

DIRECT FIRE LPG VAPORIZER
INSTALLATION,
OPERATION AND
MAINTENANCE MANUAL



SHIELD OF HEAT

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DRAGON SHIELD FEATURES

- ▶ Protective coating on anticorrosive cabinet
- ▶ Chimney with wind trap, for extreme climates
- ▶ ASME certified heat exchanger
- ▶ Auto ignition system, which guarantees autonomy
- ▶ Box to protect the electronic ignition system from extreme weather
- ▶ Does not require electricity
- ▶ Protective insulation on cabinet walls
- ▶ The most advanced, reliable and safest systems for the operation of your business
- ▶ Burner with cadminized coating to prevent corrosion

1. INTRODUCTION

Before installation and operation of the equipment, please become fully familiar with the information laid out in this manual.

The installation, maintenance and operational procedures indicated in this manual will help achieve the safe installation and operation of Dragon Shield Vaporizers.

All LP Gas installations must be validated and approved by competent verification units. Failure to comply with installation regulations will render the guarantee void.

Dragon Shield direct fired vaporizers are used when the gas vapor demand generated by operation exceeds the LP Gas storage tank's natural vaporization capacity.

The vaporizer's function is to transform the gas liquid phase into vapor phase, due to the rise in temperature provided by the vaporizer.

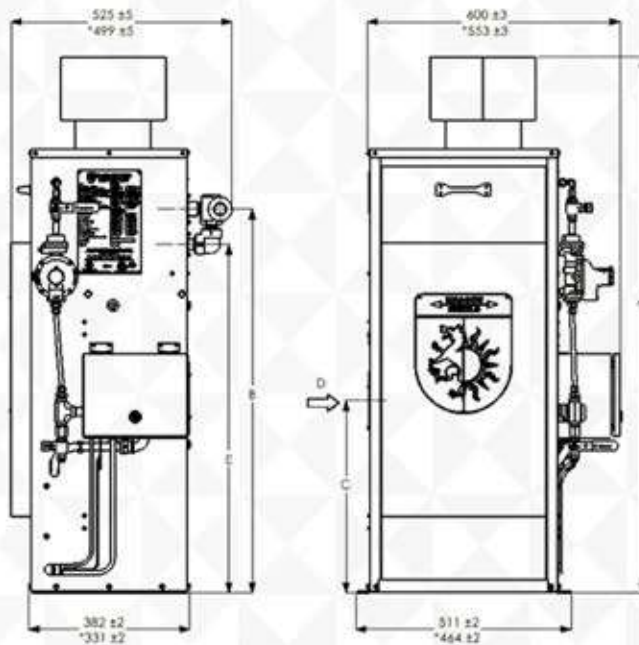
The vaporizer guarantees the adequate gas flow to the inlet line to satisfy the fuel demand required for optimal operation.

1.1 WE OFFER THREE DIFFERENT CAPACITIES

MODEL	VAPORIZATION CAPACITY (NOMINAL *)	
	Gal/h	MBTU/h
DS-50 WG	50 Gal/h	4,582,952
DS-80 WG	80 Gal/h	7,332,720
DS-120 WG	120 Gal/h	10,999,080

*The volumetric flow expenses are declared as "nominal." These may vary due to the conditions of the installation in which the equipment is located.

*The actual vaporization capacity will depend on factors that are part of the installation and loss of 15% to 20% of the nominal capacity.



