MICROZONE VPFX VERTICAL POLYMER FULLY EXHAUSTED WORKSTATION LAMINAR FLOW TYPE

Installation and Operating Manual

OWNER'S RECORD

The model and serial numbers are located on the electrical specification label on the front of the unit. Please record this information below in the space provided and refer to it whenever you call your authorized Microzone Corporation dealer regarding this product.

MODEL NO:

SERIAL NUMBER:

ELECTRICAL: VOLTS, AMPS, 1 PHASE, HZ.

INSTALLATION DATE:

DEALER INFORMATION :

NAME:

TELEPHONE:

MICROZONE CORPORATION

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SECTION 1 - INTRODUCTION

Thank you for purchasing a quality product manufactured by **Microzone Corporation**. If you maintain the unit properly, it will provide you with years of trouble-free service. The owner and/or end user is responsible for the correct operation and performance of this Vertical Fully Exhausted Workstation. You use this work station at your own risk. The unit should be thoroughly tested and checked by a qualified technician after its initial installation, each time it is moved, when the filters are changed, and at regular intervals. Do not operate the equipment until you are fully acquainted with this manual, how the unit operates, and the maintenance that is required. There is no substitute for common sense and good operational techniques and the end user must determine the best and safest methods and techniques only after study of other references in conjunction with this manual.

The airflow patterns in this workstation are similar to those in a Class 2 Type B2 Biological Safety Cabinet in that they provide protection for both the user and the product by utilizing a laminar, downward flow of clean air through the work zone and an inward flow of room air into the front grille. Removal of contaminants generated within the work zone, along with environmental protection is a function of the specific exhaust system the workstation is connected to.

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SECTION 2 - INSTALLATION

THE SERIAL NUMBER IS LOCATED ON A LABEL AFFIXED
TO THE FRONT PANEL OF THE CABINET

2.1 LOCATION

The workstation must be located in an area protected from air currents that originate from ventilation systems, air conditioners, doors, windows, and personnel movement. Tests have shown that if the drafts or other disruptive currents exceed the intake velocity of the cabinet, then room contamination may enter the clean work zone and vice versa. Thus, the proper placement of workstations in laboratories or work areas is essential.

The Vertical Laminar Flow Workstation is designed for continuous operation and all electrical circuits and motors are fully protected. If ground fault interrupters are required, we suggest that the duplex outlet located on the unit (if so equipped), be a ground fault interrupter circuit type.

2.2 UNCRATING AND HANDLING

(a) Upon receipt of this equipment, carefully inspect the exterior of the crates and skids for damage. Visual damage should be noted on the receiving slip and <u>immediately</u> reported to the delivery carrier. Please note that the shipment consists of <u>two</u> crates. <u>On no account should equipment be returned to the factory without return authorization.</u>

(b) When the unit has been shipped in very cold weather it should be allowed to sit in the heated Receiving Area for 24 hours before being moved to the point of use. Move the entire shipment on the skid <u>as close as possible</u> to the desired point of use before uncrating.

(c) First remove all surface protective coverings. **DO NOT ATTEMPT TO LIFT OFF SKID UNTIL THE UNIT IS COMPLETELY EXPOSED** and you have read SECTION 2.2 (g).

(d) Discard all packaging materials, being careful to place to one side all components necessary for the correct assembly of the unit. Any excess packaging tape can be removed from the unit with alcohol.

(e) **INSPECT ALL PARTS FOR ANY SHIPMENT DAMAGE.** If damage is noted make an <u>immediate claim</u> on the transport company. If this unit is damaged, <u>do not</u> discard any packaging materials - the carrier may want to inspect the crating.

(f) Remove the blocks wedging each component to its skid.

(g) Each module is very heavy and the top section contains the HEPA (High Efficiency Particulate Air) filters, and therefore should be handled very gently. The modules are best moved by placing it on a large dolly. Do not allow the full weight of the module to rest on the centre area of the base plenum.

(h) In order to gain entry into some areas it may be necessary to lift the modules onto their ends. It is safe to handle the module in this fashion for very short distances only. On no account should it be transported or freight shipped in this on end position. The face shield must be secured before lifting the top module onto its end.

2.3 ASSEMBLY AND INSTALLATION

(a) Uncrate the base section first and locate at its final position. Bring the services as required to inside the base section and make preliminary wiring connections to the main junction box located behind the cutout on the rear wall of the storage area. Specifics of the services for each unit are included with the detail drawings at back of this manual. The polymer materials used to construct the Vertical Laminar Flow Workstation may be easily cut with standard tools. However, in order to maximize the suction in the storage area of the base, the free space surrounding penetrations should be kept to a minimum.

(b) Adjust the foot levelers of the base section to level the top surface and obtain maximum rigidity on uneven floors.

(c) Remove all interior packaging material and vacuum out the base plenum section to remove any traces of debris.

(d) Carefully lift the laminar flow module onto the base section and align the bolt holes as per FIGURE 1. Install the bolts and complete the installation of services. Connection to building or other services must by qualified staff in accordance with local codes.

(e) Check that the work surface is firmly located in place.

(f) Check the face shield for correct operation - lift the face shield by the bottom edge only. Ensure the movement is smooth and continuous. Sticking or jerky motion indicates the counterweights have shifted during shipment or installation.

(g) Unpack and install the prefilters if they are not already in place. Ensure that there is no protective material between the prefilter and hood intake screen.

(h) Appendix 1 of this manual contains illustrations of the installation steps as well as details of the various options. Refer to these sheets as required.

(i) If the plenum drain valve is required, remove the plug from the base plenum using a 5/16" wrench. Connect the drain ball valve (provided), and check that the valve is in the closed position.

(j) If the electrical outlets are provided with a separate plug, connect them directly into a 3-prong grounded 1500W, 115V, 60Hz electrical outlet. THEY MUST BE THE ONLY EQUIPMENT ON THE CIRCUIT. Ensure that there are no other outlets on the same circuit being used.

(k) Switch the unit ON by pressing the FAN switch located on the control panel (see FIGURE 2). The LED will activate immediately, but there is a delay before the motor/blower assembly reaches its correct operating point.

NOTE: In order to reduce the line current surge, there is a delay after switching on the cabinet before the motor starts. Full operational speed is reached within 20 to 30 seconds. Likewise, there is a delay in the motor coming to full stop.

NOTE: The built-in line voltage stabilizing circuit provides a constant voltage to the motor/blower assembly, thereby eliminating airflow fluctuations.

(l) Switch ON the light assembly by pressing the LIGHT 1 switch located in the control panel. If the lights do not come on check the tubes or the orientation of the tube pins in the end sockets - the tubes may have loosened during shipment (see FIGURE 3).

(m) A minimum clearance of about four inches (102mm) is required between the top of the inlet prefilters filter and the laboratory ceiling. If the inlet is obstructed there will not be a sufficient air flow.

(n) Once the assembly and installation step is complete, the unit should appear as illustrated in FIGURE 4.

SECTION 3 - CERTIFICATION AND TESTING

3.1 ON-SITE CERTIFICATION

The workstation has been tested and certified in our factory prior to shipment but it must be tested in-situ before use. Only qualified personnel should make adjustments to the cabinet and calibrated test equipment must be used for correct on-site certification. Contact the factory for the name of a local certification company performing on-site service if your organization does not already have arrangements in place.

The minimum on-site certification consists of:

- Checking the supply filters using an aerosol test challenge technique. An aerosol generator and calibrated photometer are required.
- Checking the downflow velocity profile within the cabinet.
- Checking the cabinet work access opening airflow by measuring the exhaust volume.
- Checking the airflow within the cabinet using airflow smoke patterns.

The fan speed control must never be adjusted without a complete velocity profile and the hand opening velocity check being performed. The correct airflow is determined by the volume of exhaust flow and is identified in the specific specifications for your hood (see Appendix 2).

3.2 TESTING AND STANDARDS

The field testing and balancing of these types of hoods can be difficult and require specialized equipment that is not always available. Microzone Corporation has developed a simplified field procedure for this work that is detailed in Appendix 3.

3.2.1 ULPA FILTER LEAK CHECKS

The standard aerosol test challenge determines the integrity of the ULPA filters and this test is generally required about once a year. The aerosol test must be carried out by qualified personnel using calibrated test equipment. Consult the factory for details. Many institutions have specific requirements for the test aerosol used.

3.2.2 HAND OPENING VELOCITY ADJUSTMENT (WORK ACCESS OPENING TEST)

The amount of air entering the hand opening is equal to that exhausted through the exhaust duct located on the top of the unit. The units are designed for specific inward average hand opening velocities. Refer to APPENDIX 2 for the correct setting of this model together with the QC test data attached to this manual for results corresponding to your particular unit.

Again, we emphasize that this adjustment should be carried out only by qualified personnel using calibrated test equipment. If any difficulty is encountered immediately consult the factory.

3.2.3 DOWNFLOW AIR VELOCITY PROFILING

The unit is self balancing and generally only the adjustment outlined in SECTION 3.2 is required. However, as the HEPA filters become loaded, as indicated by an increased reading on the static pressure monitor (located in the control panel), the fan speed may need a small adjustment. The unit is designed so that the air split, i.e. the point at which the vertical air movement within the work chamber goes to the back air return grille or to the front air return grill, is about 9" from the rear of the front grille. See APPENDIX 2 for the correct settings of the unit together with the Q.C. test data corresponding to your particular unit. Downflow readings should be taken 6" below the different plate.

SECTION 4 - GENERAL OPERATION AND MAINTENANCE

4.1 GENERAL OPERATING GUIDELINES

4.1.1 DESCRIPTION

The VPFX Vertical Polymer Fully Exhausted Hood provides three functions:

- Effective protection for personnel from particulate, chemical or aerosol airborne contamination generated within the work chamber.
- A sterile work volume within the work chamber i.e. ambient laboratory airborne contamination does not impinge on the work surface.
- A degree of cross contamination control i.e. specimens placed at one end of the work tray will not cross contaminate samples at the other end.

4.1.2 TYPICAL USES

The VPFX Hood is a general purpose unit designed to provide a sterile, particulate free work volume for testing/assembly and experimentation. The unit also offers a degree of personnel protection and cross contamination control.

HOWEVER, THIS HOOD IS NOT A FUME HOOD

It should be fully understood by the user that in order to obtain satisfactory results with this hood, one must be fully acquainted with the correct operation of the unit.

4.1.3 OPERATION OF THE UNIT

FIGURE 7 illustrates the air flow within the unit. Filtered air from the supply ULPA filter (99.9995% efficient on all particulates 0.12 microns and larger) washes over the work surface before being exhausted from the building. All room air enters the cabinet through the perforated grille at the front of the unit. This unfiltered laboratory air does not impinge on the work surface. The intake air prevents contaminants generated within the work area from escaping into the surrounding laboratory.

In addition, MICROZONE CORPORATION units feature a unique method of sealing the main ULPA filter without the use of messy, contaminating sealants. The supply air is forced into a positive pressure plenum surrounding the ULPA filter, passes through the ULPA filter and down through the workzone. The blower maintains a positive pressure within the plenum and a negative pressure at the downstream gasket of the ULPA filter, thereby preventing contaminated air from by-passing the ULPA filter module and entering the critical work area. The outside shell is never subjected to contamination under positive pressure.

4.1.4 GENERAL

(a) The unit is designed for continuous operation, but in order to prolong the life of the ULPA filter it may be advantageous to run the unit only when required. Switch the unit ON for a few minutes prior to using, thereby ensuring that a particle free environment exists within the unit. If the cabinet is located in a contaminated area and the unit is not being used, the work area may be protected from the surrounding environment by closing the hand opening. However, under no circumstances should the cabinet be run with the front hand opening blocked off in this fashion.

(b) If desired, wipe down the inside of the work volume with the appropriate cleaner prior to switching the unit ON.

(c) Check that there is a reading on the Static Pressure Monitor when the fan is ON and that you can feel the air intake at the front grille.

(d) Check that the drain valve (if installed) is in the closed position.

(e) Carefully plan your experiments and work procedures within the hood. Do not clutter the work volume with unnecessary items.

(f) When the unit is operating the work area may be used to store clean equipment and media. Test results have indicated that the protection is excellent over extended periods of time. However, the unit should <u>not be used to store excess laboratory equipment.</u>

(g) When dispensing operations are being carried out within the hood, samples should be moved for storage to the right or left side of the dispensing operation. The air moves directly to the air return grilles at the front and to the rear of the unit - not sideways. If the correct handling techniques are employed there will be no cross contamination within the cabinet.

(h) Remember that at all times the operators' arms and hands can be the primary source of contamination and particulates. Use sterilized gloves or ensure that hands and arms are scrubbed with germicidal soap. When gloves are used they should be pulled up over the laboratory coat sleeves.

(i) The air outside and adjacent to the work area is heavily contaminated. Therefore precautions should be taken to ensure that these particulates are not drawn into the clean work area i.e. by drafts, air tools, personnel traffic, poor operator techniques etc.

(j) It is essential that equipment is correctly placed within the cabinet. If in doubt about the placement of equipment use an acceptable air current tester to ensure proper airflow patterns.

(k) The air return grilles at the front and rear of the work area must never be blocked off. Careful attention should be paid to this note when sterile drapes are being used.

4.1.5 MICROZONE DIGITAL MOTOR CONTROL (DMC)

(a) The Microzone VPFX hood utilizes the latest in microprocessor-controlled technology to operate and monitor the functions of your cabinet. This permits simple, operator-friendly use while at the same time providing a high degree of reliability and allowing diagnostic functions.

(b) Connect the cabinet to the recommended electrical source.

(c) Upon connection, all four LED's on the DMC keypad will flash once. This is a micro reset and, if there has been a power interruption, the controller will revert to the state it was at the time of lost power.

(d) The fan motor is engaged by activating the top switch on the keypad. The green LED will light and the motor will begin its soft start ramping. The motor will be up and running at its normal operating speed in twenty to thirty seconds.

(e) To disengage the fan motor, activate the switch again. The LED extinguishes and the motor begins its soft stop operation. The motor should stop in fifteen to twenty seconds.

(f) The lighting controls are an integrated system. The control pad is designed to take two separate lighting systems, if desired.

(g) The digital motor controller will regulate the overall speed of the fan motor and compensate for line voltage fluctuation. The cabinet will operate normally between line voltage inputs of 100 to 130 VAC.

(h) The supply voltage is monitored through the power transformer and sampled by the microprocessor. The motor current draw is kept in check through a current sensing transformer and monitored by the microprocessor. If either the voltage or current wander outside parameters, the controller will shut down the cabinet and indicate a flash code through the fan LED. A series of flashes will tell the operator which fault in the hood has occurred. The controller will try five times to restart the hood. If the problem still persists after the fifth restart attempt, the controller will flash the fault code indefinitely (see Section 5.1.5).

(i) Before calling service, is it advisable to shut off power to the hood for about 2 minutes, then re-connect and try restarting the motor. If the variation in line voltage was transient, the cabinet will restart and operate normally.

4.1.6 MICROZONE STATIC PRESSURE MONITOR (SPM)

(a) The Microzone Static Pressure Monitor consists of two button/indicators and 12 sequential LED's. These LED's indicate the percentage of full scale the static pressure is in the plenum above the supply filter referenced to the suction in the supply plenum. Normally, full scale is 1 inch w.g. (250 pa.), however in certain cases, this may not be the case. Full scale values other than 1 inch w.g. will be noted in the test sheets accompanying each cabinet.

(b) In an idle state, the Static Pressure Monitor flashes its status LED (located beside the "Push To Test" switch). On start up, the status LED will begin to blink and the static pressure indicators will begin to illuminate as static over the supply filter increases. The alarm will stay mute for thirty seconds to give time for the static to reach operating conditions. At the end of thirty seconds, the status LED will stay on. As each LED lights, it is an indication of that amount of static being detected. For example, if the last LED that is lit is 40% the static on the filter is greater than 0.40", but less than 0.45"% of full scale.

(c) The Push To Test function will test all of the LEDs and the alarm buzzer. After this test, normal operation is resumed.

(d) The Mute function will silence the buzzer for a period of thirty minutes. If, after that time, an alarm condition still exists, the alarm will again sound. The amber led beside the Mute switch gives the operator a visual indication that the cabinet is in an alarm condition. If the cabinet is turned off while a muted alarm is active, the buzzer circuit will reset and again sound on start up.

4.2 GENERAL MAINTENANCE

The unit requires very little maintenance except routine cleaning and regular on-site certification. The exact time interval for routine on-site certifications should be ascertained in conjunction with your Safety Office or Safety Committee. The following sections are aimed at prolonging the life of your equipment and keeping it in first class operating condition and appearance.

4.2.1 CARE OF CONSTRUCTION MATERIALS

Appendix 3 contains a list of chemical compatibilities for the materials used to construct the Microzone VPFX hood. Care must be taken when cleaning polymer plastics since they often do not stand up to abrasive materials.

4.2.2 WIPE DOWN PROCEDURES

To gain full access to the interior work area for general wipe-down procedures, first raise the face shield, holding it along the bottom edge. The type of wipe-down procedure will depend on all the agents being handled. Consult your Safety Office or Safety Committee for advice.

4.2.3 BASE PLENUM

Any liquids accidentally released within the work chamber will either be contained in the work tray or will flow over the work surface and into the base plenum which surrounds the perimeter of the work chamber. This base plenum can be drained by means of the valve. In normal use the drain valve must be in the closed position.

4.2.4 VISUAL INSPECTION

Routinely check that the cabinet has not been damaged by personnel moving equipment etc. within the vicinity of the cabinet. Also at regular intervals record the reading of the Static Pressure Monitor which indicates the loading on the supply HEPA filter. <u>There should always be a reading on the monitor when the unit is in operation.</u> Another good procedure is to regularly challenge the hand intake with a suitable air current tester.

SECTION 5 - SERVICE AND PARTS

5.1 MAJOR PARTS REPLACEMENT

All parts which need replacement (except the Control Panel, see SECTION 5.1.4) are located within the main negative pressure chamber above the supply ULPA filter. Access to this chamber is via the removable front panel (see Figure 8). Under no circumstances should unqualified personnel attempt major repairs.

5.1.1 REPLACEMENT OF THE ULPA FILTER

The High Efficiency Particulate Air (ULPA) filters require replacement when the motor/blower assembly cannot overcome the rise in static pressure of the ULPA filter due to dirt collected on the upstream filter face and therefore cannot maintain the correct air velocity through the ULPA filter. The life of the ULPA filter depends on the cleanliness of the localized surroundings and on how much the work station is in operation. The static pressure monitor is an excellent indicator of the loading on the ULPA filters and a record should be kept as time proceeds. When the average downflow air velocity is outside of the lowest ranges indicated in APPENDIX 2 and there is no adjustment left on the fan speed control, the ULPA filters will require changing.

