



Fisher Scientific

INSTRUCTION MANUAL

**FISHER SCIENTIFIC
MODEL 100
ULTRASONIC DISMEMBRATOR**

Model# XL2000-350R

Serial # FS3549 (Generator)

FS3549 (Converter)

MANUAL CHANGE INFORMATION

We strive to maintain our position as the leader in ultrasonic processing equipment by continually improving the designs, circuits and components in our equipment. These improvements are incorporated as soon as they are developed and fully tested.

Information concerning any improvements will be added to the appropriate technical documentation at its next revision and printing. When seeking service or operating help, please refer to the part number and print date at the bottom of this page.

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WARRANTY

Warranty: Except with respect to those component parts and uses which are hereinafter described, FISHER SCIENTIFIC warrants this Model 100 Ultrasonic Dismembrator to be free from defects in material and workmanship for a period of one year 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.

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SAFETY PRECAUTIONS

Read ALL Instructions before Installing or Using Equipment

FISHER SCIENTIFIC
Model 100 Dismembrator

INSTRUCTION MANUAL

Your new Model 100 Ultrasonic Dismembrator has been designed and tested to assure maximum operator safety. However, no design can completely protect against improper usage, which may lead to bodily injury and/or property damage. For total safety and equipment protection, read the instruction manual carefully before attempting to operate this equipment. Observe the following **WARNINGS:**

- ◆ High voltage is present in the generator (power supply), convertor and high frequency cable. Do NOT attempt to remove the generator cover or convertor case. Do not touch open connection with power engaged.
- ◆ Do NOT operate generator with convertor disconnected.
- ◆ The Model 100 Ultrasonic Dismembrator must be properly grounded with a 3-prong plug. Test electrical outlet for proper grounding before plugging in unit.
- ◆ Install the Model 100 Dismembrator in an area free from excessive dust, dirt, explosive and corrosive fumes and from extreme temperature and humidity.
- ◆ NEVER touch a vibrating horn or probe.
- ◆ NEVER immerse the convertor in liquids of any kind.
- ◆ Refer to the enclosed safety reminder.

SAFETY REMINDER

For many years, Fisher Scientific has supplied the laboratory and research industry with ultrasonic processors to handle a wide variety of applications. As with any product of this kind, some applications are more severe than others, resulting in equipment being subjected to harsh environments and aggressive handling.

Safety precautions regarding the operation and handling of high voltage equipment is prominently indicated in the instruction manual. This letter serves as a safety reminder to the operators of the Model 100 Ultrasonic Dismembrator to visually and physically inspect the unit to insure optimum and safe performance.

This inspection should be scheduled as a routine maintenance procedure, and done with the Model 100 switch in the OFF position and with the unit unplugged from the AC power source.

Long exposure to acids or caustics results in corroding metal parts or components. Check the rear of the generator, convertor, and cables for any signs of rust or discoloration. If discoloration is found, move the unit away from the source of contamination or corrosion.

Examine the condition of the high voltage cable which attaches the convertor to the power supply. Inspect the wire insulation for damage, such as burning from hot plate contact, general wear or breakage from extended use or rough handling.

Inspect the cable connectors by gently pulling on the wire while holding the body of the connector. The cable connector and rubber boot protector at the end of the cable should be tight to the wire, with no movement possible and no cracks or frayed ends visible. Do not subject the cable ends to severe bending loads while performing these tests. Return the convertor assembly immediately if your cable does not pass the above inspection.

Should the convertor/cable assembly be subjected to misuse, such as dropping or a severe pulling force on the wire itself, the cable must be inspected as above.

Should the Model 100 Dismembrator stop functioning or if it cannot be tuned, shut the unit off and inspect cable as above BEFORE any other action is taken.

DO NOT USE A CABLE WITH BROKEN END CONNECTIONS, EXPOSED WIRES OR FRAYED INSULATION. HIGH VOLTAGE IS PRESENT IN CABLE AND MAY POSE A SHOCK HAZARD. DO NOT TOUCH CONVERTOR ASSEMBLY UNTIL THE GENERATOR POWER SWITCH IS IN THE OFF POSITION AND UNIT IS UNPLUGGED.

