

A.O. Smith Water Heaters

DRE and DVE Model Commercial Electric Water Heaters with Field Conversion Information

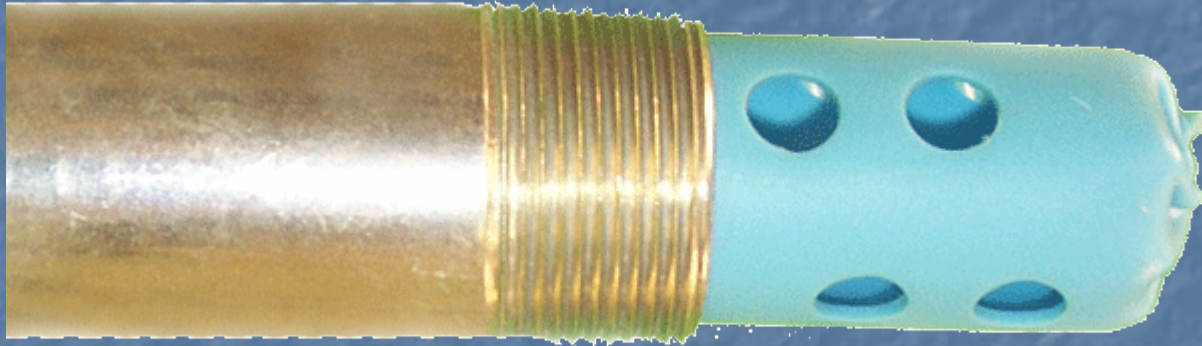


FEATURES

- ✓ Self-Cleaning reduces sediment buildup
- ✓ Glass lined steel tank
- ✓ 50, 80, and 119 gallon models
- ✓ 150 psi working pressure
- ✓ 3, 6, or 9 Incoloy, low watt density elements
- ✓ 6 to 54 KW inputs
- ✓ 208, 240, 480 VAC single or 3 phase
- ✓ 277 VAC single phase also available
- ✓ Surface mount or Immersion thermostats
- ✓ 3 year tank warranty standard (optional 5 year)
- ✓ Field conversion kits
- ✓ Factory supplied T&P valve



SELF CLEANING INLET TUBE



DRE/DVE models are equipped with a cold water inlet tube that directs incoming cold water to create self-cleaning turbulence in the tank.

ELEMENT AVAILABILITY

KW Input	Model Numbers Tank Capacity in Gallons			Number of Elements
	50	80	119	
6	DRE/DVE 52-6	DRE/DVE 80-6	DRE/DVE 120-6	3
9	DRE/DVE 52-9	DRE/DVE 80-9	DRE/DVE 120-9	3
12	DRE/DVE 52-12	DRE/DVE 80-12	DRE/DVE 120-12	3
13.5	DRE/DVE 52-13.5	DRE/DVE 80-13.5	DRE/DVE 120-13.5	3
15	DRE/DVE 52-15	DRE/DVE 80-15	DRE/DVE 120-15	3
18	DRE/DVE 52-18	DRE/DVE 80-18	DRE/DVE 120-18	*3
24	DRE/DVE 52-24	DRE/DVE 80-24	DRE/DVE 120-24	6
27	DRE/DVE 52-27	DRE/DVE 80-27	DRE/DVE 120-27	6
30	DRE/DVE 52-30	DRE/DVE 80-30	DRE/DVE 120-30	6
36	DRE/DVE 52-36	DRE/DVE 80-36	DRE/DVE 120-36	*6
40.5	DRE/DVE 52-40.5	DRE/DVE 80-40.5	DRE/DVE 120-40.5	9
45	DRE/DVE 52-45	DRE/DVE 80-45	DRE/DVE 120-45	9
54	DRE/DVE 52-54	DRE/DVE 80-54	DRE/DVE 120-54	9

Conversion Kits

Any 3 element kit can be installed in any 3 element water heater, any 6 element kit in any 6 element water heater, and any 9 element kit in any 9 element water heater. Conversions can be made up to 480 volts and 277 volt kits are available. There are only 3 exceptions - for 208 volt models shown as N/A in the table below.

CONVERSION KIT NUMBER TABLE FOR 920 SERIES

Models Allowed For Conversion	Desired Input		Conversion Kit No. At Desired Voltage			
	Total kW	Element kW	208V	240V	277V	480V
DVE/DRE 52, 80, 120 with 3 Elements	6	2	9005587	9005600	9005615	9005621
	9	3	9005588	9005601	9005616	9005622
	12	4	9005589	9005602	9005617	9005623
	13.5	4.5	9005585	9005597	9005612	9005618
	15	5	9005586	9005598	9005613	9005619
	18	6	N/A	9005599	9005614	9005620
DVE/DRE 52, 80, 120 with 6 Elements	18	3	9005592	9005606	9005627	9005632
	24	3	9005593	9005607	9005628	9005633
	27	4.5	9005590	9005603	9005624	9005629
	30	5	9005591	9005604	9005625	9005630
	36	6	N/A	9005605	9005626	9005631
DRE 80, 120 DVE 52, 80, 120 with 9 Elements	36	4	9005596	9005611	9005637	9005641
	40.5	4.5	9005594	9005608	9005634	9005638
	45	5	9005595	9005609	9005635	9005639
	54	6	N/A	9005610	9005636	9005640

ELEMENT CONFIGURATIONS

Notice the asterisks in the number of elements column for 18 kW and 36 kW equipped models in the table on the previous slide. 18 kW and 36 kW 208 volt models will contain 3 additional elements.

Instead of 3 - 6000 watt elements a 208 VAC 18 kW model will use 6 - 3000 watt elements.

Instead of 6 - 6000 watt elements a 208 VAC 36 kW model will use 9 - 4000 watt elements.

ELEMENT CONFIGURATIONS

Additional Notes:

208 Volt, 54 kW models are special construction models, 3 phase only, no field conversions are allowed on these models regardless of tank size.

All 50 gallon, 9 element models (except for the 208 Volt, 36 kW, 50 gallon model) are available with immersion thermostats only and there will be no field conversion kits for these models.

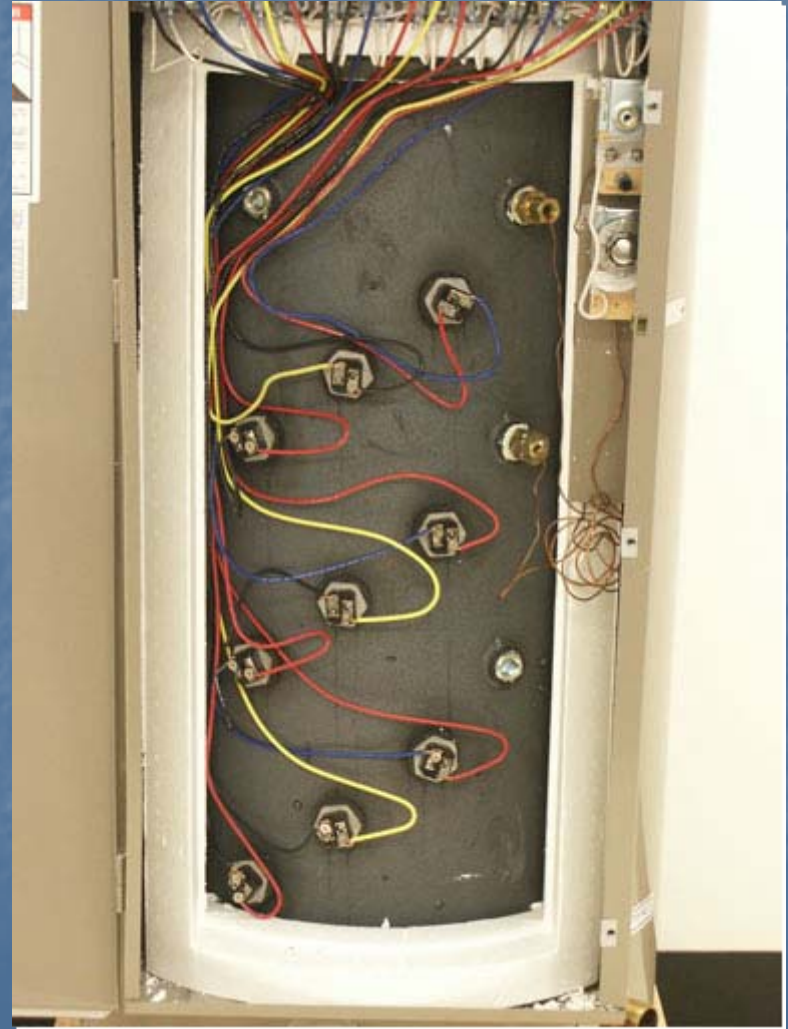
DRE/DVE models are equipped with 3, 6, or 9 elements from the factory, the number of elements cannot be added to. Conversion kits may change the kW input and/or the voltage of the water heater but never add heating elements.

THERMOSTATS

DRE SURFACE MOUNT



DVE IMMERSION TYPE



SURFACE MOUNT THERMOSTATS

DRE Models



Quiet operation. Thermostats are snap acting, one per element, no contactors.

