen. The active cycle is displayed. The currently running step is indicated. Touch any ID tab to display that cycle.

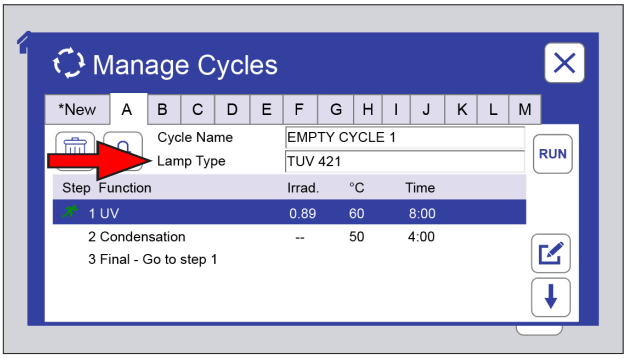


Figure 11.7.1c: If X69 = Yes the Manage Cycles screen will show the Lamp Type. Touch the text box to display the lamp type selection screen.

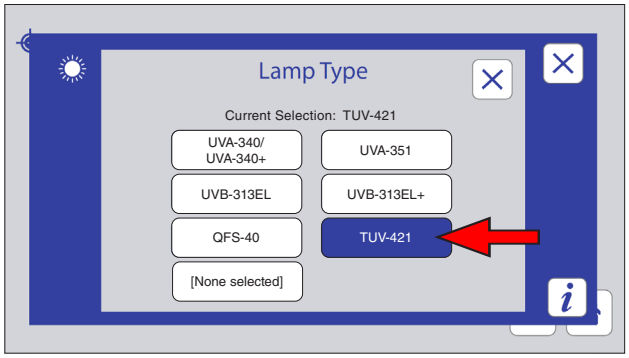


Figure 11.7.1d: Touch the lamp type button to select the installed lamps.

11.7.2 Delete a Cycle

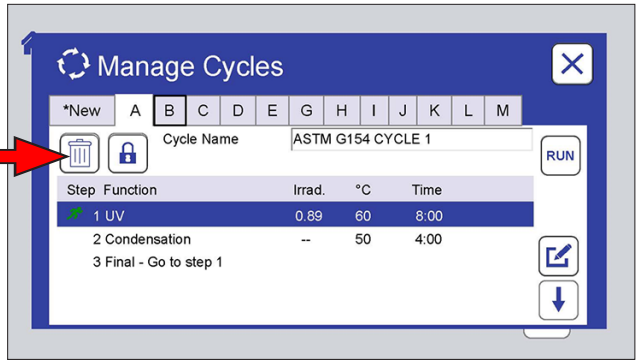


Figure 11.7.2a: Touch the delete icon to delete the selected cycle.

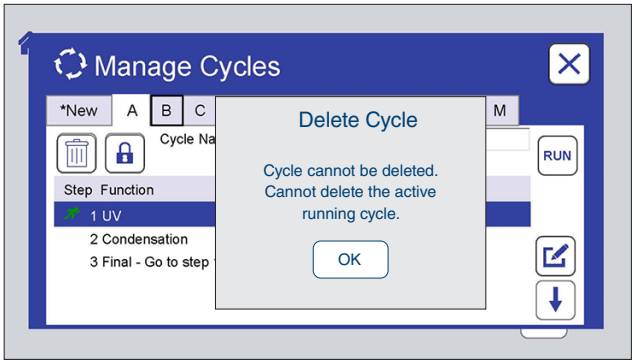


Figure 11.7.2b: The active running cycle cannot be deleted. Touch OK to clear message.

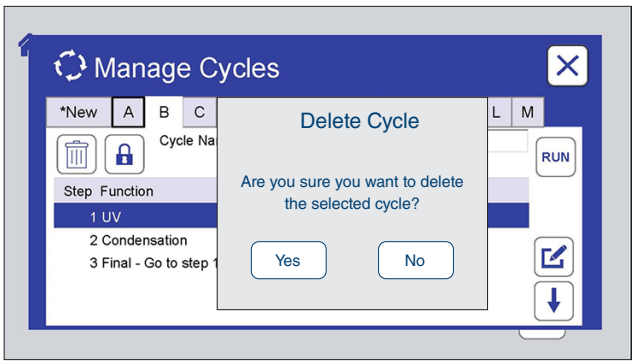


Figure 11.7.2c: To delete an inactive cycle, the operator is prompted for verification. Touch No to cancel delete. Touch Yes to create a blank cycle.

11.7.3 Lock a Cycle

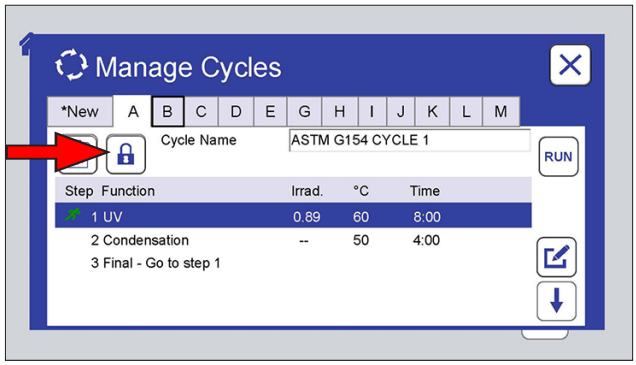


Figure 11.7.3a: Touch the lock icon to lock the cycle.

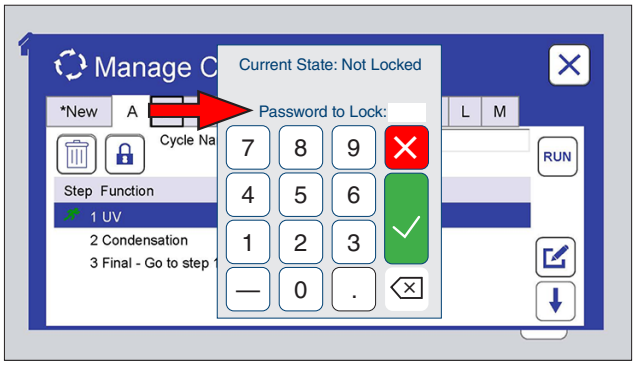


Figure 11.7.3b: The numeric keypad is displayed. A password must be entered to lock the cycle.

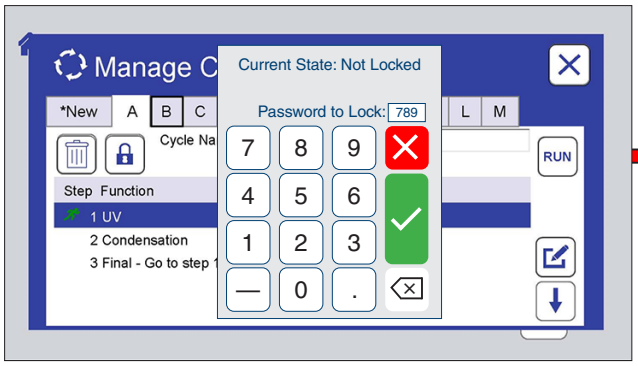


Figure 11.7.3e: Enter the numeric password. Touch the check mark button to save, or the X button to cancel setting the password.

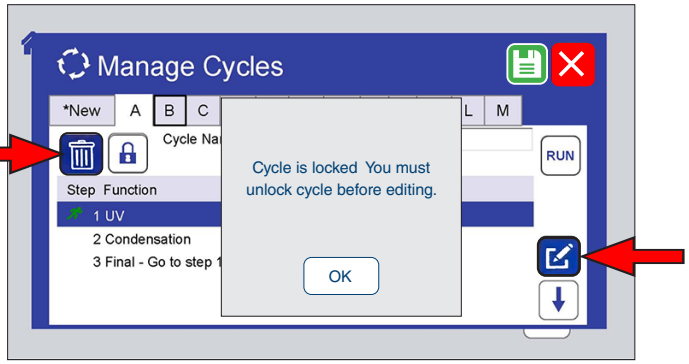


Figure 11.7.3c: This message is displayed if a delete or edit icon is touched on a locked cycle.

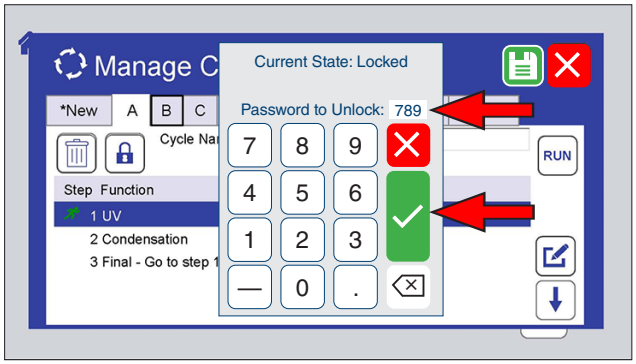


Figure 11.7.3d: To unlock a cycle, touch the lock icon, enter the password, then touch the check mark button.

11.7.4 Add a Step to a Cycle

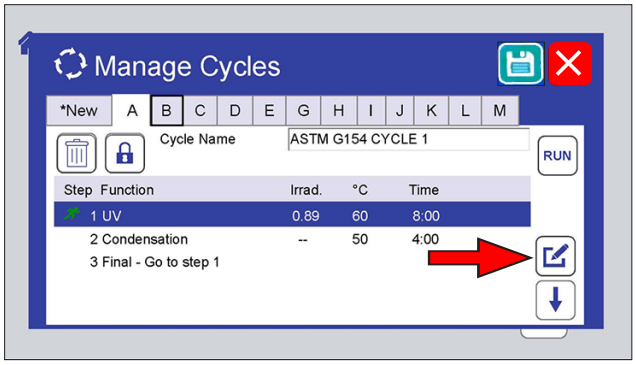


Figure 11.7.4a: For any cycle, a new step can be added before or after an existing step. Select the existing step then touch the Edit icon.

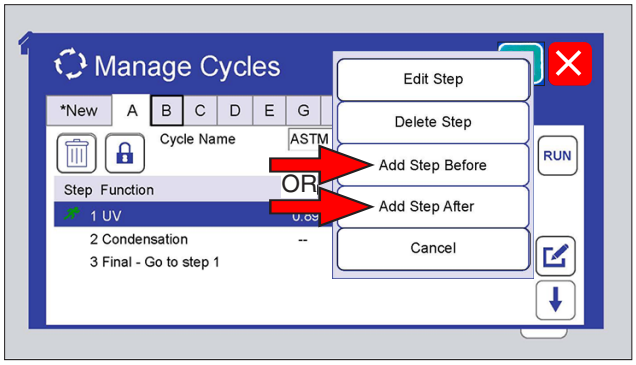


Figure 11.7.4b: Touch Add Step Before or Add Step After.

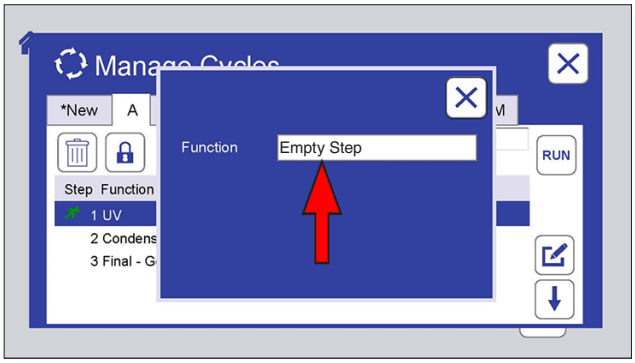


Figure 11.7.4c: Touch the function text box to select a function.

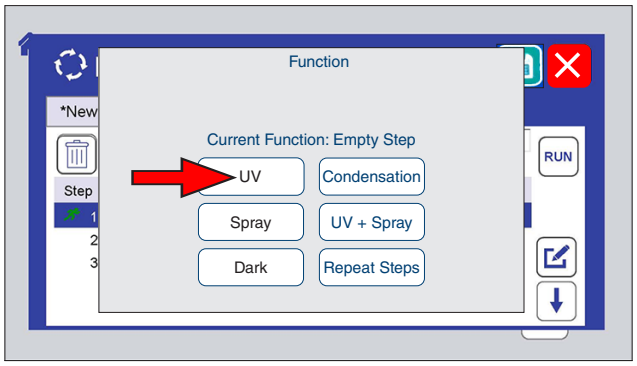


Figure 11.7.4d: Touch the desired function. Spray functions are displayed for spray models only. The QUV/uvc does not have a condensation function.

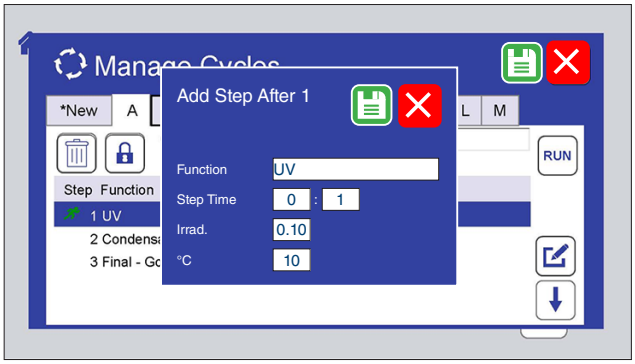


Figure 11.7.4e: Step values must be entered. Touch the Step Time (Hrs:Mins), Irrad(iance), and °C text boxes to select.

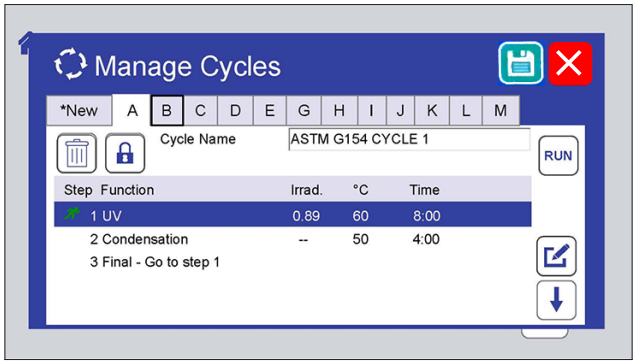


Figure 11.7.4f: Use the numeric keypad to enter the values for each parameter. Touch the check mark button to accept those values or the X button to cancel.

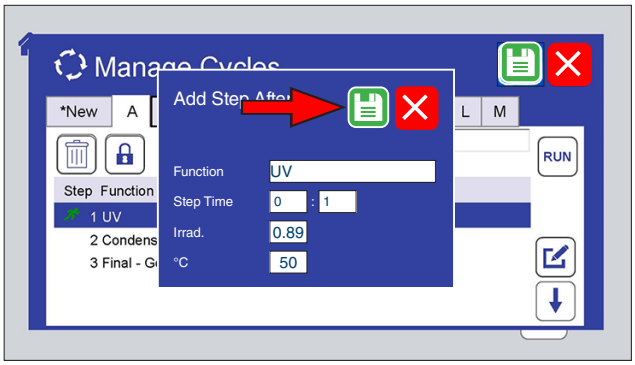


Figure 11.7.4g: The new step values are displayed. Touch the save icon to save the new step.

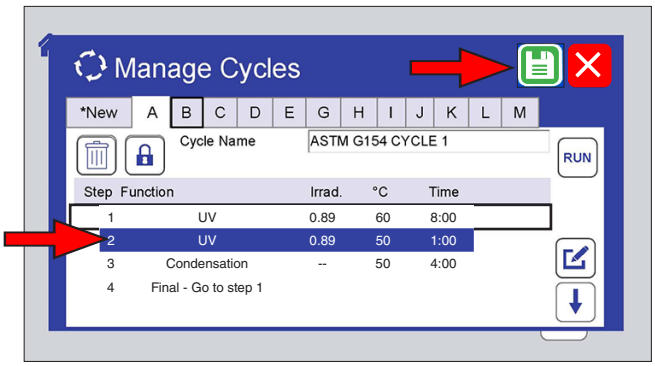


Figure 11.7.4h: The new step is shown for the cycle. Touch the save icon to save the modified cycle.

11.7.5 Edit a Step

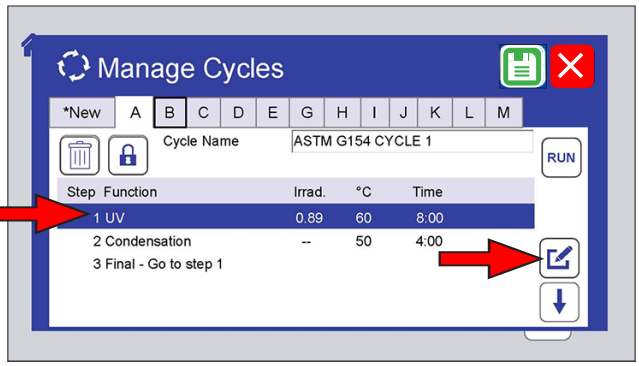


Figure 11.7.5a: To edit a step, touch the cycle ID tab, touch the step to select, then touch the pencil icon.

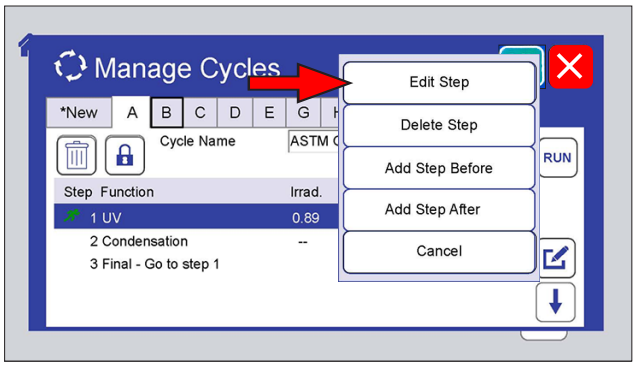


Figure 11.7.5b: Select Edit Step.

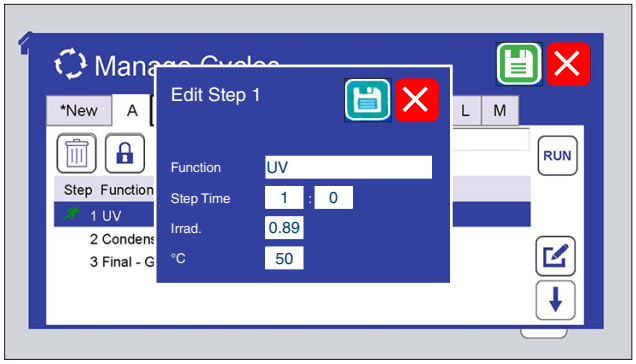


Figure 11.7.5c: Touch the Function, Step Time, Irradiance, or °C text boxes to select.

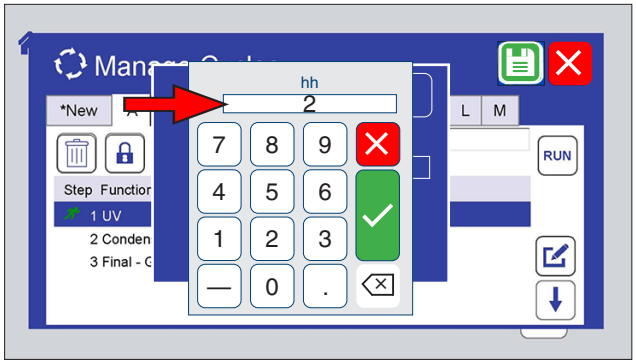


Figure 11.7.5d: Use the numeric keypad to enter the new values for the selected step. Touch the check mark button to accept those values or the X button to cancel.

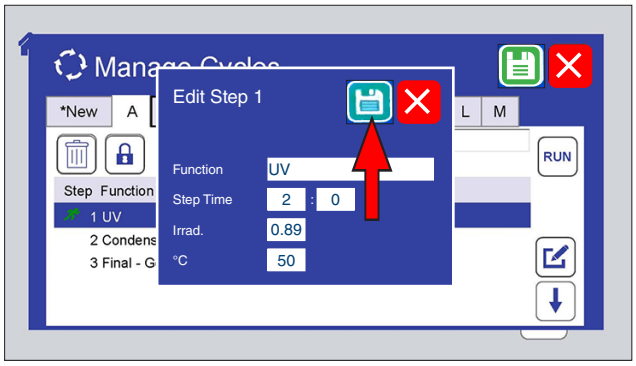


Figure 11.7.5e: Touch the save icon to save the edited step.

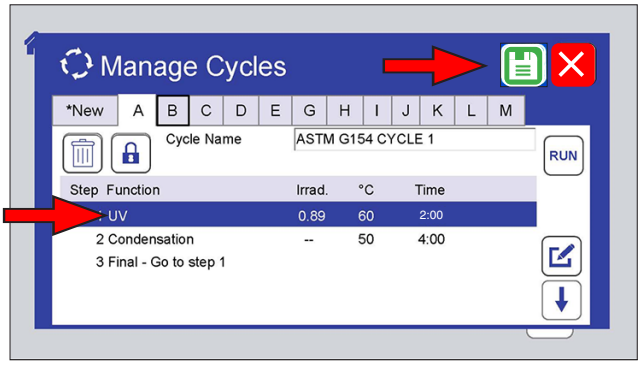


Figure 11.7.5f: The edited step is shown for the cycle. Touch the save icon to save the edited cycle.

11.7.6 Delete a Step

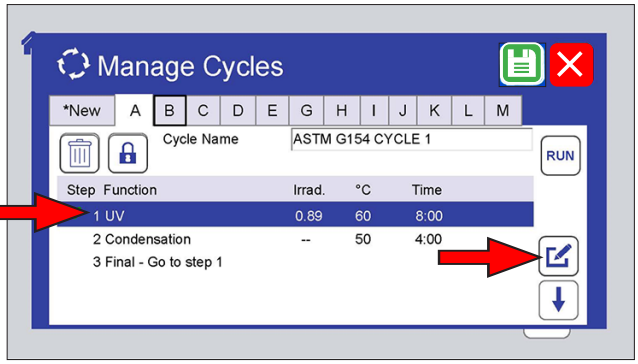


Figure 11.7.6a: To delete a step, touch the cycle ID tab, touch the step to delete, then touch the pencil icon.

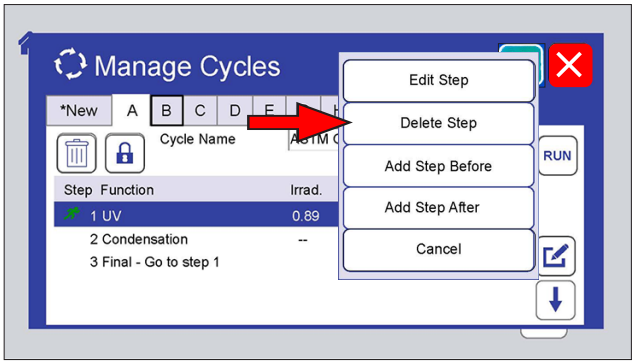


Figure 11.7.6b: Select Delete Step.

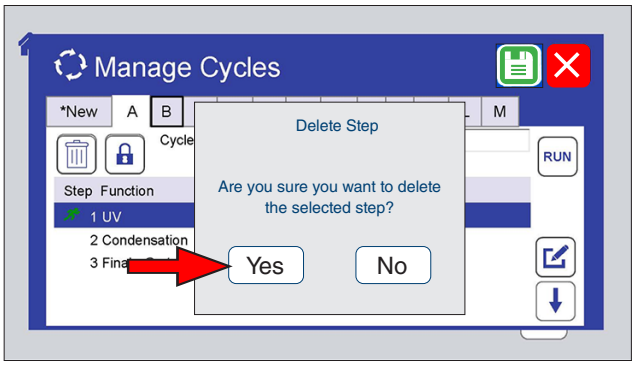


Figure 11.7.6c: Touch the Yes button to delete the step or touch No to cancel the delete.

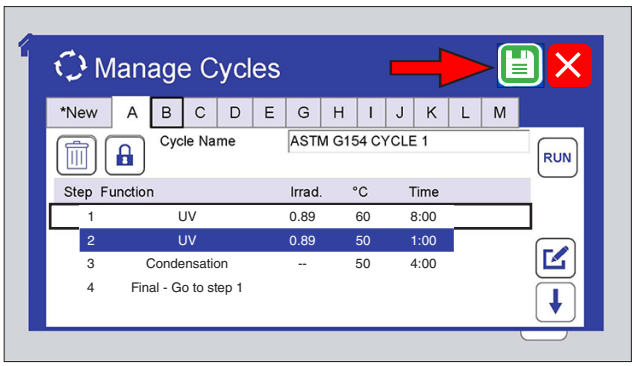


Figure 11.7.6d: Touch the save icon to save the edited cycle.

11.7.7 Create a New Cycle

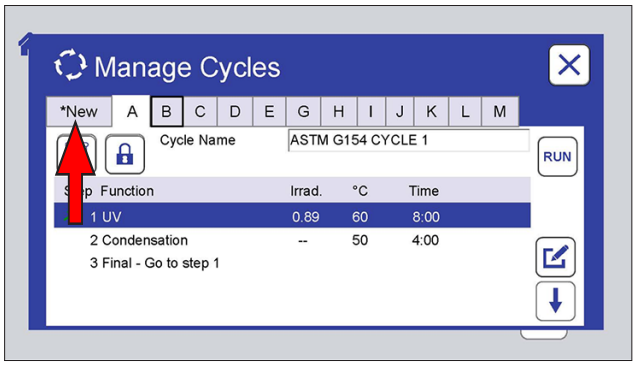


Figure 11.7.7a: To create a new cycle, touch the *New tab.

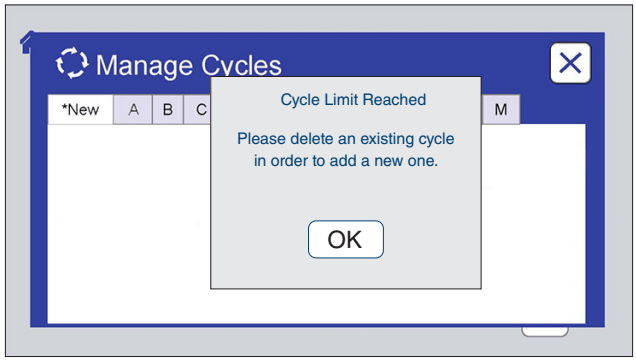


Figure 11.7.7b: If all available cycles are programmed, this message is displayed Touch OK.

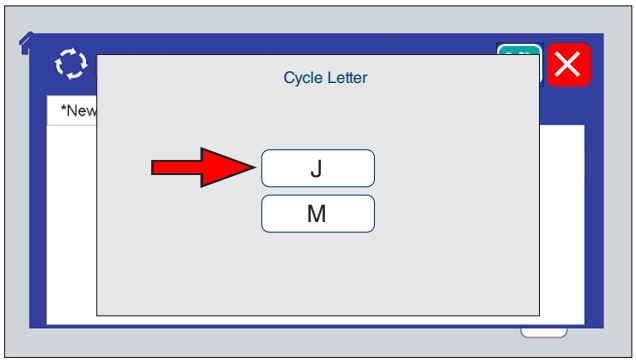


Figure 11.7.7c: If there are open (blank) cycles, the available cycle letters are displayed. Touch a letter to program that cycle.

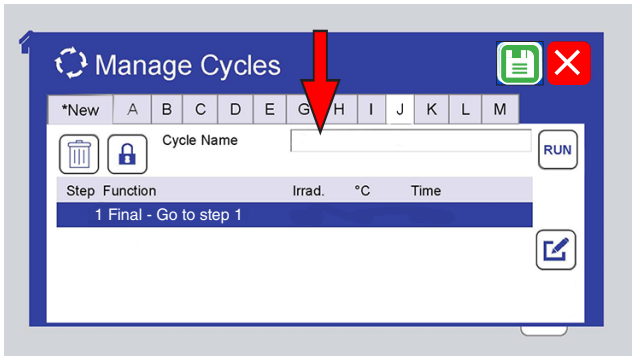


Figure 11.7.7d: An empty cycle is created with only a final step. Enter a name for the new cycle.

11.7.8 Run From Step

- Figure 11.7.8a through Figure 11.7.8e below show how to choose directly where in a program cycle to begin a test.
- Touch another cycle ID tab to run to a different test cycle from the one currently running (Figure 11.7.8f).

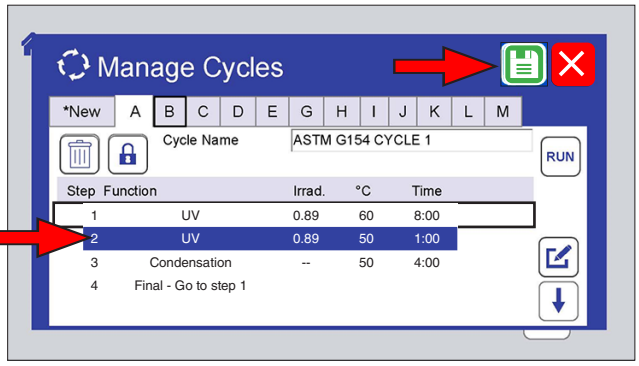


Figure 11.7.8a: Follow Figure 11.7.4a through Figure 11.7.4h to add steps and save the new cycle.

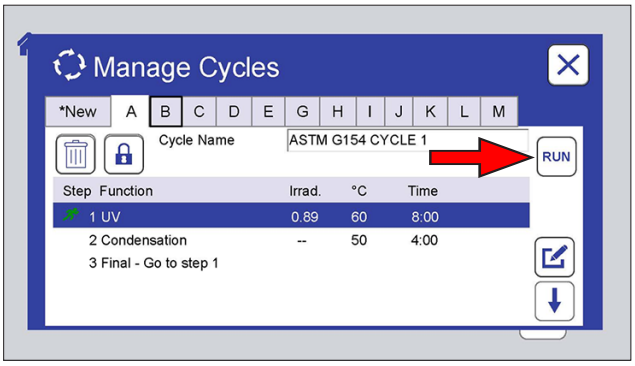


Figure 11.7.8b: A cycle can be run from a specified time in one of its steps. Select the step, then touch the Run icon.

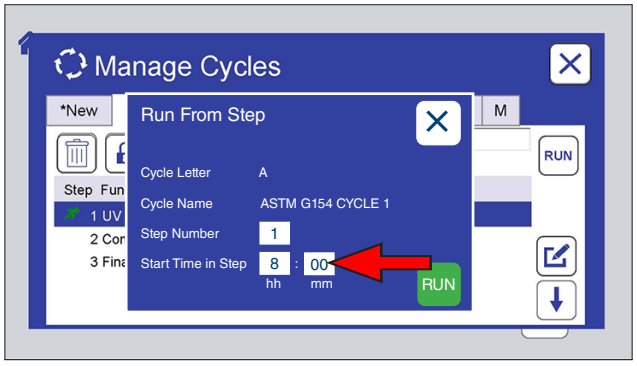


Figure 11.7.8c: Touch the start time hh (hours) text box or the mm (minutes) text box to set the time.

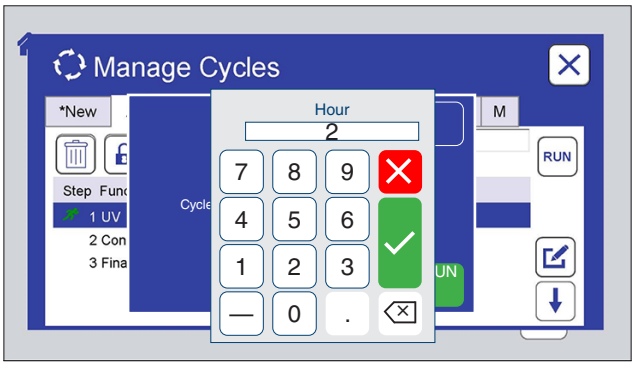


Figure 11.7.8d: Use the numeric key pad to set the time. Touch the check mark button to accept those values or the X button to cancel.

