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1. PRINCIPLE OF OPERATION

The Trion Electronic Air Cleaner is technically known as a two-stage electrostatic precipitator.

In the first stage of operation, all air-borne particles, even of submicroscopic size, are electrically charged (positively) as they pass through an ionizer where a high concentration of ions emanate from fine tungsten wires suspended between tubular electrodes. The tungsten wires are charged with 13,000 volts (13 KV), and the tubular electrodes, sometimes referred to as "ground tubes", are electrically ground.

In the second stage of operation, the charged particles pass into an electrical field set up between a series of parallel aluminum plates. Here the positively charged particles are attracted to the plates forming the negative element of the field. This field is created by placing a positive charge of 6500 volts (6.5 KV) on each alternate plate in the series, while the inter-leaving plates are relatively negative or electrically ground.

Periodically, depending on the dirt content of the air in the particular locality, the collected dirt is washed away by an integrally constructed water wash system.

Four distinct, functional units encased in a cabinet, comprise the complete Trion Electronic Air Cleaner.

1. An ionizer and dirt-collecting element referred to as an Ionizing-Collecting Cell.
2. A Power Pack containing the necessary electrical components to convert 110 volt, 60 cycle, alternating current to the high voltage direct current needed for the ionizing-collecting cell.
3. A built-in Water Wash System consisting of manifolds fitted with spray nozzles to wash away the collected dirt.
4. A dry-type Mechanical Filter to provide effective air distribution.

Figure 1
2. THE ELECTRICAL CIRCUIT

PRIMARY: All the listed Trion Electronic Air Cleaners, regardless of capacity, employ the same basic doubler circuit.

On the Model 04 units, the primary circuit, 110 volt, 60 cycle, single phase, alternating current enters the power pack through a water wash switch that interlocks the power to the power pack with the solenoid valve and furnace blower.

On all models the power then goes through a safety switch that is mechanically operated by a screw retaining an access panel. This makes it impossible to enter the power pack or any part of the unit without first interrupting the primary circuit.

The power then enters a housing containing two transformers. One transformer, supplying high voltage, has an output of 6,500 volts (6.5 KV). The other transformer, supplying heater or filament power for two identical half wave rectifier tubes, has an output of 2.5 volts.

A manually adjustable variable resistor is placed in the line to the high voltage transformer. The variable resistance is used to vary the voltage for two distinct purposes. First, it provides limited flexibility enabling one particular size power pack to be used on several different size units. Secondly, it provides adjustments for supply line voltage variations.

A fully magnetic circuit breaker attached in the primary circuit enables the power to be turned on or off and acts as a safety device cutting off the power in the event of an overload or short circuit.

SECONDARY: In the secondary circuit, the high voltage (6.5 KV) alternately charges two capacitors through the two rectifier tubes. The total charge across both capacitors is 13 KV; hence, the doubler circuit.

The collecting plate section of the ionizing-collecting cell forms one of the capacitors and is electrically located between ground and the 6.5 KV potential. The other capacitor is located in the power pack between the 6.5 KV and 13 KV potentials. The ionizing wires are charged with the 13 KV potential.

The rectifier tubes work like check valves; alternately passing then checking the current when its direction of flow changes each half cycle.

A fixed resistor connected across each capacitor bleeds off the charge when the circuit is de-energized.

A milliammeter wired into the ground leg of the secondary circuit indicates the complete electrical operation of the circuit.

---

(1) Switch, Safety
(2) Circuit Breaker
(3) Resistor, Variable
(4) Plate Transformer, Primary*
(5) Filament Transformer, Primary*
(6) Filament Transformer, Secondary*
(7) Half Wave Rectifier Tube
(8) Filament Transformer, Secondary*
(9) Half Wave Rectifier Tube
(10) Plate Transformer, Secondary*
(11) Resistor, 200 Meg. OHM (Bleeder)
(12) Resistor, 200 Meg. OHM (Bleeder)
(13) Capacitor, .0075 MFD.

*Combined Filament and Plate Transformer.
3. PROPER OPERATING RANGE

Each Trion Electronic Air Cleaner has a specific milliamperes operating range which is marked on the milliammeter. The operating ranges of all models are shown below.

To adjust the operating range, turn the circuit breaker "off" and be sure the milliammeter reads zero. If it does not read zero, adjust it to zero with the calibration screw located on the bottom, center of the meter.

