PyroLance L-1000 W-G

Operation, Installation and Parts Manual

PyroLance®
Water with firepower.™

110-20120411

Table of Contents

Unit Specification Name Plate

SPECIFICATIONS

ENGINE MFGR & MODEL:	**Briggs & Stratton, Vanguard, #540477-0120-G1**
PUMP MFGR & MODEL:	**Udor #GC-38/15-GR**
PUMP FLOW & OPERATING PRESSURE:	**10 gpm (40 L/min) 2000 PSI (135 Bar)**
FUEL TYPE:	**Gasoline**
ABRASIVE:	**PyroShot 2.5 Gallons (9 L)**
DATE OF MFG: 10-1-11	**SERIAL NO: L-1000 W-G-10012001-001**

PYROLANCE North America LLC
525 Main Street
Box 120609
New Brighton, MN 55112 USA

Phone: +1-651-636-0755
Fax: +1-651-636-0887
Web Site: www.pyrolance.com

L-1000 W-G Unit Specifications	
Nominal Pump Flow	10 gpm (40 L/min) at pump
Nominal Pump Maximum Pressure	2000 PSI (135 Bar) at pump
Nominal Nozzle Pressure & Flow	1400 PSI at 10 gpm (95 Bar at 40 L/min)
Engine	25 HP, Gasoline-Powered Briggs & Stratton
Installation Environment	Fire Apparatus Vehicle, exposed or compartment
Fuel Requirements	Unleaded Gasoline
Fuel Tank Capacity	2.5 Gallons (9 L)
Remote Controls	Line of site, radio frequency control
Water Inlet Pressure Limits	0 PSIG (Atmospheric Pressure) from water tank
Cutting Abrasive Requirements	Use only PyroShot abrasive
Nozzle Diameter	0.090" (2.29 mm)
Cutting Time (per tank of abrasive)	Approximately 4 Minutes
Overall Unit Dimensions (L x H x D)	36"L x 32"H x 24"D (914 mm x 813 mm x 610 mm)
Hose Length	150 ft (45 m) x 3/4" (19 mm) x 3125 PSI/215 Bar
Power Unit Weight (Dry)	400 lbs (184 kgs) approximate
Lance Weight	17 lbs (8 kgs) approximate

1 Safety

Before attempting to install the PyroLance unit, read all of these safety precautions and follow carefully.

An ultra-high pressure fire pump system is inherently powerful and potentially hazardous equipment; however, with the proper care and understanding of the instructions, such firefighting units can be operated effectively and safely.

A PyroLance firefighting unit must only be operated by qualified personnel who have completely read and understood this PyroLance Manual.

This manual is intended to reinforce and review safety techniques. It is recommended that qualified users complete extensive firefighting exercises prior to placing a unit in service and practice refresher exercises on an annual basis.

It is strongly recommended that this entire instruction manual be reviewed in depth before operating or maintaining this equipment. Service work should only be performed by individuals who have read and completely understood the operations manual.

1. Always wear eye protection
2. Always wear full personal protective equipment (PPE) for nozzle operator
3. Always inspect hoses and couplings prior to use
4. Observe a minimum of 15 feet (4.6 m) safety radius around the nozzle operator
5. Keep away from exhaust and hot engine components
6. Always ensure pressure vessel cap is de-pressurized prior to removing the cap for filling or service work
7. Always ensure pressure vessel cap is secure prior to operation
8. Only use ‘PyroShot’ as an abrasive material
9. Follow this Instruction Manual regarding winterization, draining, and protection of the hoses, pump, and entire plumbing system when exposed to temperatures under 32 degrees F / 0 degrees C
10. Check fuel, oil, and lubricant levels prior to operation
11. Do not operate equipment unless operator has read this installation and operation manual!

DANGER: Never direct a piercing nozzle at any person or animal.

DANGER: Never direct a water stream towards an electrical power line.

Example of Required Personal Protective Equipment

WARNING

PyroLance North America is not responsible for damages resulting from a failure to comply with instructions in this manual.

Please read carefully before use.

Ensure a safe sweep area of at least 15 feet (4.57 m) in any direction while operating the PyroLance nozzle.

Seek immediate medical attention if any unprotected part of the body comes in contact with the high pressure water stream. Serious personal injury can result from an untreated water injection wound.

2 How the System Works

The PyroLance ultra-high pressure system allows the operator to attack fire from a safe and defensive exterior position without a firefighter entering the interior of a structure or aircraft.

The PyroLance system allows the rapid piercing of the outer structure with high-pressure water and abrasive, enabling an exterior attack on the involved structure, vehicle or aircraft. Once the outer structure is penetrated, the PyroLance then sprays ultra-high pressure mist into the thermal layer which cools the interior, dropping the temperature from 1,500ºF (2,732°C) to 200ºF (93°C) in a matter of seconds.

The system is extremely effective on closed structures including marine applications, aircraft, buildings, basements, attic spaces, roofs, floors and other areas where firefighting and rescue activities are difficult and dangerous to carry out. In addition, the PyroLance system has the unique ability to attack the fire in its three-dimensional gaseous phase thereby reducing the potential for flashover or back draft conditions.

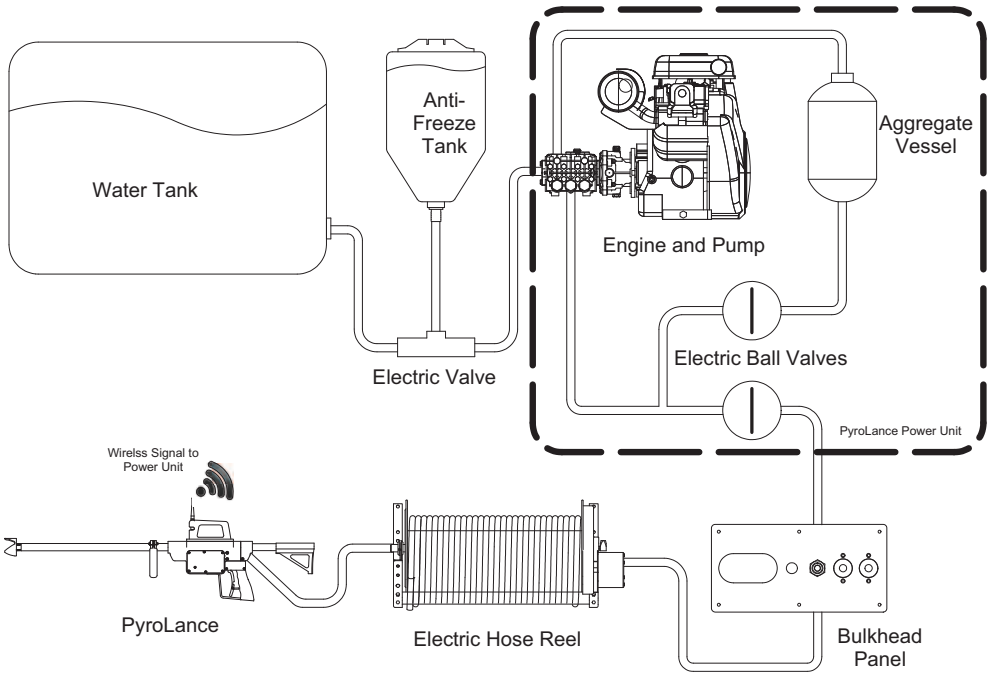
The system consists of a portable, high-pressure nozzle (referred to as the Lance in this manual) and a gasoline-powered, high-pressure pumping unit. The Lance uses electronic control signals to remotely activate the power unit. The unit is typically supplied with a high-pressure attack hose located on an electric rewind hose reel. Penetration and cutting is accomplished with a specially formulated abrasive (PyroShot) that will not rust and is environmentally safe. The proper combination of PyroShot is automatically mixed with the high-pressure water stream from a 2.5 gallon (9 L) abrasive vessel. The entire abrasive operation is controlled by the unique induction system.

The unit is equipped with many features to maintain operator safety while operating with nozzle pressures in the 1400-1500 PSI range.

Water mist systems operate on the principle of generating very fine droplets of water and delivering them to the fire zone. The advantage of this is that water mist can be very effective at fire suppression due to its high specific heat and latent heat of vaporization coupled with the increased surface area, allowing faster heat absorption. The majority of the energy absorbed by water in heating occurs during the phase change from liquid to gas.

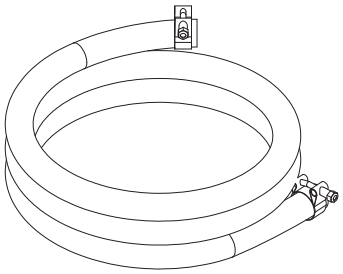
There are a number of complex interactions that occur between water mist and fires, which can lead to extinguishment. The three primary mechanisms of extinguishment are **heat extraction, oxygen depletion** and **radiation blocking**, with secondary mechanisms involving **air dilution** and kinetic effects such as **reduced flame velocity**.

PyroLance benefits from more modern delivery systems, both in terms of pump units as well as nozzles. In addition, we can apply the "wetting" agents far more efficiently and concentrate not only on the fuel phase of the fire, but also the gaseous phase. This all gives a new meaning to the very old phrase – where there is smoke, there is fire!

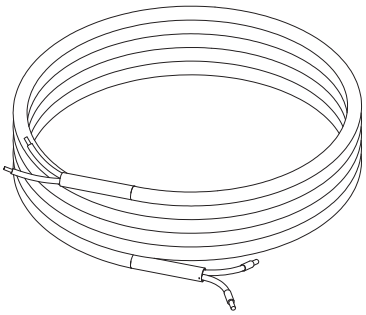


How the System Works

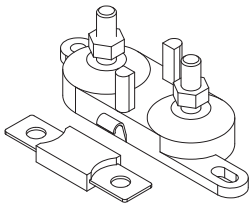
3 Installer Supplied Parts



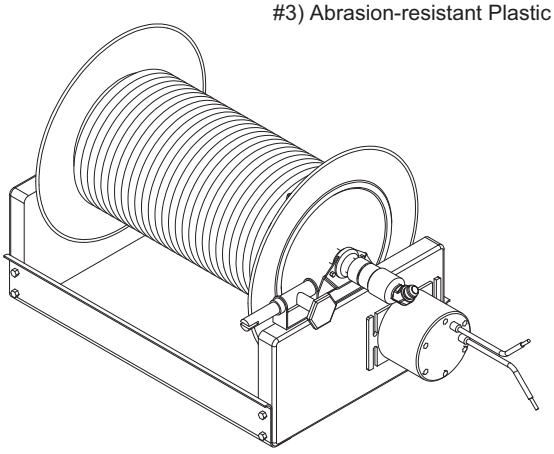
#1. 10 ft x 1" Flexible Clear Water Supply Hose
with Stainless Steel Clamps



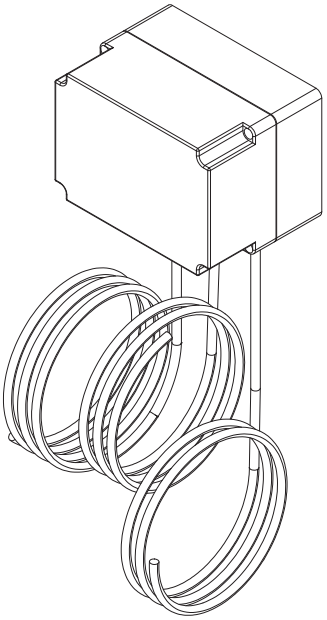
#2) 30 ft x #4/0 Red and Black
Battery Supply Cable
with
#3) Abrasion-resistant Plastic Conduit



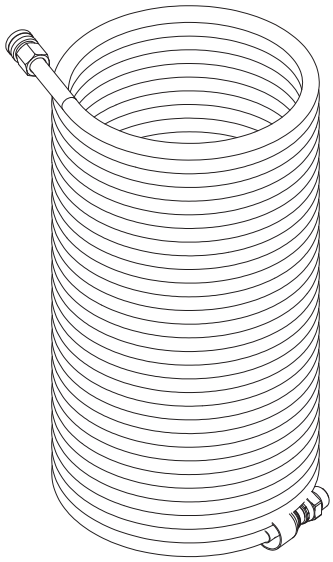
#4) High-amp Fuse Block and Fuse



#5) Hannay Hose Reel

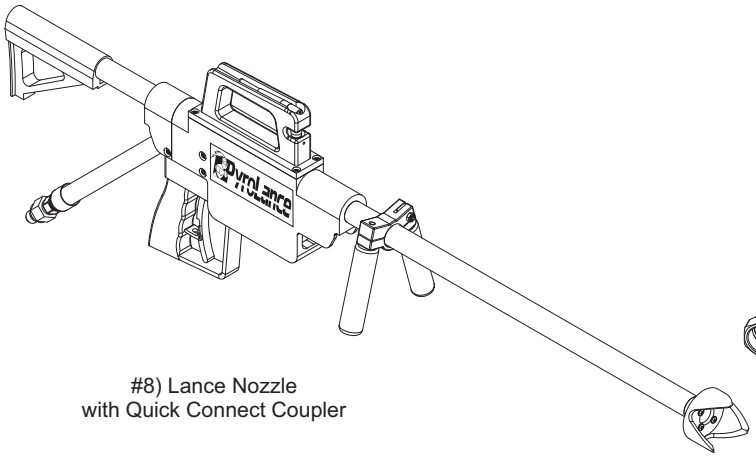


#6) Reel Electrical Box and Wiring

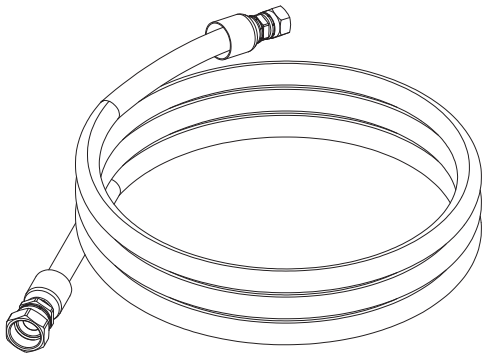


#7) 150 ft x 3/4 Ultra High Pressure
Booster Hose
(Attached to Booster Reel)

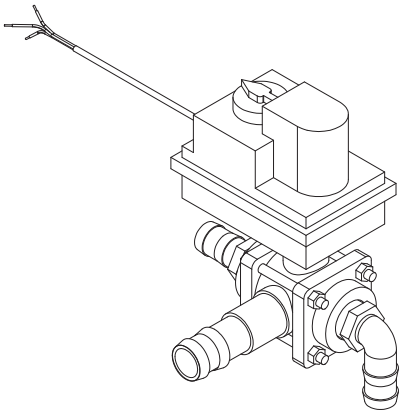
Installer Supplied Parts

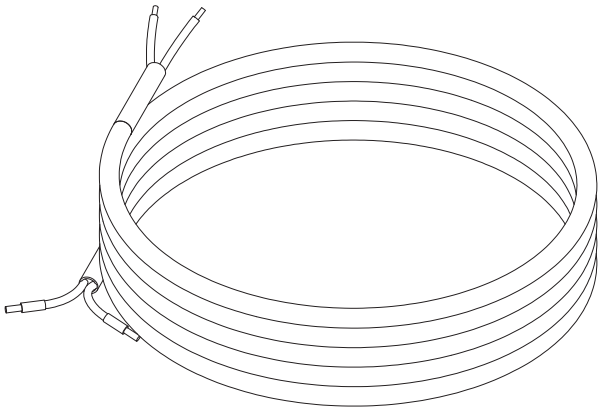


#8) Lance Nozzle
with Quick Connect Coupler

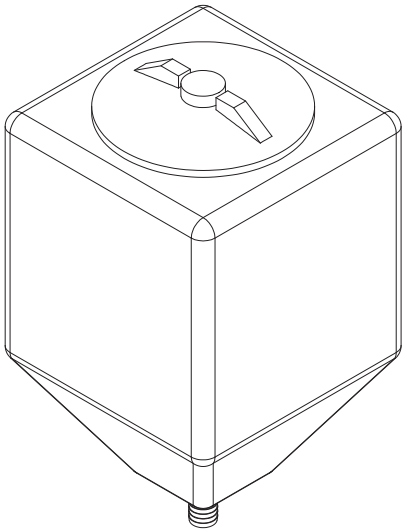


#9) 15 ft. x 3/4 Ultr a High Pressure Hose
with Female Swivel couplings
(Power Unit-to- Reel)

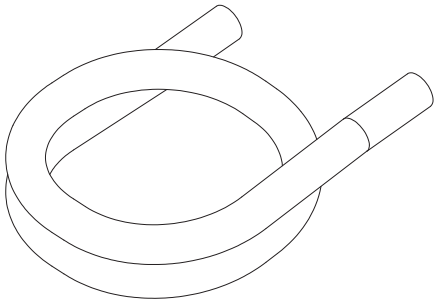




#10) Tank-to-Pump Installation Kit
a. Electric Ball Valve
b. Cable Harness with Connectors



#11) Winterization Installation Kit
a. 3 ft Clear Plastic Hose
b. Electric Ball Valve (see #11)
c. 10-gallon Anti-Freeze Tank

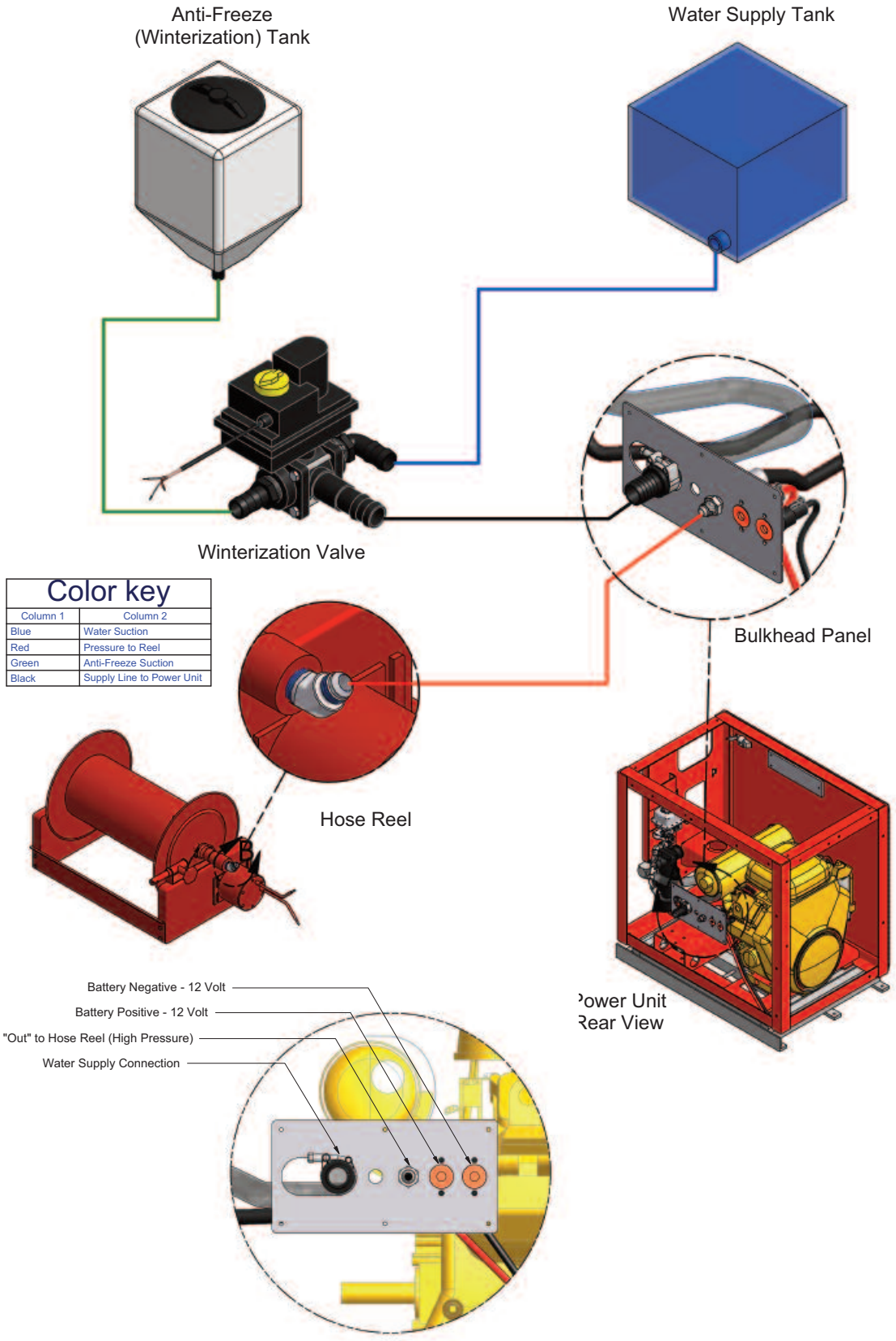


Installer Supplied Parts

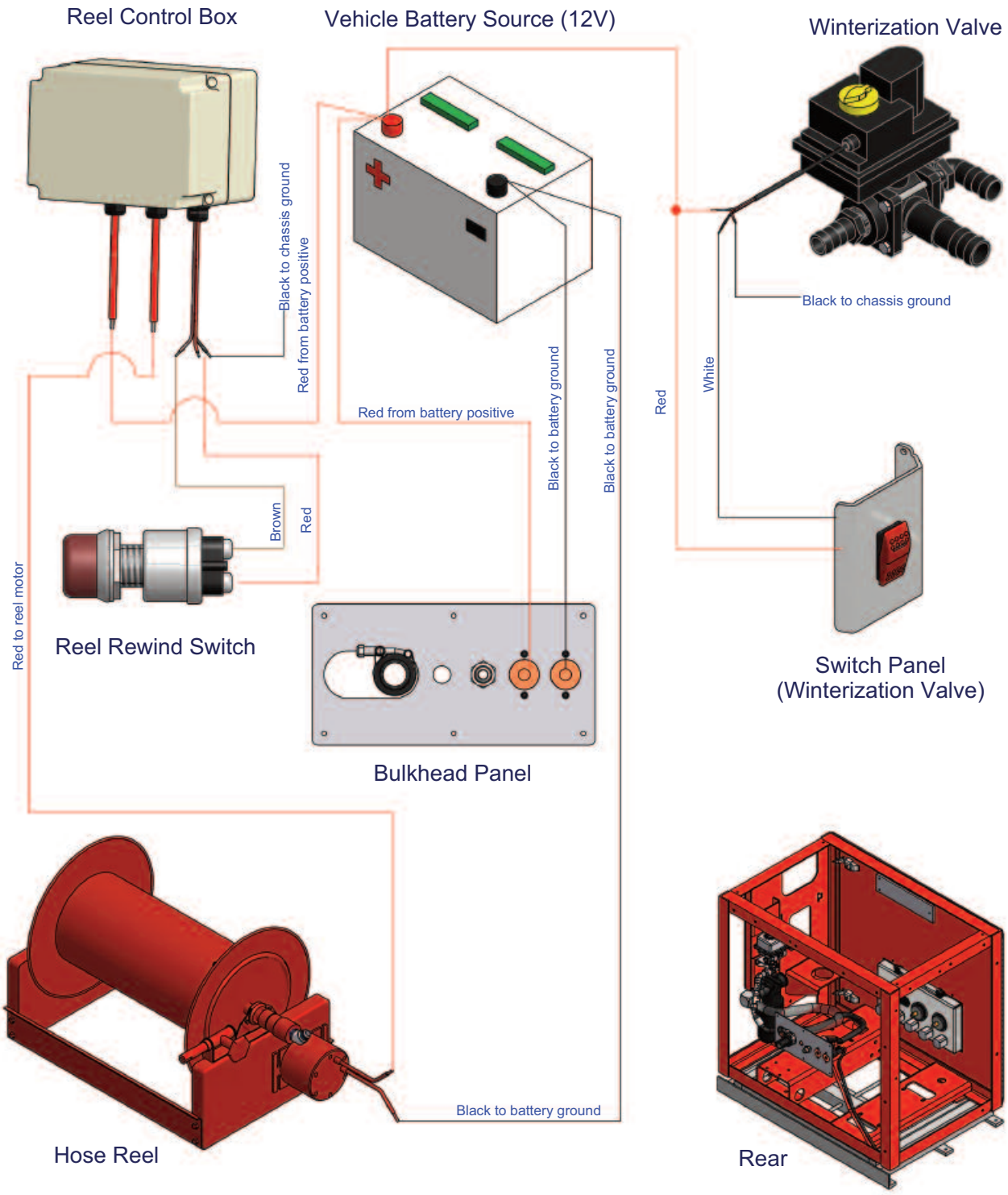
The following components are supplied separately from the power unit:

1. One (1) 10 ft (3 m) x 1" (25.4 mm) length of very flexible clear plastic hose with stainless steel clamps shall be provided for connection from the power unit to the fire apparatus water tank. (Cut length as needed.)
2. One (1) 30 ft (9 m) length of #4/0 red and black battery power supply cable, with an Deutz female connection end of the cable. The connections at the battery must be supplied by the installer.
3. One (1) abrasion-resistant plastic conduit protection shall be installed over the battery supply cable. Plastic wire ties are provided for mechanical securement of the cable along the chassis frame area.
4. One (1) high-ampere fuse is provided and must be mounted near the battery location.
5. One (1) electrically operated Hannay hose reel with roller assembly and bolts for mounting.
6. One (1) electrical cable assembly with protective loom between the power unit and hose reel electrical boxes, including electrical fittings for connection to the boxes.
7. One (1) 150 ft (45 m) x ¾" (19 mm) length of 3125 PSI (215 Bar) ultra-high pressure booster hose fitted with quick connect high-pressure coupling on the nozzle end and NPT thread coupling on the reel end of hose.
8. One (1) Lance nozzle equipped with a quick connection coupling assembly.
9. One (1) 15 ft (5 m) x ¾" (19 mm) length of ultra-high pressure hose to supply the hose reel from the power unit. This hose will be equipped with female swivel JIC threaded couplings.
10. Tank-to-pump-line installation kit:
    a) One (1) 1" electric valve. Included with this valve is a 20 ft (6 m) length of wiring harness from the PyroLance module to the valve location with plug-in connectors.
    b) Included with the valve shall be 1" nipples and Tee fitting to the anti-freeze winterization supply connection.
11. Winterization installation kit:
    a) One (1) 3 ft (0.92 m) clear flexible plastic pick-up ¾" (19 mm) hose
    b) One (1) 3-way electric balve valve c/w wiring
    c) One (1) 10-gallon (40 L) anti-freeze header tank

Vehicle Installation Guide
Plumbing Connections



Vehicle Installation Guide
Electrical Connections



Planning

Uncrating and Lifting

Open the shipping crate with care and inspect the equipment for any damage. If found, immediately contact PyroLance and the shipping company. In the unit, you will find a sealed instruction sheet outlining steps to contact PyroLance. If the unit cannot be installed immediately, leave it in its crate and provide adequate indoor storage to protect the unit against damage.

