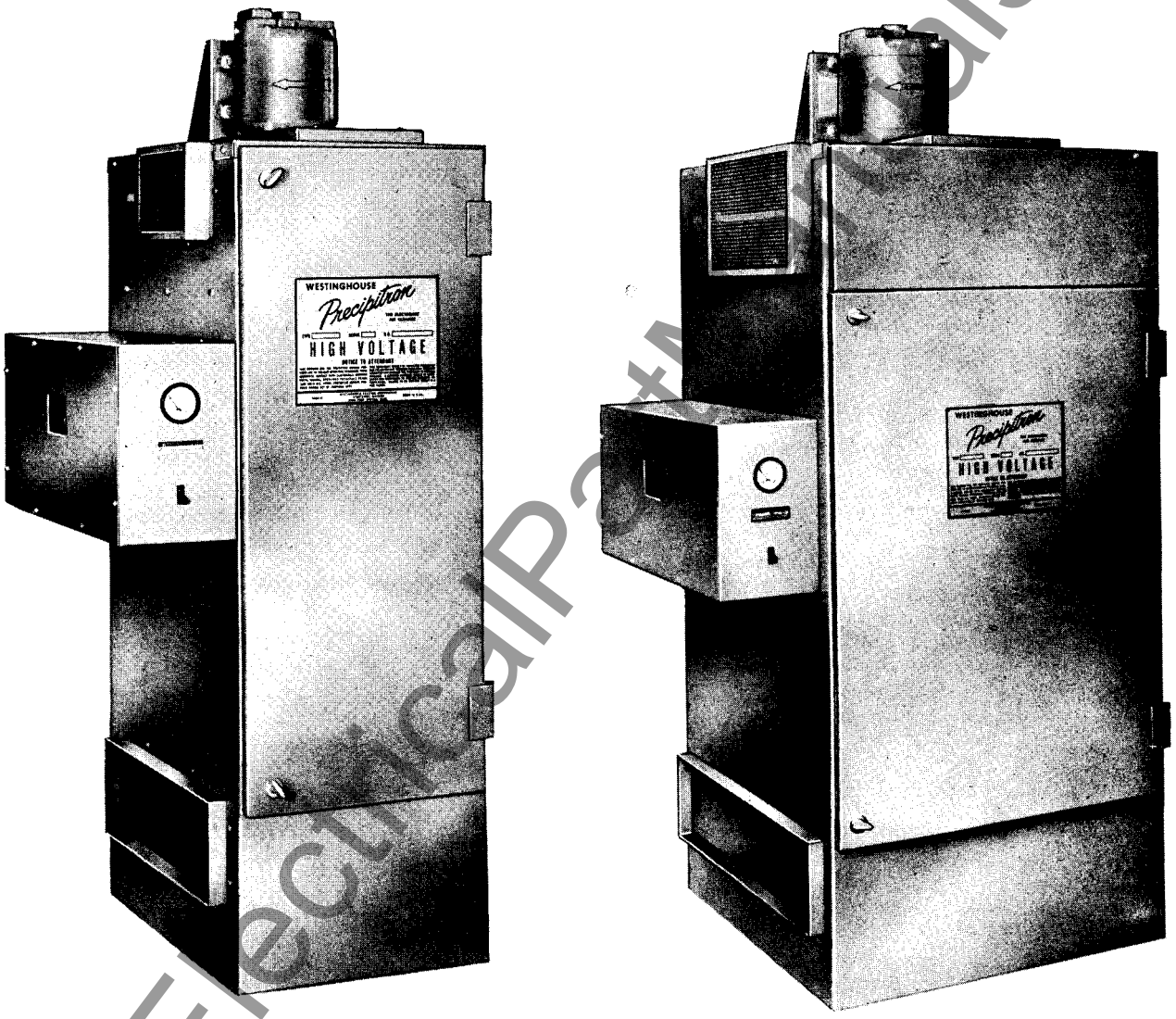
Precipitron®
THE ELECTRONIC AIR CLEANER

INSTRUCTION BOOK
1450-4

OIL MIST CONTROL UNITS



PRECIPITRON Oil Mist Control Unit is an electronic air cleaning apparatus used to remove oil mist from the machine room air. To produce the desired results, it must be properly installed and maintained. This Instruction Book gives correct steps and precautions to be taken. It should be carefully read before the unit is installed or operated.

Supersedes I.B. 1450-3
Dated September, 1962

EFFECTIVE JUNE 1968

RECEIVING, UNPACKING AND HANDLING

PRECIPITRON Oil Mist Units are shipped completely assembled and ready to install. Dimensions for each size are shown on Dimension Sheet 1450.

Model	PO-6	PO-12	PO-18	PO-24
Weights (lb.)	320	420	520	650

As shipped from the factory, the inlet duct flange is on the left-hand side when facing the access door. It may be relocated in the field to the right-hand side, if desired.

