

LC-0875-TM

Technical Manual



QCT **Condensation Tester**

The Original “Cleveland Cabinet”



For QCT/PDO Condensation Testers

Serial Numbers: XX-XXXXX-43

Revision Date
24 May 2023

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1. Specifications, Symbols

1.1. Specifications (Dec 2022)

- Installation Category: II for transient over-voltages.
- Pollution Control: Pollution Degree 2.
- Sound Pressure Level: Sound Pressure Level does not exceed 74 dBA.
- Altitude: 2000 meters or less.
- Operation: Continuous Rating
- 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).
- Short Circuit Current Rating (SCCR): 1000 A.
- See [Section 4](#) for additional important operating environment specifications.

1.1. Symbols (Oct 2022)



Electrical Shock Hazard



Hot Surfaces Hazard



Attention



Local Waste & recycling regulations per the WEEE Directive 2002/96/EC 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.
- The QCT 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 QCT meets the European Electromagnetic Directive 2014/30/EC and complies with the requirements of EN 55011:2007 Radiated and Conducted Emissions – class A.
- Use only parts that have been supplied or recommended by Q-Lab.

2.1. Heat and Electrical Shock Hazards (Feb 2023)

Warning Labels

- Warning: If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- Warning labels indicate heat and electric shock hazards inside the QCT tester ([Figure 2.2a](#) and [Figure 2.2b](#)).



Figure 2.2a: Hot surface warning label.



Figure 2.2b: Shock hazard warning label.

2.2. Disposal (Dec 2022)



- When disposing of the QCT, please follow local regulations.
- Components such as lithium batteries or electronic assemblies may be restricted items for ordinary disposal.

3. General Description

3.1. Overview (Feb 2023)

- The QCT/PDO Condensation Tester is based on the Cleveland Condensing Humidity Cabinet, originally designed and tested by the Cleveland Society for Paint Technology.
- Since 1965, hundreds of laboratories throughout the world have successfully used QCT testers for research and quality control, including paint, automotive, and appliance manufacturers, oil producers, chemical companies, and researchers.
- The QCT condensation function ([Section 7.1](#)) simulates the damaging effects of rain and dew on metals, paints, and organic materials by condensing warm water directly onto test specimens.
- The hot condensation delivered by the QCT tester can, in a few days or weeks, reproduce the damage caused by outdoor moisture over months or years.
- The QCT dry-off function ([Section 7.2](#)) dries specimens to simulate natural outdoor wet/dry cycles.
- This Technical Manual provides detailed information on the installation, operation, and maintenance of the QCT Condensation Tester.

3.2. Major Components (Dec 2022)

- The major components of a QCT Condensation Testers are listed below and shown in [Figure 3.2a](#) through [Figure 3.2i](#).
- See [Section 7](#) for descriptions of component functions.

- | | | |
|--|---------------------------------|----------------------------|
| o Air Heater | o Drain Tube | o Status LED |
| o Air Heater Fan | o Ethernet Port | o Touchscreen Display |
| o Base | o Laboratory Temperature Sensor | o USB Port |
| o Casters | o Main Controller Circuit Board | o Water Feed Assembly |
| o Chamber Air Temperature (CAT) Sensor | o Power Cord | o Water Heater |
| o CAT Sensor Calibration Port | o Power Switch | o Water Pan |
| o Control Panel | o Specimen Racks | o Water Temperature Sensor |



Figure 3.2a: QCT front view.

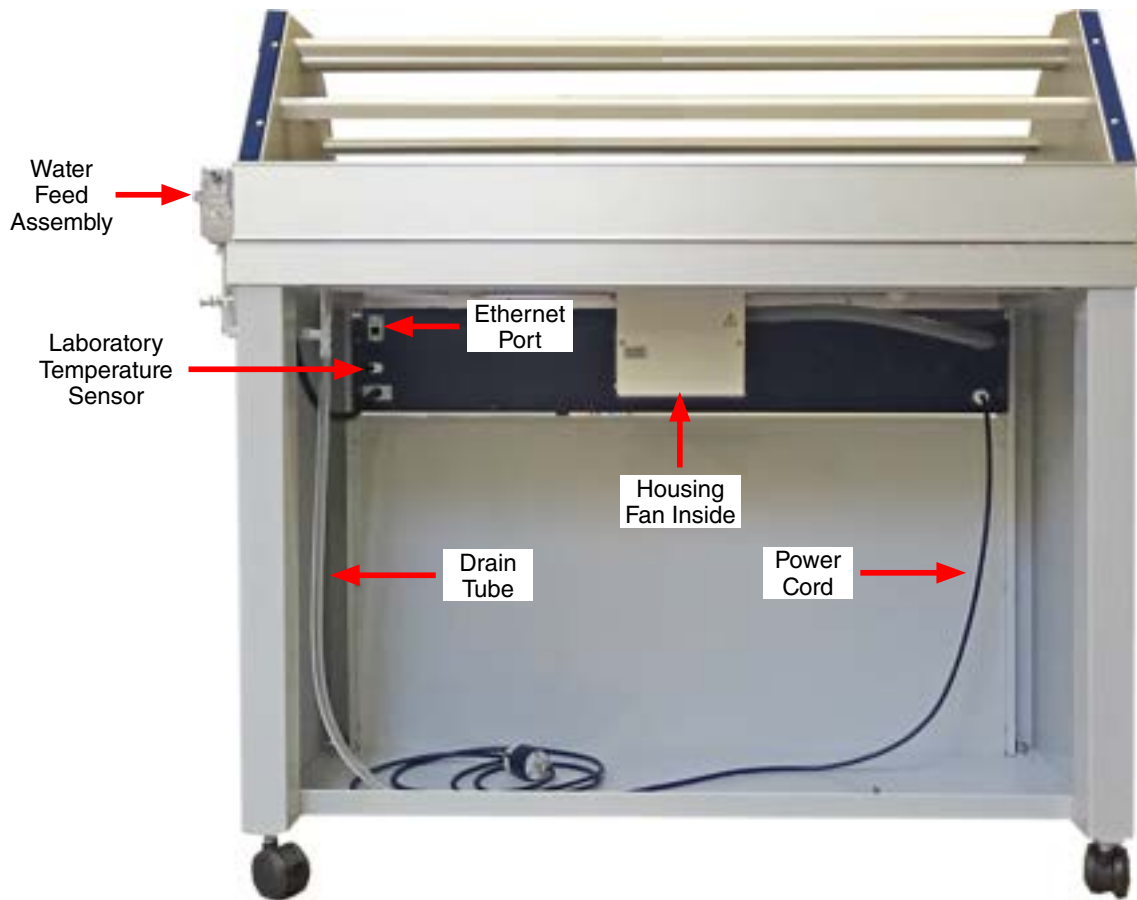


Figure 3.2b: QCT rear view.

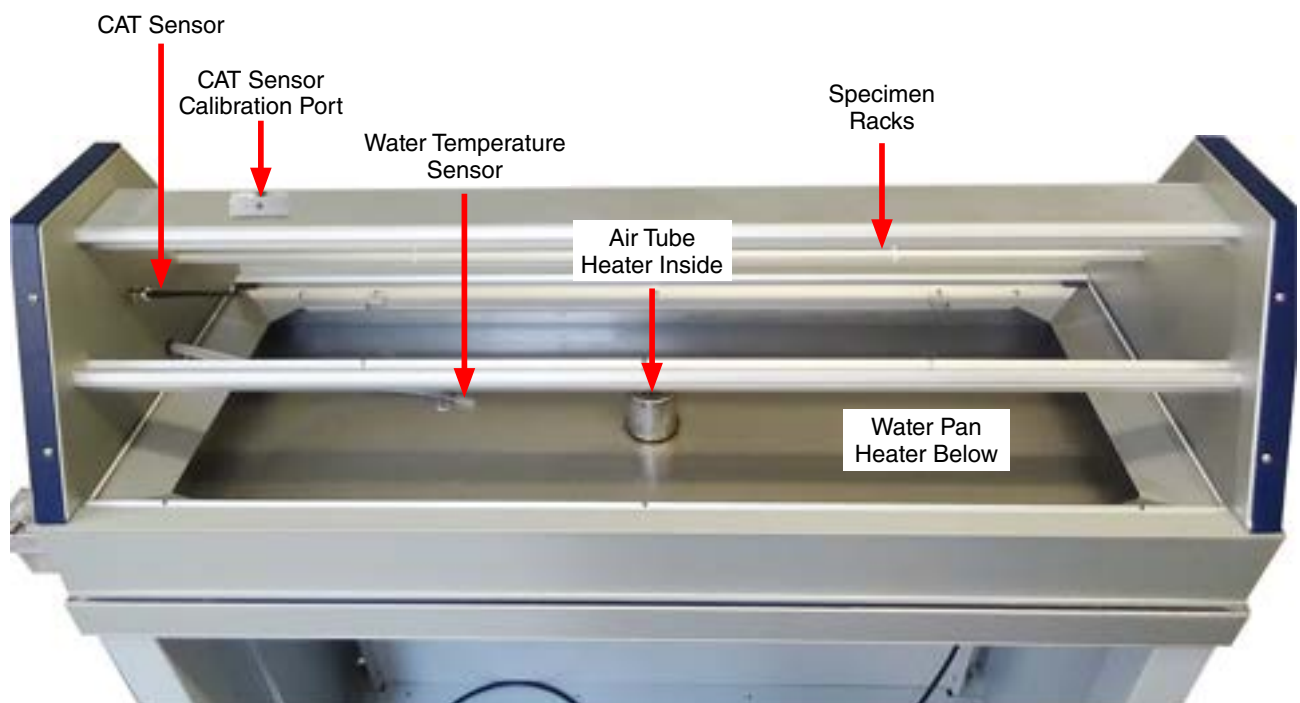


Figure 3.2c: QCT top rear view.

Section 3. General Description

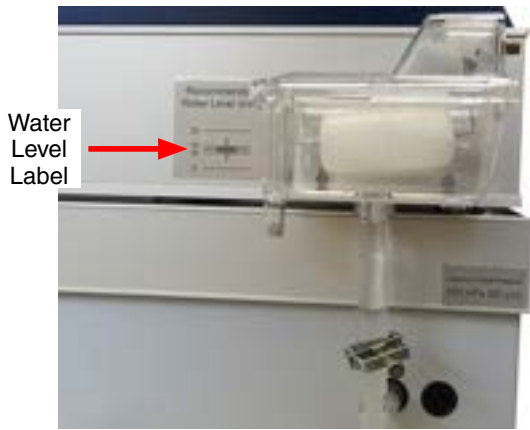


Figure 3.2d: Water feed assembly with recommended water level label.

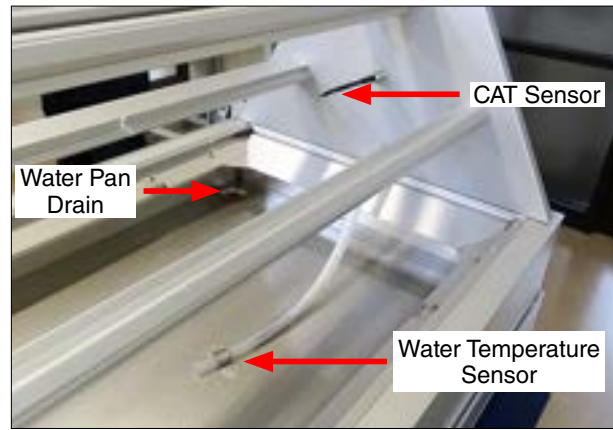


Figure 3.2e: Chamber air temperature sensor, water temperature sensor and water pan drain.

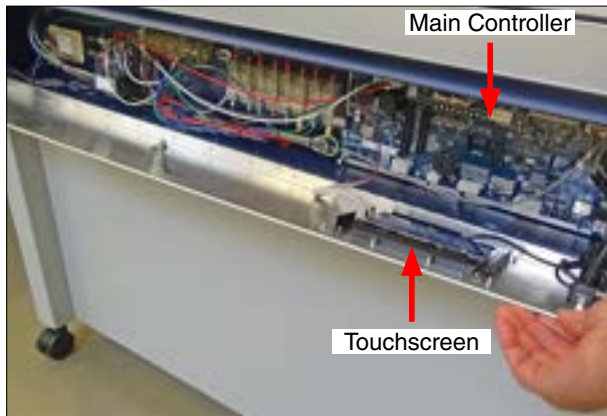


Figure 3.2f: Control panel lowered to access electronic components.



Figure 3.2g: Air heater inside tube at the center of the water pan.



Figure 3.2h: Air heater fan housing under water pan.



Figure 3.2i: Touchscreen displaying Main Menu. See [Section 8](#) for tester operation instructions.

3.3. Standard Tests Conducted in the QCT (Feb 2023)

- The standard tests that can be performed in a QCT tester include:
 - ASTM D4585, Testing Moisture Resistance of coatings with Controlled Condensation
 - ISO 6270-1, Paints and varnishes — Determination of resistance to humidity — Part 1: Condensation (single-sided exposure)
 - ISO 6270-2, Paints and varnishes — Determination of resistance to humidity — Part 2: Condensation (in-cabinet exposure with heated water reservoir) **NOTE:** Requires the optional Humidity Chamber Attachment (see Section 12 for more information).
 - BS 3900-F2, Test for paints — Determination of resistance to humidity (cyclic condensation)
 - BS 3900-F9, Paints and varnishes —Determination of resistance to humidity (continuous condensation)
- See [LC-8070 QCT Summary & Standards Met](#) for additional information on standards met by QCT testers.

4. Operating Environment



The Tester Must Be Located in a Suitable Environment

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

4.1. Suitable Environments (Feb 2023)

Ambient Laboratory Temperature and Humidity

- The recommended ambient operating temperature and relative humidity (RH) for QCT testers is 23 ± 5 °C and $50 \pm 25\%$ RH.
- Never operate your tester in lab temperatures >40 °C or $>80\%$ RH.
- Operating outside the recommended range (or in rare cases, even within it), certain standards or test cycle conditions may not be achievable, and may result in test notifications (see [Section 8.5](#)).
- [Consult with Q-Lab](#) for more specific information about achievable chamber test conditions based upon specific laboratory environments.

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 (Dec 2022)

Salt Fog or Other Airborne Contamination

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



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



Figure 4.2b: Do not locate QCT 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 QCT near open windows.

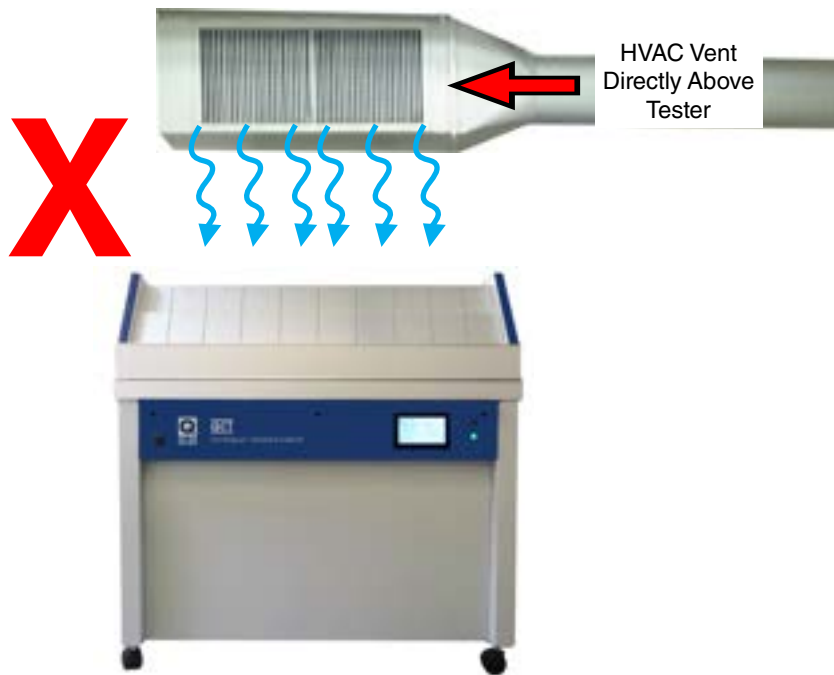


Figure 4.2d: Keep tester away from sources of hot or cold air.

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, SO₂ 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 17](#) for contact information.

5. Uncrating (May 2023)

- All QCT 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.

NOTE: If the Humidity Chamber Accessory, Kit, Factory Installed (C-60692-K-INST) was ordered with the QCT tester, the humidity chamber doors are packed separately from the main QCT unit.



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.

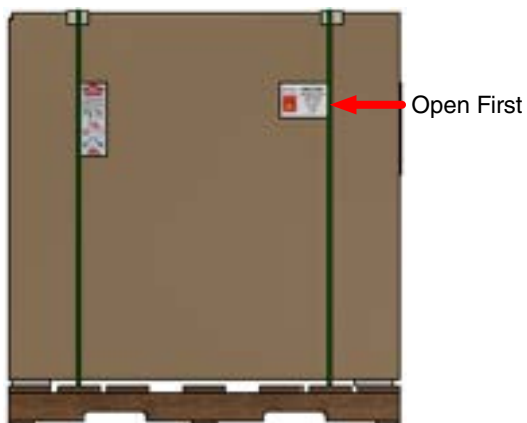


Figure 5a: This Crate has a Carton Banded to a Wooden Skid.

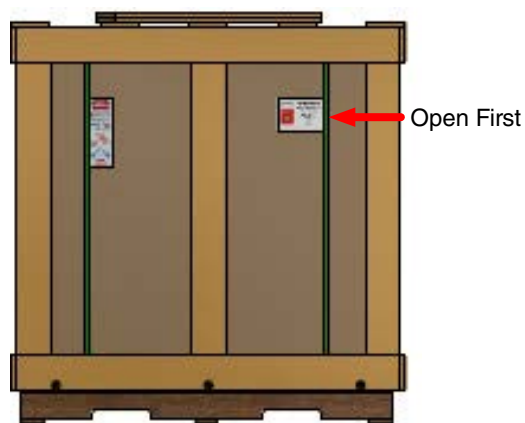


Figure 5b: This Crate has a Wooden Frame Surrounding the Carton.



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)

On Skid With Wooden Crate	123 kg (270 lbs)
On Skid With Carton Only	80 kg (176 lbs)

Tools Required

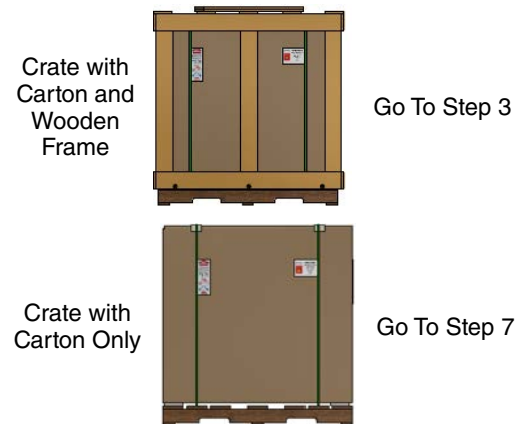
Phillips Screwdriver (Wooden Crate Only)	Flat Blade Screwdriver	Fork Lift*
Pry Bar (Wooden Crate Only)	Utility Knife	Band Cutter

*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.



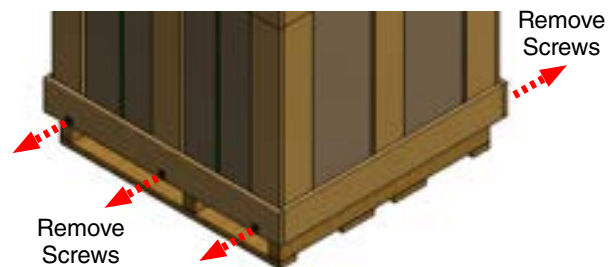
1. Uncrating instructions are located in this envelope. Remove and read the instructions.



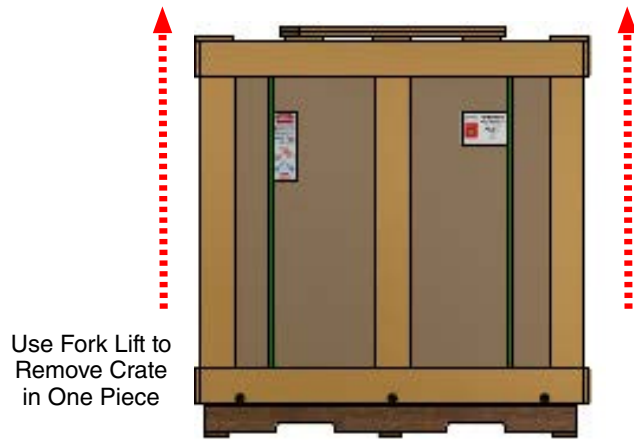
2. For crate with wooden frame continue with Step 3. For crate with carton only, go to Step 7.



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

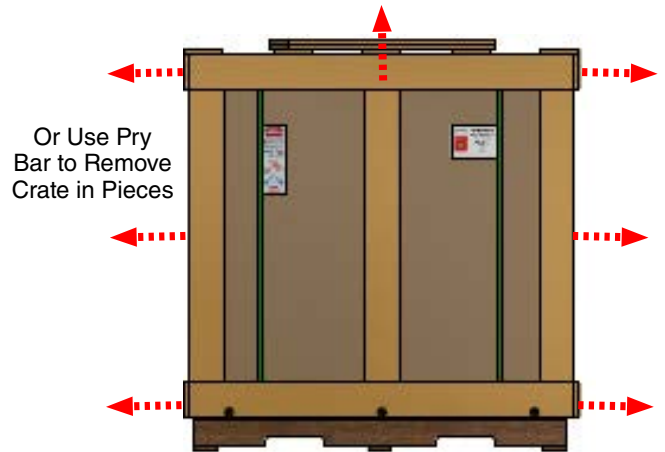


4. Remove all six (6) screws.



Use Fork Lift to Remove Crate in One Piece

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

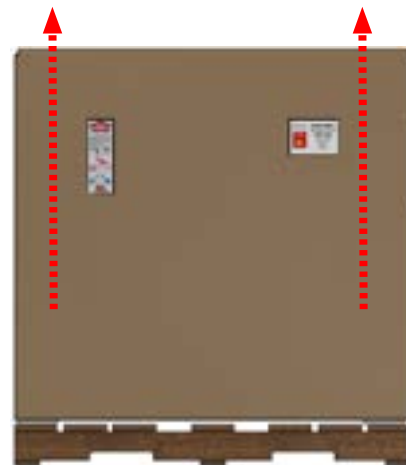


Or Use Pry Bar to Remove Crate in Pieces

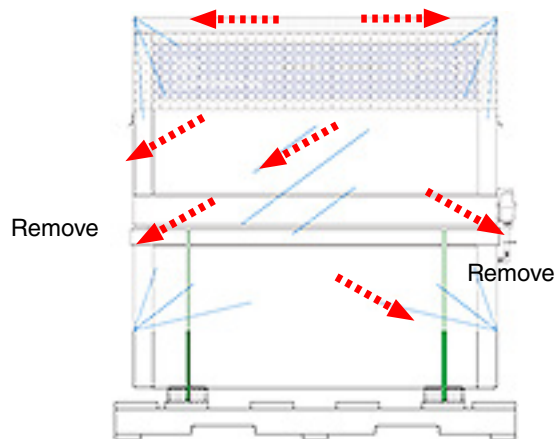
6. If a fork lift is not available, use a pry bar to carefully remove the horizontal and vertical wooden pieces from the tester.



