



**By Vehicle Systems, Inc.**

*Motor Coach Heating Specialists*

## **Shop Manual**

**Model Numbers**

**HHE-200-07E - 12 VDC**

**HHE-500-07M - 12 VDC**

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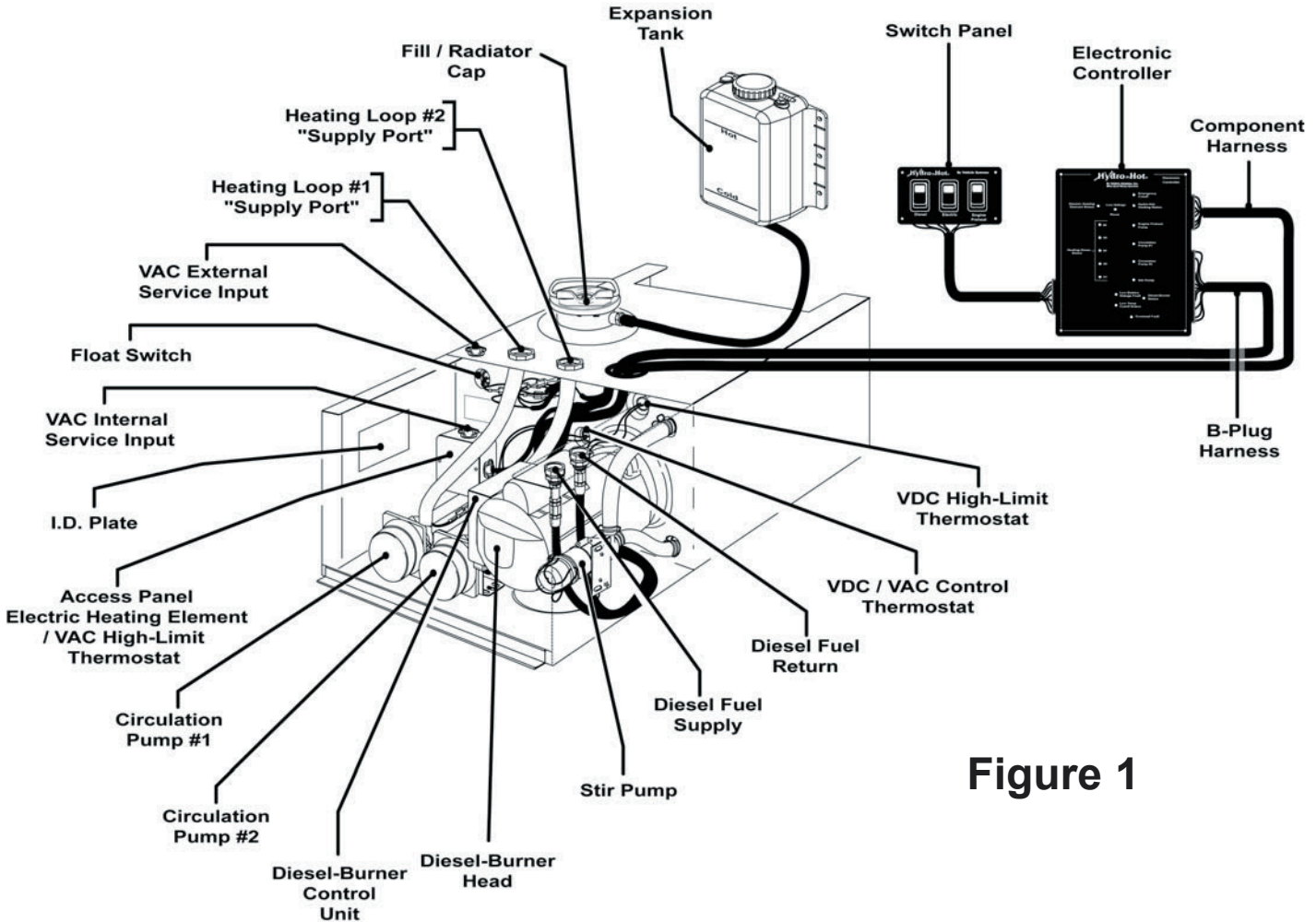
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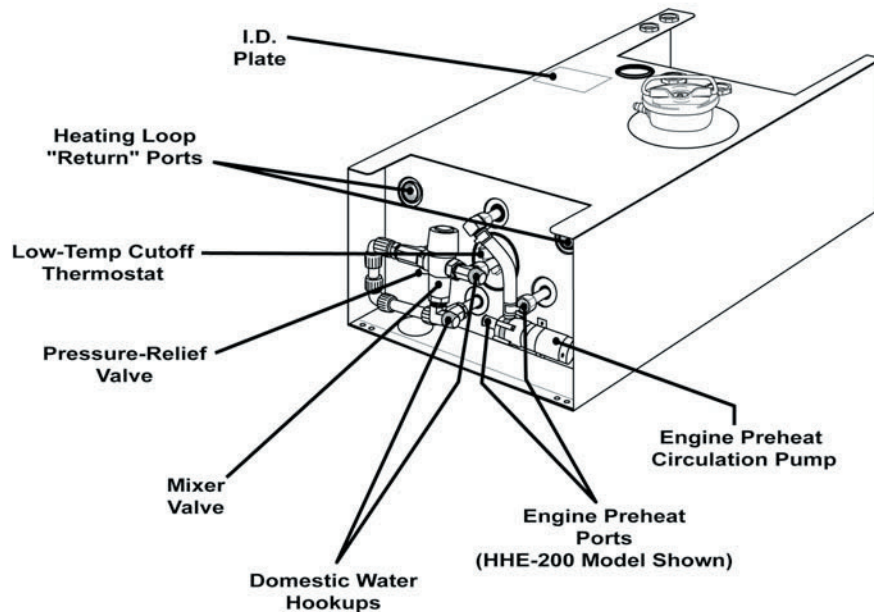
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**Component Overview**

1.1 Component Overview



**Figure 1**



# Section 1: General Heater Information

## I.D. Plate

### 1.2 Identification Plate

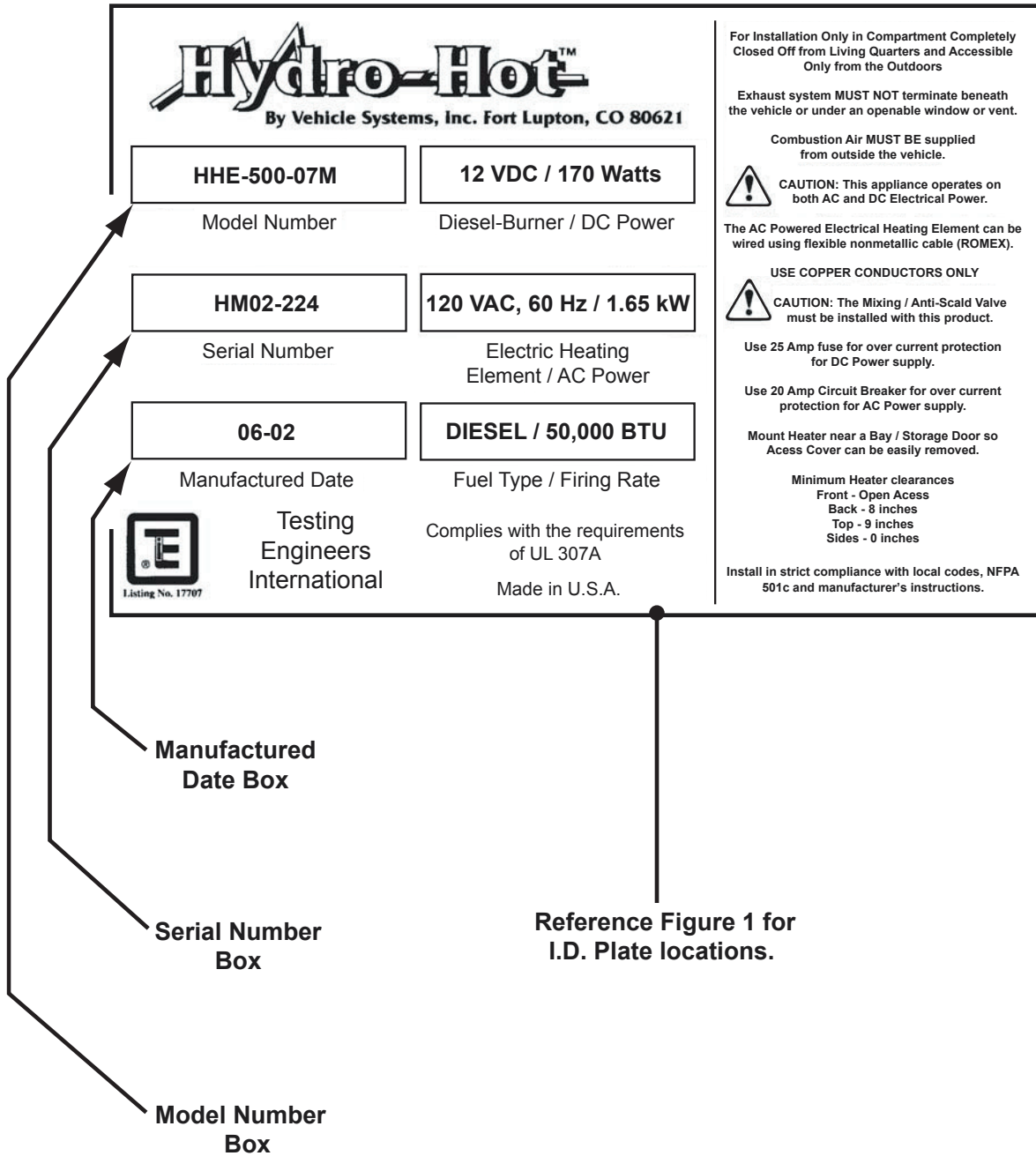




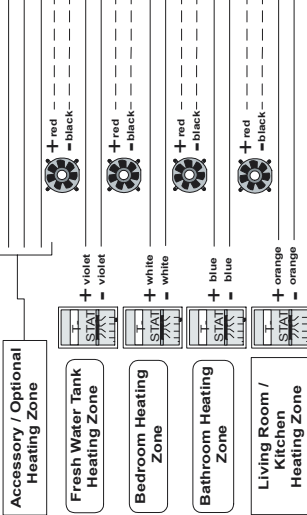
Figure 2

## Section 2: Wiring Information

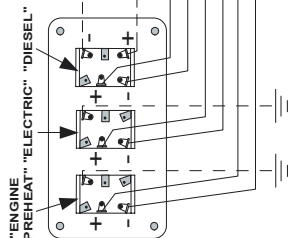
### Key

-  - Indicates Cozy III Heat Exchangers
-  - Indicates Interior Room / Fresh Water Tank Thermostats
- ("- - -") - Indicates "Polarity Sensitive" Connections

**Note:** All wire colors shown, for "Field Wiring Connections" and "Switch Panel Connections" may vary from actual OEM / Converter wiring colors.



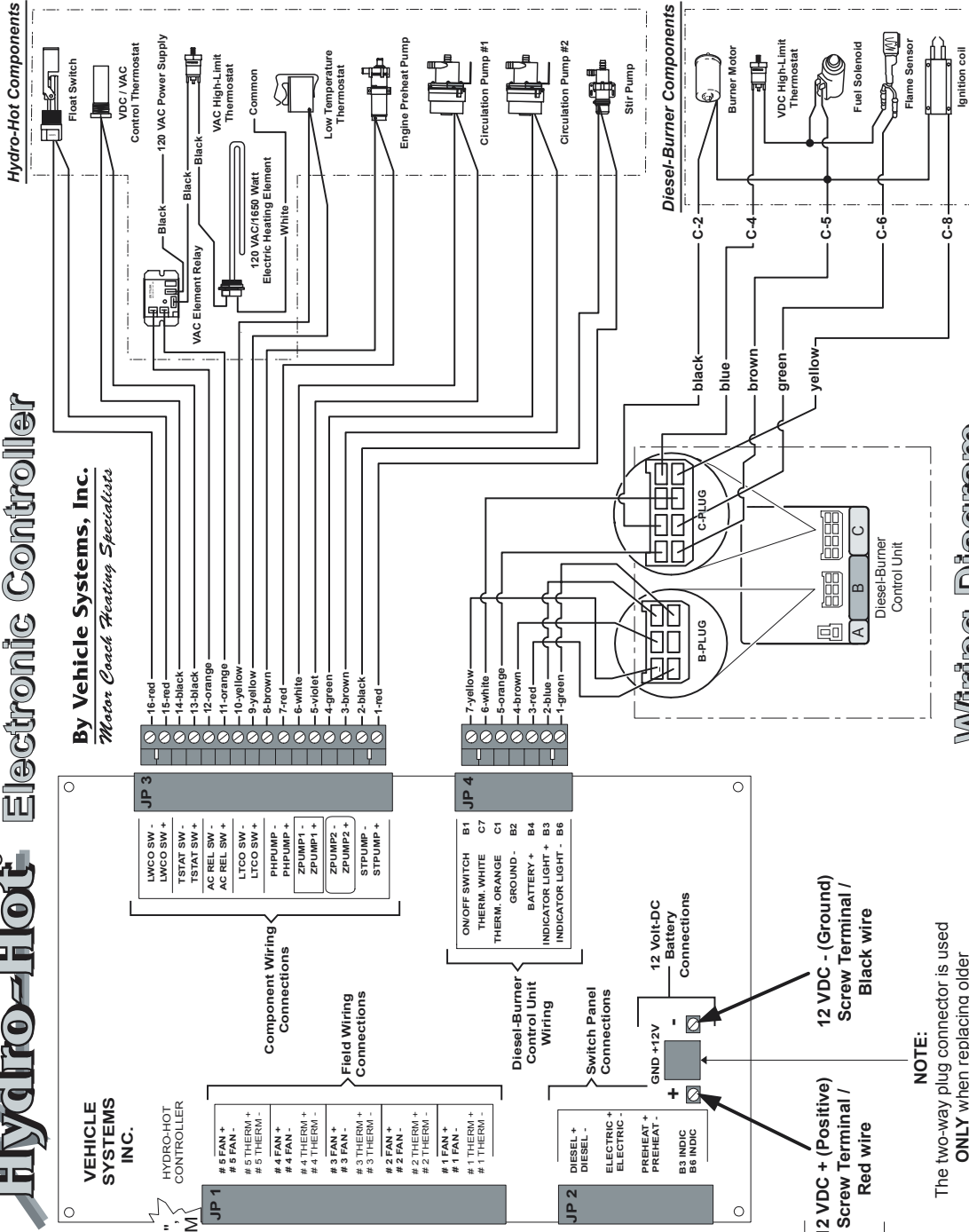
### Switch Panel, Backside View



**CAUTION:** Reversed polarity to the 12 Volt-DC Battery Connections will seriously damage the Electronic Controller.

# Hydro-Hot<sup>®</sup> Electronic Controller

By Vehicle Systems, Inc.  
Motor Coach Heating Specialists



## Wiring Diagram

Figure 3

For Technical Support call 1-800-685-4298

### NOTE:

The two-way plug connector is used ONLY when replacing older Hydro-Hot Electronic Controllers.

## Section 3: General Heater Information

### Switch Panel

#### 3.0 Switch Panel

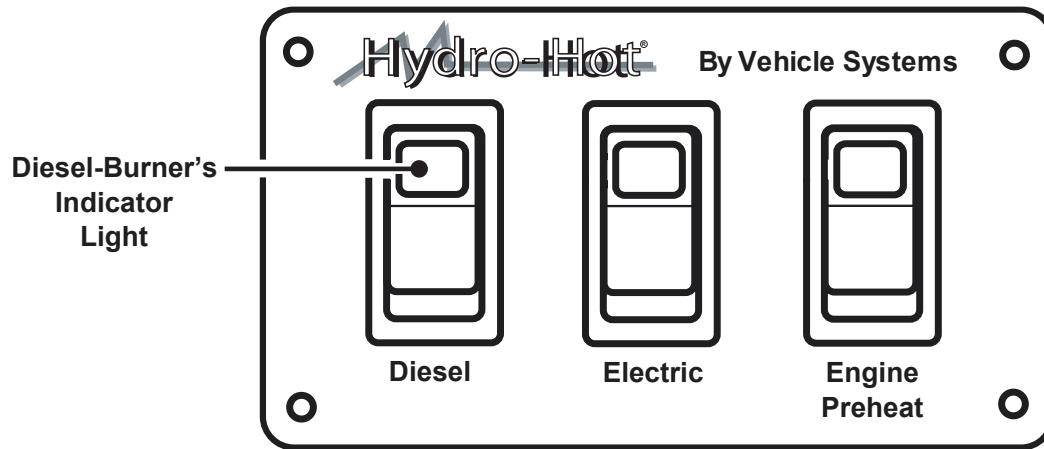


Figure 4

#### 3.1 Diesel Switch

**Function:** The *Diesel* switch activates the indicator light on the switch and the Hydro-Hot's *Diesel-Burner*, reference Figure 4. This procedure allows the *Diesel-Burner* to operate and supply heat to the Hydro-Hot's *Boiler Tank*. The *Diesel-Burner* will heat the *Hydro-Hot System* to maximum operating temperature (190°F {+/- 5 deg.}) in approximately 10-20 minutes. Please note that the *Diesel-Burner* is the Hydro-Hot's **primary heat source** for heating both the interior and/or the domestic hot water (such as when cool ambient temperatures exist and/or when there is a high demand for domestic hot water).

#### 3.2 Electric Switch

**Function:** The *Electric* switch activates the indicator light on the switch and the Hydro-Hot's *120 VAC Electric Heating Element*, reference Figure 4. This procedure allows the *120 VAC Electric Heating Element* to supply heat to the Hydro-Hot's *Boiler Tank*. The *120 VAC Electric Heating Element* will heat the *Hydro-Hot System* to maximum operating temperature (190°F {+/- 5 deg.}) in approximately 1-2 hours. Please note the *120 VAC Electric Heating Element* is the Hydro-Hot's **secondary heat source** for heating both the interior and/or the domestic hot water during low heating demand situations (such as when moderate ambient temperatures exist and/or when there is a low demand for domestic hot water). This feature is only operational whenever the motorhome is connected to VAC power or when the generator is operating.

#### 3.3 Engine Preheat Switch

**Function:** The *Engine Preheat* switch activates the indicator light on the switch and the Hydro-Hot's *Engine Preheat Circulation Pump*, reference Figure 4. This procedure allows the *Engine Preheat Circulation Pump* to circulate the engine's coolant through a separate double wall copper loop in the Hydro-Hot's *Boiler Tank*, resulting in a warm engine for easy start-ups on cool mornings. Please note that this feature will be effective only if the *Engine Preheat* switch is **ON** in conjunction with either the *Diesel* and/or *Electric* switch. This feature is available on *HHE-200 Model Hydro-Hot's*, ONLY.

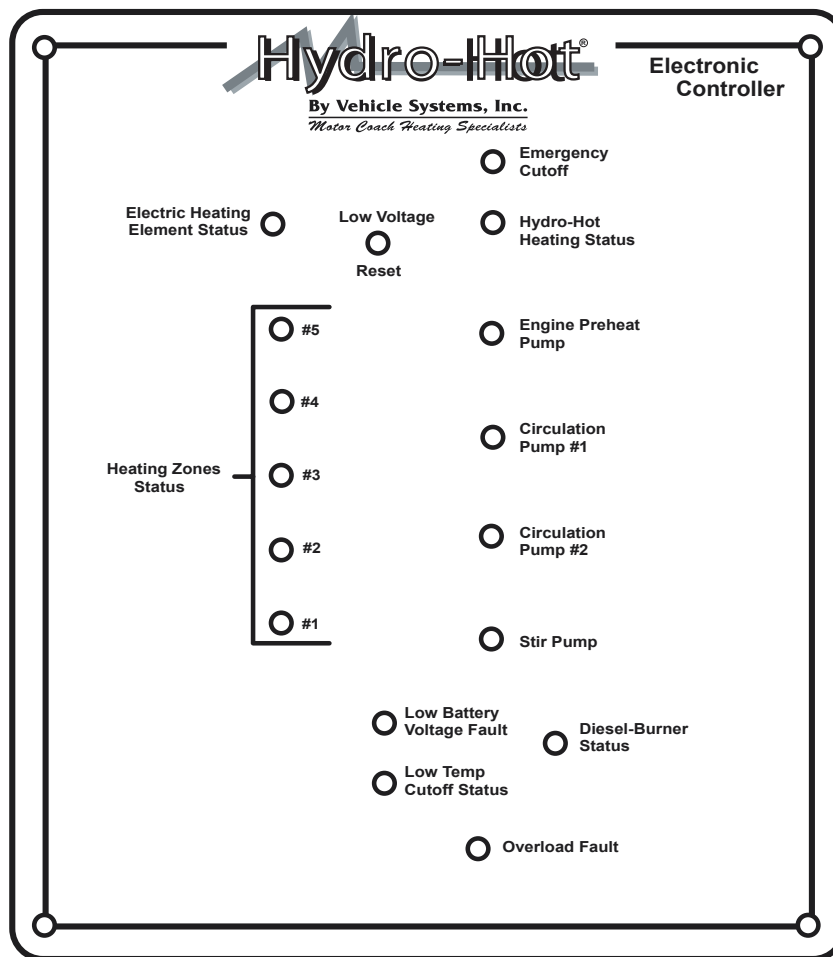


Figure 5

#### 4.1 Electric Heating Element Status Indicator Light

This indicator light will illuminate GREEN whenever the Hydro-Hot's 120 VAC *Electric Heating Element* is operating and providing heat to the Hydro-Hot's *Boiler Tank*, reference Figure 5. Please note that this light will only be active if the *Electric* switch is in the **ON** position, reference Figure 4. If this indicator light illuminates RED, it indicates an electrical overload condition (i.e. short) has occurred in the Electric Heating Element's VDC powered circuitry.

#### 4.2 Heating Zones Status Indicator Lights

These five indicator lights (separately) will illuminate GREEN whenever a *Zone Thermostat*, for each particular zone, is calling for heat, reference Figure 5. The GREEN indicator lights also indicate that VDC power is being supplied to the particular interior heating zone's *Heat Exchangers* (i.e. fan motors). If any of the five indicator lights illuminate RED, it indicates that an electrical overload condition (i.e. short) has occurred in a particular heating zone's circuitry.

**NOTE:** A short in either a heating zone's *Thermostat* or a heating zone's *Heat Exchanger* circuit, will cause the indicator light to illuminate RED.



### Electronic Controller, continued

#### 4.3 Low Voltage Reset (Button)

---

The Hydro-Hot's *Electronic Controller* must be manually reset whenever the *Low Battery Voltage* fault indicator light has been activated, reference Figure 5. To reset the *Electronic Controller*, simply depress the "Low Voltage Reset" button located on the *Electronic Controller* (use a thin straight object to access the reset button through the small hole in the faceplate).

#### 4.4 Emergency Cutoff Indicator Light

---

This indicator light will illuminate RED when either the *120 VAC Electric Heating Element* and/or the *Diesel-Burner* have automatically shutdown due to a low water and antifreeze solution level inside the Hydro-Hot's *Boiler Tank*, reference Figure 5. This fault will automatically reset when the low level condition is corrected.

#### 4.5 Heating Status Indicator Light

---

This indicator light will illuminate GREEN whenever the Hydro-Hot's *VDC / VAC Control Thermostat* is calling for heat, allowing the water and antifreeze solution in the Hydro-Hot's *Boiler Tank* to be heated by either the *Diesel-Burner* and/or the *120 VAC Electric Heating Element*, reference Figure 5. When this indicator light is off, no heat is being supplied to the Hydro-Hot's *Boiler Tank*. Please note that this light will only be active if either the *Diesel* and/or the *Electric* switch are turned **ON**, reference Figure 4.

**NOTE:** The Hydro-Hot's *VDC / VAC Control Thermostat* will automatically activate the *Diesel-Burner* and/or the *120 VAC Electric Heating Element*, **only** if the *Diesel* and/or *Electric* switch is in the **ON** position. So to heat the motorhome / domestic hot water, simply choose the desired heat source(s) and leave the switch(s) (i.e. *Diesel* and/or *Electric*) **ON**.

#### 4.6 Engine Preheat Pump Indicator Light

---

This indicator light will illuminate GREEN whenever the *Engine Preheat Pump* is operating, reference Figures 1 and 5. Please note that this light will only be active if the *Engine Preheat* switch is **ON** in conjunction with either the *Diesel* and/or the *Electric* switch, reference Figure 4. If this indicator light illuminates RED, it indicates an electrical overload condition (i.e. short) has occurred in this particular component's circuitry.

#### 4.7 Circulation Pump #1 Indicator Light

---

This indicator light will illuminate GREEN whenever *Circulation Pump #1* is operating, reference Figures 1 and 5. Please note that this light will only be active if the *Hydro-Hot* is at normal operating temperature (i.e. between 160°F and 190°F) and if either *Heating Zone #1* or *#5* are calling for heat, reference Figure 3. If this light illuminates RED, it indicates an electrical overload condition (i.e. short) has occurred in this particular component's circuitry.

### Electronic Controller, continued

#### 4.8 Circulation Pump #2 Indicator Light

---

This indicator light will illuminate GREEN whenever *Circulation Pump #2* is operating, reference Figures 1 and 5. Please note that this light will only be active if the *Hydro-Hot* is at normal operating temperature (i.e. between 160°F and 190°F) and if either *Heating Zones #2, #3, or #4* are calling for heat, reference Figure 3. If this light illuminates RED, it indicates an electrical overload condition (i.e. short) has occurred in this particular component's circuitry.

#### 4.9 Stir Pump Indicator Light

---

This indicator light will illuminate GREEN whenever there is a continuous demand for domestic hot water (i.e. during a shower), reference Figures 1 and 5. Please note that this light will be active **only** when the *Diesel* switch is turned **ON**, reference Figure 4.

#### 4.10 Low Battery Voltage Fault Indicator Light

---

This indicator light will illuminate RED whenever the VDC voltage level is too low for the *Hydro-Hot* to operate properly, reference Figure 5. This fault must be manually reset after the voltage level has been restored to the VDC battery system, reference Section 4.3 for reset instructions.

#### 4.11 Low Temp Cutoff Status Indicator Light

---

This indicator light will illuminate GREEN whenever the *Hydro-Hot* is able to provide heat for both the *Interior* and *Fresh Water Tank Heating Zones*, reference Figure 5. Whenever this indicator light is **OFF**, it indicates that domestic hot water is being used on a continuous basis (i.e. during a shower).

**NOTE:** The *Hydro-Hot* will not provide both interior zone heating and a continuous supply of domestic hot water simultaneously; Domestic Hot Water will take priority over Interior Heating. This is referred to as the "Domestic Water Priority System".

#### 4.12 Diesel-Burner Status Indicator Light

---

This indicator light will illuminate GREEN whenever the *Hydro-Hot's Diesel-Burner* is operating and supplying heat to the *Hydro-Hot's Boiler Tank*, reference Figures 1 and 5. Please note that this light will only be active if the *Diesel* switch is turned **ON**, reference Figure 4.

#### 4.13 Overload Fault Indicator Light

---

This indicator light will illuminate RED (reference Figure 5) whenever one of the following conditions have occurred:

1. The *Hydro-Hot* is off due to an electrical overload (i.e. short) in the main VDC power supply circuitry.
2. The *Hydro-Hot* is off due to a combination of high electrical VDC power loads and a high surface temperature of the *Electronic Controller*.

The *Hydro-Hot* will automatically restart once the electrical overload (i.e. short) and/or high heat condition is corrected.

