

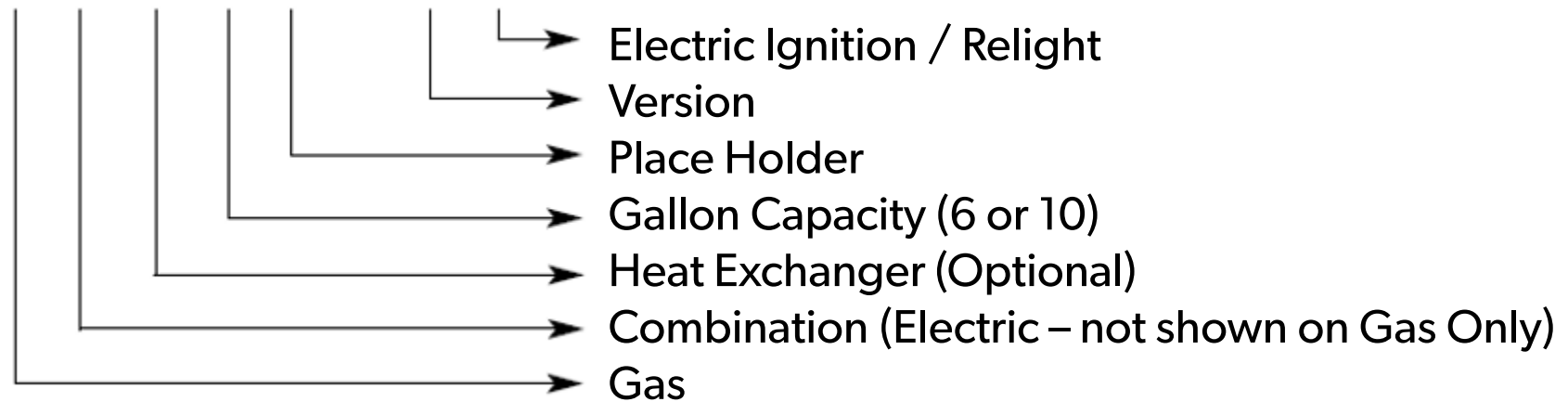
DOMETIC

Water Heaters

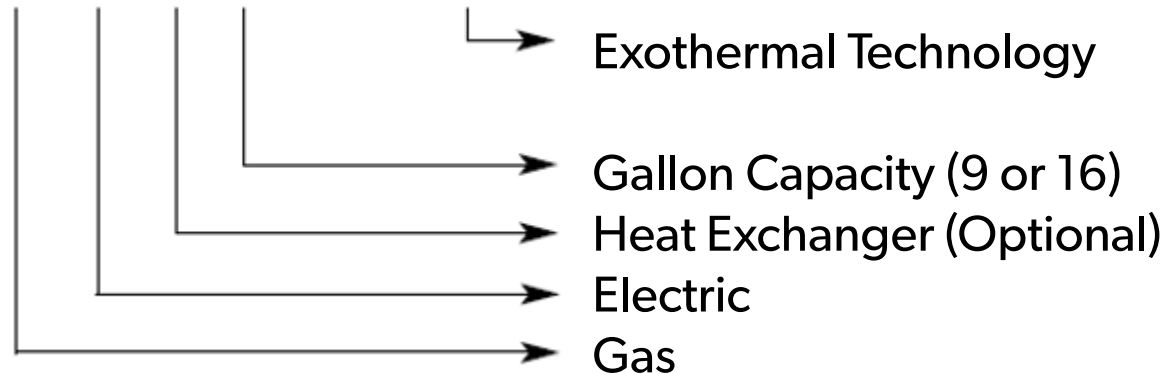
- Tank Water Heaters
 - XT Model Tank
 - On Demand

Product Identification

G C H 10 A - 4 E



G E H 16 - EXT



Product Identification Continued



Water Heater

Hot Water Heater

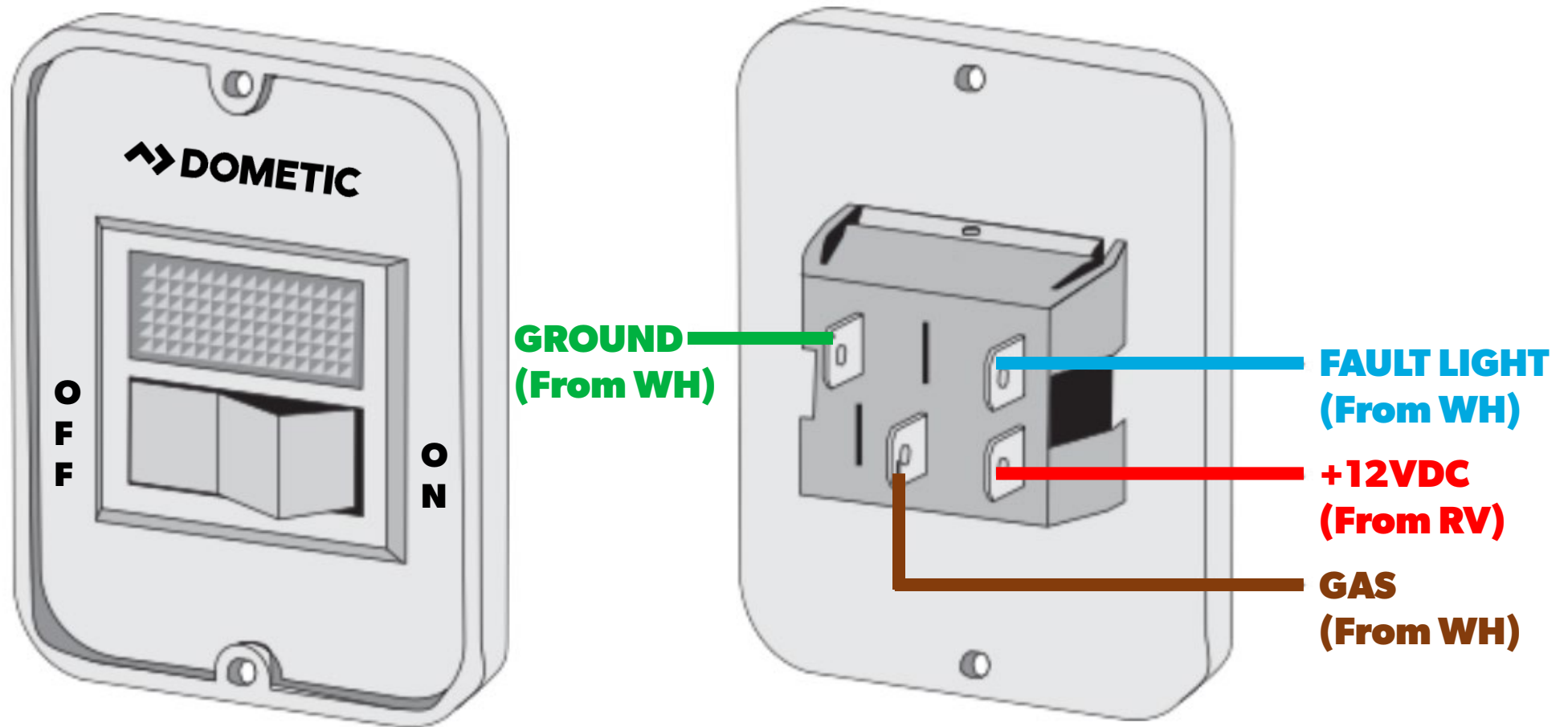
The unit just heats up WATER, not already HOT water.

Installation

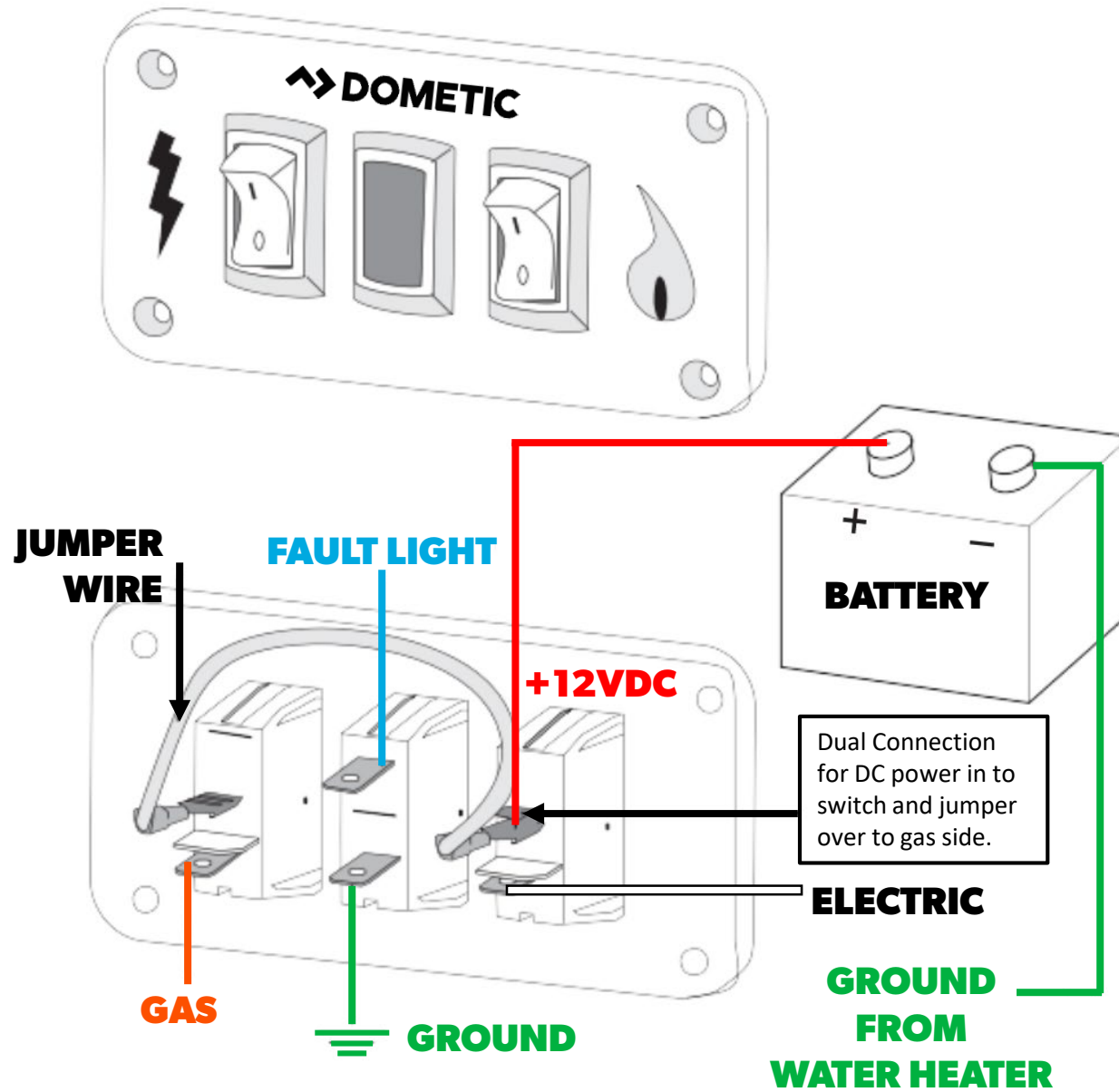
Mobile living made easy.



Gas Only / Single Wall Switch Wiring



NOTE: The switch light illuminates during ignition. Once flame is recognized, the light goes out. If the light stays on, the unit failed to light the gas.

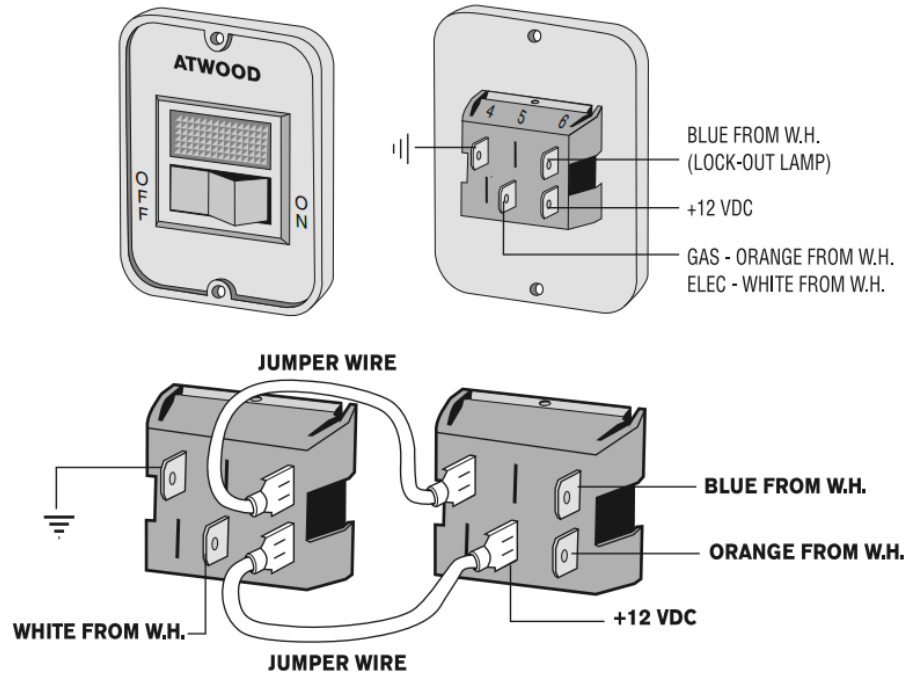


Wall Switch Wiring

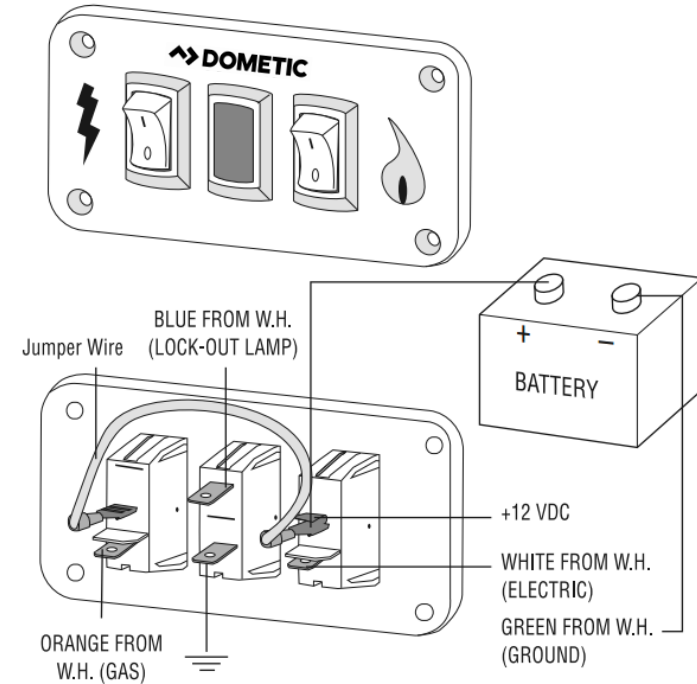
Going from a 3 wire to a 4 wire

Current generation Wall Switches are a four wire Dual Switch installation. Anything prior to 10 gallon 4E and 6 gallon 10E units would have wired up with a Single Switch that only needed 3 wires.

SINGLE SWITCH



DUAL SWITCH



When replacing an older model water heater you will need to change from a Single Switch to a Dual Switch. The problem that you will run into is that you need an additional wire through the wall for the 12V +. You can often jump from another 12V + source near the water heater.

120VAC Wiring at Back of Combo Water Heater

The installer must wire up the 120VAC Live, Neutral, & Ground, and is responsible to make a secure connection.

Neutral

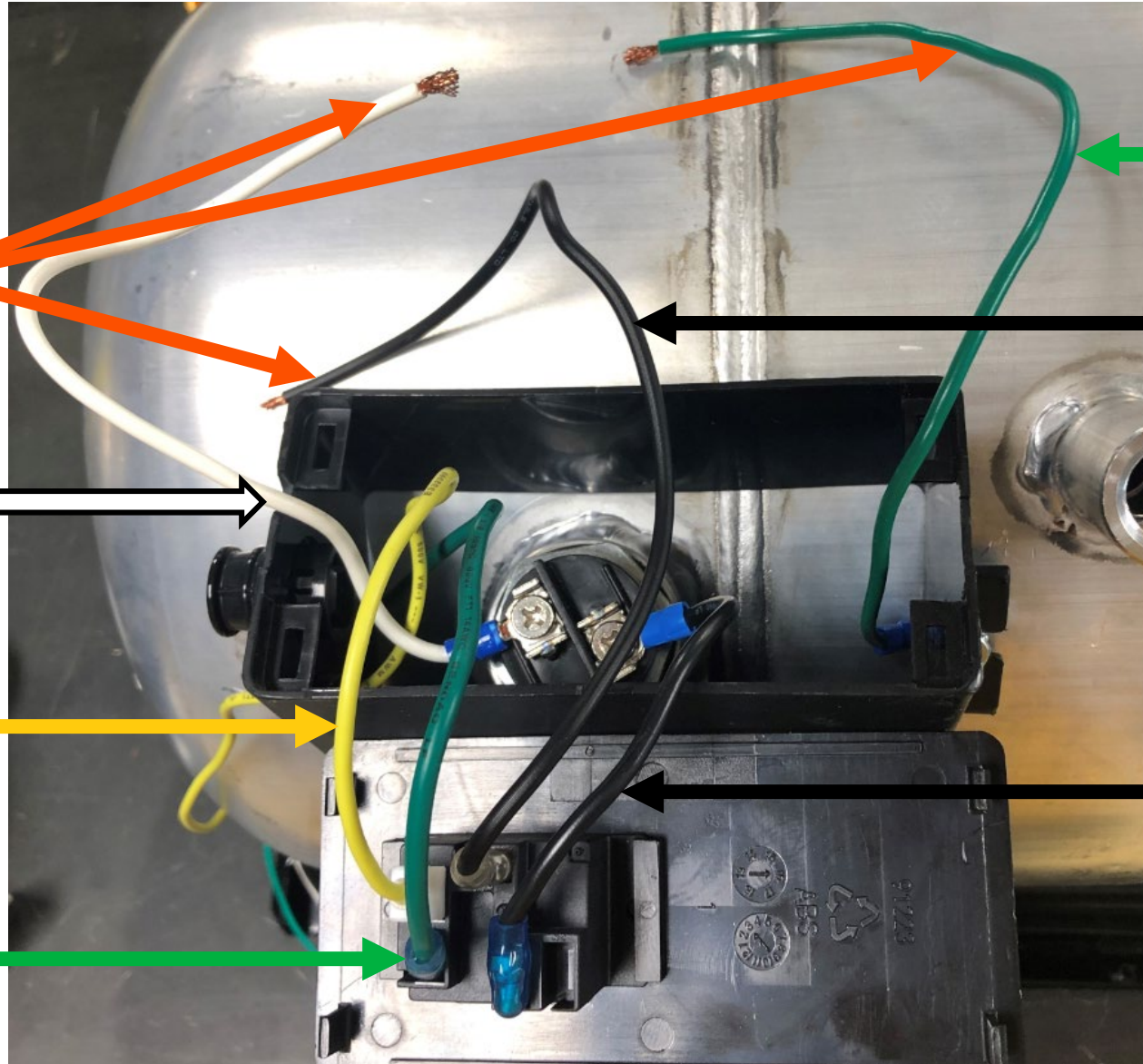
**12VDC
From
Board**

**Tank
Ground-**

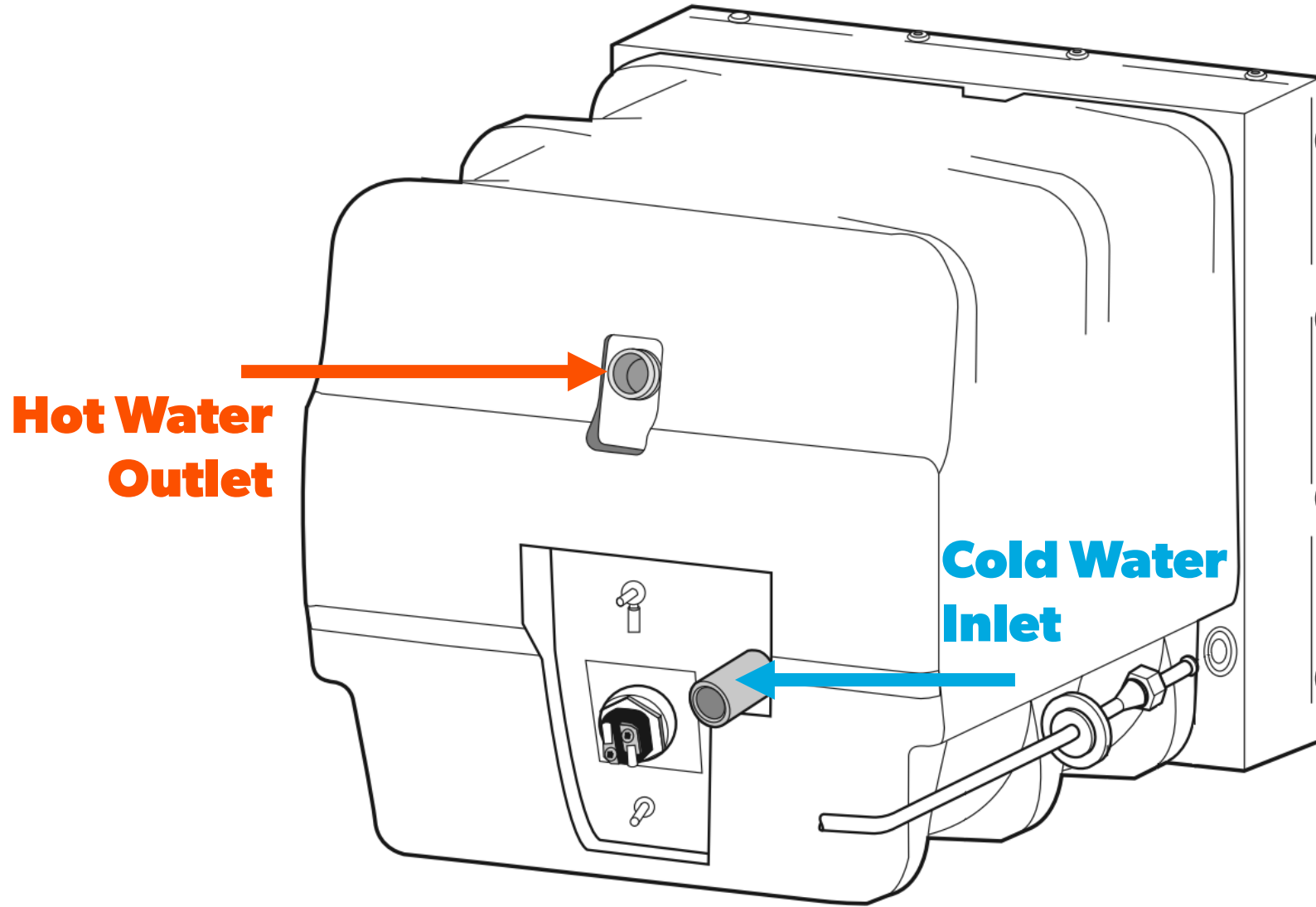
**Ground
From RV**

**120VAC
From RV**

**120VAC
To Element**



Water Line Hookup



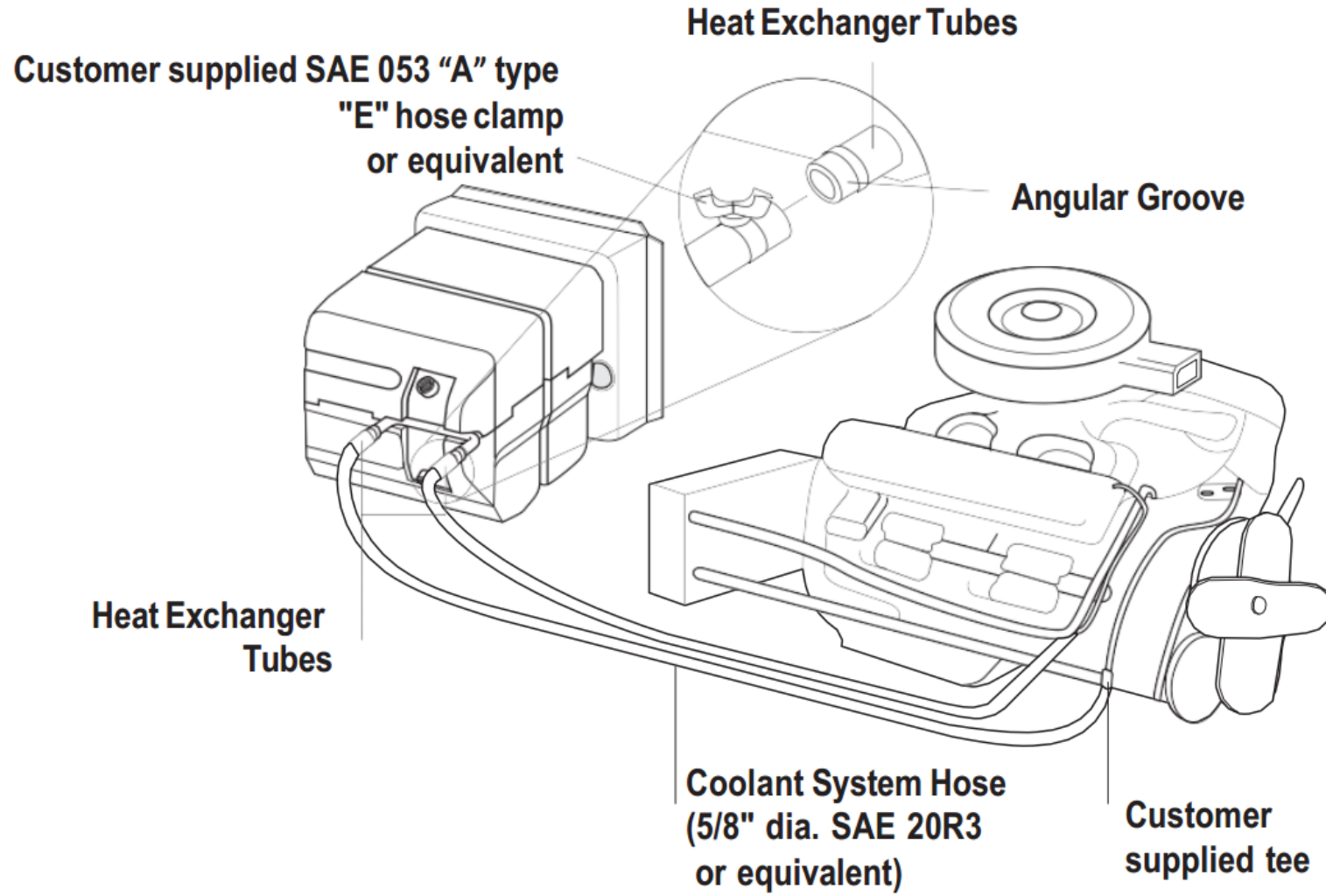
Always use pipe lubricant on threads when connecting hot and cold water couplings. A suitable plastic fitting is recommended.