Upon receipt of the unit, any evidence of damage or loss should be reported immediately to the last carrier so that an inspection can be made by an agent of the transportation company. A claim should be filed against the carrier to cover any shipping damage or loss.

Except for initial inspection, it is recommended that the unit be stored in the crate, being sure that it is protected from the weather. Move or handle the unit by using a lift or slings under the skid. Avoid jarring or dropping the unit since the electronic equipment can be damaged by rough handling.

To uncrate, remove the top of the crate and then the four sides. Remove skid by tilting the unit and unscrewing the four bolts under the skid.

INSTALLATION

LOCATING THE UNIT. Oil Mist Units should be located as close as possible to the machines which they serve to allow the use of short ducts and oil return lines. They may be set up on a mounting stand, mounted on the machine, or supported from overhead structures. Base of unit is provided with tapped holes at the four corners to accommodate ⅜-16 mounting bolts.

CLEARANCES. A minimum of 30" (40" for PO-18 only) of clearance space in front of the cabinet door, 10" on the window side of the power pack, and 10" above the overall height of the unit is required for service access.

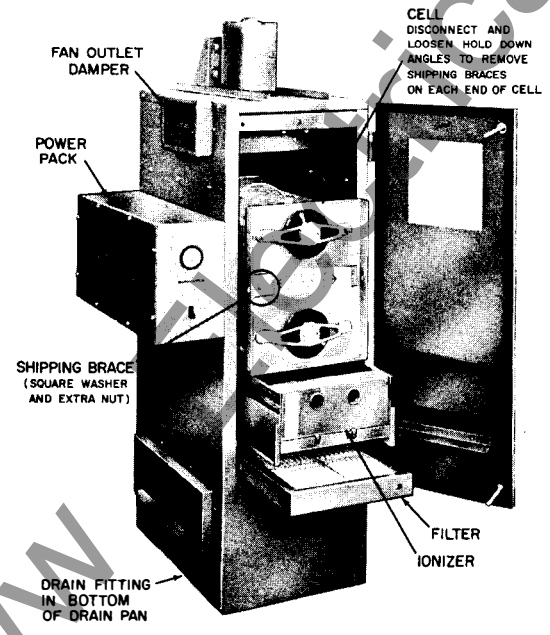


Fig. 1. PO-6 Unit

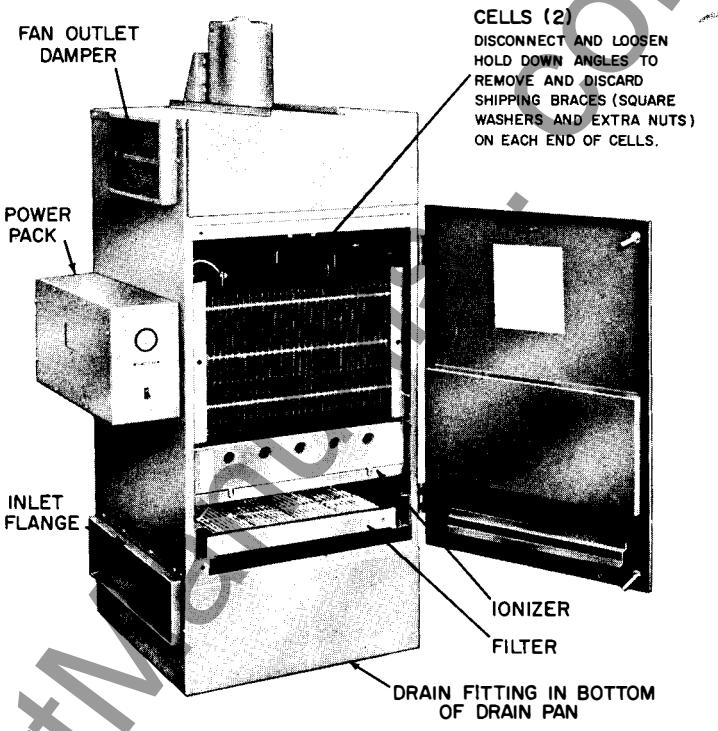


Fig. 2. PO-12 Unit

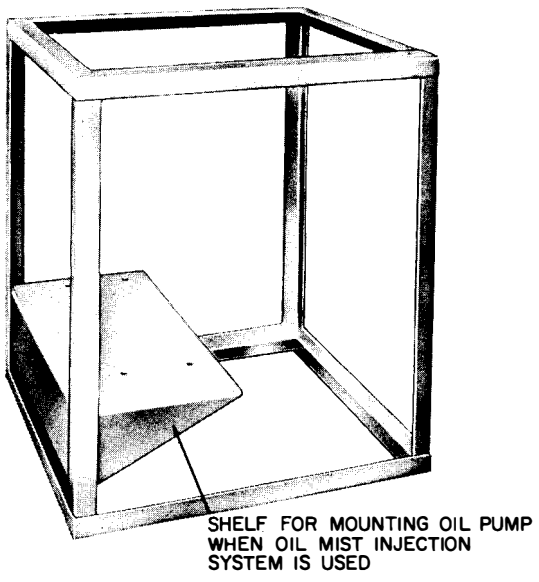


Fig. 3. Typical Mounting Stand
(Available as an accessory)

INTERNAL PACKING. When unit is located, open the cabinet door and remove cardboard packing between the ionizer and door. Disconnect the high voltage cable connection to the cell (and the cell connector on Models PO-12, PO-18 and PO-24.) Loosen and re-position the cell clamp angles to free the cell(s).