* Dimensions exclusive to 50 WG model

UNIT SIZE

D - Liquid inlet height
 B - Vapor outlet diameter

* Liquid inlet diameter: 1 1/4"

* NPT for all models

Steam outlet diameter:

- 1" NTP in model 50
- 1" NPT in model 80
- 1" NPT in model 120

CODE	MODEL	A		B		C		D		E	
		Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
GA51204148-U	DS 50 WG	51-7/64"	1298	36-29/32"	937	21"	533	1-1/4"	32	33-19/32"	853
GA51204146-U	DS 80 WG	50-1/8"	1273	35-7/8"	912	18"	457	1-1/4"	32	32-5/8"	828
GA51204147-U	DS 120 WG	58-15/32"	1485	44-7/32"	1123	28-5/16"	719	1-1/4"	32	40-15/16"	1040

1.2 CAGE

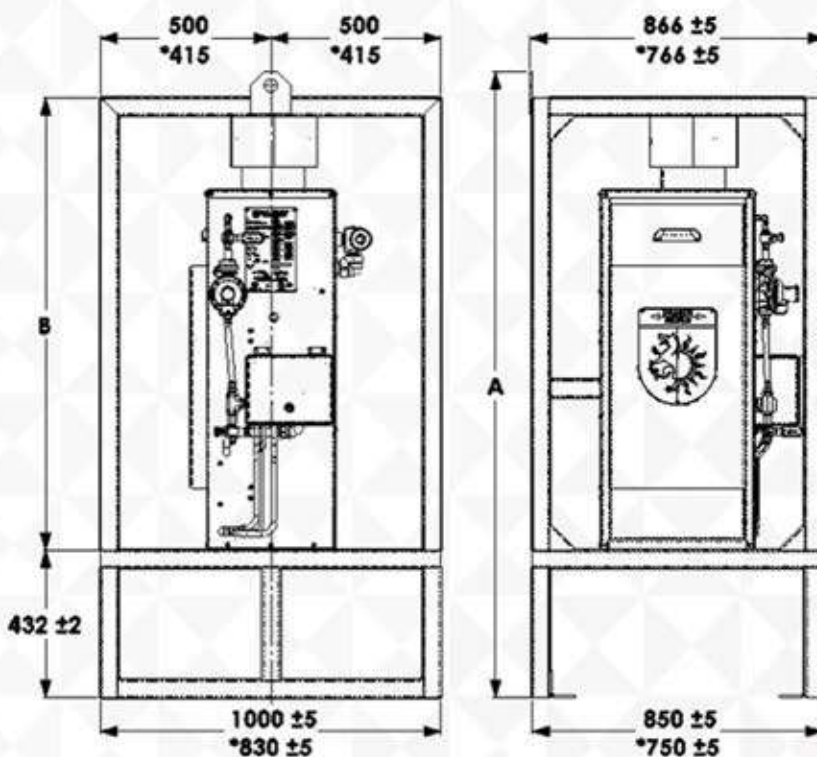
Every Dragon Shield Direct Fired Vaporizer includes a multi-purpose cage:

1. Protect the vaporizer during the transportation
2. Easy handling for crane and forklift operations
3. Serves as a foundation base to install the vaporizer for operation

50 WG		A		B		Weight	
CODE	MODEL	inches	mm	inches	mm	Kg	pounds
GA51204148-U	DS 50 WG	71-3/8"	1813	51-1/2"	1307	154	339

80 WG		A		B		Weight	
CODE	MODEL	inches	mm	inches	mm	Kg	pounds
GA51204146-U	DS 80 WG	72-11/64"	1833	52-1/4"	1327	192	423

120 WG		A		B		Weight	
CODE	MODEL	inches	mm	inches	mm	Kg	pounds
GA51204147-U	DS 120 WG	78-35/64"	1995	58-19/32"	1488	218	481



• Dimensions exclusive to 50 WG model



2. VAPORIZER FEATURES

2.1. DRAGON SHIELD COMPONENTS

- a) Cabinet with chimney
- b) Liquid inlet valve
- c) Heat exchanger
- d) Burner and pilot
- e) Temperature control (Thermostat)
- f) Electronic ignition system
- g) Box protection
- h) Capacity control valve
- i) Pressure regulator
- j) Relief valve

2.2 FEATURES



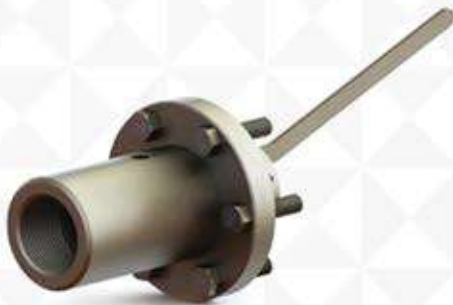
Cabinet with Chimney

Our cabinet is fabricated with a heavy-duty metal frame to protect the devices.

