

Operator's Manual

Tabletop Ultrasonic Cleaners

Models:

**FS-20, FS-20H, FS-30, FS-30H, FS-60, FS-60H, FS-110,
FS-110H, FS-140, FS-140H, FS-220, FS-220H**



**Fisher
Scientific**

Warranty

Warranty: Except with respect to those component parts and uses which are hereinafter described, FISHER SCIENTIFIC warrants this ultrasonic cleaner to be free from defects in material and workmanship for a period of two years from date of sale. FISHER's liability under this warranty is limited solely to repairing, or, at FISHER's option, replacing those products included within the warranty which are returned to FISHER within the applicable warranty period (with shipping charges prepaid), and which are determined by FISHER to be defective. This warranty shall not apply to any product which has been subjected to misuse, negligence, accident, or has been improperly installed, misapplied, modified, or repaired by unauthorized persons.

Inspection: Buyer shall inspect the product upon receipt. The buyer shall notify FISHER in writing of any claims of defects in material and workmanship within 30 days after the buyer discovers or should have discovered the facts upon which such claim is based. Failure of the buyer to give written notice of such claim within this time period shall be deemed to be a waiver of such claim.

Disclaimer: The provisions herein stated are FISHER's sole obligation and exclude all other remedies or warranties, expressed or implied, including those related to merchantability and fitness for a particular purpose.

Limitation of Liability: Under no circumstances shall FISHER be liable to the buyer for any incidental, consequential, or special damages, losses, or expenses.

Limitation of Actions: The buyer must initiate any action with respect to claims under the warranty described in the first paragraph within one year after the cause of the action has accrued.

CAUTION

- Do not place parts or containers directly on the bottom of the cleaning tank; use a tray or wire to suspend items.
- Do not allow the cleaning solution level to drop more than one inch below the top of the tank.
- Do not ever use alcohol, gasoline or flammable solutions. Doing so could cause a fire or explosion. Use only water-based solutions.
- Do not ever use mineral acids. These could damage the tank.
- Failure to comply with these cautions will void your warranty.

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Safety Precautions

Before using your Ultrasonic Cleaner, please read and thoroughly understand these safety precautions. Failure to follow them may result in serious personal injury or property damage.

To avoid electrical shock:

- Do unplug from power source before filling or emptying the tank.
- Do keep the control panel and the area around the cleaner clean and dry -- wipe up solution which spills over the tank brim. Water and high voltage can cause electrical shock.
- Do not operate the cleaner without proper grounding.
- Do not remove the grounding prong on the line cord plug.
- Do not disassemble your cleaner -- high voltage inside the cleaner is dangerous.
- Do not immerse the cleaner in water.

To prevent personal and/or property damage:

- Do use only water-based solutions.
- Do not ever use alcohol, gasoline or flammable solutions. Doing so could cause a fire, explosion, or serious personal injury and will void your warranty. Use only water-based solutions.
- Do not ever use mineral acids. These could damage the tank.
- Do not touch the stainless steel tank or cleaning solution - they may be hot.
- Do not allow fluid temperature to exceed 70°C (160°F).
- Do not place your fingers or hands into the tank while the cleaner is operating. Doing so may cause discomfort and possible skin irritation. Avoid contact with solutions and provide adequate ventilation.
- Do not use solutions containing chlorine bleach.

To prevent damage to the cleaner:

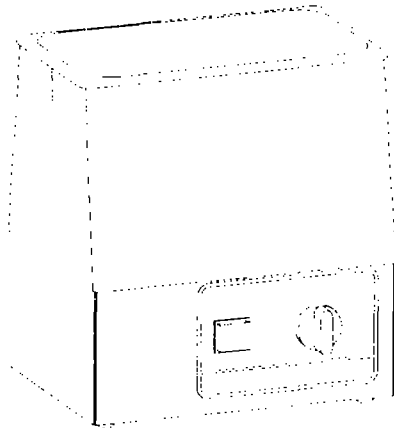
- Do change your solution regularly.
- Do not operate the cleaner dry
- Do not place parts or containers directly on the bottom of the cleaning tank; use a tray or wire to suspend items. Failure to comply may cause transducer damage and will void your warranty.
- Do not allow the cleaning solution level to drop more than one inch below the top of the tank with heat or ultrasonics on. Failure to comply may cause transducer and/or heater damage and will void your warranty.