IMPORTANT!

Remove cell(s) carefully, handling only by the end frames and making sure cell plates are not bent or damaged. Remove and discard the shipping braces and extra nuts on both ends *of the cell. See Figs. 1, 2 and 4. Shipping braces will cause a short circuit if not removed.*

Re-install cell(s) in cabinet and replace high voltage connections. The unit is now ready to operate.

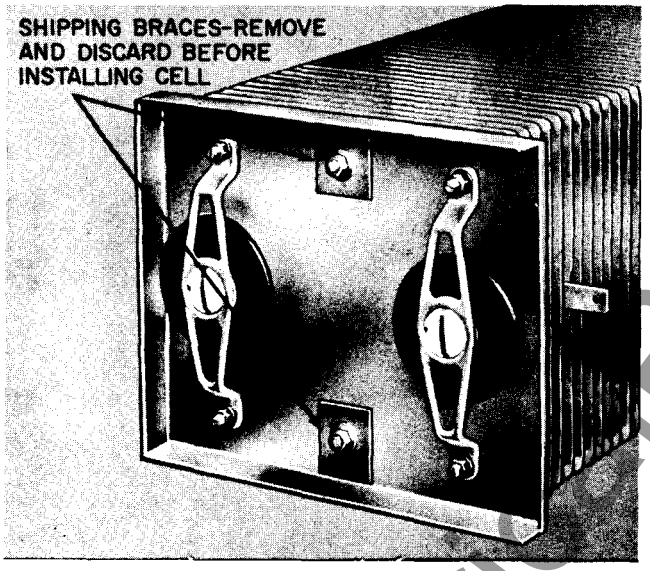


Fig. 4. Cell Shipping Braces

AIR FLOW REQUIREMENTS. Nominal ratings are:

Model	PO-6	PO-12	PO-18	PO-24
Volume (cfm)	600	1200	1800	2400
Duct loss (in w. g.)	1	1	2	2

At these volumes, cleaning efficiency is 90%

Best over-all results are obtained when full rated capacity is used. Efficiency will be slightly improved with less than normal flow but will be seriously reduced if flow exceeds the rating by more than 20%.

Unit fans are designed to accommodate up to 1" and 2" w.g. static pressure loss in externally connected ducts and hoods. This is ample when these elements are properly designed and sized.

When duct losses are less, adjustment of the fan outlet damper, provided, (see Figs. 1 and 2) permits reduction of air flow to the point where best results are obtained. However, if duct losses exceed 1" or 2" respectively, reduced air flow can only be corrected by re-designing the duct elements.

APPLICATION REQUIREMENTS. To control the spread of oil mist, air from around the point of mist generation is drawn into a suction hood ducted to the inlet of the Precipitron Unit. The unit fan creates the necessary suction. Oil laden air first passes through a filter to remove metallic chips or large particles. It then flows through the ionizer and collector cell where the oil mist particles are charged and removed by electrostatic precipitation. Oil gathers in droplets on the collector cell plates eventually draining to the sump. Cleaned air is discharged from the outlet of the fan.

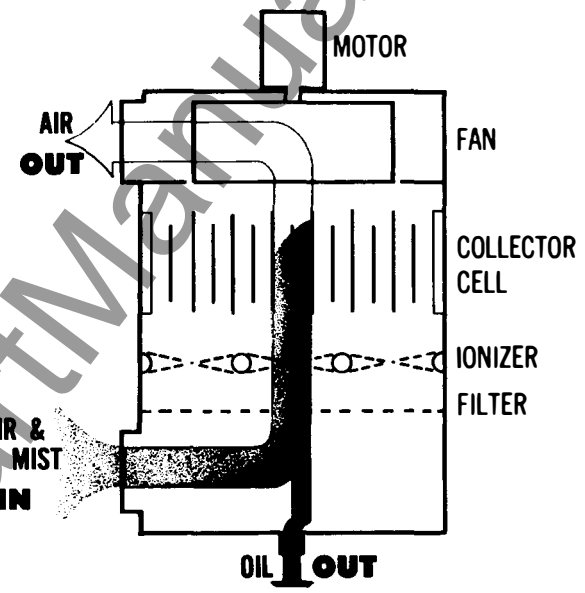


Fig. 5. Principle of Operation

In addition to collecting oil mist (fluid) the collector cell will also simultaneously collect such dirt and smoke (solids) as may be in the air. This is unavoidable, since oil mist particles and solid dust particles both will respond to the precipitating forces. Ordinarily, sufficient oil collects to flush out the solid constituents, keeping the collector cell and ionizer relatively clean. This self-cleaning action will enable these parts to function for considerable time without maintenance. However, if the air is excessively smoky or dirty, or if the oil gums or does not flow freely, a residue will build up on the surfaces of the ionizer and cell causing them to cease operating until they are removed and cleaned.

