Baron·Blakeslee

A Division of Enviro Tech International, Inc.

INSTRUCTION AND OPERATING MANUAL

FOR

BARON-BLAKESLEE MODEL MRR-LE SOLVENT RECOVERY STILLS

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IMPORTANT INFORMATION

The information presented in this manual and its attachments are intended by Enviro Tech International to provide information to install, start up, operate and maintain the equipment described. This manual requires a skill level of its readers and practitioners equivalent to a journeyman status and recognizes that local codes, specifications and other use requirements may be beyond the scope of this manual. The information herein is intended to be accurate, complete and presented in good faith and is not to be construed as guarantees or warranties, express or implied regarding performance, results, comprehensiveness or merchantability nor do they imply any recommendations to infringe any patent or an offer of license under any patent.

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GLOSSARY OF TERMS

Still

Solvent recovery still - used to reclaim (distill) liquid-vapor degreasing grade solvents. This is accomplished by boiling contaminated solvent and re-condensing the solvent vapors. The heat input converts contaminated liquid solvent to pure, uncontaminated vapor. The vapor rises to the cooling coils and the coils condense the vapor back to a liquid state. The liquid is collected in a trough underneath the cooling coils and is directed to a gravity water separator, which separates out any free water. The solvent is then essentially clean, pure and ready for use again in the vapor degreaser.

Heating System

Electric immersion heaters of low watt density and stainless steel sheath construction are provided in the tank. The immersion heaters are mounted to a ¼" thick clean out door, complete with terminal box. The clean out door is of bolted construction with a solvent resistant gasket. The heat input is engineered to meet distillation requirements with solvent economy in mind.

Water Separator

Condensed solvent is collected in troughs underneath the cooling coils and flows through piping to a large capacity, Type 304 Stainless Steel water separator. The water separator is equipped with a cooling coil to reduce solvent temperature for high-efficiency free water separation. Pure distillate returns to the vapor degreaser for reuse.

Safety Vapor Control (SVC)

The safety vapor control shuts off the heat if solvent vapors pass through the heat exchanger due to inadequate supply or temperature of refrigerant. It consists of a manual reset thermostat (indicated by a lighted pushbutton on the control panel) and a thermocouple sensor. The thermocouple is located within an elbow fitting on the exit side of the heat exchanger. The thermostat must be manually reset for safety purposes.

High Temperature Control (HTC) or Liquid Temperature Safety Control (LTC)

A high temperature control (HTC) is included in the distillation tank. It consists of a manual reset thermostat (indicated by a lighted pushbutton on the control panel) with a thermocouple clamped to the uppermost heater within the tank. The thermostat shuts off heat if the temperature of solvent in the sump exceeds the set temperature under the following conditions:

a. if the boiling temperature of the solvent exceeds proper temperature range due to contamination or if the heating coils become exposed.

b. if the regulated temperature range is exceeded.

Low Level Control (LLC)

A pressure transducer is connected by way of a tee fitting in the solvent drain piping. The pressure transducer works in conjunction with a pressure switch located in the control box to monitor solvent levels and automatically actuate the transfer pump and heaters for continuous operation.

Still Bottoms, Sludge

Material left in the still after most solvent has boiled off. The contamination removed from work processed through a degreaser, such as machine oil, flux, lapping compound, etc.

TLV, PEL, WEL

Refer to 8-hour time weighted average airborne concentrations of chemicals and represent maximum exposure levels under which it is believed that nearly all workers may be repeatedly exposed without adverse effect. It is usually given in parts per million (ppm). Because of the wide variation in individual sensitivity, a small percentage of workers may experience minor discomfort from some substances at or below the threshold limit. A smaller percentage may be affected more seriously by aggravation of a pre-existing condition or by development of an occupational illness.

TWA, Time Weighted Average

Average concentration for a normal 8-hour work day and 40-hour work week to which nearly all workers may be repeatedly exposed without risk of adverse effects.

Confined Area Entry

Use hoes, etc to clean out tanks. Only enter tank when absolutely necessary. Any tank that has had halogenated organic degreasing grade solvent shall be completely drained and ventilated prior to entry. Drains shall be opened and any and all solvents removed. Water or steam valves must be closed and locked or disconnected to prevent accidental refilling, etc. Clean out doors must be removed. Tank must be ventilated prior to any entry. The atmosphere in tank shall be checked for safe levels of solvent concentrations and adequate oxygen content (19.5 to 22.0%) at all levels in tank. Any person entering a confined area should have adequate protective equipment and be fitted with a safety harness and lifeline. A second person with proper protective equipment should be at the tank entrance to assist worker in tank. The second person shall be equipped with communications equipment. At no time should second person enter tank without summoning additional help. No welding shall be attempted without checking atmosphere, which must be non explosive (less than 10% of the lower flammable limit). Any solvent vapor will decompose in welding arc to toxic gases. Proper ventilation is necessary.

Condensing Unit

An assembly of parts, compressor, condensing heat exchanger, fan, etc., which generates refrigeration for the condensation of heated solvent vapors.

Sight Glass

A sight glass in refrigeration liquid line. Allows inspection of charge and moisture in refrigerant.

Condensing Heat Exchanger

A refrigerant cooled heat exchanger to transfer heat from solvent vapors to liquid refrigerant.

Accumulator

A vessel in refrigerant gas line that prevents liquid from getting into the compressor.

Level Master Control

A metering valve that modulates the flow of liquid refrigerant into the cylindrical plate heat exchanger.

SAFETY

This safety information pertains to all equipment using degreasing grade solvents. It includes some relevant sections from the Occupational Safety and Health Act (OHSA), either directly quoted or paraphrased. **PLEASE READ AND OBSERVE ALL SAFETY INFORMATION IN THIS SECTION AND ALL CAUTIONS AND WARNINGS THROUGHOUT THIS MANUAL.**

Personal Protection

1. *Instruction*: "All employees working in and around open-surface tank operations must be instructed as to the hazards of their respective jobs, and in the personal protection and first aid procedures applicable to these hazards."

2. *Filling*: Whenever there is a danger of splashing (For example: when additions are made manually to the tanks) or when acids and chemicals are removed from the tanks, the employees so engaged shall be required to wear either tight fitting chemical goggles or an effective face shield.

3. *Emergencies*: "When, during emergencies, workers must be in areas where concentrations of air contaminants are greater than the threshold limit of solvent, or oxygen concentrations are less than 19.5 percent, they shall be required to wear respirators adequate to reduce their exposure to a level below these limits, or to provide adequate oxygen. Such respirators shall also be provided in marked, quickly accessible storage compartments built for the purpose, when there exists the possibility of an accidental release of hazardous concentrations of air contaminants. Respirators shall be approved by the US Bureau of Mines, US Department of the Interior (see CFR Part II) and shall be selected by a competent industrial hygienist or other technically qualified source. Respirators shall be used in accordance with Section 1910.134 (a), (b) and (c), and persons who may require them shall be trained in their use."

4. *Splashing*: "Near each tank containing a liquid which may burn, irritate, or otherwise be harmful to the skin if splashed upon the worker's body, there shall be a supply of clean cold water. The water pipe (carrying a pressure not exceed 25 pounds) shall be provided with a quick opening valve and at least 48 inches of hose not smaller thank three-fourths inch, so that not time may be lost in washing off liquids from the skin or clothing. Alternatively, deluge showers and eye flushes shall be provided in cases where harmful chemicals may be splashed on parts of the body."

5. Be familiar with MATERIAL SAFETY DATA SHEETS for solvents being used.

First Aid

1. If solvent gets into eyes, hold eyes open and flush with plenty of water.

2. If solvent should soak clothing, remove such clothing at once and aerate thoroughly. Use soap and water to wash parts of the body that have been wetted with solvent, and then apply lanolin-type cream. Remove contaminated shoes.

