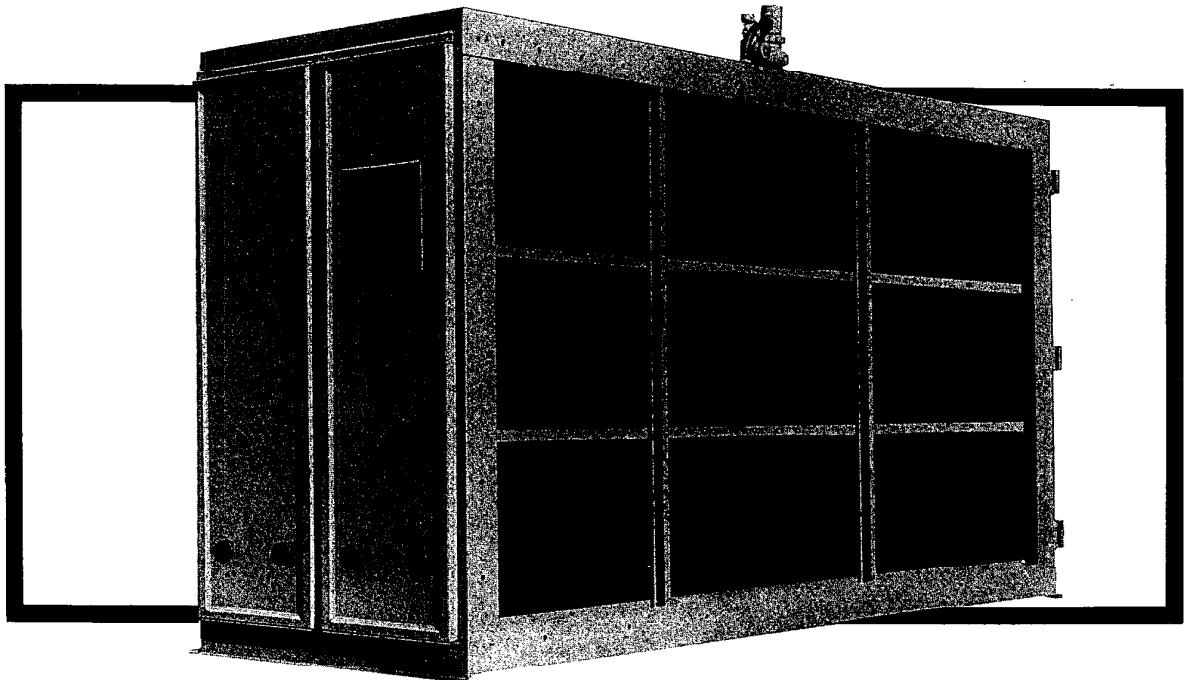


PERFORMAIR^{T.M.} MODEL 3100

ELECTRONIC AIR CLEANER

**INSTALLATION, OPERATION, AND
MAINTENANCE INSTRUCTIONS**



AAF American Air Filter

Installation

Caution:

The PERFORMAIR unit must not be installed in hazardous atmospheres as defined by the National Electric Code. Its application on highly flammable or explosive materials is not recommended. If applied on moderately flammable contaminant such as oil mist, suitable fire control equipment should be installed in compliance with local and national safety codes.

This equipment should be inspected frequently and collected dirt removed from it to prevent access accumulation which may result in flashover or fire damage.

1. SHIPMENT

The standard PERFORMAIR shipment contains:

Collector Cell Housing Section and Washer Section
Collector Cell Elements
Power Pack
Control Box
Viscous Adhesive and Pump Assembly
Miscellaneous Hardware

Check cartons received against shipping papers. If there is any discrepancy, notify the carrier immediately.

