CEMENT TEST EQUIPMENT, INC.

Tulsa, Oklahoma, USA

M2-450-230

Stirred Fluid Loss Tester

Instruction Manual

CEMENT TEST EQUIPMENT, INC.

Stirred Fluid Loss Tester

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Chapter 1

Introduction

This chapter contains general information about the Stirred Fluid Loss Tester and its uses as well as detailed specifications for the instrument and installation instructions.

What is a Stirred Fluid Loss Tester used for?

ICON KEY	
	Important information
	Potential Danger or Safety Hazard
!	Operational Warning

Cements are a critical element in the drilling, completion, workover, and abandonment of wells. For each application, a cement slurry is designed with specific properties and is given additives that provide predictable slurry density, volume, viscosity, compressive strength, fluid loss, gas migration, and thickening time. A stirred fluid loss tester is used to determine the quantity of free fluid that is available in a given slurry as it is mixed under simulated downhole conditions of temperature and pressure.

Description of Instrument

The CTE stirred fluid loss tester consists of a pressure vessel that is capable of achieving pressures up to 2,000 psig/13.8 Mpa and temperatures up to 450°F/232°C. The pressure is applied using high pressure nitrogen gas. Heat is applied to the cylinder using a heating/cooling jacket and may be rapidly cooled by circulating cooling water through the jacket after completion of a test. The pressure vessel includes a stirring paddle that rotates at 150 rpm. A standard 325 mesh screen is used as the filter medium to determine the amount of free water in a slurry. A filtrate cooling jacket is included for tests above 200°F/ 95°C.

The major features of the CTE Stirred fluid loss tester are listed below:

- Easy to install and use.
- Stirring is done using a flexible drive shaft.
- Digital controller.
- Easily replaceable bearings and packing.
- All stainless steel pressure vessel.
- Conforms to API Specification 10.
- Simple to use filtrate cooling jacket in place of filtrate receiver.
- Internal cooling coils for rapid oil cooling between tests.
- Unique back flow preventer eliminates the need for a messy, hard to clean stand pipe.

Instrument Specifications

The specifications below apply to the CTE, Inc. M2-450-230 Stirred fluid loss tester.

ELECTRICAL

Input Voltage:	230 VAC (±15%)
Input Power:	1,500W
Input Current:	7 A (230 VAC)
Input Frequency:	50/60 Hz

MECHANICAL

Height:	34 in. (86 cm)
Width:	23 in. (58 cm)
Depth:	28 in. (71 cm)
Weight:	150 lb. (68 kg)

ENVIRONMENTAL

Operating Temperature:	(32 to 120°F) 0-50°C
Operating Humidity:	0-95% non-condensing

HEATER

Heater Power:	1,000 W
Heater Type:	Cast heating jacket
Heater Control:	Solid state relay

UTILITIES – WATER, NITROGEN, AND ELECTRICITY

Compressed nitrogen:	up to 3000 psig (207 bar)
Cooling water pressure:	100 psig (6.8 bar) maximum
Utility Inlets:	¼ inch female NPT

Installation

Upon uncrating the instrument, verify that the instrument and any spare parts on the packing list have been received and are undamaged. Notify CTE if anything is missing or damaged. The temperature controller may have been removed from its sleeve prior to shipping and may need to be reinstalled prior to use.

It is a good idea to leave room behind the instrument so that qualified personnel may have service access. If this is not possible, try to make the unit easy to disconnect and move for service.

Once the instrument has been moved to its desired location, compressed nitrogen, water, and electrical connections can be made. The nitrogen inlet, water inlet, and water drain connections are each ¼ inch female NPT connections and are located on the rear of the instrument. A number of ¼ inch male NPT to 8mm tube fittings are included for international locations.

Connect the cooling water to the connector labeled **COOLING WATER INLET** on the rear panel of the instrument. The fitting has a ¼ inch female N.P.T. connection. The water must be clean and free of debris. If in doubt, a water filter or strainer is recommended.

Connect the water drain line to the connector labeled **COOLING WATER DRAIN** on the rear panel of the instrument. The fitting has a ¼ inch female N.P.T. connection. The drain system should be metal as it may be required to carry hot water or steam periodically.

Never use oxygen or compressed in place of nitrogen. If compressed oxygen comes in contact with oil or grease, it can cause a spontaneous explosion.

Connect compressed nitrogen to the connector labeled **NITROGEN INLET** on the rear of the instrument. The fitting has a ¼ inch female N.P.T. connection. Never use compressed air or oxygen in place of nitrogen. Doing so could cause a potentially hazardous condition to exist.

Electrical connections are made using the receptacle on the rear of the instrument. A power cord is supplied with the instrument. Please observe the following precautions when making the wiring connections.

- Wiring should be done by a qualified electrician in accordance with local electrical codes.

- The instrument should be securely connected to a separate earth ground. The ground wire must be larger in diameter than the supply conductors. A 14 gauge or larger ground wire is recommended.

- An 8BC or larger fire extinguisher to fight electrical fires should be placed within 50 feet of the instrument.

Before attempting to operate the instrument, it is recommended that the operators read the remainder of the manual and study the drawings that appear in the Drawings/Schematics section of this manual to become familiar with the stirred fluid loss tester operation.

Chapter 2

Using the Temperature Controller

The complete temperature controller manual is included for reference. This chapter contains brief instructions on how to use the most common functions of the temperature controller.

About the Temperature Controller

The temperature controller is a fully functional, self-tuning, digital controller. This manual will briefly describe the two functions most often used by operators—ramp and dwell programming. All other features of the controller have been pre-set at the CTE factory and should not be changed in most circumstances. It may be beneficial to refer to the Temperature Controller's Installation and Operation Handbook.

