



Donaldson®



*Filtration Solutions for Gas Turbines,
Generators and Compressors*

TECH TOPIC - Primary Filter Pair

2008-El-101 Rev 1

Primary Filter Pair Installation and Maintenance

1.0 Primary Filter Pair Installation

Before Installing Filter Media

- ❑ Read the entire Donaldson erection manual for this project. If any clarification is required, contact Donaldson and resolve the issue before proceeding.
- ❑ Make sure that all ducting and filter house joints are absolutely air- and water-tight. Gaskets and caulking must be correctly placed per drawing requirements.
- ❑ Make sure that all door and access hatch seals are in place, undamaged, and effective.
- ❑ Do a thorough check of all painted parts and repair and/or touch-up as required.
- ❑ Check interior of ducting and filter house for cleanliness.

WARNING! Before servicing the filter elements:

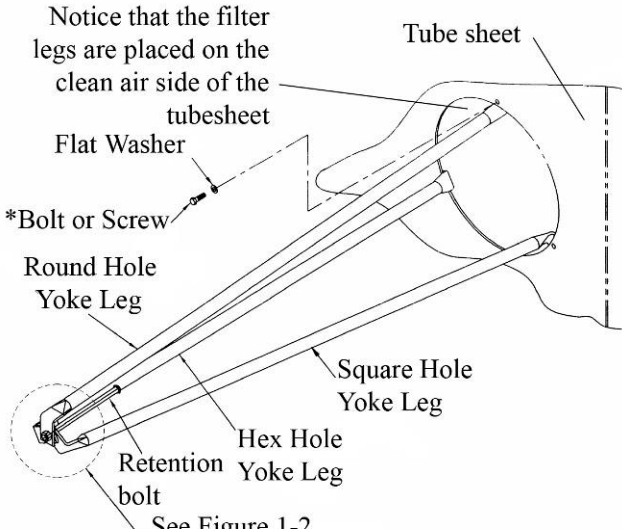
- **Shutdown the gas turbine and Shut off the air supply**
- **Check that line pressure is zero**
- **Shut off pulse-cleaning**

WARNING! Wear eye protection when servicing the filter elements. The exposed filter yokes are a hazard to unprotected eyes
WARNING!

WARNING! All filtration in the air filtration system are combustible. Use every precaution necessary to make sure that filter media is kept away from all heat sources. Do not smoke or weld near the air filter system. Any welding must be done before installation of the inlet hood treatment or filtration media.

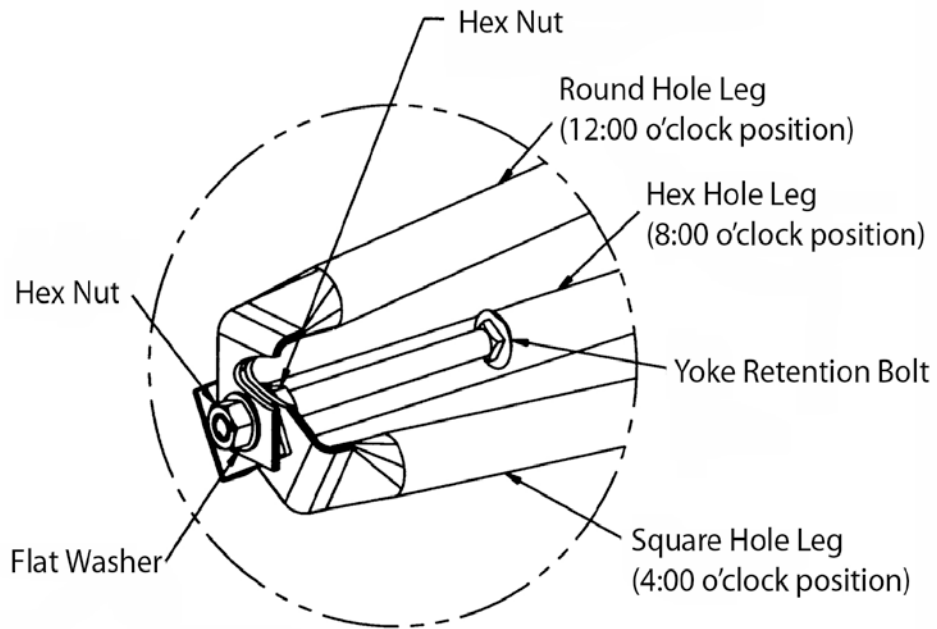
CAUTION! Remove the black factory-installed tie wraps from the element supports when the support retention bolt is installed. The tie wraps are only used to secure the three element supports together during shipment. Movement caused by the cleaning action of the filter and the clamping action of the filter supports will eventually cut through the tie wrap and result in turbine inlet FOD.

