

# **Pump Unit 1-2**

## **PyroLance L 1000-W-D Operations**

### **Lesson Goal**

After completing this lesson, the student shall be able to summarize procedures and guidelines for the operations of the PyroLance L 1000-W-D following the policies and procedures set forth by PyroLance North America LLC.

### **Objectives**

Upon successful completion of this lesson, the student shall be able to:

1. Conduct a pre use inspection
2. Operate the unit in Normal Operation Mode.
3. Operate the unit in Emergency Operation Mode.
4. Fill Abrasive Tank.
5. Replace the Transmitter Battery & reprogram in the nozzle.
6. Shut down and ready unit for next use.
7. Winterize unit.
8. Trouble Shoot Basic issues.

## Instructor Information

This lesson covering the PyroLance L 1000-W-D operations for both water and Pyro shot will demonstrate the UHP fog stream and the piercing capabilities of the PyroLance Piercing nozzle. The purpose of this lesson is to provide the student with an understanding of full operations of the L 1000-W-D and what UHP with Piercing capabilities consist of and guidelines for using UHP/Piercing nozzles. While this lesson specifically covers PyroLance L 1000-W-D and the PyroLance Piercing nozzle operations, the instructor should always stress firefighter safety throughout the course. **You should emphasize that safety must be a priority for all firefighters in every situation they may encounter.**

Important instructor information is provided in shaded boxes throughout the lesson plan. Carefully review the instructor information before presenting the lesson. Use this lesson to initiate discussion on safety issues in the fire service. Supplement this lesson with current case studies involving safety issues in the fire service.

## Methodology

This lesson uses demonstration in the field, discussion, and skills practice. The level of learning is application.

### Estimated Total Time: 2-4 hours

Field teaching/demonstration:	30 minutes
Skills Practice:	20 minutes/student

Time	Section/Activity	
10 min.	Walk through the entire PyroLance L 1000-W-D Unit	

<p>20 min.</p>	<p>Demonstrate the use of the PyroLance L 1000-W-D and the PyroLance Piercing Nozzle:</p> <ul style="list-style-type: none"> <li>• Pump Unit Inspection                             <ul style="list-style-type: none"> <li>○ Check Engine Oil</li> <li>○ Check the clean water strainer</li> <li>○ Check Anti-freeze tank (if applicable)</li> <li>○ Check Fuel</li> <li>○ Check &amp; Fill abrasive tank</li> </ul> </li> <li>• Nozzle Inspection                             <ul style="list-style-type: none"> <li>○ Check Hoses</li> <li>○ Check Battery</li> <li>○ Battery Replacement/reprogramming</li> <li>○ Confirm Signal between Transmitter/Receiver Unit</li> <li>○ Connect nozzle</li> <li>○ Show use of Emergency Override</li> <li>○ Show Emergency Stop</li> </ul> </li> <li>• Flow Water                             <ul style="list-style-type: none"> <li>○ Show misting &amp; distance</li> </ul> </li> <li>• Flow Pyro Shot                             <ul style="list-style-type: none"> <li>○ Select object to pierce</li> <li>○ Pierce object</li> </ul> </li> </ul>	
<p>20 min.</p>	<p>Choose one student to demonstrate the use of the PyroLance L 1000-W-D and the PyroLance Piercing Nozzle:</p> <ul style="list-style-type: none"> <li>• Walk thru PPE Requirements</li> <li>• Demonstrate correct operations of the L 1000-W-D Unit</li> <li>• Demonstrate Manual &amp; Automatic operations</li> <li>• Demonstrate correct shut down procedures</li> <li>• Demonstrate Emergency Stop Procedures</li> <li>• Demonstrate correct cleanup operations.</li> </ul>	
	<p>Skills Practice</p>	

10 min	Summary and Review	
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### **Audiovisuals/Handouts**

- PyroLance L 1000-W-D and PyroLance Piercing Nozzle video
- PyroLance L 1000-W-D Operations, installation & parts Manual

### **Evaluation**

- Skill Sheet 1-2
- Skill Sheet 2-1

### **Standards**

- NFPA 1500 – Standards on Fire Department Occupational Safety and Health Program
- NFPA 1971 – Standard on Protective Ensembles for Structure Fire Fighting and Proximity Fire Fighting.

**Section I: Introduction to Unit 1-1***10 min.***I.INTRODUCTION TO UNIT 1-1****A. Lesson Goal**

**Instructor Note:** Briefly review the lesson goal. Answer any questions about the goal. Emphasize that the purpose of the lesson is to familiarize the students with the correct operations of the PyroLance L 1000-W-D & the PyroLance Piercing Nozzle

Unit 1 lesson goal — after completing this lesson, the student shall be able to correctly start, run and ready the PyroLance L 1000-W-D and demonstrate the correct techniques when using the PyroLance Piercing Nozzle with both water and Pyro Shot for piercing, following the policies and procedures set forth by PyroLance North America LLC and the authority having jurisdiction (AHJ).

