

Operation Manual

RES SERIES - LIQUID PETROLEUM GAS ELECTRIC VAPORIZERS

WARNING!!! Read Before Using

This equipment is designed for use with LP-Gas, flammable fuels handled under pressure, Natural Gas, and other gases of a volatile and or hazardous nature. The nature of the application involves inherent hazards, and must be thoroughly understood to allow safe operation and maintenance. This operating manual contains important information and instructions which **MUST** be read and followed by anyone operation or servicing this equipment. Do not attempt to operate this equipment unless you have read the manual.

IMPROPER INFORMATION OR USE OF THIS EQUIPMENT COULD CAUSE SEVERE BURNS, DISFIGUREMENT, PERMANENT DISABILITY OR DEATH.

Only a trained, fully qualified person should install and service this equipment. This product could expose you to substances in fuel or fuel combustion which are known by the state of California to cause cancer, birth defects, or other reproductive harm.



Figure 1-1 – RES Series Vaporizer

**RES SERIES
LPG ELECTRIC VAPORIZERS
DIRECTION AND OPERATION**

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CERTIFICATION

FM APPROVED FOR UNITED STATES:

1. Explosion Proof
2. Class 1, Division 1, Group D
3. Type 4** (see below)
4. TA (Ambient Temp.):
-20C to +40C (-4F to +104F)
5. T3C [160C (320F) Max.]

REFERENCED STANDARDS:

FM3600:2011
FM3615: 2006
FM3810: 2005
ANSI/ISA 61010-1:2015
NEMA 250: 1991

FM APPROVED FOR CANADA:

1. Explosion Proof
2. Class 1, Division 1, Group D
3. Type 4** (see below)
4. TA (Ambient Temp.):
-20C to +40C (-4F to +104F)
5. T3C [160C (320F) Max.]

REFERENCED STANDARDS:

CSA-C22.2 No. 0.4:2013
CSA-C22.2 No. 0.5:2016
CSA-C22.2 No. 30:2012
CSA-C22.2 No. 94: 2011
CAN/CSA-C22.2 No. 61010-1:2012

SPECIFIC CONDITIONS OF USE:

** Type 4 Rating only on assemblies with no push button Start, Direct Power Only. When push button start is installed, the Type 4 Rating is removed.

** Also, to maintain the Type 4 Rating: The bottom head and base must be painted (NEMA 250: 1991 clause 3.5.2) and PTFE tape must be applied to threaded conduit during installation.

- Consult the manufacturer for dimensional information on the flameproof joint for repair.

OTHER CUSTOMER REQUIREMENTS:

1. Seal all conduits within 18" of enclosure.

Sceller tous les conduits à moins de 18 po de l'enceinte

2. To prevent ignition of flammable gases or vapors, do not remove cover while circuits are live.

Pour éviter l'inflammation de gaz ou de vapeurs inflammables, ne pas enlever le couvercle pendant que les circuits sont en marche

1. GENERAL

1.01 This manual provides a physical and functional description and operating theory necessary for effective use of the Ransome RES Series Electric Vaporizers.

1.02 Ransome RES Series Electric Vaporizers provide an economical, dependable source of Liquefied Petroleum (LP) gas vapor for a wide range of applications up to 120 gallons per hour. Standard units are self-contained and completely prewired. The customer simply connects power to the unit and the electrical installation is complete. They are individually factory-tested on Propane and shipped ready for use. The LP-Gas Inlet and Vapor Outlet are connected to the user's system. The Start button is activated, and the Ransome RES Series Vaporizer goes to work, quietly and automatically.

1.03 1.03 LP-Gas is stored as a liquid and used as a vapor. To change it into a vapor, heat must be added at the rate of:

- (a) From 785 BTU for each gallon of Propane at -44 F to 441 BTU @ 132 F.
- (b) (b) From 808 BTU for each gallon of Butane at -32 F to 634 BTU @ 130 F.

The liquid will then boil, changing to vapor at the rate of:

- (c) (c) 36.4 ft. for each gallon of Propane.
- (d) (d) 31.3 ft. for each gallon of Butane.

1.04 Ransome RES Series Vaporizers develop the heat required for vaporization of LP-Gas. Operating on temperature control, the heaters function only as needed to maintain proper temperature.

1.05 Features of the RES Series Vaporizers include the following:

1. ASME code pressure vessel shell(s) with internal heat exchange cylinders. Each vessel is constructed of carbon steel material for its high strength and thermal conductivity characteristics.
2. Ransome's unique liquid level float switch

configuration. The high liquid level prevents liquid from entering the outlet.

3. Precision operating and high temperature switches. The electronic operating temperature controller operates the heater circuit(s) for the desired outlet set vapor temperature. The high temperature switch(s) turn the vaporizer off in case of runaway heater malfunction.
4. Liquid Inlet valve, closes the inlet preventing the liquid from spilling over to the outlet.
5. Electric resistance heater core. Located within an ASME vaporizer shell.
6. ASME stamped relief valve. Each vaporizer unit is adequately protected in accordance with NFPA 58 and California Title 8 codes.
7. All controls are located inside an enclosure protected from the weather.
8. All sizes are capable of infinite turndown and will maintain a ready supply of vapor from zero load to full capacity. At no load, only enough will be generated to maintain temperature and to prevent condensation. .

