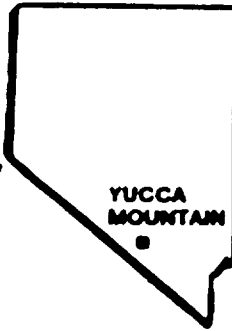


U.S. DEPARTMENT OF ENERGY

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YUCCA MOUNTAIN PROJECT

ENVIRONMENTAL RADIOLOGICAL MONITORING TECHNICAL PROCEDURE MANUAL

VOLUME V

UNCONTROLLED

WORK PERFORMED UNDER CONTRACT NO. DE-AC08-87NV10576

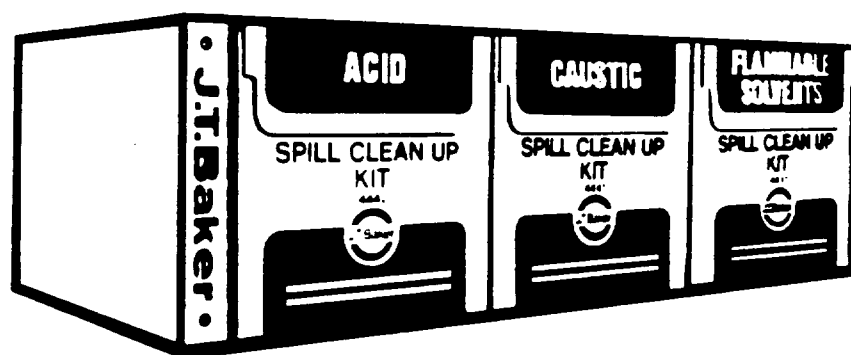
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Technical & Management Support Services



SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Spill Control Products Instruction Manual



**Prod. No.
3-4436**



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WM-11

**Acid Spill Cleanup Kit
Directions****NOTE: Not a first aid kit****Spill Cleanup Capacity**

For the neutralization and cleanup of liquid acid spills to include the following:

<u>Acid (Conc.)</u>	Neutralization Capacity/ 7 lbs. of <u>NEUTRASORB™ Acid Neutralizer</u>
Hydrobromic Acid (48%)	5.5 pints
Hydriodic Acid (51%)	13.4 pints
Hydrochloric Acid (38%)	4.1 pints
Nitric Acid (71%)	3.2 pints
Phosphoric Acid (87%)	1.0 pints
Sulfuric Acid (98%)	1.4 pints
Perchloric Acid (72%)	4.2 pints

HAZARDS

The above acids can cause serious and painful burns to exposed skin or eyes. In case of contact, IMMEDIATELY flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing or shoes. Call a physician immediately.

General Safety Information

Spills of concentrated acids (for example, 38% hydrochloric or 71% nitric acid) evolve irritating and harmful fumes. It is recommended that an approved respirator or self-contained breathing apparatus be worn in confined areas. Otherwise, insure adequate ventilation.

Neutralization of concentrated acids produces heat. Allow two minutes between treatment steps for the dissipation of this heat.

DO NOT STEP into spill material.

Don Protective Wear

Gloves	Supplied
Safety Glasses	Supplied
Laboratory Coat/Apron	Recommended
Self-contained breathing apparatus/maintain adequate ventilation	In the presence of heavy fumes

Procedure

1. Open the carton of NEUTRASORB™ Acid Neutralizer using the perforated opening.
2. Apply NEUTRASORB to the spill from the perimeter inward, applying sufficient neutralizer to obtain a uniform color change throughout. Foaming will begin, indicating neutralization is proceeding. After foaming subsides, proceed to next step.
3. Note the color of the slurry.

Color Code:

Red/Pink	— (Highly Acidic) HAZARDOUS
Yellow/Buf	— (Slightly Acidic) HAZARDOUS
Blue/Green	— (Safe)

If the slurry color indicates an acidic condition (may be encountered in spills of concentrated acids), carefully add water and additional NEUTRASORB. Mix thoroughly with the PLASTIC SCOOPS provided until a persistent blue/green color appears. DO NOT proceed until foaming has ceased.

4. Pick up the neutralized spill material with the scoops and transfer to the plastic DISPOSAL BAG provided. Wipe up any residual neutralized spill material with the SPONGE (moistened) provided.
5. Place used sponge, scoops, and gloves in the disposal bag and twist seal with the BAG TIE provided. Fill out the disposal LABEL, peel off backing and affix to the bag.
6. Dispose of bag and contents* in accordance with local environmental regulations.

*Waste material contains NEUTRASORB™ Acid Neutralizer and alkali metal and alkaline earth salts of the treated acid.

Capacities and Use Directions

5-4456

NEUTRASORB™ Acid Neutralizer

7 lbs.

NEUTRASORB Acid Neutralizer (7 lb.) can be used to neutralize the quantities of acids listed below.

<u>Acid (Conc.)</u>	<u>Neutraliza- tion Capac- ity/7 lbs. of NEUTRA- SORB</u>
Hydrobromic Acid (48%)	5.5 pints
Hydriodic Acid (51%)	13.4 pints
Hydrochloric Acid (38%)	4.1 pints
Nitric Acid (71%)	3.2 pints
Perchloric Acid (72%)	4.2 pints
Phosphoric Acid (87%)	1.0 pints
Sulfuric Acid (98%)	1.4 pints
Sulfurous Acid (9%)	24.2 pints

NOTE:

While 7 lbs. of NEUTRASORB Acid Neutralizer will neutralize these quantities of acids, its liquid absorption capacity is limited to 1-pint/7 lbs.

CAUTION

1. NOT TO BE USED on hydrofluoric acid, peroxy (per-) organic or other highly reactive and/or acids not listed above.
2. Wear adequate protective clothing.
3. Wear a self-contained breathing apparatus if the acid spill volume is greater than 1-pint or if adequate ventilation cannot be maintained.

DIRECTIONS

1. Open carton by tearing at the perforated tab.
2. Apply NEUTRASORB Acid Neutralizer to the spill from its perimeter inward.

3. After foaming has subsided, add water in small amounts and mix until all foaming ceases and the slurry maintains a blue color throughout (See color code below).

NOTE:

If a blue color is not obtained in Step 3, add additional NEUTRASORB Acid Neutralizer and water. Continue to mix until slurry is blue.

COLOR CODE

Red/Pink — Highly acidic
Yellow/Buf — Slightly acidic
Blue — Safe

4. Pick up and dispose of neutralized waste in a suitable leak-proof container. Container should be labeled as containing NEUTRASORB Acid Neutralizer and alkali metal and alkaline earth salts of the treated acid.
5. Dispose of neutralized waste in accordance with local environmental regulations.

CAUTION

NEUTRASORB Acid Neutralizer may cause irritation. Avoid contact with eyes, skin, and clothing. Avoid breathing dust. Wash thoroughly after handling.

FIRST AID

In case of contact with eyes, flush with water for at least 15 minutes and call a physician.

Safety and Disposal equipment for the treatment and cleanup of spills are supplied in the J. T. Baker Equipment Kit Prod. No. 3-4483

Caustic Spill Cleanup Kit Directions

NOTE: Not a first aid kit

Spill Cleanup Capacity

For the neutralization and cleanup of the following liquid caustic spills:

<u>Caustic</u>	<u>Quantity/Concentration (Maximum)</u>
Ammonium hydroxide (aqueous)	1.6 pts. (1 lb.)/28%
Potassium hydroxide (aqueous)	1.4 pts. (1 lb.)/45%
Sodium hydroxide (aqueous)	1.0 pts. (1 lb.)/50%

HAZARDS

Caustic substances can cause severe and painful burns to exposed skin and eyes. In case of contact, IMMEDIATELY flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician immediately.

General Safety Information

Some caustics, notably ammonium hydroxide, evolve irritating fumes. For spills involving these materials, insure adequate ventilation before beginning neutralization and cleanup. In cases involving 30% or greater ammonium hydroxide, it is recommended that the user wear a respirator or self-contained breathing apparatus.

Neutralization of concentrated caustics produces heat. Observe appropriate precautions when handling hot slurry materials. DO NOT STEP into spill material!

Don Protective Wear

Gloves	Supplied
Safety Glasses	Supplied
Laboratory Coat/Apron	Recommended
Respirator*/maintain adequate ventilation	In the presence of heavy fumes

*Respirator must be an all-purpose or special canister respirator for NH_3 .

PROCEDURE

1. Open the box of NEUTRACIT^R 2 and apply to the caustic spill from its perimeter inward to dike and completely absorb the spill. A color change from YELLOW to BLUE signifies CAUSTIC MATERIAL. (HAZARDOUS)

NOTE: If absorption is slow or spill material is concentrated (40% or greater) add additional cool tap water to aid absorption and color reaction.

2. Thoroughly mix the slurry with the SCOOPS provided until it changes to a YELLOW/YELLOW-GREEN color (neutralized). Add additional NEUTRACIT 2 and/or water if necessary to obtain the above color reaction and desired slurry consistency.

NOTE: This step will be accompanied by slurry boiling if concentrated caustic solutions are treated. Observe appropriate precautions when handling hot materials.

3. Scoop up the neutralized material and place in the plastic DISPOSAL BAG provided. Wash the spill area with the sponge provided for final cleanup. Place used scoops, sponges, and waste residuals in the plastic disposal bag and twist-seal with the BAG TIE provided.
4. Fill out the DISPOSAL LABEL, affix to bag, and dispose in accordance with local environmental regulations. Waste materials contain citrate salts of the treated caustic.

Cinnasorb — Elemental Mercury Absorbent
Directions

Capacity

For the absorption of elemental mercury not to exceed 25 ml (338g).

HAZARDS

The toxicity of mercury is such that the element and its compounds should not be allowed to contaminate air and water.

General Safety Information

Clear general spill area before cleanup is begun. Avoid unnecessary contamination of clothing or equipment. Remove gold, copper or silver jewelry.

Don Protective Wear

Gloves

Laboratory Coat/Apron

Maintain adequate ventilation

Procedure

1. Activate the Cinnasorb base using the Cinnasorb Activator.
 - A. Cinnasorb Base Activation: Prepare Cinnasorb Activator by adding water to the "fill" line on the label. Shake until the crystals are dissolved.
 - B. In a small cup, add an amount of Cinnasorb base. While mixing with a wooden or plastic spatula, add sufficient activator solution to form a soft paste. The Cinnasorb base is now in its activated form. Note: some heat and gas may be formed during activation.
2. Apply a narrow strip of activated Cinnasorb base to the spill surface and push across the contaminated area using a wooden spatula. Small droplets of mercury will be absorbed into the paste. Repeat until the entire area has been covered at least twice. Activate additional Cinnasorb base as is necessary for complete treatment. (Saturated Cinnasorb base is indicated by a highly silvered appearance throughout.)

3. Pick up the used or saturated Cinnasorb with a small scoop and set it aside to dry. CAUTION: wet unsaturated Cinnasorb may generate gas. Do not place in sealed containers unless it is dry.
4. Dispose of mercury waste in accordance with local environmental regulations.

Flammable Solvents Spill Cleanup Kit
Directions

NOTE: Not a first aid kit

Spill Cleanup Capacity

For the cleanup of common organic liquids.

For use in the cleanup of spills not to exceed one pint in volume.

HAZARDS

Explosion — Fire — Inhalation

General Safety Information

IMMEDIATELY remove all sources of ignition from the spill area.

IMMEDIATELY provide maximum ventilation.

AVOID excessive inhalation of vapor or contact of skin with solvents.

DO NOT USE for the cleanup of strong oxidizers, including peroxides, or other highly unstable organic compounds.

Don Protective Wear

Gloves	Supplied
Laboratory Coat/Apron	Recommended
Self-contained breathing apparatus/maintain adequate ventilation	In the presence of heavy fumes

Procedure

1. Open the carton of SOLUSORB™ Solvent Adsorbent using the perforated opening.

NOTE: Each box of SOLUSORB will adsorb 239 ml. (8 oz.) of solvent. Two boxes are supplied.

2. Apply sufficient SOLUSORB onto the spill to adsorb all of the solvent.
3. THOROUGHLY mix the SOLUSORB and solvent with the SCOOPS provided until the SOLUSORB regains its appearance as a dry, free running, non-adhering granular material.

NOTE: If the proper quantity of SOLUSORB is used, the solvent odor in the mixture will be very slight. If a strong odor persists, add additional SOLUSORB.

4. Pick up the saturated SOLUSORB with the scoops and transfer it to the plastic DISPOSAL BAG provided.
5. Place used scoops and gloves in the disposal bag and twist seal with the BAG TIE provided. Fill out the disposal LABEL, peel off backing, and affix to the bag.
6. Dispose of the bag and contents in accordance with local environmental regulations.

CAUTION: Do not store waste SOLUSORB at temperatures in excess of 125°F.

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**Capacities and Use
Directions**

5-4458

SOLUSORB™ Solvent Adsorbent

2.5 lbs.

SOLUSORB Solvent Adsorbent can be used to adsorb common organic liquids.

Solvent treatment capacity: 1/2 pint/
2.5 lbs. of SOLUSORB Solvent Ad-
sorbent.

IMPORTANT

IMMEDIATELY remove all sources of
ignition from the spill area.

IMMEDIATELY provide maximum
ventilation. **AVOID** excessive inhala-
tion of vapor or contact of skin with
solvents.

DO NOT USE for the cleanup of
strong oxidizers, including peroxides,
or other highly unstable organic
compounds.

CAUTION

1. Wear adequate protective cloth-
ing.
2. Wear a self-contained breathing
apparatus when vapor concentra-
tions are high or adequate venti-
lation cannot be maintained.

DIRECTIONS

1. Open carton by tearing at the
perforated tab.

2. Apply SOLUSORB Solvent Ad-
sorbent to the spill from its pe-
rimeter inward covering the en-
tire spill.

IMPORTANT

Use one 2.5 lb. carton to treat each
1/2 pint of spilled solvent.

3. Mix the SOLUSORB Solvent Ad-
sorbent and solvent thoroughly.
Continue mixing until it regains
its appearance as a dry, free-run-
ning, non-adhering granular ma-
terial.
4. Pick up the saturated SOLU-
SORB Solvent Adsorbent and
place in a tightly sealed, labeled
disposal container.
5. Dispose of saturated SOLUSORB
Solvent Adsorbent in accordance
with local environmental regula-
tions.

CAUTION

Do not store used SOLUSORB
Solvent Adsorbent at tempera-
tures in excess of 125°F.

Safety and Disposal equipment for
the treatment and cleanup of spills
are supplied in the J.T. Baker Equip-
ment Kit Prod. No. 3-4483.

Mercury Spill Cleanup Kit
Directions

NOTE: Not a first aid kit.

HAZARDS

The toxicity of mercury is such that the element and its compounds should not be allowed to contaminate air or water.

General Safety Information

CLEAR general spill area before cleanup is begun.

AVOID any unnecessary contamination of clothing or equipment.

REMOVE gold, copper, or silver jewelry.

Don Protective Wear

Gloves

Supplied

Laboratory Coat/Apron

Recommended

Maintain adequate ventilation

Procedure

1. Using the wooden SPATULAS provided, gather as much mercury together as possible. Retrieve this material using the MERCURY ASPIRATOR provided.

Mercury Aspirator Directions

Retrieval

- A. Squeeze bulb to exhaust air from the Aspirator.
- B. Place nozzle tip next to mercury drops and release the bulb sharply.
- C. Repeat until the bulb feels about half full.

CAUTION: Never exhaust air from the ASPIRATOR with the nozzle point-upward!

Emptying

- A. Invert the ASPIRATOR (nozzle up) and remove the metal tube and collar assembly.
- B. Empty the ASPIRATOR into the narrow mouth bottle labeled "Impure Mercury".

- C. Re-insert the metal tube and collar assembly into the ASPIRATOR to its original depth.

Retrieve as much mercury as possible using the above method, then proceed to step 2.

2. Activate the CINNASORB™ Elemental Mercury Absorbent Base (Prod. No. 4505) using the CINNASORB Elemental Mercury Absorbent Activator. See instructions and cautions on individual product labels.

CINNASORB Base Activation:

- A. Prepare CINNASORB Activator by adding water to the "fill" line on the label. Shake until the crystals are dissolved.
 - B. Fill MIXING CUP supplied about 1/3 full with CINNASORB Base. Mixing with a wooden SPATULA, add sufficient Activator solution to form a soft paste. NOTE: Some heat and gas may be formed during activation.
3. Apply a narrow strip of activated CINNASORB base to the spill surface and push across the contaminated area using a wooden SPATULA. Small droplets of mercury will be absorbed into the paste. Repeat until the entire area has been covered at least twice. Activate additional CINNASORB Base as is necessary for complete treatment.
 4. Using the plastic SCOOP provided, scrape up the CINNASORB absorbent waste and transfer to the wide mouth JAR supplied. DO NOT CLOSE JAR — Complete and affix one MERCURY WASTE MATERIAL label to the JAR. Set aside and allow the contents to dry thoroughly before closing.
 5. Wipe up the treated spill area with the SPONGE (moistened) with warm soapy water.
 6. Place contaminated SPONGE, SPATULAS, GLOVES, etc. in the plastic disposal BAG provided and seal with the TIE. Complete and affix the second MERCURY WASTE MATERIAL label. Dispose of waste materials (Step 4 and Step 6) in accordance with local environmental regulations.
 7. PERSISTENT MERCURY VAPOR TREATMENT
RESISORB™ Mercury Vapor Absorbent should be used to absorb mercury vapors given off by small amounts of mercury remaining in areas inaccessible to physical cleanup.

Sprinkle RESISORB into any cracks or areas where the presence of mercury droplets is suspected. Check mercury vapor levels periodically using a UV absorbance type vapor detector and renew the RESISORB absorbent as necessary.

Mercury Indicator Directions

Indicating Capacity

Applied as a thin opaque layer over contaminated surfaces, it will cover approximately 13-15 ft.² and detect the presence and location of mercury contamination on or within porous surfaces.

HAZARDS

Metallic mercury vaporizes at room temperature and has a Threshold Limit Value (TLV) for exposure to its vapor of 0.05 mg/m³. The principal route of merc poisoning is exposure to its vapor; poisoning from exposure to mercury compounds occurs less frequently.

Don Protective Wear

Gloves
Safety Glasses
Laboratory Coat/Apron
Respirator/maintain adequate ventilation

Procedure

Lightly sprinkle a thin opaque layer of Mercury Indicator over the contaminated area. Allow to stand undisturbed for 24 hours. If mercury metal is present, pink or black spots will develop directly over the mercury source within five minutes to 24 hours after application. A strong positive response, i.e. large black spots or areas, indicate fresh or extensive contamination by the metal. Areas showing contamination should then be treated by physical and/or chemical methods to remove the mercury. Retest with Mercury Indicator after decontamination treatment.

For Vertical Surfaces

Mix Mercury Indicator with enough water to form a slurry and "paint" contaminated vertical surfaces with the mixture.



Mercury Sponge Directions

HAZARDS

The toxicity of mercury is such that the element and its compounds should not be allowed to contaminate air and water.

General Safety Information

Clear general spill area before cleanup is begun. Avoid unnecessary contamination of clothing or equipment. Remove gold, copper or silver jewelry.

Don Protective Wear

Gloves

Laboratory Coat/Apron

Maintain adequate ventilation

Procedure

1. Collect and remove as many large drops of mercury from the spill area as possible. The Bulb Aspirator provided in the J. T. Baker Mercury Spill Cleanup Kit (Product No. 1-4439) may be used for this purpose.
2. FOR BEST RESULTS: Remove extraneous dirt and debris from the spill area taking care not to spread mercury contamination further (e.g., dropping mercury to the floor). NOTE: excessive dirt and debris will reduce the Mercury Sponge's capacity.
3. Remove the Mercury Sponge mercury absorber pad and Activator Packet from their container.
4. Separate the mercury absorber pad into two equal sizes.
5. Fill the container $\frac{1}{2}$ full with water and empty the entire contents of the activator packet into the water. Stir if necessary to dissolve the activator.
6. Dip one of the mercury absorber pads into the Activator solution for about 30 seconds, then remove.
IMPORTANT: Do not leave mercury absorber pads in the Activator Solution longer than two minutes.

7. Gently wipe the spill area with the activated pad using only LIGHT hand pressure — avoid abrasion. Continue until all visible traces of mercury are removed.
NOTE: pickup of mercury is indicated by a highly silvered appearance of the pad fibers.
8. For maximum effectiveness, repeat the treatment procedure steps 6 and 7 using the second, unused pad.

Neutrasol 'Low Na' Liquid Acid Neutralizer
Directions

Neutralization Capacity

For the neutralization of the following acid spills:

<u>Acid (concentrated)</u>	<u>Treatment capacity (pts. acid) Per 2.5 Gal. Neutrasol 'Low Na'</u>
Acetic (99%)	9.5 pts. (10.4 lb.)
Formic (88%)	7.7 pts. (9.6 lb.)
Hydrobromic (48%)	8.0 pts. (12.6 lb.)
Hydrochloric (38%)	11.8 pts. (14.6 lb.)
Hydrofluoric (49%)	6.3 pts. (7.7 lb.)
Hydriodic (47-51%)	30.3 pts. (50.5 lb.)
Nitric (70%)*	9.5 pts. (14.1 lb.)
Phosphoric (87%)	5.9 pts. (10.4 lb.)
Sulfuric (98%)	5.0 pts. (9.6 lb.)

(There are two 2.5 gal. containers of Neutrasol 'Low Na' per package. Therefore, total neutralization is double the treatment capacity.)

HAZARDS

The above acids can cause serious and painful burns to exposed skin or eyes. In case of contact with acids, IMMEDIATELY flush eyes or skin with copious amounts of water for at least 15 minutes and remove contaminated clothing or shoes. Call a physician immediately.

General Safety Information

Observe the following precautions BEFORE attempting to treat and/or clean up ANY acid spills.

- Clear spill area of all unnecessary personnel and equipment.
- Insure adequate ventilation and/or respiratory protection.
- Wear protective clothing and equipment appropriate and adequate respirator (acid form types)

*See special instructions for nitric acid

self-contained breathing apparatus
face shield/goggles
acid (impermeable) gloves, body suit and boots

- Do not step in acid spill material without adequate foot protection.

Special Handling Information

Caution:

Do not use on perchloric acid, fuming nitric acid or other oxidizing acid mixtures. Neutrasol 'Low Na' is an organic based material, and as such, may react with oxidizing materials to produce excessive heat, flames or unstable compounds. See special use directions for nitric acid.

For Nitric Acid or Nitric Containing Mixtures

Follow the same precautions as with general use. Dilute the spill with water if the nitric acid is in excess of 50% concentration. General use directions may then be followed. This waste should be disposed of immediately. Do not allow to solidify.

Neutrasol 'Low Na' is a 'controlled reaction' acid neutralizer. It is designed for acid spill neutralization where metal ion contamination is critical. Neutrasol 'Low Na' has a total metal content less than 0.08%.

Cleanup Procedure

1. Apply the BLUE colored Neutrasol 'Low Na' around the perimeter of the acid spill.
2. Using a long-handled floor squeegee or acid resistant brush, gradually mix the Neutrasol 'Low Na' inward into the spilled acid. Foaming (CO₂ release) and a color change from BLUE to YELLOW or PINK indicates the start of neutralization.

Color Indication

<u>Mixture Color</u>	<u>Indication</u>
YELLOW/PINK	ACIDIC
BLUE	NEUTRALIZED

3. Apply additional Neutrasol 'Low Na' to the acid spill with mixing until the mixture changes to a BLUE color. (For guidance in application ratios see Neutralization Capacity Guide.)

4. Pick up neutralized spill mixture (BLUE) with a liquid shop vacuum or mop. Thoroughly rinse treated area with water and detergent to remove residual neutralized materials.

5. Dispose of the waste liquids by either method below.

A. Flush to a suitable chemical waste treatment system.

B. Absorb liquid onto an absorbent and dispose of in accordance with local environmental regulations.

NOTE: Waste liquids contain the respective soluble alkanolamine salts of the treated acid(s).

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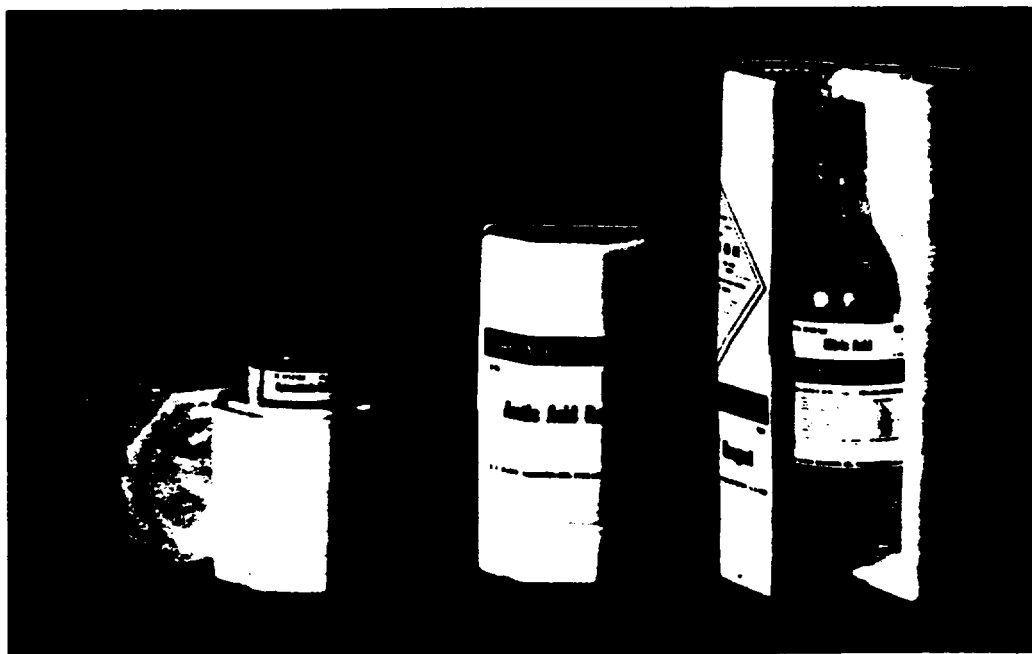
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ACID SINGLE SHIPPER

Single bottles of acids are handled several times during a normal course of distribution from producer to end user. Each time a bottle is packed or unpacked, the possibility of breakage exists.

To minimize the potential hazards of breakage, J. T. Baker's 1 and 5 pint acid bottles are available in sealed Styrofoam® overpacks.



These "single shippers" are chemical and weather resistant and will withstand a 4 foot drop on any face. This special packaging allows single bottles of acids to be more safely stored on storeroom shelves or laboratory benches. The single shipper also offers extra convenience to storeroom personnel because there is no box to pry apart and no messy packaging materials to remove and dispose of.

Styrofoam — a registered trademark of the Dow Chemical Company.

The following acids are available in single shippers (all products are Baker Analyzed REAGENT Grade except when noted):

9508	Acetic Acid, Glacial (Low Aldehyde)
9507	Acetic Acid, Glacial
9522	Acetic Acid, Glacial, U.S.P.-F.C.C.
9721	Ammonium Hydroxide
9535	Hydrochloric Acid
9544	Hydrochloric Acid, U.S.P.-F.C.C.
9601	Nitric Acid
9598	Nitric Acid, BIA
9624	Nitric Acid, 90%
9652	Perchloric Acid, 70-72%
9653	Perchloric Acid, 70-72%, BIA
9656	Perchloric Acid, 60-62%
0260	Phosphoric Acid
0262	Phosphoric Acid, N. F.
9681	Sulfuric Acid
9691	Sulfuric Acid, for Babcock Milk Test
9699	Sulfuric Acid, Fuming, 15-18%
9703	Sulfuric Acid, Fuming, 20-23%
9705	Sulfuric Acid, Fuming, 30-33%
0370	Sulfurous Acid

Baker

SAFETAINER™

Meets OSHA Requirements for Solvent Storage

In 1970 J. T. Baker introduced the SAFETAINER as a new improved container for solvents. This special package was designed to provide a break proof, vapor proof container that would maintain the reagent quality of its contents. OSHA requirements for storage of flammable, hazardous solvents are met by the SAFETAINER.

The SAFETAINER'S polypropylene cap has Baker's new linerless, twin seal construction that provides a vapor proof seal. The cap is directionally ribbed for ease of removal and it cannot be overtightened.



Reagent quality
is maintained by
a special tin-lined
inner wall.

C-382

The SAFETAINER offers an added measure of safety in the following ways:

1. High impact strength resists breakage even from a 10 ft. drop onto concrete.
2. Tin-lined inner walls inhibits peroxide formation.
3. Polypropylene screw cap eliminates sparks upon opening and closes easily by hand.
4. Polypropylene screw cap melts at high temperatures, reducing explosive hazard inherent with metal caps.
5. Vapor-proof seal reduces flame and inhalation hazards.

The following solvents are available in 2-pint and 8-pint SAFETAINER (Baker Analyzed REAGENT grade unless noted).

9006	Acetone	9324	Methylene Chloride
9401	Alcohol	9319	Methyl Ethyl Ketone
9154	Benzene	9272	Petroleum Ether, 20-40°C.
1512	Carbon Tetrachloride	9268	Petroleum Ether, 30-60°C.
9180	Chloroform	9274	Petroleum Ether, 30-75°C.
9206	Cyclohexane	9273	Petroleum Ether, 60-110°C.
9231	p-Dioxane	9086	1-Propanol
9246	Ether, Insta-Start™	9084	2-Propanol (iso-propyl alcohol)
9244	Ether, Anhydrous	9243	iso-Propyl Ether
9248	Ether, Anhydrous, Suitable for Fat Extraction	9450	THF
9240	Ether	9451	THF, Insta-Start™
9239	Ether, U.S.P.	9458	Trichloroethylene
9252	Ether, Purified	9460	Toluene
9280	Ethyl Acetate	9490	Xylenes
9309	Hexanes		

INSTA-START™—Trademark of Realco Chemical Company, Division
of National Patent Development Corporation, New
York, New York. U. S. Patent applied for.

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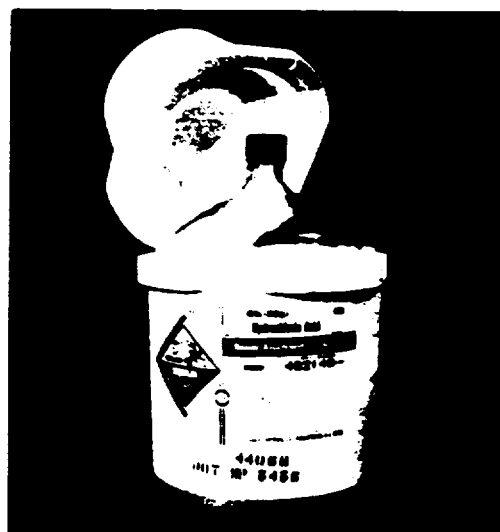
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6 1/2 Gallon Non-Returnable Carboy

Bulk acid handling can be hazardous because of the corrosive nature of the material and package weight. J. T. Baker's 6 1/2 gallon non-returnable carboy packaged in a molded polystyrene overpack, withstands shock, is chemical and weather resistant and weighs an average of 24 lbs. less than carboy packaged in wooden boxes.



The following products are supplied in these non-returnable carboys (Baker Analyzed REAGENT Grade, except where noted).

- 9508 Acetic Acid, Glacial (Low Aldehyde)
- 9507 Acetic Acid, Glacial
- 9522 Acetic Acid, Glacial, U.S.P.-F.C.C.
- 0018 Acetic Anhydride
- 9013 Acetyl Chloride
- 0626 Ammonium Bisulfate Solution, 45%
- 9721 Ammonium Hydroxide
- 0160 Hydriodic Acid, 45-51%
- 9535 Hydrochloric Acid
- 9544 Hydrochloric Acid, U.S.P.-F.C.C.
- 9548 Hydrochloric Acid, 22° Be, Technical
- 0260 Phosphoric Acid
- 9681 Phosphoric Acid, NF
- 9691 Sulfuric Acid for Babcock Mill Test

C-382

PRODUCT TEST INFORMATION



No. 1

FLAMMABLE LIQUID HAZARDS

Flammable liquids present serious fire and explosion hazards. Additionally, solvents such as methanol and benzene are flammable and toxic. Carbon tetrachloride is not flammable but is highly toxic.

Flammable liquids are easily ignited, difficult to extinguish and burn rapidly (10 times faster than wood!). Their vapors form explosive mixtures with air. Many of the common laboratory solvents are more flammable and dangerous than gasoline.

Solvent spills in the laboratory should be quickly cleaned up to prevent fire and explosion. Common spill control measures, such as the use of paper towels can increase the hazard by accelerating evaporation and providing additional flammable material.

A solvent control system has recently been developed by J. T. Baker's Research and Development Department to safely control solvent spills.

The J. T. Baker Flammable Solvent Spill Cleanup Kit contains a proprietary granular adsorbent, SOLUSORB™, that is applied to a flammable solvent spill at an approximate volume ratio of 10:1. The effectiveness of SOLUSORB in reducing the flammability hazard of solvents is highlighted by the following experiments:

In the first experiment, the effect of increasing volumes of SOLUSORB on three common solvents [toluene, alcohol (denatured ethyl alcohol)*, and methyl iso-butyl ketone] was assessed in terms of the flashpoint, which is a common index to flammability hazards. An increased flashpoint corresponds to a decrease in flammability.

Flashpoints were determined by the closed cup method using a Seta-flash tester (Stanhope-Seta). A 0.65 ml. test volume for the liquid solvent was selected for each test run to duplicate the volume of solvent mixtures. The flashpoint values found for the liquid solvents were in good agreement ($\pm 2^\circ\text{F.}$) with established values.

The results are shown graphically in Chart 1. It can be seen that a substantial increase in flashpoint is obtained at SOLUSORB/Solvent ratios of 6:1 V/V or greater. Consequently, an application ratio of 10:1 V/V provides adequate security for the cleanup of diverse organic solvents.

PRODUCT TEST, No. 1

In the second experiment, the effect of SOLUSORB was studied on the flashpoint of 20 common organic solvents. The suggested SOLUSORB/Solvent ratio of 10:1 V/V was used throughout this experiment. The results, shown graphically in Chart 2, indicate that the application of SOLU-

SORB in a 10:1 ratio raises the flashpoint of the adsorbed solvent by 100°F. or more. The left value of each pair, shown as a circle, is the flashpoint found for the liquid solvent. The right value is for the solvent retained on the SOLUSORB. The right value is shown as a square, where the exact value could be determined, or as a plus sign where the value exceeds the upper limit of the flashpoint instrument.

In conclusion, the two experiments show that SOLUSORB significantly reduces the flammability of flammable liquids, and can be used effectively in their cleanup.

References

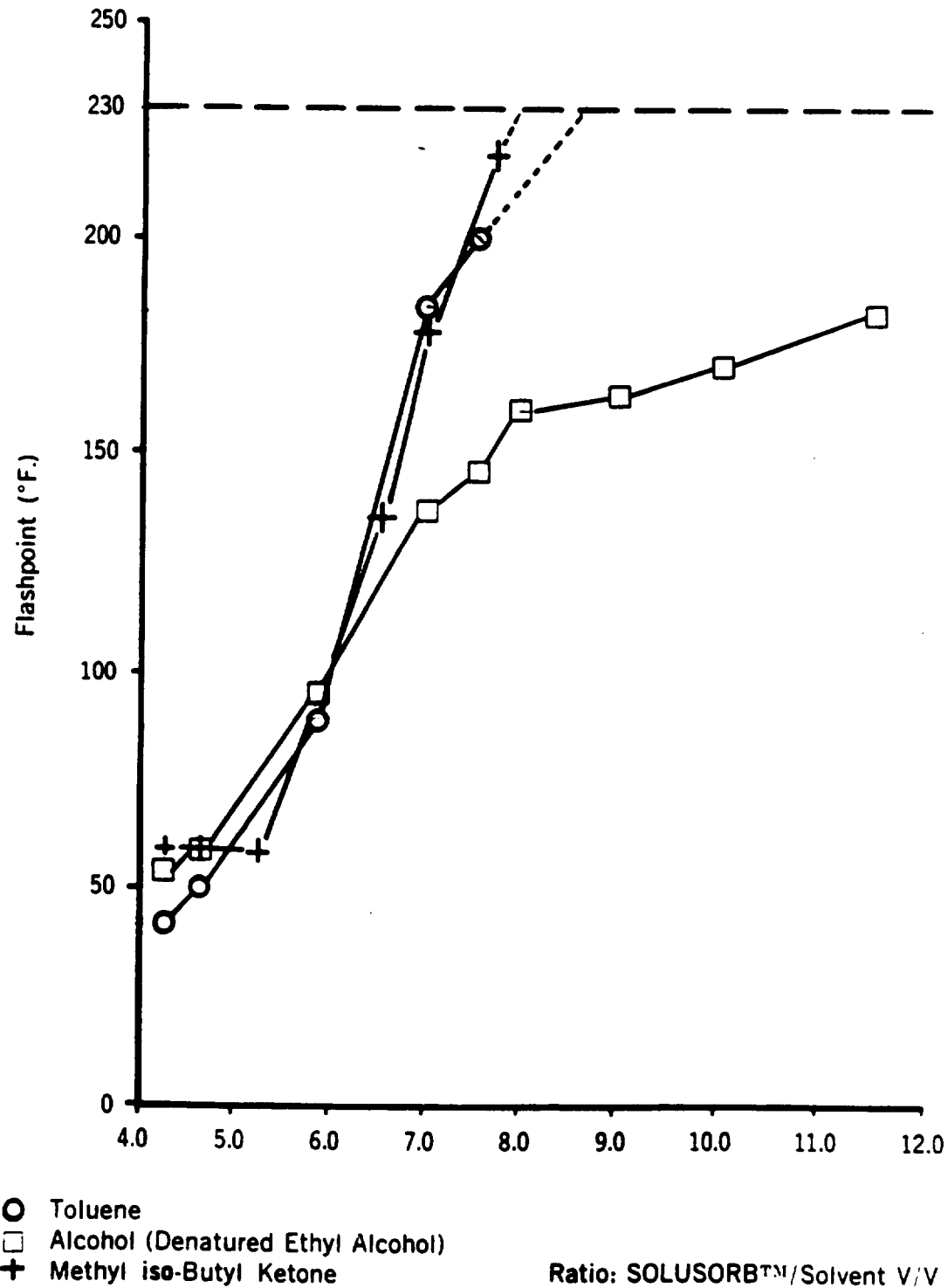
1. Seidenberger, J. W. and Blum, F. M., "A New Concept in Lab Safety — The Chemical Spill Cleanup Kit," **American Laboratory**, 7: 27-35, 1975.
2. Steere, N. V., ed., **Handbook of Laboratory Safety**, The Chemical Rubber Co., Cleveland, 1967, p. 132.

For more information about the Laboratory Spill Control products, and reprint of the **American Laboratory** article (Reference 1) write to:

Safety Products Specialist
J. T. Baker Chemical Company
222 Red School Lane
Phillipsburg, N. J. 08865

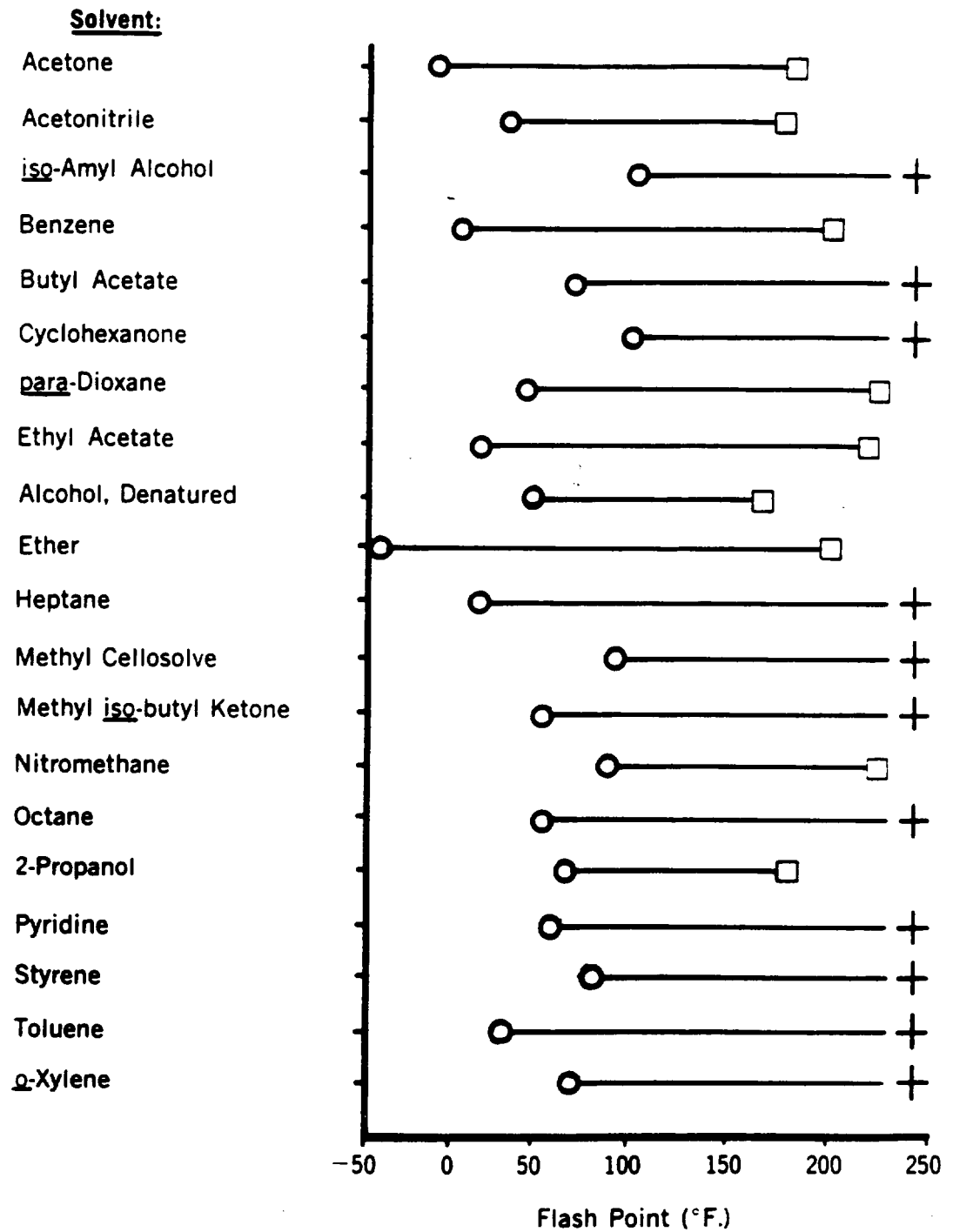
*Denatured Ethyl Alcohol: SD 3-A, Denatured with 5% 2-Propanol.

Flash Point vs. SOLUSORB™/Solvent Ratio



Solvent Flash Points

Liquid/Sorbed*



- Solvent (liquid)
- Solvent (sorbed)
- † Greater than 230°F.

*10:1 SOLUSORB™/Solvent V/V

PRODUCT TEST INFORMATION



No. 2

SOLVENT SPILL CONTROL: EXPERIMENTAL DATA

Flammable/toxic solvents are found in most laboratories. Fire and explosion are the most common hazards presented by flammable solvents. It is calculated that only one pint of hexane in the air, if ignited, could "blow up" an average two-man lab. Even in small quantities flammable solvents are hazardous enough to require utmost care when being handling. Ventilation helps reduce the threat of explosion, but immediate cleanup of a spilled solvent is critical. Without an established method and proper materials, the spill control procedure used often increases the hazard involved. Two commonly misused spill control materials are granular clay (kitty litter) and paper toweling. Their lack of effectiveness is detailed in this report.

A complete, test proven system for the control of solvent spills has recently been developed by J. T. Baker Chemical Co. The Flammable Solvents Cleanup Kit includes an effective adsorber SOLUSORB™ in addition to equipment for rapid spill cleanup and disposal.

The experiments include SOLUSORB, applied to a flammable solvent spill at an approximate volume ratio of 10:1. Product Test No. 1 presented the results of two experiments showing that SOLUSORB significantly reduces the flammability of solvents and can be used effectively in their cleanup.

The experiments described below compare the effectiveness of SOLUSORB with other common spill control agents in reducing flammability hazards. In both experiments flash points are determined since they represent the critical index to flammability hazards. An increase in flash point corresponds to a decrease in flammability.

In the first experiment, the effect on flash point was studied for the sorption of three common solvents on SOLUSORB and a granular clay. A 10:1 adsorbent/solvent volume ratio was used throughout this experiment.

Flash points were determined by the closed cup method using a Seta-flash tester (Stanhope-Seta). A 0.65-ml test volume for the liquid solvent was selected for each test run to duplicate the volume of solvent in the 10:1 adsorbent/solvent mixtures. The flash point values found for the liquid solvents were in good agreement ($\pm 2^\circ\text{F}$.) with established values.

The findings are summarized in Table I. It can be seen that a substantial increase in flash points of all three flammable solvents is obtained with the application of the SOLUSORB. In contrast, there is virtually no increase in flash point for the three flammable solvents when absorbed on the granular clay. In other words, the use of SOLUSORB, in the recommended quantities, reduces the flammability substantially, whereas the granular clay fails to do so.

In the second experiment, the relative rates of volatilization were studied for a solvent alone and retained on the following materials: SOLUSORB, granular clay, and paper toweling. A constant weight of toluene was added to a steel pan either alone or followed by the addition of SOLUSORB or granular clay in a 10:1 volume ratio. The pan was then placed on a pedestal within a fume hood. After temperature equilibration, the weight of toluene lost was monitored at five minute intervals for one hour. Additionally, the same weight of toluene was taken up on a minimum area of brown paper toweling (3-ml. thickness). The saturated toweling was then crumbled, placed in the pan, and the weight loss was monitored similarly. The results are presented in Figure 1 as a plot of the accumulated percentage weight loss of toluene versus time.

Inspection of the curves indicates that toluene is volatilized from the paper toweling (Curve I) more rapidly than from the liquid pool (Curve II). This finding can be explained in terms of the toweling providing more surface for the escape of toluene to the air. The inert, granular clay (Curve III) provides a modest decrease in the volatilization of the toluene. SOLUSORB (Curve IV) provides a dramatic decrease in the volatility of the flammable solvent. The SOLUSORB does not allow a measureable amount of toluene to be volatilized within the one hour test period. This finding is informally substantiated by the observation that the odor of toluene is minimally detectable over the surface of the SOLUSORB.

The two experiments show that SOLUSORB greatly reduces both the flammability and volatility of solvents while granular clay is almost ineffective in minimizing the hazard. The use of paper toweling as a cleanup material actually increases the flammability hazard, because it increases the rate of volatilization of the solvent. SOLUSORB provides a significant improvement in safety over both granular clay and paper toweling in the cleanup of flammable solvent spills.

References

1. Seidenberger, J. W., and Blum, F. M., "A New Concept in Lab Safety — The Chemical Spill Cleanup Kit," **American Laboratory**, Vol. 7 (1975), No. 6, pp. 27.
2. SAFE-T-DATA, No. 1, "Flammable Liquid Hazards," Safety Product Research, J. T. Baker Chemical Co., 1975.
3. Shaw, A. J., "Safe Use of Flammable Liquids in Laboratories," **Safety In The Chemical Laboratory**, Vol. 2 (1971), pp. 43.
4. Steere, N. V. ed., **Handbook of Laboratory Safety**, Chemical Rubber Co., Cleveland, 1967, p. 132.

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For more information about the Laboratory Spill Control products, and a re-
print of the **American Laboratory** article (Reference 1), write to:

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J. T. Baker Chemical Company
222 Red School Lane
Phillipsburg, N. J. 08865

Table 1
Flash Points of Solvents Retained on SOLUSORB & Granular Clay

Solvent	Flash Points (°F.)		
	Liquid	SOLUSORB*	Clay Absorbant*
Ethyl Alcohol, Denatured SD 3-A	55	161	64.5
Methyl iso-Butyl Ketone	58	>230	58
Toluene	43	>230	40

*Absorbant/Solvent Ratio 10:1 V/V

Percentage Weight Lost
vs
Time, Through Evaporation

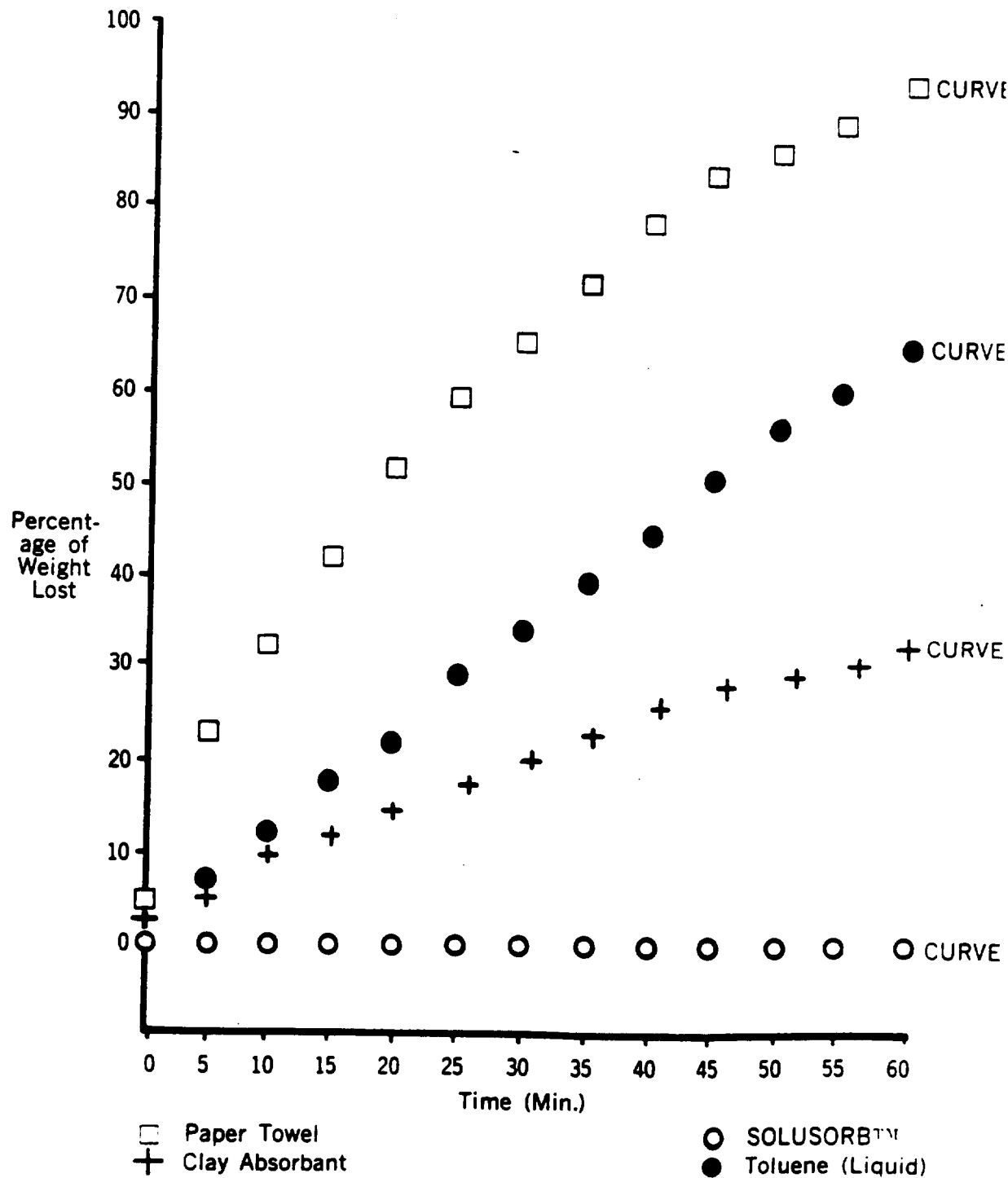


Figure 1

PRODUCT TEST INFORMATION



No. 3

EVALUATING ACID SPILL NEUTRALIZERS

Mineral acids are among the most common types of chemicals found in the laboratory. In addition to their highly corrosive nature, fumes of most common acids are toxic. For example, brief exposure (1-2 min.) to hydrochloric acid fume concentrations of 0.10 to 0.20% in air may be lethal to humans. Proper precautions should always be taken whenever acids are handled. Gloves, an apron, and face shield should be worn to prevent the acid from coming in contact with the skin.

Acids are so commonly used that spills are inevitable. The first treatment step in most spill control procedures for acids is neutralization. By neutralization, the hazard is greatly reduced and acid vapors are no longer present. Until recently, laboratories have suffered from an unavailability of proper neutralizing agents and cleanup equipment to control spills rapidly and effectively. The neutralizers that have been available are either ineffective or are potentially hazardous to use. Some of these commonly used neutralizers are sodium carbonate (soda ash), perlite, and a 9:1 sand/soda ash mixture.

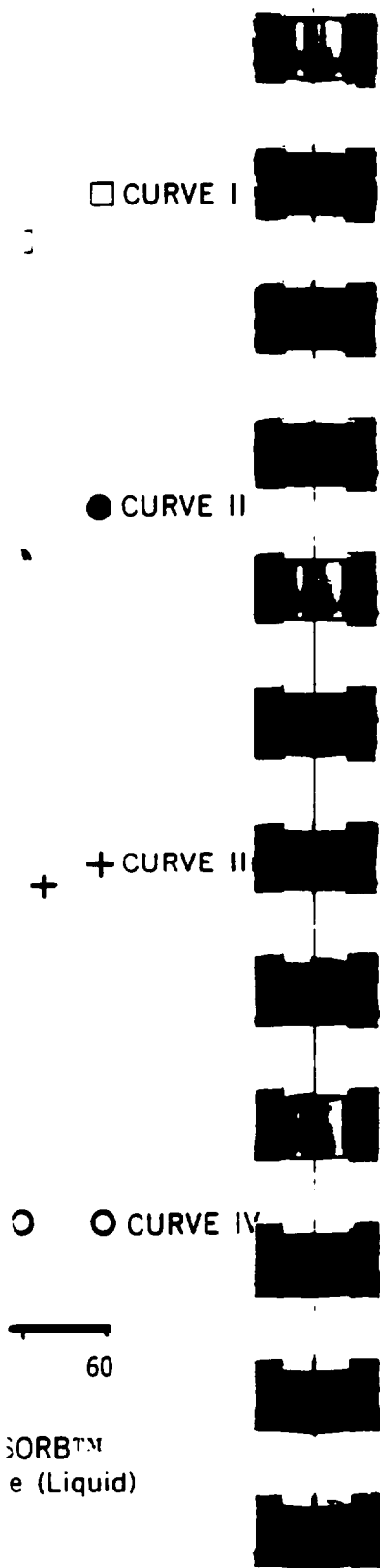
A complete, test-proven system for the control of acid spills has been developed by J. T. Baker Chemical Company. An integral part of this spill control system is a specially formulated acid neutralizer called NEUTRASORB[®]. The experiments summarized below, demonstrate that the NEUTRASORB formulation not only neutralizes an acid spill rapidly, but does so in a safe manner.

The capacity of three agents to neutralize acid was measured by monitoring the normality of an acid solution over a five-minute interval after addition of the agent. In this way, both the acid neutralizing capacity and its rate of neutralization were assessed for each of the agents tested.

A 200-ml volume of 15N nitric acid was placed in a 1-liter flask, stirred, and 165-grams of neutralizer added. After two minutes, 100-ml of water was added and the reaction allowed to progress. Portions of the supernatant reaction mixture were removed at specific intervals, immediately filtered, and their acidities established by titimetry. Values for samples at or beyond three-minutes were corrected for the water added at two-minutes. The "corrected" acidity values were converted to % Acid Neutralized. A plot of the % Acid Neutralized versus time is seen as Figure 1.

The following neutralizing agents were evaluated under these experimental conditions: NEUTRASORB, sand/soda ash, and anhydrous granular soda ash.

In Figure 1, the 9:1 sand/soda ash mixture curve (□) indicates that complete reaction of the sodium carbonate component occurs within one-minute with about 95% of the acid remaining unneutralized. The granular soda ash curve (-) shows rapid reaction with neutralization of 99% of the acid within



one-minute and virtually complete neutralization within two-minutes. Inspection of the curve (○) for the NEUTRASORB formulation indicates rapid neutralization to about 73% within one-minute. Thereafter, the acid is neutralized at a moderated rate, with 99% neutralized within five-minutes.

Figure 1, points out the inefficiency on a weight-to-weight basis of the 9:1 sand/soda ash mixture as an acid neutralizer. Lack of a pH indicator and a low neutralizer content increases the likelihood of a highly acidic hazardous waste slurry. The experiment demonstrates that while sodium carbonate will neutralize an acid spill, the amount of heat generated will be excessive and can cause splattering of hot acid, creating an additional hazard. If an excessive amount of sodium carbonate is placed on the spill, a potentially hazardous caustic situation would be created.

An expanded glass product (perlite) is also commonly used for treating acid spills. Perlite has been found to contain no acid neutralizing components. It is totally ineffective as an acid neutralizer.

The experiment does show that the NEUTRASORB formulation offers a combination of several desirable features to make it the safest and most effective neutralizer evaluated. The NEUTRASORB formulation is a fully tested and proven product, specifically formulated for the treatment of mineral acid spills. As Figure 1 illustrates, NEUTRASORB provides rapid but controlled neutralization of concentrated acids. The incorporation of a pH indicator that provides a positive, visual means to determine the completion of neutralization, is an added safety factor. The NEUTRASORB formulation also contains bulking agents that assist in initial absorption of the acid spill and later facilitate the physical pickup and disposal of the treated material. Finally the NEUTRASORB formulation provides more total neutralization capacity on either a weight or volume basis than the other common acid spill neutralizers tested. NEUTRASORB is an integral part of a systematic approach to acid spill control developed by J. T. Baker, called the Acid Spill Control Center.