Introduction

Ultrasonic Cleaners

Fisher ultrasonic cleaners include six models with sizes of 3/4 gallons, 1 gallon, 1 ½ gallons, 2 ½ gallons, 3 ½ gallons and 5 ½ gallons. Each model is constructed using durable industrial style 40kHz transducers. These provide increased cleaning power along and with built in sweep frequency, ensure uniform cleaning activity throughout the bath. The five(5) larger size units have drains and are supplied with tank drain kits.

Each model can be purchased in two different configurations –MT with a Mechanical Timer, and MTH with a Mechanical Timer plus Heat.



When you first fill your unit, or refill it with fresh solution, use warm water for the solution. Turn on the heater (press the HEAT switch, if available), turn on the ultrasonics (rotate the Timer knob), add the cover and the solution will heat to temperature.

Accessories For Your Cleaner

All units include regular covers. Perforated insert trays, beaker covers, and beakers are available as accessories.

Unpacking Your Cleaner

Please check your cleaner and its carton carefully for any external or internal damage. **If you find shipping damage, contact your shipping carrier immediately for resolution.** Please retain your packaging materials for future use.

Installing Your Cleaner

Check the label on the back of the cleaner for correct input power requirements. Position your cleaner within easy reach of a standard grounded electrical outlet. Do not place the cleaner on a circuit which could become overloaded.

If your cleaner does not operate correctly, first refer to the troubleshooting section for possible causes, or contact an authorized service center listed at the back of this manual, for additional information.

Equipment Specifications

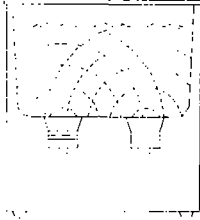
Fisher Model	Tank Capacity	Tank Size	Overall Size	Weight	Ultra Sonic Power	Heater Power	Total Power (MTH)
FS-20	3/4 gal. (2.8 L)	L: 6" W: 5.5" D: 6"	L: 8.9" W: 8.9" H: 11.3"	11 lbs. (5KG)	80W	63W	80W 63W 143W
FS-30	1 gal. (3.7 L)	L: 9.5" W: 5.5" D: 6"	L: 10.4" W: 8.9" H: 11.3"	13 lbs. (5.9 KG)	130W	109W	130W 109W 239W
FS-60	1-1/2 gal. (5.7 L)	L: 11.5" W: 6" D: 6"	L: 12.7" W: 9.5" H: 11.3"	15 lbs. (6.8 KG)	130W	205W	130W 205W 335W
FS-110	2-1/2 gal. (9.5 L)	L: 11.5" W: 9.5" D: 6"	L: 12.7" W: 13" H: 11.3"	19 lbs. (8.6 KG)	185W	284W	185W 284W 469W
FS-140	3-1/2 gal. (13.3 L.)	L: 11.5" W: 9.5" D: 8"	L: 12.7" W: 13" H: 13.3"	20lbs. (9.1 KG)	185W	284W	210W 284W 469W
FS-220	5-1/2 gal. (20.8 L)	L: 19.5" W: 11.5" D: 6"	L: 21.4" W: 15.4" H: 11.3"	32 lbs. (14.5 KG)	320W	561W	320W 561W 881W

NOTE:

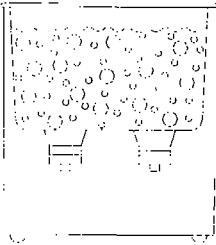
- All models have an operating frequency of 40kHz.
- Voltages available: 120V or 220V \pm 10%, 50/60Hz (Check your label)
- All cleaners have CSA approval and comply with FCC regulations.
- All 220V units meet CE standards.
- Units will cause GFI outlets to trip.
- All units have a ground leakage current less than .50ma.

