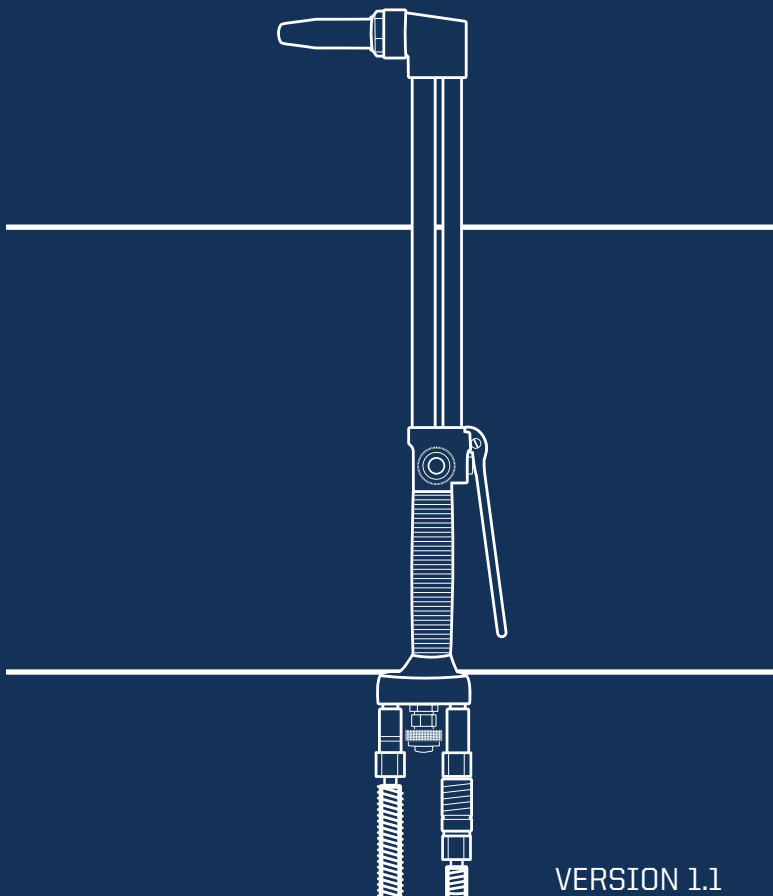




PETROGEN
Advanced Cutting Torch Systems



VERSION 1.1

LIQUID FUEL CUTTING TORCH SYSTEM
**REFERENCE
MANUAL**

CONFIDENTIAL AND PROPRIETARY INFORMATION



Thank you for putting your trust in Petrogen products.

NOTE: Petrogen systems are bespoke appliances, not compatible with any other oxy-fuel cutting torch systems.

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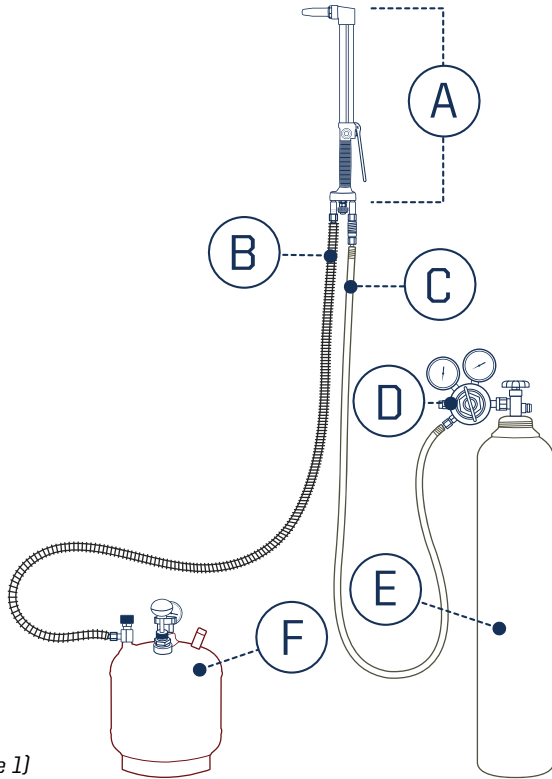
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SYSTEM COMPONENTS

COMPLETE SYSTEM



(Figure 1)

A. Liquid Fuel Torch - The Petrogen Liquid Fuel Torch (Torch) is designed for use with liquid fuels such as gasoline, and heavy fuels like diesel and kerosene when using the Multi-Fuel Adaptor. Petrogen torches are not compatible with compressed gasses. - Available in lengths of 7, 15, 18 (Machine), 20, 27, 36, 48, 60, 72, and 84 inches

B. Liquid Fuel Hose - The Petrogen Liquid Fuel Hose (Fuel Hose) is designed for use with liquid fuels such as gasoline, diesel and kerosene. The PTFE interior of the Petrogen hose prevents damage from long term exposure to petroleum. *Hoses designed for use with compressed gases should not be used with Petrogen systems.* - Available in lengths of 6, 10, 20, 50, and 100 feet

C. Oxygen Hose - Petrogen systems can be used with any commercial oxygen hose which has 9/16 hose connection. - Available in lengths of 25, 50, and 100 feet

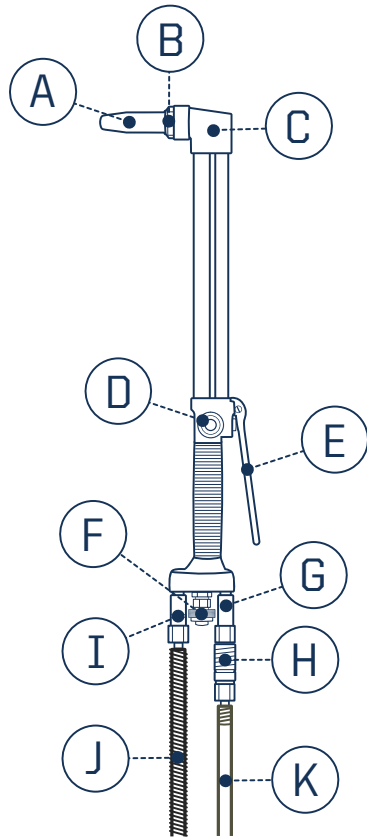
D. Oxygen Regulator - Petrogen systems can be used with any commercial Oxygen Regulator (Regulator) which has a 9/16 hose connection.

E. Oxygen Bottle - Some Petrogen systems include an Oxygen Bottle.

Petrogen systems are compatible with all sizes of commercial Oxygen Bottles to include liquid oxygen and oxygen manufactured using Pressure Swing Adsorption (PSA) oxygen generators. (Oxygen manufactured through the PSA process have a lower purity oxygen than oxygen made in cryogenic plants. For every 1% reduction of purity reduced, operators can expect a 4-5% reduction in overall performance. This can be partially compensated for by using higher oxygen pressures.)

F. Liquid Fuel Tank - The Petrogen Liquid Fuel Tank (Fuel Tank) is designed for use with liquid fuels such as gasoline of any grade, "white" gas, camping fuel, stabilizer additive fuels, diesel, biodiesel, kerosene, Jet-A, JP-8, JP-5 and JP-24. For the best performance use clean fresh fuel. *Never attempt to use any compressed gases with the Petrogen Fuel Tank or any Petrogen components.*

LIQUID FUEL TORCH



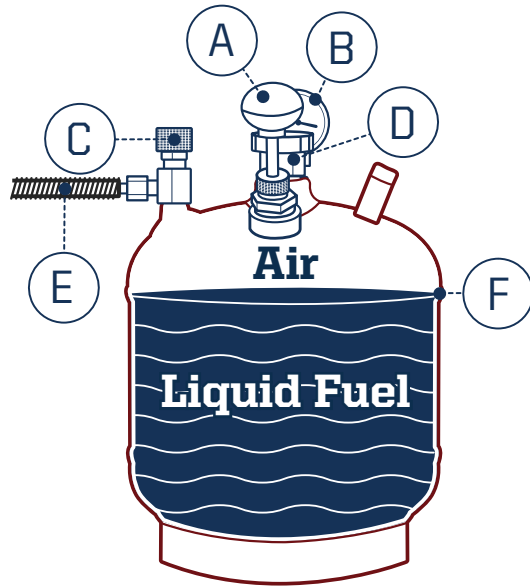
(Figure 2)

- A. Liquid Fuel Tip** - The Petrogen Liquid Fuel Tip (Tip) is designed for use with Petrogen (liquid fuel) Torches only.
- Available in sizes 0, 1, 2, 3, 4, 5, 6, 7, 8, L, 81, and 83 (see page 15, or back of manual for Tip Selection Chart)
- B. Tip Nut** - The Tip Nut secures the Tip to the Torch Head.
- C. Torch Head** - Accommodate various cutting operations.
- Available in 75°, 90°, and 180° angles

- D. Pre-Heat Oxygen Knob** - The Pre-Heat Oxygen Knob controls the volume of pre-heat oxygen delivered to the Pre-Heat Flame.
- E. High Pressure Oxygen Trigger** - The High Pressure Oxygen Trigger controls the flow of cutting oxygen.
- F. Fuel Control Knob** - The Fuel Control Knob regulates the volume of liquid fuel delivered to the preheat flame.
- G. Oxygen Hose Connector** - The Oxygen Hose Connector is the point of attachment for the Oxygen Flashback Arrestor (H).
- H. Oxygen Flashback Arrestor** - The Oxygen Flashback Arrestor prevents flashback through the oxygen hose. Using a flashback arrestor is not a replacement for manually purging the torch before each light-up.

No additional fuel line flashback arrestor is required with Petrogen systems because combustion is not possible with the absence of oxygen. Therefore no additional fuel line flashback arrestor is required with Petrogen systems.
- I. Liquid Fuel Hose Connector** - The Liquid Fuel Hose Connector is the point of attachment for the Liquid Fuel Hose (J). All fuel connections are reverse thread (counter clockwise tightening) and marked with a notch.
- J. Liquid Fuel Hose** - The Liquid Fuel Hose transports liquid fuel from the Liquid Fuel Tank to the Torch.
- K. Oxygen Hose** - The Oxygen Hose transports oxygen from the Oxygen Regulator to the Torch.

