TRION®

Indoor Air Quality

READ AND SAVE THESE INSTRUCTIONS

Grease Viper Series

Electrostatic Precipitators
Commercial & Industrial Applications

Electrostatic Precipitators for Commercial & Industrial Applications

Grease Viper

Custom Electronic Air Cleaner

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Design

FOR THE SYSTEM DESIGN ENGINEER

1. General Description

The standard major components supplied with each unit for installation are as follows:

- Inlet Plenum Section with Grease Baffle Impinger Prefilters
- Electrostatic Precipitator (ESP) with Integral Power Supplies
- Control Panel
- Detergent System
- Water Wash Solenoid Valve(s), 'Y' Strainer, and Detergent
- Odor Control Section
- Optional Exhaust Fan

Stage 1 of the Grease Viper System is an Inlet Plenum Section with Grease Baffle Impinger Prefilters.

Stage 2 of the Grease Viper System is an ESP that provides primary filtration and contains the following components:

- Ionizing/Collecting Cells (collecting elements)
- Aluminum Mesh Afterfilters
- Wash Manifolds - located both above and upstream of the Cells
- Optional Pre-piped Fire Suppression Nozzles

Stage 3 of the Grease Viper System is an optional 2nd stage ESP Section that provides secondary filtration to the 1st Stage ESP for both increased collection capacity and efficiency. 3rd stage ESP sections are also available.

Stage 4 of the Grease Viper System is an Odor Control Section. Panels, filled with activated carbon granules, are arranged in a V-shaped bank providing a large surface area for the air. The surface of each granule is extremely porous and absorbs materials that are in a gaseous or vaporized state that cannot be removed by the previous filter sections. Using the carbon filters without pre-filtration by a 2nd stage ESP is not recommended. When the panels have become saturated or fully loaded they may be replaced with new panels or reactivated carbon.

Gasketed access doors located on one side of the cabinet, 90 degrees to the direction of the airflow, provide entry for removal of the cells and filters. The location of the access doors may be specified as right-hand or left-hand access - determined by facing the inlet of the ESP (dirty airflow at your back).

NOTE

TRION® Tridex Detergent is specially formulated for use with TRION® electronic air cleaners. Use of other cleaners and detergents, not specifically approved by TRION®, can cause possible failures in the unit and will void any and all warranties on our equipment.

The solid-state high voltage power supplies are factory installed and wired within an enclosure on ESP access doors.

The control panel consists of a NEMA 12 enclosure designed for remote mounting and houses power supply transformers and electrical components for initiating and sequencing the wash cycle. In addition, the control panel is a central junction for the primary wiring. The detergent system is furnished as a completely assembled unit to be piped directly to the wash water supply, into the wash manifolds.

Note: 16, 30, or 55-gallon detergent tanks are available as an option.

The strainer is to be installed in the main wash water supply line. Back flow preventer and/or check valves should be installed according to local code requirements - these items are not provided as part of the system accessories.

When furnished, the Exhaust Fan (optional) has been sized to handle the air flow and static pressure requirements for the Grease Viper System and the adjoining hood ductwork.

2. System Design and Layout

The arrangement of the supplied components and the general layout of the system will vary according to application, adjoining equipment, and available space. However, there are several basic factors pertaining to all installations that must be considered:

To maintain the selected cleaning efficiency, it is important to assure that the total air volume (capacity in CFM) is uniformly distributed across the entire face area of the unit - the prefilters and after filters provide some airflow resistance to influence uniform air distribution. However, since most duct systems are designed to handle air velocities greater than the rated velocity of the air cleaner, it is necessary to properly transition any attached ducting. If possible, a contraction angle of less than 60° should be maintained. If space prohibits, turning vanes, air baffles, or other means may be utilized. Ducting – where attached to the cabinet – should be gasketed, caulked or otherwise made watertight (and in accordance with NFPA 96 on commercial cooking exhaust applications).

Contaminants to be collected – such as oils in vaporous state – must be condensed into particulate form prior to entering the ionizing-collecting cells in order to maintain the anticipated efficiency. Gases, vapors or any nonparticulate cannot be precipitated and will therefore pass through the ESP. Any condensing that takes place downstream from the ESP defeats the purpose. By the same token, heavy concentrations of water vapor, or other matter that becomes highly conductive when condensed, must be prevented from entering and/or condensing in the collecting elements to prevent electrical arc over and shorting.

SAFETY NOTE

Factory designed access to all electrically charged high voltage components contain electrical interlocks for the safety of operating personnel. Any additional access that may be provided in the system, where there is access to high voltage, must be equipped with such interlocks. Interlocks are readily available from the factory.

Individual drain lines from the drain basin of each section should be trapped or otherwise sealed against the system pressure (in accordance with local codes) to prevent air bypass. Wash water to the unit must meet the volume required for the specific unit involved and must be between 40 psig min. to 60 psig max. at full flow to provide proper spray patterns from the wash nozzles. The wash water MUST be hot (140°F recommended) and installed as close as possible to the unit and detergent system. Where applicable, all water lines must be protected from freezing.

