INSTRUCTION MANUAL
MODEL 8340
PRESSURIZED CONSISTOMETER

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S/N _____

AMETEK®
CHANDLER
ENGINEERING®

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General Information

Application of the Consistometer

Cements have numerous applications in the drilling, completion, work-over, and abandonment of wells. For each application, the cement is designed with special properties and is given additives that provide predictable slurry density, volume, viscosity, compressive strength, and thickening time. Thickening time, or the time a cement slurry remains able to be pumped into the well, is one of the most critical properties in designing a slurry. A short thickening time is desired, while maintaining the special properties of the cement's design. The thickening time of a slurry can be measured in a laboratory by testing a sample of the slurry in a Pressurized Consistometer. The elapsed time between an initial application of pressure and temperature on the slurry sample and the development of 100 Bearden units of consistency (Bc) is the thickening time for the sample at a particular specification test schedule American Petroleum Institute (API) Spec 10A - Specification for Materials and Testing for Well Cements (International Organization of Standardization (ISO) 10426-1 - Petroleum and Natural Gas Industries – Cements and Materials for Well Cementing).

Briefly, the test procedure for the Model 8340 Pressurized Consistometer entails the preparation of the slurry sample, placing it in the Consistometer, applying pressure and increasing temperature according to the API Spec 10A (ISO 10426-1), and recording the consistency of the slurry as a function of time. Details of the procedure are contained in the Specification.

Description of Apparatus

The Model 8340 is designed so that closure, heating, and pressurization can be achieved quickly.

The pressurized consistometer incorporates a rotating, cylindrical slurry cup (Drawing 08-0045) equipped with a stationary paddle assembly enclosed in a pressure chamber designed for a working pressure of 275 MPa (40,000 psi) at a maximum temperature of 600°F (316°C). An air-operated hydraulic pump generates pressure to the cylinder assembly. The hydraulic system incorporates a reservoir, piping, valves and filters. Heat is supplied to the chamber by a 5000-watt internal tubular heater controlled by the automatic temperature control system program. Thermocouples are provided for determining the temperatures of the oil bath and cement slurry.

The programmable temperature controller automatically controls the rate of temperature rise (i.e. temperature gradient). When the slurry reaches the desired temperature, the controller will hold the temperature at that level. Hydraulic pressure is generated with an air operated high-pressure pump. Pressure settings are maintained through the control of a pressure relief valve and air pressure available to the pump.

The slurry container is rotated at a constant speed of 150 +/- 15 rpm by a magnetic drive. Drive torque is transmitted from a set of outside drive magnets, through a non-magnetic housing, to permanent magnets attached to the rotating shaft within the cylinder. Permanent, rare earth magnets are used to ensure high torque and a long magnetic-field life.

The viscosity (i.e. consistency) of the cement slurry is recorded on a chart as BC (Bearden Units) obtained from a potentiometer installed within the pressure cylinder. The potentiometer contains a standardized torsion spring, which resists the rotating force of the paddle. Rotational force is proportional to consistency of the cement slurry.

In the Model 8340, pressure is controlled using a dynamic, programmable pressurization system. The temperature, pressure and the viscosity of the slurry are recorded on a strip chart in the electronics module. An interface is also included for PC based data acquisition. The Chandler Model 5270 Instrument Control System is specifically designed for this interface.

Using the Model 5270 software, hesitation squeeze treatments can also be simulated using the programmable motor and pressure control capabilities.

Table 1 - Specifications

This unit is in complete compliance with API Spec 10A

Model 8340

Maximum Temperature:	600°F (316°C)
Maximum Pressures:	40,000 psi (275 MPa)
Heater Power:	5000 Watts
Slurry Cup Rotational Speed:	150 rpm
Viscosity Range:	0-100 Bc (Bearden Units)
Pressurizing Medium:	White Mineral Oil

Features Summary

- Programmable Temperature Control
- Rapid Cool Down
- Digital Chart Recorder
- External Chiller Capable
- Dynamic Pressure Control
- Hesitation Squeeze Simulation
- Instrument Control with 5270 System

Mechanical and Electrical

- **Input Voltage:** 208-240 VAC, 50/60 Hz
- **Input Power:** 7.5 kVA
- **Heater Wattage:** 5000 Watts

Environment and Utility

- **Operating Temperature:** 1° to 49°C (34° to 120°F)
- **Compressed Air:** 75 to 125 psi (517 to 862 kPa)
- **Cooling Water:** 20 to 80 psi (138 to 552 kPa)

Safety Requirements

READ BEFORE ATTEMPTING OPERATION OF INSTRUMENT

Any instrument that is capable of the extremely high temperatures and pressures as a Consistometer should always be operated with **CAUTION**. The instrument is designed for operator safety, however to ensure that safety:

- **Locate** the instrument in a **low traffic** area.
- Post signs where the instrument is being operated, to warn non-operating personnel.
- Read and **understand** instructions before attempting instrument operation; observe caution notes!
- Observe and **follow** the **Warning Labels** on the instrument.
- **Never exceed** the instrument maximum pressure and temperature ratings secured on the machine.
- **Always** disconnect main power to the instrument before attempting any repair; ***HIGH VOLTAGE CAN KILL!!!***
- Keep front access door **closed** when operating instrument.
- Turn **off** the heater at completion of each test! Oil in an open cylinder exposed to atmospheric conditions can result in fire, if heated past its "flash" point.
- A fire extinguisher, Type 8 BC should be located within 50 feet of instrument.

Before attempting to operate the instrument, the operator should study the drawings provided in the *Drawings/Schematics* section of this manual to become totally familiar with the Consistometer operation.

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Section 1 – Installation

Unpacking the Instrument

After the consistometer is unpacked, the operating equipment and spare parts on the packing list should be checked to affirm that all have been received and none are damaged.

File an insurance claim with your freight carrier if damage has occurred during shipment.

Utility Requirements

Your unit will require dry, oil-free compressed shop air (not instrument quality) of 75 to 125 psi (517 to 862 kPa), and a water supply of 20 to 80 psi (138 to 552 kPa). The unit is capable of operating in ambient temperatures from 1°C to 49°C (34°F to 120°F).

Tools and Equipment Required

A standard maintenance or mechanics tool set is adequate for the installation, operation, and maintenance of the instrument. No special tools are required.

This unit is supplied with an installation kit, which includes the necessary hardware for the water, air, and electrical hook-ups. The water and air hose may be cut to length and the appropriate barbed fittings inserted into the hose and clamped into place.

Caution: The laboratory electrical power wiring must be capable of a 50-ampere load and comply with local electrical codes. The instrument must be securely connected to an appropriate earth ground. The ground wire must have a larger diameter than that of the supply voltage conductors.

Setting up the Instrument

Make the appropriate electrical hook-ups between the top and bottom cabinets according to the rear view of the enclosed Model 8340 Assembly drawing.

The weight of the slurry cup paddle should be recorded prior to using in order to establish the original weight. Weight the paddle after every 20 tests. Replace paddle when the original weight has dropped by 20%.

Connecting Air and Water

Water and air hose hook-ups are located at the lower rear of the instrument. Use the adapters provided in the accessory kit for each of these connections. All of the fitting threads are 1/4” NPT.

1. Connect the air supply line to the inlet labeled AIR.
2. Connect the water supply line to the inlet labeled WATER IN.
3. Connect the water drain line to the outlet labeled WATER OUT.

Connecting Power to the Consistometer

1. Connect the supplied twist-on power connector to the receptacle at the rear of the unit.
2. Connect the power plug to an appropriately rated power source and receptacle. For user safety a power plug and mating receptacle are required.

Note: This receptacle MUST be properly grounded.

Section 2 – Operating Instructions

The chart recorder is configured at the factory and will be ready for use at power-up. A manual has been enclosed for your reference.

The Bearden unit indicator is pre-configured at the factory to alarm at 100 Bc. The alarms control four items. First, an audible alarm is triggered; second, the heater current is cut off; third, the motor is shut off; and fourth, the timer is stopped.

Preparing the Instrument for a Test

Prior to running a test, the following steps must be performed.

Configuring the Consistency Display

1. Turn on the instrument.
2. Press or (Up or Down) to change the alarm limit.

A manual has been enclosed for your reference.

Programming the Temperature and Pressure Controllers

The programming for the temperature and pressure controllers is identical. Following is a brief procedure for programming the controllers. For complete instructions, see the Model 8050/8051 Temperature Controller and Model 8060/8061 Pressure Controller manuals.

1. Press and hold the Advance key for approximately five seconds. The profile prompt (ProF) will appear in the lower display and the profile number (e.g. P1) appears in the upper display.
2. Multiple profiles (P1 to P4) can be stored in the device. The shortcut keys (EZ1 and EZ2) are factory configured to start and stop profile P1. The 5270 DACS software also utilizes P1 when a profile is downloaded to the controller for an automated test. Press the Up or Down keys to select P1.
3. Press the Advance Key to move to the first step.
4. Press the Up or Down keys to move through and select the step type.
5. Press the Advance Key to move through the selected step settings.
6. Press the Up or Down keys to change the step settings.
7. Press the Infinity Key at any time to return to the step number prompt.
8. Press the Infinity Key again to return to the profile number prompt.
9. From any point press and hold the Infinity Key for two seconds to return to the Home Page.
10. To manually start or stop a profile, press either the EZ1 or EZ2 key.

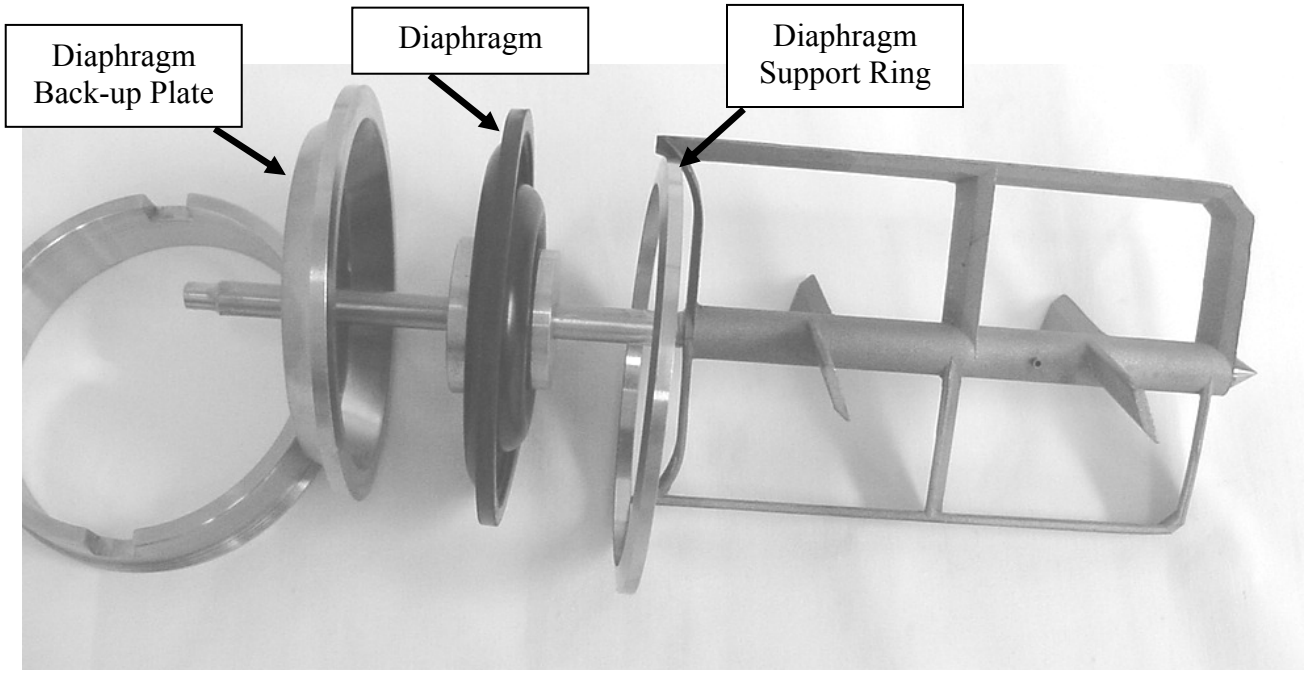
Hesitation Squeeze

The motor can be programmed to run a hesitation squeeze schedule using the 5270 DACS software. To allow the motor to run continuously during a test, place the motor switch in the ON position. To allow the 5270 DACS software to control the motor, place the motor switch AUTO position. Refer to the 5270 online help files for detailed information on setting up hesitation squeeze schedules.

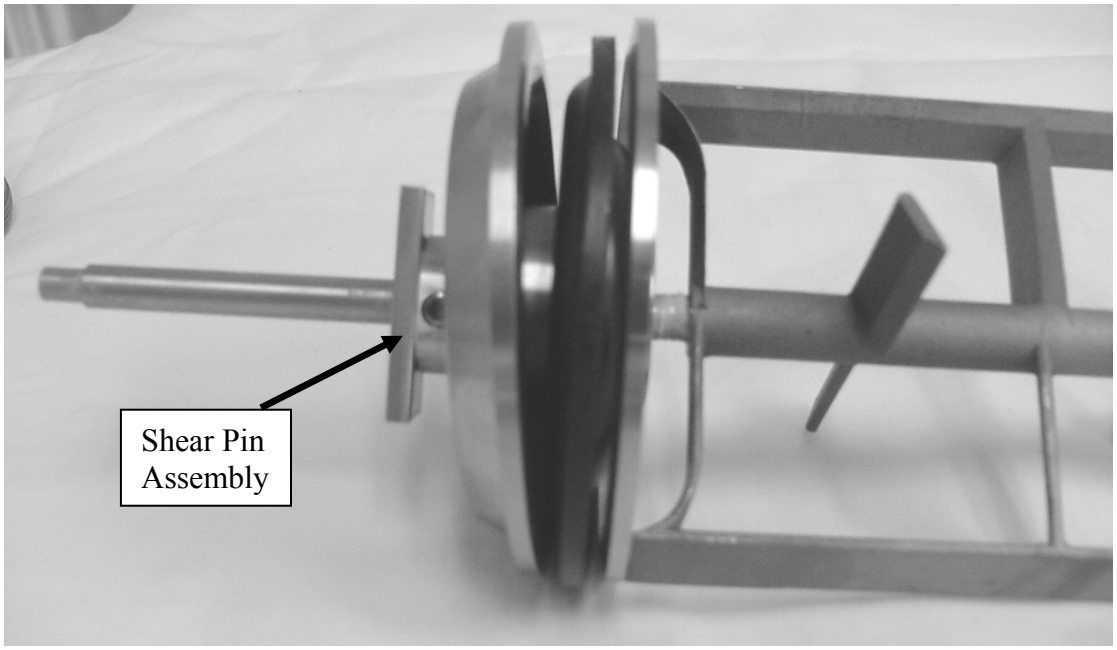
API Slurry Cup Preparation

For an accurate thickening time test to be performed, it is important for the slurry cup to be properly maintained and prepared. The following procedure should serve as a guideline for slurry cup preparations. While assembling the slurry cup, refer to drawing 08-0045 in the *Drawings* section of this manual.

1. Thoroughly clean all parts and verify that all parts are in good condition.
2. Lightly grease all interior surfaces of the slurry cup with white lithium grease or the equivalent.
3. Install the diaphragm support ring, the diaphragm, and the diaphragm backup plate onto the paddle assembly. The diaphragm should be oriented so that the larger brass piece is at the top.



4. Slide the shear pin assembly onto the paddle shaft. Place the potentiometer mechanism on the paddle shaft until it seats. Using an Allen wrench, align the shear pin assembly into the bottom of the potentiometer mechanism and tighten the set screw to secure it in place. Remove the potentiometer mechanism from the paddle shaft.



5. Install the complete paddle assembly into the slurry cup.
6. Screw the diaphragm lock-down ring into the top of the slurry cup while checking to make sure the paddle turns freely.
7. Invert the slurry cup into the slurry cup support.
8. Prepare the cement slurry in accordance with API Spec 10A (ISO 10426-1).

Caution: According to API specs: The cement has to be under test (under pressure) within 5 minutes of mixing.

9. Fill the cup with prepared cement slurry to the bottom of the threads.
10. Remove the plug (pivot) from the center of the bottom cap.
11. Replace the bottom cap without the plug. Slowly screw the cap into place and add cement through the hole if required.
12. Grease the plug and replace.
13. Rinse the exterior surfaces of the slurry cup.

Running a Test

Air pressure, temperature, and oil viscosity will all have a significant effect on the time required to fill and drain the cylinder. Optimum air pressure is 100 psi. For example, with a 60 psi air supply, your fill time will be doubled and the drain time tripled over those obtainable with a 120 psi air supply. Low ambient air temperature will have a similar effect. At 45°F, expect the fill time to double and the drain time to be triple those at 70°F.

1. Turn the Power switch ON.
2. Remove the test cell plug, if it is not already removed from a previous test.
3. Attach the long bail through the holes on the top of the prepared slurry cup and insert it into the test cell, rotating it until the bottom pins engage the cup drive table. Remove the bail.

4. After the slurry cup is loaded into the cell, the potentiometer mechanism (pot. mech.) is pushed onto the slurry cup paddle shaft and the test cell contact pins. Attach the short bail to the top of the potentiometer and lower the pot mech into the test cell. When properly engaged, the top of the paddle shaft will be flush with the top of the torque measurement potentiometer bearing. Remove the bail.
5. Check to be certain that the slurry cup and pot mech are properly engaged. Turn the Motor switch to ON. No rubbing noise should be heard.

The Model 8340 is supplied with two types of O-ring seals for the cylinder plug. (See drawing 8240-0023, item 18.)

Caution: Selection of the proper O-ring to match the test conditions is critical.

- The **viton** O-ring (C09762) is suitable only for low temperature/pressure tests **below** 20,000 psi (138 Mpa), or 275°F (135°C).
- The **metal** O-ring (P-1080) is suitable for testing at any rated temperature or pressure.

5. Close the pressure cylinder by swinging the Swivel Arm Assembly and plug, vertically above the cylinder, lowering the plug until the tapered threads engage. Screw the plug down until it is firmly engaged. In order to assure that the cylinder will operate **at the maximum rated working pressure and temperature**, we recommend that you work the plug down until the line up mark on the plug matches the mark on the cylinder. Never run a test with the line up mark on the plug tightened down past the mark on the cylinder. Under these conditions, the plug may not unscrew from the cylinder without damaging the threads or plug handles.
6. Slide the thermocouple through the test cell plug into the slurry cup paddle shaft. Start the threads of the sealing gland into the test cell plug, but do not tighten the thermocouple at this time. Verify that the thermocouple is plugged in.
7. Next, fill the test cell with oil. To accomplish this, close the Pressure Release Valve, and turn the AIR control switch to the FILL position. When oil escapes from the top thermocouple high-pressure fitting, tighten the sealing gland with a 5/8" wrench.
8. To begin the test, the Temperature Controller and Pressure Controller programs must be started as follows.
9. Press the Advance Key to display the Control Mode (AUTO, OFF or MAN). Press the Up or Down keys to select AUTO. Press the Infinity Key to return to the main screen. Press the **EZ1** button to start the program. The "**1"** light should begin flashing indicating the control output to the heater and or pump.
10. Turn the Heater and Pump Switch to the ON position, and start the timer. (The heater and pump will not start until the program start up is initiated through the controller.)

Note: Turn the coolant control switch to ON if an external chiller is used.