Model PO-Units give excellent results and are largely self-cleaning when the oil meets the following qualifications:

FLASH POINT — Above 275 degrees F

VISCOSITY — Free flowing at room temperatures

QUALITY — Petroleum oil with stable properties

CONDITION — Oil not carbonized

ADDITIVES — Nothing to affect aluminum

Where excess dirt or smoke is also present, satisfactory performance can be obtained if ionizer and collector cells are periodically removed and cleaned. It is also possible to deliberately inject oil into the incoming air stream to retard the build-up of residual deposits.

In any application where toxic or obnoxious fumes accompany the oil mist, these will have to be vented from the outlet of the unit. Precipitron will collect the oil mists and solid particles but not gases.

Some conditions and materials must be avoided as being unsuited for control by Precipitron methods. Inflammable and explosive material must be excluded as presenting too great a fire risk. Highly volatile materials, while not necessarily hazardous, may leave residues which are insoluble, or which may combine with the moisture normally present in the air to form corrosive compounds. Animal and some vegetable oils, air drying oils, paints, inks and others that dry out, oxidize readily, or form gums, will coat the working elements too effectively and too quickly for practical operation. With due respect to these limitations the application of Precipitron oil mist control still offers tremendous possibilities for the improvement of nuisance conditions within its field of application.

OIL MIST INJECTION (optional) is the deliberate injection of additional oil into the incoming air stream to retard the build-up of solid deposits on the ionizer and collector cell.

Clean oil taken from the machine tool coolant system is delivered under pressure to the oil injection nozzle. Shop air atomizes this into a fine mist at the rate of 7 gallons per hour. The oil is recovered by the unit.

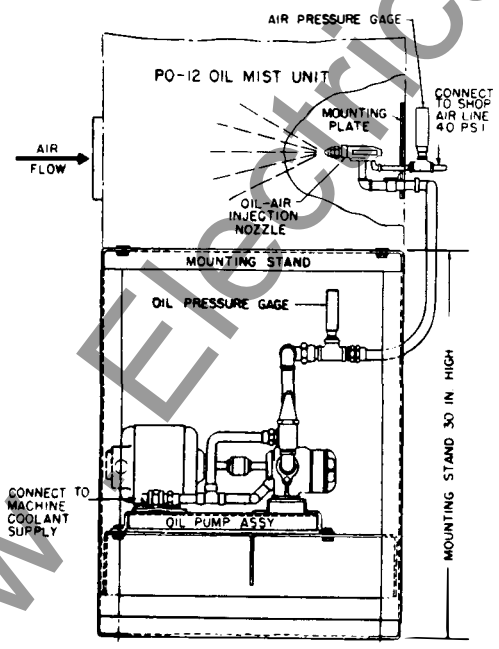


Fig. 6. Oil Mist Injection System

The complete oil injection system consists of (a) the mounting stand to elevate the unit 30″ above floor level, (b) the oil pump-assembly to develop necessary oil pressure and (c) the mounting plate and nozzle assembly for attachment to the unit.

The mounting stand (Fig. 3) provides a protected shelf for mounting the oil pump assembly.

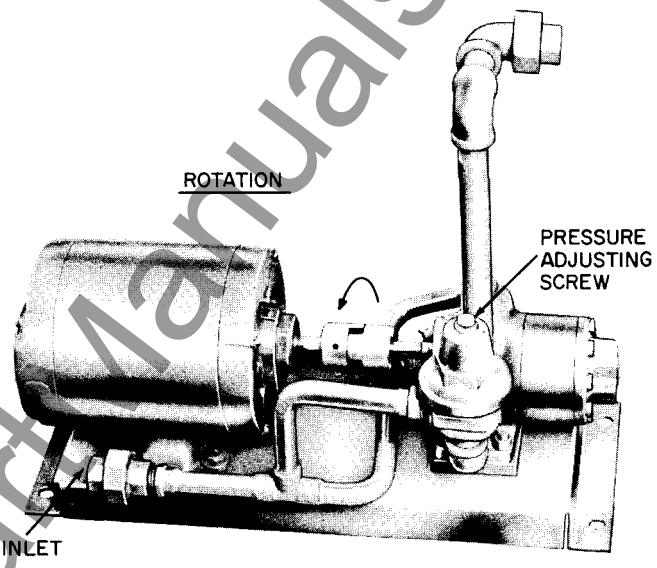


Fig. 7. Oil Pump Assembly

The oil pump assembly (Fig. 7) is driven by a ⅓ HP, 115 volt, single phase, 60 cycle motor. A pressure gauge and hose connection (not shown) are included for installation as in Fig. 6. For oil of viscosity comparable to SAE 30, the pressure adjustment should be set for 15 pounds on the gauge. Increase pressure slightly for heavier oils: decrease for lighter oils, making sure a full mist spray is produced by the atomizing nozzle at all times.