**Safety Note:** Explain First Aid Procedures involving injuries sustained by UHP equipment and how to avoid them.

**Instructor Note:** Discuss the use of UHP and UHP with Piercing when deciding your tactical operations on the fire ground. Explain some examples such as: Attic fires, Cellar fires, Compartment fires pre ventilation. Discuss the safety considerations during UHP operations. Explain the advantages of the piercing concept and how the UHP water mist affects fire.

**Section II:** Demonstrate the prestart check, starting, running and after use readiness of the PyroLance L 1000-W-D Unit

*30 mins.*

## II. DEMONSTRATE THE STARTING, RUNNING AND AFTER USE READIENESS OF L 1000-W-D

**Instructor Note:** The purpose of this section is to walk through each step of the operations of the PyroLance L 1000-W-D, showing the students both the automatic and the manual operations. See pages 17-19 of the L 1000-W-D Manual.

**Page 17-19**

### Preparing the unit for operations

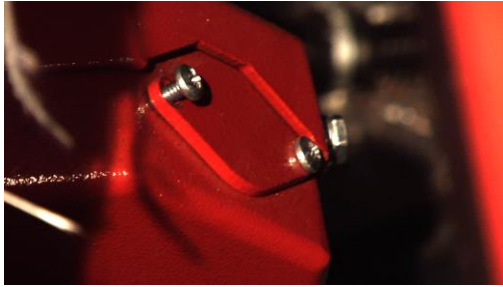
**Instructor Note:** It is very important to stress the difference between a low pressure pump and a UHP system and why the preoperational inspection is crucial.

1) Check the Engine oil.



2) Check the Pump oil.





### 3) Inspect the belts.

- Located be at back of unit in the center.

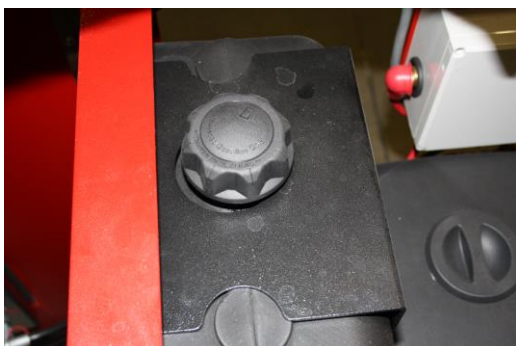


### 4) Inspect the clean water strainer.

- When re-installing the unit, turn clockwise, hand tight until snug and check for leaks.
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### 5) Check water tank level and open tank to pump valve.



### 6) Check Fuel tank level.

- Only use Unleaded fuel do not use ethanol blended fuels.



- 7) Connect PyroLance nozzle to hose and ensure safety lock in engaged.



- 8) Check and fill the abrasive tank.  
Abrasive tank filling procedures:

- a) Verify the unit is **OFF** and the **Emergency Stop** button is depressed.
- b) Verify the system is totally DE-PRESSURIZED. To check: depress the nozzle trigger.
- c) Using the 2 1/8" (54mm) wrench, remove the filler plug counter clockwise.
- d) Slowly pour 2.5 gallon of PyroShot abrasive into abrasive vessel. Water will spill out as the abrasive is filled.
- e) Rinse threads with water and inspect O-ring.
- f) Thread the filler plug into the vessel and tighten by hand until bottoms. Carefully use the wrench to tighten the plug.



LED indicator Water Trigger Light/Battery Status Light

- 9) Verify communications between nozzle and power unit.



## **Replacement of Remote Control Signal Transmitter Battery**

### **Page 35 of Operation Manual**

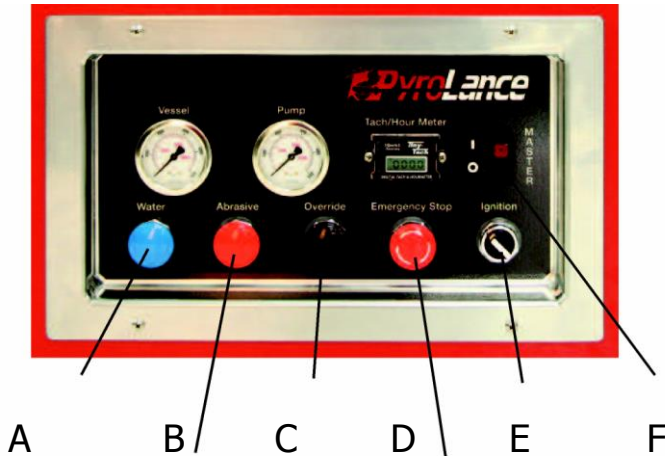
**Instructor Note:** Do not depress the trigger or cycle the abrasive switch while the batteries are removed. This will delete the memory and require reprogramming of the Transmitter/Receiver unit.