How to Select an Electric Vaporizer

1.06 Determine the total amount of LP-Gas Vapor required. Add up the maximum inputs of all the gas-using equipment in the system from manufacturer's data plate or literature, usually expressed in BTU/HR. Be SURE this is correct. If in doubt, contact the manufacturer's of the equipment.

- (a) Calculate required capacity as follows:

$$Q = \frac{Ht \times Fd}{91,690}$$

Where:

Q = Required Capacity in Gallons/Hour Propane.
H = Total Input Required, BTU/Hour

Fd = Load Variation Factor

- ◆ 1.0 for Gradual Load Changes

- ◆ 1.1 for Rapidly Fluctuating Load Changes
- ◆ 1.2 for Temperatures Below Minus 30 °F.

LP-Gas level in the Vaporizer. Most of the system components are the same or similar between models. Capacity is increased by heater core and vaporizer tube size.

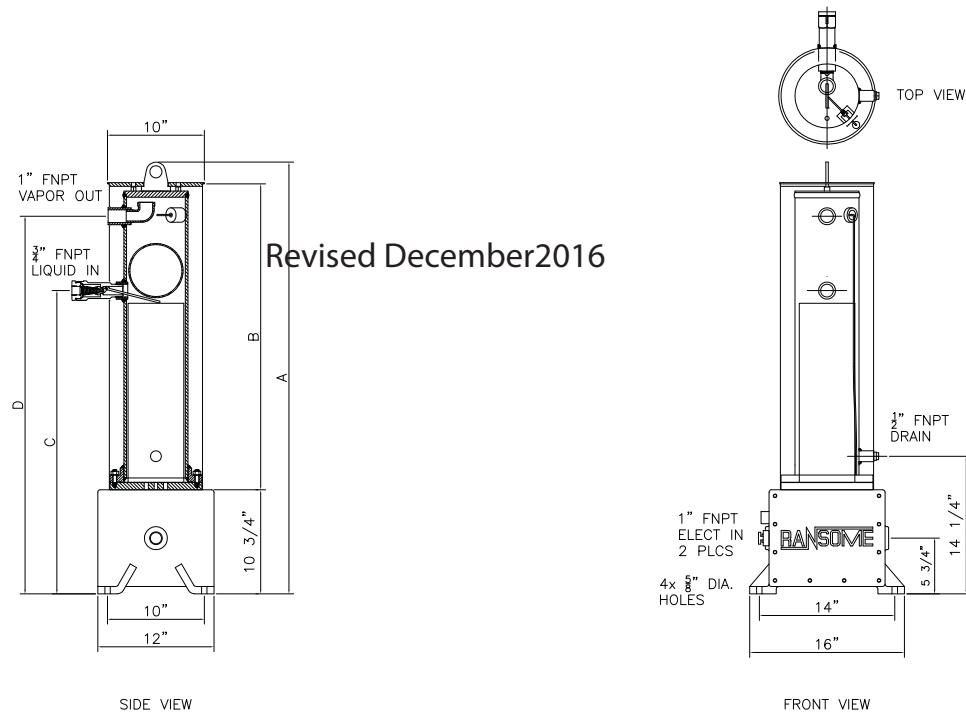
2. PHYSICAL DESCRIPTION

2.01 The Ransome RES Series Vaporizers are all similar in design and construction. They are designed for mounting on a concrete slab, outdoors, in varied weather conditions. The heat exchanger is mounted on an aluminum enclosure and thermally insulated.

2.03 Figure 2-1 illustrates a typical Vaporizer and is provided with key letter callouts for Physical dimensions.

2.02 The principle difference between models is the capacity, ranging from 50 to 120 GPH.

Model RES 50, 80 and 120 utilize an internal Float switch and electric inlet valve to control



RES50 – RES120 Dimensions										
MODEL	A		B		C		D		Weight (lbs/kg)	
	in.	cm.	in.	cm.	in.	cm.	in.	cm.	lbs.	kg.
RE50	44 5/8	113.4	31 5/8	80.3	31 3/8	79.7	39	99.1	220	100
RE80	53 5/8	136.2	40 5/8	109.2	40 3/8	102.6	48	121.9	254	115
RE120	63 5/8	166.7	52 5/8	133.7	52 3/8	133.0	60	152.4	300	136

