



# Service Training Agenda

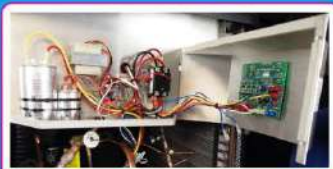
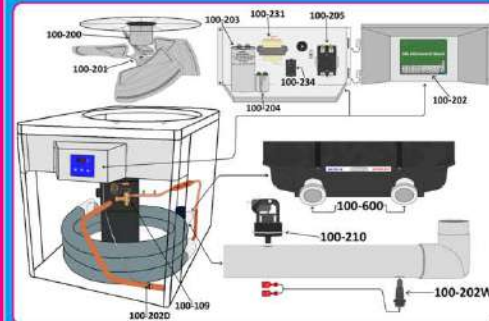
**AquaComfort**   
TECHNOLOGIES, LLC



*Signature Heat*



**AquaComfort**  
HEAT PUMPS



**AquaComfort**  
TECHNOLOGIES, LLC



### How a Heat Pump Operates



No Harmful CO<sub>2</sub> Emissions.  
A typical gas heater will produce 18,000 lbs CO<sub>2</sub> each year.

Built Better to Last Longer.

The Total Comfort Heat Cool System.  
Heat When It's Cold, Cool When It's Hot.  
Gas Heaters Can't Do This.

Lowest Temperature Performance.  
More Heat When You Need It Most.  
Works effectively down to 40°.

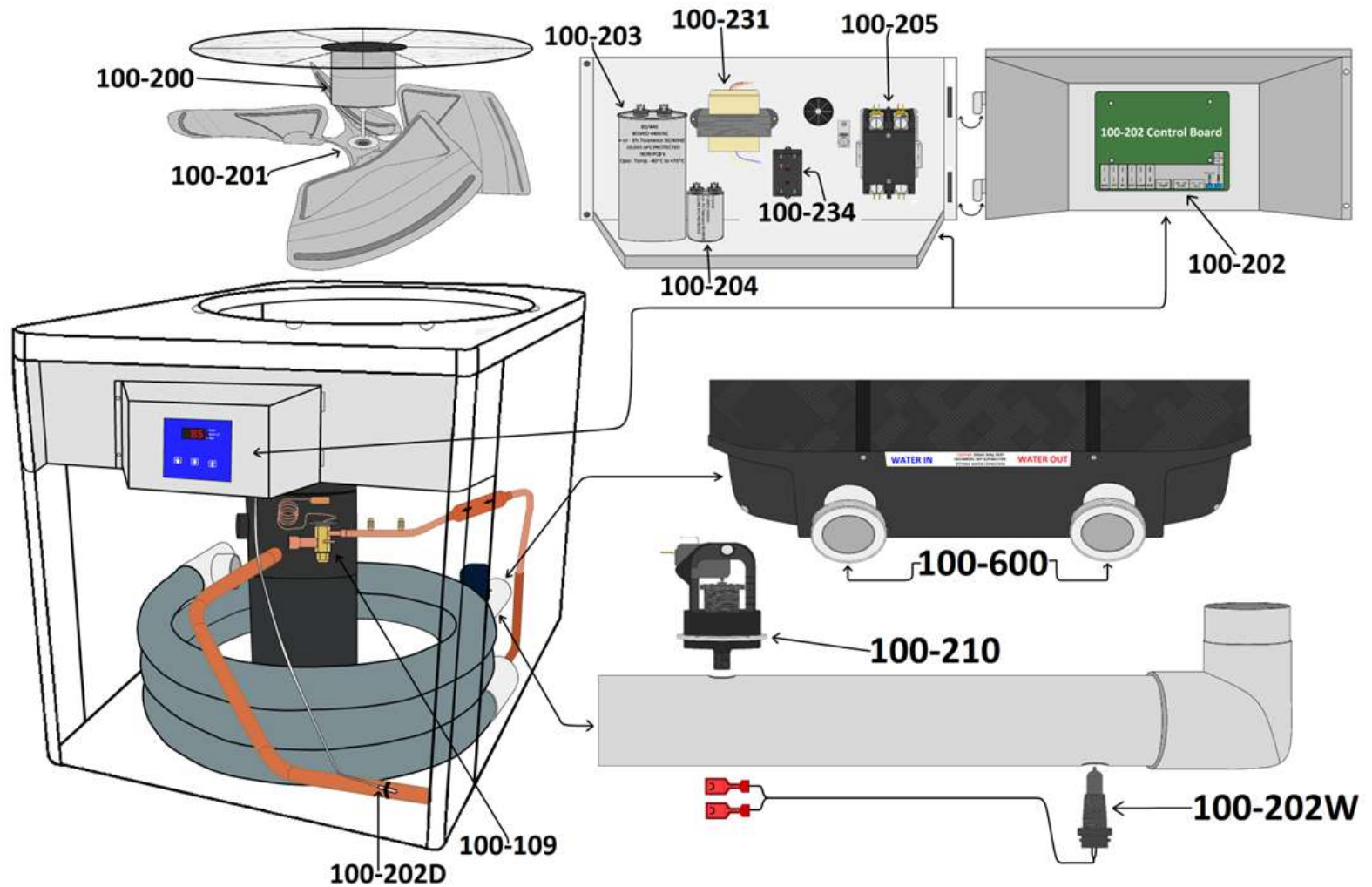




# Maintenance Check List

- Inspect the outer coil for dirt or debris
- Inspect the Heat pump cabinet for dirt or oxidation on the cabinet
- Inspect the fan blade to ensure clearance around the fan shroud and components below the fan blade to ensure it isn't rubbing against or hitting anything.
  - Inspect the condensate pan for dirt and debris
- Inspect the area surrounding the heatpump for objects that may be obstructing airflow to the outer coil.
  - Inspect around the unit for erosion.
  - Inspect surrounding area for threats to heatpump functionality
- Run test the unit for a minimum of 20 minutes to insure proper operation.
  - Make sure both the fan and compressor start
  - Check for cooler air blowing out of the top of the unit.
    - Check for condensation
  - Check for the correct water temperature displayed on the unit.







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**Warning! Disconnect power to heat pump before performing service on our heat pumps**

## **Topics that will be covered :**

- *What makes AquaComfort the best?*
  - *How a heat pump works*
- *Tools needed for servicing a Heatpump*
- *Benefits of being trained to service an Aqua Comfort Heat pump*
- *Troubleshooting Error Codes / Causes and Solutions*





- Made in the USA
- New Haven Connecticut
- TUV certified the German Standard of excellence in manufacturing
- Veteran hiring preference

# AquaComfort's Titanium Heat Exchanger Technology



The Picture on the **left** is a Titanium Heat Exchanger used in another manufactures heat pump. This Design is Called a Tub and Tube design and is less Efficient Than the design you see in the Pictures on the top and bottom **right**. This is because AquaComfort has designed a spiraled titanium Heat Exchanger that has the same Robust Qualities as the traditional Titanium heat exchangers but is far more efficient

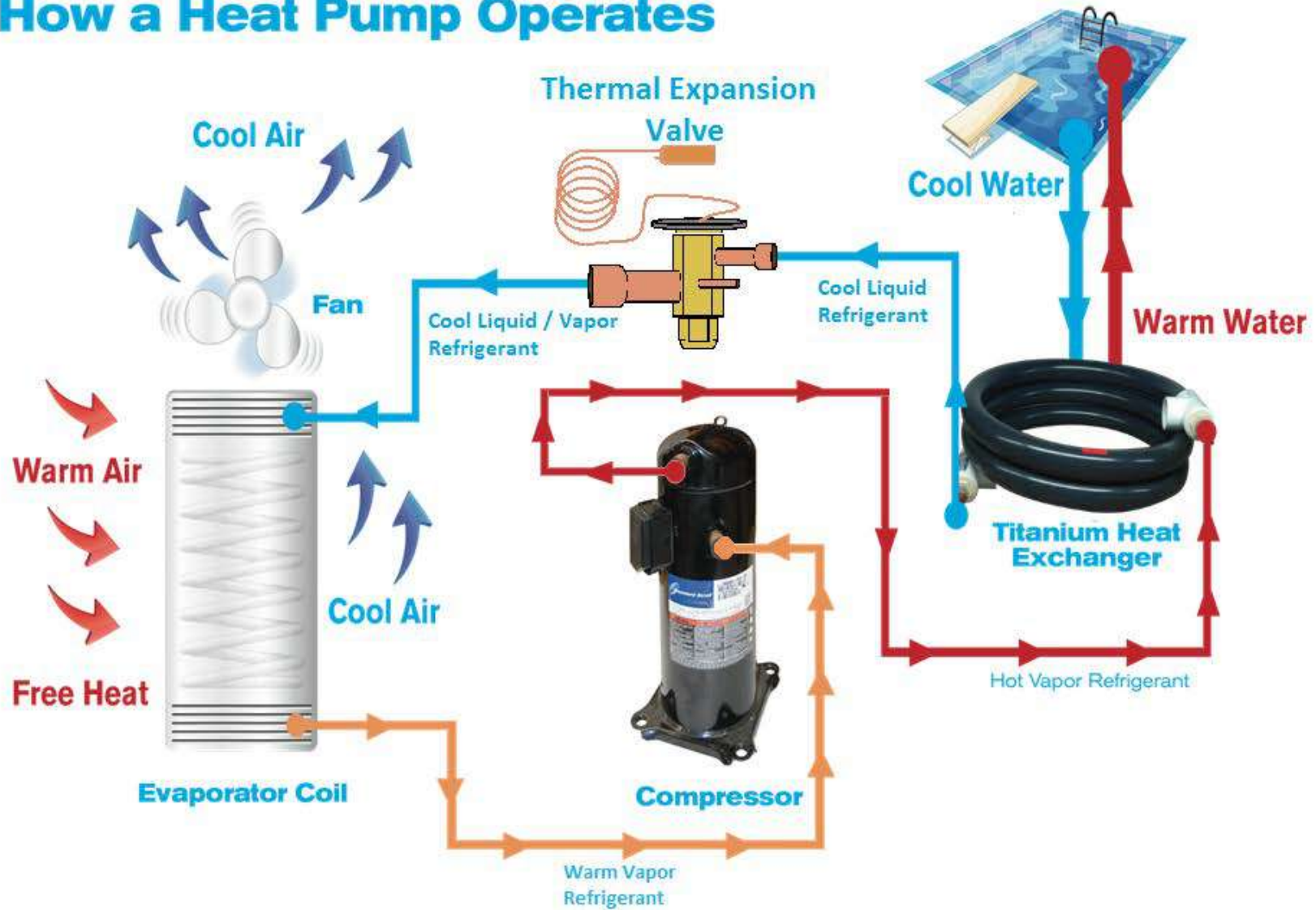


- Our Heat Exchanger allows for more surface area per inch of the heat exchanger and it also causes a “turbulence” effect with the water which removes scaling that may occur from poor water chemistry. The heat exchanger is easier to winterize and also allows for more space in the heat pump for service





# How a Heat Pump Operates



# Tools Recommended for Servicing An AquaComfort Heatpump

- Flat Head Screwdriver
- Phillips Head Screwdriver
- 5/16" Nut Driver
- 1/4" Nut driver
- OR 5-in-1 screwdriver tool

- Small Needle Nose Pliers
- Wire Strippers
- Wire Crimpers
- Large Channel lock Pliers
- Small Channel Lock Pliers



- Medium size Adjustable Wrench
- Refrigeration Service wrench
- Multi-meter capable of Measuring Volts, Ohms, Amps, and Microfarad's
- Teflon tape
- 8 inch and 4 inch zip ties



# Error Code: FLO

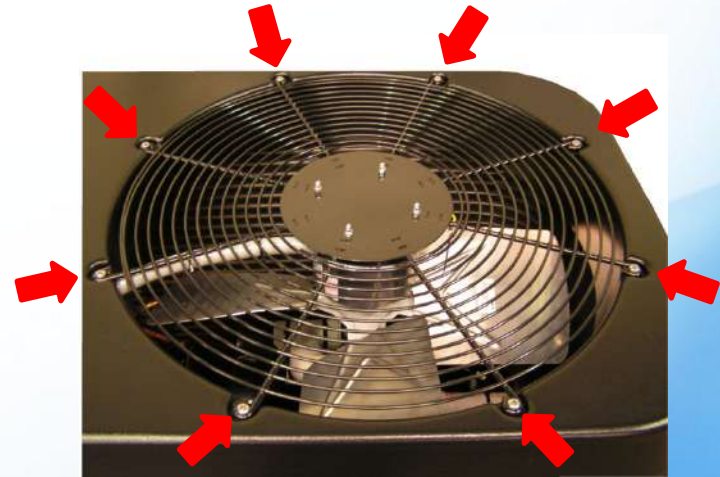
The “FLO” Error code is an indication that the control board is reading an open circuit from the water pressure switch. The Causes of this are the following:



- The filter pump has shut off and now the heatpump is no longer getting water flow.
- The Pool Filter is dirty and needs to be cleaned causing the Heat pump to not get the proper water pressure to activate the water pressure switch.

