INSTRUCTION MANUAL
MODEL 8040D10
PRESSURIZED CONSISTOMETER

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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 the most critical properties in designing a cement. A short thickening time is desired, while maintaining the special properties of the cement's design. The thickening time of a cement can be measured in a laboratory by testing a sample of the cement 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 [Table 8.2, API Spec 10(1)].

Test Procedure

Briefly, the test procedure for the Model 8040D10 Pressurized Consistometer entails the preparation of the slurry sample, placing it in the Consistometer, applying pressure and increasing temperature according to the API Spec 10 Code Schedule(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 Pressurized Consistometer incorporates a rotating, cylindrical Slurry Cup 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 315°C (600°F). (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 will automatically control the rate of temperature rise of the slurry (i.e. temperature gradient). When the slurry reaches the desired maximum temperature, the controller will hold the slurry temperature at that level. Pressure settings are maintained through the control of a pressure release 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 (Drawing 8-229). 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.

REFERENCES

American Petroleum Institute; API Specification for Materials and Testing for Well Cements, Latest Edition; Dallas, TX.

The viscosity (i.e. consistency) of the cement slurry is indicated by a meter and is recorded on a chart as a DC voltage 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.

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.

Specifications

This unit is in complete compliance with API Spec 10A

Model 8040D10

Maximum Temperature:	**600°F (315°C)**
Maximum Pressures:	**40,000 psi (275 MPa)**
Heater Power:	**5,000 Watts**
Slurry Cup Rotational Speed:	**150 rpm**
Viscosity Range:	**0-100 Bc (Bearden Units)**
Pressurizing Medium:	**White Mineral Oil**

Mechanical and Electrical

Input Voltage: 240 VAC ± 15% 50/60 Hz
Input Power: 7.5 kva
Heater Wattage: 5,000 watts

Shipping Dimensions and Weight

	Dimensions		Weight	
	In.	**cm**	**lbs.**	**Kg**
Model 8040D10	56 x 38 x 75	142 x 96 x 190	2400	1090

Environment and Utility

- **Operating Temperature:** 40° to 120°F (0 to 50°C)
- **Compressed Air:** 75 to 125 psi (517 to 862 kPa)
- **Cooling Water:** 20 to 80 psi (138 to 552 kPa**)**

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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, and a water supply of 20 to 80 psi. The unit is capable of operating in ambient temperatures from 40°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

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. If the optional chiller is being used, connect the outlet port of the chiller system to the water inlet port and the water drain port to the chiller inlet port. Configure the chiller to operate at the minimum set-point temperature (41°F, 5°C).
4. Connect the water drain line to the outlet labeled WATER OUT.

Connecting Power to the Consistometer

1. Connect the supplied twist-on power connectors to the receptacles at the rear of the unit.
2. Connect the power plugs 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

Training

On site training classes are available. For more information, contact our Sales Department at Chandler Engineering.

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.

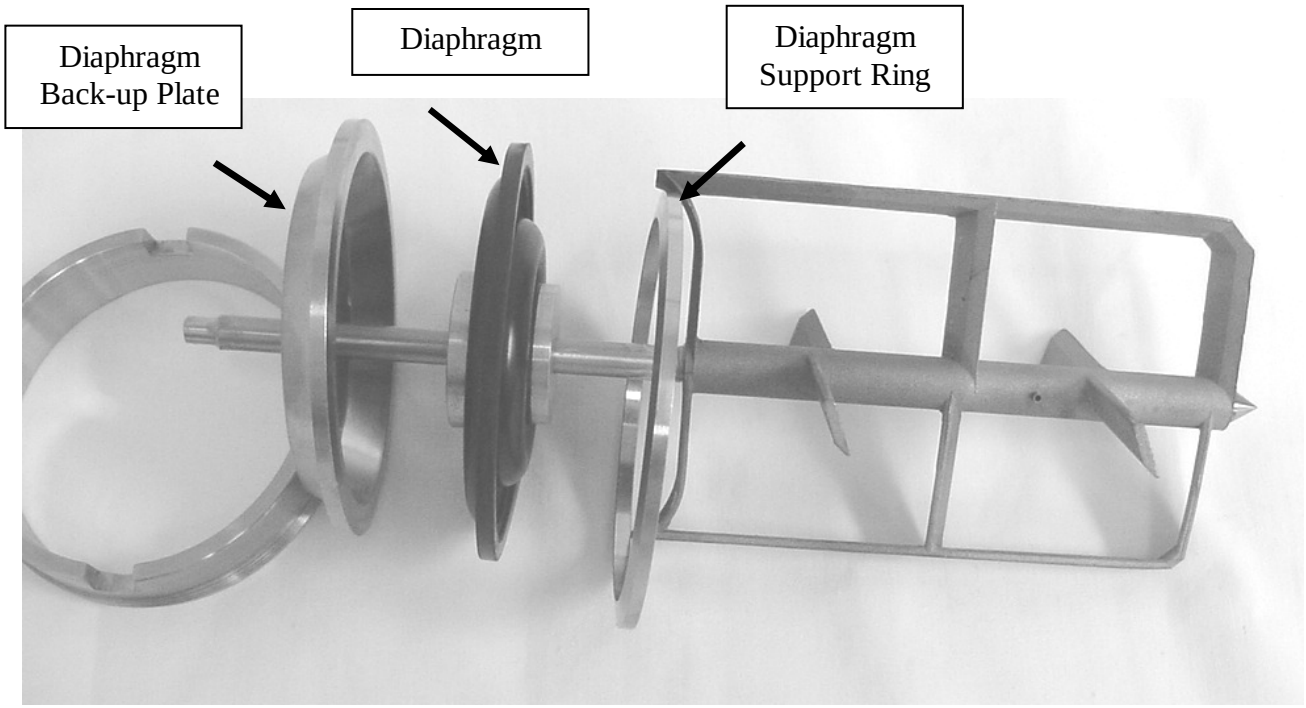
API Slurry Cup Preparation

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 07-0031 in the

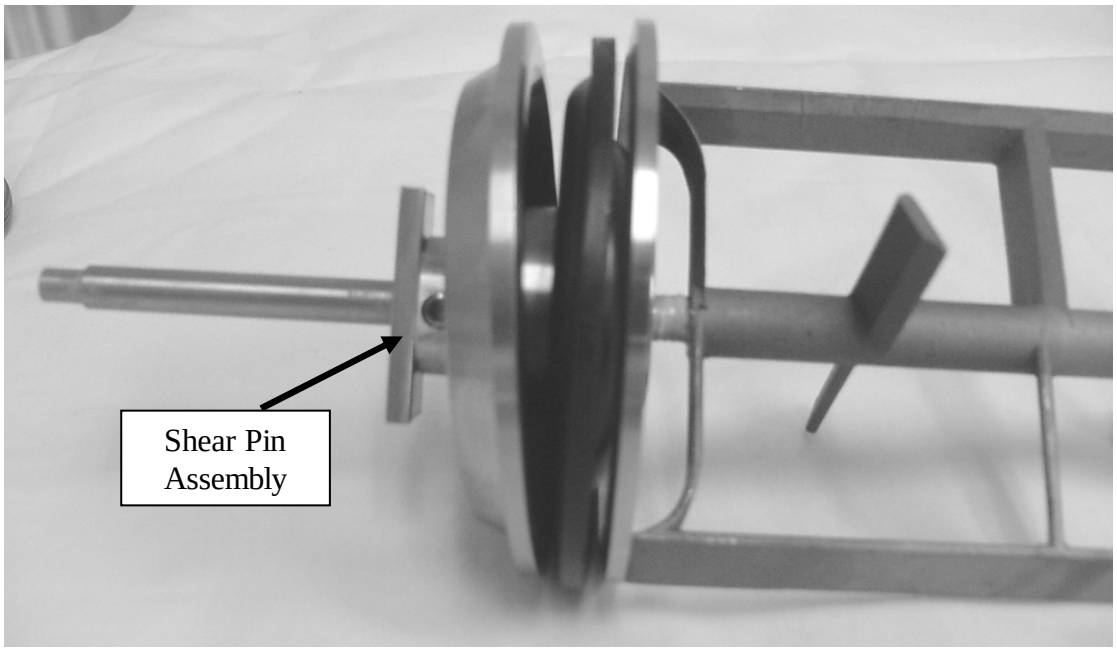
Drawings and Schematics section of this manual.

Thoroughly clean all parts and verify that all parts are in good condition.

1. Lightly grease all interior surfaces of the slurry cup with white lithium grease or the equivalent.
2. 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.



3. 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.



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

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

8. Fill the cup with prepared cement slurry to the bottom of the threads.
9. Remove the plug (pivot) from the center of the bottom cap.
10. Replace the bottom cap without the plug. Slowly screw the cap into place and add cement through the hole if required.
11. Grease the plug and replace.
12. 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 of those at 70°F.

1. Turn the Power switch ON.
2. 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.

3. 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.
4. 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 8040D10 is supplied with two types of O-ring seals for the cylinder plug. (See drawing 08-0280, 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-4080) 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, turn the CYLINDER 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. Leave the CYLINDER control switch in the FILL position during the test.
8. To apply the initial pressure to the test cell on a Model 8040D10 without pressure control, turn the Pump Switch to the MANUAL position. When the pressure reaches the desired level turn the Pump Switch to the OFF position. Adjust the pressure as required throughout the test by turning the Pump Switch to MANUAL to increase pressure or by slowly cracking open the Pressure Release Valve to relieve pressure. Use care to open the Pressure Release Valve slowly when attempting to bleed pressure.
9. Turn the Heater Switch to the ON position, the Pump Switch to the AUTO position (Model 8040D10 with pressure control), and start the timer. (The heater and pump will not start until the program start up is initiated through the controller.)
10. To begin the test, the Temperature Controller and Pressure Controller (if equipped) programs must be started as follows.
11. 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.

Caution: The pressure cylinder and plug may be extremely hot. Severe burns can result from touching.

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.

Warning: If the cylinder is opened while its temperature is above 212ºF (100 ºC), steam will escape, and the operator can be injured! Allow the unit to cool before opening the cylinder.

Cooling the Cylinder

The cylinder cooling coil provides for cooling the cylinder rapidly prior to the start of another test. (The coil can also be used to correct chamber overheating during a test.)

The following sequence of steps will allow the operator to manually cool down the cylinder before removing the cup. This procedure must be carried out immediately because further hardening of the slurry can result in damage to the Slurry Cup Paddle.

1. Set the Cool switch to ON, (manual control) in order to turn on the cooling water.
2. Set the Pump switch to MANUAL in order to circulate and cool the oil.
3. Allow the cylinder to cool to 190º F or less before continuing to the next step.
4. Open the T-handled manual pressure release valve to relieve pressure in the cylinder to be cooled. Slowly opening and closing the valve to release pressure in increments will prevent rupture of the Slurry Cup Diaphragm.
5. Set the CYLINDER control rocker switch to the DRAIN position to start the oil transfer. (Completion of transfer will be indicated by a bubbling or hissing noise in the reservoir.)
6. Set the CYLINDER control rocker switch to the OFF (middle position) to stop the oil transfer.
7. Close the T-handled manual pressure release valve.
8. Loosen the Thermocouple Seal Gland to vent the remaining air pressure from the cylinder.
9. Remove the thermocouple from the cylinder head.
10. 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.
11. 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.

12. Using the short Bail, reach into the cylinder and remove the Potentiometer Mechanism.
13. Using the Bail, reach into the cylinder and remove the Slurry Cup. The Cup should be immersed immediately in a container of cold water, after which the slurry should be removed from the Cup.
14. Prior to starting a new test, clean the Slurry Cup thoroughly and recoat 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.

After Every Test

Pressure Cylinder

Inspect the metal O-ring on the pressure cylinder seal shaft and wipe it free of cement particles. (The ring will seal many times if the ring and seat are kept clean.) Replace the o-ring if any nicks, pits, or dents are present. Coat the o-ring with a thin film of molybdenum disulfide grease before installation.

The thread of cylinder plug has been lubricated with a 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 a 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

1. All components of the slurry cup must be cleaned and inspected thoroughly after every test to ensure proper operation of the consistometer.
2. 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.
3. 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.
4. 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.

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 old 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. Burnish the resistance wire lightly 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.

The potentiometer mechanism and the voltage measuring circuit, which indicate consistency, should be calibrated by using the Weight-Loaded Potentiometer Calibrating Device. This device is used to apply torque to the potentiometer spring, using the radius of the potentiometer frame as a lever arm.

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

1. Set the calibrator at a table's edge for free cord movement.
2. Install a potentiometer on the holder and insert the wedge into the open slot nearest the mounting frame "Stop" contact.
3. Locate the steel cable around the potentiometer frame and over the pulley. Place the hanger weight hook in the cord eye.
4. Install wire-end clips to the potentiometer.
5. Insert the plug on the end of the calibrator wires into the Calibrator Socket.
6. Turn on Master Switch.
7. Place 350 grams of weights on the 50 gram hanger for a total of 400 grams mass.

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 front panel.

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. 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.

For further calibration details, refer to API Spec 10 booklet. 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 solvent 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 solvent. 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 OD and ID 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 OD or ID 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 OD and ID 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 occurring 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 Magnetic Drive is reinstalled, the drain plug should be screwed in (but not tightened) and the drive filled 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.

High Pressure Filter

Disassemble and clean as follows.
Cleaning is best achieved using an ultrasonic bath filled with a citric acid solution.