If the operator is in doubt as to the condition of the unit, call your local representative for prompt attention.

In general use, the cable assembly should not be used to carry the convertor or pull it toward the user. Make certain the cable always has slack and is never tensioned. Move the generator or convertor assembly closer to one another to accomplish this.

INSPECTION

Your Model 100 Dismembrator was thoroughly inspected, tested and carefully packed before leaving the factory. Prior to unpacking, carefully inspect the shipping carton for any evidence of damage. Claims for loss or damage sustained in transit, must be made with the shipping company.

Unpack the unit from its shipping carton and check the contents against the packing list. Before disposing of the packing material, check it carefully for small items.

Visually inspect all external controls, indicators, and surfaces to detect any damage in transit. If damage has occurred, contact your carrier within 48 hours of delivery date. DO NOT OPERATE DAMAGED EQUIPMENT. Retain all packing material for future shipment.

SPECIFICATIONS

Generator:

Dimensions:	33cm W x 19cm D x 17cm H (13" x 7.5" x 6.7")
Weight:	4.2 kg (9.2 lb.)
Input Voltage:	100/115 VAC nom. (switchable to 220 VAC nom.) 50/60 hz
Full Load Current:	1.8 amps at 100v, 1.7 amps at 115v, 0.8 amps at 220v
Fuse Rating and Type:	3 amp/1.5 amp fast acting
Voltage Tolerance:	+/- 10% nominal voltage
Output Voltage/Frequency:	950 Vrms (maximum) 22.5 kHz (nom)

Convertor:

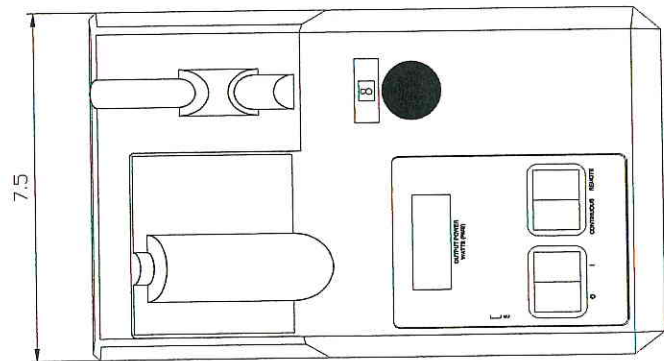
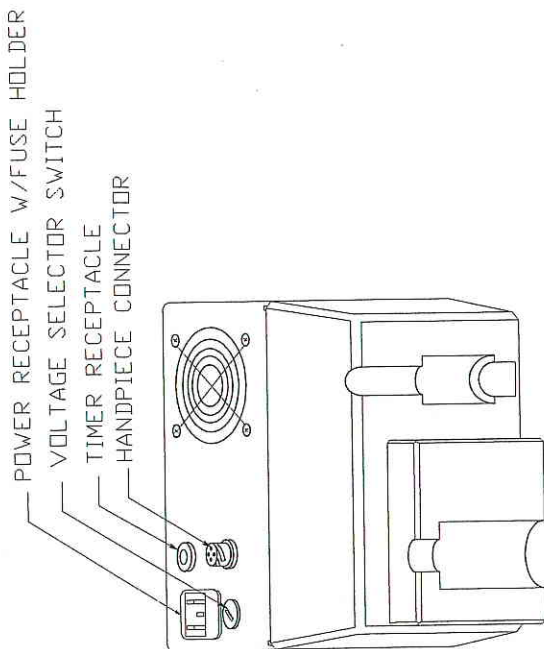
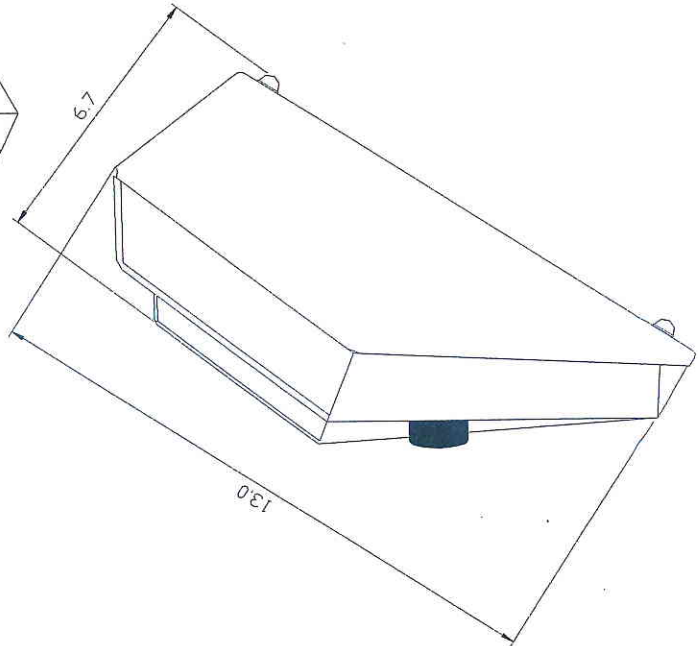
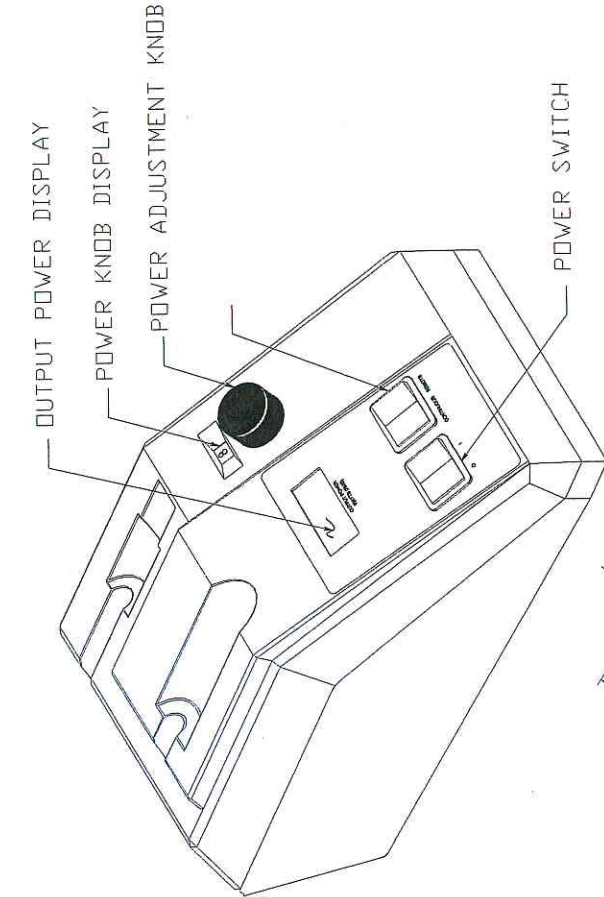
Dimensions:	17cm L x 3cm Dia. (6.7" L. x 1.18" Dia.) without probes
Weight:	.2 kg (.5 lb.)
Materials:	Aluminum case and Front Driver

Environmental:

Temperature Limits:	50° F - 110° F (10° C - 43° C)
Barometric Pressure:	Unlimited (Note: In high vacuum areas, additional cooling provisions may be needed.)

Accessories:

Use only accessories and probes listed in the Fisher Scientific catalog with this appliance. Do not attempt to fabricate ultrasonic tooling or accessories. Inappropriate or poorly designed components can permanently damage the generator (power supply).



I. **INSTALLATION**

WARNING!!

- High voltage is present in the generator(power supply), convertor, and high frequency cable. **Do not attempt to remove the generator cover or convertor case.**
- **Do not touch any open cable connections on the unit.**

A. **Power Requirements**

The generator requires a single phase, grounded, three wire, 100v, 115v, or 220v, 50/60Hz source. Do not remove the grounding plug under any circumstances. The plug must be plugged into a mating three prong grounded outlet. There is a select switch on the rear panel of the generator to set the input voltage to either 100-115v (92v-140v RMS) or 220v (200v-240v RMS). The unit requires a 3 ampere fuse for 100/115v and 1.5 ampere fuse for 220v operation. Use only IEC approved fast acting fuses. Do not use "slow blow" fuses or higher rated fuses in this equipment.

CAUTION!

