Twin Cell UCA
Model 420 ATC

Instruction Manual

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Twin Cell UCA Instruction Manual

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1 Introduction

The Fann Model 420 ATC Twin Cell Ultrasonic Cement Analyzer (UCA) performs nondestructive compressive strength tests on two cement slurry samples at the same time.

It features two independent cells in the same enclosed unit, labeled Cell 1 and Cell 2. It uses its own pressure source, with built in pressure ranging from 5000 to 20000psi (depending on the configuration), touch screen operation, and internal memory. Below is an explanation of components of the front panel:

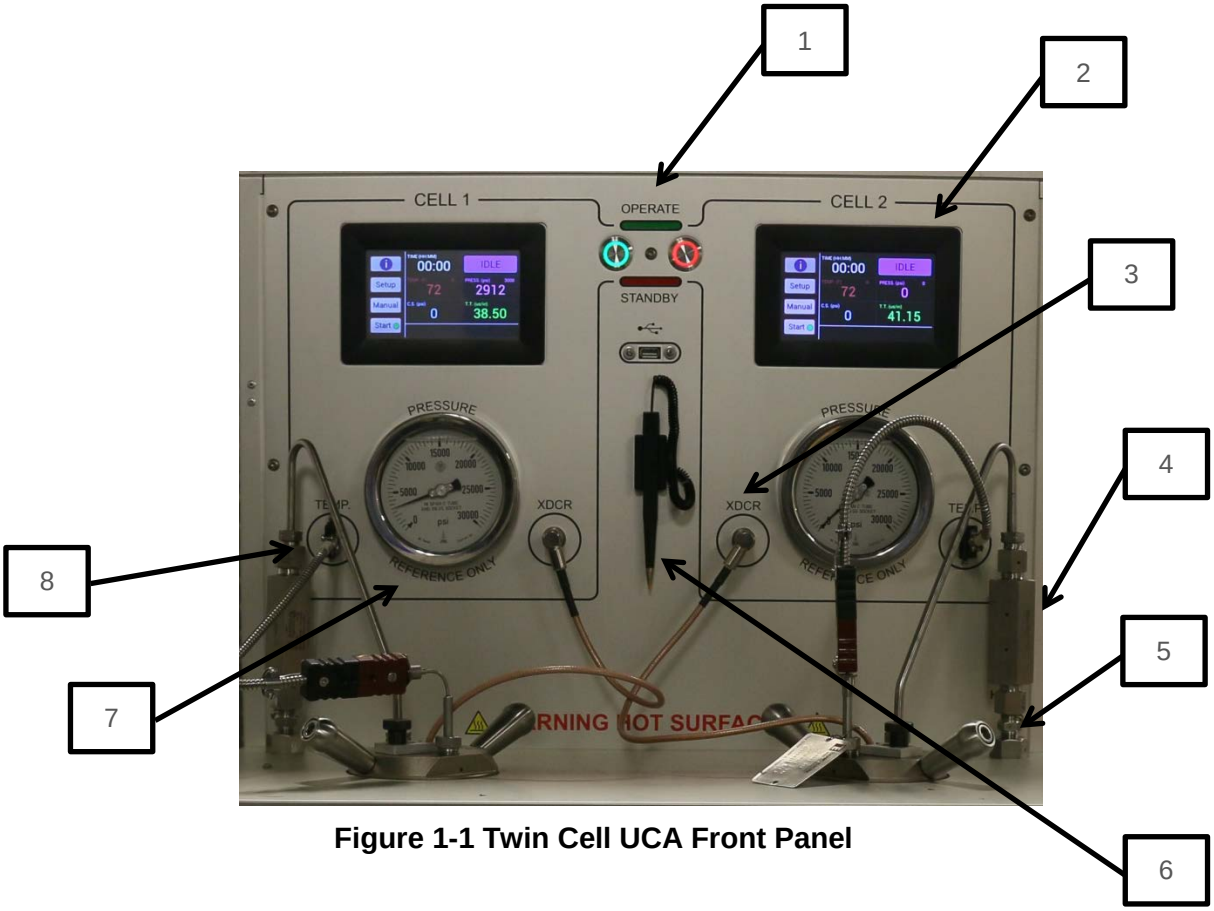


Figure 1-1 Twin Cell UCA Front Panel

1. Standby/Operate button: Each cell must be put in operate mode to run a test. When in operate mode the button light up green indicating normal operation is possible. User can put each individual cell in standby mode. In standby mode the heater power and pressure system are disengaged and no further energy is imparted to the system. In standby mode if there is pressure in the cell then it is kept locked in. The system does not try to control the pressure or the temperature. It is recommended that user keep the cells in standby mode if no test has to be run.

In case of abnormal conditions, the machine may switch to standby mode automatically. These are as follows:

a) Air Pressure Loss: if the air pressure to the system is inadequate, the system will switch the machine to standby mode with red blinking lights. To restore normal operation ensure air pressure is present and is adequate

b) Loss of CPU control: if CPU becomes unresponsive then standby mode is engaged with red blinking lights. To restore normal operation a complete shutdown and startup is required.

c) Over Temperature: If temperature of heaters become too high then over temperature circuit is engaged and standby mode activated with solid Red light on the cell. To resolve this ensure that the temperature on heater is below 650°F and then Engage and Disengage the standby switch to return to normal operation.

2. Control and display (touch screen): the main display from which all the settings and test parameters are controlled and available for display. User will interact with the touch screen to run their tests. Refer to section 5 for detailed explanation of the software.
3. Sonic transducer connector: BCN connectors for each. Connect the sonic transducer to this connector for each individual cell.
4. Filter CF4: a high pressure water filter in line to the chamber to pressurize the sample. The filter is used to filter out cement fines during depressurization so that the pressure subsystem does not contaminate and damage the components.
5. High pressure fitting HF4: the high pressure line that is used to connect to the pressure chamber.
6. Stylus: a stylus is provided to operate the touch screen.
7. Pressure gauge (for reference only): the pressure gauge shows the pressure in each individual cell. These gauges are for reference only for the user to understand the level of pressure present in the system and should not be used to record or measure pressure.
8. J Type thermocouple connector (3 pin): this is 3 pin J-type thermocouple connector. Connect the thermocouple inserted in the chamber to this connector.

1.1 Document Conventions

The following icons are used as necessary in this instruction manual.

NOTE. Notes emphasize additional information that may be useful to the reader.

CAUTION. Describes a situation or practice that requires operator awareness or action in order to avoid undesirable consequences.

MANDATORY ACTION. Gives directions that, if not observed, could result in loss of data or in damage to equipment.

WARNING! Describes an unsafe condition or practice that if not corrected, could result in personal injury or threat to health.

ELECTRICITY WARNING! Alerts the operator that there is risk of electric shock.

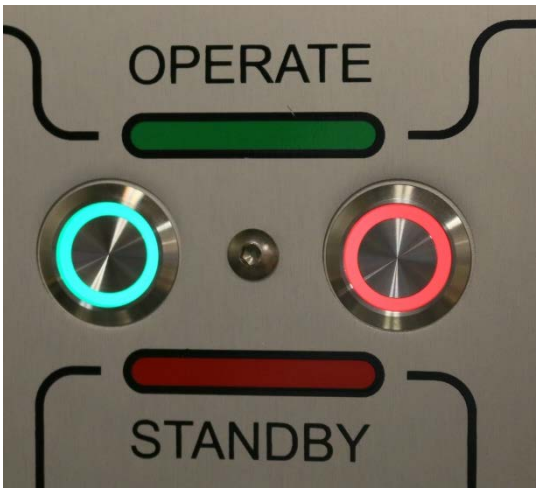
HOT SURFACE! Alerts the operator that there is a hot surface and that there is risk of getting burned if the surface is touched.