- The water pressure switch may be bad and will need to be replaced

# Water Pressure switch Access

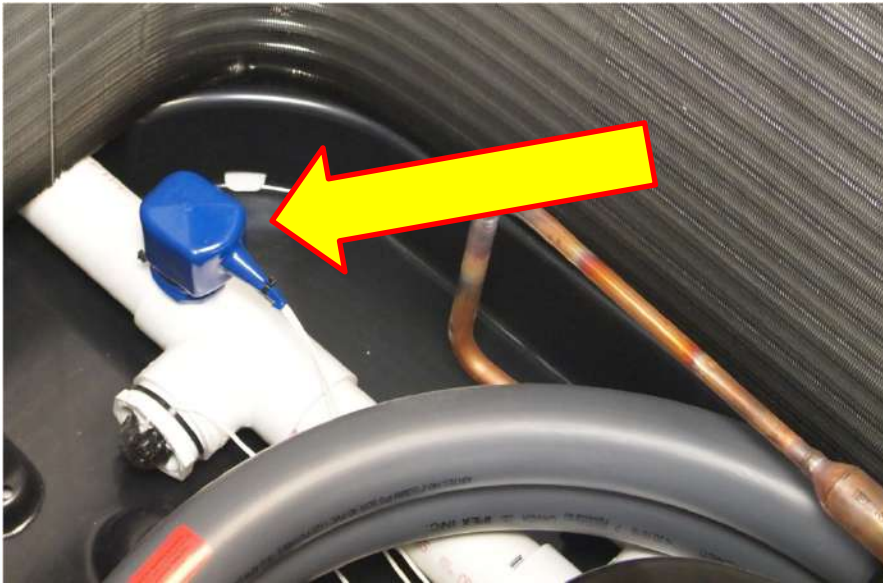


**Warning! Disconnect power to heat pump before performing this operation.**



# Water Pressure switch Replacement

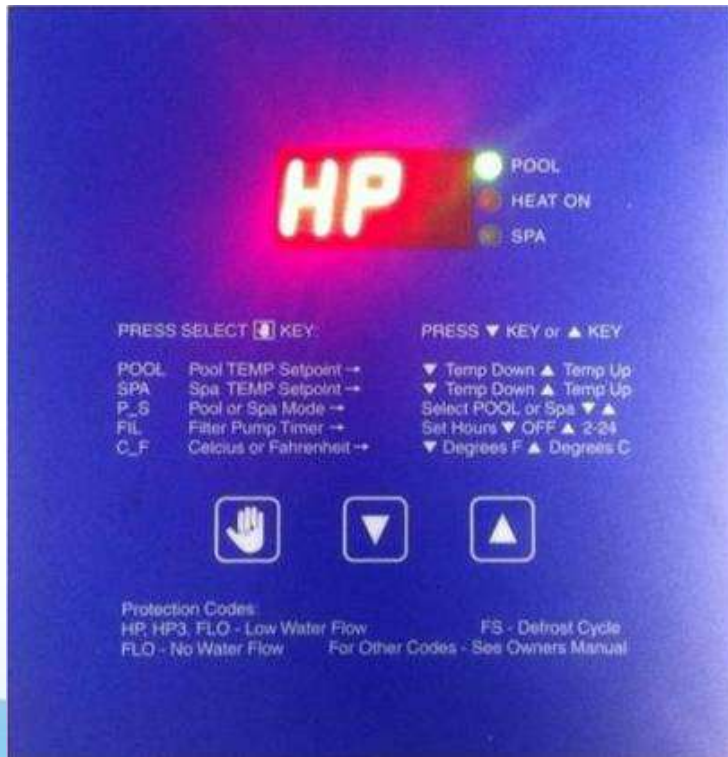
Part # (100-210)



- First Remove the blue rubber boot so that you can thread the flow switch out and remove the two wires connected to it.
- Next, Once the wires are removed from the old water Pressure switch, put Teflon tape on the threads for the new water pressure switch and thread it into the plumbing. Be sure not to over tighten it.

Next, turn on the filter pump to check for leaks. Once you have determined that there are no leaks, connect the wires to the water pressure switch and place the fan guard back in its proper position. Secure the fan guard down with only two of the Eight screws and test the heat pumps operation. If the heat pump is operating properly, put the remaining screws back on the fan guard. To test the flow switch, turn the filter pump off. The heat pump should shut off and read "FL0". If it does not , than you may have to adjust the dial on the water pressure switch.

# Refrigerant Related Error Codes



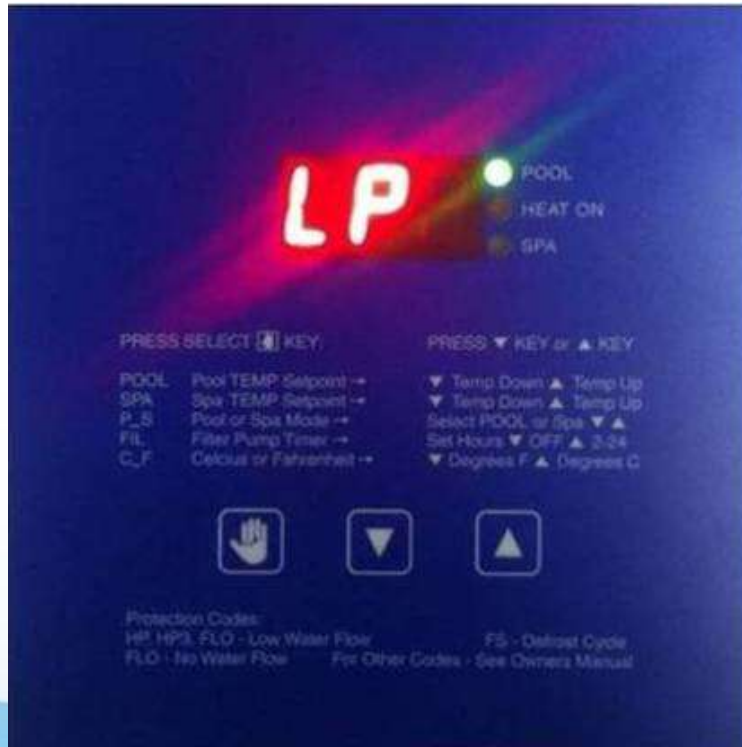
## Causes of an “HP” Error Code

- Insufficient Water Flow caused by dirty filter, or By-pass Valve open
- Water Pressure Switch not working properly
- Heat pump is installed below grade ( 5 foot or more below pool water surface )
- Refrigerant related issue
- Bad “HP” pressure switch ( not likely )



# Refrigerant Related Error Codes Cont.

## Causes of an “LP” Error Code



- Ambient Air Temperature below 40 degrees F
- Insufficient air flow caused by Fan motor not running, bush's or other debris blocking airflow to heater, or structure has been built around heat pump
- Defrost sensor not working properly

- Unit is low on refrigerant due to external or internal leak such as a Flooded heat exchanger
- Bad “LP” Pressure switch ( Not Likely )



# Refrigerant Pressure Switch locations

Remove the bottom two screws on the left and right side of the Front Panel as indicated below to gain access to the inside of the Heatpump



**Warning! Always Disconnect power to heat pump before performing this operation.**

# Refrigerant Pressure Switch locations

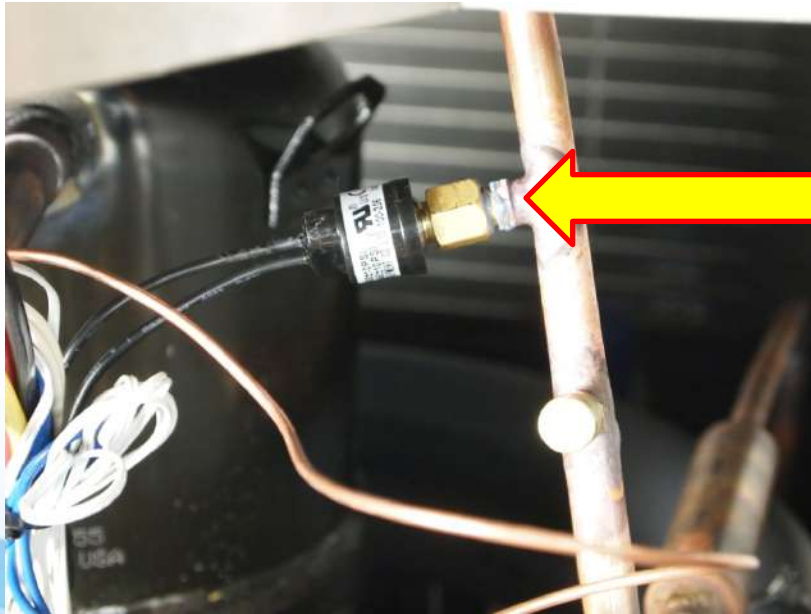
Here is a Larger view of what the unit will look like with the front Panel Removed



**Warning! Always Disconnect power to heat pump before performing this operation.**

# Refrigerant Pressure Switch locations

The High Pressure switch is on the smaller diameter Copper tubing, and the Low Pressure Switch is on the Larger diameter Copper tubing.



High Pressure Switch



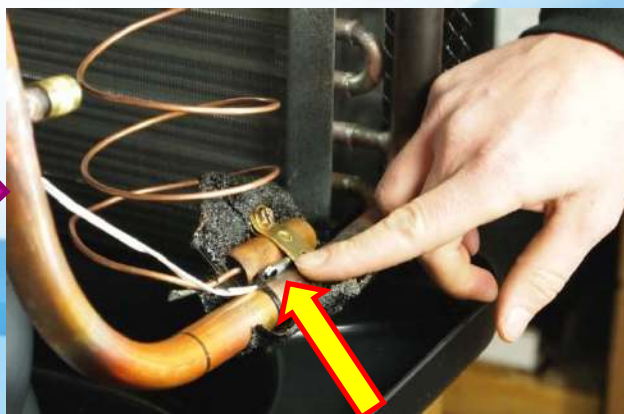
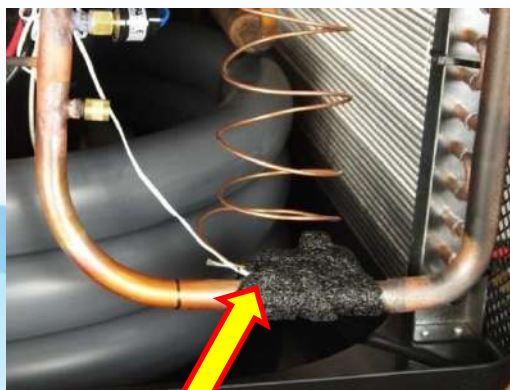
Low Pressure Switch



# Defrost Sensor

## Part # (100-202D)

The Defrost Sensor controls when the unit shuts off due to ice build up. Our units will begin to build up frost between 45 – 50 degrees ambient air temperature and this frost is normal and will not damage the unit. However when the unit builds up too much frost , the ice will begin to block the air flowing across the evaporator coil and the coil temperature will drop eventually causing the defrost sensor to shut the unit off, Display “DEF” on the display and allow it the unit defrost some of the ice it has built up. If the unit is shutting off on defrost in temperatures above 50 degrees , especially in temperatures well above 60 degrees , the unit may have a bad defrost sensor or There could be something around the unit causing it to not get proper airflow. The Error Codes related to a bad defrost sensor are “ESO” for Evap sensor open or “ESS” for evap sensor closed

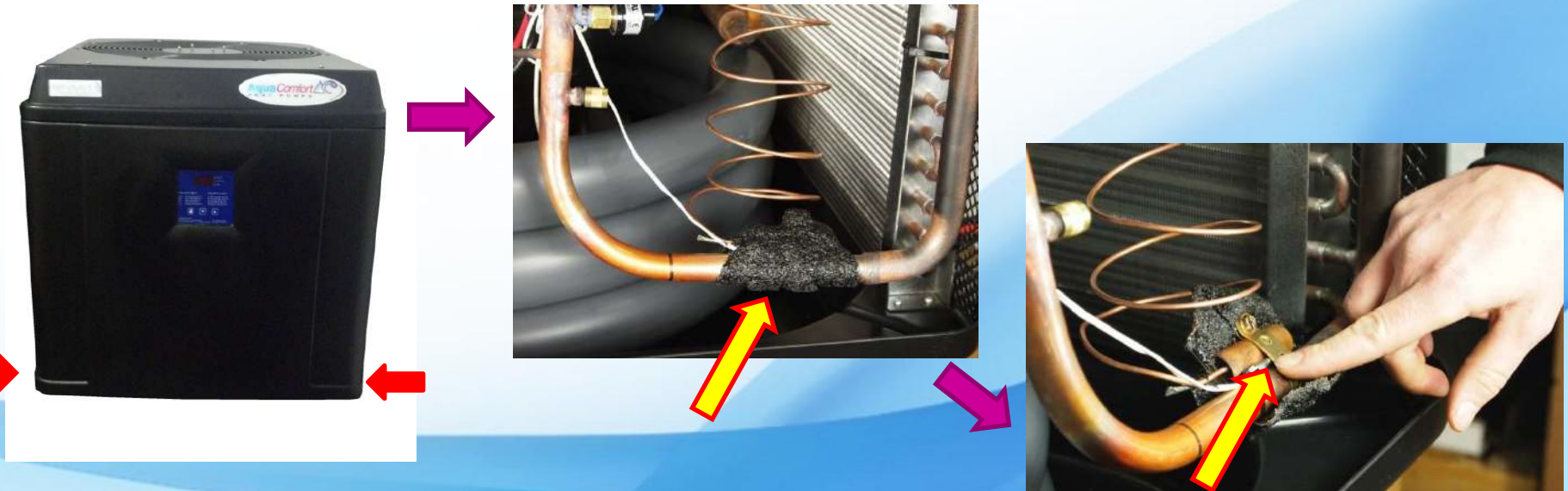


**Warning!** Always Disconnect power to heat pump before performing this operation.

# Defrost Sensor

## Part # (100-202D)

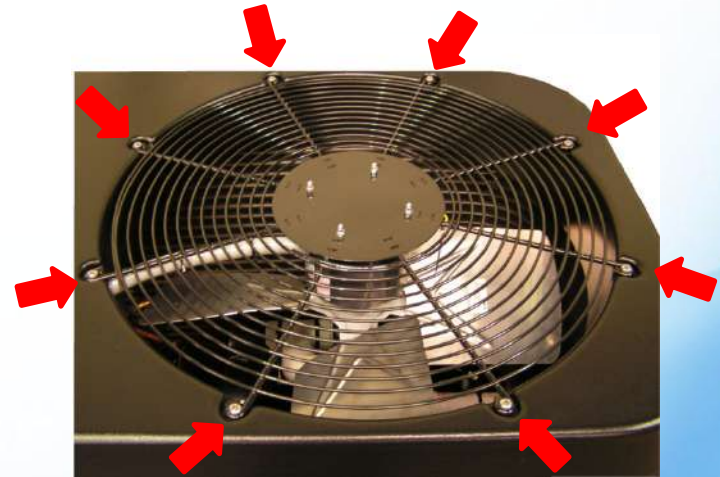
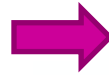
Remove the bottom left and right screws to pull the front panel off and gain access to the inside of the heatpump. The defrost sensor will be mounted on the bottom right hand corner on the copper pipe. To replace it, carefully remove the Cork Tape ( Black Tar ) and unscrew the clamp that is holding it in place, replace the sensor and hand tighten the clamp and be sure to completely cover it back up with the cork tape.