SURFACE MOUNT THERMOSTATS

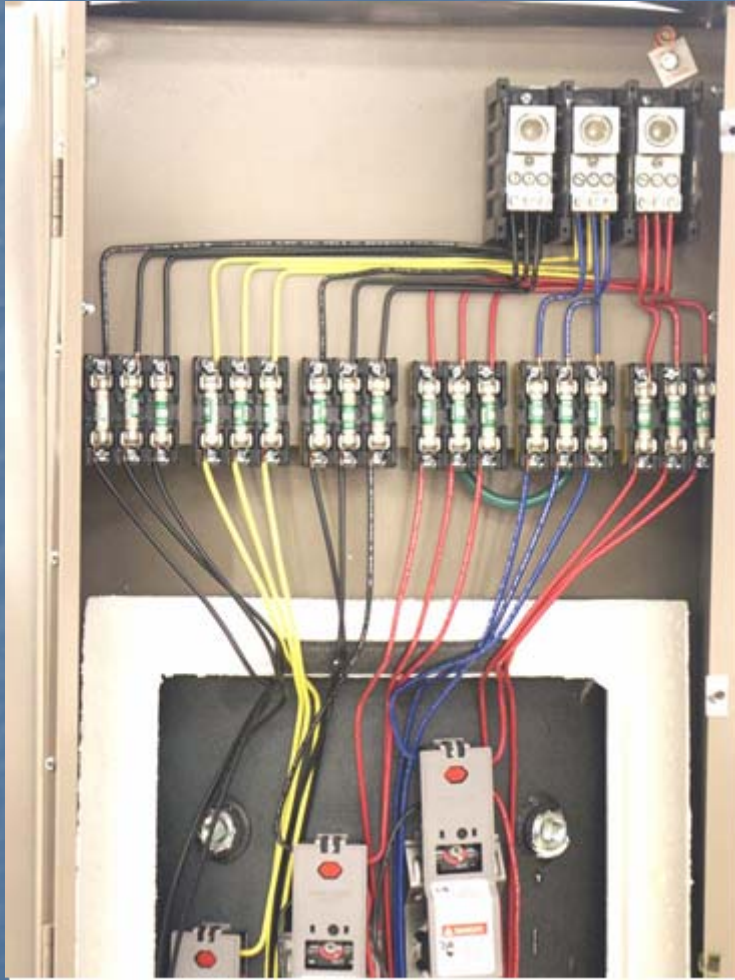
DRE Models



Natural staging effect of the heat elements with multiple thermostats.

SURFACE MOUNT THERMOSTATS

DRE Models

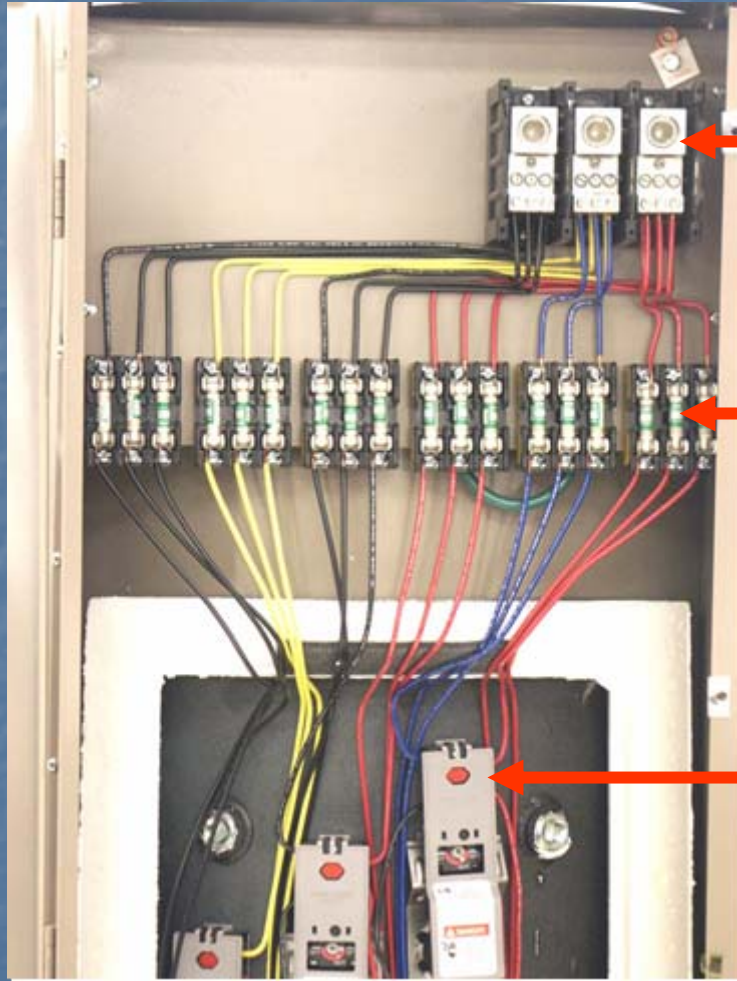


Quiet operation. Thermostats are snap acting, one per element, no contactors.

Natural staging effect of the heat elements with multiple thermostats.

If a thermostat or ECO does fail, it will effect only one element; remaining elements will continue to operate.

