THE WORLD LEADER IN CLEAN AIR SOLUTIONS

SAAF™ Air Purification Systems

Recirculation Unit and Pressurization and Recirculation Unit

INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

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1.0 Introduction

1.1 About this Document

This document contains the information necessary to properly receive, assemble, install, operate, and maintain the AAF Recirculation Unit (RU) and Pressurization and Recirculation Unit (PRU) filter systems and filters.The purchaser, installer, and operator of the filter system MUST read and comply with this document in its entirety prior to installation of the equipment and its operation. Failure to comply with the requirements of this manual may void the product warranty.

CAUTION: These instructions are specific to the AAF Recirculation Unit and Pressurization and Recirculation Unit filter systems and filters. All ancillary tasks including, but not limited to, electrical and mechanical work, equipment handling, and safety procedures must be performed in accordance with industry-accepted practice and all relevant local, state, and federal government codes, laws, and policies.

NOTE: The AAF Recirculation Unit and Pressurization and Recirculation Unit filter systems and filters are similar in most respects. For ease of reading, this manual will refer only to the Recirculation Unit. Unless specifically stated otherwise, all references to the Recirculation Unit will apply equally to the Pressurization and Recirculation Unit. A detailed description of both systems can be found in section 2.0, Principles of Operation.

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1.2 Packaging and Shipping, Receiving and Inspection, Handling and Storage

1.2.1 Packaging and Shipping: Unless otherwise defined in the purchase order and agreed by AAF, the RU filter housing and filters are packaged for domestic transit and shipped FOB the AAF factory. The method of shipment will be as specified in the customer's purchase order to AAF.

1.2.2 Receiving and Inspection: Obtain a copy of the purchase order, the product drawing that was submitted by AAF in association with the order, and a copy of the bill of lading, along with any other shipping papers. Upon receipt of the equipment, or any part thereof, these documents shall be used to ensure that the correct product has been received.

For maximum protection, complete the following steps upon receipt of the RU and filters:

- Inspect the shipment and all associated documentation. Notify the carrier immediately if there is any visible damage to the packaging or the equipment, or a discrepancy in the shipping papers. If necessary, file an immediate claim with the carrier against such damage or discrepancy.
- Confirm that the equipment received agrees with the contents of the shipping papers.
- Confirm that the shipping documents agree with the purchase order. Refer to the product drawing submitted for the order as necessary.
- If it is determined that any equipment ordered on the purchase order has not been delivered and is not accounted for in the shipping papers, contact AAF immediately by calling 1-800-477-1214. Reference the AAF control number, which will be listed on the shipping papers.

Each shipment may include:

- One or more individually packaged RUs.
- Packaged particulate filters.
- Packaged gas-phase chemical filter cassettes.

Note that the RU and the particulate and gas-phase filters may ship from different locations and be received at different times.

1.2.3 Handling and Storage: Following receipt, inspection, and acceptance of the equipment, and prior to installation, the RU and the particulate and gas-phase filters should be handled with great care. The RU may ship mounted vertically or horizontally on a pallet for protection during shipping and handling. It is recommended that it remains on its pallet until it has been moved to its final installation location. Only personnel experienced in rigging and handling equipment should be employed for this task. In most cases, the RU may be moved using a forklift. A suggestion for rigging horizontally shipped equipment is shown in Figure 1. Rig the housing using straps or a sling. Fasten the strapping under the skid on which the RU ships. To prevent damage to the exterior surface of the RU, use spreader bars at all times. Position the spreader bars to keep the cables from rubbing against any part of the housing. Before hoisting, make sure that the load is properly balanced.

! WARNING: The housing top (when shipped vertically) or the top-side (when shipped horizontally) will not support the weight of the unit. Any attempt to support the housing from these surfaces may result in serious equipment damage and severe personal injury. Do not walk on the top or the top-side of the unit, or use these surfaces for storage of materials.

The components shall be retained and stored in their protective packaging until immediately prior to installation. Care should be taken to ensure that the packages are not dropped or subjected to any impact loads.

At all times the equipment should be protected from exposure to weather. The equipment should be stored in a clean, dry, temperature-controlled environment. All items should be stored on pallets so that they are elevated above grade. Recirculation Units (RU) should not be stacked. Particulate and gas-phase filters should not be stacked more than three (3) cartons high to prevent crushing. Only particulate filters should be stacked on particulate filters, and gas-phase filters on gas-phase filters. The gas-phase filters ship inside a carton enclosed in transparent protective plastic. Under no circumstances should the filters be removed from this plastic protection until immediately prior to installation.

Filter products should not be stored in areas where they may become contaminated by chemicals, either acids or alkalis, in liquid, vapor, or gaseous form.

1.3 Product Descriptions

1.3.1 Recirculation Unit (RU): Each RU will be received individually mounted on a shipping pallet and wrapped in plastic for protection during shipping. Refer to the product drawings submitted on the order for details. The RU is typically supplied in one style, the Heavy Duty (HD) model. This refers to the style of SAAF Cassette gas-phase chemical filter that can be accommodated in the unit (see 1.3.2 for details).

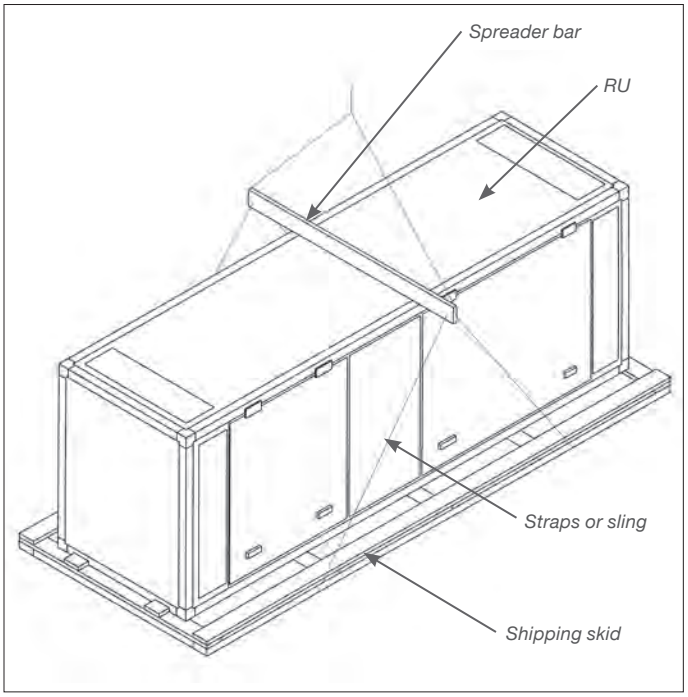


Figure 1

Typical Recirculation Unit.

Recirculation Unit Model RU2000V with tracking to accommodate four (4) SAAF™ HD cassettes.

1.3.2 Gas-Phase Chemical Filter Cassettes: Gas-Phase filter cassettes are shipped in cartons and plastic bags. The carton shown to the right contains a single 6″ high x 24″ wide x 18″ deep Medium Duty (MD) cassette, which is supplied as two (2) 6″ high x 12″ wide x 18″ deep half-cassettes. An HD cassette carton will contain a single 12″ high x 24″ wide x 12″ deep cassette which is supplied as two (2) 12″ wide x 12″ deep half-cassettes.