LIQUID FUEL TANK



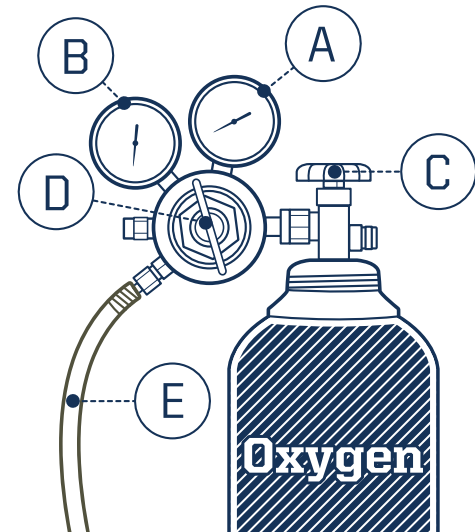
(Figure 3)

- A. Hand Pump** - The hand pump is used to pressurize the fuel tank (An Automatic Pressure Regulator is available: Part #2348). The standard operating pressure is 20 psi. During cutting operations, ensure the Fuel Tank pressure remains above 10 psi. When the Fuel Tank pressure reaches 10 psi, re-pressurize the Fuel Tank to 20 psi. This will ensure the fastest activation of the Fast Flow Check Valve.
- B. Fuel Tank Pressure Gauge** - The Fuel Tank Pressure Gauge displays the tank pressure.
- C. Shut-Off Valve** - The Shut-Off Valve controls the flow of fuel exiting the tank (also houses the Fast Flow Check Valve).
- D. Filler Cap** - The Filler Cap seals the tank fill port and

contains the automatic pressure relief valve. - Available in 35 psi, 50 psi & 100 psi configurations

- E. Liquid Fuel Hose** - Transports liquid fuels from the Liquid Fuel Tank to the Torch.
- F. Two Gallon (Top) Weld Line** - Fill the Fuel Tank to the top weld line before conducting cutting operations. Filling the Fuel Tank above the two gallon line will result in fuel flow problems. Filling the Fuel Tank below the two gallon line will require in excessive pumping.

OXYGEN BOTTLE



(Figure 4)

- A. Bottle Pressure Gauge** - The Oxygen Bottle Pressure Gauge displays the pressure within the Oxygen Bottle.
- B. Output Pressure Gauge** - The Oxygen Output Pressure Gauge displays the oxygen pressure delivered to the Oxygen Hose. When setting the oxygen pressure, refer to

the Petrogen Tip Selection Chart (see page 15, or back of the manual) as pressures vary between tip sizes.

C. Oxygen Bottle Valve - The Oxygen Bottle Valve opens and closes the oxygen bottle.

D. Regulator Control Valve - The Regulator Control Valve regulates the oxygen pressure delivered from the Oxygen Bottle to the Oxygen Hose.

E. Oxygen Hose - The Oxygen Hose transports oxygen from the Oxygen Regulator to the Torch.

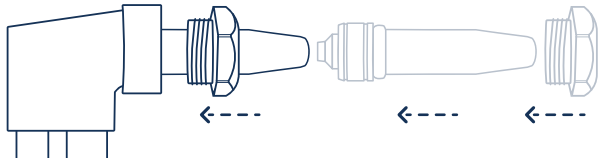
SYSTEM ASSEMBLY

1. SYSTEM COMPONENT CHECK

Before assembling your system or after prolonged storage check that all components are present, serviceable, and undamaged. It is also best practice to check system components for serviceability before each use. If there is any question as to whether or not a part is in good working order, please contact Petrogen Customer Service 877-888-6724.

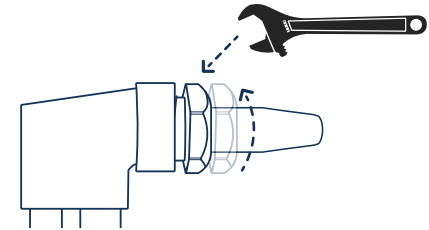
2. TORCH ASSEMBLY

2.1 Slide Tip Nut over chosen Tip. Place Tip's seating surface into Torch Head (Fig. 5). (see page 15, or back of manual for Tip Selection Chart).



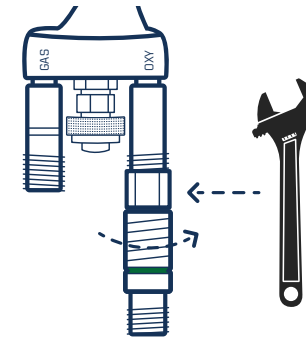
(Figure 5)

2.2 Tighten the Tip Nut in a clockwise manner using an Adjustable Wrench (Fig. 6). DO NOT OVERTIGHTEN.



(Figure 6)

2.3 Attach the Oxygen Flashback Arrestor (found in the Standard Spare Parts Kit) to the Torch's Oxygen Hose Connector (labeled OXY). Use an Adjustable Wrench to snug the Oxygen Flashback Arrestor to the Torch (Fig. 7).

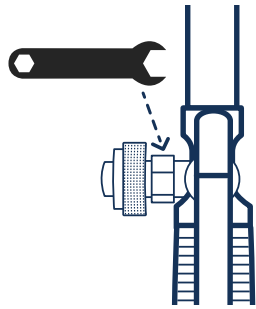


(Figure 7)

3. PACKING NUT CHECK

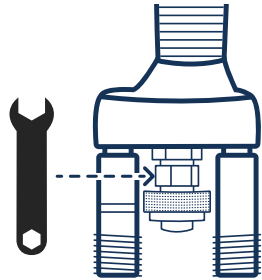
Use the included Packing Nut Wrench found in the Standard Tool Kit to check the following packing nuts for snugness:

(1) Pre-Heat Oxygen Packing Nut - located under the Pre-Heat Oxygen Knob on the Torch, shown in figure 8.



(Figure 8)

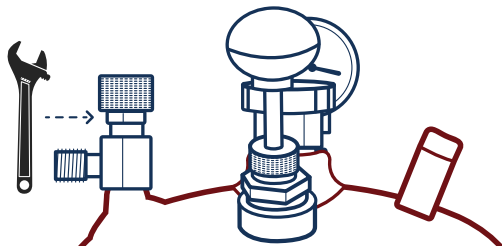
(2) Fuel Control Packing Nut - located under the Fuel Control Knob on the Torch, shown in figure 9.



(Figure 9)

With the Adjustable Wrench, check:

(3) Fuel Valve Packing Nut - located under the Fuel Valve on the Liquid Fuel Tank, shown in figure 10.



(Figure 10)

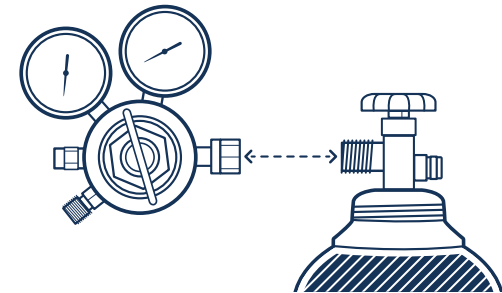
The packing nuts should be snug at all times to ensure proper valve seal. If desired, knob tension can be adjusted by increasing the tightness of the packing nuts.

NOTE: These three fittings should be checked:

- (1)** As part of initial assembly of new systems
- (2)** During routine maintenance
- (3)** If any leaking is observed

4. OXYGEN REGULATOR & OXYGEN HOSE

4.1 Inspect the Regulator inlet and Oxygen Bottle Valve port for debris (Fig. 11). Ensure the oxygen valve is clear by briefly opening (crack open) the Oxygen Bottle, allowing oxygen to expel any debris.



(Figure 11)

WARNING: Any debris between the Regulator and Oxygen Bottle Valve can create combustion inside the Regulator which may violently exit through the regulator gauges.

4.2 Connect the Regulator to the Oxygen Bottle. Snug the fitting with the Adjustable Wrench.

4.3 Attach one end of the green Oxygen Hose to the Oxygen Flashback Arrestor on the Torch and the other end to the Regulator. Snug both fittings with an adjustable wrench (All Oxygen fittings have a standard right hand thread and cannot be confused with fuel fittings which have a left hand

thread).

5. OXYGEN HOSE PRESSURIZATION

It is best practice to pressurize the oxygen line before the fuel line. Maintaining positive pressure throughout the oxygen system safeguards the oxygen line against fuel contamination. If fuel is allowed to enter the Oxygen Hose, a flashback may occur. Purging the Torch before light up further protects the operator against oxygen line flashback.

5.1 When opening the Oxygen Bottle Valve, ALWAYS FACE AWAY FROM THE GAUGES. Open the valve slowly and fully.



6. OXYGEN PRESSURE SETTINGS

6.1 The oxygen pressure setting is based on the Tip size selected. Each Tip has a specified range of acceptable oxygen pressure. Begin with the lower pressure indicated and increase the pressure if necessary. Using incorrect oxygen pressure will greatly affect performance and consumption, however it will not create a hazard.

6.1.1 The gauge on the left indicates the amount of pressure being delivered to the Torch. The gauge on the right indicates the amount of pressure inside the Oxygen Bottle.

6.1.2 To increase the amount of pressure delivered to the torch, turn the Regulator Control Valve clockwise. To decrease the amount of pressure delivered to the torch, turn the Regulator Control Valve counter clockwise while depressing the High Pressure Oxygen Trigger on the Torch.



TIP SELECTION CHART

AMERICAN

Tip No.	Inches	Pounds / Inches ²	
		Fuel	Oxygen
0, HHO	0 - ¼	10 - 20	12 - 17
1, 81, HH1	¼ - 1	10 - 20	17 - 25
2, HH2	1 - 2	10 - 20	25 - 35
3, 83, HH3	2 - 4	10 - 20	35 - 40
4, HH4	4 - 6	12 - 20	40 - 50
5, HH5	6 - 8	14 - 20	50 - 60
6, HH6	8 - 10	16 - 20	70 - 80
7	10 - 12	18 - 20	80 - 100
8	12 - 14	20	120+
L	Heating	18-20	100

METRIC

Tip No.	MM	KPA	
		Fuel	Oxygen
0, HHO	0 - 7	70 - 140	80 - 120
1, 81, HH1	7 - 25	70 - 140	120 - 180
2, HH2	25 - 50	70 - 140	180 - 250
3, 83, HH3	50 - 100	80 - 140	250 - 280
4, HH4	100 - 150	80 - 140	280 - 350
5, HH5	150 - 200	100 - 140	350 - 420
6, HH6	200 - 250	110 - 140	490 - 560
7	250 - 300	130 - 140	560 - 700
8	300 - 350	140	80+
L	Heating	130 - 140	700

7. FUEL TANK FILLING

7.1 Select Fuel - For best performance, use clean fresh fuel. If the only fuel available is old or fouled the system can still be operated without damage.