**Warning! Always Disconnect power to heat pump before performing this operation.**



# Water Temperature Sensor

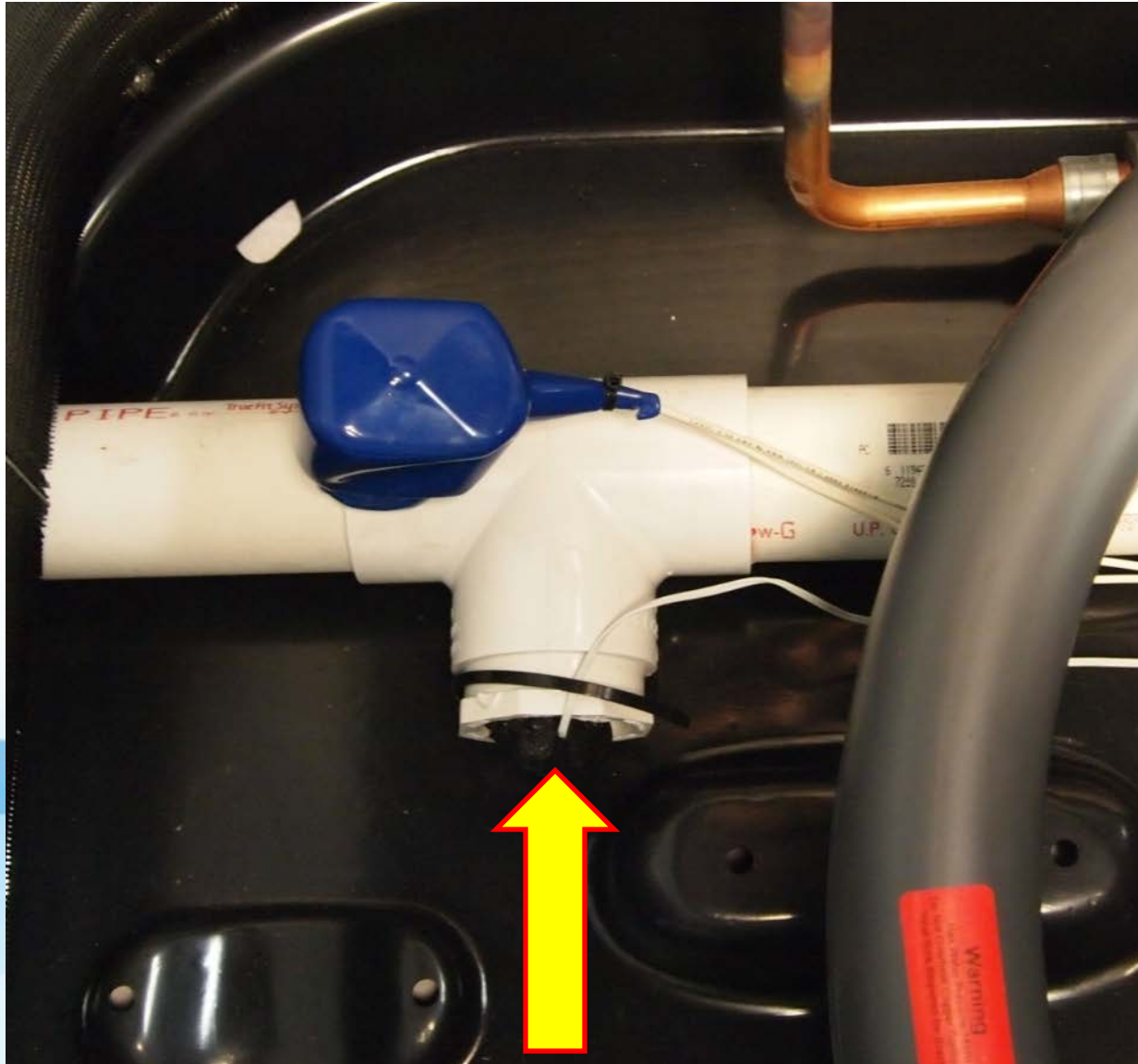


**Warning! Always Disconnect power to heat pump before performing this operation.**



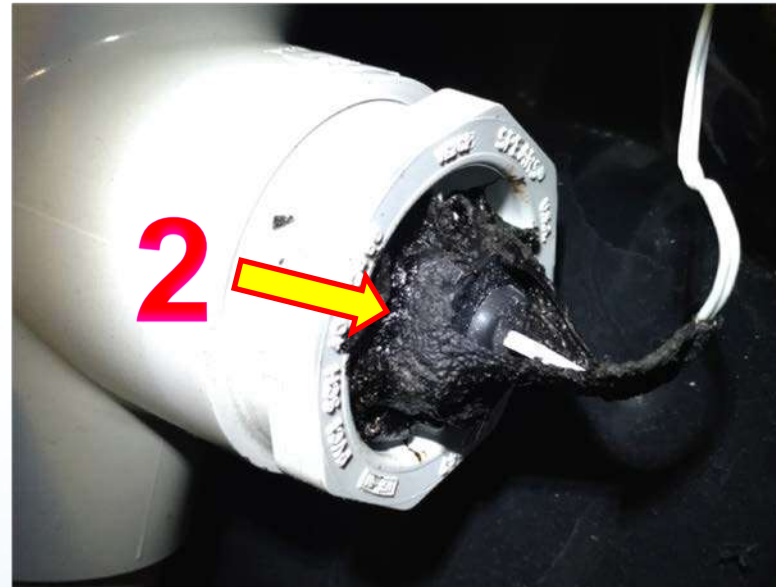
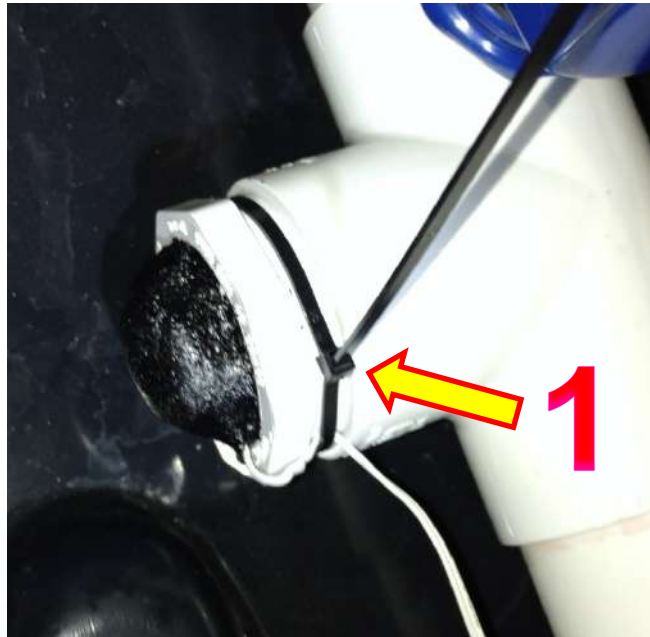
# Water Temperature Sensor

## Part # 100-202D



# Water Temperature Sensor

Part # 100-202D



1. Cut the Zip Tie that is holding the temp sensor.
2. Remove the insulation material called Cork Tape. Try to remove it in a way that will Allow you to Re-use the cork tape. Otherwise you will need a new piece of cork tape

**Warning! Always Disconnect power to heat pump before performing this operation.**

# Water Temperature Sensor

**Part # 100-202D**



**4** Part # 100-605

Part # 100-202D **3**

3. Remove the 100-202D sensor from the 100-605 temperature well

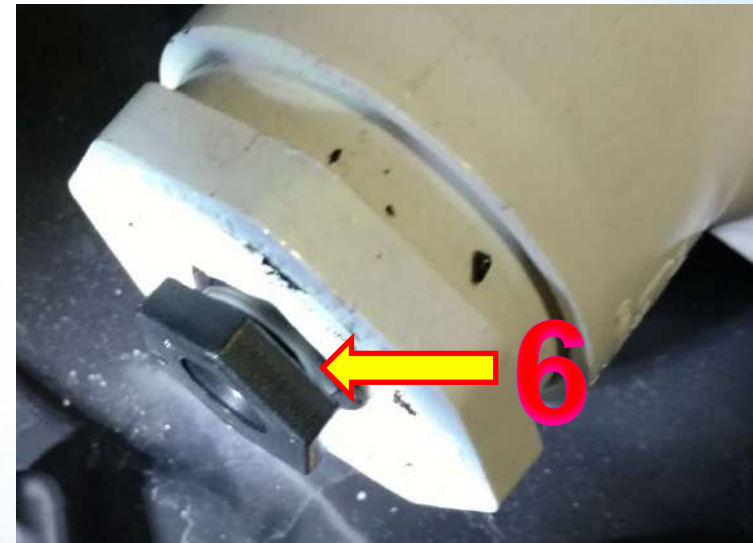
4. Remove the 100-605 Temperature well from the PVC threaded bushing using an adjustable wrench

**Warning! Always Disconnect power to heat pump before performing this operation.**



# Water Temperature Sensor

## Part # 100-202D

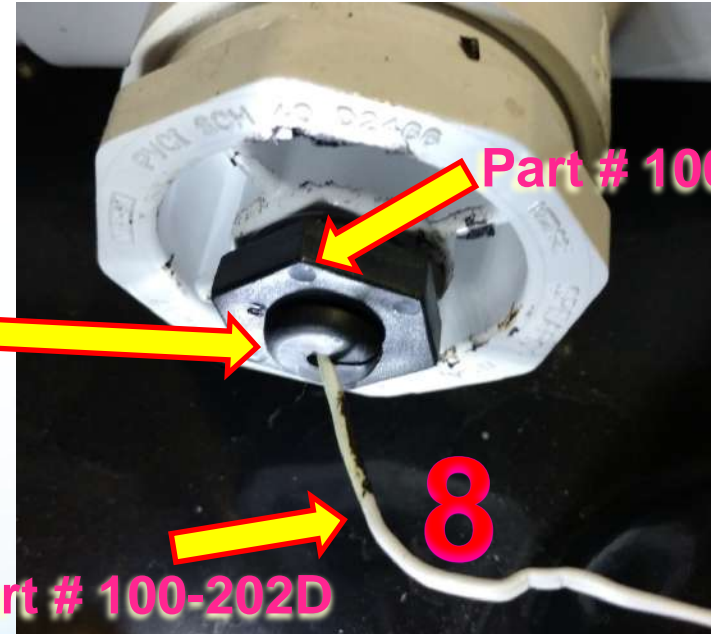
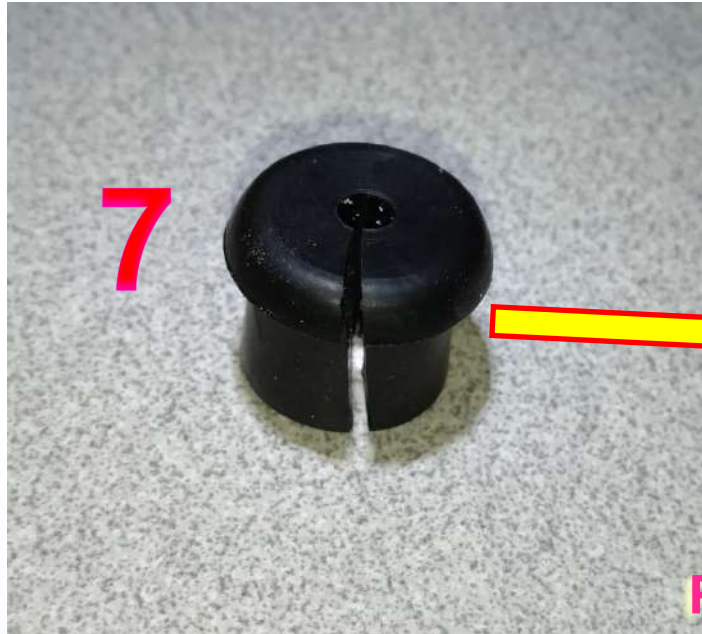


5. Wrap the threaded section of the 100-605 well in teflon tape in a Clockwise direction. Complete 4-5 wraps around the threading as shown pictures above.
6. Thread the well into the PVC bushing by turning it clockwise. Get the Well Hand Tight and do not overtighten it. The well does not need to go all the way flush with the PVC bushing. Shown in the picture above, the well should have some space left in between the hex head and the fitting.