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.



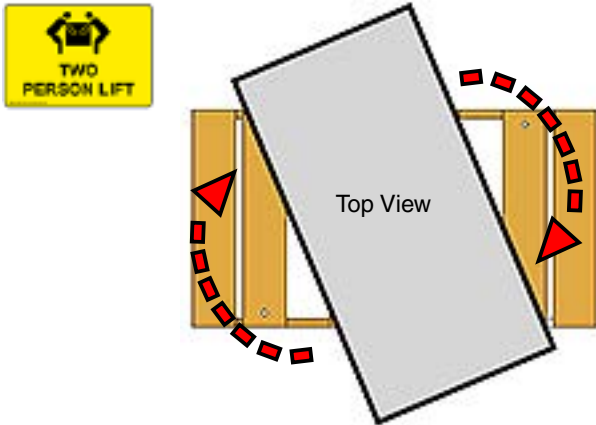
10. Cut the straps holding the tester to the skid. Remove the bands.



11. If present, remove boxes of accessories in the bottom rear of the tester.



12. Remove all adhesive tape from various parts inside and outside 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. Set Up

6.1. Dimensions and Space Requirements (Dec 2022)

Dimensions

- The external dimensions for QCT testers are shown in [Figure 6.1a](#).
- Dimension D, tester height, can vary slightly (< 2.5 cm) due to adjustment to the tester leveling casters or feet.

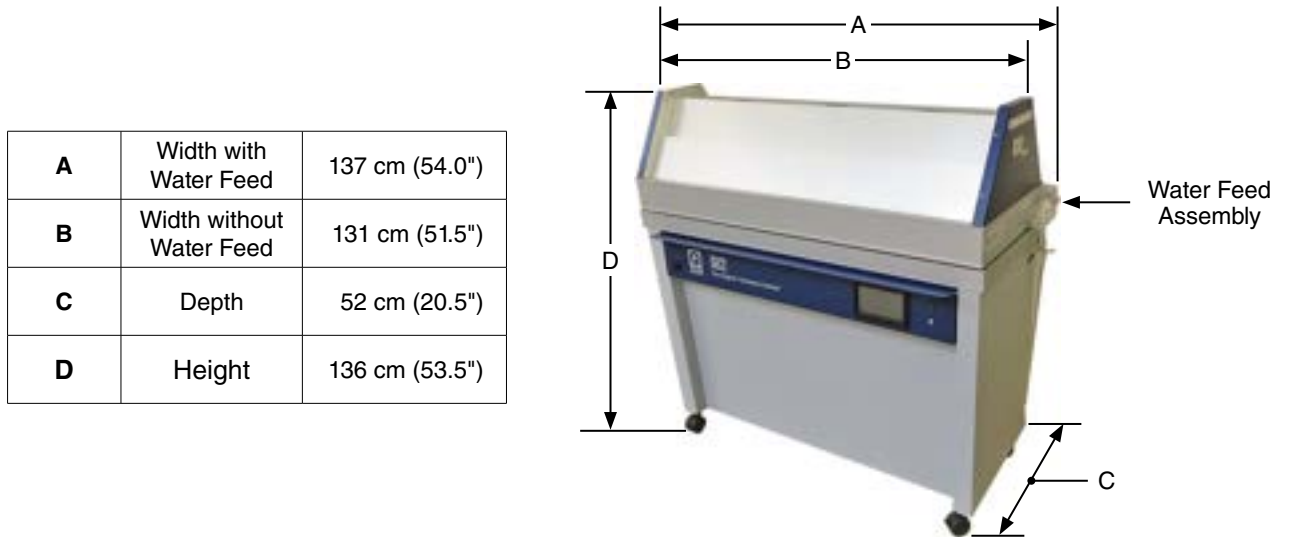


Figure 6.1a: External dimensions.

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.

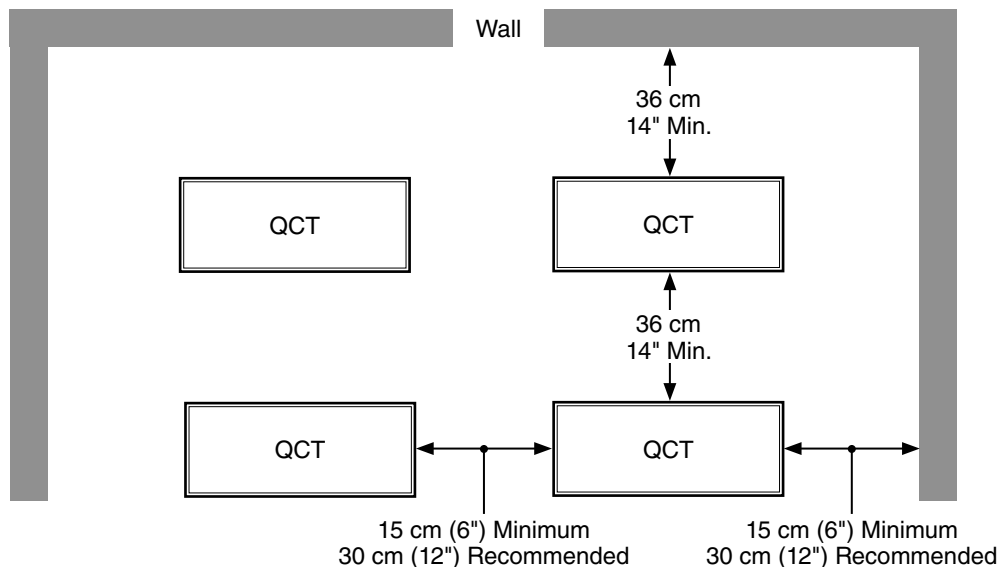


Figure 6.1b: Tester space requirements (top view).

6.2. Leveling (Feb 2023)

Standard Casters

- For optimal specimen testing, it is important for the QCT tester to be level.
- A bubble level is located on the top right end of the tester to make leveling easier (Figure 6.2a).
- Leveling casters are supplied as standard equipment on all QCT testers (Figure 6.2b)
- 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.



Figure 6.2a: Bubble level location.



Figure 6.2b: Leveling casters are standard.

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 QCT 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 (not supplied) to the floor to keep the tester from moving.

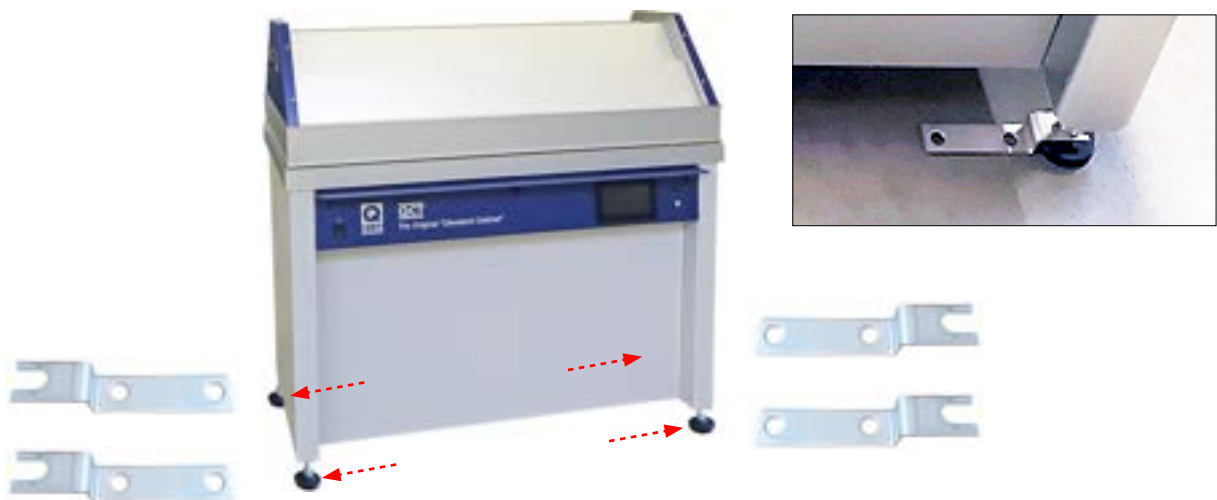


Figure 6.2d: Optional earthquake restraints.

6.3. Electrical (Mar 2023)

Voltage: Shown on the nameplate, either 120 V or 230 V, 1-phase, $\pm 10\%$ (Figure 6.3).

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

Current:	120 V	230 V
	20 amps	10 amps

Frequency:	120 V	230 V
	60 Hz	50 or 60 Hz

Electrical Connection:		120 V	230 V
	Power Cord	12 ga, 3 wire, 4 m provided	16 ga, 3 wire, 4 m provided
	Plug	3 wire grounding provided	Customer provided

Wiring:		120 V	230 V
	Power	Black	Brown
	Neutral	White	Blue
	Earth Ground	Green	Green/Yellow

- Although a Main Power Switch is provided at the left front 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 QCT testers.

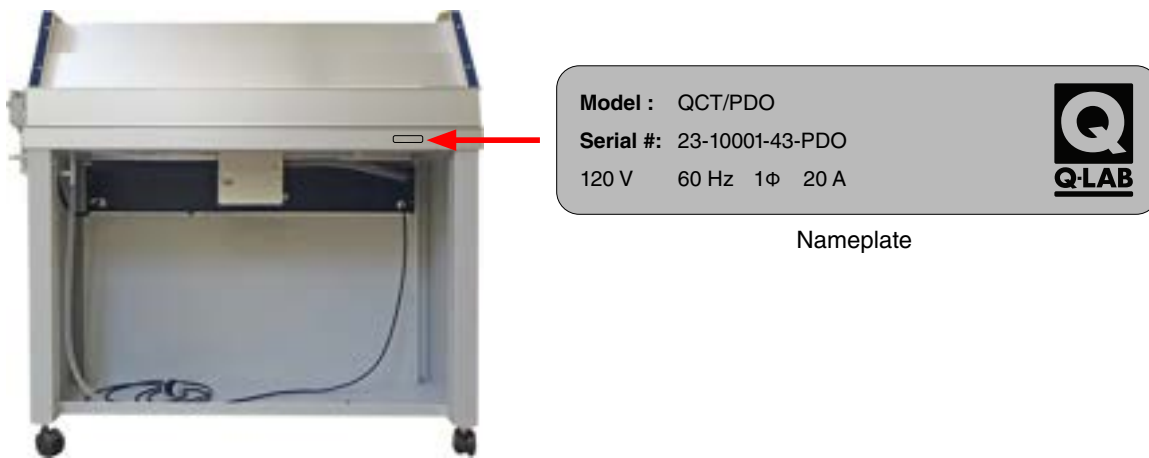


Figure 6.3: QCT rear view: nameplate location.

6.4. Water (May 2023)

- Water in the form of condensation is used extensively in accelerated weathering testing.
- The QCT produces condensing humidity (see [Section 7.1](#)).

Supply Connections

- The water supply connects to the water feed assembly at the rear right side of the tester ([Figure 6.4a](#) through [Figure 6.4d](#)).
- Connect the water supply to the QCT 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 6.4c](#).
- Alternatively, 6 mm (1/4") copper tubing can be used.
- The water supply line should be equipped with a shutoff valve.



Figure 6.4a: QCT water supply connection location.

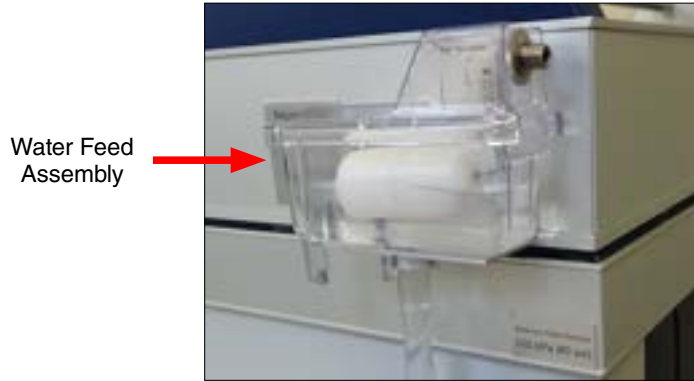


Figure 6.4b: Water feed assembly detail.

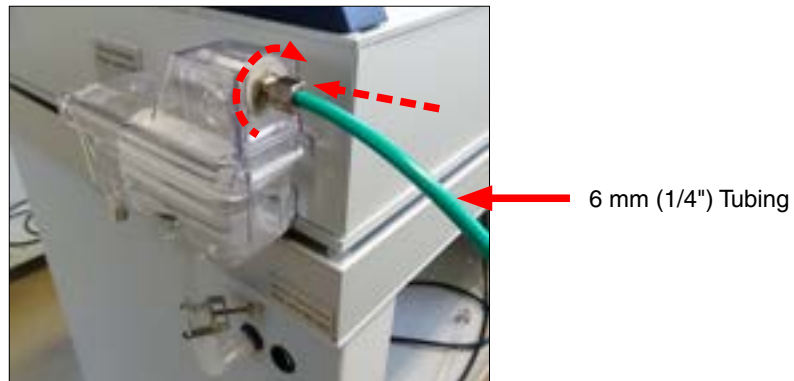


Figure 6.4c: Water supply connection.

Water Level Adjustment

- Make sure the QCT tester is level (see [Section 6.2](#)).
- The Recommended Water Level label behind the water feed assembly shows the correct water level ([Figure 6.4d](#)).
- The water level in the water pan should be 10 mm to 15 mm high.
- At this level, the water pan holds approximately 9 liters of water.
- See [CV-222-L Water Feed Assembly, Float Valve and Bracket Replacement](#) for information on adjusting the water level.

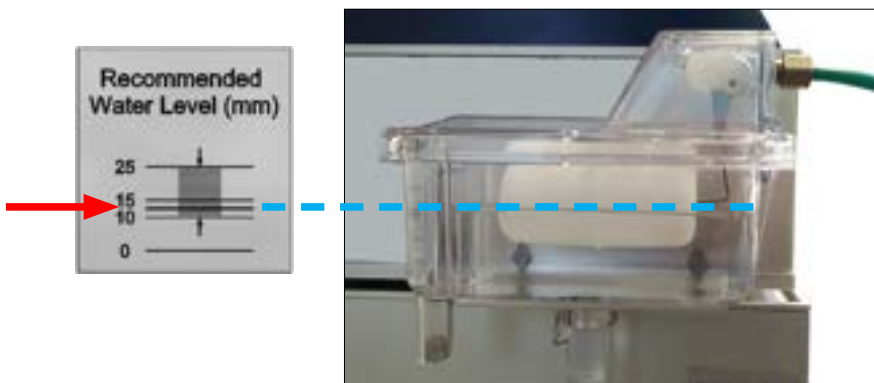


Figure 6.4d: Correct water level.

Purity

- **IMPORTANT** The tester **warranty is voided** if water purity requirements are not met.
- [Figure 6.4e](#) lists water purity requirements for QCT testers.

Model	Pressure	Condensation Volume	Spray Volume	Resistivity	Conductivity	Total Dissolved Solids	pH
QCT	2-80 psi (20-550 kpa)	2.0 liters/day	NA	Tap Water*			

Figure 6.4e: Water Purity Requirements

- * 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. Alternatively, a reverse osmosis / deionized (RO/DI) water system may also be used to reduce these deposits.

Drains

Water Pan Cleaning Drain

- Turn off water supply and unclamp the water pan cleaning drain to empty the water pan ([Figure 6.4f](#)).

Water Feed Overflow Drain

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

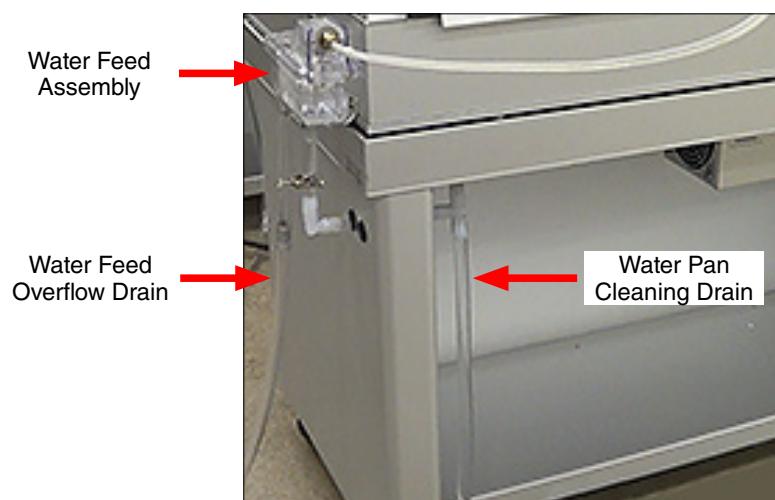


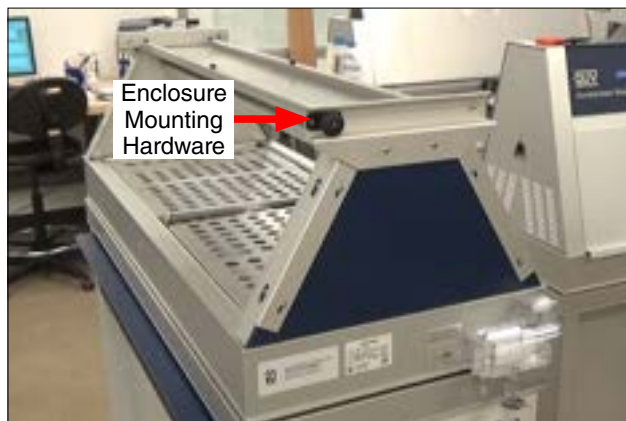
Figure 6.4f: QCT drain locations.

6.5. Venting (Oct 2022)

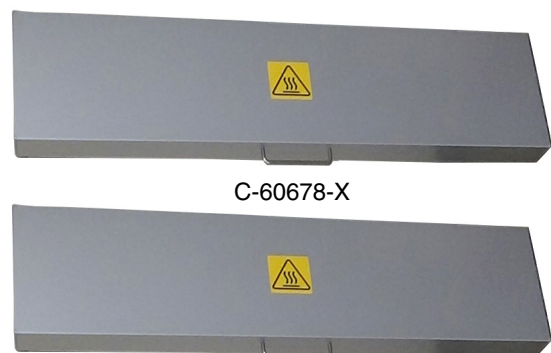
- The QCT adds 700 watts (2400 BTU/hr) and 5 liters of water per day to room air.
- The QCT does not require any external venting.
- See [Section 4](#) for important operating environment information.

6.6. Optional Humidity Enclosure Assembly Door Installation (May 2023)

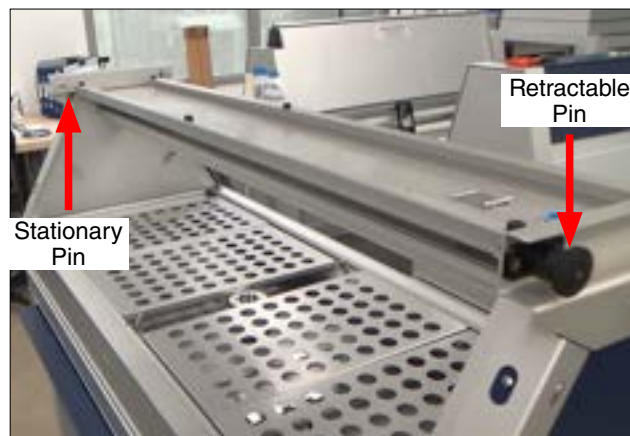
- If the Humidity Enclosure Accessory Kit (C-60692-K-INST) was ordered as a factory installed option, the kit will be installed on the QCT except for the two (2) enclosure doors.
- Uncrate and set up the main QCT unit as detailed in [Section 5](#) and [Section 6](#).
- The enclosure assembly doors are packaged separately. Remove the doors from the packaging.
- Follow the instructions below to install the humidity enclosure doors on the QCT/PDO tester.



1. After uncrating and set up, the QCT tester should look like this. The enclosure assembly mounting hardware is already installed.