For more information about this and other Laboratory Spill Control products, and a reprint of the **American Laboratory** article (Reference 1) write to:

Safety Products Specialist
J. T. Baker Chemical Company
222 Red School Lane
Phillipsburg, N. J. 08865

References

1. Seidenberger, J. W., and Blum, F. M., "A New Concept in Lab Safety — The Chemical Spill Cleanup Kit," **American Laboratory**, Vol. 7 (1975), No. 6, p. 27.

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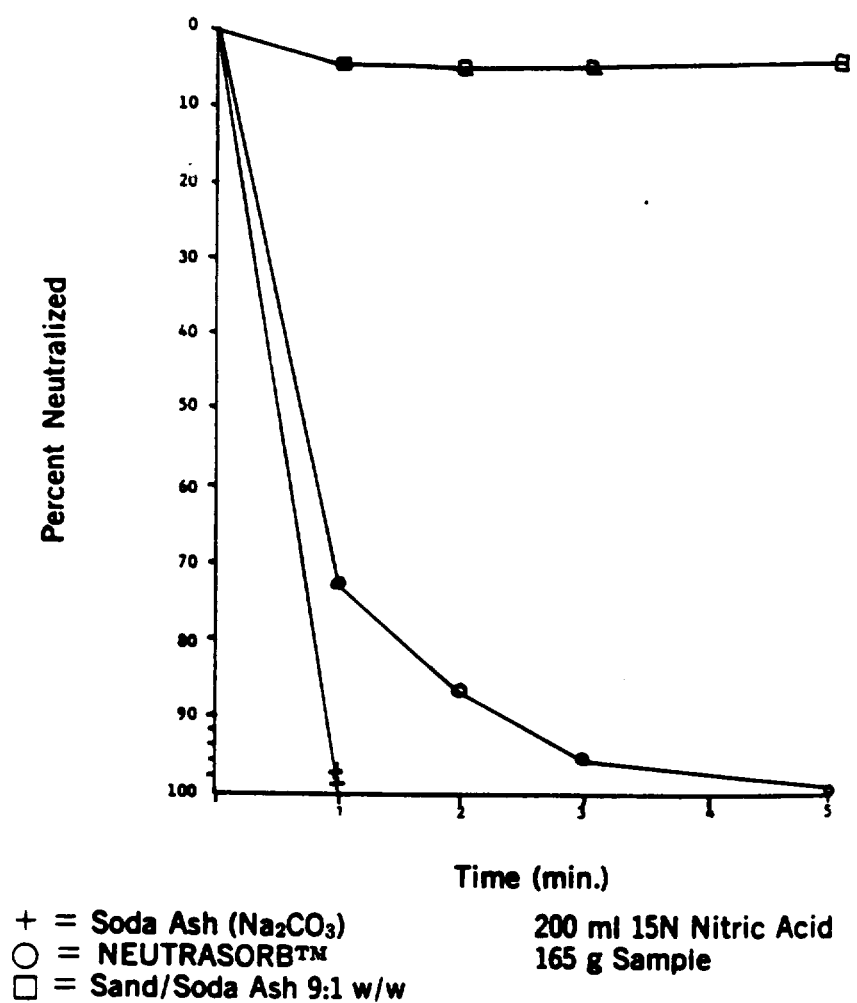
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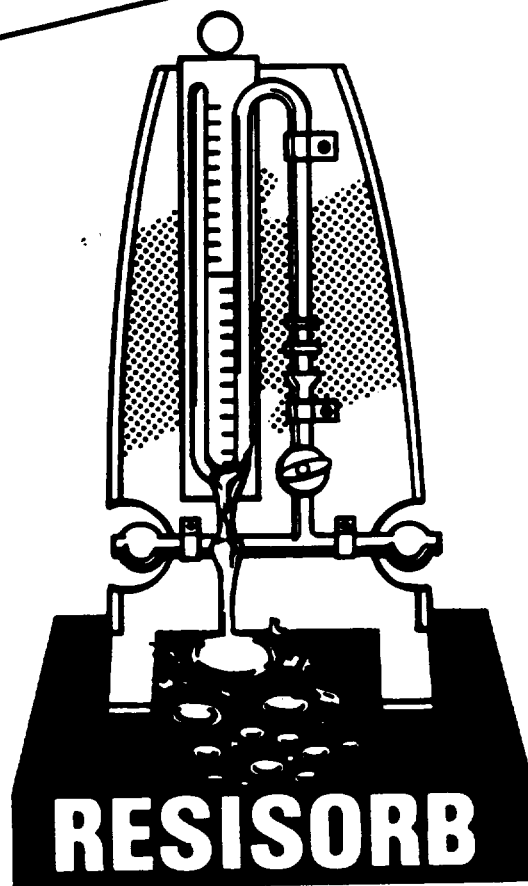
2. Steere, N. V. (ed.), **Handbook of Laboratory Safety**, Chemical Rubber Co., Cleveland, Ohio, 1967, p. 132.
3. American Conference of Governmental Industrial Hygienists, **TLVs Threshold Limit Values . . . for 1974**, Cincinnati, 1974.

Figure 1
Neutralization of 15 Normal Nitric Acid With Selected Agents
(Percent Neutralized versus Time (min.))



No. 4

PRODUCT TEST INFORMATION



RESISORB
for Mercury Vapor
Absorption

SAFETY PRODUCT RESEARCH

J.T. Baker Chemical Co., Phillipsburg, N.J. 08865



RESISORB® FOR MERCURY VAPOR ABSORPTION

An awareness of the hazardous properties of mercury has been growing in the past few years. Mercury poisoning, however, is still an occupational hazard. Because of its unusual physical properties, mercury finds widespread use in the chemical industry, and in the manufacture of electrical apparatus. It finds application in almost every chemistry and physics laboratory, as well as many biomedical laboratories. Its uses are so widespread that it is estimated that 150,000 individuals in the U.S.A. are routinely exposed to it.

It is important to remember that mercury vaporizes at room temperature, and has a Threshold Limit Value (TLV) for exposure to its vapor of 0.05 mg/M³. The principal route of mercury poisoning is exposure to mercury vapor; exposure to mercury compounds occurs less frequently.

A spill of metallic mercury should be thoroughly cleaned up to eliminate prolonged exposure to its vapor. A typical spill produces three categories of mercury drops; (1) drops (easily visible and accessible), (2) droplets (small, yet visible, but often difficult to pick up), and (3) microdroplets (too small to be visible or pick up).

J. T. Baker's Mercury Spill Cleanup Kit provides means to treat the first two categories of drops, as well as a proprietary chemical formulation, RESISORB, for persistent absorption of mercury vapor evolved by any droplets.

Experiment 1

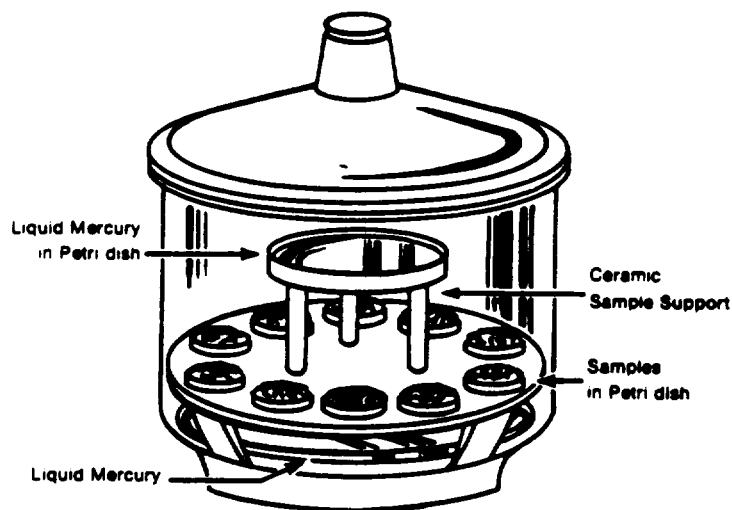
An experiment was conducted to compare the effectiveness of RESISORB in absorbing mercury vapor with that of some currently used materials: Sulfur, HgXTM, and Activated Carbon, 18-40 mesh.

Experimental Design:

Test Vessels: Two large glass desiccators (12" diam. x 12" high) were employed as test vessels. A volume of 167 ml of mercury, J. T. Baker Product No. 2564, was placed in the bottom of desiccator 1, to form a pool 13.5 cm. in diam. In addition, a 14.5 cm. diam. Petri dish filled with mercury was placed about 9 cm. above the internal perforated ceramic sample support. A total of 308 cm.² of clean mercury surface area was exposed within the desiccator. Desiccator 2, contained air with no mercury and served as a control.

Procedure: Four samples of each material to be tested, and samples of sand, as a control, were placed in small Petri dishes 4.15 cm. diam. x 0.318 cm. depth. Each Petri dish was filled to level.

Initial weights (± 0.2 mg) were obtained for each sample before placing duplicate samples into each desiccator. (1) The desiccators were sealed and remained undisturbed at ambient room conditions (22-24°C.) for 28 days.



The mercury vapor concentration within desiccator 1 was calculated as 16.9 mg Hg/M³ at 23°C.⁽²⁾

At the end of the 28 day test period, the samples were removed and immediately reweighed. A difference of ± 1 mg from the initial weight was considered insignificant.

Results (see Table 1).

Sand was used as a control; 8.7 g of Purified Sand, J. T. Baker Product No. 3382, was exposed in both desiccators. The weight gain after 28 days for both the test and control samples was less than 1 mg/g of sand.

Sulfur — 4.3 g of Sulfur, Precipitated, USP, J. T. Baker Product No. 4084, was exposed in both desiccators. The weight gain for both the test and control samples was less than 1 mg/g of sulfur.

RESISORB — 2.5 g of RESISORB, Mercury Vapor Absorbent, J. T. Baker Product No. 4455, was exposed in both vessels. The weight gain for the control sample was less than 1 mg/g of RESISORB, while the weight gain of the test sample was 16.5 mg/g of mercury per gram of RESISORB. Comparison of the two weight gains indicates that little of the test sample weight gain can be attributed to material other than mercury.

HgX™ — 7.1 g of HgX, Acton Associates, was exposed in the test and control vessels. The weight gain for both the test and control samples was less than 1 mg/g of HgX.

Activated Carbon: 2.5 g of activated carbon, 18-40 mesh, was exposed in both vessels. The weight gain for both the test and control samples was less than 1 mg/g of activated carbon.

HgX is a trademark of Acton Associates.

Experiment 2

A second experiment was conducted to evaluate RESISORB's potential for absorbing mercury vapors over a prolonged period.

Experimental Conditions:

Test Vessel: A single glass desiccator (8" diam. x 9.5" high) was employed as the test vessel. 18.4 milliliters of mercury, J. T. Baker Product No. 2514, was placed in the bottom of the test vessel to form a 5.5 cm. diam. pool with a surface area of 23.8 cm.².

Procedure: A sample of RESISORB, 5.29 ± 1 mg. was placed in a Petri dish. The sample was spread evenly over the bottom of the dish and sealed in the desiccator. The experiment was run for 10.5 months with the sample being removed and immediately weighed, and then replaced on days 2, 8, 76, 101 and 323. The test was terminated after 365 days. Changes in weight for the sample were determined by difference and percent weight increase calculated, based on the initial sample weight.

On the 365th day, a 1.00 g sample was subjected to rigorous acid digestion and subsequent atomic absorption (AA) determination of the leached mercury content.

Results (see Figure 1)

A plot of percent weight increase versus time demonstrates RESISORB's ability to absorb in excess of 9% of its own weight in mercury over the time period studied. The curve shown, based on gravimetrically obtained data, was supported by chemical analysis of the sample after 365 days. Analysis of the sample yielded 9.6% mercury (day 365) in comparison with 9.8% extrapolated from the gravimetric curve.

Conclusion: The results of both experiments serve to illustrate RESISORB's unique ability to absorb mercury vapor from the surrounding atmosphere over prolonged periods of time. In addition, it can be concluded that RESISORB absorbs 30-40 times more mercury than any of the other materials tested, and is capable of absorbing in excess of 9% of its own weight in mercury under the test conditions described.

References

1. Mettler H6T, analytical balance used for all weighings.
2. Equation for determination of mercury concentrations in air from "Calibration Procedures for Mercury Vapor Detectors," by Paul Roper, U. S. Department of Health, Education, and Welfare, Public Health Service (NIOSH), June, 1972.

Table 1

Weight Change mg of Mercury/g of Sample

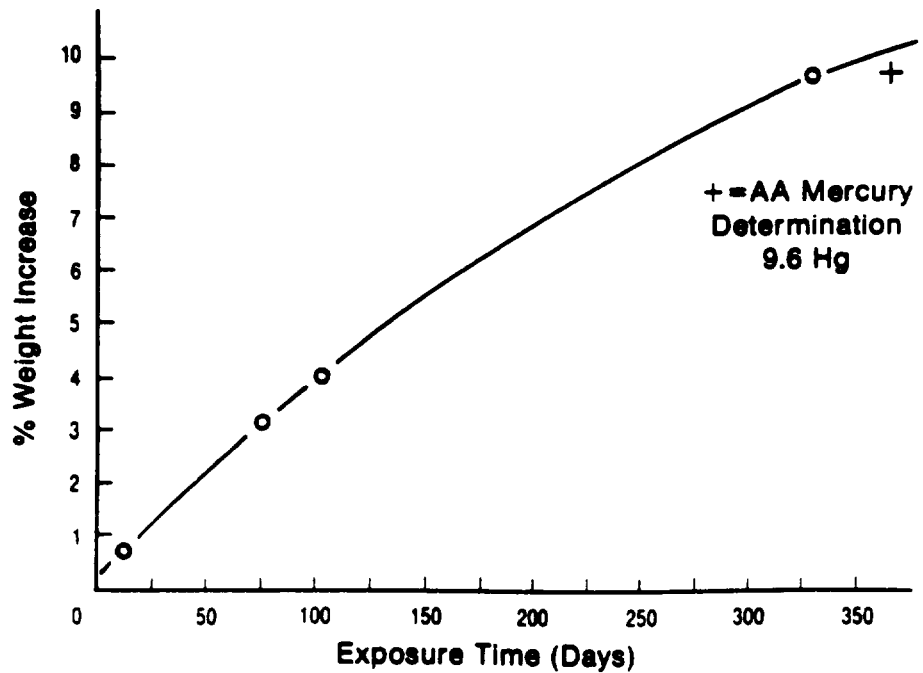
Sand
Sulfur
RESISORB
HgX
Activated Carbon

Control	Hg Vapor (Test Vessel)
0.04	0.09
0.09	-0.17*
0.26	16.24
0.56	0.45
-0.52*	0.32

*These small weight losses were attributed to loss of moisture over the test period.

Figure 1

**% Weight Increase of RESISORB®
on Exposure to Mercury Vapor**



[REDACTED]

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List of Hazardous Chemicals
for which J. T. Baker Spill Control Products
can be used!

Hazardous Chemicals

CINNASORB/MERCURY Spill Kit

Mercury, Triple Distilled

NEUTRASOL LOW Na⁺

Acetic Acid
Formic Acid
Hydriodic Acid
Hydrobromic Acid
Hydrochloric Acid
Hydrofluoric Acid
Nitric Acid
Phosphoric Acid
Sulfuric Acid

NEUTRASORB/Acid Spill Kit

Acrylic Acid
3-Bromopropionic Acid
Butyric Acid
Iso-Butyric Acid
Deuterium Bromide
Deuterium Iodide
Fluoboric Acid
Fluosulfonic Acid
Formic Acid
Hydriodic Acid
Hydrobromic Acid
Hydrochloric Acid
Iodoacetic Acid
Nitric Acid
Perchloric Acid
Periodic Acid
Phosphoric Acid
Propionic Acid
Pyruvic Acid
Sulfuric Acid
Sulfurous Acid
Thioacetic Acid

NEUTRACIT-2/Caustic Spill Kit

Ammonia Solution, Strong
Ammonium Hydroxide
Potassium Hydroxide
Sodium Hydroxide

SOLUSORB/Flammable Solvent Spill Kit

Acetaldehyde
Acetone, Anhydrous
Acetone-d₆

Acetone-Alcohol Mixture (1:1 v/v)

Acetonitrile
Acetonitrile-d₃
Acetophenone
Acrylonitrile
Alcohol, Anhydrous, Reagent
Allyl Acetate
Allyl Alcohol
Allylbenzene
Allyl Sulfide
Amyl Acetate (Mixed Isomers)
Amyl Alcohol (Mixed Isomers)
iso-Amyl Alcohol
tert-Amyl Alcohol
Anisole
Aromatic Elixir
Benzaldehyde
Benzene
Benzene-d₆
Benzoin Tincture, Compound
Benzyl Alcohol
Bis(2-chloroethyl) Ether
N,N-Bis(trimethylsilyl)acetamide
Bromine
mono-Bromobenzene
1-Bromobutane
2-Bromobutane
1-Bromo-3-chloropropane
Bromocyclopentane
1-Bromo-2-fluorobenzene
1-Bromoheptane
1-Bromohexane
1-Bromo-3-methylbutane
1-Bromo-2-methylpropane
2-Bromo-2-methylpropane
1-Bromopentane
1-Bromopropane
2-Bromopropane
2-Bromopropene
3-Bromopropene
2-Bromothiophene
2,3-Butanedione
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tert-Butyl Alcohol
Butylamine
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sec-Butylamine
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sec-Butylbenzene
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Butyl Butyrate
Butyl Chloroformate
Butylcyclohexane
Butyl Ether
Butyl Formate
tert-Butyl Hypochlorite
Butyl Vinyl Ether
Butyraldehyde
Butyronitrile
Carbon Tetrabromide
Carbon Tetrachloride
Chloroacetonitrile
Chlorobenzene
Chlorobenzene-d₅
1-Chlorobutane
2-Chlorobutane
4-Chloro- 1-butanol
2-Chloroethanol, Anhydrous
2-Chloroethyl Vinyl Ether
Chloroform
Chloroform-d₁
2-Chloro-2-methylbutane
1-Chloro-2-methylpropane
2-Chloro-2-methylpropane
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2-Chloropropane
2-Chloropropionyl Chloride
3-Chloro- 1-propyne
o-Chlorotoluene
p-Chlorotoluene
Chlorotrimethylsilane
Collodion
Collodion, Flexible
Crotonaldehyde
Crystal Violet, 0.143% w/v Solution
in Alcohol Anhydrous, Stabilized
Crystal Violet, Hucker Formula
Cumene
1,3-Cyclohexadiene
1,4-Cyclohexadiene
Cyclohexane
Cyclohexane-d₁₂
Cyclohexanone
Cyclohexene

Cyclohexylamine
1,5-Cyclooctadiene
1,3,5,7-Cyclooctatetraene
Cyclooctene
Cyclopentanol
Cyclopentanone
Cyclopropylamine
p-Cymene
Decahydronaphthalene
(cis-trans mixture)
cis-Decahydronaphthalene
Decane
Diallylamine
Dibutylamine
o-Dichlorobenzene
m-Dichlorobenzene
Dichlorodimethylsilane
1,2-Dichloroethane
trans- 1,2-Dichloroethylene
Dichloromethyl Methyl Ether
Dicyclopentadiene
1,2-Diethoxyethane
1,1-Diethoxytrimethylamine
2-(Diethylamino)ethanol
1-(Diethylamino)-2-propanol
m-Diethylbenzene
Diethyl Carbonate
N,N'-Diethylethylenediamine
Diethyl Ketone
N,N-Diethyl- 1-propynylamine
N,N-Diethyl-
1, 1, 1-trimethylsilylamine
3,4-Dihydro-2H-pyran
1,2-Dimethoxyethane
2,2-Dimethoxypropane
2-(Dimethylamino)ethanol
3-(Dimethylamino)-1-propanol
2,3-Dimethyl-1,3-butadiene
3,3-Dimethyl-2-butanol
2,3-Dimethyl-2-butene
Dimethyl Carbonate
1,1-Dimethylcyclohexane
N,N-Dimethylethylenediamine
Dimethylformamide
N,N-Dimethylformamide
Dimethylacetal
2,5-Dimethylfuran
2,6-Dimethyl-4-heptanone
2,4-Dimethylpentane
1,4-Dimethylpiperazine
2,4-Lutidine
p-Dioxane

Di-iso-propylamine
 Dodecane
 1-Dodecanol
 Epichlorohydrin
 1,2-Ethanedithiol
 Ethanethiol
 Ethanol-d₃, Anhydrous
 Ether, Anhydrous
 Ether, For Anesthesia
 2-Ethoxyethanol
 2-Ethoxyethyl Acetate
 Ethyl Acetate
 Ethyl Acetate-d₈
 Ethyl Acetoacetate
 Ethyl Acrylate
 Ethylbenzene
 Ethyl 2-Bromo-2-methylpropionate
 Ethyl 3-Bromopropionate
 Ethyl Butyrate
 Ethyl iso-Butyrate
 Ethyl Chloroformate
 Ethyl Crotonate
 Ethylene Dichloride
 Ethylene Glycol Monomethyl Ether
 Ethyl Isocyanate
 Ethyl Lactate
 Ethyl Methacrylate, Monomer
 2-Ethyl-2-methyl-1,3-dioxolane
 Ethyl Methyl Sulfide
 Ethyl Propionate
 3-Ethylpyridine
 Ethyl Vinyl Ether
 Ethynylbenzene
 Fluorobenzene
 o-Fluorotoluene
 Furan
 2-Furanmethanethiol
 Furfural
 Giemsa Blood Staining Solution,
 Stock
 Heptane
 4-Heptanol
 2-Heptanone
 Hexadecyltrimethylammonium
 Hydroxide, Titrant
 Hexadecyltrimethylammonium
 Hydroxide, 0.5 M in water
 cis, trans-2,4-Hexadiene
 Hexafluoro-2-propanol
 1,1,1,3,3,3-Hexamethyldisilazane
 Hexamethyldisiloxane
 Hexanol

Hexane
 1-Hexanethiol
 2-Hexanone
 3-Hexanone
 trans-3-Hexene
 Hexylamine
 Hyamine Hydroxide, 1 M in Methanol
 3-Hydroxy-2-butanone
 4-Hydroxy-4-methyl-2-pentanone
 Indene
 1-Iodobutane
 2-Iodo-2-methylpropane
 1-Iodooctane
 3-Iodopropene
 Isobutyl Alcohol
 Isonicotinaldehyde
 Isophorone
 Isopropyl Alcohol
 Karl Fischer Reagent
 Kerosene, (Deodorized)
 LSC Cocktails
 AQUALYTE
 AQUALYTE PLUS
 BETACOUNT
 CARBO-TRAP
¹⁴C-FLUOR
 DYNACOUNT
 DYNAGEL
 DYNAGEL SBS
 HYDROCOUNT
 LIPOFLUOR
 MAXIFLUOR
 Tissue Solubilizer QT
 Uni/verse
 2,6-Lutidine
 3,5-Lutidine
 Mesitylene
 Mesityl Oxide
 Methanol, Absolute
 Methanol-d₄
 2-Methoxyethanol
 1-Methoxy-2-propanol
 Methyl Bromoacetate
 3-Methyl-2-butanone
 Methyl iso-Butyl Ketone
 2-Methyl-3-butyn-2-ol
 Methyl Butyrate
 Methyl Chloroformate
 Methylcyclohexane
 3-Methylcyclohexanone
 4-Methylcyclohexanone

anol

3-Methylcyclohexene
Methyl Decanoate
Methyl Disulfide
1,2-Methylenedioxybenzene
Methyl Ethyl Ketone
Methyl Hexanoate
Methylhydrazine
Methyl Isocyanate
Methyl Methacrylate
4-Methylmorpholine
4-Methyl-1-pentanol
4-Methyl-2-pentanol
2-Methyl-2-propanethiol
Methyl Sulfide
Morpholine
Nitroethane
Nitromethane
1-Nitropropane
2-Nitropropane
Nonane
1-Nonanol
2,5-Norbornadiene
Octanal
Octane
1-Octene
trans-4-Octene
Paraldehyde (C-IV)
Pentane
2,4-Pentanedione
3-Pentanol
2-Pentanone
1-Pentene
2-Pentene
1-Penten-3-one
Pentyl Acetate
Iso-Pentyl Acetate
Pentylamine
Iso-Pentyl Nitrite
Petroleum Ether
Phenetole
Phenyl Isocyanate
Picolinaldehyde
2-Picoline
1-2-Pinene
Piperidine
1,2-Propanediamine
1-3-Propanedithiol

1-Propanol
2-Propanol
iso-Propenyl Acetate
Propionaldehyde
Propionitrile
Proprietary Solvent, Anhydrous
Propyl Acetate
iso-Propyl Acetate
iso-Propylamine
Propyl Ether
iso-Propyl Ether
Pyridine
Pyrimidine
Pyrrole
ReAquant Solvent
ReAquant Titant
Sodium Biphenyl Reagent
Sodium Methoxide Titant
Styrene
Tetraethyl Orthosilicate
Tetrahydrofuran
Tetrahydropyran
Tetramethyl Orthosilicate
N,N,N',N'-
Tetramethylethylenediamine
2,2,6,6-Tetramethylpiperidine
Tetramethylsilane
Thiophene
Toluene
m-Tolunitrile
Triethylamine
Triethyl Orthoacetate
Triethyl Orthoformate
Triethyl Orthopropionate
Triethyl Phosphite
2,2,2-Trifluoroethanol
1,1,1-Trifluoro-2,4-pentanedione
1,2,4-Trimethylbenzene
Trimethyl Borate
Trimethyl Orthoformate
2,2,4-Trimethylpentane
Trimethyl Phosphite
2,4,6-Trimethylpyridine
VITRIDE Reducing Agent
Wright's Blood Staining Solution
Wright-Giemsa Staining Solution
Xylenes

We believe this information is, to the best of our knowledge, correct and reliable but is not guaranteed to be so. We do not assume responsibility connected with the use of this information.

GLOSSARY

CINNASORB™ Elemental Mercury Absorbent Activator — Component of the Mercury Spill Cleanup Kit, a chemical used in conjunction with CINNASORB Base for the absorption of elemental mercury.

CINNASORB™ Elemental Mercury Absorbent Base — Component of the Mercury Spill Cleanup Kit, a chemical used in conjunction with CINNASORB Activator for the absorption of elemental mercury.

MERCURY SPONGE — A specially treated pad which, when activated, may be used to cleanup metallic mercury.

MERCURY INDICATOR — A dry powder for the detection of mercury metal and its vapors. It is effective on vertical and horizontal surfaces.

NEUTRASOL 'Low Na' — A liquid neutralizer for acids. Its low metal ion content and liquid formulation make it useful in areas where metal ion and particulate contamination are a problem.

NEUTRACIT-2 — A caustic neutralizer for use in the neutralization and cleanup of substances listed in the Caustic Spill Cleanup directions.

NEUTRASORB™ Acid Neutralizer — Component of the Acid Spill Cleanup Kit, a chemical composition for use in the neutralization and cleanup of those acids listed in the Acid Spill Cleanup directions.

RESISORB™ Mercury Vapor Absorbent — Component of the Mercury Spill Cleanup Kit, a chemical composition for the chemical absorption of mercury vapors.

SOLUSORB™ Solvent Adsorbent — Component of the Flammable Solvents Spill Cleanup Kit, a chemical composition for the adsorption of flammable solvents with a vapor pressure less than 100 mm Hg at 20°C.

MYSTAIRE®
FUME ENCLOSURE
MODELS 100, 200, AND 500

CONTENTS

Pg.

2.	Introduction
3.	Installation, MYSTAIRE® Model 100
5.	Installation, MYSTAIRE® Models 200 and 500
5.	General Installation Procedures
6.	Fitting and Removal of Pre-Filters and Main Filters
8.	Operating Instructions
10.	Filter Monitoring
13.	Fume Enclosure Log Sheet
14.	Troubleshooting
16.	TLV List
18.	Maintenance
20	Wiring Diagram

1. INTRODUCTION

Thank you for purchasing a MYSTAIRE® Fume Enclosure. Installed and used correctly, this unit will give you many years of service. Please spend a few minutes reading this manual to insure that you know how to operate it correctly and safely.

There are three models in the MYSTAIRE Fume Enclosure product line. All models are simple to use and easy to install. They all feature a minimum face velocity of 100 linear feet per minute (0.5 m/sec) for standard versions and a choice of filter media for varying applications. It is essential that the correct filter is installed for the application. Refer to sections 9 and 10 of this manual for further information.

MYSTAIRE® Fume Enclosure Model 100 Fitted with two 2.2kg (activated carbon, A/C) filters or other chemisorptive filters for special applications. A HEPA filter may be fitted for fine particulate containment. Airflow-125 cubic feet/minute.

MYSTAIRE® Fume Enclosure Model 200 Fitted with one 14kg (A/C) filter, or special chemisorptive filter or multilayer filter (maximum four layers). The 200 HEPA version is fitted with a carbon filter plus a HEPA filter. Airflow-¹²⁵~~140~~ cubic feet/minute.

MYSTAIRE® Fume Enclosure Model 500 Fitted with two 14kg (A/C) filters, or special chemisorptive filter or multilayer filter (maximum four layers). The 500 HEPA version is fitted with a carbon filter plus a HEPA filter. Airflow-140 cubic feet/minute.

MYSTAIRE Fume Enclosure model 100 is available cart mounted at a fixed height. MYSTAIRE Fume Enclosure models 200 and 500 units are available cart mounted at a fixed height or with variable height.

Note that actual airflow values will depend on the type of filter used.

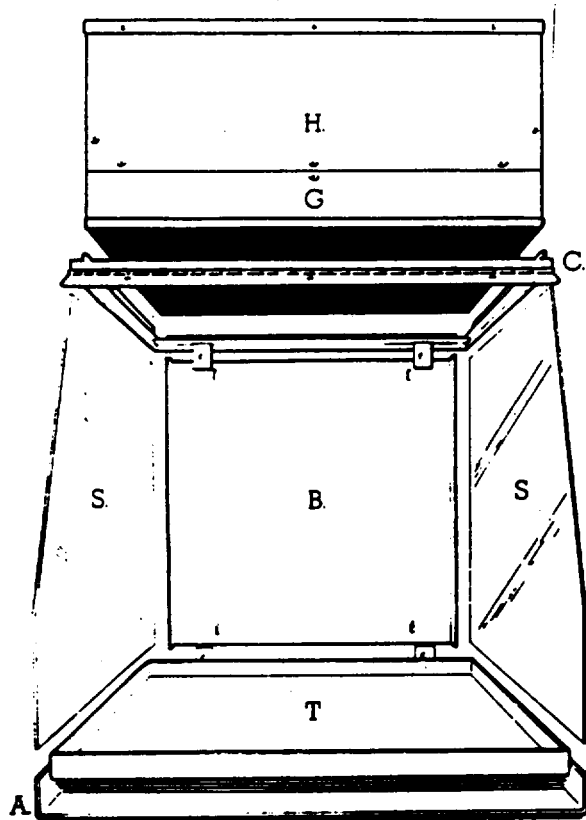
2. INSTALLATION OF MYSTAIRE® Fume Enclosure Model 100

Since printing the Operators Manual, design changes have been made to the MYSTAIRE® Model 100 unit. Please follow these new installation instructions for setting up your MYSTAIRE Fume Enclosure Model 100.

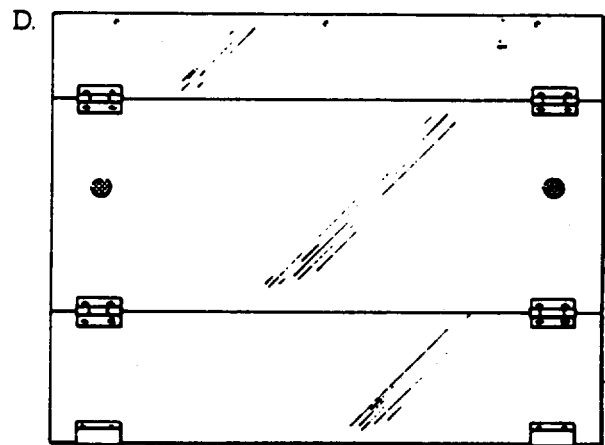
The MYSTAIRE Model 100 base unit is provided flat - packed, and you should assemble the base as follows (refer to detailed illustration overleaf):

1. Attach back panel (B) to base (A) with two nuts and bolts.
2. Slide acrylic side panels (S) into slots on base (A).
3. Attach top frame (C) to back panel (B) with two nuts and bolts.
4. Attach two side cover strips (M) to acrylic sides (S) at front. Fix with self-tapping screws.
5. Put self-tapping screws through rear holes in top frame (C) into side panels (S).
6. Hang door (D) to top frame (C) using door cover strip (E) provided.
7. Fix top section of door (D) to side cover strips (M) using 4mm nuts and bolts. Fit nylon ring (washer) underneath bolt heads. Press on black caps.
8. Place head unit (H) onto frame (C).
9. Slide tray (T) into base unit.
10. Connect plug to cable lead (brown wire to hot, blue wire to neutral, and yellow/green wire to ground). Check that the voltage indicated on the specifications plate is correct for your electrical outlet. If the plug is fused, use a 3 amp fuse.

MYSTAIRE® 100 ILLUSTRATION



HEAD-Unit



BASE-Unit

- A = Base-Panel (steel)
- B = Back-Panel (steel)
- C = Frame (steel)
- D = Folding Door
(Acrylic Glass)
- S = Side-Panels
(Acrylic Glass)
- T = Tray (steel)

3. INSTALLATION OF MYSTAIRES® Fume Enclosure Models 200 and 500

The MYSTAIRES® Fume Enclosure models 200 and 500 base (enclosure) sections are supplied already assembled. Attach the self-adhesive foam tape to the four top sides of the enclosure section to form a seat for the head unit. Place the head unit on top of the enclosure.

Connect plug to power receptacle. Check that the voltage indicated on the rear of the head assembly is correct for your power supply.

Slide the spillage tray into the base of the enclosure section, with the airfoil outwards (where fitted).

4. GENERAL INSTALLATION RECOMMENDATIONS

The following recommendations are made for the installation of fume enclosures.

1. The distance from the working aperture to any circulation space should be at least 39".
2. The distance from the working aperture to a bench top opposite it and used by the same operator should be at least 59".
3. There should be no opposite wall (or other obstruction likely to effect the airflow) within 79" of the working aperture.
4. No fume enclosure should be installed in a position where it is likely to be affected by any other item of equipment.
5. Any room air supply should not be within 118" of the working aperture.
6. No fume enclosure should be positioned with either side closer than 12" from a wall or similar obstruction.
7. No large obstruction (e.g. an architectural column) projecting beyond the plane of the working aperture should be within 12" of the side of the fume enclosure.
8. No doorway should be within 59" of the working aperture or within 39" of the side of a fume enclosure.

5. FITTING AND REMOVAL OF FILTERS

WARNING! - Do not operate the fume enclosure without the appropriate filter block installed in the head unit. Refer to sections 9 and 10 of this manual for further details concerning filter types and usage. Your unit should be supplied with the correct filter for your application, but in case of doubt please call Heat Systems-Ultrasonics, Inc. directly, or contact your local dealer/distributor. Details will be found in section 8 of this manual.

MYSTAIRE Fume Enclosure Model 100 Remove filter cover from head unit (see page 5 of this manual) by turning the center screw 90 degrees (quarter-turn fastener). Tilt the top of the cover slightly away from the head unit, and lift the cover up and out so that the retaining clips at the bottom of the cover clear the lip at the lower edge of the head unit.

Lower filter compartment trays by releasing the two over-center latches on each tray (older units are fitted with quarter-turn fasteners). With the arrows pointing upward, attach pre-filter to bottom front of the filter block using adhesive tape. Before installing the filter, lightly smear the rubber seal with domestic liquid detergent or petroleum jelly. Gently ease the filter into place with light finger pressure.

Failure to observe this precaution can result in damage to the filter seal and consequent leakage. Place filter block (with pre-filter underneath) in the hinged rack, and push forward until slight resistance is detected. Move the filter block fully forward by exerting moderate pressure while moving the filter block from side to side. When fully located, raise and latch the trays, and replace and secure the door. Visually check that the pre-filters are not crumpled.

MYSTAIRE Fume Enclosure Model 200 Remove the front cover by unscrewing the four screws on the front panel. Rotate cam levers counter-clockwise and remove the two filter trays. Add the pre-filter to the smaller tray and reinsert into the head unit. Add the main filter to the large tray with the arrows pointing upward (the foam gasket is on the top of the filter). Reinsert the main filter tray. Rotate the cam levers clockwise to seal the filters to the head unit. Replace the front cover. Note that the front cover cannot be replaced

properly until the cam levers are in the correct position (to the right). Visually check from underneath the head unit that the pre-filters are correctly in position and are not crumpled.

MYSTAIRE® Fume Enclosure Model 500 Remove the front cover by unscrewing the two phillips-head screws at the top of the head unit, and the two phillips-head screws at the bottom of the front cover. Rotate cam levers counter-clockwise and remove both sets of filter trays. Add pre-filters to the smaller trays and reinsert into the head unit. Add the main filters to the large trays with the arrows pointing upwards (the foam gasket is on the top of the filters). Reinsert the main filter trays. Rotate the cam levers clockwise to seal the filters to the head unit. Replace the front cover. Note that the front cover cannot be replaced properly until the cam levers are in the correct position (to the right). Visually check from underneath the head unit that the pre-filters are correctly in position and are not crumpled.

MYSTAIRE® Fume Enclosure Models 200HEPA and 500HEPA The HEPA filter is fitted on the top of the head unit. Remove the screws on the top panel, and remove the panel. Place the HEPA filter on the head unit with the rubber seal facing DOWN, then replace the top panel.

Used filters should be removed wearing plastic gloves. The used filters should be placed in a plastic bag and sealed prior to waste disposal. The used filters do not normally represent a hazard, and can be disposed with normal laboratory waste. If dangerous materials such as asbestos dust or radioactive chemicals have been contained by the filter, then normal precautions taken for the disposal of such materials should be observed.

6. OPERATING INSTRUCTIONS

- A. The fume enclosure may only be operated with the correct filter installed for the application. Refer to sections 9 and 10 of this manual for further information. If in doubt call Heat Systems-Ultrasonics, Inc. directly, or contact your local dealer/distributor.
- B. Monitor the airflow and test for filter saturation on a regular basis. Provide a log card for your fume enclosure, and fix it at some convenient point on or by your unit. See section 7 of this manual for details of a monitoring kit available from Heat Systems-Ultrasonics, Inc. The monitoring procedure is also described in detail in section 7.
- C. The face velocity at the working aperture (and therefore containment of fumes) is at a maximum with the front lower flap in the closed position. The unit should be used in the closed position whenever practical, particularly with highly toxic fumes.
- D. A Bunsen burner or other heat source should not be placed closer than 6" (150 mm) from the side or back panels. Open flames or heat sources should not be positioned closer than 12" (300 mm) from the bottom of the filter bed.
- E. Fiber reinforced plastic (FRP) tray and head units have a chemically resistant gel coat; however, spilled chemicals should be removed from the surface as soon as possible.
- F. Note that filterblocks have little effect on carbon monoxide or hydrogen. However small quantities (such as used in schools) will not present a hazard because of the large dilution factor from the air-flow through the fume enclosure.

- G. MYSTAIRES® Fume Enclosures are designed to handle fumes and vapors given off during normal laboratory procedures. These will be at the ppm level in the airstream entering the filterblock, equivalent to about 3 ml of solvent per minute in MYSTAIRES Fume Enclosure Models 100 and 200 units, and about 6 ml per minute in MYSTAIRES® Fume Enclosure Model 500 units. Large quantities of solvents or acids should not be regularly boiled off in the fume enclosure.
- H. Always keep a spare set of filters available
- I. High concentrations of fumes entering the filterblock may temporarily reduce the filtration efficiency. For this reason, any major spillage within the fume enclosure should be handled as if it had occurred on an open laboratory bench, that is:
1. Immediately increase room ventilation.
 2. Immediately remove spillage.
- J. Following a major spillage, the main filters must be changed, as the heat of reaction due to wetting may reduce filter efficiency. After stabilization, the old filter can normally be re-used, provided saturation has not been reached.
- K. Some MYSTAIRES® Fume Enclosure units are fitted with a two-speed fan. It should be noted that face velocity and therefore containment will be reduced when using the lower fan speed. High fan speeds should normally be used except for special applications or when using low toxicity chemicals.

7. MONITORING MYSTAIRE® FUME ENCLOSURES

1. Why is monitoring necessary?

The purpose of monitoring is to detect when the filters above the fume enclosure have become saturated and cease to filter effectively. It is necessary to carry out a simple procedure to test the filters.

2. Is smell an indication of filter saturation?

If smell seems excessive, it is sensible to monitor the fume enclosure. However, it must be remembered that the sense of smell is very sensitive for some chemicals (e.g.: ammonia or hydrogen sulfide) and a slight smell does not mean that the levels have approached the maximum acceptable concentration.

3. How often should monitoring be carried out?

This depends on the level of use. For intermittent use and schools use, once every three months should be sufficient. If the fume enclosure is used regularly every day, then more frequent monitoring is advised.

4. Monitoring procedure

The monitoring procedure is described on the following pages. A monitoring kit should be purchased from Heat Systems-Ultrasonics, Inc. The MULTIPLE-S filterblock should be tested by monitoring for the breakthrough of two chemicals, trichloroethylene and sulfur dioxide, after challenging the filters with these substances.

5. Airflow measurements

Reduced airflow indicates pre-filter blockage. The pre-filters will normally need to be changed more frequently than the main filters. A blocked HEPA filter (where fitted) is also indicated by reduced airflow which is not restored after a pre-filter change.

ELECTRONIC LOW AIRFLOW ALARM

INTRODUCTION

The MYSTAIRE® Fume Enclosure Electronic Low Airflow Alarm consists of a red warning light located on the front switch panel next to the ON/OFF switch, and a pair of precision differential pressure switches located in an enclosure in the head unit.

The purpose of the alarm is to warn the operator that the pre-filters are clogged with dust, thus reducing the airflow through the fume hood. The unit is factory calibrated so that the red warning light will come on if the airflow through the working aperture (lower door closed) is reduced to about 90 LFM. The indicator will also show if the fan fails. This does NOT indicate main filter saturation. An option (MYSTAIRE part no. FE-140) is available for this purpose.

OPERATION

If your MYSTAIRE unit has a two speed fan, select high speed. Switch on the unit at the main switch on the front panel. The red indicator lamp will come on for 1-5 seconds, and should then go out and stay out. This indicates correct operation of the unit.

If the red indicator lamp comes on initially and stays on, the fan is not operating. On units fitted with two speed fans, it should be noted that the red indicator light will come on and stay on as long as slow speed is selected.

If the red indicator lamp comes on initially and stays on for 1-5 seconds, then goes out, then comes on again and remains on, the pre-filter is blocked with dust and must be replaced.

If the red indicator lamp does NOT come on initially, there is a fault in the indicator circuit.

Instructions on replacing filters are given in Section 6 of the Operator's Manual.

NOTES FOR USERS OF MODELS FE-200H AND FE-500H ONLY

If the red indicator light comes on initially and remains on, this may indicate blockage of the exhaust HEPA filter, or a possible fan failure.

The HEPA filter should be changed once a year.

After replacing a HEPA filter, a particle count test should be performed on the exhaust air before returning the unit to routine use.

PRESSURE SWITCH CALIBRATION PROCEDURE

Introduction

The Low Airflow Alarm, fitted as standard to all current production filtration fume enclosures, operates using two differential pressure switches. These pressure switches detect a "no vacuum" situation caused by a fan failure incorrectly sealed filter, and a "high vacuum" situation caused by a blocked pre-filter. The pressure switches are carefully calibrated before leaving our factory and, in the majority of cases, no further calibration will be required.

The factory calibration is carried out using a standard A/C filter 110 volts 60 Hz main supply. A standard Filtrete pre-filter is used. If the end-user is known (e.g. a school) then the calibration will be performed using the correct main filter in place (e.g a Multiple-S filter)

In some cases it may be necessary to recalibrate the pressure switches in customer's laboratory if the test procedure described in the Operator's Manual fail. The main reasons for test failure are:

1. A severe knock during transport.
2. A change in the voltage or frequency.
3. Use of a different main filter from that used during factory calibration.

Calibration

WARNING! CALIBRATION OF THE PRESSURE SWITCHES INVOLVES REMOVING THE COVER OF THE ELECTRONIC ENCLOSURE, EXPOSING ELECTRICAL CONTACTS AT POWER SOURCE. THE PRESSURE SWITCHES ARE ALSO ELECTRICALLY OPERATED. THE ADJUSTMENT MUST ONLY BE MADE BY A SUITABLY COMPETENT PERSON, SUCH AS AN ELECTRICIAN OR INSTRUMENT TECHNICIAN.

The pressure switches are located in the following places:

- FE100 Behind a removable plate at the rear of the head unit.
- FE200 In the electronic enclosure at the rear of the head unit.
- FE500 In the electronic enclosure at the top of the head unit.
- CONDOR In the electronic enclosure at the bottom front of the filter box. The switches are labelled A and B.

The filtration fume enclosure should be fitted with main filter(s) and new Filtrete pre-filters(s) (1 or 2 depending on the model). Switch on, and select HIGH speed on those units fitted with a two speed fan.

1. Unscrew (counterclockwise) switches A and B by 2 turns. The red warning light should be off.
2. Screw in (clockwise) switch B until the red warning light JUST comes on. It will flicker.
3. Unscrew switch B by 15 degrees (half an hour on the hour hand of the clock) so the red warning light goes out.
4. Switch the unit off, and wrap the pre-filter(s) in plastic bag(s) and replace flat in the unit. Switch on.
5. Screw in switch A until the red warning light comes on. It should flicker strongly, more on than off, but not be on continuously. Take care with this adjustment.
6. Switch off and remove the plastic bags. The calibration is complete.

It should be noted that the alarm is not an ON/OFF device, but start to flicker as the pre-filter progressively blocks with dust.

MONITORING PROCEDURE

The Heat Systems-Ultrasonics, Inc. Monitoring Kit Consist of:

1. A flap anemometer
2. A log sheet with instructions for use
3. A Gastec sampling pump
4. Two packs of ten Gastec sampling tubes each, normally trichlorethylene and sulfur dioxide unless specified

The kit is suitable for testing fume enclosures fitted with A/C filters, ACI filters or multiple filters containing these filter materials including MULTIPLE-S (schools) filterblocks. Contact Heat Systems-Ultrasonics, Inc. for advice on monitoring other filterblocks. To use the kit, proceed as follows:

A. Pre-filter check

1. With the unit switched off, place the anemometer in the center of the aperture, with the lower door down. Check that the anemometer is level and the flap is correctly positioned.
2. Switch the unit on and read the airflow on the anemometer scale.
3. Repeat the measurement to the left and right of the center position.
4. Average the three results, and enter on log sheet.
5. Change the pre-filters if the airflow is less than about 80 FPM (0.4 m/sec) (red section of the anemometer).

B. Main filter check

1. Select a suitable test chemical and matching Gastec sampling tube. For MULTIPLE-S filterblocks, both trichloroethylene and sulfur dioxide should be used. Other laboratories may use toluene or xylene or any suitable chemical in routine use in the fume enclosure, provided it has an A rating (see adsorption index) and a TLV above 20 ppm (see section 11).
2. Place 6 ml of chemical (3 ml for the 100 or 200 units) in a beaker on a hotplate. Adjust the hotplate to boil off the chemical in about two minutes. This gives a concentration of about 100-200 ppm to challenge the filter.

3. For testing ACI filters (acid adsorbing), or multi-filters with acid adsorbing layers (e.g.: schools filter), use sulfur dioxide gas (SO_2) at 2 bubbles per second through water (1 bubble per second with 100 or 200 units).
4. Using the Gastec tube, sample the outlet airstream from the top of the fume enclosure, following the instructions given with the Gastec tube (one pump stroke for trichloroethylene, eight pumpstrokes for sulfur dioxide).
5. The reading should be well below 15 ppm (1 ppm for sulfur dioxide). Enter the result on the log sheet, and change the main filter if these levels are exceeded.
6. Repeat the measurements at three monthly intervals (more often if the enclosure is used frequently), and change the main filter when the level of chemical in the effluent airstream approaches the TIV limit.

MYSTAIRES®
FUME ENCLOSURE LOG SHEET

Model: PRE-FILTER FITTED: ENCLOSURE NO:
 MAIN FILTER FITTED:

PRE-FILTER CHECK

DATE AIRFLOW FILTER
 CHANGE
SIGNED

MAIN FILTER CHECK

TEST CHEMICAL: TLV:
DATE LEVEL FILTER SIGNED
 CHANGE

TEST CHEMICAL: TLV:
DATE LEVEL FILTER SIGNED
 CHANGE

8. TROUBLESHOOTING

WARNING! Before attempting any inspection or replacement of electrical components in the head assembly, always unplug the fume enclosure.

Electrical components are mounted on a plate in an electrical enclosure which is isolated from the airflow through the fume enclosure and is separately vented to room air. Access to the electrical enclosure is gained via a cover plate which is located at the rear of the head assembly on MYSTAIRE® Fume Enclosure Models 100 and 200, and at the top of the head assembly on MYSTAIRE Fume Enclosure Model 500. Wiring diagrams for each model are in section 14 of this manual.

Some possible problems and their causes are shown below:

- A. Unit will not operate, no lights or airflow.
 - 1. Check that the unit is plugged in and switched on.
 - 2. Check fuse in electrical supply or plug (where fitted).
 - 3. Check fuse in head unit (one or two depending on model). The fuse is located in a holder next to the cable inlet.
- B. Unit operates, but one or both lights do not come on.
 - 1. Replace starter lamp in electrical enclosure.
 - 2. Change fluorescent light tube. To gain access to lamp holder proceed as follows:

MYSTAIRE Fume Enclosure Model 100, remove plate from bottom rear of head unit by unscrewing the six fixing screws.

MYSTAIRE Fume Enclosure Model 200, remove two cover plates from bottom rear of head unit. Partly withdraw lamp holder. Unplug electrical connector; and completely remove lamp holder from head unit.

MYSTAIRE Fume Enclosure Model 500, remove three nylon screws from front switch panel and remove panel. Withdraw lamp holder.

3. Fan does not operate, but lights come on.
 - a. Change motor start capacitor in electrical enclosure.
 - b. Motor failure - contact Heat Systems-Ultrasonics, Inc. or your local distributor for advice.
4. Fan operates initially, but then cuts out. Lights remain on. Motors are fitted with a thermal cutout device, which will operate if the motor temperature rise exceeds 95°C. The most likely cause of overheating is a blockage of the airflow, either at the filters or at the exhaust outlet at the top of the unit.

Please feel free to contact Heat Systems-Ultrasonics, Inc. directly in case of difficulty, or contact your local dealer/distributor.

Heat Systems-Ultrasonics, Inc.
1938 New Highway
Farmingdale, NY 11735

Tel No.: 516-694-9555
800-645-9846

Telex No.: 14-3101

10. MAINTENANCE

Regular maintenance will reduce the possibility of hazard to the operator and prolong the life of the fume enclosure.

WARNING! Before attempting any inspection or replacement of electrical components in the head assembly, always unplug the fume enclosure.

MONTHLY MAINTENANCE

Check the face velocity of the fume enclosure as described in section 13 of this manual. Replace the pre-filter if necessary. Ensure the result is entered on the log sheet.

QUARTERLY MAINTENANCE

Check the main filter for saturation as described in section 7 of this manual. Replace the main filter if necessary. If the fume enclosure is used daily or is used to contain large quantities of fumes, then the main filter check should be carried out monthly. Ensure the result is entered on the log sheet.

HALF-YEAR MAINTENANCE

- a. Remove the spillage tray (where fitted) and wash in dilute detergent solution.
- b. Wash the interior surface of the enclosure with dilute detergent solution.
- c. Inspect the enclosure frame and panels for mechanical damage.
- d. Inspect the hinged door for corrosion and correct adjustment of friction hinges (where fitted).
- e. Remove the pre-filter and main filter, and inspect the fan assembly for correct running.

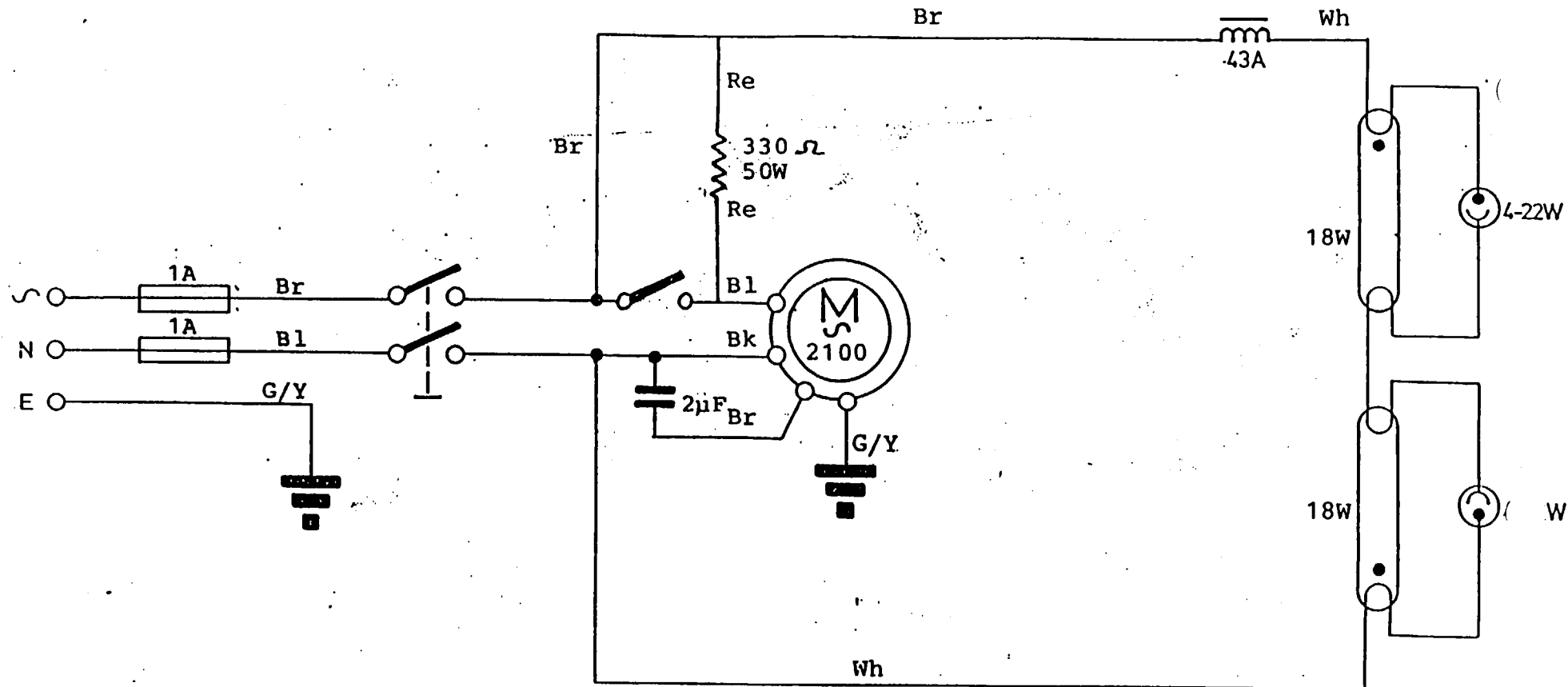
YEARLY MAINTENANCE

Check the condition of services to the enclosure, including water supply, drip cup, and waste drain (where fitted), gas supply tubing (where fitted) and electric cable and plug.

TWO YEAR MAINTENANCE

The electrical grounding and insulation should be inspected by a qualified electrician.

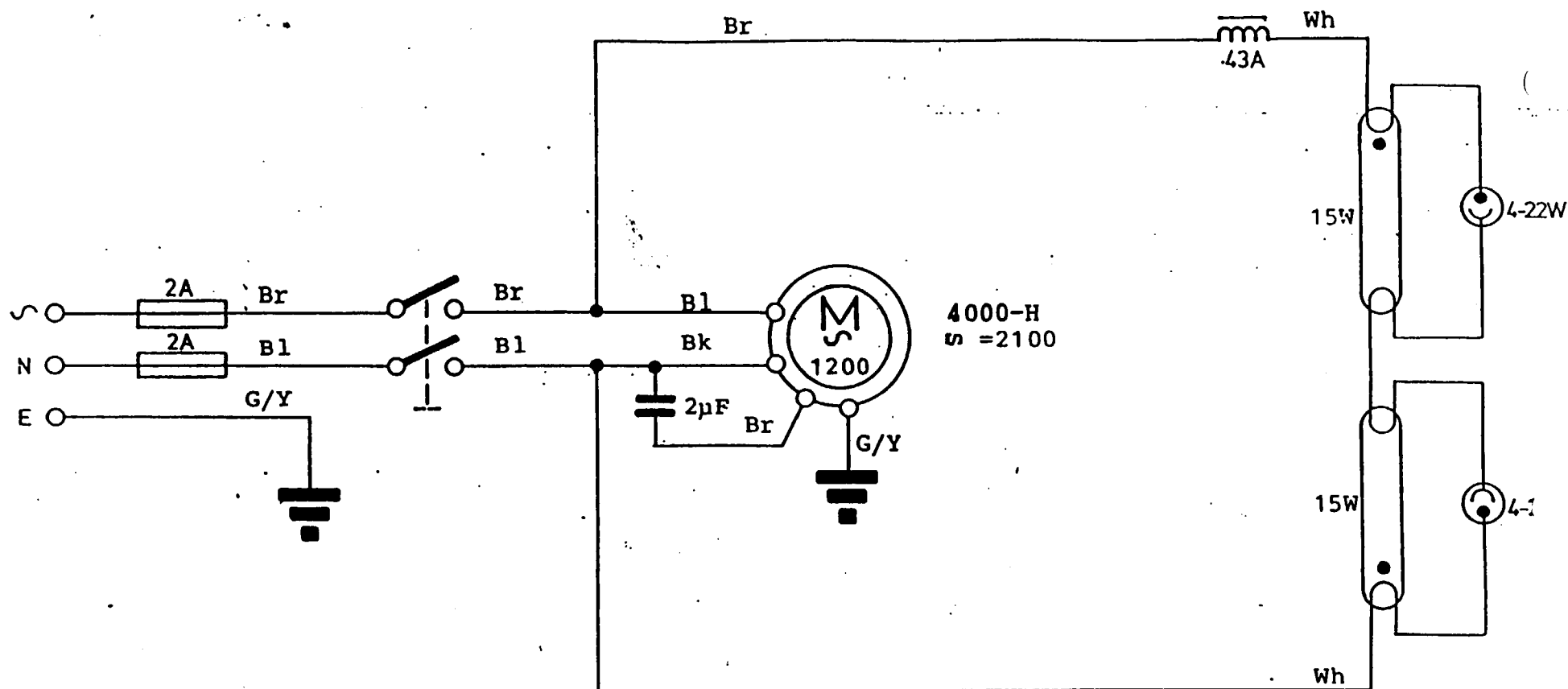
CIRCUIT DIAGRAM MYSTAIRE 100



NOTES

- (1) In some markets the units are fused on the positive line only.
- (2) 110v units include a step-up transformer (110 to 220v) in the lighting circuit.
- (3) Wiring colours: Br = brown, Bl=blue, G/Y=green/yellow, Bk=black, Re=red, Wh=white.

