PS-200

Service Manual

Revised 5/7/04

Power Soak®

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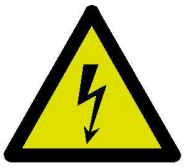
Explanation of Warning Messages

Be sure to read, understand and follow all DANGER, WARNING, and CAUTION messages located in this guide and on the equipment.

Danger

Personal Injury and Property Damage hazard.
May result in serious injury or death.
May cause extensive equipment damage



Warning

Property Damage Hazard.
May result in property or equipment damage.

Personal Injury Hazard

Hazard from sharp objects.
May result in serious injury or death.

Chemical Hazard

May result in serious injury or death. Instructions, labels and Material Safety Data Sheets (MSDSs) should be supplied with all detergents and sanitizing chemicals. The manufacturers, importers and distributors of your cleaning chemicals are responsible for providing this information.

Preventive Maintenance

Your system requires minimal, routine preventive maintenance. As such, the following should be done on a routine basis to ensure that your system remains reliable:

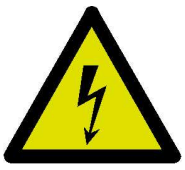
Daily

Clean the liquid level sensors. These sensors are located on the side walls of the wash and sanitizer tanks. They are the white plastic discs with metal centers. **Clean the sensor faces thoroughly**. If cleaned regularly, a washcloth and soapy water are all that is required.

If the liquid level sensors are not cleaned regularly, the machine may fail to operate; or it may be possible to run it without water, which may cause serious damage to the unit.

Monthly

IMPORTANT: Turn off the power to the unit at the main breaker prior to performing the following task!



After shutting off the power at the system's dedicated breaker, **clean the pump motor fan shroud** with a stiff bristle brush and a vacuum. If a brush and vacuum are unavailable, clean the shroud with a damp, soapy rag. The motor shroud is the "vented" cover located at the end of the motor (closest to the control panel). This will prevent grease and dust from accumulating in the cover's openings, which can obstruct the airflow that cools the motor.

De-lime the wash sink. Simply add a de-liming agent to a sink of warm, fresh water and run the system overnight.

Ask your chemical sales representative to recommend a specific de-liming agent.

There are no other preventive maintenance procedures that you will need to perform on your ***Power Soak*** system. You need not be concerned about greasing the motor bearings, as they are permanently sealed. If you have any questions regarding the preventive maintenance procedures, please contact the factory at **800-444-9624**.

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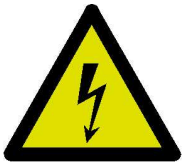
Troubleshooting

Hazard to untrained or unauthorized personnel.

The following procedures are provided for use only by an authorized service agency. No facility owner, manager, employee or other unauthorized person should attempt to perform any of these procedures. To obtain the name of a recommended service agent in your area, please call the Metcraft, Inc. ***Power Soak*** Service Department at **800-444-9624**.

When performing troubleshooting procedures, the authorized service agency will need to open the ***Power Soak*** system's main electrical enclosure.

Properly close the control panel before reconnecting the circuits.



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Troubleshooting PS-200

Pump leaks

	Look For	Correction
1	Defective ADAPTER O-RING	replace
2	Defective PUMP SEAL	Replace

Intermittent running

See "**Pump does not work**" below

Pump does not work

	Look For	Correction
1	Slow Flashing Green Light	Clean Liquid Level Sensors Fill sink with water to proper level Tighten the External Wiring Harness on back of Control Panel
2	Solid Blue Light	Clean Liquid Level Sensors Drain sink and refill with water to proper level
3	Error LED on UPM	Record the pattern – See "**Error Codes**"
4	Red, Green, Blue lights blinking together	Low power to UPM – See "**No Power**"
5	No indicator lights at all	Water too hot – reduce temperature to 115°F with ice or cold water See "**No Power**"

Pump works – Heater does not work

	Look For	Correction
1	Water temperature < 110°F	Check Heater and replace as necessary Check Triac(s) and replace as necessary
2	Water temperature between 110°F and 120°F	Normal operating temperature
3	Water temperature > 120°F	Water too hot – reduce temperature to 115°F with ice or cold water

Water too hot or not hot enough

	Look For	Correction
1	Water temperature < 110°F	Check Heater and replace as necessary Check Triac(s) and replace as necessary
2	Water temperature between 110°F and 120°F	Normal operating temperature
3	Water temperature > 120°F	Check Thermistor and replace as necessary Too much soap can cause excessive heat buildup

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Troubleshooting PS-200

No Power

	Look For	Correction
1	Incoming voltage between L1 and L2 (L1-L2) (Also L1-L3, L2-L3 if 3 phase)	Check Heater and replace as necessary
2	Less than 10 volts to UPM (leave UPM plugged in during check)	Water too hot, above 135°F – empty sink and refill with 115°F water Tighten the External Wiring Harness on back of Control Panel Check transformer and replace as necessary Check thermal cutoff for heater and replace as necessary Check thermal cutoff for motor and replace as necessary

Error Codes

~ Represents a “long” flash

* Represents a “short” flash

	Look For	Correction
1	~ ~ ~ *	This indicates a Water Level problem. Turn off breaker to sink. Drain sink, clean sensors, refill sink. Turn on breaker to sink.
2	~ ~ ~ * *	This indicates a Temperature Sensor problem. Tighten the External Wiring Harness on back of Control Panel. Check and replace Thermistor as necessary.
3	~ ~ ~ * * *	This indicates an Over-Current problem. Check and Replace motor and/or heater as necessary. Check and Replace UPM or CT as necessary.

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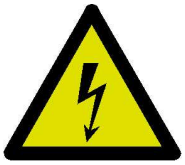
Component Operation and Checks

The following checks should only be performed by qualified technicians using extreme caution.

Electrical hazard to untrained personnel may result in electrical shock, burns, or death.



Liquid Level Sensors

There are two Liquid Level Sensors (LLS) in the wash sink, and two more in the sanitize sink (if equipped with a sanitize sink). To check operation, first unplug the white connector from the UPM. Measure the resistance between the face of the LLS and the appropriate pin of the white connector. You should read less than one ohm. Refer to the chart below for the appropriate pins.

Description	UPM pin number	Wire color
Wash Sink Low LLS	Pin 19	White with Orange stripe
Wash Sink High LLS	Pin 20	White with Green stripe
Sanitize Sink Low LLS	Pin 21	White with Yellow stripe
Sanitize Sink High LLS	Pin 22	White with Blue stripe

If you read higher than that, you may have a dirty sensor, a broken wire, or a loose connection. The loose connection may be at the sensor on your wiring harness, or the external wiring harness may not be tight at the back of the Control Panel.