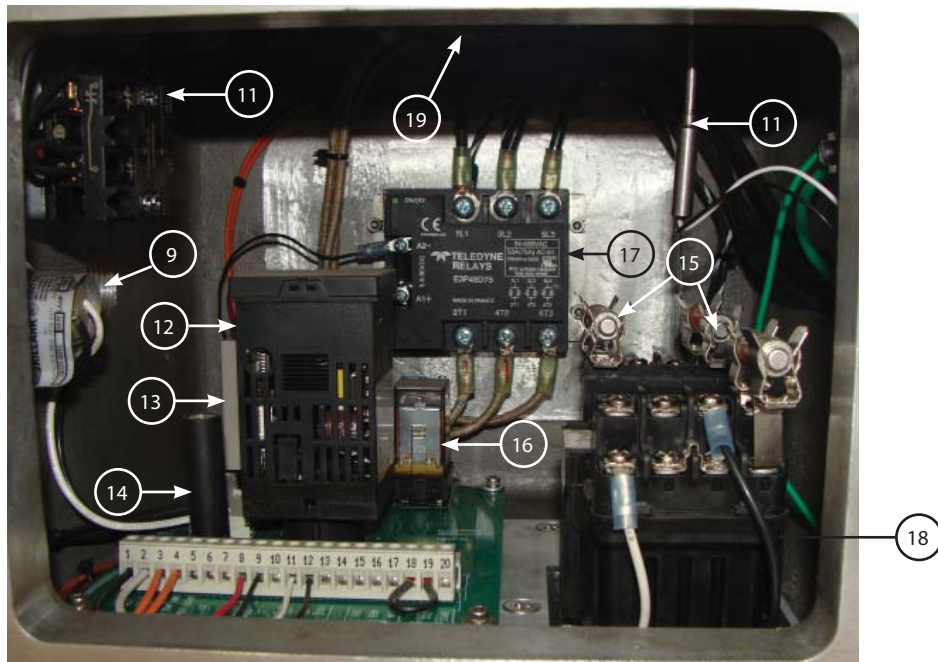
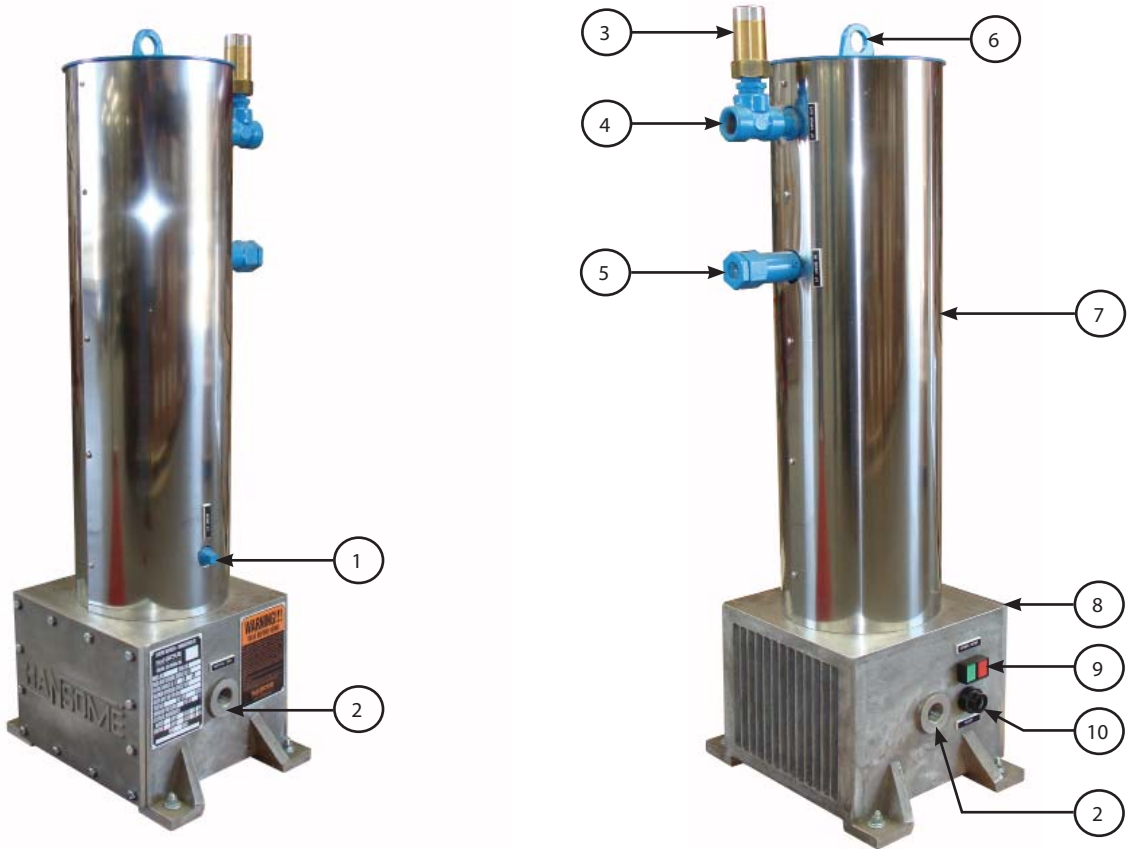