How Ultrasonic Cleaning Works

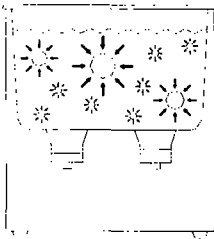
Ultrasonic sound is sound transmitted at frequencies generally beyond the range of human hearing. In your ultrasonic cleaner, ultrasonic sound (sonics) is used for cleaning materials and parts. This is how it works



As the sound waves from the transducer radiate through the solution in the tank, they cause alternating high and low pressures in the solution



During the low pressure stage, millions of microscopic bubbles form and grow.



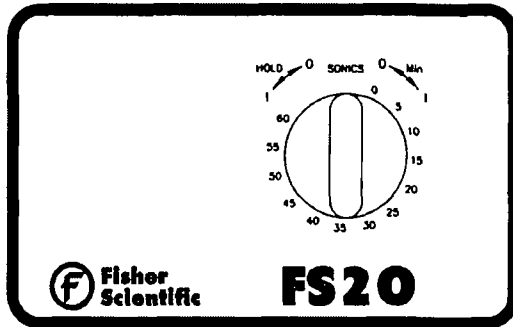
During the high pressure stage, the bubbles implode, or "collapse" releasing enormous amounts of energy. These implosions act like an army of tiny scrub brushes. They work in all directions, attacking every surface and invading all recesses and openings. This process is called CAVITATION

Operating Your Cleaner

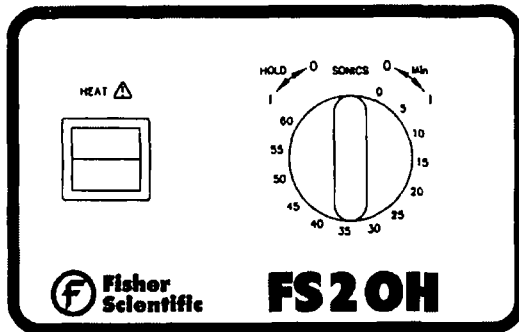
If this is the first time you are using the cleaner, please read this whole section before proceeding.

Operating Your MT or MTH Cleaner

MT Cleaner



MTH Cleaner



Explanation of Controls

Control	Function
HEAT (MTH only)	Activates heat to 60°C maximum.
TIMER	Activates ultrasonics and sets time. Use to turn unit Off.
TIMER	Turn clockwise for variable time 0-60 mins. Turn counterclockwise to hold position for continuous operation.

Before You Start Cleaning



- Do not place parts or containers directly on the bottom of the cleaning tanks; use a tray or wire to suspend items.
- Do not allow the cleaning solution level to drop more than one inch below the top of the tank with the cleaner on.
- Do not ever use alcohol, gasoline or flammable solutions. Doing so could cause a fire or explosion. Use only water-based solutions.
- Do not ever use mineral acids. These could damage the tank.

Failure to comply with these cautions will void your warranty.

Step	Action
1	Select your cleaning solution (check with Chemical Supplier for solution effects on metals).
2	Allowing for the volume of the parts you will be cleaning and cleaning solution, fill the tank with warm tap water to the operating level (one inch from the top).
3	Add cleaning solution to the tank water.
4	Plug the cleaner into a grounded outlet.
5	For maximum efficiency, refer to page 15, "Optimizing Your Cleaner" before proceeding.

NOTE:

If this is the first time you are running the cleaner, or if you have changed cleaning solution, you must degas the solution. If not, move to "**Cleaning Items**".

Degassing

Step	Action
1	Turn the HEAT ON (MTH Cleaner only).
2	Turn the TIMER to 5-10 and let the cleaner run to allow the solution to "degas". NOTE: Refer to page 16 for information on degassing.