The cabinet is coated to increase its resistance to oxidation in contact with corrosive environments.

The design of our chimney with wind trap prevents gusts of wind from entering through the shaft and turning off the burner. It also avoids continuous use of the self-ignition system and gives the battery and spark generator a longer life.

Additionally, the 2 sidewalls have a double-wall construction that insulate for extreme temperatures (-49 °C to 750 °C / -56 °F to 1382 °F) to avoid freezing or overheating of components, guaran-



Liquid inlet valve

The design enables the device to keep a controlled liquid level inside the exchangers. In addition, it regulates the vaporizers internal pressure, exchanging vapor with the storage tank.



Heat exchanger (Tank)

The container is constructed with materials certified for the application of direct fire and resistance to service pressure. Inside, it allows for vapor to be generated in an accelerated manner. The container is manufactured under ASME code, Section VIII, Division 1, Addenda 2021.

2.2 FEATURES



Burner and Pilot

Dragon Shield designs and manufactures its own burner to eliminate porosity leaks in materials. This is accomplished by utilizing a steel bar instead of cast iron. The burner body receives a cadminization treatment, which improves resistance to acid and salt corrosion.

We manufacture our jet burner and extensions in stainless steel to eliminate leaks and corrosion.

Burner working pressure: 11PC

Burner consumption: 95,249 Btu/h

Pilot working pressure: 332-415PCA

Pilot consumption: 0.57 m3/h



Temperature control (thermostat)

The thermostat regulates operation cycles of the burners and pilot, and the regulation of the vapor output temperature. It is calibrated with a 140-158° F output temperature range.



Electronic ignition

The system detects if the pilot flame extinguishes and automatically generates a spark in the pilot to reignite it. This guarantees that in case of extreme weather the vaporizer will automatically re-start.



Capacity control valve

This mechanical device is designed to prevent the untimely over-demand of vapor, partially blocking the gas output through the hydrostatic pressure generated by excessive liquid input.

2.2 FEATURES



Box protection

The metal cabinet is coated to increase its resistance to oxidation in contact with corrosive environments.

New ergonomic design, with superior support by means of magnets, to reduce maintenance time for the thermostat and electronic ignition system. Easy opening and closing allow for efficient operation.



Pressure regulator

Regulates the pressure and flow of LP gas in vapor state towards the burner and pilot.

This element is designed to work at high temperatures (-40 °C to + 74 °C) and high pressure.

It supplies to burners and pilot with pressure of 11 WC in second stage, with a regulation range of (9.5 - 13 WC)



Relief valve

The relief valve is a device used to release the fluid flow rate or excess pressure whenever it exceeds 250 psi.

3. VAPORIZER INSTALLATION

3.1 ELEMENTS COMPRISE PART OF THE INSTALLATION

The main elements that make up the typical installation for direct fired vaporization equipment

- Storage Tank
- Direct Fired Vaporizer (Dragon Shield)
- High-pressure Regulator (CMS 041)
- Pressure Gauges and Thermometers

3.2 AUTO SUPPLY OF GAS TO THE REGULATOR FROM THE HEAT EXCHANGER

Once filled with gas in a liquid state, the heat exchanger provides sufficient natural vaporization to ignite the vaporizer for the first time. Once the burners are in operation, the system consistently generates steam to be partly used to power the burner system.

3.3 INSTALLATION

Before proceeding with the installation of a vaporizer, please inquire and comply with local regulations for LPG equipment.

Install the vaporizer on a level, firm base made of non-flammable material. Firmly anchor it with the four screws in a location with good ventilation, preferably where there is no vehicle traffic.