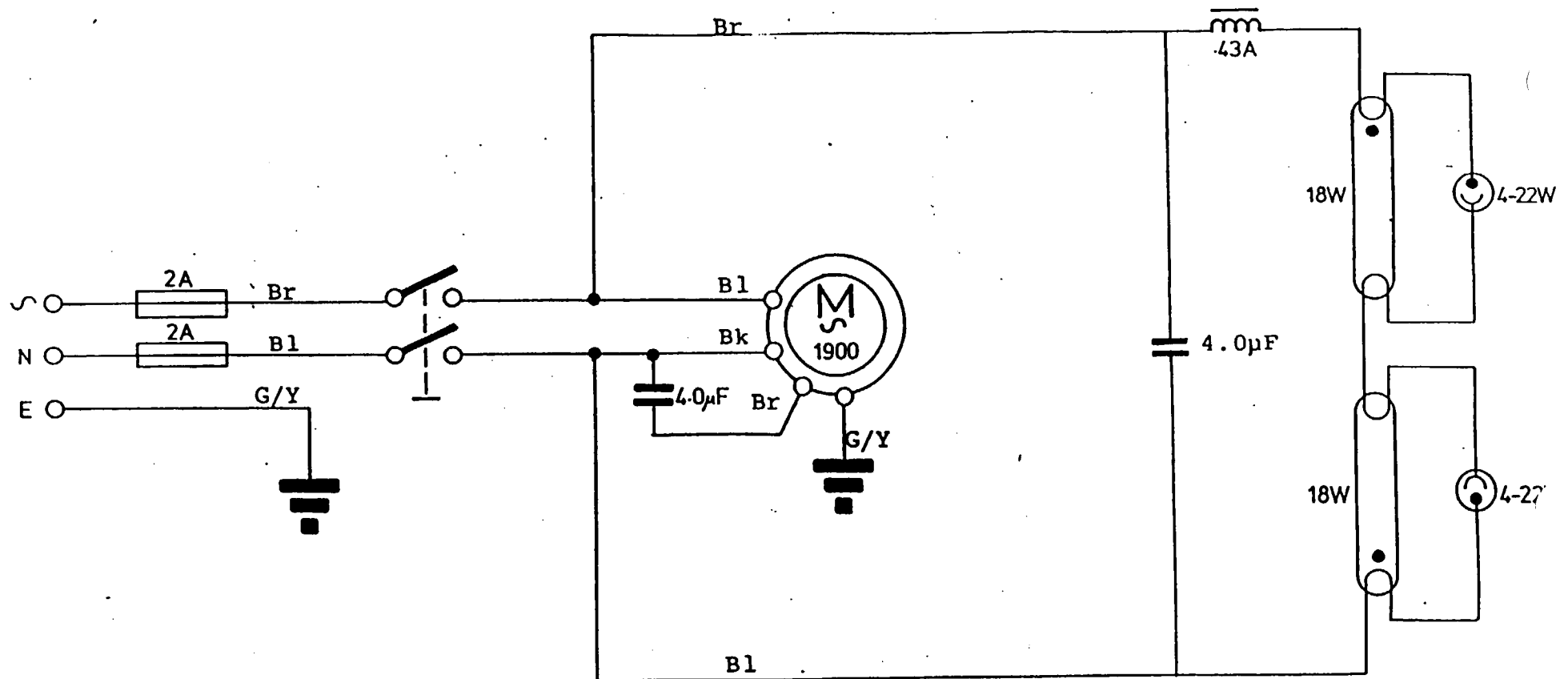
CIRCUIT DIAGRAM ASTECAIR MYSTAIREF 200 & 200H



NOTES

- (1) In some markets the units are fused on the positive line only.
- (2) 110v units include a step-up transformer (110 to 220v) in the lighting circuit.
- (3) Wiring colours: Br=brown, Bl=blue, G/Y=green/yellow, Bk=black, Wh=white.

CIRCUIT DIAGRAM MYSTAIRE 500



NOTES

- (1) In some markets the units are fused on the positive line only.
- (2) 110v units include a step-up transformer in the lighting circuit. (110 to 220v).
- (3) Wiring colours: Br=brown, Bl=blue, G/Y=green/yellow, Bk=black, Wh=white.

ELECTRONIC FILTER SATURATION ALARM OPTION

MYSTAIRES® Part No. FE-140

INTRODUCTION

The MYSTAIRES® Electronic Filter Saturation Alarm is a highly sensitive unit which will continuously check the airflow from your MYSTAIRES Fume Enclosure. It gives a visible and audible alarm in the presence of hydrocarbons. Please read this manual before attempting to operate the unit.

The unit consists of an outer case containing the electronic circuits, and a front panel with a green READY light, a meter, and a red ALARM light (Figure 1). The meter has an arbitrary scale of 1 to 10. At the rear of the unit is the power cord (double fused) and alarm buzzer, a socket containing a gas sensor over which is fitted a sampling tube and connector, and three potentiometers labelled (from top to bottom) ALARM ADJUST, METER ZERO, and GAIN ADJUST.

The gas sensor consists of a ceramic tube onto which is deposited a layer of tin oxide (SnO_2). The ceramic tube is electrically heated to a temperature of about 200°C . At this temperature in the presence of clean air the tin will all be in the form of tin oxide. This has a high electrical resistance, which is measured by an electrical circuit. In the presence of hydrocarbon material in the air, the surface layer of tin oxide is reduced to tin metal, which has a low electrical resistance. The change in resistance activates the meter display and alarm.

This type of gas sensor will respond to all hydrocarbon compounds from formaldehyde (CHO) up, and can be adjusted to detect a few ppm of hydrocarbon in the exhaust air. The sensor is extremely reliable, and, after initial stabilization and calibration, will operate for many years trouble-free. The sensor is located in a tough NYLON case, and is protected by a flameproof double layer of 100 mesh stainless steel gauze.

INSTALLATION

The filter saturation detector is supplied assembled, complete with a gas sensor fitted to the rear of the case (Figure 1) onto which is fixed a sampling tube. There is also a strip of self-adhesive metal clips for holding the sampling tube in place, and a support bar about 240mm long and 50mm deep, which is only required for the Model 500.

The case of the unit is provided with small rubber feet, and the case should be placed on top of the head unit so it is clearly visible to the operator (Figures 2 through 4). In the case of the Model 500 only, the support bar should first be placed across the electrical enclosure cover as shown in the top photograph of Figure 6. The support bar should be located 4" (100mm) from the front of the Model 500, and fixed in place by removing the protective layer from the self-adhesive foam strips on the support bar. It should be noted that the filter saturation alarm unit should be moved back before attempting to remove the front cover of the Model 500.

The air sampling tube must now be fixed in the exhaust outlet of the fume enclosure head unit as shown in Figures 2 through 4. The self-adhesive metal clips should be used to hold the sampling tube firmly in position in the airstream. Under no circumstances may this tube be replaced with another type of tube, nor must the tube be reduced in length from the 18" (440mm) provided. A small metal sampling tube is fitted into the end of the tube, and this should remain in place. In the case of the 500 and Double 500 models, the sampling tube should be placed at the periphery of the exhaust aperture to prevent an excessive airflow in the sampling tube. The power cord wire should be plugged into a switched electrical receptacle.

OPERATION

Following installation, the unit must be calibrated before use. This is a simple procedure, similar to that required for a pH meter, and is described in the CALIBRATION section of this manual.

When the unit is first switched on, the green READY light will indicate a power-on situation. The meter needle will read about 10, as a time delay disables the meter circuit until the sensor has warmed up, which takes about 2 minutes.

After the warm up time, the meter needle will move towards 0. The sensor will respond to changes in temperature, barometric pressure, and relative humidity and a zero reading between 0 and 2 on the meter scale should be regarded as normal.

In the event of hydrocarbon fumes appearing in the exhaust air, the meter needle will move toward the high end of the scale, and at about 6 on the meter scale the red ALARM light will come on and the buzzer will sound. This may be caused by a number of reasons:

1. The filter is saturated and requires replacing.
2. The filter is not located correctly and there is a leak between the filter seal and the head unit.
3. An extremely high concentration of fumes has entered the filter block and temporarily caused a small amount of hydrocarbon to enter the exhaust air (e.g. a spillage).
4. Hydrogen or carbon monoxide has been released. The sensor will respond to these compounds, which are not removed by the normal activated carbon filters used.
5. A very large amount of water vapor has been released. However, this will not normally cause a problem.

The sensitivity of the unit does vary according to the chemical vapor present and higher boiling point, highly halogenated hydrocarbons such as trichloroethylene will give a smaller response than very volatile, fully saturated hydrocarbons such as xylene. However, almost all hydrocarbons will cause an alarm at a few ppm concentration.

It should be noted that the unit may take several minutes to respond to the presence of hydrocarbons. Following an alarm, the unit will take about 1 hour to return to normal, and the meter needle will return to zero in an exponential fashion.

The alarm may be tested at any time by removing the front cover of the fume enclosure head unit and releasing the filter from its sealed position in the head unit. If the front cover is now replaced, and a cloth soaked in solvent is held at the fume enclosure aperture, the alarm will go off. Don't forget to replace the filter correctly after this test, and remember the meter display will take about 1 hour to return completely to zero.

CALIBRATION

If your filter saturation alarm is brand new, it should be left on for two working days before attempting a calibration. This will allow the gas sensor to stabilize. If the alarm is sounding and you wish to silence it, unscrew (counterclockwise) the ALARM ADJUST potentiometer with a small screwdriver until the alarm stops.

The alarm must be calibrated before use. The calibration must only be performed with new or correctly working filters in place, and there must be no chemical fumes present in the fume enclosure.

1. Allow the alarm unit and fume enclosure to warm up for 1 hour.
2. Unscrew (counterclockwise) all three potentiometers (ALARM ADJUST, METER ZERO, GAIN ADJUST) on the rear of the unit using a small screwdriver. The potentiometers have 20 full turns end-to-end, and a slip clutch operates when the potentiometer reaches the end of its travel.
3. Screw in (clockwise) the GAIN ADJUST potentiometer until the meter reads 9 on the scale.
4. Screw in (clockwise) the METER ZERO potentiometer until the meter reads just above 0 (0.5) on the scale.
5. Remove the front cover of the fume enclosure, and release the filter from its sealed position in the head unit. On models fitted with two filters, only one should be released. Replace the front cover.
- 6) Hold a cloth towel soaked in solvent in the aperture of the fume enclosure. As the meter needle moves up the scale, screw in (clockwise) the ALARM ADJUST potentiometer so that the alarm goes on at 6 on the meter scale. By removing and replacing the solvent soaked cloth, the meter needle can be maintained around 6 on the scale while making the adjustment.
- 7) Re-seal the filter in the head unit.

The filter saturation alarm is now correctly calibrated, and will respond to most hydrocarbons at the ppm level. Remember, the meter needle will take about 1 hour to return completely to zero. If you are using solvents with a high TLV value such as alcohols and wish to set the unit to be less sensitive, set the GAIN ADJUST to 2 (instead of 9) on the meter scale at step 3.

The gas sensor used in the alarm unit takes about four weeks to stabilize completely. It will thus be necessary to REPEAT THE CALIBRATION PROCEDURE AFTER FOUR WEEKS of use. After this second calibration, the unit will remain stable for a very long period of time.

The unit will have to be recalibrated if it is moved to another fume enclosure or if the sampling tube is moved in the exhaust air stream. The correct functioning of the alarm should be tested from time to time as described in the OPERATION section of the manual.

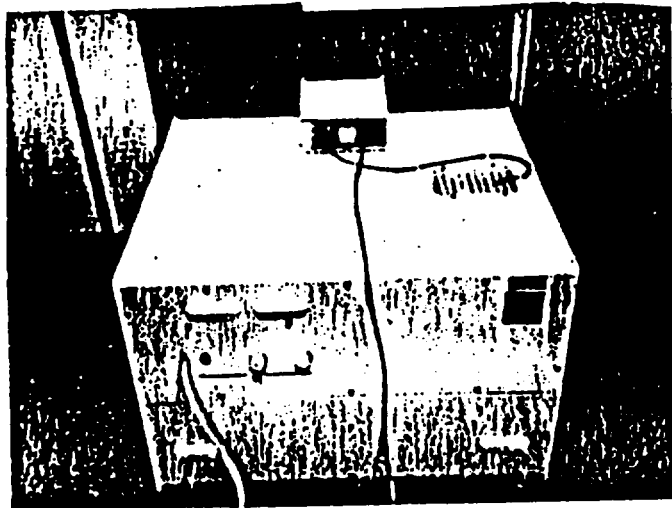


FIGURE 1

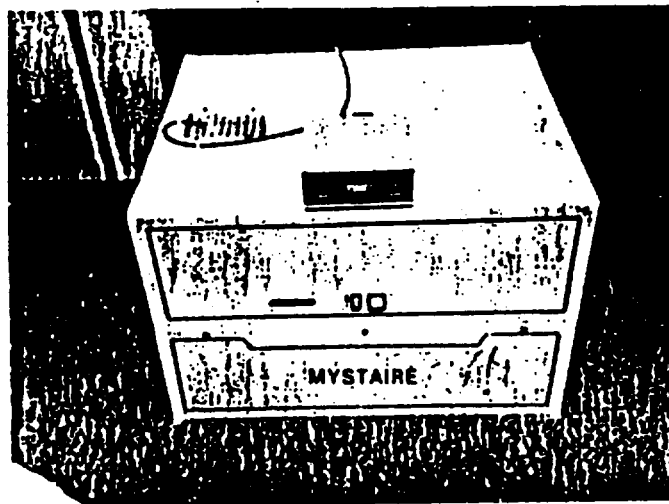


FIGURE 2

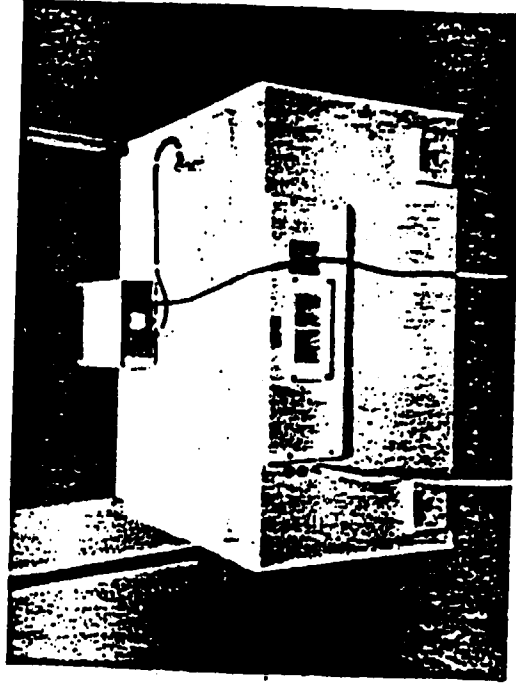
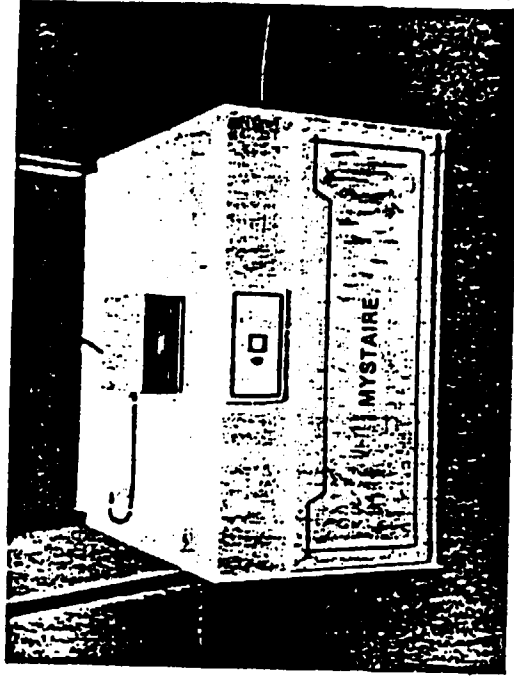


FIGURE 3

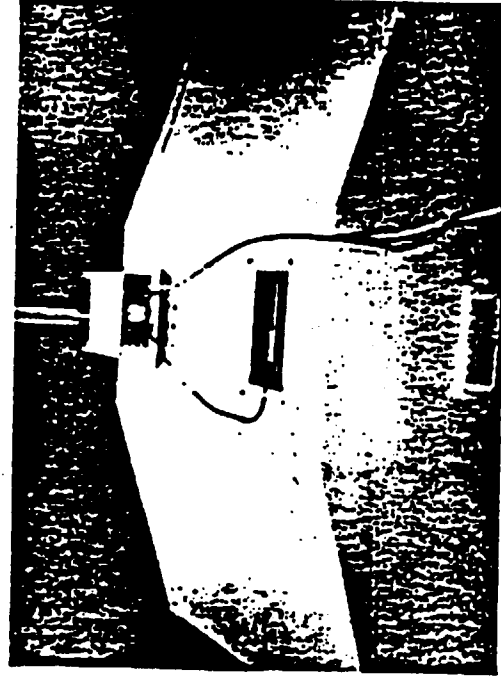
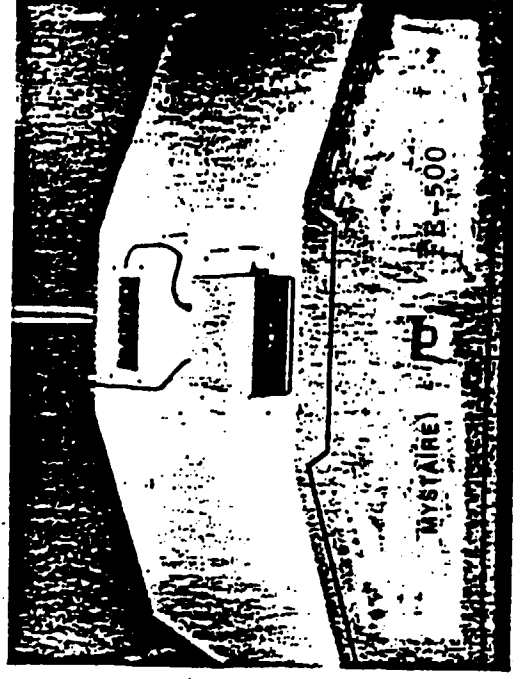
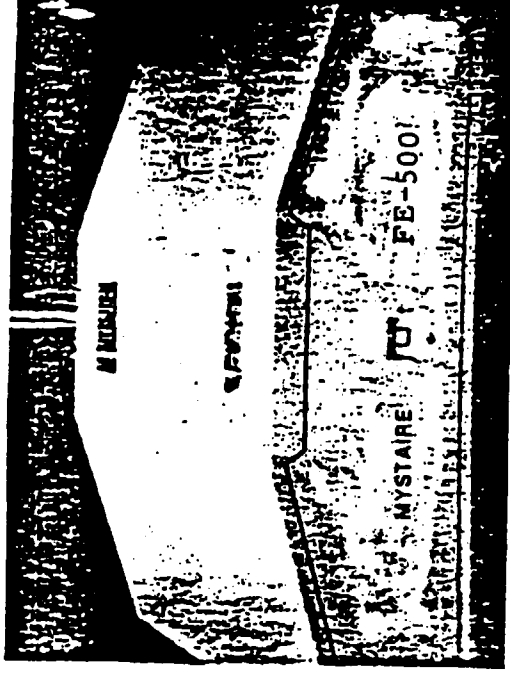
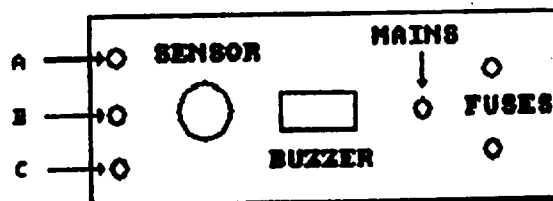
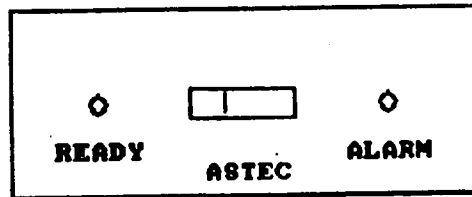


FIGURE 4



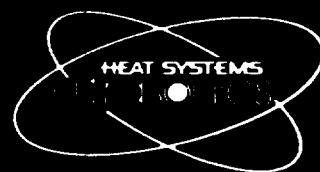
A = ALARM ADJUST
 B = METER ZERO
 C = GAIN ADJUST

FIGURE 1

Mystaire[®]

Fume Enclosures Air Purifiers

Portable,
ductless,
contaminant
enclosures and
air purifiers
with a selection
of adsorption
filters that
eliminate
hazardous
fumes and
odors.



Make your laboratory a safer place to breathe

MYSTAIRES® Fume Enclosures are designed for use in clinical, biomedical, research, industrial, and academic laboratories to replace or supplement the familiar laboratory fume hood. For more than a century, laboratories have been venting noxious and toxic gases, vapors, and particulates through built-in fume hoods ducted to the atmosphere. Now, with escalating heating and construction costs, and today's rapidly changing laboratory needs, the standard fixed laboratory hood is an inefficient compromise at best. When these factors are coupled with the more stringent OSHA and EPA air quality regulations, the need for a viable alternative is immediately evident.

An Unfulfilled Need — Until Now

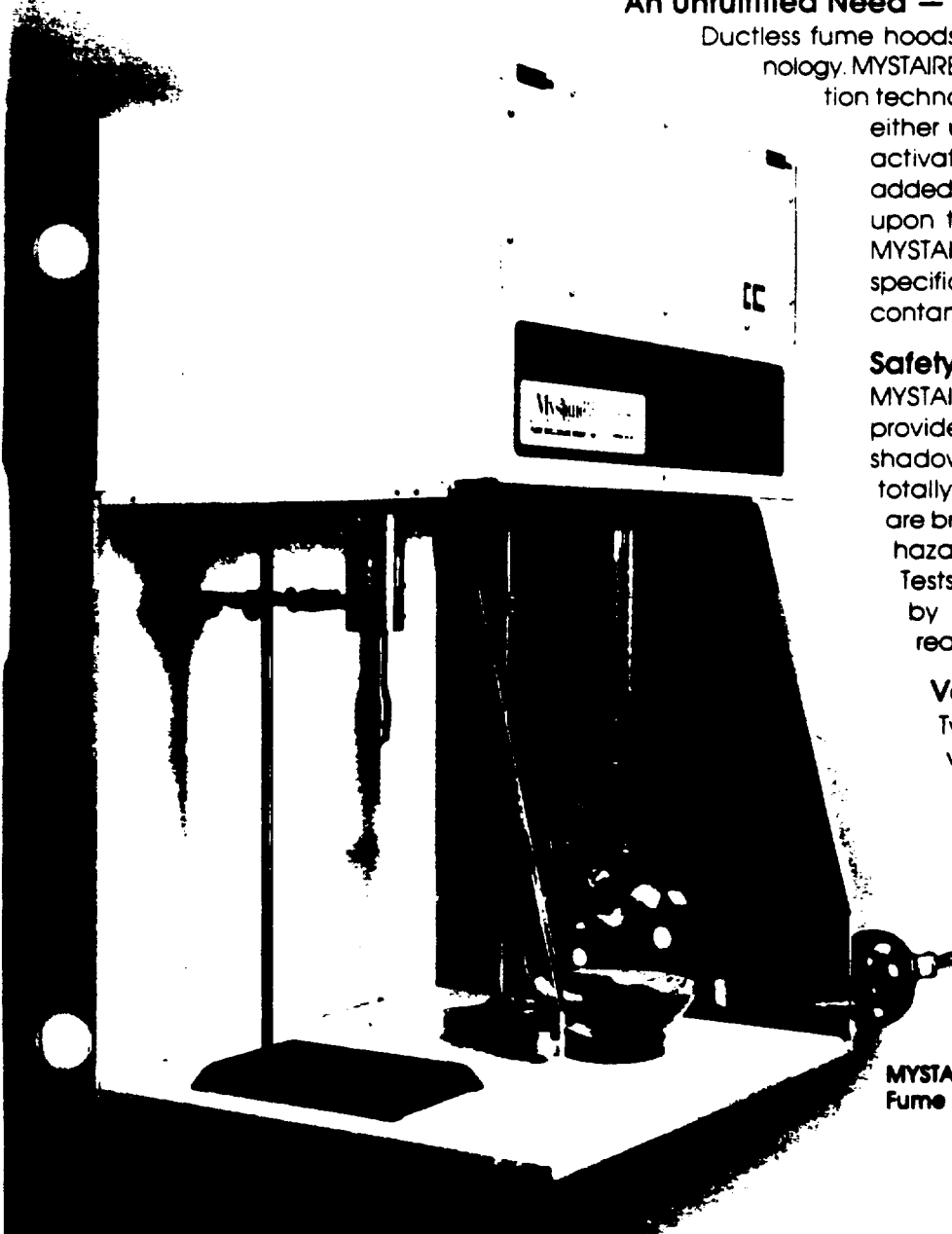
Ductless fume hoods have relied largely on carbon filter technology. MYSTAIRES Fume Enclosures use state-of-the-art adsorption technology that combines a particulate filter with either unique color-coded chemisorbent filters or activated charcoal. A final carbon cloth filter is added as a polishing stage. Filter selection depends upon the class of contaminant to be removed. MYSTAIRES Fume Enclosures permit the selection of specific filters to most efficiently deal with each contaminant encountered.

Safety Considerations

MYSTAIRES Fume Enclosures have built-in lights to provide good, even lighting that eliminates dark shadow areas. Electrical motors and switches are totally isolated from the airstream and fan motors are brushless and sparkless — eliminating any fire hazards when flammable materials are used. Tests show that once a contaminant is adsorbed by the filter media, no danger of adverse reactions or fire hazards exists.

Versatile — Flexible — Mobile

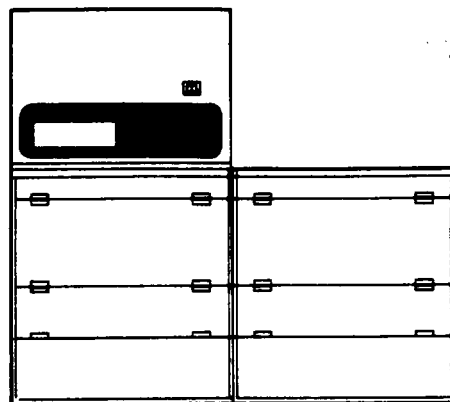
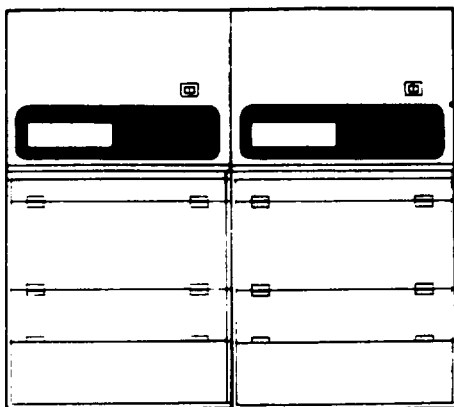
Two basic models are available to meet a variety of needs. The dimensions of both styles are such that they will fit on standard laboratory benches or on carts for portability.



MYSTAIRES 100
Fume Enclosure

MYSTAIRES[®] 100 Fume Enclosure

The MYSTAIRES 100 Fume Enclosure is a portable, modular system that can be used with the full range of interchangeable filters. The enclosure consists of a base unit and a head unit. The base unit has the working area enclosed by clear acrylic sides and front that allow full visibility of the working area. A double-hinged front panel allows easy access to the working area and a special removable tray contains spills. The head unit is the heart of the system and contains the blower, lights, controls, and filter tray packs.



The modular concept of the enclosure permits two units to be used together for more working area; and, depending upon the contaminant and air flow requirements, two bases may be operated with only one head unit.

The three-stage filter section of the MYSTAIRES 100 Fume Enclosure is the key to its effectiveness. (See section on filters on pages 3 and 4 for complete information).

MYSTAIRES[®] 500 Fume Enclosure

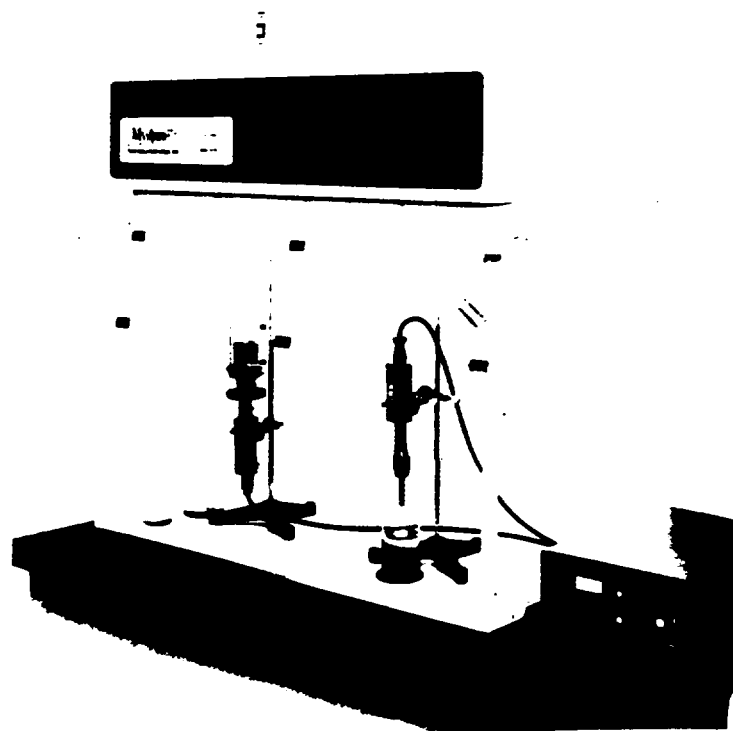
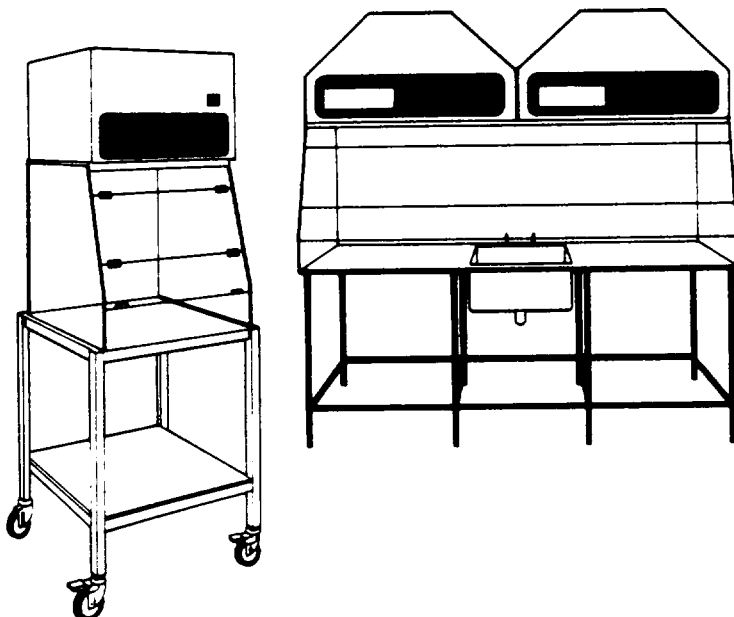
The Model 500 embodies the same practical and safety considerations as the Model 100 but in a larger size.

For applications where a large work area is required, the MYSTAIRES 500 is ideal.

Versatility is the Key

The depth of MYSTAIRES 500 Fume Enclosures allow them to be used on standard laboratory benches. Large, well lighted working areas and convenient modular construction allow systems to be assembled to meet a wide variety of needs. The double-size Model 500 is ideal for use on stainless steel cut-up benches and other large area applications.

The 500 uses the same separate head and base concept as the 100. Two filter tray packs are required for the single units and four for the double units. A standard particulate filter is also used to remove any particulate matter. The same wide range of activated charcoal and chemisorbent filters is available for both the Model 100 and 500.



Filters For Every Application



Model 100 Filter System

The filter section of the MYSTAIRE 100 is made up of a three-stage filter.

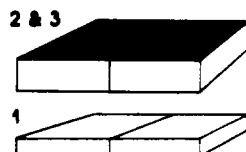
Stage 1: Particulate Filter

Stage 2: A/C or C/S Filter

Stage 3: Carbon Cloth Filter

NOTE: The A/C filter system contains approximately 4 kg of medium.

(Shown with Carbon Cloth Filter Bonded)



Particulate Filters

The filter for the Model 100 has electrically charged fibers which act as an electrostatic precipitator to remove submicron particulates at an efficiency of 99.95%. Since the Model 500 filters are 100 mm thick, the special electrostatic particulate filter is not necessary, and therefore a standard gauze type filter is used.

Activated Carbon/Chemisorptive Filters

The main filter beds can be either activated charcoal (A/C), one of five special color-coded chemisorptive (C/S) filters, or the specially treated filter for radioactive iodine or mercury, depending upon the contaminant to be removed.

Carbon Cloth Filters

Carbon cloth filters are made up of multiple layers of charcoal impregnated cloth and act as a final polishing stage (100 only).

Model 500 Filter System

The filter section of the MYSTAIRE 500 consists of a particulate filter and two large filter blocks.

Stage 1: Particulate Filter

Stage 2: A/C or C/S Filter

NOTE: Stage 2 filters are the main filter beds. The A/C filter system has 30-40 kg of filter medium and is 100 mm thick.

SPECIFICATIONS				Model 100			Model 500			Model 500 Double		
Dimensions (Inches)				H	W	D	H	W	D	H	W	D
Head				16-1/2	25	21-1/2	16	48	28	16	97	28
Base				26	25	24	33	48	28	33	97	28
Total				43	25	24	49	48	28	49	97	28
Internal Volume				8.5 cu. ft.			24 cu. ft.			48 cu. ft.		
Opening Under Folding Door (Inches)												
Lower Opening				6			9			12		
w/First Flap Up				11			15			19		
w/Both Flaps Up				25			25			27		
Air Flow Characteristics												
Face Velocity at Low Speed				70'/min			140'/min			140'/min		
Face Velocity at High Speed				125'/min			533 CFM			1066 CFM		
Volume of Air Treated				70/125 CFM			22/min			22/min		
Air Changes				14/min								
Lighting												
Fluorescent Tubes				2			2			4		
Electrical												
Electric Fan Motor - Brushless and Sparkless				110V - 60 Hz			110V - 60 Hz			110V - 60 Hz		
Control Switches				Power ON/OFF — Fan Speed HIGH/LOW			Power ON/OFF					
Construction				Head and Base — White Epoxy-Coated Steel Base Tray — Coated Steel			Head and Base Tray — Fiberglass Base — White Epoxy-Coated Steel					
				Front Folding Door and Sides — Acrylic								
				Optional Material of Construction — Stainless Steel. Details on Request								

How To Choose The Filter

A/C Activated Charcoal

The list below gives a representative selection of contaminants that can be removed with the activated charcoal filter.

Aliphatic Hydrocarbons:

Acetylene
Cyclohexane
Pentane
Propylene

Aromatic Hydrocarbons:

Benzene
Toluene
Xylene
Naphthalene

Acids:

Acetic
Acrylic
Carbolic
Valeric

Alcohols:

Amyl
Isopropyl
Methyl

Esters:

Butyl Acetate
Cellulose Acetate
Ethyl Acetate
Methyl Acrylate
Propyl Acetate

Aldehydes & Ketones:

Acetone
Acetaldehyde
Benzaldehyde
Diethyl Ketone
Valeric Aldehyde

Ethers:

Amyl
Butyl
Ethyl
Isopropyl
Methyl

Halogens:

Carbon Tetrachloride
Chlorobenzene
Chloroform
Iodine
Iodoform
Methyl Bromide
Phosgene
Propyl Chloride
Tetrachloroethylene
Vinyl Chloride

Sulfur Compounds:

Carbon Disulphide
Ethyl Mercaptan
Butyl Mercaptan

Nitrogen Compounds:

Aniline
Dimethyl Amine
Nitrobenzene
Nitrotoluene
Urea
Uric Acid

A detailed adsorption index is available upon request.

C/S Chemisorptive Filters

ALK Filter

For offensive odors from excreta, urine, or a combination which are alkaline in nature.

ACD Filter

For cadaverine and putrescine and odors which are acid in nature.

FOR Filter

For formaldehyde (formalin).

AME Filter

For ammonia, amines, and similar compounds.

SUL Filter

For hydrogen sulfide, sulfur dioxide, formic acid, etc.

Filter Life

The life of the filter is determined by the type of contaminant, use, and concentration. Widespread experience indicates average filter life greater than six months before exceeding TLV. Units should be regularly tested to assure that the filters are working properly and desired safety levels are maintained.

Special Filters

A/C-R Filter

Specially impregnated activated charcoal to adsorb radioactive iodine (e.g. - Iodine₁₂₅).

A/C-Hg Filter

Specially impregnated activated charcoal to adsorb mercury vapors.

HEPA Filter

Efficiency of 99.99% for particles 0.3 microns.



Mystaire[®] Air Purifiers

Specifications

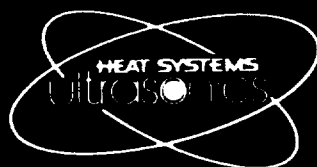
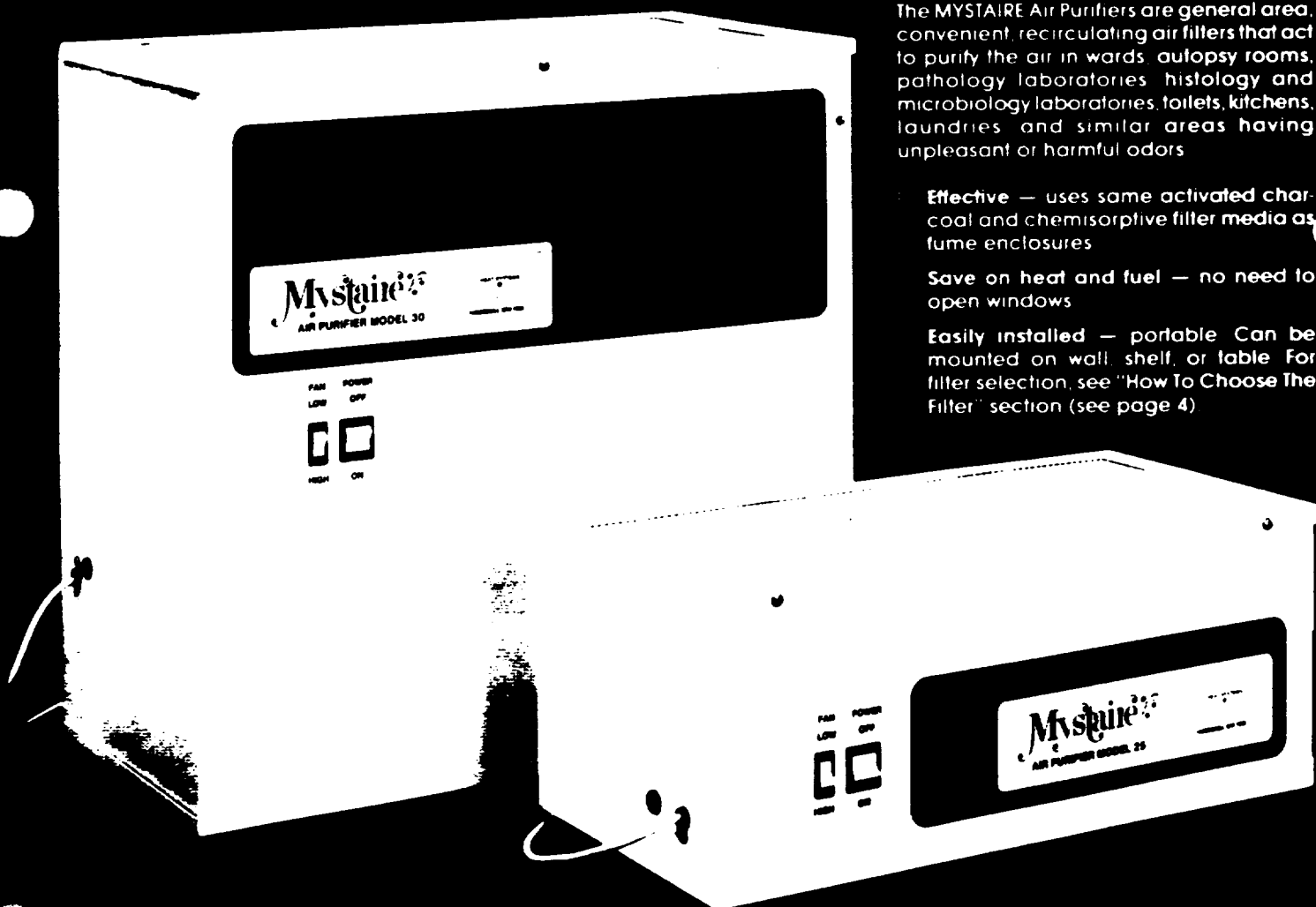
	Controls	Power Supply	Construction	Air Throughput	Maximum Room Size	Dimensions (inches)	Filters
Model 25 Table Top	ON/OFF HIGH LOW	110V AC	White Epoxy-coated Steel	85/130 CFM	2000 cu ft	Height 8 3/4 Width 20 Depth 10 1/2 Weight 28 lbs	1 A/C or C/S 1 High Efficiency Particulate Filter
Model 30 Wall Mount	ON/OFF HIGH LOW	110V AC	White Epoxy-coated Steel	190/320 CFM	5000 cu ft	Height 21 1/2 Width 21 1/4 Depth 12 1/2 Weight 60 lbs	2 A/C or C/S 2 High Efficiency Particulate Filters

The MYSTAIRES Air Purifiers are general area, convenient, recirculating air filters that act to purify the air in wards, autopsy rooms, pathology laboratories, histology and microbiology laboratories, toilets, kitchens, laundries, and similar areas having unpleasant or harmful odors.

Effective — uses same activated charcoal and chemisorptive filter media as fume enclosures

Save on heat and fuel — no need to open windows

Easily installed — portable. Can be mounted on wall, shelf, or table. For filter selection, see "How To Choose The Filter" section (see page 4).



**HEAT SYSTEMS
—ULTRASONICS**
INCORPORATED

1938 NEW HIGHWAY, FARMINGDALE, NEW YORK 11735 • telex 825339

For application assistance and information call Heat Line 800 645 9846, in New York 516/694-9555

ADSORPTION INDEX

for

MYSTAIRE® FUME ENCLOSURE MODELS 100, 200, AND 500

and

MYSTAIRE® AIR PURIFIER MODELS 25 AND 30

This information applies to MYSTAIRE® A/C Filter Blocks as installed in MYSTAIRE Fume Enclosures and Air Purifiers.

NOTE: The following adsorption level is the percentage weight of the contaminant trapped in the filter at saturation, NOT the filtration efficiency.

[Percentage = by weight of A/C media (4 kg in Model 100, 14 kg in Model 200 and 28 kg in Model 500)].

KEY TO TYPICAL ADSORPTION LEVELS:

- A = 15-50% adsorption wt. of A/C media
- B = 5-20% adsorption wt. of A/C media
- C = 5% max. adsorption wt. of A/C media
- D = 1% max. adsorption wt. of A/C media

FILTERS AVAILABLE

<u>Application</u>	<u>Filter Req'd</u>	<u>Examples</u>
Organic Compounds	A/C	Refer to pages 2 & 3 of this index for specific application.
Particulates	HEPA	Filter efficiency rating of 99.99% removal at 0.3µm particles (e.g. toxic powders, asbestos fibers)
Special Impregnated A/C Filters		
Radioactive Isotope or Compounds	A/C-R	e.g. Iodine ₁₂₅ , methyl iodide ₁₃₁
Mercury Compounds	A/C-Hg	e.g. mercury vapors, compound fumes
C/S Chemisorptive		
Odors - Alkaline	ALK	e.g. urine, feces
Odors - Acid	ACD	e.g. cadaverine, putrecine
Formaldehyde	FOR	e.g. formalin
Nitrogen Compounds	AME	e.g. ammonia, amines,
Sulfur Compounds	SUL	e.g. hydrogen sulfide, sulfur dioxide, and mercaptans
Mineral Acids	ACI	e.g. sulfuric, perchloric, hydrochloric
Cyanide	CYN	for cyanide fumes to NATO specs

FOR MODELS 200 AND 500 ONLY

Multiple-S Filter
four layer filter
for general and teaching use
(A/C, AME, SUL, ACI).

MULTIPLE FILTER
to user specifications up to four
layers of our A/C and/or
chemisorptive range of filters

The adsorption index refers to standard A/C filters and gives an indication of the pick-up capacity of activated carbon. As a guide, if the main contaminant has an A or B rating then the A/C filter is suitable. Substances with a lower rating of C or D may also be satisfactorily filtered in small quantities or if used infrequently. Those compounds noted with a parenthesis indicates that a particular filter is available to improve pick-up capacity.

Acids

- A. Acetic
- A. Acetic Anhydride
- A. Acrylic
- A. Butyric
- A. Caprylic
- A. Carboic
- B. Formic
- A. Lactic
- A. Palmitic
- A. Phenol
- A. Propionic
- A. Valeric

Alcohols

- A. Ethanol [Ethyl]
- A. Amyl
- A. Butyl
- A. Cyclohexanol [Cyclohexyl]
- A. Isopropanol [Isopropyl]
- B. Methanol [Methyl]
- A. Propyl

Aldehydes & Ketones

- B. Acetone
- C. Acetaldehyde (FOR filter)
- B. Acrolein
- B. Acrylaldehyde
- A. Benzaldehyde
- B. Butyraldehyde
- A. Caproaldehyde
- A. Crotonaldehyde
- A. Cyclohexanone
- A. Diethylketone
- C. Formaldehyde (FOR filter)
- A. Mesityl oxide
- A. Methyl butyl ketone
- A. Methyl ethyl ketone
- A. Methyl isobutyl ketone
- B. Propionaldehyde
- A. Valeraldehyde
- A. Valeric aldehyde

Aliphatic Hydrocarbons

- A. Acetylene
- B. Butane [Iso-butane]
- B. Butylene
- C. Butadiene
- A. Cyclohexane
- D. Decane
- D. Ethane
- D. Heptane
- C. Heptylene
- B. Hexane
- C. Hexylene
- D. Methane
- D. Nonane
- D. Octane
- D. Octylene
- B. Pentane
- C. Propane
- B. Propylene

Aromatic Hydrocarbons

- A. Benzene
- A. Napthalene
- A. Styrene Monomer
- A. Toluene
- A. Toluidine
- A. Zylene

Esters

- A. Butyl acetate
- A. Cellusolve acetate
- A. Ethyl acetate
- A. Ethyl acrylate
- B. Ethyl formate
- A. Isopropyl acetate
- B. Methyl acetate
- A. Methyl acrylate
- B. Methyl formate
- A. Propyl acetate

Ethers

- A. Amyl
- A. Butyl
- A. Cellosolve
- A. Dioxane
- B. Ethyl
- B. Ethylene oxide
- A. Isopropyl
- A. Methyl cellosolve
- B. Methyl
- A. Propyl

Halogens

- A. Butyl chloride
- A. Carbon tetrachloride
- B. Chlorine
- A. Chlorobutadiene
- A. Chloroform
- A. Chloronitropropane
- A. Chloropicrin
- A. Dibromoethane
- A. Dichlorobenzene
- A. Bromine
- B. Dichlorodifluoromethane
- A. Dichlorodifluoroethane
- A. Dichlorethane
- A. Dichloroethylene
- A. Dichloroethyl ether
- A. Dichloromethane
- B. Dichloromonofluoromethane
- A. Dichloropropane
- B. Dichlorotetrafluoroethane
- B. Ethyl bromide
- B. Ethyl chloride
- A. Ethylene chlorohydrin
- A. Ethylene dichloride
- B. Fluorotrichloromethane
- C. Freon
- C. Hydrogen bromide (ACI filter)
- C. Hydrogen chloride (ACI filter)
- B. Hydrogen cyanide (CYN filter)
- C. Hydrogen fluoride (ACI filter)
- B. Hydrogen iodide
- A. Iodine
- A. Iodoform
- B. Methyl bromide
- B. Methyl chloride
- A. Methyl chloroform
- A. Methylene chloride
- A. Monochlorobenzene
- B. Monofluorotrichloromethane
- A. Paradichlorobenzene
- A. Perchloroethylene
- B. Phosgene
- A. Propyl chloride
- A. Tetrachloroethane
- A. Tetrachloroethylene
- A. Trichloroethylene
- B. Vinyl chloride

Nitrogen Compounds

- C. Ammonia (AME filter)
- C. Amines (AME filter)
- A. Aniline
- B. Diethyl amine
- A. Diethyl aniline
- A. Dimethyl amine

Nitrogen Compounds (cont.)

- B. Ethyl amine
- A. Indole
- A. Nicotine
- B. Nitric acid
- A. Nitrobenzene
- A. Nitroethane
- C. Nitrogen dioxide (AME filter)
- A. Nitroglycerine
- A. Nitromethane
- A. Nitropropane
- A. Nitrotoluene
- A. Pyridine
- A. Skatole
- A. Urea
- A. Uric acid

Sulfur Compounds

- B. Carbon disulfide
- A. Dimethyl sulfate
- A. Ethyl mercaptan
- C. Hydrogen sulfide (SUL filter)
- A. Mercaptans
- A. Methyl mercaptan
- A. Propyl mercaptan
- C. Sulfur dioxide (SUL filter)
- B. Sulfur trioxide
- A. Sulfuric acid
- A. Tetrahydrothiophene

Miscellaneous

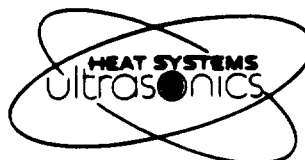
- A. Adhesives
- A. Animal Odors
- A. Camphor
- D. Carbon monoxide
- D. Carbon dioxide
- A. Citrus fruits
- A. Cooking odors
- A. Degreasing solvent
- B. Deodorizers
- A. Detergents
- A. Hospital odors
- A. Human odors
- A. Leather
- A. Ozone
- A. Nicotine
- A. Perfumes
- A. Petrol
- B. Purifying odors
- A. Putrescine
- A. Plastic
- A. Resins
- A. Tar odors

NOTES FOR ADSORPTION INDEX

Please note that the pick up capacity of carbon in the A/C Filters is very much dependant on the following operating factors:

- a) Concentration of contaminant in feed gas - a high feed concentration will enable peak wt/wt pick up onto the carbon. Conversely, trace levels of contaminant, and strict levels of outlet tolerance, permit only lesser total wt/wt adsorption; this alone does not foreshorten the life of the carbon on account of the lower weight deposition on the carbon.
- b) Temperature - volatile contaminants will, understandably, be more difficult to adsorb at elevated temperature unless an impregnated carbon relying on chemisorption is used.
- c) Pressure - elevated pressure will reduce the volatility of a contaminant and accordingly increase the pick up potential. This in turn may reduce the total quantity or quality requirement of carbon for stipulated adsorptive efficiency.
- d) Moisture - water content both in the gas stream and deposited in the carbon can have physical and chemical effects on pick up behavior. High humidity is liable to impair the adsorption of organics, and ionize inorganics. It can nevertheless improve the pick up of some acid gases, and extend the effectiveness of certain chemisorptive operations.
- e) Compounds with an A or B rating will be efficiently retained onto a standard A/C filter.
- f) Compounds with a cord adsorption rating may, under special circumstances, be effectively trapped onto carbon. Alternatively, one of the chemisorptive or special filters may be used. In case of doubt, contact Heat Systems-Ultrasonics, Inc.

**HEAT SYSTEMS
-ULTRASONICS**
INCORPORATED



1938 NEW HIGHWAY, FARMINGDALE, NEW YORK 11735
HEATLINE: 800-845-8846
TELEX: 825339

TEL.: 516-894-8555
FAX: 516-894-8412

**NEW
INTERMEDIATE
SIZE**

Mystaire®

Fume Enclosures

Model FE-200 Portable, Ductless, Fume Enclosure

Designed to fill the requirement for an intermediate sized MYSTAIRe Fume Enclosure, with a range of adsorption filters, the Model FE-200 is ideal for use in clinical, biomedical, research, industrial, and academic laboratories.

FEATURES:

- New intermediate size offers convenient work area
- Accepts the full range of MYSTAIRe Activated Charcoal (A/C), Chemisorptive (C/S), and Special Filters (see MYSTAIRe Brochure HSU-FE-1)
- Unit uses a single filter block
- Head unit and spill tray fabricated from rugged, chemical resistant, reinforced fiberglass
- Available with HEPA Filter
- Portable cart available for all FE-200 Models
- Face velocity exceeds OSHA standard



HEAT SYSTEMS Ultrasonics, Inc.

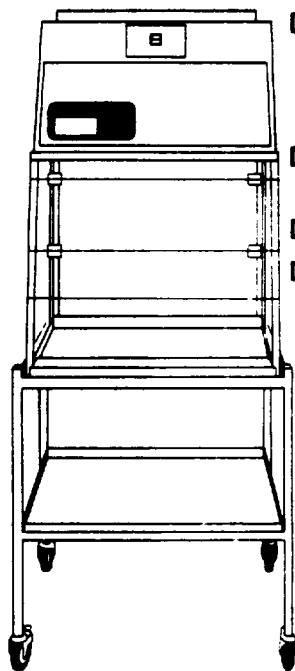
Model FE-200 HPA

The Model FE-200 HPA is identical to the Model FE-200 except that it accommodates an HEPA filter* in addition to a single block adsorption filter.

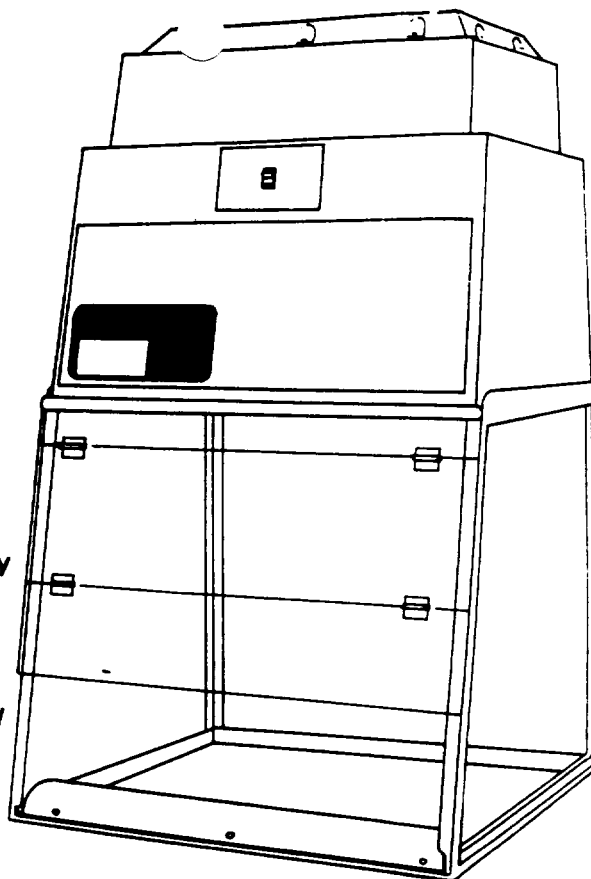
*HEPA filter efficiency of 99.99% for 0.3 micron particles.

STYLES

Both models of the MYSTAIRE® Model FE-200 Fume Enclosure are available in the following styles:



- ☐ Standard, bench mounted for positioning on existing work surfaces, complete with a removable chemical resistant tray
- ☐ Open bench mounted to fit over existing sink
- ☐ Mobile cart mounted
- ☐ Two base widths 30" W and 36" W



FILTRATION

Eleven different chemical filters are available, ranging from standard charcoal to specialty filters for mercury and radioactive iodine. (See MYSTAIRE HSU-FE-1 Brochure)

SPECIFICATIONS

Dimensions (Inches)	H	W	D
Head	18	29	22
Base	28	30	26
Total	45	30	26
Internal Volume	13 cu. ft.		
Opening Under Folding Door (Inches)			
Lower Opening	8		
With First Flap Up	13½		
With Both Flaps Up	25		
Air Flow Characteristics			
Face Velocity	125'/min		
Volume of Air Treated	206 CFM		
Air Changes	16/min		
Lighting			
Fluorescent Tubes	2		
Electrical			
Electric Fan Motor	110V - 60 Hz		
Brushless and Sparkless			
Control Switches	Power ON/OFF		
Construction	Head and Spill Tray - Fiberglass Base Frame - Epoxy Coated Steel Front Folding Door and Sides - Acrylic		

BUILT-IN SAFETY

Switches and other electrical components are totally isolated from the air stream and the fan motor is brushless and sparkless eliminating any fire hazard when flammable materials are used in the fume enclosure. A large removable chemical resistant tray provides containment for spills.