SURFACE MOUNT DRE PANEL

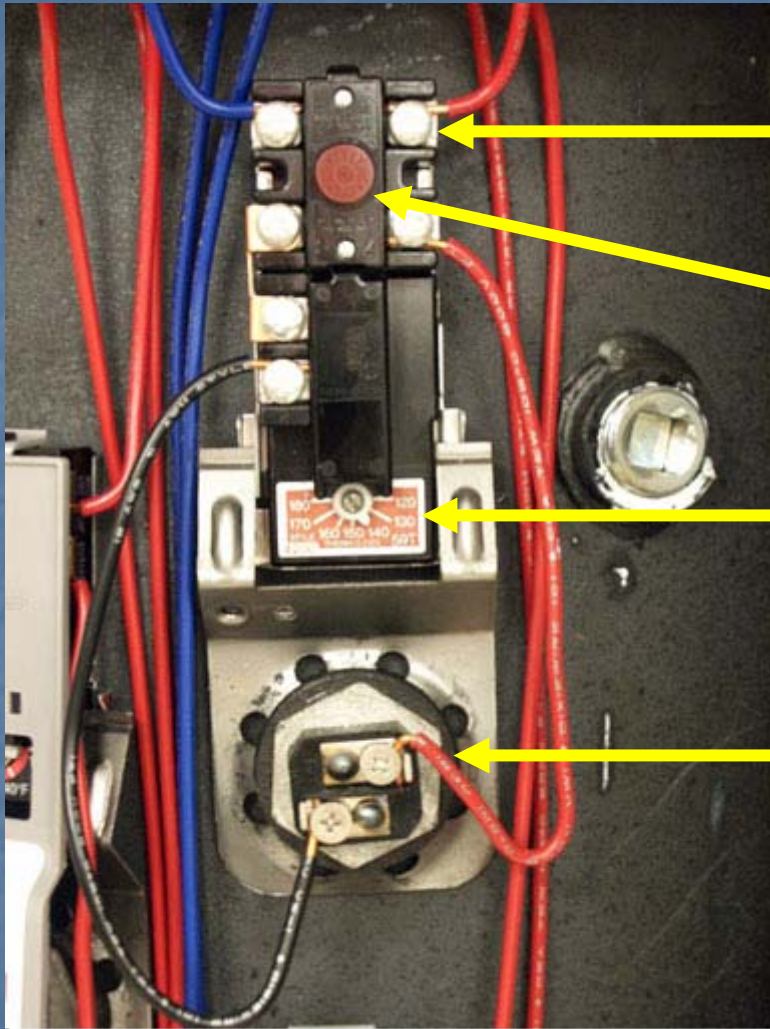


Line voltage terminal block

Fuse blocks

Individual thermostat/ECOs

SURFACE THERMOSTAT & ECO



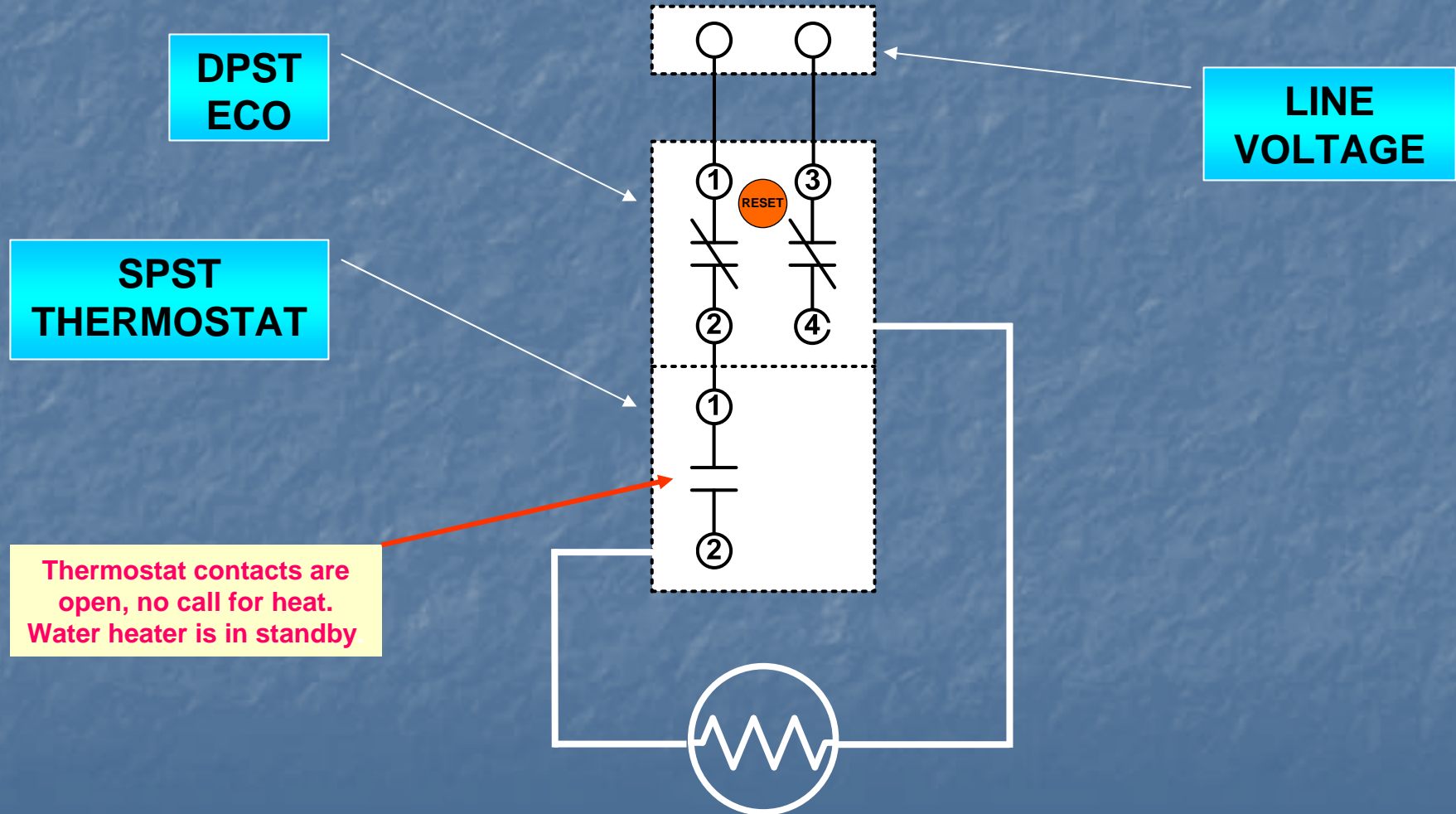
DPST ECO – Opens at 200°F
can be reset at 180°F

Manual Reset Button

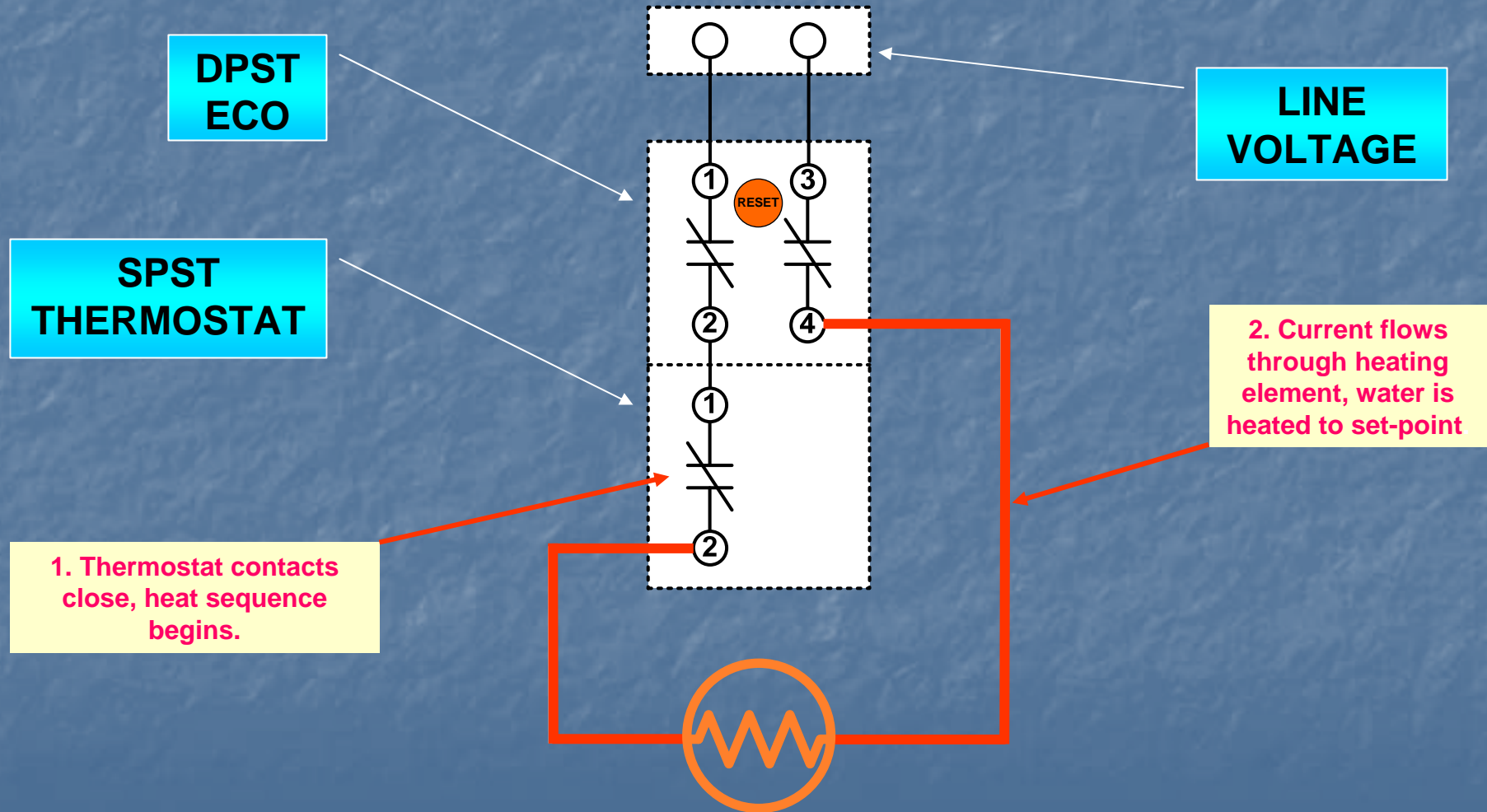
Thermostat 120 to 180°F
± 5° cut-out
5 – 15° cut-in differential