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 & 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 may be made by pouring oil into the pressure cylinder. The oil level in the reservoir should be kept at 3/4 full. 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, Air to Cylinder 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			
Mag Drive		Disassemble, clean, inspect			
Oil			Replace		
Low Press. Filter			Replace		
High Pressure Filter		Disassemble, clean, inspect			Replace
Cylinder Press. Release Valve					Replace
Air Operated Valve				Disassemble, replace needle, seat	
Pump					Maintenance performed by qualified factory service technician
Pressure Gauge					●Calibration
Drive Motor			●Set Speed		
Temp. Controller Thermocouple	Inspect	●Calibration			Calibrated by qualified factory service technician
Timer				●Calibration	
Heater					Tested by qualified factory service technician
Reservoir					Clean-out by qualified factory service technician
Rupture Disk					Replace

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

● PER API SPEC REQUIREMENTS

σ WHERE APPLICABLE

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Section 4 - Troubleshooting

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
-

Solutions

- Check all thermocouple wiring and components
- Replace thermocouple wiring
- Replace thermocouple

Drive motor inoperative

Causes

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

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 Meter Readings

Symptom: Meter 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

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Section 5 - Replacement Parts

Part Number	Description
07-0032	Sleeve, Slurry Cup
07-0033	Cup Base
07-0035	Plug, Cup Base
07-0037	Collar, Cup Diaphragm
07-0038	Diaphragm
07-0039	Support Diaphragm
07-0042	Paddle
07-0045	Disc, Shaft Drive
07-0046	Bar, Drive
07-0047	Bail, Slurry Cup
07-0053	Arm, Stop
07-0055	Sleeve, Spring
07-0056	Retainer, Bearing, Shaft
07-0058	Resistor, Potentiometer
07-0059	Collar, Spring
07-0060	Arm, Contact (Pot. Mech)
07-0064	Spring, Calibration
07-0065	Adjuster Spring
07-0182	Support, Slurry Cup
07-0183	Wrench, Slurry Cup
07-0216	Insulator
07-0405	Clamp, Spring Adjuster
07-0423	Jack Assy, Removal
07-0430	Wrench, Spanner
07-0454	Gasket, Heater
07-0536	Ring, Diaphragm Packing
07-0537	Cap, Hub
07-0538	Hub
07-0539	Potentiometer Mechanism Ass'y
07-0638	Strips, Connecting
07-1030	Heater, 5,000 watt
07-1084	Filter Assy (High Pressure)
07-1112	Frame, Mounting, Teflon
07-1113	Springs, Contact (Set)
07-1144	Wire, Ground
08-0045	Slurry Cup Assembly
08-0049	Shaft, Cup

Part Number	Description
08-0054	Cap, Slurry Cup
08-1081	Thermocouple (Cylinder)
08-0083	Pin, Contact
08-0085	Pin, Ground
08-0087	Gasket, Base Plug
08-0136	Bearing, Carbon (Mag Drive)
08-0139	Bearing, Bronze (Mag Drive)
08-0189	Handle, Cylinder Plug
08-0229	Magnetic Drive Assembly
08-0312	Stop, Mounting Frame
188-13668	Hex Key (1/16")
70-0023	Thermocouple (Slurry Cup)
C07539	Fuse, 3A
C08964	Element, Oil Filter (Includes P-1757 Gasket)
C09762	Viton O-ring, Cylinder
C10062	Mallet, Rubber Dead Blow
C13800	Fuse, 30A
H-43-101	Nut
P-0001	Bearing, Shaft
P-0007	Bearing, Frame
P-0061	O-Ring
P-0284	Regulator
P-0317	Valve, Solenoid
P-0397	Wrench, Hex (1/8")
P-0471	Drain Pan
P-0779	Wrench, Hex (5/32")
P-0844	Pin, Shear (Shaft Drive Assembly)
P-0860	Pin, Roll (Paddle)
P-1080	O-Ring, Cylinder, Metal
P-1454	Pin, Roll
P-1462	Pump
P-1560	O-Ring (Magnetic Drive)
P-1593	Disc, Rupture
P-1604	Belt, Timing
P-1667	Hex Key (5/64")
P-1765	Oil, White Mineral
P-1846	Ball Bearing
P-1848	O-Ring, Drain Plug (Magnetic Drive)
P-1855	Ring, Backup (for P-1848)

Part Number	Description
P-3331	Motor, Gear
P-3517	Valve, Angle, 60,000 PSI, SST, 3/8”

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
07-0520	Typical Calibration Curve
07-0539	Assembly, Potentiometer Mechanism
07-1086	Filter Assembly
08-0045	Slurry Cup
08-0174	Swivel Arm Assembly
08-0229	Assembly, Magnetic Drive
08-0280	Cylinder Assembly
08-0280-CP	Cylinder Assembly, ChanProbe
08-0412	Piping Schematic
08-0413	Wiring Diagram
08-0414	Panel Layout
7222-UEP	Electrical Panel
7222-UEP-0030	Electrical Panel Wiring
CP162-07-0505-01	Assembly, Potentiometer Calibrating Device

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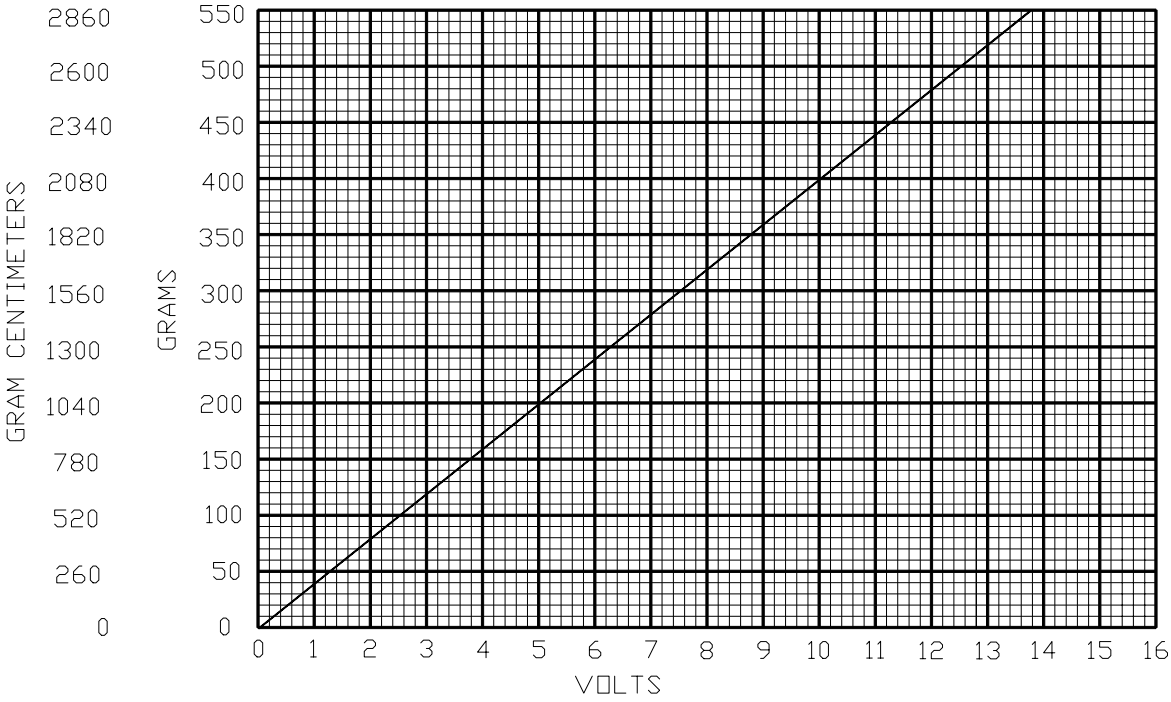
PRESSURE THICKENING TIME TESTER
PAN AMERICAN TYPE
TYPICAL CALIBRATION CURVE USING
POTENTIOMETER CALIBRATING DEVICE



(EACH POTENTIOMETER REQUIRES INDIVIDUAL CALIBRATION- SEE INSTRUCTIONS)

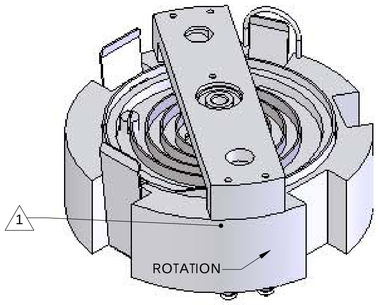
CHANDLER ENGINEERING

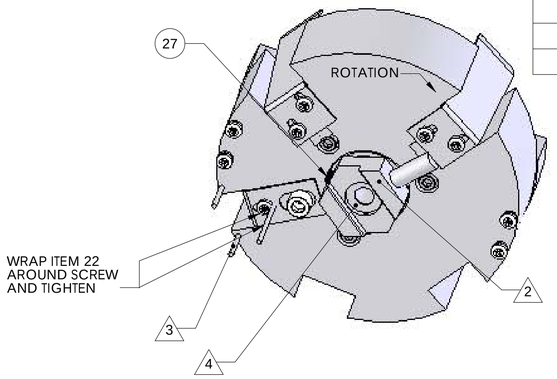
9-10-91
DWG. NO.
7-520

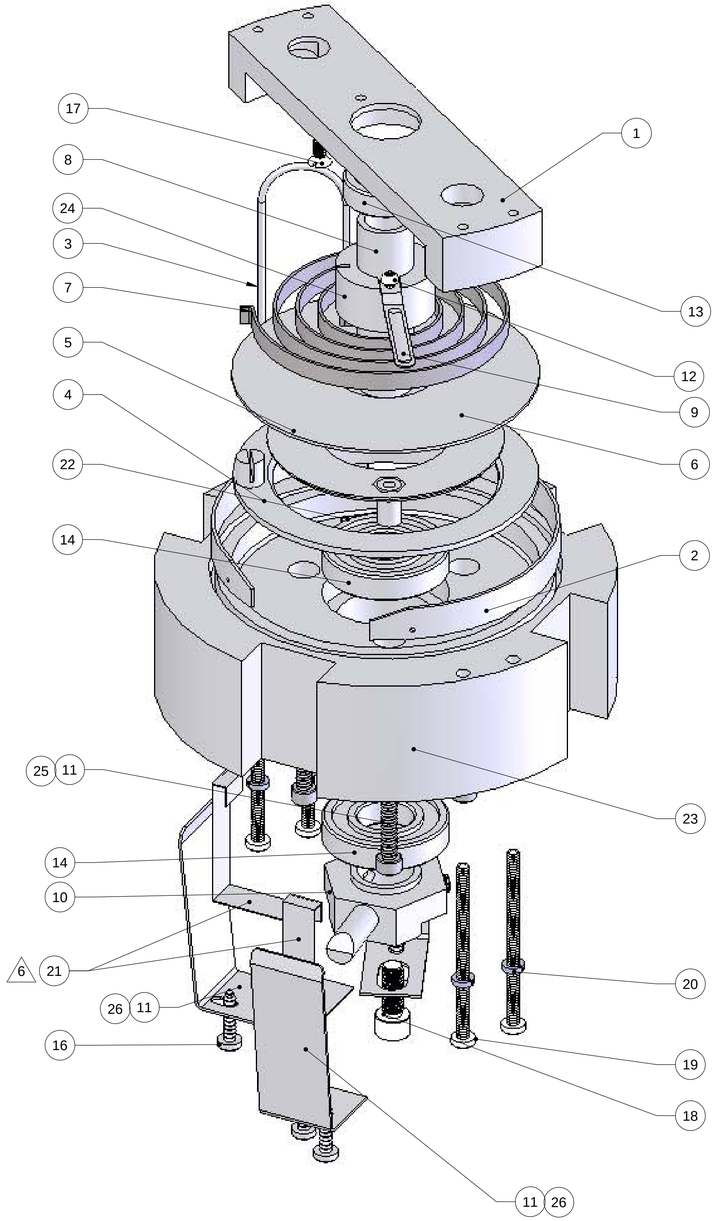
NOTES:

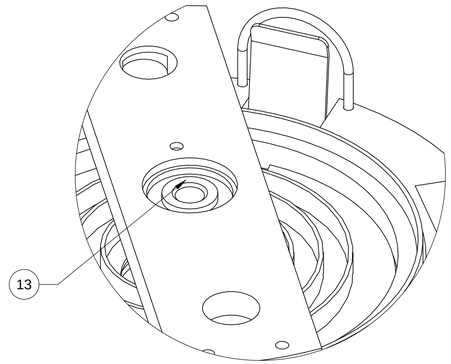
1. CONTACT ARM (ITEM 11) SHOULD ROTATE FROM FIRST WIRE WRAP AROUND TO LAST WIRE WRAP. ROTATION AS SHOWN.
2. ORIENT STOP ARM (ITEM 12) AS SHOWN, AGAINST (ITEM 21).
3. TOP OF ITEM 4 TO BE LEVEL WITH 07-1110. BEND EXCESS UNDER BOTTOM OF ASSEMBLY.
4. LARGE DIAMETER HOLE OF ITEM 9 (07-0055) SLEEVE SPRING 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

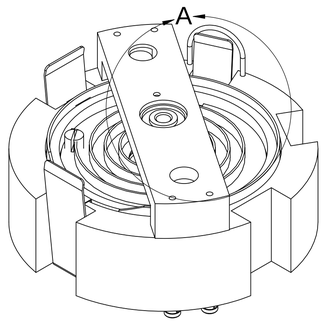








DETAIL A
SCALE 2 : 1



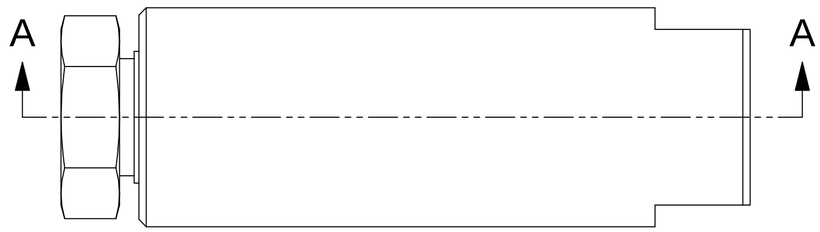
ITEM NO.	PART NUMBER	DESCRIPTION	Default/QTY.
1	07-0056	RETAINER,SHAFT BEARING	1
2	07-0058	ASSY,RESISTOR,POT MECH	1
3	07-0431	STOP,FRAME,POT MECH	1
4	07-0065	SPRING,ADJUSTER	1
5	07-0405	CLAMP,SPRING ADJUSTER	1
6	07-0216	INSULATOR	1
7	07-0064	SPRING,CALIBRATION	1
8	07-0055	SLEEVE SPRING	1
9	07-0060	ARM, 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

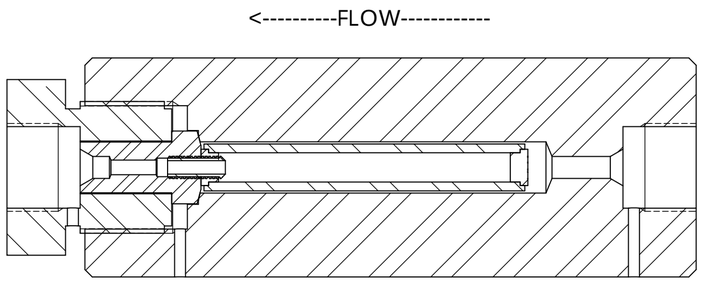
-04	-03	-02	-01	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM
							. 1
QTY. REQD.				PARTS LIST			

		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
NEXT ASSY	USED ON		POT,MECH,ASSY
APPLICATION			
BREAK SHARP EDGES, DEBURR		APPROVALS / DATE	