Cleaning Items

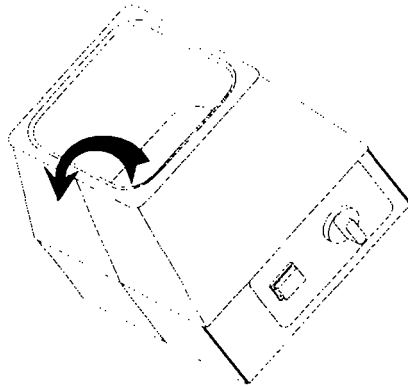
Step	Action
1	Set the TIMER for the amount of time you wish the items to be cleaned. To stop ultrasonics at any time, turn the TIMER to zero.
2	Place the items into a basket or perforated tray.
3	Slowly lower the tray into the tank. Do not allow items to contact the tank bottom. Do not stir the solution.
4	When items are clean, slowly remove them from the cleaner.
5	Rinse the clean items with clean water and dry them, if necessary.

Draining Your Cleaner

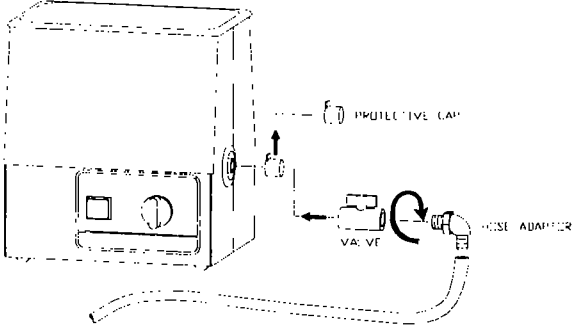
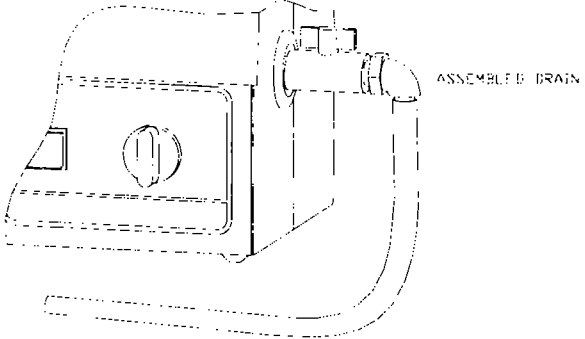


Do not immerse the cleaner in water.
Unplug the cleaner from the power source.

The 3/4 gal. model does not have a drain. To empty, carefully tilt unit toward back left corner and pour the used solution into a waste disposal unit, rinse the tank thoroughly, dry off outside skirt and refill with new solution.



Five larger models include a drain and valve kit.

Step	Action
1	Place the cleaner to allow easy reach of the drain tube into a waste disposal unit.
2	Remove the thread protecting cap from the end of the cleaner's drain pipe. This will expose the white teflon sealing tape on the drain pipe's threads.
3	<p>Hand tighten the drain valve onto the drain pipe over the white teflon sealing tape. Finish tightening the valve in place using an adjustable or a 21mm wrench. Tighten the valve no more than one full turn when using the wrench until the handle is on top.</p> <p>CAUTION: Over tightening of the valve can cause damage to the ultrasonic tank. Always use teflon sealing tape or a sealing paste designed for use with stainless steel if retightening or refitting of the drain valve is required.</p> 
4	<p>Hand tighten the hose adaptor into the end of the drain valve. Slide the drain tube over the barbed hose adaptor end.</p> 
5	Close the drain valve by turning the handle perpendicular to the valve body and the cleaner is ready to fill with solution. To open the valve and drain the cleaner, turn the handle so that it is in line with the valve body.

Optimizing Your Cleaner

Cleaning - check the tank for contamination whenever you change solution. If necessary, remove contaminants with a nonabrasive cloth and water.

