Precipitron®
THE ELECTRONIC AIR CLEANER

INSTRUCTION BOOK
1435-1

MODEL PD FIELD ASSEMBLED UNITS

for

Commercial Applications

RECEIVING • INSTALLATION • MAINTENANCE

INSTRUCTIONS

HORIZONTAL AIRFLOW — DUAL HEADER WASHER WITH SCPD
FULLY AUTOMATIC OR SCMD MANUAL CONTROL

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 to remove soot, smoke, dust, dirt and other air borne particles.

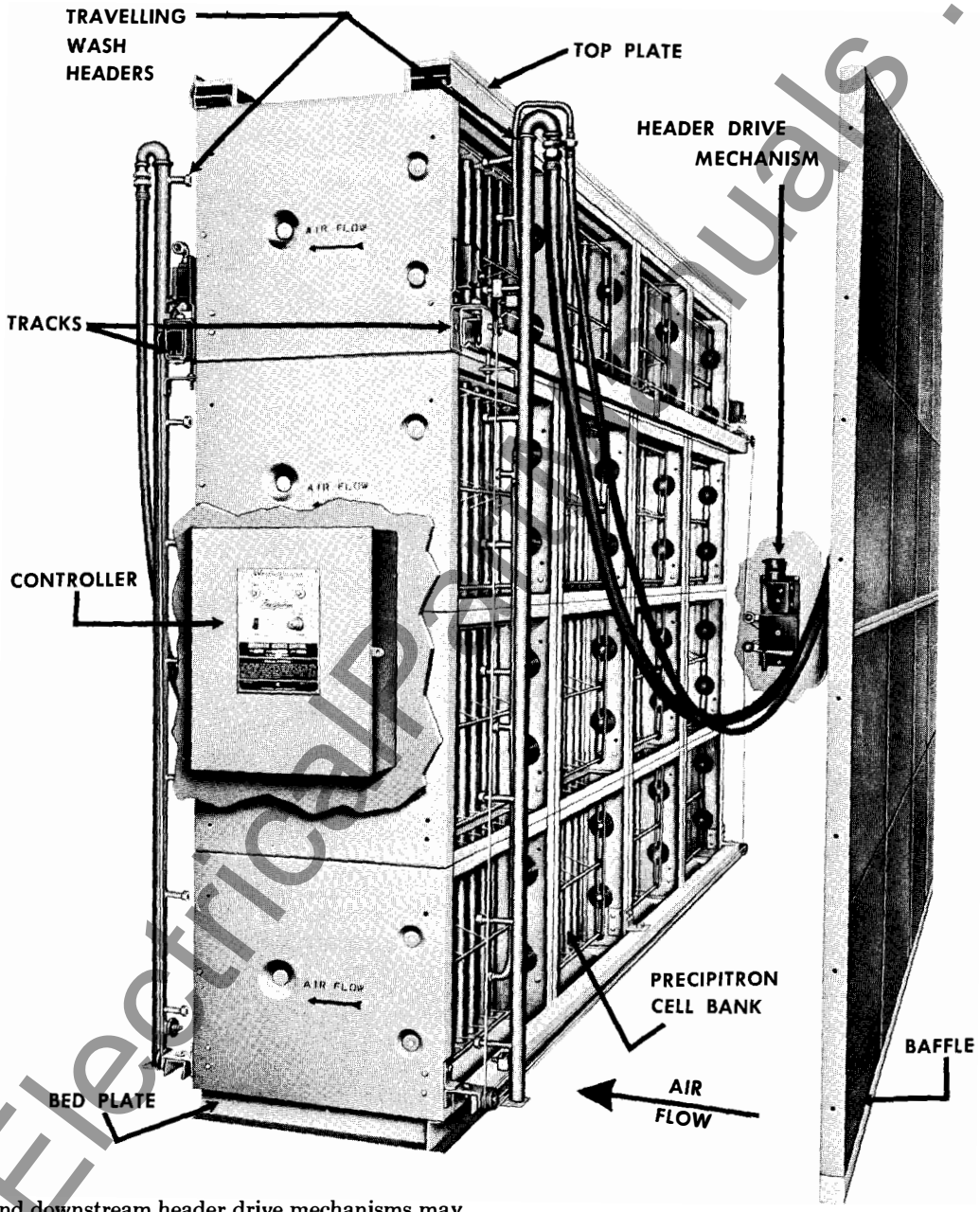
Model PD PRECIPITRON unit includes facilities for washing off the collected dirt and for applying adhesive with motorized moving nozzles, controlled from outside the duct.

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

NEW INFORMATION

EFFECTIVE SEPT. 1960



NOTES:

Upstream and downstream header drive mechanisms may be mounted on either plenum wall.

Controller location is optional but should be near the access end of unit.

TYPICAL MODEL PD PRECIPITRON UNIT

Power Packs, Foundations and Ductwork not shown

RECEIVING AND HANDLING

A separate instruction package is forwarded to the customer's shipping address for each PRECIPITRON unit. This includes a bill of material, an instruction book and two nameplates, together with any special instructions needed for the particular unit.

To facilitate handling and erection, the proper number of parts are packed in individual containers, each marked as to contents. The bill of material may be checked with the shipping notice. *Handle the equipment carefully to prevent damage.*

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.

Except for the initial inspection, store the parts until needed in the original shipping containers in a clean dry location protected from the weather.

For actual erection, the parts will be used in the following order:

PART	INSTALLATION INSTRUCTIONS *Page*
1. Instruction Package	1
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WESTINGHOUSE SUPPLIES necessary basic parts to erect a complete PRECIPITRON assembly as listed in the bill of material. Westinghouse also supplies such items as special hardware, special electrical fittings, high voltage cable and initial supply of adhesive.

INSTALLATION REQUIREMENTS

CUSTOMER SUPPLIES regular construction items which are not included in the bill of material, such as ductwork, foundation, mounting bolts, conduit, low voltage wiring and plumbing. The following installation instructions give further details as to the source of individual items.

LOCATING THE UNIT. Successful installation and operation of a PRECIPITRON unit require consideration of the following points both before and during installation.

1. Sufficient space for unit, including service access.
2. Satisfactory air handling system.
3. Level and plumb foundation.
4. Adequate water supply and drains.
5. Correct power supply.

SPACE REQUIREMENTS. Unit dimensions and space requirements are given on Dimension Sheets 1435 supplied for the order. Note that a 34″ minimum clear space is required on both the inlet and outlet sides of the collector cell bank for clearance of the hoses. This space is also needed for inspection and maintenance.

AIR HANDLING REQUIREMENTS. A PRECIPITRON unit is sized to clean a rated quantity of air (cfm) to a specific efficiency. To obtain rated efficiency, the actual cfm through the unit should not exceed rated cfm. Efficiency also depends on uniform air flow throughout the whole unit. Air velocity through any part of the cell bank should not exceed rated velocity by more than 10%. Baffles help to equalize the air flow, but may not fully correct for bad entrance conditions. If stratification, turbulence or other deficiencies exist when the fan is operating, it will be necessary to install vanes or additional baffles in the duct as a corrective.

OUTSIDE AIR INTAKE should be sized generously to minimize sucking in unnecessary dirt due to high air velocities. Intakes should be located above ground or roof top levels, away from sources of high dust concentrations, corrosive fumes or electrically conductive particles, and properly oriented away from prevailing winds. Most *important*, all outside air intakes should be equipped with weather louvers or dampers to prevent entrance of rain or snow plus cleanable screens of 8 to 16 mesh to keep out leaves, insects, etc. The PRECIPITRON unit should be down-stream from the outside air intake a distance at least equal to the height of the unit. This is to allow rain, snow and large dirt particles which may get through the louvers or screen, to settle out to the floor instead of being drawn into the unit.

LINT. Where recirculated air is brought into the unit, presence of excessive quantities of lint may necessitate some sort of a lint screen across the duct opening. Lint tends to collect on ionizer wires and holders and generally interferes with the proper functioning of the PRECIPITRON.

INLET BAFFLES (furnished with the unit) are panels of perforated metal in angle iron frames. Their purpose is to improve air distribution through the PRECIPITRON cell bank and arrest up-stream waste splash. *Customer supplies all angles, channels stiffeners* and *block off members necessary for mounting.*

AFTER-FILTERS (optional) are cleanable type, located down-stream from the PRECIPITRON cell bank as a precaution against dirt blow-off or wash water carry-over into down-stream ducts.

DUCTS must be tight to prevent air leaks, particularly leakage of uncleaned air into the cleaned air stream. Duct access doors should be gasketed and fitted with positive means for clamping shut.

INSPECTION WINDOWS either in the duct doors or adjacent thereto are recommended to permit observation of spray headers during operation. These should be water-tight.

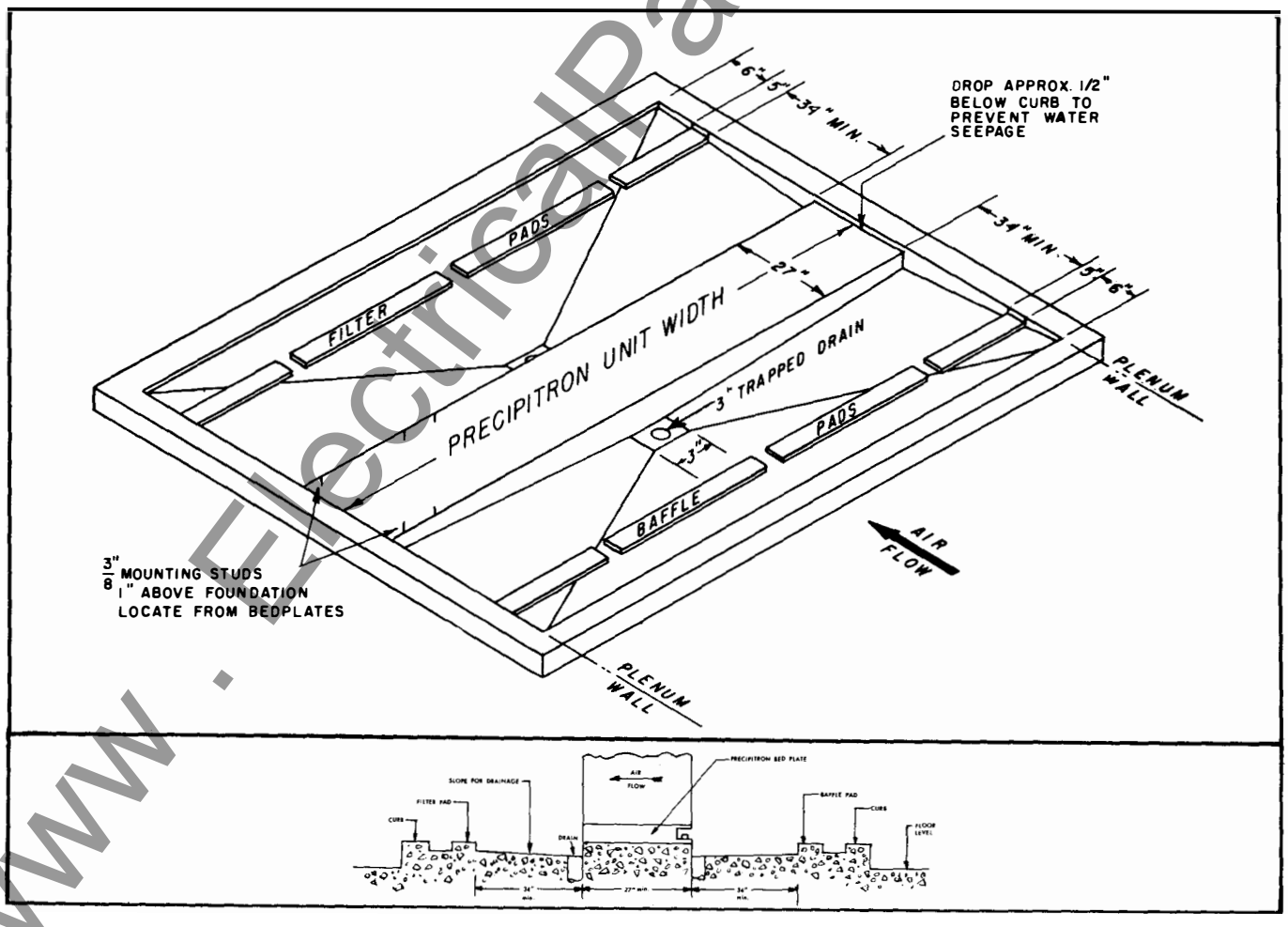
AIR WASHER, if located up-stream from the unit, must never be operated so that water droplets or free moisture can enter the PRECIPITRON cell bank.

FOUNDATION (Fig. 1 & 2) made of concrete is recommended because it will not settle or distort and will remain waterproof. Foundation must be level. If a metal drain basin is used, it should be rigid enough to prevent distortion of the cell bank and provided with slotted wooden walkways to assure firm footing for the operator. While mounting stud layouts can be made in advance from Dimension Sheet data, it is preferable to use the actual bedplates as templates. Where both 2′ and 3′ bedplates are furnished, locate one or both 2′ bedplates at one end of the foundation. Use ⅜″ anchor bolts or studs (by others).

DRAINS. Install both sides of unit, see Fig. 1 & 2.

WATER. Cold (tap) temperature in ample supply at 40 p.s.i. minimum running pressure is recommended.

POWER. 120 volts, 1 phase, 60/50 cycles.



Figs. 1 & 2. Suggested Foundation and Drain Cross Section

ERECTION OF COLLECTOR CELL BANK

HARDWARE is contained in cloth bags attached to the component parts. It should be sorted carefully and saved until needed.

BEDPLATES (3 ft. and/or 2 ft. lengths) provide proper drainage of wash water, and prevent by-passing of air under the unit. All bedplates are drilled for ⅜″ foundation bolts (not supplied). Place one or both 24″ bedplates at one end of foundation.

Bolt all bedplates to the foundation, making sure that they butt together closely, and are in line and level in both directions (see Fig. 3). Shim if necessary. Grout any openings under the *inlet* air side of the bedplates to prevent leakage of air under the bedplates.

