



PS-200



Service Manual

Revised 5/7/04



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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**.

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.



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 |

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

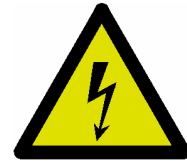
* Represents a “short” flash

| 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. |

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.

| <u>Description</u> | <u>UPM pin number</u> | <u>Wire color</u> |
|------------------------|-----------------------|--------------------------|
| 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 k Ω and less than 15 k Ω . 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.

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.

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 |

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 |

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 |

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 |

Parts List

Optional Chemical Dispenser

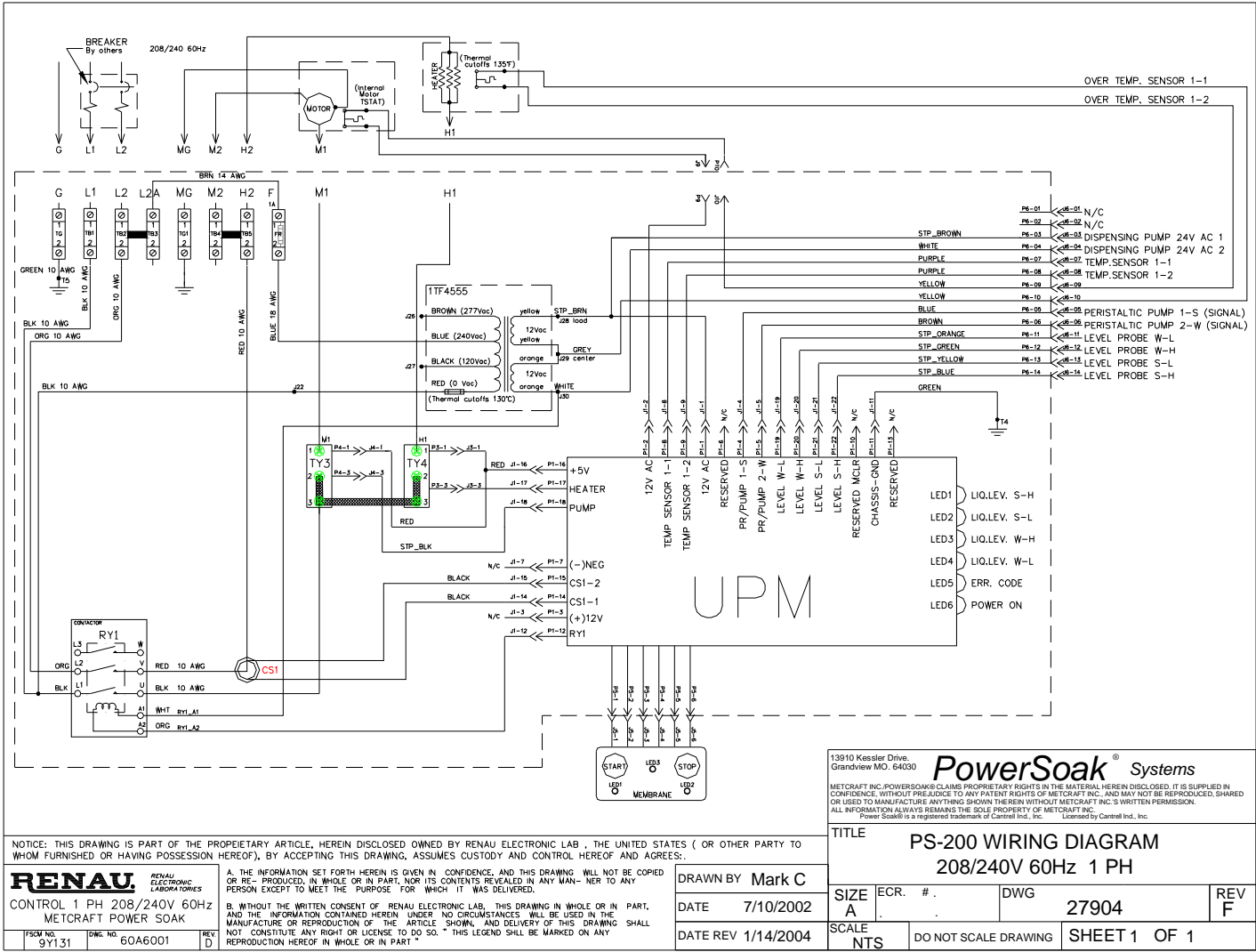
Dual Pump Chemical Dispenser

| 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 |

Electrical Schematic

208-240 volt 60 Hz 1 phase

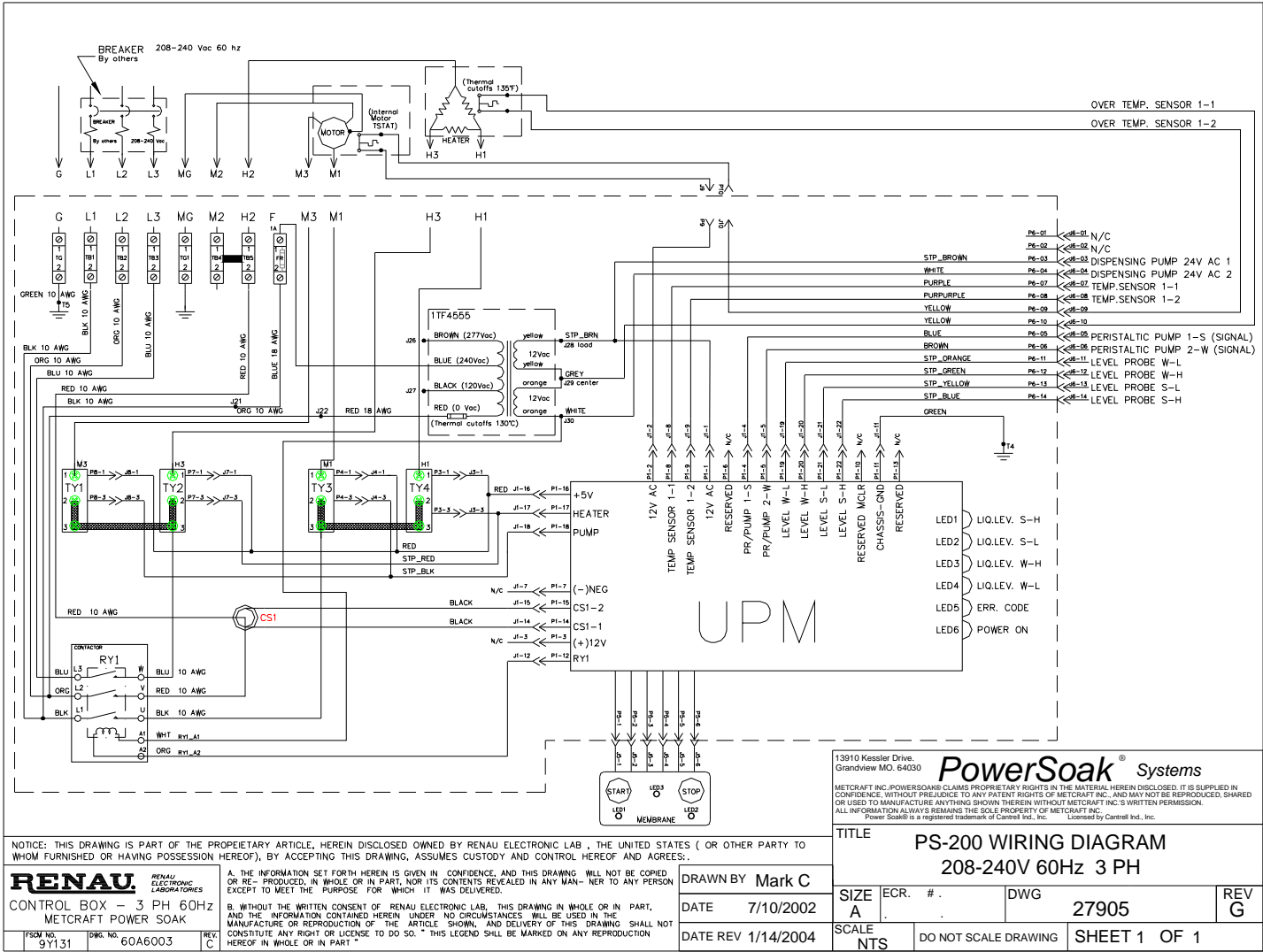
PS-200



Electrical Schematic

208-240 volt 60 Hz 3 phase