Gas Supply Line Installation



Seal gas line entrance opening by sliding grommet onto 3/8" tubing before flaring tubing. Pull gas line and grommet through opening in housing. Connect flare fitting and press grommet into opening. Secure gas connection tight. Seal area with caulking to complete.

Optional Heat Exchanger



Pilot Model

Mobile living made easy.

 **DOMETIC**

Pilot Model Component Location

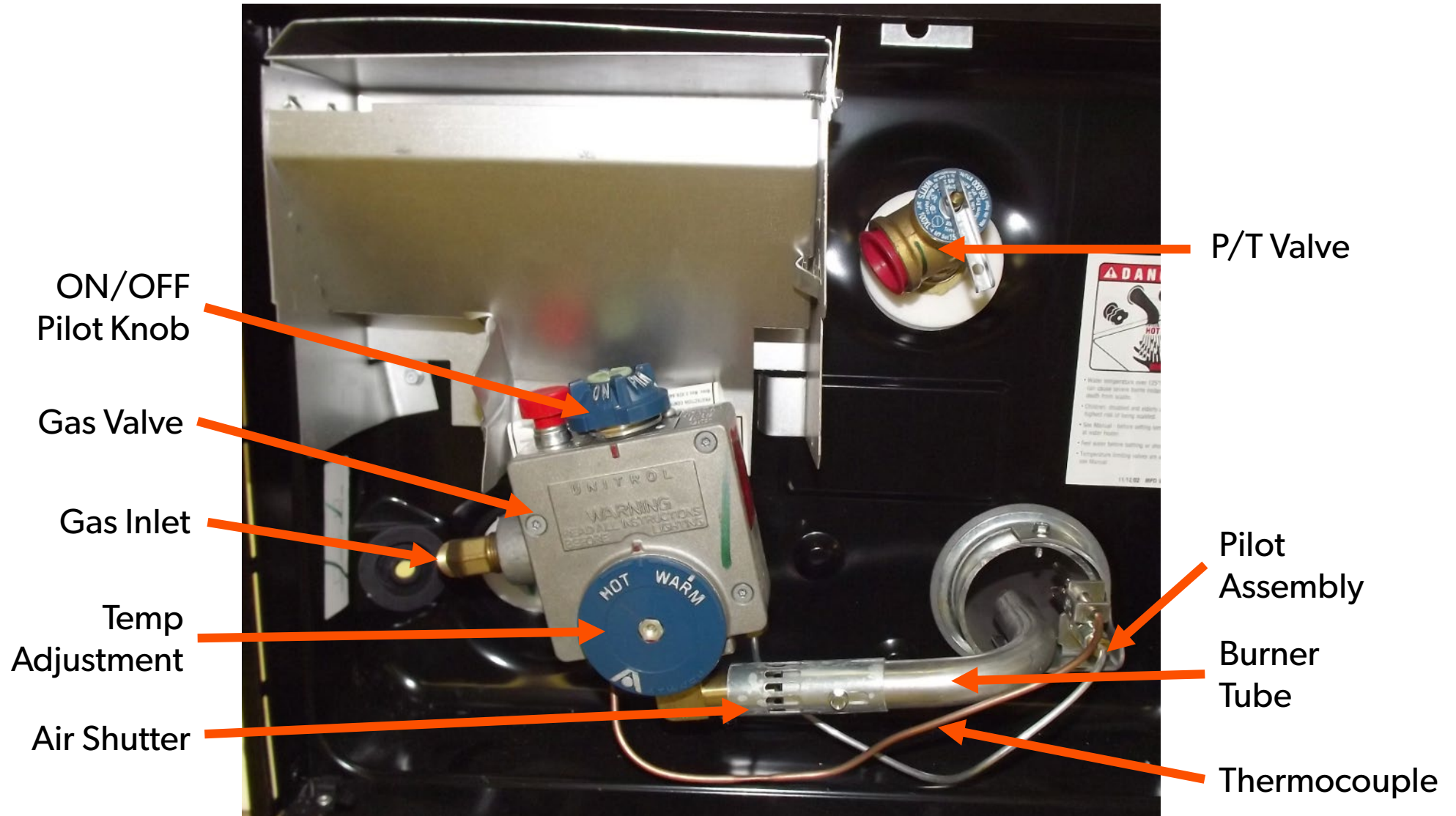


Diagram illustrating the components of a gas furnace control system:

- One Shot E.C.O. 190°
- Gas Inlet 11" W.C. Pressure
- Temperature Lever
- ON/OFF Pilot Knob
- Pilot Flame
- Pilot Orifice (inside)
- Thermocouple
- Air Shutter

- **Gas Operation**
- **Gas Control**
- **Pilot Orifice**
- **Thermocouple**
- **Magnet**
- **E.C.O.**

Supplies gas to pilot orifice when control ON/OFF pilot knob is held at pilot position.

Generates millivoltage to the gas control's magnet assembly.

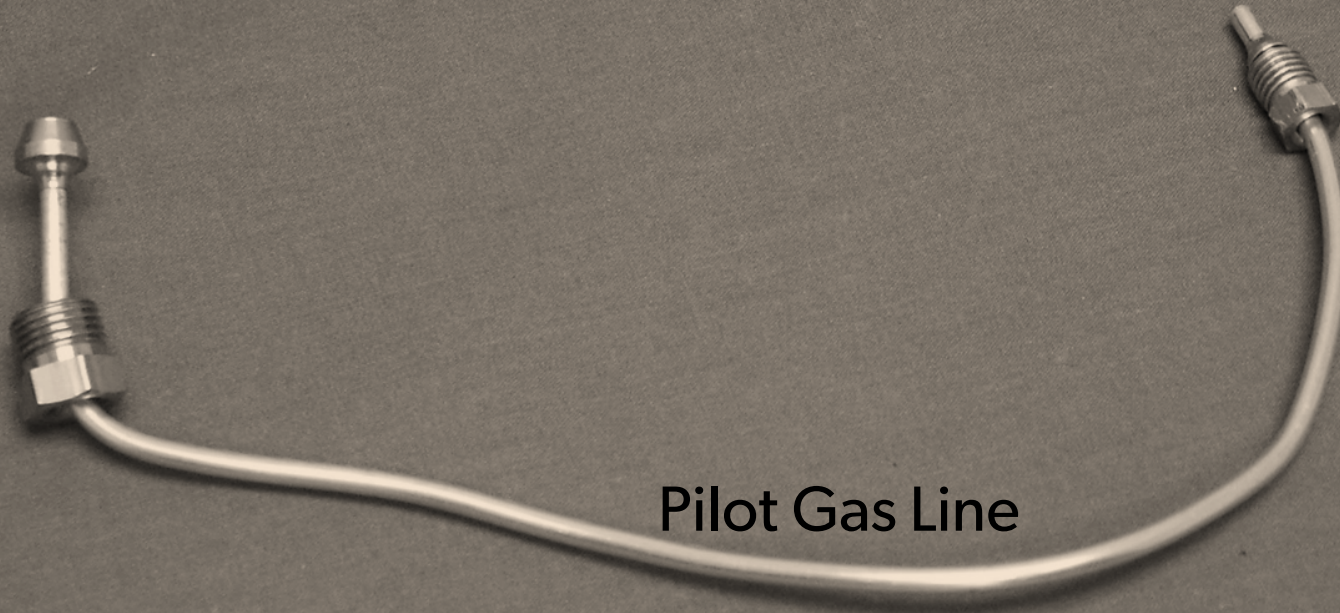
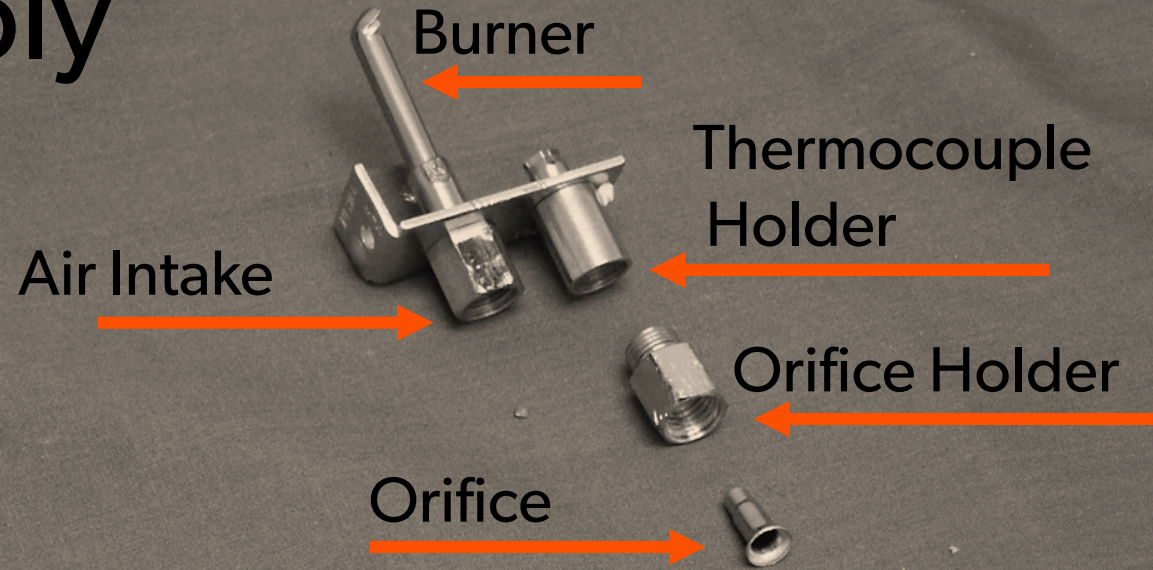
Passes millivolts through the gas control and back to thermocouple. Trips permanently open if water temperature exceeds 190° F.

- **Gas Control**
- **Main Burner Orifice**
- **Main Burner**
- **Temperature Knob**

Meters gas through the burner tube.

Setting of knob determines burner cycle and water temp. Temp range is 70-140°F.

Pilot Assembly



Thermocouple Testing

Apply heat to
thermocouple for approx.
30 seconds

Depress the
plunger



Thermocouple Testing Cont.



Plunger stays in after heating the thermocouple or it's bad.

Connected to bottom of Robert Shaw Valve. Can be removed and used as a testing tool.

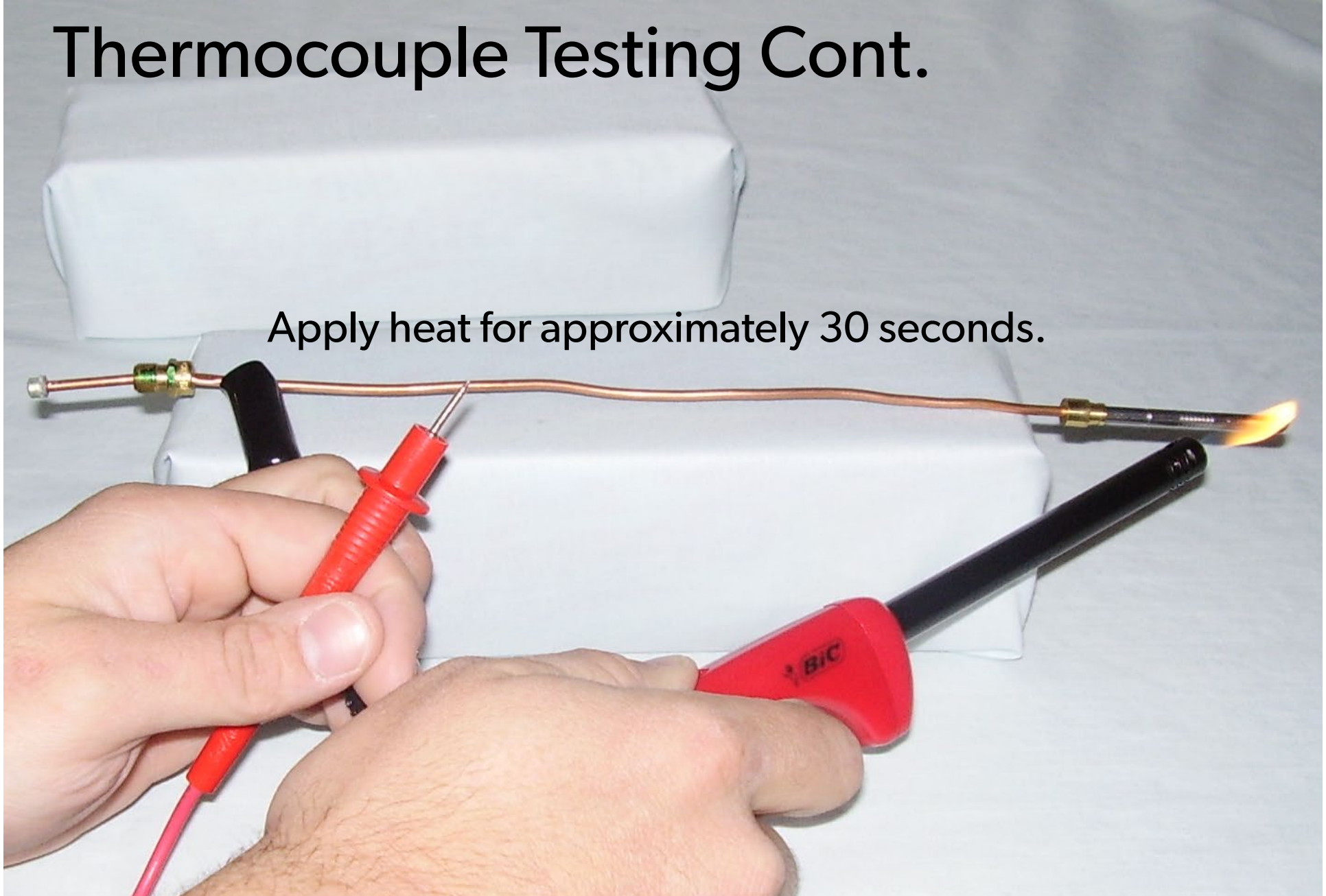
Thermocouple Testing Cont.

No voltage through the thermocouple at room temperature.

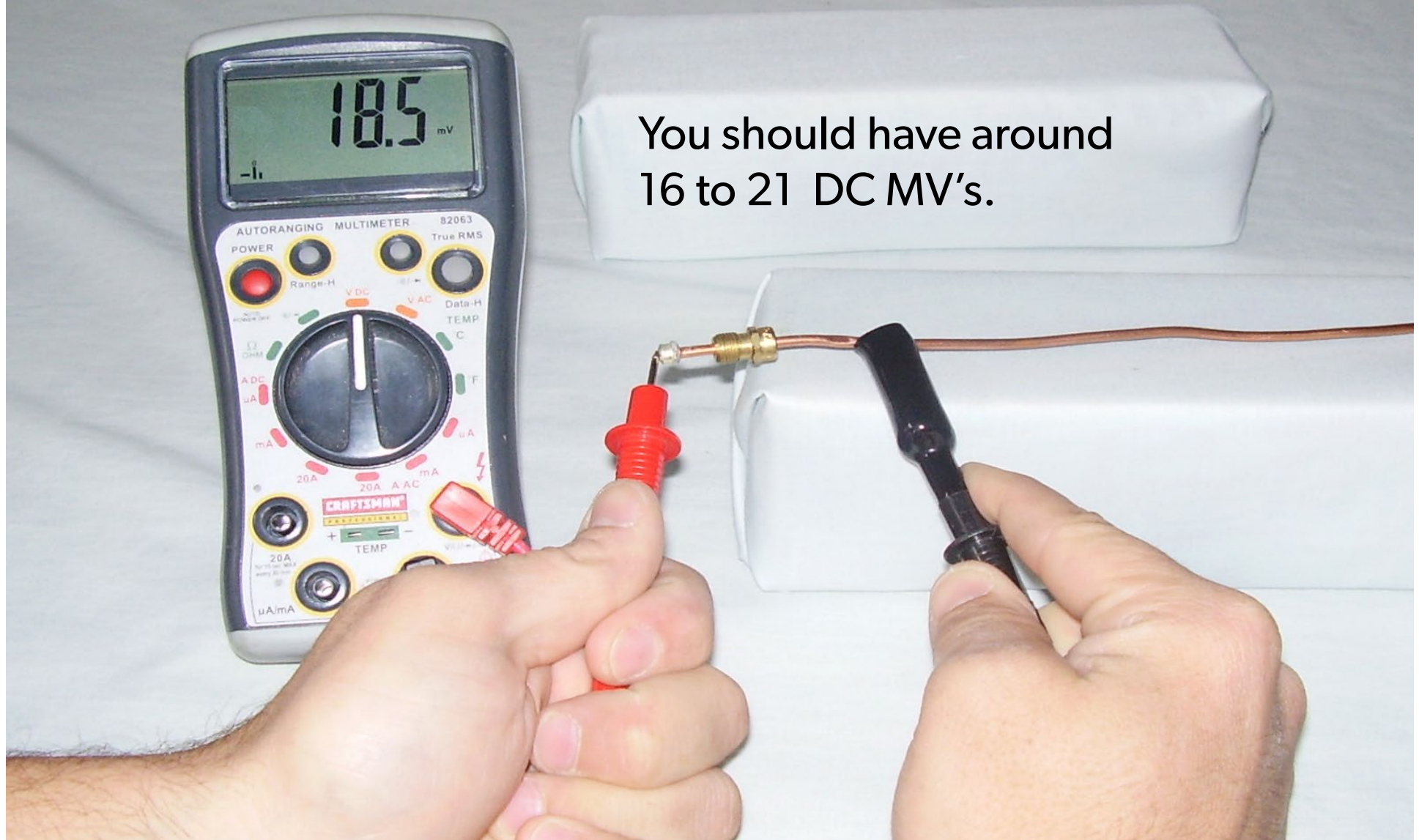


Thermocouple Testing Cont.

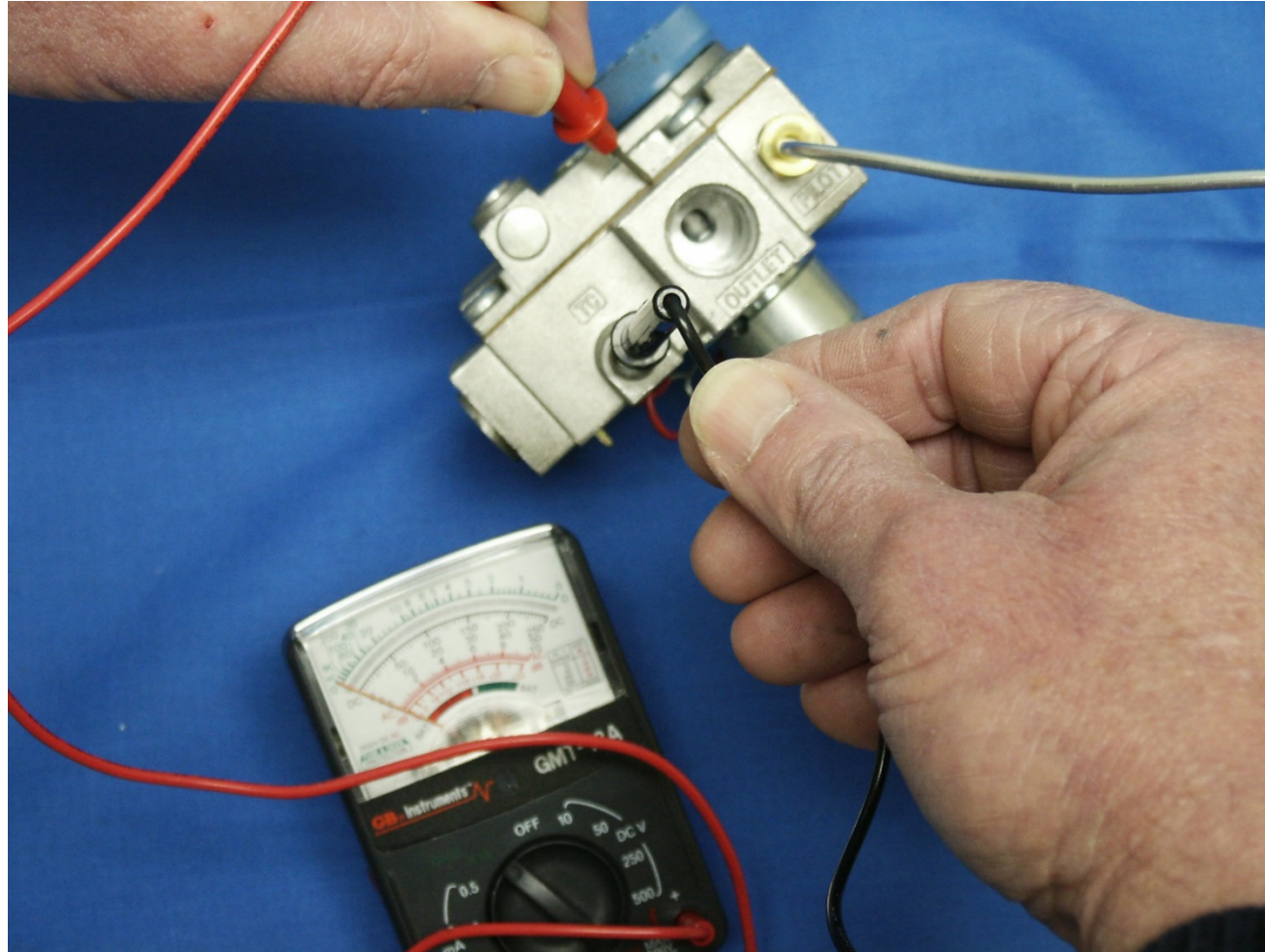
Apply heat for approximately 30 seconds.



Thermocouple Testing Cont.

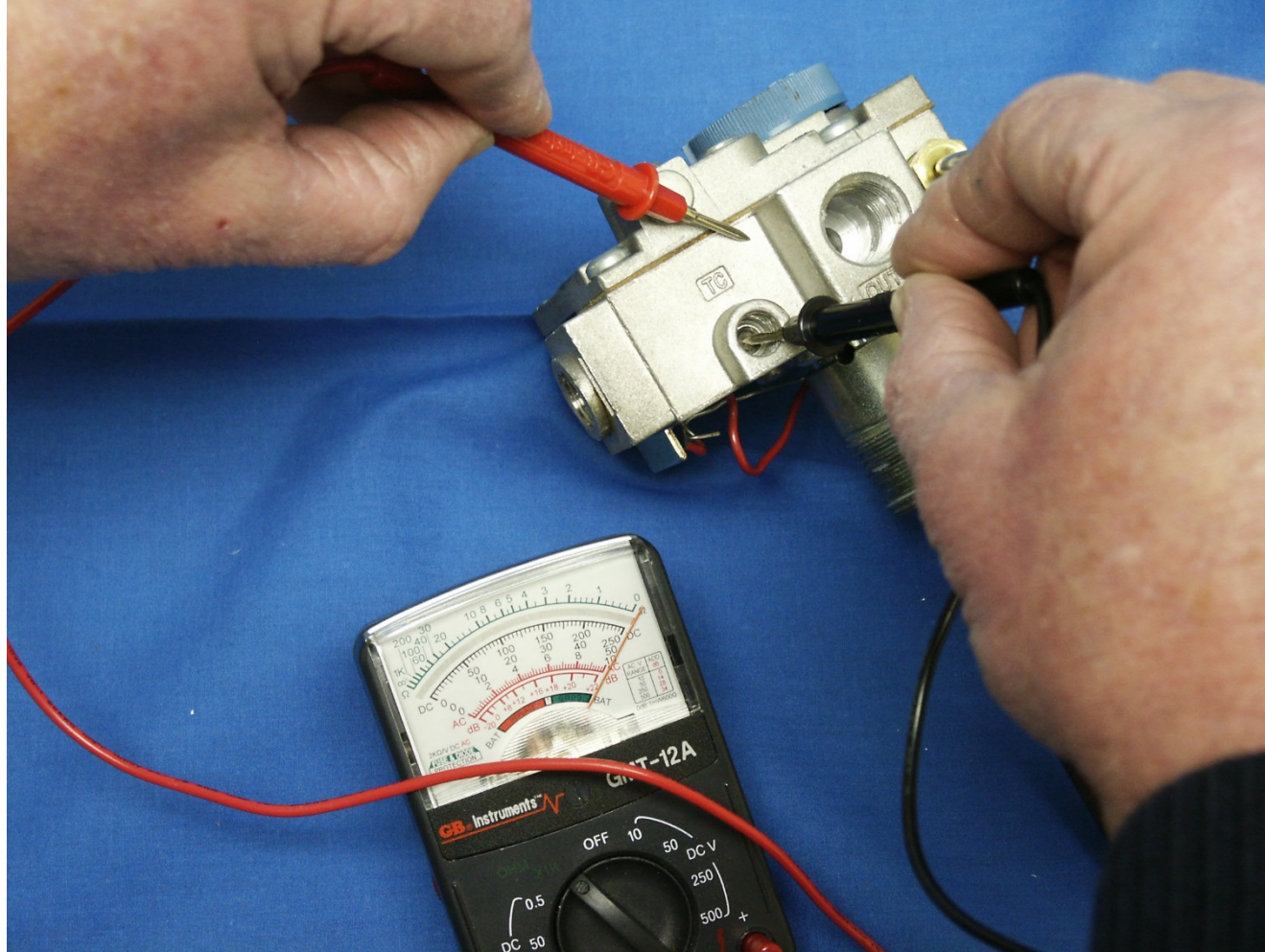


Testing ECO Circuit



Be sure to center thermocouple port to ground. With no continuity present, valve would be defective.