2. Remove the two (2) enclosure door assemblies from the packaging



3. At the top of the QCT, locate the two (2) pins that will hold the enclosure door assembly in place.

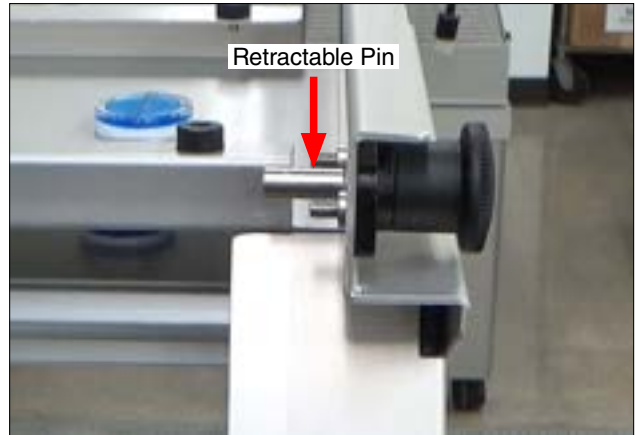


4. The left side of the door assembly will mount onto a stationary dowel pin at the end of the QCT tester.

Section 6. Set Up



5. Align the pin and the hole in the door, and Insert the left side of one door assembly onto the stationary dowel pin.



6. The right side of the door assembly will mount onto a retractable pin on the right end side hinge assembly.



7. Pull the retractable pin outward and turn so it remains retracted when released.



8. Align the mounting hole in the door assembly with the retractable pin. Turn and release the pin to secure the door.



9. The retractable pin should spring back and secure the door assembly into place.



10. Repeat [Step 3](#) through [Step 9](#) to Install the second door assembly on the opposite side off the tester.



11. Humidity Enclosure Accessory door Installation is complete.
-



12. Open the enclosure doors to load specimens.
-



13. Door assemblies are designed so that when they are lifted all the way up, they will remain open.
-



14. Specimen holders and/or middle rails can be removed to accommodate differently-sized specimens.
-

7. Functions (Dec 2022)

- In QCT condensation testers, specimens are exposed to a series of different environments in a repetitive cycle that mimics the outdoors.
- Environments are simulated via a set of user-programmable function steps.
- QCT test cycles can include one or more steps of these weathering functions:
 - Condensation, [Section 7.1](#).
 - Dry Off, [Section 7.2](#).
- In addition to weathering functions, the following test cycle functions are provided by the main controller:
 - Repeat Steps (Subcycle), [Section 7.3](#).
 - Final Step, [Section 7.4](#).
- 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 QCT main controller ([Section 8](#)).
- A simple, full-color touchscreen interface allows for easy programming and operation ([Section 8.2](#)).
- The operator can quickly create new cycles by specifying functions ([Figure 7](#)), or run any of the programmed cycles.
- See *LC-0879-SO QCT System Overviews* for additional information on QCT functions.
- Visit Q-Lab.com for a detailed overview of QCT capabilities as well as a complete catalog of available QCT documentation.

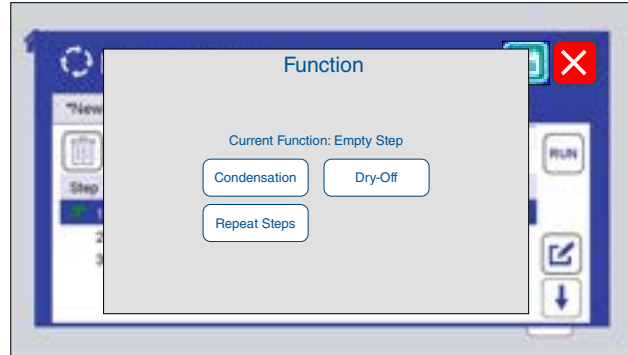


Figure 7: Functions are specified when adding steps to a cycle ([Section 8.7](#)).

7.1. Condensation (Dec 2022)

- The Condensation System includes: a water feed assembly, a water pan, a water heater, and a control system. [Figure 7.1](#) shows the major components and function of the QCT condensation system.
 - The water feed assembly is mounted at the right end of the tester. The water supply line is attached to the water feed assembly. Ordinary tap water can be used for condensation (see [Section 6.4](#)).
 - The water feed assembly provides water to the water pan that forms the bottom of the test chamber.
 - The water heater is mounted immediately below the water pan.
 - A water temperature sensor in the water pan sends water temperature data to the main controller that in turn adjusts the water heater output.
- During Condensation steps, the water is heated in the water pan and generates water vapor.
 - Water vapor fills the test chamber, which reaches 100% humidity at equilibrium.
 - The test panels form the chamber walls and the back sides of the panels are exposed to room temperature air.
 - Room temperature air on the back side of the panels cools the panels so that they are a few degrees cooler than the vapor temperature inside of the QCT test chamber.
 - The temperature difference causes the water vapor to condense on the test panels, producing liquid water (condensation) 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 3.2](#)) to ensure that the water temperature remains in the specified range.
 - The water temperature determines the amount of condensate formed on test specimens. By controlling water temperature and cycle time, the unit can be operated so that condensation never reaches a run-off equilibrium condition. This will simulate a condition where there is no leaching action by a run-off condensate.
- The condensation on the test panels has a high degree of chemical purity because the water is distilled when it vaporizes from the water pan.
- A vent slot around the water pan assures that the condensing vapor is saturated with oxygen. Some vapor will escape through this vent and some will be lost from around the panels.

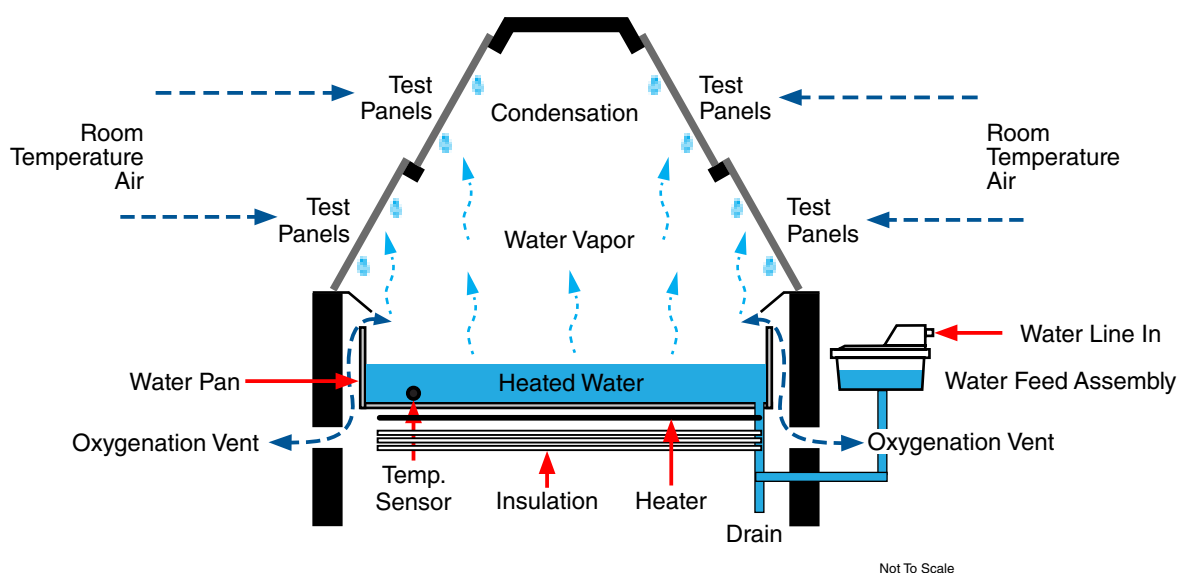


Figure 7.1: QCT Condensation System

7.2. Dry-Off (Dec 2022)

- The dry-off system is comprised of a fan, an air heater, an air tube, and a control system. [Figure 7.2](#) shows the major components and function of the QCT dry-off system.
 - The fan, heater and associated electronics are located in a housing below the tester water pan.
 - An air tube extends through the water pan to deliver the heated dry-off air into the test chamber.
 - A programmable temperature control for the heater adjusts the temperature of the dry-off air.
- During Dry-Off steps, the fan brings air into the test chamber, displacing the moisture-laden air, which is present from a prior condensation step. The dry-off air evaporates the water and dries the test panels.
- Dry-off time depends on the character of the moisture of the panel surface.
 - Whenever the moisture does not wet the surface but collects as large drops, the drying rate is slower.
 - Whenever the water spreads on the surface by wetting, the drying action is more rapid.
 - On surface coatings, it is also necessary to consider the drying of moisture contained in the coating itself, as well as the moisture which is visible on the surface.
 - Usual dry-off times range from 30 minutes to about 1.5 hours.
 - Transition back and forth from wet to dry is much more important than the length of dry-off time. When a material is dry, very little deterioration occurs. A drying time of one to two hours is usually enough for cyclic operation.
- See *LC-0879-SO QCT System Overviews / Diagrams* for dry-off system details.

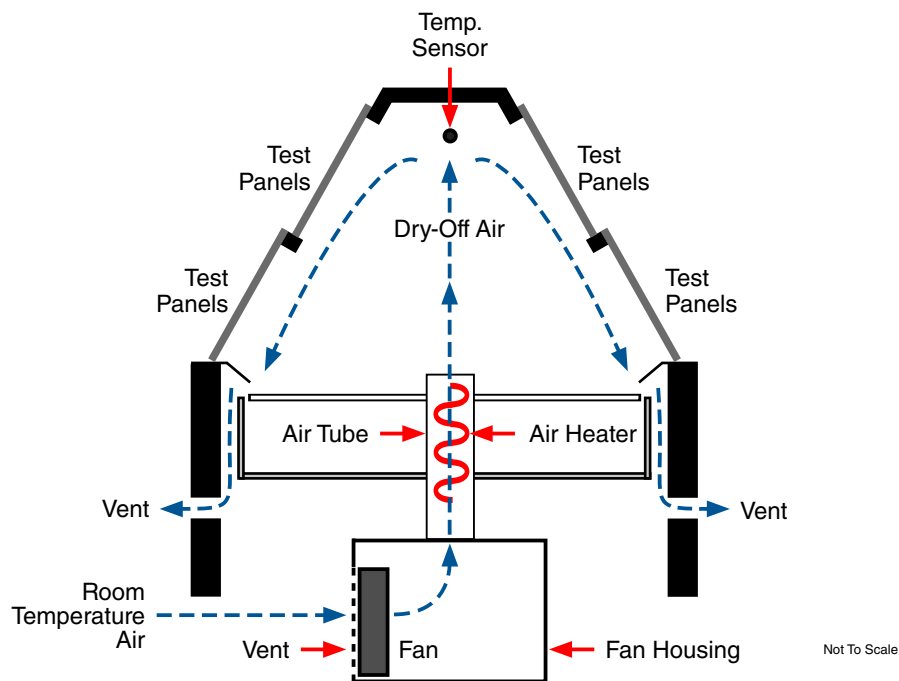


Figure 7.2: QCT Dry-Off System.

7.3. Repeat Steps (Dec 2022)

- 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.

7.4. Final Step (Dec 2022)

- Every test cycle must have a “Final - Go to step 1” step ([Figure 7.4](#)).
- The final step function indicates where the test cycle should loop back and repeat.
- When a new (empty) cycle is created, the “Final - Go to step 1” is automatically inserted in the cycle

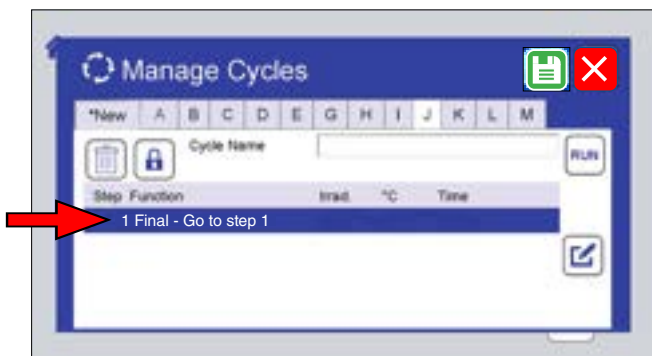


Figure 7.4: An empty cycle is created with only a final step ([Section 8.7](#)).

8. Main Controller

8.1. Overview (Dec 2022)

- The QCT Gen 4 main controller controls all functions of the tester.
- The main controller circuit board, along with other QCT electronic components, is located in the control box mounted on the QCT base, underneath the chamber (Figure 8.1a).
 - **NOTE:** When the main controller circuit board is mounted in the control box, annotations on the board will be inverted.
- Interactive software allows easy programming using a full-color touchscreen display.
- Common test cycles have been pre-programmed (Section 9.1).
- Custom test cycles can be easily created.
- The main controller continuously displays (see Step 8.2) see all test status conditions and continuously monitors for errors.
- The main controller will automatically stop a test if an error is detected.
- New software revisions can easily be downloaded and installed.
- System configuration and performance data can be exported to assist in troubleshooting.
- QCT operation is controlled via displays on a touchscreen monitor.
- On QCT power up the display in Figure 8.1b is shown on the touchscreen monitor.

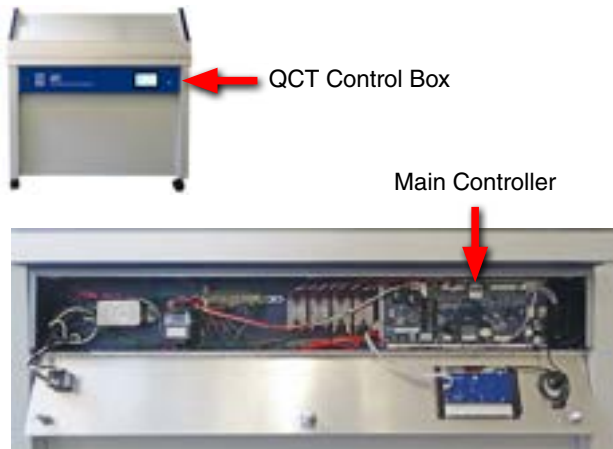


Figure 8.1a: Control box opened showing main controller circuit board.

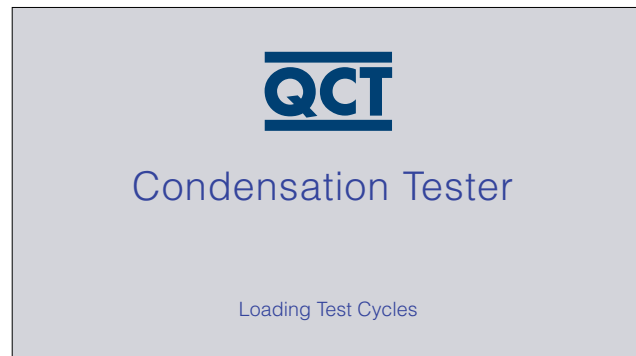


Figure 8.1b: QCT touchscreen monitor power up display.

8.2. Controls (Dec 2022)

- A touchscreen display is used to operate the QCT(Main Menu Display) and show test status (Status Display).
- The screen is mounted on the control panel located in the base of the tester (Figure 8.2a).
- The screen is activated when the tester is powered on.
 - o After an interval of inactivity, the screen will automatically deactivate.
 - o Tap the screen to reactivate (Figure 8.2b).
- The Status Display (Figure 8.2c, Section 8.3) shows tester current running conditions. Touch the Home Icon to see the Main Menu display.
- The Main Menu Display (Figure 8.2d, Section 8.4) is the main interface for operator control of the tester, including settings and programming. Touch the Run/Stop icon to see the Status Display
- The touchscreen should be cleaned with a soft cloth and alcohol. Do not use water to clean the screen.
- The screen can be operated using a stylus. Many operators prefer using a stylus with the touchscreen.
- 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 8.2a: Power Switch, Touchscreen and LED locations.



Figure 8.2b: Touch the screen to activate.

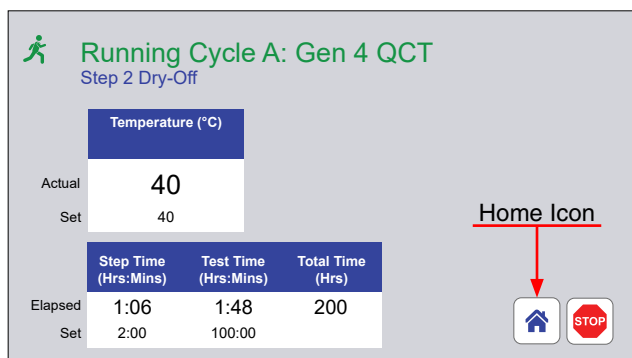


Figure 8.2c: Status Display.

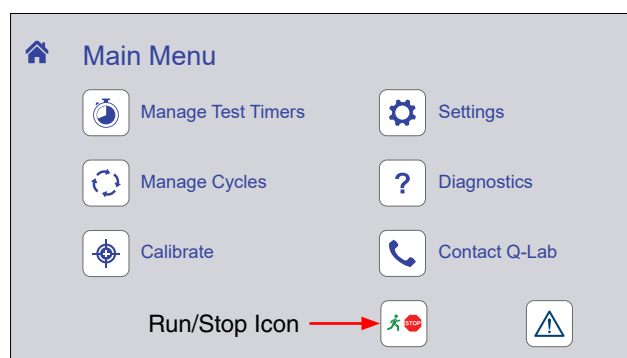


Figure 8.2d: Main Menu Display.

8.3. Status Display (Dec 2022)

- The Status Display (Figure 8.3a) shows:
 - o The status icon and state that indicates the overall status of the tester (see Overall Test Status).
 - o The cycle identification and the name of the test being run.
 - o The current test step number and type of step.
 - o Actual temperature and set point temperature of the chamber air temperature sensor.
 - o Elapsed and set step time and test time.
 - o Tester total operation time.
 - o RUN / STOP icon.
 - o Home icon. Touch to see the Main Menu Display (Section 8.4).

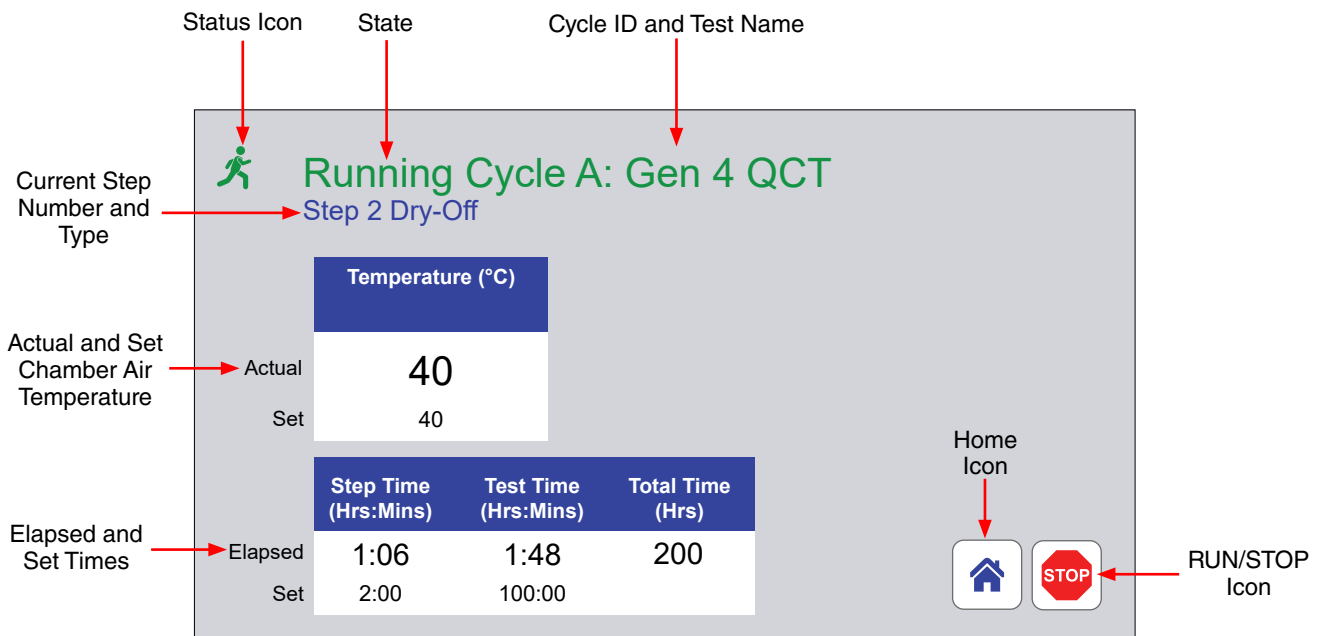


Figure 8.3a: Status screen components.

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 8.3b, Figure 8.3c).
- Icons in the lower right corner of the screen can be used to STOP or RUN the test.
- The LED status indicator (Figure 8.2a) changes color corresponding to the icon and title status.
- The table below summarizes all status conditions.

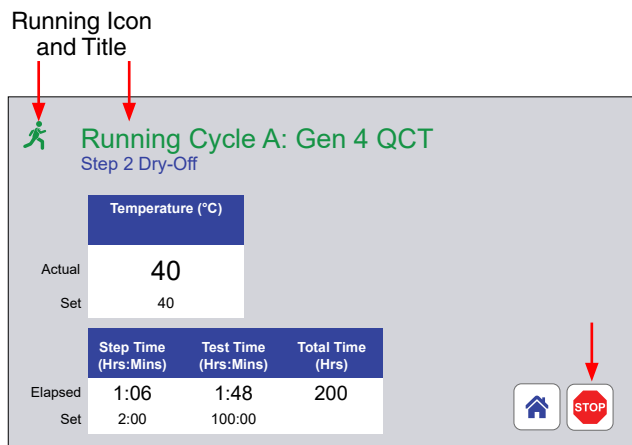


Figure 8.3b: Status icon when test running.

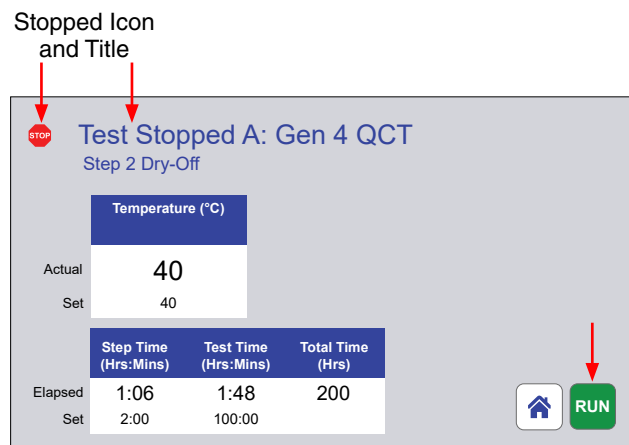


Figure 8.3c: Status icon and title when test stopped.

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.