EXPLOSION RISK! Alerts the operator that there is risk of explosion.

2 Safety

Safe laboratory practices and procedures should be observed while operating and maintaining the Twin Cell UCA. This section lists some precautions to follow. In general:

- Ensure that the connections for air, water, coolant, and power on the rear of the machine are secure and meet the specification requirement of the machine.
- Standby mode is engaged by pressing the circular button on the front of the machine for each individual cell. In standby mode the heat and pressure to the system are isolated.



- If the red light is blinking or steady, this indicates an abnormal condition.
- The Twin Cell UCA utilizes an over-temp circuit operating independently of the software to detect over-temperature condition and cut off power to the heaters automatically.

2.1 Pressure

Pressurized air, High pressure hydraulic, and Water lines present a hazard if not depressurized before maintenance or disassembly.

Domestic water is often used to cool the instrument. In some labs, a closed loop chilled water system is used for cooling. Internal to the instrument, the coolant supply and drain lines are copper. Externally, these may be plastic or copper. Shut off the cooling supply line external to the instrument before working on it. The drain line does not have pressure in it, and it does not need to be disconnected, unless it is connected to a chilled water return line. The external cooling supply lines may be plastic.

The high pressure lines present the greatest hazard as they can hold as much as 20000 psi. These lines are ¼ in or 1/8 in OD stainless steel. Operators must ensure that the pressure in these lines has been reduced to zero before attempting to disassemble any high pressure lines. Confirm that all pressure in the system has been relieved using the pressure gauge on the front panel.

2.2 Temperature

The pressure chamber has an electric heating jacket that can heat the cement slurry to 480°F (205°C). The metal jacket itself can be considerably hotter. Before removing the pressure chamber or performing any work on the heating jacket, use the cooling system to lower the temperature to at least 120°F (49°C). Monitor the temperature by observing the temperature controller display when the chamber is in the heating jacket. The coolant return line can be very hot at the beginning of a post-test cool down.

2.3 Electrical

The power source for the Twin Cell UCA is 230 Volts. There are electrically active terminals inside the instrument when the power switch is turned off. Disconnect the power from the plug before attempting any electrical or mechanical maintenance. Contact Fann technical service with detailed questions.

3 Features and Specifications

- Two independently operating UCA cells with continuous automatic temperature and pressure control
- Integrated 5000 or 20000 psi pressure system
- Can be plumbed to accept pressure from other devices
- Up to 480°F operation with zero heat migration between cells
- Coolant ports allow low temperature tests down to 40°F
- Digital control of pressure and temperature set point
- User programmable Test profiles with customizable data rates
- User configured event recording
- Can be operated without computer, or connected to external computer
- USB data transfer if running standalone
- Independent safety mechanisms for over temperature, over pressure, air and power loss

Table 3-1 Twin Cell UCA Part Number 102551791 Specifications

Category	Specification
Size	24in x 24in x 33in (W x D x H)
Weight	<200 lbs
Minimum Temperature	40°F
Maximum Temperature	480°F
Minimum Pressure	0 psi
Maximum Pressure	5000 or 20000 psi
Pressure Tolerance	100 psi
Operating Temperature	4°C to 50°C
Power (2 inlets)	CPU 208 - 240 VAC, 50/60 Hz 360 W Heat 208 – 240 VAC 50/60 3200 W
Water In	¼ in NPT female, 10 psi min
Drain Out	¼ in NPT female, hot water
Air In	¼ in NPT female, 100 psi min
High Pressure In (only for external pressure source)	Cell 1: HF2 female Cell 2 : HF2 female
Ethernet	TCP/IP over RJ45

4 Installation

Before starting up the machine, check all connections on the back of the unit.

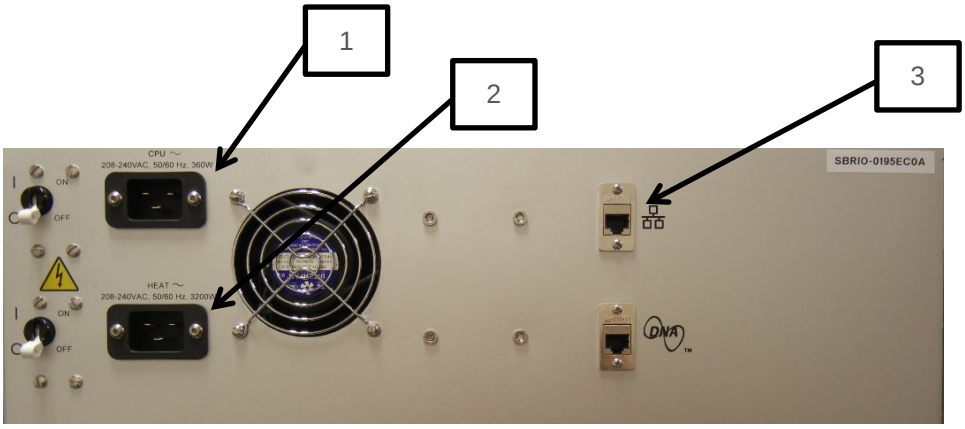


Figure 4-1 Back View of Twin Cell UCA and Components

1. CPU: Locking Power Cord for all AC input except for heater
2. Heat : Locking Power Cord for Heater Power Only
3. Network Connection (Optional)

The Twin Cell UCA can generally be arranged to suit the available space and the desires of the lab personnel, consistent with any established work processes.

Consideration should be given to the location where samples are prepared and the cells are cleaned following test completion. Connected systems such as additional pressurization or coolant dictate installation specific requirements. There should be sufficient storage area nearby for commonly used tools, such as pressure gauges or thermometers to connect to the unit for situations such as calibration.