The vaporization system must be done according to Figure No. 1, as described in Table No. 5, which details each models inlet and outlet pipe diameters.

The installation described in Figure No. 1 is for the basic system that in addition to complying with applicable national and international standards has proved to be the easiest and most efficient.

Pipeline dimensions must be proportional to the flow rate that will be used. As well as, to the pressure drop calculated from the regulation block to the consumption centers, making sure the installation is projected with two-stage regulation.

4. INSTALLATION DIAGRAM

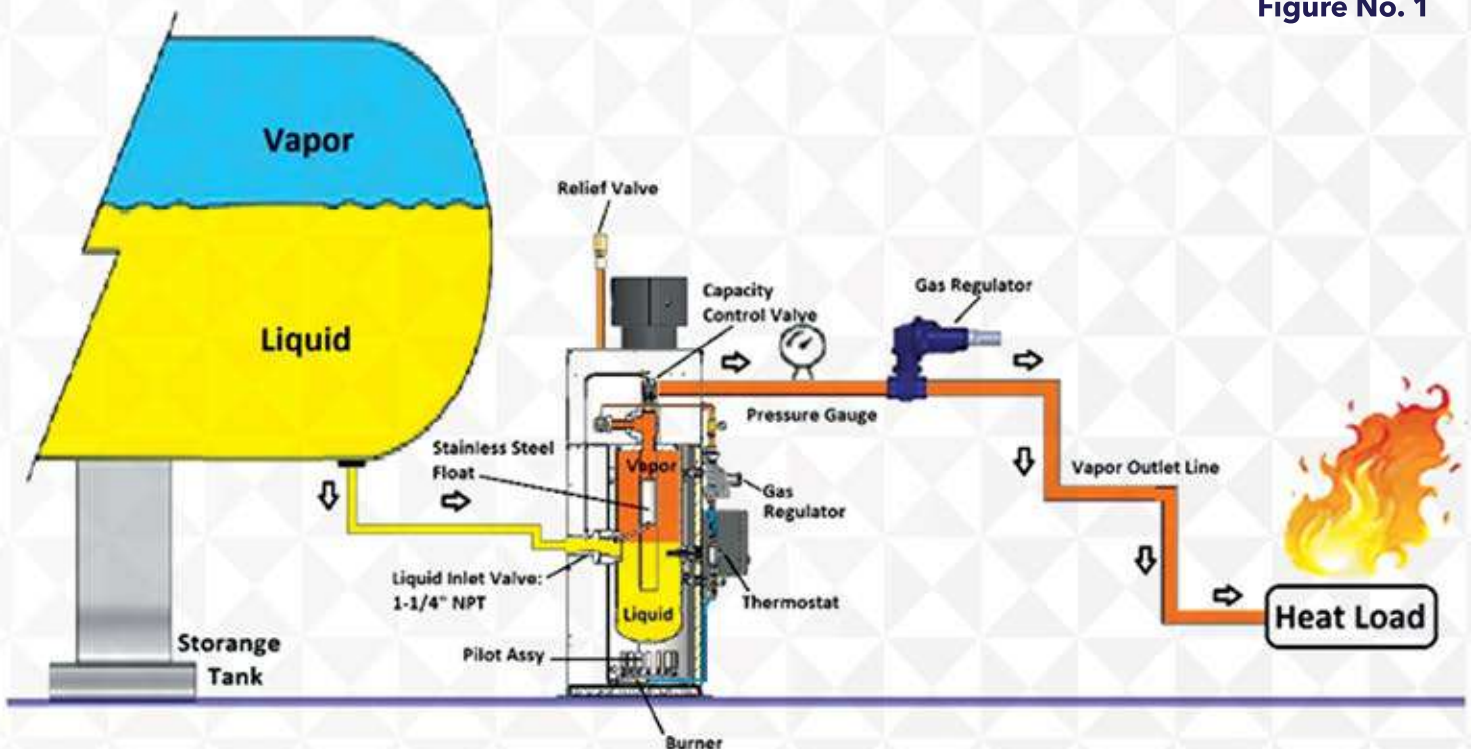


Figure No. 1

4.1 VAPORIZER FUNCTIONALITY

When opening the bypass valves, the liquid will flow either by gravity or by pressure difference from the storage tank to inside the vaporizer's heat exchange containers, and said flow will stop when the liquid level rises the floater inside them, thus closing the inlet valve.