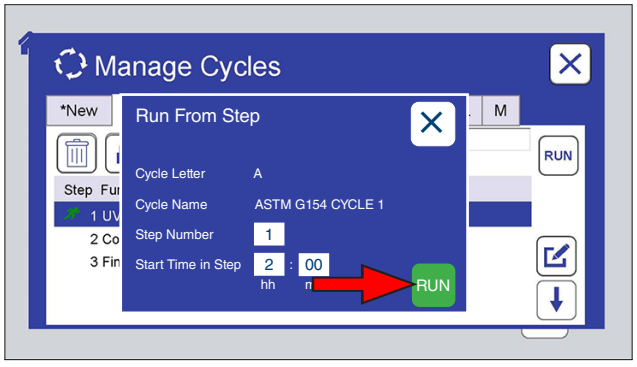


Figure 11.7.8e: Touch the Run icon to run the step from the time entered.

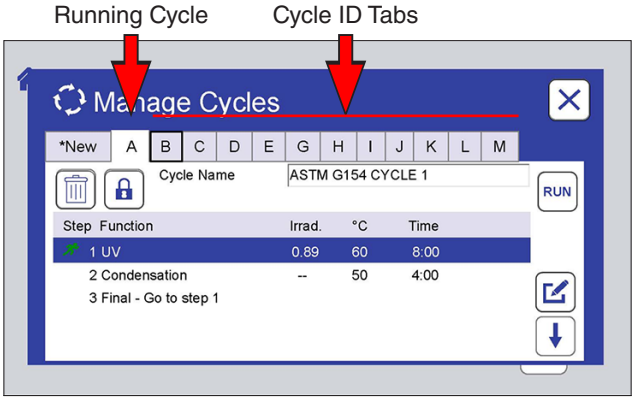


Figure 11.7.8f: Touch another cycle ID tab to switch to a different cycle from the one currently running.

11.8. Settings

- On the Main Menu screen touch the Settings icon (Figure 11.8a) to display the Settings screen.
- The Settings screen displays user-selectable machine parameters (Figure 11.8b)
  - Volume (Figure 11.8c).
    - Alarm
    - Touch
  - Display Options (Figure 11.8e)
    - Status Screen Brightness
    - Main Menu Screen Brightness
    - Sleep Time
  - Language & Date/Time (Figure 11.8i & Figure 11.8p). 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
  - Ethernet (Figure 11.8r).
  - Machine Configuration (Figure 11.8t). Contact Q-Lab Repair and Tester Support for more information on using this setting.
- QUV models equipped with two (2) touchscreens (QUV/se, QUV/cw, QUV/spray, QUV/spray/rp, and QUV/uvc) can be operated using just one screen.
  - 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 (see Single Screen Operation). This will also be indicated by the appropriate notification M900, M901, or M902 (see Section 17.1).
  - A button appears in the upper right corner of the screen to toggle the remaining screen between Main Menu and Status displays (Figure 11.8y through Figure 11.8ab).
- The QUV/basic is equipped with one (1) touchscreen display that can be toggled back and forth between the Status Screen and the Main Menu Screen (see Section 11.2).

Main Menu

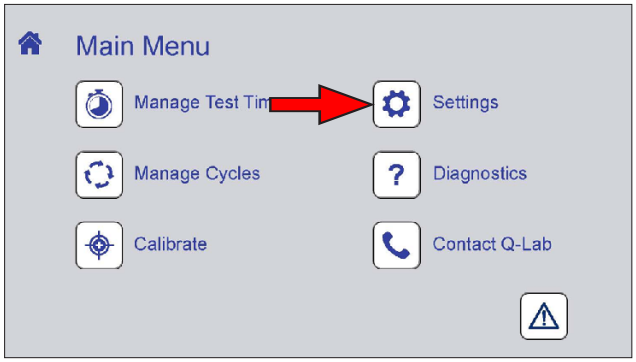


Figure 11.8a: Touch the Settings icon on the Main Menu screen to display settings controls.

Settings

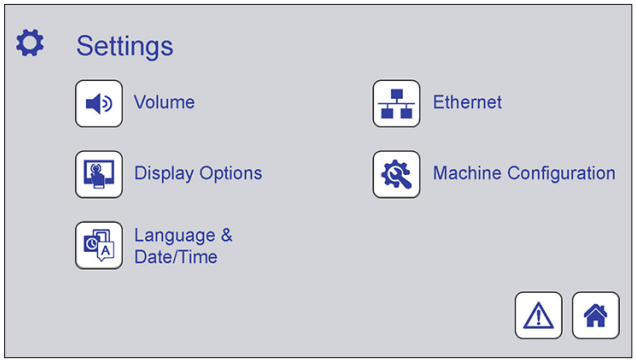


Figure 11.8b: Settings screen. Touch any icon to display controls for that function. The notification screen (Section 11.5) and the home screen can also be displayed.

Volume

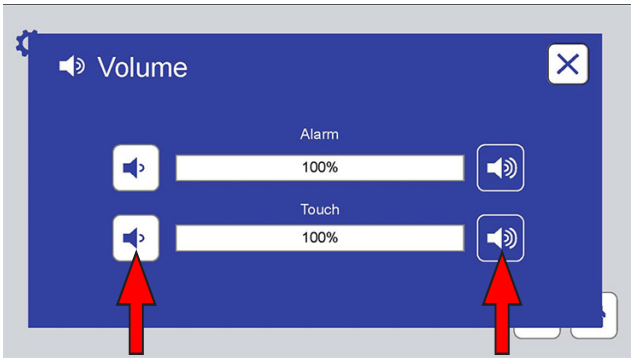


Figure 11.8c: The Volume screen provides controls to set volume (0 to 100) for machine alarms and for the screen touch indicator. Touch a volume icon to adjust.

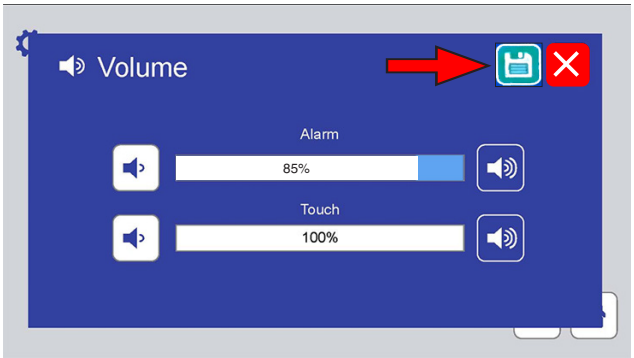


Figure 11.8d: If a volume is changed, touch the save icon to save the new volume level.

Display Options

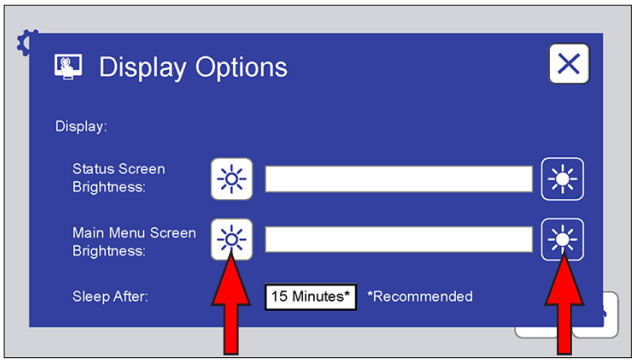


Figure 11.8e: For SOLAR EYE testers, touch a brightness icon on the Display Options screen to adjust the brightness of the status and menu screens.

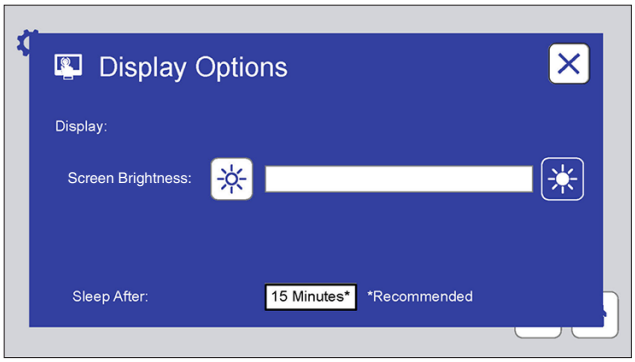


Figure 11.8h: For the QUV/basic, touch a brightness icon on the Display Options screen to adjust the brightness of the single screen.

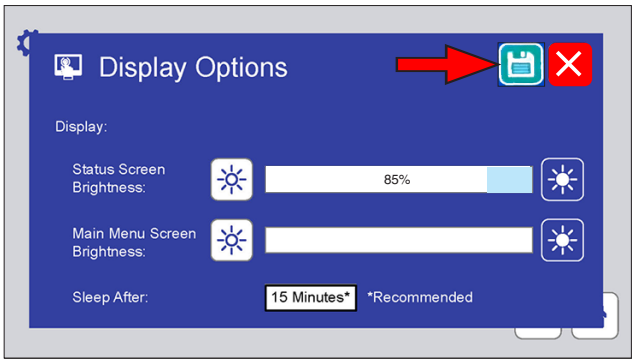


Figure 11.8f: If a brightness is changed, touch the save icon to save the new volume level.

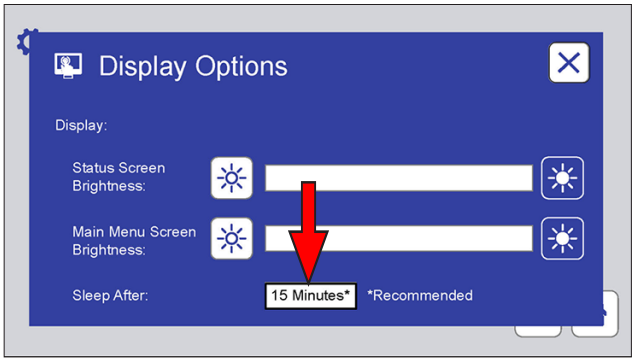


Figure 11.8g: The Display Options screen can also be used to adjust the inactive time that elapses before the screens “go to sleep” (i.e. deactivate). 15 minutes is recommended.

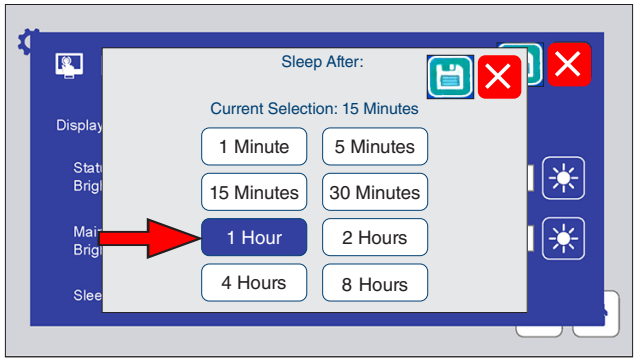


Figure 11.8j: Touch a time button to change the time before screens go to sleep. If changed, touch the save icon to save the new time.

Language

Figure 11.8i: This screen displays controls to select the control interface language.

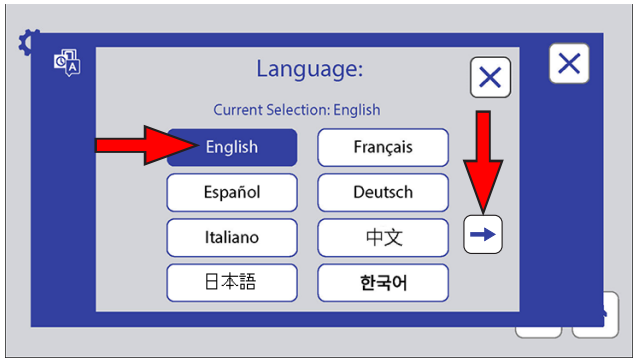


Figure 11.8l: Touch the language text box to select the control display language. Touch the Down Arrow icon to display additional available languages.

Figure 11.8m: Touch the text box for the desired language.

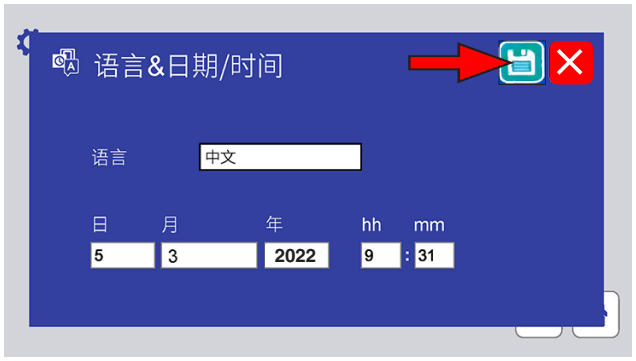


Figure 11.8k: All text on both screens will be in the selected language. Touch the save icon to save the selection.

Date/Time

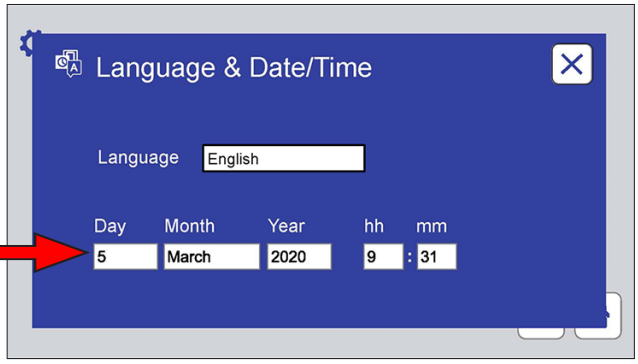


Figure 11.8p: This screen displays controls to set the date and time. Touch a text box to set Day, Month, Year, hh (hour) or mm (minute). hh display is always 24 hour time.

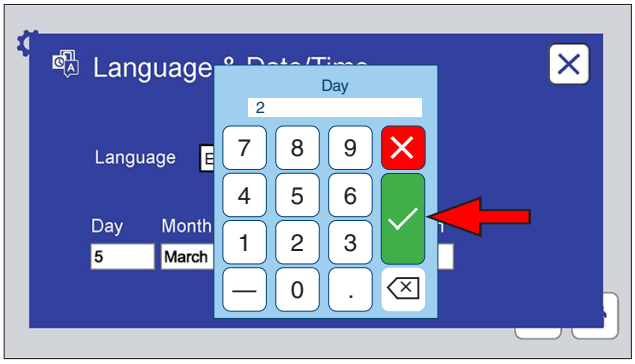


Figure 11.8q: The numeric keypad is used to set Day, Year, hh, and mm. Enter the number, then touch the check mark button.

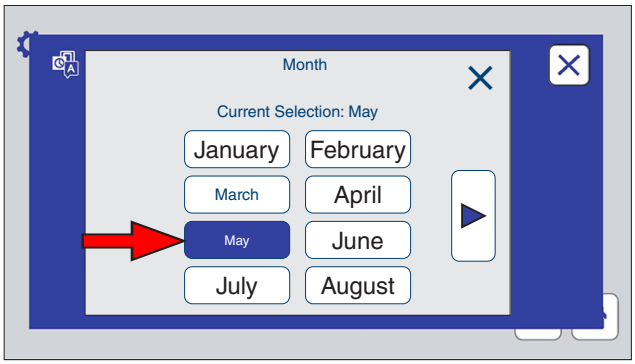


Figure 11.8n: Touch the month button to select the month on this display. Touch the right arrow button to display the remaining months.

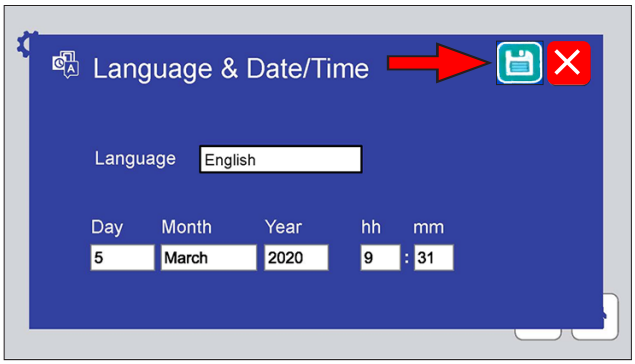


Figure 11.8o: Touch the save icon to save any changes to the Language & Date/Time.

Ethernet

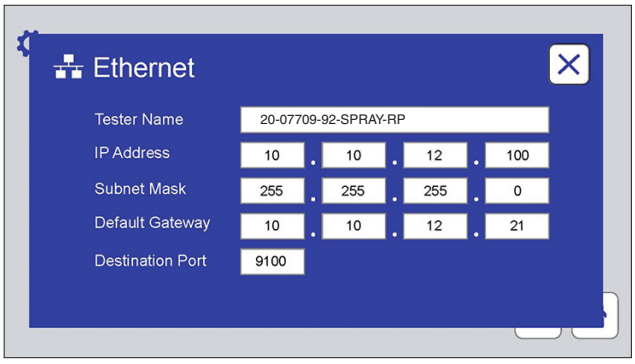


Figure 11.8r: This screen displays and provides text boxes to enter Ethernet connection parameters.

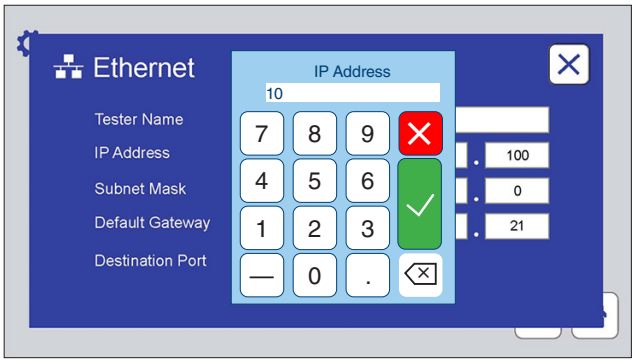


Figure 11.8s: Touch any text box to use the numeric keypad to input the parameter.

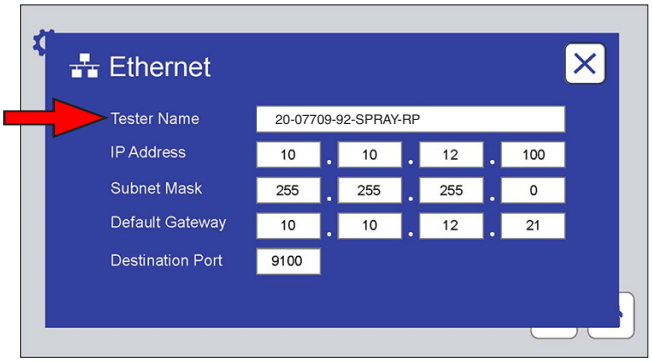


Figure 11.8v: Additionally, this screen has the name of the tester as it would appear on a network, if using the VIRTUAL STRIPCHART network version.

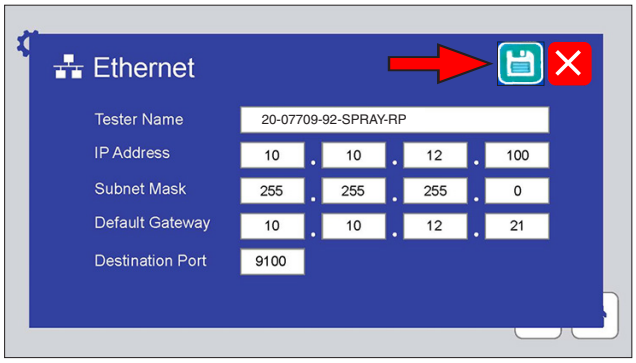


Figure 11.8w: Touch the save icon to save any changes to Ethernet parameters.

Machine Configuration

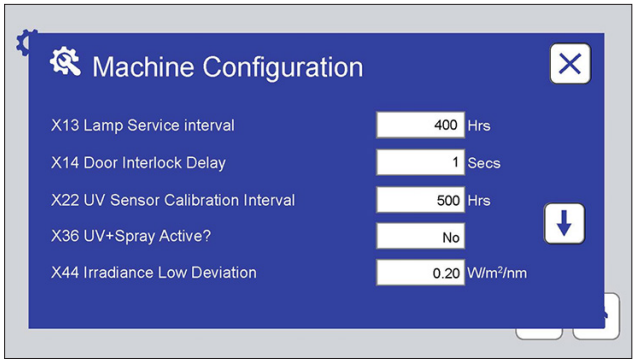


Figure 11.8t: Machine Configuration includes several customizable parameters. Please contact Q-Lab Repair with questions about parameters. Touch the down arrow to display additional parameters.

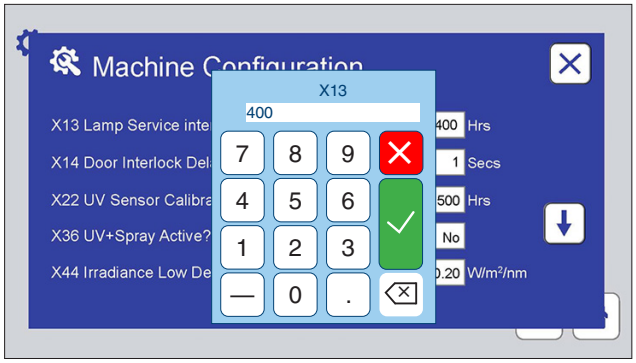


Figure 11.8u: Touch the parameter text box to use the numeric keypad to enter a value. Contact Q-Lab Repair and Tester Support for more information.

No.	Name	Unit	Range	Default	Description
X14	Door Interlock Delay	Secs	1-99	1	This is a delay that will prevent the “M1 Door is Open” alarm from sounding when an open door is detected before a designated amount of time. This delay is used to prevent nuisance alarms.
X22	UV Sensor Calibration Interval	Hrs	0-999	500	This is the allowed duration that the UV sensors can be used before the sensors must be calibrated. Once the time limit has been reached, the “M66 Calibrate UV sensors” alarm will sound. Not applicable to QUV/basic.
X36	UV + Spray Active?		Yes/No	No	This enables the tester to perform the UV + spray function. The UV + spray function is used in QUV/spray and QUV/spray/rp models.
X44	Irradiance Low Deviation	W/m^2	1-100	0.20	This is the amount the irradiance value must be below the set point to produce the “M51 UV Irradiance Channel X Too Low” alarm. Not applicable to QUV/basic.
X49	Spray On Time	Secs	5-999	5	Spray models only. This determines the length of time that water is sprayed. Water will be sprayed continuously unless X50 Spray Off Time is non-zero. This parameter describes how long the spray relay will be turned on.
X50	Spray Off Time	Secs	0-999	0	Spray models only. This determines the length of time that the spray relay will be turned off during a spray step.
X53	UV + Condensation Active ?		Yes/No	No	This enables the tester to perform the UV + condensation function when the parameter is set to yes. Not applicable to QUV/uvc.
X69	Lamps Specified in Cycle Management		Yes/No	No	Enables selection of lamp type on Cycle Management screen. Must be set to Yes to use TUV-421 lamps.
X500	Serial Number Year		##		Two-digit year of tester manufacture from serial number
X501	Serial Number Unique ID		#####		Five-digit unique tester ID from serial number
X502	Serial Number Series		###		Two- or three-digit tester series from serial number

Figure 11.8x: Complete list of accessible machine configuration parameters.

Single Screen Operation

- QUV SOLAR EYE models equipped with two (2) touchscreens can be operated using just one screen.
- QUV/basic testers have one (1) touchscreen that can be toggled between the Main Menu and the Status Screen (see Section 11.2).

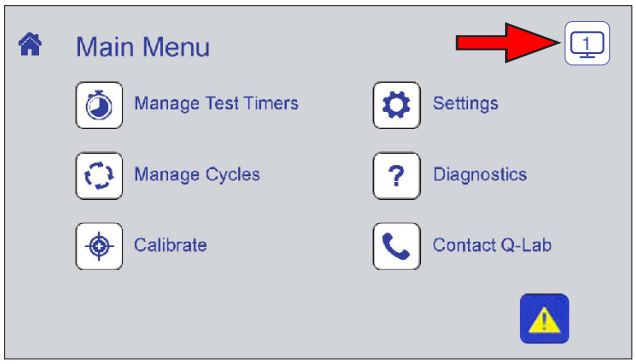


Figure 11.8y: Main Menu in single screen mode. Touch the screen icon.

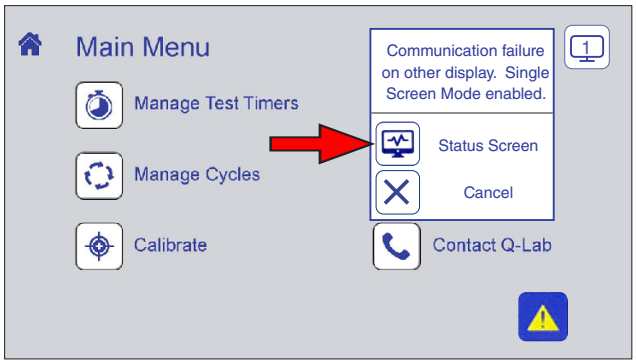


Figure 11.8z: Touch the Status Screen icon to display the Status Screen.

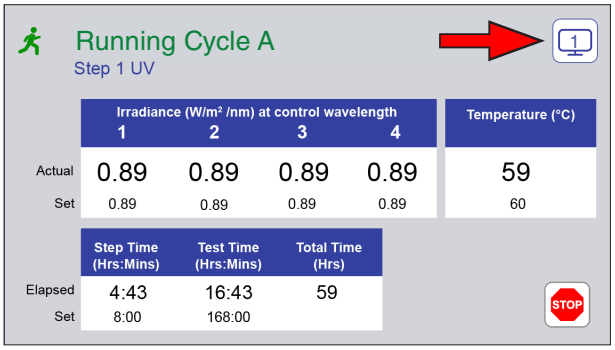


Figure 11.8aa: Status Screen in single screen mode. Touch the screen icon.

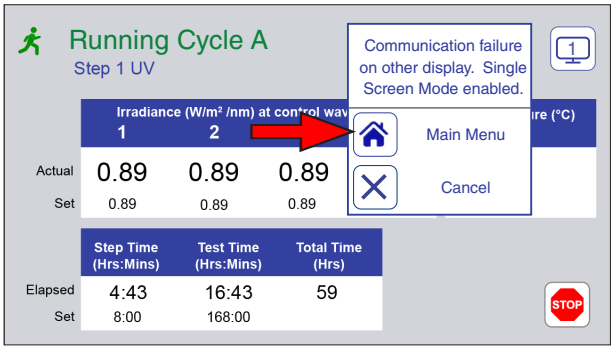


Figure 11.8ab: Touch the Menu Screen icon to display the Menu Screen.

11.9. Diagnostics

- Diagnostics are a list of tester current operating conditions.
- Diagnostics are an important tool to assist in troubleshooting tester conditions.
- On the Main Menu screen, touch the Diagnostics icon (Figure 11.9a) to display the Diagnostics screen (Figure 11.9b).
- 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 11.8ac for a complete list of QUV diagnostic numbers, messages, and descriptions.
- Not all diagnostic messages appear in all QUV models, as noted in the Figure 11.8ac table.

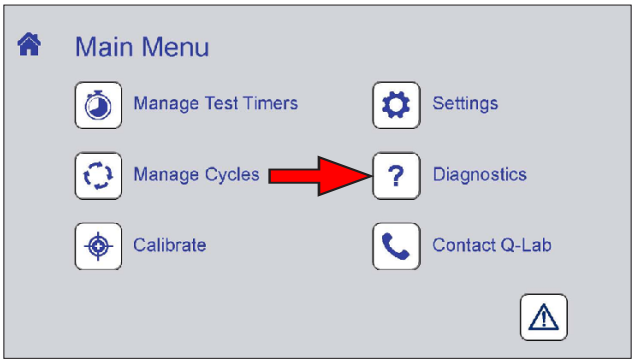


Figure 11.9a: Touch the Diagnostics icon on the Main Menu screen to display diagnostic information.

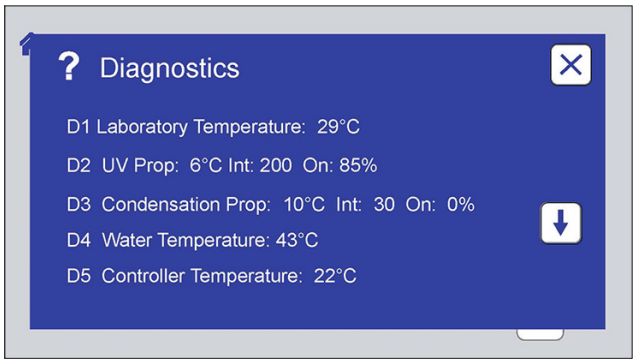


Figure 11.9b: The Diagnostics screen displays current machine operating conditions.

No.	Diagnostic Message	Description	Appears in QUV Model		
			basic	uvc	se, spray, spray/rp, cw
D1	Laboratory Temperature= XX °C	The current laboratory temperature.	●	●	●
D2	UV Prop=XX °C, Int=XX On = XX%	The settings for controlling the panel temperature in a UV step and the percentage of time the chamber heater is on.		●	●
D3	Cond Prop=XX °C, Int=XX, On=XX%	The settings for controlling the chamber temperature in a condensation step and the percentage of time the water heater is on.	●		●
D4	Water Temperature= XX °C	The current temperature of the water in the water pan.	●		●
D5	Controller Temperature = XX °C	The current temperature of the controller.	●	●	●
D7	Version X.XXX	The software version.	●	●	●

No.	Diagnostic Message	Description	Appears in QUV Model		
			basic	uvc	se, spray, spray/rp, cw
D8	XXXX Hours Since Lamp Service	This shows the elapsed time since the last “M65 Service Lamps” alarm was cleared. When the timer reaches the Lamp Service Interval, an alarm will sound. The UV lamps must be on for the timer to increment.	●		
D9	Joules/m^2 = XXX,XXX,XXX	The accumulated energy dosage.		●	●
D10	XXXX Hours Since UV Sensor Cal	The elapsed time since the last “M66 Calibrate UV Sensors” alarm was cleared.		●	●
D11	UV% CH1=XXX CH2=XXX CH3=XXX CH4=XXX	The output to each channel during UV, UV+spray, and UV+condensation steps.		●	●
D12	Dark Prop=XX °C, Int=XX On = XX%	The settings for maintaining the panel temperature at the UV temperature set point during a dark step and the percentage of time the chamber heater is on.	●	●	●
D13	UV+COND Prop= XXX °C Int=XXX On=XXX%	The settings for controlling the panel temperature in a UV+condensation step and the percentage of time the water heater is on.			●
D14	Serial Number= XX-XXXXX-XX-XXXXX	The tester serial number as input either at Q-Lab or during a main controller replacement or reset operation.	●	●	●
D15	MAC Address= XX-XX-XX-X-X-XX	The media access control (MAC) address for the tester.	●	●	●

Figure 11.8ac: Complete list of QUV diagnostic numbers, messages, and descriptions.

11.10. Contact Q-Lab

- The Contact Q-Lab screen displays the link to Q-Lab Repair and Tester Support on the web site.

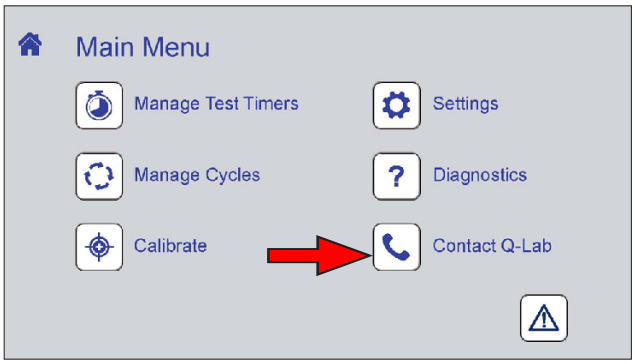


Figure 11.10a: Touch the Contact icon on the Main Menu screen to display Q-Lab contact information.