The L-1000 W-G power unit should be lifted from the top, such as with a forklift. Four (4) nylon lifting straps (each rated for 500 to 1000 lbs (225 to 450 kg) may be used for lifting, with two straps on each side of the unit.

Installation Procedures and Initial Preparation

After the unit is uncrated and lifted from its shipping container, immediately ensure the following is performed prior to installation:

1. Fill the engine with the appropriate engine oil. (See link to Engine Manual located in the appendix)
   - Type of oil: SYNTHETIC 5W-30
   - Quantity of oil: 78-80 oz.
2. Fill the transfer case of the pump with the appropriate gear oil. (See link to Pump Manual located in Appendix A)
   - Type of gear oil: Udor Lube Premium Pump Oil or SAE30W Non-Detergent Oil
   - Quantity of gear oil: 10 oz. 90 wt. gear lube
3. Fill the pump gear drive with the appropriate gear oil. (See link to Pump Manual located in Appendix A)
   - Type of gear oil: Udor Lube Premium Pump Oil or SAE30W Non-Detergent Oil
   - Quantity of gear oil: 40 oz.

User-Required Installation Material and Labor

The installation kit is provided with the PyroLance power unit to assure the user that few if any additional materials are required. However, due to the hundreds of various types of fire apparatus and body compartments that could be encountered around the world, a user may need to supply additional hose or equipment for a proper installation.

The installer should contact PyroLance directly for additional materials or information when problems arise.

Installation Requirements from the Apparatus

1. The PyroLance unit shall be supplied from the apparatus water tank, with a 1" (25 mm) tank to pump supply line (see installation kit). Most fire apparatus have an existing tank-to-pump line to the main fire pump OR a "sump" in the bottom of the water tank with a threaded 3" (75 mm) NPT plug. The installer needs to connect to one of these locations for water supply.
2. Water tank shall be at least 100 Gallon (480 L) capacity.
3. Battery connections for the electrical supply to the #4/0 electrical cable.

Exterior Installation Location

For maximum flexibility the PyroLance power unit should be installed in a fire apparatus open area that is capable of housing the unit.

Open and Exposed Area Mounting

1. If mounted in an exposed open area of the apparatus, a sun and water shield plate may be attached 6" above the top of the Power Unit for protection against UV sun rays or snow/rain accumulation.
2. Unit is designed to operate on the slide tray in the "fully extended" position; DO NOT block the sides; air flow must be ensured for proper operation.
3. Leave adequate space for air flow and maintenance of the unit.

Enclosed Compartment Mounting

1. Compartment provisions and requirements:
   a) Clearance of the compartment door opening must be a minimum of 40" wide (1016 mm) x 36" (914 mm) high.
   b) The inside width of the compartment must be a minimum of 48" (1220 mm) wide x 48" (1070 mm) high.
   c) Adequate door opening and interior compartment clearances for electrical and water lines must be provided.
2. Installation location must be a level surface, able to safely and completely support the unit weight. The compartment floor shall be rated to carry a minimum of 750 lbs (340 kgs) of weight.
3. Orient the unit to allow unrestricted access to the control panel and abrasive vessel located on the front of the unit (control panel must face outward towards the operator position).

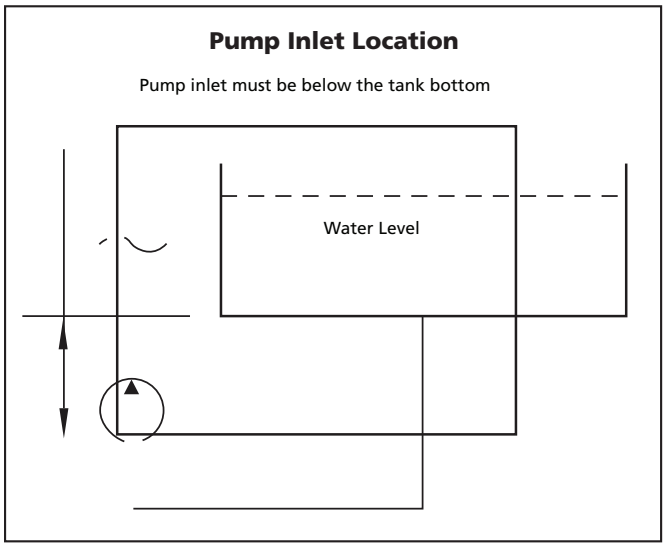
General Installation and Mounting Guidelines

The following installation and mounting procedure is for either an exterior-mounted location or a compartment-mounted application.

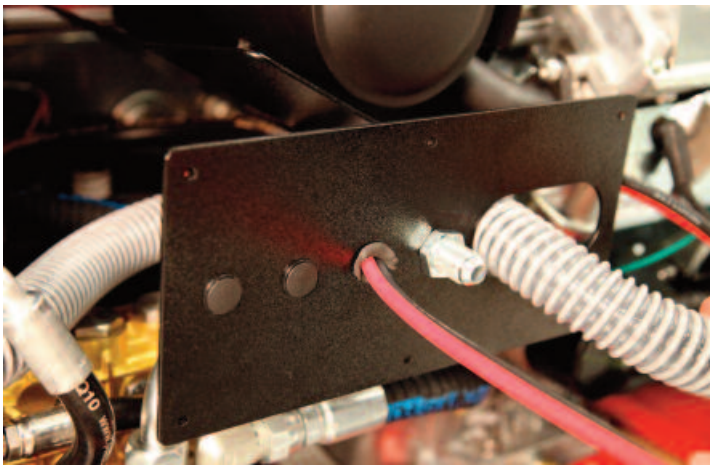
After installation as described above, for either the exterior or compartment location mounting procedures, the following steps should be taken:

1. Determine installation location with respect to load-carrying capacity and compartment requirements (as previously outlined).
2. Install 1" (25 mm) tank-to-pump supply hose from apparatus water tank to the power unit.
   a) In a compartment installation, particular care must be used at the connection point to the power unit, so that sufficient hose is looped in a semi-circle to allow for the extension of the slide tray assembly.
   b) Install 3-way banjo electric balve.
   c) Connect to the fire apparatus water tank, then to the inlet fitting with a 1" (25 mm) inside diameter hose.
   d) Locate the inlet fitting under the bottom of the tank to ensure a flooded suction line.
   e) Install 10 Gallon (40 L) anti-freeze header tank.
   f) Water quality found in domestic water supplies or fire hydrant water is sufficient for normal operation. ***The PyroLance is NOT designed to pump water from an unfiltered water source.***
3. Install the 12 volt electrical battery supply connection from the apparatus battery box to the power unit. The Deutz male battery plug is provided on the power unit and the female receptacle shall be installed on the supply cable. Particular attention must be provided during the installation of this cable to avoid higher temperature exhaust and muffler equipment. The cable and abrasion-resistant loom shall be mechanically secured during installation to protect this cable. The fuse protection shall be installed at the battery location.
4. Install the Hannay booster reel as desired. It is recommended the reel be installed within 10 feet (3 m) of the power unit since only 15 ft (4.57 m) of electrical wiring and hose is provided. If over 10 feet from the power unit, the installer must provided additional hose and electrical cable. (Note: these may be ordered on the PyroLance web site if desired.)

   PLEASE NOTE: Hose reel must be installed at a higher point than the top of the pressure vessel.
5. Install ultra-high pressure hose and electrical cable between power unit and hose reel.



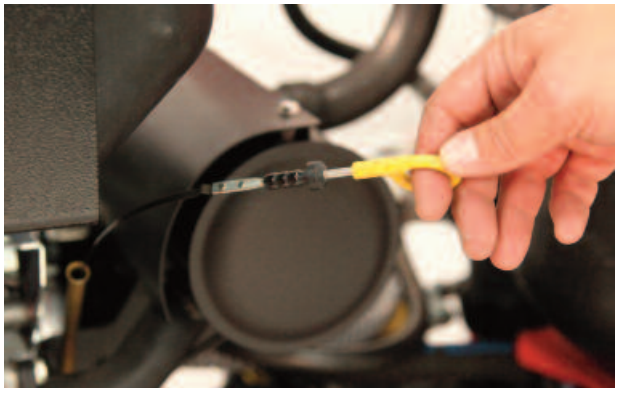
Water Inlet Connection (Barb for 1-inch Inside Diameter Hose)



Making Sure Everything is Working Right

The following checklist should be completed in advance, so that the unit is always ready for immediate use. This should be completed on a weekly schedule and/or after each use.

1) Check the engine oil. (Download Briggs and Stratton Engine Manual – refer to the Appendix.)



2) Check the pump oil. (Download Udor Pump Manual – refer to the Appendix.)

3) Check and clean the water inlet strainer.

To inspect and clean this strainer, follow this procedure:

a. Shut off the 3-way valve (turn to the anti-freeze **ON** position).

b. Unscrew the filter bowl (turn ***counter clockwise***) and carefully remove the filter assembly.

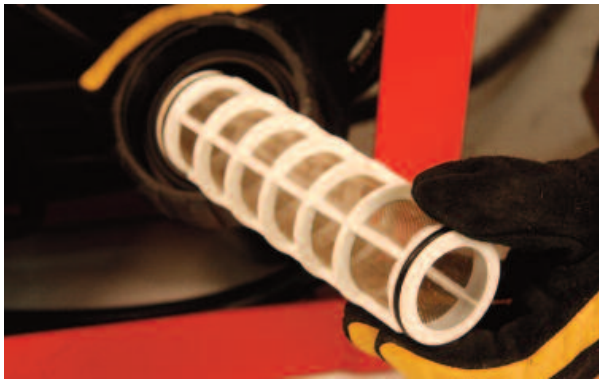
Unscrew Filter Bowl

c. Remove the internal stainless steel strainer assembly (be careful not to damage the fine mesh strainer).

Remove Internal Stainless Steel Strainer

d. Inspect the strainer and flush any debris with clean water.

Pull and Inspect Strainer



e. Push strainer back into filter housing.

f. Re-install the water filter bowl assembly carefully, threading the unit in a ***clockwise*** rotation by hand. Tighten the assembly and check for leaks after the valve is opened.

g. Open the 3-way anti-freeze/water tank control valve to the water tank **ON** position.

4) Check the fuel tank and fill if required.

5) Lubricate the couplings on the end of the reel hose and Lance nozzle connection to the hose.

6) Connect the Lance nozzle to the hose.

   1) On the female half of the coupling, align the slot with the pin.

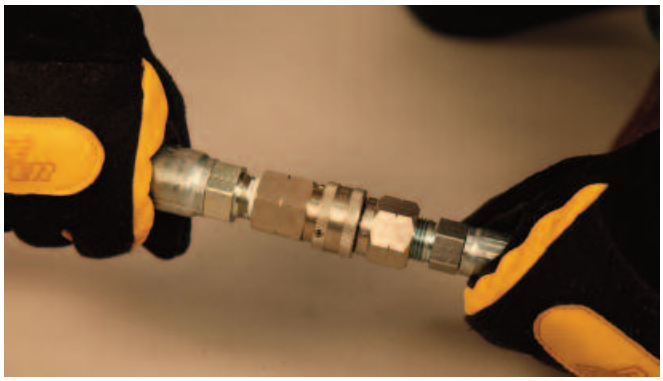
Align slot with pin on female half; slide collar back over pin.

   2) Slide the collar back over the pin.

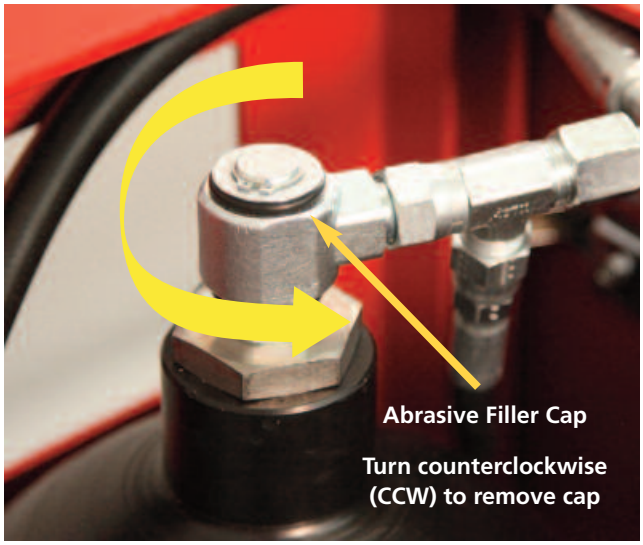
   3) Insert the male coupling half and push together firmly until connected.

   4) Release the collar and then rotate the slot away from the pin.

Push coupling together; rotate collar away from pin.



7) Fill the abrasive vessel with PyroShot.



The abrasive vessel is located in the front of the power unit to the right of the control panel (see photos). The PyroShot abrasive is required for the water-jet cutting feature of the PyroLance system.

The PyroLance is designed for use with only PyroShot abrasive. PyroShot abrasive is packaged in one gallon (3.75 liter) containers and the vessel requires 2.5 Gallons (9 L) when empty.

The abrasive can be ordered directly from PyroLance (see the "Replacement Parts" section of this manual for ordering information).

To load the abrasive vessel, follow this procedure:

a) Verify the power unit is **OFF** and the **Emergency Stop** button is depressed.

b) Verify the system is totally DE-PRESSURIZED. To check: cycle the water valve by depressing the Lance nozzle trigger and verify zero pressure on the abrasive vessel gauge (see photo).

c) Using a 2 1/8" (54 mm) wrench, remove the filler plug by turning it counter clockwise from the abrasive vessel.

d) Slowly pour 2.5 Gallons (9 L) of PyroShot abrasive into the abrasive vessel. *Note that water will spill out (or anti-freeze solution) as the abrasive displaces some of the liquid already in the vessel (this is normal).*

e) Rinse the filler plug threads with water and inspect the plug O-ring. Replace O-ring if worn or damaged.

f) Thread the filler plug into the vessel and tighten by hand until it bottoms. **Carefully use a wrench to tighten the plug**. ***DO NOT over tighten as this may lead to permanent damage of the vessel or cap threads.***

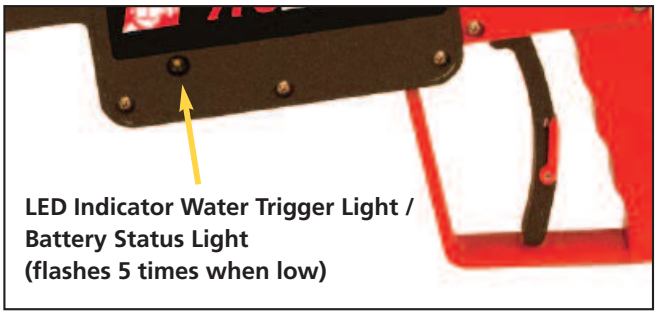
WARNING

Always verify that the abrasive filler plug is properly installed before operation. Failure to properly install and tighten the filler plug may lead to serious personal injury or death.

Use only PyroShot abrasive in the PyroLance. The use of any other abrasive may lead to equipment damage and/or failure.

Serious personal injury or death may result if the abrasive vessel is opened while under pressure. Always verify the abrasive pressure gauge reads ZERO before opening the vessel.

8) Verify communication between the Lance nozzle trigger and power unit.

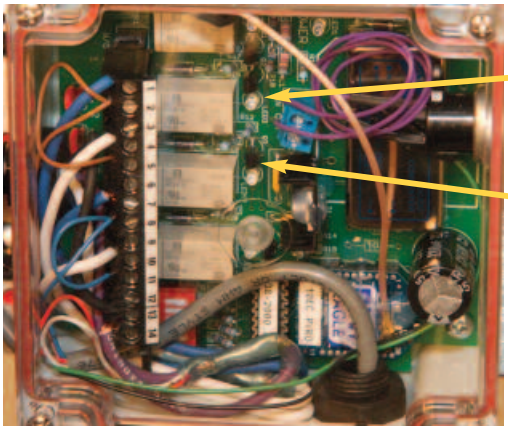


LED Indicator Water Trigger Light / Battery Status Light (flashes 5 times when low)

a) Verify the **Emergency Stop** control switch is in the **ON** position.

b) Set the ignition switch on the power unit. **DO NOT start the engine.**

c) Pull the water trigger and verify activation of the throttle solenoid and **verify operation on dial of ball valve and LED indicator lights on receiving unit.**



LED Water Relay Light

LED Abrasive Relay Light

d) While holding in the water trigger, activate the abrasive switch and **verify operation on dial of ball valves.**

e) If signalling fails, check batteries in transmitter units and power to receiving unit (see Maintenance Section). Or else, refer to Transmitter and Receiver Programming setup on next page.

LED Indicator Light for Abrasive Flow

6 Operating Instructions

Start-Up Operation of Power Unit

Before starting the PyroLance power unit, review all safety requirements found in Section 3. PyroLance units can only be operated by qualified firefighters who have read and understood this instruction and operating manual.

The following steps should be taken in start-up operations:

1) Operator #1: Verifies the unit has been properly inspected and is in a total "operational" state.

2) Operator #1: Verifies the **Emergency Stop Button** (see photo) is released by twisting clockwise, which is the **ON** position.

3) Operator #2: Verifies that the Lance nozzle is properly connected and water trigger control activates the power unit as described above.

4) Operator #2: Should NOT pull the Lance nozzle water trigger until the hose is unwound to the desired length. Lock hose reel prior to activating throttle to prevent uncoiling of hose on the hose reel drum. The hose will be hard to unroll if pressurized.

5) Operator #1: Warns personnel that the unit will now be started.

6) Operator #1: Starts the engine as if it were a keyed switch in a car by turning the ignition switch (see photo).

Emergency Water ON Button
(Only active when Safety Button is also depressed)

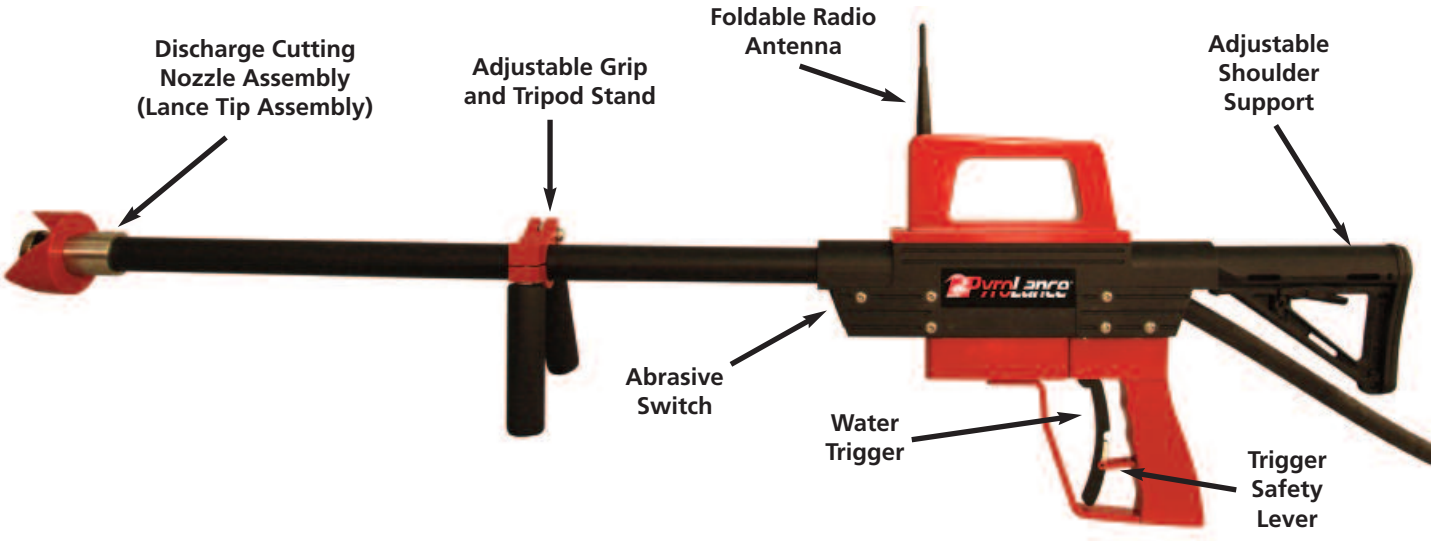
Emergency Override Button ("Deadman Switch")

Engine Ignition Key

Master Switch

Emergency Abrasive ON Button
(Only active when Safety Button is also depressed)

Emergency Stop Button
(Push to Stop Unit, Twist to Reset)



PLEASE NOTE: The Lance nozzle trigger mechanism is programmed to work sequentially.

a) The water trigger must be activated prior to the abrasive switch to allow activation of the abrasive flow control valve.

b) Operating the abrasive switch prior to activating the water control valve will result in zero output from either function (see photo at right).

Normal Operation

Normal operation of the PyroLance system is defined as:

a) Operator #1: Power unit control person. Control of the power unit from the Lance nozzle is accomplished by a remote-controlled wireless radio signal. Should a problem develop with this signal, a manual (emergency mode) can be used as described later in this section.

b) Operator #2: Nozzle control person who will control flow of water and abrasive via the Lance nozzle water trigger and abrasive switch control.

Normal operation shall be as follows:

1) Normally the Lance nozzle is "pre-connected" to the hose on the hose reel. The hose will be spooled off the reel to the required length to reach the operating area by Operator #2.

2) Operator #1 will engage the positive latching device on the reel to prevent movement of the reel during operations.

3) Operator #2 will advance the hose and nozzle to the operating area and place the nozzle shoulder unit against the body.

4) Operator #2 will press the Lance nozzle tip firmly against the target and communicate to Operator #1.

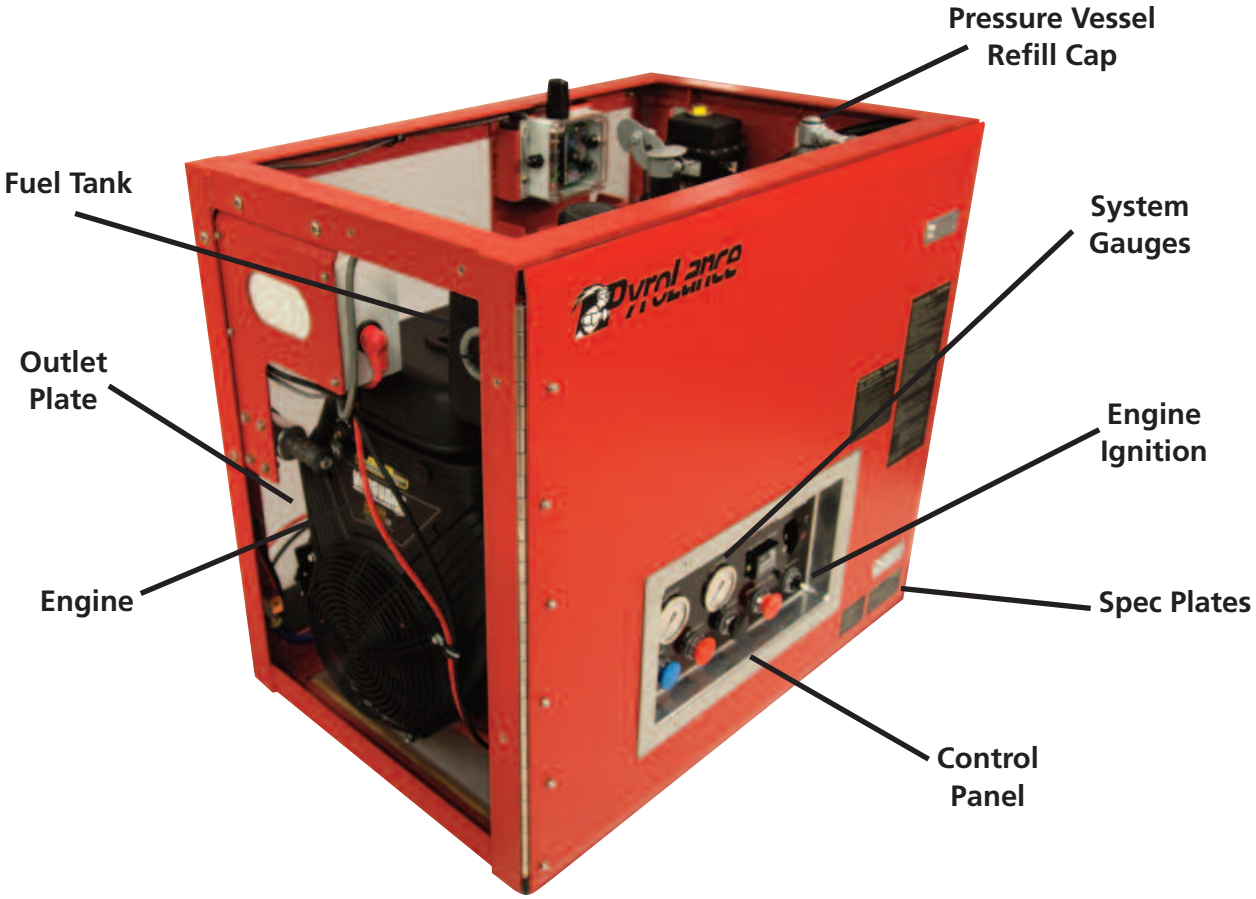
5) Operator #2 will take a firm and stable stance before pulling the water trigger.