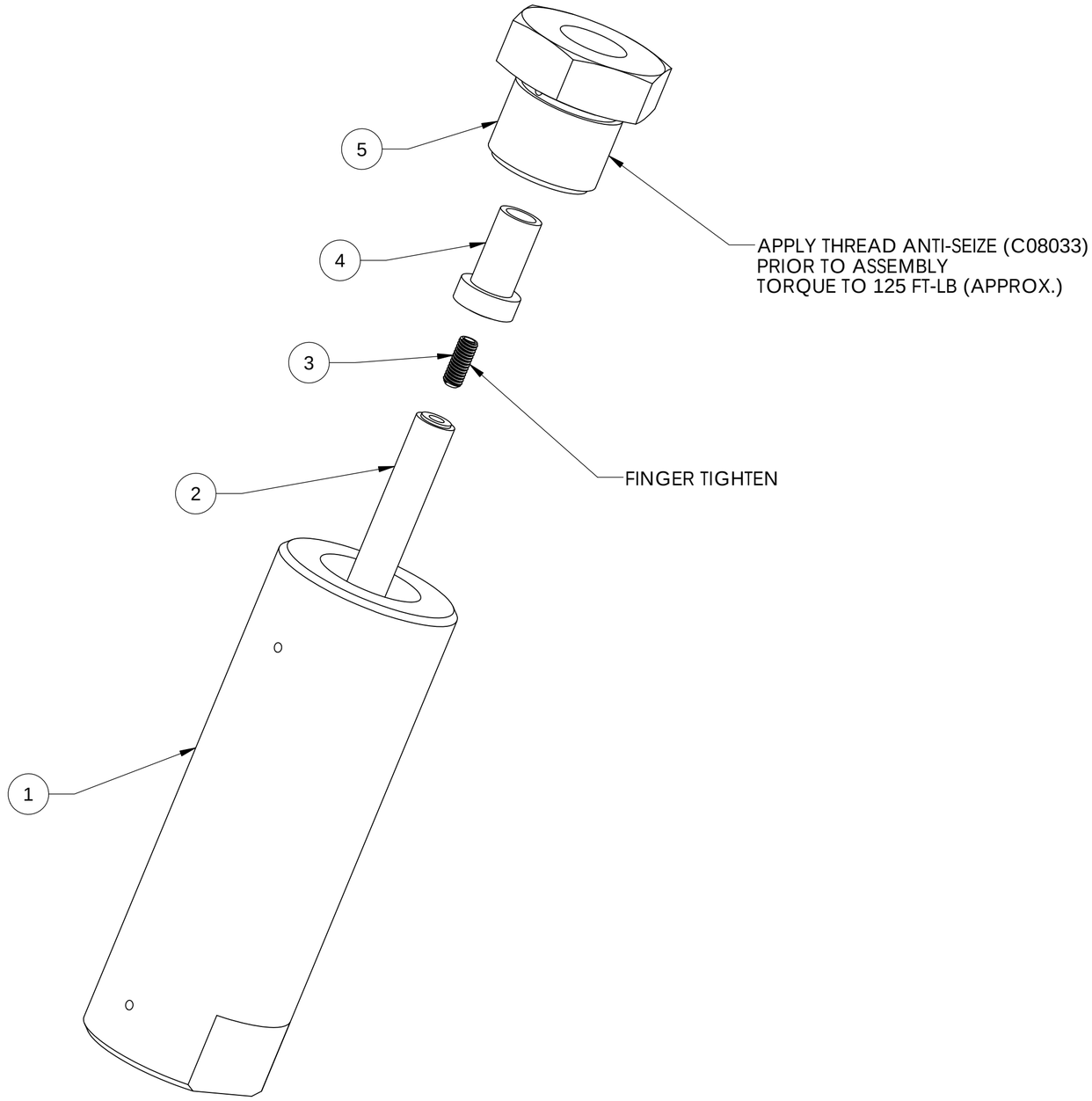
DRAWN: JB	1/25/07	SIZE D	DWG NO. 07-0539		REV. AC
CHECKED: TC	2/23/07				
ENGR.: JJM	1/25/07	SCALE: 1:1	TITLE BLOCK REV: 2.0	SHEET: 1 of 1	

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	E	ECN T1791; REDESIGNED	07/07/2008	JJM
	F	ECN T6415; CHANGED TORQUE FROM 25 FT LBS TO 125 FT LBS	2/11/15	TC





SECTION A-A
SCALE 1 : 1



NOTES:
1. MAXIMUM WORKING PRESSURE: 40000 PSIG AT 600˚F.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	07-1087	HOUSING,FILTER	1
2	07-1084	FILTER, POROLLOY	1
3	07-1246	NIPPLE,FLTR,10-32x.50x.115ID	1
4	07-1088	SEAT	1
5	07-1089	RETAINER,SEAT	1

PED CONTROLLED DRAWING

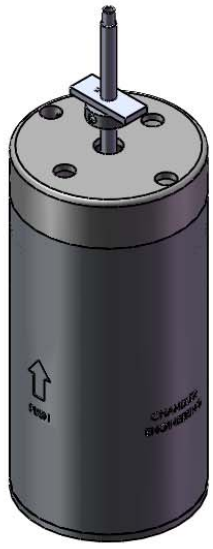
BREAK EDGES, DEBURR
UON DIMS ARE IN INCHES
1 PLC ±0.030 2 PLC ±0.010
3 PLC ±0.005 ANGL ±1/2°
SURFACE FINISH 63 RMS
THIRD ANGLE PROJECTION

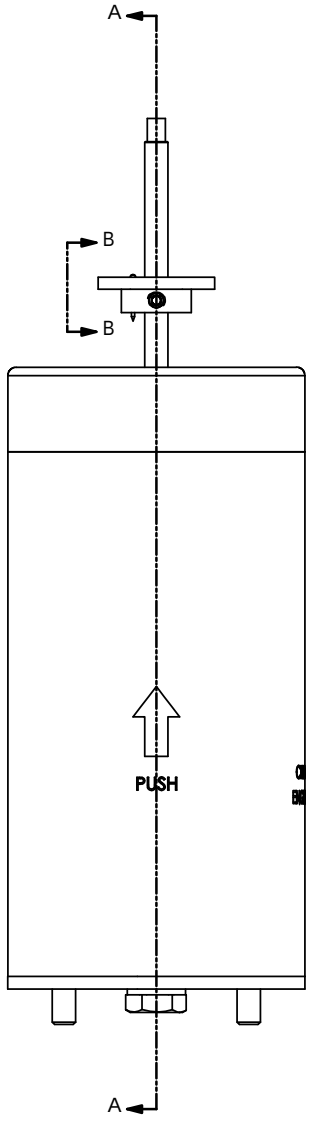
DRAWN: JJM 07-07-08
MFG: DH 07-07-08
ENGR: JJM 07-07-08
TYPE:
STRUCT:

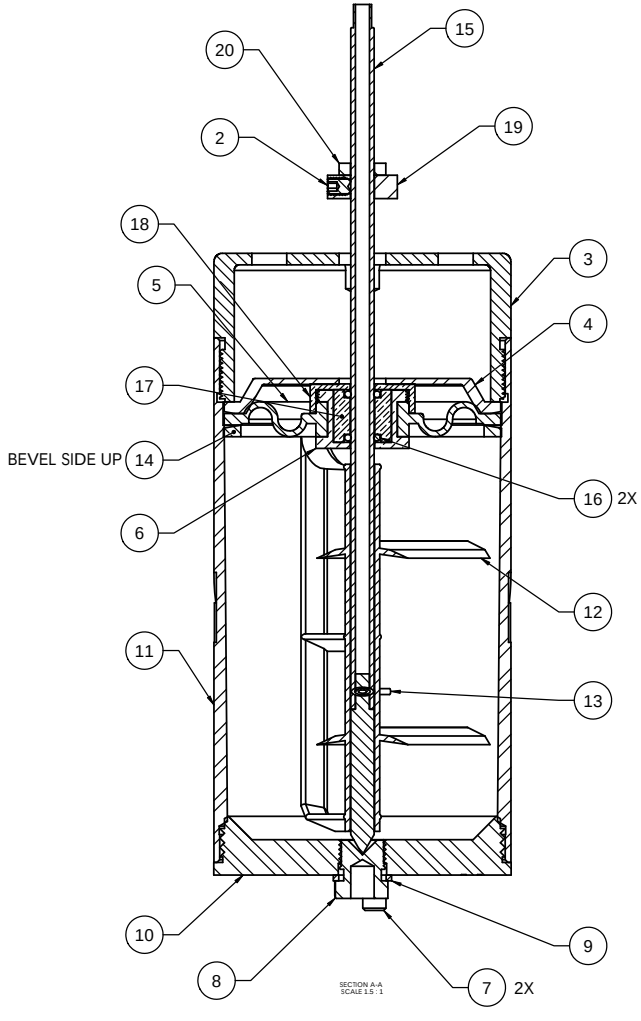
CHANDLER ENGINEERING
FILTER, ASSY
PN: 07-1086
PROJ:
REV F | SIZE C
SHEET 1 OF 1

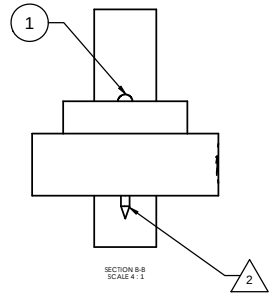
TITLE BLOCK REV 3

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









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. Ⓜ

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

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

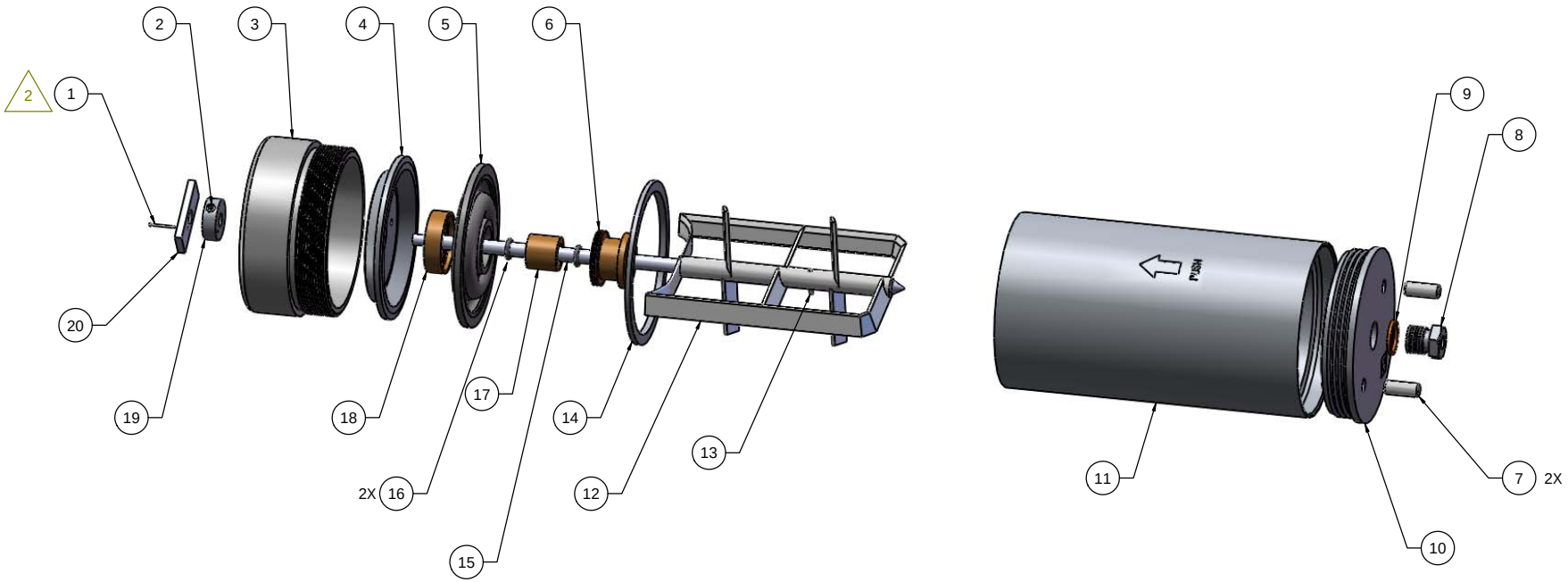
APPROVALS	DATE
DRAWN: TC	1/17/08
CHECKED: TC	1/17/08
ENGR.: JJM	1/17/08

CHANDLER ENGINEERING

TITLE: CUP, SLURRY ASSY

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

SCALE: 1:8 | TITLE BLOCK REV: 1.0 | SHEET: 1 of 2



			.	08-0045	.	.	1
-04	-03	-02	-01	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM
QTY. REQD.				PARTS LIST			
.			.				
.			.				
.			.				
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