Emptying - always unplug the cleaner before emptying the tank. Empty the solution into a waste disposal unit.

Filling - always unplug the line cord before filling the tank. Fill the cleaner to the operating level (one inch from the top with beaker/tray in place), using warm tap water.

Low solution level - will cause the cleaner to fail. When you remove heavy or bulky loads from the cleaner, the solution level may drop below the operating level. If so, be sure to replace lost solution and degas, if necessary, depending on the amount used.

Overload - do not rest any items on the tank bottom. Weight on the tank bottom dampens sound energy and will cause damage to the transducer. Instead, use a tray and/or beaker positioning cover to support all items. Allow at least one inch between the tank bottom and the beaker or receptacle for adequate cavitation.

Covers - allow the cleaner to heat up faster, to a higher temperature, and limit excessive liquid evaporation. However, leaving the cover on with heat and ultrasonics operating can cause the solution to become very hot, diminishing effectiveness and creating the potential for burns.

Heater - the heater may cause some discoloration of the tank wall. This is normal and will not affect the performance of the unit.

Solution temperature- the fastest method to heat your cleaner is to fill with warm solution, use heat, ultrasonics (which also adds heat), and a cover.

Apparent ultrasonic activity - the amount of visible ultrasonic activity is not necessarily related to optimum cavitation for cleaning.

Chemical Solution Management

Degassing - fresh solutions contain many dissolved gases (usually air), which reduce effective ultrasonic action. Solutions will naturally degas during the first five to ten minutes of operation.

Heat - increases the chemical activity of cleaning solutions.

Surface tension - can be reduced by adding a detergent or surfactant to the bath. Reduced surface tension will increase cavitation intensity and enhance cleaning.

Solvents - never use solvents. Vapors of flammable solutions can collect under the cleaner, where ignition is possible from electrical components.

Renewal - replace cleaning solutions often to improve cleaning activity. Cleaning solutions, as with most chemicals, will become depleted over time. Solutions can become contaminated with soil particles which coat the tank bottom, inhibiting ultrasonic activity.

Application Hints



- Never clean *novelty or inexpensive jewelry* in the cleaner. The combination of heat and vibration may loosen a cement-held setting.
- Never clean the following *gemstones*, emerald, amethyst, pearl, opal, coral, turquoise, peridot or lapis lazuli. They are “soft” and may be damaged.

First time cleaning - first experiment with one piece, then proceed with the remainder.

Solution level - Be sure to maintain solution level within one inch of the tank top. Surface activity can vary with liquid level.

Load size - It is faster and more efficient to run several small loads rather than a few big loads.

Placing items - Never allow items to sit on the bottom of the tank. Always place them in a tray or beaker or suspend in the solution.

Rinsing items - After cleaning, use a clean water bath to rinse away chemicals adhering to items.

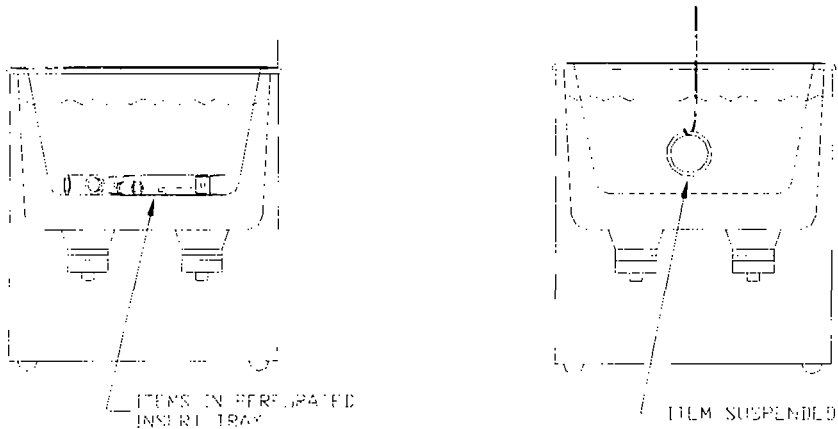
Lubricating items - When necessary, re-lubricate items immediately after cleaning.