Figure 11.10b: 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.
- Achievable test conditions, including maximum and minimum setpoints and transitions between steps, are influenced by laboratory ambient conditions, specimen types, mounting techniques, and interdependencies between test parameters. Thus, not all listed setpoint combinations may necessarily be achievable.
- Standard test cycles pre-programmed in the QUV are shown in Section 12.1.
- For instructions on modifying cycles or creating custom cycles see Section 9.6.
- Guidelines for choosing settings for custom cycles are given in Section 12.2.
- Various methods for mounting test specimens are illustrated in Section 12.3.
- Recommendations for repositioning test specimens are provided in Section 12.4.

12.1. Standard Test Cycles

- See Section 9.6 for detailed information on test cycle programming.
- The tables below list standard test cycle names, lamp type used, QUV models programmed with the cycle, and the test cycle step parameters. For models not shown in "Programmed in Models", the cycle will be blank.

Cycle A: ASTM G154 CYCLE 1				
Lamp Type: UVA-340, UVA-340+				
Programmed in Models: QUV/se, QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	0.89	60	8:00
2	Condensation	N/A	50	4:00
3	Final Step - Go to Step 1			

Cycle A: ASTM G224 Cycle 1				
Lamp Type: UVC-254				
Programmed in Models: QUV/uvc				
STEP	FUNCTION	Irradiance (mW/cm²)	Temperature (°C)	Time (hh:mm)
1	UV	6.0	35	24:00
2	Final Step - Go to Step 1			

Cycle B: ASTM G154 CYCLE 2				
Lamp Type: UVB-313EL+				
Programmed in Models: QUV/se, QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	0.71	60	4:00
2	Condensation	N/A	50	4:00
3	Final Step - Go to Step 1			

Cycle C: SAE J2020 (also ASTM G154 CYCLE 3)				
Lamp Type: QFS-40, UVB-313EL+				
Programmed in Models: QUV/se, QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	0.48	70	8:00
2	Condensation	N/A	50	4:00
3	Final Step - Go to Step 1			

Cycle D: ASTM G154 CYCLE 4				
Lamp Type: UVA-340+				
Programmed in Models: QUV/se, QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	1.55	70	8:00
2	Condensation	N/A	50	4:00
3	Final Step - Go to Step 1			

Cycle E: ASTM G154 CYCLE 5				
Lamp Type: UVB-313EL+				
Programmed in Models: QUV/se, QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	0.62	80	20:00
2	Condensation	N/A	50	4:00
3	Final Step - Go to Step 1			

Cycle F: ASTM G154 CYCLE 6				
Lamp Type: UVA-340+				
Programmed in Models: QUV/se, QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	1.55	60	8:00
2	Condensation	N/A	50	4:00
3	Final Step - Go to Step 1			

Cycle G: ASTM G154 CYCLE 7				
Lamp Type: UVA-340+				
Programmed in Models: QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	1.55	60	8:00
2	Spray	N/A	N/A	0:15
3	Condensation	N/A	50	3:45
4	Final Step - Go to Step 1			

Cycle H: ISO 11507 METHOD A				
Lamp Type: UVB-313EL+, UVA-340, UVA-340+, UVA-351				
Programmed in Models: QUV/se, QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	0.71*	60	4:00
2	Condensation	N/A	50	4:00
3	Final Step - Go to Step 1			
	* The irradiance set point is not specified in ISO 11507, 0.71 was chosen because it represents the approximate average irradiance in non-irradiance control QUV testers.			

Cycle I: EN 927-6				
Lamp Type: UVA-340, UVA-340+				
Programmed in Models: QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	Condensation	N/A	45	24:00
2	Subcycle repeat steps 3-4 48x			
3	UV	0.89	60	2:30
4	Spray	N/A	N/A	0:30
5	Final Step - Go to Step 1			

Cycle J: Cool White				
Lamp Type: Cool White				
Programmed in Models: QUV/cw				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	0.60	40	24:00
2	Final Step - Go to Step 1			

Cycle K: ISO 4892-3 Cycle 1				
Lamp Type: UVA-340, UVA-340+				
Programmed in Models: QUV/se, QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	0.76	60	8:00
2	Condensation	N/A	50	4:00
3	Final Step - Go to Step 1			

Cycle L: ISO 4892-3 Cycle 2				
Lamp Type: UVA-340, UVA-340+				
Programmed in Models: QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	0.76	50	8:00
2	Spray	N/A	N/A	0:15
3	Condensation	N/A	50	3:45
4	Final Step - Go to Step 1			

Cycle M: ISO 4892-3 Cycle 6				
Lamp Type: UVB-313EL+, QFS-40				
Programmed in Models: QUV/se, QUV/spray, QUV/spray/rp				
STEP	FUNCTION	Irradiance (W/m²/nm)	Temperature (°C)	Time (hh:mm)
1	UV	0.48	70	8:00
2	Condensation	N/A	50	4:00
3	Final Step - Go to Step 1			

12.2. Custom Test Cycles

- See Section 11.7 for details on programming custom test cycles.
- The SOLAR EYE® irradiance control system continuously monitors and precisely maintains irradiance by adjusting power to the lamps.
- Irradiance control is very important because changes in light intensity may affect both speed and type of material degradation.
- Models with irradiance control feature programmable setpoints.
  - For example, with UVA-340 lamps, an irradiance of 0.89 W/m²/nm@340 nm is a good match with noon summer sunlight.
  - For faster results, the QUV tester can operate at about double the irradiance of noon summer sunlight.
- Table 12.2 shows warranted lamp life for QUV lamps at common irradiance set points.
- For the most recent QUV lamp irradiance ranges and warranty information see LU-0819 QUV Specification Bulletin.
- For more information on lamp selection see LU-8160 A Choice of Lamps for the QUV Accelerated Weathering Tester.

Irradiance Set Points	Warranty[1,5]	UVGI	Extraterrestrial			Daylight		Window	Total UV	Indoor
		UVC-254[2]	UVB-313EL	UVB-313EL+[3]	QFS-40	UVA-340	UVA-340+[4]	UVA-351	TUV-421[2,3]	Cool White[2]
Minimum	*Reference*	1.0	0.20	0.35	0.20	0.20	0.35	0.20	30	2.0
Low	1,000 hours	1.1-1.9	0.40-0.47	0.40-0.47	0.30-0.43	0.40-0.59	0.60-0.74	0.35-0.59	60[5]	3.0-3.9
Typical	8,000 hours	2.0-6.0	0.48-0.62	0.48-0.95	0.44-0.52	0.60-0.90	0.75-0.95	0.60-0.80		4.0-5.9
High	1,000 hours	6.1-10.0	0.63-0.95	0.96-1.85	0.53-0.70	0.91-1.25	0.96-1.85	0.81-1.25		6.0-10.0
Maximum	*Reference*	13.0	1.23	2.04	0.86	1.54	2.04	1.54	75	20.0

1. Irradiance values less than "Low" and greater than "High" (including Minimum and Maximum reference values) are not warrantied. For important warranty information, visit Q-Lab.com/Warranty.
2. Values above are in units of W/m²/nm, except for UVC-254 (mW/cm²), TUV-421 (W/m² TUV), and Cool White (kLux).
3. UVB-313EL+ and TUV-421 lamps must be calibrated using the Universal Calibrator system. They cannot be calibrated with a CR10.
4. Some older QUV/basic testers may require an upgrade to work properly with UVA-340+ lamps. Contact Q-Lab Repair for details.
5. Warranty for TUV-421 lamps at the Irradiance indicated is 2,000 hours.

Table 12.2: QUV Lamp Warranties at Common Irradiance Set Points.

Irradiance Set Point Considerations

Correlation:

- Tests run at typical irradiance may correlate with natural outdoor exposures better than tests run at high irradiance.

Black Panel Temperature Range:

- Black panel temperatures above 75 °C require high irradiance.
- Black panel temperatures below 55 °C require low irradiance, or normal irradiance in a QUV/uvc tester.

Moisture Cycle Guide

Condensation:

- Minimum time is 2 hours. Minimum temperature is 40 °C.

Spray and Condensation (QUV/spray models only):

- Thermal shock is produced with a short period of water spray.
- A condensation step should follow for maximum acceleration of the damaging effects of moisture.

Spray only (QUV/spray models only):

- Mechanical erosion is produced with long periods of water spray requiring large volumes of Reverse Osmosis / Deionized water.
- See Section 5.4.

12.3. Mounting Test Specimens

- The QUV specimen mounting system is highly adaptable.
- The standard QUV panel holders are designed to hold two (2) 75 mm × 150 mm (3 × 6 inch) panels.
- In addition, Q-Lab can provide 100 mm (4") or 150 mm (6") wide panel holders upon request. See table below.
- For complete specimen mounting information see Specification Bulletin LU-8001, QUV Specimen Mounting Guidelines and Available Holders.

Holder Size	Total QUV Panel Capacity Front and Back
75 × 150 mm (3 × 6")	48
100 × 150 mm (4 × 6")	32
150 × 150 mm (6 × 6")	24

75 mm (3") Panel Holder Kit V-131.3-K Includes 25 Panel Holders (V-131.3-X) and 4 End Seals (V-60316-X)

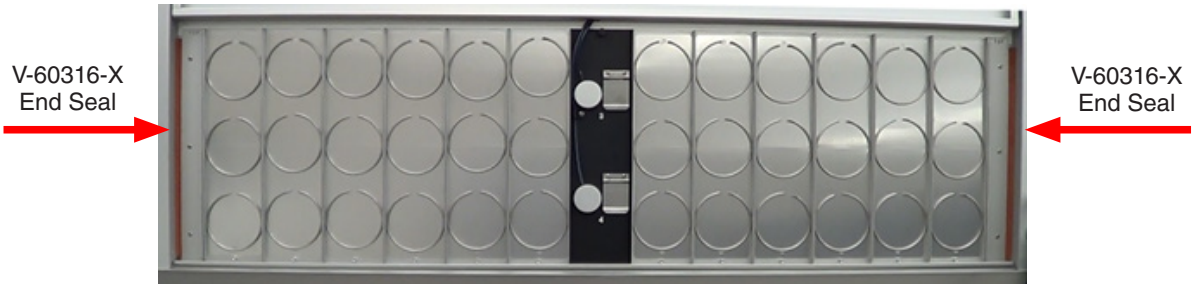


Figure 12.3a: QUV with 75 mm (3") wide panel holders.
NOTE: QUV/uvc uses different 3" end seals (part # V-60480-X).

100 mm (4") Panel Holder Kit V-131.4-K Includes 18 Specimen Holders (V-131.4-X), 2 End Seals (V-60316-X) and 4 End Seals (V-60317-X)

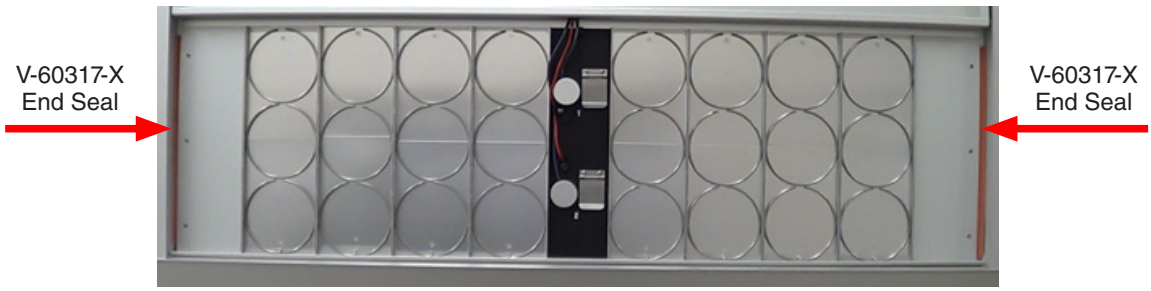


Figure 12.3b: QUV front view with 100 mm (4") wide specimen holders.
NOTE: QUV/uvc 4" end seals not available.

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150 mm (6") Panel Holder Kit V-131.6-K Includes 13 Specimen Holders (V-131.6-X), 4 End Seals (V-60318-X) and 2 End Seals (V-60319-X)

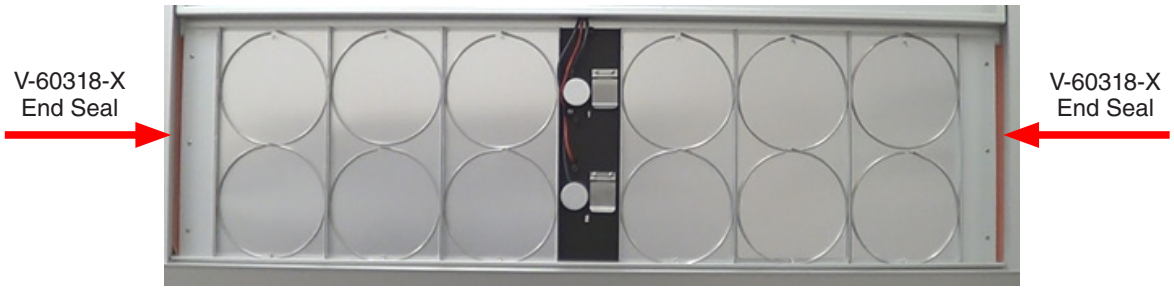


Figure 12.3c: QUV front view with 150 mm (6") wide specimen holders.
NOTE: QUV/uvc 6" end seals not available.

Figure 12.3d: Snap-in rings hold panels in place.

- Fasten flat panels up to 6 mm (1/4") thick to the holders with snap-in rings.
- Push the ring snugly against the panel.
- Keep the opening of the ring in the center of the holder.

- Install the panel holders on the QUV with the stop pin down.

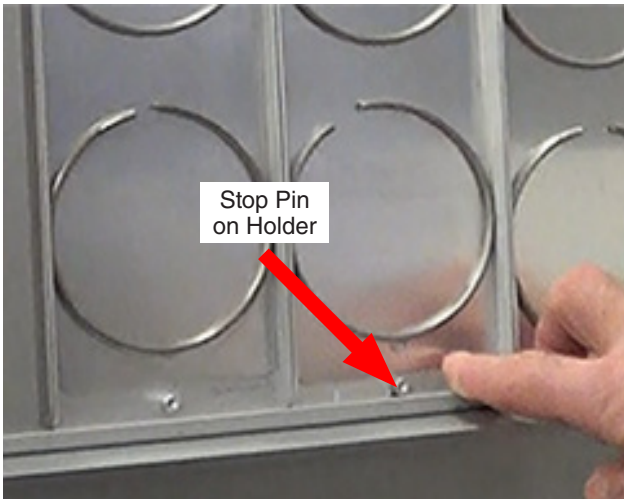


Figure 12.3e: Stop pin on bottom of panel holder.

- Thick panel retainer clips are available (Part No. V-133).

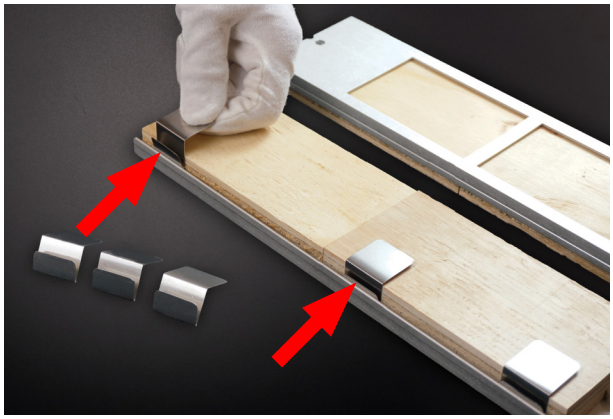
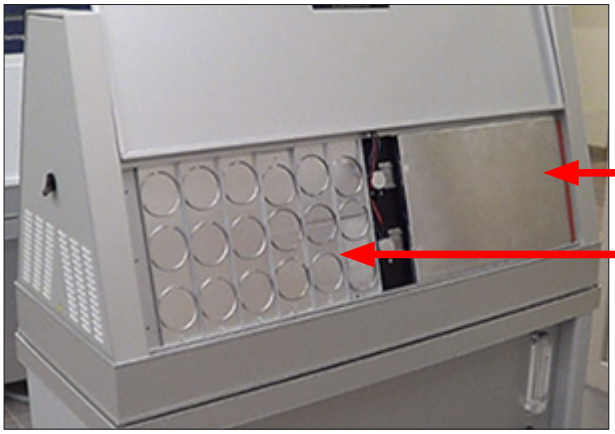


Figure 12.3f: Thick panel retaining clips.



- Mount large specimens on an aluminum panel 325 mm (12.75") high.
- The entire opening of the sample mounting area must be covered with panels to avoid loss of water vapor during the condensation cycle

Figure 12.3g: Large specimen mounting, entire sample area covered.

- Thin, flexible specimens are mounted by wrapping them around a panel.

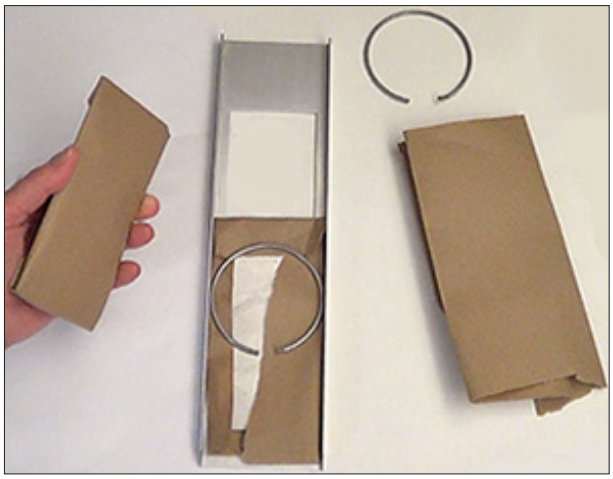


Figure 12.3h: Wrap flexible specimens around a panel.

Three-dimensional (3D) parts can also be mounted in a variety of different mounting boxes as shown below.

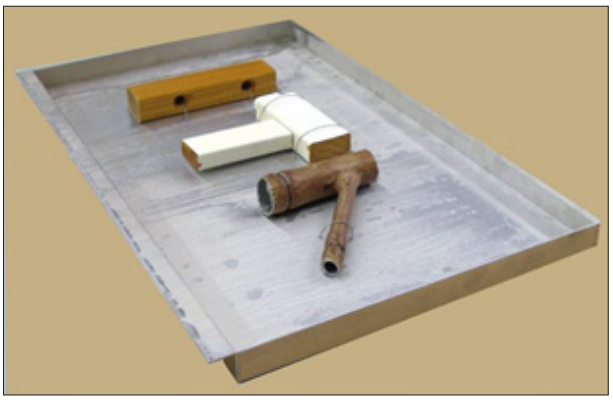


Figure 12.3i: Wide 3D specimen holder.

- 50 × 3 cm (19.5 × 1") specimen holder (Part No. V-4961-X).
- For best UV exposure, position specimens away from the edges of the 3D specimen holder. See Figure 12.3i.

- 8 x 3 cm (3.25 × 1") specimen holder (Part No. V-4960-X).

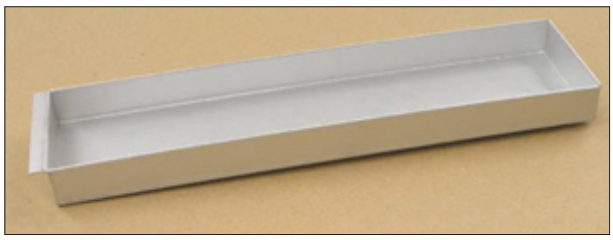


Figure 12.3j: Narrow 3D specimen holder.

- 8 × 2 cm (3.25 × 0.7") specimen holder with adjustable mounting clamps (Part No. V-4019-X).

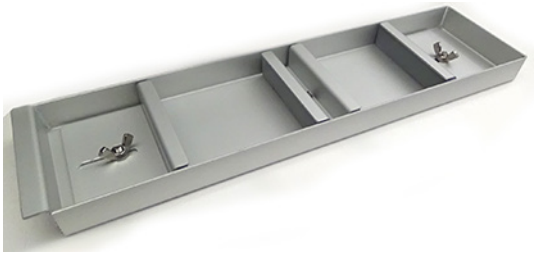


Figure 12.3k: Narrow 3D specimen holder with clamps.

Figure 12.3l: Wide specimen holder with clamps.

- 50 × 5 cm (19.5 × 2") specimen holder with adjustable mounting clamps for specimens like artificial lumber (Part No. V-4962-K).

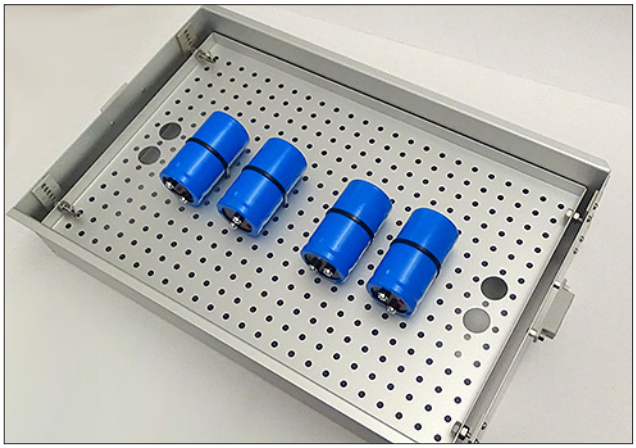


Figure 12.3m: Quadrant boxes with adjustable mounting trays hold large specimens.

- Quadrant box kits V-60301-K and V-60292-K have adjustable perforated trays for mounting large three dimensional specimens.
  - The quadrant box in kit V-60301-K can accommodate specimens up to 10 cm (4") deep.
  - The quadrant box in kit V-60292-K can accommodate specimens up to 20 cm (8") deep.
- For best UV exposure, position specimens away from the edges of the box. See Figure 12.3m.

- Panel holders stack conveniently for carrying by alternating flanges up and down.

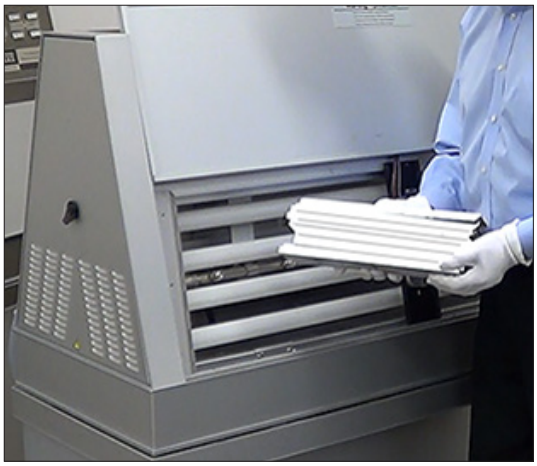


Figure 12.3n: Stacked panel holders.

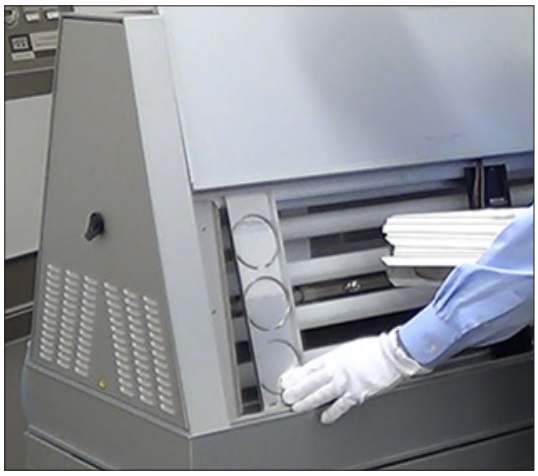


Figure 12.3o: End panel holders.

- The extreme right and left-hand panel holders receive less UV because they are at the ends of the lamps.
- ASTM G154 requires repositioning of test specimens if irradiance at end positions is less than 90% of that measured at the center of the specimen exposure area. Contact Q-Lab for more information.

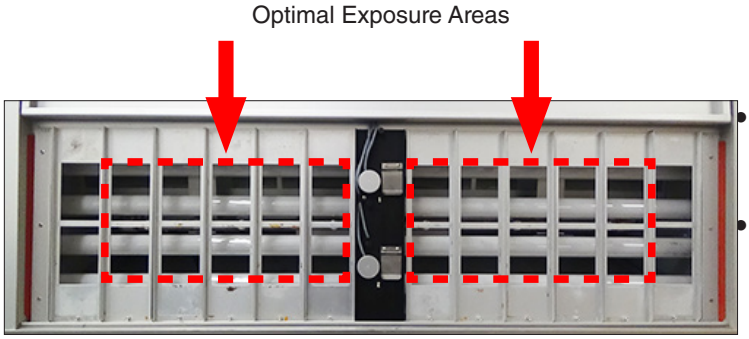


Figure 12.3p: Panels removed from holders to show optimal exposure areas.

- The optimal UV exposure areas are shown in Figure 10.3w. Specimens mounted outside these areas receive less UV.
- Specimens can be mounted in the far left and right specimen holders as long as these specimen holders are repositioned as shown in Section 12.4.

- All QUV models except QUV/uvc have removable rubber end seals to hold vapor in the chamber.
  - Install the seals with the rubber strip against the end frame and the “OUT” arrow pointing away from the specimen holders (Figure 12.3q).
- QUV/uvc tester end seals are attached to the tester frame.

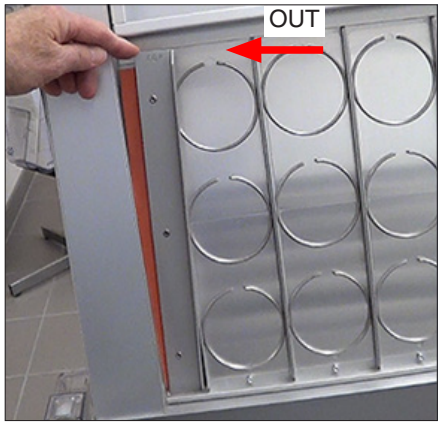


Figure 12.3q: Correct end seal installation.

- The test panels form the side walls of the QUV test chamber.
- All the panel holders must be in place.
- All holders must be filled with test specimens or blank panels.
- Missing panel holders allow vapor loss and affect temperature control.
- Gaps larger than 1 mm (1/32") are not acceptable (see Figure 12.3r).

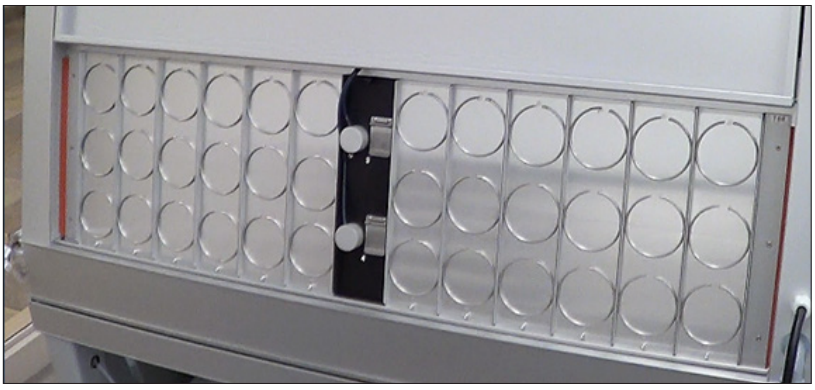


Figure 12.3r: Correct specimen configuration with no gaps between panel holders.

Optional Sensor Panel Relocation Kit Allows for Mounting of Long Specimens

- With the optional QUV Sensor Panel Relocation Kit, the QUV irradiance and temperature sensor panels (both front and back) can be relocated to near the end of the specimen area (Figure 12.3s and Figure 12.3t).
- Moving the sensor panel allows a single specimen box up to 91 cm (35.75”) in length to occupy nearly all of the specimen area for mounting long test specimens.
  - Long specimen boxes are custom-ordered parts. Please contact Q-Lab for information on ordering custom parts.
  - When testing long specimens there is a potential for temperature and/or irradiance non-uniformity along specimen length. Contact Q-Lab Repair and Tester Support for more information.
- The sensor panel should be relocated to the side of the specimen area shown in the Figures.
- The sensor panel should not be moved to the very end specimen position. The irradiance is lower there, and the irradiance sensor calibration will be incorrect.
- Following sensor panel relocation, both the irradiance and temperature sensors must be recalibrated (see Section 13).
- The relocation kit can be ordered as a factory-installed option (V-60371-K-INST) or as a field retrofit (V-60371-K).

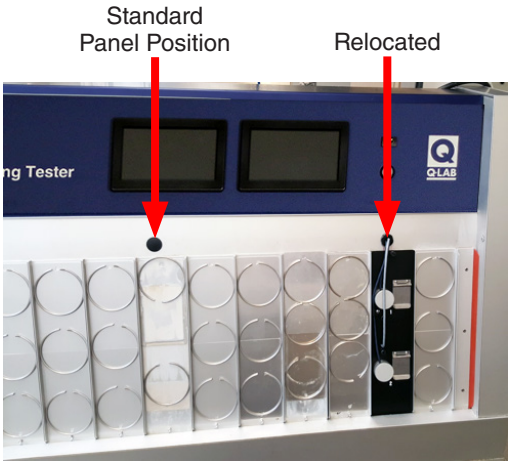


Figure 12.3s: Sensor panel relocated on front of tester.

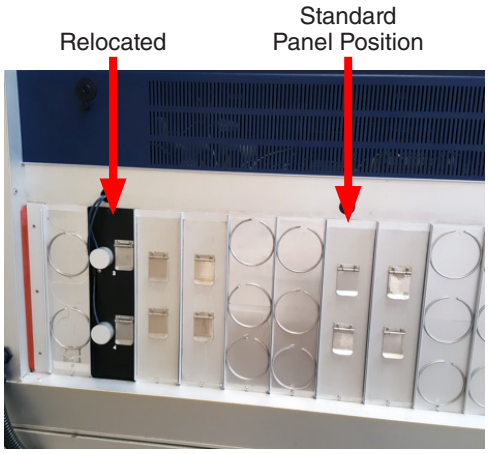


Figure 12.3t: Sensor panel relocated on rear of tester.

12.4. Repositioning Test Specimens

- Reposition the test specimens to obtain the most uniform results.
- Reposition at least 5 times for each test.
- This means that specimens should be repositioned every day for a one week test and once a week for a 5 week test.
- For tests shorter than one week, reposition specimens 2 times per day.
- Shut off the QUV and remove the two panel holders on the left end (Figure 12.4a).
- Slide all the other holders to the left and replace the two that were removed on the right end (Figure 12.4b).
- For ASTM G154, leave the end panels in place and shift the inner panels.
- For best results, also reposition specimens from top to bottom.

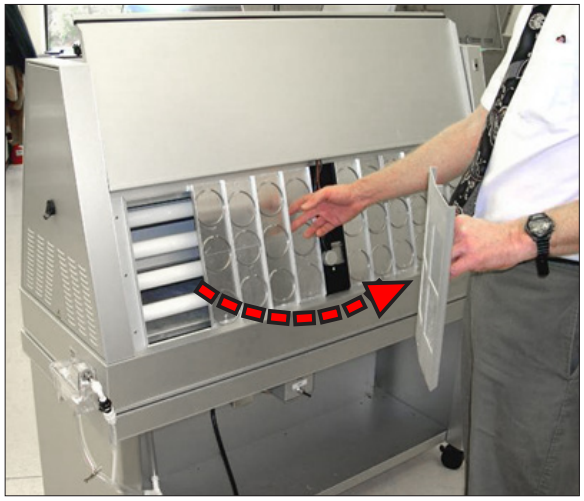


Figure 12.4a: Remove two panels from left end.