2. FOUNDATION

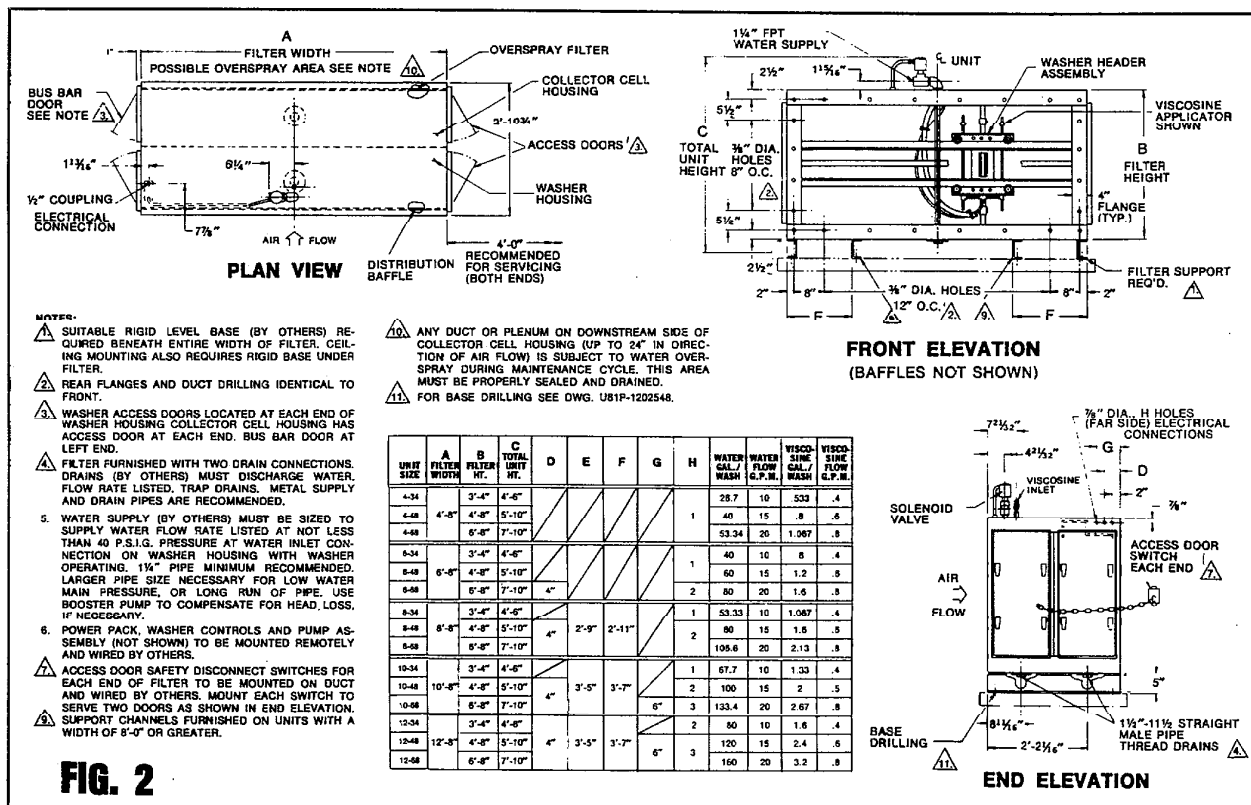
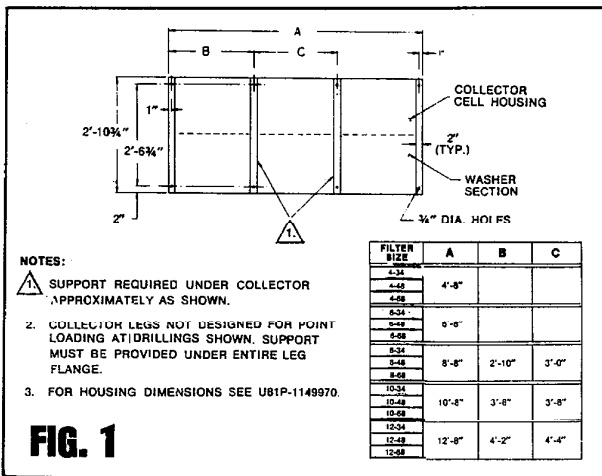
The PERFORMAIR unit requires a level, rigid base. (See Base Drilling, Figure 1.) Larger sizes require additional support under the electrostatic collector using two channels furnished by AAF as shown in Figure 1. DO NOT attach these channels to the electrostatic collector section. Affix them to the support base before placement of the collector cell and washer housings.

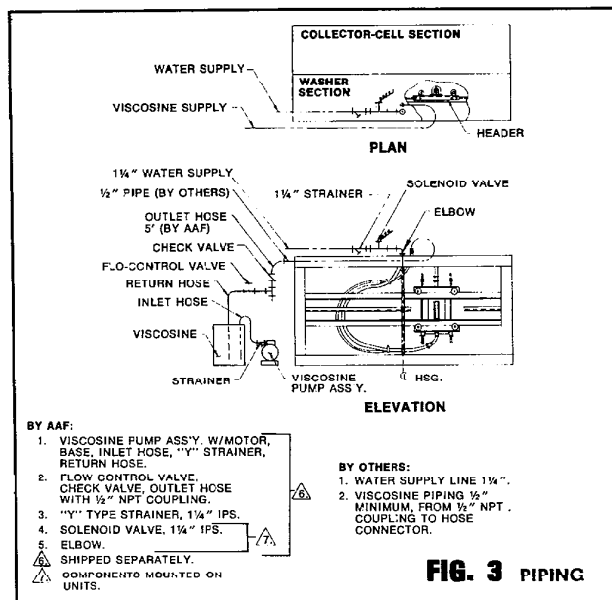
3. CLEARANCE

The PERFORMAIR Model 3100 is serviced through side access doors. At least four feet (4') of clearance is required on the sides of the units for cell removal and maintenance. Service access to the washer solenoid assembly (top) must also be provided. Units above floor level will require suitable platform(s) with guardrails. See Figure 2, Note 1 for base requirements.

4. MECHANICAL INSTALLATION

The unit should be firmly affixed to a support base. The mating faces should be carefully caulked and bolted to prevent outside air infiltration. See Figure 2 for dimensions.





5. PLUMBING INSTALLATION

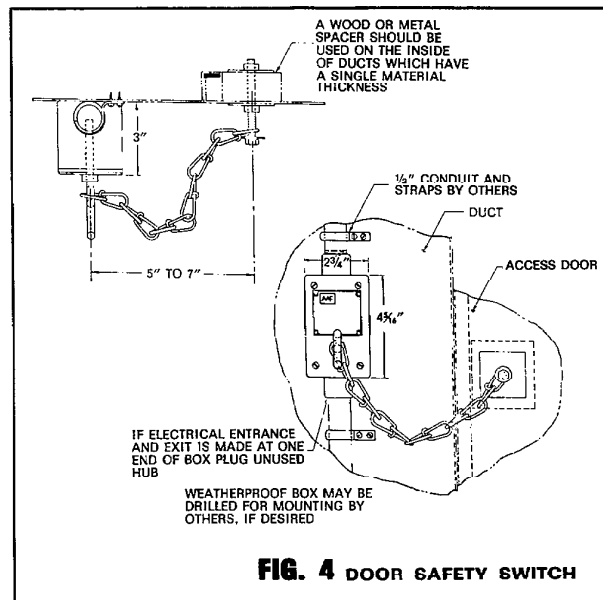
Pipe inlet cold water to the housing 1 1/4" npt connection. Supply water pressure must be at least 25 psig with the washer in operation. Water drains shown on Figure 2 must be used for proper draining. Refer to Figure 3 for installation of adhesive pump. It is recommended that it be placed adjacent to the filter unit.

