



**Operations and  
Maintenance**

**MANUAL**

**EE Series**

**Economic & Efficient  
Degreasing Equipment**

**Unit# 2167**



## **PLEASE NOTE:**

**ALL SAFETY CONTROLS ARE CHECKED AND OPERATING WHEN ANY EQUIPMENT (NEW OR USED) IS TESTED AT ULTRONIX AND REPLACED, IF NECESSARY, BEFORE SHIPMENT.**

**THE USER IS CAUTIONED TO VERIFY THE OPERATION AT LEAST MONTHLY, PAYING SPECIAL ATTENTION TO THE HIGH TEMPERATURE CONTROLS. IF THERE IS ANY MALFUNCTION, THE CONTROLS OR TEMPERATURE PROBES OR BOTH, SHOULD BE REPLACED IMMEDIATELY.**

**UNDER NO CIRCUMSTANCES SHOULD EQUIPMENT BE KEPT OPERATING BY JUMPING OUT OR OTHERWISE DISABLING THIS IMPORTANT SAFETY FUNCTION. SERIOUS DAMAGE OR INJURY CAN RESULT IN THE EVENT OF HEATER OVERTEMPERATURE AND THE RESPONSIBILITY FOR SUCH DAMAGE OR INJURY IS WITH THE USER.**

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## BASIC NEW EQUIPMENT WARRANTY

**U**ltronix warrants its product against defects in material and workmanship for twelve (12) months from date of delivery, provided such equipment is properly installed, used and maintained. Written maintenance instructions are provided to the purchaser and must be followed to keep this warranty in full force and effect. Ultronix does not warrant any equipment against damage from corrosion, contamination, misapplication, improper specification and abnormal wear and tear or any other operating conditions beyond our control. This warranty does not extend to any losses or damages due to misuse, accident, abuse, abnormal wear and tear, buyers negligence, unauthorized modification or alteration, use beyond rated capacity, or improper installation, maintenance or application. The terms of this warranty are the exclusive remedy available to any purchaser. **ULTRONIX IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM USE OF ITS EQUIPMENT WHETHER SUCH CLAIM IS BASED UPON THIS WARRANTY, CONTRACT, NEGLIGENCE, OR OTHER THEORY. THIS WARRANTY APPLIES ONLY TO THE ORIGINAL PURCHASER AND IS NOT TRANSFERRABLE.**

All equipment requiring service must be shipped F.O.B. the factory of Ultronix, located at 2880 Bergey Road, Hatfield, PA 19440. If a field service call is requested, Ultronix, Inc. will supply all parts and labor while at the customer's location. The warranty does not cover travel time, transportation expenses, lodging, and other incidental costs which will be billed to the customer in advance on an estimated basis, and upon receipt of payment, final arrangements for repair services will be made.

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2880 Bergey Road  
Hatfield, PA 19440

800-553-7881  
215-822-9622 Fax

[www.ultronix.com](http://www.ultronix.com)  
email: [zoc@ultronix.com](mailto:zoc@ultronix.com)

# INTRODUCTION

Thank you for purchasing an Ultronix degreaser.

This EE Series degreaser is one of several new degreasers being manufactured for the customer that requires economic and efficient degreasing equipment. Our standard features include stainless steel primary refrigeration coils, pitched bottom boil and immersion sumps, ball valves on all sumps with common drains, circulating pump and filter, air powered hoist assembly with individual timers, 150% freeboard, stainless steel sliding lid, a Zer-O-Coil low temperature freeboard chiller with nickel plated fin low temperature copper tubing, and a large number of options to enhance your specific process.

Even though the EE Series degreaser is considered to be "user friendly" equipment, Ultronix, Inc. technical staff is always available and ready to assist you with any questions you may have.

Included in this manual, is a recommended spare parts listing. Since several items such as "O" rings, gaskets, filter cartridges, etc. must be periodically replaced to attain satisfactory cleaning results, we suggest that your maintenance department keep these parts on hand to insure minimum down time during maintenance. Please contact our parts department for current pricing and availability.

Customer service is our number one priority! A satisfied customer is a happy customer. We will always make sure that you receive the best possible service on the Ultronix equipment you have purchased.

## IMPORTANT RULES FOR VAPOR DEGREASING

1. **No drafts** at entrance and exit of equipment. (Drafts = solvent loss).
2. The equipment should be **up to temperature** (condensation of heated solvent at coldspot) before processing any work.
3. **Vertical speed of travel for work** entering, leaving, or while in vapor zone is 12 feet per minute **maximum**. The main reasons are fewer solvent losses and cleaner parts.
4. If spray is required, only spray in vapor zone.
5. Parts should be arranged so that solvent drains off readily. If this is not done, parts can trap solvent and bring solvent vapors out of degreaser creating a possible health hazard and undesired solvent losses.
6. Never lift parts **above** vapor zone when transferring from one sump to another sump.
7. Never let liquid level get **below top** of heat source. Keep adequate supply of solvent on hand. The equipment should always be filled to proper operating levels.
8. Size and type of load to be processed can be critical to the degreaser. If vapor line lowers rapidly and requires extra time to recover, load is too great for machine and should be reduced to machines design limits.
9. Machine maintenance - A cleanout schedule should be established for the removal of contamination (sludge) from the boil sump(s) at regular intervals to eliminate undesired and unsafe conditions, and to maintain efficient cleaning operation.
10. Never locate a degreaser near open flames, baking ovens, or any arc welding operations.
11. Never place hands below vapor line! Use hooks or long handle baskets to place parts in solvent. Do not use absorbent

materials such as cloth, wood, or rope, etc. to handle work in degreaser.

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### Section 1 Vapor Degreaser (Equipment using Solvent for Cleaning)

1. What is it?  
A vapor degreaser is a tank with some means of boiling the solvent and some means of controlling the vapors in the upper section.
2. What does it do?  
If the solvent is properly selected, contamination will be removed from the part being cleaned by solvent action.
3. How does it work?  
The selected solvent is heated within the tank, which will generate a vapor. The vaporized solvent is maintained in the tank by means of a cold area, which condenses the vapor back to a liquid. The liquid solvent is collected in a trough and directed to a water separator (to remove free water) and returned to the tank.
4. How does it clean?  
The articles to be cleaned are suspended in the air-free zone of solvent vapors, which condense on the cool parts to dissolve the contaminant and give a continuous rinse in clean solvent. As the condensed solvent drains from the part, it carries off the contaminant and returns to the boiling liquid. The vapor treatment is often augmented by mechanical action such as liquid immersion or spraying the work with liquid (distillate) solvent in the vapor zone. The work is held in the vapor zone for final rinsing and drying until the parts reach vapor temperature, at which time condensation stops. The articles should then be **slowly** withdrawn from the machine. The process is a safe, rapid, economical procedure for preparing dry, clean articles for subsequent finishing or fabricating steps, usually without further treatment. Ultrasonics may be applied to further enhance the cleaning capability of the degreaser. By adding

ultrasonics to a liquid immersion sump, holes and crevices on a part that cannot normally be cleaned by solvent action alone, should be penetrated to make the part thoroughly clean.



## Section 2 Safety

1. Any degreaser pits two feet deep or more should be exhausted at a minimum rate of twice its air volume per minute. Ventilate at least 10 minutes before entering.
2. Allow solvent to cool before draining. Make sure that all solvent and vapor have been removed before entering or welding in/on a degreaser. **DO NOT** enter this machine unless all cleanout doors have been removed. All solvent must be expelled and the unit purged with air by using fan forced or compressed air from above. **ENTER ONLY** with a life line and NIOSH/MESA approved breathing apparatus, **THEN ONLY** when another man similarly equipped is watching you.
3. Do not smoke in vicinity of a degreaser.
4. **IF SOLVENT GETS INTO EYE**, hold eye open, flush with water for at least 15 minutes, call a physician. If solvent contacts skin, immediately flush with plenty of water.
5. **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 wet with solvent, and then apply lanolin-type cream. Remove contaminated shoes.
6. **IF SOLVENT IS SWALLOWED**, see MSDS Sheet for your particular solvent for instructions and contact the Poison Control Center immediately. (Inducing vomiting is not recommended for some solvents.)
7. **IF A PERSON IS OVERCOME BY EXCESSIVE EXPOSURE**, remove patient to fresh air. Call a doctor. If breathing stops, give artificial respiration. When patient starts to breathe again, give oxygen. **HIGH VAPOR CONCENTRATION CAN CAUSE UNCONSCIOUSNESS OR DEATH.**

**NOTE TO PHYSICIAN:** Overexposure to many of the chlorinated solvents, especially if accompanied by anoxia, may temporarily increase cardiac irritability. Maintain adequate oxygenation until recovery. Avoid sympathomimetic amines; such as epinephrine, which may precipitate arrhythmia's.

8. Stop distillation before heating element surfaces become exposed (liquid level never lower than the top of steam coils, gas immersion tubes, or electric heating elements).
9. Never add solvent to hot oil-solvent mixtures. Sudden expansion can splash solvent out of the degreaser and possibly harm operator.



## Section 3 Personal Protection

Specific requirements deemed necessary for personal protection are listed:

### 1. Instruction

All employees working in and around open-surfaced 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 U.S. Bureau of Mines, U.S. Department of the Interior (see 30 CFR Part 11) 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 exceeding 25 pounds) shall be provided with a quick opening valve and at least 48 inches of hose not smaller than 3/4", so that no 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.

### Section 4 Operation

- Avoid excessive speed of work in and out of vapor,
- Prevent liquid dragout by entrainment in parts,
- Avoid contamination of solvent with water and other materials,
- Keep proper heat balance.

#### 1. Spray Cleaning and Degreasing

In vapor degreasing, spraying takes place in an air-free atmosphere below the vapor blanket so that evaporative losses due to the mixing of solvent and air are negligible. However, care should be taken to always emerge parts dry.

#### 2. Covers

We recommend suitable covers for degreasers to reduce vapor emission when the degreasers are not operating and condenser coils are not functioning. For large machines, roll top covers or power operated covers are available to facilitate their use. In addition, freeboard chillers are very helpful in reducing solvent emissions. The principle used in this case is the creation of a heavy, cold air blanket over the solvent vapor by means of refrigeration devices.

#### 3. Welding in Vicinity

Degreasing or other cleaning operations involving chlorinated hydrocarbons shall be so located that no vapors from these operations will reach or be drawn into the atmosphere surrounding any welding operation. In addition, trichlorethylene and perchlorethylene should be kept out of atmospheres penetrated by the ultraviolet radiation of gas shielded welding operations.

### Section 5 General

The basic machine is a two sump unit with a clean condensate reservoir equipped with a solvent pump for final spray rinsing. One sump contains the heaters for solvent boiling while the second sump contains the clean solvent overflow from the spray reservoir and may be equipped with an ultrasonic transducer bottom. The condensed vapors are collected in a trough below the condensing coil and are directed into the gravity type water separator. The clean solvent is stored in the spray reservoir with the overflow directed into the clean solvent sump. Finally, the clean solvent sump overflows into the boiling sump to complete the closed recirculating system. Safety controls (high temperature and safety vapor) are incorporated to turn the boiling sump OFF in the event of either low solvent level in the boiling sump or high vapor level in the freeboard area.

The refrigerated machines are supplied with a thermostatically controlled refrigeration system energized at all times when the

electrical power is connected. The refrigeration unit operates periodically even when the boiling sump heat is turned OFF to provide a cold blanket of air in the freeboard area covering the solvent. The result is a savings in solvent, due to evaporation, of almost 50% as compared to typical tap water cooled machines.



## Section 6 Installation

### A. Location

Among the considerations in selecting the cleaning system location are providing a work area free of dirt or contamination in the air and a means of filling and draining the tank when changing solvent solutions. Care must also be taken not to locate the system near blowers, drafts, fans, open flames, baking ovens, or arc-welding operations. If the machine is water cooled, consideration must be given to the water inlet and outlet connections in addition to the necessary electrical requirements. The refrigeration cooled machines require only electrical connections for operation and are easily moved if equipped with casters.

When locating the refrigeration cooled machine, it is important that the particular location selected does not restrict the flow of cooling air to the refrigeration condensing unit. In addition, the refrigerated degreaser must not be operated in a small room without ventilation, since the condensing unit produces heat that would eventually heat up the room air used for cooling the condensing unit.

### B. Electrical Connections

Check the nameplate located on the machine and electrical schematic diagram in the back of the manual for proper voltage, current, and frequency of the input power requirements. Check the electrical schematic for proper connections. A fused disconnect switch must be supplied for the main input power line, if required by local electrical code.

### C. Water Connections

For maximum solvent conservation, the cooling water inlet temperature must be 60° F. or less when using Fluorocarbon solvents in the cleaning system. When connecting the water piping to the machine, install two valves in the inlet; one for daily ON/OFF of the water supply and one for an initial adjustment to control the water flow rate.

Do not install any valves or obstructions other than connecting pipe on the water outlet. The inlet water temperature and flow rate should be adjusted to maintain a solvent vapor level half way up the condensing coils when the boiling sump heat is turned ON.

### D. Setting Safety Controls

The machines covered by this manual are protected by two built-in safety controls; the safety vapor control (S.V.C.) and high temperature control (H.T.C.). The safety vapor control turns OFF the heat in the event of high vapor level and must be set at 15° F. below the boiling point of the solvent being used. The high temperature control turns OFF the heat in the event of low solvent level in the boiling sump and must be set about 25° F. above the boiling point of the solvent used. Both controls are manual reset type and must be reset after the fault is corrected and before the heat can be turned ON. When first turning ON the machine, check both controls by pushing the reset buttons in until the switch resets.

## Section 7 Operating

### A. Filling and Turn-On Procedure

Before filling the cleaning system with solvent be sure that you have checked for possible leaks in the piping. Also check that all drain valves are closed and drain plugs are installed tight. Be sure that the cooling media is flowing thru the solvent condensing apparatus. Then fill both sumps with the selected solvent to a level even with a divider between the two sumps. Do not attempt to pour solvent into the spray reservoir. After the machine is turned ON and the spray reservoir fills with clean condensate, additional solvent will have to be added to the boiling sump. To charge and seal off the water separator tank after the spray reservoir is full of condensate, pour approximately four cups of clean water

into the condensate trough and allow it to run into the water separator tank. Water will drip out of the water separator "water outlet" when fully charged with water. (Note: Your solvent supplier will advise when or when not to add water.)

**Note:** Do not pour water into the water separator until solvent overflows from the spray reservoir into the rinse sump. Also, solvent such as TCA or solvents with ethanol should not have water added, as they are capable of absorbing water.

**Note:** DO NOT add water to a water separator when using n-Propyl Bromide or solvents containing acetone or alcohol.

**Note:** DO NOT add water to a Desiccant Dryer System. This tank contains a dryer media, which absorbs water from the distillate solvent. Adding water to this tank defeats its purpose.

If the machine is a refrigerated cooled model, the refrigeration system will turn ON automatically as soon as the main power is applied. Until the heat switch is turned ON, the refrigeration system will cycle to maintain an air temperature of approximately 50° F. in the freeboard area above the solvent. After turning ON the heat, the solvent vapors will rise and the refrigeration system will run continuously to maintain a constant vapor height.

#### **B. Cleaning Procedure**

Never use hands for placing work in the machine. Cleaning may begin as soon as the boiling sump starts boiling and the condensed vapors are dripping off the condensing coil. For ease of handling, large parts may be placed in the cleaning tank directly with long handle hooks or tongs, while small parts are best placed in a basket. (Stainless steel baskets are recommended.) If a basket is used, rack the parts for best drainage and minimum solvent entrapment. Best cleaning will result when the number of parts being cleaned at one time is kept at a minimum. Lower the contaminated work into the boiling sump slowly and allow to sit for several minutes.

The exact time will depend on the kind and amount of contamination and is best

determined by experiment. Next, transfer the work slowly into the clean solvent sump for a several minute rinse while moving the part around. **Never** bring work above the vapor line when transferring. If the clean solvent tank is equipped with ultrasonics, additional surface cleaning will take place. The work can then be raised into the solvent vapor for a spray rinse, if desired, and final vapor rinse.

After completing the cleaning operation, the stainless steel cover should be moved into place to conserve solvent whether the boiling sump is ON or OFF.



## **Section 8 Maintenance**

### **A. Refrigeration System\***

At weekly intervals, or sooner if operating conditions demand, the refrigeration condensing unit heat exchanger must be thoroughly cleaned with compressed air or a vacuum cleaner to remove all dirt, dust or other material that would reduce the heat transfer effectiveness. In the event the dirt and dust is not removed, the compressor discharge pressure will become too high with a resultant overheating of the compressor motor. Safety controls in the form of a high pressure and thermal overload switch are incorporated in the machine to protect it. A sight glass is included in the high pressure refrigeration liquid line to check the refrigeration system operation. Under normal operating conditions, the sight glass will be clear without the presence of bubbles. In the event the sight glass contains bubbles, or no liquid refrigerant, the refrigeration system is operating incorrectly due to either a dirty condensor, defective expansion valve, or low refrigerant level as a result of a leak. Under such conditions, the system should not be operated until the faults are corrected.

### **B. Safety Vapor Control**

At least once a month check operation of safety vapor thermostat. This can be done on refrigerated units by bringing unit up to heat (vapor condensing on cooling coils). Jump "out" or otherwise disable the refrigeration but allow the heat to remain

"ON." Wait until vapors are at top of cooling coils, after the SVC turns off the heat, restart the refrigeration which will start immediately. Heating elements should not be energized, due to the S.V.C. turning off the heating system. After vapors drop below cooling coils (none or very little vapor condensing on cooling coils) turn heat switch off. Re-set safety vapor control and turn heat switch to "ON" position. Heating elements should be energized. For water cooled units, simply turn off cooling water. Observe vapors until (a) heating elements are turned off, (b) vapor rises above cooling coils. Do not allow vapors to rise to top of machine tank and into work area. Turn cooling water "ON" and heat switch "OFF." Re-set safety vapor control, and turn machine heat "ON."

Malfunctioning of safety vapor control can be caused by miscalibration, improper setting, or defective control.

**\*See Primary Refrigeration Piping Schematic on next page**

### C. Cleaning Tank

The degreaser tank requires very little maintenance other than an occasional draining and cleaning. The boiling sump can be cleaned by turning ON the heat as it is produced. As soon as the boiling sump level is down to the heaters, the heat switch must be turned OFF. Then the dirt and sludge may be removed through the boiling sump drain valve (small units) or thru cleanout door opening (large units) before refilling with clean solvent.

Mild non-scratching abrasives in powder form (Bon-Ami or other household cleaners) and soap can be used to clean the stainless steel tank. Steel brushes and sponges should not be used to clean stainless steel as they may leave particles embedded in the stainless steel surface, which would lead to rusting.

### D. Ultrasonics

Maintenance and servicing is covered by the attached ultrasonic generator manual.

