

**PAM120-5 SERIES
 LP-GAS/AIR MIXERS**
OPERATION MANUAL

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(No. 17)
Mix Gas Outlet

Figure 1-1 -- M Series Mixer

1. GENERAL

1.01 This manual provides a physical and functional description and operating theory necessary for effective use of Ransome LP-Gas M Series mixers.

1.02 Ransome M Series mixers provide an economical dependable source of Propane-air mixture to replace natural gas for any industrial or commercial use up to 103,250 SCFH at as high as 30 PSI. These Mixers are for applications where the user supplies the vaporizer.

1.03 Ransome ST Series Surge Tanks compliment these systems and are available in three sizes:

- (a) Model ST 500 - 500 gallons
- (b) Model ST 750 - 750 gallons
- (c) Model ST1000 - 1000 gallons

They are designed for ease of installation; mounted on a prepared concrete slab adjacent to the Mixer and piped into the system.

1.04 Propane is highly concentrated source of energy, with 2516 BTUs per Cubic Foot heat content and must be diluted with air to use as a substitute for natural gas. The Ransome Mixer blends in just the right amount of air for an equivalent mixture, providing the same heat input as natural gas. A mixture with a specific gravity of 1.31 (1480 BTU/Cu.Ft.) will match 0.6 specific gravity natural gas with approximately 1000 BTU/Cu. Ft. gross heat content.

1.05 Features of the M Series mixers include:

- Exclusive Ransome GASONIC Venturis maintain close control of mixture at outlet pressures as high as 30 PSI — Up to 10 PSI without compressed air.
- Safety interlocks to protect installation from damage or hazard due to excessive or insufficient temperatures and pressure. Simple electrical control system properly grounded and fused for long, dependable service life.
- Dual air valves on each Venturi prevent leakage of mixed gas into air inlet system.
- Multiple Venturis provide quieter operation with much smaller surge tanks than large, single Venturi systems.
- Gas-Air mixture is adjustable over a wide range to match natural gases with different specific gravities and heat contents.

- All controls are located inside modular cabinets in a warm area for proper performance even in extreme weather conditions.
- Modular design provides maximum capacity in a compact, rectangular unit.
- Models are available in a complete range of sizes from 10,000 to 70,000 SCFH mixed gas eliminating the need to buy more capacity than required.
- All Sizes are capable of infinite turndown and will maintain a ready supply of mixed gas from zero load to full capacity. At zero load, only enough heat will be generated to maintain temperature and prevent condensation.
- All units built to FM and FIA specifications.

Options

1.06 For units to be installed at FIA-insured locations, specify Option A. All units are covered under FIA non-site approval program, but Ransome must submit documents for use by local FIA offices if user is actually FIA insured.

(a) Standard units, 5-10 PSI. Air supply is aspirated into Venturi by pressure energy of the gas. No compressed air is required.

(b) High pressure air from a user-supplied blower, 11-30 PSI. These Ransome Mixers require clean, dry air at a constant pressure of approximately 2 PSI less than the mixed gas. The mixed gas pressure is specified on order Option HB.

(c) High pressure air from user-supplied compressor plant air, 11-30 PSI. These Ransome Mixers require clean, dry air at a minimum pressure of 20 PSI over mixed gas pressure. Option HP.

1.07 The Control Panel displays the cause of a safety shutdown to simplify servicing. Option C. It includes:

(a) Alarm lights for high and low Propane and mixed gas pressures.

(b) Alarm lights for high and low air pressure.

(c) Alarm lights for high vapor and mixed gas temperatures.

(d) An alarm acknowledge switch.

Mixer systems equipped with the Built-In Specific Gravitometer option also include:

(f) Warning lights for high and low specific gravity.

1.08 Ransome Mixer systems equipped with the Built-In Specific Gravitometer give a continuous reading of the mixed gas specific gravity. High and Low limit warning alarm contacts are furnished, e.g., to Control Panel option. The cabinet is larger when optioned for the specific gravitometer. Option G.

1.09 M Series systems up to 10 PSI can be equipped with the Inlet Air Filter option. This includes a washable dry filter with housing, weather cap, mounting bracket and piping. Option F. If Option F is not selected, the user must use an equivalent filter to protect the air system from damage or malfunction due to foreign materials.

1.10 Class 1, Group D, Division 2 electrical wiring, Option X, should be specific for M Series Mixers in these applications:

(a) If the Mixer is mounted remote from a direct fired Vaporizer.

(b) If the Mixer is used in conjunction with an indirect fired Vaporizer.

How to Select A Mixer

1.11 Determine the total amount of mixed gas required. Add up the maximum inputs of all the gas-using equipment in the system from the manufacturer's data plates or literature. This may be expressed in:

(a) Millions of BTU/hr.,

(b) Thousands of SCFH natural gas

(c) Thousands of SCFH mixed gas.

Be sure this is correct. If in doubt, contact the manufacturers of the equipment. Refer to Tables 4-3, to determine the appropriate Ransome model. Derating the load is not necessary, but it is wise to allow for future expansion when determining the maximum heat input.

1.12 Determine the desired pressure of the mixed gas.

(a) 10 PSI or less can be naturally aspirated. Specify the pressure needed from 5-10 PSI.

(b) 11-30 PSI will need an external air supply depending on which is available to the user. Option HB specifies the unit to be used with an external blower.

(c) Option HP specifies unit to be used with external compressor or plant air supply.

CAUTION

All Ransome vaporizers are capable of handling the fluctuating loads required of M Series Mixers. Users specifying Ransome M Series Mixers must be certain that if another make Vaporizer is used, it is capable to handling such surge loads.

2. PHYSICAL DESCRIPTION

2.01 All M Series Mixers are similar in design and construction. They are designed for mounting on a concrete slab, outdoors, in varied weather conditions. They are housed inside of a 14-gauge, hot-rolled steel cabinet.

2.02 Figure 2-2 illustrates the Mixer interior and includes key number callouts for all major Mixer elements and controls. Associated Table 2-1 provides a cross reference for each callout, identifying the respective element as to function and/or description.

11.30 PSI Mixers

2.03 M-series mixers optioned for a user-supplied blower (Option HB) are equipped with Low Air Switch on the Air Inlet. The Interlock Circuit is interrupted if air pressure falls below a preset value. An Air Solenoid Valve replaces one of the Air Back Check Valves and is operated each time the Gas Solenoid Valve is opened.