**Warning! Always Disconnect power to heat pump before performing this operation.**

# Water Temperature Sensor

Part # 100-202D



Part # 100-605

Part # 100-202D

7. Place the rubber plug shown above over the new sensor approximately 4-5 inches from the probe end of the 100-202D sensor

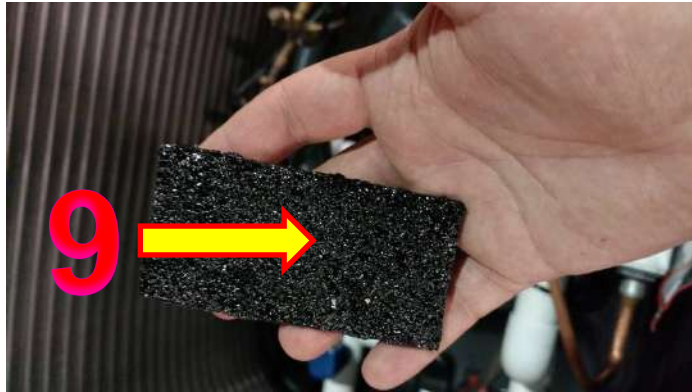
8. Insert the new 100-202D sensor with the rubber plug attached into the 100-605 temp well and slide the sensor in until the plug is firmly in place at the entrance to the 100-605 well

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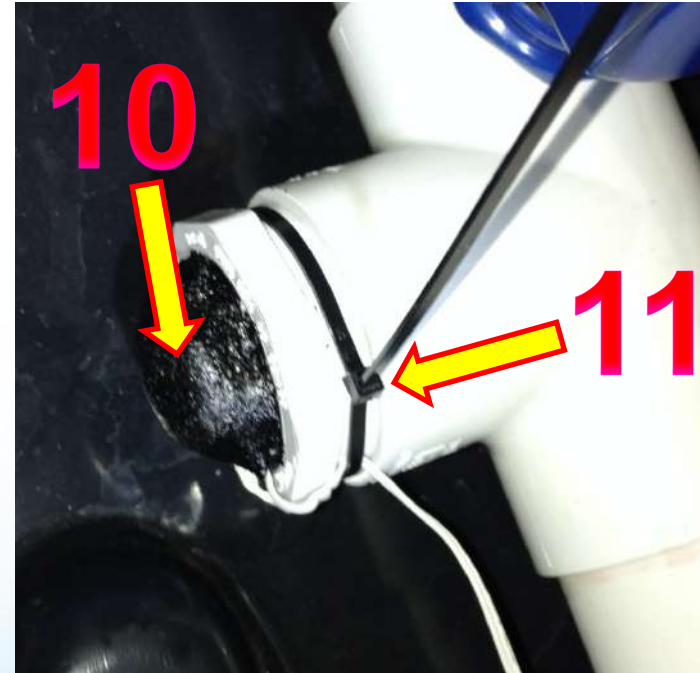


# Water Temperature Sensor

## Part # 100-202D



9. Cut a piece of Cork Insulation tape approximately 4 inches long like the picture shown above.



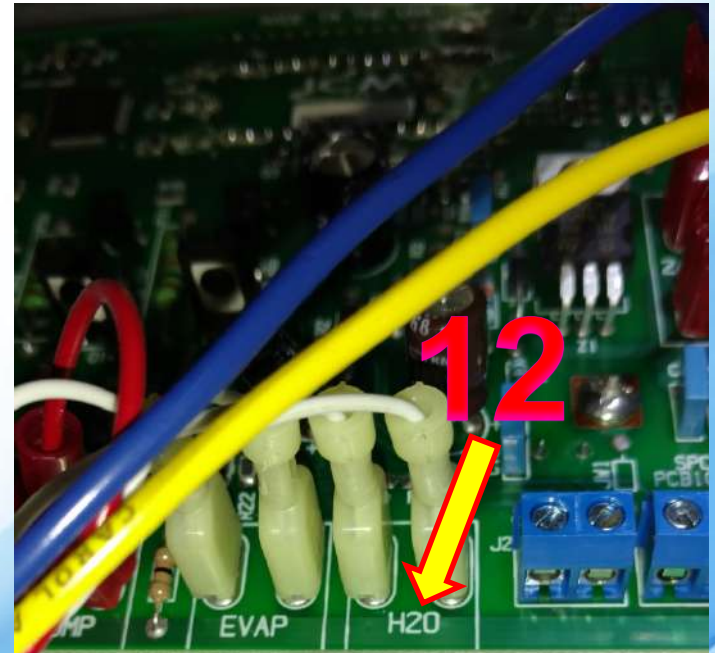
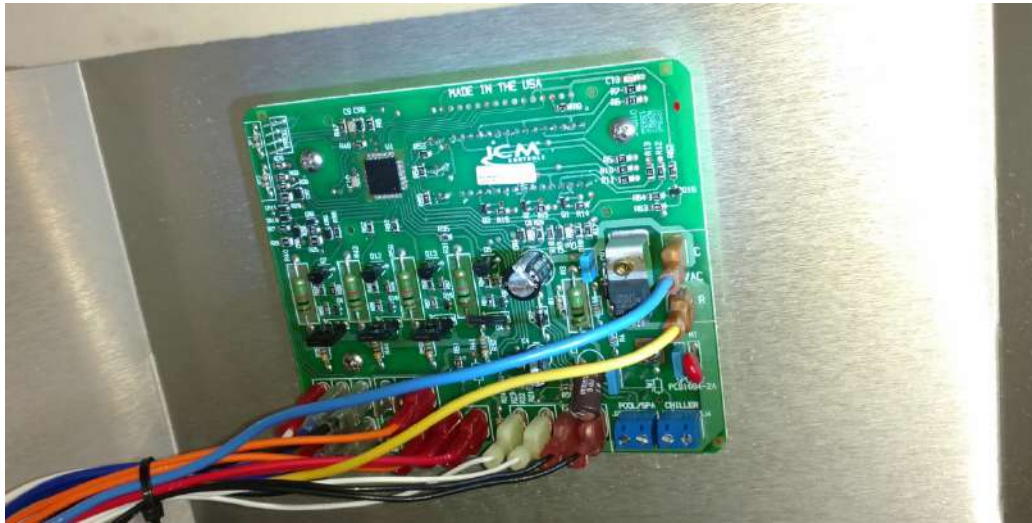
10. Peel the paper off the cork tape and Use the paper to apply the cork tape to the top of the temperature well. Make sure to push out any air pockets or loose sections so that it looks like the picture above.

11. Use a 14 inch zip tie to secure the 100-202D sensor to the PVC tee as shown in the picture. Tighten the zip tie just tight enough to stay in place and then cut the excess plastic end off.

**Warning! Always Disconnect power to heat pump before performing this operation.**

# Water Temperature Sensor

## Part # 100-202D



12. Run the 100-202D sensor wires to the control panel and plug them into the terminals labeled “H2O” on the control board.

**Warning! Always Disconnect power to heat pump before performing this operation.**



# Control Box Components

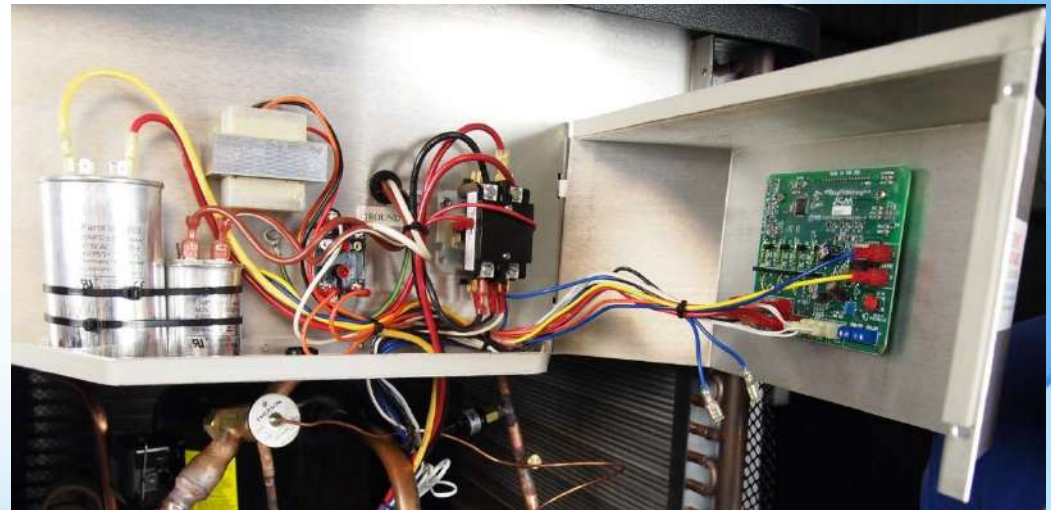
Remove the bottom left and right screws to pull the front panel off and gain access to the inside of the heatpump.



**Warning! Always Disconnect power to heat pump before performing this operation.**

# Control Box Components

Remove the two Screws indicated by the Red arrows, once removed you can now swing open the Control box door. Inside will be all of the electrical components that operate the heatpump.



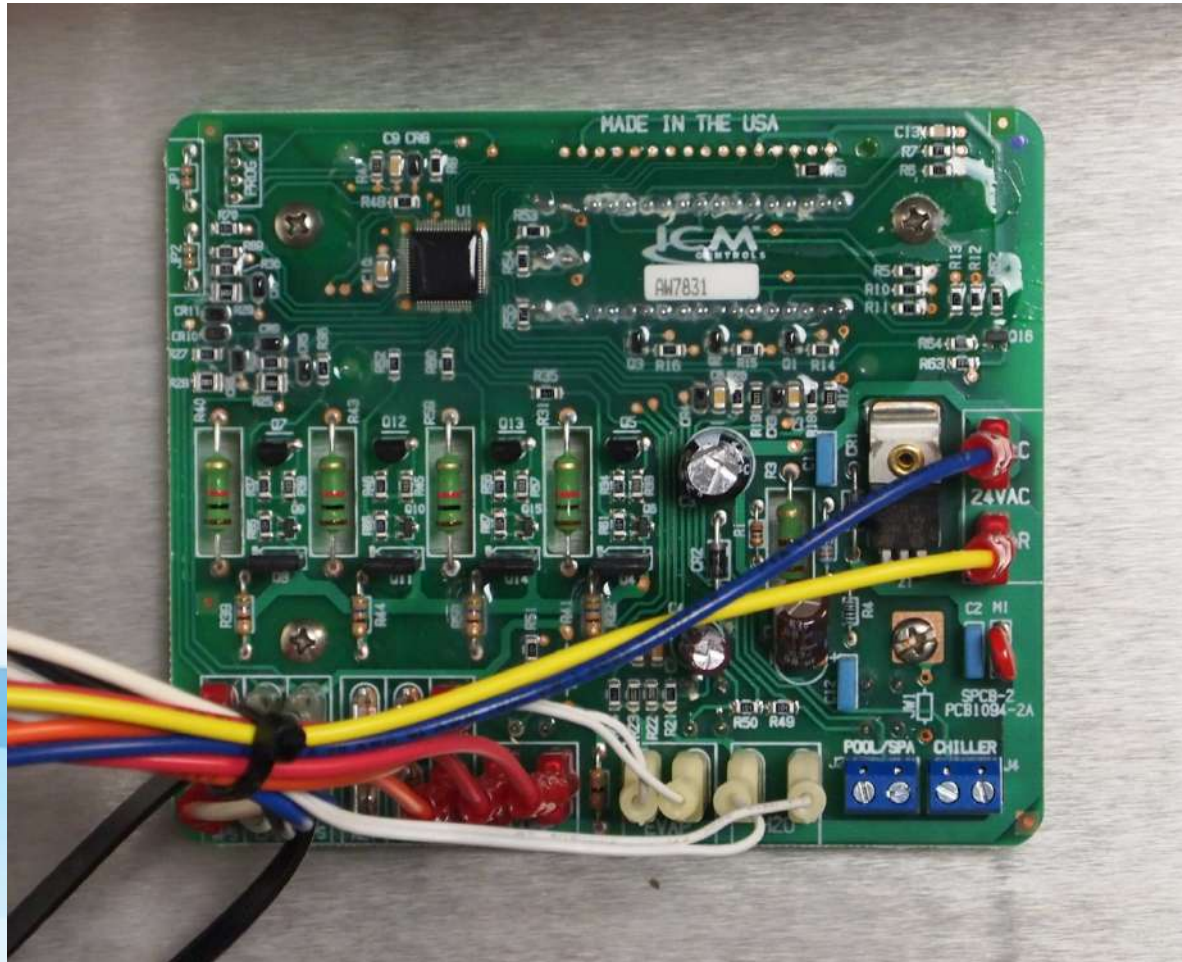
**Warning!** Always Disconnect power to heat pump before performing this operation.