7.1.1 Fuels suitable for use include gasoline of any grade, white gas, camping fuel, and stabilized (tool or small engine) fuels. When using the Multi-Fuel Adaptor, diesel, biodiesel, kerosene, Jet-A, JP-8, JP-5 and JP-24 can be used.

7.2 Remove Filler Cap from the Fuel Tank - If there is pressure in the Fuel Tank, open the cap slowly until you hear the pressure venting through the machined groove in the cap body. Let the tank completely vent its pressure before removing the cap completely.

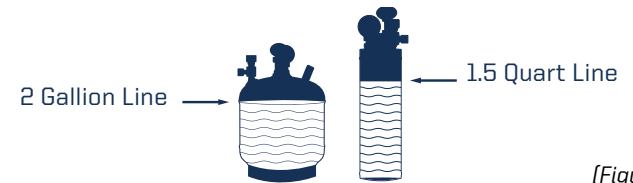
7.3 Fill the Fuel Tank to specified level - It is important to fill your Fuel Tank to the specified level (Fig. 12). This leaves the optimum amount of air space in the Fuel Tank for proper pressurization. Overfilling the Fuel Tank will cause the pressure to fall rapidly. Under filling the Fuel Tank will require in excessive pumping to obtain optimum pressure.

7.3.1 Place the Fuel Tank on the ground to avoid static discharge while fueling.

7.3.2 Fill the Fuel Tank directly from a fuel pump OR from an approved fuel container.

7.3.2.1 2.5 Gallon Fuel Tank (Standard): Fill to 2 gallon Weld Line, indicated by the welded seam on the upper half of the tank, shown in figure 12.

7.3.2.2 2 Quart Fuel Tank (PCS.): Fill with 1.5 quarts, shown in figure 12.



(Figure 12)

7.4 Replace the Filler Cap and secure snugly by hand.

8. FUEL TANK PRESSURIZATION

8.1 Pump the Fuel Tank to the pressure specified for your system (If your system requires 50 or 100 psi, this will be indicated on the Filler Cap).

- Standard Systems: 20 psi
- Multi-Fuel Adaptor Systems: 50 psi
- Underwater System: 100 psi

Pumping a standard 2.5 gallon Fuel Tank should require between 80 and 100 plunges to reach 20 psi. The standard 2 quart Fuel Tank should require between 15 to 25 plunges to reach 20 psi.

8.1.1 During cutting operations, ensure the Fuel Tank pressure remains above 10 psi. When the Fuel Tank pressure reaches 10 psi, re-pressurize the Fuel Tank to 20 psi. This will ensure the fastest activation of the Fast Flow Check Valve.

8.2 All Petrogen pressure vessels are fitted with an automatic pressure relief valve inside the Filler Cap. Do not attempt to adjust or modify the pressure relief valve. If you believe the valve has been tampered with, return the Filler Cap assembly to Petrogen for re-calibration.

NOTE: Tampering with the tank pressure relief valve voids the warranty for the entire system.

8.3 When conducting overhead cutting in excess of 30 feet, it may be necessary to compensate by increasing the fuel tank pressure. This may require a Filler Cap with a higher activation setting. If this type of cutting is common it is recommended that operators install the tank Automatic Pressure Kit (Part #2349), which uses an external compressed Air Carry Tank (Part #2370), eliminating the need for hand pumping. Contact Petrogen Customer Support for more details.

9. FUEL LINE PURGE

Purging the fuel line eliminates air bubbles. If air bubbles are left in the Fuel Hose, the flame may go out during the first minutes of operation. Purging the line may take up to 2 minutes per 25 feet of hose.

9.1 Attach one end of the Fuel Hose to the Torch's Liquid Fuel Hose Connector (labeled GAS) and the other end to the Fuel Tank's Shut-Off Valve hose connector.

9.1.1 Snug both fittings with the provided Adjustable Wrench. All Fuel Hose fittings have a left hand tightening thread identified with a hash mark to indicate counter-clockwise tightening.

9.2 **Slowly** turn the Fuel Tank's Shut-Off Valve 1/4 turn allowing fuel to flow out of the tank into the hose.

9.2.1 Opening the Shut-Off Valve too quickly will activate the Fast Flow Check Valve, stopping fuel flow. If this happens, fuel will not leave the tank and cutting will not be possible. To reset the valve, close the Shut-Off Valve on the tank fully, and tap the top of the knob. Slowly re-open the knob 1/4 turn.

9.3 Hold the Torch above the Fuel Tank and oscillate/

agitate the Fuel Hose to speed the movement of the fuel through the Fuel Hose and help eliminate air bubbles.

9.4 Open the Fuel Control Knob on the Torch.

9.4.1 This step is necessary to allow air in the fuel line to escape.

9.4.2 Be prepared for a small amount of fuel (approximately 1-2 Tbsp) to come out of the torch tip while the air is purging. Use a metal can or other approved fuel container to catch the fuel.

9.5 Close the Fuel Control Knob on the Torch.

9.6 Once the line is purged, completely open the Shut-Off Valve on the Fuel Tank. The Shut-Off Valve should remain completely open during operation.

LIGHT UP

10. SAFETY CHECKS

10.1 CHECK YOURSELF & YOUR TEAM

- Wear the correct protective equipment for the job
- Know how the material you are cutting reacts to heat

10.2 CHECK YOUR ENVIRONMENT

- Know what is beneath, beside and above your cut
- Aggressively look for hidden hazards
- Never cut into, or near anything you are not sure of

10.3 CHECK YOUR EQUIPMENT

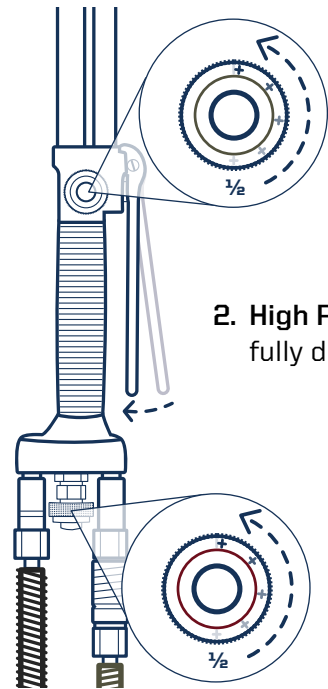
- Check that all fittings are snug
- Store and transport your system safely
- Before light up, PURGE the system by depressing the High Pressure Oxygen Trigger

11. LIGHT UP

11.1 PREP THE SPARK STRIKER - Ensure that your spark striker is engaging the flint and creating adequate sparks before beginning the light up process. Doing so will prevent excess fuel from being lost.

11.2 CONTROL SURFACES - There are three control surfaces to activate on the Petrogen Torch when performing light up (see Fig. 13).

11.3 LIGHT UP PROCEDURE - The recommended light up sequence (1/2 turn - Purge - 1/2 turn), shown in figure 13, creates a suitable preheat mixture for light up and also helps to protect from oxygen flashback.



(Figure 13)

1. **Pre-Heat Oxygen Knob** - Open precisely 1/2 turn.*
 - If using tips 6, 7, or 8 open 1/4 turn.

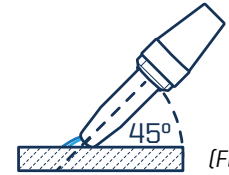
2. **High Pressure Oxygen Trigger** - Purge by fully depressing for 3 to 5 seconds.

3. **Fuel Control Knob** - Open precisely 1/2 turn.*

* Use the '+,-' decals to execute a precise 1/2 turn.

11.4 LIGHTING THE TORCH - When lighting the Torch, strike the sparker directly at the tip. Striking sparks too far away will slow or even prevent ignition.

11.5 WARM UP (IMPORTANT) - After ignition, rest the Tip directly on the steel at a 45 degree angle (Fig. 14) for 5 to 10 seconds. The reflected heat will bring the Tip to its operating temperature allowing the fuel to fully vaporize inside the Tip. Make no flame adjustments during this period. Failing to allow the Tip to fully heat will prevent proper flame adjustment. As the Tip warms, the yellow and orange in the flame will disappear.



(Figure 14)

Increase efficiency by warming the Tip on the cut line, effectively preheating the metal while bringing the Tip to cutting temperature.

11.6 FINAL FLAME ADJUSTMENT - With the Tip still touching the steel, use the Fuel Control Knob to make the final adjustment. When using the recommended light-up setting (1/2 turn oxygen / 1/2 turn fuel), the preheat flame will be slightly rich. Using the Fuel Control Knob, adjust the flame so that the preheat jets slightly oscillate. See figures 15-17 or flame adjustment card for visual reference.

11.6.1 RUN IT RICH - The Petrogen preheat flame should look and sound more aggressive than the flames of compressed gas cutting torches. Running the Torch with a rich flame setting is critical to unlocking the performance of the system. Running the torch with a lean (wispy) setting will overheat the head, reduce performance and increase maintenance and repair.

11.6.2 WHY RUN IT RICH? - A rich setting al-

lows more liquid fuel to enter the head of the torch. The natural cooling effect created by the liquid fuel evaporation protects the Mixer and Tip against overheating. Additionally, the liquid fuel rapidly increases in volume as it expands into a gas, creating a greater oxy/fuel velocity as it leaves the Tip, ultimately driving more BTUs into the steel.