NOTE: Normally, the unit will not require any adjustments whatsoever for the first 50% rise in static pressure across the ULPA filters.

It is essential that the correct size replacement ULPA filter is used. The ULPA size and its efficiency are indicated on a label attached to the side of the existing ULPA filter. We recommend that the ULPA filter change is carried out by properly trained personnel.

NOTE: The ULPA filters can be obtained from MICROZONE CORPORATION.

5.1.2 FILTER REMOVAL

(a) Decontaminate the unit - if the unit has been used with toxic chemicals, consult your Safety Office.

(b) Disconnect the cabinet from the electrical supply.

(c) Remove the front access panels (See FIGURE 8).

(d) Remove the static pressure monitor tube from the plenum.

(e) Remove the filter hold down brackets by undoing the nuts at rear and bolts at the front of each.

(f) Remove the supply ULPA filter.

(g) Remove filter cap and impeller assembly. Set aside for use on the new ULPA filter.

5.1.3 FILTER INSTALLATION

(a) Reinstall existing cap and impeller assembly to new supply ULPA, ensure a good seal is made using screws and aluminum tape.

(b) Make sure that you have the connection for the static pressure monitor tube in the correct position, (front R.H. side when viewed from the front).

(c) Carefully place the filter in position and reinstall the hold down brackets by reversing the removal steps.

(d) Reconnect the electrical connections and ensure the impeller operates properly.

(e) Do not touch the inside of the unit when the access panel is removed. Turn the unit OFF.

(f) Replace the front access panels.

(g) Test the filters and reset the downflow air velocity profile as in APPENDIX 2.

5.1.4 MOTOR REPLACEMENT

(a) Decontaminate the unit - if the unit has been used with toxic chemicals, consult your Safety Office.

(b) Disconnect the cabinet from the electrical supply.

(c) Remove the front access panel (See FIGURE 8).

(d) Disconnect the electrical wires to the motor impeller.

(e) Remove the bolts holding the motor/impeller cone to the filter cap and lift the cone out.

(f) Disassemble the impeller mounting plate from the cone and replace the motor/impeller assembly. Ensure the cage spins freely and is centred within the cone.

(g) Re-install the cone assembly onto the filter cap and re-connect the electrical wiring.

(h) Plug in the unit and turn the blower ON. Do not touch the inside of the unit when the access panel is removed. Merely inspect to see if the system works properly. Turn the unit OFF.

(i) Replace the front access panel.

(j) Reset the downflow air velocity as in APPENDIX 2.

5.1.5 DMC CONTROL PANEL FAULT CODES

The Digital Motor Control Panel has built-in diagnostics that will identify problems with the electrical system and provide the operator with a visual display of a fault code. The green LED for the motor control will flash in accordance with the code table, with a five second pause between flash sequences. Only one fault code will be displayed at any one time.

Number of Flashes	**Description**
1	Over current (unit drawing too much current)
2	External fault input went active
3	Lost zero crossing reference
4	Undercurrent (no current to motor – open fuses)
5	AC line too low to operate (under 100 volts)
6	AC line too high (over 130 volts)
7	Frequency out of range
8	EEPROM corrupted
9	Wrong version of generator program

NOTE: AC line too low or too high (fault 5 or 6) may be caused by either a continuous line voltage or spiking outside of range.

5.1.6 REPLACEMENT OF ELECTRICAL COMPONENTS IN THE CONTROL PANEL

(a) Disconnect the cabinet from the electrical outlet.

(b) Remove the screws holding the control panel housing to the front panel.

(c) There are no field replaceable components other than the fuses on the circuit boards. If a fuse is blown, replace with the values listed below:

DESCRIPTION	**LOCATION**	**RATING**
Motor	DMC F3	10 amps slo-blo ceramic
Lights	DMC F1	3 amp
Duplex	DMC F2	6.25 amps
Power Supply	DMC F4	1/8 amp
AFI-X^2 Power	Taken from DMC	

There is also thermal overload protection with automatic reset on the motor itself. The basic circuit diagram is as shown in FIGURE 13 and is located on top of the cabinet.

5.2 SPM FIELD CALIBRATION

The SPM Static Pressure Monitor can be calibrated in the field by a simple setup procedure. The equipment required is a manometer (or other static pressure indicating device) measuring to at least 1 inch w.g. (250 pa.) or selected range, a syringe, three lengths of mag gauge tubing and a tee fitting – see Figure 14.

(a) Remove the screws holding the control panel housing and hinge down for access.

(b) Start the hood and determine that the motor system is active and producing velocity. Disconnect P4 (2 pin connector close to the sensor) on the SPM board and the tubing at both ports of the sensor (see Figure 6).

(c) Simultaneously press the two buttons on the SPM keypad and continue to hold them down for at least twenty seconds. This will put the board into its calibration mode. The green "Press to Test" LED and the "Mute" LED should be on and the <20% LED should be flashing.

(d) With no connection to the air sensor, press the "Press to Test" button. This sets the zero pressure or reference to room state. The "Press to Test" LED should go out and the >70% LED should be now flashing.

(e) Connect the positive port of the manometer to the tee and to the syringe using mag tubing. Connect this assembly to the adapter fitting that was disconnected in Step B. At this point the manometer and the sensor should be connected in parallel and be controlled by the syringe (see Figure 14).

(f) Apply desired full scale pressure to the sensor by slowly squeezing the syringe and monitoring the manometer. When this level is set, press the Mute button. Disconnect the tubing and re-install the tubing from the supply filter.

5.3 FAULT FINDING HINTS

PROBLEM	SOLUTION
Unit does not function, blower and lights	(a) Check power at the electrical outlet into which the unit is plugged (b) Check that the fuses located in the control panel are not blown or overloaded
Blower only not functioning	(a) Check fuse #F3 on the DMC circuit board (b) Check electrical connections (c) Check the motor capacitor (d) Faulty digital motor controller in the Control Panel (e) Before removing the front access panel and replacing the motor/blower assembly, connect a 115V supply directly to the motor. Perform this by removing the solid blue and blue with white tracer wires form terminal P2 on the DMC board. Connect external 115V to these wires using the solid blue as the hot. If the blower does not function then the fault must lie inside the negative pressure chamber of the unit
Motor hums, but blower does not function	(a) Replace starting capacitor or motor (b) Fan speed is set too low
Lights only not functioning	(a) Replace fluorescent tubes (b) Check fuse F1 on the PC board (c) Replace ballast
Irregular running or hunting of the blower	(a) Faulty speed control. Replace Control Panel circuit board
Rattling or scraping noise from motor/blower assembly	(a) Check for debris, paper, wrappings, etc. in the blower cage. Remove as necessary (b) The blower may have slipped on the motor drive shaft. To correct: - Decontaminate the unit unplug unit - Remove front access panel - Loosen the bolt holding the blower wheel on motor drive shaft - Reposition blower wheel in the blower housing to centre the wheel - Re-tighten the locking bolt making sure the bolt clamps onto the flat of the drive shaft
Air flow velocity too low	(a) Fan speed is incorrectly set (b) Faulty motor speed control (c) ULPA FILTERS are loaded - check the Static Pressure Monitor reading (d) Supply/Exhaust air flow requires balancing

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SECTION 6 - AFI-X^2 EXHAUST FLOW ALARM INSTALLATION AND SET-UP INSTRUCTIONS

The AFI-X^2 (Air Flow Indicator) alarm is a pre-programmed self-contained package that monitors differential static air pressure. The alarm is used on cabinets or benches where negative exhaust or positive upstream pressure must fall within specified parameters. The AFI-X^2 can monitor from -0.9 to +0.9 inches w.g. (-225 to +225 pa.). In this instance, the static pressure in the exhaust duct stub is monitored relative to the room.

6.1.1 KEYPAD FUNCTIONS and INDICATORS

(a) The keypad consists of two switches and four LED's (see Figure 12). The PUSH TO TEST switch engages all LED's and activates the alarm for a one-second interval to test circuitry functions.

(b) The MUTE switch, which is depicted by the speaker symbol with a slash through it, will silence an active alarm for a period of thirty minutes. The amber LED indicates a mute state. The alarm will automatically sound again if no change in pressure has been detected. If within the muted period the static returns to an acceptable level, the mute function will reset and normal operation will be restored.

(c) The green LED under the "check mark" indicates an acceptable static pressure in the exhaust canopy. The red LED's under the minus (-) and plus (+) signs relate to which direction the static has changed to create an alarm.

6.1.2 STANDBY and ON FUNCTION

(a) When the cabinet is off, the AFI-X^2 is in the STANDBY mode and the alarm is inactive. The minus (-) and plus (+) LED's flash indicating that power is present to the unit. When the cabinet is turned on, the alarm enters a transition period of thirty seconds where the minus (-) and plus (+) LED's pulse at a faster rate. This gives time for the alarm to accurately measure the static pressure. At the end of this period, if the pressure is acceptable the green LED will light. If the static pressure is unacceptable, the appropriate red LED will light and within five seconds the audible alarm will sound.

(b) If the VPFX hood is turned off, the alarm will sound. To silence the alarm, the MUTE switch must be pressed. This two step operation avoids a mistaken de-activation.

6.1.3 INTERNAL CONNECTIONS and PRESSURE SETTINGS

(a) Although the settings for pressure are adjusted at the factory, it may be necessary to re-adjust in the field to accommodate room balancing and/or building exhaust requirements.

(b) To adjust the settings first REMOVE AC POWER FROM THE UNIT by unplugging the cabinet. Open the control panel by removing the screws at the top of the extrusion.

(c) Locate S3 and S2, which are blue rotary switches found at the bottom of the AFI-X^2 circuit board (close to the ribbon connector P7, see Figure 13). Each increment on the switch faces represent 0.1″ w.g. For example, S3 may be set at 1 and S2 may be set at 3. In an exhaust application this indicates that an acceptable range is between -0.1″ to -0.3″ w.g.. S3 is always the value closest to zero. If the static matched this setting the green LED is lit. If the exhaust fails, as soon as the static rises above -0.1″ the plus (+) LED lights and the alarm sounds. The alarm will also sound if exhaust pressure drops below -0.3″.

(d) The settings can be adjusted by using a small slot screwdriver and dialing in the desired range. The range selection is between zero and -0.9″. Even though a switch can be set to zero, an offset in the software actually places the set point at -0.025″. This offset prevents false alarms when using the room pressure as a reference. The OK range cannot extend over zero inches. If both rotary switches are set to zero the alarm will not operate.

(e) The plug or wiring connections on the circuit board are as follows:

P1	AC Input
P3	ISP Connector (not used)
P4	External Run
P5	DC In/Out (12VDC)
P6	External Battery (9 volt)
P7	Keypad Ribbon Connector
P8	Pressure Sensor Output (not used)
P9	External Alarm Contacts
W1/W2	Grounding Lugs

(f) The pressure sensor U4 has two ports. The lower port (the one closest to the board) is used for monitoring positive pressure and the higher port is used for monitoring negative pressure. If this does not suit your application, simply attach the tube to the positive port but note the visual alarm will now be reversed. If the tubing is removed for service conditions, ensure that it is re-attached to the proper port.

(g) An external alarm can be connected to the AFI-X^2 by using the connection points at P9 found on the right side of the board close to the buzzer assembly. P9 is labeled NC (normally closed), COM (common) and NO (normally open). By choosing COM and the appropriate NC or NO connection suited for your particular alarm system, the AFI-X^2 can notify personnel or safety precaution equipment outside the immediate area of the unit. The relay contacts are rated for 0.5 amps so note the current draw of the connected equipment. A drive relay may be necessary for high current applications.

6.1.4 TROUBLE SHOOTING

If the AFI-X^2 becomes inoperative, ensure that power is supplied to the unit. If problems persist, remove power and open the control panel. Check the fuse F4 and if defective replace with the same rating (1/16th amp/250VAC). Reassemble and apply power.

If problems persist, contact the factory.

SECTION 7 - WARRANTY

MICROZONE CORPORATION extends a warranty to all purchasers of any of its Biological Safety Cabinets, subject to the following terms and conditions:

(a) Term of the warranty is limited to a 36 month period as follows:
- First 12 months commencing the date of delivery: Labour and parts*
- Next 24 months: Parts* only
- *Parts do not include consumables (e.g. light tubes and filters).

(b) Liability for defective work or material shall be confined solely to replacement or repair of defective goods. No charge for repairs will be accepted by **MICROZONE CORPORATION** without its written consent. No return of products will be accepted unless arrangements have been made for such return.

(c) Liability of defects included by misuse or abuse, by incorrect operating procedures or for equipment operated outside recommended limitations, characteristics, specifications or parameters is specifically excluded from this warranty.

(d) This warranty will not exceed in time or nature the warranty extended to **MICROZONE CORPORATION** by our suppliers on items incorporated by **MICROZONE CORPORATION** into its products.

(e) This warranty does not cover cost of shipment of products to **MICROZONE CORPORATION** for repair or replacement and return to purchaser.

(f) Premature blockage of HEPA filters due to site conditions is specifically excluded.

(g) The thorough decontamination of biological or nuclear equipment prior to its shipment to **MICROZONE CORPORATION** for warranty related work is the responsibility of the purchaser. Should the product be serviced or repaired by **MICROZONE CORPORATION** at the purchaser's location, it is the purchaser's responsibility to ensure that the product is properly decontaminated beforehand.

(h) In the event any product fails to conform to its specifications, **MICROZONE CORPORATION'S** liability shall be limited to either supplying another product or refunding the full purchase price to the purchaser.

(i) Any modifications or changes made to the equipment or parts, without the written consent of **MICROZONE CORPORATION,** voids the warranty.

NO WARRANTIES OTHER THAN THOSE SET OUT ABOVE SHALL BE IMPLIED.

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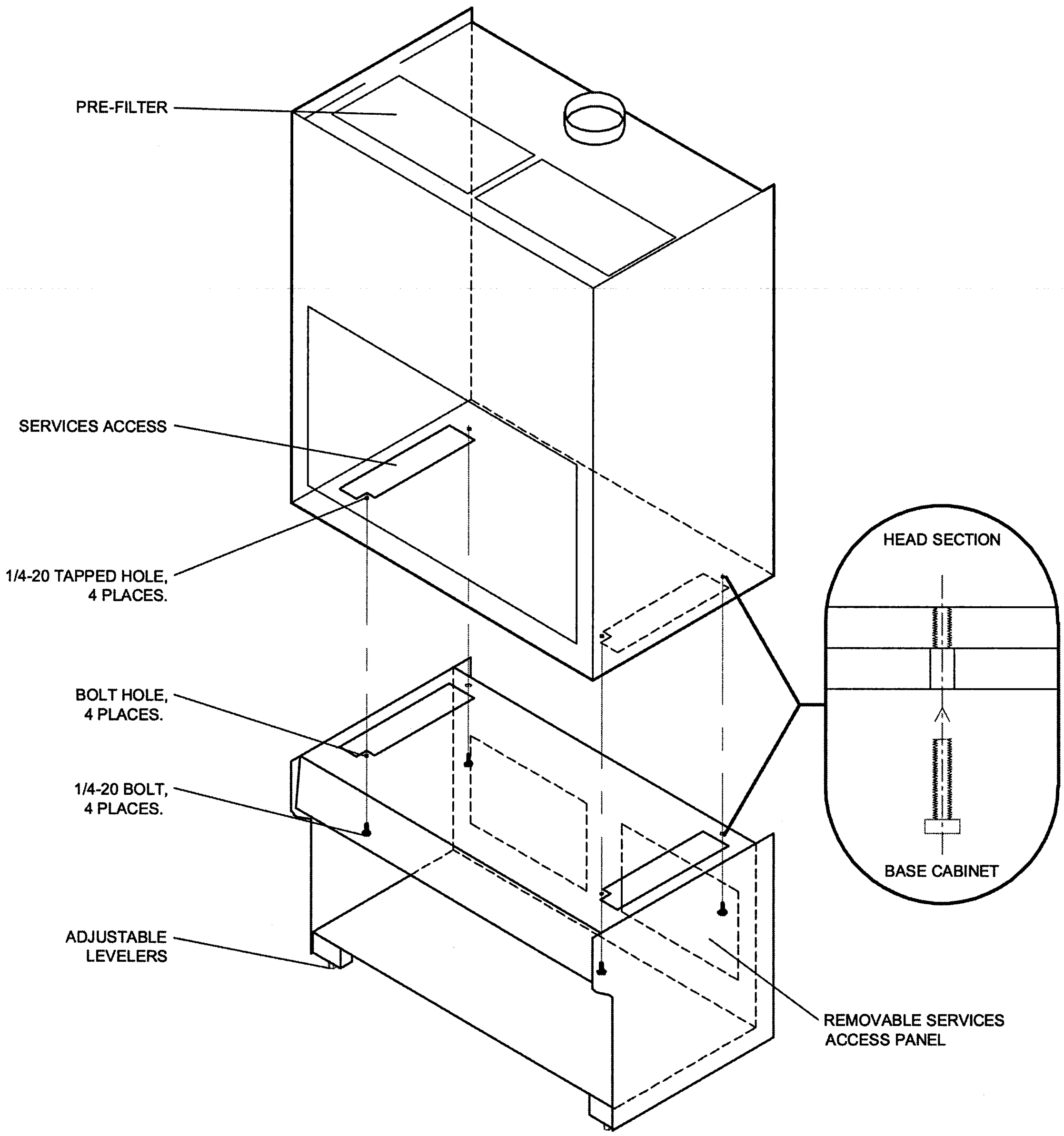