Then turn the circuit breaker "on" and turn the slotted shaft extruding from the power pack until the needle on the milliammeter reads within the prescribed operating range. NOTE: On Model 04 units the access door must be removed and access door safety switch actuated with 1/4-20 bolt in order to adjust the operating range.

After the initial adjustment it should never be necessary to readjust the reading unless the supply line voltage varies.

The operating range for all models are as follows:

<table>
<thead>
<tr>
<th>UNIT MODELS</th>
<th>OPERATING RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>05</td>
</tr>
<tr>
<td>04</td>
<td>05</td>
</tr>
<tr>
<td>104</td>
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<td>304</td>
<td>105-00</td>
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<tr>
<td>404</td>
<td>203-00</td>
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<tr>
<td></td>
<td>303-00</td>
</tr>
<tr>
<td></td>
<td>206-00</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. NOMENCLATURE AND WIRING DIAGRAMS

(A) Power Pack
(B) Operating Range Adjustment
(C) Circuit Breaker
(D) Milliammeter, Zero Adjustment
(E) Milliammeter
(F) Water Wash Switch
(G) Terminal Board
(H) Access Panel Safety Switch
(I) Transformer
(J) Rectifier Tubes
(K) Capacitor
(L) Sheet Metal Screws
   Retaining Power Pack in Cabinet
(M) Sheet Metal Screws Retaining Power
   Pack Chassis to Power Pack Housing

(N) Trion Cabinet
(O) After Filter
(P) Ionizing-Collecting Cell
(Q) Ionizing-Collecting Cell Handle
(R) Collecting Plate Section
(S) Ionizing Section
(T) Ionizing Wires
(U) Ionizing Wire Suspension Pin
(V) Plate Hi-Tension Lead
(W) Ionizing Hi-Tension Lead
(X) Insulators
(Y) Serial Record Plate

Figure 3, Model 04.
**PRIMARY CIRCUIT**

Automatic Water Wash

<table>
<thead>
<tr>
<th>Switch</th>
<th>$S_3$</th>
<th>$S_4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit</td>
<td>Water</td>
<td>Norm. Fan</td>
</tr>
<tr>
<td>Normal</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>Wash</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>Dry</td>
<td>Off</td>
<td>On</td>
</tr>
</tbody>
</table>

*On at this switch but off thru $S_3$*

(1) Switch, Water Control
(2) Switch, Safety
(3) Circuit Breaker
(4) Resistor, Variable
(5) Plate Transformer, Primary*
(6) Filament Transformer, Primary*
(7) Solenoid Valve, Water
(8) Timer**
(9) Switch, Timer**
(10) Switch, Timer**

---

**SECONDARY CIRCUIT**

Figure 4, Wiring Diagram - Model 04.

* Combined Filament and Plate Transformer.
** Used on automatic wash Trions only.
(A) Power Pack
(B) Operating Range Adjustment
(C) Circuit Breaker
(D) Milliammeter Zero Adjustment
(E) Milliammeter
(F) Transformer
(G) Power Pack Access Panel & Serial Record Plate
(H) Access Panel Safety Switch & Screw
(I) Resistor
(J) Capacitor

(K) Rectifier Tubes
(L) Power Pack Retaining Latch
(M) Ionizing-Collecting Cell
(N) Handle, Ionizing-Collecting Cell
(O) Plate Hi-Tension Lead
(P) Ionizing Hi-Tension Lead
(Q) Trion Cabinet
(R) Ionizing Wires
(S) Water Wash Manifold
(T) Electrical Cord

Figure 5, Model 05.
Figure 6, Wiring Diagram - Model 05.

* Combined Filament & Plate Transformer
(A) Power Pack
(B) Operating Range Adjustment
(C) Circuit Breaker
(D) Milliammeter Zero Adjustment
(E) Milliammeter
(F) Transformer
(G) Power Pack Access Panel
(H) Access Panel Safety Switch & Screw
(I) Capacitor
(J) Power Pack Retaining Latch
(K) Rectifier Tubes
(L) Trion Cabinet Access Panel
(M) Ionizing-Collecting Cell

(N) Collecting Plate Section
(O) Ionizing Section
(P) Water Wash Manifold
(Q) Ionizing High Tension Lead
(R) Plate High Tension Lead
(S) Ionizing Wires
(T) Trion Cabinet
(U) After Filter
(V) Power Pack Retaining Hasp
(W) Insulators
(X) Electrical Cord Set
(Y) Serial Record Plate attached to Cabinet Access Door & Located under Power Pack.