Drying items - Air drying at room temperature works for some items. Place parts requiring faster drying time under hot air blowers or in ovens.

Cleaning Methods

There are two methods of cleaning - direct and indirect. Each has advantages and disadvantages. When in doubt, run test samples using both methods to decide which one produces the best results for you.

Direct Method

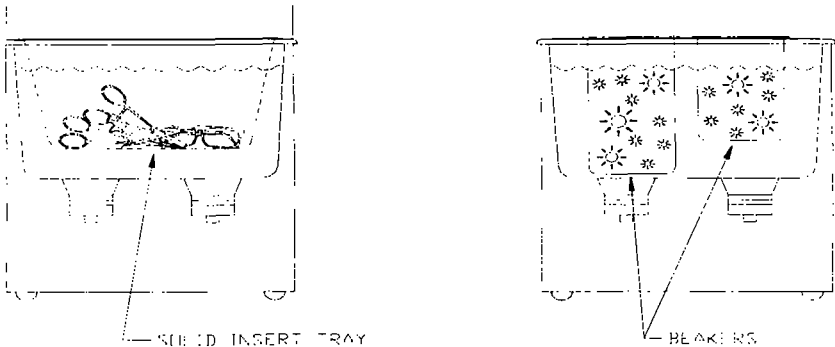


How it works:

- Fill the tank with warm water and a cleaning solution.
- Place the items to be cleaned in a perforated tray and lower them into the tank. You can also suspend items on a wire and then immerse them in the solution.

The advantages of this method are the simplicity of operation and cleaning effectiveness.

Indirect Method



How it works:

- Fill the tank with warm water and a cleaning solution.
- Pour your cleaning solution into one or more beakers or into a solid insert tray
- Place the beakers in a beaker positioning cover or a solid insert tray to fit your cleaner. Beakers should not touch the tank's bottom.

The advantages of this method are:

- Removed soil stays in the beaker or tray so you can easily examine, filter or discard it.
- You can use one or more solutions at the same time.
 - two completely different cleaning solutions.
 - one beaker or tray with a cleaning solution and one with a rinse solution.
- Cleaning solution in your tank needs to be changed less often.

Cleaning Solutions



CAUTION

Do not use alcohol, gasoline, bleach, mineral acids, solutions with a flash point, semi-aqueous or combustible liquids in ultrasonic tanks, or you will void the warranty. Only use non-flammable and water-based solutions.

Solution Types

Water-based solutions are either slightly acidic or alkaline. They include detergents, soaps and industrial cleaners designed to remove specific soils.

Acidic water-based solutions: remove rust, tarnish or scale. They range from mild solutions that remove tarnish, to concentrated, inhibited acidic solutions that remove investment plaster, milk-stone, zinc oxide and rust from steel and cast iron as well as smut and heat-treat scale from hardened steel.

Alkaline water-based solutions: include carbonates, silicates and caustics. These cause emulsifying action, which keeps soil from redepositing on the cleaned surface, and improves cleaning action in hard water.

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Alkaline strength	Removes:
Mild	Light oils and greases, chemical deposits, general lab and handling soils.
Mild to strong	Heavy grease and oil, waxes, vegetable oils, inks, wax or fat-base buffing and polishing compounds, milk residues and carbohydrates.
Heavy-duty	Mill scale, heat-treat scale, corrosion or oxides.

Chemistry Concentrations

Chemistry concentrations may vary. The amount you use depends on the detergent and the type of soil to be removed. Follow instructions on the chemistry container for the effects of chemistry on metals.

Troubleshooting

If your cleaner does not operate satisfactorily, please check the tables below for possible causes before calling your authorized service center.