Heating Element

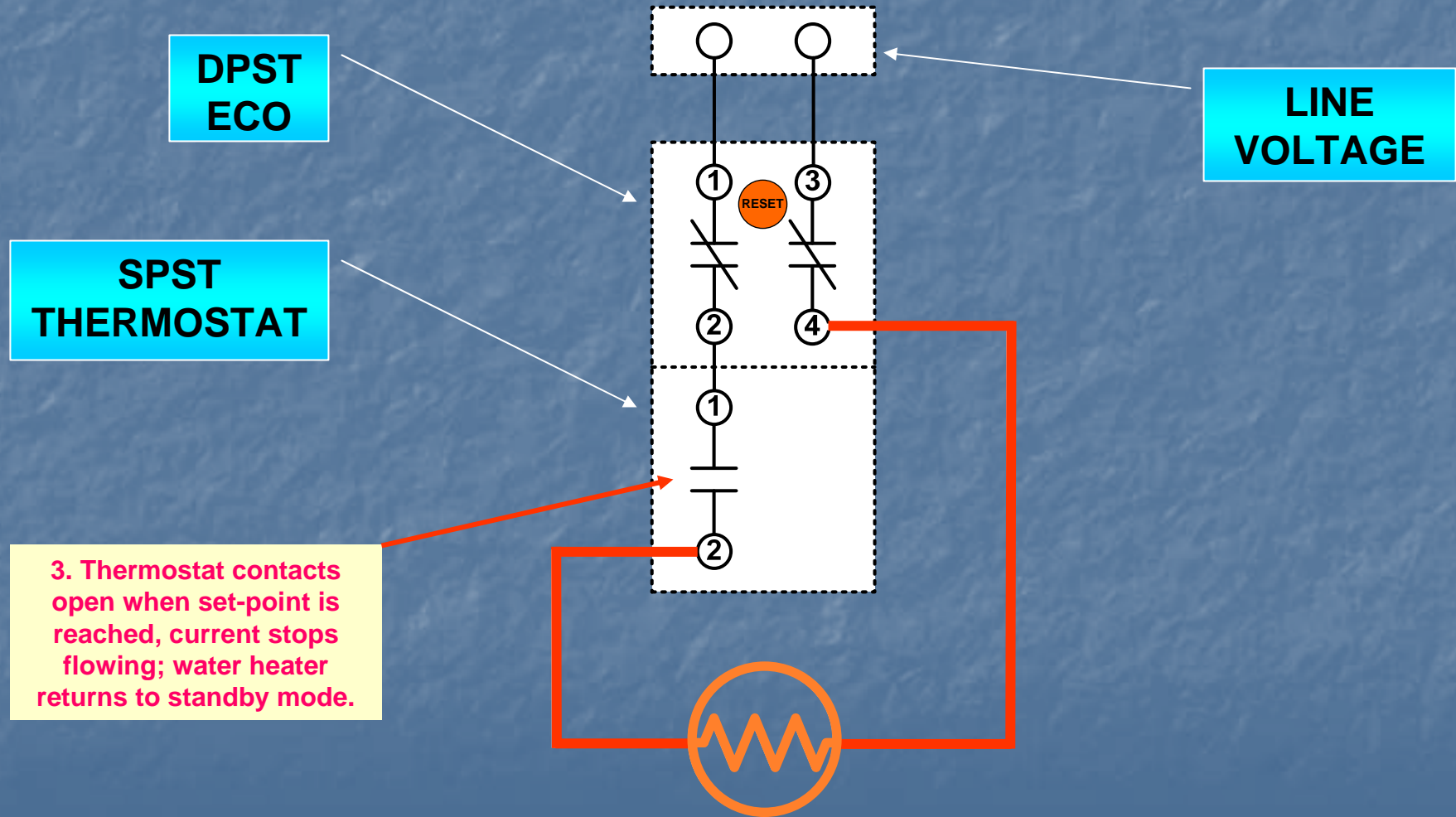
SURFACE MOUNT THERMOSTAT OPERATION



SURFACE MOUNT THERMOSTAT OPERATION



SURFACE MOUNT THERMOSTAT OPERATION



IMMERSION THERMOSTATS

DVE Models

Immersion thermostats provide more precise temperature control; $\pm 5^\circ$ cut-out and a 5° cut-in differential, vs. surface mount differential at 5 - 15°F.



IMMERSION THERMOSTATS

DVE Models

Immersion thermostats provide more precise temperature control; $\pm 5^\circ$ cut-out and a 5° cut-in differential, vs. surface mount differential at $5 - 15^\circ\text{F}$.

Thermostat range of $60^\circ - 180^\circ$ vs. surface mount at $120^\circ - 180^\circ$. Will accommodate lower temp applications such as whirlpools and film processing.



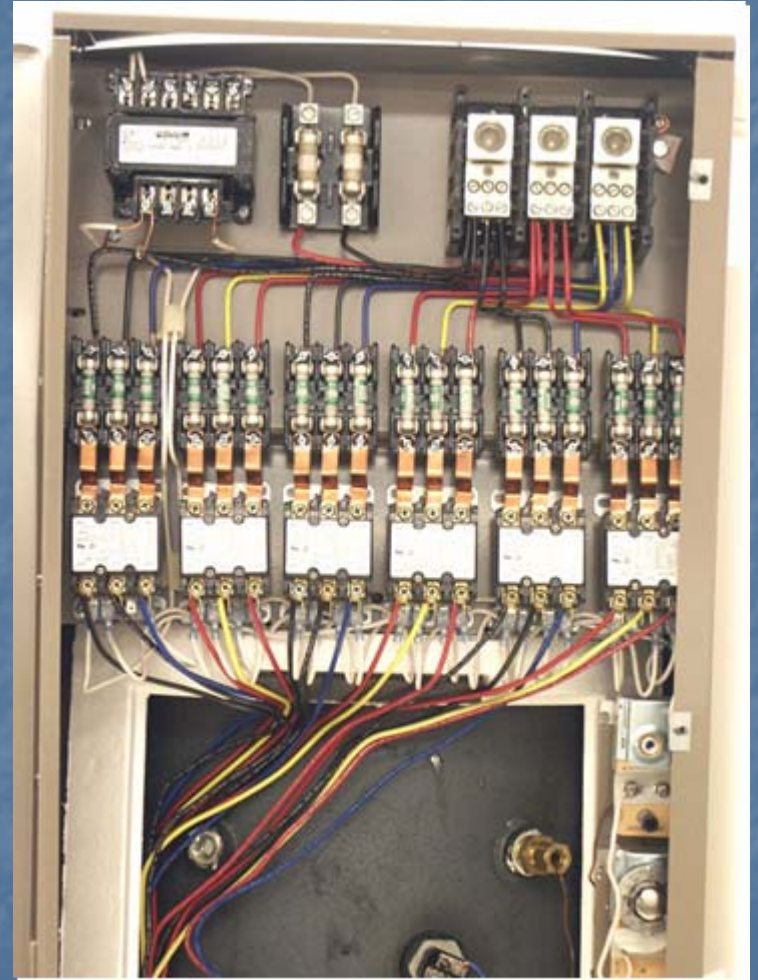
IMMERSION THERMOSTATS

DVE Models

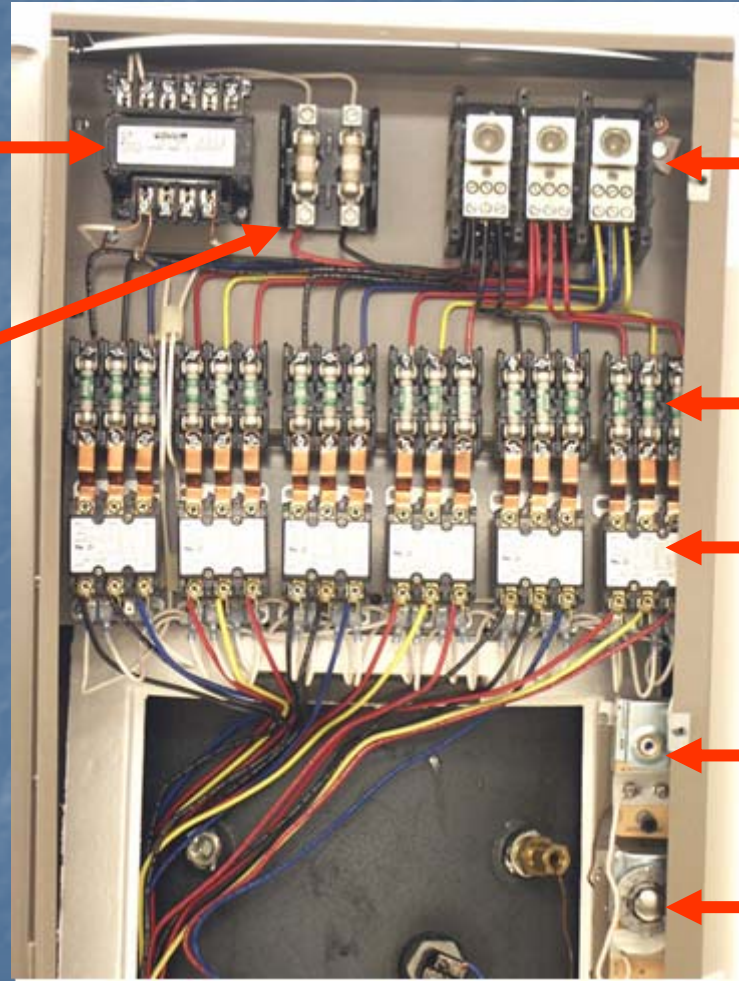
Immersion thermostats provide more precise temperature control; $\pm 5^\circ$ cut-out and a 5° cut-in differential, vs. surface mount differential at 5 - 15°F.

Thermostat range of 60° - 180° vs. surface mount at 120° - 180°. Will accommodate lower temp applications such as whirlpools and film processing.

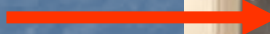
Can be optionally equipped with up to 3 immersion thermostats (one per 3 elements) to help minimize peak demand by staging elements in banks of 3.