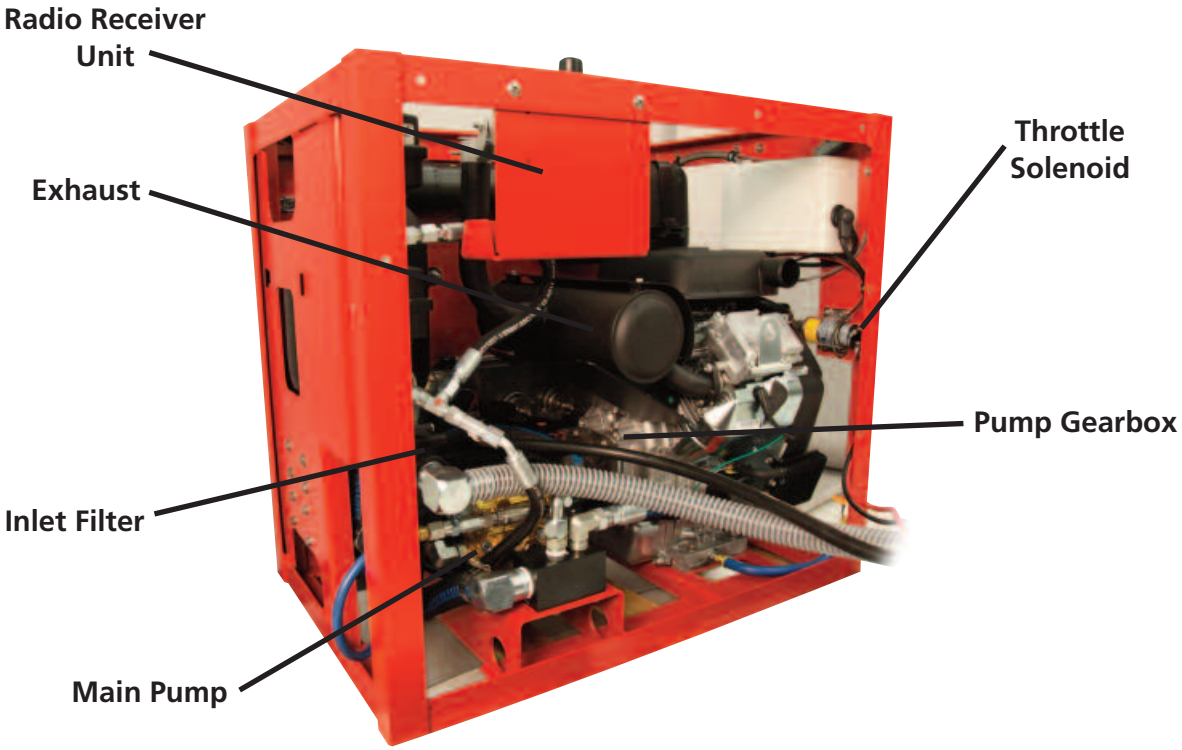
   a) To penetrate the target, pull the water trigger and activate the abrasive switch.

   b) This will activate the power unit and send high-pressure water and abrasive to the Lance nozzle.

   c) **Please note:** It will take several seconds for the abrasive to travel the length of the hose and begin penetrating the targeted object.

   d) Penetration time will be minimized if the Lance nozzle tip is held steady.


Pressure Vessel
Refill Cap
Fuel Tank
System
Gauges
Outlet
Plate
Engine
Ignition
Engine
Spec Plates
Control
Panel


Radio Receiver
Unit
Throttle
Solenoid
Exhaust
Pump Gearbox
Inlet Filter
Main Pump

External spray is visible during penetration (cutting) of the target.

Little or no external spray is visible after penetration is complete.

6) After the target object has been penetrated, de-activate the abrasive switch while continuing to depress the water trigger. The target has been penetrated when the external spray stops.

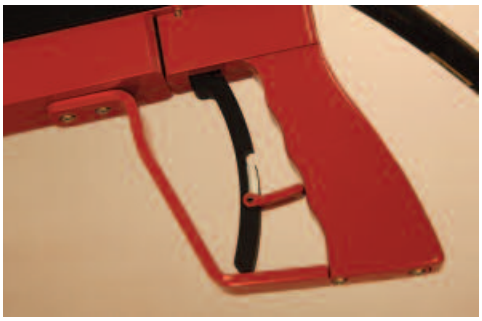
7) The duration of water flow into the fire will vary and is determined by many factors such as:

   a) Type and size of the fire

   b) Enclosure size.

   The decision to stop water flow can be based on an internal temperature reading *(if thermal imaging equipment is available)* or other established practices.

8) Releasing the water trigger will cause the power unit to go back to idle.



Safety Trigger Engaged

Safety Trigger Disengaged

Note: To operate with abrasive in emergency mode, all THREE buttons must be simultaneously depressed.

Water flow activated by holding Emergency Override Button AND Emergency Water Button simultaneously

Emergency Mode Operation (Control Signal Failure)

Should a problem develop with the control signal transmission between the Lance nozzle and power unit, the following emergency procedure can be used:

1. Operators #1 and #2 must be in continuous verbal communication to operate in **Emergency Mode.**
2. Operator #2 operating the Lance nozzle and Operator #1 operating the power unit controls. (Reference the troubleshooting section for suggestions to remedy common issues with Lance nozzle communications.)
3. Operator #1: starts up the power unit as described in the Normal Operations section.
4. Operator #2:
   a. Unrolls hose from reel, stands in a visible location to Operator #1, and brings the Lance nozzle to the target location.
   b. Presses the Lance nozzle tip firmly against the target and takes a firm and stable stance.
   c. Verbal communication takes place from Operator #2 to Operator #1 to activate the system.
5. Operator #1:
   a. Operator #1 simultaneously presses and holds Emergency Water Button and Emergency Override Button to activate power and send high-pressure water to Lance nozzle.
   b. While continuing to hold both buttons, Operator #1 then presses and holds the Emergency Abrasive Button to activate abrasive flow.
   c. Please note: *It will take several seconds for the abrasive to travel the length of the hose and begin penetrating the target object. Penetration time will be minimized if the lance tip is held steady.* The target has been penetrated when the external spray stops.

6. Operator #2: After the target object has been penetrated, Operator #2 advises Operator #1 to release the Emergency Abrasive Button and continue to hold the Emergency Water Button **ON**, while still continuing to hold the Emergency Override Button.

7. Operator #1: On audio command from Operator #2, Operator #1 releases all Buttons so that the power unit will go back to idle.

   Please 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 active while the Emergency Override Button is also depressed.

WARNING

The PyroLance can be operated only by qualified firefighting personnel who have completely reviewed all safety, service and maintenance, operational, installation and other pertinent requirements of this PyroLance Instruction and Operational Manual.

The trigger mechanism is programmed to work sequentially; when water trigger is activated, it will then allow activation of the Emergency Abrasive Button.

Operating the Emergency Abrasive Button prior to activating the Emergency Water Button will result in zero output from either function.

Recommendations for Selected Materials in Penetration/Cutting

The PyroLance has been specifically designed to perform penetration/ cutting operations at a much reduced pressure and flow rate. The unit is optimized for ARFF and structural applications in particular.

1. ARFF

The PyroLance has the capability of penetrating/ cutting aluminum, composites, structural extrusions, and steel of varying thicknesses. Multiple layers of composite materials (such as those found on 5th generation aircraft) can be penetrated or cut through using the hand-held Lance nozzle in either the static or dynamic mode.

It is possible to penetrate or cut thinner composite material by flowing water only, thereby eliminating collateral damage to sensitive interior structures and/or equipment and allowing a much safer penetration/cutting environment.

2. Structural

The PyroLance is capable of penetrating most structural material and cutting through thinner sheeting such as roofing material and coverings. It is important to attack structural materials at their weakest points, which is normal for fire service operations. This will enable the quickest penetration/ cutting times and conserve valuable abrasive capacity.

3. Material Penetration/Cutting

a) **Brick:** Structural brick can easily be penetrated using abrasive. Cutting of brick can be more of a challenge using the Lance nozzle dynamically and should only be considered as a last resort.

b) **Roofing:** It is possible to penetrate roofing material very quickly. It is also possible to run ventilation cuts using the Lance nozzle in the dynamic mode while flowing abrasive. Maximum distance between Lance nozzle tip and roofing material should not exceed 3 ft (1 m).

c) **Reinforced Concrete:** Fairly difficult to penetrate in thicker constructions depending on different hardness. Maximum depth that could be attempted should not exceed 2" (50 mm). Cutting of reinforced concrete is not advisable.

d) **Cinder Block:** It is possible to penetrate through multiple layers of cinder block across internal spacing without any problem. Limited cutting of cinder block is possible but will require substantial use of abrasive to achieve a proper cutting effect.

e) **Mild steel:** The difficulty increases with the thickness. It is possible to penetrate mild steel up to a maximum depth of 1" (25 mm).

f) **Aircraft Aluminum:** Penetration of aircraft aluminum is easily achieved and can be attempted using **water** only. Limited cutting is possible with the use of abrasive on thinner sheets of aluminum.

g) **Laminated glass:** It is easy to penetrate a thickness of up to 1" (25 mm) of laminated glass quickly. Cutting of laminated glass is possible using abrasive and limited to thinner panels or windows.

h) **Rubber:** Rubber can be penetrated fairly easily in the static mode. Cutting operations will be limited depending on the thickness of the rubber.

i) **Wood:** Penetrating wood can be a challenge since the more porous the wood is, the more the water will be diverted away from its path. Cutting wood panels/sheeting is possible even from a distance of 3 ft (1 m) away while flowing abrasive.

j) **Plexiglas:** Penetration of Plexiglas is easily achieved even without flowing abrasive. Cutting of Plexiglas is also possible while flowing abrasive.

4. Duration of Abrasive Supply

The abrasive vessel has a capacity of 2.5 gallons (9 L) and the induction rate will allow approximately four minutes of continuous flow of abrasive.

NOTE: After flowing the abrasive, it is imperative to flush the system and clear the hose of all abrasive prior to shutting the unit down.

Should the nozzle become clogged, it will be necessary to remove the Lance nozzle from the hose reel and flush the excess abrasive from the system prior to reconnecting the nozzle.

Engine Maintenance

Maintenance on this unit should be restricted to authorized personnel who have read and understood the PyroLance Instruction and Operation Manual. Review this manual, especially the safety information section, prior to performing any service on this equipment.

If the engine is to be replaced during the life cycle of the power unit, the following information is provided on the Briggs and Stratton engine. Newer versions or alternate engines for replacement purposes must be approved by PyroLance prior to installation.

The PyroLance L-1000 W-G utilizes the following engine:

a. Briggs & Stratton Engine
b. Van Guard Series
c. Type: Horizontal V-Twin engine
d. Gross Horsepower: 25HP at 3600 RPM
e. Fuel:
    1. Gasoline
    2. Type: leaded or non-leaded
    3. Octane range: 85 to 90
    4. Fuel tank capacity: 2.5 gallons

PLEASE NOTE: When shipped the PyroLance power unit, fire pump, and pump gear box are shipped without fluids. IMMEDIATELY fill the components with lubrication fluids after removing the power unit from the box. The plumbing system is filled with anti-freeze solution; upon start-up operation the anti-freeze solution should be flushed prior to use.

Reference Information on Engine and Pump Maintenance

The Udor pump and Briggs and Stratton engine instruction, operation, and maintenance manuals in PDF format are located in the Appendix of this manual.

Specific information can be found in various sections of the manual for the following:

a) Briggs & Stratton engine
    1. Oil Types, Manufacturers, and Viscosity Range
    2. Engine Oil Fill Location & Procedures
    3. Routine Scheduled Maintenance Information
    4. Troubleshooting Guide for the Engine

b) Udor pump
    1. Gear Oil Types, Manufacturers, and Viscosity Range
    2. Pump and Gear Box Fill Locations and Procedures
    3. Routine Scheduled Maintenance Information
    4. Troubleshooting Guide for the Pump

c) **PLEASE NOTE:** The user **MUST** ensure the lubricate levels are correct prior to starting the engine. Dry starting the engine without oil can lead to engine failure and is not covered under the PyroLance warranty or the separate Briggs & Stratton warranty.

d) **USE OF PDF MANUALS:** Please refer to the Briggs & Stratton Engine Manual and the Udor Pump Manual for fluid level information and/or see specific information as follows to verify the correct oil type, quantity, and viscosity prior to start-up operations.

WARNING

The PyroLance power unit emergency shut off control must be in the OFF position prior to performing any service work.

For major work, the Deutz electrical plug to the battery system must be unplugged and disconnected entirely.

Unauthorized replacement of any part may lead to catastrophic equipment failure and serious personal injury.

Use only replacement parts that are supplied by or approved by PyroLance.

Use of any other parts may lead to equipment failure and severe personal injury.

Engine Oil, Air Filter, Spark Plug and Filter Replacement

The Briggs & Stratton engine oil needs to be checked and/or changed regularly.

Use the following guide as a template:

a. **5** hours of initial operation – change engine oil and filter.
b. **8** hours of operation/Daily – check engine oil level.
c. **100** hours of operation or annually:
   - Change engine oil and filter.
   - Change engine air filter.
   - Change engine spark plug.
   - Clean engine of foreign debris.
d. **250** hours of operation or annually:
   - Check engine valve clearance (it may be necessary to have this service preformed at an Authorized Briggs & Stratton service center).
e. **400** hours of operation or annually:
   - Change air filter.
   - Change fuel filter.

Fluid Levels, Spark Plug, Points and Filter Replacement

The "first level" of normal maintenance includes the following:

a. Engine Oil:
   Manufacturers: All high quality detergent oils are acceptable if classified for service SF, SG, SH, SJ or higher
   Type Oil: Synthetic 5W-30
   Viscosity Range: 5W-30
   Quantity (including the filter): 78-80 oz.
b. Oil Filter:
   Manufacturers: Briggs & Stratton
   Model: Briggs & Stratton Part No. 842921
c. Fuel Filter:
   Manufacturers: Briggs & Stratton
   Model: Briggs & Stratton Part No. 691035
d. Air Filter:
   Manufacturers: Briggs & Stratton Low Profile
   Model: Briggs & Stratton Part No. 692519
e. Spark Plug:
   Manufacturers: Long Life Platinum
   Model: Briggs & Stratton Part No. 5066
f. Spark Plug Gap:
   Manufacturers: Long Life Platinum
   Model: Briggs & Stratton Part No. 5066 – Spark Plug Gap Setting: 0.030 in. (.076 mm)

Checking Engine Oil Level

Prior to checking oil, be sure the engine is located on a level and horizontal surface. Safely clean the oil fill area and remove any debris.

The user should follow the indicated steps in checking the engine oil on a Briggs & Stratton engine:

Step 1: Remove the dipstick from the engine and wipe the dipstick with a clean dry cloth.

Step 2: Re-insert the dipstick into the engine from which it was removed.

Step 3: Remove the dipstick from the engine again and verify that the oil level is correct. The oil level should be near or at the top of the indicator marks located on the dipstick.

Step 4: If the oil level is found to be low:

a) Remove the oil fill cap and safely add the correct viscosity to the engine; based on how low the oil level is found in Step 3.
b) To verify the correct viscosity oil, refer to the Briggs & Stratton Manual.
c) After adding the correct amount of oil, wait approximately 60 seconds for the oil to move through the engine.

Step 5: Wipe the dipstick with a clean dry cloth and safely re-insert the dipstick fully into the engine.

Step 6: Safely remove the dipstick from the engine and verify the oil level. Again, the oil level should be near or at the top of the oil of the indicator marks found on the dipstick.

Step 7: If the oil level is still found to be low, repeat Steps 4, 5 and 6 until the oil level is correct.

Step 8: Replace the oil fill cap that was removed in Step 4.

Changing Engine Oil

Prior to changing oil, be sure the engine is located on a level and horizontal surface. Safely clean the oil fill area and remove any debris.

The user should follow the indicated steps in changing the engine oil on a Briggs & Stratton engine:

Step 1: Safely remove drain plug from engine turning a ***counter clockwise*** direction and capture the used oil as it drains from the engine. Dispose of the used waste oil in an environmentally safe way.

Step 2: Wipe the drain plug with a clean dry rag and re-install into the engine, turning in a ***clockwise*** direction until it is hand tight. Use an appropriate size wrench to torque the drain plug to its recommended specifications. See Briggs & Stratton Manual for correct torque specifications.

Step 3: Safely remove the engine oil filter, turning it in a ***counter clockwise*** direction. Capture any residual oil and dispose of it in environmentally safe way.

Step 4: Prepare to re-install a new oil filter. Lubricate the oil filter gasket with a thin layer of fresh, clean oil. Install oil filter onto engine, turning in a ***clockwise*** direction until the oil filter gasket comes in contact with the base of the engine. **Hand tighten** the oil filter an additional ½ to ¾ turn until the filter is seated properly to the engine oil filter adapter.

Step 5: Prior to filling the engine with oil, please check earlier in this section for oil quantity and type. The oil should be suitable for your temperatures and altitudes.

Changing Engine Air Filter

To change the air filter in the Briggs & Stratton engine, the following steps must preformed:

Step 1: Remove air cleaner latches and safely remove air filter from the air filter assembly housing.

Step 2: Dispose of air cleaner in an environmentally safe way.

Step 3: Re-install new air cleaner into air filter assembly housing and re-latch retainer latches.

Changing Engine Fuel Filter

To change the fuel filter in the Briggs & Stratton engine, the following steps must be performed:

Step 1: Close fuel shut-off valve. Failure to do so could cause an explosion leading to injury or death.

Step 2: Using pliers, gently squeeze the fuel filter retaining clamp tabs and remove the fuel filter from the fuel lines. A twisting motion may be needed to remove the filter.

Step 3: Safely dispose of the fuel filter in an environmentally safe way.

Step 4: Re-install a new Briggs & Stratton or approved fuel filter and re-install fuel retaining clamps to fuel filter and fuel lines.

Step 5: Turn on the fuel valve.

Preventive Maintenance Recommendations

	After Every Use	*Monthly*	*Every 3 Months or 100 Hours**	*Every 6 Months or 200 Hours**	*Every 3 Years or 1,500 Hours**
Check nozzle and end nut for wear and replace if necessary	X				
Check engine oil and add if low [1]		X			
Check pump oil and add if low [2]		X			
Replace engine oil and oil filter [1]				X	
Replace engine fuel filter [1]					X
Replace engine air filter [1]				X	
Check water strainer	X				
Check radio battery (located in Lance)			X		
Inspect hose for wear or damage [3]	X				
Replace hoses					X

* Whichever comes first
[1] See engine manufacturer's literature found in the Appendix for additional recommendations.
[2] See pump manufacturer's literature found in the Appendix for additional recommendations.
[3] If any damage to the hose is found, replace immediately.

Changing Engine Spark Plug

To replace the spark plugs in the Briggs & Stratton engine, the following steps must be preformed:

Step 1: Remove spark plug caps from spark plugs. Then using a proper-sized socket wrench, safely remove spark plugs from engine, turning in a ***counter clockwise*** motion.

Step 2: Dispose of used spark plugs in an environmentally safe way.

Step 3: Replace spark plugs with new Briggs & Stratton or approved replacement spark plugs. Re-install into engine, turning in a ***clockwise*** direction until seated properly. (Refer to Briggs & Stratton Manual for proper torque settings.)

Step 4: Replace spark plug wire caps.

Gasoline Engine Service Manual

The gasoline engine requires routine maintenance similar to a car engine. Oil must be checked and changed regularly. Oil, air and fuel filters must be checked and changed regularly. For detailed information on these routine maintenance requirements as well as other service recommendations, please see the Briggs and Stratton Manual referenced in the Appendix.

Pump Service Manual

The Udor high-pressure water pump requires minimal maintenance. The pump and gear box gear oil should be checked on a regular basis. For detailed information on these routine maintenance requirements as well as other service recommendations, please see the Udor Pump Manual referenced in the Appendix.

Nozzle Maintenance

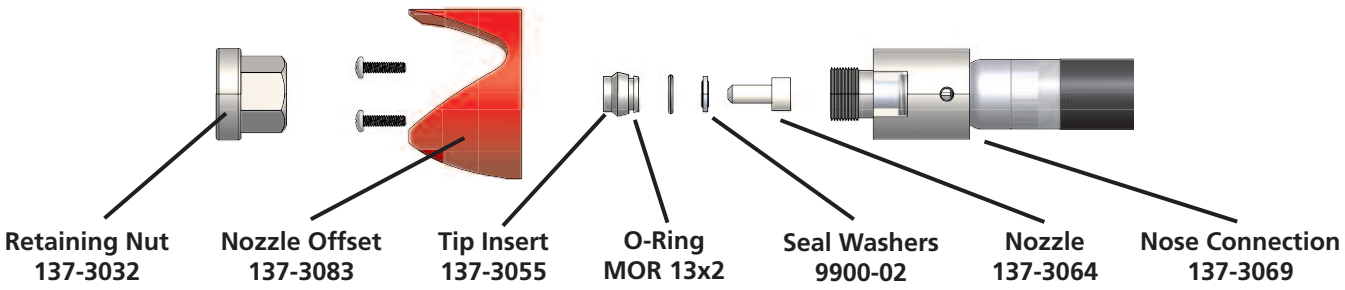
Replacement of Nozzle and/or Nozzle Retaining Nut

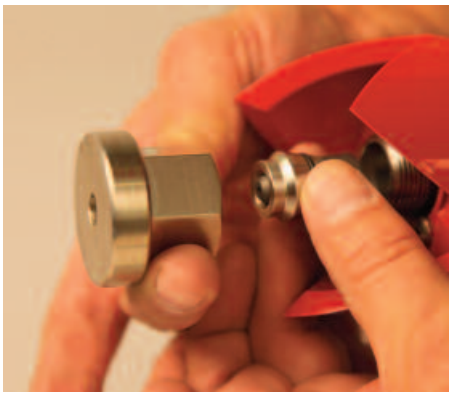
The nozzle and retaining nut are wear parts and frequent replacement should be expected. A worn nozzle will not cut well or give maximum extinguishing effect. After **each use** of the PyroLance system, inspect the nozzle and retaining nut for wear and replace if required.

Nominal orifice diameter for the PyroLance Model L-1000 W-G is 0.090" (2.286 mm). Refer to the replacement part section of this manual for ordering information.

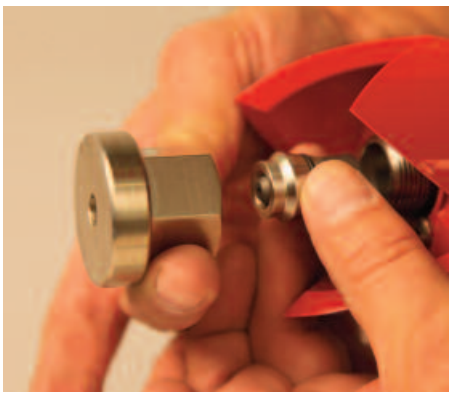
PLEASE NOTE THE FOLLOWING:

1. Replace the nozzle when pressure decreases by more than 350 PSI (21 Bar) from pump discharge pressure of 2000 PSI (135 Bar). **Please note:** This will require reading the power unit pressure gauge and user must install a test gauge at the nozzle. (**Please note:** Complete this test without the abrasive flowing.)
2. Replace the retaining nut and washer when any wear is visible.
3. **To replace the Lance nozzle tip assembly, the following steps should be performed:**
   a) Verify unit is **OFF** and depressurized. Disconnect Lance nozzle from the hose reel and hose.
   b) Unscrew the retaining nut, ***counter clockwise*** fully and remove (see next page).
   c) Slide the nozzle and washer out of the retaining nut.
   d) Replace any and all worn parts.
   e) Insert the washer and nozzle into the black retaining nut (see next page).
   f) Thread the retaining nut back onto the Lance tip and turn ***clockwise*** fully by hand until it bottoms. **It is not necessary to tighten the retaining nut more than hand tight.**




1. Unscrew Retaining Nut, CCW


2. Remove Nut and Nozzle


3. Reassemble, Turn End Nut CW

Lance Nozzle Hose Replacement

If the hose shows **ANY** signs of wear or damage, replace it immediately and refer to the replacement parts section of this manual for ordering information.

The following steps should be performed in the Lance nozzle hose replacement process:

1) Verify power unit emergency control switch is in the **OFF** position.