## Component Overview

### 5.1 Component Overview

- |                          |   |
|--------------------------|---|
| 1. Control Unit          | 10. Heat Exchanger                                      |
| 2. Motor                 | 11. Combustion Chamber                                  |
| 3. Ignition Coil         | 12. Exhaust Port  |
| 4. Clutch                | 13. Flame Sensor  |
| 5. Combustion Air Blower | 14. Fuel Pump   |
| 6. Fuel Solenoid         | 15. Fuel Ports (Supply / Return)                        |
| 7. Electrode Holder      | 16. Combustion Air Intake Port, with Adjustable Shutter |
| 8. Ignition Electrodes   |   |
| 9. Fuel Nozzle           |   |

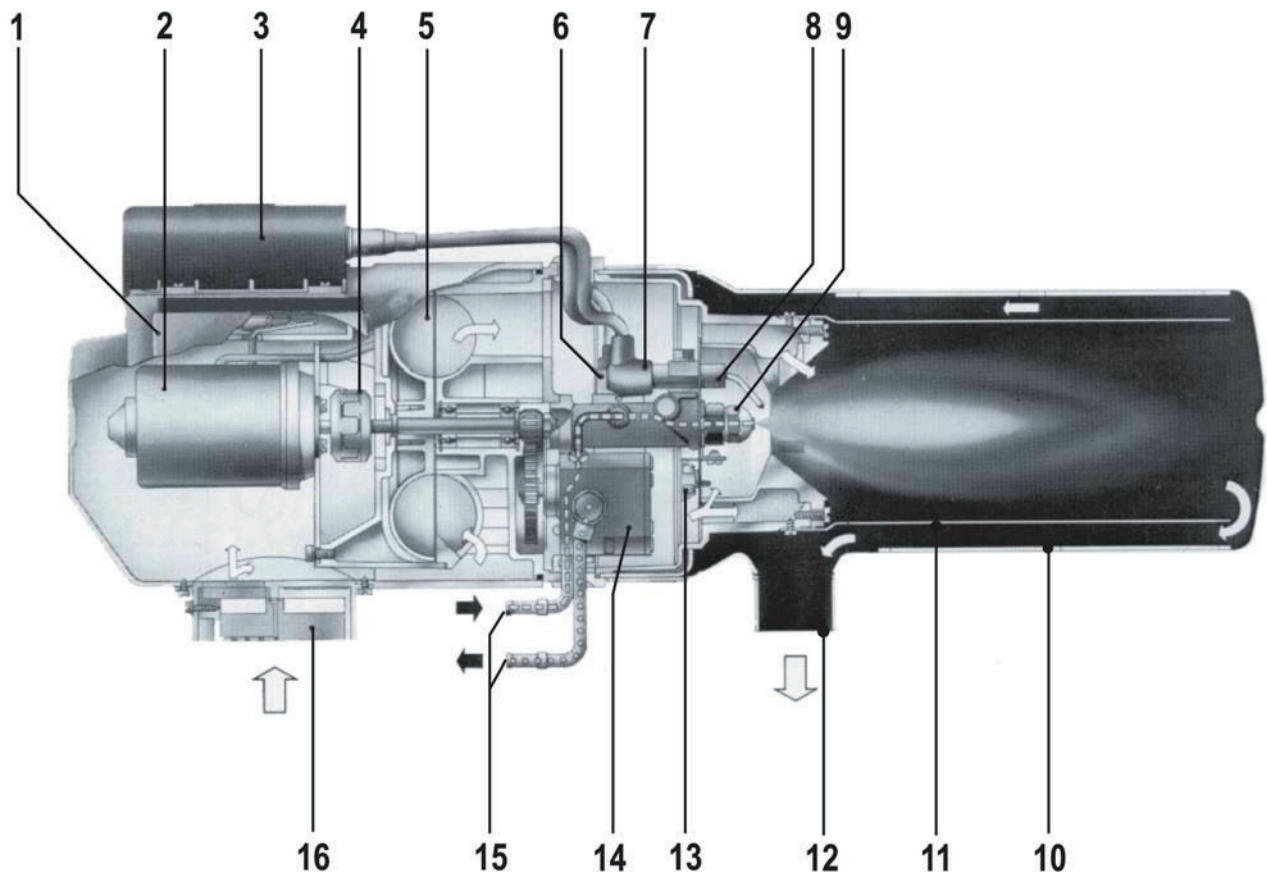
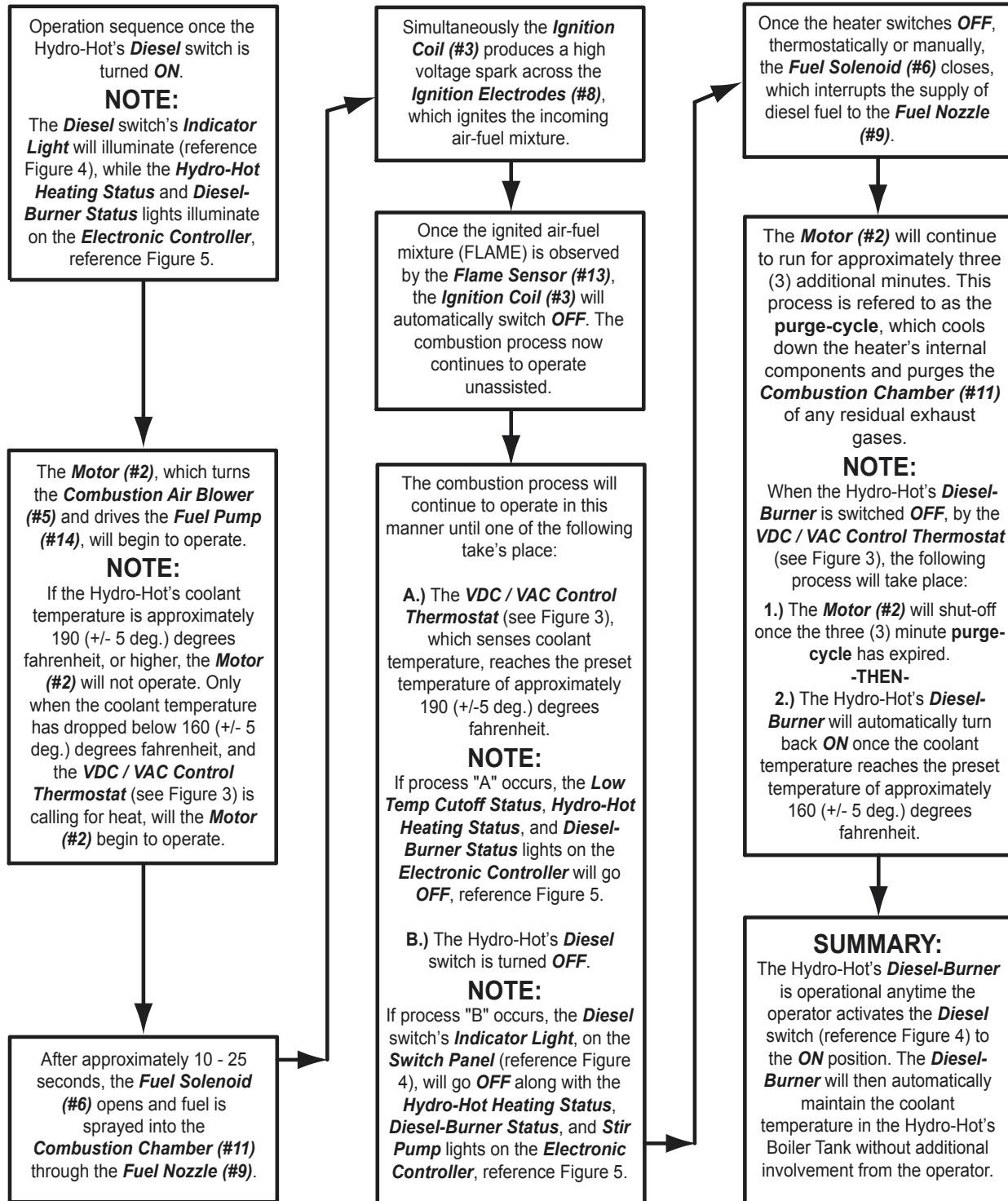


Figure 6

**Operational Flow-Chart**

**5.2 Operational Flow-Chart**

~ Reference Figure 6 for all numbers indicated inside parenthesis. (e.g. #8).



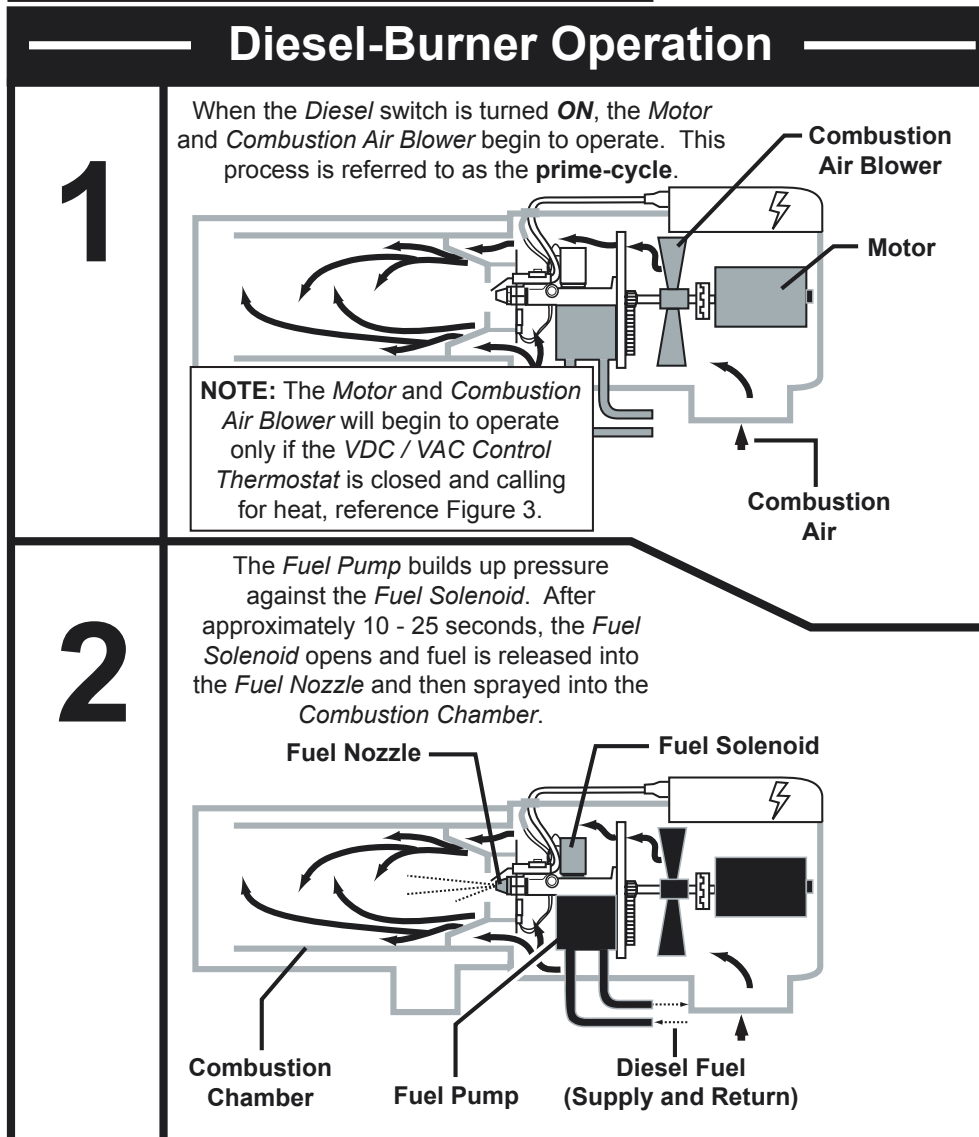
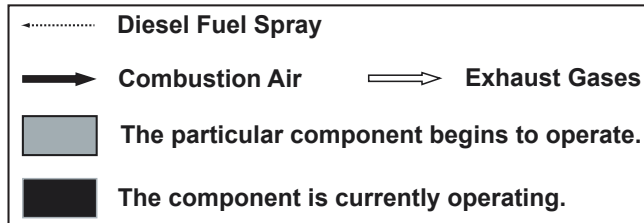
## Section 5: Diesel-Burner

### Operational Sequence

#### 5.3 Operational Sequence

The following sequence illustrates how the Hydro-Hot's *Diesel-Burner* operates once it is activated. Also, if you are experiencing malfunctions with your *Diesel-Burner*, use this sequence of operating events as a diagnostic tool to determine at what point, in the Diesel-Burner's operation, does the malfunction occur. Use the "KEY" provided below to understand each symbol shown.

#### KEY



**Operational Sequence, continued**

5.3 Operational Sequence

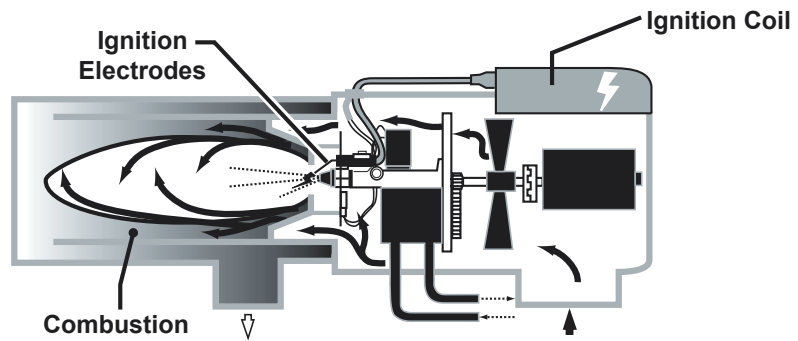
KEY

	Diesel Fuel Spray		Exhaust Gases
	Combustion Air		
	The particular component begins to operate.		
	The component is currently operating.		

**Diesel-Burner Operation, continued**

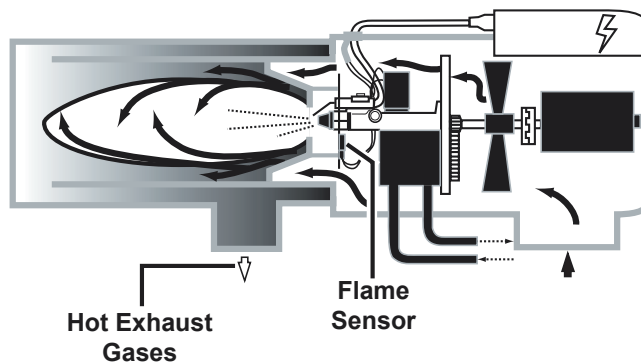
**3**

The *Ignition Coil* produces a high voltage spark, which is transferred across the *Ignition Electrodes*. The incoming air-fuel mixture is then ignited, creating combustion.



**4**

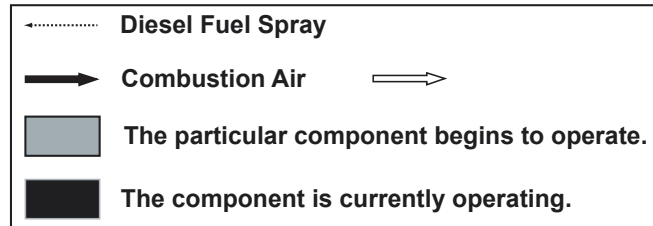
The combustion's flame is detected by the *Flame Sensor* and the *Ignition Coil* is then automatically switched off (no more spark across the *Ignition Electrodes*).



**Operational Sequence**  
continued

5.3 Operational Sequence

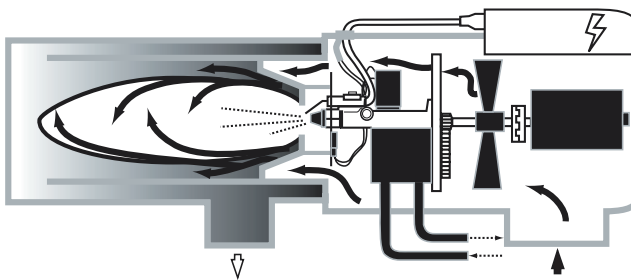
KEY



**Diesel-Burner Operation, continued**

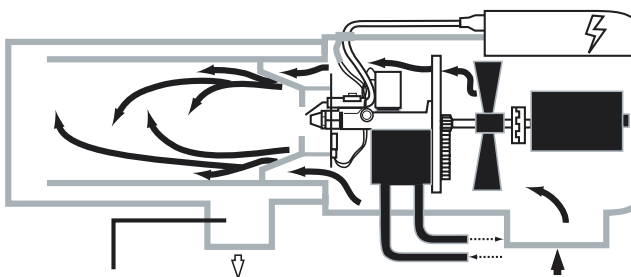
**5**

The *Diesel-Burner* will continue to operate continuously in this manner (produce heat) until it is switched off manually, or by the *VDC / VAC Control Thermostat* once the coolant temperature in the *Hydro-Hot's Boiler Tank* reaches 190 (+/- 5 deg.) fahrenheit.



**6**

Once the *Diesel-Burner* has switched **OFF**, the *Motor and Combustion Air Blower* will continue to operate for approx. 2-3 minutes. This process is referred to as the **purge-cycle**.



Cool Exhaust Gases

**NOTE:** If the *Diesel-Burner* is switched off by the *VDC / VAC Control Thermostat*, it will automatically reactivate the *Diesel-Burner* whenever the *Hydro-Hot Boiler Tank's* coolant temperature has dropped below 160 (+/- 5 deg.) degrees fahrenheit.



I.D. Plate

5.4 Identification Plate

Fabrikschild-Duplikat gultig nur zusammen mit Original		← [To be shipped with Original Heater
Thermosysteme GmbH MADE IN GERMANY		
HEIZGERAT Typ	DBW 2010.75	← Model Type
Spannung / El. Leistung	12 V / 60W	← Voltage / Wattage
Warmestrom	13,2 kW	← Fuel Type
Brennstoff	Diesel	
zul. Betriebsüberdruck	2 bar	← Serial Number (230410)
Prufzeichen	~	
Fabriknummer	1B230410	← Year Manufactured
Inbetriebnahmejahr	2001 2002 2003	

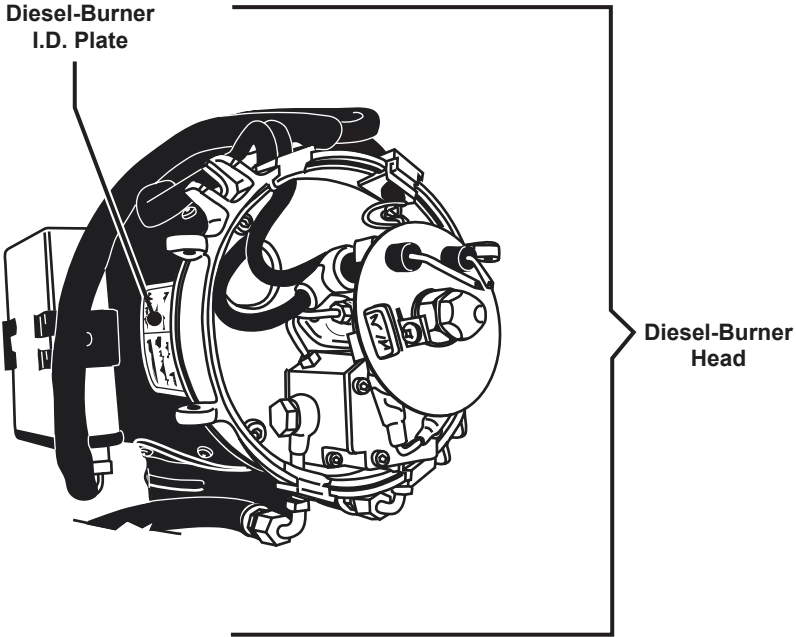


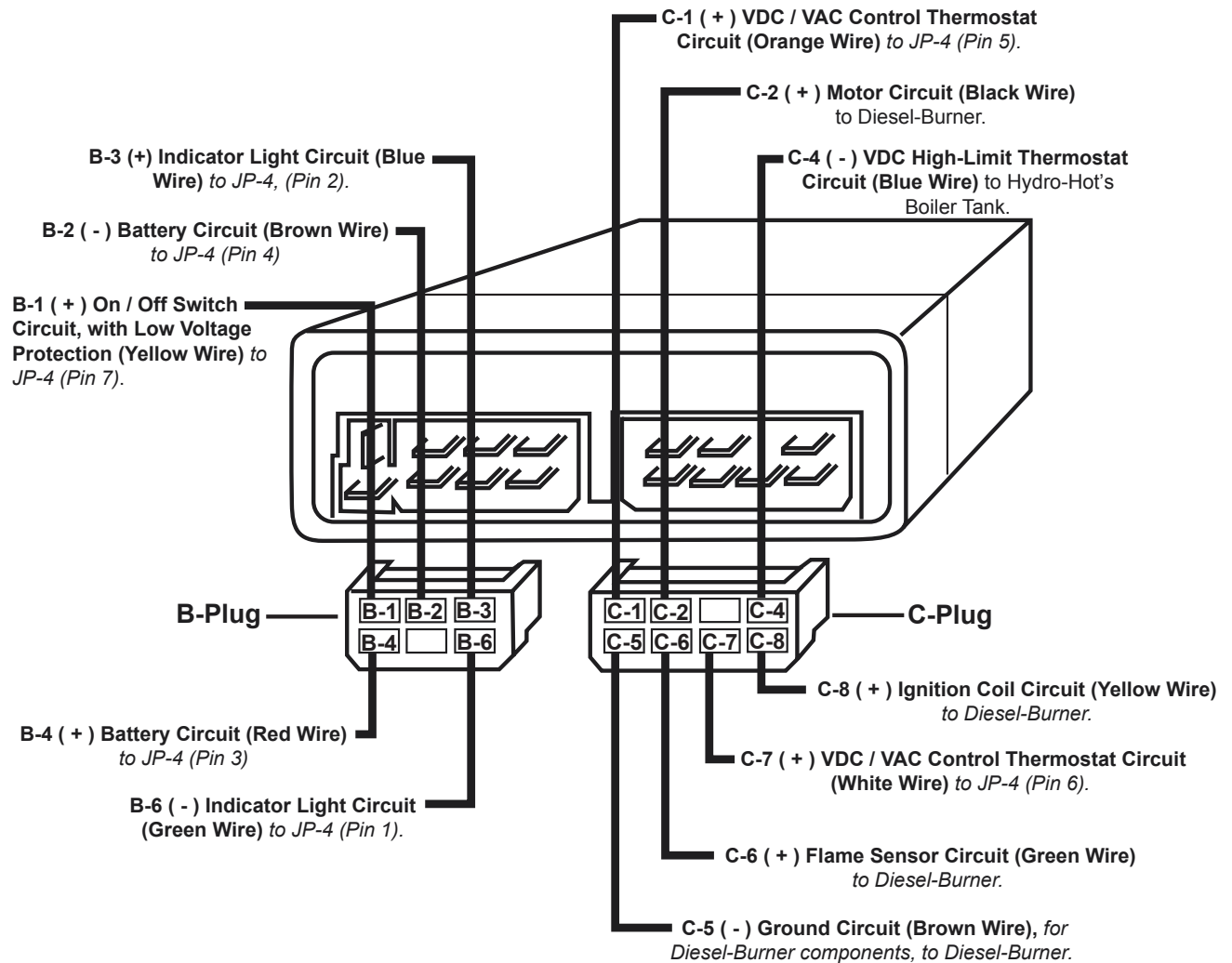
Figure 7



## Control Unit Wiring

### 6.1 Control Unit Wiring

**NOTE:** Reference Figure 3 for all "JP" Plug and Pin locations on the Electronic Controller.



**Figure 8**

## ■ Troubleshooting

This Troubleshooting Section has been separated into different Hydro-Hot Troubleshooting Scenario's, that may be experienced by the heater. Each section listed below begins with the most probable cause and remedy, to the least probable cause and remedy. This concept has been put in place to expedite the troubleshooting process and pinpoint the problem quickly. However, if you need additional assistance, please feel free to contact our Technical Department at 1-800-685-4298 or e-mail them by going to [www.vehiclesys.com](http://www.vehiclesys.com) and clicking on the [Technical Support](#) button. Also, please review the following "KEY", prior to troubleshooting, as it may be helpful in understanding each nomenclature.

**KEY:**

**TS#:** (i.e. TS1, TS2, ....) = Troubleshooting Scenario 1, Troubleshooting Scenario 2, ....  
**Q#:** (i.e. Q1, Q2,....) = Question 1, Question 2, ....  
**A:** = Answer

**After turning the Diesel switch ON:** **Section**

TS1 - The Hydro-Hot's <i>Diesel-Burner</i> does not operate. ....	7.1
TS2 - The Hydro-Hot's <i>Diesel-Burner</i> operates (3-minute prime cycle only), but does not ignite. ....	7.2
TS3 - The Hydro-Hot's <i>Diesel-Burner</i> ignites after several starting attempts. ....	7.3
TS4 - The Hydro-Hot's exhaust system sputters. ....	7.4
TS5 - The Hydro-Hot's exhaust system produces white smoke after ignition. ....	7.5
TS6 - The Hydro-Hot's exhaust system produces black smoke after ignition. ....	7.6

**Other troubleshooting issues:**

TS7 - The <i>Hydro-Hot</i> is at operating temperature, but an <i>Interior and/or Fresh Water Tank Heating Zone</i> is not producing heat. ....	7.7
TS8 - The <i>Hydro-Hot</i> is at operating temperature, but the fans of an <i>Interior and/or Fresh Water Heat Exchangers</i> are not operating. ....	7.8
TS9 - The <i>Hydro-Hot</i> is at operating temperature, but the domestic hot water system is not producing hot water. ....	7.9

**After turning the Electric switch ON:**

TS10 - The Hydro-Hot's <i>120 VAC Electric Heating Element</i> does not operate (i.e. lack of hot water and/or interior heat). ....	7.10
---	------

**After turning the Engine Preheat switch ON:**

TS11 - The Hydro-Hot's <i>Engine Preheat System</i> does not preheat the engine. ....	7.11
---	------

## Section 7.1

After turning the *Diesel* switch **ON**:

**TS1: The Hydro-Hot's Diesel-Burner does not operate.**

**NOTE:** In order to perform the following checks, it is necessary to locate the Hydro-Hot's *Electronic Controller* and *Switch Panel*.

**Q1: Is the Electronic Controller's Emergency Cutoff light illuminated?**

**A:** If YES:

**Perform each of the following procedures as necessary until the problem is resolved.**

If NO:

**Proceed to Q2.**



**WARNING: DO NOT** remove the Hydro-Hot's *Radiator Cap* when the heater is at maximum operating temperature, reference Figure 1. Hot coolant can be present and serious personal injury may result.

- a. Check the coolant level in the Hydro-Hot's *Expansion Tank*, and then the *Boiler Tank* if necessary.
 

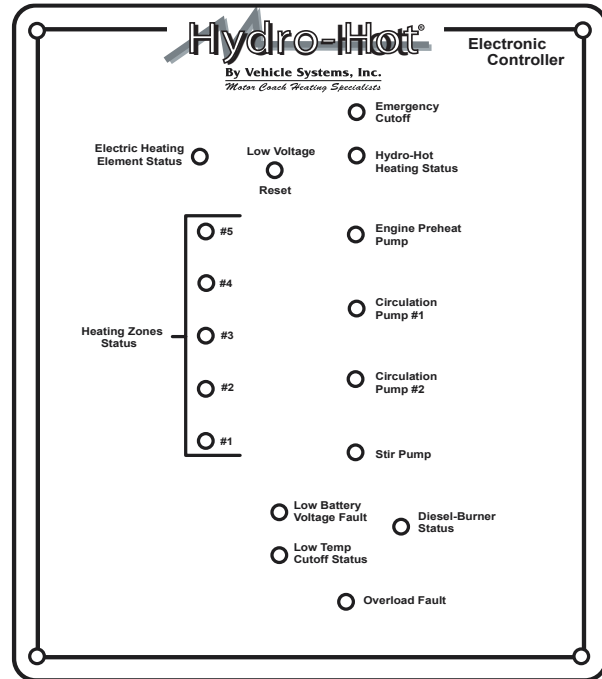
**A:** If coolant level is okay:  
**Continue troubleshooting.**

If coolant level is low:  
**Add coolant and attempt heater restart.**
- b. Check for continuity at the *Float Switch*, reference Figures 1 and 3.
 

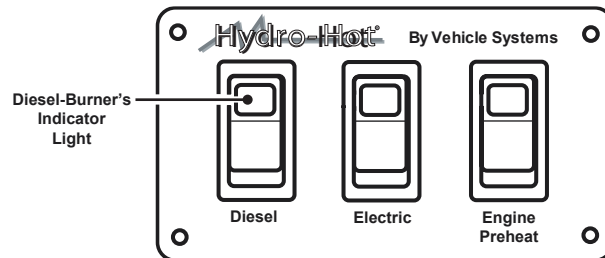
**A:** If continuity exists:  
**Continue troubleshooting.**

If continuity does not exist:  
**The Float Switch must be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.**
- c. Remove the Electronic Controller's *Faceplate* and use a jumper wire to make a connection from *Pin 15* to *Pin 16* on the *JP-3 Plug*, reference Figure 3. Does the *Emergency Cutoff* light go off?

## Section 7.1, continued



**Electronic Controller Faceplate**



**Switch Panel**

## ■ Section 7.1, continued

A: If YES:

Check the *JP-3 Plug* for loose wire connections and/or harness damage.

If NO:

The *Electronic Controller* must be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.

### Q2: Is the Electronic Controller's Low Battery Voltage Fault light illuminated?

A: If YES:

Perform each of the following procedures as necessary until the problem is resolved.

If NO:

Proceed to Q3.

- a. Remove the Electronic Controller's *Faceplate*. Check the DC battery voltage level at the supply batteries and at the Electronic Controller's *Battery Connections*, reference Figure 3. Both voltage readings should be between 11.5 and 14.0 volts.

A: If the voltage level is within specs:

**Continue troubleshooting.**

If the voltage level is out of specs:

**Recharge and/or replace batteries, if necessary.**

- b. Reset the *Low Voltage Reset* (button) on the *Electronic Controller* (this can be accomplished by using a thin straight object to access the reset button through the small hole in the *Faceplate*). Continue to read the voltage level at the Electronic Controller's *Battery Connections* and then turn the *Diesel* switch **ON**. Under load, is the voltage level within 0.5 volts of the supply battery's voltage?

A: If YES:

See the "NOTE" at the top right of this page.

If NO:

Load-test the supply batteries, inspect battery wiring for damage

## ■ Section 7.1, continued

and/or loose connections, and ensure that all of the Hydro-Hot's electrical motors are operating normally when under load.

**NOTE:** If after testing and correcting the battery system, the *Low Battery Voltage Fault* indicator light continues to illuminate, and/or if the *Low Voltage Reset* (button) will not reset, the *Electronic Controller* must be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.

### Q3: Is the Electronic Controller's Diesel-Burner Status light illuminated?

A: If NO:

Perform each of the following procedures as necessary until the problem is resolved.

If YES:

Proceed to Q5.

- a. Remove the Electronic Controller's *Faceplate*. Use a jumper wire to make a connection from the *Diesel (+)* to the *Diesel (-)* on the *JP-2 Plug*, reference Figure 3. Does the *Diesel-Burner Status* light illuminate?