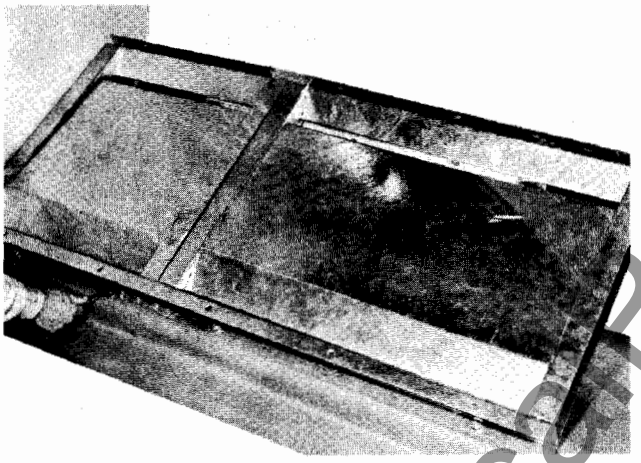


Fig. 3. Installing Bedplates

FRAMES (3 ft. and/or 2 ft. lengths) are bolted to the bedplates. In handling, be careful not to break the ionizer wires.

Start with one end, and set frames on all bedplates the full length of the bottom row. Bolt the frames together first using four $\frac{3}{8} - 16 \times \frac{3}{4}$″ lg bolts, nuts and washers between frames. (Hardware furnished in cloth bag with each frame.) See Fig. 4.

Next bolt the frames to the bedplates on the *outlet air side*. Finally install bolts in the remaining holes on the inlet side.

Check this row for levelness and plumbness, and shim if necessary. Continue in this manner until all rows of frames are installed, being sure each row is plumb and level.

TOP PLATES (3 ft. and/or 2 ft. lengths) are installed as shown by Fig. 5. Remove the cover from the wiring raceway on the outlet air side prior to installation. Top plates should be securely at-

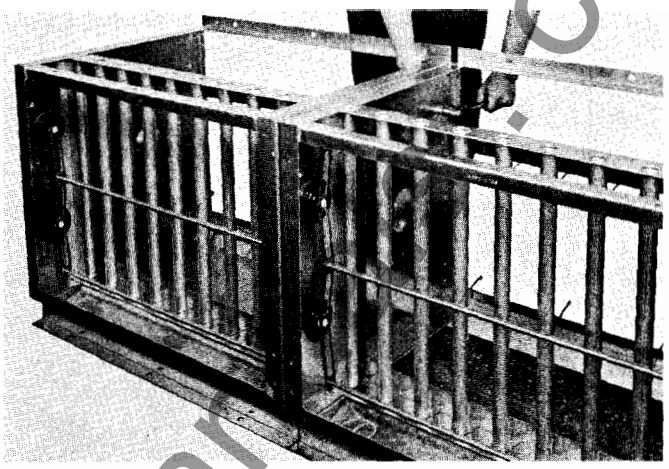


Fig. 4. Bolting the Frames Together

tached to the frames with sheet metal screws. Fasten ends of wiring raceway together with small bolts and nuts. Screws, bolts and nuts are included in the bag with each top plate. Top plate covers should be installed after installation of high voltage wiring.

Be careful not to lose the remaining wire, terminals and hardware packed in the bags. These will be used later for the high voltage wiring.

SEALING THE FRAMEWORK. All spaces around or above the frame bank must be sealed. By-passing of air is prevented under the frame bank by air baffles built into the bedplates. Top plates have a

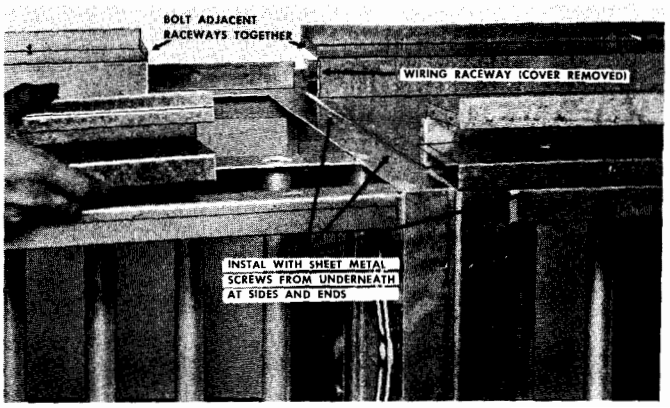


Fig. 5. Assembly of Top Plates (One in Place)

turned up edge on both inlet and outlet air sides for attaching safe-off or sealing strips between the top of the unit and the duct or plenum ceiling. Drill the turned up edge only, and attach the seal-off strip with sheet metal screws (See Fig. 5).

Sealing between ends of the unit and duct or plenum walls may be accomplished in several ways.

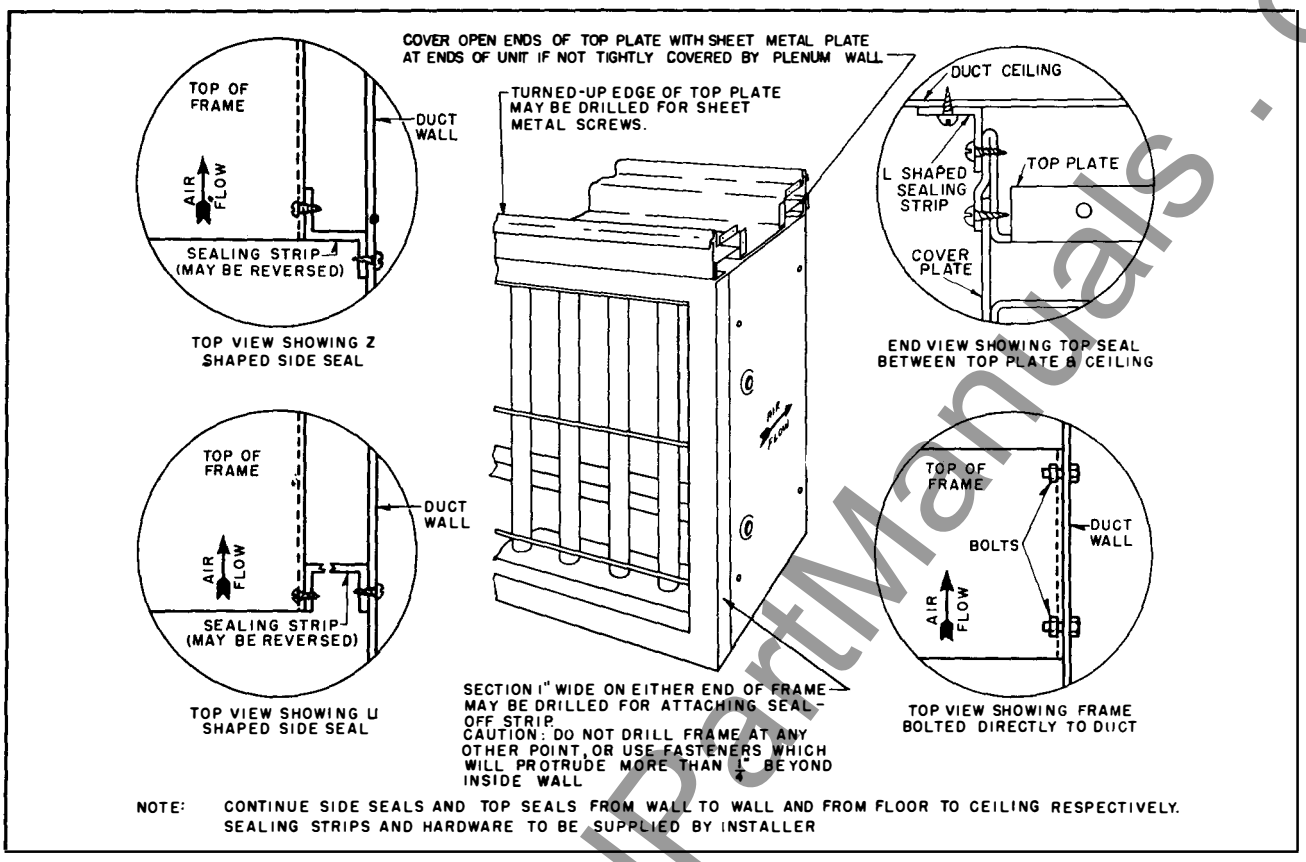


Fig. 6. Sealing the Framework

It is always better to attach the duct or plenum walls directly to the ends of the unit, using the existing bolt holes in the frame. If the space is very narrow, caulking compound (Minnesota Mining & Mfg. Co. EC-750 or EC-801) or felt strips may be used. Otherwise seal with metal strips as illustrated in Fig. 6.

CELLS should be handled by the end frames to prevent damage. Remove the tier connectors which are taped on the cells, but save them for high voltage connections later. Carefully inspect all cells to be sure plates are unevenly spaced and undamaged. Install cells with the connector posts pointing toward the outlet air side. See Fig. 7. Push cells into frames as far as they will go.

ADHESIVE SHIELDS are formed aluminum strips to collect drip from the bottom corners of the cell plates. They are slid in place between cells; the weight of the cell above holding the shield in place. Install with the wider flange at the bottom and push the strip in toward the cells until the flanges touch the plates. See Fig. 8.

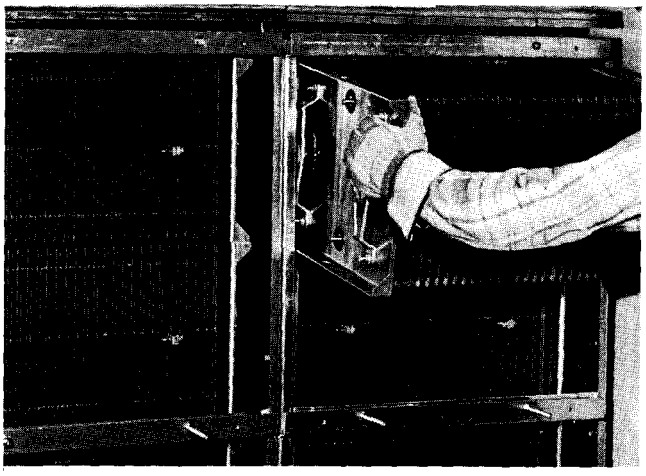


Fig. 7. Installing Cells

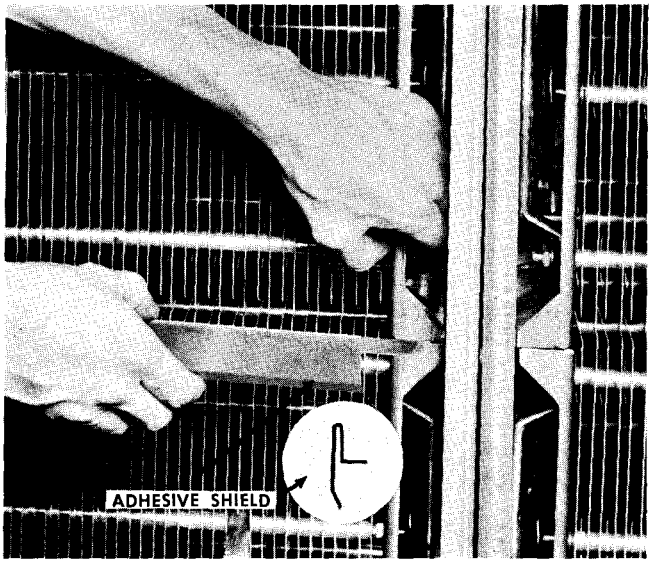


Fig. 8. Installing Adhesive Shields

CELL CLAMP ANGLES. Cell Clamp Angles hold the cells in place, and are installed after the shields are in place. See Fig. 9. Use $\frac{3}{8} - 16 \times \frac{3}{4}''$ lg bolts, thin nuts, washers, and clamp angles supplied in bag with each frame.

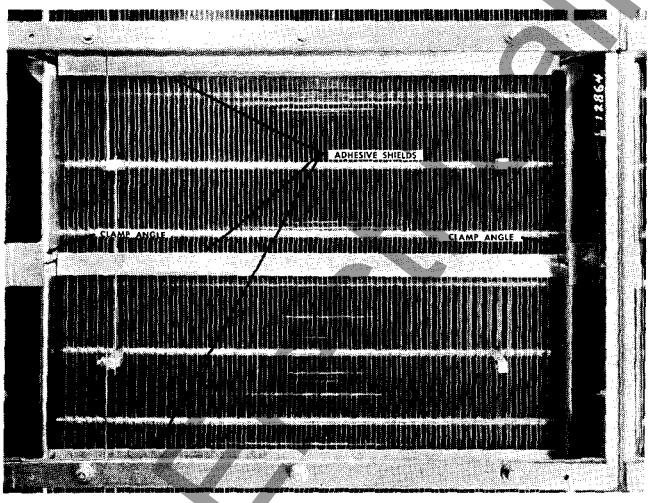


Fig. 9. Shields and Clamp Angles In Place

TRACKS & SPRAY HEADERS. Upper tracks carrying the spray headers (both sides) are located approximately 2 ft. down from the top of the unit. Frames are punched to receive the supports and back-up angles. Bottom guides go along the lower edge of the bottom row of frames. When more than one length of track and guide is required per side, there will be center supports for each joint. See Fig. 10.

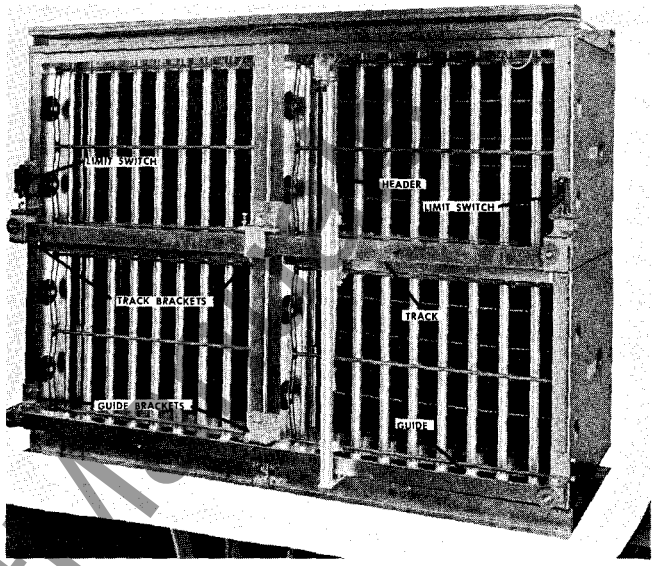


Fig. 10. Location of Tracks and Guides.