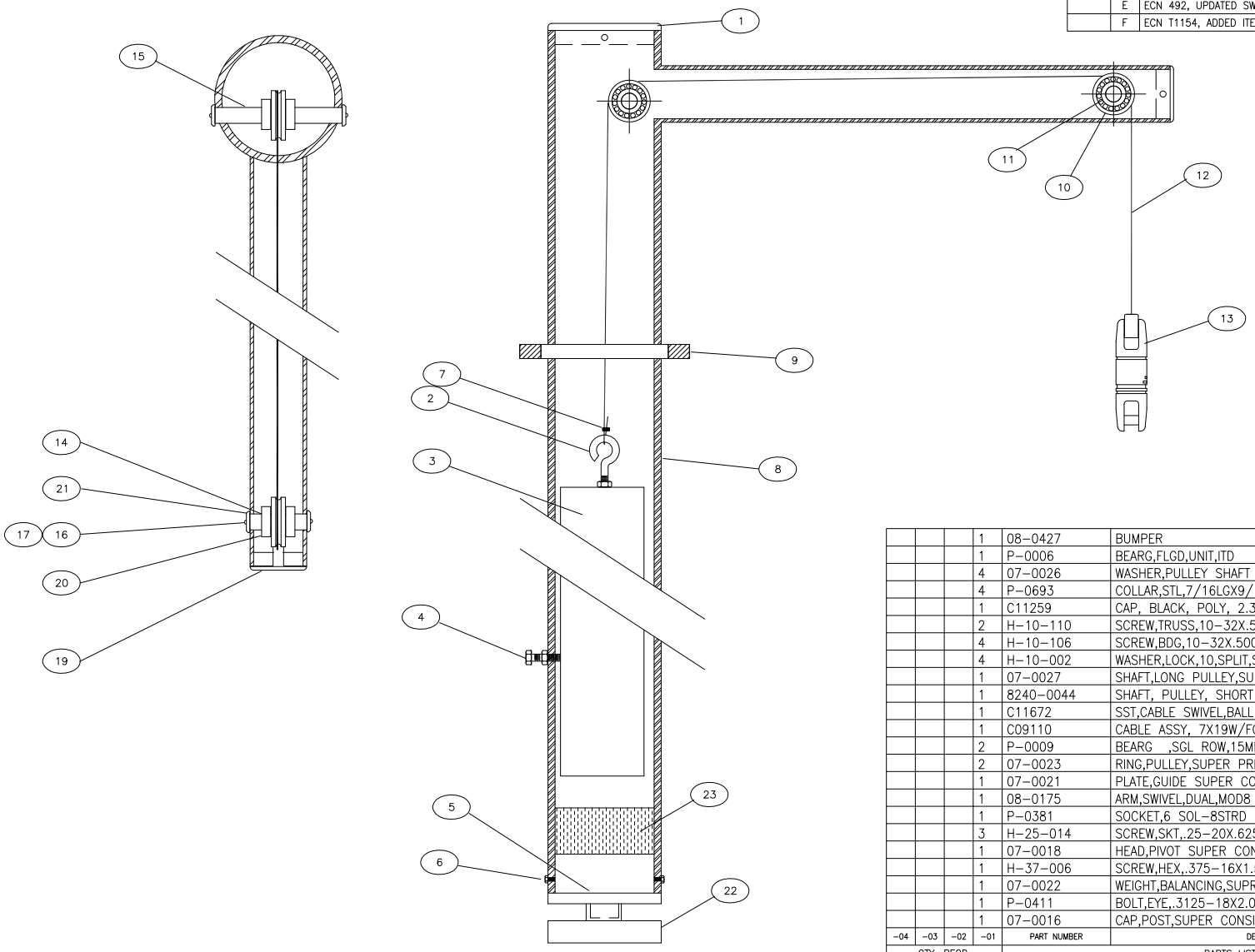
DRAWN: TC 1/17/08
CHECKED: TC 1/17/08
ENGR.: JJM 1/17/08

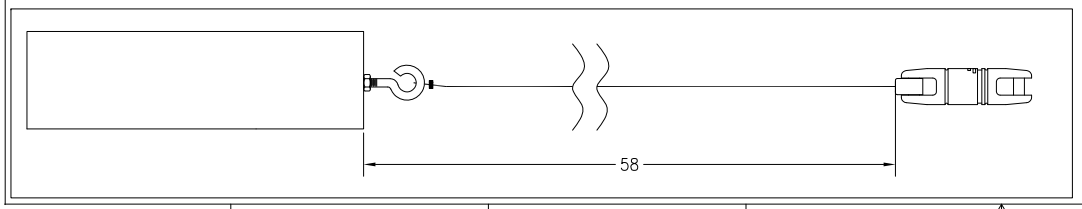
CHANDLER ENGINEERING

TITLE
CUP, SLURRY ASSY

SIZE D | S.O. NO. | DWG NO. 08-0045 | REV. M
SCALE: 1:8 | TITLE BLOCK REV: 1.0 | SHEET: 2 of 2

REVISIONS					
ZONE	REV	DESCRIPTION OF REVISION	DATE	APPROVALS	
	E	ECN 492, UPDATED SWIVEL	1/17/06	JB	TC
	F	ECN T1154, ADDED ITEM 7, 22, 23 TO BOM	9/10/07	JB	TC





-04	-03	-02	-01	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM
			1	08-0427	BUMPER		23
			1	P-0006	BEARG,FLGD,UNIT,ITD		22
			4	07-0026	WASHER,PULLEY SHAFT		21
			4	P-0693	COLLAR,STL,7/16LGX9/16IDX10D		20
			1	C11259	CAP, BLACK, POLY, 2.375		19
			2	H-10-110	SCREW,TRUSS,10-32X.500,PHH,SST		18
			4	H-10-106	SCREW,BDG,10-32X.500,PHH,SST		17
			4	H-10-002	WASHER,LOCK,10,SPLIT,SST		16
			1	07-0027	SHAFT,LONG PULLEY,SUPER CONSIS		15
			1	8240-0044	SHAFT, PULLEY, SHORT		14
			1	C11672	SST,CABLE SWIVEL,BALL BEARING,1.250",4K LB MAX.		13
			1	C09110	CABLE ASSY, 7X19W/FORK,82"LG		12
			2	P-0009	BEARG ,SGL ROW,15MMX35MMX11MM		11
			2	07-0023	RING,PULLEY,SUPER PRESS CONSIS		10
			1	07-0021	PLATE,GUIDE SUPER CONSIS		9
			1	08-0175	ARM,SWIVEL,DUAL,MOD8		8
			1	P-0381	SOCKET,6 SOL-8STRD		7
			3	H-25-014	SCREW,SKT,.25-20X.625,SKT,SST		6
			1	07-0018	HEAD,PIVOT SUPER CONSIST		5
			1	H-37-006	SCREW,HEX,.375-16X1.50,HEX,CD		4
			1	07-0022	WEIGHT,BALANCING,SUPR PRESS		3
			1	P-0411	BOLT,EYE,.3125-18X2.0,STL		2
			1	07-0016	CAP,POST,SUPER CONSIS		1

QTY. REQD. | PARTS LIST

NEXT ASSY | USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]

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

CHANDLER ENGINEERING

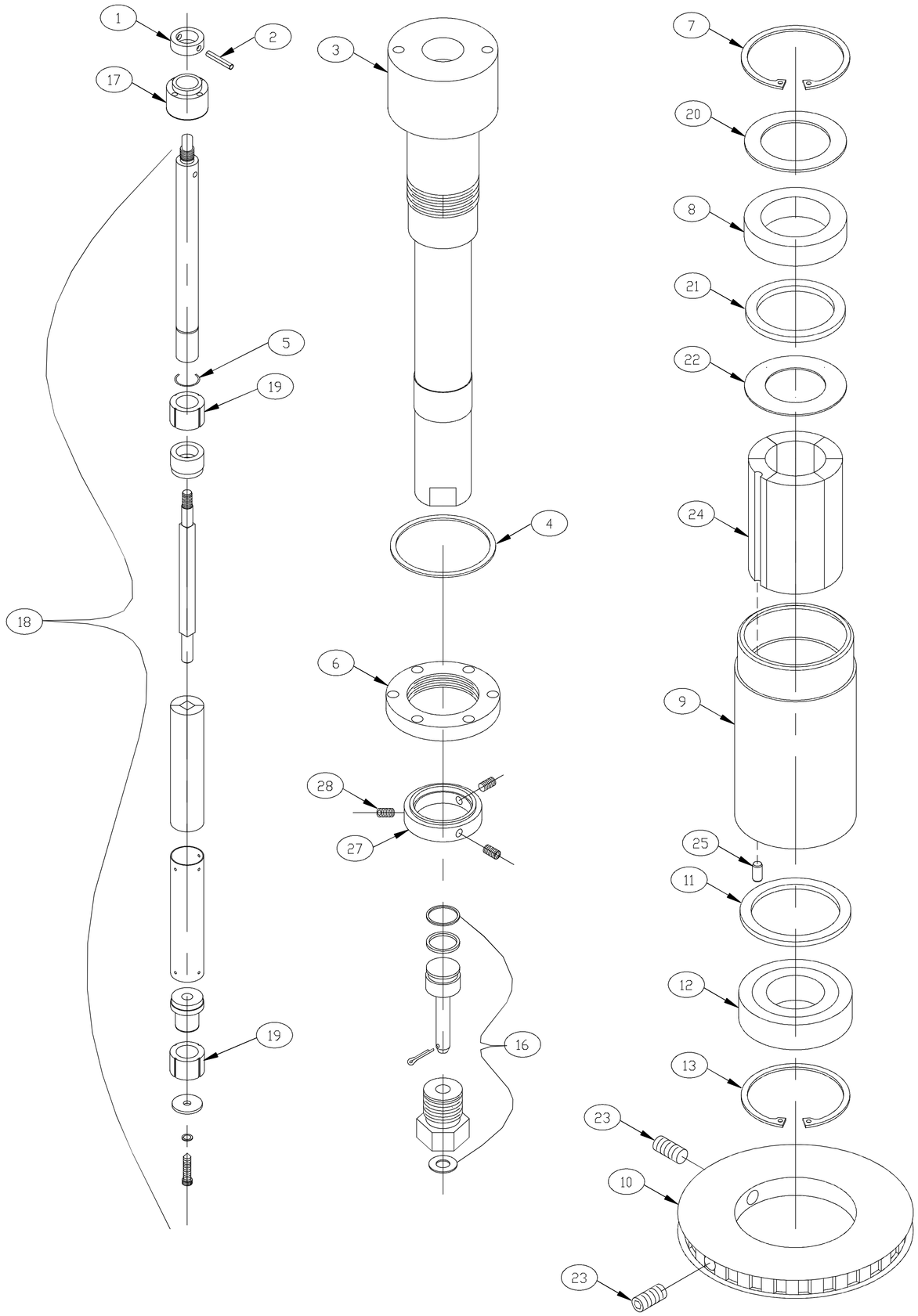
TITLE: ASSEMBLY, SWIVEL ARM

	APPROVALS	DATE
DRAWN:	JAC	07/07/04
CHECKED:	BD	07/07/04
ENGR.:	BD	07/07/04

SIZE: A2 | S.O. NO. | DWG NO. 08-0174 | REV. F

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

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

NEXT ASSY | USED ON

APPLICATION

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

CHANDLER ENGINEERING

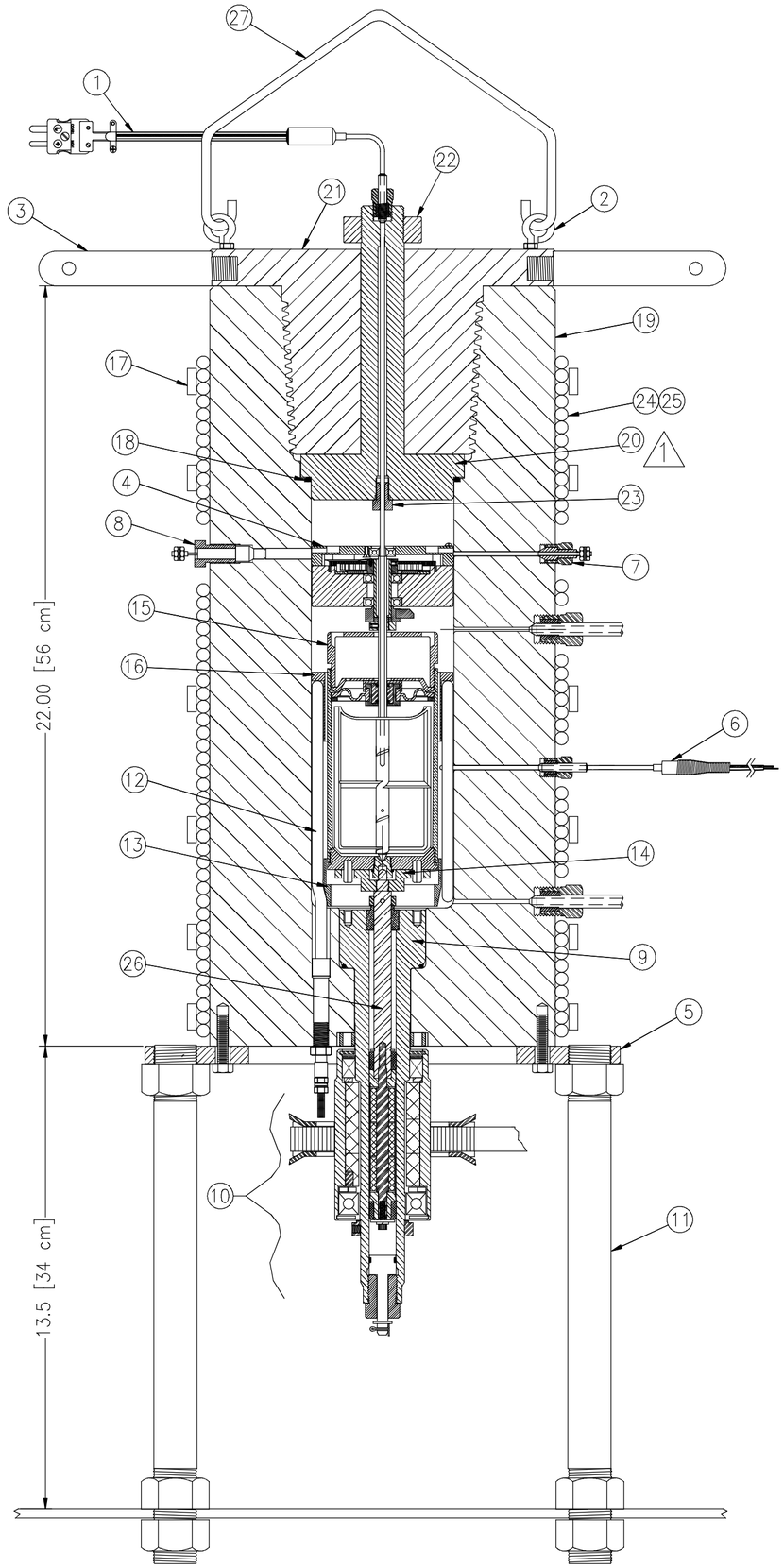
TITLE: MAGNETIC DRIVE ASSEMBLY

APPROVALS	DATE
DRAWN: JAC	03/22/00
CHECKED: JH	10/11/99
ENGR.: BD	10/11/99

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

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

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
BOM	N	ECN T4178; CHG QTY OF 07-1489	9/30/11	TC
BOM	P	ECN T5889; REPL 08-0081 WITH 08-1081	4/9/14	TC



NOTES:
1. FINISH MACHINING PER 08-0082, RECORD ALL SEAL SHAFT DIMENSIONS PER 07-0234.
2. STAMP MARKS FOR P-1080 O-RING, REFER TO 07-1512.
3. PRESSURE TEST PER 8240-0027 PROCEDURE.
4. ASSEMBLE USING TOOLS: 08-0432, 08-0433, AND 08-0434.

