



**User's Guide
OFS 2000
Thermal Activator
Heater Option**

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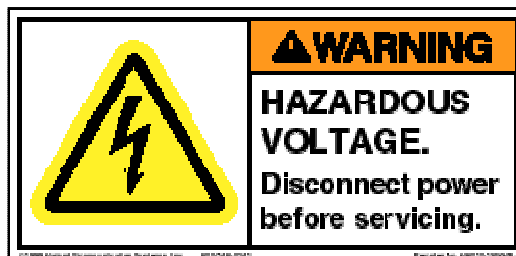
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Caveats

Only trained personnel are allowed to service this equipment.

The OFS shall only be used in a manner specified by the manufacturer.



This equipment contains hazardous voltages.

Disconnect AC power before servicing.

Optical Scientific, Inc. will not be held liable for any accident, injury to personnel, or damage to property incurred while operating or servicing this equipment. Implementation and enforcement of proper work safety procedures is solely the responsibility of the user, user employees or contracted personnel.



!CAUTION!

Read the entire User's Guide before proceeding with any installation or maintenance activity.

1 OFS 2000 Thermal Activator OVERVIEW

1.1 Theory of Operation

Scintillation is the variation of light caused by its passage through pockets of air with different temperature and density. It's what makes the stars seem to twinkle in the night sky. OFS uses scintillation in air flow to determine velocity. Our proven measurement technology, originally developed and patented for use in atmospheric visibility and turbulence detecting instruments, offers unequalled response and accuracy in air flow sensing.

Hot, turbulent, moving air provides optimum scintillation, and is a perfect medium for OFS operation. OFS has a wide range of acceptance. It has been proved to work well even under adverse conditions. However, some applications cannot provide sufficient signal-to-noise ratio (SNR). In our case, signal is the thermal or density turbulence while noise is vibration and electrical interference.. In these circumstances, applying heat to increase the amount of thermal turbulence present has been found to work very well. To that end, OSI offers the Thermal Activator option.

The Thermal Activator Option is simply a bar heater installed in the stack/duct approximately 8" upstream of the OFS Receiver. The heater may (or may not – depending on application requirements) have a companion temperature probe installed 24" further upstream for measurement/control purposes.

The best practice is to have the heater installed upstream on the Receiver side. The maximum effect of the heater is then concentrated in the portion of the light path closest to the Receiver window. This raises the scintillation in the immediate area to a level where the detectors can "lock on" to the scintillation movement.

It should be noted *the addition of heat to raise scintillation characteristics has no effect on the OFS path-averaging flow measurement.* The added turbulence in the portion of the measurement path simply serves to "jump start" the DSP measurement algorithm so it can focus in on the proper measurement range. The actual measurement calculations are still done based on the full path length.