Thermistor

The Thermistor is a temperature sensor. The UPM measures the resistance through the Thermistor, and associates that resistance to a temperature. To check operation, first unplug the white connector from the UPM. Next, measure the resistance across the Thermistor. This reading can be attained at the white UPM connector (reference "UPM" for pin layout), between pin 8 and pin 9. If your reading varies significantly from the Temperature-Resistance chart in Appendix A, the Thermistor may be defective. The UPM will signal an error if it reads a resistance greater than 430 kΩ and less than 15 kΩ. The Thermistor is located close to the Heater, inside the Sensor Pad. When replacing a Thermistor, it is helpful to use a glue dot to hold it in place while reattaching the Sensor Pad to the sink. Also, it is imperative to put heat sink compound on the side of the Thermistor that will be against the sink, and the Heater Thermodisc as well, to help ensure good heat transfer.

Component Operation and Checks

Heater Thermodisc (Hi-Limit or Cutoff Switch)

The Heater Thermodisc is a protection device. If the temperature at the Thermodisc reaches 135°F, the disc opens, cutting off power to the UPM. To check operation, first shut off the circuit breaker to the sink. Next, unplug the connectors P9 and J10 from J9 and P10 for the Motor Thermodisc (reference schematic or "Motor Thermodisc" for location and description). Measure the resistance between J10 and the center-tap of the transformer (reference schematic or "Transformer" for location). Device should read less than one ohm when closed. If you read more than one ohm, the Thermodisc may be defective. Next, check for a short to ground. If you find a short to ground from either side of the Thermodisc, the Thermodisc is either defective, or you may have water in the sensor pad. This condition will keep the UPM from operating correctly. The Thermodisc is located close to the Heater, inside the Sensor Pad. When replacing a Thermodisc it is helpful to use a glue dot to hold it in place while reattaching the Sensor Pad to the sink. Also, it is imperative to put heat sink compound on the side of the Thermodisc that will be against the sink, and the Thermistor as well, to help ensure good heat transfer.

Motor Thermodisc (Hi-Limit or Cutoff Switch)

The Motor Thermodisc is a protection device. If the temperature at the Thermodisc reaches 180°F, the disc opens, cutting off power to the UPM. To check operation, first shut off the circuit breaker to the sink. Next, unplug the connectors P9 and J10 from J9 and P10 for the Motor Thermodisc (reference schematic for location and description). These connectors plug the two Thermodisc wires (black) to two yellow wires coming out of the internal wiring harness of the Control Panel. Measure the resistance between J9 and P10 (reference schematic, these are the black Thermodisc wires). The device should read less than one ohm when closed. If you read more than one ohm, the Thermodisc may be defective. Next, check for a short to ground. If you find a short to ground from either side of the Thermodisc, the Thermodisc is either defective, or you may have water on the Thermodisc. This condition will keep the UPM from operating correctly. On some of our motors, the Thermodisc is built in to the motor, which is not replaceable. On others, it is located in the wiring box of the Motor, which is replaceable. When replacing, it is imperative to put heat sink compound on the side of the Thermodisc that will be against the motor to help ensure good heat transfer.

Component Operation and Checks

Transformer

The Transformer reduces the incoming power supply voltage to 24 volts, with a 12-volt center-tap. The transformer has acceptable inputs of 120, 240, and 277 volts. It should already be wired to the specifications of Control Panel (refer to schematic). To test the Transformer, first verify the input voltage. This can be done between the L2 terminal and the down-stream/transformer side of the fuse. The fuse holder can be found on the end of the terminal strip. Next, verify the output voltage of the Transformer. You should get 24 volts across it, and 12 volts between the center-tap and each of the other outputs. These voltages can be verified at the three wire nuts on the internal wiring harness near the Transformer. Note the wire colors on the schematic for each wire nut.

Triac (Thyristor or Solid-State Relay)

The Triac is a three terminal semiconductor for controlling current in either direction. Our use for the Triac is similar to a contactor. When a gate voltage is applied from the UPM (similar to coil voltage on a mechanical Contactor Relay), the Triac conducts (closes) through the power terminals. On a single phase Control Panel, there are two Triacs, one for the Heater, the other for the Motor. Terminals 2 and 3 on each Triac are supplied with incoming voltage. On the top of these Triacs, they are labeled M1 (motor leg 1) and H1 (heater leg 1). On a three phase Control Panel there are four Triacs, two for the Heater, and two for the Motor. Two are labeled identically to a single phase Panel. The two others are labeled M3 (motor leg 3) and H3 (heater leg 3). Terminals 2 and 3 on each Triac are supplied with incoming voltage. To test the Triac, first verify the input voltage to the Triac. An LED on the Triac board signals whether gate voltage has been applied by the UPM. If this light is on, the Triac should be closed, and terminal 1 of the Triac should be supplying power to the respective device. If the LED is off, there should be virtually no current on the output side of the Triac.

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Component Operation and Checks

Contactor

If there is 20v-28v across the coil and the contactor does not pull in, the contactor is defective. If there is input voltage across terminals L1 and L2 (also L1-L3 and L2-L3, if three phase) and the contactor is pulled in, but no voltage across terminals T1 and T2 (also T1-T3 and T2-T3, if three phase), the contactor is defective.

Heater Element

The heater in a PowerSoak sink is rated at 7000 watts. To check operation of the heat element, first turn the power off at the breaker. Disconnect the H2 wire from terminal H2 and the H1 wire from the triac H1 (and H3 wire from H3 triac, if 3 phase) from the Control Panel. Check each heater lead to ground for a short. They all should be open to ground. Check resistance between each of the combinations of the chart below.

Connection	Heater rated voltage	phase	Resistance (ohms)
H1-H2	208-230	1	7.56
H1-H2	208-230	3	15.12
H2-H3	208-230	3	15.12
H1-H3	208-230	3	15.12
H1-H2	460	1	32.91
H1-H2	460	3	65.83
H2-H3	460	3	65.83
H1-H3	460	3	65.83

The heater should be within about 10% of the value in the chart.

If the reading varies significantly from the chart above, the heater may be defective, or there may be a broken wire or loose connection.

Electrically, the Heater is three separate elements, each of 2333 watts. When replacing, note how the existing Heater is wired, and refer to the schematic when wiring the new Heater.