After the final temperature is reached for the schedule being run, the controller will continue on a programmed soak until the schedule is completed.

*Note: Once a program has been entered into the controller it may be reused by pressing the **Run/Hold** button to run the program again.*

After the Test is Complete

A buzzer will sound, signaling the slurry has reached the required consistency. The controllers must now be shut down as follows:

1. Turn the alarm switch to 'Off."
2. Press the Infinity Key on the consistency display to reset the alarm condition.
3. Set the heater switch to 'Off."
4. If the profile status light is displayed on the temperature or pressure controller screen, press the EZ1 button to stop the profile and place the controllers in OFF mode (**OFF** will appear on the lower display).
5. If OFF does not appear in the lower display, press the Advance Key to display the Control Mode (AUTO, OFF or MAN). Press the Up or Down keys to select OFF.
6. Start cooling the cylinder by placing the Coolant Switch to the ON position.

Allow the cylinder to cool to 190º F (90º C) or less before continuing to the next step. The following steps are necessary in order to transfer the hydraulic oil from the pressure cylinder back into the reservoir. When cool-down is complete, set the pump switch to 'Off.'

Warning: When the temperature of the sample is above 212°F, leave at least 500 psig on the sample during cool-down.

Warning: If the cylinder is opened while its temperature is above 100°C (212° F), steam will escape, and the operator can be injured! Be sure the cylinder temperature is below 100°C (212°F).

Draining the Test Cell of Oil

After the cell has cooled and all of the pressure has been relieved, perform the following steps to drain the oil.

1. Open the T-handled manual pressure release valve to relieve pressure in the cylinder (slowly opening and closing the valve to release pressure in increments will prevent rupture of the slurry cup diaphragm).
2. Set the "Cylinder" control rocker switch to the 'Drain' position to transfer the oil from the cylinder into the reservoir. (Completion of the oil transfer will be indicated by a bubbling or hissing noise in the reservoir.)
3. Set the "Cylinder" control rocker switch to the 'Off' position to stop the oil transfer.
4. Loosen the thermocouple seal gland to vent the remaining air pressure from the cylinder.

Warning: If the cylinder is opened while its temperature is above 100ºC (212 ºF), steam will escape, and the operator can be injured! Be sure the cylinder temperature is below 100°C (212°F).

5. Remove the thermocouple from the cylinder head.
6. Remove the cylinder head by tapping the cylinder head handles with a rubber mallet to jar the head loose and then remove the head itself.
7. When the plug is removed after a test, the metal O-ring may come out with the seal shaft. If this happens, clean the O-ring and mating surfaces and inspect for scratches or dents. If

the parts are OK, drop the O-ring back into the cylinder with the same side facing up. The top side will be likely to have a slightly more flattened square surface.

8. Using the pot mech bail, reach into the cylinder and remove the pot mech.
9. Using the slurry cup bail, reach into the cylinder and remove the slurry cup. The cup should be immersed immediately in a container of cold water.
10. Clean the slurry cup thoroughly and coat it with grease. Also, disassemble and clean the diaphragm hub and apply grease liberally to the hub O-rings.

Section 3 - Maintenance

The operating life of the consistometer can be extended measurably if operating and maintenance instructions provided in this manual are adhered to. Avoidance of down time and parts replacement depends on the proper cleaning, lubrication, replacement of filters, and calibration of instrumentation and controls. The following procedures will correspond with the maintenance schedule time intervals included in this manual.

Chillers

Instruments using a chiller sometimes produce condensation when used. The use of a fan or air conditioned environment will help in keeping the moisture level lower. Wipe away any condensation that may occur inside the cabinet.

After Every Test

Pressure Cylinder

1. Inspect and replace the O-ring on the cylinder plug if cuts, damage, or imbedded particles are present. If none of these conditions are noted, wipe the O-ring and the plug groove free of cement particles or other foreign matter and lubricate the O-ring with a light film of grease or oil.
2. The thread of cylinder plug has been lubricated with molybdenum disulfide grease by the factory. If molybdenum disulfide grease is not immediately available, a mixture of white lead and lubricating oil will be a satisfactory substitute.

Potentiometer Mechanism

The potentiometer mechanism (pot mech) must be cleaned after every test. Using a nylon brush, lightly brush down the unit with mild dish washing soap. Clean all cement sediment from the contact springs, resistor, and exterior surfaces. Rinse the assembly thoroughly with water. Apply a light coat of mineral oil to the resistor surface and bearings to prevent oxidation.

Slurry Cup

All components of the slurry cup must be cleaned and inspected thoroughly after every test to ensure proper operation of the consistometer.

1. Inspect the plug for any wear such as dishing or rounding out of the inner taper. Excessive wear of the tapered seat will prevent the proper centering of the paddle shaft and result in binding the paddle to the interior wall of the slurry cup.
2. Inspect the shaft tip for wear and ensure that the shaft is straight. Excessive wear of the sharp tip or a bent shaft will prevent the shaft from centering in the cup base plug. Either of these conditions will result in binding of the paddle to the interior wall of the slurry cup.
3. Replace the paddle any time damage such as bent or broken vanes exists. The paddle weight should be recorded before the first use. Weigh the paddle after every 20 tests. When the original weight of the paddle has dropped by 20%, replace the paddle.

Thermocouple (Slurry Cup)

Inspect the thermocouple to insure that it is straight and the threaded collar is positioned with two threads showing on the lower side. Inspect the threaded collar and gland nut for clean and well formed threading. Worn threading on either part presents a safety hazard to the operator. If the threads are damaged, the thermocouple may blow out under pressure. Inspect the exterior of the probe for thinning or nicking. Replace any or all components as required.

Thermocouple (Oil)

Inspect the thermocouple to insure that the threaded collar is positioned with two threads showing on the lower side. Inspect the threaded collar and gland nut for clean and well formed threading. Worn threading on either part presents a safety hazard to the operator. If the threads are damaged, the thermocouple may blow out under pressure. Inspect the exterior of the probe for thinning or nicking. Replace any or all components as required.

Monthly

Potentiometer Mechanism

The potentiometer mechanism must be completely disassembled and cleaned. If any of the following components exhibit signs of wear, they must be replaced as follows.

Resistor Replacement

1. Remove the shaft bearing retainer and contact arm.
2. Remove the oil resistor, using care not to damage the slot.
3. Position the new resistor, straight side down, with equal overlap from the contact strips to the end of the winding.
4. Seat the resistor firmly in the slot (use a block of wood to press into position). The top surface of the resistor must be level.
5. Lightly burnish the resistance wire by rubbing the top surface with a hardened drill rod shank. This will ensure that the contact arm slides smoothly.
6. Rotate the contact arm by hand. Affirm that the arm rotates smoothly and maintains contact with the resistor from contact strip to contact strip with no dragging. If necessary, adjust the arm by bending it up or down.
7. Adjust the position of the stop arm on the center shaft in order to obtain strip-to-strip travel of the contact arm. All set screws must be tight.
8. Replace the shaft bearing retainer.
9. Calibrate the potentiometer.

Calibration Spring Replacement

1. Remove the shaft bearing retainer and contact arm.
2. Remove the old calibration spring.
3. Install a new spring (when the center shaft of the potentiometer mechanism is turned counterclockwise, the spring is wound tighter).
4. Replace the contact arm.

5. Loosen but do not remove three screws on underside.
6. Rotate the spring adjuster until slack is out of the spring and the contact arm lines up with the contact strip. Tighten the screws.
7. Replace the shaft bearing retainer.
8. Calibrate the potentiometer.

Potentiometer Calibration

Depending on the frequency of its use, the potentiometer mechanism should be recalibrated regularly and whenever the spring, contact arm, or resistor is adjusted or replaced. Higher operating temperatures in the pressure chamber require more frequent recalibration of the potentiometer.

Refer to the enclosed drawings of the calibration table assembly and Model 8340 assembly.

The step-by-step calibration procedure is as follows:

1. Rotate the pot mech calibration table out to the side of the instrument.
2. Install the potentiometer on the calibration table, located on the consistometer, and insert the 07-0515 wedge into the open slot of the potentiometer.
3. Wrap the steel cable around the potentiometer frame and over the pulley. Place the hanger weight hook in the cord eye.
4. Install the wire-end clips to the potentiometer tabs. (Note the wire locations.)
5. Insert the plug on the end of the calibrator wires into the calibrator socket.
6. Turn on the master switch and place 400 grams of weight on the hanger.
7. The Bearden unit gauge should read 100 Bc. (100 Bearden Units is 10 volts). The contact points of the spring should be oiled, the weights lifted and released, and the calibrator lightly tapped to offset friction during the calibration. If the unit does not read 100 Bc, manually adjust the pot mech calibration screw located on the face panel of the top cabinet.
8. The radius of the potentiometer mechanism is 5.2 centimeters and is multiplied by the total weight on the hanger to obtain gram centimeter torque.
9. Slurry consistency is expressed in Bearden units where 100 Bc is equivalent to the spring deflection observed with 2080 gcm of torque (400 grams weight) using the weight-loaded calibration device.
10. For further calibration details, refer to API Spec 10A (ISO 10426-1) standard. This unit is supplied with weights to accommodate the full range of tests per API specs.

Magnetic Drive

The magnetic drive should be flushed with clean water or oil whenever cement spills into the cylinder or particles contaminate the drive. More frequent flushing of the drive is required when high-temperature, high-pressure tests are run.

The inner magnetic shaft must be pulled and inspected. Replace the complete assembly if the magnet sleeve is worn through or bulging at the center. Remove the magnetic housing drain plug and flush all cement sediment from the cylinder using water. Dry any remaining water on the cylinder floor using towels. Inspect and replace the following components as required.

- Carbon bearing: Remove and clean all cement from the O.D. and I.D. of the bearing. Clean all cement from the external grooving. Replace the carbon bearings when excessive chipping is visible. Replace the carbon bearing if the O.D. or I.D. has lost .010" of material. The bearing must fit snugly on the shaft with no visible wobble.
- Bronze bearing: Remove and clean all cement from the O.D. and I.D. of the bearing. Clean all cement from the perimeter weep holes. Replace the bronze bearing if when the upper collar has lost .030" off its original height.
- Thrust ring: Replace the ring if a groove is present on the lower side. The lower surface should be flat with no cutting or gouging occu rring from contact with the bronze bearing collar.
- O-ring & Backup ring: Replace at every cleaning or any time the drain plug is removed.
- Before the center shaft of the m agnetic drive is reinstalled, the drain plug should be screwed in (but not tightened) and the drive f illed with clean oil. Then install the center shaft, and pressurize the cylinder with oil (air supply pressure only) to ensure that air is not trapped in the lower part of the drive. Oil passing by the plug will purge the air.

Thermocouple and Temperature Control System

API specs require that the temperature measuring system be verified for accuracy monthly. No equipment is supplied with the unit for performing these tests. Review your API specs for details and contact Chandler Engineering.

Three Months

Oil and Filter

The mineral oil in the reservoir should be drained and replaced when it becomes dirty. At the same time, the oil filter element should be replaced. A drain plug is provided on the oil reservoir, and a fill plug is located on top. Additions of mineral oil prior to oil drainage and replacement may be made by pouring oil into the pressure cylinder. The mineral oil supplied with the instrument is white technical oil (API gravity approximately 24.2, pour point 40°C, flash 214°C, and viscosity 60 to 63 SSU at 38°C). This oil may be ordered from the factory.

Drive Motor

API requires that the speed be checked and maintained at 150 rpm +- 15 rpm. A motor speed adjustment screw is located on the rear of the electrical cabinet. A tachometer for this test is user supplied.

Six Months

Timer

Accuracy should be verified according to API specs every six months. There are no provisions for adjusting the timer provided with the instrument. Review your API specs for details.

Air Operated Valve

1. Relieve system pressure. Remove the valve from the system and place it securely in a vice.
2. Fully open the valve stem.
3. Remove the packing gland locking device.
4. Unscrew the packing gland and remove the packing gland and stem.
5. Remove the packing from the body. Note the packing and washer arrangement.
6. Replace the packing and place the packing and packing washers into the valve body.
7. Replace the stem and packing gland, tightening to the appropriate torque.
8. Replace the packing gland locking device.

Annually

Replace the high pressure filter, cylinder pressure release valve, and rupture disk.

Pump

Chandler Engineering recommends that the pump valve body be disassembled, cleaned and rebuilt by our service department.

Reservoir

Chandler Engineering recommends that the reservoir be removed, cleaned out, and flushed by our service department.

Heater

Chandler Engineering recommends that the heater be inspected and tested for insulation breakdown and voltage leakage, which can lead to arcing on the cylinder wall. This procedure requires the use of specialized test equipment. Insulation breakdown poses two potentially hazardous conditions: electrical shock hazard to the operator, and pitting of the cylinder at the point of arcing. Chandler highly recommends that our service department perform a series of tests on the heater at this time interval.

Thermocouples (Slurry Cup and Cylinder) and Temperature Controller

Our service department can perform a calibration procedure using specialized instrumentation to assure that temperature drift and inaccuracies as a result of time and usage are compensated for in order to keep your instrument compliant with API specs.

MAINTENANCE SCHEDULE CONSISTOMETER					
COMPONENT	EACH TEST	MONTHLY	3 MONTHS	6 MONTHS	ANNUAL
Slurry Cup	Disassemble, Clean, Inspect				
Potentiometer Mechanism	Clean, Lube, Inspect	Disassemble, Clean, Lube, Inspect			
Magnetic Drive		Disassemble, Clean, Inspect			
Oil			Replace		
Low Pressure Filter			Replace		
Cylinder Press. Release Valve				Replace	
Oil-to-Cylinder Valve				Replace	
Air Operated Valve				Disassemble, Replace Needle, Seat	
Pump				Maintained	By Qualified Factory Service Technician
Pressure Gauge					●Calibration
Drive Motor			●Set Speed		
Temp. Controller Thermocouples (Slurry and Oil)	Inspect	●Calibration			Calibrate By Qualified Factory Service Technician
Timer				●Calibration	
Heater					Test By Qualified Factory Service Technician
Reservoir					Clean-Out By Qualified Factory Service Technician
Rupture Disk					Replace

This maintenance schedule applies to usage of two tests per day. Detailed procedures for these operations are contained in your manual.

● Per API Spec Requirements

σ Where Applicable

Section 4 – Troubleshooting Guide

Unit will not power-up

Causes

- Blown fuse
- Main breaker tripped

Control system components inoperative

Causes

- Recorder not initialized (Refer to operation manual)
- Blown fuse

Erratic/Incorrect temperature readout

Causes

- Defective thermocouple
- Broken or corroded/rusted terminal
- Check all thermocouple wiring and components
- Check the selection of slurry (iP.1) or oil (iP.2) for control feedback.

Solution**s**

- Replace thermocouple wiring
- Replace thermocouple

Drive motor inoperative

Causes

- Blown fuse
- Defective motor or controller
- Wiring
- Defective switch
- Recorder not initialized

Drive motor does not switch on and off via software

Causes

- Incorrect setup
- Defective PCB
- Wiring
- Defective switch

Heater system inoperative

- No voltage at heater/blown fuse
- Defective switch
- Open heater circuit
- Heater shorted to ground
- Defective SSR
- No signal to SSR from controller
- Defective controller

Pressure

Causes

- Will not build pressure
- Pressure control valve open or leaking
- Pressure bleed valve open or leaking
- Cylinder plug leaking
- Pump malfunction
- Blown rupture disk
- No air at pump
- Oil level low

Solutions

- Disassemble and clean air control valve body and seat per maintenance instructions
- Replace stem, seat, and packing on air control valve per maintenance instructions
- Close or replace pressure bleed valve
- Remove cylinder plug and clean, lube, replace seal per maintenance instructions
- Contact Chandler Engineering service department for pump rebuild

Plug jammed in cylinder

Causes

- Failure to lubricate threads
- Foreign matter in seal ring
- Plug was over-tightened

Solutions

- Cool down plug and unscrew by striking handles with rubber mallet
- See cylinder maintenance section

Pressure will not bleed off

Causes

- Cement or other foreign material in manual valve

Solutions

- Disassemble and clean or replace valve

Erratic pump action

Causes

- Air lock in pump piston cavity
- Contaminants in pump valve body

Solutions

- Increase air drive pressure more gradually to slow down pumping cycle
- Pump must be serviced by Chandler Engineering service tech.

Erratic Bearden Unit Readings on Recorder

Symptom: Reading drops to 0

- Pot mech resistor defective (refer to maintenance instructions)
- Pot mech has disengaged from the drive bar and/or is no longer touching the contact pins
- Pot mech bearings are contaminated with cement (refer to maintenance instructions)
- Set screw on pot mech drive shaft is loose
- Shear pin has broken

Solutions:

- Service pot mech per maintenance instructions
- Remove pot mech, check contact pin tabs, and re-insert properly into cylinder

Symptom: Meter jumps to 10

- Contact pins shorted to cylinder

Section 5 - Replacement Parts

Part Number	Description
07-0035	Plug, Cup Base
07-0038	Diaphragm
07-0042	Paddle
07-0058	Resistor, Potentiometer
07-0060	Arm, Contact (Potentiometer Mechanism)
07-0064	Spring, Calibration
07-0536	Ring, Diaphragm Packing
07-0537	Cap, Hub
07-0538	Hub, Diaphragm
07-0539	Potentiometer Mechanism Assembly
07-1144	Wire, Ground
08-0045	Slurry Cup Assembly
08-0049	Shaft, Cup
08-0081	Thermocouple (Cylinder)
08-0087	Gasket, Base Plug
08-0136	Bearing, Carbon (Mag Drive)
08-0139	Bearing, Bronze (Mag Drive)
188-13668	Hex Key (1/16"L)
70-0023	Thermocouple (Slurry Cup)
8240-0043	Pin, Shear, Steel (Shaft Drive Assembly)
C08964	Oil Filter
C08964	Element, Oil Filter
C09762	Viton O-ring, Cylinder
C10257	Kit, Pump Rebuild, Hydraulic & Air Section
C13800	Fuse, 30A,5AG,250V,SLOBLO
P-0001	Bearing, Shaft
P-0007	Bearing, Frame
P-0061	O-ring, Diaphragm Hub
P-0397	Wrench, Hex (1/8")
P-0556	Wrench,Open,5/8-11/16
P-0779	Wrench, Hex (5/32")
P-0844	Pin, Shear (Shaft Drive Assembly)
P-0860	Pin, Roll (Paddle)
P-1080	Metal O-ring, Cylinder
P-1560	O-Ring, Magnetic Drive

Part Number	Description
P-1593	Disc, Rupture
P-1667	Hex Key (5/64"L)
P-1765	Oil, White Mineral
P-1848	O-Ring, Drain Plug (Magnetic Drive)
P-1855	Ring, Backup (for P-1848)
P-3517	Valve, Pressure Release

To ensure correct part replacement, always specify Model and Serial Number of instrument when ordering or corresponding.