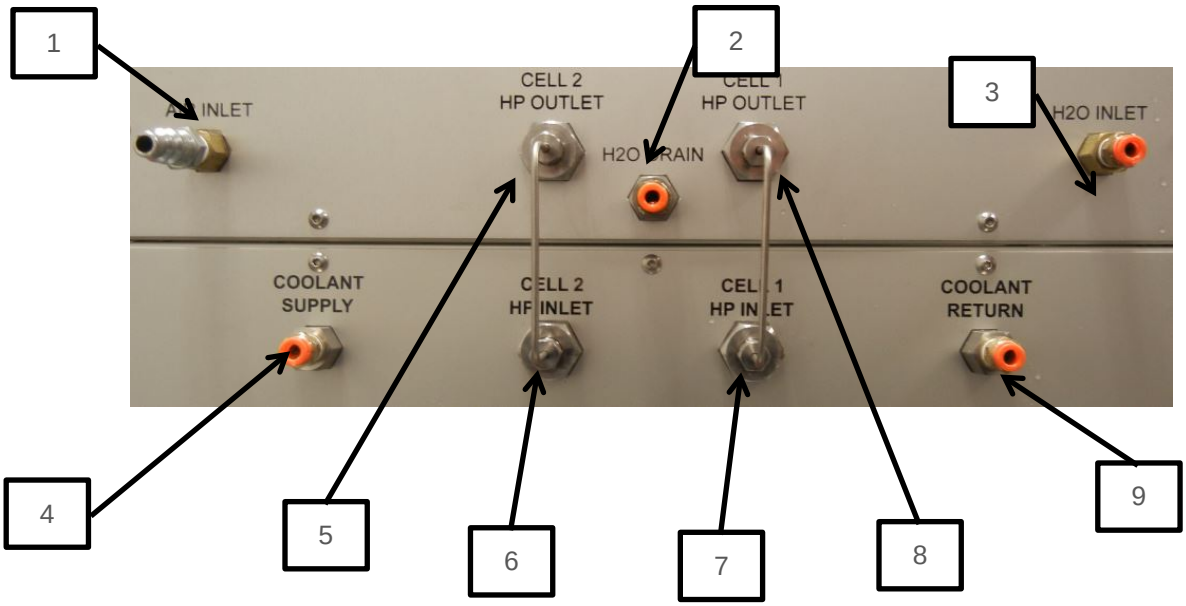


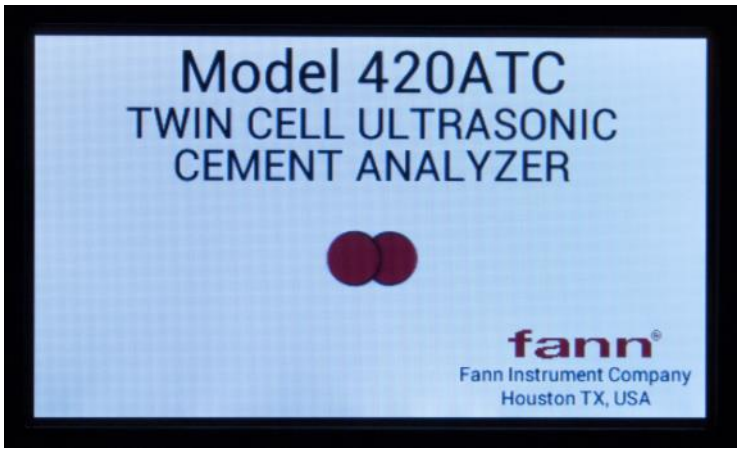
Figure 4-2 Twin Cell UCA Connections Panel

1. Clean dry air 100 psi min
2. Common water drain for cell depressurization
3. Filtered water inlet 10 psi min
4. Chiller or water supply for cooling of cells
5. High pressure u-tube for cell 2 connection to pump control box
6. Connection for cell 2 if external pressure control is used
7. Connection for cell 1 if external pressure control is used
8. High pressure u-tube for cell 1 connection to pump control box
9. Chiller return or water supply drain for cooling cells

5 Setup and Software

5.1 Starting Up

The software will take approximately one minute to load up on the touch screen.



5.2 Main Menu

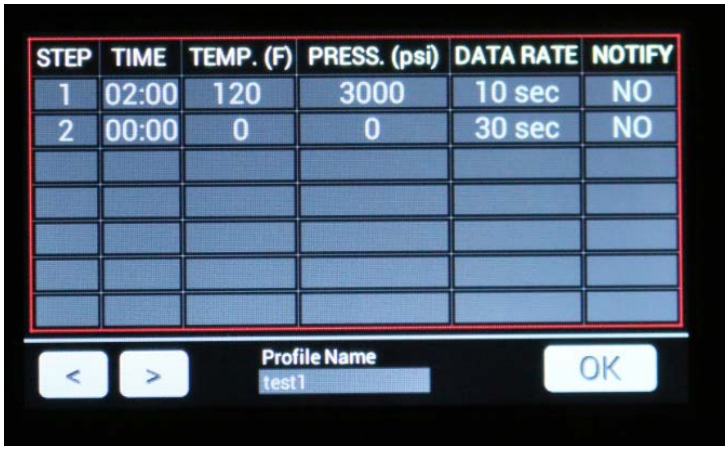
The main menu appears as below, with left side menu choices outlined in sections to follow.

1. Time elapsed: This indicator shows the elapsed time when a test is running. When a test is running, the right hand corner will also shoe the target time of the test step.

2. Mode: This indicator shows the current state of the system. It can be either in Idle, Running or Alert mode. If a test is not running then the mode is Idle (blue). If a test is running the mode will be Running (green). An Alert (orange) may appear during the test based on criteria set in events or profile choices as configured by the user. Use the Info button to view the alert and clear it from the screen. The **i** button menu on the left side will also turn yellow when an alert is raised.
3. TEMP(F) or TEMP(C): This is the temperature field. It shows the current Temperature of the cell. The right hand corner of this box shows the current set point. At all times the system tries to match the current temperature to set point, except when it is below ambient temperature.
4. PRESS (psi) or PRESS (MPa): This is the pressure field. It shows the current pressure of the cell. The right hand corner of this box shows the current set point. At all times the system tries to match the current pressure to set point, except when it is below ambient pressure.
5. C.S. (psi): This field shows the compressive strength of cement sample when test is running. This is a calculated parameter and is only relevant when test is running. The right hand corner will show the target compressive strength if so configured as part of running test.
6. T.T (µs/in) or T.T. (µs): This field shows the measured transit time of the sonic pulse though the sample in the cell.
7. Message Box: Any messages that are pertinent to operation of the machine will appear here. These are informational messages and no user action is needed. From time to time pop up message boxes may appear in which case user action is needed or in case where the user action was incompatible with the machine.
8. Info menu (**i**): Use this button to navigate to events and profile that is loaded for running a test. This button allows the user to view and clear events and view the profile when the test is running.
9. Setup: Use this button to navigate to setup screen to setup machine parameters. Other sub menu options such as Calibration and Data Transfer are also available under this menu.
10. Manual: Use this button to operate the machine manually. This button is used to manually check each of the subsystems, if they are operating correctly and also to preheat or pre-pressurize the sample if the user so desires.
11. Start: Use the start button to start the test. The software will walk the user through different steps to ensure all necessary process is addressed before starting the test.