- a) Using a Phillips screwdriver, remove the 6 screws holding the cover. (See photo 1 below).
- b) Remove the cover. (See photo 2 below)
- c) Lift out the transmitter.
- d) Using Phillips screwdriver, remove the screw and transmitter cover.
- e) Replace 2 AAA batteries and repeat steps a-d in reverse.



**Page 20-26****Starting the Unit**

**Instructor Note:** This section will include both the unit/pump operator and the Nozzleman. It is important to clarify who is to do what during the demonstration to the students.



1. Prior to start the operator must ensure that a proper inspection has been completed.
2. Operator to ensure that the **EMERGENCY STOP BUTTON** is released by twisting clockwise, which is the **ON** position ("D" in picture to the left).
3. Operator must verify that the PyroLance Nozzle is correctly connected.
4. Extend the hose to the working location and lock the hose reel prior to the Nozzleman pulling the trigger on the nozzle.
5. Operator warns personnel that the unit will be started.
6. Operator turns the master switch to the on position "F" in picture to the left. Turns the ignition switch on like a key in a car.

**Trouble Shooting:****ENGINE DOESN'T START UP:**

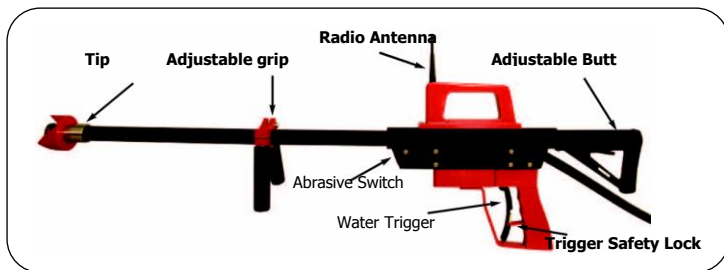
- a) Check Emergency Stop button is released.
- b) Check fuses located in unit electrical box.
- c) Check Battery connections.
- d) Check Fuel level in fuel tank.

**ENGINE DOESN'T SPEED UP WHEN TRIGGER PULLED:**

- a) Check power supply and steady green light at the receiver.
- b) Check battery in Nozzle transmitter assembly.
- c) Check fuses located in unit electrical box.

**Page 21-23****Normal Operations of L 1000-W-D**

**Instructor Note:** Normal operations are described as: Control of the power unit from the PyroLance Piercing Nozzle is accomplished by a remote-controlled wireless radio signal. See Page 21 of the operations manual.



1. Correct Pre-use inspection of Nozzle.

Make sure that all components of the PyroLance Piercing nozzle are gone over and that the students can identify each component.

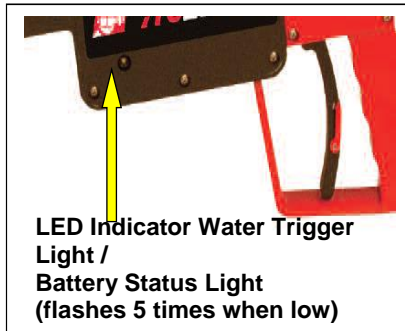


2. Engage the trigger safety lock prior to use.
3. Explain muzzle discipline as they would use a hunting rifle.

**Safety Note:** Explain Muzzle Discipline concept when one is hunting to equate the safety issues with the nozzle tip and where it is pointed. Observe a minimum of 15 feet (4.6m) safety radius around the nozzle operator.

4. Connect PyroLance Piercing nozzle to hose and engage safety lock.
5. Adjust Tripod stand grip & Adjustable Butt to fit.

## 6. Test trigger switch with pump unit...



**Instructor Note:** The LED light will flash 5 times when battery is low.

- Show signal between Transmitter/Receiver unit.
- Demonstrate Battery replacement.
- Demonstrate Emergency Override Procedure.
- Demonstrate Re-Programming of receiver/Transmitter unit.

## 7. Pull trigger and spray water into the air, spray then release trigger.

**Instructor Note:** This is a great opportunity to demonstrate the UHP water stream and discuss the droplet size. Explain the significance of "Hang time" in terms of increasing the humidity to 30%.

### **Trouble Shooting: Piercing Nozzle Problems**

#### **No water flow:**

- a) Check tank to pump valve is open
- b) Prime system
- c) Check water level in tank
- d) Check for leakages in system
- e) Check water filter
- f) Check Nozzle tip for blockage

#### **Water still flows after trigger release:**

- a) Check for air bubbles in abrasive tank
- b) Stop engine, while power still **ON**, and pull trigger, observe automatic valve action.