**HEAT SYSTEMS
-ULTRASONICS**

INCORPORATED

1938 NEW HIGHWAY, FARMINGDALE,
NEW YORK 11735 • telex 825339

For application assistance and information call Heat Line:
800/645-9846, in New York 516/694-9555

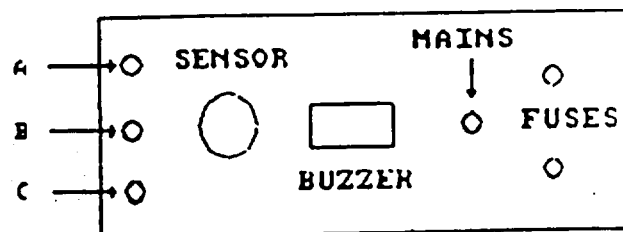
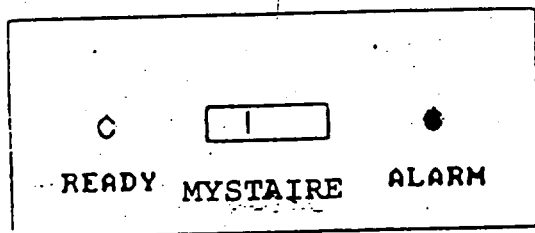
ELECTRONIC FILTER SATURATION ALARM OPTION

(Part Number FE-140)

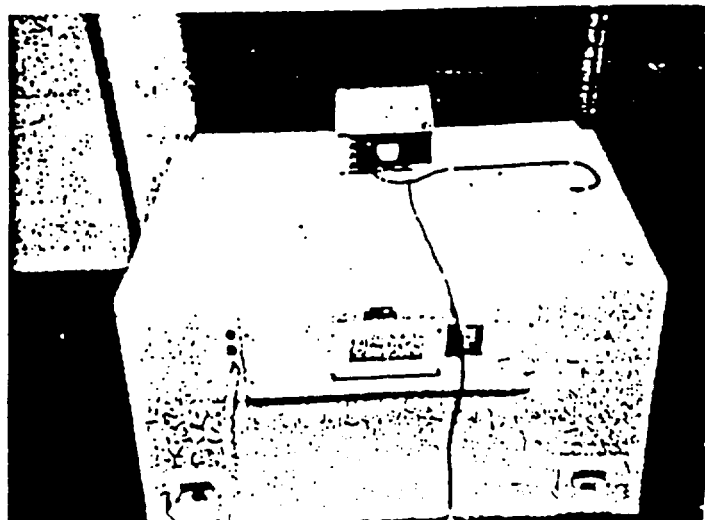
This is a highly sensitive unit which will continuously check the airflow from your MYSTAIRES® Fume Enclosure and give a visible and audible alarm in the presence of hydrocarbons (e.g. formaldehyde, alcohols, mercaptans, and xylene). The gas sensor consists of a ceramic tube onto which is deposited a layer of tin oxide (SnO_2). The ceramic tube is electrically heated to a temperature of about 200°C . At this temperature, and in the presence of clean air, the tin will remain in the form of tin oxide. This has a high electrical resistance which is measured by an electrical circuit. In the presence of hydrocarbons the surface layer of the tin oxide is reduced to tin metal which has a low electrical resistance. This change in resistance is used to operate the meter display and alarm.

This unit offers the convenience and security of continuous filter saturation monitoring.

FE-140 Filter Saturation Alarm\$625.00



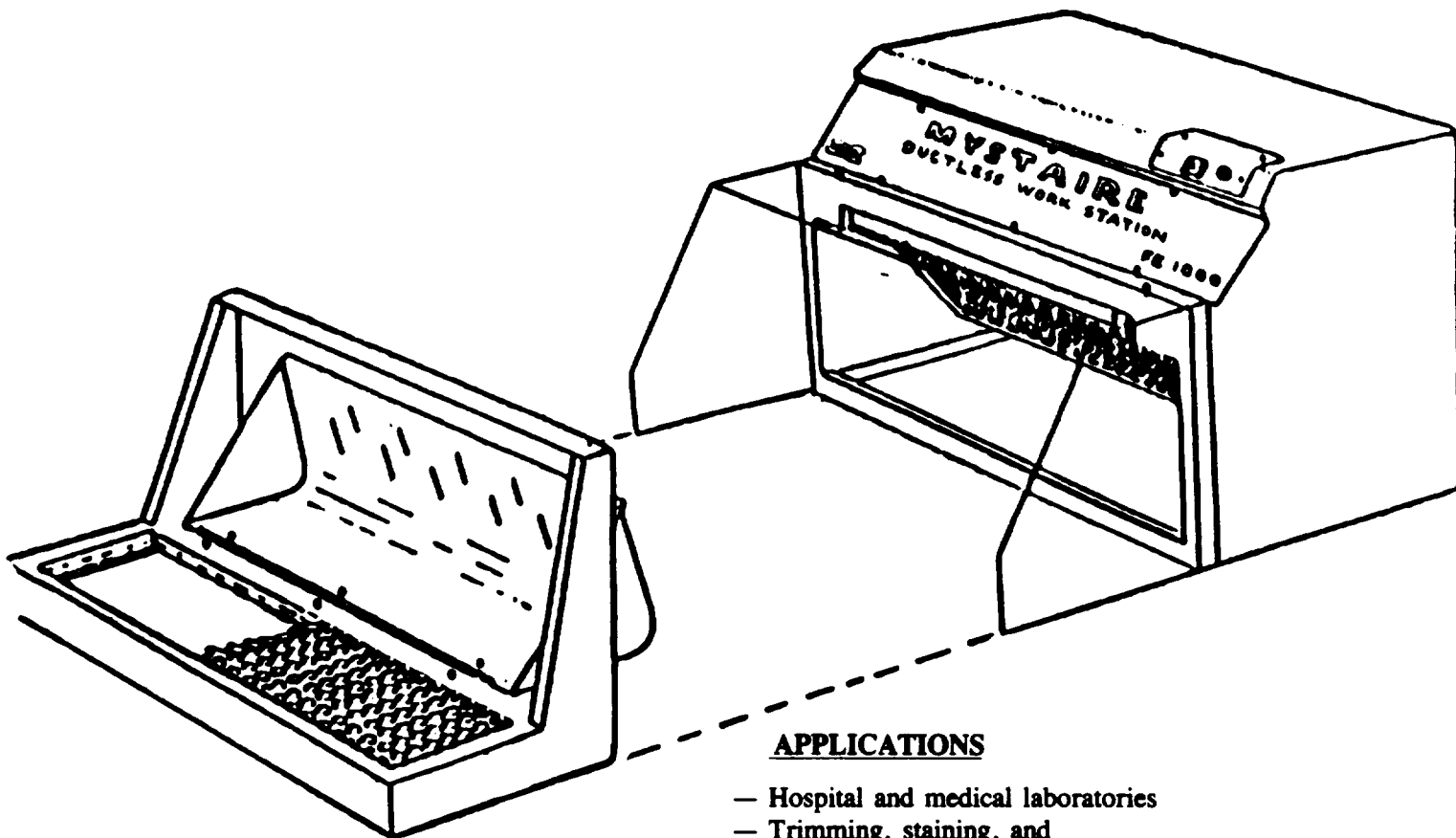
A = ALARM ADJUST
B = METER ZERO
C = GAIN ADJUST



MYSTAIRE®

**Model
FE-1000**

DUCTLESS WORK STATION



APPLICATIONS

- Hospital and medical laboratories
 - Trimming, staining, and coverslipping tissue samples
 - Surgery on small animals
 - Industrial processes (solvents)
 - Soldering pots
 - Asbestos analysis
-
- RIDS WORK AREA OF XYLENE, FORMALDEHYDE, PARTICULATES, AND OTHER DANGEROUS CONTAMINANTS BEFORE THEY PERMEATE YOUR LABORATORY
 - WIDE VARIETY OF APPLICATIONS IN PATHOLOGY, HISTOLOGY, CYTOLOGY, LIFE SCIENCES AND INDUSTRY
 - FILTRATION TECHNOLOGY ELIMINATES NEED FOR EXPENSIVE DUCTWORK
 - DOWNFLOW ATTACHMENT ALLOWS OPERATOR TO WORK CLOSE TO SAMPLE WHILE FUMES ARE PULLED THROUGH WORK SURFACE
 - POWERFUL UL-LISTED MOTOR/BLOWER

MYSTAIRE® ODEL FE-1000 DUCTLESS WORK STATION

DESCRIPTION

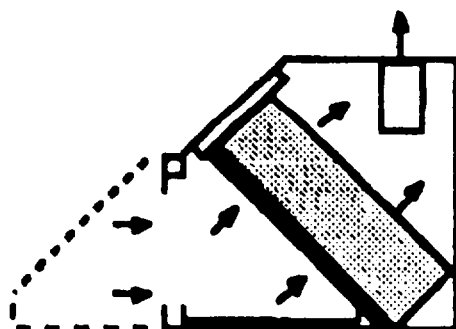
The new MYSTAIRE Model FE-1000 is designed as a ductless, portable laboratory work station that provides operator protection from noxious fumes and vapors. The FE-1000 utilizes activated carbon technology to allow a wide range of applications.

The standard model provides maximum operator protection with horizontal airflow. An optional downflow attachment is also available which fits on the front of the standard unit and provides airflow through the work surface. This is useful with heavy vapors or if the operator's face is close to the working area.

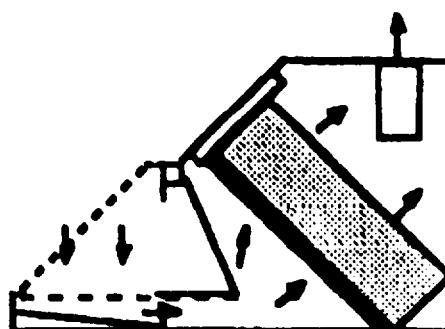
General features:

- a choice of filters to handle various applications
- HEPA filter available for particulates, with 99.99% efficiency
- integral lighting
- removable stainless steel spillage tray (downflow unit)
- two year warranty

AIRFLOW PATTERNS



HORIZONTAL MODEL



DOWNFLOW ATTACHMENT

SPECIFICATIONS

DIMENSIONS:

Width -	25 in. (640mm)
Depth -	27 in. (680mm)
Height -	17 in. (430mm)
Weight-standard unit -	44 lbs. (20kg)
Weight-downflow attachment -	18 lbs. (8kg)

AIRFLOW:

Volume of air treated -	118cfm (200m ³ /hr.)
Input air -	80lfm (0.4m/sec.)

ELECTRICAL:

Voltage -	110v/60Hz
Lighting -	20 watt fluorescent lamp (1)
Total power consumption -	110 watts

CONSTRUCTION:

Main Unit -	Epoxy painted zinc steel
Color -	Ivory
Fume Hood -	¼" Clear Acrylic
Downflow Unit -	Epoxy painted zinc steel with stainless steel worksurface and spill tray

FILTER:

Width -	24 in. (600mm)
Depth -	13 in. (380mm)
Height -	4 in. (100mm)
Weight -	19.81 lbs. (9kg)

HEAT SYSTEMS-ULTRASONICS, INC.

1938 NEW HIGHWAY, FARMINGDALE, NY 11735

HEATLINE: 800-645-9846
TELEX: 825339

TEL.: 516-694-9555
FAX: 516-694-9412

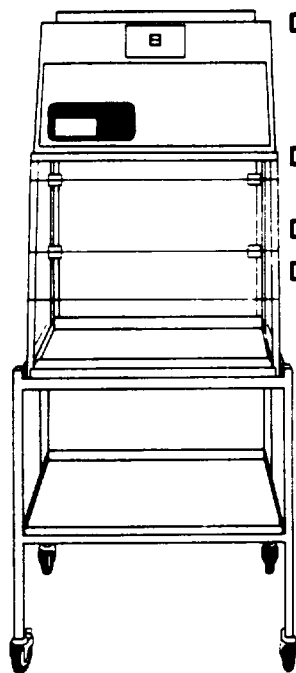
Model FE-200 HPA

The Model FE-200 HPA is identical to the Model FE-200 except that it accommodates an HEPA filter* in addition to a single block adsorption filter.

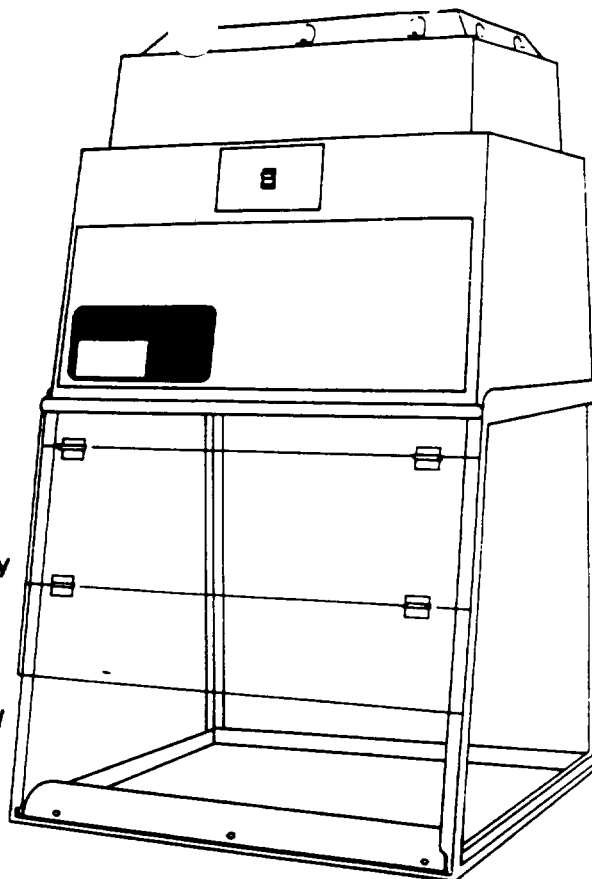
*HEPA filter efficiency of 99.99% for 0.3 micron particles.

STYLES

Both models of the MYSTAIRES® Model FE-200 Fume Enclosure are available in the following styles:



- ☐ Standard, bench mounted for positioning on existing work surfaces, complete with a removable chemical resistant tray
- ☐ Open bench mounted to fit over existing sink
- ☐ Mobile cart mounted
- ☐ Two base widths 30" W and 36" W



FILTRATION

Eleven different chemical filters are available, ranging from standard charcoal to specialty filters for mercury and radioactive iodine. (See MYSTAIRES HSU-FE-1 Brochure)

SPECIFICATIONS

Dimensions (Inches)	H	W	D
Head	18	29	22
Base	28	30	26
Total	45	30	26
Internal Volume	13 cu. ft.		
Opening Under Folding Door (Inches)			
Lower Opening	8		
With First Flap Up	13½		
With Both Flaps Up	25		
Air Flow Characteristics			
Face Velocity	125'/min		
Volume of Air Treated	206 CFM		
Air Changes	16/min		
Lighting			
Fluorescent Tubes	2		
Electrical			
Electric Fan Motor	110V - 60 Hz		
Brushless and Sparkless			
Control Switches	Power ON/OFF		
Construction	Head and Spill Tray - Fibreglas Base Frame - Epoxy Coated Steel Front Folding Door and Sides - Acrylic		

BUILT-IN SAFETY

Switches and other electrical components are totally isolated from the air stream and the fan motor is brushless and sparkless eliminating any fire hazard when flammable materials are used in the fume enclosure. A large removable chemical resistant tray provides containment for spills.



**HEAT SYSTEMS
-ULTRASONICS**

INCORPORATED

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NEW YORK 11735 • telex 825339

For application assistance and information call Heat Line:
800/645-9846, in New York 516/694-9555

MYSTAIRE[®]

DUCTLESS WORK STATION

Model
FE-100

PRICE LIST

Effective Date: May 1, 1988

WS-PL-1

<u>MODEL</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
FE-1000	Model 1000 Work Station: Horizontal Airflow unit with acrylic hood and fluorescent lamp (requires one filter - not included)	\$1,410.00
FE-1000A	Model 1000 Work Station: Downflow unit with acrylic hood and fluorescent lamp (requires one filter - not included)	1,775.00

OPTIONS

FE-1000T	Polypropylene tray-shelf for horizontal airflow unit	55.00
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FILTERS*

FE-1004	A/C Activated Carbon Filter	265.00
FE-1005	ALK Chemisorptive Filter	310.00
FE-1006	ACD Chemisorptive Filter	310.00
FE-1007	FOR Formaldehyde Filter	335.00
FE-1008	AME Chemisorptive Filter	310.00
FE-1009	SUL Chemisorptive Filter	310.00
FE-1011	A/C HG Mercury Compound Filter	455.00
FE-1014	ACI Chemisorptive Filter	310.00
FE-1015	CYN Chemisorptive Filter	475.00
FE-1017	Multiple Layer Filter to user specifications (Two Layers)	365.00

PARTICULATE FILTERS

FE-1013	Replacement Particulate Pre Filters (Package of 10)	150.00
FE-1020	HEPA Filter	335.00

* Contact Heat Systems-Ultrasonics for proper filter selection.

All prices are FOB Farmingdale, New York.

Terms of Payment: Net 30 Days.

HEAT SYSTEMS-ULTRASONICS, INC.

1938 NEW HIGHWAY, FARMINGDALE, NY 11735

HEATLINE: 800-645-9846
TELEPHONE: 516-694-9555
FAX: 516-694-9412

TELEPHONE: 516-694-9555
FAX: 516-694-9412

MYSTAIRE® AIR PURIFIERS

<u>CAT NO.</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
AP25	Model 25 Air Purifier (Main Filters not included)	\$ 635.00
AP30	Model 30 Air Purifier (Main Filters not included)	1,175.00

FILTERS (Not included)

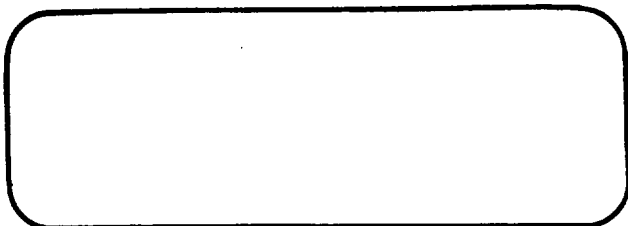
AP304	A/C Activated Carbon Filter	\$80.00
AP305	ALK Chemisorptive Filter	90.00
AP306	ACD Chemisorptive Filter	90.00
AP307	FOR Chemisorptive Filter	95.00
AP308	AME Chemisorptive Filter	90.00
AP309	SUL Chemisorptive Filter	90.00
AP314	ACI Chemisorptive Filter	90.00
AP320	HEPA Filter	90.00
AP313	Replacement Particulate Pre-Filters (Pkg of 10)	\$60.00

MODEL AP25 REQUIRES ONE FILTER**MODEL AP30 REQUIRES TWO FILTERS**

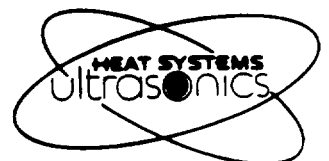
Particulate pre-filters are included with all complete fume enclosures, head units, and air purifiers and the price shown includes their cost.

All prices are FOB Farmingdale, New York.

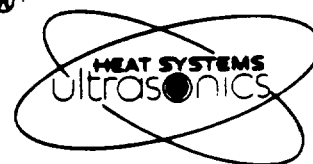
Terms of Payment: Net 30 days.



**HEAT SYSTEMS
-ULTRASONICS**
INCORPORATED



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FUME ENCLOSURES

PRICE LIST

Effective Date: March 1, 1988

HSM-FE-PL1

MYSTAIRE® MODEL FE100 FUME ENCLOSURE

<u>CAT.NO</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
FE100	Model 100 Fume Enclosure: Head, base, spill tray, and Low Airflow Alarm (2 Filters, not included)	\$2,290.00
FE100H	Model 100 Head Section only with Low AirFlow Alarm (2 Filters, not included)	\$1,545.00
FE100HE	Model 100 Head Section only, single speed fan, no lights, no airflow alarm (2 Filters, not included)	1,270.00
FE100R	Model 100 Reverse Flow, Head section only (2 Filters, not included)	1,735.00
FE100B	Base and Spill Tray	745.00
FE100BO	Open Base without Spill Tray	625.00
FE100T	Spill Tray	120.00
FE103	Cart for Model 100 Fume Enclosure	410.00
FE140	Filter Saturation Alarm	625.00

FILTERS

FE104	A/C Activated Carbon Filter	\$165.00
FE105	ALK Chemisorptive Filter	185.00
FE106	ACD Chemisorptive Filter	185.00
FE107	FOR Chemisorptive Filter	205.00
FE108	AME Chemisorptive Filter	185.00
FE109	SUL Chemisorptive Filter	185.00
FE110	A/C-R Radioisotope Filter (please specify isotope)	320.00
FE111	A/C-Hg Mercury Compound Filter	270.00
FE114	ACI Chemisorptive Filter	185.00
FE115	CYN Chemisorptive Filter	265.00

PARTICULATE FILTERS

FE113	Replacement Particulate Pre-Filters (package of 10)	\$105.00
FE120	HEPA Filter	205.00

MYSTAIRES® MODEL FE200 FUME ENCLOSURE

<u>CAT.NO</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
FE200	Model 200 Fume Enclosure: Head, Base, Spill Tray, and Low Airflow Alarm (1 Filter, not included)	\$3,635.00
FE200H	Model 200 Head Section only with Low Airflow Alarm (1 Filter, not included)	\$2,480.00
FE200HPAH	Model 200HEPA Head Section only with Low Airflow Alarm (2 Filters, not included)	3,540.00
FE200R	Model 200 Reverse Flow Head Section Only (1 Filter, not included)	3,410.00
FE200B	30" Closed Base without spill tray	955.00
FE200BO	30" Open Base without spill tray	955.00
FE200B1	35" Closed Base without spill tray	1,115.00
FE200BO1	35" Open Base without spill tray	1,115.00
FE200T	30" Spill Tray	200.00
FE200T-1	35" Spill Tray	250.00
FE203	Cart for Model 200 with 30" Base	525.00
FE203-1	Cart for Model 200 with 35" Base	610.00
FE218	Adjustable Height Cart for Model 200 with 30" Base	840.00
FE218-1	Adjustable Height Cart for Model 200 with 35" Base	1,180.00
FE140	Filter Saturation Alarm (except Reverse Flow models)	625.00
FE250	Horizontal Airflow Plenum for Model 200	260.00
FE250-1	Horizontal Airflow Plenum for Model 200 with 35" base	415.00

FILTERS

FE504	A/C Activated Carbon Filter	\$395.00
FE505	ALK Chemisorptive Filter	455.00
FE506	ACD Chemisorptive Filter	455.00
FE507	FOR Chemisorptive Filter	475.00
FE508	AME Chemisorptive Filter	455.00
FE509	SUL Chemisorptive Filter	455.00
FE510	A/C-R Radioisotope Filter (please specify isotope)	790.00
FE511	A/C-Hg Mercury Compound Filter	665.00
FE514	ACI Chemisorptive Filter	455.00
FE515	CYN Chemisorptive Filter	660.00
FE516	Multiple-S 4 Layer Filter (A/C, AME, SUL, ACI)	455.00
FE517	Multiple Filter to user specifications (max. 4 layers)	505.00

PARTICULATE FILTERS

FE513	Replacement Particulate Pre-Filters (package of 10)	\$125.00
FE212	HEPA Plenum Filter for Model FE200HPA	345.00
FE520	HEPA Main Filter for Model FE200	395.00

MYSTAIRES® MODEL FE500 FUME ENCLOSURE

<u>CAT.NO</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
FE500	Model 500 Fume Enclosure: Head, Base, Spill Tray, and Low Airflow Alarm (2 Filters, not included)	\$5,220.00
FE500H	Model 500 Head Section only with Low Airflow Alarm (2 Filters, not included)	\$3,465.00
FE500HPAH	Model 500HEPA Head Section only with Low Airflow Alarm (3 Filters, not included)	4,375.00
FE500R	Model 500 Reverse Flow Head Section only (2 Filters, not included)	4,230.00
FE500B	Closed Base without spill tray	1,500.00
FE500BO	Open Base without spill tray	1,500.00
FE500-2B	Double Closed Base without spill tray (2 required)	2,400.00
FE500-2BO	Double Open Base without spill tray	2,400.00
FE500T	Spill Tray	255.00
FE503	Cart for Model 500 Closed Base	670.00
FE518	Adjustable Height Cart for Model 500 Closed Base	1,235.00
FE140	Filter Saturation Alarm (except Reverse Flow models)	625.00
FE550	Horizontal Airflow Plenum for Model 500	520.00
FE550-2	Horizontal Airflow Plenum for Double 500	1,035.00
FE519	Stainless Steel Bench, Sink, and Wash-down Facilities to fit Model 500-2 (Double) Fume Enclosure	4,025.00

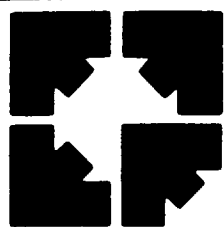
FILTERS

FE504	A/C Activated Carbon Filter	\$395.00
FE505	ALK Chemisorptive Filter	455.00
FE506	ACD Chemisorptive Filter	455.00
FE507	FOR Chemisorptive Filter	475.00
FE508	AME Chemisorptive Filter	455.00
FE509	SUL Chemisorptive Filter	455.00
FE510	A/C-R Radioisotope Filter (please specify isotope)	790.00
FE511	A/C-Hg Mercury Compound Filter	665.00
FE514	ACI Chemisorptive Filter	455.00
FE515	CYN Chemisorptive Filter	660.00
FE516	Multiple-S 4 Layer Filter (A/C, AME, SUL, ACI)	455.00
FE517	Multiple Filter to user specifications (max. 4 layers)	505.00

PARTICULATE FILTERS

FE513	Replacement Particulate Pre-Filters (package of 10)	\$125.00
FE512	HEPA Plenum Filter For Model FE500HPA	345.00
FE520	HEPA Filter for Model FE500	395.00

\$25.00



Model 8380
Biological Storage
Chest Freezer
Manual 7018380

TECHNICAL MANUAL

FOR SERVICE ON THIS EQUIPMENT

Call the Forma Scientific Service Department
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Forma Scientific

DIVISION OF MALLINCKRODT, INC.

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**Model 8380
Biological Storage
Chest Freezer
Manual 7018380**

September, 1985

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SECTION 1 - INTRODUCTION

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1.1 Standard Features

1.2 Auxiliary Equipment

1.1 STANDARD FEATURES

PRECISION CONSTRUCTION AND INTEGRATED DESIGN provide for optimal temperature conditions in the freezer chamber while also affording a new standard of convenience.

- ~ Two removable sub-lids are included to minimize the likelihood of frost development.
- ~ A security lock mechanism is provided to insure product safety and prevent tampering. Optional pad lock available.
- ~ Pre-punched holes located at the back of the cabinet are provided for connection of the optional LN2 back-up system.
- ~ Six double-wheel swivel casters allow for convenient transportation of the freezer, thus eliminating the need for a transfer dolly.
- ~ The lid is counterbalanced through spring-loaded hinges to provide for easy opening.
- ~ The air-cooled triple cascade refrigeration system operates at low amperage draw for maximum economy.
- ~ A time delay prevents compressors from starting simultaneously to prevent possible overloading of the electrical circuit to which the freezer is connected.
- ~ Only non-flammable fluorocarbon refrigerants which meet all state and local codes are used in the system.

Form's UNIQUE CH/P PERFORMANCE MONITOR SYSTEM features electronic, solid state technology to provide for precise monitoring of conditions in the cabinet and rapid response to temperature changes.

- ~ A totally independent safety system provides audible and/or visual alarms in the event of a power failure or a overtemp or undertemp condition.
- ~ A newly designed alarm test system can be used not only to simulate freezer warm-up whereby only the temperature probe is warmed, but also to simulate a probe failure.
- ~ An easy-to-read LCD digital display continually displays the actual temperature in the freezer chamber.
- ~ A slide switch on the Performance Monitor module provides the means of programming and displaying the high and low temperature limits.

- ~ Dry contacts (SPDT) are provided in the Performance Monitor module to permit connection to a remote alarm system.
- ~ A millivolt recorder output is provided inside the Performance Monitor module for easy field installation of an electronic temperature recorder.
- ~ An alarm silence switch disables the audible alarm for approximately forty minutes when an unacceptable temperature condition or a power failure occur.
- ~ An alarm keyswitch bypasses the audible alarm until normal conditions are restored in the chamber.

1.2 AUXILIARY EQUIPMENT

~ STAINLESS STEEL INVENTORY STORAGE RACKS:

Inventory storage rack is complete with water repellent cardboard boxes to provide a conveniently organized biological sample storage system. Racks are supplied with handles. Two types are available:

3" Boxes (8 Box Capacity): Stock #820008
 2" Boxes (12 Box Capacity): Stock #820012

Freezer will accomodate 21 #820008 or 820012 Inventory Racks.

~ EXTRA STORAGE BOXES AND DIVIDERS:

64 cell-dividers are supplied as standard equipment for Inventory Storage Racks. Also available are 100, 81, 49, 25, and 16 cell-dividers.

2" Boxes: Stock #820002
 3" Boxes: Stock #820003

DIVIDERS	NOMINAL OPENING	STOCK #
16 Cell	1.2" (3 cm)	820016
25 Cell	.97" (1.7 cm)	820025
49 Cell	.67" (1.5 cm)	820049
64 Cell	.58" (1.4 cm)	820064
81 Cell	.5" (1.3 cm)	820081
100 Cell	.45" (1.1 cm)	820100

~ LN2 BACK-UP SYSTEM: Designed to inject liquid LN2 into the freezer chamber if chamber temperature rises above a fixed (customer adjustable) value. The system is primarily composed of an electronic control, a solenoid injection valve, a rechargeable battery pack, and a built-in charger. A switching device prevents LN2 injection when the freezer door is opened, and the self-contained battery pack and charger maintain injection system operation in the event of a power failure. The system is designed for connection to multiple LN2 cylinders if necessary. Information about manifolds which provide a means of connecting two or more cylinders is available upon request.

Stock #189604 (115V, 60Hz)

Stock #189614 (220V, 50Hz)

NOTE: LN-2 Back-Up system pre-set at -85C.

~ SAFETEMP GLOVES: Are insulated to protect the user in ultra-cold temperatures (down to -130 degrees C) or extremely hot temperatures (up to +260 degrees C). The outer portion of the glove is water-proof. Safetemp gloves carry a 90 day warranty against defects in materials or workmanship.

Mid-Arm (Medium).....	Stock #189561
(Large).....	Stock #189562
(X-Large).....	Stock #189563
Elbow-Length (Medium).....	Stock #189564
(Large).....	Stock #189565
(X-Large).....	Stock #189566
Shoulder-Length (Medium)...	Stock #189567
(Large)....	Stock #189568
(X-Large)..	Stock #189569
Wrist-Length (Small).....	Stock #189573
(Medium).....	Stock #189574
(Large).....	Stock #189575

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- 2.1 Construction
- 2.2 Dimensions
- 2.3 Capacity
- 2.4 Shipping Weight
- 2.5 Triple Cascade Refrigeration System
- 2.6 Low Temperature Limit
- 2.7 Electrical Requirements

2.1 CONSTRUCTION

Exterior: 18 Gauge Cold Rolled Steel
Interior: One Piece Aluminum Chamber/Coil With
Stainless Steel Floor
Insulation: Freon-Foamed Polyurethane

2.2 DIMENSIONS

Exterior: 77" W x 42" H x 29" D
195.6 cm W x 106.7 cm H x 73.6 cm D
Interior: 41" W x 27.5" H x 17" D
104.1 cm W x 69.9 cm H x 42.2 cm D

2.3 CAPACITY

11 Cu. Ft.

2.4 SHIPPING WEIGHT

480 Lbs. (217 Kgs.)

2.5 TRIPLE CASCADE REFRIGERATION SYSTEM

Low Stage System: R14
150# PSIG when entire system is
warm.
1/2 HP Compressor
Intermediate Stage System: R12 Refrigerant, 2 ozs,
R503 (150# PSIG) When entire system
is warm
1/2 HP Compressor
High Stage System: R500 Refrigerant, 16 ozs.
(453 Grams)
3/4 HP Compressor

2.6 LOW TEMPERATURE LIMIT

-120 Degrees C (-184 Degrees F)
(Rated in an 90 degrees F/32.2 degrees C ambient)

2.7 ELECTRICAL REQUIREMENTS

197-253 VAC, 2 Wire, 1 Phase, 60 Hz, 15 FLA or
190-242 VAC, 2 Wire, 1 Phase, 50 Hz, 15 FLA

SECTION 3 - OPERATION

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- 3.1 Temperature Controller/Indicator
- 3.2 CH/P Performance Monitor System
- 3.3 Weksler Temperature Recorder (Optional)

3.1 TEMPERATURE CONTROLLER/INDICATOR

REFRIGERATION ON/OFF SWITCH:

This switch controls power to the temperature control board and also acts as the on/off switch for the compressors. NOTE: THIS SWITCH MUST BE IN THE "ON" position FOR PROPER OPERATION.

TEMPERATURE CONTROLLER KNOB:

This adjustment knob is located directly to the right side of the "Refrigeration Switch". This knob is used to establish the operating setpoint temperature. The temperature control range is from -100C to -120C. The temperature setpoint is displayed on the LCD in 1C increments.

3.2 CH/P PERFORMANCE MONITOR SYSTEM

The electronic, solid state Performance Monitor System includes an alarm selector keyswitch with normal and standby positions, a green power pilot light, a yellow normal temp light, a red overtemp alarm pilot light, a red undertemp alarm pilot light, an audible alarm, an alarm silence button, an alarm test button, and an LCD temperature display that reads out in 1C increments.

~ POWER PILOT LIGHT

The green main Power pilot light is activated when the unit is connected to a power supply and A.C. power is applied. NOTE: When there is a loss of power to the unit the green main Power pilot light will not be on.

~ NORMAL PILOT LIGHT

The yellow Normal pilot light is ON when chamber temperature is within low and high alarm set points.

~ ALARM SELECTOR KEYSWITCH

When the Normal/Standby keyswitch is in the NORMAL position, the alarm system is fully operational and will alert the operator of an overtemp condition, an undertemp condition, or a power failure. Both the audible and visual aspects of the alarm system will be activated in the event of an undertemp or overtemp condition.

The STANDBY mode is provided primarily so that the user may disable the audible alarm after an alarm condition or a power failure has been recognized. A RING-RACK feature is built into the circuitry to notify the operator that the selector switch should be returned to the "Normal" position once the problem has been determined and corrected, and the temperature in the chamber has returned to within normal limits.

~ UNDERTEMP & OVERTEMP ALARM PILOT LIGHTS, AUDIBLE ALARM & ALARM SILENCE BUTTON

Should the temperature in the chamber rise to the overtemp alarm point or drop to the undertemp alarm point, the appropriate alarm light will be activated.

The alarm can be temporarily silenced (approximately 20 minutes) when the alarm silence button is pushed, or it can be silenced if the alarm keyswitch is set to the Standby position.

~ LCD TEMPERATURE DISPLAY

If the Performance Monitor module is pulled out slightly from its recess in the control panel, a slide switch (labeled SW-2) and two adjustment screws (labeled LO and HI) can be found on the top edge of the module. When the slide switch is in the right-hand position (looking at the back of the module), the actual temperature in the chamber will be displayed on the LCD readout. If the slide switch is pushed to the left-hand position, the overtemp (hi limit) setpoint can be set via the HI setscrew, and the selected limit setpoint will be displayed on the digital indicator. When the slide switch is placed in the center position, the undertemp (lo limit) setpoint can be set via the LO setscrew, and the selected limit setpoint will be displayed on the digital indicator. If an alarm condition should occur (chamber temperature above or below normal limits), a "hi limit" or "lo limit" notation will appear on the digital display along with the readout of the actual chamber temperature to indicate what is causing the alarm condition.

~ ALARM TEST BUTTON

The alarm test button utilizes the temperature probe to test the overtemp alarm. To test the high alarm:

- 1) Depress the alarm test button for approximately two seconds.
- 2) Voltage will be applied to the probe while the test button is being depressed, thus warming the sensor and effectively SIMULATING chamber warm-up. The audible alarm will be activated and the red overtemp alarm pilot light will light up when the probe temperature rises to the established high limit alarm control point.

NOTE: ALTHOUGH THE DISPLAY IS INOPERATIVE WHILE THE PROBE IS BEING WARMED, IT WILL INDICATE THE TEMPERATURE OF THE SENSOR AS THE TEMPERATURE BEGINS TO DROP BACK TO THE CONTROL TEMPERATURE. AS SOON AS THE PROBE TEMPERATURE DROPS BELOW THE HIGH LIMIT CONTROL POINT, THE ALARM SYSTEM WILL BE RETURNED TO NORMAL.

~ REMOTE ALARM CONTACTS

The remote alarm connection is located on the back side of the Performance Monitor Board and is equipped with a screw type terminal block, which permits a quick and easy connection. Terminals can be selected for either Normally Open or Normally Closed configuration. All terminals are clearly marked.

~ ELECTRONIC RECORDER CONTACTS

A set of electronic recorder contacts have been provided for installing electronic recorders capable of having an input signal from -999 to +999 millivolt. The electronic recorder connection is located beside the remote alarm connection on the back side of the Performance Monitor Board and is equipped with two screw type terminals marked (+)= positive, (-)=negative. The Model B300's easily connects to Forma's Electronic Digital Recorder/Alarm Model 1525. This unit records the status of temperature in Fahrenheit or Celsius, percent Co/2, percent Relative humidity, pH, percent o2, plus two additional conditions producing a millivolt signal.

~ BATTERY

In the event of a power disruption, the alarms and digital display will continue to operate under the power supplied by the one (1) 9V Ni-Cad battery. The battery will be recharged automatically through the freezer's electrical system when power is restored. UNITS ARE SHIPPED WITH THE BATTERY DISCONNECTED! BATTERY MUST BE CONNECTED FOR PROPER OPERATION OF THE PERFORMANCE MONITOR.

NOTE: AT LEAST TWICE A YEAR THE BATTERY SYSTEM SHOULD BE CHECKED. DISCONNECT THE UNIT FROM THE POWER SUPPLY. THE ALARM SHOULD BE ACTIVATED, AND THE DIGITAL DISPLAY SHOULD CONTINUE TO PROVIDE A READOUT. IF THE DIGITAL DISPLAY CONTINUES TO PROVIDE A READOUT FOR FIVE TO TEN MINUTES AFTER THE POWER WAS DISCONNECTED, THE BATTERY SYSTEM IS OPERATIVE. RECONNECT THE UNIT TO THE POWER SOURCE.

3.3 WEKSLER TEMPERATURE RECORDER (OPTIONAL)

Operation of the optional temperature recorder motor chart drive is automatic when power is applied to the freezer. Recording action relies on a liquid volume change.

Recording action does not require electrical power. In the event of a power failure, a high temperature record will be provided even though the chart drive is not operational.

For additional information on the temperature recorder, see the Weksler manual included as a supplement at the rear of this manual.

NOTE: The felt-tip pen on the Weksler recorder requires periodic replacement. Usually the pen will ink more faintly for about one to three weeks before replacement becomes necessary. Additional pen tips (Forma Stock #245220) should be purchased and stored to allow for quick replacement.

SECTION 4 - INSTALLATION & START-UP

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- 4.1 Location**
- 4.2 Checking Compressor Ventilation**
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- 4.6 Connecting to Power**
- 4.7 Initial Start-Up Procedure**
- 4.8 Adjusting the Hi and Lo Limit Setpoints**
- 4.9 General Recommendations**
- 4.10 Initial Loading**

4.1 LOCATION

Locate the freezer on a firm, level surface in an area of minimum ambient temperature fluctuation.

* (WE SUGGEST A MINIMUM SPACE OF 4" BE PROVIDED ON ALL SIDES OF THE FREEZER).

This is to insure that there is adequate ventilation and air flow for the condenser.

4.2 CHECKING COMPRESSOR VENTILATION

NOTE: Make sure the freezer is NOT connected to a power source before checking the compressor ventilation.

With the side ventilation panels removed, check to see that the fans move freely and are unobstructed by tubing, so that the compressor will be adequately cooled after starting.

4.3 INSTALLING THE OPTIONAL TEMPERATURE RECORDER

NOTE: Make sure that the freezer is NOT connected to a power source before installing the recorder.

A tool kit has been provided with the recorder kit containing all tools required for recorder installation.

- 1) Remove the side access cover by removing the two phillips screws on the top edge of the cover.
- 2) Remove the panel recorder cover plate by removing the one screw that secures it in place from the back side of the control panel.
- 3) Remove the brackets provided on the recorder, and discard them as they will not be needed.
- 4) Slide the recorder in place, and secure it on the top and bottom sides with the bracket, screw, and wing nut with star lock washer. The star lock washer should be placed between the bracket and the recorder.

- 5) Open the exterior lid, and remove the chamber probe cover located on the left side of the chamber.
 - 6) With a screwdriver or similar instrument, CAREFULLY remove the permagum from the probe access hole. Take care not to puncture the performance monitor probe wires or the electronic temperature control wires.
 - 7) Feed the recorder probe from the control panel area through the access port, and carefully insert it through the black rubber grommets on the probe mounting.
- NOTE: If any permagum adheres to the probe, it can be removed with paint thinner or a similar solvent.
- 8) Pull any excess capillary tube back into the control panel compartment, carefully coil the excess, and use a tie wrap to secure the coil.
 - 9) Replace the permagum, or use the silastic provided with the recorder kit to seal the access port, and replace the chamber probe cover.
 - 10) Plug the recorder line cord into the electrical outlet on the back right-hand side of the relay enclosure. Coil any excess cord, and use the tie wraps and tie wrap anchors to secure the line cord in place.
 - 11) Replace the side access cover.

4.4 PREPARING THE (OPTIONAL) TEMPERATURE RECORDER

Prior to connecting the freezer to the power source, install a chart on the temperature recorder, and remove the protective cap from the pen. Make sure the pen is inking properly by manually rotating the chart. See the Weksler manual, included as a supplement at the rear of this manual, for additional information.

4.5 CONNECTING THE PERFORMANCE MONITOR BATTERY

The battery has been disconnected to prevent it from discharging during shipment. To connect the battery:

- 1) Pull the Performance Monitor module out of the control panel.
- 2) Locate the battery and battery snap connector. Snap the battery connector onto the battery terminals and reinstall the Performance Monitor module.
- 3) The alarm will sound to indicate a power failure as soon as the batteries are installed, since the freezer is not yet connected to a power supply. Turn the alarm keyswitch to "Standby" to silence the alarm.

4.6 POWER CONNECTION

With the Refrigeration switch in the off position, connect the freezer to an adequate power source. See the electrical data plate mounted on the unit for exact electrical specifications.

NOTE: When used outside the U.S. all that's necessary is adding the proper electrical plug, providing the electrical specifications are met.

To insure product safety, it is strongly recommended that the freezer be operated on its own individual circuit. Other devices which might cause overloading should not be connected in the same circuit.

4.7 INITIAL START-UP PROCEDURE

- 1) Place the refrigeration switch in the "ON" position.
- 2) Place the alarm selector switch in the "Standby" position to prevent the audible alarm from sounding during the initial start-up procedure.
- 3) Turn the temperature control knob to display -100C, and allow the freezer to operate at this temperature for 12 hours.
- 4) After the 12-hour start-up period, reset the temperature control knob to the desired operating temperature (Minimum of -100C and Maximum -120C). The freezer is now ready for normal operation.

4.8 ADJUSTING THE HI AND LO LIMIT SETPOINTS

NOTE: The hi limit setpoint has been factory-set at -90 degrees C, and the lo limit setpoint has been factory-set at -123 degrees C.

If temperature limit setpoints other than those established at the factory are desired, they can be adjusted as follows:

NOTE: A BUILT IN SCREWDRIVER HAS BEEN PROVIDED TO MAKE THE FOLLOWING ADJUSTMENTS. FOR LOCATION OF THE SCREWDRIVER, REMOVE THE PERFORMANCE MONITOR. THE SCREWDRIVER IS LOCATED ON THE RIGHT SIDE.

- 1) Pull the Performance Monitor module out slightly to gain access to the slide switch (labeled S-2), the high alarm setscrew (R-61) and the low alarm setscrew (R-62) located at the top edge of the circuit board.
- 2) TO SET THE HIGH ALARM POINT, place the S-2 switch in the left hand position to display the high alarm point on the readout. If adjustment is desired, turn R-61 until the desired temperature is displayed on the readout.

NOTE: Clockwise adjustment of the R setscrews will raise the temperature reading, and counterclockwise adjustment will lower the temperature. One revolution of a R setscrew will adjust the temperature approximately 2 degrees C.

- 3) TO SET THE LOW ALARM POINT, place the S-2 switch in the center position to display the low alarm point on the readout. If adjustment is desired, turn R-62 until the desired temperature is displayed on the readout.
- 4) After checking and/or adjusting the alarm point(s), place the S-2 switch in the right hand position to display the actual temperature.

4.9 GENERAL RECOMMENDATIONS

The refrigeration system is designed to maintain ultra-low temperatures with safety in a 90 degrees F ambient environment only when the freezer is used for storage. The unit is not a "quick-freeze" device. Freezing substantial quantities of liquid or high-water content items will temporarily increase chamber temperature and will cause the low stage compressor to operate for a prolonged period of time; the safety of other materials in storage may be jeopardized. Small quantities of liquid, however, may be frozen without damaging other products in storage.

Opening the lid for extended periods of time should be avoided, since the cold air in the chamber will tend to drain rapidly. As the air which replaces the drained air will be more humidified, frost may develop more rapidly in the chamber.

4.10 INITIAL LOADING

As previously mentioned, this unit is not a "quick-freeze" device. This unit is designed as a "storage freezer" for storage of "pre-frozen" materials. It is not designed for freezing "un-frozen or warm" materials.

Before loading, the instructions for initial start-up and pull down to the low end setting should be followed as outlined in section 4.7.

If you have any questions concerning this procedure, please contact Forma Service at 1-800-848-3080 in the USA or Ex-USA, your local Sales Representative.

SECTION 5 - ROUTINE MAINTENANCE

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5.1 Refrigeration System Maintenance

5.2 Defrosting

5.1 REFRIGERATION SYSTEM MAINTENANCE

The air-cooled condenser (the finned surface located in the lower rear center area of the refrigeration compartment) should be cleaned periodically with a vacuum or air-hose so that air will move freely through the fins. The efficiency of the refrigeration unit is a direct function of the efficiency of the air-cooled condenser; dust in the condenser fins slows the rate of heat dissipation, increases the operating temperature of the compressors (thereby decreasing their effective lives), and may reduce the overall performance of the refrigeration system in terms of recovery time and setpoint control accuracy.

Also periodically clean any accumulated dirt from the compressors and other refrigeration system parts. Dirt on the compressor housings will cause the compressors to operate at elevated temperatures.

ALWAYS DISCONNECT THE FREEZER FROM THE POWER SUPPLY BEFORE CLEANING THE REFRIGERATION SYSTEM!

Compressors and fan motors are permanently lubricated and do not require regular servicing.

5.2 DEFROSTING

The type of frost formed in the chamber is generally very soft and may be easily removed with a bristle brush. Do not use a wire brush as it will scratch the finish.

CAUTION! NEVER USE ANY SHARP OBJECT TO SCRAPE FROST OR ICE OFF OF THE UNIT.

A complete defrosting may occasionally be required. To completely defrost the chamber, remove the product, disconnect the freezer from the power supply, open the lid, remove the sublids and wait until the frost melts. If a substantial amount of frost is present, towels should be placed on the floor of the chamber. Dry the chamber with a clean cloth after defrosting is completed.

SECTION 6 - SERVICE

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6.1 Servicing the Refrigeration System

6.2 Troubleshooting Guide

**CAUTION! SERVICING MUST BE PERFORMED BY QUALIFIED
SERVICE PERSONNEL ONLY!**

6.1 SERVICING THE REFRIGERATION SYSTEM

In the case of a unit malfunction, check all electrical components including starting relays, thermal protectors, and starting capacitors on the compressors before examining the refrigeration system.

Electrical schematics and schematics with parts for the refrigeration system are included at the rear of this manual.

REPAIR WORK SHOULD ONLY BE PERFORMED BY PERSONNEL WHO HAVE HAD PRIOR EXPERIENCE WITH CASCADE REFRIGERATION SYSTEMS. A GUIDE TO SERVICING CASCADE REFRIGERATION SYSTEMS IS AVAILABLE FROM FORMA SCIENTIFIC: WRITE FOR DETAILS IF PROBLEMS DEVELOP WITH THE SYSTEM.

6.2 TROUBLESHOOTING GUIDE

The following pages are intended to be a guide in troubleshooting the system if a problem occurs. Actual servicing of the freezer MUST be performed by qualified service personnel only.

PROBLEM 1: The freezer appears to be completely inoperative except that the audible alarm is activated when the alarm selector switch is set to Normal; all pilot lights are out; chamber is not being refrigerated.

POSSIBLE CAUSES:

- a) Power line cord is disconnected.
- b) Power source circuit breaker is open or the source control fuse is blown.

PROBLEM 2: Chamber temperature deviates substantially from setpoint; all compressors and cooling fans are operational.

POSSIBLE CAUSES:

- a) Dirty condenser or air flow to the condenser is otherwise obstructed.
- b) Too much warm product has been placed in the chamber at one time.
- c) Chamber door has been open for an extended period of time or the door is not sealing properly against gasket.
- d) Either the controller or indicator or the Weksler recorder need calibration.
- e) Inadequate air circulation through the side ventilation panels.
- f) Refrigeration system malfunction. See Problems 11 and 12.

PROBLEM 3: Chamber temperature deviates substantially from setpoint; low stage compressor is cycling on thermal overload.

POSSIBLE CAUSES:

- a) Defective starting components
- b) Low stage system is overcharged.
- c) Non-condensables (air, nitrogen, etc.) are present in the low stage system.
- d) High or Intermediate system stage malfunction. See Problem 11.

PROBLEM 4: Chamber not being refrigerated although high, intermediate and low stage compressors are running.

POSSIBLE CAUSE: a) Low stage system malfunction. See Problem 12.

PROBLEM 5: Chamber not being refrigerated; low stage compressor motor is inoperative; low stage compressor seems cold, indicating it is not receiving power.

POSSIBLE CAUSES:

- a) Low stage compressor thermal overload is open.
- b) Controller contactor relay is defective. See Electrical Schematic.
- c) Defective contactor 3-CR.

PROBLEM 6: Chamber not being refrigerated; low stage compressor motor is inoperative; low stage compressor seems warm, indicating it is receiving power.

POSSIBLE CAUSES: a) Low stage compressor starting relay or capacitor is defective.
b) Low stage compressor is defective

PROBLEM 7: Chamber not being refrigerated; both compressor motors and fans are inoperative; both compressors are cold, indicating they are not receiving power; all pilot lights are operational.

POSSIBLE CAUSE: a) Defective temperature control.
b) Defective timer.

PROBLEM 8: Chamber not being refrigerated; all compressor motors are inoperative; compressors seem warm, indicating they are receiving power; high stage compressor cycles rapidly on the thermal overload.

POSSIBLE CAUSES: a) High stage compressor starting relay is defective.
b) High stage compressor starting capacitor is defective.
c) High stage compressor is defective
d) Low voltage

PROBLEM 9: Freezer is noisy when operating.

POSSIBLE CAUSES:

- a) Fan bearing is worn and requires replacement.
- b) One or both of the cooling fan blades is either loose or bent.
- c) Either loose tubing supports or bolts in the refrigeration compartment.
- d) Tubing is in contact with compressors or frame.
- e) Defective compressor(s).

PROBLEM 10: Temperature controller reads -120 degrees C, but chamber is not being refrigerated; compressor motors and fans are not operating.

POSSIBLE CAUSE:

- a) Temperature controller/indicator has shorted probe

PROBLEM 11: High stage refrigeration system not functioning properly.

POSSIBLE CAUSES:

- a) Refrigeration charge either too high or too low.
- b) Moisture is present in the refrigeration system.
- c) Cap-tubing is blocked or plugged.
- d) High stage evaporator is "oil-logged", caused by low refrigeration charge.
- e) Either high stage compressor or its starting components is (are) defective.
- f) Non-condensables (air, nitrogen, etc.) are present in the high stage system.

PROBLEM 12: Low stage refrigeration system not functioning properly.

POSSIBLE CAUSES:

- a) Refrigeration charge either too high or too low.
- b) Moisture is present in the refrigeration system.
- c) Cap-tubing is blocked or plugged.
- d) Low stage evaporator is "oil-logged", possibly relating to low refrigeration charge, defective oil separator, or continuous operation below the design temperature.
- e) Non-condensables (air, nitrogen, etc.) are present in the low stage system.
- f) Either low stage compressor or its starting components is (are) defective.

PROBLEM 13: Audible alarm is silent and LCD is blank regardless of chamber temperature or position of alarm selector switch; power is disconnected.

POSSIBLE CAUSE:

- a) Performance Monitor System batteries are in need of recharging or replacement.

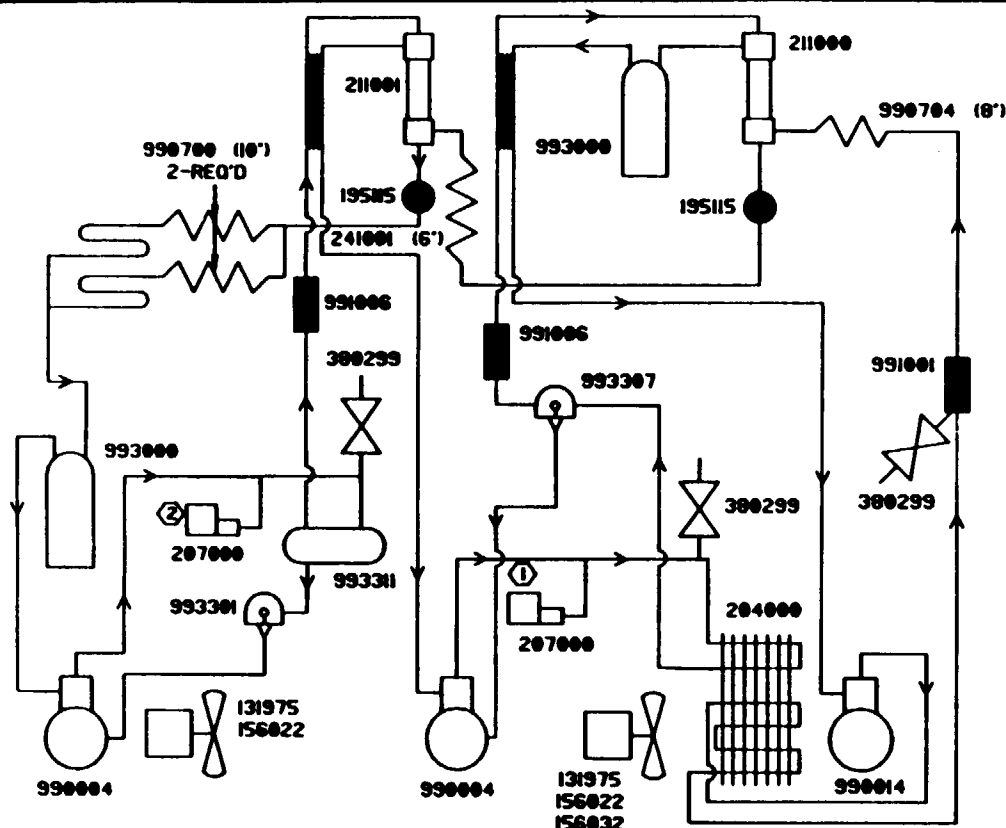
PROBLEM 14: Temperature controller reads -120 degrees C but chamber temperature is colder; all compressors and fans are running continuously.

POSSIBLE CAUSE:

- a) Defective temperature probe.

MODEL 8380 - PARTS

QUANTITY	STOCK #	DESCRIPTION
1	231073	Temp Control -125C/-100C
2	290041	Probe 1000 OHM Platinum
1	400045	CH/P Digital Performance Monitor
2	156022	16 Watt Condenser Fan Motor
1	189572	Relay Encl 220V Chest
2	990004	Motor Comp 1/2 HP
1	990014	Motor Comp 3/4 HP
1	991001	Dryer 1/4 ODF
2	991006	Dryer 3/8 SAE
1	993301	Oil Separator
1	993307	S-5581 AC&R Oil Separator



CASCADE REFRIGERATION

HIGH STAGE-
REFRIGERANT 500 APPROX. LBS. 16 OZS.

INTERMEDIATE STAGE-
• REFRIGERANT 503-140 LBS P.S.I.G.
REFRIGERANT 12 2 OZS P.S.I.G.
HIGH PRESSURE CUTOUT ① OUT 150 LBS IN 300 LBS

LOW STAGE-
SET HIGH PRESSURE CONTROL ② OUT 150 LBS. IN 300 LBS
• REFRIGERANT 14 150 LBS.P.S.I.G.