Install the upper end supports, with back-up angles, first. If there is more than one track length per side, pair them on the floor so that every track joint lines up with a joint in the frame bank. Then install center support brackets, with back-up angles, at these positions. See Fig. 11.

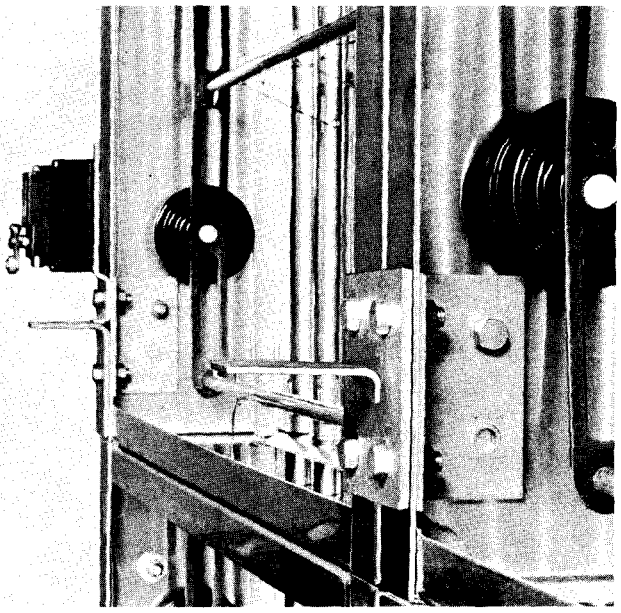


Fig. 11. Upper Track Supports (Up-stream Side)

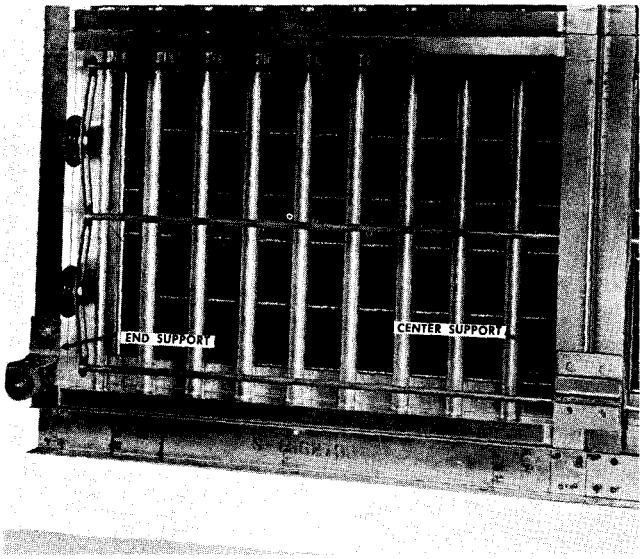


Fig. 12. Bottom Guide Supports (Up-stream Side)

Mount the track sleeves loosely and install the track. If there is only one track length, hang the header on the track by its rollers before mounting the track in place. Otherwise, install one track length, run the header on it and then install the others. Note the *header having 2 sets of nozzles goes on the upstream side of the unit: the header with 1 set of nozzles goes on the downstream side.* When all parts are in place, check track alignment carefully and clamp in final position.

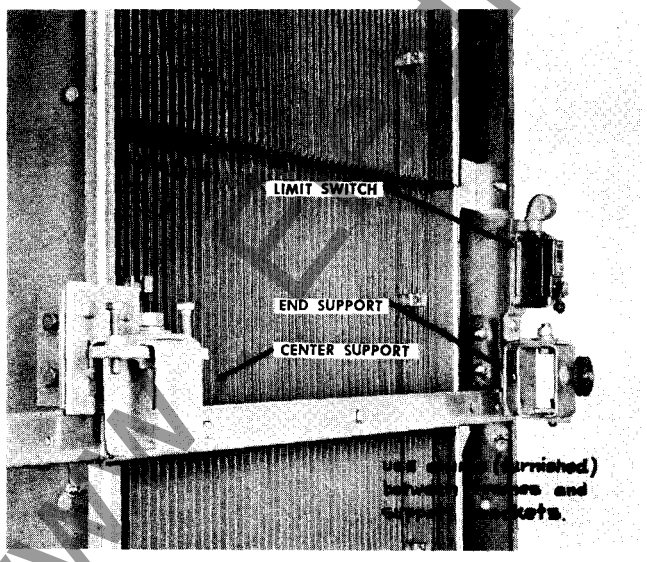


Fig. 13. Upper Track Supports (Down-stream Side)

Next, install the bottom guide support brackets and rails. Now hold the header pipe vertical and move it by hand along the track to see that it moves freely. Correct any roughness or binding. Also, check to see that the header operates the limit switches as it is moved toward both ends of the unit. Use the locknuts for up or down adjustment. Finally, square up headers so that nozzles point parallel to the cell plates and tighten the header locknuts securely.

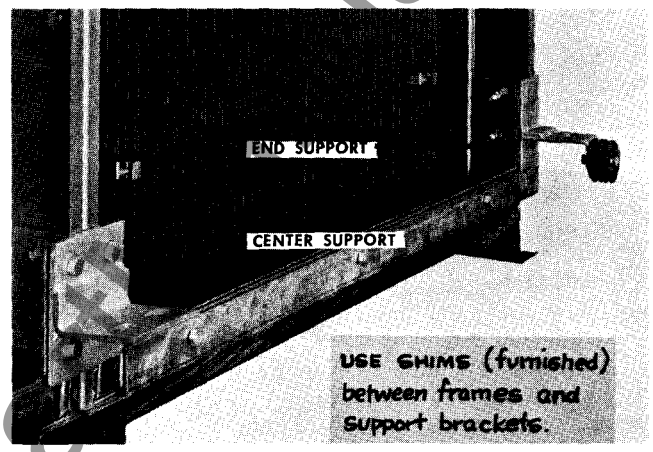


Fig. 14. Bottom Guide Brackets (Down-stream Side)

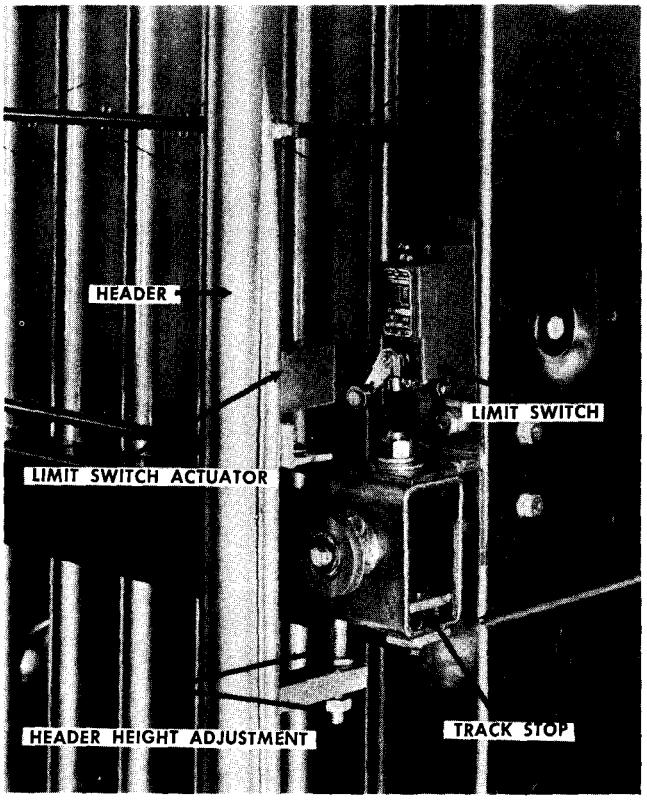


Fig. 15. Limit Switch Position

WASHER ADDITIONS to existing early model cell banks may require drilling frame assemblies at the end, and possibly intermediate positions to receive support brackets for the tracks and guides. Fig. 16 shows size and locations of necessary holes.

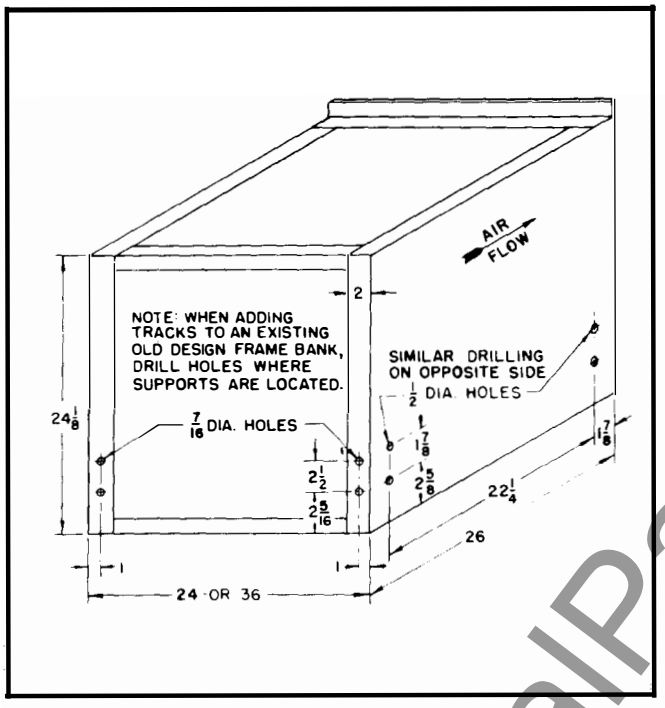


Fig. 16. Drilling for Old Units

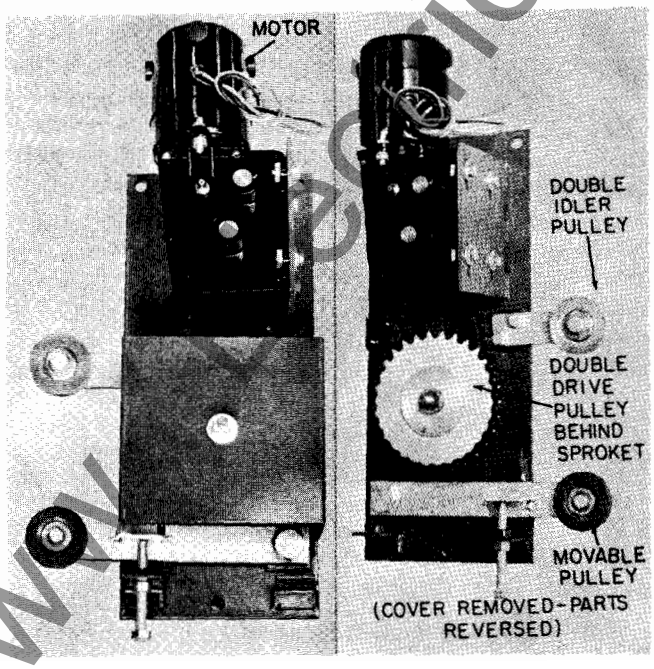


Fig. 17. Header Drive Assembly

HEADER DRIVE ASSEMBLIES (Fig. 17 and 19) are positioned and mounted on an inside duct wall as shown in Fig. 18. Normally this is the wall opposite the duct access doors since this keeps the hoses away from the doorway when headers are in parked position. Either duct wall is satisfactory provided both mechanisms can be correctly positioned and rigidly mounted along the *same side.* Rigid mounting is important. Add additional bracing to the wall for this purpose if necessary. Mechanisms are reversible for right- or left-hand mounting — see Instruction Leaflet 1486-1 packed with the mechanism.