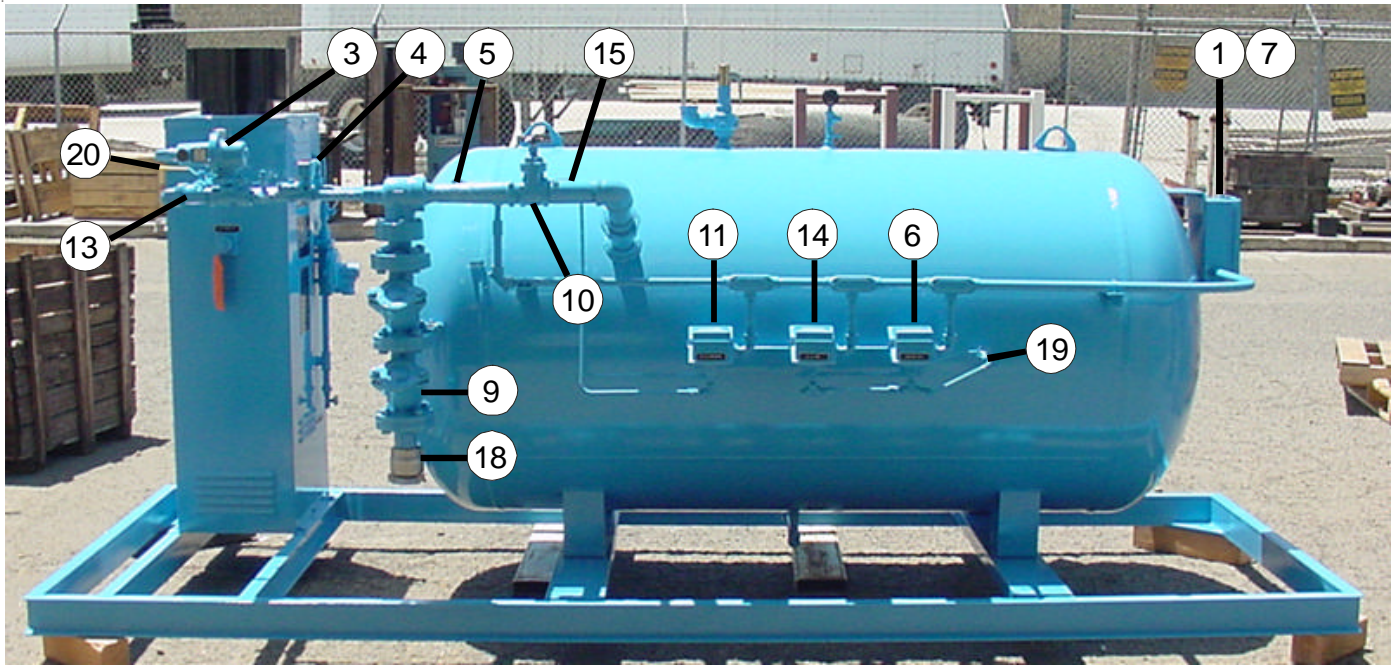


Figure 2-1 -- Typical M Series Mixer

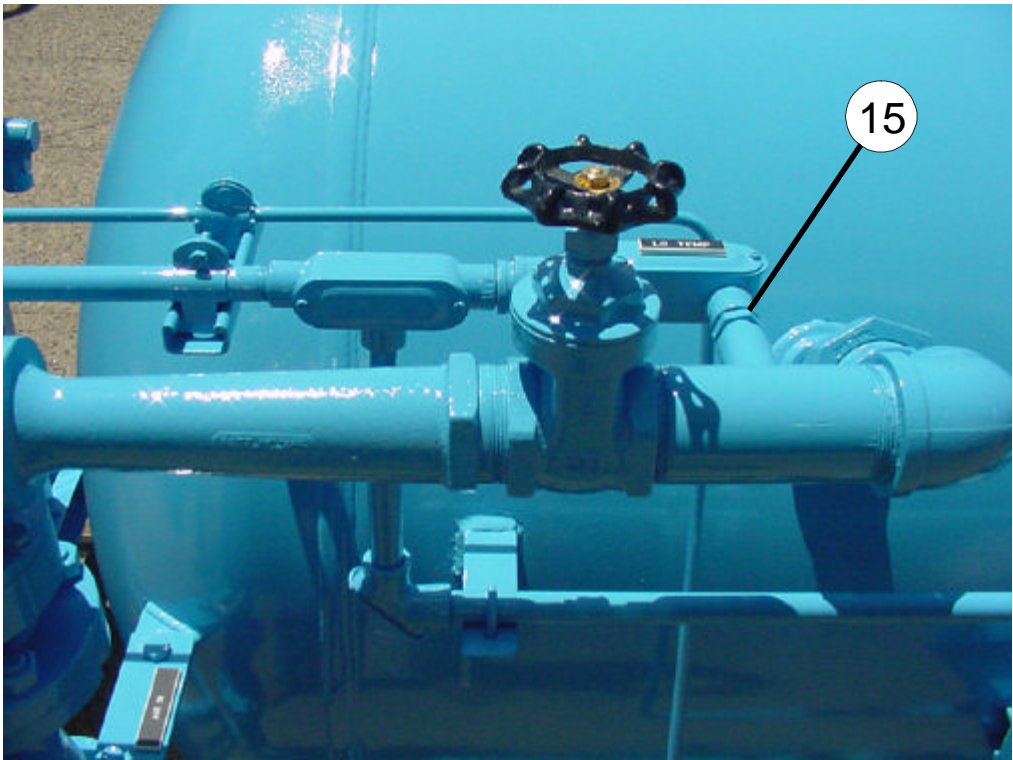
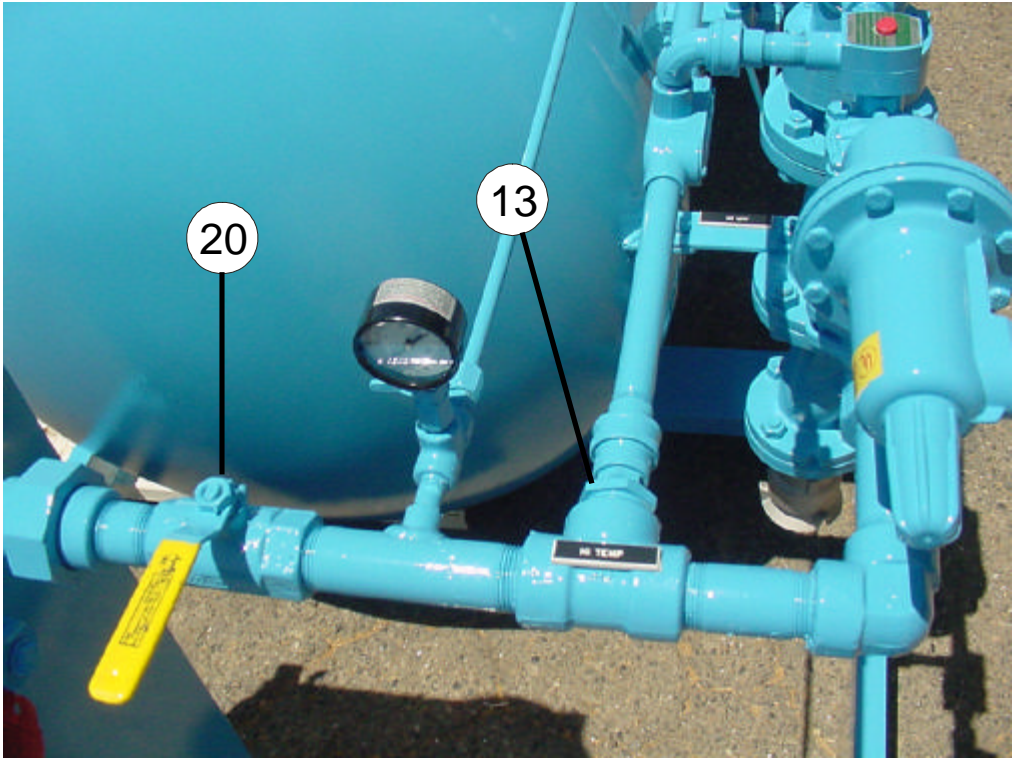