8.4. Main Menu Display (Dec 2022)

- The Main Menu Display (Figure 8.4) provides access to all other operator controls for the tester.
- Use the Menu Display icons to access these functions:
 - o Main Menu
 - o Notifications (Section 8.5)
 - o Manage Test Timers (Section 8.6)
 - o Manage Cycles (Section 8.7)
 - o Settings (Section 8.8)
 - o Diagnostics (Section 8.9)
 - o Contact Q-Lab (Section 8.10)

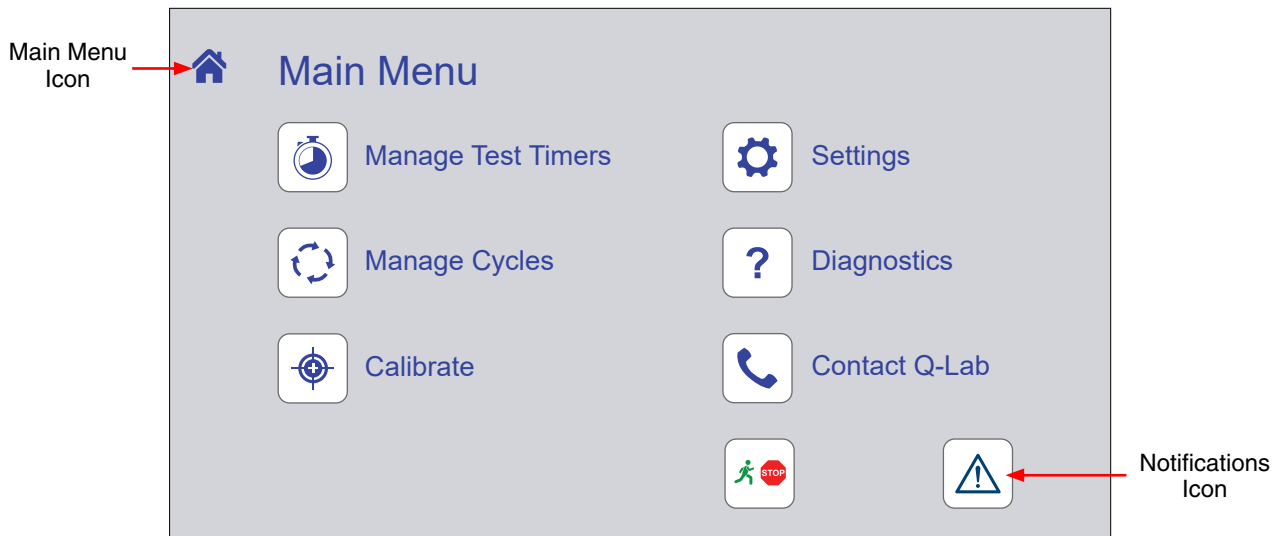


Figure 8.4: QCT Main Menu Display

8.5. Notifications (Dec 2022)

- 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 QCT main controller.
- On the Menu Display, touch the notification icon to display the Notifications Display (Figure 8.5a).
- The type, information icon, identification code (ex. M104), and name are displayed for each notification (Figure 8.5b).
- “Active” and “Cleared” notifications are listed separately, in chronological order, most recent at the top of the list (Figure 8.5c, Figure 8.5d).
- Color-coded attention icons indicate the type of notification (Figure 8.5e).
 - ▲ 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.
- Touch the notification information icon to display details (Figure 8.5f and Figure 8.5g).
- See Section 17.1 for a complete list of notifications.

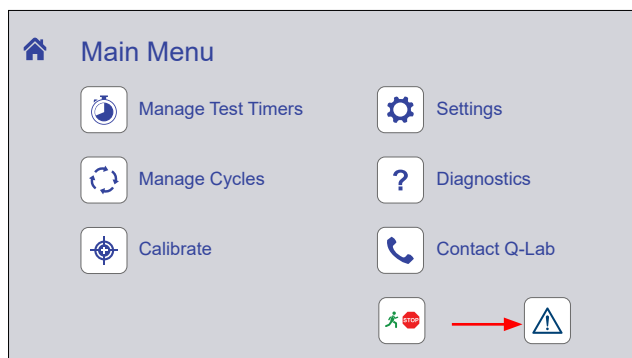


Figure 8.5a: The notifications icon. Icon color changes depending on notification status.

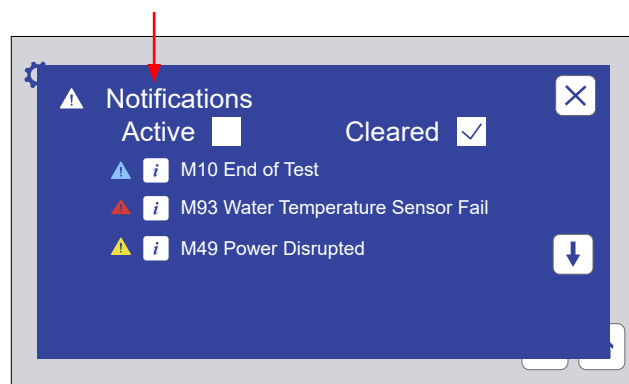


Figure 8.5b: The Notifications Display lists notification information.

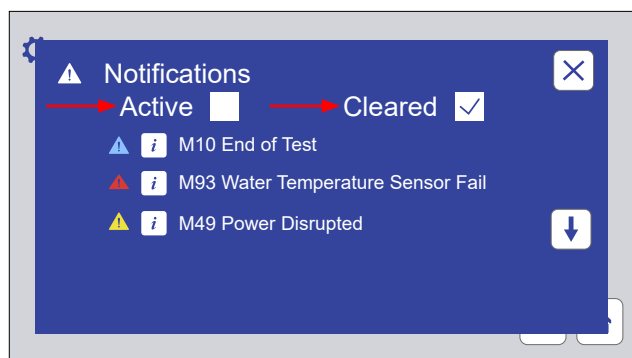


Figure 8.5c: Touch the Active or Cleared check box to view active or cleared notifications.

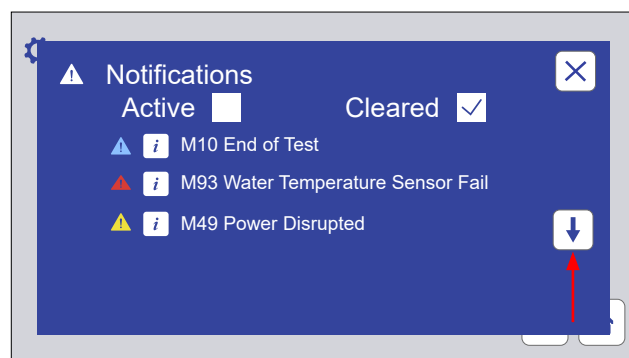


Figure 8.5d: Touch the scroll button(s) to move down or up the notification list.

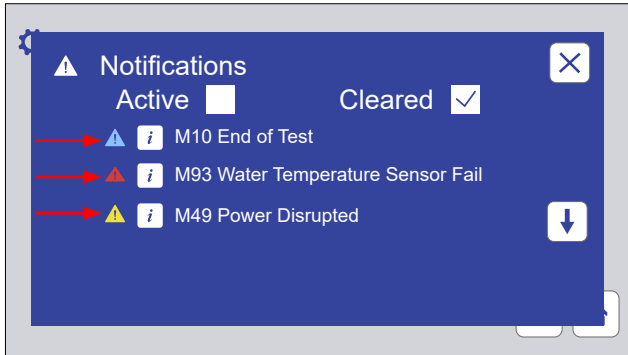


Figure 8.5e: Color coded icons show notification type.

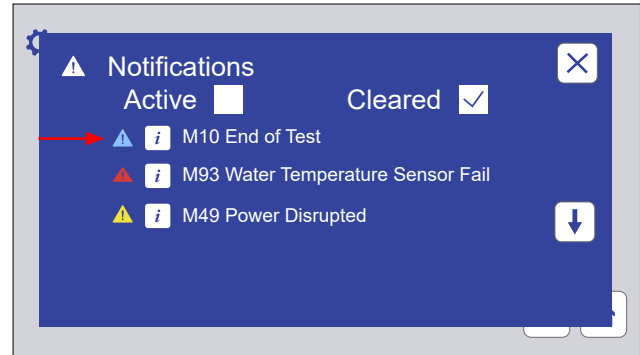


Figure 8.5f: Touch the information icon to display notification details.

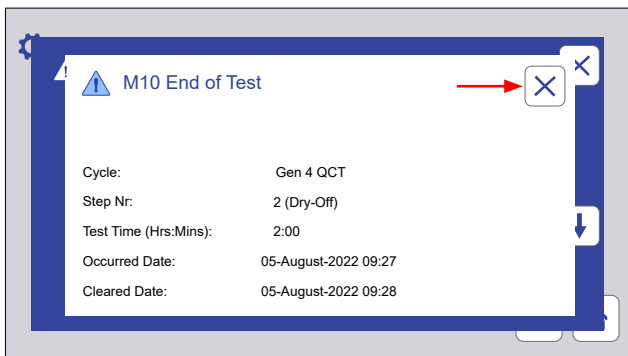


Figure 8.5g: Notification details. Touch the Close icon to return to the Notifications Screen.

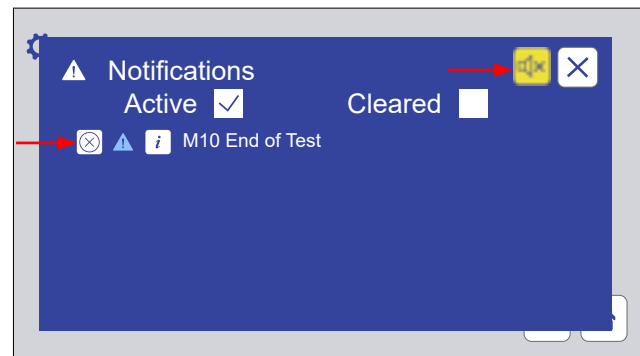


Figure 8.5h: If the alarm is active, touch the yellow mute icon to silence. When the notification has been resolved, touch the icon to the left of the notification to clear it.

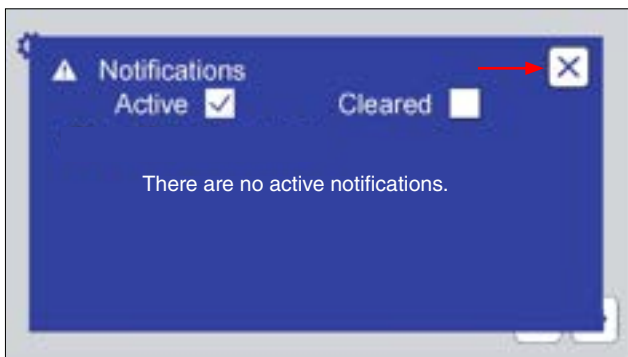


Figure 8.5i: Touch the Notification Screen close icon to re-display the main menu. A complete list of notifications and their meaning is given in [Section 14.1](#).

8.6. Manage Test Timers (Dec 2022)

- On the Main Menu screen touch the Manage Test Timers icon to display the Manage Test Timers screen (Figure 8.6a).
- The Manage Test Timers screen provides three functions:
 1. Specify what action the tester should perform at the end of a test (Figure 8.6b and Figure 8.6c).
 - o Stop
 - o Message only
 - o Alarm only
 - o Stop and alarm
 - o None
 2. Set test elapsed time.
 - o Change the elapsed time in hours and minutes for the current test (Figure 8.6d).
 3. Set test duration.
 - o Set the duration in hours and minutes for the current test (Figure 8.6e).
- If any changes are made to Manage Test Timers, the operator can accept or cancel the changes (Figure 8.6f and Figure 8.6g)

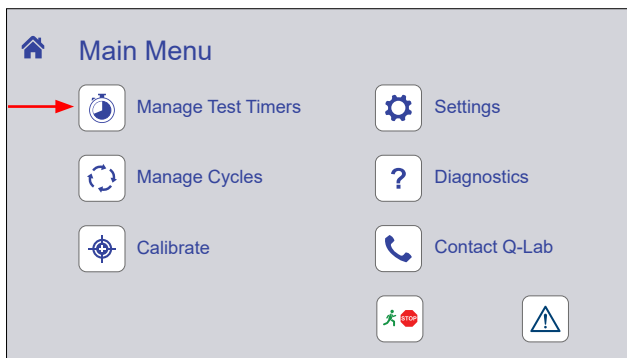


Figure 8.6a: Manage Test Timers icon.

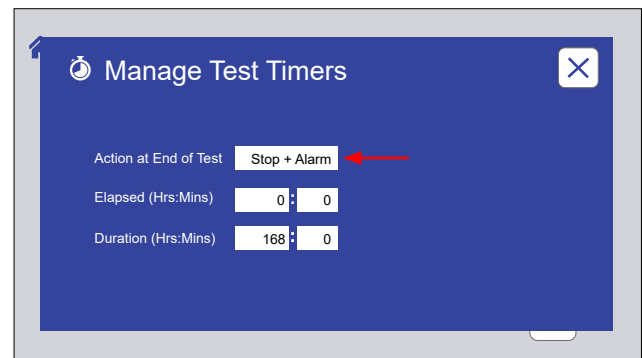


Figure 8.6b: Manage Test Timers screen. Touch the Action at End of Test text box to specify the action.

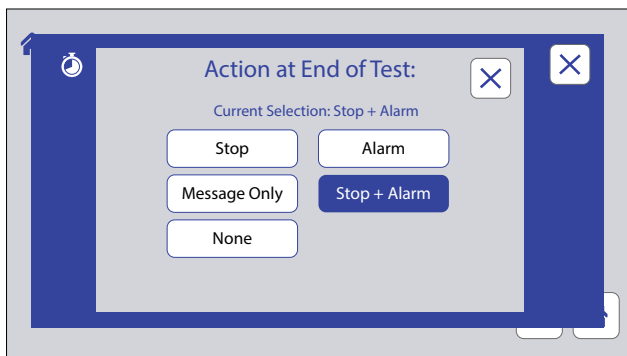


Figure 8.6c: Action at End of Test screen. Touch an action button to select that action.

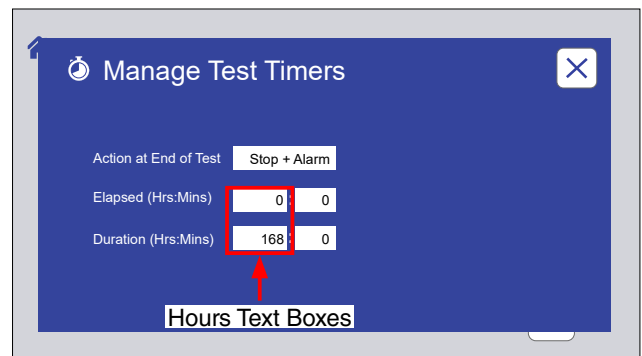


Figure 8.6d: To reset the Elapsed or Duration hours of the current test, touch the hours text box. A numeric keypad will be displayed.

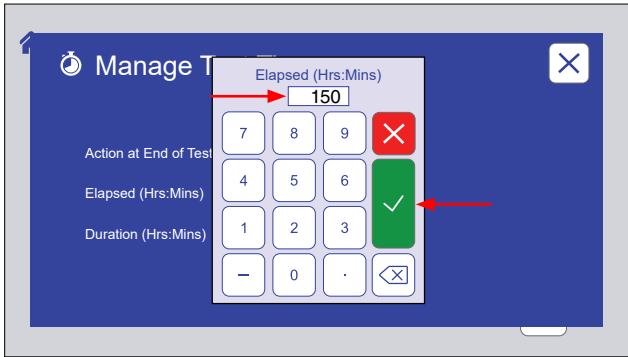


Figure 8.6e: Enter the desired hours on the keypad. Touch the check mark to save, or the X to cancel changes.

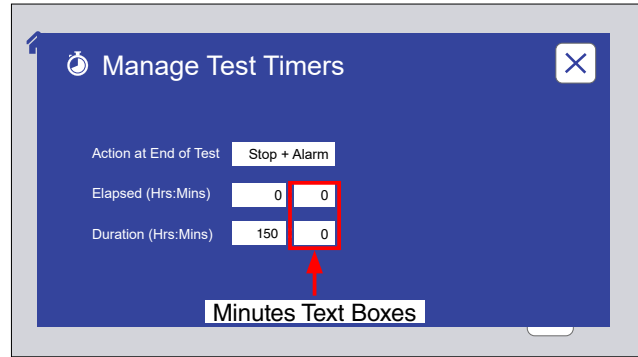
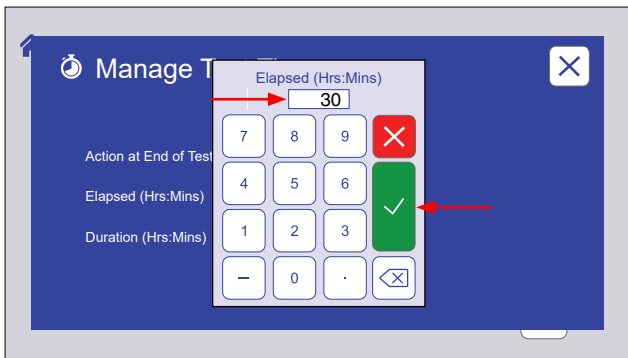


Figure 8.6i: To reset the Elapsed or Duration minutes of the current test, touch the minutes text box. A numeric keypad will be displayed.



Enter the desired minutes on the keypad. Touch the check mark to save, or the X to cancel changes.

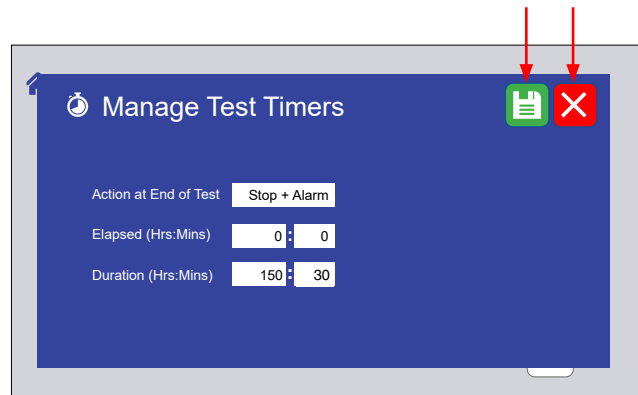


Figure 8.6f: If any changes have been made, touch the save changes icon or the cancel changes icon to re-display the Main Menu screen.

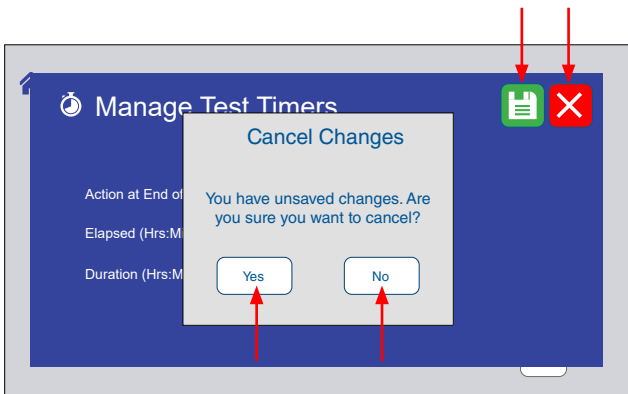


Figure 8.6g: If the cancel changes icon is touched, the operator is prompted for verification. Touch Yes or No.

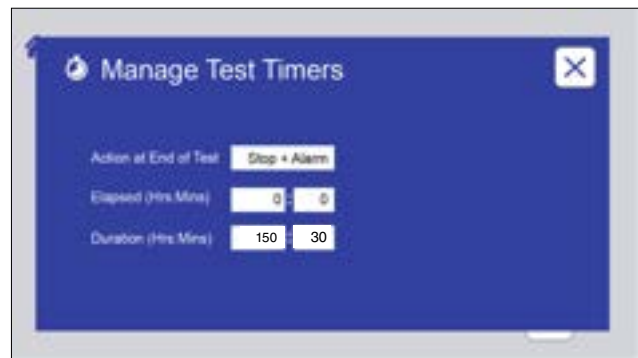


Figure 8.6h: Touch the Manage Test Timers screen close icon to re-display the main menu.

8.7. Manage Cycles (Dec 2022)

- On the Main Menu screen touch the Manage Cycles icon (Figure 8.7.1a) 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 8.7.1b).
- Each cycle is stored with an alphanumeric (A through M) identification tab (Figure 8.7.1b).
 - o 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:
 - o Delete a cycle (Figure 8.7.2a).
 - An actively running cycle cannot be deleted (Figure 8.7.2b).
 - Deleting an inactive cycle will create a blank cycle with only a final step (Figure 8.7.2c).
 - o Lock a cycle to prevent unauthorized changes (Figure 8.7.3a through Figure 8.7.3e).
 - o Add, edit, or delete steps in a cycle (Figure 8.7.4a through Figure 8.7.6c). Pre-programmed test cycles cannot be edited (they can be deleted).
 - o Create a new cycle (Figure 8.7.7a through Figure 8.7.7e).
 - o Run a cycle from any of its steps (Figure 8.7.8a through Figure 8.7.8d).
- The QCT main controller can store thirteen (13) test cycles.
- A test cycle can consist of up to twenty-five (25) steps.

8.7.1 Select a Cycle

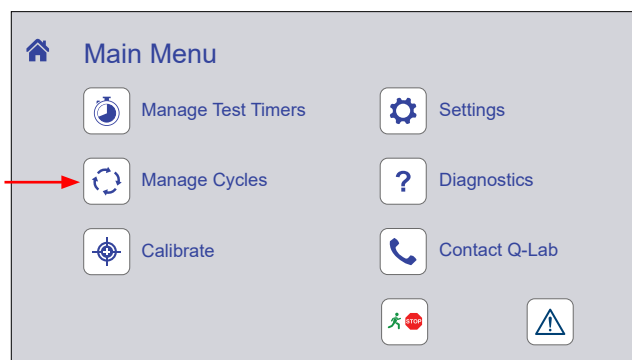


Figure 8.7.1a: Manage Cycles icon.

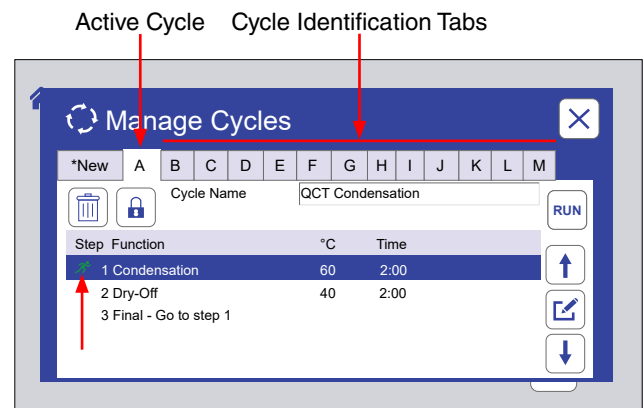


Figure 8.7.1b: Manage Cycles screen. The active cycle is displayed. The currently running step is indicated. Touch any ID tab to display that cycle.