### E. Solvent Maintenance

Most solvent can be recycled indefinitely with proper care in distillation and water removal. The solvent should be periodically checked

for proper pH and acid acceptance, due to type of stabilizers, the contamination introduced into the solvent and water in the system (condensation or by parts). For chlorinated solvents your solvent supplier offers an acid acceptance test kit. Fluorinated solvents are very stable and normally do not require periodic tests.

A degreaser removes oil, chips and most organic soils. Where do these soils accumulate? In most degreasers the boiling sump collects the majority of contamination. Solvent flow is normally from condensing coils, to gravity water separator, to spray reservoir, to rinse sump, to boil sump. The solvent counter-flows the travel of work to provide the purest solvent for rinsing (either by spray or immersion).

**Caution:** Contaminated solvents can be flammable due to nature of contamination.

The degree of solvent contamination, governs the degree of part cleanliness. Briefly, a "CLEAN DEGREASER" produces "CLEAN PARTS." Oil contamination increases boiling temperature of solvent. When the normal boiling temperature is exceeded by 7° F., machine should be cleaned out.

Aluminum or magnesium fines or trimmings can cause accelerated solvent breakdown. When cleaning parts of these materials, a closer watch on solvent acidity is required.

Discard solvent with high acidity and completely clean and flush equipment with a solution of water and soda ash (2oz. per gallon). **Caution: NEVER USE CAUSTIC SODA.** Flush and rinse with water, dry and refill with fresh solvent.

Periodic inspection is required on some machines equipped with silica gel dryers. When water droplets are observed on top of liquid in dryer shell, replace silica gel.



# **INSTRUCTIONS FOR CLEANING DEGREASERS AFTER SOLVENT DECOMPOSITION**

## **Introduction:**

The introduction of modern stabilization systems for degreasing solvents has reduced the incidence of acid degreasers to the point where significant decomposition is rare. Occasionally, however, acidity may develop because a necessary maintenance schedule is not followed; acidic soils are introduced; white metals contact heating surfaces, etc.

Rapid, violent chemical reactions are possible when considerable quantities of aluminum or magnesium fines are present in an acid degreaser and great precaution is necessary to prevent damage to the equipment and plant if trouble develops.

Steel, copper and zinc alloys do not present the same violent reaction possibilities as aluminum and magnesium in an acid degreaser, but all due caution should be exercised.

Two types of reaction products are formed in an acid degreaser:

1. Irritating, corrosive and toxic fumes; sharp, pungent odors emanate from the machine.
2. Black, gummy residues composed of carbon, polymers, metal-organic compounds and, when aluminum is present, aluminum chloride.

The fumes are corrosive to metals, not only in the degreaser, but also in the surrounding plant area. The black, gummy residues are also very corrosive and, in addition, 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 degreaser.

To check the condition of the solvent, shake equal volumes of distilled solvent and neutral

distilled water. Check the water layer for pH. Generally a pH below 6.0 is a result of decomposition of the solvent. Acid acceptance kits are available for Trichlorethylene and n-Propyl Bromide.

Your solvent supplier should be consulted if you suspect an acid condition and the following procedure should be adopted to prevent serious damage to the machine and disruption of the process.

## **Stepwise Cleaning of an Acid Degreaser:**

1. Turn off the heat to the degreaser.
2. Do not shut off the water to the condenser coils.
3. Send all personnel away from the immediate area except those required to clean the machine.
4. Wait until the temperature of the solvent drops to a minimum of 30 - 50° F. below boiling point of solvent. In some cases, it may be necessary to cool the degreaser by external means. Should this be necessary, spray cold water on the outside of the degreaser until the temperature of the solvent drops at least 30 - 50° F. below boiling point of solvent.
5. Use a 3/4" or 1" hose attached to the main water supply to flood the degreaser. Cover all solvent to a depth of 2 to 4 inches. (NOTE: Adding a small amount of water may aggravate the condition.) Adding 1/2 cup of soda ash for each gallon of water used will help neutralize the acidic decomposition products and will facilitate cleaning the machine.
6. Drain water separator on degreaser and /or still and pour solvent portion back into degreaser.
7. Turn heat on and proceed to distill out into steel drums. Check distillate for pH frequently. If pH is 6 or higher, this reclaimed solvent can be mixed immediately with an equal or greater quantity of new solvent for reuse. Distill down as far as possible without danger of exposing heating surfaces.
8. Turn heat off and pump bottoms into still or into drums.

9. Pump all residual solvent from the degreaser and water separator into steel drums to which have been added about one pound of soda ash and some water. (NOTE: Do not insert the bungs in the drums.

Carbon dioxide is formed by the reaction between soda ash and acid solvent. If the drums are sealed, internal pressure built up from the evolution of carbon dioxide will split the drums.) Make sure enough water is present in the degreaser to prevent solid residues from being exposed to the air when the solvent is pumped out of the machine. (The water floats on top of the solvent.) Do not use caustic soda.

10. After the solvent has been removed, cover heater surfaces with water. Add 1/2 cup of soda ash per gallon of water and bring to a boil. After cooling, pump or drain water out of the system.

11. Remove the cleanout doors and scrape out any residues (from outside) of the tank. Transfer all solids from the machine into metal drums containing water. All of these wastes should be disposed of in accordance with all applicable Federal, State and local Hazardous Waste Regulations. Handle the drums with care. Turn off the heat and hand spray soda ash solution on cooling coils, troughs, walls, and allow water separator to fill up (via the troughs).

#### **WARNING**

a. Before cleaning tank interior, drain contents and open cleanout doors. Ventilate and clear all vapors from pockets in tank or pits.

b. Do not enter degreaser until unit has been shut off, all solvent drained from unit and cleanout doors removed. Person entering degreaser shall be equipped with halter and lifeline together with NIOSH/MESA pressurized air mask. Man on outside shall be similarly equipped and be able to communicate with person in tank.

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

d. Death can result from carelessness.

12. Replace all cleanout door plates.

13. Refill all sumps of machine with 6 to 8 inches of water. Add about 1/2 cup of soda ash for each gallon of water used. Turn on the heat to the machine. When solution comes to boil, pump solution from each sump thru a flexible hose, spray the condenser coils, troughs, conveyors, and inside wall of machine. Be sure to fill the water separator (via the troughs). Also pump soda ash solution thru spray wand, spray piping, etc., depending on how machine is equipped.

14. Turn off heat. Cool and drain.

Remember to drain water separator.

15. Remove cleanout doors to scrape out any remaining residues. (An undetected deposit of unneutralized residue as small as a pea can cause the degreaser to go acidic again after it has been put back in service because of the catalytic nature of the residue.)

16. Wipe dry all interior surfaces of the degreaser body, conveyor and components.

17. Inspect and replace damaged thermostats, corroded condenser coils, etc.

18. Replace all damaged cleanout door gaskets with new ones.

19. Recharge the degreaser with clean solvent and bring up to operating levels with new solvent.

The degreaser is now ready for service. It is suggested that the degreaser run idly for 1 to 2 hours to expel excess water from the system.

#### **Further Comments:**

1. If solvent decomposition is experienced, your cleanout and maintenance program should be thoroughly reviewed.

2. Consult your solvent supplier to determine whether the acidic solvent is salvageable.



# "ZER-O-COIL" FREEBOARD CHILLER

**ULTRONIX, INC.**, a manufacturer of degreasing and distillation equipment, has developed a NEW low temperature freeboard chiller. Trademarked as *ZER-O-COIL*, this system operates continuously in the refrigeration cycle. By installing finned tubing around the inside perimeter of the degreasing tank directly above the primary condensing coils, proper sizing of the *ZER-O-COIL* develops a cold air blanket across the entire vapor zone. To develop this cold air blanket, the refrigeration must operate at  $-10^{\circ}$  to  $-30^{\circ}$  F. At these temperatures ice forms, and here is where the *ZER-O-COIL* surpasses all other equipment -- *ZER-O-COIL* operates at these temperatures without a defrost cycle.

## **HOW "ZER-O-COIL" WORKS:**

ULTRONIX, INC. "ZER-O-COIL" is composed of a minimum of four passes of extruded finned tubing placed directly above the vapor line. ULTRONIX, INC. "ZER-O-COIL" is designed to operate continuously in the refrigeration cycle and maintain the cold air blanket. Other systems must defrost the coils (usually once every hour). The blanket deteriorates during this defrost cycle and can take from several minutes to as much as 50% of the run cycle to reform after defrost. This means that once every hour there is a period where solvent fumes are expelled from the tank.

## **"ZER-O-COIL" REMOVES ICE WITHOUT DEFROSTING THE COILS AND WITHOUT LOSING THE COLD AIR BLANKET:**

ULTRONIX, INC. "ZER-O-COIL" divides the four passes into TWO individual circuits. Circuit one (1) contains coils one and three, while Circuit two (2) contains two and four. "ZER-O-COIL" removes ice build-up by

directing hot gas into individual circuits and removing the ice just on that circuit. The other circuit remains at sub-zero temperatures and maintains the cold-air blanket.

ULTRONIX, INC. "ZER-O-COIL" is adjusted specifically for each individual tank according to the amount of ice accumulated on the coils. Each "ZER-O-COIL" is equipped with a NEMA 12 electrical enclosure containing a run timer and a hot gas timer. The run timer is the actual length of time between the hot gas cycles. The hot gas timer is the actual length of time that hot gas is directed into each circuit. These timers will be set by the **ULTRONIX** technician at the time of installation, but may need to be readjusted periodically.

## **ULTRONIX, INC. "ZER-O-COIL" TIMER INSTRUCTIONS:**

The run timer must never be set below one-half (1/2) hour; more frequent intervals will not allow the refrigeration to maintain desired temperatures. **ULTRONIX** also recommends never setting this timer above one (1) hour as the hot gas is also used to return oil to the refrigeration compressor.

The hot gas timer should be carefully set to remove between 2/3 and 3/4 of the ice buildup on the circuit, the rest is removed by the transfer of heat as the coils pull back to temperature. It must be noted that if the hot gas period is too long, all of the coils will heat up and cause the blanket to deteriorate.

**"ZER-O-COIL" MAINTENANCE**  
**INSTRUCTIONS:**

ULTRONIX, INC. recommends that routine service be performed every three or six months depending on your degreasing process, that includes the following:

- Clean condensing coils on air-cooled units,
- Check refrigerant charge,
- Check compressor oil charge,
- Check discharge and suction pressure,
- Check refrigeration temperatures,
- Readjust refrigeration (as needed),
- Readjust Run and Hot Gas cycle (as needed),

**CAUTION: Above routine service MUST be performed by a LICENSED REFRIGERATION MECHANIC ONLY. Should you opt to have other than Ultronix personnel perform this service, please contact Ultronix first. Failure to do so will result in void of warranty.**





**INSERT STEAM  
PRESSURE & COOLING  
WATER REQUIREMENTS**



**INSERT TYPICAL EE  
SERIES PANEL PLATES**

# SAFETY & OPERATION CONTROLS

(INCLUDED ON ALL ULTRONIX DEGREASERS)

## A. SAFETY VAPOR CONTROL

If there is inadequate or excessive warm water entering the primary condensing coils, the solvent vapor can rise and overflow the degreaser. A thermocouple or sensing bulb is located directly above the primary coils. Solvent vapor reaching the sensor will cause the heat input to the boiling sump to shut off. In most cases, the poor coolant conditions must be rectified before the degreaser can be restarted. The manual reset button on the control must be depressed.

## B. LIQUID HIGH TEMPERATURE

When the boiling solvent becomes contaminated with an excess of oil from the degreasing operation, the temperature of the mixture will rise eventually to a point where degreasing efficiency is impaired. A thermocouple or sensing bulb in the boiling liquid will cause the heat input to shut off at the preset temperature, the digital readout will allow maintenance to monitor the status of the solvent and schedule solvent replacement.

## C. LOW LIQUID LEVEL

It is dangerous and undesirable for the solvent level to be so depleted that the heating coils are exposed to the solvent vapor. The low liquid level is a float-type control, which will shut off the heat. Restart is automatic, after the solvent level is replenished.

## D. WATER FLOW HEAT SHUT-OFF

If in the event the water temperature in the primary condensing system is inadequate, the heat input to the degreaser or still is turned off. Restarting is automatic, when the water flow is resumed.

## E. WATER HIGH TEMPERATURE/HEAT SHUT OFF

If the water temperature being discharged from the degreaser exceeds the designed set point, the heat control is automatically turned off. Restarting is automatic when the water temperature drops below the design set point.

## F. LOW VAPOR LEVEL/SPRAY SHUT OFF

If an excessive work load is introduced into the degreaser and the vapor line drops, either manual or automatic spray systems will not operate until the vapor line recovers to the normal operating level.

## G. MODULATING ENERGY

When the unit is idling, this control will cut off approximately 40% of the heat input. When work is introduced into the degreaser, the vapor level drops, and the sensing bulb will automatically increase the heat input.

## H. MODULATING WATER

A temperature sensing bulb placed on the discharge of the water line from the primary coil will modulate the water flow to allow approximately 110° F. discharge.



# DEGREASER OPERATION

## PREPARATION FOR USE:

### 1. SOLVENT LEVEL:

Solvent level in the degreaser should be 4 to 5 inches above the steam, or electrical heating elements, depending upon the type of heat used. The solvent level should never be above the work rest. Use solvent as received in the drum. Do not dilute with any other substances.

### 2. TURN ON THE WATER TO THE CONDENSER:

A water flow switch is provided to ensure that cooling water flow has been established before the heat can be turned on.

### 3. TURN ON THE HEAT:

Steam, before energizing the steam coils on a degreaser or still, make sure the steam pressure corresponds to the solvent being used. Example: Trichlorethylene = 15psig.

### 4. VAPOR LEVEL:

When the solvent boils, a vapor is generated which will rise up to the condenser, thus filling the machine with pure, saturated vapors.

For proper operation the vapor level, when there is no work in the machine, it should be at the center of the bottom water condensing coil.

### 5. VAPOR UP THERMOSTAT:

The **ULTRONIX** vapor up thermostat is an automatic reset thermostat with the sensing system located at the design vapor line. The system opens on the rise of temperature to modulate the steam solenoid on steam heated units, or removes auxiliary heat elements on electrical heated systems.

Similar units are used to detect vapor up for the control of spray systems or where regulations require that vapor should be at a design level before a function can take place.

### 6. CONDENSER WATER UPPER LIMIT CONTROL:

The **ULTRONIX** water temperature control is the same model temperature control that is used in the vapor line control. The sensing bulb is located on the discharge side of the water outlet line. The control opens on temperature rise and automatically resets.

### 7. WATER TEMPERATURE:

Five to ten minutes after the vapor reaches the condensing coils, the water flow valve can be regulated to minimize water flow. This will also check the "Condenser water upper limit control." Refer to the **ULTRONIX** quote sheet for recommended upper water temperature limit.



# INSTRUCTIONS FOR CLEANING WORK

## 1. LOADING THE BASKETS:

Recommended baskets are those of round rod and mesh construction. Work should always be loaded in the best position for complete drainage. Liquid solvent should not be carried out of "cup-shape" of recessed articles. If work cannot be placed in a position for complete drainage, it is recommended that tilting, shaking and/or tumbling be done while the work is below the vapor line.

## 2. ENTRY INTO VAPOR:

Speed of lowering or raising work into or out of the vapors should be controlled. The maximum speed should be 11' per minute, however, 8' per minute is recommended. The workload is lowered into the vapors and held until all cleaning operations are complete.

## 3. SPRAYING:

The tip of the nozzle is placed below the vapor line where it is kept during the entire time that solvent is being sprayed. The switch is used to start the pump motor. Direct the spray of solvent at the work and slush the part until the insoluble are removed. Take care to avoid ricochet of solvent up out of the vapor. Shut off the pump, and drain the nozzle inside the machine. Do not allow spray hose in vapor.

## 4. REMOVAL OF WORK:

Permit the work to remain in the vapor until all condensing has stopped on the parts. The time of cleaning in vapor is relation to the mass of the work. Observation of the time when vapors practically stop condensing on the work is a signal that

cleaning has been completed, and work may be removed.

## 5. SHUTTING OFF DEGREASERS:

The sequence of steps in shutting off a degreaser is as follows:

- a. Turn off the heat,
- b. Close the cover of the machine slowly.

**CAUTION: NEVER ALLOW THE MACHINE TO BOIL DRY.**

## 6. DISPOSAL OF SLUDGE:

**(ALWAYS COOL BEFORE REMOVING)**

See if solvent vapors rise to the condenser when the above levels (or higher) exist for a period of 15 minutes, when full heat is being applied. If not, the liquid remaining is concentrated oil and may be disposed of in accordance with all current local, state and federal regulations covering the disposal of hazardous wastes.



## HOIST OPERATION (Optional)

1. Start Button (Green) - Cycle Start  
Stop Button (Red) - Stop/Reset  
Amber Light - Cycle Complete
2. ALWAYS start the cycle at the Load/Unload position. Press and hold the red stop button until the hoist arm stops at the up position and left of the degreaser (above the boil wash sump).
3. Load wash load.
4. Press cycle start (green button).
5. When load is complete, the amber light will come on.
6. Remove load and press red stop button to reset for next load.
7. IMPORTANT: If the stop button is used during any part of the cycle, press and hold stop button until the hoist is in the START position. DO NOT press the start button until the platform is in the load position.

# ENVIRONMENTAL SAFETY

1. Under no circumstances should any of the chlorinated hydrocarbon solvents or mixtures containing such material ever be dumped on the ground as they may pollute the surface as well as underground water.

2. Accidental spills should be cleaned up immediately under ventilation by personnel wearing an airlike mask or oxygen supply equipment. Unprotected persons should leave area of spill immediately. When a spill occurs, one of the recommended procedures is to contain the spilled solvent in as small an area as possible using a dry absorbent or sawdust to absorb the solvent.

3. Degreaser clean-out sludge should be placed in containers, which are kept, closed but not tightly sealed. Containers should be stored away from sparks or open flames as the sludge may contain combustible material. If these drums are stored outside, until their contents can be treated according to EPA approved procedures, they must be maintained properly to make sure their contents are contained and no spillage or seepage takes place.

4. Each employee should be impressed with his responsibility to report promptly any suspected leaks or equipment failures. All use and storage equipment must be properly maintained. Make sure there are no leaks in your degreaser piping, storage tank, and transfer piping. Check all valves and pump seals for leaks.

5. All containers, shipping equipment, common carriers, other vehicles, storage and equipment covering applications for solvent should have proper labeling to identify the product and carry a warning statement. Appropriate warning statements

should be placed in prominent positions on the degreasing equipment itself.

6. In the interest of economy, solvent should be reclaimed from sludge. In degreasers, the contaminated solvent is

distilled until there is no condensed solvent flowing to the water separator. The surfaces of the steam heating coils, electric immersion heaters, or gas immersion tubes, should not be exposed since it is important to avoid the possible bake-on which otherwise may take place and which can detract from the heat transmitting function of the heater or coils.