• WHEN ENTIRE SYSTEM IS WARM

LOW STAGE

INTERMEDIATE STAGE

HIGH STAGE

CUSTOMER APPROVAL/REFERENCE							
APPROVED BY _____							
APPROVING FIRM _____							
DATE OF APPROVAL _____							
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION IS NOT TO BE DISCLOSED TO OTHERS FOR ANY PURPOSE AND USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM FORMA SCIENTIFIC							
REV	REV NO.	DATE	BY	APPD	DESCRIPTION OF REVISION		
		DATE 5-13-85	OWN D. DYE	APPD	SCALE NONE		
CUSTOMER							
JOB TITLE 8380 CHEST FREEZER							
DWS TITLE REFRIGERATION SCHEMATIC							
JOB NUMBER				DRAWING NUMBER			
				8380-90-0-D			



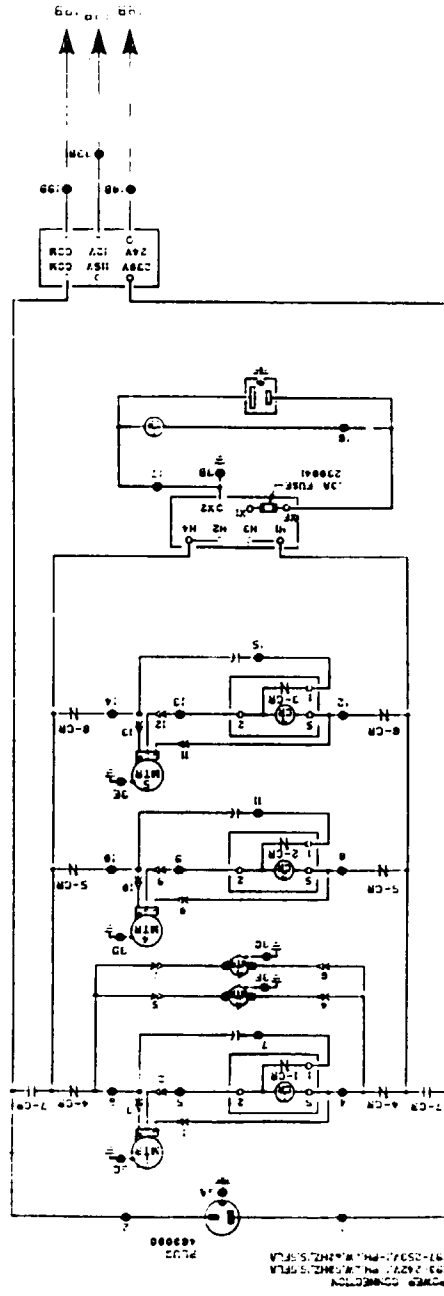
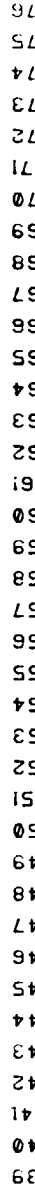
Forma Scientific

DIVISION OF MALLINCKRODT, INC.

ONE 940 NINTH AVE. NEW YORK, N.Y. 10019
TELEPHONE 212-692-1000, 212-692-1100

NOTES:
1. * DENOTES LOCATION IN CONNECTOR

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INSTALLATION, OPERATION AND SERVICE INSTRUCTIONS



6" TEMPERATURE, PRESSURE AND TIME-OF-OPERATION RECORDERS

RECEIVING INSPECTION

As soon as the recorder is received, visually inspect the shipping container for signs of damage or rough handling. If the container has been damaged, or if there is evidence of rough handling, inspect the recorder immediately to make certain that it is intact and has not been damaged in shipment.

TRANSIT LOSS

All Weksler instruments are insured against transit loss by breakage. To make this insurance effective all claims must be filed with the carrier at destination within one week of receipt of merchandise. No claims, regardless of the nature of same, will be accepted beyond this period.

PACKING

Each recorder is shipped together with accessory items listed below, as standard. When unpacking the recorder make certain that all of the items are accounted for, before disposing of the shipping container:

1. Charts: One box.
2. Ink: One bottle and applicator, for each pen.
3. One stainless steel pen cleaning wire (0.005 inch diameter).
4. One chart drive winding key (hand wound chart drive recorders only).

WEKSLER INSTRUMENTS CORPORATION

80 Mill Road, Freeport, NY 11520

GENERAL

Weksler Recorders are provided with universal mounting brackets, suitable for either surface (wall) or flush (panel) mounting. See page 4 for case mounting dimensions.

RECORDER CASE LOCATION

Select a location that is well lighted, free from dust, dirt and corrosive fumes. The instrument should not be located near any sources of heat or be subjected to sudden or extreme temperature changes. It should be mounted on a rigid support that is not subject to vibration. The case must be vertical and level.

TEMPERATURE RECORDER INSTALLATION

After the instrument has been mounted uncoil and stretch out the connecting tubing, placing the bulb at the location where the temperature is to be measured. Do not kink, twist or strain the connecting tubing. Remove the union bushing, separable socket, or other means of attachment from the bulb. Fasten the means of attachment to the process and insert the bulb and secure it in place. Starting at the bulb end, fasten the connecting tubing to a wall or other means of support where it will not be exposed to accidental damage. Avoid hot or cold pipes or any source of heat. Sufficient slack should be provided at the bulb so that it can be removed from the process. Do not bend connecting tubing on a radius of less than 3 inches. **IMPORTANT** — The connecting tubing cannot be extended or shortened. Any excess should be coiled and secured in place at the instrument end.

The bulb should be located in the process at the point that will provide the temperature indication that is most representative of the process. Adequate circulation of the measured medium around the bulb is necessary for fast response and accurate indication. Pockets or dead zones must be avoided. The bulb should not be placed in the path of the heating or cooling medium where it will be influenced by radiation losses to a cooler surface or radiation from a source of heat. It may be necessary to try several locations before final installation can be made.

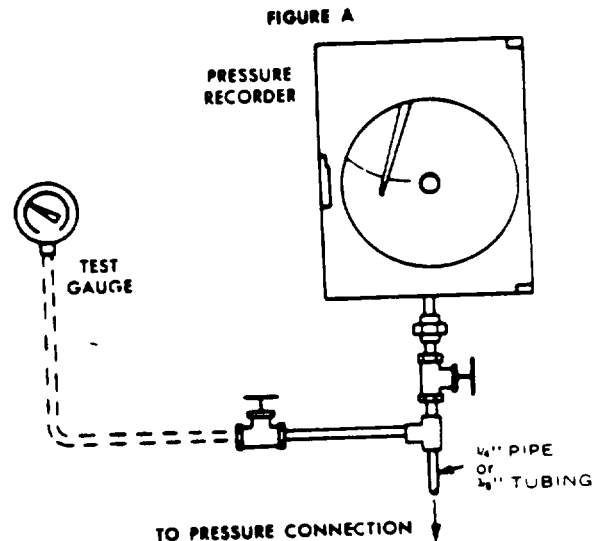
Where the bulb is to be installed at an elevation different than stamped on the instrument serial number plate serious error may result. Test the instrument as outlined under "Temperature Recorder Calibration Check", and make the necessary bulb elevation corrections.

PRESSURE/VACUUM RECORDER INSTALLATION

After mounting the instrument and before it is connected to the process, check the zero position of the pen. If necessary, using the micrometer adjustment screw on the pen arm, adjust the pen to be on the zero line of the chart.

The pipe or tubing used to connect the instrument to the process should be thoroughly clean. These should be no scale, rust or other foreign matter to come loose and plug the line. A sediment trap should be installed in the line at the process.

Connect the instrument to the process at the point at which the pressure is to be measured. Use $\frac{1}{4}$ " pipe or $\frac{1}{4}$ " tubing with flared fittings. Slope all horizontal lines toward the process at least $\frac{1}{8}$ " per foot, to permit drainage. Install a shut off valve in the pressure line to facilitate removal of the instrument without shutting down the process. It is recommended that a connection be provided at the instrument so its accuracy can be checked periodically.



If the process equipment is subject to vibration while in operation a length of flexible tubing should be installed in the connecting line, to prevent vibration being transmitted to the instrument.

Where the measured pressure fluctuates rapidly or is of a pulsating nature a suitable pulsation damper or pressure snubber should be used.

If the measured medium is steam a pigtail siphon filled with water should be installed in the line near the process.

Where it is desired to record pressure of media which will corrode or clog the Bourdon tube element a diaphragm attachment is recommended. A factory installed diaphragm will prevent the media from entering the recorder, without impairing the accuracy or sensitivity of the instrument.

RENEWAL OF CHART

To change the chart, lift the pen manually to provide adequate clearance for its removal. Remove the knob at the center of the chart. Install a new chart on the arbor and replace the chart knob. Rotate the chart until the correct time line on the chart coincides with the pen. Then tighten the chart knob firmly against the chart. Lower the pen(s) onto the chart. A small dot of ink appearing where the pen(s) touch the chart will indicate that the ink is flowing properly. If the ink fails to flow try touching the end of the nib with a moistened finger. If it still fails to write, clean the pen as outlined in paragraph "Cleaning the Pen".

CHART DRIVE

Weksler Recording Instruments are furnished with either electric or hand wound chart drives. If the instrument is equipped with a hand wound chart drive a winding key is furnished. Before applying the chart, wind the drive by inserting the winding key through the hole provided in the chart plate. The balance wheel is visible through another hole in the chart plate. Observe if, after winding, the drive is going. If not, insert the key again and alternately turn it in opposite directions gently but quickly, releasing the key after each turn. It is usually necessary to wind the chart drive each time when changing the chart.

When the instrument is equipped with an electric chart drive a terminal block is provided to which the electric service of the correct specifications must be connected. (See serial plate) The electric chart drive is self-starting and will run continuously. An external on-off switch can be installed in service line if the instrument is not to be used continuously. Both the hand wound and electric drives are readily replaced in the field. To order replacement drive specify "Chart Drive" number that is stamped on serial plate. Also specify the "Type" and "Serial" numbers of the instrument for which the replacement is intended.

INKING THE PEN

Procedure for THE INITIAL FILLING of the recording pen: —

1. Remove the pen from the pen arm in the following manner: — Hold the pen arm firmly with one hand at a point just above the pen holder. Grasp the pen holder (tapered sleeve) which carries the ink cup, with other hand and pull.
2. Remove the red cap from the plastic ink bottle.
3. Insert the nib of pen into the small hole at the tip of the bottle cap.
4. Gently squeeze the bottle. When cup is half full, remove the nib from the bottle cap.
5. Replace pen by pushing the pen holder firmly onto the pen arm as far as it will go. **DO NOT BEND THE PEN ARM.** Check ink flow by gently pushing the pen, with finger, to the left or right about $\frac{1}{2}$ inch.

Refilling of the pen is accomplished by applying 3 or 4 drops of ink directly into the cup.

CLEANING THE PEN

Remove the pen as described above. A length of 0.005 inch diameter stainless steel wire is supplied with each recorder for the purpose of cleaning the nibs of the capillary type pen. Insert the wire into the opening at the tip of the nib. Move the wire in and out several times. Refill with ink as described above for initial filling. Replace pen onto pen arm.

NOTE

Only a clean pen will assure a good record. In order to obtain continuous clean records at all times, it is recommended that the pen be cleaned periodically by washing it in alcohol, ammonia or hot water. If necessary, soak it for several minutes in boiling water. Dry thoroughly before refilling with ink.

TO ARC THE PEN

The radius of the time lines on the chart is $3\frac{1}{4}$ ". The inner pen is adjusted to track along the time line. The outer pen is adjusted to pass the inner pen within $\frac{1}{16}$ ". If these lengths are not correct the instrument will be out of calibration. To re-establish the correct length of the inner pen arm mark off a distance of $3\frac{1}{4}$ " from the corner along the edge of a piece of fairly stiff paper. Cut the paper into a strip about $\frac{1}{4}$ " wide. Slide the paper up behind and parallel to the pen arm until the end is against the shaft about which the pen arm moves. Loosen the screws that hold the pen arm and lengthen or shorten it until the point coincides with the mark on the paper. Adjust the length of the outer pen arm so that it passes the inner one within $\frac{1}{16}$ ". Adjust the time of operation pen to track on the same line as the inner pen.

OVER/UNDER RANGE

All Weksler Recorders are provided with stops that limit the movement of the pen to slightly more than is required to traverse the chart. They are also provided with an over/under range link that will permit the Bourdon tube to move beyond the limits of the range without damage to the linkage or pen movement. Weksler recorders can safely withstand over-range to 50% of the range span. However, if the recorder has been subjected to over-range in excess of 50% of the range span, its accuracy should be checked, as outlined in paragraph "Temperature Recorder Calibration Check" or, "Pressure/Vacuum Recorder Calibration Check".

TEMPERATURE RECORDER CALIBRATION CHECK

To check the calibration of a temperature recorder a test thermometer of known accuracy and a well agitated constant temperature bath are required.

Remove the bulb from the process. Place it in the agitated temperature bath with the test thermometer as close to it as is possible. The temperature of the bath should be approximately equal to the mid-point of the range. The bath must be at the same elevation relative to the instrument case as the bulb is when it is installed in the process. Allow approximately five (5) minutes before comparing the temperature indication of recorder with that of the test thermometer. If the temperature indicated by the recorder does not agree with that indicated by the test thermometer, adjust the recorder, using the micrometer screw on the pen arm, if the amount of adjustment required does not exceed $\frac{3}{16}$ " on the chart.

If more than $\frac{3}{16}$ " adjustment is required initial adjustment should be made by shifting the take-off lever at the Bourdon tube. Remove the chart plate (as outlined under "Removing the Chart Plate") and loosen the large screw that holds the lever to the stud at the center of the Bourdon tube. Move the lever until the pen indication on the chart agrees with the test thermometer approximately and tighten the screw. Make final adjustment with the micrometer screw on the pen arm. After this adjustment (exceeding $\frac{3}{16}$ " on the chart) it is necessary to check the accuracy of at least two other points on the chart, preferably at 10% and 90% of the range span. If the instrument is not accurate within tolerance of one scale division, at all

points tested, it should be returned to Weksler Instruments Corporation, for factory recalibration. A brief statement of reason for return should accompany the instrument.

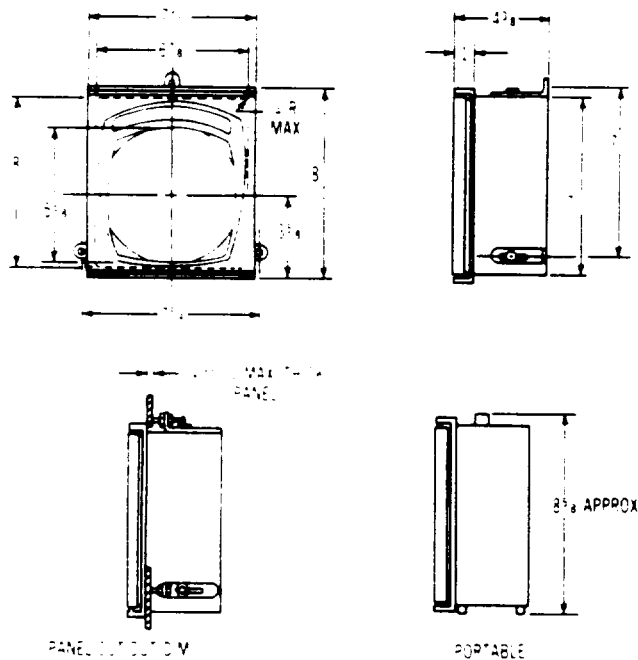
PRESSURE/VACUUM RECORDER CALIBRATION CHECK

Weksler Pressure and Vacuum Recorders are calibrated accurately to the chart at the factory. **However**, it is recommended that they be checked for accuracy periodically.

Connect a test gauge (of known accuracy) as shown on page 2, Fig. A. If the pressure indicated by the recorder does not agree with that indicated by the test gauge adjust the recorder, using the micrometer screw on the pen arm, if the amount of adjustment required does not exceed $\frac{1}{32}$ " on the chart.

If more than $\pm 0.2\%$ adjustment is required initial adjustment should be made by shifting the take-off lever at the Bourdon tube. Remove the chart plate (as outlined under "Removing the Chart Plate") and loosen the large screw that holds the lever to the stud at the center of the Bourdon tube. Move the lever until the pen indication on the chart agrees with the test gauge approximately and tighten the screw. Make final adjustment with the micrometer screw on the pen arm. After this adjustment (exceeding $\pm 0.2\%$ on the chart) it is necessary to check the accuracy of at least two other points on the chart, preferably at 10% and 90% of the range span. If the instrument is not accurate within tolerance of one scale division, at all points tested, it should be returned to Wexsler Instruments Corporation for factory recalibration. A brief statement of reason for return should accompany the instrument.

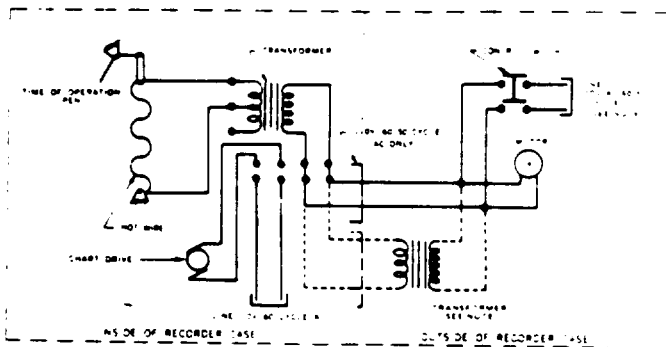
RECORDER CASE DIMENSIONS



TIME-OF-OPERATION RECORDER

The Time-of-Operation pen is operated by the thermal expansion and contraction of a length of high resistance wire, connected to the pen arm. The "hot wire" is energized by a transformer.

In operation the primary of the transformer (A.C. only) is connected *in parallel* with the equipment on which a time-of-operation record is desired. A terminal block is provided within the instrument case for this purpose. Make all connections in accordance with diagram below.



When the circuit is energized heats the "hot wire" causing it to increase in length. The pen is deflected towards the center of the chart by approximately $\frac{1}{4}$ ". It takes about 10 seconds to complete this movement. When the circuit is de-energized the "hot wire" cools and the pen returns to its original position. The resultant step pattern is a record of the "ON" and "OFF" periods when checked with the time lines on the chart.

NOTE

If the equipment to be timed requires power supply other than 110 Volt 60/50 cycle Alternating Current, a suitable matching transformer should be installed externally, as shown by dotted lines in diagram.

REPLACEMENT OPERATIONAL PARTS *

Pen #1.....	M25-18
Pen #2 (#1 Pen on a one pen recorder).....	M25-19
Pen Arm #1.....	M13-202
Pen Arm #2 (#1 Arm on a one pen recorder).....	} M13-208
Pen Arm #2, T-of-O.....	
Chart Hub, Hand Wound.....	M12-607
Chart Hub, Elec. Drive.....	M12-456
Chart Knob w/Chain.....	M27-95A
Chart Drive.....	See # on Serial # Plate
Door Latch Roller.....	M12-593
Door Latch Bushing.....	M12-594
Door Latch Hook.....	M27-350
Door Latch Handle.....	M27-161
Door Latch Roll Pin.....	M14-371
Glass Front.....	M6-63
Clip, for Glass.....	M13-399
Screw, for Glass Clip.....	M14-358
Door Gasket.....	M23-59
Chart Plate.....	M13-30*
T-of-O Wire Ass'y.....	M24-34A

*Factory calibrated thermal systems are available. When ordering a replacement system, give recorder serial number.

GENERAL USE LABORATORY DISINFECTANTS FROM FORMA SCIENTIFIC

AMIPHYL® Spray

DISINFECTANT-DEODORANT

O-Syl DISINFECTANT-
DETERGENT

ROCCAL II

SANITIZING AGENT/
GERMICIDE-ALGICIDE
DEODORIZER

For use in and around the laboratory. Perfect for cleaning incubators. Ideal for biological storage freezers, glassware washers, baths and circulators . . . anywhere you must prevent cross contamination, reduce chances of infection.

distributed by:



Forma Scientific

DIVISION OF MALLINCKRODT, INC.

BOX 649 MARIETTA, OHIO 45750 TELEX 29-8205
TOLL FREE USA 800-848-3080, OHIO 614-373-4763

AMPHYL[®] Spray

DISINFECTANT-DEODORANT

E.P.A. Reg. No. 675-25-AA

ABSORBS ODORS, CUTS DOWN CONTAMINATION.

Amphyl Spray is a true laboratory disinfectant. That means it's effective against Staphylococci, Pseudomonas, Tubercle Bacilli, Coliform, and various fungi, including mold and mildew. Spraying for two to three seconds, until surfaces are wet, helps prevent cross contamination even in hard to reach areas.

MICROBIOLOGICAL TESTS:

- I. METHOD: A.O.A.C. (11th Edition) Germicidal Spray Method — Official
AGAINST: Staphylococcus aureus — 180 slides tested; 0 growth
Salmonella choleraesuis — 90 slides tested; 0 growth
Pseudomonas aeruginosa — 90 slides tested; 0 growth
Trichophyton interdigitale — 20 slides tested; 0 growth
- II. METHOD: A.O.A.C. (11th Edition) Tuberculocidal Activity Tests
10 slides tested and cultured in Proskauer-Beck Middlebrook and Kirchner media; 0 growth
- III. METHOD: Virucidal Activity Test Method of Dr. Morton Klein, Temple University, accepted by E.P.A.
AGAINST: Herpes simplex, Vaccinia and Influenza A-2
RESULTS: All viruses treated with AMPHYL Spray Disinfectant were completely inactivated.
- IV. METHOD: E.P.A. Pesticide Regulation Division, March 19, 1969, Hard Surface Mildew Fungistatic Test.
AGAINST: Aspergillus niger, used as required.
RESULTS: No growth observed during 30 days' incubation.
- V. METHOD: E.P.A. Pesticide, Regulation Division, March 19, 1969, Fungicidal Activity (for mold & mildew)
AGAINST: Aspergillus niger
RESULTS: 20 slides tested — 0 growth
- VI. METHOD: E.P.A. Pesticide Regulation Division, March 19, 1969, Fabric Mildew Fungistatic Test
AGAINST: Aspergillus niger and Penicillium variable, used as required
RESULTS: No growth observed during 30 days' incubation.

ORDERING INFORMATION:

Catalog No.	Minimum Order
170002	1 case (twelve 14 oz. Aerosol Cans)



E.P.A. Reg. No. 675-24-AA

A COMBINATION CLEANER AND DISINFECTANT WITH A BROAD-SPECTRUM ANTIMICROBIAL ACTIVITY.

O-SYL destroys a wide variety of pathogenic organisms on environmental surfaces including *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Candida albicans*, and *mycobacterium tuberculosis* at a use-dilution of 1:128. It is also virucidal against such common viruses as Influenza A-2, Herpes simplex, vaccinia, and Adenovirus Type 2.

This phenolic disinfectant-detergent can be used for general disinfecting and cleaning laboratory floors, walls, fixtures, and laboratory equipment.

O-SYL is effective in the presence of organic matter, it is useful for disinfecting areas or articles contaminated by purulent material, blood, serum, or excreta even when the pathogen is the tubercle bacillus.

MICROBIOLOGICAL TESTS:

Tests against various organisms (Tested in both 400 ppm hard water and distilled water) (O-SYL at a Use-Dilution of 1:128). Test Procedure: As described by Official Methods of Analysis of the Association of Official Analytical Chemists: 61-63, 11th Edition, Washington, D.C., 1970, but modified where necessary for the specific microorganism.

TEST ORGANISM	SUBCULTURE MEDIA	RESULT OF 10 MIN. USE-DILUTION (NO OF CYLINDERS PLUS OF EACH 20 TESTED
<i>Salmonella choleraesuis</i> ATCC 10708	Letheen Broth	0
<i>Salmonella paratyphi</i> ATCC 9281	Letheen Broth	0
<i>Salmonella schottomuelleri</i> ATCC 10719	Letheen Broth	0
<i>Shigella dysenteriae</i> ATCC 11835	Letheen Broth	0
<i>Enterobacter aerogenes</i> ATCC 13048	Letheen Broth	0
<i>Proteus vulgaris</i> ATCC 9920	Letheen Broth	0
<i>Escherichia coli</i> AMC 198 (ATCC 11229)	Letheen Broth	0
<i>Pseudomonas aeruginosa</i> ATCC 15442	Letheen Broth	0
<i>Klebsiella pneumoniae</i> ATC 9997	Letheen Broth	0
<i>Neisseria elongata</i> ATCC 25295	Letheen Broth	0
<i>Serratia marcescens</i> ATCC 8195	Letheen Broth	0
<i>Staphylococcus aureus</i> 209 ATCC 6538	Letheen Broth	0
<i>Staphylococcus aureus</i> 80/81 (Penicillin resistant)	Letheen Broth	0
<i>Streptococcus faecalis</i> ATCC 828	TSB w/Letheen	0
<i>Streptococcus pyogenes</i> ATCC 12384	TSB w/3% sheep blood	0
<i>Streptococcus salivarius</i> ATCC 9222	TSB w/3% sheep blood	0
<i>Corynebacterium diphtheriae</i> ATCC 11913	TSB w/Letheen	0
<i>Candida albicans</i> ATCC 10231	F-Broth w/Letheen	0
<i>Trichophyton interdigitale</i> ATCC 640	F-Broth w/Letheen	0

ORDERING INFORMATION:

Catalog No.	Minimum Order
170001	1 case (six 1 gallon bottles)

ROCCAL II

10 SANITIZING AGENT,
GERMICIDE-ALGICIDE
DEODORIZER

E.P.A. Reg. No. 675-30-AA

BACTERICIDAL, KILLS MILDEW, PREVENTS GROWTH OF ALGAE IN WATER-JACKETED INCUBATORS.

ROCCAL II 10% is germicidal sanitizing agent effective against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, and *Salmonella choleraesuis* when diluted 1 oz. per gallon (800 ppm).

ROCCAL II 10% is also used as an algae preventative in incubator water jackets. Five milliliters added to each 18 gallon Forma Water-Jacketed Incubator when filling will provide lasting protection . . . will not harm sensitive temperature probes. ROCCAL II 10% is also used to prevent microbial growth in humidity reservoirs when diluted 2 milliliters per liter demineralized water.

ORDERING INFORMATION:

Catalog Number	Minimum Order
170003	1 case (four 1 gallon bottles)



GUARANTEE

Modern manufacturing facilities and careful laboratory control assure materials of uniform quality at all times. National Laboratories' products are unconditionally guaranteed to give complete satisfaction when used as directed or they may be returned for credit.

Amphy, O-SYL, and ROCCAL II are registered trademarks of National Laboratories.

FORMA STANDARD PRODUCT WARRANTY

Dear Customer:

Good performance is what you expect when you buy products from Forma Scientific. We, too, are concerned about performance. That's why we offer the following One Year Protective Warranty:

The Warranty Period starts two weeks from the date your equipment is shipped from our factory. This allows for ample shipping time so that the warranty will go into effect at approximately the same time your equipment is delivered. This same protection extends to any subsequent owner during the warranty period.

During the one year warranty period, component parts proven to be defective in materials or workmanship will be repaired or replaced at our expense, labor included. Installation and calibration is not covered by this warranty agreement. The Forma Scientific Service Department must be contacted for warranty determination and direction prior to any work being done.

Expendable items such as glass, filters, pilot lights, light bulbs, and door gaskets are excluded from this warranty coverage. Naturally, our warranty does not cover damage caused by accident, misuse, fire, flood, or acts of God.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original one year warranty period. The Forma Service Department must give prior approval for the return of any components or equipment.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Forma Scientific shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

A word on installation and operation. We know you expect a proper installation. Your local Forma Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation, and preventive maintenance.

And about equipment service? Let's face it. Even the best products need service. If this occurs, please call your Forma Service Office at 1-800-848-3080 in the USA. (Ohio customers call 1-800-421-3080, and Canadian customers 1-800-327-3080.) We're ready to answer your questions on equipment warranty, operation, maintenance, service and special applications.

We encourage you to keep this warranty explanation. You may never need it, but it's nice to know the protection is there.

Sincerely,
FORMA SCIENTIFIC
DIVISION OF MALLINCKRODT, INC.

CONDITIONS AND TERMS OF SALE

SPECIFICATIONS AND MATERIAL CHANGES: Forma Scientific reserves the right to offer our latest and improved models at time of shipment.

SHIPMENTS: All shipments are FOB Marietta, Ohio, freight prepaid and add. Unless specific shipment instructions are provided, shipment will be made by the least expensive method.

PRICES: All prices are firm for the delivery period specified, based on receipt of a purchase order within 30 days. Purchase Orders received after this time are subject to review and price adjustment. If, after acceptance of a Purchase Order the required delivery date is modified by the customer, Forma reserves the right to adjust the price to recover additional expenses incurred, due to increase in labor or material cost (including mark-up), inventory expenses, and such like. In addition, Forma Scientific will be entitled to invoice and receive payment for 90% of the value of labor and material expended.

TAXES: The prices quoted do not include any state, local or federal taxes.

PAYMENT: All payments are net 30 days from date of shipment. Order acceptance is subject to approval of our Credit Department.

CANCELLATION: Orders shall not be subject to cancellation unless cancellation charges are paid by the purchaser. Custom, non-catalog and modified units are not subject to cancellation under any condition.

DAMAGES OR SHORTAGES: Claims for shortages in shipment must be made within 5 working days of receipt of material. If the outer crate or carton is damaged in any way, customer should not sign the bill of lading until the carrier notes such damage on the bill of lading. Without this notation, carriers usually refuse customer damage claims. Unauthorized returns of goods will be refused at Forma's dock. Authorized returned goods will be allowed at a 20% restocking charge plus whatever expenses are necessary to return material to first class, saleable condition. Custom fabricated or modified equipment is not subject to return under any condition.

DELIVERY: Delivery dates are approximate and based on production at time of quotation. Forma shall not be liable for damages to the buyer for any default or delay in delivery for any reason. Every effort shall be made to meet the delivery quoted, but failure to meet the estimated delivery will not be considered cause for cancellation and/or claims which may arise from such delay.

LIMITATION OF LIABILITY: In no event, whether as a result of breach of contract, warranty or tort (including negligence and strict liability) shall Mallinckrodt, Inc. or its division Forma Scientific (both noted hereinafter as Mallinckrodt) be liable for any consequential or incidental damages including but not limited to, loss of profit or revenues, loss of use of the equipment or any associated equipment, down-time costs, cost of substitute equipment, costs of labor, costs due to delays or claims of Customer's own customers for such damages. Customer agrees to indemnify Mallinckrodt and hold Mallinckrodt harmless from any and all liability, claims, demands, actions, suits, expenses or costs, including reasonable attorney's fees relating to such consequential or incidental damages.

The responsibility of Mallinckrodt for damages due to injuries, or the death of employees of the Customer, or ultimate user of the equipment being serviced, caused by the equipment, shall be limited to that portion of such damages as might be attributable to the negligence of strict liability of Mallinckrodt. The Customer and ultimate user agree to indemnify Mallinckrodt and hold Mallinckrodt harmless from any further damages, indemnity or contribution. All warranties, limitations of liability and indemnities provided herein will survive the termination of this agreement.

Mallinckrodt's liability for any claim of any kind (including negligence and strict liability) for any loss or damage arising out of, or resulting from, this agreement or from the performance or breach thereof, or from the Services, Products or Parts furnished hereunder shall in no case exceed the price of the same giving rise to the claim.

INSTALLATION: Installation of all equipment shall be by, and at the expense of, the purchaser unless quoted herein. When installation is quoted it is understood that elevator service will be made available to Forma Scientific at no charge to move the equipment to specified locations. If elevator service is not available or if access to the specified location is not adequate, Forma Scientific reserves the right to bill the purchaser for the additional cost of work required.

ACCEPTANCE: Orders, terms and specifications are subject to approval of Forma Scientific, Home Office. No variation shall be binding unless in writing signed by a Forma executive officer.

Operating Instructions for Type 30400 Automatic Furnace

Series 412 Serial Number_____

Model No.	Phase	Voltage	Display
F30420C	1	240	°C
F30420F	1	240	°F
F30428C	1	208	°C
F30428F	1	208	°F

Type 30400 Programmable Furnace

Series 412 Serial Number_____

Model No.	Phase	Voltage	Display
F30430C	1	240	°C
F30430F	1	240	°F
F30438C	1	208	°C
F30438F	1	208	°F
F30440	1	240	°F & °C
F30448	1	208	°F & °C
F30450	1	240	°F & °C
F30458	1	208	°F & °C

INSTRUCTION INFORMATION

THIS MANUAL CONTAINS IMPORTANT OPERATING AND SAFETY INFORMATION. THE USER MUST CAREFULLY READ AND UNDERSTAND THE CONTENTS OF THIS MANUAL PRIOR TO USE OF THIS EQUIPMENT.

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SAFETY INFORMATION

Your Thermolyne furnace has been designed with function, reliability and safety in mind. It is the users responsibility to insure conformance with required electrical codes. For safe operation, please observe the following:

WARNINGS

TO AVOID ELECTRICAL SHOCK, THIS FURNACE MUST:

- 1) BE INSTALLED BY A COMPETENT, QUALIFIED ELECTRICIAN WHO INSURES COMPATIBILITY AMONG FURNACE SPECIFICATIONS, POWER SOURCE AND GROUNDING CODE REQUIREMENTS.**
- 2) ALWAYS BE DISCONNECTED FROM THE POWER SUPPLY PRIOR TO MAINTENANCE AND SERVICING.**
- 3) HAVE THE DOOR SWITCH OPERATING PROPERLY.**

DO NOT USE IN THE PRESENCE OF FLAMMABLE OR COMBUSTIBLE CHEMICALS. FIRE OR EXPLOSION MAY RESULT; THIS DEVICE CONTAINS COMPONENTS WHICH MAY IGNITE SUCH MATERIALS.

TO AVOID BURNS, THIS FURNACE MUST:

- 1) NOT BE TOUCHED ON THE EXTERIOR OR INTERIOR FURNACE SURFACES DURING USE OR FOR A PERIOD OF TIME AFTER USE.**

SIGNAL WORDS

"WARNING" notes apply when there is a possibility of personal injury.

"CAUTION" notes apply when there is a possibility of damage to equipment.

"NOTES" alert the user to pertinent facts and conditions.

DESCRIPTION

A. Intended Use

1. The Type 30400 Automatic and Programmable furnaces are general laboratory and heat treating furnaces. Standard models are intended for applications requiring temperatures from 400°F (204°C) to 1800°F (982°C) for continuous use, or temperatures from 1800°F (982°C) to 2000°F (1093°C) for intermittent use. Continuous use is operating the furnace for more than 3 hours and intermittent use is operating the furnace for less than 3 hours.
2. The unit consists of 1) a heating chamber and 2) an automatic proportioning digital set, digital read control with an overtemperature protection and 3) a door interlock relay for user safety.
3. The Type 30400 Programmable furnace is designed to control a programmed temperature profile. The profile is in the format of ramps and dwell segments. The first ramp, RAMP 1, starts at the initial measured furnace temperature. This ramp is positive going at a programmed rate until the programmed level is reached. The setpoint will stay at this level for a period determined by the setting of DWELL 1. Additional positive or negative going ramp are now initiated starting at the level at the end of DWELL 1. When the second ramp reaches the second programmed level, the setpoint stays at that level for the duration of the segment. Depending on the program model ordered, additional ramp and dwell segments may be added. See specific model number below for total number of program segments.

Model Number	Digital Commun.	Number of Ramp Segment	Number of Dwell Segments	Number of Stored Programs
F30430C	NO	2	2	1
F30430F	NO	2	2	1
F30438C	NO	2	2	1
F30438F	NO	2	2	1
F30440	YES	.	.	16
F30448	YES	.	.	16
F30450	YES	8	8	1
F30458	YES	8	8	1

*Comb. of 256

4. The Type 30400 Automatic furnace is designed as a single set point automatic temperature controlled furnace able to reach and maintain one temperature value.

B. Principles of Operation

1. **Furnace:** The furnace chamber is heated by four electric resistance heaters which are embedded in a refractory material. The chamber is insulated with a ceramic fiber insulation. The temperature is controlled by an automatic proportioning controller using a platinum thermocouple. The control is located under the furnace chamber and well insulated from the heat generated in the furnace chamber. The door hinges may be attached for either left or right hand opening.
2. **Temperature Controller: "Automatic":** This furnace controller consists of a micro-processor based three mode temperature controller with integral programmable overtemperature protection and appropriate output switching devices to control the furnace.

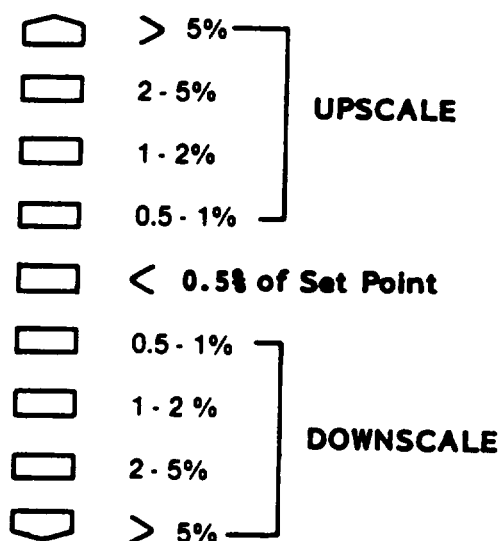
3. **Temperature Controller. "Programmable":** This furnace controller consists of a microprocessor based three mode temperature controller/programmer with integral programmable overtemperature protection and appropriate output switching devices to control the furnace.

NOTE: When in the program RUN mode, the programmer/controller serves to provide a programmed temperature profile as described earlier. When in the RESET mode, the unit serves as a single setpoint automatic temperature controller.

NOTE: Following does not pertain to models F30440, F30448, F30450, and F30458.

The digital readout continuously displays chamber temperature. If either the up or down button is momentarily depressed, the display will indicate the setpoint temperature for five seconds and then revert to actual furnace temperature.

The nine segment bar graph situated to the left of the digital readout provides error percentages of measured value of temperature with respect to the setpoint temperature. Illumination of the center bar only indicates within $\pm 0.5\%$ of setpoint. The bars above and below center signify the following percentages:



Whenever a parameter other than measured value is being displayed, a flashing dot will appear at the top left of the display.

NOTE: In the event of a thermocouple break (open circuit), the numeric display increases and goes blank. The alarm LED is illuminated and the upper four segments of the deviation bars graph are illuminated. At this time the controller output signal ceases.

GENERAL SPECIFICATIONS

MODEL NO.		F30420C F30420F	F30430C / F30430F F30440 / F30450	F30428C F30428F	F30438C / F30438F F30448 / F30458	
LISTING		UL				
		CSA				
DIMENSIONS IN. (CM)	OVERALL	WIDTH	21 ½ (55)	21 ½ (55)	21 ½ (55)	
		HEIGHT	29 ½ (75)	29 ½ (75)	29 ½ (75)	
		DEPTH	25 ½ (65)	25 ½ (65)	25 ½ (65)	
	CHAMBER	WIDTH	14 (35)	14 (35)	14 (35)	
		HEIGHT	14 (35)	14 (35)	14 (35)	
		DEPTH	14 5/8 (37)	14 5/8 (37)	14 5/8 (37)	
WEIGHT LBS. (KG)		188 (86)	188 (86)	188 (86)	188 (86)	
ELECTRICAL RATINGS	VOLTS		240	240	208	208
	AMPS		22.9	22.9	26.4	26.4
	WATTS		5500	5500	5500	5500
	FREQUENCY		50/60	50/60	50/60	50/60
	PHASE		1	1	1	1
TEMP. RATINGS °F (°C)	CONTINUOUS		1800 (982)	1800 (982)	1800 (982)	1800 (982)
	INTERMITTENT		2000 (1093)	2000 (1093)	2000 (1093)	2000 (1093)

CONTROLLER CONFIGURATION

FIG. 1

Automatic Control
Panel Layout

MODELS:

F30420C
F30420F
F30428C
F30428F

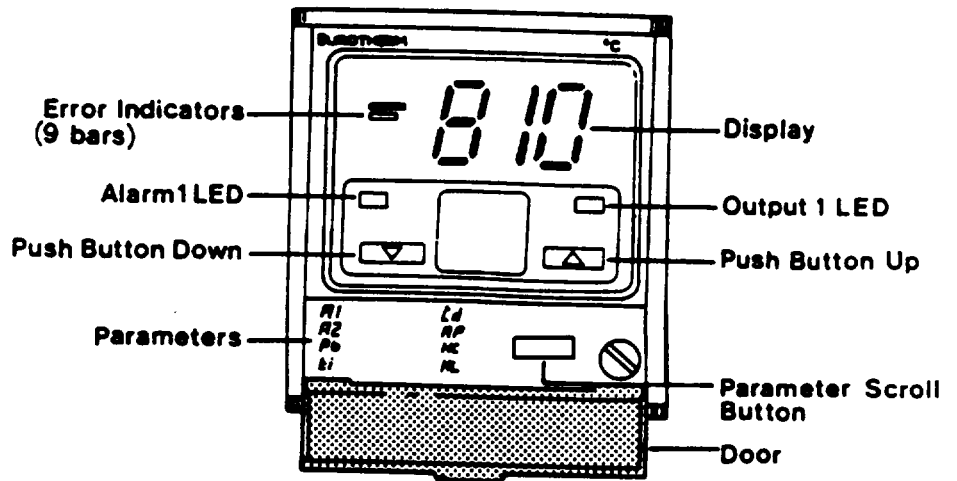


FIG. 2

Programmable Control
Panel Layout

MODELS:

F30430C
F30430F
F30438C
F30438F

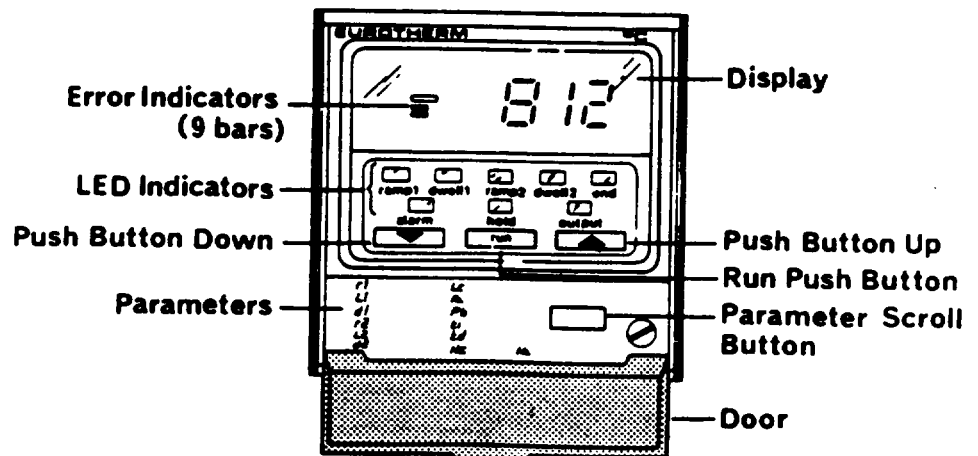
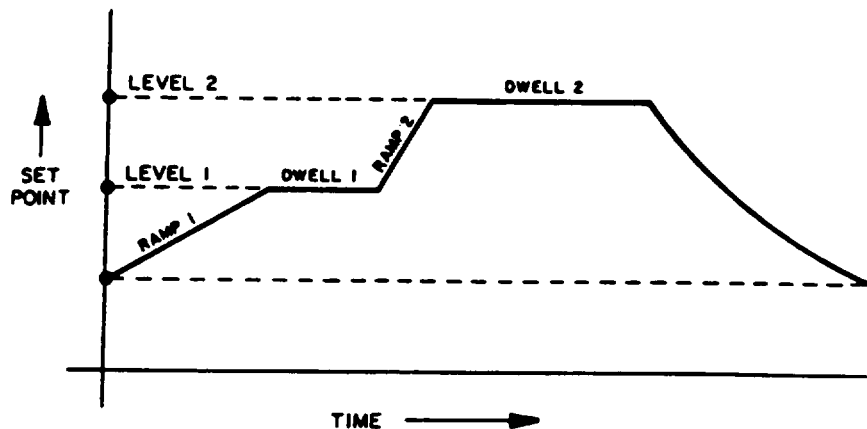


FIG. 3

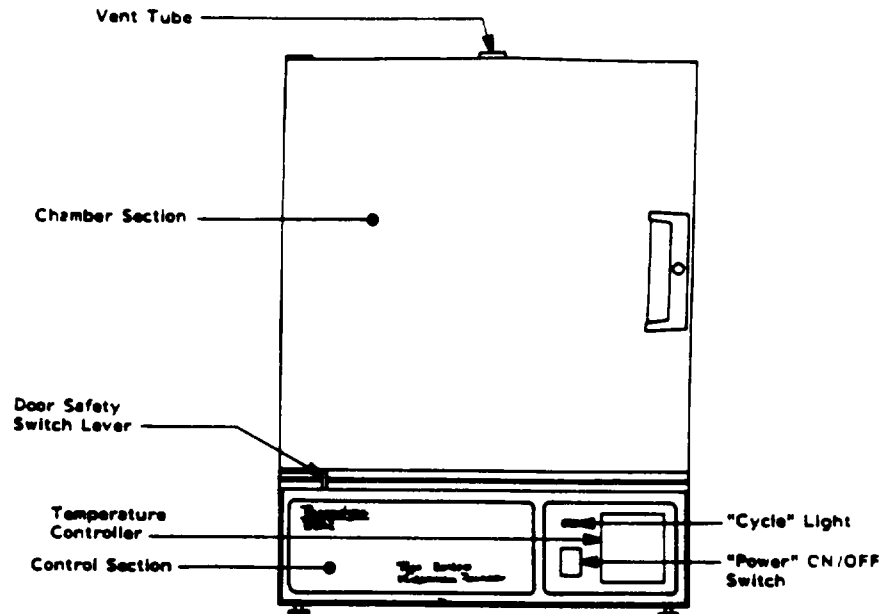
Typical Profile For
Programmable Models
Above. Other Profiles
May Be Formed.



30400 FURNACE CONFIGURATION

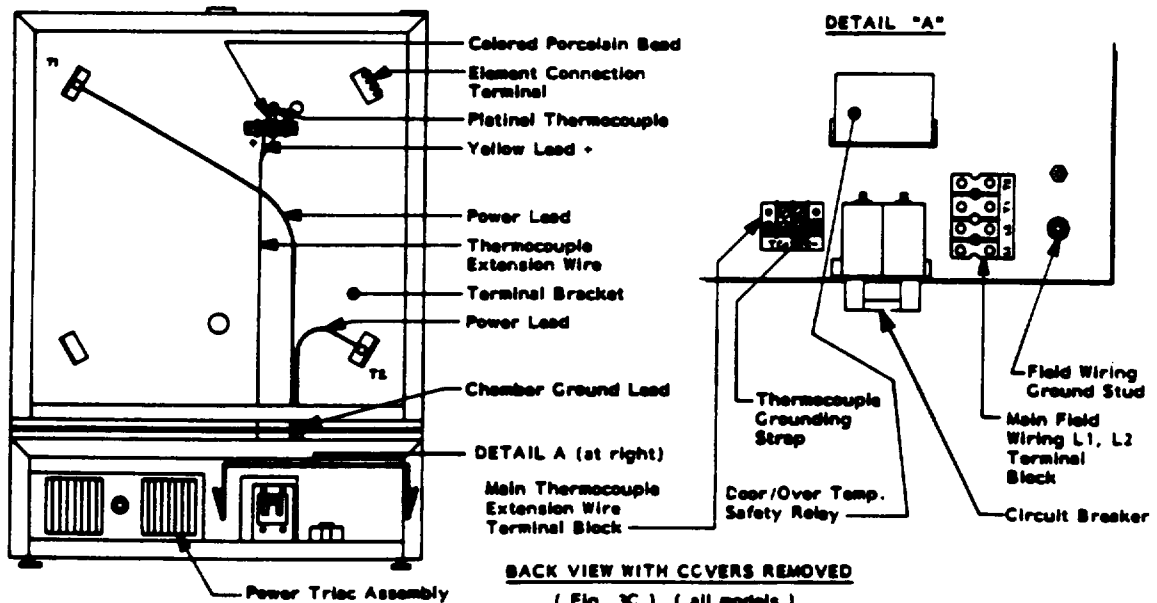
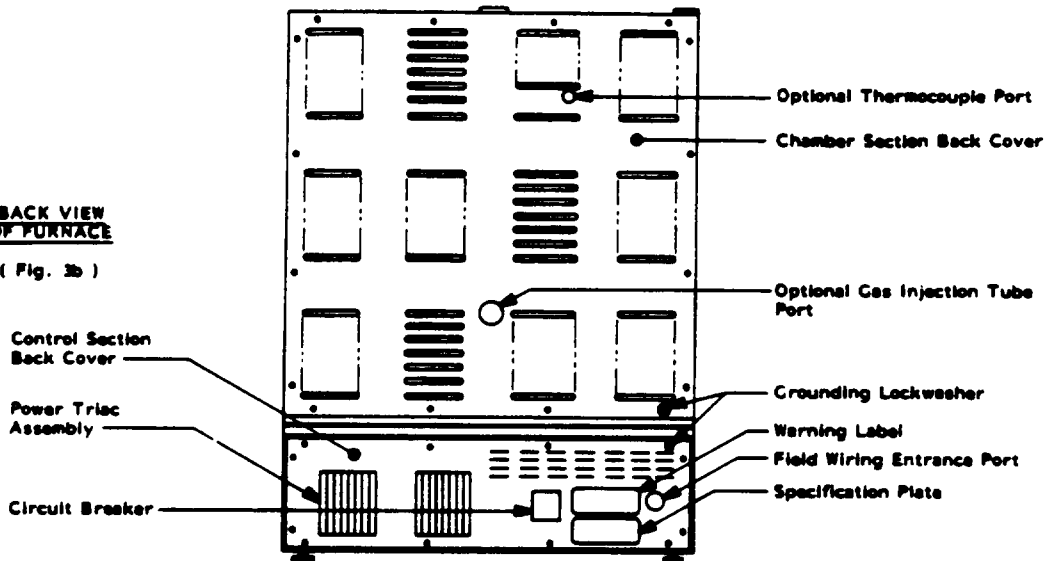
FRONT VIEW OF FURNACE

(Fig. 3a)



BACK VIEW OF FURNACE

(Fig. 3b)



UNPACKAGING

- 1-1. Unpack furnace from box. After unpacking the furnace, open door and remove packing material from inside the furnace chamber. THE TYPE 30400 FURNACES DO NOT COME WITH A POWER CORD BECAUSE CURRENT REQUIREMENTS ARE TOO GREAT TO BE HANDLED BY ORDINARY POWER CORDS AND STANDARD WALL SUPPLY.
- 1-2. Vacuum the chamber prior to use to remove the insulation dust due to shipment.

INSTALLATION

- 2-1. Site Selection: Install furnace on a sturdy surface and allow space for ventilation. CAUTION: Be sure ambient temperature does not exceed 104°F (40°C). Ambients above this level may result in damage to the controller.

CAUTION: Allow at least six inches of space between the furnace and any vertical surface. This permits the heat from furnace case to escape so as not to create a possible fire hazard.

- 2-2. The electrical specifications are located on the specification plate on the back of the furnace. Consult Thermolyne if your electrical service is different than those listed on the specification plate. Prior to connecting your type 30400 furnace to your electrical supply, be sure the front power switch and rear circuit breaker are in the OFF position.

WARNING

TO AVOID ELECTRICAL SHOCK, THIS FURNACE MUST BE INSTALLED BY A COMPETENT, QUALIFIED ELECTRICIAN WHO INSURES COMPATIBILITY AMONG FURNACE SPECIFICATIONS, POWER SOURCE AND GROUND CODE REQUIREMENTS.

- 2-3. Your 30400 furnace may be wired either directly through a conduit system or by using a power cord and plug which conforms to the National Electrical Codes and electrical code requirements of your area. The terminal block to be used in wiring is located on the lower rear of the furnace. (See Page 7, Fig. 3C.)

2-4. Operational Check:

- A. Temperature Parameters. "Automatic" Models (F30420C, F30420F, F30428C, F30428F)

NOTE: To be sure the temperature control parameters have not been altered during shipment, follow the subsequent procedures:

1. Turn the power source to the unit "ON".
2. Turn the circuit breaker located at the rear of the furnace to "ON".
3. Turn the "ON/OFF" front power switch to "ON". The digital display should be reading chamber temperature.

4. Depress and hold the "Down" push button. The display screen will show the temperature set point currently loaded into the control. After five seconds the display value will begin to scroll down scale. Maintain holding in the "Down" push button until the display reads zero.

NOTE: When performing "operational check" it is important that the set point is set at zero so that the furnace is not heating during the check out procedures.

5. Open the door on the "Parameter" portion of the controller and verify that the proper parameters are still loaded into the controller's memory.

NOTE: When performing the following steps remember that if you depress and release either the "scroll", "up" or "down" push buttons and more than five to ten seconds elapse before the buttons are used again the following will occur:

The display screen will automatically switch back to displaying chamber temperature. If this happens you will have to step through each parameter until you reach the point at which the interruption occurred. The parameter values you checked earlier, however, will not be lost or altered.

- a. AL₁ - Alarm (overtemperature protection)

NOTE: The controller is fitted with a mechanical relay which is de-energized in the alarm mode. This relay when de-energized removes power from the heating element. The overtemperature protection can be preset from 0 to 50 degrees above set point. The OTP is a trackable OTP and follows the set point by a preset temperature value you put in at this step. If the primary control circuit fails, the OTP will control the furnace temperature at the preset value above your set point. It does not shut off the furnace but will maintain it at that value.

Depress and release the scroll button, AL₁ will be displayed. After two to three seconds AL₁ will be replaced by a value. This is the OTP value. Depress either the "UP" or "DOWN" push button to select the OTP value you desire. The OTP range is 0-50 degrees. Thermolyne recommends 15 to 20 degrees as a standard value.

- b. Depress and release the scroll button, AL₂ will be displayed, after two to three seconds AL₂ will be replaced by a value of 0 to 5. Proceed to step "C" as the alarm is inactive and can not be used.

NOTE: The next three parameters, Proportional Band, Integral and Derivative are the three control parameters of a P.I.D. control system. These values should be set and maintained per the following:

- c. Pb - Proportional Band. Depress and release the scroll button, Pb will be displayed. After two to three seconds the value "2" will be displayed. If "2" is not displayed depress the "UP" or "DOWN" push buttons to put in the proper value. For each value change depress the push button one time. In this parameter the values do not scroll up or down but must be stepped by depressing the push button each time.
- d. TI - Integral. Depress and release the scroll button, ti will be displayed. After two to three seconds the value "150" will be displayed. If "150" is not displayed, depress the "UP" or "DOWN" push button as instructed in step "C" until the proper value is displayed.
- e. Td - Derivative. Depress and release the scroll button, td will be displayed. After two to three seconds the value "15" will be displayed. If "15" is not displayed, depress the "UP" or "DOWN" push button as instructed in step "C" until the proper value is displayed.

f. Ap - Approach - NOTE: This parameter aids the control in preventing temperature overshoots. If the temperature you are operating at produces excessive overshoots, increase the Approach parameter by "ONE" setting at a time until desired results are obtained. Increasing Approach increases the time the furnace takes to reach set temperature. Depress and release the scroll button, Ap will be displayed. After two to three seconds the value "1.5" will be displayed. If "1.5" is not displayed, depress the "UP" or "DOWN" push button as instructed in step "C" until the proper value is displayed.

g. Hc - Heat cycle time.

NOTE: This parameter determines the speed at which the power switching device (relay, scr, triac or solid state relay) can be turned on and off. Do not change this value or damage to the switching device could result.

Depress and release the scroll button, Hc will be displayed. After two to three seconds the value "0.3" will be displayed. If "0.3" is not displayed, depress the "UP" or "DOWN" push button as instructed in step "C" until the proper value is displayed.

h. H1 - Maximum Power (%)

NOTE: This parameter limits the average maximum power that is applied to the heating elements. Normal setting is 100%. If you plan to use the furnace below 260°C (500°F) the output power may be reduced. This will significantly shorten the time it takes for stabilization. It will also reduce drastic temperature overshoots. Contact Thermolyne Customer Service for advice on the proper value to use. Remember that this parameter does not reduce the voltage to the elements by cycling power on and off. It reduces the average power to the elements.

Depress and release the scroll button, H1 will be displayed. After two to three seconds the value "100" will be displayed. If "100" is not displayed, depress the "UP" or "DOWN" push button, after five seconds the value will begin to scroll up or down. Release the button when the value "100" is displayed.

i. Depress and release the scroll button. "END" will be displayed. After five seconds "END" will disappear and the chamber temperature will be displayed on the display screen.

CONTROL PARAMETERS FOR AUTOMATIC MODELS

Alarm (deg)	20
Prob. Band (%)	2.0
Integral (secs)	150
Derivative (secs)	15
Approach	1.50
Cycle Time (secs)	0.3
Maximum Power (%)	100

B. Temperature Parameters. "Programmable Models (F30430C, F30430F, F30438C and F30438F)

NOTE: Check to be sure the temperature control parameters have not been altered during shipment, follow the subsequent procedures:

1. Turn the power source to the unit "ON".

2. Turn the circuit breaker located at the rear of the furnace to "ON".
3. Turn the "ON/OFF" front power switch to "ON". The digital display should be reading chamber temperature.

NOTE: If the Dwell 1, Ramp 1, Dwell 2, or Ramp 2 LED light is illuminated, depress both "UP" and "DOWN" push buttons simultaneously to reset the controller to the single set point control mode.

4. Depress and hold the "Down" push button. The display screen will show the temperature set point currently loaded into the control. After five seconds the display value will begin to scroll down scale. Maintain holding in the "Down" push button until display reads zero. Remember that when the control is not in the program mode and the power is turned on, the furnace will heat to the temperature value you have put in at this step.

NOTE: When performing "operational check" it is important that the set point is set at zero so that the furnace is not heating during the check out procedures.

5. Open the door on the programmer portion of the controller and verify that the proper parameters are still loaded into the controller memory.