Figure 7, Models 06 and 28.
 PRIMARY CIRCUIT

(1) Power Pack Access Panel Safety Switch
(2) Circuit Breaker
(3) Resistor, Variable
(4) Plate Transformer – Primary*
(5) Filament Transformer – Primary*
(6) Filament Transformer – Secondary*
(7) Half Wave Rectifier Tube
(8) Filament Transformer – Secondary*
(9) Half Wave Rectifier Tube
(10) Milliammeter
(11) Plate Transformer – Secondary*
(12) Resistor, 200 Meg. OHM (Bleeder)
(13) Resistor, 200 Meg. OHM (Bleeder)
(14) Capacitor, .0075 MFD.

 SECONDARY CIRCUIT

Figure 8, Wiring Diagram - Model 06 and 28.

* Combined Filament & Plate Transformer
5. SERVICE TROUBLES AND CORRECTION

CAUTION:
(1) ALWAYS GROUND POWER PACK WHEN BENCH TESTING.
(2) DISCHARGE ANY RESIDUAL CURRENT IN THE SECONDARY CIRCUIT WITH AN INSULATED HANDLE SCREW DRIVER BEFORE TOUCHING ANY OF THE COMPONENTS.
(3) EXERCISE THE USUAL PRECAUTIONS WHEN WORKING WITH HIGH VOLTAGE.

(A). NO MILLIAMMETER READING
     Model 4 Unit

(1) Access Panel Safety Switch not closed. Back the access panel safety screw (top center of access panel) out 5 complete turns, then screw it in until a faint click is heard, denoting the closing of the micro switch.

(2) Supply line power not being supplied to unit. Remove access panel and place test light on terminals 4 and 8. If light does not glow, make the necessary change to bring the installation in accord with the specified wiring diagram.

(3) Defective Water Wash Switch.
Place test light on terminals 4 and 7. The light should glow with the switch in the "up" position and should not glow with the switch in the "down" position. Place the light on terminals 1 and 2. The light should not glow with the switch in the "up" position and should glow with switch in the "down" position. If switch proves defective, replace same.

(4) Defective access panel safety switch.
Remove the access panel and place the switch in the closed position (use a 1/4-20x1-1/2" bolt or depress the micro switch by some other means). With the water wash switch in the "up" position, place test light on terminals 4 and 7, then on 4 and 6. If light glows on 4 and 7, and does not glow on 4 and 6, the switch or the wires to the switch are defective. Replace same.

(5) Broken or disconnected wiring.
Check for any broken or disconnected primary or secondary wiring.

(6) Defective Rectifier Tubes.
Replace with new tubes.*

(7) Defective Transformer (Open Circuit)
Replace: 1. Remove Capacitor & Tubes from transformer. 2. Energize power pack. 3. Short from ground (power pack housing etc.) to transformer hi-volt thru bushing using insulated handle screw driver. 4. The arc drawn should be fine line ripples and bluish in color. If there is no arc (or tubes do not light up), the primary or secondary winding is open or shorting to ground.

(8) Disconnected Hi-Tension Leads (at Power Pack or Cell)"
Connect same.

(9) Defective Milliammeter
Replace: 1. Energize power pack. 2. Short from ground to 13KV voltage. (at cell or in power pack) A loud cracking sound (arching) should occur. If so, unit is functioning and meter is defective.

(B). NO MILLIAMMETER READING
     Model 5, 6, and 28 Units

(1) Safety screw retaining power pack access panel not properly seated.
Back safety screw(s) out five complete turns, then screw it in until faint click is heard denoting the closing of the safety switch.

(2) Supply line power not being supplied to unit. Check fuse or power supply.

(3) Defective safety switch.
Check switch with trouble light and replace if necessary.

(4) Defective rectifier tubes.
Replace with new tubes.*

(5) Disconnected high tension leads.
Connect same.

(6) Broken or disconnected wiring inside power pack.
Repair or connect.