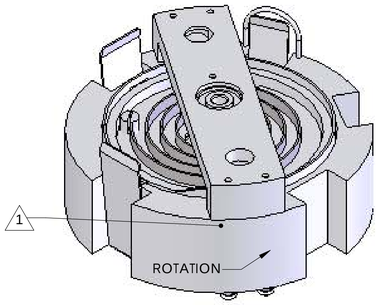
Section 6 - Drawings and Schematics

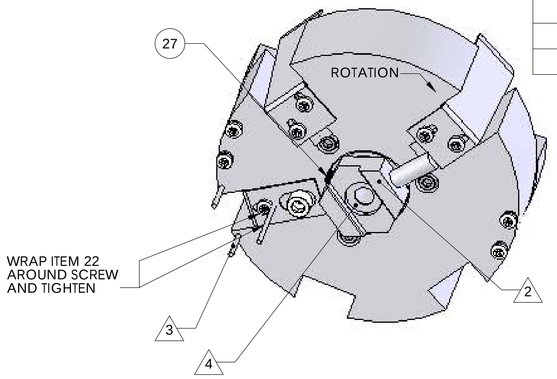
Drawing Number	Description
07-0539	Assembly, Potentiometer Mechanism
08-0045	Cup, Slurry
08-0229	Assembly, Magnetic Drive
08-0469	Assembly, Pot Mech Calibration Table
7222-UEP	Electrical Panel
7222-UEP-0030	Electrical Schematic, 7222-UEP
8240-0023	Cylinder Assembly
8340	Model 8 Consistometer
8340-0001	Upper Level Assembly
8340-0006	Electrical Schematic
8340-0007	Piping Schematic

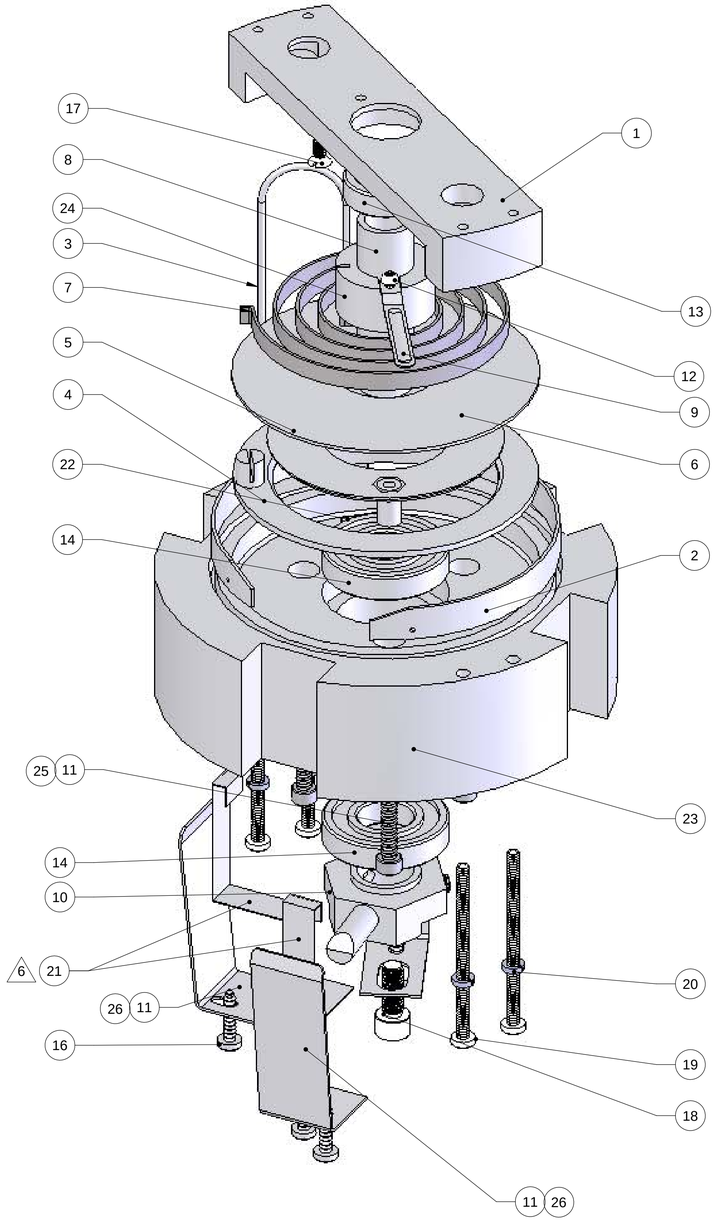
NOTES:

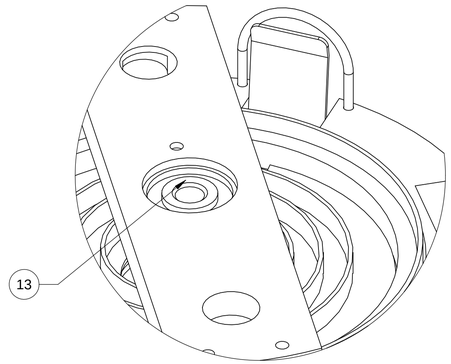
1. CONTACT ARM (ITEM 11) SHOULD ROTATE FROM FIRST WIRE WRAP AROUND TO LAST WIRE WRAP. ROTATION AS SHOWN.
2. ORIENT STOP ARM (ITEM 12) AS SHOWN, AGAINST (ITEM 21).
3. TOP OF ITEM 4 TO BE LEVEL WITH 07-1110. BEND EXCESS UNDER BOTTOM OF ASSEMBLY.
4. LARGE DIAMETER HOLE OF ITEM 9 (07-0055) SLEEVE SPRING SHOULD BE ON TOP END TOWARDS ITEM 1 (07-0056). SMALL DIAMETER END SHOULD BE ON END WITH ITEM 2 (07-1112).
5. PACKAGE USING C12546. (AA)
6. ONE OF THE P-2016 SCREWS NEEDS TO GO THRU THE 07-0638 CONNECTING STRIP, TO HOLD IT IN PLACE.

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	Z	ECN T1630, REMOVED P-2014	5/6/2008	JB/TC
	AA	ECN T1806; ADDED NOTE 5	8/14/2008	TC
	AB	ECN# T3972, REPLACE P-2019 W/H-6045	6/27/11	SS/TC
	AC	ECN# T4233, ADD NOTE 6	11/3/11	SS/TC









DETAIL A
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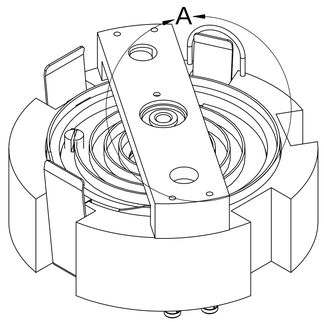

ITEM NO.	PART NUMBER	DESCRIPTION	Default/QTY.
1	07-0056	RETAINER,SHAFT BEARING	1
2	07-0058	ASSY,RESISTOR,POT MECH	1
3	07-0431	STOP,FRAME,POT MECH	1
4	07-0065	SPRING,ADJUSTER	1
5	07-0405	CLAMP,SPRING ADJUSTER	1
6	07-0216	INSULATOR	1
7	07-0064	SPRING,CALIBRATION	1
8	07-0055	SLEEVE SPRING	1
9	07-0060	ARM, CONTACT	1
10	07-0053	STOP,ARM	1
11	07-1113	SET, SPRING, CONTACT	1
12	P-2014	SCREW,PHMS,2-56X1/8	REF
13	P-0001	BEARG,SGL ROW,.50X1.125X.25	1
14	P-0007	BEARING,INT,5MMX19MMX6MM	2
15	H-6045	SCREW,SHCS,BK,6-32X.625,ALN	3
16	P-2016	SCREW,PHSM,SS,4-40X0.500,PHIL	5
17	P-2017	SCREW,FHMS,SS,4-40X0.250,SLOT	1
18	P-2021	SCREW,SHCS,SS,10-32X0.500,AL	1
19	H-4119	SCREW,PHMS,SS,4-40X1.750,PHIL	4
20	H-4001	WASHER,LOCK,SS,#4	4
21	07-0638	STRIP,CONNECTING	2
22	07-1144	WIRE,GROUNDING	1
23	07-1112	FRAME,MOUNTING,TEFLON,POT MECH	1
24	07-0059	COLLAR,SPRING,W/SCREWS	1
25	07-1110	SPRING,GROUND	REF
26	07-1109	SPRING,CONTACT	REF
27	P-2020	SCREW,SKHSS,SS,8-32X0.250,CUP	REF

-04	-03	-02	-01	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM
							. 1
QTY. REQD.				PARTS LIST			

		UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES	**CHANDLER ENGINEERING**
		TOLERANCES: 1 PLACE ±0.030, 2 PLACE ±0.010, 3 PLACE ±0.005, ANGLES ±1/2˚, SURF. FINISH 63	TITLE: POT,MECH,ASSY
.	.		
NEXT ASSY	USED ON		
APPLICATION			
BREAK SHARP EDGES, DEBURR		APPROVALS / DATE	

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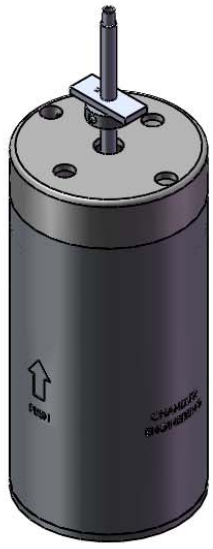
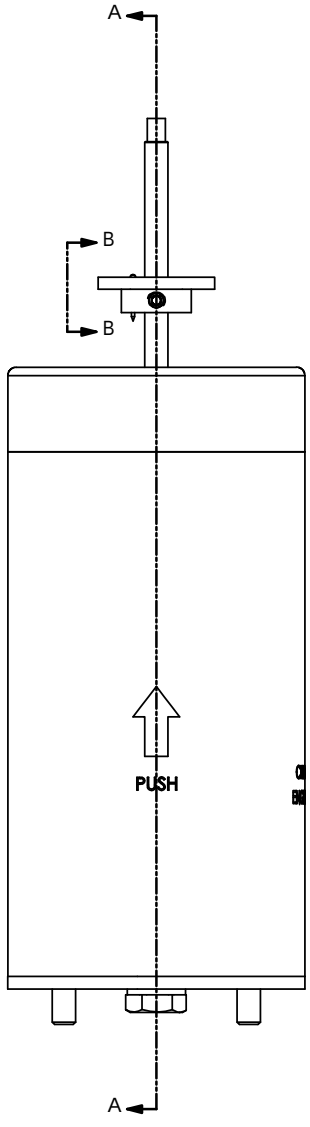
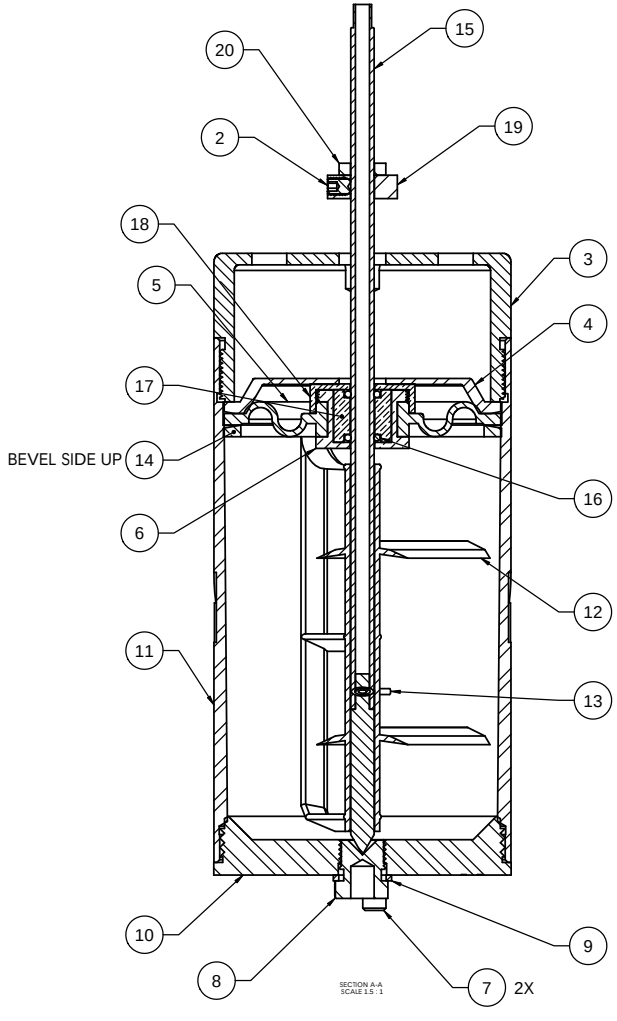
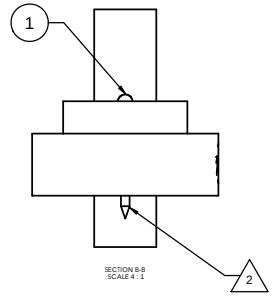
CHECKED: TC	2/23/07	
ENGR.: JJM	1/25/07	SCALE: 1:1; TITLE BLOCK REV: 2.0; SHEET: 1 of 1









REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	L	REDRAWN, NO CHANGES MADE	1/17/08	TC
	M	ECN 71824; ADDED NOTE 3	8/14/2008	TC

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	P-0844	SHEAR PIN	1
2 (REF)	H-10-128	SCREW,SKHSS,SS,10-32X0.25,CUP	1
3	08-0054	CAP, SLURRY CUP	1
4	07-0039	DIAPHRAGM SUPPORT	1
5	07-0038	SLURRY CUP DIAPHRAGM	1
6	07-0538	HUB DIAPHRAGM	1
7 (REF)	P-1454	PIN,ROLL,SST,.25X.625	2
8	07-0035	BASE PLUG PLUG	1
9	08-0087	COPPER GASKET	1
10	07-0033	BASE,SLURRY CUP	1
11	07-0032	TAPPERED SLURRY CUP	1
12	07-0042	PADDLE	1
13	P-0860	ROLL ROLL	1
14	07-0037	COLLAR	1
15	08-0049	SHAFT, PADDLE	1
16	P-0061	ORING	2
17	07-0536	PACKING RING	1
18	07-0537	HUB CAP	1
19	07-0045	DISK,DRIVE SHAFT	1
20	07-0046	DRIVE SHAFT BAR	1

NOTES:

1. LUBRICATE ALL PARTS WITH WHITE LITHIUM GREASE.
2. BEND SHEAR PIN UNDER DISC TO HOLD DISC AND BAR TOGETHER.
3. PACKAGE USING BOX C12549. Ⓒ

NEXT ASSY	USED ON
APPLICATION	
BREAK SHARP EDGES, DEBURR	

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES
TOLERANCES:
1 PLACE ±0.030
2 PLACE ±0.010
3 PLACE ±0.005
ANGLES ±1/2°
SURF. FINISH 63

APPROVALS	DATE
DRAWN: TC	1/17/08
CHECKED: TC	1/17/08
ENGR.: JJM	1/17/08

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CHANDLER ENGINEERING

TITLE: CUP, SLURRY ASSY

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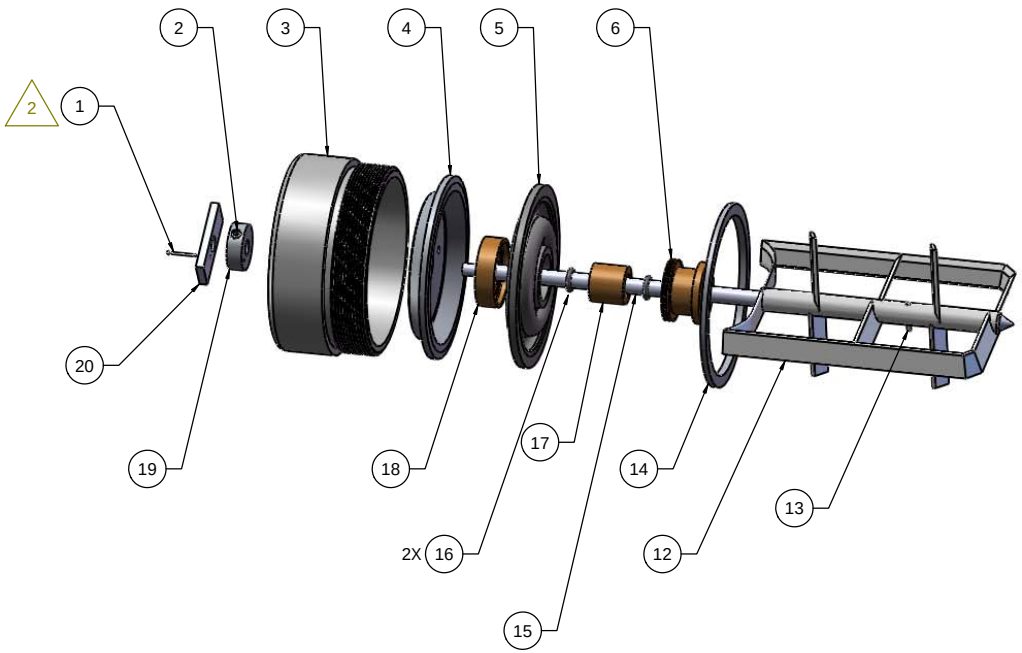

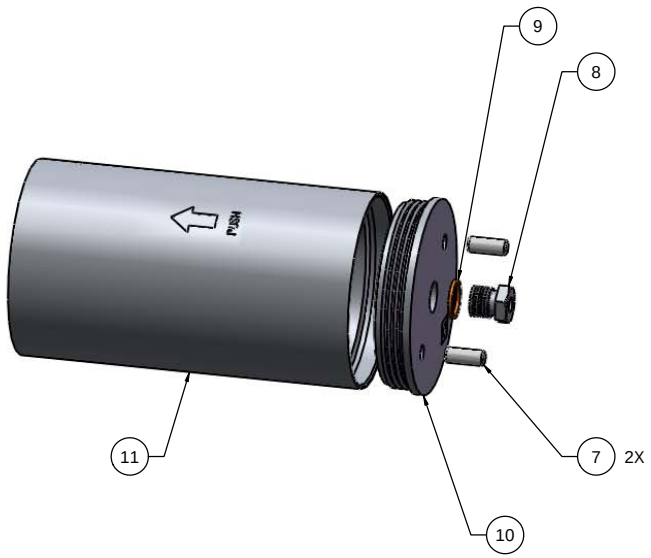

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QTY. REQD.				PARTS LIST			
.			.				
.			.				
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NEXT ASSY			USED ON				
APPLICATION							
BREAK SHARP EDGES, DEBURR							

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES
TOLERANCES:
1 PLACE ±0.030
2 PLACE ±0.010
3 PLACE ±0.005
ANGLES ±1/2°
SURF. FINISH 63