FRONT PANEL LAYOUTS

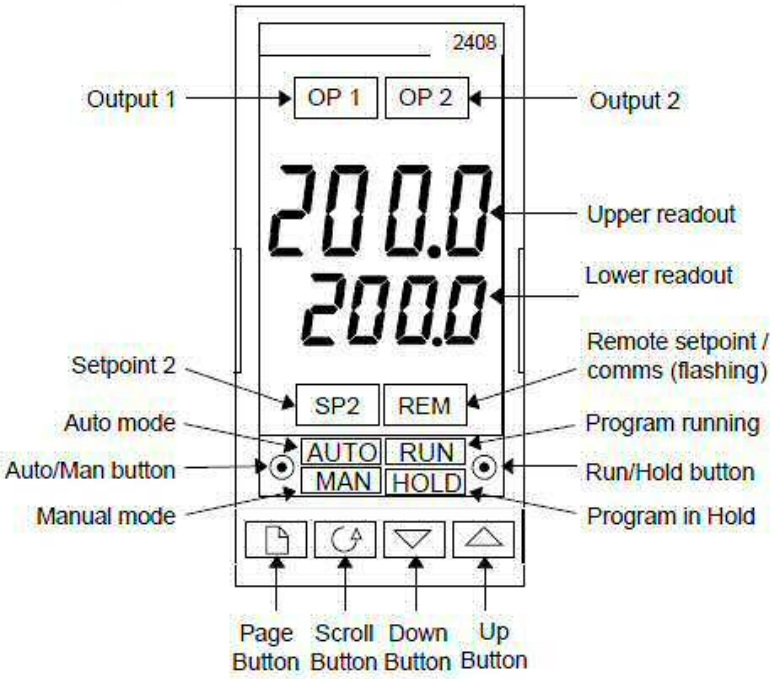
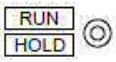


Figure 2-1 Model 2408 front panel layout

Button or indicator	Name	Explanation
OP1	Output 1	When lit, it indicates that the output installed in module position 1 is on. This is normally the heating output on a temperature controller.
OP2	Output 2	When lit, it indicates that the output installed in module position 2 is on. This is normally the cooling output on a temperature controller.
SP2	Setpoint 2	When lit, this indicates that setpoint 2, (or a setpoint 3-16) has been selected.
REM	Remote setpoint	When lit, this indicates that a remote setpoint input has been selected. 'REM' will also flash when communications is active.
	Auto/Manual button	When pressed, this toggles between automatic and manual mode: • If the controller is in automatic mode the AUTO light will be lit. • If the controller is in manual mode, the MAN light will be lit. The Auto/Manual button can be disabled in configuration level.
	Run/Hold button	• Press once to start a program (RUN light on.) • Press again to hold a program (HOLD light on) • Press again to cancel hold and continue running (HOLD light off and RUN light ON) • Press and hold in for two seconds to reset a program (RUN and HOLD lights off) The RUN light will flash at the end of a program. The HOLD light will flash during holdback.
	Page button	Press to select a new list of parameters.
	Scroll button	Press to select a new parameter in a list.
	Down button	Press to decrease a value in the lower readout.
	Up button	Press to increase a value in lower readout.

WHAT IS SETPOINT PROGRAMMING?

Many applications need to vary temperature, or process value, with time. Such applications need a controller which varies a setpoint as a function of time; all 2408 and 2404 models can do this.

The setpoint is varied by using a *setpoint program*. Within each 2408 and 2404 controller, there is a software module called *the programmer*, which stores one, or more, such programs and drives the setpoint according to the selected program. The program is stored as a series of 'ramp' and 'dwell' segments, as shown below.

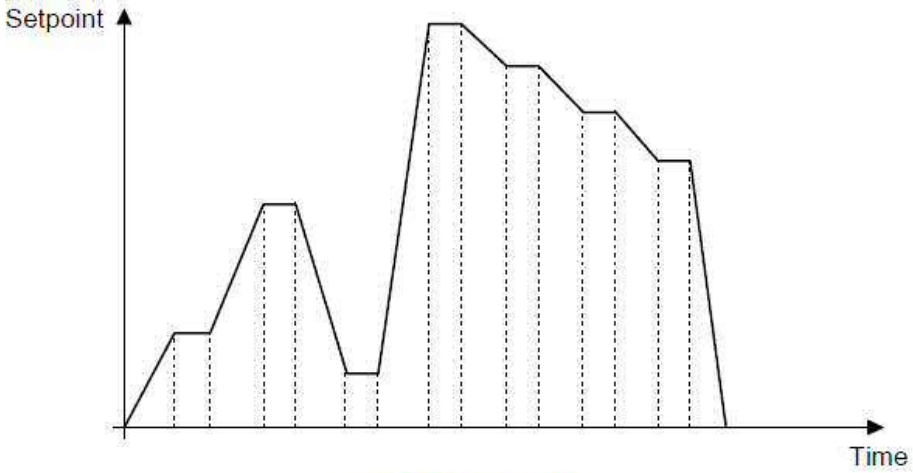


Fig 5-1 Setpoint profile

Programming a Ramp and Dwell Temperature Profile

To program a single or dual ramp and dwell profile, follow the steps below. Refer to Chapter 5-11 in the Temperature Controller Operation Handbook for more complete instructions on temperature controller programming. The example below will describe how to program a ramp from 20°C (room temperature) to 180°C in 90 minutes, a second ramp from 180°C to 200°C in 240 minutes, and a continuous dwell at 200°C.

1. ProG/LiSt > From the home display press the page button  until you reach the ProG/LiSt header.

   Press 

2. Hb/OFF > Leave the holdback disabled in the OFF position.

   Press 

3. Hb U/0 > Leave the holdback value at 0.

   Press 

4. rmP.U/min > Select min for ramp units

   Press 

5. dwL.U/min > Select min for dwell units

   Press 

6. CYC.n/1 > In this example we are only running one program cycle, select 1.

   Press 

7. SEG.n/1 > Select 1.

   Press 

8. tYPE/rmP.t > For this segment type we will choose to ramp to a new setpoint in a set time. Select rmP.t.

Press 

9. tGt/180 > For this example the target setpoint is 180 degrees Celsius. Select 180.

Press 

10. dur/90 > For this example our duration time in this segment is 90 minutes. Select 90.

Press 

11. SEG.n/2 > Select 2.

Press 

12. tYPE/rmP.t > Select rmP.t.

Press 

13. tGt/200 > For this example, our second ramp is to 200 degrees Celsius. Select 200.

Press 

14. dur/240 > Duration time for segment two is 240 minutes. Select 240.

Press 

15. SEG.n/3 > Select 3.

Press 

16. tYPE/End > For this example, we have chosen to dwell at 200 degrees Celsius continuously. Select End.

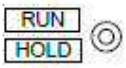
Press 

17. End.t/dwEll > Select dwell for an indefinite dwell.

Press  to return to the ProG/LiSt header.

