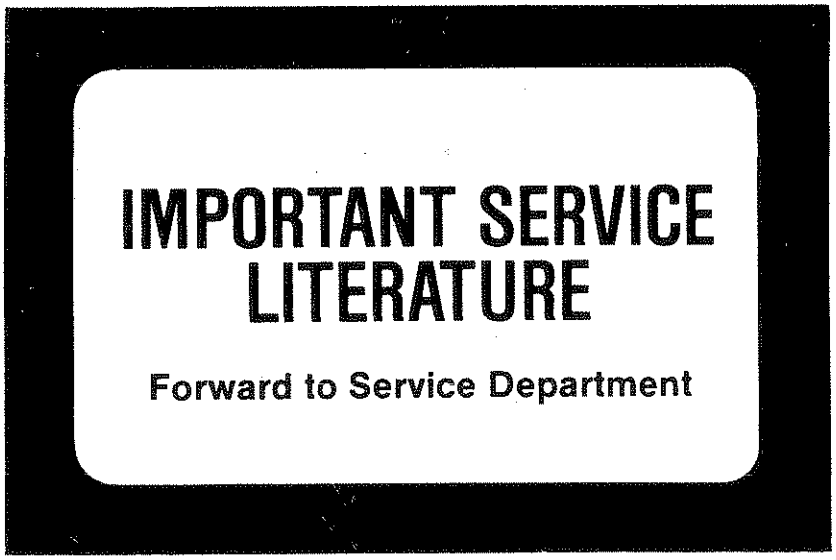
INSTRUCTION MANUAL

ULTRASONIC DEGREASER MODEL B400



BRANSON CLEANING EQUIPMENT COMPANY

Parrott Drive, Shelton, Connecticut 06484-0768, (203) 929-7301
Branson Ultrasonics Corporation, May 1985

Printed in U.S.A.
Rev. 12/86

NOTICE

SUBJECT: DOT Regulations Regarding, Return of Equipment

Attention Branson Cleaning Equipment Customers

Under Federal Regulations, Dept., Of Transportation 49CFR, Parts 100 to 177 and, OSHA "Right To Know" section of the "Chemical Hazard Communication" (29CFR1910, 1200), OSHA 3084, certain requirements must be met before returning equipment that use "Hazardous Chemicals" as defined in the following:

Chemicals which are listed in one of the following sources are to be considered hazardous in all cases:

- 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), and
- Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment, American Conference of Governmental Industrial Hygienists (ACGIH).

In addition, chemicals which have been evaluated and found to be a suspect or confirmed carcinogen in the following sources are to be reported as such:

- National Toxicology Program (NTP), Annual Report on Carcinogens,
- International Agency for Research on Cancer (IARC), Monographs, and
- 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances, Occupational and Health Administration (OSHA).

You must take the following steps before returning equipment:

1. Equipment must be completely drained of all solvents or solutions (including plumbing, etc.) and all residues cleaned out.
2. You must include material safety data sheets (MSDS) for the solvents or solutions and the contaminants which were in the the unit.

Both the carrier and Branson Cleaning Equipment Company have the right to refuse to accept delivery of the equipment unless these steps are taken.

Yours Truly,

James H. Barbieri

James H. Barbieri
Director of Product Assurance
Branson Cleaning Equipment Co.

WARNING

PLEASE READ BEFORE USING DEGREASER

All personnel using the equipment should read this manual thoroughly and understand its contents, as well as familiarize themselves with precautionary instructions pertaining to the usage and handling of solvents. If necessary, contact the solvent manufacturer for recommendations regarding handling and usage of solvents.

Since all cleaning solvents are toxic to some degree, we recommend that all personnel be informed as to the extent of the toxicity. Do not allow solvent vapors to exceed the safe maximum allowable concentration. Consult published safety regulations for the particular solvent being used.

DO NOT expose any halogenated solvent or its vapors to the high temperatures existing in open flames and exposed electrical heating elements because the solvent may decompose to toxic and corrosive substances. Install the degreaser in a well ventilated room, away from glowing electrical heating elements, open flames or welding operations.

DO NOT allow solvent to come in contact with the body. Solvent above 140°F (60°C) and solvent vapors above 160°F (71°C) can cause burns. Solvent removes the natural oils from the skin with prolonged or frequent contact. Wear eye protection, gloves and protective clothing. Use a rack, basket or tong to insert or remove parts from the degreaser.

DO NOT use solvents other than those specified on page 1-3.

Keep face away from tank when lifting cover.

Prolonged inhalation of solvent can be fatal.

DO NOT operate while wearing contact lenses.

DO NOT take solvent internally.

DO NOT bring solvent into contact with highly active metals such as sodium, potassium and barium.

DO NOT allow solvent to become excessively contaminated.

DO NOT perform any maintenance on the degreaser while the solvent is hot.

If the noise of the ultrasonic action is objectionable, turn the ultrasonics on only after the work is placed in the tank, and the top cover is in place.

Install the degreaser in accordance with the National Electrical Code and any applicable local codes.

GUARANTEE STATEMENT

When used in accordance with written instructions and under normal operating conditions, Branson manufactured products are guaranteed to be free from defects in material and workmanship for one year from the invoice date. Any unit which proves defective during the stated period will be repaired or replaced, at the sole discretion of BRANSON, F.O.B. Shelton, Connecticut, provided the defective part is returned properly packed with all freight charges prepaid to Branson's factory, located on Parrott Drive, Shelton, Connecticut or to a designated repair center.

Branson's liability, whether based on warranty, negligence or other cause, arising out of and/or incident to the sale, use or operation of the equipment, or any part thereof, shall not in any case exceed the cost of repair or replacement of the defective equipment and such repair or replacement shall be the exclusive remedy of purchaser. In no case shall Branson be responsible for any and/or all incidental or consequential damages, including consequential damages arising out of commercial loss.

This guarantee shall not apply to:

- ☐ Complete assemblies such as pumps and refrigeration units purchased from other manufacturers and incorporated into Branson products. In case of failure of these assemblies, Branson will honor the specific guarantee terms of the individual manufacturer involved,
- ☐ Cavitation erosion of tank and transducer surfaces which is a normal occurrence and develops over time in the operation of ultrasonic cleaning equipment, and
- ☐ Equipment subjected to misuse, improper installation, alteration, neglect or accident.

This guarantee is limited to the original purchaser and is not transferrable.

No warrantees expressed or implied have been made other than those stated herein. SELLER HEREBY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

ULTRASONIC DEGREASER, MODEL B400W

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SECTION 1 - DESCRIPTION

1.1 MANUAL

1.1.1 Contents

This manual contains instructions for the installation, operation and maintenance of the Branson Ultrasonic Degreasers, Model B400R (Refrigerated) and Model B400W (Water Cooled).

1.1.2 Emission Control Guidelines

As a responsible equipment manufacturer, Branson's policy is to produce equipment that meets applicable Environmental Protection Agency regulations. In some cases, state regulations may differ from these. Therefore, we suggest contacting Branson or other appropriate suppliers if any questions arise regarding conformance of specific solvent cleaning equipment with state or federal regulations.

1.1.3 Intent

The material contained in this manual is intended for use by technical personnel. Branson makes no representations or warranties, either expressed or implied, with regard to the material contained in this manual.

Since conditions of application are beyond the control of Branson, Branson assumes no liability for special consequential or incidental damages or otherwise in connection with or arising out of the use of this material or any part thereof.

1.1.4 Change Information

Branson continually strives to produce state-of-the-art products by incorporating innovations and improvements as soon as we have qualified them. Occasionally, a change cannot be included in the text and will be located in the "Change Information" section.

1.2 OVERVIEW

The Ultrasonic Degreaser, Model B400, is a compact, self-contained system, which consists of the following:

- ☐ Control Box — Contains ultrasonic generator and control circuits
- ☐ Boiling Sump — Generates vapors for removal of gross contaminants
- ☐ Ultrasonic Sump — Scrubs exposed and hidden areas of complex geometrical parts
- ☐ Recirculation System — Recirculates and filters ultrasonic sump
- ☐ Spray System — Provides extra cleaning through impingement action
- ☐ Refrigerated (B400R) — Has refrigeration unit to cool coils and condense vapors
  or
- ☐ Water Cooled (B400W) — Uses tap water (max 60°F) to cool coils
- ☐ Desiccant Drying System (Optional) — Absorbs ambient water from condensed solvents

1.2 OVERVIEW (Cont'd)

1.2.1 Vapor Degreasing

Located in the boiling sump is an immersion heater which causes the solvent to boil when energized. The solvent vapors fill the space above the solvent and condense on the parts to be cleaned. While the parts are being heated up to the vapor temperature, liquid solvent condensate dissolves and washes away gross contaminants adhering to the part. Soil and liquid solvent drain back to the lower boiling chamber, where the solvent is vaporized again, and the non-volatile soil remains behind. When the parts reach the temperature of the vapors, condensation and cleaning ceases.

1.2.2 Ultrasonic Cleaning

The ultrasonic generator converts 50/60 Hz line voltage to high frequency electrical energy. This electrical energy is applied to transducers where it is converted into high frequency mechanical energy. When it is applied to a liquid, the mechanical energy produces high frequency sound waves. These longitudinal vibrations cause the liquid to form alternating high and low pressure waves, both above and below the vapor pressure of the liquid. This "cold boiling" phenomenon is called cavitation.

Cavitation forms millions of microscopic bubbles which expand during the low pressure wave, and contract during the high pressure wave. These contractions, or implosions, create many powerful localized shock waves. As these shock waves travel through the liquid they loosen the soil and break it up into fine particles. Now the chemical action of the solvent can effectively scrub the remaining contamination from the exposed and hidden surfaces of the parts, thoroughly removing soluble and insoluble soils.

1.2.3 Spray Rinsing

After the parts leave the ultrasonic tank, they may be spray rinsed. The spray rinse circuit pumps the solvent from the distillate reservoir through the spray lance. This provides the extra cleaning action required by complex geometrical parts. Spray rinsing takes place within the vapor zone and serves several purposes.

- ☐ It dislodges any particulate matter that was not previously removed, and
- ☐ It lowers the temperature of the parts, insuring adequate condensation in the rinsing stage

While spraying, always keep the nozzle of the spray lance in the vapor zone. After spraying, allow parts to remain in the vapor zone until condensation ceases, and then, slowly raise them into the freeboard area.

1.2.4 Vapor Rinsing

After the parts are withdrawn from the cooler ultrasonic tank, they are held in the vapor zone to drain. Since the parts are cooler than the solvent vapors, the vapors condense on the parts and soil residue is dissolved and rinsed away. The parts are kept in the vapor zone until their temperature reaches that of the vapors and condensation ceases.

1.2.5 Drying

Drying takes place when the parts are transferred slowly out of the vapor zone. The remaining solvent evaporates almost immediately and the parts are brought out of the unit clean and dry.

SECTION 2 - UNPACKING AND INSTALLATION

2.1 UNPACKING

Normal precautions in unpacking and reasonable care in handling should be employed to avoid possible damage to the degreaser. A visual inspection of all external controls, indicators and surfaces should be conducted to detect any damage which might have occurred during shipment. Damage should be reported at once to the shipping company

NOTE: The shipping company is responsible for damage to equipment during shipment. If damage has occurred, notify the shipping company immediately to establish proper basis for claim. We recommend that you save both the container and packing material for returning any damaged equipment.

2.2 INSTALLATION

2.2.1 Placement

Install the degreaser in a well ventilated area but away from excessive drafts and allow at least eight inches (20 cm) of clearance at the rear and both sides of the degreaser. Ensure that the refrigeration air intake remains unobstructed

● **WARNING:** Degreaser must be installed away from glowing electric heating elements, open flames and welding operations. Degreaser solvent and solvent vapor can decompose to form toxic and corrosive substances when exposed to high temperatures

Level the degreaser by loosening the one-half inch nut on each leveling foot. Screw in feet. To replace the leveling feet with casters (degreaser should remain upright) - remove one foot at a time, insert caster and tighten the one-half inch nut on caster's stud located inside of frame.

2.2.2 Set-Up

After installing the degreaser, perform the following.

● **WARNING:** Use eye protection, gloves and protective clothing when handling solvent

1. Check line voltage to ascertain that it agrees with voltage rating specified on the degreaser. DO NOT USE IF THE LINE VOLTAGE IS ± 5% FROM THE VOLTAGE SPECIFIED ON THE B400 SPECIFICATION LABEL.

2. Ground the degreaser properly to earth ground with a three pronged plug or ground strap.

3. On B400W: Run hose with a control valve with water supply to pipe marked "Water In." Run another hose from water outlet connection to open drain.

4. Check that all drains in degreaser are closed

5. If equipped with optional dryer, fill the desiccant dryer cannister with molecular sieve to within one inch of top. Remove water separator cover. Slowly lower cannister into opening and thread into fitting at bottom of separator - finger tight.

6. Slowly pour approximately one gallon (3.8 liters) of solvent into the condensate trough until it begins to flow out of the water separator outlet into the ultrasonic tank.

7. Slowly pour additional solvent into the ultrasonic tank and allow it to overflow into the boiling sump. Stop pouring when the boiling sump is approximately one-half full.

8. Ensure that all switches are in OFF position.

2.2 INSTALLATION

2.2.2 Set-Up (Cont'd)

9. Plug degreaser power cord into wall outlet.
   DO NOT ISOLATE PLUG FROM GROUND.

10. The degreaser is now ready for operation.

Go to Section 3 for operating instructions.

1.2 OVERVIEW (Cont'd)

1.2.6 Water Separating

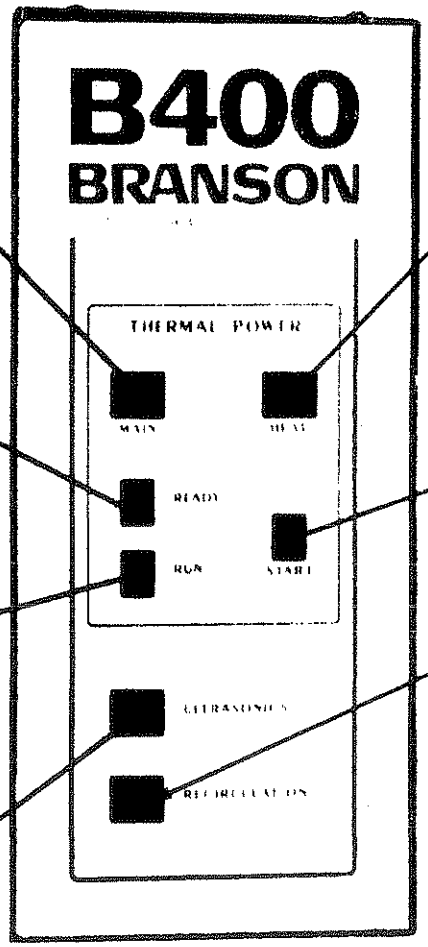
Both ambient water vapor and solvent vapors condense on the peripheral cooling coil. This water/solvent mixture accumulates in the collection trough at the bottom of the coil and flows into the water separator. The water separator has four openings: one on top, two on the bottom and one on the side. The top opening is the inlet from the collection trough. One bottom opening drains the water separator and feeds the spray pump. The other bottom opening is the outlet to the ultrasonic tank. The one on the side is the water drain.

The water separator is filled up to the overflow with solvent. Condensate being discharged into the water separator contains water and solvent. Being lighter than solvent, water floats on top and must be drained daily, or as often as necessary. Just open the petcock at the back of the degreaser. Being denser than water, the solvent sinks to the bottom and is returned to the ultrasonic sump.

When the B400 has the optional desiccator (required when using Freon® TMS, TE or TA), the solvent overflows from the separator through the desiccator, then returns to the ultrasonic sump. Because these Freons® consist of solvents which are miscible with water, a desiccator is required to selectively absorb water from the solvents. Whenever the desiccator option is used, the water separator petcock becomes nonfunctional.