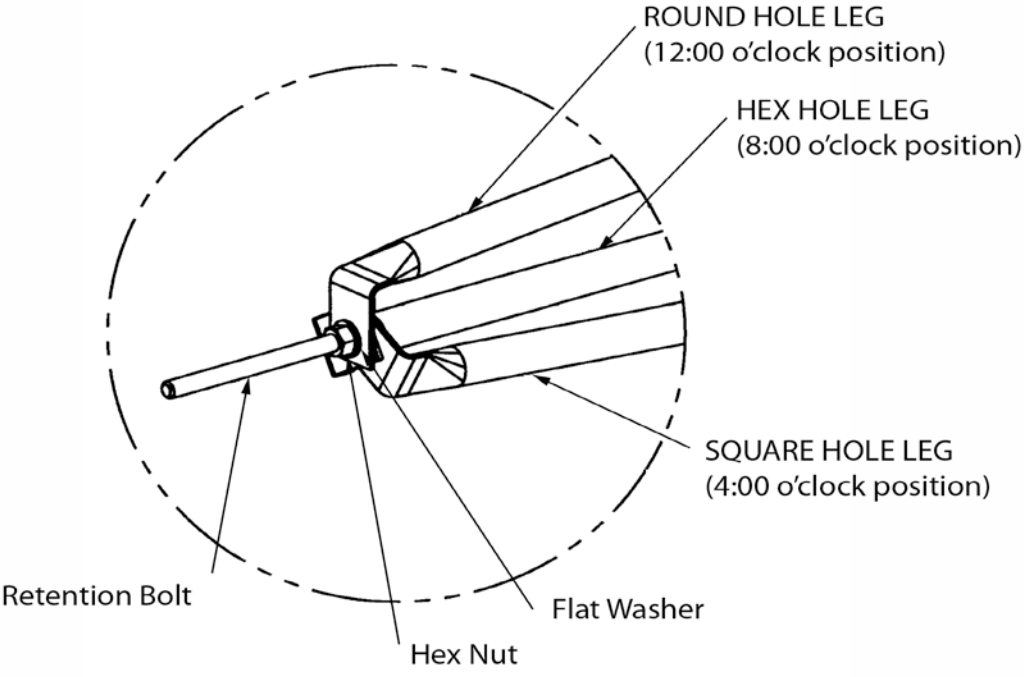
Notice! Element retention bolts are typically shipped with the yoke mounting kits. The yoke assembly legs are typically tied together with cable ties.

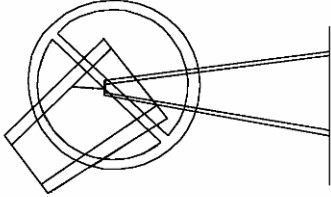
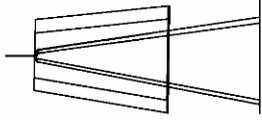
Sec./ Step No.	Reference	Procedure
1.1	Yoke Installation to Tubesheet	
When Filter Yokes are not Installed to Tubesheet		
❖	See Yoke Mounting Kit (provided with your erection manual), adjacent illustration and Figures 1-1 and 1-2	<p>Notice: Torque specification for the yoke leg bolts is 14-17 ft/lbs. (19-23 Nm).</p> <p>Fasten the legs of the yoke assemblies to the tube sheets as shown below or in referenced Yoke Mounting Kit.</p>  <p>Notice that the filter legs are placed on the clean air side of the tubesheet</p> <p>*SSTL yokes are treaded, CS yokes are not</p>

Sec./ Step No.	Reference	Procedure
1.2	Yoke Bolt Installation	
When Filter Element Retention Bolts are not Installed to Yoke Assembly Legs		
A.	Yoke Mounting Kit or Figure 1-1	Retention bolts are typically factory installed in the backward position as shown in the references.

Figure 1-1 Factory Installed Element Retention Bolt in Backward Position.