FIGURE 1 UNIT ASSEMBLY

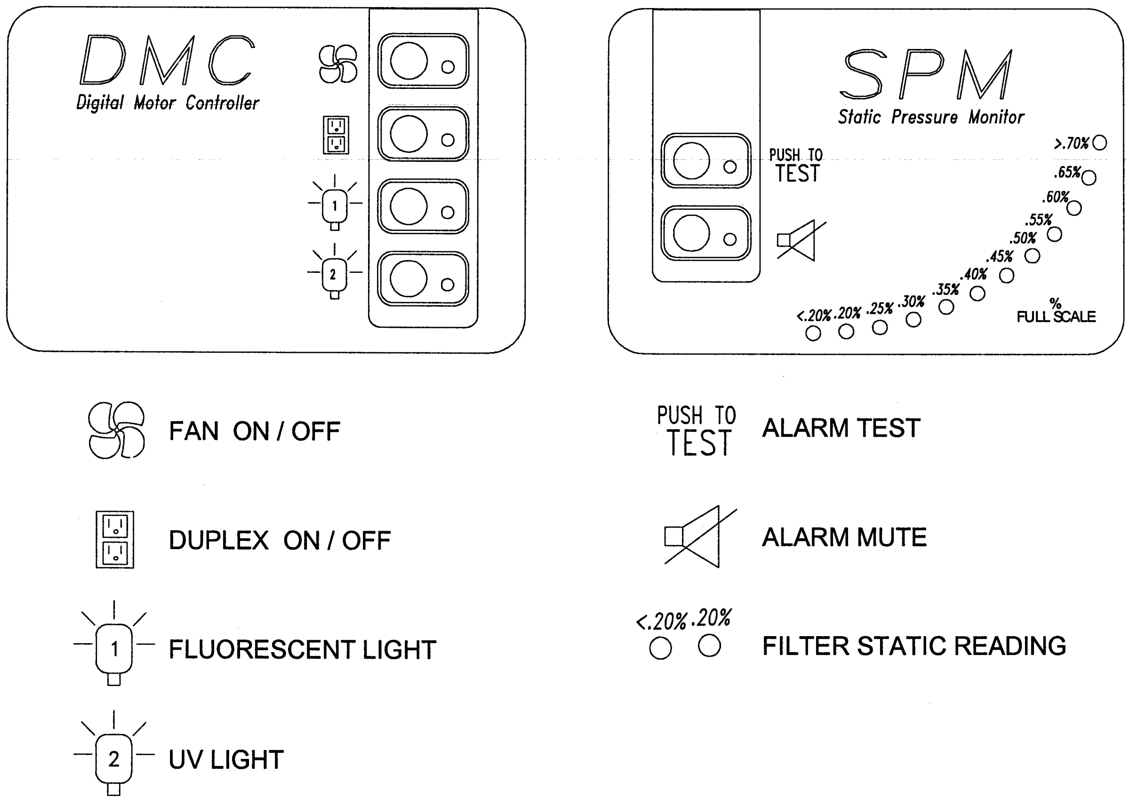

FIGURE 2 CONTROL PANEL TOUCH PADS

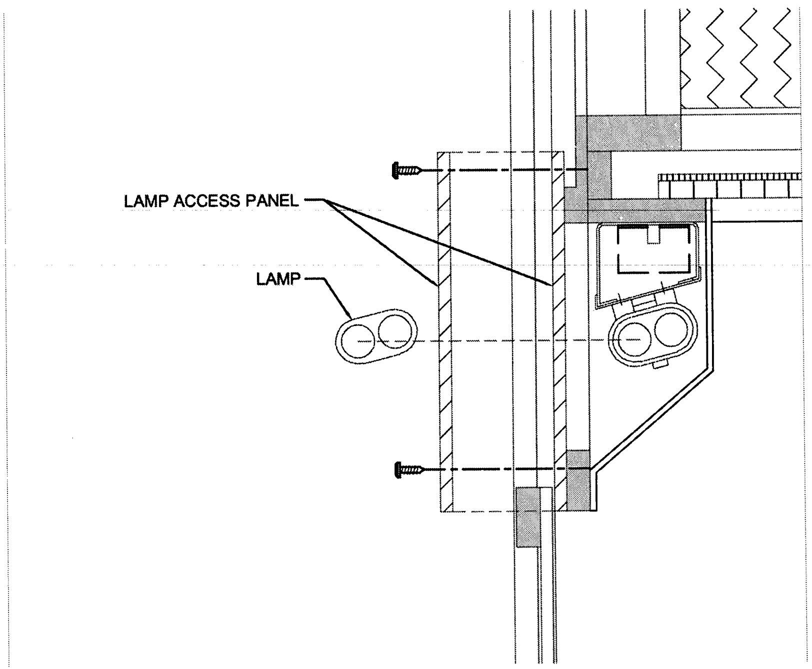

FIGURE 3 FLUORESCENT LIGHT REPLACEMENT

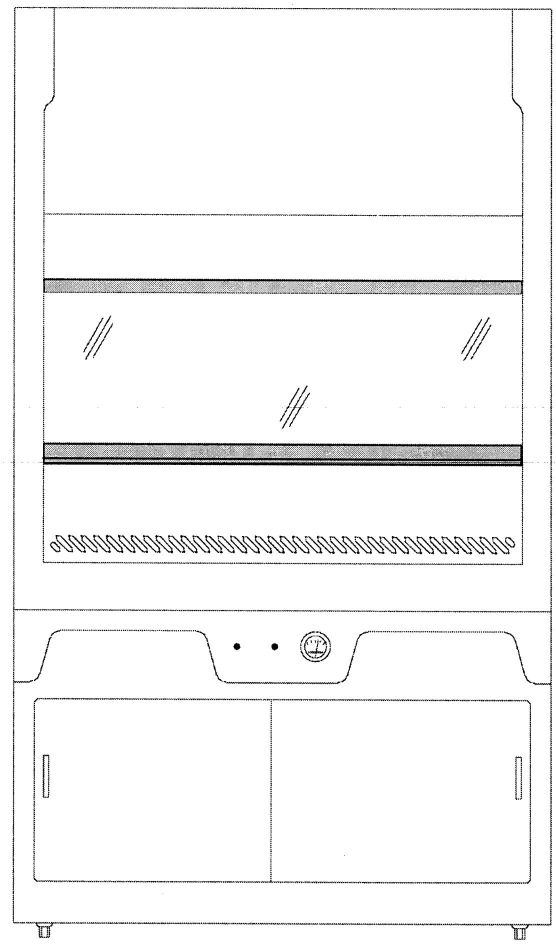

FIGURE 4 MICROZONE VPFX VERTICAL POLYMER FULLY EXHAUSTED HOOD

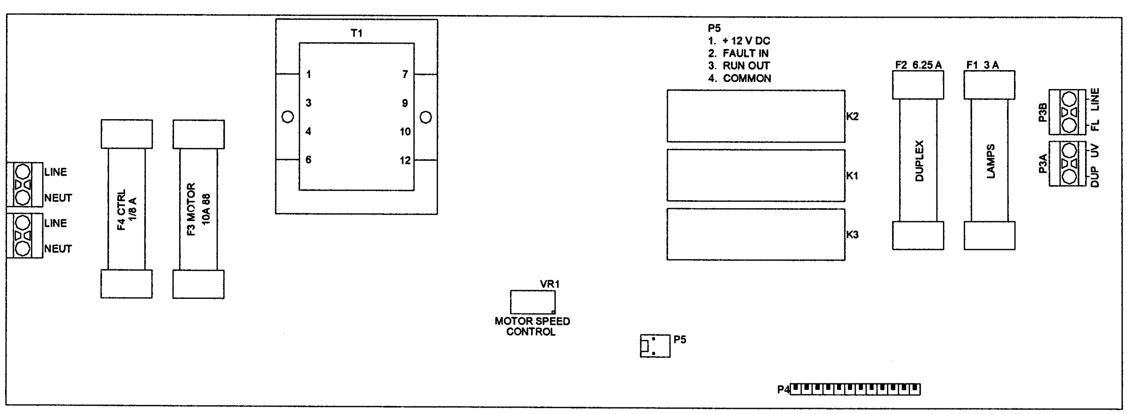

FIGURE 5 DIGITAL MOTOR CONTROL (DMC) BOARD LAYOUT

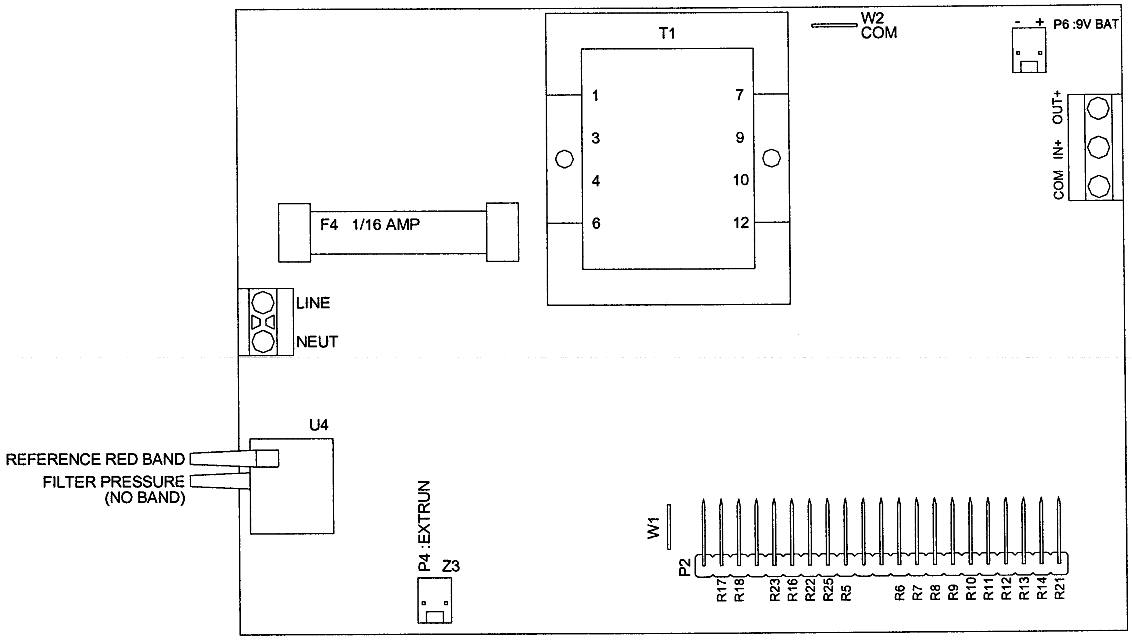

FIGURE 6 STATIC PRESSURE MONITOR (SPM) BOARD LAYOUT

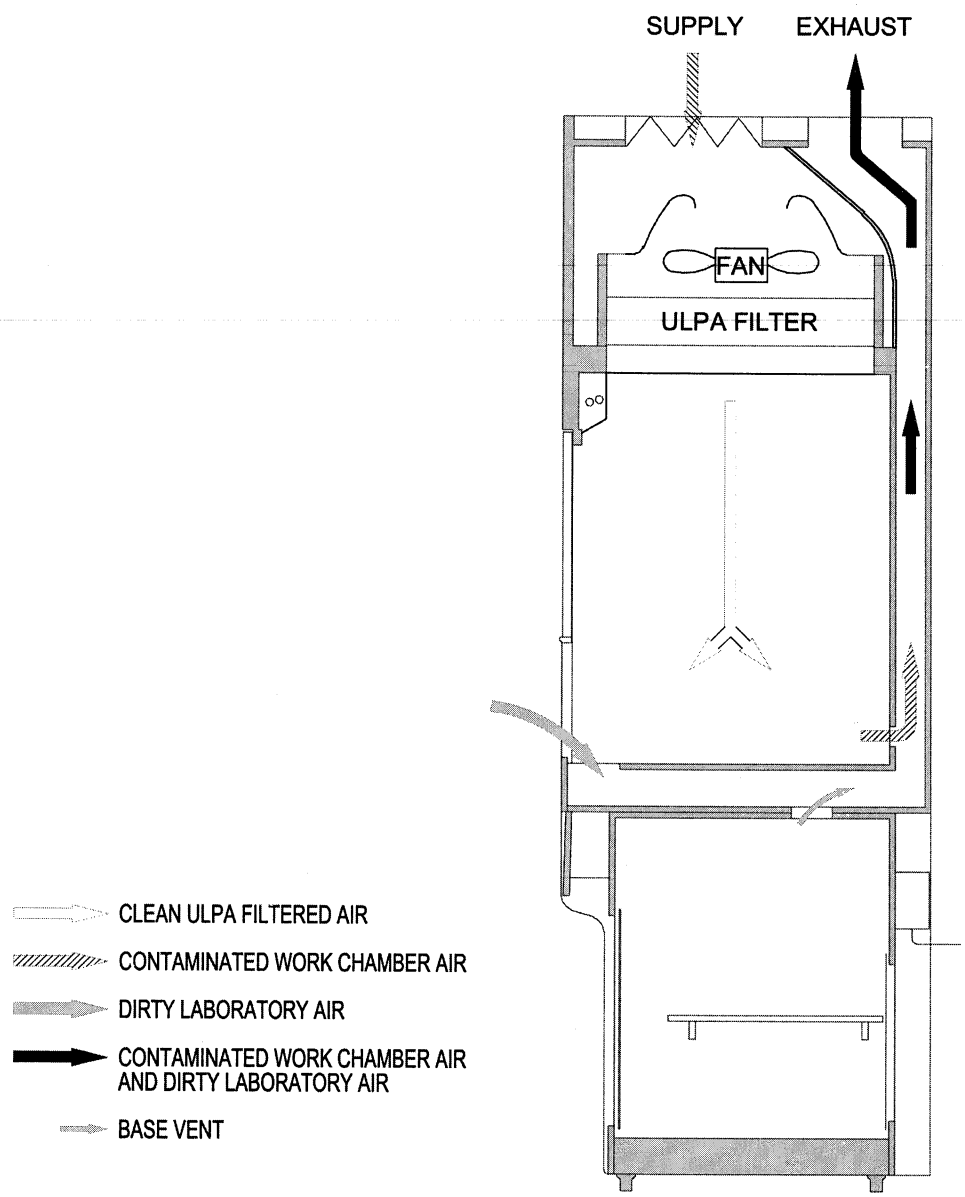

FIGURE 7 AIRFLOW PATTERN

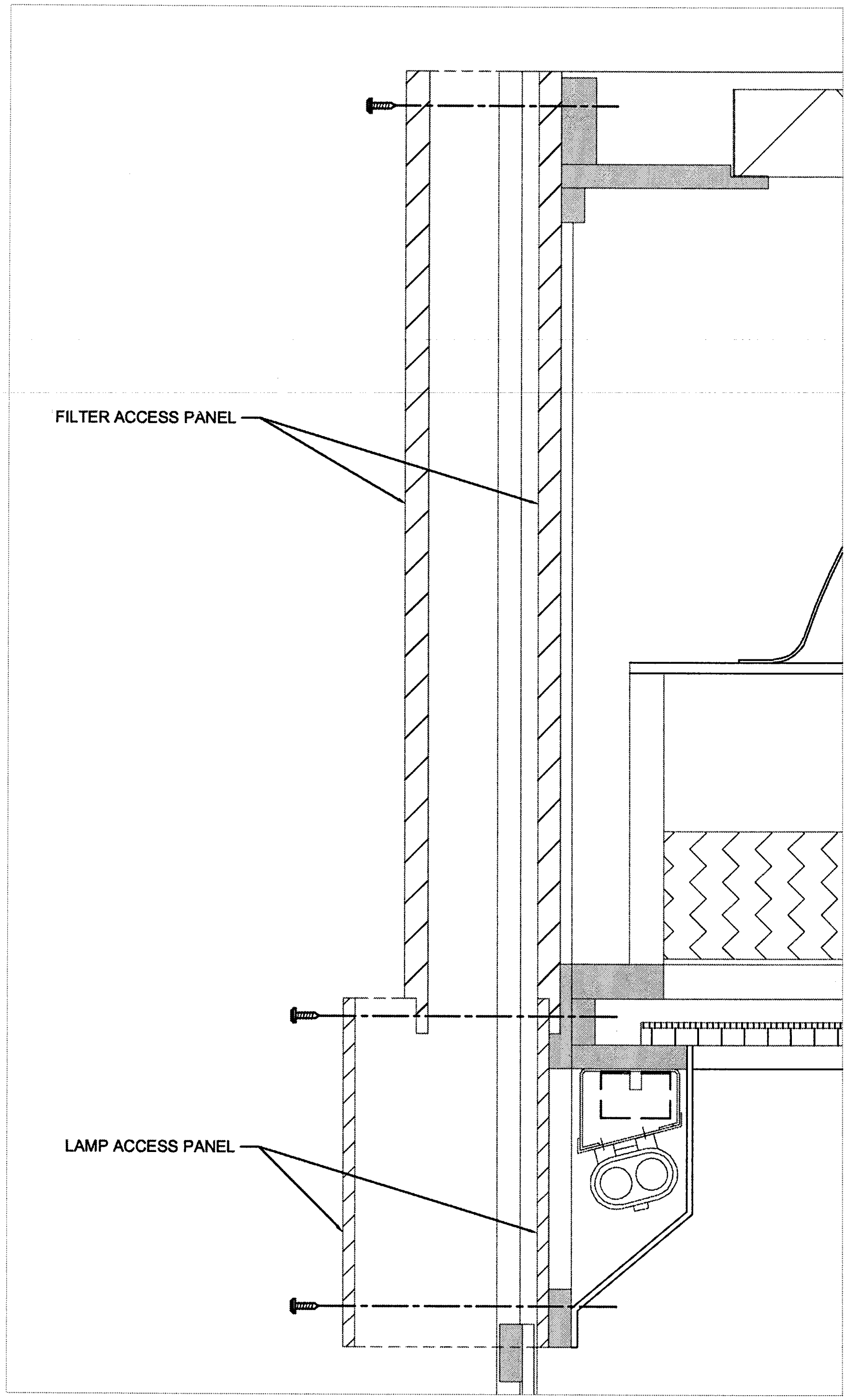

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FIGURE 8 FILTER ACCESS PANEL REMOVAL