A: If YES:

The *Diesel* switch must be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance. Attempt heater restart.

If NO:

Continue troubleshooting.

- b. Turn the *Diesel* switch **OFF** (also, make sure the *Electric* switch is **OFF**). Use a jumper wire to make a connection from *Pin 13* to *Pin 14* on the *JP-3 Plug*, reference Figure 3. With the jumper wire in place, turn the *Diesel* switch **ON**. Does the *Diesel-Burner* ignite and the *Diesel-Burner Status* light illuminate?

A: If YES:

The *VDC / VAC Control Thermostat* must be replaced, reference Figure 3. Please contact our Technical

### Section 7.1, continued

Department at 1-800-685-4298 for assistance.

If NO:

The *Electronic Controller* must be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.

**NOTE:** If no problems were discovered up to this point, the problem most likely lies within the *Diesel-Burner Head*. However, prior to troubleshooting the *Diesel-Burner Head*, be sure to review the "Operational Flow-Chart" in Section 5.2, the "Operational Sequence" in Section 5.3, and the "Function" section for each of the *Diesel-Burner Components*, reference Sections 8.3 thru 8.11. This information may help determine at what point the *Diesel-Burner* fails to operate.

#### Q4: Is the Diesel-Burner's *Motor* operating?

**Quick Check** - Listen at the heater for the Diesel-Burner's *Motor* to operate, or check for output air at the heater's exhaust pipe.

**A:** If the *Motor* does not seem to be operating: Reference Section 8.3 and perform the *Motor's* "Component Test".

If the *Motor* is operating:

Continue troubleshooting.

#### Q5: Is the Diesel-Burner's *Control Unit* functioning properly?

In order to determine if the *Control Unit* is functioning properly, reference Section 8.11 and perform the *Control Unit's* "Component Test".

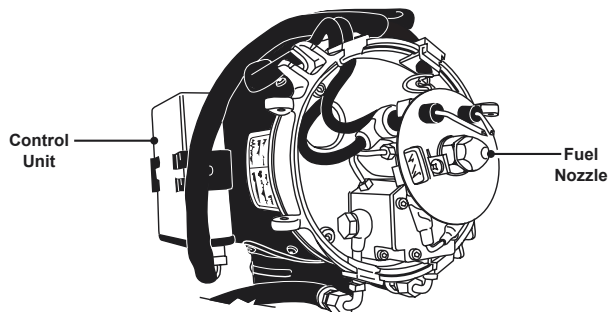
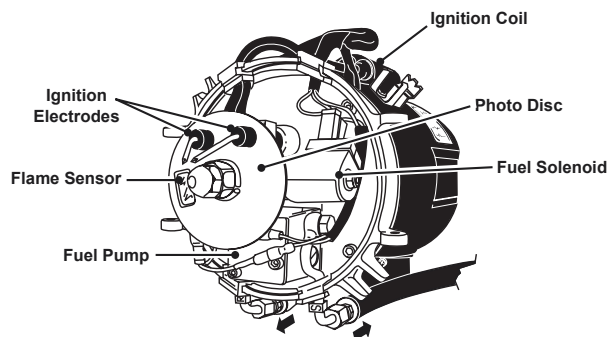
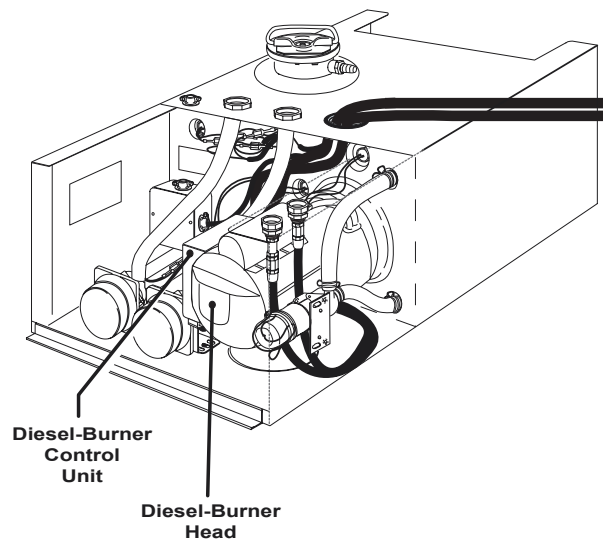
**A:** If the *Control Unit* is not functioning properly:

The *Control Unit* must be replaced, reference Section 8.11 for replacement instructions.

If the *Control Unit* is functioning properly:

See the "NOTE" on the top left-hand side of the following page.

### Section 7.1, continued



■ **Section 7.1,**  
continued

**NOTE:** If the *Hydro-Hot* still does not operate after performing all of the listed checks, contact our Technical Department at **1-800-685-4298** for additional assistance.

■ **Section 7.2**  
**After turning the Diesel switch ON:**

**TS2: The Hydro-Hot's Diesel-Burner operates (3-minute prime cycle only), but does not ignite.**

**NOTES:**

A. It is ideal to have the Hydro-Hot's *Fuel Filter* replaced yearly, reference Section 8.1. A plugged *Fuel Filter* will not allow the *Diesel-Burner* to operate properly. Also, before proceeding on to the following procedures, be sure to check that the vehicle's fuel tank has a sufficient level of fuel.

B. In order to perform some of the following procedures it may be necessary to detach the *Diesel-Burner Head* from the *Hydro-Hot*. Therefore, be sure to reference Section 8.2 for detaching and reattaching instructions.

**Q1: Has the Hydro-Hot's VDC High-Limit Thermostat tripped?**

Locate the *VDC High-Limit Thermostat* and check for continuity, reference Figure 1. Is continuity present?

**A:** If YES:

**Proceed to Q2.**

If NO:

**Press the red reset button located on the VDC High-Limit Thermostat and attempt heater restart.**

**NOTE:** Although the *Diesel-Burner* is now functioning, be sure to perform the following steps until the cause for overheating has been discovered and corrected. Failure to do so could result in another overheating condition.

■ **Section 7.2,**  
continued

a. Turn the *Diesel* switch **ON** and allow the *Hydro-Hot* to reach operating temperature (i.e. until the *Diesel-Burner* cycles **OFF**). Locate both the *VDC High-Limit Thermostat* and the *VAC / VDC Control Thermostat* and check them for continuity, reference Figure 1.

**A:** If there is no continuity at the *VDC High-Limit Thermostat*, but there is continuity at the *VAC / VDC Control Thermostat*:

**The VAC / VDC Control Thermostat must be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.**

If there is continuity at the *VDC High-Limit Thermostat*, but none at the *VAC / VDC Control Thermostat*:

**The overheat condition may have been caused by another faulty component and no further troubleshooting is necessary, see the "NOTE" below and please contact our Technical Department at 1-800-685-4298 for additional assistance.**

**NOTE:** If the *VDC High-Limit Thermostat* continues to trip, and no overheating problems were discovered (i.e. faulty *VAC / VDC Control Thermostat* or *Control Unit*), it may be that the *VDC High-Limit Thermostat* is not operating properly and it may need to be replaced.

**Q2: Is the Diesel-Burner's Fuel Nozzle functioning properly?**

In order to determine if the *Fuel Nozzle* is functioning properly, reference Section 8.6 and perform the *Fuel Nozzle's "Component Test"*.

**A:** If the *Fuel Nozzle* is not functioning properly:

**The Fuel Nozzle must be replaced, reference Section 8.6 for replacement instructions.**

If the *Fuel Nozzle* is functioning properly:  
**Continue Troubleshooting.**



### ■ Section 7.2, continued

#### **Q3: Is the Diesel-Burner's *Fuel Solenoid* functioning properly?**

In order to determine if the *Fuel Solenoid* is functioning properly, reference Section 8.7 and perform the Fuel Solenoid's "Component Test".

**A:** If the *Fuel Solenoid* is not functioning properly:

**The *Fuel Solenoid* must be replaced, reference Section 8.7 for replacement instructions.**

If the *Fuel Solenoid* is functioning properly:  
**Continue Troubleshooting.**

#### **Q4: Is the Diesel-Burner's *Control Unit* functioning properly?**

In order to determine if the *Control Unit* is functioning properly, reference Section 8.11 and perform the Control Unit's "Component Test".

**A:** If the *Control Unit* is not functioning properly:

**The *Control Unit* must be replaced, reference Section 8.11 for replacement instructions.**

If the *Control Unit* is functioning properly:  
**Continue Troubleshooting.**

#### **Q5: Is the Diesel-Burner's *Ignition Coil* functioning properly?**

In order to determine if the *Ignition Coil* is functioning properly, reference Section 8.10 and perform the Ignition Coil's "Component Test".

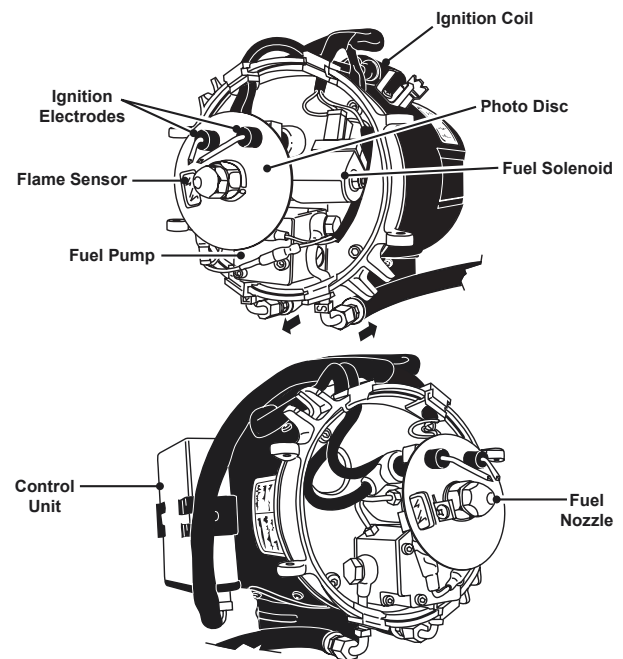
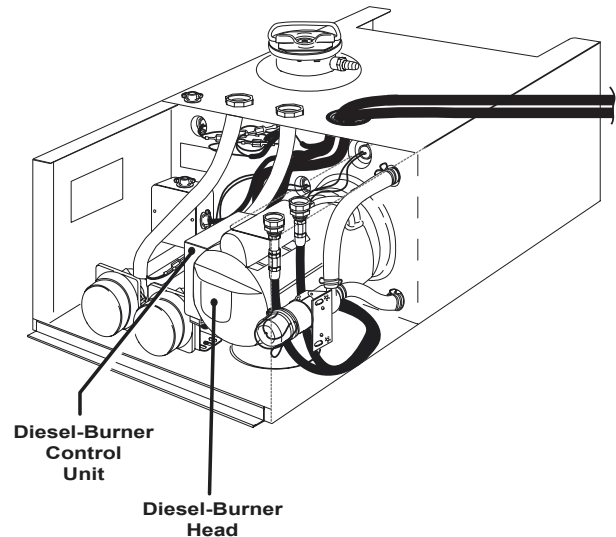
**A:** If the *Ignition Coil* is not functioning properly:

**The *Ignition Coil* must be replaced, reference Section 8.10 for replacement instructions.**

If the *Ignition Coil* is functioning properly:  
**Continue Troubleshooting.**

#### **Q6: Are the Diesel-Burner's *Ignition Electrodes* in good condition and properly adjusted?**

### ■ Section 7.2, continued



■ **Section 7.2,**  
continued

In order to determine if the *Ignition Electrodes* are in good condition and properly adjusted, reference Section 8.5.

**A:** If the *Ignition Electrodes* are in poor condition:

**The *Ignition Electrodes* must be replaced, reference Section 8.5 for replacement instructions.**

If the *Ignition Electrodes* are not properly adjusted:

**Adjust the *Ignition Electrodes*, reference Section 8.5 for adjustment instructions.**

If the *Ignition Electrodes* are both in good condition and properly adjusted:

**Continue Troubleshooting.**

**Q7: Is the Diesel-Burner's Flame Sensor functioning properly?**

In order to determine if the *Flame Sensor* is functioning properly, reference Section 8.4 and perform the Flame Sensor's "Component Test".

**A:** If the *Flame Sensor* is not functioning properly:

**The *Flame Sensor* must be replaced, reference Section 8.4 for replacement instructions.**

If the *Flame Sensor* is functioning properly:

**Continue Troubleshooting.**

**Q8: Is the Diesel-Burner's Fuel Pump functioning properly?**

In order to determine if the *Fuel Pump* is functioning properly, reference Section 8.8 and perform the Fuel Pump's "Component Test".

**A:** If the *Fuel Pump* is not functioning properly:

**The *Fuel Pump* must be replaced, reference Section 8.8 for replacement instructions.**

If the *Fuel Pump* is functioning properly:

**See the "NOTE" below.**

■ **Section 7.2,**  
continued

**NOTE:** If the *Hydro-Hot* still does not ignite after performing all of the listed checks, contact our Technical Department at **1-800-685-4298** for additional assistance.

■ **Section 7.3**

**After turning the Diesel switch ON:**

**TS3: The Hydro-Hot's Diesel-Burner ignites after several starting attempts.**

**NOTES:**

A. It is ideal to have the Hydro-Hot's *Fuel Filter* replaced yearly, reference Section 8.1. A plugged *Fuel Filter* will not allow the *Diesel-Burner* to operate properly. Also, before proceeding to the following procedures, be sure to check that the vehicle's fuel tank has a sufficient level of fuel.

B. In order to perform the following procedures, it is necessary to detach the *Diesel-Burner Head* from the *Hydro-Hot*. Be sure to reference Section 8.2 for detaching and reattaching instructions.

**Q1: Is the Diesel-Burner's Fuel Nozzle functioning properly?**

In order to determine if the *Fuel Nozzle* is functioning properly, reference Section 8.6 and perform the Fuel Nozzle's "Component Test".

**A:** If the *Fuel Nozzle* is not functioning properly:

**The *Fuel Nozzle* must be replaced, reference Section 8.6 for replacement instructions.**

If the *Fuel Nozzle* is functioning properly:

**Continue Troubleshooting.**



### Section 7.3, continued

#### Q2: Is the Diesel-Burner's Flame Sensor functioning properly?

In order to determine if the *Flame Sensor* is functioning properly, reference Section 8.4 and perform the Flame Sensor's "Component Test".

**A:** If the *Flame Sensor* is not functioning properly:

**The *Flame Sensor* must be replaced, reference Section 8.4 for replacement instructions.**

If the *Flame Sensor* is functioning properly:  
**Continue Troubleshooting.**

#### Q3: Are the Diesel-Burner's Ignition Electrodes in good condition and properly adjusted?

In order to determine if the *Ignition Electrodes* are in good condition and properly adjusted, reference Section 8.5.

**A:** If the *Ignition Electrodes* are in poor condition:

**The *Ignition Electrodes* must be replaced, reference Section 8.5 for replacement instructions.**

If the *Ignition Electrodes* are not properly adjusted:

**Adjust the *Ignition Electrodes*, reference Section 8.5 for adjustment instructions.**

If the *Ignition Electrodes* are both in good condition and properly adjusted:

**Continue Troubleshooting.**

#### Q4: Is the Diesel-Burner's Fuel Pump functioning properly?

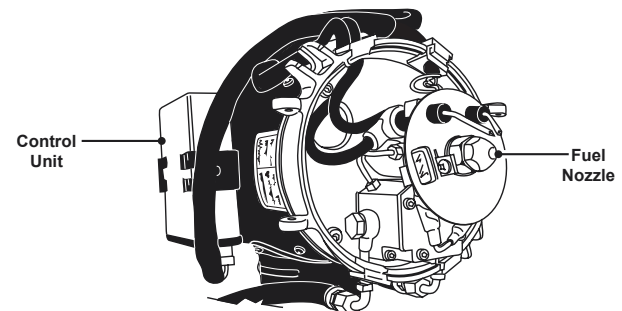
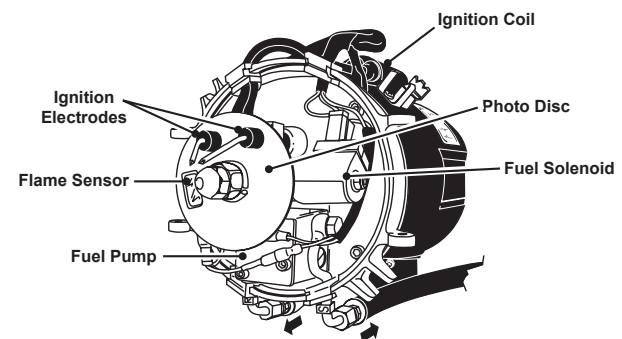
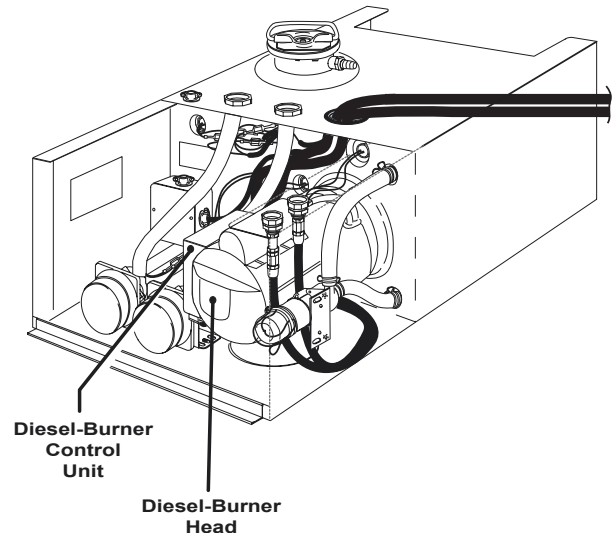
In order to determine if the *Fuel Pump* is functioning properly, reference Section 8.8 and perform the Fuel Pump's "Component Test".

**A:** If the *Fuel Pump* is not functioning properly:

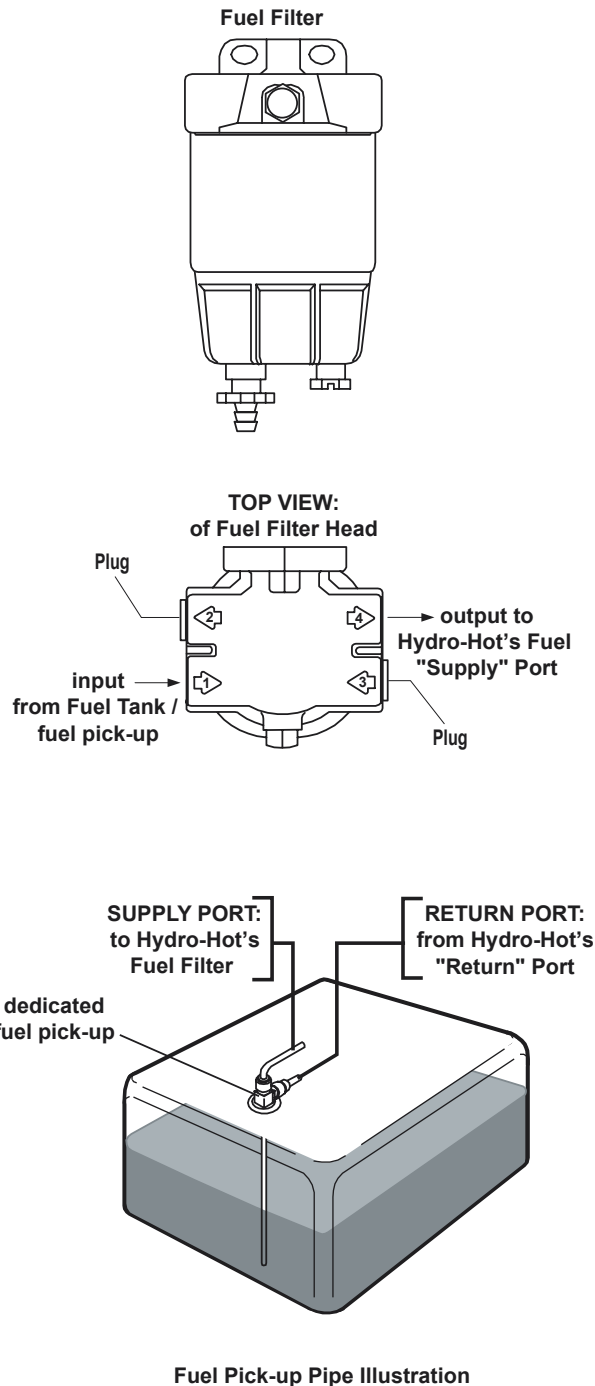
**The *Fuel Pump* must be replaced, reference Section 8.8 for replacement instructions.**

If the *Fuel Pump* is functioning properly:

### Section 7.3, continued



■ Section 7.3, continued



■ Section 7.3, continued

Continue Troubleshooting.

**Q5: Is the Diesel-Burner's Fuel Supply System functioning properly?**

**Quick Check** - With the *Diesel-Burner* ignited, listen for constant sputtering from the Hydro-Hot's exhaust system.

**A:** If constant sputtering exists:

**Continue Troubleshooting.**

If constant sputtering does not exist:

**Proceed to Q6.**

**NOTE:** Inspect the clear bowl of the *Fuel Filter* for water. If water exists, be sure to purge the Hydro-Hot's entire fuel system prior to replacing the *Fuel Filter*. Attempt heater restart.

- a. Clamp off and remove the Hydro-Hot's *Fuel Return Line*, reference Figure 1. Now attach a short piece of fuel line to the Hydro-Hot's *Fuel Return Port* and place the other end in a container of diesel fuel. Remove the clamp and ensure that the fuel line is completely submerged in the fuel and then turn the *Diesel* switch **ON**. Are air bubbles visible in the container of fuel when the *Diesel-Burner* is operating?

**A:** If air bubbles are not visible:

**Proceed to Q6.**

If air bubbles are visible:

**You will need to inspect the fuel system (supply side) for air leaks. Therefore, be sure to perform the inspections listed below until the air leak has been detected:**

1. Inspect the fuel system (supply side) from the vehicle's fuel tank to the *Diesel-Burner*. Inspect the fuel connections at the *Hydro-Hot*, *Diesel-Burner*, and at the vehicle's fuel tank for looseness. Tighten if necessary. Also, check that all *Fuel Filter Head* fittings are securely tightened; see the "NOTE" at the top left-hand side of the following page.

### Section 7.3, continued

**NOTE:** Be sure to check that each fitting at the *Fuel Filter Head* contains thread sealant. A fitting without thread sealant could result in an air leak. Be sure to clamp off both fuel lines at the filter head prior to any fitting removal. If fittings are removed and reinstalled, be sure to remove the fuel line clamps prior to attempting a heater restart. Failure to do so could result in serious damage to the Diesel-Burner's *Fuel Pump*.

2. Once the potential air leak has been discovered and corrected, reattach the Hydro-Hot's *Fuel Return Line* and attempt heater restart. Does the Hydro-Hot's exhaust system still sputter?

If the exhaust system is still sputtering:  
**Perform the air leak inspections again, until all air leaks have been discovered and corrected.**

#### **Q6: Is the Diesel-Burner's *Control Unit* functioning properly?**

In order to determine if the *Control Unit* is functioning properly, reference Section 8.11 and perform the *Control Unit's* "Component Test".

**A:** If the *Control Unit* is not functioning properly:

**The *Control Unit* must be replaced, reference Section 8.11 for replacement instructions.**

If the *Control Unit* is functioning properly:  
**Continue Troubleshooting.**

#### **Q7: Is the Diesel-Burner's *Ignition Coil* functioning properly?**

In order to determine if the *Ignition Coil* is functioning properly, reference Section 8.10 and perform the *Ignition Coil's* "Component Test".

**A:** If the *Ignition Coil* is not functioning properly:

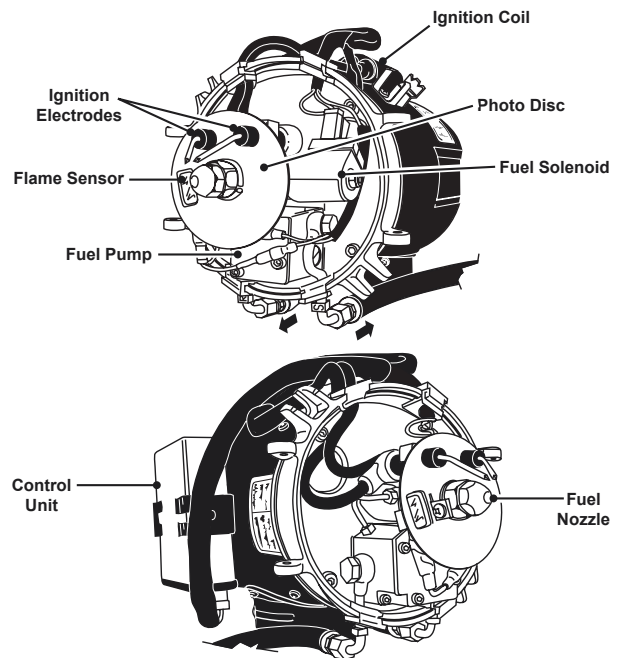
**The *Ignition Coil* must be replaced,**

### Section 7.3, continued

**reference Section 8.10 for replacement instructions.**

If the *Ignition Coil* is functioning properly:  
**See the "NOTE" below.**

**NOTE:** If the *Hydro-Hot* still does not ignite after several starting attempts and all of the listed checks were performed, contact our Technical Department at **1-800-685-4298** for additional assistance.



■ Section 7.4

**After turning the Diesel switch ON:**

**TS4: The Hydro-Hot's exhaust system sputters.**

**NOTE:** Before proceeding to the following procedures, be sure to check that the vehicle's fuel tank has a sufficient level of fuel.

**Q1: Is the Diesel-Burner's Fuel Nozzle functioning properly?**

In order to determine if the *Fuel Nozzle* is functioning properly, reference Section 8.6 and perform the Fuel Nozzle's "Component Test".

**A:** If the *Fuel Nozzle* is not functioning properly:

**The Fuel Nozzle must be replaced, reference Section 8.6 for replacement instructions.**

If the *Fuel Nozzle* is functioning properly:  
**Continue Troubleshooting.**

**Q2: Is the Diesel-Burner's Fuel Supply System functioning properly?**

**Quick Check** - With the *Diesel-Burner* ignited, listen for constant sputtering from the Hydro-Hot's exhaust system.

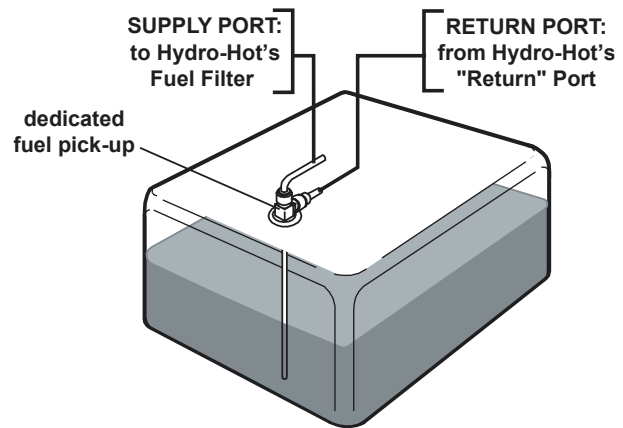
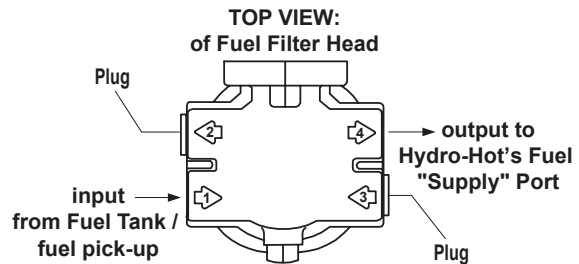
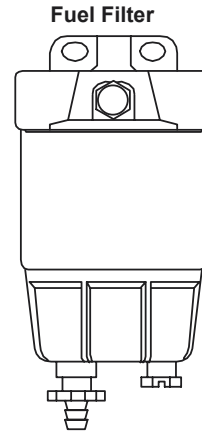
**A:** If constant sputtering exists:  
**Continue Troubleshooting.**

**NOTE:** Inspect the clear bowl of the *Fuel Filter* for water. If water exists, be sure to purge the Hydro-Hot's entire fuel system prior to replacing the *Fuel Filter*. Attempt heater restart.

- a. Clamp off and remove the Hydro-Hot's *Fuel Return Line*, reference Figure 1. Now attach a short piece of fuel line to the Hydro-Hot's *Fuel Return Port* and place the other end in a container of diesel fuel. Remove the clamp and ensure that the fuel line is completely submersed in the fuel and then turn the *Diesel* switch **ON**. Are air bubbles visible in the container of fuel when the *Diesel-Burner* is operating?

**A:** If air bubbles are not visible:  
**See the last "NOTE" in this section (Section 7.4).**

■ Section 7.4, continued



Fuel Pick-up Pipe Illustration

## Section 7.4, continued

If air bubbles are visible:

**You will need to inspect the fuel system (supply side) for air leaks. Therefore, be sure to perform the inspections listed below until the air leak has been detected:**

1. **Inspect the fuel system (supply side) from the vehicle's fuel tank to the Diesel-Burner. Inspect the fuel connections at the Hydro-Hot, Diesel-Burner, and at the vehicle's fuel tank for looseness. Tighten if necessary. Also, check that all Fuel Filter Head fittings are securely tightened, see the "NOTE" below.**

**NOTE:** Be sure to check that each fitting at the Fuel Filter Head contains thread sealant. A fitting without thread sealant could result in an air leak. Be sure to clamp off both fuel lines at the filter head prior to any fitting removal. If fittings are removed and reinstalled, be sure to remove both clamps prior to attempting a heater restart. Failure to do so could result in serious damage to the Diesel-Burner's Fuel Pump.