Figure 2-2 -- Typical M Series Mixer

2.04 M Series Mixers optioned for the user to supply plant compressed air to the system (Option HP), are also equipped with the Low Air Interlock Circuit. In place the two Air Back Check Valves are:

- (a) One Air Back Check Valve.
- (b) An Air pressure Regulator
- (c) An Air Solenoid Valve.

The Air Pressure Regulator assures a uniform supply of air. The Air Solenoid Valve operates as described in paragraph 2.04.

Safety Interlock:

2.05 Automatic shutdown protection is provided in Ransome M Series Mixers systems with a Safety Interlock Circuit and sensors at critical points.

- (a) 117 Vac power interruption.
- (b) High LP-Gas vapor pressure.
- (c) Low LP-Gas vapor pressure.
- (d) High LP-Gas vapor temperature.
- (e) High-Low Mixer pressure.
- (f) Low Mixer temperature
- (g) Low air pressure on models optioned for pressurized air.

Interruption of the interlock Circuit results in the system being shut down. The Gas Solenoid Valve in the Mixer module closes. The interrupted interlock point is displayed on the optional Control Panel (Option C).

Table 2-1 -- M Series Mixer

Key	Element	Function
1.	Electric Junction Box	Installer's connection point for 117VAC.
2.	N/A	
3.	Gas Pressure Regulator	Adjusts the inlet LP-Gas vapor pressure to the correct pressure for the Venturi Assembly.
4.	Gas Solenoid Valve	Provides for automatically turning on the vapor supply to the Venturi Assembly on demand from the Operating Pressure Switch.
5.	Venturi Assembly	Induces the flow of air into the LP-Gas vapor. Consists of An Air Chamber, Nozzle and Venturi.
6.	Operating Pressure Switch	Monitors the pressure of the Gas-Air mixture in the Surge Tank. Furnishes 117 Vac to the Gas Solenoid Valve (and Air Back Check Valve on some models) when the mixed gas pressure drops below a factory set level.
7.	Mixer Start Stop Switch	Turns Mixer Module ON and OFF.
8.	N/A	
9.	Air Back Check Valve	Prevents reverse flow of the Gas-Air mixture back out of the air inlet.
10.	Mixed Gas Shut Off Valve	Provides for shutting off mixed gas from individual Venturi Assembly. Used on multiple Venturi units only.

Table 2-1 -- M Series Mixer (continued)

Key	Element	Function
11.	High/Low Vapor Pressure Switch	Monitors pressure of Vapor Header. Interrupts the interlock Circuit if pressure exceeds 230 PSI or drops below 75 psi and shuts the system down. Factory set.
12.	N/A	
13.	High Vapor Temperature Switch	Monitors the temperature of Vapor Header. Interrupts the Interlock Circuit if temperature exceeds a predetermined value in the system and shuts the system down to protect the system from excessive temperatures. Factory set.
14.	High-Low Mixer Pressure Switch	Monitors the Surge Tank pressure. Interrupts the Interlock Circuit if mixed gas pressure exceeds or drops below preset values and shuts the system down. Factory set.
15.	Low Mixer Temperature Switch	Monitors the temperature of the mixed Gas Header for a drop in temperature indicating the possibility of the presence of LP-Gas liquid. The Interlock Circuit is interrupted and the system is shut down. Factory set.
16.	N/A	
17.	Mixed Gas Outlet	Provides the connection point to the Surge Tank.
18.	Air Inlet	Provides the connection point to the Air Inlet Filter, piping and bracket
19.	Mixed Gas Pressure Tap	Provides the connection point to sample mixed gas pressure in the Surge Tank.
20.	Vapor Shut Off Valve	Provides for manually turning off the vapor supply to one Venturi.

3. FUNCTIONAL DESCRIPTION

3.01 The vapor inlet is supplied vapor from a Vaporizer Outlet Line. Vapor pressure is reduced and regulated by the Gas Pressure Regulator. An electrically controlled Gas Solenoid Valve supplies vapor to the Venturi Assembly on demand from the operating Pressure Switch which monitors the pressure within the Surge Tank.

3.02 When the pressure in the Surge Tank drops below a preset level the Pressure Switch senses this drop and applies power to open the Gas Solenoid Valve.

3.03 LP-Gas vapor enters the Nozzle of the Venturi Assembly. The action of gas Velocity from the Nozzle

entering into the Venturi Assembly causes a drop in the pressure within the Air Chamber. This pressure drop causes the Air Shutters to open, permitting the air to rush in and mix with the LP-Gas vapor from the Nozzle. This results in a precise mixture of air and LP-Gas vapor being sent to the Mixed Gas Header and Surge Tank.