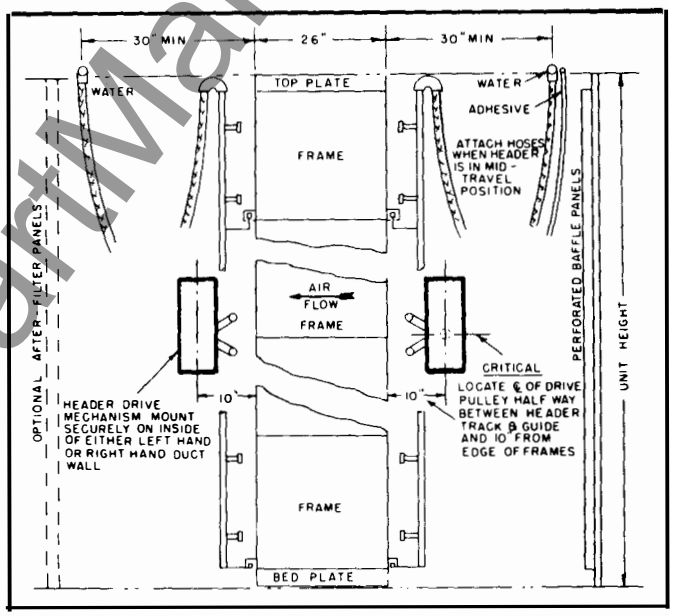


Fig. 18. Location of Drive Mechanisms

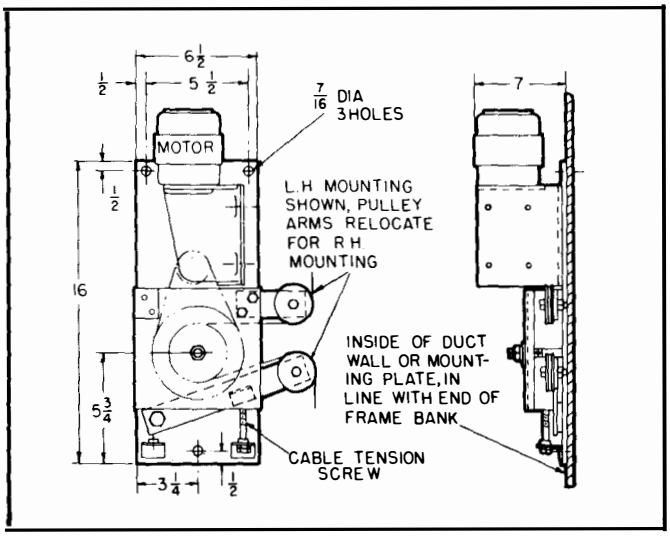


Fig. 19. Header Drive Mechanism

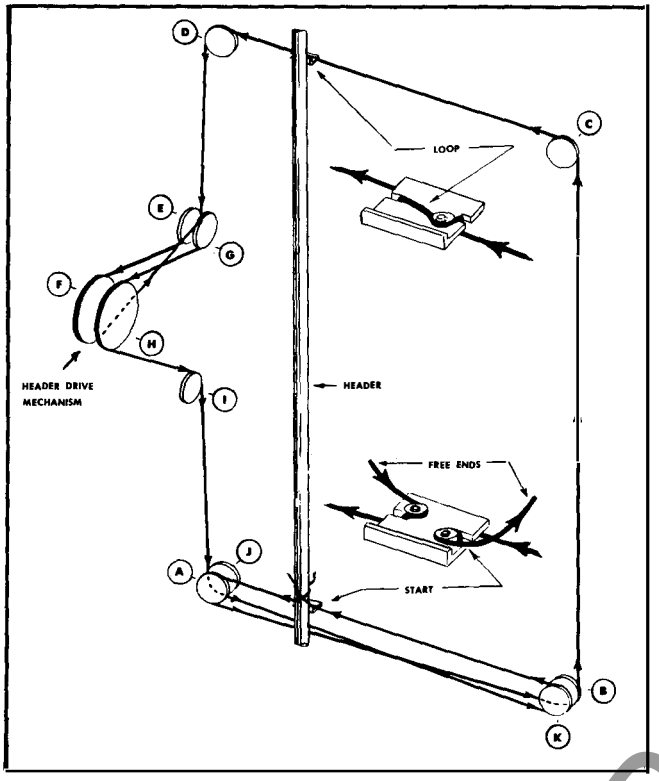


Fig. 20. Cable Routing with Drive Mechanism on Left Side Wall

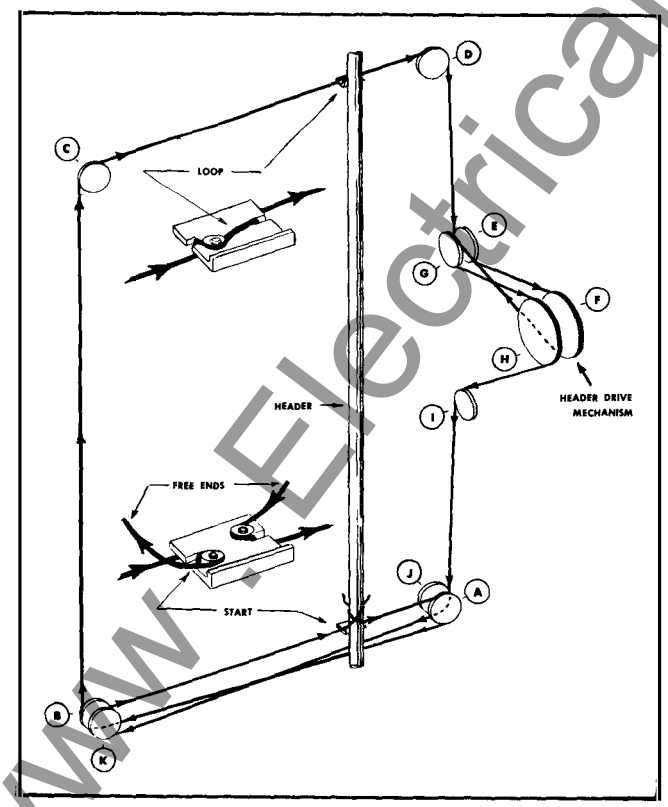


Fig. 21. Cable Routing with Drive Mechanism on Right Side Wall

HEADER DRIVE CABLE should be routed as shown in Fig. 20 *or* Fig. 21 depending on whether the drive mechanism is to the left or right when looking toward the cell bank. Before starting to string cable, remove the cover from the drive mechanism and completely back off the tension screw. See Fig. 19. Move the header by hand to the center of the cell bank and temporarily block in vertical position, using "C" clamps on the track and guide rails.

Start cable stringing by attaching the loose end at the lower cable clamp angle (see detail). Allow 6-8 inches free end. Note that the cable must pass *under* the clamp angle going to pulley Ⓐ.

Continue over and around pulley Ⓐ, under pulley Ⓑ, over pulley Ⓒ and under the upper clamp angle. Loop cable around this angle (see detail). Clamp only enough to keep it from slipping. Continue from under angle and pass cable over pulley Ⓓ and under pulley Ⓔ.

At this point, uncoil the remainder of the cable, keeping it free of knots. Feed the free end behind the roller chain and over and around drive pulley Ⓕ located behind the sprocket. Feed the free end through a second time to pass over pulley Ⓗ. Work slack cable around the loop thus formed until it is just long enough to reach pulley Ⓖ. Twist the loop ½ turn and slip it on pulley Ⓖ. This makes the cable cross-over between pulleys Ⓕ, Ⓖ, Ⓗ. Position cables in the proper grooves and continue stringing over pulley Ⓘ, under pulley Ⓙ, under and around pulley Ⓚ and back to the lower cable clamp. Note that the cable must pass *under* the clamp angle. Do not cut cable at this time.

Pull out sufficient slack to keep the cable on the pulleys, *but no more*. Snub under the clamp screw and around the pipe. Re-check cable routing against appropriate diagram and cut off surplus cable, leaving 6-8 inches face end.

Remove temporary blocking on the header. Align the pipe vertically before finally tightening the top cable clamp screw. Tighten the tension screw on the drive mechanism *by hand* only until remaining slack disappears. *Do not tighten cable enough to bend the end guide pulleys.* Final cable adjustment is made later with the header operating and then tightened only *enough* so that the header moves without faltering.

In operation, the cable need not and should not be taut. The double turn around driving pulleys Ⓕ and Ⓗ develops sufficient torque to drive the header properly.

Replace the cover on the drive mechanism as the final operation.

FIXED BAFFLES are furnished as panels 2′ or 3′ wide by 4′ or 6′ high — in the proper quantity and combination to match the active face area of the PRECIPITRON unit. For adding rigidity to the perforated metal, each baffle section has a steel frame with a 2″ flange on all four sides. Flanges are punched for ⅜″ bolts (supplied with each baffle) for bolting together.

Baffles are installed across the duct or plenum, on the inlet side of the PRECIPITRON unit. They must be mounted far enough away from the unit to allow the necessary space for hose clearance and access to the unit. (See Dimension Sheet 1435 supplied with the order.)

To withstand the air pressure, *fixed baffle assemblies must be reinforced*, and rigidly anchored to the floor, side walls, and ceiling of the plenum. Due to the variations in plenum sizes and construction, such reinforcing as may be required must be provided by the customer as a part of the installation. A suggested arrangement, using 2″ standard angle is shown in Fig. 22. All openings around the top, bottom and sides of the baffle wall should be sealed, to make effective use of the restriction imposed by the perforated metal.

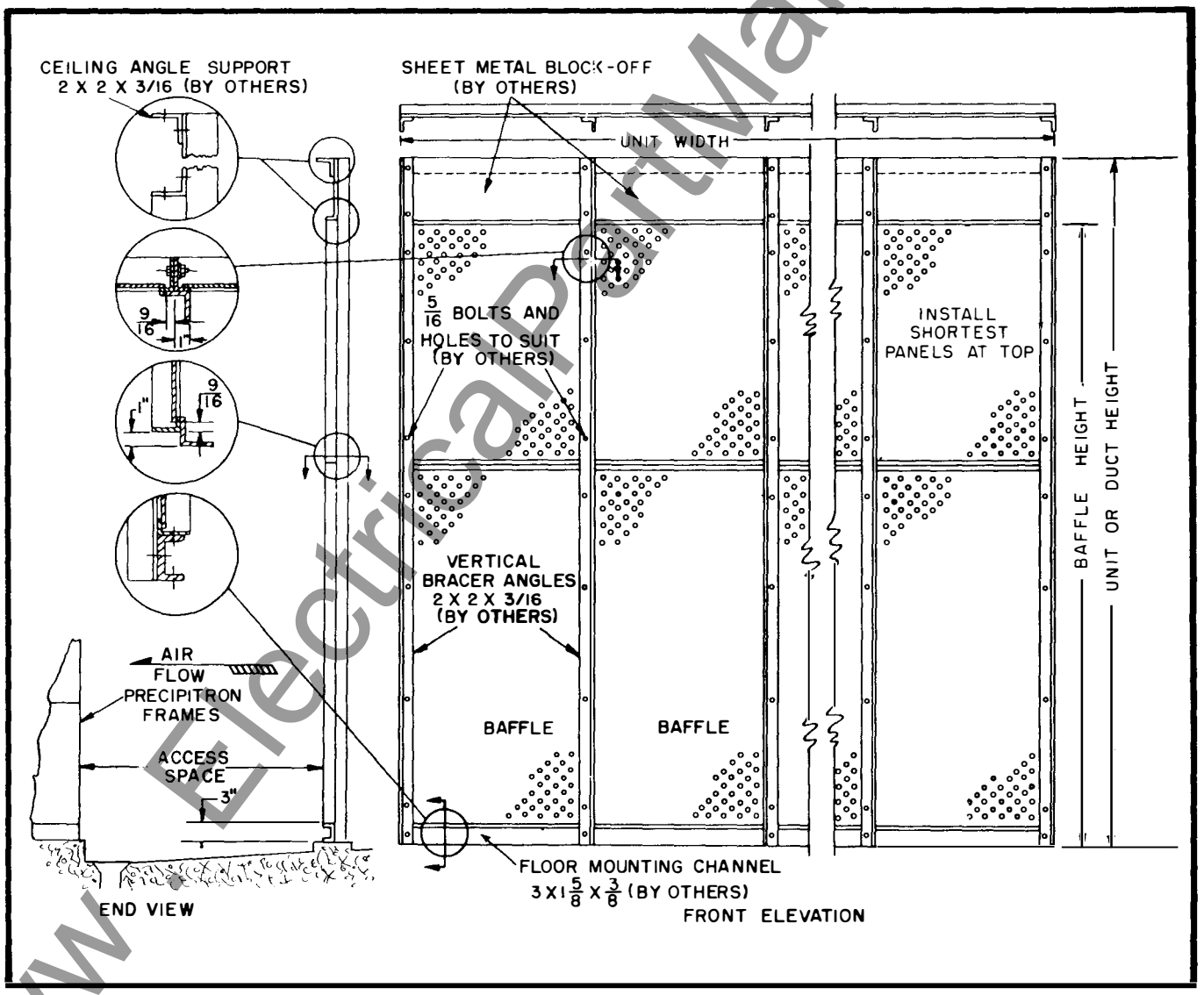


Fig. 22. Fixed Baffle Mounting

AFTER FILTERS (optional) are located downstream from the PRECIPITRON unit sufficiently to allow hose clearance and access space — see Dimension Sheet 1435 supplied with order. Sufficient 16″ x 25″ holding frames, filter panels and hardware are furnished to match the active face area of the PRECIPITRON. Customer furnishes all other items needed for erection. See Fig. 23.

It is good practice to elevate the bottom row of frames above the curb or foundation level. The entire framework should be centered so there will be equal spaces between the ends of the framework and the duct walls. These spaces as well as the space at the top of the framework are finally to be sealed.

Holding frames are all to be stacked with the 16″ dimension horizontal and the 20″ dimension vertical. Select enough frames for one *vertical* section and lay these out on a flat level surface. Rivet together. Continue in this manner until the column is completed. If not too tall, the second column may be assembled along with the first, otherwise move the first in final position and bolt the others up with #10-32 x ⅜″ screws as the work progresses.

Depending upon installation conditions, banks over 5 frames and 6 frames wide may require supplemental bracing. This may be a flat strip of metal bolted between frames or a light angle attached to frames along a junction line.

Caulk joints where necessary and seal all openings above and around the filter bank as shown in Fig. 15. (Minnesota Mining & Mfg. Co. EC-801 or EC-750 are recommended caulking compounds.)

When all frames are in place, the fasteners furnished should be installed. Two fasteners are used with each frame. The filter panels may then be installed.