Running a program using the RUN/HOLD Button

If there are multiple programs programmed into the controller, you must first select the number of the program that you want to run. Do this in the 'run' list. Then:

	RUN / HOLD button	Press once to run a program (RUN light on) Press again to hold a program (HOLD light on) Press again to cancel hold and continue running (HOLD light off, RUN light on) Press and hold in for two seconds to reset a program (RUN and HOLD lights off).

The heater power switch on the front panel must be turned on after you have initiated a program!

Chapter 3

Front Panel Controls

Chapter 3 will discuss in detail each front panel control found on the stirred fluid loss tester.

It may be convenient to refer to the piping drawings in Chapter 6 when studying this section.

All the functions of the stirred fluid loss tester are controlled from the front panel. It is very important for the user to have a thorough understanding of each control and its effect on the operation of the instrument.

The front panel controls can be roughly divided into three different sections: the pneumatic controls, the cooling water controls, and the electrical/electronic controls. This chapter will discuss each section in detail.

The Pneumatic Controls

The pneumatic section consists of the **CYLINDER PRESSURE** gauge and the nitrogen pressure **REGULATOR**. The components in this section are used to apply pressure to the pressure vessel during testing.

The pressure gauge displays pressure in both English and SI units.

The **CYLINDER PRESSURE** gauge indicates how much nitrogen pressure is being supplied to the pressure vessel. The pressure vessel also has its own pressure gauge so the two gauges should display approximately the same pressure. The part number for this gauge is C-1014.

The **CYLINDER PRESSURE REGULATOR** is used to control the nitrogen pressure to the test cylinder. Turn the regulator knob clockwise to increase the pressure and counterclockwise to decrease the pressure. This regulator is non-venting so pressure must be released manually from the test cylinder via the valve located on top of the pressure vessel. The regulator is non-venting because it prevents cement or free water from backing up into the pressure regulator and damaging it.

Releasing pressure from the stainless steel pressure hose can be achieved by using a 9/16" wrench and loosening the nut at the end where it is connected to the front panel. Be careful as high pressure gas will escape. Turn off the supply gas before you attempt this otherwise gas will continue to flow.

The Cooling Water Controls

The cooling water controls are used to cool the cylinder after a test and the filtrate (free water) removed from the cell during a test (if necessary). The cooling water controls consist of a **CYLINDER COOLING** valve and a **FILTRATE COOLING** valve.

The **CYLINDER COOLING** valve allows water to flow through the cooling coils surrounding the pressure vessel. This valve should be turned on at the completion of a test to cool the pressure vessel, but should remain closed during testing. The part number for this valve is C-0056.

The **FILTRATE COOLING** valve allows water to flow through the filtrate cooling jacket. The cooling jacket may be attached to the bottom of the test cylinder via a quick connect fitting during the filtration portion of the test to cool the filtrate as it exits the test cell. This is done to prevent the loss of filtrate as steam. This is generally only necessary for tests that exceed 200°F/95°C. The part number for this valve is C-0056.

The Electrical Controls

The primary electrical controls are the **POWER**, **HEATER**, **MOTOR**, and **TIMER** switches. These controls are discussed in detail below.

The switch labeled **POWER** controls electrical power to the entire instrument. The heater and motor are inoperable if this switch is not on. The switches labeled **HEATER, MOTOR** and **TIMER** turn on power to the heater, stirring motor, and elapsed timer, respectively. The part number for the **POWER, MOTOR,** and **HEATER** switches is C-0075 and the part number for the **TIMER** switch is C-0076. The timer itself is a C-0200.

A part number C-0516 thermocouple is plugged into the **THERMOCOUPLE** connector so the temperature of the test cell may be controlled and monitored. The thermocouple is inserted into one of the holes in the pressure vessel cylinder.

Timer runs in minutes and hours and counts 60 minutes as 1 hour. To reset the timer it is necessary to turn the on/off switch to the on position and then press and hold the black rubber button next to the LCD until the number reset to zero. Turn the on/off switch to off and it is ready to run the next time it is used.

This completes our tour of the front panel components. The operation of these components will be discussed in greater detail along with examples in Chapter 4, *Operation and Calibration*.

Chapter 4

Operation

Chapter 4 will discuss in detail the steps required to operate a stirred fluid loss tester. Examples will be provided when necessary.

The stirred fluid loss tester has some of the characteristics of an atmospheric consistometer and some of a static fluid loss cell. The slurry is conditioned in the test cell using heat and a rotation paddle, much the same as an atmospheric consistometer would be used.

After the slurry is conditioned, the free water (filtrate) is filtered out using a standard 325 mesh screen, much in the same way that a static fluid loss cell would be used. The stirred fluid loss tester eliminates the need to transfer the hot slurry from an atmospheric consistometer to a static fluid loss cell.

Stirred fluid loss tester Operation

This section provides detailed instructions on stirred fluid loss tester operation. **Refer to Chapter 5 for detailing cleaning and maintenance instructions along with this section.**

1. Close both cooling water valves on the front panel. Make certain the HEATER and MOTOR switches are in the OFF position. Make certain the CYLINDER PRESSURE regulator is turned counterclockwise (CCW) as far as it will go.

2. Turn POWER switch to the ON position. This supplies power to the entire instrument. Wait a few seconds until the temperature controller initializes.

3. Program the temperature ramp and soak parameters into the temperature controller. Refer to *Chapter 2* or the *Temperature Controller User's Manual* for detailed information.

4. Thoroughly clean the entire pressure vessel assembly and verify all components are free from defects. Be cautious when disassembling to avoid damaging any threads or surfaces. Assemble the clean and prepared test cell. Clean the valve stem and cavity. Replace the stem valve o-ring and lightly grease. Clean and then apply anti-seize compound to the threads of the valve stem, top plug and bottom plug. Refer to chapter 5 for further maintenance and troubleshooting requirements. Make certain the bearing under the paddle is well lubricated with grease and that there are no cement particles between the paddle shaft and bearing. If the bearing is worn excessively, it should be replaced. Make certain the threads and o-rings are well greased. Clean and grease the 15-0026 or 15-0026-2 Back Flow Preventer periodically to prevent it from becoming cemented in place. It may be useful to refer to drawing 15-0020 Cylinder Assembly located in the back of this manual.

