

# **FILTRATION GROUP**

## **SENTINEL Fan Filter Units**

### **Installation Operation and Maintenance Instructions**

**READ AND SAVE THESE INSTRUCTIONS WARNING – TO REDUCE THE RISK OF FIRE, ELECTRICAL SHOCK, OR INJURY TO PERSONS OBSERVE THE FOLLOWING:**

Use this unit only in the manner intended by the manufacturer. If you have any questions, contact the manufacturer.

Before servicing or cleaning unit, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.

SENTINEL Fan Filter Units are suitable for commercial and industrial use only. They are designed for suspended installation or installation in T-Grid Ceiling Systems for Vertical Flow.

SENTINEL Fan Filter Units must never be exposed to rain, ice, snow, or excessive moisture. Do not use this product near water, i.e. near bathtubs, washbowls, whirlpools, etc. If the unit is equipped with a flexible power cord, do not handle with wet hands.

Do not place anything on top of the units. Do not restrict the flow of air into the unit.

#### **RECEIVING AND UNPACKING**

All shipments are “FOB Ship Point.” This means once goods are picked up and signed for by the driver, they are the responsibility of the freight company. When the shipment is delivered and signed for by your receiving personnel, the ownership and responsibility is transferred to the receiving company.

Filtration Group inspects each product before packaging and does not ship damaged goods. Inspect the incoming shipment with the freight carrier driver present. Note any suspected damage on the receiving papers and immediately inspect the damaged carton(s). Note damages on the receiving documents and file a freight claim with the transportation company. Filtration Group does not take responsibility for damages caused by the freight company.

If damage is discovered after the carton is opened, it is the buyer’s/receiver’s responsibility to file a freight claim. Keep all incoming cartons and the product for inspection. Do not send back to Filtration Group.

**PRE-INSTALLATION INSTRUCTIONS WARNING – TO REDUCE THE RISK OF FIRE, ELECTRICAL SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING:**

Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.

SENTINEL Fan Filter Units operate on 115 Volts, 208-230 Volts, 277 Volts at 60 Hz., or 208-240 Volts, 50 Hz. Check the label on the front of the unit for voltage, current and frequency of operation. Verify the rating of the branch circuit protector and branch circuit wiring prior to installation and electrical connection to the unit.

Certain models are provided with an optional flexible power cord with plug. Do not use any type of adapter that will allow the unit to be plugged into an outlet that is not grounded.

Do not plug the unit into an outlet that is controlled by an on/off wall switch or by a facility house lighting control switch.

**CAUTION:** To reduce the risk of injury to persons, install the unit at least 7 feet above grade or in ceiling.

**INSTALLATION INSTRUCTIONS CAUTION** – HEPA and ULPA filter media is fragile and can be damaged easily. Special precautions must be taken during un-packaging and installation of SENTINEL Fan Filter Units. To avoid damage to the filter media, touch only the frame. **DO NOT PLACE HANDS OR ANY OTHER OBJECTS ON THE FILTER SURFACE.**

**CAUTION:** Commercially available 1" or 1-1/2" T-Grid suspended ceiling systems are not designed to support the weight of any fan powered filter units. Filtration Group 2" T-Grid systems for softwall and hardwall cleanrooms provide the support for direct mounting of SENTINEL Fan Filter Units. If Filtration Group, Inc. or equivalent 2" T-Grid system **is not** installed, it is mandatory that SENTINEL Fan Filter Units be suspended independently from these suspended ceiling RSR.

**Mechanical Installation of Suspended Vertical Flow Units:** SENTINEL Fan Filter Units are equipped with attachment points to make the installation hanging process easy. Units may be supported with flexible or rigid hangers. Use at least 12 gage hanging wire or the equivalent light chain or cable on each corner to support the unit.

#### **Mechanical Installation of Units in 2" T-Grid Systems:**

Install 2" T-Grid system in accordance with site plan and manufacturers instructions. Install seal gaskets (if provided) in pre-designated locations. Carefully place SENTINEL Fan Filter Unit into the grid opening taking care to observe the precautions not to damage the filter media while handling the units.