NOTE

THE HOT WATER TANK IS NOT PROVIDED BY TRION®.

Each installation varies according to needs, but normally the control panel is located indoors near the ESP. Ideal mounting height is at eye level for ease in reading the instrumentation and to facilitate service. For ease in maintenance and component removal, adequate space must be provided in front of all access doors, motors, pump and accessory equipment. Special consideration should be given in this respect for installations where the unit is suspended overhead. Catwalks or platforms should be provided.

CAUTION

In addition to the above space requirement, installation of the Grease Viper in NFPA applications shall have a clearance of at least 18 inches to a combustible material, 3 inches to limited combustible material, and 0 inches to noncombustible material. Any reduction in clearance or exceptions must be in compliance with NFPA and acceptable to the Authority Having Jurisdiction.

WARNING
Fire Suppression System

Extreme caution should be exercised when this unit is installed in applications that are collecting volatile or potentially flammable contaminants such as cooking grease and petroleum based oils. TRION® strongly recommends a fire suppression system be installed in the ductwork and on the Grease Viper in cases where these contaminants are collected on the cell plates and collect on the attached ductwork. Contact the factory for questions or concerns regarding a fire suppression system.

3. Outdoor Installations

Requirements for outdoor protection vary in accordance to climate and equipment component arrangement for the particular job. The best approach for equipment protection is the construction of a heated shed or building over the installation. As an

alternative, the installing contractor should treat the equipment as required to meet the specific needs. Detailed discussions of the installation components are as follows, using a rooftop installation as an example.

Adjoining Ductwork (not supplied by TRION®)
The ductwork located on the air entering side of the cabinet, between the point where it penetrates the roof and the cabinet, must be air tight to prevent the entrance of moisture, especially if it is under negative pressure. Ductwork must also be adequately insulated or other means taken to prevent the formation of condensation through temperature change. Condensation will short out the ionizing-collecting cells. Insulation must be of the outdoor variety.

TRION® Grease Viper Cabinet
The access doors on the Grease Viper cabinet are gasketed, and the unit is basically sealed against air leakage. The paint finish (epoxy) is for interior and exterior use. Like the air-entering duct, the cabinet must be insulated or other means taken to prevent condensation from taking place, which results in electrical shorting of the ionizing-collecting cells. Insulation, when employed, must be suitable for outdoor applications and when applied, consideration given to all access door openings and electrical interlock box covers.

Control Panel
The control panel is designed for remote mounting indoors, protected from the elements. If located outdoors with the cabinet, the control panel must at a minimum be weather protected. In sub-freezing climates, the control panel must also be insulated and/or heat traced to prevent freezing.

Drain Lines
The drain lines, located under the section access doors at the lowest point of the sectional drain pan, should be pitched downward and piped with as short a run as possible to the heated interior of the building (preferably, straight down from the drain pan supply through the floor). The recommended drain line trap, to seal off the cabinet from the drain against the system pressure, and the drain dump valve should be located in the heated interior. If not installed in this manner, heat trace or other means should be employed to prevent freezing. Clean-outs are recommended to be installed in all drain lines.

Wash Water Supply Line
The length of the wash water supply line between the Grease Viper cabinet and the heated building should be kept to a minimum. Preferably the line would go through the roof directly below each precipitator section. The strainer, pressure gauge (by others), and back flow preventer (by others, if required) should be installed indoors. Installed in this manner, a dumping valve can be included in the supply line to drain the remaining water from the wash manifolds and prevent freezing. The normally open dump valve will be energized to close when the water wash solenoid valve is energized to open. The strainer and solenoid valve(s) are supplied by TRION®. The dump valve, back flow preventer, or check valve are to be supplied by others.

If the above method is not employed, the water supply line, and drain line must be heat traced and insulated to minimize the potential for freezing.

Detergent System
The detergent system, designed for remote mounting, should be installed indoors and piped to the water supply line within the heated interior. Detergent feed line should be piped with as short a run as possible and inject into the wash water supply line as close as possible to the Grease Viper water wash connection fittings.

Contact the local TRION® representative or the factory if questions arise or any additional information is required.

Installation

FOR THE INSTALLING CONTRACTOR

1. Unpack and Inspect
At the time the unit is received, all shipping containers and their contents should be examined for damage. Any damage occurring in shipment must be immediately reported to the carrier, an inspection report completed, and a claim filed at the receiving point.

The unit cabinet is shipped completely assembled and, where size permits, the ionizing-collecting cells

are shipped inside the cabinet. On large units, the cells may be shipped in separate containers. The control panel, detergent feeder, odor control panels, and other separate accessories are shipped in the containers as noted on the packing list.

INSTALLATION WARNING

Precautions must be taken to protect the Grease Viper System and its sub-systems when installed outdoors or in extreme environments. Condensation, freezing, and elevated temperatures must be considered (see detailed Warning on Page 6).