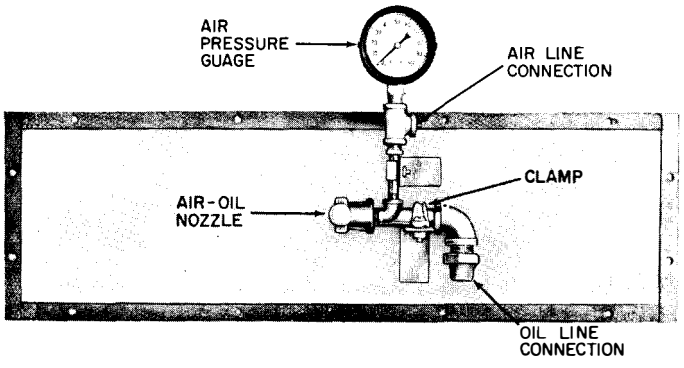


Fig. 8. Mounting Plate and Nozzle

The injection nozzle is attached to a cover plate (see Fig. 8) which replaces the blank cover plate installed on the unit. Gasket edges go inside the cabinet. Once installed, the nozzle can be partially withdrawn or removed from the plate for inspection and cleaning by loosening the pipe clamp. To facilitate removal, a flexible air line connection is recommended.

The injection nozzle is an atomizing type requiring both air and oil under pressure for complete misting of the oil. Air at 40 pounds gauge pressure is required. This may be taken from a shop air line. A regulator should be provided if line pressures exceed 50 psi.

DRAIN CONNECTION. A female drain fitting is located in the bottom of the cabinet. Size is 1" Ips on Model PO-6, 1-1/4" on Models PO-12, PO-18 and PO-24. Suitable plumbing connections are necessary to drain collected oil to a coolant sump or other disposal facility. Because the unit cabinet is under suction, a trap should be installed in the drain line (or the drain opening submerged in the coolant sump) to prevent blocking, or reverse flow, and drain piping should be pitched sharply to insure gravity flow.

POWER REQUIREMENTS. Power packs require 115 volt, single phase 60/50 cycle input power. For best operation, voltage should not fluctuate more than ± 5 volts. Average power consumption is 50 to 140 watts depending upon the unit size.

Standard fan motors are 3 phase, 230/460 volt, 60 cycles. These may be operated on 50 cycle power but cfm ratings of the fans will be 1/6 less due to reduced speed. Motors of other than standard voltage may be furnished on order in which case, suitable service power service must be provided.

Model	PO-6	PO-12	PO-18	PO-24
Motor size (hp)	1/4	1/2	2	3

A fused switch or circuit breaker is recommended for controlling the fan motor. This should be located convenient to the operator and wired as shown in Fig. 9.

In general, all wiring should be in conduit and installed in accordance with local code requirements.

GROUNDING THE UNIT. Connect the cabinet to a permanent low resistance ground using solid or flexible copper cable. Use a dummy screw in the side opposite the power pack for this connection.