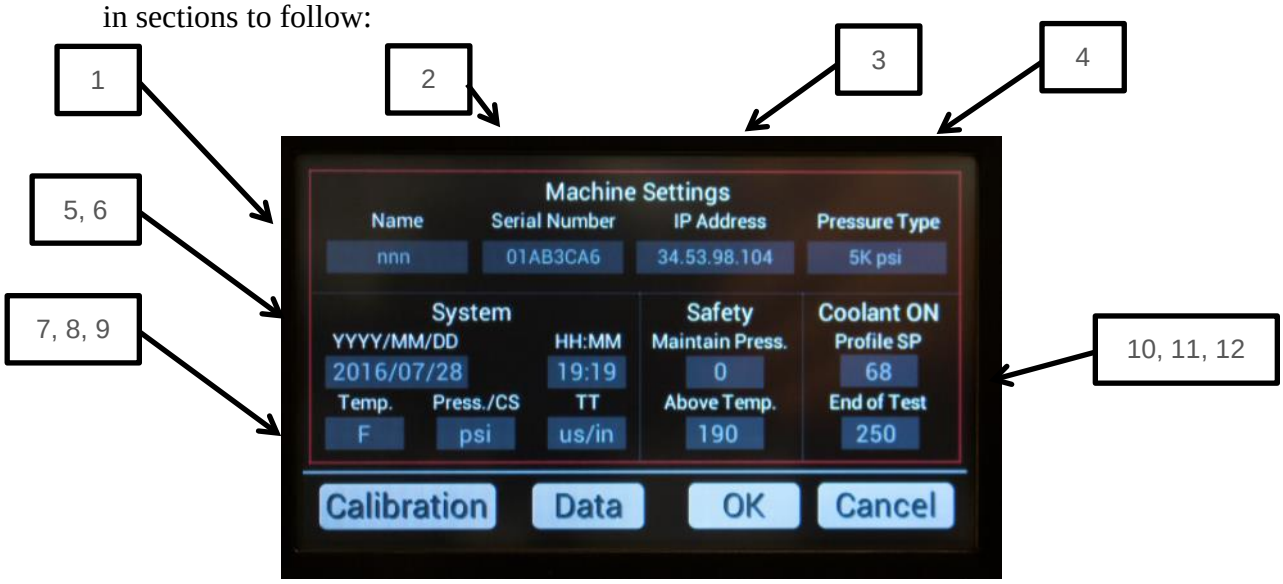
5.2.1 i Menu

The **i** info button shows a list of currently running or last run tests.



5.2.2 Setup Menu

The Setup button shows the following screen, with bottom menu choices outlined in sections to follow:



The menu is divided into the following sections, and using the touch screen the user can update values and choices:

- Machine Settings
    1. Name (input by user by pressing the field and entering in a name on the touchscreen keypad)
    2. Serial Number (generated by the unit)
    3. IP address (generated by the unit)
    4. Pressure type (selected by user from a toggle of choices: 5000 psi, 20000 psi or None). Note: 5000psi and 20000 psi pressure are offered by Fann, None should only be chosen when the user has provided a pressure control system. The unit will calibrate to chosen pressure type.
- System

    5. Date (in four character year/two character month/two character day format)
    6. Time (in two character hours and two character minutes format)
    7. Temperature (in degrees Fahrenheit or Celsius)
    8. Pressure (in psi or MPa)
    9. TT (transit time in µs/in or µs, per toggled choices)

- Safety

    10. Maintain Pressure and Above Temp: unit will maintain a pressure of chosen value if temperature is above chosen temperature.

WARNING! Maintain Pressure and Above Temperature values follow the units of the System Temperature and Pressure unit choice. If Temperature or Pressure units are changed, pressure and temperature values for Safety need to be verified.

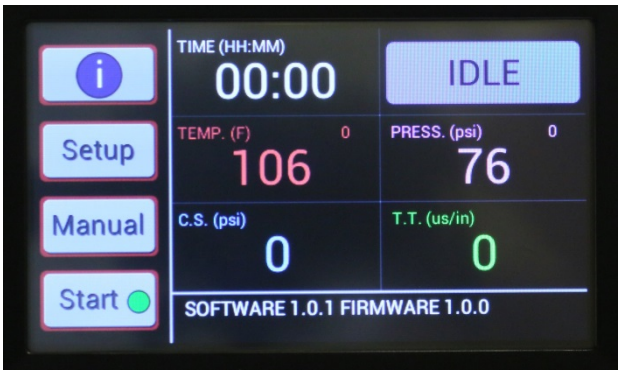
- Coolant ON

11. Profile SP: The profile set point temperature below which the coolant will start automatically.
12. End of Test: if temperature is below this setting at end of test, coolant will turn on. Coolant always stops if temperature lowers to 120°F after end of test.

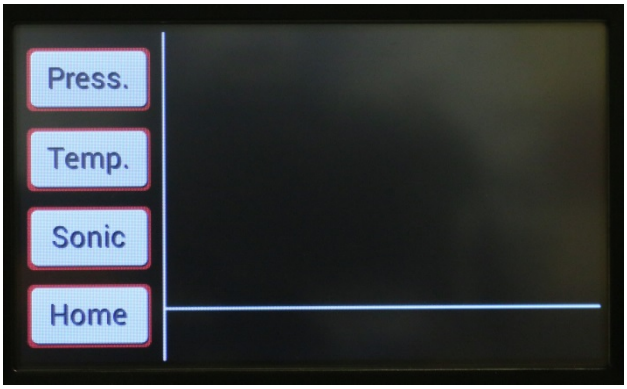
5.2.2.1 Calibration

To calibrate the unit for pressure, temperature, and sonic, follow the following instructions.

Select the Setup tab from the Main Screen.

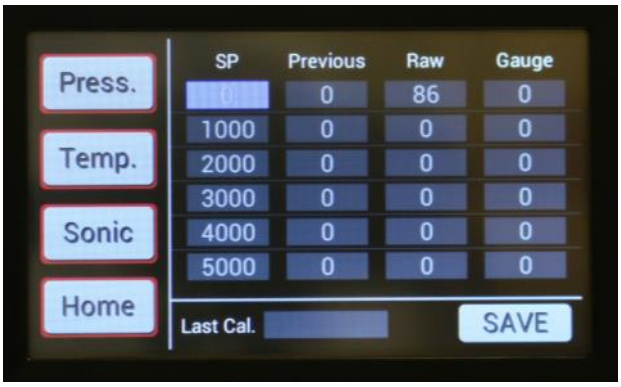


Select the tab for the device to be calibrated.

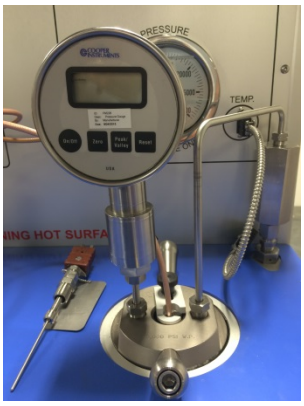


Pressure:

Pressure calibration is needed periodically to ensure that the tests are conducted at correct pressure. It is recommended to calibrate pressure at least once a year.



1. Remove thermocouple
2. Connect pressure gauge as shown below (connect pressure gauge before touching the screen) :

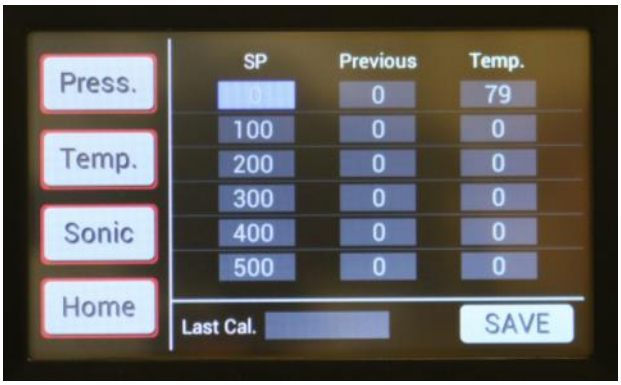


Pressure gauge connected for pressure calibration

3. Select the Press. tab
4. Press SP field on screen to select. (Previous value will show 0 if no previous calibration exists)
5. Wait for Raw value to stabilize.
6. Press Gauge field on screen.
7. Read value on the pressure gauge, and enter in this value in the Gauge field on screen.
8. Repeat for all SP fields.

Temperature:

Temperature calibration is needed periodically to ensure that the tests are conducted at correct Temperature. It is recommended to calibrate temperature at least once every 3 months.