*Refer to: Rectifier Tubes—Checking and Types (Page 15).
(7) Defective Transformer (Open Circuit)
Replace: 1. Remove Capacitor and Tubes from transformer. 2. Energize power pack. 3. Short from ground (power pack housing etc.) to transformer hi-volt thru bushing using insulated handle screwdriver. 4. The arc drawn should be fine line ripples and bluish in color. If there is no arc (or tubes do not light up), the primary or secondary winding is open or shorting to ground.

(8) Defective Milliammeter
Replace: 1. Energize power pack. 2. Short from ground to 13 KV voltage (at cell or in power pack). A loud cracking sound should occur. If so, unit is functioning and meter is defective.

(C). LOW MILLIAMMETER READING
All Models

(1) Defective rectifier tubes.
Replace with new tubes.*

(2) Low supply line voltage.
Remove resistance from primary circuit. Turn slotted shaft on power pack clockwise.

(3) Missing ionizing wire(s).
Replace same.

(4) Milliammeter set below zero when power is off.
Turn power off and adjust milliammeter reading to zero with zero calibration screw on front of meter.

(5) Ionizing-collecting cell electrically disconnected on multi-cell units.
Connect same. (Electrical connection to both ionizing and collecting plate sections.)

(6) Defective transformer.
Replace. (Refer to above transformer check.)

(D). HIGH MILLIAMMETER READING
All Models

(1) High supply line voltage.
Increase resistance in the primary circuit. Turn slotted shaft on power pack counterclockwise.

(2) Extremely dirty collecting cell.
Clean same.

(3) Dirty insulators.
Clean same.

(4) Defective or leaking insulator.
Replace same. Usually a defective insulator will be warm to the touch after the cell(s) has been powered for a short period. Note: Reset circuit breaker if it trips out. Caution: Feel insulators with power OFF.

(5) Wet cell or damp insulators.
Allow to dry.

(6) Foreign material such as hair or lint bridging collecting plates.
Remove same.

(7) Milliammeter set above zero when power is off.
Turn power off and adjust milliammeter reading to zero with zero calibration screw on front of meter.

(E). FLUCTUATING MILLIAMMETER READING
All Models

(1) Loose ionizing wire.
Repair or replace same.

(2) Defective lead bead hum suppressor on ionizing wire where applicable.
Repair or replace ionizing wire.

(3) Fluctuating supply line voltage.
Find stable source of supply.

(4) Loose ground.
Tighten same.

(5) Loose high tension lead.
Repair, tighten or replace.

(6) Loose electrical connection between ionizing-collecting cells on multi-cell units.
Tighten same.

(7) Loose power pack wiring.
Tighten same.

(8) Defective transformer.
Replace. (Refer to transformer check page 12.)

(F). CIRCUIT BREAKER KICKING OFF
All Models

When the circuit breaker kicks off, it is usually accompanied by an extremely high milliammeter reading and is an indication of a short circuit. A short circuit can be easily isolated to the power pack or ionizing-collecting cell(s).

Disconnect the high tension leads, either inside the power pack or at the ionizing-collecting cell(s). Support them away from any point of contact and energize the power pack.

With the high tension leads disconnected, all the normal load is removed from the circuit and the milliammeter should therefore read zero when the power pack is energized.

If the meter reading is zero with the high tension leads disconnected, the power pack is operating normally and the short circuit is in the ionizing-collecting cell. If a reading is indicated on the milliammeter with the high tension leads disconnected, then the short circuit is in the power pack. NOTE: There are rare occasions when the
transformer could be defective but will only show up on a load condition. By turning the variable resistor fully clockwise, the circuit breaker may trip out, indicating a short in the transformer.

If the short circuit is isolated to the ionizing-collecting cell, it may be isolated further to the ionizing section or plate section by connecting each respective high tension lead individually, energizing the power pack and observing the milliammeter reading. With 6.5KV lead (plate section) connected and 13KV lead disconnected, no meter reading is normal. A high reading indicates a short circuit in the plate section. With 13KV lead (ionizing section) connected and 6.5KV lead disconnected, approximately one-half of operating range is normal. A high reading or circuit breaker tripping off indicates a short circuit in the ionizing section.

On units consisting of more than one ionizing-collecting cell, the electrical connections between cells may be removed in such a way to isolate the short to a group of cells, then, further removed so as to isolate it to one particular cell.

If short is found to be in the cell(s), check the following:

1. **Broken ionizing wires.**
   Replace same.

2. **Large particles of dirt or foreign material lodged between collecting plates.**
   Clean.