Figure 2-1 – RES Series Vaporizers

Table 2-1 – RES Series Vaporizers

Key	Element	Function
1	Drain	Provides low point drain
2	Electrical In	Connection point to electrical supply (Typ. 2)
3	Safety Relief Valve	Relieves vapor outlet pressure when pressure exceeds rated pressure.
4	Vapor Outlet	Connection point to process vapor line
5	Liquid Inlet	Connection point from liquid supply
6	Lift Lug	Provides lifting point for easy lifting and positioning of unit
7	Heater Assembly	Includes heater core, pressure vessel and shroud. Provides the heat required for vaporization of liquid for the supply of vapor.
8	Enclosure	Encloses electrical components for installation in Class 1, Div. 1 Hazardous location.
9	Stop/Start Switch	Push buttons for "Stopping" and "Starting" unit
10	Ready Light	Provides indication unit is "Started" and within limits. The heater will cycle ON and OFF as required.
11	RTD	Provides vapor temperature input to Temperature Controller
12	Temp Controller	Provides signal to SSR Relay to cycle heater ON and Off for precise control of vapor outlet temperature.
13	Auto Restart Relay	Timer relay that restarts unit in the event of momentary loss of power
14	Control Fuse	Provides fuse protection for control circuit
15	Transformer Fuse	Provides fuse protection for control transformer
16	Control Relay (2)	Control relays for safety limit and Temperature Controller
17	SSR Heater Control Relay	Interrupts line voltage to heater to maintain proper heat input for required vaporization rate
18	Control Transformer	Provides reduced voltage for control circuit
19	High Temp Switch	Provides protection for heater and system components in the event of over-temperature

3. FUNCTIONAL DESCRIPTION

3.01 Figure 3-1 illustrates the general schematic for RES Vaporizers and is functionally equivalent for all RES Series Vaporizers.

3.02 LP-Gas is supplied to the vaporizer inlet from the user’s Storage Tank(s) System at a pressure dependent on temperature. (Refer to Table 3-1).

(a) RES50 thru RES120 use an internal float switch to limit liquid level and prevent flooding.

Table 3-1 – Storage Tank Pressure vs. Ambient Temperature Chart

Temperature		Approximate Pressure			
°F	°C	Propane		Butane	
		PSIG	kPa	PSIG	kPa
110	43.3	220	1516.8	46	317.2
100	37.8	190	1310.0	37	255.1
90	32.2	165	1137.6	29	199.9
80	26.7	140	965.3	22	151.7
70	21.1	120	827.4	16.5	113.8
60	15.6	102	703.3	11.5	79.3
50	10.0	86	592.9	6.9	47.6
40	4.4	72	496.4	3.0	20.7
30	-1.1	58	399.9		
20	-6.7	47	324.1		
10	-12.2	37	255.1		
0	-17.8	28	193.1		
-10	-23.3	20	137.9		
-20	-28.9	13.5	93.1		
-30	-34.4	8	55.2		
-40	-40.0	-3	-20.7		

Control Mode

3.03 The RES Series Electric Vaporizer uses an electronic Temperature Controller with an RTD (Resistance Temperature Detector) probe input to control the heat required for vaporization. The control mode used is time proportioning. This provides for precise control of process temperature. A time proportioning control operates in the same way as an ON/OFF control when a process temperature is far enough away from set point to be outside the proportional band. When process temperature approaches set point and enters the proportional band, the output device is switched ON and OFF at the established cycle time. At the lower limit of the band, the ON time is considerably greater than the OFF time. As the process temperature more closely approaches set point, the ratio of ON to OFF changes; the amount of ON time decreases and the OFF time increases. This change in heat delivered provides a modulating effect which results in less process temperature overshoot. The ON and OFF cyclic action continues until a relationship of equal ON and OFF is attained. At that time, the system will stabilize such that process temperature is controlled at a point just below the set point.

The process temperature does stabilize with resultant droop. This condition will remain providing there are not work load changes in the system. The overshoot is typical of proportional control systems on initial temperature rise or during a change in demand.

Limits and Safety Features

3.04 RES Series Electric Vaporizers have two high temperature protection devices to protect the system in the event of an over-temperature condition. A separate precision Snapdisk type high temperature switch is installed in the potential hottest part of the heat exchange vessel. Incorporated within the electronic temperature controller is another high temperature monitor to provide protection against high temperatures. In addition, the electronic temperature controller protects against a low temperature condition in the event of over capacity or heater failure and the resultant loss of heat. In any of the above cases, a safety shutdown will occur requiring a manual restart once the problem has been rectified.