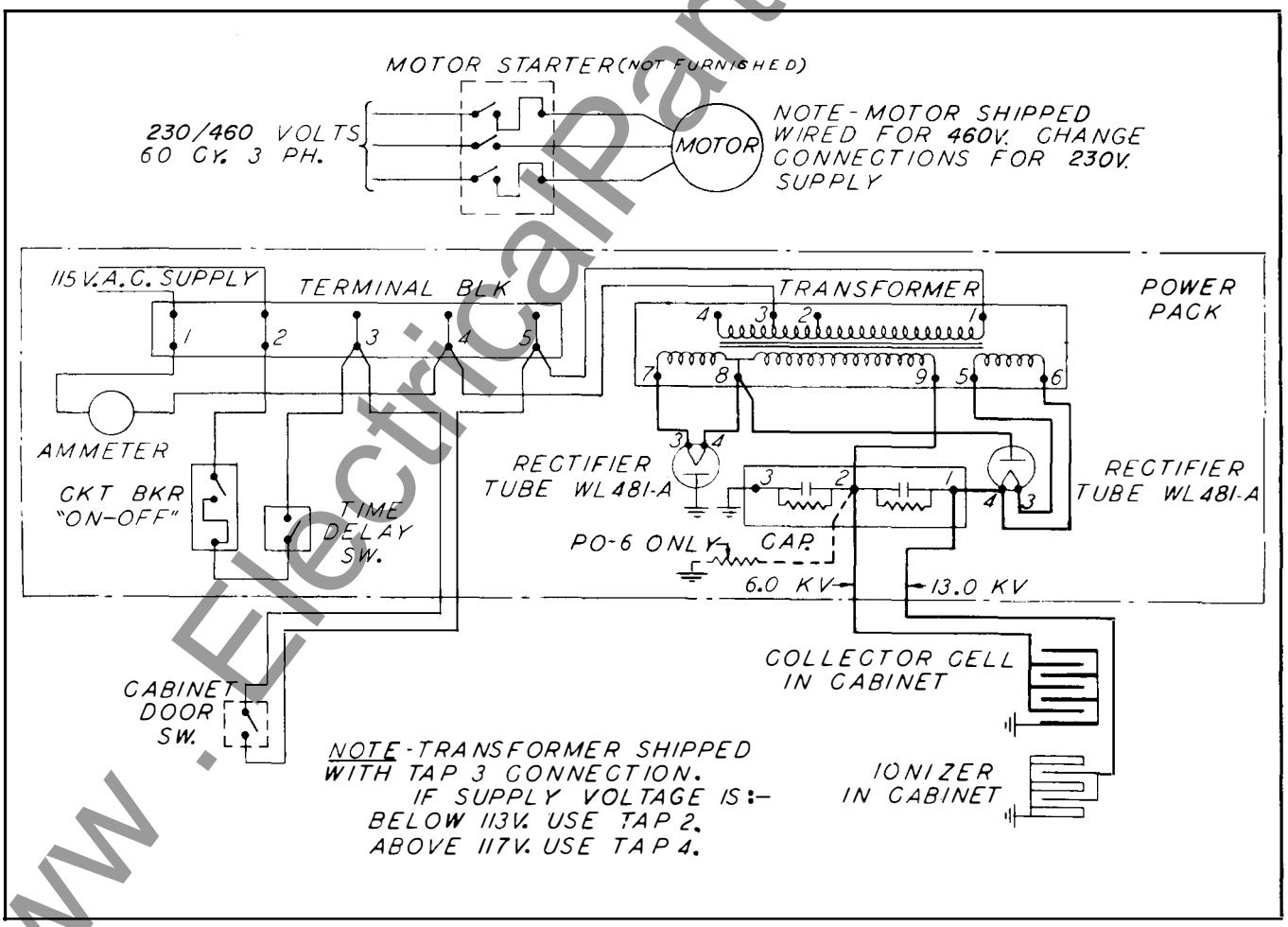


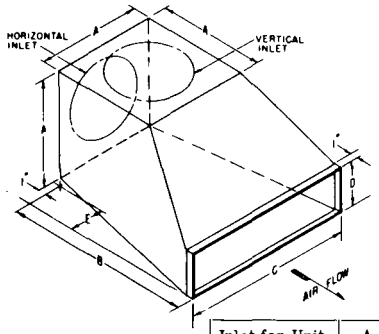
Fig. 9. Power Pack and Cabinet Schematic Wiring Diagram

HOODS AND DUCTS. Proper shape and placement of exhaust hoods, adequate duct size, and fewest possible elbows are the keys to successful system performance. *For oil mist, drawing in the proper quantity of air* is more important than high velocity pick-up.

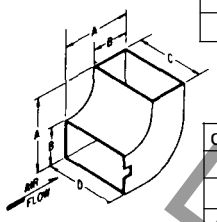
Due to the many possible variation in machine arrangements and exhaust requirements, hoods and ducts will need to be tailored to each individual job. These should be designed with these thoughts in mind:

1. Total static pressure loss for hoods, elbows and ducts must be less than 1" w.g. for PO-6 or PO-12 and 2" w.g. for PO-18 or PO-24 for full air flow.
2. Duct velocity should be 2000-2500 fpm.
3. Hood inlet velocity should be minimum 100 fpm over the opening.
4. Hoods should be 1½ pipe diameters or less distance from the point of oil mist generation.
5. Streamlined hoods are most efficient, flared (40° taper) are good, flanged are fair, straight pipe openings poor.

Suitable designs for inlet and outlet duct connections to the unit are shown in Fig. 10.



Inlet for Unit	A	B	C	D	E
PO-6	12	20	17-7/8	5-3/4	3
PO-12	14	25	22-7/8	5-3/4	4-1/2
PO-18	15	28	22-7/8	5-3/4	5
PO-24	17	32	22-7/8	5-3/4	6



Outlet for Unit	A	B	C	D
PO-6	9-1/8	5-1/4	8-3/4	8-13/16
PO-12	15-5/8	8	13-3/4	13-15/16
PO-18	13-1/2	5-1/2	11-1/2	11-9/16
PO-24	13-1/2	7-1/2	11-1/2	11-9/16

Fig. 10. Typical Duct Connections

STARTING THE UNIT

After unit and duct system have been properly installed and adjusted, turn the fan wheel by hand to be sure that it turns free. Then turn on power and check fan rotation with the direction arrow on the motor housing. To reverse rotation interchange two line leads.

Measure the power pack supply voltage with a voltmeter and change the transformer primary tap, if necessary, as shown on Wiring Diagram, Fig. 9. Transformer taps are accessible when the power pack cover is removed.