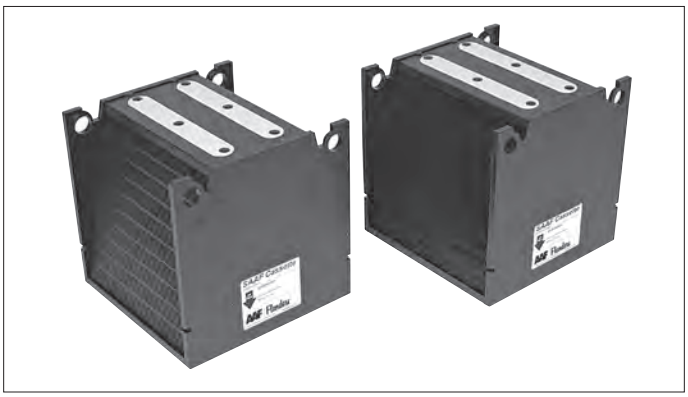
The gas-phase chemical filter cassette typically supplied with the RU is as follows:

1.3.3 Particulate Filters

Prefilters and Afterfilters – Particulate prefilters and afterfilters will typically be AAF PerfectPleat® pleated filters. Depending on the size of the RU ordered, 24″ high x 24″ wide x 2″ deep full size filters or 12″ high x 24″ wide x 2″ deep half size filters may be supplied. PerfectPleat 2″ deep filters are packaged 12 to a carton.

High-Efficiency Filters – High-efficiency filters will typically be AAF VariCel® M-Pak pleated filters. Depending on the size of the RU ordered, 24″ high x 24″ wide x 6″ deep full size filters or 12″ high x 24″ wide x 6″ deep half size filters may be supplied. M-Pak filters are packaged two to a carton.

Note: Optional or special filter arrangements may be supplied, depending on the requirements of the project. Check the purchase order and AAF submittal drawing(s) for details.



12″ high x 24″ wide x 12″ deep SAAF™ HD cassette ships in two halves.

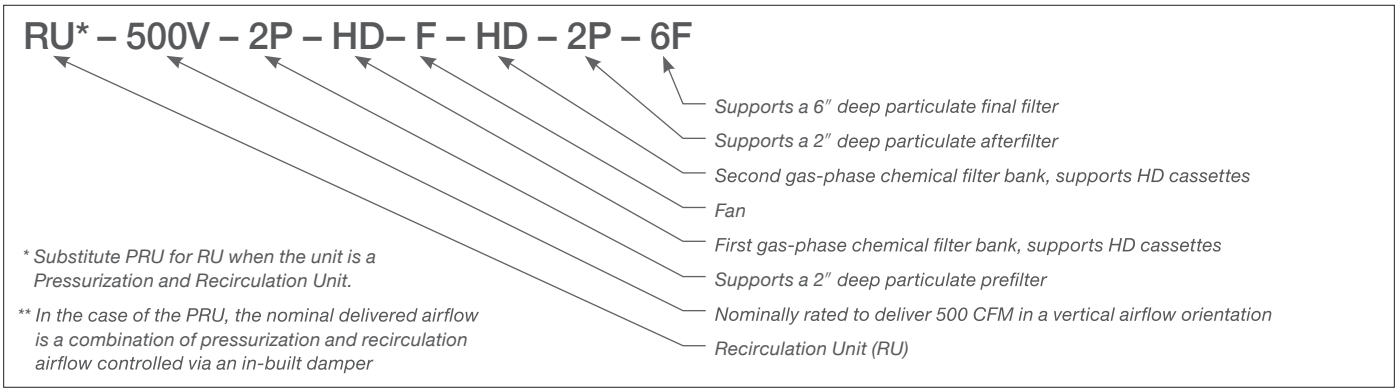
1.4 Product Model Designations

The product models are designated as shown in Table 1:

Table 1: Typical Model Numbers

Recirculation Unit (RU)	Pressurization & Recirculation Unit (PRU)	Nominal Delivered Airflow (CFM) **	Full Product Description
RU500V	PRU500V	500	RU*-500V-2P-HD-F-HD-2P-6F
RU1000V	PRU1000V	1000	RU*-1000V-2P-HD-F-HD-2P-6F
RU2000V	PRU2000V	2000	RU*-2000V-2P-HD-F-HD-2P-6F
RU4000V	PRU4000V	4000	RU*-4000V-2P-HD-F-HD-2P-6F

The full product description is defined below:



1.5 Product Drawings

Details of some standard RU filter systems are shown on the following AAF drawings:

Model	AAF Drawing Number
RU500V	114D-3025889
RU1000V	114D-3025855
RU2000V	114D-3025897

Copies of the appropriate drawings will have been supplied as part of the AAF submittals in response to the purchase order. Obtain and review the drawing(s) before proceeding with the installation of the filter system. The RU filter system drawings include the following details:

- Overall filter system dimensions
- Shipping weights
- Operating weights
- Sizes and quantities of the particulate and gas-phase filters required
- Details of the gas-phase chemical media supplied
- Details of the particulate filters supplied
- System design airflow
- Pressure losses across the filter system at nominal airflow design velocities
- Product details

1.6 Assembly – General Comments

As indicated previously, the individual components that will comprise the filter system will ship separately and will be required to be installed on site. The RU is a self-contained product and, consequently, a minimum amount of assembly is required. Refer to section 3.0, Installation Instructions, of this manual for further detailed instructions. Consult with an experienced installer to obtain an accurate estimate of the time, personnel, and equipment resources and tools that will be required to complete the assembly and installation of the filter system. Site assembly will be limited to moving and lifting individual components, screwing components together, and caulking. The RU weights and dimensions can be found on the product submittal drawings. The gas-phase chemical filters will typically have a maximum weight of approximately 40 pounds (20kg). Particulate filters will typically weigh less than the gas-phase filters.

Completion of the following preparations and provision of the following items will be the responsibility of the installer or others:

- Site preparation
- Connecting screws and hardware for attaching inlet and outlet ducts, if required
- Provisions for anchoring and supporting the RU, including anchor bolts, angles, straps, hangers and cradles, etc.
- Caulk, as required
- Inlet and outlet ducts, or other sheet metal parts, as required

These items will not be supplied by AAF unless noted specifically in the AAF quotation and in the accepted customer purchase order.

NO WELDING WILL BE REQUIRED.

In general, assembly of the filter system will consist of the following:

- Preparation of the installation location
- Transportation of all components to the installation location
- Unpacking the RU
- Installing the RU
- Installing inlet and outlet ducts, if required
- Unpacking and preparation of the gas-phase chemical filter cassettes
- Installing gas-phase chemical filter cassettes
- Unpacking particulate filters
- Installing particulate filters
- Cleaning the site
- Start-up and commissioning of the filter system

1.7 Related System Equipment

Ventilation systems will often include other equipment, including but not limited to:

- Fan(s), if not supplied as part of the RU
- Dampers
- Weather louvers
- Air tempering equipment
- Analog instrumentation
- Electronic instrumentation and controls

Neither the interface of these items with the filter system supplied by AAF, nor the installation, operation, and maintenance of these items, is covered in this manual. Whether these items are supplied by AAF or by others, consult the documentation specific to these products for appropriate instructions.

2.0 Principles of Operation

2.1 General

An understanding of the design and operating principle of the RU with gas-phase chemical filters is useful for effective installation, operation, and maintenance. Typically, the RU and PRU systems are intended to remove gaseous contaminants from intake and/or recirculated ventilation air. Examples of such contaminants may be nuisance odors and smells that may cause domestic and neighborhood discomfort and reduce workplace productivity, or harmful gases that may cause damage to health, plant, and product in industrial applications. The heart of the system is the AAF SAAF Cassette. This is a high-impact plastic frame that supports various types of dry, granular, chemical media between perforated screens that allow air to move through the filter. The SAAF Cassette is designed to support the chemical media in a V-bank configuration of media beds that maximizes the media exposed to the air stream, reduces the air stream velocity through the media bed, maximizes energy efficiency, and maximizes the removal of contaminants and the life of the product. The method of contaminant removal is through a combination of the physical property of adsorption and the chemical process of oxidation. AAF offers a variety of impregnated and un-impregnated dry granular media to handle a wide range of contamination problems. For more information on AAF's gas-phase air cleaning products, contact your AAF representative.