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Parts List

Motor – Impeller – Pump Assembly

60 Hz - self-draining

HP	Side	Phase	Volt	Wet End	Motor	Impeller
1.5	LH	1	208	29600	29506	27590
1.5	RH	1	208	29601	29506	27591
1.5	LH	1	230	29602	29500	27590
1.5	RH	1	230	29603	29500	27591
1.5	LH	3	208	29604	29508	27590
1.5	RH	3	208	29605	29508	27591
1.5	LH	3	230/460	29606	29502	27590
1.5	RH	3	230/460	29607	29502	27591
2.0	LH	1	208	29608	29507	27592
2.0	RH	1	208	29609	29507	27593
2.0	LH	1	230	29610	29501	27592
2.0	RH	1	230	29611	29501	27593
2.0	LH	3	208	29612	29509	27592
2.0	RH	3	208	29613	29509	27593
2.0	LH	3	230/460	29614	29503	27592
2.0	RH	3	230/460	29615	29503	27593
3.0	LH/RH	3	208	29616	29510	27594
3.0	LH/RH	3	230/460	29617	29504	27594
5.0	LH	3	208	29618	29511	27596
5.0	RH	3	208	29619	29511	27597
5.0	LH	3	230/460	29620	29505	27596
5.0	RH	3	230/460	29621	29505	27597

60 Hz - non self-draining

HP	side	Phase	Volt	Wet End	Motor	Impeller
1.5	LH	1	208/230	27548	see above	27590
2.0	LH	1	208/230	27554	see above	27592
2.0	LH	3	230/460	27558	see above	27592
3.0	LH	3	230/460	27566	see above	27594

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Parts List

Motor – Impeller – Pump Assembly

50 Hz - European

HP	side	Phase	Volt	Wet End	Motor	Impeller
1.5	LH	1	220	29622	29512	27592
1.5	RH	1	220	29623	29512	27593
1.5	LH	3	380	29624	29514	27592
1.5	RH	3	380	29625	29514	27593
2.0	LH/RH	1	220	29626	29513	27594
2.0	LH/RH	3	380	29627	29515	27594
3.0	LH	3	380	29628	29516	27488
3.0	RH	3	380	29629	29516	27489
5.0	LH	3	380	29630	29517	?
5.0	RH	3	380	29631	29517	?

Pump Parts Common to all

Part #	Description
28920	Seal Kit
27886	Thermodisc - motor - thermal cutoff
27047	Intake gasket
27132	Discharge gasket
27480	Mechanical Seal
27475	"O" ring - sleeve
27476	"O" ring - seal plate
27477	Key
27478	Impeller Bolt
27479	Fiber Washer
27481	Sleeve
27483	Cap Screw - seal plate
28262	Dowel Pin

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Parts List

Heater

Part #	Description
27743	Element - 230 volt - rev. A - ribbon - rear mount
27744	Element - 460 volt - rev. A - ribbon - rear mount
27839	Gasket for Chromolox heater
29243	Element - 208 volt -rev. B - wire - bottom mount - not available yet
27930	Element - 230 volt -rev. B - wire - bottom mount
29244	Element - 380 volt -rev. B - wire - bottom mount - not available yet
27939	Element - 480 volt -rev. B - wire - bottom mount
27934	Gasket for Accutherm heater
27702	Cover - rev. A - front mount - 17"
27934	Cover - rev. B - angle mount - 14"
29654	Cover - rev. C - after 02/05/04 - 12"
27934	Bolt - heater cover
18797	Terminal strip - heater
27926	Thermistor - temperature sensor
28454	Thermodisc - heater - thermal cutoff
27322	Sensor pad
28928	Heatsink compound
28881	Glue dot

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Parts List

Control Panel

Part #	Description
27901	Control Panel 220 volt single phase
27902	Control Panel 220 volt three phase
27903	Control Panel 480 volt three phase
27171	Contactor
27172	Transformer - 24 volt
27920	UPM - Programming Module
27923	Terminal Block
27924	Grounding Block
27925	Din Rail - mount for terminal blocks
27928	Triac - solid state relay
28923	Fuse Block
27927	Heatsink
27200	Overlay - start/stop membrane
27922	Wiring Harness - internal to control panel

Miscellaneous

Part #	Description
23987	Liquid Level Sensor
23988	Gasket - Liquid Level sensor
27847	Wiring Harness - Wash
27848	Wiring Harness - Sanitize
28065	Wiring Harness Extension - 3 ft
28066	Wiring Harness Extension - 6 ft
28669	Utensil Basket
27854	Chemical Injector
27854	Connector - chemical injector
28553	Cap - chemical injector
27855	Gasket – Chemical Injector

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Parts List

Optional Chemical Dispenser

Dual Pump Chemical Dispenser

Part #	Description
28900	Chemical Dispenser - Dual Pump - Generic
28370	Chemical Dispenser - Dual Pump - Kay Chemical
29233	Timer - solidstate
29230	Button Guard - metal
29231	Switch - MOM - N/O - metal
29232	Rectifier - bridge
29235	Lock & Key
29234	Motor - 24 volt - 120 rpm
28067	Wiring Harness - soap dispenser
29236	Hook & Loop
29237	Screw - #8-32 x 1/2" flat phillips s/s
29238	Spring Cone
29239	Screw - #10-24 x 1-3/4" pan phillips s/s
29240	Pump - 2 cc power wash
29241	Tape - double sided foam
29242	Key
28703	Screw - #6-32 s/s
28704	Nut - hex #6-32 s/s
103-014	Nut Sert - #10-24 tsn
27858	Gasket - soap dispenser - PS-200
28557	Overlay - soap dispenser - Kay Chemical
28901	Overlay - soap dispenser - generic
29145	Terminal Fork 22-18 #8 Insulated
28555	Decal - Overlay - Metcraft service