In solvent stills, the residue should be steam stripped before it is discarded (except 1,1,1-Trichloroethane). Waste disposal depends a great deal on local and federal regulations. The waste material may be flammable and must be treated with care. It should not be burned in boilers or heaters nor dumped into a sewer. Direct contact with residue should be avoided, and all residues should be handled in covered receptacles. Exposure to vapors arising from hot residues should be avoided, and food should not be permitted anywhere near an accumulation of such residues.

Sludge should be transported by EPA approved waste and disposed of by companies who employ EPA approved disposal facilities and procedures.



**Equipment Model:** General

**Subject:** Watlow Temperature Control

## General Description

Ultronix, Inc. uses different models of the Watlow Thermostat control for different functions. The next section describes each functional use for the thermostat. In general, a thermostat circuit monitors or controls the temperature in one area of the machine. It reads a thermocouple sensor input to determine that temperature. It then opens and closes the circuit between output terminals as the sensed temperature goes above or below the operator adjustable set point temperature. We use this thermostat output to turn heating or cooling circuits on and/or off.

Ultronix, Inc. changed to the solid state Watlow thermostat. There are distinct advantages of the Watlow over the previously used electro-mechanical type thermostat.

- Solid State Operation
- Faster Response Time
- Probe is Replaceable As Separate Unit
- No Field Calibration Required

All models of the Watlow Thermostat used in Ultronix, Inc. equipment, are factory calibrated for a 0-300° F, operator adjustable, set point range. They require a Type "K" Thermocouple sensor for input. They provide output connections from a SPDT Relay. This allows using them for a High or Low Limit control or an On and Off control.

See attached Watlow cut sheets.

When the temperature at the thermocouple sensor is below the set point temperature, the amplified input voltage is less than the set point reference voltage. The comparator circuit keeps the output relay energized. When the sensor temperature goes above the set point temperature, the amplified thermocouple voltage exceeds the set point

reference voltage. The comparator circuit de-energizes the output relay.

We use the High Limit control for areas of safety, such as for SVC and HTC (see next section). In normal operation, the thermostat output relay remains energized. Its closed "NO" contacts create a series circuit for the heaters. If the temperature at the sensed area increases above the set point, the output relay contacts open the circuit and turn off the heaters. Even after the temperature returns to a normal value, the relay will not re-energize until you press the manual Reset switch.

We use the On-Off control on refrigeration cooling units. During night time operation, this control causes the refrigeration compressor to turn on and off to maintain a consistent temperature at the cooling coils. The output relay automatically resets as the sensed temperature goes above and below the set point temperature. When the temperature reaches the set point, the compressor turns on. When the temperature decreases below the set point by a differential amount, the compressor turns off.

## Function and Adjustment

**NOTE:** Your equipment will not use all of the optional controls described in this section. Refer to your General Assembly and/or Wiring prints to determine which ones do apply. The listed temperature settings are typical. They can vary with different applications.

1. Proper adjustment and function of the safety vapor control (SVC) is extremely important. The vapor line (where top of vapor blanket meets air) is usually half way up the solvent condensing (cooling) coils. See the General Assembly print for your equipment. The safety vapor control turns off the heat if the solvent vapors rise above the condensing coils. The SVC trips if the

cooling coils do not maintain a temperature cold enough to condense the solvent vapors. This control helps prevent the hazards associated with solvent vapors escaping into the atmosphere.

The proper temperature setting for the SVC is about 15° F below the normal boiling temperature of the chosen solvent. Refer to solvent specification sheet for the boiling point of solvent used in your system. Use the following test procedure to determine the specific temperature setting required to allow proper operation.

Periodically (monthly) verify the operation of the safety vapor control. Turn the cooling off until: (a) the SVC turns off machine heat, or (b) the vapors rise above the condensing coils. Do not allow vapor to reach the top of the tank. Re-adjust the safety vapor control if heat does not shut off as vapors reach the top of the condensing coils. Set the control for a lower temperature. Repeat checking the SVC operation until you obtain the proper setting. You should not operate the equipment with a faulty safety vapor control.

2. The cleaner is equipped with a high temperature control (HTC). The proper temperature setting is 20° F above the solvent boiling temperature. The H.T.C. will turn off the heat if the solvent level drops below the top of the heater elements. This helps prevent burning out the elements if you let the solvent level get too low in the tank. Check this level daily.

3. The optional Vapor Up (VU) thermostat turns on an indicator light when the solvent vapors are up to proper level on the cooling coils. This indicates the equipment is ready to operate. It also inhibits the spray pump(s) when the vapor line is below normal operating level. Proper temperature setting is 3- 5° F below the solvent boil temperature. This control indicates vapor up when the heat of rising vapors reach the cooling coils and the VU sensor. A long heat up time can indicate contaminated solvent or a defective heating element.

4. The optional liquid temperature control (LTC) senses the temperature of the solvent in the boil sump. Contamination or alcohol

buildup in the boil sump will cause the boiling temperature to increase. The LTC will shut off the heat if the boiling point raises to an undesirable degree. When using an alcohol blend solvent, the alcohol level could increase to a flammable point. The same condition applies when parts carry in alcohol or other flammable liquids into the cleaner. This control should turn off the heat before the solvent blend becomes flammable. It is set at approximately 7° F above the boiling point of the solvent. When the LTC trips, you should drain the boil sump and recharged with fresh solvent. Dispose of contaminated solvent in the proper manner.

5. The optional water temperature thermostat (WTH) may be included in models with water cooled condensing coils. This control shuts off the heat input if the cooling water is above adjusted temperature. See prints with degreaser/cleaner for specifications. Verify the water valve is open, the "Y" strainer is not clogged, and the water pressure and temperature are within specifications. Insufficient cooling will cause a trip of the safety vapor control circuit also.

6. The refrigeration thermostat (RT) is used on units with refrigeration cooled coils. It functions to control the operation of the compressor. It automatically resets as temperature at the probe (connected to the cooling coil) changes. During night time operation of the refrigeration system, this control causes the compressor to turn on when the coil temperature increases to the set point temperature. The compressor runs until the coil cools down to the differential point below the set point. During machine operation, the heat load of the solvent vapors on the coils (and sensor) prevents the temperature from reaching the shut off point. The compressor should continue running as long as vapor is up in the machine.

### Testing/Troubleshooting

While recalibration is not normally required, it may be necessary to replace the unit at some time. Here are some brief tests that you can perform to determine if the defective part is the thermostat or the probe.

Normal operation for the safety thermostats will have the green "load" indicator lamp on. When the control trips because of an unsafe condition, the "load" indicator will go off. If the "load" indicator stays on all the time, even when the thermostat dial is turned to the low end of the scale, replace the thermostat.

The more likely condition is that the "load" indicator will be off and can not be reset. The following procedure should assist in troubleshooting and identifying the problem.

1. Short the Reset switch. If the indicator lamp comes on, replace the switch. If the lamp stays off, go to next step.

NOTE: In normal operation, you must press and hold the Reset switch a few seconds before the thermostat will reset.

2. Remove probe leads from the thermostat and short the terminals with a 14 gauge jumper (paper clip). If the "load" light comes on, replace the probe. If the lamp stays off, replace the thermostat.

Erratic operation can be caused by a failing thermostat or a misplaced or dirty probe. The probes are tip sensitive, which means that only 1/8" - 1/4" of the probe tip is a sensing surface. For contact probes, like those used on the H.T.C. or RT, the tip must be in close contact with the component being sensed (heating element or cooling coil). Contamination or sludge around the tip can cause a loss of sensitivity.

To check operation of the thermostat, remove the probe leads and short between the terminals with a paper clip as previously described. Turn the dial down until the thermostat trips ("load" light goes out). The indicated temperature should be close to the ambient temperature in the control panel. Turn the dial back up, reset the thermostat and repeat the step. If this step can be repeated several times with no more variation than 1° F indicated, the thermostat is probably good and the probe should be replaced. On rare occasion, the wire connecting the probe and thermostat may

require replacement. Use type "J" thermocouple wire. Replace full length. **Do Not Splice.**



# INSERT - WATLOW INFO



# INSERT - WATLOW INFO

**Equipment Model: General**

**Subject: Magnetic Drive Solvent Pump**

**General Description**

This pump assembly usually mounts in the unit by threading directly into a fitting on the tank wall (male pipe threads on both the suction and discharge fittings). It is used in rinse filtration and in distillate spray systems.

A magnetic drive pump allows for a more reliable seal against solvent leaks. The motor shaft does not connect directly to the impeller and therefore, does not require a seal. The impeller assembly contains a magnet which "floats" in a cup housing. A cup shaped magnet connects to the motor shaft. This magnet fits over the impeller housing. As the motor and magnet rotate, it magnetically turns the impeller. This arrangement normally creates a positive drive from the motor to the impeller. However, if the impeller binds or stalls, it does not cause a bind and overheating of the motor. Note that if the solvent temperature exceeds 200° F., the magnets lose their function. The impeller temporarily stalls until the magnets cool. Use a different pump or cool the solvent prior to the pump.

**To Remove/Replace the Pump Assembly:**

1. Drain / assure solvent level in sump is below the pump fitting.
2. Disconnect power to the unit.
3. Disconnect wiring at the motor junction box and piping from the pump.
4. Unscrew the motor and pump assembly from the sump wall fitting.
5. Reassemble the new pump in reverse of

removal - use new Teflon tape or Teflon based pipe thread compound on the fittings.

**Preventative Maintenance:**

The only routine maintenance required on this assembly is lubrication of the motor, and observing the assembly for solvent leaks and proper output. Each six (6) months, add several drops of S.A.E. 20 wt. Oil in the motor lubrication tube. If a leak is noticed, replace the "O" ring seal. If output volume / pressure is decreasing, clean the pump assembly. Contamination in the solvent, particularly metal fines, can collect around the magnet and cause the impeller to bind.

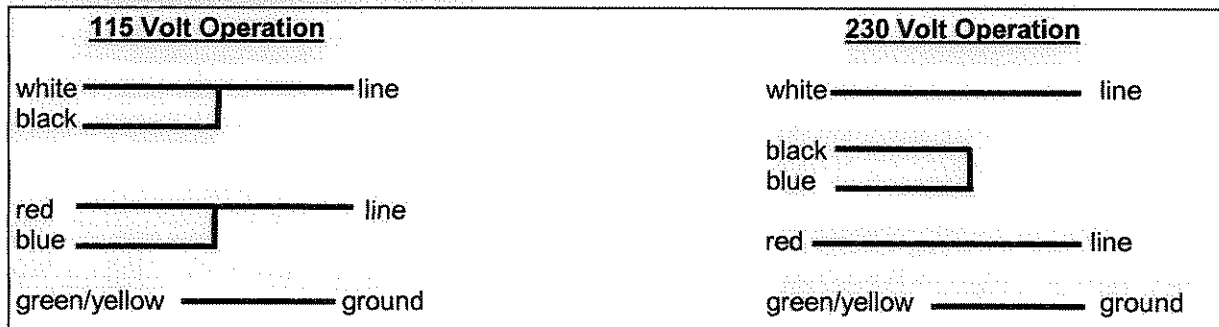
**Pump Cleaning / Repair**

1. Remove the pump assembly from the unit.
2. Remove the four (4) screws securing the pump housing to the connecting bracket (see illustration).
3. Remove the four (4) screw securing the impeller magnet housing to the pump housing.
4. Remove the impeller / magnet from the housing and clean all parts.
5. Install a new "O" ring and reassemble in reverse order of disassembly. Tighten the screws evenly and in a cross pattern.

**NOTE:**

You may prefer to leave the pump housing attached to the sump fitting, and remove the rest of the assembly from the housing.

**MOTOR WIRING CONNECTIONS:**



**Equipment Model:** Precision Degreasers**Subject:** Dryer/Spray Reservoir

### General Description

A dryer system removes water from the solvent distillate. The solvent vapors condense on the cooling coils and drip into a trough. This solvent distillate gravity feeds through the trough and into a pipe that goes through the tank wall. The distillate then runs into the dryer tank. This tank contains a molecular sieve (desiccant dryer media). This media adsorbs any water present in the distillate.

The distillate solvent collects in the dryer tank until it overflows through the stand pipe in the spray reservoir tank. When you use the spray, solvent pumps from this reservoir to the spray wand. As you spray parts below the vapor line, solvent returns into the degreaser tank. If sufficient solvent builds up in the spray reservoir, it overflows through a pipe into the degreaser tank. The solvent boils to a vapor and the process starts over again. This is a sealed, closed loop system. It's designed to prevent solvent losses.

As solvent passes through the dryer tank, the desiccant media adsorbs suspended water molecules. The media will adsorb a limited amount of water. You need to replace the media before it loses its capacity to adsorb water.

The first result of excessive water in the solvent is water vapor in the solvent vapor. Solvent vapor is normally colorless. When present, water causes the vapor to have a white, foggy appearance. This water vapor will deposit on the part, leaving water marks and some contamination. Without proper maintenance, solvents can become corrosive (go acid) when they contain concentrations of water. Alcohol blend solvents can become flammable with a concentration of water present.

### Dryer Media Maintenance

As soon as experience on the system allows, develop a schedule to replace the desiccant dryer media, before water vapor appears.

1. The desiccant media is a molecular sieve, type 3A. It is the potassium form of the Type A crystal structure, on alkali metal aluminosilicate. Type 3A will adsorb molecules with critical diameters up to 3 angstroms. This small pore size prevents coadsorption of other molecules, while adsorbing water.
2. You place the molecular sieve in a cloth bag with a draw string. Place the bag of media into the dryer basket. Lower the basket inside the dryer tank. The bag should be below the solvent liquid line and the solvent outlet. After you can see water in the vapor, you will see water droplets floating on the surface of the solvent in the dryer tank. This is further indication that the media needs to be changed.
3. To replace the media, turn off the heat, then drain the solvent from the dryer. Return the solvent to the vapor sump. Unclamp the sealed lid from the dryer tank.



**INSERT - FIGURE - DRYER/SPRAY RESERVOIR**

**INSERT - HOW TO START UP & CLEAN SINGLE COLUMN  
CARTRIDGE FILTERS**

**AMERICAN SOCIETY FOR TESTING AND MATERIALS**  
**1916 Race Street, Philadelphia, PA 19103**

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If not listed in the current combined index, will appear in the next edition.

**Standard Practice for**  
**CONFINED AREA ENTRY<sup>1</sup>**

This standard is issued under the fixed designation D 4276; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parenthesis indicates the year of last reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

**1. Scope**

1.1 This practice covers recognized procedures necessary to protect the health and safety of workers required to enter confined spaces. These procedures are particularly applicable to entry into the confined areas associated with the use of halogenated organic solvents.

1.2 Confined areas addressed in this practice include, but are not limited to: vapor degreasers, cold cleaning tanks, storage vessels, tank cars and trucks, van trailers, ships or barges, pits or sumps, and unventilated rooms.

1.3 This practice does not necessarily address entry into all confined spaces nor does it address the decision strategy involved in requiring such entry.

1.4 Although this practice describes specific safety steps to be taken for entry into confined spaces, it is not intended to preclude the use of any additional measures that may be deemed necessary for a particular situation.

1.5 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the*

**4. Procedure**

4.1 All personnel working in confined areas should be properly trained in safe entry and rescue procedures. They should have a working knowledge and understanding of the hazards that may exist.

*responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

**2. Significance and Use**

2.1 Vapor inhalation is the primary hazard encountered in the use of chlorinated solvents. The greatest potential for over exposure to these solvent vapors occurs where the employee is exposed to the high concentrations of vapor that may be found in enclosed areas. The seriousness of this hazard is often underestimated by those performing this type of work.

2.2 This practice is designed for use by employers in developing their own specific standards for vessel or enclosed area entry.

**3. Summary of Practice**

3.1 Confined area entry refers to the entering of any tank, vessel, sump, pit, duct, tank car, tank truck, van trailer, or enclosed space in which there has been, or may have been chemicals, chemical vapors, or a lack of ventilation.

4.2 *Entry Permit* - Entry into confined spaces should be by written entry permit, issued by the responsible supervisor or other qualified person. The purpose of the entry permit is to ensure that a checklist of precautions has been reviewed prior to entry. This permit is an authorization, and approval in writing certifying that all existing hazards have been evaluated

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D-26 on Halogenated Organic Solvents and is the direct responsibility of Subcommittee D26.05 on Industrial Hygiene.  
Current edition approved April 4, 1984. Published May 1984.

and necessary protective measures have been taken to insure the safety of the worker. The permit should be valid for a limited time only, (usually an 8 or 10 hour shift) and issuance of a new permit required in the event of any job interruption or any indication of changes in job conditions. Issuance of the entry permit should address all of the following considerations.

#### 4.3 Vessel Preparation:

4.3.1 *Isolation* - All process lines exiting or entering the confined space should be disconnected, capped off, and blinded. Closing of valves alone is *not* adequate protection.

4.3.2 *Lockout* - Pumps, connected to the enclosed area, or any other mechanical or electrical equipment (particularly conveyors) are to be locked out by locking the main electrical switch in the "OFF" position.

4.3.3 *Cleaning* - The space should be cleared, flushed, or purged of hazardous materials to the extent practical. This should be followed, where practical, by cleaning with water, steam, or other suitable materials.

4.3.4 *Ventilation* - A system for positive ventilation should be provided, prior to and during the entire entry period, through the use of fans, portavents, air movers, or by adequate natural drafts.

4.4 *Atmospheric Testing* - The enclosed space must be tested for the following prior to and during any entry:

4.4.1 *Oxygen Content* - The oxygen content must be between 19.5 and 22.0% in all levels of the tank.

4.4.2 *Flammability* - The atmosphere must be nonexplosive (less than 10% of the lower flammable limit).

4.4.3 *Toxicity* - The atmosphere should be tested to ensure the absence of toxic concentrations of vapors.

4.5 *Personal Protective Equipment* - Personal protective equipment is not an adequate substitute for safe working conditions, adequate ventilation, or safe working practices.

4.5.1 Personal protective equipment can include, but is not limited to: approved respirator, hard hat, safety glasses or safety goggles, gloves, and long sleeved shirts.

4.6 *Area Safety Equipment* - Any person entering the enclosed area must be fitted with a safety harness and lifeline. The lifeline would be secured outside the entrance.

4.6.1 Where entry into the vessel must be made through a top opening, a hoisting device or other effective means must be provided to lift employee out of the space.

4.6.2 Ladders must be in place for entrances and exits where the drop or climb involves a depth of more than 3 ft.

4.6.3 Self-contained breathing apparatus or supplied air respirators should be available at the vessel entrance. These devices must be worn if testing finds the toxicity level to be above the OSHA limits.