-04	-03	-02	-01	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM
			1	07-0009	BAIL,PLUG	SST	27
			1	08-0257	SHAFT ASSY,MAG DRIVE		26
			1	C09057	UNION,BRS,3/8TX3/8T,SW (NOT SHOWN)	BRS	25
			1.5	07-1489	COIL,COOLING	CU	24
			1	07-1114	THERMOCOUPLE GUIDE		23
			1	07-0010	NUT,SEALING,1/4,BLACK	SST	22
			1	07-0215	PLUG,CYLINDER		21
1			1	08-0082	SHAFT, SEAL, FINISHED(08-0278 ROUGH MACHINED)		20
			1	08-0279	CYLINDER		19
			1	P-1080	SEAL RING		18
			6	C10841	STRAP, 33.75 X .75"W		17
			1	07-1523	COLLAR, HEATER	SST	16
			1	08-0045 (REF)	CUP,SLURRY ASSY	VARIES	15
			1	08-0148	CUP,TABLE	SST	14
			1	07-0186	SPACER,HEATER	SST	13
			1	07-1030	HEATER ASSY,5K watt,220v		12
			4	07-1249	LEG,CYLINDER	CRS	11
			1	08-0229 (REF)	DRIVE,MAGNETIC ASSY,PACKLESS	VARIES	10
			1	08-0258	HOUSING ASSY,MAG DRIVE		9
			2	08-0083	ELECTRODE,MINIATURE	SST	8
			1	08-0085	PIN,GROUND	SST	7
			1	08-1081	THERMOCOUPLE,SIDEWALL,LONG	SST	6
			1	08-0032	RING,MOUNTING	CRS	5
			1	07-0539 (REF)	POT,MECH,TEFLON	TFE	4
			4	08-0189 (REF)	HANDLE,PLUG	SST	3
			2	P-0408	BOLT,EYE,.25-20X2.0,STL	PLATED CRS	2
			1	70-0023	TC,SPECIAL TYPE J,15.3" LONG	SST	1

QTY. REQD. | PARTS LIST

NEXT ASSY | USED ON

APPLICATION

BREAK SHARP EDGES, DEBURR

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 32

CHANDLER ENGINEERING

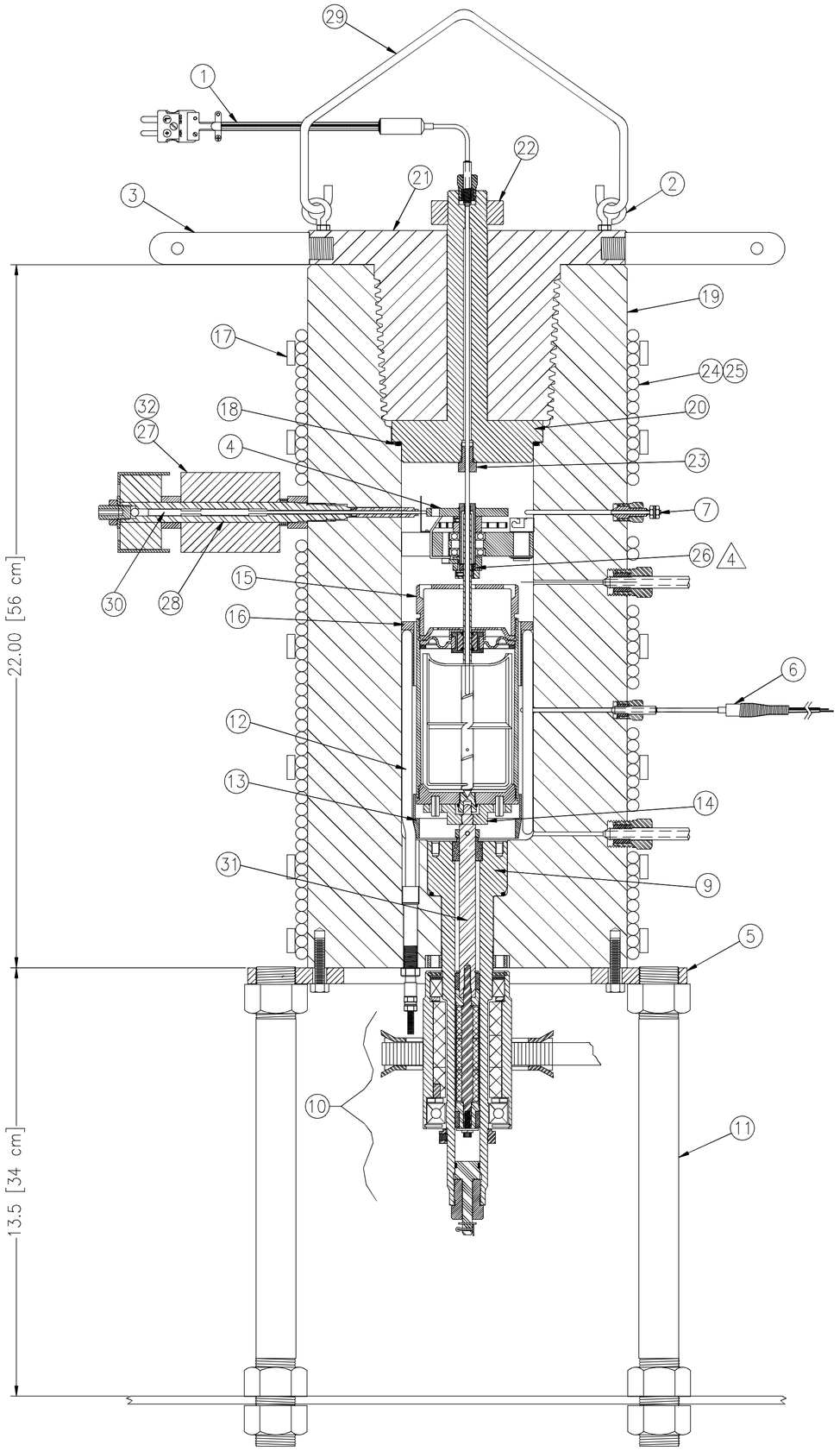
TITLE: CYLINDER ASSY

APPROVALS		DATE
DRAWN:	JAC	07/02/04
CHECKED:	BD	08/11/04
ENGR.:	BD	07/02/04

SIZE	S.O. NO.	DWG NO.	REV.
C		08-0280	P

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

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
BOM	G	ECN T4178; CHG QTY OF 07-1489	9/30/11	TC
BOM	H	ECN T5889; REPL 08-0081 WITH 08-1081	4/9/14	TC



NOTES:
1. FINISH MACHINING PER 08-0082, RECORD ALL SEAL SHAFT DIMENSIONS PER 07-0234.
2. STAMP MARKS FOR P-1080 O-RING, REFER TO 07-1512.
3. PRESSURE TEST PER 8240-0027 PROCEDURE.
4. REPLACE 07-0046 DRIVE BAR WITH 78-0172.

-04	-03	-02	-01	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM
			1	78-0250	ELECTRONIC ASSY, CHANPROBE		32
			1	08-0257	SHAFT,ASSY MAG DRIVE		31
			1	78-0208 (REF)	PROBE ASSY, LVDT, MODEL 8		30
			1	07-0009	BAIL, PLUG, LIFTING	SST	29
			1	78-0218	TUBE,LVDT TRANSDUCER		28
			1	78-0205 (REF)	CHANPROBE ASSEMBLY		27
			1	78-0172 (REF)	BAR, DRIVE, SHAFT		26
			1	C09057	UNION, 3/8T X 3/8T, SW (NOT SHOWN)	BRS	25
			1.5	07-1489	COOLING COIL		24
			1	07-1114	THERMOCOUPLE GUIDE		23
			1	07-0010	NUT, SEALING	SST	22
			1	07-0215	PLUG, PRESSURE VESSEL		21
			1	08-0082	SHAFT, SEAL, FINISHED(08-0278 ROUGH MACHINED)		20
			1	08-0279	VESSEL, PRESSURE		19
			1	P-1080	ORING,METAL		18
			6	C10841	STRAP, 33.75 X .75" W		17
			1	07-1523	COLLAR, HEATER	SST	16
			1	08-0045 (REF)	ASSEMBLY, CUP - SLURRY	VARIES	15
			1	08-0148	TABLE, CUP	SST	14
			1	07-0186	SPREADER, HEATER	SST	13
			1	07-1030	HEATER ASSEMBLY, 5kW @ 220 VAC		12
			4	07-1249	LEG, SUPPORT	CRS	11
			1	08-0229 (REF)	MAGNETIC DRIVE ASSEMBLY	VARIES	10
				08-0258	HOUSING ASS'Y, MAGNETIC DRIVE		9
			2	08-0083	CONTACT ELECTRODES	SST	8
			1	08-0085	GROUND PIN	SST	7
			1	08-1081	THERMOCOUPLE,SIDEWALL,LONG	SST	6
			1	08-0032	RING, CYLINDER MOUNTING	CRS	5
			1	78-0179 (REF)	CAM MECHANISM ASSY		4
			4	08-0189 (REF)	HANDLE, PLUG	SST	3
			2	P-0408	EYE BOLT	PLATED CRS	2
			1	70-0023	THERMOCOUPLE, TEMP, SLURRY	SST	1

QTY. REQD. | PARTS LIST

NEXT ASSY | USED ON | APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]
TOLERANCES:
1 PLACE ±
2 PLACE ±
3 PLACE ±
ANGLES ±
SURF. FINISH ✓

CHANDLER ENGINEERING

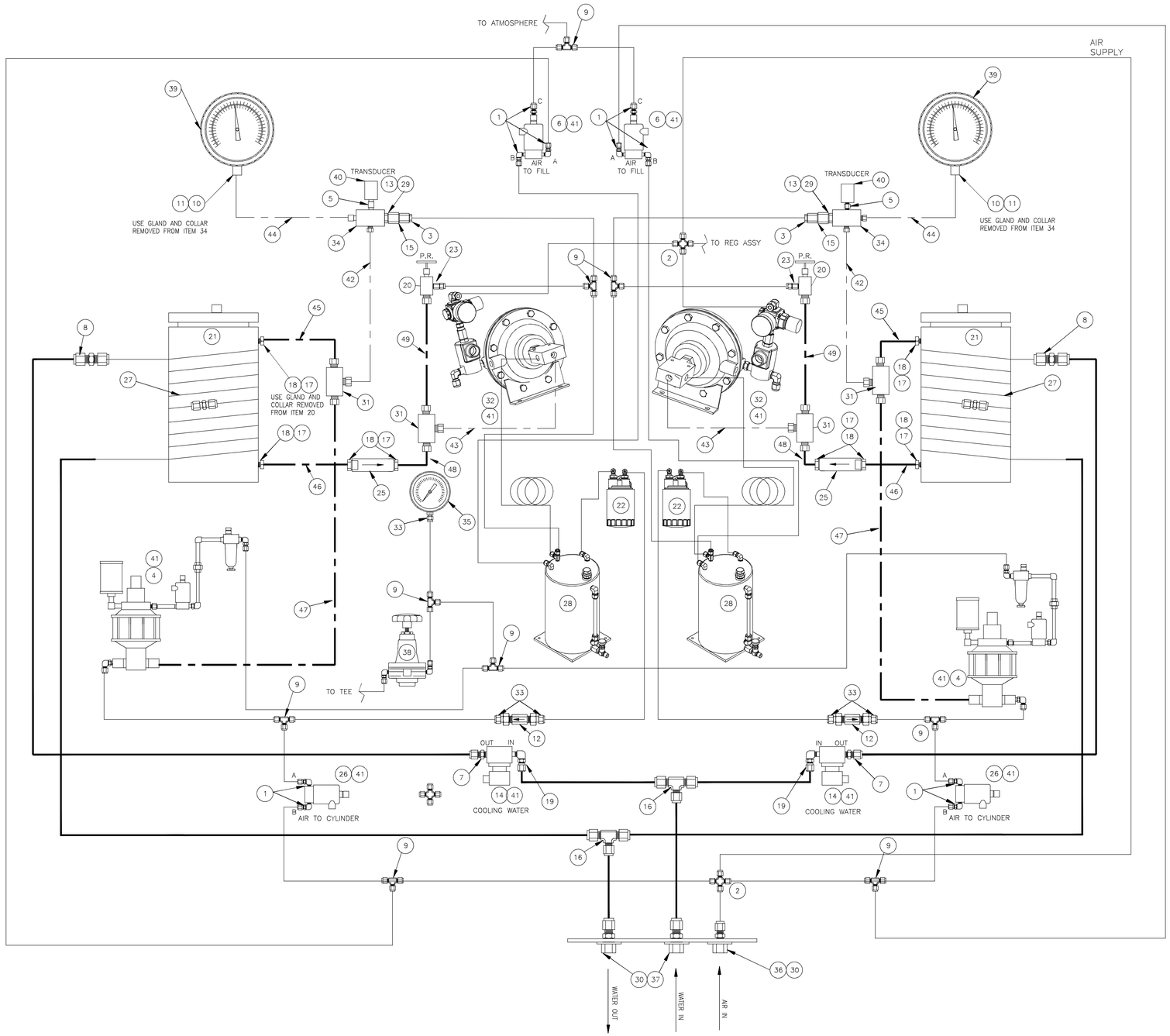
TITLE
CYLINDER ASSEMBLY,CHANPROBE
MODEL 8040 CONSISTOMETER

APPROVALS		DATE
DRAWN:	JAC	07/02/04
CHECKED:	BD	07/02/04
ENGR.:	BD	07/02/04

SIZE	S.O. NO.	DWG NO.	REV.
A2		08-0280-CP	H

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

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
BOM	K	ECN T4480; CHANGED BOM	3/9/12	TC
BOM	L	ECN T5514; CHG'D QTY'S #2 & #9, REM #28	11/14/13	AMH
BOM	M	ECN T6446; UPDATE BOM	3/2/15	TC