1. Connect temperature calibrator as shown below.

Temperature calibrator connected for temperature calibration

2. Select the Temp. tab
3. Press SP field on screen to select. (Previous value will show 0 if no previous tests exists)
4. Set temperature calibrator to SP point.
5. Wait for temperature reading to stabilize.
6. Repeat for all set points.

Sonic:

Calibration is an important part of preparing the Twin Cell UCA for use. Calibration may be performed any time there is uncertainty about the test results. Without proper calibration, the UCA System provides inaccurate data.

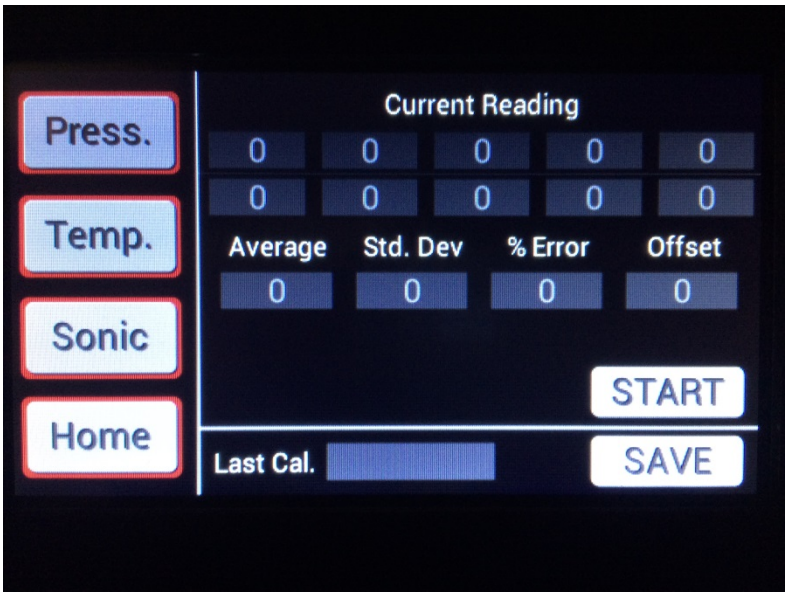
Calibrations must be performed on both of the cells when the Twin Cell UCA is first set up, when the ultrasonic transducers or cables are replaced, or every month if in continuous use. If the unit is used infrequently then calibrate before usage.

Calibration is performed by using a steel calibration rod which is supplied with the system. The chamber is assembled with the calibration rod and ultrasonic transducers installed.

See section 6 for more information.

1. Select the Sonic Tab,

2. If chamber is connected as per section 6 then select start



3. After screen is populated with good calibration values, select SAVE.

The following are the acceptable criteria for a good calibration:

- Avg.: The average of 10 readings that were generated as part of calibration is shown here. Typically this should be about 18 µs.

- Std. Dev.: The standard deviation of the 10 readings is shown in this field. During calibration with calibration rod this reading should be less than 0.2 for acceptable calibration.

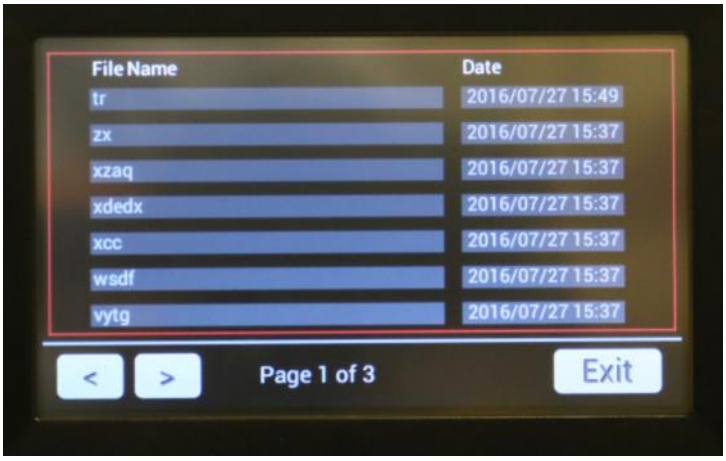
- % Err.: Percentage error is the difference of all readings from average calculated value. This value should be less than 1% for acceptable calibration.

- Offset: This is the offset as calculated during calibration. The offset time is additional delay that the system sees as compared to what a theoretical sample should read. The offset accounts for Cell wall thickness, any electrical delays in cables and latency in electronics. This value of offset is used arrive at the actual transit time through the actual cement sample. A value of 3 µs or less is required for successful calibration.

- When the calibration is finished the system checks the acceptance of calibration based on offset value. If calibration fails the user has to perform the calibration again. If the calibration passes then the user has a choice to save this as new calibration. The user can also discard the results of the new calibration by clicking cancel.

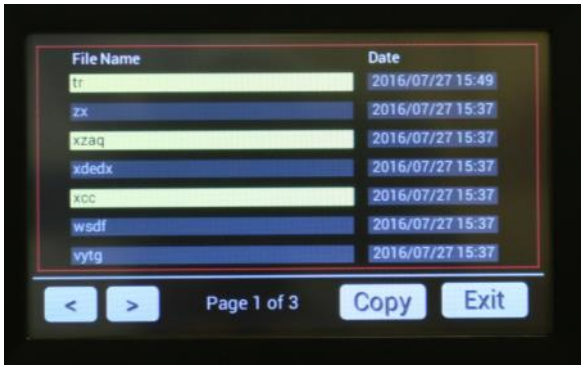
5.2.2.2 Data and Copying Files

This menu loads available data from a list of files saved on internal memory: Press < or > to scroll through pages of file names.



It also will copy files to a user provided USB drive, which can be connected on the front of the machine.

To select files, press the file name. The copy button becomes available when a file is selected. Note: copy desired files from each page before scrolling to the next page, as any selections are lost when < or > is pressed.



If no USB is connected, an error message will be shown.

5.2.3 Manual Settings Menu

The Manual button shows the following screen to enter manual control settings:

1. Temp SP: press and enter desired value using keypad which appears. Press Apply to have value take effect.
2. Pressure: press and enter desired value using keypad which appears. Press Apply to have value take effect.
3. Coolant Off: manual disengagement of the coolant application

CAUTION. As soon as Apply button is pressed, unit will try to control parameters to match setpoints within tolerances.

4. Next: this will display a menu to verify signal quality in transit time and a quality percentage and show temperature and pressure. The intent of the signal quality test is to validate the sonic subsystem for an optimized test.

NOTE. To test signal quality, a cell needs to be set up and calibrated.

NOTE. Before a test should be initiated, signal quality should meet the following criteria. With calibration rod, signal quality should be above 80%. With cement sample, it should be above 20%.

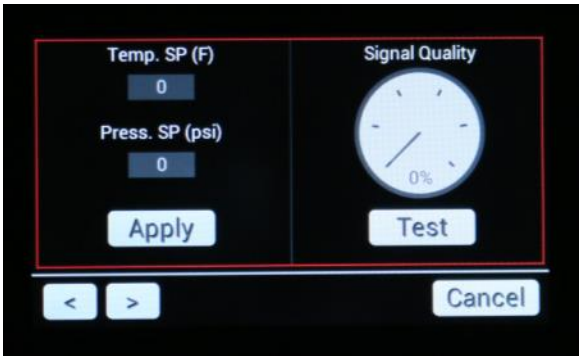
5.2.4 Start Menu – Starting a Test

The Start menu first displays new profile text fields to begin the test, with required fields marked with an asterisk. Each field can be selected by pressing the screen and text entered into the keypad that is subsequently displayed. Cement weight is chosen from a toggled list: Standard, Lightweight, and High Density. Press New to input steps and criteria for a new profile.