6. CAULKING

The entire unit must be thoroughly inspected and caulked to prevent water leakage. Caulk all adjoining housing joints and check access doors for snug fit.

7. ELECTRICAL INSTALLATION

Use connection diagram (Figure 7) for wiring to the control box, washer junction box, pump, power pack, and fan starter. The two high voltage leads from the power pack should be run in conduit (1/2") to the 7/8" knockout at the top end of the electrostatic filter. Both the electrostatic filter and the power pack must be grounded. Also, see Power Pack Bulletin CAD-3-200C3F.



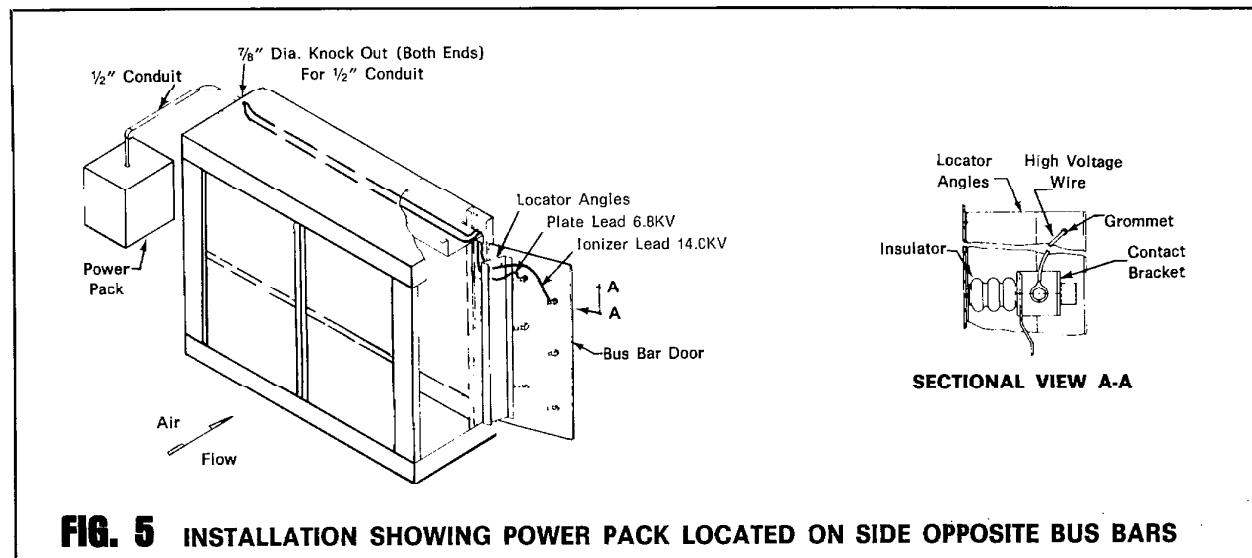
The fan motor is to be wired separately through an appropriate starter by others (230/460 volts, 60 Hz, 3 phase supply). Bring line voltage (120/60/1) to the control box and wire to the other components as indicated in the connection diagram (Figure 7). The control box should be located in the vicinity of the filter to facilitate inspection and maintenance.

Mount and wire filter door safety switches on an adjacent section or duct wall (Figure 4). These provide time delay (about 15 seconds) draining the capacitor voltage to a safe level.

8. WEATHER PROTECTION

The PERFORMAIR unit is designed for inside installation. If exposed to freezing temperatures, the water and adhesive supply and washer solenoid assembly must be protected from freezing. The power pack and the control box should be completely covered or remotely installed inside.

If outside air is to be introduced into the system, suitable weather protection must be provided to prevent free moisture in the form of rain, snow, or heavy fog from reaching the filter. Caution should also be taken to insure all joints are suitably caulked to prevent infiltration of outside air.



9. COLLECTOR CELL INSTALLATION

(Supervised by AAF Service Engineer)

Attach sliding rails to electrostatic collector cells (Figure 6). During installation keep cells in a horizontal plane to prevent damage to the cell plates. The ionizer wires must be on the air-entering side. Insure that the ionizer wire tension pins do not hit adjacent cells.

10. INSPECTION AND START-UP

Insure that all wiring indicated in the connection diagram has been completed. Check the drain pans and filter doors after piping connections are made to insure that there is no water leakage or air infiltration. After inspection, contact the local AAF representative for necessary start-up service (no charge).