8.7.2 Delete a Cycle

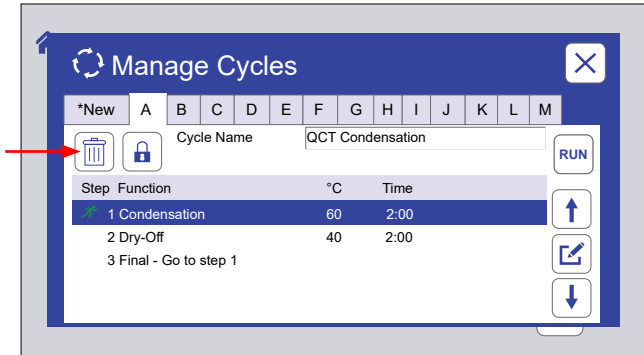


Figure 8.7.2a: Touch the delete icon to delete the selected cycle.

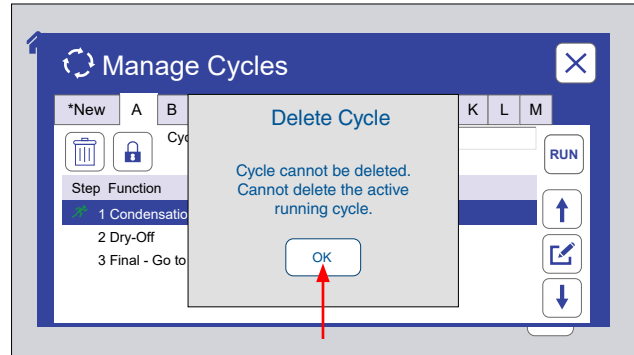


Figure 8.7.2b: The active running cycle cannot be deleted. Touch OK to clear message.

8.7.3 Lock a Cycle

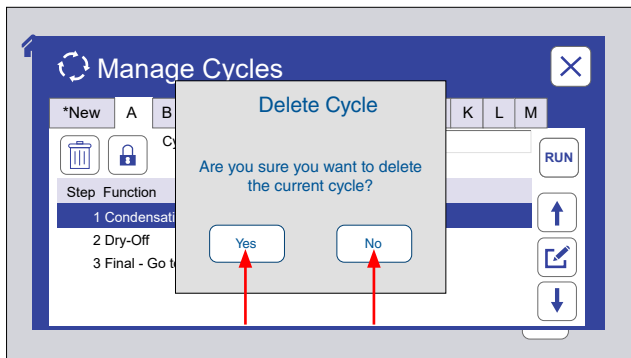


Figure 8.7.2c: To delete an inactive cycle, the operator is prompted for verification. Touch No to cancel delete. Touch Yes to create a blank cycle.

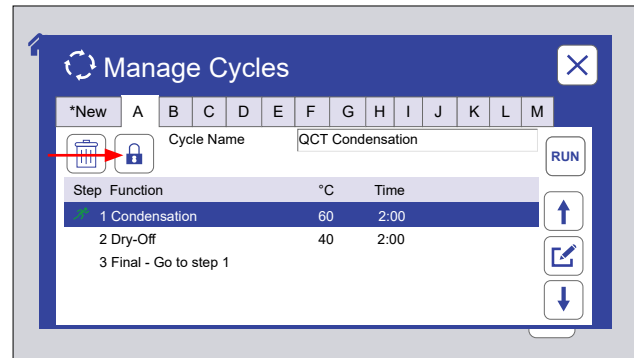


Figure 8.7.3a: Touch the lock icon to lock the cycle.

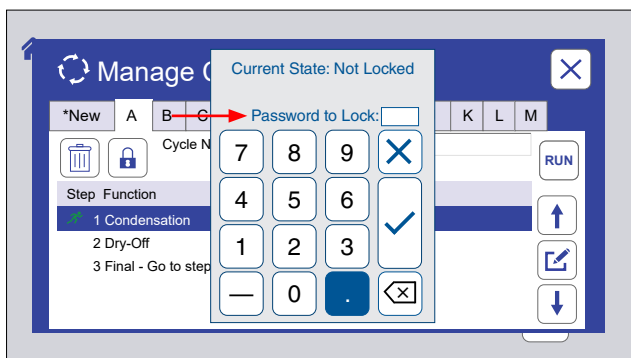


Figure 8.7.3b: The numeric keypad is displayed. A password must be entered to lock the cycle.

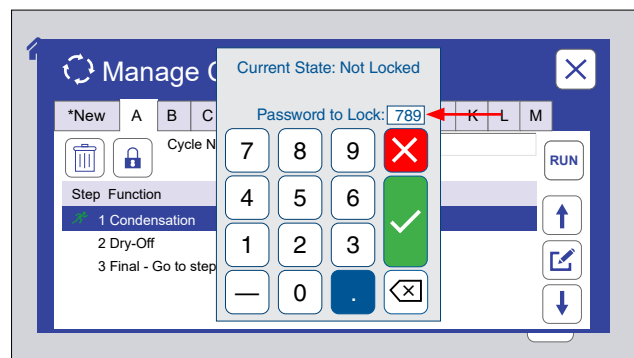


Figure 8.7.3c: Enter the numeric password. Touch the check mark icon to save, or the X icon to cancel setting the password.

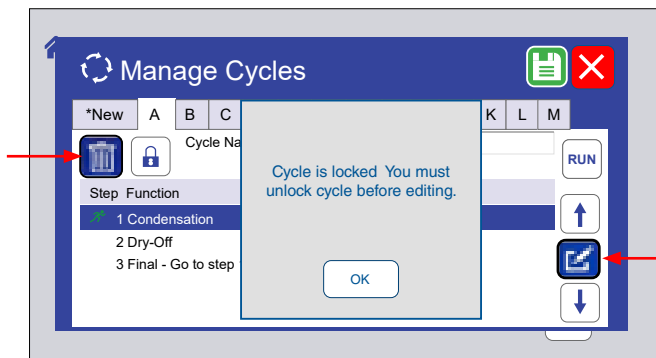


Figure 8.7.3d: This message is displayed if a delete or edit icon is touched on a locked cycle.

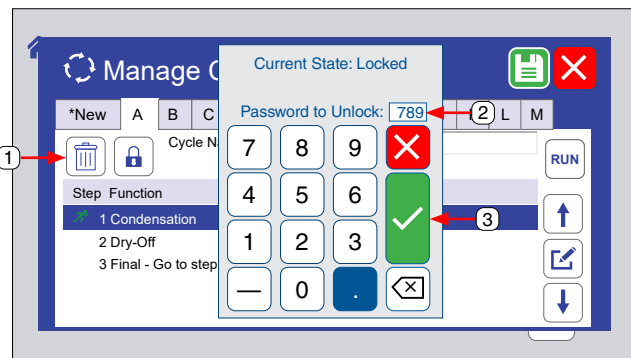


Figure 8.7.3e: To unlock a cycle, touch the lock icon, enter the password, then touch the check mark button.

8.7.4 Add a Step to a Cycle

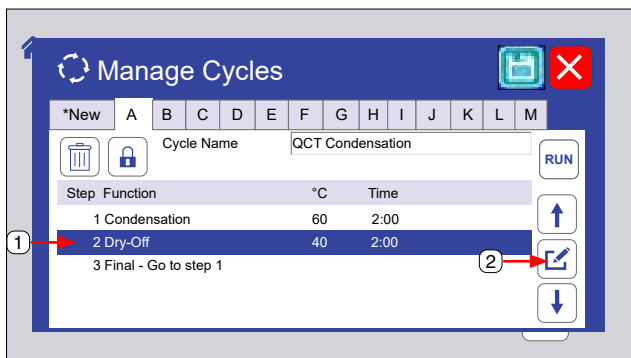


Figure 8.7.4a: For any cycle, a new step can be added before or after an existing step. Select the existing step then touch the Edit icon.

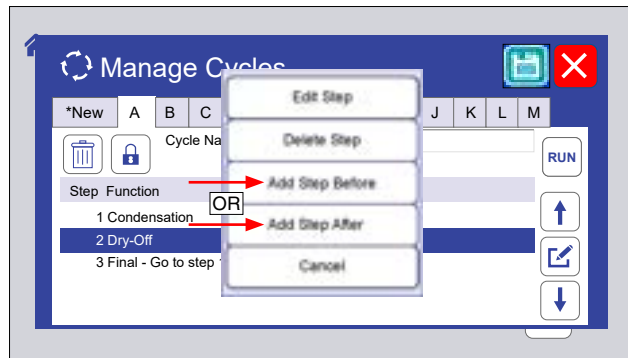


Figure 8.7.4b: Touch Add Step Before or Add Step After.



Figure 8.7.4c: Touch the function text box to select a function.

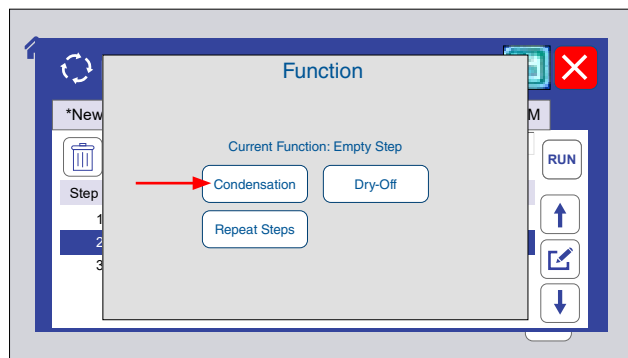


Figure 8.7.4d: Touch the desired function.

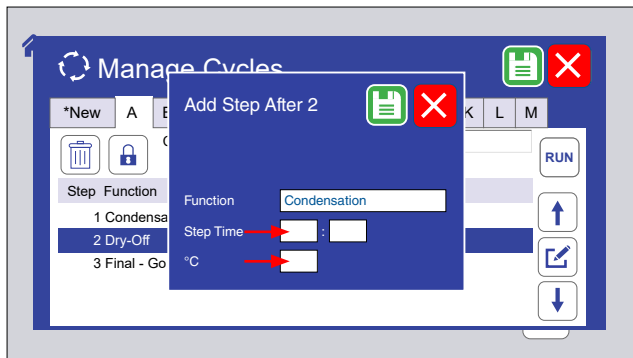


Figure 8.74e: Step values must be entered. Touch the Step Time (Hrs:Mins) and °C text boxes to select.

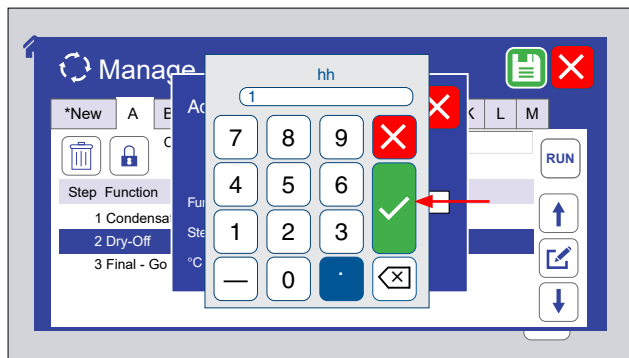


Figure 8.74f: Use the numeric keypad to enter the values for each parameter. Touch the check mark button to accept those values or the X button to cancel.

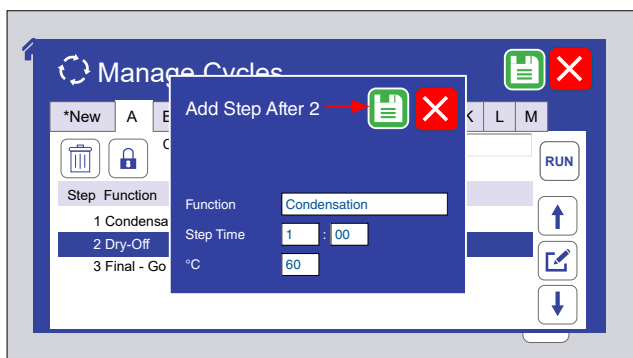


Figure 8.74g: The new step values are displayed. Touch the save icon to save the new step.

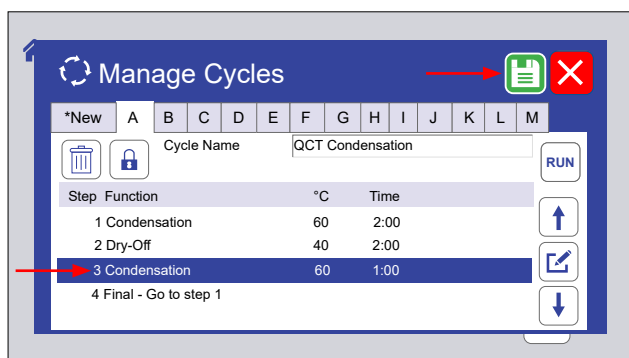


Figure 8.74h: The new step is shown for the cycle. Touch the save icon to save the modified cycle.

8.7.5 Edit a Step

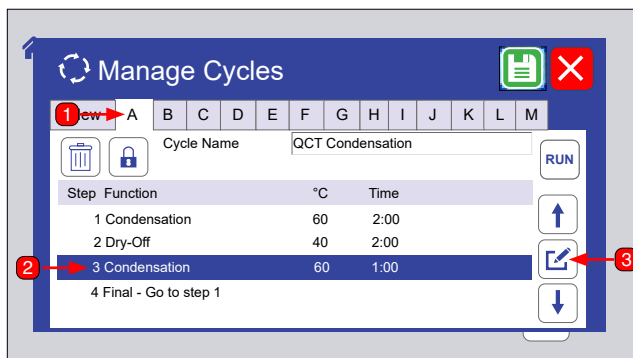


Figure 8.75a: To edit a step, touch the cycle ID tab, touch the step to select, then touch the pencil icon.

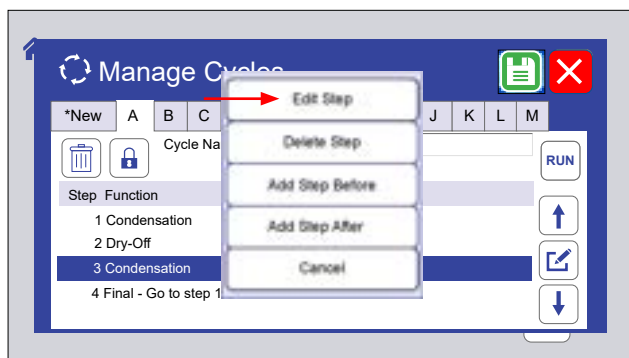


Figure 8.75b: Select Edit Step.

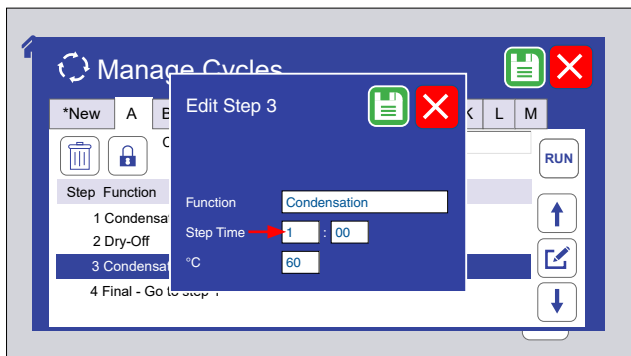


Figure 8.7.5c: Touch the Function, Step Time, or °C text boxes to select that parameter for editing. Example here is edit Step Time.

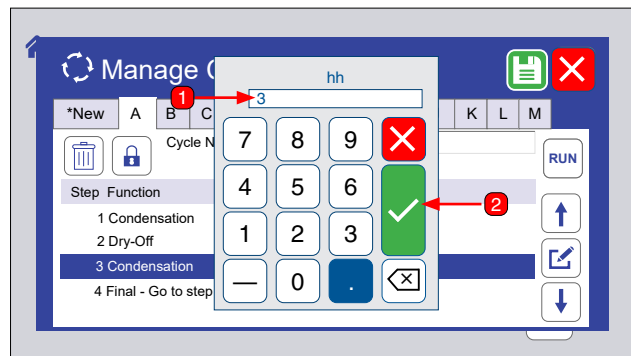


Figure 8.7.5d: Use the numeric keypad to enter the new values for the selected step. Touch the check mark button to accept those values or the X button to cancel.

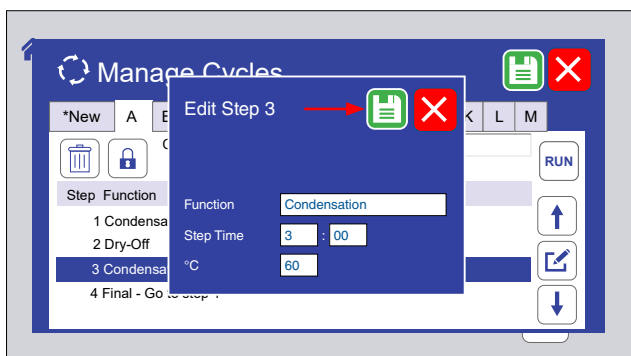


Figure 8.7.5e: Touch the save icon to save the edited step.

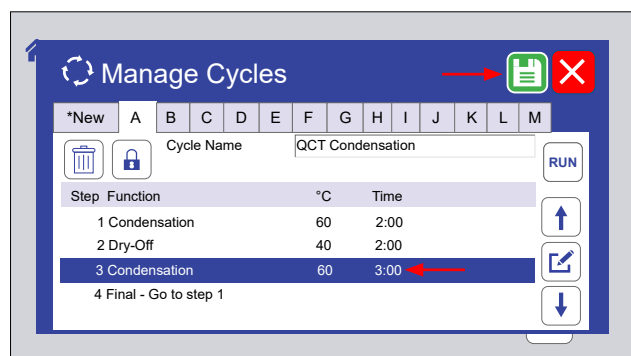


Figure 8.7.5f: The edited step is shown for the cycle. Touch the save icon to save the edited cycle.

8.7.6 Delete a Step

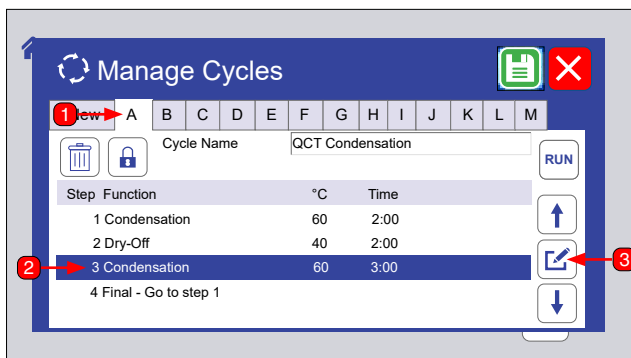


Figure 8.7.6a: To delete a step, touch the cycle ID tab, touch the step to delete, then touch the pencil icon.

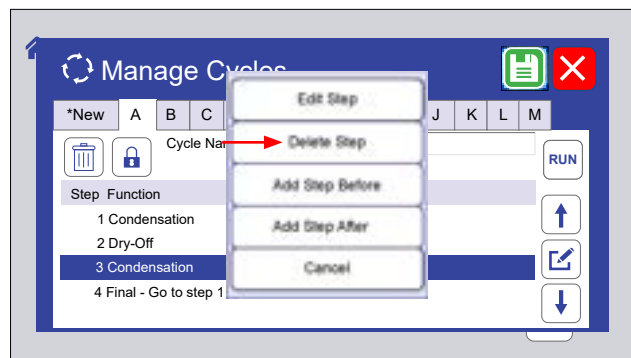


Figure 8.7.6b: Select Delete Step.

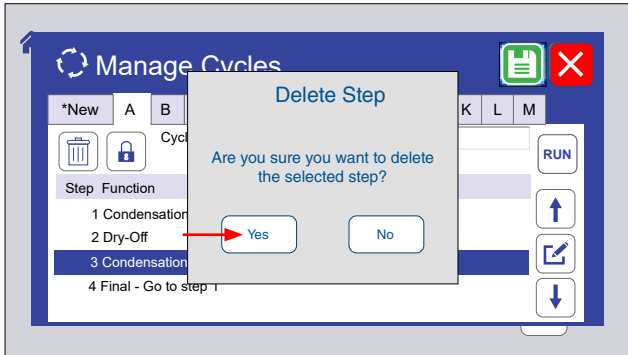


Figure 8.7.6c: Touch the Yes button to delete the step or touch No to cancel the delete.

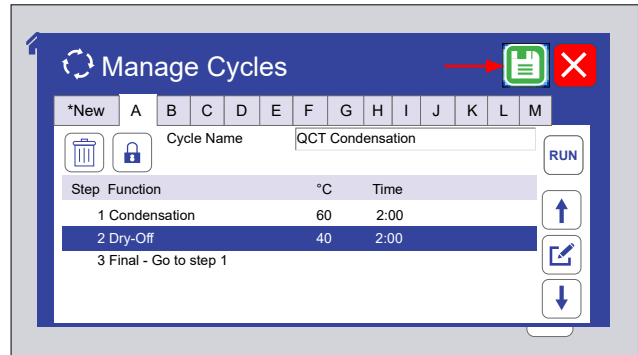


Figure 8.7.6d: Touch the Save icon to save the edited cycle.

8.7.7 Create a New Cycle

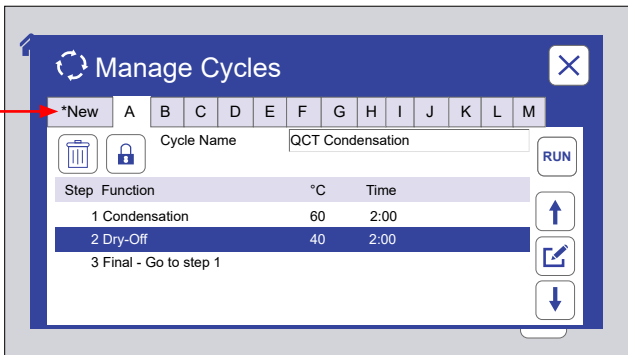


Figure 8.7.7a: To create a new cycle, touch the *New tab.

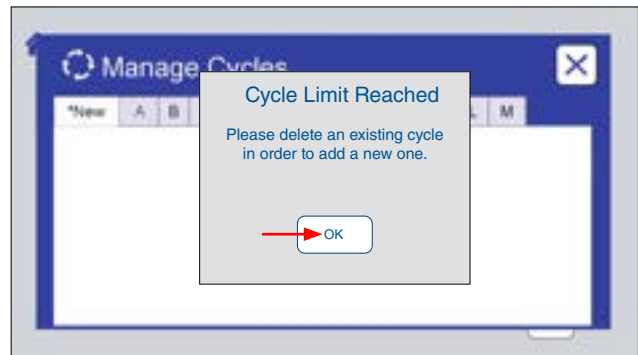


Figure 8.7.7b: If all available cycles are programmed, this message is displayed. Touch OK.