5. Make certain that the 15-0028 Packing Gland on the bottom plug is tight.

6. Fill the test cell with cement no higher than the top of the paddle. Filling the test cell any higher will cause the paddle to be in the slurry during the filtration portion of the test.

7. DO NOT FILL THE CYLINDER MORE THAN HALF FULL OF ANY LIQUID. DOING SO MAY CAUSE A DANGEROUS OVERPRESSURE CONDITION IF THE CYLINDER IS HEATED. During normal operation of the instrument, the slurry is able to expand into the pressurized gas blanket over the slurry causing only a small increase in pressure. If the slurry does not have room to expand, it may cause the internal cylinder pressure to exceed the maximum pressure of the instrument.

The top and bottom plugs are sealed using o-rings. Overtightening the cell caps will not make them seal better. It will only cause removal difficulty.

8. Be sure the C-0295 Screen is properly in place in the top of the test cell.

9. Make certain the valve on the top plug is open. This will prevent pressure build up in the cylinder that may force cement into the backflow preventer element. Screw the top plug into place. Do not over tighten.

10. Carefully lower the test cell into the heating/cooling jacket. You can rotate the heating/cooling jacket 90° to allow easier insertion if necessary.

11. Rotate the test cell until the flats on the bottom plug engage the flats on the bottom cylinder support. This will prevent rotation of the cylinder during the test.

12. Insert the thermocouple into the opening in the wall of the pressure vessel. It is probably best to use the hole in the bottom of the test cell, but either thermocouple hole may be used as desired.

13. DO NOT REMOVE THE THERMOCOUPLE FROM THE CELL FOR A LONG PERIOD OF TIME IF THE TEMPERATURE CONTROLLER IS OPERATIONAL. DOING SO MAY CAUSE A DANGEROUS HEATER RUNAWAY CONDITION.

14. Close the valve at the top of the test cell.

15. Connect the flexible drive shaft to the 15-0025 Paddle Shaft using the set screws. Do not over tighten the set screws.

16. Connect the high pressure nitrogen line to the bottom of the test cell using the quick connect fitting. Do not disconnect this quick connect fitting when there is pressure on it. The pressure rating is significantly less when the quick connect fitting is disconnected.

17. Turn the MOTOR switch to the ON position.

18. Using the CYLINDER PRESSURE regulator, adjust the nitrogen pressure to the desired test pressure. If the pressure becomes too high during a test, some nitrogen may have to be released from the valve on top of the test cell. However, as long as the cell is only half full of slurry, the pressure should not increase a dramatic amount during a test.

19. Turn HEATER switch to the ON position and press the START/RUN key on the temperature controller until the RUN LED is on continuously. Refer to *Chapter 2* for complete instructions on operating the temperature controller.

20. Turn the TIMER switch to the ON position**.**

CAUTION: The top of stirred fluid loss tester may become extremely hot. Severe burns can result from touching the pressure vessel or plug.

Allow the slurry to be conditioned for the appropriate length of time. When the slurry has been conditioned, follow the steps below to begin the filtration process.

1. Turn the MOTOR switch to the OFF position.

2. The temperature controller may also be stopped now if desired. If the temperature controller is stopped and the HEATER switch is in the OFF

position, the thermocouple may be removed. Otherwise the thermocouple must be left in place to prevent a heater runaway.

3. Loosen the set screws attaching the flexible drive shaft to the paddle shaft and remove the drive shaft. Be careful not to burn yourself on the hot test cell.

4. After insuring that the test cell is held in place by the top plunger, carefully invert the test cell. Do not disconnect the high pressure nitrogen hose.

5. Place a beaker or other container under the test cell pressure release valve.

6. If the test temperature was 200°F/95°C or below, the valve may be opened, allowing the filtrate to drain out. If the test temperature was above these values, the filtrate cooling jacket must first be attached using the quick connect coupler.

7. After the cooling jacket has been attached, open the FILTRATE COOLING valve to start water flowing through the filtrate cooling jacket. The test cell pressure release valve may now be opened to allow the filtrate to drain.

8. Allow the filtrate to drain for the prescribed time, generally 30 min. Record the data as required. In order to simplify data recording, the electronic balance may be used to determine the volume of the free water drained from the cell.

When the prescribed data recording time has ended or when nitrogen gas comes out the valve continuously for more than 1-2 minutes, the test is complete. The slurry may now be removed from the cell.

Stopping a Test

When the cement has dehydrated for the desired time and it becomes necessary to stop the test, follow the steps below.

1. Turn the HEATER switch to the OFF position.

2. Press the RUN/START key on the temperature controller to stop the program. The RUN LED should not be lit and the L1 LED should be off. If the RUN LED is off and the L1 LED is on, use the down arrow key (⇩) to lower the set point such that the set point is below ambient. The L1 LED will then go off.

3. Slowly open the CYLINDER COOLING valve to start the flow of cooling water through the internal cooling coils.

- Do not remove the cylinder until the instrument has cooled below 200°F/93°C. Doing so may cause any water in the cylinder to turn to steam causing a hazardous condition. Also maintain a pressure of at least 500 psig (34 bar) to prevent steam from forming inside the vessel.

4. When the test cell has cooled sufficiently, turn the CYLINDER PRESSURE regulator counterclockwise (CCW) as far as it will go. Open the pressure release valve on the cell and leave it open.

5. A pressure release valve stem is also located on the bottom plug. This valve must be opened to vent pressure that may be trapped in the cylinder. This valve may be opened with a flat bladed screwdriver. The pressure on the front panel gauge and the test cell gauge should go to zero as the pressure escapes.

6. When all the pressure has been released from the cylinder, remove the thermocouple.

7. Pull the plunger on the top of the heating/cooling jacket cover back and remove the test cell from the jacket.

8. While ensuring there is no pressure inside the cylinder, slowly remove the top cell cap. If the cap comes off unusually hard, it may mean that pressure is trapped inside the vessel.

9. After the top plug has been removed, remove the bottom plug and thoroughly clean all the cement from the test cell.

10. Remember to grease the bearings and o-ring in preparation for the next text.

The fluid loss test is now complete.

Chapter 5

Maintenance and Troubleshooting

This chapter contains information about the necessary periodic maintenance of the stirred fluid loss tester as well as common service and troubleshooting guidelines.