Sec./ Step No.	Reference	Procedure
B.	Yoke Mounting Kit or Figure 1-2	<ul style="list-style-type: none"> Remove the yellow painted hex nut and washer. Remove the retention bolt from the yoke holes and the unpainted washer and nut from the retention bolt.
<p style="text-align: center;"><i>Figure 1-2 Preparing the Yoke Assembly for Element Installation</i></p>  <p>The diagram shows a yoke assembly with three legs. The Round Hole Leg is at the 12:00 o'clock position, the Hex Hole Leg is at the 8:00 o'clock position, and the Square Hole Leg is at the 4:00 o'clock position. A Retention Bolt is shown passing through the Square Hole Leg, Hex Hole Leg, and Round Hole Leg. A Flat Washer and Hex Nut are also shown.</p>		
C.	Yoke Mounting Kit or Figure 1-2	<p>From the backside, insert retention bolt in the following manner:</p> <ul style="list-style-type: none"> first through the square hole leg, then through the hex hole leg, and finally through the round hole leg as shown in referenced figure. <p>Correct orientation of yoke legs is CRITICAL for proper sealing of the element gasket on the tube sheet.</p>

Sec./ Step No.	Reference	Procedure
D.	Yoke Mounting Kit or Figure 1-2	Firmly tighten the retention bolt against the yoke legs using the washer and nut to a minimum of 30 ft/lbs (40.67 Nm).
1.3	Primary Filter Element Pair Installation	
Install filter element pairs only after the yokes have been properly installed to tubesheet and retention bolts are properly installed to yoke assemblies.		
<p>Element retention yokes must not be subjected to excessive downward loads over 75 lbs. (34 kg.) during the assembly and erection process. Any excessive load will damage the yoke, create bad alignment of the filter element, and result in a poor seal between the tube sheet and the element. Make sure that the element retention yokes are centered on the tube sheet hole to ensure proper element sealing between the element and the tube sheet.</p>		
<p>CAUTION! Do not step on any of the air manifolds, air tubes, or element yokes inside the filter module because damage will result. Donaldson does not warranty equipment unless proper and responsible erection procedures are followed.</p>		
<p>CAUTION Use caution when installing filter elements. impacting into inner filter liner.</p>  <p>CAUTION Slide element onto yoke so that element is parallel to bolt shank.</p> 	<p><i>Figures 1-3 and 1-4. Proper Filter Element Installation over Yoke Assembly.</i></p> <p>CAUTION! Use caution when installing the filter elements. Damage can result from the retention bolt puncturing the filter element liner as shown here.</p>	

Sec./ Step No.	Reference	Procedure
A.	See Figure 1-3 Proper Filter Element Installation over Yoke Assembly.	Slide (one) conical filter element onto the element support yoke in a parallel manner as shown in Figure 1-3 until the gasket at the large end touches the tube sheet. Make sure that the element does not impact against the retention bolt.
B.	See Figure 1-4 Proper Filter Element Installation over Yoke Assembly.	Slide (one) cylindrical filter element onto the element support yoke in a parallel manner until the cylindrical filter element is against the conical filter element. Make sure that the element does not impact against the retention bolt.

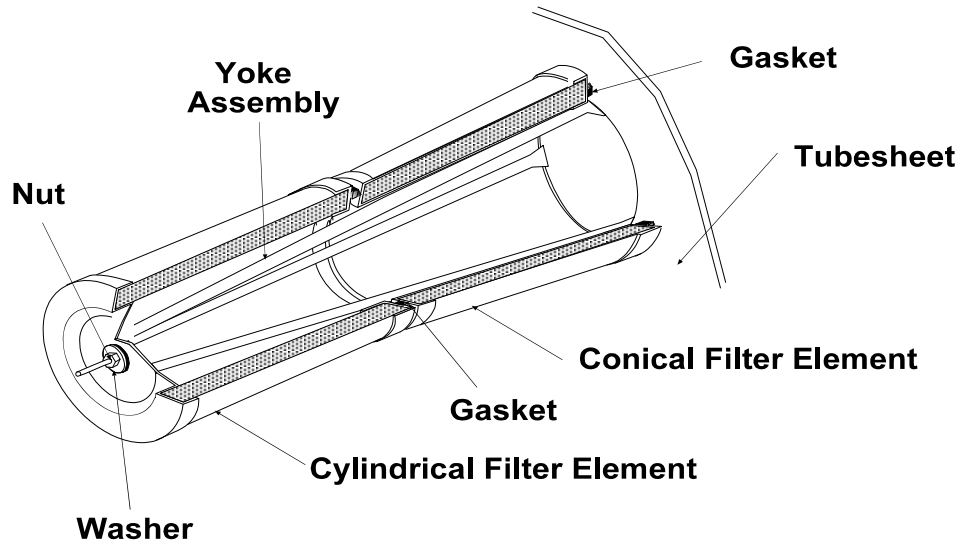


Figure 1-4. Installed Filter Element.