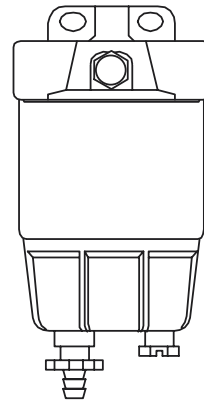
2. **Once the potential air leak has been discovered and corrected, reattach the Hydro-Hot's Fuel Return Line and attempt heater restart. Does the Hydro-Hot's exhaust system still sputter?**

If the exhaust system is still sputtering: **Perform the air leak inspections again, until all air leaks have been discovered and corrected.**

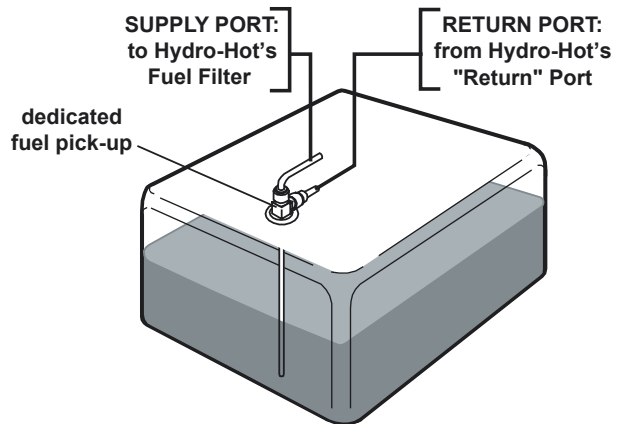
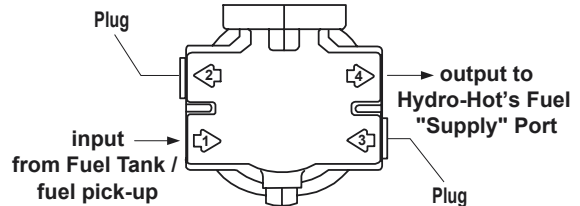
**NOTE:** If the Hydro-Hot's exhaust system still sputters after performing all of the listed checks, contact our Technical Department at **1-800-685-4298** for additional assistance.

## Section 7.4, continued

Fuel Filter



TOP VIEW:  
of Fuel Filter Head



Fuel Pick-up Pipe Illustration

■ Section 7.5

**After turning the Diesel switch ON:**

**TS5: The Hydro-Hot's exhaust system produces white smoke after ignition.**

**Q1: Is the Diesel-Burner's Fuel Nozzle functioning properly?**

In order to determine if the *Fuel Nozzle* is functioning properly, reference Section 8.6 and perform the Fuel Nozzle's "Component Test".

**A:** If the *Fuel Nozzle* is not functioning properly:  
**The Fuel Nozzle must be replaced, reference Section 8.6 for replacement instructions.**

If the *Fuel Nozzle* is functioning properly:  
**Continue Troubleshooting.**

**Q2: Is the Diesel-Burner's Fuel Pump producing the proper pressure?**

In order to determine if the *Fuel Pump* is producing the proper pressure, reference Section 8.8 and perform the Fuel Pump's "Fuel Pressure Adjustment Check".

**A:** If the *Fuel Pump* is not producing the correct pressure:  
**Adjust the fuel pressure to 145 psi.**  
 If the *Fuel Pump* is producing the correct pressure:  
**Continue Troubleshooting.**

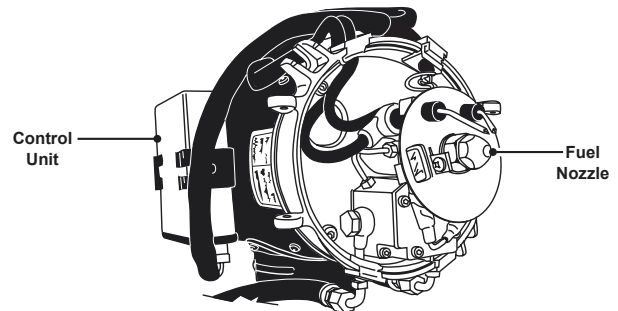
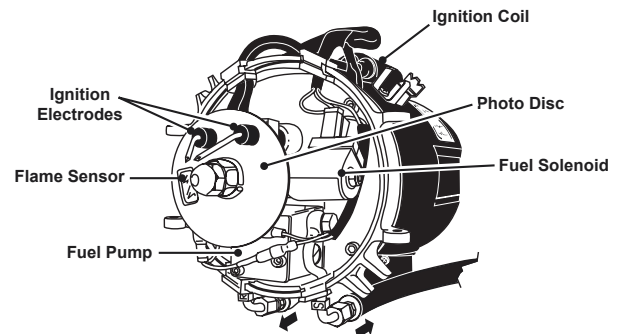
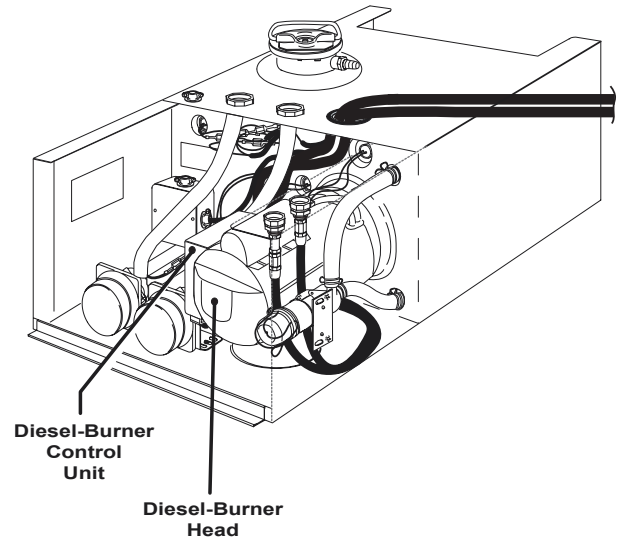
**NOTE:** Be sure to check that the Ignition Electrode's *Retaining Clamp Bolt* has not been overtightened, reference Figure 16. Overtightening can result in a bound-up (i.e. rigid) *Photo Disc*. Not allowing the *Photo Disc* to float freely (i.e. a loose fit) will cause poor combustion and result in a smoky exhaust. If a tight *Photo Disc* exists, reference Section 8.5 and perform the "Ignition Electrode Adjustment Procedure".

**Q3: Is the Diesel-Burner's Fuel Supply System functioning properly?**

**Quick Check** - With the *Diesel-Burner* ignited, look for constant white smoke from the Hydro-Hot's exhaust system.

**A:** If constant white smoke exists:  
**Continue Troubleshooting.**

■ Section 7.5, continued





## Section 7.5, continued

**NOTE:** Inspect the clear bowl of the *Fuel Filter* for water. If water exists, be sure to purge the Hydro-Hot's entire fuel system prior to replacing the *Fuel Filter*. Attempt heater restart.

- a. Clamp off and remove the Hydro-Hot's *Fuel Return Line*, reference Figure 1. Now attach a short piece of fuel line to the Hydro-Hot's *Fuel Return Port* and place the other end in a container of diesel fuel. Remove the clamp and ensure that the fuel line is completely submersed in the fuel and then turn the *Diesel* switch **ON**. Are air bubbles visible in the container of fuel when the *Diesel-Burner* is operating?

**A:** If air bubbles are not visible:

**Proceed to Q6.**

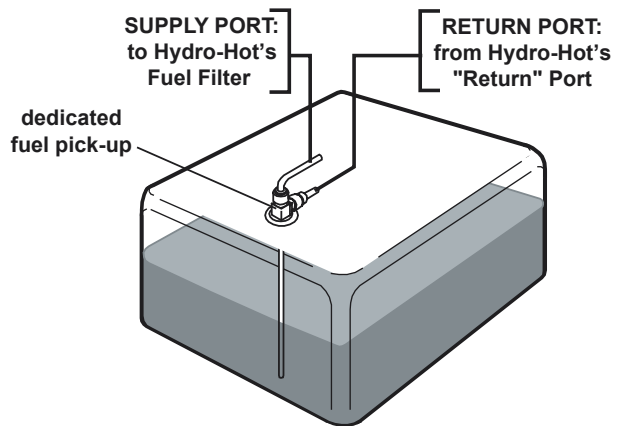
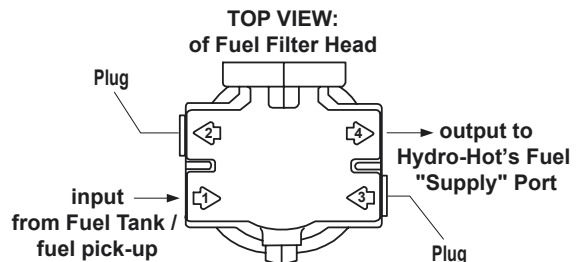
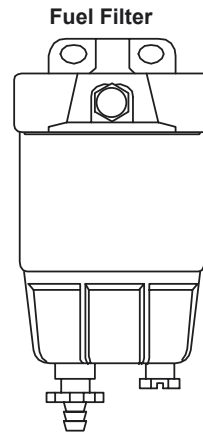
If air bubbles are visible:

**You will need to inspect the fuel system (supply side) for air leaks. Therefore, be sure to perform the inspections listed below until the air leak has been detected:**

1. Inspect the fuel system (supply side) from the vehicle's fuel tank to the *Diesel-Burner*. Inspect the fuel connections at the *Hydro-Hot*, *Diesel-Burner*, and at the vehicle's fuel tank for looseness. Tighten if necessary. Also, check that all *Fuel Filter Head* fittings are securely tightened, see the "NOTE" below.

**NOTE:** Be sure to check that each fitting at the *Fuel Filter Head* contains thread sealant. A fitting without thread sealant could result in an air leak. Be sure to clamp off both fuel lines at the filter head prior to any fitting removal. If fittings are removed and reinstalled, be sure to remove both clamps prior to attempting a heater restart. Failure to do so could result in serious damage to the *Diesel-Burner's Fuel Pump*.

## Section 7.5, continued



Fuel Pick-up Pipe Illustration

■ Section 7.5,  
continued

2. Once the potential air leak has been discovered and corrected, reattach the Hydro-Hot's *Fuel Return Line* and attempt heater restart. Does the Hydro-Hot's exhaust system still sputter?

If the exhaust system is still sputtering:  
**Perform the air leak inspections again, until all air leaks have been discovered and corrected.**

**NOTE:** If the Hydro-Hot's exhaust system still produces white smoke after performing all of the listed checks, contact our Technical Department at **1-800-685-4298** for additional assistance.

■ Section 7.6

After turning the Diesel switch ON:

**TS6:** The Hydro-Hot's exhaust system produces black smoke after ignition.

**Q1:** Is the Electronic Controller's Low Battery Voltage Fault light illuminated?

A: If YES:

**Perform each of the following procedures as necessary until the problem is resolved.**

If NO:

**Proceed to Q2.**

- a. Remove the Electronic Controller's *Faceplate*. Check the DC battery voltage level at the supply batteries and at the Electronic Controller's *Battery Connections*, reference Figure 3. Both voltage readings should be between 11.5 and 14.0 volts.

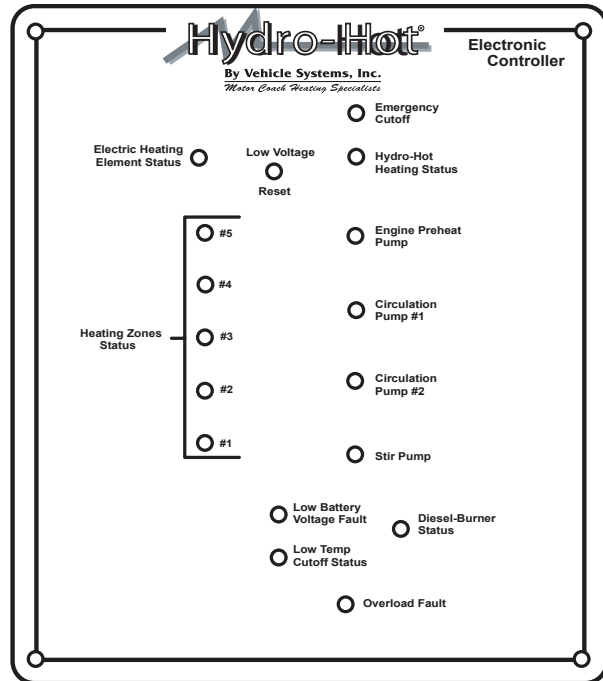
A: If the voltage level is within specs:

**Continue troubleshooting.**

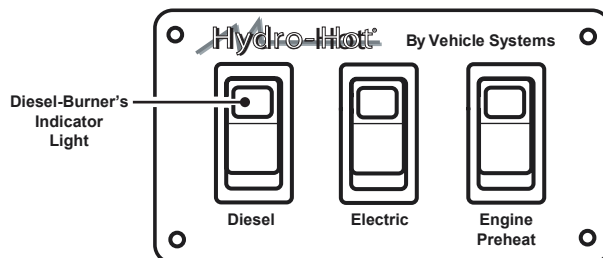
If the voltage level is out of specs:

**Recharge and/or replace batteries, if necessary.**

■ Section 7.6,  
continued



**Electronic Controller  
Faceplate**





### Section 7.6, continued

- b. Reset the Electronic Controller's *Low Voltage Reset* (button) on the *Electronic Controller* (this can be accomplished by using a thin straight object to access the reset button through the small hole in the faceplate). Continue to read the voltage level at the Electronic Controller's *Battery Connections* and then turn the *Diesel* switch **ON**. Under load, is the voltage level within 0.5 volts of the supply batteries voltage?

**A:** If YES:

**See the first "NOTE" below.**

If NO:

**Load-test the supply batteries, inspect battery wiring for damage and/or loose connections, and ensure that all of the Hydro-Hot's electrical motors are operating normally when under load.**

**NOTE:** If after testing and correcting the battery system, the *Low Battery Voltage Fault* indicator light continues to illuminate, and/or if the *Low Voltage Reset* (button) will not reset, the *Electronic Controller* must be replaced. Please contact our Technical Department at **1-800-685-4298** for assistance.

**NOTE:** In order to perform some of the following procedures it may be necessary to detach the *Diesel-Burner Head* from the *Hydro-Hot*. Therefore, be sure to reference Section 8.2 for detaching and reattaching instructions.

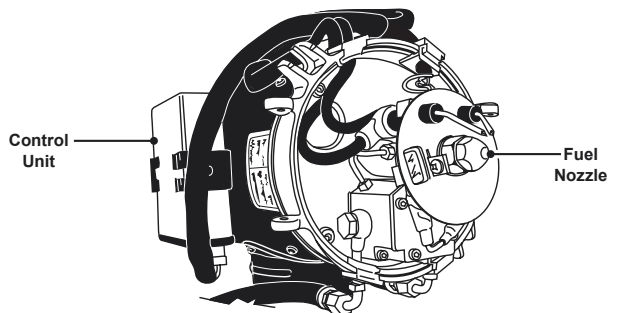
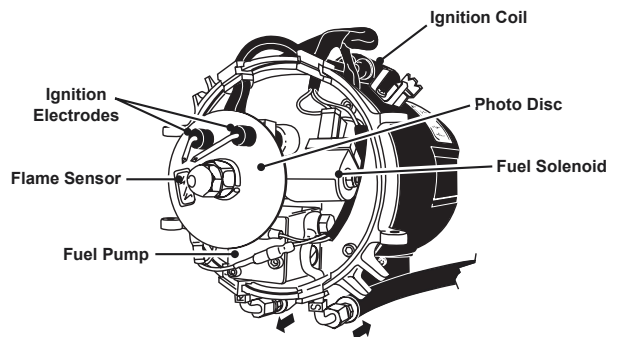
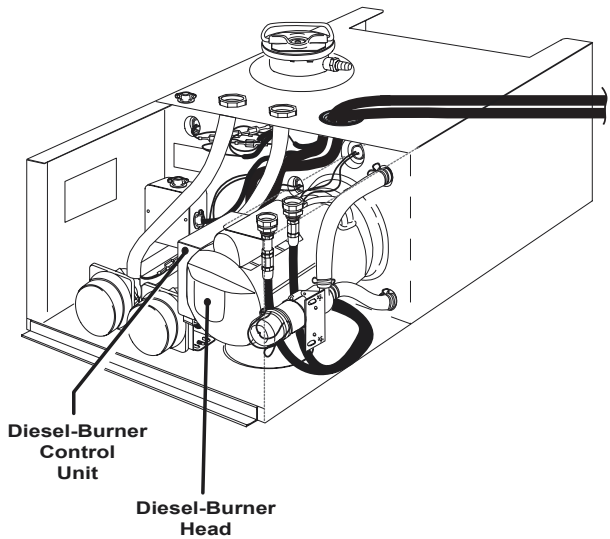
**Q2: Is the Diesel-Burner's Fuel Nozzle functioning properly?**

In order to determine if the *Fuel Nozzle* is functioning properly, reference Section 8.6 and perform the Fuel Nozzle's "Component Test".

**A:** If the *Fuel Nozzle* is not functioning properly:

**The Fuel Nozzle must be replaced, reference Section 8.6 for replacement instructions.**

### Section 7.6, continued



■ Section 7.6, continued

If the *Fuel Nozzle* is functioning properly:  
**Continue Troubleshooting.**

**Q3: Is the Diesel-Burner's *Motor* operating at the proper RPM speed?**

In order to determine if the *Motor* is operating properly, reference Section 8.3 and perform the *Motor's "RPM Test"*.

**A:** If the *Motor* is not operating at the proper RPM:

**The *Motor* must be replaced, reference Section 8.3 for replacement instructions.**

If the *Motor* is operating at the proper RPM:

**Continue Troubleshooting.**

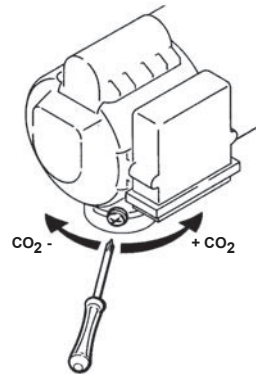
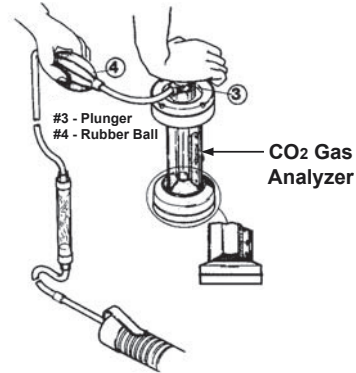
**Q4: Is the Diesel-Burner's *Combustion Air Intake* adjusted properly?**

**A: See the "NOTE" below.**

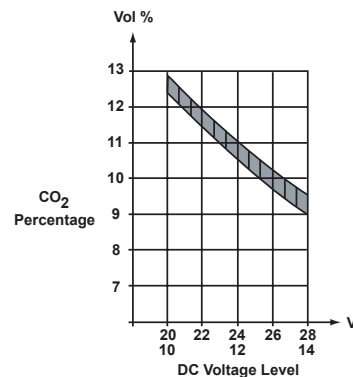
**NOTE:** In order to determine if the Diesel-Burner's *Combustion Air Intake* is adjusted properly, a CO<sub>2</sub> Gas-Analyzer will be required, reference the illustration on this page. Also, reference Section 11 for the Bacharach Fyrite CO<sub>2</sub> Analyzer's part number information, if necessary.

- a. When using the Bacharach Fyrite CO<sub>2</sub> Analyzer, turn the *Diesel* switch **ON** and allow the *Diesel-Burner* to ignite. Then perform the following procedures:
  1. Place the small end of the CO<sub>2</sub> Analyzer's suction hose into the *Hydro-Hot's Exhaust Pipe*.
  2. Place the round plunger connection of the suction hose on the CO<sub>2</sub> Analyzer's "Plunger". Press down on the suction hose, with the palm of your hand, so that the CO<sub>2</sub> Analyzer's Plunger" is fully compressed. This will allow a sample of the *Hydro-Hot's exhaust* to enter the CO<sub>2</sub> Analyzer.

■ Section 7.6, continued



**Combustion Air Intake Adjustment**



**CO<sub>2</sub> - Value Chart**

### ■ Section 7.6, continued

3. Pump the rubber ball - 18 times.
4. Release the suction hose from the CO<sub>2</sub> Analyzer's plunger.
5. Turn the CO<sub>2</sub> Analyzer upside down so that the fluid runs to the top and then turn it right side up again. Perform this procedure twice.
6. Place the CO<sub>2</sub> Analyzer on a flat surface and read the CO<sub>2</sub> level.
7. The CO<sub>2</sub> level should be between 10.5 and 11.5 percent (at a nominal 12 volts DC). If the CO<sub>2</sub> level is not within specs, an adjustment of the Diesel-Burner's *Combustion Air Intake* will be necessary, reference the illustration on the previous page. Once the proper CO<sub>2</sub> adjustment has been made, be sure to tighten the adjustment screw.

**NOTE:** For temporary high altitude situations (less available oxygen) the CO<sub>2</sub> will rise by 0.3% CO<sub>2</sub> per 1,000 feet of elevation. (e.g. a *Diesel-Burner* adjusted at sea level should register approximately a 1.5% higher CO<sub>2</sub> reading when in Denver, Colorado {5,000 above sea level}). If permanently residing in a high altitude area, be sure to properly adjust the *Diesel-Burner* so that it operates within the 10.5% - 11.5% CO<sub>2</sub> range.

**NOTES:** If the proper CO<sub>2</sub>-value cannot be obtained, perform each of the following inspections as necessary until the cause has been detected:

- A. Check the rubber *Grommets* on the top and bottom of the *Diesel-Burner Head's* cast-aluminum *Blower Casing* to ensure they are securely in place.
- B. Check the *Diesel-Burner Head* for proper alignment. (torque specification = approx. 20-40 in. lbs.), reference Section 8.2.
- C. Check to ensure that the Diesel-Burner's

### ■ Section 7.6, continued

*Fuel Pump* is producing the proper pressure. In order to determine if the *Fuel Pump* is producing the proper pressure, reference Section 8.8 and perform the Fuel Pump's "Fuel Pressure Adjustment Check".

- D. Check and reset the *Combustion Air Blower* gap, if applicable. In order to determine if the Combustion Air Blower's gap is set properly, reference Section 8.9 and perform Steps 1-6 and 11-17 of the Bearings "Replacement Procedure".
- E. See the "**NOTE**" below.

**NOTE:** If the Hydro-Hot's exhaust system still produces black smoke after performing all of the listed checks, contact our Technical Department at **1-800-685-4298** for additional assistance.

■ Section 7.7

After turning the *Diesel* switch ON:

TS7: The *Hydro-Hot* is at operating temperature, but an *Interior* and/or *Fresh Water Tank Heating Zone* is not producing heat.

Q1: Is the particular Heating Loop's *Circulation Pump* operating?

**Quick Check** - Remove the *Hydro-Hot*'s Access Cover and determine if the problem Heat Exchanger(s) are plumbed with *Circulation Pump #1* or *Circulation Pump #2*, reference Figure 1 and the illustration below. Once the correct *Circulation Pump* has been determined, locate and activate the *Room Thermostat* for the particular heating zone. This should activate that particular *Circulation Pump*. Is the *Circulation Pump* operating?

A: If YES:

Check the particular *Heating Loops* plumbing system for kinks and/or any other types of flow restrictions.

If NO:

Perform each of the following procedures as necessary until the problem is resolved.

1. Locate the *Electronic Controller* and remove the *Faceplate*.

■ Section 7.7, continued

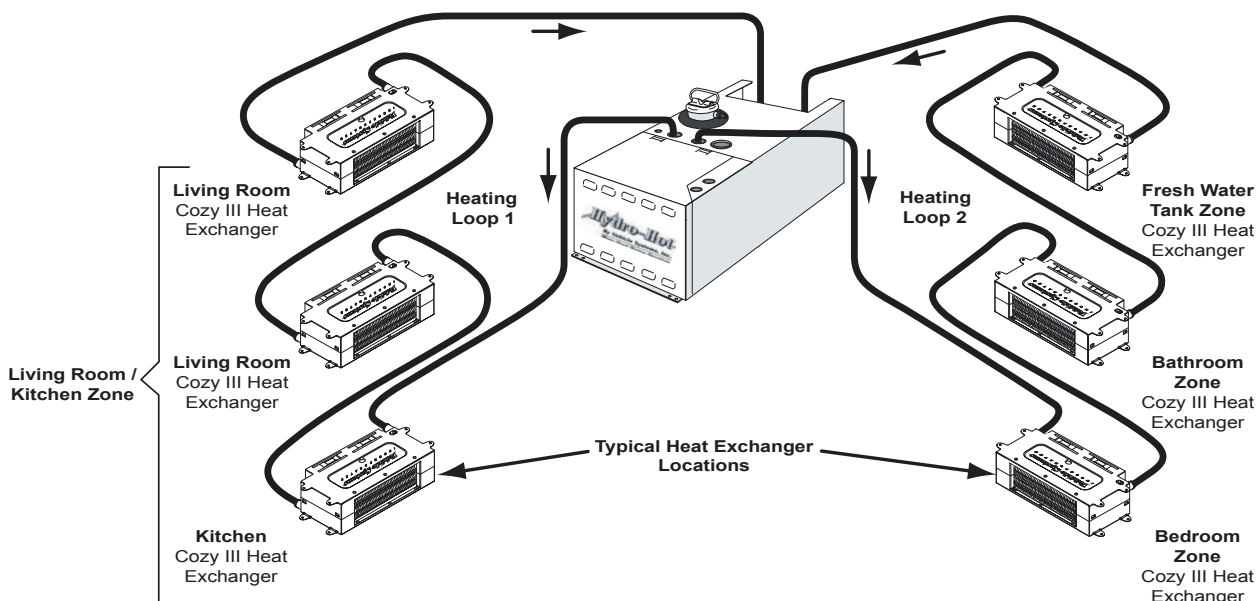
2. Locate the *Electronic Controller*'s *JP-3 Plug* and then insert the probes of a DC voltmeter into *Pin* locations 5 (+) and 6 (-) for *Circulation Pump #1*, and/or into *Pin* locations 3 (+) and 4 (-) for *Circulation Pump #2*, reference Figure 3. Observe the DC voltage level on the voltmeter. Does a nominal voltage reading register on the voltmeter?

A: If YES:

The *Circulation Pump* must be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.

If NO:

The *Electronic Controller* must be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.



## Section 7.8

After turning the Diesel switch ON:

**TS8: The Hydro-Hot is at operating temperature, but the fans of an Interior and/or Fresh Water Tank Heat Exchangers are not operating.**

**Q1: Is the Electronic Controller's Low Temp Cutoff Status light illuminated?**

**A: If YES:**

**Perform each of the following procedures as necessary until the problem is resolved.**

**If NO:**

**Inspect the Heat Exchanger fans and interior Room Thermostat wiring for loose connections at JP-1 Plug of the Electronic Controller, reference Figure 3.**

- a. Activate the interior Room Thermostat and then turn the Diesel switch ON. Remove the Hydro-Hot's Access Cover and locate the two yellow colored wires, which connect to the two black wires, reference the illustration on this page. Disconnect the wires and then connect the two yellow wires together by utilizing an ATO type automotive fuse, again reference the illustration. Do the Heat Exchanger fans now operate?

**A: If YES:**

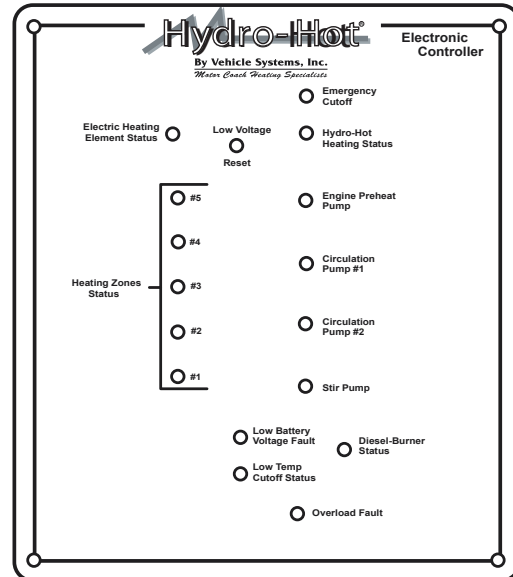
**The Low Temp Cutoff Thermostat may need to be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.**

**If NO:**

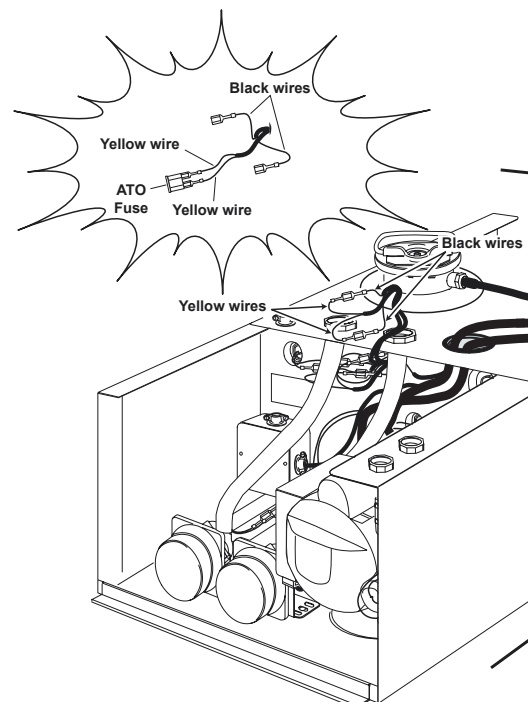
**Perform each of the following procedures as necessary until the problem is resolved.**

1. Locate the Electronic Controller and remove the Faceplate.
2. Locate the Electronic Controller's JP-1 Plug and read the DC voltage signal output, and input, at the particular interior Room Thermostat's circuit, reference Figure 3. Is there an output DC

## Section 7.8, continued



**Electronic Controller Faceplate**



■ Section 7.8,  
continued

voltage signal at the *Electronic Controller*?