#### **Electrical Installation:**

Refer to wiring schematics at the back pages of these instructions.

Provision of electrical branch circuit supply to the appropriate location within close proximity to the SENTINEL Fan Filter Units is the responsibility of the customer's electrical installer. If local or national electrical codes or the customer's installation specifications require the provision of

metal conduit directly to the unit it is recommended that a Listed flexible metal conduit be provided.

SENTINEL Fan Filter Units may be supplied with optional flexible power cord with grounded plug, optional 2" x 4" or 4" x 4" Metallic wiring box with cover, with or without an on/off switch mounted in the wiring box or optionally within the prefilter frame housing. When an on/off switch is provided, field connections are to be made directly to the open supply terminals of the switch. When an on/off switch is not provided, field connections are to be made to the non-connected pigtail leads within the metallic wiring box or pre-filter frame.

**CAUTION:** When making field wiring connections within the Pre-Filter Frame, make sure that all field installed wiring is routed away from moving motor and fan parts and is secured in place to prevent inadvertent damage to wires.

### **Start-up Check List—Before Applying Power:**

Check the voltage on the Manufacturer's Name Plate and verify that the power supplied to the unit is the Sentinele as that listed on the Name Plate. Remove the prefilter and determine if the fan is free to rotate and has not been misaligned during shipment of installation. Check nuts, bolts, screws and electrical connections for tightness.

**CAUTION:** If the unit is provided with a square perforated metal barrier over the opening to the prefilter frame, it must be re-installed prior to application of power and start-up of the Fan Filter Units.

Apply power and check that the wheel is rotating in the correct direction. Looking through the prefilter frame the fan must be rotating in a clockwise direction.

## **OPERATING INSTRUCTIONS**

### **Principle of Operation:**

SENTINEL Fan Filter Units are self-contained, low profile, electric powered, motor-fan driven HEPA or ULPA Filter, air filtering appliances. The units are heavy-duty units suitable for many industrial/commercial applications where clean air is needed. This is accomplished by maintaining a flow of filtered air to remove airborne particles within an enclosed room or chamber. Where manufacturing and assembly processes require Federal Standard 209 or ISO Classification clean rooms, multiple SENTINEL Fan Filter units can provide a sufficient number of filtered air changes to maintain a positive pressure of clean air within the controlled environment.

Because of the unique variety of sizes and options offered, SENTINEL units can be incorporated into many different areas such as Softwall Cleanrooms, new Hardwall Cleanroom designs, and facility upgrades over conveyors or free standing machinery. They may also be incorporated into custom workbench constructions providing concentrated filtered air to meet critical clean air process requirements.

### **Method of Operation:**

Unfiltered air is drawn into the air inlet at the top of the unit through an optional 20 x 20 Pre-Filter. This air is pulled through the motor/blower assembly into a baffled and insulated air plenum designed to evenly distribute air over and through the entire receiving surface of the

HEPA Filter. Thus, SENTINEL Fan Filter Units efficiently and quietly deliver the desired volume of cleaned air to the controlled environment. The volume of air delivered can be adjusted by means of a factory installed variable motor speed controller mounted within the unit.

## **SENTINEL Maintenance**

### **Preventive Maintenance**

It is the intention of Filtration Group, Inc. to deliver a safe and reliable product that will give years of trouble-free service.

To ensure optimum, safe performance and maximum product life a preventative maintenance program must be established.

1. Inspect prefilter and HEPA or ULPA filter after the first three (3) months of operation. Based on the findings, schedule periodic inspections and maintenance for changing prefilter and the HEPA or ULPA Filter.
2. Prefilters should be changed at least every six (6) months.
3. Cleaning fan wheel is required to insure smooth quiet operation. Periodic cleaning of all fan equipment is strongly recommended because dirt accumulation on the impeller can cause vibration which greatly increases stress and load on motor bearings.

All services to be performed by a qualified technician.