ADJUSTING THE OUTLET DAMPER. The damper provides a means of balancing the air system for rated air flow and best cleaning efficiency. Since direct air measurements are difficult to make and somewhat unreliable for the small air volumes involved, a more convenient method of checking is measurement of the fan motor current. With full load on the motor, air flow will be rated CFM.

Temporarily connect an A.C. Ammeter (0-10 Amp. Scale) in the fan motor circuit. With the fan running, close the damper until the current measured agrees with the motor nameplate. Mark position of the damper handle for future reference. If oil mist is adequately controlled, clamp the damper in this position. If noticeable mist escapes at the outlet of the unit, slowly close the damper until best results are obtained. If mist escapes at the hood, slowly open the damper to increase air flow, but *check motor current to be sure it does not exceed nameplate reading by more than 15%.* If current is less than full load with the damper full open, the duct system is probably undersized.

OPERATION

PRINCIPLE. PRECIPITRON Units operate on the principle that oil mist may be removed from the air by first giving the mist an electrostatic charge (ionizer) and then deflecting the charged mist particles by electrostatic forces to collecting surfaces (cell plates). When connected to a suitable duct system, electric power and drain facilities, the unit will effectively clean and salvage ventilating air with a minimum of maintenance.

NORMAL OPERATION. Consists of keeping the power pack and fan operating when oil mist is being generated. The power pack ammeter should read 0.6 to 0.7 amps. Rectifier tubes are visible through the window and should glow at an "incandescent lamp" color.

PROTECTIVE DEVICES. For safety of the operator the cabinet door and power pack access panel are equipped with screw operated switches. These open 115 volt circuit and delay access to the interior high voltage parts until the capacitor charge has drained off to a safe value through discharge resistors built into the capacitor. These switches should not be tampered with even though the time consumed in turning the screw may seem unnecessary. The screw at the cabinet door may be pushed into place without turning, but must be fully unscrewed to open the door.

FAN AND MOTOR ASSEMBLY is sized for rated air volume through the unit when connected to a properly designed duct system. Fan wheel is attached to the motor shaft with two set screws.

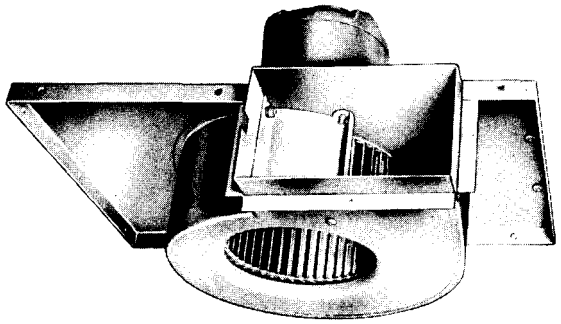


Fig. 11. Fan and Motor Assembly

CELLS comprise an assembly of many flat plates, equally spaced and arranged to provide alternate grounded and charged surfaces parallel to the air flow. Charged plates are at 6000 volts d.c.

IONIZERS comprise an assembly of grounded tubes between which the small ionizer wires are suspended. Ionizer wires are at 13000 volts d.c. Near the center of each wire, a vibration dampener bead is attached to keep the wire from vibrating during operation. Pre-looped wires with beads are available as Repair Parts.

Fig. 12. PO-6 Ionizer

POWER PACK provides d.c. voltages for the ionizer and cells, operating from a 115 volt a.c. input. The transformer steps up the voltage, tubes rectify it and the two-part capacitor smooths out pulsations and doubles the output for the ionizer circuit. (2 power packs are used on the PO-24.)

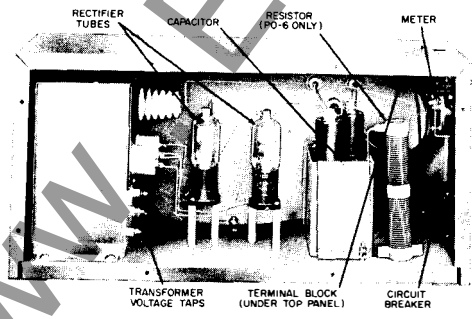


Fig. 13. Power Pack

MAINTENANCE

INSPECTION. Regular inspection of the unit will assure optimum performance. Inspect daily to see that the fan and power pack are operating properly and that clean air is being discharged as outlined under "Normal Operation".

CLEANING THE UNIT. For new units, cells, ionizers, and filters should be inspected weekly for cleanliness. Experience after a few inspections will determine the need for regular cleanings. In any event, it is good practice to inspect the internal components at least monthly. If a layer of dirt or hardened oil is observed on cell plates, ionizer tubes, ionizer wires, insulators, or filters, the dirty components should be removed and thoroughly cleaned. This is not necessary if a slight oil film is noted, but its presence should be carefully observed during subsequent inspections to be sure that buildup is not taking place. Thick layers are difficult to clean off, particularly if allowed to remain for long periods.

When removing components, be careful not to break ionizer wires or bend cell plates. Also, be sure to disconnect and reconnect high voltage cables properly.