The AAF RU is one of the various framing and support systems designed to support the SAAF Cassette in the air stream, allowing easy installation, operation, and maintenance of the system.

2.2 Recirculation System

The recirculation system is intended to draw air from a defined space, clean the air, and then return the cleaned air to the space. The system is supplied when contaminants are generated within the space or infiltrate from outside the space. It is normally provided to protect personnel, equipment (particularly electronic equipment), or product. A typical schematic of the recirculation system operation is shown in Figure 2.

2.3 Pressurization System

The pressurization system is intended to pressurize a space by drawing air from outside the space, cleaning the air, and then discharging the cleaned air to the space. The system is supplied when contaminants are generated from outside the space. All leakage will be from the higher pressure space within the room to the lower pressure surrounding environment. This prevents outside contaminants from entering the space. An optional arrangement allows some in-room recirculation to take place. This system is normally provided to protect personnel, equipment (particularly electronic equipment), or product. A typical schematic of the pressurization system operation is shown in Figure 3.

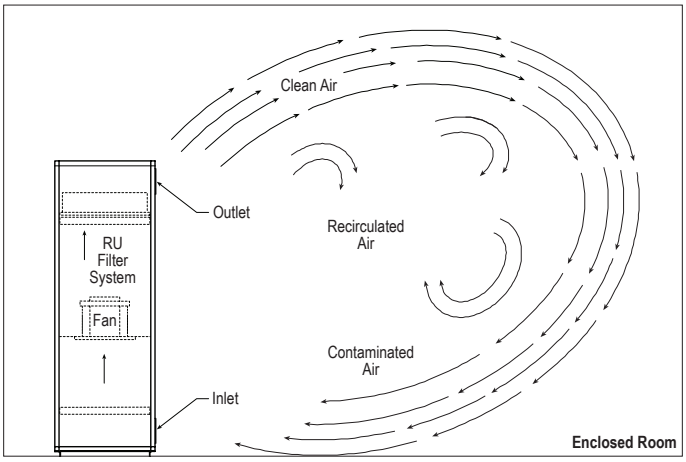


Figure 2 - Recirculation System Using the PRU

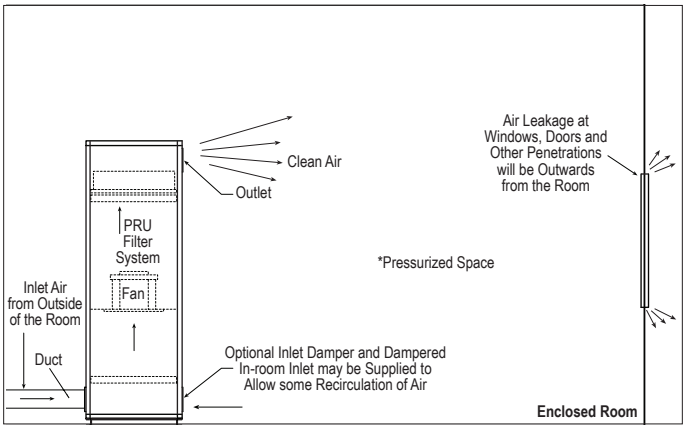


Figure 3 - Pressurization System Using the PRU

3.0 Installation Instructions

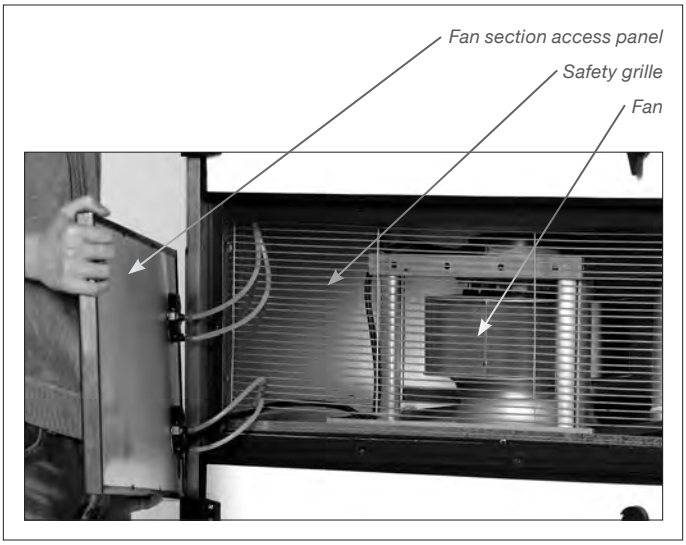
Consult the product drawing(s) submitted on this order before proceeding.

3.1 Space Requirements

A minimum of 36” clear space must be available at the access side of the Recirculation Unit to perform routine maintenance. Additional space may be required for inlet and outlet ductwork.

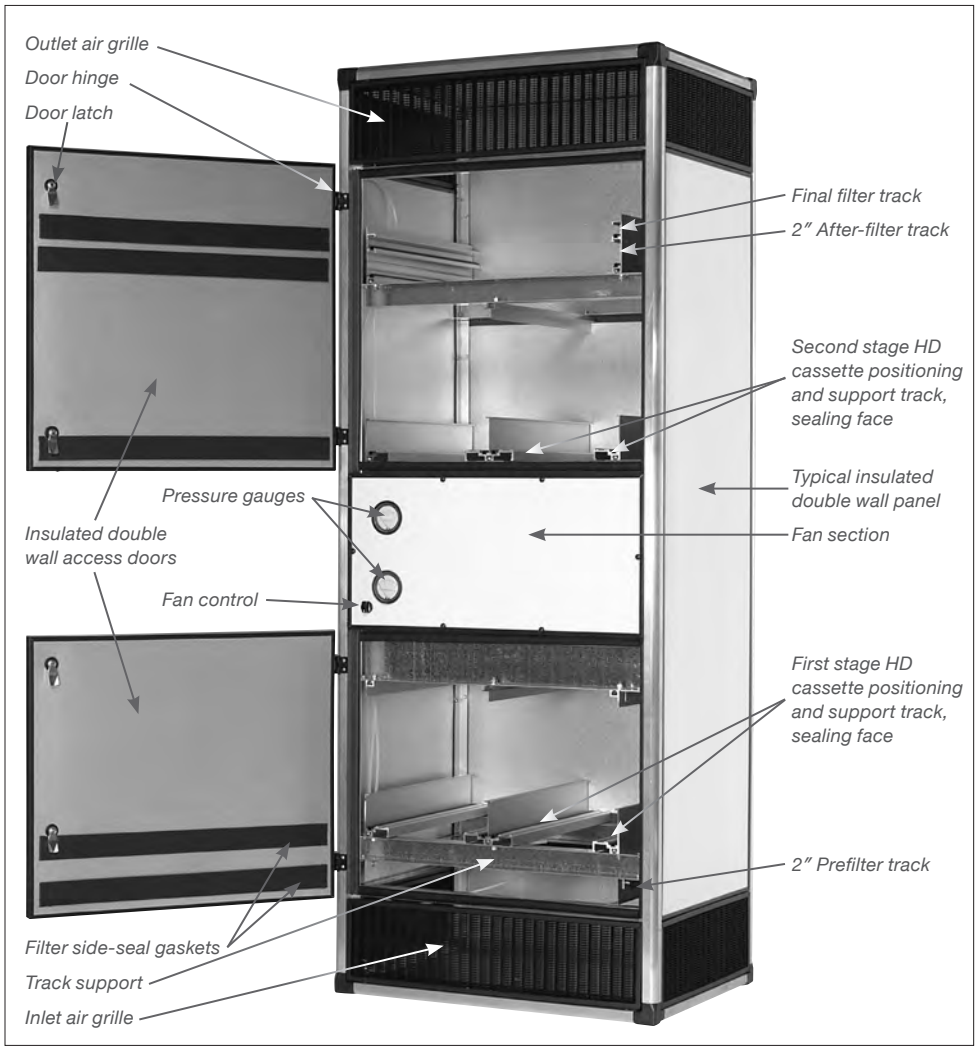
3.2 Foundations, Supports, and Anchoring

The foundation and/or supports must be designed to be adequate to support the filter system operating weight, and any seismic, live or other loads (if any), with a sufficient factor of safety as determined to comply with the requirements of all applicable governing codes, standards, and laws. Ensure that the foundation or support surface is level and smooth before proceeding. The filter system is designed for operation in indoor locations. The equipment is not specifically designed to resist and operate under unusual dynamic loading situations, such as earthquake conditions. If the equipment is required to function in such circumstances, special precautions may be required to ensure that the equipment will remain intact, anchored, and functioning. If this situation applies, consult with a qualified professional engineer before installing the equipment.

