

INSTRUCTION MANUAL  
MODEL 3065  
Wettability Tester  
Revision F – January 2016  
P/N: 3065-0009

S/N: \_\_\_\_\_



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## Additional Documentation:

Timer #814

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# General Information

## Introduction

This manual contains installation, operation and maintenance instructions for the Chandler Engineering Model 3065 Wettability Tester.

### **Purpose and Use**

The Chandler Engineering Model 3065 Wettability Tester is designed to evaluate the water-wetting capability of spacers and/or pre-flushes designed to water-wet surfaces after these surfaces have been exposed to non-aqueous fluids, specifically oil- and synthetic-based drilling fluids. This is accomplished by measuring the electrical conductivity between electrode surfaces. The Model 3065 also provides all the functionality of the Model 3060 Constant Speed Mixer.

### **Description**

The Chandler Engineering Model 3065 Wettability Tester has all the features of the Model 3060 Constant Speed Mixer, with the addition of two electrodes in the body of the mixer to measure the electrical conductance. Additionally, the Model 3065 is equipped with a heating jacket to allow testing to 194°F.

Oil-external fluids, such as oil- or synthetic-based drilling fluids, are generally not electrically conductive, whereas water-external fluids are partially conductive. The water-external fluid to be used in the testing (generally a spacer or pre-flush) is used to establish a reference conductance using the Span control. The conditioned oil-based/oil-external fluid is placed in the pre-heated cup and stirred. Water-based/water-external fluid is then added as a titrant until the digital conductivity meter indicates a stable water-wetting state. In addition to the digital display, the operator is able to visually ascertain the compatibility of the mud and spacer during this test, including significant changes in viscosity as the fluids are mixed.

## Features and Benefits

- Programmable temperature control
- Easy to operate, easy to clean and maintain
- Both mixer and wettability operations are easily observed via the bright digital displays at eye level
- Broad range of sensitivity/scalability to accommodate a wide variety of fluid types
- Analog conductance output for data acquisition via a chart recorder or a computerized system, such as Chandler's 4270 and 5270 PC based data acquisition systems
- Hardened mixing blades assure long life
- Variable speed control (1,000 to 18,000 rpm)
- Two preset constant speeds (4,000 and 12,000 rpm). The preset speeds can be easily changed to any value between 1,000 and 18,000 rpm for applications outside API Spec 10
- Stainless steel container can withstand abrasive action when mixing cement at high speeds

- Stability of the unit is ensured by the heavy base plate and control panel which is designed for safe and simple operation
- Heavy duty industrial-grade mixer assures its trouble-free and long-life operation

## Specifications

<b>Operating Conditions:</b>	75°F - 194°F (24°C - 90°C)
<b>Maximum Temperature:</b>	194°F (90°C)
<b>Input Voltage:</b>	110 or 220 VAC $\pm$ 15%; 50/60 Hz $\pm$ 10%
<b>Heater Wattage:</b>	280 Watts
<b>Dimensions:</b>	27.6" (70cm) high x 11" (28cm) wide x 16" (41cm) deep
<b>Shipping Dimensions:</b>	32" (81cm) high x 16" (41cm) wide x 26" (66cm) deep
<b>Net Weight:</b>	45 lbs (20 kg)
<b>Shipping Weight:</b>	80 lbs (36 kg)
<b>Container Volume:</b>	1 quart (1 liter)
<b>Adjustable Speeds:</b>	1,000 to 18,000 rpm
<b>Maximum Speed:</b>	18,000 rpm (Note: as mixers begin to exhibit substantial wear, maximum rpm will decrease. Maximum rpm is dependent on amplitude of line voltage.)

# Safety Requirements

## *READ BEFORE ATTEMPTING OPERATION OF INSTRUMENT*

The Chandler Engineering Model 3065 Wettability Tester is designed for operator safety. Any instrument that is capable of high temperatures should always be operated with **CAUTION!!**

To ensure 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 temperature ratings.
- Always disconnect main power to the instrument before attempting any repair.
- Turn off the heater at completion of each test.
- Appropriately rated fire extinguishers should be located within close proximity.
- Surface of heater jacket can become hot! Use a glove for protection when touching the cup handle. Burns may result if caution is not exercised.

Before attempting to operate the instrument, the operator should read and understand this manual.

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# Section 1 – Installation

## Unpacking the Instrument

*Note: Verify all parts listed on packing slip have been shipped with instrument. If parts are missing, contact Chandler Engineering.*

## Utilities Required

100-130 VAC/200-240 VAC

10 A

50/60 Hz

## Tools/Equipment Required

None

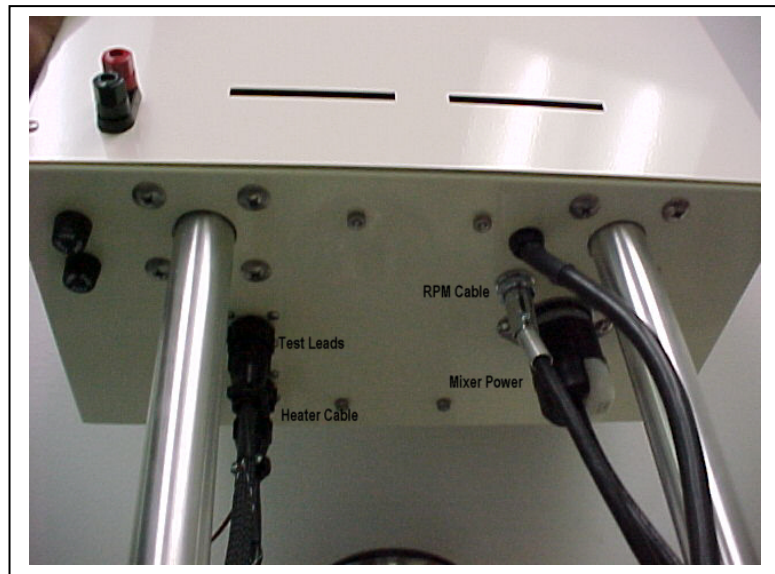
## Setting up the Instrument

1. Refer to Figure 1 on the following page while setting up the instrument.
2. Plug the Tachometer Cable from the mixer motor into the matching socket located at the bottom of the Control Enclosure.
3. Plug the Mixer Power cable into the matching socket located at the bottom of the Control Enclosure.
4. Place heating jacket around the mixing cup and fasten the Velcro strips.
5. Plug red and black test leads into mixing cup (the leads are interchangeable between the receptacles, it is only necessary that they both be plugged in).
6. Plug the Test Lead cable into the matching socket located at the bottom of the Control Enclosure.
7. From the heater jacket, plug the Heater cable into the matching socket located at the bottom of the Control Enclosure and the thermocouple into the front of the Control Enclosure.
8. Connect the power cord to an appropriately rated power source in accordance with local wiring codes.

*Caution: Check your power supply (110 VAC or 240 VAC) against your Model 3065 system power rating. Damage can occur if wrong line voltage is applied.*

*Note: To prevent shock hazard, connect the instrument to an electrical outlet using a three-prong socket to provide positive ground.*

Figure 1  
(Viewed from the back of the instrument)



# Section 2 – Operating Instructions

## Sample Preparation for Wettability Test

1. Prepare a mud sample according to instructions from the supplier. Laboratory-prepared mud samples may require additional preparation such as static aging or hot rolling to more fully simulate field mud properties.
2. Mix the spacers and/or pre-flush fluids to be evaluated according to manufacturer's procedures. A 500 ml sample is normally sufficient to run a single test.
3. Condition all spacer fluids at BHCT (Bottom Hole Circulating Temperature) to ensure that fluids are stable and all chemicals have been conditioned and are in solution. Condition fluids under pressure using high-temperature / high-pressure equipment if conditioning at temperatures above 194°F (90°C). Fluids should be cooled below 194°F (90°C) before releasing pressure. The Model 3065 Wettability Tester has been designed for use at atmospheric pressure. Test temperature should not exceed 194°F (90°C).

## Model 3065 Wettability Test Procedure

*Note: The span should be adjusted with the spacer fluid being tested before each test (steps 1-7).*

1. Turn Master switch to the On position.
2. Turn Heater switch to the On position.
3. Set the desired temperature using the temperature controller.
4. Preheat cup to desired test temperature.
5. When the water reaches the desired temperature, pour it out and place enough pre-heated spacer in the cup to reach 1" above the electrodes.
6. With the mixer set in VAR position and the Auto/Manual switch in Manual position, set the mixer to stir the spacer at a moderate speed (~1000 RPM).
7. Adjust the span to 1.0 (or desired reading for test).
8. Turn off heat to the test cup.
9. Remove the spacer fluid, clean and dry cup and return to base. The meter should read 0.
10. Refill the cup with hot water and stabilize the temperature again before proceeding to the actual test.
11. When temperature is stabilized, pour out water. Replace immediately with pre-heated drilling fluid (400mls recommended) in the test cup.
12. Stir at constant rpm (1000 rpm recommended).
13. Add pre-heated spacer at defined intervals until the target reading is obtained (the target reading is the reading the span was adjusted to in step 7). Monitor fluid temperature with a thermometer.
14. Record amount of spacer added.
15. Report results as volume percentage of spacer in the mud-spacer mix (see equation below) that exhibits conductivity measurements indicative of maximum water wetting. (i.e. maximum water wetting is achieved when the target reading obtained equals the reading the span was set to at the onset of the test.)

$$\text{Volume \% Spacer} = (\text{Total volume of spacer} / (\text{Total volume of drilling fluid} + \text{spacer})) * 100$$

## Mixing a Cement Slurry

1. Measure the amount of water and pour into the mixer cup. Place the cover on the mixer cup.
2. Using a scale, measure the amount of cement.
3. Set the Timer Switch to the AUTO position.
4. Verify that the total countdown time is set to 50 seconds in accordance with the API procedure. Adjust the timer by pressing the small buttons below each digit.
5. Turn the MASTER switch to ON (red power light lit). Press the Mix 1 button.
6. Press the Red START/RESET button. The motor will operate at 4,000 rpm.
7. Add the measured cement into the mixer cup as the water is mixed.
8. Replace the mixer cup cover and press the MIX 2 button to increase the motor speed to 12,000 rpm. The motor will turn off when the timer countdown has ended.