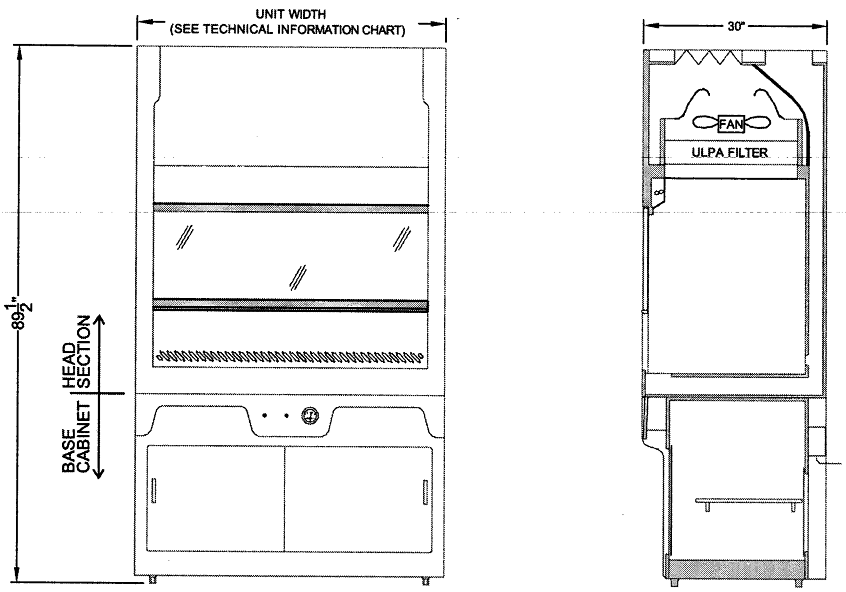


FIGURE 9 OVERALL DIMENSIONS

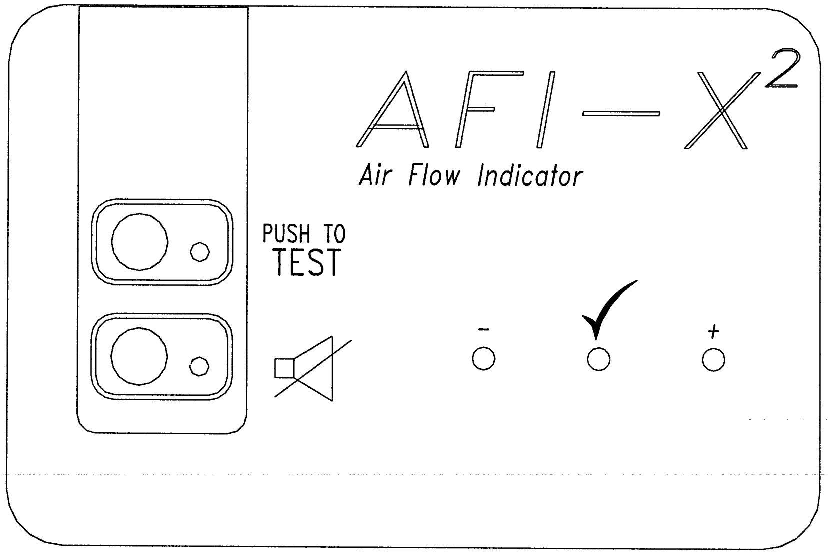


FIGURE 10 AFI-X^2 CONTROL TOUCH PAD

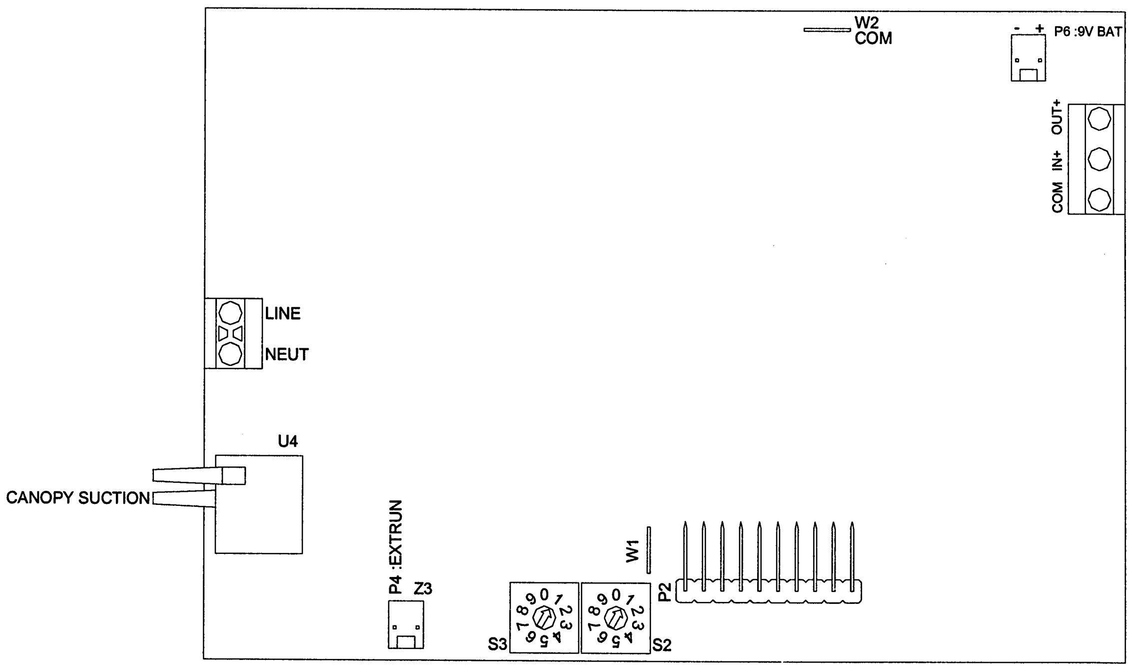


FIGURE 11 AFI-X^2 BOARD LAYOUT

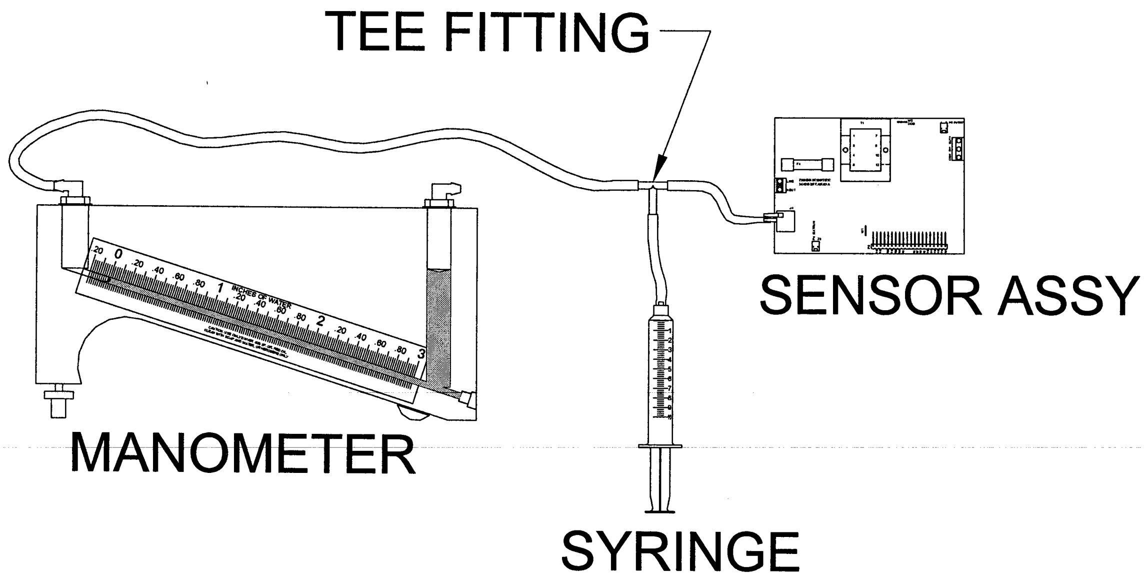
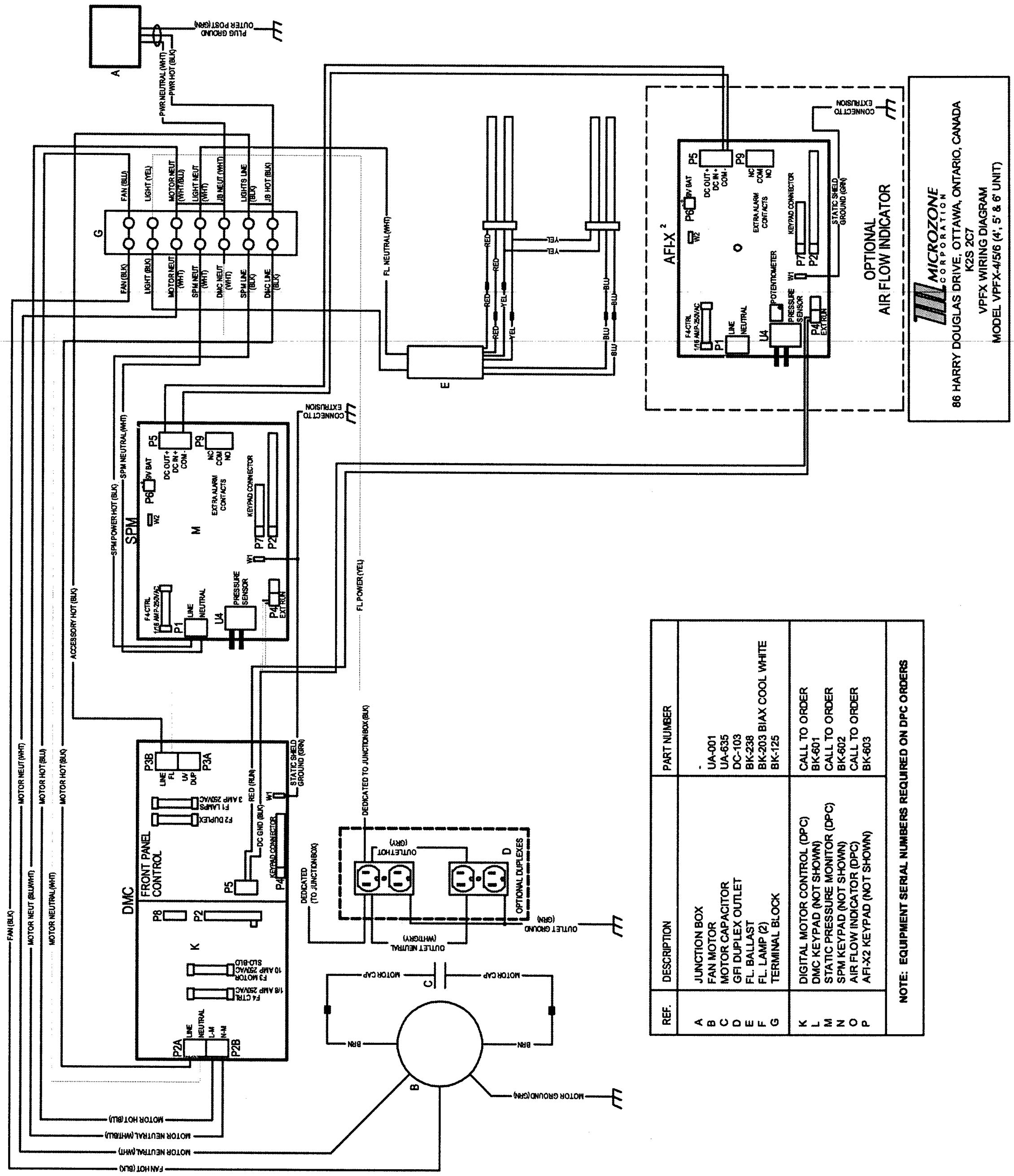


FIGURE 12 STATIC PRESSURE MONITOR CALIBRATION SETUP



REF.	DESCRIPTION	PART NUMBER
A	JUNCTION BOX	-
B	FAN MOTOR	UA-001
C	MOTOR CAPACITOR	UA-635
D	GFI DUPLEX OUTLET	DC-103
E	FL. BALLAST	BK-238
F	FL. LAMP (2)	BK-203 BIAX COOL WHITE
G	TERMINAL BLOCK	BK-125
K	DIGITAL MOTOR CONTROL (DPC)	CALL TO ORDER
L	DMC KEYPAD (NOT SHOWN)	BK-601
M	STATIC PRESSURE MONITOR (DPC)	CALL TO ORDER
N	SPM KEYPAD (NOT SHOWN)	BK-602
O	AIR FLOW INDICATOR (DPC)	CALL TO ORDER
P	AFI-X2 KEYPAD (NOT SHOWN)	BK-603

NOTE: EQUIPMENT SERIAL NUMBERS REQUIRED ON DPC ORDERS

FIGURE 13 ELECTRICAL SCHEMATIC

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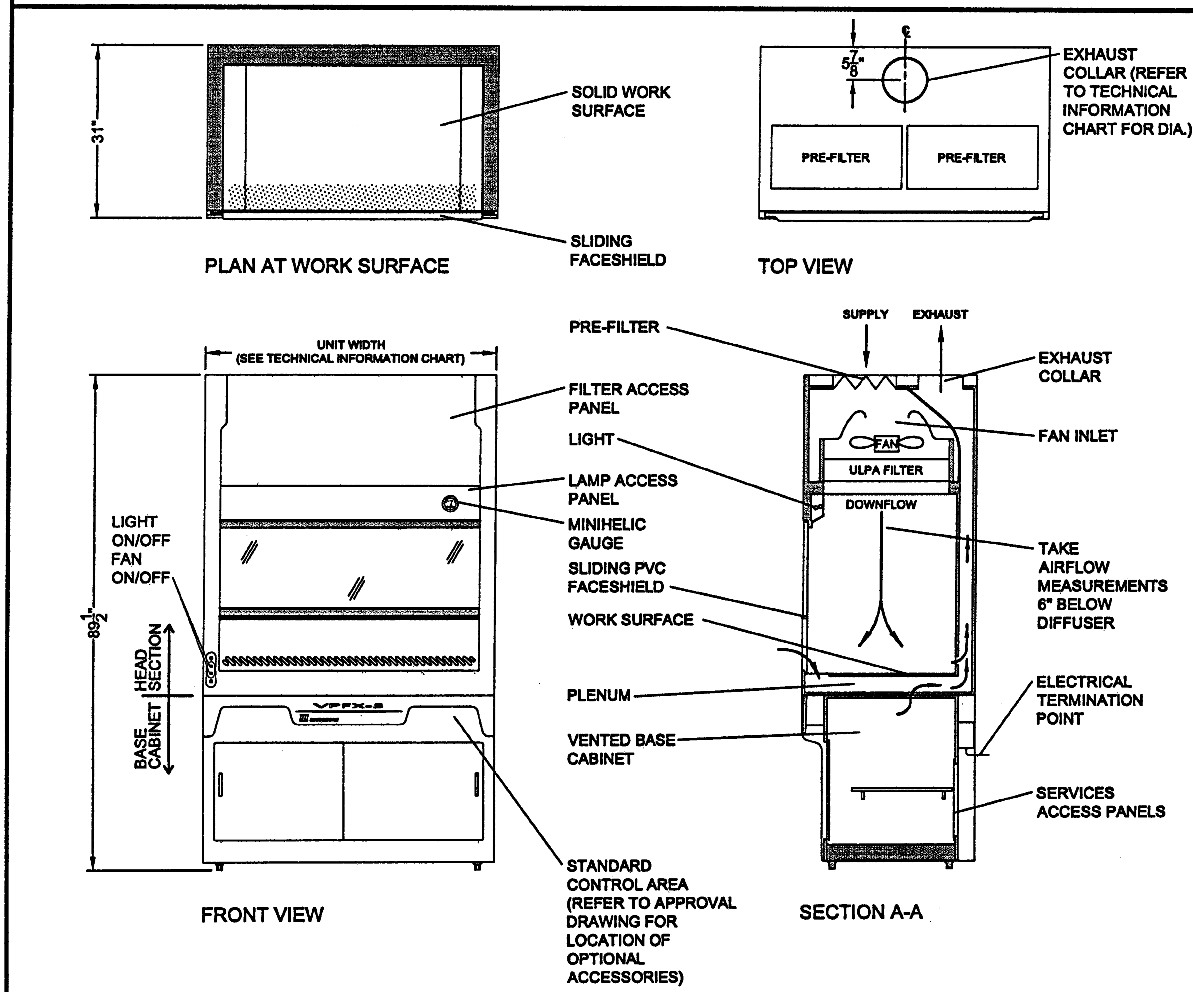
APPENDIX 1

ILLUSTRATION SHEETS

MICROZONE CORPORATION

VPFX SERIES OF VERTICAL FULL EXHAUST WORKSTATIONS



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TELEPHONE: (613) 831-8318 - www.microzone.com - FAX: (613) 831-8321

"Simply Building Better Environments" *For Advanced Technology & Life Sciences*

GENERAL DESCRIPTION

DESCRIPTION

- Provides laminar airflow complete with a high degree of both personnel and product protection.
- Provides better than Class 10 (ISO Class 4) cleanliness within the work zone at 0.3µ.

CONSTRUCTION MATERIALS

- STANDARD - White Polypropylene
- OPTIONAL - White Fire Retardant Polypropylene
- OPTIONAL - White Fire Retardant Polypropylene in work zone only, regular polypropylene elsewhere
- OPTIONAL - White PVC

STANDARD FEATURES

- ULPA filter rated 99.9995 @ 0.12µ
- All service connections accessible from front of unit
- 10" hand opening
- Vented base cabinet complete with sliding doors and adjustable shelves
- Fan on/off, light on/off and minihelic gauge
- Integral work surface with front air intake openings
- Fluorescent biax light fixture
- Workstation interlocked with remote exhaust system c/w visual indicator

OPTIONAL ACCESSORIES

- Digital Motor Controller
- Airflow (Exhaust) indicator alarm system
- 10" X 10" X10" potsink
- 3" X 6" X 3" cupsink
- Polypropylene gooseneck faucet, deck mounted c/w remote
- operator
- Teflon D.I. water spray gun, deck mounted c/w shutoff valve
- Nitrogen spray gun, deck mounted c/w shutoff valve
- Teflon hand held eyewash, deck mounted c/w shutoff valve
- Air, Gas or Vacuum turrets, deck mounted c/w remote operators
- GFI Duplex outlets
- PTFE filter rated 99.9999 @ 0.1µ
- For other accessories & options, please consult factory

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VPFX SERIES OF VERTICAL FULL EXHAUST WORKSTATIONS

HEAD SECTION & BASE CABINET ASSEMBLY

ASSEMBLY SEQUENCE

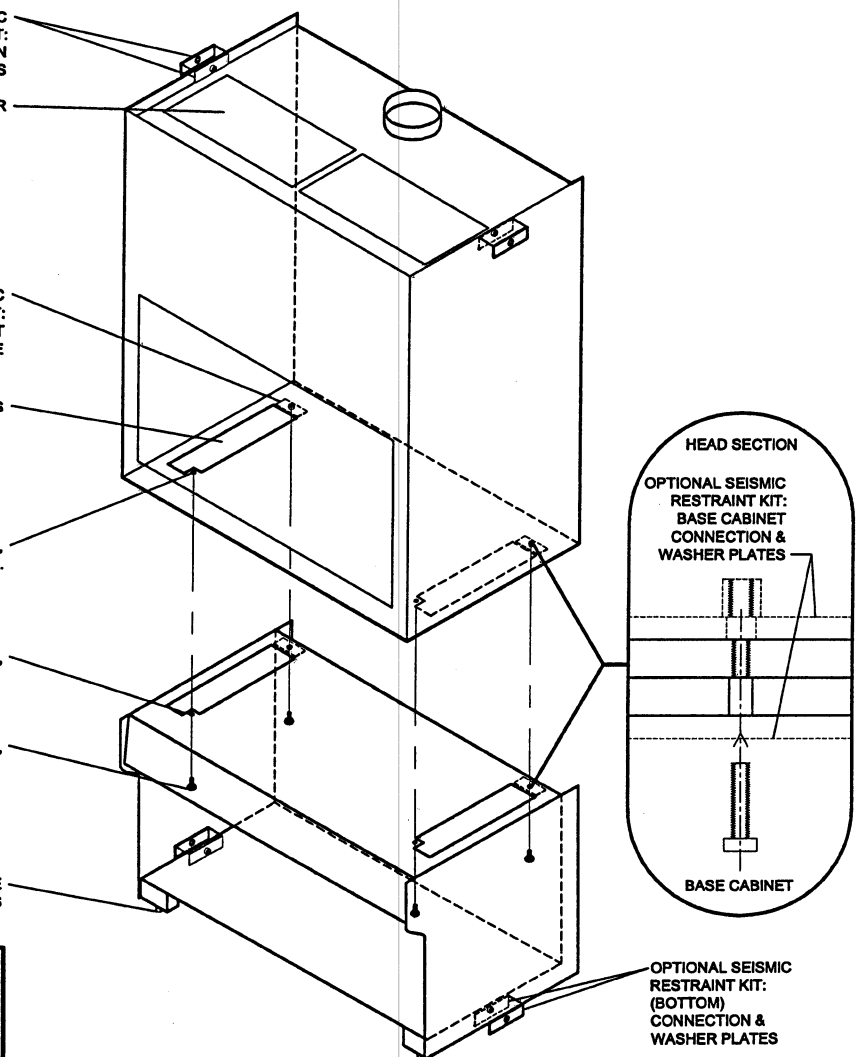
1. POSITION THE BASE CABINET NEAR THE END POINT OF USE.
2. CONNECT SERVICES TO THE UNIT AS REQUIRED. (SEE SHEET 7, POTSINK/CUPSINK ASSEMBLY)
3. POSITION THE HEAD SECTION ONTO THE BASE CABINET. ENSURE THAT THE HEAD SECTION BOLT HOLES ARE PROPERLY ALIGNED WITH THE BASE CABINET HOLES.
4. FASTEN THE HEAD SECTION AND BASE CABINET TOGETHER USING THE FASTENERS PROVIDED.
5. GENTLY SLIDE THE UNIT TO ITS FINAL LOCATION AND ADJUST THE LEVELERS AS REQUIRED.