Testing ECO Circuit Cont.



Center of thermocouple port to ground should show continuity.

Pilot Model Issues?

- **Pilot lights but won't stay lit**

- Poor pilot flame – need a nice blue flame, ¼" tall with flame surrounding the thermocouple
- Thermocouple is possibly weak
- Bad Gas Valve – due to a tripped ECO (needs to be replaced)
- Pilot Orifice is possibly blocked

- **Pilot won't light**

- LP Gas issue – Low pressure or not present at all
- Remove Pilot Gas Line to see if gas is present from the valve when in the pilot position. If gas is present, there is a blockage in the pilot gas line or pilot orifice. If no gas is present, the gas valve is defective once it has been confirmed gas is coming into the valve.

- **Main Burner – Erratic flame or won't light**

- Burner Tube – Blocked or mis-aligned
- Main Burner Orifice is possibly blocked
- Flame Spreader is out of alignment
- Air Shutter might need adjusted
- Gas Valve possibly defective



DSI Models Gas & Electric

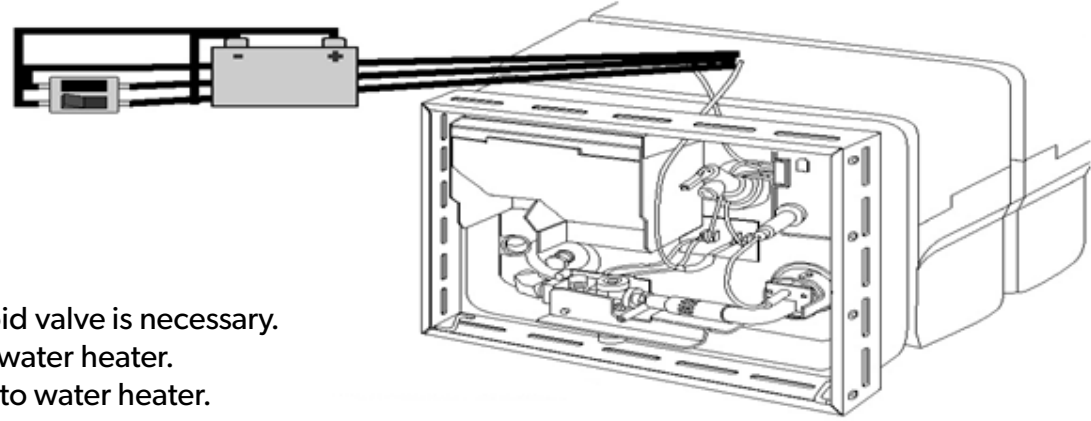
Mobile living made easy.





Gas Only Sequence of Operation

DSI Sequence of Operation – Gas Only Control Board



- Gas Supply
- 12VDC Supply
- ON/OFF Switch
- Thermal Cut-Off

11" W.C. to solenoid valve is necessary.

Voltage source to water heater.

It supplies 12VDC to water heater.

A one shot heat sensing fuse that's normally closed and sends power to the thermostat. When tripped by excessive heat (190°F), (i.e. blocked burner or flue tube) it cuts power to the circuit board and shuts down ignition.

- Thermostat

A normally closed non-adjustable temperature switch that sends current to the circuit board. It opens when the water temperature reaches approximately 140°F.

- Circuit Board

The next step is the direct spark ignition system. For a period of 6-8 seconds the circuit board will send voltage to both the gas solenoid valve and the electrodes. If ignition does not occur, the board goes into a lock-out condition and the non-ignition light illuminated at the ON/OFF switch.

E.C.O.

A normally closed safety temperature switch that sends voltage to the solenoid valve. The switch opens if the water temperature exceeds 180°F.

Gas Valve

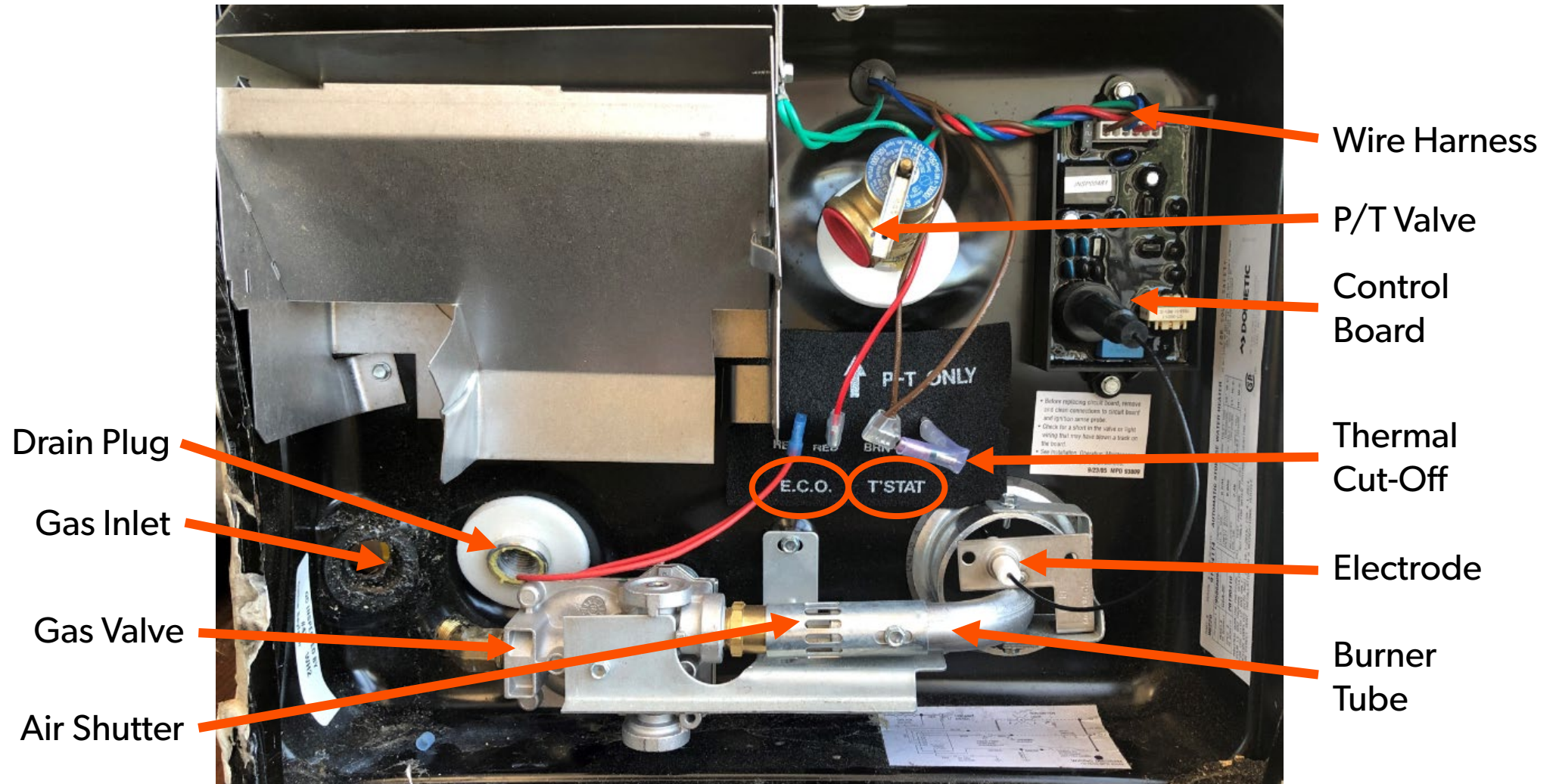
The dual solenoid valve that opens and sends gas to the electrodes.

Electrodes

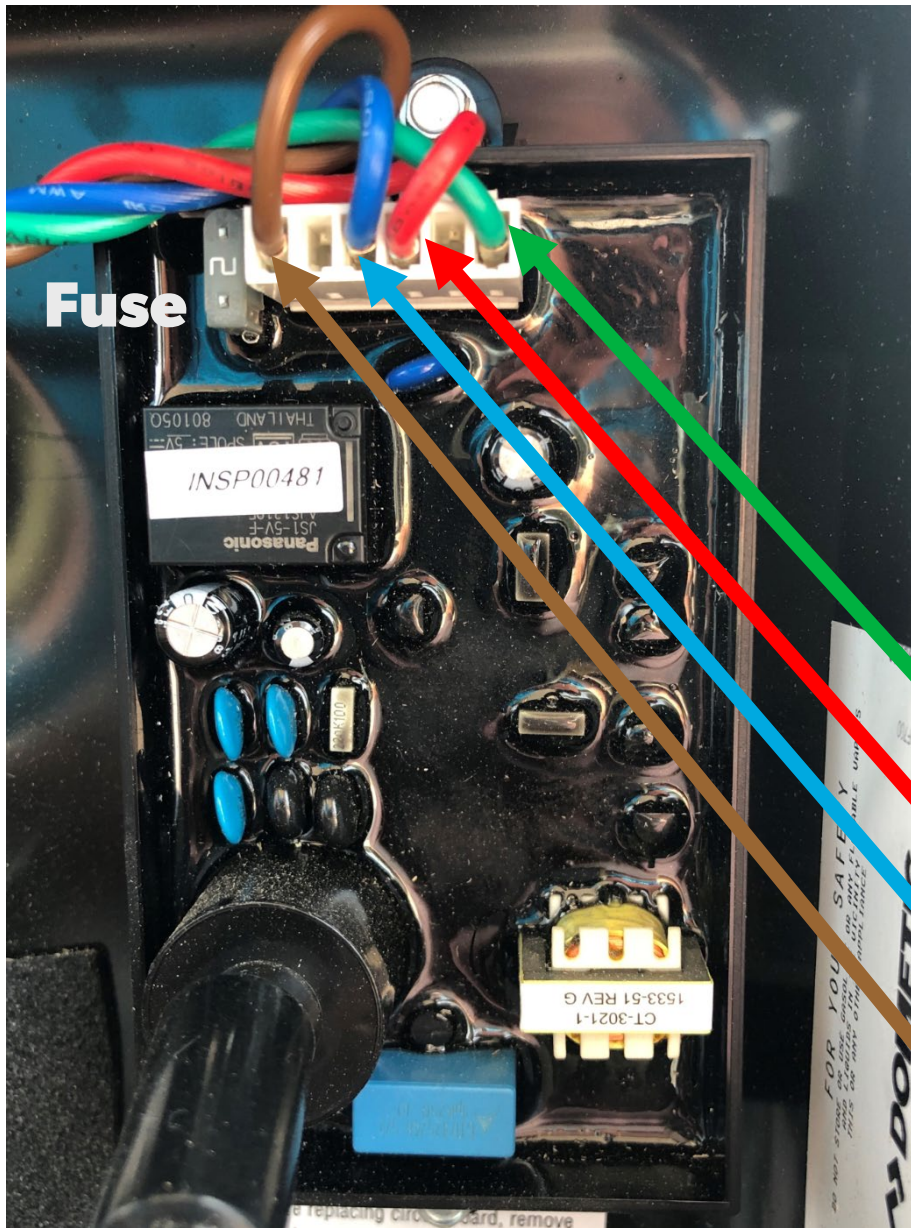
Creates a spark to ignite gas. If the electrodes do not sense a flame in 6-8 seconds, a signal is sent to the board to shut the gas valve down and the system goes into safety lock-out.

NOTE: If this situation exists, the ON/OFF switch must be turned off and back on again.

Gas Only Model Component Location



Gas Only Control Board



Fuse

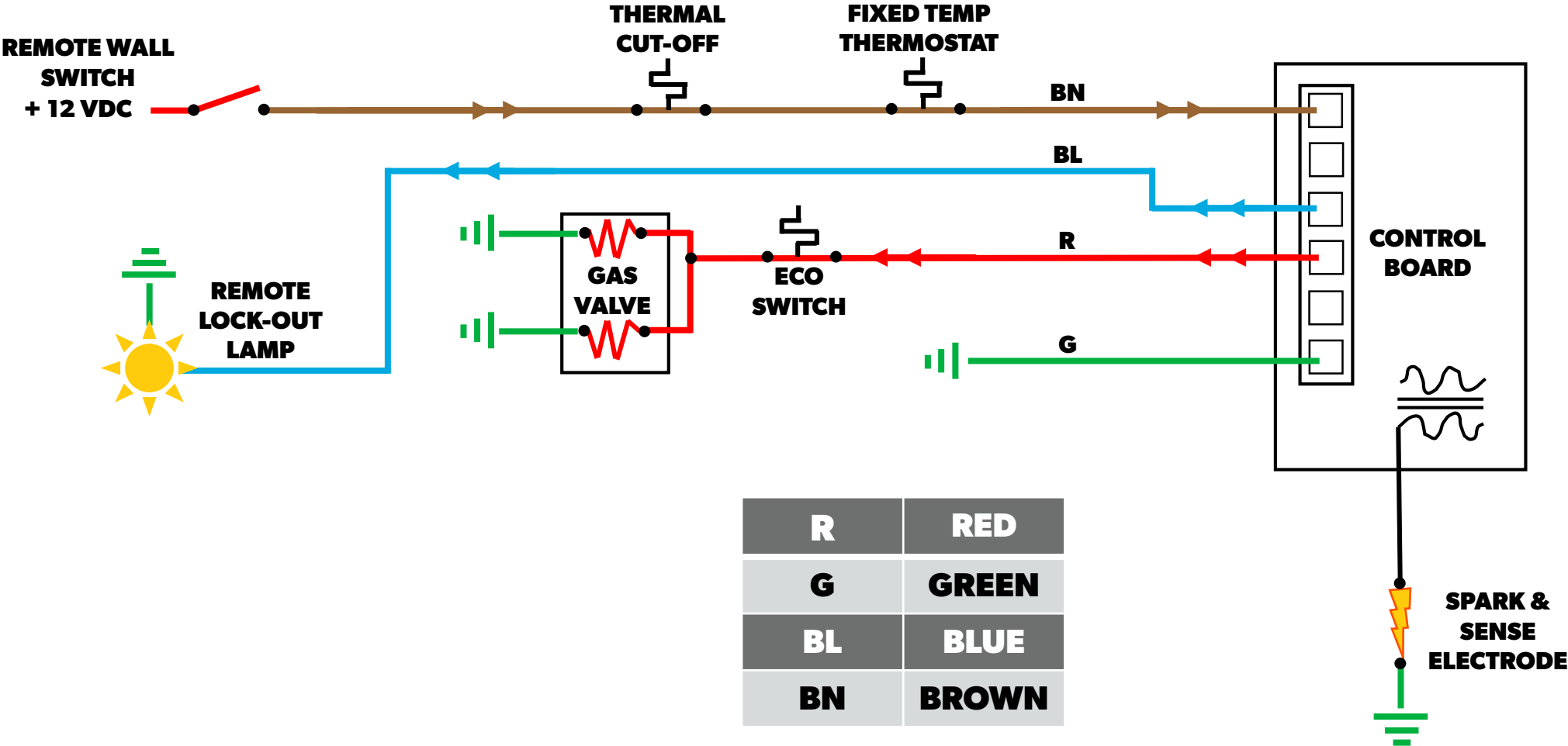
Green = Ground

Red = 12VDC+ to Gas Valve

Blue = Light Circuit

Brown = 12VDC+ Input

Gas Only Wiring

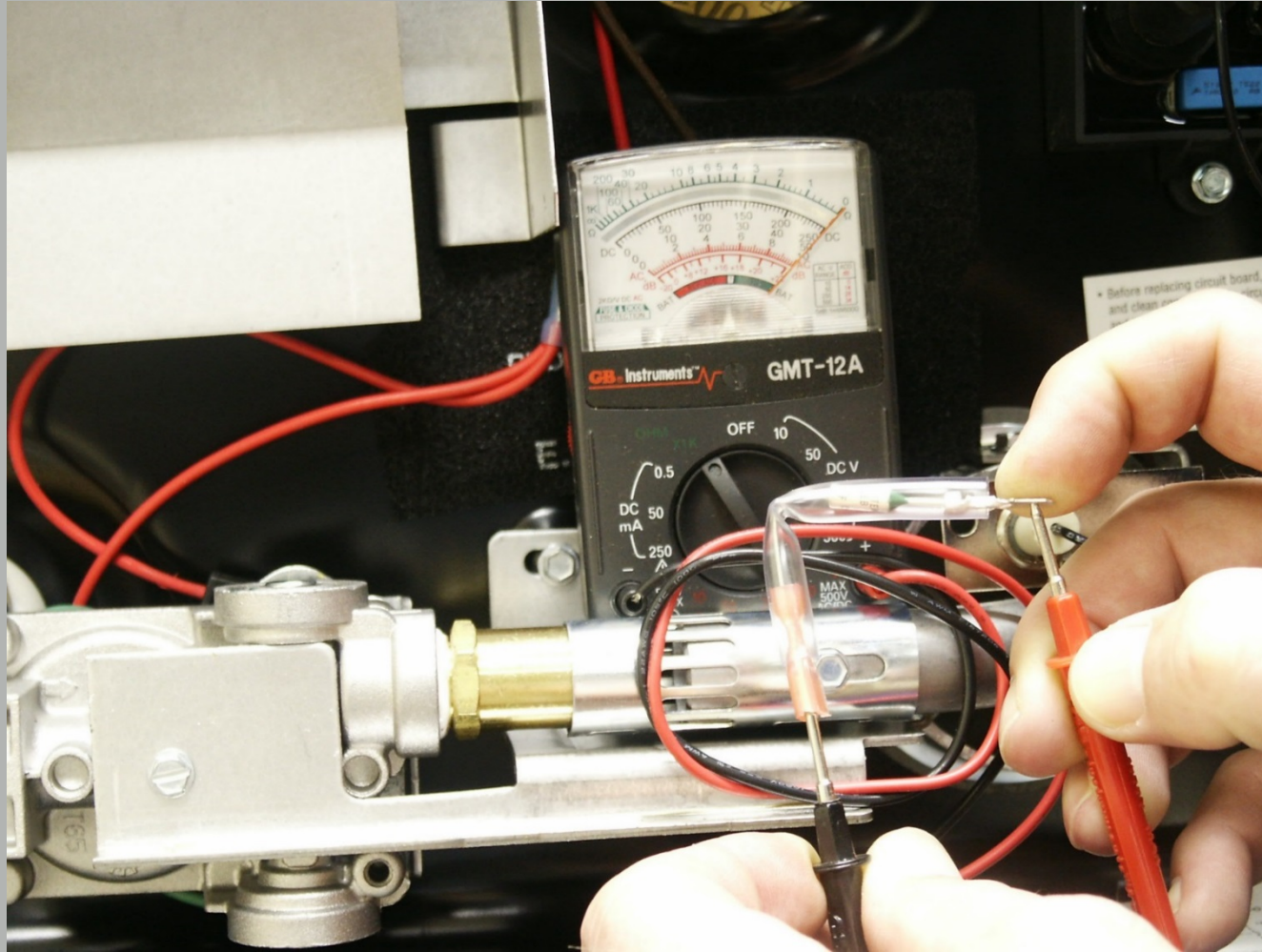


Thermal Cut-Off



Power to the water heater comes from the brown wire on the wall switch. It first goes through the thermal cut-off.

Testing the Thermal cut-off



Check for continuity through the Thermal Cut-Off.
If no continuity is found it will need to be replaced..

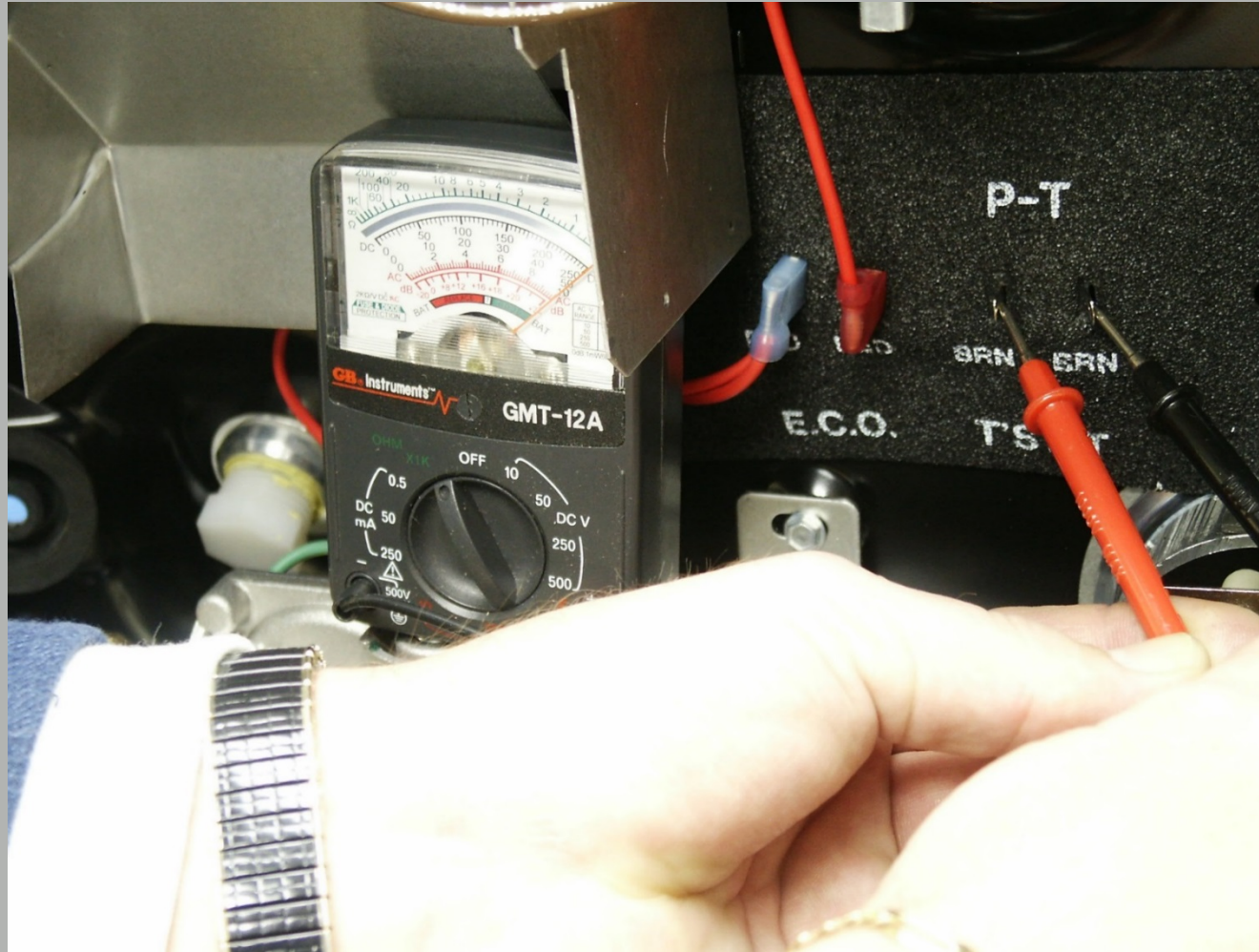
Testing the Thermal cut-off



Thermal Cut-Off and Wiring that has evidence of melting and charring is normally denied under warranty.

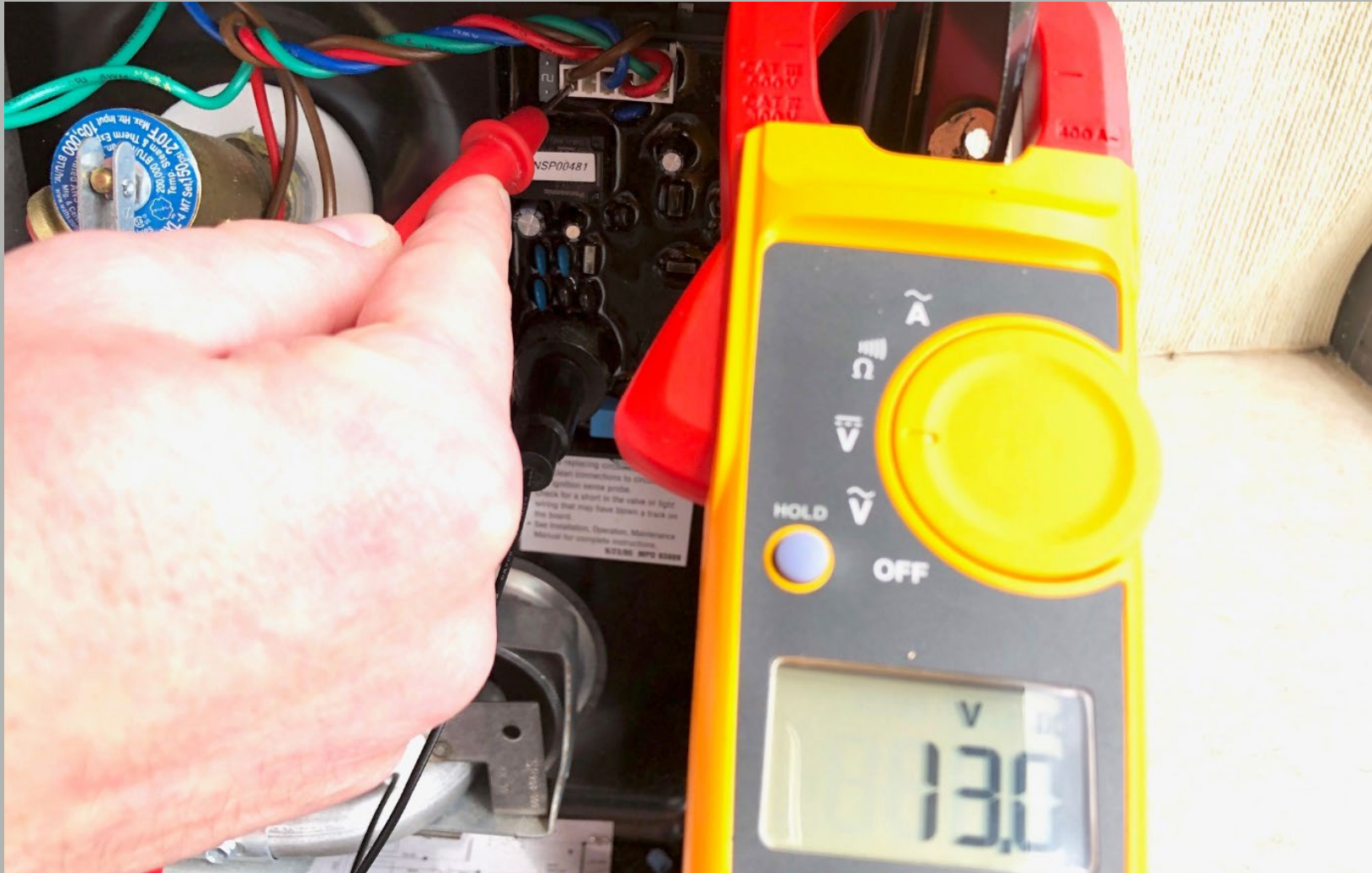
These situations are NOT due to a defect in the water heater but are caused by improper installation, improper gas-to-air mixture, dirty gas, lack of maintenance, blockage, dirty burner, or an act of nature (I.E. bug nests, spider webs, leaves, etc.).