NOTE: When performing the following steps remember that if you depress and release either the "scroll", "up" or "down" push buttons and more than five to ten seconds elapse before the buttons are used again the following will occur:

The display screen will automatically switch back to displaying chamber temperature. If this happens you will have to step through each parameter until you reach the point at which the interruption occurred. The parameter values you checked earlier, however, will not be lost or altered.

NOTE: Perform the following prior to moving on to step (a) below:

1. Depress and release scroll button, R1 will appear.
2. Depress and release scroll button, L1 will appear.
3. Depress and release scroll button, D1 will appear.
4. Depress and release scroll button, R2 will appear.
5. Depress and release scroll button, L2 will appear.
6. Depress and release scroll button, D2 will appear.
7. Depress and release scroll button, LC will appear.

a. Al-Alarm (overtemperature protection)

NOTE: The controller is fitted with a mechanical relay which is de-energized in the alarm mode. This relay when de-energized removes power from the heating element. The overtemperature protection can be preset from 0 to 50 degrees above set point. The OTP is a trackable OTP and follows the set point by a preset temperature value you insert at this step. If the primary control circuit fails, the OTP will control the furnace temperature at the preset OTP value above your set point. It does not shut off the furnace but will maintain it at that value.

Depress and release the scroll button, AL will be displayed. After two to three seconds AL will be replaced by a value. This is the OTP value. Depress either the "UP" or "DOWN" push button to select the OTP value you desire. The OTP range is 0-50 degrees. Thermolyne recommends 15 to 20 degrees as a standard value.

NOTE: The next three parameters, Proportional Band, Integral and Derivative are the three control parameters of a P.I.D. control system. These values should be set and maintained per the following:

- b. **Pb - Proportional Band.** Depress and release the scroll button, Pb will be displayed. Depress either "UP" or "DOWN" push buttons and the value "1.7" will be displayed. If "1.7" is not displayed release the "UP" or "DOWN" push button and depress again. The value displayed will change to the next highest or lower value. For each value change depress the push button one time. In this parameter the values do not scroll up or down but must be stepped by depressing the push button each time. Continue until the desired value is shown.
- c. **Ti - Integral.** Depress and release the scroll button, ti will be displayed. Depress either "UP" or "DOWN" push button and the value "145" will be displayed. If "145" is not displayed, depress the "UP" or "DOWN" push button as instructed in step "b" until the proper value is displayed.
- d. **Td - Derivative.** Depress and release the scroll button, td will be displayed. Depress either "UP" or "DOWN" push button and the value "12" will be displayed. If "12" is not displayed, depress the "UP" or "DOWN" push button as instructed in step "b" until the proper value is displayed.

- e. **Hc - Heat cycle time.**

NOTE: This parameter determines the speed at which the power switching device (relay, scr, triac or solid state relay) can be turned on and off. Do not change this value or damage to the switching device could result.

Depress and release the scroll button, Hc will be displayed. Depress either "UP" or "DOWN" push button and the value "0.3" will be displayed. If "0.3" is not displayed, depress the "UP" or "DOWN" push button as instructed in step "b" until the proper value is displayed.

- f. **H1 - Maximum Power (%)**

NOTE: This parameter limits the maximum power that may be applied to the heating elements. Normal setting is 100%. If you plan to use the furnace below 260°C (500°F) the output power may be reduced. This will significantly shorten the time it takes for stabilization. It will also reduce drastic temperature overshoots. Contact Thermolyne Customer Service for advice on the proper value to use. Remember that this parameter does not reduce the voltage to the elements. It reduces the average power to the elements by cycling power on and off.

Depress and release the scroll button, H1 will be displayed. After two to three seconds the value "100" will be displayed. If "100" is not displayed, depress the "UP" or "DOWN" push button, after five seconds the value will begin to scroll up or down. Release the button when the value "100" is displayed.

- g. Depress and release the scroll button. The screen will momentarily go blank and then the chamber temperature will be displayed on the display screen.

CONTROL PARAMETERS FOR MODELS F30430C, F30430F, F30438C & F30438F

Alarm (deg)	20
Prop. band (%)	1.7
Integral (secs)	145
Derivative (secs)	12
Cycle Time (secs)	0.3
Maximum Power (%)	100
Ramp Rate (units/time)	0.1 to 6.5 degrees/minute maximum
Dwell (time)	0.1 to 999.9 minutes
Level (units)	0-max. scale range

C. Door Safety Switch

The door safety switch removes power for the heating elements whenever the door is opened. Open and close the door a few times. Observe that the CYCLE light goes out. If this condition is not true, consult the Troubleshooting Tips section before proceeding.

WARNING:

TO AVOID ELECTRICAL SHOCK, THIS FURNACE MUST HAVE THE DOOR SWITCH OPERATING PROPERLY.

OPERATION

3-1. Main Circuit Breaker:

- A. The System is ready for operation whenever the rear circuit breaker is turned on.

3-2. Power Switch: (front control panel)

- A. Turn control switch to "ON". The digital display will be illuminated. The power light on the switch should be on and the cycle light will be illuminated if power is being supplied to the heating elements.

3-3. Temperature Control:

- A. **Automatic Models:** (F30420C, F30420F, F30428C and F30428F)

NOTE: The temperature control in these models is a single set point device. By using the "UP" or "DOWN" push buttons a specific temperature can be chosen. The control will cause the furnace chamber to heat to the temperature and hold it at this specific temperature until you turn off the power switch or select another temperature.

1. To operate the control:

CAUTION: Remember that whenever the power switch is turned "ON", the furnaces will begin to heat to the set point temperature that was previously set in. This value will remain unchanged for up to a year without power being applied to the control.

- a. Depress either "UP" or "DOWN" push button.
- b. A small LED will flash in upper left corner of display.
- c. A value will be displayed, this value is the set point temperature presently set in the control.
- d. To change this set point, continue to depress the push button, after five seconds the value will begin to scroll in the direction of the push button you are depressing.
- e. When the desired set point value is displayed, release the button, after five seconds the displayed value will change back to displaying chamber temperature.
- f. At this point the furnace will begin to heat if the new set point chamber temperature you have chosen is higher than the present chamber temperature.

NOTE: At any time you can view what your set point is by depressing either "UP" or "DOWN" push buttons and releasing it. For five seconds the set point value (temperature) will be displayed. After the five seconds the display reverts back to indicating chamber temperature.

B. Programmable Models (F30430C, F30430F, F30438C and F30438F "ONLY")

NOTE: Remember that all programmable temperature controls operate as automatic controls first and programmers second. Please refer to the operation of Automatic controls in section 3-3-A.

1. Prior to entering a program, depress both "UP" and "DOWN" push buttons simultaneously to reset the control to insure it is not in the program mode.
2. Depress the "DOWN" push button and hold it in. the single set point temperature value will be displayed. After five seconds it will begin to scroll down. Hold in until the value reads "zero".

NOTE: It is important that step 2 is accomplished prior to proceeding. If a temperature set point value greater than ambient temperature is left in for the single set point mode the furnace will heat to this value whenever the power switch is turned to "on". In addition, at the end of a program, instead of the furnace turning off and cooling to room temperature it will only return to the set point temperature.

e.g. Single set point value was set at 700°C. At the end of the program which had a dwell temperature of 550°C instead of cooling to room temperature as you might expect, the single set point value of 700°C would cause the furnace to heat up to 700°C.

It is very important to understand this "NOTE". If any confusion exists, please contact Thermolyne Customer Service for clarification.

3. Open the door to the parameter scroll button.

NOTE: Maximum ramp rates for this furnace for heat up are: 7°C (13°F) per/min. from 25°C-537°C (75°F-1000°F). 5.5°C (10°F) per/min. from 537°C-1093°C (1000°F-2000°F). Exceeding these values will cause the programmer to out run the performance of the furnace resulting in ruined samples. This program does not have a "hold back" feature available in other models. "Hold back" causes the program to wait for the furnace in the event the program is asking the furnace to perform faster than it is capable. Because it does not have "Hold Back", programming a ramp to go from a high temperature to a lower temperature is difficult. The maximum cooling rate is determined by the natural heat loss of the furnace chamber plus load. At high temperature cooling is greater than at low temperature. Contact Thermolyne Customer Service for assistance.

4. Depress and release the parameter scroll button, the value r1 will appear on display screen. Depress either "UP" or "DOWN" push button and the current ramp value for r1 will be displayed. To change this value depress and hold in the correct "UP" or "DOWN" push button until the desired new value for Ramp 1 (r1) is displayed, then release the push button.

5. Depress and release the parameter scroll button, the value "L1" will be displayed. Depress either "UP" or "DOWN" push button and the current Level 1 (L1) value will be displayed.

NOTE: The level value is expressed in degrees C or F depending on the control type. The level value determines the direction of the Ramp which was set in the previous step. When the control enters the ramp segment from the previous step it begins to heat/cool starting at the temperature of the chamber the moment it enters the ramp. The chamber heats/cools at the ramp rate until the temperature level selected in this step is reached.

e.g. Ramp 1 = 4.0 starting at room temperature you desire to heat to 350°C and then dwell. You would put the value 350 in for L1 (level).

If the desired value for L1 is not correct, depress and hold in the appropriate "UP" or "DOWN" push button, after five seconds the value will begin to scroll. Release the push button when the desired value for L1 is reached.

6. Depress and release the parameter scroll button, the value d1 will be displayed. Depress either "UP" or "DOWN" push button and the current Dwell 1 (d1) value will be displayed.

NOTE: The dwell value is in minutes and is adjustable from 0.1 to 999.9 minutes. The value you place in at this step will determine how long the chamber will remain at the temperature level set in the previous step 5. If you do not desire to use the dwell the value must be set to zero.

If the desired value for Dwell 1 (d1) is not correct, depress and hold in the appropriate "UP" or "DOWN" push button. After five seconds the value displayed will begin to scroll. Release the push button when the desired dwell time is reached.

7. Depress and release the parameter scroll button, the value r2 will be displayed. This ramp (r2) functions the same as r1. Refer back to step 4 for operation details.

NOTE: If you desire to not use Ramp 2 (r2) proceed to step 8 and set the value for L2 (level 2) the same as level 1 previously set. Since both Level 1 and Level 2 are set the same, the ramp is cancelled out. You do not need to change the value for r2 that is already set in from a previous program.

8. Depress and release the parameter scroll button, the value L2 will be displayed. The level 2 (L2) functions the same as L1. Refer back to step 5 for operation details.
9. Depress and release the parameter scroll button, the value d2 will be displayed. The Dwell 2 (d2) functions the same as Dwell 1 (d1). Refer back to step 6 for operation details.
10. Depress and release the parameter scroll button, the value Lc will be displayed. Depress, either "UP" or "DOWN" push button and the value for Loop Counter (LC) will be displayed. The value for Lc should be 1. If any other value is displayed, hold in the "DOWN" push button and after five seconds the value will begin to scroll down. Release the push button when the value 1 is showing. The value 1 causes the program to run one time and shut off. If values higher than one are used, the program will repeat that many times. However due to the furnaces inability to cool quickly it is very difficult for the furnace/programmer to stay in sync. Prior to attempting to repeat a program using the loop counter contact Thermolyne Customer Service for assistance.
11. The following parameters will appear when subsequently depressing the parameter scroll button. (Al, Pb, tl, td, Hc, Hl). These parameters are the same as described in section 2-4 Operational checks, part B - Programmable models and do not have to be reset. After five seconds the display screen will revert back and display chamber temperature.
12. To operate the furnace using the program mode merely depress the "RUN" push button. After depressing, the Ramp 1 LED light will illuminate and the furnace will begin to heat per the program loaded in the previous steps.

NOTE: You cannot alter any of the four program segments (r1, d1, r2, d2) while in the program (RUN) mode. Once you cancel the program by depressing both "UP" and "DOWN" push buttons simultaneously, when you press RUN again it restarts in Ramp 1. It can not be started in the middle of the program.

13. At the end of the program the system does not shut off but returns to the single set point temperature described in step 1 of this section.

NOTE: You can view the progress of the program at any time without worry of altering the program.

- a. Ramp segments - To compare how the furnace is tracking the program merely depress either "UP" or "DOWN" push button. The value which appears is the temperature value at that specific moment in the program. After five seconds the display will revert back to monitoring chamber temperature thus allowing you to see if an error exists between program and furnace.
- b. Dwell segments - To view the time remaining in a dwell segment, depress the parameter scroll button until the correct dwell (d1 or d2) is displayed, then depress either the "UP" or "DOWN" push button. The value which appears is the time in minutes remaining in that dwell segment.

C. Multi Segment/Multi Programmable Models: (F30440, F30448, F30450, F30458)

NOTE: The maximum ramp rates for this furnace for heat up are: 7°C (13°F) per/min. from 25°C-537°C (75°F-1000°F), 5.5°C (10°F) per/min. from 537°C-1093°C (1000°F-2000°F).

Remember that all programmable temperature controls operate as a single set point control first and programmers second.

1. For specific operation of the temperature controls for these model furnaces please refer to the separate operating instructions enclosed from Eurotherm Corporation.

For Models: F30440 & F30448 you should have received these three booklets (a) HAO18931 "Controller/Programmer Type 822 Operating and Installation Instructions", (b) HAO20152 "822 Read/Write Communications Protocol", (c) HAO18915 "820/822 Calibration and Configuration".

For Models: F30450 & F30458 you should have received these three booklets (a) HAO20143 "Controller/Programmer Type 821 Operating Instructions", (b) HAO18915 "820/822 Calibration and Configuration", (c) HAO20143 "821 Installation Instructions".

NOTE: All parameters for the control operation have been preloaded at the factory. Following are the parameters that were loaded. This information will aid you in setting up the controller.

Set Point - 0°C

Manual Pwr - 100%

Alarm 1 - 50°C

Alarm 2 - 1300°C

No Sensor Pwr - 0.0%

Max O/P Pwr - 100%

Cycle T - 1.0 sec.

Prop Band - 2.0%

Integ. T. - 150 sec.

Deriv. T. - 15.0 sec.

Cutback HI - 3°C

Cutback LO - 3°C

O/P Bias - 0.0%

Scale Range - 0-1300°C

T/C - Platinum II

Temp Scale - °C

Security Code 6666

2. If you experience problems in operating these multi programmable temperature controls contact Thermolyne Customer Service for assistance.

3-4. The controller has the capability for numerous other function controls:

- A. Timer to turn on, turn off control.
- B. Control of gas injection into furnace.
- C. External alarms.

For information and assistance in connecting these or other options, contact Thermolyne Corporation.

- 3-5. Furnace loading: For best results, use only the back 12" of the furnace chamber.

CAUTION: Do not overload your furnace chamber. If the load is to be heated uniformly, it should not occupy more than the back 12 inches of the furnace chamber. Failure to observe this caution could result in damage to furnace components.

- 3-6. If you are heating a number of small parts, spread them throughout the back 12 inches of the furnace chamber.
- 3-7. Keep objects away from thermocouple.
- 3-8. For best results, use the shelving arrangements illustrated in Figure 5, page 5 when loading the furnace.
- 3-9. Use insulated tongs and mittens when loading and unloading furnace.
- 3-10. Always wear safety glasses.

PREVENTIVE MAINTENANCE

WARNING

TO AVOID ELECTRICAL SHOCK, THIS FURNACE MUST ALWAYS BE DISCONNECTED FROM THE POWER SUPPLY PRIOR TO MAINTENANCE AND SERVICING.

- 4-1. This unit is equipped with a venting system on the top of the furnace. This is for the removal of fumes from the chamber of the unit. Contamination is a major cause of element failure, therefore, when possible remove the fume forming material before heating. (e.g., cleaning cutting oil from tool steel).
- 4-2. Housekeeping is vital to your electric furnace — **KEEP IT CLEAN.** Run your furnace up to 1800°F empty occasionally to burn off the contamination that may exist on the insulation and elements.
- 4-3. Element life is reduced somewhat by repeated heating and cooling. If the furnace is to be used again within a few hours, it is best to keep it at the operating temperature or at a reduced level such as 500°F (260°C).

TROUBLESHOOTING TIPS

- 5-1. The Troubleshooting Tips section is intended to aid in defining and correcting possible service problems. When using the chart, select the problem category that resembles the malfunction. Then proceed to the possible causes category and take necessary corrective action.

PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTION
The cycle light does not illuminate.	1. Door switch defective. 2. The furnace is not connected to power supply. 3. ON and OFF power switch defective. 4. Defective cycle light. 5. Incorrect power source.	1. Re-align or replace furnace door switch. 2. Check furnace connection to power source. 3. Replace power switch. 4. Replace cycle light. 5. Check power source.
The furnace does not heat.	1. No power. 2. Defective electrical hookup. 3. Thermocouple has oxidized and opened the circuit. 4. Controller malfunction. 5. Heating elements in 208V or 240V furnaces are burned out. NOTE: AT LEAST BOTH SIDES OR THE TOP AND BOTTOM ELEMENTS MUST BURN OUT TO CAUSE FURNACE NOT TO HEAT AT ALL 6. Door switch malfunction. 7. Defective safety relay. 8. Defective output triac. 9. Defective control unit.	1. Check power source and fuses or breakers. 2. Repair electrical hookup. 3. Replace thermocouple. 4. Replace controller. 5. Replace defective elements. 6. Re-align or replace door safety switch. 7. Replace safety relay. 8. Replace output triac. 9. Replace control unit.

PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTION
Slow heatup.	1. Low line voltage. 2. Heavy load in chamber. 3. Wrong heating element. 4. One or more heating elements are burned out.	1. Install line of sufficient size and proper voltage. (Isolate furnace from other electrical loads.) 2. Lighten load in chamber to allow heat to circulate. 3. Install proper element. 4. Replace burned out elements.
Door switch does not cut power to the furnace chamber.	1. Door switch is not functioning. 2. Safety relay malfunction.	1. Re-align or replace door safety switch. 2. Replace safety relay.
Controller over-temperature alarm does not cut power to furnace chamber.	1. Alarm output defective. 2. Safety relay malfunction.	1. Replace control unit. 2. Replace safety relay.
Repeated element burnout.	1. Overheating furnace. 2. Heating harmful materials. 3. Wrong element. 4. Oxidized thermocouple. 5. Contamination present from previous burnout.	1. Keep furnace under maximum temperature. Closer supervision of control setting. 2. Enclose material in container. Clean up spills on chamber. Ventilate chamber by leaving door cracked slightly open when heating known harmful reagents. 3. Install proper element. 4. Replace thermocouple. 5. Clean and/or replace insulation material.
Inaccurate temperature readout.	1. Oxidized or contaminated thermocouple. 2. Poor thermocouple connection. 3. Improper loading. 4. Poor ventilation of base. 5. Thermocouple connections reversed.	1. Replace thermocouple. 2. Tighten connections. 3. Use proper loading procedures. 4. Clear area around furnace base. 5. Reconnect thermocouple correctly. (See fig. 3C Thermocouple Installation.)

MAINTENANCE AND SERVICING

NOTE: Only perform maintenance described in this manual. Contact an authorized dealer or our factory for parts and assistance.

6-1. To replace controller:

The controller plugs into a panel mounting sleeve which should be left permanently installed in the controller housing. To remove the controller, open the front door and turn the screw in the lower right hand corner, counterclockwise. The controller will start to withdraw from the sleeve and once the screw has been turned to its furthest extent the instrument can be withdrawn by hand. Do not attempt to dismantle this unit further, but replace it either with a Thermolyne loaner or a new unit.

6-2. Other component replacement: (contact Thermolyne for specific information on replacement of heating elements, insulation, thermocouples or the electrical components.)

REPLACEMENT PARTS LIST

Part Number	Description
CN71X2	Control section, automatic model F30420C, F30428C
CN71X3	Control section, automatic model F30420F, F30428F
CN71X8	Control section, programmable model F30430C, F30438C
CN71X1	Control section, programmable model F30430F, F30438F
CN71X9	Control unit, multi programmable (822) F30440 & F30448
CN71X12	Control unit, multi programmable (821) F30450 & F30458
EL412X1	Heating element, top, 208 volt models
EL412X2	Heating element, bottom, 208 volt models
EL412X3	Heating element, side, 208 volt models (2 req'd.)
EL412X4	Heating element, top, 240 volt models
EL412X5	Heating element, bottom, 240 volt models
EL412X6	Heating element, side, 240 volt models (2 req'd.)
PLX82	Pilot light, "cycle" (all models)
RYX31	Relay, (all models)
SCX30A	Triac, (all models)
SH412X1	Accessory Shelf
SWX68	Switch, power on/off (all models)
SWX103	Switch, circuit breaker (all models)
SW412X1A	Switch, assembly, door interlock (all models)
TC412X1A	Thermocouple, type F (platinel) all models

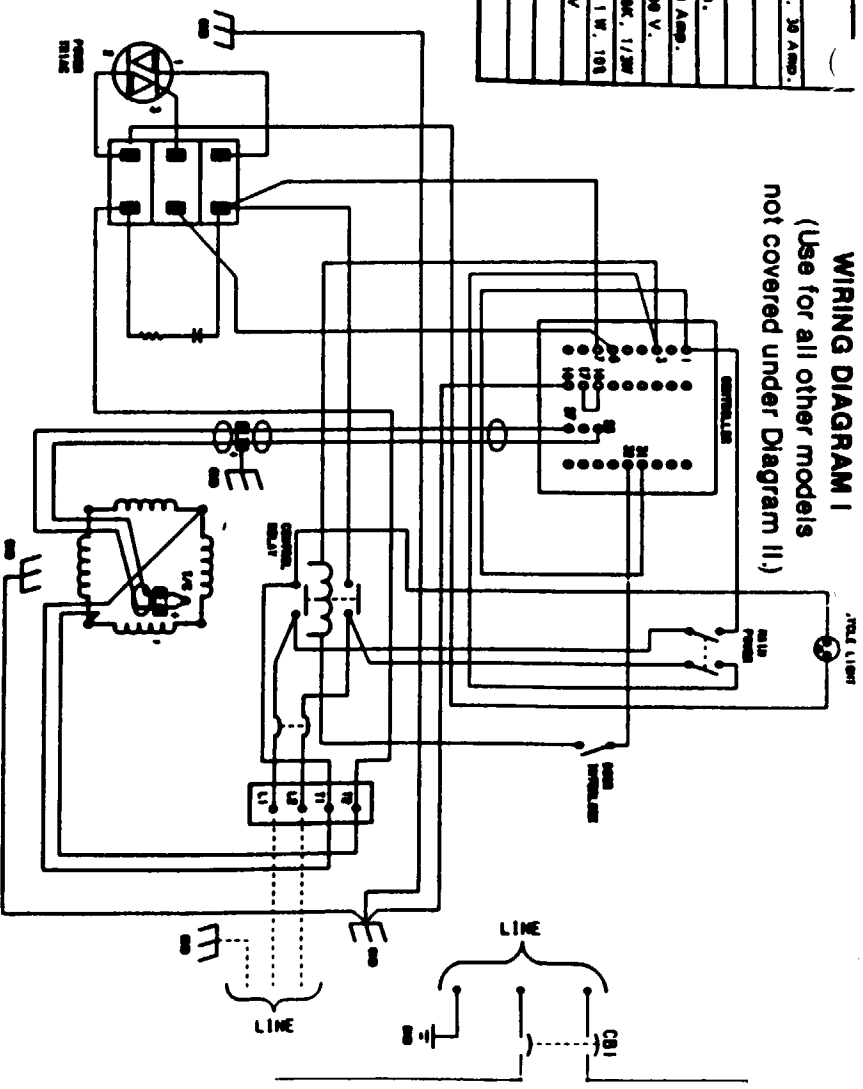
ORDERING PROCEDURES

Please refer to the Specification Plate for the complete model number, serial number and for series number when requesting service, replacement parts or in any correspondence concerning this Thermolyne unit.

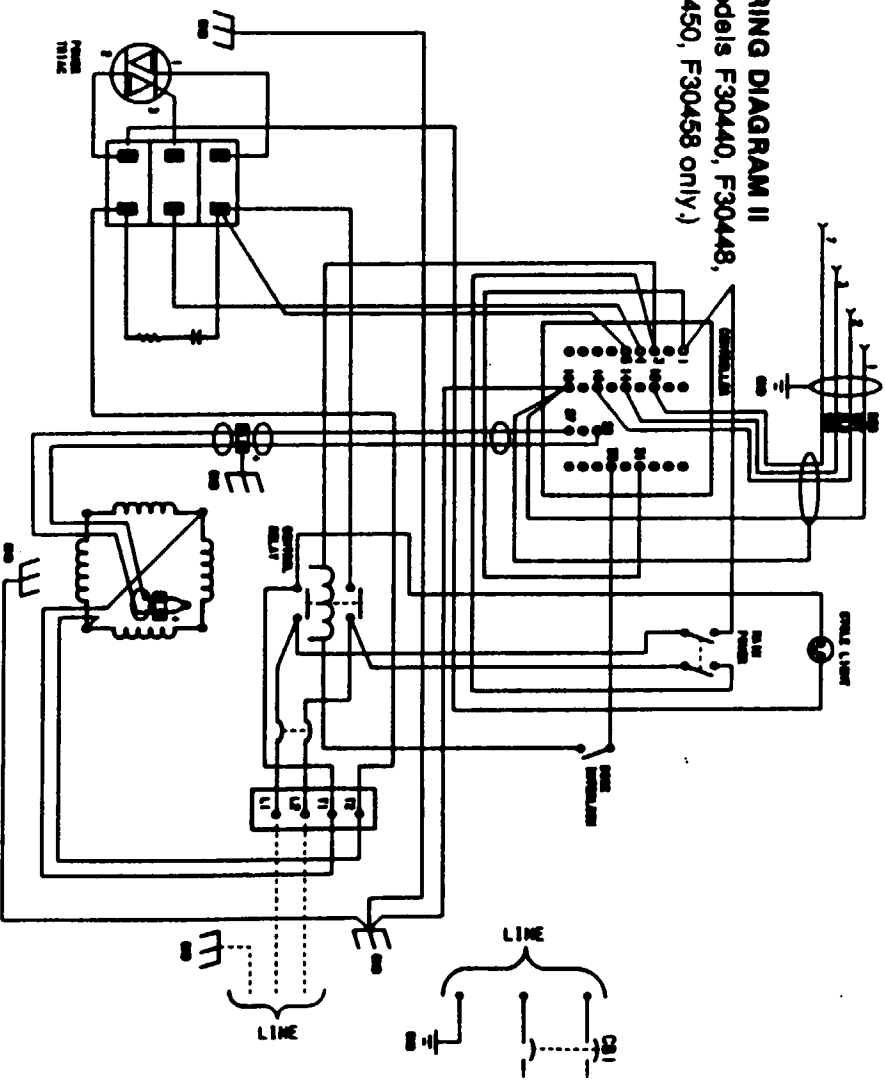
All parts listed herein may be ordered from the Thermolyne dealer from whom you purchased this unit or can be obtained promptly from the factory. When service or replacement parts are needed, we ask that you check first with your dealer, if he cannot handle your request, then contact our Customer Service Department - (319) 556-2241 or (800) 553-0039.

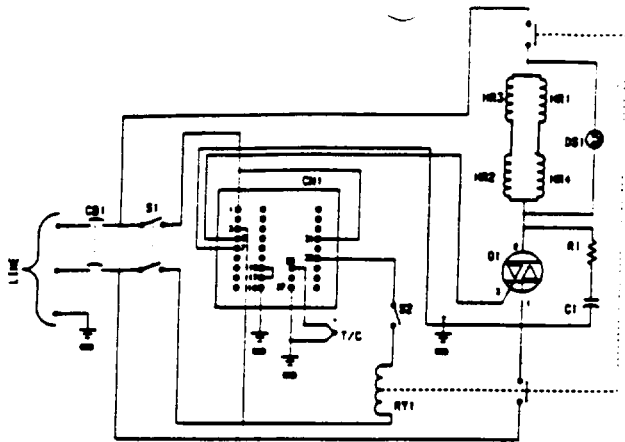
DESIGNATED NO.	DESCRIPTION
CBI	Circuit Breaker, Double Pole, 30 Amp.
S1	Switch, Reactor, DPST, 15 A.
2N1	Controller, Automatic
2	Switch, Micro, DPST, 15 Amp.
RV1	Relay, DPST, Norm-Open, 40 Amp.
Q1	Trlcs, RCA, T642IM, 20A, 400 V.
DS1	Pilot Light, Neon, 250 V., 120K, 1/2W
R1	Resistor, Type BW, 5.6Ω, 1 W, 100
C1	Capacitor, .1 uFd, 210V, 500 V
MR1	Element, Heating Top
MR2	Element, Heating Bottom
MR3 & 4	Element, Heating Side

WIRING DIAGRAM I
(Use for all other models not covered under Diagram II.)

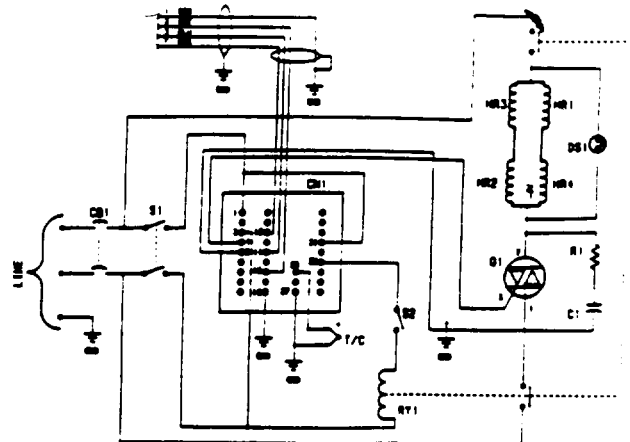


WIRING DIAGRAM II
(For models F30440, F30448, F30450, F30458 only.)





CIRCUIT DIAGRAM I
(Use for all other models
not covered under Circuit Diagram II.)



CIRCUIT DIAGRAM II
(For models F30440, F30448,
F30450, F30458 only.)

ONE YEAR LIMITED WARRANTY

Thermolyne Corporation warrants this product to be free from defects in material and workmanship for a period of one year from date of purchase.

This warranty applies only to defects in original parts or components, and does not apply to claims or alleged product failures resulting from unauthorized repairs, misuse, accidents or lack of proper maintenance, failure to follow Thermolyne's instructions for use or from ordinary wear and tear.

Warranty service may be obtained by returning any defective product to an authorized Thermolyne dealer or to Thermolyne. Heating elements, because of their susceptibility to overheating and contamination, must be returned to our factory and if, upon inspection, it is concluded that failure is not due to excessive high temperature or contamination, warranty replacement will be provided.

Thermolyne's sole obligation under this warranty shall be to repair or replace any products which it delivers and are found to be defective.

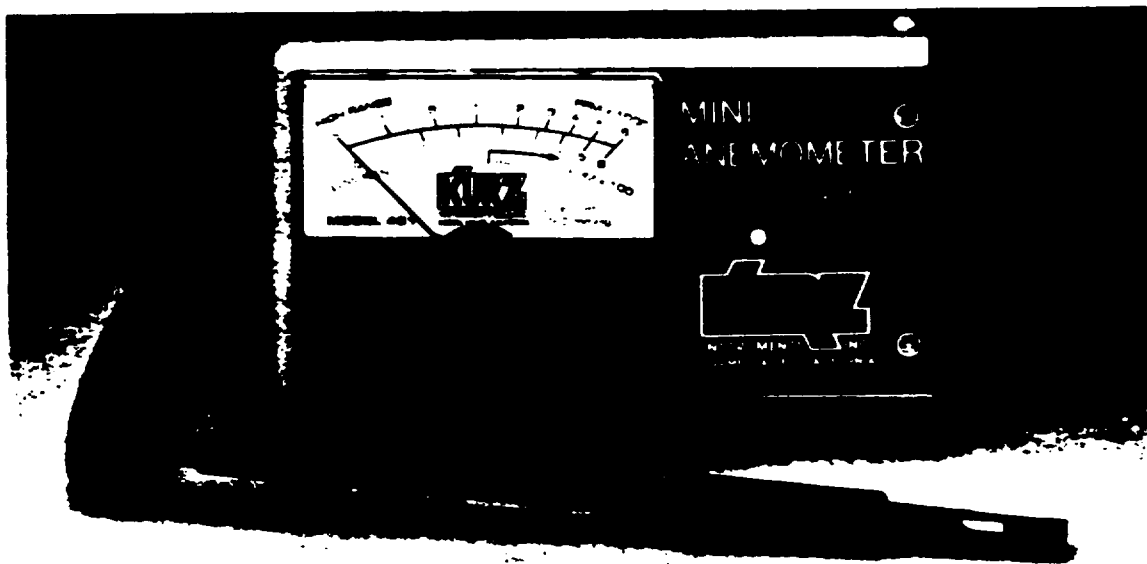
SPECIAL Five Year Warranty on control module.

THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, MADE IN CONNECTION WITH THE SALE OF THIS PRODUCT. THERMOLYNE EXPRESSLY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR SPECIFIC USE.

**THERMOLYNE CORPORATION
SUBSIDIARY OF SYBRON CORPORATION
2555 KERPER BOULEVARD
DUBUQUE, IOWA 52001
PHONE 319 556-2241**

USER GUIDE

SERIES 490 MINI-ANEMOMETER



KURZ
INSTRUMENTS, INC.

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RELEASE NO. 2.00

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SECTION 1

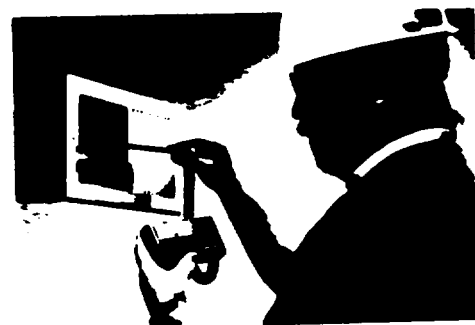
Description

Kurz's 490 Series is a rugged line of Electronic Velocity Meters that, through the use of low power consumption technology, are powered by four ordinary alkaline AA cells. This makes the units compact enough to be carried in one's pocket, with up to 50 hours of use (four months of typical operation) obtainable from four easy-to-remove cells. Cell replacement is accomplished by removing the meter cover. The 490 uses our advanced low-power sensor, which exhibits extraordinary sensitivity and resistance to shock and vibration. The non-conductive graphite probe shaft is extremely strong; we have never seen a broken probe. Dual ranges are standard: for example, the Model 490 has ranges of 0-200 fpm and 0-2,000 fpm. Also available are metric, feet-per-second and mile-per-hour scale versions, all capable of covering velocities up to 12,000 sfpm (200 sfps).

To use the Mini-Anemometer, the sensor is simply placed in the direction of flow and the meter indication is read. Range selection, battery check and power "OFF" are indicated on the recessed switch plate at the "probe end" of the meter.



SERIES 490
With Carrying Case



SERIES 490
In Operation

SECTION 2

Principles of Operation

The basic sensing element is the Kurz unique low-power "DuraFlo-LP" probe, which consists of a velocity sensor and a temperature sensor. The velocity sensor is heated and operated as a constant-temperature thermal anemometer which responds to "standard" velocity or mass flow by sensing the cooling effect of the air as it passes over the heated velocity sensor. The temperature sensor accurately compensates for a wide range of ambient temperature variations.



Because it is large and constructed in a coil configuration, the unit is shock and vibration resistant, and insensitive to contamination as well.

It should be noted that the velocity readings of all Kurz Air Velocity Meters are referenced to standard conditions: 25° degrees C and 760 mm Hg barometric pressure. Therefore, the measure local mass velocity of the air (standard barometric pressure). In order to obtain the actual velocity, the following density correction formula may be used:

$$V_{act} = V_{ind} \times \rho_s / \rho_a$$

Where: ρ_s = air density at standard conditions of 25°C and 760 mm Hg.

ρ_a = actual air density at local temperature and barometric pressure, and

V_{act} = actual air velocity
in feet-per-minute

V_{ind} = indicated velocity on
Kurz Air Velocity Meters

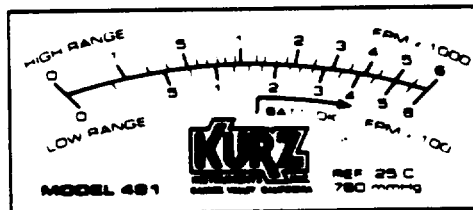
Normally, this correction is small and may be neglected in most instances. In fact, most applications require only the mass velocity, with no density calculations being required.

SECTION 3

Operating Instructions

Operation of the series 490 is simple. Before taking a measurement, check the battery voltage by moving the slide-switch to the "BAT" position and observing the scale. The needle must be above the scale symbol for meter readings to be accurate. Next, slide the switch to the "HIGH" position, slide the protective shield back from the probe window, and position the probe so that the air flows through the window and across the sensor. If sufficient resolution is achieved, slide the switch to the "LOW" position and make a reading. The lower side of the scale corresponds to the "LOW" position and the upper side corresponds to the "HIGH" position.

The red LED immediately to the right of the meter scale is illuminated when power is on. The LED serves as a reminder to switch off the unit when it is not in use.



Model 491 Scale

If a return or suction opening is covered by a grill and it is necessary to compute the total flow into the opening, the correct procedure is to take a number of readings at the center of equal areas to determine the average velocity, as in the case of having no grill. The flow rate can be computed fairly accurately with the following equation:

$$Q = F A \bar{V}, \text{ where}$$

Q = flow rate in standard cubic feet-per-minute

F = the application factor (see following table)

A = designated area in square feet, and

$\bar{V}$ = average velocity in standard feet-per-minute

<u>Grill type</u>	<u>Application Factors (F)</u>	<u>Designated areas</u>
No Grill	1.00	Full duct area
Square punched grill	0.88	Full (daylight) area
Bar grill	0.78	Core area
Steel strip grill	0.73	Core area

For applications requiring greater accuracy, it is suggested that a duct extension be used having a length of at least 10 percent of the largest dimension of the grill. (e.g. a grill having dimensions of 10 inches x 8 inches would require an extension of at least one inch, or 10 percent of the largest dimension). This duct extension is placed against the grill and the procedures for measuring an open grill are followed to compute flow rate. For greatest accuracy, a smoothly tapered flow nozzle should be placed over the supply grill. The velocity profile at the exit jet of such a nozzle will necessarily be very flat.

C. Velocities and Flow Rates in Small Ducts

The 490 can be used to take velocity measurement within a duct provided the duct diameter is less than 18 inches and the air velocity is fairly uniform. (For larger ducts refer to the Series 440 Portable Air Velocity Meters, featuring much longer probes.) Whenever possible, choose a measurement location at least 10 duct diameters downstream from the nearest elbow, tee, bend, valve or other flow obstruction. This optimizes the profile. The 490 probe can be semi-permanently mounted in the wall of the duct using a Kurz Probe Mounting Adapter. The adapter is easily installed by drilling a $\frac{1}{4}$ " hole into the duct and mounting the adapting plate with four sheet metal screws. (see Figure 1)

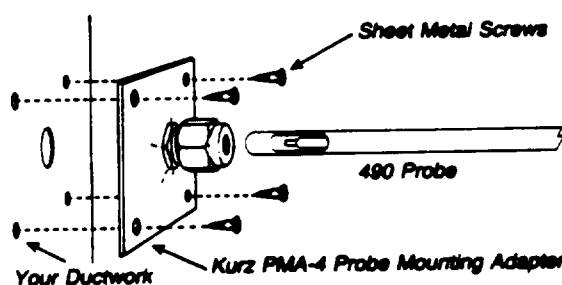


Figure 1 For mounting the 490 in sheet metal ducts, use the Kurz Probe Mounting Adapter part number PMA-4. This is a 2" x 2" .060" sheet metal plate with 4 corner mounting holes, and with a $\frac{1}{4}$ " compression fitting welded to the center of the plate. The $\frac{1}{4}$ " compression fitting is the ideal way to mount the $\frac{1}{4}$ " O.D. 490 probe. The user drills holes in his sheet metal ductwork using the PMA-4 as a guide, then installs it with 4 sheet metal screws. Then simply insert the 490 probe and tighten the fitting.

The total flow rate within the duct can be determined if the point velocity measurement is representative of the average velocity. This is generally not the case unless the velocity profile is extremely smooth or unless a multi-point traverse is conducted (a difficult task in small ducts).

SECTION 4

Applications

A. Air Velocities in Open Spaces or Single-Point Measurements

The 490 series can easily be used to measure local air velocities in a wide variety of applications. The window in the probe tip should be oriented such that the flow passes directly through it. You will notice that the output is relatively unaffected by angular rotation of the probe until the angle approaches ± 30 degrees to the flow direction.

In situations in which the air temperature is changing, allow the probe to reach thermal equilibrium, thus allowing the temperature-compensation features of the meter to respond.

B. Ventilation Openings

The 490 Series Air Velocity Meters can be conveniently used to obtain the velocity and total flow of supply and return openings, as well as suction openings. In either case, place the probe near the surface of the opening and parallel to it, allowing air to flow perpendicularly through the window at the probe tip.

When it is necessary to obtain the total flow (SCFM) of a supply or return opening without a grill, use the following equation:

$$Q = A \bar{V}, \text{ where}$$

Q = quantity of air in standard cubic feet per minute (SCFM)

A = area of the opening in square feet

$\bar{V}$ = the area-weighted average air velocity in standard feet-per-minute (SFPM)

To determine the average air velocity, divide the opening into a number of equal areas. Take a velocity reading at the center of each area and numerically average the results. If the velocity profile is relatively flat, only a few areas need to be taken; if the profile is non-uniform, several areas should be used. Generally, it's a good idea to make a traverse across the duct in both directions to determine the uniformity of the air velocity. If the velocity is not constant at one measuring point, use the mean velocity between the upper and lower readings. Generally, the velocity profile is more uniform on suction openings than on supply openings.

If a supply opening is covered by a grill, it is suggested that the probe be placed about one inch in front of the grill to obtain the average velocity reading as above. The area (A) used in the above equation is the core area of the grill.

If information is given on the coefficient of discharge for a specific grill, the probe should be placed against the grill and centered over the open areas in the grill. Choose several grill openings to obtain an average air velocity. In this case, the total flow is given by:

$$Q = K A \bar{V}, \text{ where}$$

K = the given coefficient of discharge, and

A = the area of the grill as specified by the manufacturer

For openings covered by diffusers, refer to the manufacturer's instructions for the particular type of diffuser. This information is usually available.

Figure 3
SEINES 490

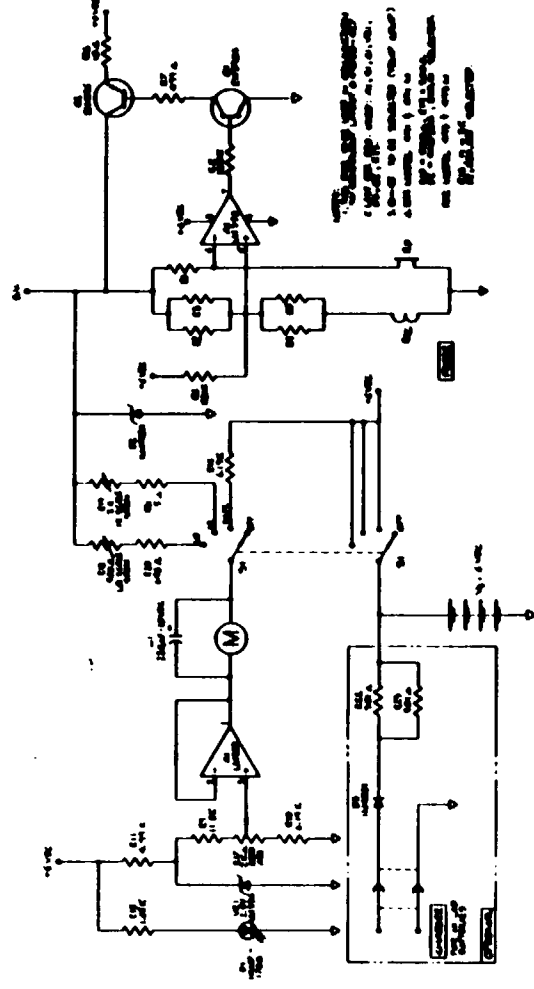
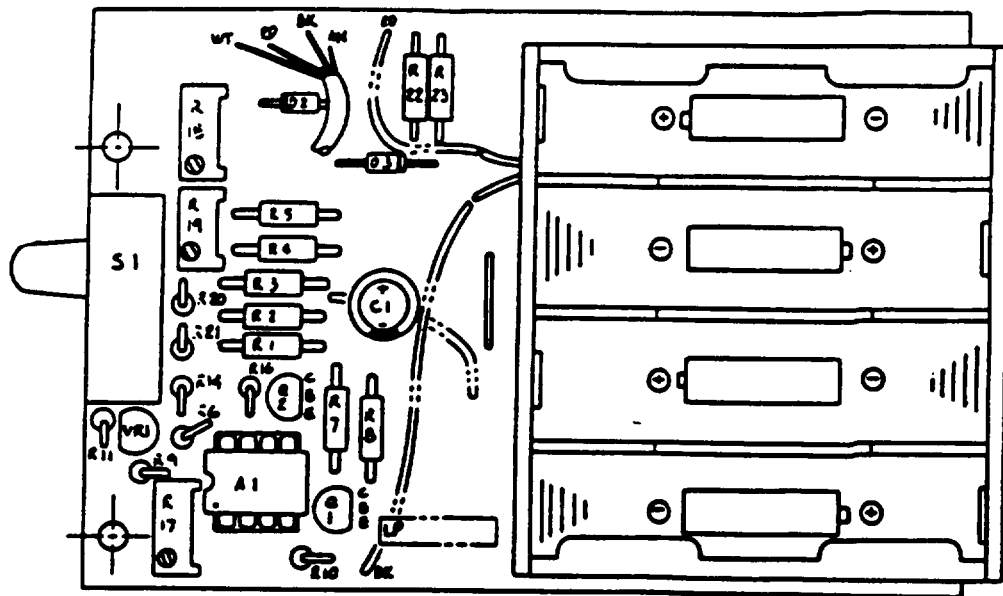


Figure 4
SERIES 490
P.C. Board Layout



SECTION 4

Applications

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A = area of the opening in square feet

$\bar{V}$ = the area-weighted average air velocity in standard feet-per-minute (SFPM)

To determine the average air velocity, divide the opening into a number of equal areas. Take a velocity reading at the center of each area and numerically average the results. If the velocity profile is relatively flat, only a few areas need to be taken; if the profile is non-uniform, several areas should be used. Generally, it's a good idea to make a traverse across the duct in both directions to determine the uniformity of the air velocity. If the velocity is not constant at one measuring point, use the mean velocity between the upper and lower readings. Generally, the velocity profile is more uniform on suction openings than on supply openings.

If a supply opening is covered by a grill, it is suggested that the probe be placed about one inch in front of the grill to obtain the average velocity reading as above. The area (A) used in the above equation is the core area of the grill.

If information is given on the coefficient of discharge for a specific grill, the probe should be placed against the grill and centered over the open areas in the grill. Choose several grill openings to obtain an average air velocity. In this case, the total flow is given by:

$$Q = K A \bar{V}, \text{ where}$$

K = the given coefficient of discharge, and

A = the area of the grill as specified by the manufacturer

For openings covered by diffusers, refer to the manufacturer's instructions for the particular type of diffuser. This information is usually available.

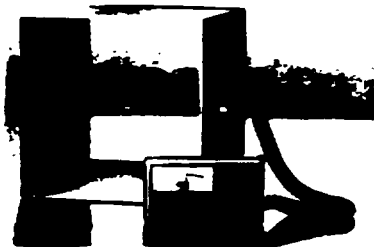
Once the average velocity is known, the flow rate can be calculated as follows:

$$Q = \bar{V} A, \text{ where}$$

Q = flow rate in standard cubic feet-per-minute

$\bar{V}$ = average velocity in standard feet-per-minute, and

A = area of duct in square feet



D. Wind Speed Measurements

The series 490 can be readily used for a wide variety of wind speed measurements such as meteorological studies and sporting activities (e.g. sailing, golf, track & field, etc.). Using the 490 in these activities is the same as described in paragraph "A" above.

Example of the 490 being installed in a duct via the PMA-4 Probe Mounting Adapter.

E. Clean Room Applications

The series 490 can be used for monitoring clean room crossflows. Proper HEPA air circulation assures that clean air is efficiently issued from an HEPA ceiling duct and contaminated air is expelled from the protected zone. The probe can be positioned at various points in the clean room in a variety of orientations, establishing major flow lines and investigating the differential pressure of various rooms.

The 490 can also be used to certify HEPA filters, in accordance with governmental standards, and to assure uniform laminar airflow through the filter. This is accomplished by setting meter sensitivity to low and taking readings repeatedly. For HEPA certification, readings should fall between 72 and 108 fpm.

SECTION 5

Specifications

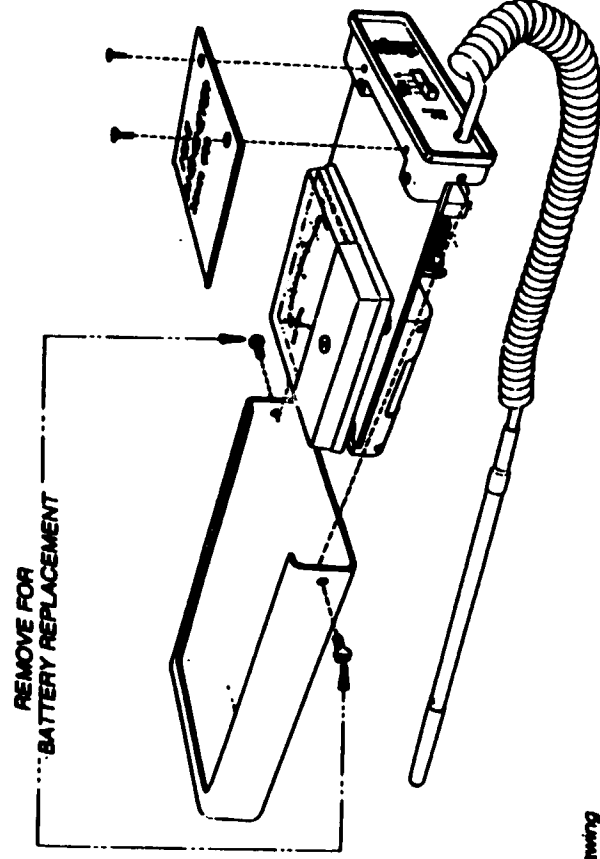


Figure 2
SERIES 400
Breakaway Drawing

SECTION 6

Maintenance and Battery Replacement

The 490 operates with four (4) AA alkaline batteries. These batteries must be replaced when testing indicates they are worn. Check battery voltage by moving the slide-switch to the "BAT" position and observing the scale. If the needle is not above the scale symbol, the batteries must be replaced, or poor performance will result. Insufficient battery voltage will affect the accuracy of the system, and may cause a deflection at zero, with no velocity present.

To replace the batteries, simply remove the two screws at the top and bottom of the meter case. (Do NOT remove the screws on the base plate.) Slide the case away from the baseplate, exposing the battery compartments, and remove the four batteries while observing the polarity indications. Depress the spring-loaded batteries slightly with the head of a screwdriver to aid in reinstallation of the battery covers. Once the meter case is reassembled, the unit is ready for operation. (See Figure 2)

Those Mini Anemometers equipped with Kurz's optional Ni-Cad battery kit can be recharged for continuous operation. The kit includes a battery charger and a convenient jack mounted in the face of the 490 to accommodate the charger plug. Depleted Ni-Cad batteries merely require an overnight recharge of 16 hours to restore full service.

Although the large diameter of Kurz's low power sensors make them generally immune to particulate contamination, continued use in dirty environments may necessitate periodic cleaning of the sensor. This can be done by gently waving the probe back and forth in a bath of alcohol. This will remove most of the dust and grime and should restore the unit to normal operation. The sensor should be dry before resuming operation. (DO NOT touch the sensor coil with a brush or other object during the cleaning process.) Always protect the probe when not in use.

Recalibration should be performed annually under normal circumstances, depending on the accuracy of data needed and the amount of use. Prior to shipping for recalibration, contact Kurz's service department to obtain a return authorization number. This expedites the calibration/shipping process and will provide you with more timely service. Meters can be returned to:

KURZ INSTRUMENTS, INC.
2411 GARDEN ROAD
MONTEREY, CA 93940

When shipping, be sure to include user name, address and phone number.

Request for Reader's Comments

Kurz tries to provide instruction manuals which meet the needs of all users. This response form allows you to participate directly in our documentation process. Certainly, we will appreciate your comments and carefully consider your suggestions. Consider commenting on useability, accuracy, readability, organization and completeness.

1. Release Number: _____

2. Publication Date: _____

3. Specify by page any errors that you found.
Page No. Description of Error

4. Does the document cover information you need? If not, please explain.

5. Is it at the right level? Should it be more simple or more detailed?

6. What other documentation do you need?

7. Did you have difficulty understanding wording or descriptions? If so, please specify where.

8. Please rate this document on a scale of 1 to 10, with 10 being the best rating. _____

Date _____

Name _____

Position _____

Company _____

Address _____

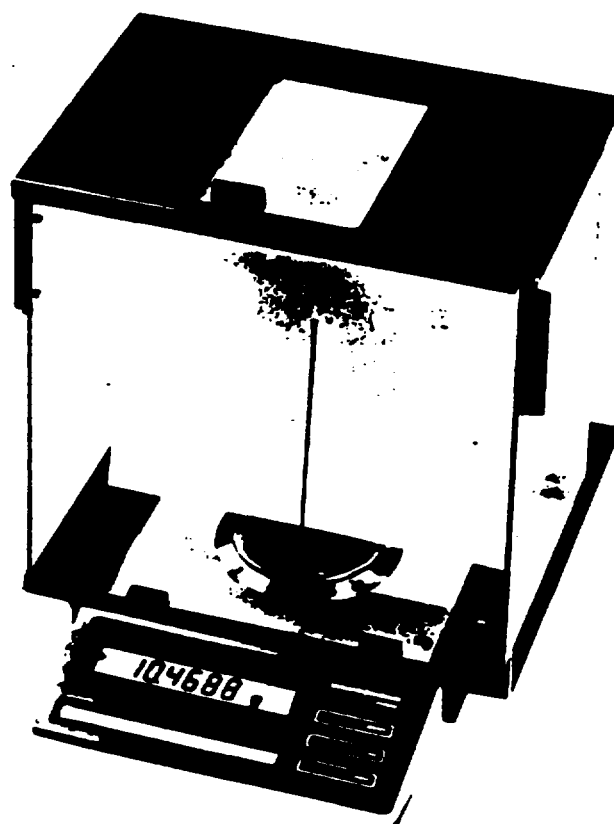
City _____

State _____ Zip _____

Phone Number _____

Thanks for your comments, look for a small token of our appreciation in your mail soon!

Sartorius Filter Weighing Analytical Balances Models A120S-FW and A200S-FW



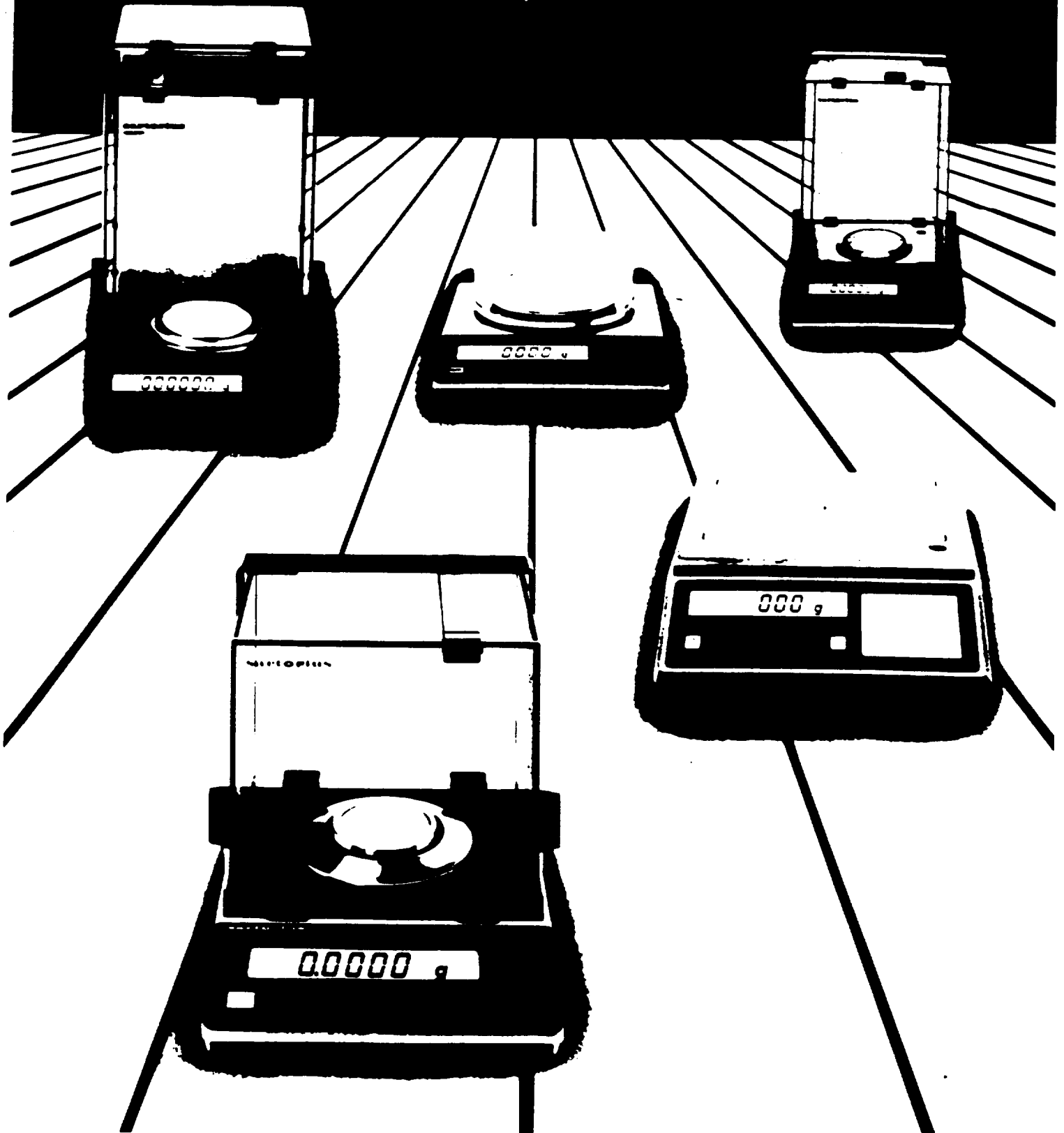
- Extra-wide weighing chamber, especially designed to accept an 8 x 10 inch *unfolded* filter
- Equipped with unique filter holder
- One-finger, front panel control of *all* balance functions, including automatic calibration
- Weighing range to 200g with Super-Range readability of 0.1 mg

Sartorius

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INSTRUMENTS, INC.