ASSEMBLY SEQUENCE FOR OPTIONAL SEISMIC RESTRAINT CONNECTIONS

1. FOLLOW ITEMS 1, 2, & 3 ABOVE.
2. INSTALL THE NYLON FASTENERS PROVIDED IN THE TWO FRONT BOLT HOLES AND INSTALL THE TWO STEEL FASTENERS PROVIDED IN THE REAR BOLT HOLES.

SMALL PARTS LIST

DESCRIPTION		QTY	PART NO.
(STANDARD)	1/4-20 x 1 NYLON HEXAGON CAP SCREW	4	FH-040
(OPTIONAL SEISMIC RESTRAINT KIT)	1/4-20 x 1 NYLON HEXAGON CAP SCREW	2	FH-040
	#HC-77 1/2 x 13 x 2 HEXAGON CAP SCREW -STEEL COURSE THREAD	2	FI-026
	(TOP & BOTTOM) CONNECTION PLATE	4	JK-215
	(TOP & BOTTOM) WASHER PLATE	4	JK-216
	BASE CABINET CONNECTION PLATE (FACTORY INSTALLED)	2	JK-217
	BASE CABINET WASHER PLATE (FACTORY INSTALLED)	2	JK-218



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VPFX SERIES OF VERTICAL FULL EXHAUST WORKSTATIONS

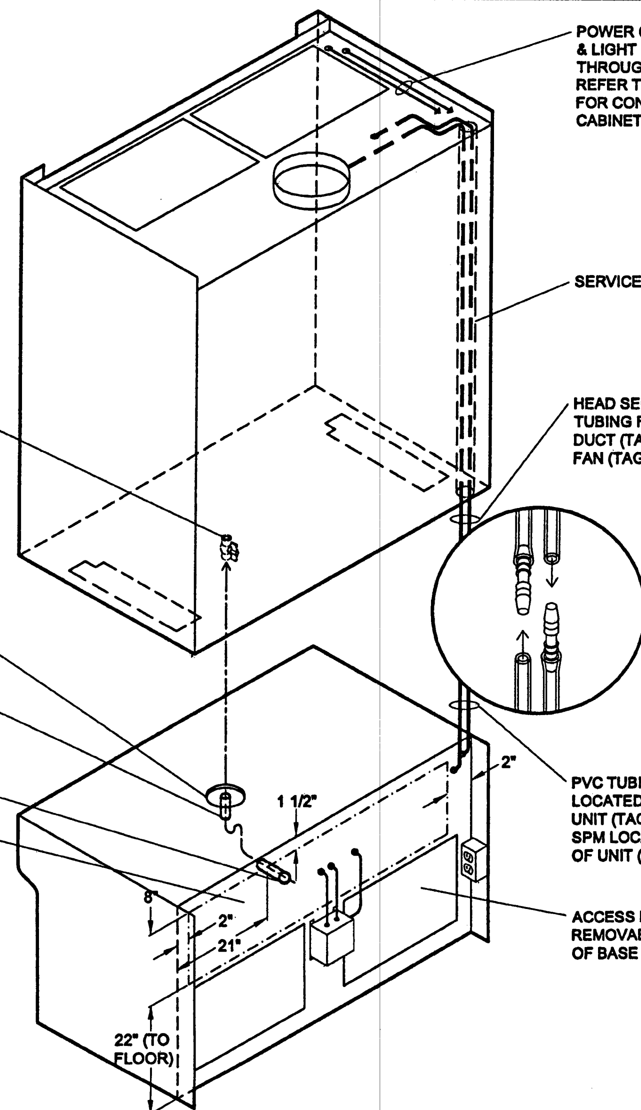
AFI-X^2 ,SPM AND PLENUM DRAIN HOOK-UP

AFI-X^2 HOOK-UP

1. CONNECT CLEAR PVC TUBING WHICH EXTENDS FROM HEAD SECTION (TAGGED SPM & AFIX) TO THE APPROPRIATE TUBING FROM THE BASE CABINET.

PLENUM DRAIN HOOK-UP

1. MAKE CUT-OUTS AS REQUIRED IN RESERVED AREA IN BACK OF BASE CABINET FOR PLENUM SINK DRAIN PIPING.
2. OWNER TO PROVIDE & CONNECT PLENUM SINK DRAIN PIPING C/W TRAP TO PLENUM SINK DRAIN VALVE



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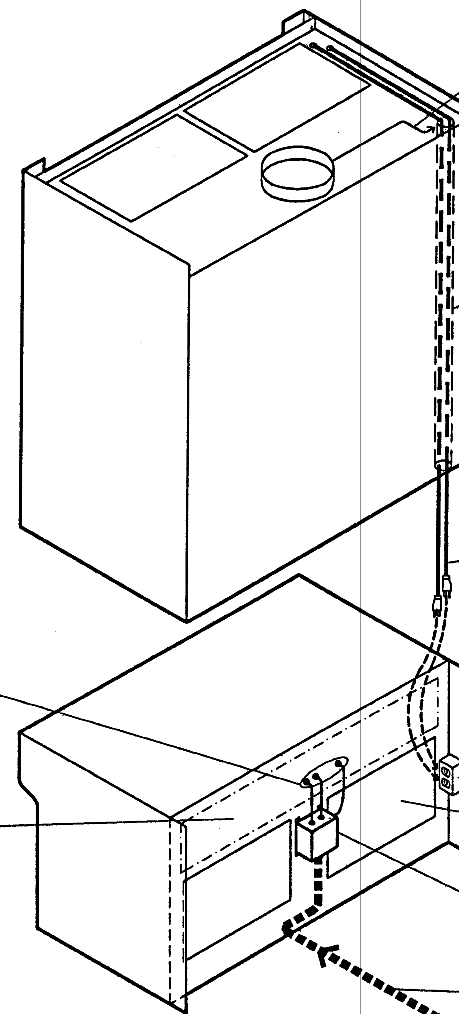
ELECTRICAL HOOK-UP

ELECTRICAL HOOK-UP

1. CONNECT HEAD SECTION POWER CORDS FROM FAN & LIGHT TO DUPLEX OUTLET MOUNTED ON THE BACK OF THE BASE CABINET.
2. OWNER TO BRING POWER TO MAIN POWER JUNCTION BOX.



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VPFX SERIES OF VERTICAL FULL EXHAUST WORKSTATIONS

FLUORESCENT LIGHT & FILTER REPLACEMENT

ULPA/HEPA FILTER REPLACEMENT

NOTES

1. MICROZONE CORPORATION RECOMMENDS THAT ONLY QUALIFIED PERSONNEL CHANGE THESE FILTERS.
2. HANDLE ULPA & HEPA FILTERS WITH CARE & ONLY BY THE SUPPORTING FRAMES, NEVER BY THE MEDIA.
3. USE CARE WHEN USING THE NYLON FASTENERS ON THIS UNIT. OVER TORQUING WILL DISTORT OR SHEAR THE FASTENER HEADS.

STEPS

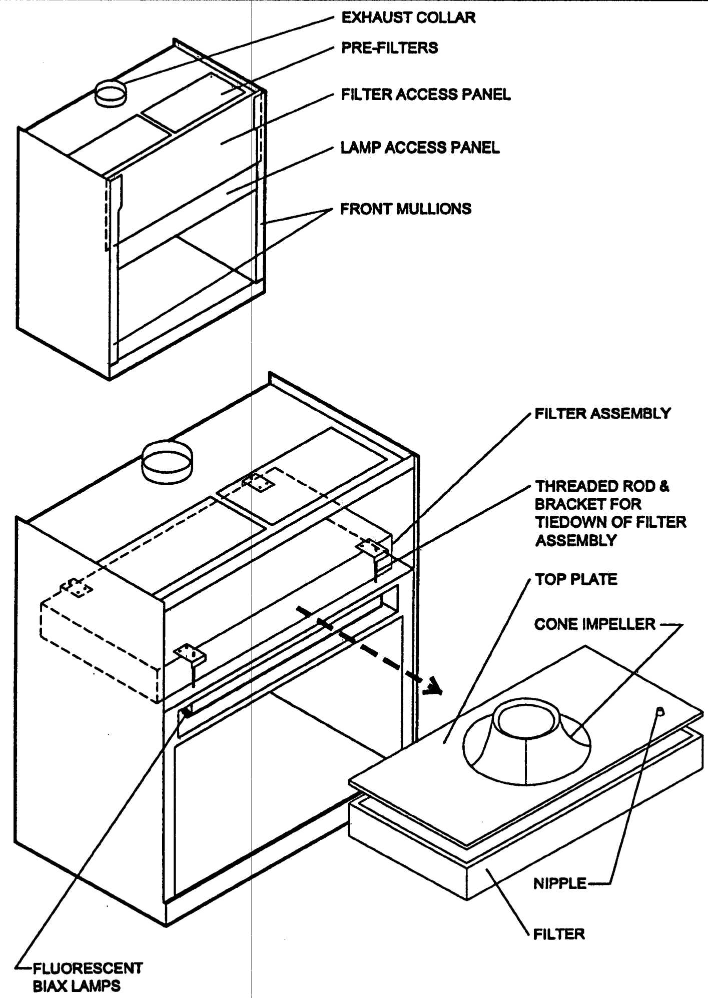
1. REMOVE POWER FROM UNIT.
2. LOWER FACESHIELD TO LOWEST POSITION.
3. REMOVE LEFT & RIGHT MULLIONS.
4. REMOVE LAMP ACCESS PANEL TO EXPOSE THE BOTTOM ROW OF FASTENERS OF THE FILTER ACCESS PANEL. REMOVE THE FILTER ACCESS PANEL.
5. DISCONNECT THE INTERNAL POWER CORD FROM THE MOTORIZED IMPELLER UNIT.
6. DISCONNECT THE PVC TUBING FROM THE NIPPLE LOCATED ON THE TOP PLATE OF THE FILTER.
7. LOOSEN THE FILTER TIE-DOWN BRACKETS.
8. REMOVE THE TWO THREADED RODS FOR THE TIE-DOWN BRACKETS LOCATED AT THE FRONT OF THE FILTER.
9. GENTLY LIFT THE FILTER TO BREAK THE SEAL AROUND THE BOTTOM EDGE OF THE FILTER FRAME.
10. REMOVE THE FILTER/MOTORIZED IMPELLER UNIT FROM THE HEAD SECTION.
11. CUT THE ALUMINUM FOIL TAPE THAT COVERS THE SEAM BETWEEN THE FILTER & TOP PLATE.
12. INSTALL TOP PLATE/MOTORIZED IMPELLER ASSEMBLY ONTO NEW FILTER USING THE EXISTING FASTENERS.
13. RESEAL THE SEAM BETWEEN THE TOP PLATE AND THE NEW FILTRE USING ALUMINUM FOIL TAPE.
14. INSTALL THE COMPLETED FILTER/TOP PLATE/MOTORIZED IMPELLER INTO THE HEAD SECTION. **DO NOT OVER-TIGHTEN THE FILTER TIE-DOWN BRACKETS.**
15. CONNECT THE PVC TUBING AND THE POWER CORD. REPLACE THE FILTER ACCESS & LIGHT ACCESS PANELS, & MULLIONS.

PRE-FILTER REPLACEMENT

1. THE PRE-FILTERS ARE LOCATED ON THE TOP OF THE UNIT. SEE SECTION ____ OF THE MANUAL FOR CARE AND REPLACEMENT OF THESE FILTERS.

FLUORESCENT BIAX LAMP REPLACEMENT

1. FOLLOW FILTER REPLACEMENT STEPS #1, 2 & 3.
2. REMOVE LAMP ACCESS PANEL
3. REPLACE BIAX LAMP TUBES AS REQUIRED.



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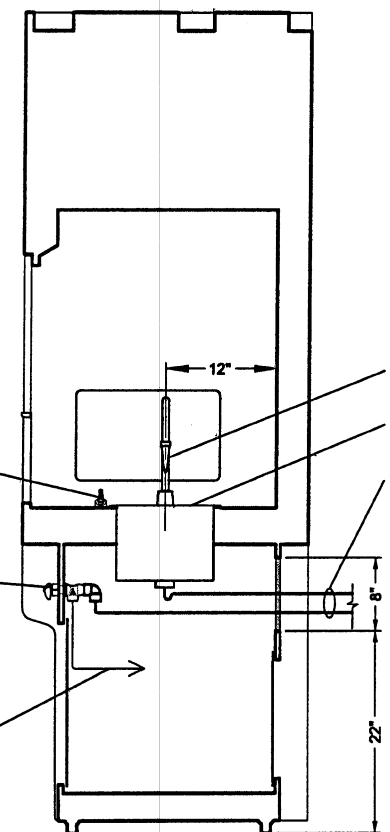
MICROZONE CORPORATION

VPFX SERIES OF VERTICAL FULL EXHAUST WORKSTATIONS

CONNECTIONS FOR OPTIONAL ACCESSORIES

DESCRIPTION	THREAD SIZE	P.N.
10" x 10" x 10" POTSINK C/W NATURAL POLYPROPYLENE COUPLING	1" COUPLING	EC-025
3" x 6" x 3" CUPSINK C/W TAIL & STRAINER. MATERIAL: WHITE POLYPROPYLENE	1 1/2" NPSM	EB-015
GOOSENECK FAUCET C/W LOCALIZED OPERATOR. NATURAL PP.	3/8" FNPT	
GOOSENECK FAUCET C/W REMOTE OPERATOR. NATURAL PP.	3/8" FNPT	EC-335
TEFLON D.I. WATER SPRAY GUN C/W SHUTOFF VALVE	1/4" FNPT	EC-215
TEFLON NITROGEN SPRAY GUN C/W SHUTOFF VALVE	1/4" FNPT	EC-018
AIR, VACUUM TURRETS C/W REMOTE OPERATOR	3/8" FNPT	EC-342
GAS TURRET C/W LOCALIZED OPERATOR. INDEXED FOR NATURAL GAS. CORROSION RESISTANT. BLACK FINISH	1/4" IP	EE-129
30 DEGREE ANGLE GAS TURRET C/W REMOTE MOLDED NYLON OPERATOR (COLOR CODED BLUE). INDEXED FOR NATURAL GAS. POWDER COATED BLUE FINISH	TUR. = 3/8" IPS MALE OPER. = 3/8" IPS FEM.	
TEFLON HANDHELD EYE WASH C/W REMOTE OPERATOR	1/2" FNPT	TA-036
TEFLON ASPARATOR C/W REMOTE OPERATOR	1/2" FNPT	EC-014
REMOTE OPERATOR	1/2" FNPT	EC-306



SEQUENCE OF INSTALLATION

1. CONNECT DRAIN LINE(S) AS REQUIRED TO SINK(S). MAKE PENETRATIONS IN THE REAR OF THE BASE CABINET AS REQUIRED. LEAK TEST DRAIN(S) ACCORDINGLY.

2. CONNECT EACH LINE FROM THE FACTORY INSTALLED VALVE IN THE BASE CABINET TO THE APPROPRIATE ACCESSORIES LOCATED IN THE HEAD SECTION. IDENTIFICATION TAGS ARE APPLIED TO EACH LINE AND VALVE AT THE FACTORY.

3. BRING SERVICE(S) TO THE VALVE(S), MAKING PENETRATIONS IN THE REAR OF THE BASE CABINET AS REQUIRED. LEAK TEST THE LINES ACCORDINGLY.