Maintenance

Stirred fluid loss testers can be relatively reliable and trouble free—provided they are serviced and maintained properly. Instruments that are neglected and receive infrequent service or are subject to abuse are certain to cause trouble. The maintenance requirements for the stirred fluid loss tester are very simple and should consume little time.

The first maintenance item is to thoroughly clean the complete test cylinder after every test. Remove all cement, grease, anti-seize, etc. from the pressure vessel assembly. Either replace or remove and re-coat all O-rings with supplied red grease. Coat the cylinder and plug threads with high-temperature anti-seize compound. Also lubricate mating surface between the paddle shaft and the bronze bearing with red grease. Make certain that any cement particles that get between the bearing and the shaft are cleaned out or else the cement particles will act as an abrasive and wear the bearing out very quickly.

If the valve stem on the bottom plug has been opened, then it must be removed and thoroughly cleaned of cement particles. Failure to do so may allow the valve stem to leak which may create a dangerous pressure no-release situation where the cement has invaded the valve stem hole and backing out the valve stem doesn't release pressure until the stem is completely removed. This may cause the valve stem to become a projectile causing serious injury.

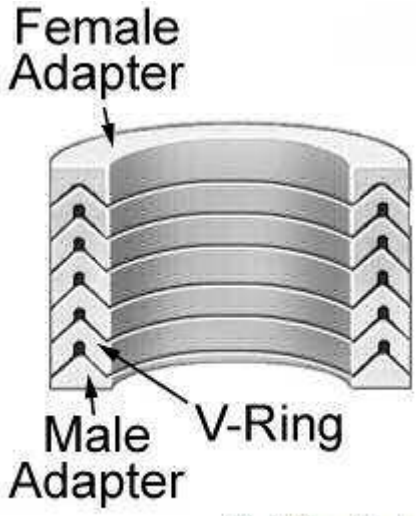
Remove, clean, and grease the 15-0026, Back Flow Preventer periodically. It is the small black plug screwed into the inside of the bottom plug. This device is used to prevent cement or liquid from backing up into the nitrogen regulator. Clean the C-1362 check valve and O-ring C-1362-1. Clean the check valve cavity and replace or re-grease the O-ring.

Clean the paddle 15-0022 using a wire brush or light instrument. Avoid hammering as the paddle is delicate and susceptible to damage. Clean shaft threads.

If the filtrate cooling jacket is used often, it is a good idea to clean the filtrate tube occasionally. The salts and other compounds found in the filtrate can cause the tube to get stopped up unless cleaned periodically.

If the test cell begins to leak fluid, nitrogen or cement out the bottom of the cell and onto the drive shaft, tighten the 15-0028 Packing Gland located on the bottom plug. If the packing gland cannot be tightened further, it is time to replace the packing (Part Number C-1028). A good way to remove the packing is to obtain a strong pick with a 90 degree angle and try to hook the packing anywhere you can and pull. It may take some time to remove. It may also be worthwhile to push the packing from the paddle side. To install new packing use 3 to 3 ½ wraps around the paddle shaft. Push the packing into the cavity and work it down and around until it's all in. You may use the retainer screw to push it down further then removing it to place the spacer and then tighten the retainer screw. Tighten until it stops and then loosen ¼ to ½ turns. If it is too tight, you may find the paddle binds or produces unwanted noise. Loosen if so.

Newer models now come with Teflon V-ring seal sets which replace the use of Aramid packing rope. These V-ring seals are much easier to install and provide virtually leak free performance. A set contains a male adapter, a female adapter and five v-rings. The male adapter end of the set is placed nearest to the paddle. In other words, the open end of the V points towards the paddle.



Five V-Ring Seal

It is also recommended to unscrew the paddle from the shaft after every test and grease the shaft and paddle threads so the paddle does not become cemented to the shaft.

Troubleshooting

The following section consists of a table listing possible remedies for the most common stirred fluid loss tester problems.

Symptom	*Cause*	*Remedy*
Water or nitrogen leaks out top of test cell	Bad o-ring.	Replace the o-ring.
Cement particles come out the test cell when filtrate is released.	Bad screen.	Replace screen.
Cement or nitrogen leaks out around bottom plug of test cell.	Bad o-ring.	Replace the o-ring.
Instrument not receiving power	Instrument not plugged in. Blown fuse or breaker on power circuit power.	Connect instrument to the correct power source. Check fuses and breakers on electrical supply circuit.
Heater will not get hot.	Blown fuse. Faulty **HEATER** switch. **HEATER** switch not in the ON position. Faulty heater. Faulty solid state relay.	Check fuses inside cabinet. Replace any that are blown. Replace switch. Turn **HEATER** switch to ON position. Replace. Replace.
Temperature display is erratic.	Faulty thermocouple. Loose connection in thermocouple wiring.	Replace thermocouple. Check for loose wiring and correct if necessary.
Temperature displays ---- instead of temperature	Open circuit in thermocouple. Open circuit in thermocouple circuitry	Replace thermocouple. Check thermocouple circuitry for open circuits or loose connections.

Symptom	*Cause*	*Remedy*
Cement or nitrogen leaks from around paddle shaft.	Loose packing gland. Packing is worn out.	Tighten packing gland. Replace packing.
Test cell will not pressurize and cylinder pressure gauge indicates zero.	Nitrogen bottle is empty or the bottle valve is not open.	Check nitrogen bottle.
Test cell will not pressurize but cylinder pressure gauge shows the correct pressure.	High pressure line plugged with cement. Fitting on top of test cell is plugged with cement.	Clean high pressure ports. Replace fittings if necessary. Replace 15-0026 Back Flow Preventer and/or C-0855 o-ring.
Motor will not turn.	Faulty motor switch.	Replace switch.
Paddle shaft or paddle is rubbing bottom plug.	Worn bearing.	Replace bearing.
Filtrate will not come out of test cell.	Quick connect or cooling jacket tube is plugged.	Clean or replace.
Pressure cannot be released.	Pressure release valve or quick connect on top of test cell are plugged with cement. Valve stem on bottom plug is not open.	Remove lines and inspect for blockage. Replace any that are plugged. Open valve stem with a screwdriver.