A: If YES:

The interior *Room Thermostat* may need to be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.

If NO:

The *Electronic Controller* must be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.

■ Section 7.9

After turning the *Diesel* switch ON:

TS9: The *Hydro-Hot* is at operating temperature, but the domestic hot water system is not producing hot water.

Q1: Is the *Electronic Controller's Stir Pump Status* light illuminated? (reference Figure 5)

A: If YES:

Perform each of the following procedures as necessary until the problem is resolved.

1. Seal all openings that may allow cool air to enter the open area at the backside of the *Hydro-Hot*.
2. Locate the *Low-Temp Cutoff Thermostat*, reference Figure 1. Make sure that the thermostat has not been dislodged from the copper line, reference Figure 1.
3. Turn the *Diesel* switch ON and allow the *Hydro-Hot* to reach it's maximum operating temperature. Once the *Diesel-Burner* has cycled OFF, check the *Low-Temp Cutoff Thermostat* for continuity, reference Figures 1 and 3. If no continuity is present, the *Low Temp Cutoff Thermostat* must be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.

If NO:

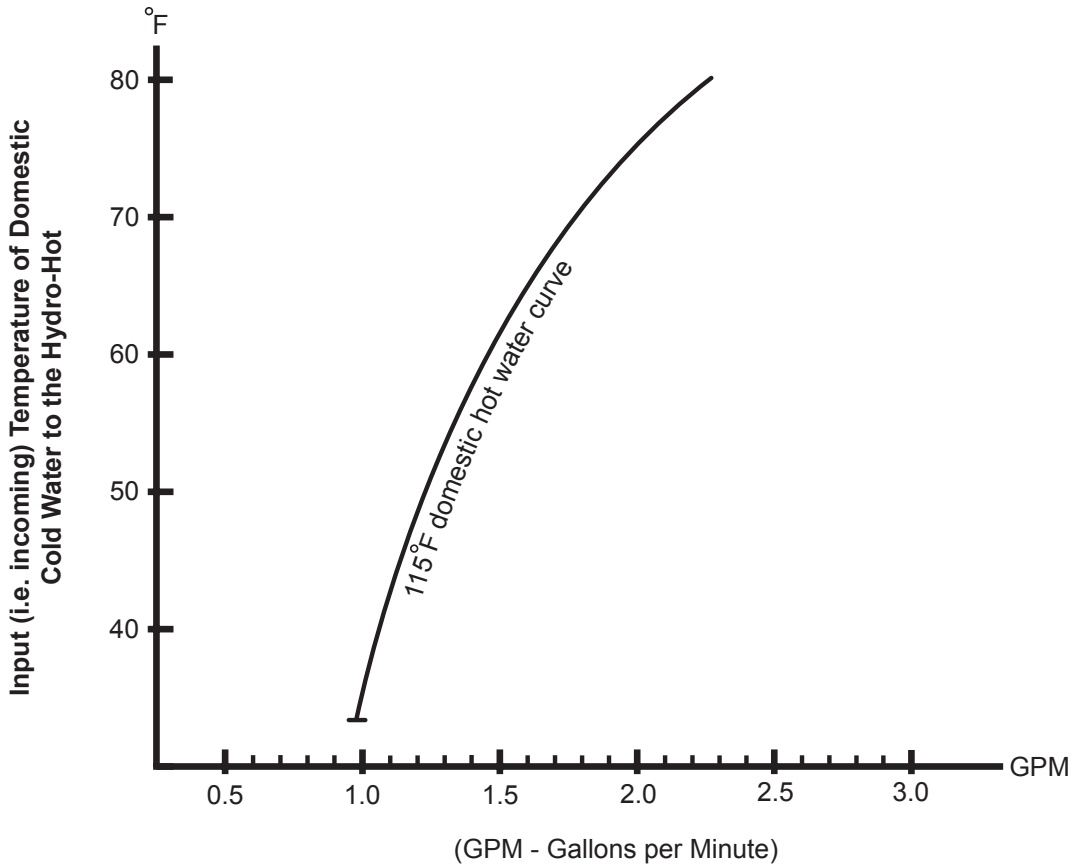
Check the *Hydro-Hot's* heating solution for the proper antifreeze to water mixture (should be 33% antifreeze and 67% water). A high concentration of antifreeze will cause a poor domestic hot water performance.

**NOTE:** If there is still a lack of hot water after performing all of the listed checks, contact our Technical Department at 1-800-685-4298 for additional assistance. Also, be sure to reference the chart on the following page regarding the *Hydro-Hot's* Domestic Hot Water System.



■ Section 7.9,  
continued

The chart below, is a graphical representation of how the Hydro-Hot's Domestic Hot Water System *theoretically* performs under varying domestic cold water temperatures. Because each Hydro-Hot has a performance tolerance, this graph should be used as a general guideline and not as actual domestic hot water performance data.



Estimated flow rate, of domestic cold water, required to maintain an approximate 115°F output temperature of domestic hot water.

Notes of interest:

**When water is heated to.....**

- 156 degrees - Hot water causes a third-degree burn in one second
- 149 degrees - Hot water causes a third-degree burn in two seconds
- 133 degrees - Hot water causes a third-degree burn quickly
- 115-120 degrees - General purpose temperatures
- 107-109 degrees - Average "Hot-Tub" temperatures
- 105 degrees - Average "Shower" temperature

■ Section 7.10

After turning the *Electric* switch ON:

**TS10:** The Hydro-Hot's 120 VAC *Electric Heating Element* does not operate (i.e. lack of hot water and/or interior heat).

**Q1:** Is the Electronic Controller's *Electric Heating Element Status* light illuminated? (reference Figure 5)

**A:** If YES:

Perform each of the following procedures as necessary until the problem is resolved.

1. Locate the *Electronic Controller* and remove the *Faceplate*.
2. Locate the Electronic Controller's *JP-3 Plug* and check for DC voltage at *Pin 11 (+)* and *Pin 12 (-)*, reference Figure 3.

**A:** If voltage is present:

Check for loose wire connections at *Pin 11 (+)* and *Pin 12 (-)* of the *JP-3 Plug*. If the wire connections are in good condition, proceed to Q2.

If no voltage is present:

Replace the *Electronic Controller*. Please contact our Technical Department at 1-800-685-4298 for assistance.

If NO:

Perform each of the following procedures as necessary until the problem is resolved.

1. Locate the *Electronic Controller* and remove the *Faceplate*.
2. Locate the Electronic Controller's *JP-2 Plug*. Use a jumper wire to make a connection from the *Electric (+)* pin to the *Electric (-)* pin, reference Figure 3. Does Electronic Controller's *Electric Heating Element Status* light illuminate?

**A:** If the *Electric Heating Element Status* light illuminates:

Check for loose wire connections at *Electric* switch and at the *JP-2*

■ Section 7.10, continued

Plug's *Electric (+)* and *Electric (-)* pins. If connections are in good condition, replace the *Electric* switch.

If the *Electric Heating Element Status* light did not illuminate:

Locate the Electronic Controller's *JP-2 Plug* and check for DC voltage at the *Electric (+)* and *Electric (-)* pins, reference Figure 3.

If no voltage is present:

Replace the *Electronic Controller*. Please contact our Technical Department at 1-800-685-4298 for assistance.

**Q2:** Has the Hydro-Hot's VAC *High-Limit Thermostat* tripped?



**WARNING:** Turn the VAC breaker **OFF** prior to performing the following checks. Failure to do so may result in serious bodily injury (i.e. **electrical shock**).

Remove the 4 in. x 4 in. *Electric Heating Element Access Panel* and locate the VAC *High-Limit Thermostat*, reference Figure 1. Check for continuity at the *VAC High-Limit Thermostat*. Is continuity present?

**A:** If YES:

Proceed to Q3.

If NO:

Press the red reset button located on the *VAC High-Limit Thermostat*. Reset the VAC breaker and then turn the *Electric* switch ON.

**NOTE:** Although the 120 VAC *Electric Heating Element* is now functioning, be sure to perform the following steps until the cause for overheating has been discovered and corrected. Failure to do so could result in another overheating condition.



### ■ Section 7.10, continued

- a. Turn the *Diesel* and *Electric* switches **ON** and allow the *Hydro-Hot* to reach maximum operating temperature (i.e. until the *Diesel-Burner* cycles **OFF**). Locate both the *VAC High-Limit Thermostat* and the *VAC / VDC Control Thermostat* and check for continuity, reference Figure 1.

**A:** If there is no continuity at the *VAC High-Limit Thermostat*, but there is continuity at the *VAC / VDC Control Thermostat*:

**The *VAC / VDC Control Thermostat* must be replaced. Please contact our Technical Department at 1-800-685-4298 for assistance.**

If there is continuity at the *VAC High-Limit Thermostat*, but none at the *VAC / VDC Control Thermostat*:

**The overheat condition may have been caused by another faulty component and no further troubleshooting is necessary, see the "NOTE" below. Please contact our Technical Department at 1-800-685-4298 for additional assistance.**

**NOTE:** If the *VDC High-Limit Thermostat* continues to trip, and no overheating problems were discovered (i.e. faulty *VAC / VDC Control Thermostat*), it may be that the *VDC High-Limit Thermostat* is not operating properly and it may need to be replaced.

#### **Q3: Is VAC power being supplied to the VAC Element Relay?**



**WARNING:** The following checks need to be performed with the motorhome connected to VAC power. Be sure to use extreme caution when performing each check, as 120 VAC power will be present at each of the electrical components. Failure to do so may result in serious bodily injury (i.e. **electrical shock**).

### ■ Section 7.10, continued

Turn the *Electric* switch **ON**. Locate the *VAC Element Relay* in the 4 in. x 4 in. junction box, reference Figure 1. Check for AC voltage at the *Black (+)* wire ("120 VAC Power Supply") connection at the *AC Element Relay*, reference Figure 3. For a common ground, use the *White* wire connection at the *120 VAC Electric Heating Element*. Is voltage present?

**A:** If YES:

**Proceed to Q4.**

If NO:

**Check for loose wire connections at the motorhome's VAC junction box. If the wire connections are in good condition, please contact our Technical Department at 1-800-685-4298 for additional assistance.**

#### **Q4: Is VAC Element Relay functioning properly?**



**WARNING:** The following checks need to be performed with the motorhome connected to VAC power. Be sure to use extreme caution when performing each check, as 120 VAC power will be present at each of the electrical components. Also, be sure to disconnect VAC power prior to replacing any electrical components. Failure to do so may result in serious bodily injury (i.e. **electrical shock**).

**NOTE:** Inspect the *VAC Element Relay* for damage. If visual signs of damage exist, the relay must be replaced.

Turn the *Electric* switch **ON**. Locate the *VAC Element Relay* in the 4 in. x 4 in. junction box. Check for AC voltage at the *Black (+)* wire (from the *VAC High-Limit Thermostat*) connection at the *AC Element Relay*, reference Figure 3. For a common ground, use the

## ■ Section 7.10, continued

*White* wire connection at the *120 VAC Electric Heating Element*. Is voltage present?

**A:** If YES:

**Proceed to Q5.**

If NO:

**The VAC Element Relay must be replaced. Please contact out Technical Department at 1-800-685-4298 for assistance.**

**Q5: Is *120 VAC Electric Heating Element* functioning properly?**



**WARNING:** The following checks need to be performed with the motorhome connected to VAC power. Be sure to use extreme caution when performing each check, as 120 VAC power will be present at each of the electrical components. Also, be sure to disconnect VAC power prior to replacing any electrical components. Failure to do so may result in serious bodily injury (i.e. **electrical shock**).

Disconnect the motorhome from VAC shore power. Locate the *120 VAC Electric Heating Element* in the 4 in. x 4 in. junction box. Remove the *White (common)* wire from the *120 VAC Electric Heating Element*. Check for continuity at the *Black (+)* wire and at the terminal where the *White (common)* wire was removed. Is continuity present?

**A:** If YES:

**See the "NOTE" on the top right-hand side of this page.**

If NO:

**The *120 VAC Electric Heating Element* must be replaced. Please contact out Technical Department at 1-800-685-4298 for assistance.**

## ■ Section 7.10, continued

**NOTE:** If the *120 VAC Electric Heating Element* still does not seem to operate after performing all of the listed checks, contact our Technical Department at **1-800-685-4298** for additional assistance.

## ■ Section 7.11

**After turning the *Engine Preheat* switch ON:**

**TS11: The Hydro-Hot's *Engine Preheat System* does not preheat the engine.**

**NOTE:** The *Diesel* or *Electric* switch must be activated, along with the *Engine Preheat* switch, prior to performing the following checks.

**Q1: Is the *Electronic Controller's Engine Preheat Pump* light illuminated? (reference **Figure 5**)**

**A:** If YES:

**Perform each of the following procedures as necessary until the problem is resolved.**

- 1. Locate the *Electronic Controller* and remove the *Faceplate*.**
- 2. Locate the *Electronic Controller's JP-3 Plug* and check for DC voltage at *Pin 7 (+)* and *Pin 8 (-)*, reference **Figure 3**.**

**A:** If voltage is present:

**Check for loose wire connections at *Pin 7 (+)* and *Pin 8 (-)* of the *JP-3 Plug*. Also, check the wire connections at the *Engine Preheat Pump*. If all connections are in good condition, listen and feel the *Engine Preheat Pump* to ensure that it is operating, reference **Figure 1**. If the *Engine Preheat Pump* is not operating, it must be replaced.**

### ■ Section 7.11, continued

If no voltage is present:

**Replace the *Electronic Controller*.**

If NO:

**Perform each of the following procedures as necessary until the problem is resolved.**

- 1. Locate the *Electronic Controller* and remove the *Faceplate*.**
- 2. Locate the *Electronic Controller's JP-2 Plug*. Use a jumper wire to make a connection from the *Preheat (+)* pin to the *Preheat (-)* pin, reference Figure 3. Does *Electronic Controller's Engine Preheat Pump* light illuminate?**

**A:** If the *Engine Preheat Pump* light illuminates:

**Check for loose wire connections at *Engine Preheat* switch and at the *JP-2 Plug's Preheat (+)* and *Preheat (-)* pins, reference Figure 3. If connections are in good condition, replace the *Engine Preheat* switch.**

If the *Engine Preheat Pump* light did not illuminate:

**Locate the *Electronic Controller's JP-2 Plug* and check for DC voltage at the *Preheat (+)* and *Preheat (-)* pins, reference Figure 3.**

If no voltage is present:

**Replace the *Electronic Controller*. Please contact our Technical Department at 1-800-685-4298 for assistance.**

If voltage is present:

**See "NOTE" below.**

**NOTE:** If the *Engine Preheat Pump* still does not seem to operate after performing all of the listed checks, contact our Technical Department at **1-800-685-4298** for additional assistance.

## General Recommended Maintenance

### 8.1 General Recommended Maintenance

#### Monthly

Check the Hydro-Hot's water and antifreeze solution to ensure that it is at the proper level. Do this by visually checking the coolant level in the Hydro-Hot's *Expansion Tank*, reference Figure 1. This should be checked **only** when the *Hydro-Hot* is at maximum operating temperature (i.e. when the *Diesel-Burner* cycles **OFF**), "**HOT**".



**WARNING:** When the *Hydro-Hot* is at maximum operating temperature (**HOT**), **DO NOT** loosen the *Radiator Cap*. If removed, scalding by hot vapor or coolant could result.

If the coolant needs replenishing, fill the Hydro-Hot's *Expansion Tank* to the **FULL HOT** level mark. Be sure to reference the Hydro-Hot "Owner's Manual" for the proper antifreeze type and mixture. If coolant frequently needs replenishing, please contact our Technical Department at 1-800-685-4298 for assistance.

#### Annually

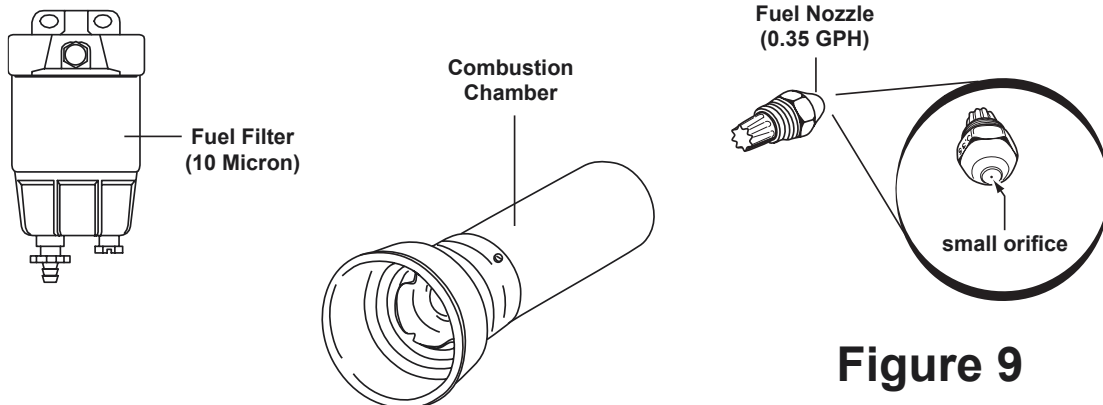


**WARNING:** Before cleaning or servicing, disconnect all power supplies.

To keep your *Hydro-Hot* running smoothly, it is ideal to have the *Diesel-Burner* tuned-up annually. A tune-up should consist of a new *Fuel Nozzle* and *Fuel Filter*, along with a thorough cleaning of the *Combustion Chamber*, if necessary (reference Figure 9). To ensure maximum *Diesel-Burner* performance, always use the recommended *Fuel Nozzle* and *Fuel Filter* (i.e. 10 Micron) when replacing these parts. Reference Section 10 for spare parts information.

**NOTE:** Be sure to use care when handling the *Fuel Nozzle*. Oils and/or small dust or dirt particles from your hands may plug the nozzle's small orifice. A partially plugged orifice will restrict fuel flow, which will affect the combustion process of the *Diesel-Burner* (i.e. excessive smoking).

**CAUTION:** Operating the Hydro-Hot's *Diesel-Burner* or the *120 VAC Electric Heating Element*, without the water and antifreeze solution, will cause **serious damage** to the heater.



**Figure 9**

### Detaching and Reattaching the Diesel-Burner Head

#### 8.2 Detaching and Reattaching the Diesel-Burner Head

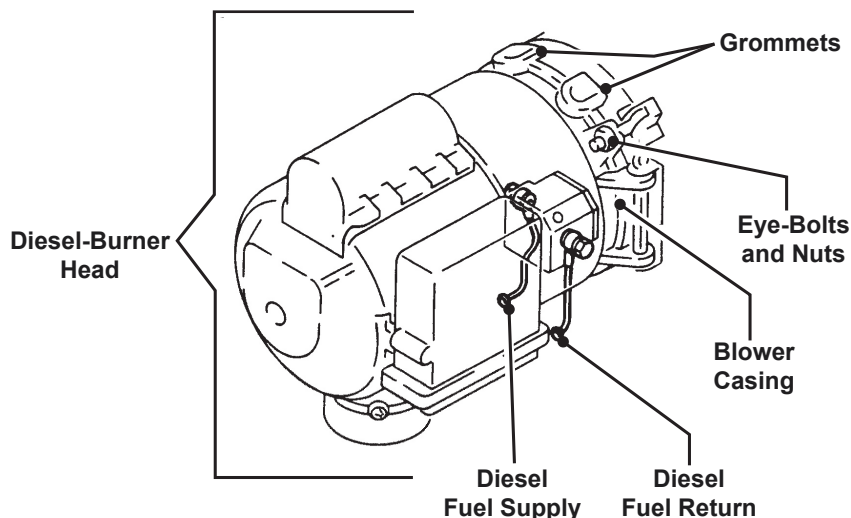


Figure 10



**WARNING:** Be sure to turn the *Diesel* switch **OFF** and disconnect the *B-Plug Harness* from the Diesel-Burner's *Control Unit* prior to detaching the *Diesel-Burner Head*, reference Figures 8 and 26. Failure to do so may result in the ignition of the *Diesel-Burner* and serious bodily injury.

1. Loosen the two *Eye-Bolt Nuts* and swing the *Eye-Bolts* out of the way, reference Figure 10.
2. With both hands, carefully pull the *Diesel-Burner Head* away from the *Hydro-Hot* (approximately 4-5 inches). Please note that you may have to lift the *Diesel-Burner Head* slightly while pulling it away from the *Hydro-Hot*.
3. Rotate the *Diesel-Burner Head* upward until all the internal components are visible.

**CAUTION:** When reattaching the *Diesel-Burner Head*, be sure to properly align the *Diesel-Burner Head* before tightening the *Eye Bolt Nuts*. Also, visually inspect all of the rubber *Grommets* on the top and bottom of the *Diesel-Burner Head's* cast-aluminum *Blower Casing* to ensure they are in place. **DO NOT** over tighten the *Eye-Bolt Nuts* (torque specification = approx. 20-40 in. lbs.). An improper alignment and/or an over tightening of the *Eye-Bolt Nuts* can cause damage to the *Diesel-Burner Head's* cast-aluminum *Blower Casing*, reference Figure 10.

## Motor

### 8.3 Motor

**Function:** The *Motor* drives the *Combustion Air Blower* and the *Fuel Pump*.

**NOTE:** In order to perform the following procedures, it may be necessary to detach and reattach the *Diesel-Burner Head*. Be sure to reference Section 8.2, Page 42 for detaching and reattaching instructions.

**Component Test:** Locate the Control Unit's *C-Plug* and insert the probes of a DC voltmeter into the C-2 (+) and C-5 (-) locations, reference Figure 11. Turn the *Diesel* switch **ON** and observe the voltage level. If a nominal voltage registers on the voltmeter and the *Motor* is not operating, inspect the *C-Plug Harness* for loose or damaged wire connections. If the *C-Plug Harness* and connections are in good condition, the *Motor* must be replaced, reference the Motor's "Replacement Procedure" on Page 45.

**Cleaning Tips / Maintenance:** N/A

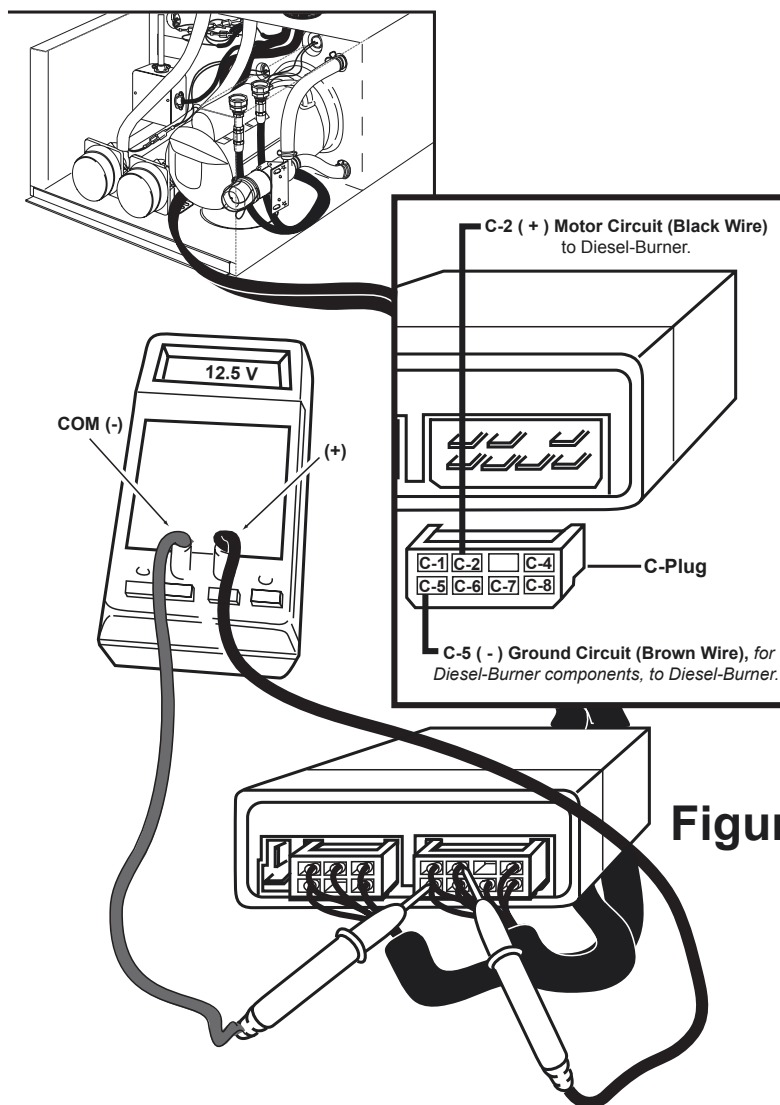


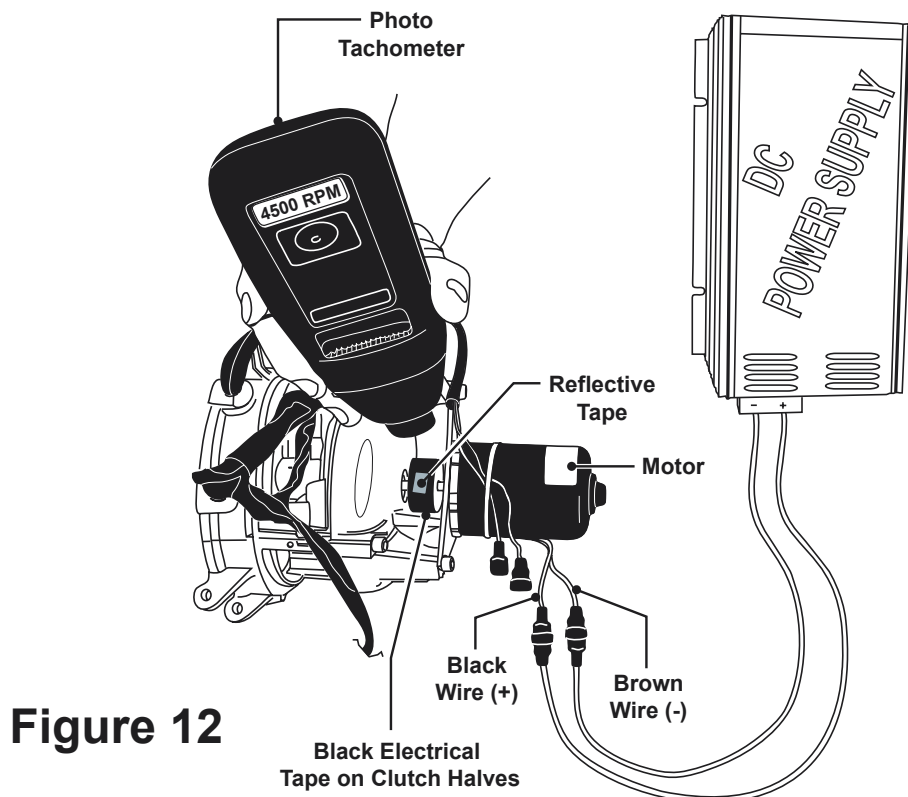
Figure 11

### Motor, continued

#### Adjustment Procedure: N/A

**RPM Test:** Disconnect the *Ignition Cables* from the *Ignition Electrodes*, reference Figure 16. Remove the four *Ignition Coil Screws* that secure the *Ignition Coil* to the *Protection Cap*, reference Figure 13. Lift the *Ignition Coil* and disconnect its *wires* from the C-Plug Harness *wires* prior to removing. Remove the *Protection Cap* from the *Diesel-Burner* so that the *Motor* and *Clutch Halves* are exposed, reference Figures 12 and 13. Place a few wraps of black electrical tape around the *Clutch Halves* and then place a small piece of reflective tape over the black tape, as illustrated in Figure 12. Disconnect the Motor's *Black (+)* and *Brown (-)* wires from the C-Plug Harnesses *Black (+)* and *Brown (-)* wires, reference Figures 12 and 13. Connect the Motor's *wires* directly to a 12 volt DC power supply, reference Figure 12. Turn the power supply **ON** and use a photo-tachometer to test for a proper RPM reading, reference Figure 12. At approximately 12.5 volts DC, the RPM reading should be 4500 RPM's (+/- 300 RPM's). If the Motor's RPM reading is not within the above specs, the *Motor* must be replaced, reference the Motor's "Replacement Procedure" on Page 45. Reference Section 10 for spare part number information.

