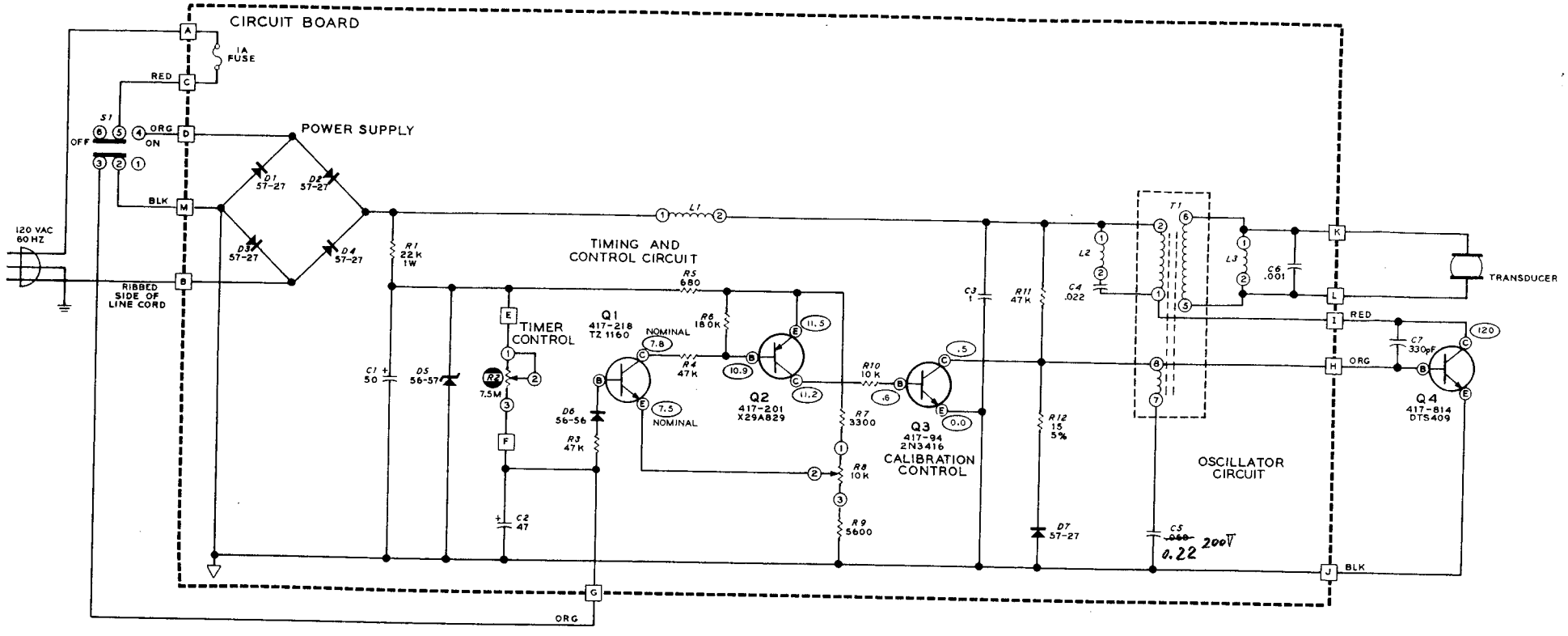
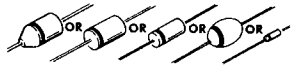
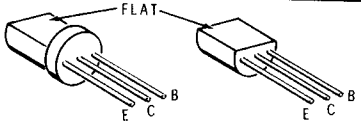
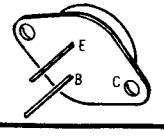


SCHEMATIC OF THE HEATHKIT® ULTRASONIC CLEANER MODEL GD-1150

NOTES:

1. ALL RESISTORS ARE 1/2 WATT 10% UNLESS OTHERWISE STATED. VALUES ARE IN OHMS (K=1000).
2. CAPACITOR VALUES ARE IN µF.
3. ⬬ THIS SYMBOL INDICATES PARTS NOT MOUNTED ON THE CIRCUIT BOARD.
4. ⬭ THIS SYMBOL INDICATES A DC VOLTAGE MEASUREMENT, TAKEN WITH A HIGH IMPEDANCE VOLTMETER, FROM THE POINT INDICATED TO GROUND. VOLTAGES MAY VARY ±20%.