### **Servicing SENTINEL Units**

**WARNING** – REDUCE THE RISK OF FIRE, ELECTRICAL SHOCK, OR INJURY BY OBSERVING THE FOLLOWING:

1. Turn the Safety Switch and Variable Speed Control on each unit to the off position.
2. To prevent power from being switched on accidentally before servicing, switch power off at the service panel and lock the service disconnecting means.
3. If the service disconnecting means cannot be locked, securely fasten a permanent warning device, such as a tag, to the service panel.
4. For units with an optional power cord, unplug unit and tie cord out of reach of receptacle.

### **When to Change the HEPA or ULPA Filter**

Static pressure can be measured with a Magnehelic gage or manometer.

It is time to change the HEPA or ULPA filter when the pressure drop across the filter reaches two (2) times the original resistance.

Tools Required for STD Style:

1. Power driver, ¼" socket bit. Or,
2. Standard Phillips head screw driver.

Tools Required for RSR and RSR LI Style:

1. Standard Phillips head screw driver.
2. 5/32" allen wrench.

3. (2) persons, if installing from roomside. To hold the filter in place and to position the filter clamps correctly.
4. (1) person, if installing on a bench with housing upside down.

### **STD Style units with HEPA or ULPA Filter (are not replaceable from roomside)**

#### **How to Change the HEPA or ULPA Filter**

**CAUTION:** Do not touch either side of the HEPA or ULPA filter surface while installing or removing the filter.

1. Remove SENTINEL Unit from ceiling, and place on solid surface.
2. Using a power driver and ¼" socket bit or, Phillips head screwdriver, remove twelve Tek Screws located on plenum flange.
3. Separate plenum hood assembly from filter.
4. Clean plenum flange surface.
5. Place plenum hood assembly on top of replacement filter. NOTE: Gasketed surface of filter should mate with plenum.
6. Install all Tek Screws.
7. Replace SENTINEL unit back into ceiling.

### **RSR and RSR LI Style units with HEPA or ULPA Filter (are replaceable from roomside)**

#### **How to Change the HEPA or ULPA Filter**

Note: For the purposes of this manual it is understood that changing/installation (for RSR and RSR LI styles is being performed from roomside.

**CAUTION:** Do not touch either side of the HEPA or ULPA filter surface while installing or removing the filter. Do not touch gel. Do not allow gel to collect dirt or rust. Inspect gel track on filters to:

1. Insure adequate gel depth, (within 1/16" from top of gel track).
2. Check for consistence and color for uniformity.

Removal of unit from ceiling grid is not required.

1. Using a standard Phillips head screw driver, remove (2) Phillips screws from the grille assembly, lower grille. Proceed to step 3 for RSR series units without lights.
2. To remove fluorescent tubes from the housing:
  - Carefully grasp one of the fluorescent tubes with both hands.
  - Rotate the fluorescent tube ¼ turn in either direction until the pins line up with the slot in the lamp holder.
  - Then gently pull down on one end. The other end will pull out easily once this is done.
  - Repeat this procedure for all remaining fluorescent tubes.

3. With a 5/32" allen wrench, remove the (4) filter clamp bolts and (4) filter clamps from housing.
4. Pull down on the HEPA or ULPA filter to break the seal, then lower the filter straight down through the housing. Discard the filter.
5. With the assistance of another person, center the new HEPA or ULPA filter in the housing with equal clearance on all four sides between the filter and the housing guides. Then carefully install the new filter into the housing.
6. With the assistance of another person (to hold the new filter in place), replace the (4) filter clamps and the (4) filter clamp bolts. Using a 5/32" allen wrench hand tighten firmly. Proceed to Step 8 for RSR series units without lights.
7. To replace fluorescent tubes in the RSR LI housing:
  - Carefully grasp one of the fluorescent tubes with both hands.
  - Gently insert one end of the fluorescent tube into the lamp holder.
  - Then align the pins on the other end, with the slot in the lamp holder.
  - Gently insert into the lamp holder. Rotate the fluorescent tube ¼ turn in either direction until the pins are firmly locked in place.
  - Repeat this procedure for all remaining fluorescent tubes.
8. Replace the grille assembly and fasten with the remaining (2) Phillips screws.

### **Gel Filter Replacement**

Polyurethane and Silicone Gel are often used in systems where HEPA filters are installed into grids or housing and where ease of installation and removal of the filter is desirable.