3.04 When the pressure within the Surge Tank rises to the desired pressure, the Pressure Switch senses the

rise and disconnects the power to the Gas Solenoid Valve. The Gas Solenoid Valve shuts off the supply of LP-Gas vapor to the Nozzle completing the cycle. This operating cycle is repeated as needed to handle the load.

3.05 In multiple Venturi units, operating pressure switches are set so Venturis will be energized in sequence as required to handle the load.

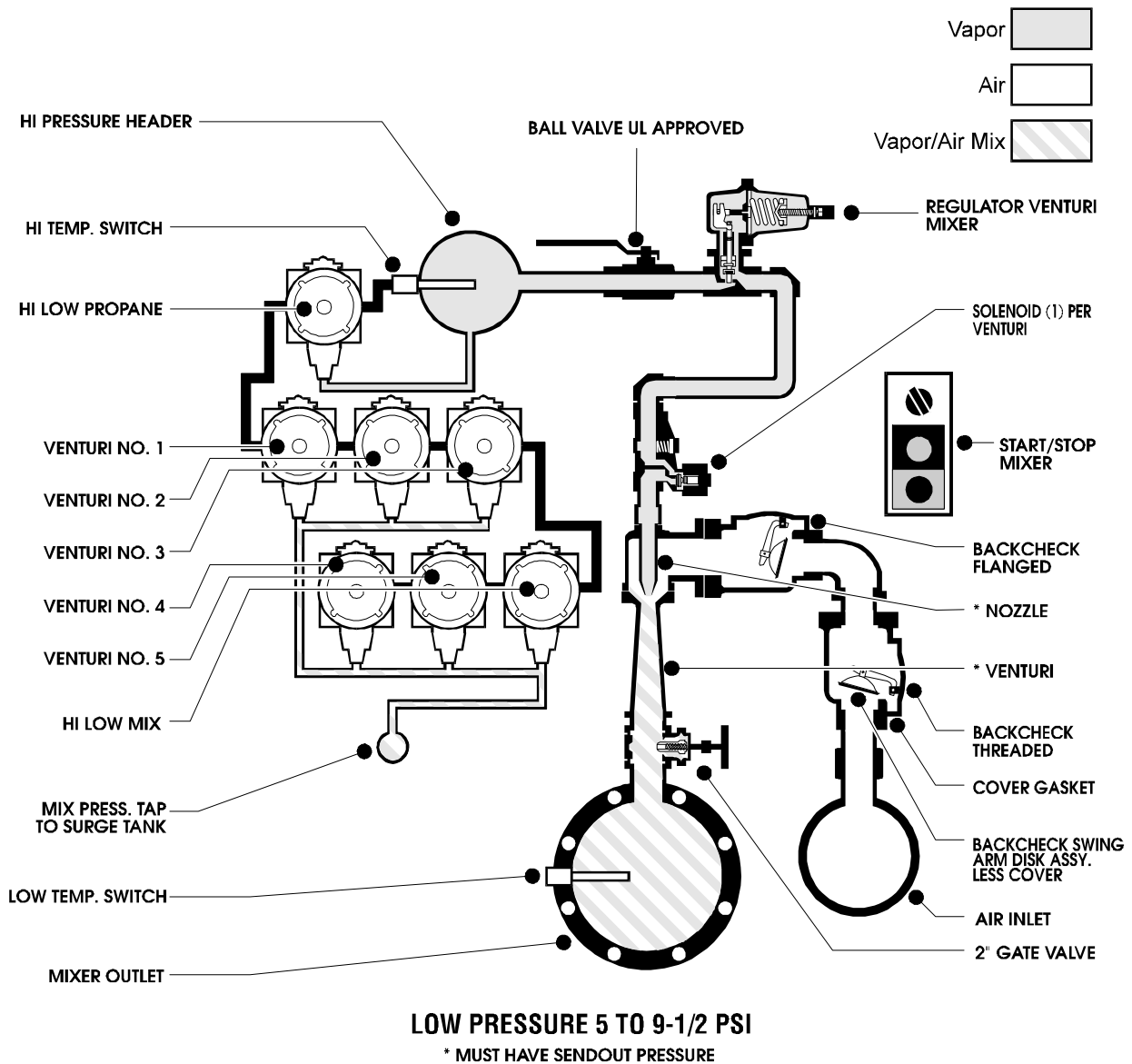


Figure 3-1 -- General Schematic for M Series Mixer

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 M Series Mixers. Each user’s application will differ slightly, but it is hoped the user will gain from these generalized instructions.

5.02 After consultation with the Ransome Sales and Service Engineer or Distributor, the user will make a plan for the LP-Gas storage, Vaporizer, Mixer and Surge Tank locations.

Inlet Pressure

5.03 A Ransome M Series Mixer is part of a complete system, all elements of which must be properly designed and installed before it can do its job. Proper performance cannot be obtained unless the correct pressure is supplied to the inlet of the M Series Mixer as shown on the Mixer Test Report.

Table 5-1 tabulates the inlet pressure for M Series Mixers.

Table 5-1 -- Minimum Inlet Pressures

Mixed Gas Pressure PSIG	Minimum Inlet Pressure Required PSIG
5	80
6	90
7	110
8	125
9	130
10	135

5.05 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 6.19 The shipment will include a Ransome Mixer Test Report illustrated in Figure 5-3. This should be retained with the Operation Manual as part of the users maintenance records.

Install Mixer on a simple concrete pad. Refer to

Step	Procedure
1.	Figure 5-1
2.	Install 117 Vac. 60 Hz, single phase power for control.
3.	Provide an adequate supply of LP-Gas Vapor to mixer inlet. Refer to Table 5-1.
4.	Select a suitable Surge Tank and Trim. Refer to Table 4-1.
5.	Connect the Mixer outlet to the Surge Tank.
6.	Provide piping from the Surge Tank to the natural gas line tie in.