2. Position Air Cleaner Cabinet

To reduce weight for ease in handling, remove the pre-filters, after-filters and the ionizing-collecting cells from the cabinet, and place them safely aside. Position the cabinet in the designated location giving consideration to the following points:

- Ionizing/collecting cells require 30" clearance in front of the access door for cell and mechanical filter removal.
- Level the cabinet to assure proper drainage from the drain pan.

3. Connect Adjoining Ductwork

The installation plan may call for adjoining ductwork on the air entering and/or air leaving sides of the cabinet. When adjoining ducting is to be installed, the bottom of the horizontal duct runs should be relatively flat and sloped toward the cabinet drain pan for an 18-inch length. As a result, any wash water splash back occurring during the washing operation will drain back into the drain pan.

Duct securement to the Grease Viper cabinet should be made air and watertight by caulking, gasketing, or welding (when required in accordance with local codes).

When an exhaust fan is installed downstream from the Grease Viper cabinet, the ducting between the cabinet and the blower will be under negative pressure and should be made air tight to prevent infiltration of contaminated air in accordance with local codes.

After the ductwork has been installed, clear remaining material or debris from inside ducts and bottom of cabinet, then re-install the ionizing-collecting cells and all other filters. When the ionizing/collecting cells are reinstalled, the directional arrows on the cell end plates must concur with airflow direction through the cabinet. Impinger prefilters are to be installed within the inlet plenum section on the air entering side of the unit.

NOTE

Follow the directional arrows located on the cell end plates. The side of each cell containing the spiked ionizer blades must be located on the air entering side of the cabinet. The brass contact plungers on the cell must face the access door side of the cabinet. Also, mist suppressors, when specified, must be located within the optional inlet plenum section on the air entering side of the cabinet.

4. Mount Detergent System

The detergent system should be located as close to the unit as practical, but should not exceed 30 feet in elevation difference. Service space must be provided for periodic manual filling of the detergent tank and to gain access to the pump and motor assembly. When positioned, the assembly may be secured in place at the predrilled factory mounting pads, either by bolting or welding. Local disconnect is recommended at the tank for pump motor service.

5. Connect Drain

Connect drain piping to the pipe nipples provided in the cabinet drain basin in accordance with the governing plumbing codes. The drain lines must be sealed with a trap or other means to prevent air by pass. If a trap is used, it should hold sufficient water column to overcome the system air pressure and to assure that loss of liquid from evaporation between cleaning periods will not break the seal. The drain line should not be smaller than the drainpipe connection, or it will otherwise restrict the flow of water. Elevation of the equipment may be required to allow adequate draining. Clean-outs are recommended to be installed in all drain lines.

6. Connect Water Wash Supply

Solenoid valve(s), 'Y' strainer, and a detergent tank/pump assembly are factory furnished for field installation. **Flush entire piping system before connecting to unit wash headers.**

Unless otherwise specified, the water wash supply should be hot **(140°F recommended - WATER HEATER NOT SUPPLIED BY TRION®)** at the volume specified for the given unit, and at a full flow pressure between 40 and 50 psig measured at header.

WARNING

Precautions should be taken in the event the water supply, detergent piping, and drains are subjected to freezing temperatures: 1) All plumbing components – backflow preventer, 'Y' strainer, pressure gauge, solenoid valve(s), detergent system, drain valve, and air gap fitting - must be installed indoors or in a heated mechanical room in accordance with the plumbing schematic to prevent freezing. 2) All piping exposed to cold climate outdoor conditions should be heat traced and insulated to prevent freezing. 3) An air gap fitting should be installed on the drain line to facilitate gravity draining of wash water from the internal headers and manifolds. 4) The water supply line should be pitched back toward the heated space.

Although not required, a pressure gage and a manual service valve are recommended as shown in the plumbing schematic (separate from this manual). The components should be located within the system to provide for service access.

7. Mount Control Panel

The control panel should be mounted indoors (unless supplied with a weatherproof enclosure), at eye level, and located as close to the ESP as practical. Allow sufficient space in front of the access door(s) for service. Refer to appropriate control panel outline drawing for mounting hole layout and dimensions.

8. Complete Wiring

a. *Primary Wiring*: The control panel is the main distribution point for all primary wiring. The various electrical components involved are connected to and powered from the control panel.

b. *Grounding*: An earth ground must be provided to the Grease Viper cabinet and control panel. All ground connections must be in contact with bare metal and securely affixed. Ground conductor size and connection means will be in accordance with all applicable electrical code standards.