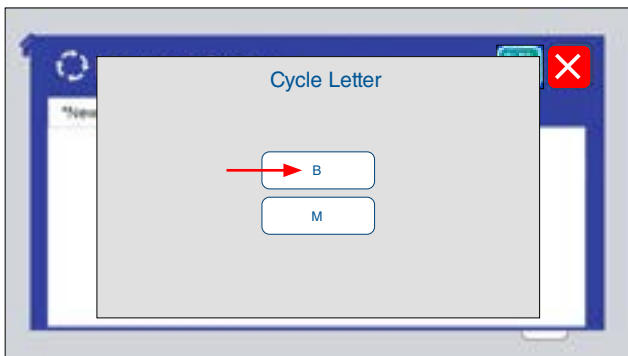


Figure 8.7.7c: If there are open cycles, the available cycle letters are displayed. Touch a letter to program that cycle.

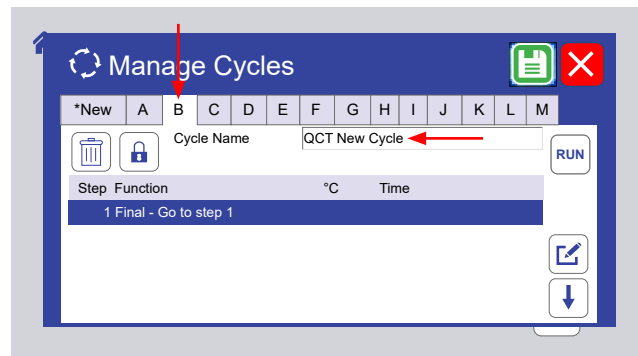


Figure 8.7.7d: An empty cycle is created with only a final step. Enter a name for the new cycle.

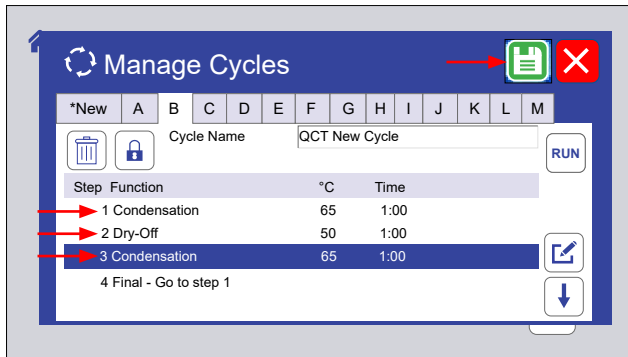


Figure 8.7.7e: Follow Figure 8.7.4a through Figure 8.7.4h to add steps and save the new cycle.

8.7.8 Run From Step

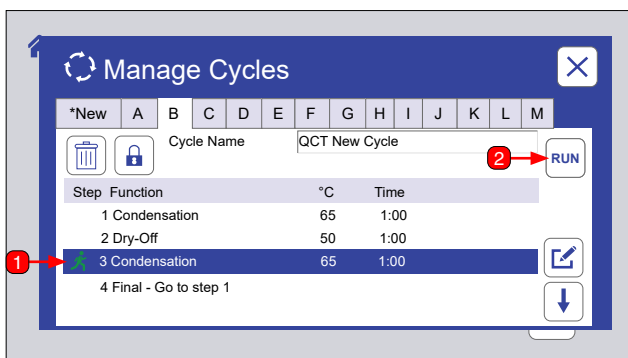


Figure 8.7.8a: A cycle can be run from a specified time in one of its steps. Select the step, then touch the Run icon.

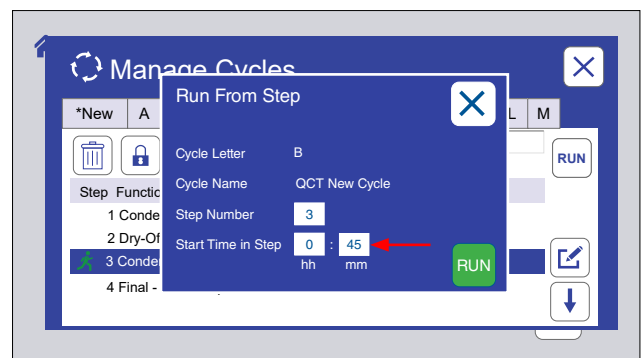


Figure 8.7.8b: Touch the start time hh (hours) text box or the mm (minutes) text box to set the time.

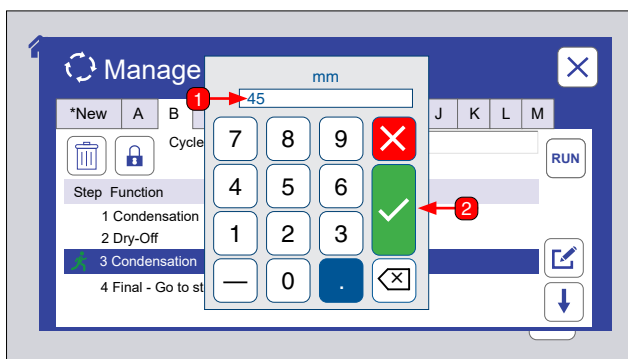


Figure 8.7.8c: Use the numeric key pad to set the time. Touch the check mark button to accept those values or the X button to cancel.

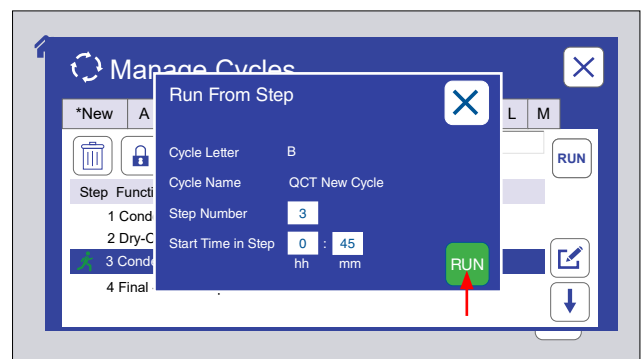


Figure 8.7.8d: Touch the Run icon to run the step from the time entered.

8.8. Settings (Dec 2022)

- On the Menu Display touch the Settings icon (Figure 8.8a) to display the Settings screen.
- The Settings screen displays user-selectable machine parameters (Figure 8.8b)
 - o Volume (Figure 8.8c).
 - Alarm
 - Touch
- o Display Options (Figure 8.8e)
 - Screen Brightness
 - Sleep Time
- o Language & Date/Time (Figure 8.8i & Figure 8.8l). 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

Settings

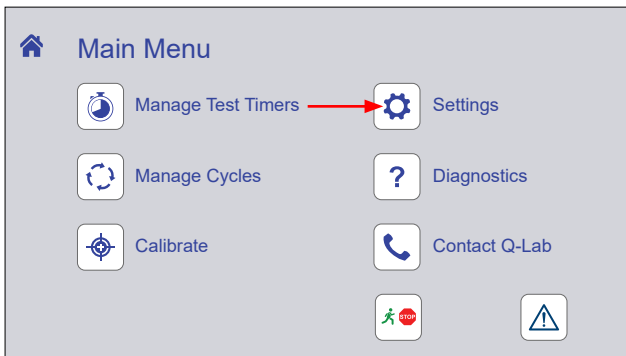


Figure 8.8a: Touch the Settings icon on the Main Menu screen to display settings controls.

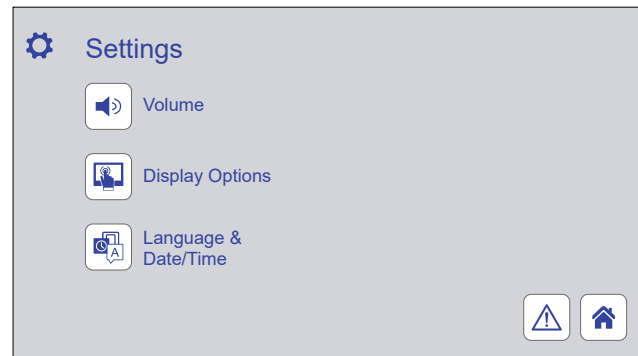


Figure 8.8b: Settings screen. Touch any icon to display controls for that function. The Notification screen (Section 8.5), the Main Menu screen can also be displayed.

Volume



Figure 8.8c: 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.

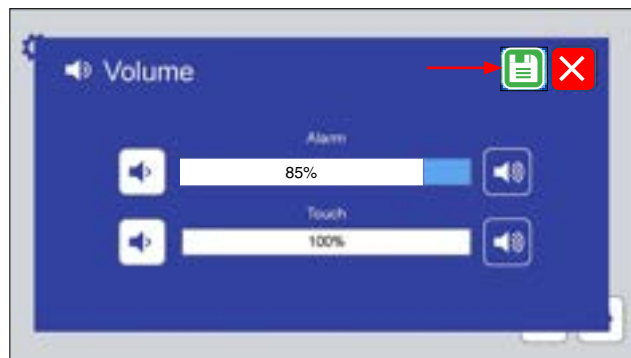


Figure 8.8d: If a volume is changed, touch the save icon to save the new volume level.

Display Options

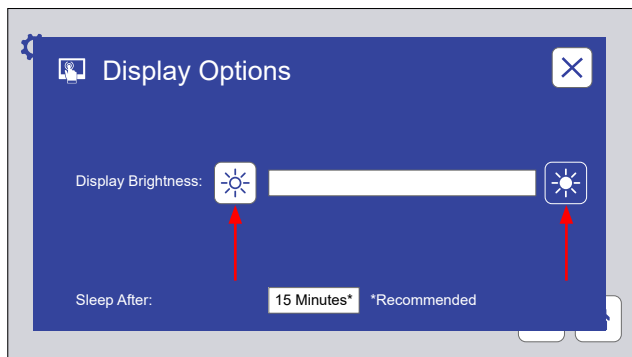


Figure 8.8e: The Display Options screen provides controls to adjust the brightness screen. Touch a brightness icon to adjust up or down.

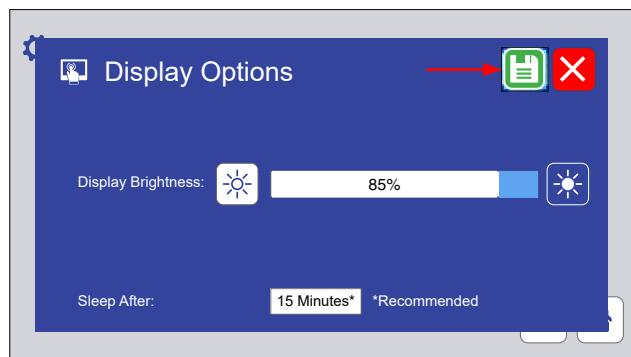


Figure 8.8f: If a brightness is changed, touch the save icon to save the new volume level.

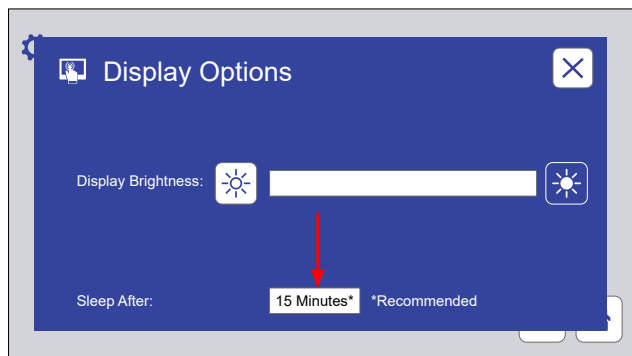


Figure 8.8g: The Display Options screen can also be used to adjust the inactive time that elapses before the screen “go to sleep” (i.e. deactivates). Fifteen (15) minutes is recommended.

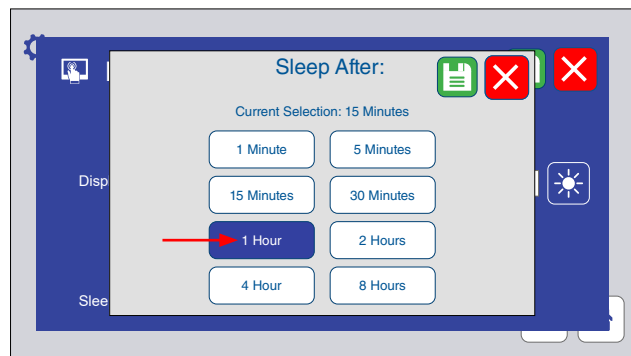


Figure 8.8h: Touch a time button to change the time before screens go to sleep. If changed, touch the save icons to save the new time.

Language

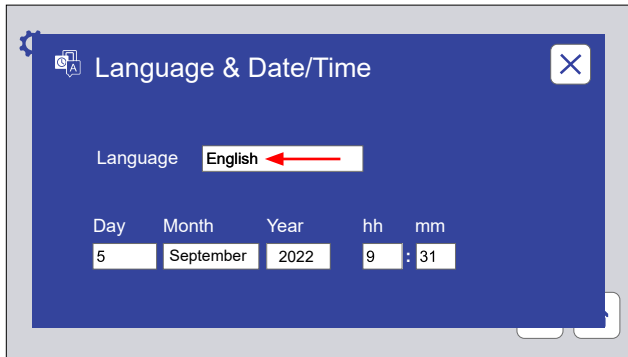


Figure 8.8i: This screen displays controls to select the control interface language.



Figure 8.8j: Touch the language text box to select the control display language, or touch the right arrow button to display additional available languages.



Figure 8.8k: All text on both screens will be in the selected language. Touch the save icon to save the selection.

Date/Time

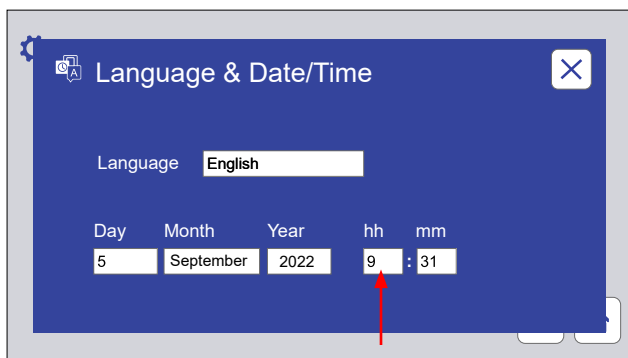


Figure 8.8l: This screen displays controls to set the date and time. Touch a text box to set Day, Month, Year, hh (hour) or mm (minute). hh display is always 24 hour time.

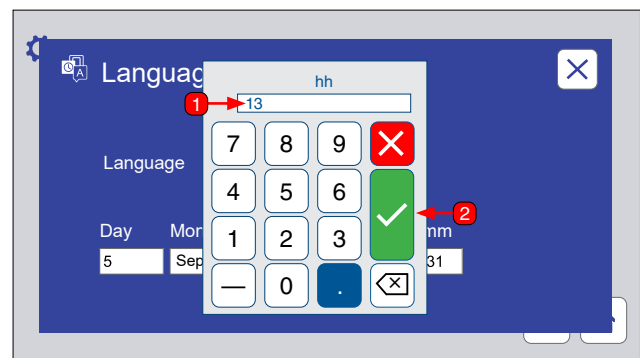


Figure 8.8m: The numeric keypad is used to set Day, Year, hh, and mm. Enter the number, then touch the check mark button.

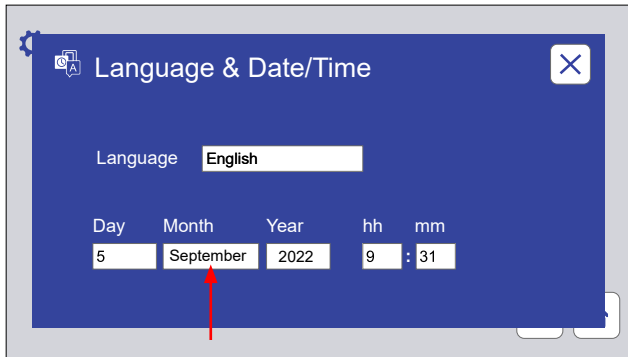


Figure 8.8n: To set the month, touch the Month text box. The month buttons are displayed.

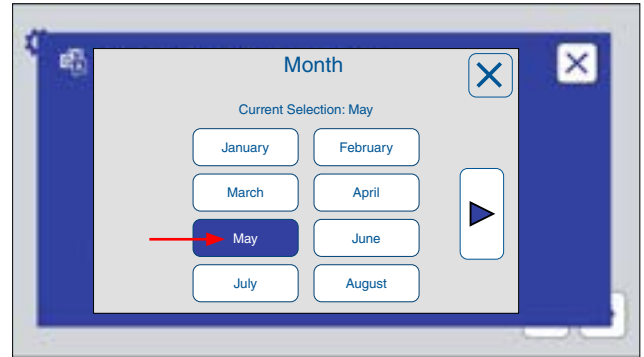


Figure 8.8o: Touch the month button to set the month. Touch the right arrow button to display the remaining months.

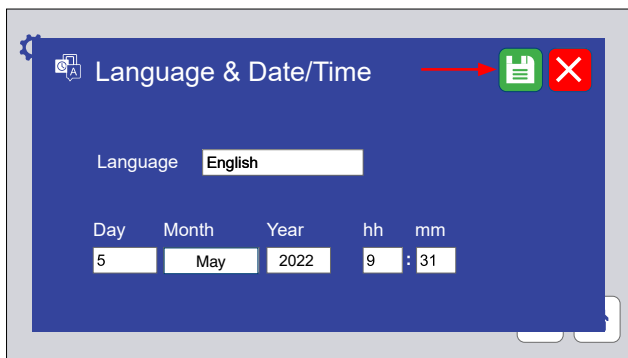


Figure 8.8p: Touch the save icon to save any changes to the Language & Date/Time.

8.9. Diagnostics (Dec 2022)

- 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 8.9a) to display the Diagnostics screen (Figure 8.9b).
- 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.
- Figure 8.9c shows a complete list of QCT diagnostic names and descriptions.

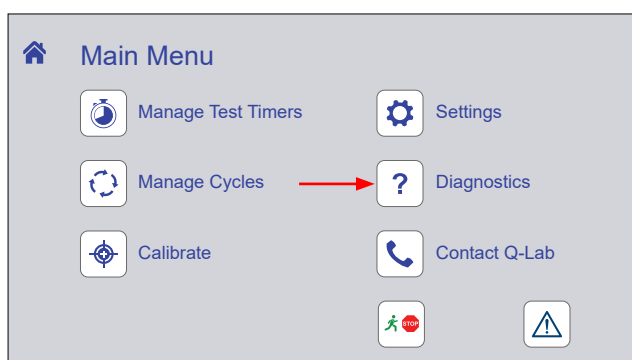


Figure 8.9a: Touch the Diagnostics icon on the Main Menu screen to display diagnostic information.

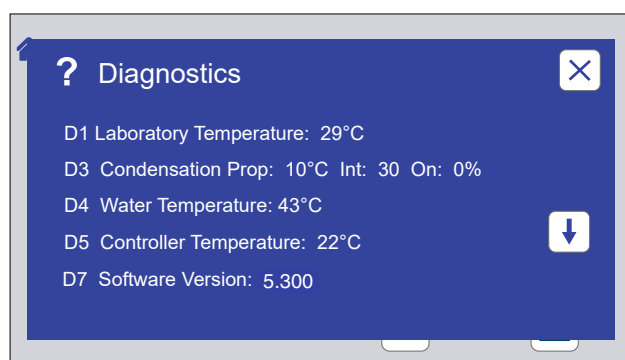


Figure 8.9b: The Diagnostics screen displays current machine operating conditions. Touch the Close icon to return to the Main Menu.

No.	Name	Description
D1	Laboratory Temperature= XX °C	The current laboratory temperature. The laboratory temperature sensor is mounted in the side of the air heater fan housing below the water pan.
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 and checksum. The checksum can be used by the software programmer to determine if there is a compiling error.
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.
D17	Dry-Off Prop=XX °C, Int=XxX, On=XX%	The settings for controlling the chamber temperature in a dry off step and the percentage of time the air heater is on.

Figure 8.9c: Complete list of diagnostic numbers, names, and descriptions.

8.10. Contact Q-Lab (Dec 2022)

- The Contact Q-Lab screen displays the link to [Q-Lab Repair and Tester Support](https://q-lab.com/support) on the web site.

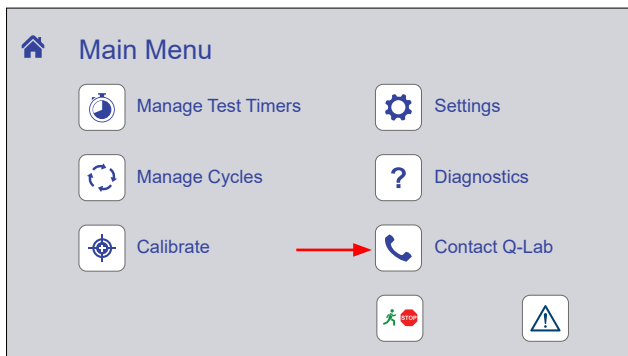


Figure 8.10a: Touch the Contact icon on the Main Menu screen to display Q-Lab contact information.



Figure 8.10b: Scan the code on this screen for Q-Lab contact information.

9. Running a Test

- Tests can be run using standard test cycles pre-programmed into the tester, or custom cycles can be constructed.
- Standard test cycles pre-programmed in the QCT are shown in [Section 9.1](#).
- For instructions on modifying cycles or creating custom cycles see [Section 8.7](#).
- Guidelines for mounting test specimens are listed in [Section 9.2](#).

9.1. Test Cycles (Dec 2022)

- See [Section 8.7](#) for detailed information on test cycle programming.
- The tables below list pre-programmed QCT test cycles and step parameters.

Cycle A: QCT Condensation			
STEP	FUNCTION	Temperature (°C)	Time (hh:mm)
1	Condensation	60	24:00
2	Final Step - Go to Step 1		

Cycle B: QCT Condensation and Dry-Off			
STEP	FUNCTION	Temperature (°C)	Time (hh:mm)
1	Condensation	60	24:00
2	Dry-Off	49	2:00
3	Final Step - Go to Step 1		

9.2. Mounting Test Specimens (Dec 2022)

- All test panels should be carefully butted together on the QCT panel racks for a good seal between adjacent panels (Figure 9.2).
- If panels are curved, bend them by hand to get a good seal.
- If metal panels are slightly oversized, overlap their edges with aluminum blank panels.
- Fifty (50) Q-PANEL® 4x6" (100x150 mm) blank aluminum panels are provided to fill in unused spaces on the test frame.
- Condensation will seal the tops and bottoms of the panels.
- Use vinyl electrical tape to seal any gaps wider than 1/32" (1 mm).
- Small air leaks will not affect accuracy but will simply cause the QCT to use slightly more water and heat.
- Large air leaks will cause loss of temperature control and loss of condensation.
- Make certain all positions on the panel racks are filled with test specimens or blank panels.
- Q-Lab can provide a wide variety of standard test panels: see [Q-PANEL Standard Test Substrates](#) for detailed information on available test panels.