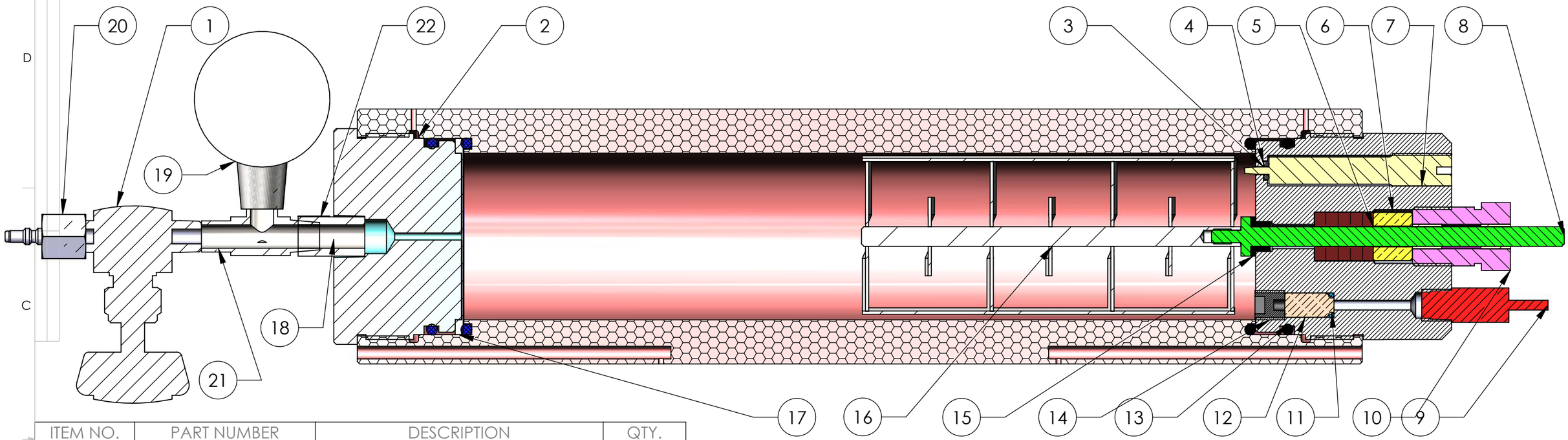
The following is a table of frequently used replacement parts along with the CTE part numbers.

Description	Part Number
High Pressure Regulator	C-0623-1
Quick connect body (bottom plug)	C-1020
Quick connect stem (bottom plug)	C-1019
Pressure gauge, test cell	C-1017
Pressure release valve, test cell	C-0348
Quick connect stem (top plug)	C-0632
Quick connect body (top plug)	C-0633
Paddle	15-0022
Bearing, bronze	C-0854
Paddle shaft	15-0025
Back flow preventer (older model 5/16")	15-0026
Back flow preventer (newer model 3/8")	15-0026-2
O-ring for Check Valve	C-1362-1
O-ring (top and bottom plugs and PV)	C-0650
Screen, 325 mesh	C-0295
Packing	C-1028
Heater assembly	06-0032
Motor (115 VAC)	C-0039-1
Motor (230 VAC)	C-0039
Motor coupling	C-1026
Flexible drive shaft	C-1012
Valve, cooling water	C-0056
Plunger, ball handle	C-1024
Switch, 20A breaker (230 VAC)	C-0075
Switch, breaker (115 VAC)	C-0075-1
Temperature controller	C-1086-1
Motor control board (230 VAC)	C-0565
Motor control board (115 VAC)	C-0565-1
Solid state relay (SSR)	C-0080
Thermocouple	C-0516
Thermocouple cable	C-1027
O-ring (bottom plug valve stem)	C-0068
Hose, SST Braided, 40" length	C-0642-2
Regulator, pressure, Tescom	C-0623-1
Valve, Ball	C-0056-1
Check valve, test cell	C-1362
Stem Valve O-ring	C-0893

Chapter 6

Drawings and Schematics

This chapter contains the drawings and schematics necessary to service and support the stirred fluid loss tester.



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	C-0348	NEEDLE VALVE, 1/8NPT	1
2	15-0024	Pressure Vessel, SFL	1
3	15-0023-1 REV C	Bottom Plug	1
4	C-0893	O-ring	1
5	15-0047	V-Ring Set	1
6	15-0029	Spacer, Packing, SFL	1
7	15-0027	Valve Stem, Pressure Rel	1
8	15-0025	Shaft, Paddle, SFL	1
9	C-1019	Quick-Release Stem	1
10	15-0028	Packing Retainer	1
11	C-1362-1	O-ring, check valve	1
12	C-1362	Check Valve	1
13	C-0650	VITON O-RING	4
14	15-0026-3	Back Flow Preventer	1
15	C-0854	Bearing, SFL	1
16	15-0022	Paddle	1
17	C-0295	SCREEN 325 MESH	1
18	15-0021	Plug, Top, SFL	1
19	C-1017	Pressure Gauge	1
20	C-1322	Quick Connect, 1/8"FNPT	1
21	C-1321	STREET Tee 1/8"NPT	1
22	C-1038	Reducer, 1/4 to 1/8" NPT	1

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
C	ADDED NEW CHECK VALVE AND LARGER BACK FLOW PREVENTER	3/6/2013	GRH
D	CHANGED FROM PACKING TO V-RING	12/6/2013	GRH
E	PRINT IMPROVEMENT	4/16/2015	GRH

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS DECIMALS ANGLES
±1/32 .XX ±.01 ±1
.XXX ±.005