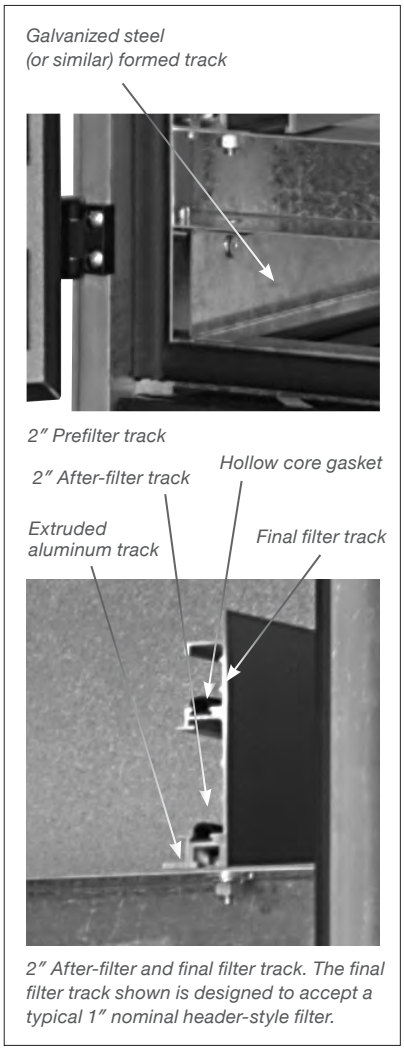


Typical fan section with access panel removed.

3.3 Typical RU Housing Details

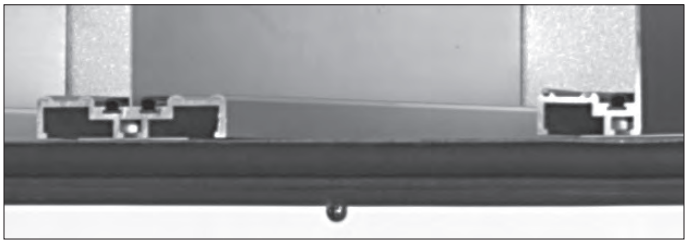


A typical Recirculation Unit Model RU500 is shown.

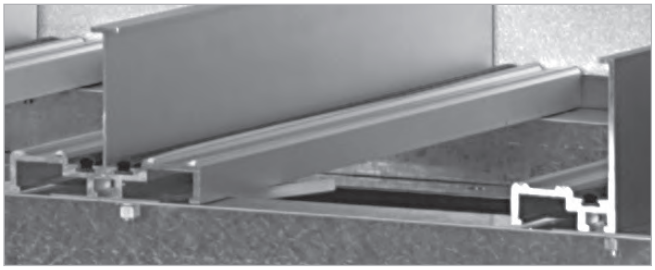


2″ After-filter and final filter track. The final filter track shown is designed to accept a typical 1″ nominal header-style filter.

The RU is uniquely designed to accommodate and securely seal AAF's gas-phase chemical filter cassettes. Each housing incorporates AAF's patent-pending filter sealing system to ensure that the contaminated air passes through the filter and does not bypass around the filters. Typical details of the tracks are shown in these illustrations. In some instances, depending on the equipment supplied and the filters required, minor track details may differ from those shown.



Track connection detail at support beam. This detail shows AAF's "quick release" track installation method. Accurately located support post holes ensure high tolerance track spacing. Note that the track connection is completely isolated from the filter sealing surface and cannot interfere with filter installation.



Cassette support track, sealing face.

3.4 General Filter System Installation Procedure

3.4.1 Installing the RU: Keeping the RU on its shipping pallet, move it to its final installation location. Remove the restraints that secure the RU to its pallet and remove any wrapping or packaging material.

! WARNING: The housing top will not support the weight of the unit. Any attempt to support the housing from the top may result in serious equipment damage and severe personal injury. Do not walk on the top of the unit or use the top for storage of materials.

3.4.2 Locating, Mounting, and Supporting the RU: Locate the RU in its final installation location. The support surface under the base of the frame should be level, smooth, clean and dry. The location should not be subject to standing water or flooding. The circumference of the housing base should be fully supported. Adjust the supports so that the base is level in all directions.

Anchoring the Housing: Depending on the project requirements, it may not be necessary to anchor the housing. However, if it should be necessary, a suggestion for anchoring the standard housing is provided in Figure 4.

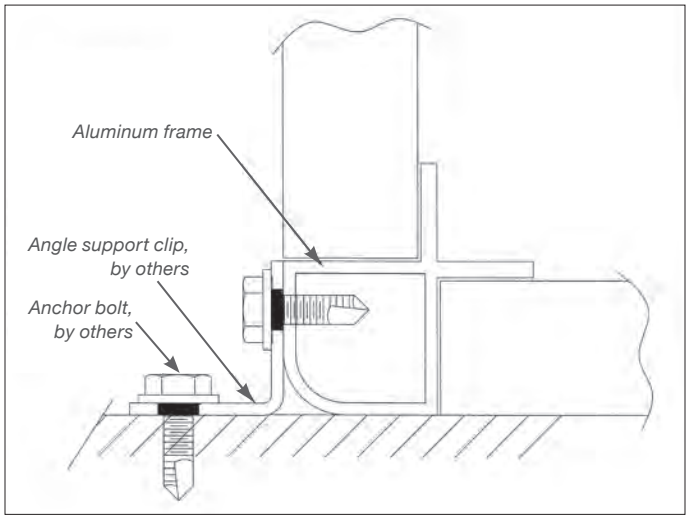


Figure 4

In all cases, the foundation and supporting structure should be designed for each specific installation by a qualified professional engineer.

Provision of anchoring hardware or any other supporting component will be the responsibility of the installer or others. These items will not be supplied by AAF unless noted specifically in the AAF quotation and in the accepted customer purchase order.

3.4.3 Connection of Inlet and Outlet Ducts: Inlet and outlet ducts, when required, should be connected to the inlet and outlet faces of the housing as shown in Figure 5.