2) Totally depressurize the entire plumbing system. Check to see if pressure gauges are at zero and remove the plug from the abrasive vessel (see abrasive vessel fill procedures) to ensure no pressure is trapped in the vessel.

3) Disconnect the Lance nozzle from the hose.

4) Using a 3/16" (4.765 mm) Allen wrench, loosen both set screws holding the Lance tip to the Lance nozzle tube (see next page).

5) Slide the Lance nozzle tip and hose out of the tube approximately 6" (152 mm).

6) While holding the hose firmly, turn the Lance nozzle tip assembly in a ***counter clockwise*** direction by hand to loosen and remove (do not discard).

7) Slide the hose out of the Lance nozzle tube.

8) Replace with a PyroLance supplied hose, complete with the proper end fittings.

9) Slide the new hose through the Lance nozzle tube with the male SAE O-ring fitting first.

10) Thread the Lance nozzle tip assembly onto the hose and tighten by hand only. **Note that this fitting uses a straight thread and O-ring for sealing. Do not use any pipe sealant or Teflon tape.**

11) Slide the Lance nozzle tip back onto the Lance nozzle tube.

12) Tighten both set screws, turning them in ***clockwise*** direction.

1. Loosen Set Screw CCW (2 places)

2. Pull out Tip Assembly

3. Hold Hose firm, Twist Tip CCW until removed

4. Tip removed. Slide Hose out of Metal Lance Tube

Set-up Transmitter and Receiver Programming

Transmitters and receivers must be paired to work together. Before beginning the pairing process, the receiver must be set up to your desired frequency and digital address. After following the set-up procedure, ensure the receiver is powered on before continuing to the pairing procedure.

Receiver Set-up

The unit is shipped from the factory with SEL1 switches in the open positions and the unit is receiving commands on Address 1/Frequency 1. If you wish to change these default settings, follow the instructions in the table below.

It is highly recommended that you use all available frequencies BEFORE changing the digital address of systems. For instance, the first system pairing would be left at the default of F1/ A1. The next pairing would be F2/A1. Then continue as follows: F3/A1; F4/A1; F5/A1; F6/A1; F7/A1; F8/A1 (now all frequencies for Address 1 have been exhausted). The next pairing would be set as F1/A2, then F2/A2; F3/A2; F4/A2; F5/A2; F6/A2; F7/A2; F8/A2. Then F1/A3; F2/A3; F3/A3, etc.

1) Remove power from unit.
2) Remove top cover.
3) Select address and/or frequency using table below.
4) Reattach cover and apply power.
5) Address and Frequency Set-Up is now complete.

DIGITAL ADDRESS SET-UP

SEL1	Digital Address		
(SW1-3)	SW1	SW2	SW3
1 (default)	OPEN	OPEN	OPEN
2	CLOSED	OPEN	OPEN
3	OPEN	CLOSED	OPEN
4	CLOSED	CLOSED	OPEN
5	OPEN	OPEN	CLOSED
6	CLOSED	OPEN	CLOSED
7	OPEN	CLOSED	CLOSED
8	CLOSED	CLOSED	CLOSED

FUTURE OPTION SET-UP

SEL1 SW4	Unused on this model – leave in open position

FREQUENCY SET-UP

SEL1	Frequency		
(SW5-7)	SW5	SW6	SW7
1 (default)	OPEN	OPEN	OPEN
2	CLOSED	OPEN	OPEN
3	OPEN	CLOSED	OPEN
4	CLOSED	CLOSED	OPEN
5	OPEN	OPEN	CLOSED
6	CLOSED	OPEN	CLOSED
7	OPEN	CLOSED	CLOSED
8	CLOSED	CLOSED	CLOSED

Pairing Procedure

The pairing procedure begins by matching the transmitter frequency to the receiver which will be followed IMMEDIATELY by linking the remote to the receiver, so be sure to have them both readily available.

Note: The Lance's trigger will be squeezed and released to set up the frequency. Each squeeze and release of the trigger will increment the frequency by one. The initial squeeze and release as performed in Step 2 below counts as the first increment and will set the frequency to #1.

Step 1. Select the Lance to be paired and remove one of the AA batteries from the transmitter battery pack.

Step 2. Squeeze the trigger and while holding in, replace the AA battery in the battery pack. The Power/TX LED will illuminate solid RED. Release the trigger to set to Frequency 1, or, within two seconds, stay in programming mode by squeezing and releasing the trigger the number of times equal to the frequency you are choosing. So the second squeeze and release takes the transmitter to Frequency #2, the third squeeze and release sets its Frequency to #3, and so on. You will use the TX LED to confirm your setting. After you squeeze and release the number of times you wish the frequency to be set to, observe the LED. It will blink RED or GREEN up to four times depending on the frequency chosen. See table below for clarification:

LED Flashes:	Indicates Unit is Operating On:
RED – one time	Frequency 1
RED – two times	Frequency 2
RED – three times	Frequency 3
RED – four times	Frequency 4
GREEN – one time	Frequency 5
GREEN – two times	Frequency 6
GREEN – three times	Frequency 7
GREEN – four times	Frequency 8

Replacement of Remote Control Signal Transmitter Battery

The Lance nozzle uses a battery-powered, radio transmitter to send control signals to the power unit. The batteries should be replaced every six months or whenever there are communication problems between the Lance nozzle and the power unit.

The control signal transmitter uses two (2) Lithium Ion AAA size batteries. **(Note that the frequency settings are maintained in a flash memory during battery replacement).**

To replace the batteries follow these procedures:

1. Using a Philips screwdriver, remove the six screws holding the cover (see Photo 1 on next page).
2. Remove the cover (see Photo 2)
3. Lift out the transmitter
4. Use a Philips screwdriver to remove one screw holding down the battery cover on transmitter unit.
5. Lift off battery cover from transmitter unit (see Photo 3).
6. Remove two AAA batteries as shown and replace.
7. Replace battery cover on transmitter unit.
8. Place transmitter unit back into compartment.
9. Replace compartment cover and tighten down six screws using Philips screwdriver, ensuring tight fit.

NOTE: BATTERY STATUS LED WILL ILLUMINATE SOLID WHEN WATER TRIGGER IS ACTIVATED. BATTERY STATUS LED WILL FLASH WHEN BATTERY STATUS IS LOW (see Photo 4).

NOTE: DO NOT DEPRESS THE TRIGGER OR CYCLE THE ABRASIVE SWITCH WHILE BATTERIES ARE REMOVED. THIS WILL DELETE THE MEMORY AND REQUIRE REPROGRAMMING OF THE TRANSMITTER/RECEIVER UNIT.

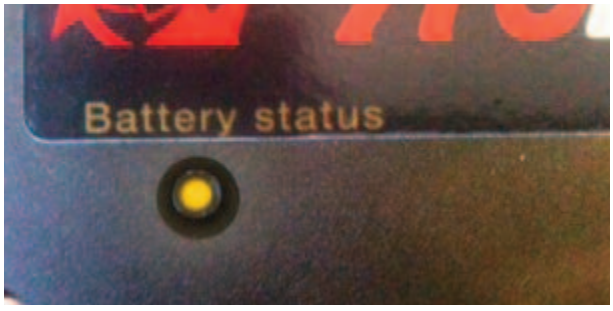
Replacement of Faulty Control Nozzle Mounted Transmitter Unit

If it is determined that the remote control Lance nozzle signal transmitter unit requires replacement, **return the entire Lance to PyroLance for repair.**

1.

2.

3.



4.

Pump Maintenance

Winterization

The abrasive vessel, fire pump and plumbing system are equipped with a winterization kit which includes a filling system and valves to permit the introduction of an anti-freeze liquid into the complete system. The anti-freeze kit includes a header tank, 3-way control valve and related plumbing.

The unit must be **immediately** winterized when temperatures are below 32°F (0°C) to avoid freezing. Total system displacement is approximately 10 Gallons (40 L), excluding the hose reels.

NOTE: Use only RV type (– 50°F) undiluted anti-freeze solution.

To winterize the PyroLance Power Unit, follow these steps:

STEP #1: Flush Procedure

1. The PyroLance unit should be in the **OFF** position.
2. Disconnect the Lance nozzle from the hose reel, but leave the hose on the reel.
3. Start the PyroLance unit (with nozzle removed) and simultaneously push the following buttons on the control panel:
   a) Emergency Override Button
   b) Emergency Water Button
   c) Emergency Abrasive Button
4. Run the PyroLance unit for 3 to 4 minutes to flush the entire system of abrasive. Visually check the water flow from the hose to ensure the water is clear of abrasive. If not, continue to flow water until water is clean.
5. Shut off the PyroLance engine using the **OFF** switch.

STEP #2: Anti-Freeze Filling Procedure

Following this procedure will ensure all the critical system components exposed to water are filled with anti-freeze solution:

1. Pull out the Emergency Stop Button so that the module is in the **ON** position. The electric switch on the pump panel should be moved from the TANK TO PUMP VALVE OPEN position to WINTERIZATION OPEN position.
2. Start the PyroLance unit with Lance removed and simultaneously push the following buttons on the control panel:
   a) Emergency Override Button
   b) Emergency Water Button
   c) Emergency Abrasive Button
3. Run the unit until anti-freeze solution is discharging in full color (without water) out the end of the hose.
4. Shut off the PyroLance engine using the **OFF** button.
5. Quickly re-attach the Lance nozzle to the hose and then rewind the hose onto the reel.
6. Shut off the anti-freeze valve.
7. Remove the abrasive fill cap and replenish the abrasive into the vessel. The abrasive will displace the anti-freeze solution in this process (which is normal). When filled completely, replace the abrasive vessel cap. (Please see the filling procedure section of this manual for this segment to assure proper replenishment.)
8. The unit is now protected against freezing and the power unit can be returned to the storage position.

STEP #3: Re-Activation of System for Normal Operations

1. Activate the tank to pump control switch (valve located between the apparatus water tank and the PyroLance power unit) by moving the three-way valve from “anti-freeze open” position to the “water tank open” position.
2. Start the unit and operate per the Operation section of this manual.

WARNING

Proper winterization procedures must be immediately followed after use to avoid freezing in temperatures below 32°F (0°C).

Winterization must also be completed prior to shipping and storage.

Engine Problems

1. **ENGINE DOESN'T START UP.**
   a) Check if the Emergency Stop control is released.
   b) Check the fuses located at the main power unit electrical box.
   c) Check if the Deutz connector to the battery terminals are securely connected and power is being supplied to the power unit from the vehicle's battery system.
   d) Check the fuel level in the fuel tank.

2. **THE ENGINE DOESN'T SPEED UP WHEN PULLING THE WATER TRIGGER.**
   a) Check for power supply and steady green light at the receiver.
   b) Check battery condition or replace the battery in the Lance nozzle transmitter assembly.
   c) Check the fuses located at the main power unit electrical box.

Pump and Plumbing Problems

1. **PUMP IS UNDER PRESSURE AND WILL NOT ALLOW ENGINE TO TURN.**
   a) Check that the bypass/relief valve is not stuck in the closed position.
   b) Check that the EZ-Start valve is in operation.
   c) Check that vehicle batteries are in a "fully charged" condition.
   d) Check the battery supply cable from the vehicle batteries to the power unit.

2. **PUMP IS CAVITATING OR WATER IS SURGING.**
   a) Check water tank level.
   b) Check that tank to pump valve is in fully open position.
   c) Check that bypass/relief valve is not stuck.
   d) Check that pump water is not overheating by observing thermal relief valve discharge port.

3. **BYPASS/RELIEF VALVE CONTINUOUSLY CYCLING.**
   a) Check for water leaks in plumbing system.
   b) Check for blocked water filter strainer.
   c) Check pump-to-tank valve is fully open.
   d) Check that KZCO valves operate properly.

Lance Nozzle Problems

1. **WATER DOES NOT EXIT THE LANCE NOZZLE UNDER LOAD**
   a) Check if the tank-to-pump valve is open.
   b) Prime the system.
   c) Check the water level in the tank.
   d) Check for leakages in plumbing system.
   e) Check if the water filter element – remove and clean.
   f) Check to see if the Lance nozzle orifice is blocked.

2. **AFTER RELEASING THE WATER TRIGGER, WATER IS STILL GOING OUT OF THE LANCE NOZZLE.**
   a) Check for air bubble in the abrasive vessel.
   b) Stop the engine, with power still **ON**, and cycle the water trigger, observe operation from the KZCO ball valve indicator dial.

3. **PENETRATING/CUTTING OPERATION DOES NOT MAKE HEADWAY.**
   a) Check abrasive level in vessel.
   b) Check operation of abrasive flow control valve.
   c) Check operating pressure on pressure vessel (loss of more than 500 PSI (35 Bar) will indicate worn-out nozzle).

4. **EXCESSIVE SPRAYBACK FROM LANCE NOZZLE TIP OR FLARING OF STREAM.**
   a) Check for worn end plate.
   b) Check for worn nozzle tip.
   c) Check that end plate is properly secured.
   d) Check Lance nozzle angle of attack and re-position to better operating angle.

Electrical Problems

1. **POWER UNIT IS NOT RESPONDING TO LANCE INPUTS.**
   a) Check that Emergency Stop control is released and power is **ON**.
   b) Check that batteries in Lance nozzle are fully charged.
   c) Check that fuses work in main power unit electrical box.
   d) Check that green LED flashes on the remote control wireless receiver box.

Anti-Freeze Loading Problems

1. **ANTI-FREEZE SYSTEM DOES NOT LOAD OR WORK PROPERLY.**
   a) Check tank-to-pump valve and ensure it is in the anti-freeze position.
   b) Check anti-freeze container for contents.
   c) Check that UHP pump is primed.

Hose Reel Problems

1. **THE REEL DOES NOT REWIND.**
   a) Check if battery is connected.
   b) Check if the fuse reel electrical box is operational.
   c) Check wiring connections in power unit electrical box and reel electrical box for loose connections.
   d) Check the reel rewind button on the front panel for proper operation.

L-1000 W-G POWER UNIT REPLACEMENT PARTS			
Item #	**Adapters**	**QTY**	**Component Location**
1	4501-20-20	3	In-line suction filter inlet & outlet
2	25TB-20-20	2	Manifolds C & D
3	8-8 FTX-S	1	Manifold C
4	4-8 CTX-S	1	Manifold C
5	12 FTX-S	1	Manifold D
6	12 CTX-S	1	Manifold D
7	12 C40MX-S	1	Udor Pump inlet
8	12 F40MX-S	1	Udor Pump outlet
9	8 S6X-S	1	Udor Pump outlet port tee
10	8-8 F40MX-S	1	Unloader Valve & Udor outlet to tee
11	8-8 C40MX-S	4	Unloader Valve (3 ports)
12	8 G6X-S	1	EZ Start Valve
13	4-4 DTX-S	2	Gauges
14	8-8 CTX-S	1	Lower actuator valve inlet
15	8-8 VTX-S	3	Upper & lower actuator valves
16	8 R6X-S	3	Tee connectors & Vessel
17	S2503-8-8	1	Vessel Cap
18	24-1/2 F5OG-S 993XXX	1	Vessel Cap
19	8 F50X-S	1	Lower vessel port
20	12-16 VTX-S	1	Hose reel swivel
21	SST-N4	1	Hose reel
22	SST-4-SL	1	Lance
23	213.53 3000 PSI/BAR 1/4 B UCZ PYROLANCE	2	Gauges
24	TBC-175	4	Bolt Clamps
25	8 WTX-WLN-S	1	Panel bulkhead
26	6M14F80MX	1	Engine Drain
27	MV609-4	1	Engine Drain
	HOSE ASSEMBLIES		
1	471ST-01-05-8-8-8-70"	1	Lance
2	451TC-01-13-8-12-12-1800"	1	Hose Reel 150'
3	471TC-06-06-12-8-8-240"	1	20' supply
4	471TC-06-37-8-8-8-26"	1	Lower vessel to tee
5	471TC-06-06-8-8-8-21"	1	Upper actuator to vessel cap
6	471TC-06-06-8-8-8-18"	1	Tee to upper actuator inlet
7	471TC-06-39-8-8-8-26.5"	1	Unloader valve to lower actuator inlet
8	471TC-06-06-8-4-4-44"	1	Gauge line to unloader valve (Pump)
9	471TC-06-06-8-4-4-78"	1	Gauge line to vessel cap
10	471TC-06-41-8-8-8-22"	1	Unloader valve to manifold C block
11	471TC-06-37-8-8-8-23"	1	Udor pump outlet to unloader valve
12	801BLU-06-EZV-4-4-4-23"	1	Udor pump EZ Start line
13	7395-1250025-23"	1	Manifold C to D
14	7395-06-06-12-12-12-17.25"	1	Udor Pump inlet
15	7395-06-39-12-12-12-24"	1	Udor Pump intlet
16	7395-1250025-5"	1	In-line suction filter outlet
17	7563-1250-240"	1	20' supply
18	7563-1250-24"	1	Supply line from panel
19	471TC-06-37-8-8-8-24"	1	Supply line from panel
20	801BLK-06-01-6-4-6-24	1	Engine drain hose

Ordered from:

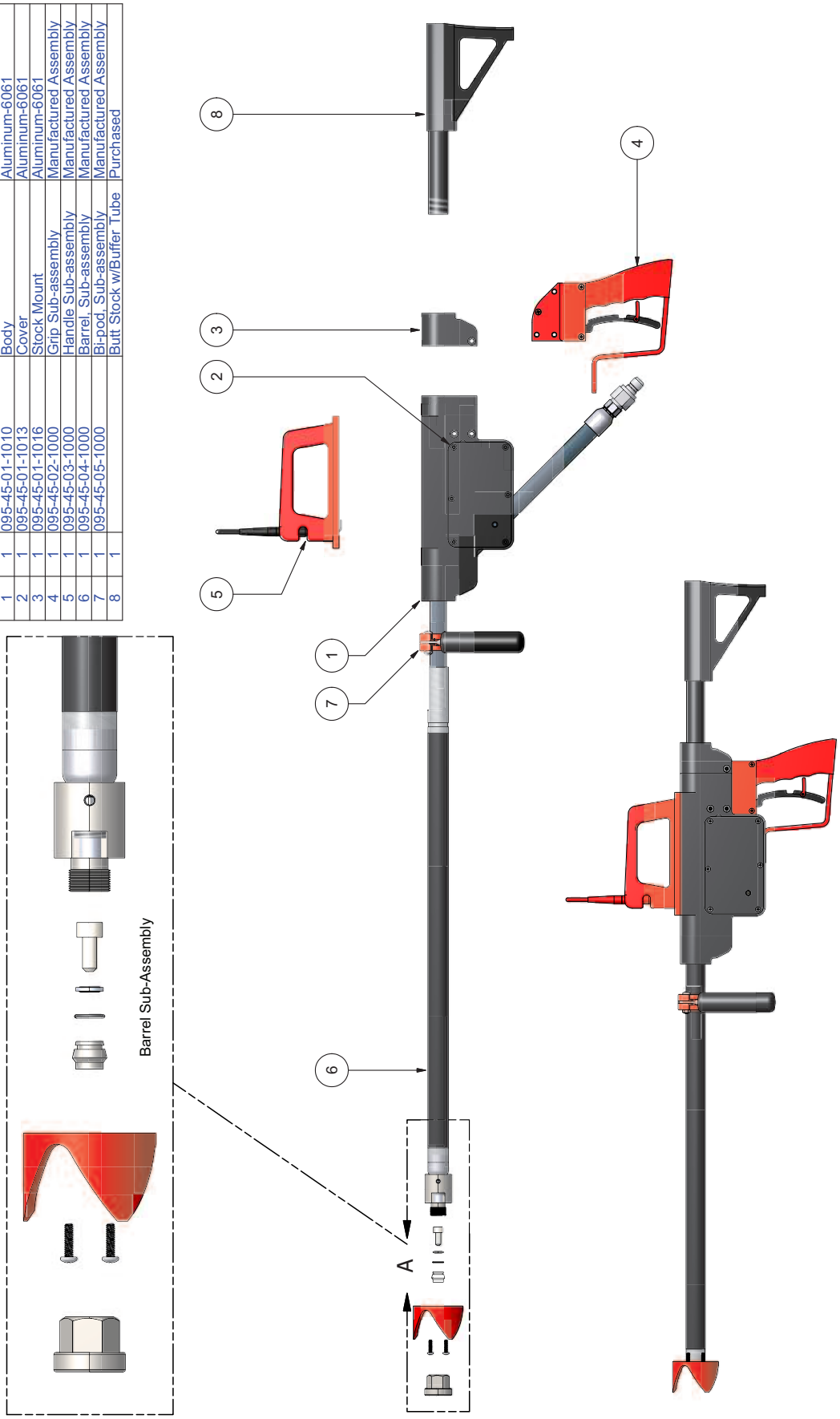
PyroLance North America
525 Main Street, Box 120609
New Brighton, MN 55112 USA

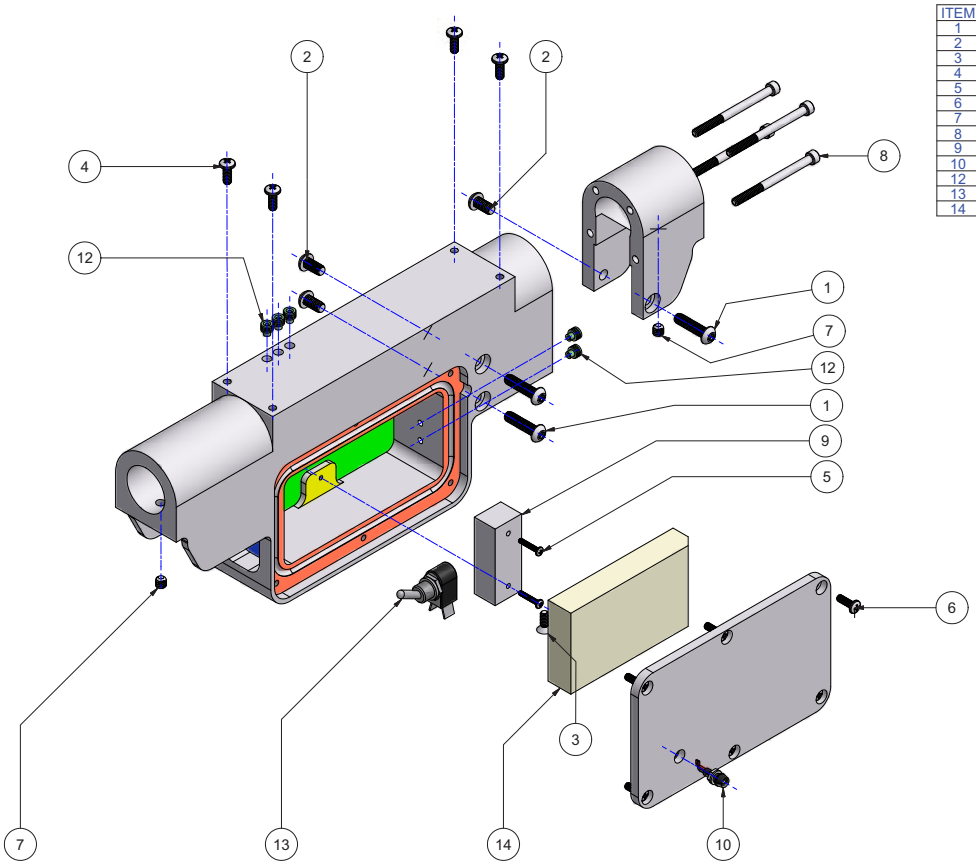
Phone: +1-651-636-0577
Fax: +1-651-636-0887
Email: sales@pyrolance.com

www.pyrolance.com

Parts Identification

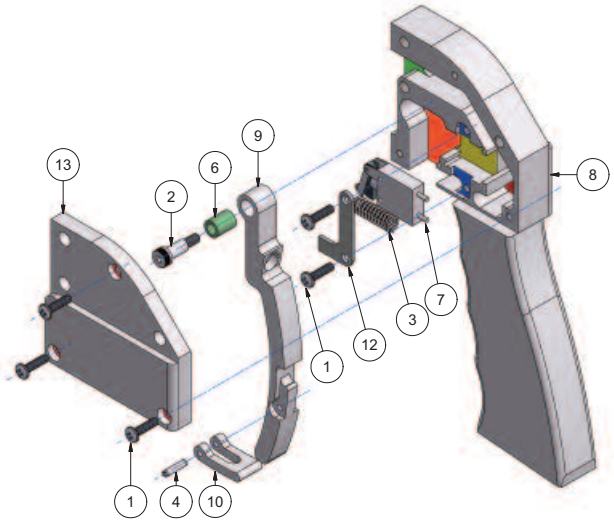
ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL
1	1	095-45-01-1010	Body	Aluminum-6061
2	1	095-45-01-1013	Cover	Aluminum-6061
3	1	095-45-01-1016	Stock Mount	Aluminum-6061
4	1	095-45-02-1000	Grip Sub-assembly	Manufactured Assembly
5	1	095-45-03-1000	Handle Sub-assembly	Manufactured Assembly
6	1	095-45-04-1000	Barrel. Sub-assembly	Manufactured Assembly
7	1	095-45-05-1000	Bi-pod. Sub-assembly	Manufactured Assembly
8	1		Butt Stock w/Buffer Tube	Purchased