*Note: Mixer should run for 15 seconds at LOW speed (4,000 rpm) and the remaining 35 seconds at HIGH speed (12,000 rpm) in accordance with API Specification 10.*

# Section 3 – Maintenance

## Tools Required

7/8" socket  
3/8" wrench

## Cleaning and Service Tips

Most of the problems that occur with the Model 3065 Wettability Tester are due to inadequate cleaning. The blade assembly, mixing cup, and probe leads must be thoroughly cleaned after each test. If the blade assembly becomes contaminated with cement, the assembly will bind causing the motor to over heat. Care should be taken to clean between the heating jacket and cup if fluid is spilled or splashed.

First remove the nut on the bottom outside with a 7/8" socket. Pull the blade assembly through the cup. Remove the small "acorn" nut with a 3/8" wrench. Replace the blade with a new one. Tighten acorn nut onto new blade. Re-insert the blade assembly through the cup. Tighten the nut on the bottom outside.

## Calibration Procedure

### Thermocouple

1. To check thermocouple calibration, heat water in the mixing cup to 100°F.
2. Using a NIST traceable thermometer, check that the temperature is actually 100°F +/- 3°F.
3. Repeat at 175°F.

# Maintenance Schedule

MAINTENANCE SCHEDULE INSTRUMENT NAME					
COMPONENT	EACH TEST	MONTHLY	3 MONTHS	6 MONTHS	ANNUAL
Blending Assembly	Clean				
Mixing Cup	Clean				
Control Base	Clean				
Mixer Motor	Clean				
Check and Replace Blending Blade	Per API Spec 10 Recommendation				
Inspect the blending assembly for blade wear and leaks.	Inspect				
Change o-ring in the Blending Assembly	When broken				
Thermocouple				Check Calibration	
<p>This maintenance schedule applies to normal usage of two tests per day. Detailed procedures for these operations are contained in your manual.</p> <ul style="list-style-type: none"> <li>● Per API Specifications</li> <li>σ Where Applicable</li> </ul>					

## Section 4 – Troubleshooting Guide

Problem	Solution
Faulty motor	<ol style="list-style-type: none"> <li>1. Remove the mixing cup from the motor.</li> <li>2. Place the AUTO/MANUAL switch in Manual.</li> <li>3. Push the VAR button in.</li> <li>4. Rotate VARIABLE SPEED control counterclockwise.</li> <li>5. Turn the MASTER switch to ON. Motor should not be turning or should turn at a very low speed (&lt;100 rpm). Motor speed should increase to 16,000 rpm when knob is in full clockwise position.</li> </ol>
Faulty tachometer	<p>Some apparent malfunctions of the tachometer may be caused by other components:</p> <ol style="list-style-type: none"> <li>1. The tachometer indication is zero and the mixer is running properly.</li> <li>2. The tachometer reads zero and the mixer is running at very high speed (greater than 12,000 rpm).</li> <li>3. The tachometer reads zero or is erratic and the mixer speed oscillates over a wide range (greater than +/- 200 rpm).</li> </ol> <p>If these symptoms are present, the cause of the problem will most likely be found in the speed transducer circuit.</p> <ol style="list-style-type: none"> <li>1. To verify that the tachometer is working properly, connect a 6000 Hz 0.5 vdc square wave signal to the pins of the transducer cable connector. The tachometer should read 1000 rpm. If reading does not indicate the correct value, the tachometer should be repaired or replaced.</li> </ol>
Faulty transducer	<p>With the motor running, the tachometer will indicate the RPM of the motor. If the tachometer is known to be functioning properly but indicates zero RPM when the motor is turning, the transducer may be faulty or in need of adjustment. Most common symptoms of a faulty or misadjusted transducer are:</p> <ol style="list-style-type: none"> <li>1. A zero RPM indication</li> <li>2. The motor runs at very high speed (usually greater than 12,000 RPM).</li> <li>3. The Control Enclosure cannot control the speed of the motor.</li> <li>4. To verify the transducer is faulty, disconnect the transducer cable from the Control Enclosure. Measure the voltage at the two pins on the connector at the end of</li> </ol>

	<p>the cable. The peak-to-peak voltage should be at least 0.4 V and may be as high as 3 to 5 V depending on the motor speed. If the voltage is too low or not present, the possible causes are:</p> <ul style="list-style-type: none"> <li>Open or shorted cable</li> <li>Failed transducer</li> <li>Transducer is not positioned properly</li> </ul> <p>Check the resistance between the two pins in the transducer connector. If the resistance is less than 200 ohms, the transducer may be good. Note that the 3065 Wettability Tester requires a very small clearance between the transducer and the gears for proper operation. If the resistance is greater than 200 ohms, there may be a broken wire or the transducer may be damaged. Contact Factory for assistance.</p>
<p>Faulty Timer</p>	<p>The timer normally has closed contacts at terminals 1 and 4. Terminal 1 is ground. When the timer is off, terminal 4 is also grounded. When the timer is on, terminal 4 will have a DC voltage between 0 and 15 vdc depending on the speed setting of the mixer.</p>
<p>Faulty SCR/Voltage Regulator Module</p>	<p>If the SCR/Voltage Regulator module is suspected to be faulty, check the fuse under the SCR/Voltage Regulator. Replace it if it has failed. If fuse fails repeatedly, the SCR/Voltage Regulator may be bad. If fuse is OK, proceed as follows:</p> <ol style="list-style-type: none"> <li>1. Set the VARIABLE SPEED control knob to its full counterclockwise position. The motor will not turn or turn very slowly (less than 100 RPM). Slowly rotate the control clockwise. After the control is rotated about 30 degrees, the motor will start turning. The motor speed should be smooth at speeds less than 3000 RPM. As the VARIABLE SPEED control knob is turned, the motor speed should increase smoothly and continuously from less than 3000 RPM to greater than 16,000 RPM as the control is rotated.</li> <li>2. If the motor does not rotate or change speed smoothly, the VARIABLE SPEED control potentiometer or the SCR/Voltage Regulator is faulty.</li> </ol>
<p>Faulty Speed Control Board</p>	<p>Eliminate all other possible sources of the problem before replacing the speed control board. If the problem persists, replace the speed control board.</p>



Heater is not functioning	<ol style="list-style-type: none"><li>1. Check connections</li><li>2. Check to see that thermocouple is plugged in and functioning properly</li></ol>
Conductivity probe is not functioning	<ol style="list-style-type: none"><li>1. Check to see that leads are completely plugged into mixing cup and that probe is plugged into the Control Enclosure.</li><li>2. Be sure that the span has been adjusted with spacer before the test (Wettability Test Procedure steps 1-7).</li></ol>

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## Section 5 - Replacement Parts

<b>Part Number</b>	<b>Description</b>
106917	Fitting, Thermocouple
30-0048	Blending Assembly
30-0049	Hardened Blade (1 liter)
3065-0012	Modified Blender Cup
3065-0020	Test Lead Assembly
3065-0021	TC,1.00" Long
3065-0027	Heater Jacket Assy,W/O T/C
C07709	Washer, SS
C07710	Washer, Rubber
P-1662	Fuse, 2 Amp, 250V, 3AG, Fast Blow
P-1798	O-Ring
P-2034	Fuse, 20 Amp
P-2610	Fuse, .25 Amp, 250V, 313250

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

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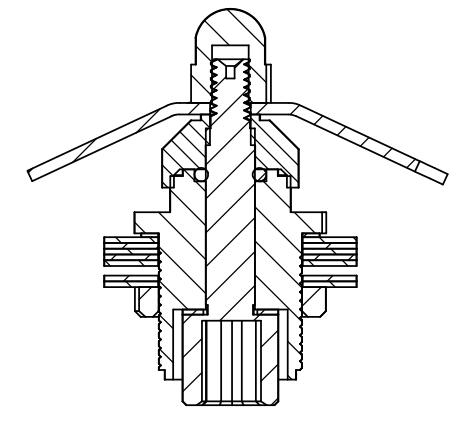
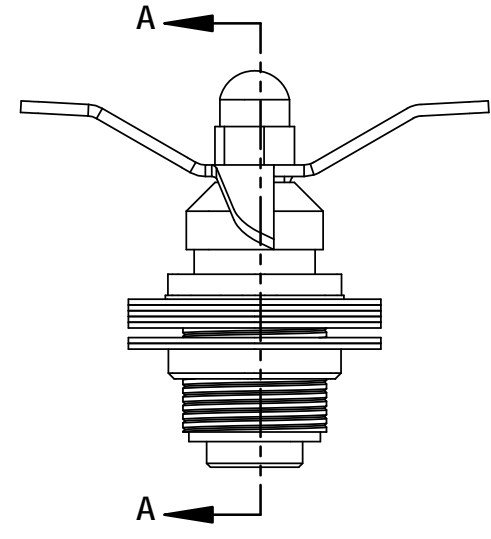
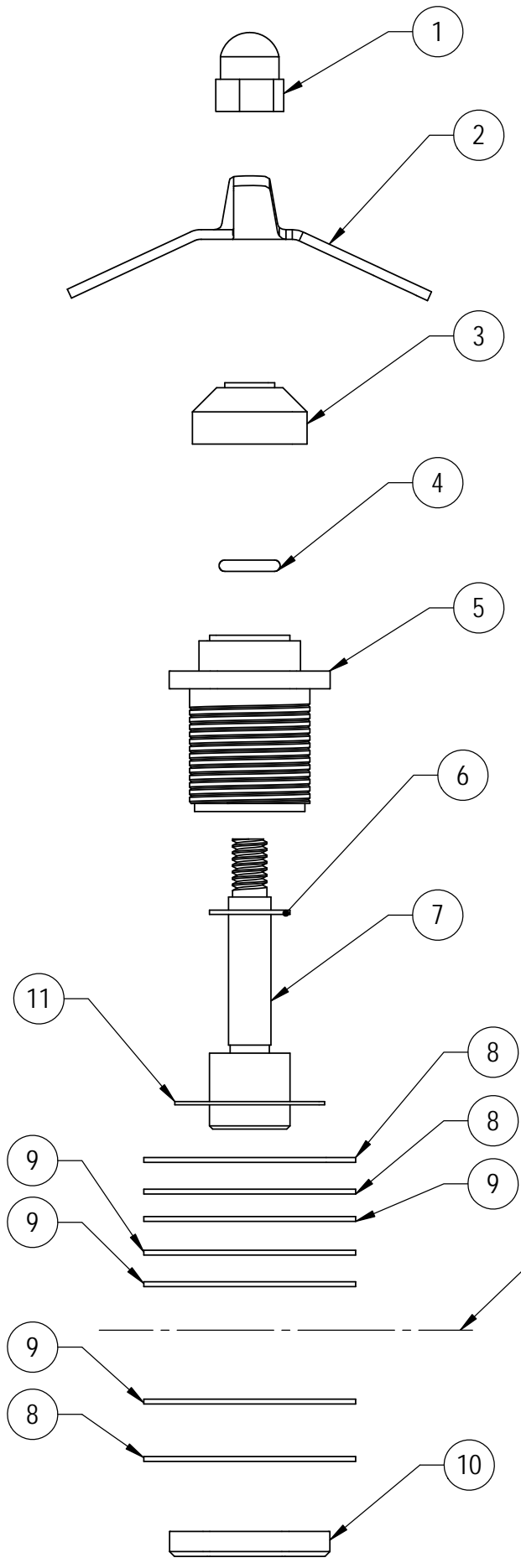
# Section 6 - Drawings and Schematics