Both Silicone and Polyurethane base Gel offer properties that are suitable for a wide variety of HEPA filter sealing applications. These applications consist of two mating structures. One side of the seal consists of a channel or tract containing the gel. The other side of the seal consists of a "knife edge" which penetrates into the gel. Modern systems often feature a knife edge on the housing or grid and the gel is in a tract integral to the filter, but the reverse construction is also common and just as effective.

Gel can become damaged from a variety of factors including age, exposure to chemicals, cutting and abrasion due to over-stressing the gel (sharp knife edges, excessive penetration, shearing, etc.) and tearing due to too rapid removal of the knife edge from the gel.

In situations where a filter is removed from the system and re-installed, the question often arises, "Is the condition of the gel satisfactory for reinstallation of the filter, or does the gel need to be replaced?"

Due to the nature of gel and the wide variety of circumstances that can exist in actual installations, no "hard and fast" criteria exist.

It is the purpose of this guideline to discuss various possibly conditions of the gel and to assist the end user in making rational decisions of when to replace the gel.

For the purpose of this guideline, gel damage may be divided into two categories: chemical damage and physical damage.

### **Chemical Damage to Gel**

Chemical damage to gel may be due to the presence of external or internal substances or conditions that result in a chemical change to the gel. These include:

1. Reversion (degradation) of the gel into liquid state.
2. Chemical attack (usually by oxidizing agents like those used for sanitizing clean rooms.) This usually results in a loss of surface tack the formation of a skin or blisters on the surface of the gel.
3. Ultra Violet degradation which usually results in surface crazing, cracking, skinning and may also result in liquification of the gel.
4. Thermal degradation, which usually results in a loss in elasticity, surface tack and iSTDease in hardness of the gel.

Chemical damage can be separated into two groups; mild and severe.

Mild chemical attack results in slight changes in the physical characteristics of the gel. These include:

1. Change or loss in color that does not have measurable effects on gel hardness or elasticity.
2. Formation of a slight skin, noticeable only when the gel is "pinched" between the fingers.
3. Some loss of surface tack.

Severe chemical attack results major and significant changes in the physical characteristics of the gel. These include:

1. Significant change in hardness or elasticity.
2. Complete loss of surface tack.
3. Formation of thick Skin.
4. Formation of wet areas on or in the gel. Dripping of the gel.

Filters may be re-installed into gel showing mild chemical attack. Reinstalled filters will likely continue to seal and perform without any problem. In any case a scan test to verify and confirm the integrity of the filter and seal system upon re-installation fo the filter is necessary and should always be performed. If the filter is found to be leaking at the gel seal during the test, the filter should be removed and the gel should be replaced prior to reinstallation and testing.

Gel exhibiting severe chemical attack must be completely removed and replaced prior to reinstallation of the filter and subsequent scan testing for filter and seal integrity.

### **Physical Damage to Gel**

Physical damage to gel is the most common type of gel damage experienced and is the result of subjecting the gel to forces that result in stress greater than the strength of the gel. Physical damage to the gel can range from very mild to severe. Most often, physical damage to the gel is caused by too rapid removal of an object inserted into the gel. The most common causes of physical damage are:

1. Too rapid removal of the knife edge from the gel. The knife edge must be removed slowly, working from one corner and slowly removing the filter allowing the gel to peel off the knife edge at its own rate.
2. Too deeply inserting the knife edge into the gel. If the knife edge is allowed to penetrate too deeply, the force exerted on the gel will be sufficient to cut the gel or split the gel. We recommend that the knife edge clearance to the bottom of the gel channel be not less than 0.10 inches (2.4 mm). We recommend that the maximum penetration of the knife edge into the gel be not greater than a depth equal to 70% the inside width of the gel channel.
3. Abrasion of the gel surface by dragging the knife edge or other object, including fingers across the surface of the gel.
4. Cutting the gel by using a knife edge that is too sharp at the corners or at the tip.
5. Careless removal of the plastic bag from the filter during unpacking can cause the gel to adhere to the bag. If the bag adheres to the gel during shipping, the bag can be slowly peeled out of the gel. Slight surface disruption to the gel due to the plastic bag is insignificant.