# Control Box Components:

## Control Board

Part # (100-202)

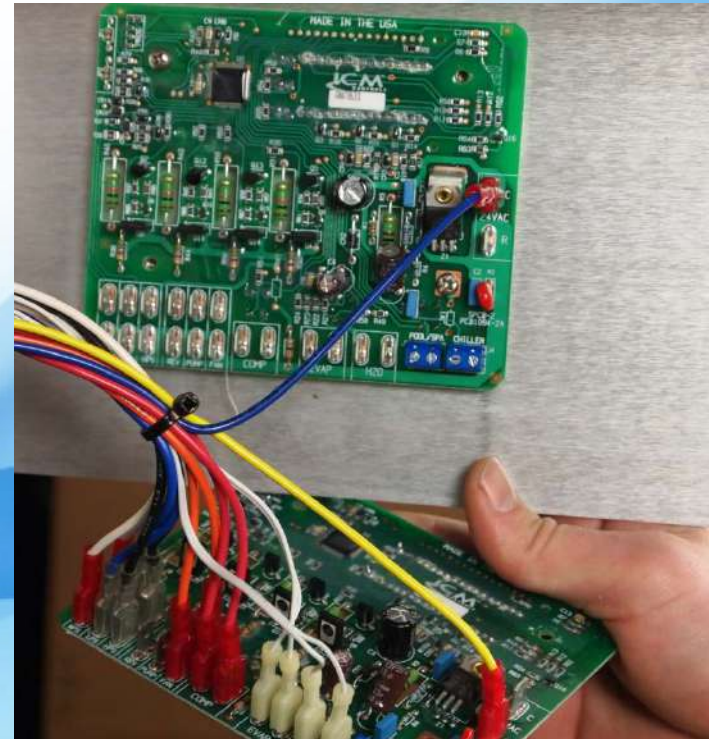
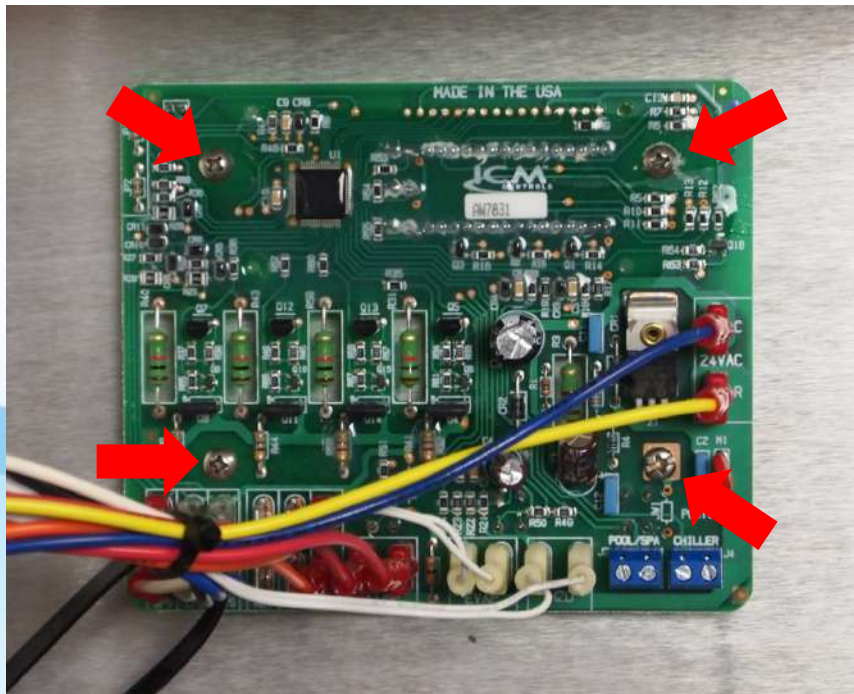




# Control Box Components:

## Control Board cont.

To Replace the control board remove the 4 screws indicated by the **Red** arrows. Then place the new board on the mount and align the holes so that you can Tight the screws back in place. Do not over tighten the screws. Next, remove each wire one by one being sure to connect to the exact same terminal it was connected to on the old board. Once done make sure the buttons are making good contact. You may need to loosen or tighten one of the mounting screws in order for the buttons to work correctly.



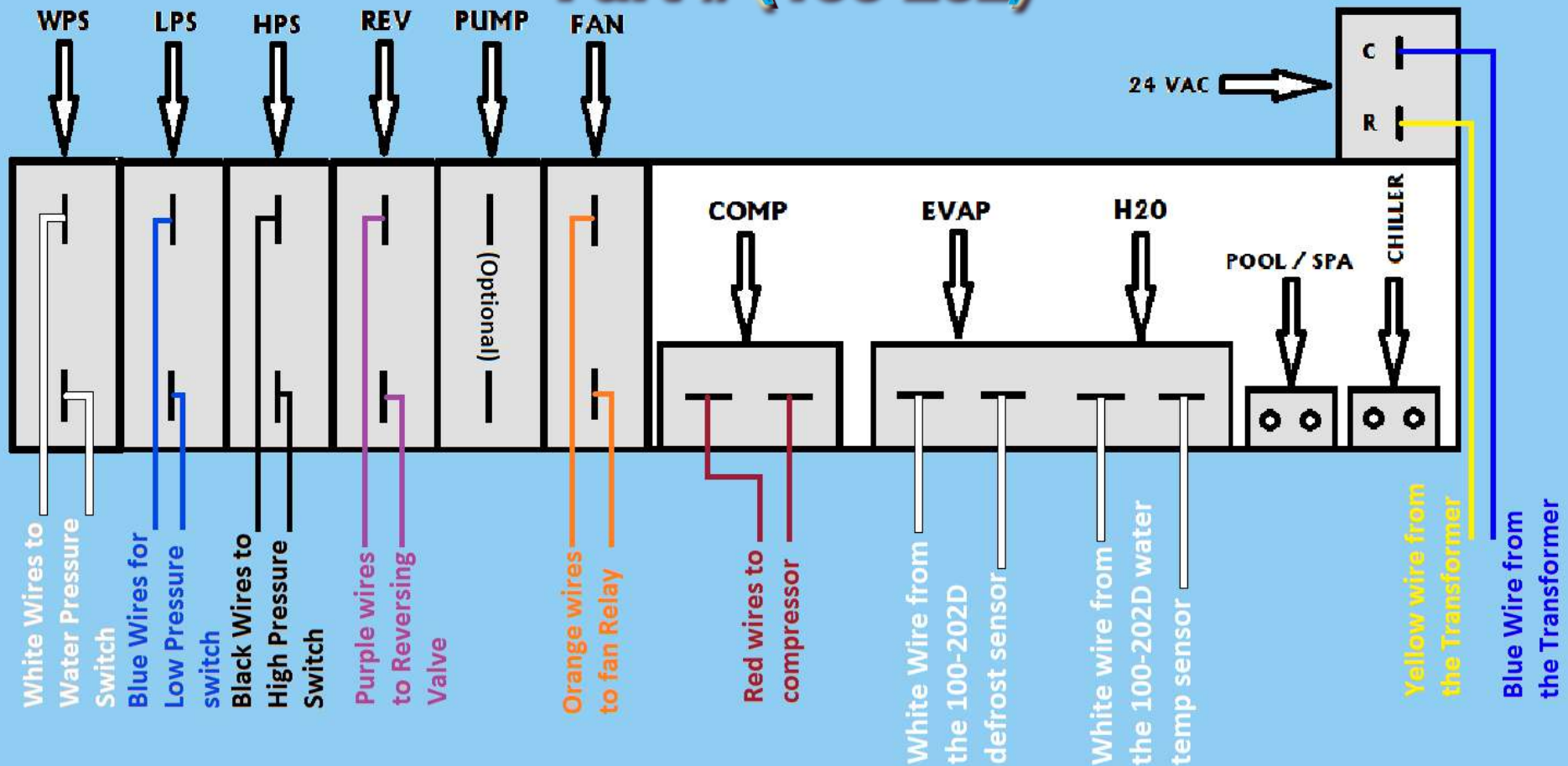
**Warning!** Always Disconnect power to heat pump before performing this operation.



# Control Box Components:

## Control Board cont.

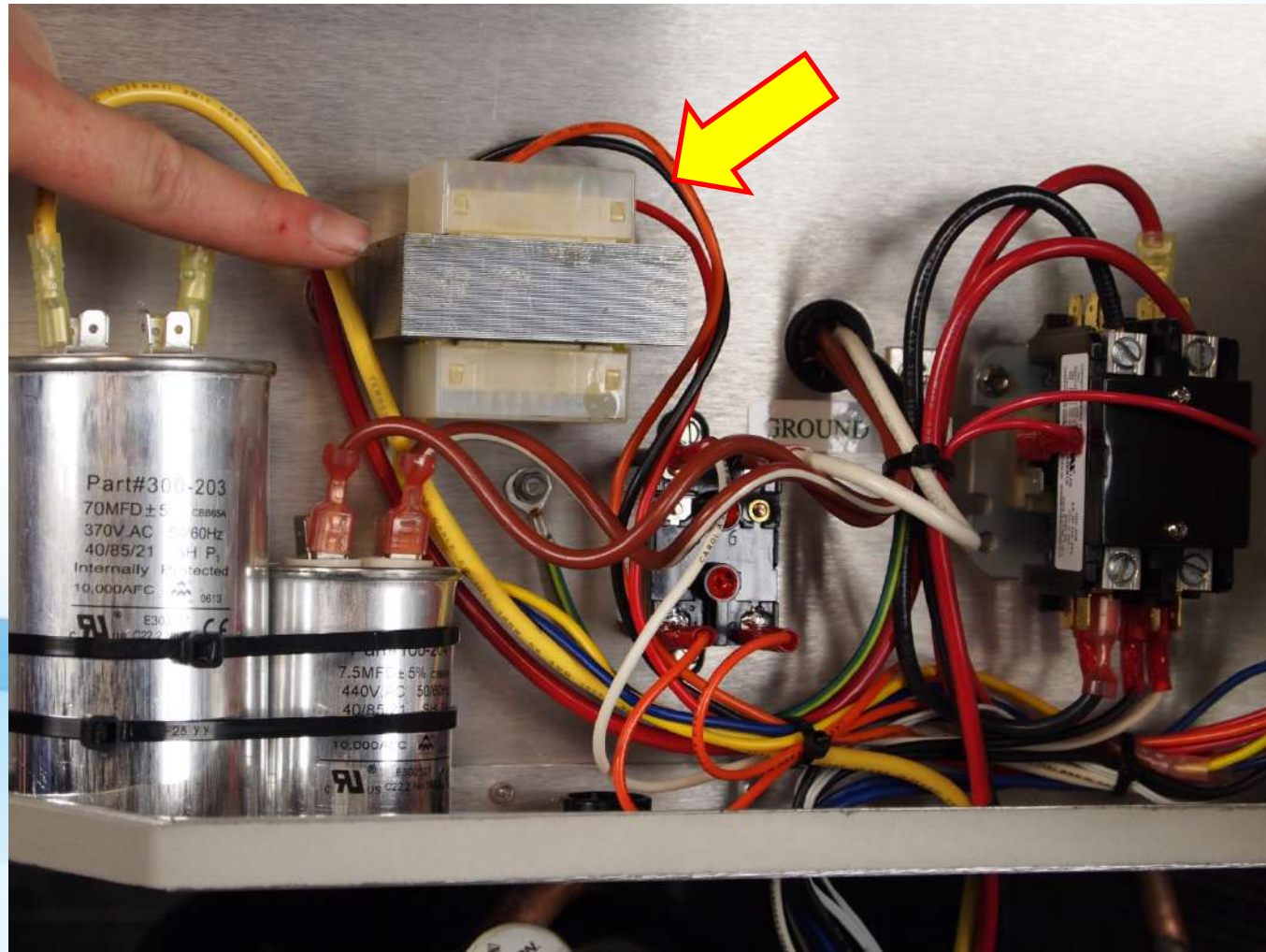
Part # (100-202)



**Warning!** Always Disconnect power to heat pump before performing this operation.

# Control Box Components: Transformer (24v)

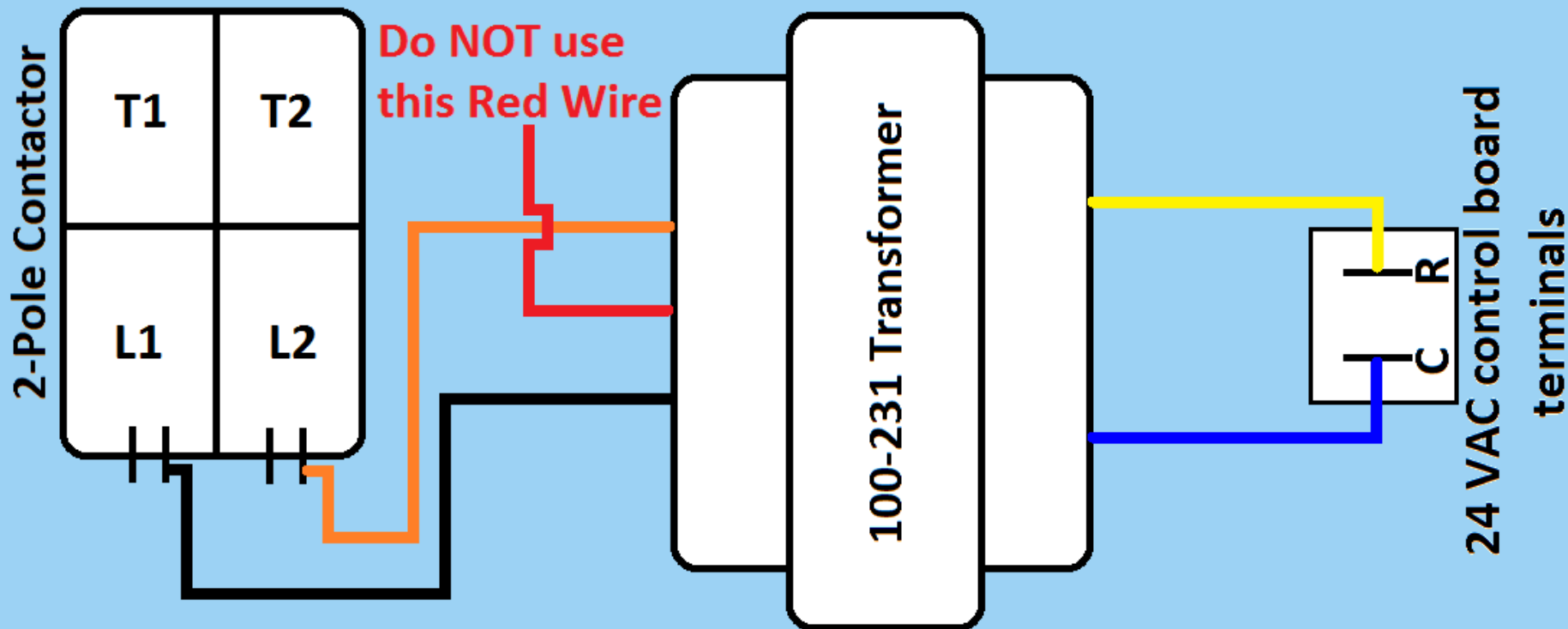
Part # (100-231)