IMMERSION TYPE DVE PANEL



Transformer



Line Voltage
terminal block

Transformer
fuse block



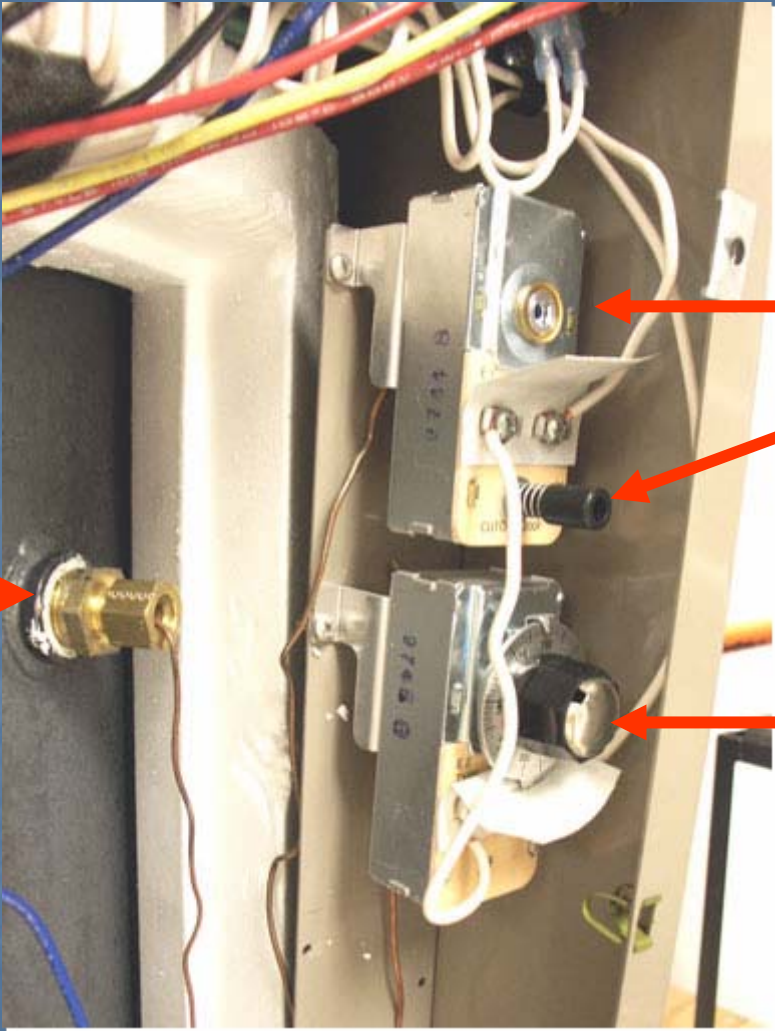
Fuse blocks

Contactors

ECO

Thermostat

IMMERSION THERMOSTAT & ECO



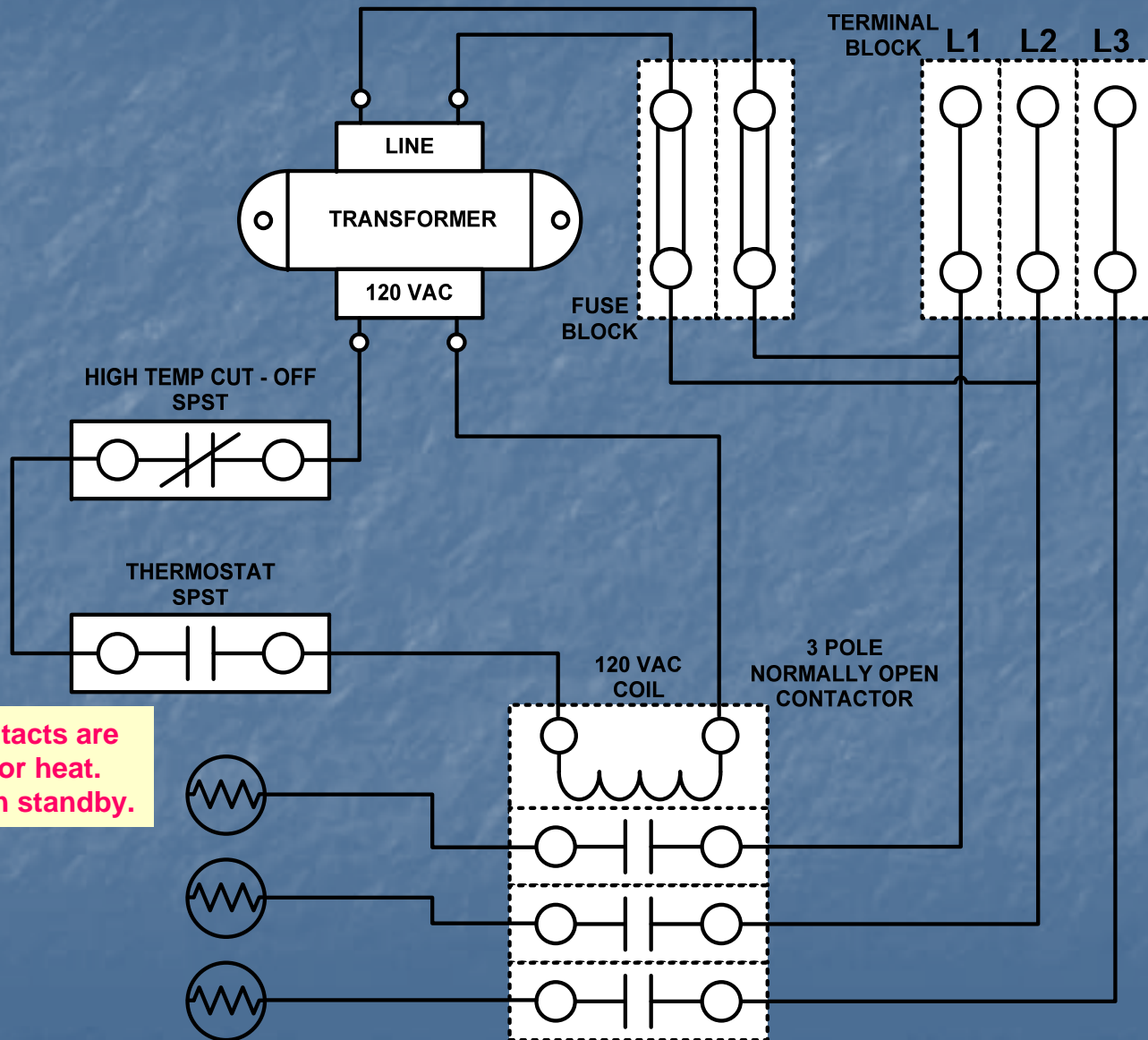
Immersion
ECO Sensor
Wet Well

Immersion
Manual Reset ECO
cutout 200° reset 180°

Manual Reset Button

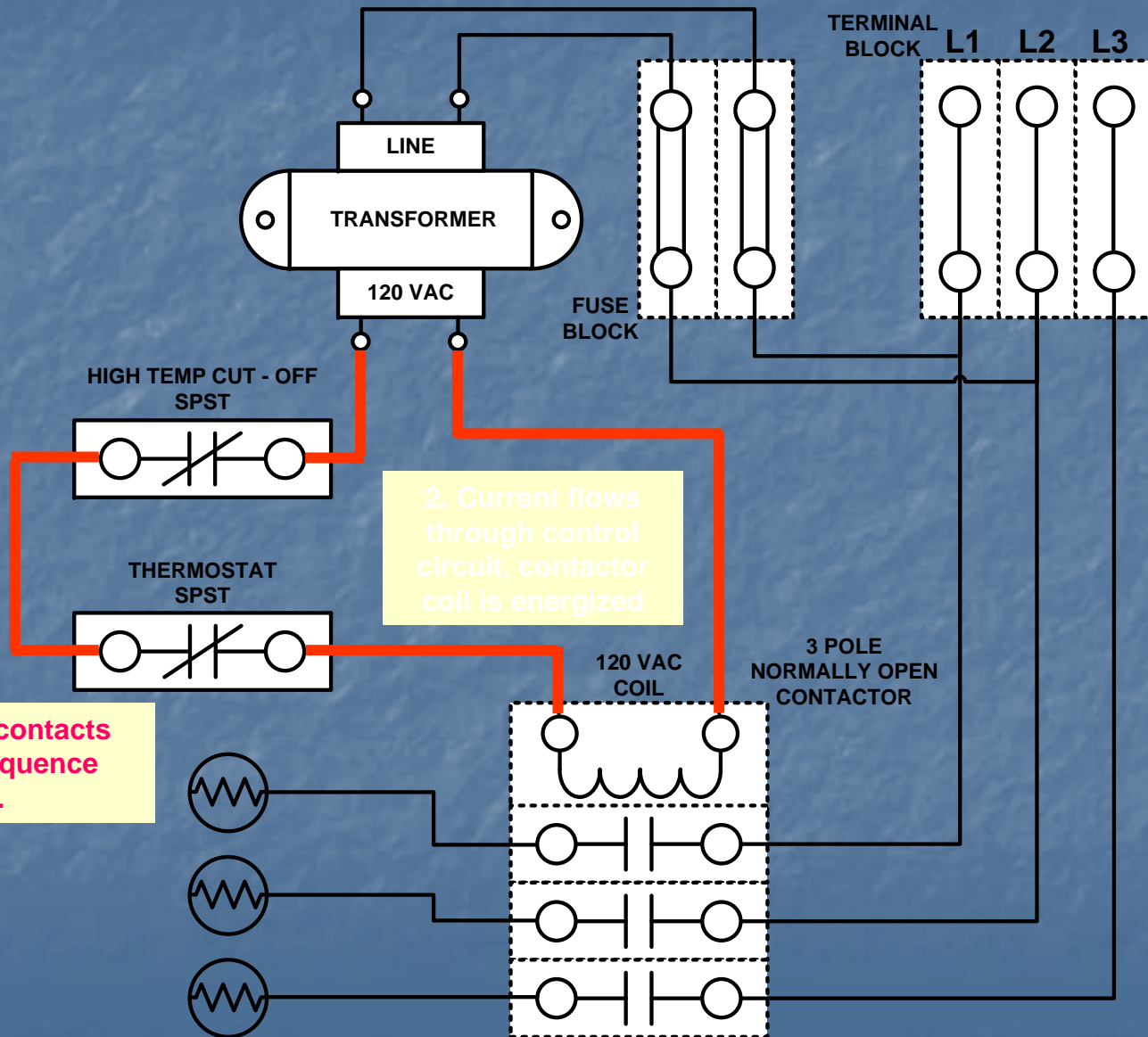
Immersion Thermostat
60° to 180°, Dry Well
(± 5°F cut-out / °5 cut-in differential)