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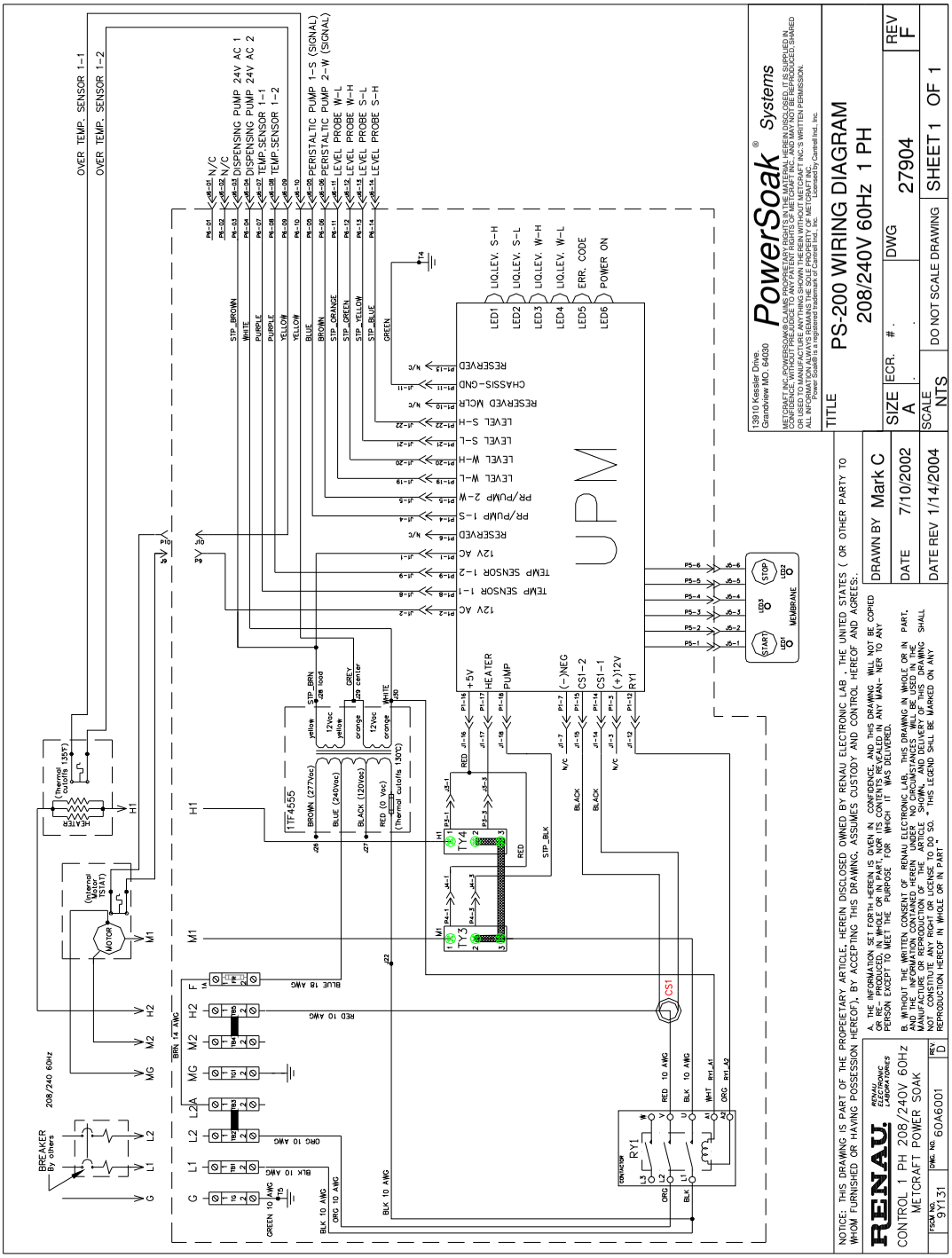
Electrical Schematic PS-200

208-240 volt 60 Hz 1 phase



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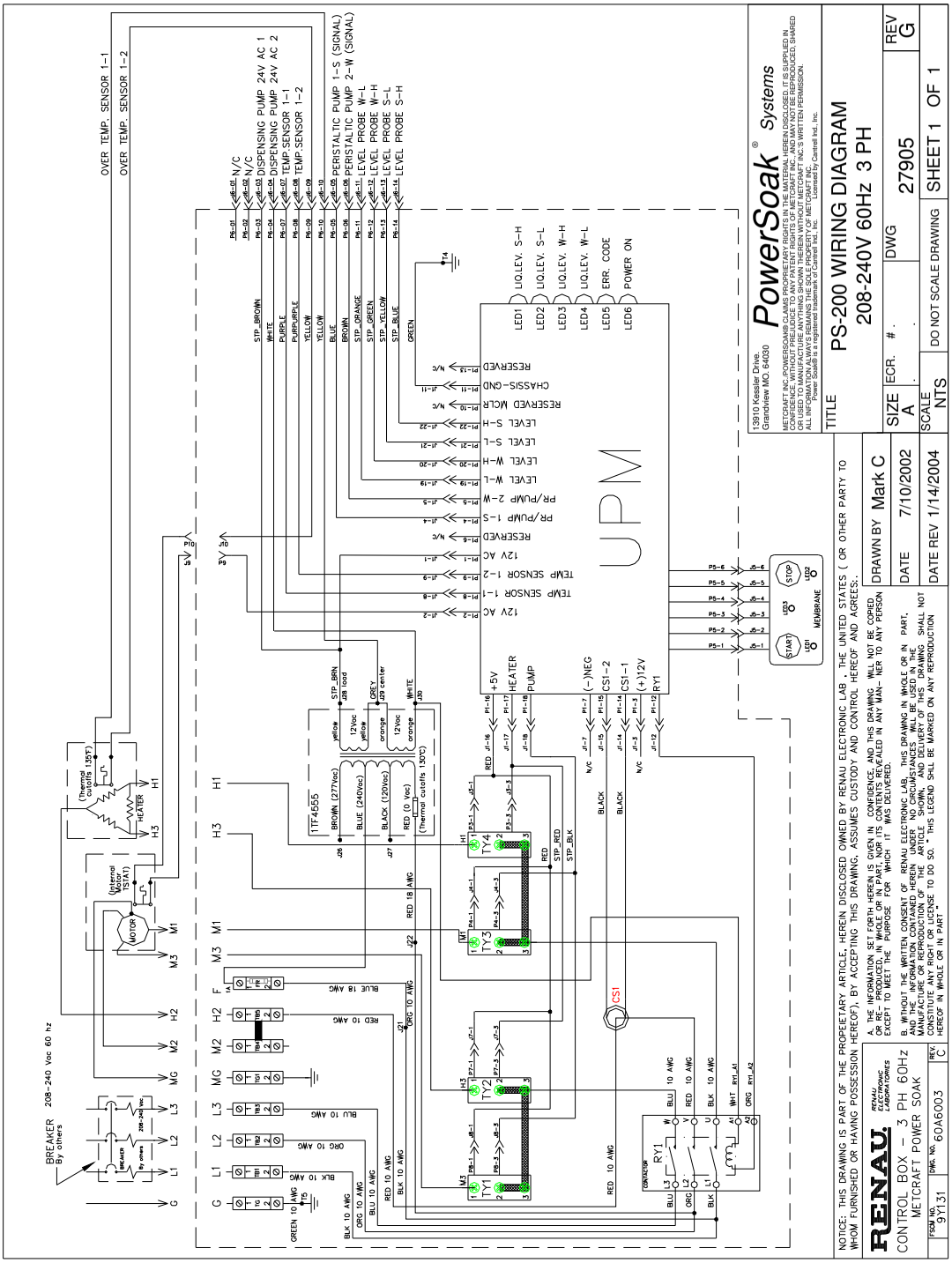
Electrical Schematic