FLAME EXAMPLES

LEAN - Not Enough Fuel

- No canopy
- Hissing sound
- Flame about to separate from tip



[Figure 15]

RICH - Desired Setting

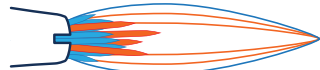
- Canopy
- Roaring sound
- Dark blue core $\frac{3}{16}$ inch



[Figure 16]

TOO RICH - Too Much Fuel

- Canopy
- Wavering blue core
- Large orange streaks



[Figure 17]

12. SHUTDOWN

- (1)** Close the Fuel Control Knob on the torch by turning it clockwise fully.
- (2)** Purge the torch by depressing the High Pressure Oxygen Trigger for 3 to 5 seconds.
- (3)** Close the Pre-Heat Oxygen Valve by turning it clockwise fully.

STORAGE

Refer to the *American Welding Society Safety in Welding, Cutting and Allied Processes* (ANSI Z49.1:2012) publication and local regulations for detailed storage and transportation guidelines.

13. NORMAL SHUTDOWN

After the Torch is shutdown (as described on Pg. 22), close the Tank Fuel Valve. Close the Oxygen Bottle Valve at the source bottle. Relieve the pressure in the oxygen line by depressing the High Pressure Oxygen Trigger. To return to cutting operations, first open the Oxygen Bottle Valve on the source tank and then open the Tank Fuel Valve.

14. STORAGE SHUTDOWN

14.1 Before the last cut of the day, close the fuel shutoff valve. During the last cut the pressure in the fuel line will be relieved, reducing spillage during disassembly. Perform the steps listed in “Normal Shutdown”.

14.2 Disconnect the Oxygen Hose from the Torch and Regulator.

14.3 Remove the Regulator from the Oxygen Bottle .

14.4 Install the transport safety cap on the Oxygen Bottle and secure the bottle in an approved storage area.

14.5 Unscrew the Fuel Tank Filler Cap until the sound of escaping air can be heard. Once the pressure has been completely relieved, remove the Filler Cap completely.

14.6 Remove the Fuel Hose from the Fuel Tank and place the hose end into the Fuel Tank. This is easiest when done

with two people. Hold the Torch above the level of the Fuel Tank and open the Fuel Control Knob on the Torch to eliminate any vacuum which might keep fuel in the line or Torch.

14.7 Working from the Torch to the Fuel Tank, push any remaining fuel out of the hose by holding the line above the Fuel Tank. Repeat this until no fuel drains from the hose into the Fuel Tank.

14.8 Remove the torch from the fuel line and allow both to fully air dry. **IMPORTANT:** NEVER STORE ANY OXY/FUEL SYSTEM IN AN AIRTIGHT CONTAINER OR COMPARTMENT. FLAMMABLE FUMES MAY COLLECT AND EXPLODE.

14.9 Drain the contents of the Fuel Tank into an approved storage container. If no container is available, the Petrogen Fuel Tank actually meets or exceeds the requirements for flammable liquid storage containers in most areas. It is a UL tested, ASME code pressure vessel.

Prolonged storage of fuel in the Fuel Tank or Torch will not damage the equipment. However, over time fuel will degrade and lose volatility. If the quality of the fuel has degraded to a point where performance is adversely affected, replace the fuel in the tank and lines. Remove old fuel and oily build-up by flushing the Fuel Hose using a ratio of one cup of fresh fuel per 25 feet of hose. Generally fuel will remain effective for 2-3 months when stored in the system. Fuel stabilizing additives may be used to extend fuel life.

15. READY LEVELS

15.1 Ready 1 should be used when cutting operations must be initiated in the shortest amount of time. Primed and ready for use, this is the highest level of system readiness.

Common usage: During daily operations, Rescue/Military Vehicles In Service.

- Fuel tank full and pressurized
 - Fuel in line
 - Fuel and oxygen hoses connected and secure
 - Fuel and oxygen off at the Torch
 - Fuel and oxygen off at the bottles
- a. PCS/SAR systems include oxygen valve protection. The Regulator may remain attached at all times including during transport.
 - b. Standard Systems do not include additional Oxygen Valve protection and Regulators should be disconnected from the Oxygen Bottle during vehicle transport.

15.2 Ready 2 is a safe way to store and transport the Petrogen System when use is intermittent. Keep in mind that it will be necessary to pressurize the fuel tank and prime the fuel line before cutting.

- Fuel in tank *NOT UNDER PRESSURE*
 - Fuel line empty
 - Fuel and oxygen hoses connected and secure
 - Fuel and oxygen off at the Torch
 - Fuel and oxygen off at the bottles
 - Regulator disconnected and safely stored
- a. PCS/SAR systems include oxygen valve protection. The Regulator may remain attached at all times including during transport.
 - b. Standard Systems do not include additional Oxygen Valve protection and Regulators should be disconnect-

ed from the Oxygen Bottle during vehicle transport.

15.3 Ready 3 is the appropriate way to store the Petrogen System for prolonged periods.

- Fuel tank empty and not under pressure
- Fuel line empty
- Regulator disconnected and safely stored
- Oxygen bottle turned off and stored with transport safety cap installed
- Fuel and oxygen hoses disconnected

* The above storage procedures are recommendations and may be modified to fit established SOP's

CUTTING BASICS

16. KEYS TO SUCCESS

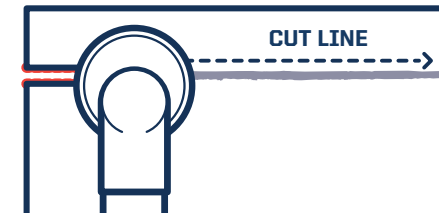
Performing clean, fast cuts requires practice. Make the following habits a standard part of cutting operations to greatly increase productivity and reduce the learning curve of the operator.

- Take the time to find a stable, comfortable position
- Use what's available to rest or stabilize the torch and/or the operators hand
- Use small, smooth movements
- Use a consistent speed of travel throughout the cut
- Pay extra attention at the beginning of the cut to ensure that the flame has completely penetrated the material before proceeding.
- If at any time sparks or molten material exits the cut

from a direction other than directly from the bottom of the material, examine the area, as the flame may not be fully penetrating the steel.

17. TORCH POSITIONING

17.1 Take time to analyze the precise path the cut will follow before lighting the torch. This path is called the Cut Line (Fig. 18). Identify and mark the cut line with soap stone or chalk. This will result in a smoother and thus faster cut.

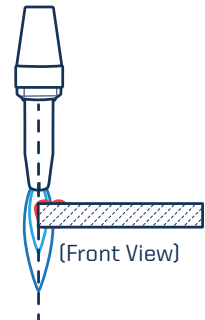


(Figure 18)

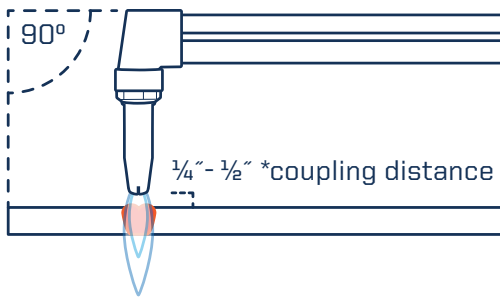
17.2 Preheat the steel along the cut line.

17.3 Position the preheat flame so that half of the flame is on the steel and the other half runs down the leading edge of the steel (Fig. 19).

17.4 Keep the torch perpendicular to the face of the steel while cutting (Fig. 20). This directs all of the energy of the pre-heat flame and high pressure oxygen jet directly into the steel, maximizing cutting efficiency and controlling hot material as it exits the cut.



(Figure 19)



*Coupling distance is the distance between the Tip and the material.

(Figure 20)

18. INTRODUCE HIGH PRESSURE OXYGEN

Once the steel becomes molten, depress the High Pressure Oxygen Trigger smoothly and fully. If ignition is lost, release the trigger and allow the preheat flame to bring the steel back to a molten temperature.

19. ASSESS THE CUT

It is best to assess and fix mistakes as they occur rather than waiting to the end of the cut and attempting to remember where they happened. The best indicator that the cut is not completely penetrating the steel is when the sparks move sideways rather than straight from the bottom of the cut. Any time this is observed, evaluate the area and do what is necessary to fix any problem.

20. STEEL IS THE FUEL

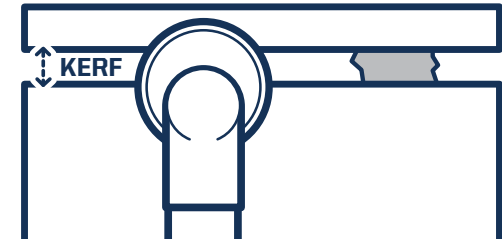
The BTUs generated by the burning steel produce the majority of the overall energy released in the cutting process. The preheat flame is simply the catalysis for ignition. When faced with difficult cutting scenarios, consider how the burning steel can be used to ignite layers beneath it. This is essential knowledge when cutting through air gaps, layers or difficult shapes because it is the contribution of BTUs

from the burning steel that allow these operations to be possible.

21. FAILED CUT

In the event that the steel does not fully separate after the cut is complete, you may need to go back and retrace a portion of the cut. Take the following actions:

- (1) Look down through the kerf to determine the point of attachment (Fig. 21). Tapping the metal may help to identify the snag.



(Figure 21)

- (2) Identify a point above or below the snag where the cut clearly penetrates completely through the material.
- (3) Begin a new cut with the intention of cutting around the snag at the bottom.

NOTE: A common operator mistake is holding the Tip in the middle of the kerf (the gap where steel was removed), and depressing the High Pressure Oxygen Trigger in an attempt to burn or dislodge metal or slag which is holding the cut together.

When only a small bridge of material exists, the fastest technique may be to begin a new cut adjacent to the bridge, allowing the molten steel from the cut to flow down and eliminate the snag. If there is substantial material holding the cut together it is advisable to make a new cut directly

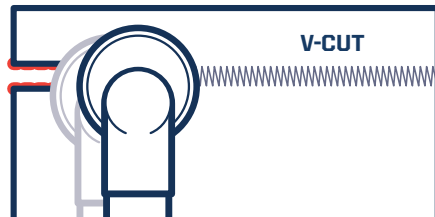
parallel to the original cut. It is important to move into the material deep enough to engage fresh steel. Generally 1/4 inch is sufficient.