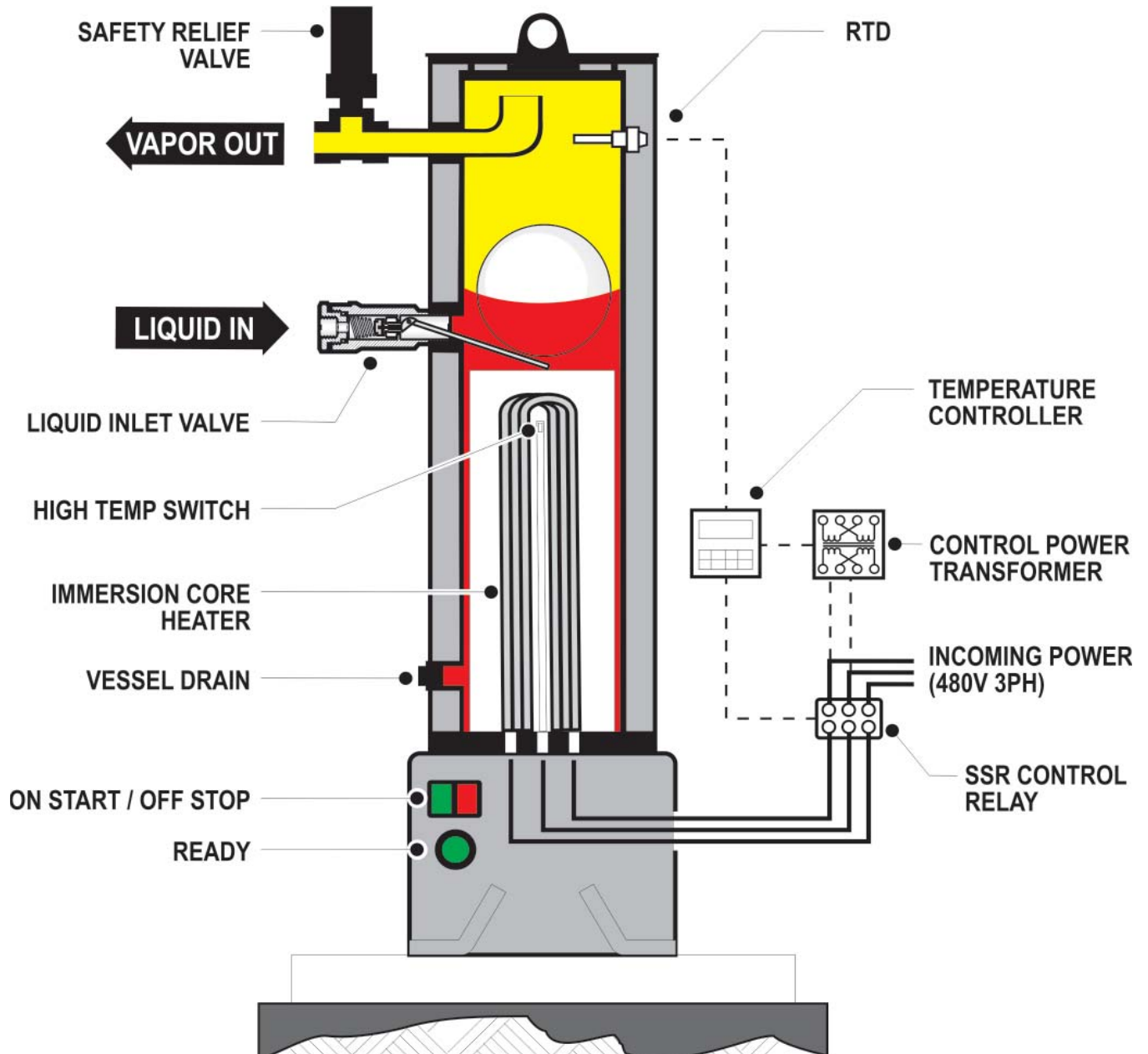


Figure 3-1 – General Schematic for RE Series Vaporizers

3.05 The Vapor Outlet Line pressure is monitored by the Safety Relief Valve which opens when the line pressure exceeds 250 PSIG. The user should provide a Shut-Off Valve and Outlet Pressure Regulator on the Vapor Outlet Line. The Pressure Regulator should not be over 24 inches from the Vaporizer.

4. SPECIFICATIONS

4.01 Table 4-1 will provide the user with tabulated performance specifications for RES Series Vaporizers. Figure 2-1 illustrates the physical specifications of respective RES Vaporizers. The user will find this useful when planning new installations.

**Table 4-1 – RES Performance Specifications
Selection Chart**

Ransome Model	Flow Rate of Liquid Propane*		Flow Rate of Propane Vapor		Millions of		Heater Input		Approx. Shipping Weight	
	GPH	L/hr	ft ³ /hr	m ³ /hr	BTU/hr	kJ/hr	BTU/hr	kJ/hr	lbs.	kg.
RES 50	50	189.3	1825	51.7	4.58	4.8	50,127	52,887	220	99.8
RES 80	80	302.8	2920	82.7	7.34	7.7	79,794	84,187	254	115.2
RES 120	160	605.7	5840	165.4	11	11.6	119,691	126,281	300	136.1

* Rated capacity in GPH of Propane @ 0 degrees F with a minimum vapor outlet temperature of 100 F.
Note: Rated capacity for Butane will be lower than that of Propane.

Electrical

Ransome Model	Amps Per Line			Conduit Size Heater Circuit	Number of Lines	KW
	240V-3Ph	480V-3Ph	575V-3Ph			
RE 50	33A	18A	15A	min. 3/4"	3	14.7
RE 80	--	28A	24A	min. 3/4"	3	23.4
RE 120	--	42A	36A	min. 3/4"	3	35.1

5. OPERATION

5.01 The intent of Part 5 is to give the LP-Gas user general information on installation and turn-on procedure for the Ransome RES Series Vaporizers. Each user's application will differ slightly, but it is hoped the user will gain from these generalized instructions.