Table 5-2 -- Installation Features for M Series Mixers

Key	Features
1.	Electrical power is wired for 117VAC, 60 Hz, single phase, 20 Amp service including a circuit breaker and a disconnect switch to be supplied by the customer. The disconnect switch should be able to be locked off during the Mixer servicing.
2.	Air Inlet Filter, Piping and Bracket Assembly (Option F). An air inlet filter must be installed on the air inlet to prevent damage to the Air Back Check Valves from airborne materials or insects.
3.	Mixed gas test connection for connection to Specific Gravitometer or other test instrument provided by user. A 1/4" Shut Off Valve and nipple are provided with Surge Tank Trim Kit (Suffix T).
4.	Surge Tank Safety Relief Valve is provided with the Surge Tank trim kit (Suffix T). An ASME code relief valve is provided to adjust to 50 PSI start-to-discharged pressure. This valve must be installed on all Surge Tanks to prevent excessive pressures in the event of an emergency. It must be capable of relieving the entire capacity of the Mixer without exceeding safe limits. If this valve is intended to protect any downstream components with a lower working pressure, the 50 PSI setting must be reduced. If other than the 50 PSI setting is needed, it should be specified with the Surge Tank trim kit order.
5.	Surge Tank Safety Relief Valve Vent Stack. Refer to Step 6.
6.	The Surge Tank Safety Relief Valve Rain Cap is included with the trim kit (Suffix T). A Rain Cap is intended to prevent rain, snow or sleet from entering into the safety relief valve.

Notes:

1. Installation must be in accordance with NFPA Pamphlet 58 and all applicable state provincial and local codes and regulations.
2. Actual design of foundations including concrete specifications, reinforcement, etc. Must be in accordance with good engineering practice and within limitations imposed by soil conditions, frost levels, etc.
3. In California a distance of 5 feet (min.) is required between the vaporizer and surge tank.

Table 5-2 -- Installation Features for M Series Mixers (Continued)

Key	Features
7.	<p>A Mixed Gas Pressure Gauge is provided by the user. A Shut Off Valve and Nipple is provided with the Surge Tank trim kit (Suffix T). The recommended ranges are:</p> <p>(a) 0-15 PSI for naturally aspirated Mixers.</p> <p>(b) 0-60 PSI for pressurized Mixers.</p>
8.	<p>Mixed Gas Outlet to Load. Piping is fitted to 2" NPT threaded outlet connection on the Surge Tank and should be equipped with a full Shut Off Valve and/or Back Check Valve at the Surge Tank depending on the application and local codes.</p>
9.	<p>Shut Off Valve for Flare Burner is provided with the Surge Tank trim kit (Suffix T). This valve and piping is installed on the Surge Tank Flare Outlet to provide control to test flare used for checking and calibrating the mixture.</p>

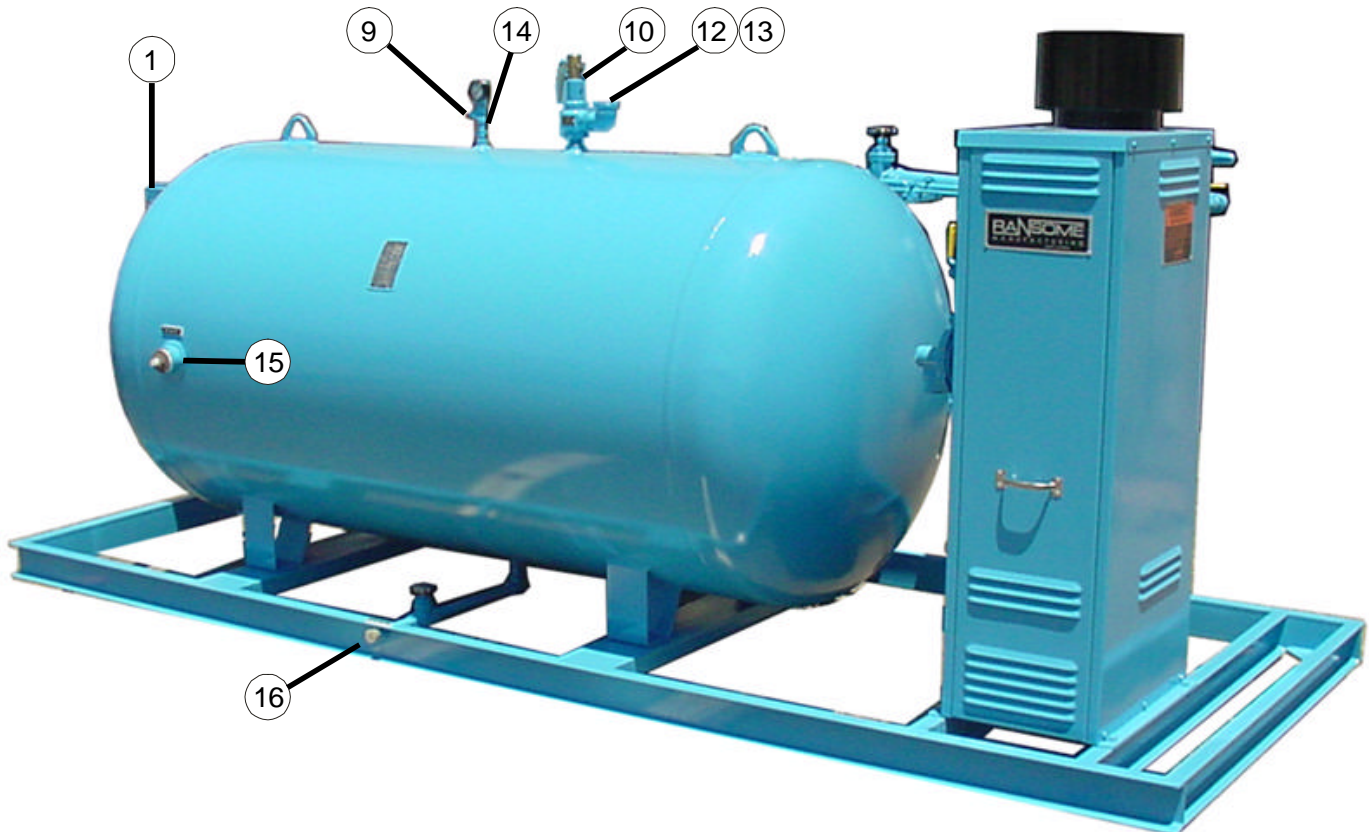


Figure 5-2 -- M Series Mixer Typical Installation

Start Up and Operating Procedure

5.06 All Ransome Mixer Systems are factory tested using commercial propane. Ransome Mixers are thoroughly tested at the factory and are 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 such a Leaktek for leak checking. This is available for subfreezing temperatures as needed. A thorough leak test using this solution or equivalent leak detector must be conducted after installation and any leaks must be repaired prior to operation of the system.