Common causes for a cutting pass to fail include moving too quickly, stopping slightly short leaving a web on the bottom end, not using the appropriate tip size, or incorrect oxygen pressure for the tip size.

ADVANCED TECHNIQUES

22. V-CUT

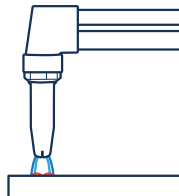
The V-Cut (Fig. 22) is a very subtle technique used to grab added steel from the top most layer of a stack to fuel the layers beneath. This added back and forth “V” motion is useful in situations when there is a significant buildup of debris between layers or there is difficulty achieving penetration through all layers.



(Figure 22)

23. HOLE PUNCHING

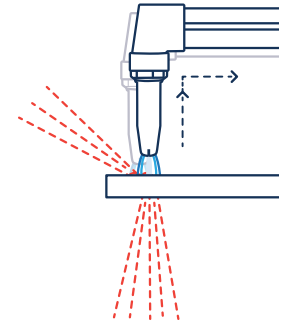
Place the preheat flame in the location of the desired hole (Fig. 23). Maintain a 1/4 inch coupling distance and observe beneath the preheat flame for a molten puddle to form. Once a molten puddle has formed and begins to drip (spider out) perform the follow-



(Figure 23)

ing three actions simultaneously.

- Smoothly engage the High Pressure Oxygen Trigger fully.
- Increasing the coupling distance 1/4 to 1/2 inch (Fig 24).
- Move the torch 1/4 to 1/2 inch left, right or back (Fig. 24).



(Figure 24)

The movement of the torch head will create a small trench which molten material and expanding gases will follow. The material will travel in the opposite direction of the movement of the torch. For example, to direct the material to the left, move the torch head right. Don't push the torch forward as this will direct the material toward the operator.

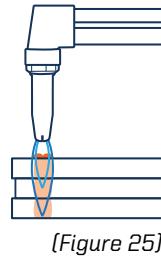
Once a hole has been pierced through the steel, the operator may enlarge the hole by keeping the High Pressure Oxygen Trigger depressed and moving the Torch in an outward spiral.

When this technique is performed properly, little or no popping will occur and the tip will be protected from overheating because the heat is directed away. Failure to use a proper hole punching technique may result in overheating the head of the torch or melting the Tip. Indications that this has occurred include: the Tip Nut becoming loose, and leaking around the Tip Nut due to melted O-rings on the Mixer (see Mixer Repair Pg. 41).

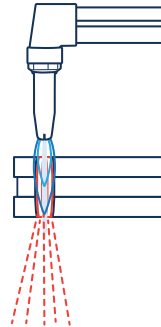
24. LAYER CUTTING

If the layers are exposed, preheat the cut line and down the

side of the material (Fig. 25) where the cut will be initiated before beginning the cut. If the layers are not exposed, begin by punching a hole (as described on page 30). Once the top-most layer becomes molten, depress the High Pressure Oxygen Trigger smoothly and fully, allowing the heat generated from the top layers to ignite the bottom layers before moving deeper into the cut.



When proceeding into the cut, executing the small, controlled 'V' pattern (see Fig. 22) will make penetrating the bottom layers much easier. Once through all layers (Fig. 26), proceed with the cut normally, using the 'V-Cut' technique whenever needed.

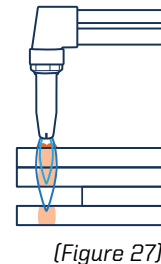


Watch the material as it leaves the bottom of the cut. If it does not exit directly from the bottom, as it would when cutting a solid piece, then the cut is probably not penetrating all of the layers.

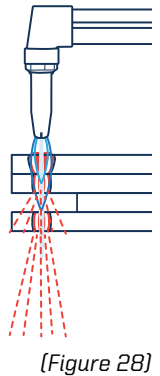
NOTE: When cutting layers, it is generally necessary to increase one tip size over the cutting chart recommendation for the solid equivalent of the cut thickness.

25. GAP CUTTING

Use the same techniques described in layer cutting. Preheat the cut line and down the side of the material (Fig. 27) where the cut will be initiated before beginning the cut. Once the top-most surface becomes molten, depress the High Pressure Oxygen Trigger. Maintain this position until the heat from the burning of



the top layers has passed through the air gap and ignited the layer(s) below (Fig. 28). As you move into the cut, make the "V" motion (see Fig. 22) to increase the heat of the cut. Watch the material as it leaves the bottom of the cut. If it does not exit directly from the bottom as it would when cutting a solid piece, then the cut is probably not penetrating all of the layers.



26. DRIVE TECHNIQUE

If there is a significant buildup of debris between the layers or there is difficulty achieving penetration through all layers, it may be necessary to increase the forward speed of the cut and increase the size of the 'V' until complete penetration is achieved. This technique will increase the heat significantly, allowing for deeper penetration. Note that there may be uncut layers at the start of the cut when using this technique.

MAINTENANCE

The Petrogen system requires very little day-to-day maintenance when operated properly. Most problems occur as a result of using a flame adjustment that is too lean (too much oxygen and not enough fuel). As described on Pg. 22, using a slightly rich flame adjustment eliminates this problem and significantly enhances overall performance.

27. TIP MAINTENANCE

Perform Tip maintenance when preheating performance and/or cut cleanliness has been noticeably reduced.

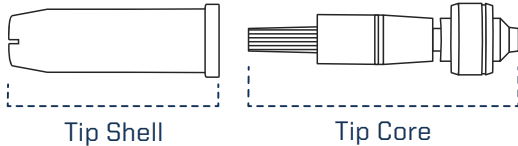
* A cleaner Tip will produce a cleaner cut. Clean the preheat flutes to produce a more consistent preheat flame. Clean the high pressure oxygen center hole to improve cut edge quality. Though cleaning the preheat flutes will produce a more stable flame, cleaning the high pressure oxygen center hole directly affects cut edge quality by enhancing laminar flow of the oxygen jet.

27.1 TIP ASSEMBLY & COMPONENTS



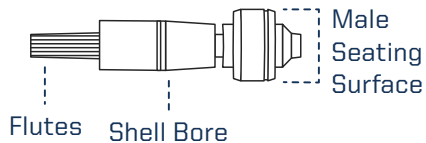
Tip Assembly

(Part #0, 1, 2, 3, 4, 5, 6, 7, 8, 81, 83, L, HHO, HH1, HH2, HH3, HH4, HH5, HH6)



Tip Shell

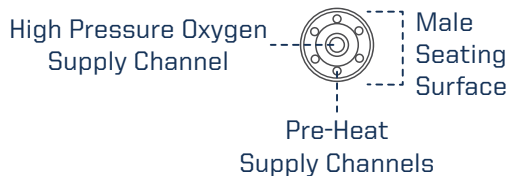
Tip Core



Flutes

Shell Bore

Male Seating Surface



High Pressure Oxygen Supply Channel

Male Seating Surface

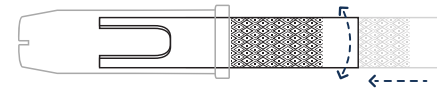
Pre-Heat Supply Channels

(Figure 29)

27.2 TIP REMOVAL - Using an adjustable wrench, loosen the Tip Nut by turning it counterclockwise. Remove the Tip Nut and Tip from the head of the torch, being careful not to drop the tip core.

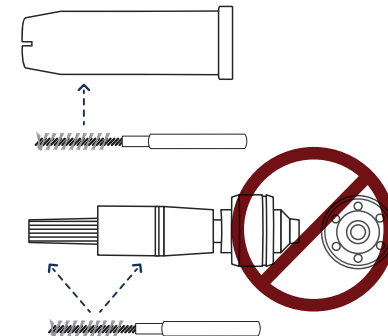
Note: To cool a hot Tip before removal, take the following actions. Briefly open the torch fuel control valve. The evaporating fuel will quickly cool the Tip to room temperature. Once the fuel exiting the Tip becomes a liquid immediately close the fuel valve.

27.3 Tip Reamer (Part # 4012) - Used to remove deposits from the slot inside of the tip shell.



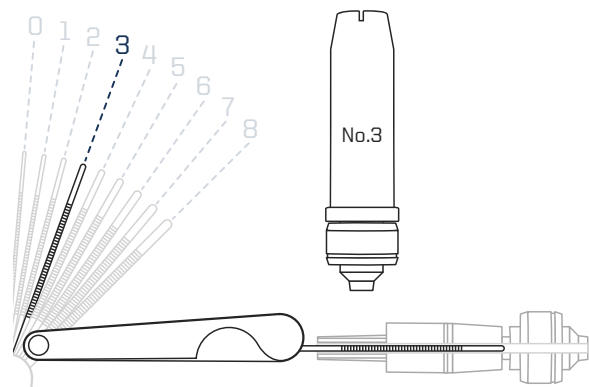
(Figure 30)

27.4 Two Part Tip Brush (Part #4013) - Used to remove slag from the Tip shell and the flutes of the Tip core. **DO NOT** use this brush or any abrasives on the seating surface of the Tip core where it mates with the Mixer inside the Torch Head (see Fig. 31).



(Figure 31)

27.5 Tip Drill Set (Part #4018) - Used to clear debris from the high pressure oxygen center hole, as shown in figure 32. The nine drills in the set correspond to the nine Tip sizes. The brass brush can be used to clean the Tip core flutes as well as remove slag from around the high pressure oxygen center hole.



(Figure 32)

28. PACKING NUT MAINTENANCE

Packing Nut maintenance should be performed regularly between uses or if valve leaking/weeping is observed.

Use the included Packing Nut Wrench found in the Standard Tool Kit to check the following packing nuts for snugness:

- (1) Pre-Heat Oxygen Packing Nut** - located under the Pre-Heat Oxygen Knob on the Torch (see Fig. 8).
- (2) Fuel Control Packing Nut** - located under the Fuel Control Knob on the Torch (see Fig. 9).
With the Adjustable Wrench, check:
- (3) Fuel Valve Packing Nut** - located under the Fuel Valve on the Liquid Fuel Tank (see Fig. 10).

