RECEIVING • INSTALLATION • MAINTENANCE

INSTRUCTIONS

MODEL PF CABINET UNITS

HORIZONTAL AIR FLOW - MOVABLE NOZZLE WASHING AND ADHESIVE APPLICATION

Westinghouse Precipitron®

THE *ELECTRONIC* AIR CLEANER

120 Volts
Single Phase

60 and 50 Cycle
Alternating Current

The Precipitron is an electronic air cleaning apparatus used in ventilating and air conditioning systems of commercial establishments to remove soot, smoke, dust, dirt and other air borne particles.

Model PF PRECIPITRON cabinet units include facilities for washing off the collected dirt and applying adhesive with movable nozzles which are operated from outside the cabinet.

In order to produce the results expected of the Precipitron, it must be properly installed and maintained. Whether installed by itself or in conjunction with air conditioning equipment, this instruction book gives the correct steps and precautions to be taken.

WESTINGHOUSE ELECTRIC CORPORATION
HYDE PARK • STURTEVANT DIVISION • BOSTON 36, MASS.
Printed in U.S.A.

NEW INFORMATION

EFFECTIVE MAY, 1957

RECEIVING AND HANDLING

An instruction package is forwarded separately to the customers' shipping address for each PRECIPITRON unit. This package includes a bill of material, an instruction booklet and spare ionizer wires. Contents of this package should be carefully preserved because it is needed for receiving, installation and operation of the unit.

To facilitate handling and erection, most internal parts of the cabinet, except the collector cells, are shipped assembled whenever possible. The collector cells and certain other items which mount outside the cabinet are shipped in separate containers. The bill of material (see instruction package) may be checked with the shipping notice forwarded with every shipment.

Upon receipt of shipment, any evidence of damage or loss should be reported immediately to the last carrier for inspection by an agent of the transportation company. A claim should be filed by the customer to cover any shipping damage or loss.

Handle the equipment carefully to prevent breakage or damage. Handle the cabinet with a lift or slings under the bottom legs only.

Except for the initial inspection, store the parts until needed in the original shipping containers in a clean dry location protected from the weather. Do not remove shipping straps or retainers until the parts are ready for installation.

INSTALLATION

Westinghouse Supplies necessary basic parts for a complete PRECIPITRON installation as listed in the Bill of Material. Westinghouse also supplies such items as: special hardware, high voltage cable and special electrical connectors.

Customer Supplies regular construction items which are not included in the Bill of Material, such as duct work, mounting supports and bolts, conduit, low voltage wiring, and plumbing. The following installation instructions give further details as to the source of individual items.

Installation and Operating Requirements. Successful installation and operation of the PRECIPITRON unit requires consideration of the following points, both before and during installation:

1. Proper air flow and duct connections.
2. Sufficient space for cabinet, including access clearances.
3. Suitable mounting supports.
4. Adequate drain, water and electrical facilities.

Air Flow Requirements. The PRECIPITRON unit is sized to clean a specified quantity of air (cfm) at a stated efficiency. To obtain this efficiency, the cfm through the cabinet should not exceed the rated cfm. Overall cleaning efficiency also depends a great deal on uniform air flow throughout the cabinet. The air velocity through any part of the cabinet should therefore not exceed the rated velocity by more than 10%. Air filters supplied help to equalize the air flow. However, sharp bends and irregularities in the ducts may cause uneven air flow. Where this is unavoidable, splitters, turning vanes or baffles ahead or behind the cabinet may be necessary to assure uniform air flow.

Outside Air Intake should be sized generously to minimize any dirt that might be sucked in by high air velocities. It should be located so that it will not bring in high concentrations of heavy dirt, corrosive fumes or electrically conductive particles, and should be orientated away from the prevailing winds. Most important, the intake should be equipped with weather louvres or dampers to prevent entrance of rain or snow, plus a cleanable screen of 8 to 16 mesh to keep out leaves, insects, etc. It is a good practice to locate the PRECIPITRON cabinet at least three feet down stream from the outside air intake to provide a settling space for the larger particles.

Lint. Where recirculated air is brought into the cabinet, presence of lint may necessitate some sort of lint screen across the duct opening. Lint tends to collect on ionizer wires and holders and will generally interfere with the proper functioning of the PRECIPITRON. Standard lint screen sections are available from Westinghouse.

Space Requirements. Exact overall dimensions and clearances are shown on Dimension Sheet 1465 supplied with the order. It is important to allow clearance space in front of the access door located at the side of the cabinet. This space is needed for operation, inspection and removal of the internal parts. Note: The access door may be supplied on either side of the cabinet as specified on the order.

Mounting the cabinet is relatively easy since practically all internal parts except the cells are assembled prior to shipment. (Install cells after cabinet is mounted.) The cabinet may be either floor, or platform mounted. 5/8'' or 3/4'' holes are provided in the legs for lagging the cabinet to the floor or platform. (Mounting bolts not supplied.) Unit sizes up to and including size 36/115 may also be suspended with hanger rods. See Fig. 3 for suggested mounting. Regardless of the type of mounting, the cabinet must be supported only from the legs - not from the cabinet itself.