3. **Broken or leaking insulators.**
   Replace same. Usually a defective insulator will be warm to the touch after the cell(s) have been powered for a short period. NOTE: Reset circuit breaker if it trips out.

CAUTION: Feel insulators with power OFF.

4. **Broken electrical connectors between cells on multi-cell units.**
   Repair or replace same.

If short is found to be in the power pack, check the following:

5. **Defective rectifier tubes.**
   Replace with new tubes. If unit is still inoperative, proceed as follows.

6. **Defective capacitor.**
   Replace same. Look for traces of oil on or near capacitor. With capacitor removed from the transformer and power pack energized, the circuit breaker should remain on. If short circuit still exists, the transformer is probably the cause.

7. **Defective transformer.**
   Replace same. With capacitor removed from transformer, turn variable resistor fully clockwise and energize power pack. If circuit breaker still trips out, transformer is defective.

---

8. **Defective high tension leads.**
   Replace: Disconnect from circuit to determine.

9. **Defective water wash switch Model 4 units.**
   Replace: Refer to page 10 for checking.

10. **Defective primary wiring.**
    Repair.

11. **Defective Resistor.**
    Replace. Look for burnt appearance. (Remove sleeving).

A short circuit may be presumed to exist if an undersize circuit breaker is used. The rated circuit breakers for all models are shown below.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>UNIT MODEL NUMBERS</th>
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<tbody>
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<td>04</td>
<td>104 &amp; 204</td>
<td>.8</td>
</tr>
<tr>
<td></td>
<td>304 &amp; 404</td>
<td>1.2</td>
</tr>
<tr>
<td>05</td>
<td>95</td>
<td>.5</td>
</tr>
<tr>
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<td>105 &amp; 205</td>
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<tr>
<td></td>
<td>303 &amp; 206</td>
<td>2.0</td>
</tr>
</tbody>
</table>

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(G). HUMMING NOISE

1. **Atmospheric conditions – low humidity.** (Under normal circumstances, this condition may only be evident several days a year.)
   Wash unit to temporarily raise humidity.

2. **Unit not properly grounded.**
   Check ground and correct if necessary.

3. **Ionizing-collecting cell(s) in need of washing.**
   Clean cell(s) manually if necessary.

4. **Dirty insulators.**
   Clean.

5. **Loose ionizing wires.**
   Repair or replace.

6. **Center bead on ionizing wire binding where applicable.**
   Repair or replace ionizing wire.

7. **Defective rectifier tubes.**
   Replace with new tubes.*

*Refer to: Rectifier Tubes—Checking and Types (Page 15).
(H). CONSTANT OR INTERMITTENT ARCING
(1) Water leak or defective valve.
   Repair or replace.
(2) Loose or defective ionizing wire.
   Repair or replace.
(3) Voltage too high (indicated by high milliammeter reading).
   Adjust to correct operating range.**
(4) Excessively dirty cell.
   Clean same.
(5) Foreign material such as string etc. lodged in or close to cell and flapping in air stream.
   Remove same.
(6) Reversed Hi-Volt leads.
   Reconnect properly in power pack. i.e. 6.5 KV lead to transformer connection. 13 KV lead to capacitor end.
(7) Defective Rectifier Tube
   Replace with new tubes.*

(I). DEFECTIVE AUTOMATIC TIMERS
    Model 04

   The Cramer Automatic Timer once used on the Model 04 unit has been discontinued for some time. Most of the parts are not available for repair. In the event of a timer failure, the automatic feature may be disconnected from the power pack, making the unit a standard manual wash, or the automatic feature may be maintained by installing the currently produced Control "M" and Initiator Clock IC-07.
   To disconnect the automatic feature, cut and tape the leads to the timer motor. Be sure the double disc cam is in the neutral position by working the disc until the roller falls in the Y slot in cam. With the automatic feature disconnected, the unit should be washed with the manual controls every 2 to 4 weeks depending on the dirt content in the particular locality.