WARNING


**High voltage inside - dangerous shock hazard.
DO NOT attempt to disassemble or repair the cleaner.**

Problem	Cause	What to do
Cleaner will not start.	Cleaner not plugged in properly. MT - Mechanical timer not ON.	Plug into functioning electrical outlet. Turn timer clockwise.
Cleaner operates but does not heat solution	Heater malfunctions. MTH - HEAT not ON.	Call nearest authorized service center. Turn heat ON
Decreased ultrasonic activity. NOTE: Refer to page 22 for cavitation check.	Solution is not degassed. Solution is spent. Solution level is incorrect for load. Tank bottom is covered with soil particles. Using deionized water in the tank.	Make sure that tank was filled with warm tap water plus cleaning solution and has run 5-10 minutes. Change solution Adjust solution to +/- 3/8 inch from current level. Empty, then clean tank with warm water. Wipe with a nonabrasive cloth. Deionized water does not cavitate as actively as soapy tap water.

Performance

Check your cleaner periodically to test the level of activity of the ultrasonic cavitation. Frequency of testing will depend on your use of the cleaner, however, Branson suggests running this test monthly.

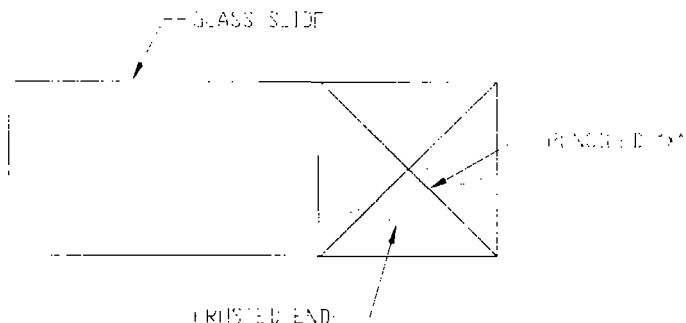
Glass Slide Test

You will need the following equipment:

- Frosted microscope glass slide (1" x 3"), such as Fisherbrand #12-550-34
- No. 2 lead pencil; and
- General purpose dish detergent, such as "Joy" liquid soap.

Test procedure:

1. Prepare a fresh solution with general purpose dish detergent (concentration 1%) and warm tap water (120° - 140°F).
2. Fill the cleaner to within one(1) inch of the tank top.
3. Turn the ultrasonics on for at least five minutes to allow for degassing.
4. Prepare the glass slide by first wetting the frosted portion with tap water.



5. With the No. 2 pencil, on the frosted portion make an "X" from corner to corner.
6. Immerse the frosted end of the slide into the solution. Hold the slide vertically and center it in the solution.

The ultrasonics will begin immediately to remove the lead from the slide. All lead should be removed within 10 seconds. If your cleaner passes this test, its ultrasonic cavitation is acceptable.

NOTE:

To ensure consistency from test to test, be sure to repeat test conditions - use the same solution concentration, liquid level, temperature, type of pencil, length of degassing, etc.

Service Centers

With normal use, your Ultrasonic Cleaner should not require servicing. However, if it fails to operate satisfactorily, first try to diagnose the problem by following the suggestions in the Troubleshooting Guide.

If you find that your cleaner needs repair, carefully pack and return it to your nearest service center. If under warranty, remember to include proof of purchase.



You will void the warranty if you disassemble your cleaner. High voltage inside the cleaner is dangerous.

Your cleaner will be return shipped by ground service unless you specify otherwise.