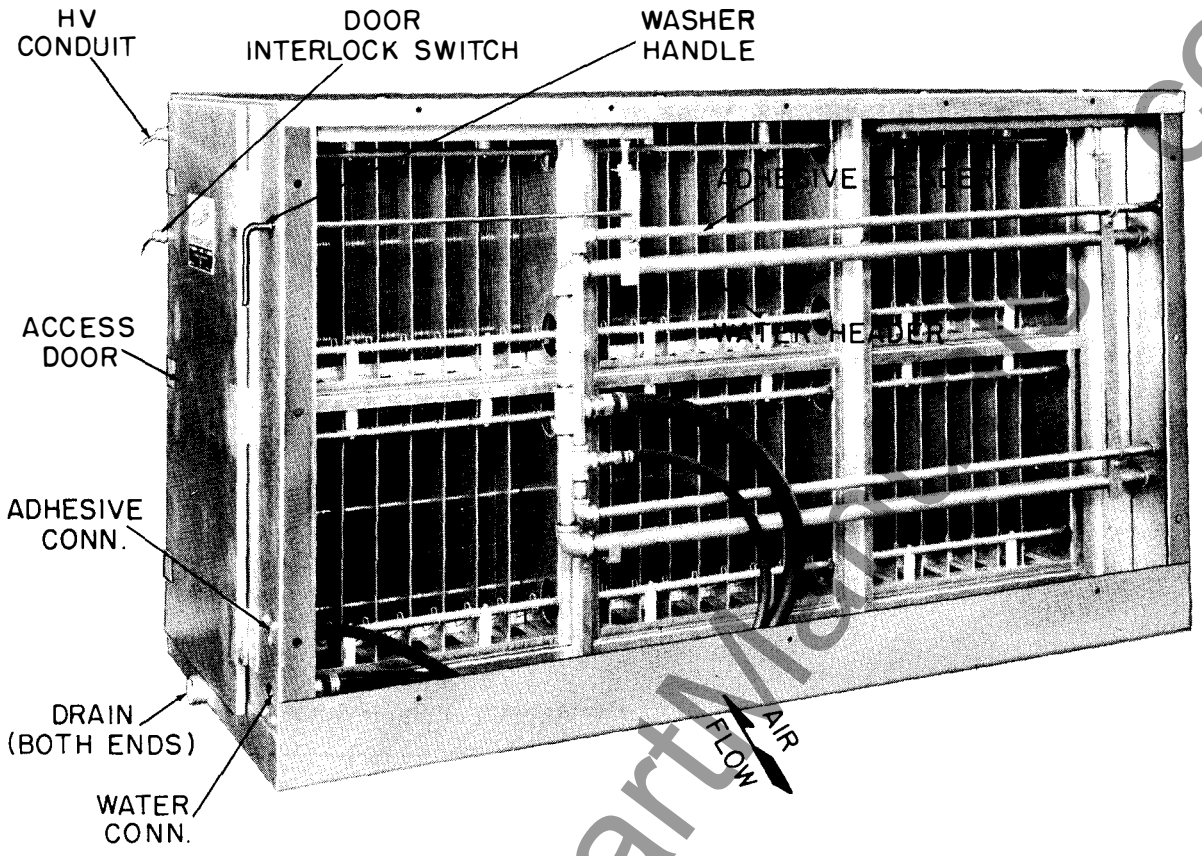


Fig. 1 Typical Cabinet (Inlet Air Side)

For platform or hanger-rod mounting, provision should be made for convenient and safe access to the access door side of the cabinet. This is needed for moving the operating handle and for servicing the internal parts.

The cabinet must be mounted level so that water will flow from the drain pan.

Ducts are easily attached to the cabinet using the flanges provided on the inlet and outlet air sides. See Figs. 1 & 2. Ducts should be pitched toward the cabinet for drainage of any liquid which might splash or carry over. It is recommended that the ducts be sealed at the cabinet flanges, to insure tight construction and prevent air leaks, particularly of uncleaned air into cleaned air stream.

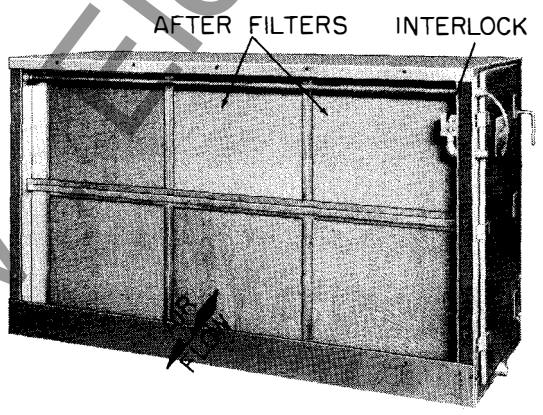
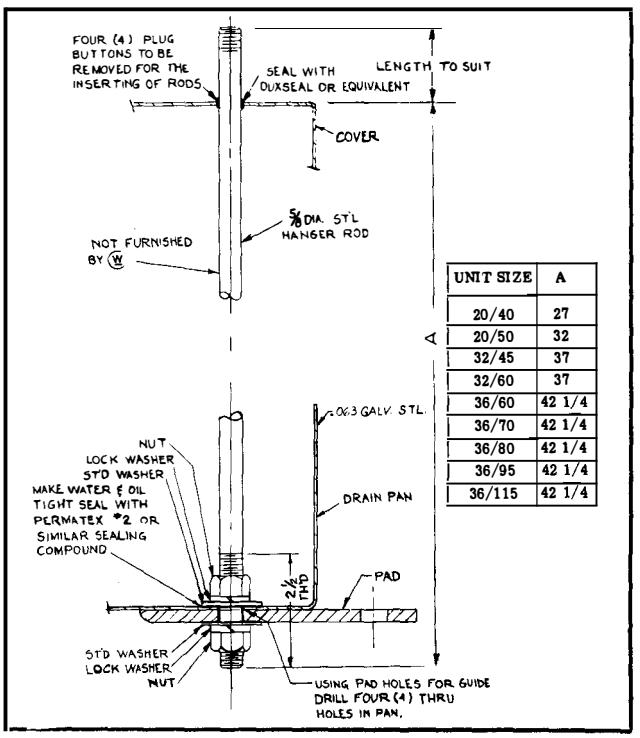


Fig. 2 Typical Cabinet. (Leaving Air Side)

Sharp bends in the ducts near the cabinet should be avoided to assure uniform air flow throughout the cabinet. Where duct sizes are different than the flanged openings on the cabinet, the connections should taper as gradually as space limitations will allow. For uniform air flow, this taper should not be greater than one foot in three feet of duct length.