From the Thermal Cut-Off, then to the Thermostat

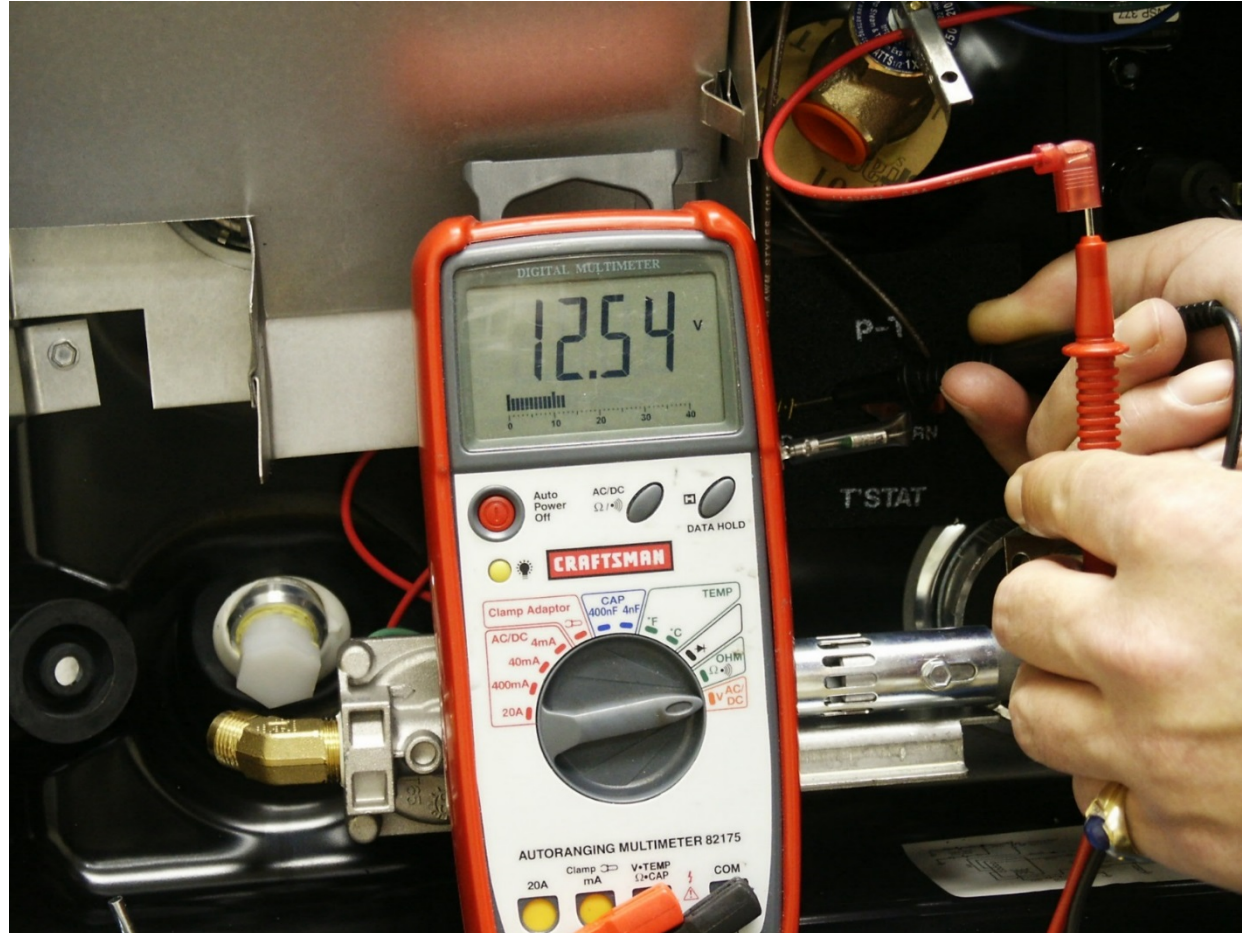


The Thermostat is a fixed temperature thermostat pre-set to 140 degrees +/- 10 degrees. It is a normally close circuit that becomes an open circuit when the tank reaches temperature.

Power then goes in to the board on the Brown wire from the Thermal Cut-Off & Thermostat.



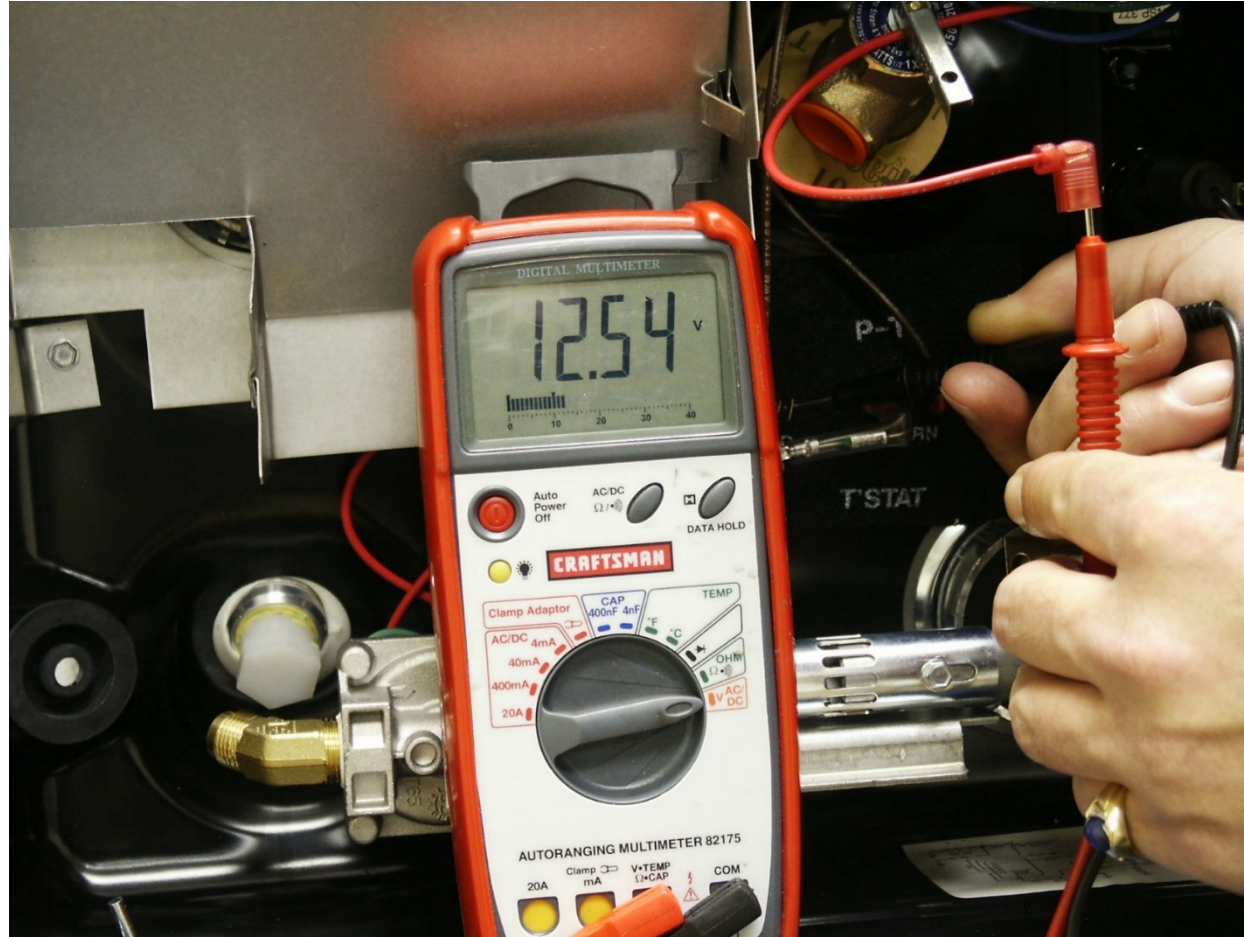
When the Board sees voltage on the Brown wire it sends power out to the ECO on the Red wire.



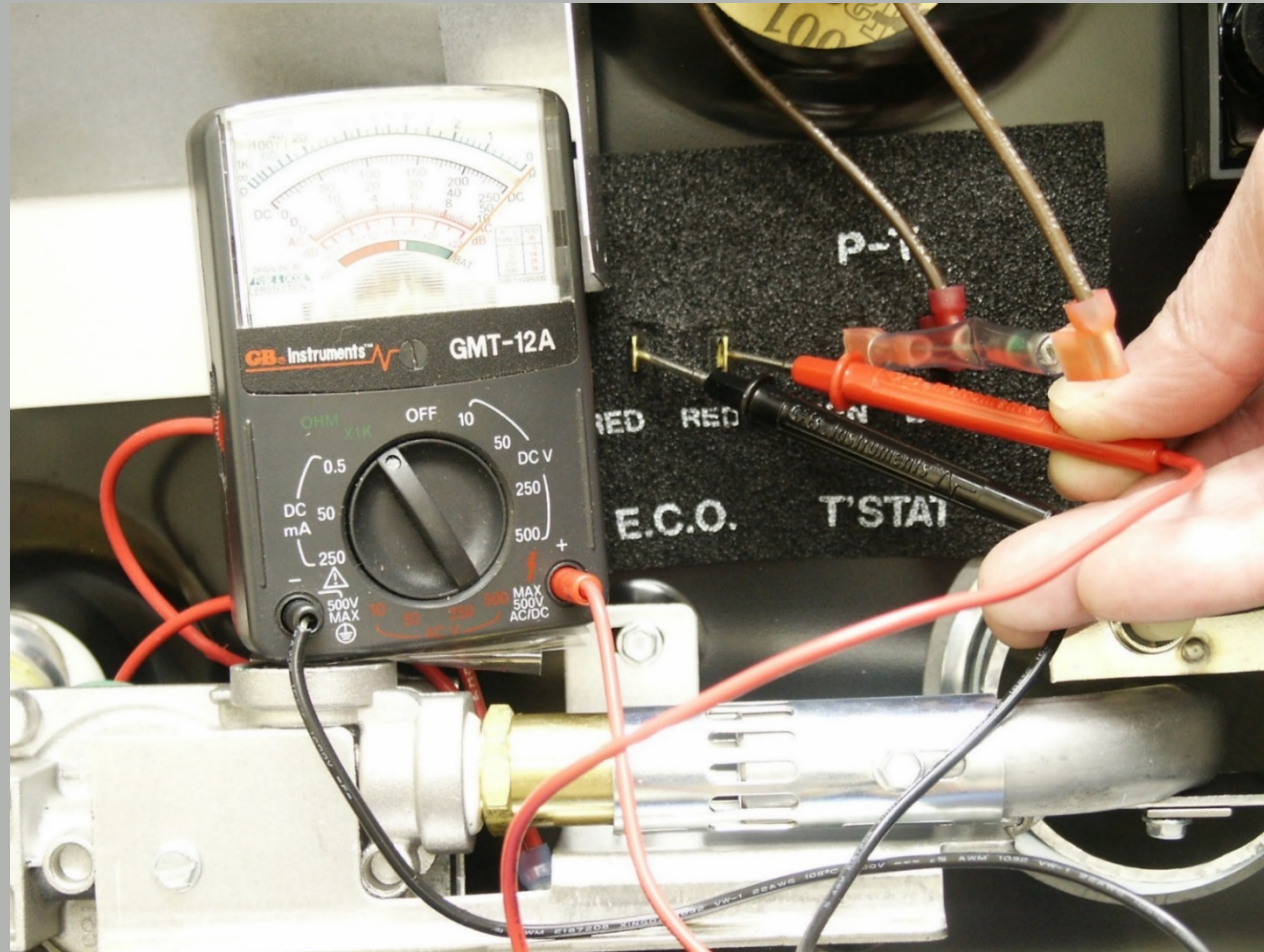
NOTE: If the 2 AMP fuse is blown, no power will be sent to the gas valve on the red wire.

ECO = Emergency cut off – becomes open circuit at 180 degrees +/- 10 degrees.

Power must pass through the ECO before it gets to the Gas Valve (Red Wire)



Checking continuity through the ECO



NOTE: If the ECO is an open circuit on a gas only water heater, the electrode will still spark but the gas valve will not open. Three attempts to light before the board goes in to fault.

With continuity through the ECO, voltage makes it's way to the gas valve, valve opens up allowing gas to flow, spark and gas will meet, and you should have ignition.

Thermostat & Sensor Values

- T-stat (non XT) calls for heat at approx. 120 F (49 C) and ends the cycle at approx. 140 F (60 C)
- XT Model T-stat calls for heat at approx. 135 F (57 C) and ends the cycle at approx. 154 F (68 C)
- ECO becomes an open circuit at approx. 180 F (82 C) – Self resets once it cools down
- Thermal Link wiring becomes an open circuit at approx. 208 F (98 C) – permanently disabled
- Pressure / Temperature Valve (P/T) relieves pressure of the tank at approx. 210 F (99 C)



Adjustable Thermostat

Available in the
aftermarket if a
customer states the
water is too hot.

Adjustable range of
110F – 150F approx.

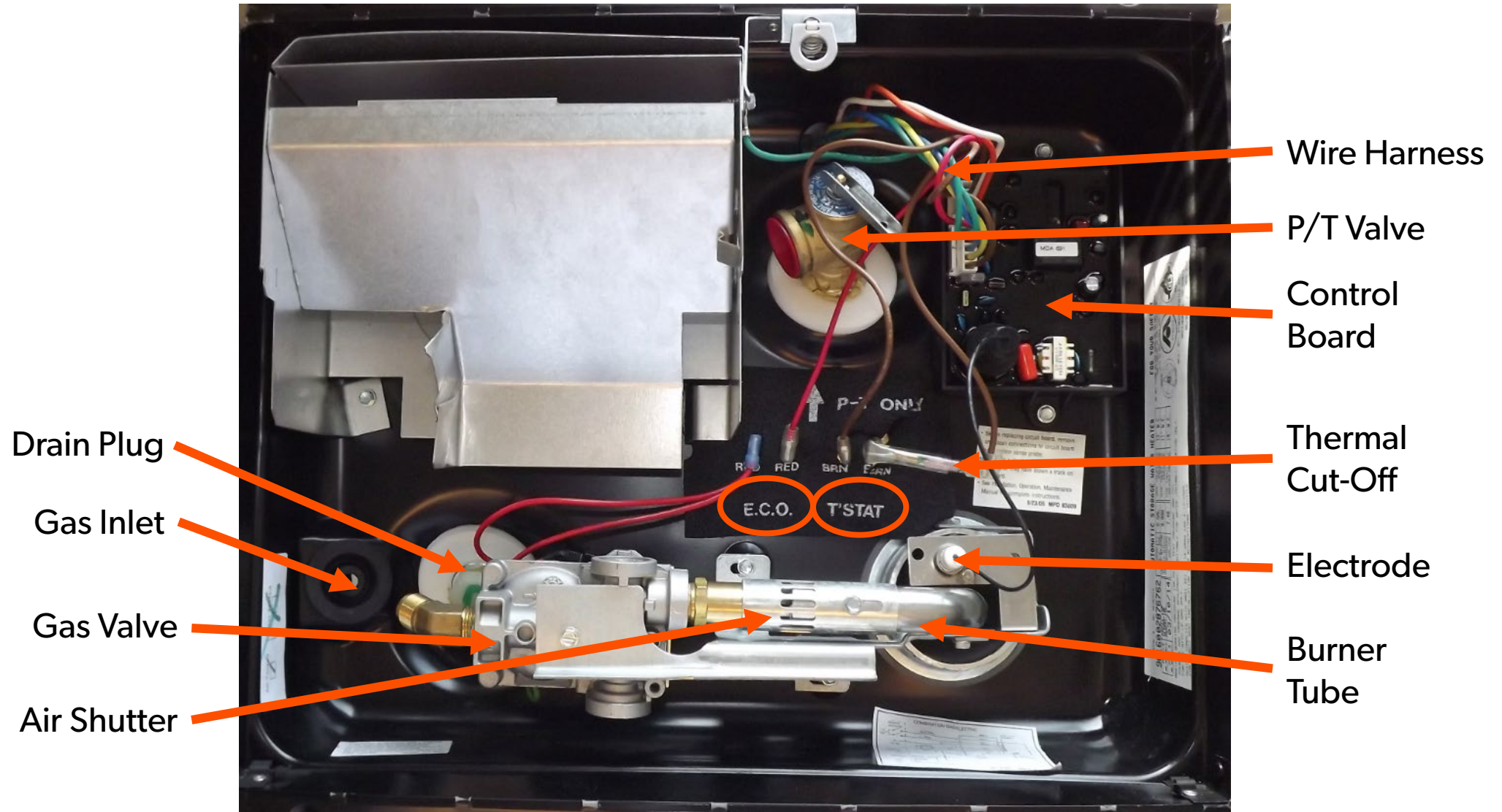
PN: 93105



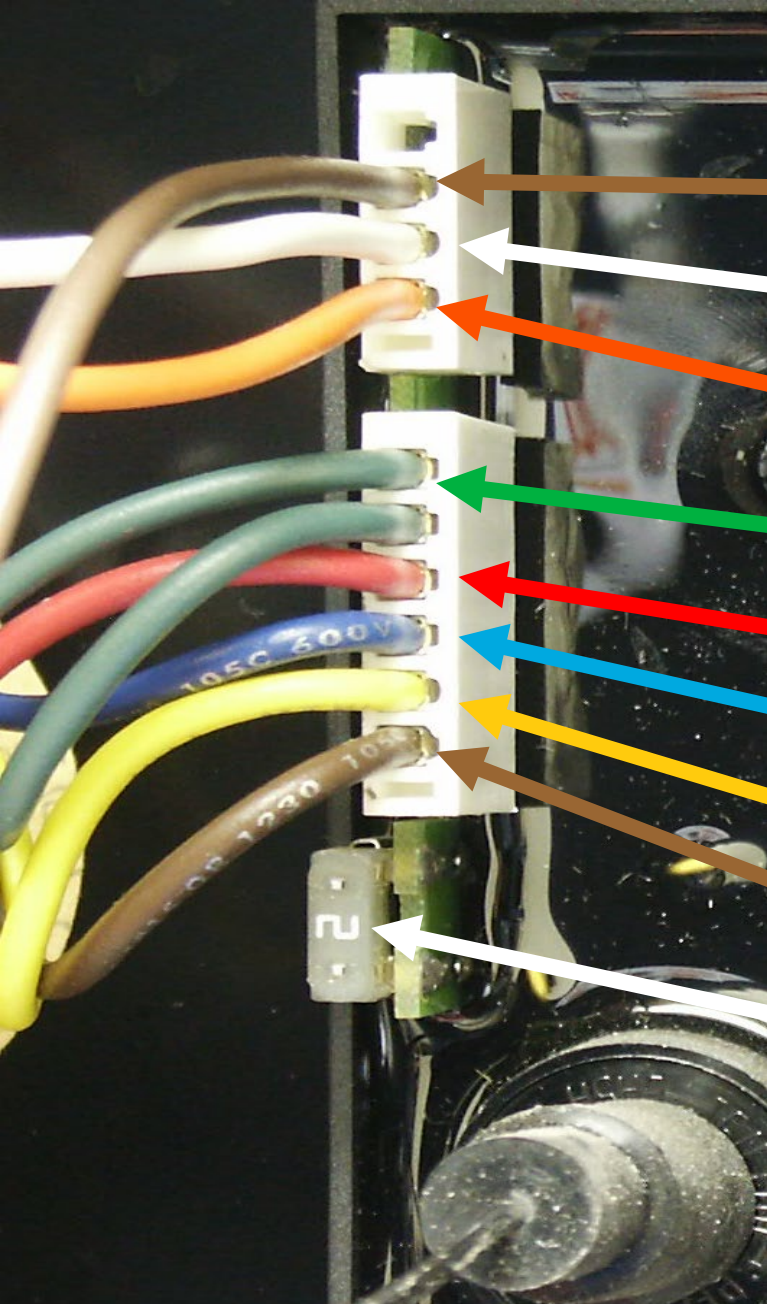
Combo Water Heater

Sequence of Operation

Combo Model Component Location



Gas/Electric module board



Power to Thermal cut-off/thermostat

Power in from electric switch

Power in from gas switch

Both green are ground

Power to gas valve

Light circuit (only lights if fails)

Power to AC circuit on the back

Power from top through thermostat

Fuse

NOTE: On Combo Water Heaters, if the 2 AMP fuse blows, you will find power everywhere else on the board except no volts sent out on the yellow for electric and no volts sent out on the red for gas.

Control Panel / Electric Wiring

Turn electric on. Power is sent to the board on the white wire.

REMOTE WALL SWITCH

+ 12 VDC

ELECTRIC

GAS

12VDC at the switch

- 12 VDC

If there is an ignition failure, the Lock Out Light comes on after three tries. If the ECO is an open circuit, the fault lights comes on immediately.



REMOTE LOCK-OUT LAMP

115 VAC NEUTRAL

115 VAC HOT

Element heats water. and lets the the element.

ELECTRIC HEATING ELEMENT

RELAY



GAS VALVE

ECO SWITCH

FIXED TEMP CONT T-STAT

Current is sent to the electrode. Gas is ignited and heats the water.

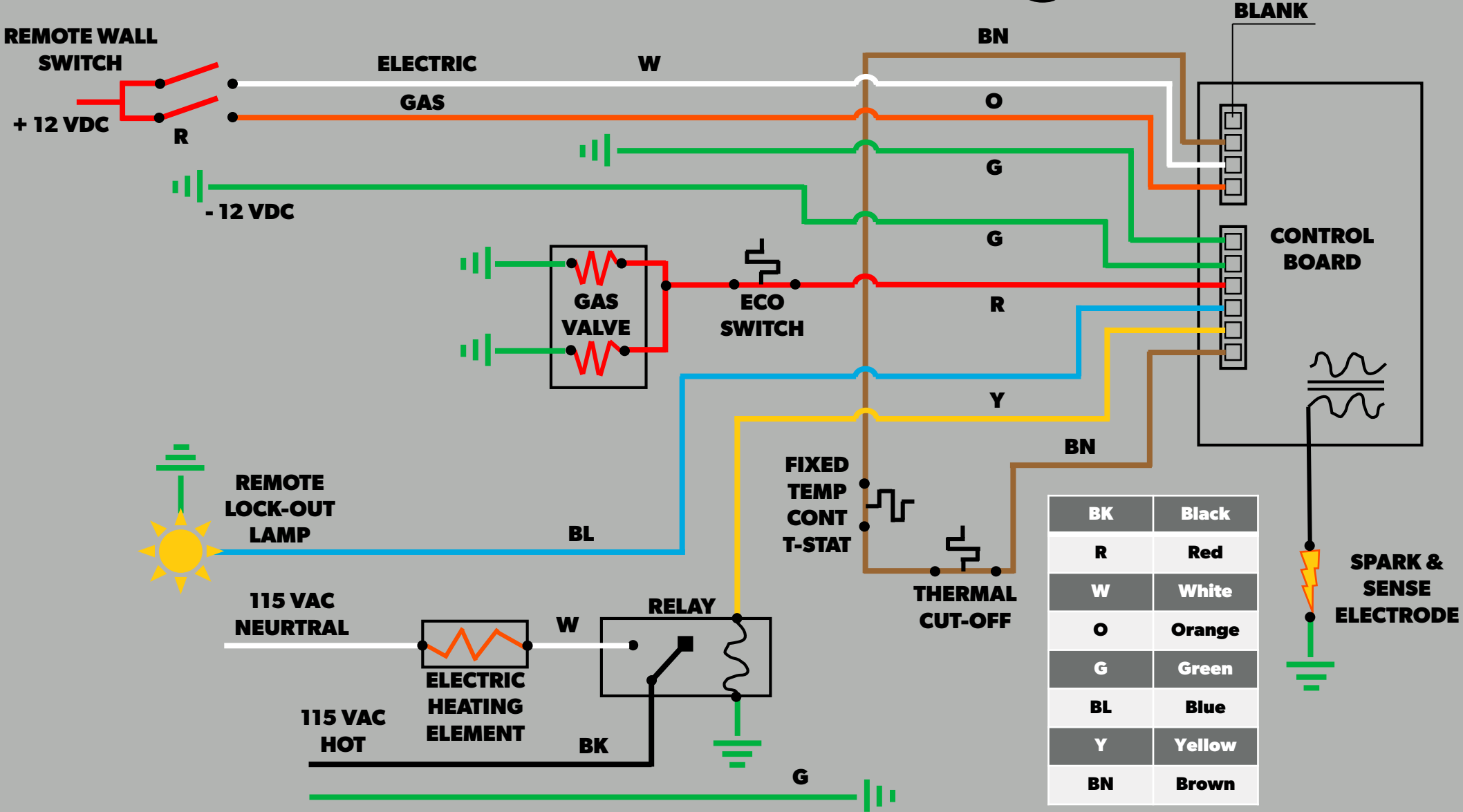
THERMAL CUT-OFF

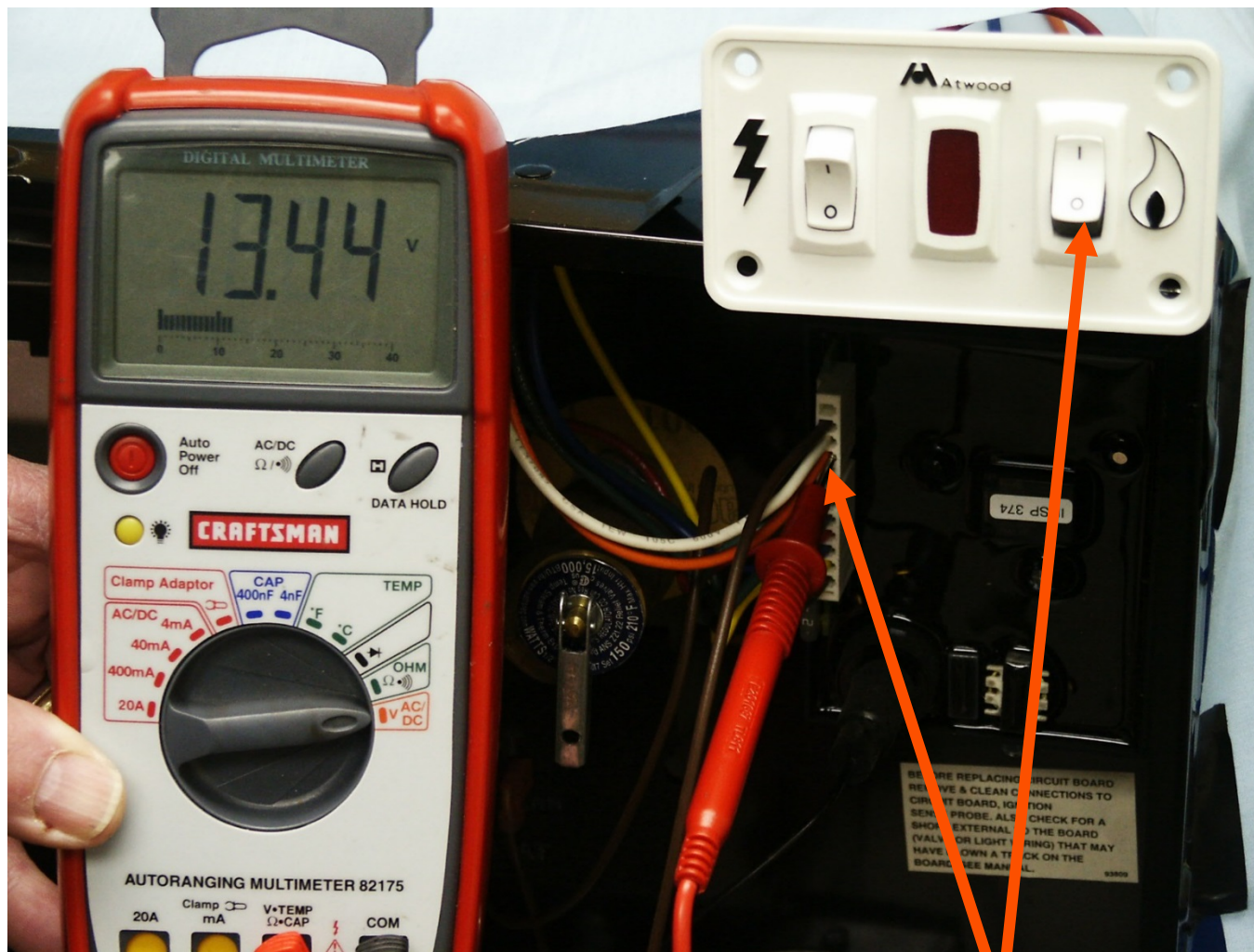
DC power is sent to the relay on the yellow wire. At this time, there is a check to see if the Gas Valve is open. If so it will prohibit AC operation.