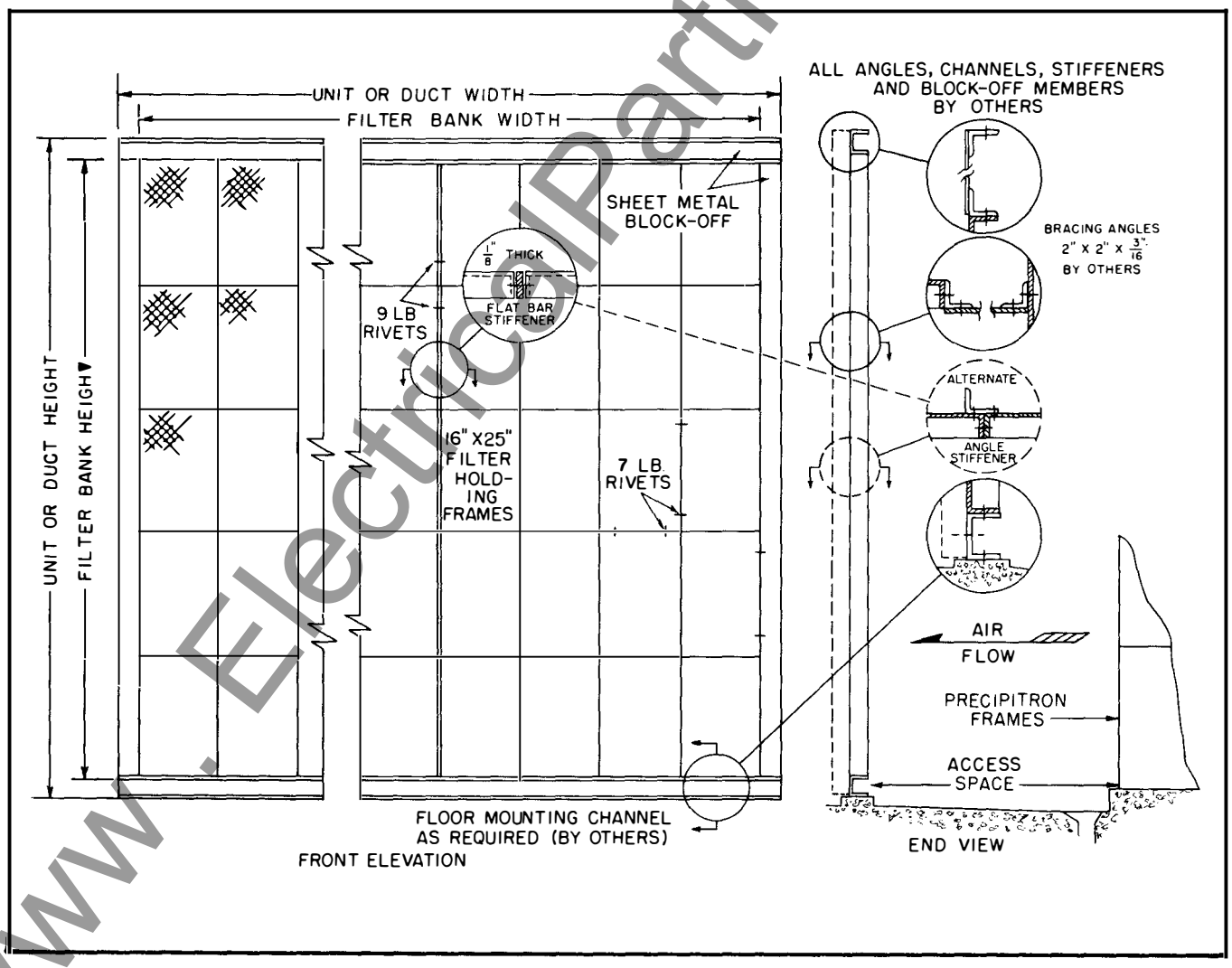
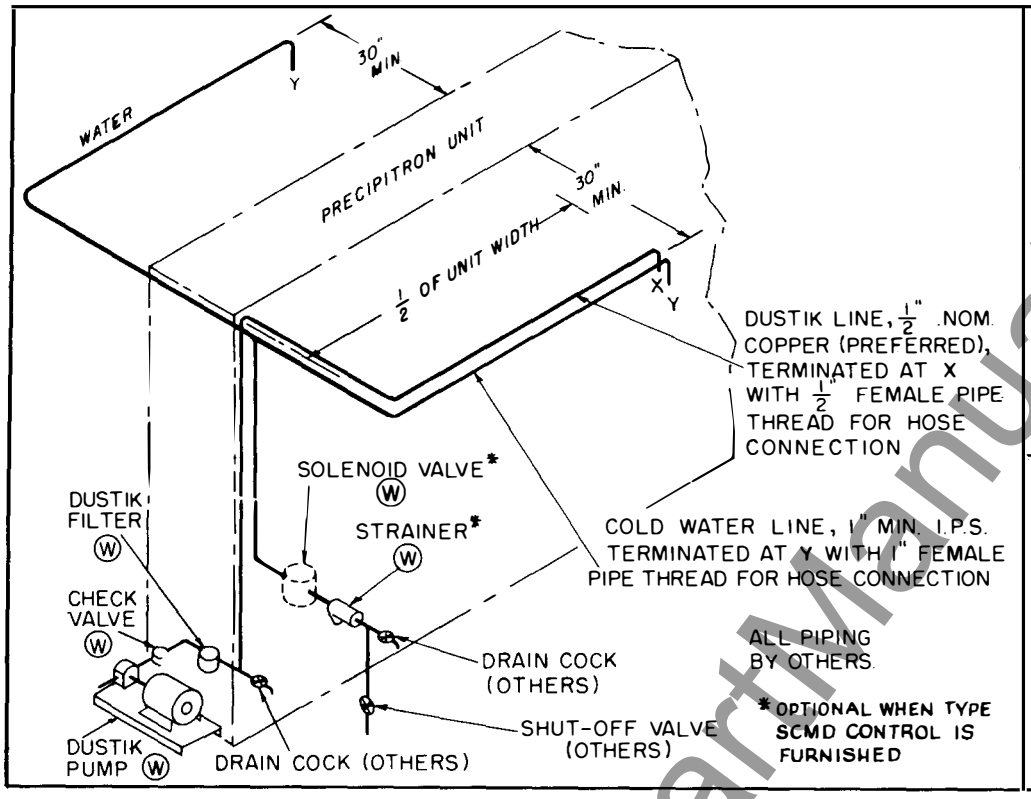


Fig. 23. Typical Assembly of Filter Holding Frames



WATER REQUIREMENTS

Temp. 40-100 F

Running pressure 30 psi min.

GPM REQUIREMENTS

Unit Height	30 psi	40 psi	50 psi
4 ft.	9	11	12
6 ft.	13	16	18
8 ft.	17	20	23
10 ft.	21	25	29
12 ft.	25	30	35
14 ft.	29	35	40

Average water running time 1.1 minute per foot of unit width.

DUSTIK REQUIREMENTS

Temp. 40-100 F

Running pressure 40 psi

Average usage per wash equals 1/3 pint per square foot of face area.

Average usage per year equals 1.5 gal. per 1000 CFM PRECIPITRON unit capacity.

Fig. 24. Water and Adhesive Piping

WASH WATER should be clean and at ordinary tap temperature. The source should be capable of supplying the required G.P.M. (See Table Fig. 24) at a *running* pressure between 30 and 50 psi, neither lower or higher. If water may contain dirt, strainers or filters (not furnished) must be provided.

WATER PIPING (customer) should be at least 1" ips. If water pressure is low, or lines are long or *vacuum breakers* are required by local plumbing codes, larger pipe should be used. Piping should include a shut-off valve convenient to the unit control center. *Keep water lines clean during installation.*

WATER SOLENOID VALVE and strainer (1-¼" ips) is furnished when SCPD fully automatic control is used. It is optional, and must be purchased when SCMD manual control is specified. See Fig. 24.

DUSTIK PIPING (customer) is required for the upstream header *only*. Use *copper* pipe, ½" nominal diameter or larger if piping is longer than 35 feet. *Clean piping thoroughly before installation.* Install filter where convenient.

COLD WEATHER PRECAUTIONS. To prevent freeze-up in water and DUSTIK lines, piping should be pitched and equipped with drain cocks (customer). Hoses may be disconnected at the unions for drainage.

DUSTIK PUMP (Fig. 25) is installed outside the duct close to the center of controls. Pump includes a check valve on the discharge, hose for drawing DUSTIK from a container and a built-in pressure regulator.

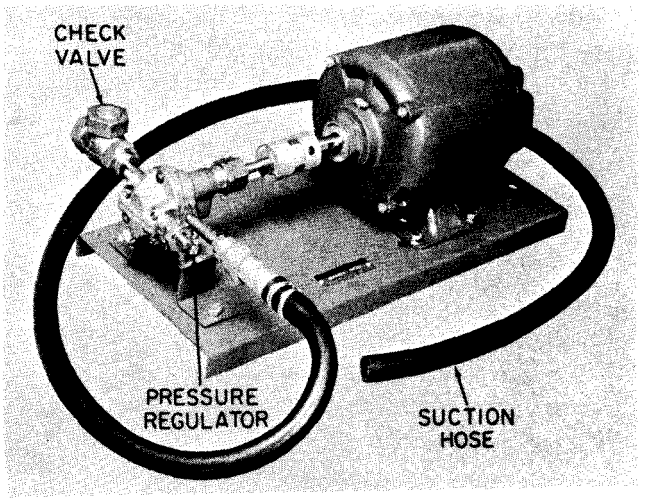


Fig. 25. Dustik Pump

HOSES for water (1") and adhesive (½" oil resistant) with terminal fittings are furnished. *Position headers at the center of the cell bank and remove all twists before tightening fittings.* Hoses should drape naturally.

LOW VOLTAGE WIRING

Nominal 120 volt, 60 cycle, 1 phase primary power is required. Taps are provided in the power packs for 110 volt and 120 volt primary. Stable primary voltage is important. Fluctuations beyond 3 to 4 volts must be corrected by voltage regulators or other means to insure proper operation of the PRECIPITRON. Low voltages result in reduced efficiency, and high voltages may cause excessive arcing and shortened rectifier life.

Depending on the Control used, low voltage wiring is as shown in Figure 33 or Figure 34. The 120 volts supplied to the power packs should be run in conduit. All low voltage wiring located inside the duct should be installed in conduit and made watertight. See Figure 26 for typical layout of low voltage components.

CONTROL PANEL. Wiring for the standard SCPD Controller (Figs. 27 and 28) is shown in Fig. 33. Wiring for the optional SCMD Controller (Figs. 30 and 31 is shown in Fig. 34.

TIME CLOCK CONTROL. When specified on the order, Type EC Time Clock Controller will be supplied to work in conjunction with the SCPD Controller. This should be mounted adjacent to the SCP Controller and wired as shown in Figure 33.

POWER PACKS (Figure 29) should be wired as shown on the appropriate wiring diagram. See instruction book and wiring diagram included with the power pack.

HEADER DRIVE MOTOR (Figure 17) is equipped with a 1/2" threaded nipple for conduit and should be wired as indicated on the appropriate wiring diagrams.

DUSTIK PUMP MOTOR (Figure 25) should be wired as indicated on the wiring diagrams.

MAGNETIC CONTACTOR (supplied only with three or more power packs) should be mounted adjacent to the power packs and wired as indicated in the appropriate wiring diagram. This contactor is provided to prevent overloading of the interlock switches where three or more power packs are supplied.

RED PILOT LIGHTS (Figure 32) should be installed above the duct access doors. See Figure 26 and appropriate wiring diagrams. These lights glow when power is connected to the power packs.

DOOR INTERLOCK SWITCHES (Figure 28 — supplied with accessories) should be installed in the two duct doors as a positive means of de-energizing the power packs before the duct may be entered. Any additional doors in ductwork allowing direct access to the PRECIPITRON must also be provided with interlock switches. See Figure 22 and wiring diagrams.

MANUAL SWITCHES (Figure 28 — supplied with accessories) should be mounted inside the duct at the doors as shown in Figure 22. These permit the operator to disconnect the 120 volt supply while he is inside the duct.

DUCT LIGHTS (supplied with accessories) should be installed at the ceiling on each side of the cell bank to facilitate inspection and servicing. See Figure 22 and wiring diagrams.

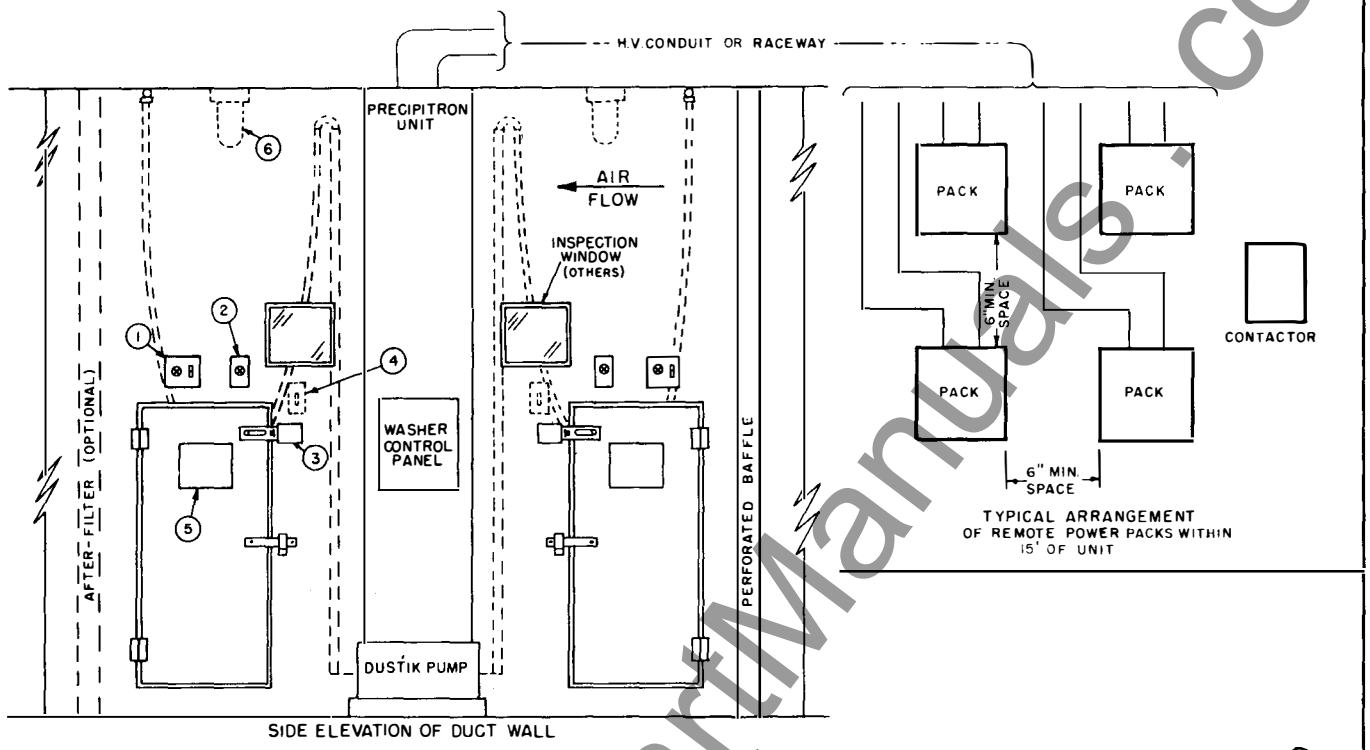
DUCT LIGHT SWITCHES AND PILOTS (Figure 28 — supplied with accessories) should be installed as shown in Figure 22 and wiring diagrams.