The packing nuts should be snug at all times to ensure proper valve seal. If desired, knob tension can be adjusted by increasing the tightness of the packing nuts.

TROUBLESHOOTING

29. LIFETIME WARRANTY

Any Petrogen product found to be defective in materials or craftsmanship will be repaired or replaced at no charge during the warranty period (25 Years). Petrogen may require the product to be returned to the factory for examination. Return transportation charges will be at the customer's expense; replacement transportation charges will be at Petrogen's expense.

The "Petrogen Warranty" will be considered void if the product has been subject to misuse, negligence, accident, misapplication, modification, used with other than OEM components, or repaired by unauthorized personnel.

Please do not hesitate to contact Petrogen for assistance:

- 1-877-88-TORCH (877-888-6724)
- torch@petrogen.com

30. SYSTEM TROUBLESHOOTS

30.1 DIFFICULTY LIGHTING THE TORCH

- Check Torch settings (see Pg. 20)
- Check Regulator settings (see Pg. 15)
- Check Fast Flow Check Valve (see 9.2.1)
- Check Mixer Wick (see Pg. 41)

- Fuel Stream Check (see Pg. 40)

30.2 FUEL LEAKS

30.2.1 TIP

- Fully close the torch Fuel Control Valve

30.2.2 TIP NUT/ TORCH HEAD

- Loosen and retighten the Tip Nut
- Check Mixer O-ring(s) (see Pg. 41)

30.2.3 TORCH HANDLE WEEP HOLE/S

- Contact Petrogen for warranty service

30.2.4 FUEL CONTROL KNOB

- Tighten the packing nut under the knob

30.2.5 FUEL HOSE / TORCH HOSE CONNECTOR

- Remove the Fuel Hose and clean the threads and mating surfaces

30.2.6 FUEL HOSE /TANK FUEL HOSE CONNECTOR

- Remove the Fuel Hose and clean the threads and mating surfaces

30.2.7 SHUT-OFF VALVE

- Tighten the compression fitting below the Fuel Control Knob

30.2.8 PUMP CYLINDER

- If fuel is leaking past the Pump Cylinder Check Valve, the first indication will be the pump handle raising by itself.
- Release the Fuel Tank pressure by unscrewing the Filler Cap until air begins to escape
- Replace the Pump Check Valve Seal (see 34.9)

30.3 OXYGEN LEAKS

30.3.1 TIP

- Check High Pressure Oxygen Valve (see Pg. 44)

30.3.2 PRE-HEAT OXYGEN KNOB

- Tighten packing nut under the knob

30.3.3 OXYGEN HOSE / TORCH HOSE CONNECTOR

- Remove the Oxygen Hose and clean the threads and mating surfaces

30.3.4 OXYGEN HOSE / REGULATOR

- Remove the Oxygen Hose and clean the threads and mating surfaces

30.3.5 REGULATOR / OXYGEN BOTTLE VALVE

- Use a plastic bristle brush to clean the threads of the Regulator Valve Connector and the threads of the Oxygen Bottle Valve
- Never use liquids or abrasives to clean this connection
- Carefully inspect the components for debris before reassembling

30.4 FUEL TANK PRESSURE

30.4.1 DIFFICULTY PRESSURIZING THE FUEL TANK

- Check the Leather Pump Cup (see 34.4)
- Check the fuel level in the Fuel Tank (see 7.3)
- Use smooth, complete strokes when pumping

30.4.2 FUEL TANK LOSES PRESSURE WHEN NOT IN USE

- Make sure the Filler Cap Gasket is in place

- Contact Petrogen Customer Service for warranty repair

30.5 POPPING

- Loosen and retighten the Tip Nut
- Inspect the seating surfaces of the Tip and replace the Tip if necessary

30.6 FLICKERING OR UNSTABLE FLAME

- Clean the Tip
- Check Torch settings (see Pg. 20)
- Check Mixer Wick (see Pg. 41)



REPAIRS

31. FUEL STREAM CHECK

If little or no fuel exits the Tip when the Fuel Tank and Torch valves are open, perform the following test to determine the location of the restriction.

NOTE: Because the problem may be an accidental activation of the Fast Flow Check Valve, reset the valve before beginning the test (see 9.2.1).

NOTE: Safety Glasses are required safety equipment for the Fuel Stream Check.

- Perform this test with the Oxygen Bottle Valve open and the Oxygen Hose pressurized. (This will protect the oxygen system from fuel contamination during the test.)
- Begin the test with the Torch Fuel Control Knob and Pre-Heat Oxygen Knob closed.



(1) Remove the Tip and Mixer from the head of the Torch (see Fig. 37 A-C).

(2) In a well lit area, look straight down into the head of the Torch.

(3) Open the Fuel Control Knob on the Torch and look for a small focused stream of liquid fuel (Fig. 33) to enter the head of the Torch.

(4) Close the Fuel Control Knob.

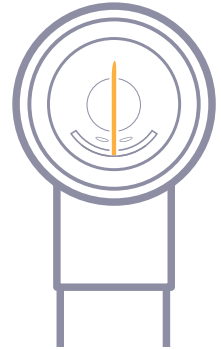
(5) If the stream is present, fuel is passing through the system normally and the restriction is after the head of the Torch. Take the following action.

- Replace the Wick (Part #1802) located on the Mixer (see Pg. 44).
- Replace the Tip
- Reinstall the Mixer and Tip into the head of the Torch (see Fig. 38 A-C).

If no stream is present, contact Petrogen for additional assistance.

(6) Perform the following Special Purge before continuing. Press the High Pressure Oxygen Trigger and open the Pre-Heat Oxygen Knob simultaneously. Keep both valves open until fuel no longer exits the tip.

NOTE: Avoid pressing the High Pressure Oxygen Trigger when performing the test as this may blow fuel into the face of the operator.



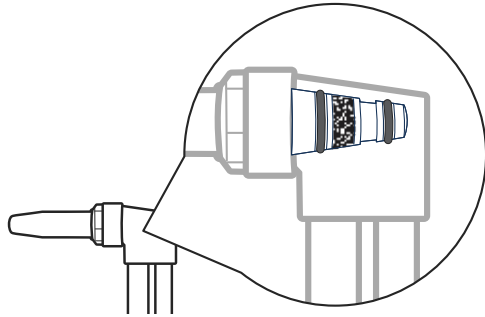
(Figure 33)

32. MIXER REPAIR

The Mixer is located inside the Torch Head (see Fig. 34). Its function is to mix oxygen and liquid fuel to supply the pre-

heat flame.

The Mixer does not require regular maintenance, however it may require attention if any of the following problems is encountered.



(Figure 34)

Fuel leaks from between the Torch Head and Tip Nut

- Replace Small and/or Large O-ring(s)

Popping occurs

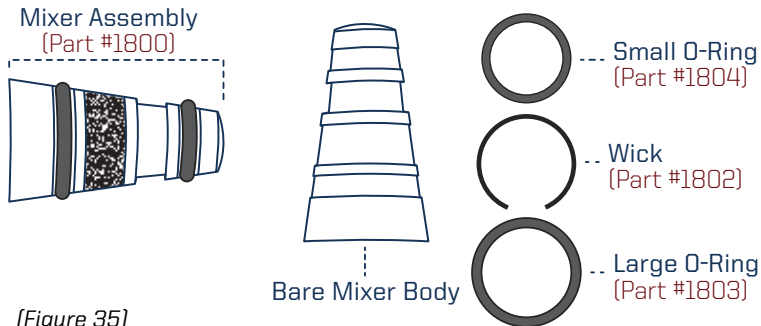
- Clean the Tip and/or Mixer seating surfaces

Dying flame or no fuel flow to the Tip

- Replace Mixer Wick
- See fuel stream test

NOTE: Running the Torch with a rich fuel setting will keep both the Tip and the head of the torch cool, preventing damage to the Mixer O-rings and Wick.

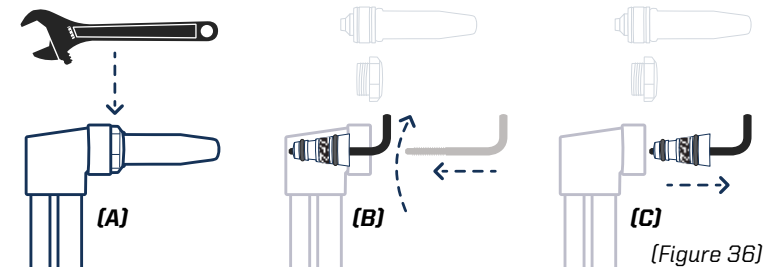
32.1 MIXER ASSEMBLY & COMPONENTS



(Figure 35)

32.2 MIXER REMOVAL:

- Using the Adjustable Wrench (Part #6022), remove the Tip Nut and Tip from the Torch Head (Fig. 36 A). Be careful not to drop the tip core when removing the tip.
- The Mixer sits directly beneath the tip inside the head of the Torch. Slide the Jackscrew (Part #4016), which can be found in the Tool Kit, into the center hole of the Mixer and turn it clockwise (Fig. 36 B). Keep turning the Jack Screw until the Mixer is pulled from its position in the head (Fig. 36 C).



(Figure 36)

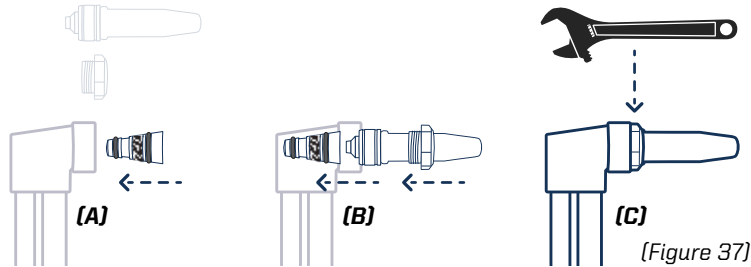
32.3 O-RING & WICK REPLACEMENT:

- Remove the damaged O-rings and replace them with the provided spares from the Standard Spare Parts Kit (Part #4002). There is one large and one small O-ring. Sometimes damage to the O-rings is not obvious. Overheating can reduce the elasticity of the O-ring, keeping it from forming a complete seal inside the head of the torch.
- Remove the damaged Wick and replace it with the provided spare from the Spare Parts Kit. A Damaged Wick will have a brown “cooked” appearance. Severe overheating can fuse the centered bronze, reducing fuel flow into the Mixer.