APPROVALS | DATE

DRAWN: TC 1/17/08
CHECKED: TC 1/17/08
ENGR.: JJM 1/17/08

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TITLE
CUP, SLURRY ASSY

SIZE	S.O. NO.	DWG NO.	REV.
D		08-0045	M

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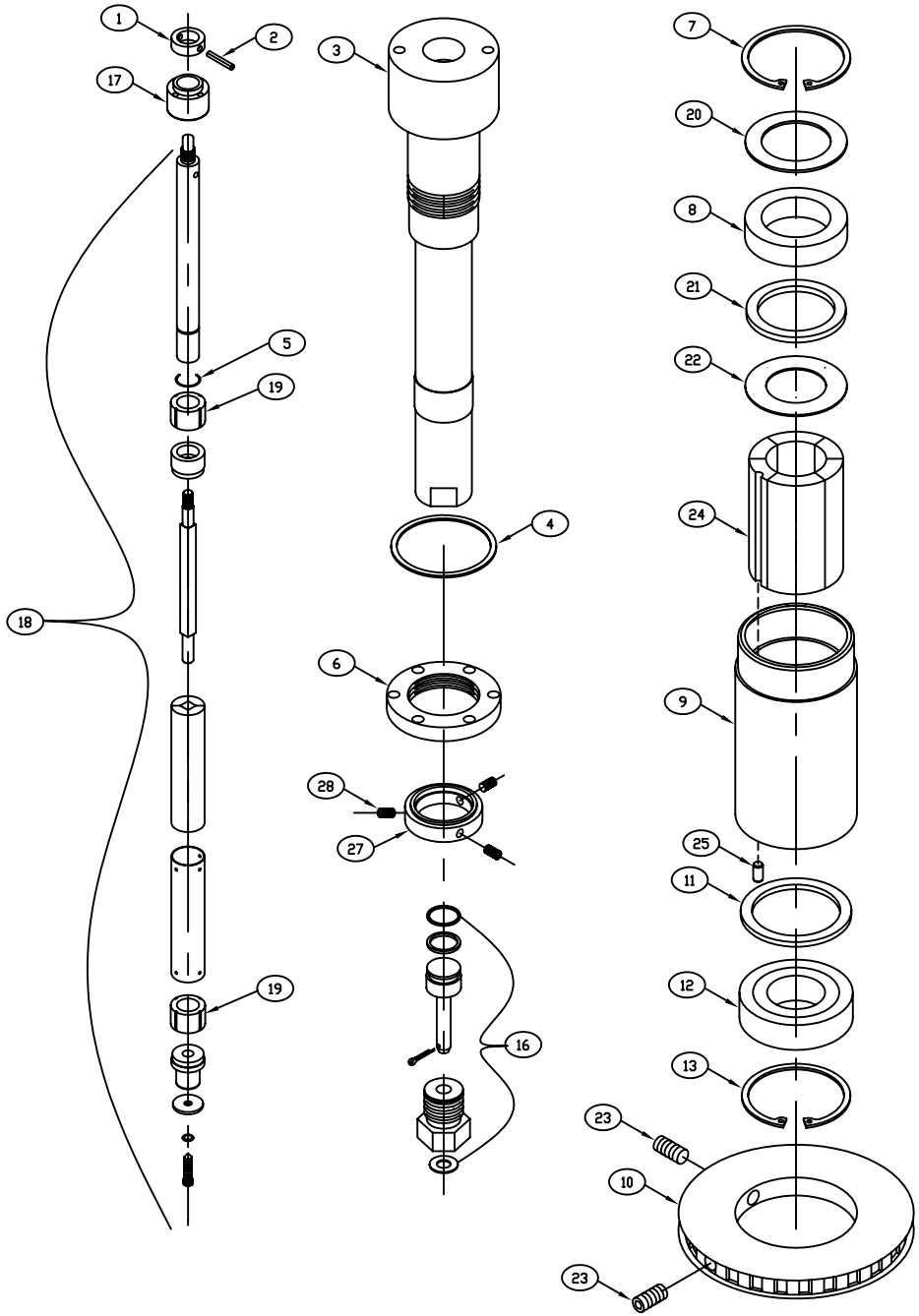

REVISIONS				
ZONE	REV	DESCRIPTION OF REVISION	DATE	APPROVALS
	D	ECN 5454	11/13/97	AEB BD
	E	ECN 6801	3/22/00	JAC JH

NOTE:
FULL ASSEMBLY CONSISTS OF (1) EACH OF THE FOLLOWING SUB-ASSEMBLIES: 8-256 ROTATOR ASSEMBLY, 8-257 SHAFT ASSEMBLY, AND 8-258 HOUSING ASSEMBLY.

THE 8-263 SEAL PLUG ASSEMBLY CONSISTS OF (1) 8-362 PLUG, (1) 8-266 NUT, (1) P-1848 O-RING, (1) P-1855 BACK-UP RING, (1) P-2144 WASHER, AND (1) C08208 COTTER PIN.

-04	-03	-02	-01	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM
							30
							29
			3	H-25-008	1/4-20 X 1/4 SOC. HD. SET SCREW		28
			1	8-0135	COLLAR, RETAINING		27
							26
			1	8-0253	PIN, MAGNET		25
			1	8-0230	ASSEMBLY, MAGNET		24
			2	H-25-020	1/4-20 X 3/4 SOC. HD. SET SCREW		23
			1	8-0255	SPACER		22
			1	8-0154	SPACER		21
			1	8-0251	SPACER		20
			2	8-0136	BEARING		19
			1	8-0231	ASSEMBLY, MAGNET SHAFT		18
			1	8-0139	BEARING, BRONZE		17
			1	8-0263	ASSEMBLY, SEAL PLUG		16
							15
							14
			1	P-2138	RING, RETAINER		13
			1	P-1846	BEARING, BALL		12
			1	8-0152	SPACER		11
			1	8-0132	SPROCKET		10
			1	8-0244	MOLDER, MAGNET		9
			1	8-0153	BEARING, CARBON		8
			1	P-2136	RING, RETAINER		7
			1	8-0141	LOCK RING		6
			1	P-2135	SNAP RING		5
			1	P-1560	O-RING		4
			1	8-0241	HOUSING		3
			1	P-1641	PIN, ROLL		2
			1	8-0140	RING, THRUST		1
QTY. REQD.				PARTS LIST			

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]
TOLERANCES:
1 PLACE ±0.030 [.76]
2 PLACE ±0.010 [.25]
3 PLACE ±0.005 [.127]
ANGLES ±1/2°
SURF. FINISH 63

NEXT ASSY | USED ON
APPLICATION

	APPROVALS	DATE
DRAWN:	JdC	03/22/00
CHECKED:	JM	10/11/99
ENGR.:	RB	10/11/99

CHANDLER ENGINEERING

TITLE
MAGNETIC DRIVE ASSEMBLY

SIZE	S.O. NO.	DWG NO.	REV.
A2		08-0229	E

SCALE: 1 = 1 | DO NOT SCALE DRAWING | SHEET: 1 of 1

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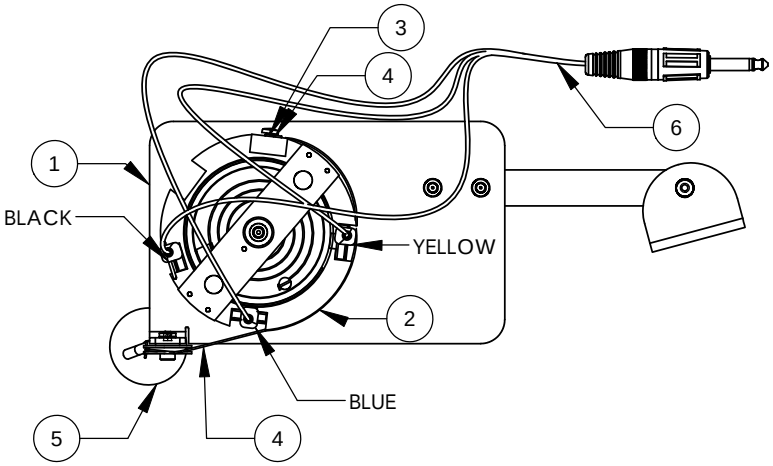

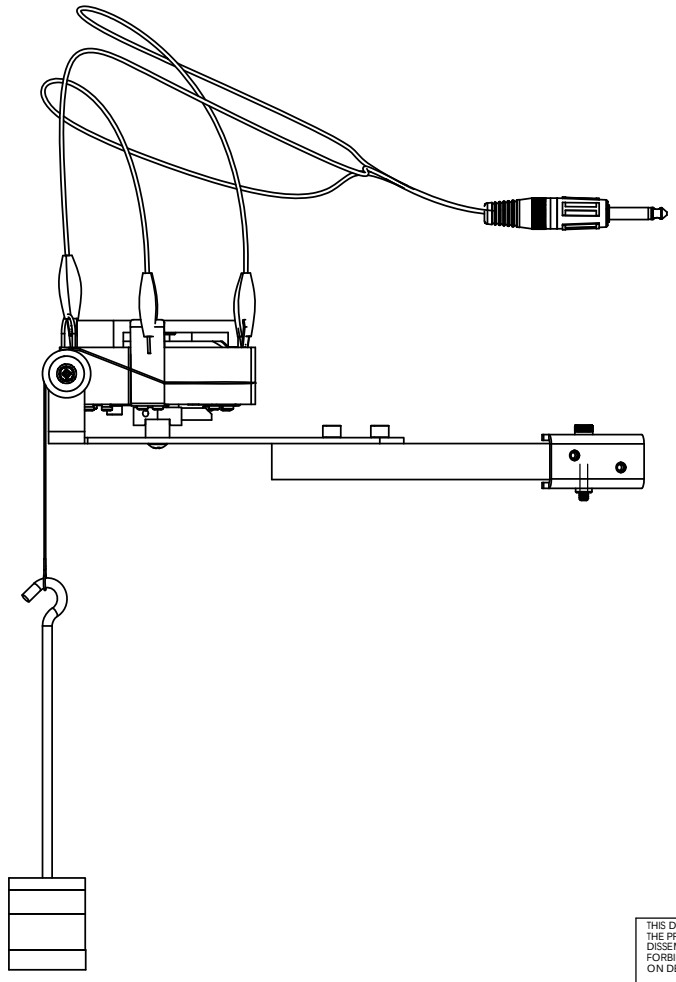

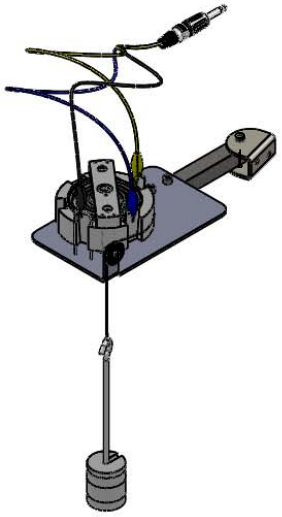

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	ISSUED	5/13/2011	SS

PARTS LIST

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	08-5001-110	CALIBRATION ASSEMBLY	1
2	07-0539	POT,MECH,ASSY	1
3	07-0515	WEDGE,CALIBRATION DEVICE	1
4	07-0519	CORD,ASSY,NYLON	1
5	07-1564	SET,CALIBRATED WEIGHTS&HANGER	1
6	7222-0020	CABLE,SIGNAL	1

.	.
NEXT ASSY	USED ON
APPLICATION	
BREAK SHARP EDGES, DEBURR	

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]

TOLERANCES:
1. PLACE ±0.030
2. PLACE ±0.010
3. PLACE ±0.005
ANGLES ±1/2°
SURF. FINISH 32

APPROVALS		DATE
DRAWN:	TRB	5/11/11
CHECKED:	SS	5/13/11
ENGR:	TRB	5/11/11

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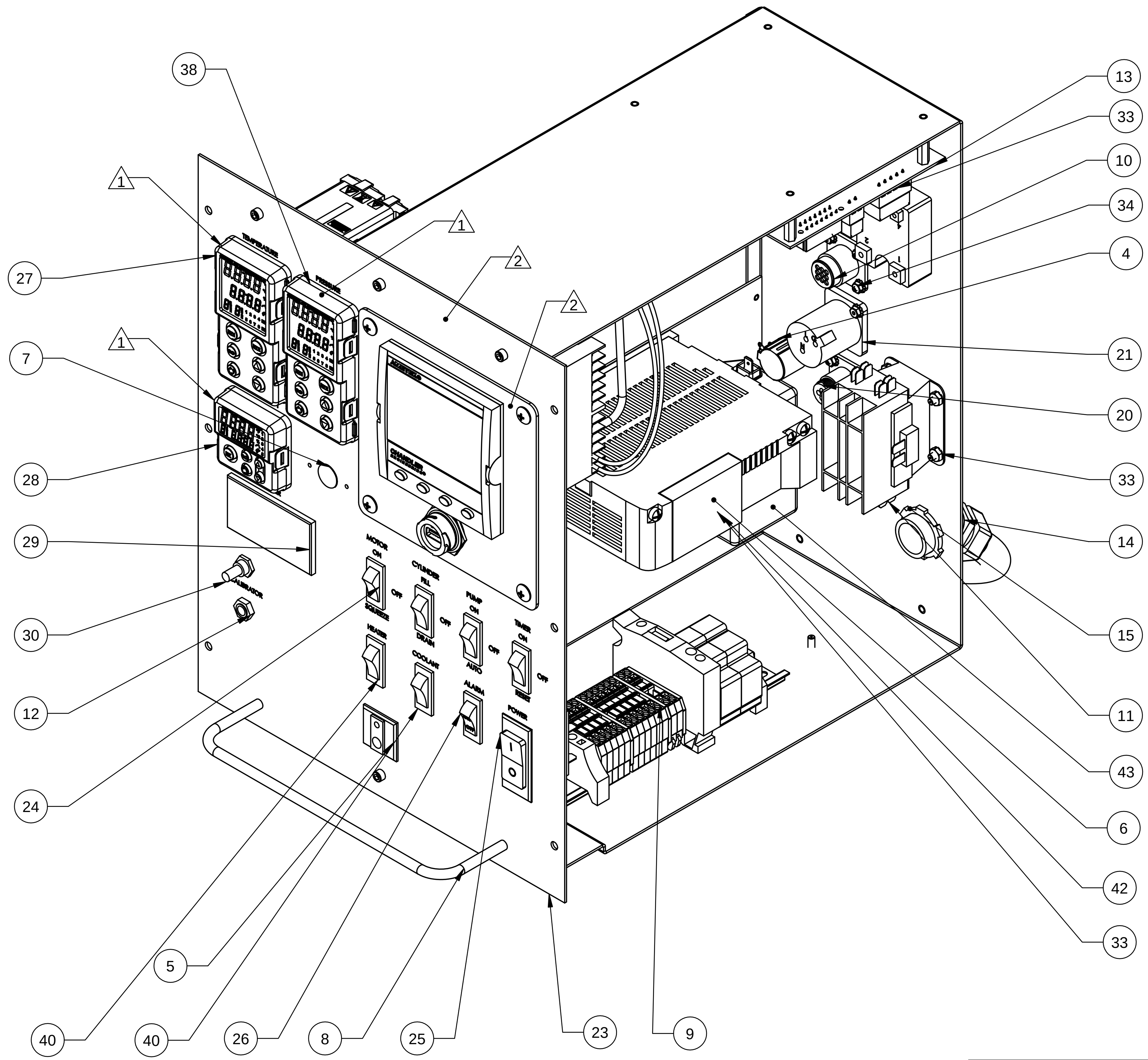
TITLE
ASSEMBLY,CALIBRATION TABLE

SIZE	DWG. NO.	REV.
A	08-0469	A

SCALE: 1:4 | TITLE BLOCK REV: 2.0 | SHEET 1 OF 1

NOTE:
1. ENSURE THAT ALL CONTROLLERS ARE INSTALLED TIGHTLY SO THAT BRACKETS SNAP INTO PLACE AT TOP AND BOTTOM ON BOTH SIDES.
2. ENSURE THAT THE FRONT-FACING SIDE OF EACH PANEL IS FREE OF SCRATCHES AND OTHER COSMETIC DEFECTS.
3. USE DRAWING 7222-UEP-0030 FOR WIRING INSTRUCTIONS

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	C	ECN# T4222, REPLACE ITEMS 6 AND 43	10/27/11	SS/TRB
	D	ECN T4894; CHANGED CONTROLLERS AND RECORDER	9/18/12	TRB
	E	ECN T5174; UPDATED COMPONENTS, ADDED #45 AND NOTES	2/19/13	TRB



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	7222-1609	PANEL,BASE,ELECTRICAL	1
2	P-0413	SWITCH,SPST,TOGGLE,3A,125V,BAT	1
3	C08262	RELAY,SSR,45 AMP,DC CONTROL	1
4	C10410	POT, 10K, 10 TURN	1
5	P-2380	JACK,PNL,TC,1.12,SQ FACE	2
6	C14040	CONTROLLER,AC INVTR,ACS55,1/2H	1
7	C13204	PLUG,HOLE,0.5IN,ZINC	1
8	07-1611	HANDLE,7222-UEP	1
9	07-1612	DIN RAIL ASSY,7222-UEP	1
10	P-3166	RCPT,SQ FLG,SIZE 13,9 CONT	1
11	C08112	CONTACTOR,2POLE,220V,30A	1
12	C09343	JACK,PHONE,1/4" DIAMETER	2
13	7222-0141	PCA,CONSISTOMETER	1
14	C09920	STRAIN RELIEF, 45 DEG. CONN	1
15	C09921	LOCKNUT,CONDUIT,3/4"	1
20	C13372	CONN,PANEL,MALE,4PIN,CPC	1
21	C13370	CONN,PANEL,250V,32A,NEUTRIK	1
23	07-1608	PANEL,FRONT,ELECTRICAL	1
24	C08126	SWITCH,SPDT,ROCKER,OFF/NONE/ON	4
25	C13140	SWITCH,CIRCUIT BRKR,10A,240V	1
26	C08106	SWITCH,SPDT,ROCKER,OFF/NONE/ON	1
27	C15517	CONTROLLER,1/8,2IP,1LGC,RS485	1
28	C15516	CONTROLLER,1/16,1IP,1RLY,RS485	1
29	C09078	CONTROLLER,PANEL MNT,6-DIG,240VDC	1
30	C13147	POT,500 OHM,7/8",WW 2W	1
31	43098-00	SCREW,SHCS,SS,8-32X0.375	6
32	H-8001	WASHER,LOCK,SS,#8	2
33	H-6041	NUT,KEPS,SS,8-32	14
34	H-4122	NUT,HEX,4-40,KEPS,SS	10
35	C13206	STANDOFF,6-32x1.25,F-F,.25 HEX,AL	4
36	H-6001	WSHR,LOCK,SS,#6	4
37	H-6009	SCREW,BHMS,SS,6-32 X 0.25	4
38	C15518	CONTROLLER,1/8,1IP,2TRIAC,485	1
39	07-1613	HARNESS,WIRING,7222-UEP	1
40	C13256	SWITCH,RCKR,PNL,NEON,RED,250VAC	2
42	H-8011	SCREW,BHMS,SS,8-32X0.375	6
43	C13979	FILTER, POWER LINE,10A,250VAC	1
44	103296	RECORDER,DIGITAL,ASSY	1
45	C01472	RES ,100K,1/4W,5%	1

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.	.
NEXT ASSY	USED ON
APPLICATION	
BREAK SHARP EDGES, DEBURR	

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES
TOLERANCES:
1 PLACE ±0.030
2 PLACE ±0.010
3 PLACE ±0.005
ANGLES ±1/2°
SURF. FINISH 32