PS-200

208-240 volt 60 Hz 3 phase



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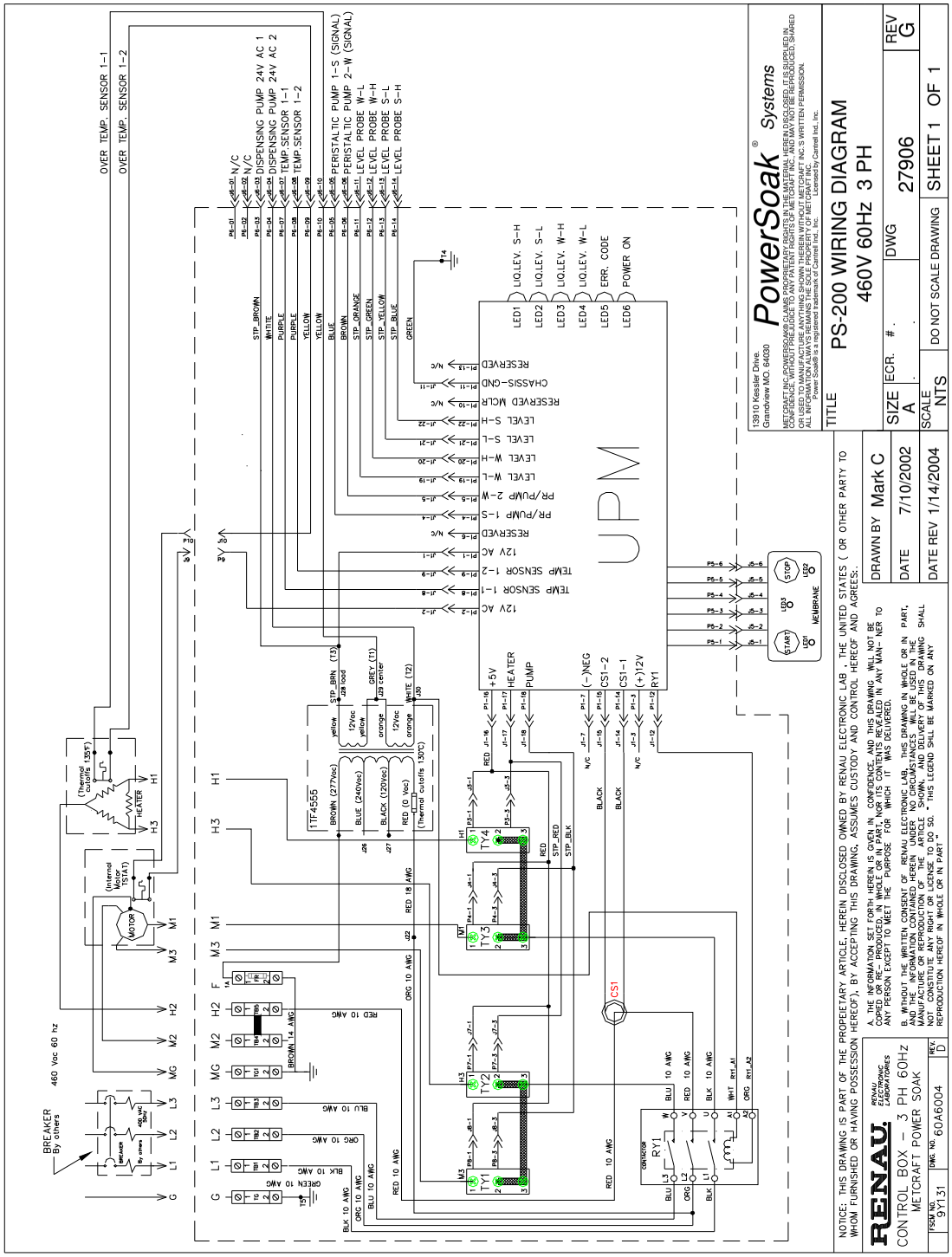
Electrical Schematic

PS-200

460 volt 60 Hz 3 phase



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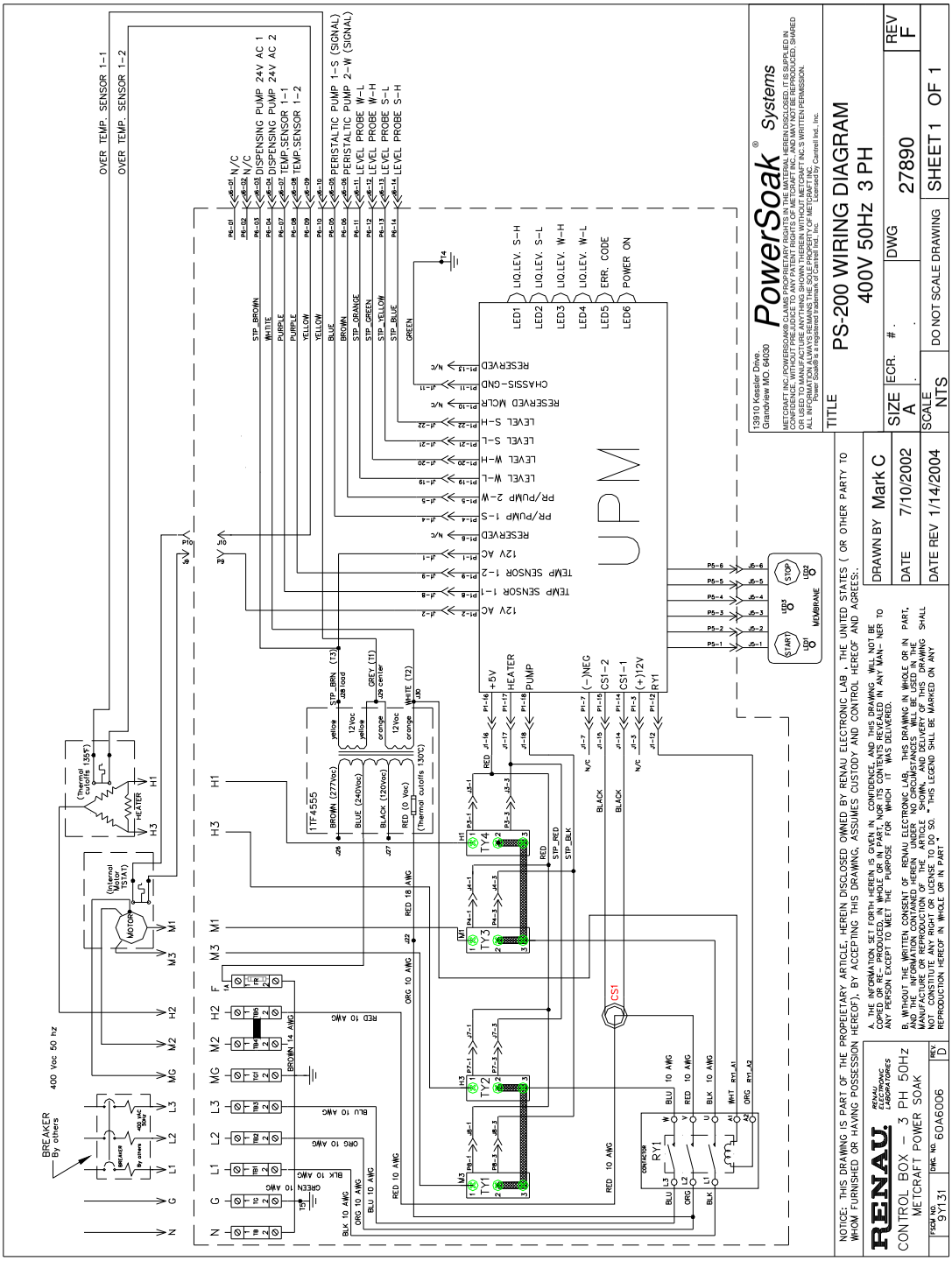
Electrical Schematic European PS-200