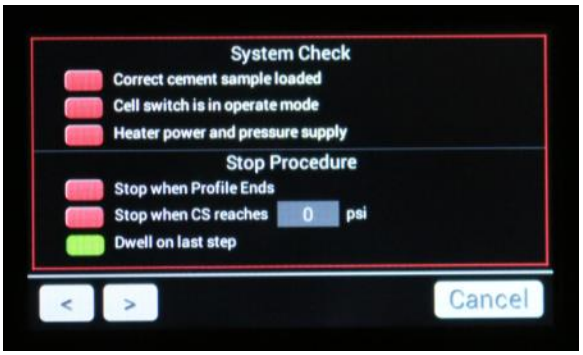
Press < or > to scroll through pages of file names and select a previous profile. Cancel will return the user to previous menu.

- Press a blank Step field to start a new step.
- Press an already populated step number to delete a step.
- Press < or > to scroll through other steps.
- Press fields for Time, Temperature, Pressure to enter in values on the keypad.
- Press field on Data Rate and Notify to select toggled choices (10 seconds, 30 seconds, 1 minute, 2 minutes, 5 minutes, 10 minutes). Note: data rates are independent for each step.
- Press a Step number to enter a new step's events, such as Time or Strength event as shown below:

While on the step event submenu, press > to preset temperature, pressure and test signal. Press Apply to have settings take effect.



After the signal check, press > to perform a system check and confirm stop procedures as shown below.



The system check has three components:

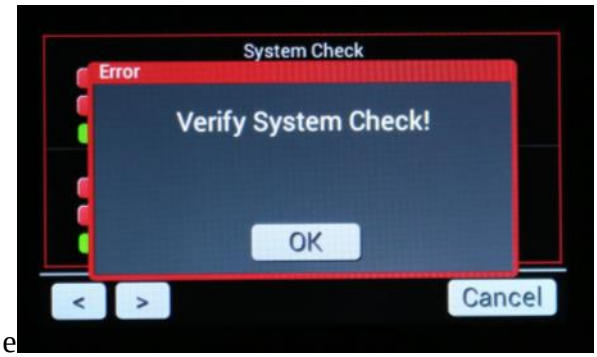
- Correct cement sample loaded (user to confirm)
- Cell switch is in operate mode (circular light is green, not red for standby)
- Heater power and pressure supply is connected and switched on (see unit back panel)

The stop procedure has three options

- Stop tests when chosen time has elapsed
- Stop test when chosen pressure is reached
- Have test remain on the last step chosen, maintaining temperature and pressure

MANDATORY ACTION. The first three items on the system check need to be confirmed by the user for the test to start. If not confirmed, an error message will appear.

e



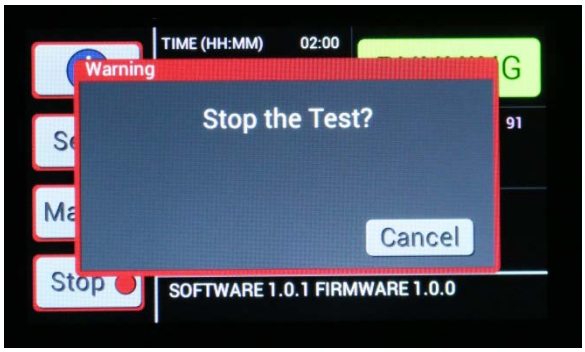
The test will now be running, and display will go to full screen mode after 10 seconds.

Press << to exit full screen, and return to menu options. Note the changes from the original screen since profile has been set up and test is now running:

- Idle status in the top right corner has now updated to Running
- Set points are now visible proximal to the current values for each parameter
- The start button is now a Stop button

5.2.5 Stopping a Test

Press the Stop button to stop the test. A confirmation screen will appear to confirm stopping the test while it is running.



CAUTION. Pressing the stop button will override all settings and stop unit.

6 Test Cell Setup

6.1 Assembling the Sample Chamber for Calibration

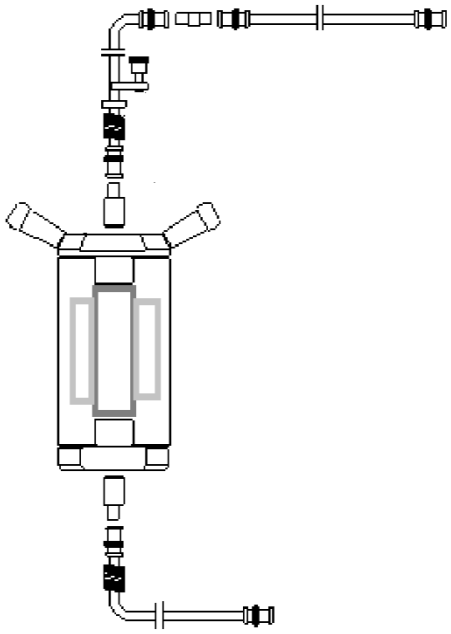
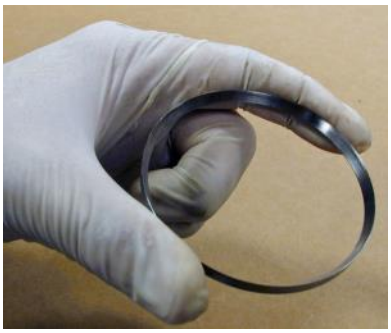


Figure 6-1 Test Chamber

NOTE. The top end of the test chamber body is marked.

To assemble the test chamber for calibration, perform the following steps:

1. Check the sealing components of the upper and lower covers of the test chamber. The sealing components are the O-rings, metal sealing rings, and retaining rings. Verify that they are in good condition; if not in good condition, replace them.



Inspection of the O-rings

2. Lightly lubricate the two covers and the O-rings by applying a high-temperature grease.

3. Place the lower cover (base) in a vise with the threaded end pointing up.

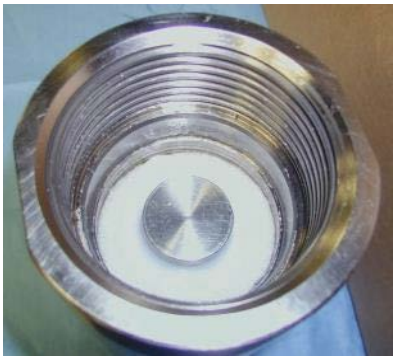
4. Screw the test-chamber body, bottom down, partially onto the base, leaving about ¾ in (2 cm) of threads exposed. The test-chamber body cannot be completely screwed on because the calibration rod would not fit into the test chamber if the covers were screwed on completely.

Autoclave chamber

NOTE. Be certain the bottom side of the test-chamber body is screwed onto the base. The inside of the test-chamber body is tapered from the bottom to top, so that the bottom has a greater inner diameter than the top. The top of the test-chamber body is labeled “top”; if this marking is obscured, compare the inner diameters of the ends of the chamber body to determine which is the top.