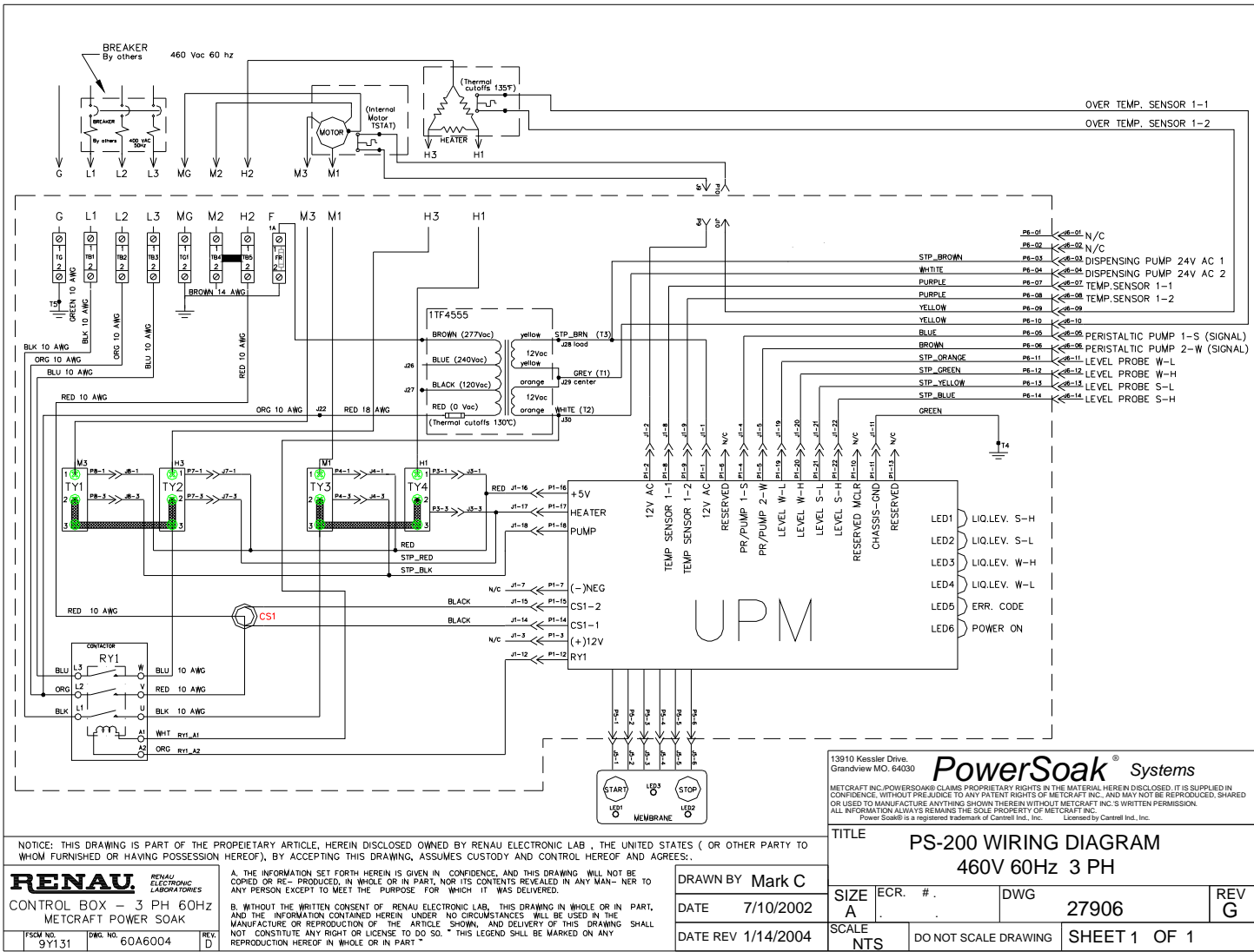
PS-200



Electrical Schematic

460 volt 60 Hz 3 phase

PS-200

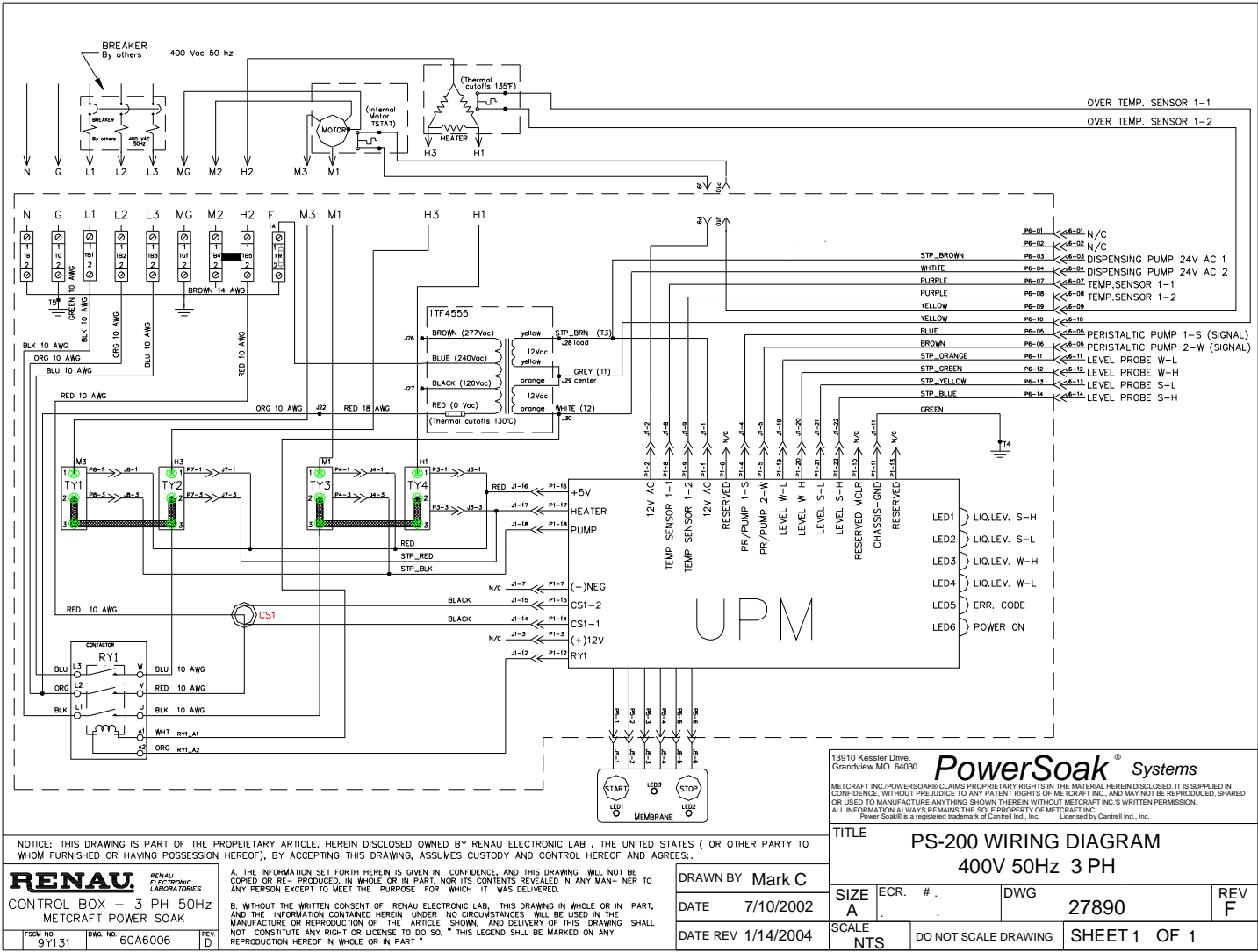


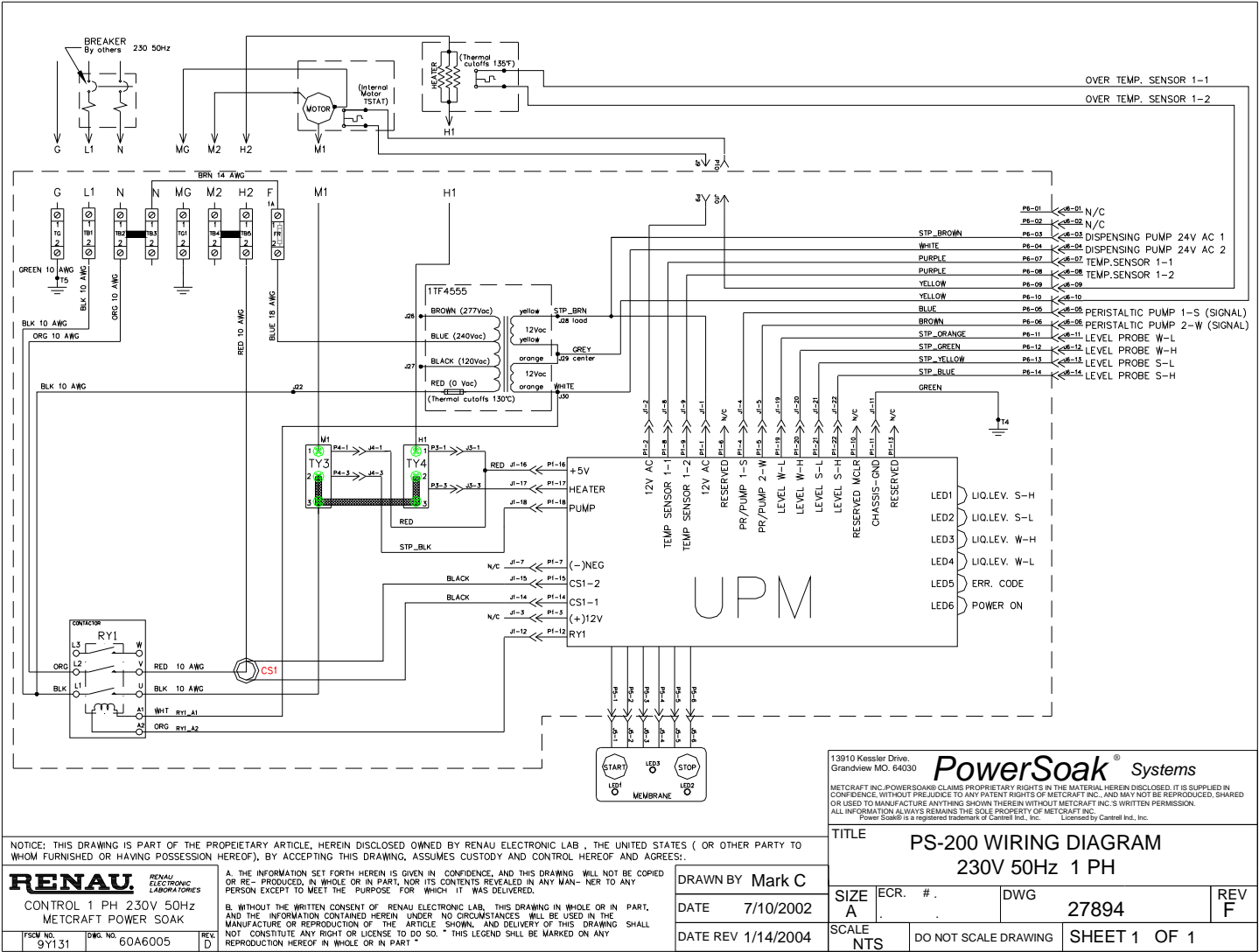
Electrical Schematic

European

PS-200

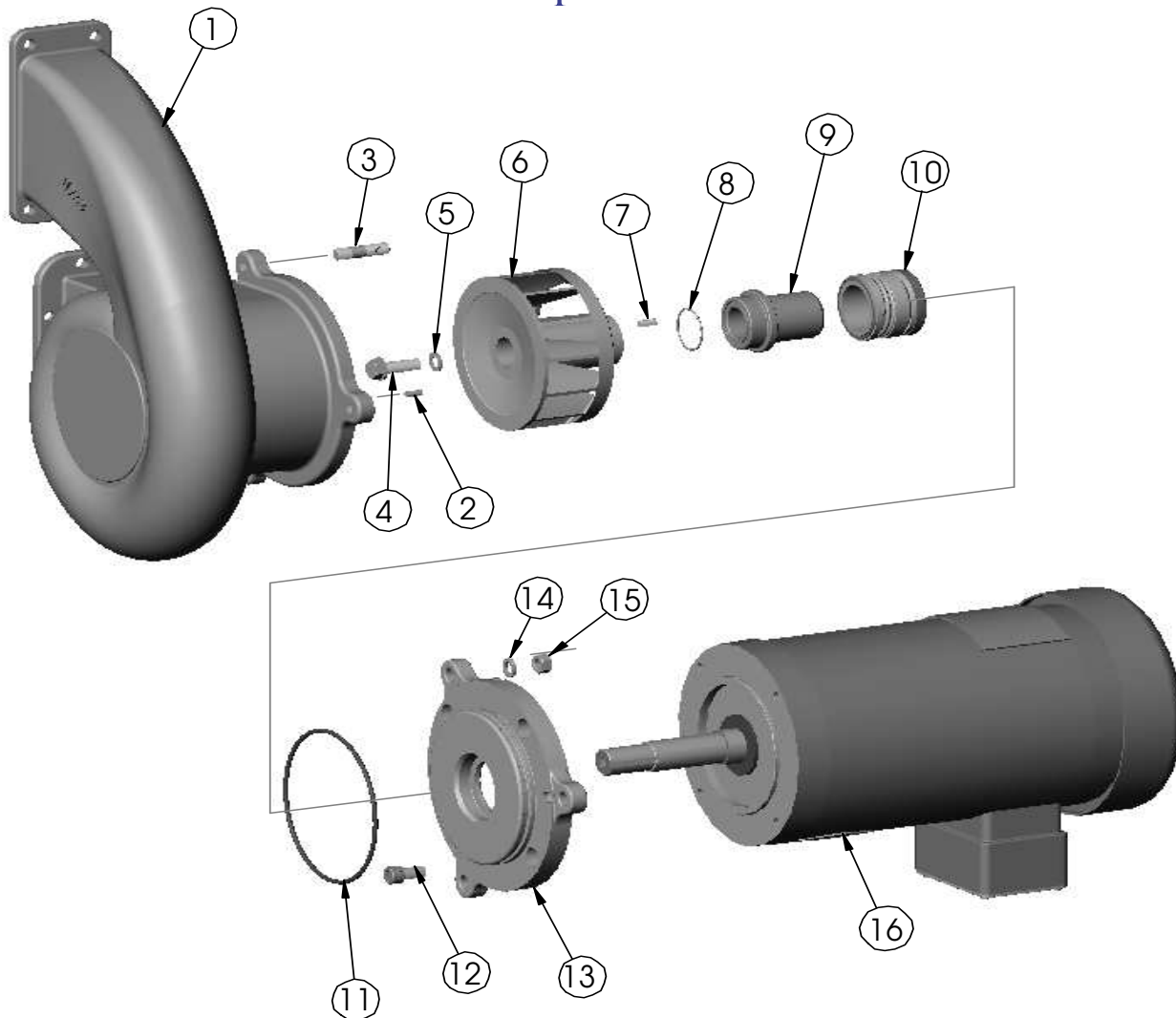
400 volt 50 Hz 3 phase





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

Motor and Pump Assembly

DISASSEMBLY PROCEDURE:

1. Remove (3) nuts from the back of the adaptor plate. Slide the pump end out from the volute.
2. Holding the impeller to keep it from turning, loose the washer head cap screw, remove the screw and gasket.
3. Slide the impeller off of the shaft and remove the key.
4. Remove the seal/sleeve as a unit by pulling it off of the shaft. Some corrosion may prohibit movement and a lubricant may be used to penetrate between the sleeve and motor shaft. With the impeller and key removed, the shaft sleeve and the mechanical seal assembly can be removed.
5. Remove O-ring from the shaft sleeve.
6. With the shaft sleeve removed, the seal rotating assembly can be pulled off of the shaft sleeve.
7. Mark the adaptor plate and motor to insure proper re-assembly. Remove (4) screws from the adaptor plate. Take the adaptor plate off the motor.
8. Remove o-ring from adaptor plate.
9. With the adaptor plate removed, the seal seat can be removed using a screwdriver or by using your fingers.

INSPECTION OF THE COMPONENTS:

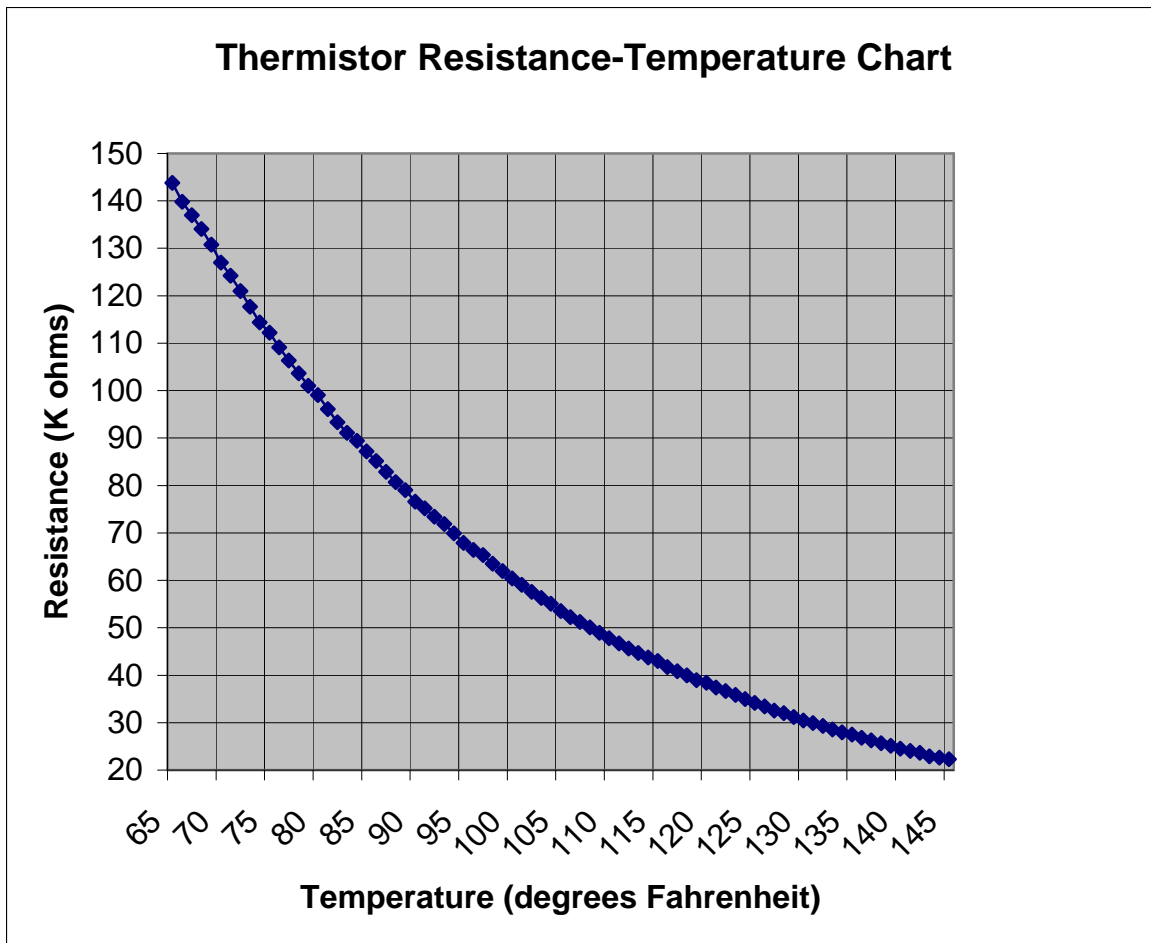
With pump end disassembled, clean all parts and check for worn and damaged areas. Worn or damaged metal parts should be replaced. The mechanical seal, gasket, o-ring, O-ring and washer head cap screw are replacement parts that are provided in the kit. All old parts must be discarded and are not to be reused.

ASSEMBLY PROCEDURE:

1. Push the mechanical seal seat squarely into the seal bore of the adaptor plate by using fingers. A little lube can be used on the seal bore of the adaptor plate. Make sure that ceramic side up and it is fully seated.
2. Install the adaptor plate and tighten (4) screws, which hold it to the motor face. Make sure the marks made in step 7 above line up.
3. Install o-ring into the groove of the adaptor plate.

4. Coat the shaft sleeve lightly with lube. Install the mechanical seal on the shaft sleeve using your hand to push against the seal face. Make sure rubber seal bellows are seated against sleeve shoulder and carbon seal face is not scratched or chipped.
5. Slide the shaft sleeve onto the motor shaft and install the O-ring on the groove of the sleeve. Using lube or grease on the O-ring will help hold the ring in place temporarily until the impeller is secured.
6. Install the key on the motor shaft and place the impeller on the motor shaft engaging the key.
7. Put the gasket on the washer head cap screw.
8. Install the impeller cap screw by holding the impeller, push the impeller back against the sleeve and the other hand tighten the screw to 23-ft.lbs. of torque. (Do not over tighten as this could cause the gasket to squeeze out, become deformed and not seal properly.
9. Slide the pump end on the (3) studs of the volute. The motor junction box should be at the bottom.
10. Install (3) nuts on the studs and tighten to 23-ft.lbs.

Appendix A



Notes

[illegible]

Notes

[illegible]



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