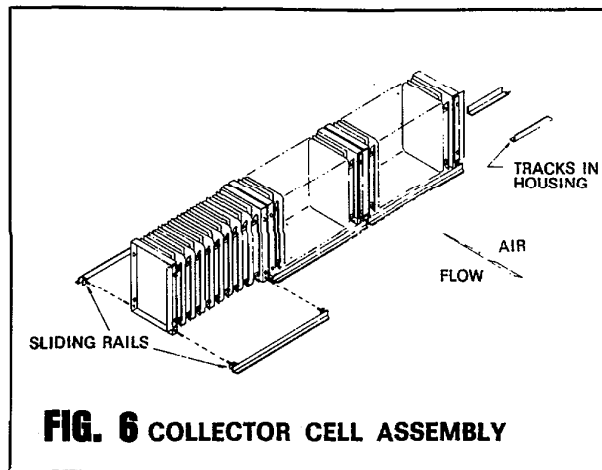


FIG. 6 COLLECTOR CELL ASSEMBLY

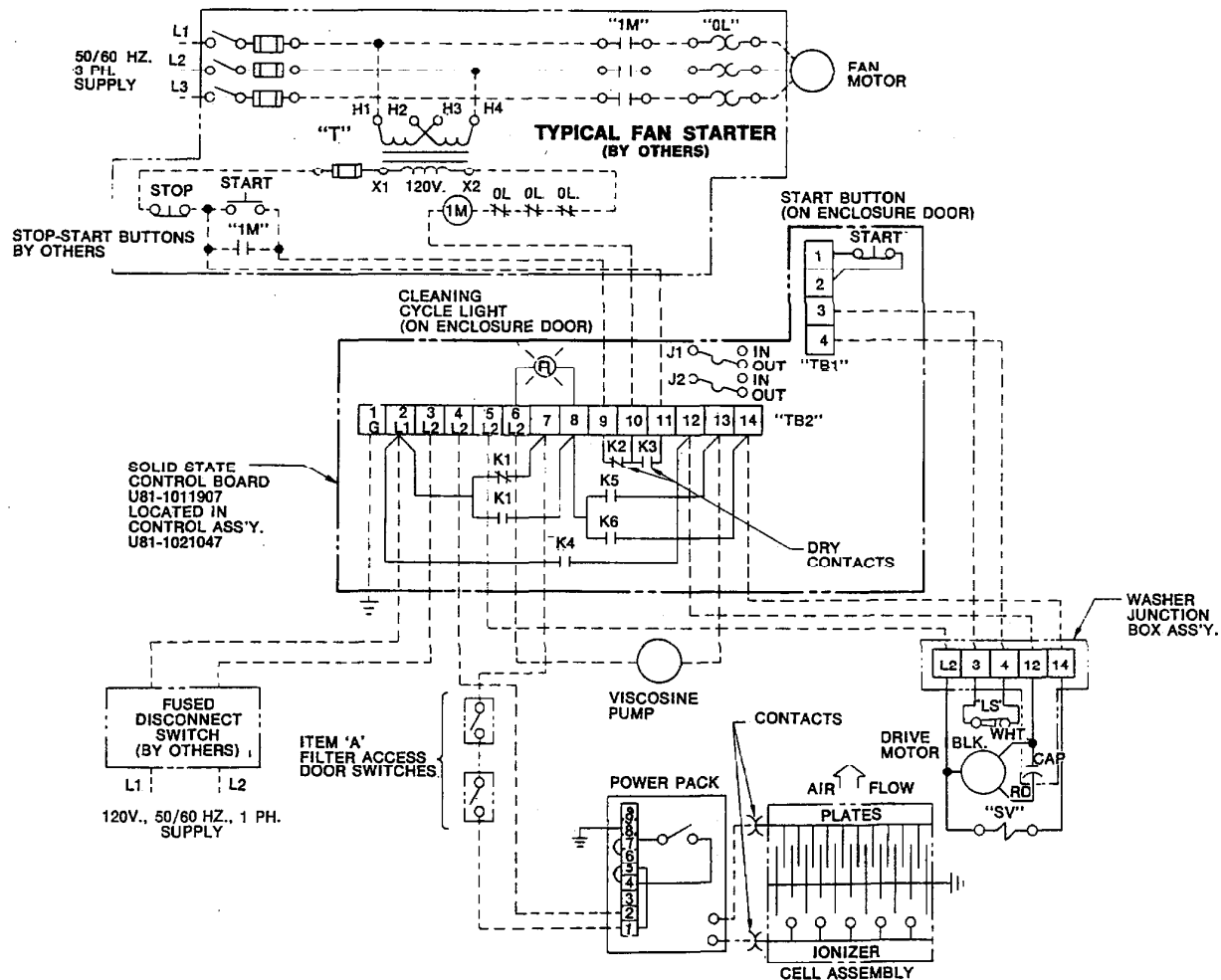
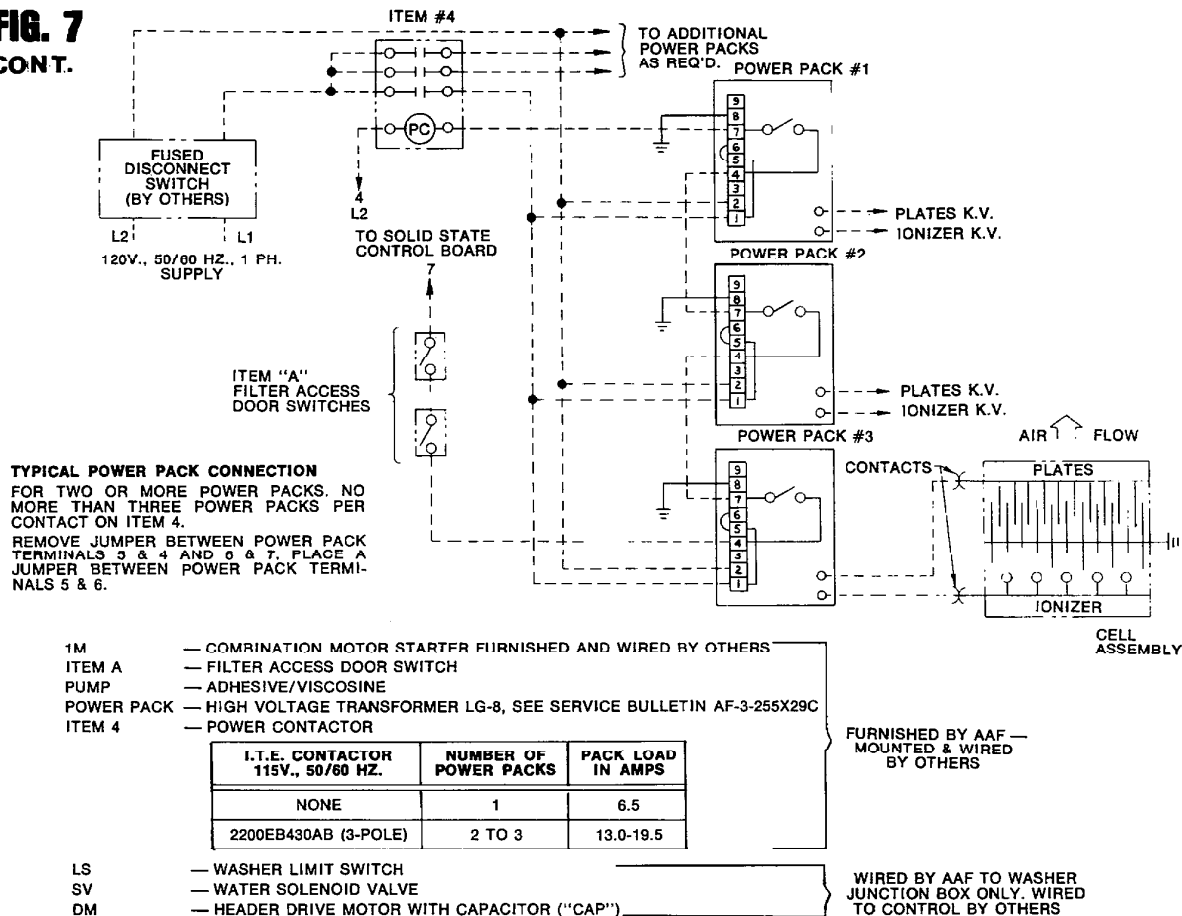