1.3 CONTROLS AND INDICATORS

Located on the front panel of the control box, the switches and indicators illuminate when energized.



MAIN SWITCH
Energizes refrigeration compressor on R units

HEAT SWITCH
Places degreaser on standby. De-energizes heater during shutdown. Illuminates when cooling coils are cold enough.

READY INDICATOR
Signifies when heater and ultrasonic generator can be energized.

START SWITCH
Starts and resets degreaser. Momentary switch.

RUN INDICATOR
Signifies when heater is energized.

RECIRCULATION SWITCH
Energizes recirculation pump.

ULTRASONICS SWITCH
Energizes ultrasonics.

CONTROLS AND INDICATORS
Front Panel

Figure 1-1

NOTICE

Degreaser Series: B125, B250, B400, L400

A secondary "Vapor Zone Thermostat" has been incorporated into the above mentioned degreaser models. The purpose, function and theory of operation are explained below.

Purpose and Function

The secondary "Vapor Zone Thermostat" (VZT) nas been added to these degreaser models and placed above the 'Vapor Zone' to provide additional protection against the hazard that might result if vapors escaped from the degreaser.

On the water cooled B400W and L400W degreasers the "VZT" replaces the water-line pressure switch

Theory of Operation

The Vapor Zone Thermostat is normally closed. If the vapor level in the degreaser rises and contacts the VZT, the temperature of the VZT will rise, and the thermostat will open, de-energizing the heaters, the ultrasonic generator and the spray pump.

If your degreaser shuts down because the vapor level is rising to the "Vapor Zone Thermostat" contact your Branson service representative.

See the appropriate wiring schematic and final assembly drawings for further information on the particular model degreaser you have purchased.

1.4 OPERATIONAL THEORY

1.4.1 General Description

The 50/60 Hz line voltage is supplied to the MAIN POWER switch through two 15 amp fuses (B400W) or two 20 amp fuses (B400R). When the MAIN POWER switch is depressed, it lights up and power is on. The START and ULTRASONIC switches are nonoperational at this time. Approximately five minutes after activating the HEAT switch, the READY indicator will light up. Depressing the START switch energizes the relay to the heater and the RUN indicator lights up. The ULTRASONIC and RECIRCULATION switches are now operational. When the ULTRASONIC switch is depressed, the ultrasonic generator is energized. After the vapor reaches operating level, depress the FOOT switch in order to energize the spray pump motor.

The BOILING SUMP thermostat, PRESSURE switch (B400W only) and OVERTEMP and COOLING thermoswitches are safety devices and not heat controls. They de-energize the heater, the ultrasonic generator, and both spray and recirculation pumps. The READY and RUN indicators extinguish if normal operating temperatures are exceeded. The OVERTEMP thermoswitch, mounted on the heater, senses the heater's temperature and will trip open if its limit is exceeded. The COOLING thermoswitch will trip open if the coil's temperature is excessive. When temperature is sufficient the COOLING thermoswitch closes, and the READY indicator lights up. This indicates that power to the heater and ultrasonic generator can be re-energized by depressing the START switch.

The BOILING SUMP thermostat is located in the boiling sump and will trip open if the set point of the thermostat is reached.

The B400W also has a PRESSURE switch in the cooling line and trips open if water pressure is not sufficient.

The SPRAY thermostat, located on the tank wall and below the cooling coil, will de-energize the spray pump if the vapor layer collapses significantly and remains collapsed.

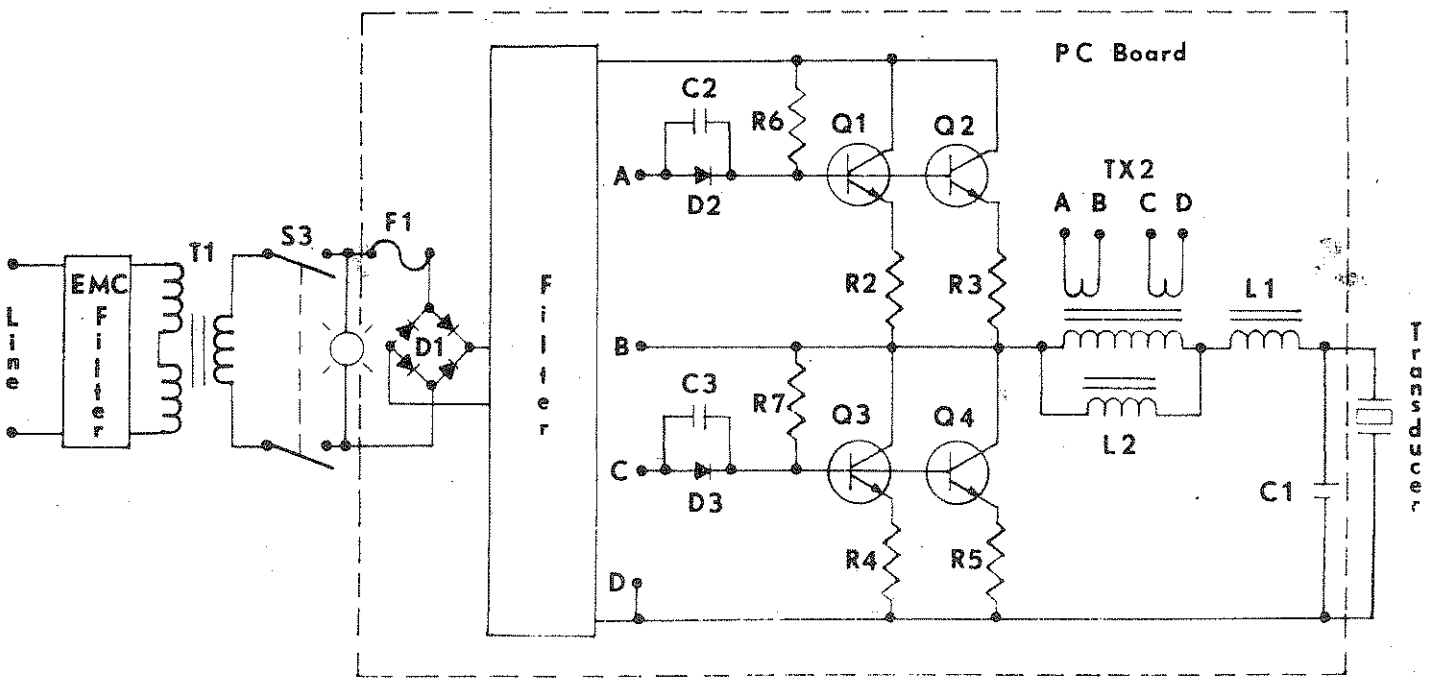
1.4.2 Detailed Description (See Figure 1-2)

As switch S3 is closed, 50/60 Hz input voltage is supplied from the secondary winding of isolation transformer T1 and the EMC filter. The secondary winding of isolation transformer T1 is applied to switch S3 and to the printed circuit (PC) board. Fuse F1 protects the PC board against damage when transistors or diodes on PC board are shorted. The voltage is supplied via full wave bridge D1 and filter to half bridge transformerless output class D oscillator. Switching transistors Q1, Q2 and Q3, Q4 are connected in parallel for higher power output. Equalizing resistors R2, R3, R4 and R5 compensate for the differences between transistors and eliminate matching transistor characteristics. Without starting resistor R6, the circuit would be in a state of equilibrium and oscillation would not take place.

1.4 OPERATIONAL THEORY (Cont'd)

1.4.2 Detailed Description (Cont'd)

However, when starting resistor R6 is connected to the base of Q1/Q2, current flows through R6 biasing Q1/Q2 into an active region. Q1/Q2 draw current through TX2. And TX2's rising magnetic field induces a current into the feedback windings TX2/AB and TX2/CD. Current feedback TX2-AB keeps Q1/Q2 on. Current feedback TX2-CD keeps Q3/Q4 off. Q1/Q2 conducts until collector currents fall to zero. At this point the current in the feedback circuit reverses and the drive is no longer applied to Q1/Q2. Now the drive is applied to Q3/Q4 and the forward bias current across feedback winding TX2-CD causes Q3/Q4 to turn on. Now Q3/Q4 will turn itself off as did Q1/Q2 when the collector currents fell to zero. The feedback winding reverses again to turn on Q1/Q2. Q1/Q2 and Q3/Q4 conduct alternately and oscillation is sustained. C2/D2 and C3/D3 improve switching characteristics, while L2 maintains proper phase shift in the feedback windings. The frequency of oscillation is determined by the secondary inductance of TX2, and the capacitances of the transducer and of the resonant circuit L1/C1.



Simplified Schematic - Ultrasonic Generator.

Figure 1-2

1.5 PERFORMANCE SPECIFICATIONS

B400R (Refrigerated) Electrical Requirements

Input Voltage	230 VAC ± 5% @ 60 Hz
Input Power	3800 watts maximum
Compressor	1300 watts typical
Heater	2000 watts typical
Ultrasonics	200 watts typical
Spray Pump	150 watts typical
Recirculation Pump	150 watts typical

B400W (Water-Cooled) Electrical Requirements

Input Voltage	230 VAC ± 5% @ 60 Hz
Input Power	2500 watts maxium
Heater	2000 watts typical
Ultrasonics	200 watts typical
Spray Pump	150 watts typical
Recirculation Pump	150 watts typical

Operational Requirements

Start up time	5 minutes typically*
Boiling time	10 minutes typically*
Turn over rate	7 gallons/26.5 liters per hour typically*

* Using Freon® TF, ambient temperature 70° F/21° C and input voltage 230 VAC

Ultrasonic Requirements

Operating Frequency	40 KHz
Input Power	200 watts typical
Output Power	33 watts/transducer typical
Six Piezoelectric Transducers	

Solvent Capacity (gallon/liter)

Boiling Sump	4/15.2
Ultrasonic Sump	4/15.2
Total Solvent Capacity	9/34.1

Dimensions	(inch-centimeter)
Ultrasonic Sump	10/25.4 x 12/30.5 x 8/20.3
Boiling Sump	10/25.4 x 12/30.5 x 8/20.3
Vapor Zone	21/53.3 x 12/30.5 x 8/20.3
Over all (B400R)	31.5/80 x 27/68.6 x 46.5/118.1
Over all (B400W)	31.5/80 x 22/55.9 x 36/91.4

Cooling System: Thermal protection and stainless steel evaporator coil.
(The B400R includes a 3/4 H.P. air cooled condensing unit.)

Types of solvent: Freons® TF, TA, TMS, TE, TMC, Methylene Chloride and Chlorothene VG

Ambient Operating Temperatures: 55° F to 100° F (13° C to 38° C) - input voltage at 230 VAC

55° F to 90° F (13° C to 32° C) - input voltage at 253 VAC, or operating @ 50 Hz, or using Freons® TMC, TMS or Methylene Chloride

1.5 PERFORMANCE SPECIFICATIONS (Cont'd)

Water Flow Rate (B400W): One gallon/3.79 liters per minute at 60F/15.6C

Freeboard/width ratio: 0.8gpm

Water separated from solvent automatically.

2.2.3 THERMOSTAT SETTINGS

Read from left to right:

IF	THEN	
the **SOLVENT**[1] is:	the **BOILING POINT**[2] is:	and the **THERMOSTAT** is set at:
Freon® TMC	97.6°F/36.4°C	115°F/46.1°C
Methylene Chloride	102.6°F/39.2°C	
Freon® TMS[3,4]	103.5°F/39.7°C	
Freon® TA[3]	110.5°F/43.6°C	125°F/51.7°C
Freon® TES[3]	111.9°F/44.4°C	
Freon® TE[3]	112.3°F/44.6°C	
Freon® TF	117.6°F/47.6°C	130°F/54.4°C
111 Trichloroethane	162.0°F/72.2°C	180°F/82.2°C
Chlorothene VG®	167.0°F/75.0°C	185°F/85.0°C

[1]Use degreaser grade (inhibited) solvents only. Uninhibited grades are unstable.

[2]At sea level with an ambient temperature of 70°F/21.1°C. Subtract 2.5°F/1.4°C for every 1,000 feet/305 meters of elevation.

[3]Requires dessiccator/drier option Water causes alcohol extraction and possibly stabilizer extraction.

[4]Requires higher cooling rates. If you can't keep the water for cooling at a maximum constant temperature of 60°F/15.6°C. then the degreaser MUST have a refrigeration system.

CAUTION:

The thermostat is factory-set at the proper temperature for the solvent specified for use at time of purchase. If you intend to use a solvent other than the one specified at time of purchase, your thermostat must be reset. Contact your Branson representative before you reset your thermostat.

SECTION 3 - OPERATION

3.1 START-UP INSTRUCTIONS

3.1.1 Procedure

1. Follow set-up instructions, Section 2.2.2.
2. Remove top cover slowly to prevent vapor dragout.
3. On the B400W, open water valve.
4. Set MAIN switch to ON. Switch will light. Set HEAT switch to ON. Wait approximately five minutes.
5. When READY indicator lights, depress START switch. The RUN indicator will light.
6. In approximately ten minutes, the solvent will begin to boil and fill the boiling sump with vapors. When the liquid level in the boiling sump drops below half-full, de-energize the degreaser and add more solvent to the boiling sump, not the ultrasonic tank. Because solvents can thermally degrade and break down into toxic/acidic components, never let the solvent level drop below one inch from the top of the serpentine heater.
7. Set ULTRASONICS switch to ON. Switch will light. (Ultrasonics can be energized whenever the RUN light is on.) To prevent damage to the ultrasonic generator, never energize it when the ultrasonic sump is empty.
8. Allow fifteen (15) minutes or longer for the solvent to degas and for the ultrasonic sump to reach proper operating temperature.
9. Open ultrasonic sump drain valve.
10. Inspect both canisters for leaks. If there are leaks, turn off ultrasonic sump drain valve. Ensure that canister is screwed in properly and finger tight.
11. Start recirculation pump and loosen filter bleed screw.
12. After solvent begins to flow from screw, tighten bleed screw.

3.1.2 Important Notes

Some of the ultrasonic energy put into the tank when the power is first turned on is usually consumed in expelling air from the solvent (degassing). The gas bubbles formed during this degassing period act as an energy sink, which may absorb energy from the sound field. This means that fresh solvent, or solvent that has been sitting for some time, must be allowed to degas before full ultrasonic cleaning efficiency is realized. When working with solvents note the following.

- ☐ Solvents should be brought to their operating temperatures before degassing.
- ☐ Initially, cavitation within the tank will be intense.
- ☐ Intense cavitation will decrease within ten seconds. However, it will reappear after the degassing phase has been completed and the solvent has reached the proper temperature.

3.2 OPERATING INSTRUCTIONS

3.2.1 Important Safeguards

- ☐ Always keep top cover on degreaser when not cleaning parts. When using degreaser, remove cover slowly to prevent drag out.
- ☐ Periodically check solvent level and ensure that boiling sump is at least half full.
- ☐ Do not operate the ultrasonics without solvent in both the boiling sump and the ultrasonic tank.
- ☐ If additional solvent is needed, de-energize the degreaser and pour solvent into the boiling sump - not the ultrasonic tank.
- ☐ Do not place parts being cleaned directly on bottom of ultrasonic sump.
- ☐ Do not degrease porous or absorbent materials such as cloth, leather, wood or rope.
- ☐ Do not overload the degreaser. Two smaller loads can be cleaned with a higher degree of effectiveness in half the time required to clean one large load.
- ☐ Move basket slowly to minimize solvent losses. Rapid movement of the basket in the vapor zone will cause air to be drawn in, which lowers the solvent's efficiency. The Environmental Protection Agency's regulations require that the speed at which the parts enter and exit the machine must not exceed 11 ft/min (3.3 m/min).
- ☐ When moving parts from one area of the degreaser to another, always transfer them below the vapor level.
- ☐ When spraying, keep the spray nozzle in the vapor zone. Spray in the vapor zone and above the boiling sump
- ☐ Avoid unnecessary spraying.
- ☐ Allow parts to dry within the degreaser until visually dry.
- ☐ Once a day drain the water out of the water separator. If degreaser is used on a continuous basis, drain at more frequent intervals
- ☐ Periodically check the strainer and clean as required. During initial operation, check the strainer on a daily basis until a regular schedule can be determined.
- ☐ Periodically check the filter cartridge and replace when necessary.