4.7 *Observer* - A second person should be available at the area entrance and in sight of the person inside at all times. He should be equipped with proper safety equipment and adequate communications equipment for summoning additional help if necessary (for example, two-way radio, whistle, etc.). Under no conditions should this observer enter the enclosed area unless others are standing by. If the observer is required to leave his post, the person inside the enclosed space must come out.

4.8 *Tools* - Approved low-voltage electrical equipment must be used where the atmosphere in the confined area may contain flammable vapors or where the atmosphere could contain solvent vapors within their flammable limits. All electrical circuits should be equipped with a ground-fault interruptor.

4.9 *Labeling* - Entrances to confined space should be posted, identifying the area as a confined space and that a permit is required for entry. During the work, when there is more than one entrance to the confined area, signs indicating that workers are inside, posted at each entrance, are advisable.

## 5. Testing Procedures

5.1 The tests required prior to entry into a confined area make use of specialized equipment.

5.1.1 *Oxygen Content*<sup>2</sup> - Use a portable instrument that analyzes directly for oxygen irrespective of the solvent vapors present in the air.

5.1.2 *Flammability* - Measurement of the flammability of the atmosphere may be done using a combustible gas indicator.<sup>3</sup>

5.1.3 *Toxicity* - If the prior contents of the vessel are known, the remaining concentrations of those materials may be determined as follows: for methylene chloride,

<sup>2</sup> Model OX230 Audible Alarm Oxygen Monitor, National Mine Service Co., Oakdale, PA., or equivalent.

<sup>3</sup> Explosimeters (registered trademark), Mine Safety Appliances, or equivalent.

trichloroethylene, 1,1,1 trichloroethane, and perchloroethylene, use gas-detector tubes found in the NIOSH certified equipment list.<sup>4</sup>

A calibrated halide meter<sup>5</sup> may be used as an alternative. For trichlorotrifluoroethane, use either a portable flame-ionization gas chromatograph<sup>6</sup> or a portable IR analyzer.<sup>7</sup>

*The American Society for Testing and Material takes no position respecting the validity of any patent rights asserted in connection with any mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race Street, Philadelphia, PA 19103.*

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<sup>4</sup> Available from the National Institute for Occupational Safety and Health, 5600 Fisher Lane, Rockville, MD 20857. Publication Number 80-144 and Supplement Publication No. 82-106.

<sup>5</sup> Gas Tech Inc. or equivalent.

<sup>6</sup> OVA-108 or 128, Foxboro, or equivalent.

<sup>7</sup> MIRAN 101, Foxboro, or equivalent.

## SAMPLE PERMIT Tank or Confined Area Entry Permit

NOTE - This permit is valid only between the hours noted. Any change of supervisor, workman, or working conditions will void this permit.

Permit is required for entering any tank or enclosed space for any purpose;

Good This Date Only | Time: \_\_\_\_\_ a.m. to \_\_\_\_\_ a.m.  
p.m. p.m.

Location: \_\_\_\_\_

Equipment: \_\_\_\_\_

Purpose: \_\_\_\_\_

I certify that all necessary precautions have been taken to make this tank safe for entering and carrying on prescribed work during specified time:

Production Supervisor: \_\_\_\_\_

Maintenance Supervisor: \_\_\_\_\_

Atmosphere Tester: \_\_\_\_\_

I have been properly instructed for safe entry into this tank and understand my responsibilities:

Standby Observer: \_\_\_\_\_

Person(s) authorized to enter tank:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Authorizations:

Permit Noted - Supervisor: \_\_\_\_\_

Permit Granted - Superintendent: \_\_\_\_\_

Note - Before this permit can be signed the following sample items must be checked for preparation:

1. Tank cleaned, washed, and purged:  
 Yes  Not necessary
2. Wash water tested for neutrality:  
 Yes  Not necessary
3. All fuses or safety jacks pulled, breakers and switches locked out and tagged:  
 Yes  Not necessary
4. All lines broken or blinded, or both:  
 Yes  Not necessary
5. Atmosphere tested for flammable concentration:  
 Yes  Not necessary Time: \_\_\_\_\_ by \_\_\_\_\_
6. Test for toxic atmosphere:  
 Yes  Not necessary ppm of: \_\_\_\_\_  
Time: \_\_\_\_\_ by \_\_\_\_\_
7. Test for oxygen content:  
 Yes  Not necessary Reading: \_\_\_\_\_%
8. Surrounding area checked for flammability and toxic gases:  
 Yes  Not necessary Time: \_\_\_\_\_ by \_\_\_\_\_
9. Observer assigned and properly instructed:  
 Yes
10. Employees in the immediate area alerted to help if needed:  
 Yes  Not necessary
11. Fresh air supply provided:  
 Yes  Not necessary
12. Rescue harness provided and worn:  
 Yes  Not necessary
13. Tie line attached:  
 Yes
14. Rescue equipment on the job: extra rope, harness, hoisting device, breathing equipment, and alarm:  
 Yes  Not necessary
15. Self-contained breathing equipment to be worn:  
 Yes  Not necessary
16. Protective clothing required and worn:  
 Yes  Not necessary
17. Additional precautionary remarks: \_\_\_\_\_

**REFRIGERATION TROUBLE SHOOTING**  
**(USE ONLY QUALIFIED REFRIGERATION REPAIR SERVICE)**

<b>PROBLEM</b>	<b>PROBABLE CAUSE</b>	<b>SYMPTOMS</b>	<b>REMEDY</b>
Compressor will not start or try to run.	Power failure due to blown fuse, open circuit breaker or open disconnect switch or service switch.	Electrical circuit test shows no power on line side of start relay.	Replace fuse, check load on fuse. Determine why circuit breaker or disconnect switch open. If no reason, close breaker or switch.
	Defective start relay	Test for burned out or open holding coil and broken contacts	Repair or replace
	Open control circuit	Start relay coil not energized	Check pressure switch (on 3 H.P. and up) reset switch. Check reason for either too low or too high pressure.
	Defective compressor	Compressor will not run	Replace defective compressor.
	Low voltage	Electrical circuit tester glows but not at full brilliance, wiggley moves but not up to proper voltage	Check with volt meter, if low check internal power source, loose connections etc. Call power company.
	Low oil pressure	Compressor will restart upon resetting oil pressure switch	Check oil level, add oil if necessary, check pressure control and wiring.

**REFRIGERATION TROUBLE SHOOTING**  
**(USE ONLY QUALIFIED REFRIGERATION REPAIR SERVICE)**

<b>PROBLEM</b>	<b>PROBABLE CAUSE</b>	<b>SYMPTOMS</b>	<b>REMEDY</b>
Condenser starts and stops with machine heat on	Dirty condensing coil	Condensor shuts off on overload	Clean condensing coil (vacuum, do not brush dirt in).
	Condensor fan defective	High head pressure shuts off on overload or pressure switch (if furnished).	Replace defective fan.
	Defective run or start capacitor	Humming on start-up. Frequent start-stops.	Replace defective capacitor.
	Defective start relay		Replace defective start relay.
	Low oil pressure	Compressor will restart upon resetting oil pressure switch (if furnished)	Check oil level, add oil if necessary, check control and wiring, replace control if necessary.
Cooling coils frosting (Normal for chlorinated solvents and low ambient conditions with fluorinated solvents)	R.T. thermostat set too low	Frosting and ice on cooling coils	Reset R.T. thermostat to 45° F. Recalibrate if necessary.
Insufficient cooling with heat "ON"	Dirty condensing coils or obstructed air flow over	Unit heat shuts off on safety vapor thermostat	Clean condensing coil. Clear air flow over condensor.
	System low on refrigerant	Bubbles in system sight glass	Repair leak and charge system.

**REFRIGERATION TROUBLE SHOOTING**  
**(USE ONLY QUALIFIED REFRIGERATION REPAIR SERVICE)**

<b>PROBLEM</b>	<b>PROBABLE CAUSE</b>	<b>SYMPTOMS</b>	<b>REMEDY</b>
Insufficient cooling or adjust	Restricted line strainer, dryer or expansion valve	Temperature change in line after restriction (frosting). * Unit heat shuts off on safety vapor thermostat	Replace restricted part expansion valve (if adjustable) to proper super heat setting 8°/ 12° F.
	High ambient temperature room temperature too high to remove enough heat from condensing coil.	Same as above	Do not operate equipment until ambient temperature drops.
Compressor noisy when starting	Check hold down bolts	Noise from condensor	Spring mounted compressors, loosen hold down bolts. Check 1/2 H.P. condensing unit base bolts, if too long, shorten.
	Liquid returning to compressor	Noisy on start-up	Check R.T. thermostat bulb location, if not on <u>bottom</u> of bottom coil and tight, relocate and tighten.

\* NOTE: Frosting at suction accumulator is normal.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Strong solvent odor around degreaser (also see high vapor concentration below).	Cover open.	Keep machine cover closed except when putting parts into, taking parts out of or hand spraying in degreaser.
Air make-up unit and gas fired space heater corrosion.	Drafts over open top degreasers cause vapor to be disturbed.	Remove fans, air make-up units, etc. from degreaser area where they can cause air currents over open top degreasers.
High vapor concentration around machine high solvent usage (also see solvent odor above).	Drafts over degreaser pulling out solvent vapors, solvent vapors decomposing and corroding units. Exhaust system not operating.	It may be necessary to put up partitions to block air currents over open top degreasers. Space heaters require special flue gas venting. Exhaust system should be interlocked with degreaser heat. No exhaust, no heat.
	Exhaust duct blocked or damper not adjusted properly.	Remove duct blockage, readjust damper for proper air flow.
	Lip slot(s) closed or not adjusted properly.	Open lip slot(s) and adjust for even air flow along entire slot.
	Work being processed too fast through machine.	Reduce speed - never exceed eleven (11) feet per minute vertical travel. Wait until parts (work) looks dry before removing from machine.
	Parts (work) cupping (holding) solvent because of part configuration.	Proper part orientation for complete drainage. Tilt or rotate parts to promote draining.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
High vapor concentration around machine high solvent usage.	Parts cupping solvent.	Tumble parts in vapor to spill out solvent before they are removed from degreaser.  (Use rotating basket conveyORIZED machine or rotary plating basket that can withstand solvent).  If none of above solve the problem, process may require drying tunnel or section with a carbon adsorption system. Check with Ultronic, Inc. sales engineer or factory.
	Too high spray pressure or spraying at or above vapor line.	Reduce spray pressure.  Do not spray at or just below vapor line.  Spray as far below vapor line as possible.
	Too large or heavy loads. Vapor line drops with load and takes 5 minutes or more to recover (return to proper level). This pumps a vapor air mixture from machine when vapor line recovers.	See instructions or degreaser assembly print for vapor line location.  Reduce weight or surface area per load to reduce heat requirement.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
High vapor concentration around machine. High solvent usage.	Solvent leakage or spills.	Use all safety precautions. Evacuate area if necessary. Be sure to notify proper agencies of any reportable release. Correct or repair leaks, clean up any pools of liquid solvent.
Parts not degreasing properly	Solvent not up to proper temperature, vapor line too low. Solvent too contaminated. High boiling point, 9° F. or higher above fresh solvent boiling point. Very little solvent vapor being condensed on cooling coils. Very little condensed solvent coming from still.	Air out area. Check for safe working conditions before resuming production. Always tighten cleanout door gaskets from center out to edges. Use a teflon or teflon filled pipe compound when making up joints in solvent piping. Never use galvanized pipe for solvent. Do not use aluminum or any white metal for pumps, fittings or piping. Wait until solvent is condensing on cooling coils before processing work. Boil down boiling or vapor sump (see instructions or degreaser assembly print). Do not expose heating surfaces. Drain boil sump. If boil sump has solids, metal fines, etc. drain entire machine (if degreaser has more than one sump). Using all safety precautions clean out machine and refill with fresh degreasing grade solvent.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Parts not degreasing properly	Improper cleaning cycle. Parts wet when removed from degreaser. Too fast a cycle.	Increase immersion or time in vapor spray and let dry before removing. Lengthen time and/or immersion in degreaser.
	Temperature of ultrasonic sump too high - solvent boiling (units with heater/cooler package).	Check with Ultronic, Inc. or cleaning solvent representative for proper cleaning process for parts.
	No recirculation of heater/cooler package, too much particulate matter in ultrasonic sump.	Set heater/cooler thermostat lower - if thermostat non-functional - replace thermostat. See ultrasonic section of manual for proper cavitating temperature of solvent being used.
	Too much recirculation tends to upset proper ultrasonic operation.	Replace filter cartridge recirculation system.
	Adjustable power control turned down. No ultrasonic activity in sump.	Partially close valve on discharge side of recirculation pump.
	Ultrasonic sump not degassed. Ultrasonic sump must be degassed before proper cavitation for parts cleaning.	Turn up adjustable power control. Turn up slowly and check parts being processed.
Parts not degreasing properly		Bring sump up to temperature. Turn on ultrasonic generators. Set half/full wave switch to full.
		Wait for high pitch sound and until ultrasonic sump surfaces is peaking with ultrasonic cavitation.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Ultrasonic generator not working		See trouble shooting in ultrasonic section of manual.
Spray pump not pumping solvent. No solvent coming out of spray wand.	Spray reservoir empty.  Not enough solvent being condensed.	Reduce amount of spraying. Spraying too much for solvent being condensed.  Check boiling point of solvent. Maybe too much contamination for proper vapor generation. Drain and replace with fresh solvent.
	Condensed solvent overflowing trough back into boil sump.	Clean piping from trough to separator, clean separator and piping to spray reservoir.
	Spray filter/strainer clogged.	Replace cartridge filters/clean strainers.
	Metal fines in spray pump (especially magnetic drive pump).	Remove metal fins, provide strainer before pump or replace pump with direct drive pump.
Spray pump will not start	Vapor up thermostat not sensing vapor. Vapor up light not illuminated.  Vapor up thermostat out of adjustment.	Machine heat must be on and vapor at proper level to start spray pump.  Re-adjust vapor up thermostat. (Calibrate thermostat if necessary, see instruction sheet).
	Vapor up thermostat not functioning.	Replace vapor up thermostat.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Spray pump works fine until solvent (n-Propyl Bromide or Trichlorethylene) is hot when it is pumped.	Magnetic drive spray pump. Shaft pin on high side of tolerance and impeller I.D. on low side of tolerance.	Enlarge impeller I.D. slightly or reduce shaft pin O.D.
Spray pump leaking solvent	Shaft seal bad. Front end plate loose (Suction and discharge plate).	Replace shaft seal(s). Tighten end plate.
Spray pump on no spray or uneven spray	Spray nozzle(s) clogged or partially clogged.	Clean spray nozzle(s) if spray headers located in machine - observe all safety precautions - drain and air out machine if necessary.
Heat shuts off because of high temperature control or low level control	Liquid level too low in boil sump.	Add fresh degreasing grade solvent until proper level is reached in boil sump. See degreaser assembly print.
Heat shuts off because of liquid temperature control.	Too much alcohol in boil sump when using fluorinated solvent mixes. Maximum setting 130° F.	Drain boil sump and fill with fresh solvent through spray reservoir. Dispose of drained solvent properly.
Heat shuts off because of high temperature control	Too much oil in chlorinated solvent. 9° to 10° F. above fresh solvent boiling point.  Metal fines, lint, etc. collecting around thermostat capillary bulb.	Same as above.  Drain sump clean material away from capillary bulb and all solids from sump. Observe all safety precautions when cleaning out boil sump.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Electric heating element burnt out	High contamination in boil sump or still. Too many solids, oil, etc.	Drain machine, pull clean out door, clean or replace heating element(s). Observe all safety precautions.
Solvent takes a long time to heat up.	Boiling point 9° F. or higher than fresh solvent.	Clean out sump. Observe all safety precautions when cleaning out machine.
Distillate flow sight shows very little flow	Acidic solvent too much aluminum or white metal fines in solvent. Too much water getting into solvent (inhibitors immersible in water).	Refill with fresh degreasing grade solvent.
Parts, especially aluminum parts, discoloring. Toxic fumes sharp pungent odors. Corrosion on cooling coils, discolored tank interior. Conveyor rusting.		Stop production. Check pH of solvent. Check acid acceptance of solvent. If solvent acidic, see instructions for cleaning acid degreaser - observe all safety precautions.
Heat shuts off because of safety vapor control or water flow switch.	Cooling water not on.	Turn on cooling water. Re-set safety vapor control.
	Temperature control valve not properly adjusted (do not use with cooling tower water).	Readjust water temperature control valve. Check strainer to see if it is blocked.
	Cooling water piping and/or coil blocked or limed up.	Clean cooling water piping and coil. Boiler service people can clean out water lines. Reset safety vapor control.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Safety vapor control shuts off heat	Cooling water temperature too high.	Check chiller if chilled water used for cooling. Clean air filters or repair for proper temperatures.
Safety vapor control shuts off heat	Not proper temperature setting.	Check cooling tower system if tower water used. Especially return piping for proper flow. Reset safety vapor control. Calibrate per instruction sheet. It may be necessary to set a little higher to prevent nuisance shut downs.
Safety vapor control shuts off heat	Safety vapor control not functioning.	Replace safety vapor control.
<b><u>*Check Proper Operation of Safety Vapor Control Weekly*</u></b>		
Machine heat stays on and vapors come out of machine	Heat solenoid valve(s) stuck open.	Evacuate personnel from area - observe all safety precautions. Turn off heat to degreaser manually.
	Heat contactor(s) stuck closed.	Turn off main line disconnect (unless degreaser does not have electric heat and exhaust is required for breathable atmosphere).
	Safety vapor control not functioning.	Check for proper setting and calibration. Replace if necessary.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Machine heat or control circuit will not energize.	Main line disconnect off. Fuse(s) blown.	Turn on main line disconnect. Check fuse(s), find reason for fuse(s) blowing, repair, then replace fuse(s) with proper size.
Machine heat will not come on	Control transformer not functioning. Not functioning pilot light(s), push button(s), or switch(es). Exhaust system not on.	Replace control transformer. Replace not functioning pilot light(s), push button(s), or switch(es). Turn on exhaust system.
Safety vapor, high temperature or liquid temperature control tripped	Low liquid level. Low cooling, dirty boil sump, contaminated or too high boil point of solvent.	Add fresh degreasing grade solvent to spray reservoir or distillate tank until level in boil sump up to proper level. Correct condition, reset control.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Conveyor drive starts but chains or belt does not move.	Torque limiter slipping.	Check for obstructions to conveyor movement, parts spilled into sumps, open cover on rotating fixtures or baskets. If necessary drain machine, observe all safety precautions. Clean out spilled parts, close covers, repair any damage. Replace shear pin - restart conveyor - or if necessary tighten torque limiter. Caution: Do Not over tighten, adjust in quarter turn increments and try drive.
Conveyor drive starts but chains or belt does not move.	Cross rods not aligned.	Refill machine. Check chain take ups - take up evenly and if necessary, jump tooth on drive sprocket to align crossrods - replace shear pin or adjust torque limiter if required.
	Excessively rusted conveyor chain.	Lubricate chain.
	Sprocket(s) worn or damaged.	Replace worn or damaged sprocket(s). Look for uneven loading, misalignment or improper adjustment. Check chain for wear.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Conveyor drive motor trips overloads or still	Torque limiter adjusted too tight.  Shear pin replaced with straight pin.	Adjust torque limiter to drive conveyor with normal loads. Replace friction discs if necessary. Do not over tighten.  Replace with proper shear pin. Remove cause of overload. Reset drive motor overloads.
Ghost vapor (foggy-white) in degreaser	Excess water in solvent.	Check water separator - be sure solvent is flowing through separator and water outlet on separator is free.
Thermometer shows temperature of solvent to be below normal boiling point and solvent is boiling	Clogged piping.  Water and solvent can form an azeotrope with lower boiling point.	Check for clogged pipes to or from water separator.  Free pipe lines for full flow.
If steam heated; decrease rate of boil even though steam pressure is up.	Cooling water coils leaking.  Leaking steam coils. <b><u>THIS CAN BE HAZARDOUS.</u></b>	Drain excess water from separator through water purge valve.  Repair or replace cooling coils.  Shut off boiler, evacuate boiler and degreaser areas.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Blow down of boiler has solvent odor	Boiler water is treated. Sodium hydroxide is a form of water treatment. When sodium hydroxide, solvent, water and high temperatures exist, dichloroethylene gas lines can form.  <u>Dichloroethylene gas will automatically ignite when mixed with air.</u>	SLOWLY drain boiler, while bringing in raw water, so that air will not enter boiler. Flush all steam piping, steam coils, and condensate with raw water from boiler.  Drain solvent, check for pH and acid acceptance. Dispose of solvent properly if solvent cannot be reclaimed.