Fisher Services Division Traditional Lab Service Centers

Name	Address	Tel/Fax Number
ATLANTA Fisher Scientific Co.	2775 Horizon Ridge Court Suwanee, GA 30024	Tel: 770-614-1122 FAX: 770-614-1106 Other #: 770-614-1090 Contact: Cheryl Liston
LOS ANGELES Fisher Scientific Co.	1495 W. 9 th Street #102 Upland, CA 91786-5641	Tel: 919-949-2200 FAX: 919-949-2790 Contact: Charles Culpepper
CHICAGO Fisher Scientific Co.	4500 Turnberry Drive Hanover Park, IL 60103	Tel: 630-259-4663 Fax: 630-259-4505 Other #: 630-259-4648 Contact: Rey Noche
PITTSBURGH Fisher Scientific Co.	585 Alpha Drive Pittsburgh, PA 15238	Tel: 412-963-1668 Fax: 412-963-3394 Contact: Art DeThomas

**Fisher Services Division
Traditional Lab Service Centers**

Name	Address	Tel/Fax Number
PUERTO RICO Fisher Scientific Co.	Carretera #1, KM 56.4 Barrio Montellano Cayey, PR 00737	Tel: 787-738-4231 FAX: 787-263-1322 Contact: Adolfo Wittgreen

Safety Service Centers

Name	Address	Tel/Fax Number
LEESPORT Fisher Scientific Co.	Leisz's Road, R.D. #1 Leeport, PA 19533	Tel: 610-926-5237 FAX: 610-926-0605 Contact: Mike Taddeo
HOUSTON Fisher Scientific Co.	3500 So. Richey Road Suite 100 Houston, TX 77017	Tel: 713-941-7666 FAX: 713-941-1666 Other #: 713-941-8964 Contact: Jack Lambert
TUSTIN Fisher Scientific Co.	1495 W. 9 th Street #102 Upland, CA 91786-5641	Tel: 909-949-2200 FAX: 909-949-2790 Contact: Charles Culpepper

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Instructions

Fisher Series 100 Thermix® Hot Plate Model 100M

Catalog No. 11-493-100M & -101M

The Fisher Series 100M Thermix® Hot plate is a compact, thermostatically-controlled laboratory appliance. Providing fast and even heat distribution — to 370°C in 15 minutes — the unit features a 15 cm (6 in.) square cast aluminum top plate, die-cast aluminum base and replaceable heating element (insulated and enclosed for efficiency and safety). In addition, a rear-panel thumbscrew clamp allows the unit to be mounted on a support or a lattice rack and be positioned such that flasks and beakers of various sizes can rest on and contact the top plate properly. Four integral feet protect table and bench tops; a perforated metal strip underneath the top plate helps provide air circulation and maintain a relatively cool base temperature.

UNPACKING

The Model 100M hot plate is shipped in a single carton, completely assembled. It is supplied with these instructions and a warranty card, which should be completed and returned as soon as possible. In cases where shipping damage is observed, keep the unit and carton intact — including the packing material — and file claim with the final carrier. Usually the firm will send an inspector to ascertain liability.

ELECTRICAL REQUIREMENTS

Catalog No.	Catalog No.
11-493-100M	11-493-101M
115V	230V
25-60 Hz	25-60 Hz
450 Watts	450 Watts
3.9 Amps	2.0 Amps

OPERATION

The Model 100M hot plate provides top plate temperatures from ambient to about 370°C (700°F), consuming power only when current is supplied through the thermostat to the heating element. For convenience, the temperature control dial is marked with seven arbitrary positions to aid in reproducing a specific temperature, and an OFF position to shut the hot plate down without disconnecting it from power source.

- To operate the unit:
1. Turn temperature control to OFF.
 2. Check data plate for power requirements and insert line cord plug into suitable electrical outlet.
 3. Place solution to be heated on top plate.
 4. Adjust temperature control until desired process temperature is obtained.

REPLACEMENT PARTS

Item	Schematic Code	Number	
		115V	230V
Thermostat	THM1	09179	09179
Knob	-----	18953	18953
Heater	HTR1	09169	09174
Line	P1	06643	09172

Part No. 44640
Series 100 Thermix® Hot Plate
Operation Procedures
Effective with
Serial No. 101 for 115V
Serial No. 101 for 230V
Published 12-80
First Issue (0-1214-02/1294)