When the burner is turned on, the heat it provides will accelerate the liquid's evaporation inside the heat exchanger, generating the sufficient amount of liquid to supply the system. As a consequence of this, the liquid level will decrease inside the exchanger, making the floater drop and open the inlet valve to replace any evaporated liquid.

In constant demand conditions, the inlet valve will remain partially open, replacing the liquid as it evaporates.

In variable demand conditions, the inlet valve will open and close as the liquid level varies inside the exchanger. Thus, incoming liquid will be heated and cooled according to demand, turning the thermostat on and off.

Whenever the vaporizer is in operation and the liquid inside the exchanger has reached the temperature at which the thermostat was calibrated, the main burner will turn off and the liquid level will drop, activating the inlet valve which will allow cold liquid back in. This will turn the thermostat on, igniting the main burner. This cycle will continually repeat itself as the vapor phase propane demand varies.

IMPORTANT:

Requirements for installations in the USA and Canada.

Canadian Installations: The vaporizer and piping shall be installed in accordance with Natural Gas and Propane Installation Code, CAN/CSA-B149.1, the Canadian Propane Storage and Handling Code, CAN/CSA-B149.2, and electrical components installed in accordance with the Canadian Electrical Code, CSA C22.1, Part I.

US Installations: The vaporizer shall be installed in accordance with Liquefied Petroleum Gas Code, NFPA 58, and electrical components installed in accordance with the National Electrical code, NFPA 70.

5. VAPORIZER SPECIFICATIONS (CHART NO. 5)

CAPACITY	50 WG	80 WG	120 WG
Design Pressure	250 psig 17.2 Bar	250 psig 17.2 Bar	250 psig 17.2 Bar
Relief Valve	✓	✓	✓
Hydrostatic Pressure	435 psig 29. Bar	435 psig 29. Bar	435 psig 29. Bar
Liquid Inlet (NPT)	1-1/4"	1-1/4"	1-1/4"
Vapor Outlet	1"	1"	1"
Vaporization Capacity (Nominal)			
US Gal/h	50	80	120
MBTU/h	4.5	7.3	10.9
Burner Outlet			
(.000) kcal/h	18,001	24,002	35,020
(.000) BTU/h	71,437	95,249	138,963
Certifications			
ASME	✓	✓	✓
UL	✓	✓	✓
CRN	✓	✓	✓
ISO 9001	✓	✓	✓
Weight			
Kg	112	134	158
Lb	247	256	293
Weight with Cage			
Kg	154	192	218
Lb	339	423	481

5.1 FUNCTIONALITY

Dragon Shield Vaporizers are manufactured to work under extreme weather conditions.

This equipment works with a direct fired system, which receives gas in liquid state, turning it into a gas state.

They are ideal for consumption that exceeds storage tank evaporation capacities.

6. OPERATION

6.1 EQUIPMENT START-UP

During the equipment's start-up, it is imperative to run a preheating cycle. If this initial step is not completed, there is a risk of liquid seeping to the service line.

6.2 EQUIPMENT OPERATION

ONLY TRAINED AND SKILLED PERSONNEL SHOULD OPERATE THIS EQUIPMENT.

NOTE: Before the vaporizer is installed, lines need to be swept. This will help guarantee pipelines without impurities that could damage the equipment.

1) Before the vaporizer is put into service, make sure the valves at the start of the line are open and the valves at the end of the line are closed.

2) Fill the vaporizer with liquid, slowly opening the bypass valves, located between the storage tank and the vaporizer (CAUTION: if these valves are opened too quickly, there is a risk of closing of the valves with excess gas in the tank). If excess gas is present, close the valve that is next to the tank and allow time for the valve to achieve balance. Then open and repeat the operation slowly.