Sartorius Balances and Scales

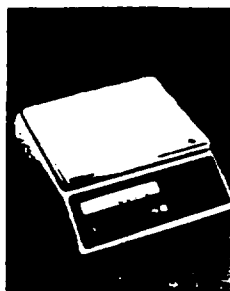
Product Specifications



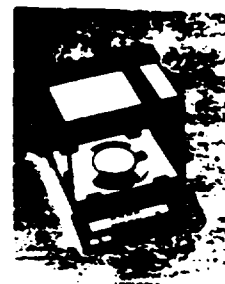
Series A



Series E



Series H



Model	A120S	A200S	E1200S	E2000D	ES600S	EB100P	E12000S	H51	H120
Weighing Mode	Single	Super	Super	Dual	Super	Poly	Super	Single	Single
Capacity	121g	202g	1210g	500/ 2020g	5500g	800/1600 4000/8100g	12100g	51g	121g
Readability	0.1 mg	0.1 mg	0.001g	0.001/ 0.01g	0.01g	0.01/0.02/ 0.05/0.1g	0.1g	0.1 mg	0.001g
Precision	±0.1 mg	±0.1 mg	±0.001g	±0.001/ 0.01g	±0.01g	±0.01/0.01/ 0.025/0.05g	±0.05g	±0.1 mg	±0.001g
Linearity	±0.2 mg	±0.2 mg	±0.002g	±0.002/ 0.01g	±0.02g	±0.02/0.02/ 0.05/0.1g	±0.1g	±0.3 mg	±0.0025g
Tare Range	0-121g	0-202g	0-1210g	0-500/ 2020g	0-5500g	0-8100g	0-12100g	0-51g 31 elec 20 mech	0-121g
Stabilization Time	~3 sec	~3 sec	~2 sec	~2 sec	~2 sec	~2 sec	~2 sec	~2 sec	~2 sec
Digital Filters	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable
Display Sequence	0.1-0.8 sec*	0.1-0.8 sec*	0.1-0.8 sec*	0.1-0.8 sec*	0.1-0.8 sec*	0.1-0.8 sec*	0.1-0.8 sec*	0.1-0.8 sec*	0.1-0.8 sec*
Operating Temp	10-40°C	10-40°C	0-40°C	0-40°C	0-40°C	0-40°C	0-40°C	10-40°C	10-40°C
Sensitivity Drift	±2x10 ⁻⁶ /°C	±2x10 ⁻⁶ /°C	±2x10 ⁻⁶ /°C	±2x10 ⁻⁶ /°C	±2x10 ⁻⁶ /°C	±3x10 ⁻⁶ /°C	±4x10 ⁻⁶ /°C	±4x10 ⁻⁶ /°C	±4x10 ⁻⁶ /°C
Pan Size	90 mm dia.	90 mm dia.	130 mm dia.	130 mm dia.	235x190 mm	235x190 mm	235x190 mm	63 mm dia	80 mm dia
Weighing Below	Standard	Standard	Standard	Standard	Standard	Standard	Standard	N/A	N/A
Built-in Calibration	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Yes	Yes
Weighing Chamber, with lid	200x265x 184 mm	200x265x 184 mm	Optional	Optional	Optional	Optional	N/A	151x134x 121 mm	Optional
Pan Clearance	257 mm	257 mm	N/A	N/A	N/A	N/A	N/A	120 mm	35 mm
Housing, with lid	230x343x 291 mm	230x343x 291 mm	252x84x 275 mm	252x84x 275 mm	252x84x 275 mm	252x84x 275 mm	252x64x 275 mm	185x210x 200 mm	185x53x 200 mm
Weight	7.5 Kg	7.5 Kg	8 Kg	8 Kg	8 Kg	8 Kg	7 Kg	2 Kg	2 Kg
Power Consumption	9 VA	9 VA	8 VA	8 VA	8 VA	8 VA	10 VA	7 VA	7 VA
Data Output	Optional**	Optional**	Optional**	Optional**	Optional**	Optional**	Optional**	Optional**	Optional**

*Depending on filter setting

**RS232C/423

Series L



Series P



L220S	L310	L420D	L420P	L420S	L610	L610D	L2200P	L2200S	P5	P500
Super	Single	Dual	Poly	Super	Single	Dual	Poly	Super	Single	Single
222g	310g	40/424g	80/160/424g	424g	610g	60/606g	400/800/2200g	2220g	5050g	505g
0.001g	0.01g	0.001/0.01g	0.001/0.002/0.005g	0.001g	0.01g	0.001/0.01g	0.01/0.02/0.05g	0.01g	10g	0.1g
±0.001g	±0.005g	±0.001/0.005g	±0.001/0.001/0.0025g	±0.001g	±0.005g	±0.001/0.005g	±0.01/0.01/0.025g	0.005g	±10g	±0.1g
±0.005g	±0.01g	±0.001/0.01g	±0.0015/0.002/0.005g	±0.002g	±0.01g	±0.001/0.01g	±0.02/0.02/0.05g	0.015g	±10g	±0.1g
0-222g	0-310g	0-40/424g	0-424g	0-424g	0-610g	0-60/606g	0-2200g	0-2220g	0-5050g	0-505g
~2 sec	~2 sec	~2 sec	~2 sec	~2 sec	~2 sec	~2 sec	~2 sec	~2 sec	~2 sec	~2 sec
4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	2 adjustable settings	2 adjustable settings
0.1-0.8 sec	0.1-0.8 sec	0.1-0.8 sec	0.1-0.8 sec	0.1-0.8 sec	0.1-0.8 sec	0.1-0.8 sec	0.1-0.8 sec	0.1-0.8 sec	0.25-0.5 sec	0.25-0.5 sec
0-40°C	0-40°C	0-40°C	0-40°C	0-40°C	10-40°C	0-40°C	10-40°C	10-40°C	0-40°C	0-40°C
±2x10 ⁻⁶ °C	±5x10 ⁻⁶ °C	±5x10 ⁻⁶ °C	±5x10 ⁻⁶ °C	±2x10 ⁻⁶ °C	±5x10 ⁻⁶ °C	±5x10 ⁻⁶ °C	±1x10 ⁻⁵ °C	±2x10 ⁻⁶ °C	±7x10 ⁻⁵ °C	±7x10 ⁻⁵ °C
130 mm dia.	130 mm dia.	130 mm dia.	130 mm dia.	130 mm dia.	211x169 mm	130 mm dia.	211x169 mm	211x169 mm	160x128 mm	116 mm dia.
Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	N/A	N/A
Yes	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Optional	Optional	Optional	Optional	Optional	N/A	Optional	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
220x60x235 mm	220x74x235 mm	220x74x235 mm	220x74x235 mm	220x60x235 mm	220x75x235 mm	220x74x235 mm	220x75x235 mm	220x75x235 mm	175x57x165 mm	175x57x165 mm
4.5 Kg	4.5 Kg	4.5 Kg	4.5 Kg	4.5 Kg	4.5 Kg	4.5 Kg	4.5 Kg	4.5 Kg	1.7 Kg	1.7 Kg
7 VA	7 VA	7 VA	7 VA	7 VA	7 VA	7 VA	7 VA	7 VA	0.35 VA	0.35 VA
Optional**	Optional**	Optional**	Optional**	Optional**	Optional**	Optional**	Optional**	Optional**	N/A	N/A

Electrical requirements (all balances): 110V, 50-60 Hz.
 Series P models can be operated on a 9v battery or 220V.
 Size required for series A, L and L specified when ordering.

Series R



Series U



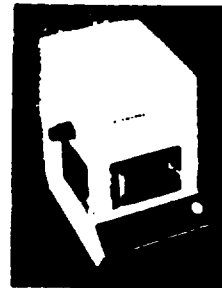
R180P	R2000	R300S	U8	U3800	U4800P	U8000D	U8100
Poly	Dual	Super	Single	Single	Poly	Dual	Single
30/60/ 162g	42/205g	303g	8100g	3640g	600/1200/ 3000/4140g	500/5050g	6100g
0.01/0.02 0.05 mg	0.01 0.1 mg	0.1 mg	1.0g	0.1g	0.01/0.02 0.05/0.1g	0.01/0.1g	0.1g
±0.02/0.03/ 0.05 mg	±0.02/ 0.1 mg	±0.2 mg	±1.0g	±0.05g	±0.01/0.01/ 0.025/0.05g	±0.01/0.05g	±0.05g
0.03/0.05 mg	±0.03 0.2 mg	±0.3 mg	±1.0g	±0.1g	±0.02/0.02 0.05/0.01g	±0.01/0.1g	±0.1g
0-162g	0-42/ 205g	0-303g	0-8100g	0-3640g	0-4140g	0-500/ 5050g	0-6100g
~5 sec	~5.3 sec	~3 sec	~2 sec	~2 sec	~2 sec	~2 sec	~2 sec
4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable	4 levels program controllable
0.2-0.8 sec	0.2-0.8 sec	0.2-0.8 sec	0.1-0.8 sec	0.1-0.8 sec	0.1-0.8 sec	0.1-0.8 sec	0.1-0.8 sec
10-40°C	10-40°C	10-40°C	0-40°C	0-40°C	0-40°C	0-40°C	0-40°C
±1 x 10 ⁻⁶ °C	±2 x 10 ⁻⁶ °C	±2 x 10 ⁻⁶ °C	±3 x 10 ⁻⁵ °C	±1 x 10 ⁻⁵ °C	±4 x 10 ⁻⁶ °C	±5 x 10 ⁻⁶ °C	±5 x 10 ⁻⁶ °C
90 mm dia	90 mm dia	90 mm dia	235x180 mm	235x180 mm	235x180 mm	235x180 mm	235x180 mm
Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard
Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A
188x253x 149 mm	188x253x 149 mm	188x253x 149 mm	N/A	N/A	N/A	N/A	N/A
246 mm	246 mm	246 mm	N/A	N/A	N/A	N/A	N/A
219x317x 408 mm	219x317x 408 mm	219x317x 408 mm	250x65x 270 mm	250x65x 270 mm	250x65x 270 mm	250x65x 270 mm	250x65x 270 mm
9	13 Kg	13 Kg	5 Kg	5 Kg	5 Kg	5 Kg	5 Kg
135 VA	125 VA	125 VA	8 VA	8 VA	8 VA	8 VA	8 VA
Optional**	Optional**	Optional**	Optional**	Optional**	Optional**	Optional**	Optional**

Model
Weighing Mode
Capacity
Readability
Precision
Linearity
Test Range
Stabilization Time
Digital Filters
Display Sequence
Operating Temp
Sensitivity Drift
Pan Size
Weighing Below
Built-in Calibration
Weighing Chamber (w x h x d)
Pan Clearance
Housing (w x h x d)
Weight
Power Consumption
Data Output

Series 3800



Series 4500



3807 MP6	3808 MP6	3826 MP6	3882 MP6	3876 MP6	4803 MP6	4884 MP6
Single	Single	Single	Single	Poly	Single	Single
60,000g	30,000g	31,000g	16,000g	3000/6000/ 15,000/ 24,200g	4.1g 300 mg (electronic)	4.02g 120 mg (electronic)
10g	0.1g	10g	0.1g	0.1/0.2/ 0.5/1.0g	1.0 µg	0.1 µg
±1.0g	±0.15g ±0.2g	±0.5g ±1.0g	±0.05g ±0.15g	±0.1/0.1/ 0.25/0.5g ±0.2/0.2/ 0.5/1.0g	±0.001 mg	±0.0002 mg
0-60,000g	0-30,000g	0-31,000g	0-16,000g	0-24,200g	0-300 mg	0-120 mg
~2 sec	~2 sec	~2 sec	~2 sec	~2 sec	~10 sec	~10 sec
4 adjustable settings	4 adjustable settings	4 adjustable settings	4 adjustable settings	4 adjustable settings	auto. adjustable	4 adjustable settings
0.1-0.8 sec*	0.1-0.8 sec*	0.1-0.8 sec*	0.1-0.8 sec*	0.1-0.8 sec*	0.25 (fixed)	0.2-0.8 sec.
0-40°C	0-40°C	0-40°C	0-40°C	0-40°C	0-40°C	0-40°C
±5x10 ⁻⁶ °C	±2x10 ⁻⁶ °C	±1x10 ⁻⁵ °C	±2x10 ⁻⁶ °C	±2x10 ⁻⁶ °C	±2x10 ⁻⁶ °C	±2x10 ⁻⁶ °C
318x408 mm	318x408 mm	240x295 mm	240x295 mm	240x295 mm	22 mm dia.	22 mm dia.
Optional	Optional	Optional	Optional	Optional	N/A	N/A
Standard	Standard	N/A	Standard	Standard	Standard	Standard
N/A	N/A	N/A	N/A	N/A	145x80x 70 mm	185x78x 128 mm (outer)***
N/A	N/A	N/A	N/A	N/A	50 mm	55 mm
350x185x 582 mm	350x185x 582 mm	250x125x 410 mm	250x125x 410 mm	250x125x 410 mm	170x245x 390 mm	203x326x 380 mm
27.3 Kg	27.3 Kg	10 Kg	10 Kg	10 Kg	9 Kg	14.5 Kg
15 VA	15 VA	12 VA	15 VA	15 VA	12 VA	12 VA
Optional	Optional	Optional	Optional	Optional	Standard BCD	Standard

***52x78x
77 mm (inner)

Plug-in Accessories for Sartorius Balances

Printer

Economical alphanumeric printer connects directly to all -RS- balances. Permanently records all data displayed and sequentially records all weight printouts from 1 to 999. Model YDP01-TD includes time date feature. RS232C data output and basic statistical data.

Description	Catalog No.
Model YDP01-Printer	73 82 190-5
Model YDP01-TD Printer	73 82 203-5

Infrared Dryer for Moisture Determination

Used with Sartorius Series L balances with RS232C data output (-RS). Featuring program-controlled drying and data computation that reduce time-consuming operation and errors. Ten programmable drying routines satisfy different drying needs: adjusting parameters such as time, temperature and rate of change (g/sec). Reproducibility ensured by precise temperature control ranging from 40° to 160° C. Automatic shut-off at end of drying routine with predetermined settings. Three-phase drying (ramping) for all ten programs. Results displayed as the amount of dry substance in grams or percent or weight loss as a percent value of the dried substance. Percentages are read to one or two places behind the decimal point. Heat source is an IR lamp (250W/110V).

Description	Catalog No.
Infrared Dryer, Model YTC01-L for Sartorius Balance Models L310-RS, L220S-RS, L420D-RS, L420P-RS, -420S-RS and L610C-RS	73 93 053-2
Disposable aluminum bowls (pkg. of 80)	73 93 300-5

Data Output Converters

All Sartorius MP8-RS balances can accommodate other standard data transfer formats. We also offer the following converters:

Description	Catalog No.
Model 7253-15 20 mA Loop Converter	73 72 535-5
Model 7253-16 IEEE 488 Converter	73 72 536-5
Model 7253-18 BCD Parallel Converter	73 72 538-5
Model 7253-19 RS422 Converter	73 72 539-5
Model 7287 Analog Converter	73 72 870-5

Brimmann Limit Value Controller

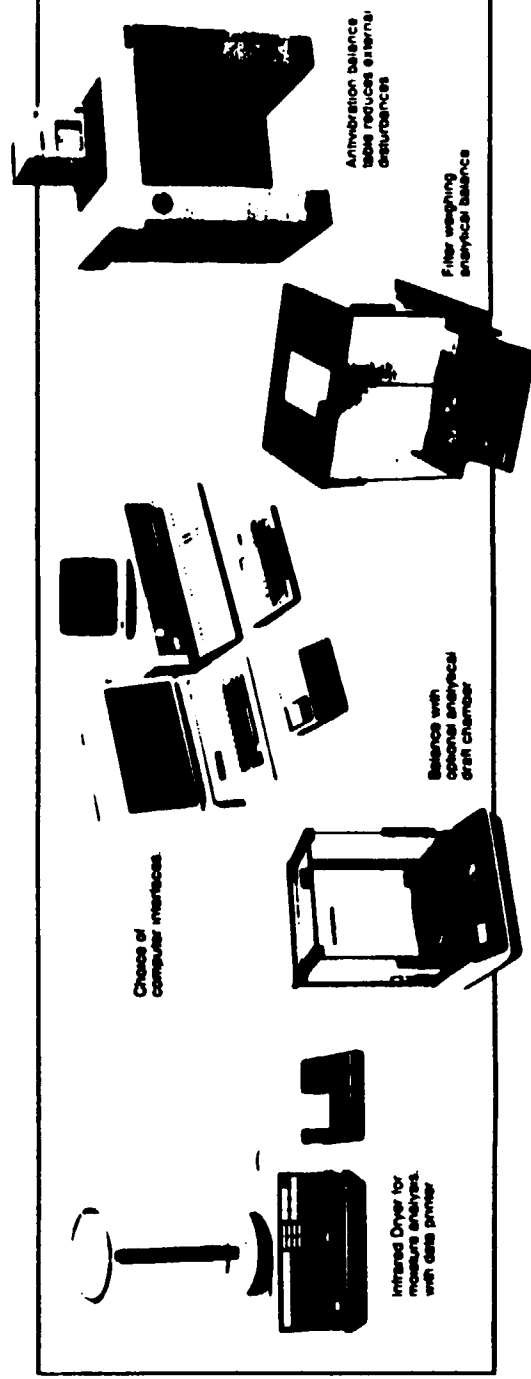
Connects to Sartorius balances with RS232C 423 data output. Permits upper and lower weight settings with either logic level or relay switch outputs. Three LEDs indicate when weight is above upper limit, below lower limit or within limits. Outputs can be used to activate an alarm, start or stop a filling pump, or close a level-control valve.

Description	Catalog No.
Model FC2582 Limit Value Controller for MP8-RS Balances	72 70 599-5

Computers & Interfaces to MP8-RS Balances*

Description	Catalog No.	External Keyboards to MP8-RS Balances*
Epson HX-20 System with Program and Interface	72 69 545-3	Counting
Interface for Epson HX-20	72 69 160-1	Animal Weighing
Interface for Hewlett-Packard 85	72 70 305-7	Conversion
Interface for Apple II	72 70 304-9	Formulation/Compounding
Interface for IBM PC	72 69 230-6	Statistics
		Density (specific gravity)

*Also for Series A, E, H, L and U Balances with -RS output.



Sartorius Balances and Scales

General Accessories

Foot Switches for MP8 RS Balances

Model	7252 Tare Foot Switch
Model	7223 Data Transfer Foot Switch
Catalog No.	72 70 264-6
72 70 262-0	Model: 7258 T-Connector
72 70 462-7	

Analytical Draft Chambers

Model	YD5011 Draft Chamber for Models L2205, L310, L4205
Model	YD501E Draft Chamber for Model E8100P
Model	YD501E Draft Chamber for Models L2205, L310, L4205 and L6100
Model	YD501H Draft Chamber for Model H120
Model	YD501H Draft Chamber for Models E1200S, E3500S and E518 MP8
72 70 523-8	
73 03 020-0	

Antivibration Balance Tables

Model	I Antivibration Balance Table 29 1/2" W x 23 1/2" D x 31 1/2" H
Model	II Antivibration Balance Table 29 1/2" W x 23 1/2" D x 34 1/2" H
73 03 020-0	
73 03 020-1	

Loading Devices

Model	LD1000A/E/H/L/R/U
Model	LD1000A/E/H/L/R/U
73 03 020-3	

Filter Weighing Balance A200S-FW

Model	A200S-FW Filter Weighing Balance
73 03 020-1	

Calibration Weights

Calibration of Sartorius Balances can be performed by Brinkmann field service technicians on a regular basis. To purchase your own calibration weights, contact Brinkmann Instruments, Inc. with the model number and calibration weight required.

Ordering Information

Order by model number	
Optional RS232C/422 Data Output for MP8 Models	
Add - RS to the balance model number	
Defaulted Balances:	
Add the appropriate meter - for example a Model LB10 Counting Scale is ordered as Meter LB10-C	
For Other Accessories:	
Please consult the appropriate accessories price list for complete listings. Price lists are available from your local Brinkmann representative branch office or the main office in Westbury, NY.	

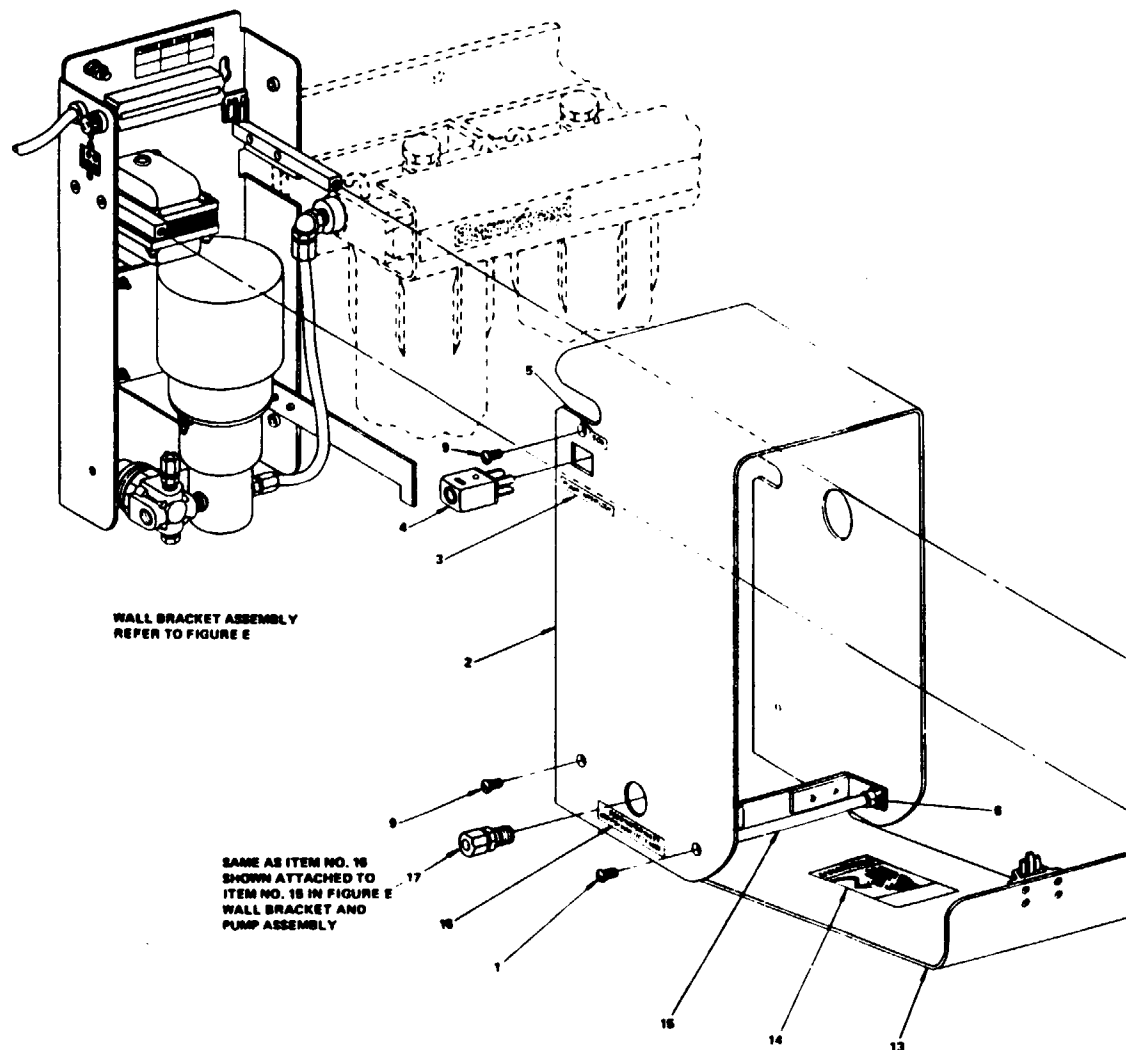
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For more information call 800-645-3050 in New York.
516-334-7500 Or write Brinkmann Instruments, Inc.,
Cantiague Road, Westbury, NY 11590

BR 49811

Sartorius

Shaping the future. **Brinkmann**
INSTRUMENTS, INC.



ITEM NO.	DESCRIPTION	CATALOG NO.
1	SCREW, MACHINE, OVAL HEAD, NO. 8 - 32 UNC x 3/8"	10485
2	COVER WRAPPER	10441
3	DECAL, PUMP INTERLOCK	00893
4	JUMPER PLUG	0424
5	DECAL, 2.0A	(1) 00894
6	DECAL, 3.0A	(2) 00895
7	SHOULDER WASHER, NYLON	10448
8	PRINTED CIRCUIT FUSE, 0.2 AMP, SLOW-BLOW	04487
9	RESISTIVITY METER ASSEMBLY	(3) 10488
10	RESISTIVITY METER ASSEMBLY	(4) 10500
11	RESISTIVITY METER ASSEMBLY	(1) 10501
12	SCREW, MACHINE, OVAL HEAD, NO. 10 - 24 UNC x 3/8"	10480
13	FINISHING WASHER, COUNTERSUNK, NYLON	10483
14	SCREW, MACHINE, NO. 4 - 40 UNC x 1/4"	10486
15	STRIKER LATCH	00837
16	FRONT COVER	10446
17	LABEL, WARNING	00867
18	HINGE PIN	10433
19	DECAL, FEEDWATER INLET	00862
20	ADAPTER, 1/4" O.D. x 1/4" NPT	00931
21	BULB, INDICATOR SWITCH	04458
22	LENS, INDICATOR SWITCH, GREEN	04432
23	LENS, INDICATOR SWITCH, RED	04433
24	DECAL, IDENTIFICATION	00838

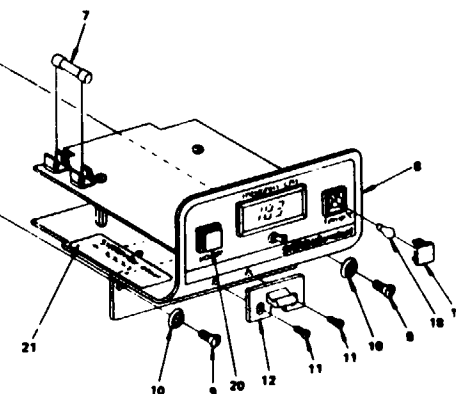
(1) FOR 230 VAC VERSIONS (D3782 OR D3787) ONLY.

(2) FOR 100 VAC VERSIONS (D3784 OR D3785) AND 115 VAC VERSIONS (D3791) OR (D3794) ONLY.

(3) FOR 100 VAC VERSIONS (D3784 OR D3785) ONLY.

(4) FOR 115 VAC VERSIONS (D3791 OR D3794) ONLY.

* HARDWARE ITEM MAY BE OBTAINED LOCALLY.



F/O I
Figure A. Pump Module Housing

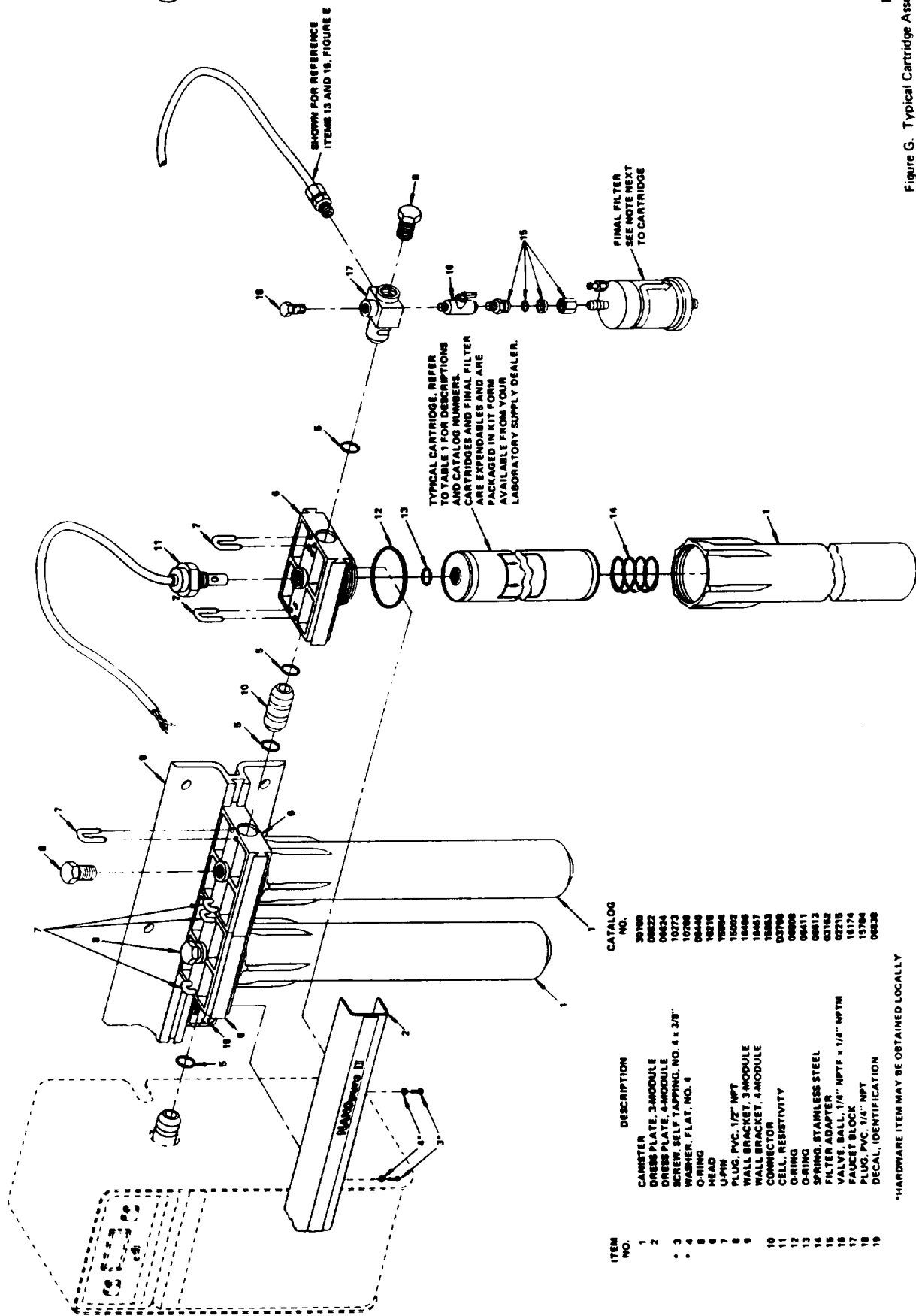
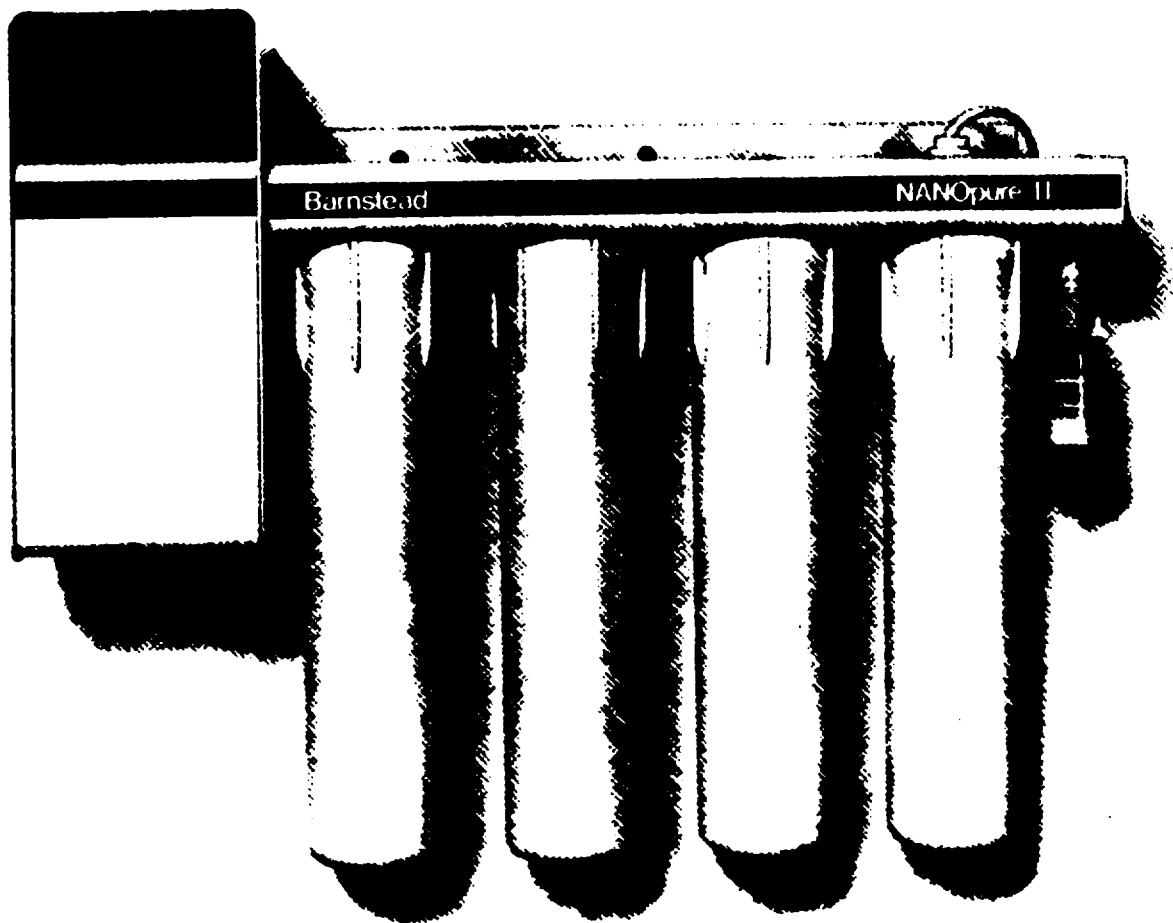


Figure G. Typical Cartridge Assembly
F/O II

Barnstead NANOpure II

Owner's Manual



Barnstead | Thermolyne

Barnstead | Thermolyne

2555 KERPER BOULEVARD
DUBUQUE, IOWA 52001 U.S.A.

Dear Customer:

Thank you for selecting Barnstead's NANOpure II for your deionized water needs. We appreciate your confidence in our company and our products.

Barnstead's ability to meet today's needs and to develop tomorrow's systems is basic to our company's adherence to a tradition of ingenuity and craftsmanship.

Knowing your needs can help us to achieve a better understanding of how we can improve our products for water purification.

If you have any comments or suggestions, please contact me directly at Barnstead.

If you should encounter problems, please contact your laboratory supply dealer or Barnstead Customer Service.

Sincerely yours,



Chet Chomka
Development Engineer
Barnstead Company

NANOpure II Design Team



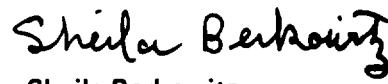
George Dikmak
Industrial Engineer



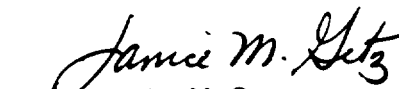
Matthew J. Radigan
Microbiologist



Susan Adam
Designer



Sheila Berkowitz
W.A.T.E.R. Lab Technician



Janice M. Getz
Communications Coordinator

IMPORTANT

WATER PURIFICATION TECHNOLOGY EMPLOYS ONE OR MORE OF THE FOLLOWING:

CHEMICALS, ELECTRICAL DEVICES, MERCURY VAPOR LAMPS, STEAM AND HEATED VESSELS. CARE SHOULD BE TAKEN WHEN INSTALLING, OPERATING OR SERVICING BARNSTEAD PRODUCTS. LISTED BELOW ARE THE SPECIFIC SAFETY NOTES PERTINENT TO THE BARNSTEAD NANOpure II.

WARNING

THIS DEVICE IS TO BE USED WITH WATER FEEDS ONLY. SANITIZING/CLEANING AGENTS MUST BE USED IN COMPLIANCE WITH INSTRUCTIONS IN THIS MANUAL. FAILURE TO COMPLY WITH THE ABOVE COULD RESULT IN EXPLOSION AND PERSONAL INJURY.

WARNING

ENSURE THAT THE EQUIPMENT IS CONNECTED TO ELECTRICAL SERVICE ACCORDING TO LOCAL AND NATIONAL ELECTRICAL CODES. FAILURE TO PROPERLY CONNECT MAY CREATE A FIRE OR SHOCK HAZARD.

WARNING

DO NOT MOUNT NANOpure II DIRECTLY OVER EQUIPMENT THAT REQUIRES ELECTRICAL SERVICE. ROUTINE MAINTENANCE OF THIS UNIT MAY INVOLVE WATER SPILLAGE AND SUBSEQUENT ELECTRICAL SHOCK HAZARD IF IMPROPERLY LOCATED.

WARNING

TO PREVENT ELECTRICAL SHOCK, DISCONNECT THE POWER PRIOR TO SERVICING NANOpure II.

WARNING

FOR CONTINUED PROTECTION AGAINST POSSIBLE FIRE HAZARD, REPLACE FUSES ONLY WITH THE SAME TYPE AND RATING OF FUSE.

WARNING

- AVOID SPLASHING DISINFECTING SOLUTIONS ON CLOTHING OR SKIN.
- ENSURE ALL PIPING CONNECTIONS ARE TIGHT TO AVOID LEAKAGE OF CHEMICALS.
- ALWAYS DEPRESSURIZE CHEMICAL LINES BEFORE DISASSEMBLY.
- ENSURE ADEQUATE VENTILATION.
- FOLLOW CAREFULLY THE MANUFACTURER'S SAFETY INSTRUCTIONS ON LABELS OF CHEMICAL CONTAINERS.

DESCRIPTION OF TERMS IN MANUAL

WARNINGS

APPLY WHEN THERE IS A POSSIBILITY OF PERSONAL INJURY.

CAUTIONS

APPLY WHEN THERE IS A POSSIBILITY OF DAMAGE TO THE EQUIPMENT.

NOTES alert the user of the manual to pertinent facts and conditions.

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INTRODUCTION

It is the user's responsibility to read and understand the contents of this manual prior to installation and use of this equipment.

This manual contains the information you will need to install, operate, and maintain the NANOpure II, D3700 Series, cartridge deionization system manufactured by Barnstead Company/Division of Sybron Corporation.

The NANOpure II is designed to produce Type I Reagent Grade Water equal to or exceeding standards established by ASTM, CAP, and NCCLS.

Careful attention to the following instructions will assure that the NANOpure II runs properly and produces water to specification.

Illustrated parts list are attached inside the front and back cover and in the centerfold. Open the book at the centerfold and unfold the front and back drawings. Take a few minutes to familiarize yourself with the hardware before installation.

WARNING

THIS DEVICE IS TO BE USED WITH WATER FEEDS ONLY. SANITIZING/CLEANING AGENTS MUST BE USED IN COMPLIANCE WITH INSTRUCTIONS IN THIS MANUAL. FAILURE TO COMPLY WITH THE ABOVE COULD RESULT IN EXPLOSION AND PERSONAL INJURY.

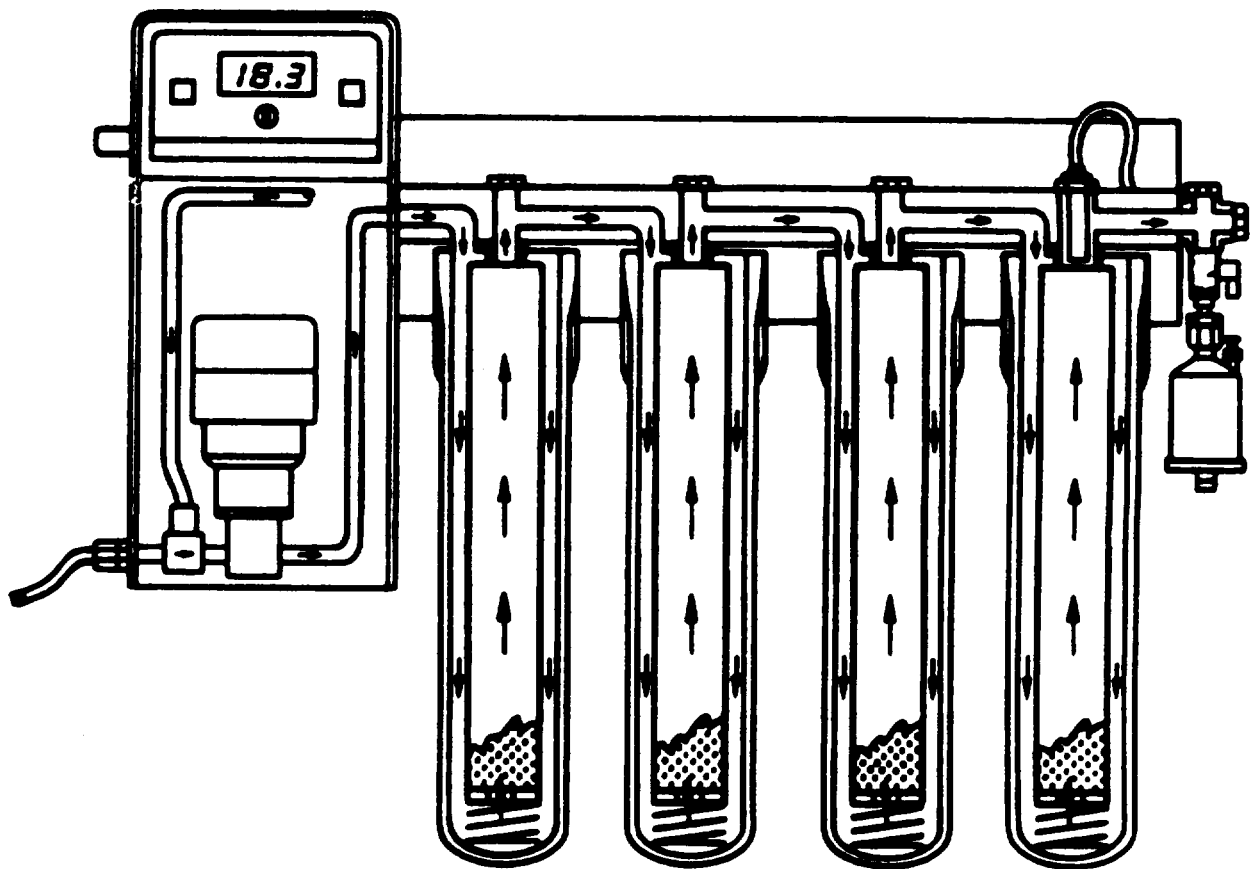


Figure B. System Flow Schematic

INSTALLATION

PRECAUTIONS BEFORE INSTALLATION

The NANOpure II deionization system can be used on pretreated or high quality tap water. Some municipal tap water supplies contain a very high concentration of suspended particulates, colloids, dissolved organic and inorganic materials that should be removed by pretreatment before the water is processed by the NANOpure II. The 4-Module unit is typically used with suitable tap water or for increased capacity with pretreated water. The 3-Module unit is typically used with water pretreated by reverse osmosis, distillation or deionization. If you plan to use tap water feed for your NANOpure II, Barnstead encourages the use of our water analysis service to verify feedwater suitability. A sample collection kit may be obtained by contacting any of our offices, or your preferred laboratory supply dealer.

The NANOpure II requires expendable pretreatment and deionization cartridges and final filters which are not supplied with the unit and must be purchased separately. These expendables are available as individual components or in Expendables Kits, as follows:

TABLE 1. EXPENDABLES KITS

D3805 3-Module Expendables Kit Consisting of
1 ea. D0835 Pretreatment Cartridge 2 ea. D0809 Ultrapure Cartridges 4 ea. D3749 NANOpure Final Filters

D3804 4-Module Expendables Kit Consisting of
1 ea. D0835 Pretreatment Cartridge 1 ea. D0803 High Capacity Cartridge 2 ea. D0809 Ultrapure Cartridges 4 ea. D3749 NANOpure Final Filters

Your NANOpure II is supplied with a pre-wired jumper (Item 4, Figure A) in the "pump interlock" connector. Installation of options D0603, D0606 (Float Switch) or D2706 (Pressure Switch) require removal of this jumper plug. DO NOT discard this plug, it will be needed for certain maintenance operations.

The North American 115 VAC version power cord is provided with a plug to be connected to a standard grounded electrical outlet. The 100 VAC and 230 VAC version power cords are not provided with a plug. Refer to TECHNICAL CHARACTERISTICS in this instruction for the electrical requirements, Table 2 and electrical wiring schematic on page 22 when either hard wiring or connecting the appropriate plug to the power cord. The power cord on NANOpure II is color coded to CEE* specifications.

TABLE 2. POWER CORD COLOR CODE

CEE* Color Coding	North American Standard Color Coding	Function
Light Blue	White	N – Neutral
Brown	Black	L – Live
Green/Yellow	Green or Green/Yellow	E – Earth or Ground

*International Commission on Rules for the Approval of Electrical Equipment.

WARNING

ENSURE THAT THE EQUIPMENT IS CONNECTED TO ELECTRICAL SERVICE ACCORDING TO LOCAL AND NATIONAL ELECTRICAL CODES. FAILURE TO PROPERLY CONNECT MAY CREATE A FIRE OR SHOCK HAZARD.

UNPACKING

Unpack the NANOpure II carefully. The pump housing is packaged separately from the cartridge assembly. Remove the "NANOpure II Mounting Instructions and Template" from the inside back cover of this manual.

Screws and fasteners required for wall mounting are not supplied with unit. See mounting template for further information.

SYSTEM LOCATION

Unfold the template carefully and follow the instructions on the template to prepare for mounting the unit on the wall.

The NANOpure II must be mounted at a level where there can be easy access to controls and the digital display can be read.

WARNING

DO NOT MOUNT NANOpure II DIRECTLY OVER EQUIPMENT THAT REQUIRES ELECTRICAL SERVICE. ROUTINE MAINTENANCE OF THIS UNIT MAY INVOLVE WATER SPILLAGE AND SUBSEQUENT ELECTRICAL SHOCK HAZARD IF IMPROPERLY LOCATED.

MOUNTING AND UTILITY CONNECTIONS

CAUTION

DO NOT CONNECT UNIT TO ELECTRICAL SERVICE UNTIL INSTRUCTED TO DO SO.

Mount the NANOpure II unit by the following steps:

- A. Remove the cartridge canisters (Item 1, Figure G) from the assembly by unscrewing them. Mount the cartridge assembly onto the wall using the holes marked T (for 3-Module) or F (for 4-module) on template.
- B. Remove the plastic protective plug located on the left side of the first cartridge canister and remove the U-pin at the top of this hole. Feed the resistivity cell cable behind the wall bracket so that the cable extends beyond the left side of the wall bracket.

- C. Now place the pump housing on a table. The pump housing has a "push to open" type concealed latch. Press the door just under the resistivity meter until you hear a click. Release pressure and open the door. The door may stick because of packing material. If this happens, pull gently on the rubber band, holding the packing material in place. Remove packing material.
- D. Remove the cloth bag of tools and plastic bag of Teflon® tape, feedwater tubing and fittings.
- E. Remove the two screws that hold the resistivity meter in place.
- F. With both hands, put your fingers behind the back of the bracket beneath the resistivity meter and press both thumbs against the front edges of the pump housing. Firmly, but carefully draw the resistivity meter assembly toward you until the printed circuit board is released from its connector.

CAUTION

THE METER ASSEMBLY AND PUMP HOUSING CONTAIN HAZARDOUS ENERGY COMPONENTS THAT CAN BE DAMAGED BY CARELESS HANDLING. EXERCISE CAUTION WHEN HANDLING THE METER ASSEMBLY OR WORKING INSIDE THE HOUSING.

- G. Disconnect short piece of plastic tubing by unscrewing the nut (Item 16, Figure E) from the discharge side of the pump. Insert the round adapter (Item 24, Figure E) in the left side of the cartridge assembly. Make sure the O-Ring is in place in the hole before installing U-pin. Install and seat the U-pin. This may require some gentle tapping with a hammer. The U-pin is properly seated when it is at a level equal to the other U-pins.
- H. Holding the pump housing up next to the cartridge assembly, insert the plastic tubing from the cartridge assembly through the round hole in the pump housing.
- I. Run the resistivity cell cable through the rectangular hole.

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- J. Maneuver the pump housing over the fitting attached to the cartridge assembly and then hang the housing on the fastener previously installed.
- K. Unwrap the coiled tubing connected to the pressure regulator. **DO NOT REMOVE THE FITTING AT THE END OF THIS TUBE.** Snake the tubing through the rectangular hole and push through to the right side of the wall bracket.
- L. Reconnect the short tube from the cartridge assembly to the pump discharge. Finger tighten only. Do not use a wrench.
- M. Make sure that the cable is placed behind cable guide (Item 28, Figure E) provided next to connector. No wires or tubing should cross in front of connector strip.
- N. Connect the resistivity cell wires to the connector block using the following table. A small screwdriver is required to reach the screw heads in the connector block. Use established wiring as a guide for proper insertion of wires.

TABLE 3. WIRING TABLE

Wire Color	Pin Number
Clear	17
Red	19
Black	21

- O. Install the remaining fasteners in the wall bracket of the pump housing. It is helpful here to lift the front door and check for alignment of the blue stripes. Adjust the housing up or down to achieve alignment and then tighten all fasteners.

- P. Re-install the resistivity meter in the housing carefully. Make sure the meter is inserted straight. When the circuit board is properly seated, the front panel will be about $\frac{1}{4}$ " behind the front edge of the pump housing cover. Secure this assembly with the two screws removed earlier.

NOTE

In some installations, Steps Q & R are more easily accomplished if the faucet block assembly is removed from the unit. If this is necessary, remove the block by prying up the U-pin.

- Q. Remove the rear $\frac{1}{4}$ " plug from the faucet block. Remove excess tape in threads of faucet block. Remove the fitting from the tubing that extends from the wall bracket and screw fitting into the faucet block. Finger tighten and then tighten one turn with a wrench. Reconnect the tubing to the fitting in faucet block (finger tighten only).
- R. If there is excess tubing, cut the tube to the correct length. Make sure you leave enough tube to allow for bends and a little slack. Disassemble the fitting from the short piece of tubing you cut off by backing the hex nut and the stainless steel grab ring off of the tube. The grab ring moves easily in only one direction (backwards). To re-install this fitting, see section, Tubing Connector Installation.
- S. To make your feedwater connection, refer to Figure D on page 6 and locate your particular configuration. Make connections as shown with tubing and fittings provided in plastic bag.

TUBING CONNECTOR INSTALLATION

CAUTION

DO NOT TIGHTEN TUBE FITTING HEX NUT WITH A WRENCH. TIGHT CONNECTIONS CAN BE EASILY MADE BY HAND.

- A. Completely disassemble the fitting. Refer to Figure C to familiarize yourself with the names of the component parts.
- B. Make sure the tubing is cut off reasonably square and that no plastic burrs or ridges are present.
- C. Place the grab ring and back up ring in the hex nut in the order and orientation shown in Figure C. Thread the nut onto the connector. DO NOT use the O-ring at this time.
- D. Push the tubing through the nut until it bottoms out in the connector.
- E. Remove the adapter nut and tubing. Place the O-ring over the tubing. Be careful not to push the backing ring or grab ring further back on the tubing when installing the O-ring.
- F. Install the hex nut on the connector and hand tighten.

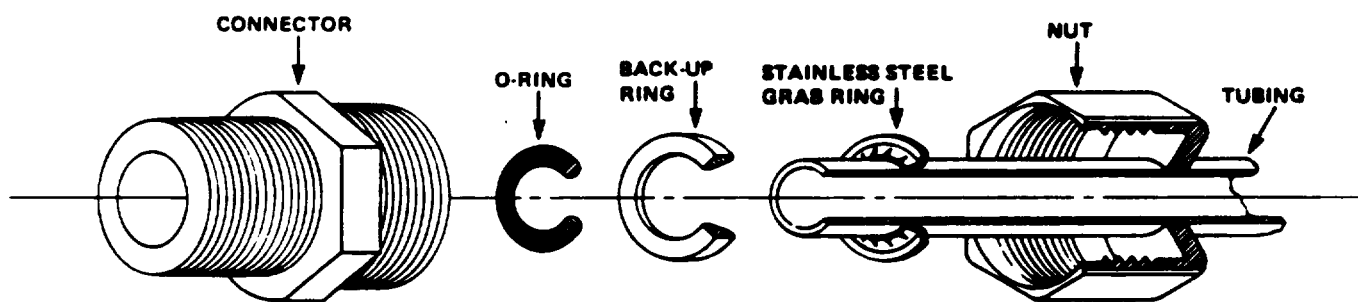


Figure C. Typical Polypropylene Tubing Connector Installation

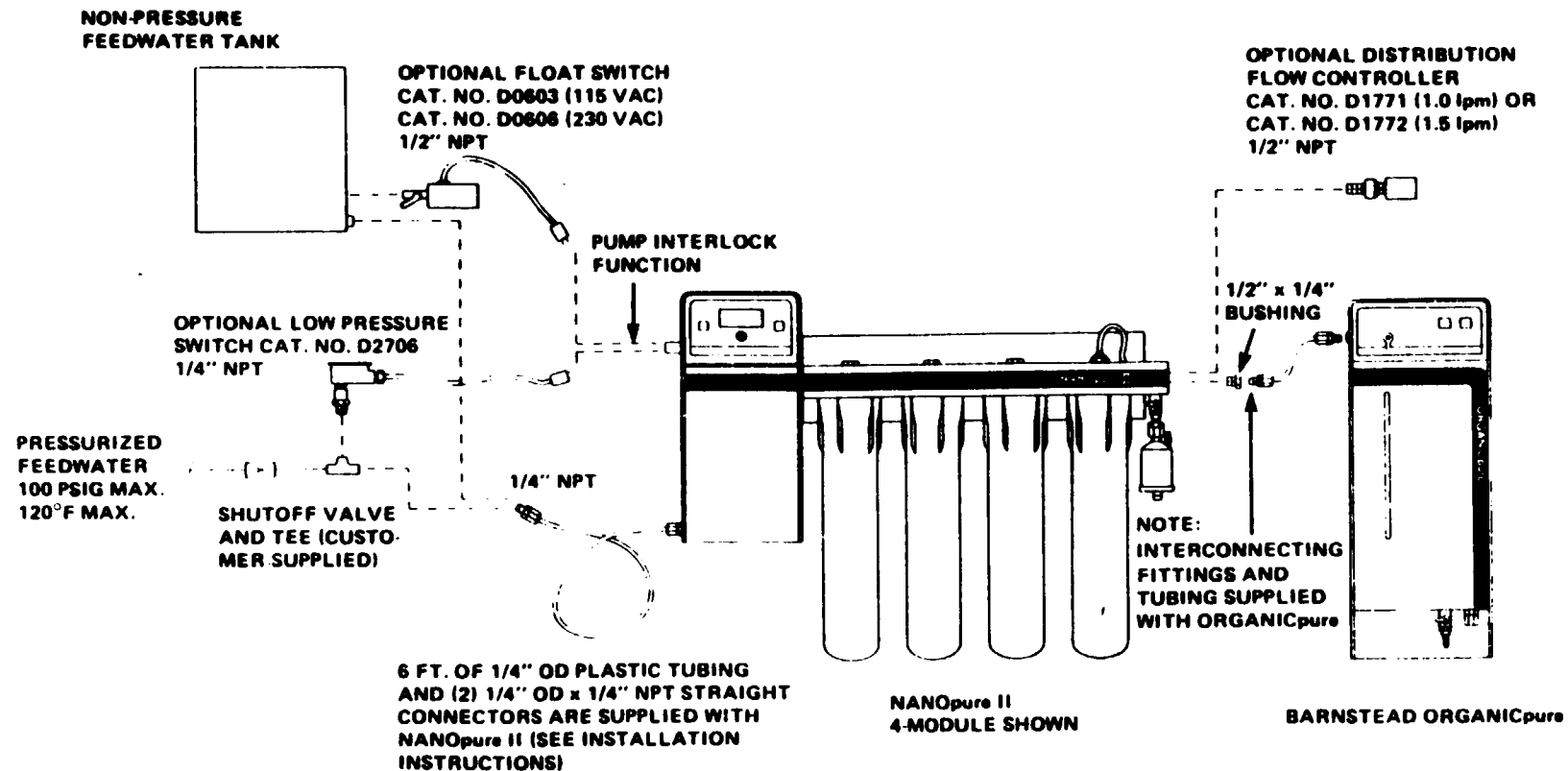


Figure D. Feedwater and Outlet Connection Options

OPERATION

INITIAL OPERATION

Install the cartridges from the Expendables Kit as follows:

- A. Remove seals from both ends of the large blue cartridge.
- B. Check to be sure a spring is installed in each canister.
- C. Check to be sure that the small O-ring inside the head (Item 13, Figure G) is in place. This is important because water will bypass the cartridge if this O-ring is not in place.
- D. Place cartridge(s) in canister with the **LARGE OPENING DOWN**.
- E. Refer to Table 4 for the correct left to right positioning of cartridges. This information is also shown on the side of the Expendables Kit box.