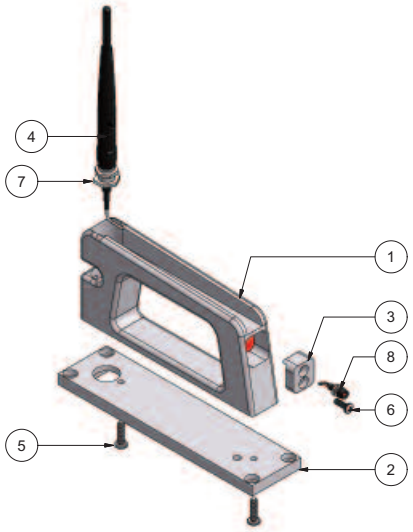
ITEM	QTY	DESCRIPTION
1	3	Bolt_ButtonHeadSocket_1/4-20x1
2	3	Bolt_ButtonHeadSocket_1/4-20x1/2
3	2	Bolt_FlatHead_10-24x1/2
4	4	Bolt_PanHead_10_24x1/2
5	2	Bolt_PanHead_4-40x9/16
6	6	Bolt_PanHead_8-32x1/2
7	2	Screw_Set_1/4-20x1/4
8	4	Bolt_SocketHeadCapScrew_10-24x2-1/2
9	1	JunctionBlock, 8Wire
10	1	LED_BSI_3mm_Yellow_MicroPrecision
12	5	RubberBushing_WireSeal
13	1	Switch_Toggle_On/Off
14	1	Transmitter, RF, Air Eagle

ITEM	QTY	PART NUMBER	DESCRIPTION
1	5		Bolt_PanHead_8-32x5/8
2	1		Bolt_Shoulder_1/4x1/2x10-24
3	1		Spring_11/32x1in
4	1		Spring Roll Pin_1/8x9/16
5	2		Bolt_FlatHead_10-24x3/4
6	1		Bushing_Igus_Trigger Pivot
7	1		Switch_Micro
8	1	095-45-02-1010	Grip/Trigger Housing
9	1	095-45-02-1012	Trigger
10	1	095-45-02-1013	Safety Lever
11	1	095-45-02-1014	Trigger Guard
12	1	095-45-02-1015	Spring Keeper
13	1	095-45-02-1016	Cover



Lance Pistol Grip Handle

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-45-03-1010	Handle
2	1	095-45-03-1011	Mounting Plate
3	1	095-45-03-1012	Holder, LED
4	1		Antenna_Folding_4in_RP-TNCm
5	2		Bolt_PanHead_10_24x750
6	1		Bolt_PanHead_8_32x500
7	1		Bulkhead_RP-TNCf
8	1		LED_BSI_3mm_Red_MicroPrecision

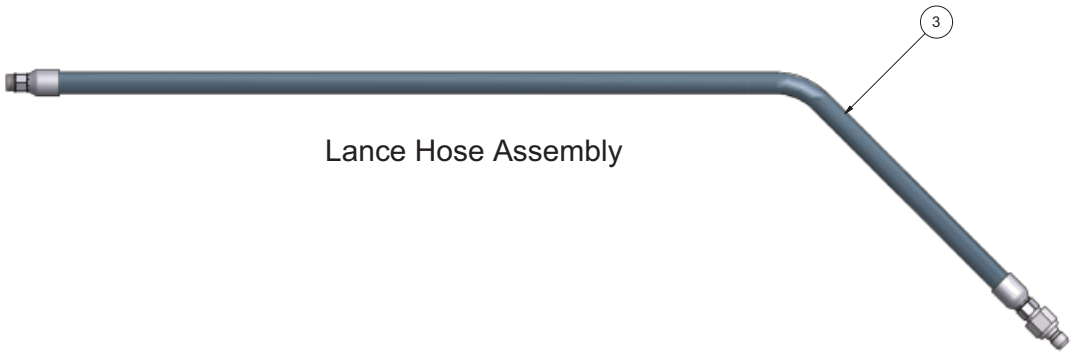


Lance Handle Assembly

Parts Identification

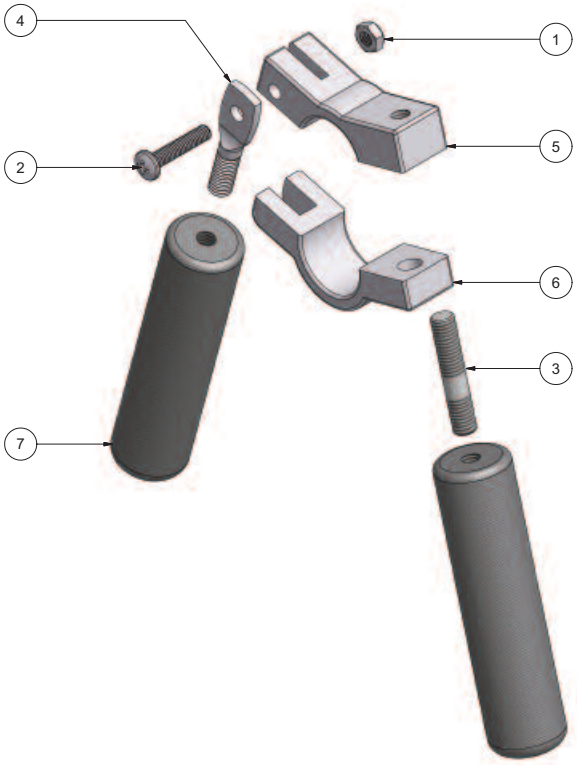
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-45-04-1011	Barrell End
2	1	095-45-04-1010	Barrel
4	4		Bolt_PanHead_10_24x750
5	1		NOZZLE, WASHER, PRESSURE SEALING
6	1		NOZZLE, SEAL BUSHING
7	1		NOZZLE, ORING - 907
8	1		NOZZLE, HYDRO JET
9	1		NOZZLE, HEAD
10	1		NOZZLE, HOUSING

Lance Barrel

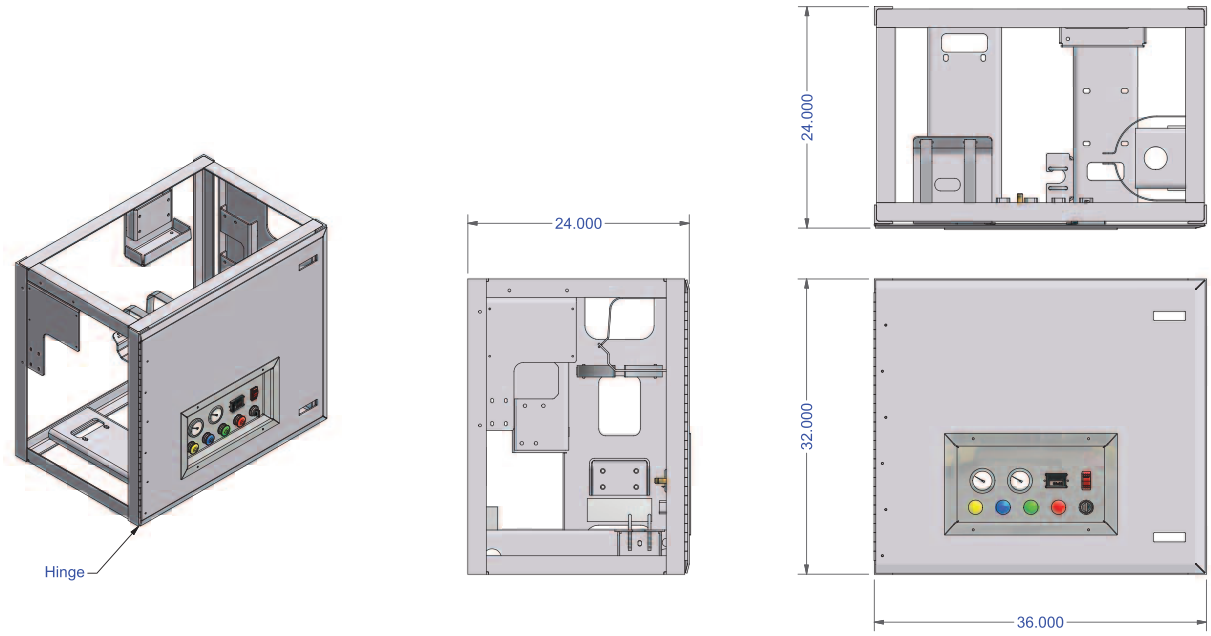


Lance Hose Assembly

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1		Nut_NylonLocking_Thin_250_20
2	1		Bolt_PanHead_250_20x1 250
3	1		SpacingStud_375_16x2_625x1
4	1		Bolt_HangerBolt_375_16
5	1	095-45-05-1010	Upper Clamp
6	1	095-45-05-1011	Lower Clamp
7	2	095-45-05-1012	Knurled Handle



Bi-Pod Handle Assembly



PyroLance North America
Assembly Drawing
Air Force Power Unit
MIL-L-1000

Weld-on & Bolt-on
Accessories

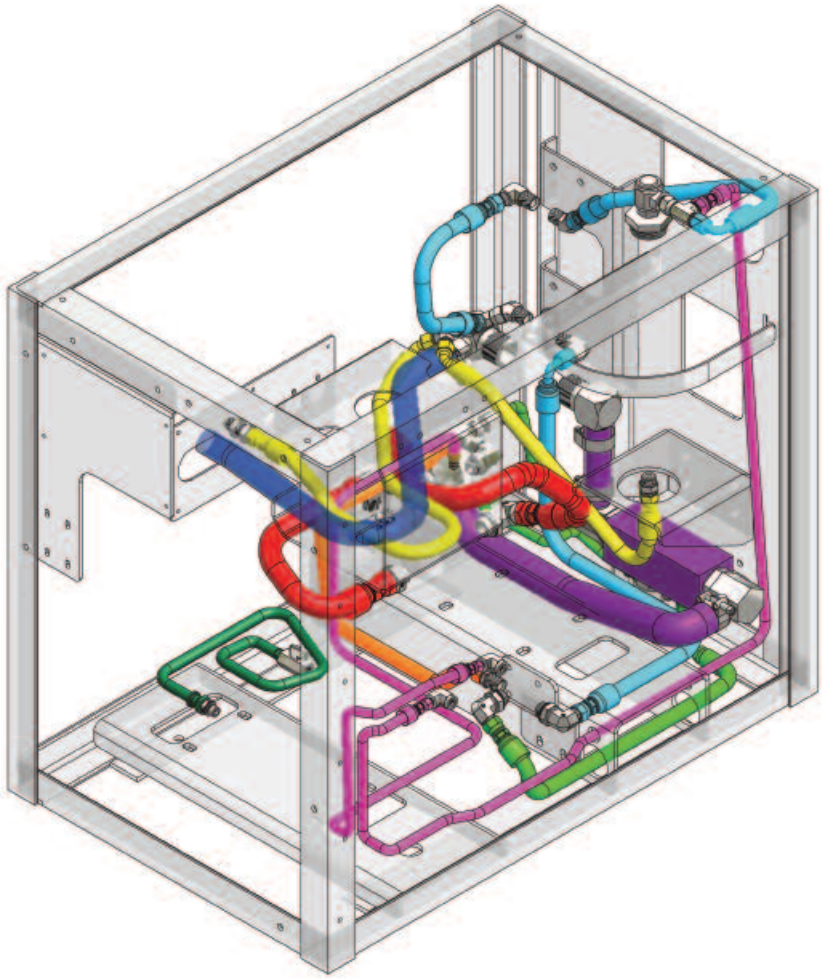
ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL
1	1	095-45-20-1020	Engine Mounting Plate	ALUM, Sheet, .250, Smooth, 5052
2	1	095-45-20-1021	Pump Mounting Plate	ALUM, Sheet, .250, Smooth, 5052
3	1	095-45-20-1022	Vessel/Valve Plate	ALUM, Sheet, .190, Smooth, 3003
4	1	095-45-20-1023	Bracket_KZCO Valves	ALUM, Sheet, .190, Smooth, 3003
5	1	095-45-20-1024	Bracket_PressureVessel	ALUM, Sheet, .250, Smooth, 5052
6	1	095-45-20-1025	Door	ALUM, Sheet, .190, Smooth, 3003
7	1	095-45-20-1026	Bracket_Fuel Tank	ALUM, Sheet, .190, Smooth, 3003
8	1	095-45-20-1027	Bracket_JunctionBox_ThrottleSolenoid	ALUM, Sheet, .190, Smooth, 3003
9	1	095-45-20-1028	Bracket_ReceiverBox	ALUM, Sheet, .190, Smooth, 3003
10	1	095-45-20-1030	Bracket_ReceiverBox	ALUM, Sheet, .190, Smooth, 3003
11	1	095-45-20-1031	Bracket, Unloader Valve	ALUM, Sheet, .190, Smooth, 3003
12	2	095-45-20-1040	RetainingStrap_Vessel	SS, Sheet, 12GA
13	2	095-45-20-1041	RetainingStrap_FuelTank	SS, Sheet, 12GA
14	1	095-45-20-1051	Spacer_Block_Manifold	Aluminum-6061
15	1	095-45-22-1000	Panel, Control	Manufactured Assembly

Udor Pump Parts

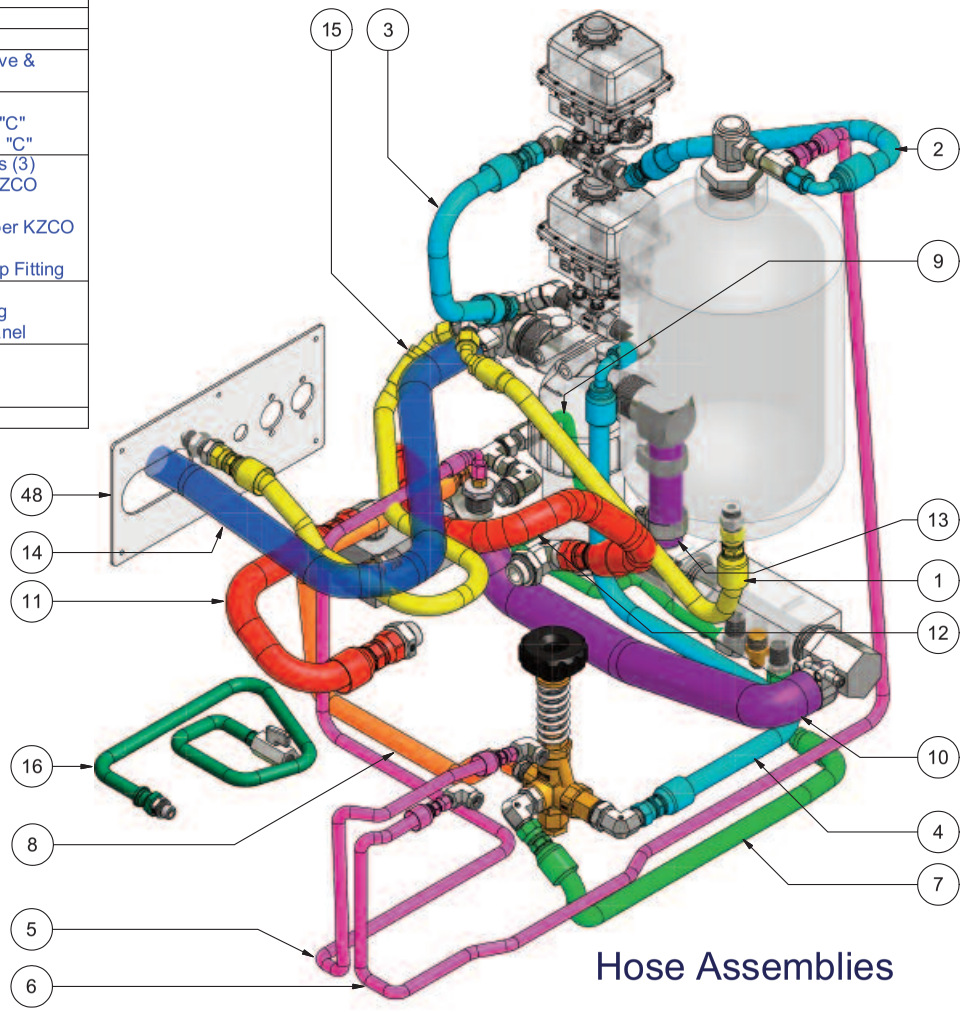
GC 38/15-S Quick Reference

Maximum Flow .....10.0 GPM	Valve Kit 04-KIT UD-3
Maximum Pressure .....2200 PSI	Seal Kit.....04-KIT UD-12
Rated Pump Speed .....1450 RPM	Brass Kit 04-KIT UD-19
Oil Capacity.....40 oz. UDOR LUBE	Plunger Bolt Kit 04-KIT UD-6
or SAE 30W	Plunger Part # 04-1205.34
Non-Detergent Oil	Plunger Diameter.....28 MM

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-30-12-4318	Hose Assembly, Lower Vessel-to-Tee
2	1	095-30-12-4319	Hose Assembly, Upper KZCO-to-Vessel Cap
3	1	095-30-12-4321	Hose Assembly, Tee-to-Upper KZCO Inlet
4	1	095-30-12-4322	Hose Assembly, Unloader-to-Lower KZCO Inlet
5	1	095-30-12-4323	Hose Assembly, Pump-to-PumpGuage
6	1	095-30-12-4324	Hose Assembly, Vessel Cap-to-Vessel Gauge
7	1	095-30-12-4325	Hose Assembly, Unloader Vavle-to-Manifold C
8	1	095-30-12-4326	Hose Assembly, Pump Outlet-to-Unloader
9	1	095-30-12-4327	Hose Assembly, EZ Start-to-Manifold C
10	1	095-30-12-4328	Hose Assembly, Manifold C-to-Mainifold D
11	1	095-30-12-4329	Hose Assembly, Manifold D-to-Pump Inlet, 17-1/4in
12	1	095-30-12-4330	Hose Assembly, Manifold D-to-Pump Inlet, 24in
13	1	095-30-12-4331	Hose Assembly, Filter-to-Manifold C
14	1	095-30-12-4333	Hose Assembly, Supply Tank-to-Filter Inlet
15	1	095-30-12-4334	Hose Assembly, Supply, Power Unit-to-Bulkhead Panel
16	1	095-30-12-4335	Hose Assembly, Engine Oil Drain
17	2	095-30-12-4350	Adapter, 90 Elbow, 1-1/4 MSTO x 1-1/4 Barbed Hose
18	3	095-30-12-4351	Adapter, 90 Elbow, 1-1/4 MNPT x 1-1/4 Barbed Hose
19	2	095-30-12-4352	Adapter, 1/2M37JIC x 1/2MNTPF, Straight
20	1	095-30-12-4353	Adapter, 90, 1/4M37JIC x 1/2MNPTF
21	1	095-30-12-4354	Adapter,Straight, 3/4MNPTF X 3/4M37JIC
22	1	095-30-12-4355	Adapter, 90, 3/4MNPTF X 3/4M37Flare
23	1	095-30-12-4356	Adapter, 90, 3/4M37JIC x 3/4MBSPP O-ring
24	1	095-30-12-4357	Adapter, 3/4M37JIC x 3/4MBSPP
25	1	095-30-12-4358	Tee Fitting, 1/2M37JIC x 1/2F37JIC Swivel
26	3	095-30-12-4360	Adapter, 90 Elbow, 1/2M37JIC x 1/2MST
27	1	095-30-12-4361	Adapter, 1/2M37JIC x 1/2F37JIC Swivel
28	2	095-30-12-4362	Adapter, 90, 1/4M37JIC x 1/4FNPTF
29	2	095-30-12-4363	Adapter, 90, 1/2MNPTF X 1/2M37JIC
30	2	095-30-12-4364	Adapter, 45, 1/2MNPTF X 1/2M37JIC
31	3	095-30-12-4365	Tee Fitting, 500M37JIC x 500F37JIC Swivel
32	1	095-30-12-4366	Fitting, Swivel, 90, 1/2MNPT x 3/4-16UNF37JIC
33	1	095-30-12-4367	Adapter, 1/2FNPTF x 1-1/2 ST O-ring
34	1	095-30-12-4368	Adapter, 1/2M37JIC x 3/4-16MST O-ring
35	1	095-30-12-4369	Adapter, Straight, 1/4MNPTF x 1/4M37JIC
36	5	095-30-12-4372	Clamp, HeavyDuty, T-Bolt
37	1	095-30-12-4373	Fitting, Bulkhead, 1/2M37JIC x 1/2M37JIC
38	1	095-30-12-4374	Adapter, Straight, 3/8M37JIC x M14-1-1/2 O-ring
39	1	095-30-12-4375	Valve, Ball, Low Pressure, 1/4 x 1/4
40	1	095-30-12-4381	Reducer Bushing, 1/2MNPT x 3/8FNPT
41	1	095-41-01-2010	Manifold C
42	1	095-41-01-2020	Manifold D
43	1	095-41-05-1201	Thermal Relief Valve
44	1	095-41-05-1202	EZ Start Valve
45	1	095-41-05-1210	Pressure Relief Valve
46	1	095-41-05-1212	O-ring Guage Port
47	1	095-41-05-1320	Unloader Valve
48	1	095-45-20-1032	Bulkhead Panel

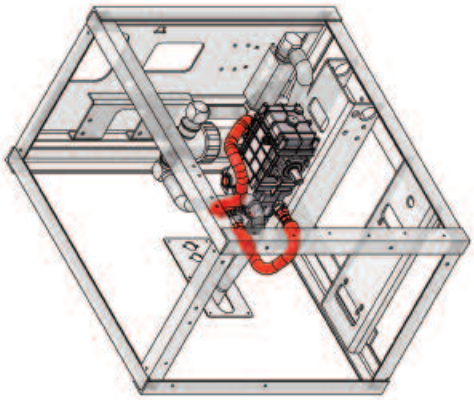


Color Key	
Color	Plumbing Section
Dark Blue	Bulkhead Panel-to-Filter
Purple	Filter-to-manifolds
Red	Manifold-to-Pump Inlets
Orange	Pump Outlet-to-Unloader Valve & Pressure Relief Valve
Light Green	Return Lines (2) 1. EZ Start Valve-to-Manifold"C" 2. UnloaderValve-to-Manifold "C"
Light Blue	Pressurized Valve Feed Lines (3) 1. UnloaderVavle-to-Lower KZCO Valve 2. Lower KZCO Vavle-to-Upper KZCO Valve 3. Upper KZCO-to-Vessel Top Fitting
Yellow	Pressurized Oultets (2) 1. Vessel Outlet-to-Tee Fitting 2. Tee Fitting-to-Bulkhead Panel
Pink	Gauge Lines (2) 1. Pump Pressure 2. Vessel Pressure
Dark Green	Engine Oil Drain Line

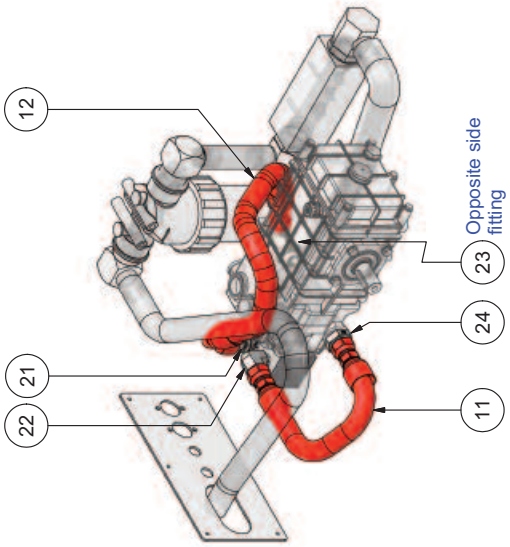


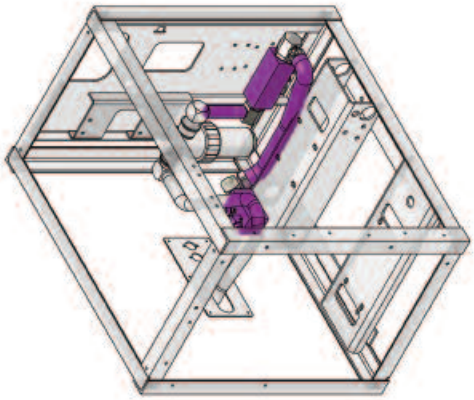
Hose Assemblies

Hose Assemblies			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-30-12-4318	Hose Assembly, Lower Vessel-to-Tee
2	1	095-30-12-4319	Hose Assembly, Upper KZCO-to-Vessel Cap
3	1	095-30-12-4321	Hose Assembly, Tee-to-Upper KZCO Inlet
4	1	095-30-12-4322	Hose Assembly, Unloader-to-Lower KZCO Inlet
5	1	095-30-12-4323	Hose Assembly, Pump-to-PumpGuage
6	1	095-30-12-4324	Hose Assembly, Vessel Cap-to-Vessel Gauge
7	1	095-30-12-4325	Hose Assembly, Unloader Vavle-to-Manifold C
8	1	095-30-12-4326	Hose Assembly, Pump Outlet-to-Unloader
9	1	095-30-12-4327	Hose Assembly, EZ Start-to-Manifold C
10	1	095-30-12-4328	Hose Assembly, Manifold C-to-Mainifold D
11	1	095-30-12-4329	Hose Assembly, Manifold D-to-Pump Inlet, 17-1/4in
12	1	095-30-12-4330	Hose Assembly, Manifold D-to-Pump Inlet, 24in
13	1	095-30-12-4331	Hose Assembly, Filter-to-Manifold C
14	1	095-30-12-4333	Hose Assembly, Supply Tank-to-Filter Inlet
15	1	095-30-12-4334	Hose Assembly, Supply, Power Unit-to-Bulkhead Panel
16	1	095-30-12-4335	Hose Assembly, Engine Oil Drain