UNIT SIZE	A
20/40	27
20/50	32
32/45	37
32/60	37
36/60	42 1/4
36/70	42 1/4
36/80	42 1/4
36/95	42 1/4
36/115	42 1/4

Fig. 3 Hanger Rod Mounting

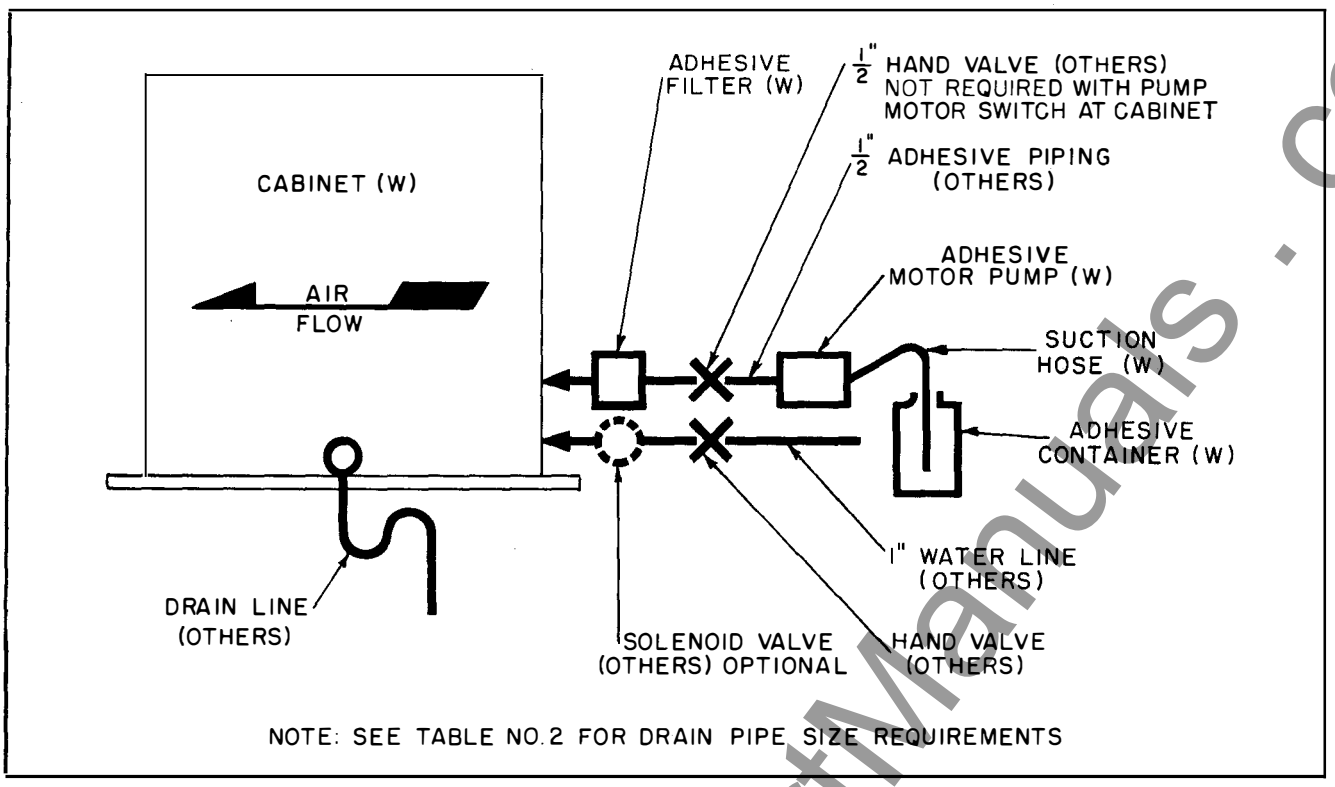


Fig. 4 Typical Water, Adhesive and Drain Piping

Drain. A drain pipe is required to carry off the wash water. This pipe should be at least as large as the female connection at the drain pan. See Fig. No. 4. The drain pipe should be connected to the sewer in accordance with applicable plumbing codes. Either one or both drain fittings may be used as desired.

Water Supply capable of delivering 40°-100°F water with a running pressure of 25 min. to 40 max. psi is required properly to wash off the collected dirt. See Table No. 2 for water flow requirements. A clean water supply is essential to prevent clogging of the nozzles. Where the supply is dirty, strainers or other filtering means (not supplied) are required.

Water Piping. The water supply should be piped to the female fitting provided at the access panel side of the cabinet. See Fig. 4. Keep piping clean during installation. A hand operated water valve (not supplied) is required to control the water flow. As an added convenience, an electrically operated water valve (not supplied) may be installed in the water line as shown in Fig. 4. See "Low Voltage Wiring" for connections. Piping and valves should not obstruct the clearance required at the access panel.

Winter Operation. As a precaution against freezing temperatures, all water piping should be installed so that it may be drained. A union fitting is provided inside the cabinet for draining the flexible hose.