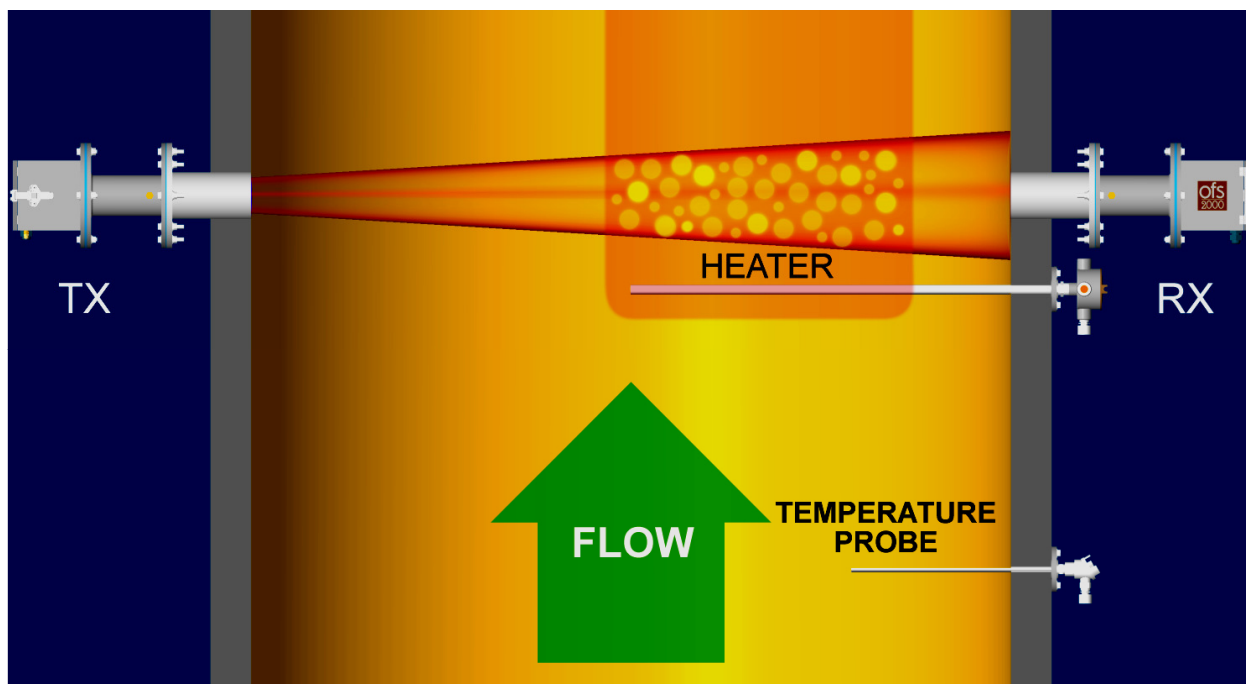


Figure 1-1 Typical Thermal Activator Setup

1.2 General Heater Specifications

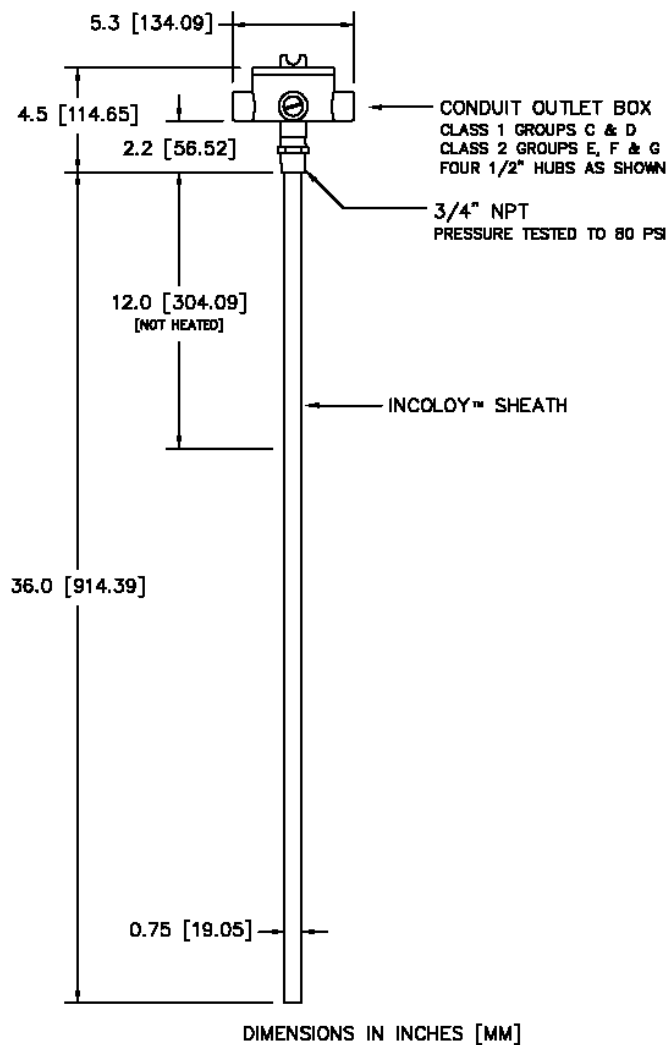


Figure 1-2 Thermal Activator Dimensions

Operational Environment		
Ambient Temperature	-40 to 60 C	
Power Requirements		
	120 VAC, 50/60 Hz, 7A -or- 240VAC, 50/60 Hz, 3.5A (depending on user line power)	
Physical Characteristics		
Weight	4 lb 12 oz.	
Dimensions	Heater Rod	36" L X 3/4" Dia.
	Connector Hub (NEMA-7),	2" X 3-1/2" Dia. w/1/2" NPT conduit conn.
Materials	Heater Rod	Incoloy™/Inconel™
	Connector Hub (NEMA-7),	Aluminum

1.3 Thermal Activator Wiring

These figures show basic wiring connections. (OFS-2000C application is shown... See Note at bottom of page)