MATERIAL

FINISH

DO NOT SCALE DRAWING

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

APPROVALS		DATE
DRAWN	CCD	8-7-03
CHECKED	CCD	8-7-03
RESP ENG	CCD	8-7-03
MFG ENG		
QUAL ENG		

NEXT ASSY	USED ON
APPLICATION	

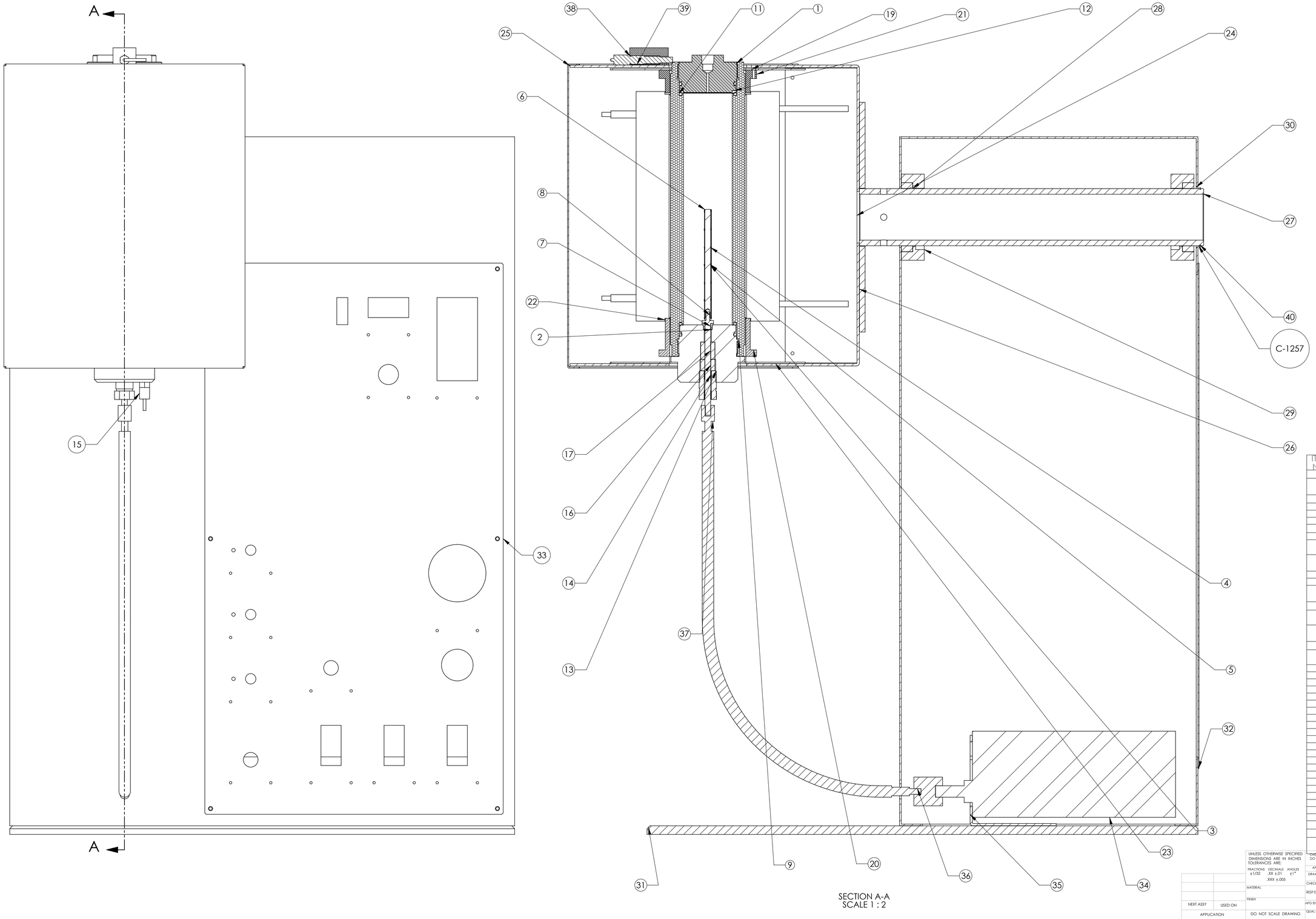
CEMENT TEST EQUIPMENT, INC.

CYLINDER ASS'Y STIRRED FLUID LOSS TESTER M2-450

SIZE	DWG. NO.	REV.
B	15-0020	E
SCALE	CAD FILE:	SHEET 1 OF 1

REVISIONS

REV.	DESCRIPTION	DATE	APPROVED



SECTION A-A
SCALE 1 : 2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	15-0021	Plug, Top, SFL	1
2	15-0023-1 REV C	Bottom Plug	1
3	15-0022	SFL Paddle Assy	1
4	15-0022-3		4
5	15-0022-2		3
6	15-0022-5		2
7	C-0854	Bearing, SFL	1
8	15-0025	Shaft, Paddle, SFL	1
9	15-0024	Pressure Vessel, SFL	1
10	15-0026-2	Back Flow Preventer	1
11	C-0650	VITON O-RING	4
12	C-0295	SCREEN 325 MESH	1
13	15-0028-1	Packing Retainer Body	1
14	C-0346	Bushing	2
15	C-1019	Quick-Release Stem	1
16	15-0029	Spacer, Packing, SFL	1
17	C-1028	Packing Material	1
18	15-0027	Valve Stem, Pressure Rel	1
19	6-0036		1
20	15-0032		1
21	15-0033		1
22	6-0037		2
23	15-0034		1
24	15-0030-1		1
25	15-0030-2		1
26	15-0031-1		1
27	15-0031-2		1
28	15-0035		2
29	15-0036		2
30	15-0040-1		1
31	15-0040-2		1
32	15-0040-3		1
33	15-0040-4		1
34	C-0039		1
35	C-1011		1
36	C-1026		1
37	C-1012		1
38	C-1023		1
39	15-0037		1
40	C-1010		1
41	C-1362	Check Valve	1
42	C-0893	O-ring	1
43	C-1362-1	O-ring, check valve	1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/32 DECIMALS .XX ±.01 .XXX ±.005 ANGLES ±1°
MATERIAL
FINISH
NEXT ASSY | USED ON
APPLICATION
DO NOT SCALE DRAWING