Drawing Number	Description
30-0048	Modified Blending Assembly
3065-0001	Wettability Tester Model 3065
3065-0013	Schematic Wiring, 110V
3065-0014	Schematic Wiring, 220V
3065-0027	Assembly Heater, Jacket
3065-0112	Assembly, Slurry Cup

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REV	DESCRIPTION	DATE	APPROVED
F	ECN T6603; ADDED KRYTOX GREASE	5/12/15	TC

BLADES  
FACE DOWN



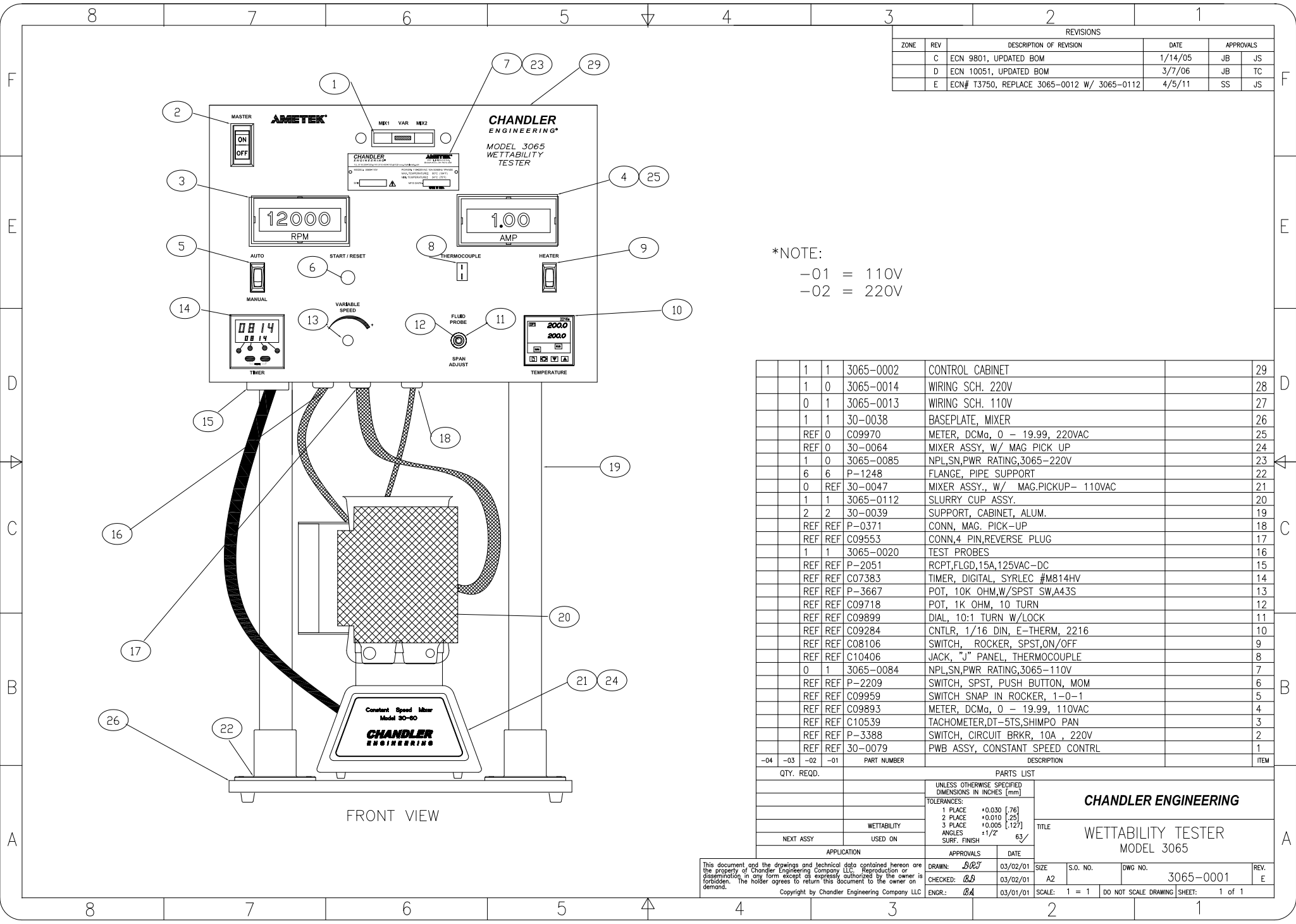
SECTION A-A

NOTES:  
1. LUBRICATE WITH DUPONT KRYTOX GPL-250 GREASE (C16748).

ITEM	PART NUMBER	DESCRIPTION	QTY
1	P-2232	CAPNUT,SS,1/4,BLENDER	1
2	30-0049	HARDENED BLADE	1
3	P-2233	CAP,BRNG	1
4	P-1798	ORING,BUNA-N,AS010	1
5	30-0055	HOLDER, BEARING	1
6	P-2235	WSHR,FLAT,FB,1/2	1
7	P-2236	SHAFT,SOCKET HEAD,BLNDG ASSY	1
8	C07709	WSHR,FLAT,SS,3/4,WARING	3
9	C07710	WSHR,FLAT,RB,3/4,WARING	4
10	P-2237	NUT,HEX,SS,3/4,BLENDER,LH	1
11	C10541	WSHR,FLAT,NY,3/4,WARING	1

BLENDING CONTAINER

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		TYPE: STRUCT:	PN: 30-0048 PROJ: Imported Data Set	REV F SIZE B SHEET 1 OF 1



REVISIONS				
ZONE	REV	DESCRIPTION OF REVISION	DATE	APPROVALS
	C	ECN 9801, UPDATED BOM	1/14/05	JB JS
	D	ECN 10051, UPDATED BOM	3/7/06	JB TC
	E	ECN# T3750, REPLACE 3065-0012 W/ 3065-0112	4/5/11	SS JS

\*NOTE:  
 -01 = 110V  
 -02 = 220V

QTY.	REQD.	REV	PART NUMBER	DESCRIPTION	ITEM
1	1		3065-0002	CONTROL CABINET	29
1	0		3065-0014	WIRING SCH. 220V	28
0	1		3065-0013	WIRING SCH. 110V	27
1	1		30-0038	BASEPLATE, MIXER	26
REF	0		C09970	METER, DCMa, 0 - 19.99, 220VAC	25
REF	0		30-0064	MIXER ASSY, W/ MAG PICK UP	24
1	0		3065-0085	NPL,SN,PWR RATING,3065-220V	23
6	6		P-1248	FLANGE, PIPE SUPPORT	22
0	REF		30-0047	MIXER ASSY., W/ MAG.PICKUP- 110VAC	21
1	1		3065-0112	SLURRY CUP ASSY.	20
2	2		30-0039	SUPPORT, CABINET, ALUM.	19
REF	REF		P-0371	CONN, MAG. PICK-UP	18
REF	REF		C09553	CONN,4 PIN,REVERSE PLUG	17
1	1		3065-0020	TEST PROBES	16
REF	REF		P-2051	RCPT,FLGD,15A,125VAC-DC	15
REF	REF		C07383	TIMER, DIGITAL, SYRLEC #M814HV	14
REF	REF		P-3667	POT, 10K OHM,W/SPST SW,A43S	13
REF	REF		C09718	POT, 1K OHM, 10 TURN	12
REF	REF		C09899	DIAL, 10:1 TURN W/LOCK	11
REF	REF		C09284	CNTLR, 1/16 DIN, E-THERM, 2216	10
REF	REF		C08106	SWITCH, ROCKER, SPST,ON/OFF	9
REF	REF		C10406	JACK, "J" PANEL, THERMOCOUPLE	8
0	1		3065-0084	NPL,SN,PWR RATING,3065-110V	7
REF	REF		P-2209	SWITCH, SPST, PUSH BUTTON, MOM	6
REF	REF		C09959	SWITCH SNAP IN ROCKER, 1-0-1	5
REF	REF		C09893	METER, DCMa, 0 - 19.99, 110VAC	4
REF	REF		C10539	TACHOMETER,DT-5TS,SHIMPO PAN	3
REF	REF		P-3388	SWITCH, CIRCUIT BRKR, 10A , 220V	2
REF	REF		30-0079	PWB ASSY, CONSTANT SPEED CONTRL	1