5. Apply a thin layer of high-temperature ultrasonic coupling gel to the ends of the calibration rod, and place the rod into the sleeve, using a foam centering ring.

Calibration rod and foam centering ring



Calibration rod and foam centering ring in the chamber

6. Apply a thin layer of high-temperature ultrasonic coupling gel to the ultrasonic transducer in the lid of the test chamber.

CAUTION. Verify that the ultrasonic transducers are free of debris and are not chipped or cracked. One grain of contaminant can ruin a test.

7. Screw on the lid of the test chamber until it comes into contact with the calibration rod. Both the lid and the base of the test chamber should be protruding about ¾ in (2 cm) to accommodate the calibration rod.

Chamber assembly with calibration rod

8. Apply a thin layer of high temperature ultrasonic coupling gel to the ultrasonic transducer in the bottom of the chamber.

9. Lift the test chamber by the handles and place it into the heated well of the UCA Autoclave. The test chamber will not fit all the way into the heated well because of the calibration rod. Rotate the test chamber clockwise a full revolution to ensure that the chamber is firmly seated in the heated well, to fully engage the bottom transducer.

10. Connect the BNC connector to the test-chamber lid.

Assembled test chamber with transducer

11. Make sure the Heater is turned OFF, and do NOT turn it on during calibration. Doing so causes the foam centering ring to melt. Calibration is then begun. Before ultrasonic testing can begin, the user must establish a base line for ultrasonic signal. The concept of calibrating the cell is to zero the time delays that may be present in electronics associated with ultrasonic transducers.

12. Refer to section 5.2.2.1 to follow software steps to perform the calibration

6.2 Removing the Test Chamber

To remove the test chamber, perform the following steps:

1. Disconnect the BNC connector from the test-chamber lid.

2. Remove the test chamber from the heated well.

3. Place the chamber in a vise, with the vise clamped around the base.

4. Unscrew and remove the lid and the test-chamber body. Remove the calibration rod and the sleeve.

5. Clean transducers with a clean, dry cloth only. Many solvents will damage the transducer.

6. Clean all the parts in a solvent appropriate for the high-temperature grease used when assembling the chamber.

7. Inspect the O-rings, metal sealing rings, and retaining rings for damage or corrosion. Replace them if necessary.

6.3 Preparing a Test Chamber for Running a Test

To prepare the test chamber for operation, follow the following steps.

1. Assembling the test chamber (test cell) for a slurry test is similar to assembling the chamber for calibration, except the calibration rod and foam centering ring are not used.

2. Check the sealing components of the upper and lower covers of the test chamber. The sealing components are the O-rings, metal sealing rings, and retaining rings. Verify that they are in good condition; if not in good condition, replace them.

3. Apply a very light film of high-temperature grease to the inside of the two covers up to the O-rings. Apply a light film of high-temperature grease to the O-ring surface.

4. Apply a very light film of high-temperature grease throughout the inside of the test-chamber body up to the threads.

5. Place the lower cover (base) in a vise with the threaded end pointing up.

6. A reusable sleeve is available to create samples suitable for a crush tests on a cured cement slurry sample. If used, grease the sleeve heavily on all surfaces and then insert the sleeve firmly into the base.

Groove in bottom test chamber lid for sample sleeve

7. Apply a heavy layer of grease to the threads of the upper and lower lids.
8. Screw the test-chamber body, bottom down, fully onto the base.

NOTE. It may be necessary to use the O-ring Seating Tool and Feed Sleeve to keep the bottom lid O-ring from becoming displaced while threading on the test chamber body.

Seating sample sleeve into bottom lid groove

CAUTION. Be certain the bottom side of the test-chamber body is screwed onto the base. The inside of the test-chamber body is tapered from the bottom to the top, so that the bottom has a greater inner diameter than the top. The top of the test-chamber body is labeled “top”; if this marking is obscured, compare the inner diameters of the ends of the chamber body to determine which is the top.

9. Mix the cement slurry and pour cement into the sample sleeve.

Pouring cement slurry into sample sleeve

Fill the sample sleeve to the top

CAUTION. Do not overfill the sample sleeve so cement spills outside the sleeve.

10. Slowly fill the chamber with water up to the top of the chamber to about ⅜ in from threads.

Pouring water around sample sleeve

Water just covers the cement slurry

6.3.1 Alternate Fill Method, without Sample Sleeve

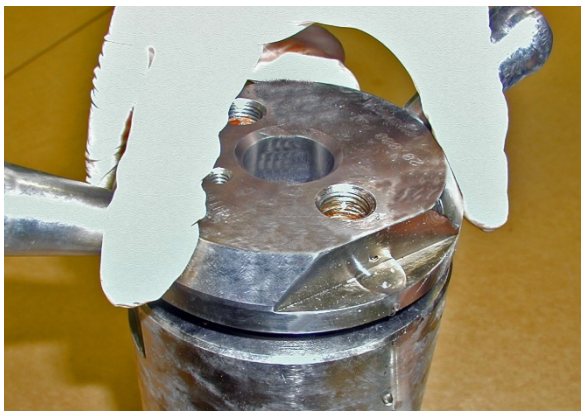
1. Place a slurry level gauge on top of the open UCA Autoclave test chamber.
2. Pour slurry into the chamber between the “wet” and “dry” levels marked on the gauge.

Slurry level gauge

3. Pour water over the top of the slurry until the volume reaches the “fill water to this level” mark.

CAUTION. When performing tests without the sample sleeve, the thermocouple MUST be fully removed BEFORE attempting to unscrew the test chamber lid. Failure to remove the thermocouple results in it becoming bent and possibly unusable.

4. Screw the sample chamber cap into the chamber. Observe for water to be displaced through the high pressure connection or thermocouple hole in the cap. The presence of water at either or both of these openings indicates the chamber is properly filled with water, and excess air is displaced from the chamber.



Tightening top lid, water expelled through open port

Water coming out of test chamber lid

Top lid fully tightened

5. Insert a thermocouple into the cap and fully tighten it.

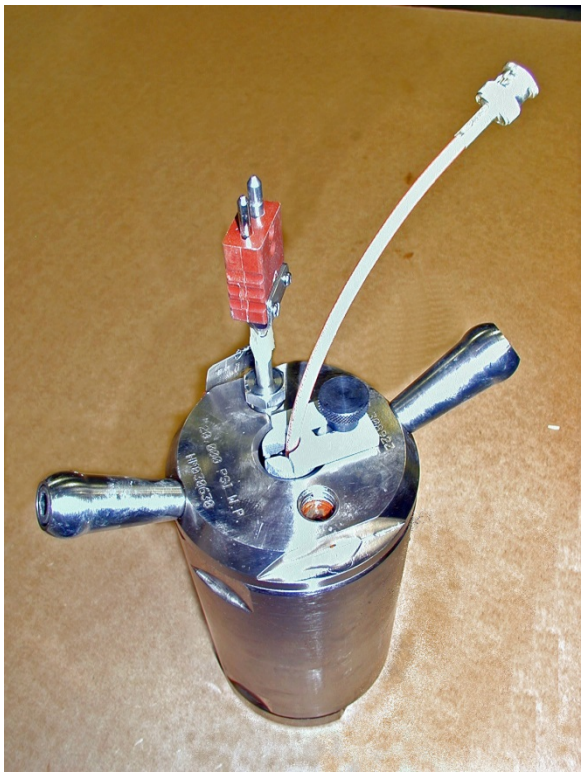
6. Connect a transducer to either end of the short coax cable. Apply ultrasonic coupling gel to a transducer, approximately 1/4 inch diameter by 1/8 inch thick. Insert the transducer into the pocket in the sample chamber cap.