COMPONENT NUMBER	HEATH PART NUMBER	MAY BE REPLACED BY	DESCRIPTION	LEAD IDENTIFICATION
D6	56-56	1N4149	DIODE	NOTE: HEATH PART NUMBERS ARE STAMPED ON MOST DIODES. 
D1, 2, 3, 4	57-27	1N2071	DIODE	
D5	56-57	1N716A	ZENER DIODE	
Q1	417-218	TZ1160	TRANSISTOR	
Q2	417-201	X29A829	TRANSISTOR	
Q3	417-94	2N3416	TRANSISTOR	
Q4	417-814	DTS409	TRANISITOR	

SPECIFICATIONS

Power Requirements	105-130 VAC, 60 Hz, 100 watts maximum.
Operating Frequency (transducer)	Approximately 41 kHz.
Operating Temperature	0°C to 50°C.
Timer	0 to 5 minutes (adjustable).
Timer Accuracy	±10% of full scale after calibration at 25°C.
Tray Size	Approximately 6" long by 4" wide by 2-3/8" deep. (1" solution equals approximately 1-3/4 cups.)
Overall Size	11" long by 5-3/4" wide by 3-1/16" high.
Weight	2.5 lbs.

The Heath Company reserves the right to discontinue new products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

THEORY OF OPERATION

For maximum electrical to mechanical conversion, the frequency of the electrical signal must be the same as the resonant frequency of the transducer.

The electronic circuit produces a 41 kHz signal which is amplified and fed to a (41 kHz) lead-titanate-zirconate transducer. This transducer converts the electrical signal into a mechanical motion by the expansion and contraction of the transducer. This motion is coupled to the cleaner tank through the epoxy bond.

The motion of the tank creates pressure variations in the cleaning solution which produces microscopic bubbles. These tiny bubbles grow and collapse in an action called cavitation. This cavitation causes high instantaneous pressures which force the cleaning solution through the contaminants so they can be dissolved.

The cavitation bubbles are provided by nuclei which are in the contaminants and form under and around the contaminants. This is why ultrasonic cleaning is so effective. The cleaning action happens where it is needed the most. A dirty solution is ineffective since the cavitation takes place throughout the solution rather than concentrating on the item being cleaned.

There are many factors pertaining to the solution that can affect cavitation. Some of these are: the temperature, surface tension, viscosity, and depth of the solution. Also the amount of dissolved gases in the solution can affect cleaning action. Be sure to read the "Operation" section concerning "The Cleaning Solution."

CIRCUIT DESCRIPTION

Four electronic circuits; power supply, timing, switch, and oscillator; make up the Ultrasonic Cleaner.

Power Supply

The AC line voltage is rectified by diodes D1, D2, D3, and D4. This provides a full wave rectified voltage to drive the oscillator circuit. Resistor R1, capacitor C1, and zener diode D5, form a filter circuit that supplies 12 volts DC to the timer circuit.

Timing and Control Circuit

Resistor R2 and capacitor C2 form a timing circuit that determines how long the timing circuit will operate. Resistor R2 is adjustable and can be set for the correct operating time from the front of the Cleaner.

When the unit is turned on, current flows through resistor R2 and charges capacitor C2 to a point where this charge causes Q1 to conduct. This in turn causes Q2 to conduct, latching the circuit on. As transistor Q2 conducts, it causes transistor Q3 to conduct, which in turn reduces the base voltage on Q4 and causes it to turn off.

Oscillator

Transistor Q4 and its associated circuitry form an oscillator circuit. The signal out of this circuit is stepped up across transformer T1 and then coupled to a tuned circuit comprised of coil L3, capacitor C6, and the transducer. This circuit is tuned to the resonant frequency of the transducer.

Coil L1 and capacitor C3 filter out any voltage spikes that may cause damage to transistor Q4. Calibration control R8 provides a calibration adjustment for the timer circuit.