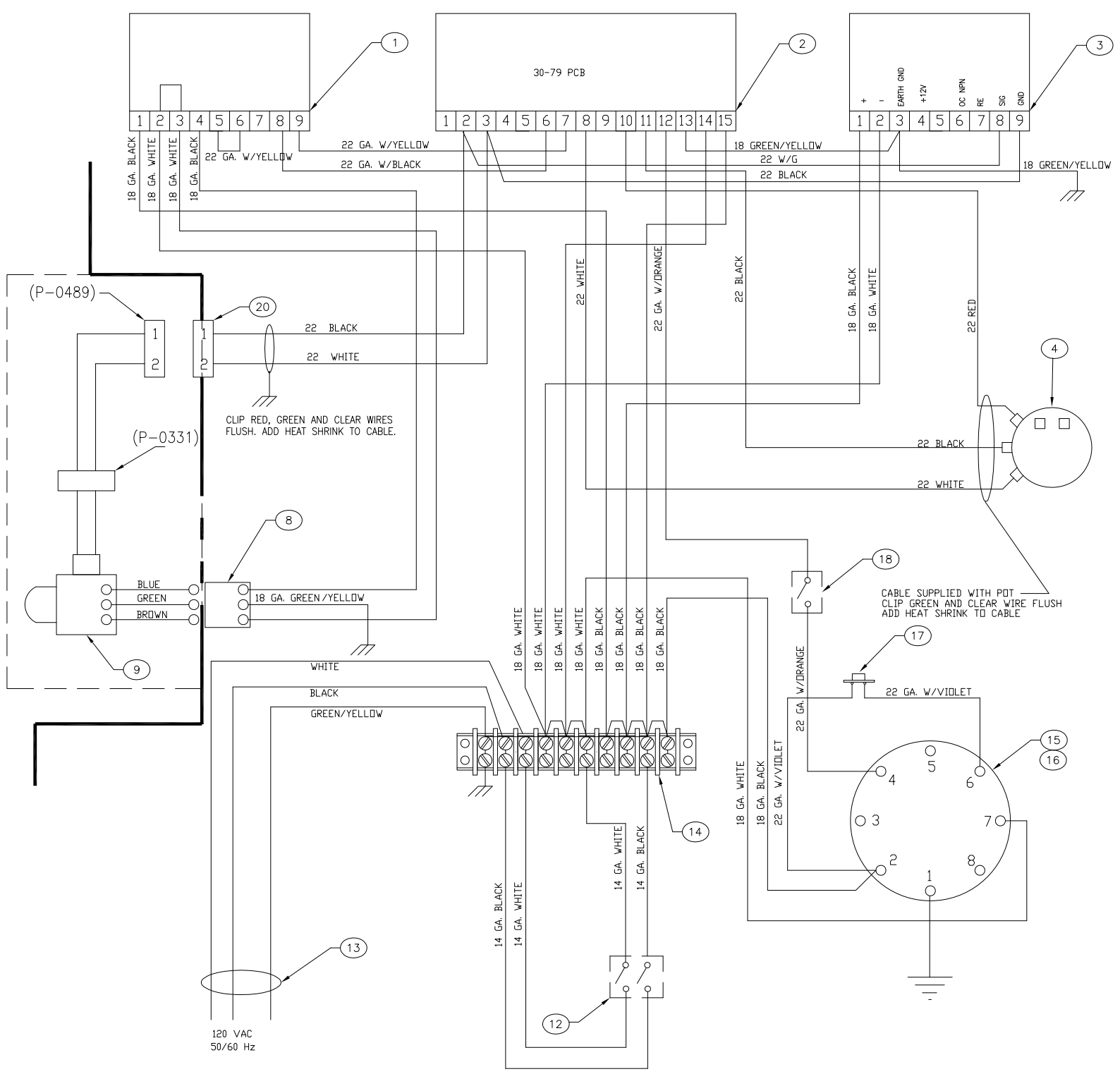
QTY. REQD.		PART NUMBER		DESCRIPTION		ITEM
				UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]		<b>CHANDLER ENGINEERING</b>
		WETTABILITY		TOLERANCES:		
		USED ON		1 PLACE +0.030 [.76]		
				2 PLACE +0.010 [.25]		
				3 PLACE +0.005 [.127]		TITLE <b>WETTABILITY TESTER MODEL 3065</b>
				ANGLES +1/2° 63/		
				SURF. FINISH		
				APPLICATION		
				APPROVALS		
				DATE		
				DRAWN: <i>DBZ</i>		SIZE
				CHECKED: <i>BD</i>		S.O. NO.
				ENGR.: <i>BA</i>		DWG NO.
				03/02/01		3065-0001
				03/02/01		REV. E
				03/01/01		SCALE: 1 = 1
						DO NOT SCALE DRAWING SHEET: 1 of 1

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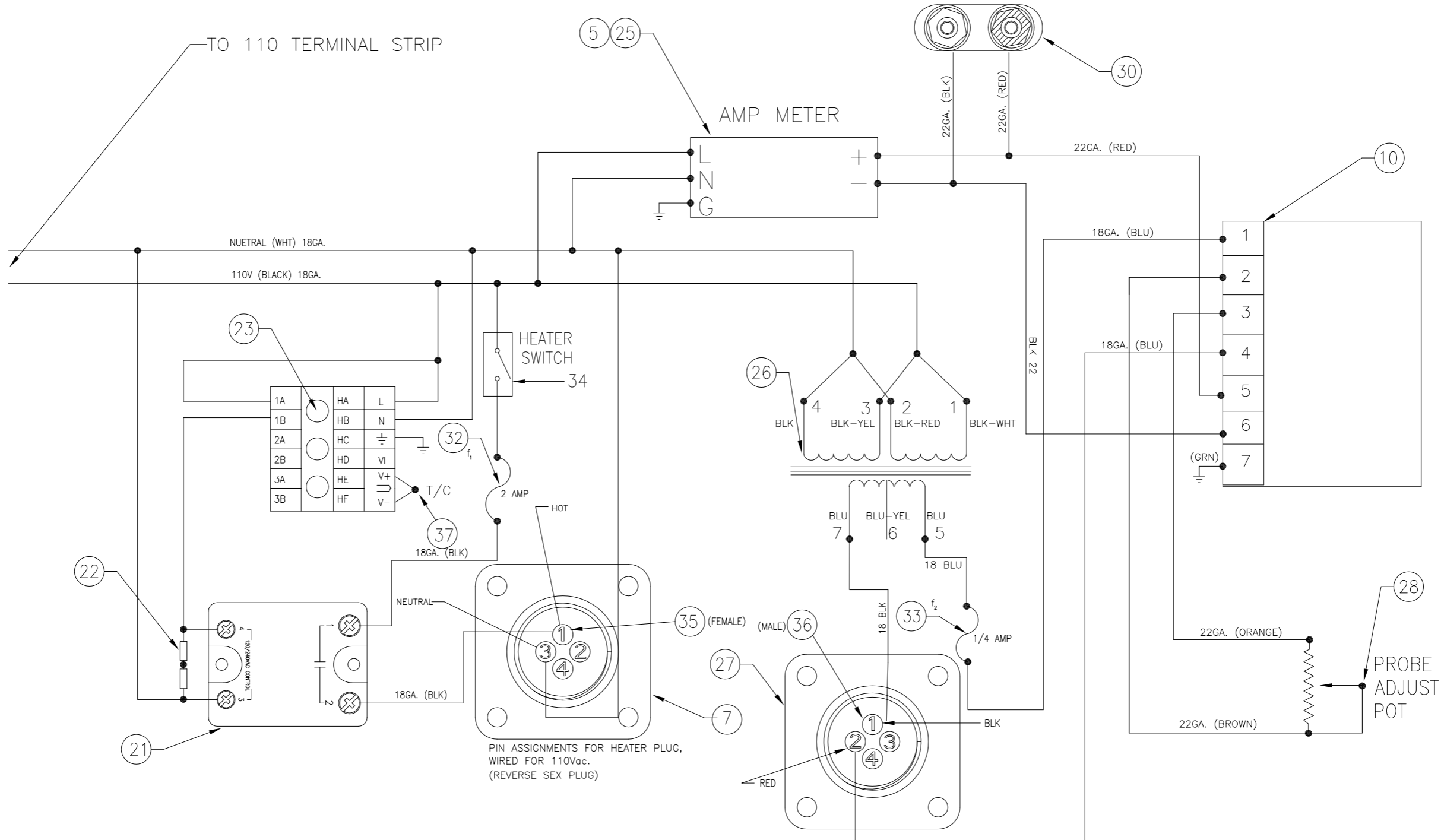
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	L	ECN# T2069	12/22/08	SS/TC
	M	ECN T3750; REMOVED C09748	4/6/11	TC

NOTES:  
 CLEARANCE BETWEEN MAGNETIC PICKUP AND SPROCKET SHALL BE 0.025-0.029.  
 COVER ALL EXPOSED SOLDER JOINTS WITH SHRINK TUBING. TUBING SHOULD COVER THE WIRE INSULATION APPROXIMATELY 0.25 INCHES.



		1	C10406	CONN, TC, TYPE J, MINI, PANEL SIDE	37		
		2	C09552	MALE AMP PIN ASSY, 24-20 AWG	36		
		3	C09551	FEMALE AMP PIN ASSY, 24-20 AWG	35		
		1	C08106	HEATER SWITCH	34		
		1	P-2610	.25 AMP 250V 313250 FUSE	33		
		1	P-1662	FUSE, 2 AMP, 250V, 3AG FAST BLOW	32		
					31		
		1	C07237	BANANNA PLUG RECEPCTS.	30		
					29		
		1	C09718	10 TURN POT	28		
		1	P-3084	AMP RECEPCTS. PROBE	27		
		1	P-2900	XFMR-PWR 115/230V 50-60 HZ	26		
		1	C09893	AMP METER	25		
					24		
		1	C09284	EUROTHERM TEMP. CONTROLLER	23		
		2	P-2702	SERIES RESISTORS	22		
		1	P-3330	SSR	21		
		1	P-0371	RECEPTACLE, 2 PIN, FEMALE	20		
					19		
		1	C09959	SWITCH, ROCKER SPDT/ ON-NONE-ON	18		
		1	P-2209	SWITCH, PUSH-BUTTON, "RESET"	17		
		1	P-2812	BASE, OCTAL, TIMER	16		
		1	C07383	TIMER, DIGITAL, COUNT DOWN	15		
		1	P-1384	TERMINAL BLOCK, 10 CONDUCTOR	14		
		1	P-1676	CORD SET, 3 CONDUCTOR, 14 GA.	13		
		1	P-3388	SWITCH, DP CIRCUIT BREAKER, 10 A	12		
					11		
		1	3065-0023	PCB WETTABILITY	10		
		1	30-0047	BLENDER, 2 SPEED, 120 VAC	9		
		1	P-2051	RECEPTACLE, 120 VAC, 15A	8		
		1	C09561	CONN, AMP, 4 PIN, REVERSE SOCKET	7		
					6		
		1	C09899	DIAL, 10:1 TURNS W/LOCK	5		
		1	C10410	POT, 10K, 10 TURN	4		
		1	C10539	TACHOMETER	3		
		1	30-0079	PCB, SPEED CONTROL	2		
		1	C10670	SCR, POWER, 10A, 120 VAC	1		
-04	-03	-02	-01	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM

QTY. REQD.	PARTS LIST		TITLE					
	UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]		<b>CHANDLER ENGINEERING</b>					
	TOLERANCES:							
	3065 WETTABILITY	1 PLACE +0.030 [.76]	SCHEMATIC WIRING 1 QT., 100-130 VAC					
	NEXT ASSY USED ON	2 PLACE +0.010 [.25]						
	APPLICATION	3 PLACE +0.005 [.127]						
	BREAK SHARP EDGES, DEBURR	ANGLES +1/2°						
		SURF. FINISH 32/						
		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: <i>DBT</i>	03/21/01	SIZE	S.O. NO.	DWG NO.	REV.
			CHECKED: <i>DBT</i>	03/22/01	C		3065-0013	M
Copyright by Chandler Engineering Company LLC			ENGR.: <i>BA</i>	03/21/01	SCALE: 1 = 1	TITLE BLOCK REV: 1.0	SHEET: 1 of 2	



PIN ASSIGNMENTS FOR HEATER PLUG,  
WIRED FOR 110Vac.  
(REVERSE SEX PLUG)

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
APPROVALS	DATE
DRAWN: <i>BA</i>	11-20-00
CHECKED: <i>BA</i>	03/22/01
ENGR.: <i>BA</i>	11/20/00

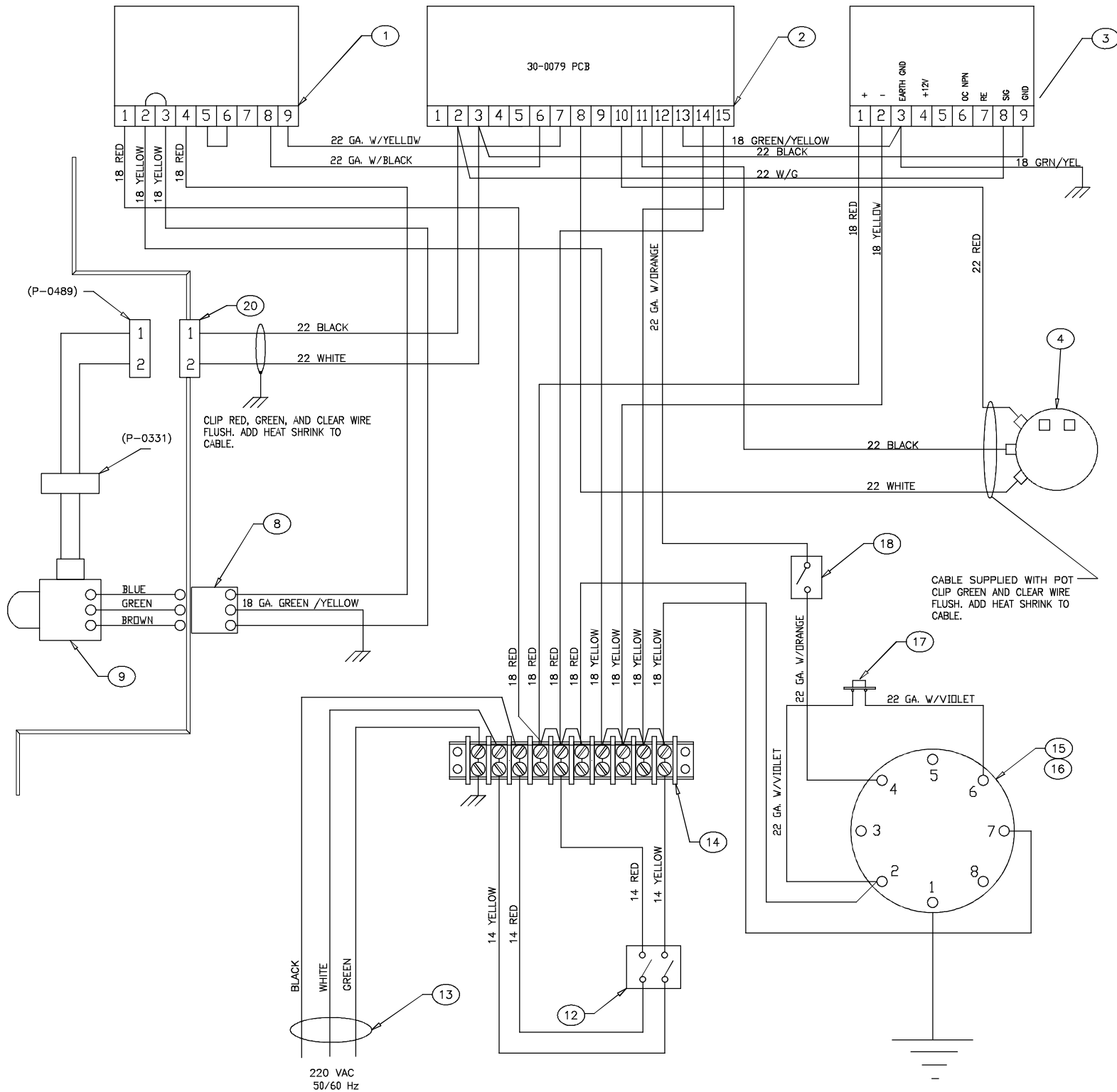
<b>CHANDLER ENGINEERING</b>			
TITLE SCHEMATIC WIRING 1 QT., 100-130 VAC			
SIZE	S.O. NO.	DWG NO.	REV.
C		3065-0013	M
SCALE: 1 = 1	TITLE BLOCK REV: 1.0	SHEET: 2 of 2	

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REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	N	ECN T4166; REMOVED ITEM 30 C09957	9/20/11	SS/TC
	P	ECN T4301; DEL 30-0168, ADD 30-0079	12/28/11	TC

NOTES:

CLEARANCE BETWEEN MAGNETIC PICKUP AND SPROCKET SHALL BE 0.025-0.029.  
 COVER ALL EXPOSED SOLDER JOINTS WITH SHRINK TUBING. TUBING MUST COVER INSULATION BY APPROXIMATELY 0.25 INCHES.



QTY.	REV.	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM
		1	3065-0023	PCB,WETTABILITY	39
		1	C10406	CNN,TC,TYPE J,MINI,PANELSIDE	38
		2	C09552	MALE AMP PIN ASSY, 24-20 AWG	37
		3	C09551	FEMALE AMP PIN ASSY, 24-20 AWG	36
		1	C08106	HEATER SWITCH	35
		1	P-2610	.25 AMP, 250V, 313250	34
		1	P-1662	FUSE,2 AMP,250V,3AG FAST BLOW	33
		1	C07237	BANANNA PLUG RECEPTS.	32
		1	C09718	10 TURN POT	30
		1	P-3084	AMP RECEPT. PROBE	29
		1	P-2900	115/230V 50-60HZ	28
		1	C09970	METER, AMP DCMA	27
		1	C09561	REVERSE SEX PLUG	26
		1	C09284	EUROTHERM TEMP CONTROLLER	25
		2	P-2702	SERIES RESISTORS	24
		1	P-3330	SSR	23
		1	P-0371	RECEPTACLE, 2 PIN, FEMALE	22
		1	C09959	SWITCH, SPST, "AUTO/MANUAL"	20
		1	P-2209	SWITCH, PUSH-BUTTON, "RESET"	19
		1	P-2812	BASE, OCTAL, TIMER	18
		1	C07383	TIMER, DIGITAL, COUNT-DOWN	17
		1	P-1384	TERMINAL BLOCK, 10 CONDUCTOR	16
		1	P-1676	CORD SET, 3 CONDUCTOR, 14 GA.	15
		1	P-3388	SWITCH,CIRCUIT BRKR,10A,220V	14
		1	30-0064	BLENDER, 1 QT., 220 VAC	13
		1	P-2052	RECEPTACLE, 220V, 15A	12
		1	C09899	DIAL,10:1 TURNS W/LOCK	9
		1	C10410	POT, 10K, 10 TURN	8
		1	C10539	TACHOMETER	6
		1	30-0079	PCB ASSY,MIXER,TESTED	5
		1	C10634	SCR, POWER, 10A,	4
					3
					2
					1

QTY. REQD.	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM

PARTS LIST				
QTY. REQD.	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM

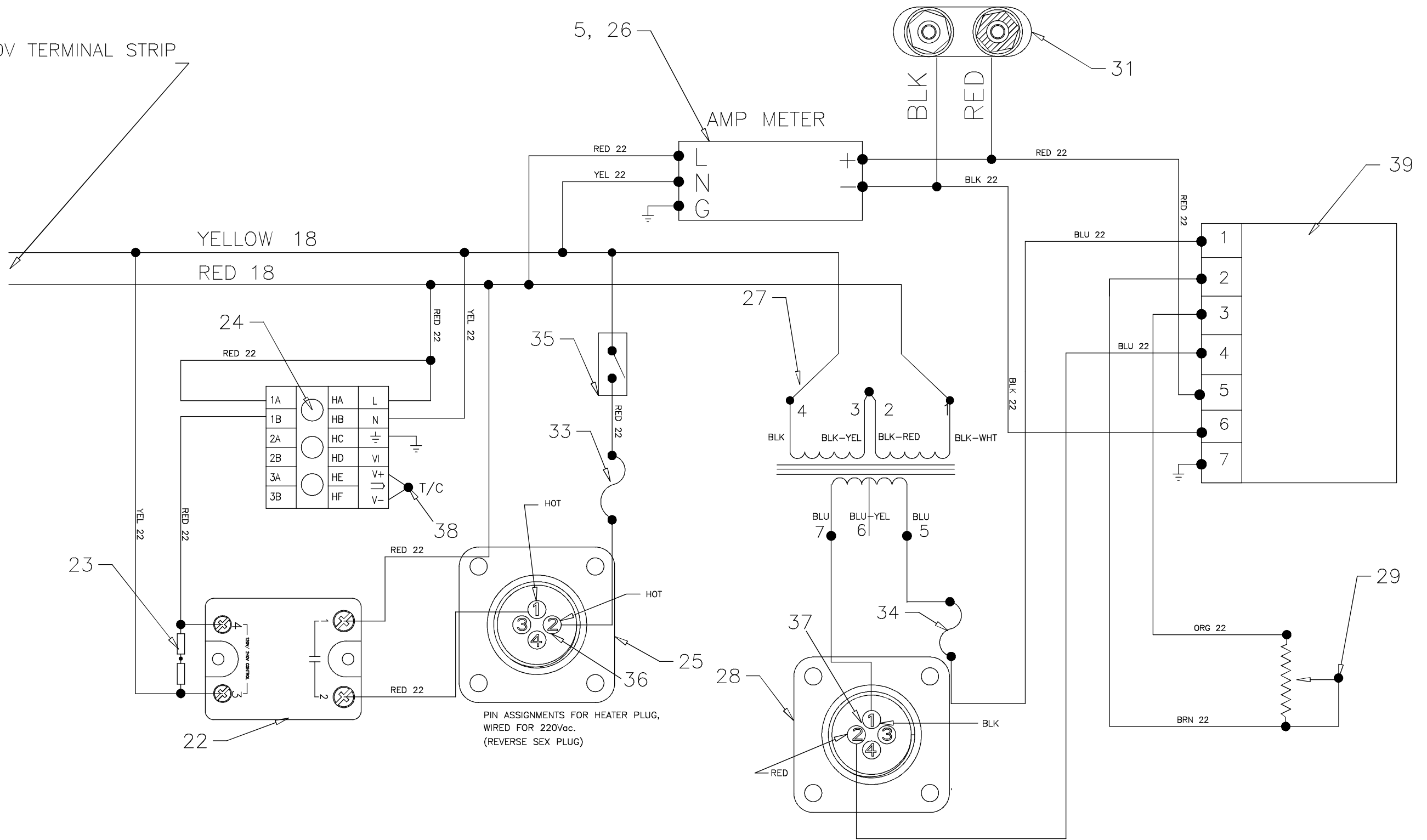
UNLESS OTHERWISE SPECIFIED  
 DIMENSIONS IN INCHES [mm]  
 TOLERANCES:  
 1 PLACE ±0.030 [.76]  
 2 PLACE ±0.010 [.25]  
 3 PLACE ±0.005 [.127]  
 ANGLES ±1/2°  
 SURF. FINISH 32/