IMMERSION THERMOSTAT OPERATION



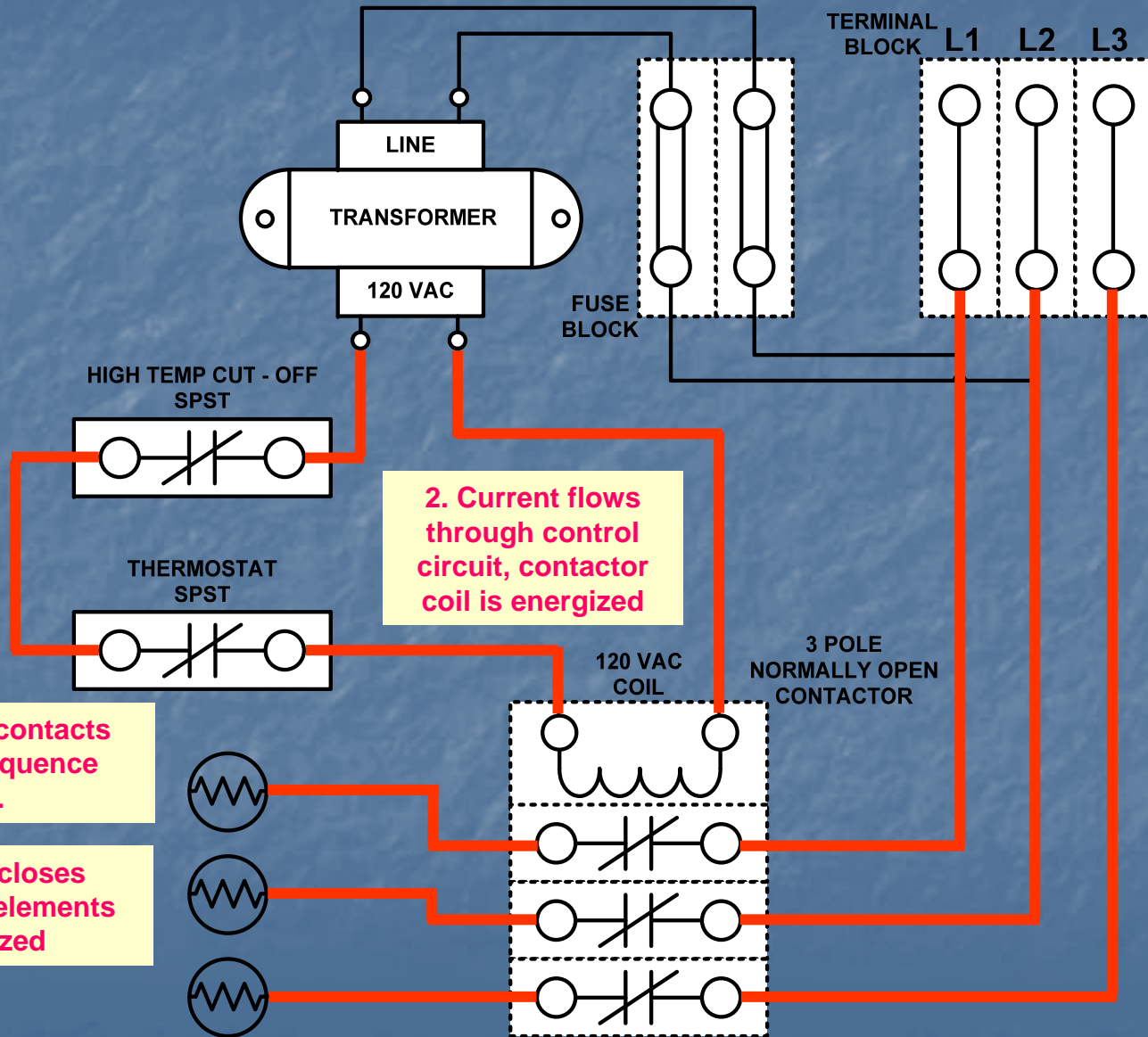
Thermostat contacts are open, no call for heat. Water heater is in standby.

IMMERSION THERMOSTAT OPERATION



1. Thermostat contacts close, heat sequence begins.

IMMERSION THERMOSTAT OPERATION



2. Current flows through control circuit, contactor coil is energized

1. Thermostat contacts close, heat sequence begins.

3. Contactor closes contacts, heat elements are energized

FIELD CONVERSIONS

The following section will cover:

- Label requirements for conversion kits.
- Amp draw considerations.
- Heating element field conversion kits.
- Power supply voltage conversions.
- Power supply phase conversions.



FIELD CONVERSIONS

Label Change Requirement

Each heating element conversion kit will come with an adhesive back **rating modification label** that is affixed over a portion of the existing rating plate. This label will reflect the new wattage and voltage ratings.

There will be a second adhesive back **caution label** that is affixed next to the rating plate that notifies anyone servicing the water heater that it has been modified with a field conversion kit.

These labels must be installed when using a field conversion kit.

Failure to install both of these new labels will leave the water heater with an inaccurate representation of how it is equipped.

FIELD CONVERSIONS

Label Change Requirement

The rating modification label must be placed/aligned to cover the 2nd, 3rd, 4th, and 5th lines of the existing rating plate.

Rating Modification Label

WATTSELEMENT	
KIT NO.	
VOLTS-AC	
PHASES	MAX.WATTS



Existing Rating Plate

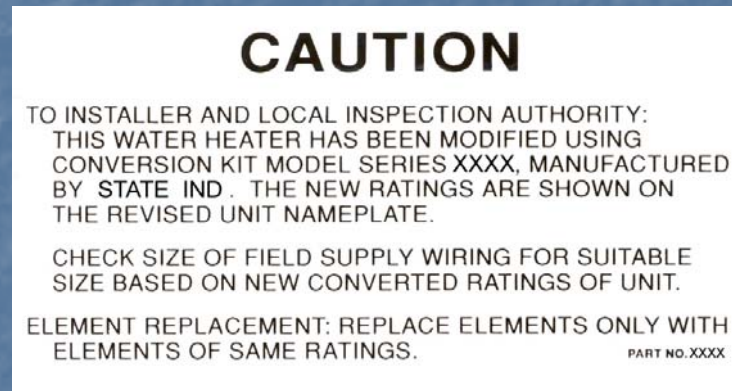
ELECTRIC WATER HEATER		ECO
IN CORRESPONDENCE REGARDING THIS HEATER ALWAYS MENTION MODEL & SERIAL NO'S.	UL	LISTED 2201
MODEL NUMBER	SERIAL NUMBER	
WATTSELEMENT		
VOLTS-AC	CAP.	U.S.GAL.
PHASES	MAX.WATTS	
MAXIMUM HYDROSTATIC WORKING PRESS. 150 PSI		

FIELD CONVERSIONS


Label Change Requirement

The caution label included with the conversion kit must also be affixed to the water heater near the existing rating plate.

Caution Label



Existing Rating Plate

ELECTRIC WATER HEATER			ECO INSTALLED
IN CORRESPONDENCE REGARDING THIS HEATER ALWAYS MENTION MODEL & SERIAL NO'S.		LISTED 22U1	
MODEL NUMBER	SERIAL NUMBER		
WATTS/ELEMENT			
VOLTS-AC	CAP	U.S. GAL.	
PHASES	MAX. WATTS		
MAXIMUM HYDROSTATIC WORKING PRESS. 150 PSI			



FIELD CONVERSIONS

Amp Draw Considerations

Three things that increase amp draw

1. Converting to a higher kW input.
2. Converting from 3 phase power to single phase power.
3. Converting from a higher voltage to a lower voltage.

When making any of these conversions the breaker, fuses, and power supply wiring may need to be changed due to increased amp draw.

FIELD CONVERSIONS

Heating Element Conversions

Elements

Instructions



MODEL NO.	
SIZE	
TYPE	
DATE	

Labels

CAUTION
TO INSTALLER AND LOCAL INSPECTION AUTHORITY:
THIS WATER HEATER HAS BEEN MODIFIED USING
CONVERSION KIT MODEL SERIES MANUFACTURED
BY THE NEW RATINGS ARE SHOWN ON
THE REVISED UNIT NAMEPLATE.
CHECK SIZE OF FIELD SUPPLY WIRING FOR SUITABLE
SIZE BASED ON NEW CONVERTED RATINGS OF UNIT.
ELEMENT REPLACEMENT: REPLACE ELEMENTS ONLY WITH
ELEMENTS OF SAME RATINGS.

Conversion Kit Contents



FIELD CONVERSIONS

Using The Conversion Kit Instructions

Three things must be known about the water heater

1. Determine the nominal tank size of the water heater (52, 80, 120).
2. Determine the number of heating elements (3, 6, or 9) the water heater was equipped with from the factory.
3. Determine the original factory rated voltage of the water heater.

Turn to the page that matches the nominal tank size and number of heating elements of the water heater being considered.

Use the table on that page that matches the factory rated voltage of the water heater being considered for available conversion kits.

FIELD CONVERSIONS

Voltage Conversions

Voltage Conversions Occur When:

A conversion kit being installed contains heating elements rated at a different voltage than what the water heater was factory equipped with.

Voltage conversions on DRE and DVE models differ due to the presence of a transformer on the DVE immersion thermostat models.

FIELD CONVERSIONS

Voltage Conversions **DRE** Models

Models equipped with surface mount thermostats merely require installation of the appropriate heating elements to accomplish a change in voltage.