**WHEN WORKING ON OR NEAR DEGREASING EQUIPMENT, NEVER USE 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.**

# ULTRONIX, INC.

## "INSTRUCTION BULLETIN" HOW TO START UP AND CLEAN SINGLE COLUMN CARTRIDGE FILTERS

### WHEN TO SERVICE:

As the filter cartridge removes contamination, the pressure drop across the unit will slowly rise. You can determine this by mounting a pressure gauge upstream from the filter or by mounting a gauge in the vent opening with a T, so that the filter can still be vented.

Experience with your particular application will determine the pressure rise indicative of a dirty filter. Without pressure gauges, too low a flow rate will indicate when new cartridges are required.

### HOW TO SERVICE:

When filter cartridges need replacement:

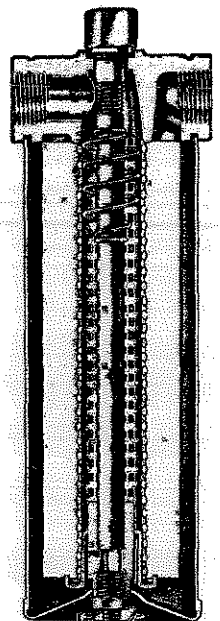
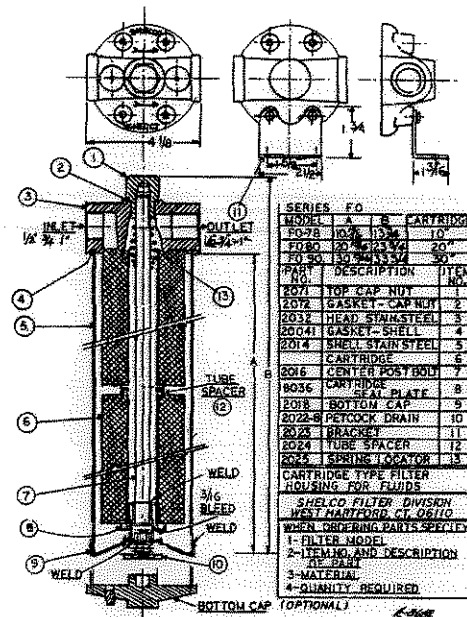
1. Close inlet and outlet valves to unit.
2. Open bottom drain plug and loosen vent screw to drain unit.
3. Unscrew cover nut while supporting bottom assembly with hand.
4. Remove and discard used cartridge.
5. Clean all parts.
6. Inspect, clean, and replace, if necessary, head and base gaskets or "O" ring as required by the particular filter unit being serviced.
7. In two and three cartridge units, insert cartridge connector in one cartridge, then place second cartridge over other end - being careful that spacer is between the cartridges. (Should tension between cartridge and connector weaken, spread connector with fingers.)
8. Place new filter cartridge over boss in shell.
9. Raise entire shell assembly to filter head until the cartridge guide engages in the cartridge center core.
10. Rescrew cover nut and tighten until metal to metal contact is made on "O" ring unit; 15 ft.-lbs. of torque on flat gasket unit. Do not exceed this limit in either case.

### HOW TO OPERATE:

1. Open inlet valve to filter slowly, checking for gasket leak.

**CAUTION:** These units incorporate either "O" ring seals or flat gaskets. If leakage occurs, open the unit; clean and inspect the "O" ring or flat gasket. Replace if stretched or otherwise damaged. On "O" ring units, the cover should be bolted until metal contact is made. Further tightening will stretch the bolt without improving the seal. Filter cartridges will compress about  $\frac{1}{4}$ " -  $\frac{3}{8}$ ".

2. Loosen vent screw to bleed trapped air.
3. Tighten when liquid appears around vent opening.



## DEGREASER AND SOLVENT RECOVERY STILL STEAM PRESSURE AND COOLING WATER REQUIREMENTS

Standard design on most equipment is represented by listing below. For special equipment, refer to general assembly print for any deviation.

### SOLVENT USED:

Trichloroethylene  
Perchloroethylene

10 P.S.I. = 0.7 Kgs. per Sq. Cm.  
50 P.S.I. = 3.50 Kgs. per Sq. Cm.

### STEAM PRESSURE REQUIRED:

P.S.I. = pounds per square inch. Kgs. per Sq. Cm. = Kilograms per square centimeter. Slightly lower pressures can be used for initial start-up of equipment because all solvent in system is clean.

### COOLING WATER TEMPERATURES

SOLVENT	INLET TEMPERATURE		OUTLET TEMPERATURE		TEMPERATURE RISE	
	F°	C°	F°	C°	F°	C°
Trichloroethylene	75°	24°	125°	52°	50°	28°
Perchloroethylene	75°	24°	125°	52°	50°	28°
*Methylene Chloride	60°	16°	70°	21°	10°	5°

*\*Normally requires chilled water.*

Closed loop system such as water tower, requires 1.6 times as much as listed quantity of water.

Trichloroethylene	85°	30°	115°	46°	30°	16°
Perchloroethylene	90°	32°	130°	55°	40°	23°

F = Fahrenheit                      C = Celsius

Higher inlet temperatures are permissible, however, quantity of water and temperature rise will vary. With heat "ON," vapor level must be maintained without work being processed.

# **IMPORTANT**

## **THESE MAINTENANCE PROCEDURES MUST BE FOLLOWED:**

- 1. EVERY FOURTEEN (14) DAYS, THE ACID ACCEPTANCE LEVEL AND THE STABILIZER LEVEL SHOULD BE CHECKED.**
- 2. EVERY THIRTY (30) DAYS, THE CONTAMINATED SOLVENT **MUST** BE CLEANED FROM THE STILL (VIA THE CLEANOUT DOOR).**
- 3. EVERY THIRTY (30) DAYS, ALL SAFETIES **MUST** BE CHECKED FOR PROPER OPERATION.**

**IF THESE MAINTENANCE PROCEDURES ARE NOT FOLLOWED, THE WARRANTY ON THIS UNIT WILL BECOME NULL AND VOID.**



# ULTRONIX, INC.

## "ZER-O-COIL" FREEBOARD CHILLER

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ULTRONIX, INC., a manufacturer of degreasing and distillation equipment, has developed a NEW low temperature freeboard chiller. Trademarked as ZER-O-COIL, this system operates continuously in the refrigeration cycle. By installing finned tubing around the inside perimeter of the degreasing tank directly above the primary condensing coils, proper sizing of the ZER-O-COIL develops a cold air blanket across the entire vapor zone. To develop this cold air blanket, the refrigeration must operate at -10° to -30° F. At these temperatures ice forms, and here is where the ZER-O-COIL surpasses all other equipment -- ZER-O-COIL operates at these temperatures without a defrost cycle.

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### HOW "ZER-O-COIL" WORKS:

ULTRONIX, INC. "ZER-O-COIL" is composed of a minimum of four passes of extruded finned tubing placed directly above the vapor line. ULTRONIX, INC. "ZER-O-COIL" is designed to operate continuously in the refrigeration cycle and maintain the cold air blanket. Other systems must defrost the coils (usually once every hour). The blanket deteriorates during this defrost cycle and can take from several minutes to as much as 50% of the run cycle to reform after defrost. This means that once every hour there is a period where solvent fumes are expelled from the tank.

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### "ZER-O-COIL" REMOVES ICE WITHOUT DEFROSTING THE COILS AND WITHOUT LOSING THE COLD AIR BLANKET:

ULTRONIX, INC. "ZER-O-COIL" divides the four passes into TWO individual circuits. Circuit One (1) contains coils one and three, while Circuit Two (2) contains two and four. "ZER-O-COIL" removes ice build-up by directing hot gas into individual circuits and removing the ice just on that circuit. The other circuit remains at sub-zero temperatures and maintains the cold-air blanket.

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ULTRONIX, INC. "ZER-O-COIL" is adjusted specifically for each individual tank according to the amount of ice accumulated on the coils. Each "ZER-O-COIL" is equipped with a NEMA 12 electrical enclosure containing a run timer and a hot gas timer. The run timer is the actual length of time between the hot gas cycles. The hot gas timer is the actual length of time that hot gas is directed into each circuit. These timers will be set by the ULTRONIX technician at the time of installation, but may need to be readjusted periodically.

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### ULTRONIX, INC. "ZER-O-COIL" TIMER INSTRUCTIONS:

The run timer must never be set below one-half (1/2) hour; more frequent intervals will not allow the refrigeration to maintain desired temperatures. ULTRONIX also recommends never setting this timer above one (1) hour as the hot gas is also used to return oil to the refrigeration compressor.

The hot gas timer should be carefully set to remove between 2/3 and 3/4 of the ice buildup on the circuit, the rest is removed by the transfer of heat as the coils pull back to

temperature. It must be noted that if the hot gas period is too long, all of the coils will heat up and cause the blanket to deteriorate.



**“ZER-O-COIL” MAINTENANCE  
INSTRUCTIONS:**

**ULTRONIX, INC.** recommends a routine service be performed every three months that includes the following:

- Clean condensing coils on air-cooled units,
- Check refrigerant charge,
- Check compressor oil charge,
- Check discharge and suction pressure,
- Check refrigeration temperatures,
- Readjust refrigeration (as needed),
- Readjust Run and Hot Gas cycle (as needed),
- Please note all changes.



# ULTRONIX, INC.

## IMPORTANT RULES FOR VAPOR DEGREASING

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1. No drafts at entrance and exit of equipment. (Drafts = solvent loss).
2. The equipment should be up to temperature (condensation of heated solvent at coldspot) before processing any work.
3. Vertical speed of travel for work entering, leaving, or while in vapor zone is 12 feet per minute maximum. The main reasons are fewer solvent losses and cleaner parts.
4. If spray is required, only spray in vapor zone.
5. Parts should be arranged so that solvent drains off readily. If this is not done, parts can trap solvent and bring solvent vapors out of degreaser creating a possible health hazard and undesired solvent losses.
6. Never lift parts above vapor zone when transferring from one sump to another sump.
7. Never let liquid level get below top of heat source. Keep adequate supply of solvent on hand. The equipment should always be filled to proper operating levels.
8. Size and type of load to be processed can be critical to the degreaser. If vapor line lowers rapidly and requires extra time to recover, load is too great for machine and should be reduced to machines design limits.
9. Machine maintenance - A cleanout schedule should be established for the removal of contamination (sludge) from the boil sump(s) at regular intervals to eliminate undesired and unsafe conditions, and to maintain efficient cleaning operation.

10. Never locate a degreaser near open flames, baking ovens, or any arc welding operations.

11. Never place hands below vapor line! Use hooks or long handle baskets to place parts in solvent. Do not use absorbent materials such as cloth, wood, or rope, etc. to handle work in degreaser.

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### Section 1 A Vapor Degreaser (Equipment using Solvent for Cleaning)

#### 1. What is it?

A vapor degreaser is a tank with some means of boiling the solvent and some means of controlling the vapors in the upper section.

#### 2. What does it do?

If the solvent is properly selected, contamination will be removed from the part being cleaned by solvent action.

#### 3. How does it work?

The selected solvent is heated within the tank, which will generate a vapor. The vaporized solvent is maintained in the tank by means of a cold area which condenses the vapor back to a liquid. The liquid solvent is collected in a trough and directed to a water separator (to remove free water) and returned to the tank.

#### 4. How does it clean?

The articles to be cleaned are suspended in the air-free zone of solvent vapors, which condense on the cool parts to dissolve the contaminant and give a continuous rinse in clean solvent. As the condensed solvent drains from the part, it carries off the contaminant and returns to the boiling liquid. The vapor treatment is often augmented by mechanical action such as liquid immersion or spraying the work with liquid (distillate) solvent in the vapor zone. The work is held in the vapor zone for final rinsing and drying until the parts reach vapor temperature, at which time condensation stops. The articles should then be slowly withdrawn from the machine. The process is a safe, rapid, economical procedure for preparing dry, clean articles for subsequent finishing or fabricating steps, usually without further treatment. Ultrasonics may be applied to further enhance the cleaning capability of the degreaser. By adding ultrasonics to a liquid immersion sump, holes and crevices on a part that cannot normally be cleaned by solvent action alone, should be penetrated to make the part thoroughly clean.



## Section 2 Safety

1. Any degreaser pit two feet deep or more should be exhausted at a minimum rate of twice its air volume per minute. Ventilate at least 10 minutes before entering.
2. Allow solvent to cool before draining. Make sure that all solvent and vapor have been removed before entering or welding in/on a degreaser. DO NOT enter this machine unless all cleanout doors have been removed. All solvent must be expelled and the unit purged with air by using fan forced or compressed air from above. ENTER ONLY with a life line and NIOSH/MESA approved breathing apparatus, THEN ONLY when another man similarly equipped is watching you.

3. Do not smoke in vicinity of a degreaser.

4. IF SOLVENT GETS INTO EYE, hold eye open, flush with water for at least 15 minutes, call a physician. If solvent contacts skin, immediately flush with plenty of water.

5. 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 wet with solvent, and then apply lanolin-type cream. Remove contaminated shoes.

6. IF SOLVENT IS SWALLOWED, induce vomiting by sticking finger down throat or by giving soapy water or strong salty water to drink (1TBS. per glass). Repeat until vomit is clear. NEVER induce vomiting or give anything by mouth to an unconscious person or a person having convulsions.

7. IF A PERSON IS OVERCOME BY EXCESSIVE EXPOSURE, remove patient to fresh air. Call a doctor. If breathing stops, give artificial respiration. When patient starts to breathe again, give oxygen. HIGH VAPOR CONCENTRATION CAN CAUSE UNCONSCIOUSNESS OR DEATH.

NOTE TO PHYSICIAN: Overexposure to many of the chlorinated solvents, especially if accompanied by anoxia, may temporarily increase cardiac irritability. Maintain adequate oxygenation until recovery. Avoid sympathomimetic amines; such as epinephrine, which may precipitate arrhythmia's.

8. Stop distillation before heating element surfaces become exposed (liquid level never lower than the top of steam coils, gas immersion tubes, or electric heating elements).

9. Never add solvent to hot oil-solvent mixtures. Sudden expansion can splash solvent out of the degreaser and possibly harm operator.



## Section 3 Personal Protection

Specific requirements deemed necessary for personal protection are listed:

### 1. Instruction

All employees working in and around open-surfaced 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 U.S. Bureau of Mines, U.S. Department of the Interior (see 30 CFR Part 11) 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

exceeding 25 pounds) shall be provided with a quick opening valve and at least 48 inches of hose not smaller than 3/4" , so that no 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.



## Section 4 Operation

- Avoid excessive speed of work in and out of vapor,
- Prevent liquid dragout by entrainment in parts,
- Avoid contamination of solvent with water and other materials,
- Keep proper heat balance.

### 1. Spray Cleaning and Degreasing

In vapor degreasing, spraying takes place in an air-free atmosphere below the vapor blanket so that evaporative losses due to the mixing of solvent and air are negligible. However, care should be taken to always emerge parts dry.

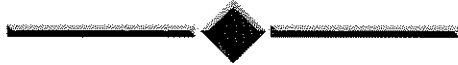
### 2. Covers

We recommend suitable covers for degreasers to reduce vapor emission when the degreasers are not operating and condenser coils are not functioning. For large machines, roll top covers or power operated covers are available to facilitate their use. In addition, freeboard chillers are very helpful in reducing solvent emissions. The principle used in this case is the creation of a heavy, cold air blanket over the solvent vapor by means of refrigeration devices.

### 3. Welding in Vicinity

Degreasing or other cleaning operations involving chlorinated hydrocarbons shall be so located that no

vapors from these operations will reach or be drawn into the atmosphere surrounding any welding operation. In addition, trichlorethylene and perchlorethylene should be kept out of atmospheres penetrated by the ultraviolet radiation of gas shielded welding operations.



## Section 5 General

The precision cleaning equipment covered by the operating manual is specifically designed for use with fluorocarbon solvents. Chlorinated solvents with higher boiling points, may also be used in the subject machines. Machines with an "R" prefix, such as MSR, MVR, and MLR, are equipped with a refrigeration cooled solvent condensing coil and freeboard area, while the "W" prefix machines such as MSW, MVW, and MLW require a cold water supply and drain facilities for cooling. Those machines equipped with ultrasonics include an "S" in the prefix such as MSR and MSW. Models with a "V" in the prefix such as MVR and MVW, are units designed for vapor immersion only, while the other models are designed for both liquid and vapor immersion.

The basic machine is a two sump unit with a clean condensate reservoir equipped with a solvent pump for final spray rinsing. One sump contains the heaters for solvent boiling while the second sump contains the clean solvent overflow from the spray reservoir and may be equipped with an ultrasonic transducer bottom. The condensed vapors are collected in a trough below the condensing coil and are directed into the gravity type water separator. The clean solvent is stored in the spray reservoir with the overflow directed into the clean solvent sump. Finally, the clean solvent sump overflows into the boiling sump to complete the closed recirculating system. Safety controls (high temperature and safety vapor) are incorporated to turn the boiling sump OFF in the event of either low solvent level in the boiling sump or high vapor level in the freeboard area.