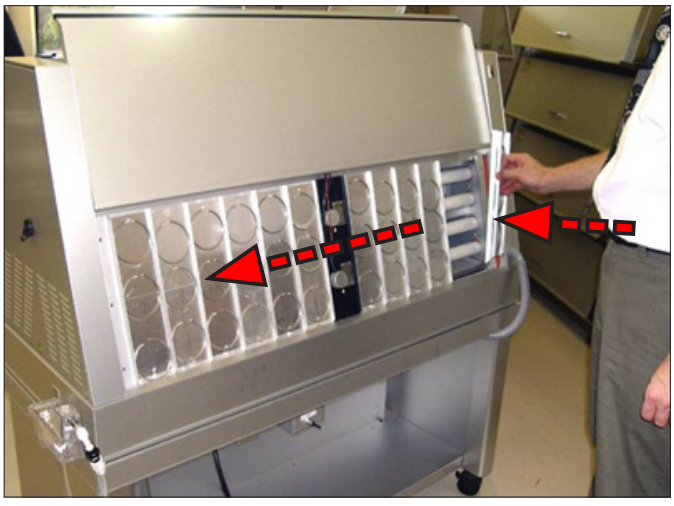


Figure 12.4b: Slide panels to the left, place two panels at right end.

13. Calibration

- Irradiance for all SOLAR EYE models is calibrated with the UC10 Smart Sensor (Section 13.1).
- The QUV/basic tester is not equipped with SOLAR EYE. Irradiance is controlled by periodic lamp replacement and repositioning (see Section 16.1 for details).
- Black panel temperature for all QUV models is calibrated with a reference thermometer (Section 13.3).
- The table below lists irradiance and temperature calibration requirements.
- Please contact Q-Lab for more information.

Tester Sensor	Calibration Frequency	Calibration Method
Four (4) Irradiance Sensors - SOLAR EYE Models	500 hours[1]	UC10 Smart Sensor
No Irradiance Sensors - QUV/basic	400 hours	Lamp Replacement / Specimen Repositioning
Black Panel Temperature - All Models	6 months[2]	Calibrated Reference Thermometer

1. Or whenever the lamps, irradiance sensors, or test cycle conditions are changed.
2. Or whenever the lamps, panel temperature sensors, or test cycle conditions are changed.

13.1. Calibrate Irradiance - SOLAR EYE Models

Overview

- For SOLAR EYE testers the four (4) on-board Irradiance sensors are calibrated with a UC10/UV, UC10/CW, or UC10/UVC Smart Sensor (Figure 13.1a, Figure 13.1b, and Figure 13.1c).
  - The UC10/UV sensor is used to calibrate UVA lamps at 340 nm in W/m^2/nm.
  - The UC10/UV sensor is used to calibrate UVB and QFS 40 lamps at 310 nm in W/m^2/nm.
  - The UC10/UV sensor is used to calibrate TUV-421 lamps at 300-400 nm in W/m^2.
  - The UC10/CW sensor is used to calibrate Cool White fluorescent lamps in a QUV/cw tester only.
  - The UC10/UVC sensor is used to calibrate UVC-254 lamps in a QUV/UVC tester only.
- Smart Sensors are calibrated at Q-Lab and the calibration information is stored in the Smart Sensor.
- Calibration information is shown on the sensor calibration certificate and on a Smart Sensor case label (Figure 13.1e and Figure 13.1f).
- Calibration information can also be displayed on the QUV menu screen when the Smart Sensor is connected (Figure 13.1g).
- All UC10 Smart Sensors will give a notification on-screen when plugged-in if calibration is due in the next 90 days or overdue.
- Upon calibration expiration, Smart Sensors should be discarded and replaced with an inexpensive new sensor. See the Replacement Parts List, Section 16.
- Optionally, Smart Sensors can be returned to Q-Lab for recalibration. Contact Q-Lab Repair and Tester Support for more information.
- Clean the Smart Sensor face with isopropyl alcohol (IPA) and a cotton cloth before calibrating irradiance.
  - 99% IPA is strongly recommended for best results.
  - Vigorously clean the Smart Sensor face, especially in environments where airborne contamination is possible.
- Store the Smart Sensor in its box when not in use to avoid any contamination (Figure 13.1d).
- Irradiance Calibration Procedure on page 100 provides detailed instructions for irradiance sensor calibration.

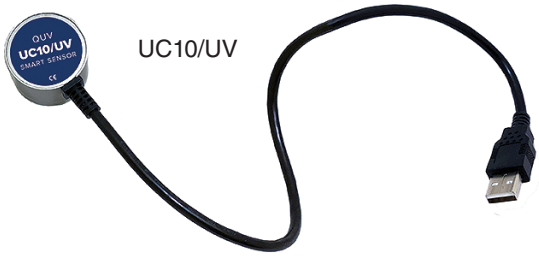


Figure 13.1a: UC10/UV Smart Sensor.

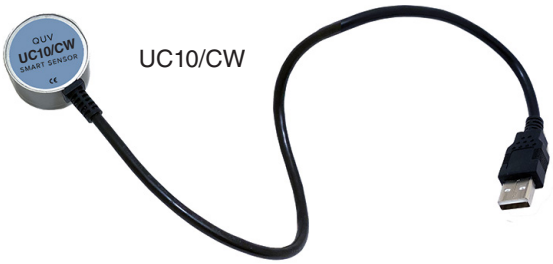


Figure 13.1b: UC10/CW Smart Sensor.

Figure 13.1c: UC10/UVC Smart Sensor.

Figure 13.1d: Store Smart Sensors in the box.

Section 13. Calibration

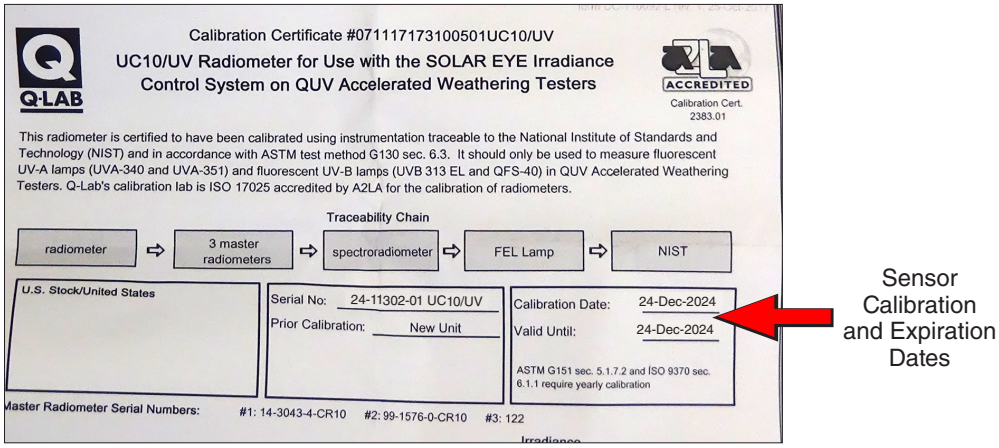


Figure 13.1e: UC10/UV Calibration certificate.

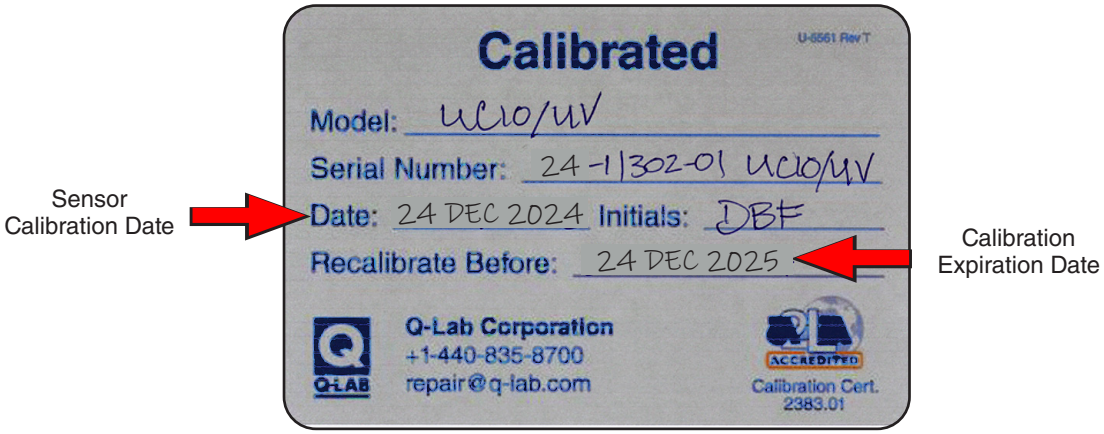


Figure 13.1f: Smart Sensor calibration label inside sensor box.

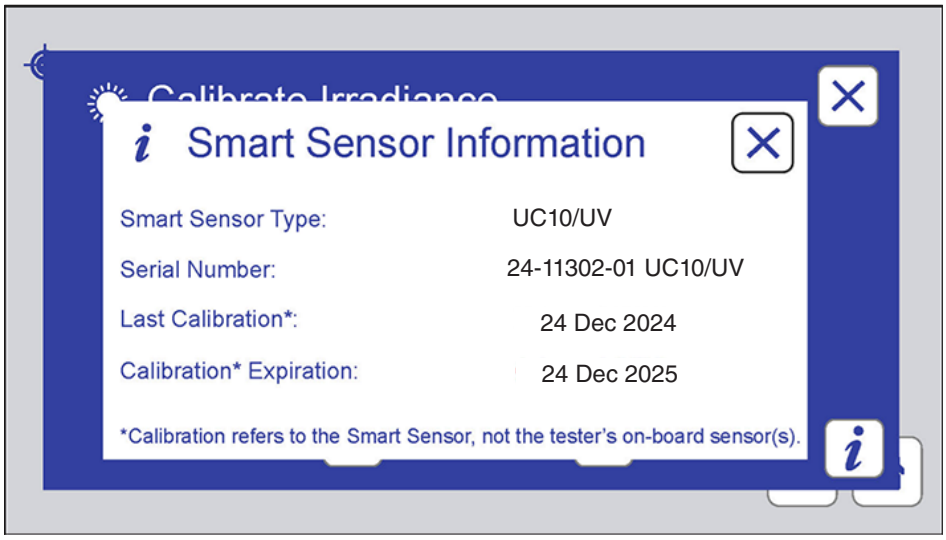
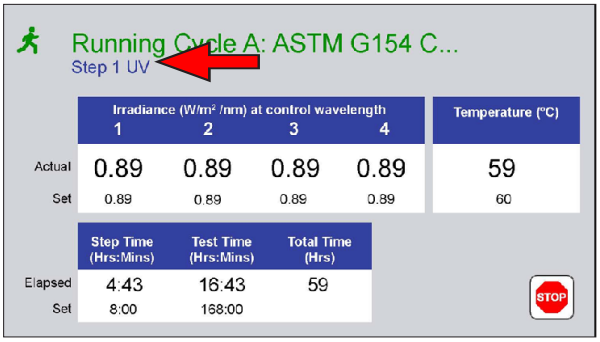


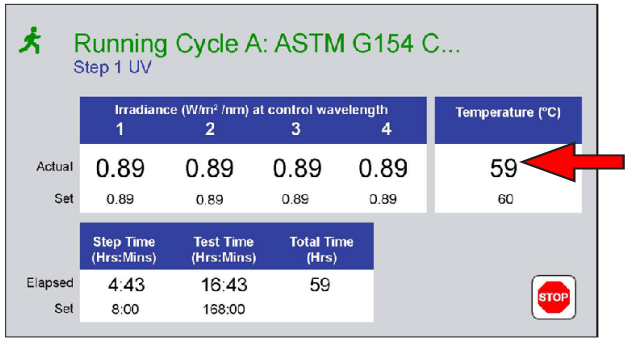
Figure 13.1g: Smart Sensor information displayed on QUV menu screen.

Irradiance Calibration Procedure

- QUV testers are equipped with door interlocks. The UV lamps normally turn off when the door is opened.
- However, when a UC10/UV or UC10/CW smart sensor is connected to the QUV, a special override feature has been incorporated that allows the lamps to remain on. This prevents unintended interruption of the calibration process.
- The override feature is not present when using a UC10/UVC sensor in the QUV/uvc as an extra safety measure.



1. Run a UV step.

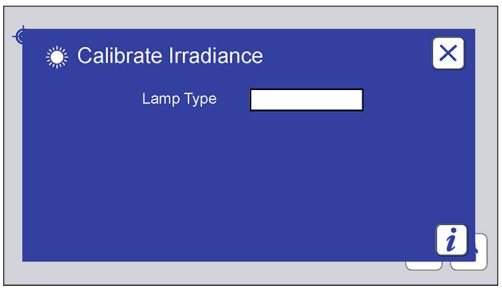


2. Allow the temperature to come up to Set Point and stabilize before proceeding with the calibration.

3. Remove the Smart Sensor from the case.

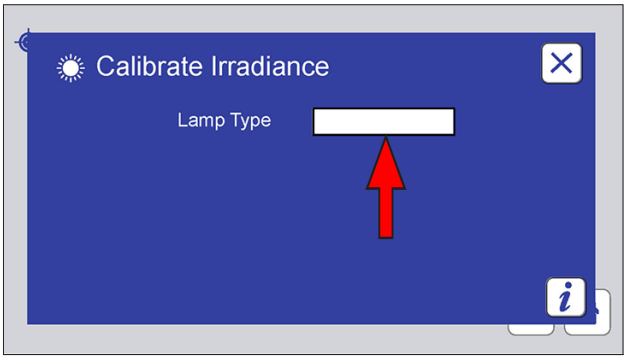
4. Clean the sensor face vigorously with isopropyl alcohol (IPA) and a cotton cloth. 99% IPA is strongly recommended for best results.

5. Plug the Smart Sensor into USB connector on the QUV control panel.

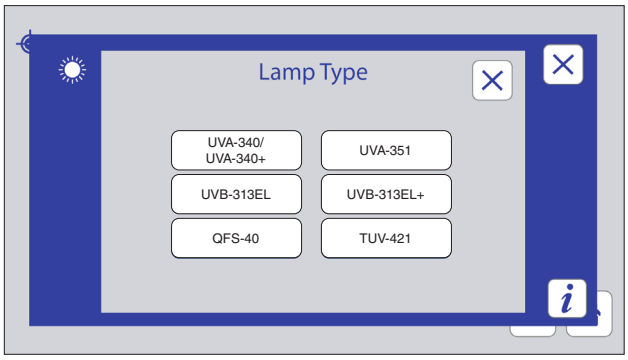


▶ When a UC10/UV smart sensor is used, the user must select the lamp type. The calibrate irradiance screen with Lamp Type text box is displayed.

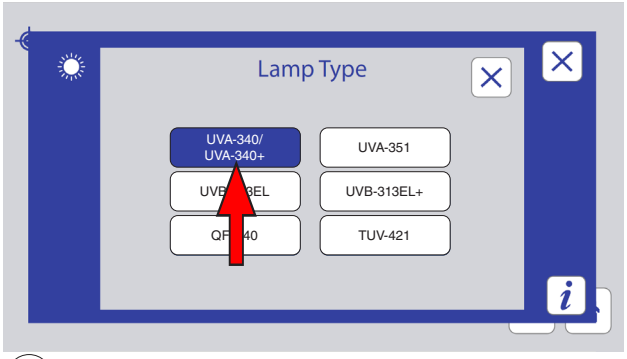
Section 13. Calibration



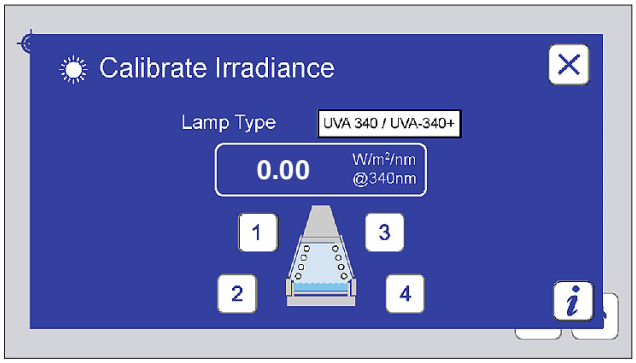
6. Touch the lamp type text box.



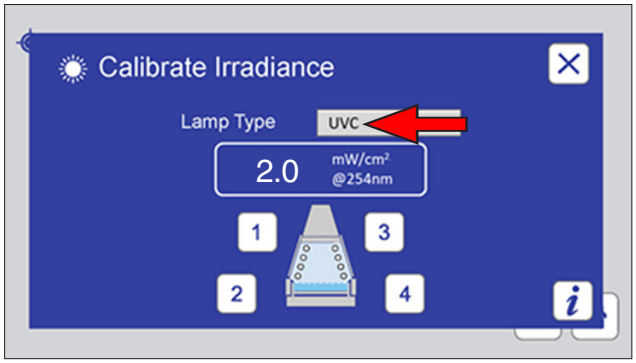
▶ The lamp type screen is displayed.



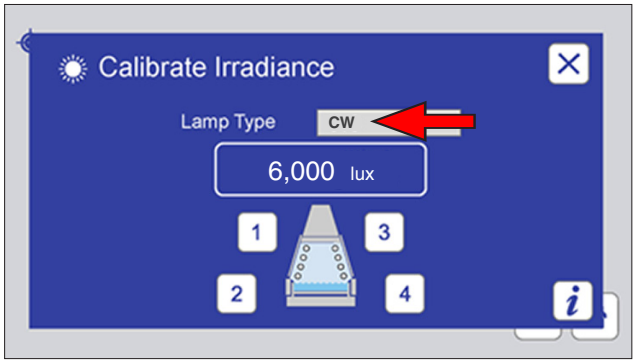
7. Touch the lamp type button that matches the lamp type installed in the QUV tester. The UVA 340 lamp is used in this example.



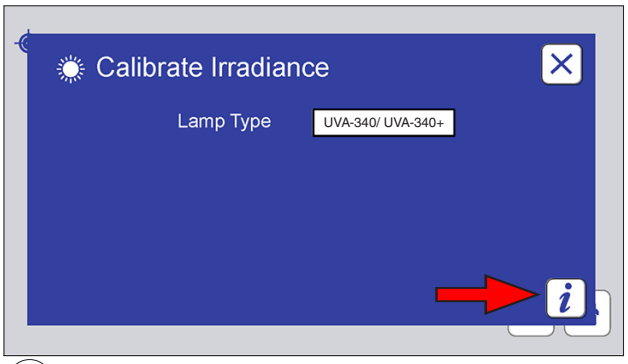
▶ This irradiance calibration screen is displayed.



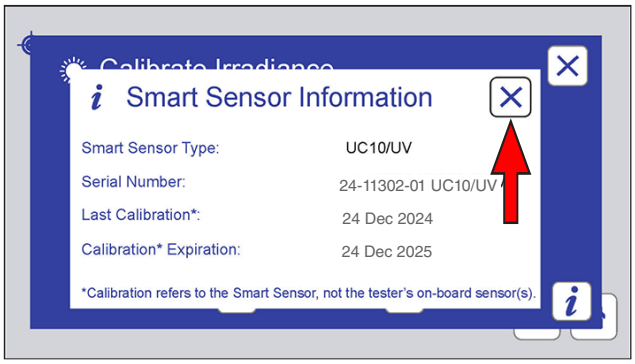
▶ When a UC10/UVC smart sensor is used, the lamp type selection is automatic. This calibrate irradiance screen is displayed.



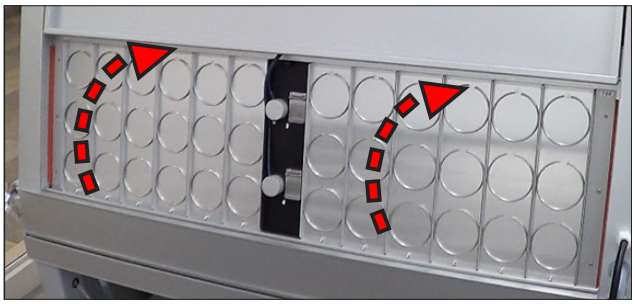
▶ When a UC10/CW smart sensor is used, the lamp type selection is automatic. This calibrate irradiance screen is displayed.



8. **Optional:** For any lamp type, to display the Smart Sensor calibration information, touch the information icon.

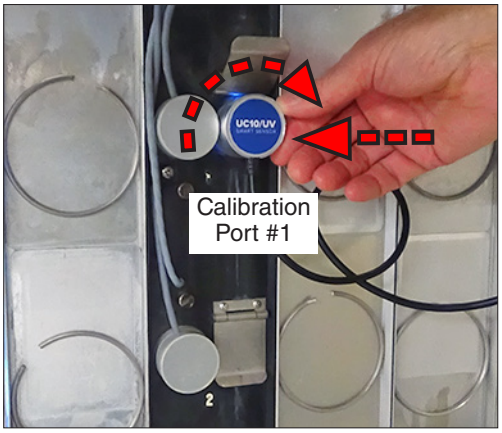


▶ The Smart Sensor information screen is displayed. This example is for a UC10/UV sensor. Touch the close icon to close the information screen.



9. Lift the front specimen door. Make sure all specimen holders are in place.

10. The UC10 has a spring-mounted flange for docking in the tester calibration port.

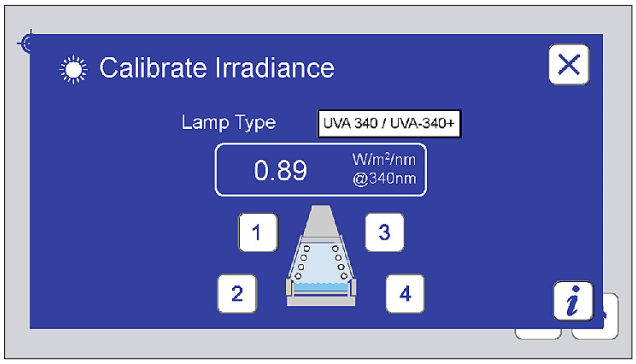


11. Press the Smart Sensor sensor into the QUV calibration port #1. Twist the sensor clockwise until it locks in place.

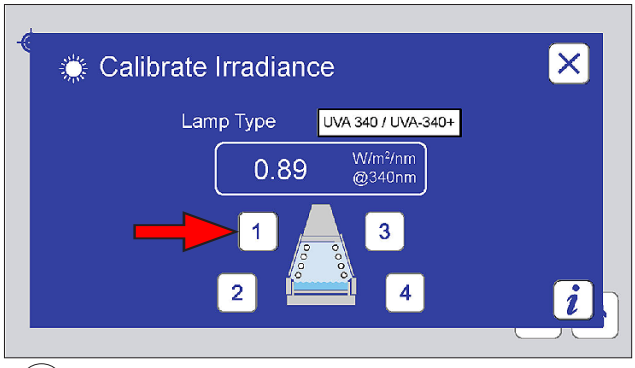
12. Close the specimen door.

Section 13. Calibration

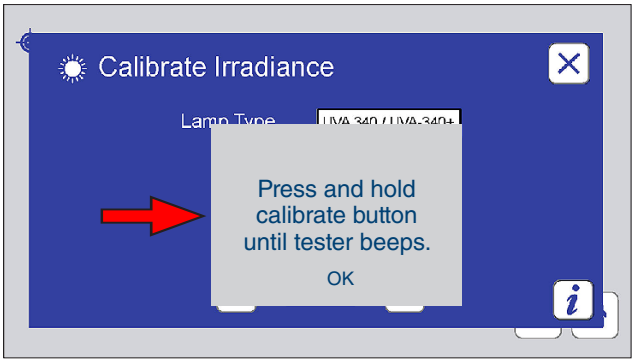
These panels illustrate UC10/UV calibration. The process is identical for UC10/CW and UC10/UVC sensors.



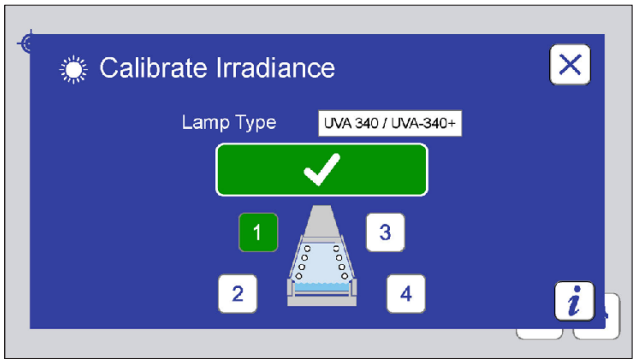
13. **IMPORTANT:** Wait a few seconds to allow the irradiance to stabilize.



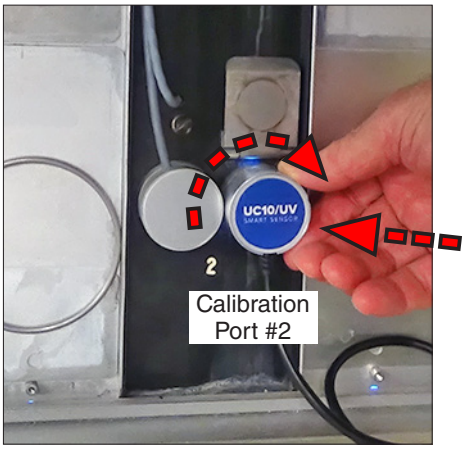
14. Press and hold the channel 1 calibration button until the tester beeps.



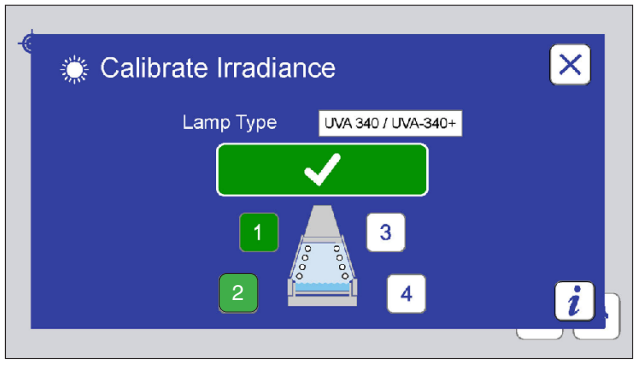
15. If the button is not pressed long enough, this message is displayed. Touch the OK button to close the message. Press and hold the channel 1 button again until the tester beeps.



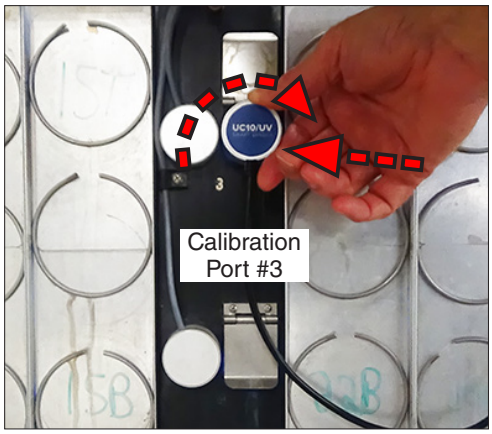
16. The channel button turns green and a check mark is displayed indicating the successful calibration of channel 1.



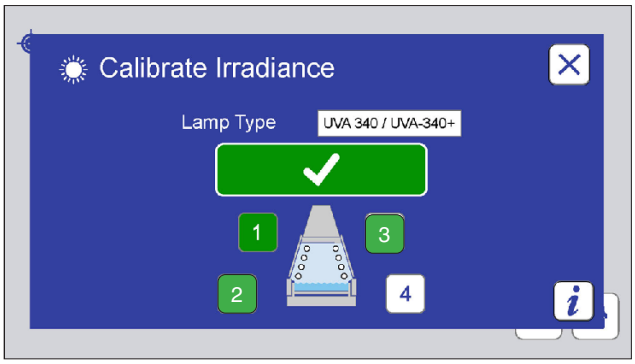
17. Place the Smart Sensor into calibration port #2.



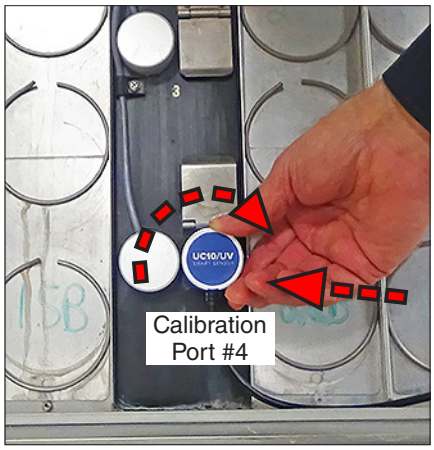
18. Repeat Step 13 - Step 16 to calibrate channel 2.



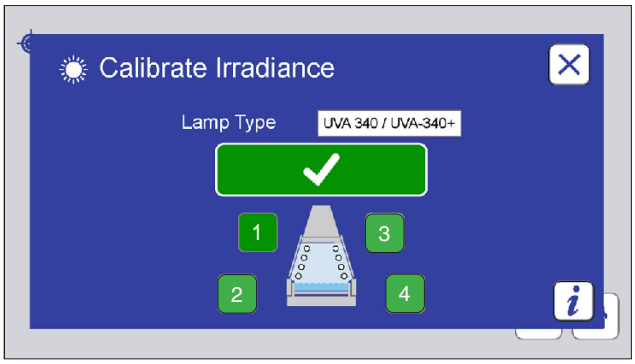
19. Move to the rear of the tester, open the specimen door and place the Smart Sensor into calibration port #3.



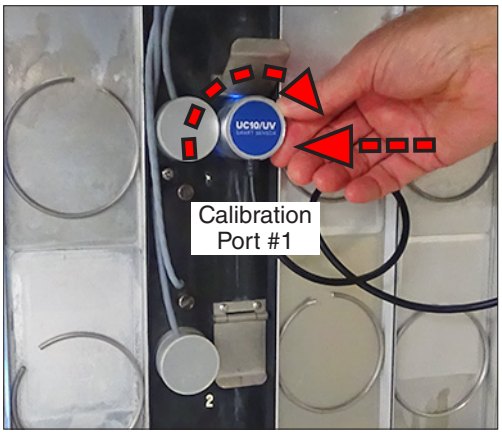
20. Repeat Step 13 - Step 16 to calibrate channel 3.



21. Place the Smart Sensor into calibration port #4.



22. Repeat Step 13 - Step 16 to calibrate channel 4.



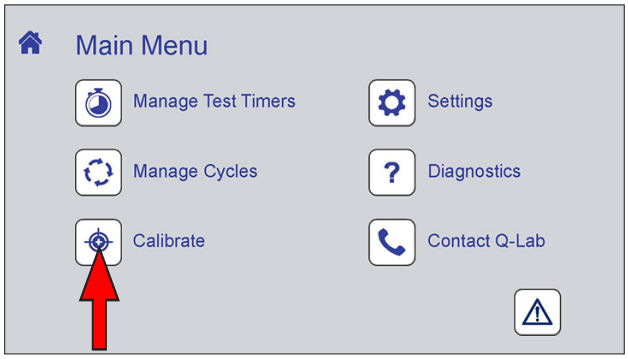
23. **Optional:** Repeat Step 9 through Step 22 to make sure that the Smart Sensor and the QUV actual irradiance values have stabilized.

- Complete the calibration at each calibration port 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.