Coupling gel on transducer

Inserting the transducer into the top lid

7. Slide a compression spring over the coax cable and up to the back of the transducer.

8. Secure the transducer into the sample chamber cap with the spacer washer, retaining bracket, and thumb screw.



Assembled test chamber with thermocouple and transducer

9. Look inside the heating jacket to verify that the bottom transducer and compression spring are in place. Apply ultrasonic coupling gel to a transducer, approximately 1/4 inch diameter by 1/8 inch thick. Place the transducer and spring into the tube extending upwards from the heating jacket base.

Bottom transducer in heating jacket

10. Lift the assembled test chamber by the handles and slowly lower it into the Twin Cell UCA heating jacket. Rotate the test chamber clockwise one full revolution to ensure that the chamber is firmly seated in the heating jacket.

11. Connect the high pressure U-Tube to the test chamber cap and to the bulkhead connection on the top of the Twin Cell UCA, and securely tighten both connections.

12. Connect the top transducer coax cable to the top connector on the front of the Twin Cell UCA.

13. Connect the top cap thermocouple to the thermocouple connector on the front of the Twin Cell UCA.

14. Check for leaks at all high pressure fittings. Release all pressure from the UCA Autoclave before attempting to resolve any leaking fittings.

6.3.2 Starting a Test

Once the chamber is assembled and in the autoclave, the test can be started. See section 5.2.4 for setting up a test using Twin Cell UCA software.

6.3.3 Ending a Test

Based on how the test is configured to run, the test may end when profile ends, or it may end when compressive strength achieves a target value or it may be dwelling on the last step. See section 6.4.3 for stop a test in the software.

7 Troubleshooting and Maintenance

If extensive maintenance or service of the instrument is required, please contact Fann Instrument Company. For your convenience:

1. To engage standby mode, press the circular button on the front of the machine for cell (Cell 1 or Cell 2) the user wishes to stop heat and pressure.

2. If the red light is blinking, this indicates an operational error.

8 Accessories

Table 8-1 Accessory Kit, Air Regulator, Twin Cell UCA Part Number 102572827

Part Number	Description
102271707	FILTER REGULATOR, MIST SEPARATOR 1/4IN NPT PORT NORMALLY OPEN, ROUNT TYPE PRESSURE GAUGE WITH LIMIT INDICATOR,WITH BOWL GUARD, PRESSURE GAUGE IN IMPERIAL UNITS.
100023811	CONNECTOR, PLASTIC TUBING, 90 DEG, 1/4 TUBE X 1/4 MPT, MILLER INSTANT TUBE, LEGRIS, 31095614
394028	TUBING 1/4 OD CLEAR POLYURETHANE PNEUMATIC, 33 METER COIL
100112806	SCREW, SOCKET HEAD CAP, #10-32 UNF X 3/8, STAINLESS STEEL, HEXAGONAL SOCKET
208704	WASHER SPLIT 10 STAINLESS STEEL

9 Parts List

Table 9-1 Twin Cell UCA 102551791 Parts List

Item No.	Part No.	Quantity	Description
0001	102551794	1	ASSEMBLY, ENCLOSURE FRAME, MODEL 420ATC, TWIN CELL UCA
0002	102551800	1	ASSEMBLY, 5K PSI PUMP INSERT, MODEL 420ATC, TWIN CELL UCA
0003	102572828	1	ACCESSORY KIT, WATER FILTER, TWIN CELL UCA
0005	102551789	2	U-TUBE, 30K HIGH PRESSURE TUBING, FOR ASSEMBLY, 5K AND 20K PSI PUMP INSERT, MODEL 420ATC, TWIN CELL UCA
0006	102551788	2	KIT, PRESSURE CHAMBER ASSEMBLY, UCA, HIGH PRESSURE, HIGH TEMPERATURE
0007	102554870	2	CABLE ASSEMBLY, THERMOCOUPLE EXTENSION, 3-PRONG MINIATURE CONNECTORS, 3 WIRE TYPE J
0008	100004319	2	THERMOCOUPLE, TYPE J, 20KPSI, SPEC
0009	102572836	1	CABLE ASSEMBLY, FOR ELECTRICAL BOX TO PUMP BOX INSERT, TWIN CELL UCA
0010	100072557	2	KIT ACCESSORIES UCA AUTOCLAVE
0011	100071996	1	KIT, TOOL, ULTRASONIC CEMENT ANALYZER AUTOCLAVE
0012	102572837	2	U-TUBE, CELL PRESSURE PORT, TWIN CELL UCA
0013	203964	2	FILTER 35 MICRON INLINE 60K PSI
0014	101392264	2	60K MALE TO MALE 1/4 HIGH PRESSURE CONNECTOR HIP 60-21HM4HM4

Table 9-2 Twin Cell UCA Accessory Kit 102572827 Parts List

Item No.	Part No.	Quantity	Description
0001	102271707	1	FILTER REGULATOR, MIST SEPARATOR 1/4IN NPT PORT NORMALLY OPEN, ROUNT TYPE PRESSURE GAUGE WITH LIMIT INDICATOR,WITH BOWL GUARD
0002	100023811	3	CONNECTOR, PLASTIC TUBING, 90 DEG, 1/4 TUBE X 1/4 MPT, MILLER INSTANT TUBE, LEGRIS
0003	394028	1	TUBING 1/4 OD CLEAR POLYURETHANE PNEUMATIC, 33 METER COIL
0004	100112806	2	SCREW, SOCKET HEAD CAP, #10-32 UNF X 3/8, STAINLESS STEEL, HEXAGONAL SOCKET
0005	208704	2	WASHER SPLIT 10 STAINLESS STEEL

10 Warranty and Returns

10.1 Warranty

Fann Instrument Company warrants only title to the equipment, products and materials supplied and that the same are free from defects in workmanship and materials for one year from date of delivery. THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED OF MERCHANTABILITY, FITNESS OR OTHERWISE BEYOND THOSE STATED IN THE IMMEDIATELY PRECEDING SENTENCE. Fann's sole liability and Customer's exclusive remedy in any cause of action (whether in contract, tort, breach of warranty or otherwise) arising out of the sale, lease or use of any equipment, products or materials is expressly limited to the replacement of such on their return to Fann or, at Fann's option, to the allowance to Customer of credit for the cost of such items. In no event shall Fann be liable for special, incidental, indirect, consequential or punitive damages. Notwithstanding any specification or description in its catalogs, literature or brochures of materials used in the manufacture of its products, Fann reserves the right to substitute other materials without notice. Fann does not warrant in any way equipment, products, and material not manufactured by Fann, and such will be sold only with the warranties, if any, that are given by the manufacturer thereof. Fann will only pass through to Customer the warranty granted to it by the manufacturer of such items.

10.2 Returns

For your protection, items being returned must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Fann will not be responsible for damage resulting from careless or insufficient packing.

Before returning items for any reason, authorization must be obtained from Fann Instrument Company. When applying for authorization, please include information regarding the reason the items are to be returned.

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Toll Free: 800-347-0450
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