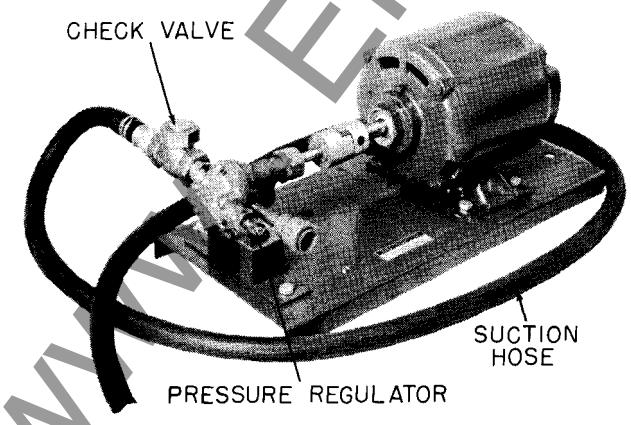


Fig. 5 Adhesive Pump

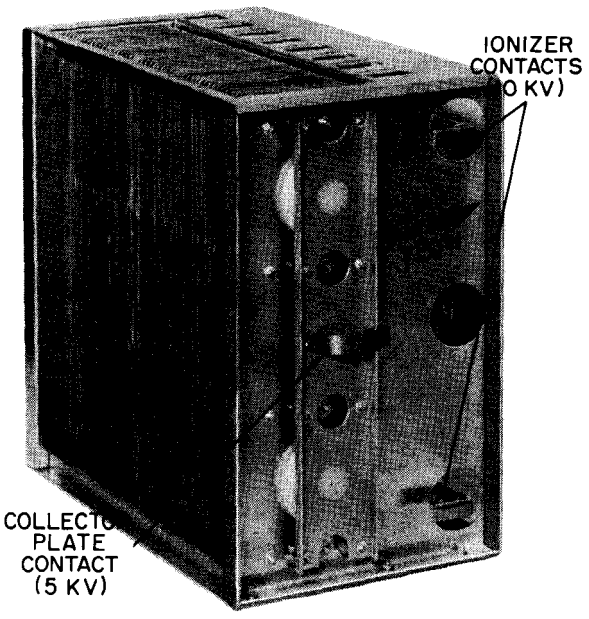


Fig. 6 Cell

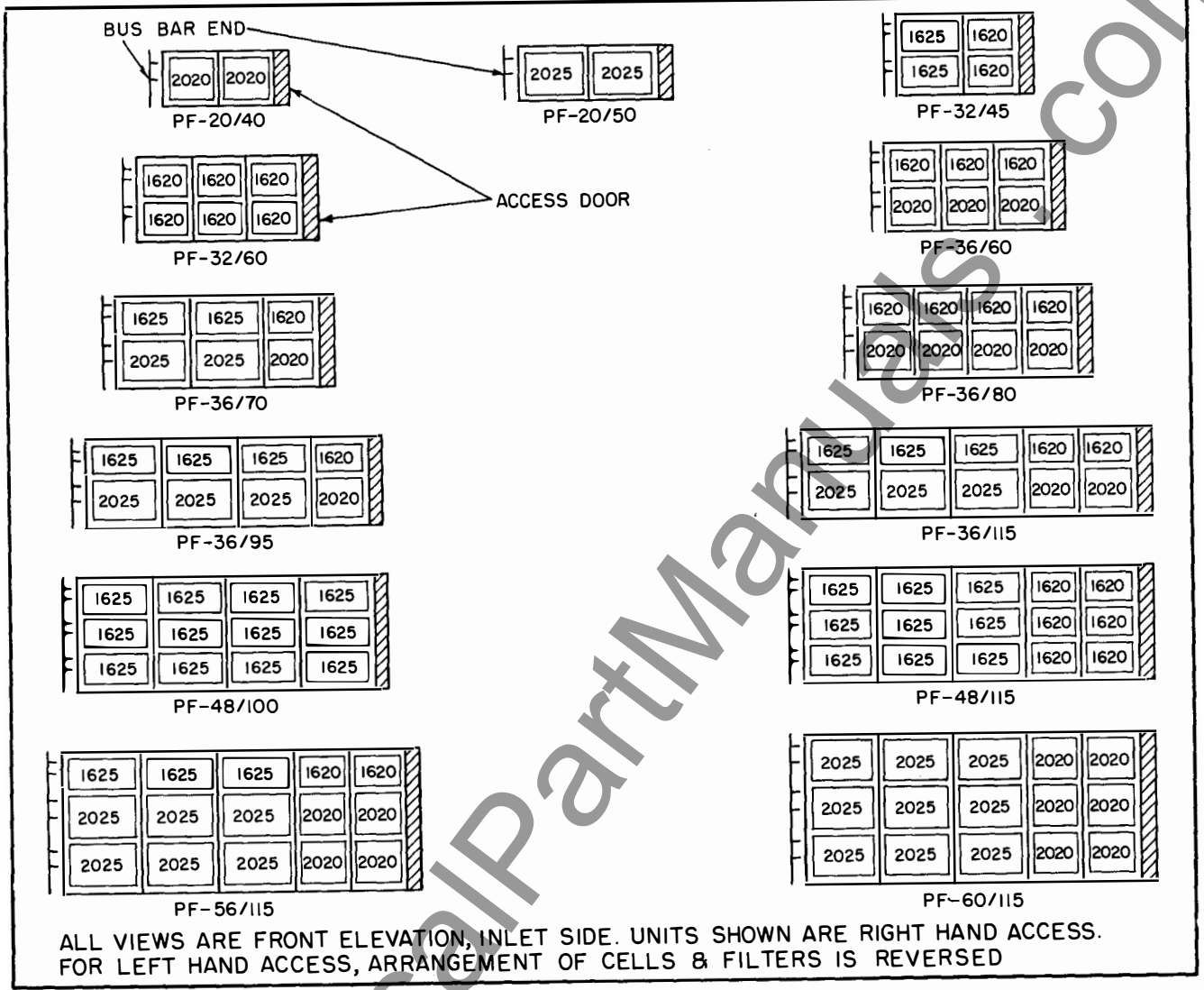


Fig. 7 Location of Cells and After-Filters Inside Cabinets

Adhesive Pump. A motor driven gear pump is supplied to apply adhesive. It is recommended that this motor-pump be lagged to the floor close to the panel side of the cabinet. See Fig. 5. Be careful not to distort the base. Be sure the pump does not obstruct the clearance required in front of the cabinet panel.

Several feet of suction hose are provided for drawing adhesive from a container to the pump. An adjustable by-pass regulator is built into the pump which is factory set to deliver 60 psi. This will provide a good spray pattern for the average unit. See "Maintenance" for adjustment of pressure.

Adhesive Piping. The adhesive discharge line (not furnished) from pump to cabinet should be 1/2" ips, steel, brass or 1/2" nominal copper tubing. This line should be clean when installed.

Install the adhesive filter in the discharge line close to the cabinet. See Fig. 4. This replaceable element filter is to prevent dirt from clogging adhesive nozzles. Piping and filter must not obstruct clearance space at access panel.

If the pump is controlled by plugging in the extension cord, a hand operated valve should be

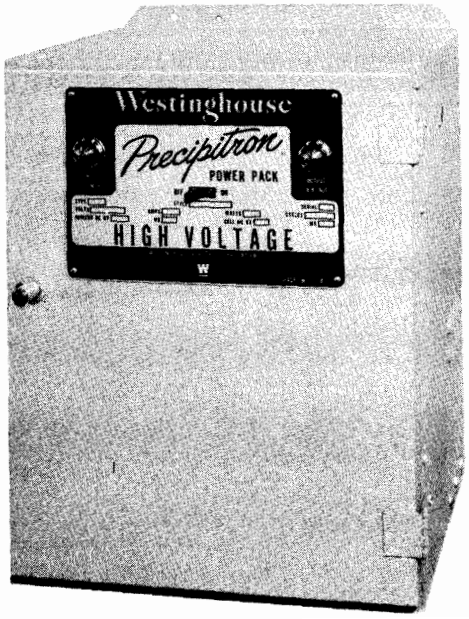
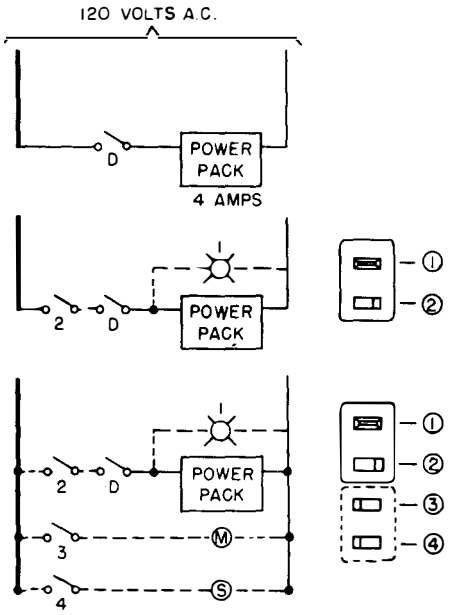


Fig. 8 Power Pack



Wiring for basic unit with equipment as furnished. Unit turned on-off with switch on power pack. Water control by hand valve. Adhesive pump started and stopped by plugging into utility outlet (not furnished).

ALTERNATE

Where power pack is remote add pilot light and switch combination. Adhesive pump started and stopped by plugging into utility outlet (not furnished).

ALTERNATE

For convenience, mount additional box and add switch 3 and/or 4 to control all functions from one position.