32.4 MIXER INSTALLATION:

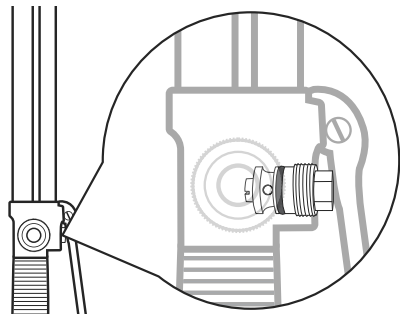
- To install the Mixer, place it small side down into the Torch Head (Fig. 37 A), and push it into position by hand.
- Replace the Tip and Tip Nut (Fig. 37 B).
- Tightening the Tip Nut will complete the Mixer seating process (Fig. 37 C).
- Following the initial tightening of the Tip Nut to seat the mixer, loosen and re-tighten the Tip Nut to ensure the Tip is properly seated into the Torch Head.

Do not overtighten the Tip Nut. Doing so will lead to premature wear of the Torch Head.



33. HIGH PRESSURE OXYGEN VALVE REPAIR

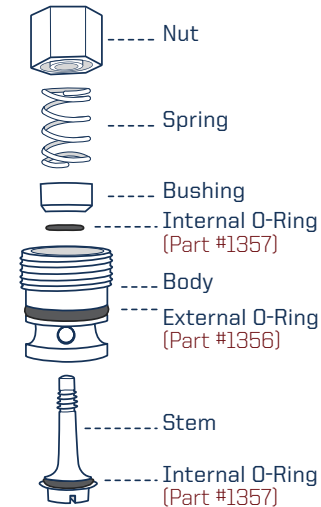
Located under the High Pressure Oxygen Trigger (see Fig. 38), The High Pressure Oxygen Valve regulates the flow of high pressure oxygen through the torch. Perform valve maintenance if the torch exhibits the following behavior.



Oxygen leaks from the Tip center hole while the Pre-Heat Oxygen Knob is fully closed and High Pressure Oxygen Trigger is disengaged.

- Replace High Pressure Oxygen Valve
- Replace High Pressure Oxygen Valve Internal O-ring

33.1 HIGH PRESSURE VALVE ASSEMBLY & COMPONENTS



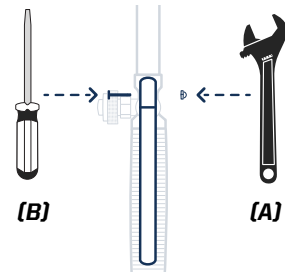
(Figure 39)

33.2 HIGH PRESSURE OXYGEN VALVE REMOVAL:

- Shut off the oxygen supply to the Torch by closing the Oxygen Bottle Valve and depressing the High Pressure Oxygen Trigger on the torch.
- Use the Adjustable Wrench to remove the Lever Nut

(Part #1403) from the Lever Assembly (Part #1401) as shown in figure 40 A.

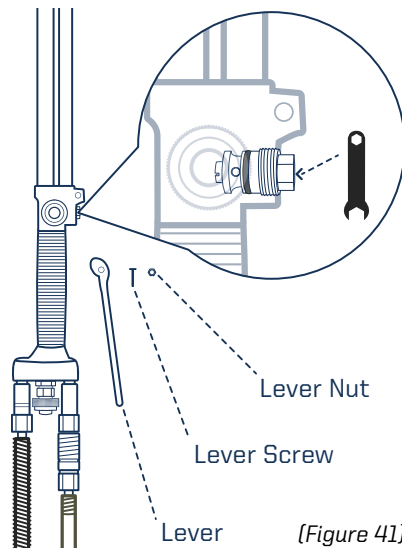
- Use a Flat Head Screwdriver to remove the Lever Screw (Part #1404) from the Lever and center body of the Torch as shown in figure 40 B.



[Figure 40]

- Using the Packing Nut Wrench (Part #4011), provided in the Standard Tool Kit (Part #4003), place the wrench over the exposed hex nut on the top of the High Pressure Valve (Fig. 41) and turn it counter clockwise to remove it.

- Install the spare High Pressure Valve found in the spare parts kit. To repair the valve proceed to the next step.

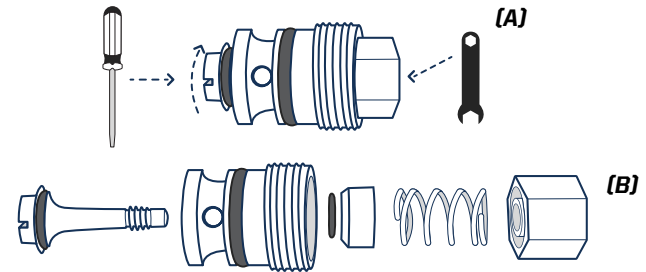


[Figure 41]

33.3 HIGH PRESSURE OXYGEN VALVE DISASSEMBLY:

- Place the Packing Nut Wrench over the High Pressure Valve Nut. Using a Flat Head Screwdriver, turn the head of the High Pressure Valve Stem counterclockwise as shown in Fig. 42 A.
- Remove the High Pressure Valve Stem from the High Pressure Valve. The Nut and Spring will then be released from the assembly (Fig. 42 B). The Bushing and Internal

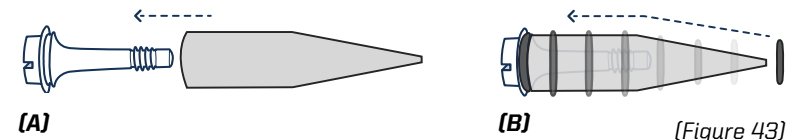
O-ring will remain inside the High Pressure Valve Body until gently pushed out.



[Figure 42]

33.4 O-RING REPAIR:

- Remove the damaged O-ring.
- Replace the damaged O-ring with a spare found in the Spare Parts Kit.
- If the High Pressure Valve Stem O-ring is damaged take the following action.
 - Slide the High Pressure Valve Stem Internal O-ring Installation Tool (Part #4017) provided in the Standard Parts Kit (Part #4002), over the High Pressure Valve Stem (Fig. 43 A). The tool allows the replacement O-ring to be rolled into position on the High Pressure Valve Stem (Fig. 43 B).



[Figure 43]

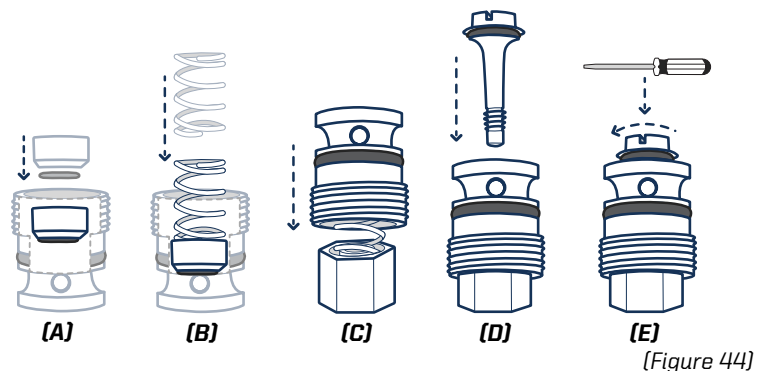
33.5 HIGH PRESSURE OXYGEN VALVE ASSEMBLY:

- Insert the O-ring and Bushing into the Valve Body with the O-ring facing down (Fig. 44 A).
- Hold the Bushing in place using the Spring (Fig. 44 B).

- While holding the assembly together, slide the Spring into the Nut (Fig. 44 C).
- Push the Valve Body down so that the spring is compressed and the nut slides into the Valve Body.

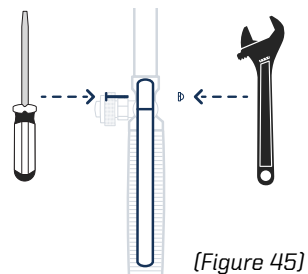
NOTE: It may be necessary to rotate the Nut slightly so that it aligns properly with the Valve Body

- With the spring compressed, slide the Valve Stem through the Valve Body and screw it into the Nut on the opposite side (Fig. 44 D).
- Use the Packing Nut Wrench to hold the Nut and tighten the Valve Stem with a flat head screwdriver until it is snug (Fig. 44 E).



33.6 HIGH PRESSURE OXYGEN VALVE INSTALLATION:

- Inspect the High Pressure Valve hole in the Torch Centerbody to ensure it is free of debris.
- Insert the High Pressure Valve into the hole in the Centerbody with the Nut facing up.



- Use the provided Packing Nut Wrench to tighten the High Pressure Valve in the Centerbody.
- Replace the Lever, Screw and Nut (Fig. 45).

NOTE: Place one drop of thread lock on the threads of the Lever Nut.

34. PUMP ASSEMBLY REPAIR

Located on the Fuel Tank (Fig. 46), the Pump Assembly is comprised of two assemblies: the Pump Cylinder Assembly and the Pump Shaft Assembly. Perform Pump Assembly maintenance if the following behaviors are observed.