(J). AIR NOT BEING CLEANED

   Be sure the milliammeter reading is within the specified operating range, indicating proper electrical operation.
(1) Air volume through unit too great.†
   Reduce air flow to the designed cfm rating.
(2) Unsealed openings in or near Trion enclosure such as open drains, etc. Such openings permit infiltration of uncleaned air contaminating air cleaned by Trion.
   Seal or close openings. Drains should be trapped in accordance with local plumbing codes or sealed with length of collapsible drain hose.
(3) Leaks in ductwork on blower box and other parts of system under negative pressure on clean air side of Trion.
   Seal with masking tape or caulking compound.
(4) Dirty air not being delivered to Trion. A common cause for this in residential units is the blocking of air grills with drapes, furniture, etc.
   Remove obstruction.
(5) Uneven air distribution across the face of the ionizing-collecting cell(s).††
   Install turning vanes, air baffles or provide means for even air distribution.
   †A good indication of too much air volume is excessive build-up of dirt on the trailing edges of the collecting plates and after filters. (Dirt build-up should not be confused with dirt stains. Dirt stain on the after filters and plates is normal).
   ††Uneven air distribution across the face of the ionizing-collecting cell(s) may be determined in many instances by examining the dirt pattern before washing. The entering side of the cell should be covered evenly with the dirt collected.

(K). RADIO OR TELEVISION INTERFERENCE
(1) Defective rectifier tubes.
   Replace with new tubes.*
(2) Unit improperly grounded.
   Make sure power pack and cabinet or ionizing-collecting cell housing has a good electrical ground.
(3) Ground line of supply line voltage not properly grounded.
   Correct same.
(4) High tension leads not secure, either at cell(s) or power pack terminals.
   Tighten connections.
(5) Loose ionizing wires.
   Tighten or replace same.
(6) Loose intercell high tension connections on units consisting of more than one cell.
   Tighten connections.
(7) Dirty or "leaking" insulators.
   Clean or replace same.
(8) Large foreign particle(s) lodged between collecting plates.
   Clean same.
(9) Loosely connected components or primary wiring inside power pack.
   Tighten same.
(10) Defective transformer.
   Replace. Refer to Transformer check on Page 12.

*Refer to: Rectifier Tubes - Checking and Types (Page 15).
**Refer to: Proper Milliammeter Operating Range (Page 3).
(L). WHITE DUST

One of the most difficult service calls to handle is the complaint of the presence of white dust in Trionized areas. The majority of these complaints are from residential users. In many instances, the statement is made: "We have more dust now than we ever had." These service calls are difficult because the limitations of the installation must be explained.

White dust actually can be described as "clean dirt." Where it is noticed an examination will show the user that it is largely lint. It is most noticeable on dark furniture, and is usually found in homes containing new furnishings such as carpeting, drapes, etc., which give off more lint than such items that have been used and cleaned for some time. The amount of lint generated is increased by activity in the areas; especially by children, pets and heavy house traffic.

Visible lint particles, like cigarette ashes, are heavy as compared to the extremely small, individual dirt particles which make up cigarette smoke. Their weight causes the lint particles to "fall-out" on furniture, floors, etc., just as cigarette ashes fall to the floor while cigarette smoke particles remain suspended in the air. Dirt particles, such as heavy pieces of lint or cigarette ashes, which do not remain air-borne, never reach the Trion Electronic Air Cleaner, and the Trion cannot remove from the air particles which never reach its collecting elements.

Fortunately, the black, greasy dirt particles with the damaging staining power are light in weight, remain in the air stream, and do reach the Trion. It is their removal from the air that keeps the lint clean, and, therefore, more visible.

There is no question that the Trion is capable of collecting lint in addition to other atmospheric contaminants. This is easily confirmed by examining the air entering side of the ionizing-collecting cell before it is washed. You will note that along with the black, greasy dirt collected, there are lint particles that did stay airborne long enough to reach the Trion.

Lint from new furnishings will decrease with wear. The length of time depends on the amount and type of fabric in the furnishings and the air circulation. In some areas, a bedroom for example, a lint condition will always remain.

Normally, continuous fan operation (24 hours a day) will minimize this problem. If this cannot be accomplished, the controls should be set for as near continuous fan operation as possible. In some instances, the use of a two speed fan motor is advantageous.

Cold air returns should not be restricted in any manner, particularly from rooms in which lint is prevalent. If the returns in these rooms are blocked, the return air will seek another, longer path. In traveling a greater distance, lint fall-out is increased.

Actually, the presence of large, clean lint particles are further proof that Trion is doing its superior air cleaning job. Electronic air cleaners are dependent on the movement of air currents to bring the dirt particles to the unit for their removal. Weighty, non-air-borne particles such as cigarette ashes weigh too much to remain in the air currents while other particles, such as cigarette smoke, remain suspended and are carried to the Trion for removal.