3) Open the supply valve to the regulator and burners.

It is essential that the pressure supplied to the burner be verified by installing a pressure gauge at the outlet of the purge valve installed in the lower part of the regulator.

This pressure must be 11" WC (0.4 psi), pressure required for the equipment to operate properly and not have combustion problems in burners.

4) Once the pressure is verified, turn the thermostat dial to the "PILOT" position.

Press the electronic ignition switch, making sure the spark plug generates the electric arc discharge to turn the pilot on. Once the spark is generated properly, press the button at the top of the thermostat, releasing it after 30 to 60 seconds.

After the button is released, the pilot should remain ignited. For the initial operation, the pilot ignition may take some time, since it requires ventilation of all air contained in the pipe. If this is the case, purge the line from the storage tank until all air is vented.

5) Turn the thermostat knob to the open position, set the thermostat temperature dial to the "MEDIUM" part of its range, so the vaporizer turns on.

6) Once it is on, allow the main burner to "heat up" until the preheating cycle is done and it turns off.

NOTE: During this operation it is very important to make sure the pressure gauge reading to the vaporizer outlet does not surpass the storage tank pressure, for the safety valves trigger at a 17.5 Kg/cm² pressure. If this should happen, turn the thermostat to the off position immediately. Open the valve to the vaporizer outlet and relieve the pressure.

In the liquid line that runs from the storage tank to the vaporizers, it is crucial not to use non-return valves, as this prevents the inlet valve from exchanging vapor with the tank and equalizing pressure during preheating. In addition, all the liquid valves must remain open during the preheating process.

7) Gradually open the vapor valves that feed all the piping.

Then set the thermostat temperature dial to "MAXIMUM".

In this process, the vaporizer may turn on again, allow the vaporizer to finish an operation cycle to start lighting the consumption devices.

Set up the regulators to the desired service pre-ssure between 0.7 and 1.5 Kg/cm2 (gauge pre-ssure), the lower the temperature the lower the pressure to prevent the LP Gas from condensing.

8) The vaporizer will continue to run on and off cycles according to the consumption line demand.

9)) If the vaporizer will be taken out of service for

turn the thermostat dial to the "PILOT" position.

IF THE VAPORIZER WILL BE OUT OF SERVICE FOR LONG SERVICE PERIODS, FOLLOW THE INSTRUCTIONS INDICATED BELOW:

a) Close the liquid bypass valve at the entrance of the vaporizer and let the consumption exhaust all the liquid inside the vaporizer. This is shown by a drop in the vapor outlet line pressure.

b) Turn the thermostat dial to the "OFF" position and close the burner feed bypass valve.

c) To resume operation, repeat steps 2, 3, 4, 5, 6 and 7.

7. MAINTENANCE AND SERVICES

Vaporizers, as any other LP Gas equipment, require periodical checks and maintenance. The next points are a maintenance guide. However, their frequency may vary depending on each installation, as well as the propane usage characteristics and quality of the propane that is vaporized.

ONLY SKILLED AND AUTHORIZED PERSONNEL SHOULD PERFORM MAINTENANCE ON THIS EQUIPMENT.

Before performing any service on a component or accessory in the circuit, it must first be isolated and depressurized by purging all gas in that section.

In addition, all types of ignition sources must be cleared from the area where the service is being performed (clearly at least a 10m radius).