Sym	Description	Source
D	Access Door Interlock Switch	(W) - Built-in
1	Red Indicating Light	Others
2-3-4	10 Amp S.P.S.T. Toggle SW	Others
M	Motor on Adhesive Pump	(W) - Built-in
S	Water Solenoid Valve	Others

Fig. 9 Low Voltage Connections

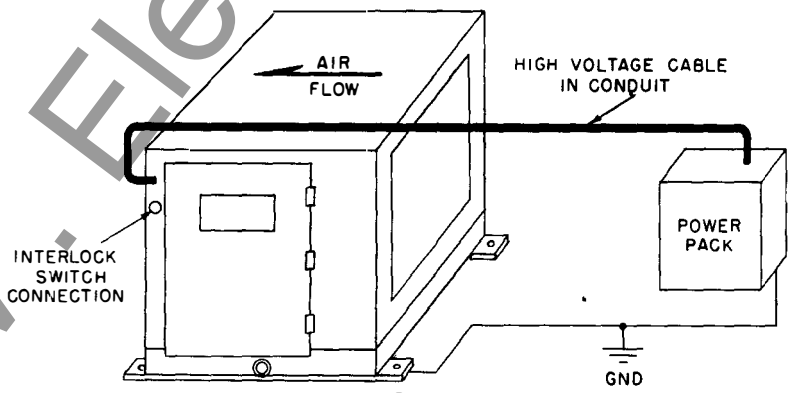
installed in the adhesive discharge line near the control panel to control the adhesive flow. Note: Do not run pump longer than one minute with this discharge valve closed - the motor may overheat. A better way to control the adhesive flow is to install an On-Off switch for the motor at the cabinet. See "Low Voltage Wiring." (Discharge valve not needed if On-Off switch is provided.)

Installation of Cells. After unpacking, inspect the cells to be sure that all plates are evenly spaced and undamaged. Lift or handle the cells only by the end frames.

The cells are equipped with spring contacts at both ends. See Fig. 6. Be sure that they project 1/8" beyond the end frame. These contacts connect high voltage between adjacent cells in a horizontal direction. Note AIR FLOW arrow on cells.

It is essential that the cells be loaded in the cabinet precisely as shown in Fig. 7. Failure to obtain proper alignment of the spring contacts will result in "dead" cells with zero cleaning efficiency.

Open the access door and slide cells into framework on their tracks. See Fig. 12. Push the cells in carefully as far as they will go, maintaining correct order of sizes as shown in Fig. 7. Be sure that the end cells (those farthest in from door) make proper contact with the high voltage bus bars on inner end sheet of cabinet. Adjustable cell stop



High Voltage Cable furnished by (W) is run in conduit (not furnished) from the power pack to the unit.

Fig. 10 High Voltage Conduits and Grounding

angles are provided for proper location of cells. Cell contacts are designed to depress about 1/8'' when in proper position. See Fig. 6.

Cell retainer clips, Fig. 13, are used to hold cell assembly in position. Secure these tightly with the nuts and bolts provided, so that cells will not "creep" apart after installation in cabinet.

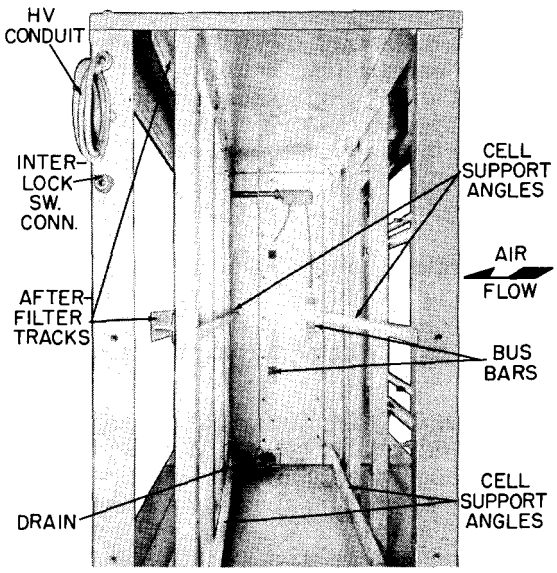


Figure 11. View Looking Into Cabinet Thru Access Door

Mount the Power Pack close to the access door side of the cabinet on an adjacent building wall or on a suitable mounting stand. Four 3/8" mounting bolts (not supplied) are required. Allow clearances for opening the power pack door and 6" minimum under the pack for service access. The power pack should not obstruct the access space at the cabinet. Note: Additional high voltage cable will be required if the cable length between the power pack and the cabinet exceeds 20 ft. See high voltage wiring.

LOW VOLTAGE WIRING

Power Supply required is 120 volts (plus or minus 5 volts) ac., 1 ph., either 50 or 60 cycles.

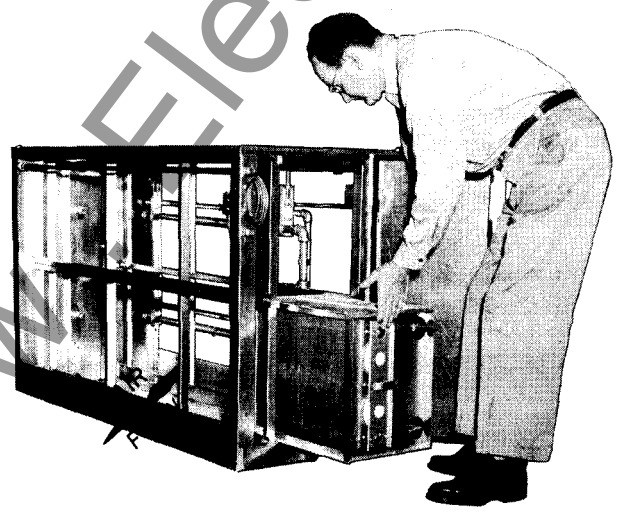


Figure 12. Installing Collector Cells

If the supply varies more than ±5 volts, the local power company or a competent engineer should be consulted and the voltage corrected to assure proper operation.

Connections. Fig. 9 shows typical wiring connections required. The access door interlock switch is wired in series with the power pack to the 120 volt supply. The interlock is for the safety of the operator. It must disconnect the 120 volt supply before the cabinet access door can be opened. A 120 volt convenience outlet and flexible cord are required for the adhesive pump motor. Alternate wiring methods are shown in Fig. 9. Red light (Sym. 1) and switch (Sym. 2) are recommended if power pack must be located remote or out of sight from cabinet access area. Conduit and wiring (not supplied) should not obstruct the clearance space in front of the cabinet door.

HIGH VOLTAGE WIRING

All connections to the cells are accessible through the cabinet access door.

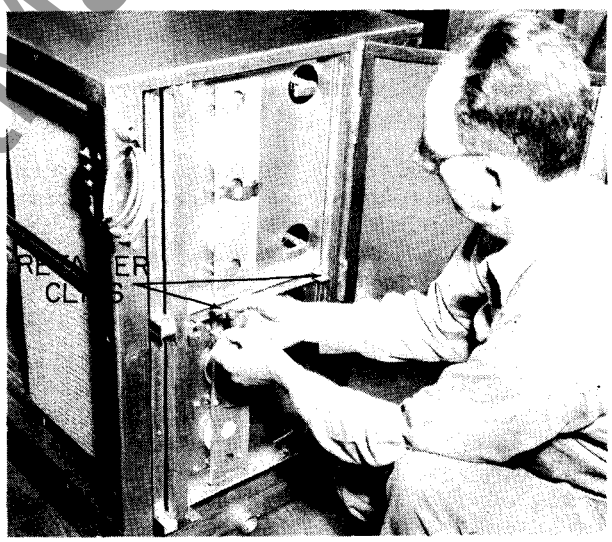


Figure 13. Installing Cell Retainer Clips

High Voltage Cable. Install 1/2'' rigid conduit (not supplied) between the power pack and cabinet. See Fig. 10. A coil of high voltage cables is supplied for installing in conduit. Cables are marked to show proper voltages for connections in power pack.