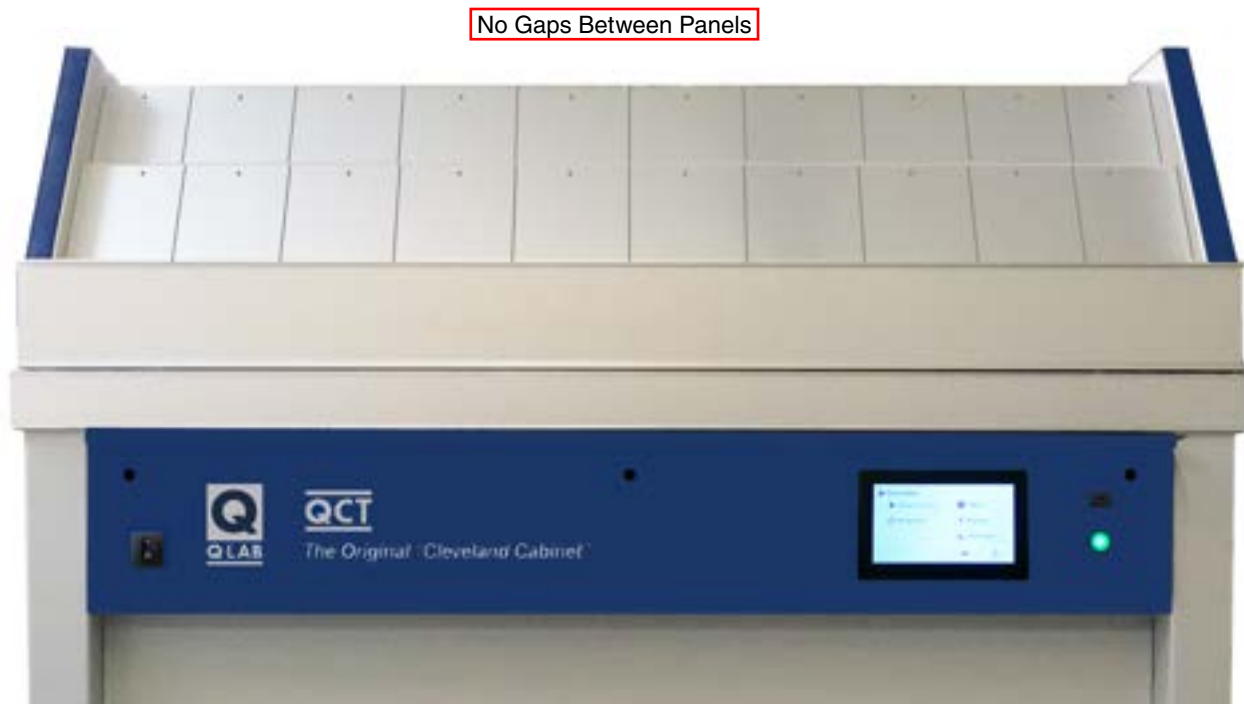
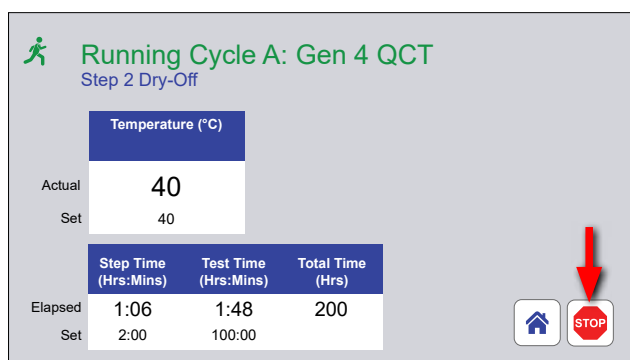


Figure 9.2: Specimens should fill both panel racks, front and back.

10. Calibration (Dec 2022)

- The QCT condensation temperature sensor can be calibrated with a reference thermometer.
- The condensation temperature sensor should be calibrated every 6 months, or whenever test cycle conditions are changed.
- A calibrated reference thermometer is needed to calibrate the sensor.
- Follow the steps below to calibrate the tester temperature sensor with a reference thermometer.
- Please [contact Q-Lab](#) with any questions concerning the calibration process.

* Q-Lab offers an optional Temperature Calibration Kit ([Figure 16.1](#)) which includes an easy-to-use insulated container.



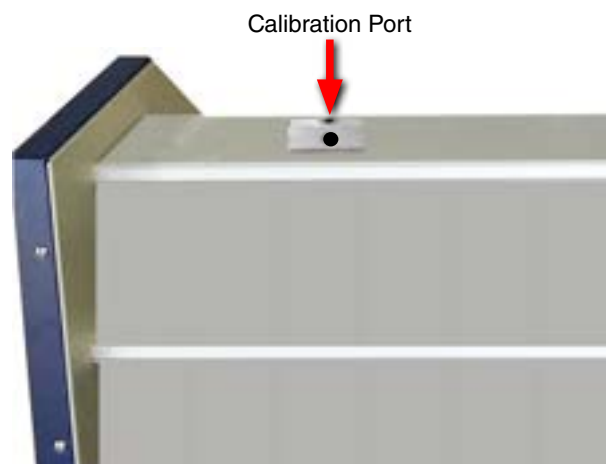
1. If running, **STOP** the tester.



2. Locate the reference thermometer.



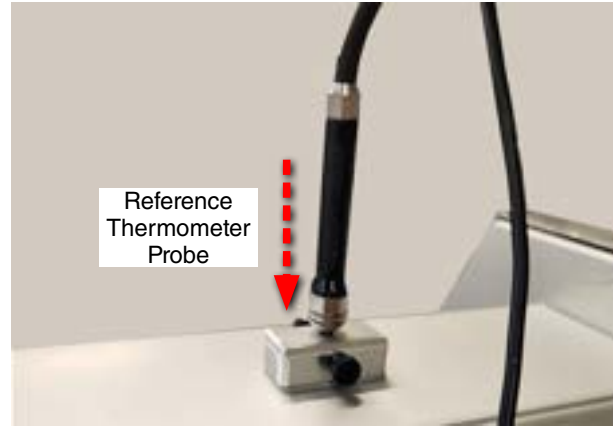
3. The diameter of the reference thermometer probe must be less than or equal to 4.749 mm (0.187") to fit into the opening in the sensor calibration port.



4. Locate the calibration port on the top of the QCT specimen exposure area.



5. Loosen the thumbscrew on the side of the port mounting block.



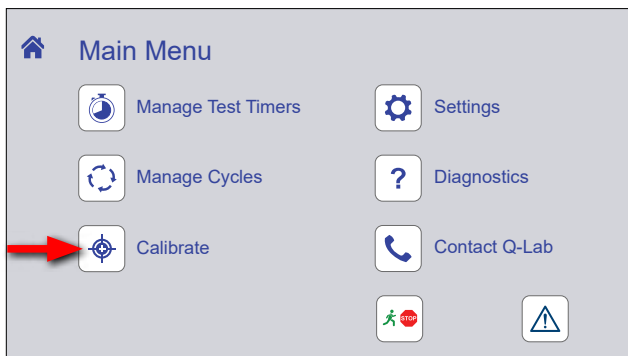
6. Turn the reference thermometer **ON** and insert the probe all the way into the calibration port.



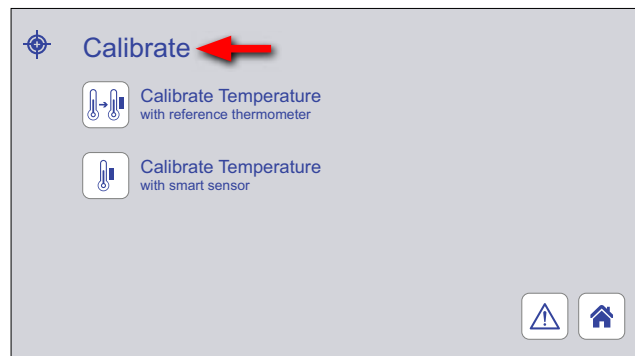
7. Tighten the thumbscrew to hold the probe in place.



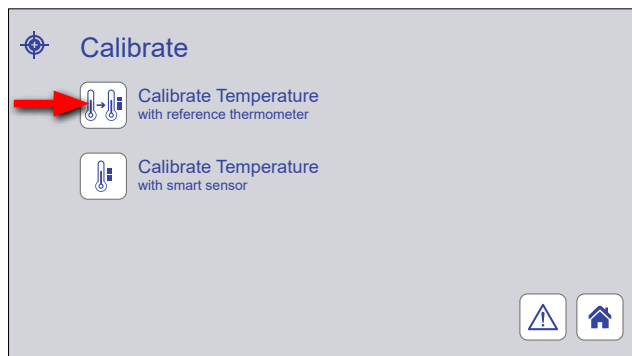
8. Wait 10 minutes to allow the reference temperature reading to stabilize.



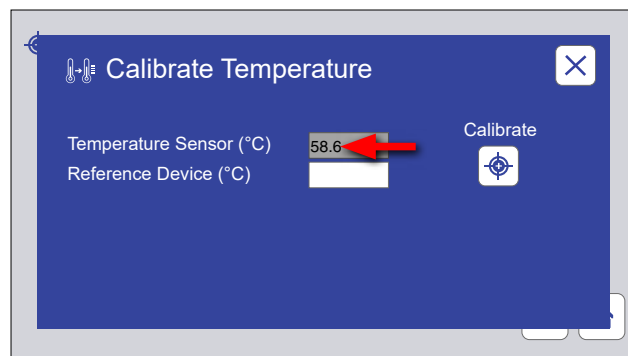
9. Touch the calibrate icon on the QCT Main Menu screen to access the calibrate functions.



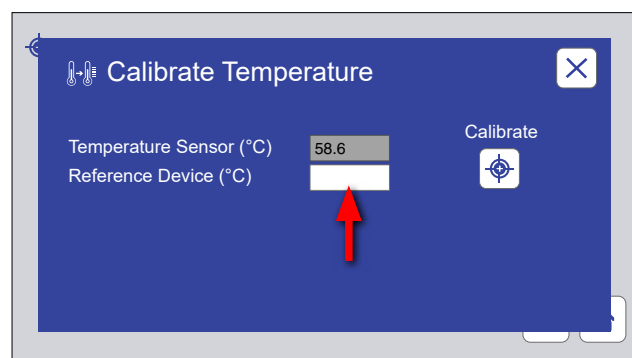
- The calibrate screen is displayed.



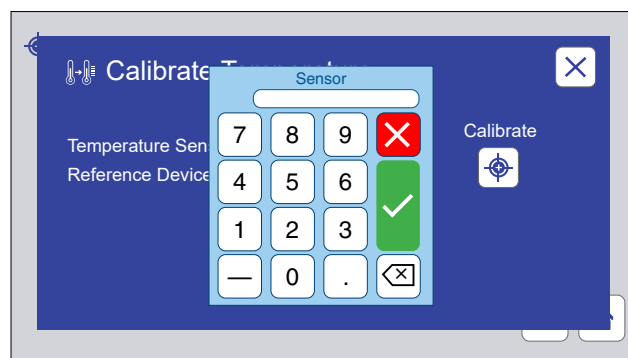
10. Touch the Calibrate Temperature with reference thermometer icon.



- ▶ The Calibrate Temperature screen is displayed. The current reading of the QCT temperature sensor is shown.



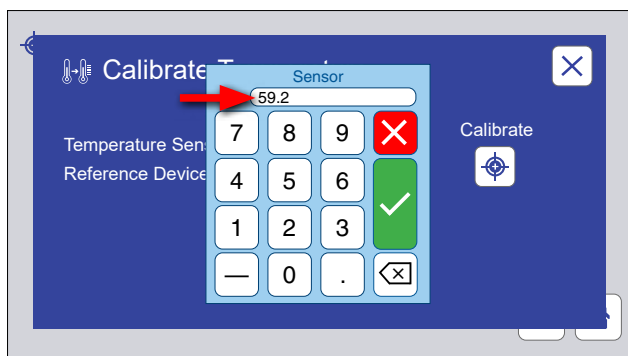
11. Touch the Reference Device text box.



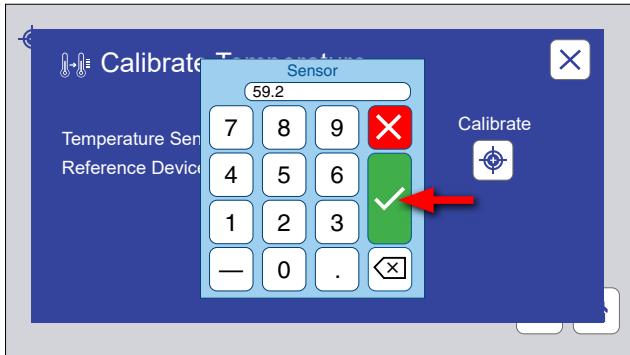
- ▶ The Sensor temperature enter keypad is displayed.



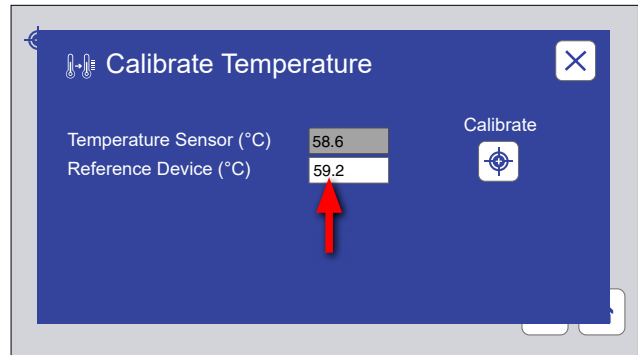
12. Read the temperature displayed on the reference thermometer.



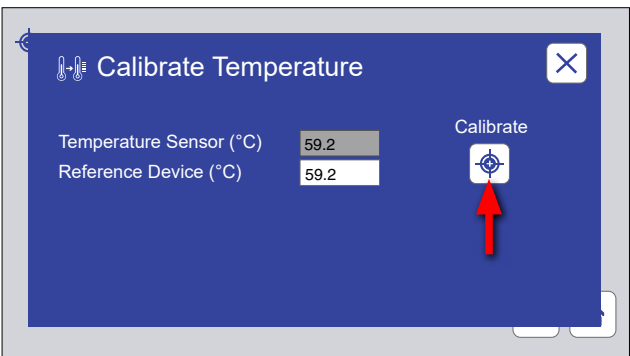
13. Use the keypad to enter the reference temperature into the reference device text box.



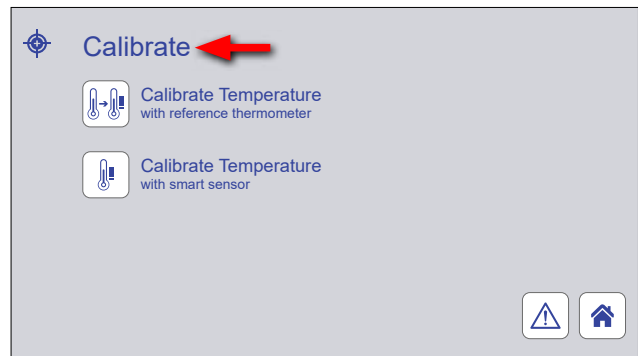
14. Touch the check mark button.



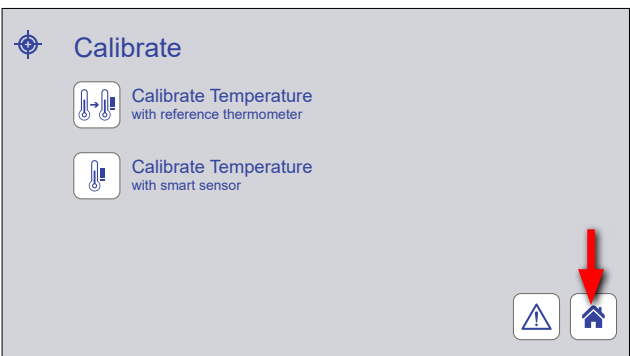
► The keypad is removed. The reference temperature is displayed in the reference device text box.



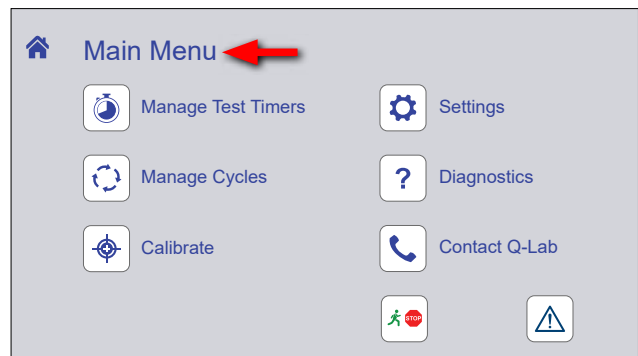
15. Touch the calibrate icon to complete the calibration process. The tester temperature sensor is calibrated to the reference temperature.



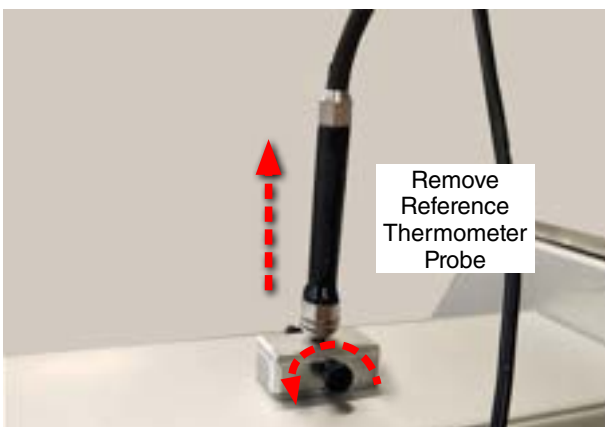
► The calibrate screen is displayed.



16. Touch the home icon.



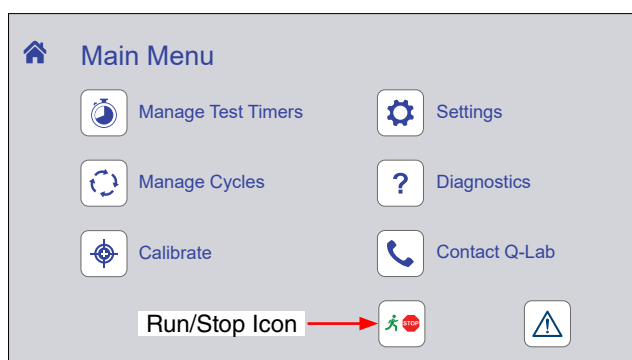
► The main menu screen is displayed.



17. Loosen the thumbscrew and remove the reference thermometer probe from the QCT calibration port,



18. Dry the reference thermometer sensor and store the thermometer for future use.



► Calibration is complete. Resume test.



Remember to calibrate the temperature sensor every 6 months, or whenever test cycle conditions are changed.

11. Data Storage and Transfer

11.1. Secure Digital (SD) Card (Dec 2022)

- The SD card is located on the Main Controller ([Section 8.1](#)) circuit board ([Figure 11.1](#)).
- 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](#) 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 re-enter 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.



SD Card files should not be edited unless such actions are specifically directed by [Q-Lab Repair and Tester Support](#).

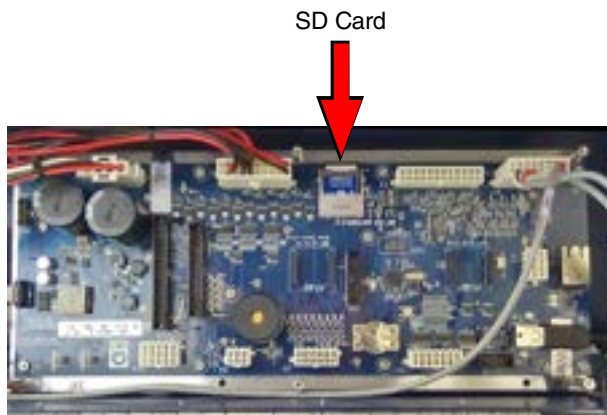


Figure 11.1: SD card location on Main Controller circuit board.

11.2. Export Diagnostics (Dec 2022)

- 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, heater and blower percentages, calibration factors, test cycles, and error messages.
- A USB flash drive is used to export diagnostic parameters (Figure 11.2c)
- Connect the USB drive to the USB port of the QCT control panel (Figure 11.2d).
- The USB Options screen will be displayed (Figure 11.2a).
- Touch the Export Diagnostics button to begin the export process (Figure 11.2b).



Figure 11.2c: USB drive needed to export diagnostics.

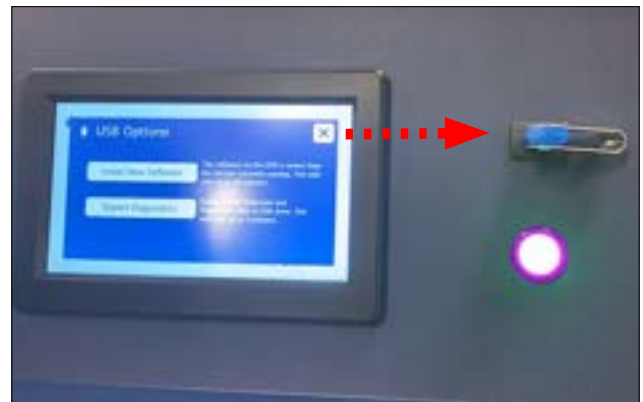


Figure 11.2d: Connect the drive to the USB port of the QCT control panel.

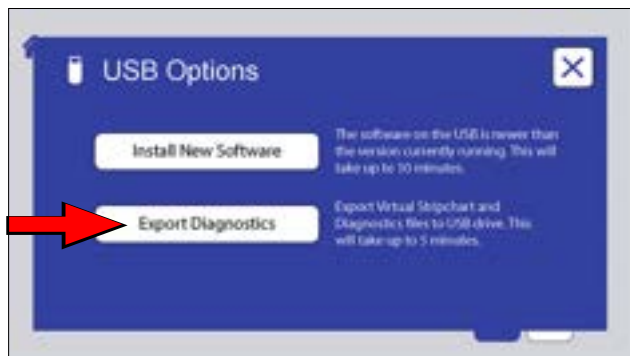


Figure 11.2a: USB Options screen showing the Export Diagnostic button.