Power from the top of the board to the bottom of the board on the brown wire to check continuity through the T-stat and Thermal Cut-off.

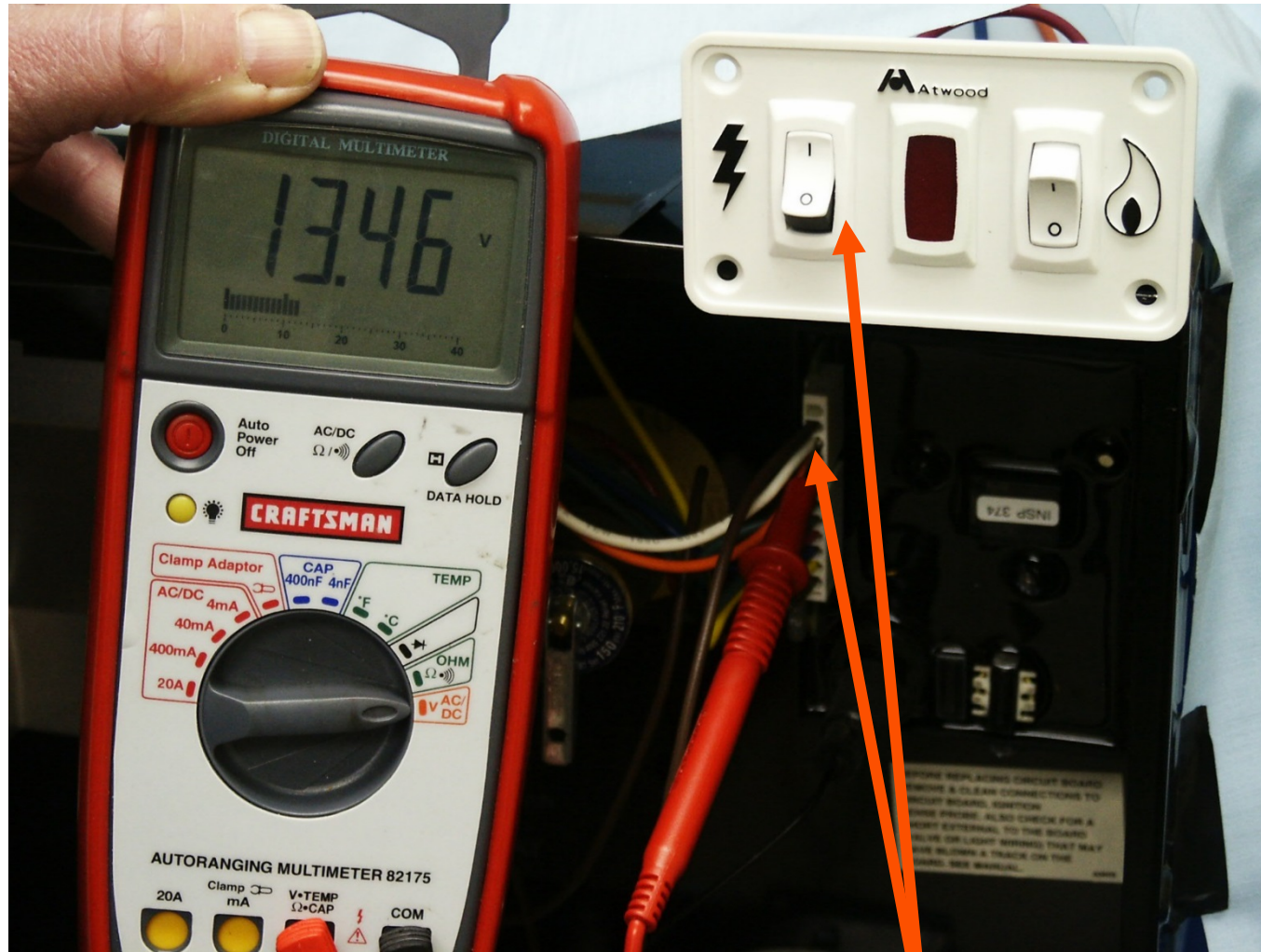
SPARK & SENSE ELECTRODE

Combination Gas/Electric Wiring





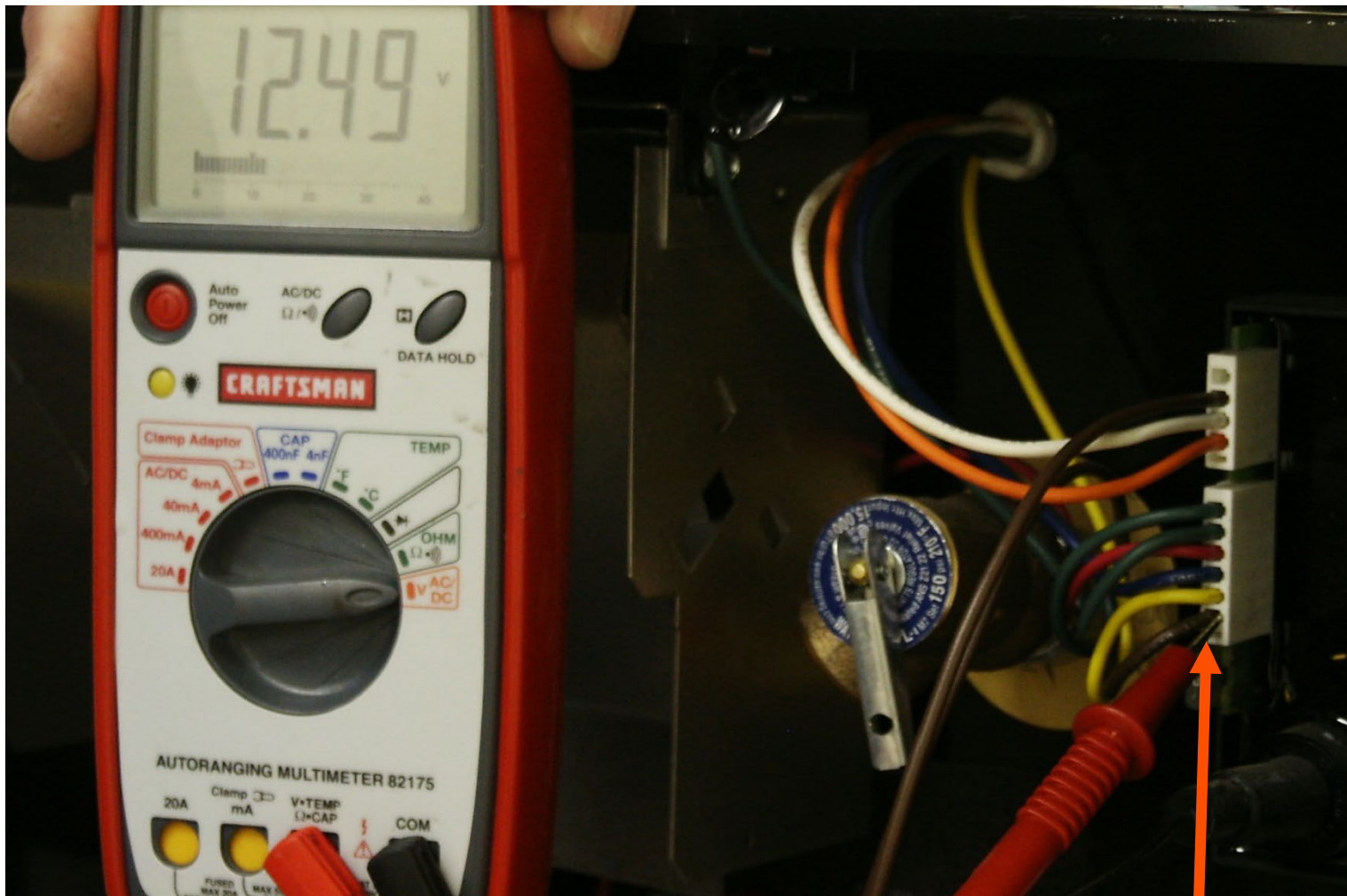
With the gas switch on, power comes into the control board on the orange wire.



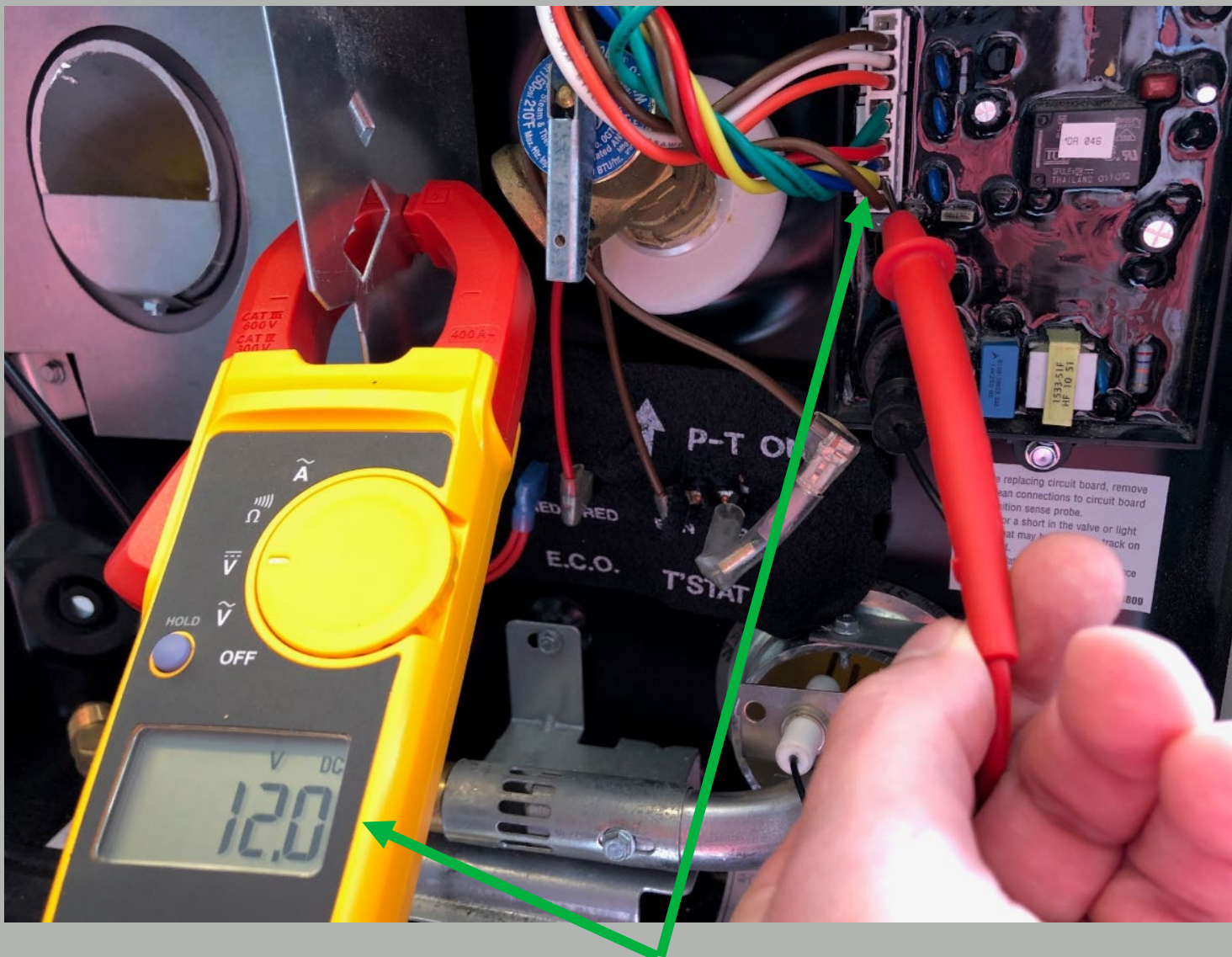
With the electric switch on,
power comes into the board on the white wire.



With gas or electric on, power goes out of the board on the brown wire, through the thermostat/thermal cut-off...



...then back into the board on the bottom brown wire.



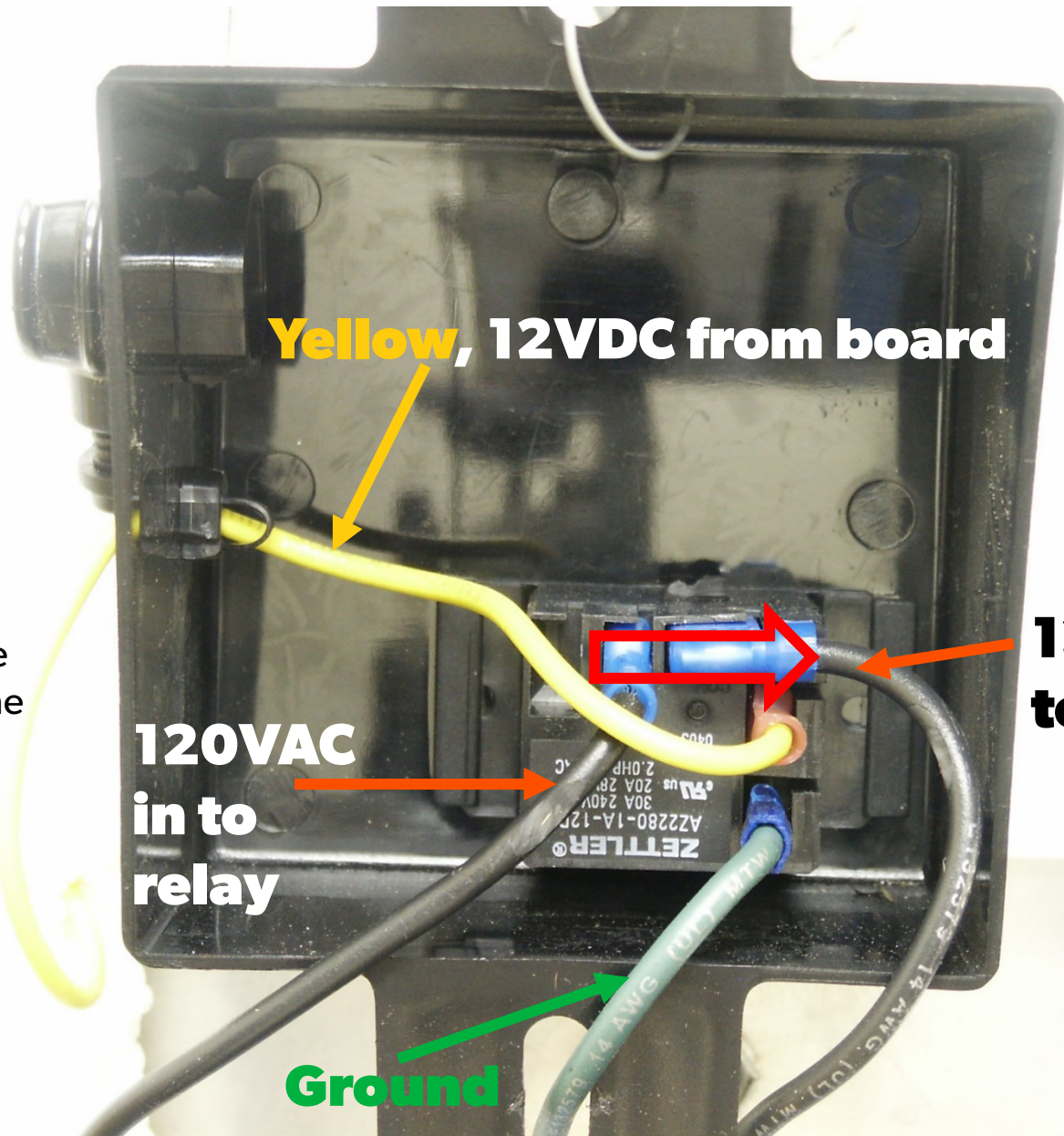
Also, with electric on,
power is sent to the back relay on the yellow wire.

1. With the wall switched turned on to electric, DC voltage comes in to control board on the white wire.

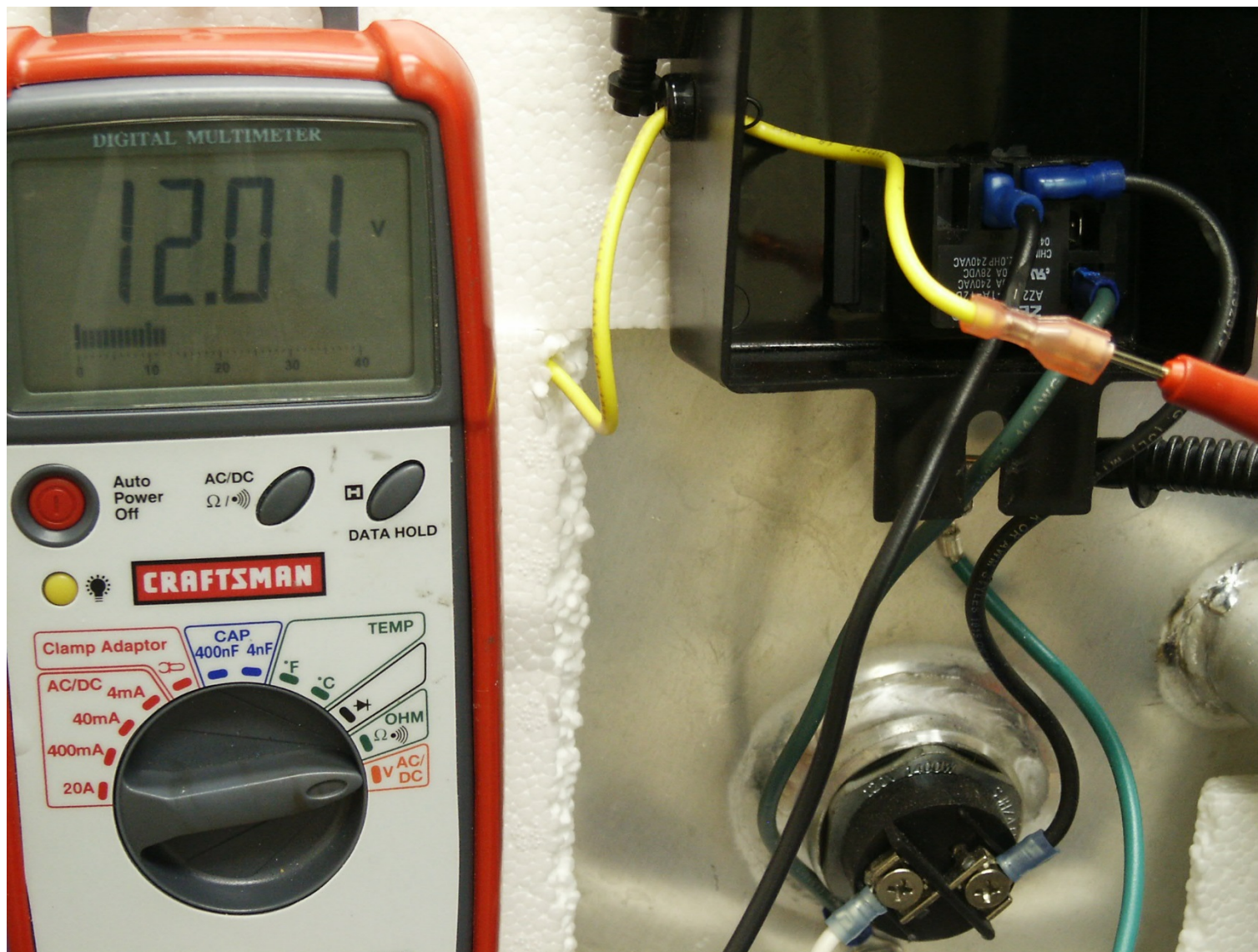
2. DC voltage comes out of the board (top brown wire), passes through the t-stat and thermal cut off, and back in to the board on the bottom brown wire.

3. DC voltage comes out of the board on the yellow wire to the relay on the back of the water heater.

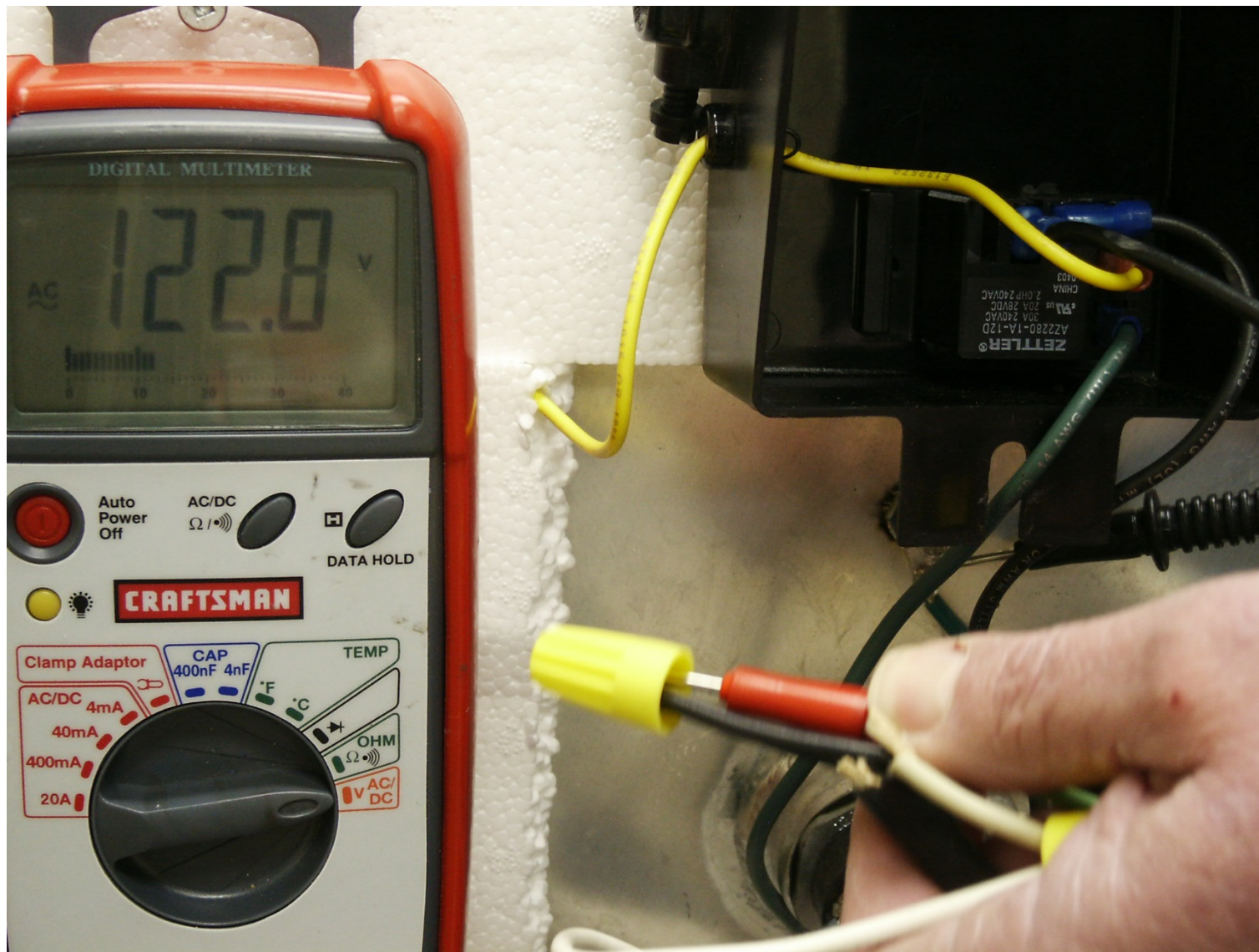
4. DC voltage closes the relay (you should hear a click). There should now be continuity and AC voltage through the relay and out to the element.