FIELD CONVERSIONS

Voltage Conversions DVE Models

In addition to changing the heating elements, models equipped with immersion thermostats will require a wiring change on the transformer to complete a voltage conversion.

If the conversion kit heating elements are rated at the same voltage as the original elements, the transformer wiring does not need to be changed.

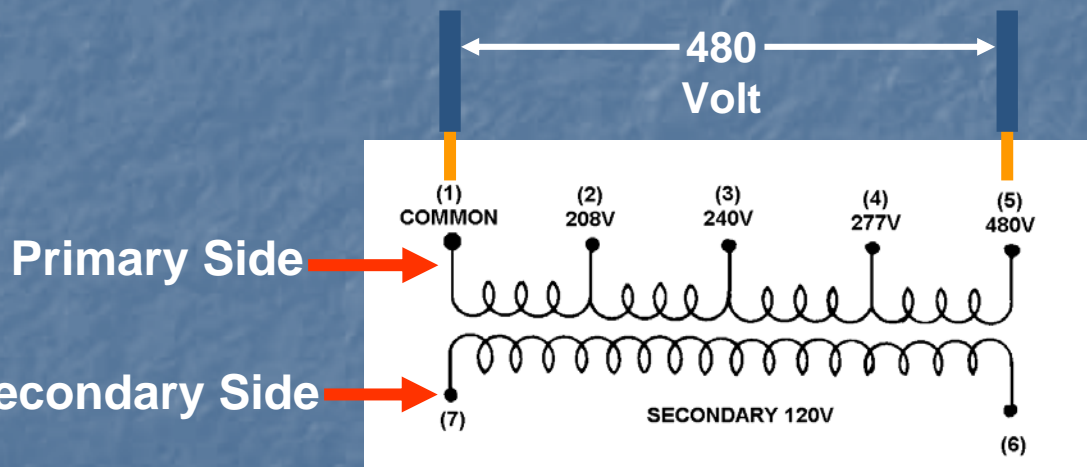
FIELD CONVERSIONS

Voltage Conversions DVE Models

DVE immersion thermostat models are equipped with a “multi-tap” transformer. There is one *unused terminal and five voltage connection terminals on the top (primary side) of the transformer:

Voltage Terminals: Common 208, 240, 277, 480

***Sixth terminal not used**

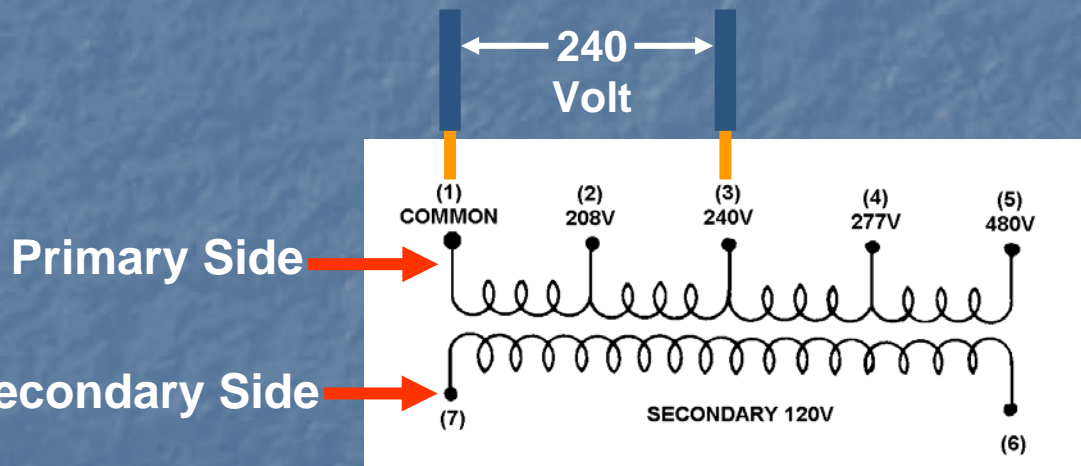


FIELD CONVERSIONS

Voltage Conversions DVE Models

Only one wire needs to be moved when voltage conversions are made. The wire attached to the 'common' terminal (left) stays in place. The other wire is moved from its factory position to the terminal that corresponds to the voltage of the power supply and the conversion kit being installed.

***Sixth terminal not used**





FIELD CONVERSIONS

Voltage Conversions DVE Models

Service Note

It is critically important to make this wiring change to the transformer when field voltage conversions are made.

Failure to make this required change can result in:

1. Contractor chattering - contacts opening and closing rapidly.
2. Contactor failure - burnt contacts and/or contactor coil failure.
3. Repeated transformer fuse failure.
4. Transformer failure.

FIELD CONVERSIONS

Power Supply Phase Conversions

All DRE/DVE water heaters will come from the factory configured for 3 phase power.

Field conversions will be necessary for a single phase power supply.

Power Supply Phase Conversions

The load wiring from the line voltage terminal block uses four different wire colors:

Black

Red

Blue

Yellow

To convert to single phase power:

Combine black and blue wires on terminal L1

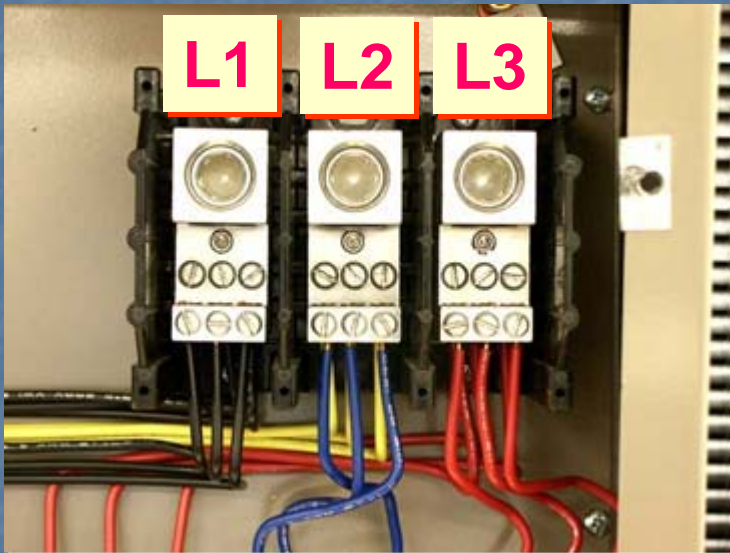
Combine red and yellow wires on terminal L2

Keep in mind that converting from 3 phase to single phase power will increase the full load amps.

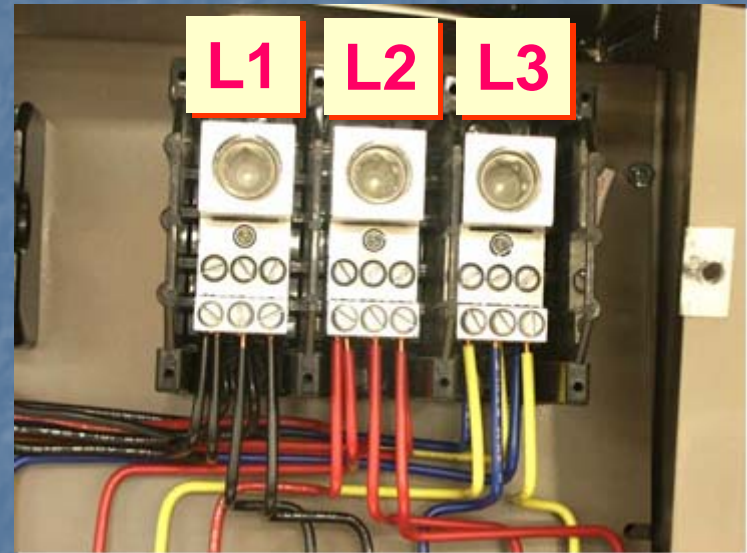
And 208 volt 54 kW models may not be converted to single phase.

Power Supply Phase Conversions

DRE Model



DVE Model



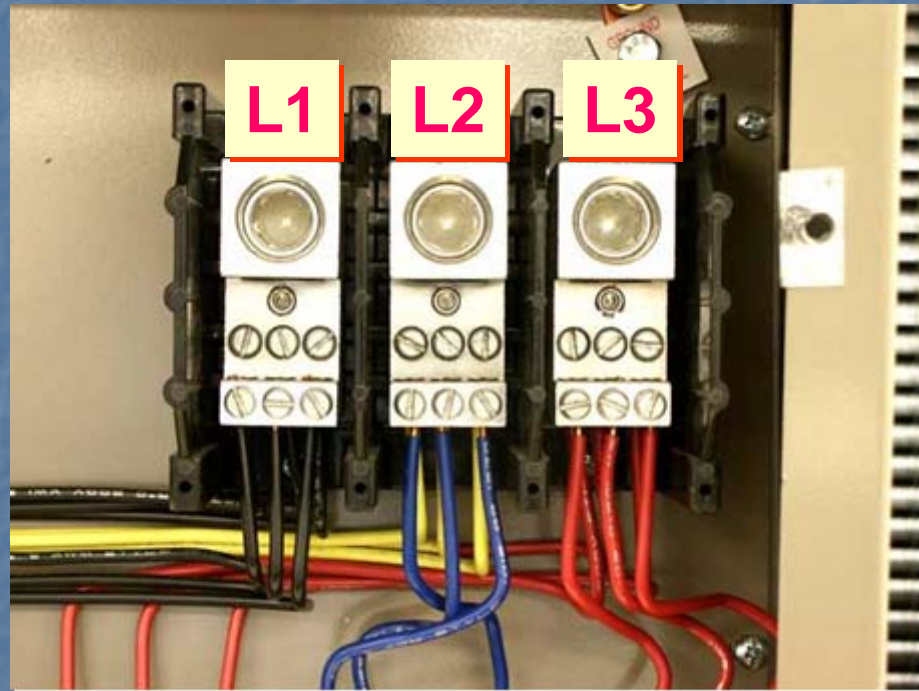
The internal load wiring differs on DRE and DVE models.