APPROVALS		DATE
DRAWN:	TRB	4/12/10
CHECKED:	JS	4/26/10
ENGR.:	TRB	4/12/10

CHANDLER ENGINEERING

TITLE: ELECTRICAL PANEL,CONSISTOMETER

SIZE: C | DWG NO.: 7222-UEP | REV.: E

SCALE: 1:2 | TITLE BLOCK REV: 2.0 | SHEET: 1 of 2

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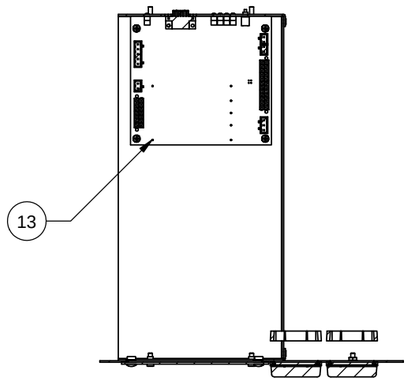
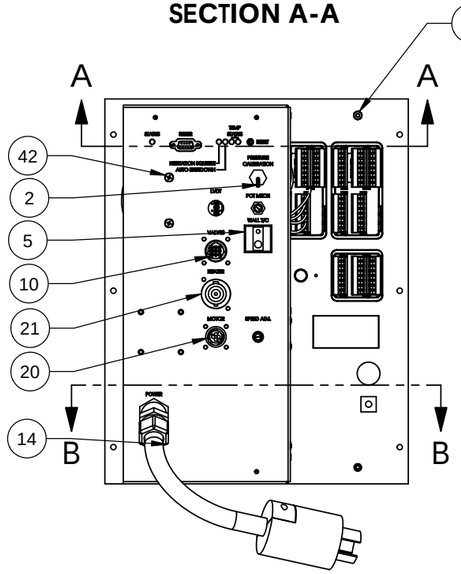
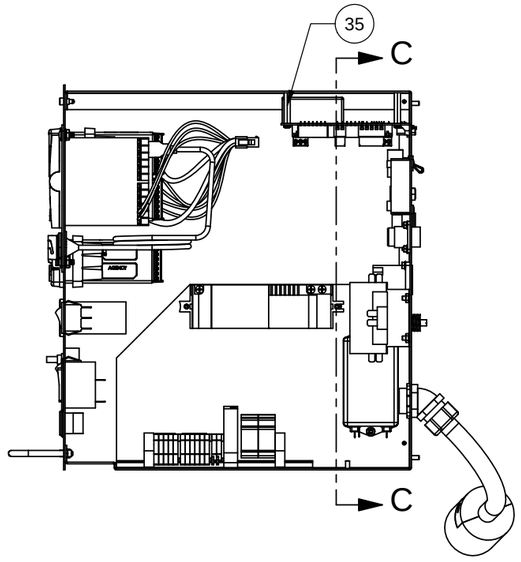
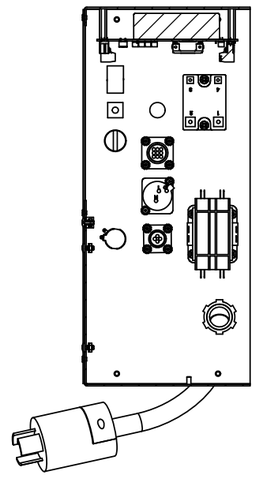


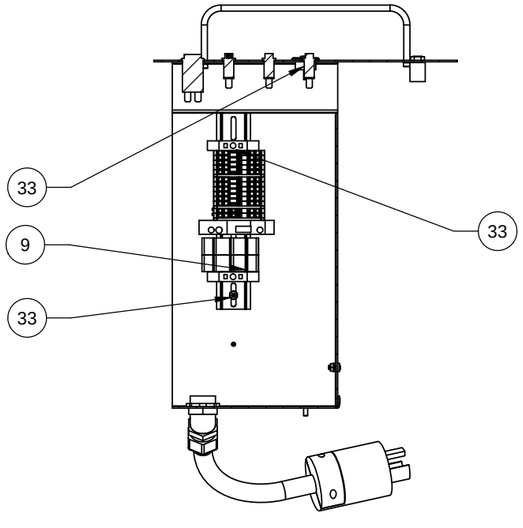
SECTION A-A







SECTION C-C



SECTION B-B

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.	.
NEXT ASSY	USED ON
APPLICATION	
BREAK SHARP EDGES, DEBURR	

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES

TOLERANCES:

1 PLACE	±0.030
2 PLACE	±0.010
3 PLACE	±0.005
ANGLES	±1/2°
SURF. FINISH	32

APPROVALS		DATE
DRAWN:	TRB	4/12/10
CHECKED:	JS	4/26/10
ENGR.:	TRB	4/12/10

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CHANDLER ENGINEERING

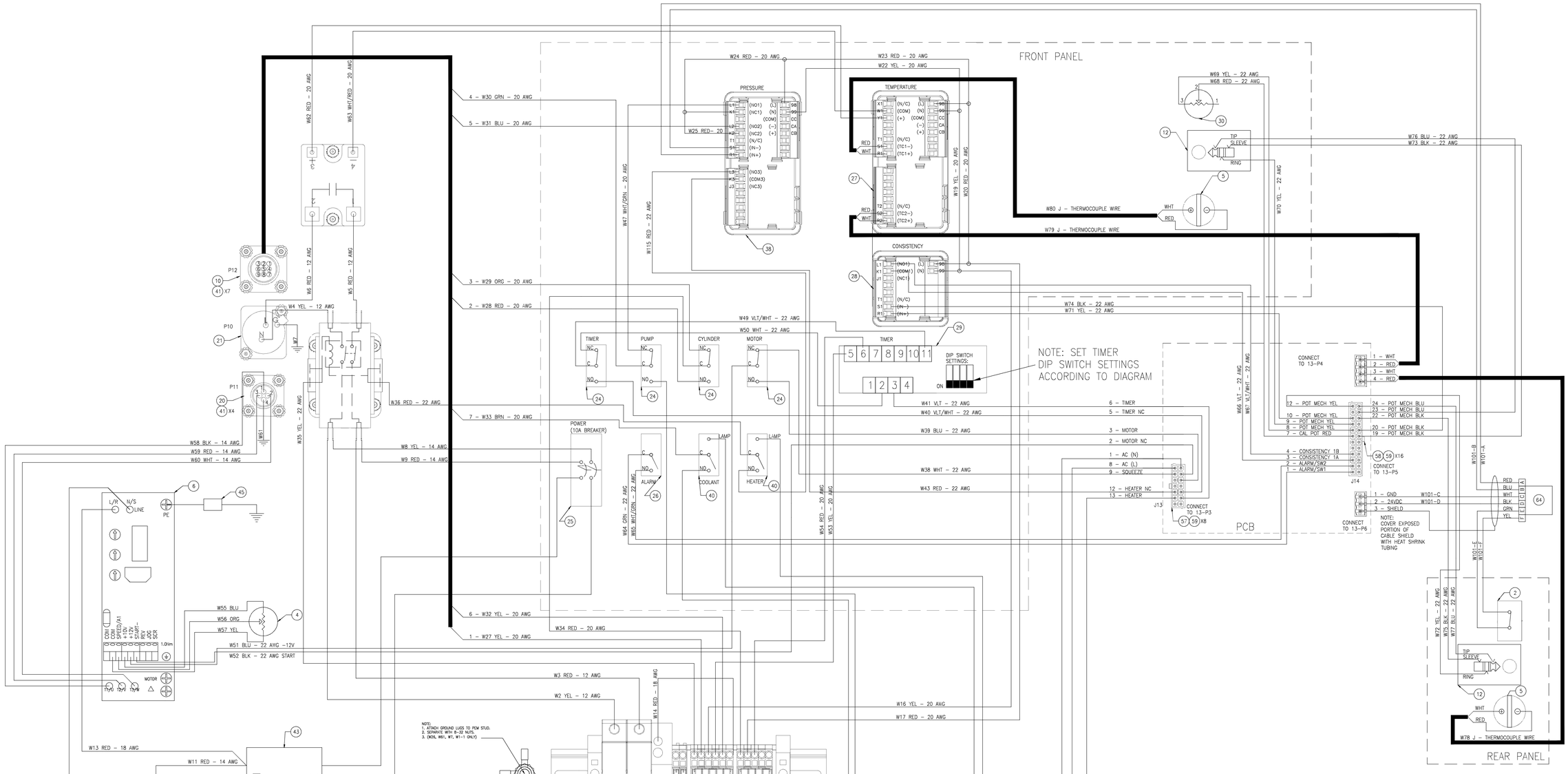
TITLE

ELECTRICAL PANEL,CONSISTOMETER

SIZE	DWG NO.	REV.
C	7222-UEP	E

SCALE: 1:4 | TITLE BLOCK REV: 2.0 | SHEET: 2 of 2

REVISIONS				
ZONE	REV	DESCRIPTION OF REVISION	DATE	APPROVALS
D11,G6,B9	K	ECN T5174;ADDED ITEM 45, CORRECTED WIRING	2/19/13	TB TC
SHT 2	L	ECN T6446; CORRECTED ITEM NUMBERS	3/2/15	TC TC
SHT 2	M	ECN T6541; CHD WIRING TO DIG RECORDER	04/20/15	AMH AMH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]		CHANDLER ENGINEERING			
		TOLERANCES:		TITLE	SCHEMATIC,WIRING 7222–UEP		
NEXT ASSY	USED ON	1 PLACE ±0.030 2 PLACE ±0.010 3 PLACE ±0.005 ANGLES ±1/2°	63				
APPLICATION		SURF. FINISH					
BREAK SHARP EDGES, DEBURR		APPROVALS	DATE				
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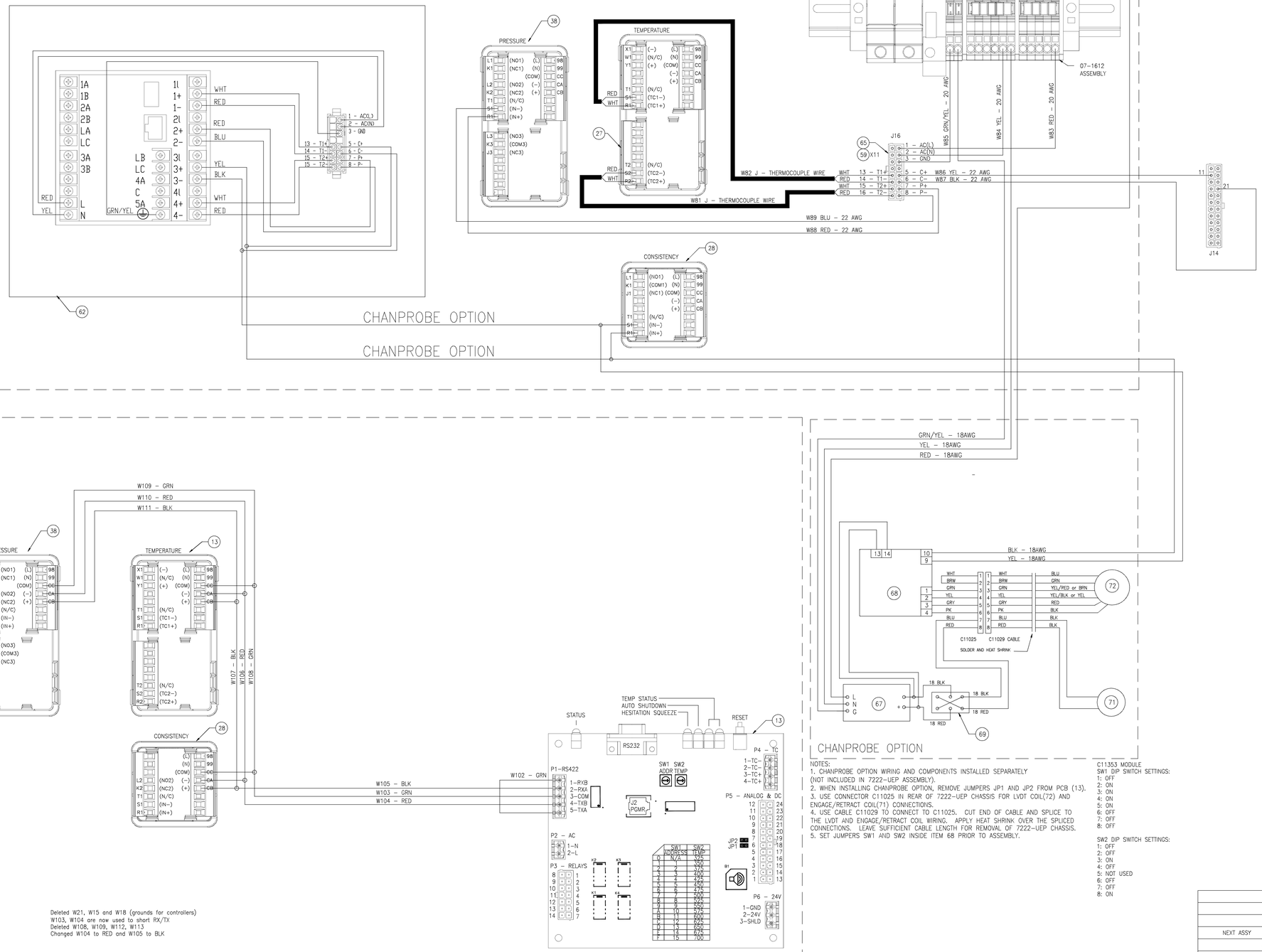
Copyright by Chandler Engineering Company LLC		CHECKED: JS	4/26/10				
		ENGR.: TRB	4/14/10	SCALE: N/A	TITLE BLOCK REV: 1.0	SHEET: 1 of 2	



NOTES:
1. CHANPROBE OPTION WIRING AND COMPONENTS INSTALLED SEPARATELY (NOT INCLUDED IN 7222-UEP ASSEMBLY).
2. WHEN INSTALLING CHANPROBE OPTION, REMOVE JUMPERS JP1 AND JP2 FROM PCB (13).
3. USE CONNECTOR C11025 IN REAR OF 7222-UEP CHASSIS FOR LVDT COIL(72) AND ENGAGE/RETRACT COIL(71) CONNECTIONS.
4. USE CABLE C11029 TO CONNECT TO C11025. CUT END OF CABLE AND SPLICE TO THE LVDT AND ENGAGE/RETRACT COIL WIRING. APPLY HEAT SHRINK OVER THE SPLICED CONNECTIONS. LEAVE SUFFICIENT CABLE LENGTH FOR REMOVAL OF 7222-UEP CHASSIS.
5. SET JUMPERS SW1 AND SW2 INSIDE ITEM 68 PRIOR TO ASSEMBLY.

C11353 MODULE
SW1 DIP SWITCH SETTINGS:
1: OFF
2: ON
3: ON
4: ON
5: ON
6: OFF
7: OFF
8: OFF

SW2 DIP SWITCH SETTINGS:
1: OFF
2: OFF
3: ON
4: OFF
5: NOT USED
6: OFF
7: OFF
8: ON

PARTS LIST (FOR REFERENCE ONLY)

ITEM	PN	DESCRIPTION
1	7222-1609	PANEL,BASE,ELECTRICAL
2	P-0413	SWITCH,SPST,TOGGLE,3A,125V,BAT
3	C08262	RELAY,SSR,45 AMP,DC CONTROL
4	C10594-1	POTENTIOMETER,MOTOR SPEED CONTROL
5	P-2380	JACK,PNL,TC,1.12,SQ FACE
6	C14040	CONTROLLER,AC INVTR,ACS55,1/4H
7	C13204	PLUG,HOLE,0.5IN,ZINC
8	07-1611	HANDLE,7222-UEP
9	7222-E	DIN RAIL ASSY,7222-UEP
10	P-3166	RCPT,SQ FLG,SIZE 13,9 CONT
11	C08112	CONTACTOR,2POLE,220V,30A
12	C09343	JACK,PHONE,1/4" DIAMETER
13	7222-0141	PCA,CONSISTOMETER
14	C09920	STRAIN RELIEF, 45 DEG. CONN
15	C09921	LOCKNUT,CONDUIT,3/4"
20	C13372	CONN,PANEL,MALE,4PIN,CPC
21	C13370	CONN,PANEL,250V,32A,NEUTRIK
22	C13205	CLAMP CABLE .437/.140 NYLON
23	07-1608	PANEL,FRONT,ELECTRICAL
24	C08126	SWITCH,SPDT,ROCKER,OFF/NONE/ON
25	C13140	SWITCH,CIRCUIT BRKR,10A,240V
26	C08106	SWITCH,RCKR,PNL,SPST,OFF-XX-ON
27	C15517	CONTROLLER,1/8,2IP,1LGC,RS485
28	C15516	CONTROLLER,1/16,1IP,1RLY,RS485
29	C09078	CONTROLLER,PANEL MNT,6-DIG,240VDC
30	C13147	POT,500 OHM,7/8",WW 2W
31	43098-00	SCREW,SHCS,SS,8-32X0.375
32	H-8001	WASHER,LOCK,SS,#8
33	H-6041	NUT,KEPS,SS,8-32
34	H-4122	NUT,HEX,4-40,KEPS,SS
35	C13206	STANDOFF,6-32x1.25,F-F,.25 HEX,AL
36	H-6001	WSHR,LOCK,SS,#6
37	H-6009	SCREW,BHMS,SS,6-32 X 0.25
38	C15518	CONTROLLER,1/8,1IP,2TRIAC,485
39	07-1613	HARNESS,WIRING,7222-UEP
40	C13256	SWITCH,RCKR,PNL,NEON,RED,250VAC
41	P-3062	PIN,MALE,18-14GA,CIRC CONN
43	C13979	FILTER,POWER LINE,10A,250VAC
44	103296	RECORDER,DIGITAL,ASSY
45	C01472	RES.,100K,1/4W,5%
51	C13143	CONN,RECEPT,4POS,VERT,SINGLE
52	C13144	CONN,RECEPT,3POS,VERT,SINGLE
53	C13145	CONN,TERM,FEMALE,10-12AWG,TIN
57	C13239	CONN,RECEPT,14POS,MINI-FIT-JR
58	C13240	CONN,RECEPT,24POS,MINI-FIT-JR
59	C13241	CONN,TERM,FEMALE,18-24AWG
60	C09945	CORD,12AWG,600V,SO-3COND,BLK
61	08-0425	COVER PLATE,RECORDER
62	103296	RECORDER,ASSY,DIGITAL
64	C07833	XDCR,PRESSURE,40KPSI,W/CABLE
65	C12347	CONN,RECEPT,16POS,MINI-FIT-JR
66	C12348	CONN,PLUG,16POS,MINI-FIT-JR
67	C10179	PS,SW,DIN,24VDC
68	C11353	MODULE,LVDT,LDM1000
69	P-1469	SWITCH,TGLE,PNL,3PST,OFF-XX-ON
71	1602-0052	COIL ASSEMBLY, HT
72	C13301	COIL, LVDT
73	C13250	CONN,TERM,MALE,18-24AWG

		UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]
		TOLERANCES:
		1 PLACE ±0.030
		2 PLACE ±0.010
NEXT ASSY	USED ON	3 PLACE ±0.005
		ANGLES ±1/2°
APPLICATION		SURF. FINISH 63
BREAK SHARP EDGES, DEBURR		APPROVALS / DATE