3.2 OPERATING INSTRUCTIONS (Cont'd)

3.2.2 Procedure

1. To ensure that all surfaces get wet, carefully arrange the parts to be cleaned in the basket. This provides optimum cleaning action and good drainage.

2. Slowly lower basket with parts to be cleaned into vapor zone above the boiling sump, but below the cooling coils.

3. When solvent condensation decreases, slowly transfer basket within vapor zone over to the ultrasonic sump. Slowly lower it into the sump. Ensure that all parts are fully immersed. Do not drop or rest parts directly on the bottom of the tank.

4. As the cleaning process takes place, slowly agitate the parts to allow trapped air to escape. This provides more uniform and efficient soil removal. (You may have to experiment with various lengths of time to determine the appropriate length for your needs.)

5. Slowly raise basket out of the ultrasonic sump and into the vapor zone - below the cooling coils and above the boiling sump.

6. Minimally spray the parts with solvent within the vapor zone. Excessive spraying can cause the vapor blanket to collapse. If it remains collapsed, the spray thermostat will de-energize the spray pump motor. Therefore, SPRAYING SHOULD BE MINIMIZED.

7. Hold the basket in place until the solvent has drained into the sump and condensation ceases.

8. Slowly raise basket out of the vapor zone and into the freeboard area. Drain cup shaped parts, if any, inside the degreaser.

9. Slowly raise basket out of the degreaser. Parts should be clean and dry.

3.3 SHUTDOWN INSTRUCTIONS

3.3.1 Procedure

1. Set ULTRASONIC switch to OFF.

2. Set RECIRCULATION switch to OFF.

3. Set HEAT switch to OFF.

4. Allow the cooling water of the B400W or the refrigerant of the B400R to continue circulating through the coils until the vapor blanket collapses. This will minimize chances of vapor escaping from degreaser. Then set MAIN switch to OFF. The water supply on the B400W may be turned off now, too.

5. Place top cover on degreaser.

6. If it is necessary to re-energize the degreaser, wait at least five minutes before setting MAIN switch to ON. This precaution will allow the system to equalize without blowing any fuses.

SECTION 4 - MAINTENANCE AND TROUBLE-SHOOTING

4.1 PREVENTIVE MAINTENANCE

To keep your Branson degreaser in proper working order, we recommend that you perform preventive maintenance regularly. And, unless the maintenance specialist is familiar with the degreaser's physical make-up and operational characteristics, we recommend that assistance be obtained from a Branson authorized service center (see Section 6.1) or your service representative.

●**WARNING:** Before inspecting the degreaser and performing any maintenance, shut down all electrical power and associated external equipment. Place "OUT OF SERVICE" signs on the degreaser and any associated external equipment.

4.1.1 Daily Preventive Maintenance* (See Figure 4-1 or 4-2)

* If the degreaser is used continously, it may need maintenance more frequently. Also, perform this maintenance after each shutdown.

To keep the solvent free flowing and to prevent possible damage to pump, the strainer must be kept clean and the filter replaced when necessary:

☐ Shut off ultrasonic sump drain valve.

☐ Open bleed screw on top of filter canister. This will cut recirculation circuit and stop solvent flow.

Strainer:

1. Unscrew strainer canister.
2. Remove and clean strainer.
3. Place clean strainer back into canister. Ensure that rubber gasket is properly seated inside canister.
4. Screw on canister, ensuring tightness.

Filter:

1. With a bucket beneath filter canister, remove filter drain screw on bottom. This will allow solvent to drain into bucket.
2. Remove filter canister by loosening the 1-1/16 inch nut on top.
3. Remove and inspect filter cartridge. Replace if necessary. (See Section 4.2 for replacement instructions.)
4. Place filter cartridge into canister
5. Inspect condition of filter gasket. Replace if necessary
6. Replace canister and tighten 1-1/16 inch nut
7. Replace filter drain screw.

4.1 PREVENTIVE MAINTENANCE (Cont'd)

4.1.1 Daily Preventive Maintenance (Cont'd)

☐ Open ultrasonic sump drain valve.

☐ Inspect both canisters for leaks. If there are leaks, turn off ultrasonic sump drain valve. Ensure that canister is screwed in properly and tightly.

☐ Start recirculation pump and loosen filter bleed screw.

☐ After solvent begins to flow, tighten bleed screw

☐ Slowly pour solvent from bucket into boiling sump.

4.1.2 Monthly Preventive Maintenance

☐ Use eye protection, gloves and protective clothing when handling solvent.

☐ On Model B400R never tip the degreaser on its side. This could result in damage to the compressor.

☐ Do not use any utensils which might scratch the degreaser tank.

---

1. Inspect the entire degreaser for leaks
2. Empty the water separator
3. On Model B400R inspect the refrigeration air intake to ensure that it is free of dirt.
4. Drain solvents from the degreaser and clean as follows.

☐ Clean inside of degreaser thoroughly with a long handled natural bristle brush.

☐ Flush out with a small amount of clean solvent.

---

5. Close all drains and refill with solvent
6. Replace top cover of degreaser

4.1.3 Periodical Preventive Maintenance

The function of the desiccator is to extract the water from Freon® TE, TMS and TA solvents. The desiccator contains molecular sieves which are capable of absorbing 14% water by weight.

Factors that influence the rate of desiccant exhaustion are.

☐ Ambient humidity

☐ Moisture introduced during work load

☐ Temperature of water jacket and or vapor condensing coils.

4.1 PREVENTIVE MAINTENANCE (Cont'd)

4.1.3 Periodical Maintenance (Cont'd)

Techniques are available for quantitatively determining water in organic solvents. However, these require costly equipment and careful technique. Historically, the color change of cobaltous chloride from blue to pink will suffice as an indicator. But, even though cobaltous chloride is sufficiently soluble in these solvents, it cannot be used in the desiccator. Therefore, it is necessary to use a sampling procedure in which the sample is discarded:

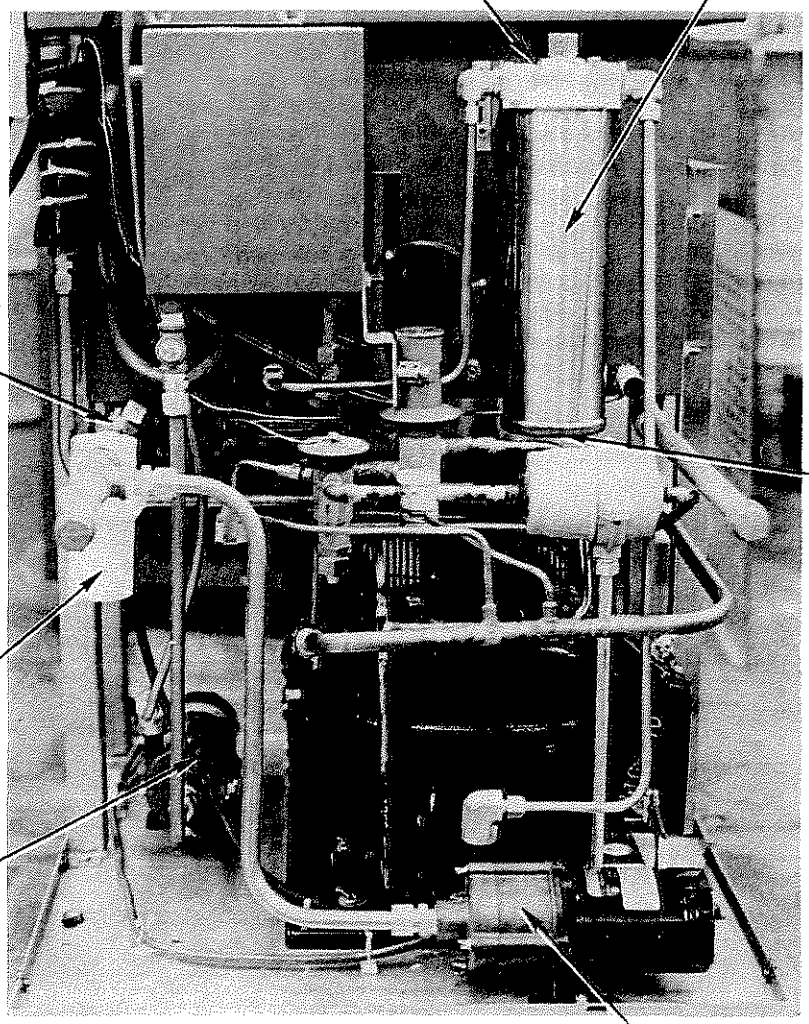
1. Remove a 100 milliliter (mL) sample of solvent from the desiccant dryer and place in a stoppered bottle. Allow it to cool to room temperature.

2. Add one teaspoon (tsp) of TEL-TALE® silica gel to the bottle containing the solvent and secure the top with stopper.

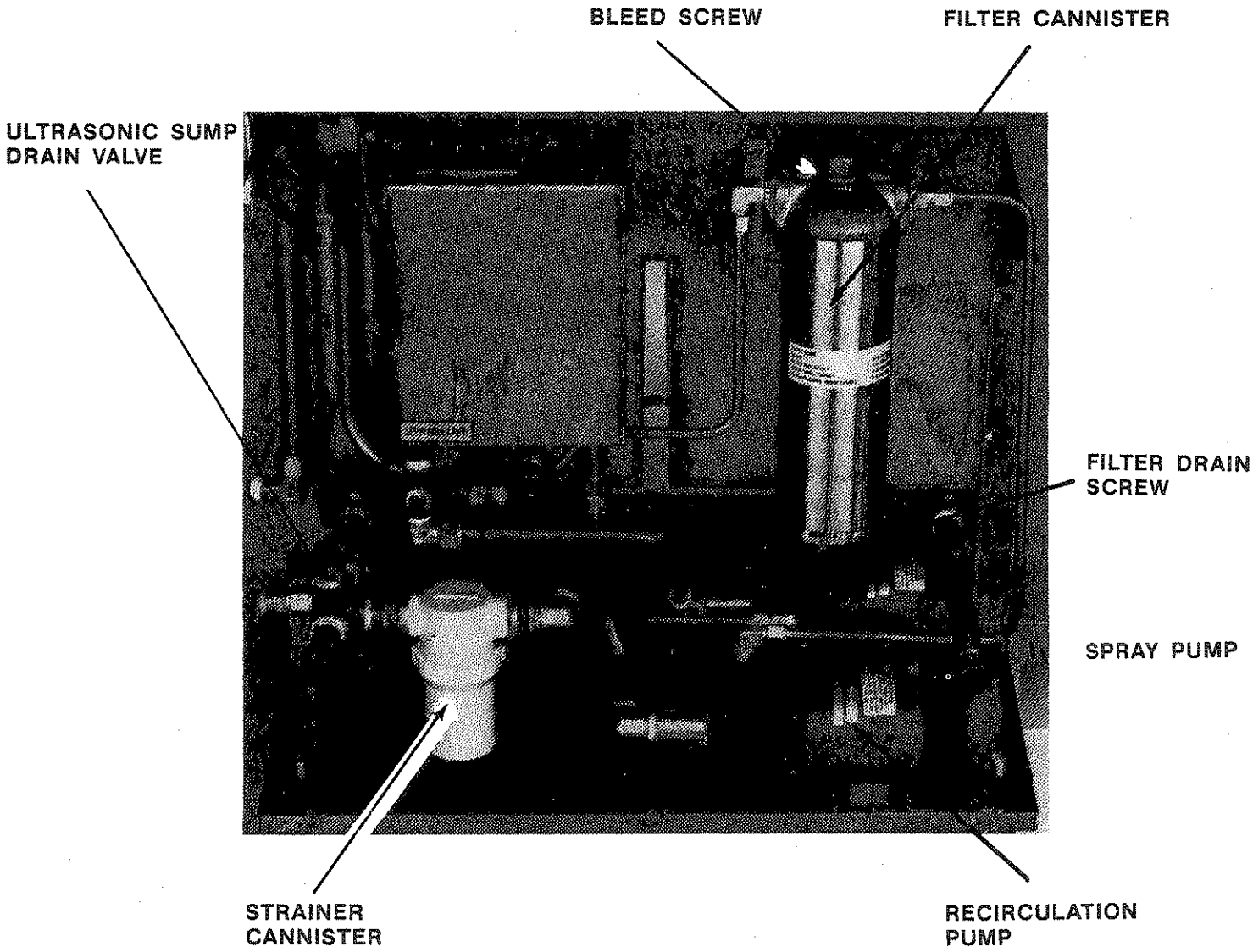
3. Shake the bottle for one minute and set aside.

4. After the bottle has stood for thirty (30) minutes, observe the color of the silica gel. If it has a pink tinge, change the desiccant in the dryer.

We recommend that sampling and testing be performed twice per working shift, until experience shows how often you should change the desiccant. For example: if, after sampling twice per shift and changing the desiccant three times, you find that the shortest desiccant life is four days and the longest desiccant life is six days, than begin sampling on the third day after a desiccant change. And continue sampling daily until the desiccant needs to be changed again.



B400R — INTERIOR VIEW
Figure 4-1



B400W - INTERIOR VIEW
Figure 4-2

4.1 PREVENTIVE MAINTENANCE (Cont'd)

4.1.5 Dessicant Regeneration

Molecular sieve can be regenerated in the following manner:

1. Allow the solvent to drip from the molecular sieve.
2. Allow the molecular sieve to thoroughly dry* at room temperature by spreading out a layer no more than one inch deep in a flat container and allowing Freon® and methanol to evaporate overnight.

***WARNING:** Because Freon® and methanol can become corrosive and explosive when exposed to high temperatures, NEVER put the molecular sieve into the oven until the Freon® and methanol have evaporated COMPLETELY.

3. Remove water by baking for about four hours in an atmospheric oven at 400F/204C.
4. Store regenerated sieve in dry, airtight container

4.1.6 Pump Obstruction Removal

To remove obstruction from pump, disassemble the appropriate pump as follows:

1. Shut down all electrical power.
2. If recirculation pump is jammed, then shut off ultrasonic sump drain valve. If spray pump is jammed, drain water separator.
3. Remove two mounting screws from pump's base.
4. Loosen and remove all four wing nuts.
5. Separate motor and impeller from housing by sliding back.
6. Remove obstruction.
7. Reassemble in reverse order.

4.2 TROUBLE-SHOOTING CHART

When using trouble-shooting chart, check meter for proper range, polarity and observe the following:

- ☐ All measurements are made with Simpson Volt Ohmmeter Model 260 or 270. Resistance measurements made with other meter may not correspond to those specified, and
- ☐ All readings are ± 20%

CAUTION: To avoid shock hazard when trouble-shooting the degreaser, always disconnect line cords from electrical outlet and the ultrasonic tank cable from printed circuit (PC) board in control box. To remove any charge that remains in the transducers, momentarily short the terminals of the tank cable.