If the power pack is located too remote from the cabinet, additional high voltage cable must be procured. (Only high voltage cable supplied by Westinghouse is recommended.)

Electrical Grounding. High voltages are supplied from the power pack to the cells with single conductor cables. A common ground return through the cabinet to the power pack is required to complete the circuit and for safety purposes. See Fig. 10. Connect the cabinet and power pack case to a common low resistance ground, using solid copper wire.

Checking the Installation. The following items should be carefully checked by the installer prior to energizing the PRECIPITRON unit:

Electrical Inspection.

1. All cell plates should be evenly spaced and undamaged.
2. All ionizer wires should be under slight tension and midway between the ground electrodes. (Replace broken wires with spares furnished with cabinet.)
3. All wiring should be in accordance with the wiring diagrams and connections should be tight.

Mechanical Inspection.

1. Check operation of adhesive pump and be sure that all nozzles give a good spray pattern.
2. Check that all water nozzles give a strong stream.
3. Check ducts for air leaks.
4. Check fan speed to be sure that air volume does not exceed rated cfm.

Starting the Unit. When the installation is complete and ready to be placed in service, a Westinghouse Service Representative should be requested to check and start the PRECIPITRON unit. Representatives of the contractor and the customer should be present to facilitate necessary corrections and to receive operating instructions. The adhesive and instruction books should be available at this time.

OPERATION

PRECIPITRON is an electronic air cleaner - not an air filter. Strong electrostatic forces draw the dirt particles from the air. These forces are equally effective on both large and small particles. Because of this, PRECIPITRON will remove from 6 to 8 times more dirt than a conventional filter. Moreover, it removes the extremely small particles which pass right through a regular filter - and it is these tiny particles which are the principal cause of smudging, soiling and dirt damage.

Because of this high efficiency, frequent washings are needed to dispose of the increased amount of collected dirt. Model PF PRECIPITRON units are designed to flush off the collected dirt easily with a system of moving water spray nozzles which are controlled from outside the cabinet.

To insure that the dirt will be held after it is removed from the air, the collecting surfaces are coated with a water soluble adhesive fluid. The adhesive washes off with the accumulated dirt, and a fresh coating is applied for the next air cleaning cycle. Adhesive is also applied with moving nozzles which are controlled from outside the cabinet.

Cabinet. The factory assembled cabinet encloses the wash and adhesive headers, cells and after filters. All internal parts are easily accessible from the side access door and may be slid out for inspections or servicing.

Moveable Nozzle Header is mounted in the inlet air side of the cabinet. This consists of a frame supporting two separate nozzle pipes which are connected to flexible hoses. One pipe is for wash water and the other for adhesive. Rollers and guides ride in tracks for easy movement of the frame in a horizontal direction. The frame is attached to a handle which projects through the side of the cabinet. Slow, steady movement of the handle during spraying directs a head-on stream to all collector parts assuring complete and thorough washing or adhesive application.

Ionizers are part of the cell assembly, and comprise a set of fine wires spaced equally between flat electrode plates at ground potential. When 10.0 KV d.c. voltage is applied to the ionizer wires, an ionizing zone is created between the wires and the grounded plates. Dirt particles passing through this space pick up an electrostatic charge.

Collector Cells are designed to permit sliding them into the cabinet without damage to the plates. These are an arrangement of two sets of flat metal plates, one of which is grounded and the other supported by insulators. When 5.0 KV d.c. voltage is applied between the two sets of plates, a strong electrical field is set up which forces the charged dirt particles onto the plates.

After Filters are mounted in tracks in the leaving air side of the cabinet. These guard against splashing of water into the down stream duct. They also help equalize the air flow through the cabinet, and serve as a back-stop air filter during shut downs or in the event of power failure.

Power Pack furnishes high voltages to the ionizers and collector cells, using a 120 V, 1 ph. source. The power pack has indicating lights to warn the operator when the unit is not functioning properly. An On-Off circuit breaker protects the internal elements.

Protective Devices for safety of the operator include screw operated (time delay) switches at the power pack door and the cabinet access door. These open the 120 volt supply circuit and delay access to the high voltage parts until the charge in the capacitor has drained off. These switches should not be tampered with even though the time consumed to turn the screw may seem unnecessary.

Adhesive System. Regular use of Westinghouse Type B Dustik adhesive is recommended. Adhesive serves two functions: (a) to bind the collected dirt to the collector plates as it is precipitated and (b) to render the deposit washable with water. Westinghouse adhesives are compounded to provide the proper balance between dirt binding qualities and washability.

MAINTENANCE

Regular maintenance is the key to good performance and efficient operation of the PRECIPITRON unit. This includes (a) periodic inspections (b) regular washing and adhesive procedures and (c) prompt correction of any faults.

Inspections. A simple daily inspection of the power pack is recommended to assure that the unit is properly energized while air is flowing. Both indicator lights should glow steadily.

See "Location and Correction of Electrical Faults" if the above conditions do not exist. For other occasional inspections see "Frequency of Washing", "Inspection Before Washing", "Build-Up of Dirt" and "After-Filter Maintenance."

Frequency of Washing depends upon how much dirt is in the air at the particular location. Average time between washings is every 3 weeks. To determine the actual interval, inspect a new installation frequently. The unit needs washing when the cell plates on the inlet air side appear to be 1/16" thick. However, the unit should not be allowed to go unwashed longer than one month. Based upon the time determined by the initial inspections, a schedule should be set up for regular washing. This will assist in scheduling maintenance work and will insure that the unit does not become too dirty.

Inspection Before Washing. An inspection of the dirt collection pattern on cells and after filters just before washing may show installation or maintenance faults. Open the access door and inspect for the following points, using a flashlight or other similar light source. (It is not normally necessary to remove the internal components for this inspection.)

1. Dirty after-filters indicate too infrequent washings, excessive air velocities or operation with the unit de-energized.
2. Some after-filters or cells dirtier than others suggest broken ionizer wires, missing high voltage connections or uneven air distribution. This can also be caused by plugged spray nozzles.