(M). OZONE

Under normal operating conditions electronic air cleaners produce very minute quantities of ozone ($O_3$). These quantities in no way approach the point of being harmful and ozone, an exothermic compound, is considered to be a very unstable material which rapidly decomposes to oxygen.

The 1960 Guide, American Society of Heating, Refrigerating and Air Conditioning Engineers states that ozone in amounts of 0.05 ppm (parts per million) of air is allowable in comfort air conditioning. For submarine air conditioning systems, which are completely recirculated air systems, military specification, MIL-F-22963A, dated June 14, 1963, permits quantities up to 0.1 ppm. The quantities of ozone produced by Trion Electronic Air Cleaners for ventilating air are between 0.002 and 0.02 ppm which is less than one half of the lowest of the above allowable limits.

Usually, a new installation will produce more ozone than one that has been in operation for several weeks. This is due to sharp corners or burrs on the dirt collecting elements causing points of voltage concentration which in turn produce ozone. The concentration of voltage in these areas, however, tends to round them off, thereby they are self-correcting.

In addition to new installations, the spring and fall seasons of the year are periods where ozone may be noticed on systems set for intermittent blower operation. The long periods of time between calls for heat permits the normal amounts of ozone produced to build up in the duct work adjoining the Trion. This accumulation may then be noticed
when the blower first comes on. (There are also times during these periods when the furnace heat exchanger causes odors that could be confused with ozone).

A more than normal amount of ozone is also produced when the ionizing-collecting cell is over-powered. This is indicated by a milliampere reading above the maximum prescribed operating range for the unit.

There are also occasions when a Trion owner will hear that electronic air cleaners are capable of producing ozone and believes he smells it at times when the smell actually does not exist. During the explanation to these people, it sometimes helps to point out that equipment is made for the sole purpose of producing ozone (ozonaters) to combat kitchen odors, etc.

(1) **Milliampmeter reading set too high.**
Increase resistance in the primary circuit. Turn slotted shaft on side of power pack counterclockwise.

(2) **Insufficient blower operation.**
Adjust controls for more continuous blower operation.

(3) **Dampered outside fresh air intake.**
Introduce more fresh air into system.

(4) **Misunderstanding by owner.**
Give complete explanation.

(N). **RECTIFIER TUBES — CHECKING AND TYPES**

The most practical method of checking a tube in the field is by substituting the questionable tube with a spare tube that is known to be good.

Usually, when a tube fails, it becomes weak or "soft" and this condition is indicated on the milliampmeter by a low reading. The replacement of the weak tube with a good tube will bring the milliampmeter reading back to normal.

The doubler circuit used in Trion Electronic Air cleaners employs two identical half wave, high vacuum, rectifier tubes. They are interchangeable and keyed to fit the tube socket in only one way. Their ratings are as follows:

- **Filament Voltage**: 2.5 volts
- **Filament Current**: 3 amperes
- **Anode Voltage, Peak Inverse**: 20,000 volts
- **Anode Current, Peak**: 100 milliamperes
- **Anode Current, Average**: 20 milliamperes

Any of these tubes listed may be used, although both tubes used should be of the same type.

- **Continental Electric** – CEQ-72, CE-220
- **Raytheon** – RKR-72, CRP-72, 3B24
- **Western Electric** – 3B24
- **United Electronics** – 3B24WA
- **Lewis Electronics** – CYN-72, 3B24

If the above tubes are not available at an electrical supply house, radio or electronics store, they or their equal are available from Trion Inc.
6. ORDERING AND RETURNING PARTS

When ordering replacement or spare parts, state the Trion model and serial numbers, obtainable from the data plate secured to the unit as well as the part name and number as listed on the parts price sheet. Orders will be filled in accordance with the terms and conditions on current parts price sheets.

When returning parts, state the Trion unit model and serial numbers from which the parts were removed and state the disposition to be made when the part is received.

In Warranty Replacements – Adjustments will be made, under warranty, upon the immediate return of the defective parts properly identified by the model and the serial number of the Trion unit.

Out-Of-Warranty Replacements – If warranty has expired, adjustments may be made on an exchange basis at the discretion of the manufacturer. Material for return must be shipped prepaid. Replacement shipments will be F.O.B. factory, Sanford, North Carolina.