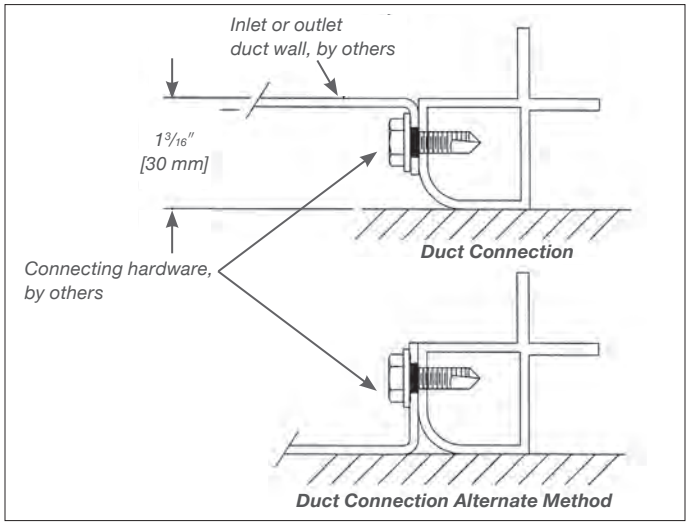


Figure 5

! WARNING: The housing is not designed to support the weight of inlet and outlet ducts. All ducts should be supported independently of the housing. Any attempt to support the ducts from the housing may result in serious equipment damage and severe personal injury.

3.4.4 Sealing the Inlet and Outlet Duct Connections

Provide continuous gaskets, or caulk generously, between the flanges of the connecting ducts and the housing to prevent air leaks.

Provision of the inlet and outlet ducts, the connecting hardware, and the gaskets or caulk will be the responsibility of the installer or others. These items will not be supplied by AAF unless noted specifically in the AAF quotation and in the accepted customer purchase order. Any caulk used should be a long-life, flexible, nondrying caulking material. The caulk supplier should ensure that the caulk meets the customer specifications for the application in which it is being used.

> **CAUTION:** Many installations prohibit the use of certain caulking materials, such as Silicone. The use of materials containing VOCs should also be avoided, as they may have a negative effect on the life of the gas-phase filters.

3.5 Preparation for Filter Installation

In order to maximize the life of the gas-phase chemical filters and the particulate filters, it is recommended that filter installation be the final installation task before start-up and commissioning of the system. In preparation for filter installation, it is recommended that the following be completed:

- Completely clean the system to remove all construction debris and dirt, sweep and vacuum to remove visible dirt.
- Damp wipe all surfaces to remove dust.
- Finalize and complete all caulking in the system.
- Finalize and complete all painting in the system.

It is recommended that all cleaning materials and paints used in the system be free of solvents. If this is unavoidable, it is recommended that sufficient time be allowed for complete drying to occur and for the VOCs to disperse before installing the filters. This process can be accelerated by “blowing down” the system, i.e., operating the fan without the filters to ventilate the system. It is recommended that a blanket-style construction filter be installed at the inlet to the system to prevent construction dust from being drawn into the system. Consult with your AAF representative to obtain an appropriate product. Also, before “blowing down” the system, check that it is safe to operate the fan without the pressure load of the gas-phase chemical filters. Consult the AAF submittal drawing for pressure information.

3.6 Prefilter Installation

Prefilters are used to prevent the build-up of lint and dust on the face of the gas-phase chemical filters. If prefilters are not installed, the effective operating life of the gas-phase and high-efficiency final filters may be reduced. Install the prefilters as shown in the sequence shown below. The standard RU is designed to accept 2″ deep prefilters only. For best results, AAF recommends the use of the MERV 8-rated PerfectPleat. The tracks are spaced and sized to accept 24″ x 24″ x 2″ and/or 24″ x 12″ x 2″ nominal ASHRAE style filters.

Place the prefilter into the prefilter track.

Step 1: *Insert the prefilter into the track*
Step 2: *Slide the prefilter in as far as it will go*

Step 3: *The installed prefilter*

Repeat the process of prefilter installation until all prefilters have been installed.

3.7 Gas-Phase Chemical Filter Installation

The following instructions are specific to the installation of the HD gas-phase chemical filter cassettes into an RU housing. Typically, two stages of gas-phase filtration will be supplied in any RU, a lower filter bank and an upper filter bank. The instructions for installing the gas-phase filters will be identical for both banks.

3.7.1 Preparing the Cassette for Installation: Remove the cassette from its carton and plastic bag. You will notice that each half-cassette is accompanied by a plastic bag containing loose gaskets (see right). These are supplied specifically for use when the cassette is to be installed into the RU. These gaskets are critical for the sealing of the gas-phase cartridges to prevent bypass of contaminated air around the filters.

Type HD half-cassette with butterfly and side gaskets.

First, completely remove any dust that may have settled on the outer surface of the plastic cassette during shipping and handling. If not removed, such dust may interfere with the adhesion between the gaskets and the plastic cassette. Install the gaskets onto the half-cassettes. The following pictures show the installation of gaskets onto a Type HD half-cassette:

Side Gaskets

Step 1: *Remove the paper strip on the back of the black gasket to expose the adhesive.*

Step 2: *Locate the gasket on the leaving air side of the half-cassette along the edge of the cassette side plate. A gasket location guide has been formed into the side plate. The gasket should be located to the outside of this line.*

Step 3: *Firmly press the gasket into position so that it adheres to the side plate.*

Step 4: *Repeat to install the second side gasket on the other side of the half-cassette.*

Butterfly-style Face Gaskets

Step 1: *Remove the paper strip on the back of the yellow "butterfly-style" face gasket to expose the adhesive.*

Step 2: *Locate the gasket on the edge of the leaving air side face of the half-cassette as shown and firmly press the gasket into position so that it adheres to the face of the half-cassette.*

Step 3: *Repeat to install the second butterfly gasket on the other side of the leaving air side face of the half-cassette.*

Step 4: *The Type HD half cassette is now ready for installation into the RU.*

3.7.2 Handling of the Cassette: The AAF SAAF Cassette is designed to be sturdy and to support a significant weight of chemical media. However, it should not be handled roughly. The cassette should always be lifted with two hands, one beneath each side panel as shown in the following installation pictures. The cassette should never be lifted, supported, carried, or pulled by a single side panel.

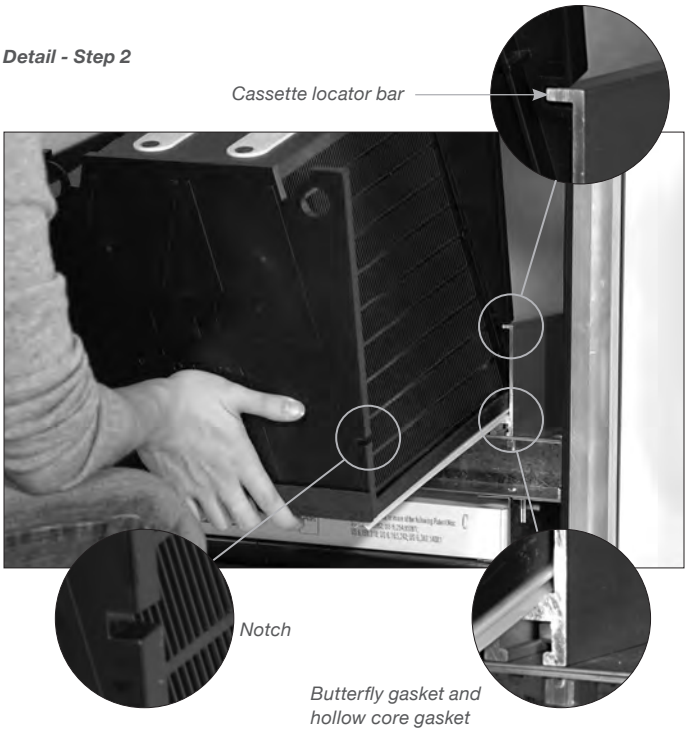
3.7.3 Installation of the Cassettes in the RU: Install the cassettes as shown in the sequence below starting with the bottom cassette(s). Slide each half-cassette into the RU tracks and push it firmly into the enclosure until the side gasket on the first half-cassette is firmly compressed against the enclosure wall surface on the opposite side from the access door. The plastic edge of the final cassette inserted should be even with the outer edge of the extruded aluminum track. Repeat this process until the tracks at each level have been filled.