CAUTION

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

5.07 This start-up procedure assumes a complete, proper installation of the entire gas system including storage tank(s), Vaporizer, valves, piping, bypass valves, etc., and including electrical power. All installations must be in accordance with the 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 start up. Then proceed as follows:

Step	Procedure
1.	<p>Slowly open LP-Gas Vapor Inlet Valve (customer supplied shutoff valve at inlet of mixer) until Mixer pressure rises above minimum LP-Gas pressure. refer to Table 5-1 or Mixer Data Plate. Then, open valve completely.</p> <div data-bbox="334 936 1455 1150" style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">NOTE</p> <p style="text-align: center;"><i>If Compressed air has been optioned, start the blower or compressor which is to supply air to the Mixer. Open Air Inlet Valve that will supply air to the Mixer Air Regulators.</i></p> </div>
2.	Slowly open Vapor Shut Off Valve(s) (3/4 inch Ball Valves) on the Vapor Header supplying vapor to the Venturi(s) and open mixed gas shutoff valves.
3.	Operate the Mixer module START pushbutton for two seconds and then release. The Gas Solenoid Valve should operate and the Mixer should start supplying mixed gas to the Surge Tank and stop when the push button is released.
4.	Operate the Mixer Module START pushbutton holding it in for eight seconds. Then, release it for 10 seconds. Repeat this sequence until pressure in the Surge Tank reaches 1.5 PSI below the specified mixed gas pressure.
5.	Again, operate the Mixer Module START pushbutton and then release it. If the Interlock Circuit is complete, the Mixer should continue to run until the specified mixed gas pressure is reached. The Gas Solenoid Valve(s) should release automatically.
6.	Light the Flare Pilot. (Pilot gas should be supplied from other than mixed gas to facilitate purging.) Slowly open the valve between the Surge Tank and the Flare. The mixed gas pressure will drop and the Gas Solenoid Valve(s) will operate again to replenish the mixed gas consumed by the Flare. Flare will ignite when air is purged from the system. Adjust the valve to flare so that the Mixer cycles on and off with on-cycle time equal to approximately 1/5 of the off-cycle time.
7.	Allow the Mixer system to operate for ten minutes under this condition and observe its performance. Close the valve to extinguish the flare.

Step	Procedure
8.	Carefully open the valves between the Surge Tank and the point of injection into the natural gas line starting at the Surge Tank. The Mixer will supply mixed gas automatically up to its capacity on demand.
9.	<p>To shut down, close the valve at the natural gas injection point.</p> <p>(a) Close the Vapor Shut Off Valve(s) on the Vapor Header during the long idle periods.</p> <p>(b) Close the Air inlet Valve during the long idle periods.</p> <p>Open both valves before restarting.</p>
10.	<p>To restart from IDLE:</p> <p>(a) Make certain pump is operating whenever vapor pressure is below setting of low pressure interlock to prevent unit from shutdown.</p> <p>(b) Open the valve to the natural gas line.</p>
11.	<p>To restart from OFF:</p> <p>(a) Steps 1 to 9 above.</p> <p>(b) Step 6 - Air purging - can be excluded.</p>
12.	Refer to paragraph 6.16 for gas-air ratio adjustment procedure, if required.

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 Ransome M Series mixers contain flammable gas under various pressures 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 fittings indicate a possible gas leak. If such a leak does exist, pilots or other sources 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 many other components in the installation use threaded

joints, vibrations and thermal stresses, the possibility of leaks developing over a period of time is always present.

Emergency Instructions

If a large leak is discovered do not attempt to effect 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.

VAPORIZER/MIXER TEST REPORT

WORKORDER NUMBER: _____ DATE: _____

MODEL NUMBER: _____ SERIAL NUMBER: _____

VAPORIZER TUBE(S) SER. NO.(S): _____

MIXER INFORMATION: NOZZLE _____ VENTURI _____

SOLD TO: _____ SHIP TO: _____

Capacity, _____ SCFH Mixed Gas @ _____ PSIG Nominal Outlet Pressure

Minimum Required LP-Gas Liquid Inlet Pressure _____ PSIG.

Air Required _____ SCFM @ _____ PSIG.

Accessories: _____

Test Fuel _____ @ _____ S.G.U. Average Ambient Temp. _____ F.

VAPORIZER CALIBRATION

Burner Pressure, (All Burners On) Inches W.C.	
Burner Operating Control Switches, Degrees F.	
LP-Gas Inlet Pressure During Test, PSIG	
LP-Gas Vapor Header Pressure During Test, PSIG	

MIXER CALIBRATION, Nominal Specific Gravity _____

Mixer Module Number:	1	2	3	4	5
Gas Regulator Setting, PSIG					
Air Regulator Setting, PSIG					
Mixer Operating Switch On, PSIG					
Mixer Operating Switch Off, PSIG					

SAFETY INTERLOCK CALIBRATION

High Mix Pressure, PSIG		High Vaporizer Temp. Degrees F.	
Low Mix Pressure, PSIG		Low Mix Temp. Degrees F.	
High Vaporizer Pressure, PSIG		Low Water Cut-Off, W.C.	
Low Vaporizer Pressure, PSIG		High Air Pressure, PSIG	
Low Air Pressure, PSIG			