# Control Box Components: Transformer (24v) Cont.

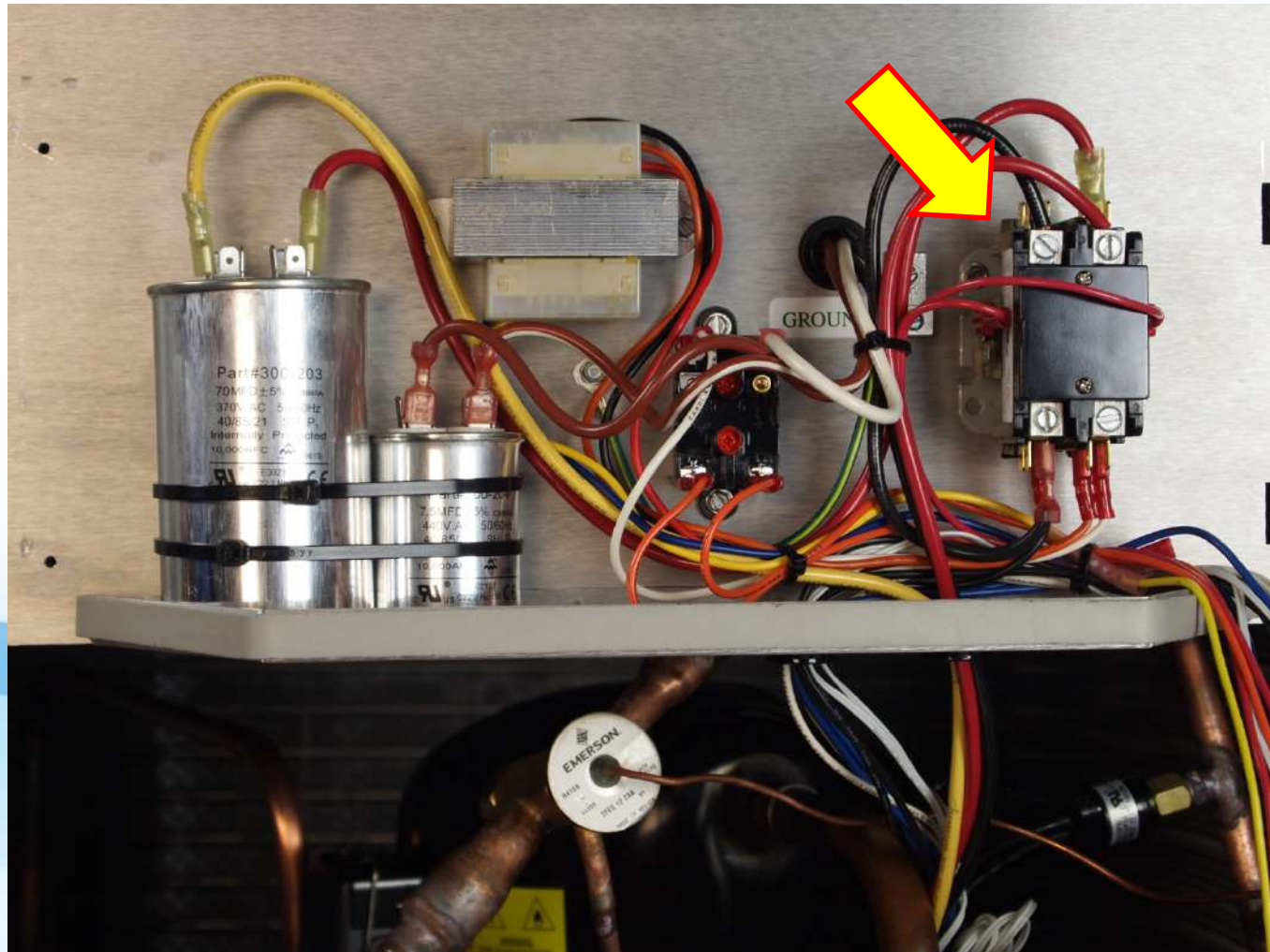
Part # (100-231)



**Warning!** Always Disconnect power to heat pump before performing this operation.

# Control Box Components: Contactor (2-pole)

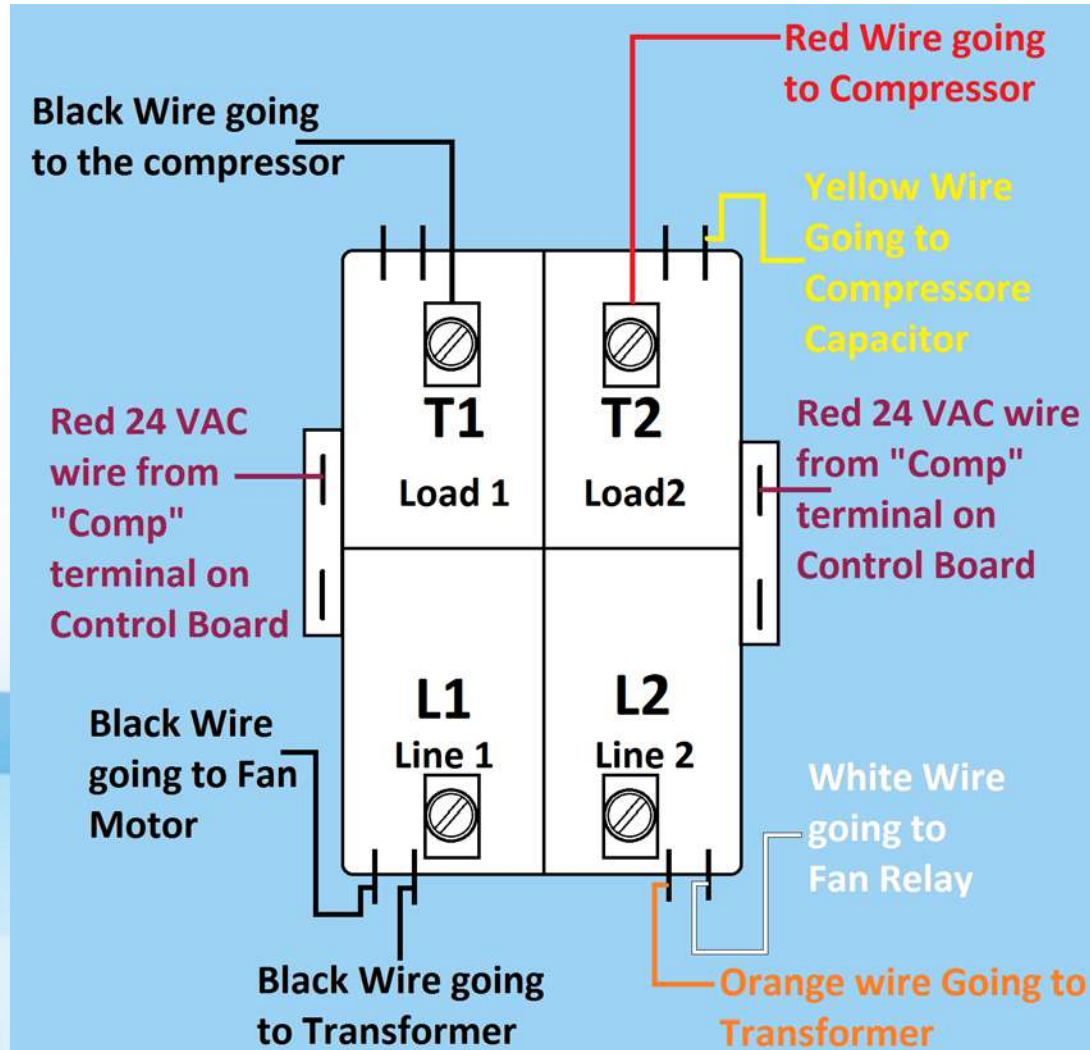
Part # (100-205)



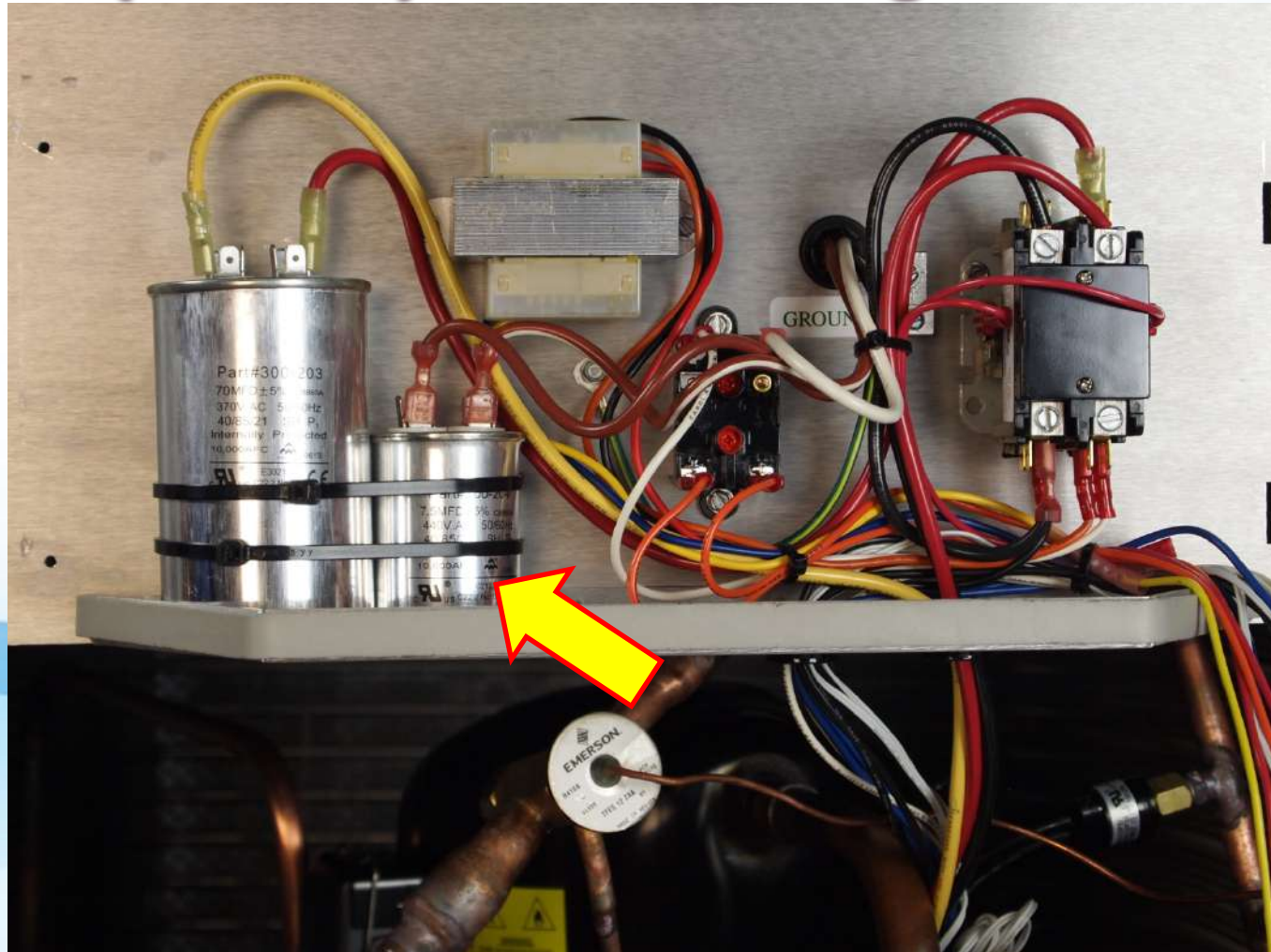


# Control Box Components: Contactor (2-pole)

Part # (100-205)