9. Check Out for System Start-up

When the installation has been completed, assure that the equipment is ready for start-up by checking the following:

- All construction debris has been removed from the ionizing-collecting cells, drain basin and ductwork.
- The inside of the control panel and detergent tank are clear of any foreign materials.
- The drain lines from the Grease Viper drain basins are clear and completely connected to their point of termination.
- All piping is completed to the manifold headers and wash water is available.
- Supply line power is available and electrical wiring is completed to the following components:

  a. Control Panel
  b. Solenoid Valve(s)
  c. Detergent Pump Motor
  d. Electrical Interlocks
  e. Power Supplies for Ionizing-Collecting Cells
  f. Exhaust Fan

NOTE

Do not add the initial supply of detergent into the detergent tank - this is to be done after volume settings are adjusted at start-up.

Operation & Service

FOR THE MAINTENANCE ENGINEER

WARNING
RISK OF ELECTRIC SHOCK

These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

1. Introduction and Principle of Operation

The TRION® electronic air cleaner is technically known as an Electrostatic Precipitator (ESP). In this type of equipment, all airborne particles, even of microscopic size, are electrically charged (positively) as they pass through a high voltage ionizer. These charged

particles are then attracted and adhere to a series of parallel collecting plates, which form the negative elements of an electrostatic field.

The ionizer consists of charged stainless steel spiked blades spaced between grounded electrodes. The collecting section consists of parallel plates arranged so that each alternate plate is charged while the intermediate plates are electrically grounded.

Periodically, depending on the type and concentration of contamination in the air, the contaminant is washed from the plates by the integrally constructed water wash system.

Three major functional components comprise the air cleaner:

- Ionizing-collecting cells to ionize and collect airborne particulate matter.
- Power supply(s) to supply high voltage direct current to the ionizing-collecting cells.
- Control operated wash system to automatically wash away the collected contaminant.

Normally, systems are designed for collection efficiencies in the range of 90% DOP (0.3 micron) or more. Collecting a contaminant at these efficiencies, especially when there are high concentrations, can result in large accumulations in a relatively short period. Therefore, maintenance must encompass two areas: the operation of the equipment for efficient collection, and the systematic removal of the collected contaminant.

2. General Description

The inlet plenum contains grease baffle impinger prefilters to reduce airborne grease and mist concentrations and provide resistance for uniform air distribution.

The ionizing-collecting cells (contaminant collecting elements) are housed in the ESP section(s) and can be removed from the cabinet as required, through the side access door, by sliding them out like drawers. On multi-cell units, all of the electrical connections between cells in a given tier are automatically made through spring plunger connectors. Install cells into the cabinet in accordance with the directional arrows on the cell end plates. The side of the cell containing the spiked ionizer blades must always be located on the air entering side. The spring plunger connectors, located on one end of each cell, will always face toward the access side of the Grease Viper cabinet.

The power supply(s) convert the 24 volt, 60 Hz, single phase AC supply to the high voltage DC required to power the ionizing-collecting cells. Potential of 11.5 KVDC is required for the ionizer sections and 5.7 KVDC for the collector sections of the cells.

Metal mesh after filters, located downstream of the cells in the last ESP section, prevent re-entrainment of contaminants and wetting of the odor control panels during the wash cycle.

The integral wash system consists of a series of spray nozzles soldered into fixed water wash manifolds. The manifolds are located in the front and top of each cell tier. A detergent system is also incorporated into the wash system. The amount of detergent used for washing is readily adjustable, and that amount is dependent upon the type and amount of collected contaminant.

The washing operation is cycled periodically - the frequency is dependent on the type and amount of contaminant collected. The sequential events in a wash cycle are:

- Power Supply(s) and System Fan “OFF”
- Wash Water and Detergent “ON”
- Wash Water and Detergent “OFF”
- Pause for Detergent to react
- Wash Water “ON” (without Detergent for rinse)
- Wash Water “OFF”
- Pause for Drip Dry
- Exhaust Fan “ON” for forced air dry
- System Standby (Exhaust Fan and Power Supplies “OFF”)

The time span for all of the events is factory set when the equipment is initially ordered – see “Sequence of Operation” in submittals.

3. Initial Start-up

1. Inspect the inside of the adjoining ductwork and TRION® cabinet to be sure it is clean and free of

any debris or construction materials. Especially note the opening in the drain basin for any restrictions. The ducting, where secured to the cabinet collars, should be sealed water tight either with gasketing or caulking.

2. Inspect the ionizing-collecting cells to see that all of the ionizing blades are intact, that no large pieces of foreign material are lodged between the plates, and that the cells are properly installed in the cabinet with the spiked ionizing blades located on the air entering side and the brass contact plungers facing the access side of the cabinet.
3. Confirm that the drain lines from the TRION® cabinet drain basin are completely connected and properly terminated. A trap or seal of some type should be incorporated in each line to prevent air bypass.
4. Check the water supply line to be sure water is available and that the strainer, solenoid valve(s), and detergent system are properly installed and connected.
5. Confirm that electrical power is available, that the wiring is completed, and that the system exhaust fan is ready to be energized.
6. Confirm that all access door interlocks are closed.
7. Close the system electrical supply switches, making power available to the TRION® control panel and the system fan.
8. Turn the selector switch on the control panel to the "ON" position. Push filtration button on door. The exhaust fan should run (if installed) and the power supply(s) should be energized. Electrical arcing within the ionizing-collecting cells may occur - this is a normal occurrence caused by accumulation of dusts from construction or other sources in the cell(s) and should quickly subside.
9. Ensure the detergent tank is clean, and then fill the tank 1/8 full with clean water. Do not fill the tank with detergent until start-up adjustments have been completed.
10. (Review this paragraph in its entirety before initiating the wash start button.)