The refrigerated machines are supplied with a thermostatically controlled refrigeration system energized at all times when the electrical power is connected. The refrigeration unit operates periodically even when the boiling sump heat is turned OFF to provide a cold blanket of air in the freeboard area covering the solvent. The result is a savings in solvent, due to evaporation, of almost 50% as compared to typical tap water cooled machines.



## Section 6 Installation

### A. Location

Among the considerations in selecting the cleaning system location are providing a work area free of dirt or contamination in the air and a means of filling and draining the tank when changing solvent solutions. Care must also be taken not to locate the system near blowers, drafts, fans, open flames, baking ovens, or arc-welding operations. If the machine is water cooled, consideration must be given to the water inlet and outlet connections in addition to the necessary electrical requirements. The refrigeration cooled machines require only electrical connections for operation and are easily moved if equipped with casters.

When locating the refrigeration cooled machine, it is important that the particular location selected does not restrict the flow of cooling air to the refrigeration condensing unit. In addition, the refrigerated degreaser must not be operated in a small room without ventilation, since the condensing unit produces heat that would eventually heat up the room air used for cooling the condensing unit.

### B. Electrical Connections

Check the nameplate located on the machine and electrical schematic diagram in the back of the manual for proper voltage, current, and frequency of the input power requirements. Check the electrical

schematic for proper connections. A fused disconnect switch must be supplied for the main input power line, if required by local electrical code.

### C. Water Connections (MLW, MVW, and MSW)

For maximum solvent conservation, the cooling water inlet temperature must be 60° F. or less when using Fluorocarbon solvents in the cleaning system. When connecting the water piping to the machine, install two valves in the inlet; one for daily ON/OFF of the water supply and one for an initial adjustment to control the water flow rate.

Do not install any valves or obstructions other than connecting pipe on the water outlet. The inlet water temperature and flow rate should be adjusted to maintain a solvent vapor level half way up the condensing coils when the boiling sump heat is turned ON.

### D. Setting Safety Controls

The machines covered by this manual are protected by two built-in safety controls; the safety vapor control (S.V.C.) and high temperature control (H.T.C.). The safety vapor control turns OFF the heat in the event of high vapor level and must be set at 15° F. below the boiling point of the solvent being used. The high temperature control turns OFF the heat in the event of low solvent level in the boiling sump and must be set about 25° F. above the boiling point of the solvent used. Both controls are manual reset type and must be reset after the fault is corrected and before the heat can be turned ON. When first turning ON the machine, check both controls by pushing the reset buttons in until the switch resets.

## Section 7 Operating

### A. Filling and Turn-On Procedure

Before filling the cleaning system with solvent be sure that you have checked for possible leaks in the piping. Also check that all drain valves are closed and drain plugs are installed tight. Be sure that the cooling media is flowing thru the solvent condensing apparatus. Then fill both sumps with the selected solvent to a level even with a

divider between the two sumps. Do not attempt to pour solvent into the spray reservoir. After the machine is turned ON and the spray reservoir fills with clean condensate, additional solvent will have to be added to the boiling sump. To charge and seal off the water separator tank after the spray reservoir is full of condensate, pour approximately four cups of clean water into the condensate trough and allow it to run into the water separator tank. Water will drip out of the water separator "water outlet" when fully charged with water. (Note: Your solvent supplier will advise when or when not to add water.)

**Note:** Do not pour water into the water separator until solvent overflows from the spray reservoir into the rinse sump. Also, solvent such as TCA or solvents with ethanol should not have water added as they are capable of absorbing water.

**Note:** DO NOT add water to a water separator when using 1,1,1 trichloroethane, or solvents containing acetone or alcohol.

**Note:** DO NOT add water to a Desiccant Dryer System. This tank contains a dryer media which absorbs water from the distillate solvent. Adding water to this tank defeats its purpose.

If the machine is a refrigerated cooled model, the refrigeration system will turn ON automatically as soon as the main power is applied. Until the heat switch is turned ON, the refrigeration system will cycle to maintain an air temperature of approximately 50° F. in the freeboard area above the solvent. After turning ON the heat, the solvent vapors will rise and the refrigeration system will run continuously to maintain a constant vapor height.

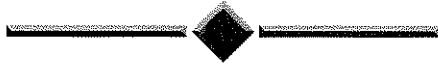
### B. Cleaning Procedure

Never use hands for placing work in the machine. Cleaning may begin as soon as the boiling sump starts boiling and the condensed vapors are dripping off the condensing coil. For ease of handling, large parts may be placed in the cleaning tank directly with long handle hooks or tongs, while small parts are best placed in a basket. (Stainless steel baskets are

recommended.) If a basket is used, rack the parts for best drainage and minimum solvent entrapment. Best cleaning will result when the number of parts being cleaned at one time is kept at a minimum. Lower the contaminated work into the boiling sump slowly and allow to sit for several minutes.

The exact time will depend on the kind and amount of contamination and is best determined by experiment. Next, transfer the work slowly into the clean solvent sump for a several minute rinse while moving the part around. **Never** bring work above the vapor line when transferring. If the clean solvent tank is equipped with ultrasonics, additional surface cleaning will take place. The work can then be raised into the solvent vapor for a spray rinse, if desired, and final vapor rinse.

After completing the cleaning operation, the stainless steel cover should be moved into place to conserve solvent whether the boiling sump is ON or OFF.



## Section 8 Maintenance

### A. Refrigeration System

At weekly intervals, or sooner if operating conditions demand, the refrigeration condensing unit heat exchanger must be thoroughly cleaned with compressed air or a vacuum cleaner to remove all dirt, dust or other material that would reduce the heat transfer effectiveness. In the event the dirt and dust is not removed, the compressor discharge pressure will become too high with a resultant overheating of the compressor motor. Safety controls in the form of a high pressure and thermal overload switch are incorporated in the machine to protect itself. A sight glass is included in the high pressure refrigeration liquid line to check the refrigeration system operation. Under normal operating conditions, the sight glass will be clear without the presence of bubbles. In the event the sight glass contains bubbles, or no liquid refrigerant, the refrigeration system is operating incorrectly due to either a dirty condenser, defective

expansion valve, or low refrigerant level as a result of a leak. Under such conditions, the system should not be operated until the faults are corrected.

### B. Safety Vapor Control

At least once a month check operation of safety vapor thermostat. This can be done on refrigerated units by bringing unit up to heat (vapor condensing on cooling coils). Jump "**out**" or otherwise disable the refrigeration but allow the heat to remain "ON." Wait until vapors are at top of cooling coils, after the SVC turns off the heat, restart the refrigeration which will start immediately. Heating elements should not be energized, due to the S.V.C. turning off the heating system. After vapors drop below cooling coils (none or very little vapor condensing on cooling coils) turn heat switch off. Re-set safety vapor control and turn heat switch to "ON" position. Heating elements should be energized. For water cooled units, simply turn off cooling water. Observe vapors until (a) heating elements are turned off, (b) vapor rises above cooling coils. Do not allow vapors to rise to top of machine tank and into work area. Turn cooling water "ON" and heat switch "OFF." Re-set safety vapor control, and turn machine heat "ON."

Malfunctioning of safety vapor control can be caused by miscalibration, improper setting, or defective control.

### C. Cleaning Tank

The degreaser tank requires very little maintenance other than an occasional draining and cleaning. The boiling sump can be cleaned by turning ON the heat as it is produced. As soon as the boiling sump level is down to the heaters, the heat switch must be turned OFF. Then the dirt and sludge may be removed through the boiling sump drain valve (small units) or thru cleanout door opening (large units) before refilling with clean solvent.

Mild non-scratching abrasives in powder form (Bon-Ami or other household cleaners) and soap can be used to clean the stainless steel tank. Steel brushes and sponges should not be used to clean stainless steel as they may leave particles embedded in the

stainless steel surface which would lead to rusting.

#### D. Ultrasonics

Maintenance and servicing is covered by the attached ultrasonic generator manual.

#### E. Solvent Maintenance

Most solvent can be recycled indefinitely with proper care in distillation and water removal. The solvent should be periodically checked for proper PH and acid acceptance, due to type of stabilizers, the contamination introduced into the solvent and water in the system (condensation or by parts). For chlorinated solvents your solvent supplier offers an acid acceptance test kit. Fluorinated solvents are very stable and normally do not require periodic tests.

A degreaser removes oil, chips and most organic soils. Where do these soils accumulate? In most degreasers the boiling sump collects the majority of contamination. Solvent flow is normally from condensing coils, to gravity water separator, to spray reservoir, to rinse sump, to boil sump. The solvent counter-flows the travel of work to provide the purest solvent for rinsing (either by spray or immersion).

**Caution:** Contaminated solvents can be flammable due to nature of contamination.

The degree of solvent contamination, governs the degree of part cleanliness. Briefly, a "CLEAN DEGREASER" produces "CLEAN PARTS." Oil contamination increases boiling temperature of solvent. When the normal boiling temperature is exceeded by 7° F., machine should be cleaned out.

Aluminum or magnesium fines or trimmings can cause accelerated solvent breakdown. When cleaning parts of these materials, a closer watch on solvent acidity is required.

Discard solvent with high acidity and completely clean and flush equipment with a solution of water and soda ash (2oz. per gallon). **Caution: NEVER USE CAUSTIC SODA.** Flush and rinse with water, dry and refill with fresh solvent.

Periodic inspection is required on some machines equipped with silica gel dryers. When water droplets are observed on top of liquid in dryer shell, replace silica gel.



## INSTRUCTIONS FOR CLEANING DEGREASERS AFTER SOLVENT DECOMPOSITION

### Introduction:

The introduction of modern stabilization systems for degreasing solvents has reduced the incidence of acid degreasers to the point where significant decomposition is rare. Occasionally, however, acidity may develop because a necessary maintenance schedule is not followed; acidic soils are introduced; white metals contact heating surfaces, etc.

Rapid, violent chemical reactions are possible when considerable quantities of aluminum or magnesium fines are present in an acid degreaser and great precaution is necessary to prevent damage to the equipment and plant if trouble develops.

Steel, copper and zinc alloys do not present the same violent reaction possibilities as aluminum and magnesium in an acid degreaser, but all due caution should be exercised.

Two types of reaction products are formed in an acid degreaser:

1. Irritating, corrosive and toxic fumes; sharp, pungent odors emanate from the machine.
2. Black, gummy residues composed of carbon, polymers, metal-organic compounds and, when aluminum is present, aluminum chloride.

The fumes are corrosive to metals, not only in the degreaser, but also in the surrounding plant area. The black, gummy residues are also very corrosive and, in addition, 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 degreaser.

To check the condition of the solvent, shake equal volumes of distilled solvent and neutral distilled water. Check the water layer for pH. Generally a pH below 6.0 is a result of decomposition of the solvent. Acid acceptance kits are available for Trichlorethylene and 1,1,1 Trichloroethane.

Your solvent supplier should be consulted if you suspect an acid condition and the following procedure should be adopted to prevent serious damage to the machine and disruption of the process.

#### **Stepwise Cleaning of an Acid Degreaser:**

1. Turn off the heat to the degreaser.
2. Do not shut off the water to the condenser coils.
3. Send all personnel away from the immediate area except those required to clean the machine.
4. Wait until the temperature of the solvent drops to a minimum of 30 - 50° F. below boiling point of solvent. In some cases, it may be necessary to cool the degreaser by external means. Should this be necessary, spray cold water on the outside of the degreaser until the temperature of the solvent drops at least 30 - 50° F. below boiling point of solvent.
5. Use a 3/4" or 1" hose attached to the main water supply to flood the degreaser. Cover all solvent to a depth of 2 to 4 inches. (NOTE: Adding a small amount of water may aggravate the condition.) Adding 1/2 cup of soda ash for each gallon of water used will help neutralize the acidic decomposition products and will facilitate cleaning the machine.
6. Drain water separator on degreaser and/or still and pour solvent portion back into degreaser.

7. Turn heat on and proceed to distill out into steel drums. Check distillate for pH frequently. If Ph is 6 or higher, this reclaimed solvent can be mixed immediately with an equal or greater quantity of new solvent for reuse. Distill down as far as possible without danger of exposing heating surfaces.

8. Turn heat off and pump bottoms into still or into drums.

9. Pump all residual solvent from the degreaser and water separator into steel drums to which have been added about one pound of soda ash and some water. (NOTE: Do not insert the bungs in the drums. Carbon dioxide is formed by the reaction between soda ash and acid solvent. If the drums are sealed, internal pressure built up from the evolution of carbon dioxide will split the drums.) Make sure enough water is present in the degreaser to prevent solid residues from being exposed to the air when the solvent is pumped out of the machine. (The water floats on top of the solvent.) Do not use caustic soda.

10. After the solvent has been removed, cover heater surfaces with water. Add 1/2 cup of soda ash per gallon of water and bring to a boil. After cooling, pump or drain water out of the system.

11. Remove the cleanout doors and scrape out any residues (from outside) of the tank. Transfer all solids from the machine into metal drums containing water. All of these wastes should be disposed of in accordance with all applicable Federal, State and local Hazardous Waste Regulations. Handle the drums with care. Turn off the heat and hand spray soda ash solution on cooling coils, troughs, walls, and allow water separator to fill up (via the troughs).

#### **WARNING:**

- a. Before cleaning tank interior, drain contents and open cleanout doors. Ventilate and clear all vapor from pockets in tank or pits.
- b. Do not enter degreaser until unit has been shut off, all solvent drained from unit and cleanout doors removed.

Person entering degreaser shall be equipped with halter and lifeline together with NIOSH/MESA pressurized air mask. Man on outside shall be similarly equipped and be able to communicate with person in tank.

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

d. Death can result from carelessness.

12. Replace all cleanout door plates.

13. Refill all sumps of machine with 6 to 8 inches of water. Add about 1/2 cup of soda ash for each gallon of water used. Turn on the heat to the machine. When solution comes to boil, pump solution from each sump thru a flexible hose, spray the condenser coils, troughs, conveyors, and inside wall of machine. Be sure to fill the water separator (via the troughs). Also pump soda ash solution thru spray wand, spray piping, etc., depending on how machine is equipped.

14. Turn off heat. Cool and drain. Remember to drain water separator.

15. Remove cleanout doors to scrape out any remaining residues. (An undetected deposit of unneutralized residue as small as a pea can cause the degreaser to go acidic again after it has been put back in service because of the catalytic nature of the residue.)

16. Wipe dry all interior surfaces of the degreaser body, conveyor and components.

17. Inspect and replace damaged thermostats, corroded condenser coils, etc.

18. Replace all damaged cleanout door gaskets with new ones.

19. Recharge the degreaser with clean solvent and bring up to operating levels with new solvent.

The degreaser is now ready for service. It is suggested that the degreaser run idly for 1 to 2 hours to expel excess water from the system.

#### **Further Comments:**

1. If solvent decomposition is experienced, your cleanout and maintenance program should be thoroughly reviewed.

2. Consult your solvent supplier to determine whether the acidic solvent is salvageable.



## **PLEASE NOTE:**

**ALL SAFETY CONTROLS ARE CHECKED AND OPERATING WHEN ANY EQUIPMENT (NEW OR USED) IS TESTED AT ULTRONIX AND REPLACED, IF NECESSARY, BEFORE SHIPMENT.**

**THE USER IS CAUTIONED TO VERIFY THE OPERATION AT LEAST MONTHLY, PAYING SPECIAL ATTENTION TO THE HIGH TEMPERATURE CONTROLS. IF THERE IS ANY MALFUNCTION, THE CONTROLS OR TEMPERATURE PROBES OR BOTH, SHOULD BE REPLACED IMMEDIATELY.**

**UNDER NO CIRCUMSTANCES SHOULD EQUIPMENT BE KEPT OPERATING BY JUMPING OUT OR OTHERWISE DISABLING THIS IMPORTANT SAFETY FUNCTION. SERIOUS DAMAGE OR INJURY CAN RESULT IN THE EVENT OF HEATER OVERTEMPERATURE AND THE RESPONSIBILITY FOR SUCH DAMAGE OR INJURY IS WITH THE USER.**

## DEGREASER AND SOLVENT RECOVERY STILL STEAM PRESSURE AND COOLING WATER REQUIREMENTS

Standard design on most equipment is represented by listing below. For special equipment refer to general assembly print for any deviation.

**SOLVENT USED:**

Trichlorethylene  
Perchlorethylene

**STEAM PRESSURE REQUIRED:**

10 P.S.I. = 0.7 Kgs. per Sq. Cm.  
50 P.S.I. = 3.50 Kgs. per Sq. Cm.

P.S.I. = pounds per square inch. Kgs. per Sq. Cm. = Kilograms per square centimeter. Slightly lower pressures can be used for initial start-up of equipment because all solvent in system is clean.

### COOLING WATER TEMPERATURES

<u>SOLVENT</u>	<u>INLET TEMPERATURE</u>		<u>OUTLET TEMPERATURE</u>		<u>TEMPERATURE RISE</u>	
	F°	C°	F°	C°	F°	C°
Trichlorethylene	75°	24°	125°	52°	50°	28°
Perchlorethylene	75°	24°	125°	52°	50°	28°
*Methylene Chloride	60°	16°	70°	21°	10°	5°

\*Normally requires chilled water.

Closed loop system such as water tower, requires 1.6 times as much as listed quantity of water.

Trichlorethylene	85°	30°	115°	46°	30°	16°
Perchlorethylene	90°	32°	130°	55°	40°	23°

**F = Fahrenheit                      C = Celsius**

Higher inlet temperatures are permissible, however, quantity of water and temperature rise will vary. With heat "ON," vapor level must be maintained without work being processed.

# ULTRONIX, INC.

## OPERATION

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### PREPARATION FOR USE:

#### 1. SOLVENT LEVEL:

Solvent level in the degreaser should be 4 to 5 inches above the steam, or electrical heating elements, depending upon the type of heat used. The solvent level should never be above the work rest. Use solvent as received in the drum. Do not dilute with any other substances.

#### 2. TURN ON THE WATER TO THE CONDENSER:

A water flow switch is provided to ensure that cooling water flow has been established before the heat can be turned on.

#### 3. TURN ON THE HEAT:

Steam, before energizing the steam coils on a degreaser or still, make sure the steam pressure corresponds to the solvent being used. Example: Trichlorethylene = 15psig.

#### 4. VAPOR LEVEL:

When the solvent boils, a vapor is generated which will rise up to the condenser, thus filling the machine with pure, saturated vapors.

For proper operation the vapor level, when there is no work in the machine, it should be at the center of the bottom water condensing coil.

#### 5. VAPOR UP THERMOSTAT:

The ULTRONIX vapor up thermostat is an automatic reset thermostat with the sensing system located at the design vapor line. The system opens on the rise of temperature to modulate the steam solenoid

on steam heated units, or removes auxiliary heat elements on electrical heated systems. Similar units are used to detect vapor up for the control of spray systems or where regulations require that vapor should be at a design level before a function can take place.