**CHANDLER ENGINEERING**  
 ELECTRICAL SCHEM.  
 (200-240V)

APPROVALS	DATE	SIZE	S.O. NO.	DWG NO.	REV.
DRAWN: DRT	2/14/01	C		3065-0014	P
CHECKED: BD	04/07/03	SCALE: 1 = 1	TITLE BLOCK REV: 1.0	SHEET: 1 of 2	
ENGR.: BD	04/07/03				

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TO 220V TERMINAL STRIP



PIN ASSIGNMENTS FOR HEATER PLUG,  
WIRED FOR 220Vac.  
(REVERSE SEX PLUG)

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
APPROVALS	DATE
DRAWN: DRT	11/28/00
CHECKED: JH	11/28/00
ENGR.: DT	11/28/00

<b>CHANDLER ENGINEERING</b>			
TITLE ELECTRICAL SCHEM. (200-240V)			
DRAWN: DRT	S.O. NO. C	DWG NO. 3065-0014	REV. P
CHECKED: JH	SCALE: 1 = 1	TITLE BLOCK REV: 1.0	SHEET: 2 of 2
ENGR.: DT			

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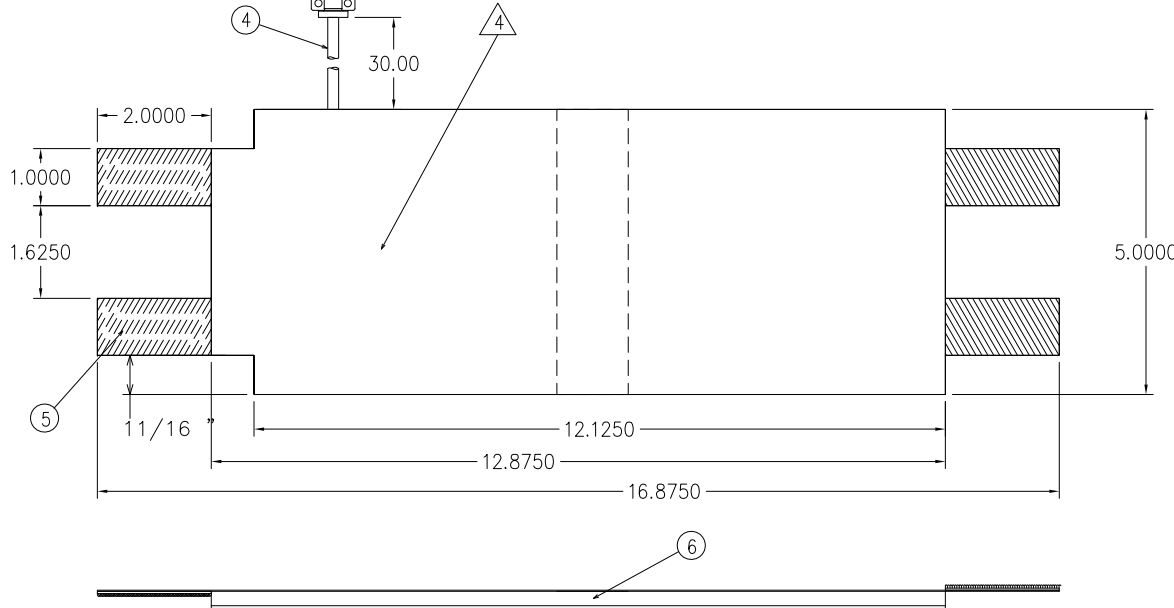
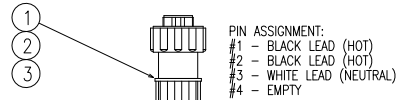


3

2

1

REVISIONS					
ZONE	REV	DESCRIPTION OF REVISION	DATE	APPROVALS	
	A	ECN 9980, ISSUED	1/24/06	JB	TC
	B	ECN T2766; DELETE TWO HOLES	3/1/10	SS	TC
D5	C	ECN# T3459, CHANGE DIM FROM 6" TO 30.00"	11/18/10	SS	TC



STD LEAD/CORD TOL.  
 LESS THAN 36' ± 1 1/2" 1/2"  
 36' TO 72' ± 3" 1"  
 OVER 72' ± 4" 4"

STD HEATER TOL.  
 HOLE DIA. ± 1/16" 1/16"  
 <DR = TO 6" ± 1/16"  
 >6" TO 18" ± 1/8"  
 >18" TO 36" ± 3/16"  
 >36" UP TO 72" ± 1/4"  
 EA . ADDITIONAL 36" AN ADDITIONAL 1/4"

NOTES:

- MANUFACTURE PER WATLOW STANDARD TOLERANCES AND PRODUCTION STANDARDS.
- ELECTRICAL RATING (POWER SPECIFICATIONS UNLESS OTHERWISE SPECIFIED ARE PER WATLOW STANDARD TOLERANCES).  
 VOLTS: 240/ 120  
 WATTS: 280
- SPECIFICATIONS:  
 ALL HEATER DIMENSIONS AND POWER SPECIFICATIONS ARE PER STANDARD WATLOW TOLERANCING.  
 22 AWG TEFLON LEADS.  
 UNLESS SPECIFIED, PART MARKED PER WATLOW STANDARDS.
- USED ON UNITS STARTING WITH SERIAL NUMBER 112.
- REF: WATLOW DRAWING 050121503S

QTY.	REQD.	PART NUMBER	DESCRIPTION	MATERIAL SPEC.	ITEM
1		C09887	HEATER JACKET		6
2			VELCRO HOOK/LOOP		5
18"		C09986	LOOM, EXPANDED, 1/4" ID (OR SILICONE SLEEVING)		4
1		P-3082	BACK SHELL, CPC SIZE (11) (AMP 1-206062-4)		3
3		C09952	PIN ASSY, 24-20AWG (AMP 66103-3)		2
1		C09553	PLUG, REVERSE SEX (AMP 206429-1)		1

QTY. REQD.		PARTS LIST		APPROVALS		DATE	
		UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]		APPROVALS		DATE	
		TOLERANCES: 1 PLACE ±0.030 2 PLACE ±0.010 3 PLACE ±0.005 ANGLES ±1/2° SURF. FINISH 63/		APPROVALS		DATE	
		NEXT ASSY	USED ON	APPROVALS		DATE	
		APPLICATION		APPROVALS		DATE	
		BREAK SHARP EDGES, DEBURR		APPROVALS		DATE	
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				CHECKED: <i>MM</i> 4/9/01		SCALE: 1 = 1 TITLE BLOCK REV: 1.0 SHEET: 1 of 1	
				ENGR.: <i>BA</i> 11/17/00			