**NOTE:** If the Motor's RPM reading is out of specs, or even if within specs, be sure to test the Diesel-Burner's *Bearings* prior to reattaching the *Diesel-Burner Head* or replacing the *Motor*, if applicable. Worn *Bearings* can cause lower than normal RPM readings and premature *Motor* wear. To properly test for worn *Bearings*, reference Section 8.9, Page 60 for the *Bearings* "Function Test".



**Figure 12**



### Motor, continued

#### Replacement Procedure:

1. Remove the four *Ignition Coil Screws* that secure the *Ignition Coil* to the *Protection Cap*, reference Figure 13. Lift the *Ignition Coil* to disconnect its *wires* from the C-Plug Harness *wires* prior to removing. Remove the *Protection Cap* from the *Diesel-Burner* so that the *Motor* and *Clutch Halves* are exposed, reference Figures 13 and 14.
2. Remove the three *Hex Head Screws* that secure the *Motor* and flange assembly to the *Blower Housing*, reference Figure 13. Remove the *Motor* and flange assembly along with the *Clutch Halves*, reference Figures 13 and 14. Disconnect the *Motor's Black (+)* and *Brown (-)* wires from the C-Plug Harness' *wires*, reference Figure 13.

**NOTE:** Inspect the *Clutch Halves* for cracks and also ensure that the flat portion in each shaft hole is free of wear and tear. Too much play on the shaft produces a loud clacking noise. If any cracks or wear are detected, the *Clutch Half* must be replaced. Reference the Hydro-Hot's "Parts Manual" for spare parts information.

3. Detach the *Motor* from the *Motor Flange* by removing the two *Phillips Head Screws* that fasten the two parts together, reference Figure 13.

#### NOTES:

- A:** Be sure to test the Diesel-Burner's *Bearings* prior to reinstalling the *Motor*. Worn *Bearings* can cause lower than normal RPM readings and premature *Motor* wear. To properly test for worn *Bearings*, reference Section 8.9, Page 60 for the *Bearings* "Function Test"..
- B:** The *Motor* must be mounted to the flange with the *wires* and drain hole pointing downward and the recessed edge of the *Motor Flange* pointing upward, reference Figure 14. This will ensure a proper *Protection Cap* fit.

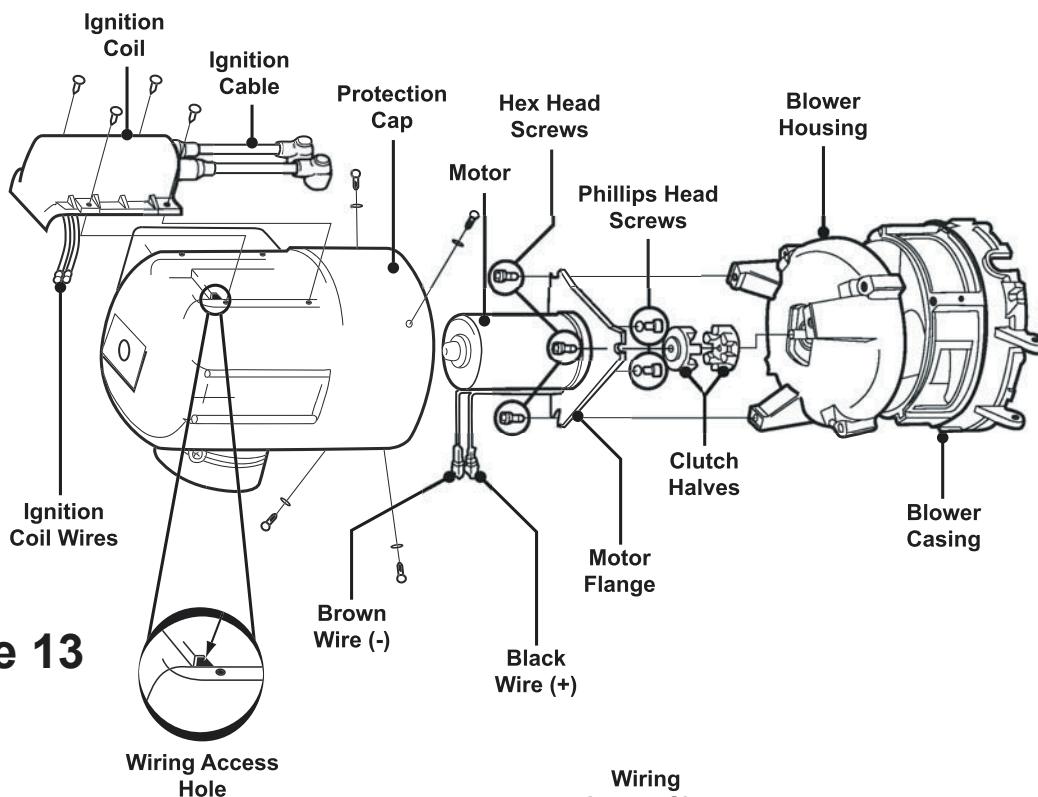
4. Reinstall a *Clutch Half* on both the new *Motor's* shaft and the Combustion Air Blower's shaft. Attach the *Motor* and flange assembly, with the recessed edge of the *Motor Flange* in-line with the wiring access slot of the *Blower Casing*, to the *Blower Housing* with the three *Hex Head Screws*, reference Figure 14.

**NOTE:** Inspect the Blower Casing's *O-Ring* for damage or wear prior to reinstalling the Diesel-Burner Head's *Protection Cap*, reference Figure 14. If damage or wear exists, replace the *O-Ring*. Reference the Hydro-Hot's "Parts Manual" for spare parts information.

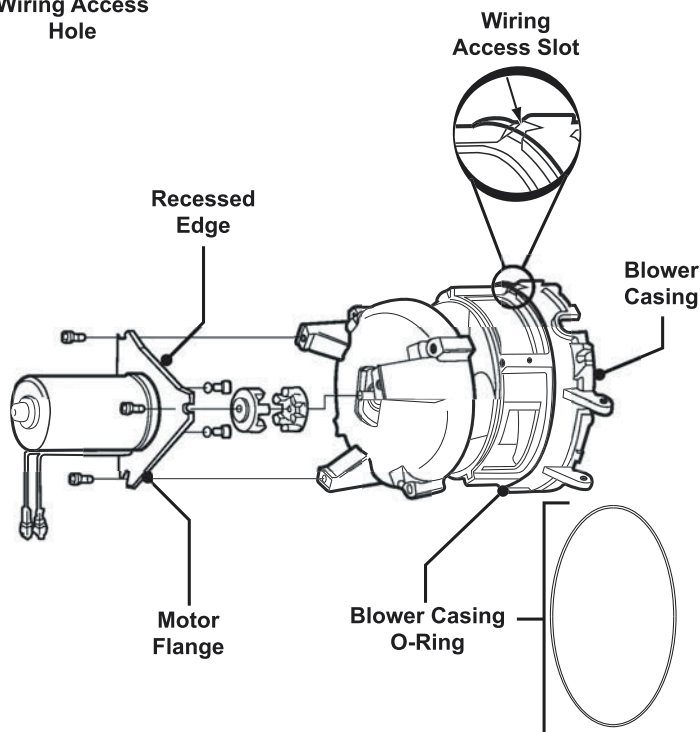
5. Connect the *Black (+)* and *Brown (-)* wires of the new *Motor* to the C-Plug Harness' *Black (+)* and *Brown (-)* wires, reference Figure 13. Feed the C-Plug Harness' *Yellow* and *Brown* wires back through the wiring access hole in the *Protection Cap*, reference Figure 14.
6. Reinstall the *Protection Cap*. Reconnect the *Black (+)* and *Brown (-)* wires of the *Ignition Coil* to the C-Plug Harness' *Yellow (+)* and *Brown (-)* wires, reference Figure 24. Reinstall the *Ignition Coil* and

**Motor,**  
continued

secure to the *Protection Cap* with the four *Ignition Coil Screws*, reference Figure 13.



**Figure 13**



**Figure 14**

### Flame Sensor

#### 8.4 Flame Sensor

**Function:** The *Flame Sensor* is a photoresistive device which supplies the Diesel-Burner's *Control Unit* with a DC voltage signal when it detects a flame (i.e. light source).

**NOTES:**

- A:** In order to perform the following procedures it is necessary to detach and reattach the *Diesel-Burner Head*. Be sure to review Section 8.2, Page 42 for detaching and reattaching instructions.
- B:** Be sure to calibrate your ohmmeter prior to checking the *Flame Sensor* for proper resistance values.

**Component Test:** Locate and detach the Flame Sensor's *Green* and *Blue* wires from the C-Plug Harness *wires*, reference Figure 15. Connect the Flame Sensor's *Green* and *Blue* wires to an ohmmeter, reference Figure 15. Check resistance by placing a shop rag over the Flame Sensor's glass surface, to simulate a no flame condition, and then remove the rag (and expose to a light source) to simulate a flame condition. If the *Flame Sensor* is operating properly, the ohmmeter should register high resistance (i.e. 100K  $\Omega$  +) when the glass surface is covered, and less than 300  $\Omega$  when exposed to a light source. If these resistance numbers cannot be obtained, the *Flame Sensor* must be replaced, reference the Flame Sensor's "Replacement Procedure" below. Reference Section 10 for spare parts information.

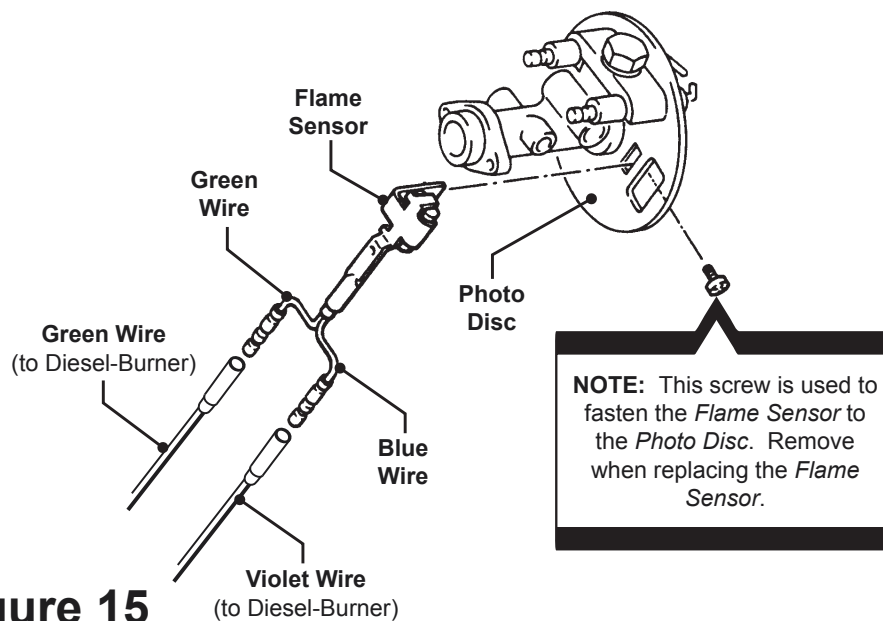
**Cleaning Tips / Maintenance:** For light dirt, dust, and/or carbon deposits, simply wipe off the *Flame Sensor* with a soft cloth. Should heavy carbon deposits be present, completely remove the *Flame Sensor* from the *Photo Disc* and clean with brake cleaner, reference Figure 15.

**Adjustment Procedure:** N/A

**Replacement Procedure:**

1. Remove the *Screw* that fastens the *Flame Sensor* to the *Photo Disc* and detach the sensor's *Green* and *Blue* wires from the C-Plug Harness' *Green* and *Violet* wires, reference Figure 15.
2. Slide the tab of the new *Flame Sensor* into the provided slot in the *Photo Disc* and secure in place with the screw, reference Figure 15. Connect the Flame Sensor's *Green* wire to the *Green* C-Plug Harness wire and the *Blue* wire to the C-Plug Harness' *Violet* wire, reference Figure 15.

## Flame Sensor, continued



**Figure 15**

## Ignition Electrodes

### 8.5 Ignition Electrodes

**Function:** The Diesel-Burner's *Ignition Coil* (reference Figure 24) produces a high voltage ignition spark across the *Ignition Electrodes*, which ignites the incoming air / fuel mixture.

**NOTE:** In order to perform the following procedures it is necessary to detach and reattach the *Diesel-Burner Head*. Be sure to review Section 8.2, Page 42 for detaching and reattaching instructions.

**Component Test:** N/A

**Cleaning Tips / Maintenance:** Polish away any carbon deposits that may have baked onto the metal tips of the *Ignition Electrodes* with a scotch brite<sup>®</sup> pad (or similar), reference Figure 16. If the Ignition Electrode's electrical insulator (reference Figure 16) is cracked and/or damaged, the *Ignition Electrode* must be replaced, reference the Ignition Electrode "Replacement Procedure" on Page 49. Reference Section 10 for spare parts information.

**NOTE:** The *Electrode Adjustment Gauge* is to be used to set the gap between the *Ignition Electrodes*. The *Electrode Adjustment Gauge* is located on the outside surface of the *Diesel-Burner Head* on the lefthand side.

**Ignition Electrode Adjustment Procedure:** An adjustment of the *Ignition Electrodes* can be accomplished by performing the following procedures:

1. Slightly loosen the *Retaining Clamp Bolt*, reference Figure 16.
2. Place the *Electrode Adjustment Gauge* on the *Nozzle Stand Hex* (reference Figure 17) and insert the metal tips of the *Ignition Elec-*

### Ignition Electrodes, continued

trodes into the appropriate notches of the *Electrode Adjustment Gauge* as illustrated in Figure 16.

3. Tighten the *Retaining Clamp Bolt*.

**NOTE:** Be sure not to overtighten the *Retaining Clamp Bolt* when readjusting the *Ignition Electrodes*. Overtightening the *Retaining Clamp Bolt* will bend the *Retaining Clamp* and prevent the *Photo Disc* from floating freely (i.e. loose fit). Not allowing the *Photo Disc* to float freely will cause poor combustion and result in a smoky exhaust. A bent *Retaining Clamp* can be restraightened with a punch and hammer. Lay the clamp's beveled side down on a solid flat surface and align the thick end of the punch at dead center. Tap the punch lightly until the *Retaining Clamp* returns to proper form (i.e. flat).

4. Remove the *Electrode Adjustment Gauge* and reattach to the *Diesel-Burner Head*.

#### Replacement Procedure:

1. Disconnect the *Ignition Cables* from the *Ignition Electrodes* and slightly loosen the *Retaining Clamp Bolt* just enough to allow the *Ignition Electrodes* to be removed, reference Figure 16.
2. Slide the new *Ignition Electrodes* up through the *Retaining Clamp* and *Photo Disc*. Do not tighten the *Retaining Clamp Bolt* yet.
3. Perform Steps 2 thru 4, of this section's "Adjustment Procedure", to complete the *Ignition Electrode* installation. Once Steps 2 thru 4 have been performed, connect the *Ignition Cables* to the *Ignition Electrodes*, reference Figure 16.

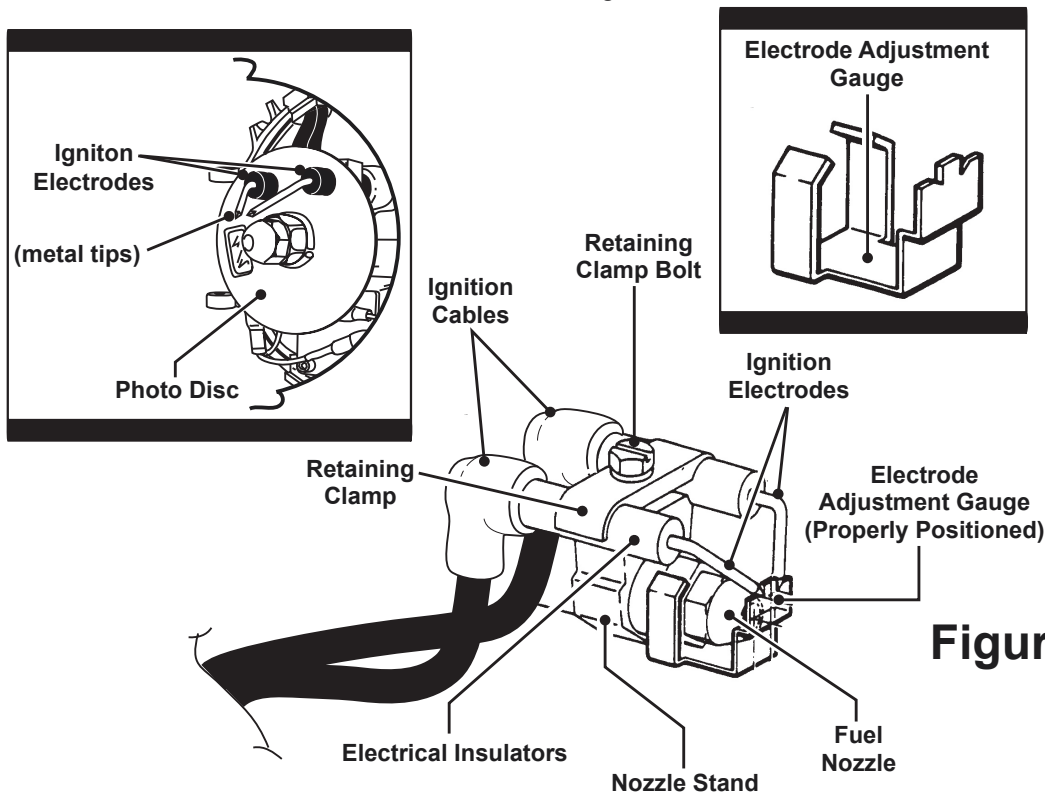


Figure 16

### Fuel Nozzle



#### 8.6 Fuel Nozzle

**Function:** The *Fuel Nozzle* is simply a fuel atomizer. It reduces the diesel fuel into a fine spray which is mixed with incoming combustion air and is ignited within the *Combustion Chamber*.

**NOTE:** In order to perform the following procedures it is necessary to detach and reattach the *Diesel-Burner Head*. Be sure to review Section 8.2, Page 42 for detaching and reattaching instructions.

**Component Test:** Remove both *Ignition Cables* from the *Ignition Electrodes* (reference Figure 16), or connect a jumper wire (with alligator clips) across the metal tips of the electrodes.

**WARNING:** Failure to connect a jumper wire across the *Ignition Electrodes*, or to remove the *Ignition Cables* from the *Ignition Electrodes* (reference Figure 16), will result in a **HIGH VOLTAGE** shock and/or a fire. If the *Ignition Cables* are removed, be sure to place a piece of electrical tape to the end of each cable.

Remove the *B-Plug* from the Diesel-Burner Head's *Control Unit*, reference Figure 8. Turn the *Diesel* switch **ON** (reference Figure 4) and then plug the *B-Plug* back into the *Control Unit* to activate the *Diesel-Burner*. After approx. 20 seconds, the *Fuel Solenoid* will "click" and a fine mist of fuel should appear from the *Fuel Nozzle* in a cone shaped spray pattern. Remove the *B-Plug* from the *Control Unit*. If the cone shaped spray pattern did not appear, the *Fuel Nozzle* must be replaced, reference the *Fuel Nozzle's* "Replacement Procedure" below. Reference Section 10 for spare parts information.

**Cleaning Tips / Maintenance:** The *Fuel Nozzle* is a precision calibrated part and **cannot** be cleaned or serviced. A replacement of the *Fuel Nozzle* is recommended annually. Reference Section 8.1, Page 41 for maintenance information.

**Adjustment Procedure:** N/A

#### Replacement Procedure:

1. Use a 3/4 in. wrench to hold the *Fuel Nozzle Stand Hex* while loosening the *Fuel Nozzle* with a 5/8 in. wrench, reference Figure 17.

**NOTE:** Be sure to use care when handling the new *Fuel Nozzle*. Oils and/or small dust or dirt particles from your hands may plug the nozzle's small orifice. A partially plugged orifice will restrict fuel flow, which will affect the combustion process of the *Diesel-Burner* (i.e. excessive smoking).

2. When replacing the *Fuel Nozzle*, be sure to tighten the nozzle, loosen it a 1/4 turn, and then firmly retighten. This will establish a seated fit and avoid any leaks.



**Fuel  
Nozzle,**  
continued

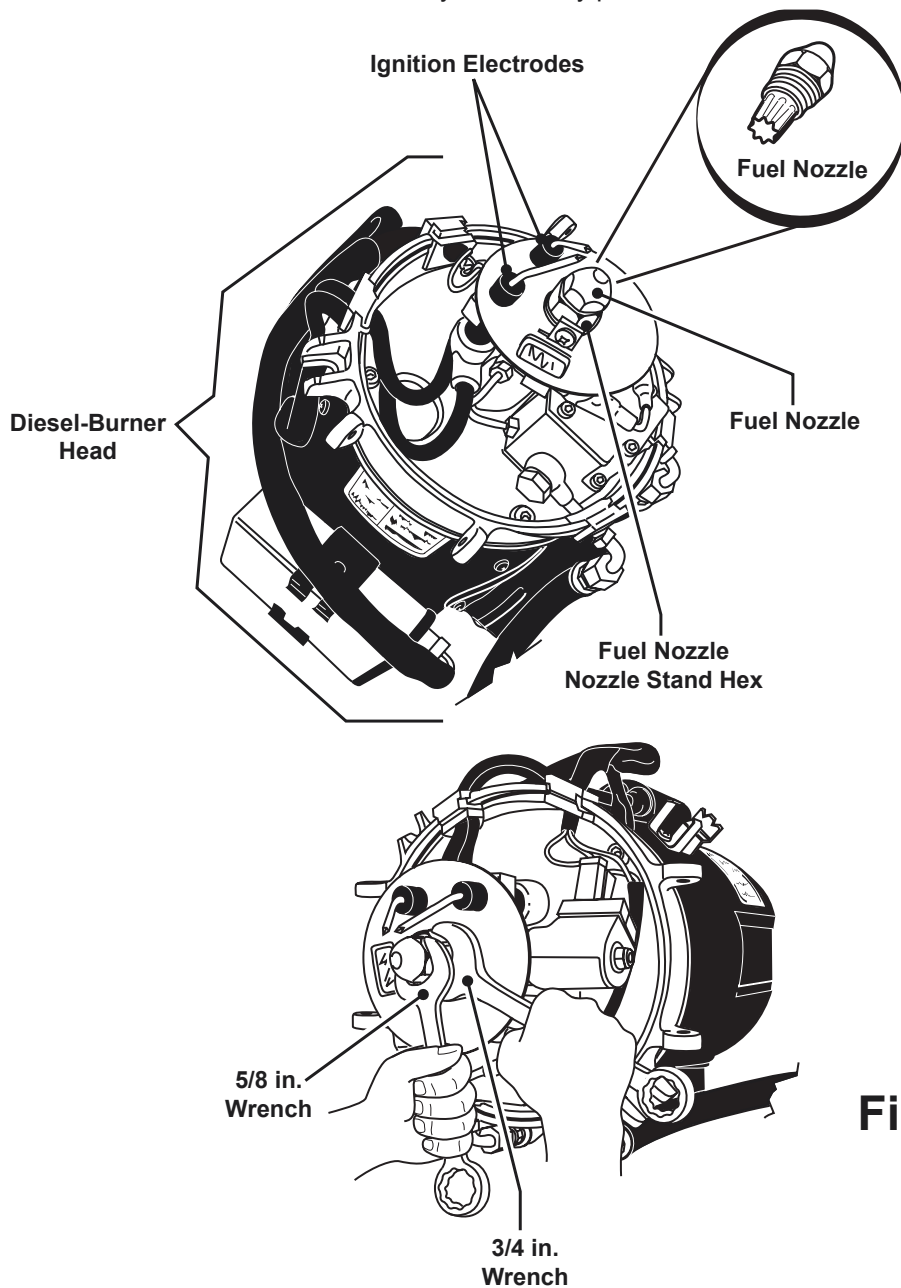


**NOTE:** An adjustment of the *Ignition Electrodes* may be necessary after replacing the *Fuel Nozzle*. Reference Section 8.5, Page 48 for the Ignition Electrode "Adjustment Procedure".

3. After replacing the *Fuel Nozzle*, reattach the *Diesel-Burner Head*.

**WARNING:** Be sure to reattach the *Diesel-Burner Head* prior to switching the heater **ON**. Failure to do so may result in ignition of the *Diesel-Burner* and serious bodily injury.

4. Turn **ON** the *Diesel* switch (reference Figure 4) for 5 seconds, then turn it **OFF**. This will activate the Diesel-Burner's prime-cycle and flush the fuel system of any potential contaminants.



**Figure 17**



### Fuel Solenoid

#### 8.7 Fuel Solenoid

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**Function:** The *Fuel Solenoid* allows the flow of diesel fuel to the Diesel-Burner's *Fuel Nozzle*.

**NOTE:** In order to perform the following procedures it is necessary to detach and reattach the *Diesel-Burner Head*. Be sure to review Section 8.2, Page 42 for detaching and reattaching instructions.

**Component Test:** Locate and detach the C-Plug Harness' *Violet (+)* and *Brown (-)* wires from the *Fuel Solenoid*. Connect the (-) lead of a 12 volt DC power supply to the Fuel Solenoid's (-) *Electrical Terminal*, reference Figure 18. Now, intermittently apply the (+) lead of the power supply to the Fuel Solenoid's (+) *Electrical Terminal* and listen for the *Fuel Solenoid* to click (i.e. open and close). If the *Fuel Solenoid* does not click, it must be replaced, reference the Fuel Solenoid's "Replacement Procedure" below. Reference Section 10 for spare parts information.

**Cleaning Tips / Maintenance:** N/A

**Adjustment Procedure:** N/A

#### **Replacement Procedure:**

1. Disconnect the *Ignition Cables* from the *Ignition Electrodes* and loosen the *Retaining Clamp Bolt*, reference Figure 16.
2. Remove the *Retaining Clip* that secures the *Photo Disc* in place. Gently lift the *Photo Disc* (with *Flame Sensor* attached) so that it releases from the *Nozzle Stand* and the *Ignition Electrodes*, reference Figures 16 and 19.
3. Disconnect the C-Plug Harness' *Violet (+)* and *Brown (-)* wires from the *Fuel Solenoid*, reference Figure 18.
4. Remove the four *Nozzle Stand Plate Screws* that secure the *Nozzle Stand Plate* in place, reference Figure 19. Remove the *Nozzle Stand Plate* by pulling on the *Nozzle Stand* until the plate releases from the cast-aluminum *Blower Casing*, reference Figures 13 and 19.
5. Remove the *Lock Nut* and *Flat Washer* from the end of the *Fuel Solenoid Shaft* and then remove the *Fuel Solenoid*. With the appropriate wrench, remove the *Fuel Solenoid Shaft* from the *Nozzle Stand*. Discard the shaft and valve kit, as replacements are provided with the new *Fuel Solenoid Assembly*.
6. Insert the contents of the new *Fuel Solenoid Valve Kit* into the new *Fuel Solenoid Shaft*, as illustrated in Figure 18. Thread the new *Fuel Solenoid Shaft* to the *Fuel Nozzle Stand* and tighten. Slide the new *Fuel Solenoid* onto the *Fuel Solenoid Shaft* and secure in place with the new *Flat Washer* and *Lock Nut*.
7. Fit the *Nozzle Stand Plate* inside the cast-aluminum *Blower Casing* and secure in place with the four *Nozzle Stand Plate Screws*.

### Fuel Solenoid, continued

- Reinstall the *Photo Disc* and secure in place with the *Retaining Clip*. Connect the *C-Plug Harness' Violet (+)* and *Brown (-)* wires to the Fuel Solenoid's (+) and (-) *Electrical Terminals*, reference Figure 18.
- Perform the "Ignition Electrodes Adjustment Procedure" in Section 8.5, Page 48 to complete the *Fuel Solenoid* installation.

**NOTE:** If a long after-smoking condition exists during the Diesel-Burner's purge-cycle (reference Page 12, Step 6), the *Fuel Solenoid Valve Kit* may need to be replaced, reference Figure 18. Please contact our Technical Department at 1-800-685-4298 for assistance. Reference Section 10 for spare parts information.