#### 6. CONDENSER WATER UPPER LIMIT CONTROL:

The ULTRONIX water temperature control is the same model temperature control that is used in the vapor line control. The sensing bulb is located on the discharge side of the water outlet line. The control opens on temperature rise and automatically resets.

#### 7. WATER TEMPERATURE:

Five to ten minutes after the vapor reaches the condensing coils, the water flow valve can be regulated to minimize water flow. This will also check the "Condenser water upper limit control." Refer to the ULTRONIX quote sheet for recommended upper water temperature limit.



# ULTRONIX, INC.

## INSTRUCTIONS FOR CLEANING WORK

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### 1. LOADING THE BASKETS:

Recommended baskets are those of round rod and mesh construction. Work should always be loaded in the best position for complete drainage. Liquid solvent should not be carried out of "cup-shape" of recessed articles. If work cannot be placed in a position for complete drainage, it is recommended that tilting, shaking and/or tumbling be done while the work is below the vapor line.

### 2. ENTRY INTO VAPOR:

Speed of lowering or raising work into or out of the vapors should be controlled. The maximum speed should be 11' per minute, however, 8' per minute is recommended. The workload is lowered into the vapors and held until all cleaning operations are complete.

### 3. SPRAYING:

The tip of the nozzle is placed below the vapor line where it is kept during the entire time that solvent is being sprayed. The switch is used to start the pump motor. Direct the spray of solvent at the work and slush the part until the insoluble are removed. Take care to avoid ricochet of solvent up out of the vapor. Shut off the pump, and drain the nozzle inside the machine. Do not allow spray hose in vapor.

### 4. REMOVAL OF WORK:

Permit the work to remain in the vapor until all condensing has stopped on the parts.

The time of cleaning in vapor is relation to the mass of the work. Observation of the time when vapors practically stop condensing on the work is a signal that cleaning has been completed, and work may be removed.

### 5. SHUTTING OFF DEGREASERS:

The sequence of steps in shutting off a degreaser is as follows:

- a. Turn off the heat,
- b. Close the cover of the machine slowly.

### CAUTION: NEVER ALLOW THE MACHINE TO BOIL DRY.

### 6. DISPOSAL OF SLUDGE:

**(ALWAYS COOL BEFORE REMOVING)**  
See if solvent vapors rise to the condenser when the above levels (or higher) exist for a period of 15 minutes, when full heat is being applied. If not, the liquid remaining is concentrated oil and may be disposed of in accordance with all current local, state and federal regulations covering the disposal of hazardous wastes.



# **SAFETY & OPERATION CONTROLS**

(INCLUDED ON ALL ULTRONIX DEGREASERS)

## **A. SAFETY VAPOR CONTROL**

If there is inadequate or excessive warm water entering the primary condensing coils, the solvent vapor can rise and overflow the degreaser. A thermocouple or sensing bulb is located directly above the primary coils. Solvent vapor reaching the sensor will cause the heat input to the boiling sump to shut off. In most cases, the poor coolant conditions must be rectified before the degreaser can be restarted. The manual reset button on the control must be depressed.

## **B. LIQUID HIGH TEMPERATURE**

When the boiling solvent becomes contaminated with an excess of oil from the degreasing operation, the temperature of the mixture will rise eventually to a point where degreasing efficiency is impaired. A thermocouple or sensing bulb in the boiling liquid will cause the heat input to shut off at the preset temperature, the digital readout will allow maintenance to monitor the status of the solvent and schedule solvent replacement.

## **C. LOW LIQUID LEVEL**

It is dangerous and undesirable for the solvent level to be so depleted that the heating coils are exposed to the solvent vapor. The low liquid level is a float-type control which will shut off the heat. Restart is automatic, after the solvent level is replenished.

## **D. WATER FLOW HEAT SHUT-OFF**

If in the event the water temperature in the primary condensing system is inadequate,

the heat input to the degreaser or still is turned off. Restarting is automatic, when the water flow is resumed.

## **E. WATER HIGH TEMPERATURE/HEAT SHUT OFF**

If the water temperature being discharged from the degreaser exceeds the designed set point, the heat control is automatically turned off. Restarting is automatic when the water temperature drops below the design set point.

## **F. LOW VAPOR LEVEL/SPRAY SHUT OFF**

If an excessive work load is introduced into the degreaser and the vapor line drops, either manual or automatic spray systems will not operate until the vapor line recovers to the normal operating level.

## **G. MODULATING ENERGY**

When the unit is idling, this control will cut off approximately 40% of the heat input. When work is introduced into the degreaser, the vapor level drops, and the sensing bulb will automatically increase the heat input.

## **H. MODULATING WATER**

A temperature sensing bulb placed on the discharge of the water line from the primary coil will modulate the water flow to allow approximately 110° F. discharge.



# ULTRONIX, INC.

## ENVIRONMENTAL SAFETY

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1. Under no circumstances should any of the chlorinated hydrocarbon solvents or mixtures containing such material ever be dumped on the ground as they may pollute the surface as well as underground water.

2. Accidental spills should be cleaned up immediately under ventilation by personnel wearing an airlike mask or oxygen supply equipment. Unprotected persons should leave area of spill immediately. When a spill occurs, one of the recommended procedures is to contain the spilled solvent in as small an area as possible using a dry absorbent or sawdust to absorb the solvent.

3. Degreaser clean-out sludge should be placed in containers which are kept closed but not tightly sealed. Containers should be stored away from sparks or open flames as the sludge may contain combustible material. If these drums are stored outside, until their contents can be treated according to EPA approved procedures, they must be maintained properly to make sure their contents are contained and no spillage or seepage takes place.

4. Each employee should be impressed with his responsibility to report promptly any suspected leaks or equipment failures. All use and storage equipment must be properly maintained. Make sure there are no leaks in your degreaser piping, storage tank, and transfer piping. Check all valves and pump seals for leaks.

5. All containers, shipping equipment, common carriers, other vehicles, storage and equipment covering applications for solvent should have proper labeling to identify the product and carry a warning statement. Appropriate warning statements

should be placed in prominent positions on the degreasing equipment itself.

6. In the interest of economy, solvent should be reclaimed from sludge. In degreasers, the contaminated solvent is distilled until there is no condensed solvent flowing to the water separator. The surfaces of the steam heating coils, electric immersion heaters, or gas immersion tubes, should not be exposed since it is important to avoid the possible bake-on which otherwise may take place and which can detract from the heat transmitting function of the heater or coils.

In solvent stills, the residue should be steam stripped before it is discarded (except 1,1,1-Trichloroethane). Waste disposal depends a great deal on local and federal regulations. The waste material may be flammable and must be treated with care. It should not be burned in boilers or heaters nor dumped into a sewer. Direct contact with residue should be avoided, and all residues should be handled in covered receptacles. Exposure to vapors arising from hot residues should be avoided, and food should not be permitted anywhere near an accumulation of such residues.

Sludge should be transported by EPA approved waste and disposed of by companies who employ EPA approved disposal facilities and procedures.



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## **Standard Practice for CONFINED AREA ENTRY<sup>1</sup>**

This standard is issued under the fixed designation D 4276; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parenthesis indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### **1. Scope**

1.1 This practice covers recognized procedures necessary to protect the health and safety of workers required to enter confined spaces. These procedures are particularly applicable to entry into the confined areas associated with the use of halogenated organic solvents.

1.2 Confined areas addressed in this practice include, but are not limited to: vapor degreasers, cold cleaning tanks, storage vessels, tank cars and trucks, van trailers, ships or barges, pits or sumps, and unventilated rooms.

1.3 This practice does not necessarily address entry into all confined spaces nor does it address the decision strategy involved in requiring such entry.

1.4 Although this practice describes specific safety steps to be taken for entry into confined spaces, it is not intended to preclude the use of any additional measures that may be deemed necessary for a particular situation.

1.5 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the*

*responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### **2. Significance and Use**

2.1 Vapor inhalation is the primary hazard encountered in the use of chlorinated solvents. The greatest potential for over exposure to these solvent vapors occurs where the employee is exposed to the high concentrations of vapor that may be found in enclosed areas. The seriousness of this hazard is often underestimated by those performing this type of work.

2.2 This practice is designed for use by employers in developing their own specific standards for vessel or enclosed area entry.

### **3. Summary of Practice**

3.1 Confined area entry refers to the entering of any tank, vessel, sump, pit, duct, tank car, tank truck, van trailer, or enclosed space in which there has been, or may have been chemicals, chemical vapors, or a lack of ventilation.

### **4. Procedure**

4.1 All personnel working in confined areas should be properly trained in safe entry

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D-26 on Halogenated Organic Solvents and is the direct responsibility of Subcommittee D26.05 on Industrial Hygiene.

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and rescue procedures. They should have a working knowledge and understanding of the hazards that may exist.

4.2 *Entry Permit* - Entry into confined spaces should be by written entry permit, issued by the responsible supervisor or other qualified person. The purpose of the entry permit is to ensure that a checklist of precautions has been reviewed prior to entry. This permit is an authorization, and approval in writing certifying that all existing hazards have been evaluated and necessary protective measures have been taken to insure the safety of the worker. The permit should be valid for a limited time only, (usually an 8 or 10 hour shift) and issuance of a new permit required in the event of any job interruption or any indication of changes in job conditions. Issuance of the entry permit should address all of the following considerations.

4.3 *Vessel Preparation:*

4.3.1 *Isolation* - All process lines exiting or entering the confined space should be disconnected, capped off, and blinded. Closing of valves alone is *not* adequate protection.

4.3.2 *Lockout* - Pumps, connected to the enclosed area, or any other mechanical or electrical equipment (particularly conveyors) are to be locked out by locking the main electrical switch in the "OFF" position.

4.3.3 *Cleaning* - The space should be cleared, flushed, or purged of hazardous materials to the extent practical. This should be followed, where practical, by cleaning with water, steam, or other suitable materials.

4.3.4 *Ventilation* - A system for positive ventilation should be provided, prior to and during the entire entry period, through the use of fans, portavents, air movers, or by adequate natural drafts.

4.4 *Atmospheric Testing* - The enclosed space must be tested for the following prior to and during any entry:

4.4.1 *Oxygen Content* - The oxygen content must be between 19.5 and 22.0% in all levels of the tank.

4.4.2 *Flammability* - The atmosphere must be nonexplosive (less than 10% of the lower flammable limit).

4.4.3 *Toxicity* - The atmosphere should be tested to ensure the absence of toxic concentrations of vapors.

4.5 *Personal Protective Equipment* - Personal protective equipment is not an adequate substitute for safe working conditions, adequate ventilation, or safe working practices.

4.5.1 *Personal protective equipment* can include, but is not limited to: approved respirator, hard hat, safety glasses or safety goggles, gloves, and long sleeved shirts.

4.6 *Area Safety Equipment* - Any person entering the enclosed area must be fitted with a safety harness and lifeline. The lifeline should be secured outside the entrance.

4.6.1 Where entry into the vessel must be made through a top opening, a hoisting device or other effective means must be provided to lift employee out of the space.

4.6.2 Ladders must be in place for entrances and exits where the drop or climb involves a depth of more than 3 ft.

4.6.3 Self-contained breathing apparatus or supplied air respirators should be available at the vessel entrance. These devices must be worn if testing finds the toxicity level to be above the OSHA limits.

4.7 *Observer* - A second person should be available at the area entrance and in sight of the person inside at all times. He should be equipped with proper safety equipment and adequate communications equipment for summoning additional help if necessary (for example, two-way radio, whistle, etc.). Under no conditions should this observer enter the enclosed area unless others are standing by. If the observer is required to leave his post, the person inside the enclosed space must come out.

4.8 *Tools* - Approved low-voltage electrical equipment must be used where the atmosphere in the confined area may contain flammable vapors or where the atmosphere could contain solvent vapors within their flammable limits. All electrical circuits should be equipped with a ground-fault interruptor.

4.9 *Labeling* - Entrances to confined space should be posted, identifying the area as a confined space and that a permit is required for entry. During the work, when there is more than one entrance to the confined area, signs indicating that workers are inside, posted at each entrance, are advisable.

## 5. Testing Procedures

5.1 The tests required prior to entry into a confined area make use of specialized equipment.

5.1.1 *Oxygen Content*<sup>2</sup> - Use a portable instrument that analyzes directly for oxygen irrespective of the solvent vapors present in the air.

5.1.2 *Flammability* - Measurement of the flammability of the atmosphere may be done using a combustible gas indicator.<sup>3</sup>

5.1.3 *Toxicity* - If the prior contents of the vessel are known, the remaining concentrations of those materials may be determined as follows: for methylene chloride, trichloroethylene, 1,1,1 trichloroethane, and perchloroethylene, use gas-detector tubes found in the NIOSH certified equipment list.<sup>4</sup> A calibrated halide meter<sup>5</sup> may be used as an alternative. For trichlorotrifluoroethane, use either a portable flame-ionization gas chromatograph<sup>6</sup> or a portable IR analyzer.<sup>7</sup>

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*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race Street, Philadelphia, PA 19103.*

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<sup>2</sup> Model OX230 Audible Alarm Oxygen Monitor, National Mine Service Co., Oakdale, PA., or equivalent.

<sup>3</sup> Explosimeters (registered trademark), Mine Safety Appliances, or equivalent.

<sup>4</sup> Available from the National Institute for Occupational Safety and Health, 5600 Fisher Lane, Rockville, MD 20857. Publication Number 80-144 and Supplement Publication No. 82-106.

<sup>5</sup> Gas Tech Inc. or equivalent.

<sup>6</sup> OVA-108 or 128, Foxboro, or equivalent.

<sup>7</sup> MIRAN 101, Foxboro, or equivalent.

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**REFRIGERATION TROUBLE SHOOTING**  
**(USE ONLY QUALIFIED REFRIGERATION REPAIR SERVICE)**

PROBLEM	PROBABLE CAUSE	SYMPTOMS	REMEDY
Compressor will not start or try to run.	Power failure due to blown fuse, open circuit breaker or open disconnect switch or service switch.	Electrical circuit test shows no power on line side of start relay.	Replace fuse, check load on fuse. Determine why circuit breaker or disconnect switch open. If no reason, close breaker or switch.
Defective start relay	Defective start relay	Test for burned out or open holding coil and broken contacts	Repair or replace
Open control circuit	Open control circuit	Start relay coil not energized	Check pressure switch (on 3 H.P. and up) reset switch. Check reason for either too low or too high pressure.
Defective compressor	Defective compressor	Compressor will not run	Replace defective compressor.
Low voltage	Low voltage	Electrical circuit tester glows but not at full brilliance, wiggley moves but not up to proper voltage	Check with volt meter, if low check internal power source, loose connections etc. Call power company.
Low oil pressure	Low oil pressure	Compressor will restart upon resetting oil pressure switch	Check oil level, add oil if necessary, check pressure control and wiring.

**REFRIGERATION TROUBLE SHOOTING**  
**(USE ONLY QUALIFIED REFRIGERATION REPAIR SERVICE)**

<b>PROBLEM</b>	<b>PROBABLE CAUSE</b>	<b>SYMPTOMS</b>	<b>REMEDY</b>
Condenser starts and stops with machine heat on	Dirty condensing coil	Condenser shuts off on overload	Clean condensing coil (vacuum, do not brush dirt in).
	Condenser fan defective	High head pressure shuts off on overload or pressure switch (if furnished).	Replace defective fan.
	Defective run or start capacitor	Humming on start-up. Frequent start-stops.	Replace defective capacitor.
	Defective start relay		Replace defective start relay.
	Low oil pressure	Compressor will restart upon resetting oil pressure switch (if furnished)	Check oil level, add oil if necessary, check control and wiring, replace control if necessary.
Cooling coils frosting (Normal for chlorinated solvents and low ambient conditions with fluorinated solvents)	R.T. thermostat set too low	Frosting and ice on cooling coils	Reset R.T. thermostat to 45° F. Recalibrate if necessary.
Insufficient cooling with heat "ON"	Dirty condensing coils or obstructed air flow over	Unit heat shuts off on safety vapor thermostat	Clean condensing coil. Clear air flow over condensor.
	System low on refrigerant	Bubbles in system sight glass	Repair leak and charge system.

**REFRIGERATION TROUBLE SHOOTING**  
**(USE ONLY QUALIFIED REFRIGERATION REPAIR SERVICE)**

<b>PROBLEM</b>	<b>PROBABLE CAUSE</b>	<b>SYMPTOMS</b>	<b>REMEDY</b>
Insufficient cooling or adjust	Restricted line strainer, dryer or expansion valve	Temperature change in line after restriction (frosting). * Unit heat shuts off on safety vapor thermostat	Replace restricted part expansion valve (if adjustable) to proper super heat setting 8°/ 12° F.
	High ambient temperature room temperature too high to remove enough heat from condensing coil.	Same as above	Do not operate equipment until ambient temperature drops.
Compressor noisy when starting	Check hold down bolts	Noise from condensor	Spring mounted compressors, loosen hold down bolts. Check 1/2 H.P. condensing unit base bolts, if too long, shorten.
	Liquid returning to compressor	Noisy on start-up	Check R.T. thermostat bulb location, if not on <u>bottom</u> of bottom coil and tight, relocate and tighten.