    Manually initiate the wash cycle by pushing the "Wash Mode" button on the control. The wash control duration is 70 minutes and by means of a factory preset programmable logic controller (PLC) will sequence the washing events as previously outlined. When the detergent pump is energized, note the volume that is used by observing the reduction in the liquid level in the tank. The usage should be approximately 1 part of detergent to 20 parts of water. The pump is a constant displacement type and the amount of detergent forced into the water supply to wash the unit is dependent upon the setting of the control valve in the bypass return line to the reservoir. The side of the translucent reservoir is marked with volume markers. Adjust the control valve to obtain the correct usage for the given unit in accordance with the submittal outline data, and then secure the setting with the Allen head set screw located in the valve adjustment knob. When the correct adjustment has been made, remove the remaining water from the reservoir and fill the tank with initial supply of detergent furnished, unless Tridex concentrate mixture is being used.

11. Programming Time Clock for Automatic Wash

General Information

The panel-mounted digital timer series included with the Grease Viper can be operated in four separate power supplies, ranging from 240 VAC to 12 VDC. Output format can be produced to be volt-free or voltiac-output. Batteries of lithium CR2032 or rechargeable V80H are optional for retaining the programming during timer's disconnected operating power.

The digital timer is accurate to the minute, designed with either six or eight ON/OFF (events) per day. It also provides 15 combinations of daily programs which can lead great convenience to users upon choosing the required days in a week for operating the timer.

Programming Functions

- TIMER: Programs review and setting programs
- MANUAL: To select "ON, AUTO, or OFF"
- CLOCK: To adjust current DAY and TIME
- DAY: To adjust day of week
- HOUR: To adjust hour
- MIN: To adjust minute
- Ⓡ: Reset timer's setting
- LED: To indicate ON/OFF status

Press Ⓡ button to reset timer before programming.

Adjusting Clock
Press and hold CLOCK and then press DAY key, HOUR key, MIN key respectively to adjust clock of timer to accurate DATE, HOUR, MINUTE. In 12-hour format, PM and AM shall appear on LCD screen. In 24-hour format, LCD screen shall indicate 0:00 - 23:59.

Programming the Timer
1. Press TIMER key. LCD screen shall show 1^{ON}.
2. Press DAY key to select any of the 15 combinations of daily programs to your application demand. Continuing to press DAY key will cause the LCD screen to alternate among 15 combinations.
3. Press HOUR and MIN respectively to set desired hour and minute for 1^{ON}.
4. After finished setting 1^{ON}, press TIMER key again. 1^{OFF} should appear on the LCD screen.
5. Press DAY key to select any of the 15 combinations of daily programs to your application demand. Continuing to press DAY key will cause the LCD screen to alternate among 15 combinations.

NOTE: Day combinations chosen in each of the ON/OFF program periods must be consistent. The OFF time settings for each period must be one minute after the ON time setting.

6. Repeat programming procedure 3 to set desired hour and minute for 1^{OFF}.
7. When finished setting 1^{ON} and 1^{OFF}, press TIMER. 2^{ON} shall appear on LCD screen.
8. Repeat programming procedure above to complete the rest of ON/OFF program period event or just to the desired number of ON/OFF (event) setting for demand of practicable application.
9. When finished program setting (event), press CLOCK. Timer shall start to execute programs.

Reviewing Programs
Keep pressing TIMER, and the display on the LCD screen shall alternate display among each of 6 or 8 ON/OFF events.

Using Override Functions
Timer is designed with two override functions to widen its usage among practicable applications. Override function is only effective when timer is running in AUTO mode.

Temporary Override
Condition 1: When timer's output status is ON, press MANUAL key to move indicator from AUTO to OFF. Timer output shall turn to OFF status, programs overrided. Press MANUAL again to switch timer status to AUTO. Timer's output shall continue maintaining OFF. Timer shall resume its automatic operation when next program (event) calls for ON (with next opposite set point).

Condition 2: When timer's status is OFF, press MANUAL key to move indicator from AUTO to ON. Timer status shall turn to ON status, programs overrided. Press MANUAL again to switch timer status to AUTO. Timer's output shall continue maintaining ON. Timer shall resume its automatic operation when next program (event) calls for OFF (with next opposite set point).

Random Startup Override: Press and hold DAY key, and then press MIN key. There shall be a symbol "nn" that shows on the left corner of the LCD screen to indicate that this override is executing. When this override is being executed, the original programs will be stopped, and once every 10 to 120 minutes, timer shall automatically turn its output to ON status. Once again, pressing and holding DAY key and then MIN key shall terminate this override.