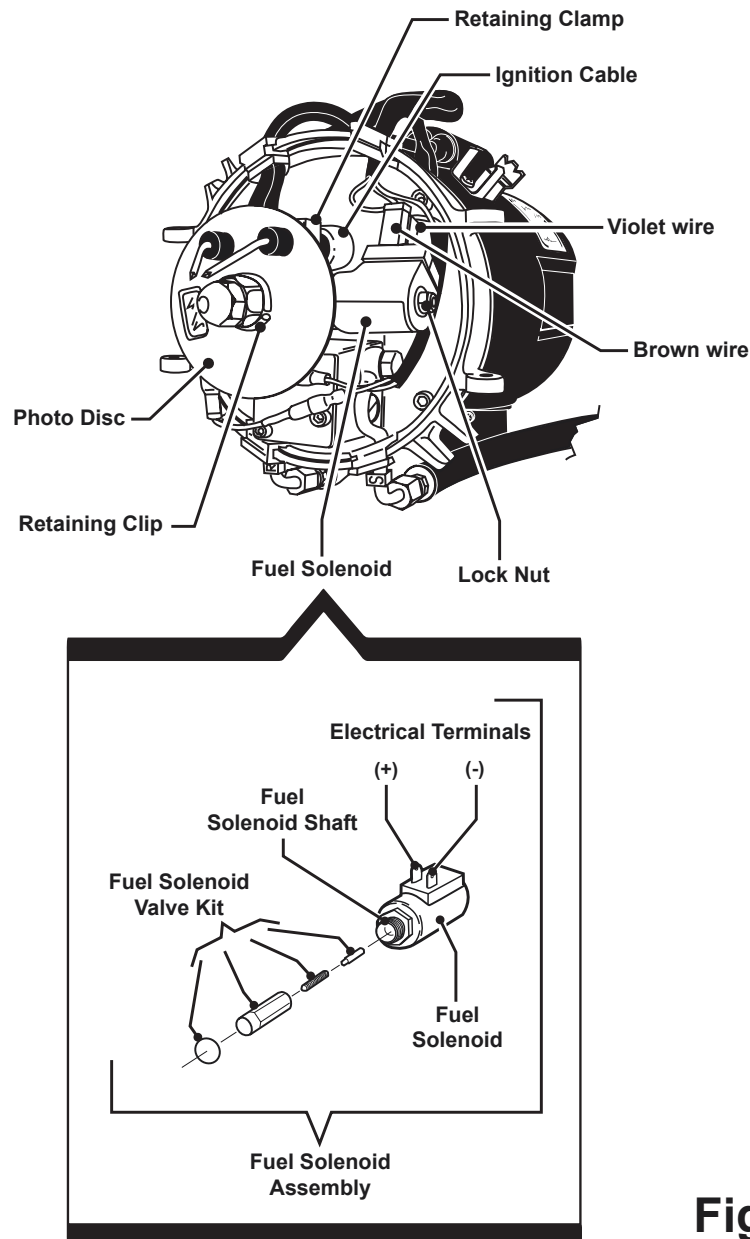
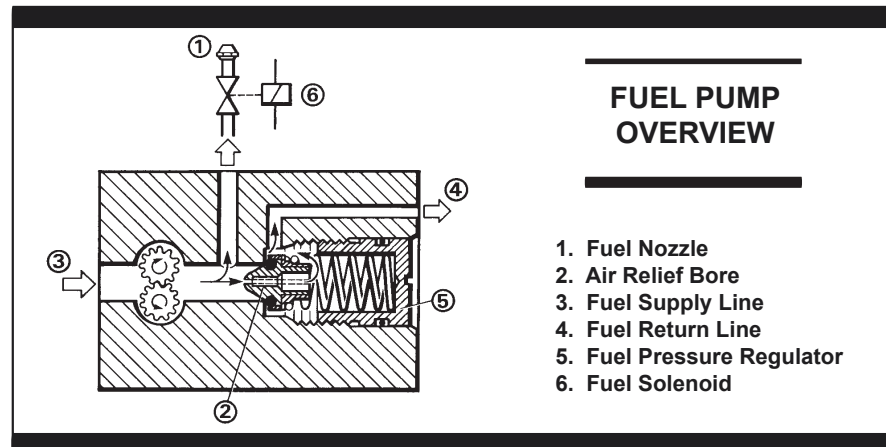


Figure 18

### Fuel Pump

#### 8.8 Fuel Pump

**Function:** The *Fuel Pump* draws diesel fuel from the vehicle's fuel tank and creates a preset pressure of 145 psi (required for proper fuel atomization). Reference the illustration below for a basic overview and understanding of how the *Fuel Pump* functions.



**NOTE:** In order to perform some of the following procedures it may be necessary to detach and reattach the *Diesel-Burner Head*. Be sure to reference Section 8.2, Page 42 for detaching and reattaching instructions.

#### Component Test:

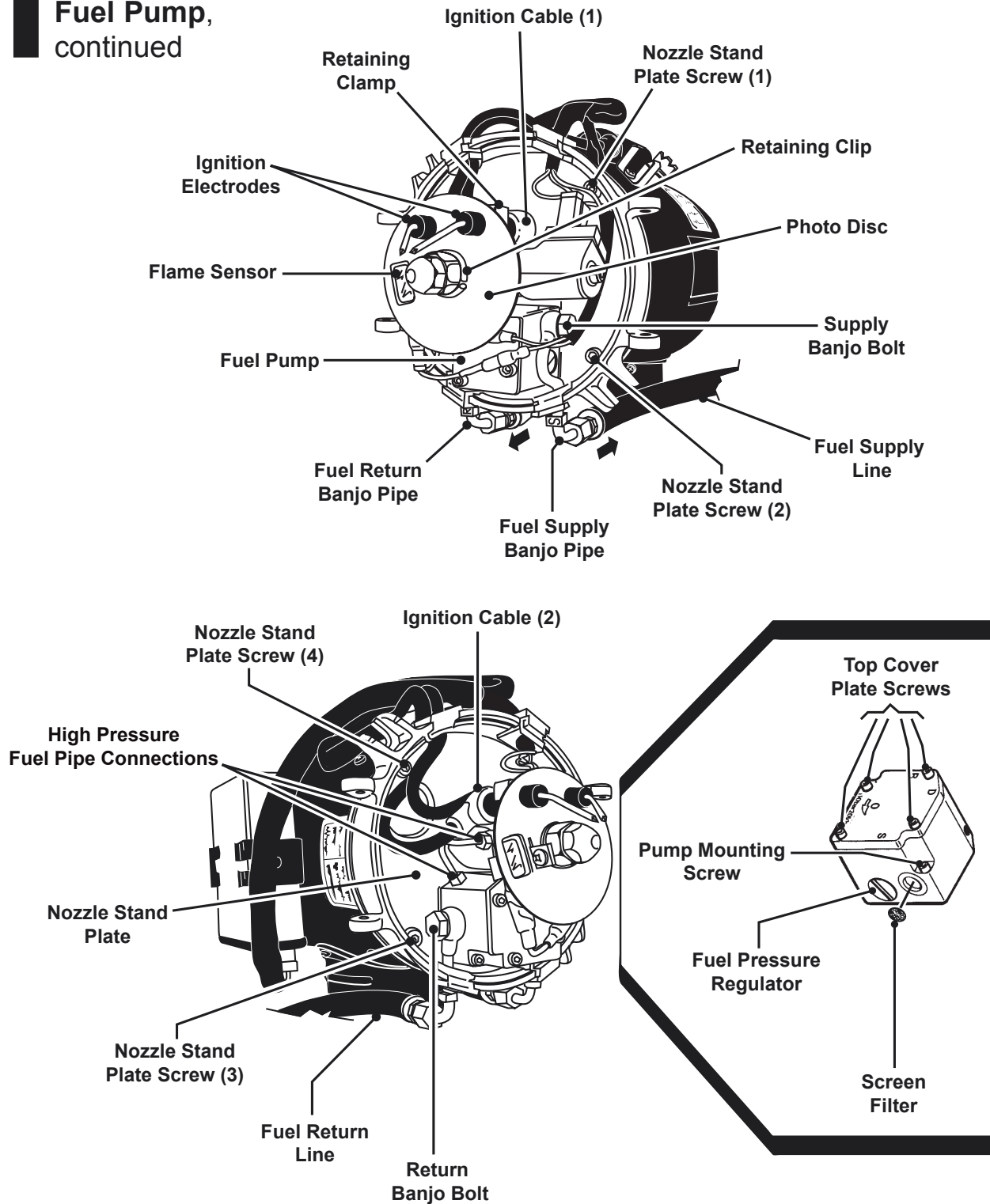
Clamp off and remove the Hydro-Hot's *Fuel Return* and *Fuel Supply Lines*, reference Figure 1. Attach a short piece of fuel line to both the Hydro-Hot's *Fuel Return* and *Fuel Supply* ports, reference Figure 1. Submerge the opposite end of the temporary fuel supply line in a container of diesel fuel. Place the opposite end of the temporary fuel return line in an empty container. Turn the *Diesel* switch **ON** to activate the *Diesel-Burner*, reference Figure 4. If fuel does not flow out of the return line into the empty container, the *Fuel Pump* must be replaced, reference the *Fuel Pump's* "Replacement Procedure" on Page 58. Reference Section 10 for spare parts information.

**NOTE:** Prior to replacing the *Fuel Pump*, be sure to inspect the *Screen Filter* in the supply inlet of the *Fuel Pump*, for dirt particles (reference Figure 19). Clean and/or replace, if necessary. A plugged *Screen Filter* will restrict fuel from entering the *Fuel Pump*. Reference the Hydro-Hot's "Parts Manual" for spare parts information.

#### Cleaning Tips / Maintenance:

1. Check all *Fuel Connections* for tightness (i.e. *Banjo Bolts*, *High Pressure Fuel Pipe Connections*, reference Figure 19).
2. Check the *Screen Filter*, located in the fuel supply inlet of the *Fuel Pump*, for dirt particles. Clean and/or replace, if necessary (reference Figure 19).

**Fuel Pump,**  
continued



**Figure 19**

### Fuel Pump, continued



#### Fuel Pressure Adjustment Check:

##### NOTES:

**A:** A *Fuel Pressure Gauge* (reference Section 11 for special tools information) is used to properly check the Fuel Pump's pressure setting, reference Figure 20. The *Fuel Pump* is preset to 145 psi (the pressure required for proper fuel atomization at the *Fuel Nozzle*). Perform the following procedures to check for a proper fuel pressure setting.

**B:** Be sure to use care when handling the *Fuel Nozzle*. Oils and/or small dust or dirt particles from your hands may plug the nozzle's small orifice, reference Figure 9. A partially plugged orifice will restrict fuel flow, which will affect the combustion process of the *Diesel-Burner* (i.e. excessive smoking from the exhaust pipe).

1. Remove the *Fuel Nozzle* (reference Figure 17) and replace it with the *Fuel Pressure Gauge*, reference Figure 20.

**WARNING:** A spark will appear across the *Ignition Electrodes* (reference Figure 16) for a brief moment after the *Diesel-Burner* has been activated. **DO NOT** attempt to make any fuel pressure adjustments until the spark has disappeared. Failure to do so may result in serious bodily injury (i.e. **electrical shock**).

2. Turn the *Diesel* switch **ON**, reference Figure 4. A pressure will register on the *Fuel Pressure Gauge* once the *Fuel Solenoid* opens (after approx. 10-25 seconds).
3. If the *Fuel Pressure Gauge* registers a 145 psi pressure reading, no pressure adjustment is necessary. Turn the *Diesel* switch **OFF** and wait until the motor stops running. Remove the *Fuel Pressure Gauge* and reinstall the *Fuel Nozzle* (reference Section 8.6, Page 50 for the Fuel Nozzle's "Replacement Procedure"). Reattach the *Diesel-Burner Head*.

**NOTE:** If the *Fuel Pressure Gauge* registers below or above 145 psi, perform the adjustment procedures listed below.

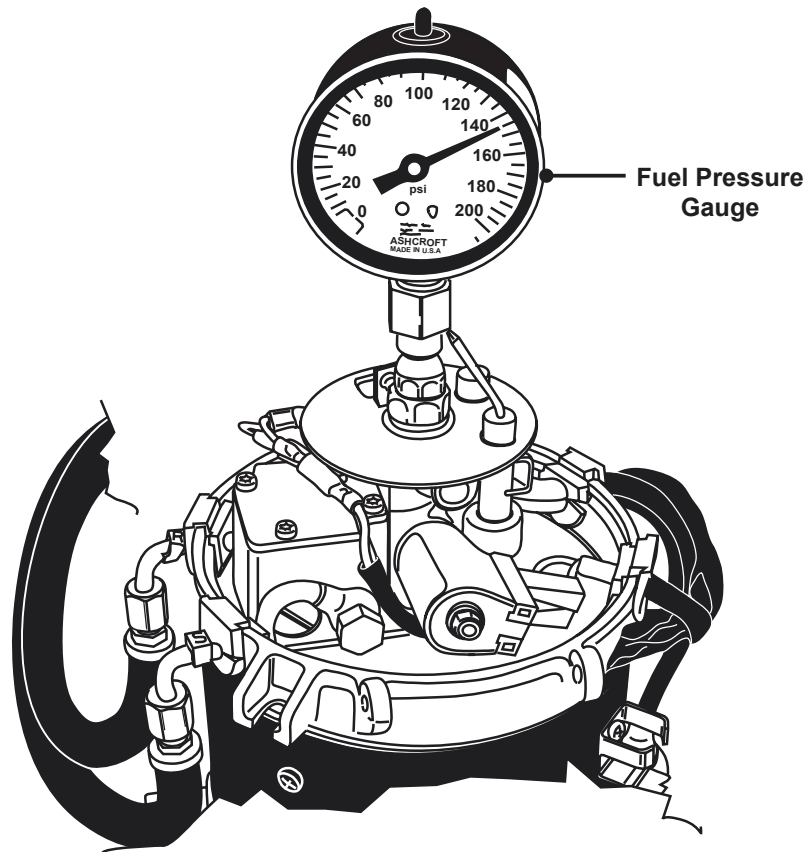
#### Fuel Pressure Adjustment Procedure:

1. Turn the *Diesel* switch **ON** and simply turn the *Pressure Regulator Adjustment Screw* clockwise to increase fuel pressure or counter clockwise to decrease fuel pressure, reference Figure 21.

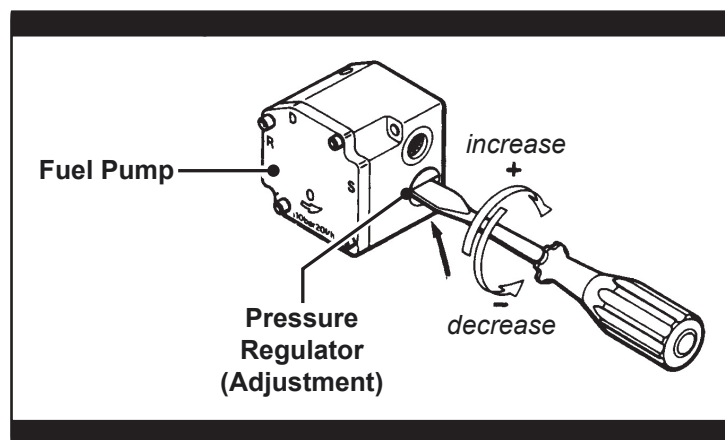
**NOTE:** If the fuel pressure will not maintain a 145 psi setting, the *Fuel Pump* must be replaced, reference the Fuel Pump's "Replacement Procedure" on Page 58. Also, reference Section 10 for spare parts information.

2. Once the pressure adjustment has been made, turn the *Diesel* switch **OFF** and wait until the motor stops running. Remove the *Fuel Pressure Gauge* and reinstall the *Fuel Nozzle* (reference Section 8.6, Page 50 for the Fuel Nozzle's "Replacement Procedure"). Reattach the *Diesel-Burner Head*.

**Fuel Pump,**  
continued



**Figure 20**



**Figure 21**

### Fuel Pump, continued

#### Replacement Procedure:

1. Locate and disconnect the C-Plug Harness wires that connect to the *Flame Sensor* and the *Fuel Solenoid*, reference Figures 3, 15, and 18. Also, disconnect the *Ignition Cables* from the *Ignition Electrodes*, reference Figures 16 and 19.
2. Remove the *Retaining Clip* that secures the *Photo Disc* in place, reference Figure 19. Gently lift the *Photo Disc* (with *Flame Sensor* attached) so that it releases from the *Nozzle Stand* and the *Ignition Electrodes*, reference Figures 16 and 19.
3. Clamp off both the *Fuel Supply* and *Return Lines* from the *Diesel-Burner Head*, reference Figures 19 and 22. Loosen the *Supply* and *Return Banjo Bolts* to remove the *Fuel Supply* and *Return Pipes* (with the fuel lines attached) from the *Fuel Pump*, reference Figures 19 and 22. Also, disconnect the *High Pressure Fuel Pipe* from both the *Fuel Pump* and the *Nozzle Stand*, reference Figures 19 and 22. Discard the *High Pressure Fuel Pipe*, *Gasket Rings*, *Banjo Bolts*, and *Grommets*, as replacements are provided in the new Fuel Pump Kit (Part No. WPX-502-05A).
4. Remove the four *Nozzle Stand Plate Screws* that secure the *Nozzle Stand Plate* in place, reference Figure 19. Remove the *Nozzle Stand Plate* by pulling on the *Nozzle Stand* until the plate releases from the cast-aluminum *Blower Casing*, reference Figures 13 and 19.
5. Remove the two *Pump Mounting Screws* that secure the *Fuel Pump* in place, reference item 70 of Figure 22. Turn the *Nozzle Stand Plate* over and remove the *Snap Ring* from the Fuel Pump shaft, using snap ring pliers, reference item 89 of Figure 22. Remove the nylon *Drive Gear* and then the *Fuel Pump*, reference items 88 and 72 of Figure 22.
6. Attach the new *Fuel Pump* to the *Nozzle Stand Plate* with the two *Pump Mounting Screws*. Turn the *Nozzle Stand Plate* over to install the nylon *Drive Gear* on the Fuel Pump's shaft and secure in place with the *Snap Ring*. Dab the teeth of the nylon *Drive Gear* with white lithium grease (Isoflex LDS-18 is recommended).

#### **NOTES:**

**A:** Do not adjust the *Fuel Pressure Regulator* of the new *Fuel Pump*, as it has been factory preset.

**B:** Inspect the nylon Drive Gear's cavity inside the cast aluminum *Blower Casing* for fuel stains. If fuel stains are present, a replacement of the *Bearings* and/or the entire *Blower Casing* may be necessary (leaking fuel could cause *Bearing* seizure, resulting in potential damage to the internal bore / bearing cavity of the *Blower Casing*). Reference Section 8.9, Page 60 for the Bearing "Replacement Procedure" and contact our Technical Department at 1-800-685-4298 for additional assistance.

7. Fit the *Nozzle Stand Plate* inside the cast-aluminum *Blower Casing*



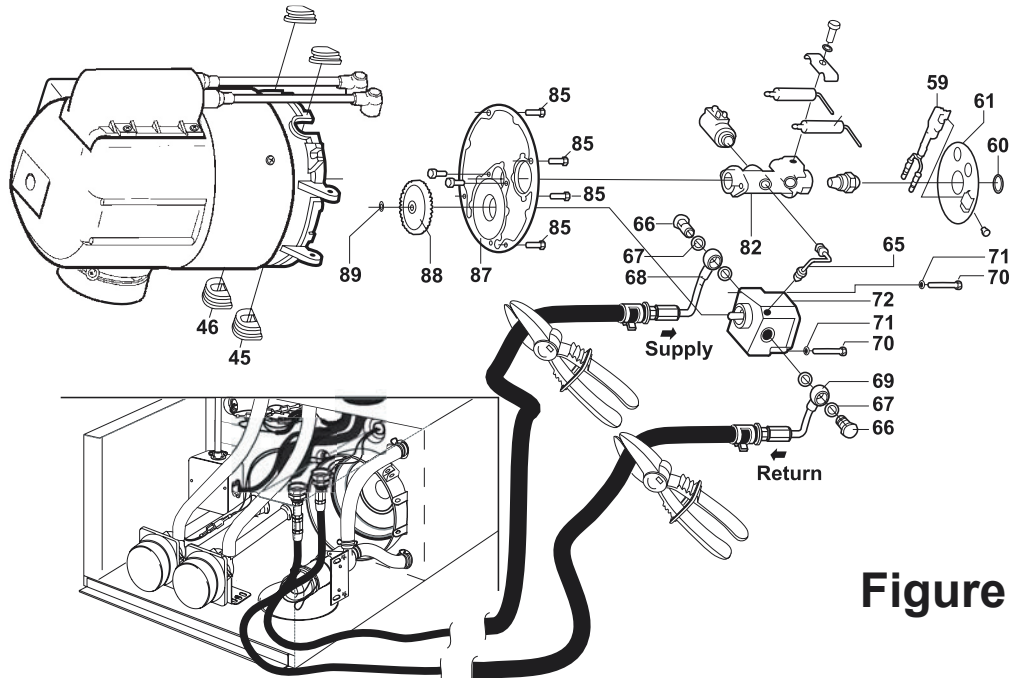
### Fuel Pump, continued

and secure in place with the four *Nozzle Stand Plate Screws*. Install the new *Grommets* on the *Fuel Return* and *Supply Banjo Pipes* (with the fuel lines attached) and secure the pipes to the *Fuel Pump* with the new *Banjo Bolts* and *Gasket Rings*, reference Figure 22.

**NOTE:** Reference Figure 22 for the correct order placement of the (4) *Gasket Rings*. Failure to use the new *Gasket Rings*, and/or the correct order placement, could result in a fuel leak.

8. Reconnect the C-Plug Harness' *Violet (+)* and *Brown (-)* wires to the Fuel Solenoid's (+) and (-) *Electrical Terminals*, reference Figure 18. Insert both *Ignition Cables* into the new rubber *Grommet* and slide into the appropriate notch on the *Blower Casing*, reference Figure 19. Reconnect the *Ignition Cables* to the *Ignition Electrodes* and remove the fuel line clamps from the *Fuel Return* and *Supply Lines*.
9. Reinstall the *Photo Disc* and secure it in place with the *Retaining Clip*, reference Figure 19. Reconnect the Flame Sensor's *Green* wire to the *Green* C-Plug Harness wire and the *Blue* wire to the C-Plug Harness' *Violet* wire, reference Figure 15.

**NOTE:** Check the *Ignition Electrodes* for proper adjustment, reference Steps 2 thru 4, of the Adjustment Procedure in Section 8.5, Page 48 to ensure proper *Ignition Electrode* adjustment.



**Figure 22**

- |                            |                             |
|----------------------------|-----------------------------|
| 45 Grommet (Left)          | 69 Fuel Return Banjo Pipe   |
| 46 Grommet (Right)         | 70 Pump Mounting Screw      |
| 59 Flame Sensor            | 71 Lock Washer              |
| 60 Retaining Clip          | 72 Fuel Pump                |
| 61 Photo Disc              | 82 Nozzle Stand             |
| 65 High Pressure Fuel Pipe | 85 Nozzle Stand Plate Screw |
| 66 Banjo Bolt              | 87 Nozzle Stand Plate       |
| 67 Gasket Ring (X4)        | 88 Drive Gear (Nylon)       |

### ■ Bearings

#### 8.9 Bearings

---

**Function:** The *Bearings* support the Combustion Air Blower's shaft and allows the blower to turn smoothly.

**NOTE:** In order to perform some of the following procedures it is necessary to detach and reattach the *Diesel-Burner Head*. Be sure to review Section 8.2, Page 42 for detaching and reattaching instructions.

**Function Test:** Remove the *Motor* (reference Section 8.3, Page 45 for the Motor's "Replacement Procedure") and spin the *Combustion Air Blower* by hand (place one of the *Clutch Halves* to the end of the shaft to assist with this spinning exercise). If the *Combustion Air Blower* rotates smoothly without any friction or noise, the *Bearings* are in proper working condition. However, if the *Combustion Air Blower* does not rotate smoothly and/or produces noise, the *Bearings* are worn and must be replaced, reference the Bearings "Replacement Procedure" below.

**Component Test:** N/A

**Cleaning Tips / Maintenance:** N/A

**Adjustment Procedure:** N/A

**Replacement Procedure:**

1. Clamp off and remove the *Fuel Supply* and *Return Lines* from the *Diesel-Burner Head*, reference Figures 19 and 22.
2. Locate and disconnect the C-Plug Harness wires that connect to the *Flame Sensor* and *Fuel Solenoid*, reference Figures 3, 15 and 18. Also, disconnect the *Ignition Cables* from the *Ignition Electrodes*, reference Figures 16 and 19.
3. Remove the four *Nozzle Stand Plate Screws* that secure the *Nozzle Stand Plate* in place, reference Figure 19. Remove the *Nozzle Stand Plate* by pulling on the *Nozzle Stand* until the plate releases from the cast-aluminum *Blower Casing*, reference Figures 13 and 19.
4. Remove the four *Ignition Coil Screws* that secure the *Ignition Coil* to the *Protection Cap*, reference Figure 13. Lift the *Ignition Coil* and disconnect its *Black (+)* and *Brown (-)* wires from the C-Plug Harness wires, prior to removing (reference Figures 3 and 24). Remove the *Protection Cap* from the *Diesel-Burner* so that the *Motor* and *Clutch Halves* are exposed, reference Figures 12 and 14.
5. Remove the three *Hex Head Screws* that secure the *Motor* and *Motor Flange* to the *Blower Housing*, reference Figure 13. Remove the *Motor* and flange assembly along with the *Clutch Halves*, reference Figures 13 and 14. Disconnect the Motor's *Black (+)* and *Brown (-)* wires from the C-Plug Harness' wires, reference Figure 13.

### Bearings, continued

**NOTE:** Inspect the Clutch Halves' for cracks and also ensure that the flat portion in each shaft hole is free of wear and tear. Too much play on the shaft produces a loud clacking noise. If any cracks or wear are detected, the *Clutch Half* must be replaced. Reference the Hydro-Hot's "Parts Manual" for spare parts information.

6. Remove the four *Blower Housing Screws* that secure the *Blower Housing* to the *Blower Casing*, reference Figure 23. Remove the *Blower Housing* so that the *Combustion Air Blower* is exposed, reference Figure 23.

**NOTE:** Be sure to observe the placement of the three *Washers* of the Bearing Kit illustrated in Figure 23. To ensure proper tension, the same order and direction of the dished surfaces of the *Washers* must be followed when reassembling.

7. Hold Side-B of the *Blower Casing* and loosen the *Retaining Nut* located in Side-A of the *Blower Casing*. Remove the *Retaining Nut*, steel *Drive Gear*, and thick *Flat Washer* from the Combustion Air Blower's shaft. Lightly tap the threaded end of the shaft so that the *Combustion Air Blower* can be easily removed from the *Blower Casing*.
8. With a pair of snap-ring pliers, remove the *Snap Rings* from both Side-A and Side-B of the *Blower Casing*, reference Figure 23. Push all the contents of the Bearing Kit out of the *Blower Casing's* bore / bearing cavity. Discard the *Retaining Nut*, steel *Drive Gear*, *Snap Rings*, *Bearings*, *Spacer Tube*, and *Washers*, as replacements are provided in the new Bearing Kit.

**NOTE:** Be sure to inspect the *Blower Casing's* bore / bearing cavity for signs of damage due to potentially seized *Bearings*. If damage is present, the *Blower Casing* must be replaced. Reference the Hydro-Hot's "Parts Manual" for spare parts information.

9. Install a new *Snap Ring* into Side-A of the *Blower Casing*, reference Figure 23. Once the *Snap Ring* is in place, insert the remaining contents of the new Bearing Kit into Side-B of the *Blower Casing*, starting with the *Wave Washer*, as illustrated in Figure 23. Secure the Bearing Kit assembly in place with the remaining *Snap Ring* (Side-B).

**NOTES:**

- A:** Reference Figure 23 for exact placement of the three *Washers* that slide over the threaded end of the Combustion Air Blower's shaft prior to installation. Failure to follow the correct order and direction of the dished surfaces on the *Washers* will result in a restricted rotation of the *Combustion Air Blower*.
- B:** Inspect the *Combustion Air Blower* for warpage and/or damage. If warpage or damage is visible, the *Combustion Air Blower* must be replaced. Reference the Hydro-Hot's "Parts Manual" for spare parts information.

10. Slide the Combustion Air Blower's shaft (with the three washers) up

### Bearings, continued

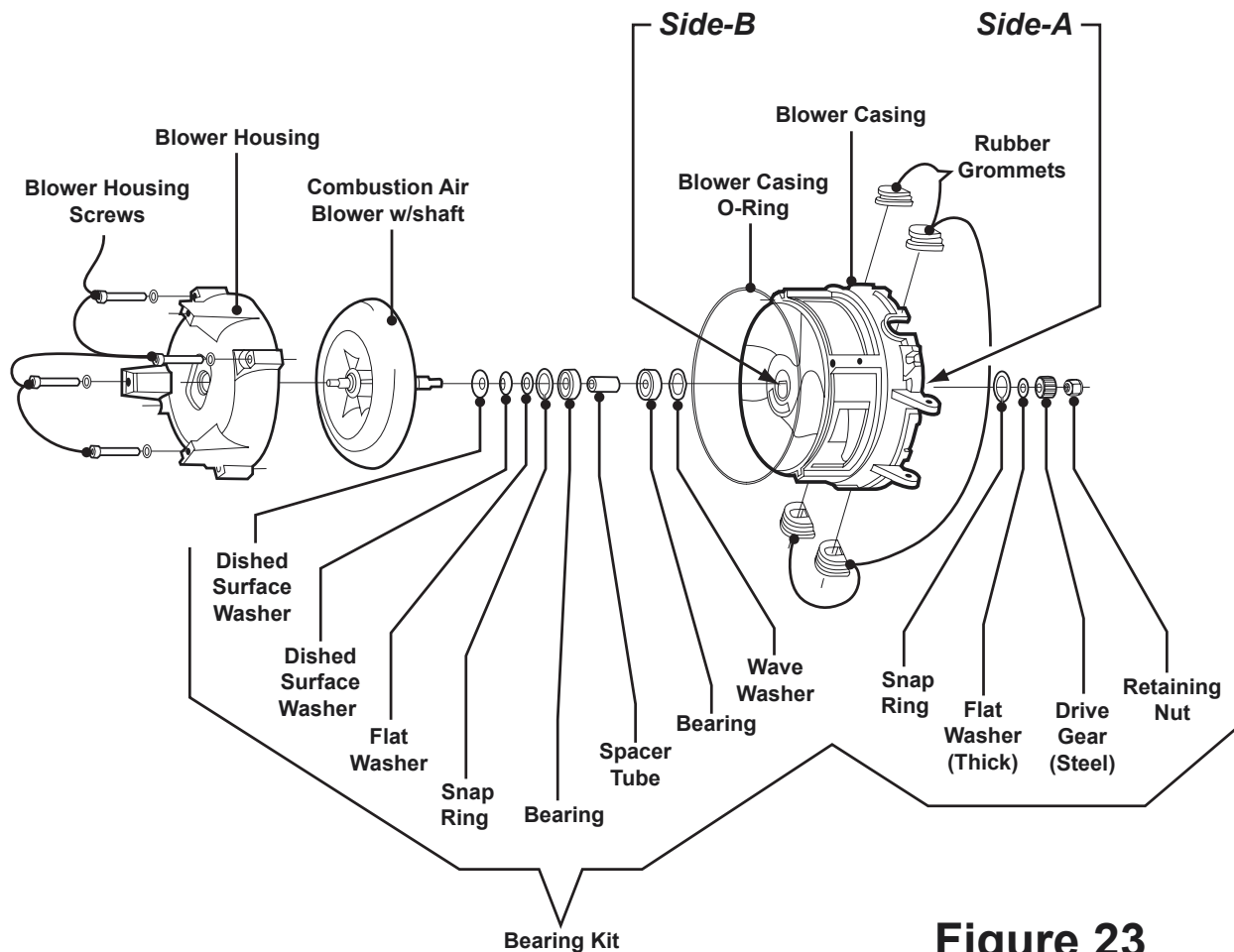
through the Bearing Kit assembly until the threaded portion appears on Side-A of the *Blower Casing*, reference Figure 23. Place the new thick flat *Washer* and steel *Drive Gear* on the threaded end of the Combustion Air Blower's shaft. Thread the new *Retaining Nut* on the Combustion Air Blower's shaft until it is finger tight (**DO NOT TIGHTEN**).