Ordinary degreasing equipment is usually quite effective in removing oily dirt, and should be used if available. If a degreaser is not available or if it is not effective, a dip tank (at least 24" x 18" x 15" for the PO-6, PO-12 and PO-24 and 36" x 18" x 15" for the PO-18) is recommended. Mix a solution of one pound of mild detergent in each gallon of 130-150°F. water. (Detergent "ALL" is recommended because it is available and will not adversely affect the aluminum. Dip dirty components in the detergent solution and allow to soak ten minutes. Immediately after removing components from the dip tank, thoroughly rinse or hose with clean hot water. Inspect components for cleanliness and repeat detergent dip and rinse if necessary. Components should be metal clean.

LOCATION AND CORRECTION OF FAULTS

When the unit is properly applied, installed and adjusted, all mist should be drawn into the duct pick-up and no appreciable mist should be exhausted from the unit. Any deviation from this condition indicates the unit is under-size and a larger or additional unit is required. Before actually changing the unit, a thorough check of the installation is recommended to be sure that the duct elements are properly designed and installed and that the unit is operating properly. The "Check Chart" should be used as a guide for this check as well as for locating and correcting troubles.

CAUTION: During servicing, be careful not to come in contact with electrical parts inside the power pack or cabinet when the power pack is energized. Allow at least 30 seconds after the power pack has been turned off. This will permit the HIGH VOLTAGE to leak off to a safe value through the resistors in the capacitor. In addition, before touching any high voltage part it is recommended that the part be grounded with a ground prod equipped with a suitably insulated handle.

CHECK CHART

Trouble	Verification	Correction
1. Mist in machine room	a. All mist not drawn into duct pick-up	See 2 & 3 below
	b. Mist exhausting from the unit	See 2, 4, 5 & 6 below
	c. Mist originating from another source	Install another PRECIPITRON Oil Mist Control Unit or otherwise eliminate
2. Low air velocity	a. Undersized duct or poor hood design	See "Air Flow Requirements" & "Hoods and Ducts"
	b. Low motor current	See "Adjustment of Outlet Damper"
	c. Low electrical frequency	See "Power Supply"
3. Fan not running	a. Power supply open	Check incoming power supply
	b. Motor starting switch "off" or "tripped"	Turn on switch — check heater rating — also see 3c, d or e below
	c. Wrong or faulty wiring	Correct wiring
	d. Defective motor	Repair or replace motor
	e. Fan wheel restrained	Correct fan wheel clearance
4. Ammeter reads zero	a. Power pack circuit breaker "off" or "tripped"	Turn on breaker. Also see 6 below
	b. Time delay switch at cabinet or power pack open	Tighten or adjust time delay screw
	c. Open circuit in low voltage system or faulty ammeter	Check continuity of low voltage wiring and parts. Repair or replace as required
5. Ammeter reads low (below 0.5 amps)	a. Low power supply voltage	See "Power Supply" & "Power Pack Wiring"
	b. Dirty Ionizer	Clean wires and tubes. See "Cleaning"
	c. Ionizer and cell cables not connected	Connect cables
	d. Rectifier tube does not glow	Check tube socket contact — try replacing tube — check transformer wiring and winding. See "Normal Operation"
	e. Faulty ammeter	Replace meter
6. Ammeter reads high (above 0.8 amps)	a. High supply voltage	See "Power Supply" & "Power Pack Wiring"
	b. Broken ionizer wire	Replace wire being sure to remove broken pieces
	c. Dirty cells or ionizer	See "Cleaning". Also too much moisture in mist
	d. Short circuit in cells, ionizer or wiring	Cell Shipping Braces not removed. See notes 1 & 2 below
	e. Short circuit in power pack	See notes 1 & 2 below
	f. Cell shipping braces not removed	Remove all shipping braces from both ends of each cell. See page 3

Note #1: Short circuits can usually be located in the cells or ionizer by inspection. (See "CAUTION"). Check for broken ionizer wires, bent cell plates, dirt between plates or dirty components. If the fault cannot be located by inspection, localize the trouble by alternately disconnecting the high voltage cables at the cells, ionizer and capacitor terminals. Repair or replace the defective part. For power pack short circuits, first check the rectifier tubes. Next inspect the wiring for grounds and then test the tansformer and capacitor or try replacing them until the fault is corrected.

Note #2: If a d.c. high voltage meter is available, measurement of the ionizer and cell voltages is helpful in locating troubles. See "CAUTION". Ionizer voltage should be 12.5 ± 0.5 KV and cell voltage 6 ± 0.5 KV. Usually these voltages will be low when there is a high voltage short circuit.

WARRANTY

Westinghouse, in connection with apparatus sold, agrees to correct by repair or replacement any defects in workmanship or material which may develop under proper or normal use during the period of one year from date of original installation, but not more than two years from date of shipment. Such defective part replacement will be shipped f.o.b. factory with freight prepaid and allowed to common carrier point nearest destination and such correction shall constitute a fulfillment of all Westinghouse liabilities in respect to said apparatus. Westinghouse shall not be liable for consequential damages.

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