400 volt 50 Hz 3 phase



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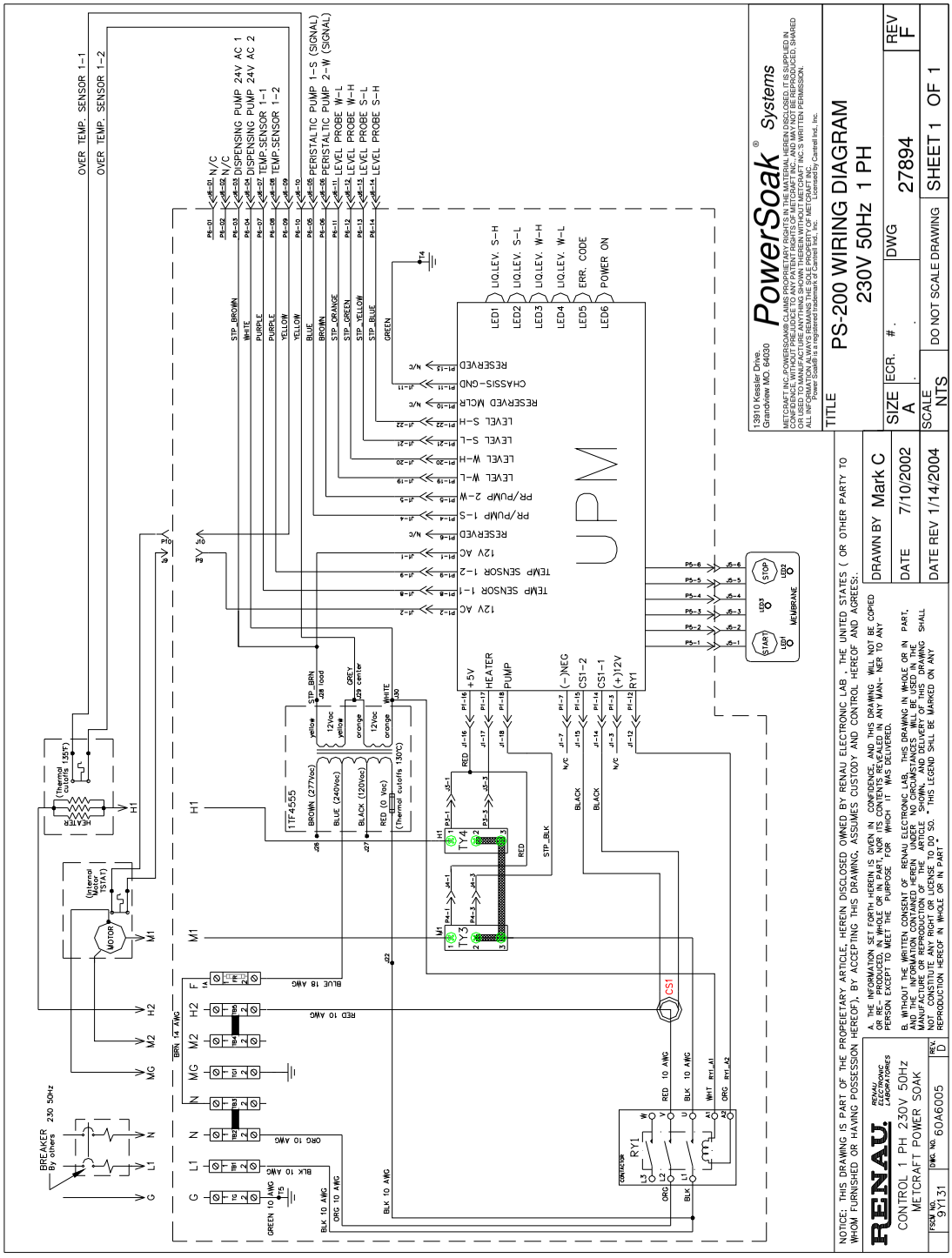
Electrical Schematic European PS-200