5.02 After consulting with the Ransome Sales and Service Engineer or Distributor and reviewing Figure 5-1, the user will make a plan for the LP-Gas storage and Vaporizer location.

5.03 When the Ransome equipment arrives, examine the shipping container for obvious shipping damage. All claims for shipping damage should be made to the shipper, not to Ransome Manufacturing or the Distributor. Obvious workmanship problems or incomplete shipments should be immediately referred to Ransome Manufacturing (or Distributor) following the warranty service procedures described in Part 6.

CAUTION

Only a trained, experienced vaporizer serviceman should inspect, test, start up or service Ransome equipment.

Start Up and Operating Procedure

5.04 All RES Series Vaporizers are factory tested using Commercial Propane. Ransome Vaporizers are thoroughly tested at the factory and assured to be free from leaks. However, vibration and jarring during subsequent handling, shipment and installation can cause leaks. The factory recommends:

- (a) Use a good quality liquid leak detecting solution, for leak checking. This is available for subfreezing temperatures as needed. A thorough leak test using one of these solutions or equivalent leak detector must be conducted after installation and any leaks must be repaired prior to operation of the Vaporizer.

CAUTION

Do not use matches or other flames to conduct leak tests.

This start-up procedure assumes a complete, proper installation of the entire gas system including storage tank(s), valve, piping, bypass valves, etc., and including any required electrical power. All installations must be in accordance with NFPA No. 58 Standards, state, provincial or local regulations, codes and laws. The procedure assumes use of clean, contamination-free LP-Gas. Close ALL VALVES in the system prior to startup. Then proceed as follows:

Step 1 Allow a qualified electrician to complete all electrical connections from customer supply power to the RES vaporizer control panel. Be sure to conform to all applicable electrical installation codes.

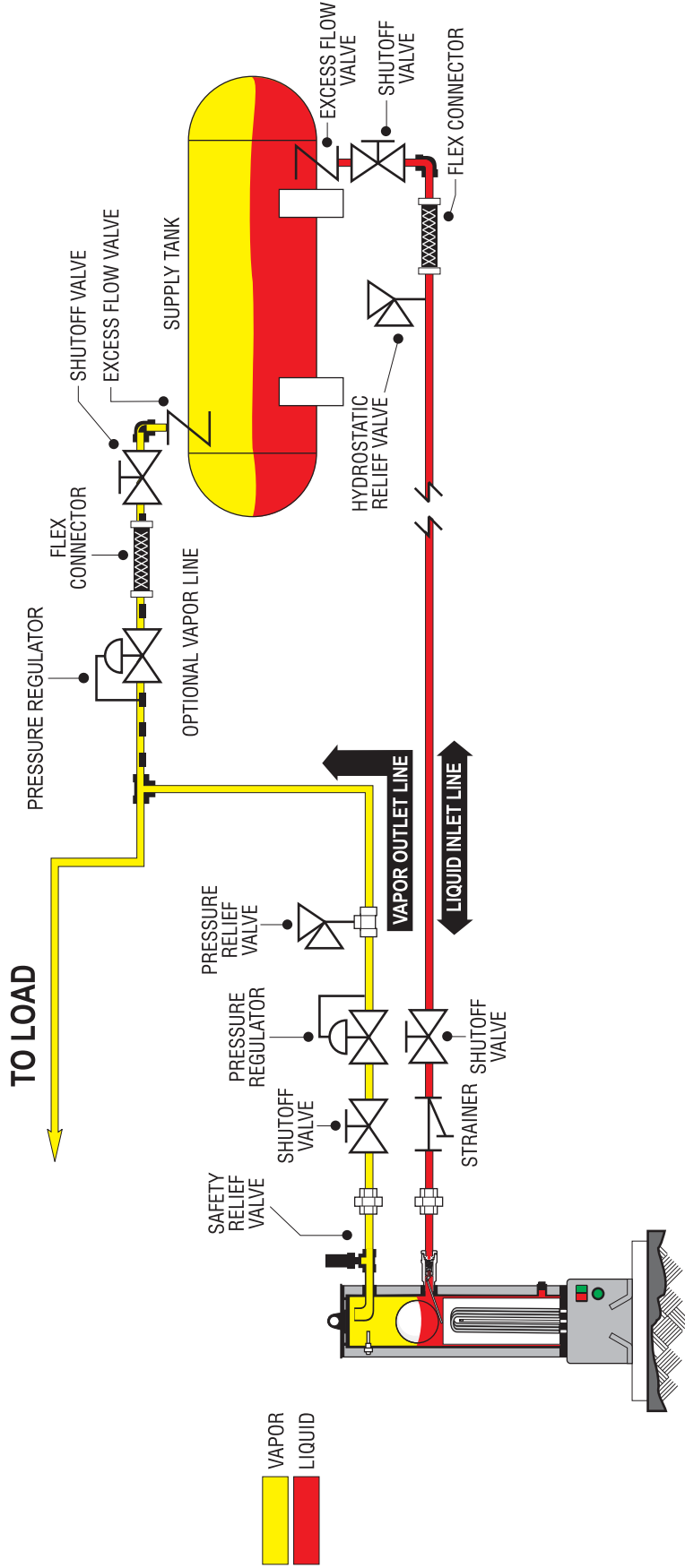
Step 2 Prime the system by slowly opening valves in the LP- Gas liquid line one at a time between the storage tank and the RES vaporizer inlet, starting at the storage tank. If a pump is incorporated, be sure to open valves on the manual bypass line to avoid excessive differential pressure and possible damage. Do not start the pump at this time.