No resistance is felt when Pumping

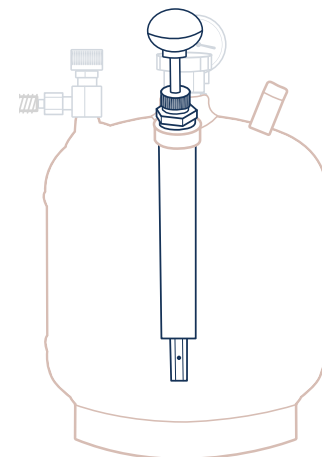
- Lubricate and/or replace the Leather Pump Cup

Tank pressure does not build when pumping

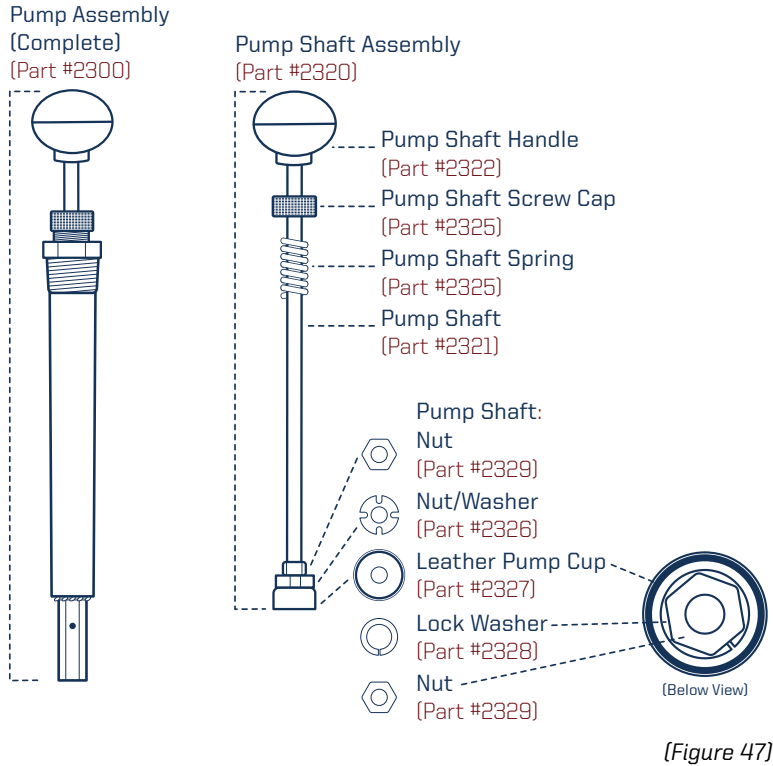
- Lubricate and/or replace the Leather Pump Cup
- Tighten Filler Cap
- Add fuel (see Pg. 17)

Pump Handle raises by itself

- Replace Pump Cylinder Seal
- Contact Petrogen for warranty service



34.1 PUMP ASSEMBLY (COMPLETE), PUMP SHAFT ASSEMBLY & COMPONENTS



34.2 REMOVING THE PUMP SHAFT ASSEMBLY:

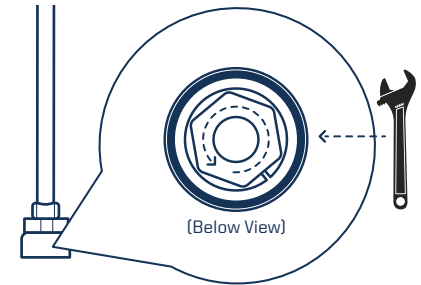
- Unscrew the Pump Shaft Screw Cap from the pump cylinder.
- Pull the pump shaft out from the cylinder.
- Inspect the Leather Pump Cup.
 - The Pump Cup should be well lubricated and moist to the touch.

34.3 LEATHER PUMP CUP LUBRICATION:

- If the Leather Pump Cup is dry to the touch, lubricate it with a medium viscosity oil.
- Firearm lubricants have proven to be ideal, however heavier lubricants like motor oil and lighter aerosol lubricants may also be used.

34.4 LEATHER PUMP CUP REPLACEMENT:

- Use the Adjustable Wrench to remove the Pump Shaft Nut located under the Leather Pump Cup (Fig. 48).
- Remove the Lock Washer and the old Leather Pump Cup.
- Replace the old pump cup with the provided spare located in the Spare Parts Kit (Part #4002).
- Replace the Lock Washer and Pump Shaft Nut, tightening the nut until it is snug.



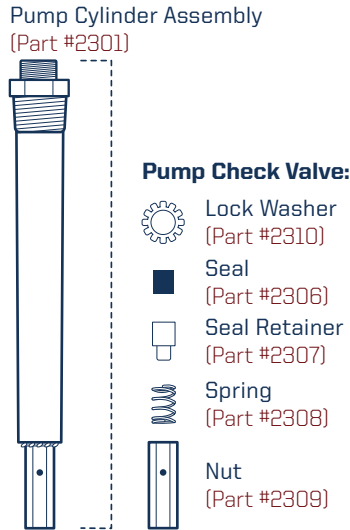
34.5 PUMP SHAFT INSTALLATION:

- Splay the Leather Pump Cup open to increase the tension against the wall of the Pump Cylinder (this will increase efficiency while pumping).
- Place one edge of the Leather Pump Cup into the Pump Cylinder.
- Using a twisting motion, squeeze the Leather Pump Cup into the Pump Cylinder.
- Push the Pump Handle to the bottom of the Pump Cylinder and screw the Pump Shaft Screw Cap

back to the Pump Cylinder.

34.6 PUMP CYLINDER ASSEMBLY & COMPONENTS

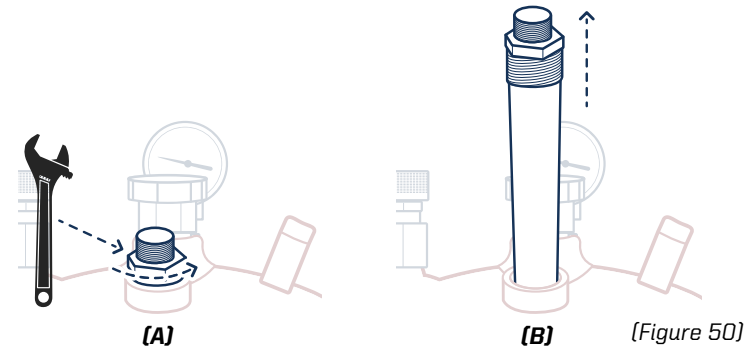
If the Pump Handle is pushed up by the pressure in the Fuel Tank, or if fuel is observed leaking from the Pump Assembly, please contact Petrogen directly to process a warranty repair. If the unit must be repaired in the field, take the following steps.



[Figure 49]

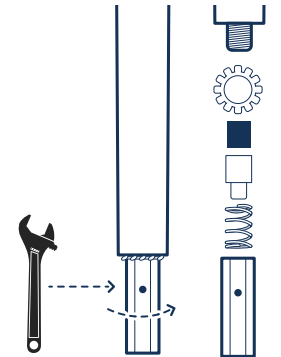
34.7 REMOVING THE PUMP CYLINDER ASSEMBLY:

- Discharge the tank pressure by opening the Filler Cap until the sound of escaping air can no longer be heard.
- Do not remove the Filler Cap completely until the Fuel Tank pressure has reached “0”.
- Remove the Pump Shaft as described in “REMOVING THE PUMP SHAFT ASSEMBLY” (see 34.2).
- Hold the Fuel Tank securely and, using a large adjustable wrench, unscrew and remove the Pump Cylinder Assembly (Fig. 50 A).



34.8 PUMP CHECK SEAL REPLACEMENT:

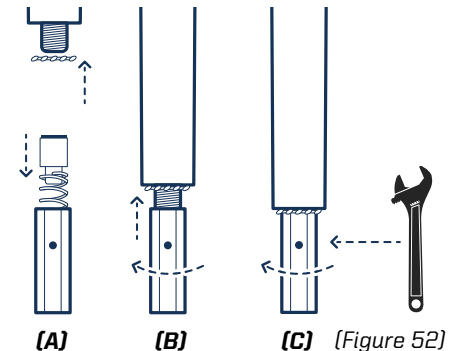
- Use the Adjustable Wrench to unscrew the Pump Check Valve Nut from the cylinder (Fig. 51).
- Remove the Pump Check Valve Seal, Seal Retainer, and Spring.
- Replace the Check Valve Seal with the spare located in the Spare Parts Kit (Part #4002).



[Figure 51]

34.9 ASSEMBLING THE PUMP CYLINDER:

- Place the Spring, Retainer and Seal back into the Nut as shown in figure 52 A.
- Place the Lock Washer over the threaded nipple and screw the Nut back onto the pump cylinder tightening it snugly with the Adjustable



Wrench (Fig. 52 B&C).

34.10 PUMP CYLINDER INSTALLATION:

- Clean the threads of the Pump Cylinder and Fuel Tank making sure that no PTFE tape or dirt remains.
- Make two complete wraps of the Pump Cylinder threads with new Teflon tape.
- Place the Pump Cylinder back into the Fuel Tank, and tighten it with the Adjustable Wrench.
- Reinstall the Pump Shaft as described in “PUMP SHAFT INSTALLATION” (see 34.5).
- Pressurize the tank and then perform a leak test using soapy water.
- If the tank leaks, tighten the fitting further.



Your System Is Under Warranty

Please do not hesitate to contact us for assistance:

- 1-877-88-TORCH (877-888-6724)
- torch@petrogen.com

For additional resources, visit:

- www.petrogen.com/training
- www.petrogen.com/videos

This manual is available online at:

- www.petrogen.com/training





TIP SELECTION CHART

AMERICAN

Pounds / Inches²

Tip No.	Inches	Fuel	Oxygen
0, HH0	0 - ¼	10 - 20	12 - 17
1, 81, HH1	¼ - 1	10 - 20	17 - 25
2, HH2	1 - 2	10 - 20	25 - 35
3, 83, HH3	2 - 4	10 - 20	35 - 40
4, HH4	4 - 6	12 - 20	40 - 50
5, HH5	6 - 8	14 - 20	50 - 60
6, HH6	8 - 10	16 - 20	70 - 80
7	10 - 12	18 - 20	80 - 100
8	12 - 14	20	120+
L	Heating	18-20	100

METRIC

KPA

Tip No.	MM	Fuel	Oxygen
0, HH0	0 - 7	70 - 140	80 - 120
1, 81, HH1	7 - 25	70 - 140	120 - 180
2, HH2	25 - 50	70 - 140	180 - 250
3, 83, HH3	50 - 100	80 - 140	250 - 280
4, HH4	100 - 150	80 - 140	280 - 350
5, HH5	150 - 200	100 - 140	350 - 420
6, HH6	200 - 250	110 - 140	490 - 560
7	250 - 300	130 - 140	560 - 700
8	300 - 350	140	80+
L	Heating	130 - 140	700