LIMIT SWITCHES (supplied with end sheets) should be wired as shown in the wiring diagrams.

SOLENOID VALVE (supplied with SCPD Control) optional for SCMD Control — should be wired as shown in appropriate wiring diagrams.

ELECTRICAL GROUNDING. High voltages are fed from the power packs to the cells and ionizers with single conductor cables. A common ground return is required to complete these circuits, as well as for safety purposes. Connect the power pack cases, the cell bank frame structure and the control boxes to a common ground using solid copper wire. If ground is a water pipe a jumper may be needed around the water meter since some meters are insulated.

NAMEPLATES (supplied in instruction package) are installed on the outside of the duct access doors. See Figure 26. They include a high voltage warning, special cleaning requirements and unit identification.



LEGEND

1 Duct light switch with amber pilot light (2 furnished by Ⓦ).

2 Red pilot light (2 furnished by Ⓦ).

3 Door interlock switch (2 furnished by Ⓦ).

4 Manual switch (2 furnished by Ⓦ).

5 Nameplate and high voltage sign (2 furnished by Ⓦ).

6 Duct lights (2 furnished by Ⓦ).

7 Conduit, fittings and wiring by others.

One power pack may be mounted on unit end or duct wall. Multiple power packs and contactor are best located elsewhere within 15 feet.

Fig. 26. Typical Low Voltage Components

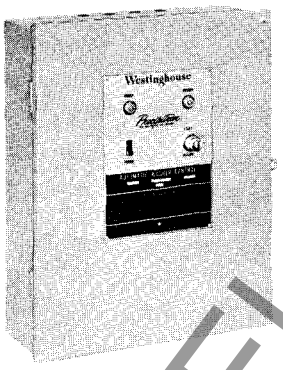


Fig. 27. SCPD Control

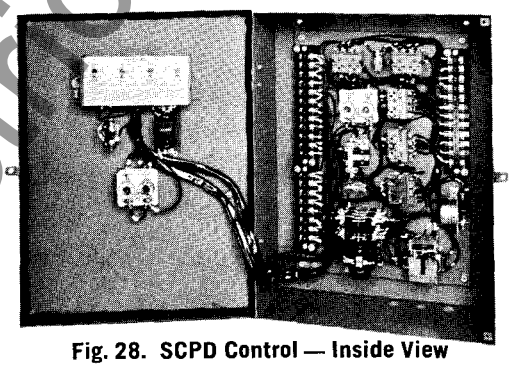


Fig. 28. SCPD Control — Inside View

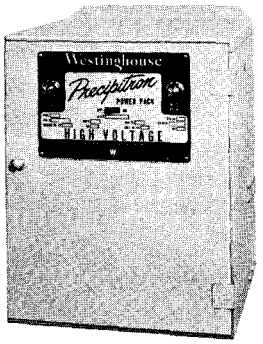


Fig. 29. RF Power Pack

Fig. 30. SCMD Control

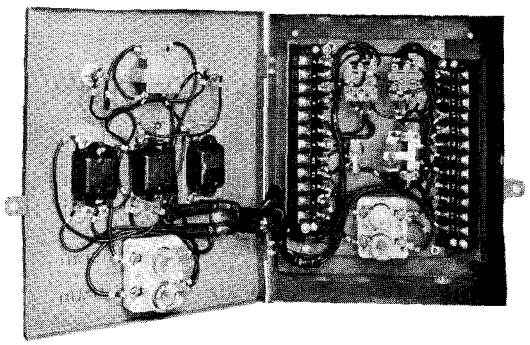


Fig. 31. SCMD Control — Inside View

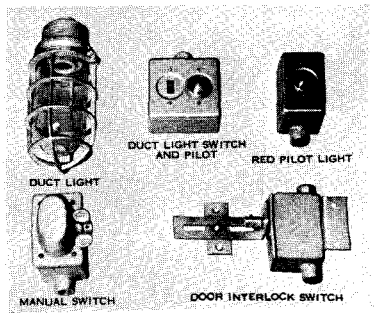
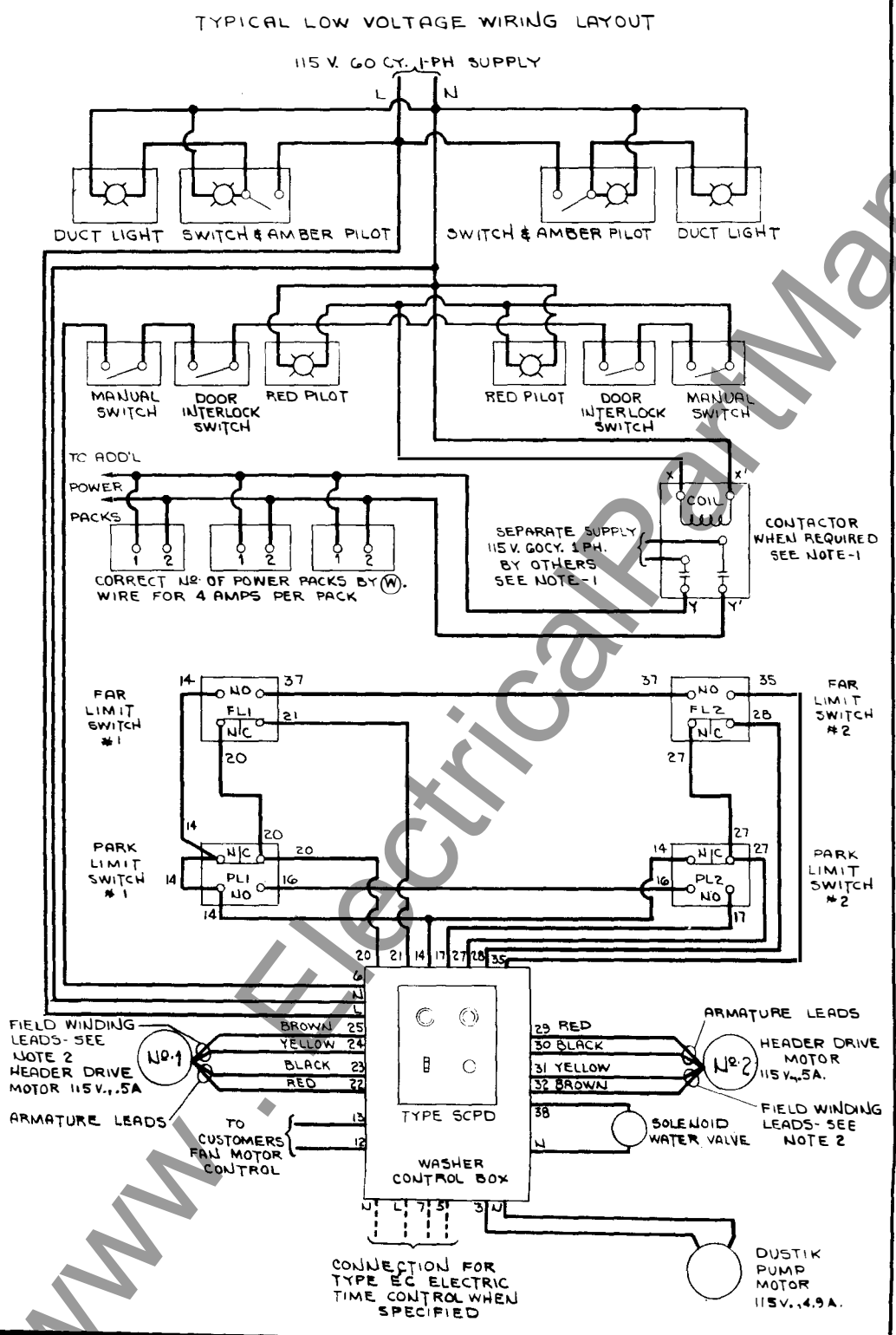


Fig. 32. Electrical Accessories

TYPE SCPD FULLY AUTOMATIC SEQUENCING CONTROL



LEGEND

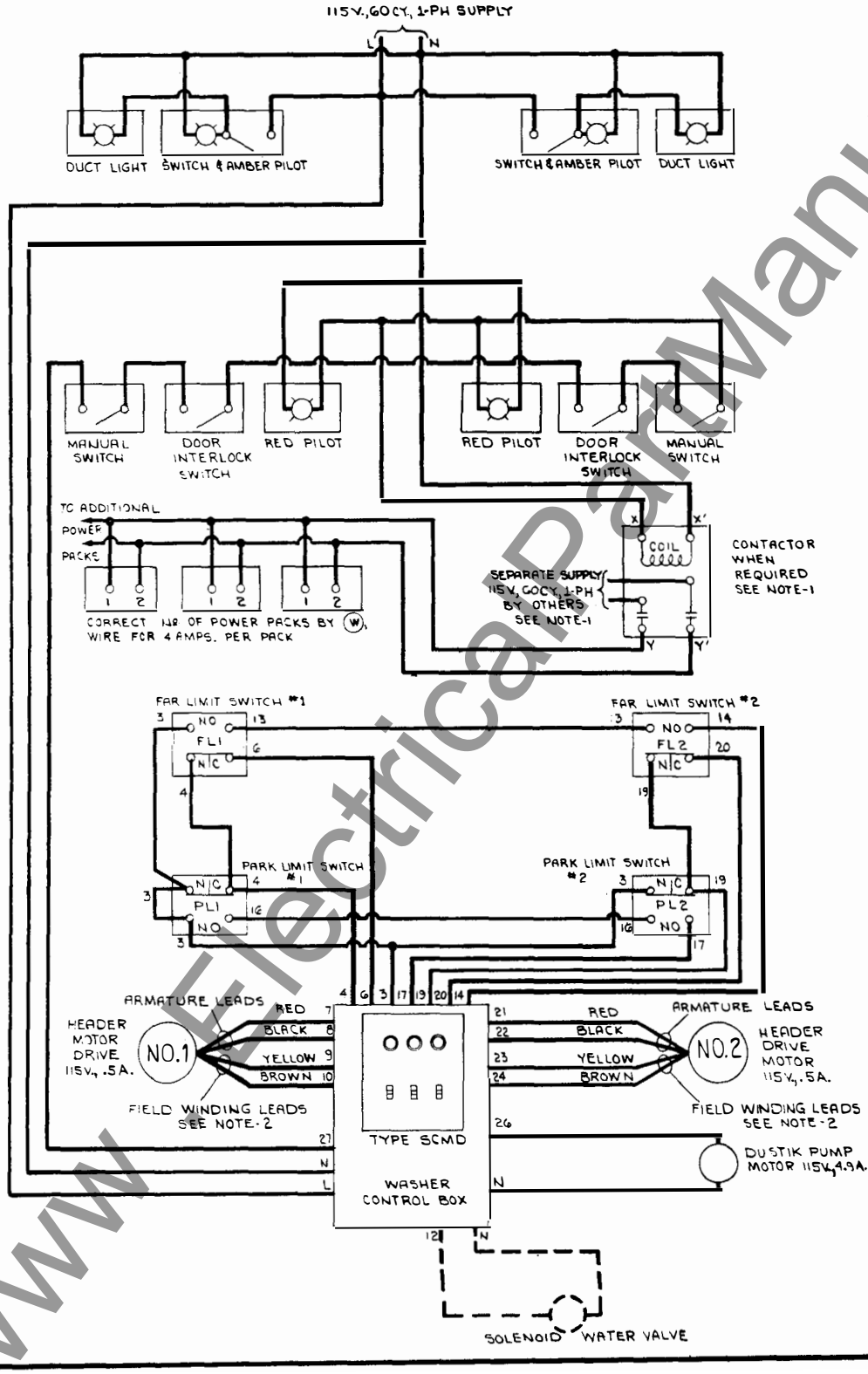
- Wiring by Others.
- Wiring & Equipment by Ⓦ
- Optional.

NOTES

1. For units with 1 or 2 power packs, connect leads x-x' to y-y'. (The contactor & separate supply are not required.) For 3 or more power packs, install contactor & separate supply as shown.
2. Limit switches are shown in free position. Limit switches PL1 & FL1 must be located on same side of unit as header motor #1. Limit switches PL2 & FL2 must be located on same side of unit as header motor #2. For normal operation, headers park against their respective park limit switches holding PL1/NC & PL2/NC contacts open and PL1/NO & PL2/NO contacts closed.
3. Rotation of headers motors must be such that the headers move away from their respective park limit switches when started. Rotation of header motors may be reversed by interchanging the yellow & brown field leads.

Fig. 33. Typical Low Voltage Connections

TYPE SCMD MANUAL SEQUENCING CONTROL (OPTIONAL)



LEGEND

- Wiring by others.
- Wiring and Equipment by (W).
- Optional.

NOTES

1. For units with 1 or 2 power packs, connect leads X-X' to Y-Y'. (The contactor and separate supply are not required) for 3 or more power packs.
2. Limit switches PL1 & FL1 must be located on same side of unit as Header Motor No. 1. Limit switches PL2 & FL2 must be located on same side of unit as Header Motor No. 2.
3. Limit switches are shown in free position. For normal operation, the headers park against their respective park limit switches, holding PL1/NC & PL2/NC contacts open and PL1/NO & PL2/NO contacts closed.
4. Rotation of Header Motors must be such that the Headers move away from their respective park limit switches when started. Rotation of Header Motors may be reversed by interchanging the yellow & brown field leads.