Step 1: *Bring the HD half-cassette to the RU and prepare to install it. Turn the half-cassette so that the yellow butterfly gasket will be on the bottom and pointing into the enclosure.*

Step 2: *Address the left and right hand side support and sealing tracks at a slight angle as shown. Engage the black hollow core gaskets in the tracks with the yellow butterfly gaskets on the half-cassette, see detail below. Also, begin to align the left and right hand side notches in the half-cassette with the horizontal cassette locator bars which form part of the track.*

Step 3: *Rotate the cassette slightly upwards so that the vertical locator bars are inserted into the slots in the half-cassette, while maintaining the compression between the hollow core and butterfly gaskets. Maintaining a steady and even force on the side of the cassette, push it into the housing to engage the notches on the outer side of the half-cassette and continue to insert the half-cassette until it is fully installed.*

Detail - Step 2



Detail - Step 3

Step 4: *Repeat the process of gas-phase cassette installation and sealing until the track is filled with sealed cassettes as shown. The outside face of the cassette should be even with the edge of the track.*

Step 5: *Repeat the process until all gas-phase filter tracks are filled with cassettes.*

3.8 Afterfilter Installation

It is recommended that a temporary afterfilter be installed in the system to collect an initial plume of dust that might be blown from the gas-phase chemical filters. The installation of the afterfilters is exactly the same process as described for the prefilters in Section 3.6. See below:

Step 1: *Insert the afterfilter into the track.*

Step 2: *The installed afterfilter.*

Repeat the process of afterfilter installation until all tracks are filled with afterfilters.

3.9 High-Efficiency Final Filter Installation

A high-efficiency final filter bank ensures that the filtered air meets the highest levels of particulate cleanliness. Install the final filter as shown here. The standard RU is designed to accept a 6″-deep, single header final filter only. For best results, AAF recommends the use of one of its line of single header M-Pak high-efficiency filters. The tracks are spaced and sized to accept 24″ x 24″ x 6″ and/or 24″ x 12″ x 6″ nominal ASHRAE style filters.

Step 1: *Insert the high-efficiency M-Pak filter into the track.*

Step 2: *The installed high-efficiency M-Pak filter.*

Repeat the process of high-efficiency filter installation until all tracks are filled with high-efficiency filters.

3.10 Latch RU Doors

Now close and latch the RU doors as shown.

3.11 Pressure Gauge

Pressure gauges are installed across the filter system to indicate when the particulate filters (being the prefilter and high-efficiency filters) need to be replaced. The pressure gauge will register the pressure differential across each filter bank. As the particulate filter loads with dirt, the resistance to the airflow, and consequently, the pressure across the filter, will increase. The pressure across the gas-phase chemical filter(s) will remain constant, since these filters collect gas molecules and not particulate. Pressure gauges across the gas-phase filter banks are not supplied as part of the standard product. The pressure gauges are normally part of the housing and will be supplied in the installation shown below:

Recirculation Unit (RU) with wall mounted gauges

3.12 Fans

The standard RU is supplied with an internally-mounted fan. See the AAF submittal drawing and wiring diagram for information and details.

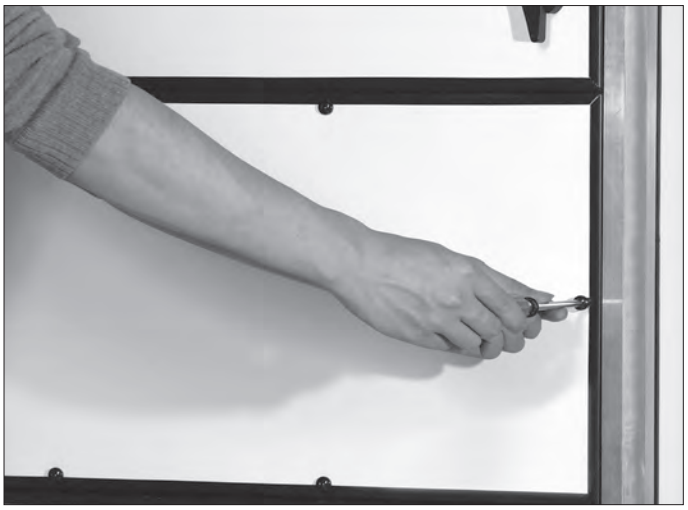
CAUTION: All electrical work must be carried out in accordance with all appropriate governing electrical codes and standards.

! WARNING: All electrical work has the potential to cause shock, injury, and even death. Disconnect all power whenever working on the system. Only qualified electrical personnel should work on the fan and control system.

3.12.1 Provide an appropriate power supply as specified in the submittal information.

CAUTION: Use of the incorrect line voltage may result in irreparable damage to electrical components.

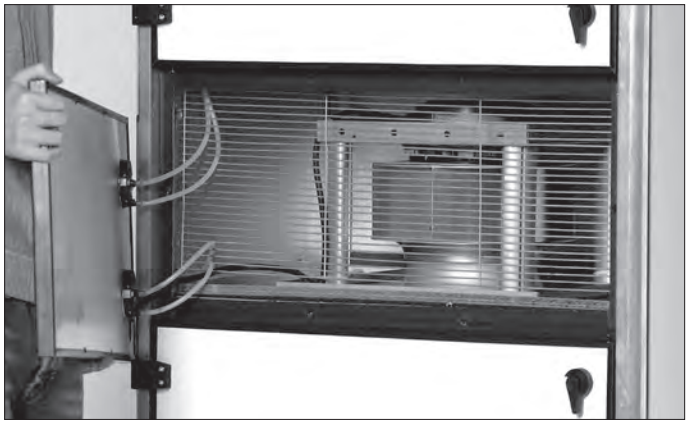
3.12.2 Access to the Fan: Access to the fan section is obtained by removing the center panel, as shown in the following sequence.



Step 1: *Remove screws holding the fan access panel in place.*

Step 2: *Remove the panel.*

Step 3: *Mark the tubes that are connected to the pressure gauges to ensure that they are returned to the correct locations later, and disconnect the tubes from the gauges.*



Step 4: *Remove the safety grille to access the fan and motor.*

Fast but limited access to the fan can be obtained from above the fan, as shown, with the filters removed.

3.12.3 Installation: In order for the fan to be operated, some or all of the following installation steps may be required:

3.12.3.1 On the standard product, the fan will be fully wired internally, and the controls required to operate it will be installed. Under some circumstances, the installer may need to provide, install, and wire a properly sized motor starter. See the AAF wiring diagram supplied on the order for details. In all cases, an appropriate disconnect switch with fuses/circuit breakers should be provided. These components are normally supplied and installed by others.

CAUTION: An electrical disconnect should be incorporated into the power wiring and mounted adjacent to the equipment, so that power can be cut when required during start-up and maintenance. Normally, the disconnect switch will be supplied and installed by others.

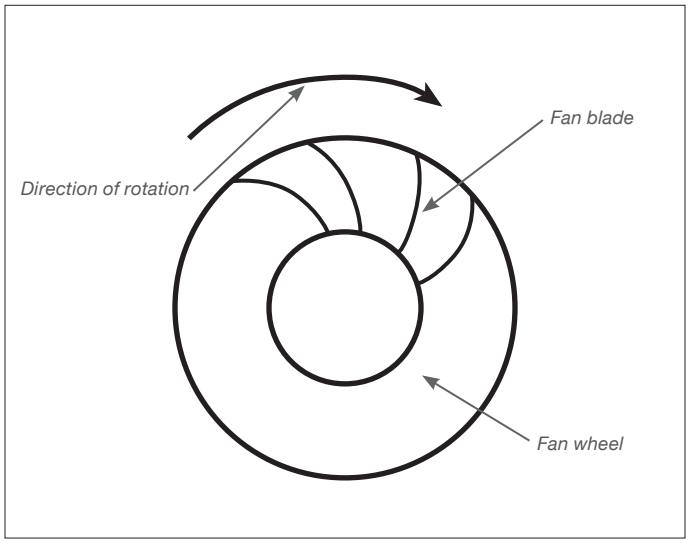
3.12.3.2: Installation of Power Wiring to the Fan Motor: See the AAF wiring diagram supplied on the order for details.