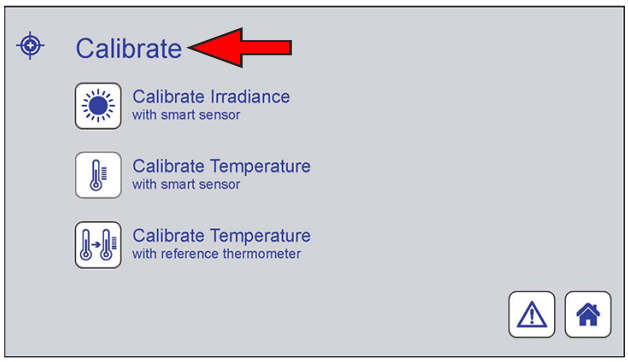
Section 13. Calibration

Access Calibrate Functions Through the Main Menu

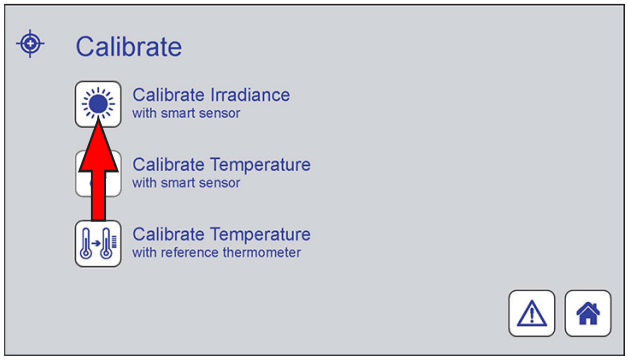
- The calibrate screens can also be accessed through the Main Menu.



▶ Calibrate functions can also be accessed by touching the calibrate icon on the QUV main menu screen.



▶ The calibrate screen is displayed.



▶ Touch the Calibrate Irradiance icon.

13.2. Lamp Replacement/Repositioning - QUV/basic

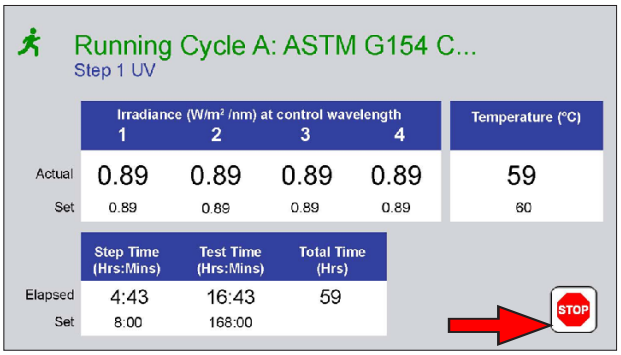
- QUV/basic testers are not equipped with irradiance sensors. Irradiance is managed by manual lamp replacement and rotation.
- Go to Section 16.1 for lamp replacement and rotation details.

Section 13. Calibration

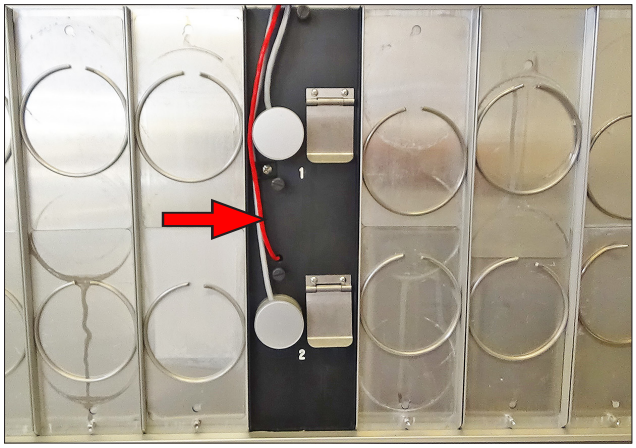
13.3. Panel Temperature Sensor - All Models

Overview

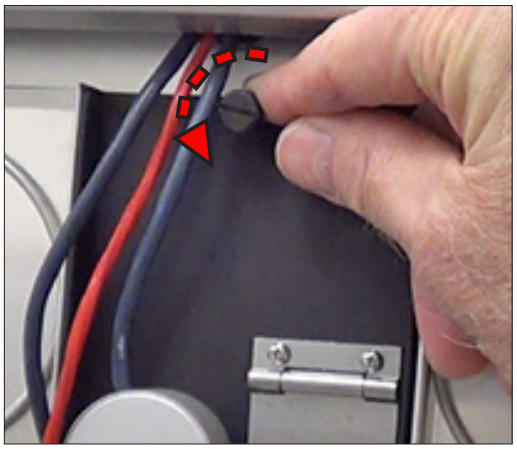
- For accurate temperature readings, calibrate the panel temperature sensor (sometimes referred to as a black panel temperature sensor) every six months in accordance with ASTM E220.
- The following tools are needed to calibrate the panel temperature sensor:
  - o A calibrated reference thermometer.
  - o Phillips screwdriver
  - o Insulated container
  - o Hot water
- Q-Lab offers an optional Temperature Calibration Kit (U-41085-K) which includes an easy-to-use insulated container.
- Follow the steps below to calibrate the panel temperature sensor with a reference thermometer.
- The calibration procedure is the same for uninsulated and insulated panel temperature sensors.



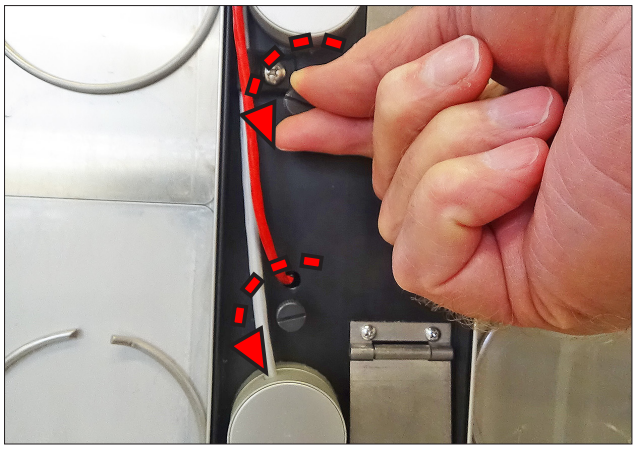
1. If a test is running, touch the STOP icon on the status screen to suspend the test.



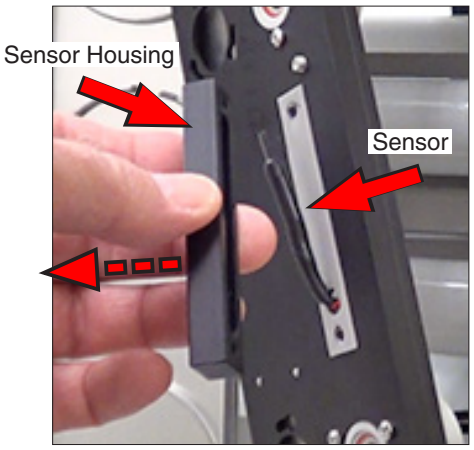
2. Locate the black sensor panel mounted in the front sample area of the QUV tester.



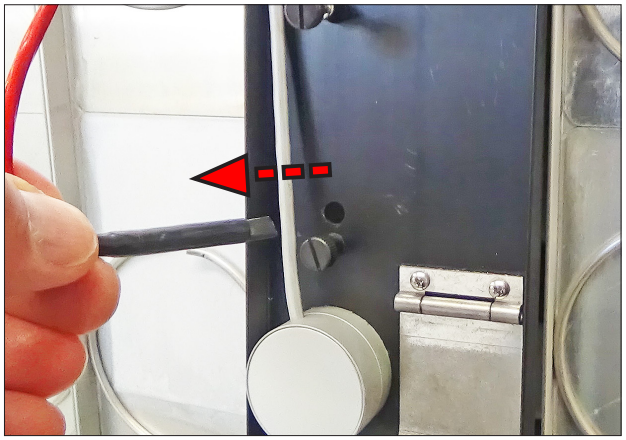
3. Unfasten the black sensor panel by loosening the thumbscrew at the top center.



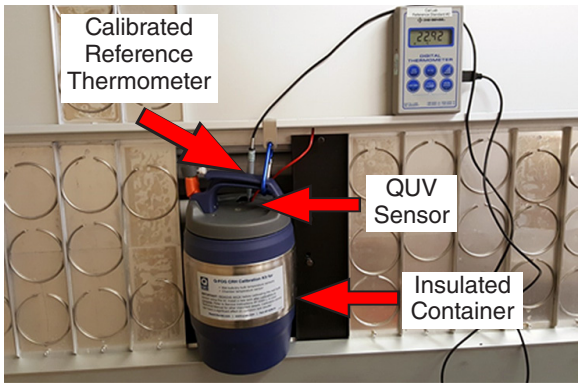
4. Loosen the 2 thumbscrews holding the sensor housing.



5. Turn the panel over. Remove the sensor housing from the back side of the sensor panel.

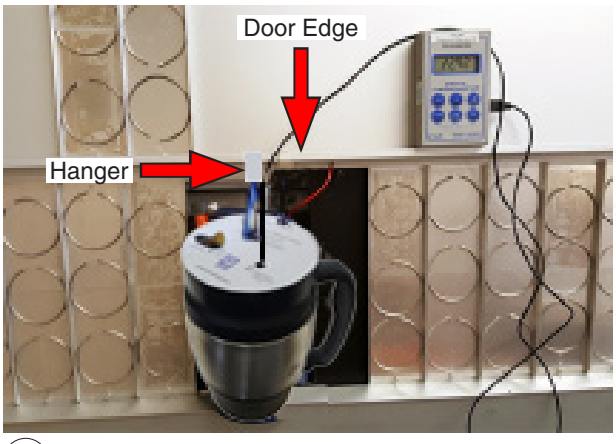


6. Carefully, pull the temperature sensor through the panel.



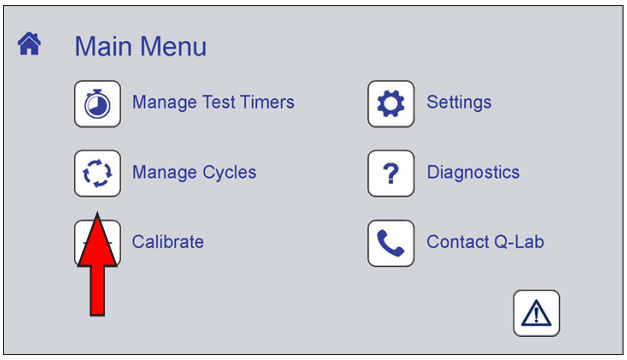
7. Place the QUV temperature sensor and a calibrated reference thermometer in an insulated container of water at approximately the highest temperature called for in the test cycle.

8. If using the Q-Lab insulated container, attach the carabiner to the insulated container and place the hanger over the bottom edge of the QUV door.

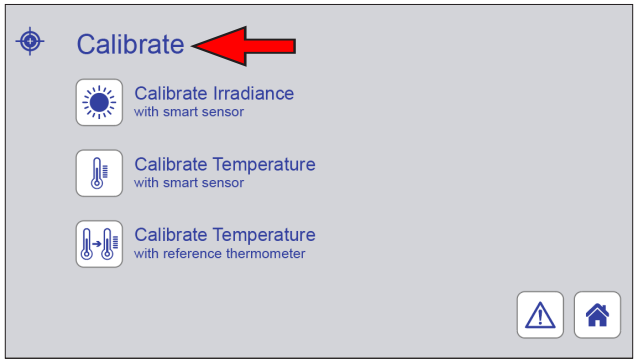


9. Q-Lab insulated container with hanger placed over bottom edge of QUV door.

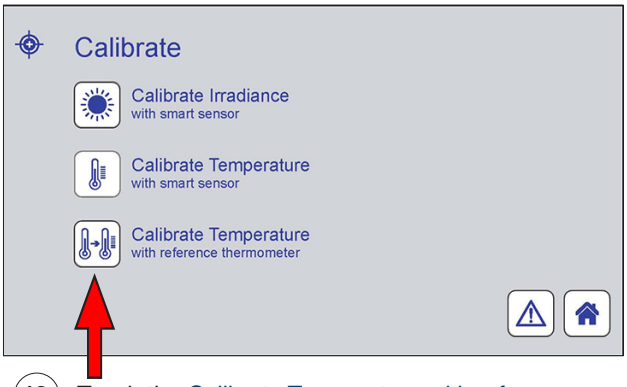
10. Wait 10 minutes for the sensors to stabilize.



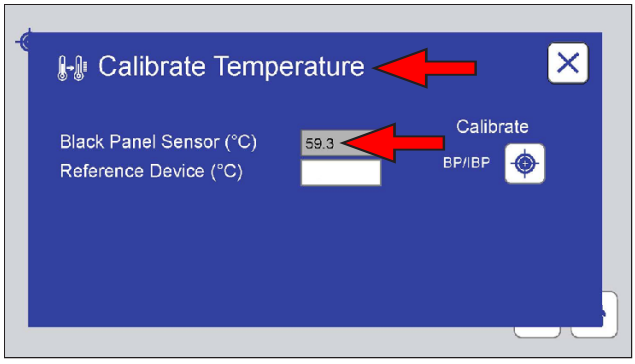
11. Touch the calibrate icon on the QUV menu screen.



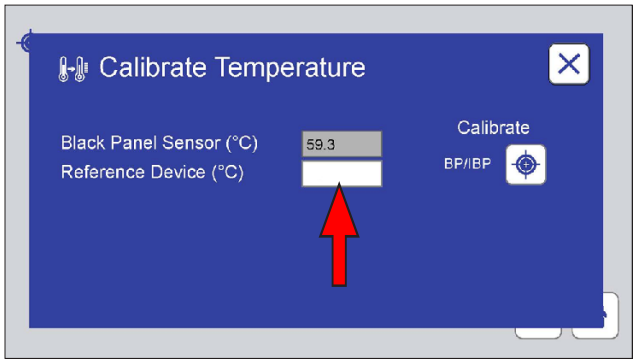
▶ The calibrate screen is displayed.



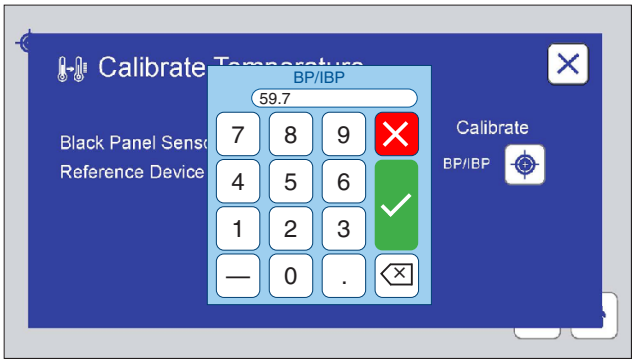
12. Touch the Calibrate Temperature with reference thermometer icon.



▶ The Calibrate Temperature screen is displayed. The current reading of the QUV panel temperature sensor is shown.



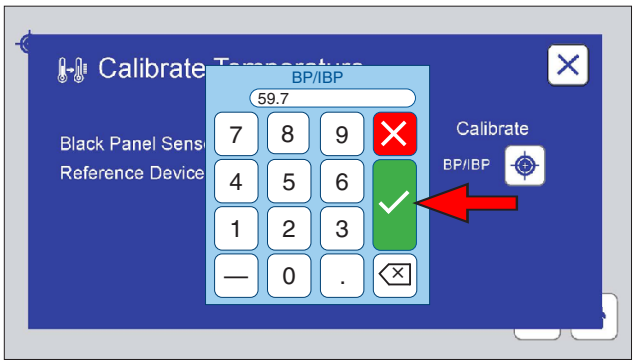
13. Touch the Reference Device text box.



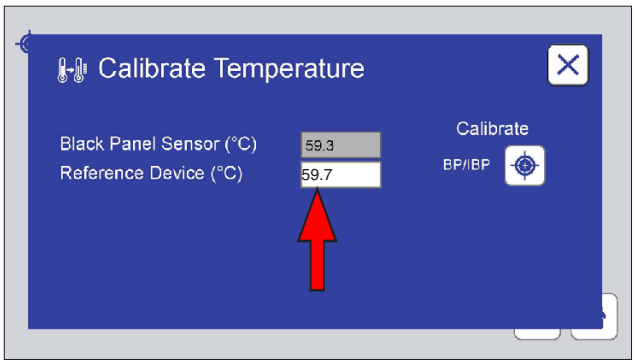
▶ The BP/IBP temperature enter keypad is displayed.

14. Read the temperature displayed on the reference thermometer.

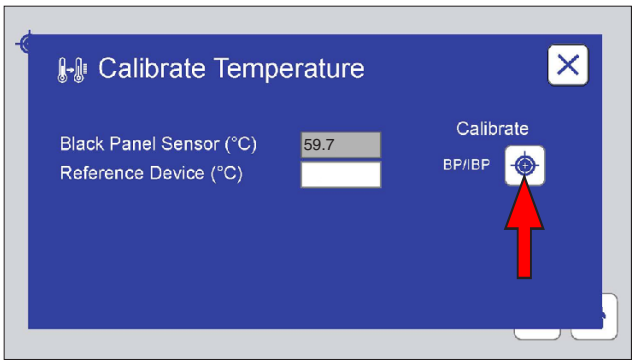
15. Use the keypad to enter the reference temperature into the reference device text box.



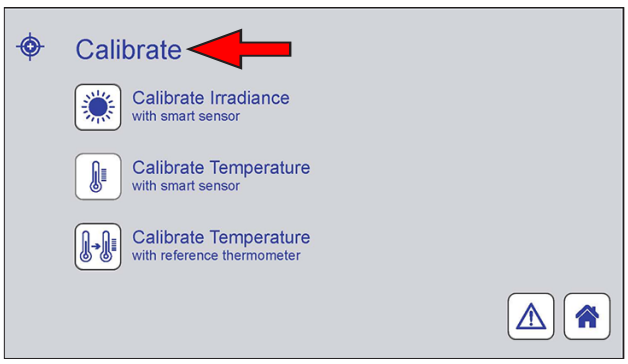
16. Touch the check mark button.



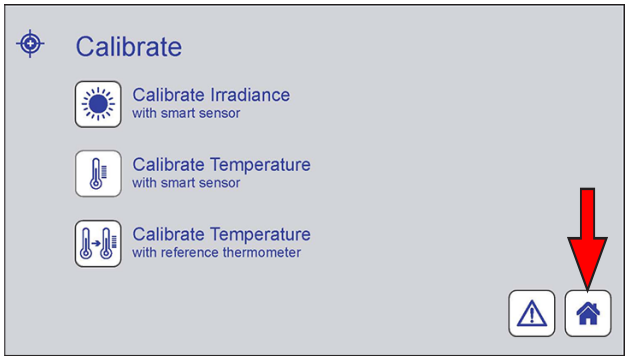
▶ The keypad is removed. The reference temperature is displayed in the reference device text box.



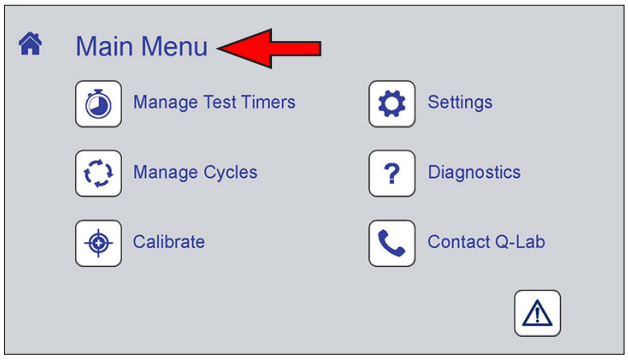
17. Touch the calibrate icon to complete the calibration process.



▶ The calibrate screen is displayed.



18. Touch the home icon.



▶ The main menu screen is displayed.

14. Data Storage and Transfer

14.1. Ethernet Communications

- The QUV main controller has the capability to transfer data via Ethernet (Figure 14.1).
- 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 set up communications, request data groups, and save and display that data.

Figure 14.1: Ethernet port located on right rear of tester frame.

14.2. Secure Digital (SD) Card

- 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.
- All tester operating parameters written to the SD card are automatically being saved.
- 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 14.3c)
- Connect the USB drive to the USB port of the QUV control panel (Figure 14.3d).
- The USB Options screen will be displayed (Figure 14.3a).
- Touch the Export Diagnostics button to begin the export process (Figure 14.3b).
- The exported files (Figure 14.3e and Figure 14.3f) can be uploaded to the Q-Portal Asset Center where customers can view basic operational data (Figure 14.3g and Figure 14.3h) and Q-Lab personnel can view extended operational data.

Figure 14.3c: USB drive needed to export diagnostics.

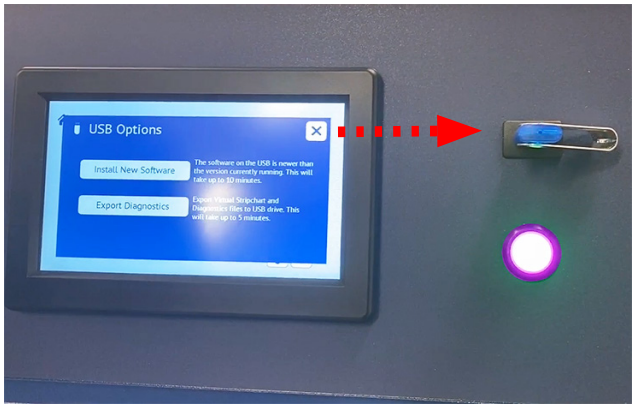


Figure 14.3d: Connect the drive to the USB port of the QUV control panel.

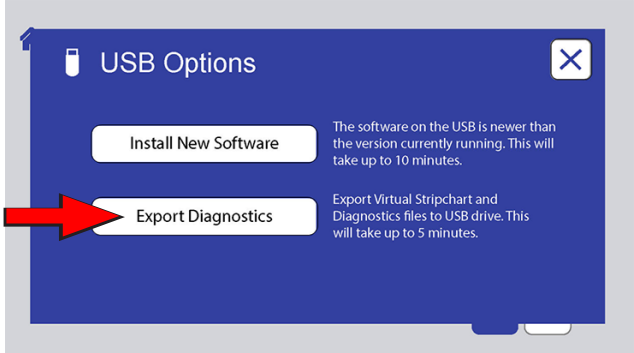


Figure 14.3a: USB Options screen showing the Export Diagnostic button.

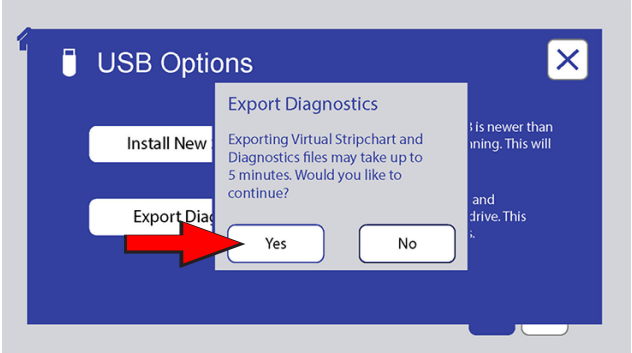


Figure 14.3b: Touch Export Diagnostics then the Yes button to begin export.

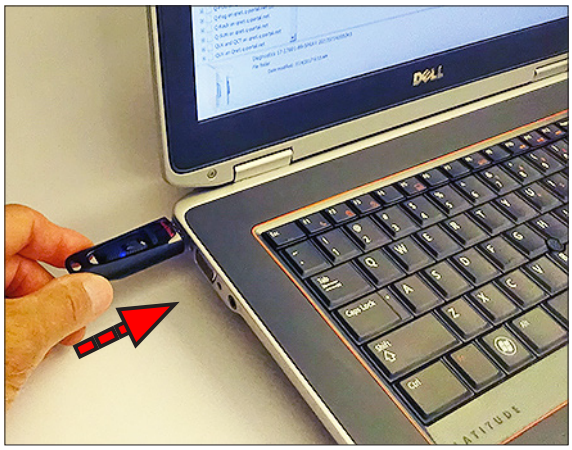


Figure 14.3e: Insert the USB drive into a Windows computer to display the list of files

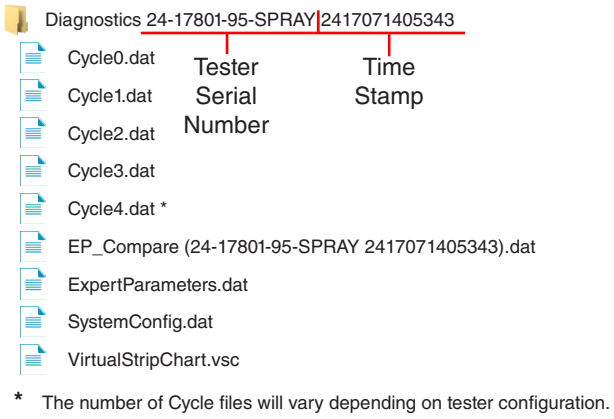


Figure 14.3f: The USB drive will have a folder with the diagnostic data files exported from the tester.

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.

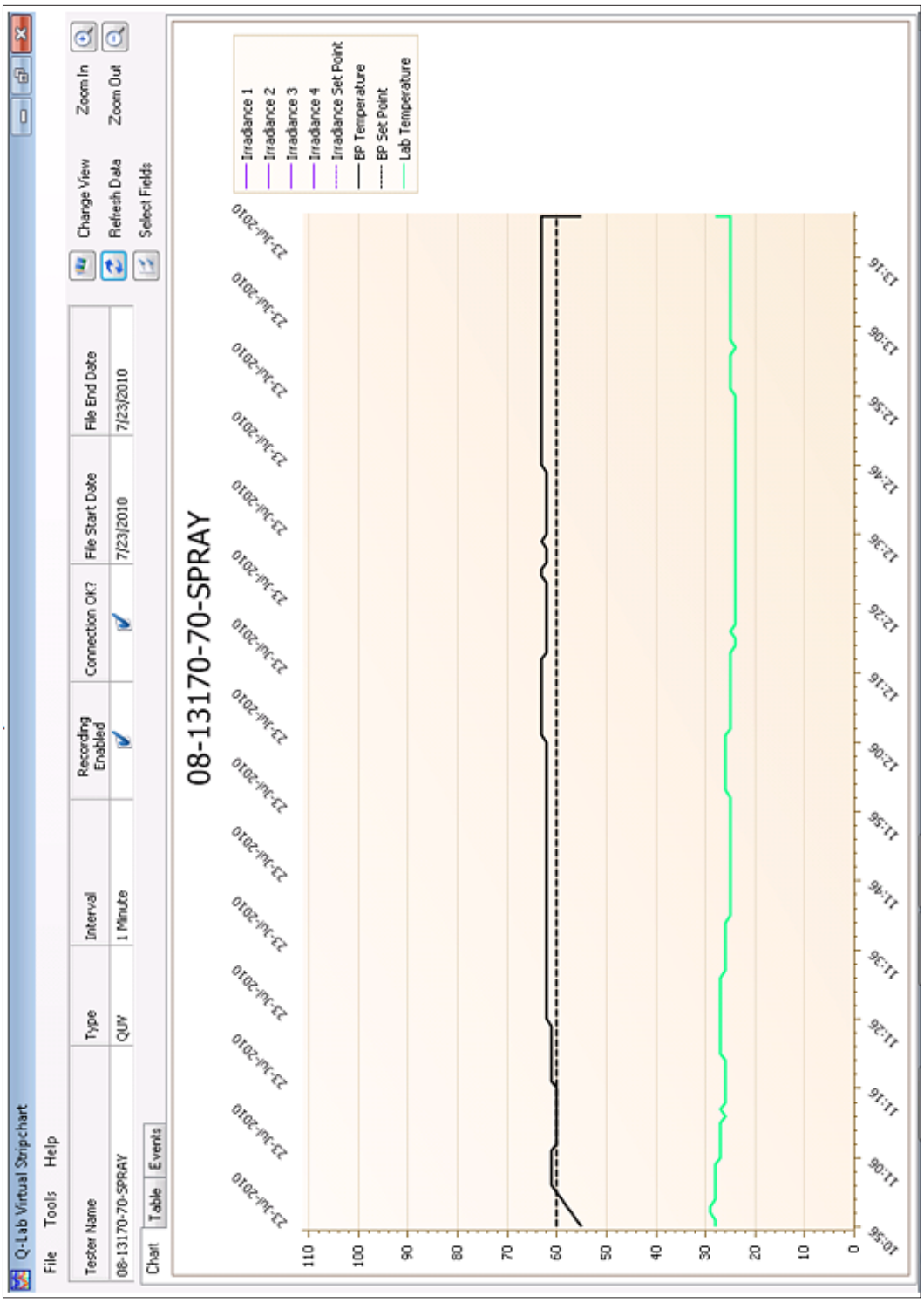


Figure 14.3g: Stripchart view of QUV operational data.

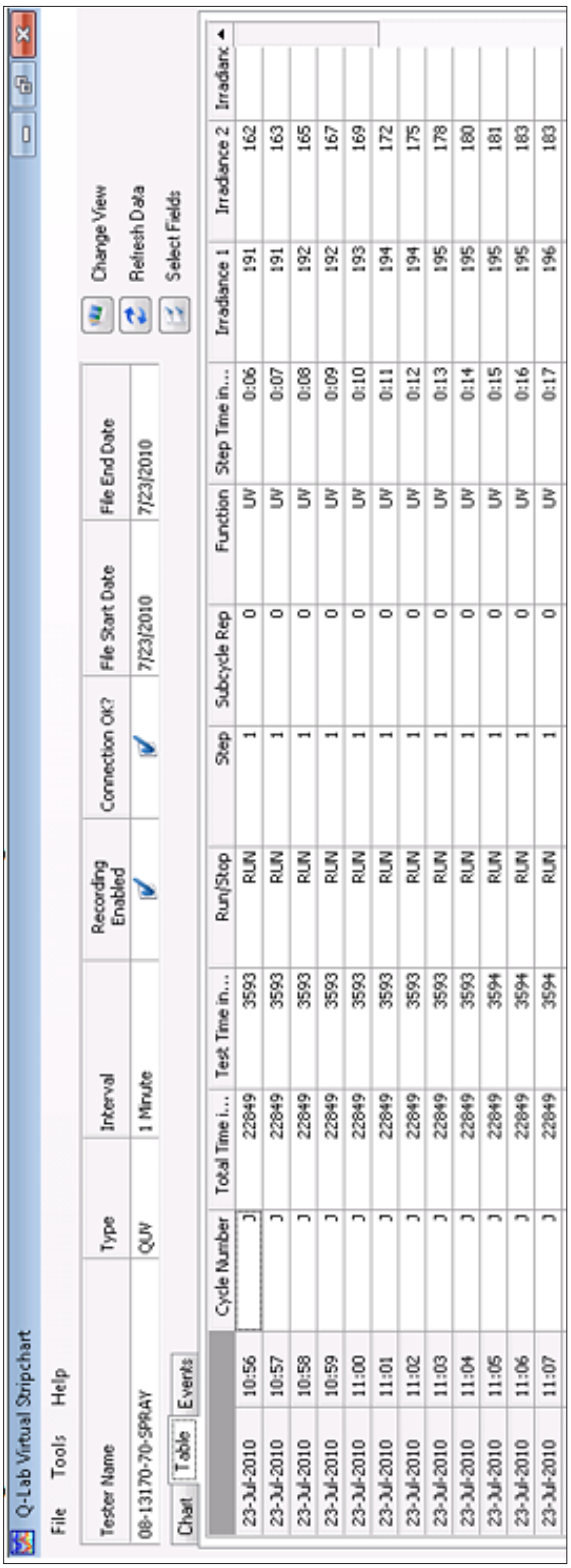


Figure 14.3h: Table view of QUV operational data.