CAD GENERATED DRAWING.
DO NOT MANUALLY UPDATE

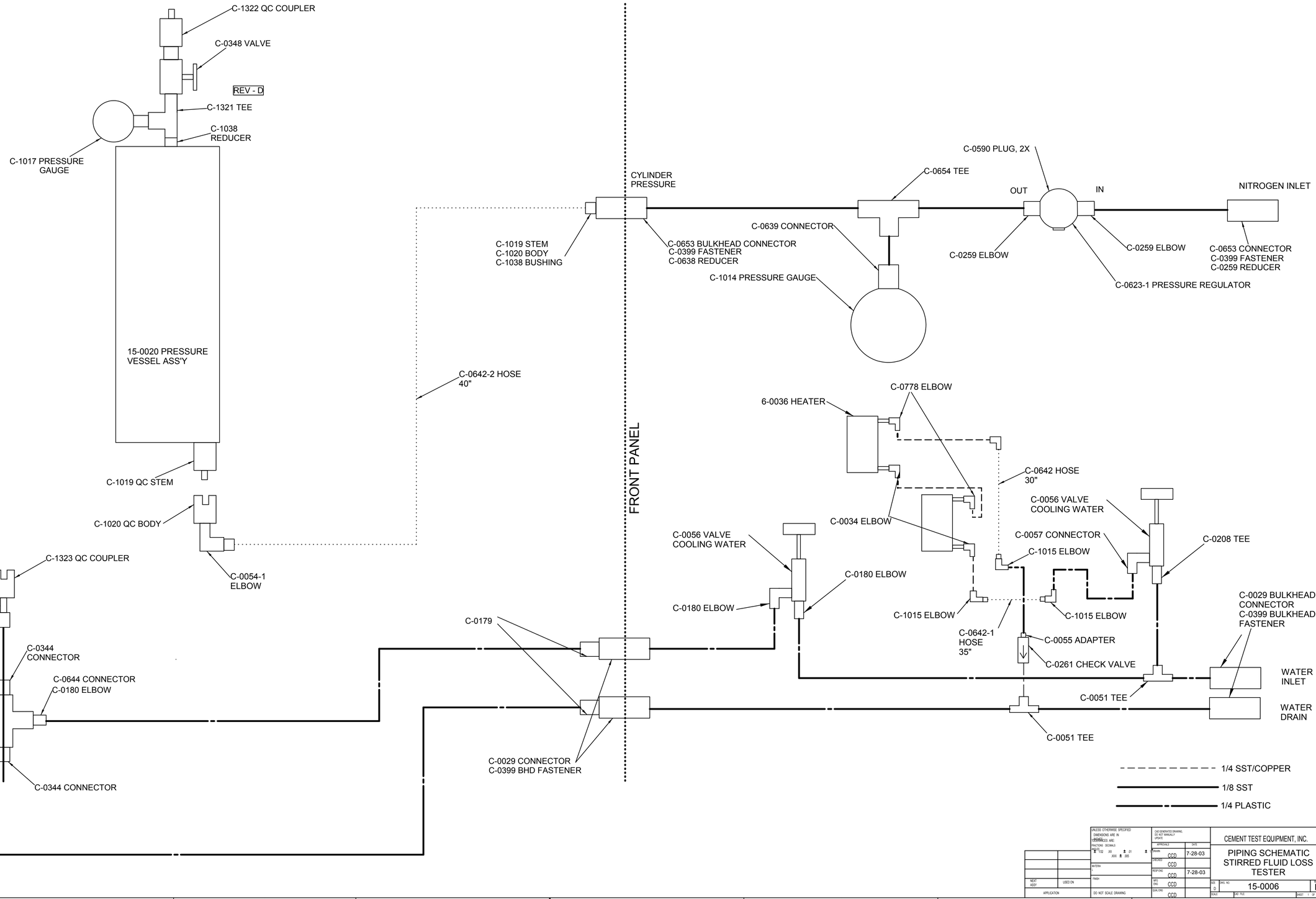
APPROVALS		DATE
DRAWN	CCD	8-7-03
CHECKED	CCD	8-7-03
RESP ENG	CCD	8-7-03
MFG ENG	CCD	
QUAL ENG	CCD	

CEMENT TEST EQUIPMENT, INC.

STIRRED FLUID LOSS TESTER

SIZE D | DWG. NO. 15-0010 | REV. A
SCALE 1:2 | CAD FILE: | SHEET 1 OF 1

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
B	UPDATES	7-30-09	GRH
C	changed hose c-642 to -1	06-03-11	GRH
D	CHANGED FITTINGS	01-12-12	GRH
E	CHANGED HOSES	09-07-12	GRH



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE: FRACTIONS ± 1/32 DECIMALS .XX ± .01 .XXX ± .005
MATERIAL
FINISH
NEXT ASSY | USED ON
APPLICATION
DO NOT SCALE DRAWING

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE

APPROVALS		DATE
DRAWN	CCD	7-28-03
CHECKED	CCD	
ENG APPR	CCD	7-28-03
MFG APPR	CCD	
QUAL ENG	CCD	

CEMENT TEST EQUIPMENT, INC.

PIPING SCHEMATIC STIRRED FLUID LOSS TESTER

SIZE D | DWG. NO. 15-0006 | REV E

SCALE | WEIGHT | SHEET 1 OF 1

C-0565
CONTROL
BOARD

DC MOTOR CONTROL BOARD

C-0482
FUSE 25A

C-0483
FUSE 2A

L1

L2

A-

A+

P1 P2 P3

0 R P

BROWN 18

BLUE 18

GREEN 18

DC GEAR
MOTOR

C-0039 (230 VAC)
C-0039-1 (115 VAC)

SPEED CONTROL POT
** MOUNTED ON ELECTRICAL PANEL INSIDE UNIT

C-0075-1
MOTOR SWITCH

RED 18

YELLOW 18

C-0472
TERMINAL
BLOCK

C-0075-1 HEATER
SWITCH

RED 18

YELLOW 18

RED 14

YELLOW 14

2 0 A2

4

6

8 1 A1

CONTACTOR
C-0684 120 VAC
C-0658 240 VAC

C-0075-1 POWER
SWITCH

RED 18

YEL 18

YELLOW 14

YELLOW 14

RED 14

FUSE BLOCK C-0574-1
10A FUSE X2; C-0988

C-0271

POWER INLET

C-0132

C-0080

SSR 2

SSR 1

4 1 3 2

1 + 3 2 -4

YELLOW 14

RED 14

6-0032 HEATER

WIRE IN PARALLEL FOR 120 VAC
WIRE IN SERIES FOR 240 VAC

YELLOW 18

RED 18

N L

GND
1A
1B

WHITE T/C (+)

RED T/C (-)

V+ V-

C-0505
TEMPERATURE
CONTROLLER

C-0167
RECEPTACLE

WHITE/RED 22

WHITE/BLACK 22

		CEMENT TEST EQUIPMENT, INC
APPROVALS	DATES	WIRING SCHEMATIC MODEL 1500 STIRRED FLUID LOSS TESTER
CCD	2-9-98	
DRAWN: ADAM NOFSINGER		15-0005 C