3. IF SOLVENT IS SWALLOWED, consult appropriate MATERIAL SAFETY DATA SHEET OR *CALL POISON CONTROL CENTER* for recommended first aid. *NEVER* induce vomiting or

4. give anything by mouth to an unconscious person or a person having convulsions. **GET PERSON MEDICAL ATTENTION AT ONCE.**

*******WARNING*******

High vapor concentration can lead to unconsciousness or death.

NOTE TO PHYSICIAN: Overexposure to many of the degreasing solvents, especially if accompanied by anoxia, may temporarily increase cardiac irritability. Maintain adequate oxygen supply until recovery. Avoid sympathomimetic amines; such as epinephrine, which may precipitate arrhythmias.

GENERAL

The MRR-LE solvent recovery stills are specifically designed for use with non-flammable vapor degreasing solvents. Stills are electrically heated and refrigeration cooled.

OPERATION

Contaminated solvent is transmitted to the solvent recovery still. When solvent levels are sufficient in the still (above the heating elements), the still heat is switched on. As the solvent boils it forms vapor, which rises up to the cooling coils where it condenses back to liquid. The liquid drips into a trough and travels to a water separator (or through a heat exchanger to a water separator). The water separator reduces the velocity of solvent flow and allows free water to rise to the top of the solvent (solvent is denser than water). The water forms a separate layer over the solvent and should be drained by maintenance personnel and disposed of in the proper manner. This water should not be allowed to drain to the sewer.

Contaminants remain in the boiling liquid and when vapor generation and distillate output drop significantly, the still should be boiled down, cooled, drained and cleaned of sludge. The still heating coil or elements are mounted to the clean out door. This door must be removed for thorough clean out. Always observe all safety precautions when working with solvents.

CONSTRUCTION

Tank

The still is a single tank assembly equipped with electric immersion heaters to boil the contaminated solvent. A cylindrical plate heat exchanger condenses the solvent vapor back into liquid. The liquid then gravity flows to a water separator/dryer to remove water from the solvent.

Stills are supplied with controls to enhance their operation (i.e. liquid level controls for high and low level detection). An automatic liquid level control operates an electric pump motor, which transfers contaminated solvent from a degreaser or storage tank. The still is fitted with a clean out door to facilitate sludge removal and heater coil cleaning.

The tank, cylindrical plate heat exchanger and water separator/dryer are all constructed of Type 304 or Type 316 Stainless Steel. The pump can be bronze or stainless steel. Solvent piping can be red brass or stainless steel.

Tank Insulation

The tank sides and ends are insulated from the tank bottom to the cooling coils with a 1-1/2" thick fiberglass blanket. This insulation minimizes heat radiation to the atmosphere surrounding the unit and reduces the danger of injury to operating personnel.

Heating System

Electric immersion heaters of low watt density and stainless steel sheath construction are provided in the heated sump(s). The immersion heaters are mounted to a ¼" thick clean out door, complete with terminal box. The clean out door is of bolted construction with a solvent resistant gasket.

Water Separator

Condensed solvent flows through piping to a large capacity Type 304 Stainless Steel water separator. Pure distillate returns to the degreaser for reuse.

Safety Vapor Control (SVC)

The safety vapor control shuts off the heat if solvent vapors pass through the heat exchanger due to inadequate supply or temperature of refrigerant. It consists of a manual reset thermostat (indicated by a lighted pushbutton on the control panel) and a thermocouple sensor. The thermocouple is located within an elbow fitting on the exit side of the heat exchanger. The thermostat must be manually reset for safety purposes.

High Temperature Control (HTC) or Liquid Temperature Safety Control (LTC)

A high temperature control (HTC) is included in the distillation tank. It consists of a manual reset thermostat (indicated by a lighted pushbutton on the control panel) with a thermocouple clamped to the uppermost heater within the tank. The thermostat shuts off heat if the temperature of solvent in the sump exceeds the set temperature under the following conditions:

a. if the boiling temperature of the solvent exceeds proper temperature range due to contamination or if the heating coils become exposed.

c. if the regulated temperature range is exceeded.

Low Level Control (LLC)

A pressure transducer is connected by way of a tee fitting in the solvent drain piping. The pressure transducer works in conjunction with a pressure switch located in the control box to monitor solvent levels and automatically actuate the transfer pump and heaters for continuous operation.

Convenience Accessories

Unit is provided with a dial thermometer, liquid level gauge and a drain valve. These provide for checking solvent temperature, proper level and draining solvent for machine clean out and maintenance.

Electrical Controls

A NEMA-12 enclosure with control panel houses the main line circuit breakers, control transformer, all necessary motor starters, magnetic contactors, etc. - all pre-wired to terminal strips. Display lights clearly indicate machine status and operation. All machine and panel wiring is per NFPA specifications. Refrigeration equipment is wired per refrigeration industry standards.

INSTALLATION

This section describes the basic procedures required to install your equipment. The following sections provide detailed information required to actually perform each step. This manual and all other documentation on this system should be read and understood before attempting installation and operation.

LOCATION

The unit should not be located in an area subject to drafts from building openings, air make-up, cold air return or heating/ventilating vents. The unit should be in proper position for workflow, heating element removal, convenient means for filling, etc. Do not install piping conduit, etc. in space required for heating element removal. Airflow through refrigeration condensing equipment should be unobstructed. The location must have sufficient area to allow for necessary piping and maintenance.

Solvent recovery stills equipped with an automatic liquid level control. The transfer pump must be located as close to the cleaning tank as possible. The transfer pump must be connected in such a manner to allow a short, unrestricted flooded suction inlet connection. Do not check rotation of pump until it is filled with solvent. Seal may be damaged if run dry. In some installations, a surge tank may be necessary to ensure an adequate supply of solvent to the pump. If the pump must transfer hot solvent, a water-cooled pump may be used to prevent cavitation.

Unit should be leveled and bolted in place. Use non-shrink grout if grouting is necessary. Elevation of still should allow distillate to flow by gravity from the water separator/dryer to either the degreaser or the clean storage tank. Arrange solvent inlet on piping so dirty solvent can be pumped from drains on degreaser to still. Piping should also provide for transfer of solvent from degreaser overflow or dirty solvent storage tank.

ELECTRICAL CONNECTIONS

This equipment requires customer-supplied power. Review the electrical and assembly prints to verify the correct voltage, phase, hertz and full load amps required.

The customer is responsible for providing all main power conduit, wire, etc. to each respective electrical enclosure. Install disconnect switches, wiring etc. as required by local electrical codes.

The respective enclosure for each system includes main power disconnects with circuit breaker protection. The customer's wiring will be connected to these disconnects.

Each separate piece of equipment with electrical components should include a junction box with numbered terminals for easy interconnecting. A wiring harness needs to be connected between the electrical boxes on the degreaser and still to the control enclosure.

Inspect electrical terminals, plug and receptacles, etc. for tight connection before starting the equipment.

FILLING STILL

1. During shipment or relocation, vibration may cause some pipe joints to loosen. Check and tighten any loose joints in water or solvent piping before proceeding with filling. Connect piping between the degreaser and still.

   For maintenance it is a good idea to add a "T" fitting and valves to allow diverting distillate flow to clean drums instead of back to the degreaser. This will allow distilling all solvent from the degreaser before performing a clean out of its sump. It also allows distilling all solvent in the still before performing a clean out of its sump.

2. Be sure all solvent drains on sumps and water separator are closed and all plugs in tank walls, piping, etc. are properly tightened. Open the degreaser sump drain valve when necessary to empty the degreaser sump to the still.

3. Open any pump suction and discharge valves.

5. Condensing unit should be started and will run for a short time. The crankcase heater should be on at least four hours before starting heating elements.

6. Remove top cover of all externally housed level controls (if so equipped) by loosening screw in top and lifting off cover. This allows visual verification of level control operation and mercury switch action. **NOTE POSITION OF SWTICHES.**

7. Unit is now ready to begin filling. Observe proper precautions when handling solvent. Solvent should be added through the solvent inlet coupling as indicated on the side of the tank by means of a transfer pump. Observe piping, tank fitting, clean out doors, etc. while filling for leaks. Any leaks should be corrected before proceeding. Be prepared to drain the unit if necessary. Solvent capacity is shown on the degreaser specification sheet and on the General Assembly print.