CIRCUIT BOARD X-RAY VIEWS

NOTE: To identify a part shown in one of these Views, so you can order a replacement, proceed in either of the following ways:

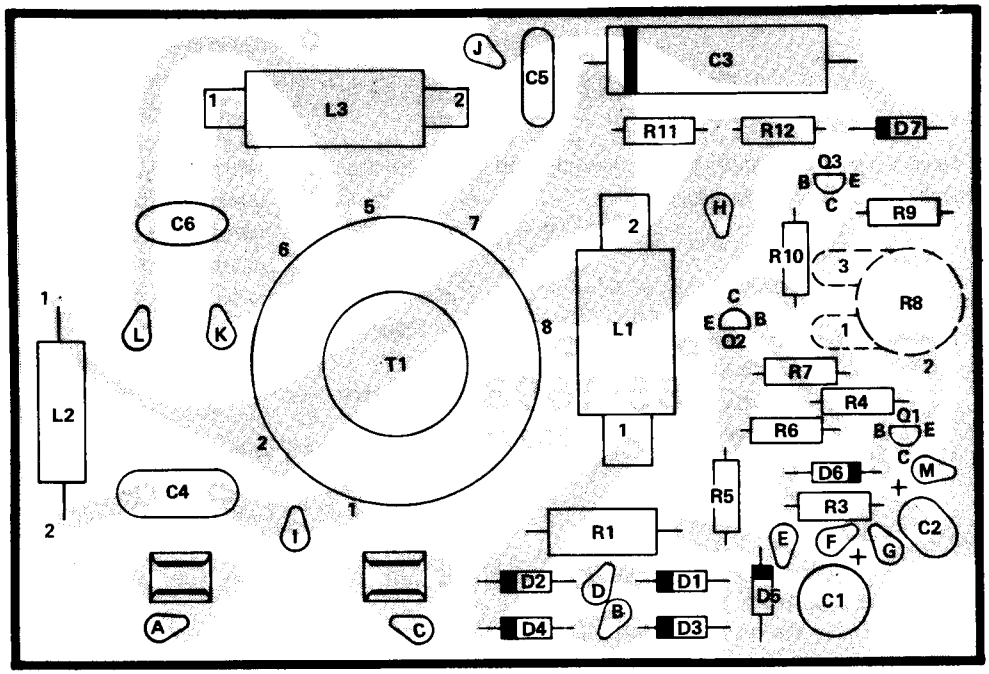
1. A. Refer to the place where the part is installed in the Step-by-Step instructions and note the "Description" of the part (for example: 10 kΩ, .068 μF, or 2N3416).

   B. Look up this Description in the "Parts List."

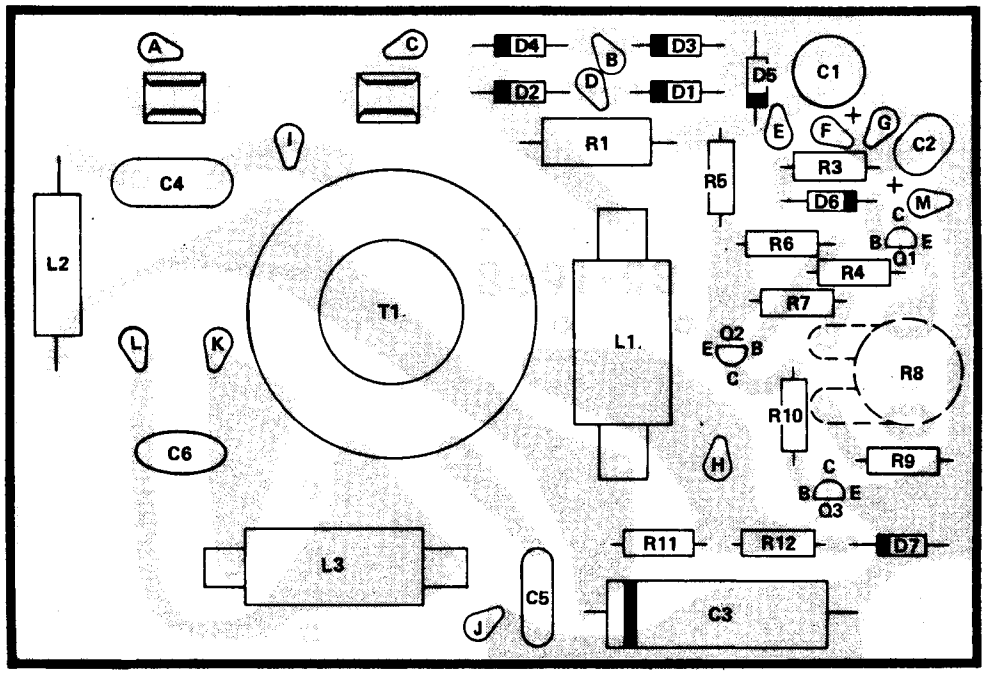
2. A. Note the identification number of the part (R-number, C-number, etc.).