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APPENDIX 2

SPECIFICATIONS

MICROZONE CORPORATION

VPFX SERIES OF VERTICAL FULL EXHAUST WORKSTATIONS | TECHNICAL INFORMATION

PHYSICAL DATA

MODEL NUMBER	OVERALL UNIT DIMENSIONS WIDTH IN	(mm)	DEPTH IN	(mm)	HEIGHT IN	(mm)	WORK ZONE DIMENSIONS WIDTH IN	(mm)	DEPTH IN	(mm)	HEIGHT IN	(mm)	EXHAUST COLLAR DIAMETER (OUTSIDE)		SHIPPING WEIGHT LBS	KG
VPFX - 4	52"	(1,321)	31"	(788)	89.5"	(2,274)	46.4"	(1,178)	26.6"	(675)	26.5"	(674)	8"	(204)	1,302	590
VPFX - 5	64"	(1,626)	31"	(788)	89.5"	(2,274)	58.4"	(1,483)	26.6"	(675)	26.5"	(674)	10"	(254)	1,576	715
VPFX - 6	76"	(1,930)	31"	(788)	89.5"	(2,274)	70.4"	(1,788)	26.6"	(675)	26.5"	(674)	10"	(254)	1,830	830
VPFX - 8	100"	(2,540)	31"	(788)	89.5"	(2,274)	94.4"	(2,398)	26.6"	(675)	26.5"	(674)	12"	(305)	2,604	1,180

PERFORMANCE

MODEL NUMBER	10" HAND INTAKE (90 FPM INTAKE VELOCITY) CFM	(M^3/hr)	BASE VENT CFM	(M^3/hr)	DOWNFLOW (60 FPM) * SEE NOTE 2 CFM	(M^3/hr)	AIR EXHAUST CFM	(M^3/hr)
VPFX - 4	290	493	40	68	510	867	840	1,428
VPFX - 5	362	615	40	68	637	1,083	1,039	1,766
VPFX - 6	435	739	40	68	765	1,300	1,240	2,108
VPFX - 8	580	986	80	136	1,020	1,734	1,680	2,856

NOTES
1. STATIC PRESSURE AT EXHAUST COLLAR APPROXIMATELY 0.70" W.G.
2. 6" BELOW DIFFUSER PLATE

SERVICE REQUIREMENTS / REPLACEMENT PARTS

MODEL NUMBER	ELECTRICAL (DUPLEX OUTLETS ARE ADDITIONAL)	WATER / GASSES & OTHER ACCESSORIES	ULPA FILTER	LAMP
VPFX - 4	115V, 4AMPS, 60HZ	CONSULT FACTORY	24" x 48" x 6"	2 x 36W BIAX
VPFX - 5	115V, 4AMPS, 60HZ	CONSULT FACTORY	24" x 60" x 6"	2 x 40W BIAX
VPFX - 6	115V, 6AMPS, 60HZ	CONSULT FACTORY	24" x 72" x 6"	2 x 40W BIAX
VPFX - 8	115V, 8AMPS, 60HZ	CONSULT FACTORY	2 - 24" x 48" x 6"	4 x 36W BIAX

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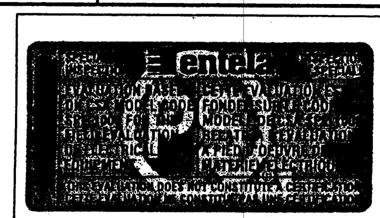

APPENDIX 3

SIMPLIFIED AIRFLOW MEASUREMENTS

Simplified Method for Determining the Airflows in Microzone VPFX Polymer Vertical Laminar Flow Hoods

Because of the nature of the airflow patterns in the Microzone VPP series of fully exhausted laminar flow hoods, it is often difficult to determine the air velocity of the various components. For that reason we provide values for supply, exhaust, intake and base as CFM since the most common method of balancing these hoods is by use of duct traverses.

However, in many installations, it is difficult, if not impossible, to accurately perform airflow measurements by duct traverse, so Microzone has developed a factory validated test procedure that is performed at the front of the hood.

Equipment required:
Cardboard
Masking tape
Flowhood such as Alnor Balometer or Shortridge Airdata Multimeter

1. Raise the sash so that the front opening is 12 inches high
2. Cut 2 pieces of cardboard to narrow the front opening to 12 inches wide at about the center of the hood. Tape the cardboard pieces in place. Tape the top of the sash to minimize leakage.
3. Using only the base of the flowhood, measure the volume of air entering the hood. This value is the intake volume.
4. Cut strips of cardboard and fully close the perforated grills in the rear wall of the workzone and the front of the worksurface. There is no need to shut off the exhaust system.
5. Measure the volume of air now coming out the front of the hood. This is the supply volume.
6. Return the hood to its normal operating configuration.

Compare the values obtained to the requirements provided with your hood using the sum of the measured supply volume and intake volume plus the nominal value for the base cabinet exhaust to determine the total exhaust. Adjust your system as required.

This procedure is fast, simple to perform at the front of the hood and provides reproducible, reliable results that can be used to either balance a hood or ensure that it is operating within specifications.

Model	Step 3 Intake Volume	Step 5 Supply Volume	Exhaust Volume in duct	Collar Size
VPFX-4	290	510	840	8" DIA
VPFX-5	362	637	1039	10" DIA
VPFX-6	435	765	1240	10" DIA
VPFX-8	580	1020	1680	12" DIA

APPENDIX 4

CHEMICAL RESISTANCE CHARTS

Selection of Plastic Materials

Many factors can affect the chemical resistance of plastics. These include, but are not limited to, exposure time, extremes of temperature and pressure, frequency of temperature and/or pressure cycling, attrition due to abrasive particles, and the type of mechanical stress imposed. The fact that certain combinations of chemical and mechanical load can induce stress cracking in many otherwise chemically resistant materials, both metallic and nonmetallic, is of particular significance.

The chemical/temperature ratings presented are based on well-processed or well-fabricated test specimens being essentially resistant to either chemical attack and/or severe swelling which would normally impair their performance under moderate mechanical stresses.

Operating characteristics are dependent upon the particular application of Proteus™ polypropylene, polyethylene, PVC, or Corzan™ CPVC and may differ from those experienced in either laboratory testing or apparently similar field service. Because corrosive fluids or vapors are often mixtures of various individual chemicals, it is strongly recommended that trial installations be evaluated under actual service conditions.

For example, immersion testing in individual chemicals at a specific operating temperature doesn't predict the performance of Proteus™ polypropylene, polyethylene, PVC, or Corzan™ CPVC should an exothermic reaction take place when mixtures of chemicals are involved.

The ratings given on the following pages are a guide and do not constitute a warranty of any kind, expressed or implied, with respect to the performance of Proteus™ polypropylene, polyethylene, PVC, or Corzan™ CPVC, in any specific application.

1	<15% loss in property values. Little or no chemical attack.
2	15-30% loss in property values. Minor chemical attack.
3	30-50% loss in property values. Moderate chemical attack.
NR	Not recommended. >50% loss in property values.
*	No data available.

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Material Selection
Chemical Resistance Charts

POLY HI SOLIDUR WORLDWIDE

	TIVAR			Proteus Polypropylene			Polyethylene		PVC		Corzan CPVC		
	70°	122°	170°	70°	140°	180°	70°	140°	70°	140°	70°	170°	210°
Acetate Solvents Pure	1	2	NR	2	NR	NR	1	3	NR	NR	NR	NR	NR
Acetaldehyde	2	3	NR	2	3	*	3	NR	NR	NR	NR	NR	NR
Acetamide	*	*	*	1	2	*	1	*	NR	NR	*	*	*
Acetic Solvents Crude	*	*	*	2	NR	NR	1	3	NR	NR	NR	NR	NR
Acetic Solvents Pure	1	1	NR	2	NR	NR	1	*	NR	NR	NR	NR	NR
Acetic Acid 10%	1	2	NR	1	1	1	1	1	1	1	1	2	NR
Acetic Acid 20%	1	2	NR	1	1	1	1	1	1	1	1	NR	NR
Acetic Acid 50%	1	2	NR	1	1	1	1	2	3	NR	NR	NR	NR
Acetic Acid 80%	1	2	NR	1	1	1	2	2	NR	NR	NR	NR	NR
Acetic Acid Glacial	1	2	NR	1	1	2	1	NR	NR	NR	NR	NR	NR
Acetic Anhydride	1	2	NR	2	NR	NR	3	NR	NR	NR	NR	NR	NR
Acetone	1	1	NR	1	1	2	NR	NR	NR	NR	NR	NR	NR
Acetophenone	3	3	*	2	2	NR	*	*	NR	NR	*	*	*
Acetyl Chloride	*	*	*	*	*	*	*	*	NR	NR	NR	NR	NR
Acetylene	*	*	*	1	*	*	*	*	1	1	1	1	*
Acrylonitrile	*	*	*	1	2	*	2	2	*	*	*	*	*
Adipic Acid	*	*	*	1	2	2	*	*	1	1	1	1	*
Alcohol Allyl	1	NR	NR	2	2	*	2	2	NR	NR	NR	NR	NR
Alcohol Amyl	1	NR	NR	1	2	*	1	2	NR	NR	2	NR	NR
Alcohol Butyl	1	1	1	1	1	2	1	1	NR	NR	2	NR	NR
Alcohol Ethyl	1	1	1	1	1	2	2	NR	1	1	1	1	1
Alcohol Methyl	*	*	*	1	1	1	1	1	1	1	1	1	1
Alcohol Propyl	*	*	*	1	*	*	2	NR	1	NR	1	*	*
Allyl Chloride	1	3	*	2	*	*	2	NR	NR	NR	NR	NR	NR
Alum	1	1	*	1	1	1	1	1	1	1	1	1	1
Alum Ammonium	*	*	*	1	1	1	1	1	NR	NR	NR	NR	NR
Alum Chrome	*	*	*	1	1	1	1	1	1	1	1	1	1
Alum Potassium	*	*	*	1	1	1	1	1	1	1	1	1	1
Aluminum Chloride	1	1	Boiling NR	1	1	1	1	1	1	1	1	1	1
Aluminum Fluoride	1	1	*	1	1	1	1	1	1	1	1	1	
Aluminum Hydroxide	1	1	*	1	1	1	1	*	1	1	1	1	1
Aluminum Nitrate	*	*	*	1	1	1	1	*	1	1	1	1	1
Aluminum Sulfate	1	1	Boiling NR	1	1	*	1	2	1	1	1	1	1
Ammonia Anhydrous	1	1	*	1	1	1	*	*	2	NR	*	*	*
Ammonia Aqueous	1	1	*	1	1	1	*	*	1	1	1	1	*
Ammonium Bifluoride	*	*	*	1	1	1	1	1	1	1	1	1	*
Ammonium Carbonate	1	*	*	1	1	1	1	1	1	1	1	1	*
Ammonium Chloride	1	1	Boiling NR	1	1	2	1	1	1	1	1	1	*
Ammonium Fluoride 10%	*	*	*	1	1	1	1	1	1	1	1	1	*
Ammonium Fluoride 25%	*	*	*	1	1	1	1	1	NR	NR	NR	NR	NR
Ammonium Hydroxide	1	1	*	1	1	1	1	1	1	1	1	1	*
Ammonium Metaphosphate	*	*	*	1	1	1	1	1	1	1	1	1	*
Ammonium Nitrate	1	1	1	1	1	1	1	1	1	1	1	1	*
Ammonium Persulfate	1	1	*	1	1	1	1	1	1	1	1	1	*
Ammonium Phosphate	1	*	*	1	1	1	1	1	1	1	1	1	*
Ammonium Sulfate	1	1	Boiling NR	1	1	1	1	1	1	1	1	1	*
Ammonium Sulfide	*	*	*	1	1	1	*	*	1	1	1	1	*
Amyl Acetate	1	*	*	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

1 <15% loss in property values. Little or no chemical attack.
2 15-30% loss in property values. Minor chemical attack.
3 30-50% loss in property values. Moderate chemical attack.
NR Not recommended. >50% loss in property values.
* No data available.

Material Selection

Chemical Resistance Charts

	TIVAR			Proteus Polypropylene			Polyethylene		PVC		Corzan CPVC		
	70°	122°	170°	70°	140°	180°	70°	140°	70°	140°	70°	170°	210°
Amyl Chloride	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Aniline	1	2	3	1	3	3	NR	NR	NR	NR	NR	NR	NR
Aniline Hydrochloride	*	*	*	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Antimony Trichloride	1	*	*	1	1	1	1	1	1	NR	NR	NR	NR
Aqua Regia	2	3	NR	2	NR	NR	NR	NR	3	NR	NR	NR	NR
Arsenic Acid	1	*	*	1	1	1	1	1	1	1	1	1	*
Barium Carbonate	*	*	*	1	1	1	1	1	1	1	1	1	*
Barium Chloride	1	*	*	1	1	1	1	1	1	1	1	1	*
Barium Hydroxide	1	1	*	1	1	2	1	1	1	1	1	1	*
Barium Sulfate	1	*	*	2	NR	NR	1	1	1	2	1	1	1
Barium Sulfide	1	1	*	1	1	1	1	1	1	2	1	1	1
Beer	1	1	1	1	1	1	1	1	1	1	1	1	1
Beet Sugar Liquors	*	*	*	1	2	*	1	1	1	1	1	1	1
Benzaldehyde	1	*	*	1	NR	NR	NR	NR	NR	NR	NR	NR	NR
Benzene	3	NR	*	3	NR	NR	NR	NR	NR	NR	NR	NR	NR
Benzene Sulfonic Acid	1	1	*	2	NR	NR	NR	NR	1	1	1	1	*
Benzoic Acid	1	1	*	1	NR	NR	1	*	1	2	1	1	*
Benzyl Alcohol	1	1	1	1	3	NR	*	*	NR	NR	NR	NR	NR
Benzyl Chloride	*	*	*	1	1	2	*	*	2	NR	*	*	*
Bismuth Carbonate	*	*	*	1	1	1	1	1	1	1	1	1	1
Borax	1	1	*	1	1	2	1	1	1	1	1	1	*
Boric Acid	1	1	*	1	1	1	1	1	1	1	1	1	*
Bromine Liquid	*	*	*	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Bromine Water	3	*	*	NR	NR	NR	NR	NR	1	1	NR	NR	NR
Butadiene	3	NR	NR	NR	NR	NR	2	*	NR	NR	1	1	*
Butane	1	*	*	1	NR	NR	2	*	2	NR	1	NR	NR
Butyl Acetate	1	*	*	2	NR	NR	NR	NR	NR	NR	NR	NR	NR
Butyl Alcohol	1	1	1	1	1	1	2	2	NR	NR	1	NR	NR
Butylene	1	*	*	2	NR	NR	2	*	3	NR	2	NR	NR
Butyl Phenol	*	*	*	2	*	*	2	*	NR	NR	2	NR	NR
Butyne Diol	*	*	*	1	1	*	2	*	1	NR	1	NR	NR
Butyric Acid	1	2	*	1	1	1	2	*	NR	NR	1	NR	NR
Butyl Amine	*	*	*	3	NR	*	3	NR	NR	NR	*	*	*
Butyl Ether	*	*	*	NR	NR	NR	2	NR	1	1	*	*	*
Butyl Chloride	*	*	*	NR	NR	NR	NR	NR	*	*	*	*	*
Butyl Phthalate	1	*	*	2	2	*	3	NR	2	NR	NR	NR	NR
Calcium Bisulfide	*	*	*	1	1	1	1	1	1	1	1	1	1
Calcium Bisulfite	1	*	*	1	1	1	1	1	1	1	1	1	1
Calcium Carbonate	*	*	*	1	1	1	1	1	1	1	1	1	1
Calcium Chlorate	*	*	*	1	1	1	1	1	1	1	1	1	*
Calcium Chloride	1	1	1	1	1	1	1	1	1	1	1	1	1
Calcium Hydroxide	1	1	Boiling NR	1	1	2	1	1	1	1	1	1	1
Calcium Hypochlorite	1	1	Boiling NR	1	2	2	1	1	1	1	1	1	*
Calcium Nitrate	*	*	*	1	1	1	1	1	1	1	1	1	*
Calcium Sulfate	1	1	*	1	1	1	1	1	1	1	1	1	1
Carbolic Acid	1	*	*	1	1	2	1	1	1	1	1	1	*
Carbon Dioxide	1	1	*	1	1	1	1	1	1	1	1	1	1
Carbon Disulfide	NR	*	*	NR	NR	NR	2	2	NR	NR	NR	NR	NR

1 <15% loss in property values. Little or no chemical attack.
2 15-30% loss in property values. Minor chemical attack.
3 30-50% loss in property values. Moderate chemical attack.
NR Not recommended. >50% loss in property values.
* No data available.

Material Selection

Chemical Resistance Charts

POLY HI SOLIDUR WORLDWIDE

	TIVAR			Proteus Polypropylene			Polyethylene		PVC		Corzan CPVC		
	70°	122°	170°	70°	140°	180°	70°	140°	70°	140°	70°	170°	210°
Carbon Monoxide	*	*	*	1	1	1	1	1	1	1	1	1	1
Carbon Tetrachloride	3	*	*	2	3	NR	NR	NR	NR	NR	NR	NR	NR
Castor Oil	*	*	*	1	3	NR	1	1	1	1	1	1	NR
Caustic Potash	1	1	*	1	1	1	1	1	1	1	1	1	1
Caustic Soda	1	1	1	1	2	2	1	*	1	1	1	1	*
Cellosolves	*	*	*	2	3	NR	2	*	1	2	1	2	*
Chloral Hydrate	*	*	*	1	*	*	2	*	1	1	1	1	*
Chloric Acid	*	*	*	NR	NR	NR	*	*	1	3	1	2	*
Chlorinated Water	1	1	*	2	3	*	*	*	1	3	*	*	*
Chlorine Dry	2	*	*	3	*	*	NR	NR	NR	NR	NR	NR	NR
Chlorine Wet	2	2	*	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chloroacetic Acid	NR	*	*	1	1	*	2	*	2	3	1	2	NR
Chlorobenzene	2	NR	*	3	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	2	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chlorosulfonic Acid	NR	*	*	3	NR	NR	NR	NR	3	NR	2	NR	NR
Chrome Alum	*	*	*	1	1	NR	1	1	1	1	1	1	NR
Chromic Acid 10%	1	1	Boiling NR	1	1	2	1	2	NR	NR	1	1	*
Chromic Acid 30%	1	1	Boiling NR	1	2	NR	1	3	NR	NR	1	1	*
Chromic Acid 40%	1	1	Boiling NR	1	3	NR	1	NR	NR	NR	1	1	*
Chromic Acid 50%	1	1	Boiling NR	1	NR	NR	1	NR	NR	NR	1	1	*
Citric Acid	1	1	3	1	1	1	1	1	1	2	1	1	1
Coconut Oil	*	*	*	1	1	*	1	1	1	1	1	1	1
Copper Carbonate	*	*	*	1	1	1	*	*	1	1	1	1	1
Copper Chloride	1	*	*	1	1	1	1	1	1	1	1	1	1
Copper Cyanide	1	*	*	1	1	1	1	1	1	1	*	*	*
Copper Fluoride	*	*	*	1	1	1	1	1	1	1	1	1	1
Copper Nitrate	1	*	*	1	1	1	1	1	1	2	1	1	1
Copper Sulfate	1	1	*	1	1	1	1	1	1	2	1	1	1
Cottonseed Oil	1	2	*	1	1	1	1	1	1	1	1	1	1
Cresol	*	*	*	NR	NR	NR	NR	NR	NR	NR	2	NR	NR
Cresylic Acid	1	*	*	NR	NR	NR	NR	NR	NR	NR	2	NR	NR
Croton Aldehyde	1	1	*	1	NR	NR	2	*	NR	NR	NR	NR	*
Crude Oil	1	2	*	1	2	*	NR	NR	1	1	1	1	*
Cyclohexane	1	1	*	3	NR	NR	*	*	2	NR	1	*	*
Cyclohexanol	1	1	1	2	*	*	*	*	NR	NR	NR	NR	NR
Cyclohexanone	1	*	*	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Detergent	1	1	1	1	1	1	1	1	1	1	1	1	*
Dextrin	*	*	*	1	1	*	1	1	1	1	1	1	*
Dextrose	1	*	*	1	1	*	1	1	1	1	1	1	*
Diacetone Alcohol	*	*	*	1	2	*	*	*	NR	NR	NR	NR	NR
Diazo Salts	1	1	*	1	1	*	1	1	1	1	1	1	*
Dibutyl Phthalate	1	1	*	1	2	NR	*	*	NR	NR	NR	NR	NR
Dichlorobenzene	*	*	*	3	NR	NR	*	*	3	NR	*	*	*
Dichlorodifluoro Methane	*	*	*	1	2	*	*	*	1	NR	*	*	*
Dichloroethylene	NR	*	*	1	NR	NR	*	*	NR	NR	NR	NR	NR
Dichlorothane	3	*	Boiling NR	1	*	*	*	*	NR	NR	*	*	*
Diesel Fuel	1	1	NR	2	3	NR	2	3	1	2	1	2	NR
Diethylamine	*	*	*	1	2	2	2	*	NR	NR	NR	NR	NR

1 <15% loss in property values. Little or no chemical attack.
2 15-30% loss in property values. Minor chemical attack.
3 30-50% loss in property values. Moderate chemical attack.
NR Not recommended. >50% loss in property values.
* No data available.