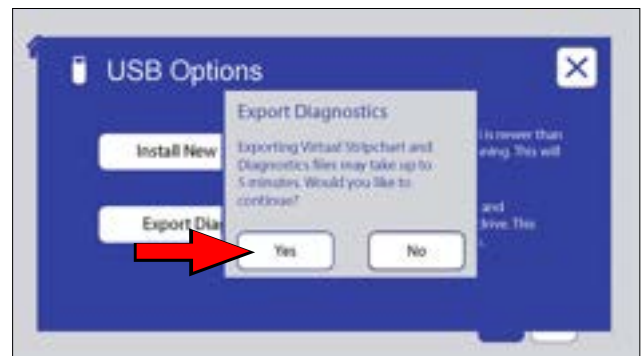


Figure 11.2b: Touch Export Diagnostics then the Yes button to begin export.

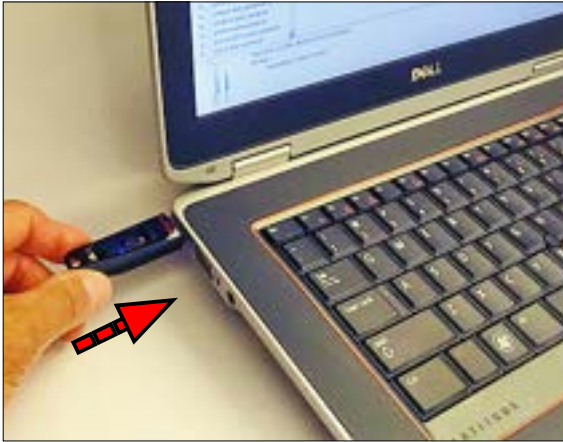
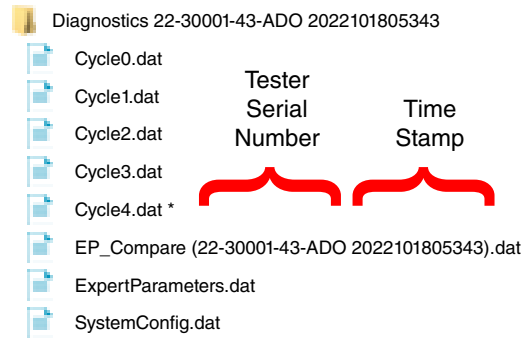


Figure 11.2e: Insert the USB drive into a Windows computer to display the list of files



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

Figure 11.2f: 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.

12. Options

12.1. Humidity Enclosure Accessory (May 2023)

- The Humidity Enclosure Accessory provides hinged doors for front and rear specimen racks to enable testing of specimens in a fully saturated humidity environment. (Figure 12.1a and Figure 12.1b).
- This accessory enables the QCT to meet the requirements of ISO 6270-2 (see Section 3.3).
- The humidity enclosure doors can be raised or lowered to access specimens.
- The entire Humidity Enclosure Accessory is easily attached to, or removed from the QCT tester.
- The Humidity Enclosure Accessory Kit can be ordered as a factory installed option (C-60692-K-INST) or as a retrofit kit (C-60692-K). The kits include instructions (C-60692-L) for installing and removing the Humidity Enclosure Accessory.
- Contact [Q-Lab Repair and Tester Support](#) for more information.



Figure 12.1a: QCT with Humidity Enclosure Accessory doors closed.



Figure 12.1b: QCT with Humidity Enclosure Accessory doors open.

12.2. Water Pump (Dec 2022)

- Q-Lab offers a water inlet pump for labs that do not have sufficient water pressure.
- 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 QCT water feed for condensation.

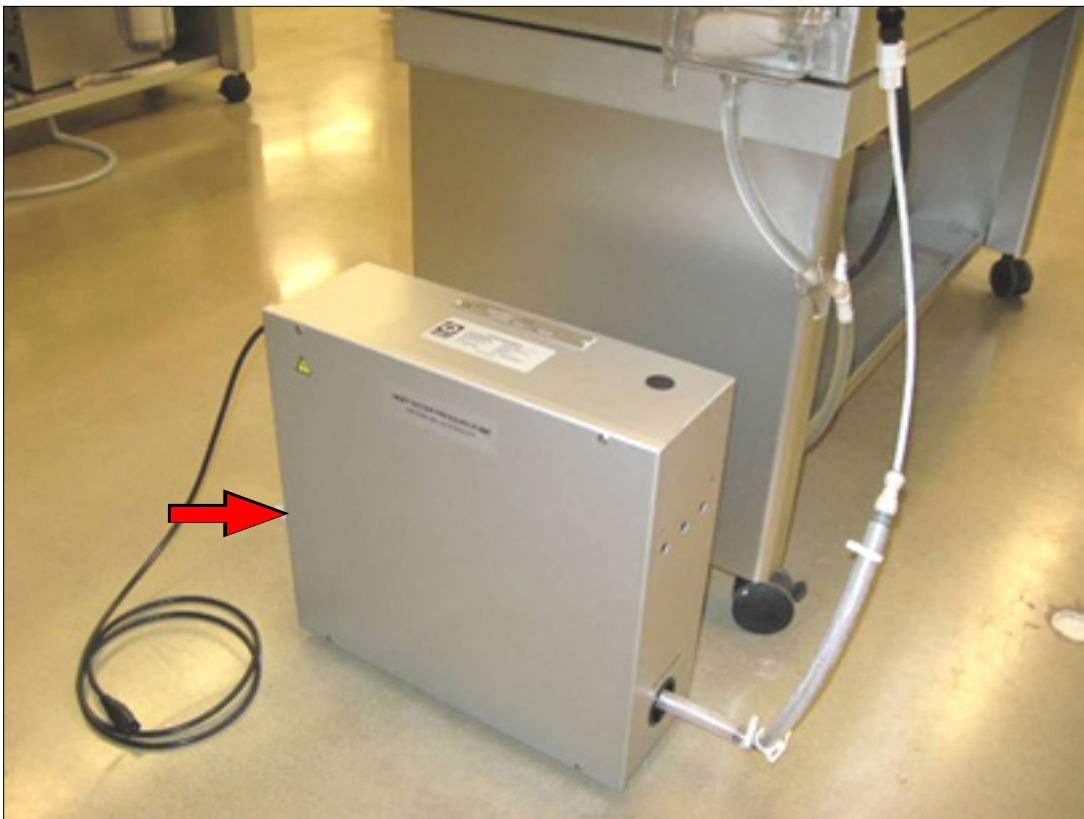


Figure 12.2: Water pump (part no. X-10570-K).

13. Maintenance

13.1. Water Pan (Dec 2022)

- Inspect and clean the water pan every 6 months.
- If hard or treated tap water is used in a QCT, inspection and cleaning should be performed more frequently.

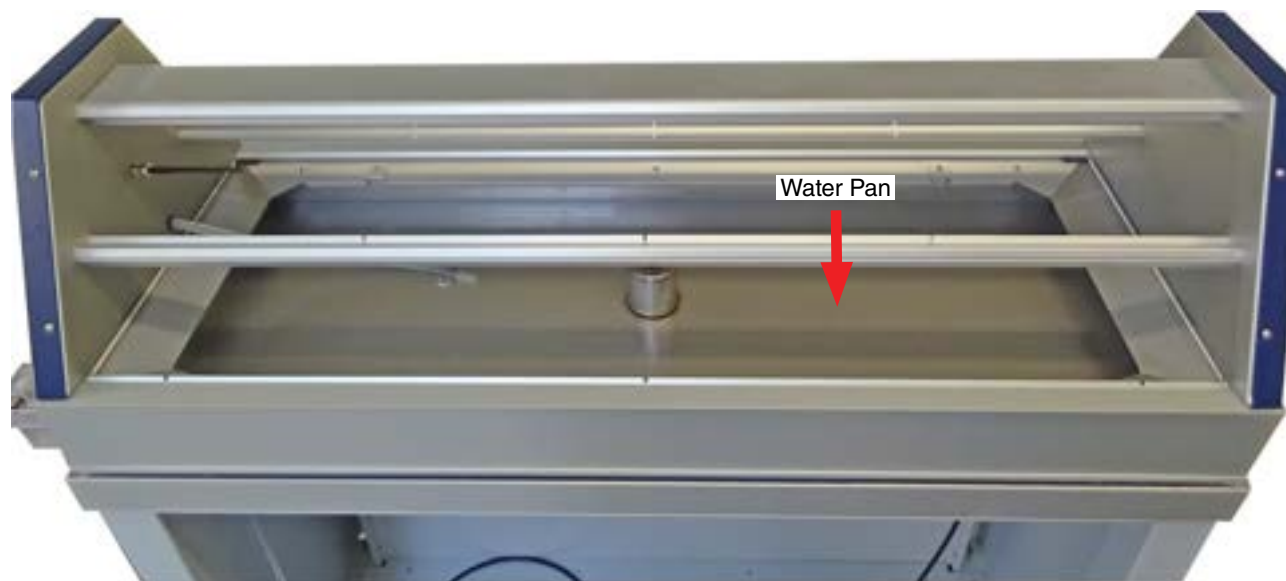


Figure 13.1: QCT water pan.

13.2. QCT Software Updates (Dec 2022)

- Q-Lab periodically updates the software that runs the QCT 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](#).

Software Version and Tester Serial Number

- The currently-installed QCT software version number and tester serial number are required to determine if a software update needs to be performed.
- The QCT serial number and the software version are listed in the diagnostics screen accessed from the controller main menu.
- See [Section 8.9](#) for instructions to display the tester serial number (diagnostic D14) and software version (diagnostic D7). The serial number is also shown on the nameplate attached to the rear of the QCT (see [Figure 6.3](#)).

Software Types

- Once you have the tester serial number and software version number, visit www.q-lab.com/software.
- The most recent versions of QCT 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 QCT (see previous section), that software needs to be installed.
 - › More recent software versions are indicated by a higher version number (e.g. 5.110 and 5.200 would both be more recent than 5.100).
 - **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.

Software Update

- The appropriate software update file can be obtained either by contacting Q-Lab Repair directly or by filling out the web-based form on www.q-lab.com/software.
- Q-Lab Repair and Tester Support personnel will contact you to discuss your situation and, when applicable, provide you with necessary software files and instructions to perform an update.
- Copy the software files (file format must be .ff4) to a USB flash drive ([Figure 13.2a](#)).
- Connect the drive to the tester USB port of the control panel ([Figure 13.2b](#)).
- 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 13.2c).
 - *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 13.2d).
- 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.
- [Contact Q-Lab Repair and Tester Support](#) for more software update information..



Figure 13.2a: Copy QCT software to a USB drive.

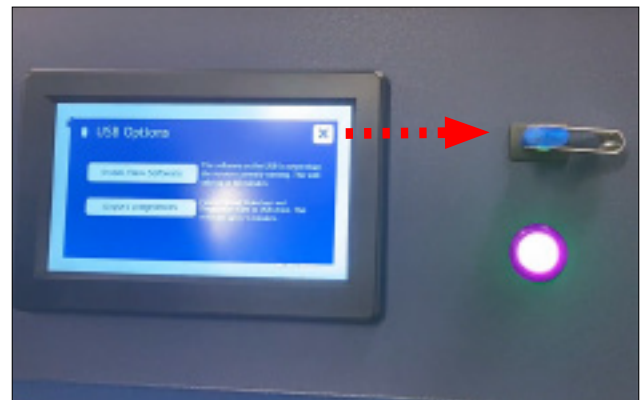


Figure 13.2b: Connect the drive to the USB port of the QCT control panel.



Figure 13.2c: The USB Options screen displays the software installation button.

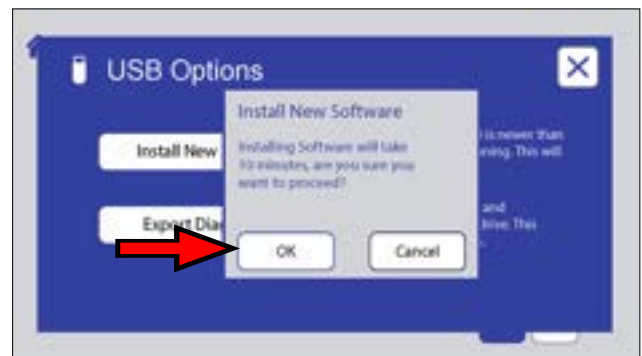


Figure 13.2d: Touch OK to proceed with software installation.

14. Troubleshooting and Repair

- The QCT is 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-lab.com to register your tester to access additional useful troubleshooting guides, operating manuals, and technical information.
- The QCT software includes functions to export data that can be used to help diagnose tester problems (see [Section 11.2](#)).



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

Q-Lab.com/support

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











14.1. Notifications (Dec 2022)





- Notifications provide useful diagnostic information for technicians and repair personnel.
- Notifications show significant tester events and errors that occurred in the recent past.
- See [Section 11.4](#) for more information on displaying and clearing Notifications.
- The table below lists all QCT 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

Code	Message	Icon	Test Status	Description • Suggested Action
M10	End of Test		Complete	Test completed successfully. No alarm is generated. <ul style="list-style-type: none"> • No action required
M11	End of Test		Complete	Test completed successfully. An alarm, as set in Section 11.7 , is generated. <ul style="list-style-type: none"> • No action required
M12	End of Test Shutdown		Complete & Stopped	Test completed successfully. No alarm is generated. <ul style="list-style-type: none"> • No action required
M13	End of Test Shutdown		Complete & Stopped	Test completed successfully. An alarm, as set in Section 10.7 , is generated. <ul style="list-style-type: none"> • No action required
M23	Condensation Temperature Fault XXX°C		Running	A Condensation step ends and the panel temperature did not reach the setpoint ± 2 °C. <ul style="list-style-type: none"> • 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
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 <ul style="list-style-type: none"> • No action required
M30	Replace Battery		Running	The Main Controller battery voltage is less than the low limit. <ul style="list-style-type: none"> • Replace the battery (V-4086) on the main controller circuit board See Section 15

Code	Message	Icon	Test Status	Description • Suggested Action
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. <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • Check room temperature • Check for overheating of relays
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. <ul style="list-style-type: none"> • Always press STOP before powering the QCT off to prevent the M49 message from being displayed when the QCT is powered back on.
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. <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • Turn the QCT off and back on • If problem persists, contact Q-Lab.com/support
M81	Flash Data Corrupt		Stopped	Tester parameter and setup data is corrupted. <ul style="list-style-type: none"> • Turn the QCT 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. <ul style="list-style-type: none"> • Press the clear and enter buttons • If problem persists, contact Q-Lab.com/support
M92	Panel Temperature Sensor Fail		Stopped	Appears if the black panel temperature reading is less than 3 °C. <ul style="list-style-type: none"> • Check the black panel temperature sensor
M93	Water Temperature Sensor Fail		Stopped	Appears if the water temperature reading is less than 3 °C. <ul style="list-style-type: none"> • Check the water temperature sensor
M94	Lab Temperature Sensor Fail		Running	Appears if the lab temperature reading is less than 3 °C. <ul style="list-style-type: none"> • Check the lab temperature sensor

Code	Message	Icon	Test Status	Description • Suggested Action
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 QCT has restarted itself in order to avoid a potential problem in operation. • <i>No action required</i>
M104	Software Install Completed Successfully		Running	Software has been installed without issue. • <i>No action required</i>
M902	Main Controller Communications Failure		Running	Communication lost between main controller and screen. • Check for loose cable between main controller and the display. Reseat cable • If problem persists, contact Q-Lab.com/support

14.2. No Power (Dec 2022)

No Power

- Main power switch is broken.
- Transformer is broken.

Power Switch/Circuit Breaker Trips

- Main power switch is broken.
- Air and water heaters are on at the same time because the air or water heater relay is stuck closed.

14.3. Water Condensation in Lower Fan Box (Dec 2022)

- Water sometimes condenses in the lower fan box when the room temperature is cold and the QCT 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 is located at the bottom of the lower fan box. See Figure 15.7.
- 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.

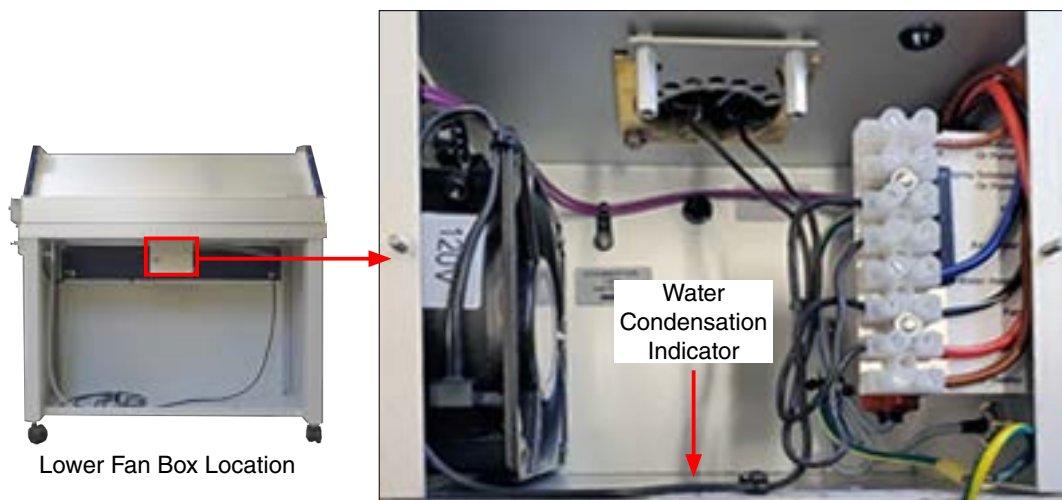


Figure 14.3: Water condensation indicator in lower fan box.

15. Replacement Parts (Dec 2022)

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

Part Number		Description	Where Pictured
120 V	230 V		
CV-60218-K	CV-60219-K	Air Heater Kit	Figure 16.a
V-4086	V-4086	Controller Battery	Figure 16.c
V-2077-X	V-2078-X	Controller Transformer	Figure 16.d
TEB-105016-K	TEB-105016-K	Touchscreen Replacement Kit	Figure 16.b
CV-60450-K	CV-60450-K	Earthquake Restraint Kit	Figure 6.2d
V-2342	V-2342	Fuse, 0.5A	Figure 16.e
F-8977-K	F-8977-K	Leveling Feet Field Replacement Kit	Figure 6.2c
TEB-105015-K	TEB-105015-K	Main Controller	Figure 16.g
V-2202	V-2200	Main Power Switch/Circuit Breaker	Figure 16.h
TEB-105043-K	TEB-105043-K	Panel Mount LED Indicator Assembly	Figure 16.f
TEB-105040-K	TEB-105040-K	Panel Mount USB Port	Figure 16.s
IC-1525	n/a	Power Cord Plug, 20A	Figure 16.i
n/a	V-2188	Power Cord, 230V 16 Gauge	No Picture
U-40825-K	U-40825-K	Relay Kit, SS, 5 A	Figure 16.j
F-8385-K	F-8385-K	Relay Kit, SS, 25 A	Figure 16.k
U-41085-K	U-41085-K	Temperature Calibration Kit	Figure 16.l
V-2156-X	V-2156-X	Temperature Sensor Assembly	Figure 16.m
CV-218A-K	CV-218A-K	Water Feed Assembly Kit	Figure 16.n
CV-218V-K	CV-218V-K	Water Feed Valve Float Kit	Figure 16.o
CV-230-K	CV-231-K	Water Heater Kit	Figure 16.p
CV-60129-K	CV-60129-K	Water Pan Kit	Figure 16.q
X-10570-K	X-10570-K	Water Pressure Booster Pump, Stand Alone, Extreme Environment	Figure 16.r



Figure 16.a CV-60218-K Air Heater Kit, 120 V
CV-60219-K Air Heater Kit, 230 V



Figure 16.b TEB-105016-K Touchscreen Replacement Kit



Figure 16.c V-4086 Controller Battery



Figure 16.d V-2077-X Transformer, Main Controller, 120V
V-2078-X Transformer, Main Controller, 230V



Figure 16.e V-2342 Fuse, 0.5 A



Figure 16.f TEB-105043-K Panel Mount
LED Indicator Assembly

Section 15. Replacement Parts



Figure 16.g TEB-105015-K Main Controller



Figure 16.h V-2202 Main Power Switch, 120 V
V-2200 Main Power Switch, 230 V



Figure 16.i IC-1525 Power Cord Plug, for V-2187, 20A



Figure 16.j U-40825-K Relay Kit, SS 5A



Figure 16.k F-8385-K Relay Kit, SS, 25 A



Figure 16.l U-41085-K Temperature Calibration Kit



Figure 16.m V-2156-X Temperature Sensor Assembly



Figure 16.n CV-218A-K Water Feed Assembly Kit



Figure 16.o CV-218V-K Water Feed Valve Float Kit



Figure 16.p CV-230-K Water Heater Kit, 120 V
CV-231-K Water heater Kit, 230 V
NOTE: Insulation not shown.



Figure 16.q CV-60129-K Water Pan Kit
HS-4587-K Water Pan Kit



Figure 16.r X-10570-K Water Pressure Booster Pump,
Stand Alone, Extreme Environment



Figure 16.s TEB-105040-K Panel Mount USB Port

16. Warranty (Feb 2023)

Standard One Year Warranty

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

Extended Warranty Available

- The standard warranty can be extended to two (2) years at no cost!
- To extend the warranty, **the new tester must be registered** and a *Commissioning Checklist* completed and approved.
- Visit http://q-lab.com/extended_warranty to obtain a warranty extension.

Replacement Parts Warranty

- Serialized replacement electronic parts, for example main controllers, (under warranty or not) are covered by a one (1) year warranty, **only if they are registered**.
- To activate the warranty, register the replacement part at the time of installation.
- Go to <http://q-lab.com/warranty> to register replacement parts and activate the warranty.

Q-Lab Tester, Parts and Lamps Warranty Policy

- Please contact [Q-Lab Sales and Marketing](#) for complete details on all Q-Lab product warranties.

17. Repair and Tester Support (Dec 2022)

- 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

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