TUBE LEGEND

- 1/4" LP = R-0125 COPPER
- 1/4" HP = R-0484 SST
- 3/8" LP = R-0127 COPPER
- 3/8" HP = R-0873 SST

REFERENCE BOM ONLY – SEE 8040D10 BOM

* INDIVIDUAL TUBES MAKE UP 07-1502 TUBE SET, QTY. 1 SET

	-04	-03	-02	-01	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM
*				REF	07-1502-08	TUBE SET, HP		49
*				REF	07-1502-07	TUBE SET, HP		48
*				REF	07-1502-06	TUBE SET, HP		47
*				REF	07-1502-05	TUBE SET, HP		46
*				REF	07-1502-04	TUBE SET, HP		45
*				REF	07-1502-03	TUBE SET, HP		44
*				REF	07-1502-02	TUBE SET, HP		43
*				REF	07-1502-01	TUBE SET, HP		42
				10	C06892	VARISTOR, 250 VAC		41
				2	C07833	TRANSDUCER, PRESSURE		40
				2	C09060	GAUGE, PRESSURE, 40,000 PSI		39
				1	07-1570	ASSY, REGULATOR		38
				2	C09880	UNION, BRS, BHD, 3/8 T x 1/4 FPT		37
				1	P-1954	UNION, BRS, BHD, 1/4 T x 1/4 FPT		36
				1	P-1840	GAUGE, AIR SUPPLY, 0-700 KPA		35
				2	P-0756	CROSS, SST, 1/4T, 60,000 PSI, HIP		34
				5	P-1267	UNION, BRS, 1/4T X 1/4FPT		33
				2	8240-0072	ASSY, VALVE, DIAPHRAGM		32
				4	P-2165	TEE, 60,000 PSI, 3/8 X 3/8 X 1/4		31
				3	C08268	RTNR ,SST,3/4ID,BHD,SW		30
				2	P-1593	DISC, RUPTURE, 45,000PSI, MODEL 8040		29
				2	07-1568	RESERVOIR SUB, DUAL		28
				1	07-1489 REF.	COOLING COIL		27
				2	P-3107	VALVE, SOL, 2-WAY, 1/4, 220		26
				2	07-1086	ASSY, FILTER		25
								24
				2	P-2167	ADPTR, SST, 1/4 HPT x 3/8 HP		23
				2	07-1569	ASSY, OIL FILTER		22
				2	08-0280	CYLINDER ASSY		21
				2	P-3517	VALVE, ANGLE, 60000 PSI, SST, 3/8 HPT		20
				2	P-3200	ELBOW,BRS,3/8MPX3/8T,CR		19
				8	P-2169	GLAND, 3/8 TUBING		18
				8	P-2168	COLLAR, 3/8 TUBING		17
				2	P-3201	TEE, BRS, UN, 3/8 T x 3/8 T x 3/8 T		16
				2	P-0269	BUSHING, PIPE, 0.375 x 0.125		15
				2	C09155	VALVE, SOL, 2-WAY, 3/8, 220		14
				2	P-1206	ADPTR, SST, HP, 1/4 HP x 3/8 FP		13
				2	P-0853	VAL, BRS, CHK, 1/4MP X 1/4 MP		12
				2	P-0855	COLLAR, 1/4-28 LH		11
				2	P-0193	NUT, HIGH PRESSURE, 9/16-18		10
				9	P-1265	TEE, BRS, UN, 1/4 T x 1/4 T x 1/4 T		9
				2	C09057	UN ,BRS,3/8TX3/8T,SW		8
				2	P-3199	CONN, BRS 3/8 MP X 3/8 T, SW		7
				2	C09062	VAL,SOL,3 WAY, 220		6
				2	C08702	ADAPT,SS,1/4MHPTX1/4MHPT,HIP		5
				2	8040-P	ASSY, PUMP		4
				2	P-1244	CONNECTOR, BRS, 1/8 T x 1/4 MPT		3
				2	P-1277	CROSS, BRS, UN, 1/4 T		2
				10	P-1255	ELBOW, BRS, 1/4 T x 1/4 MPT		1
	-04	-03	-02	-01	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM

QTY. REQD. | PARTS LIST

NEXT ASSY | USED ON

APPLICATION

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 32

APPROVALS		DATE
DRAWN:	JAC	05/19/04
CHECKED:	JH	05/19/04
ENGR.:	BD	05/19/04

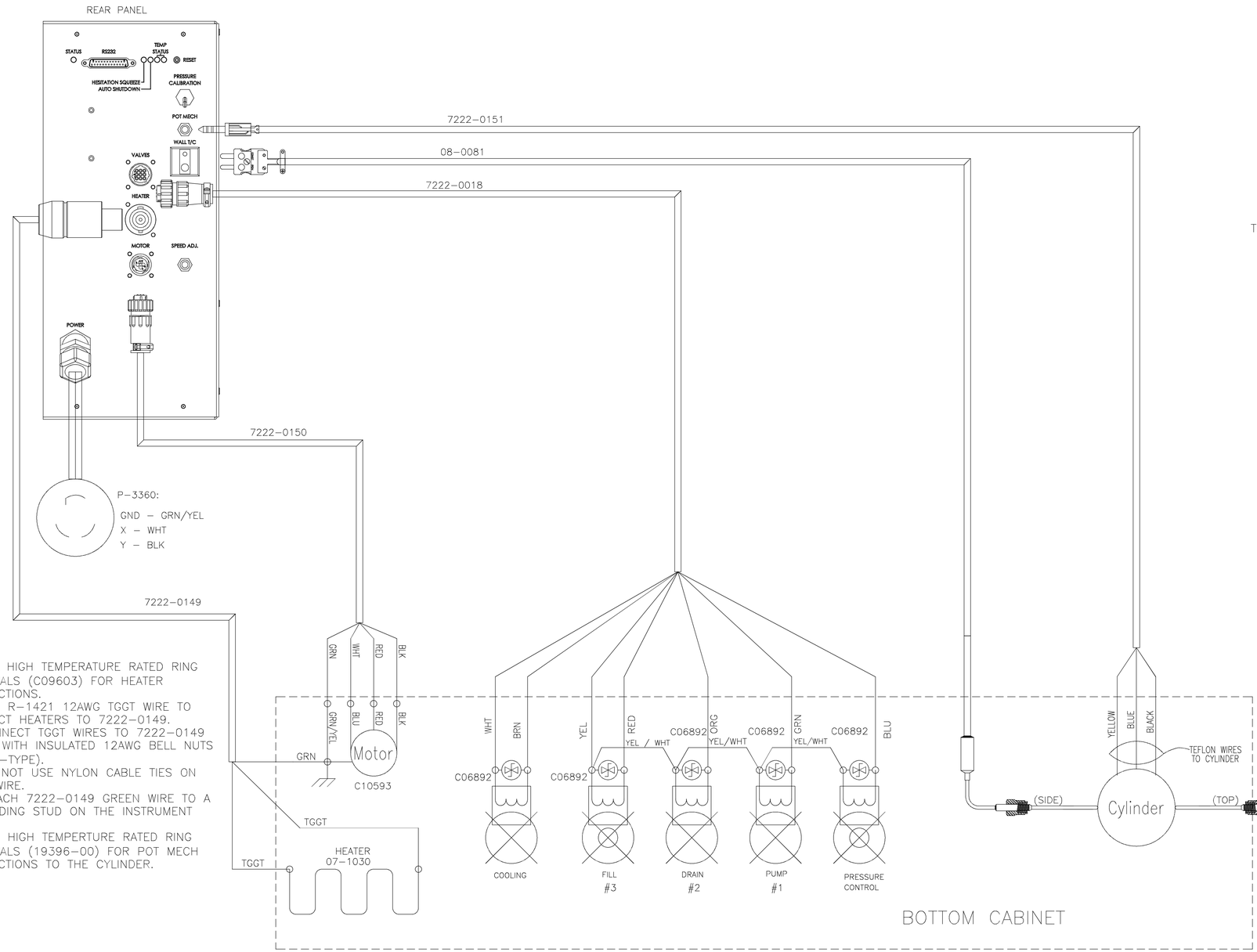
CHANDLER ENGINEERING

TITLE: PIPING SCHEMATIC
8040 DUAL CONSISTOMETER

SIZE	S.O. NO.	DWG NO.	REV.
		08-0412	M

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

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
D3,D4	F	ECN T1510, C08262 WAS C09073	3/5/08	JB/TC
G-3,4	G	ECN T3138, UPDATE P-1417 & P-1418	7/20/10	JB/TC
ALL	H	ECN T4056; UPDATE TO MODULAR ELECTRONICS	7/14/11	TRB
	J	ECN T5358; ADDED WIRING NOTES	5/10/13	TRB



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.

		UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]		**CHANDLER ENGINEERING**
		TOLERANCES:		
	MODEL 8, SPR-147	1 PLACE ±		
NEXT ASSY	USED ON	2 PLACE ±		
APPLICATION		3 PLACE ±		TITLE: SCHEMATIC, WIRING 8040 DUAL CONSISTOMETER
		ANGLES ±		
BREAK SHARP EDGES, DEBURR		SURF. FINISH ✓		
		APPROVALS	DATE	
		DRAWN: JAC	05/19/04	SIZE: D | S.O. NO. | DWG NO. 08-0413 | REV. J
		CHECKED: BD	05/19/04	
		ENGR.: BD	05/19/04	SCALE: 1 = 1 | TITLE BLOCK REV: 1.0 | SHEET: 1 of 2

RIGHT SIDE

TO FRONT PANEL

70-0023

BLACK
BLUE
YELLOW

TEFLON WIRES TO CYLINDER

(TOP)

Cylinder

(SIDE)

7222-0151

08-0081

7222-0018

7222-0150

REAR PANEL

STATUS
RS232
TEMP STATUS
RESET
HESITATION SQUEEZE AUTO SHUTDOWN
PRESSURE CALIBRATION
POT MECH
WALL T/C
VALVES
HEATER
MOTOR
SPEED ADJ.
POWER

P-3360:
GND – GRN/YEL
X – WHT
Y – BLK

7222-0149

BLU
C06892
YEL/WHT
GRN
C06892
YEL/WHT
ORG
C06892
YEL / WHT
RED
YEL
C06892
BRN
WHT
C06892

PRESSURE CONTROL
PUMP #1
DRAIN #2
FILL #3
COOLING

BLK
RED
WHT
GRN

BLK
RED
BLU
GRN/YEL

Motor

C10593

GRN

TGGT

HEATER 07-1030

TGGT

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.

		UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]
		TOLERANCES: 1 PLACE ± 2 PLACE ± 3 PLACE ± ANGLES ± SURF. FINISH ✓
	MODEL 8, SPR-147	
NEXT ASSY	USED ON	
APPLICATION		
BREAK SHARP EDGES, DEBURR		APPROVALS / DATE

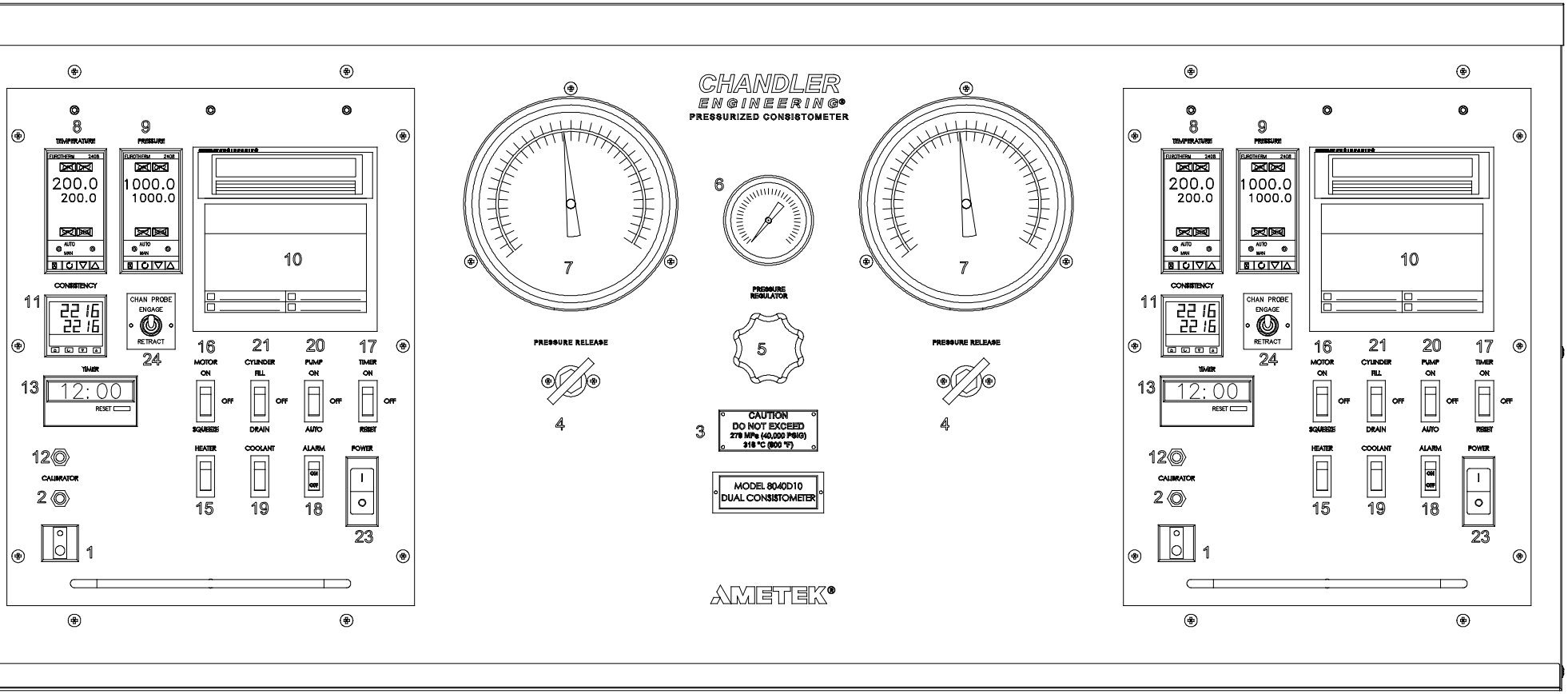
CHANDLER ENGINEERING

TITLE: SCHEMATIC, WIRING
8040 DUAL CONSISTOMETER

DRAWN:	JAC	05/19/04
CHECKED:	BD	05/19/04
ENGR.:	BD	05/19/04

SIZE: D | S.O. NO. | DWG NO. 08-0413 | REV. J
SCALE: 1 = 1 | TITLE BLOCK REV: 1.0 | SHEET: 2 of 2

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	ECN# 9104, RELEASED	06/18/04	JAC/BD
	B	ECN T4069; UPDATED FOR MODULAR ELECTRONICS	07/14/11	TRB