8. To seal off the water separator tank, pour a small amount of clean water slowly into the "P" trap on the water outlet of the water separator. Only add water on start-up or after water separator has been drained.

   A still operated on a batch basis will eventually deplete itself of dirty solvent and will turn itself off on low level or high temperature controls. However, manual shut off is recommended.

SOLVENT TRANSFER PUMPS - OPERATION OPTIONS

This system may include solvent transfer pump(s). This section will describe the operational uses.

*******WARNING*******

DO NOT OPEARATE TRANSFER PUMPS UNTIL SOLVENT OVERLFOWS AND FEEDS TO THE SUCTION SIDE. DO NOT RUN THE PUMPS DRY - DAMAGE MAY RESULT TO THE PUMP AND MOTOR.

DIRTY SOLVENT TRANSFER

The dirty solvent transfer pump has four modes of operation: it can be used to pump solvent from the degreaser to the still, degreaser to the dirty storage tank or the dirty storage tank to the still, depending on valve and switch settings. The pump ON light illuminates only when the pump is actually operating. Normal operation of this pump is from the degreaser to the still to maintain purity of the cleaning solvent during production.

Dirty solvent is pumped from the degreaser to the still and clean solvent will pump from the still back to the degreaser. The dirty transfer pump operates automatically only when level in the degreaser sump is sufficiently high AND the level in the still is NOT high. Each control automatically resets to turn the pump ON when both conditions are met and turn the pump OFF when either condition is not met.

FAULT CONDITIONS

Several safety control devices are included in this system. Some will turn off the heat to the still when specific faults occur. The first indication of most faults is the heat indicator light is off. A low liquid level in the machine turns on an indicator light on the control panel. Identify other faults by investigating the possible causes or have maintenance inspect the indicator lights on the thermostats inside the electrical enclosure.

The following provides a general list of the faults and corrective actions:

1. **LOW LIQUID LEVEL (LLC):** Trips if solvent level is too low. The heat will shut off and the dirty solvent transfer pump will send solvent from the degreaser to the still. If it does not, ensure that the transfer pump pushbutton is ON.

2. **SAFETY VAPOR CONTROL (SVC):** The safety vapor control shuts off the heat if solvent vapors pass through the heat exchanger due to inadequate supply or temperature of refrigerant. It consists of a manual reset thermostat (indicated by a lighted pushbutton on the control panel) and a thermocouple sensor. The thermocouple is located within an elbow fitting on the exit side of the heat exchanger. The thermostat must be manually reset for safety purposes.

3. **HIGH TEMPERATURE CONTROL (HTC):** Senses temperature of the solvent liquid. It trips if the temperature rises above the set point (boil point) of the solvent due to increased contamination or if the heating elements become exposed. Ensure the

"normal" high limit is set appropriately on the LTC and that the pressure switch is set and functioning properly.

NOTE: After correcting the specific fault, the "Reset" button on the control panel for the respective SVC or HTC fault must be pressed before the system can be restarted (heat turned back on).

GENERAL SHUT DOWN INSTRUCTION

To shut down the system after operation:

1. Turn the heat OFF. Leave the refrigeration on. Allow the solvent to cool down (usually about 1.5 hours or more). Some distillation will continue with the solvent vapors.

2. The condensing unit will remain on even when the heat is turned OFF. After the solvent is cooled, the condensing unit may be turned OFF by pressing the service switch OFF or flipping the circuit breaker OFF.

Note that an EMERGENCY STOP (if provided) will shut off all system functions immediately. Use this switch if conditions exist which could be a hazard to the equipment or to personnel. This is not a controlled shut-down as described above. A similar effect may be achieved by turning all circuit breakers to the OFF position.

TANK CLEANING PROCEDURE

It is important to perform a proper clean out before contamination reaches a serious level. When the system includes a still, this procedure may be required on the degreaser about once every six months. It may be required on the still about once per month or more, depending on the particulars of the cleaning process. The timing is very application dependent. Observe the sumps for particulate build-up, loose parts or other solids. Also see procedures for solvent maintenance and emergency clean out.

1. When the system includes a still, you can pump contaminated solvent from the degreaser to the still. Shut down the still and open drains to the transfer pump. Allow the dirty solvent transfer pump to operate in automatic until the cleaner is empty. Direct the clean distillate from the still to clean drums or storage tank, rather than back to the degreaser.

   Distilled solvent in the still comes out of the bottom fitting on the water separator tank. Pipe the distillate to a clean solvent storage tank or into clean drums. This distillation can be continued until heating elements are just about to be exposed. It may be necessary to jumper the level control to allow further distillation. When the machine solvent level is as low as is practical, turn off the heat. The remainder of the solvent in the machine can be transferred to drums. Do not bung drums so tightly that pressure may build up.

2. After as much solvent drains from the still as possible and the machine cools to room temperature, carefully remove the clean out door(s). Use a pan to collect any solvent or residue as you loosen the door. Exercise care to prevent damaging the gasket. Always keep spare gaskets on hand.

3. Never enter the still unless absolutely necessary. With hoe or shovel, remove sludge from the tank. Deposit sludge in containers with covers. Dispose of sludge in accordance with local codes.

   If it is necessary to enter the tank because of size and sludge build-up, proper safety precautions must be observed. Verify the threshold limit of solvent vapor in the tank is not exceeded. Verify the oxygen concentration is not below 19.5%. Refer to Safety and Personal Protection section. Never allow one person to perform the clean out alone.

4. Solids can bake on heating elements/coils. Heating coils can be wire brushed and/or cleaned with emery cloth. Do not chip or use a hammer. Mop all residues out of sumps. Clean condensing troughs and condensing coils, if needed.

   Mild non-scratching abrasives in powder form and soap can be used to clean the stainless steel tank. Do not use steel brushes and sponges to clean stainless steel. They may leave particles to become embedded in the stainless steel surface, which would lead to rusting. Plastic scrubbers or Tampico brushes are suitable for cleaning tanks.

5. Apply glycerin to both sides of the clean out door gasket. Place the gasket on the doorframe with the corner bolts in place. Place the clean out door (with heating coil) against the frame. Start the nuts on the corner bolts but do not tighten. Assemble and

snug up the remaining nuts. Tighten nuts in the clean out door from center out to corners. Equipment is ready to be refilled with solvent.

SOLVENT MAINTENANCE

A schedule for solvent maintenance should be established as soon as you are familiar with the equipment. Factors that determine the frequency of maintenance include the amount of time the equipment is used, work being processed (pounds, pieces, etc.) and the quantity and type of contamination introduced. Observe the parts for acceptable cleanliness levels. As solvent becomes contaminated, it becomes a less effective cleaner.

Periodically test the solvent for its normal characteristics. These tests indicate if the solvent is suitable for continued use in the system. An acidic solvent can form violent reactions that may be hazardous to the equipment and to personnel. Acid acceptance testing will monitor the solvent's ability to neutralize acid residues and correlates directly with useful life of the solvent.

Note that in the early phases of acidic solvent, test results may indicate in the satisfactory range. Discoloration of the cleaner and parts may occur before the solvent tests show the solvent to be unacceptable. We recommend that you perform these tests on a weekly basis, until you establish the normal readings for the application. Update chart whenever production level changes, clean out is performed, etc. Once the normal reading curve is established, you can perform the tests less frequently (either monthly or as determined by your application). Also, perform the tests if you notice a change in the solvent appearance, or part cleanliness. Schedule your clean out routine to occur before test results sharply deviate from the normal curve. If using EnSolv, follow the guidelines in the EnSolv Acid Acceptance Test Kit Procedure.

SOLVENT GUIDELINES

The following are some guidelines that should be helpful in determining your maintenance schedule for machine clean out. Refer specific questions regarding the solvent, which are not answered here, to your solvent supplier.