FIG. 7 CONNECTION DIAGRAM

FIG. 7
CONT.



SEQUENCE OF OPERATION FOR NORMAL WASH CYCLE
(JUMPERS "J1" AND "J2" "OUT")

STEP #

0. WHEN POWER IS APPLIED TO CONTROL TERMINALS "L1" AND "L2", UNIT WILL BE IN STEP "0". ALL RELAYS ARE DE-ENERGIZED, THE POWER PACK AND FAN CIRCUITS CAN BE ENERGIZED IN THE NORMAL MANNER. WHEN THE START BUTTON (LOCATED ON THE CONTROL ENCLOSURE) OR THE OPTIONAL REMOTE TIMER (IF USED) IS ACTUATED (NORMALLY CLOSED TO HELD OPEN), THE CONTROL PULSES TO STEP "1".
1. RELAY "K1" AND "K2" ENERGIZE, DE-ENERGIZING THE POWER PACK AND FAN CIRCUITS RESPECTIVELY, THE FAN "COAST TIME" LED (LIGHT EMITTING DIODE) AND CLEANING CYCLE LIGHT ARE ENERGIZED. AFTER APPROXIMATELY 2 MIN., THE UNIT IS PULSED TO STEP "2".
2. THE "COAST TIME" LED IS DE-ENERGIZED AND RELAYS "K4" AND "K6" ENERGIZE, ENERGIZING THE HEADER DRIVE MOTOR, AND WATER SOLENOID VALVE RESPECTIVELY. AFTER THE HEADER MAKES TWO PASSES, IT ACTUATES THE WASHER LIMIT SWITCH "LS" (NORMALLY CLOSE TO HELD OPEN) PULSING THE UNIT TO STEP "3".
3. THE HEADER CONTINUES TO MAKE TWO MORE PASSES AND ACTUATES "LS" AGAIN, PULSING THE UNIT TO STEP "4".
4. RELAYS "K4" AND "K6" DE-ENERGIZE, DE-ENERGIZING THE HEADER DRIVE MOTOR AND WATER SOLENOID VALVE RESPECTIVELY. "DRAIN TIME" IS ENERGIZED. AFTER AN ADJUSTABLE TIME (10 TO 60 MIN.) THE UNIT IS PULSED TO STEP "5".
5. THE "DRAIN TIME" LED IS DE-ENERGIZED AND RELAYS "K4" AND "K5" ENERGIZE, ENERGIZING THE HEADER DRIVE MOTOR AND ADHESIVE/VISCOSINE PUMP RESPECTIVELY. AFTER THE HEADER MAKES TWO PASSES,

IT ACTUATES THE WASHER LIMIT SWITCH "LS" (NORMALLY CLOSE TO HELD OPEN) PULSING THE UNIT TO STEP "6".