7.1 ELEMENTS SUBJECT TO MAINTENANCE

Components subject maintenance are:

Part Name	Model	Code
Burners	DS	GA51193159-U
Pilot	DS	3540907045-U
Thermocouple	BC-10	GA51423814
Inlet Valve	DS	GA51193120-U
Control Valve	DS	GA51193128-U
Burners 50WG	DS	GA51193182-U
Pilot 50WG	DS	3540907056-U
Inlet Valve 50WG	DS	GA51193130-U

7.2 ELEMENTS NOT SUBJECT TO MAINTENANCE

There are components that have a finite life cycle, or once activated and expired will require replacement. These include:

Item	Model	Code
Regulator (Replace annually mandatory).	REGO LV4403	GA51477118
	Fisher R232A-BBF	GA51477120
	CAVAGNA 98TW-15	GA51477121
Relief Valve (Replace after activation).	REGO	GA51484062
Electronic Ignition (Replace as needed).	DS	GA51214157-U
Battery (Replace every 2 years).	ENERGIZER L522	1890906996-U
Thermostat (As needed).	SIT 600-AC2	1890907024

The Dragon Shield Vaporizers uses 3 different trademarks of regulators. When necessary to replace the regulator of the vaporizer, it is important to replace it for the same trademark and model of regulator that was originally sent from the factory since each model uses a different assembly.

The Liquid Inlet Valve has been calibrated at the factory to ensure proper functioning in all its parts and allow correct operation of the Vaporizer. Making any adjustment in the calibration will cause a bad operation, being able to restrict the entry of liquid gas, or preventing the closing of the mechanism.

7.3 SERVICE PERIODS

Daily Service	
General system	Check the whole vaporizer for leaks
Pilot	Inspect pilot assembly, make sure that the device is turned on with the proper flame
Electronic Ignition	Verify that the whole system is capable of generating the spark ignition properly
Monthly Services	
Drain the regulator line	Remove the plug and open the drain valve to purge the line of impurities
Burner Assembly	<p>Clean the jet burner orifice and Multi-port Burner Maintenance instructions:</p> <ol style="list-style-type: none"> 1. Turn off the gas supply valve to the regulator. 2. Remove the plug from the regulator test point, making sure there are no sources of ignition, then slowly open the valve to test for contaminants. If contaminants are present, properly drain. 3. Remove the access door and visionally inspect the burner and pilot assembly area and remove any foreign debris that is present. 4. Clean the burners, pilot assembly, and combustion chamber area. If necessary, the use of a leaf blower works very well for this operation. 5. Replace the regulator test point plug being sure to use an approved thread sealant compound on the threads and tighten as necessary. 6. Reassemble the control system to its original operational condition. 7. Slowly open the gas supply valve to the regulator and check for leaks with an approved leak detector. 8. Relight the pilot assembly and check for leaks with an approved leak detector. 9. Adjust the thermostat so that the burner lights and check for leaks with an approved leak detector. 10. If all is well, reinstall the door. <p>The maintenance procedure is complete.</p>
Relief Valve	Check that there are no corrosion and the cap protector installed

7.3 SERVICE PERIODS

Every six months	
Thermostat	Check the thermostat for proper operation. If the thermostat is not operating properly, it should be replaced.
Thermocouple	Check the thermocouple -read while hot- is delivering the proper voltage to the thermostat (13 to 30 millivolts) a lower than 13 millivolt reading indicates the thermocouple should be replaced
Regulator	Keep the regulator clean, make sure that there is no damage to, or foreign material in the regulator, Clean out the exhaust vent and be sure it is not clogged If there is evidence of foreign material inside the vent the regulator should be replaced.
Liquid Inlet Valve	A careful visual inspection (using a flashlight) and check for leaks around the liquid inlet valve (free of foreign debris)
Heat Exchanger	Check the whole heat exchanger for holes or excessive scale and remove any strange material, Check the bottom head for pitting. Should pitting in excess of 3mm, should be replaced the heat exchanger.
Electronic ignition	Is important to make sure the battery is in a good state of charge. A defective or poorly charged battery will cause the various components of the ignition system to work incorrectly when they are being worked, Make sure all wiring connections are clean and tight, not only at the battery but also at all terminals