230 volt 50 Hz 3 phase



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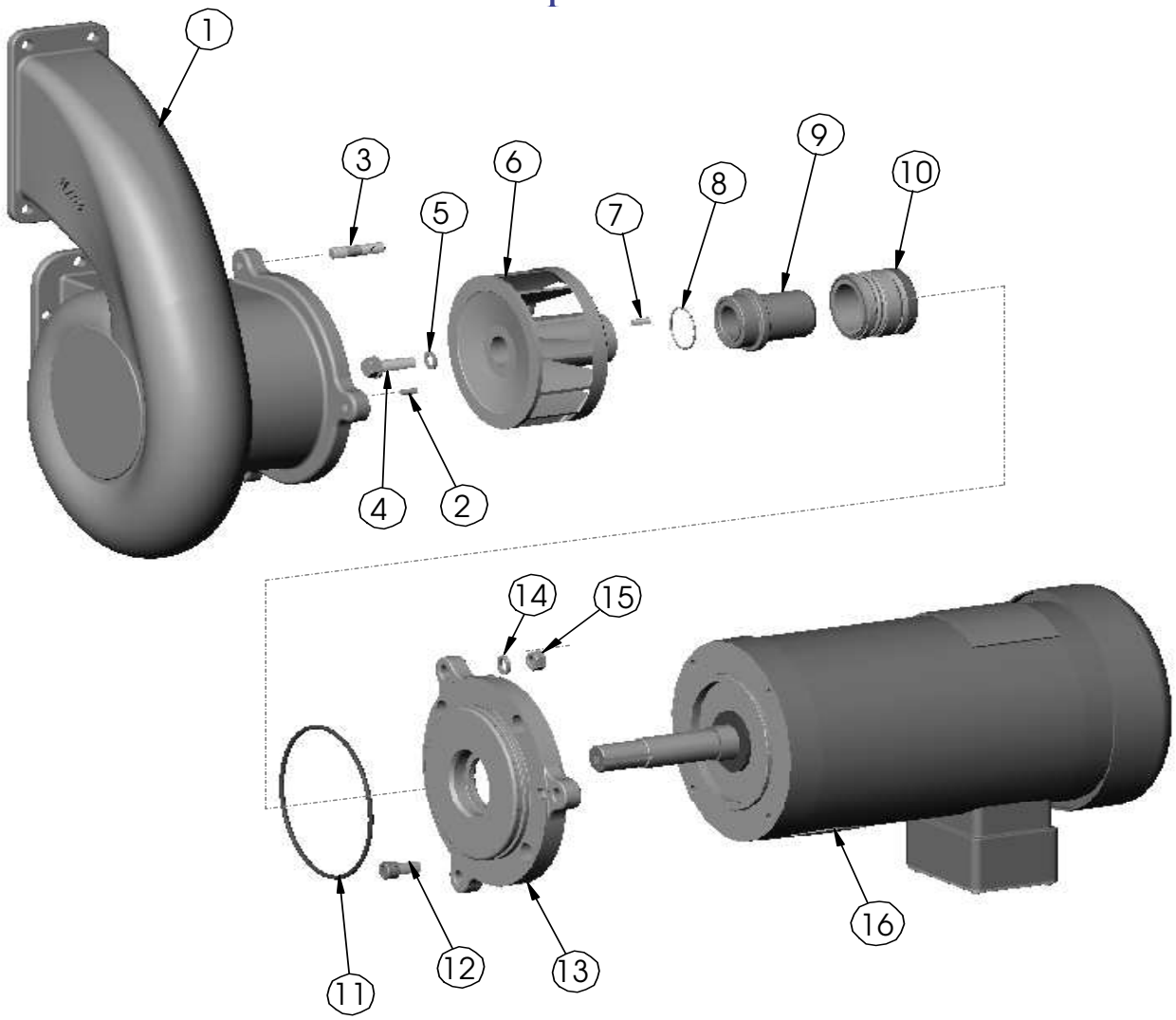
Motor and Pump Assembly

Exploded view



Item		Description
1		Casing
2		Cotter pin – part of casing
3		Stud – part of casing
4	*	Impeller screw - 9/16” hex
5	*	Impeller washer
6		Impeller
7		Impeller key
8	*	Sleeve O-ring

Item		Description
9		Shaft Sleeve
10	*	Mechanical Seal
11	*	Adapter O-ring
12		Motor bolt – 5/16” allen
13		Adapter plate
14		Washer
15		Casing Nut – 9/16” hex
16		Motor

* Indicates parts included in the seal kit

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Motor and Pump Assembly

Disassembly Procedure

1. Remove casing nuts (15), which hold adapter (13) to casing (1).

2. Pry adapter (13) from casing (1) with pry bar or large screwdriver and remove adapter (13) and motor (16) from casing (1).

3. Using a suitable holder to keep impeller (6) from turning, remove impeller cap screw (4) and washer (5). Be careful not to damage precision surfaces of impeller (6).

4. Remove impeller (6) and impeller key(7) from shaft.

5. With impeller (6) and key (7) removed, the shaft sleeve (9) and the mechanical seal(10) can be removed as a unit. Sometimes, the sleeve is difficult to remove due to rust from moisture accumulation. If this is the case, applying heat to the sleeve exterior with a torch and/or a gear puller may help. The heat allows the sleeve to expand. However, too much heat may allow the shaft to expand as well.

6. Remove adapter screws (12), which hold adapter (13) to motor (16).

7. Remove adapter (13) from motor (16) by prying with pry bar or screwdriver.

Motor and Pump Assembly

Inspection and Repair of Components

With pump wet-end disassembled, clean all parts and check for worn or damaged areas. It is seldom economical on these pumps to repair damaged or worn parts. Therefore, when a part is found unusable, it should be replaced.

Casing

Clean and inspect gasket surfaces for damaged areas that would cause leaks. Check wearing ring surfaces for excessive wear.

Impeller

Check wearing ring surfaces for excess wear and gasket surfaces of impeller hub for damage. If excessively worn or eroded, the impeller should be replaced.

Adapter

Clean and inspect gasket surfaces. Remove any dirt or scale from mechanical seal cavity. Check adapter ring for wear and excess clearance.

Shaft Sleeve

Check for any damage to gasket surface on impeller end, O-ring groove on motor end, or outside diameter where rubber bellow of mechanical seal contacts.

Mechanical Seal

It is not recommended that the mechanical seal be reused unless the pump has never been run. A mechanical seal is like a gasket in this respect. Using an old one leaves too much chance of failure to make the gamble worthwhile, considering the usual cost of installing and removing a pump from its system.

Motor or Frame Shaft

Check the shaft for any bent condition by installing the shaft sleeve, clamping a dial indicator to the motor face and reading runout at center of sleeve while turning shaft by hand. Maximum allowable runout is .002 inches for proper performance of mechanical seal. Anything beyond this will require repairs to the motor, which are beyond the scope of these instructions. Check motor fan and shroud for damage and clean, if necessary.

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Motor and Pump Assembly

Assembly Procedure

The PowerSoak pumps are easy to put together. The hardest part, requiring the most care, is installation of the mechanical seal parts.

Study the exploded diagram and become familiar with the name of each part. The diagram shows the relative order of assembly, but also READ THE FOLLOWING INSTRUCTIONS.

1. **Make sure all of the parts are clean and ready for assembly**. This means no dirt or pieces of old gasket in the joints between the motor, adapter, and casing. Make sure the parts around mechanical seal are clean. Dirt and misalignment will ruin a mechanical seal.

2. **Install the shaft sleeve o-ring in the place against the motor shaft shoulder.** Don't let it be cut by the sharp edges of the keyway.

3. **Push the mechanical seal seat squarely in the adapter.** Use fingers only. A little liquid soap (or light oil if soap not available) can be wiped on the outside of the seat ring to make it slip easily into position. Don't let it be cut by the edges of the adapter. Don't install the adapter on the motor face yet.

4. **Check the shaft sleeve fit on the motor shaft**. It should slide easily into place. If it doesn't, find out why. Do not try to drive the shaft sleeve onto the shaft with a hammer. Check to make sure there are no score marks or scratches on the sleeve.