6. RELAYS "K4" AND "K5" DE-ENERGIZE, DE-ENERGIZING THE HEADER DRIVE MOTOR AND ADHESIVE/VISCOSINE PUMP RESPECTIVELY. "DRAIN TIME" LED IS ENERGIZED. AFTER AN ADJUSTABLE TIME (SEE STEP 4) THE UNIT IS PULSED TO STEP "7".
7. "DRAIN TIME" LED IS DE-ENERGIZED, RELAY "K3" ENERGIZES, ENERGIZING THE FAN CONTROL CIRCUIT, RELAY "K2" DE-ENERGIZES, COMPLETING THE FAN HOLDING CIRCUIT. "FAN DRY TIME" LED IS ENERGIZED. AFTER AN ADJUSTABLE TIME (10 TO 60 MIN.) THE UNIT IS PULSED TO STEP "0".
0. "FAN DRY TIME" LED "K1", "K3" AND THE CLEANING LIGHT ARE ALL DE-ENERGIZED. K1 CONTACTS CLOSURE ENERGIZES THE POWER PACK CIRCUIT. THIS COMPLETES THE WASH SEQUENCE.

NOTE: 1) **CAUTION** DO NOT MOVE JUMPER "J1" OR "J2" TO THE "IN" POSITION, OTHERWISE CONTROL WILL NOT FUNCTION PROPERLY.

- 2) CONTACT RATINGS OF "K" RELAYS 115V., 10 AMP. DO NOT EXCEED.
- 3) SEE SERVICE BULLETIN AF-3-259 FOR FURTHER OPERATION AND MAINTENANCE INSTRUCTIONS.
- 4) DOTTED LINES INDICATE WIRING BY OTHERS. ALL WIRING MUST CONFORM TO THE NATIONAL ELECTRIC CODE AND OTHER PERTINENT LOCAL CODES.
- 5) DO NOT RUN HV WIRES THROUGH SOLID STATE CONTROL ASSY.
- 6) POWER AND CELLS MUST BE CONNECTED TO A GOOD EARTH GROUND PER SERVICE BULLETIN AND PERTINENT ELECTRIC CODES.

Operation and maintenance

1. GENERAL

Maintenance is essential to the proper operation of the PERFORMAIR filter. The amount and frequency of the maintenance required is dictated by the type of contaminant, concentration level and general operating conditions. Heavy dirt loads require frequent cell cleaning, routine inspection and periodic maintenance of specific components.

- a. Cell cleaning to remove the collected contaminant is a part of the normal operation of the unit. The built in washer is actuated by a push button on the control box which deactivates the electrostatic and fan components until the wash cycle is complete.
- b. Routine inspection is essential to proper operation of the unit. Inspection consists of simple visual observation as well as detail checking of operational parts. The purpose of this inspection is to detect or prevent operational problems. Inspection frequency varies with the particular component. It is suggested that the following inspection is performed:

ITEM	FREQUENCY
Power Pack status lights on	Daily
Intake screen clear	Monthly
Control light on during wash	At Wash Time
Washer drive operating during wash	At Wash Time
Nozzles spinning freely during wash	At Wash Time
Nozzles spinning rapidly and evenly	At Wash Time
Hose intact and not binding	At Wash Time
Drains clear and draining fast	At Wash Time
No excessive accumulation in drain pans	At Wash Time
Ionizer wires intact and tight	Weekly
No shorting inside unit	Weekly
Cell and Door insulators not excessively coated	Monthly
Control programming properly (Digital lights)	Monthly
Cell and Door insulators intact	Monthly
Cell and Door contacts not bent	Monthly
General interior dirt accumulation	Semi Annually

2. CLEANING THE PERFORMAIR FILTER

a. When To Clean

The length of time a PERFORMAIR filter will operate before it needs cleaning varies greatly from one locality to another and even from season to season in a particular locality.

In determining when the collector cells need cleaning, two factors should be considered: (1) the amount of dirt on the plates, and (2) the active adhesive quality of the Viscosine remaining on the plates. The plates are slightly less than $\frac{1}{32}$ " thick when clean, and as the dust and smoke deposit accumulates the plates appear to get thicker. When sufficient dirt has been collected to make the plates appear to be about $\frac{1}{16}$ " thick (observe from the air entering side), the filter should be cleaned. If the dirt is allowed to build up beyond this point, the free area for passage of air is reduced with the possible result that large particles of dirt may be dislodged from the plates and carried into the ventilating system. This process is known as "blow-off" and is usually the result of poor maintenance or too infrequent cleaning of the PERFORMAIR filter.

It is possible, however, that "blow-off" may occur before the plates have collected enough dirt to appear $\frac{1}{16}$ " thick. This would be most likely to occur if the air being handled were relatively clean or if the filter were operated on a part-time basis. Under these conditions the adhesive on the plates may become ineffectual before the specified amount of dirt has been collected, in which case the collected particles would no longer adhere firmly to the plates but would build up slightly and then "blow-off". Drying-out of adhesive is greatly increased by excessive heat. Therefore, if heating coils are close to the filter, they should not be permitted to remain on when fan and filter are shut down. Whenever the filter has been operating for more than ten days without having been washed and re-coated with adhesive an inspection should be made to see that "blow-off" caused by drying of adhesive is not occurring.

b. Washing and Applying A New Film of Viscosine

The washer has been designed to remove the bulk of the dirty build-up which is generally collected on the first few inches of the collector plates. Washing is accomplished by the use of cold water at the usual 40 pound city water pressure. It is not at all necessary that the plates be washed to a bright condition like new aluminum. In fact, a thin film on the plates is desirable as it increases the adhesive retention capacity of the plates.