For safe and proper operation, adhere to the following instructions and procedures:

- Exhaust systems shall be operated during all periods of cooking in restaurant applications.
- Filter-equipped exhaust systems shall not be operated with filters removed.
- The posted instructions for manually operating the fire extinguishing system shall be kept conspicuously posted in the kitchen and reviewed periodically with employees by the management.
- Listed exhaust hoods shall be operated in accordance with the terms of their listings and the manufacturers instructions.
- Cooking equipment shall not be operated while its fire-extinguishing system or exhaust system is not operating or otherwise impaired.

4. Wash Control and Detergent System Settings
Some contaminants are more difficult to remove than

others and require a stronger detergent solution. Average settings have been factory set. Best possible settings for any given installation, however, are determined through experience. Determination can be made by visually examining the collecting elements after the first few wash cycles.

To adjust the volume of detergent used within the given time setting, loosen the knurled knob with an Allen wrench on the control valve located in the by-pass line. Refer to the Detergent System Outline. Turning the knob clockwise increases the volume and counter clockwise decreases the volume. When adjustment has been made, be sure to retighten the setscrew.

5. Routine Maintenance

Washing Frequency

The frequency that the collected contaminant is to be washed from the unit depends upon the type and amount of contaminant in the air to be cleaned. Contaminant which is greasy in nature tends to harden after collection and should be washed away often. Likewise, units operating under extremely heavy contaminant loads should be washed more often as a large build-up of collected material will have a tendency to "blow-off" if permitted to remain on the collecting elements for long periods of time. In that the type and amount of contaminant varies geographically (and from one location to another in any given area) it is recommended to start operation with a washing frequency of at least once a week. This schedule may then be altered as needed after visual examinations of the collected material contained on the ionizing-collecting cells. Daily washing is not unusual for units operating on heavy welding fume, kitchen exhaust hoods or similar applications. Start time programming is recommended to be within one hour of the end of cooking time.

Detergent

Effective washing is dependent upon detergent. The detergent reservoir should be examined on a routine basis, a minimum tank level established, and never permitted to empty. An empty tank not only means poor washing, but can also be detrimental to the pump. The inside of the tank should be kept clean, free from dirt and foreign objects. The detergent, as supplied by TRION®, is formulated specifically for electronic air cleaners. If substitutes are used, they must be approved by TRION®, so as to not void the warranty. They should be safe for use in ventilation systems and non-caustic, as 95% of the ionizing-collecting cells are constructed of aluminum, special high voltage insulation and gasket seals.

Electrical Operation

The ESP section(s) access doors have LED indicating lights to show status of the power supplies. Illumination of LED(s) indicates proper operation. Flickering or dim LED(s) indicate arcing within the ionizing-collecting cell(s). No illumination indicates lack of input power, dead short in ionizing-collecting cell(s), failed power supply, and/or failed LED.

6. Periodic Maintenance

Water Wash System - Every 6 Months

The water wash spray pattern should be checked on each nozzle to be sure that a full spray pattern is developed. Distorted patterns are usually caused by contaminant in the nozzle orifice, which can be cleaned by inserting a small gage, soft copper wire into the orifice. If any one manifold contains several nozzles that are restricted, remove the manifold and thoroughly flush. The main supply line strainer and the strainer in the detergent system should be checked and cleaned.

Fire Suppression System (IF INSTALLED) - Every 6 Months

Properly trained and qualified personnel shall complete inspection, cleaning and servicing of the fire suppression system.

All actuation components, including remote manual pull stations, mechanical or electrical devices, detectors, fire-actuated dampers, etc., shall be checked for proper operation in accordance with the manufacturers listed procedures. In addition to these requirements, the specific inspection requirements of the applicable NFPA standard shall also be followed. If required, certificates of inspection and maintenance shall be forwarded to the authority having jurisdiction.

Control Panel - Every 12 Months

The inside of the controller cabinet should be examined for accumulated dirt and dust. If required, the components should be cleaned using a good brand of electrical contact cleaner. All terminal connections approved should be checked for securement and tightened or reworked as required.

Ionizing-Collecting Cell(s) - Every 6 Months
Handle cells with care to avoid damage to the insulators and especially the brass contact plungers. Remove and inspect the ionizing-collecting cells for excessive contaminant accumulations not removed by the integral washing system. Manually clean as required in a soak tank, commercial car wash, or with a pressure hose or pressure cleaner using a low pressure setting. At this time, particular care should be taken in cleaning each of the insulators.

WARNING
RISK OF ELECTRIC SHOCK
These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

Odor Control Panels - Every 6 Months
Replace or refill panels with odor adsorber granules, as required.

Motors – Every 24 Months
As the operation of detergent pump motor is limited, frequent oiling is not required. Lubricate with several drops of SAE 10 motor oil every two years. DO NOT OVER OIL. Lubricate fan motor per manufacturer's guidelines.