Fig. 34. Typical Low Voltage Connections

HIGH VOLTAGE WIRING

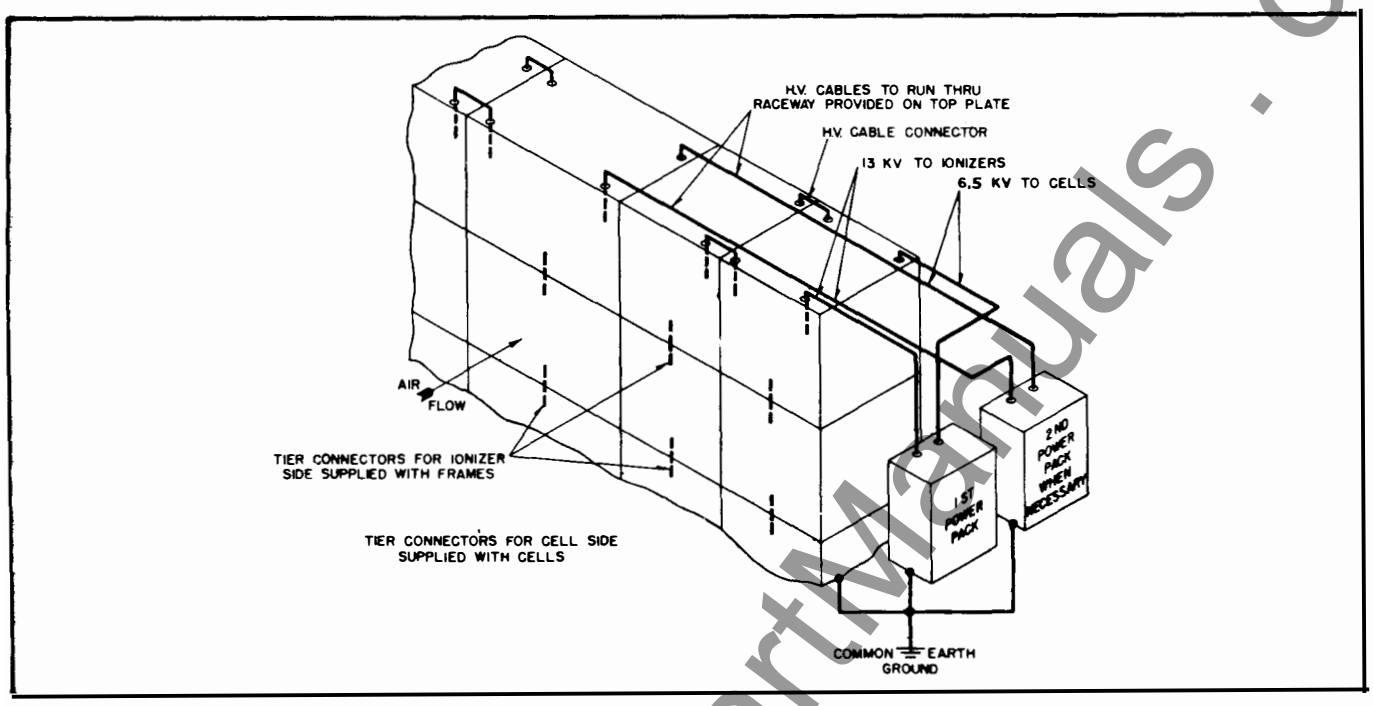


Fig. 35. High Voltage Connections

HIGH VOLTAGE CONNECTIONS (Fig. 35) are made up with the following items:

(a) High Voltage Cable — for connections from power pack(s) to the topmost cell and ionizer in a column of frames — furnished in 50 ft. rolls.

(b) High Voltage Cable Connectors — for connections from one column of frames to the next — furnish as short lengths packed with the top plates.

(c) Ionizer Tier Connectors — for vertical connections between ionizers in a column of frames — furnished packed with the frame and ionizer assemblies.

(d) Cell Tier Connectors — for vertical connections between cells in a column of frames — furnished packed with the cells.

(e) Ground Connections — for common connection between unit and power pack(s) — *not* furnished, customer supplies.

HIGH VOLTAGE CABLE. Two cables are required for each power pack; one for connection to ionizers and the other for connection to cells, see Fig. 35. Both should be continuous lengths with no splices. Enough cable is furnished to permit locating power packs up to 15′ away from one end of the cell bank. If power packs are farther away, additional cable should be procured. Only high voltage cable supplied by Westinghouse is recommended.

Cables should be installed in conduit between the power pack and the wiring raceways provided in the top plates. See Fig. 5. Remove covers to make raceways accessible. Open ends of the raceways should be sealed off, either by the duct walls or with sheet metal plates fabricated on the job. Terminate conduits from the power packs in pull boxes near or on the sealed ends of the wiring raceways and use bushings or nipples, as required, to enclose and protect cable in any intervening space.

POWER PACK LOADING. Depending on the size and configuration of the cell bank, one or more power packs will be furnished. Fig. 35 illustrates a typical arrangement of two power packs loaded with four columns of frames. Note that high voltage cables from the 1st power pack connect directly to the top cell and ionizer in the first column. Cables from the 2nd power pack connect directly to the third column. Should the unit extend further, a third power pack would connect to the fifth column, and so on.

POWER PACK CONNECTIONS are made to the terminals shown in Fig. 36. Do not tighten screws excessively.

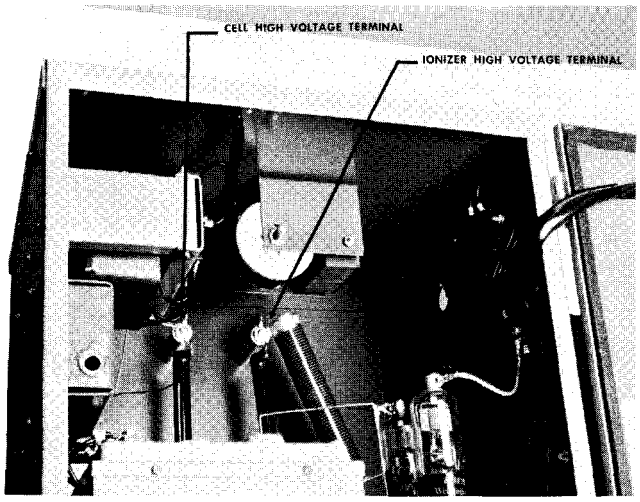


Fig. 36. Power Pack H.V. Terminals

Dimension Sheet 1435 furnished with the order provides a Power Pack Loading Table, showing the number of power packs to be used and the columns of frames to which each is to be connected.

HIGH VOLTAGE CABLE CONNECTORS are used to connect columns of cells and ionizers together where one power pack is sufficient for more than one column. See Fig. 35. These cables thread through the wiring raceways as shown in Figs. 37 and 38.

CABLE TERMINAL CONNECTORS. Fig. 37, are packed with top plate hardware and are to be installed as shown. Draw cable out of the raceway to form the loops.

IONIZER TIER CONNECTORS are semi-circular spring wires, packaged with the frame hardware. The hairpin ends plug into slotted openings of the ionizer frame inside the ionizer wire support. Position these within the third or fourth wire supports from the end of the ionizer, so the loop will be clear of the grounded framework. Use one connector between ionizers. See Fig. 37.

CELL TIER CONNECTORS are lengths of aluminum rod packaged with the cells. Install them vertically between the cell terminals as shown in Fig. 38. Either terminal may be used, but only one connector between cells is required.

ELECTRICAL GROUNDING. High voltages are fed from the power packs to the cells and ionizers with single conductor cables. A common ground return is required to complete these circuits, as well as for safety purposes. Connect the power pack cases and the cell bank frame structure to a common ground using solid copper wire.

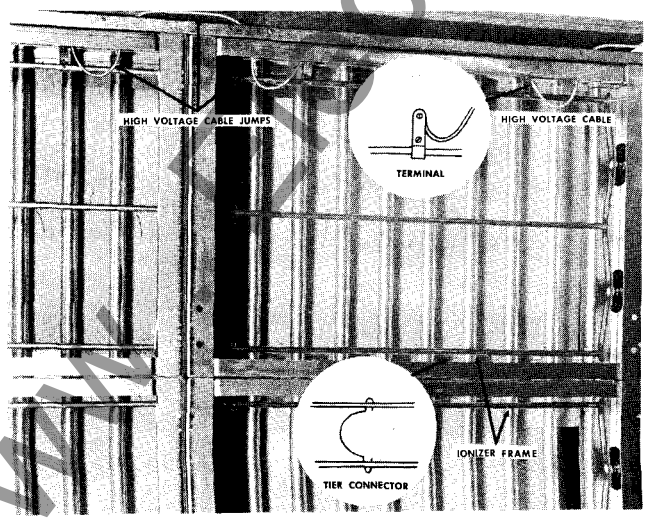


Fig. 37. Ionizer Connections

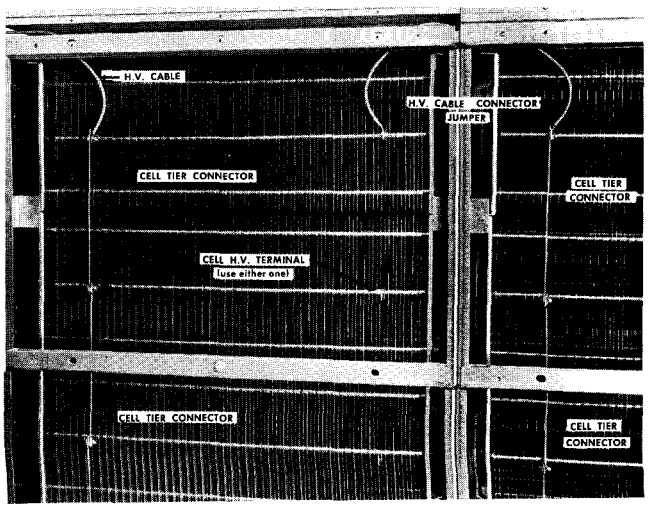


Fig. 38. Cell Connections

INSPECTIONS, CHECKS & ADJUSTMENTS

Before the PRECIPITRON unit is ready for starting, the following points should be checked and verified by the installer: —

1. **CELL BANK** — should be sealed off within duct to prevent any by-passing of dirty air.
2. **OUTSIDE AIR INTAKE** — should be screened and protected against entrance of rain, snow and trash.
3. **AIR FLOW** — Air system should be balanced to make sure cfm does not exceed PRECIPITRON rating and that high or low velocity areas do not differ from rated velocity by more than 10%.
4. **DRAINS** — should carry away all water collection in drain basin. Openings should be capped.
5. **HOSES** — should drape naturally with no twisting or mechanical interference.
6. **COLLECTOR CELLS** — All cell plates should be evenly spaced and undamaged.
7. **IONIZERS** — Wires should be in place, under slight tension and evenly centered between ground tubes.
8. **HIGH VOLTAGE WIRING** — All cables and connectors should be installed.
9. **GROUNDING** — Cell bank and power pack cabinets should be grounded to a common point.
10. **LOW VOLTAGE WIRING** — should check with diagrams on Dimension Sheets supplied with order.

    (a) Duct lights should operate with duct light switches.

    (b) Red warning lights and power packs should come *ON* when duct door switches are closed and *POWER* switch on controller is operated. (On SCMD controller, first move PRECIPITRON-WASHER switch to PRECIPITRON)

    (c) Red lights and power packs should go OFF when either access door switch is operated.

OPERATIONAL CHECK OF WASHING AND DUSTIK SYSTEM. Check first without water and DUSTIK and then with full use of these facilities. During the "dry run" turn off the hand water valve and do not use DUSTIK Adhesive.

SCPD CONTROLLER is set up for operational checks by first making sure all test switches (inside cabinet) are in AUTO position and then closing POWER switch. *Do not operate push button;* use the test switches. All controller functions may be stopped at any time by turning off POWER switch. (Similarly, on optional SCMD CONTROLLER, make sure WASHER-DUSTIK and HEADER switches are OFF, move WASHER-PRECIPITRON switch to WASHER and then close POWER switch).

Functional checks are as follows:

1. **Washer Pilot Light** — should glow when controller is switched from PRECIPITRON to washing function.
2. **Header Operation** — both headers should move from parked position upon operation of HEADER switch. CHECK these points: —

   (a) Motor Rotation — If reversed, interchange motor leads as shown on low voltage wiring diagram.

   (b) Header Travel — Should be smooth, without faltering. Correct track alignment and adjust cable tension, if necessary.

   (c) Limit Switch Operation — Headers should operate limit switches at both extremes of travel.

   (d) Hoses — Should swing freely without twisting or interference. Cut out surplus hose if necessary.
3. **Water Solenoid Valve** — should click open upon operation of switch.
4. **Dustik Pump** — should run upon operation of switch. Correct rotation is clockwise when facing shaft end of pump.

After the "dry run" is complete, full operation should be tested using water and DUSTIK. Check the following points during this test:

1. All water and DUSTIK nozzles should give full spray pattern over all cells.
2. The slots in the nozzles should be vertical.

Refer to wiring diagram included with Type EC Time Clock Control for operational check.

STARTING THE UNIT. When the above checks have been made, a Westinghouse Service Representative should be requested to check installation, adjust power packs and start the PRECIPITRON. Representatives of all erecting contractors and the owner should be present to facilitate any corrections and to receive operating instructions. The initial supply of DUSTIK adhesive and all instruction books should be available for this inspection.

OPERATION

PRECIPITRON electronic air cleaner uses strong electrostatic forces to precipitate or settle dust particles on metallic collector plates. This very efficient method of cleaning air results in the effective removal of smoke and extremely small dust particles which will pass through an ordinary filter. These tiny particles are the principal cause of smudging soiling and damage from airborne dirt.

Because **PRECIPITRON** will collect a large volume of dirt from the air, regular disposal of collected dirt is important for satisfactory operation. To simplify this requirement, PRECIPITRON employs water washing with moving sprays to flush dirt out of the collector and down the drain.

DUSTIK Adhesive fluid is applied each time the collector is washed (a) to hold dirt on the dust collector plates as it is precipitated and (b) to keep the deposited dirt soluble and washable with cold water. Westinghouse adhesives are compounded to provide the proper balance between dirt binding properties and washability. Other oils or compounds are not recommended.