4.2 TROUBLE-SHOOTING CHART (Cont'd)

SYMPTOM	PROBABLE CAUSE
Facility power fuse or circuit breaker fails when degreaser is pluged in, and degeaser is de-energized.	☐ Line cord has shorted out.
Facility power fuse of circuit breaker fails when degreaser is energized, and degreaser fuse does not fail.	☐ Fuse or circuit breaker is underrated.
Degreaser fuse fails when system energized.	1 Degreaser fuse is underrated. 2 Line voltage is incorrect. 3. B400R - refrigeration motor has failed. 4. B400R - degreaser was restarted too soon
Degreaser won't energize.	1. Electrical outlet has no power. 2. Line cord is open. 3. MAIN POWER switch has failed or is missing.
Ultrasonic generator fuse failed.	1 Fuse is underrated. 2. Line voltage is incorrect. 3 Diode bridge has failed 4. Capacitor has failed. 5 Transistor has failed.
No vapors in boiling sump	1 OVERTEMP or COOLING thermo-switches have been activated. 2 Heater has failed. 3. Heater fuse(s) failed. 4 THERMAL POWER ON/OFF and START switches were not depressed in correct order. 5 Relay has failed.
Not enough vapors in boiling sump	1 Heater element has failed. 2. Heater has not been energzed long enough 3 Parts were placed into the boiling sump too soon 4 Too many parts were placed into the boiling sump 5 Contamination level in boiling sump is too high
Water is mixed with solvent	1 Drain water from water separator. 2. Desiccant may need to be changed.
Solvent is not circulating within ultrasonic sump.	1 Air is present in line. 2 Strainer is clogged 3. Filter is clogged
Spray flow is inadequate	1 Spray nozzle is clogged 2 Air is present in line. 3 Spray reservoir is empty.

4.2 TROUBLE-SHOOTING CHART (Cont'd)

SYMPTOM	PROBABLE CAUSE
Low activity in ultrasonic tank	1. Solvent has not been degassed. 2. Solvent is excessively contaminated. 3. Input voltage to PC board is too low. 4. Fuse on printed circuit has failed. 5. Transistor has failed. 6. Diode has failed. 7. Feedback capacitor has failed. 8. Starting resistor has failed. 9. Equalizing resistor has failed. 10. Transistors are not switching properly. 11. Printed circuit board is open. 12. Joint is poorly soldered. 13. Transducers have failed. 14. Solvent's temperature is too low.
No activity in ultrasonic tank	1. ULTRASONICS switch has failed. 2. Transformer T1 has failed. 3. EMC filter has failed. 4. RF tank cable is not connected to generator or is open. 5. RF cable or tank cable has shorted out. 6. Fuse on printed circuit has failed. 7. Generator fuse(s) failed. 8. Transistor has failed. 9. Diode has failed 10. Feedback capacitor has failed. 11. Starting resistor has failed. 12. Equalizing resistor has failed. 13. Transistors are not switching properly. 14. Printed circuit board is open. 15. Joint is poorly soldered. 16. Transducers have failed
Spray pump motor is not operating.	1. MAIN POWER switch is OFF or has failed. 2 SPRAY thermostat has been activated. 3. Impeller is jammed or pump shaft is frozen 4. Pump motor has failed 5. Spray pump fuse(s) failed
Solvent loss is excessive.	1 Degreaser has a leak 2 Draft across top of degreaser is excessive 3. Solvent dragout is excessive when removing parts 4 Cover is not on when system is not being used 5 Basket was moved too fast 6. Spraying was done above vapor level.
Parts have spots or streaks.	1. Rinsing was inadequate. 2 Sump is dirty 3. Water is mixed with solvent. 4. Desiccant is saturated

4.3 TROUBLE-SHOOTING TRANSDUCER ELEMENTS

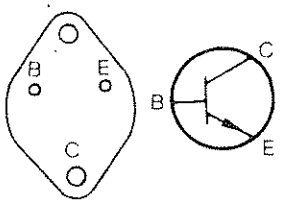
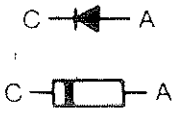
1. Remove the outside skirt of degreaser.
2. Visually check transducer elements on bottom of ultrasonic tank for loose wires or signs of discoloration, burning and charred spots. If visual inspection does not reveal any of these symptoms, perform Steps 3 - 5 to check for voltage breakdown or leakage. However, if visual inspection DOES show any of these symptoms, then contact your nearest Branson authorized service center (see Section 6).
3. Disconnect the red and black leads on right hand side of ultrasonic generator PC board.
4. To remove any charge that remains in transducer, temporarily short red and black leads together.
5. Using a D.C. Hypot (dielectric breakdown tester)* which is capable of generating 2.5 KV and measuring current leakage of 500 micro amps, perform the following:
   - ☐ Connect D.C. Hypot positive lead to red lead, and connect the negative lead to black lead.
   - ☐ Energize D.C. Hypot and gradually increase voltage to 2.5 KV until either a breakdown or arcing occurs, or the current leaks in excess of 500 micro amps at 2.5 KV.
   - ☐ If any of these events occur, test for an additional 30 seconds at 2.5 KV. If the test fails again, then the transducer elements are faulty.*
6. Decrease DC Hypot voltage to zero, disconnect leads and temporarily short red and black leads together.
7. Using a capacitor analyzer*, check transducer elements for open condition. Since the capacitance of a single transducer element is 0.0044 uf ± 7%, the total capacitance should be 0.0044 x 6 = 0.0264 uf ± 7%.
8. Reconnect the leads to PC board.

* If a DC Hypot or capacitor analyzer is not available, or it it has been determined that transducer elements are defective, contact your nearest Branson authorized service center (See Section 6).

4.4 TROUBLE-SHOOTING PRINTED CIRCUIT BOARD

4.4.1 Initial Check-Out*

Disconnect the line cord and ultrasonic tank cable. Remove PC board and refer to Figure 4-3. Transistors and diodes can be checked in the circuit and do not have to be removed from the PC board.

OHMMETER POLARITY		RESISTANCE IN OHMS SCALE—R x 1	REMEDIAL ACTION IF MEASUREMENT DOES NOT AGREE
+	−		
Collector	Emitter	High	Replace transistor 
Emitter	Collector	High	
Collector	Base	High	
Base	Collector	8-12	
Base	Emitter	8-12	
Emitter	Base	High	
Cathode	Anode	High	Replace diode 
Anode	Cathode	8-12	
	Note: Meter function switch set to ⏚ D.C.		

TRANSISTOR AND DIODE TROUBLE SHOOTING CHART
Figure 4-3

* Trouble-shooting the printed circuit board should be limited to the replacement of fuses, transistors and diodes. If other components are suspected of being defective, we recommend that you replace the PC board with a spare and return the faulty board to your nearest Branson authorized service center. (See Section 6.)

4.4 TROUBLE-SHOOTING PRINTED CIRCUIT BOARD (Cont'd)

4.4.2 Final Check-Out

Leave the input from Switch S3 disconnected and replace PC board on main panel. Reconnect input and perform the following:

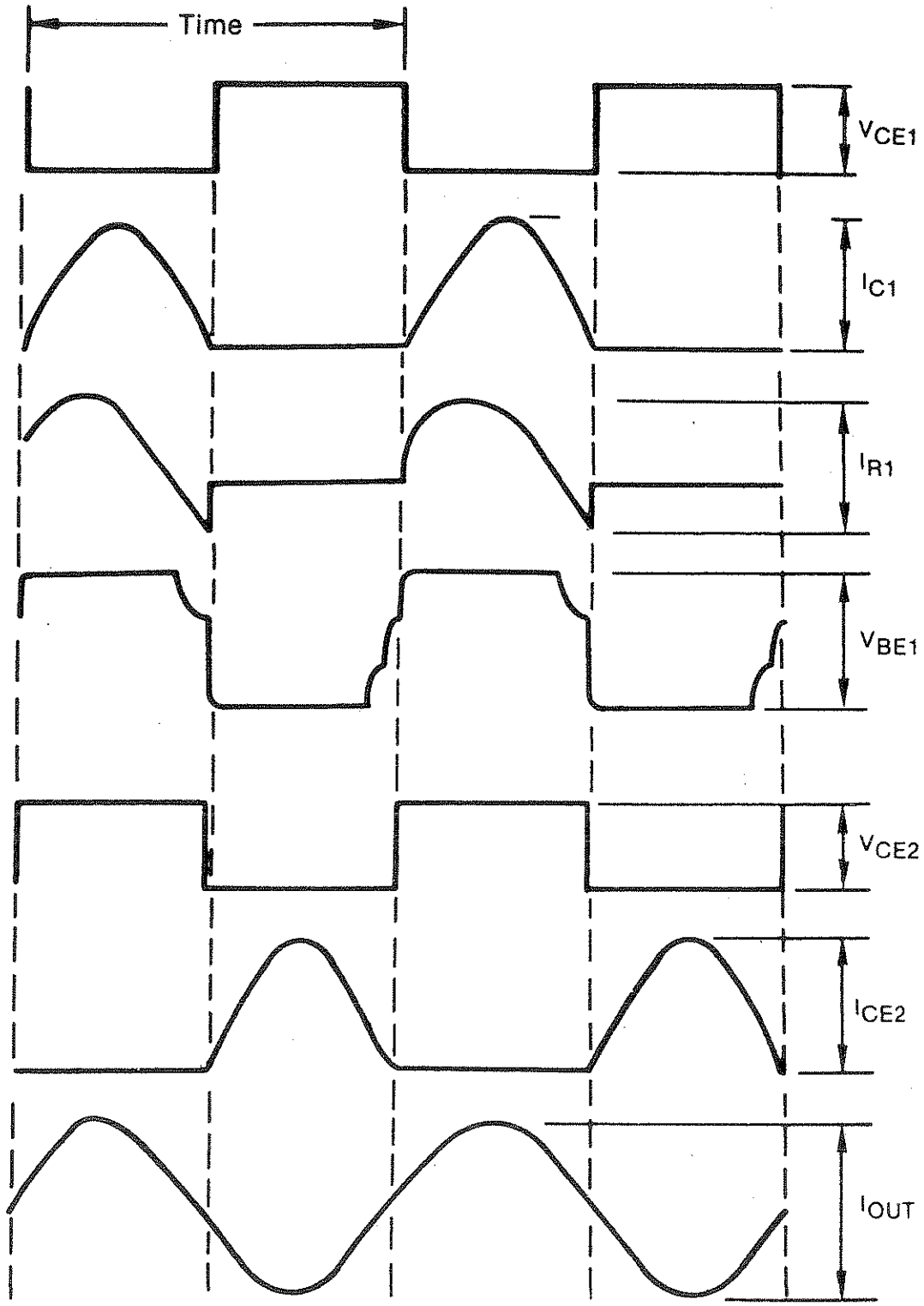
1. Connect voltmeter to S3.
2. Set MAIN POWER and ULTRASONICS switches to ON. Verify that input voltage is as specified in Figure 4-4
3. Set MAIN POWER and ULTRASONICS switches to OFF. Disconnect voltmeter.
4. Connect switch output to PC board. Connect AC ammeter in series with switch output.
5. Set MAIN POWER and ULTRASONICS switches to ON. Verify that current is as specified in Figure 4-4.
6. Monitor the waveforms with a dual channel (differential input) oscilloscope, or isolate the oscilloscope from ground. (See Figures 4-5 and 4-6.)

CAUTION: HIGH VOLTAGE IS PRESENT IN CONTROL BOX!!!

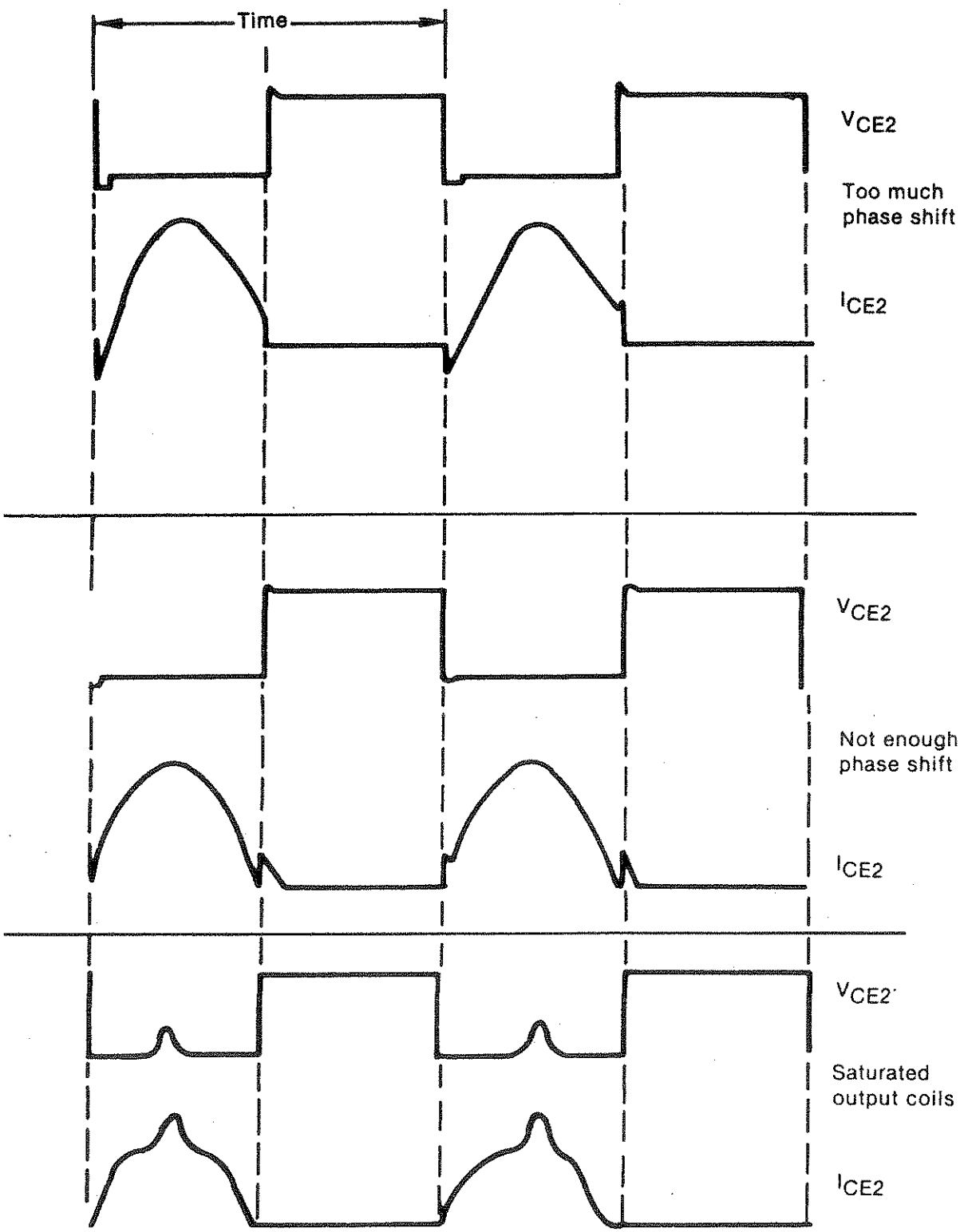
Input Voltage (Volts - RMS)	130
Input Current (Amperes - RMS)	1.6
Collector Current (Amperes - Peak)	4 - 8
Collector Voltage (Volts - Peak)	185 ± 10%
Time for One Cycle (Microsecond)	20 - 22.5
Saturation Voltage (Volts - Max)	15
Cross Over Current (Amperes - Max.)	3 @ 50 Volts

ULTRASONIC GENERATOR PRINTED CIRCUIT BOARD SPECIFICATIONS
Figure 4-4

7. If the waveforms don't conform to these specifications, then contact your nearest Branson authorized service center (see Section 6).