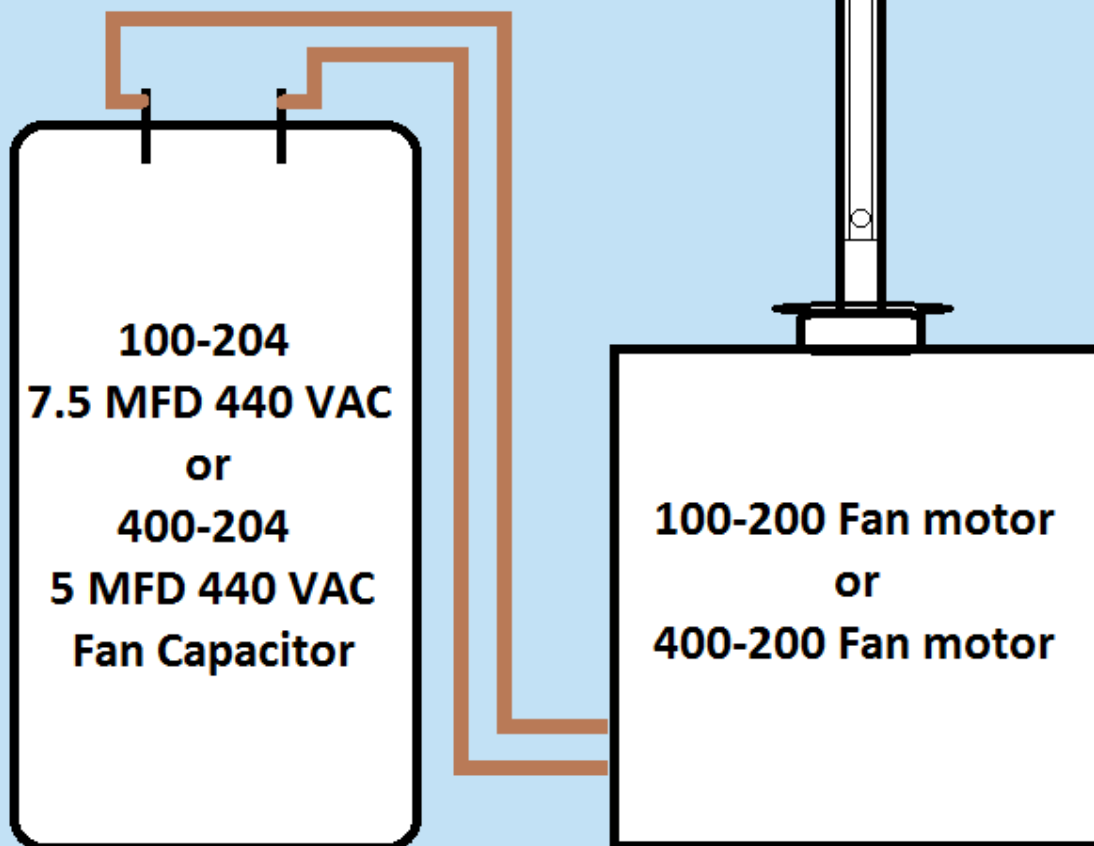
**Control Box Components:**  
**Fan Capacitor (5mfd or 7.5mfd)**  
**Part # (100-204) for All Inground models**  
**Part# (400-204) for All Above ground models**





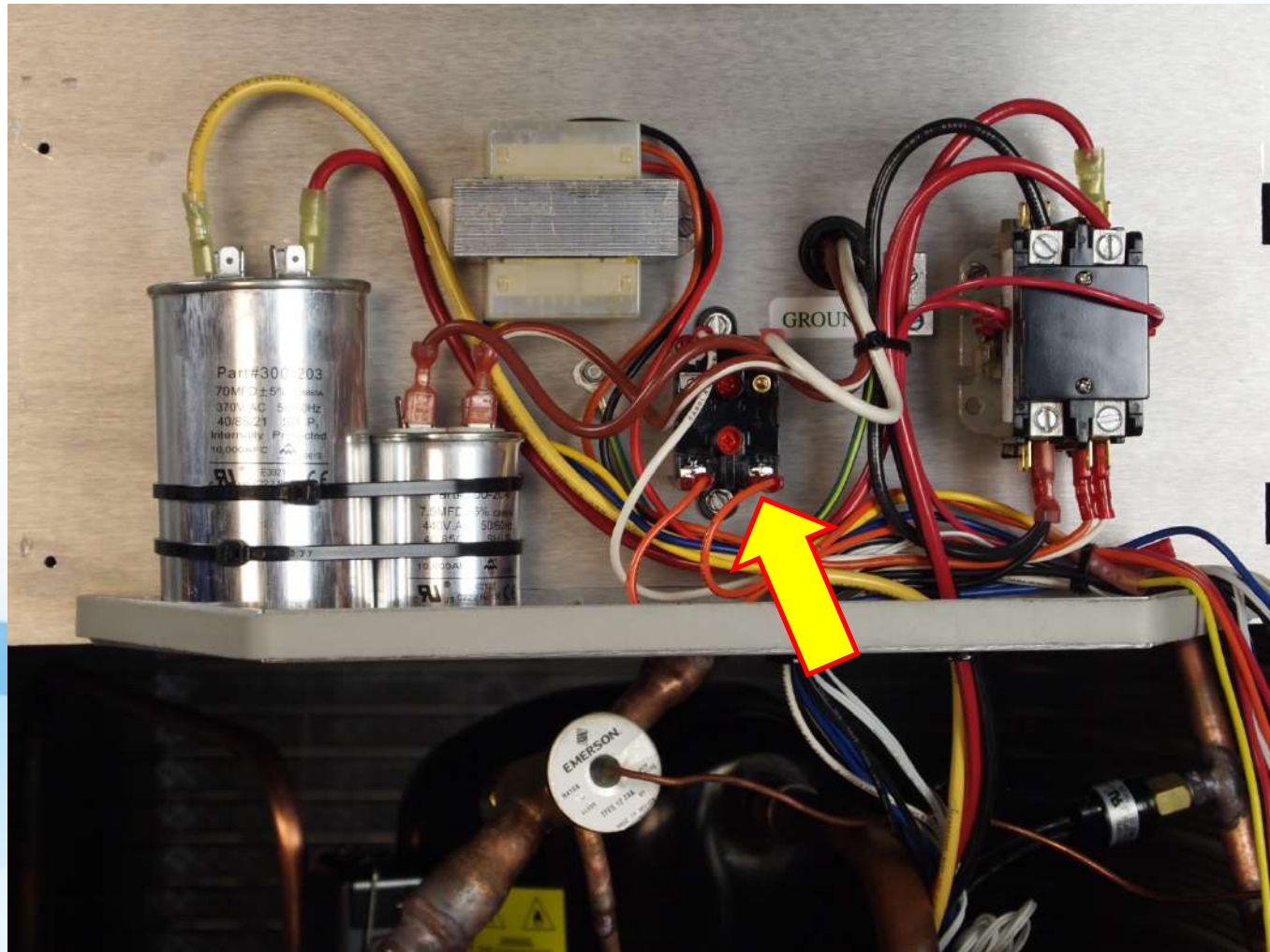
**Control Box Components:**  
**Fan Capacitor (5mfd or 7.5mfd)**  
**Part # (100-204) for All Inground models**  
**Part# (400-204) for All Above ground models**

Brown Wires from  
the Fan motor



# Control Box Components: Fan Relay

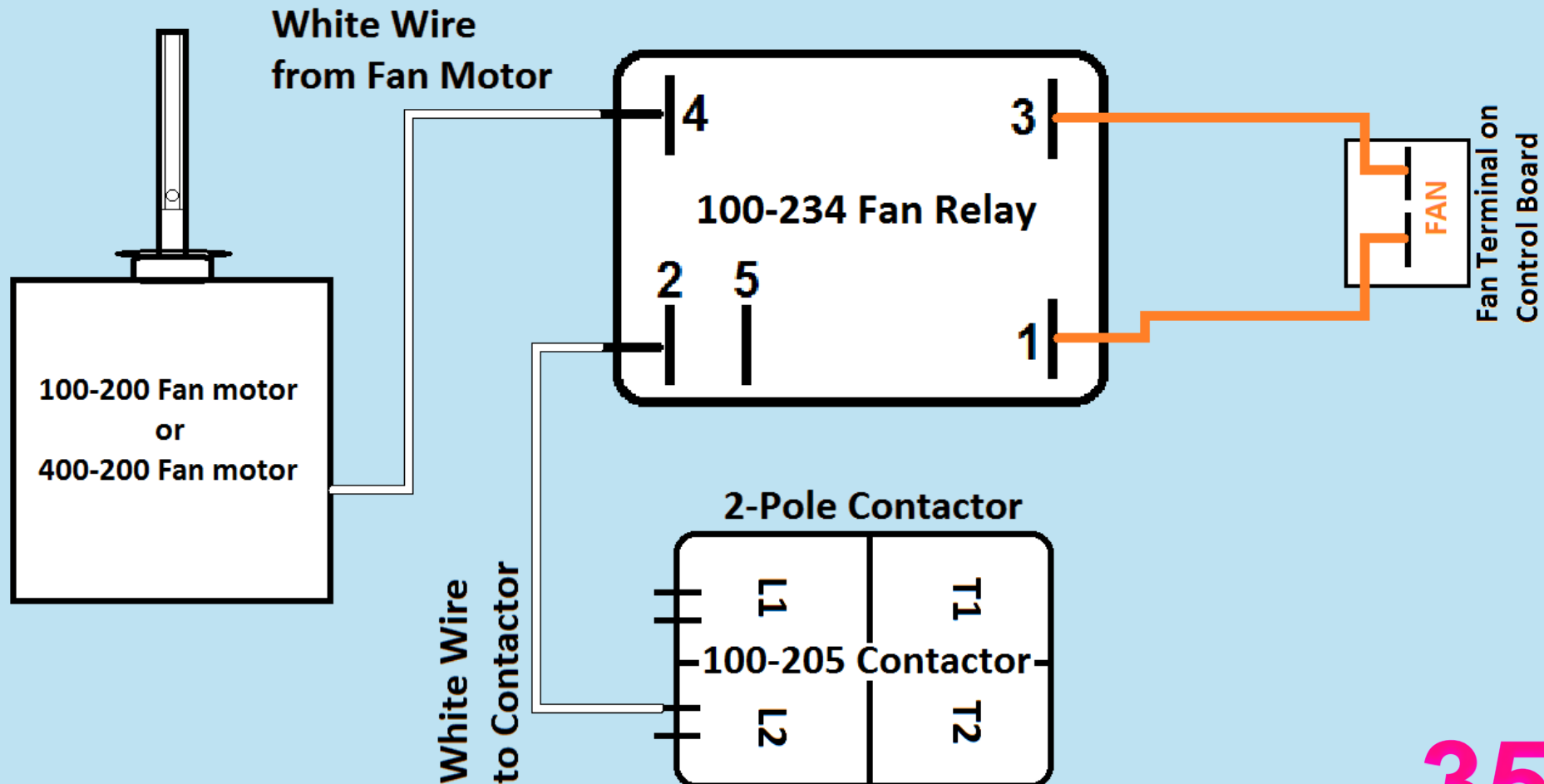
Part # (100-234)





# Control Box Components: Fan Relay

Part # (100-234)



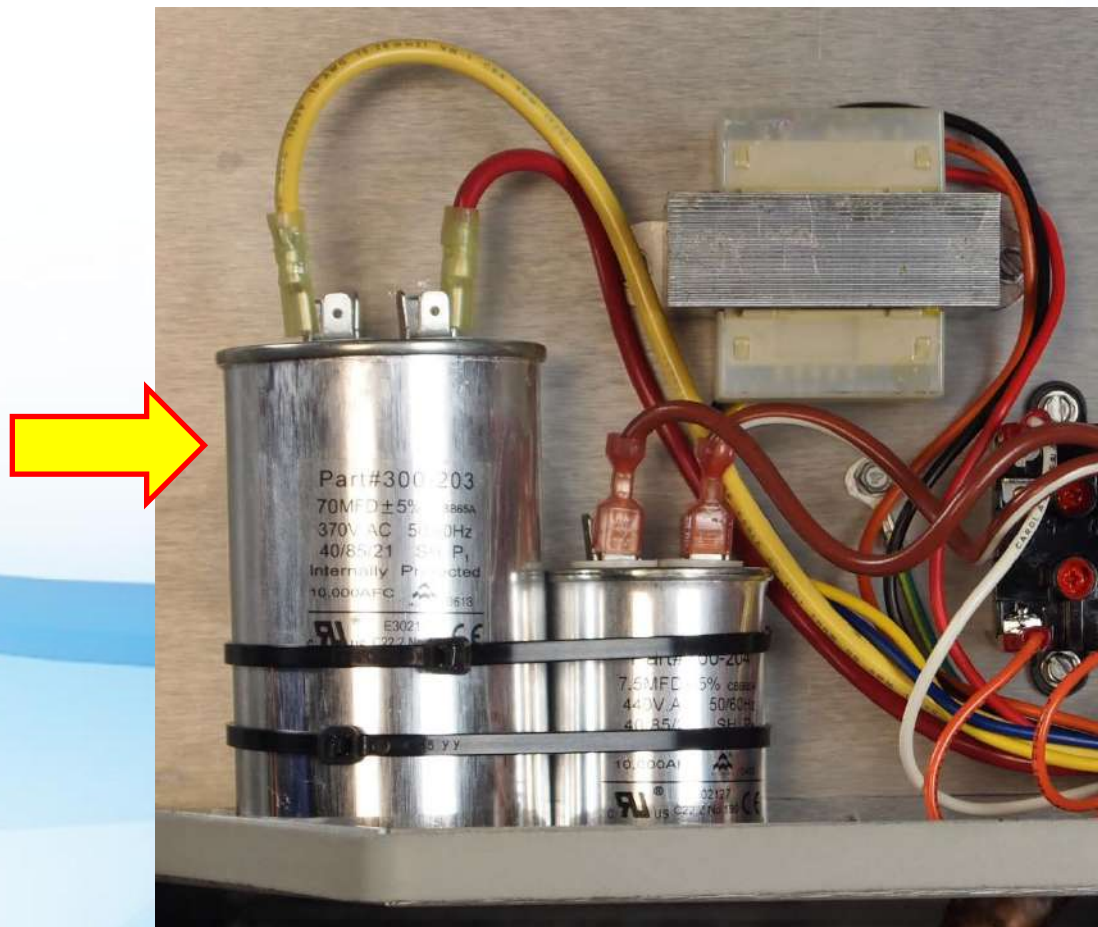
# Control Box Components:

## Compressor Capacitor

**Part # (100-203) Models 1250,1500,1750 : 80uF 440v**

**Part# (300-203) Model 1100 : 60uF 370v**

**Part# (400-203) Model 750 : 40uF 370v**





# Compressor Capacitor Replacement

If the unit does not seem to be heating and you notice the compressor isn't starting it is recommended you first test the compressor capacitor. To do this set your multi-meter to Microfarads (  $\mu\text{F}$  ) and place the probes on each terminal. You should remove the wires that are connected and ground out the capacitor using needle nose pliers or an insulated screwdriver. The reading should be the listed Rating on the capacitor or plus or minus 5% of the listed Rating.