Blue and yellow wires are on L2 on DRE models.

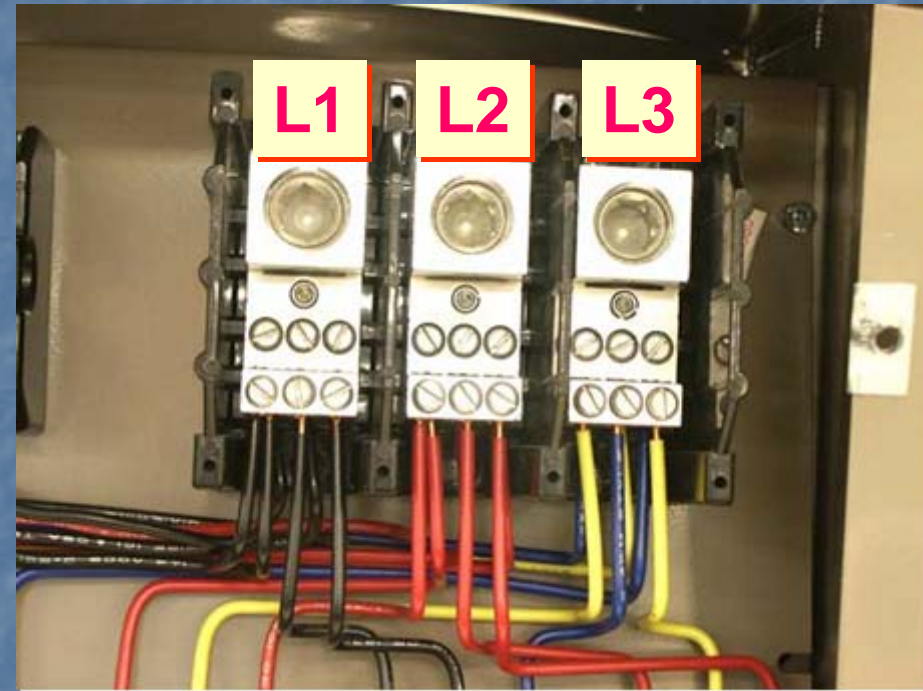
Blue and yellow wires are on L3 on DVE models.

Power Supply Phase Conversions

DRE Model - 3 Phase



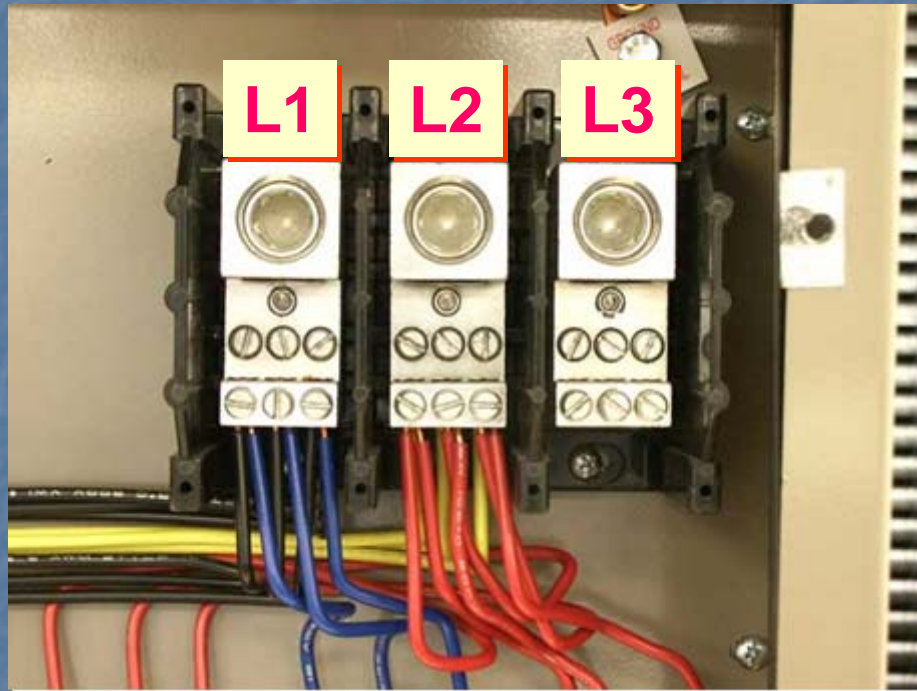
DVE Model - 3 Phase



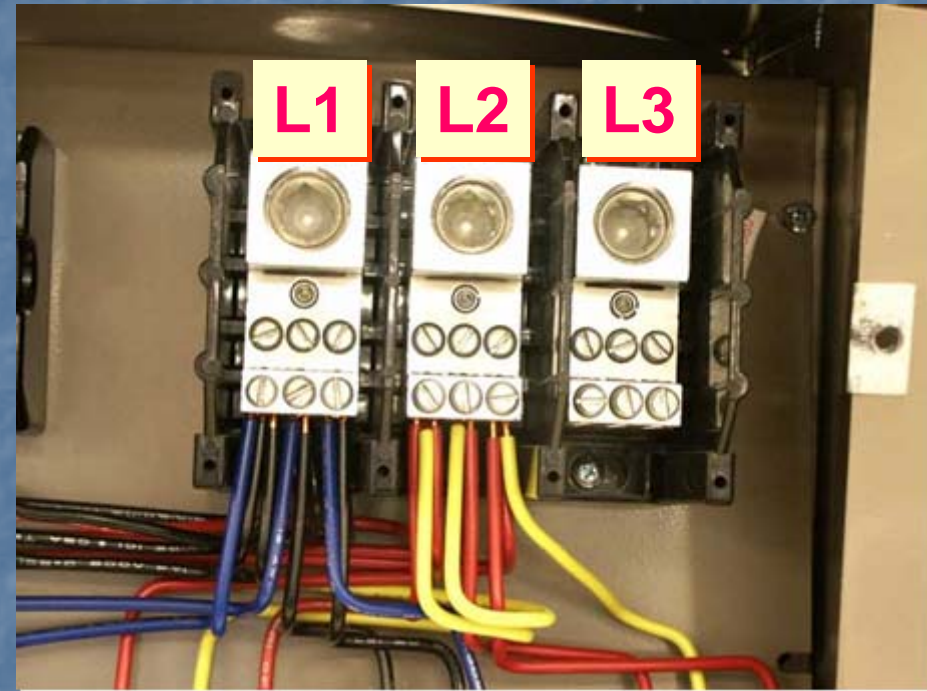
Factory Configuration

Power Supply Phase Conversions

DRE Model - Single Phase



DVE Model - Single Phase



Field Conversion to Single Phase

Black and **Blue** wires combined on L1
Red and **Yellow** wires combined on L2



SUMMARY QUESTIONS

1. Field conversions on the DRE/DVE models can only be performed in a certified UL facility.

True

False

2. The DRE/DVE models are available with kW input ranges between:

6 to 81 kW

9 to 54 kW

6 to 54 kW



SUMMARY QUESTIONS

3. DRE 50 gallon, 9 element models with the one exception of a 208 volt 36 kW model are not available with surface mount thermostats.

True

False

4. 208 volt 54 kW models are available in single phase only, no field conversions are allowed on this special construction model.

True

False

**208 volt 54 kW are available in 3 phase only
(no field conversions allowed)**



SUMMARY QUESTIONS

5. It is critically important to make the appropriate wiring tap change to the transformer on DVE models when field voltage conversions are performed. Give two examples of what can happen if this is not done.

Contactor chattering

Contactor failure

Repeated transformer fuse failures

Transformer failure



SUMMARY QUESTIONS

6. 208/240 volt models can be converted to 480 volts.

True

False

7. Voltage conversions on DRE (surface thermostats) models merely requires installing the new heating elements.

True

False



SUMMARY QUESTIONS

8. Voltage conversions on DVE (immersion thermostat) models will “always” include a wiring change on the primary side of the transformer.

True

False

9. Converting a 480 volt water heater to 240 volts will:

Increase the amp draw

Decrease the amp draw

SUMMARY QUESTIONS

10. Three things must be known about a DRE/DVE water heater to determine what conversion kits are available in the instruction manual. Which of the following is not one of the three?

Rated amp draw

Rated voltage

Tank size

Number of heating elements

Determine the:

- 1. Tank size**
- 2. Number of elements**
- 3. Factory voltage**

Turn to the page that matches tank size and number of elements.

Use the table on that page that matches the factory voltage rating of the water heater.