IONIZERS. The function of the ionizer element is to electrostatically charge dust particles floating in the air stream. When high d.c. voltage is applied to the fine ionizing wires a charging zone is created in the spaces between the wires and the grounded tube electrodes. Dust particles passing through this zone are charged when the wires are properly energized.

COLLECTOR CELLS consist of two sets of metallic plates, one grounded and the other supported by insulators. When high d.c. voltage is applied to the insulated plates, a strong electrical field is created which causes charged dirt particles to precipitate to the grounded plates.

POWER PACK provides proper high d.c. voltages for the ionizer and cells. In addition, indicating lights show the operating status of the Precipitron unit.

WASH & DUSTIK SEQUENCE. Periodic washing of ionizers and collector cells disposes of dirt removed from the air. DUSTIK adhesive is then applied to the clean surfaces in a thin film to hold dry dust and make the deposit more washable. Frequency of washing depends on the amount of dust in the air. It must be determined by trial after the PRECIPITRON is operating. *Thorough washing after each cycle of air cleaning minimizes possible build-up of insoluble dirt films on working parts* which may interfere with proper operation and later cause costly maintenance.

The washing sequence comprises the following steps requiring approximately 1½ hour total time.

1. Shut down fan.
2. Turn off power pack(s).
3. Wash for 10 or more cycles of the spray header.
4. Allow 20 minutes minimum water drain time.
5. Spray DUSTIK for one cycle of spray header.
6. Allow 40 minutes minimum DUSTIK drain time.
7. Turn on power pack(s).
8. Start fan.

SCPD CONTROL performs the WASH and DUSTIK sequence automatically. Test switches permit manual control of various operations when desired. Drain times are established by a timer in the controller.

Internal wiring is shown on a diagram inside the cabinet, also on Dimension Sheet 1484 furnished with the order. *It should be noted* that the SPCD control includes only an isolated electrical contact for controlling the fan starter. To permit independent fan operation or prevent the fan from starting at the end of the automatic sequence, fan starters must incorporate an ON-OFF-AUTOMATIC SELECTOR SWITCH, connected as shown in the diagrams.

SCMD CONTROL provides manual switches to control various operations in the WASH and DUSTIK sequence:—timing of the wash cycle and drain periods is done by the operator. Internal wiring is shown on a diagram inside the cabinet, also on Dimension Sheet 1482 furnished with the order.

INLET BAFFLES assist in equalizing air flow through the PRECIPITRON and prevent large or stringy objects from reaching the collector cells. AFTER-FILTERS (optional) assist in arresting water carry-over during washing and adding resistance for additional improvement of air distribution plus serving as emergency air cleaners.

PROTECTIVE DEVICES include screw operated (time delay) switches in the power pack and at duct access doors to open the 120 volt supply and delay access to high voltage parts until the charge has drained off to a safe value. *These switches should not be tampered with* even though the time consumed in turning the screw may seem unreasonable. Red Warning Lights show when power packs are energized. Manual Switches permit the operator to disconnect all power packs while he is inside the duct. Signs on the duct doors include a warning of high voltage. Duct Lights facilitate safe inspection and maintenance.

MAINTENANCE

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

INSPECTIONS. A simple daily inspection of the power pack indicating lights is recommended to assure that the unit is energized while air is flowing through the cell bank.

INSPECTION BEFORE WASHING when the cells are coated with dirt will indicate the overall operation of the PRECIPITRON.

1. Dirty after-filter baffles indicate too infrequent washings, excessive air velocity or operation with the cells de-energized.
2. Some after-filter baffles dirtier than others suggest broken ionizer wires, open high voltage connections or uneven air distribution.
3. Dirt streaks at sides and top of the frame bank indicate by-passing or leakage of uncleaned air.

WASHING AND DUSTIK APPLICATION

FREQUENCY OF WASHING depends upon how much dirt is in the air at the particular location. Average time between washings is every 2 to 4 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 ⅛″ thick. However, even though the unit does not appear too dirty, it is strongly recommended that it be washed at least *once a month*. This is to prevent the possibility of dirt becoming hardened on the cell plates. Based upon the initial inspections, a schedule should be set up for regular washings. This will assist the scheduling of maintenance work and will assure that the unit does not become too dirty. *The fan must be off during the wash cycle.*

With SCPD CONTROL washing and DUSTIK application is accomplished automatically simply by pushing the START button. Operation may be stopped at any point in the sequence by turning off the POWER switch. When the switch is turned on again, pressing the START button will start a new sequence, from the beginning. Operation may also be temporarily stopped for inspections or nozzle cleaning by moving the AUTO-TEST switch to TEST when (but only when) the sequence has reached a water or DUSTIK drain period.

(a) Before pressing the START button turn on hand water valve, and insert the suction hose from DUSTIK pump into the DUSTIK container.

(b) Particularly when the unit is new, check the spray nozzles just before regular washing to be sure that they are not clogged by residual or construction dirt. This may be done with the test switches located inside the panel (fan *must* be turned off manually for this test). It is further recommended that the nozzle spray patterns be checked occasionally thereafter to assure complete washing and DUSTIK during the automatic cycle.

(c) After the CONTROL has completed its full sequence, it is good practice to turn off hand water valve and replace cover on DUSTIK container until ready for next cleaning.

(d) Inspect ionizer and cell parts frequently and repeat washing if not thoroughly clean. This is particularly important if EC Time Clock is used to schedule the washing periods.

With EC TIME CLOCK, washing period should be initially set for 2 weeks, and advanced or reduced as determined from inspections of the cell bank.

With SCMD CONTROL (optional) washing is accomplished by operating the switches as specified on the instruction nameplate. Wash water is turned on and off manually with the hand control valve. When the HEADER switch is turned on (header pilot light glows), the spray header will travel back and forth across the cell bank. When the switch is turned off, the header will continue moving until it comes to rest in the park position.

(a) At start of washing, observe all spray nozzles to be sure that they give a full spray pattern. See HEADER MAINTENANCE if pattern is poor.

(b) At completion of washing (HEADER switch off, header pilot out) turn water off and allow at least 20 minutes for water to drain from the cells.

(c) Inspect ionizer and cell parts for cleanliness and repeat washing if not thoroughly clean.

(d) After washing, apply a coating of DUSTIK Type A adhesive as follows:

1. Insert suction hose (from DUSTIK pump) into adhesive container.
2. With switch in DUSTIK position, the pump will start when the header switch is turned on. Observe all DUSTIK nozzles to be sure they are giving a good spray. One cycle of the header (back and forth) is adequate to coat the cell bank. Once the header has started to travel, turning the HEADER switch to the off position will allow spraying and header travel to continue until both are stopped automatically when the header reaches park position.

(e) Allow at least 15 minutes for excess DUSTIK to drain. Then move switch to PRECIPITRON position. This turns on the power packs (some arcing may occur at the cell plates but this is harmless if it subsides in a few minutes). During drain time remove suction hose from the DUSTIK container and replace cover.

(f) Turn fan on and check power pack lights to be sure PRECIPITRON is energized.

DUSTIK REQUIREMENTS. For successful cold water washing use only Westinghouse *Type A* DUSTIK Adhesive.

COLD WEATHER OPERATION. Washing is not recommended when air temperature is below 34°F. Breaks in cold weather usually permit reasonably regular washings. With a recirculated air system close off the outside (cold) air during washing. Water and adhesive piping should have drain facilities to prevent freezing damage. Hoses have unions for draining. Observe any special instructions on the DUSTIK container label.

HEADER MAINTENANCE. Check the spray pattern of the nozzles at the start of the wash and DUSTIK cycles. Dirt in pipe lines may cause nozzle clogging on new units, but if clean water is used there should be little trouble. The DUSTIK filter should prevent clogging of adhesive nozzles.

Unscrew nozzles to clean. When replacing, be sure slots are vertical. Nozzles should give vertical fan sprays which should overlap to cover the cells. Pressure has much effect on the pattern. High pressure causes misting; low pressure gives poor coverage.

The pressure regulator on the DUSTIK pump should be turned clockwise to increase pressure and counter-clockwise to decrease pressure.

Inspect header drive system occasionally to be sure that cable tension is adequate to drive the header and that the limit switches function properly. *Do not tighten cable excessively* — just enough to keep the header from faltering.

LUBRICATION. Once a year, oil shaft bearings on the header drive mechanism, and grease DUSTIK pump with waterpump grease.

DUSTIK PUMP. If pump vibrates or makes excessive noise, check the pump-motor alignment. Periodic tightening of the packing nut may be necessary to prevent leakage around the shaft. *Motor will overheat if packing is tightened too much.*

DUSTIK FILTER. Inspect replaceable cartridge at least once a year and replace if found dirty.

INLET BAFFLE. Inspect regularly for excessive accumulation of lint and dirt.

DIRT BUILD-UP. Inadequate or incomplete washing leaves a film of dirt which will give trouble if allowed to remain after each washing. If inspection discloses such a film the cause may be: (a) low water or DUSTIK pressures, (b) clogged nozzles, or (c) using other than Westinghouse DUSTIK, *Type A* Adhesive. Should build-up persist after correcting these faults, clean the cells by one of the following methods:

1. Before washing, apply DUSTIK for one cycle (using test switches for SCPD Control). Allow to soak 20 minutes. Wash off thoroughly with several cycles of cold water. Allow to drain and repeat if necessary.

2. If the DUSTIK soaking method fails, a mild detergent may be used. Make a solution of about ½ lb. of detergent (ALL or equal) to each gallon of 100°-120°F water. Filter through a cloth and apply this solution (hot, if possible), to the dirty components and allow to soak 10 to 20 minutes. Thoroughly flush with water (warm or hot if available). Repeat if necessary to get the parts metal clean. It is best to apply the detergent with a separate spray gun to prevent clogging of the DUSTIK system. The System may be used to apply the solution, if it is thoroughly flushed and dried before DUSTIK is used again. Be sure to dry out or replace the DUSTIK filter cartridge.

SPARE PARTS. Like any other equipment in continual operation, maintenance is simplified and improved when spare parts are on hand when needed.

The following parts and supplies are recommended as a minimum.

A. DUSTIK A Adhesive — Sufficient for 60 days' operation.
B. Ionizer Wires — 6 Boxes, 6 per box.
C. Rectifier Tubes — 2 for 1 to 3 power packs, 4 for more.
D. Indicating Lamps — Box of each type.
E. Ionizer & Cell Insulators — 4 ea.
F. Water & Dustik Nozzles — 6 ea.

LOCATION AND CORRECTION OF FAULTS

ELECTRICAL FAULTS can usually be found by careful inspection. Use the CHECK CHART as a guide in localizing possible troubles. Reference to operation checks and operation sections of this book and appropriate Power Pack Instruction Book will aid in diagnosing and correcting faults. CHECK the simpler points first before attempting the more difficult process of elimination.

REPLACING IONIZER WIRES. Occasionally an ionizer will break due to prolonged use or careless handling. Spare pre-looped wires are furnished with the unit, but additional wires should be purchased and kept on hand for use when needed. Remove all pieces of broken wires and discard outside the duct to avoid causing short circuits. Depressing the spring wire holders to obtain slack will simplify hooking the wire loop on the wire holder. Be sure to clip the wire in the center support.

REPLACING TUBES in the power pack may correct an otherwise obscure cause of low operating voltages and efficiency. Keep spare tubes on hand.

REPLACING INSULATORS. Cracked or doubtful insulators should be replaced if they show less than infinite resistance when wet by ohmmeter or megger test. To remove ionizer insulators grasp high voltage framework with right hand near the upper left hand insulator and grasp insulator with left hand. Pull framework away racking the corner inward so insulator may be removed. Remove upper right and lower left insulators in similar manner and finally the lower right. Re-assemble in reverse manner.

CAUTION

When the power pack door is open, parts which operate at high voltage are exposed. Do not touch any part without first "grounding" or otherwise making sure it is not energized. When parts must be energized for testing, use extreme caution.

CHECK CHART — POWER PACK AND CELL BANK FAULTS

	INDICATION OF TROUBLE	POSSIBLE CAUSES	CORRECTION
POWER PACK	Imput Power Light Out	1. Door switch at duct or power pack not closed 2. Supply power off 3. Faulty lamp, parts or wiring in power pack	Tighten time delay screws — check switches Determine cause and correct Follow procedures in power pack Instruction Book
	Output Voltage Light Flickers	1. Cell bank needs washing 2. Power pack needs adjustment	Wash unit — inspect cells for dirt obstructions causing arcing. Follow procedures in power pack Instruction Book
	Output Voltage Light Out	1. Short circuit in cells 2. Short circuit in Ionizers 3. Grounded HV cables 4. Faulty lamp, parts or wiring in power pack	Disconnect cell HV cable in power pack and energize (See Caution) If light now glows, remove dirt from between cell plates or check insulators Disconnect ionizer HV cable in power pack and energize (See Caution) If light now glows, remove broken ionizer wires or check insulators Disconnect both ends and test Follow procedures in power pack Instruction Book
CELL	Continual Arcing (Snapping) in Cells	1. Excessive dirt build-up 2. Rain, snow or large dirt particles entering unit 3. Bent cell plates, obstructions between plates or cracked insulators 4. Improper voltage	Wash unit — See DIRT BUILD UP Improve inlet air conditions — see outside air intake and air washer Observe where repeated arcing occurs and correct fault Adjust power pack
	Washing Does Not Clean Cells	1. Water pressure incorrect 2. Clogged water nozzles 3. Inadequate DUSTIK application	Correct pressure — See WASH WATER Clean nozzles — flush lines — check strainer Clean DUSTIK nozzles, filter and piping — Adjust DUSTIK pump pressure
GENERAL	After-Filters Clogging or Air Not Being Cleaned	1. Inadequate washing 2. Improper air quantity (cfm) or air distribution 3. Missing ionizer wires, excessive arcing or power pack faults	See WASHING & DUSTIK APPLICATION See AIR HANDLING REQUIREMENTS See MAINTENANCE PROCEDURES