5. **Install the adapter and tighten the cap screws, which hold tit to the motor face**.

6. **Remove any dirt particles and coat the lapped face of the mechanical seal with clean SAE 10 or SAE 20 oil. DO NOT USE GREASE**.

7. **Slide the shaft sleeve on the shaft** so that it covers the shaft sleeve o-ring and butts against the shoulder.

8. **Coat the shaft sleeve lightly with liquid soap** (or light oil if soap not available).

9. **Carefully remove any particles from the lapped face of the carbon washer (part of the mechanical seal) and coat it with clean SAE 10 or SAE 20 oil. DO NOT USE GREASE**.

Motor and Pump Assembly

Assembly Procedure - Continued

10. **Install the mechanical seal on the shaft sleeve by hand**. A twisting motion may be needed to make it ride smoothly over the shoulders on the sleeve. Push it by hand until it contacts the seat; make sure the spring and spring holder line up properly. *(See note)

11. **Install the snap ring** using one hand to hold the snap ring pliers and the other hand to compress the spring. When the spring pressure is released, the spring will push the shaft sleeve outward, exposing the shaft sleeve o-ring to view temporarily.

12. **Install the impeller key,** first twisting the shaft sleeve on the shaft until the keyways line up.

13. **I**nstall the shaft sleeve gasket.

14. **Place the impeller on the shaft engaging the key**.

15. **Put the impeller screw gasket, impeller washer, and impeller washer gasket together on the impeller screw as an assembly**.

16. **Install the impeller screw subassemblies**. With one hand, push the impeller back against the mechanical seal spring and with the other hand turn the impeller screw in *hand tight*.

17. **Check to see if the shaft sleeve has moved to its final position** covering most of the shaft sleeve o-ring.

18. **Tighten the impeller screw** to 15 ft-lb. torque.

19. **Install the casing gasket** on the shoulder of the adapter.

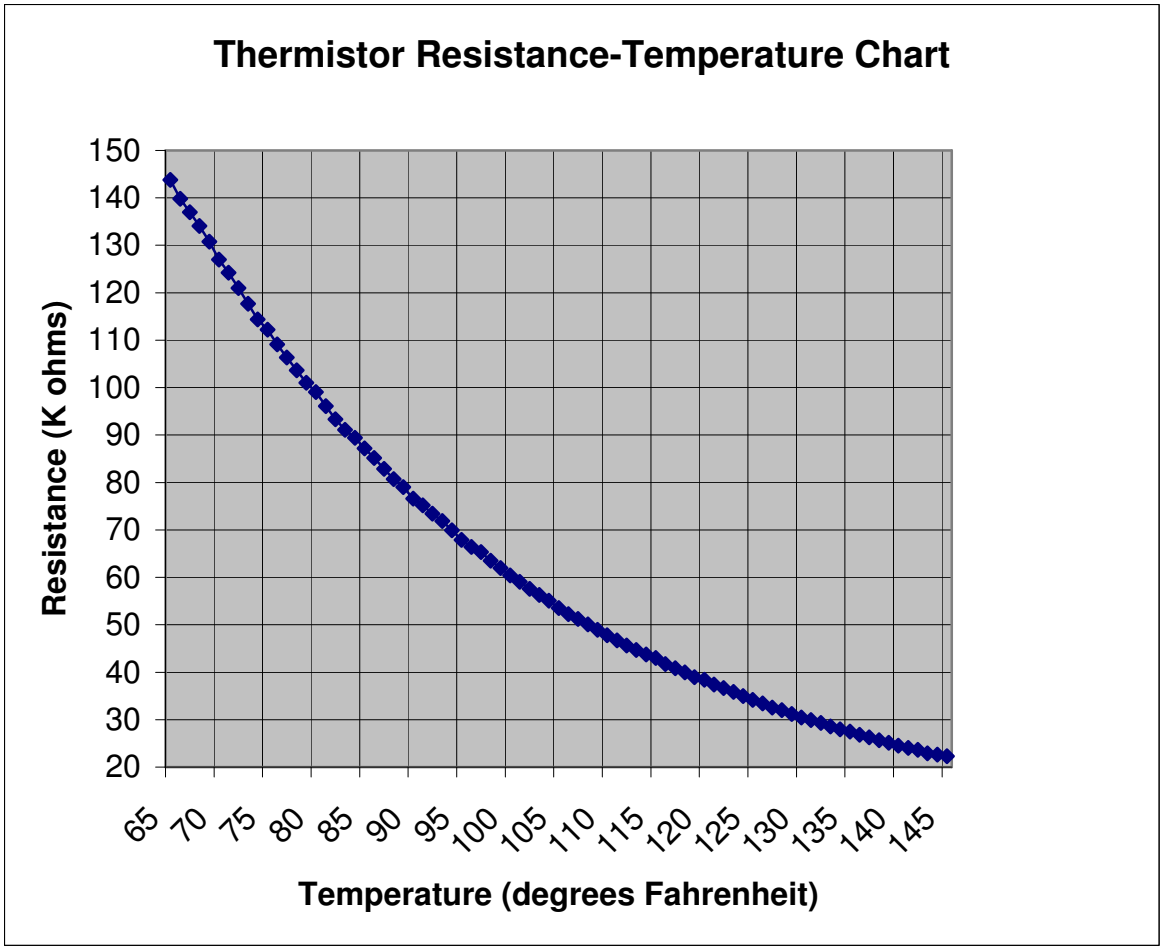
20. **Install the casing** and tighten all the casing screws.

21. **Turn the motor shaft and check for any bindings or rubs** caused by such things as damaged or mis-aligned parts. Re-check all casing bolts for tightness. Tighten casing bolts one at a time, turning the motor shaft, until rub disappears.

*NOTE

An optional procedure for assembly of the mechanical seal consists of mounting the mechanical seal and the snap ring on the sleeve as a subassembly, which is then placed in position on the motor shaft. Experienced pump mechanics may find that this is more convenient as long as they recognize that this way introduces some additional hazards of damaging or improper assembly of precision seal parts.

Appendix A


Thermistor Resistance-Temperature Chart
Resistance (K ohms)
150
140
130
120
110
100
90
80
70
60
50
40
30
20
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145
Temperature (degrees Fahrenheit)

Notes

Notes

Power Soak is a registered trademark of Cantrell Industries, Inc.
The Power Soak design and concept is fully patented.

13910 Kessler Drive, Grandview, MO 64030
Phone: (816) 761-3250 Fax: (816) 761-0544
(800) 444-9624
www.powersoak.com