CHANDLER ENGINEERING

TITLE: SCHEMATIC,WIRING 7222-UEP

DRAWN:	TRB	4/14/10
CHECKED:	JS	4/26/10
ENGR.:	TRB	4/14/10

SIZE B | S.O. NO. | DWG NO. 7222-UEP-0030 | REV. M

SCALE: N/A | TITLE BLOCK REV: 1.0 | SHEET: 2 of 2

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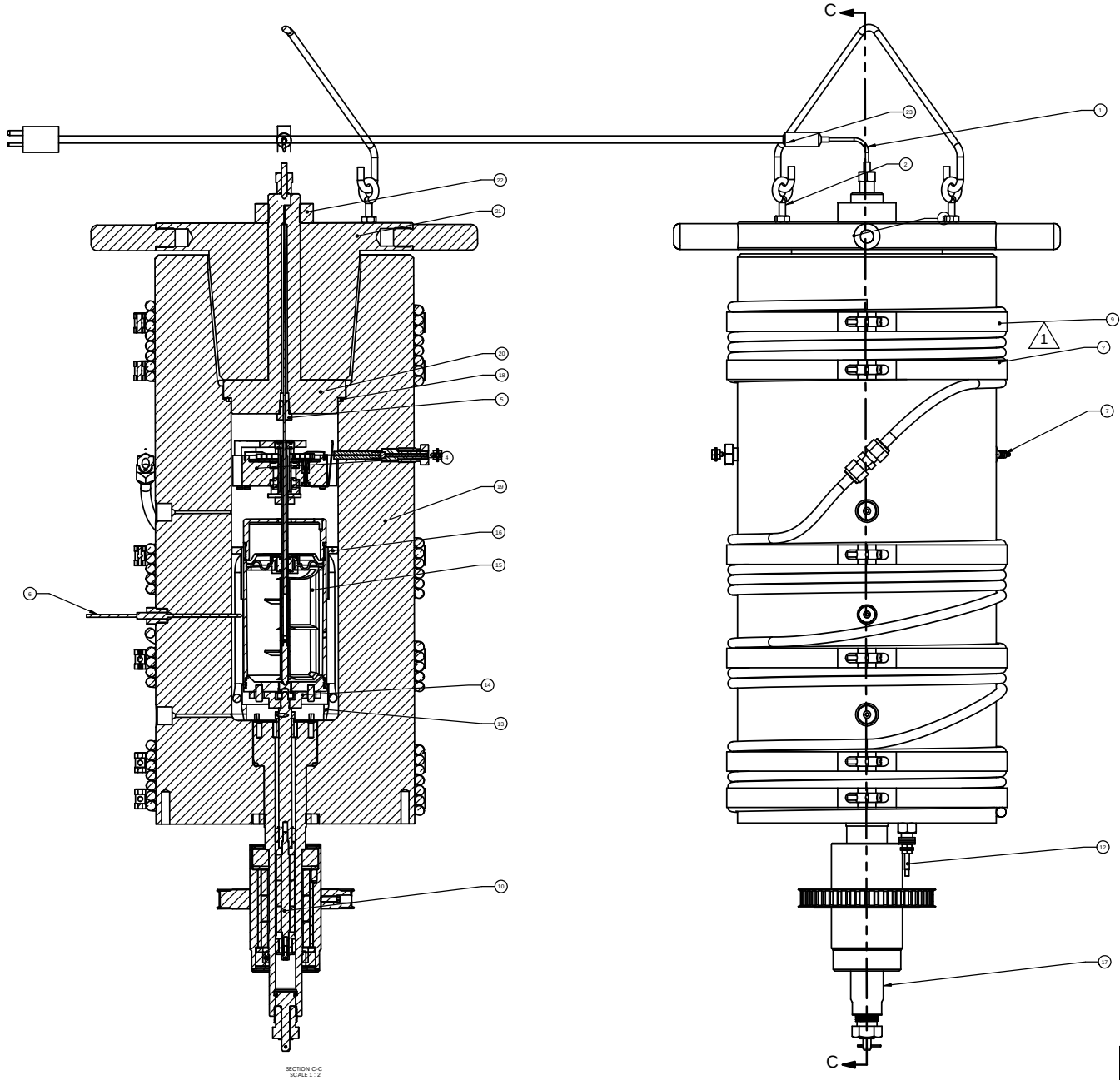

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	G	ECN T3524; REDRAWN	12/30/10	AS/TC
	H	ECN T4178; CHANGED QTY OF 07-1489	9/30/11	TC

NOTES:

1. FINISH MACHINING PER 08-0082, RECORD ALL SEAL SHAFT DIMENSIONS FER 07-0234.
2. STAMP MARKS FOR P-1080 O-RING, REFER TO 07-1512.
3. PRESSURE TEST PER 8240-0027 PROCEDURE.

ITEM NO.	PART NUMBER	Description	Default/QTY.
1	70-0023	THERMOCOUPLE	1
2	P-0408	BOLT,EYE,.25-20X2.0,STL	2
3	8240-0031	PLUG HANDLE	4
4	07-0539	POT,MECH,ASSY	1
5	07-1114	THERMOCOUPLE GUIDE, SEAL SHAFT	1
6	08-0081	THERMOCOUPLE	1
7	08-0085	PIN,GROUND	1
8	08-0083	CONTACT PIN ASSEMBLY	2
9	C10841	CLAMP,BAND,21 3/16 L,3/4 W	6
10	08-0257	SHAFT ASSY,MAG DRIVE	1
11	C09057	UNION, BRS, 3/8T X 3/8T, SW	1
12	07-1030	HEATER,ASSY 5K,WATT,220V	1
13	07-0186	SPREADER, LOWER HEATER	1
14	08-0148	CUP,TABLE	1
15	08-0045	CUP, SLURRY ASSY	1
16	07-1523	COLLAR, HEATER	1
17	08-0258	HOUSING, MAG DRIVE	1
18	P-1080	.SEAL RING, SST, 4.5 OD X 1/8T	1
19	08-0279	CYLINDER	1
20	08-0278	SEAL SHAFT	1
21	07-0215	SEAL SHAFT, CYLINDER	1
22	07-0010	NUT, SEALING	1
23	07-0009	BAIL, PLUG	1
24	07-1489	COOLING COIL	1.5

QTY. REQD.		PARTS LIST	
		UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES	**CHANDLER ENGINEERING**
		TOLERANCES: 1 PLACE ±0.030; 2 PLACE ±0.010; 3 PLACE ±0.005; ANGLES ±1/2°; SURF. FINISH 125	TITLE: CYLINDER, ASSY
-	-		
NEXT ASSY	USED ON		
APPLICATION			
BREAK SHARP EDGES, DEBURR		APPROVALS / DATE	

DRAWN: AS	12/30/10	SIZE: D	DWG NO.: 8240-0023		REV.: H
CHECKED: TC	1/3/10				
ENGR.: JJM	12/30/10	SCALE: 1:12	TITLE BLOCK REV. 2.0	SHEET: 1 of 1	

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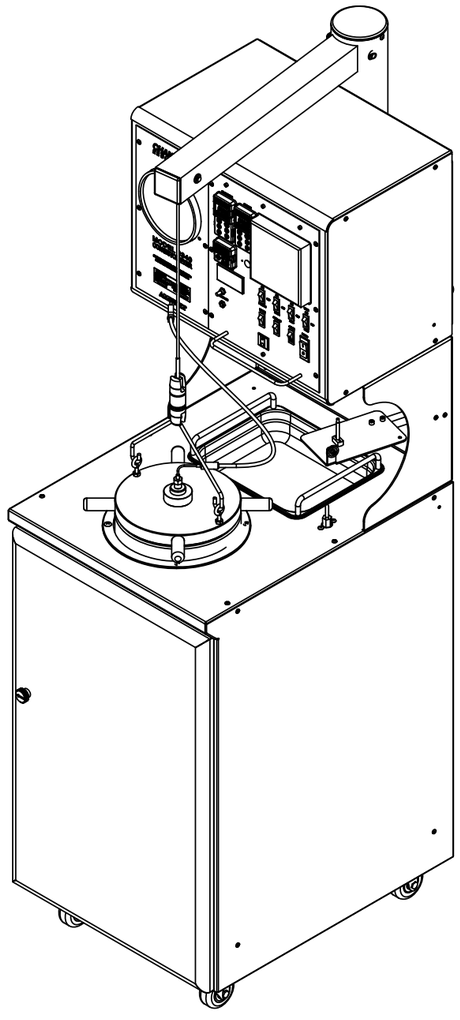

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	D	ECN T5107; DEL 35-0005-77 AND 35-0005-83	1/22/13	TC
	E	ECN T5358; ADDED ITEMS 14, 15, 16	5/31/13	TC

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	8340-0001	8340 UPPER LEVEL ASSY	1
2	8330-LABEL	LABEL PLACEMENT DIAGRAM	1
3	08-0256	ROTATOR, MAG DRIVE ASSY	1
4			1
5			1
6	7222-0149	CABLE, HEATER, 3 COND, 12 AWG	1
7	7222-0150	CABLE, MOTOR, 4 COND, 14 AWG	1
8	7222-0151	CABLE, POT MECH	1
9	8340-ACCESS	ACCESSORIES, MODEL 8340	1
10	C06892	VARISTOR, 250VAC	2
11	C07539	FUSE, 3.000A, 250V, 3AG, FAST	1
12	C13800	FUSE,30A,5AG,250V,SLOBLO	2
13	C13393	PLUG, 50A, 250V, HUBBELL CS8265C	1
14	19396-00	TERM,RING,22-18AWG,#10,HI-TEMP	3
15	C09603	TERM,RING,12-10AWG,#10,HI-TEMP	2
16	R-1421	WIRE,12 AWG,TAN,HI-TEMP,TGGT	4'

PARTS LIST

.	.
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES

TOLERANCES:
1 PLACE ±0.030
2 PLACE ±0.010
3 PLACE ±0.005
ANGLES ±1/2°
SURF. FINISH 32

BREAK SHARP EDGES, DEBURR

APPROVALS		DATE
DRAWN:	TC	1/21/11
CHECKED:	JS	1/21/11
ENGR.:	TRB	1/21/11

CHANDLER ENGINEERING

TITLE
MODEL 8 CONSISTOMETER

SIZE	DWG NO.	REV.
B	8340	E

SCALE: 1:24 | TITLE BLOCK REV: 2.0 | SHEET: 1 of 1

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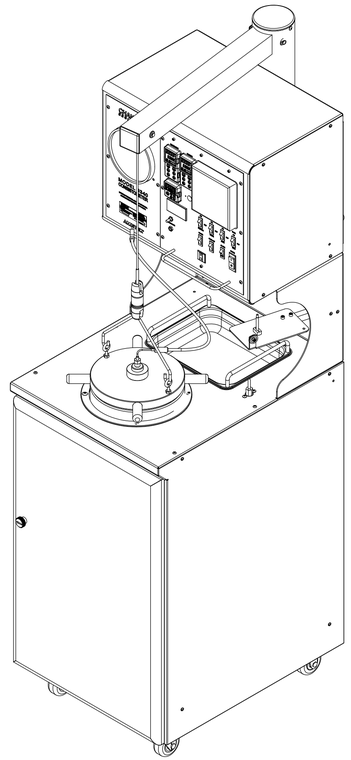
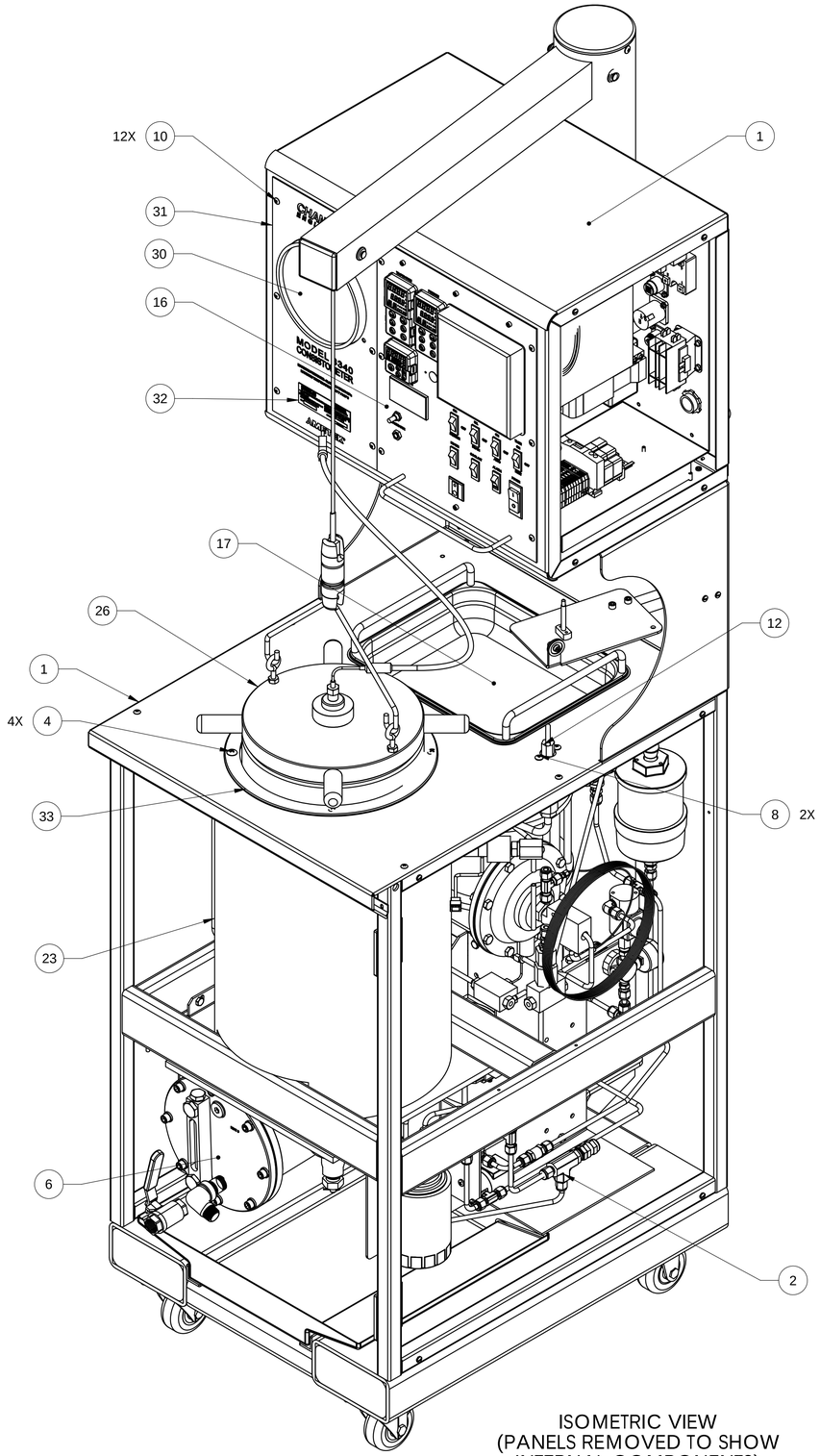
NOTES:
1. TUBING SHOWN FOR REFERENCE ONLY. BEND AS REQUIRED USING APPROPRIATE DRAWINGS.

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	ECN# T4005, RELEASED	7/15/11	SS
	B	ECN T4478; DELETE C09110	3/9/12	TC
	C	ECN T5763; ADDED P-2168	2/13/14	TC



ISOMETRIC VIEW



ISOMETRIC VIEW
(PANELS REMOVED TO SHOW INTERNAL COMPONENTS)

8340-0001			
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	08-5001	CABINET ASSEMBLY	1
2	08-5017	8340 PLUMBING ASSEMBLY	1
3	H-25-036	NUT,1/4-20,SS,KEPS	4
4	H-25-035	SCREW,THMS,SS,1/4-20X0.500	4
5	P-1604	BELT,TIMING,.375PX.50W	1
6	08-0457	RESERVOIR ASSEMBLY,7322/8340	1
7	08-5027-02	MOTOR ASSEMBLY	1
8	H-10-110	SCREW,THMS,SS,10-32X0.50,PHIL	2
9	H-8004	NUT,HEX,SS,8-32	4
10	H-8032	SCREW,THMS,8-32X0.250,PHIL	12
11	P-2167	ADAPTER,SS,3/8HPX1/4HPT,HIP	1
12	P-3517	VALVE,ANGLE,60KPSI,SST,3/8 HPT	1
13	C07833	TRANSDUCER, PRESSURE, 40000 PSIG	REF
14	C09338	GROMMET,RUBBER,1.5 I.D.	1
15	P-0754	TEE,SS,UN,1/4TX1/4TX1/4T,HP	1
16	7222-UEP	ELECTRICAL PANEL,CONSISTOMETER	1
17	7222-0015	ASSY,UTILITY PAN	1
18	08-5008	BULKHEAD, AIR/WATER	1
19	C11477	SCREW,SHCS,SS,3/8-16X1.500,AL	8
20	C13588	HEX BOLT,GR5,3/8-16X3/4	4
21	H-37-002	WSHR,LOCK,SS,3/8	8
22	H-37-001	WSHR,FLAT,SS,3/8	12
23	07-1549	JACKET, CYLINDER INSULATION	1
24	C13613	TEE,0.25"DIA,60KPSI,SS	1
25	08-0456	PUMP ASSEMBLY, 8340	1
26	8240-0023	CYLINDER, ASSY	1
27	08-5010	COUNTER BALANCE ASSEMBLY	1
28	P-2169	COLLAR,SST,3/4-16RHx3/8HPT	2
30	C09060	GA, PRESSURE, 40,000 PSI	1
31	08-5044	PANEL, GAUGE 8340	1
32	8340-0084	NAMEPLATE, 8240	1
33	08-4998	RING, CYLINDER DECK, 8340	1
34	C11672	SWIVEL,CABLE, SST,BALL BEARING, 1.25, 4K LB	1
35	08-0470	LP TUBING SET,8340	1
36	08-0471	HP TUBING SET,8340	1
37	08-5070	LP TUBING SET, COMMON	1
38	08-5071	HP TUBING SET,COMMON	1
39	P-0193	GLAND,SST,TUBE,1/4TX9/16-18RH	2
40	P-0855	COLLAR,SS,1/4-28LHX3/8LGX3/8OD	2
41	P-3202	UNION,BRS,RDCG,3/8TX1/4T,SW	2
42			
60	C09912	GROMMET, RUBBER, 5/16	1
61	P-2168	GLAND,SS,3/4-16RHX3/8HPT	2