**Example : Capacitor Rated for 70uF should read between 66.5 and 73.5 uF. If it reads lower, it is a bad capacitor that needs to be replaced.**

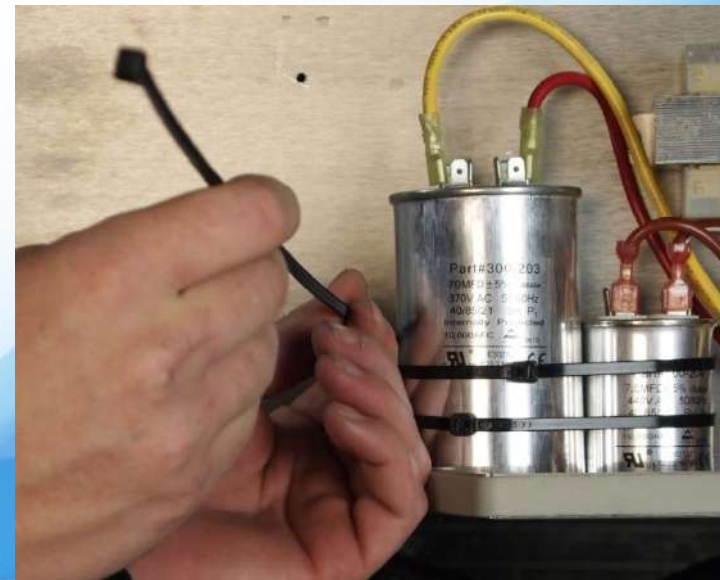
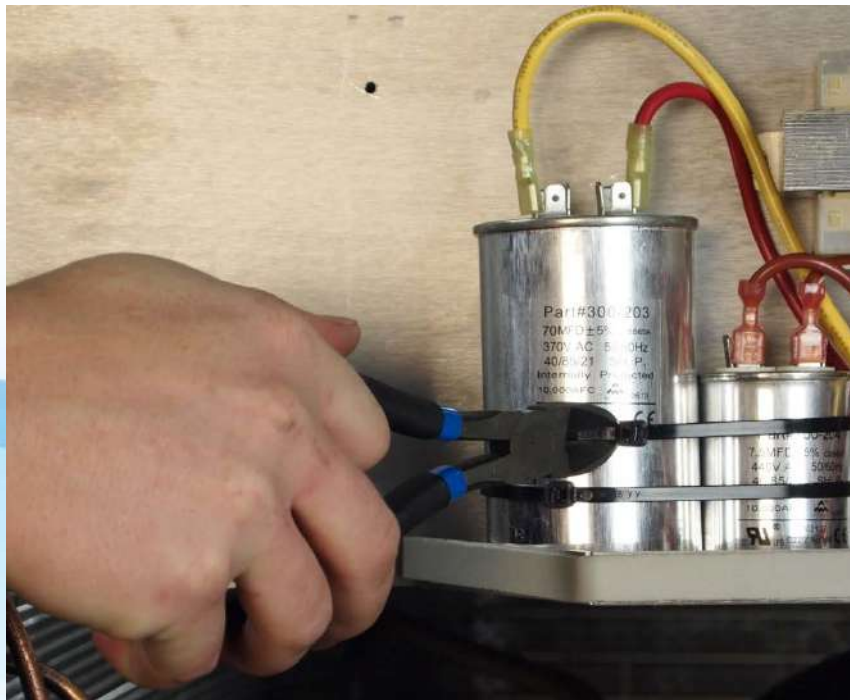


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**Warning! Always Disconnect power to heat pump before performing this operation.**

# Compressor Capacitor Replacement Cont.

Cut the two zip ties that are holding the compressor capacitor and Fan capacitor. Once cut, disconnect the wires and ground the terminals on the top of the capacitor to the control box. Remove the bad capacitor and put the new capacitor in its place. Replace the zip ties and tighten them so that both capacitors are secured in place. Reconnect the wires so that one wire is on each terminal. This process can also be used to replace the Fan Capacitor.

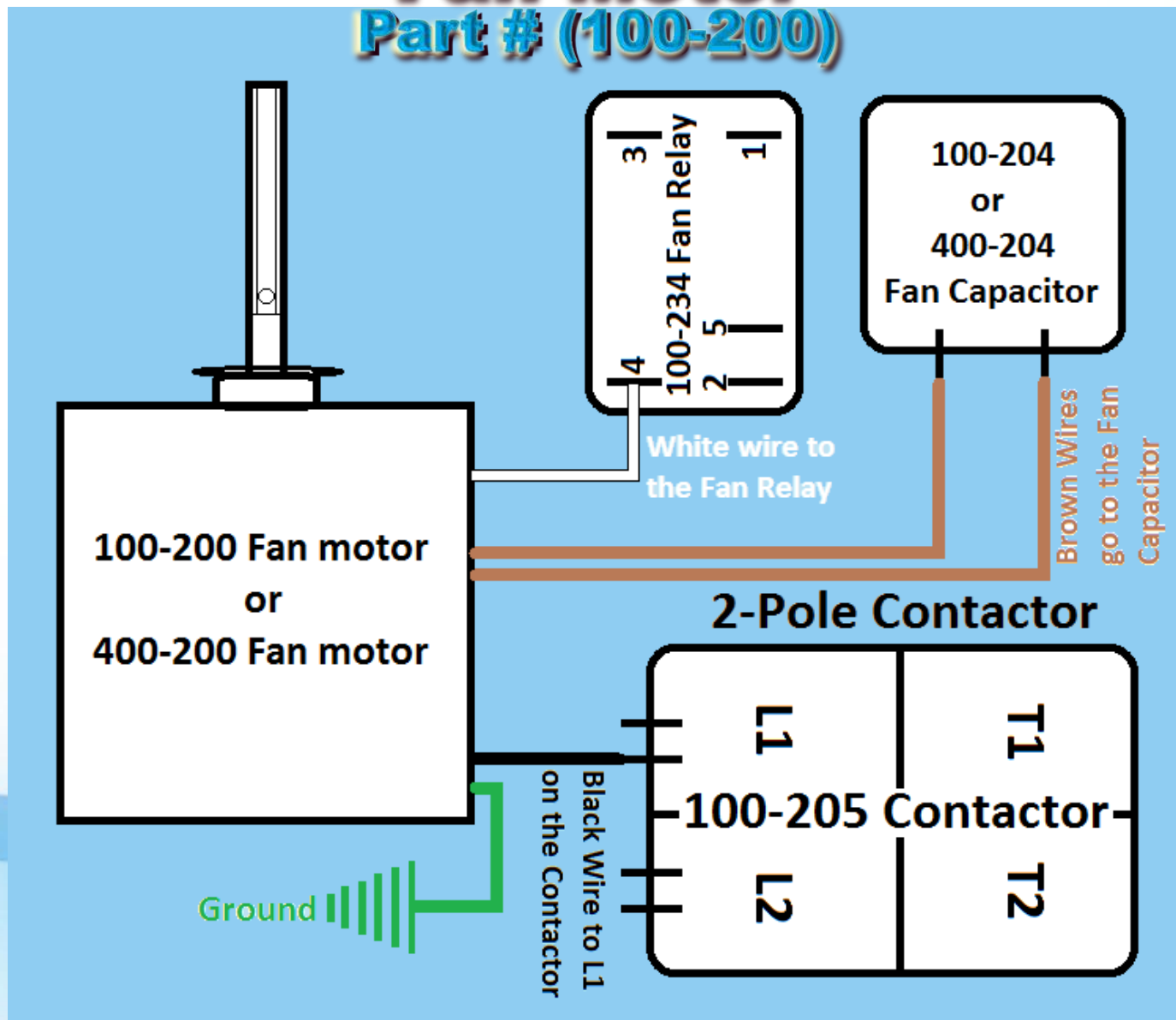


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# Fan Motor

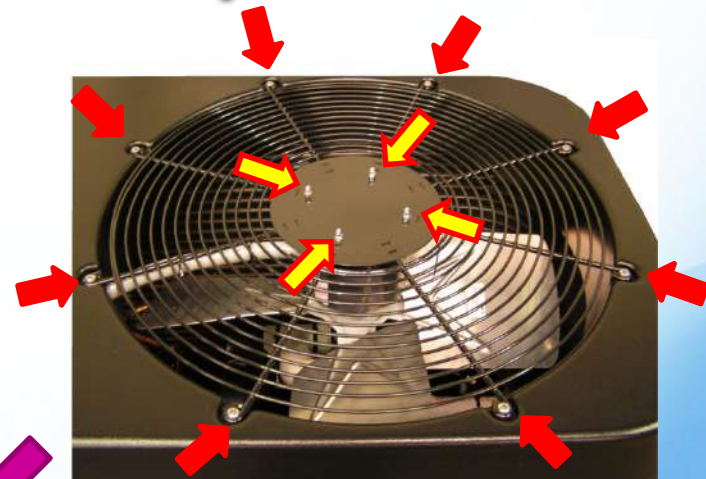
## Part # (100-200)



**Warning!** Always Disconnect power to heat pump before performing this operation.

# Fan Motor

## Part # (100-200)



When replacing fan motor, remove entire fan assembly (disconnect wiring) then remove fan motor over your truck bed or a flat surface (not the dirt or gravel) to avoid losing fan motor mounting nuts. Reassemble in reverse order.

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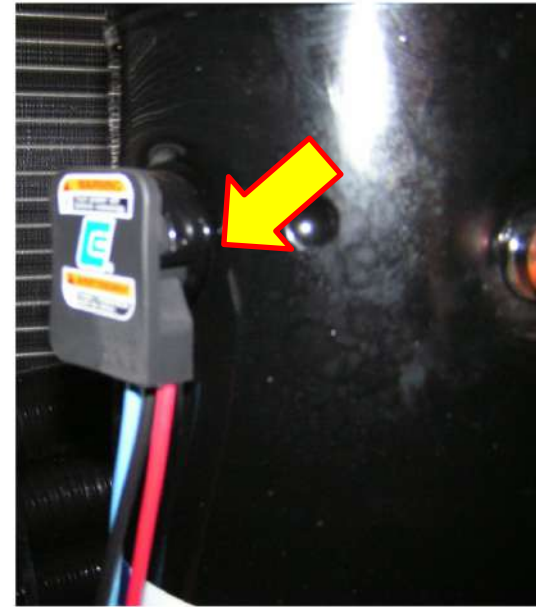
# Compressor Testing

If the heatpump is having issues heating, it is possible the compressor May not be starting or running correctly. Also if the homeowner complains that the heatpump keeps tripping the circuit breaker, this is a possible indicator that there is an electrical short in the unit and the compressor could be the cause of that short. If you suspect the compressor is the issue, Remove the screws from the bottom right and left side to gain access to the inside of the heatpump.



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# Compressor Testing Cont.



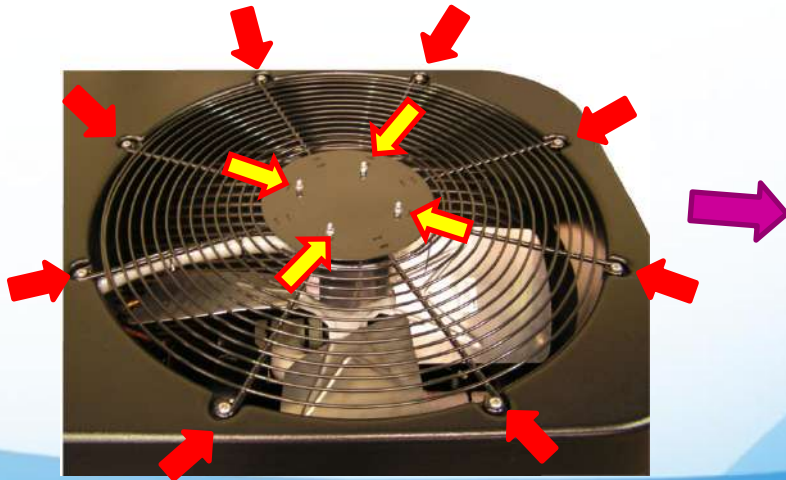
**Warning! Always Disconnect power to heat pump before performing this operation.**



# Fan Blade Replacement

## Part # (100-201)

To Replace the fan blade, remove the 8 screws that hold down the fan guard. Then lift the fan guard up, flip it back and rest it upside down on the front of the unit being careful not to scratch the top of the unit. Using an adjustable wrench, loosen the set screw. Once loose, slide the old fan blade up off the shaft, then slide the replacement onto the shaft and tighten the set screw. Do not over tighten the set screw.



**Warning!** Always Disconnect power to heat pump before performing this operation.

**Questions ?**