\* NOTE: Frosting at suction accumulator is normal.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Strong solvent odor around degreaser (also see high vapor concentration below).	Cover open.	Keep machine cover closed except when putting parts into, taking parts out of or hand spraying in degreaser.
Air make-up unit and gas fired space heater corrosion.	Drafts over open top degreasers cause vapor to be disturbed.	Remove fans, air make-up units, etc. from degreaser area where they can cause air currents over open top degreasers.
High vapor concentration around machine high solvent usage (also see solvent odor above).	Drafts over degreaser pulling out solvent vapors, solvent vapors decomposing and corroding units. Exhaust system not operating.	It may be necessary to put up partitions to block air currents over open top degreasers. Space heaters require special flue gas venting. Exhaust system should be interlocked with degreaser heat. No exhaust, no heat.
	Exhaust duct blocked or damper not adjusted properly.	Remove duct blockage, readjust damper for proper air flow.
	Lip slot(s) closed or not adjusted properly.	Open lip slot(s) and adjust for even air flow along entire slot.
	Work being processed too fast through machine.	Reduce speed - never exceed eleven (11) feet per minute vertical travel. Wait until parts (work) looks dry before removing from machine.
	Parts (work) cupping (holding) solvent because of part configuration.	Proper part orientation for complete drainage. Tilt or rotate parts to promote draining.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
High vapor concentration around machine high solvent usage.	Parts cupping solvent.	Tumble parts in vapor to spill out solvent before they are removed from degreaser.  (Use rotating basket conveyORIZED machine or rotary plating basket that can withstand solvent).
		If none of above solve the problem, process may require drying tunnel or section with a carbon adsorption system. Check with Ultronic, Inc. sales engineer or factory.
	Too high spray pressure or spraying at or above vapor line.	Reduce spray pressure.  Do not spray at or just below vapor line.  Spray as far below vapor line as possible.
		See instructions or degreaser assembly print for vapor line location.
	Too large or heavy loads. Vapor line drops with load and takes 5 minutes or more to recover (return to proper level). This pumps a vapor air mixture from machine when vapor line recovers.	Reduce weight or surface area per load to reduce heat requirement.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
High vapor concentration around machine. High solvent usage.	Solvent leakage or spills.	Use all safety precautions. Evacuate area if necessary. Be sure to notify proper agencies of any reportable release. Correct or repair leaks, clean up any pools of liquid solvent.
Parts not degreasing properly	Solvent not up to proper temperature, vapor line too low. Solvent too contaminated. High boiling point, 9° F. or higher above fresh solvent boiling point. Very little solvent vapor being condensed on cooling coils. Very little condensed solvent coming from still.	Air out area. Check for safe working conditions before resuming production. Always tighten cleanout door gaskets from center out to edges. Use a teflon or teflon filled pipe compound when making up joints in solvent piping. Never use galvanized pipe for solvent. Do not use aluminum or any white metal for pumps, fittings or piping. Wait until solvent is condensing on cooling coils before processing work. Boil down boiling or vapor sump (see instructions or degreaser assembly print). Do not expose heating surfaces. Drain boil sump. If boil sump has solids, metal fines, etc. drain entire machine (if degreaser has more than one sump). Using all safety precautions clean out machine and refill with fresh degreasing grade solvent.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Parts not degreasing properly	Improper cleaning cycle. Parts wet when removed from degreaser. Too fast a cycle.	Increase immersion or time in vapor spray and let dry before removing. Lengthen time and/or immersion in degreaser.
	Temperature of ultrasonic sump too high - solvent boiling (units with heater/cooler package).	Check with Ultronix, Inc. or cleaning solvent representative for proper cleaning process for parts.
	No recirculation of heater/cooler package, too much particulate matter in ultrasonic sump.	Set heater/cooler thermostat lower - if thermostat non-functional - replace thermostat. See ultrasonic section of manual for proper cavitating temperature of solvent being used.
	Too much recirculation tends to upset proper ultrasonic operation.	Replace filter cartridge recirculation system.
	Adjustable power control turned down. No ultrasonic activity in sump.	Partially close valve on discharge side of recirculation pump.
	Ultrasonic sump not degassed. Ultrasonic cavitation for parts cleaning.	Turn up adjustable power control. Turn up slowly and check parts being processed.
Parts not degreasing properly		Bring sump up to temperature. Turn on ultrasonic generators. Set half/full wave switch to full.
		Wait for high pitch sound and until ultrasonic sump surfaces is peaking with ultrasonic cavitation.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Ultrasonic generator not working		See trouble shooting in ultrasonic section of manual.
Spray pump not pumping solvent. No solvent coming out of spray wand.	Spray reservoir empty.	Reduce amount of spraying. Spraying too much for solvent being condensed.
	Not enough solvent being condensed.	Check boiling point of solvent. Maybe too much contamination for proper vapor generation. Drain and replace with fresh solvent.
	Condensed solvent overflowing trough back into boil sump.	Clean piping from trough to separator, clean separator and piping to spray reservoir.
	Spray filter/strainer clogged.	Replace cartridge filters/clean strainers.
	Metal fines in spray pump (especially magnetic drive pump).	Remove metal fins, provide strainer before pump or replace pump with direct drive pump.
Spray pump will not start	Vapor up thermostat not sensing vapor. Vapor up light not illuminated.	Machine heat must be on and vapor at proper level to start spray pump.
	Vapor up thermostat out of adjustment.	Re-adjust vapor up thermostat. (Calibrate thermostat if necessary, see instruction sheet).
	Vapor up thermostat not functioning.	Replace vapor up thermostat.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Spray pump works fine until solvent (n-Propyl Bromide or Trichlorethylene) is hot when it is pumped.	Magnetic drive spray pump. Shaft pin on high side of tolerance and impeller I.D. on low side of tolerance.	Enlarge impeller I.D. slightly or reduce shaft pin O.D.
Spray pump leaking solvent	Shaft seal bad. Front end plate loose (Suction and discharge plate).	Replace shaft seal(s). Tighten end plate.
Spray pump on no spray or uneven spray	Spray nozzle(s) clogged or partially clogged.	Clean spray nozzle(s) if spray headers located in machine - observe all safety precautions - drain and air out machine if necessary.
Heat shuts off because of high temperature control or low level control	Liquid level too low in boil sump.	Add fresh degreasing grade solvent until proper level is reached in boil sump. See degreaser assembly print.
Heat shuts off because of liquid temperature control.	Too much alcohol in boil sump when using fluorinated solvent mixes. Maximum setting 130° F.  Too much oil in chlorinated solvent. 9° to 10° F. above fresh solvent boiling point.	Drain boil sump and fill with fresh solvent through spray reservoir. Dispose of drained solvent properly.  Same as above.
Heat shuts off because of high temperature control	Metal fines, lint, etc. collecting around thermostat capillary bulb.	Drain sump clean material away from capillary bulb and all solids from sump. Observe all safety precautions when cleaning out boil sump.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Electric heating element burnt out	High contamination in boil sump or still. Too many solids, oil, etc.	Drain machine, pull clean out door, clean or replace heating element(s). Observe all safety precautions.
Solvent takes a long time to heat up.	Boiling point 9° F. or higher than fresh solvent.	Clean out sump. Observe all safety precautions when cleaning out machine.
Distillate flow sight shows very little flow		Refill with fresh degreasing grade solvent.
Parts, especially aluminum parts, discoloring. Toxic fumes sharp pungent odors. Corrosion on cooling coils, discolored tank interior. Conveyor rusting.	Acidic solvent too much aluminum or white metal fines in solvent. Too much water getting into solvent (inhibitors immersible in water).	Stop production. Check pH of solvent. Check acid acceptance of solvent. If solvent acidic, see instructions for cleaning acid degreaser - observe all safety precautions.
Heat shuts off because of safety vapor control or water flow switch.	Cooling water not on.	Turn on cooling water. Re-set safety vapor control.
	Temperature control valve not properly adjusted (do not use with cooling tower water).	Readjust water temperature control valve. Check strainer to see if it is blocked.
	Cooling water piping and/or coil blocked or limed up.	Clean cooling water piping and coil. Boiler service people can clean out water lines. Reset safety vapor control.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Safety vapor control shuts off heat	Cooling water temperature too high.	Check chiller if chilled water used for cooling.  Clean air filters or repair for proper temperatures.
		Check cooling tower system if tower water used. Especially return piping for proper flow. Reset safety vapor control.
	Not proper temperature setting.	Calibrate per instruction sheet. It may be necessary to set a little higher to prevent nuisance shut downs.
Safety vapor control shuts off heat	Safety vapor control not functioning.	Replace safety vapor control.
<b><u>*Check Proper Operation of Safety Vapor Control Weekly*</u></b>		
Machine heat stays on and vapors come out of machine	Heat solenoid valve(s) stuck open.	Evacuate personnel from area - observe all safety precautions. Turn off heat to degreaser manually.
	Heat contactor(s) stuck closed.	Turn off main line disconnect (unless degreaser does not have electric heat and exhaust is required for breathable atmosphere).
	Safety vapor control not functioning.	Check for proper setting and calibration. Replace if necessary.

## DEGREASER TROUBLE SHOOTING

<b>PROBLEM</b>	<b>PROBABLE CAUSE</b>	<b>REMEDY</b>
Machine heat or control circuit will not energize.	Main line disconnect off.	Turn on main line disconnect.
	Fuse(s) blown.	Check fuse(s), find reason for fuse(s) blowing, repair, then replace fuse(s) with proper size.
	Control transformer not functioning.	Replace control transformer.
	Not functioning pilot light(s), push button(s), or switch(es).	Replace not functioning pilot light(s), push button(s), or switch(es).
Machine heat will not come on	Exhaust system not on.	Turn on exhaust system.
	Low liquid level.	Add fresh degreasing grade solvent to spray reservoir or distillate tank until level in boil sump up to proper level.
Safety vapor, high temperature or liquid temperature control tripped	Low cooling, dirty boil sump, contaminated or too high boil point of solvent.	Correct condition, reset control.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Conveyor drive starts but chains or belt does not move.	Torque limiter slipping.	Check for obstructions to conveyor movement, parts spilled into surmps, open cover on rotating fixtures or baskets. If necessary drain machine, observe all safety precautions. Clean out spilled parts, close covers, repair any damage. Replace shear pin - restart conveyor - or if necessary tighten torque limiter. Caution: Do Not over tighten, adjust in quarter turn increments and try drive.
Conveyor drive starts but chains or belt does not move.	Cross rods not aligned.	Refill machine. Check chain take ups - take up evenly and if necessary, jump tooth on drive sprocket to align crossrods - replace shear pin or adjust torque limiter if required.
	Excessively rusted conveyor chain.	Lubricate chain.
	Sprocket(s) worn or damaged.	Replace worn or damaged sprocket(s). Look for uneven loading, misalignment or improper adjustment. Check chain for wear.

## DEGREASER TROUBLE SHOOTING

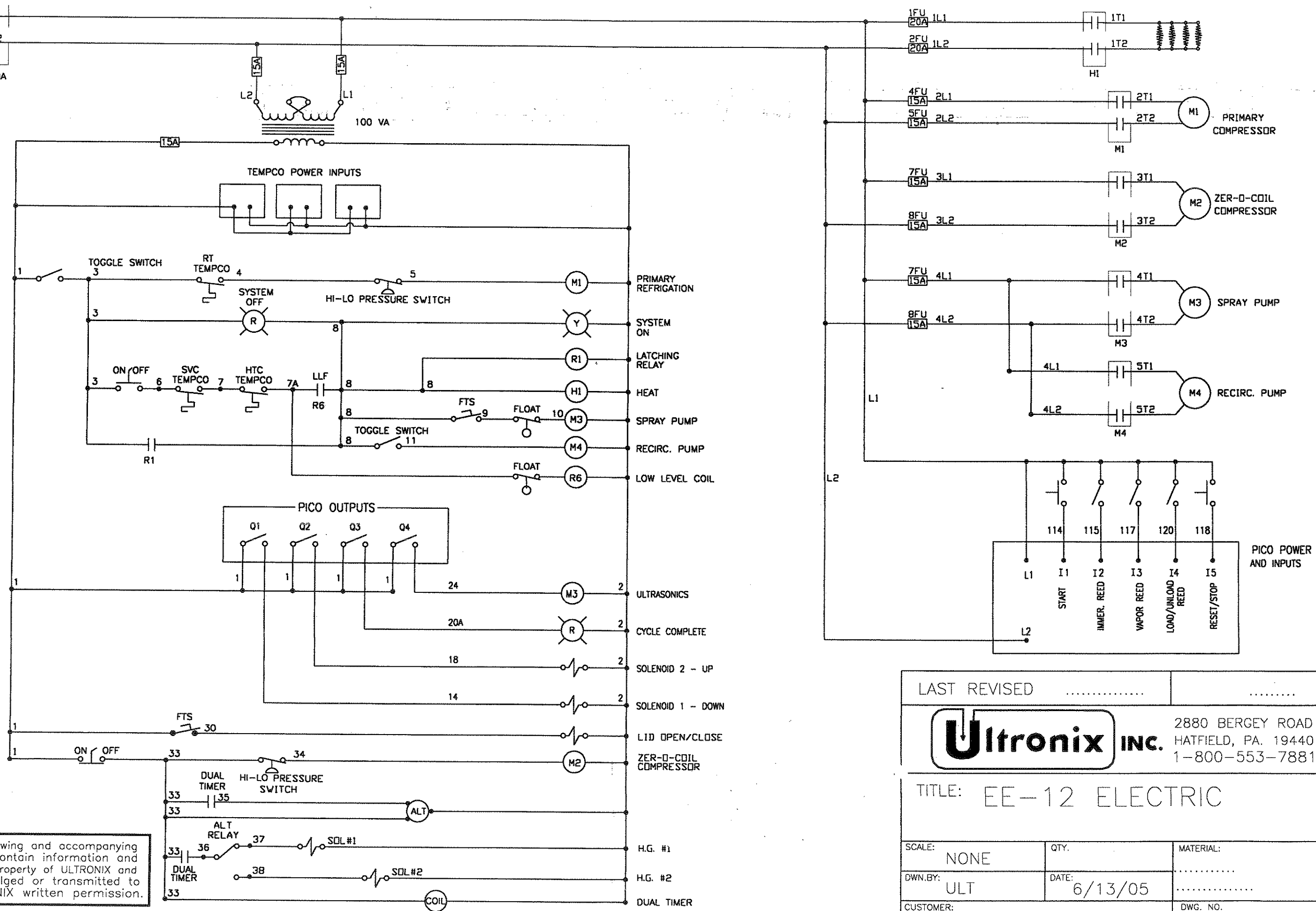
PROBLEM	PROBABLE CAUSE	REMEDY
Conveyor drive motor trips overloads	Torque limiter adjusted too tight.	Adjust torque limiter to drive conveyor with normal loads. Replace friction discs if necessary. Do not over tighten.
Ghost vapor (foggy-white) in degreaser or still	Shear pin replaced with straight pin. Excess water in solvent.	Replace with proper shear pin. Remove cause of overload. Reset drive motor overloads. Check water separator - be sure solvent is flowing through separator and water outlet on separator is free.
Thermometer shows temperature of solvent to be below normal boiling point and solvent is boiling	Clogged piping. Water and solvent can form an azeotrope with lower boiling point.	Check for clogged pipes to or from water separator. Free pipe lines for full flow.
If steam heated; decrease rate of boil even though steam pressure is up.	Cooling water coils leaking. Leaking steam coils. <b><u>THIS CAN BE HAZARDOUS.</u></b>	Drain excess water from separator through water purge valve. Repair or replace cooling coils. Shut off boiler, evacuate boiler and degreaser areas.

## DEGREASER TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Blow down of boiler has solvent odor	Boiler water is treated. Sodium hydroxide is a form of water treatment. When sodium hydroxide, solvent, water and high temperatures exist, dichloroethylene gas lines can form.	SLOWLY drain boiler, while bringing in raw water, so that air will not enter boiler. Flush all steam piping, steam coils, and condensate with raw water from boiler.
	<u>Dichloroethylene gas will automatically ignite when mixed with air.</u>	Drain solvent, check for pH and acid acceptance. Dispose of solvent properly if solvent cannot be reclaimed.

**WHEN WORKING ON OR NEAR DEGREASING EQUIPMENT, NEVER USE 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.**

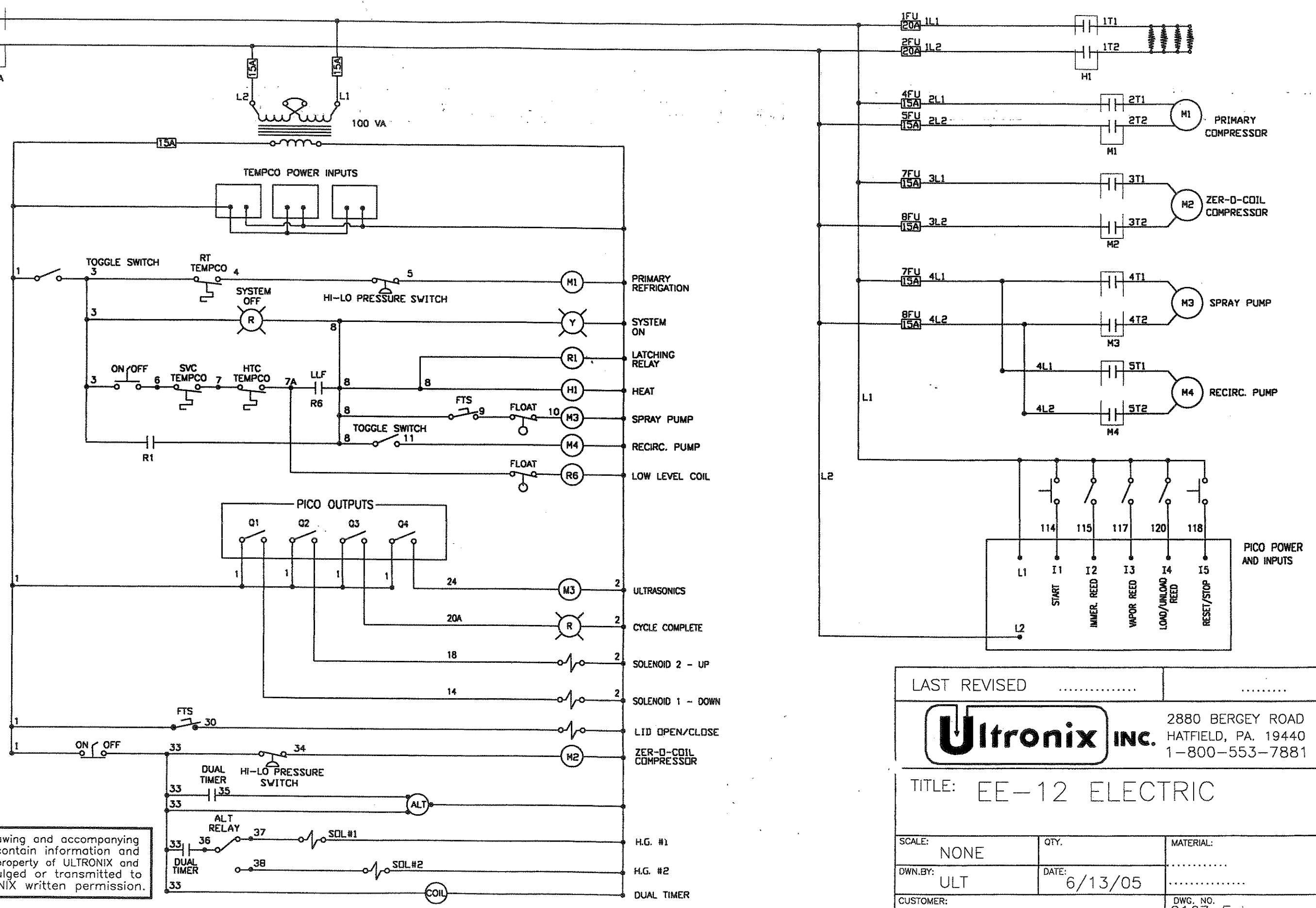
208V AC  
 CUSTOMER SUPPLIED 30A  
 FUSED DISCONNECT



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LAST REVISED .....		.....
<b>Ultronix</b> INC.		2880 BERGEY ROAD HATFIELD, PA. 19440 1-800-553-7881
TITLE: EE-12 ELECTRIC		
SCALE: NONE	QTY. ....	MATERIAL: .....
DWN.BY: ULT	DATE: 6/13/05	.....
CUSTOMER: .....	DWG. NO. 2167-E.dwg	

208V AC  
 CUSTOMER SUPPLIED 30A  
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