Filter Devices – Every 4 to 6 Months
Hoods, impingers, metal mesh filters, ducts, and other appurtenances shall be cleaned to bare metal at frequent intervals prior to surfaces becoming heavily contaminated with grease, oil or other contaminant. It may be advantageous to clean readily removable items, such as impingers, metal mesh filters or other permanent filter devices in a soak tank, with a pressure hose or pressure cleaner using a low pressure setting. After cleaning to bare metal, components shall not be coated with powder or other substance. Allow filters to completely air dry before installing in cabinet.

When a cleaning service is used, a certificate showing dates of inspection and/or cleaning shall be maintained on the premises.

WARNING
Flammable solvents or other flammable cleaning aids shall not be used.

At the start of the cleaning process, electrical switches that could be accidentally activated shall be locked out. Components of the fire suppression system (if installed) shall not be rendered inoperable during the cleaning process.

Care should be taken not to apply cleaning chemicals on any fusible links or other detection devices of the automatic extinguishing system.

7. Troubleshooting

WARNING
EXERCISE THE USUAL PRECAUTIONS WHEN WORKING WITH HIGH VOLTAGE. THE MAXIMUM OPERATING OUTPUT FROM THE POWER SUPPLY IS 12,000 VDC AND 8 MA WITH TWO POWER SUPPLIES IN PARALLEL.

IF SAFETY SWITCHES ARE CLOSED AND CIRCUIT IS ENERGIZED, DO NOT TOUCH HIGH VOLTAGE. WHEN THE CIRCUIT IS DE-ENERGIZED, ALWAYS BLEED OFF REMAINING STATIC CHARGE WITH AN INSULATED HANDLED SCREW DRIVER BY SHORTING TO GROUND THE POINTS OF HIGH VOLTAGE DC POTENTIAL.

WARNING
RISK OF ELECTRIC SHOCK
These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

Introduction
This section on troubleshooting provides a description of potential malfunctions, their cause, location and correction. A Troubleshooting Reference Chart listing the most probable causes and corrections follows the general text.

NOTE
All repairs to the fire suppression system (if supplied) must be completed by the authorized fire control contractor.

The electronic air cleaner is the unit within the system that has the highest efficiency collection rating and is also the one with the highest potential for malfunction. When a malfunction does occur, the outage is usually found in the electrical secondary circuit in the ionizing-collecting cell(s).

Indicating lights are installed in the face panel of the cell access doors to monitor the electrical operation of each power supply and the ionizing-collecting cell(s) they energize. The quantity of power supplies per unit is dependent upon unit size with one or two power supplies for each ionizing-collecting cell tier in height. Other than the basic hand tools, it is advantageous to have a volt/ohm/milliammeter with a 20 KVDC high voltage probe. These instruments are standard catalog items by several manufacturers.

Secondary Short Circuit

The most common outage is a short in the secondary circuit and is best located through the process of elimination. Symptoms are a flickering indicating light accompanied by an arcing noise in the ionizing-collecting cell(s) or an indicating light that is not glowing.

A flickering light with an arcing noise is an indication of a high resistance short circuit and a light that is not glowing is an indication of a dead short. (A light that is not glowing can also be an indication of an open circuit in the primary circuit. Refer to the paragraph on open circuits.) The short may be in the power supply, the high voltage cables or the ionizing-collecting cell(s). To isolate the short to any one of these three components, proceed as follows:

WARNING

When safety interlock switches are closed, do not come in contact with high voltage components. The operating output from the high voltage power supply(s) is 12,000 VDC and up to 8 MA.

When the power supply(s) is de-energized, there is a 20 second delay for the voltage to decay. Always short from ground to a point of high voltage with a well-insulated jumper wire or an insulated handled screwdriver to bleed-off any remaining residual charge.

1. Disconnect both high voltage leads from their respective terminals on the power supply and support them away from any point of contact.

2. Energize the power supply:
   a. Confirm the presence of 24 VAC input.
   b. If the light still flickers or does not glow, check for presence of HV output at both ionizer and collector terminals on the power supply. If no HV output is noted, the trouble is within the power supply - replace the power supply in its entirety.
   c. If HV output is noted, the trouble is in the LED. Confirm LED wiring polarity. Replace the LED if the light still does not glow.
   d. If the light glows steady with the leads disconnected, the power supply is indicated to be normal.

NOTE

It will be necessary to close the access door electrical interlock switch operated by the access door to complete the primary circuit to the power supply.

3. Next, reconnect both high voltage leads to their respective terminals on the power supply.

   The trouble can then be isolated to a single cell or the ionizing or collector section of a given cell as follows:

   a. First determine if the short is in the ionizing section or the collecting section by connecting each high voltage lead to its respective section, one at a time, and energizing the power pack. (The lead not connected must be supported away from any point of contact.) The short symptoms will still exist for the section in which the short is located. If the trouble causing the short is bridging both sections, then the short will be indicated in both sections when they are individually connected.
   b. When the short is isolated to a cell tier, remove all the cells within the tier and visually check the sections indicated to contain the short.
      - If the short is in the ionizer section, look for a broken or defective insulator.