- **Do not operate a unit set for 100/115v at 220v or a unit set for 220v at 100/115v**

B. **Placement of Equipment**

A built in fan positioned at the back of the unit draws in cool air from the room to provide radiant and convectional cooling of the internal components. Therefore, **do not block the fan inlet.** Position the generator so that air flows freely around the entire case.

II. OPERATION

A. Principle of Ultrasonics

The generator (power supply) converts conventional 50/60 Hz AC line power to 22.5 kHz electrical energy which is fed to the convertor where it is transformed to mechanical vibration. The heart of the convertor is a lead zirconate titanate electrostrictive (piezoelectric) crystal which, when subjected to an alternating voltage, expands and contracts. The convertor vibrates in the longitudinal direction and transmits this motion to the probe (microtip, horn) which is immersed in the biological or liquid process solution. Cavitation results, in which microscopic vapor bubbles are formed momentarily and implode, causing powerful shock waves to radiate throughout the sample from the tip face. Probes amplify the longitudinal vibration of the convertor; higher amplification (or gain) results in more intense cavitation action and greater disruption.

The convertor is tuned to vibrate at a fixed frequency of 22.5 kHz. Probes are resonant bodies, also tuned to vibrate at 22.5 kHz; any change in mass or geometry can disturb the resonant frequency and cause failure or damage to the convertor or generator.

B. Description of Major Components

1. GENERATOR (also known as the "power supply") - includes the operating controls and power indicator, an On/Off switch, and separable three-wire grounded line cord with integral U.S. plug or Europlug, fuse, and high frequency cable connector.
2. CONVERTOR (also known as the "transducer") - includes the transducer crystals, housing, and front driver (first stage of acoustic amplification) with ¼-20 threaded hole for the probe.
3. PROBE (also known as the "microtip" or "horn") - resonant body with ¼-20 stud, serving as a second stage of acoustic amplification.

C. Description of Operating Controls and Power Indicator

The front panel contains a digital LCD power display, the Power Control knob, Continuous/Remote Operation switch, Convertor Rest and On/Off switch. The **Digital LCD Display** provides a continuous read-out of watts being delivered to the end of the probe.. The **Continuous/Remote Operation Switch** provides continuous operation or manual pulsing (utilize the thumb switch on the convertor). The **Power Control Knob** provides continuous adjustment of probe intensity with gradations from 1 to 10. The **Convertor Rest** holds the convertor and probe when not in use, and the **On/Off Switch** contains a power light indicator. The back panel contains the line fuse and a jack for use with **optional plug-in timer** (see page 10).

D. Preparation for Use

1. The Model 100 Dismembrator is easy to set-up. Simply attach one end of the convertor cable to the back of the generator. Plug one end of the power cord into the back of the unit and the other end into a three-pronged (grounded) wall outlet. Then make sure that the probe is securely attached to the convertor. The unit is now ready to use.

2. To verify tightness of the probe, use the open-end wrenches supplied. To install a new probe, first screw the probe into the convertor finger tight only. Then tighten the probe using the wrenches provided by placing the wrenches in the slots of the probe and the (black) front driver.
3. Instead of hand-holding the convertor, a simple three-prong lab clamp and lab stand may be used to hold the convertor and sample tube. Secure the clamp only to the large (1¼ or 32mm) diameter of the convertor. The movement of the probe will be restricted if the clamp is placed directly on the probe or on the (black) front driver.

CAUTIONS:

- ◆ Never Touch the tip of a live probe to your hand or skin.
- ◆ Always allow the unit to reach room temperature before operating.
- ◆ Do not operate the generator without the convertor attached.
- ◆ Do not let the probe vibrate in air for more than just a few seconds.
- ◆ Avoid touching the activated probe to the sides or bottom of the sample container, and do not place it down on the work surface.
- ◆ Do not use the On/Off switch for pulsing, only use the thumb switch on the converter to manually pulse the probe.