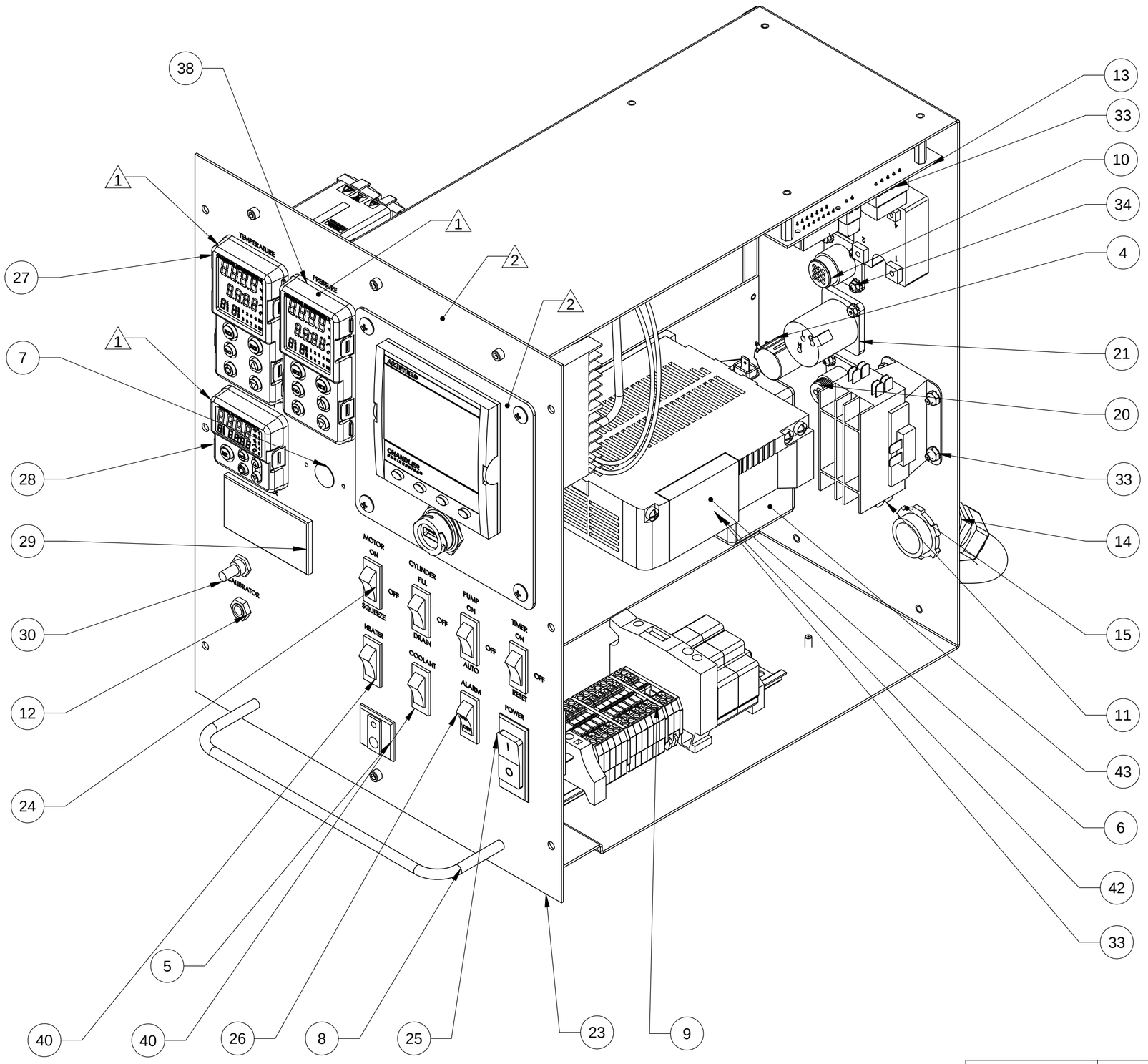


1. THERMOCOUPLE SOCKET, SLURRY
2. POTENTIOMETER CALIBRATION SOCKET
3. RESTRICTION PLATE
4. PRESSURE RELEASE VALVE
5. AIR REGULATOR
6. AIR GAUGE
7. CYLINDER PRESSURE GAUGE
8. TEMPERATURE CONTROLLER
9. PRESSURE CONTROLLER
10. CHART RECORDER
11. CONSISTENCY DISPLAY
12. CONSISTENCY CALIBRATION
13. TIMER
15. HEATER SWITCH
16. MOTOR SWITCH
17. TIMER SWITCH
18. ALARM SWITCH
19. COOLANT SWITCH
20. PUMP SWITCH
21. AIR TO CYLINDER / FILL SWITCH
23. POWER SWITCH
24. CHAN PROBE SWITCH (OPTIONAL)

		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°, SURF. FINISH 32	TITLE	LAYOUT, PANEL 8040 DUAL CONSISTOMETER
NEXT ASSY	USED ON	APPROVALS	DATE	
APPLICATION		DRAWN: JAC	05/19/04	SIZE A1 · S.O. NO. · DWG NO. 08-0414 · REV. B
		CHECKED: BD	05/19/04	
		ENGR.: BD	05/19/04	SCALE: 1 = 1 · DO NOT SCALE DRAWING · SHEET: 1 of 1

NOTE:
1. ⚠1 ENSURE THAT ALL CONTROLLERS ARE INSTALLED TIGHTLY SO THAT BRACKETS SNAP INTO PLACE AT TOP AND BOTTOM ON BOTH SIDES.
2. ⚠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
	F	ECN T5809; ADDED 2 EA C13800	3/11/14	TC



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
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
46	43098-00	SCREW,SHCS,SS,8-32X0.375	6
47	C13800	FUSE, 32A, 14X51, 500V	2

.	.
.	.
.	.
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

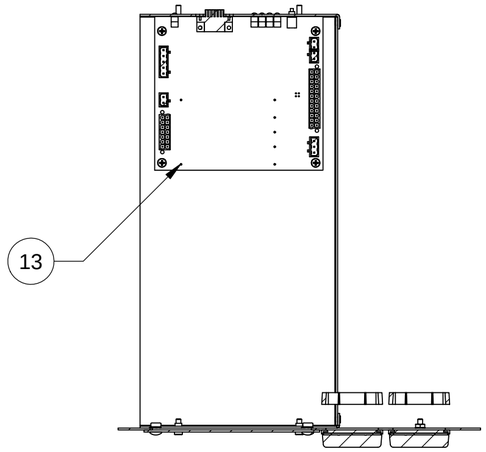
APPROVALS		DATE
DRAWN:	TRB	4/12/10
CHECKED:	JS	4/26/10
ENGR.:	TRB	4/12/10

CHANDLER ENGINEERING

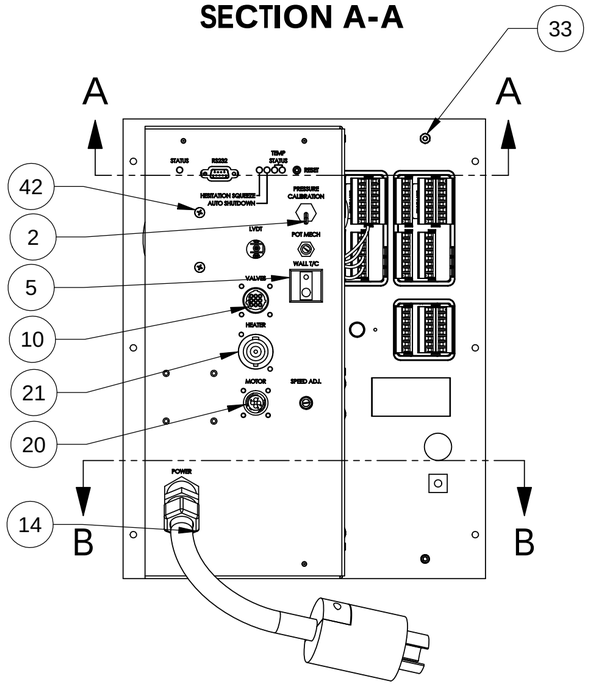
TITLE
ELECTRICAL PANEL,CONSISTOMETER

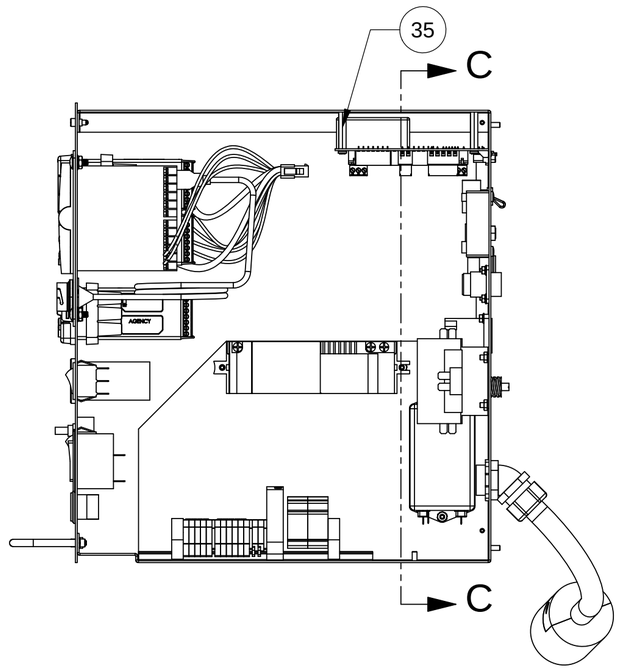
SIZE	DWG NO.	REV.
C	7222-UEP	F

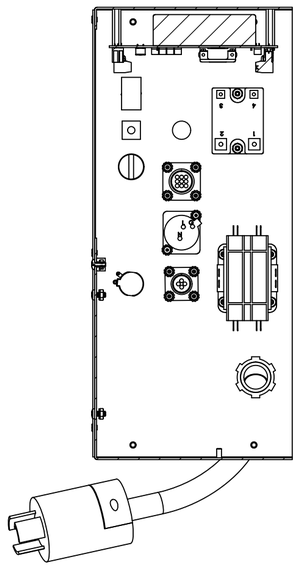
SCALE: 1:2 | TITLE BLOCK REV: 2.0 | SHEET: 1 of 2



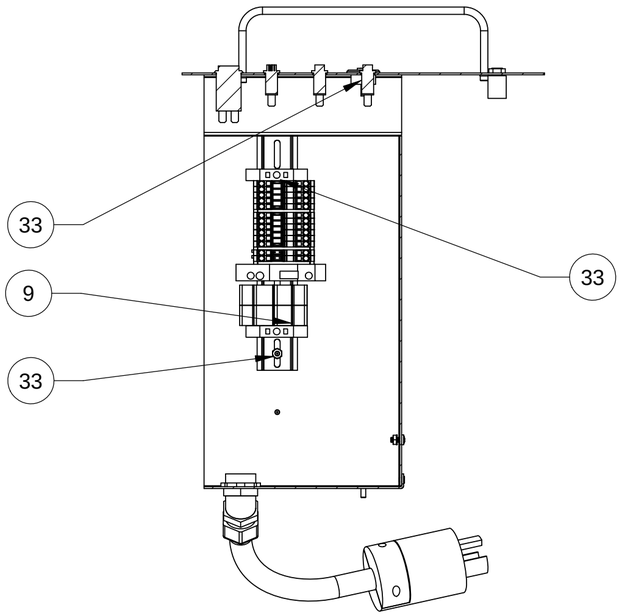
SECTION A-A







SECTION C-C



SECTION B-B

.	.	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 32		TITLE: ELECTRICAL PANEL,CONSISTOMETER
NEXT ASSY	USED ON			
APPLICATION				
BREAK SHARP EDGES, DEBURR		APPROVALS	DATE	
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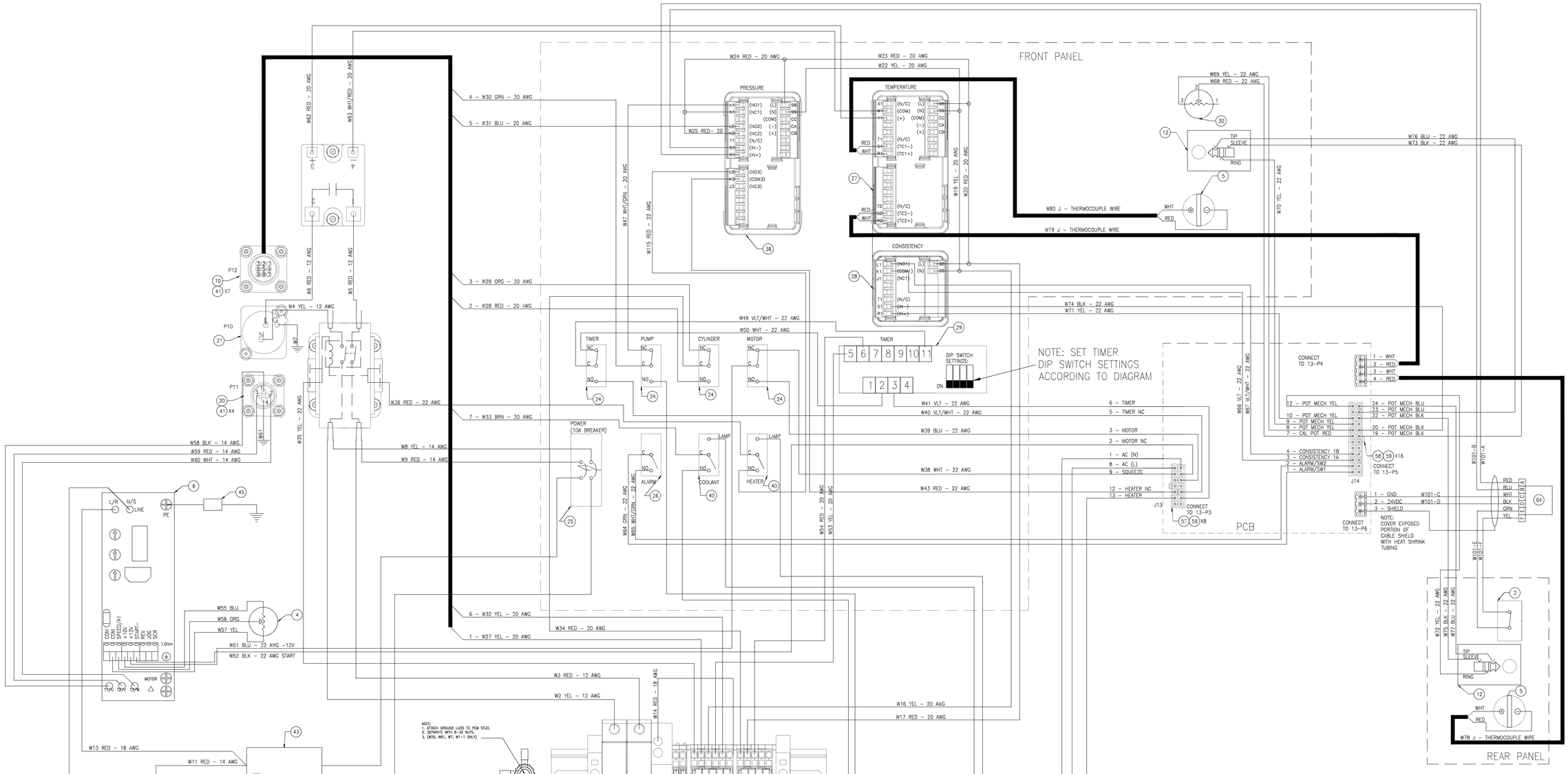
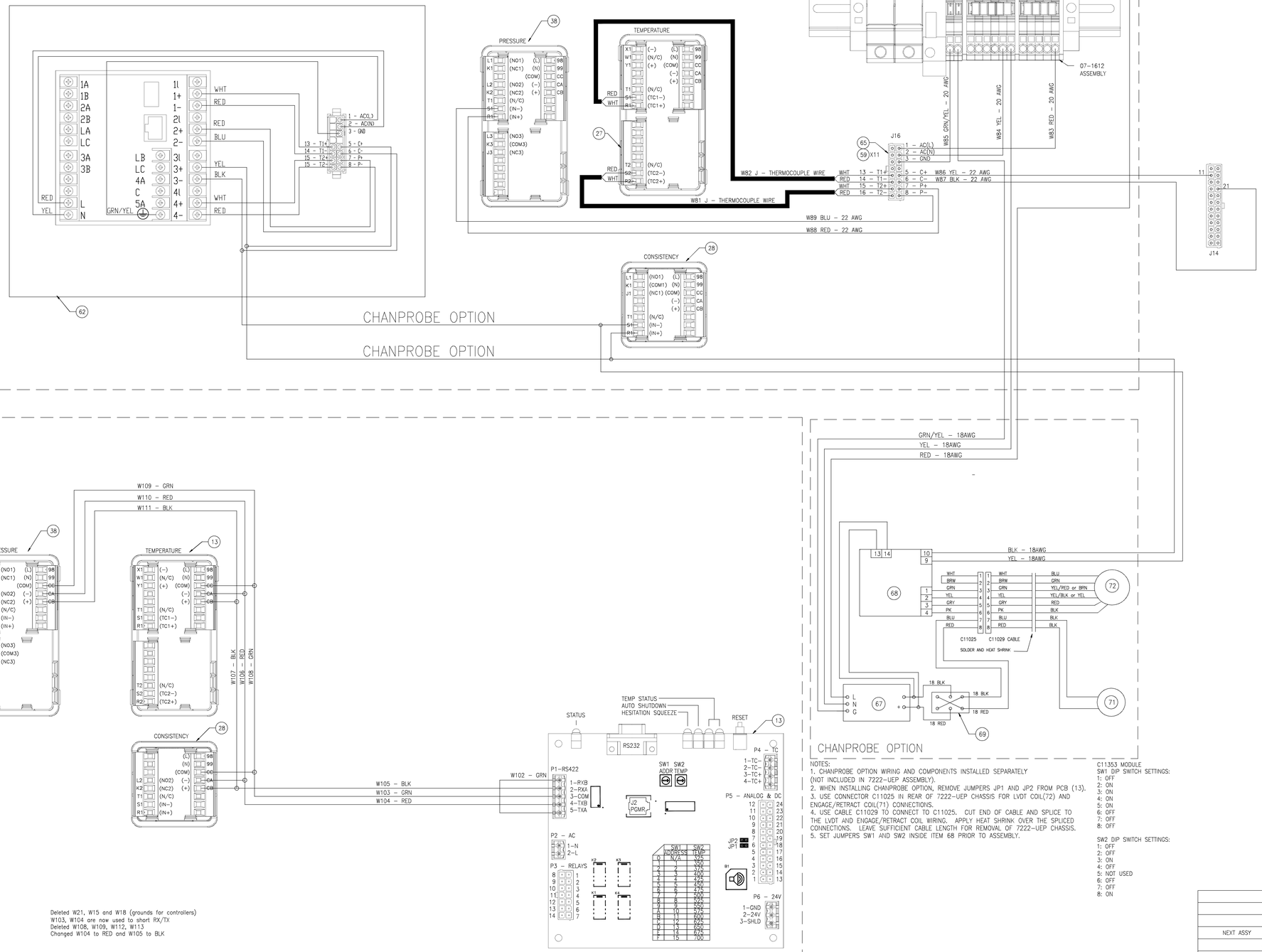
		CHECKED: JS	4/26/10	
		ENGR.: TRB	4/12/10	SCALE: 1:4 | TITLE BLOCK REV: 2.0 | SHEET: 2 of 2