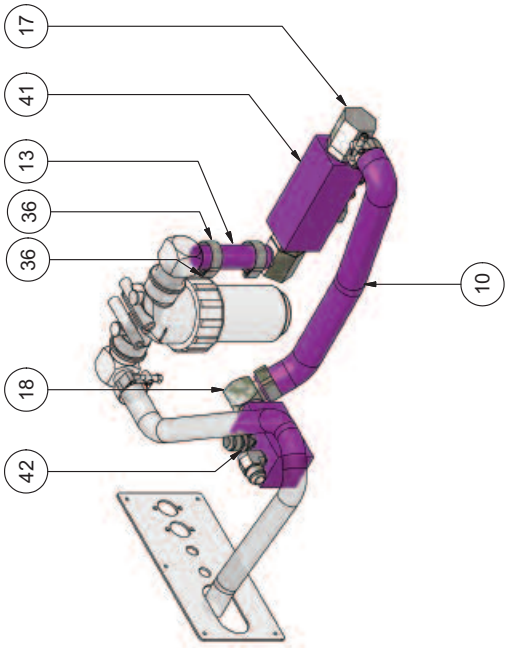


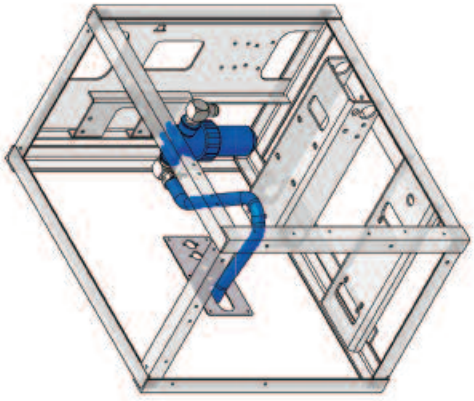
Red
Manifold-to-Pump Inlets



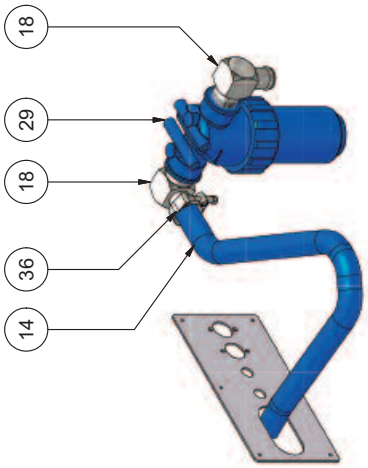


Purple
Filter-to-Manifolds

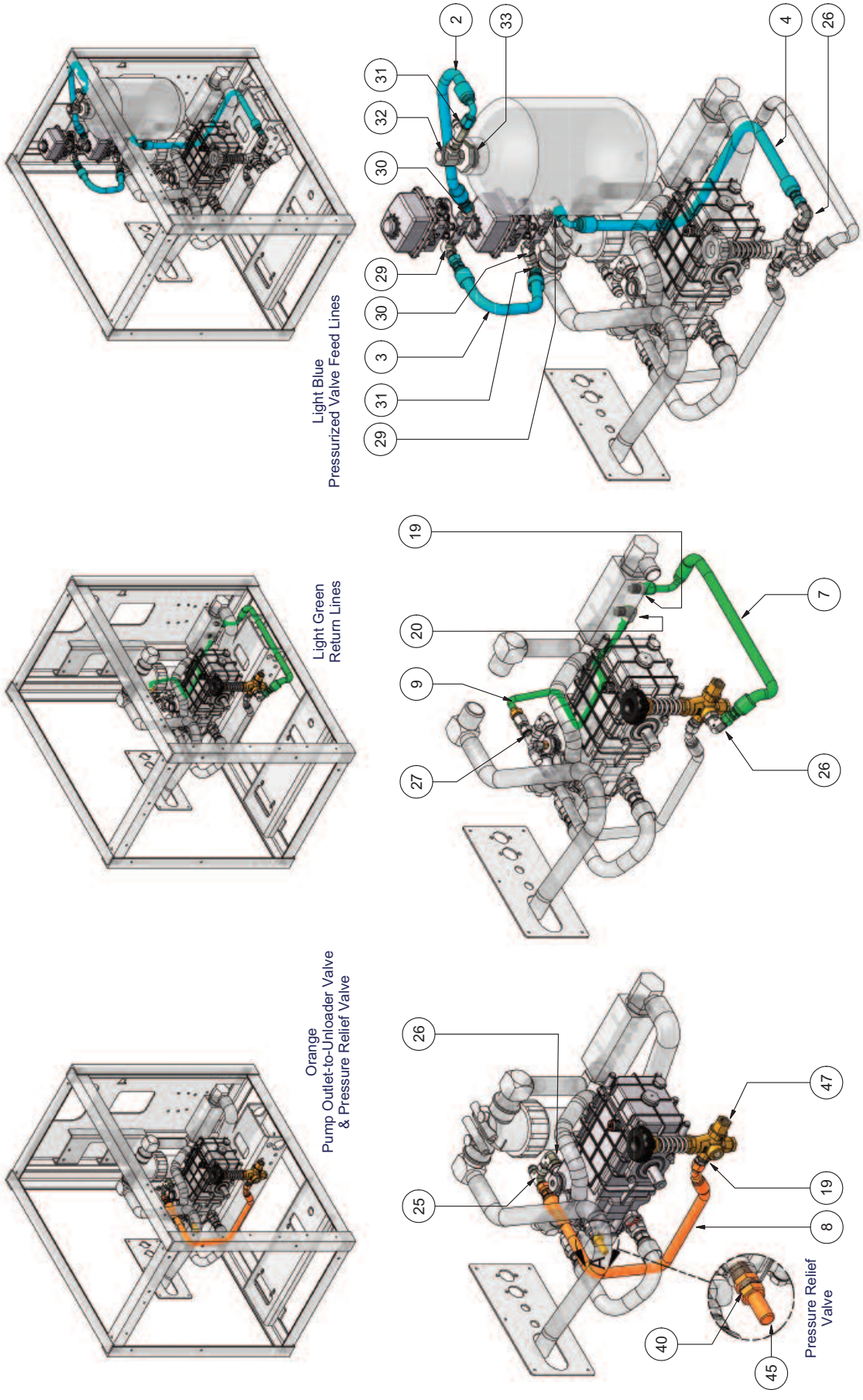


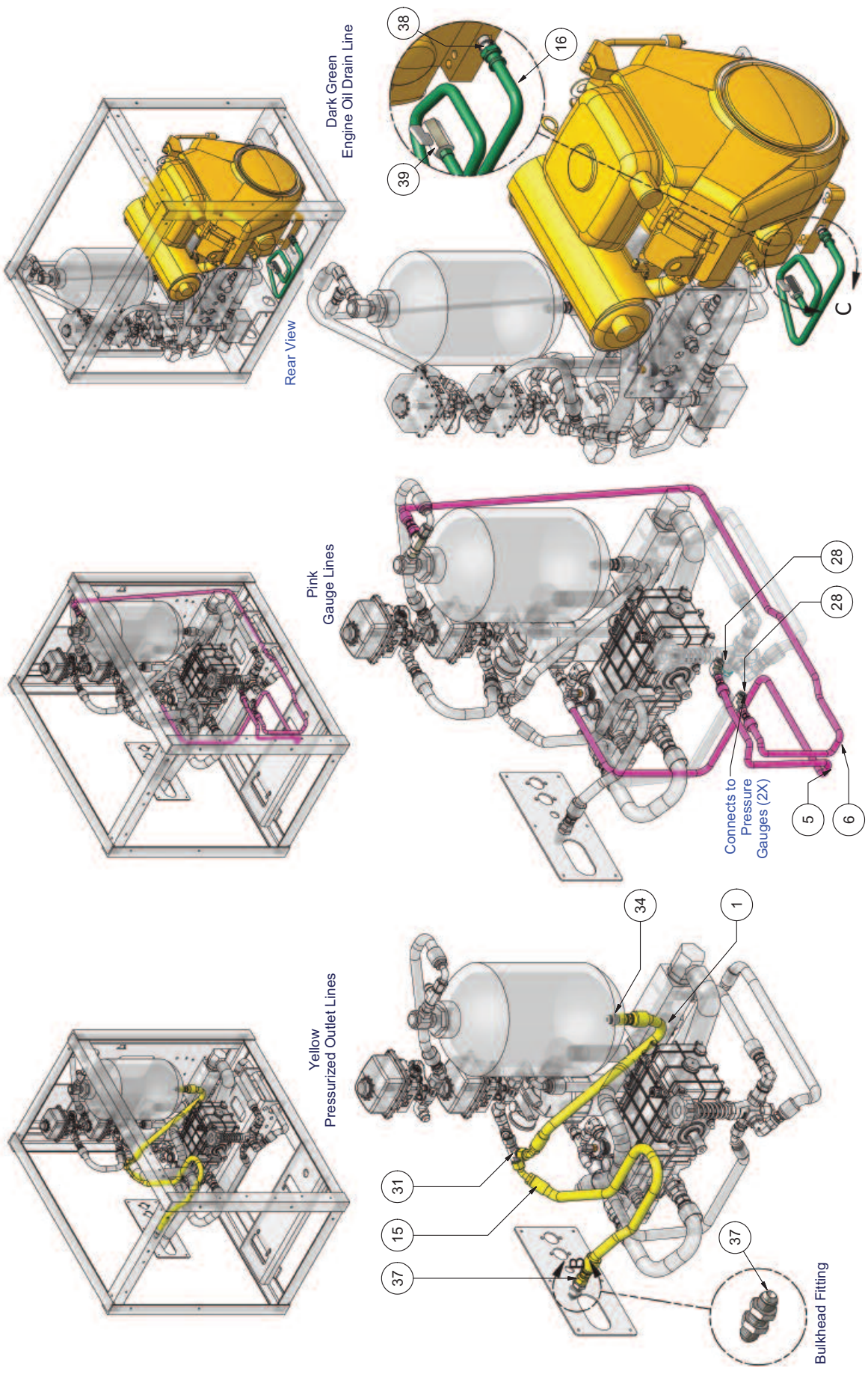


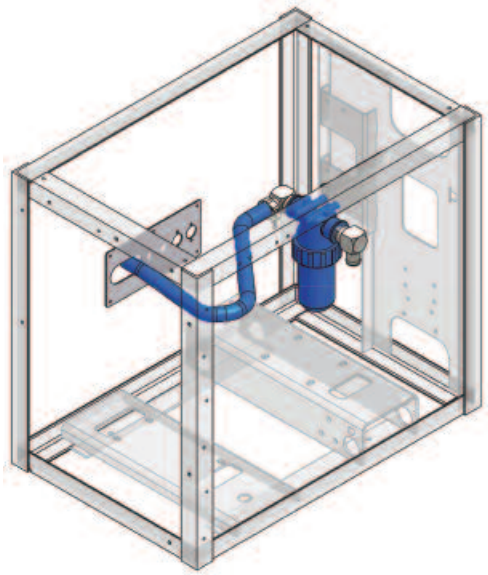
Dark Blue
Bulkhead Panel-to-Filter



Parts Identification

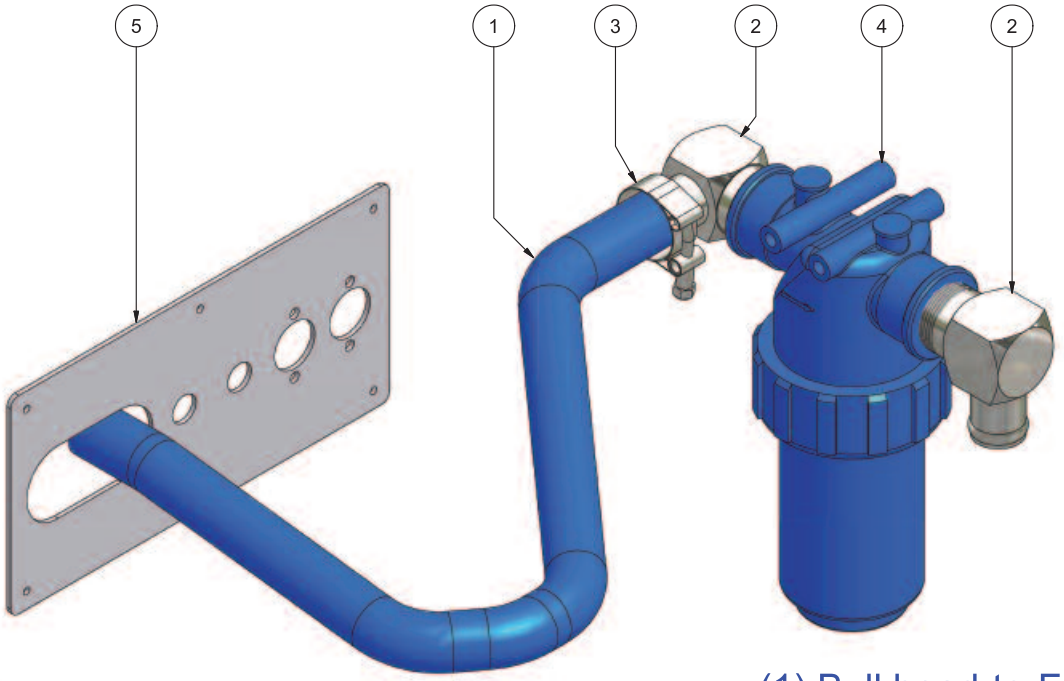



Rear View
Dark Green
Engine Oil Drain Line
38
16
39
C
Pink
Gauge Lines
28
28
Connects to
Pressure
Gauges (2X)
5
6
Yellow
Pressurized Outlet Lines
34
1
31
15
37
37
Bulkhead Fitting

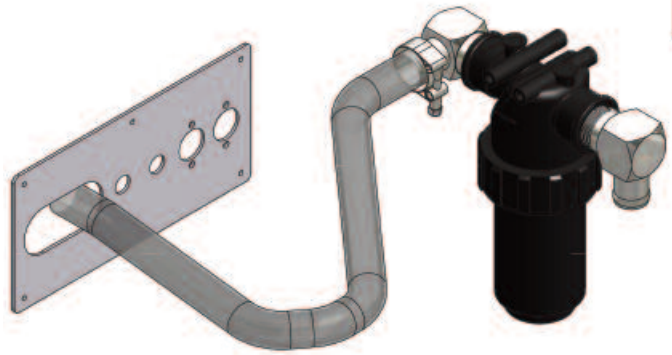


MIL-L1000 Plumbing Schematic
Bulkhead-to-Filter

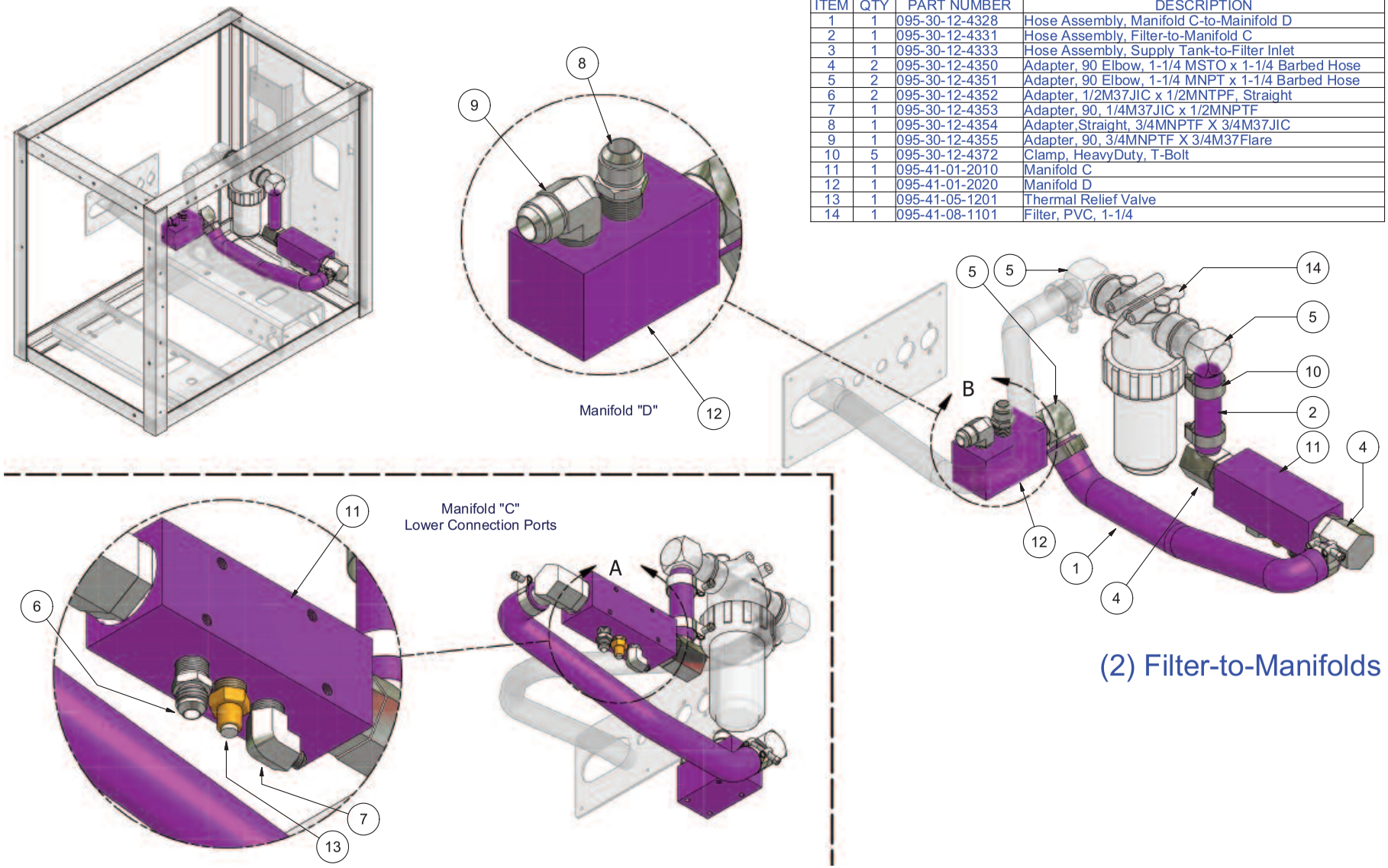
MIL-L1000 Plumbing Schematic - Bulkhead-to-Filter			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-30-12-4333	Hose Assembly, Supply Tank-to-Filter Inlet
2	2	095-30-12-4351	Adapter, 90 Elbow, 1-1/4 MNPT x 1-1/4 Barbed Hose
3	5	095-30-12-4372	Clamp, HeavyDuty, T-Bolt
4	1	095-41-08-1101	Filter, PVC, 1-1/4
5	1	095-45-20-1032	Bulkhead Panel



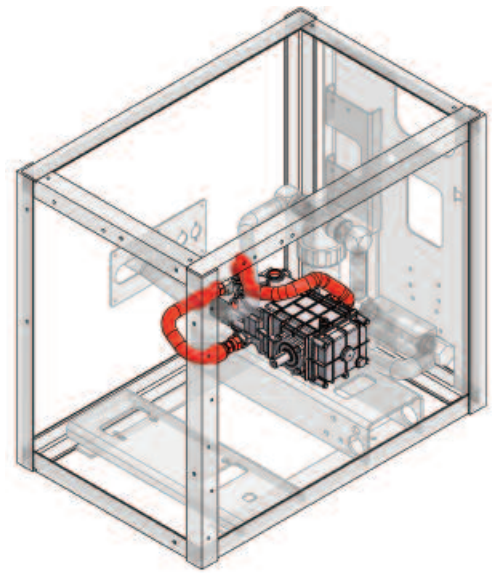
(1) Bulkhead-to-Filter

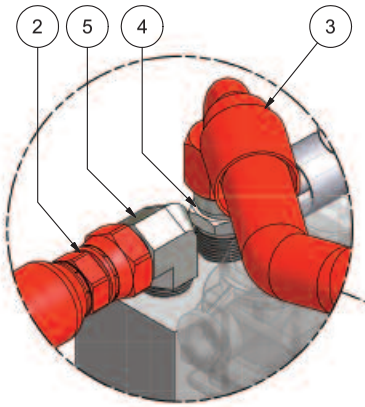


MIL-L1000 Plumbing Schematic - Filter-to-Manifolds			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-30-12-4328	Hose Assembly, Manifold C-to-Mainifold D
2	1	095-30-12-4331	Hose Assembly, Filter-to-Manifold C
3	1	095-30-12-4333	Hose Assembly, Supply Tank-to-Filter Inlet
4	2	095-30-12-4350	Adapter, 90 Elbow, 1-1/4 MSTO x 1-1/4 Barbed Hose
5	2	095-30-12-4351	Adapter, 90 Elbow, 1-1/4 MNPT x 1-1/4 Barbed Hose
6	2	095-30-12-4352	Adapter, 1/2M37JIC x 1/2MNTPF, Straight
7	1	095-30-12-4353	Adapter, 90, 1/4M37JIC x 1/2MNPTF
8	1	095-30-12-4354	Adapter,Straight, 3/4MNPTF X 3/4M37JIC
9	1	095-30-12-4355	Adapter, 90, 3/4MNPTF X 3/4M37Flare
10	5	095-30-12-4372	Clamp, HeavyDuty, T-Bolt
11	1	095-41-01-2010	Manifold C
12	1	095-41-01-2020	Manifold D
13	1	095-41-05-1201	Thermal Relief Valve
14	1	095-41-08-1101	Filter, PVC, 1-1/4



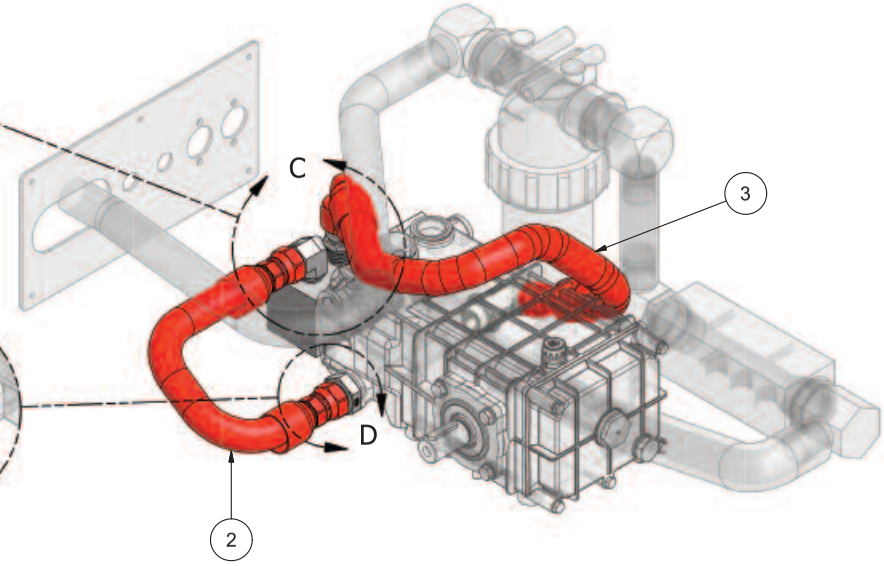
(2) Filter-to-Manifolds

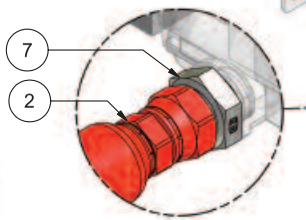




Hose Adapter Fittings
At Manifold "D"

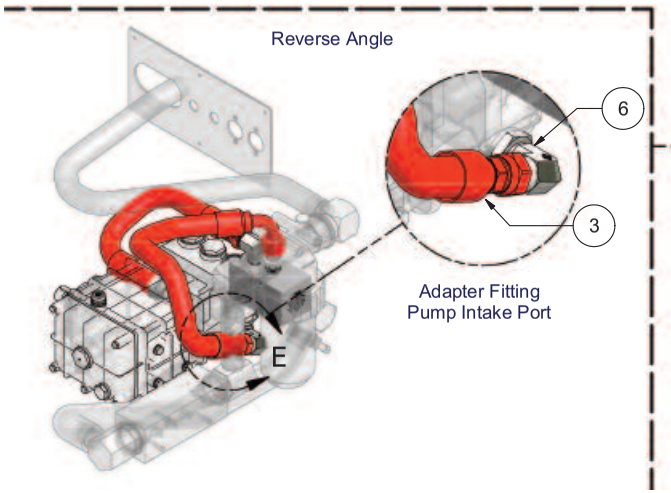
MIL-L1000 Plumbing Schematic - Manifold-to-Pump Inlets			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-30-12-4328	Hose Assembly, Manifold C-to-Mainifold D
2	1	095-30-12-4329	Hose Assembly, Manifold D-to-Pump Inlet, 17-1/4in
3	1	095-30-12-4330	Hose Assembly, Manifold D-to-Pump Inlet, 24in
4	1	095-30-12-4354	Adapter,Straight, 3/4MNPTF X 3/4M37JIC
5	1	095-30-12-4355	Adapter, 90, 3/4MNPTF X 3/4M37Flare
6	1	095-30-12-4356	Adapter, 90, 3/4M37JIC x 3/4MBSPP O-ring
7	1	095-30-12-4357	Adapter, 3/4M37JIC x 3/4MBSPP