Complete Operational Test Conducted, and Unit Found Leak-Free By _____

Certified By _____

Quality Assurance Officer

Test Date _____

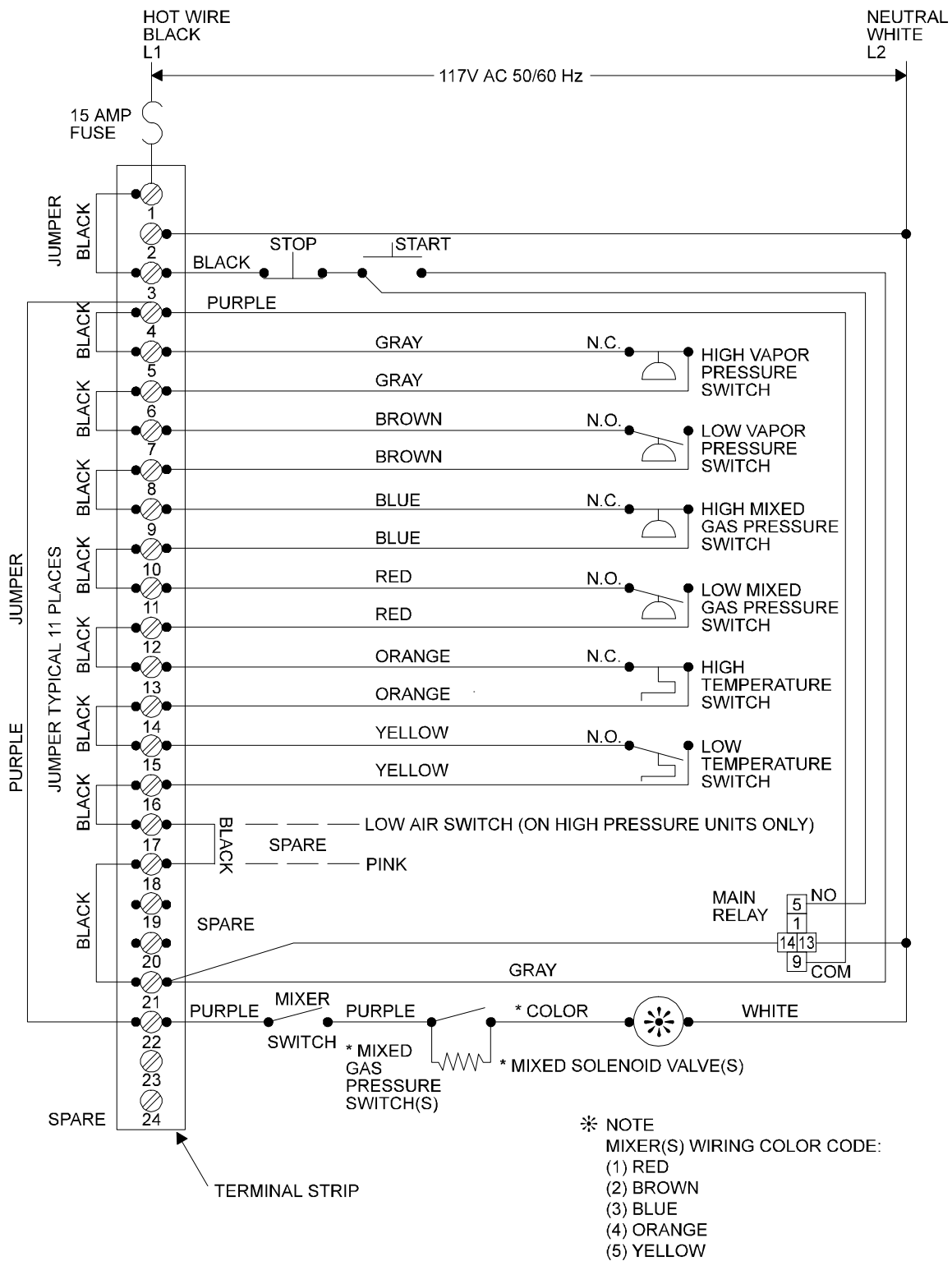


Figure 6-1 -- M Series Wiring Diagram

Routine Inspection

6.04 Operating Switches, Contols, Interlock Switches and Air Back Check Valves should be checked daily for correct performance. Repair or replacement should be accomplished at the first indication of sticking, erratic performance or any abnormal condition. Paragraph 6.13 details the maintenance procedure for the Mixer Gas Regulator Valve.

6.05 Safety Relief Valves should be replaced at no more than five-year intervals or any time possible damage is suspected. Vent piping connected to Safety Relief Vales must be kept open, free from condensation, ice or other foreign material that might restrict release of excessive pressure in an emergency.

6.06 Pressure Regulator Vents must be kept clear or erratic operation, instability or loss of control may result.

6.07 Venturi Assembly should be disassembled and cleaned any time the use suspects it is clogged by foreign material causing an improper mix ratio.

6.08 Exterior Paint Keep all external surfaces well painted to prevent deterioration and rust.

Mixer Gas Regulator Valve

6.09 Ransome Mixers use a Fisher Type 627 Gas Regulator Valve to supply LP-Gas vapor to the Venturi Assembly. Pressure and flow must be properly controlled by this valve or improper gas-air mixture will result. The Regulator Disc and metal Orifice must be in good condition for proper performance. Any small nick on the metal Orifice, imperfection in the Disc surface or foreign material trapped in the Orifice and Disc can cause operating problems.

6.10 The first symptom to look for is a slow build-up in the Nozzle pressure while the Venturi is in its off cycle. This is caused by leakage at the Gas Regulator Valve's Orifice and results in an increasingly high load being applied to the Disc and diaphragm. The greater the differnece between the inlet pressure and Regulator outlet pressure setting the more overloading can occur. Ultimately the Disc will be cut by the Orifice, and the outlet pressure will build up until it equals the pressure at the inlet. The Fisher Company states that structural damage may occur if outlet pressure builds up more than 50 PSI over the Regulator setting.

6.11 Therefore, proper Disc and Orifice replacement should ber performed whenever Nozzle pressure builds up during the OFF cycle. Replacement of these parts should be handled with great care; only new, correct parts are to be used. Follow this procedure:

MAINTENANCE HINT

It is a good practice to select a Mixer system large enough to allow one Venturi Assembly to be closed off without overloading the Mixer to allow servicing at a convenioent time.

Step	Procedure
1.	Contact Ransome Manufacturing for the Ransome and Fisher part numbers.
2.	Make sure all LP-Gas pressure is evacuated from the internal piping of the Vaporizer-Mixer. Refer to paragraph 6.12 for the proper procedure.
3.	<p data-bbox="284 1562 1502 1644">Each Orifice is specially packaged by Fisher to prevent damage to the seating surface in shipping. This seating surface must be protected at all times during handling.</p> <div data-bbox="329 1675 1463 1923" style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p data-bbox="820 1707 966 1738" style="text-align: center;">IMPORTANT</p> <p data-bbox="375 1770 1414 1896" style="text-align: center;"><i>If an unprotected Orifice is dropped, do not use it in a valve without assuring it is undamaged. The smallest scratch or dent on the seating surface will damage the seat, and early failure will result. Examine the seat under a strong magnifying flass to assure it is undamaged.</i></p> </div>

Step	Procedure
4.	Use a good quality 12 point 7/8 inch hex socket wrench with a short extension to remove and install the new Regulator Orifice. Make sure the sealing surface is not bumped during the installation.
5.	Examine the seating surface of the new Disc carefully, wipe off any dust or foreign matter with a soft cloth before installing it on the Valve Stem Assembly. Be sure the disc Holder fits freely in the stem. Install the Cotter Pin so it holds the disc holder securely, but does not cause it to bind. Then immediatly assemble the Diaphragm Assemly being sure nothing damages the Orifice.
6.	Always use a new Body Gasket when reassembling the diaphragm assembly into the body.
7.	Conduct a thorough leak test using a good soap solution or leak detector to assure no gas leaks exist before putting the Vaporizer-Mixer back into the operation.
8.	Adjust the Gas pressure regulator valve to the proper setting; refer to the Ransome Mixer test report furnished with the system or set to obtain the desired gas-air mixture. This setting must be made while the Venturi is in the ON position and the Mixer is in operation.
9.	Check the system for any slow build-up in Nozzle pressure during the OFF cycle. Also, make sure there is no leakage at the Regulator Vent. If any problems are apparent, this repair procedure should berepeated.