   B. Locate the same identification number (next to the part) on the Schematic. The "Description" of the part will also appear near the part.

   C. Look up this Description in the "Parts List."



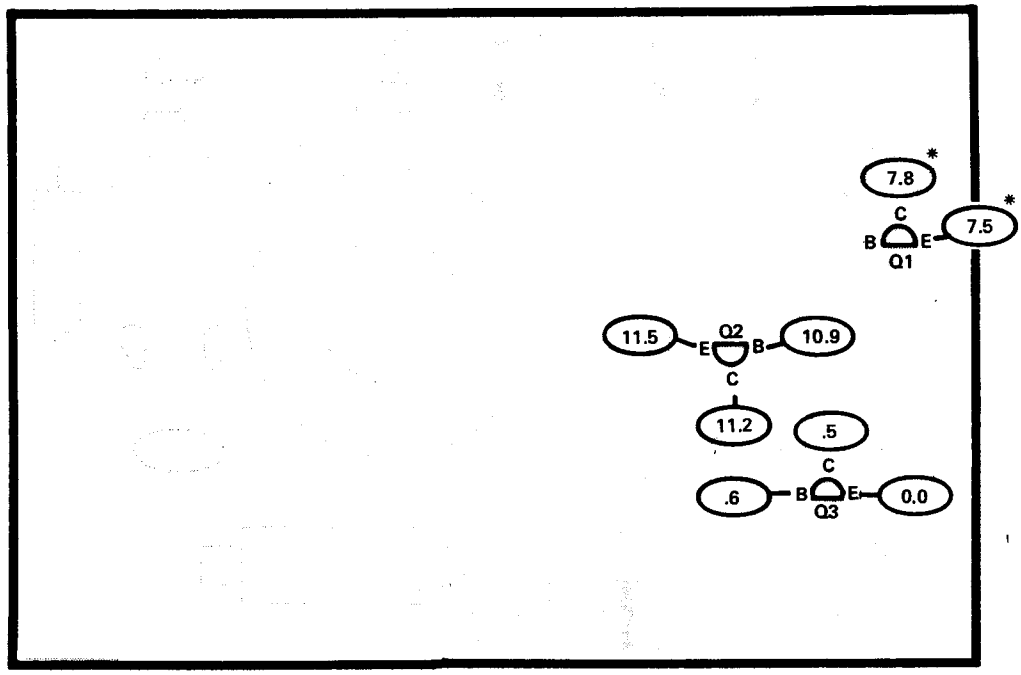
(Viewed from component side)



(Viewed from foil side)