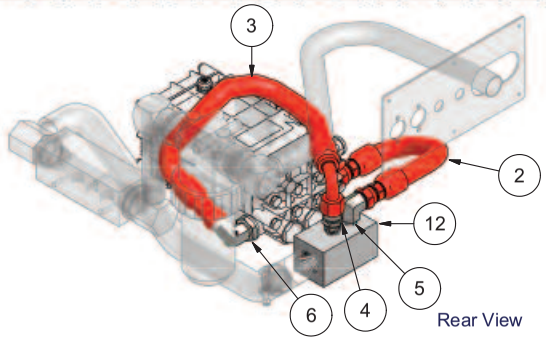


Adapter Fitting
Pump Intake Port

Reverse Angle



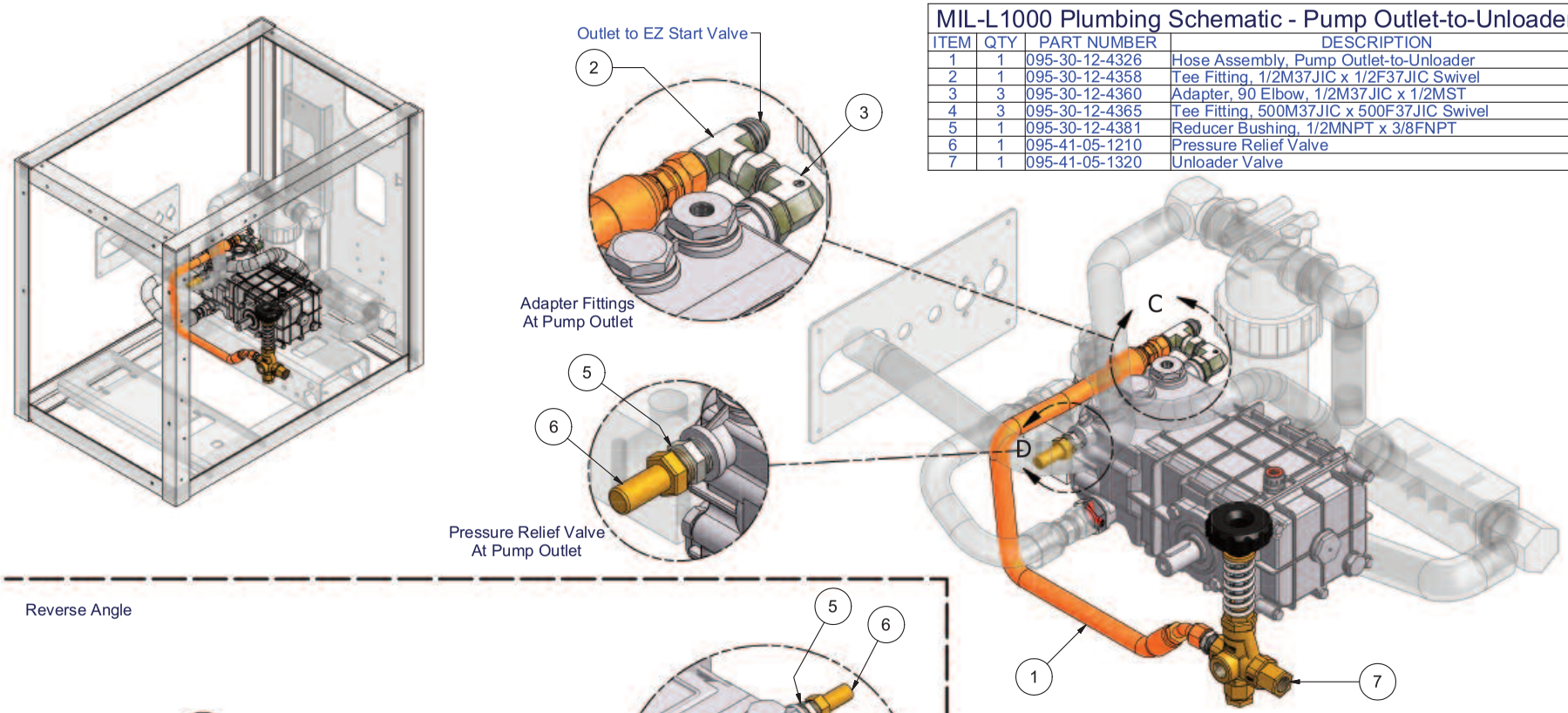
Adapter Fitting
Pump Intake Port



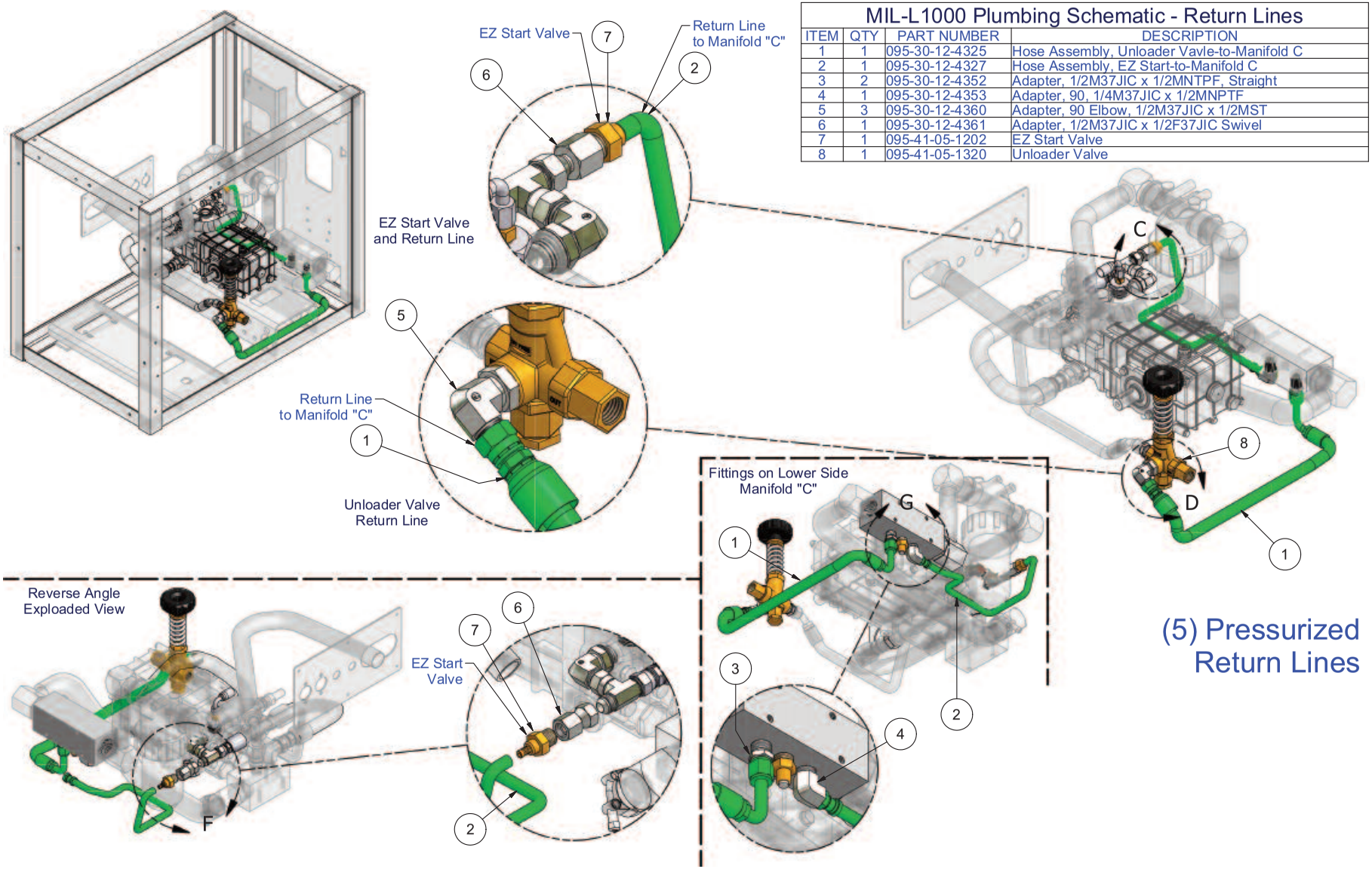
Rear View

(3) Manifold-to-Pump Inlets

MIL-L1000 Plumbing Schematic - Pump Outlet-to-Unloader			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-30-12-4326	Hose Assembly, Pump Outlet-to-Unloader
2	1	095-30-12-4358	Tee Fitting, 1/2M37JIC x 1/2F37JIC Swivel
3	3	095-30-12-4360	Adapter, 90 Elbow, 1/2M37JIC x 1/2MST
4	3	095-30-12-4365	Tee Fitting, 500M37JIC x 500F37JIC Swivel
5	1	095-30-12-4381	Reducer Bushing, 1/2MNPT x 3/8FNPT
6	1	095-41-05-1210	Pressure Relief Valve
7	1	095-41-05-1320	Unloader Valve



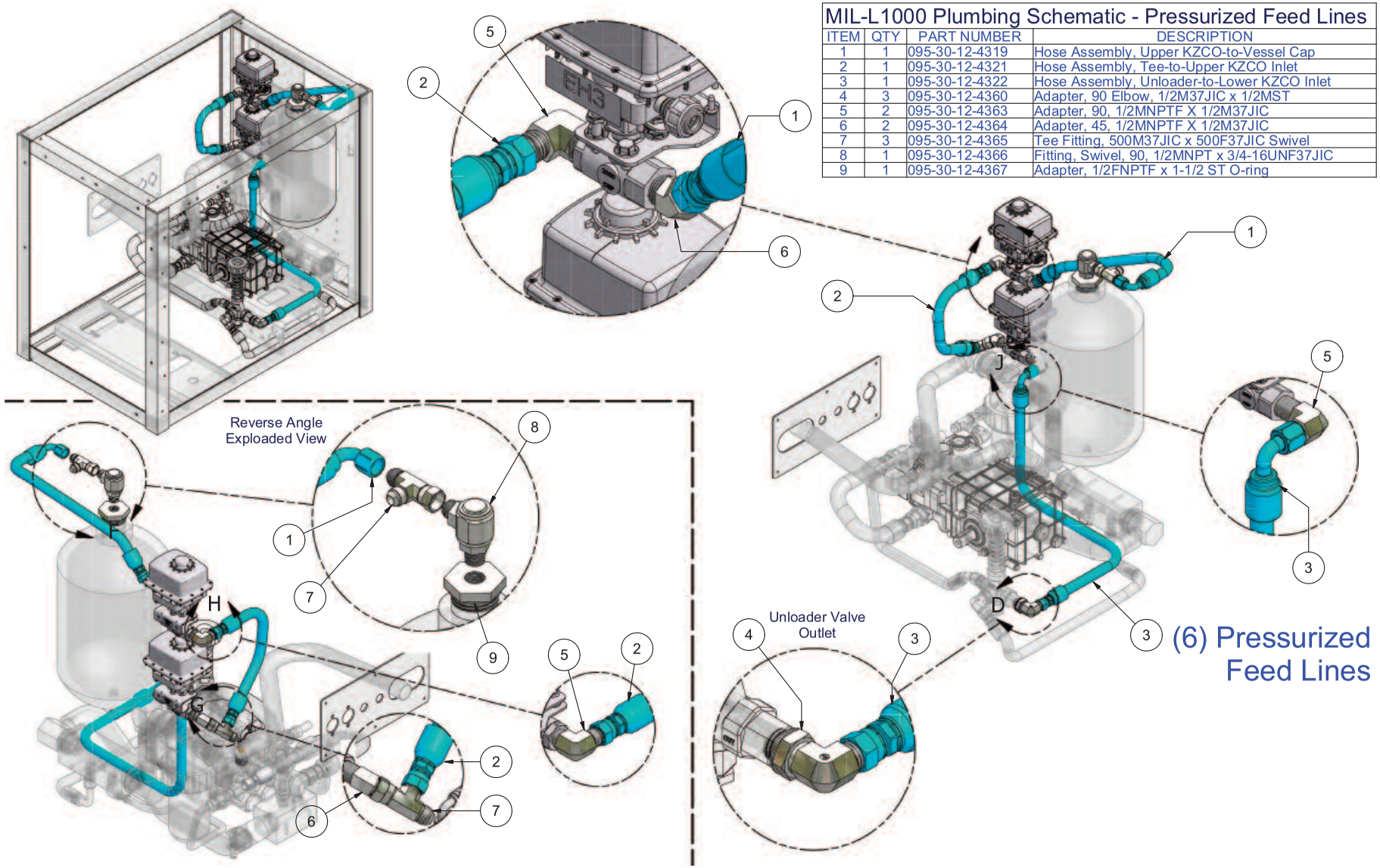
(4) Pump Outlets-to-Unloader Valve and Pressure Relief Valve



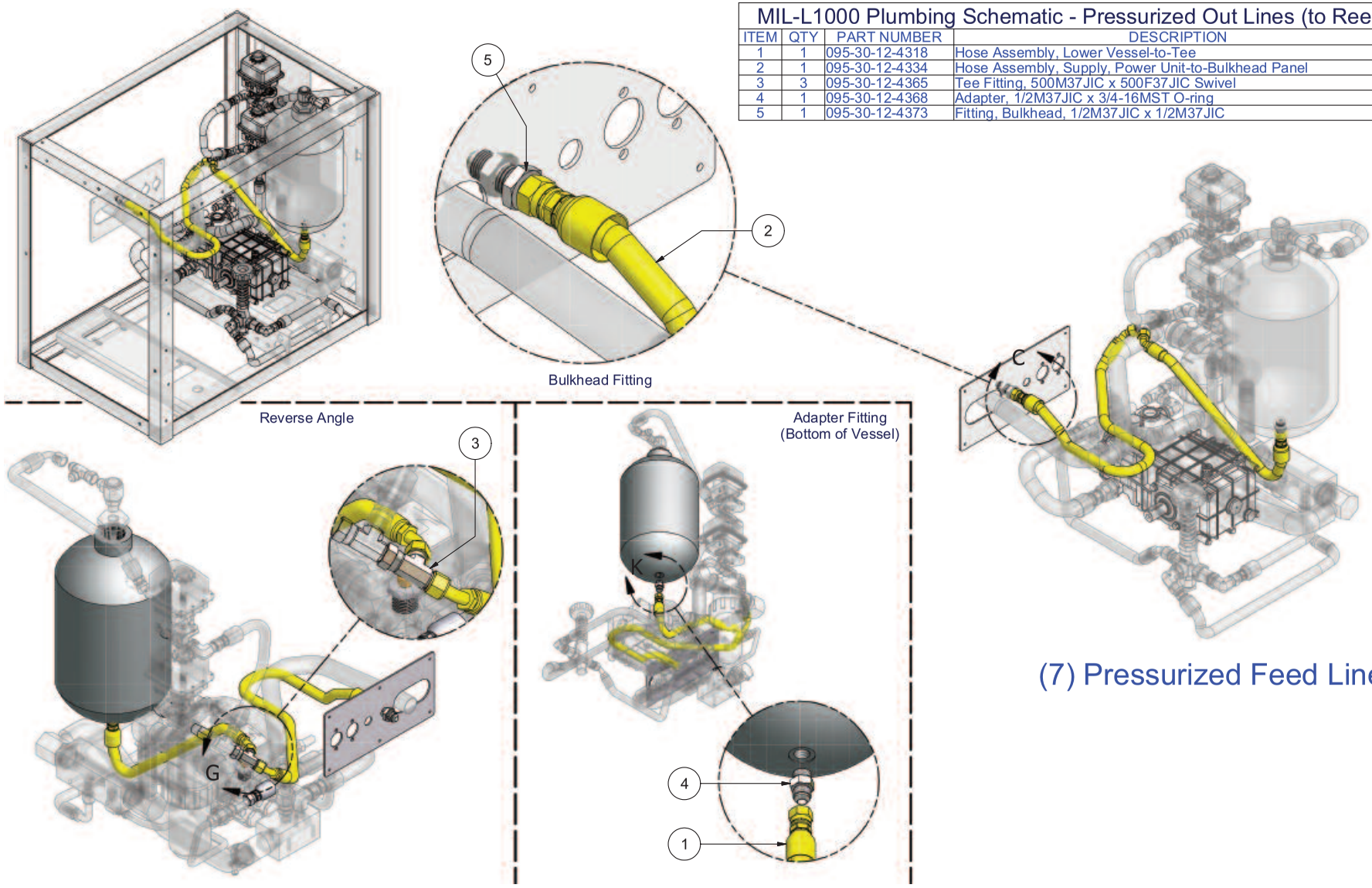
MIL-L1000 Plumbing Schematic - Return Lines			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-30-12-4325	Hose Assembly, Unloader Vavle-to-Manifold C
2	1	095-30-12-4327	Hose Assembly, EZ Start-to-Manifold C
3	2	095-30-12-4352	Adapter, 1/2M37JIC x 1/2MNTPF, Straight
4	1	095-30-12-4353	Adapter, 90, 1/4M37JIC x 1/2MNPTF
5	3	095-30-12-4360	Adapter, 90 Elbow, 1/2M37JIC x 1/2MST
6	1	095-30-12-4361	Adapter, 1/2M37JIC x 1/2F37JIC Swivel
7	1	095-41-05-1202	EZ Start Valve
8	1	095-41-05-1320	Unloader Valve

(5) Pressurized Return Lines

MIL-L1000 Plumbing Schematic - Pressurized Feed Lines			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-30-12-4319	Hose Assembly, Upper KZCO-to-Vessel Cap
2	1	095-30-12-4321	Hose Assembly, Tee-to-Upper KZCO Inlet
3	1	095-30-12-4322	Hose Assembly, Unloader-to-Lower KZCO Inlet
4	3	095-30-12-4360	Adapter, 90 Elbow, 1/2M37JIC x 1/2MST
5	2	095-30-12-4363	Adapter, 90, 1/2MNPTF X 1/2M37JIC
6	2	095-30-12-4364	Adapter, 45, 1/2MNPTF X 1/2M37JIC
7	3	095-30-12-4365	Tee Fitting, 500M37JIC x 500F37JIC Swivel
8	1	095-30-12-4366	Fitting, Swivel, 90, 1/2MNPT x 3/4-16UNF37JIC
9	1	095-30-12-4367	Adapter, 1/2FNPTF x 1-1/2 ST O-ring

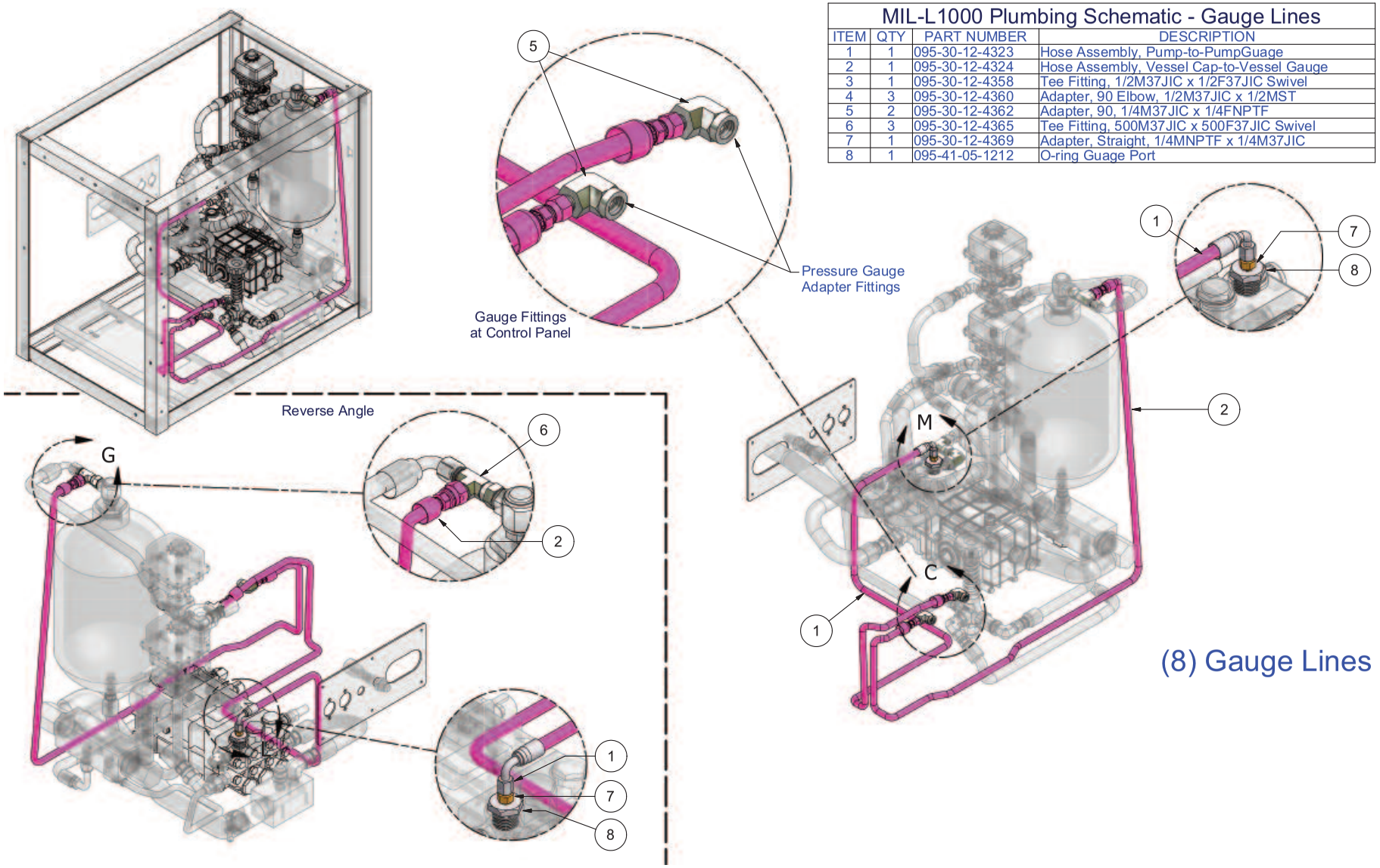


MIL-L1000 Plumbing Schematic - Pressurized Out Lines (to Reel)			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-30-12-4318	Hose Assembly, Lower Vessel-to-Tee
2	1	095-30-12-4334	Hose Assembly, Supply, Power Unit-to-Bulkhead Panel
3	3	095-30-12-4365	Tee Fitting, 500M37JIC x 500F37JIC Swivel
4	1	095-30-12-4368	Adapter, 1/2M37JIC x 3/4-16MST O-ring
5	1	095-30-12-4373	Fitting, Bulkhead, 1/2M37JIC x 1/2M37JIC



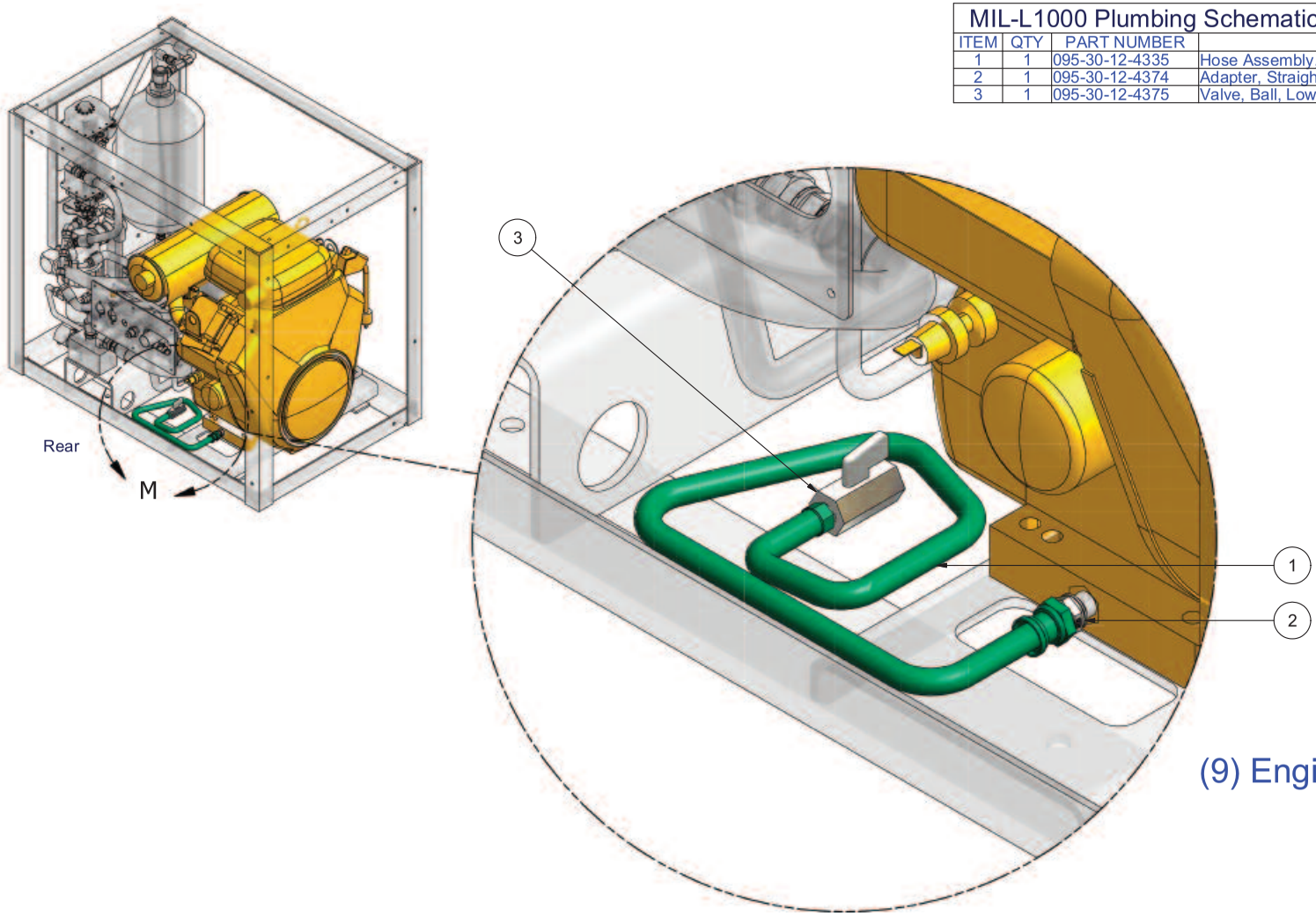
(7) Pressurized Feed Lines

MIL-L1000 Plumbing Schematic - Gauge Lines			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-30-12-4323	Hose Assembly, Pump-to-PumpGuage
2	1	095-30-12-4324	Hose Assembly, Vessel Cap-to-Vessel Gauge
3	1	095-30-12-4358	Tee Fitting, 1/2M37JIC x 1/2F37JIC Swivel
4	3	095-30-12-4360	Adapter, 90 Elbow, 1/2M37JIC x 1/2MST
5	2	095-30-12-4362	Adapter, 90, 1/4M37JIC x 1/4FNPTF
6	3	095-30-12-4365	Tee Fitting, 500M37JIC x 500F37JIC Swivel
7	1	095-30-12-4369	Adapter, Straight, 1/4MNPTF x 1/4M37JIC
8	1	095-41-05-1212	O-ring Guage Port