CONTAMINATION

Contaminants such as oils, metal chips, detergents, fluxes, etc. are usually carried into the solvent on dirty parts. A build-up of contaminants in the boil sump causes an increase in the solvent boil temperature. As solvent temperature approaches 7-10°F over the boiling point of clean solvent, consider performing a tank clean out. The procedure includes distillation of the solvent, shut down of the unit, draining/cleaning the boil sump and adding fresh/distilled solvent.

Most contaminants are transferred and collected in the still. The still returns clean, distilled solvent back to the degreaser and therefore allows for less frequent clean out of the degreaser. The degreaser can continue operation while the still is shut down and cleaned out.

SOLVENT IMBALANCE

Imbalance is a consideration mostly when using alcohol/solvent blends. The imbalance can appear as a gain or loss of alcohol. As the alcohol builds up, it will affect the temperature of the boil sump in much the same way as contaminants. You will see a loss of alcohol at the water separator and/or dryer tank. Solvent vapors typically only contain 2-3% alcohol. These vapors

condense and return to the water separator/dryer. In addition, the function of the water separator/dryer lowers the alcohol content because water and alcohol mix readily. Water removed from the solvent and expelled from the system will take a small amount of alcohol with it.

*******WARNING*******

DO NOT OVERRIDE SAFETY CONTROLS OR FAIL TO MONITOR SOLVENT BALANCE. EXCESSIVELY HIGH LEVELS OF ALCOHOL MAY CREATE A HAZARDOUS CONDITION.

EXCESSIVE WATER

This condition occurs when quantities of water are introduced into the system faster than the water separator/dryer can remove it. Equipment defects such as a pin-hole leak in the cooling coil or a blocked water drain line on the separator may cause water build-up. Whatever the cause, find and correct the problem as soon as possible. Excess water can cause the solvent to decompose (go acid) and can damage the degreaser and any parts being cleaned.

Solvent vapor is normally colorless. When water vapor is present, it causes the vapor to have a dense white, foggy appearance. This water vapor will deposit on the part, leaving watermarks and some contamination. As soon as experience on the system allows, develop a schedule to replace the desiccant dryer media (molecular sieve) in the dryer tank and/or bleed off water from the water separator tank before water vapor appears.

A more serious consequence of high amounts of water is the possibility of solvent decomposition. This can occur when the water mixes with contamination in the solvent. Decomposed solvent can damage the equipment and surrounding metals. Periodically test the solvent condition and review the following sections for testing procedures. Contact the solvent supplier for other information or procedures to test the solvent. Should the solvent begin to decompose, immediately shut down heat to the unit and follow the procedures for solvent decomposition.

NOTE: Solvent test kits are available from your solvent supplier and should be completed by a maintenance supervisor.

SOLVENT DECOMPOSITION, NEUTRALIZATION & RESTORATION

The introduction of modern stabilizer packages to degreasing solvents has significantly reduced the incidence of solvent decomposition. However, solvent decomposition with the formation of acidic, corrosive vapor and liquid/solid byproducts of chemical reactions may develop from several circumstances. These include, but are not limited to: maintenance clean out schedules, introduction of acidic soils, white metals contacting heating surfaces, excessive soil accumulation in the boil sump(s), excessive moisture, reactive metals trapped in filters, etc.

Rapid, violent chemical reactions can occur when considerable quantities of aluminum or magnesium fines are present in an acid condition. Steel, copper and zinc alloys do not present the same violent reaction possibilities in an acid condition as aluminum and magnesium. However, please exercise caution in any acid condition.

The types of reaction products formed in an acid condition are:

1. Irritating, corrosive and toxic fumes, as well as sharp, pungent odors of solvent.

2. Black, gummy residues composed of carbon, polymers, metal organic compounds, and if aluminum is present, aluminum chloride.

The fumes are corrosive to metals, not only in the machine, but also in surrounding plant areas. The black, gummy residues are also very corrosive. When a reactive metal is present it will catalyze further breakdown of the solvent. The decomposition of solvent may generate sufficient heat to ignite oils or other soils in the cleaner.

Routinely check the solvent's chemistry for those chemical characteristics associated with the particular solvent. Early phases of an acid condition may not show up in the solvent testing. Discoloration of the stainless steel tank walls (browning, blackening, or green-white deposits), or etching of the parts may occur before the solvent shows deterioration.

*******WARNING*******

THE FOLLOWING STEPS SHOULD BE FOLLOWED BY ALL SAFETY PARAMETERS IN THIS MANUAL AND PER OSHA STANDARDS. PROPERLY ATTIRED SAFETY EQUIPMENT SHOULD BE USED PER OSHA STANDARDS. FACE SHIELD, GLOVES AND APRON SHOULD BE WORN.

Should the solvent show signs of an acid condition, use the following methods to disrupt the process and any further damage to the unit:

A. Do not enter a tank until after you shut off the heat to the unit, drain all solvent and remove clean out doors. Solvent fill line valves should be locked closed. Any person entering a tank shall use a halter and lifeline together with NIOSH/MESA pressurized air mask. A second worker stationed outside the equipment shall have similar equipment and be able to communicate readily with the person working on or in the degreaser.

B. All personnel must be trained and completely familiarized with instructions before operating and performing maintenance work on equipment. An authorized supervisor must be present at all times.

1. Turn off the heat to the machine. DO NOT TURN OFF COOLING SYSTEM(S).

2. Send all personnel away from the immediate area except those required for maintenance.

3. Wait until the temperature of the solvent drops to a minimum of 30-50°F below the boiling point (or <150°F) and/or is suitable to handle from the standpoints of temperature and vapor pressure. In some cases it may be necessary to cool the unit externally by spraying cold water on the outside until the temperature drops significantly.

4. Use a ¾" or 1" hose attached to the main water supply to flood the inside cleaner. Cover all solvent to a depth of 2-4". Note that adding only a small amount of water may aggravate the condition. Add ½ cup of soda ash for each gallon of water used. DO NOT use caustic soda (sodium hydroxide) or caustic potash (potassium hydroxide).

5. Soda ash is the commercial term for anhydrous sodium carbonate. This will help neutralize the acidic decomposition products. It will also make it easier to clean the machine.

6. Open the sump drain valves and turn on the transfer pump. Add about one pound of soda ash and some water in the drums before pumping in the solvent. Pump (or drain) all solvents from the degreaser, water separator, etc. into steel drums. Stop pumping when all solvent is removed (water layer starts draining out).

********WARNING********

DO NOT INSERT THE BUNGS/COVERS IN THE DRUMS

Reaction between soda ash and acid solvent forms carbon dioxide. If the drums are sealed, internal pressure builds up from the evolution of carbon dioxide and will split the drums.

7. Make sure enough water is in the cleaner to prevent solid residues from being exposed to air when the solvent is pumped out. The water floats on top of the solvent.

8. After removing the solvent, add water, if necessary to cover the heater surfaces. Add ½ cup of soda ash per gallon of water. Turn the heat on and bring the solution to a boil. Turn the heat off and hand spray soda ash solution on cooling coils, troughs, walls, etc. and allow the water separator and dryer to fill up (via the troughs). After cooling, pump or drain water out of the system.

9. Remove the clean out doors and scrape out any residues (from outside). Transfer all solids from the machine into metal drums with the water and soda ash mixture.

10. Dispose of all wastes (solids and solvent solutions) in accordance with all applicable Federal, State and Local Hazardous Waste Regulations. Handle the drums with care.

START OF 2ND NEUTRALIZATION

11. Replace all clean out door plates.

12. Refill all sumps of degreaser with 6-8" of water/soda ash mixture (½ cup to each gallon) or enough to cover the heater elements. Turn on heat to the machine and boil the water/soda ash mixture. When the solution begins to boil, pump solution from each sump through a flexible hose. Spray the condenser coils, troughs, conveyors, and inside the water separator (via troughs), and pump solution through spray piping, filter housings, etc.

13. Turn off heat and allow solution to cool. Drain sumps, water separator and piping. Hose down the degreaser with fresh water to remove any residual soda ash. Drain and dispose of this waste as a hazardous material.