14.4. Import VIRTUAL STRIPCHART Data

- At the Q-Lab Q-Portal Asset Center, customers can register their QUV 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

- Figures in this section show QUV models with dual touchscreens. All information applies to the single touchscreen QUV/basic as well.

15.1. Space Saver Frame

- Q-Lab offers a space saver frame to stack two QUV testers on top of each other to save floor space (Figure 15.1a and Figure 15.1b).
- See Specification Bulletin LU-0820 for space saver frame specifications and part numbers.
- Not all combinations of QUV testers are compatible with Space Saver Frames.
  Contact Q-Lab Repair and Tester Support for more information.

Figure 15.1a: QUV testers without spray on space saver frame.

Figure 15.1b: QUV testers with spray on space saver frame.

15.2. Water Pump

- Q-Lab offers a water inlet pump for labs that do not have sufficient water pressure to meet tester requirements (see Section 6.4).
- The pump will boost low pressure or draw water from a reservoir.
- The pump operates on either 120 or 230 volts.
- It turns on automatically when needed to supply water to the QUV water feed for condensation and/or the spray nozzles for water spray.

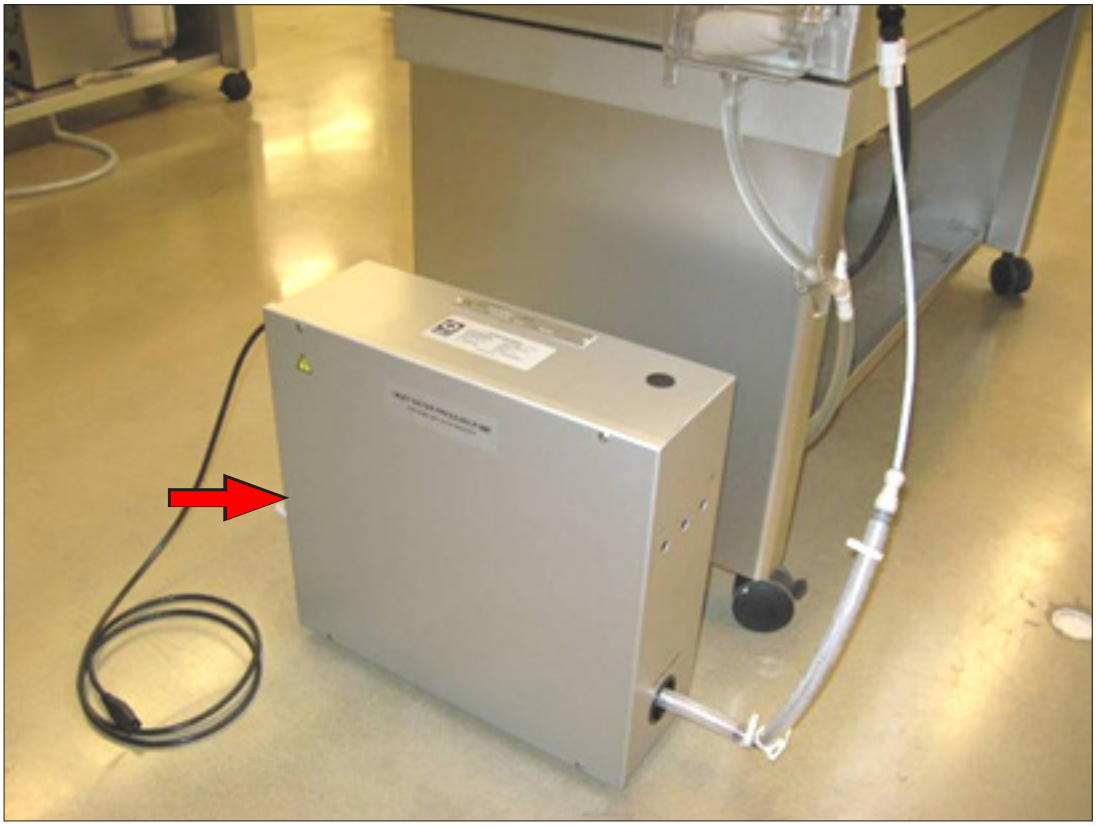


Figure 15.2: Water pump (part no. X-10570-K).

15.3. Water Repurification System

Repurification Conserves Purified Water

- Q-Lab optional water repurification systems conserve purified water. The water repurification system option is intended for QUV testers supplied with purified water. The water repurification systems re-purify and re-circulate tester spray water instead of letting it go down the drain.
- A repurification system is not a primary purification system. It is a *re-purification* system. Purified water must still be supplied to the tester (see Section 6.4).
- Repurification can save over 1,500 liters of expensive purified water per day if you are running a test cycle that calls for several hours of water spray.
    - The QUV spray system uses 7 liters per minute (lpm) of water during spray steps.
    - If tests spray 4 hours per day, that amounts to 7 lpm × 60 min/hr × 4 hr/day = 1,680 liters per day.

Q-Lab Offers Two Water Repurification System Configurations.

1. **Integrated -** the system is built into the base of the QUV tester (Figure 15.3a).
    - This water repurification system can be purchased as an integrated factory installed option (QUV/spray/rp).
    - This water repurification system can also be purchased as a retrofit kit (part no. V-60007-K) for installing an integrated unit in a QUV/spray in the field.
2. **Standalone -** the system is in a separate enclosure outside of the QUV tester (part no. V-60160-K) .
    - The standalone system is primarily intended to be used with QUV spray testers mounted on space saver frames (Figure 15.3d). See Section 15.1 for information on Space Saver Frames.
    - This type of repurification system can also be used with a standalone QUV tester (Figure 15.3d).
    - For QUV Spray models (not Spray-RP) retrofitted with a Stand Alone Water RP unit, when retrofitting the OEM Spray Pressure Regulator and Flow Meter are removed from the front of the QUV base.
    - The Stand-Alone RP Unit is equipped with a By-Pass Valve and a LPM Flowmeter mounted on the front of the unit.
    - The By-Pass Valve must be open and the flow rate adjusted to 7 LPM (see Figure 15.3d).

System Operation

- During a spray step the repurification system pump turns on and draws water out of the reservoir. The water then goes through a flow adjustment valve to the spray nozzles (and some back to the reservoir).
- The water goes through a repurification cartridge and other filters to remove any contaminants (Figure 15.3a).
- The flow adjustment valve **MUST BE OPEN** and adjusted so that the water flow meter reads 7 lpm during spray.
    - Integrated systems have the valve and flow meter on the lower front panel of the QUV tester (Figure 15.3b).
    - Standalone systems have the valve and flow meter on the front of the standalone enclosure (Figure 15.3d, Figure 15.3d).
- After the water is sprayed on the test specimens it drains back into the reservoir.
- A float valve automatically adds water to the reservoir to replenish water lost to evaporation (typically 5 liters per day) so no manual filling is necessary.
- Since the water is recycled, a drain is not mandatory. However, a drain is recommended so that if the float valve sticks open, the overflow will go down the drain instead of on the floor.
- Both types of repurification systems include a Total Dissolved Solids (TDS) Meter (Figure 15.3a) that indicates when the demineralizer cartridge needs to be replaced.
- See Section 14.5 for important repurification system filter maintenance information.

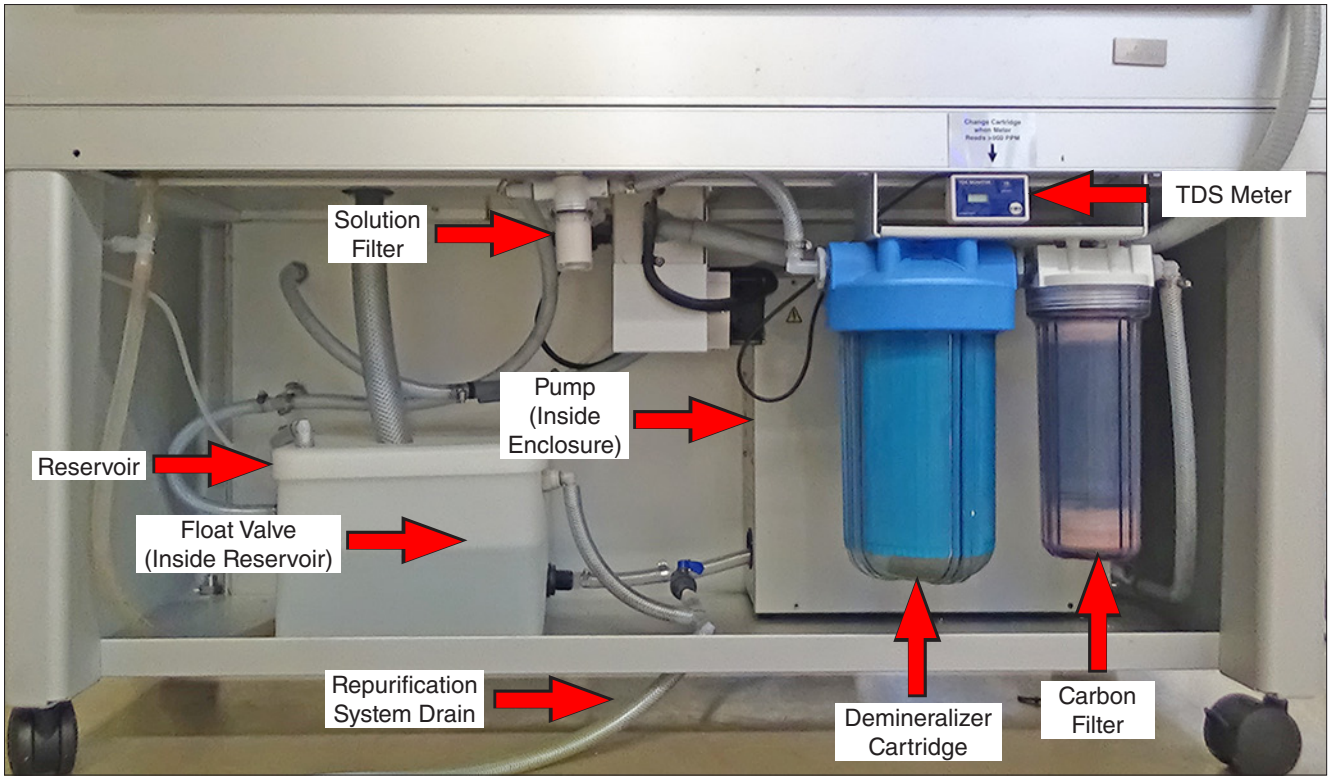


Figure 15.3a: QUV rear view showing integrated water repurification system (V-60007-K).

Figure 15.3b: Integrated water repurification system flow adjustment valve and flow meter.

Figure 15.3c: Water repurification systems (V-60160-K × 2) stacked for QUV/spray testers on space saver frame.

Figure 15.3d: QUV spray tester with standalone water repurification system (V-60160-K).

16. Maintenance

16.1. Lamps

QUV Models with SOLAR EYE Irradiance Control

- The SOLAR EYE Irradiance control automatically maintains the programmed irradiance.
- As lamp output declines, the controller automatically increases power to the lamps. The lamp spectrum doesn't change over the lamp lifetime
- The lamps generally need to be changed only once a year (see Lamp Replacement).
- To prevent excessive buildup of dirt on lamps, wipe them with a clean cloth dampened in alcohol every six months.
- An error message is displayed if irradiance falls 0.10 W/m^2/nm below the set-point in QUV/se, QUV/spray, and QUV/spray/rp testers.
- An error message is displayed if irradiance falls 2000 lux below the set-point in QUV/cw testers.
- An error message is displayed if irradiance falls 0.5 mW/cm^2 below the set-point in QUV/uvc testers.
- The pair of lamps that is low should be replaced. It is not necessary to replace all the lamps.

Always re-calibrate the irradiance and black panel temperature sensors after changing lamps.

QUV/basic

- Lamp irradiance output gradually declines over time.
- Since there is no active control of lamp irradiance on the QUV/basic, a simple rotation/replacement system is used to level lamp output.
- This system consists of discarding the oldest lamp on the QUV front and rear after every 400 hours of lamp operation and moving the remaining lamps stepwise as shown in (Figure 16.1).
- Both the front and rear exposure areas of the tester then have lamps near the following ages from bottom to top: 0 hours, 400 hours, 800 hours, and 1200 hours.
- The irradiance that the test specimen receives is therefore an average of lamps at four different points on the age/output curve.
- The main controller will display a notification (M65 - see Section 17.1) to rotate lamps every 400 hours.

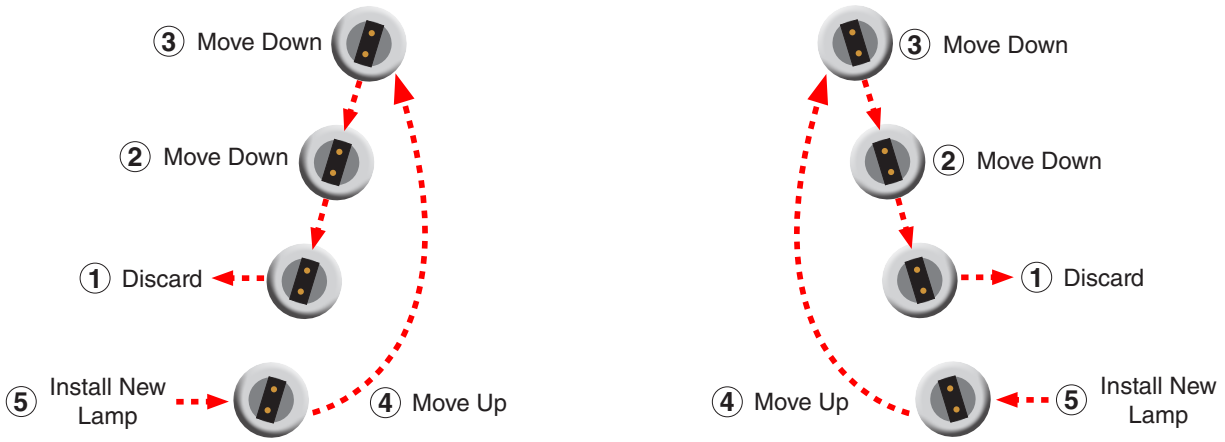
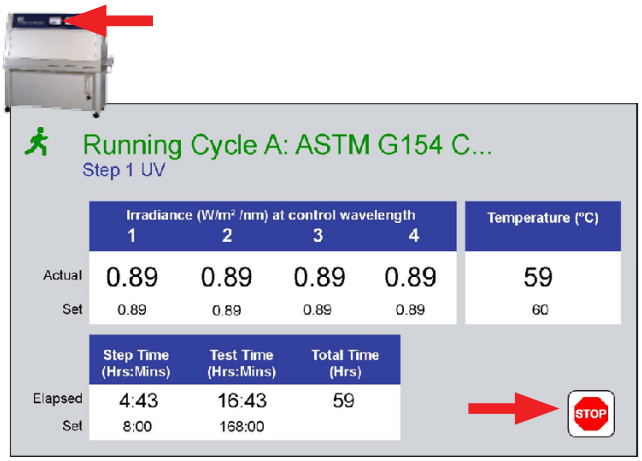


Figure 16.1: Schematic end view of installed lamps showing rotation steps.

Lamp Replacement



1. Touch the **STOP** icon.

2. Power **OFF**

OFF

3. Main power **OFF**.

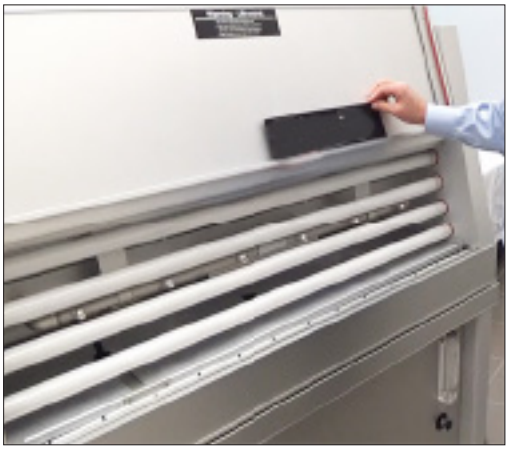
4. Disconnect power supply.

5. Open the front and back doors.

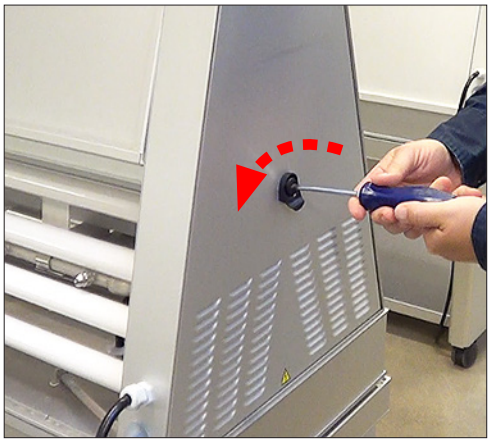
6. Remove all specimen holders from both sides of the QUV test chamber. Set holders aside.

Section 16. Maintenance

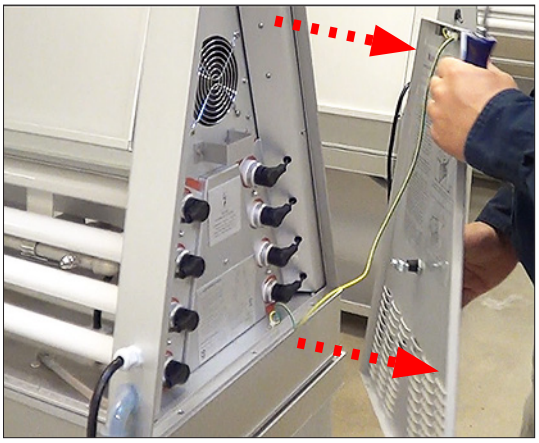
7. Loosen the thumb screws at the top of the detector panels on the QUV tester.



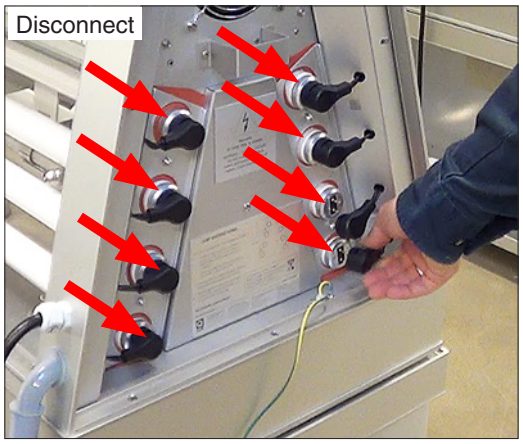
8. Place the detector panels on door ledge.



9. Open the end cover latches.



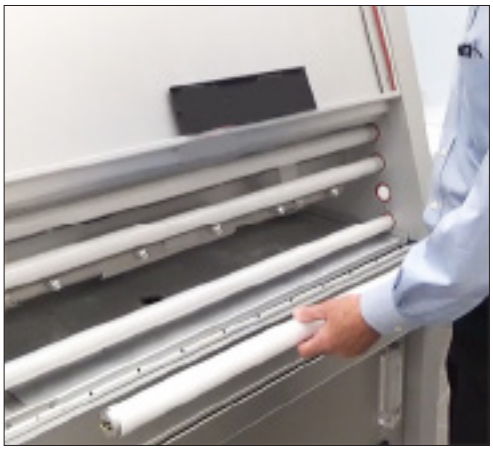
10. Remove the end covers.



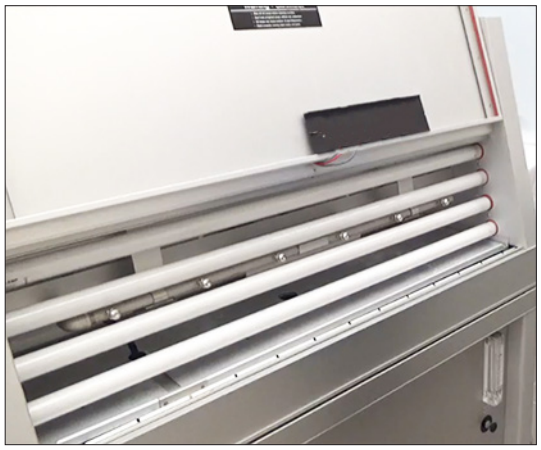
11. Disconnect the lamps on both ends.

12. Hold the lamp and carefully slide it to one end until it pulls out of the lamp gasket.

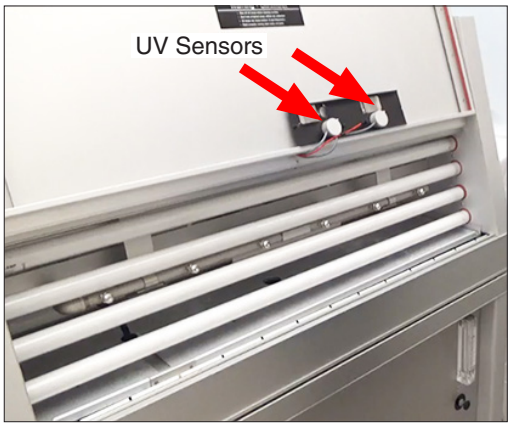
13. Carefully rotate the lamp outward, slide out of the other lamp gasket. Remove the lamp.



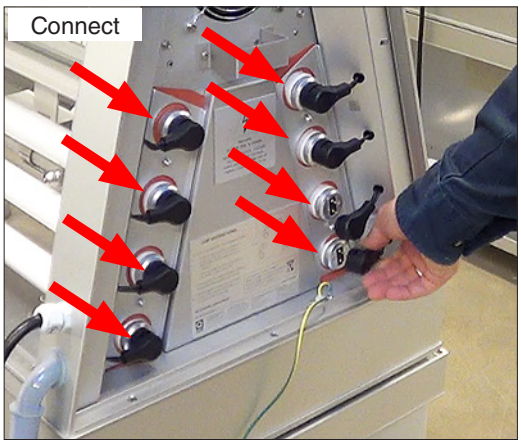
14. Repeat **Steps 12 and 13** to remove additional lamps as required.



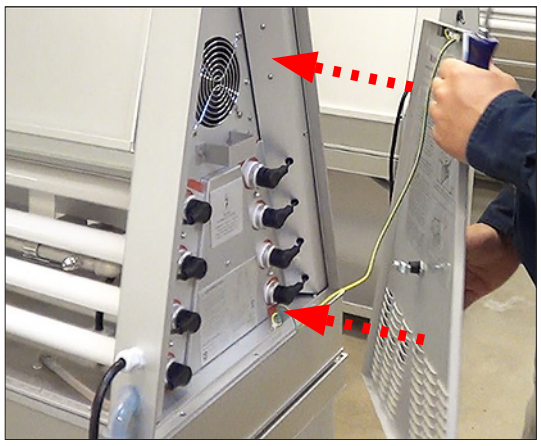
15. Install new lamps.



16. After replacing lamps, the UV sensors must re-calibrated. See **Section 11.1**.

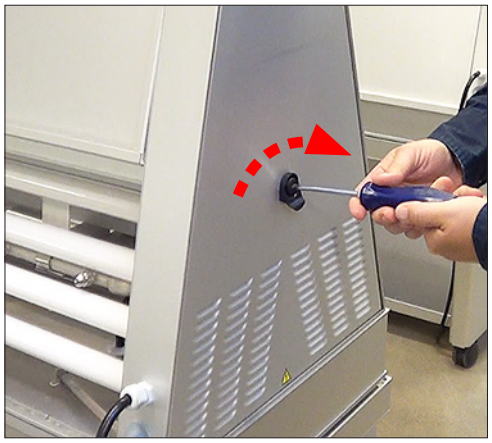


17. Re-connect the lamps on both ends.

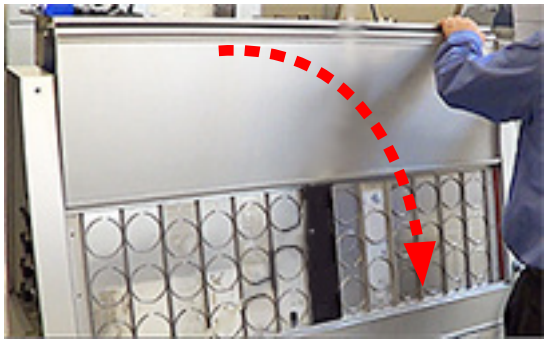


18. Replace the end covers.

Section 16. Maintenance



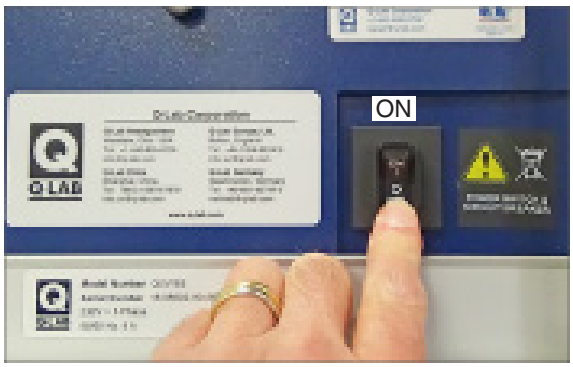
19. Close the end cover latches.



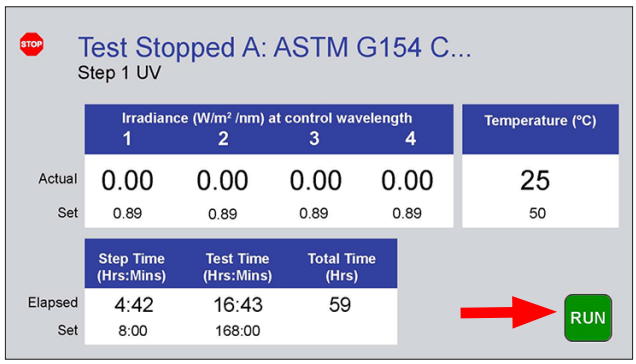
20. Replace detector panels and specimen holders. Close doors.

21. Connect power supply.

22. Main power **ON**.



23. Power QUV **ON**.



24. Touch the **RUN** icon

16.2. Water Pan

- For all QUV models except QUV/uvc:
  - Inspect and clean the water pan every 6 months.
  - If tap water is used in a QUV/basic, QUV/se, or QUV/cw, inspection and cleaning should be performed more frequently.

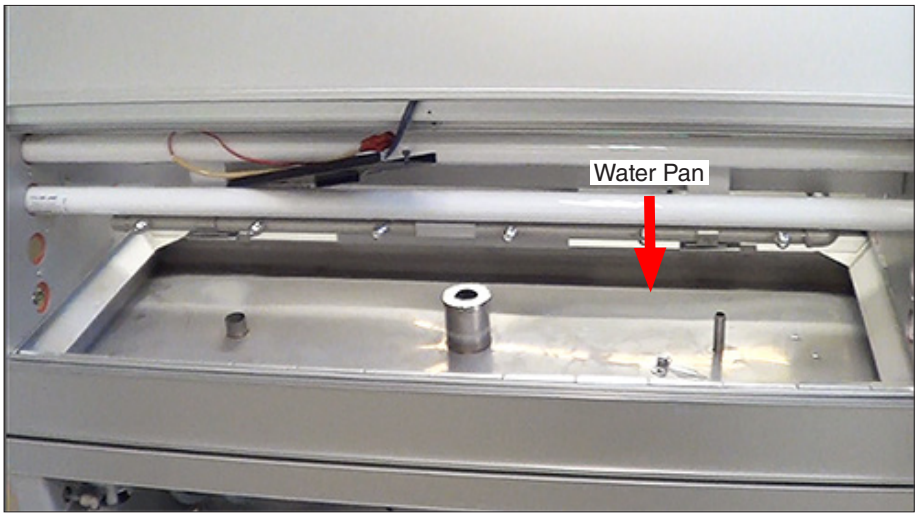


Figure 16.2: QUV water pan shown with lamps and water pan cover removed.

16.3. QUV/spray and QUV/spray/rp Spray Nozzles

Check Nozzle Spray Pattern

- Spray nozzles should be checked once a month to ensure all specimens are receiving equal amounts of spray water.
- There are six (6) nozzles on the front and six nozzles on the rear of the QUV tester.
- Left and right side spray inspection windows are used to visualize the spray pattern on the front and rear specimen mounting areas.
  - Dry areas or uneven wetting on the windows indicates clogged spray nozzles that should be cleaned.
- Spray inspection windows are supplied with every QUV/spray tester.
  - Replacement spray inspection windows are available, part number V-60190-K.
- Remove all specimen holders from one side of the QUV tester.
- Install the left and right side inspection windows in front of the lamps as shown in Figure 16.3a.
- Run a spray step and check for clogged nozzles by looking at the spray pattern on the windows.
- The spray area defined on each window should be wet.
- Repeat the procedure on the other side of the QUV tester.
- If the spray area is uniformly wet, nozzle cleaning is not necessary. Stop the test. Remove and store the spray inspection windows. Go to Section 16.4.
- If a portion of the defined spray area on each window is not wet, the spray nozzle(s) in that area should be removed and cleaned. Go to the Detailed Steps For Spray Nozzle Cleaning Section for nozzle cleaning details.

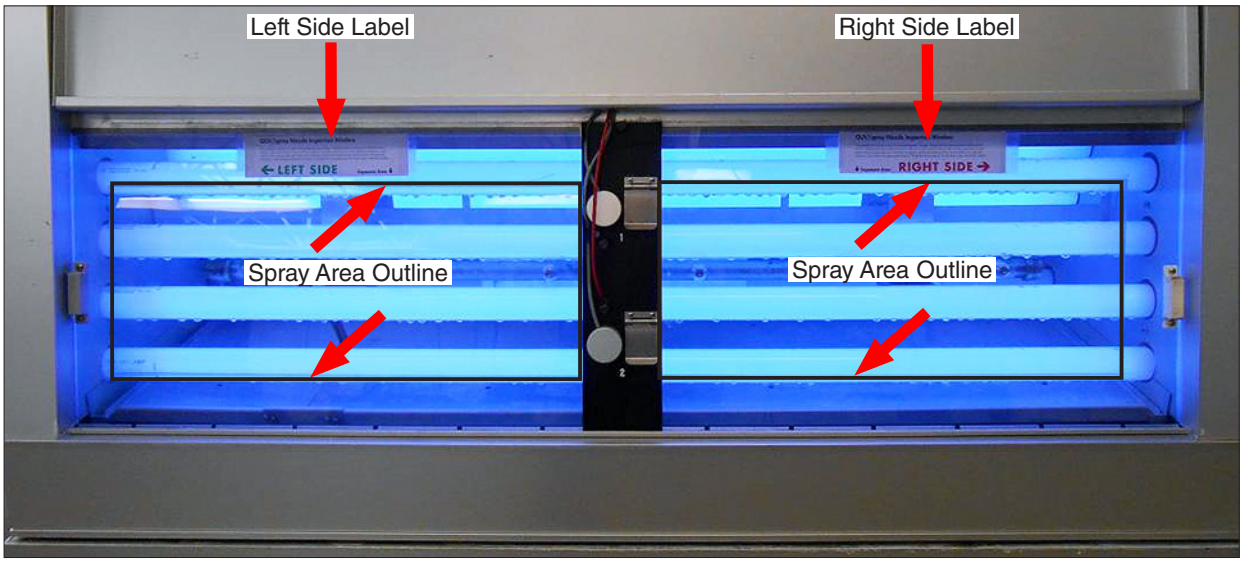
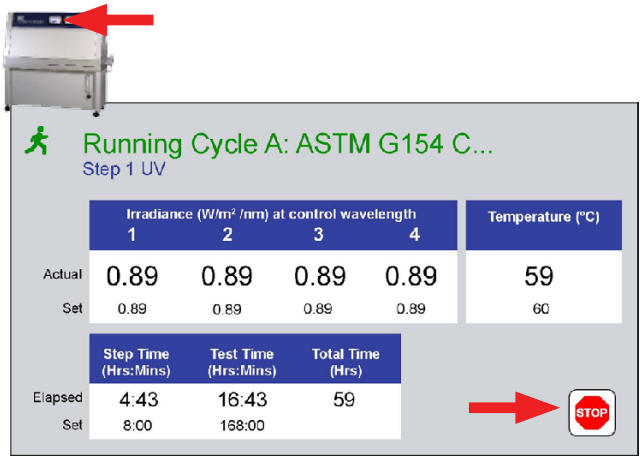


Figure 16.3a: Left side and right side spray inspection windows in place showing spray areas.