Physical damage to the gel can be divided into two groups; mild and severe.

1. Mild physical damage in most cases will not interfere with the proper sealing of the knife edge to the gel since the surface disruption of the gel is less than the penetration distance of the knife edge. Mild damage includes small ripples, lines or rough spots that leave a pattern in the gel but do not penetrate into the gel by more than 0.25 inches (6 mm). Please refer to photograph 1 and 2 for examples of mild physical damage to gel. Photograph 1 is of nearly new condition gel with the knife edge removed once. Photograph 2 is of gel experiencing multiple but careful knife edge removal and re-installation.
2. Severe physical damage results in a good probability that the proper sealing of the knife edge to the gel will be compromised since the damage may extend under a fully seated knife edge. Severe includes large deep cuts, splits or craters in the gel surface that penetrate the gel by more than 0.25 inches (6 mm). Please refer to photographs 3 and 4 for examples of severe physical damage to gel. Photograph 3 is of gel that was cut too sharp knife edge and one that was also inserted too deeply. Photograph 4 is of gel that was subject to too rapid removal of the knife edge numerous times.

Filters may be re-installed into gel showing mild physical damage. Reinstalled filters will likely continue to seal and perform without any problem. In any case, a scan test to verify and confirm the integrity of the filter and seal system upon re-installation of the filter is necessary and should always be performed.

If the filter is found to be leaking at the gel seal during the test, the filter should be removed and the gel should be replaced prior to re-installation and testing. Gel exhibiting severe physical damage must be completely removed and replaced prior to re-installation of the filter and subsequent scan testing for filter and seal integrity.

In all cases where gel is to be repaired it must be completely removed from the gel channel and the channel must be completely cleaned so that residual gel is removed. Open joints in the channel must be re-sealed to prevent gel from leaking out. Gel must be mixed well and on ratio according to manufacturer's instructions and adequate time must be allowed for the gel to fully cure before re-installation of filters. In no case is it permissible to "touch-up" the gel by pouring new gel over defects in the old gel. This practice is to be avoided because the new gel will not adhere to the old gel and problems will be encountered when the filters are installed or when they are removed in the future.

## **Troubleshooting Guide**

**Problem:** Blower does not run:

**Possible Solution:**

1. Make sure the unit is properly connected to the power source.
2. Make sure switch is in the On position.
3. Make sure the speed control is in an On position.
4. Verify power to the outlet.
5. Check capacitor for loose connection.

**Problem:** Blower is running but no or very little air flow:

**Possible Solution:**

1. Make sure the blower is running clockwise as viewed through the prefilter frame and blower opening.
  2. Prefilter is dirty and should be replaced.
  3. HEPA filter is dirty and should be replaced.
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## **Filtration Group Product Warranty**

The manufacturer warrants this equipment to be free from defects in material and workmanship for a period of one (1) year from date of purchase.

No other warranty is herein expressed and none shall be implied.

If failure appears within one (1) year from date of purchase, the buyer must notify the Company immediately. Documentary proof of length of service (which shall include date of purchase) must be furnished to Company if the date of manufacture was more than one (1) year prior to the date of alleged failure. Defective product may be delivered freight prepaid to the nearest Company authorized location. Company shall, at its option, correct the defect, or supply a replacement.

The liability of Company shall not in any case exceed either the cost of correcting defects in the product or supplying a replacement for that, whichever shall be less, and upon the expiration of one (1) year from date of purchase of product by customer all such liability shall terminate.

Company is not responsible for damage to product due to abuse, improper installation, use other than for which originally sold, or through operation above rated load, either intentionally or otherwise of any product or party. Under no circumstances will manufacturer be responsible for any freight (in or out), installation, or removal costs.

The foregoing warranty is in lieu of all other warranties, express or implied, with respect to the product, including any implied or statutory warranty of merchantability or fitness for purpose. Company shall not be liable by virtue of this warranty, or otherwise, for any consequential, incidental or special loss or damage resulting from the use or loss of use of the product.