14. Wipe dry all interior surfaces of the degreaser.

15. Replace all damaged clean out door gaskets.

16. Recharge the degreaser with clean solvent and bring up to operating levels. We suggest the degreaser run idle for 1-2 hours. This will expel excess water from the system. Bleed off the water separator and inspect dryer tank for excess water. Replace dryer media if required.

THE UNIT IS NOW READY FOR OPERATION

If you experience solvent decomposition, the clean out and maintenance program should be thoroughly reviewed.

*******WARNING*******

WHEN WORKING ON OR NEAR DEGREASING EQUIPMENT, NEVER USE NEAR OPEN FLAMES OR ARCS (SUCH AS WELDING) WHEN SOLVENT IS PRESENT IN DEGREASER. ALWAYS DRAIN DEGREASER AND THOROUGHLY AIR OUT AREA BEFORE ATTEMPTING ANY WELDING AND/OR WORK WITH TORCHES. SOME SOLVENT VAPOR AIR CONCENTRATIONS CAN BE IGNITED.

WATER SEPARATOR WITH HEAT EXCHANGER

Water floats on the surface of the solvent and will come out of the water overflow if allowed to accumulate. Such accumulation must NOT be permitted in the case of solvents with water-soluble stabilizers. Never add water - remove any water if these types of solvents are used.

For Perchloroethylene, Trichloroethylene and N-Propyl Bromide, water should be added to the "P" trap after initial start-up.

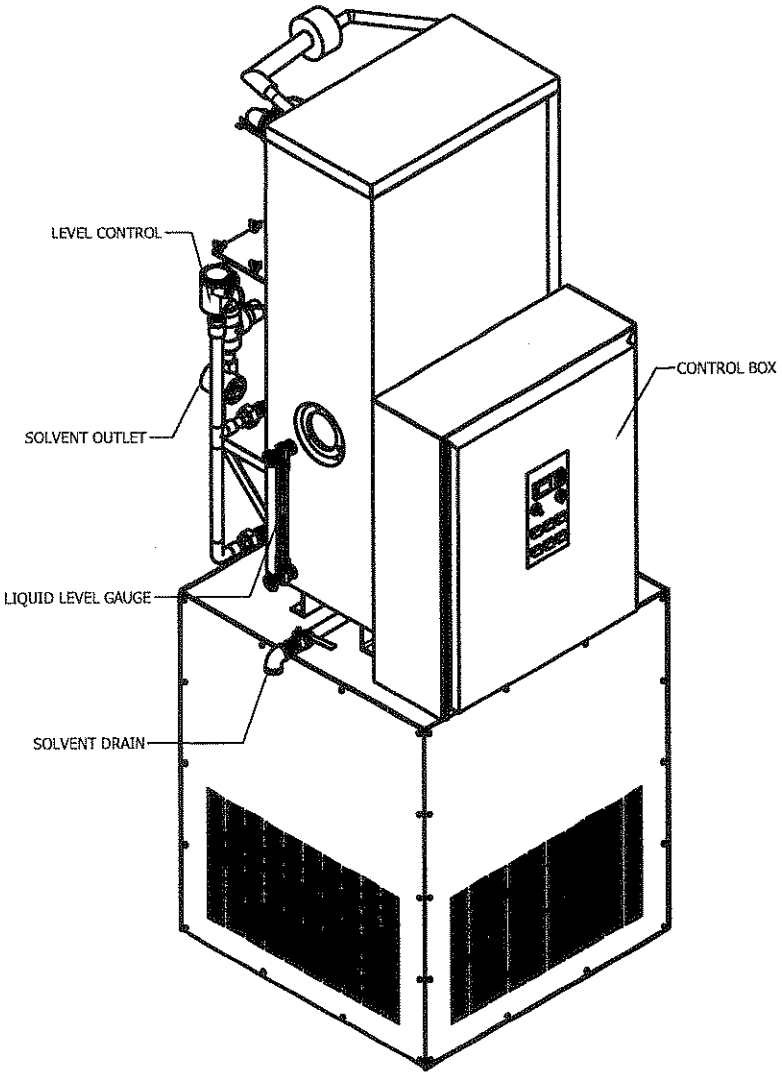
TROUBLE SHOOTING GUIDE

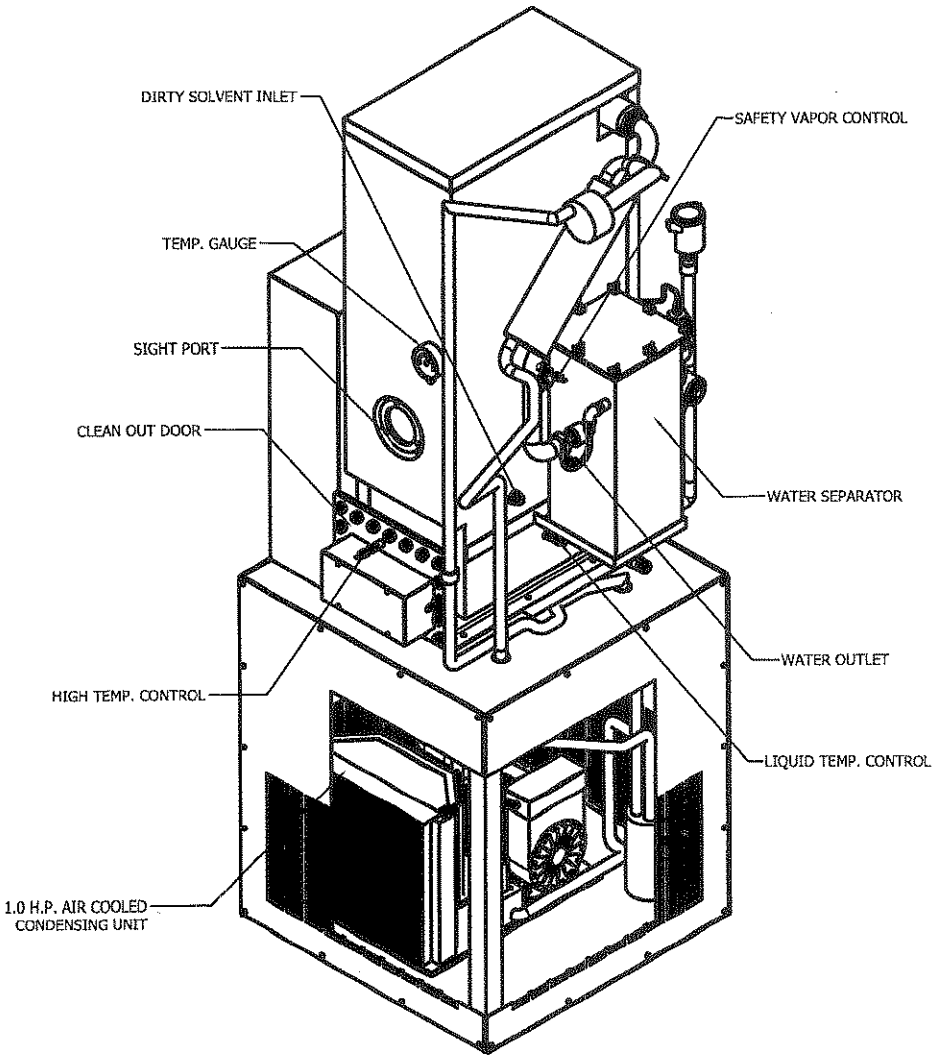
PROBLEM	PROBABLE CAUSE	REMEDY
Heat shuts off because of high temperature	*Liquid level too low*	*Add fresh solvent to proper operating levels.*
	Metal fines, lint, etc. collecting around thermostat sensing bulb	*Drain tank, clean HTC thermostat bulb and soils from still*
Heat shuts off because of liquid temperature control	*Solvent contamination has reached high limit set on LTC*	*Perform clean out of still*
Solvent takes too long to heat up. Little condensing through heat exchanger	*Solvent contamination, Boiling point exceeding LTC high limit*	*Perform clean out of still*
Tank walls or pipe fittings discoloring	*Acid solvent, too much water in system*	*Test solvent operating levels. Drain solvent, neutralize, and recharge with clean fresh solvent*
Toxic fumes, sharp pungent odors	*Acid solvent*	*Test solvent operating levels. Drain solvent, neutralize, and recharge with clean fresh solvent*
Heat shuts off because of safety vapor control (SVC)	*Compressor not operating*	*Turn on or repair cooling unit, reset safety vapor control*
	SVC not set properly or not functioning	*Check SVC settings. Test/Replace defective thermostat and/or thermocouple*
Machine heat will not energize	*Circuit breaker off*	*Turn on circuit breaker*
		Check circuit breaker, find reason for tripped breaker, repair/replace with proper size breaker
	Control transformer not functioning	*Replace control transformer*
	Pilot light(s), push button(s) not functioning	*Repair/Replace*