8. TROUBLE SHOOTING

Trouble Shooting		
Symptom	Probable Cause	Remedy
Flame is not adequate	· Jet burner clogged	Clean the jet burner (use a hard wire size properly to poke the waste out and clean of the jet burner)
Electronic Ignition system doesn't generate electric arc	· Badly installed or discharged the battery	Verify the correct installation of the battery, in case it has no charge, you must replace it
Pilot does not stay lit	· Loose thermocouple	Check the connection, make sure it is correctly installed
	· Thermal safety device of the thermostat is operating	Allows cooling of the thermostat for a period of approximately 10 minutes and turn it on again. (check for obstructions to the pilot and at the pilot)
Pilot turns off frequently	· Air currents	Make sure air circulation around the vaporizer is adequate to avoid any excessive air currents, is recommended adequate protection
	· It is possible that the thermocouple has liquid or carbonized sediments inside	Check thermocouple signal to thermostat control valve. Signal should be 13 to 30 millivolts when thermocouple is hot, clean the thermocouple. If the fault persist, replace thermocouple.
Main burner will not ignite	· Pilot off	Check the pilot burner to see if it is clear of any obstructions
	· Clogged jets burner	Clean each burner orifice
	· Damaged thermostat	Check the thermostat for proper operation (see start up procedure). If the thermostat is not operating properly it should be replaced (the thermostat cannot be serviced)
Pressure drop	· Main burner working poorly	Verify operation, check for a plugged gas line to the burner.
	· The shut off valve and excess flow valve are closed	Check liquid and vapor valves, if necessary, open them
	· Filter capped	Clean the filter mesh
	· Inadequate equipment selection	Vapor demand exceeds vaporizer capacity

8.1 EMERGENCY CONTROL

In the event of a gas leak or if a fire breaks out, it is critical to carry out the following maneuvers immediately:

- 1) Turn off the burners and the pilot, turning the thermostat dial to the off position.
- 2) Turn off the Electronic Ignition, if possible, uninstall the System battery.
- 3) Close the control valve or valves closest to the equipment to eliminate any possible flame or spark points.

4) Prevent accidental vapor ignition controlling and eliminating any possible flame or spark points.

5) Prevent leakage of liquid phase or vapor propane to the lower levels or basements of nearby buildings.

9. WARRANTY

Warranty. Dragon Shield LLC, warrants to all parties all equipment manufactured and sold by it to be free from defects in material or workmanship under normal use and service, when installed and used in accordance with all applicable state and local codes, regulations and laws in accordance with National Fire Protection Pamphlet 58.

For installations in Canada they should follow Natural Gas and Propane Installation Code, CAN/C-SA-B149.1, CAN/CSA-B149.2.

Dragon Shield LLC agrees to repair or replace, at the sole option of Dragon Shield LLC, any Dragon Shield product that fails within the Warranty Period due to defective materials or workmanship.

At the request of **Dragon Shield LLC**, the product must be returned to the company where it was purchased, all transportation charges prepaid.

Deviations from recommended applications, system design, installation and service practices, as well as deterioration or wear due to foreign materials or contamination present in LP-Gas or air shall be considered as abuses and render this warranty void.

All Potential Warranty Claims must be submitted

in writing to the Customer Service Dept at **Dragon Shield LLC**, complete with details of the failure and photos when applicable.

Send to: customerservice@dsvap.com

Phone: +1 832-871 - 4636

This warranty extends for a period of one year (12 months) from date of installation/start up, but not more than eighteen (18) months from date of shipment from **Dragon Shield LLC**. This warranty is expressly in lieu of all other warranties expressed or implied, and of all obligations or liabilities on its part for damages including but not limited to consequential damages, following the use or misuse of equipment sold by it. No agent is authorized to assume any liability for **Dragon Shield LLC**, except as set forth above.

Notwithstanding anything herein to the contrary, with respect to paints and coatings, **Dragon Shield LLC** warrants that it will apply paints and coatings in accordance with the specifications and recommendations of the manufacturer thereof; provided, however, that **Dragon Shield LLC** makes no warranty, expressed or implied, with respect to the paints and coatings or to the validity of manufacturer's specifications and recommendations.