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES

TOLERANCES:
1 PLACE ±0.030
2 PLACE ±0.010
3 PLACE ±0.005
ANGLES ±1/2°
SURF. FINISH 32

NEXT ASSY | USED ON

APPLICATION

BREAK SHARP EDGES, DEBURR

APPROVALS | DATE

DRAWN: AJS 12/30/10
CHECKED: TC 12/30/10
ENGR.: TRB 12/30/10

CHANDLER ENGINEERING

TITLE: 8340 UPPER LEVEL ASSY

SIZE: D | DWG NO.: 8340-0001 | REV.: C

SCALE: 1:4 | TITLE BLOCK REV: 2.0 | SHEET: 1 of 4

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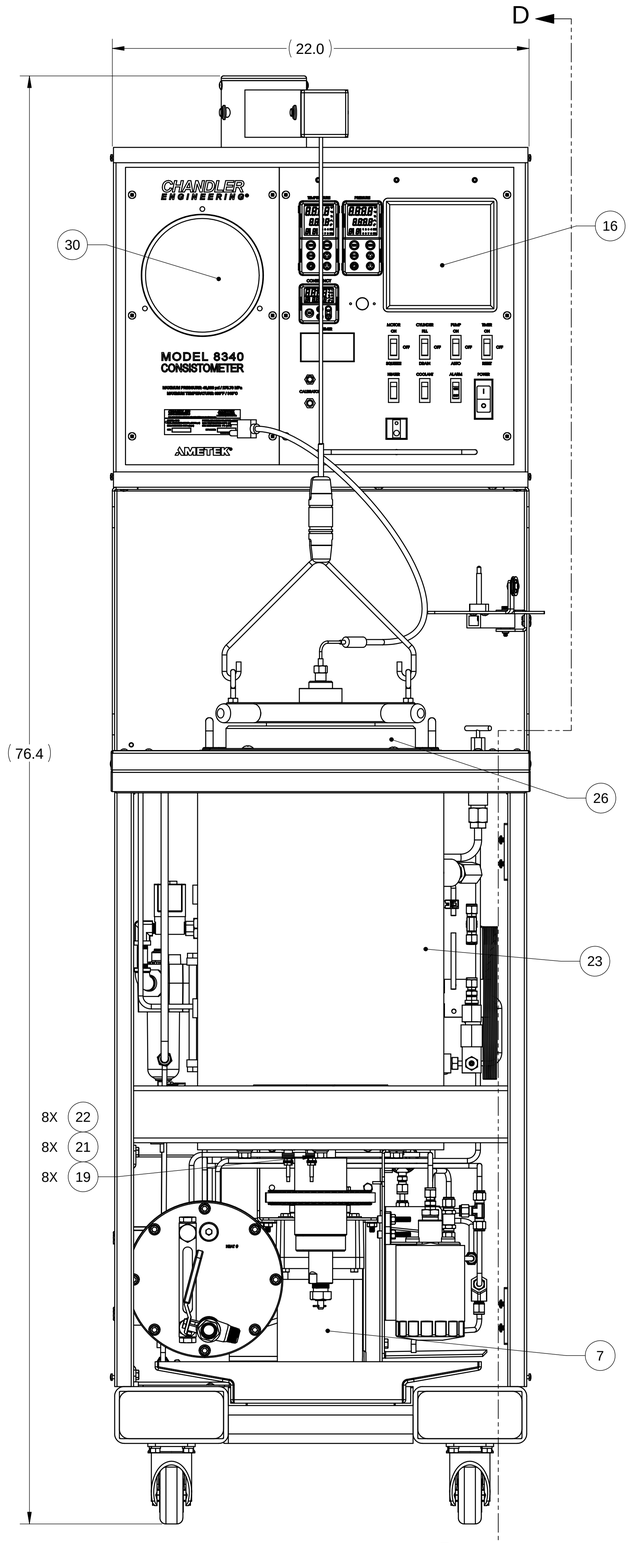
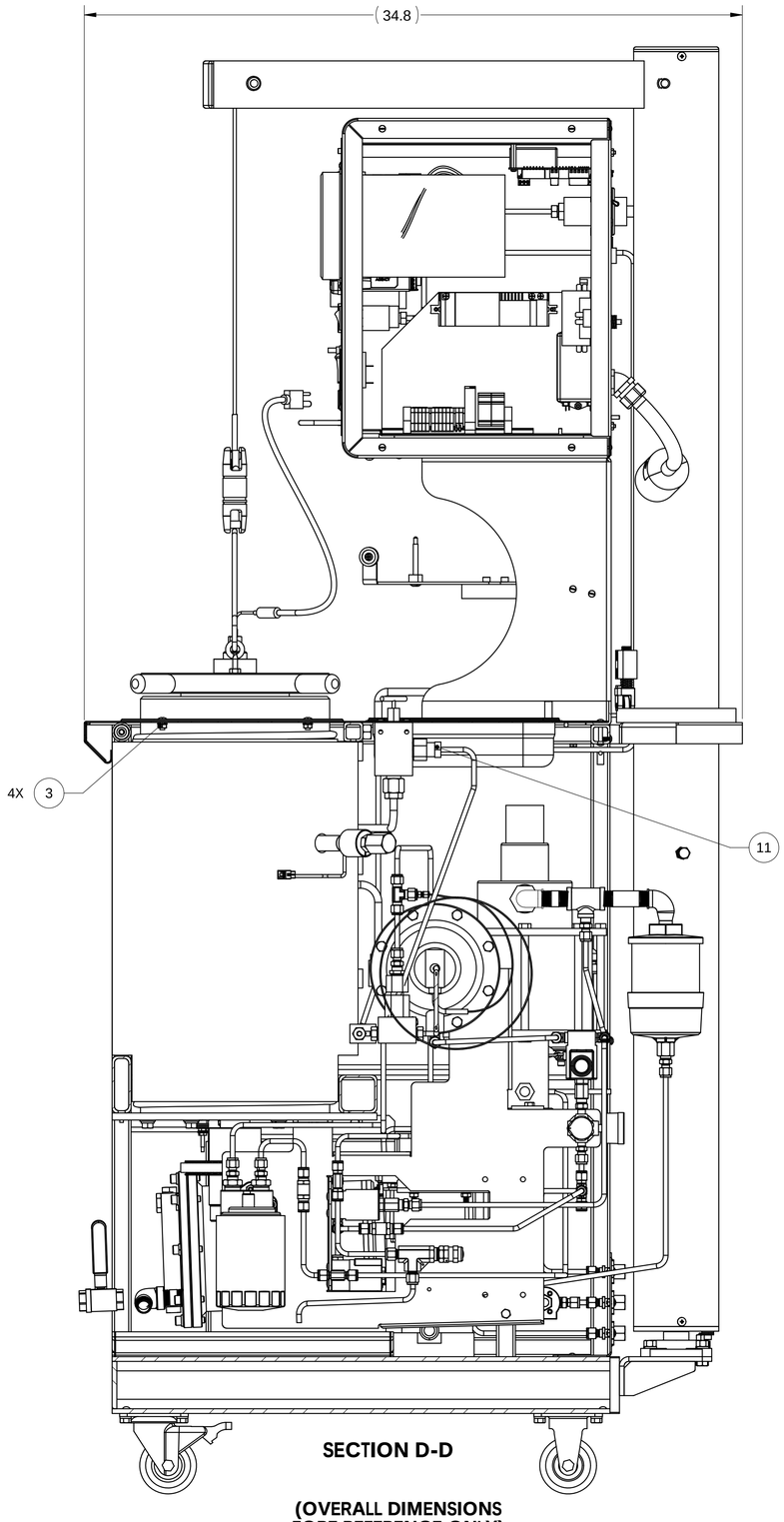
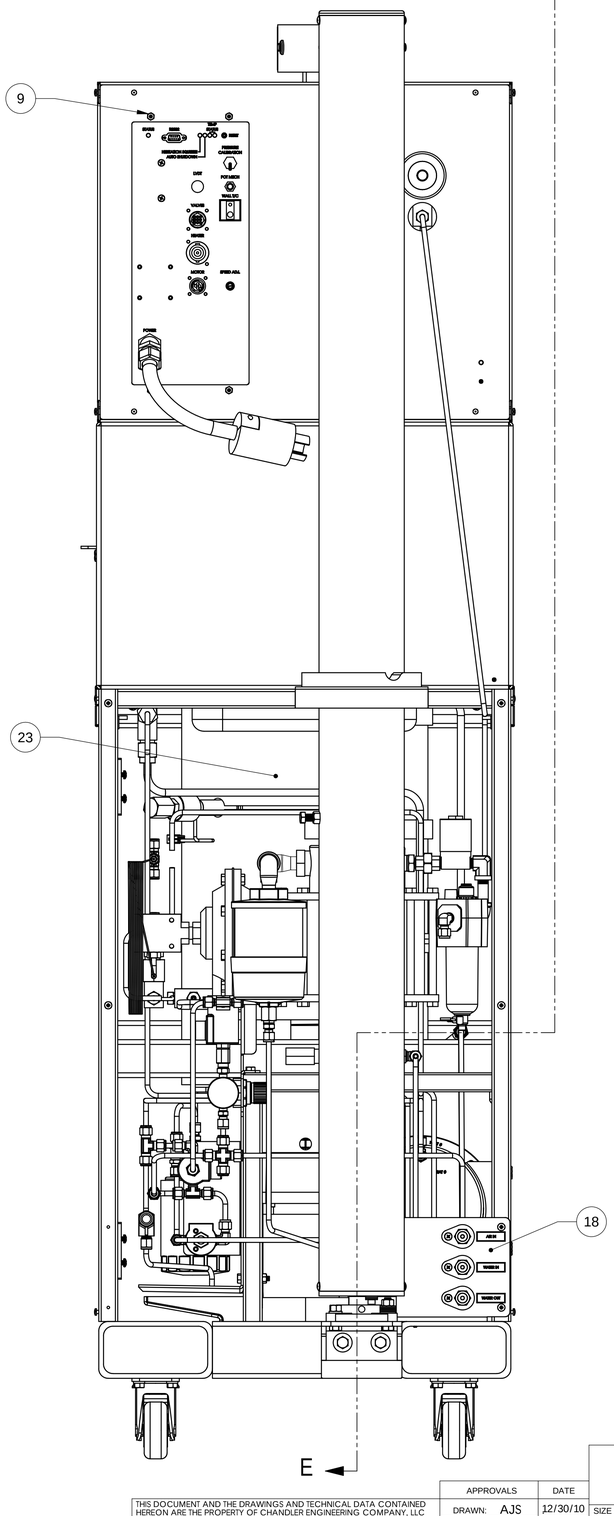




SECTION D-D

(OVERALL DIMENSIONS FORE REFERENCE ONLY)



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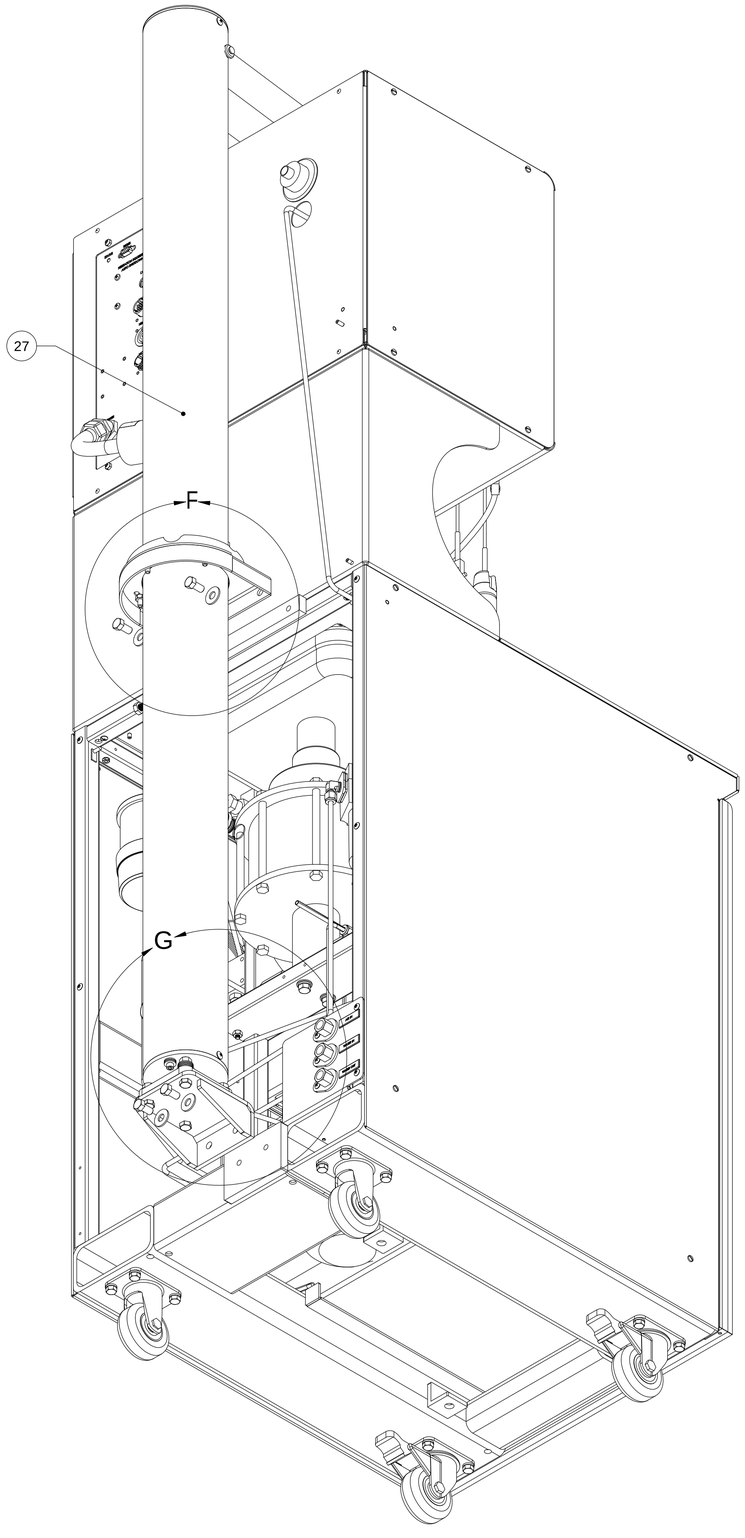
	APPROVALS	DATE
DRAWN:	AJS	12/30/10
CHECKED:	TC	12/30/10
ENGR.:	TRB	12/30/10

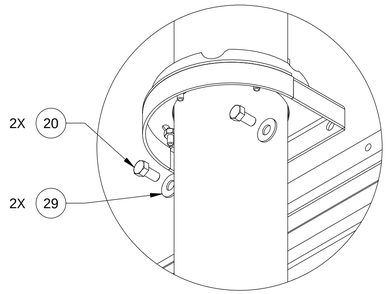
CHANDLER ENGINEERING

SIZE	DWG NO.	REV.
D	8340-0001	C

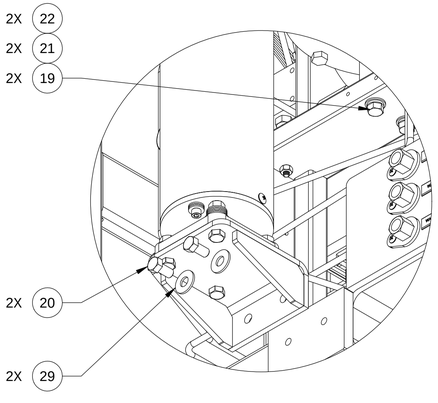
SCALE: 1:4 | TITLE BLOCK REV: 2.0 | SHEET: 2 of 4