	Low liquid level	*Add fresh solvent to proper operating levels*
SVC, HTC or LTC tripped	*Low cooling, dirty boil sump or contaminated solvent, boiling point too high*	*Correct condition, reset control(s)*
Ghost vapor (foggy white)	*Excess water in solvent*	*Check water separator. Drain excess water if required*
		Check for leaks in cooling system
Amber "Heat" indicator not lit	*Power Interruption*	*Determine cause of interruption and correct*
	Safety has tripped or probe lead disconnected	*Reset Safety, check/clean/connection at thermocouple or thermostat*
	Thermocouple or thermostat defective	*Replace*
Safety will not reset	*Defective Thermostat*	*Replace*
	Reset switch defective	*Replace*
	Thermocouple defective	*Replace*
Erratic operation	*Thermostat defective*	*Replace*
	Thermocouple out of position (HTC)	*Thermocouple tip must be clean and in contact with what is being sensed*

REVISION HISTORY

REV	DESCRIPTION	BY	DATE
G	NEW TB/LAYOUT/DWG#/PARTS	KE	6/14/2007





STILL SPECIFICATIONS

SOLVENT TURNOVER	- 10.0 GPH
HEAT INPUT	- 4.5 KW
REFRIGERATION UNIT	- 1.0 H.P.
ELECTRICAL	- 230V-1PH-60HZ

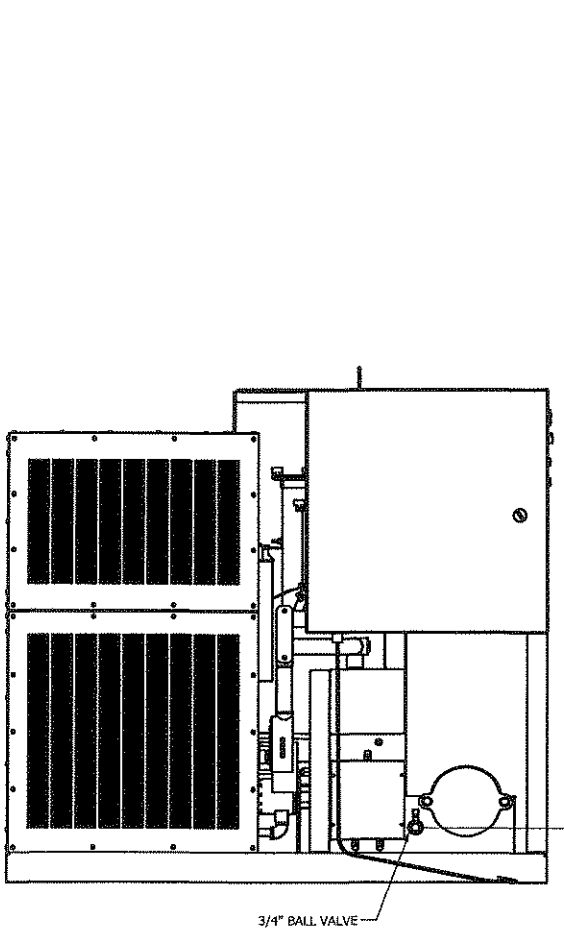
DRAWN BY	KE	6/19/2007
CHECKED BY	KE	6/19/2007
ENG	KE	6/20/2007
MFG	KG	6/19/2007
NOTES	-	
MATERIAL		

Baron·Blakeslee
A Division of Enviro Tech International, Inc.

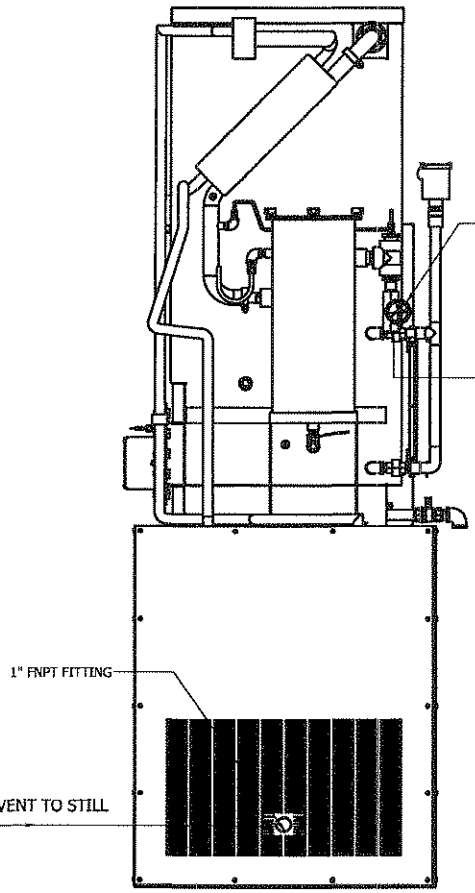
TITLE: GENERAL ASSEMBLY
PROJECT: MRR-10LE

SIZE	SCALE	DWG NO	REV
C	1/8	R010-F100	G

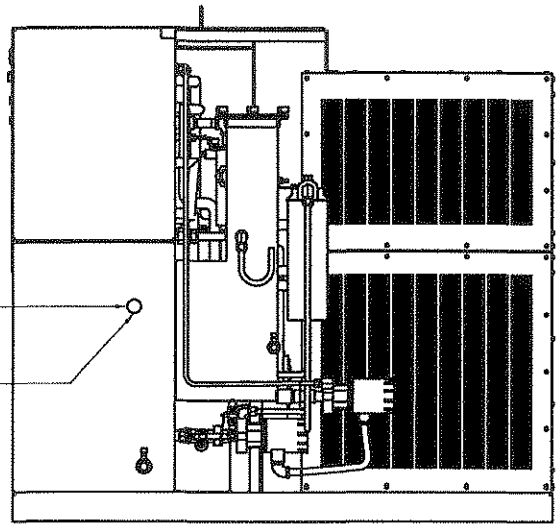
LOCATION \\Silver\pword\Baron Blakeslee\ENGINEERING-DESIGN\MRR-10LE\FINAL ASSY\R010-F100_FINAL_ASSEMBLY.iam



M-216LE (REFERENCE) LEFT SIDE VIEW



MRR-10LE REAR VIEW



M-216LE (REFERENCE) RIGHT SIDE VIEW

REV	DESCRIPTION	BY	DATE
A	NEW DRAWING	KE	9/10/07

REVISIONS

DRAWN BY:	KE	6/19/2007
CHECKED BY:	KE	6/19/2007
ENG APPROVAL:	KE	6/20/2007
MFG APPROVAL:	KG	6/19/2007

Baron·Blakeslee
A Division of Enviro Tech International, Inc.