Step 3 Slowly open the manual inlet valve to the RES vaporizer admitting LPG liquid to the vaporizer Inlet valve. Be sure that all valves downstream of the vaporizer are closed.

Step 4 With service power connected, push the vaporizer's "START" button, the heaters will be cycled on and off time proportionally by the electronic Temperature Controller. Note that initially, with the outlet valve closed, only a small amount of liquid may enter the vaporizer. The vessel will heat up and overshoot the set point on startup. This is normal.

Step 5 When the main heaters automatically shut off, the vaporizer is ready for operation.

Step 6 Slowly open the vapor outlet line valve to fill service line to load. The RES vaporizer is now on line and ready to supply vapor upon demand. It is recommended that the vaporizer system remain "ON" to maintain temperature and eliminate any possibility of corrosion from condensation.



NOTES:

1. Equipment, piping and installation must be in accordance with provisions of NFPA 58, and all applicable state, provincial and local codes.
2. Liquid pump may be required to provide sufficient pressure to inlet of vaporizer during conditions of low tank pressure.
3. Outlet pressure regulator should be no more than 24 inches from vaporizer outlet and located at or above centerline of vaporizer outlet.
4. Do not install a separator, dripleg or other liquid trap upstream of outlet pressure regulator.
5. Regulator outlet pressure must be adjusted to a pressure below the vapor pressure of the saturated L.P.-Gas at lowest operating temperature or vapor may reliquefy in downstream piping.
6. Liquid piping system must allow for occasional reverse flow toward supply tank to prevent excessive pressures during operation.

Figure 5-1 – Typical RES Series Installation

6. MAINTENANCE

6.01 Maintenance procedures in Part 6 should be performed in accordance with local regulations and the user's maintenance plan.

Safety Precautions

6.02 The RES Series Vaporizers contain flammable gas under pressure while in normal operation. Any gas leaks within the vaporizer system or in any part of the installation are potentially dangerous and must be eliminated immediately or a fire may occur. Any odor, gas or dark oily stains on joints or fitting indicate a possible gas leak. If such a leak does exist, pilots or other source of ignition must be immediately extinguished. Electrical power should be disconnected at a location remote from the suspected leak.

6.03 Thorough inspections for leaks should be conducted frequently. Any leaks should be repaired immediately. Since this equipment, as well as any other components in the installation uses threaded joints, gaskets and "O" rings and are subjected to vibration and thermal stresses, the possibility of leaks developing over a period of time is always present.

Emergency Instructions

6.04 If a large leak is discovered, do not attempt to affect repair.

- (a) Evacuate all personnel from the area.
- (b) Call the Fire Department.
- (c) If it can be done with safety, shut off the Main Gas Supply Valve(s) at the LP-Gas Storage Tank(s)

The leak will stop when all gas downstream from the Gas Supply Valve(s) has been exhausted.

- (d) Make certain all gas has safely dispersed before attempting repairs.

Routine Inspection

6.05 LP-GAS INLET VALVE(S) to Vaporizer should be inspected at least ONCE A YEAR and more often if the equipment is in heavy use and also at any time an abnormality is detected. Any

parts that are worn or show deterioration should be repaired.

6.06 OPERATING SWITCHES AND CONTROLS should be checked for correct performance at frequent intervals. Repair or replacement should be accomplished at the first indication of sticking, erratic performance or any abnormal condition.

6.07 SAFETY RELIEF VALVES should be replaced at any time possible damage is suspected. Vent piping connected to Safety Relief Valves must be kept open, free from condensation, ice or other foreign material that might restrict release of excessive pressure in an emergency.

6.08 VAPORIZER TUBES should be inspected for corrosion at regular intervals. If signs of corrosion or other damage are found, the Vaporizer Tube should be reinspected, tested and approved by a Certified A.S.M.E. Code Inspector. Any rejected Vaporizer Tube must be replaced.

6.09 EXTERIOR PAINT - Keep all external surfaces well painted to prevent deterioration and rust.

Purging Gas From The System

6.10 If service requires removal of gas from the system, DO NOT merely vent gas to atmosphere. This could result in the possibility of injury or damage.

- (a) A Flare Burner should be installed at a safe distance from any gas leakage.
- (b) Dispose of gas by burning.
- (c) Make sure all gas is actually removed from the equipment before any connections are loosened.