**CHANDLER ENGINEERING**

TITLE ASSEMBLY, HEATER JACKET W/OUT THERMOCOUPLE

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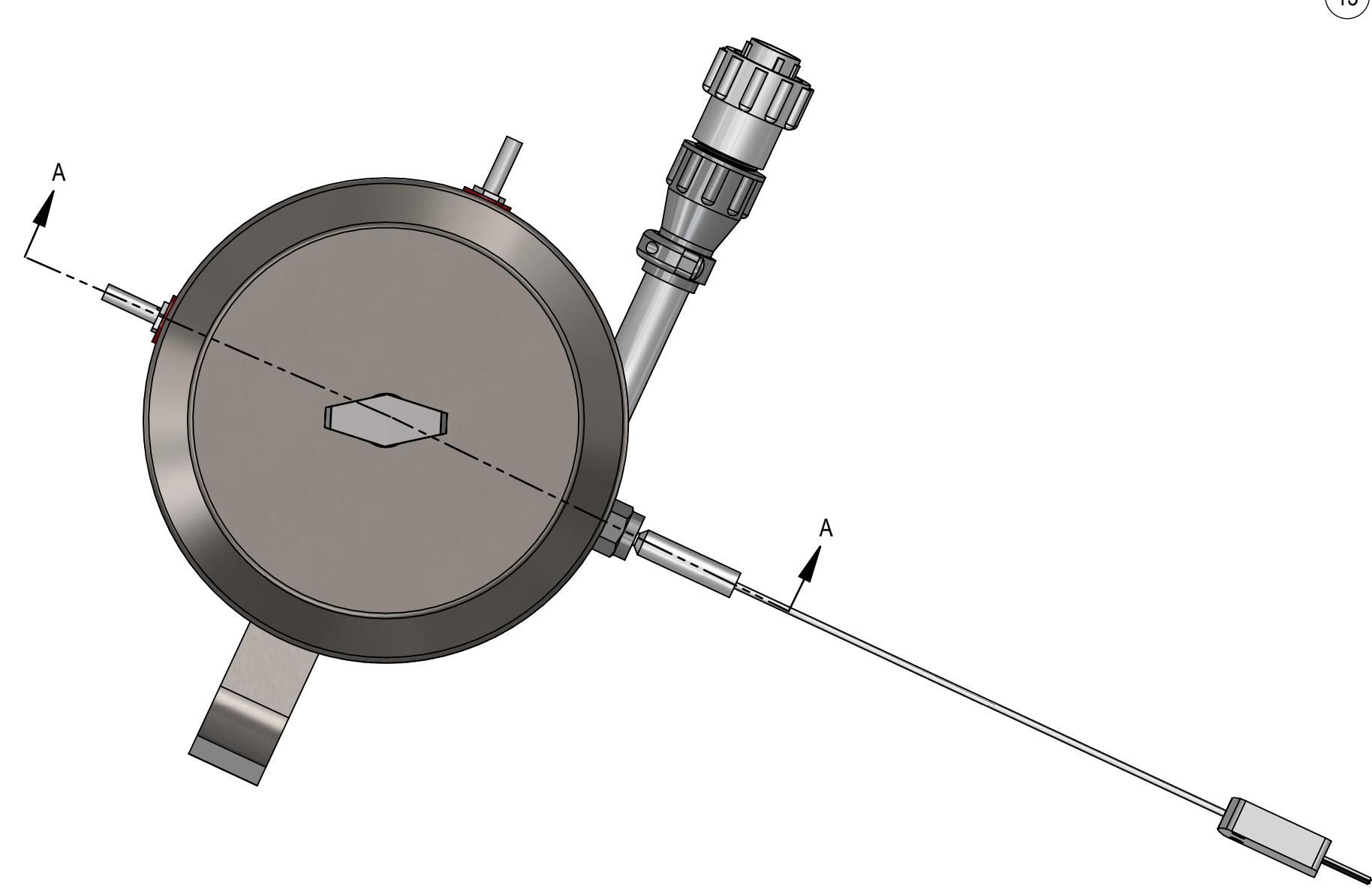
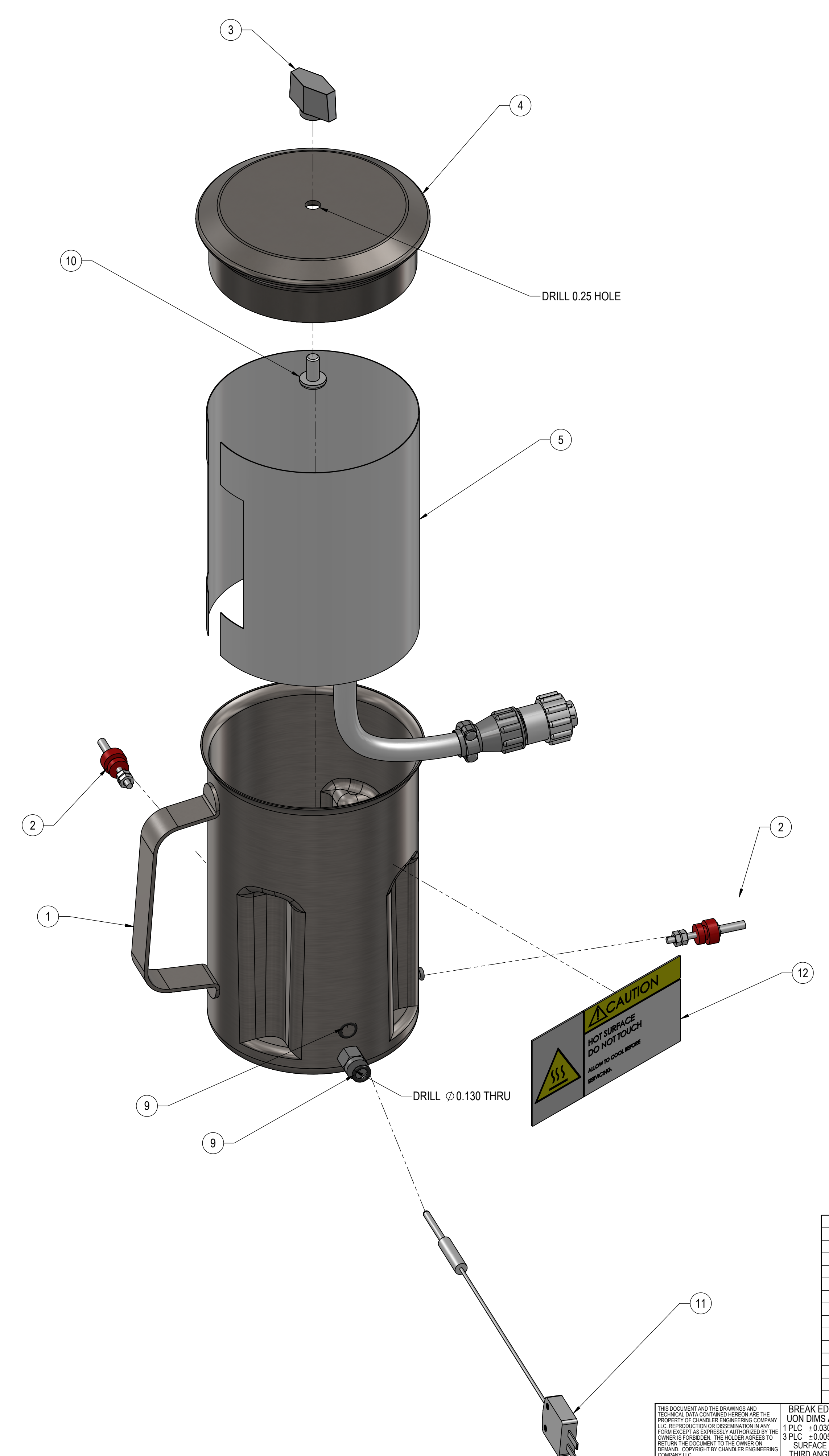
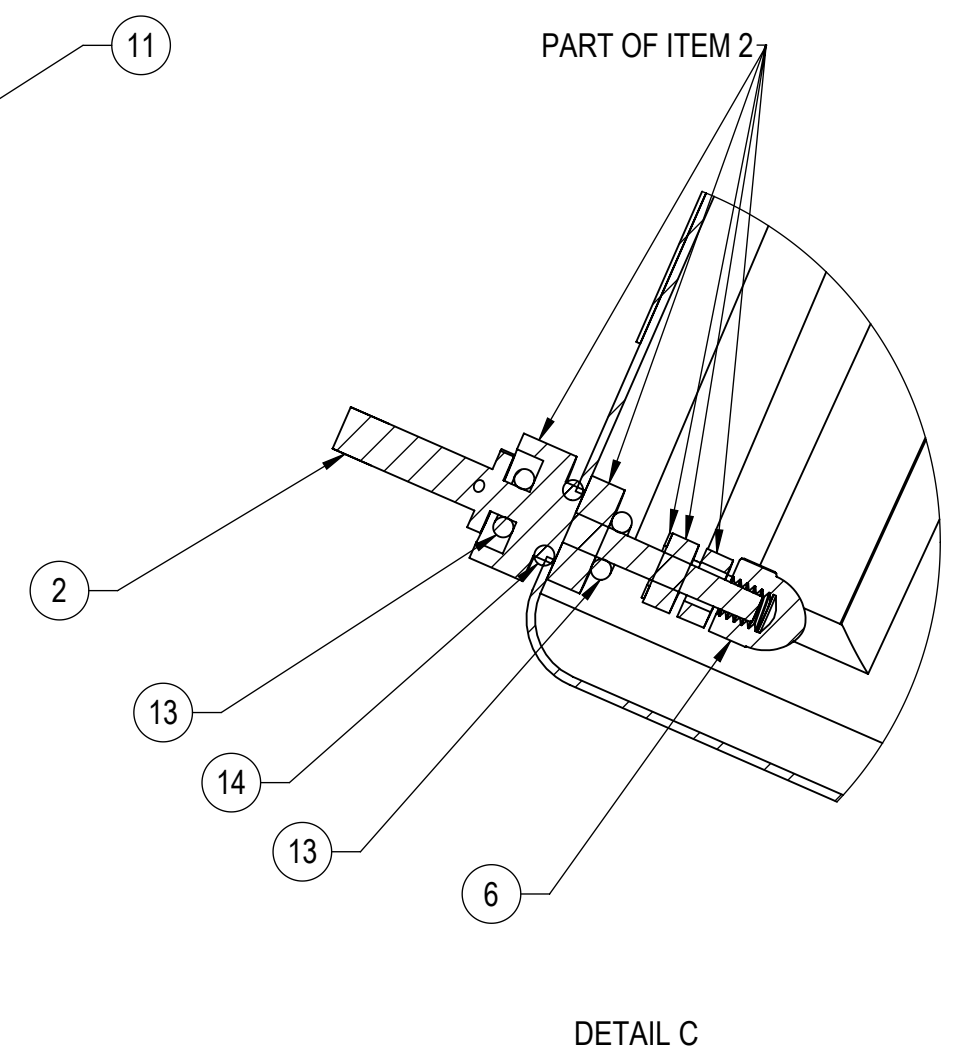
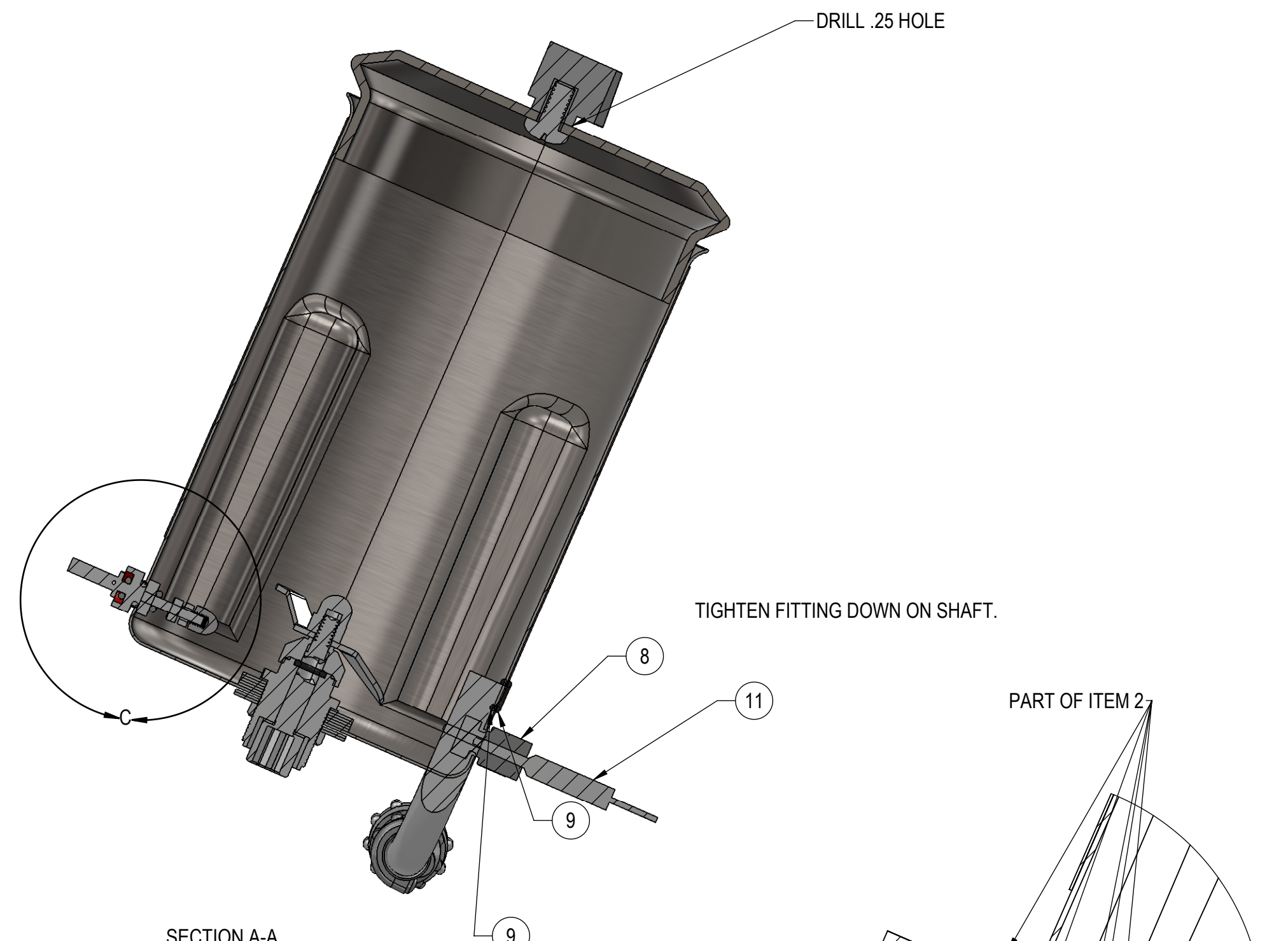