TITLE GENERAL ASSEMBLY , STILL/DEGREASER CONNECTION

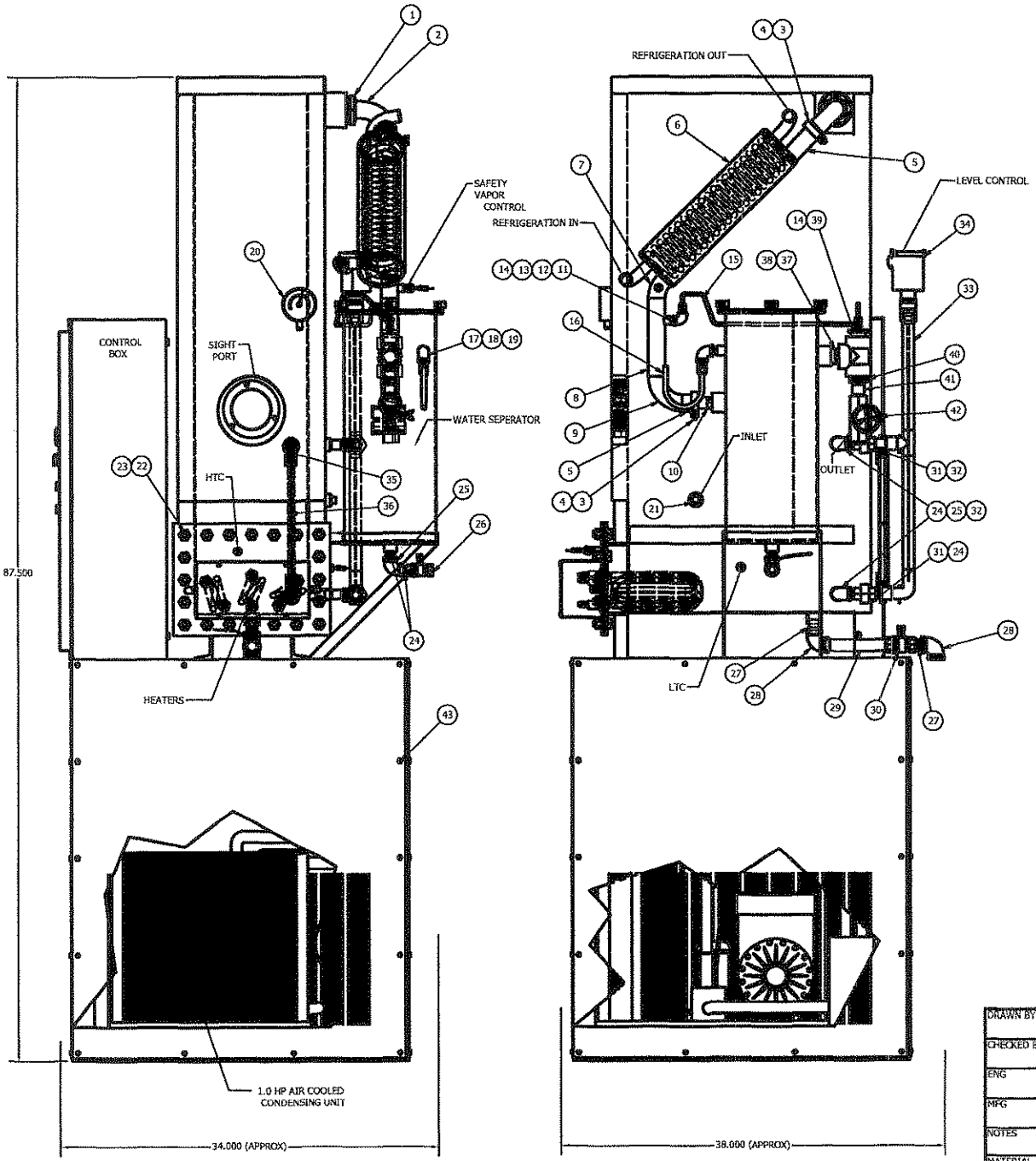
JOB NO. | SIZE B | PROJECT MRR-10LE

MATERIAL | SCALE 1/12 | DWG NO. R010-F100 | REV A

LOCATION C:\workspace\ENGINEERING-DESIGN\MRR-10LE\FINAL ASSM\R010-F100_FINAL_ASSEMBLY.iam | SHEET 1 OF 1

REVISION HISTORY

REV	DESCRIPTION	BY	DATE
G	NEW TB/LAYOUT/DWG#/PARTS	KE	6/14/2007



ITEM	DESCRIPTION	PART NUMBER	QTY	UNITS	C/P
-	MRR-10LE GENERAL ARRANGEMENT	-	1.0	EA	C
1	BUSHING, HEX HD, S/S T-304, 2" X 1-1/4"	062320	1.0	EA	P
2	ELBOW, S/S T-304, 90 DEG, CLAMP ONE END, 1-1/2"	062031	1.0	EA	P
3	CLAMP, S/S T-304, 1-1/2"	119030	2.0	EA	P
4	GASKET, TEFLON ENVELOPE, 1-1/2" TUBE	062805	2.0	EA	P
5	FERRULE, S/S T-304, BUTTWELD, 1-1/2" TUBE	062803	1.0	EA	P
6	EXCHANGER, HEAT, S/S T-316, TYPE K-2, SPIREC, 5.77 SQ FT HEAT XFER AREA, NEOPRENE BAFFLE	021115	1.0	EA	P
7	WELD FITTING, 45 DEG, 1-1/2" OD	060168	1.0	EA	P
8	TUBING, S/S T-304, 16GA, 1-1/2"	060156	0.67	FT	P
9	ELBOW, S/S T-304, 90DEG, BUTTWELD, 1-1/2" OD	062819	1.0	EA	P
10	ADAPTER, S/S T-304, 1-1/2" TUBE TO 1" MPT	034010	1.0	EA	P
11	COUPLING, S/S T-304, HALF, 1/4"	062052	1.0	EA	P
12	NIPPLE, TBE, S/S T-304, CLOSE, 1/4"	062056	1.0	EA	P
13	ELBOW, S/S T-304, 90 DEG, 1/4"	062041	1.0	EA	P
14	FITTING, S/S T-316, 1/4" TUBE TO 1/4" MPT	062948	2.0	EA	P
15	TUBING, S/S T-304, 1/4"	060161	2.0	FT	P
16	TUBING, S/S T-304, 3/8"	060162	0.83	FT	P
17	FITTING, S/S T-316, 3/8" TUBE TO 3/8" MPT	062952	1.0	EA	P
18	ELBOW, S/S T-304, 90 DEG, 3/8"	062081	1.0	EA	P
19	NIPPLE, TBE, S/S T-304, CLOSE, 3/8"	062096	1.0	EA	P
20	THERMOMETER, DIAL, 0 TO 200F, 1/2" NPT	018020	1.0	EA	P
21	PLUG, S/S T-304, SQUARE, 1/2"	062128	1.0	EA	P
22	SCREW, HEX HD, ZINC, 1/2-13 X 1-1/4"L	200012	20.0	EA	P
23	NUT, HEX, ZINC, 1/2"	201014	20.0	EA	P
24	NIPPLE, TBE, S/S T-304, CLOSE, 1/2"	062136	5.0	EA	P
25	ELBOW, S/S T-304, 90 DEG, 1/2"	062121	3.0	EA	P
26	VALVE, BALL, S/S T-304, 1/2"	066152	1.0	EA	P
27	NIPPLE, TBE, S/S T-304, CLOSE, 3/4"	062176	2.0	EA	P
28	ELBOW, S/S T-304, 90 DEG, 3/4"	062161	2.0	EA	P
29	NIPPLE, TBE, S/S T-304, 3/4" X 6"	062185	1.0	EA	P
30	VALVE, BALL, S/S T-304, 3/4"	066153	1.0	EA	P
31	UNION, S/S T-304, 1/2"	062125	2.0	EA	P
32	NIPPLE, TBE, S/S T-304, 1/2" X 2"	062138	3.0	EA	P
33	RADAR DEFLECTOR, PIPING		1.0	EA	P
34	LEVEL SENSOR, GUIDED WAVE RADAR, 4-20mA OUTPUT, 3/4" NPT PROCESS CONNECTION, 24" PROBE	045300	1.0	EA	P
35	GAUGE, AUTOMATIC WATER	019509	1.0	EA	P
36	GAUGE, GLASS, RED LINE, 5/8" TUBE X 12" LONG	019501	1.0	EA	P
37	NIPPLE, TBE, S/S T-304, CLOSE, 1"	062216	1.0	EA	P
38	TEE, S/S T-304, 1"	062204	1.0	EA	P
39	BUSHING, HEX HD, S/S T-304, 1" X 1/4"	062235	1.0	EA	P
40	BUSHING, HEX HD, S/S T-304, 1" X 3/4"	062207	1.0	EA	P
41	NIPPLE, TBE, S/S T-304, 3/4" X 2"L	062178	1.0	EA	P
42	FLOWSIGHT, S/S T-316, 1", FPT	019651	1.0	EA	P
43	SCREW, HEX HD, SELF DRILLING, 10-16 X 3/4"	200100	56.0	EA	P