TYPICAL WAVEFORMS
Figure 4-5



TYPICAL WAVEFORMS
Figure 4-6

SECTION 5 - REPLACEMENT PARTS

5.1 RECOMMENDED SPARE PARTS

PART NUMBER	DESCRIPTION	QUANTITY
138-004	FILTER CARTRIDGE DCCSC-10	1
142-001	FILTER NUT GASKET	1
142-005	FILTER GASKET	1
142-007	FILTER SHELL GASKET	1
142-008	FILTER DRAIN GASKET	1
155-721	SERPENTINE HEATER, 1.6KW/230V	1
285-120	PUMP 2MDHC, 115 V	1
100-142-030	STRAINER GASKET 3/4 VITON (Green)	1
100-142-033	STRAINER GASKET 3/4 BUNA N (Black)	1
950-555	MOLECULAR SIEVE	5

5.2 REPLACEMENT PARTS

PART NUMBER	DESCRIPTION	QUANTITY
5.2.1 Control Box		
126-005	FAN WS2107FL	1
135-003	FUSE, 2A, 3AG, 250V	4
135-008	FUSE, 15A, 3AG, 250V, (B400W)	2
135-017	FUSE, 12A, Slow-Blow	2
135-015	FUSE, 20A, 3AB, 250V, (B400R)	2
135-040	FUSE, 10A, 3AB, 250V	2
245-068	PILOT LIGHT RED, 220V	2
385-146	SWITCH, DPST	4
385-150	SWITCH, SPDT	1
820-053	CONTROL BOX	1
5.2.2 Printed Circuit Board		
135-051	FUSE, 5A, 3AG, PIGTAIL	1
456-084	DIODE, 600V, 1A	6
456-090	DIODE, 600V, 3A	4
458-056	TRANSISTOR	4
804-015	A6 PC-65500A PC BOARD	1
5.2.3 Pump and Motor Assembly		
285-120	PUMP AND MOTOR	1
100-285-140	BKT ADAPTOR	1
100-285-141	VOLUTE BODY	1
100-285-142	HOUSING	1
100-285-143	DRIVE ASSEM	1
100-285-144	IMPELLER	1
100-285-145	SHAFT	1
100-285-146	THRUST WASHER	1
100-285-147	O-RING VITON	1
100-285-148	STUD COLLARED	1
100-285-149	WING NUT	1

5.3 ORDERING REPLACEMENT PARTS

All requests for assistance, repairs and replacement of parts should be directed to one of Branson's authorized service centers listed in the Appendix, Section 6. Include the part number, serial number, model number and description with all requests.

5.4 RETURNING EQUIPMENT

When returning equipment for repairs, send F.O.B. to nearest Branson authorized service center (Section 6). Send with all transportation charges prepaid, indicate method of return shipment, and enclose a blanket purchase order for $200.00 to expedite repairs. (All prices for repairs will be quoted.) Be sure to pack it properly.

When returning equipment for credit, obtain a "Material Return Authorization" number ONLY from Branson Cleaning Equipment Company, Shelton, Connecticut. And send equipment ONLY to Shelton, CT. Be sure to pack it properly.

BRANSON AUTHORIZED SERVICE CENTERS

CALIFORNIA

Branson Cleaning Equipment Co.
12955 East Perez Place
City of Industry, CA 91746
(818) 369-5711

Branson Ultrasonics Corp.
780 Trimble Road, Suite 405
San Jose, CA 95131
(408) 435-8433
(408) 435-8434

CANADA

Branson Canada
817 Brock Road South, Unit 8
Pickering, Ontario, Canada
(416) 831-4411
Telex 06525402

CONNECTICUT

Branson Ultrasonics Corp.
Eagle Road,
Danbury, CT 06810
(203) 796-0400
Telex 643102

FLORIDA

Paragon Electronics
11075 N.E. 6th Avenue
Miami, FL 33161
(305) 757-0631

GEORGIA

Branson Ultrasonics Corp.
6090 McDonough Road
Norcross, GA 30093
(404) 448-9377

ILLINOIS

Branson Ultrasonics Corp.
541 West Golf Road
Arlington Heights, IL 60005
(312) 981-0012

JAPAN

Branson Ultrasonics Corp.
Takeshiba Building, Suzegumi-WH
1-15-8 Kaigan
Minato-Ku Tokyo 105 Japan
(011) 81-434-1421
Telex 781-24234070

MASSACHUSETTS

Branson Ultrasonics Corp.
59 Commerce Way
Woburn, MA 01801
(617) 938-8172

MICHIGAN

Branson Ultrasonics Corp.
1142 East Big Beaver Road
Troy MI 48084
(313) 524-1252

NETHERLANDS

Branson Europa B.V.
Energieweg 2
P. O. Box 9
Soest, Netherlands
(011) 31-21-551-5551
Telex 844-43086

NEW MEXICO

Rio Grand Jewelry Supply
6901 Washington North East
Albuquerque, NM 87109
(505) 345-8511

PENNSYLVANIA

Branson Ultrasonics Corp.
501 Office Center Drive,
Suite 10,
Fort Washington, PA 19034
(215) 628-4559

SOUTH CAROLINA

Sound Services Company
3111 Port Clear Drive
Fort Mill, SC 29715
(803) 548-4334

TEXAS

Alpha Omega Electronics Corp.
2821 National Drive
Garland, TX 75041
(214) 271-5569

6.2 METRIC CONVERSION CHART*

Length		
1 inch (in.)	=	2.54 cm (exact)
1 foot (ft)	=	30.48 cm
1 millimeter (mm)	=	0.04 in.
1 centimeter (cm)	=	0.39 in.
1 meter (m)	=	3.28 ft
Weight		
1 ounce (oz)	=	28.35 g
1 pound (lb)	=	0.45 kg
1 gram (g)	=	0.04 oz
1 kilogram (kg)	=	2.20 lb
Volume		
1 fluid ounce (fl oz)	=	29.57 ml
1 pint (pt)	=	0.47 l
1 quart (qt)	=	0.95 l
1 gallon (gal)	=	3.79 l
1 milliliter (ml)	=	0.03 fl oz
1 liter (l)	=	2.11 pt
1 liter (l)	=	1.06 qt
1 liter (l)	=	0.26 gal

* Approximations

6.3 FIRST AID

IF SOLVENT VAPORS HAVE BEEN INHALED, move person to fresh air. If not breathing, give artificial respiration, preferably mouth to mouth. If breathing is difficult, give oxygen and call a physician.

IF SOLVENT GETS INTO EYE, hold eye open, flush with water for at least fifteen (15) minutes and call a physician.

IF SOLVENT CONTACTS SKIN, flush immediately with plenty of water.

IF SOLVENT IS SWALLOWED, dilute by consuming several glasses of either water, soapy water, salty water (1 Tbs. per glass), or milk. Induce vomiting.

EXCEPTION: Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

IF SOLVENT CONTACTS CLOTHING, remove it immediately, wash throughly before reuse. Discard contaminated shoes.

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 arrythmias.

REFERENCES:

MCA Chemical Data Sheet
Manufacturing Chemist Association
1825 Connecticut Avenue, N.W.
Washington, D.C. 20009

OSHA/Material Data Sheet for solvent in use.

ATTENTION DEGREASER OWNERS!

ADDENDUMS

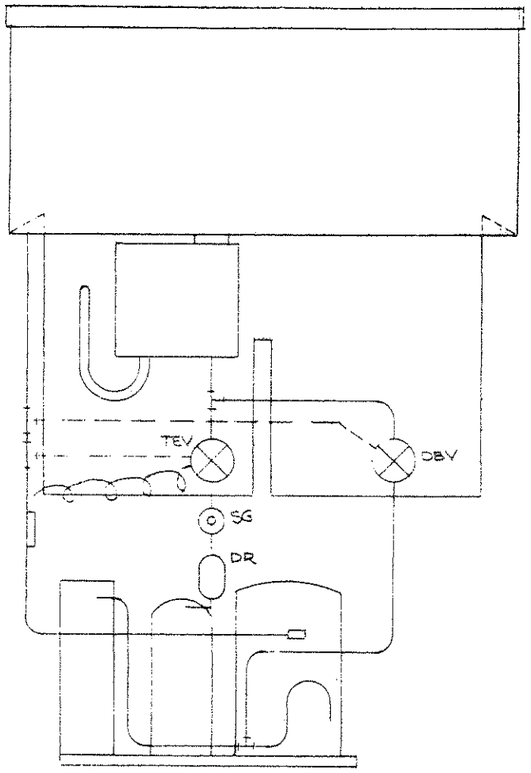
The B400 degreasers are supplied with the type gasket suitable for use with the solvent specified on the "Solvent" label on the B400. The following list indicates the two types of gaskets and the solvents compatible with each type:

VITON (Green)	Buna N (Black)
Freon TE	Freon TF
Freon TESA	Freon TA
Freon TMC	Freon TMS
1,1,1 Trichoroethane	
Methylene Chloride	
Perchlorethylene	

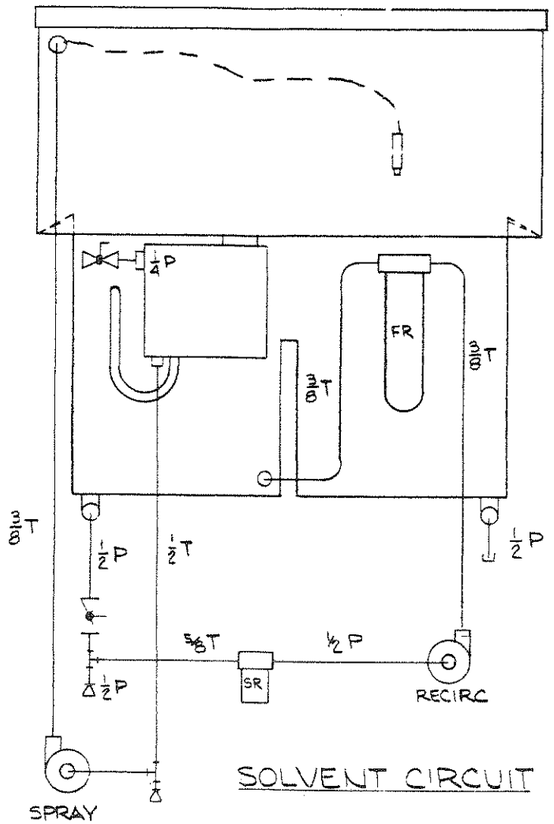
Using the wrong gasket with the wrong solvent can result in a leak which could cause a safety hazard.

SECTION 7 - DRAWINGS

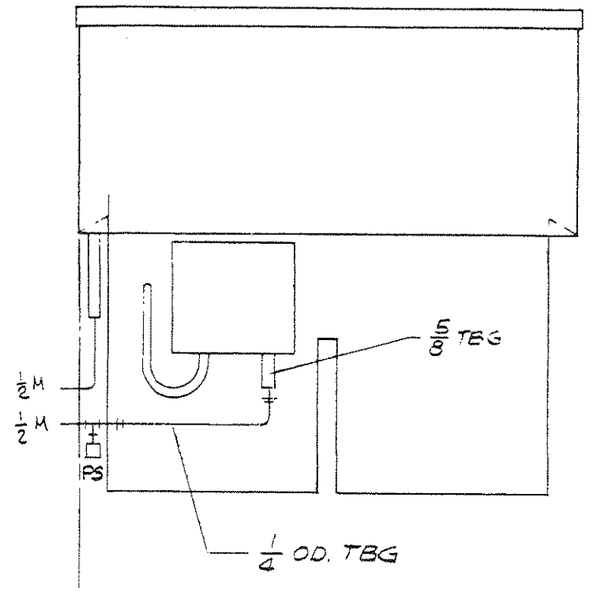
DRAWING	NUMBER
Plumbing Diagram	B13655
Wiring Diagram	C13662-C
Wiring Diagram	C13784-C
Wiring Diagram	C13751-B
Control Box Assembly	D13705-H
B400R Assembly (Refrigerated)	D13734-G
B400W Assembly (Water Cooled)	D13782-G
B400W Assembly (Water Cooled)	D13868-J



REFRIGERATION CIRCUIT



SOLVENT CIRCUIT



WATER CIRCUIT

1. ALL LIQUID LINES TO BE ⅜ OD TUBING.
2. ALL SUCTION LINES TO BE ⅝ OD TUBING
3. DBV INLET TO BE ⅜ OD, OUTLET ⅝ TUBING
4. EQUALIZER LINES TO BE ¼ OD TUBING.

REV	DESCRIPTION	BY	APPR	DATE
A	ECN# 1037	AG	PM	10/83

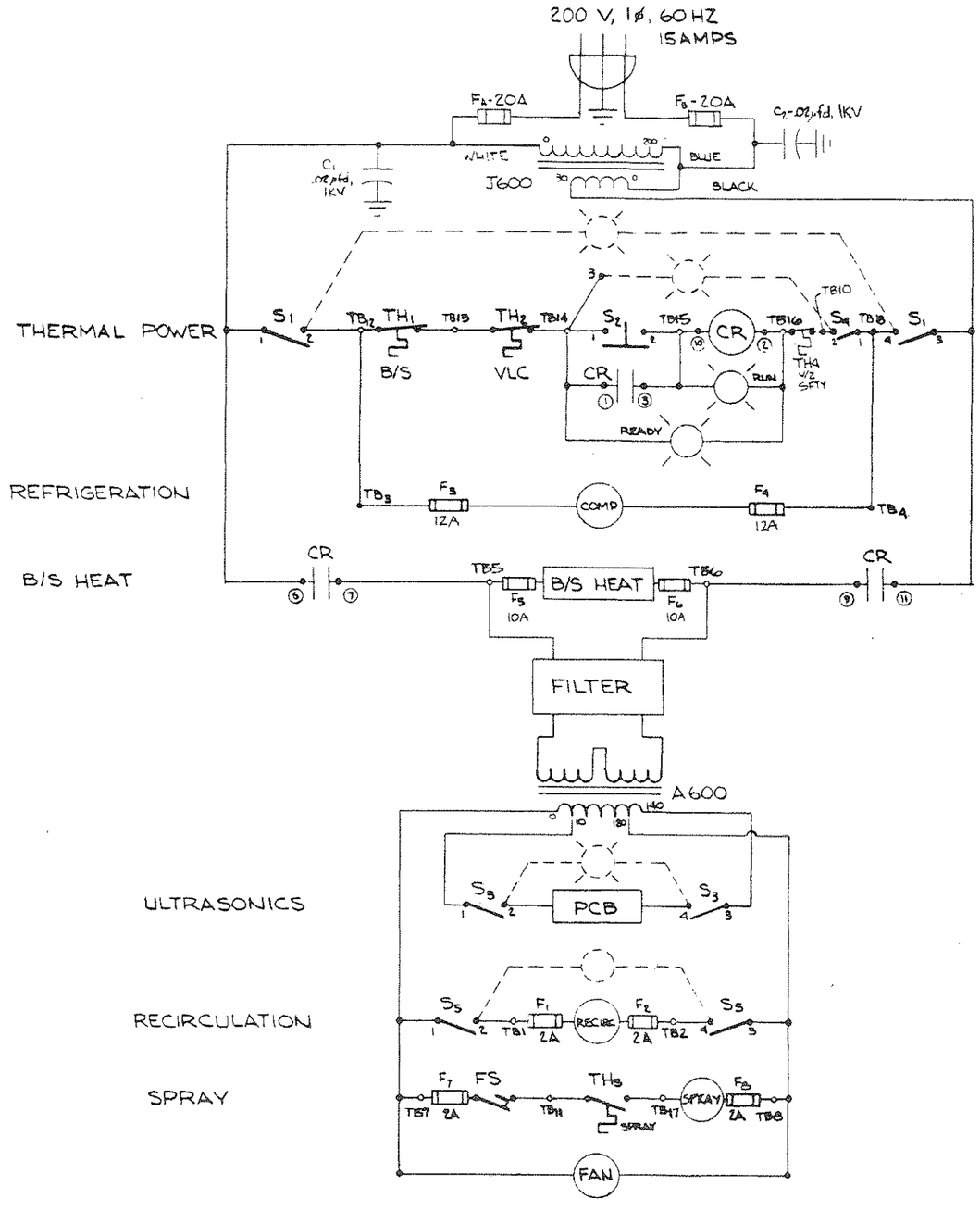
REVISIONS

BRANSON CLEANING EQUIPMENT COMPANY
PARROTT DRIVE • SHELTON CONN 06484

BRANSON

PLUMBING DIAGRAM

MODEL: B400			QTY/UNIT
ORDER NO		CUSTOMER	
MATL			FINISH
DWN: JCS	DATE: 11.19.82	PART NO	
CHKD:	DATE:	SCALE	DWG NO: B13655 REV: A
APPVD:	DATE:		