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REV	DESCRIPTION	DATE	APPROVED
D	ECN T6802, DEL70615-04, REPL C12349 W/ C16704, ADD C00595 AND QX-C-1029	10/23/15	TC



ITEM	PART NUMBER	DESCRIPTION	QTY
1	3065-0017	CUP, MODIFIED, WETTABILITY	REF
2	C09749	POST, INSUL. BINDING, WITH OUT CAP	1
3	C11330	KNOB, TWO ARM, BLACK, 1/4-20 THRD	1
4	C07707	LID, SST WARING BLENDOR	1
5	3065-0027	HEATER JACKET ASSY, W/O T/C	1
6	C16704	NUT, ACN, SSM4X7	2
7			
8	70602-53	CAP, SS, 1/8T, HP, SW	REF
9	P-1798	ORING, BUNA-N, AS010	2
10	H-25-012	SCREW, BHMS, SS, 1/4-20X.500, PHIL	1
11	3065-0021	TC, 1.00" LONG	1
12	C12228	HOT SURFACE WARNING LABEL	1
13	C00595	ORING, VITON, AS006-V75	4
14	QX-C-1029	ORING, 2-008, VITON	2

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BREAK EDGES, DEBURR  
UNION 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: TWC 10/23/2015  
MFG: ENGR: TWC 07-24-15  
TYPE: STRUCT:

**CHANDLER ENGINEERING**  
WETTABILITY KIT  
PN: 3065-0112  
PROJ: 3065

REV D | SIZE D  
SHEET 1 OF 1

# TIMER #814

## GENERAL FUNCTIONS:

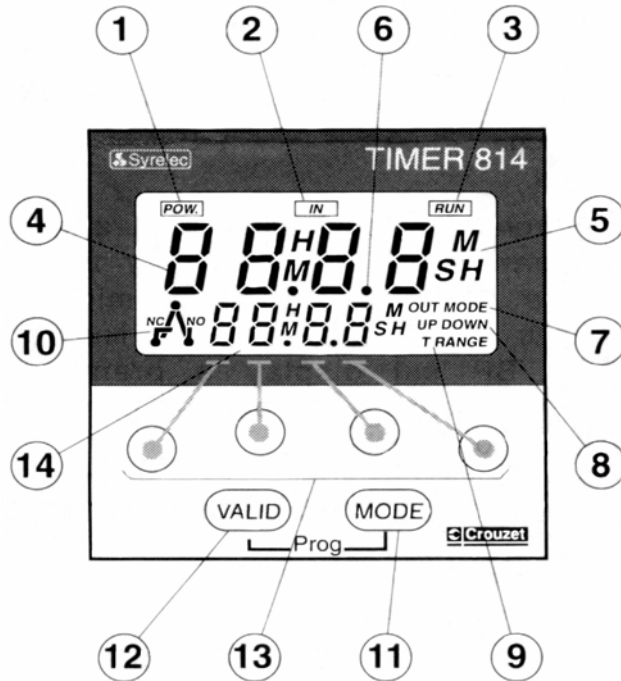
A, B, C, D, Di, H

## OPERATING MODES

- A - Delay on energization
- B - Timing on impulse
- C - Timing after impulse (one-shot)
- D - Cyclic
  - Repetitive cycle
  - Start-pause
- Di - Cyclic
  - Repetitive cycle
  - Start-pause
- H - Timing on energization

## 11 TIMING RANGES:

99.99 s 999.9 s  
9999 s 99 min 59 s  
99,99 min 999.9 min  
9999 min 99 h 59 min  
99.99 h 999.9 h  
9999 h



Note: The 99.99 s range is inhibited for the D1 and Di Cyclic modes)

Simultaneous and constant display of the current value and pre-selection value (internal battery, minimum life span 10 years at 20°C).

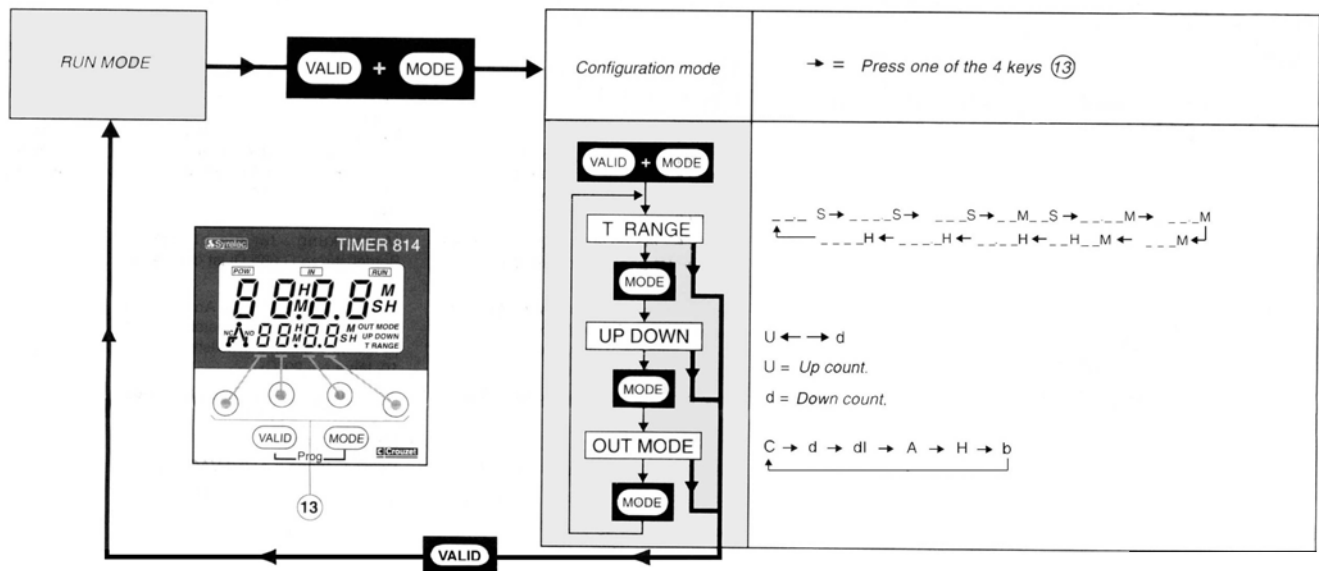
Up count (Up) or down count (Down) display

Contact input

8 A/250 VAC relay output (10A UL)

Power supply: 24 V~ DC / 110.240 V ~ or 12 V DC /24.48 V~ DC (tolerance +10% - 15%)

Front panel protection rating IP 64



READOUT LEGENDS

1. Power supply symbol
2. Closed control contact symbol
3. Flashing symbol during time delay
4. Current value readout (4 digits)
5. Unit of time
6. Separation of units of time
7. Operating modes
8. Increasing (Up) or decreasing (Down) mode
9. Time range
10. Changeover relay status symbol  
(NC = Normally Closed,  
NO = Normally Opened)
11. Next stage
12. Configuration validation
13. Incrementation of time T
14. Display of time pre-selection T (4 digits)



## **PROGRAMING**

- Increment value of **T** by pressing one of the 4 keys 13 corresponding to each digit.
- a) To program, simply set the switch on the side of the unit to the "ON" position.
- b) During operation of the timer, change of time delay values:
  - taken into account immediately if your display is on the up count (Up) and if the new value is greater than the time that has already elapsed.
  - will be taken into account in the next cycle if you are on the down count display (Down).
- c) The unit is supplied with the following configuration: 01.00 s, d (down), C (mode), Prog = ON.
- d) If, inadvertently, you enter the unit test procedure with the entire screen or certain segments of the screen flashing, press the **Mode** push-button until Bp is obtained on the screen, then press **Valid** to return to normal operation.

## **UTILIZATION PRECAUTIONS:**

- The power cables and input circuits must be separate
- A minimum requirement for ventilation and protection from vibration must be provided
- This equipment contains a lithium battery, do not incinerate the unit.