STILL SPECIFICATIONS

SOLVENT TURNOVER	- 10.0 GPH
HEAT INPUT	- 4.5 KW
REFRIGERATION UNIT	- 1.0 HP
ELECTRICAL	- 230V-1PH-60HZ

DRAWN BY	KE	6/19/2007
CHECKED BY	KE	6/19/2007
ENG	KE	6/20/2007
MFG	KG	6/19/2007
NOTES		
MATERIAL		

Baron·Blakeslee
A Division of Enviro Tech International, Inc.

TITLE: GENERAL ASSEMBLY
PROJECT: MRR-10LE

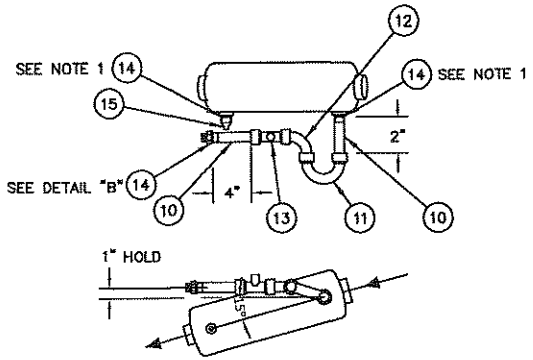
SIZE	SCALE	DWG NO	REV
C	1/7	R010-F100	G

LOCATION \\Silverworld\Baron Blakeslee\ENGINEERING DESIGN\MRR-10LE\FINAL ASSM\R010-F100_FINAL_ASSEMBLY.dwg

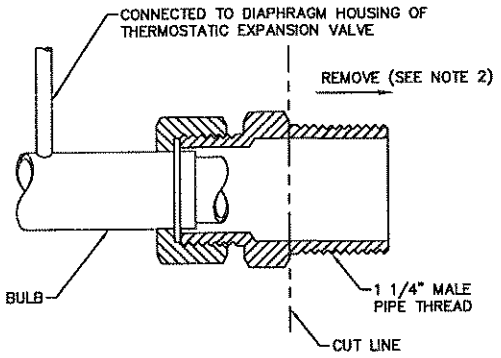
REVISION HISTORY

REV	DESCRIPTION	BY	DATE
-	-	-	2/9/2007

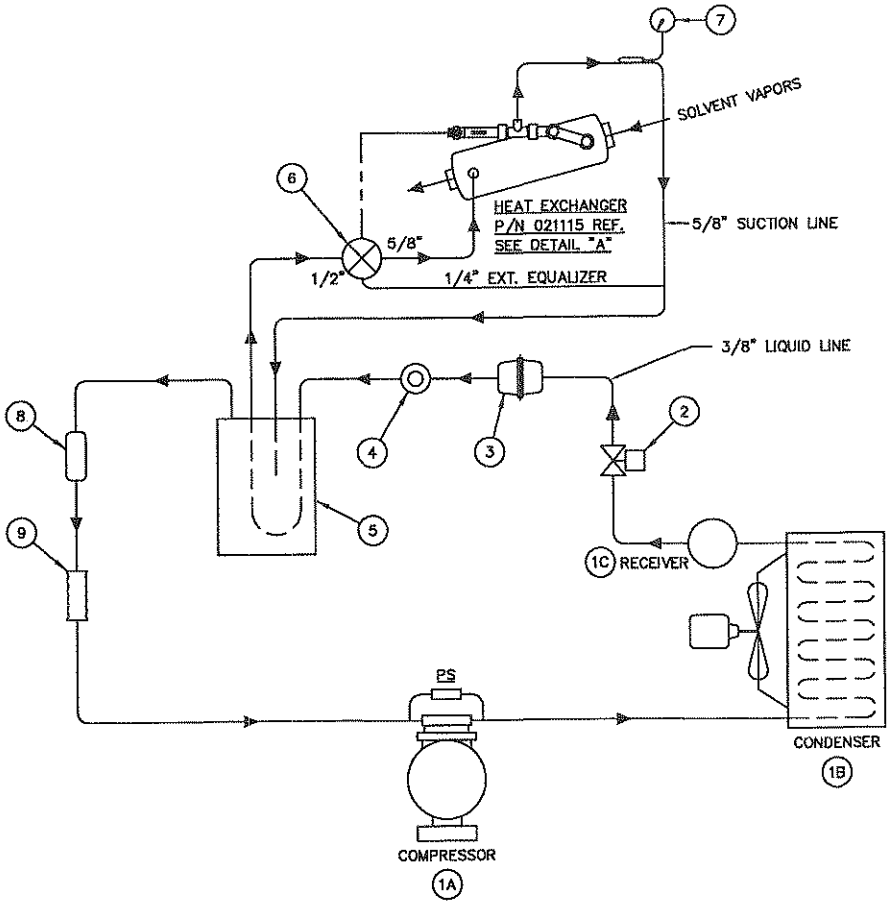
ITEM NO.	DESCRIPTION	PART NO.	QTY		C/P
1	CONDENSING UNIT, AIR, 1 HP,208/230V	130071	1.0	EA	P
2	VALVE, SOLENOID, 24V	130214	1.0	EA	P
3	DRYER, FILTER	130080	1.0	EA	P
4	INDICATOR, LIQUID, 3/8	130082	1.0	EA	P
5	ACCUMULATOR, SUCTION, W/EXCHANGER, 5/8	130067	1.0	EA	P
6	THERMOSTATIC EXPANSION VALVE	045137	1.0	EA	P
7	THERMOMETER, REMOTE, -40 TO +65F	018013	1.0	EA	P
8	FILTER, SUCTION LINE, 5/8 ODF	130112	1.0	EA	P
9	VIBRATION ELIMINATOR	130066	1.0	EA	P
10	TUBING, COPPER, HARD, 1 5/8	064866	1.0	FT	P
11	RETURN BEND, 1 5/8 TUBE	130282	1.0	EA	P
12	ELBOW, 90 DEG, SHORT RADIUS, 1 5/8	130283	1.0	EA	P
13	TEE, REDUCING, 1 5/8 RUN, 5/8 BRANCH	130280	1.0	EA	P
14	FERRULE, S/S, BUTT-WELD, 1.5 OD X 1-1/8 LG.		3.0	EA	P
15	REDUCER, COPPER, 1-1/2" TO 5/8"		1.0	EA	P



DETAIL "A" – HEAT EXCHANGER



DETAIL "B" – LMC ADAPTER



NOTES:
1. WELD FLANGE OF FERRULE TO EXCHANGER
2. WELD FLANGE OF FERRULE IN PLACE OF 1 1/4" MPT

DRAWN BY	J.O	05/30/07	Baron-Blakeslee, A Division of Enviro Tech International, Inc.
CHECKED BY	E.R	05/30/07	
ENG	K.E.	06/04/07	TITLE: 230V-1PH-60HZ REFRIGERATION SCHEMATIC, 1H.P.
MFG			PROJECT: MRR-10LE
NOTES	-		SIZE: C; SCALE: NTS; DWG NO: R010-CRS1; REV: A
MATERIAL			SHEET 1 OF 1

LOCATION ENGINEERING-DESIGN\MRR-10LE\ELECTRICAL\R010-CRS1_1HP_230V_60 REFRIGERATION_SCHEMATIC