3.12.3.3: Provision, installation, and wiring of any special controls and interconnecting wiring to associated equipment, such as dampers, airflow monitors, chemical sensors, etc.

For guidelines on fan selection, see paragraph 9.1

4.0 Start-up Instructions

Check the rotation of the fan wheel to ensure that the fan motor is wired correctly. The centrifugal fans typically supplied with the RU feature fan wheels with backward curved blades. It is critical that the blades rotate in the direction shown.



Typical RU fan wheel

If the fan wheel rotates in the wrong direction, the airflow will be severely restricted and the system will not provide the proper airflow.

When the fan system is started up, the airflow volume can be controlled by varying the fan speed, using a variable speed control or by increasing the static pressure using dampers, if these have been supplied. The HD cassettes are nominally rated to operate at a face velocity of 250 feet per minute. Note that some systems may be supplied with single speed fans. Review the product drawing and wiring diagram for details.

Immediately on start-up, examine the filter system for any apparent air leaks or other anomalies. Air leaks may be detected by noise or by use of a synthetic smoke puffing device at the external joints and seams of the filter system installation. Correct or repair any discrepancies as necessary. Repeat this examination after 24 hours of operation and again after one week of operation.

Monitor the pressure drop across the filter system to ensure that the filters are operating within the pressure range expected and to ensure that the pressure drop is not too high. Consult the AAF drawing for the expected clean filter pressure differentials.

5.0 Maintenance

5.1 Prefilter

Record the pressure drop weekly to obtain the status of the particulate filter. A normal particulate filter can be expected to last for between two and three months before reaching its final recommended pressure drop (see the AAF drawings for details). However, under heavier or lighter dust loading conditions, this may vary. At an airflow velocity of 250 feet per minute, the 2″ deep AAF PerfectPleat filter can be expected to have an initial pressure drop in the range of 0.11″ water gauge. The recommended final pressure drop is 1.0″ water gauge. This means that when a pressure drop increase of 0.89″ water gauge has been recorded, it is time to change the prefilter.

5.2 Afterfilter

Install an afterfilter in the system to collect any initial plume of dust that might be blown from the gas-phase chemical filters. This filter can eventually be removed from the system to reduce the energy required to operate the system. Monitor the pressure drop across this filter. When the pressure ceases to increase, it is safe to remove this filter from the system. This should typically be no longer than after 40 hours of operation. If afterfilters still have significant life remaining at the time of removal (based on the pressure drop reading), they should be retained for re-use as afterfilters following the change-out of the chemical filters, or be used as replacements for the prefilters.

5.3 High-Efficiency Final Filters

Record the pressure drop weekly to obtain the status of the filter. A normal high-efficiency filter can be expected to last for one year or more before reaching its final recommended pressure drop (see the AAF drawings for details). However, under heavier or lighter dust loading conditions, this may vary. At an airflow velocity of 250 feet per minute, the 6″ deep AAF VariCel M-Pak filter can be expected to have an initial pressure drop in the range of 0.23″ water gauge. The recommended final pressure drop is 1.5″ water gauge. This means that when a pressure drop increase of 1.27″ water gauge has been recorded, it is time to change the high-efficiency filter.

5.4 Gas-Phase Filter Monitoring

A discussion of sophisticated gas-phase filter monitoring is beyond the scope of this manual. At its most simple, when the filter is used to remove nuisance odors, the time to change out the gas-phase chemical media cassette is when the odor begins to be regularly detected on the clean side of the filter system. In more stringent applications where the system is supplied to protect health and/or high value plant and product, active real-time electronic and passive coupon corrosion monitoring systems are available to determine the performance of the system. The remaining life of the media in the SAAF Cassette can be determined by taking a sample of media and returning it to AAF for analysis. Consult with your AAF representative regarding active and passive monitoring systems and media sampling for remaining life analysis.

5.5 Removal and Replacement of Particulate and Gas-Phase Chemical Filters

Removal of filters will be the reverse of the installation process described earlier in this manual. Filter replacement will be carried out exactly the same as at initial installation.

5.6 Disposal of Used Filters

Used chemical filters and particulate filters should be packaged and disposed of in full accordance with all required and applicable laws and regulations. Consult with local environmental control authorities, such as local, state, and federal EPA & OSHA authorities, for direction. Material Safety Data Sheets (MSDS) are available on all products supplied by AAF. Contact your AAF representative for further information.

5.7 Gas-Phase Chemical Filter Cassette Face Sealing Gaskets

The proper maintenance of the hollow core gaskets located in the track on the entering air, or sealing, face of each cassette is critical to the performance of the system. Check the gaskets carefully whenever the gas-phase chemical filters are replaced. If gaskets are worn, frayed, or damaged in any way, they should be replaced. Check the seal between the gas-phase chemical filter cassette and the hollow core gasket on the air entering face of the gas-phase cassettes whenever new SAAF Cassettes are installed.

5.8 Afterfilter and High-Efficiency Particulate Filter Sealing Gaskets

The proper maintenance of the hollow core gaskets located in the afterfilter and high-efficiency particulate filter tracks is critical to the performance of the system. Check the gaskets carefully whenever the afterfilters and high-efficiency particulate filters are replaced. If gaskets are worn, frayed, or damaged in any way, they should be replaced. Check the seal between the filters and the hollow core gaskets whenever new particulate filters are installed.

5.9 Access Door Sealing Gaskets

There are two types of door sealing gaskets that must be considered, the access door perimeter sealing gasket and the access door side sealing gasket. The proper maintenance of the access door sealing gaskets is critical to the performance of the system. Check the gaskets carefully whenever the gas-phase chemical filters are replaced. If gaskets are worn, frayed, or damaged in any way, they should be replaced. Check the seal between the door and the housing whenever new SAAF Cassettes are installed.

5.10 General System Maintenance

Ducts, external RU surfaces, access doors, and other system infrastructure should be checked at least every six months. Internal RU surfaces shall be examined whenever filters are replaced. Examine all components for the following:

5.10.1 Cleanliness: Sweep and vacuum all standing dust or dirt in the system and damp wipe all surfaces. Be mindful of the impact of cleaning solvents on the performance and life of the gas-phase chemical filters, and take appropriate precautions to protect the system.

5.10.2 Water: The system should be completely dry at all times. The presence of standing water, condensation, or dampness is detrimental to the performance and life of the system. Determine and remove the cause for the presence of water in the system, dry the system, and examine all components for the presence of mold and other biological growth. Remove all contamination, and clean and sterilize as necessary.

5.10.3 Filter System Integrity: Ensure that all filter frames contain the appropriate filter elements, both particulate and gas-phase, and that these elements are correctly installed. Check for missing or improperly installed components and review the filter seals. Check for air leaks at joints and seams, replace gaskets and worn hardware, and seal with caulk as necessary.

5.10.4 Duct and System Integrity: Examine the entire system to ensure that contaminated air cannot leak around the filter system. Check all perimeter seals and repair as necessary.

5.10.5 Corrosion: If metal components are corroded, repair the corrosion and provide protective coatings as necessary. Be mindful of the impact of painting on the performance and life of the gas-phase chemical filters, and take appropriate precautions to protect the system. Determine the source of the corrosion and rectify.