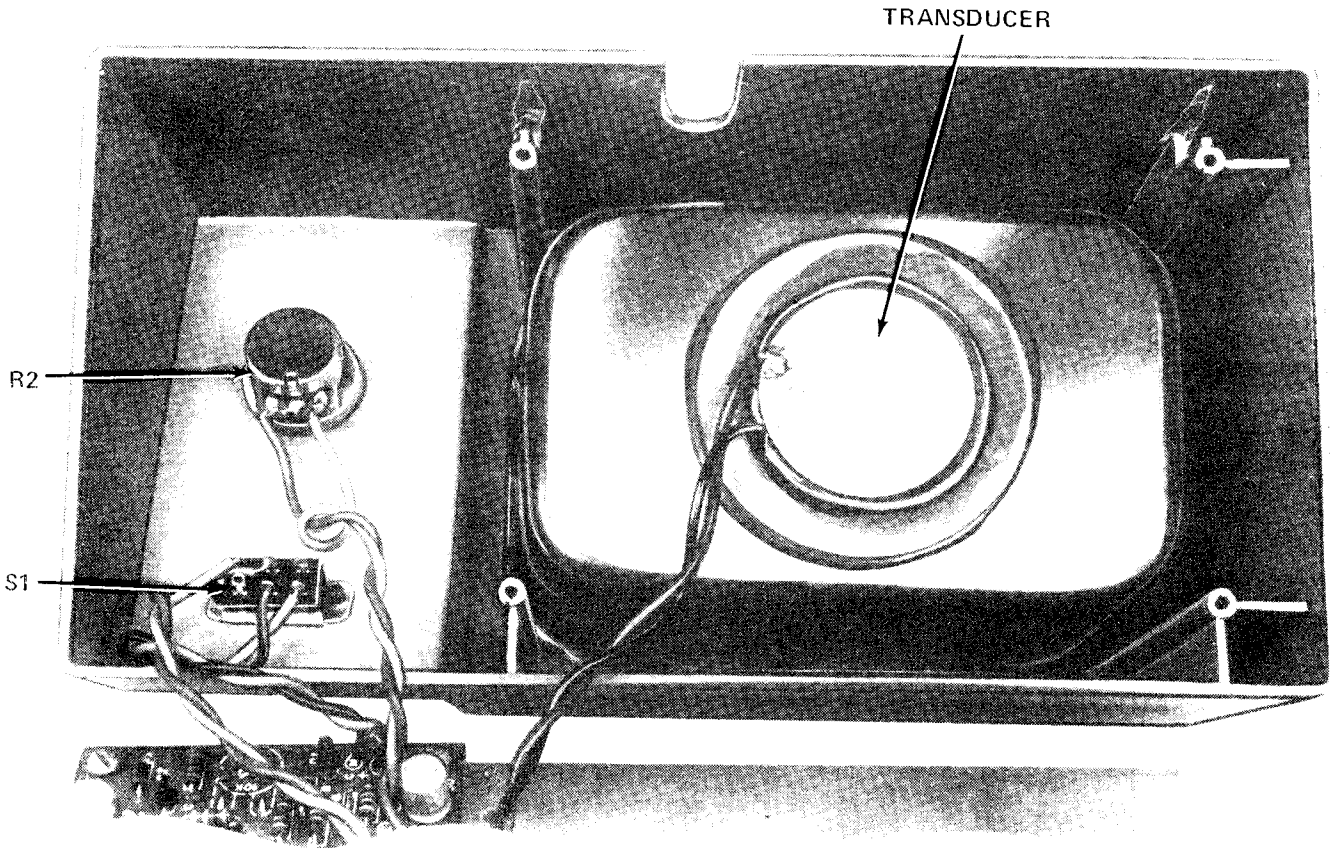
VOLTAGE CHART

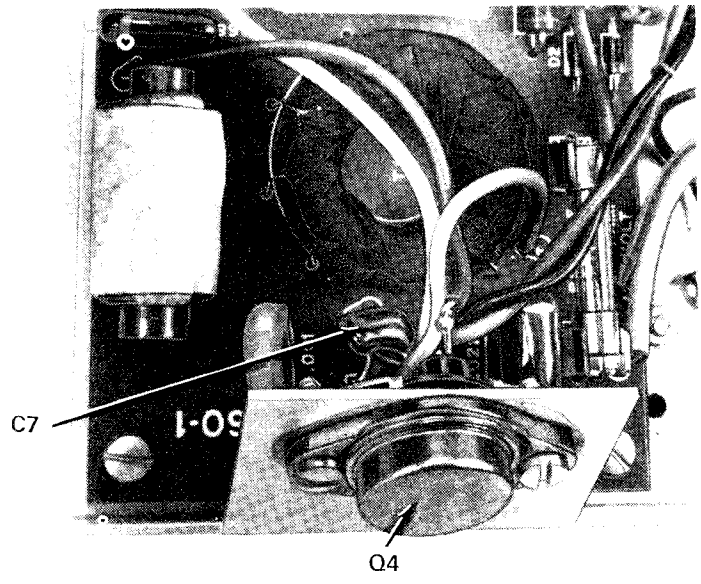
CAUTION: When measuring voltages use an isolation transformer.