NOTE: Relay will not close if not properly grounded. If the ground wire is free from the relay or the connection is loose at the grounding screw.



Checking 12VDC from Board to Relay



Checking AC voltage to Relay (or check continuity through the Relay)

**Testing the Element,
9 to 11 OHMs is
acceptable.**

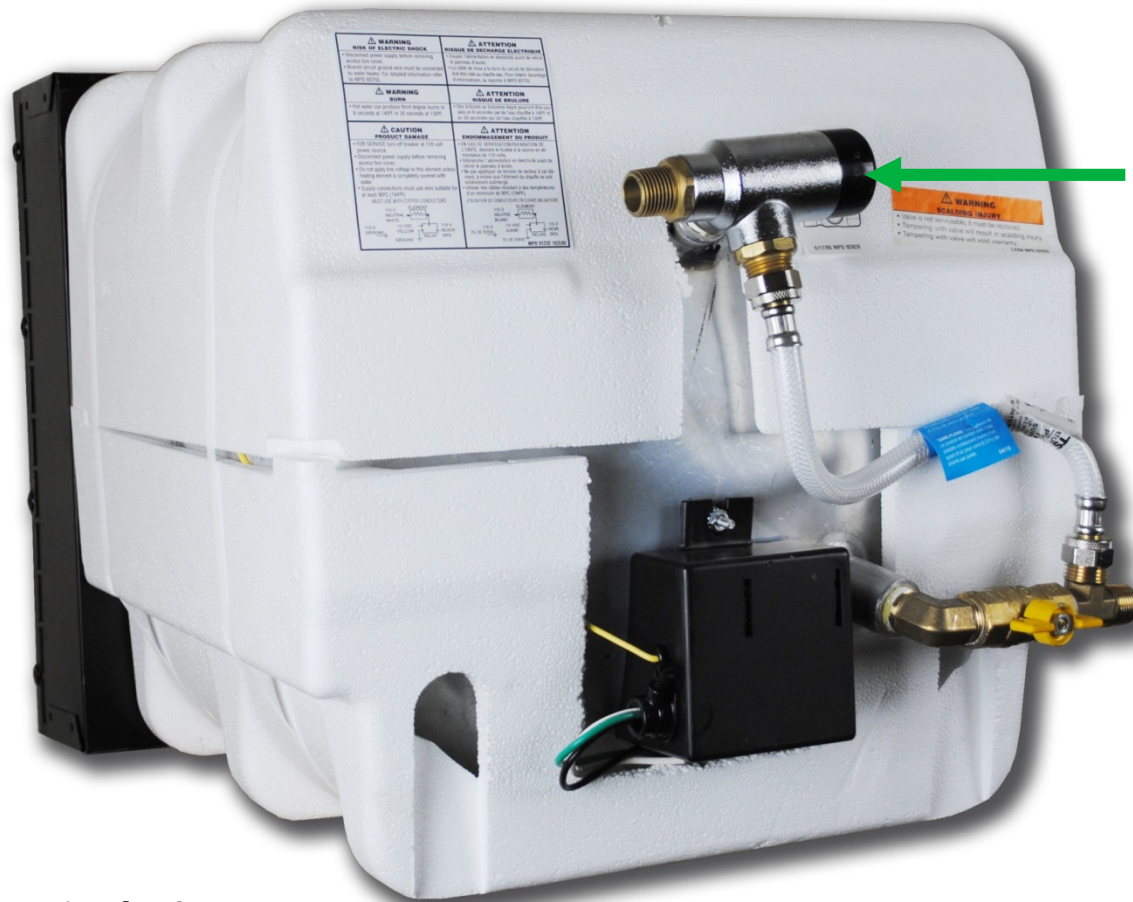


XT Model

Mobile living made easy.

 **DOMETIC**

Current Generation



Silver valve indicates new style – Self Cleaning.

The mixing valve adds capacity for hot water without storing it (10 gallon becomes 16 gallons effectively & 6 gallons becomes 9 gallons effectively.)

Low flow or water not as hot as it should be?



It may be necessary to clean the mixing valve. Once the cold water mixing valve is removed, take out the screen (if equipped), and remove any debris that would be restricting water flow. Soak the mixing valve in a hot white vinegar bath and flush out the tank.

Thermostat and ECO for XT Unit



The fixed thermostat for the XT Model is rated for 154.4 degrees F. If the XT unit is ever de-rated, the thermostat must also be changed to a 140 degree fixed thermostat.

Troubleshooting & Repair

Electrode



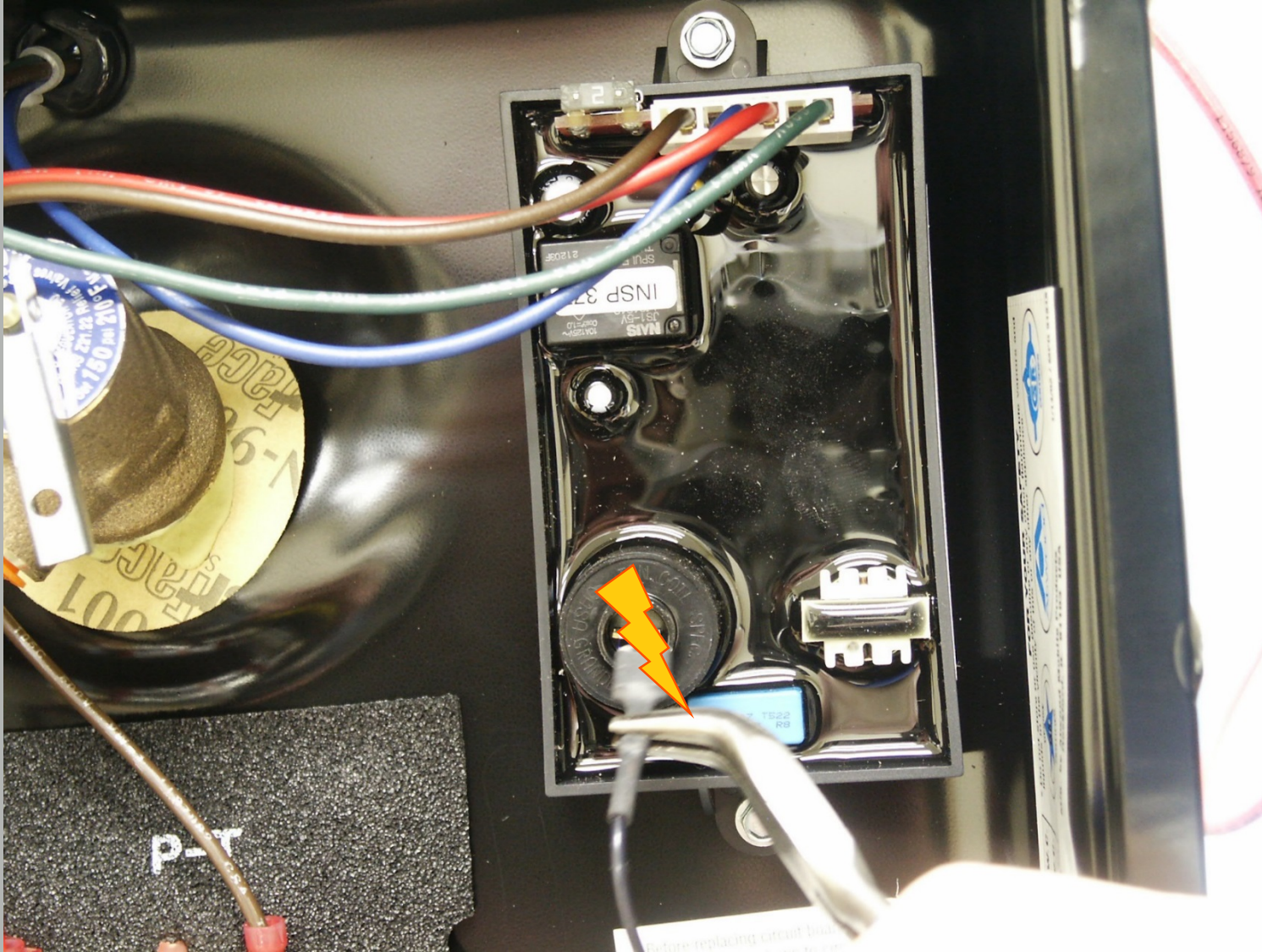
Examine electrode for cracks, bad wire, and proper adjustment (1/8" gap).

If the electrode gets bent out of position and readjusted it can put a lot of strain on the ceramic casing, any cracks that form can possibly collect moisture which will ground the electrode.

Symptoms:

- No Spark
- Sparks but will not stay lit
- Takes several attempts to finally light
- Gas valve may no open

Verify you are getting a spark?



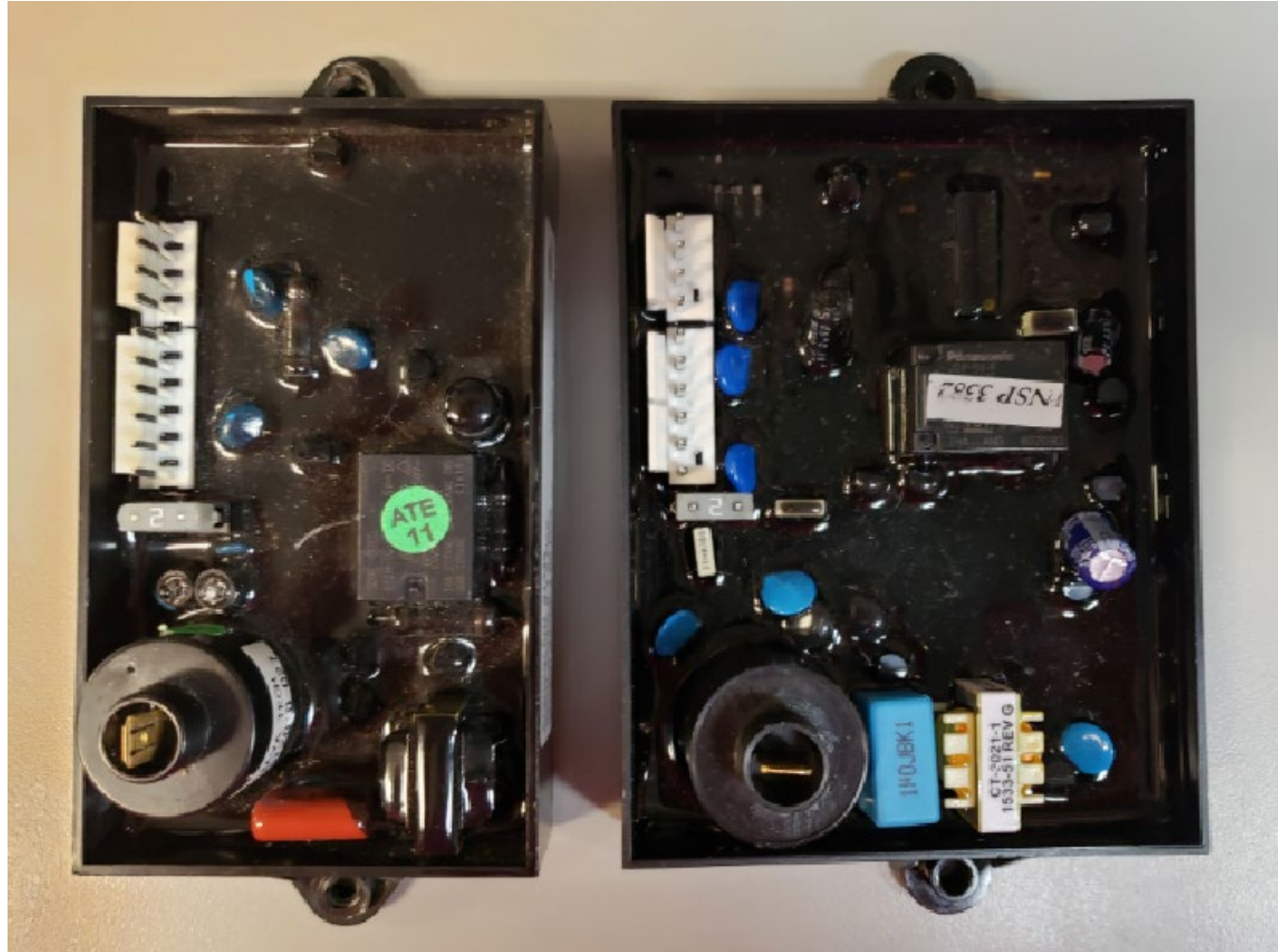
Verify you are getting a spark?

Some boards had a higher failure rate for gas operation.
The symptom would be, gas valve opening, but no spark generated.



Visually, you would see a bubble on the back of some of the boards. This was a problem with the Zhongding brand of boards. Not ALL boards were bad however, but enough were for us to change suppliers.

Board Variations



Zhongding
(previous)

Channel Products
(current)

Older Versions of Boards

Combo
Board

Pin Adapter
PN: 92074

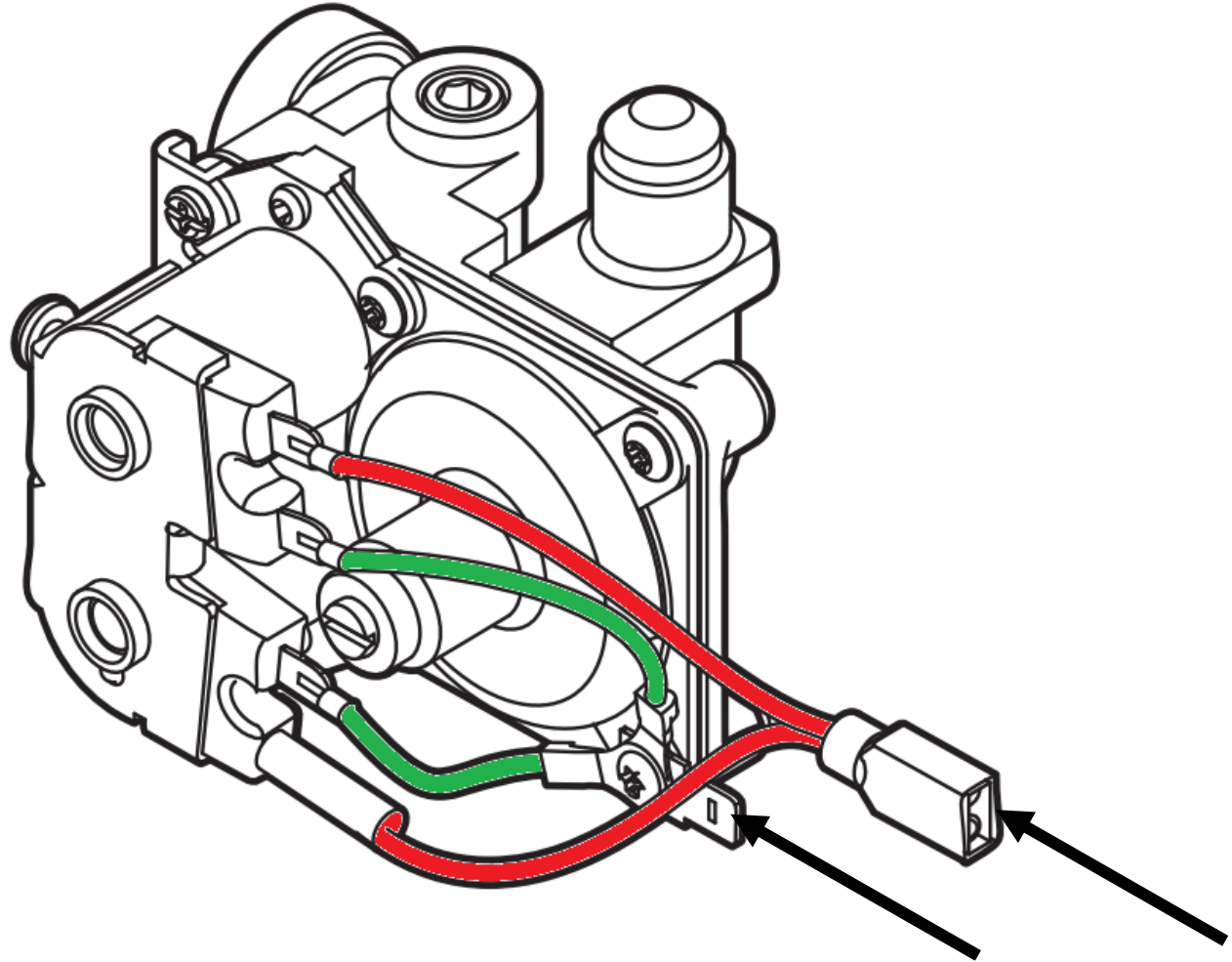
Gas Only
Board

Pin Adapter
PN: 92075

Testing Gas Valve Solenoid Coils

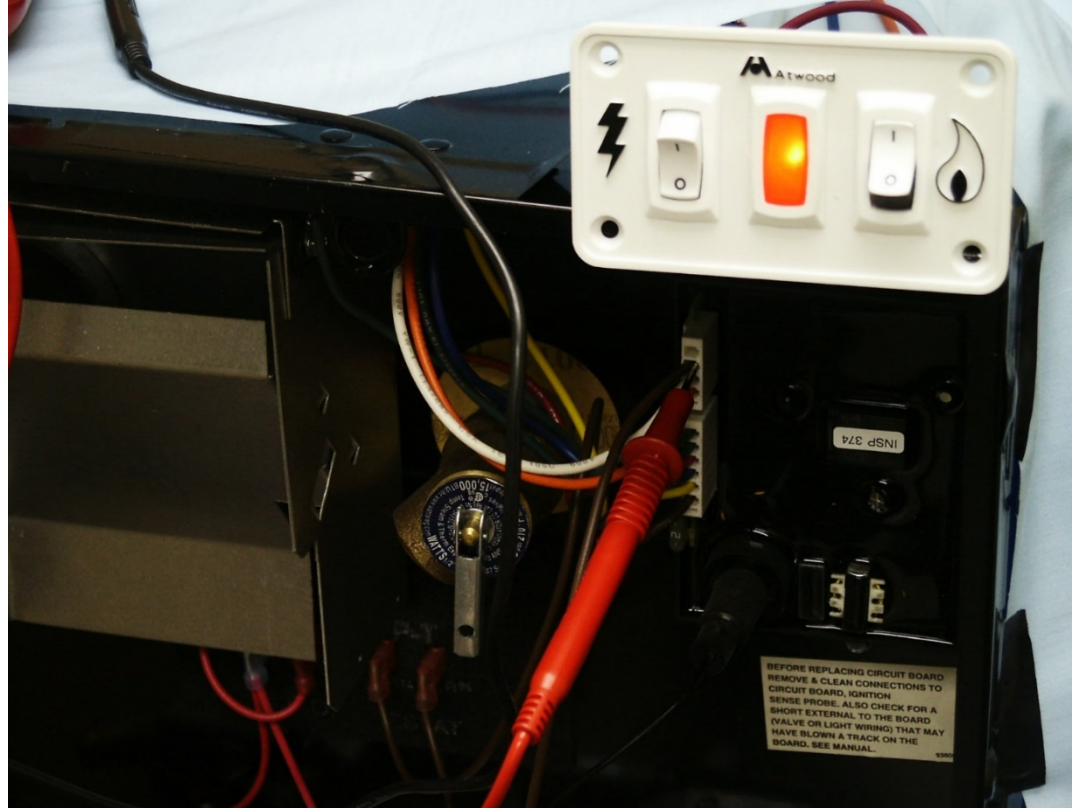
Symptoms:

- Clicking but won't light
- Not opening
- Lazy flame



You see between 15-25 ohms when checking resistance.

Dual Wall Switch Fault Light



This light will not illuminate unless there is a problem. If the board tries to light three times in gas operation and fails, the light will illuminate. If the light comes on within a few seconds of turning the switch on (either gas or electric) then the ECO is likely an open circuit and the unit won't work on both gas and electric.

Keep in mind the difference between a combo water heater and a gas only unit. Gas only wall switch light illuminates during ignition and goes out as flame is recognized.

Verifying the Flame Spreader is in the proper position

The symptom would be a tripped Thermal Cut-Off or a back fire.



Bent in too far.



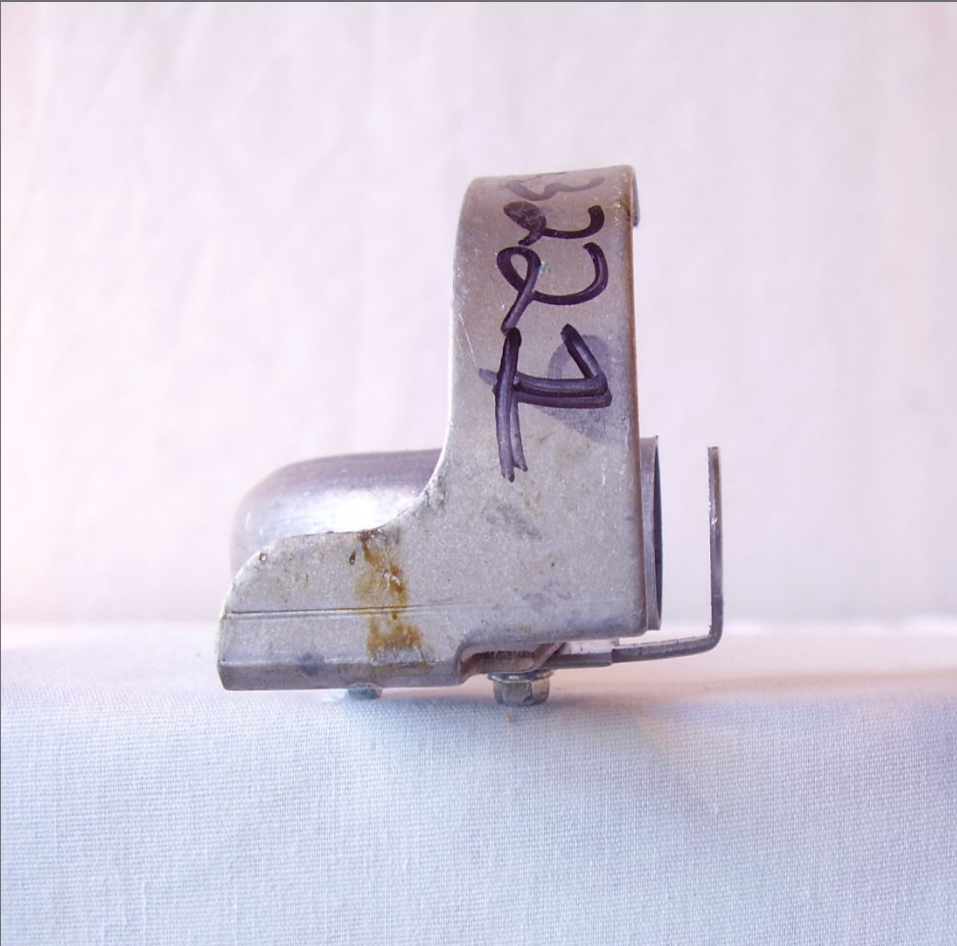
Bent out too far.



Off center.

This gets moved out of position during maintenance and cleaning of the burner tube. As a pipe cleaner is ran through the tube, it can push the Flame Spreader away and, as the pipe cleaner is pulled back out it will pull the Flame Spreader along with it.