Under normal conditions of operation, the PERFORMAIR filter will require a more thorough wash down after approximately one year of operation. Gradual accumulation or build up of dirt around the bottom cell may cause severe arcing and the power pack will refuse to stay on. If this condition occurs, it will be necessary to manually hose-down the unit, paying particular attention to the lower collection elements. Follow the instructions for applying a new film of adhesive before putting the collector back into operation.

Before the PERFORMAIR filter is put into service the plates must be recoated with adhesive. NCC Viscosine is an odorless, non-volatile, water-soluble adhesive especially for this purpose. It is available through American Air Filter and the customer should keep a sufficient quantity on hand at all times.

The adhesive should be applied with the spray equipment furnished by American Air Filter. This equipment does not atomize the adhesive but produces a fine stream which should be directed between the plates from the front of the filter.

The cleaning cycle is initiated by the start button on the face of the washer control or by an optional set timer. When the washer start button is depressed, the fan and power pack will be turned off, the signal light will light, and the headers will make four washing passes across the face of the filter with the water nozzles in action to clean the plates. Then the solid state circuit will terminate the washing cycle by turning off the water solenoid valve and drive motor.

After an adjustable 10-60 minute wash cycle drain time, the control will start the headers across the face of the filter to make two adhesive passes with the adhesive pump operating to recoat the plates with Viscosine adhesive. When the adjustable 10-60 minute adhesive cycle drain time has been completed, the control restarts the fan for a fan dry cycle and finally actuates the power packs. See the solid state control service manual CAD-3-200A1 for additional information.

c. Maintenance Instructions, Arrangement V Adhesive Applicator

After the first spraying, clean any of the nozzles that have become clogged with dirt from the new lines. The water nozzles and solenoid valve are protected by a line strainer. The adhesive nozzles are protected by a strainer in the outlet of the adhesive tank as well as a small strainer in the tip of each nozzle. After cleaning any clogged nozzles, be sure to replace the strainers in the adhesive nozzles and adjust the water nozzles so that the deflectors are in a parallel position with the header.

Small changes in Viscosine usage can be made by adjusting the by-pass valve in the line back to the adhesive tank.

3. INTAKE BAFFLES

Perforated intake baffles are installed on the air entering face of the PERFORMAIR filter. These consist of individual interlocking panel assemblies which slide in on tracks inside of the air entering flange of the unit. These panels are accessible from the front of the unit and can be removed through the washer doors.

The purpose of these baffles is to provide even air distribution across the filter, protect the filter from large objects in the air stream and to act as a safety barrier to prevent access to the high voltage cells. The baffle is constructed of perforated galvanized steel.

Heavier contaminant loadings will result in an accumulation on the baffle surface. This must be removed to insure proper air flow through the baffle. Dry particulate matter such as lint can be removed by brushing the baffle with a stiff brush. A visual inspection should be made weekly to determine the condition of the baffle and cleaning initiated as required.

4. WASHER MAINTENANCE

The AAF washer consists of a motor driven header assembly which traverses the face of the filter with a rotating nozzle for each row of filters. Each nozzle provides water jets designed to penetrate the space between the cell collecting plates. Washer maintenance is critical for continued operation in heavily contaminated air streams.

a. Nozzles

Nozzles are subject to both air and water contaminants and thus require periodic attention. If airborne particles penetrate the spinner bushing, the nozzle will bind and not spin freely. Mineral deposits from hard water will do likewise. The nozzle can be disassembled and the bearing surfaces cleaned and polished to correct this situation. If waterborne contaminants clog the nozzle holes, cleaning can be accomplished by removing the plug on the end of the nozzle.

The nozzles spin under water pressure by means of a driver hole at right angles to air flow. Nozzle speed can be adjusted by turning the nozzle pipe. Use care, as the pipe is aluminum tubing with precision drillings. The pipe is factory positioned so that the pipe indent mark is lined up with the top seam on the 90° elbow. All spinners should rotate rapidly and should be adjusted as necessary.

b. Drive Assembly

The nozzle header is attached to a trolley consisting of nylon wheels which ride on a ¼" angle track assembly. Linkage to the drive chain is through a nylon "T" slot. A nylon bearing pin attached to the chain slides vertically in the "T" slot. It is essential that the bearing slide free in the slot. Heavy accumulations of contaminant must be removed. The bearing pin also acts as a break-away point in case of accidental drive binding or malfunction.

The drive chain should be reasonably tight to prevent disengagement. Tighten by loosening and repositioning the motor brackets. The drive chain should be lubricated as required. The drive motor is lubricated for life. The

drive assembly also includes a limit switch which steps the control program. This switch must be absolutely water-tight. If opened or replaced, use proper "O" rings and tighten to seal. Insure that the arm on the trolley actuates the limit switch.

c. Plumbing

An inlet strainer is furnished on the water supply line. Clean the internal screen as required. The hose from inlet to washer header should swing free and be tightly clamped. Replace hose which is cracked or otherwise defective and clean swivels as required.

d. Drains

The washer and cell sections are each furnished with one 1½" bottom drain. These drains must be kept open and provide adequate flow to insure rapid removal of the wash water. Drain pans should be periodically inspected for residual contaminant and cleaned as necessary.