6.0 Troubleshooting

6.1 High Pressure Drop Reading Across the Filter System

6.1.1 High Dust Loading: The most probable cause of high pressure drop will be high dust loading of the particulate filters. The rate of dust loading may not always be constant and may be significantly affected by season and location; e.g., the timing of pollen blooms, production schedules, and rural versus urban locations.

6.1.2 High Airflow Volume: High airflow volume may result from improper control of the fan. When clean particulate filters are installed in the system, the pressure drop across the system will decrease and the airflow will normally increase. The airflow should be controlled through the use of a variable speed control, or if the system is ducted, modulating dampers can also be used to control airflow. Modulating dampers are designed to keep the system pressure constant.

6.1.3 Condensation: Humid air combined with cold surfaces may result in condensation of moisture and blinding of both the particulate and gas-phase filters. This moisture can also result in mold growth and corrosion, which may also impact the performance of the filter system. If condensation is a recurring problem, dehumidification or other tempering of the air may be required. Additional system insulation may also be necessary. If the source of the moisture is at the intake, weather hoods or weather louvers to remove sensible moisture, in the form of rain, should be considered. If the source of moisture is from leaking ducts, repair the leaks.

6.1.4 Freezing: On air intake systems, the presence of moisture in the filters when caused by or combined with condensation, rain, snow, sleet, or ice, and when subjected to freezing temperatures, can cause the filters to freeze and become impassible. In such cases, provide intake protection systems to remove the cause of the problem.

6.2 Visible Discharge of Particulate

Check for missing or damaged filters and system leaks. Replace filters and re-seal as necessary.

Provide higher efficiency filters on the downstream side (air leaving side) of the system.

6.3 Odors and Smells

Check the performance of the gas-phase chemical filters. If the filters are no longer effective, replace them.

Check for missing or damaged filters and system leaks. Replace filters and re-seal as necessary.

6.4 Vibration

If excessive vibration or noise occurs, check the fan to ensure the following:

- The fan is firmly bolted in place and has not come loose.
- The components of the fan are moving freely and moving parts are not rubbing.
- The fan wheel is running smoothly and has not gone out of balance.
- The fan wheel is clean and has not become unbalanced from accumulated dirt.
- The fan motor is running smoothly.
- The fan and motor bearings are running smoothly and are not overheating.
- The fan is operating within the stable portion of the fan curve.

7.0 Spare Parts List

It is recommended that the following spare parts be stored at the installation site for routine maintenance purposes. The quantities required will depend on the size of the system. Consult with your AAF representative to determine actual quantities required. Minimum recommended quantities are provided in the table below.

AAF Part Number	Description	Recommended Spares
Refer to the original customer purchase order and the AAF submittal drawing	SAAF cassette gas-phase chemical filters	One full replacement set of each type included in the system
Refer to the original customer purchase order and the AAF submittal drawing	Particulate filters	One full replacement set of each type included in the system
2500932	Extruded plastic strips which provide low friction cassette bearing surface	20% of the number supplied with the equipment
2500924	Hollow core track gasket	One full replacement set or a roll of 50 feet
2500981	Access door perimeter gasket	One full replacement set or a roll of 50 feet
2500999	Access door side seal gasket	One full replacement set
Refer to the original customer purchase order and the AAF submittal drawing	Fan	One replacement fan

To order replacement parts call: **1-800-477-1214.**

8.0 Equipment Characteristics, Dimensions, Operating Weights, and Shipping Weights

See the AAF submittal drawing supplied on the specific order.

9.0 Technical Guidelines

9.1 Fan Selection and Sizing

The following guidelines are provided to inform the user of the criteria used by AAF to select an integral fan that is provided with the RU.

9.1.1 Determination of Fan Selection Pressure Drop: The following concerns initial and final filter pressure drop and the use of pressure drop for fan selection. AAF's standard product literature indicates the start-up, being the clean filter or initial, and the recommended final, or dirty filter, pressure drops for all filters at a particular airflow velocity. If the airflow velocity in the actual installation differs from that referenced in the literature, then the start-up (initial) pressure drop will also differ. For instance, an AAF PerfectPleat or M-Pak filter is typically rated at 500 FPM velocity. However, when used with a type HD cassette, the airflow velocity will normally be 250 FPM so the initial pressure drop will be lower. Similarly, the final pressure drop referenced in the literature is a "recommended" value only, and the filter may be changed out at a lower pressure drop, if required.

A typical pressure drop profile for an RU might be as shown in Table 3 below:

Table 3: Nominal Pressure Drop (ΔP) @ 250 FPM Nominal Airflow Velocity

Pressure Component	Initial ΔP (in. w.g.)	Final ΔP (in. w.g.), Recommended or Actual
External pressure loss from inlet and outlet ducts	0.10	0.10
2″ PerfectPleat®	0.11	1.0
HD Cassette with SAAFOxidant™	0.73	0.73
HD Cassette with SAAFOxidant™	0.73	0.73
After-filter	0	0
M-Pak filter	0.23	1.5
TOTALS	**1.90**	**4.06**

9.1.2 Issues to be Considered when Selecting the Fan: There are a number of issues to be considered when determining the fan design and selection criteria:

1. If the fan is selected for the maximum pressure drop shown (4.06 in. w.g.), then it will have been selected for an operating point that will rarely occur. This may be inefficient in terms of energy usage (motor HP), physical fan size, and product cost.

2. If the fan is selected for the maximum pressure drop shown (4.06 in. w.g.), then it will deliver far more than the required airflow at the lower start-up pressure drop (1.90 in. w.g). Unless the airflow is controlled by using balancing dampers or a variable speed drive, this may result in discomfort from high discharge velocities, high noise levels, high energy use, and inefficient filter performance.

3. Conversely, if the fan is selected for the minimum pressure drop shown (1.90 in. w.g.), then it will deliver far less than the required airflow at the higher final pressure drop (4.06 in. w.g). This may result in inadequate air supply. Alternatively, the filters can be replaced before they reach their final recommended pressure drop, which results in higher filter replacement costs.

Other factors to be considered are:

4. The space available inside the cabinet. This limits the fan style or size that can be accommodated within the cabinet.

5. The costs associated with providing non-standard fans, or fan or motor control systems.

6. The type of fan to be selected. For instance, will a non-overloading fan wheel be required?

7. Power available in terms of voltage, phase, and frequency.

8. Special parameters, such as special electrical, environmental, explosion, or temperature requirements.

As is evident from this discussion, there are a number of factors to be considered when selecting the appropriate fan.

9.1.3 AAF's Policy Regarding the Provision of Internally Mounted Fans: Items 1 & 2 are standard offerings, and item 3 is an option:

1. When the size of the cabinet allows, AAF will supply a fan capable of generating the design airflow at the average pressure drop through the system. In the case of table 3, the average pressure drop is 0.5 x (1.90 + 4.06) = 2.98 in. w.g. An external pressure drop of 0.1 in. w.g. is assumed. A backward inclined non-overloading fan wheel will be supplied unless otherwise advised.

2. When the size of the cabinet limits the fan selection (normally on special smaller RU sizes), AAF will advise the maximum performance that can be supplied by a fan that will fit into the space available. An external pressure drop of 0.1 in. w.g. is assumed. A backward inclined non-overloading fan wheel will be supplied unless otherwise advised

3. When the customer specifies a fan performance that is different from that based on the design airflow at the average pressure drop through the system and the size of the cabinet is not an obstacle, AAF will select a fan to meet the specified requirements. This will normally occur when the external static pressure drop exceeds the standard value of 0.1 in. w.g.

See AAF's submittal drawing for the order in question, for the details of the fan supplied and its performance.

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