LP-Gas Vapor Air Ratio Adjustment

6.12 LP-Gas Vapor Airratio is adjustable. To maintain the factory calibration, be sure Gas Pressure Regulator setting equals value shown on the Ransome

Vaporizer-Mixer Test Report.

To adjust:

Step	Procedure
1.	<p>Loosen lock unit and turn regulating adjusting screw very slightly.</p> <p>(a) Turn the screw in to raise the Venturi nozzle pressure.</p> <p>(b) Turn the screw out to lower the Venturi Nozzle pressure.</p>
2.	<p>If a richer mixture than factory set is desired, set the Venturi nozzle pressure slightly lower. If a leaner mixture is desired, set the regulator slightly higher.</p>
<p>NOTE</p> <p><i>The LP-Gas Vapor Air ratio adjustment should be made only by properly trained personnel using a calibrated Specific Gravimeter or other suitable test instrument.</i></p>	

6.13 Mixers supplied by blower air must have air pressure adjusted to 2 PSI less than the mixed gas pressure. In the case of Mixers using plant air or air compressors, Air Regulator(s) on the Mixer should be individually adjusted to 2 PSI less than the mixed gas pressure. All mixture adjustments should be made using the same procedure as described above.

Purging Gas from the System

6.14 If service requires removal of gas from the system, do not merely vent gas to the atmosphere. This could result in fire with 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.

6.15 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 forced air heating, may expedite this process in cold weather.

6.16 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

6.17 The trouble shooting procedures described in Table 6-1 are intended to help a serviceman isolate the cause of trouble encountered during routine operation. 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 occur-

rence. To make the best use of these trouble shooting procedures, the serviceman should be thoroughly familiar with the Physical and Functional Descriptions of the Ransome system described in Parts 2 and 3 of this manual.

6.18 Before beginning any trouble shooting, make certain the Ransome M Series Mixer 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

6.19 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:

RANSOME MANUFACTURING

3495 South Maple Avenue

Fresno, CA 93725-2494

Phone (559) 485-0979 • Fax (559) 485-8869

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

(a) The name and area code — telephone number of the individual most familiar with the failure.

(b) A brief statement of the problem with the unit.

(c) Make(s) of other gas equipment in the user's system.

(d) The approximate date and Purchase Order Number for the Ransome equipment (if known).

(e) The Model and Serial number of the Ransome equipment.

Table 6-1 — Trouble Shooting

Symptom	Probable Cause	Remedy
Mixture too rich	<ol style="list-style-type: none"> 1. Gas Pressure Regulator setting. 2. Air Inlet Filter clogged. 3. Air Inlet Line clogged with foreign matter. 4. Air Back Check Valve(s) not operating correctly. 5. Vapor Shut Off Valve not fully open. 6. Inlet Pressure to Vaporizer insufficient. 	<p>Raise pressure setting. Check with Specific Gravitometer.</p> <p>Clean or replace.</p> <p>Remove.</p> <p>Repair or replace.</p> <p>Open fully.</p> <p>Check pump system; refer to "Insufficient Capacity" in Vaporizer Operation Manual.</p>
Mixture Too Lean	Gas Pressure Regulator setting.	Lower pressure setting. Check with Specific Gravitometer.
Mixture Pressure Incorrect	Operating Pressure Switch.	Adjust or replace.
Mixer Shuts Down	<ol style="list-style-type: none"> 1. Safety Interlock. 2. Power Outage. 3. Fuse Blown. 	<p>Correct basic problem. Push START button to reset. Refer to below "Safety Shut Down."</p> <p>Restore power. Push START button.</p> <p>Replace. If it continues to blow, look for cause.</p>
<p>Safety Shutdown</p> <p>High LP-Gas Pressure</p>	<ol style="list-style-type: none"> 1. Valve is closed in Pump Bypass Line. 2. Blockage in Pump Bypass Line or Bypass Valve is inoperative. 3. Vaporizer back check valve blocked or inoperative. 4. Safety Interlock Switch. 	<p>Open valve.</p> <p>Clean or replace.</p> <p>Clear or replace.</p> <p>Adjust or replace.</p>

Table 6-1 -- Trouble Shooting (Continued)

Symptom	Probable Cause	Remedy
Low LP-Gas Pressure	<ol style="list-style-type: none"> 1. Pumping problem. 2. Vaporizer capacity insufficient. 3. Safety Interlock Switch. 	<p>Repair.</p> <p>Refer to Vaporizer Operation Manual.</p> <p>Adjust or Replace.</p>
High LP-Gas temperature	<ol style="list-style-type: none"> 1. Vaporizer overheated. 2. Safety interlock Switch. 	<p>Refer to Vaporizer Operation Manual.</p> <p>Adjust or replace.</p>
High or low mixed gas pressure	<ol style="list-style-type: none"> 1. Operating Switch. 2. Safety Interlock Switch. 3. Load exceeds Mixer capacity. 	<p>Adjust or replace.</p> <p>Adjust or replace.</p> <p>Reduce load or use higher capacity Mixer.</p>
High or Low Specific Gravity (optional)	<ol style="list-style-type: none"> 1. Refer to "Mixture Too rich" and "Mixture too Lean". 2. High or low limits on Specific Gravitometer defective. 	<p>Refer to specific Gravitometer manual.</p>
Low Air Pressure.	<ol style="list-style-type: none"> 1. Air blower or compressor failure or inadequate capacity. 2. Safety Interlock Switch. 	<p>Correct as required.</p> <p>Adjust or Replace.</p>