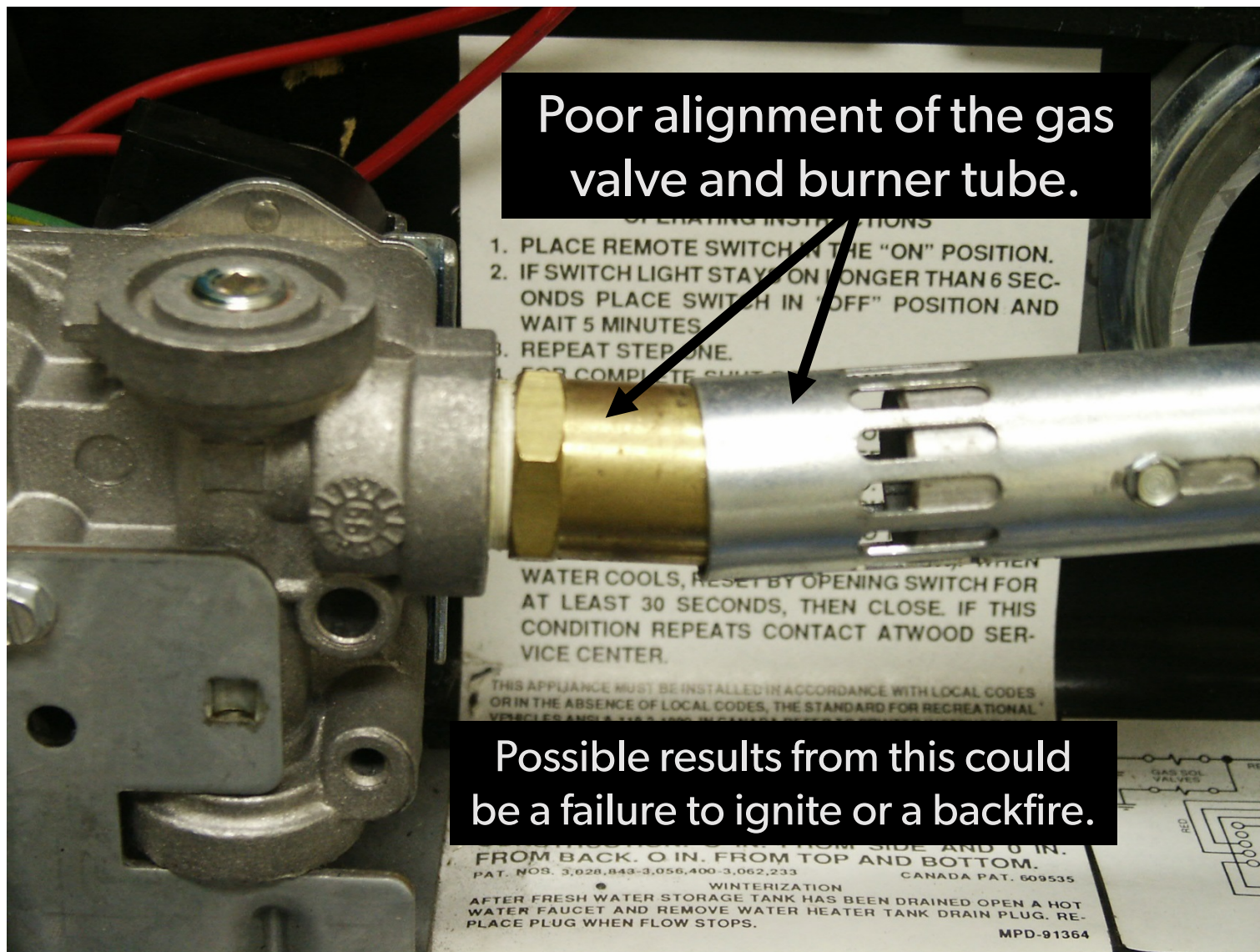
Properly Positioned Flame Spreader



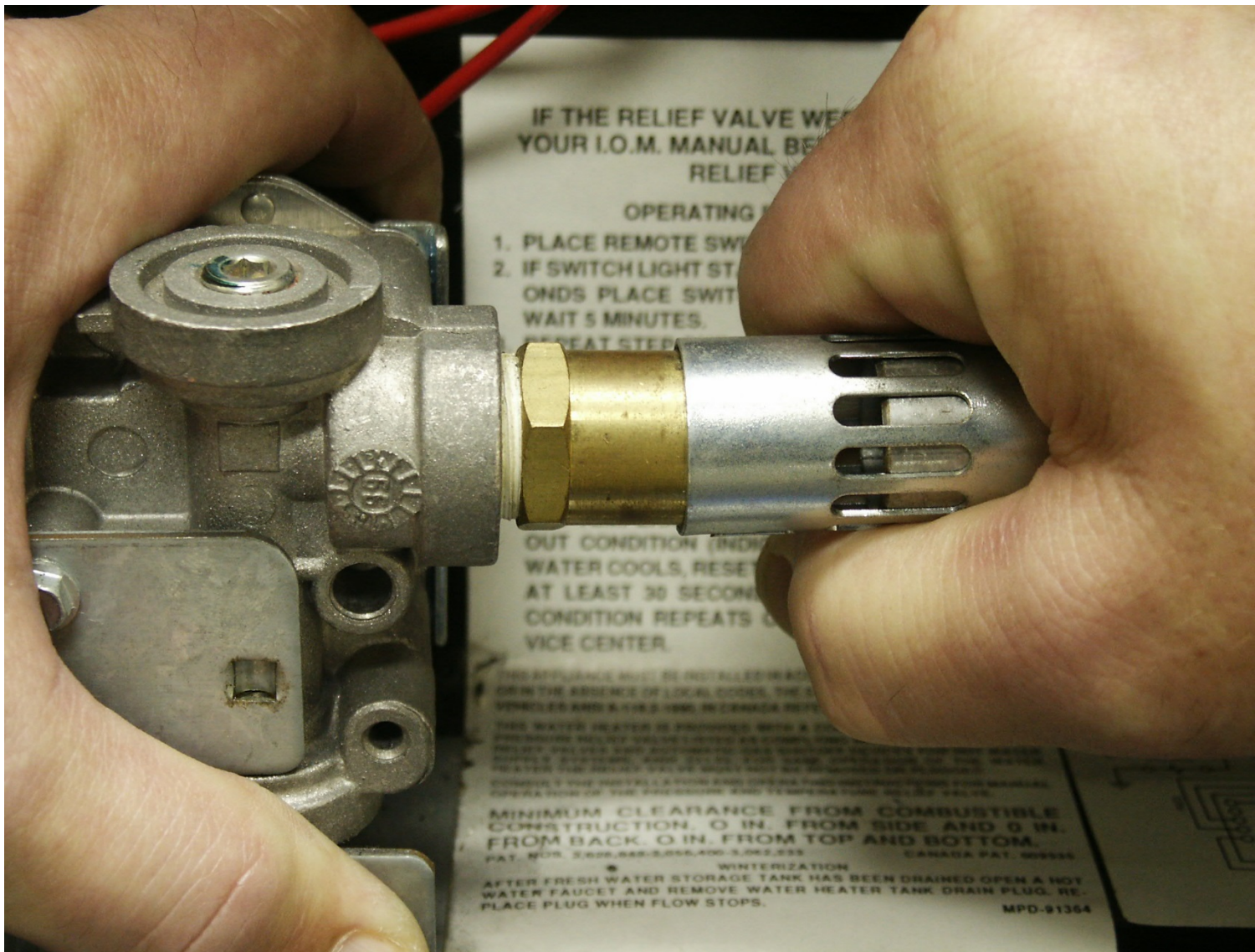
Parallel to the Burner Tube



Centered as much as possible



This is caused during installation as the installer uses the tube as a handle to grab and move the Water Heater into position.



Adjust for proper alignment. This is not covered under warranty as this would have been an installation issue.

For normal operation,
should be set to an 1/4" gap

If not adjusted properly can affect lighting,
staying lit, and cause improper burn.

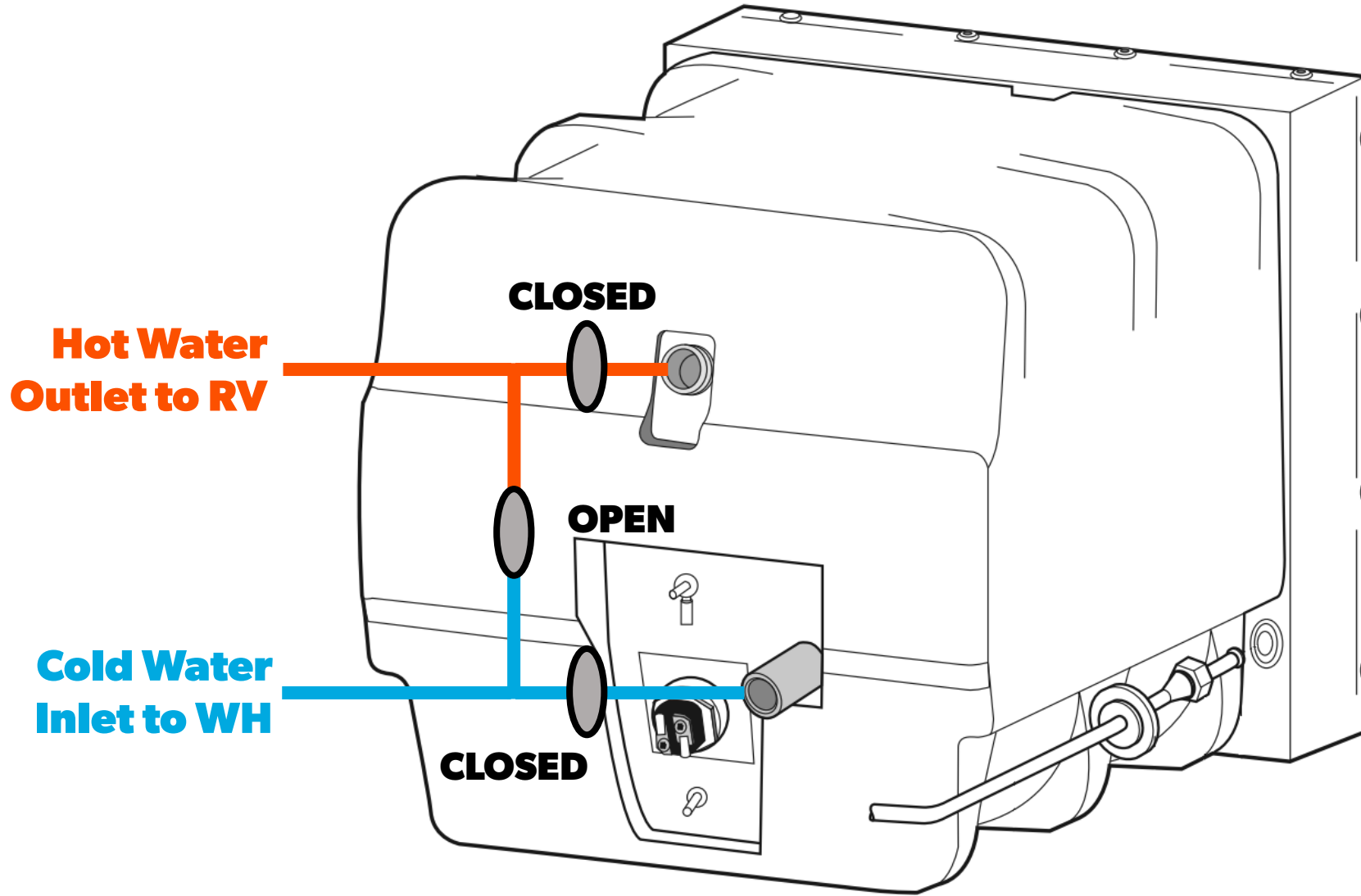
Adjust as needed in small increments. Opening to no more than ½".
Sometimes needed at higher altitudes.



Soot Issues?

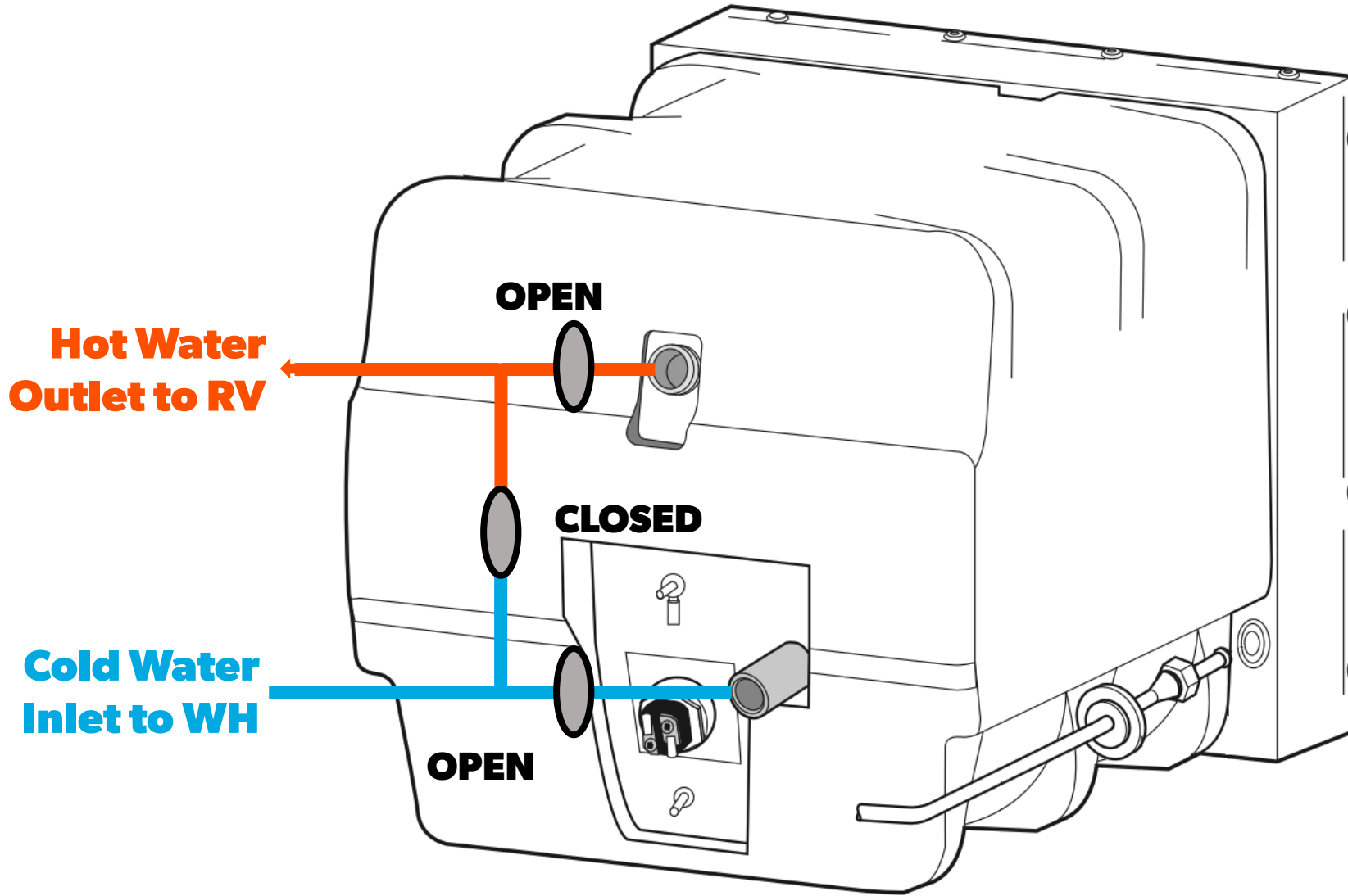
Heavy sooting occurs when the burner is out of alignment, flame spreader is bent out of position, improper gas-to-air mixture, insect nests, ect.

Bypass System (Winterization Mode)



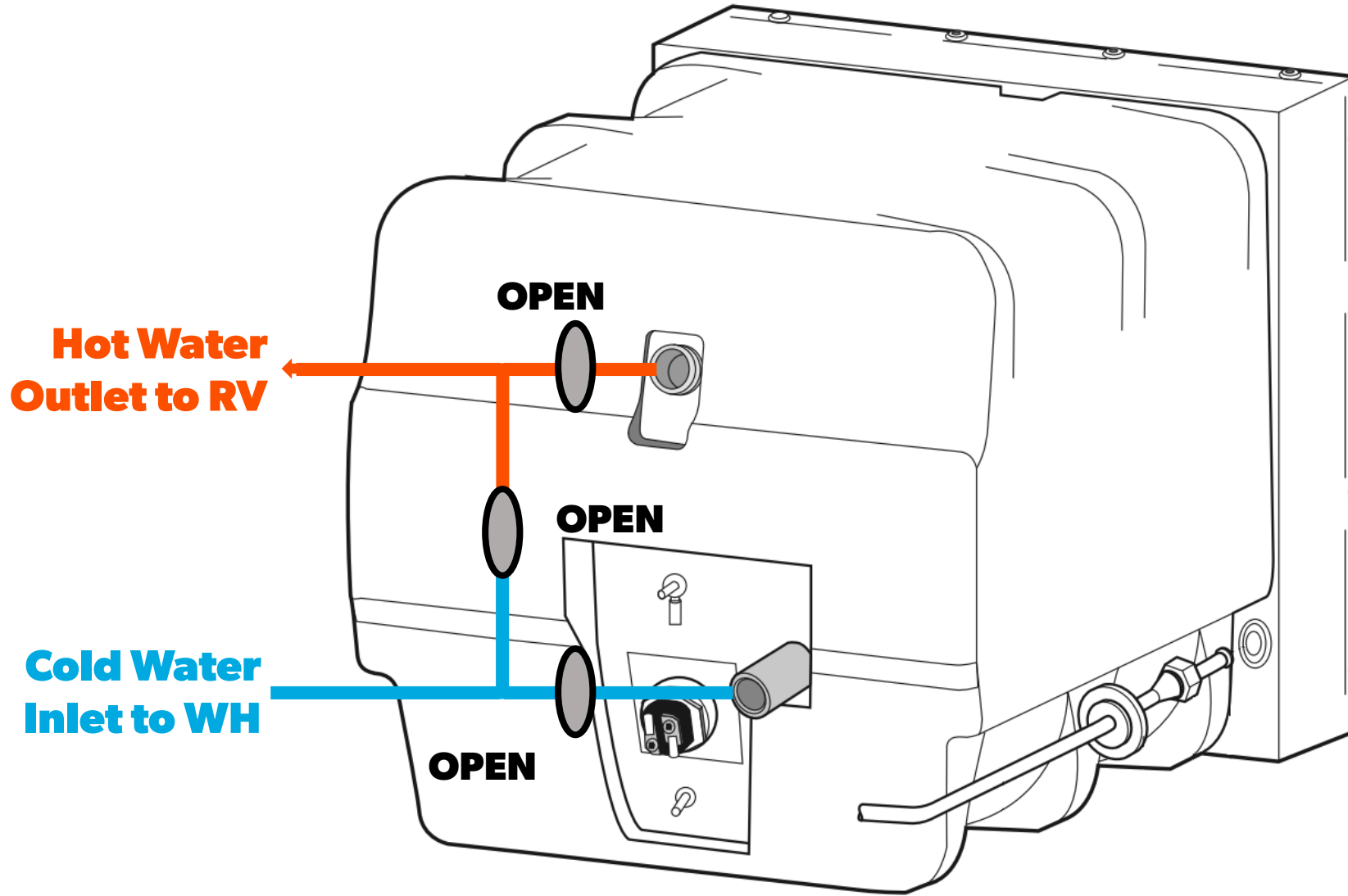
This is what the bypass system should look like for winterization mode.

Bypass System (Operation Mode)



This is what the bypass system should look like for normal operation, when taken out of winterization mode.

Bypass System (Common Mistake)



A common mistake that is made when taken out of winterization mode is opening all three valves. The symptom here would be, hot water for a moment, then luke warm / cool water as cold water is mixing in with the hot outlet water.

Tank Topics

Pressure-Temperature Relief Valve

New "PT" valve
as of 02/2006

Old

$\frac{3}{4}$ - 14 NPT

$\frac{1}{2}$ - 14 NPT

The P/T valve is designed to relieve the tank if pressure exceeds 150 psi or temperature exceeds 210° F

Dry Fired P/T Valve

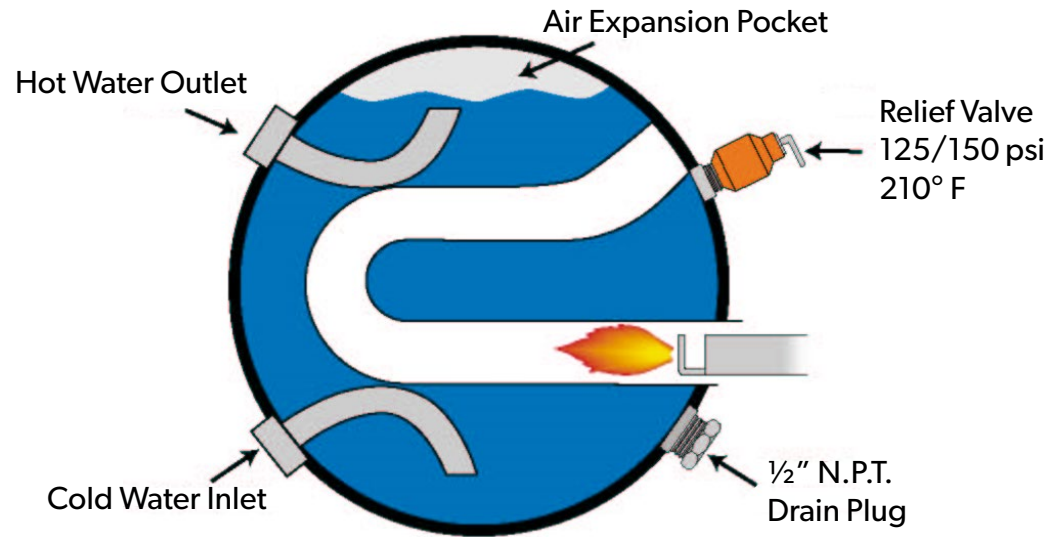


Results of a Water Heater ran without any water in the tank. The symptom here would be a constant weeping. This is not covered under warranty.

Pressure-Temperature Relief Valve

Weeping or dripping of a pressure-temperature relief valve while the water heater is running DOES NOT mean it is defective. This is normal expansion of water as it is heated in the closed water system of a recreation vehicle. The Dometic/Atwood water heater tank is designed with an internal air gap at the top of the tank to reduce the possibility of weeping and dripping. In time, the expanding water will absorb this air. To replace the air, follow these steps:

- Step 1: Turn off the water heater
- Step 2: Turn off the incoming water supply
- Step 3: Open the closest hot water faucet in the coach
- Step 4: Pull handle of pressure-temperature relief valve straight out and allow water to flow until it stops
- Step 5: Allow pressure-temperature relief valve to snap shut, turn on water supply and close faucet



Water Heater Tank Corrosion

Pinhole leaks from galvanic corrosion may cause the water heater tank to fail.

Microscopic particles of metals (like iron and copper) suspended in the water, set up a reaction inside the water heater that is not unlike the principle on which an automotive battery operates. The aluminum tank is the anode and the metals in the water serve as the cathode. Consequently, the aluminum gradually sacrifices itself and aluminum particles are carried away with the water flow.

A white scaly material (aluminum oxide) often is formed around the points where the heaviest action is taking place and heat accelerates the process. Severity of the problem varies considerably in different locales depending on the metal and mineral content of the water. White deposits inside the water heater tank are usually from water impurities that have settled out.

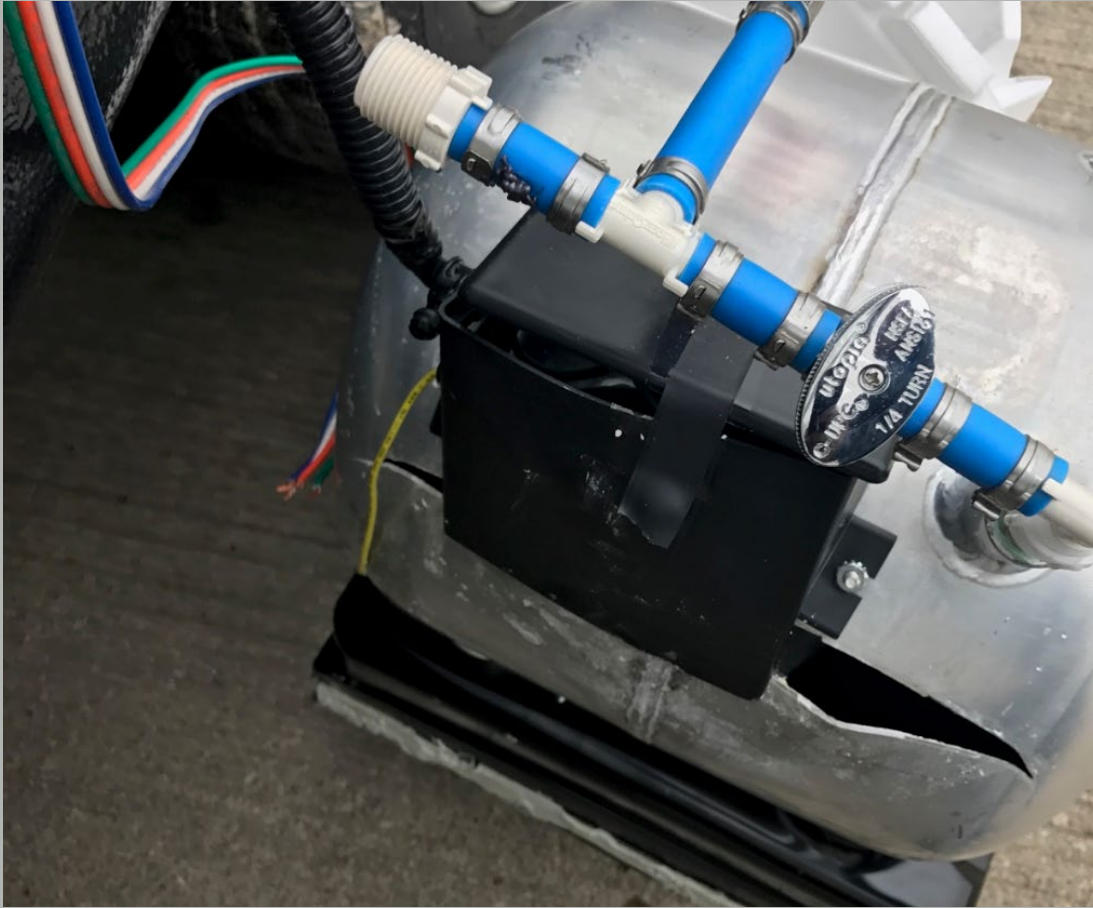
Periodic flushing of the water heater tank under pressure is recommended to slow down this process. For flushing instruction see your owners manual or contact Dometic/Atwood for a copy of our recommended procedure.

Dometic/Atwood Clad Tank

The Dometic/Atwood water heater tank is constructed of a core of high strength aluminum. The interior of the tank consists of a 15% thickness of type 7072 aluminum (pure aluminum and zinc) that is fused to the core during the rolling process. This material protects the tank from the affects of heavy metals and salts found in water throughout the country. It is anodic to these heavy metals and acts much like an anode in a steel glass lined tank except it will last much longer. There is also no need to replace an anode on a yearly basis.

Flushing the tank on a regular basis has been found to be helpful in insuring the best performance of your water heater and adding to the life of the tank. For flushing instructions, see you owners manual or contact Dometic/Atwood for a copy of our recommended procedures.

Tank Leaking Water?



This is the result of improper winterization and is not covered under Dometic Warranty.



This is the result of a bad weld and would be covered under Warranty.

On Demand Water Heater

Mobile living made easy.