Detailed Steps For Spray Nozzle Cleaning

- Do not attempt to remove spray nozzles for cleaning without removing the lamps first.
- Attempting to remove a spray nozzle with lamps in place can result in lamp breakage.

Lamps are fragile. Read **IMPORTANT** information above.



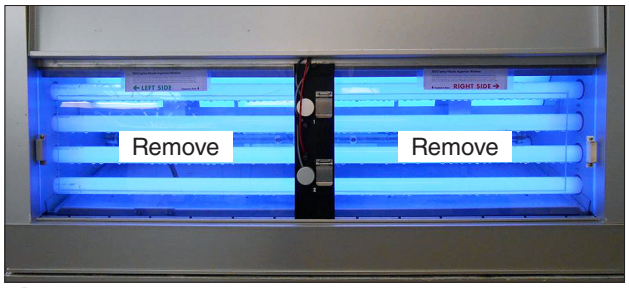
1. Touch the **STOP** icon.

2. Power **OFF**

OFF

3. Main power **OFF**.

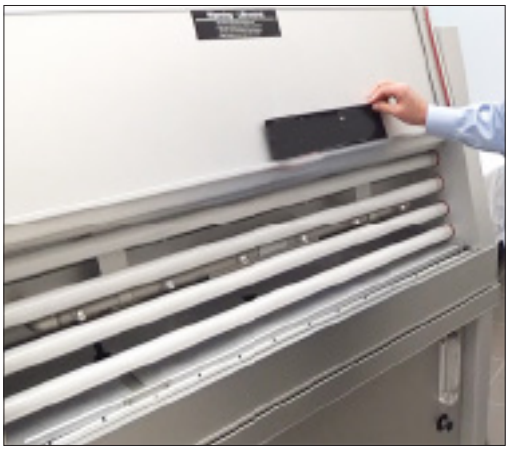
At this point lamps should be off.



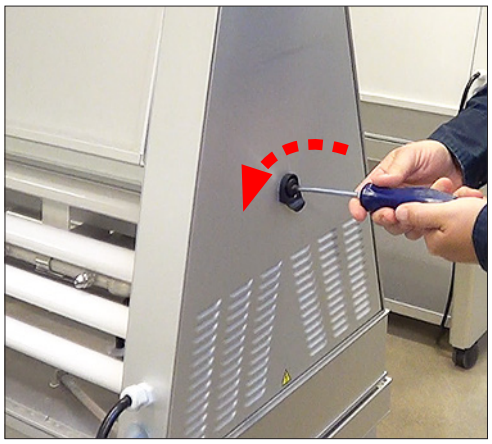
4. Remove the left and right spray inspection windows from the side of the tester showing uneven spray.

5. Loosen the thumb screws at the top of the black panel on the side where the windows were removed.

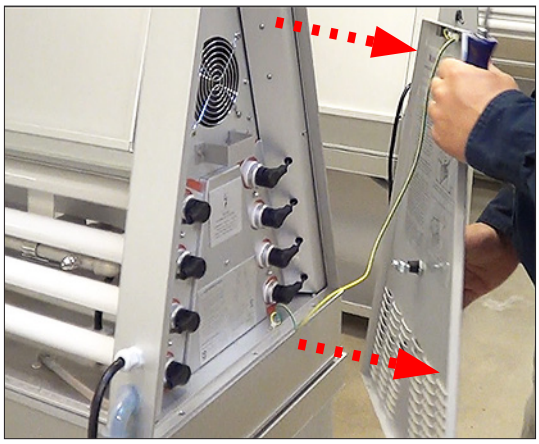
6. Disconnect power supply.



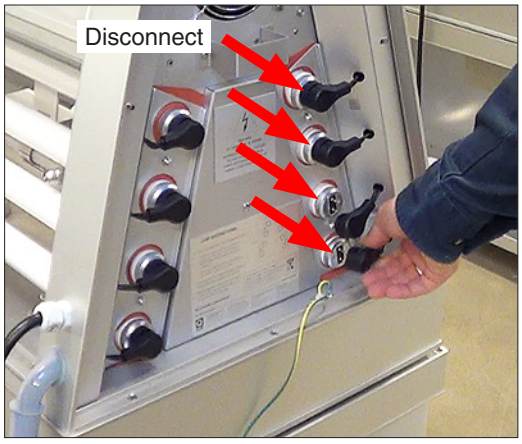
7. Place the panel on door ledge. Avoid over-extending the sensor cables.



8. Open the end cover latches on both end covers.



9. Remove both end covers. Set down on the floor. It is not necessary to disconnect the ground wire.



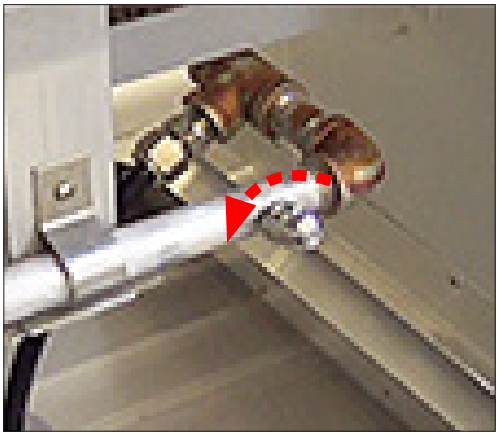
10. Disconnect the lamps at both ends on the side of the tester showing uneven spray.

11. Hold a lamp and carefully slide it to one end until it pulls out of the lamp gasket.

12. Carefully rotate the lamp outward, slide out of the other lamp gasket. Remove the lamp. Set aside.

13. Repeat Step 11 and Step 12 to remove all four (4) lamps. **IMPORTANT:** To avoid breaking lamps, do not remove spray nozzles with the lamps in place.

14. Locate the spray nozzle(s) closest to the location of the uneven spray. There are six (6) nozzles per side. End nozzle shown above.



15. Use a socket, open-end, or adjustable wrench to remove the nozzle(s) from the spray bar.

16. Disassemble the nozzle(s).

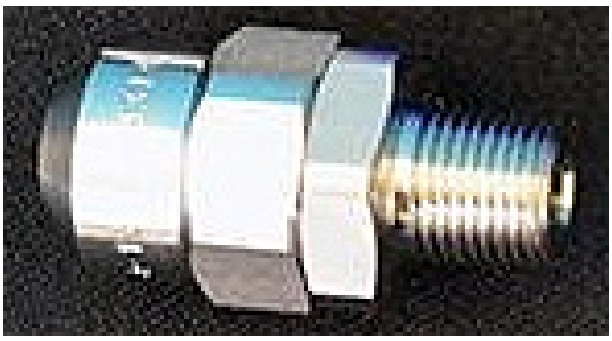
Recommended Cleaning Methods

A. Soak in white vinegar or acetone, clean with a small brush.

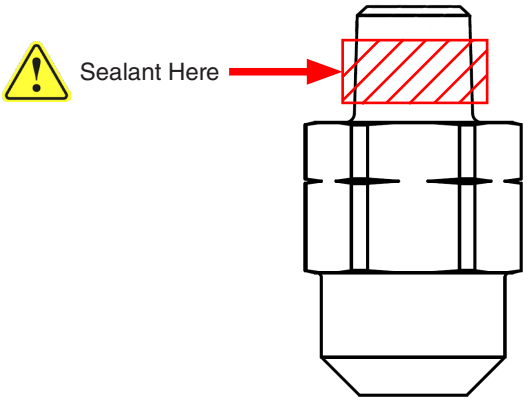
B. Place in an ultrasonic cleaner.

C. Use compressed air and a small brush.

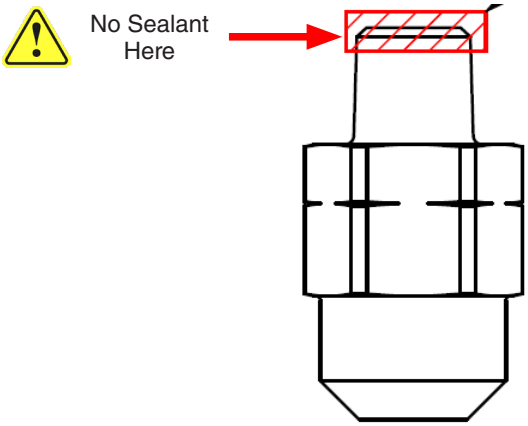
17. Use one of the methods listed above to clean nozzles. Use handling precautions appropriate for the selected cleaning method.



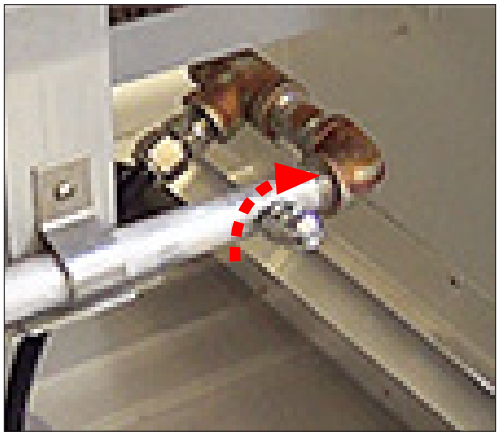
18. Dry and reassemble the nozzles. Do not over-tighten.



19. Apply a small amount of thread sealant to spray nozzle threads in the area shown here.

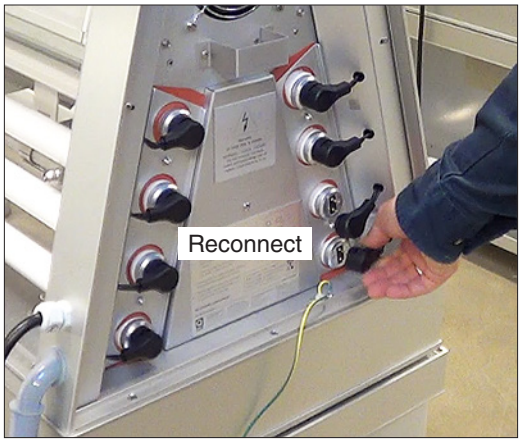


20. Avoid placing sealant in this area to make sure no sealant gets into the nozzle orifice.

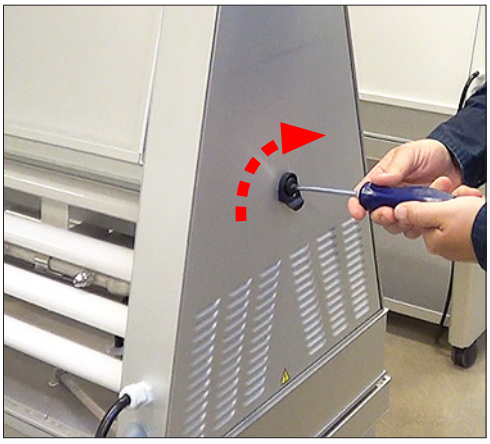


21. Reinstall the nozzle(s). Do not over-tighten. Clean any excess thread sealant.

22. Carefully reinstall the lamps.



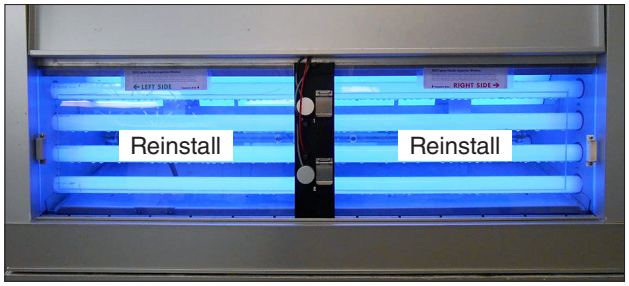
23. Reconnect the lamps at both ends.



24. Reinstall and latch both end covers.

25. Replace the black panel.

At this point lamps should be off.

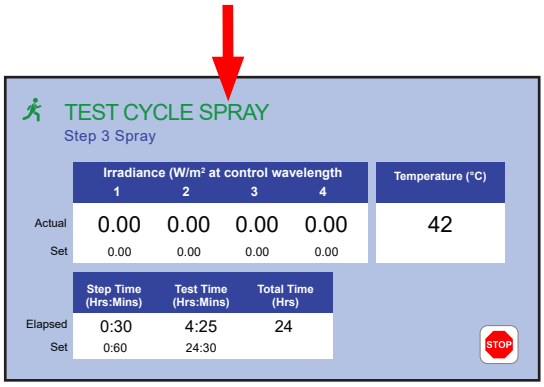


26. Reinstall the left and right spray inspection windows from the side of the tester showing uneven spray.

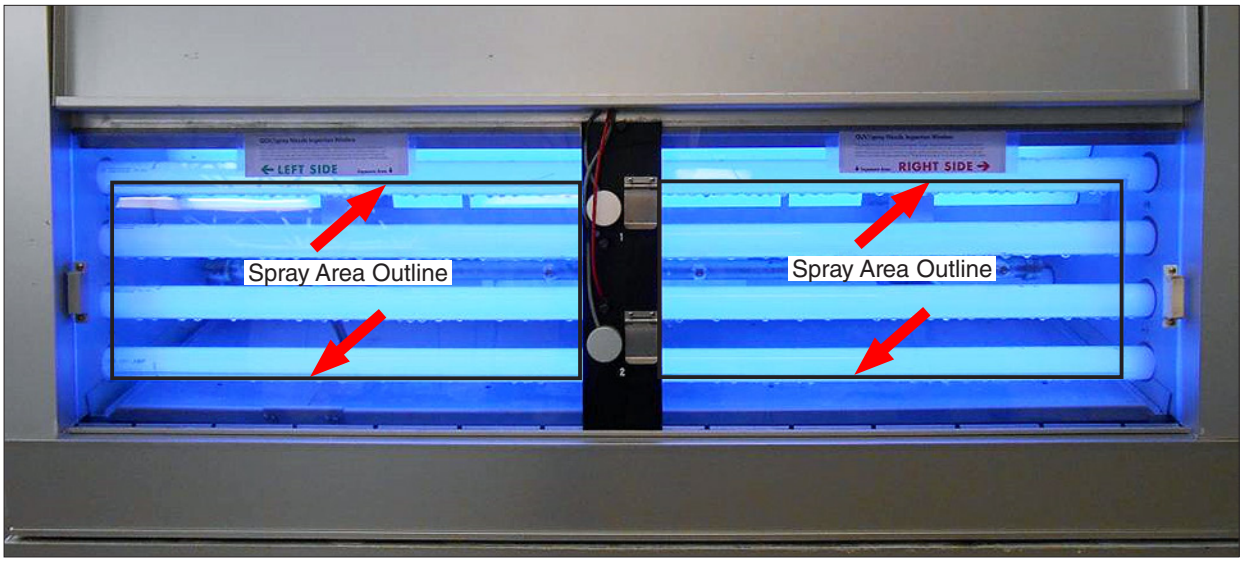
27. Reconnect power supply.

28. Main power **ON**.

29. QUV Power **ON.**



30. Run a spray step.



31. Check the spray pattern on the windows. If a portion of the defined spray area on each window is not wet, repeat the cleaning steps in this section. If the spray area is uniformly wet, nozzle cleaning is complete. Stop the test. Remove and store the spray inspection windows. Go to Section 16.4.

Spray Nozzle Replacement

- If nozzle cleaning does not resolve uneven spray patterns, nozzle replacement may be necessary. Q-Lab offers two kits to provide replacement spray nozzles:
  - V-4116-K Spray Nozzle Kit (Quantity 12)
  - V-4116-X Spray Nozzle Kit (Quantity 1)
- Contact Q-Lab for more information.

16.4. QUV/spray, /spray/rp Water and Solenoid Filters

- Inspect the water filter cartridge (Figure 16.4a) every 6 months.
- If it is dirty, replace the water filter cartridge (part number F-8066.5).

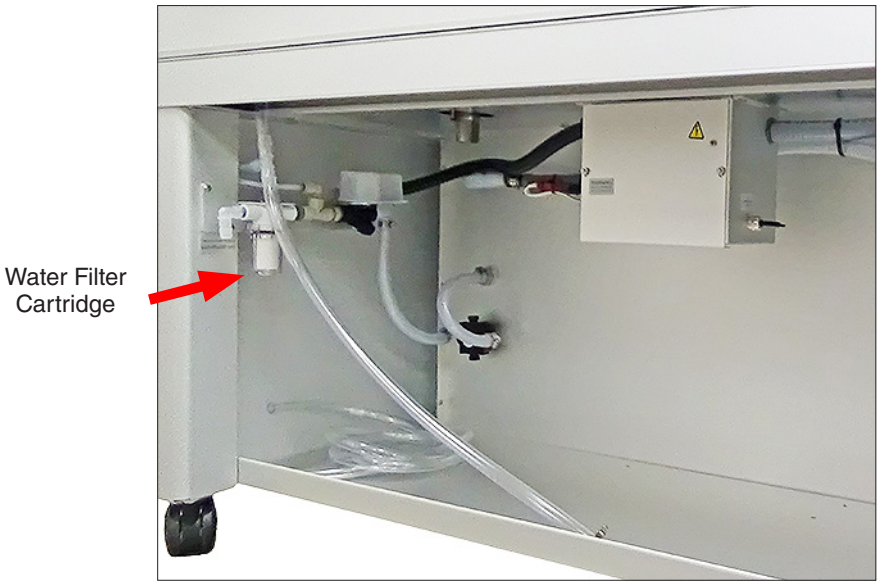


Figure 16.4a: Water filter cartridge location.

- Inspect the solenoid filter screen (Figure 16.4b) every 6 months.
- If dirty, use clean pure water and a small brush to clean the screen.

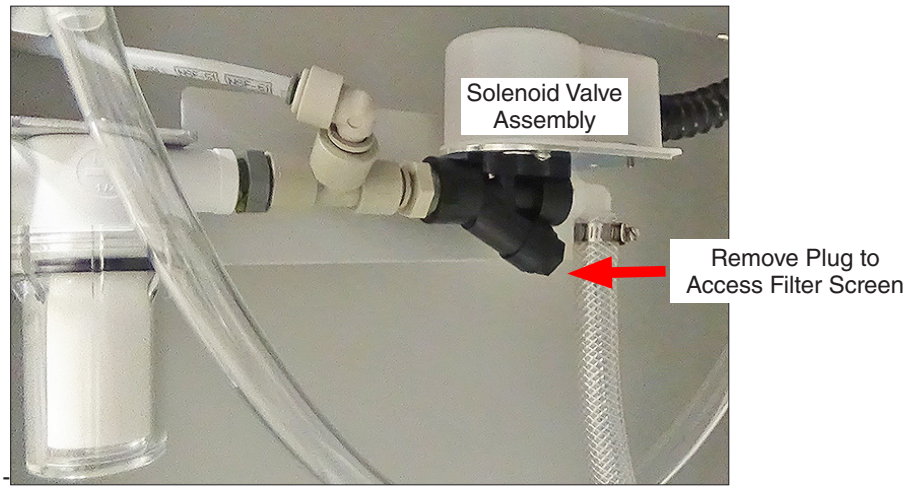


Figure 16.4b: Solenoid filter screen location.

Section 16. Maintenance

16.5. Water Repurification System

- For QUV testers equipped with an optional integrated water repurification system.

Solution and Carbon Filters

- Inspect the solution filter every 6 months (Figure 16.5a).
  - If dirty, replace with part number F-8066.5.
- Replace the carbon filter yearly with part number V-60335.
- See Section 16, Replacement Parts, for more information.

Demineralizer Cartridge

- The water purity meter (Figure 16.5a) should be checked once a month, and when the Total Dissolved Solids are greater than 1 ppm the demineralizer cartridge should be replaced with part number V-4979.
- When the QUV is supplied with pure water the demineralizer cartridge should last several years.

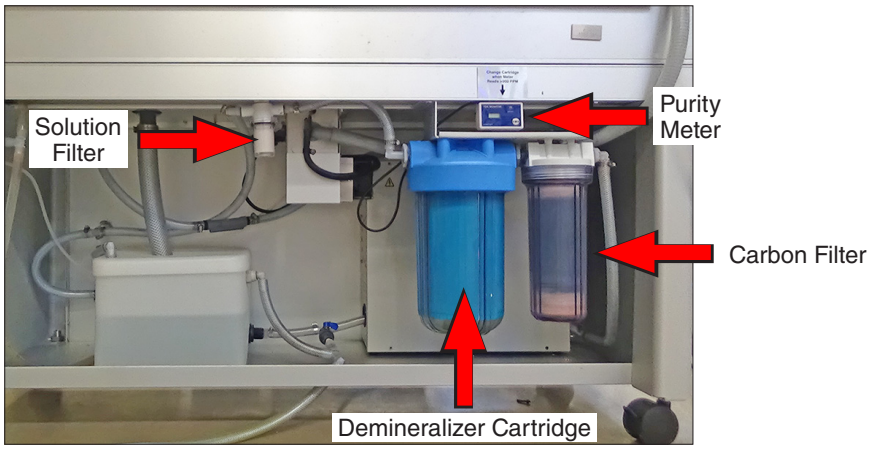


Figure 16.5a: QUV with integrated repurification system.

Demineralizer Cartridge

- Run a spray step (see Section 9.6).
- Locate the repurification system water purity meter (Figure 16.5b, Figure 16.5c).

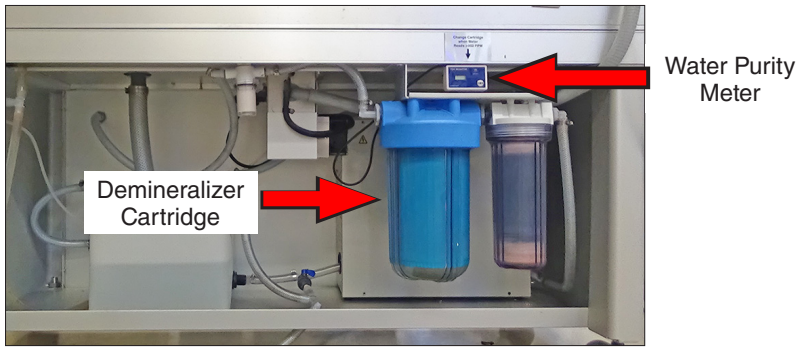


Figure 16.5b: Integrated water repurification system.

Figure 16.5c: Stand-alone water repurification system.

- Press the ON/OFF button on the water purity meter to turn it ON (Figure 16.5d).
- If the water purity meter reads > 001 the demineralizer cartridge should be replaced.
- Press the ON/OFF button again turn the meter OFF.

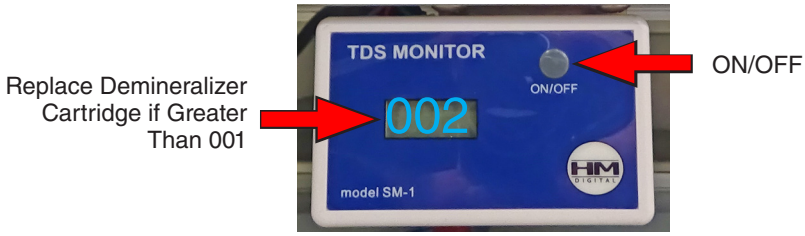


Figure 16.5d: Water purity meter reading.

Section 16. Maintenance

Water Reservoir

- Locate the repurification system water reservoir (Figure 16.5e and Figure 16.5f).
- Inspect the water reservoir and repurification system tubing for signs of discoloration.
- Mold will occasionally need to be cleaned from the water repurification system (Figure 16.5g).
- Cleaning can be done by running bleach through the system.
- Please contact Q-Lab Repair and Tester Support (Section 20) and request *Service Instruction V- 60010-L, How to Remove Mold from the QUV Water Re-Purification System*, for a detailed description of the cleaning procedure.

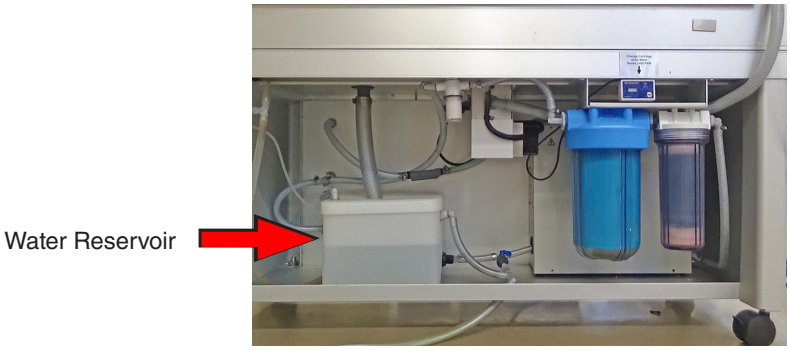


Figure 16.5e: Integrated water repurification system.

Figure 16.5f: Stand-alone water repurification system.

Figure 16.5g: Reservoir lid removed showing mold growth.

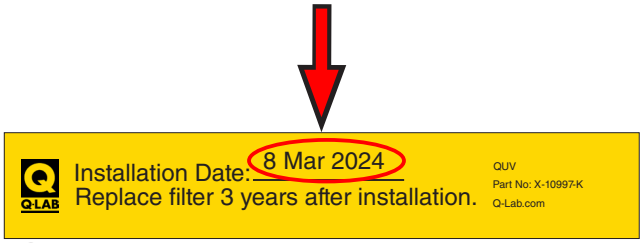
16.6. QUV/uvc Air Filters

- Remove the QUV end covers and inspect the air filters every month (Figure 16.6).
  - o Washable air filters (part number V-60287-X) are standard on QUV/uvc testers.
- If dirty, disposable air filters must be replaced (see).
- Washable air filters in service for more than three (3) years must be replaced.
- Washable air filters in service for less than three (3) years can be cleaned as shown in the Washable Air Filter Cleaning instructions.

Figure 16.6: Remove end covers at both ends of the QUV/uvc to access the air filters.

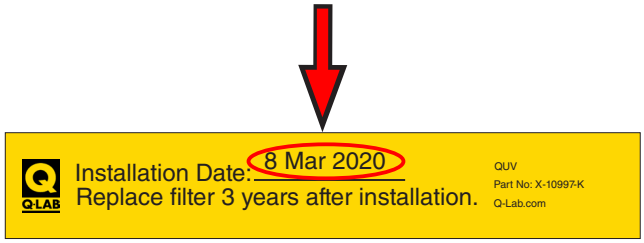
Washable Air Filter Cleaning

Less Than 3 Years Old - Wash



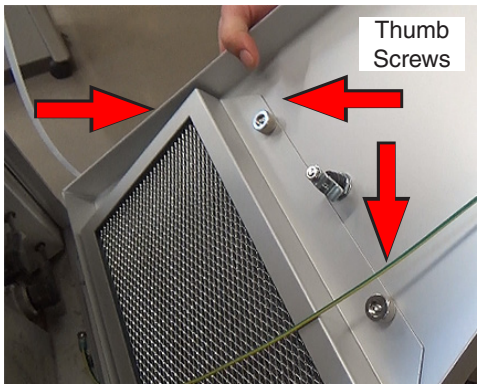
1. **IMPORTANT:** Check the date on the filter date label. If the date is less than 3 years older than the current date, the filter can be washed and reinstalled. See Step 3 through Step 8

Greater Than 3 Years Old - Replace



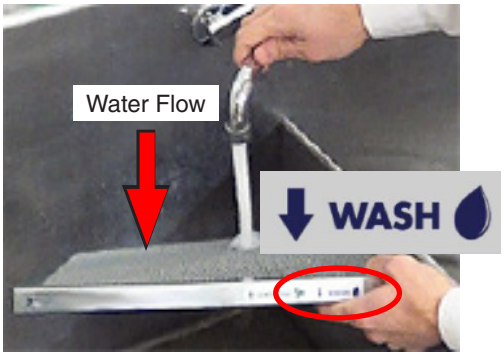
2. If the date is greater than 3 years older than the current date, discard the filter. Replace with new air filter. See Replacement Parts (Section 18).

Section 16. Maintenance



3. Remove the two (2) thumb screws on the air filter frame. Remove the frame. Remove the air filter.

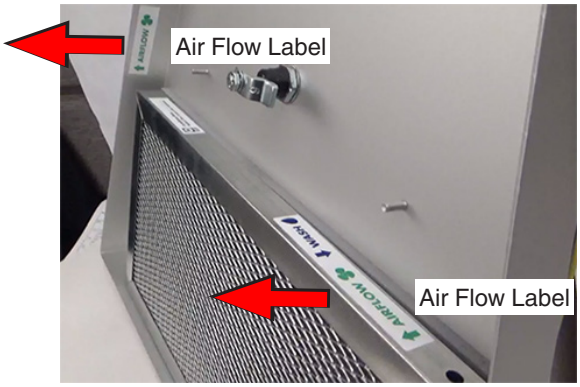
4. Locate the **WASH** label on edge of filter.



5. Hold filter under **CLEAN** running water. **IMPORTANT:** Water flow MUST BE in direction of **WASH** arrow.

6. Wash all of filter. **NOTE:** If rinsing with water does not remove dirt, use an electrostatic air filter cleaner spray.

7. Allow water to drain from the air filter.



8. Reinstall the air filter in the end cover. **IMPORTANT:** The AIRFLOW label on the edge of the filter points into the tester. Reinstall the end cover.

16.7. QUV Software Updates

- Q-Lab periodically updates the software that runs the QUV 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 required software updates have been released and should be installed.
- The files required to perform software updates can only be obtained by contacting Q-Lab (see Section 20).

Software Version and Tester Serial Number

- The currently-installed QUV software version number and tester serial number are required to determine if a software update needs to be performed.
- The QUV serial number and the software version are listed in the diagnostics screen accessed from the controller main menu.
- See Section 9.8 for instructions to display the tester serial number (diagnostic D14) and software version (diagnostic D7). The serial number can also be found on the nameplate attached to the rear of the QUV control top.

Software Types

- Once you have the tester serial number and software version number, visit www.q-lab.com/software.
- The most recent versions of QUV software will be listed and identified as either **Required**, **Recommended** or **Optional**.
    - **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 QUV (see previous section), that software needs to be installed.
        - More recent software versions are indicated by a higher version number (e.g. 5.201 and 5.300 would both be more recent than 5.200).
    - **Recommended** updates should be installed as soon as possible, as they offer a significant improvement and/or make an important correction.
    - **Optional** updates should not be installed unless Q-Lab personnel have directed you to do so.

Section 16. Maintenance

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 file (file format must be .ff4) to the root directory of a USB flash drive (Figure 16.7a).
- Connect the drive to the tester USB port of 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).
  - *Install New Software* means the software version on the USB drive is newer than the version on the tester
  - *Install Current Software* means the software version on the USB drive is the same as the version on the tester.
  - *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 Section 20 for Q-Lab Repair and Tester Support contact information.