Material Selection
Chemical Resistance Charts

POLY HI SOLIDUR WORLDWIDE

	TIVAR			Proteus Polypropylene			Polyethylene		PVC		Corzan CPVC		
	70°	122°	170°	70°	140°	180°	70°	140°	70°	140°	70°	170°	210°
Diethylene Glycol	*	*	*	1	1	1	*	*	3	NR	*	*	*
Diethyl Cellosolve	*	*	*	*	*	*	*	*	*	*	*	*	*
Diethyl Ether	1	*	*	NR	NR	NR	*	*	NR	NR	NR	NR	NR
Diglycolic Acid	*	*	*	1	NR	NR	*	*	1	1	1	1	*
Dimethylamine	*	*	*	1	1	*	2	*	NR	NR	NR	NR	NR
Dimethyl Formamide	1	*	*	1	1	*	*	*	NR	NR	NR	NR	NR
Dimethyl Sulfoxide	*	*	*	1	2	*	*	*	NR	NR	*	*	*
Dioctyl Phthalate	*	*	*	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dioxane 1,4	*	*	*	1	NR	NR	NR	NR	NR	NR	NR	NR	NR
Diphenyl	*	*	*	NR	*	*	*	*	*	*	*	*	*
Diphenyl Ether	*	*	*	NR	*	*	*	*	NR	*	*	*	*
Diphenyl Oxide	*	*	*	*	*	*	*	*	NR	*	2	*	*
Dipropylene Glycol	*	*	*	1	2	*	*	*	2	3	*	*	*
Distilled Water	1	1	1	1	1	1	1	1	1	1	1	1	1
Dizynilbenzene	*	*	*	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Epichlorohydrin	*	*	*	1	1	*	*	*	NR	NR	NR	NR	NR
Ethane	1	*	*	3	*	*	*	*	NR	*	NR	NR	NR
Ethanolamine	*	*	*	1	1	2	*	*	3	*	*	*	*
Ethers	2	*	*	NR	*	*	*	*	NR	*	*	*	*
Ethyl Acetate	1	1	NR @ 140	1	1	2	2	*	NR	*	NR	NR	NR
Ethyl Acetoacetate	*	*	*	NR	*	*	*	*	NR	NR	NR	NR	NR
Ethyl Acrylate	*	*	*	NR	*	*	2	NR	NR	NR	NR	NR	NR
Ethyl Alcohol	*	*	*	1	1	2	2	NR	1	1	1	2	*
Ethyl Benzene	1	*	*	NR	*	*	*	*	NR	*	*	*	*
Ethyl Benzoate	*	*	*	2	3	*	*	*	NR	*	*	*	*
Ethyl Butyrate	*	*	*	2	NR	*	*	*	NR	*	*	*	*
Ethyl Chloride	*	*	*	NR	*	*	NR	*	NR	*	NR	NR	*
Ethyl Ether	NR	*	*	3	NR	*	NR	*	3	NR	NR	NR	NR
Ethyl Sulfate	*	*	*	*	*	*	*	*	*	*	*	*	*
Ethylene Bromide	*	*	*	NR	NR	NR	NR	NR	NR	*	NR	*	*
Ethylene Chloride	2	NR	*	3	NR	*	*	*	NR	*	NR	NR	*
Ethylene Chlorohydrine	*	*	*	NR	*	*	NR	NR	NR	*	NR	NR	*
Ethylene Diamine	1	*	*	1	*	*	NR	*	NR	*	NR	*	*
Ethylene Dibromide	*	*	*	2	*	*	*	*	NR	*		*	*
Ethylene Dichloride	3	*	*	2	3	NR	NR	*	NR	NR	NR	NR	*
Ethylene Glycol	1	1	1	1	1	1	1	1	1	1	1	1	1
Ethylene Oxide	1	3	*	2	3	*	NR	NR	NR	*	NR	*	*
Fatty Acids	1	1	*	1	1	1	1	1	1	1	1	1	1
Ferric Chloride (Concentrated)	1	1	Boiling NR	1	1	1	1	1	1	1	1	1	1
Ferric Nitrate	1	*	*	1	1	1	1	1	1	1	1	1	1
Ferric Sulfate	1	*	*	1	1	1	1	1	1	1	1	1	1
Ferrous Chloride	1	*	*	1	1	1	1	1	1	1	1	1	1
Ferrous Sulfate	1	*	*	1	1	1	1	1	1	1	1	1	1
Fish Solubles	1	1	1	1	1	1	1	1	1	1	1	1	1
Fluoboric Acid	1	1	*	1	1	1	1	*	1	1	1	1	*
Fluorine Gas (Dry)	NR	NR	NR	NR	*	*	1	*	NR	NR	1	*	*
Fluorine Gas (Wet)	3	*	*	NR	*	*	1	*	NR	*	NR	*	*
Flousilic Acid	1	*	*	1	1	1	1	*	1	3	1	1	*

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* No data available.

Material Selection
Chemical Resistance Charts

POLY HI SOLIDUR WORLDWIDE

	TIVAR			Proteus Polypropylene			Polyethylene		PVC		Corzan CPVC		
	70°	122°	170°	70°	140°	180°	70°	140°	70°	140°	70°	170°	210°
Formaldehyde	1	1	*	1	1	2	1	*	2	2	1	NR	NR
Formic Acid	1	1	*	1	NR	NR	1	2	3	NR	1	NR	NR
Freon Dry	*	*	*	NR	*	*	*	*	*	*	*	*	*
Freon Wet	*	*	*	1	2	2	*	*	*	*	*	*	*
Fructose	1	1	1	1	1	1	1	1	1	1	1	1	1
Fruit Juice	1	1	1	1	1	1	1	1	1	1	1	1	1
Furfural	1	*	*	NR	*	*	NR	*	NR	*	NR	NR	*
Gallic Acid	1	1	*	1	1	1	NR	*	1	1	1	1	*
Gas Manufactured	*	*	*	NR	NR	NR	NR	NR	1	*	1	1	*
Gas Natural	NR	*	2	*	*	NR	NR	1	2	1	1	*	
Gasoline (Leaded)	*	*	*	3	NR	NR	3	NR	2	NR	NR	NR	*
Gasoline (Unleaded)	1	2	*	3	NR	NR	3	NR	2	NR	NR	NR	*
Gelatin	1	*	*	1	1	1	1	1	1	1	1	1	1
Glucose	1	*	*	1	1	1	1	1	1	1	1	1	1
Glue	1	*	*	1	*	*	*	*	1	1	1	1	*
Glycerine	1	1	1	1	1	1	1	1	1	2	1	1	*
Glycol	1	1	1	1	1	1	1	1	1	1	1	1	*
Glycolic Acid	*	*	*	1	1	1	2	*	1	1	1	1	*
Green Liquor	*	*	*	1	*	*	*	*	1	1	1	1	*
Helium	*	*	*	1	*	*	*	*	*	*	*	*	*
Heptane	1	1	*	2	NR	*	NR	NR	3	NR	1	1	*
Hexamine	*	*	*	*	*	*	*	*	*	*	*	*	*
Hexane	1	*	*	2	NR	NR	NR	NR	2	NR	1	*	*
Hexanol Tertiary	*	*	*	1	2	*	2	NR	2	2	1	1	NR
Hydrazine	*	*	*	3	*	*	NR	NR	NR	NR	*	*	*
Hydraulic Fluid (Petroleum)	1	*	*	NR	*	*	NR	*	NR	*	*	*	*
Hydrobromic Acid (37%)	1	1	*	1	2	3	1	1	2	NR	*	*	*
Hydrochloric Acid (>20%)	1	1	Boiling NR	1	1	1	1	2	2	2	1	*	*
Hydrochloric Acid (50%)	1	1	Boiling NR	1	1	2	1	2	2	2	1	1	*
Hydrocyanic Acid	1	1	*	1	1	1	1	1	1	1	1	1	*
Hydrofluoric Acid (>40%)	1	2	*	1	1	2	1	1	2	3	NR	*	*
Hydrofluosilicic Acid	1	*	*	1	1	1	*	*	NR	NR	NR	NR	NR
Hydrofluorisilicic Acid	1	*	*	1	1	1	*	*	1	2	*	*	*
Hydrogen Chloride	1	1	*	1	1	*	1	1	1	*	*	*	*
Hydrogen Cyanide	1	1	*	1	1	1	1	1	1	1	1	1	1
Hydrogen Fluoride	1	1	*	1	*	*	*	*	2	*	NR	*	*
Hydrogen Gas	1	*	*	1	1	1	1	1	1	2	1	1	1
Hydrogen Peroxide	1	2	3	1	2	3	1	2	1	1	1	*	*
Hydrogen Sulfide (Wet or Dry)	1	*	*	1	1	1	1	1	1	1	1	1	*
Hydroquinone	1	1	*	1	1	1	1	1	1	1	1	1	*
Hydroxylamine Sulfate	*	*	*	1	1	*	*	*	1	1	1	1	1
Hypo Sodium Thiosulfate	*	*	*	1	1	1	*	*	1	1	1	1	1
Hypochlorous Acid	*	*	*	1	1	*	2	NR	1	1	1	1	*
Iodine	1	*	*	1	1	1	2	NR	NR	NR	1	NR	NR
Isobutyl Alcohol	*	*	*	1	2	2	*	*	2	3	*	*	*
Isooctane	1	*	*	1	NR	NR	*	*	1	*	*	*	*
Isopropyl Acetate	*	*	*	2	3	*	*	*	NR	NR	*	*	*
Isopropyl Alcohol	1	1	1	1	1	1	*	*	1	2	1	*	*

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* No data available.

Material Selection
Chemical Resistance Charts

POLY HI SOLIDUR WORLDWIDE

	TIVAR			Proteus Polypropylene			Polyethylene		PVC		Corzan CPVC		
	70°	122°	170°	70°	140°	180°	70°	140°	70°	140°	70°	170°	210°
Isopropyl Ether	1	*	*	2	NR	NR	*	*	3	*	NR	*	*
Jet Fuel (JP3,4,5)	*	*	*	3	NR	*	*	*	1	1	1	1	*
Kerosene	1	3	*	1	NR	*	NR	NR	1	1	1	1	*
Keytones	2	NR	*	2	NR	*	*	*	NR	*	NR	*	*
Lactic Acid	1	1	*	1	1	2	1	1	2	3	1	1	*
Lacquer Solvents	1	*	*	NR	*	*	*	*	NR	*	*	*	*
LPG (Propane)	*	*	*	1	2	*	*	*	NR	NR	*	*	*
Lard	1	1	*	2	NR	*	NR	NR	1	2	1	1	*
Lauric Acid	*	*	*	1	1	*	2	NR	1	1	1	1	*
Lauryl Chloride	*	*	*	1	1	*	NR	*	1	1	1	1	*
Lead Acetate	1	*	*	1	1	2	1	1	1	1	1	1	*
Lead Molten	NR	NR	NR	NR	*	*	NR	*	NR	*	NR	*	*
Lead Nitrate	1	1	*	1	1	*	*	*	2	2	*	*	*
Lead Sulfamate	*	*	*	1	1	*	*	*	1	*	*	*	*
Lime	*	*	*	1	1	1	*	*	1	2	*	*	*
Lime Sulfur	1	*	*	1	1	1	*	*	1	1	*	*	*
Lineoleic Acid	*	*	*	2	*	*	2	NR	1	1	1	1	*
Linseed Oil	1	1	NR	1	1	1	NR	NR	1	1	1	*	*
Lithium Chloride	1	*	*	1	*	*	*	*	1	*	*	*	*
Lithium Hydroxide	1	*	*	1	*	*	*	*	1	1	*	*	*
Lubricating Oil	1	*	*	1	NR	*	*	*	2	2	1	1	*
Lye	1	1	1	1	1	1	*	*	1	1	1	1	*
Machine Oil	*	*	*	1	1	NR	*	*	1	1	1	1	*
Magnesium Bisulfate	*	*	*	1	2	*	1	1	1	2	1	1	*
Magnesium Carbonate	*	*	*	1	1	1	1	1	1	1	1	1	*
Magnesium Chloride	1	1	*	1	1	1	1	1	1	1	1	1	*
Magnesium Hydroxide	1	1	*	1	1	1	1	1	1	1	1	1	*
Magnesium Nitrate	*	*	*	1	1	1	1	1	1	1	1	1	*
Magnesium Sulfate	1	*	*	1	1	1	1	1	1	1	1	1	*
Maleic Acid	1	1	*	1	1	1	1	1	1	1	1	1	*
Malic Acid	*	*	*	1	NR	*	*	*	1	1	1	1	*
Manganese Chloride	1	*	*	1	*	*	*	*	1	*	1	*	*
Manganese Sulfate	*	*	*	2	*	*	*	*	2	2	*	*	*
Mercuric Chloride	1	*	*	1	1	1	1	1	1	1	1	*	*
Mercuric Cyanide	*	*	*	1	1	1	1	1	3	3	1	1	*
Mercurous Nitrate	*	*	*	1	1	1	1	1	3	3	1	1	*
Mercury	1	1	*	2	2	2	1	1	1	1	1	1	*
Methane	1	*	*	1	*	*	*	*	1	1	1	*	*
Methanol	1	*	*	1	1	1	1	1	1	3	1	1	1
Methyl Acetate	1	*	*	1	*	*	*	*	NR	*	*	*	*
Methyl Acetone	*	*	*	*	*	*	*	*	NR	*	*	*	*
Methyl Amine	*	*	*	1	*	*	*	*	NR	*	*	*	*
Methyl Bromide	*	*	*	2	NR	*	2	*	NR	*	NR	*	*
Methyl Cellosolve	*	*	*	2	*	*	*	*	NR	*	NR	*	*
Methyl Chloroform	2	NR	*	2	*	*	*	*	NR	*	NR	*	*
Methyl Chloride Wet	2	*	*	3	NR	*	NR	*	NR	*	NR	*	*
Methyl Chloride Dry	2	*	*	NR	*	*	*	*	NR	*	*	*	*
Methyl Ethyl Keytone	1	*	*	NR	*	*	NR	*	NR	*	NR	*	*

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Material Selection
Chemical Resistance Charts

	TIVAR			Proteus Polypropylene			Polyethylene		PVC		Corzan CPVC		
	70°	122°	170°	70°	140°	180°	70°	140°	70°	140°	70°	170°	210°
Methyl Isobutyl Keytone	NR	*	*	NR	*	*	NR	*	NR	*	NR	NR	*
Methyl Salicylate	*	*	*	1	*	*	*	*	1	*	1	*	*
Methyl Sulfate	*	*	*	1	*	*	NR	*	1	NR	1	NR	*
Methyl Sulfuric Acid	*	*	*	1	1	1	1	1	1	1	1	1	*
Methylene Chloride	2	*	*	2	NR	*	NR	*	3	NR	NR	NR	*
Milk	1	1	1	1	1	2	1	1	1	1	1	1	*
Mineral Oil	1	3	NR	2	2	*	NR	NR	1	3	1	1	*
Mixed Acids	*	*	*	NR	*	*	*	*	3	NR	*	*	*
Molasses	1	*	*	1	1	1	1	1	1	1	*	*	*
Morpholine	*	*	*	2	2	*	*	*	*	*	*	*	*
Monochloroacetic Acid	NR	NR	NR	1	1	*	*	*	2	3	*	*	*
Monochlorobenzene	2	NR	*	NR	*	*	NR	*	NR	*	*	*	*
Monochlorodifluoromethane	*	*	*	1	*	*	*	*	NR	*	*	*	*
Monoethanolamine	*	*	*	1	2	2	*	*	NR	*	*	*	*
Motor Oil	1	*	*	3	3	*	*	*	1	1	1	1	1
Mustard	*	*	*	1	1	*	*	*	*	*	*	*	*
Naptha	1	1	NR	3	NR	*	1	1	NR	*	1	*	*
Naphthalene	1	NR	*	2	2	*	1	1	NR	*	NR	*	*
Nickel Chloride	1	1	*	1	1	1	1	1	1	1	1	1	*
Nickel Nitrate	1	*	*	1	1	1	1	1	1	1	1	1	*
Nickel Sulfate	1	*	*	1	1	1	1	1	1	1	1	1	*
Nitric Acid (100%)	NR	*	*	NR	NR	NR	NR	*	NR	NR	NR	NR	NR
Nitric Acid (70%)	NR	*	*	3	NR	NR	NR	*	NR	NR	2	NR	NR
Nitric Acid (50%)	1	*	*	1	2	NR	2	2	1	2	1	3	NR
Nitric Acid (30%)	1	1	*	1	1	2	1	1	1	2	1	2	NR
Nitric Acid 10%)	1	1	*	1	1	2	1	1	1	1	1	1	NR
Nitrobenzene	1	*	*	2	NR	*	NR	*	NR	*	NR	*	*
Nitrous Oxide	*	*	*	1	*	*	*	*	1	3	1	*	*
Ocenol	*	*	*	NR	*	*	2	NR	1	1	1	1	*
Oils & Fats	1	*	*	1	1	*	NR	NR	2	2	1	1	*
Oils, Vegetables	1	*	*	1	1	*	*	*	1	1	1	1	*
Oleic Acid	1	1	3	2	2	2	2	NR	1	1	1	1	*
Oxalic Acid	1	1	*	1	1	*	1	1	1	3	1	1	*
Oxygen	1	*	*	1	1	1	1	1	1	1	1	1	1
Ozone	2	3	*	3	*	*	*	*	3	NR	*	*	*
Palmitic Acid	*	*	*	2	2	*	1	1	2	NR	1	*	*
Paraffin	1	*	*	1	*	*	*	*	1	1	*	*	*
Pentane	*	*	*	*	*	*	*	*	3	*	*	*	*
Perchloroethylene	2	*	*	NR	*	*	*	*	NR	*	*	*	*
Perchloric Acid (10%)	1	1	*	NR	*	*	*	*	NR	*	NR	*	*
Petroleum	1	*	*	2	*	*	NR	NR	3	3	*	*	*
Petroleum Ether	1	NR	*	1	1	*	NR	*	*	*	*	*	*
Phenol	1	3	*	1	NR	*	*	*	NR	*	1	*	*
Phenol Sulfonic Acid	*	*	*	*	*	*	*	*	2	2	*	*	*
Phenylhydrazine	*	*	*	*	*	*	*	*	NR	*	NR	*	*
Phosphoric Acid (10%)	1	1	Boiling NR	1	1	1	1	1	1	1	1	1	*
Phosphoric Acid (25%)	1	1	Boiling NR	1	1	1	1	1	1	1	1	1	*
Phosphoric Acid (50-100%)	1	1	Boiling NR	1	1	1	1	2	1	1	1	1	*