11. Place a feeler gauge between the *Combustion Air Blower* and the flat surface of the *Blower Casing*. Slowly tighten (or loosen) the *Retaining Nut*, holding the *Combustion Air Blower*, until a .003 - .005 gap is achieved.
12. Spin the *Combustion Air Blower* to ensure a friction free rotation.

**NOTE:** If the *Combustion Air Blower* is rubbing, loosen the *Retaining Nut* slightly and lightly tap on the Combustion Air Blower's shaft (opposite side {i.e. Side-B}), then readjust the gap (repeat Steps 11 and 12).

13. Reattach the *Blower Housing* to the *Blower Casing* using the four *Blower Housing Screws*. Reinstall a *Clutch Half* on both the Motor's shaft and the Combustion Air Blower's shaft. Attach the *Motor* and flange assembly, with the recessed edge of the *Motor Flange* in-line with the wiring access slot of the *Blower Casing*, to the *Blower Housing* with the three *Hex Head Screws*, reference Figure 14. Reconnect the *Black (+)* and *Brown (-)* wires of the *Motor* to the C-Plug Harness' *Black (+)* and *Brown (-)* wires, reference Figure 13. Feed the C-Plug Harness' *Yellow* and *Brown* wires back through the wiring access hole in the *Protection Cap*, reference Figure 14.
15. Reinstall the *Protection Cap*. Reconnect the *Black (+)* and *Brown (-)* wires of the *Ignition Coil* to the C-Plug Harness' *Yellow (+)* and *Brown (-)* wires, reference Figure 24. Reinstall the *Ignition Coil* and secure to the *Protection Cap* with the four *Ignition Coil Screws*, reference Figure 13. Reconnect the *Ignition Cables* to the *Ignition Electrodes*, reference Figure 16.
16. Fit the *Nozzle Stand Plate* inside the cast-aluminum *Blower Casing* and secure in place with the four *Nozzle Stand Plate Screws*. Reattach the *Fuel Supply* and *Return Lines* to the *Diesel-Burner Head*.
17. Reconnect the *Blue (+)* and *Brown (-)* wires to the Fuel Solenoid's (+) and (-) *Electrical Terminals*, reference Figure 18. Also, reconnect the Flame Sensor's *Green* wire to the *Green* C-Plug Harness wire and the *Blue* wire to the C-Plug Harness' *Violet* wire, reference Figure 15.

**Bearings,**  
continued



**Figure 23**

### ■ Ignition Coil

#### 8.10 Ignition Coil



**Function:** The *Ignition Coil* produces a high voltage ignition spark (approx. 8000 volts), which is released across the metal tips of the *Ignition Electrodes* during the initial *Diesel-Burner* start-up.

**WARNING:** Use extreme care when testing the *Ignition Coil*, as a **High Voltage Shock** may result.

**NOTE:** In order to perform some of the following procedures it is necessary to detach and reattach the *Diesel-Burner Head*. Be sure to review Section 8.2, Page 42 for detaching and reattaching instructions.

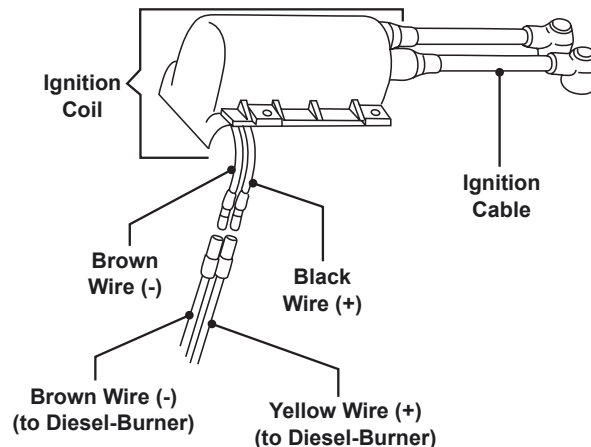
**Component Test:** Remove the four *Ignition Coil Screws* that secure the *Ignition Coil* in place, reference Figure 13. Disconnect the Ignition Coil's *Black (+)* and *Brown (-)* wires from the C-Plug Harness' *Yellow (+)* and *Brown (-)* wires. Connect the Ignition Coil wires directly to a 12 volt DC power supply (i.e. *Black (+)* wire to (+) lead and *Brown (-)* wire to (-) lead). Turn the power supply **ON** and watch for a spark to appear across the metal tips of the *Ignition Electrodes*, reference Figure 16. If a spark does not appear, the *Ignition Coil* must be replaced, reference the Ignition Coil's "Replacement Procedure" below. Reference Section 10 for spare parts information.

**Cleaning Tips / Maintenance:** N/A

**Adjustment Procedure:** N/A

#### **Replacement Procedure:**

1. Disconnect the *Ignition Cables* from the *Ignition Electrodes*, reference Figures 16 and 19. Remove the four *Ignition Coil Screws* that secure the *Ignition Coil* to the *Protection Cap*, reference Figure 13. Lift the *Ignition Coil* and disconnect its wires from the C-Plug Harness wires, prior to removing (reference Figures 3 and 24).
2. Connect the new Ignition Coil's *Black (+)* and *Brown (-)* wires to the C-Plug Harness' *Yellow (+)* and *Brown (-)* wires, reference Figure 24. Attach the *Ignition Coil* to the *Protection Cap* with the four *Ignition Coil Screws*, then reconnect the *Ignition Cables* to the *Ignition Electrodes*.



**Figure 24**

### Control Unit

#### 8.11 Control Unit

**Function:** The *Control Unit* operates all the components of the *Diesel-Burner Head* and safely shuts the heater **OFF** in the event of an overheat, flameout, and low voltage condition. It also receives *Diesel-Burner* operation status signals from the *Flame Sensor*, *VDC Control Thermostat*, and *VDC High-Limit Thermostat*.

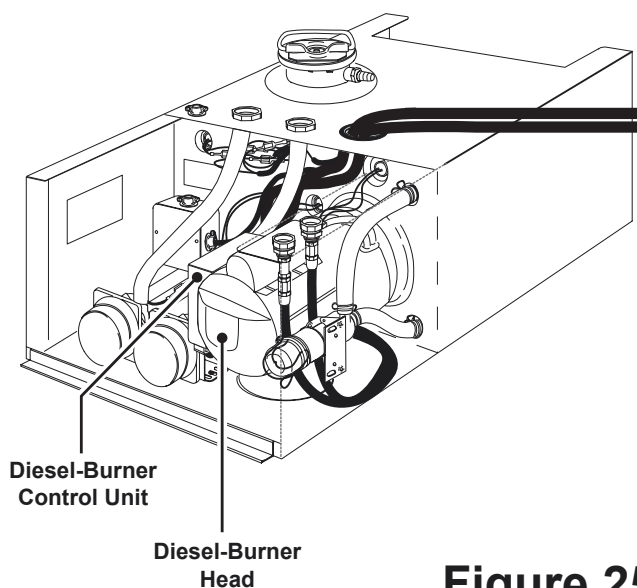
**Component Test:** The following conditions must exist prior to performing the Control Unit circuit tests on the following page. If one of the conditions below does not exist, please contact our Technical Support Department at 1-800-685-4298 for additional assistance.

##### **Condition #1**

A battery voltage level of between 11.5 to 14.0 volts DC must be present at the *Control Unit* during all testing, reference Figure 25. It may be necessary to perform a voltage check to ensure that this condition exists. To perform the voltage check, locate the Control Unit's *B-Plug*, and insert the probes of a DC voltmeter into the *B-4* (+) and *B-2* (-) locations, reference Figure 26.

##### **Condition #2**

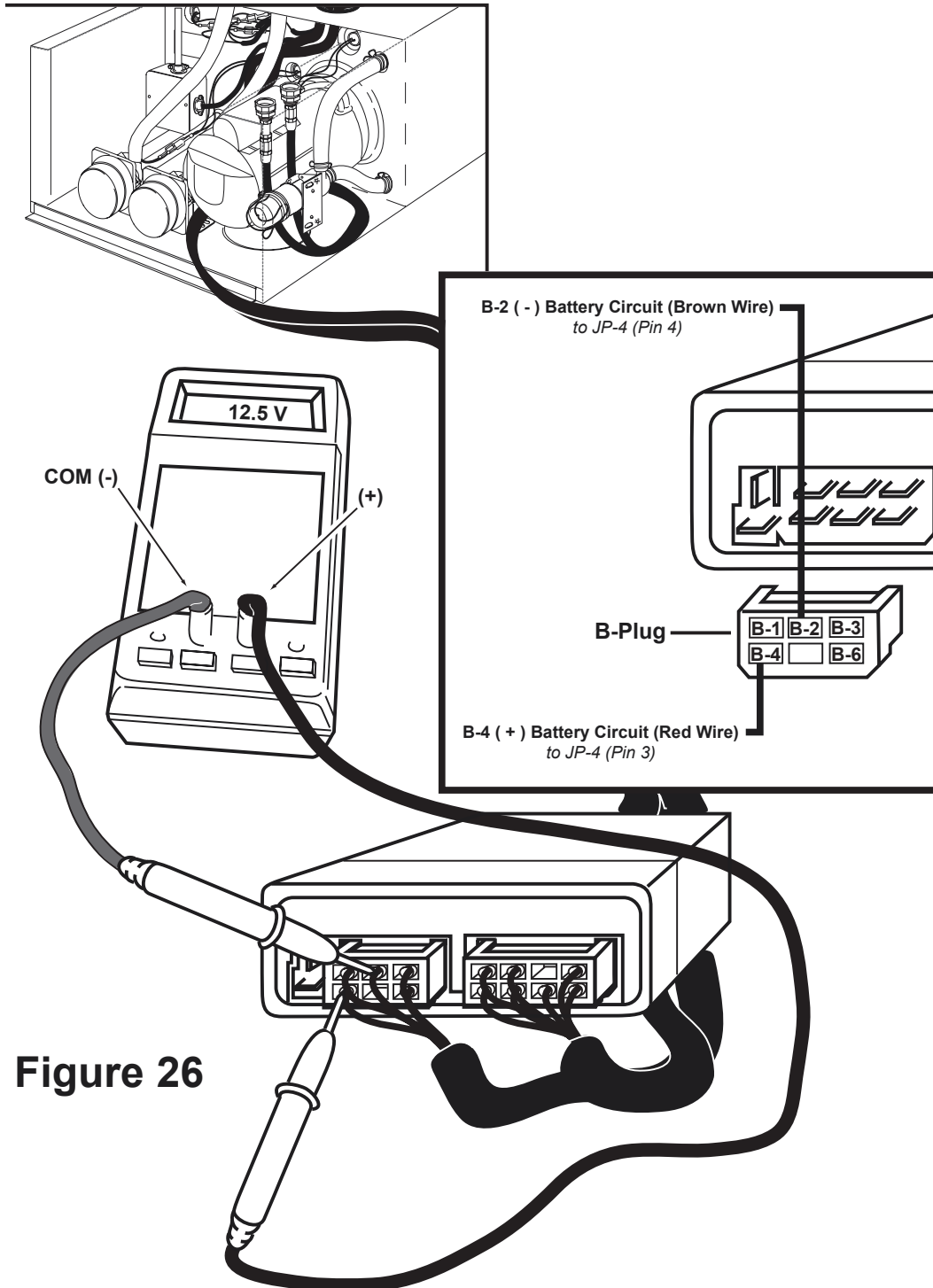
A voltage level of between 11.5 to 14.0 volts must be present at the *Diesel ON/OFF* switch circuit of the *Control Unit* during all testing. It may be necessary to perform a voltage check to ensure that this condition exists. To perform the voltage check, locate the Control Unit's *B-Plug*, and insert the probes of a DC voltmeter into the *B-1* (+) and *B-2* (-) locations, reference Figure 8. Turn the *Diesel* switch **ON** and observe the voltage level, reference Figure 4.



**Figure 25**



**Control Unit,**  
continued



**Figure 26**

### Control Unit, continued

**NOTE:** If after performing the following circuit tests, the *Control Unit* is determined to be defective, and must be replaced, reference the Control Unit's "Replacement Procedure" on the following page. Reference Section 10 for spare parts information.

#### **Ground circuit test**

Locate the Control Unit's *B-Plug* and *C-Plug*, reference Figure 8. Insert the probes of a DC voltmeter into the *B-4 (+)* and *C-5 (-)* locations and turn the *Diesel* switch **ON**, reference Figures 4 and 8. If a voltage reading does not register on the voltmeter, the *Control Unit* must be replaced. If voltage is present, proceed to the next circuit test.

#### **VDC / VAC Control Thermostat circuit test**

Locate the Control Unit's *B-Plug* and *C-Plug*, reference Figure 8. Insert the probes of a DC voltmeter into the *C-1 (+)* and *B-2 (-)* locations and turn the *Diesel* switch **ON**, reference Figures 4 and 8. If a voltage reading does not register on the voltmeter, the *Control Unit* must be replaced. If voltage is present, proceed to the next circuit test.

#### **VDC High-Limit Thermostat circuit test**

Locate the Control Unit's *B-Plug* and *C-Plug*, reference Figure 8. Insert the probes of a DC voltmeter into the *C-4 (+)* and *B-2 (-)* locations and turn the *Diesel* switch **ON**, reference Figures 4 and 8. If a voltage reading does not register on the voltmeter, the *Control Unit* must be replaced. If voltage is present, proceed to the next circuit test.

#### **Motor circuit test**

Locate the Control Unit's *C-Plug*, reference Figure 8. Use a jumper wire to make a connection from the *C-1* location to the *C-7* location, reference Figure 8. Turn the *Diesel* switch **ON** and insert the probes of a DC voltmeter into the *C-2 (+)* and *C-5 (-)* locations, reference Figures 4 and 8. If no voltage reading registers on the voltmeter, the *Control Unit* must be replaced. If voltage is present, proceed to the next circuit test.

**CAUTION:** Be sure to remove the jumper wire that was used to make the connection from the *C-1* location to the *C-7* location. A failure to do so will result in an overheating condition during normal operation.

#### **Ignition Coil circuit test**

Turn the *Diesel* switch **OFF** and locate the Control Unit's *C-Plug*, reference Figures 4 and 8. Use a jumper wire to make a connection from the *C-1* location to the *C-7* location, reference Figure 8. Also, locate the *VDC High-Limit Thermostat* and disconnect its 2-way male plug from the (white plastic) 6-way female connector, reference Figure 1. Insert the probes of a DC voltmeter into the *C-8 (+)* and *C-5 (-)* locations and turn the *Diesel* switch **ON**, reference Figures 4 and 8. If a voltage reading does not register on the voltmeter, 18-25 seconds after the initial start-up, the *Control Unit* must be replaced.

### Control Unit, continued

**NOTE:** Be sure to reconnect the VDC High Limit Thermostat's 2-way male plug to the 6-way female plug. The *Diesel-Burner* will not ignite during normal operation if the *VDC High-Limit Thermostat* is left disconnected.

**CAUTION:** Be sure to remove the jumper wire that was used to make the connection from the C-1 location to the C-7 location. A failure to do so will result in an overheating condition during normal operation.

**Cleaning Tips / Maintenance:** N/A

**Adjustment Procedure:** N/A

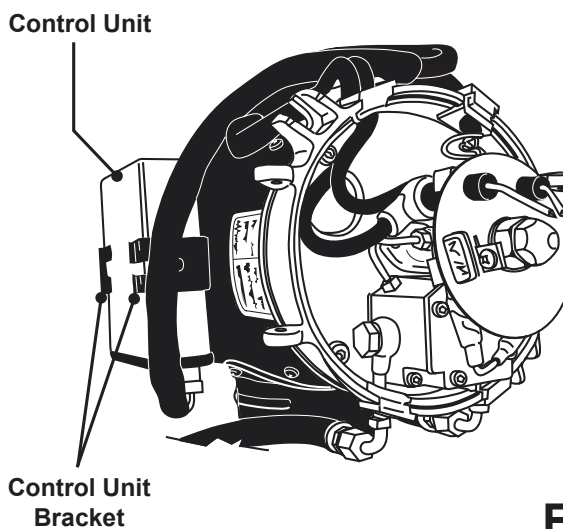
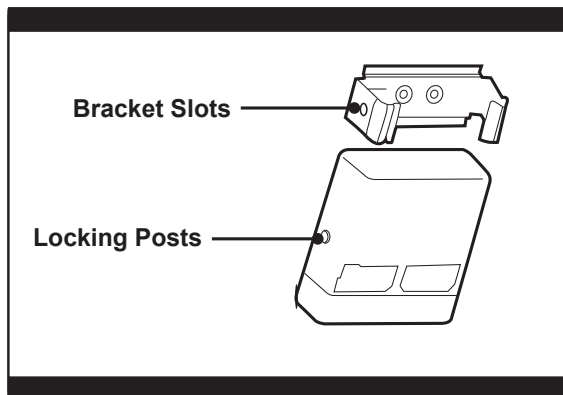
**Replacement Procedure:**

1. Remove both the *B-Plug* and *C-Plug* from the *Control Unit*, reference Figure 8. Gently pry away each side of the *Control Unit Bracket* from the Control Unit's locking posts with a flat-head screw driver. Once the locking posts have been released, pull on the *Control Unit* to remove it from the *Diesel-Burner Head*.
2. Slide the new *Control Unit* into the *Control Unit Bracket*, reference Figure 27. Push down on the *Control Unit* until the locking posts snap into the bracket slots. Reinstall both the *B-Plug* and *C-Plug*.

**NOTE:** Be sure to install the *Control Unit* with its *C-Plug* and *B-Plug* ports facing downward. Failure to do so, will result in moisture collecting in the ports and potential damage to the Control Unit's internal circuitry, reference Figure 27.

**Control Unit,**  
continued

7.11 Control Unit



**Figure 27**

## WARRANTY INFORMATION

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### - FOR ALL HYDRO-HOT MODELS -

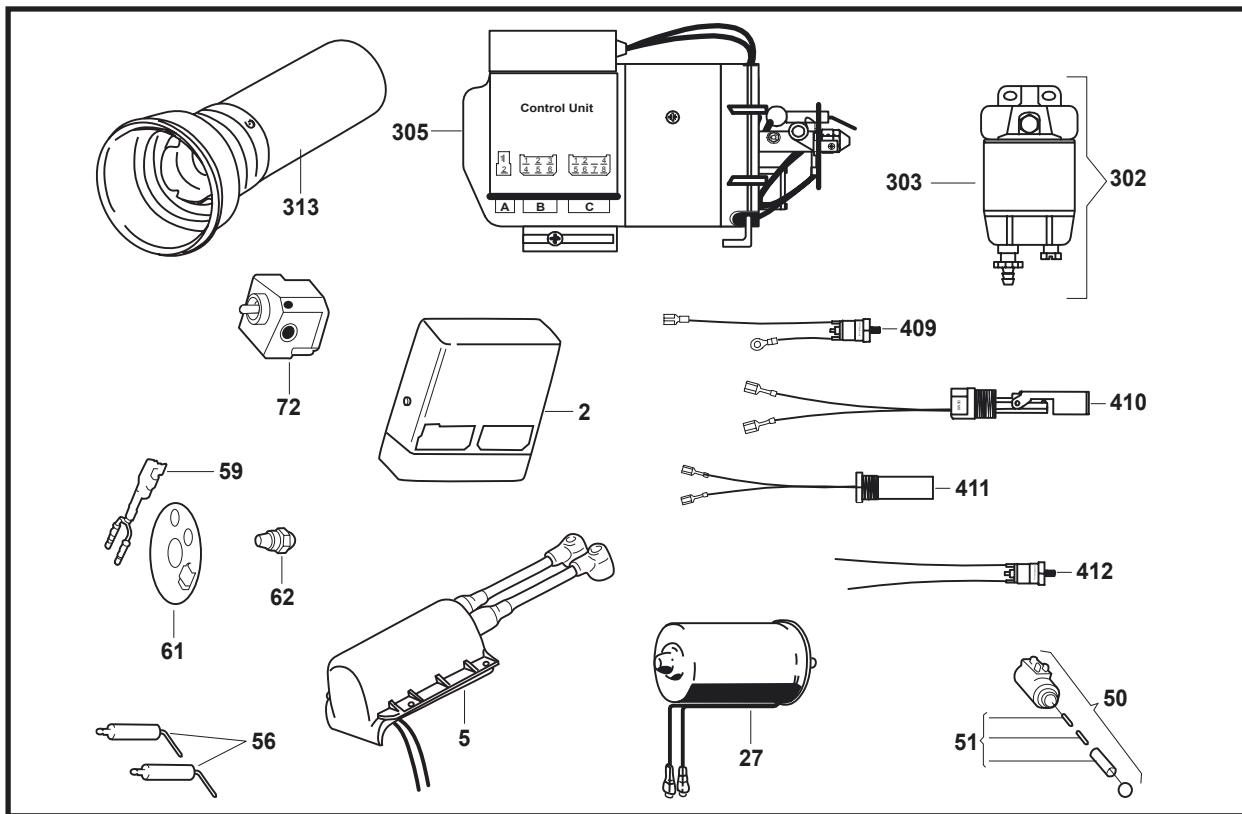
Vehicle Systems Inc. warrants the HYDRO-HOT Heater to be free from defects in material and workmanship under normal use and service for a period of two (2) years on both parts and labor commencing upon the original date of registration of the vehicle. Replacement parts are warranted for the remainder of the Heater's standard warranty period or for six months (180 days), whichever is greater.

**This warranty is conditional upon proper use of the Heater by the end-user. This warranty does not apply to damage or failure of the HYDRO-HOT Heater, or the vehicle into which it was installed, due to improper installation, assembly, maintenance, abuse, neglect, accident, or the use of parts not supplied by Vehicle Systems Inc. Vehicle Systems is not responsible for incidental or consequential damages.**

The intent of this warranty is to protect the end-user of the heating system from such defects, which would occur in the manufacture of the product. The warranty is not intended to protect the end-user from problems, which are outside the ability of Vehicle Systems' control.

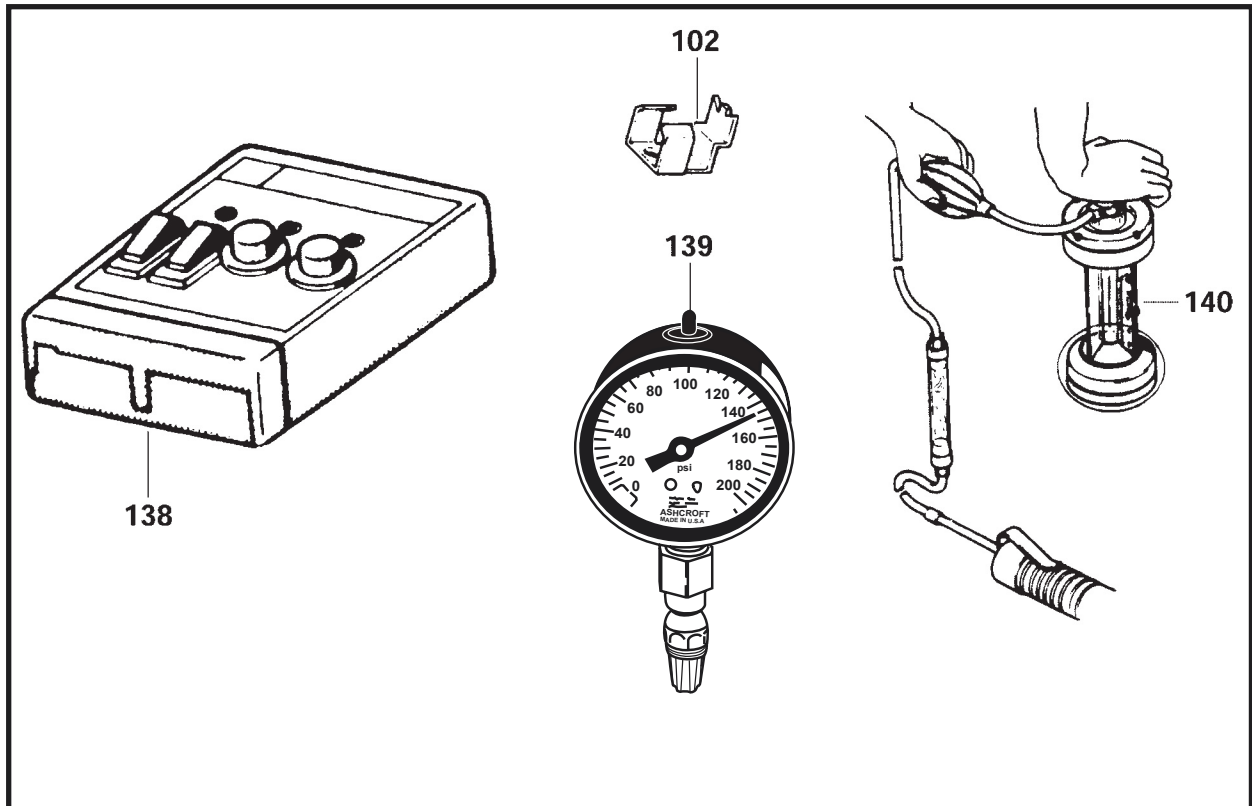
To obtain warranty repair authorization or for additional product information, please contact our **Technical Department at 1-800-685-4298 (8 AM to 5 PM Mountain Standard Time).**

## Section 10: Spare Parts List



2	WPX-287-962	Control Unit, 12 VDC, DBW 2010-300, AH/HH/WH
5	WPX-101-838	Coil, Ignition, 12 VDC, DBW 2010-300, AH/HH/WH
27	WPX-425-060	Motor, Combustion Air/Fuel Pump, 12 VDC, DBW-2010, AH/HH/WH
50	WPX-322-083	Assembly, Fuel Solenoid, 12 VDC, DBW 2010-300, AH/HH/WH
51	WPX-386-650	Valve, Kit, Fuel Solenoid, DBW 2010-300, AH/HH/WH
56	WPX-274-313	Electrode, Ignition, DBW-2010, AH/HH/WH
59	WPX-638-78A	Sensor, Flame, DBW 2010-300, AH/HH/WH
61	WPX-887-71A	Photo Disc, DBW-2010, AH/HH/WH
62	WPX-886-41A	Nozzle, Fuel, 0.35 GPH, DBW-2010, AH/HH/WH
72	WPX-502-05A	Pump, Fuel, 10 Bar, DBW 2010-300, AH/HH/WH
302	FLX-120-VS1	Filter, Fuel, System, 10 Micron, AH/HH
303	FLX-R12-TRA	Filter, Fuel, Spin-On Element, 10 Micron, AH/HH
305	WPE-905-83H	Burner-Head, Diesel, Modified, VSI DBW-2010, 12 VDC, HH
313	WPX-265-53A	Combustion Chamber, DBW-2010, AH/HH/WH
409	ELE-ASY-001	Thermostat Assembly, VAC High-Limit, 220°F, HH
410	ELX-01G-ML7	Switch, Float, HH
411	ELE-C14-001	Thermostat, VDC / VAC Control, 200°F, HH
412	ELE-HLT-222	Thermostat, VAC High-Limit, 220°F, HH

## Section 11: Special Tools



102	WPX-310-646	Gauge, Adjustment, Electrode, DBW 2010-300, AH/HH/WH
138	WPX-440-280	Control Box, Tester, DBW 2010-300, AH/HH/WH
139	WPE-600-190	Gauge Kit, Fuel Pressure, DBW 2010-300, AH/HH/WH
140	*****	Gas Analyzer, CO <sub>2</sub> , AH/HH/WH Order item #140 from a Grainger Industrial Supply Store near you or visit the Grainger website at <a href="http://www.grainger.com">www.grainger.com</a> . (Grainger Part# 6T153)



# Vehicle Systems

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