Figure 16.7a: Copy QUV software to a USB drive.

Figure 16.7b: Connect the drive to the USB port of the QUV control panel.

Figure 16.7c: The USB Options screen displays the software installation button.

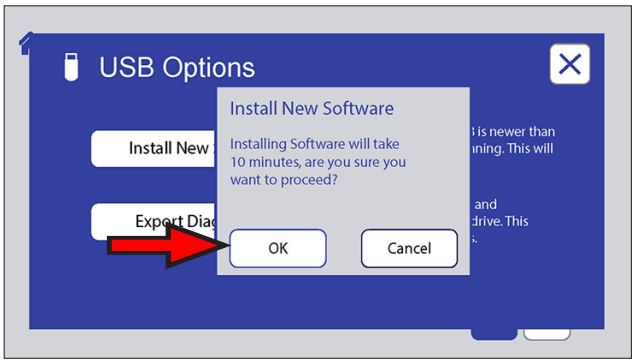


Figure 16.7d: Touch OK to proceed with software installation.

17. Troubleshooting and Repair

- QUV testers are designed so that virtually all repairs can be made by the user.
- Use only parts that have been supplied or recommended by Q-Lab.
- Q-Lab accepts no responsibility for the consequences of the use of non-approved parts.
- Please contact Q-Lab Repair and Tester Support with any questions regarding tester troubleshooting and repair.
- Or contact the nearest international office by telephone Monday through Friday from 8:30 AM to 5 PM or email for technical support.
- For immediate assistance, please contact us directly at +1-440-835-8700 (US), +44-1204-861616 (UK and Europe), +49-681-857470 (Germany/Austria/Switzerland), or +86-21-5879-7970 (China).
- Visit www.q-portal.net to register your tester to access additional useful troubleshooting guides, operating manuals, and technical information.
- The QUV software includes functions to export data that can be used to help diagnose tester problems (see Section 14.3).

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

Q-Lab.com/support

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

17.1. Notifications

- 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 11.5 for more information on displaying and clearing Notifications.
- The table below lists all QUV Notification descriptions along with suggested actions.

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.com/support.

No.	Notification Message	Icon/ Test Status	Description • Suggested Action	Appears in QUV Model		
				basic	uvc	se, spray, spray/rp, cw
M1	Door is open	 Stopped	The front or back specimen door is open. • Close the door. • If the doors are closed and this message appears, the door interlock is defective or needs adjustment.	●	●	●
M2	Outer Cover is Off	 Stopped	One of the outer (end) covers is off. • Replace the outer cover • If the outer covers are in place and this message appears, the a 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 11.6, 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 11.6, is generated. • *No action required*	●	●	●

No.	Notification Message	Icon/ Test Status	Description • Suggested Action	Appears in QUV Model		
				basic	uvc	se, spray, spray/rp, cw
M20	Panel Temperature Too Hot XXX°C	 Stopped	Panel temperature is greater than the setpoint by more than the allowable value. If in a UV cycle: • Check if the air heater relay is stuck closed • Check if the lab temperature is too hot If in a condensation cycle: • Check if the water heater relay is stuck closed • Check if the lab temperature is too hot	●	●	●
M21	Panel Temperature Too Cold XXX°C	 Stopped	Panel temperature is less than the setpoint by more than the allowable value. If in a UV cycle: • Check if the air heater relay is stuck open • Check for a failed air heater • Check if the lower blower relay is stuck open • Check for a failed lower blower • Check if the lab temperature is too cold If in a condensation cycle: • Check for gaps between or missing panel holders • Check if the lower blower relay is stuck closed • Check if the water heater relay is stuck open • Check for a failed water heater • Check if the lab temperature is too cold	●	●	●
M22	UV Temperature Fault XXX°C	 Running	A UV step ends and the panel temperature did not reach the setpoint ± 2 °C. • The UV step time is too short • Check for gaps between or missing panel holders • Check if the lab temperature is too cold	●	●	●

No.	Notification Message	Icon/ Test Status	Description • Suggested Action	Appears in QUV Model		
				basic	uvc	se, spray, spray/rp, cw
M23	Condensation Temperature Fault XXX°C	Running	A Condensation step ends and the panel temperature did not reach the setpoint ± 2 °C. • Check for gaps between or missing panel holders • Check if the lower blower relay is stuck closed • Check if the water heater relay is stuck open • Check for a failed water heater • Check if the lab temperature is too cold	●		●
M24	Panel Temp Runaway XXX°C	Stopped	Panel temperature is greater than the highest setpoint by more than the allowable value. If in a UV cycle: • Check if the air heater relay is stuck closed If in a Condensation cycle: • Check if the water heater relay is stuck closed	●	●	●
M25	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*	●	●	●
M26	UV + Cond Temperature Fault XXX°C	Running	A UV +COND step ends and the panel temperature did not reach set point ± 2 °C. • Check if the air heater relay is stuck open • Check for a failed air heater • Check if the lower blower relay is stuck open • Check for a failed lower blower • Check if the lab temperature is too cold	●		●

No.	Notification Message	Icon/ Test Status	Description • Suggested Action	Appears in QUV Model		
				basic	uvc	se, spray, spray/rp, cw
M27	Dark Temperature Fault XXX°C	 Running	A DARK step ends and the panel temperature did not reach the setpoint ± 2 °C. • Check if the air heater relay is stuck open • Check for a failed air heater • Check if the lower blower relay is stuck open • Check for a failed lower blower • Check if the lab temperature is too cold	●	●	●
M30	Replace Battery	 Running	The Main Controller battery voltage is less than the low limit. • Replace the battery (V-4086) on the main controller circuit board See Section 18	●	●	●
M33	Water Pan Too Hot XXX°C - May Be Empty	 Stopped	The temperature of the water in the water pan is greater than the allowable value. • Make sure there is water in the pan • Check that the water supply is turned on • Check if the water heater relay is stuck closed	●		●
M34	Controller Too Hot XXX°C	 Stopped	The Controller temperature is greater than 55 °C. • Check room temperature • Check for overheating of relays	●	●	●
M43	Water Spray Off: Should Be On	 Stopped	In a spray step, no water spray is detected. • Make sure the water supply is turned on • Check for clogged spray nozzles see Section 16.3 • Check the Spray Pressure Regulator • Check if the solenoid valve is stuck closed • Check if the spray relay is stuck open • Check if the flow switch is stuck open			spray, spray/rp only
M44	Water Spray On: Should be Off	 Stopped	In a non-spray step, water spray is detected. • Check if the solenoid valve is stuck open • Check if the spray relay is stuck closed • Check if the flow switch is stuck closed			spray, spray/rp only

No.	Notification Message	Icon/ Test Status	Description • Suggested Action	Appears in QUV Model		
				basic	uvc	se, spray, spray/rp, cw
M49	Power Disrupted	 Running	This message indicates power was off and then came back on when 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 QUV off to prevent the M49 message from being displayed when the QUV is powered back on	●	●	●
M50	UV Irradiance Too High	 Stopped	In a cycle with UV, the detected irradiance is greater than the setpoint by more than the allowable value. • Check the Ballast • Check the UV sensors • Check if the lamp relay is stuck closed • Check if the irradiance set point is too low		●	●
M51	UV Irradiance Too Low	 Stopped	In a cycle with UV, the detected irradiance is less than the setpoint by more than the allowable value. • Check if a rubber lamp socket is off or loose • Check for burned out lamps • Check the age of the lamps, see Section 11.9 • Check the UV sensors • Check if the Irradiance set point is too high		●	●
M52	Ballast or Ballast Relay Fault	 Stopped	In a cycle with UV, the detected irradiance is less than 0.05 W/m^2 for all irradiance sensors. • Check the ballast • Check if the ballast (lamp) relay is stuck open		●	●
M53	Ballast Relay Stuck On	 Stopped	Appears only during relay check, if an irradiance greater than 0.05 W/m^2 is detected in any channel (SOLAR EYE models) or ballast current sensed (basic). • Check the ballast • Check if the ballast (lamp) relay is stuck closed	●	●	●

No.	Notification Message	Icon/ Test Status	Description • Suggested Action	Appears in QUV Model		
				basic	uvc	se, spray, spray/rp, cw
M54	Run Relay Stuck On	Stopped	Appears only during relay check, if an irradiance greater than 0.05 W/m² is detected in any channel (SOLAR EYE models) or ballast current sensed (basic). • Check if the run power relay is stuck closed	●	●	●
M60	Lamp Fault Ballast 1	Stopped	In a UV or a UV + COND step lamp current is not sensed. • Check for a loose or disconnected rubber lamp socket • Check for a burned out lamp • Check for a failed ballast	●		
M61	Lamp Fault Ballast 2					
M62	Lamp Fault Ballast 3					
M63	Lamp Fault Ballast 4					
M65	Service Lamps	Running	Appears when Lamp Service Hours exceed the Lamp Service Interval. • Replace the lamps	●		
M66	Calibrate UV Sensors	Running	Appears when UV calibration hours exceed the UV sensor calibration interval. • Calibrate UV sensors		●	●
M69	Lamps On - Should Be Off	Stopped	Appears in a non-UV cycle if an irradiance greater than 0.05 W/m² is detected in any channel (SOLAR EYE models) or ballast current sensed (basic). • Check if the ballast (lamp) relay is stuck closed	●	●	●
M70	Heater On - Should Be Off	Stopped	Appears if the tester is in STOP mode and the black panel temperature is greater than the lab temperature + 30 °C. • Check if the run power relay is stuck closed • Check if the air heater relay is stuck closed	●	●	●
M80	Flash Memory Failure	Stopped	The checksum test on Main Controller software failed. • Turn the QUV off and back on • If problem persists, contact Q-Lab.com/support	●	●	●
M81	Flash Data Corrupt	Stopped	Tester parameter and setup data is corrupted. • Turn the QUV off and back on • If problem persists, contact Q-Lab.com/support	●	●	●
M82	RAM Corrupted, RAM Reloaded	Stopped	Indicates an error in RAM data. Data is reloaded from flash. • Press the clear and enter buttons • If problem persists, contact Q-Lab.com/support	●	●	●

No.	Notification Message	Icon/ Test Status	Description • Suggested Action	Appears in QUV Model		
				basic	uvc	se, spray, spray/rp, cw
M92	Panel Temperature Sensor Fail	 Stopped	Appears if the black panel temperature reading is less than 3 °C. • Check the black panel temperature sensor	●	●	●
M93	Water Temperature Sensor Fail	 Stopped	Appears if the water temperature reading is less than 3 °C. • Check the water temperature sensor	●		●
M94	Lab Temperature Sensor Fail	 Running	Appears if the lab temperature reading is less than 3 °C. • Check the lab temperature sensor	●	●	●
M101	SD Card Missing	 Running	The SD card on the main controller board is missing or not seated properly. • Contact Q-Lab.com/support	●	●	●
M103	System Auto Reboot	 Running	The QUV has restarted itself in order to avoid a potential problem in operation. • *No action required*	●	●	●
M104	Software Install Completed Successfully	 Complete	Software has been installed without issue. • *No action required*	●	●	●
M900	Status Screen communications failure	 Running	Communication lost between main controller and Status Screen, the tester will enter single-screen mode. • Check for loose cable between main controller and the display, reseat cable • If problem persists, contact Q-Lab.com/support		●	●
M901	Menu Screen communications failure	 Running	Communication lost between main controller and Menu Screen, the tester will enter single-screen mode. • Check for loose cable between main controller and the display, reseat cable • If problem persists, contact Q-Lab.com/support		●	●
M902	Main Controller communications failure	 Running	Message that appears on a screen that has experienced M900 or M901. • See m900/M901 for suggested action.		●	●

17.2. Insufficient Water Volume

QUV/spray without Water Repurification System

- Spray water flow in QUV testers without water repurification systems is controlled by a pressure regulator (Figure 17.2a).
- If the pressure regulator cannot be adjusted to obtain 7 liters per minute (lpm) reading on the flow meter, check that:
  - Input water pressure is at least 3.1 bar (45 psi) when running a spray step (water is flowing).
  - Check the spray nozzles and water filter cartridge (see Section 14.3 and Section 14.4).
- If the M43 *Water spray off should be on* error message is displayed, see Section 16.3 for more information
- If 7 lpm still cannot be obtained, the pressure regulator (part number HS-4650-X) may need to be replaced.
- For more information contact Q-Lab Repair and Tester Support, see Section 20.

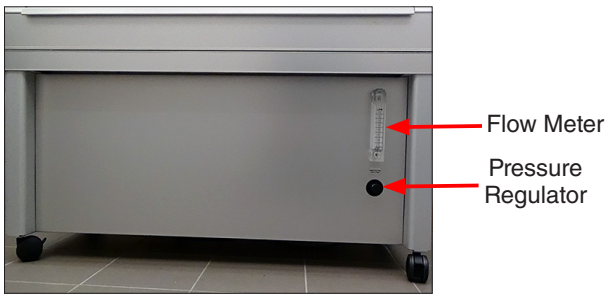


Figure 17.2a: QUV/spray pressure regulator and flow meter.

QUV/spray with Water Repurification System

- Spray water flow in QUV testers with water repurification systems is controlled by a water flow adjustment valve (Figure 17.2b and Figure 17.2c).
- If the flow adjustment valve cannot be adjusted to obtain 7 liters per minute (lpm) reading on the flow meter, check that:
  - The spray nozzles and water filter cartridges are not dirty or clogged (see Section 16.3 and Section 16.4).
  - There is water in the reservoir.
  - The spray relay is not stuck in the open position.
  - The flow switch is not stuck in the open position.
  - The pump motor (part number X-10819-K) is not broken, see Section 15.3.
- For more information contact Q-Lab Repair and Tester Support, see Section 20.

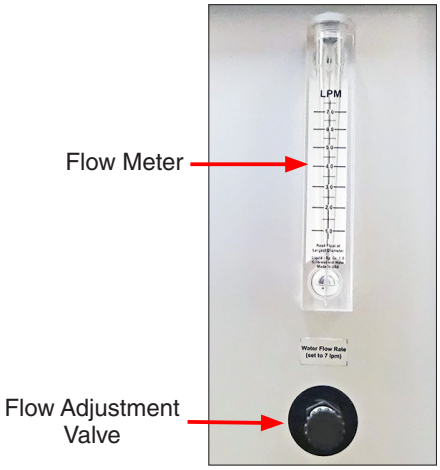


Figure 17.2b: Water flow adjustment on QUV/spray/rp integrated water repurification system.

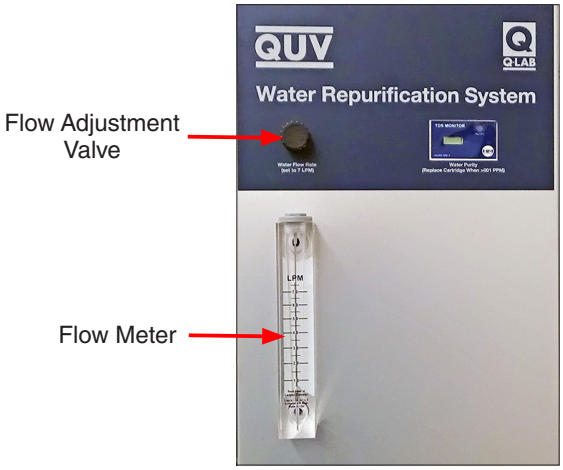


Figure 17.2c: Water flow adjustment on QUV/spray stand-alone water repurification system.

17.3. No Power

- If the tester will not power up, check for:
  - Main power switch (V-2202, 120 V or V-2200, 230 V) failure.
  - Controller transformer (V-2077-X, 120 V or V-2078-X, 230 V) failure.
- If the main power switch/circuit breaker trips, check for:
  - Main power switch (V-2202, 120 V or V-2200, 230 V) failure.
  - Air and water heaters on at the same time because the air or water heater relay is stuck closed.
- For more information contact Q-Lab Repair and Tester Support, see Section 20.

17.4. Loose Lamp Sockets

Be sure the power is OFF before performing this procedure

- If the rubber socket is loose and falls off the lamp pins:
  - Squeeze the socket *gently* with a pair of pliers (Figure 17.4).
  - This will tighten up the brass bushings inside the socket.
- Replace lamp sockets that appear worn or cannot be sufficiently tightened.

Figure 17.4: Squeeze gently to tighten socket.

Section 17. Troubleshooting and Repair

17.5. Water Condensation in Lower Fan Box

This section does not apply to QUV/uvc testers.

- Water sometimes condenses in the lower fan box when the room temperature is cold and the QUV runs a hot condensation step.
- This could cause a premature failure of the air heater located in the lower fan box.
- A water detection indicator in located the bottom of the lower fan box (Figure 17.5).
- The indicator turns red (and stays red) when it gets wet.
- To check for water condensation in the fan box, remove the fan box cover.
- If the indicator is red, contact Q-Lab to find out what can be done to prevent water condensation in the fan box.

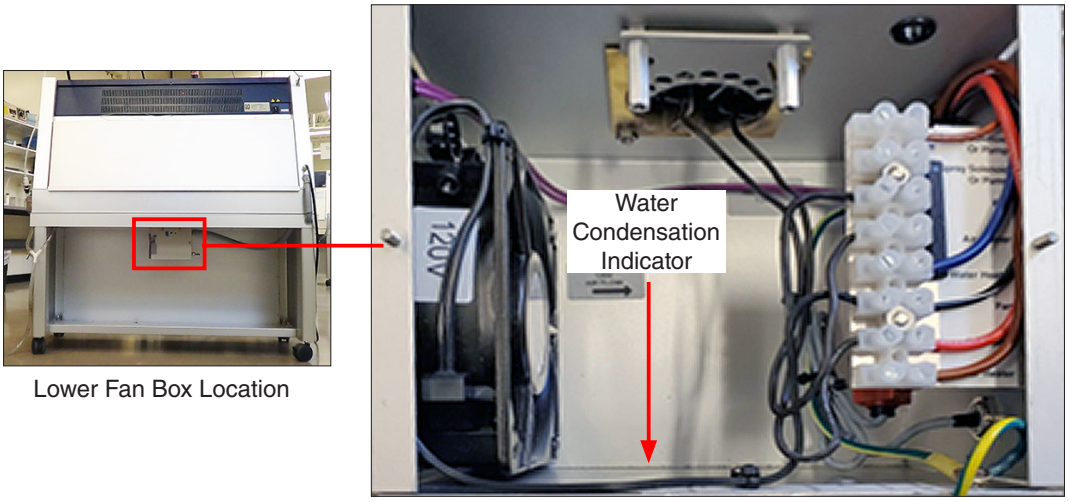


Figure 17.5: Water condensation indicator in lower fan box.

18. Replacement Parts

- Use only parts that have been supplied or recommended by Q-Lab.
- When ordering parts; specify QUV model, serial number, Volts, Hz and Part Number.

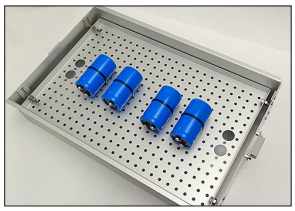
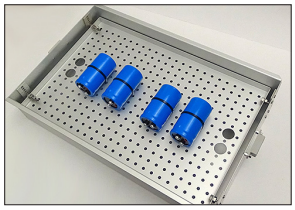
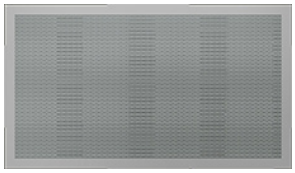
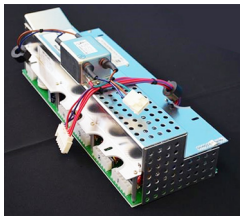
Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	V-60301-K	Adjustable Quadrant Box Kit, 4"	●	●	●	●	●
	V-60292-K	Adjustable Quadrant Box Kit, 8"	●	●	●	●	●
	V-60287-X	Air Filter Assembly, Washable					●
	V-60468 120 V V-60469 230 V	QUV/uvc Air Heater Blower					●
	CV-60218-K 120 V CV-60219-K 230 V	Air Heater Kit	●	●	●	●	●
	IC-1308-K 120 V / 230 V	Ballast Kit		●	●	●	●

Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	V-60006-X	Ballast, 120 V / 230 V	●				
	V-4086	Controller Battery	●	●	●	●	●
	V-2077-X 120 V V-2078-X 230 V	Controller Transformer	●	●	●	●	●
	TEB-105016-K TEB-105017-K	Touchscreen Replacement Kit, Red Label Touchscreen Replacement Kit, Blue Label **NOTE:** Remove bezel to determine label color.	●	●	●	●	●
	V-60353-K	Door Interlock Kit For Use With Quadrant Boxes	●	●	●	●	●
 ×4	CV-60450-K	Earthquake Restraint Kit	●	●	●	●	●
	V-2410-K	End Seal Kit for 3" Panel Holders	●	●	●	●	

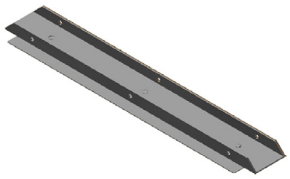
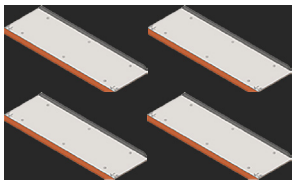
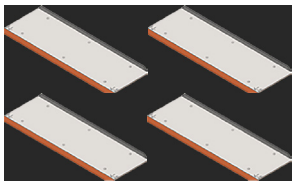
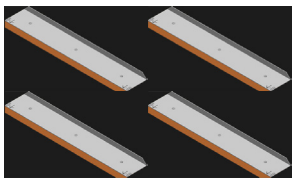
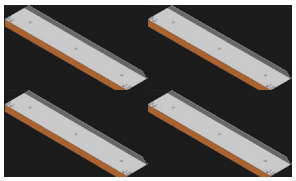
Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	V-60480-X	End Seal Assembly for 3" Panel Holders, QUV/uvc					●
	V-2411-K	End Seal Kit for 4" Panel Holders	●				
	V-2412-K	End Seal Kit for 4" Panel Holders		●	●	●	
	V-2414-K	End Seal Kit for 6" Panel Holders	●				
	V-2415-K	End Seal Kit for 6" Panel Holders		●	●	●	
	F-8066.5	Filter Assembly Cartridge, 80 µm			●		
	V-60335	Filter, Carbon			●		

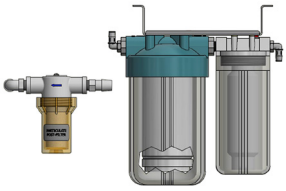
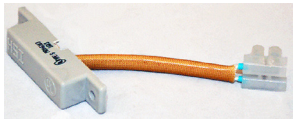
Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	V-60342-K	Carbon Pre-Filter and Particulate Post Filter, QUV/spray/rp			●		
	V-60090-X	Flow Switch			●		
	V-60089	Flowmeter			●		
	V-2342	Fuse, 0.5A	●	●	●	●	●
	V-2350-X	Interlock Switch Assembly	●	●	●	●	●
	UC10/CW	Irradiance Smart Sensor, Cool White				●	
	UC10/UV	Irradiance Smart Sensor, UV		●	●		

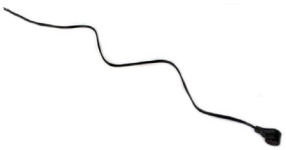
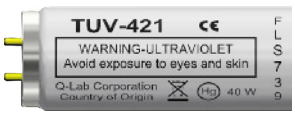
Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	UC10/UVC	Irradiance Smart Sensor, UVC					●
No Photograph	UC10/ RECALDISP	Irradiance Smart Sensor, Recalibrate and Dispose		●	●	●	●
No Photograph	UC10/ RECAL	Irradiance Smart Sensor, Recalibrate and Return		●	●	●	●
	V-155	Lamp Connector	●	●	●	●	●
	V-60183	Lamp, Cool White Fluorescent				●	
	QFS-40	Lamp, QFS-40	●	●	●		
	TUV-421	Lamp. TUV-421		●	●		

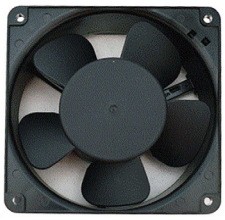
Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	UVA-340	Lamp, UVA-340	●	●	●		
	UVA-340+	Lamp, UVA-340+		●	●		
	UVA-351	Lamp, UVA-351	●	●	●		
	UVB-313EL+	Lamp, UVB-313EL+		●	●		
	UVC-254	Lamp, UVC-254					●
	IC-1500-X 120 V IC-1505-X 230 V	Lamp & Chamber Cooling Fan	●	●	●	●	●
	V-106	Lamp Gasket	●	●	●	●	●

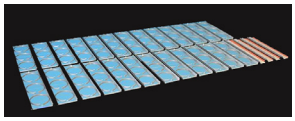
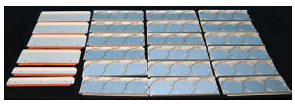
Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	F-8977-K	Leveling Feet Field Replacement Kit	●	●	●	●	●
	TEB-105015-K	Main Controller	●	●	●	●	●
	V-2202 120 V V-2200 230 V	Main Power Switch/Circuit Breaker	●	●	●	●	●
	V-131.3T-X	Panel Holder Assembly for Tensile Bars	●	●	●	●	●
	V-131.3-K	Panel Holder Kit, 3" with End Seals (25 Pieces)	●	●	●	●	
	V-131.4-K	Panel Holder Kit, 4" with End Seals (18 Pieces)	●	●	●	●	
	V-131.6-K	Panel Holder Kit, 6" with End Seals (13 Pieces)	●	●	●	●	

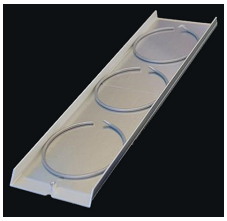
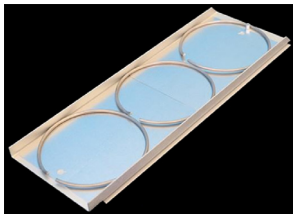
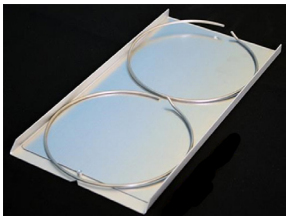
Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	V-131.3-X	Panel Holder with rings, 3"	●	●	●	●	●
	V-131.4-X	Panel Holder with rings, 4"	●	●	●	●	
	V-131.6-X	Panel Holder with rings, 6"	●	●	●	●	
	TEB-105043-K	Panel Mount LED Indicator Assembly	●	●	●	●	●
	TEB-105040-K	Panel Mount USB Port	●	●	●	●	●
	V-4962-K	Plastic Lumber Holder Kit, 19.5" × 2" with adjustable mounting clamps	●	●	●	●	
No Photograph	V-2187	Power Cord, 120 V, 12 Gauge, SOLAR EYE		●	●	●	●

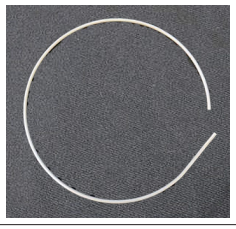
Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
No Photograph	V-2188	Power Cord, 230 V 16 Gauge	●	●	●	●	●
	IC-1525	Power Cord Plug, for V-2187, 20 A		●	●	●	●
No Photograph	CV-234	Power Cord with Plug, 120 V 16 Gauge	●				
	HS-4650-X	Pressure Regulator			●		
	U-40825-K	Relay Kit, SS, 5 A			●		
	F-8385-K	Relay Kit, SS, 25 A	●	●	●	●	●
	V-132.3	Retaining Ring for 3" Holders	●	●	●	●	●

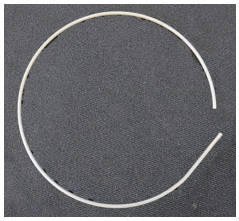
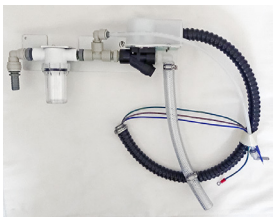
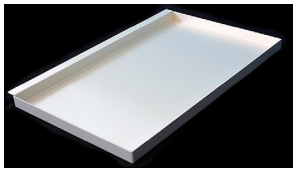
Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	V-132.4	Retaining Ring for 4" Holders	●	●	●	●	
	V-132.6	Retaining Ring for 6" Holders	●	●	●	●	
	V-60371-K	Sensor Panel Relocation Kit		●	●	●	●
	V-60278-K 120 V V-60279-K 230 V	Solenoid Valve Kit, For QUV/spray Not on Space Saver Frame			●		
	V-4961-X	Specimen Holder Assembly, 19.5" × 1"	●	●	●	●	
	V-4019-X	Specimen Holder, 3.25" × 0.7" with adjustable mounting clamps	●	●	●	●	●
	V4960-X	Specimen Holder, 3.25" × 1"	●	●	●	●	●

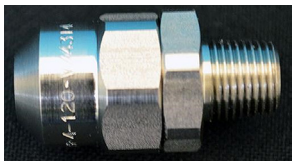
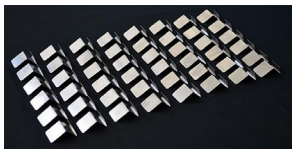
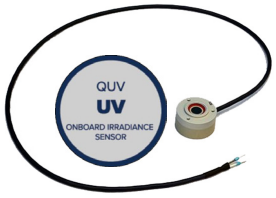
Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	V-4116	Spray Nozzle			●		
	U-41085-K	Temperature Calibration Kit	●	●	●	●	●
	V-2156-X	Temperature Sensor Assembly	●	●	●	●	●
	V-133-K	Thick Panel Retaining Clip, Set of 50	●	●	●	●	●
	V-141-X	UV Goggles	●	●	●	●	●
	V-60460-X	UV Sensor Assembly, QUV/uvc					●
	IC-1124-X	UV Sensor		●	●	●	

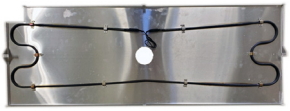
Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	CV-218A-K	Water Feed Assembly Kit	●	●	●	●	
	CV-218V-K	Water Feed Valve Float Kit	●	●	●	●	
	CV-230-K 120 V CV-231-K 230 V	Water Heater Kit	●	●	●	●	
	CV-60129-K	Water Pan Kit	●	●		●	
	HS-4587-K	Water Pan Kit, Corrosion Resistant			●		
	X-10570-K	Water Pressure Booster Pump, Stand Alone, Extreme Environment	●	●	●	●	
	V-4979-K	Water Re-Purification Demineralizer Cartridge Kit			●		

Photo	Part Number	Description	For QUV Model				
			basic	se	spray, spray/rp	cw	uvc
	V-60160-K	Water Repurification Retrofit Kit, Standalone			●		

19. Warranty

Q-Lab offers a variety of warranty options for new testers and replacement parts, including both standard and extended warranties. Visit https://pages.q-lab.com/warranty for information on warranties available to Q-Lab customers.

Liability in all events is limited to the purchase price paid. Damage due to accident or abuse is not covered. Labor cost is not covered.

Q-Lab Corporation makes no other warranties, including implied warranties of merchantability, or fitness for a particular purpose, except as may be expressly provided by the Q-Lab Corporation in writing.

Q-Lab Corporation shall not be liable for any incidental, consequential, special, or contingent damages arising out of the sale or use of any product.

Q-FOG test chambers are made in the USA.

20. Repair and Tester Support

- Repair and Tester Support is available over the telephone Monday through Friday from 8:30 AM to 5 PM.
- Please contact the nearest international branch office by phone or email for technical support.
- 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

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