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POLY HI SOLIDUR WORLDWIDE

Material Selection

Chemical Resistance Charts

	TIVAR 70°	TIVAR 122°	TIVAR 170°	Proteus Polypropylene 70°	Proteus Polypropylene 140°	Proteus Polypropylene 180°	Polyethylene 70°	Polyethylene 140°	PVC 70°	PVC 140°	Corzan CPVC 70°	Corzan CPVC 170°	Corzan CPVC 210°
Phosphorus	1	1	*	2	*	*	*	*	2	3	*	*	*
Phosphorus Trichloride	1	1	*	NR	*	*	*	*	NR	NR	NR	*	*
Phosphorus Pentachloride	*	*	*	1	2	2	*	*	3	NR	*	*	*
Photographic Solutions	1	1	*	1	1	3	*	*	1	1	1	1	*
Phthalic Acid	1	1	*	2	2	2	*	*	1	1	*	*	*
Picric Acid	*	*	*	*	*	*	*	*	NR	NR	NR	NR	*
Plating Solutions Brass	*	*	*	1	1	1	1	1	1	1	1	1	1
Plating Solutions Cadmium	*	*	*	1	1	1	1	1	1	1	1	1	1
Plating Solutions Chrome	*	*	*	1	2	3	*	*	2	2	1	1	2
Plating Solutions Copper	*	*	*	1	1	1	1	1	1	*	1	1	1
Plating Solutions Gold	*	*	*	1	1	1	1	1	1	2	1	1	1
Plating Solutions Lead	*	*	*	1	1	1	1	1	1	1	1	1	1
Plating Solutions Nickel	*	*	*	1	1	1	1	1	1	1	1	1	1
Plating Solutions Silver	*	*	*	1	1	1	1	1	1	1	1	1	1
Plating Solutions Tin	*	*	*	1	1	1	1	1	1	1	1	1	2
Plating Solutions Zinc	*	*	*	1	1	1	1	1	1	1	1	1	1
Potassium Acetate (50%)	1	*	*	1	*	*	*	*	1	1	*	*	*
Potassium Aluminum Sulfate	1	1	*	1	1	1	1	1	2	2	1	1	*
Potassium Bicarbonate (60%)	1	*	*	1	1	1	*	*	1	1	1	1	*
Potassium Bichromate (5%)	1	*	*	1	1	1	1	1	1	1	1	1	1
Potassium Bromide (10%)	1	*	*	1	1	1	1	1	1	1	1	1	*
Potassium Carbonate	1	*	*	1	1	1	1	1	1	1	1	1	*
Potassium Chlorate	1	1	*	1	1	1	*	*	1	1	1	1	*
Potassium Chloride	1	*	*	1	1	1	1	1	1	1	1	1	*
Potassium Chromate	1	*	*	1	1	1	1	1	1	1	1	1	*
Potassium Cyanide	1	*	*	1	1	1	1	1	1	1	1	1	*
Potassium Dichromate (5%)	1	*	*	1	1	1	1	1	1	1	1	1	1
Potassium Ferricyanide	1	*	*	1	1	1	1	1	1	1	1	1	*
Potassium Ferrocyanide	1	*	*	1	1	1	*	*	1	1	1	1	*
Potassium Hydrate	1	*	*	*	*	*	*	*	1	2	*	*	*
Potassium Hydroxide	1	1	1	1	1	*	*	*	1	1	1	1	*
Potassium Hypochlorite	2	*	*	NR	*	*	*	*	3	3	1	1	NR
Potassium Iodide	2	*	*	1	1	1	*	*	1	*	1	*	*
Potassium Nitrate (10%)	1	*	*	1	1	1	*	*	1	1	1	1	*
Potassium Permanganate	1	1	*	1	2	3	1	1	1	1	1	1	*
Potassium Persulfate	1	*	*	1	1	*	1	1	1	1	1	1	*
Potassium Sulfate	1	*	*	1	1	1	1	1	1	1	1	1	*
Potassium Sulfide	1	*	*	1	1	1	1	1	1	1	*	*	*
Potassium Sulfite	1	*	*	1	1	*	1	1	2	2	*	*	*
Propane	1	*	*	2	NR	*	*	*	1	2	1	*	*
Propyl Alcohol	1	1	1	1	1	1	2	NR	1	NR	1	NR	*
Propylene Glycol	*	*	*	1	2	*	1	1	3	NR	*	*	*
Propylene Oxide	*	*	*	1	2	*	*	*	3	NR	*	*	*
Pyridine	1	*	*	1	1	*	*	*	NR	*	NR	*	*
Pyrogallic Acid	*	*	*	1	*	*	*	*	3	*	*	*	*
Pyroligneous Acid	1	2	NR @ 140	1	2	*	*	*	3	3	*	*	*
Resorcinol	*	*	*	1	1	1	*	*	1	1	*	*	*
Rosin	1	*	*	1	1	*	*	*	3	NR	*	*	*

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POLY HI SOLIDUR WORLDWIDE

Material Selection
Chemical Resistance Charts

	TIVAR			Proteus Polypropylene			Polyethylene		PVC		Corzan CPVC		
	70°	122°	170°	70°	140°	180°	70°	140°	70°	140°	70°	170°	210°
Salicylic Acid	*	*	*	1	2	*	1	1	NR	*	*	*	*
Salicylaldehyde	*	*	*	1	2	*	*	*	3	NR	*	*	*
Salt Brine	1	1	1	1	1	1	1	1	1	1	1	1	*
Sea Water	1	1	1	1	1	1	1	1	1	1	1	1	*
Sewage	*	*	*	1	1	1	*	*	1	1	*	*	*
Silicon Oil	1	*	*	1	1	*	*	*	1	NR	1	1	*
Silver Chloride	*	*	*	1	2	*	*	*	1	2	*	*	*
Silver Cyanide	1	1	*	1	1	1	*	*	1	1	1	1	*
Silver Nitrate	1	1	*	1	2	2	*	*	1	2	1	1	*
Soap Solutions	1	1	*	1	1	1	1	1	1	1	1	1	*
Sodium Acetate (60%)	1	1	*	1	1	1	*	*	2	3	1	1	*
Sodium Acid Sulfate	*	*	*	1	1	1	*	*	1	1	*	*	*
Sodium Benzoate (10%)	1	*	*	1	1	1	1	1	1	1	1	1	*
Sodium Bicarbonate	1	*	*	1	1	1	1	1	1	1	1	1	*
Sodium Bichromate	1	1	*	1	1	2	*	*	1	2	*	*	*
Sodium Bisulfate	1	*	*	1	1	1	1	1	1	1	1	1	1
Sodium Bisulfite	1	*	*	1	1	1	1	1	1	1	1	1	1
Sodium Borate	1	1	*	1	1	2	1	1	1	1	1	1	*
Sodium Bromide	*	*	*	1	1	1	1	1	1	1	1	1	*
Sodium Carbonate	1	1	1	1	1	1	1	1	1	1	1	1	*
Sodium Chlorate	1	1	*	1	1	1	1	1	1	2	1	1	*
Sodium Chromate	*	*	*	1	1	*	*	*	*	*	*	*	*
Sodium Cyanide	1	*	*	1	1	1	1	1	1	1	1	1	*
Sodium Dichromate	1	1	*	1	1	2	1	1	1	2	1	1	*
Sodium Ferricyanide	*	*	*	1	1	1	1	1	1	1	1	1	*
Sodium Ferrocyanide	*	*	*	1	1	*	1	1	1	1	1	1	*
Sodium Fluoride	*	*	*	1	1	1	1	1	1	1	1	1	*
Sodium Hydroxide	1	1	1	2	2	2	1	2	1	2	1	1	*
Sodium Hypochlorite	1	1	1	2	*	*	*	*	2	2	1	1	*
Sodium Hyposulfite	1	1	*	*	*	*	*	*	2	2	*	*	*
Sodium Metaphosphate	1	*	*	1	NR	*	*	*	2	2	1	1	*
Sodium Nitrate	1	*	*	1	1	1	1	1	1	1	1	1	*
Sodium Nitrite	1	1	1	1	1	1	1	1	1	1	1	1	*
Sodium Perborate	1	*	*	1	1	1	*	*	1	1	1	1	*
Sodium Peroxide	1	1	*	2	2	*	*	*	2	*	*	*	*
Sodium Phosphates	1	1	1	1	1	1	*	*	1	2	1	1	*
Sodium Silicate	1	*	*	1	1	1	*	*	1	1	1	1	*
Sodium Sulfate	1	*	*	1	1	1	1	1	1	1	1	1	*
Sodium Sulfide	1	*	*	1	1	1	1	1	1	1	1	1	*
Sodium Sulfite (90%)	1	*	*	1	1	2	1	1	1	1	1	1	*
Sodium Thiosulfate	1	1	*	1	1	2	*	*	1	1	1	*	*
Sodium Tetraborate	1	1	1	1	1	2	*	*	1	1	*	*	*
Soy Bean Oil	*	*	*	1	*	*	*	*	1	*	*	*	*
Stannic Chloride	*	*	*	1	1	1	1	1	1	1	1	1	*
Stannous Chloride	*	*	*	1	1	1	1	1	1	2	1	1	*
Starch	*	*	*	1	1	*	*	*	1	1	*	*	*
Stearic Acid	1	*	*	1	2	3	1	1	1	3	*	*	*
Stoddard's Solution	1	3	*	1	NR	*	*	*	NR	*	NR	*	*

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Material Selection
Chemical Resistance Charts

POLY HI SOLIDUR WORLDWIDE

	TIVAR			Proteus Polypropylene			Polyethylene		PVC		Corzan CPVC		
	70°	122°	170°	70°	140°	180°	70°	140°	70°	140°	70°	170°	210°
Styrene	*	*	*	*	*	*	*	*	NR	*	*	*	*
Sugar Juice	*	*	*	1	*	*	*	*	2	*	*	*	*
Sulfate Liquor	1	*	*	1	*	*	*	*	1	2	1	1	*
Sulfinol	*	*	*	*	*	*	*	*	*	*	*	*	*
Sulfur	1	1	*	1	1	1	1	1	1	1	*	*	*
Sulfur (Molten)	NR	NR	NR	NR	*	*	NR	*	NR	*	NR	*	*
Sulfur Chloride	*	*	*	NR	*	*	*	*	3	NR	1	1	*
Sulfur Dioxide Gas (Wet)	1	1	*	1	3	NR	1	1	NR	*	NR	*	*
Sulfur Dioxide Gas (Dry)	1	1	*	1	3	*	1	1	1	1	1	*	*
Sulfur Trioxide	*	*	*	NR	*	*	1	1	1	1	1	1	*
Sulfuric Acid (10%)	1	1	*	1	1	1	1	1	1	1	1	1	*
Sulfuric Acid (30%)	1	1	*	1	1	1	1	2	1	1	1	1	*
Sulfuric Acid (60%)	1	1	*	1	1	2	1	2	1	1	1	1	2
Sulfuric Acid (80%)	1	3	*	1	1	3	2	3	1	2	1	1	2
Sulfuric Acid (100%)	1	NR	*	3	NR	NR	NR	NR	NR	NR	NR	*	*
Sulfurous Acid (10%)	1	*	*	1	1	1	1	1	1	1	1	1	*
Tall Oil	*	*	*	1	1	1	*	*	1	1	1	1	1
Tannic Acid	1	1	*	1	1	1	*	*	1	1	1	1	1
Tanning Liquor	1	*	*	1	2	2	1	1	1	1	1	1	1
Taritar Oil	*	*	*	1	*	*	*	*	NR	*	*	*	*
Tartaric Acid (10%)	1	*	*	1	1	1	NR	*	1	2	1	1	*
Tetrachloroacetic Acid	*	*	*	*	*	*	*	*	NR	*	*	*	*
Terachloroethane	*	*	*	NR	*	*	*	*	NR	*	*	*	*
Tetrachloroethylene	2	*	*	NR	*	*	*	*	NR	*	*	*	*
Tetraethyl Lead	*	*	*	2	NR	*	*	*	2	NR	1	*	*
Tetrahydrofuran	2	*	*	3	NR	*	NR	*	NR	*	NR	*	*
Tetrahydronaphthalene	1	*	*	3	NR	*	*	*	*	*	*	*	*
Tetraphosphoric Acid	*	*	*	*	*	*	*	*	*	*	*	*	*
Thionyl Chloride	3	*	*	NR	*	*	NR	*	NR	*	NR	*	*
Tin Tetrachloride	1	*	*	1	1	1	*	*	2	2	*	*	*
Titanium Tetrachloride	*	*	*	NR	*	*	*	*	NR	*	NR	*	*
Toluene	1	3	NR	NR	*	*	NR	*	NR	*	NR	*	*
Tomato Juice	1	*	*	1	1	1	*	*	1	*	1	1	*
Tributyl Citrate	*	*	*	2	3	*	*	*	3	NR	*	*	*
Tributyl Phosphate	*	*	*	2	NR	*	*	*	NR	*	NR	*	*
Transformer Oil	1	1	*	1	NR	*	*	*	NR	*	1	1	*
Trichloroacetic Acid	*	*	*	2	2	NR	*	*	NR	*	1	*	*
Trichloroethane	3	NR	*	NR	*	*	*	*	NR	*	*	*	*
Trichloroethylene	NR	*	*	3	NR	*	NR	*	NR	*	NR	*	*
Trichlorotrifluoroethane	*	*	*	1	*	*	*	*	NR	*	*	*	*
Tricresyl Phosphate	1	*	*	1	2	NR	*	*	NR	*	*	*	*
Triethanolamine	1	*	*	NR	*	*	NR	*	NR	*	NR	*	*
Triethylamine	*	*	*	NR	*	*	*	*	1	3	1	*	*
Triethylene Glycol	*	*	*	1	*	*	*	*	2	3	*	*	*
Trisodium Phosphate	1	1	*	*	*	*	*	*	*	*	*	*	*
Tripopylene Glycol	*	*	*	1	*	*	*	*	2	*	*	*	*
Trisodium Phosphate	1	1	*	1	1	1	1	1	1	1	1	1	*
Tung Oil	*	*	*	1	*	*	*	*	2	2	*	*	*

1 <15% loss in property values. Little or no chemical attack.
2 15-30% loss in property values. Minor chemical attack.
3 30-50% loss in property values. Moderate chemical attack.
NR Not recommended. >50% loss in property values.
* No data available.

Material Selection

Chemical Resistance Charts

POLY HI SOLIDUR WORLDWIDE

	TIVAR 70°	TIVAR 122°	TIVAR 170°	Proteus Polypropylene 70°	Proteus Polypropylene 140°	Proteus Polypropylene 180°	Polyethylene 70°	Polyethylene 140°	PVC 70°	PVC 140°	Corzan CPVC 70°	Corzan CPVC 170°	Corzan CPVC 210°
Turpentine	1	3	NR	2	NR	*	NR	*	2	3	1	*	*
Undecanol	*	*	*	2	NR	*	*	*	1	3	*	*	*
Urea	1	*	*	1	1	1	1	1	2	NR	1	1	*
Urine	1	1	*	1	1	1	1	1	1	1	1	1	*
Varnish	1	*	*	1	*	*	*	*	NR	*	*	*	*
Vinegar	1	1	*	1	1	1	1	1	1	1	1	1	*
Vinyl Acetate	*	*	*	2	NR	*	2	NR	NR	*	NR	*	*
Vinyl Chloride	1	NR	*	*	*	*	*	*	NR	*	*	*	*
Vinylidene Chloride	*	*	*	NR	*	*	*	*	NR	*	*	*	*
Water, Fresh	1	1	1	1	1	1	1	1	1	1	1	1	1
Water, Acid Mine	1	1	*	1	1	1	1	1	1	1	1	1	NR
Water, Distilled	1	1	*	1	1	1	1	1	1	1	1	1	*
Water, Deionized	*	*	*	1	1	1	1	1	1	1	1	1	*
Water, Demineralized	*	*	*	1	1	1	1	1	1	1	1	1	*
Water, Salt	1	1	*	1	1	1	1	1	1	1	1	1	*
Whiskey	1	*	*	1	1	1	1	*	1	1	1	1	*
White Liquor	NR	*	*	1	1	*	*	*	1	1	1	1	*
White Spirit	1	3	*	1	1	1	*	*	1	1	*	*	*
Wine	1	1	1 to 160	1	1	1	1	*	1	1	1	1	*
Xylene	3	NR	*	NR	*	*	NR	*	NR	*	NR	*	*
Zinc Chloride	1	1	*	1	1	1	1	1	1	1	1	1	*
Zinc Cyanide	*	*	*	1	1	1	*	*	1	1	*	*	*
Zinc Molten	NR	NR	NR	NR	*	*	NR	*	NR	*	NR	*	*
Zinc Nitrate	*	*	*	1	1	1	1	1	1	1	1	1	*
Zinc Stearate	*	*	*	1	*	*	*	*	1	2	*	*	*
Zinc Sulfate	1	*	*	1	1	1	1	1	1	1	1	1	1

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