5. CELL SECTION

The cell section contains the Collector Cells which actually collect the contaminant. This is high voltage equipment and care must be taken to prevent electrical shock. **Be sure the power is off before servicing the cells.** Open the time delay door interlock switch and **always** ground the cells with a long handled and insulated screwdriver to drain any residual charge.

The general condition of the cells will indicate the effectiveness of the washer. With proper washing, the cell plates will appear clean but discolored (not shiny). Maximum contaminant build-up is variable but should not exceed more than 25% of the plate spacing. Uneven washing indicates nozzle problems.

a. Ionizer Wires

The ionizers should be examined periodically to make sure that all wires are intact. A small piece of wire between the collector plates may cause a short circuit which is sometimes difficult to locate. If the broken wire is discovered and removed before it makes its way into the plates, much time and effort may be saved.

Some of the causes for broken ionizer wires are: (a) unusual dirt deposits on grounded plates which reduce the air gap causing ionizer wires to vibrate and arc to the plates; (b) large insects or large particles of dirt or other matter entering the precipitator; (c) kinks in the wire caused by improper handling; (d) drops of water or snowflakes causing arcing between the wires and grounded plates.

Ionizer wires which break during operation generally cause a short circuit which is indicated by the power pack, and usually trips the magnetic circuit breaker.

Broken wires should be replaced immediately. If the filter is operated without all ionizer wires in place, the fine dust and smoke that pass through the area in which a wire is missing will reduce the cleaning efficiency of the PERFORMAIR filter.

When the ionizer is operating properly, the wires will be surrounded by a corona. This corona, which is evidence of ionization, is visible in the dark as a pale blue glow extending the full length of the wires. If the wires become abnormally dirty or if the ionizer voltage is too low, the corona will not occur, and its absence is visual indication that the precipitator needs attention.

b. Insulators

The insulators are glass-filled polyester and tested to 40,000 volts. They are located out of the direct air stream but can accumulate a layer of contaminant in heavy loading applications and still remain operational. If this layer becomes excessive or is mixed with water, current leakage and insulator cracking can occur. Inspection, periodic cleaning and ample fan dry time are recommended to

prevent this. Insulators can be cleaned with a soft brush or wiped in place.

c. Manual Cell Cleaning

It is recommended that cells be removed and manually cleaned annually. This is to remove any residual contaminant not removed by the washer sprays and to give the insulators and side areas a good cleaning. For this purpose, use a mild detergent which will not etch aluminum. Soaking will enhance this cleaning. The frequency of this cleaning must be determined by visual inspection. If conditions dictate, cell cleaning should be more frequent than annually.

During the manual cell cleaning, the housings should be cleaned of any collected contaminant. A hose with moderate pressure will simplify this task. All tracks, channels and pans should be flushed and inspected.

d. Checking Electrical Outages

If the power packs lights are off, first turn the pack back on, and if it kicks off again, follow the trouble shooting instructions on Pages 9, 10, and 11 of the LG-8 Power Pack bulletin.

To disconnect power pack from the collector — simply open the bus bar door of collector cell housing.

Screw a spare time delay bolt or push a small screwdriver into door safety switch to re-energize the pack. CAUTION: HIGH VOLTAGE. USE EXTREME CARE TO AVOID SHOCKS.

If the disconnected pack stays on — first locate the row of collector cells and then the cell itself which is causing the short.

Hold a spare piece of high voltage wire or jumper between the plate bus bar on the door (the back one or the one near the locator angle) and one of the brass plate contact strips of each row of cells. The pack will kick off to indicate the row in which the shorted cell is located.

When the row has been determined, ground the cells to eliminate a shock.

Pull the first cell out until its brass contact strips disengage those on the adjacent cell, and reconnect the high voltage cable. If pack stays on, remove this first cell and continue until shorted cell is located. It has to be one or more of the four (4) cells in this row.

Look for abnormal dirt deposits, a broken ionizer wire, or a broken insulator and correct.

If none of the above, then look for a bent plate or any object that could cause a direct short to ground.

6. DOORS

The doors maintain a water and air seal, support the power bus bars and position the collector cells. The door latches and gaskets are designed to provide adequate sealing pressure without overtightening. The latch should be backed off completely before retightening. When closing, use care to be sure that the latch arm has properly engaged the door frame.

Door insulators require the same inspection and cleaning as the cell insulators. They should be observed and cleaned anytime the door is opened. Also, check the high voltage wire coming to the bus bar. It should not be binding or be exposed to any sharp edges.

ADDITIONAL REFERENCES

Power Pack Bulletin	AF-3-200C3F (LG-8) (Formerly AF-3-255X29)
Control Bulletin	CAD-3-200A1
Product Bulletin	AF-1-183
Connection Diagram	U81P-1031707
Parts List — Collector Cell	81P-1463215
Parts List — Door	U81P-1500925
Parts List — Washer Header	U81P-1196401
Parts List — Control	U81P-1034784
Parts List — Washer Nozzle	81P-1179654
Parts List — Pump	U90P-183194
Piping Arrangement	U81P-157362

American Air Filter has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.



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