6.11 If LP-Gas liquid is present in the Ransome equipment, it will chill as the pressure is relieved, slowing the rate at which it will boil and discharge as vapor through the Flare Burner. BE CERTAIN all liquid is actually vaporized before loosening any connections. The presence of frost on the outside of a component part is an indication of the presence of LP-Gas liquid and no connections should be loosened until it melts. The use of a heat source, such as a forced air heater, may expedite this process in cold weather.

6.12 All servicing must be done in a safe, thorough, step-by-step manner. If in doubt about what to do, the serviceman should:

- (a) Consult the Operation Manual.
- (b) Contact the gas system installer.
- (c) Contact Ransome Manufacturing, following the instructions under Warranty Service in this manual.

Gas System Trouble Shooting

6.13 6.13 The trouble shooting procedures described in Table 6-1 are intended to help a serviceman isolate the cause of trouble encountered during routine operation to a replaceable part listed in Table 6-2 and. Only the kinds of trouble more likely to be encountered in service are listed. The list is by no means comprehensive. The Probable Cause column of Table 6-1 lists in order of most likely occurrence. To make the best of these trouble shooting procedures, the serviceman should be thoroughly familiar with the Physical and functional Descriptions of the Ransome system described in Part 2 and 3 of this manual.

6.14 Before beginning any trouble shooting, make certain the Ransome Vaporizer has been properly installed. All system components including storage tanks, valves, piping, pumps and bypass valves must conform to NFPA No. 58 Standards and all state, provincial or local regulations, codes and laws.

Warranty Service

6.15 Faulty system components should be returned to Ransome Manufacturing following the conditions set out in the Warranty. Defective material or technical questions should be referred to:



When the material is returned to Ransome, the following information will expedite repair or replacement and return if it is included:

- (a) Complete Material Return Authorization (MRA) form. These can be obtained from Ransome Customer Service upon request.
- (b) The name and area code - telephone number of the individual most familiar with the failure.
- (c) A brief statement of the problem with the unit.
- (d) Make(s) of other gas equipment in the user's system.
- (e) The approximate date and Purchase Order Number for the Ransome equipment (if known).
- (f) The Model and Serial Number of the Ransome equipment.

Table 6-1 – Troubleshooting

Symptom	Probable Cause	Remedy
Heaters will not turn off	<ol style="list-style-type: none"> 1. System at capacity. 2. Faulty SSR Relay. 3. Fault in Temperature Control Circuit (Controller and RTD) 	<p>Normal Operation.</p> <p>Check and replace if necessary.</p> <p>Check components for any physical damage and replace as needed.</p>
Unit shuts down	<ol style="list-style-type: none"> 1. Exceeded High Temperature limit. 2. Low temperature limit tripped. 3. Loss of control circuit power. 	<p>Check unit for proper fuel supply and contactor operation.</p> <p>Operate unit within its rated capacity. Verify all heaters are operating at rated wattage.</p> <p>Check control and heater circuit power. Even a momentary loss of power will cause the unit to shut down.</p>
Unit overheats	<ol style="list-style-type: none"> 1. Faulty SSR Relay. 2. Fault in Temperature Control Circuit. 3. Unit dry due to loss of product. 	<p>Check and replace if necessary.</p> <p>Check component for any physical damage and replace as needed.</p> <p>Verify and assure adequate liquid supply to inlet of vaporizer.</p>
Unit will not maintain temp.	<ol style="list-style-type: none"> 1. System beyond its rated capacity 2. Loss of power to heater control circuit 3. Loss of wattage in one or more heaters. 4. Fault in Temp. Control Circuit. 	<p>Reduce demand to rated capacity.</p> <p>Verify electrical power to heaters.</p> <p>Verify heaters are operating at rated wattage.</p> <p>Check components for physical damage and replace as needed.</p>

Table 6-1 – Troubleshooting (Continued)

Symptom	Probable Cause	Remedy
Insufficient Capacity	<ol style="list-style-type: none"> 1. Unit over-capacitated. 2. Loss of wattage in one or more heaters. 3. Liquid supply inadequate. 4. Inlet valve not completely open or strainer clogged. 5. Valves in system are not completely open. 	<p>Reduce demand to rate capacity of unit.</p> <p>Verify heaters are operating at rated wattage.</p> <p>Verify and assure adequate supply of liquid to inlet of vaporizer.</p> <p>Inspect and disassemble, clean, repair as needed. Clean strainer.</p> <p>Verify that all valves (excess flows and shutoffs) are completely open.</p>
Liquid at LP-Gas Outlet	<ol style="list-style-type: none"> 1. Unit over-capacitated 2. Loss of wattage in one or more heaters. 3. High level float switch not operating properly. 	<p>See "Insufficient Capacity"</p> <p>Verify heaters are operating at rated wattage.</p> <p>Reduce demand to lower liquid level. Dislodge float if bound. Check switch for continuity.</p>
Safety relief valve	<ol style="list-style-type: none"> 1. Flow back to liquid storage blocked 2. Check valve installed in liquid supply line preventing flow back into storage tank. 	<p>Verify there are no blockages in liquid supply line.</p> <p>Remove all check valves in liquid supply line.</p>