CAUTION! If the filter elements can be rotated around their axes, they are not tight enough.

Torque on the element retention nut should be 13-15 ft/lbs (18-20 Nm) to ensure an air-tight seal. Do not exceed 15 ft/lbs (20 Nm) torque on the element retention nut. Over-tightening can damage the filter elements.

Notice: If the element(s) can be rotated around their axes, tighten further.

Notice: Each time elements are replaced new nuts need to be utilized. These nuts are supplied in the box with new elements.

Primary Filter Pair Installation and Replacement (Cont.)

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Sec./ Step No.	Reference	Procedure
C.	See Figure 1-4 Installed Filter Element.	Place gasket washer and nut (a new nut comes with every new filter) which is provided with every new filter over threaded retention bolt on yoke as shown.
D.	See Figure 1-4 Installed Filter Element.	Tighten nut to 13-15 ft-lbs (18-20 Nm). “Stops” are built into the assembly to prevent over-compression of the gaskets. See CAUTION above and Figure 10-3. This will compress both element gaskets to approximately 1/4-inch (6 mm) thickness. If elements can be rotated, tighten until they cannot be rotated around their axes.

2.0 Primary Filter Pair Maintenance

Before Installing Filter Media

- Read the entire Donaldson operation and maintenance manual for this project. If any clarification is required, contact Donaldson and resolve the issue before proceeding.

WARNING! Before servicing the filter elements:

- Shutdown the gas turbine and Shut off the air supply
- Check that line pressure is zero
- Shut off pulse-cleaning

WARNING! Wear eye protection when servicing the filter elements. The exposed filter yokes are a hazard to unprotected eyes
WARNING!

WARNING! All filtration in the air filtration system are combustible. Use every precaution necessary to make sure that filter media is kept away from all heat sources. Do not smoke or weld near the air filter system. Any welding must be done before installation of the inlet hood treatment or filtration media.

Step	Function	Result/Action to be Taken
	Primary Filter Element Replacement Criteria	Ensure that all element filter yokes have been properly installed. See Section 1 in this document.
1	Pressure drop continues to rise across the primary filter elements to the high pressure drop set point (Start Pulse Setting)	Auto pulsing begins
2	Pressure drop declines to the low pressure drop set point (Stop Pulse Setting)	Auto pulsing stops
3	Operation of the air filter continues to operate with the automatic pulse cleaning system functioning repeatedly as described in Steps 1 and 2.	The self-cleaning filter unit maintains essentially a flat or level pressure drop when the air filter system is continually pulsed while continually challenged by contaminated air flow. This pressure drop level is called the "stabilized pressure drop".

Step	Function	Result/Action to be Taken
4	When primary filters have been installed for more than 24 months within an air filter system.	<p>Donaldson recommends that the filters be tested to determine if the filter media (depends upon media makeup and manufacturer) has degraded to an extent that contaminant has migrated downstream into the clean air chamber and has threatened turbine efficiency and turbine blade fouling.</p> <p>Donaldson offers element visual inspection and pressure drop, Mullen Burst, and tensile strength testing. These tests will determine whether any of the media properties has deteriorated due to possible aggressive chemical (hydrocarbons, acidic contaminant) and environmental concerns (excess moisture). Donaldson will either recommend continued use or a complete changeout of the currently installed primary filters.</p>
5	Donaldson testing summary recommends changeout of all primary filter elements. See Step 4.	<p>Changeout all primary filter elements within the air filter house to new and clean filters.</p> <p>Continue to Step 1.</p>
6	Donaldson testing summary recommends continued operation with presently installed primary filter elements. See Step 4.	Continue to Step 3.
7	Auto pulse system can no longer bring the pressure drop across the filters below the Start Pulse Setting.	<p>Changeout of the filters is now recommended.</p> <p>Filter life is depended upon the particulate concentration, particulate type, media velocity, filter cartridge design, filter system design, and pulse cleaning compressed air pressure.</p>
8	When the pressure drop rises to the Alarm Warning pressure drop condition.	<p>Check filter elements for high pressure drop. If pressure drop can not be reduced by pulse cleaning, turn off turbine and changeout filter elements. <u>See section 1.3 and Figures 1-3 and 1-4 in this document.</u></p>