- If the short is in the collector section, look for a large piece of foreign material bridging the collector plates or a defective insulator.
- If the short is indicated to be in both sections, it will probably be a foreign object bridging the air gap between the ionizer and the collector.

c. Open Circuits: Although open circuits can occur in the secondary, they usually take place in the primary. If the unit contains only one power supply and the indicating light does not glow the outage is probably one of the following:
- Supply line power to the control disconnected. Reconnect.
- Open access door interlock in control of electronic air cleaner. Be sure all access doors are properly closed and secured.
- Blown in-line fuse located on the transformer. Identify short and replace fuse.
- Outage in the power supply. Look for charred or burned components or a loose wiring connection. Replace power supply or reconnect wiring.
- Defective indicating light. Replace light.

d. Malfunctions other than short or open circuits - refer to the Troubleshooting Reference Chart below.

Problem/Symptom	Probable Cause	Location	Reason - Correction
Indicating Light Not Glowing	Short Circuit	Ionizing Section of Cell	1. Dirty Insulator(s) - Clean 2. Defective Insulator(s) - Replace 3. Foreign Object between Spiked Ionizer and Ground Electrode - Remove
		Collecting Section of Cell	1. Dirty Insulator(s) - Clean 2. Defective Insulator(s) - Replace 3. Foreign Material Bridging Plates - Remove 4. Bent Plates - Straighten or Replace Cell
		Power Supply	Charred/Overheated Components - Replace Power Supply
Indicating Light Not Glowing	Open Circuit	Control	Transformer - Check 24 VAC Input
		Power Supply	1. Disconnected Wire - Reconnect 2. Charred/Overheated Components - Replace Power Supply
		Electrostatic Precipitator Housing	1. Electrical Interlock Switch Not Closed - Close Access Door 2. Faulty Electrical Interlock Switch - Replace
		LED	1. Incorrect Polarity - Correct Wiring 2. Faulty LED - Replace LED
Indicating Light Flickering	High Resistance Short	High Voltage Circuit	1. Loose or Defective Inter-cell Connection (on Multi-cell Units) - Tighten or Replace 2. Foreign Object Adrift in Ionizer or Plate Section of Cell - Remove

8. Spare Parts

Recommended spare part quantities are usually based on the unit size and the amount of units per installation. For specific recommendations, consult the TRION® factory or nearest representative. Consideration, however, should be given to stocking the following components:

DESCRIPTION	QTY.
Power Supply	2
Cell Insulators	6
LED	2
Brass Contact Plunger	2

Part numbers are not listed, as they are subject to change. Please supply unit model number, unit part number, and serial numbers when ordering parts. Unit data and system labels located on precipitator cabinet. Control data label located inside access door of control panel.

LIMITED WARRANTY

Unless otherwise expressly stated in Seller's published specifications for the Goods, Seller warrants that that Goods are free from defects in material and workmanship, except for services which are warranted to be performed in a competent and diligent manner in accordance with any mutually agreed specifications. The foregoing warranty shall apply for twelve (12) months from the date of shipment from Seller's facility, except for services for which the warranty shall apply for ninety (90) days from the date of performance (the "Warranty Period"). Provided Buyer informs Seller in writing of any breach of warranty prior to the expiration of the applicable Warranty Period, Seller shall, as its sole obligation and Buyer's sole and exclusive remedy for any breach of this warranty, repair or replace/ reperform the Goods which gave rise to the breach or, at Seller' option, refund the amounts paid by Buyer for the Goods which gave rise to the breach. Any repair, replacement or reperformance by Seller hereunder shall not extend the applicable Warranty Period. The parties shall mutually agree on the specifications of any test to determine the presence of a defect. Unless otherwise agreed upon by Seller in writing, Buyer shall bear the costs of access, de-installation, re-installation and transportation of Goods to Seller and back to Buyer. These warranties and remedies are conditioned upon (a) the proper storage, installation, operation, and maintenance of the Goods and conformance with the proper operation instruction manuals provided by Seller or its suppliers or subcontractors, (b) Buyer keeping proper records of operation and maintenance during the applicable Warranty Period and providing Seller access to those records, and (c) modification or repair of the Goods only as authorized by Seller. Seller does not warrant the Goods or any repaired or replacement parts against normal wear and tear or damage caused by misuse, accident, or use against the instructions of Seller. Any modification or repair of any of the Goods not authorized by Seller shall render the warranty null and void. EXCEPT AS EXPRESSLY SET FORTH HEREIN, SELLER MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT OR FITNESS FOR A PARTICULAR PURPOSE WHICH ARE HEREBY DISCLAIMED TO THE EXTENT PERMITTED BY APPLICABLE LAW.

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