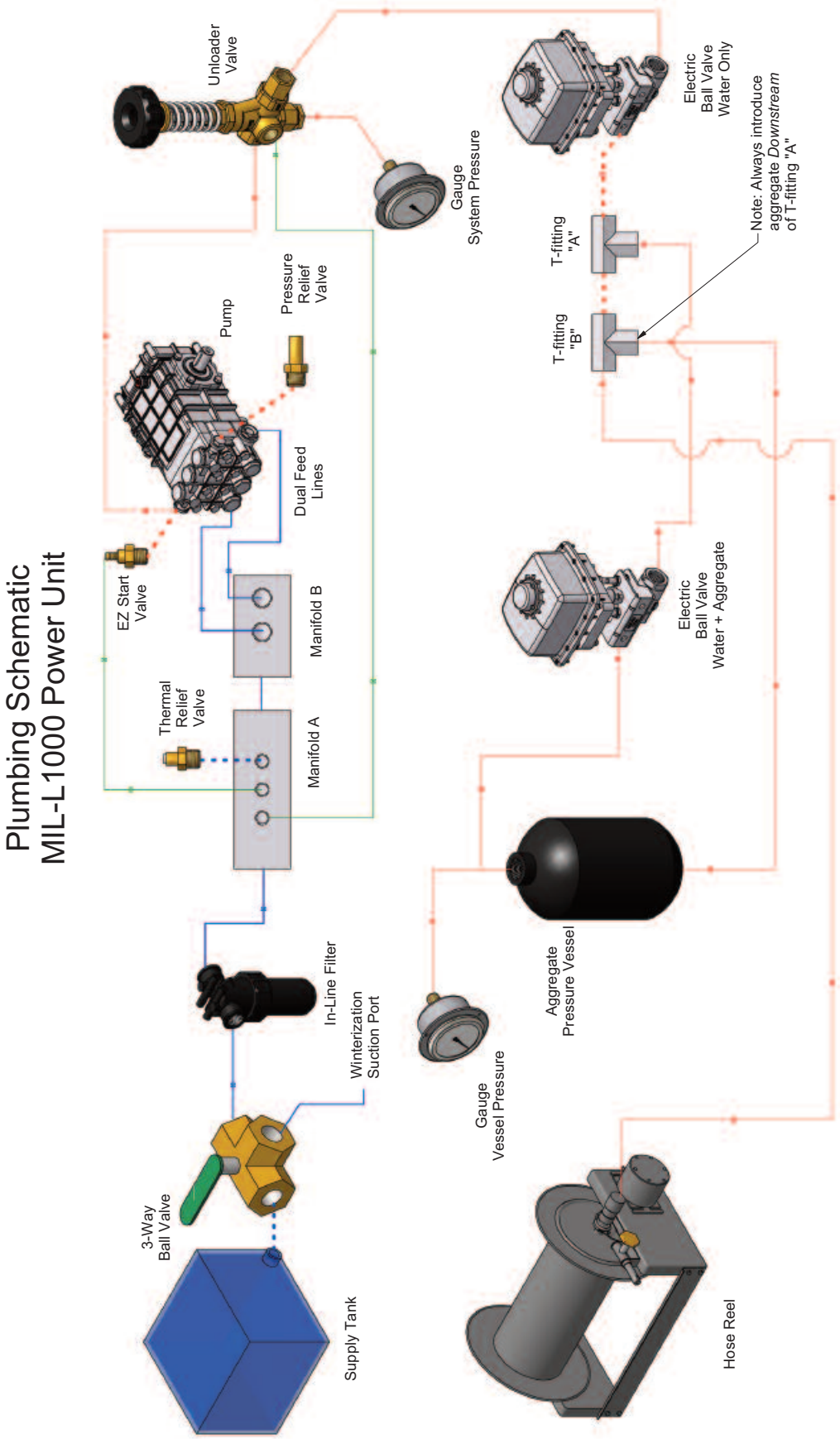
(8) Gauge Lines

MIL-L1000 Plumbing Schematic - Engine Oil Drain Line			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	095-30-12-4335	Hose Assembly, Engine Oil Drain
2	1	095-30-12-4374	Adapter, Straight, 3/8M37JIC x M14-1-1/2 O-ring
3	1	095-30-12-4375	Valve, Ball, Low Pressure, 1/4 x 1/4

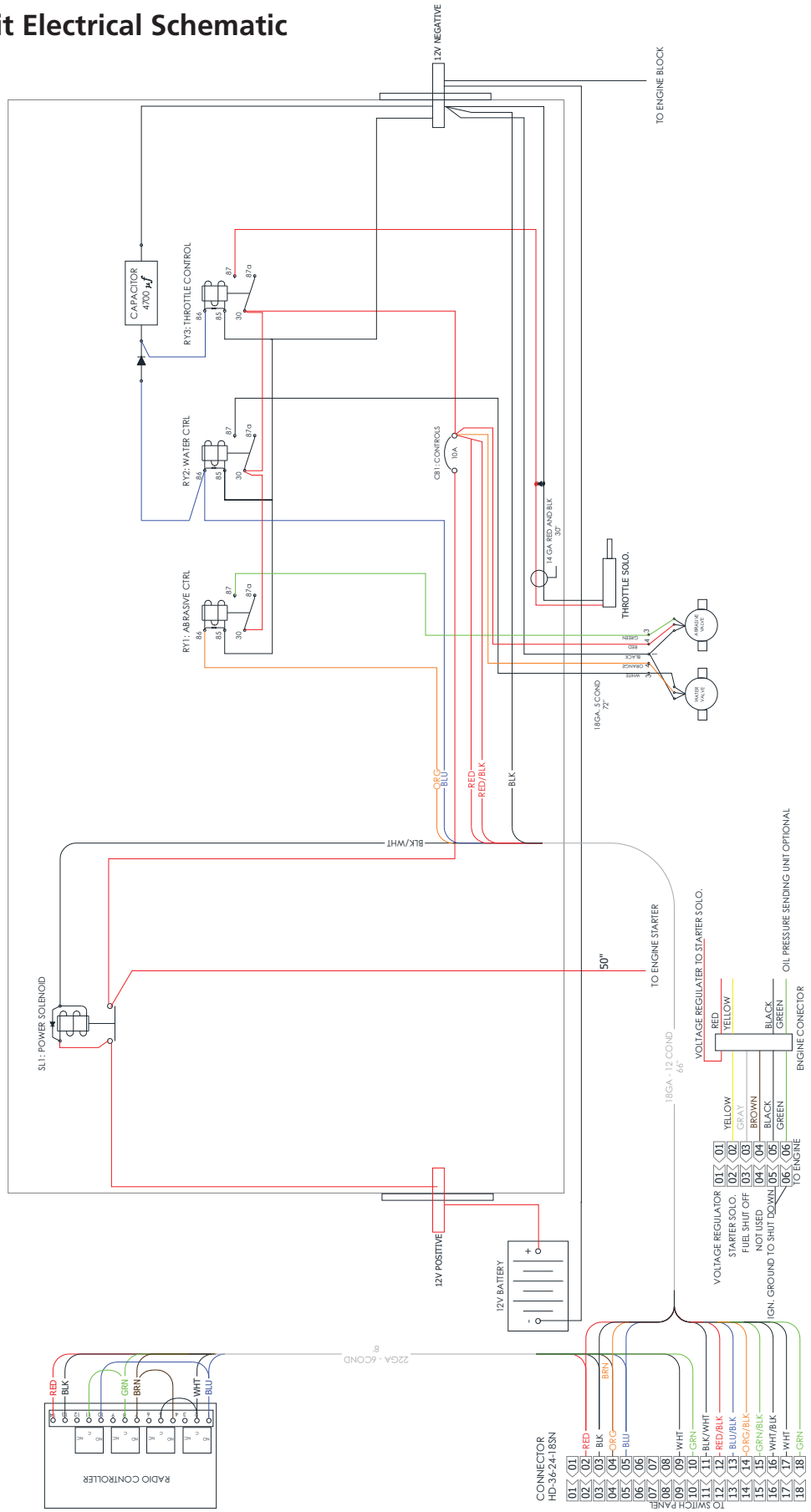


(9) Engine Oil Drain Line

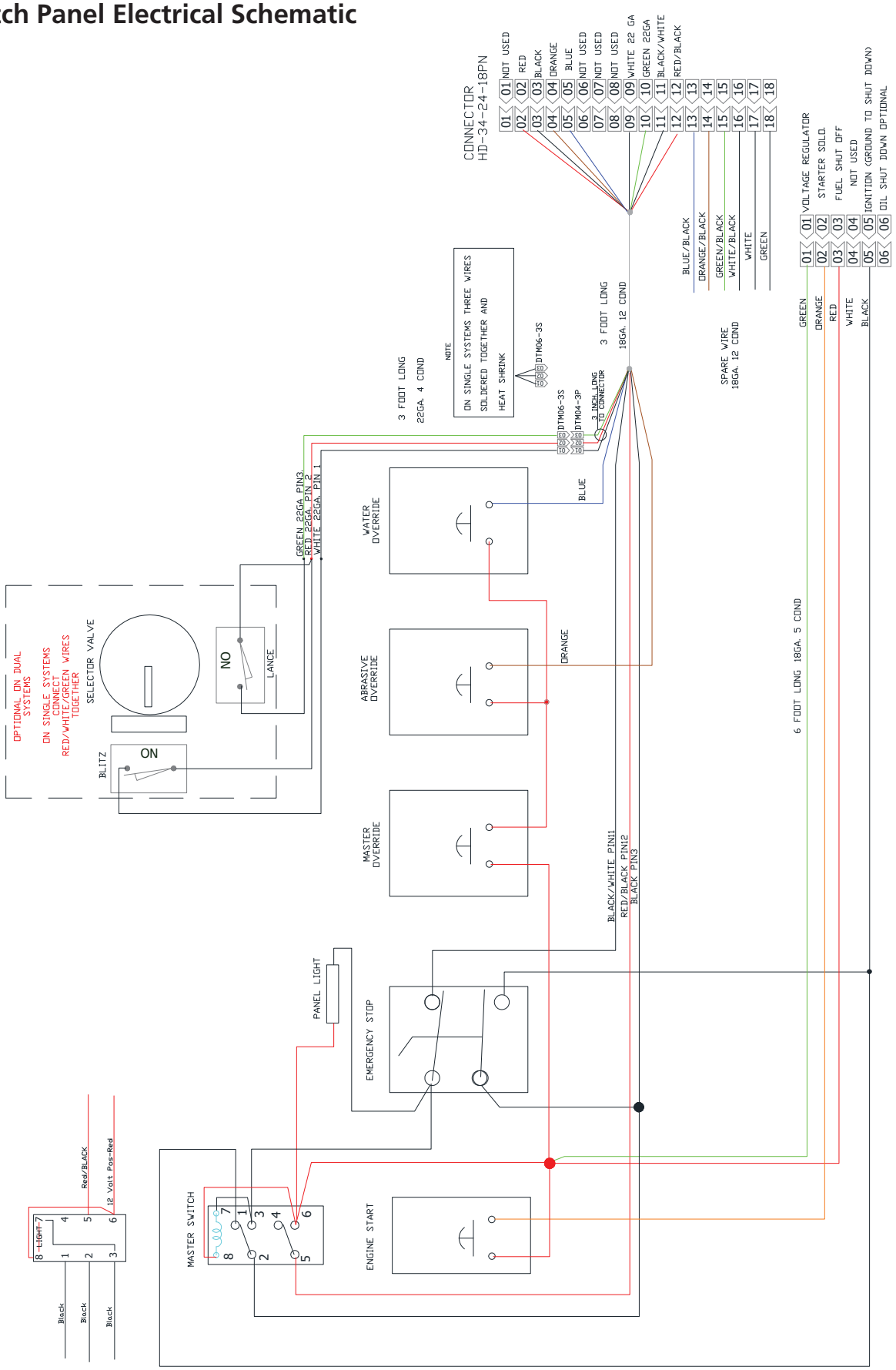
Flow Schematic and Major Components



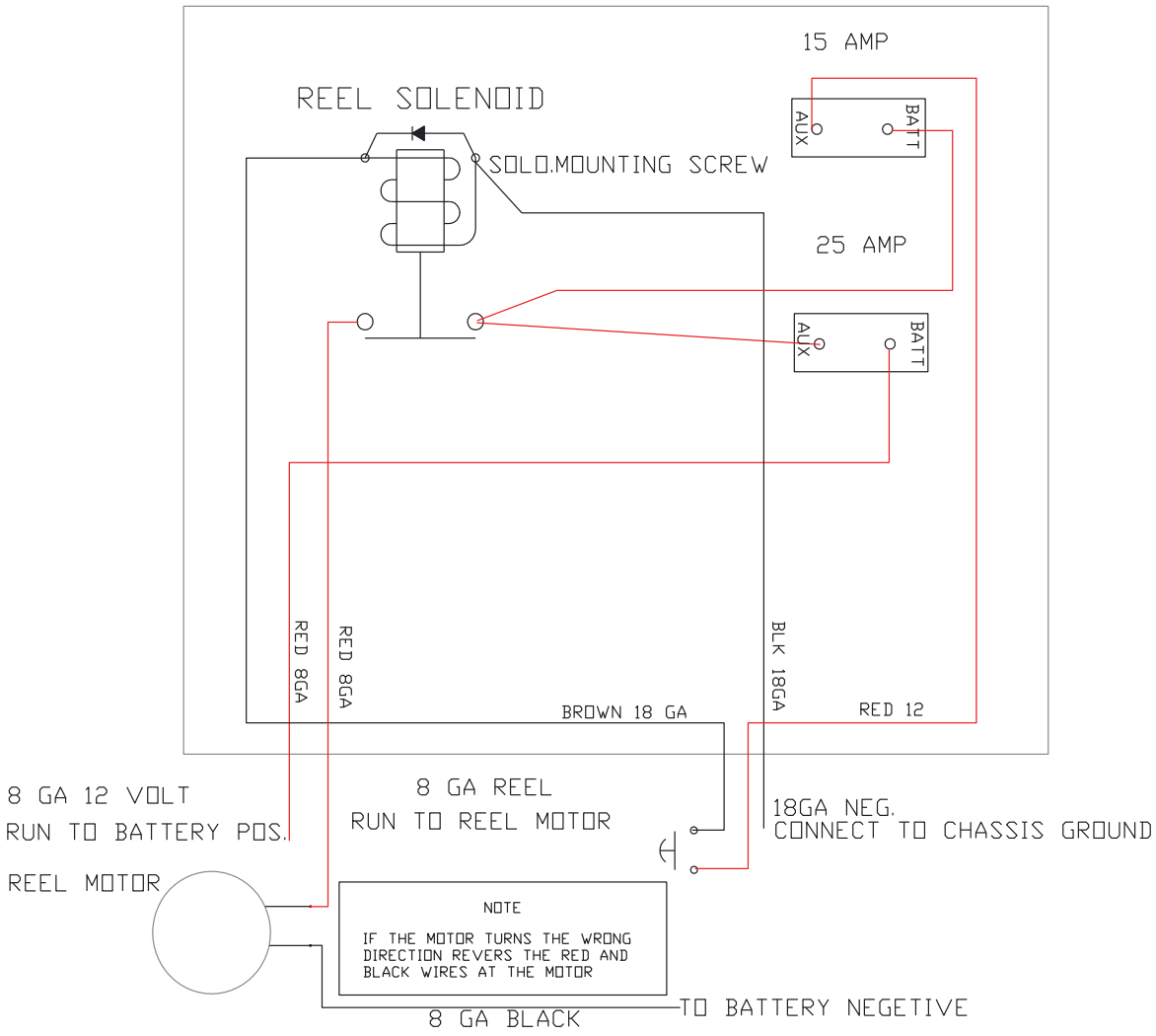
Power Unit Electrical Schematic



Switch Panel Electrical Schematic



Reel Controller Electrical Schematic



Appendix: Component Literature

Electronic versions of all vendor supplied instruction and operating manuals, plus other supplementary information has been linked in Adobe PDF format.

Briggs & Stratton Gasoline Engine Model # 540477-0120-G1	Engine Owner's Manual Engine Service Manual Engine Troubleshooting Guide Engine Maintenance Schedule Engine Spare Parts List **www.briggsandstratton.com**
Udor Pump Model # GC-38/15-GR	Pump Drawing Pump Spare Parts Drawing **www.udorusa.com**
Hannay Reel Model # E4038-17-18RT/LT H5M	Hannay PDF Instruction and Operating Manual **www.hannay.com**
Receiver/Transmitter Model # Air Eagle SR 2,4 GHz RF receiver, Model 38-2000-DC	Lance Transmitter Data Sheet Power Unit Receiver Data Sheet **www.bwieagle.com**

Material Safety Data Sheet

(This MSDS Complies with 29 CFR 1910.1200) Date of Issue: December 2006

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: **Garnet Abrasive Grains and Powders**
Chemical Formula: $(Fe, Mg)_3\ Al_2(SiO_4)_3$
CAS Number: 1302-62-1
Other Designations: Almandite and Pyrope Garnet
General Use: Industrial Abrasives
Manufacturer/Distributor: Barton Mines Company, L.L.C., 1557 State Route 9, Lake George, NY 12845
Phone: (518) 798-5462 (7:30 am-5:30 pm EST), FAX: (518) 798-5728
Emergency Phone: (518) 798-5462 or (518) 251-2296 or (518) 798-5510

Section 2 - Composition / Information on Ingredients

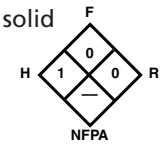
	Ingredient Name	ACGIH TLV TWA	CAS Number	% Wt
Primary Ingredient:	Almandite and Pyrope Garnet	10 mg/m³ Total Dust	l302-62-1	94 - 99.6%
Trace Impurities:	0.4 - 6% misc. trace minerals consisting of Hornblende, Magnetite, and Feldspar.			

Section 3 - Physical and Chemical Properties

Physical State: Solid
Appearance and Odor: Red, Pink, Whitish Grains or Powders
Odor Threshold: No odor
Vapor Pressure: Not Relevant
Vapor Density (Air = 1): Not Relevant
Specific Gravity (H2O = 1): 3.9 - 4.1
pH: Not Relevant
Water Solubility: Not soluble in water
Other Solubilities: Not Relevant
Boiling Point: Not Relevant
Melting Point: 1,315° C (2,399° F)
Viscosity: Not Relevant
Mean Refractive Index: 1.77 - 1.79
Evaporation Rate: Not Relevant

Section 4 - Fire Fighting Measures

Flash Point: Non-flammable solid
Flash Point Method: Not Relevant
LEL: Not Relevant
UEL: Not Relevant
Flammability Classification: Not Relevant



Extinguishing Media: Use appropriate extinguishing media for surrounding fire.
Unusual Fire or Explosion Hazards: None

Section 5 - Stability and Reactivity

Stability: Stable
Polymerization: Polymerization can not occur.
Chemical Incompatibilities: one known
Hazardous Decomposition Products: None known

Section 6 - Health Hazard Information

Acute Effects: (Effects of overexposure)
Inhalation: Dust may cause irritation of nasal and respiratory tract.
Eye: Dust may cause irritation.
Skin: May cause abrasions.
Ingestion: No known effects, however ingestion not recommended.
Medical Conditions Aggravated by Long-Term Exposure: Chronic respiratory disease may be aggravated by exposure to nuisance dust.
Emergency and First Aid Procedures
Inhalation: Remove to fresh air, if breathing is difficult administer oxygen, obtain medical assistance, if needed.
Eye Contact: Flush with large amounts of water, obtain medical assistance, if needed.
Skin Contact: Thoroughly wash exposed area with soap and water.
Ingestion: Obtain first aid or medical assistance, if needed.
Primary route(s) of entry: Inhalation, Skin Contact

Section 7 - Spill, Leak, and Disposal Procedures

Spill / Leak Procedures
Spills: Sweep or vacuum up material for disposal or recovery.
Disposal: Dispose of in accordance with local, state and federal regulations. Material contaminated in use may require special disposal requirements.

Section 8 - Exposure Controls / Personal Protection

Ventilation: Provide sufficient mechanical (General and/or Local Exhaust) ventilation to maintain dust exposure below threshold limit value (TLV).
Respiratory Protection: If needed use a NIOSH/MSHA approved dust respirator, cartridge, or mask.
Eye Protection: Recommend federally approved safety eyeglasses.
Protective Gloves: As desired by user.

Section 9 - Special Precautions and Comments

No special precautions necessary for normal handling and storage of the material.

The information set forth herein is believed to be accurate but is not warranted with respect to the accuracy of the information or recommendations. Recipients are advised to confirm in advance of need that the information is current and applicable to their circumstances and usage.

Warranty

PyroLance warrants to the original purchaser, each system or other product of its own manufacture, for a period of 18 months from the date of shipment from the factory or 12 months from the unit being placed in service, to be free from defects in material and workmanship under normal use and service. "Normal use and service" means not in excess of recommended maximum speeds, pressures, and temperatures, or handling fluids not compatible with components materials, as noted in applicable PyroLance product catalogs, technical literature and instructions.

This warranty shall not apply to any system or other product that has been repaired or altered, including the addition of foam systems or other components that are not factory-installed, to adversely affect the performance or reliability of the system or other product.

Neither will this warranty, nor any implied warranty, apply to damage or harm caused by any or all of the following:

(1) Freight damage;
(2) Freezing damage;
(3) Damage caused by parts and/or accessories or components not obtained from or approved by PyroLance;
(4) Any consequential or incidental damages, arising from the use of the PyroLance system and equipment;
(5) Damage due to mis-application, mis-installation and/or misuse; and
(6) Normal wear of moving parts or components affected by moving parts.

The liability of PyroLance under the foregoing warranty is limited to the repair or replacement at PyroLance's option without charge for labor or materials of any parts upon return of the entire system or any particular part to the PyroLance factory within the warranty period, at the sole expense of the purchaser, which part shall upon examination appear to PyroLance's satisfaction to have been defective in material and workmanship.

The liability of PyroLance under any theory of recovery (except any express warranty where the remedy is set forth in the above paragraph) for loss, harm or damage, shall be limited to the lesser of the actual loss, harm or damage, or the purchase price of the system or component part as delivered by PyroLance to the purchaser.

PyroLance expressly warrants its systems and other products as stated above. There are NO OTHER EXPRESSED WARRANTIES, nor any implied warranties, including implied warranty of merchantability or of fitness for a particular purpose. Our warranty is limited in duration to 18 months from the date of shipment from the factory, or 12 months from the unit being placed in service by the original purchaser.

Again, there is no implied warranty of fitness for a particular purpose or merchantability when this product is put to any other application or use.

No person is authorized to make any representation or warranty concerning PyroLance's products on behalf of PyroLance, or to assume for PyroLance the obligations contained in this warranty. PyroLance reserves the right to make changes in design and other changes and improvements upon its products without imposing any obligations upon itself to install the same features on its existing products then in process or being manufactured.

We would suggest our Web site for additional warranty information and use of our "Return Goods Authorization" (RGA) requirements.

It is imperative to package all PyroLance components properly, before return shipment including the required "Return Goods Authorization" forms. Some PyroLance systems and components contain electronic components that may be damaged if improperly packaged for shipping!

All PyroLance components shipped back to PyroLance will pass through Quality Control Inspection, and may be photographed after the box is opened. The purchaser is responsible for any physical damage occurring to PyroLance components at user's facility and during shipment back to PyroLance.

PyroLance appreciates your attention in this matter as we feel it will help us to serve you in a better fashion, while keeping the cost of the PyroLance product competitive and providing above-average service and warranty assistance.

[redacted]

525 Main Street · Box 120609 · New Brighton, MN 55112 USA
+1 651.636.0577 · www.pyrolance.com