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°						
APPLICATION		SURF. FINISH	63					
BREAK SHARP EDGES, DEBURR		APPROVALS	DATE					
This document and the drawings and technical data contained hereon are the property of Chandler Engineering Company LLC. Reproduction or dissemination in any form except as expressly authorized by the owner is forbidden. The holder agrees to return this document to the owner on demand.		DRAWN: TRB	4/14/10	SIZE B	S.O. NO.	DWG NO. 7222–UEP–0030	REV. M	
		CHECKED: JS	4/26/10					
Copyright by Chandler Engineering Company LLC		ENGR.: TRB	4/14/10	SCALE: N/A	TITLE BLOCK REV: 1.0	SHEET: 1 of 2		



Deleted W21, W15 and W18 (grounds for controllers)
W103, W104 are now used to short RX/TX
Deleted W108, W109, W112, W113
Changed W104 to RED and W105 to BLK

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
		3 PLACE ±0.005
NEXT ASSY	USED ON	ANGLES ±1/2°
APPLICATION		SURF. FINISH 63
BREAK SHARP EDGES, DEBURR		

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

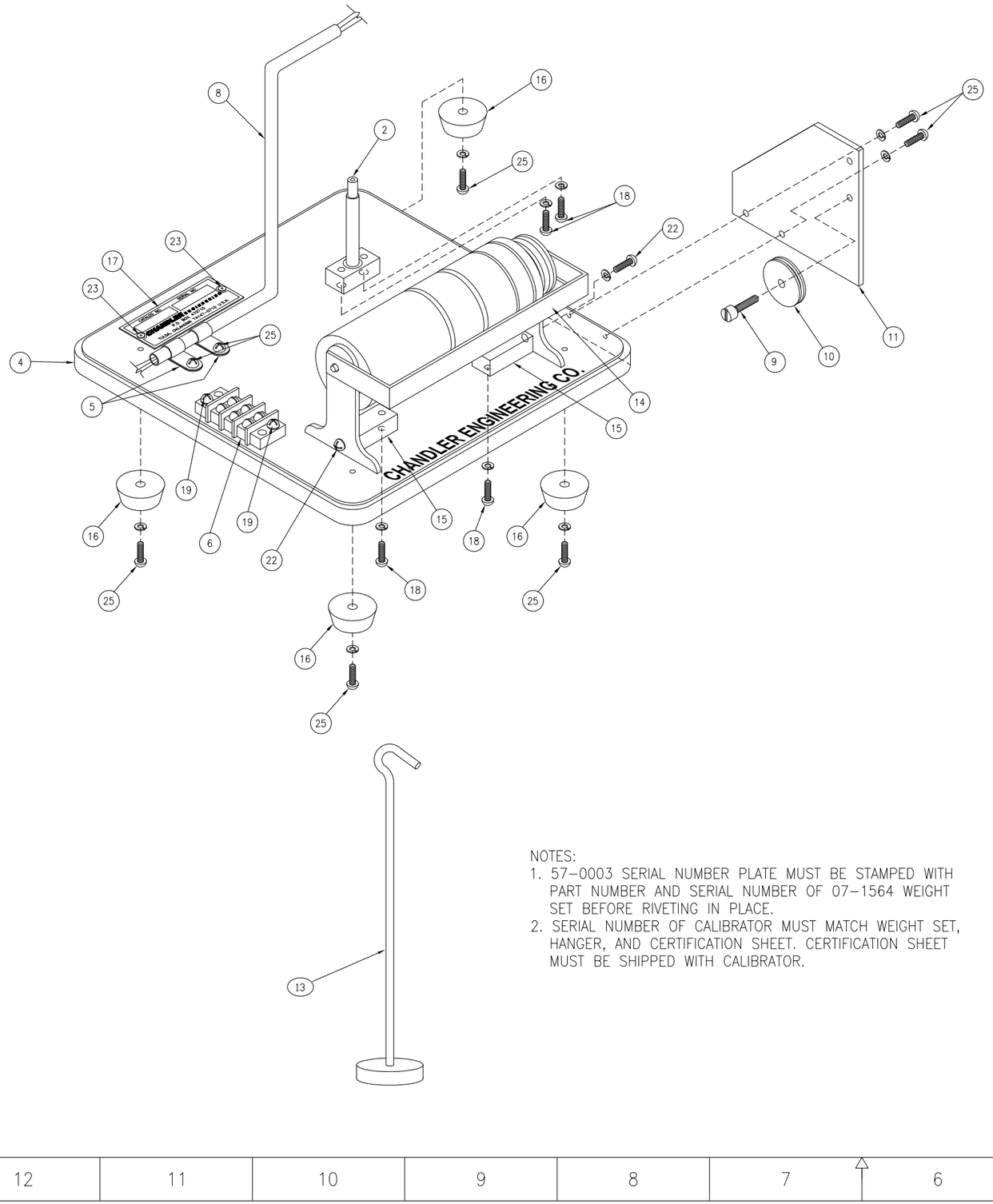
CHANDLER ENGINEERING

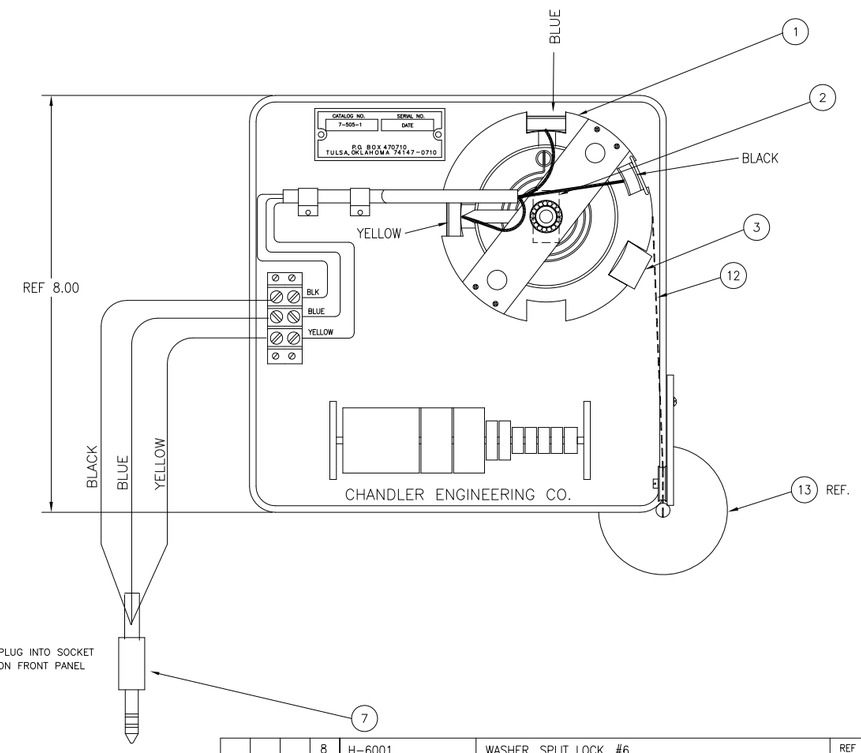
TITLE: SCHEMATIC,WIRING 7222-UEP

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

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

REVISIONS					
ECN	ZONE	REV	DESCRIPTION	DATE	APPROVED
		2	ECN T3814; MOVED 7222-0151 TO TOP LEVEL	5/9/11	TC
		A	ECN# T4214, ADD ITEM 21	10/20/11	SS/TC





NOTES:
1. 57-0003 SERIAL NUMBER PLATE MUST BE STAMPED WITH PART NUMBER AND SERIAL NUMBER OF 07-1564 WEIGHT SET BEFORE RIVETING IN PLACE.
2. SERIAL NUMBER OF CALIBRATOR MUST MATCH WEIGHT SET, HANGER, AND CERTIFICATION SHEET. CERTIFICATION SHEET MUST BE SHIPPED WITH CALIBRATOR.

			ITEM	PART NUMBER	DESCRIPTION	QTY REQ'D
			8	H-6001	WASHER, SPLIT LOCK, #6	REF
			6	H-8001	WASHER, SPLIT LOCK, #8	REF
			6	H-6017	SCREW, 6-32 X 3/8 LG., SST	25
						24
			2	H-100-000	"POP" RIVETS	23
			2	H-8011	SCREW, #8-32 X 3/8 LG.	22
			1	07-1564	SET,CALIBRATED WEIGHTS & HANGER	21
			REF	07-0539	ASS'Y, POT. MECHANISM (SUPPLIED WITH CONSIST.)	20
			2	H-6019	SCREW, 6-32 X 1/2 LG	19
			4	H-8018	SCREW, 8-32 X 5/8 LG	18
			1	57-0003	MODEL/SERIAL NO. PLATE	17
			4	P-1233	FEET, RUBBER	16
			2	07-0508	BAR, MOUNTING	15
			REF	07-1537	SET,CALIBRATED WEIGHT	14
			REF	07-1538	HANGER,CALIBRATED WEIGHT	13
			1	07-0519	CORD ASSEMBLY	12
			1	07-0595	SUPPORT, PULLEY	11
			1	C08847	PULLEY	10
			1	C08848	SCREW, S/H, SHOULDER, 8-32 X 3/8 LG.	9
			1	07-0516-01	HOLDER, WIRE	8
			1	7222-0151	CABLE,POT MECH	7
			1	P-0898	TERMINAL, 3 CONDUCTOR	6
			2	P-0724	CLIP, NYLON	5
			1	07-0507	BASE PLATE	4
			1	07-0515	WEDGE	3
			1	07-0506	HOLDER, POTENTIOMETER	2
			REF	07-0539	POTENTIOMETER (NOT FURNISHED)	1

BOTH MAKE UP 07-1564 SET

PART LIST

-04	-03	-02	-01	APPLICATION
7716-00/7720-00				7716/7720 CONSISTOMETERS
7025-00/7222-00				7025/7222 CONSISTOMETERS
8040-00				8040 CONSISTOMETER
NEXT ASSY				USED ON

TOLERANCES:
1 PLACE ±0.030 [.76]
2 PLACE ±0.010 [.25]
3 PLACE ±0.005 [.127]
ANGLES ±1/2°
SURF. FINISH 32

APPROVALS		DATE
DRAWN:	TRB	8/17/10
CHECKED:	JS	8/17/10
ENGR.:	TRB	8/17/10

CHANDLER ENGINEERING

TITLE
ASSEMBLY, CALIBRATOR
POTENTIOMETER

SIZE	S.O. NO.	DWG NO.	REV.
D		CP162-07-0505-01	A
SCALE:	DO NOT SCALE DRAWING	SHEET: 1 of 1	