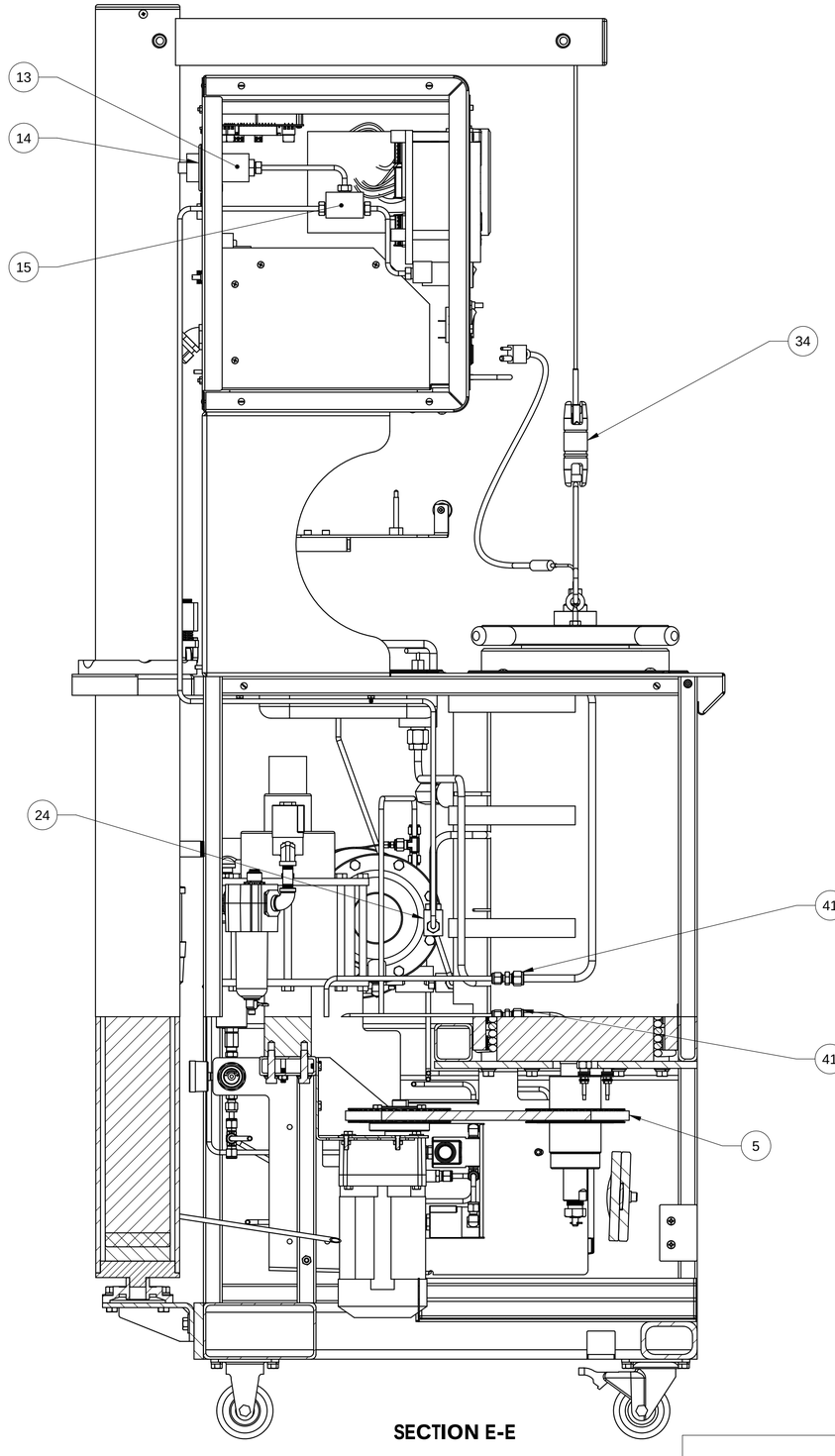
COUNTER BALANCE ASSEMBLY ATTATCHMENT



DETAIL F
SCALE 1 : 3



DETAIL G
SCALE 1 : 3



SECTION E-E

CHANDLER ENGINEERING

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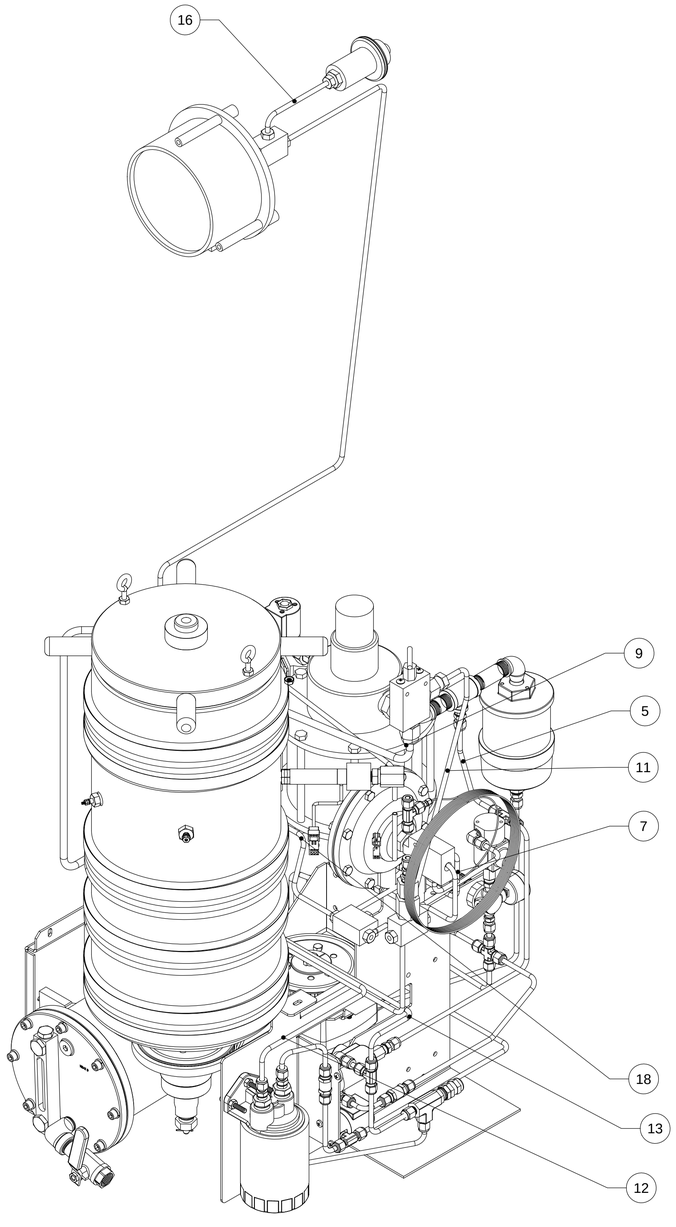
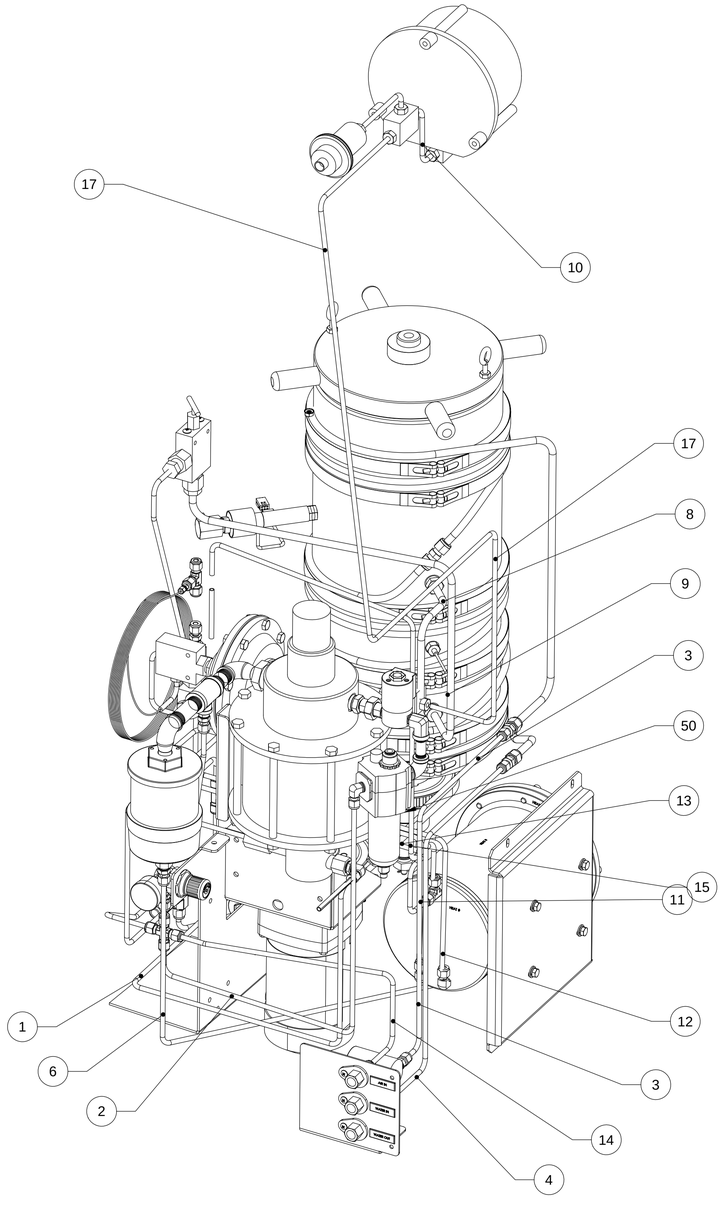
	APPROVALS	DATE
DRAWN:	AJS	12/30/10
CHECKED:	TC	12/30/10
ENGR.:	TRB	12/30/10

SIZE	DWG NO.	REV.
D	8340-0001	C

SCALE: 1:4 | TITLE BLOCK REV: 2.0 | SHEET: 3 of 4

8340-0001 TUBING			
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	08-0470-01	LP TUBING SET,8340	1
2	08-0470-02	LP TUBING SET,8340	1
3	08-0470-03	LP TUBING SET,8340	1
4	08-0470-04	LP TUBING SET,8340	1
5	08-0470-05	LP TUBING SET, 8340	1
6	08-0470-06	LP TUBING SET, 8340	1
7	08-0471-01	HP TUBING SET,8340	1
8	08-0471-02	HP TUBING SET,8340	1
9	08-0471-03	HP TUBING SET,8340	1
10	08-0471-04	HP TUBING SET,8340	1
11	08-5070-13	LP TUBING SET, COMMON	1
12	08-5070-14	LP TUBING SET, COMMON	1
13	08-5070-15	LP TUBING SET, COMMON	1
14	08-5070-16	LP TUBING SET, COMMON	1
15	08-5070-17	LP TUBING SET, COMMON	1
16	08-5071-03	HP TUBING SET,COMMON	1
17	08-5071-05	HP TUBING SET,COMMON	1
18	08-5071-06	HP TUBING SET,COMMON	1
61	C09912	GROMMET, RUBBER, 5/16	1





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	APPROVALS	DATE
DRAWN:	AJS	12/30/10
CHECKED:	TC	12/30/10
ENGR.:	TRB	12/30/10

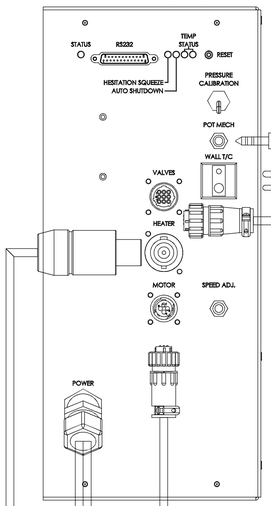
CHANDLER ENGINEERING

SIZE	DWG NO.	REV.
D	8340-0001	C

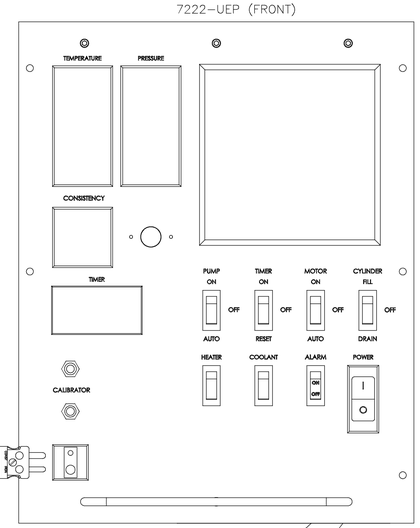
SCALE: 1:4 | TITLE BLOCK REV: 2.0 | SHEET: 4 of 4

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	ECN# T4005, RELEASED	7/15/11	SS
	B	ECN T5358; ADDED WIRING NOTES	5/10/13	TRB

7222-UEP (REAR)



7222-UEP (FRONT)



7222-0151

08-0081

CP149-7222-0018

7222-0150

7222-0149

P-3360:
GND - GRN/YEL
X - WHT
Y - BLK

GRN WHT RED BLK

GRN/YEL BLU RED BLK

GRN

Motor

C10593

TGGT

TGGT

HEATER
07-1030

WHT BRN

YEL RED ORG GRN BLU

C06892 C06892 C06892 C06892 C06892

YEL / WHT YEL/WHT YEL/WHT

COOLING

FILL #3

DRAIN #2

PUMP #1

PRESSURE CONTROL

70-0023

YELLOW BLUE BLACK

TEFLON WIRES TO CYLINDER

(SIDE)

Cylinder

(TOP)

BOTTOM CABINET

NOTE:
1. USE HIGH TEMPERATURE RATED RING TERMINALS (C09603) FOR HEATER CONNECTIONS.
2. USE R-1421 12AWG TGGT WIRE TO CONNECT HEATERS TO 7222-0149.
3. CONNECT TGGT WIRES TO 7222-0149 CABLE WITH INSULATED 12AWG BELL NUTS (CRIMP-TYPE).
4. DO NOT USE NYLON CABLE TIES ON TGGT WIRE.
5. ATTACH 7222-0149 GREEN WIRE TO A GROUNDING STUD ON THE INSTRUMENT FRAME.
6. USE HIGH TEMPERTURE RATED RING TERMINALS (19396-00) FOR POT MECH CONNECTIONS TO THE CYLINDER.

-04	-03	-02	-01	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM
QTY. REQD.				PARTS LIST			

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]

TOLERANCES:
1 PLACE ±
2 PLACE ±
3 PLACE ±
ANGLES ±
SURF. FINISH ✓

NEXT ASSY | USED ON

APPLICATION

BREAK SHARP EDGES, DEBURR

APPROVALS	DATE
DRAWN: TRB	1/18/11
CHECKED: JS	1/20/11
ENGR.: TRB	1/18/11

CHANDLER ENGINEERING

TITLE: WIRING SCHEMATIC,8340

SIZE	S.O. NO.	DWG NO.	REV.
D		8340-0006	B

SCALE: 1 = 1 | TITLE BLOCK REV: 1.0 | SHEET: 1 of 1

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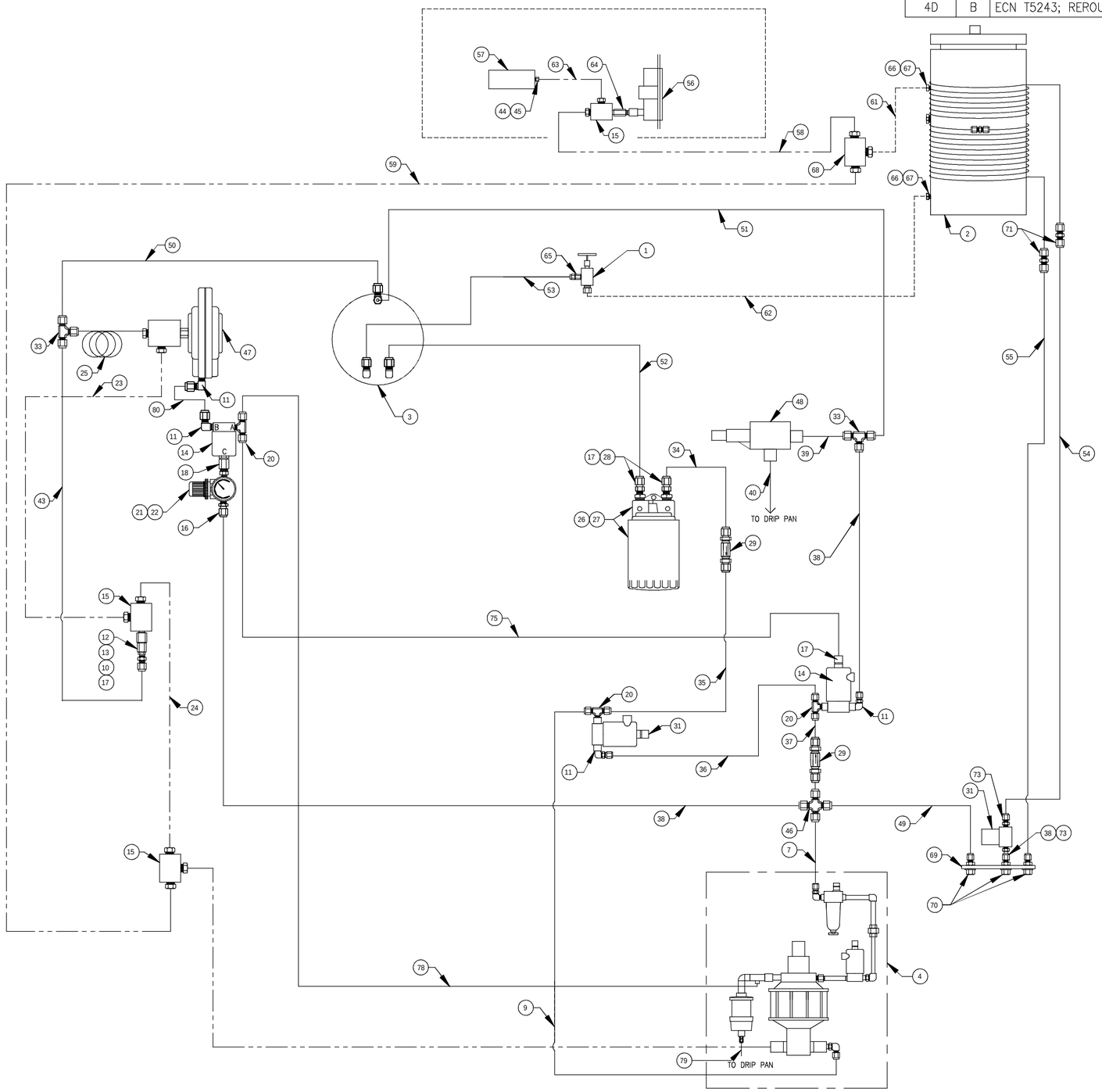
PARTS LIST (FOR REFERENCE ONLY)

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	P-3517	VALVE,ANGLE,60KPSI,SST,3/8 HPT
2	1	8240-0023	CYLINDER,ASSY
3	1	08-0457	RESERVOIR ASSEMBLY,7322/8340
4	1	08-0456	PUMP ASSEMBLY,8340
5			
6	1	08-0471-01	HP TUBING SET,8340
7	1	08-0470-02	LP TUBING SET, 8340
8			
9	1	08-0470-01	LP TUBING SET, 8340
10	1	P-0866	BUSHG,BRS,RDCG,1/4FPX3/8MP UB
11	4	P-1255	ELBOW,BRS,1/4MPX1/4T,SW
12	1	P-1206	SAFETY HEAD,1/4 HIGH PRESSURE
13	1	P-1593	DISK,RUPTURE,45000 PSI,.250,IN
14	2	C09062	VALVE,SOL,3-WAY,VERSA,240 VAC
15	3	P-0754	TEE,SS,UN,1/4TX1/4TX1/4T,HP
16	1	P-1244	CONN,BRS,1/4TX1/8MP SW
17	4	P-1254	CONN,BRS,1/4 MP x 1/4 T,SW
18	1	P-1313	NIPPLE,BRS,1/4MPX1/8MP,HEX,CA
19			
20	3	P-2270	TEE,BR,MBR,1/4TX1/4TX1/4MPT
21	1	P-1887	REG,PRESS,300/100 PSI,1/8 FP
22	1	C06572	GAGE,100PSI,1.5",1/8NPT,CBM
23	1	08-5071-01	HP TUBING SET,COMMON
24	1	08-5071-02	HP TUBING SET,COMMON
25	1	70-0011	ASSEMBLY,TUBE
26	1	C08963	BASE, OIL FILTER
27	1	C08964	FILTER,OIL
28	2	P-0256	BUSHG,BRS,1/4FPX1/2MP PK
29	2	C10380	VALVE,CHK,BR,1/4TX1/4T,3000 PSI
30			
31	1	P-3107	VALVE,SOL,1/4FP,.09370RF,230V
33	1	P-1265	TEE,BR,UN,1/4TX1/4TX1/4T,SW
34			
35	1	08-5070-04	LP TUBING SET, COMMON
36	1	08-5070-05	LP TUBING SET, COMMON
37	1	08-5070-06	LP TUBING SET, COMMON
38	3	08-5070-12	LP TUBING SET, COMMON
39	1	08-5070-08	LP TUBING SET, COMMON
40	1	08-5070-09	LP TUBING SET, COMMON
41			
42			
43	1	08-5070-02	LP TUBING SET, COMMON
44	1	P-0855	COLLAR,SS,1/4-28LHX3/8LGX3/8OD
45	1	P-0193	GLAND,SST,TUBE,1/4TX9/16-18RH
46	1	P-1277	CROSS,BRS,UN,1/4T,SW
47	1	C11218	VALVE,DIAPHRAGM
48	1	C09434	VALVE,PRESSURE RELIEF
49	1	08-5070-16	LP TUBING SET, COMMON
50	1	08-5070-17	LP TUBING SET, COMMON
51	1	08-5070-15	LP TUBING SET, COMMON
52	1	08-5070-14	LP TUBING SET, COMMON
53	1	08-5070-13	LP TUBING SET, COMMON
54	1	08-0470-03	LP TUBING SET, 8340
55	1	08-0470-04	LP TUBING SET, 8340
56	1	C09060	GAGE,40000PSI,6",1/4HIP,PNLMT
57	1	C07833	XDCR,PRESSURE,40KPSI,W/CABLE
58	1	08-5071-05	HP TUBING SET, COMMON
59	1	08-5071-06	HP TUBING SET, COMMON
61	1	08-0471-02	HP TUBING SET, 8340
62	1	08-0471-03	HP TUBING SET, 8340
63	1	08-5071-03	HP TUBING SET, COMMON
64	1	08-0471-04	HP TUBING SET, 8340
65	1	P-2167	ADAPT,SS,3/8HPX1/4HPT,HIP
66	2	P-2168	GLAND,SS,3/4-16RHX3/8HPT
67	2	P-2169	COLLAR,SS,3/8-24LHX1/2LG,1/2OD
68	1	C13613	60000 PSI HIP TEE, 1/4"x1/4"x3/8"
69	1	08-5009	AIR WATER BULKHEAD PANEL
70	3	P-1954	CONN,BRS,1/4FPX1/4T,BHD,SW
71	2	P-1189	UNION,BRS,1/4TX1/4T,SW
72			
73	2	P-1254	CONN,BRS,1/4 MP x 1/4 T,SW
74			
75	1	08-0470-07	LP TUBING SET, 8340
76			
77			
78	1	08-0470-05	LP TUBING SET, 8340
79	1	08-0470-06	LP TUBING SET, 8340
80	1	08-5070-19	LP TUBING SET, COMMON

REVISIONS

ZONE	REV	DESCRIPTION OF REVISION	DATE	APPROVALS	
	A	ECN# T4005, RELEASED	7/15/11	SS	SS
4D	B	ECN T5243; REROUTED RELIEF VALVE TO DRIP PAN	3/27/13	TRB	



TUBING LEGEND

1/4" HP: R-0484 STNLS

1/4" LP: R-0125 COPPER

3/8" HP: R-0873 STNLS

SEE DWG 08-5070 & 08-0460 FOR LP TUBE DETAIL DWGS
SEE DWG 08-0470 & 08-0461 FOR HP TUBE DETAIL DWGS

		UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]		CHANDLER ENGINEERING			
		TOLERANCES: 1 PLACE ±0.030 [.76]; 2 PLACE ±0.010 [.25]; 3 PLACE ±0.005 [.127]; ANGLES ±1/2°		TITLE: PLUMBING SCHEMATIC,8340			
NEXT ASSY	USED ON	SURF. FINISH 32					
APPLICATION		APPROVALS	DATE	SIZE	S.O. NO.	DWG NO.	REV.
		DRAWN: SYN	12/6/10	C		8340-0007	B
		CHECKED: JS	1/19/11				
		ENGR.: TRB	1/19/11	SCALE: 1 = 1	DO NOT SCALE DRAWING	SHEET: 1 of 1	

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