E. Operation

1. The Model 100 Dismembrator does not require manual tuning. It has an automatic tuning feature and is fully self-tuning across a wide band of load conditions. To operate, follow these instructions:
 - ◆ Simply hold the body of the convertor.
 - ◆ Turn the power control knob to zero.
 - ◆ Turn the power switch on.
 - ◆ Allow digital reading to stabilize at _ 0.0.
 - ◆ Place the probe into your sample with the tip at mid-depth.
 - ◆ Select one of the operating modes below:

Continuous Operation

- ◆ Switch front panel switch to "Continuous" operation
- ◆ Adjust power setting to the appropriate intensity level for your sample

Pulsed Operation

- ◆ Switch front panel switch to "Remote" operation
- ◆ Adjust power setting to the appropriate intensity level for your sample
- ◆ Pulse as desired using the transducer pulse button switch

Timer Operation

- ◆ Switch front panel switch to "Continuous" operation
- ◆ Insert timer plug into jack on rear of the unit
- ◆ Adjust power setting to the appropriate intensity level for your sample
- ◆ Activate the timer

2. The sides and end of the probe must never be allowed to come in direct contact with the container or any hard surface. The stress resulting at the point of contact could cause fracture of the probe or of the container.
3. Immerse the tip of the probe at least 1" deep into the solution (without touching the bottom). Immersion depth can be less for larger probes and may have to be more for smaller probes used at high output control settings.
4. Lower the probe into the solution to avoid aerosoling and foaming. Aerosoling and foaming generally occur when the probe tip is not immersed far enough into the solution, or if too high a power setting is used. Further insertion of the tip into the solution, decreasing power level, or reducing solution temperature will normally prevent aerosoling and foaming. In severe cases, use a narrower process vessel with plastic film over the opening. Push the tip through the film to process the sample. Be sure to clean the tip before processing another sample.
5. The highest intensity energy is concentrated directly under the tip of the probe and dissipates within ¼" (6mm) from the tip. Liquids and suspended solids to be processed must circulate freely in this zone. Whole tissue should first be finely divided or homogenized in a mechanical device, such as a laboratory blender or rotary homogenizer, before being processed. Small pieces of tissue can be processed whole if trapped directly under the probe tip.
6. **Operation with optional Plug-in Timer**

The timer allows the probe to be activated for a specific period of time between 1 to 15 minutes. At the end of the timed cycle the probe will be inactive indefinitely (the power to the unit remains on, however).

For timed operation:

1. Turn the Power Control knob to zero.
2. Turn the Power Switch on.
3. Allow digital reading to stabilize at ~ 0.0.
4. Place the probe into your sample at mid-depth.
5. Insert Timer plug into the socket on rear panel of generator.
6. Adjust the power setting to the appropriate intensity level for your sample.
7. Set the desired time on the timer. Once timer is set the probe will be activated. Unit will shut off at end of timed cycle. Repeat as necessary to process all samples.

7. Operation with optional Foot Switch

The Foot Switch allows the probe to be activated and deactivated at the users discretion using their foot to operate the switch. The Foot Switch controls only the probe and cannot be used to turn the power to the unit off.

For Foot Switch operation:

1. Turn the Power Control knob to zero.
2. Turn the Power Switch on.
3. Allow digital reading to stabilize at ~ 0.0.
4. Place the probe into your sample at mid-depth.
5. Insert Foot Switch into the socket on rear panel of generator.
6. Adjust the power setting to the appropriate intensity level for your sample.
8. Use the Foot Switch to activate the probe as necessary. Repeat as required to process all samples.

CAUTION: If Timer plug is removed from jack at rear of unit, then the unit will remain on indefinitely. Turn main power switch off to disengage unit.

F. Care of probes

Proper care of probes is essential for good performance and long service life. Tightness of the probe, cleanliness of the mating surfaces and condition of the probe tip are all very important to overall performance. The probe tip is continuously subjected to intense shock waves which cause cavitation erosion of the probe's tip. Keeping the tip face smooth and polished will significantly improve process efficiency and increase the useful life of the probe. The following maintenance procedures should be performed regularly:

- ◆ Check the tightness of the probe with the open-end wrenches provided.
- ◆ Keep the stud threads and the mating surfaces between the probe and the (black) front driver clean and dry.
- ◆ Check the probe tip for signs of cavitation erosion and pitting.
- ◆ Polish the probe tip with a very fine emery cloth or sandpaper (#600) to remove any surface scratches or pitting.
- ◆ Do not file or grind the probe tips as this could bend or break them.
- ◆ Replace probes periodically, especially if they no longer tune properly, are badly pitted or eroded, or if they are bent or cracked.
- ◆ Probes (only, not the convertor) may be cleaned in isopropyl alcohol and autoclave sterilized.