NOTE

Because of the fragile nature of the macroreticular resin used in the D0835 Pretreatment Cartridge, it is possible that shipment may have caused fracturing of some of the resin particles.

Resin fracturing will not degrade cartridge performance. However, it may reduce system performance as evidenced by premature clogging of the Final Filter. To insure optimum system performance and to prevent premature filter clogging, it is recommended that the D0835 Pretreatment Cartridge be rinsed to remove any fine particles. Install only the Pretreatment Cartridge in the first canister and run water to drain for ten minutes.

- F. Insert the canister vertically upward so that the boss in the bottom of the head is inserted in the hole in the top of the cartridge. Screw the canister onto the head by hand until a tight connection is made.

CAUTION

IT DOES NOT TAKE MUCH FORCE TO MAKE A TIGHT SEAL WHEN TIGHTENING THE CANISTER ON THE HEAD. OVERTIGHTENING WILL RESULT IN O-RING DAMAGE AND LEAKAGE.

Do not install the NANOpure Final Filter at this time.

TABLE 4. CORRECT CARTRIDGE SEQUENCE
(Left to Right)

3-Module		4-Module	
Type	Catalog No.	Type	Catalog No.
1. Pretreatment	D0835	1. Pretreatment	D0835
2. Ultrapure	D0809	2. High Capacity	D0803
3. Ultrapure	D0809	3. Ultrapure	D0809
		4. Ultrapure	D0809

NOTE

The correct sequence of cartridges is important in producing the desired quality of water.

FILLING PROCEDURE

CAUTION

DO NOT RUN THE PUMP DRY. DRY RUNNING WILL DAMAGE THE PUMP. ALWAYS MAKE SURE YOU HAVE AN ADEQUATE VOLUME OF FEEDWATER.

After every cartridge exchange, some air will be trapped in the system. Air should be purged before routine use, by the following procedure.

- A. Place a container or suitable drain under the faucet block.
- B. Open all inlet valves and the outlet valve (handle in vertical position).
- C. Plug the unit into the electrical service.
- D. Press the "power" button on the resistivity meter. To understand the indications on the digital purity meter, refer to Smart Purity Meter section.
- E. When there is a steady flow from the outlet valve, close the outlet valve.
- F. Check all fittings for leaks and tighten as necessary.
- G. Set the resistivity meter "setpoint" switch to the minimum resistivity setting ("1.0", "10.0", or "16.7" megohm-cm) required by your application.
- H. Install final filter using instructions on final filter box or as follows:
 1. Remove hex nut, backing ring and O-ring from adapter on faucet block.
 2. Place hex nut on filter. Insert backing ring into hex nut. FLAT SIDE OF RING MUST FACE AWAY FROM FILTER.

3. Place O-ring on filter hose fitting and press O-ring to seat around first hose barb.
4. Insert filter into adapter and finger tighten hex nut. Finger tighten only. DO NOT tighten with a wrench.

- I. Allow the pump to recirculate water before withdrawing any water from the unit. During this recirculation, the digital display will register a gradual improvement of water quality indicating that the ion exchange cartridges are functioning properly. After desired resistivity is reached, open the faucet valve and discard about 2 liters (½ gallon) of water into a container to rinse the filter.
- J. While water is flowing, carefully open the vent on top of the final filter to release any air trapped in the filter. This is accomplished by turning the vent fitting counterclockwise until water flows from the vent, and then closing the vent. After venting there should be a continuous flow from the filter.

NORMAL OPERATION

It is recommended that the pump be left operating during the normal workday to eliminate the need of rinsing the unit up to purity each time product water is required from the unit.

For an immediate indication of the system water temperature, press the green "temp°C" pushbutton switch. When the green light is on, the meter is indicating temperature.

NANOpure II is ready to deliver Type I Reagent Grade Water.

SMART PURITY METER

SELF CHECK SEQUENCE

When the NANOpure II is first turned on, the resistivity meter automatically goes through a series of checks to assure you of proper performance.

- A. To visually verify that all of the segments of the display are functional, all segments and decimals are illuminated, displaying three 8's and two decimal points.
- B. The numeric portion will disappear leaving the two decimals displayed for a short period of time. During this time, the error detection program is being verified (see section on Error Indications if sequence does not continue).
- C. The entire display will go blank for a short period. During this time, the circuitry is being verified for accuracy.
- D. The display will then indicate the resistivity measurement.

NORMAL OPERATION

After completing the self check sequence, the meter will measure resistivity of the NANOpure II system water, automatically corrected to 25°C. At this time, you may also measure system water temperature in °C by depressing the green button.

The three setpoints, "1.0", "10.0", and "16.7" megohm-cm) correspond to the recommended minimum quality set forth by the following specifications:

ASTM (16.7 megohm-cm)
CAP/NCCLS (10.0 megohm-cm)
Barnstead (1.0 megohm-cm) endpoint

This feature is not a controller, but an indicator to alert the user when the ionic purity falls below selected limits. As long as the water resistivity is at or above the selected setpoint, the meter will function normally. A low resistivity condition will be indicated by a

blinking display. The blinking will cease automatically when resistivity rises above the setpoint.

NOTE

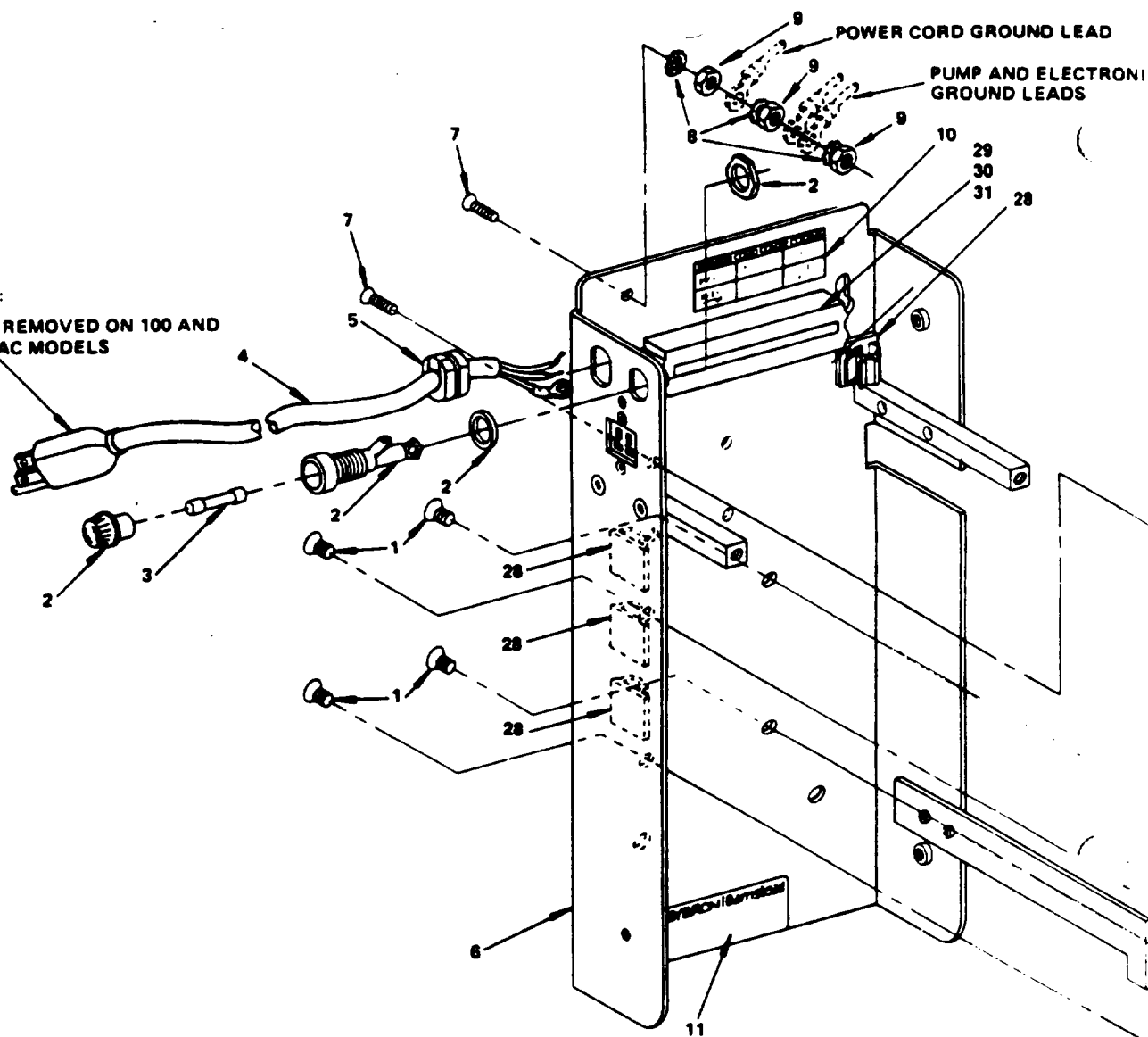
This is not an error indication. A blinking display will show the correct water resistivity.

ERROR INDICATIONS

In addition to constantly measuring resistivity, the NANOpure II automatically verifies system performance and will give the following indications of malfunction.

Blinking Decimals (no numeric display)	Air in system. Refer to Initial Operation to purge. Broken or disconnected wire from the cell to the electronics.
Continuously Lit Decimals (no numeric display)	Temperature measuring device disconnected. Broken wire at cell. (Requires cell replacement.) This indication can also be caused by incorrect wiring of the cell to the printed circuit connector block. Check for proper wiring before replacing cell.
Lower Case "c" displayed	Electronics not functioning. Return to factory.

NOTE:
PLUG REMOVED ON 100 AND
230 VAC MODELS

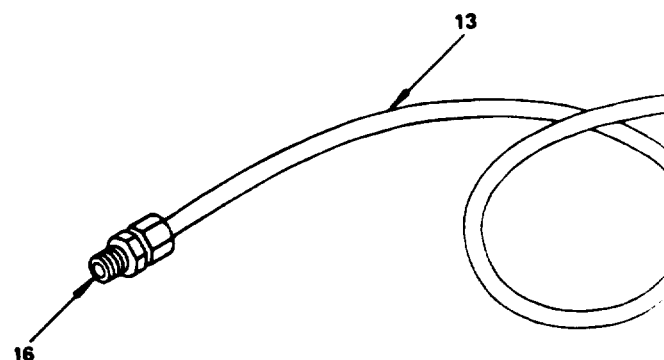


LEGEND:

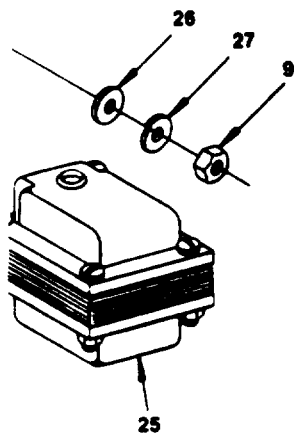
- [1] FOR 230 VAC VERSIONS (D3792 OR D3797) ONLY.
- [2] FOR 100 VAC VERSIONS (D3784 OR D3785) AND
115 VAC VERSION (D3791 OR D3794) ONLY.
- [3] SPECIFY LENGTH REQUIRED WHEN ORDERING.
- [4] FOR 100 VAC VERSIONS (D3784 OR D3785) ONLY.

* HARDWARE ITEM MAY BE OBTAINED LOCALLY.

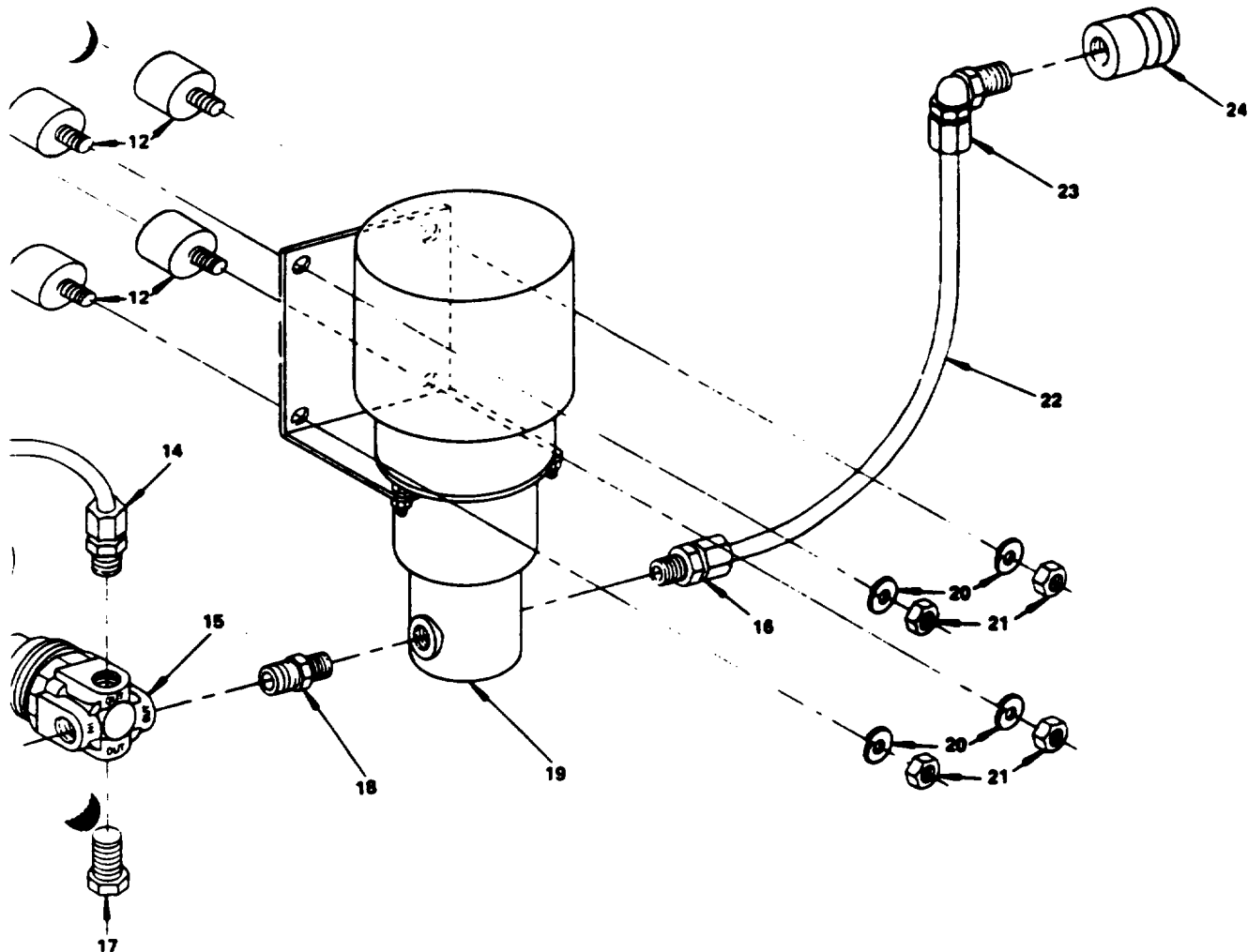
**NOT SHOWN



SAME AS ITEM NO. 17
SHOWN IN FIGURE A
PUMP MODEL HOUSING



ITEM NO.	DESCRIPTION	CATALOG NO.
1	SCREW, MACHINE, FLAT HEAD, 1/4 - 20 UNC x 3/8"	10451
2	FUSE HOLDER	15132
3	MAIN FUSE, SLOW BLOW, 2 AMPS	(1) 04420
	MAIN FUSE, SLOW BLOW, 3 AMPS	(2) 04455
4	POWER CORD	04453
5	STRAIN RELIEF, POWER CORD	15229
6	WALL BRACKET ASSEMBLY	16440
7	SCREW, MACHINE, FLAT HEAD, NO. 8 - 32 UNC x 3/4"	10316
8	WASHER, EXTERNAL TOOTH, NO. 8	10457
9	NUT, HEX, NO. 8 - 32 UNC	10243
10	DECAL, POWER CORD	06866
11	DECAL, IDENTIFICATION	06838
12	ISOLATION MOUNT	16432
13	TUBING, 1/4" OD x 40" LONG	(3) 15449
14	VALVE, CHECK, 1/4" OD TUBE x 1/4" NPT	02214
15	VALVE, PRESSURE REDUCING, 1/4" NPT	02280
16	ADAPTER, POLYPROPYLENE TUBE FITTING, 1/4" OD x 1/4" NPT	05931
17	PLUG, PVC, 1/4" NPT	15784
18	NIPPLE, 1/4" NPT x 1/4" NPT	03325
19	PUMP, MAGNETIC GEAR, 1/20 HP	01443
20	WASHER, LOCK, 1/4"	10277
21	NUT, HEX, 1/4 - 20 UNC	10257
22	TUBING, 1/4" OD x 11" LONG	(3) 15449
23	ELBOW, POLYPROPYLENE TUBE FITTING, 1/4" OD x 1/4" NPT	05766
24	END FITTING ADAPTER	16238
25	TRANSFORMER, STEP UP AUTO, 100/115V, 50/60 Hz, 2 AMP OUTPUT	(4) 01363
26	WASHER, FLAT, NO. 8	10229
27	WASHER, LOCK, NO. 8	10306
28	CABLE GUIDE	04454
29	PC CONNECTOR	04452
30	SCREW, MACHINE, FLAT HEAD, NO. 4 - 40	10467
31	NUT, HEX, NO. 4 - 40	10279



MAINTENANCE

WARNING

TO PREVENT ELECTRICAL SHOCK, DISCONNECT THE POWER PRIOR TO SERVICING NANOpure II.

Your NANOpure II is supplied with a tool kit consisting of:

- 1 ea. Lens Removal Tool
- 1 ea. Lamp Removal Tool
- 1 ea. 2.0 ampere or 3.0 ampere Fuse
- 1 ea. 0.2 ampere Fuse
- 1 ea. 14 volt Lamp

CARTRIDGE REPLACEMENT

When the resistivity of the water drops below the desired level, change all cartridges together.

- A. Disconnect power to the system.
- B. Close the shutoff valve on the inlet side of the system.
- C. Place a container under the final filter and open the faucet valve to depressurize the system. Close the faucet valve.
- D. Place a container under the cartridge canister to collect any spillage.
- E. Carefully unscrew the canister from the head by rotating the canister from right to left. Drain the canister into the container and remove the exhausted cartridge.
- F. Inspect the O-ring at the beginning of the threads on the head and replace the O-ring if worn.
- G. Install a new cartridge as explained in INITIAL OPERATION.

NANOpure FINAL FILTER REPLACEMENT

It is recommended that the final filter be replaced every 15 working days, when there is an unacceptable high bacteria passage or when flow decreases to less than 1 liter per minute.

To replace the final filter, follow instructions on filter box.

Always run at least 2 liters (½ gal.) of deionized water through a new filter after installation.

FUSE REPLACEMENT

WARNING

FOR CONTINUED PROTECTION AGAINST POSSIBLE FIRE HAZARD, REPLACE FUSES ONLY WITH THE SAME TYPE AND RATING OF FUSE.

Main Fuse Replacement. The "main fuse" is located in a fuse holder at the upper left side of the pump module housing. Simply push in and twist the fuse holder cap counterclockwise as indicated on the cap. The fuse will be attached to the cap. Replace with a slow blow 2 ampere fuse for 230 VAC units and a slow blow 3 ampere fuse for 100 or 115 VAC units. The fuses are labeled. To reassemble simply insert the fuse in the cap, align the cap keys with the keyway in the holder, push the cap inward and twist the cap fully clockwise to lock the assembly in place.

Printed Circuit Fuse Replacement. The "printed circuit fuse" is located in a fuse holder on the top of the printed circuit board in the resistivity meter assembly. To remove assembly see Mounting and Utility Connections, Paragraphs E and F. Replace this device with a 0.2 ampere slow-blow.

BULB REPLACEMENT FOR TEMPERATURE AND POWER SWITCHES

Lens and lamp removal tools are supplied with your instrument.

Using the metal lens removal tool, grasp the slots in the side of the lens, squeeze gently and pull the lens out from the lighted indicator.

Using the smallest end of the rubber tool, push the rubber tool over the bulb so that the bulb is firmly inside the tool, then pull the bulb from its socket.

Insert the replacement bulb in the shoulder (largest end of the rubber tool. Do not push the bulb too far into the tool; otherwise, it will interfere with the placement of the bulb in its socket.

Gently insert the bulb all the way into the socket, and gently pull the rubber tool from the bulb. The bulb is installed properly if the bulb remains in the socket when the tool is removed.

Push the lens back into the lighted indicator. The two tabs on the lens fit into slots in the indicator.

SYSTEM SANITIZATION

Frequency of cleaning is difficult to determine because of the wide variety of feedwater supplies that can be used, but the need for cleaning can be easily determined. Whenever a cartridge is replaced, always examine the inside of the canister for any residual deposits. If residual deposits are observed, clean the system as follows:

- A. Turn system off and disconnect power.
- B. Shut feedwater valve.
- C. Relieve system pressure by opening and closing the faucet valve.
- D. With the cartridges and springs out of all the canisters, wash the inside of the canisters and the inside of the heads with soap or detergent, using a sponge or clean cloth. Rinse out the canisters and the heads with clean water several times to remove the detergent residues.
- E. Make up either of the following disinfecting solutions
 1. Bleach: Add 1 liter (1 quart) of bleach (5.25% sodium hypochlorite) to 15 liters (4 gallons) of water to make a 0.3% solution.
 2. Formalin: Add 200 milliliters of 37% formaldehyde solution to 15 liters of water to make a 0.5% solution

WARNING

- AVOID SPLASHING DISINFECTING SOLUTIONS ON CLOTHING OR SKIN.
 - ENSURE ALL PIPING CONNECTIONS ARE TIGHT TO AVOID LEAKAGE OF CHEMICALS.
 - ALWAYS DEPRESSURIZE CHEMICAL LINES BEFORE DISASSEMBLY.
 - ENSURE ADEQUATE VENTILATION.
 - FOLLOW CAREFULLY THE MANUFACTURER'S SAFETY INSTRUCTIONS ON LABELS OF CHEMICAL CONTAINERS.
- F. Partially fill each canister with the above disinfecting solutions, and reassemble the canisters on the unit.
 - G. In a sufficient amount of the solution, soak the springs from the canisters for 5-10 minutes. Remove from solution and rinse.

- H. Remove the NANOpure Final Filter from the unit. Do not attempt to sanitize final filter with chemical solutions. Filter is autoclavable using standard autoclave procedure.
- I. If an external pressure switch or pump protector is used, disconnect from the receptacle on the left side of the pump housing, and install the jumper provided.
- J. Disconnect the feedwater line at the water source.
- K. Connect the feedwater inlet line to the container holding the remaining disinfecting solution.
- L. Connect power to the unit and start the pump.
- M. Drain off some solution through the faucet valve until a steady flow is achieved. Discard this solution.
- N. Recirculate the disinfecting solution for about one-half hour. Then open the faucet valve and allow the remaining disinfecting solution to enter the system, directing the output to drain.

CAUTION

DO NOT OPERATE THE PUMP DRY. DRY RUNNING WILL DAMAGE THE PUMP.

- O. Turn the unit off, and disconnect the power.
- P. Leave the faucet valve open to depressurize the system and to drain as much of the system as possible.
- Q. Carefully remove all the canisters from the system, and discard the solution remaining from the canisters. DO NOT RINSE THE CANISTERS.
- R. Install fresh cartridges in the system as indicated under Cartridge Replacement. DO NOT RE-INSTALL USED CARTRIDGES (they contain large amounts of bacteria).
- S. Reconnect the feedwater line to the feedwater source, and reconnect the pump protector or pressure switch to the receptacle on the pump housing. Save the jumper for future use.
- T. Open the feedwater shutoff valve, connect the power to the unit, and press the control panel "power" button to start the pump and fill the system. Run water through the system to drain any remaining disinfecting solution. A flush of 10 liters is sufficient.

- U. Close the faucet valve, and allow the resistivity of the water to rise above the "set point" setting on the resistivity meter. Install a new NANOpure Final Filter at the faucet block, as indicated under NANOpure Final Filter Replacement. The system is now ready for use.

RESISTIVITY CELL CLEANING

Disconnect the cell wires from the pump housing connector block. Tie a piece of string 6 feet long to the wire while it is still in the pump housing. Gently pull on the cell cable at the right side of the unit until the string emerges from the wall bracket. Untie the string from the cable.

Remove the cell from the head assembly with a suitable wrench. Be careful not to twist the wire at the cell body during removal of the cell. Excessive twisting may break internal connections which will ruin the cell.

CAUTION

THE CELL ELECTRODES ARE ETCHED TO IMPROVE WETTING CHARACTERISTICS. DO NOT MECHANICALLY ABRASE OR DAMAGE THIS SURFACE.

Wash the cell in a mild detergent solution or a 10% inorganic acid solution (follow manufacturers recommended handling procedure). This may be done in an ultrasonic cleaner or with a soft brush. The cell must be thoroughly rinsed in deionized or distilled water following the detergent or acid cleaning.

CAUTION

DO NOT IMMERSE THE ENTIRE CELL ASSEMBLY IN CLEANING SOLUTION, ONLY THE ELECTRODE PORTION.

After cleaning, install the cell in the NANOpure II system. Remove old teflon tape from head and cell threads and apply a fresh wrap of teflon tape to cell body threads.

CAUTION

DO NOT OVERTIGHTEN CELL. EXCESSIVE TIGHTENING WILL CRACK THE HEAD.

After tightening, tie the string to the cell cable and gently pull the cable through the wall bracket into the pump housing. Remove the string. Re-connect the cell wires as shown in Table 3. Be sure to route the cable through the cable guide.

SHUTDOWN

If NANOpure II is to be shut down for an extended period of time, the system should be completely drained and the cartridges removed to prevent the growth of bacteria.

If the system has remained inactive and full of water, then the system should be drained, sanitized and new cartridges installed prior to use.

PARTS LIST

GENERAL

This section contains parts list information for the NANOpure II cartridge deionization system, Model D3700 Series. When ordering spare parts, specify part number and quantity desired. Also supply P/N and S/N shown on Items 21, 11, 19 – Figures A, E. G, respectively. When ordering electrical parts provide voltage and frequency information.

RECOMMENDED SPARES

Consumables. Consumable parts are those REQUIRED to support the day-to-day operation of this equipment. Barnstead establishes two types of consumables; those items that MUST periodically be replaced to maintain performance (filters, resin cartridges, etc.)

and other items of limited life (indicator lights, fuses, etc.) that the USER can expect to replace on a more or less random basis. Where practical, Barnstead recommends the frequency of replacement, or provides information on life expectancy from which the USER may calculate a replacement interval compatible with his usage pattern.

The replacement of consumable parts is discussed in the Maintenance Section of this manual to assist the USER in accomplishing his own service.

Consumables may be ordered separately and in some cases, as an Expendables Kit. Check with your Barnstead representative for additional information on the Expendables Kit.

CONSUMABLES

Description	Cat. No.	Recommended Quantity	
		3-Module	4-Module
NANOpure Final Filter	D3749*	1	1
Pretreatment Cartridge	D0835*	1	1
High Capacity DI Cartridge	D0803*	N/R	1
Ultrapure DI Cartridge	D0809*	2	2
3.0 ampere Slow Blow Fuse	04455**	1	1
2.0 ampere Slow Blow Fuse	04420***	1	1
0.2 ampere Slow Blow Fuse	04457	1	1
14 Volt Indicator Lamp	04458	2	2
Teflon Tape, Roll	06078	1	1

* NANOpure II Expendables Kit (see Table 1 in Installation Section).

** For 100 VAC and 115 VAC Models.

*** For 230 VAC Models.

N/R Denotes not required.

General Maintenance Parts. General maintenance parts are defined as laboratory level repair parts which do not require great expertise or special tools for installa-

tion. Barnstead recommends that the USER stock the general maintenance parts as an aid to ensuring the continued operation of this equipment.

GENERAL MAINTENANCE PARTS

	Cat. No.	Recommended Quantity	
		3-Module	4-Module
O-Ring (between heads)	06440	2	2
O-Ring (large head seal)	06808	3	4
O-Ring (small cart. seal)	06411	3	4
"U" Pin	15854	1	1
Connector (head to head)	15853	1	1
Adapter (head end)	16238	1	1
Spring	06613	1	1
Valve	02215	1	1
Check Valve	02214	1	1
1/4" O.D. x 1/4" NPT Connector	05931	1	1
Filter Adapter	03162	1	1

Safety Stock. For critical applications where performance with MINIMUM downtime is required, Barnstead recommends that the USER maintain a local stock of those parts listed under "General Maintenance" and "Safety Stock." In the event of

component failure, this safety stock can be drawn upon by USER or Barnstead technicians, thereby, avoiding unnecessary delays in delivery of replacement parts.

SAFETY STOCK

Description	Cat. No.	Recommended Quantity	
		3-Module	4-Module
Resistivity Meter, 100 VAC	16499	1	1
Resistivity Meter, 115 VAC	16500	1	1
Resistivity Meter, 230 VAC	16501	1	1
Recirculation Pump & Motor	01443	1	1
Pump Only	01444	1	1
Cartridge Canister Head	16215	1	1
Cartridge Canister	30100	1	1
Pressure Regulator	02280	1	1
Resistivity Cell	D3788	1	1

TROUBLESHOOTING CHART

Symptom	Probable Cause	Test and Remedy
NANOpure II completely inactive (pump not operating, control panel pushbuttons not lit, etc.)	No electrical power to NANOpure II Main fuse blown. Circuit board not inserted properly in connector.	Ensure that the NANOpure II power cord is connected to a live power source and completely plugged into the electrical outlet. Replace the main fuse as indicated under Main Fuse Replacement in the Maintenance Section. Install resistivity meter correctly.
Pump does not run. Display lights.	Pump protector (on reservoir), feedwater line pressure switch, or jumper plug not connected to pump module.	Connect the pump protector or pressure switch cord to the receptacle on the left side of the pump housing. If a Barnstead pressure switch is installed in the feedwater line, the pump will not start until the line pressure rises to 0.35 kg/cm ² (5 psi). Open the feedwater line shutoff valve or fill the feedwater reservoir. If no pump protector is used, make sure a jumper plug is installed.
Pump runs, but no display (no digital display and push buttons not lit)	Printed circuit fuse blown.	Replace the printed circuit fuse as indicated under Printed Circuit Fuse Replacement in the Maintenance Section.
Pump runs, display lights, but one or more indicator bulbs not lit. NOTE: Green temperature indicator lit only when depressed.	Burned out indicator bulb.	Replace the indicator bulb as indicated under Bulb Replacement for Temperature and Power Switches in the Maintenance Section.

TROUBLESHOOTING CHART (Cont.)

Symptom	Probable Cause	Test and Remedy
Recirculated water will not rinse up to desired purity level.	Exhausted cartridges. Cartridges out of order Cartridges upside down Cartridge end caps not removed at installation. Feedwater bypassing cartridge(s)	Replace all the cartridges as indicated under Cartridge Replacement in the Maintenance Section. Install the cartridges in the proper order as indicated under Initial Operation. Install the cartridges right side up as indicated under Initial Operation. (Check that a spring is installed in the bottom of each canister). Remove end caps. Be sure that small O-ring inside head is not damaged and is properly installed.
Reduced or no product flow	Final filter clogged Air trapped in final filter. Cartridge end caps not removed at installation.	Replace the final filter as indicated under NANOpure Final Filter Replacement. Vent the final filter. This is accomplished by turning the vent fitting counterclockwise until water flows from the vent, and then turning the vent fitting fully clockwise. Remove end caps.
Leaking Canisters	Large O-ring around head is missing, damaged or not sealed properly.	Replace or position correctly.

TROUBLESHOOTING CHART (Cont.)

Symptom	Probable Cause	Test and Remedy
Short Cartridge Life	Cartridges being used are beyond expiration date. Change in feedwater characteristics	Check the expiration date. Cartridges begin to lose capacity after being stored one year from the date of manufacture. Replace the cartridges with unexpired ones. If a Barnstead ROpure is the feedwater source, check that the membrane is functioning properly. If a Barnstead Still is the feedwater source, ensure that the distillate temperature to the NANOpure II does not exceed 49°C (120°F). If tap water is the feedwater source, check the quality of the water. In some cases the quality of the water will change with the seasons. Changing the source (city water to well water, or well water to city water) will result in a water quality change. If feedwater is from a central water purification system, verify water quality and proper functioning of the system.

TECHNICAL CHARACTERISTICS

Feedwater Requirements

Types [1]	Tap, RO, DI, distilled.
Pressure Range	Gravity feed to 7 kg/cm ² (100 psig) maximum.
Temperature Range	4-49°C (40-120°F)

Product Water

Water Quality [1]	Type I Reagent Grade Water (RGW) per ASTM-D1193, NCCLS-ASC-3, and CAP. Also general purpose deionized (GP) water (unfiltered).
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Flowrate (Typical) [2]

Type I RGW	Pressure feed	60 Hz	3.0 lpm
	(40 psig inlet min.)	50 Hz	2.5 lpm
	Gravity feed	60 Hz	1.5 lpm
	(12" H ₂ O)	50 Hz	1.3 lpm
General Purpose DI [3] (unfiltered)	Pressure feed	60 Hz	2.3 lpm
		50 Hz	1.9 lpm

Installation

Overall Dimensions

3-Module	
Width	737 mm (29").
Depth	191 mm (7 1/2").
Height	711 mm (28").
4-Module	
Width	889 mm (35").
Depth	191 mm (7 1/2").
Height	711 mm (28").

Operating Weight

3-Module	24.5 kg (54 lbs.)
4-Module	30.4 kg (67 lbs.)

Mounting	Wall mount with brackets provided.
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- [1] NANOpure II will produce Type I water using pretreated water (RO, DI, Distilled) or high quality tap water, provided feedwater suitability is qualified by laboratory analysis and recommended faucet flowrate is maintained.
- [2] Flowrates are dependent on operating conditions and filter usage. Flowrates will also depend on filter compaction.
- [3] Typical flowrate with 40 psig inlet and 30 psig outlet pressure at faucet block. Use of general purpose product water is not recommended on gravity fed systems.

TECHNICAL CHARACTERISTICS (Cont.)

Installation (Cont.)

Plumbing Connections

Feedwater Inlet 1/4" OD tubing or 1/4" NPTF

Product Water Outlet

For Type I Water Output 1/2" OD hose barb

For General Purpose DI Water 1/2" NPTF and 1/4" NPTF

Electrical Requirements (depending on model supplied)

Voltage and Frequency (Nominal)

100 VAC, 50/60 Hz 85-110 VAC, 47-63 Hz, 1 phase

115 VAC, 50/60 Hz 98-127 VAC, 47-63 Hz, 1 phase

230 VAC, 50/60 Hz 196-253 VAC, 47-63 Hz, 1 phase

Protection

100 VAC service 3 ampere slow blow fuse

115 VAC service 3 ampere slow blow fuse

230 VAC service 2 ampere slow blow fuse

Resistivity Measurement

Range 0.01-18.3 megohm-cm [temperature compensated to 25°C (77°F)].

Accuracy ± 3% FS

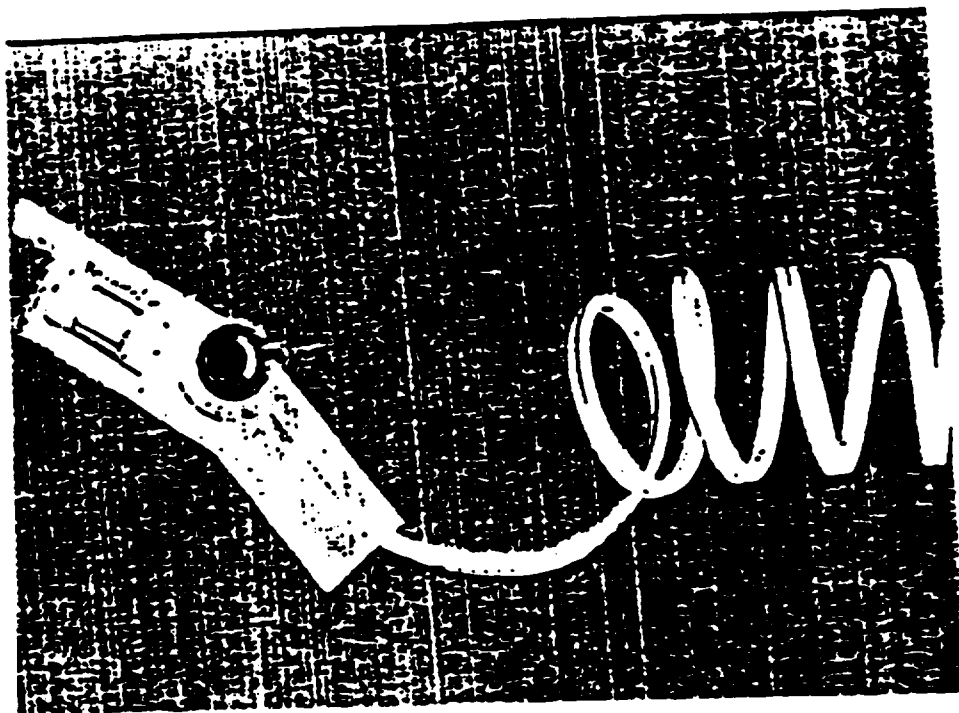
Cell 0.1 constant

Calibration Automatic check approximately every 9 minutes against internal standards. Microprocessor-controlled.

Panel Switches Power on/off; system water temperature and 1, 10 and 16.7 megohm-cm set-point capability.

INSTRUCTION MANUAL

REMOTE DISPENSER
D4700



Barnstead

Barnstead Thermolyne Corporation

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Milli-Q[®] registered trademark of Millipore Corporation.

IMPORTANT

WATER PURIFICATION TECHNOLOGY EMPLOYS ONE OR MORE OF THE FOLLOWING:

CHEMICALS, ELECTRICAL DEVICES, MERCURY VAPOR LAMPS, STEAM AND HEATED VESSELS. CARE SHOULD BE TAKEN WHEN INSTALLING, OPERATING OR SERVICING BARNSTEAD PRODUCTS. LISTED BELOW ARE THE SPECIFIC SAFETY NOTES PERTINENT TO THE BARNSTEAD REMOTE DISPENSER.

WARNING

DO NOT MOUNT REMOTE DISPENSER DIRECTLY OVER EQUIPMENT THAT REQUIRES ELECTRICAL SERVICE. ROUTINE MAINTENANCE OF THIS UNIT MAY INVOLVE WATER SPILLAGE AND SUBSEQUENT ELECTRICAL SHOCK HAZARD IF IMPROPERLY LOCATED.

WARNING

- .AVOID SPLASHING DISINFECTING SOLUTIONS ON CLOTHING OR SKIN.
- .ENSURE ALL PIPING CONNECTIONS ARE TIGHT TO AVOID LEAKAGE OF CHEMICALS.
- .ALWAYS DEPRESSURIZE CHEMICAL LINES BEFORE DISASSEMBLY.
- .ENSURE ADEQUATE VENTILATION.
- .FOLLOW CAREFULLY THE MANUFACTURER'S SAFETY INSTRUCTIONS ON LABELS OF CHEMICAL CONTAINERS AND MATERIAL SAFETY DATA SHEETS.

DESCRIPTION

WARNINGS	APPLY WHEN THERE IS A POSSIBILITY OF PERSONAL INJURY.
CAUTIONS	APPLY WHEN THERE IS A POSSIBILITY OF DAMAGE TO THE EQUIPMENT.
NOTES	Alert the user of the manual to pertinent facts and conditions.

INSTRUCTION MANUAL

D4700 Remote Dispenser

Introduction

It is the user's responsibility to read and understand the contents of this manual prior to installation and use of this equipment. This manual contains the information you will need to install, operate and maintain the remote dispenser manufactured by Barnstead/Thermolyne Corporation.

The remote dispenser is designed to deliver Type I reagent grade water up to 8 ft. away from an existing NANOpure II or Milli-Q pure water system.

Careful attention to the following instructions will assure that the remote dispenser operates properly and produces water to specifications.

UNPACKING

Unpack the remote dispenser carefully. The remote dispenser comes complete with all the necessary parts and hardware to install on an existing NANOpure II system with pump or Milli-Q system. Also, please find enclosed, 1 ea. filter to be installed after rinse out is complete. Please note, the kit comes complete with separate mounting brackets for the Milli-Q and NANOpure systems. Ensure all parts are removed before discarding packaging material.

INSTALLATION

If you are mounting the remote dispenser, D4700, to an existing NANOpure system with a pump, follow the following instructions. If you are mounting it to an existing Milli-Q system, refer to Section 2. At this time, the remote dispenser is not compatible with the Milli-Q Plus or NANOpure II with ultrafilter accessory.

- A. Ensure that all power and water are disconnected prior to proceeding further. Depressurize the water system according to the NANOpure manual. Locate the correct bracket and fitting. See Figure 2 for exploded view of this assembly.
 1. Remove the final filter from drawoff valve and discard. If your unit has a filter adapter attached to the drawoff valve remove and discard.

2. Remove recirculation tubing from rear of drawoff block. Remove adapter and install 1/4" NPT plug supplied with dispenser into the exposed hole. Ensure all excess tape is removed prior to installing plug.
3. Remove u-pin or fastener pins that secure drawoff block to last cartridge holder. U-pins are removed by prying up with a screwdriver. The fastener pins are removed by gently tapping the bottom of the pin. Remove the drawoff block ensuring that the o-ring remains in head of the cartridge holder.
4. Install the NANOpure II bracket including the 1/4 OD X 1/4 OD union so that the curved dispenser holder faces forward. Ensure that the holes on the top of the bracket line up with the holes on the last head of the NANOpure II. Install drawoff block. Secure bracket and drawoff block by gently tapping fastener pins (included with dispenser) into the exposed holes. The fastener pins are secure when the top of the pin is flush with the head.
5. Disassemble tube fitting from one of the tube fittings on dispenser. Remove adapter and tread onto valve on NANOpure II. Ensure o-ring, back up ring, grab ring and nut remain attached to tubing (see Figure 1).
6. Secure tube complete with o-ring, back up ring, grab ring and nut to adapter installed in previous step.
7. Remove nut, grab ring, back up ring and o-ring from top and bottom of the union installed on the bracket. See Figure 1 for exploded view drawing.
8. Attach recirculation tubing to the upper portion of the union. Ensure that nut, grab ring, back up ring and o-ring are in place.
9. Attach remaining tube of the dispenser to the bottom portion of the union. Again, ensure that nut, grab ring, backup ring and o-ring are in place. Please refer to Figure 1 for correct orientation of components incorporated in adapter.

CAUTION: DO NOT TIGHTEN TUBE FITTING HEX NUT WITH A WRENCH. TIGHT CONNECTIONS CAN EASILY BE MADE BY HAND.

10. Figure 1 shows the proper orientation of the various components required to complete the installation.

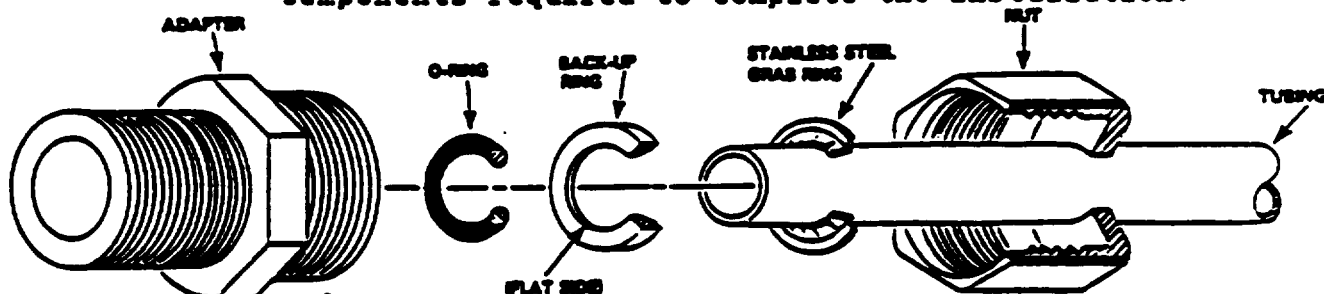
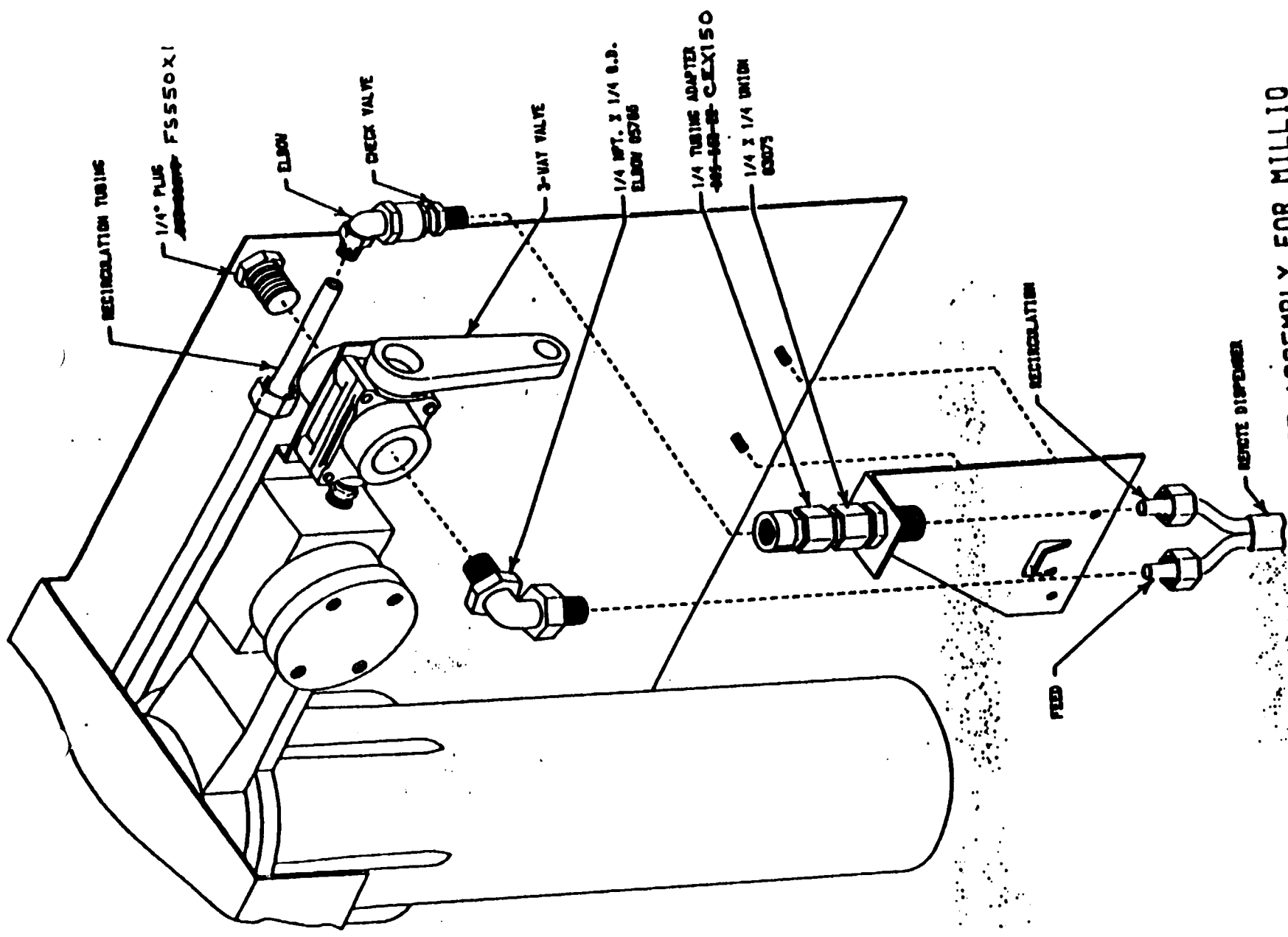


FIGURE 1. TYPICAL POLYPROPYLENE TUBING ADAPTER INSTALLATION

Figure 1



REMOTE DISPENSER BRACKET ASSEMBLY FOR MIL10
FIGURE 3

If you are mounting the remote dispenser, D4700, to an existing Milli-Q[®] system with pump, follow the following instructions:

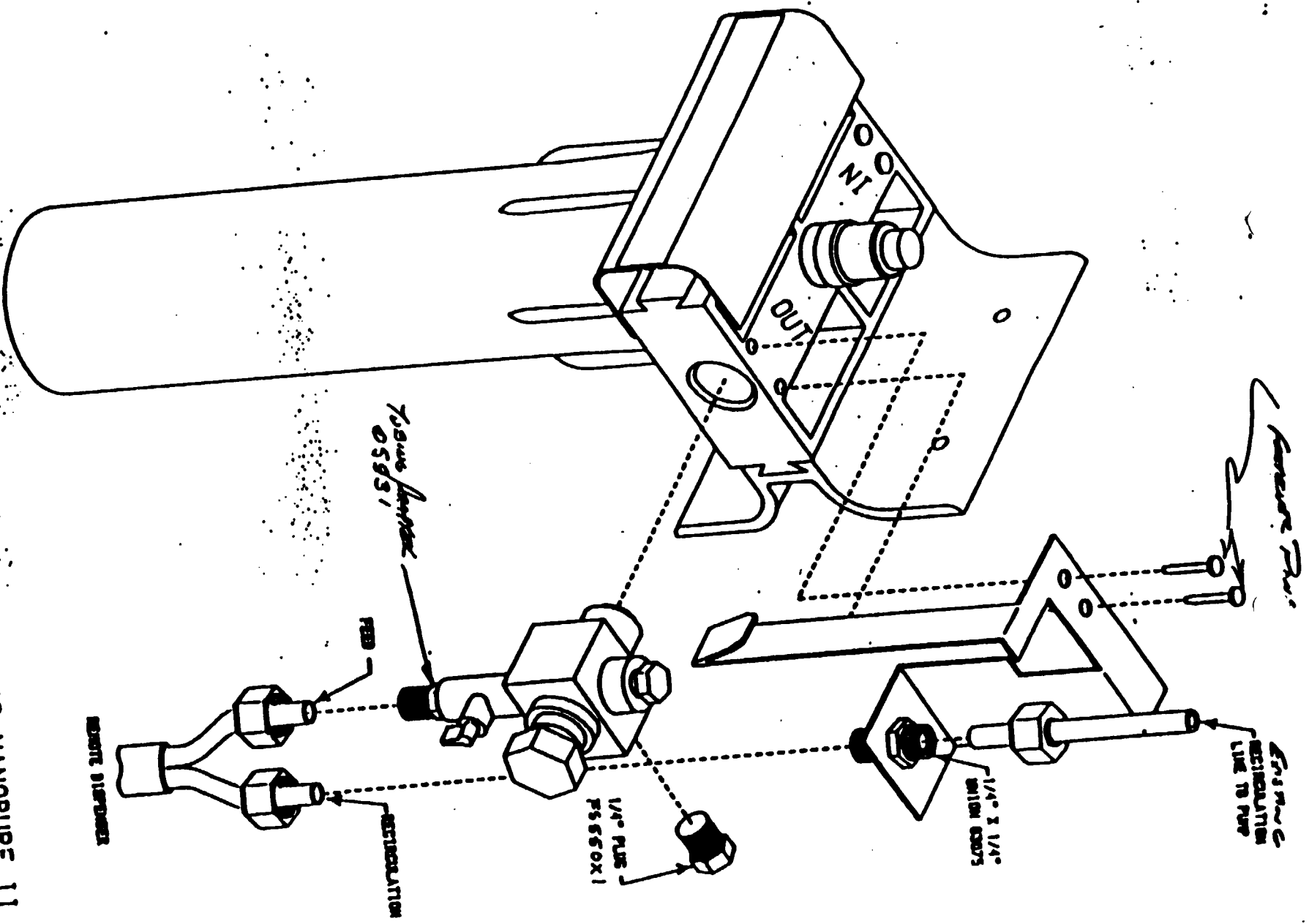
- A. Ensure that all power and water are disconnected prior to proceeding further. Depressurize the water system prior to proceeding further. Follow manufacturers recommendation. Locate the correct bracket and fittings. See Figure 3 for exploded view of the assembly.
1. Remove recirculation tubing from rear of 3-way valve.
 2. Remove check valve and elbow from 3-way valve. Retain check valve and elbow for future use. Wrap 1 1/2 - 2 turns teflon tape and secure 1/4" NPT polypropylene plug in exposed hole.
 3. Remove elbow, tubing and filter from front of 3-way valve. Install 1/4 NPT X 1/4 OD adapter to front of 3-way valve.
 4. Remove filter bracket and retain nut and washer.
 5. Locate bracket for Milli-Q[®] conversion complete with fittings attached.
 6. Clean and retape using 1 1/2 to 2 turns of teflon tape the check valve removed in Step 2. Ensure elbow is attached.
 7. Insert the check valve and elbow into 1/4 NPTF fitting at top of bracket assembly.

CAUTION: It does not require much force to affect a tight seal when installing check valve into the adapter. Overtightening will result in damage to the adapter.

8. Install bracket on the studs exposed by removing the Milli-Q filter bracket in Step 4. Use screw and washers retained from Step 4. Ensure bracket holes are at the bottom of the assembly and fittings are located at the top. See Figure 3 for proper orientation.
9. Reinstall recirculation line removed in Step 1 to elbow at top of assembly.

INSTALLATION OF THE DISPENSER

10. Remove the connector from the feed and recirculation line of the remote dispenser ensuring that the nut, stainless steel grab ring, back-up ring and o-ring remains attached to the tubing. See Figure 1.
11. Remove nut, grab ring, back-up ring and o-ring from elbow attached in Step 3 and union located on bracket. See Figure 3 for exploded view drawing.
12. Install nut of tubing connector (complete with grab ring, back-up ring and o-ring) on dispenser to elbow and union referred to in the previous step.



REMOTE DISPENSER BRACKET ASSEMBLY FOR NANOPURE II
FIGURE 2

CAUTION: Do not tighten tube fitting hexnut with a wrench.
Tight connections can be easily made by hand.

THIS COMPLETES INSTALLATION.

OPERATION

1. Open and leave open the valve on the NANOpure II or 3-way valve on the Milli-Q[®] system. The remote dispenser comes complete with a system flush housing in the filter cartridge cavity. This system flush housing should be used when it is required to rinse and dispense the water from a new cartridge kit. Ensure that this cartridge is in place prior to operating.
2. The dispenser incorporates an "easy to use" thumb wheel dispensing mechanism which is designed to deliver a steady stream when the thumb wheel is completely forward, drop by drop when it is slightly forward of the center and spray when it is back. When the thumb wheel is in the center, water will be in recirculation (no water out of dispenser).
3. After initial rinse-up, turn system off and depressurize. Remove system flush housing by pushing filter in the direction of the slots in the dispenser cavity. Ensure o-rings remain in place (Barnstead/Thermolyne supplies three extra o-rings with each dispenser and filter). Retain system flush housing for future use.
4. Inspect o-rings to ensure they are not damaged. If damage is apparent, replace. Lubricate o-rings with a small amount of deionized water.
5. Install Barnstead part #D3751, 0.2 micron cross flow filter, into housing by gently pushing into dispenser filter cavity ensuring that o-rings are in place and not crimped or damaged.
6. After filter is installed, dispenser is ready for use.

MAINTENANCE

1. Dispenser does not require any maintenance other than periodic sanitization and filter replacement.
2. When sanitizing, follow instructions in deionizer manual and recirculate sanitizing solution through dispenser. During sanitization, use system flush housing in place of D3751 filter. See Section 3-5 in operation for removal and installation of filter.
3. It is recommended that the cross flow filter be replaced every 45 working days or when there is an unacceptable high bacteria passage or when flow decreases to less than 1 liter per minute.
4. To replace D3751 cross flow filter, follow instructions in Section 3 - 5 in operation portion of this manual.
5. Always run at least 2 liters (1/2 gallon) of deionized water through a new filter after installation.

SPARE PARTS

The only replacable parts incorporated into the remote dispenser are expendable items. Barnstead/Thermolyne does not advise removing any of the components incorporated into the dispenser. Below is a listing of these replaceable items.

Description	Catalog No.
Package of 2 ea. 0.2 micron cross flow filter	D3751
O-ring filter cavity	GSX24
System flush housing	FL563X2

See Drawings 2 and 3 for the hardware component parts.

ORDERING PROCEDURES

Please refer to the Specification Plate for the complete model number, serial number and for series number when requesting service, replacement parts or in any correspondence concerning this Thermolyne unit.

All parts listed herein may be ordered from the Barnstead/Thermolyne dealer from whom you purchased this unit or can be obtained promptly from the factory. When service or replacement parts are needed, we ask that you check first with your dealer. If your dealer cannot handle your request, then contact our Customer Service Department - (319) 556-2241 or (800) 553-0039 for Return Goods Authorization (RGA) number prior to returning any materials.

BARNSTEAD NEW EQUIPMENT WARRANTY

Barnstead/Thermolyne warrants all equipment supplied by it which is of its manufacture to be free from defects in material and workmanship eighteen (18) months from original shipment or twelve (12) months from installation, whichever occurs first. Unless otherwise specified, service labor required to repair or replace shall be provided by Barnstead/Thermolyne or its authorized Agents or Distributors for a period of ninety (90) days from the start of the warranty period. Defective parts shall be replaced for the full warranty year; however, labor to repair or replace such parts shall be at the Purchaser's expense after the first ninety (90) days. This policy is limited to the Continental United States and Canada.

This warranty shall not apply if equipment has been damaged in transit or has been improperly used or maintained. Although Barnstead/Thermolyne does not warrant equipment which has been manufactured by others, it will assist Purchaser to assert guarantees or warranties furnished to Barnstead by such other manufacturers.

There are no other guarantees or warranties expressed or implied. Barnstead shall under no circumstances be liable for special, indirect or consequential damages, nor for losses and expenses arising from installation or use, regardless of the advises or recommendations that may have been rendered concerning installation or use of the product.