Washing the Unit

1. Shut off fan and power pack.
2. Turn on water.
3. Move header operating handle back and forth at a slow steady rate for 4 or 5 minutes being sure to use a full stroke each time.
4. Shut off water and allow about twenty minutes for water to drain and dry before applying adhesive. (Drying time may be facilitated by running fan with power pack turned off.)

Adhesive Requirements. Westinghouse Dustik Type B adhesive should be ordered to replace the initial supply furnished. Annual requirements may be estimated at 2 gal. per 1000 cfm unit capacity.

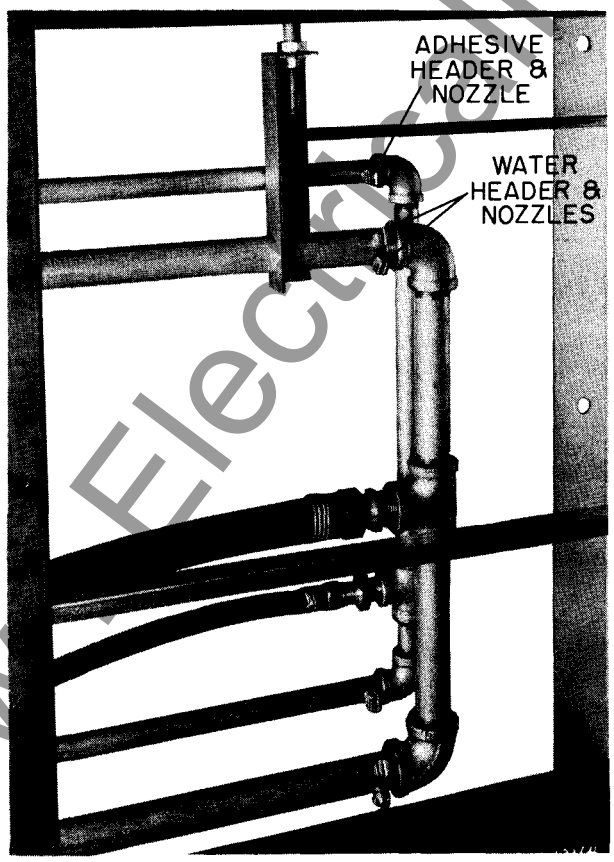


Figure 14. Typical Spray Header Section (Looking Upstream)

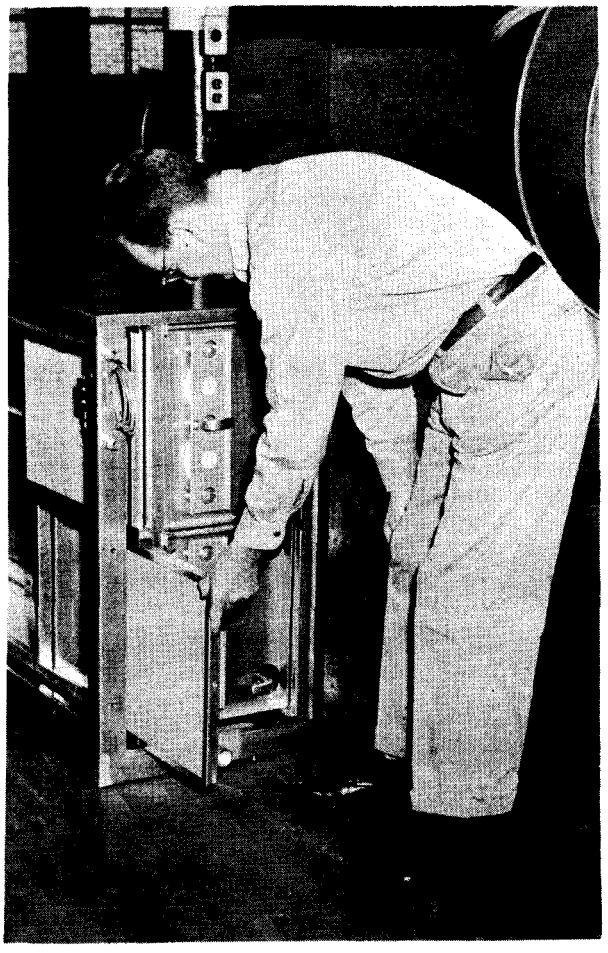


Figure 15. Installing After-Filters

During cold weather, type B adhesive should be stored at temperatures above 60°F. for 24 hours before using. Do not dilute adhesive with water. Should other types of Westinghouse adhesive be used, be sure to read the label on the container for special instructions.

Applying Adhesive. After washing, a new coating of adhesive is applied, with the fan and power pack turned off.

1. Insert suction hose into adhesive container.
2. Turn on adhesive pump and immediately move header operating handle back and forth once at a slow steady rate, using full stroke. (Should take 30 to 40 seconds to apply a complete but thin coating of adhesive on cells and ionizers.)
3. Turn off adhesive pump and allow excess adhesive to drain from cells and ionizers for 15 minutes.
4. Turn on power pack and fan (some arcing may occur at cell plates when power pack is first turned on. This is harmless if arcing stops in a few minutes).

Header Maintenance. It is good practice to check the nozzle spray patterns (open access door) during washing and applying adhesive. This is particularly important when the unit is new, to be sure that installation dirt has not clogged the nozzles. Cells should also be checked for cleanliness after washing. If clean water is used, there should be little trouble with the water nozzles. Similarly the adhesive filter should stop clogging of the adhesive nozzles.

Water nozzles should provide a fan spray pattern of approximately 80° in a vertical plane. Similarly the adhesive nozzles should have a fan spray pattern of approximately 90°. Spray pattern may be controlled by pressure. High pressure causes misting while low pressure causes a reduced angle spray. Adhesive spray pattern may be controlled by the adjustment of the pump pressure regulator. Turn clockwise to increase pressure.

On smaller units, the nozzles can be serviced through the access space. For larger units, it may be necessary to remove the cells to service the nozzles. Unscrew nozzle cap to clean internal elements. In replacing or adjusting a nozzle, be sure that the slot in the disc is in a vertical position. See Fig. 14. Note: If it is necessary to enter the cabinet with the cells removed, be sure to place boards on the drain tank to support the workman's weight.

Ionizer Maintenance. To replace broken ionizer wires, the cells may be pulled out through the access space. All broken pieces of ionizer wire should be carefully removed and discarded outside the cabinet. Spare ionizer wires are supplied with the cabinet and additional wires may be purchased when needed. The wires are equipped with prelooped ends and made to the proper length at the factory. Be careful not to kink the wire because it will eventually break at this point.

Cell Maintenance. If for any reason the cells are removed from the cabinet, they should be inspected for cleanliness, damaged plates or damaged end connectors. See "Build-Up of Dirt." Cell plate spacing should be uniform. Be sure to replace the cells in the correct order. See "Installation of Cells."