NOTES:

1. CIRCLED NUMBERS INDICATE RELAY CONNECTIONS.

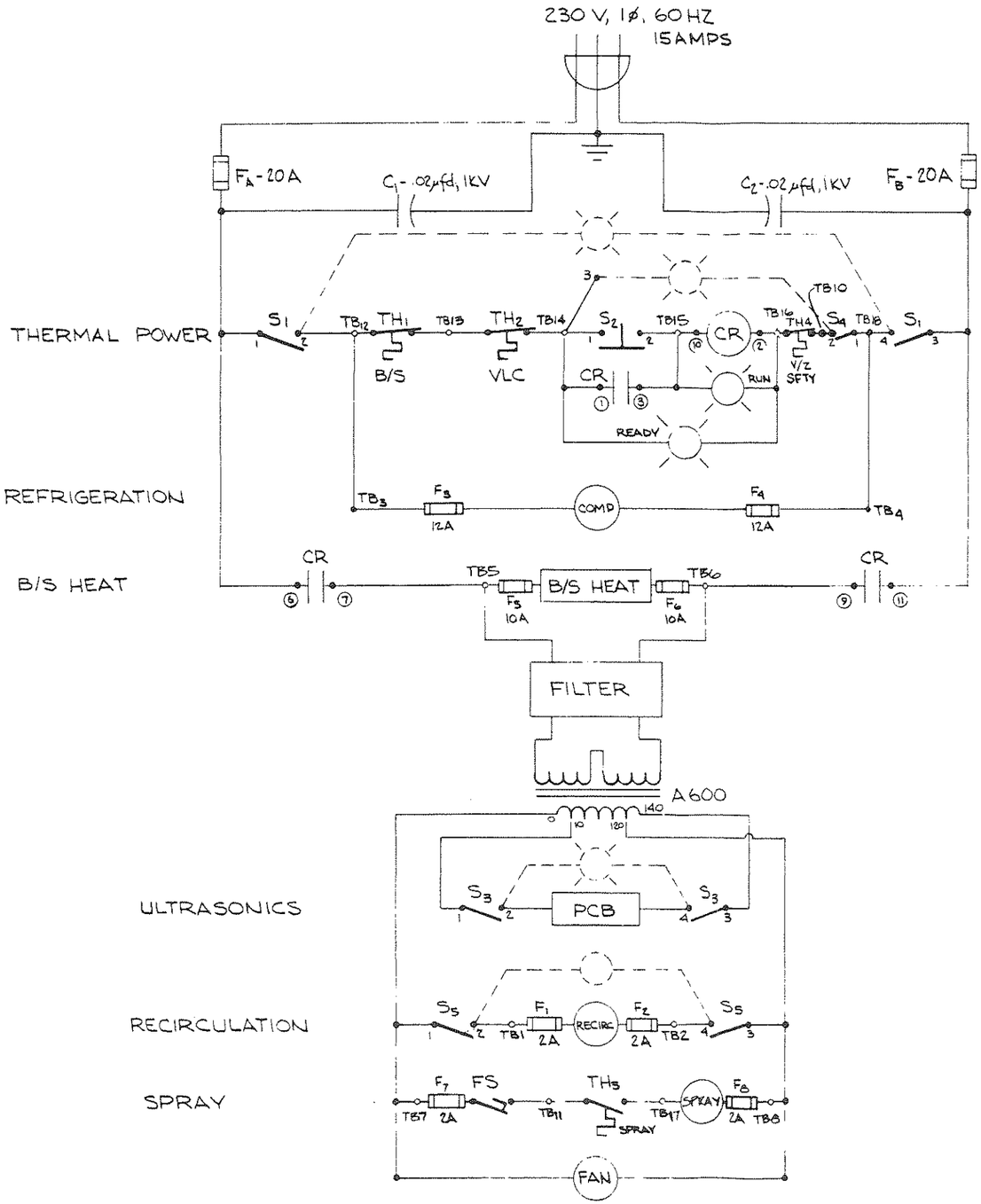
FOR CONTROL BOX ASS'Y
SEE D13705

REV	DESCRIPTION	DATE	APPR
B	ECN # 1441	7/84	JH
A	ECN # 1134	1/84	JH

BRANSON CLEANING EQUIPMENT COMPANY
PARFET DRIVE • SHELTON, CONN 06484
BRANSON a Smithkline company

WIRING DIAGRAM

MODEL B400R, 200/60	QTY/UNIT		
ORDER NO	CUSTOMER		
MAT'L	FINISH		
DRWN JCS	DATE	PART NO 927-215	
CHKD	DATE	SCALE	DWG NO C 13751
APPVD JCS	DATE 8.26.83		REV B



NOTES:

1. CIRCLED NUMBERS INDICATE RELAY CONNECTIONS.
2. $F_{A,B}$ TO BE 15A FUSES ON W-UNITS

FOR CONTROL BOX ASS'Y SEE D13705

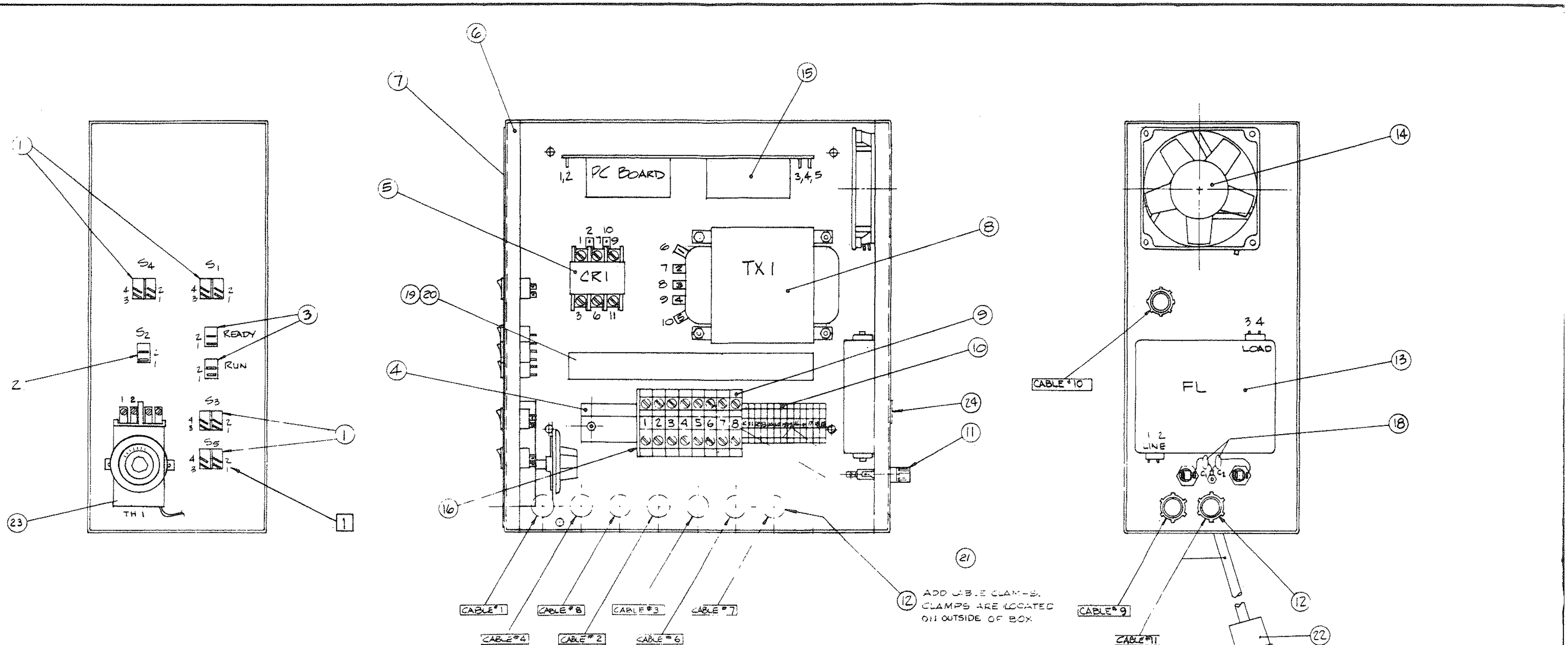
REV	DESCRIPTION	BY	APPR	DATE
J	ECN # 1441	JJH	Fas	2/86
B	ECN # 1134	DK	[illegible]	10/84
A	ECN # 1037	KG	PM	1/83

BRANSON CLEANING EQUIPMENT COMPANY
PARROTT DRIVE • SHELTON, CONN 06484

BRANSON a SmithKline company

WIRING DIAGRAM

MODEL B400		QTY/UNIT	
ORDER NO:		CUSTOMER	
MATL:		FINISH:	
DWN: JCS	DATE: 10.20.82	PART NO:	
CHK'D:	DATE:	SCALE	DWG NO: C13662
APPV'D: JHP	DATE: 7/7/83		REV: C



Nº	WIRE FROM	WIRE TO	COLOR	STRIP	LGTH.	RECEPT.	GA.
1	S2-1	CR1	YELLOW			.187-250	16
2	S2-2	CR3	BLUE		5½	.187-250	16
3	S1-1	CR6	BLACK		6½	.187-250	14
4	S1-2	TB12	BROWN		16	.187-0	14
5	S1-3	CR1	BLUE		7½	.187-250	14
6	-4	TB6	RED		18	.187-0	14
7	S4-	TB8	GRAY		8	.187-0	16
8	S4-2	TB10	BROWN		1	.187-0	16
9	S4-3	TB14	RED		1	.187-0	16
10	S3-1	TX-5	VIOLET		1½	.187-250	16
11	S3-2	PCB-1	VIOLET		14	.187-250	16
12	S3-3	TX-10	BLUE		10	.187-250	16
13	S3-4	PCB-2	BLUE		15	.187-250	16
14	S5-1	TB7	WHITE		13	.187-0	16
15	S5-2	TB1	RED		10	.187-0	16
16	S5-3	TB8	YELLOW		13	.187-0	16
17	S5-4	TB2	BLUE		11	.187-0	16
18	TB3	TB12	BLUE		8	0-0	16
19	CR1	TB14	BROWN		16½	.250-0	16
20	READY	TB14	RED		16	.187-0	16
21	CR3	TB15	RED		12	.250-0	16
	CR10	TB15	BLUE		18	.250-0	16
	RUN	TB15	VIOLET		1.1	.187-0	16
	RUN	TB16	BROWN		14	.187-0	16
25	READY	TB16	YELLOW		14	.187-0	16
26	CR2	TB16	GRAY		19	.250-0	16
27	CR7	TB5	BLACK		13	.250-0	16
[illegible]	CR9	TB6	RED		13	.250-0	16

Nº	WIRE FROM	WIRE TO	COLOR	STRIP	LGTH	RECEPT	GA.	
31	FL1	TB5	BLACK		14	.250-0	16	
32	FL2	TB6	BROWN		14	.250-0	16	
33	TX3	TX6	WHITE		5	.250-250	16	
34	TX-1	FL3	RED		21	.250-250	16	
35	TX-8	FL4	BLUE		18	.250-250	16	
36	TX-4	TB7	YELLOW		8	.250-0	16	□
37	TX-9	TB8	RED		5	.250-0	16	□
38	CR6	FA	BLACK		21	.250-187	14	
39	CR11	FB	BLACK		19	.250-187	14	
40	FANS	TX4/TX9	FAN CORDSET					
41	TB4	TB18	GRAY		10	0-0	16	⊗
42	C1, C2	FA, FB, GRD				.187-0		
43								
44	TB 14	TB 14	BLACK		2	0-0	16	
45	TB 15	TB 15	"		2	0-0	16	
46	TB 16	TB 16	"		2	0-0	16	
47	TB 18	TB 18	"		2	0-0	16	
48	TB 12	TH1-1	BRN/WHT		1	¼-10P	16	
49	TB 13	TH1-2	BRN/WHT		1	¼-10P	16	

10P - LUG P/N 400-012

Nº	PART Nº	DWG Nº	DESCRIPTION	QTY
1	385-146		SWITCH, 1805,1102 DPST	4
2	385-150		MOM. SWITCH 1801,1221 SPST	1
3	245-068		PILOT LIGHT 1807,1102 220V	2
4	404-026		"ELECTROVERT" MTG. RAIL 98-190-0000	
5	310-001		CONTACTOR, 3P/25A/220V	1
6	650-710	D13641	CONTROL BOX CHASSIS	1
7	230-075	C13689	CONTROL BOX LABEL	1
8	447-143		A600 TRANSFORMER	1
9	404-020		"ELECTROVERT" TERM BLK 54-910-5353	8
10	404-022		"ELECTROVERT" TERM BLK 54-204-6055	13
11	136-032	A 14220	FUSE HOLDER	2
12	599-003		CONN 3302 3/8 x ½	10
13	459-025		RF FILTER	1
14	126-005		FAN	1
15	804-015		AXU BOARD	1
16	404-024		"ELECTROVERT" END PLATE 07-311-4153	1
17	650-712	C13640	CONTROL BOX COVER	1
18	040-301		CAPACITOR, .02μfd, 1KVA	2
19	594-102		WIRE DUCT 1x2	11 IN.
20	594-101		WIRE DUCT COVER	11 IN.
21	404-060		"ELECTROVERT" MARKING TAG 04-242-0850	17
22			PLUG, HUBBELL 5466-C, 250V, 20A, 1Q	1

ITEM #17 - COVER NOT SHOWN

23	408-010	A-11421	THERMOSTAT AUTO 01	1
24	230-012	A 14678	PATENT LABEL	1

	FUSE	
F	R-UNIT	W-UNIT
F 1,2	2A	2A
F 3,4	12A SB	--
F 5,6	10A	10A
F 7,8	2A	2A
FA,B	20A	15A

	CABLE Nº	CABLE FROM	CABLE TO	LGTH	RECEPT.	Nº OF WIRE/GA	CABLE P/N
□	1	TB1/TB2	RECIRC. PUMP	40	0-0	PUMP WIRES	
⊗	2	TB3/TB4	COMPRESSOR	60	0-0	16/2	085-008
	3	TB5/TB6	B/S HEATER	30	0	B/S HEATER WIRES	
□	4	TB17/TB8	SPRAY PUMP	40	0-0	PUMP WIRES	
	5						
	6	TB16/TB10	V/Z SFTY	—	0-0		
	7	TB13/TB14	VAPOR THERM	12	0	THERM. WIRES	
□	8	TB11/TB17	SPRAY THERM	10		"	
□	9	TB7/TB11	FOOT SWITCH			FOOTSWITCH CABLE	
	10	PC4/PC5	X'DUCERS	48	¼-0	14/2	085-062
	11	FA/FB	POWER IN	10 FT	.187-0	12/3 P/N 085-008	
*	12	FA/FB	J600 X'FORMER		.187-0	12/4	085-034
		J600 X'FORMER	CR6/CR11		0-¼		
+	13						

* FOR J/60 UNITS ONLY

⊗ FOR R UNITS ONLY

□ DELETE ON UNITS WITH NO SP/PF. ◫ REPLACE WITH P/N 076-102(1), 076-104(2)