III.

APPLICATION CONSIDERATIONS

A. Limiting Temperature Rise

An important objective in ultrasonic processing is to keep processed samples cool. An external cooling bath can be used to draw heat away from the process samples. Selection of the proper processing vessel and cooling technique can resolve most heat problems. While any type of vessel can be used to hold the sample, the shape of the vessel is often determined primarily by the volume to be processed. For small volumes, choose the smallest diameter vessel that allows the probe to be inserted without risk of touching the sides of the vessel. This minimized diameter raises the height of the liquid sample exposing a greater surface area to the external cooling bath for more effective heat transfer.

Selection of the processing vessel's material of construction can also be important. Based on heat transfer characteristics, the following vessel materials are recommended in decreasing order of desirability:

1. Aluminum
2. Stainless steel
3. Thin-wall glass
4. Thick-wall glass
5. Plastic

Immersing the process vessel in a simple water-ice bath (0°C) provides adequate cooling for larger sample volumes as long as treatment times are short. If temperature rise is too great for this method, consider one of the following alternate cooling baths:

- Ice-salt (-6°C)
- Ice-alcohol (-14°C)
- Dry Ice-alcohol-water (-30° to -40°C)

In all cases heat transfer can be dramatically improved with a magnetic stirrer.

B. Minimizing Undesirable Factors

Foaming and aerosoling have the effect of "de-coupling" the probe from the process sample. This is often accompanied by a change in sound, excessive surface heating, or fluctuating readings on the power meter. Always place the probe tip far enough below the process liquid surface to prevent these conditions. This problem is more critical with small volumes, e.g., 0.3 to 5.0 ml. A conical-shaped tube or vial such as a cut down Eppendorf tube generally works well. The shape of this type of container raises the liquid level without increasing volume, thereby permitting the probe to be inserted more deeply into the process sample. This problem can also be minimized in small samples by energizing the probe at 10%-20% power for a few seconds and then increasing power to the required level.

Touching the probe against the side of a glass vessel will release fine particles of glass. This can have the effect of discoloring the sample (generally greying). Careful management of the probe will minimize this problem.

Sample cross-contamination can be eliminated in several ways. Horns and probes can be sterilized by removing them from the converter and autoclaving them. It is faster, easier, and equally effective to sterilize horns by immersing them in a beaker of alcohol or other disinfectant and then activating the probe for several seconds. This technique will also remove unwanted solid residues from the probe tips.

IV.

REPAIR AND REPLACEMENT

A. Return of Equipment

All requests for repairs and replacement parts should be directed to the Instrument Service Department of Fisher Scientific at (800) 395-5442. Always provide Model Number and Serial Number of both the generator and convertor with all requests for parts or service. In order to receive prompt attention, contact the Service Department and obtain an RGA (Return Goods Authorization) Number before returning any equipment. Always return the generator, convertor and probe. Include a note with the unit stating the Model Number and Serial Numbers of both the generator and convertor, the RGA number and a brief explanation of the problem with the unit. If possible include:

- ◆ A Purchase Order Number.
- ◆ Bill To and Ship To address.
- ◆ The preferred method of return shipment (usually we ship UPS Ground, prepaid and add).

CAUTION

When using loose packing materials, such as foam pellets, shredded paper, or excelsior, be sure to wrap the generator and convertor separately in plastic bags or plastic wrap. Remove Microtip probes and pack separately in the same outer carton.

IMPORTANT NOTICE

By returning any material to Fisher Scientific the customer or the customer's agent thus certifies that any and all materials so returned are, or have been rendered, free of any hazardous or noxious matter or radioactive contamination and are safe for handling under normal repair shop conditions. Do not return any material for which such certification can not be made without prior approval from Fisher Scientific.



For customer service, call 1-800-766-7000
To fax an order, use 1-800-926-1166
To order online: www.fishersci.com