(Viewed from foil side) *Nominal

CHASSIS PHOTOGRAPHS





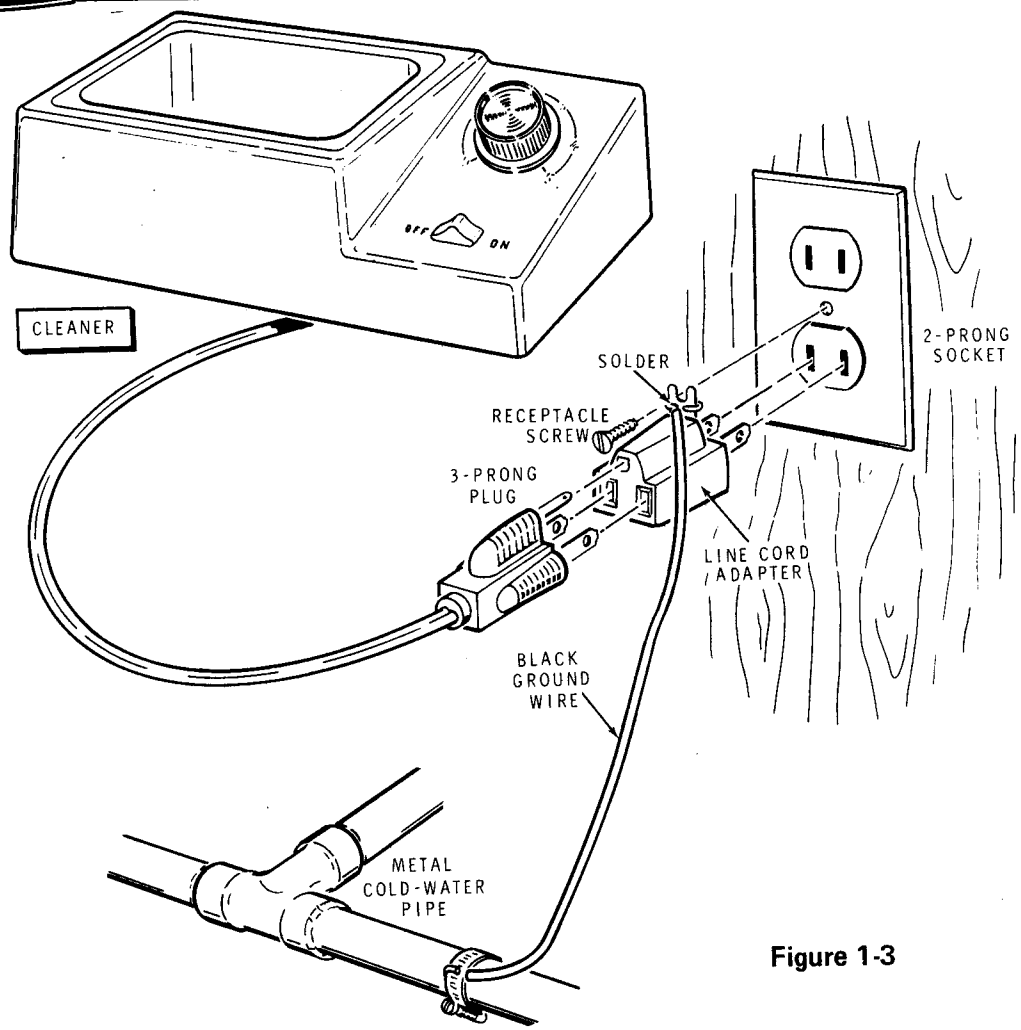


Figure 1-3

Place the item to be cleaned in the cleaner tank. Before you clean a valuable item, first try cleaning a less expensive item. After an expensive piece of jewelry is cleaned, inspect it carefully for any signs of damage. Certain items require special precautions. For example, contact lenses should be cleaned in their perforated plastic case to protect them from scratches.

Never clean an item longer than necessary. If the item is delicate or expensive, set the Timer for one minute. After a minute, inspect the item and then, if necessary, clean it for an additional minute. Also, do not overload the cleaner tank with too many items or use dirty solution to clean items.

To operate the Ultrasonic Cleaner, plug the line cord into an outlet, set the Timer, and push the POWER SWITCH to ON. When the Cleaner stops, turn the POWER SWITCH to OFF and remove any items that you put into the tank. The Cleaner can be stopped at any time by turning the POWER SWITCH to OFF. Always adjust the Timer before you start the cleaning operation.

When you empty the tank, pour the fluid out the left side of the tank so that the timer control and power switch will not get wet. Make sure the line cord is unplugged before you add solution or empty the tank. Never immerse the Ultrasonic Cleaner in a liquid.

OPERATING CONSIDERATIONS

Always operate the Cleaner in a well ventilated area.

Use the plastic lid to minimize sound and evaporation.

When you operate the Ultrasonic Cleaner for more than thirty seconds, it is advisable to set the timer and then leave the room where the Cleaner is operating. As with all ultrasonic cleaners, the high frequency sound waves given off during operation may cause headaches, nausea, or irritability if a person is subjected to them for an extended period of time. Avoid touching the tank or its contents when the unit is on.

The Ultrasonic Cleaner, when operating, can cause some interference to a nearby radio or television set and other electronic devices.