Pump Maintenance. Should the pump vibrate or make excessive noise, check the pump and motor alignment. It may be necessary periodically to tighten up on the packing nut to prevent leakage around the shaft. If the packing nut is too tight, the motor will overheat.

After-Filter Maintenance. If the after-filters appear excessively dirty, they should be removed and hosed off with hot water. Be sure to replace the filters in their original order. See Figs. 7 & 15.

Adhesive Filter Maintenance. The replaceable cartridge should be inspected at least once a year and replaced if found dirty.

Build-Up of Dirt. With infrequent or incomplete washing, a non-water soluble build-up of dirt may accumulate by allowing a film of dirt to remain after each washing. If inspection discloses such a film, the trouble may be: (a) low water pressure, (b) clogged nozzles, (c) incomplete application of adhesive or (d) using other than Westinghouse adhesive. Should the difficulty persist after checking these points, an occasional cleaning by one or the other of the following methods is recommended:

(1) Before washing apply one adhesive cycle and allow to soak about 20 minutes. Thoroughly wash off with several cycles of water. Allow to dry and repeat if necessary.

(2) If the above adhesive soaking method fails to clean the parts, make a solution of about one pound of mild detergent ("ALL" or equal) to each gallon of 100 to 120 F. water. Apply this solution to the dirty components and allow to soak 10 to 20 minutes. Thoroughly flush with 160 to 180 F. water. Repeat if necessary to get parts metal clean. It is best to apply the detergent with a separate spray gun. The solution may also be applied through the adhesive pump and header nozzles, but the system must be flushed with hot water and thoroughly dried before adhesive is used again, being sure to replace or dry out the adhesive filter cartridge. Drying is important.

Location and Correction of Electrical Faults. Electrical faults can usually be found by careful inspection. Wiring diagrams (Figs. 9 & 10) should be helpful in analyzing possible troubles. Common faults and probable causes are shown in Table No. 1. These points should be checked first before attempting the more difficult process of elimination. If a

high voltage short circuit cannot be located by inspection, disconnect the cell and ionizer cables at the power pack terminals (see caution below). Close power pack door and turn on the circuit breaker. No glow from the "output voltage" light indicates that the trouble is in the power pack. Consult the power pack instruction book for detailed corrective procedure.

If the "output voltage" light glows after disconnecting the cables, the trouble is either in the cells, ionizers or high voltage cable. This may be localized by alternately connecting the cables at the cells or ionizers until the faulty part is located. The cells may be removed if necessary for close examination and correction of the fault.

Caution. The above test procedure involves handling parts which are normally charged with high voltage. Always turn off the power pack and allow at least 1/2 minute before touching the high voltage parts. This time delay permits the residual charge in the capacitor and cells to drain to a safe value through the discharge resistor in the power pack. It is also good practice to ground the part with a grounded prod equipped with a suitably insulated handle.

TABLE NO. 1, OPERATION CHART

NORMAL OPERATION	FAULT INDICATION	PROBABLE CAUSES
Circuit breaker switch on. Input power lamp lit. Output voltage lamp lit.	Input power lamp not lit. Circuit breaker switch on. Output voltage lamp not lit.	1. No power supply voltage to power pack. 2. Door switches not closed. 3. Poor contact in a door interlock switch. 4. Burned out indicating lamp.
	Output voltage lamp out. Circuit breaker switch on, or breaker has tripped and output voltage lamp lights as breaker is reset.	1. Foreign conducting material between cell plates. 2. Broken ionizing wire touching grounded equipment. 3. Short circuited wiring inside power pack. 4. Faulty HV transformer or capacitor.
	Circuit breaker switch is tripped. (System otherwise normal when breaker is reset.)	1. Temporary short circuit which has cleared. 2. Momentary surge of excessive line (primary) voltage.
Occasional arcing or crackling between cell plates is not serious, usually being due to large particles passing between the plates. Some arcing may occur after applying adhesive but should soon stop.	Continual crackling or arcing in cells.	1. Excessive dirt build-up is short circuiting cells. 2. Insulators are dirty, cracked, broken. 3. Broken ionizing wire drawn into cell. 4. Burned out tube in power pack (10 kv portion).
Cells collecting dirt and filters clean.	Filters excessively dirty.	1. Dirt on ionizer causing inefficient ionizer operation. 2. Low voltages or a defective power pack. 3. Cell plates not properly coated with adhesive. 4. Improper air distribution: (a) Fan speed increased or system resistance reduced, (b) sharp turns in ducts. 5. Missing or disconnected ionizer or cell connectors.

TABLE NO. 2, CONDENSED SPECIFICATIONS

UNIT CODE NO.	20/40	20/50	32/45	32/60	36/60	36/70	36/80	36/95	36/115	48/100	48/115	56/115	60/115
Capacity C.F.M. @ 90% Effy.	2780	3440	5000	6670	7500	8750	10000	12400	14400	16600	19200	22300	24000
Pressure Drop ins. wg. @ 500 fpm	.19	.19	.19	.19	.19	.19	.19	.19	.19	.19	.19	.19	.19
Dimensions													
Height	26	31	36	36	41-1/4	41-1/4	41-1/4	41-1/4	41-1/4	55-1/4	55-1/4	63-3/8	70-7/8
Width	48	57	50	64	65	75	85	101	123	108	123	123	123
Depth	25-1/2	25-1/2	25-1/2	25-1/2	25-1/2	25-1/2	25-1/2	25-1/2	25-1/2	25-1/2	25-1/2	25-1/2	25-1/2
Water - GPM @ 40 psi	3.2	3.2	6.4	9.6	9.6	9.6	12.8	12.8	16.0	14.4	18.0	18.0	18.0
GPM @ 30 psi	2.8	2.8	5.5	8.3	8.3	8.3	11.0	11.0	14.0	12.5	15.5	15.5	15.5
Adhesive - qts. per application (average)	1.0	1.2	1.7	2.2	2.5	2.9	3.3	4.1	4.8	5.5	6.1	7.4	8.0
Piping Connections													
Water	1	1	1	1	1	1	1	1	1	1	1	1	1
Adhesive	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Drain (z)	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	2	2	2	2	2	2	2
Electrical 120 v-60 cy-1 ph													
Power Pack Input Watts	90	120	150	185	190	210	230	250	280	300	320	350	370
Adh. Pump Motor H.P.	1/3	1/3	1/3	1/3	1/3	1/3	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Weights approx. net lbs.													
Unit less P.P. and Pump	140	200	340	500	530	570	680	790	950	1090	1220	1440	1590
Power Pack	130	130	130	130	130	130	130	130	130	130	130	130	130
Pump	32	32	32	32	32	32	40	40	40	40	40	40	40
Add 35% to unit weight for water during washing													