REV	DESCRIPTION	BY	APPD	DATE
H	ECN #1441	JJH	CBA	2/86
G	ECN #1326	JJH	PM	9/85
F	ECN #1284	JJH	PM	5/85
E	ECN #1190	CBA	HP	1/84
D	ECN #1165	CBA	HP	11/84
C	ECN #1134	DK	[illegible]	11/83
B	ECN #1043	DK	PM	10/83
A	ECN #1037	AG	PM	10/83

REVISIONS

BRANSON CLEANING EQUIPMENT COMPANY
PARROTT DRIVE • SHELTON, CONN. 06484

BRANSON

CONTROL BOX ASSEMBLY

MODEL: B400

ORDER NO.:

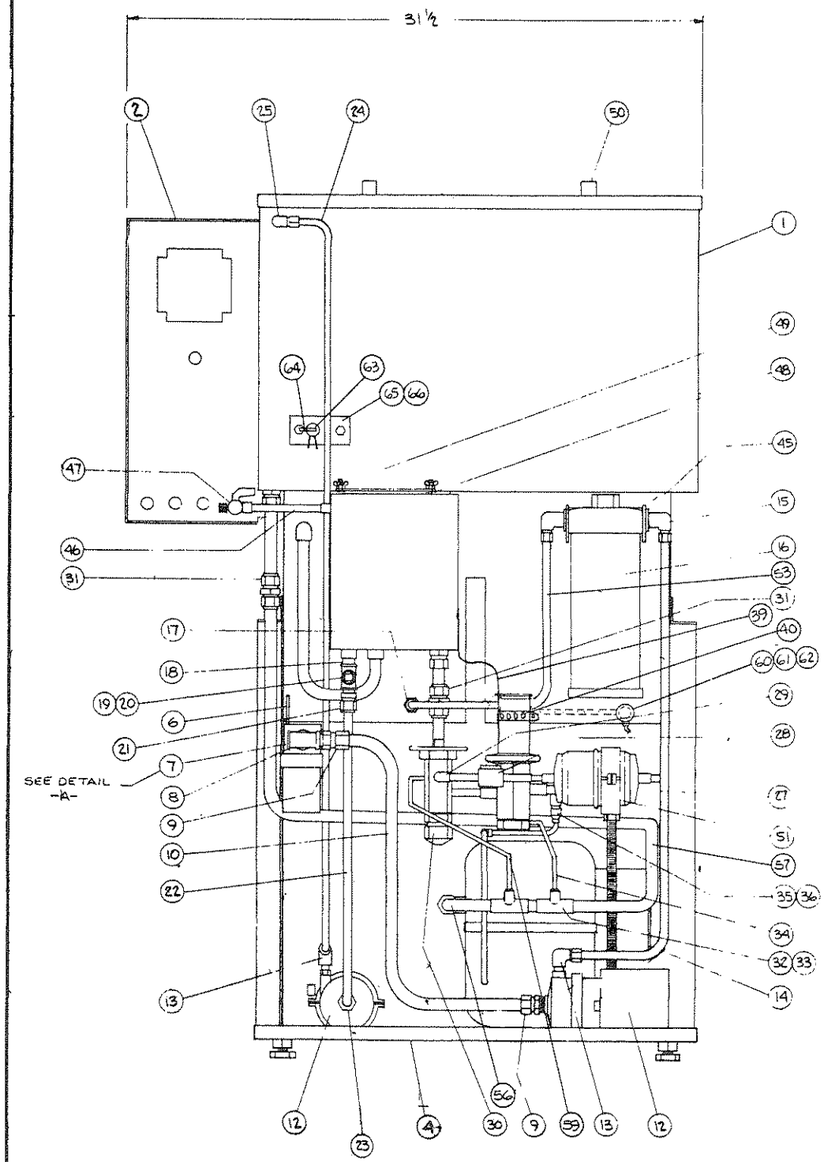
MAT'L:

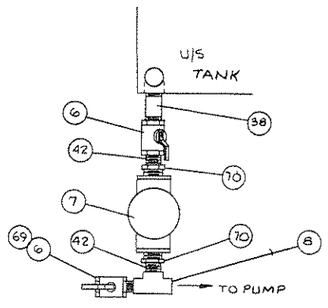
DRAWN: M COOK DATE: 2-2-83 PART NO.: 820-053

CHKD: DATE:

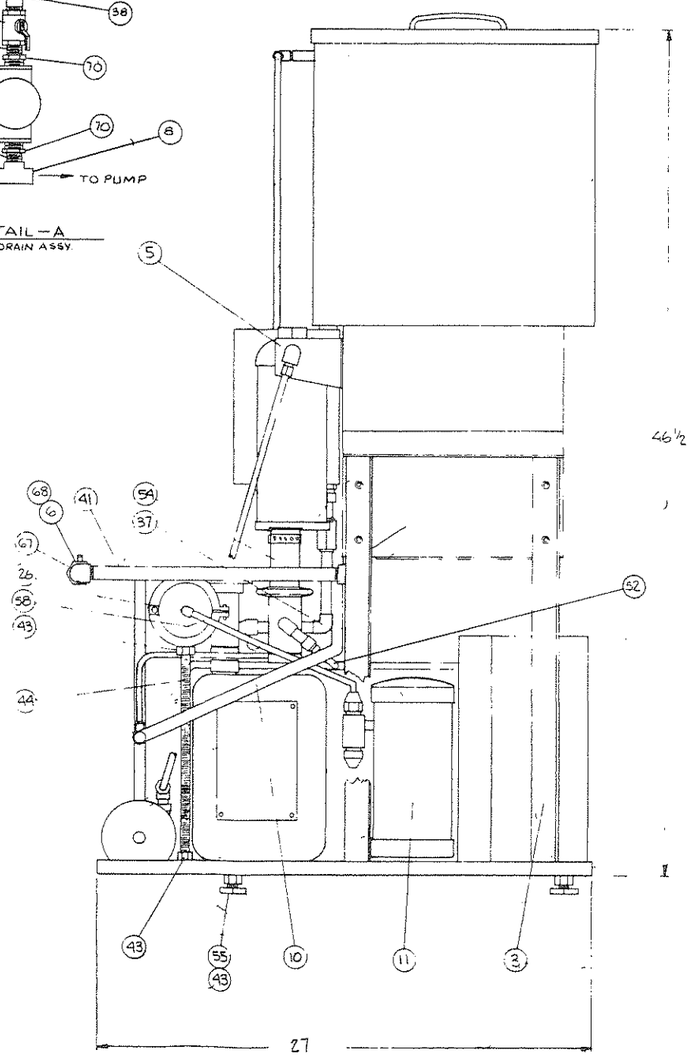
APPVD: [illegible] DATE: 7/7/83 SCALE: ½ DWG NO.: D13705

KREGS INC. 2274L





DETAIL—A
U/S DRAIN ASSY.



Nº	P/N	DESCRIPTION	QTY
67	531-210	½ x 90 BR ELB	1
68	535-263	½ x 23 BR NIP	1
69	535-255	½ x 3½ BR NIP	1
70	519-212	½ F x ¾ M BUSH	2

Nº	P/N	DESCRIPTION	QTY
1	820-051	B400 TANK ASSEMBLY	1
2	820-053	B400 CONTROL BOX ASSEMBLY	1
3	650-726	B400R TANK LEGS	4
4	650-730	B400R BOTTOM CHASSIS	1
5	650-563	FILTER MOUNTING BRACKET	2
6	559-207	BALL VALVE ½ F	3
7	545-410	PLASTIC STRAINER ¾F	1
8	547-205	TEE BRASS ½	1
9	589-154	SW CONN B1010-1-8	2
10	750-002	RECIR. PUMP INLET LINE	1
11	513-608	2OUD UNIT ¾ HP 208/230	1
12	285-122	PUMP 2N-D-HC	2
13	589-739	SW F ELBOW B6[illegible]	2
14	750-006	RECIR. PUMP OUTLET	1
15	589-139	SW ELBOW B600-2-8	2
16	138-005	FILTER BR 10x½	1
17	589-133	SW CONN B600-1-6	1
18	535-232	NIPPLE BR ¾ x CL	1
19	547-203	TEE BR ⅜	1
20	537-205	PLUG BR ⅜	1
21	589-143	SW CONN B810-1-6	1
22	750-004	SPRAY PUMP INLET LINE	1
23	589-144	SW CONN P810-1-8	1
24	750-008	SPRAY PUMP OUTLET LINE	1
25	589-137	SW ELBOW B600-2-4	1
26	531-304	ELBOW ½C x 90 ST	1
27	513-001	DRIER C1635 ⅜	1
28	513-107	INDIC SA135 ⅜	1
29	531-312	ELBOW ⅜C x 90 ST	1
30	513-420	TEV SFE-1-CP6C	1
31	589-005	PKR UNION BR 1[illegible]	2
32	547-306	TEE ½ x ½ x ¼	2
33	521-302	FL BUSH ¼ FTG x ⅜C	2
34	750-011	DBV EQUALIZER	1
35	529-314	COUP ½C x ¼C	1
36	531-321	ELB ½C x 90 ST	1
37	531-323	ELB ½C x 90	1
38	535-252	½ x 2 BR NIPPLE	1
39	650-738	TIE-DOWN BRACKET	1
40	075-024	HOSE CLAMP 2"	1
41	535-262	NIPPLE ½x11½ BR	1
42	535-250	½ x CL BR NIPPLE	2
43	352-117	HEX NUT ½-13	7
44	600-070	THREADED ROD ½-13x15½"	1
45	352-102	LOCKNUT 141-½	2
46	535-123	NIPPLE SS ¼-5	1
47	567-205	PET BR ¼M x ¼F	1
48	142-005	FILTER GASKET	1
49	352-120	WING NUT ¼-20	2
50	145-020	HANDLE 165A-8	2
51	541-510	SPL RING HANGAR 2½	1
52	750-006	DBV LINE	1
53	750-009	RECIR. FILTER OUTLET	1
54	513-436	DBV ADRPE-3-C/60	1
55	127-054	LEV FOOT FT 4445	4
56	750-001	COMP. SUCT. LINE	1
57	750-003	SUCTION LINE	1
58	750-007	REC TO DRIER	1
59	750-010	TEV EQUALIZER	1
60	155-721	1.6 KW. SERP. HTR. 230 V	1
61	600-458	GUARD, SERP. HTR. POST	2
62	127-017	PLUG, SNAP OUT	2
63	386-050	BI-METALLIC THT.	1
64	650-520	THT. CLIP	1
65	650-522	THT. MTG. PLATE	1
66	142-160	THT. MTG. PLATE GASKET	1

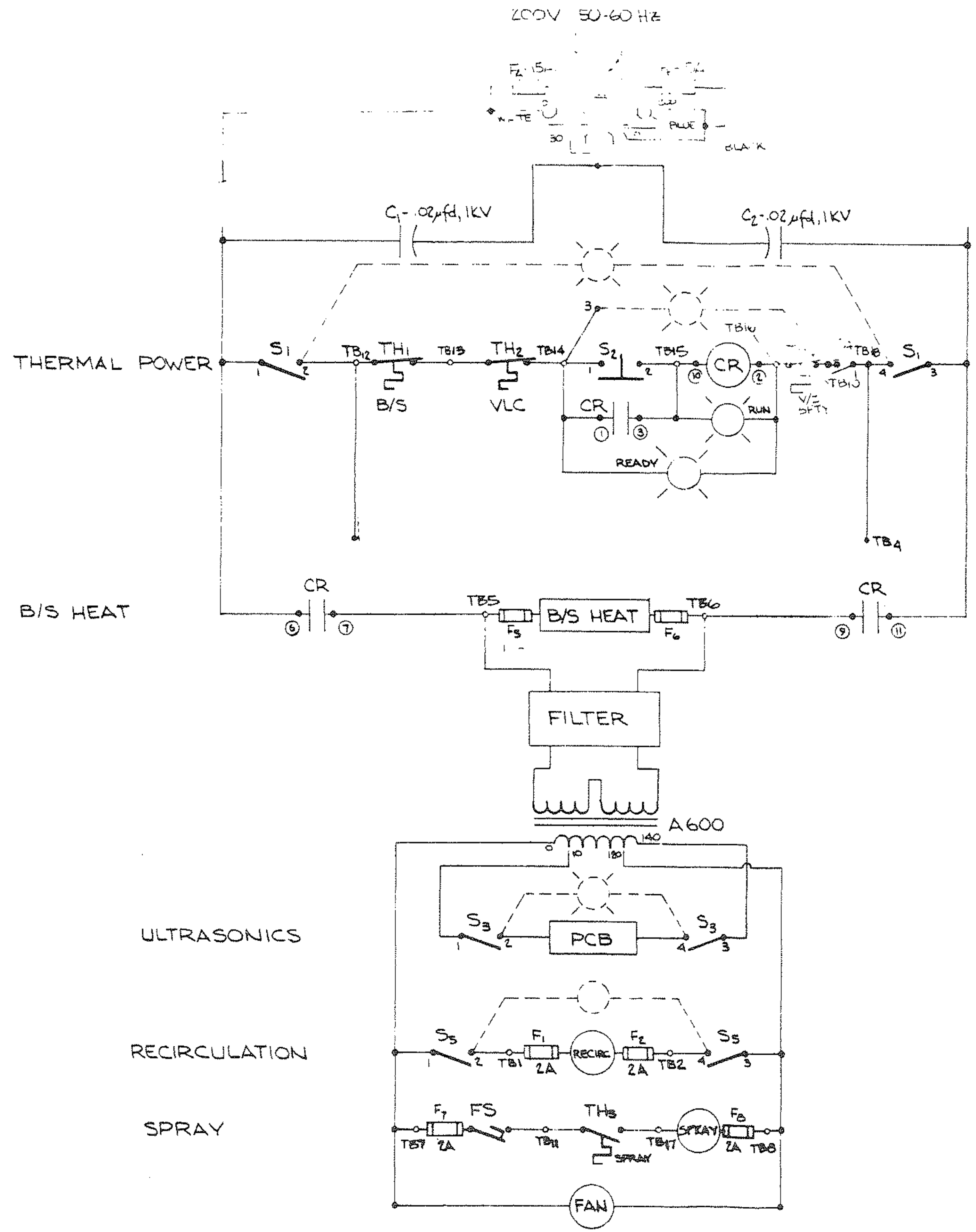
* 220/60 Hz UNITS - 513-630 ¾ HP, 220V/60Hz

REV.	DESCRIPTION	DATE	APPR.
G	ECN# 1606	7/86	
F	ECN# 1491	2.86	
E	ECN# 1374	1/86	
D	ECN# 1190	8/85	
C	ECN# 1144	3/85	
B	ECN# 1105	11/84	
A	ECN# 1037	10/84	

BRANSON CLEANING EQUIPMENT COMPANY
PARROTT DRIVE • SHELTON, CONN 06484
BRANSON a SmithKline company

B400R ASSEMBLY

MODEL: B400R — QTY/UNIT:
ORDER NO: — CUSTOMER:
MATL: SEE DWG — FINISH:
DRWN: JCS — DATE: 6.20.83 — PART NO: 927-211
CHKD: — DATE:
APPROVED: [illegible] — DATE: 7/7/83
SCALE: ~ — DWG NO: D13734 — REV: G



NOTES:

1. CIRCLED NUMBERS INDICATE RELAY CONNECTIONS.

FOR CONTROL BOX ASS'Y
SEE D13705

REV	DESCRIPTION	BY	APPR	DATE
C	ECN # 1441	JJH	[illegible]	[illegible]
B	ECN # 1134	[illegible]	[illegible]	[illegible]
A	ECN # [illegible]	AJ	[illegible]	10/[illegible]