#### **Penetrating operations not cutting:**

- a) Check Abrasive level in tank
- b) Check operation of abrasive flow control valve.
- c) Check operating pressure on pressure vessel (loss of more than 500 PSI will indicate worn-out nozzle)

#### **Excessive spray back during piercing**

- a) Check nozzle tip angle and adjust if needed.
- b) Check for worn end plate.
- c) Check for worn nozzle tip.



8. Place nozzle against object to be pierced and demonstrate correct Nozzle placement.

**Instructor Note:**

- External spray is visible during penetration (cutting) of the target.
- Little or no external spray is visible after penetration is completed

**Trouble Shooting: If the Lance is not piercing, check the following in this order:**

1. Is the Abrasive switch on
  - a. If not, turn switch on
  - b. If on, is there abrasive flowing
  - c. If no abrasive flowing, check operation manual for unit on replacing abrasive.



9. Nozzle man to engage abrasive switch and check that LED light is on which indicates abrasive flow.

**Trouble Shooting: If the light does not go on:**

- Check Antenna is up
- Demonstrate Battery Replacement
- Demonstrate Reprogramming Procedure

10. Turn off abrasive switch once piercing evolution is complete.
11. Release trigger when piercing and extinguishment are complete.
12. Shut down unit and disconnect PyroLance Piercing nozzle from hose.
13. Flush Unit.
14. Winterize Unit if Applicable.

## **EMERGENCY MODE OPERATIONS (CONTROL SIGNAL FAILURE)**

**Instructor Note:** Should there be a problem with the control signal transmission between the PyroLance Nozzle and the power unit, the unit can be run in Emergency Override mode. See Page 24 of the operations manual.



Continuous communications between the Nozzleman and the unit operator is a must during **Emergency Mode** operations.

### **Trouble Shooting: Loss of wireless Communication between nozzle and unit:**

- a) Check for power supply and steady green light at the receiver.
- b) Check Battery condition or replace the battery in the nozzle transmitter assembly.
- c) Check the fuses located at the main power unit electrical box.

1. Start the unit in normal mode as described in the Normal Operations section.
2. The Nozzleman will set up the hose and nozzle in a location that there is a clear view of the unit operator and or have a backup person with a radio.
3. When the Nozzleman is ready with the nozzle placed correctly against

the object to be pierced, they will then communicate to the unit operator that they are ready to start operations.

4. The unit operator simultaneously presses and holds **Emergency Water** (A & C Buttons in the previous page picture) and **Emergency Override** Buttons to activate power and send high pressure water to the nozzle.
5. While continuing to hold both buttons, unit operator then presses and holds the **Emergency Abrasive** (B in the previous page picture) button to activate the abrasive.



**Instructor Note:** It will take several seconds for the abrasive to travel the length of the hose to begin penetrating the target object. Penetration time will be minimized if the nozzle tip is held steady. The target has been penetrated when the external spray stops. See Page 24 of the operations manual.

6. After target has been penetrated the Nozzlemaster will communicate to the unit operator to release the abrasive button.



7. Once the evolution has been completed the Nozzleman will communicate to the unit operator to release all buttons. This will return the unit to an idle.

**Instructor Note:** The flow of abrasive can only be started while water flow is **ON**. Pressing the **Emergency Abrasive** button alone will do nothing. The Water and Abrasive buttons are only activated while the **Emergency Override** Button is also depressed.

## Section IV: Skills Practice

*20 min. each student*

### III. SKILLS PRACTICE

**Instructor Note:** The purpose of this section is to have each student demonstrate the correct use of the PyroLance L 1000-W-D and the PyroLance Piercing nozzle with both water and Pyro Shot to pierce an object.

At this point the Instructor will have 1 student operate the L 1000-W-D and 1 student operates the PyroLance Piercing nozzle and goes through the operating procedures step by step. There are Skills Sheets for both the unit operator and the Nozzleman. With a class of 6 the time needed to have each student do both would be up to 4 hours

Each student must demonstrate safe and correct operation procedures of both the L 1000-W-D and the PyroLance Piercing nozzle.

**Section V: Summary and Review***10 min.*

**Ask Students:** What are the benefits that they took out of the lesson?

Briefly discuss the answers with the students. Stress the safety to firefighters and the importance of using UHP and the limits (another tool in the tool box).

**Discussion Point:**

Discuss with the students how they see the use of UHP without and with piercing, can be used on the fire ground.

Discuss with the students any issues that they may see with the operations of the unit and talk about solutions. Ask students for solutions.

Ask students if they have any questions.

**NOTES**