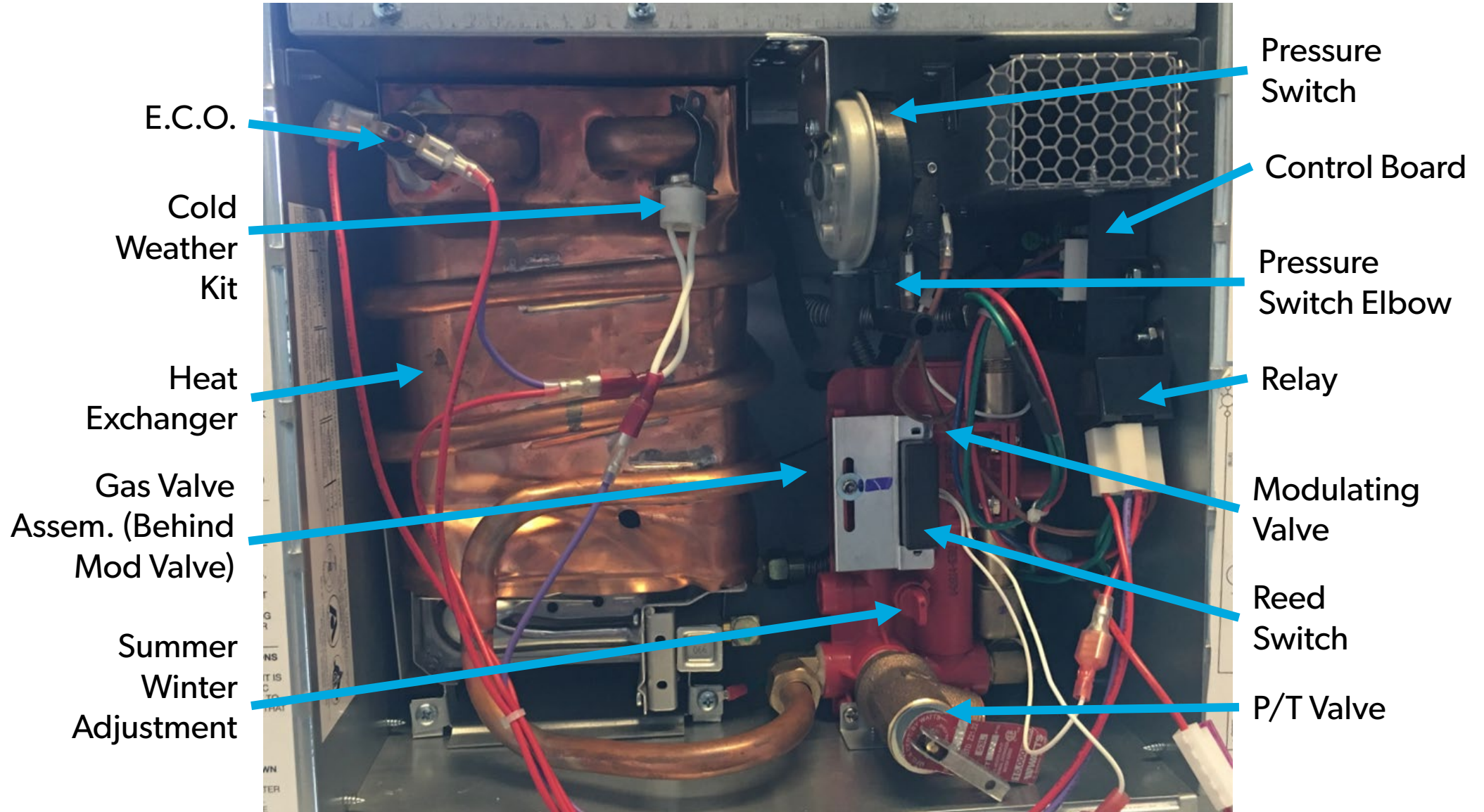


Model Number for On Demand Water Heaters

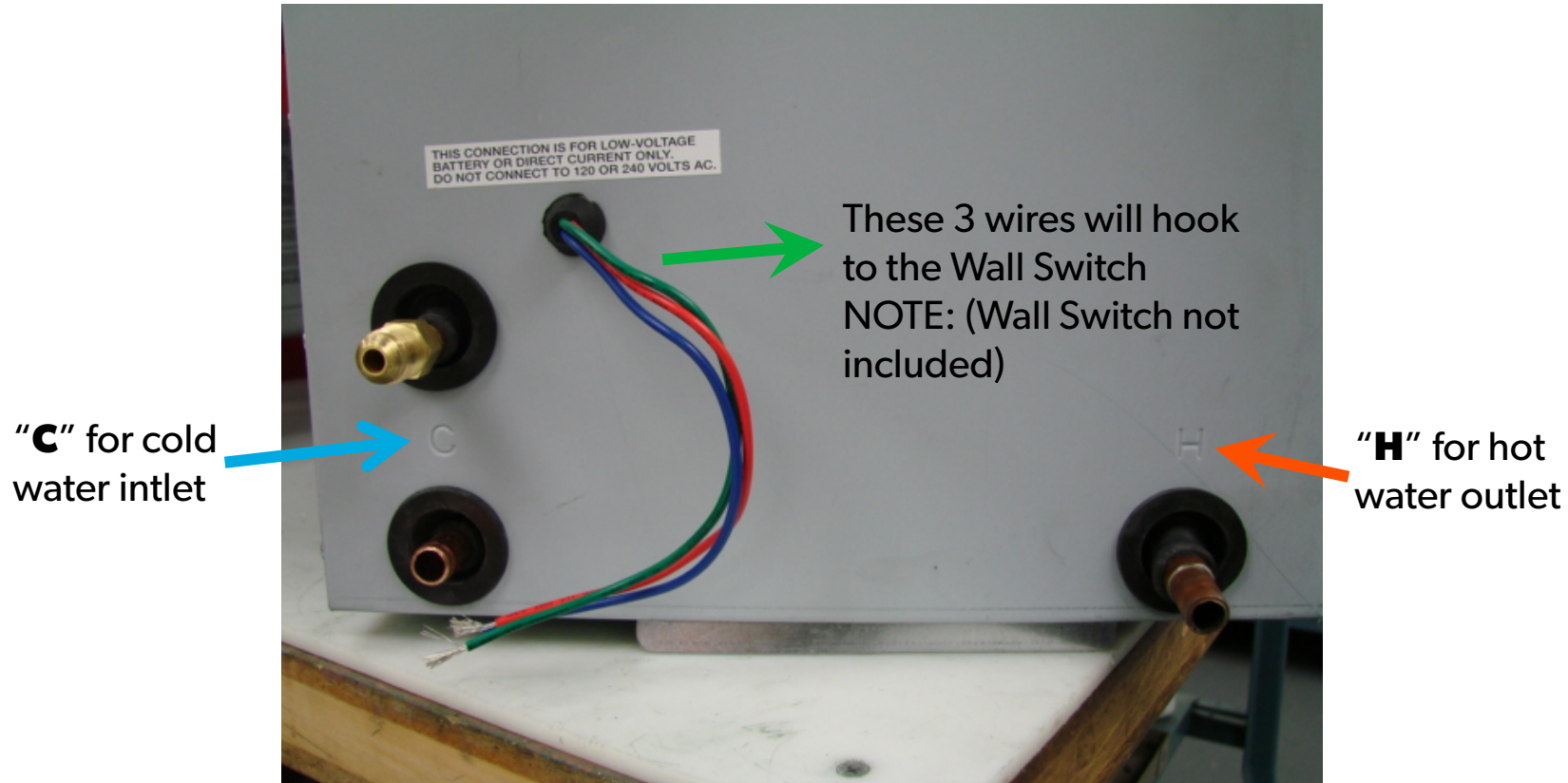
Explanation of Model Number:

OD _____ On Demand
50 _____ Input in 1000's BTU
01 _____ Generation
CW _____ Cold Weather Kit

On Demand Water Heater Components



Installation and Operation



In order for the On Demand system to work correctly it **MUST** have the proper Water Flow. Too little and the unit will not turn on at all, too much and the unit will not heat the water properly. The proper range for ideal working conditions is, 1.0 – 1.5 GPM (gallons per minute). An easy test to verify you are getting the proper amount of water flow, get an empty gallon jug, put it under the faucet and turn the Hot water on, start a timer, the gallon should be full or overflowing at about 45 seconds.

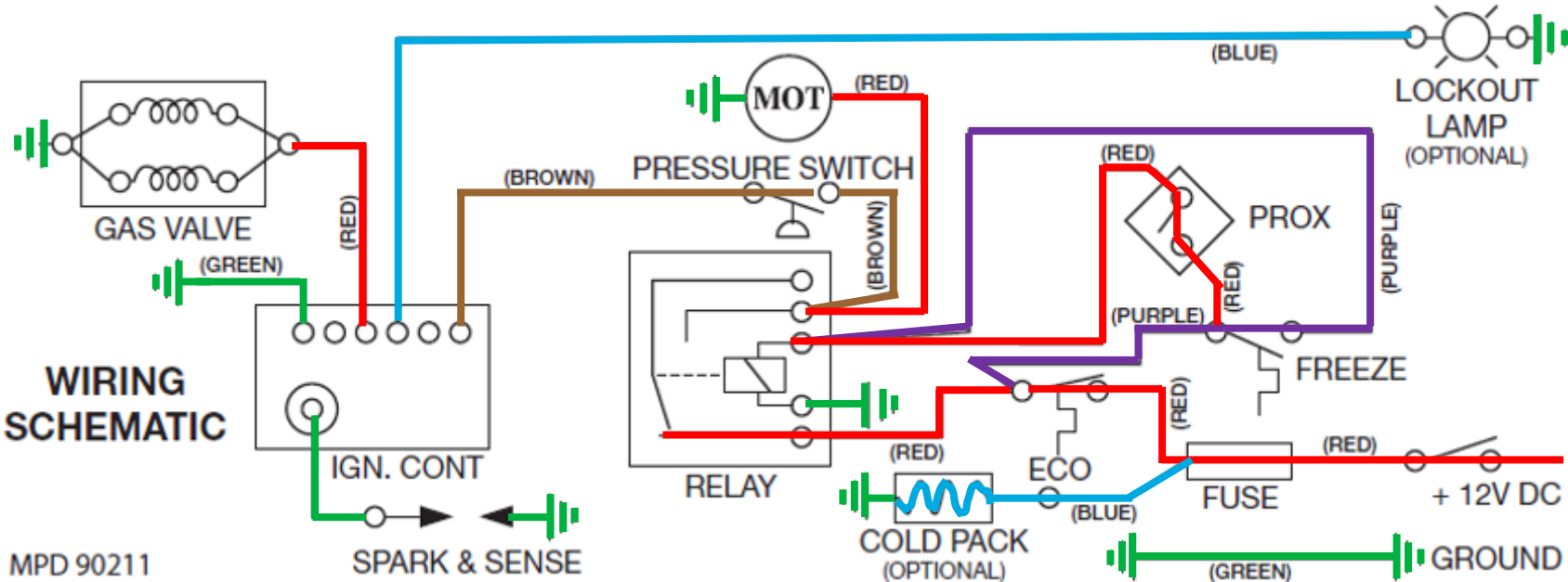
On Demand Water Heater Recall



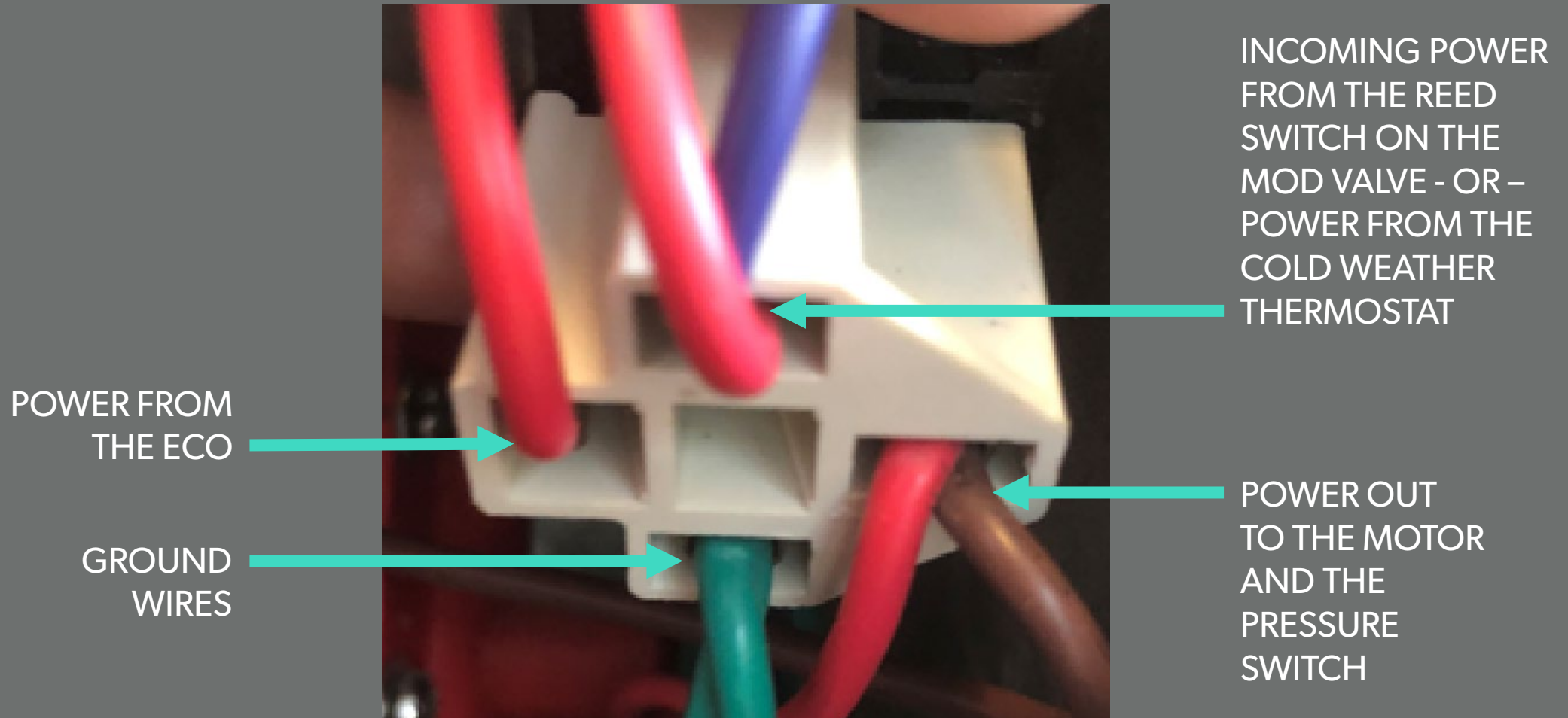
The recall consists of a Stop Key put in place on the Modulating Valve assembly that prevents any adjustment of the Reed Switch. This switch is dialed in to a specific position during production. If adjusted it can allow the unit to turn on with too little water flow which could potentially make the water so hot that it can scald the customer. Once the Stop Key has been installed there is a sticker that needs to be placed over the adjustment.



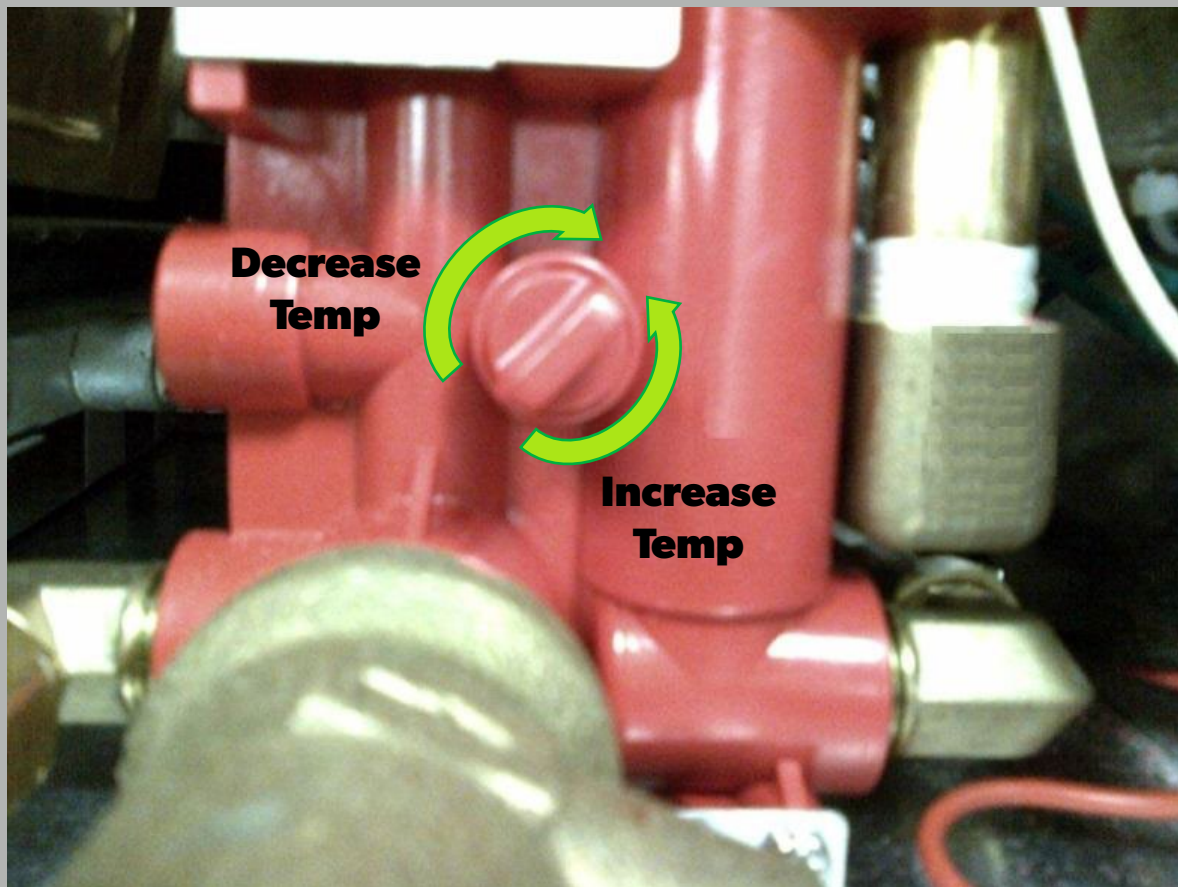
On Demand Wiring Diagram



On Demand Water Heater Relay



Summer/Winter Adjustment



Is the water temperature at the faucet too hot?

If yes, the Summer / Winter knob may need adjusted. Starting at the 2 o'clock position (at the notch), adjust in small increments to the right or toward the 3 o'clock position until desired water temperature is reached. Once at the full 3 o'clock position, the unit will likely never activate. This will need to be done at varying locations and environments as the customer travels.

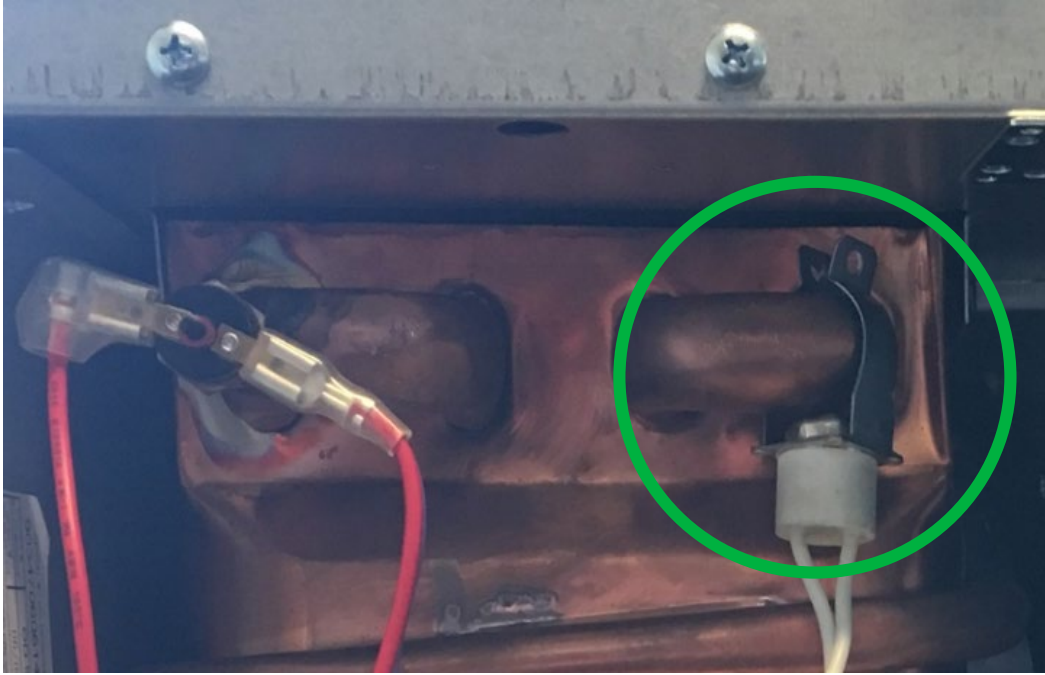
When conditions allow, keep the knob at the 12 o'clock position. This allows the water heater to work with the least amount of water flow (most common issue however is lack of water flow).

The Summer/Winter Adjustment will allow the user to adjust the temp slightly to compensate for incoming water temperatures. When hooked up to city water for example, in the summer, as the heat of sun warms the water in the hose to the city water connection, the incoming water to the On Demand System is already pretty warm, you would want to turn the adjustment knob in order to "Decrease Temp". Do the opposite with colder outside temps.

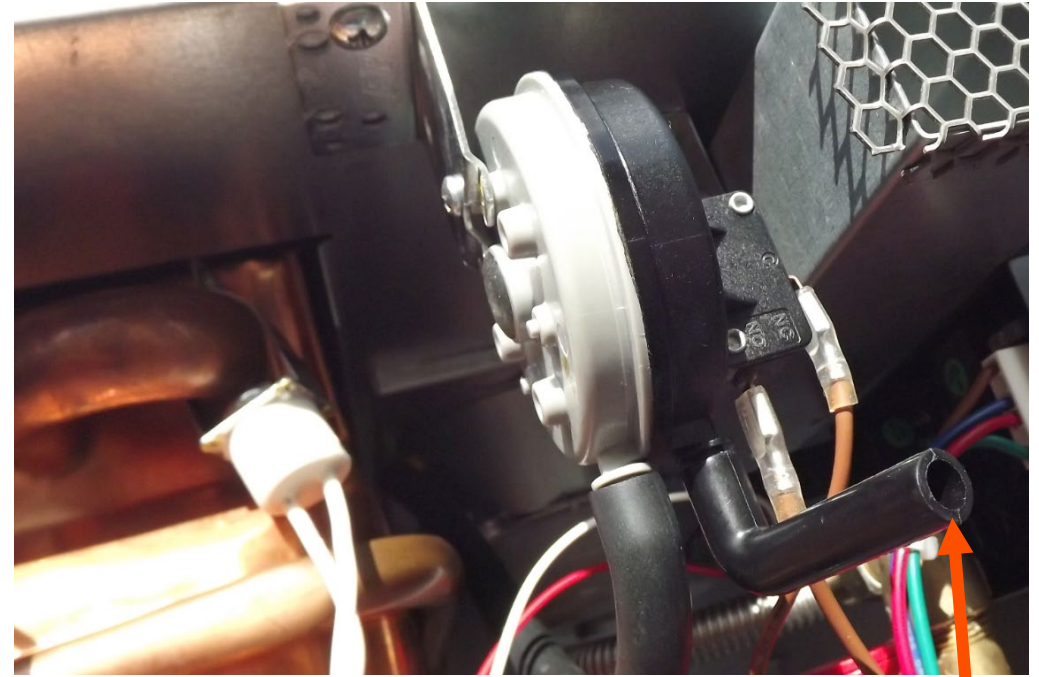
On Demand Model Issues?

- **No ignition / No Fan when calling for Hot water**
 - No enough water flow – less than 1.0 gallons per minute (GPM)
 - Winter / Summer setting on Modulating Valve needs adjusted
 - ECO is possible tripped and needs reset
 - 3 AMP Fuse may be blown
 - Wall Switch defective or mis-wired
 - Modulating Valve is possibly defective
 - DC voltage is low or not present
- **No ignition / Fan Motor is running when calling for Hot water**
 - Pressure Switch is possibly blocked or defective
 - Electrode shorted
 - Flue tube is blocked
 - Board may be defective
- **Water temperature at faucet is too hot, too cold, or inconsistent**
 - Water flow not within range – needs to be between 1.0 – 1.5 GPM
 - Inlet water temperature is too hot or too cold – will get an approx. 60F rise in temp at full flow
 - Restrictors are being used on faucets and shower heads
 - Winter / Summer setting on Modulating Valve needs adjusted
 - Gas Pressure not between 11-13" WC
 - Introducing too much cold water from the cold water tap
- **ECO keeps tripping**
 - Cold Weather Thermostat is loose and not tight against the heat exchanger
 - Winter / Summer setting on Modulating Valve needs adjusted
 - Incoming water temperature is too hot
 - ECO is possibly defective / weak and needs replaced

On Demand Water Heater Issues Cont.



Here is a good example of a loose Cold Weather Kit. You can see the screw that holds the clamp tight against the Heat Exchanger is missing, thus the sensor is not reading the temp correctly as the Water Heater turns on to warm up as outside temps drop below 40 degrees F. This will allow the unit to run too long without water flowing and will trip the E.C.O.



In situations where the Fan turns on but the Heater does not fire up, the Pressure Switch is likely not reading proper air flow. There is an elbow at the bottom of the Pressure Switch that can get clogged. Remove the elbow and blow through it to verify it is not clogged or to clear it out if it is.

Any Questions?

- Sales Department (Dealers Only) 1-800-366-3842
- Technical Services (Dealers Only) 1-800-216-5115
- Retail (Retail Customers Only) 1-800-544-4881

Visit our websites at:

www.edomestic.com – Dometic RV Products

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Email us at:

techservice@dometic.com – Technical Questions or Warranty Authorization

training.school@dometic.com – Dometic Tech Training Questions or Sign Up

A wide-angle landscape photograph of a mountainous region. In the foreground, a dry, yellowish-brown grassy field stretches across the bottom. A paved road curves through the middle ground, with a white van driving on it. The background features steep, rocky mountains with patches of green forest. The sky is a clear, pale blue.

THANK YOU.

Mobile living made easy.

 **DOMETIC**