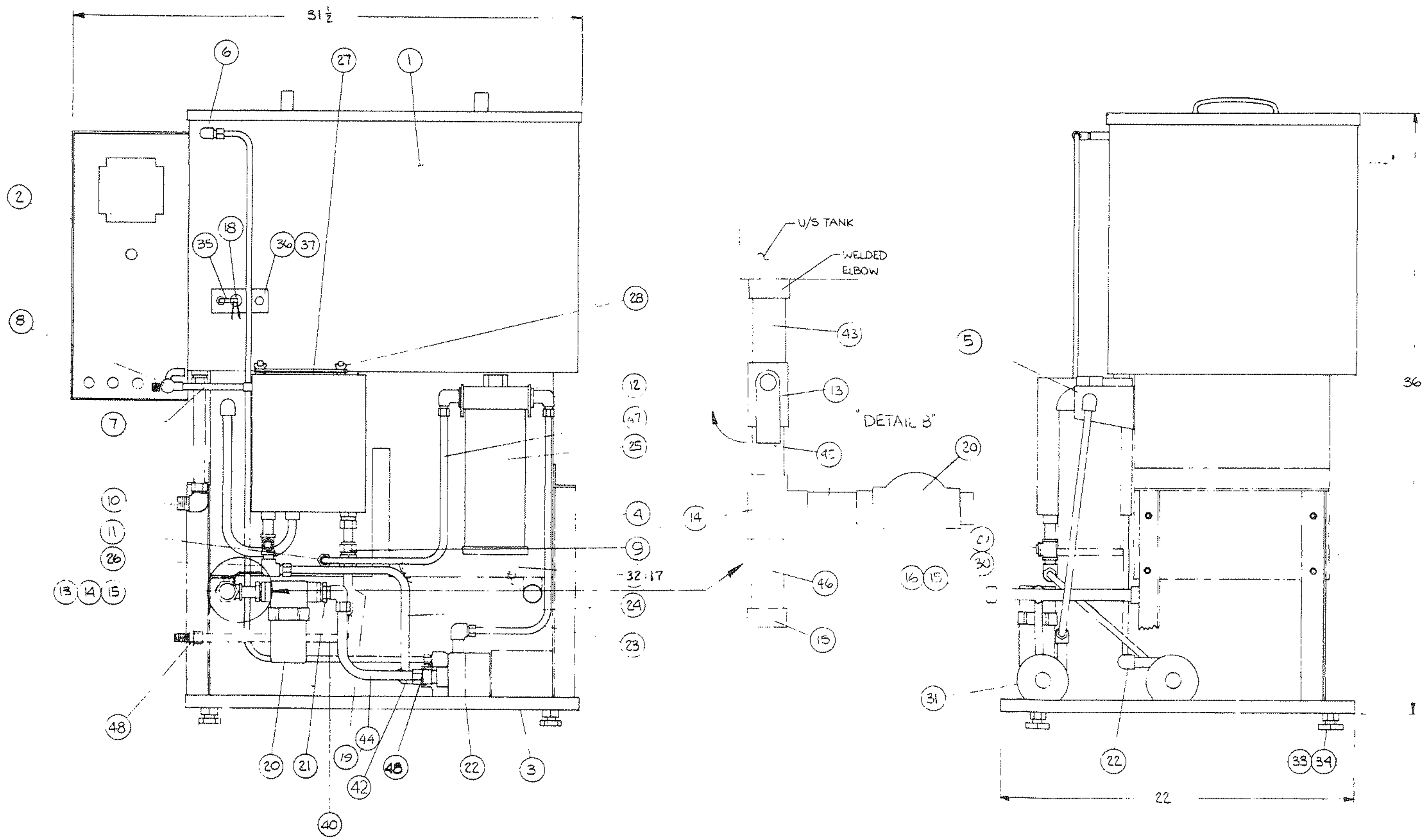
REVISIONS

BRANSON CLEANING EQUIPMENT COMPANY
PARROTT DRIVE • SHELTON, CONN 06484

BRANSON
a SmithKline company

WIRING DIAGRAM

MODEL B400 N, 200, 50-60		QTY/UNIT	
ORDER NO		CUSTOMER	
MATL		FINISH	
DWN: JCS	DATE:	PART NO 927-205	
CHKD:	DATE:	SCALE	DWG NO: C 13794 — REV C
APPVD: JCS	DATE: 8.26.83		



Nº	P/N	DESCRIPTION	QTY
1	820-051	B400 TANK ASSEMBLY	1
2	820-053	B400 CONTROL BOX ASSEMBLY	1
3	650-732	B400W BOTTOM CHASSIS	1
4	650-728	B400W TANK LEGS	4
5	650-563	FILTER MTG BRKT	2
6	589-137	SW ELBOW B600-2-4	1
7	535-123	NIPPLE SS 1/4x5	1
8	567-205	PET BR 1/4M x 1/4F	1
9	589-9CS	UNION 10-10 HBZ SS	1
10	589-157	SW ELBOW B1010-2-8	2
11	589-133	SW CONN B600-1-6	1
12	589-139	SW ELBOW B600-2-8	2
13	559-207	BL VALVE BR 1/2F	1
14	547-205	TEE BR 1/2	1
15	525-206	CAP BR 1/2	2
16	600-708	NIPPLE SS 1/2x10	1
17	600 458	GUARD, SERP HEATER	2
18	386-050	BI-METALLIC THT.	1
19	503-315	TUBING 7/8 OD COP	3 FT
20	545-410	PLAS STRAINER 3/4F	1
21	519-212	BUSHING BR 3/4M x 1/2F	2
22	589-739	SW F ELBOW B600-8-8	2
23	503-308	TUBING 3/8 OD COP	6 FT
24	503-312	TUBING 1/2 OD COP	6 FT
25	138-005	FILTER BR 10x1/2	1
26	589-146	SW ELBOW B810-2-6	1
27	142-005	FILTER GASKET	1
28	352-120	WING NUT 1/4-20	2
29	547-203	TEE BR 3/8	1
30	537-205	PLUG BR 3/8	1
31	285-120	L-G PUMP 120V 2MDHC	2
32	155-721	1.6 KW SERP HEATER, 230V	1
33	127-054	LEV FOOT	4
34	352-117	HEX NUT 1/2-13	4
35	650-520	THT. CLIP	1
36	650-522	THT. MTG. PLATE	1
37	142-160	THT. MTG. PLATE GASKET	1
38			
39			
40			
41	127-017	PLUG, SNAP OUT 5/8	2
42	589-147	S SWAGE ELBOW B810-2-8	1
43	535-254	NIPPLE 1/2 x 3	1
44	[illegible]-001	B400 TUBE [illegible] 9.75L	1
45	535-250	NIPPLE 1/2 x CL	2
46	535-253	NIPPLE 1/2 x 3 1/2	1
47	750.009	COP. TUB. [illegible] 7.06	1
48	589-54	SWAG CONN 1/2 NPT x 5/8 [illegible] TUBE	2

Ⓔ

REV.	DESCRIPTION	BY	APPR	DATE
G	ECN # 1441	JJH	[illegible]	2/86
F	ECN # 1286	JJH	[illegible]	[illegible]
E	ADD PART DESCRIPTION	JJH	[illegible]	3/85
C	ECN# 1114	DK	[illegible]	[illegible]
B	ECN# 1105	DK	[illegible]	[illegible]
A	ECN# 1037	AG	[illegible]	10/83

REVISIONS

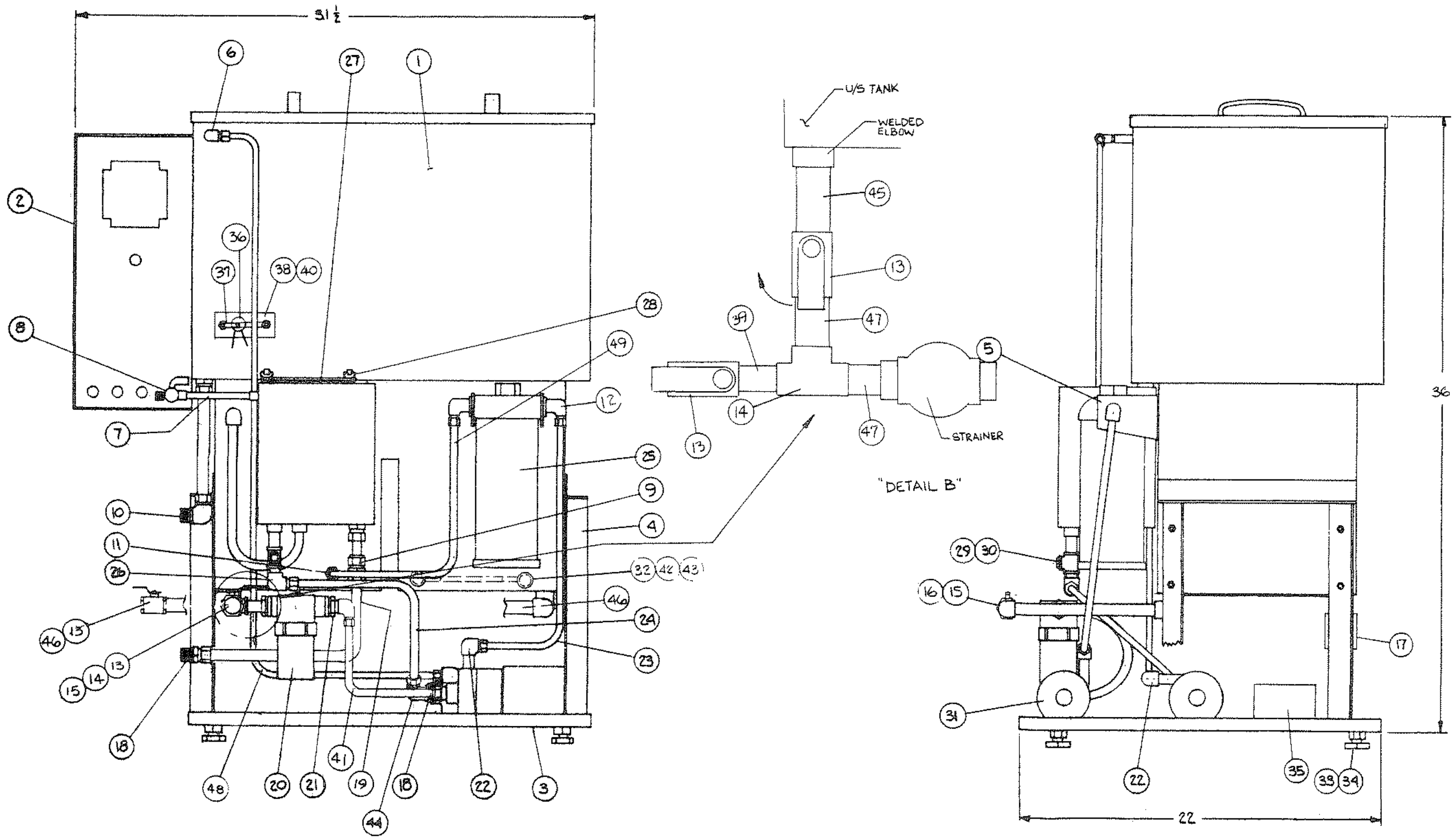
BRANSON CLEANING EQUIPMENT COMPANY
PARROTT DRIVE • SHELTON, CONN. 06484

BRANSON
a SmithKline company

B400W ASSEMBLY

MODEL: B400W
QTY/UNIT:
ORDER NO:
CUSTOMER:
MATL: SEE DWG
FINISH:
DWN: JCS DATE: 7.6.83
PART NO: 927-201
CHKD: DATE:
APPVD: JCS DATE: 8.26.83
SCALE: ~
DWG NO: D13782
REV: G

KREDS INC. 2274L



Nº	P/N	DESCRIPTION	QTY
1	820-051	B400 TANK ASSEMBLY	1
2	820-053	B400 CONTROL BOX ASSEMBLY	1
3	650-732	B400W BOTTOM CHASSIS	1
4	650-728	B400W TANK LEGS	4
5	650-563	FILTER MTG BRKT	2
6	589-137	SW ELBOW B600-2-4	1
7	535-123	NIPPLE SS 1/4x5	1
8	567-205	PET BR 1/4M x 1/4F	1
9	589-905	UNION 10-10 HBZ S.S.	1
10	589-157	SW ELBOW B1010-2-8	2
11	589-133	SW CONN B600-1-6	1
12	589-139	SW ELBOW B600-2-8	2
13	559-207	BL VALVE BR 1/2F	3
14	547-205	TEE BR 1/2	1
15	535-260	1/2 x 7 1/2 BR NIPPLE	1
16	531-210	1/2 x 90 BR ELBOW	1
17	110-052	JIFFY BOX 2x4	1
18	589-154	SW. CONN. B1010-1-8	2
19	750-025	"WATER-IN" LINE	1
20	545-410	PLAS STRAINER 3/4F	1
21	519-212	BUSHING BR 3/4M x 1/2F	2
22	589-739	SW F ELBOW B600-8-8	2
23	750-018	3/8 OD. COP x 17 7/16 LG FLT. INLET	1
24	750-019	1/2 OD. COP x 15 1/2 LG SPRAY PUMP INLET	1
25	138-205	*FILTER BR x 10 1/2	1
26	589-146	SW ELBOW B810-2-6	1
27	142-005	FILTER GASKET	1
28	352-120	WING NUT 1/4-20	2
29	547-203	TEE BR 3/8	1
30	537-205	PLUG BR 3/8	1
31	285-120	L-G PUMP 120V 2MDHC	2
32	155-721	1.6 KW SERP. HEATER, 230 V	1
33	127-054	LEV FOOT	4
34	352-117	HEX NUT 1/2-13	4
35	447-166	J600 TRANSFORMER	1
36	386-052	BI-METALLIC THT.	1
37	650-520	THT. CLIP	1
38	650-522	THT. MTG. PLATE	1
39	535-255	1/2 x 3 1/2 BR NIP.	1
40	142-160	THT. MTG. PLATE GASKET	1
41	750-001	5/8 OD-COP x 9 3/4 LG FLT PUMP INLET	1
42	600-458	GUARD, SERP. HEATER POST	2
43	127-017	PLUG, SNAP OUT, 5/8	2
44	589-147	SWAGE ELBOW B-810-2-8	1
45	535-253	NIPPLE 1/2 x 2 1/2	1
46	535-263	1/2 x 23' BR NIP	1
47	535-250	NIPPLE 1/2 x CL	1
48	750-021	3/8 OD-COP. 42 7/16 LG SPRAY PUMP OUT	1
49	750-009	3/8 OD-COP. 17 1/16 LG FLT OUTLET	1

REVISIONS

SYM	DESCRIPTION	BY	APPR	DATE
A	ECN # 1037	AG	PM	10/83
B	ECN # 1105	DK	PM	4/84
C	ECN # 1114	DK	PM	3/84
D	ECHG P 1193	[illegible]	[illegible]	[illegible]
E	ADDED ITEMS 44	[illegible]	PM	5/85
F	ECN # 1286	JJH	PM	5/85
G	ECN # 1441	JJH	CB	2/86
H	ECN 1606	CM	CB	7/86
K	ECN # 1662	JJH	CB	9/86
L	ECN # 1688	AG	CB	10/86

BRANSON CLEANING EQUIPMENT COMPANY
PARROTT DRIVE • SHELTON, CONN 06484

BRANSON
a SmithKline company

B400W ASSEMBLY

MODEL: B400W 200V/50-60
QTY/ASSY:
ORDER NO:
CUSTOMER:
MATL: SEE DWG
FINISH:
DRAWN: JCS
DATE:
PART NO: 927-[illegible]5
CHECKED:
DATE:
APPROVED: JCS
DATE: 8.24.83
SCALE: 1/4
DWG NO: D 13868

MANUAL CHANGE INFORMATION

Since the change information is carried in the manual until all changes are permanently entered, some duplication may occur. If no pages appear in this section, your manual is complete as printed.