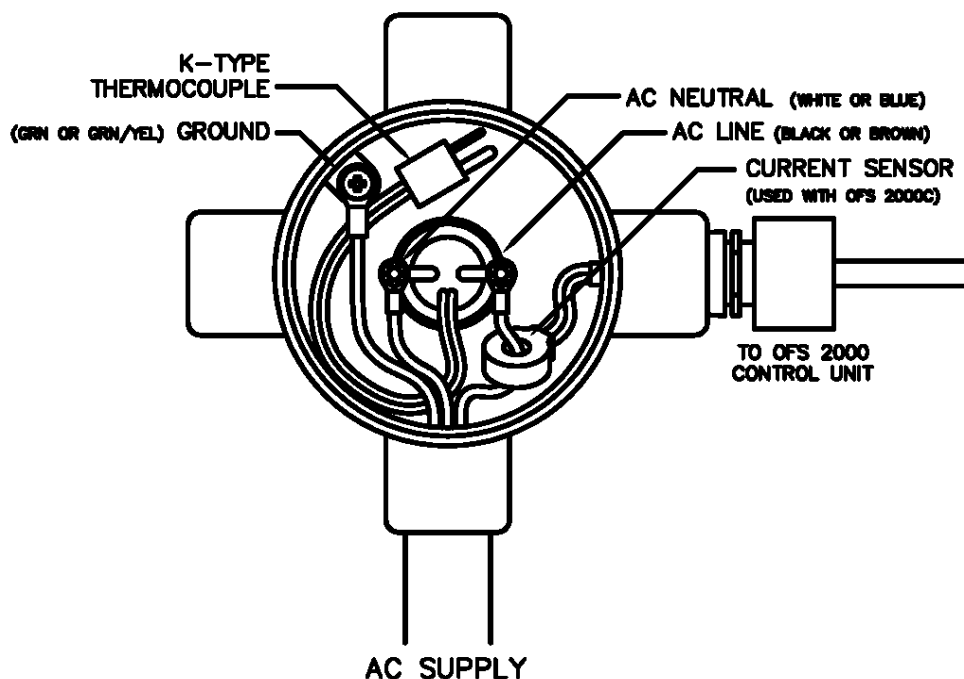


Figure 1-3 Heater Wiring

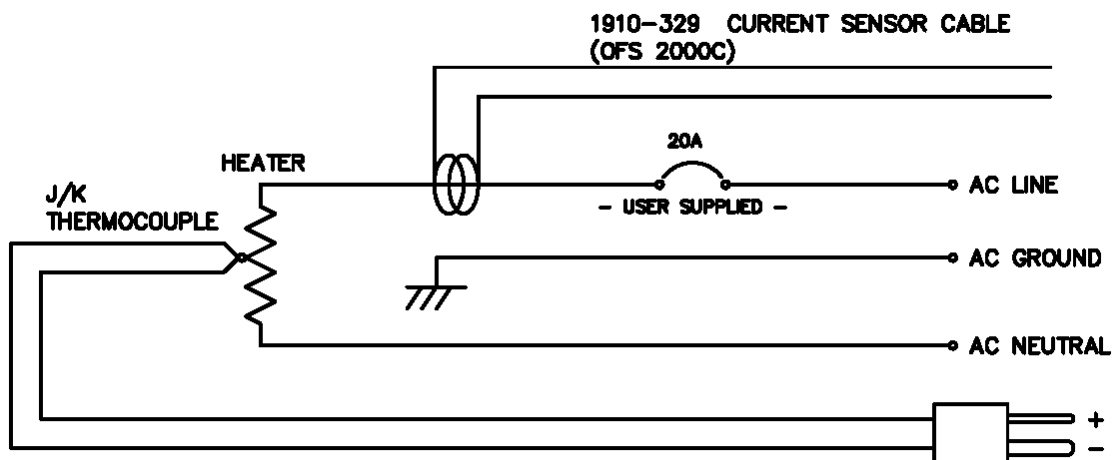


Figure 1-4 Heater Schematic

Note: The use of the thermocouple (for temperature control purposes and/or monitoring) is at the discretion of the user and outside the scope of this guide. **OSI** has no recommendations and does not warrant its use. The Current Sensor Cable is integral to the OFS 2000C model and discussed in the 2000C User Guide.

1.4 Description of Units

The Thermal Activator is typically used to excite scintillation where air flow temperature may drop below 150 °F [65.6 °C]. The Temperature Probe (1910-852) is used to monitor flow temperature and may be ordered separately. (See below) As a side note, the Thermal Activator is generally not required for use in flare applications. Even though the media temperatures involved are quite low, the fact that there are multiple sources of different media densities ensures that there is sufficient thermal and/or density turbulence present to sense and measure the flow velocity.

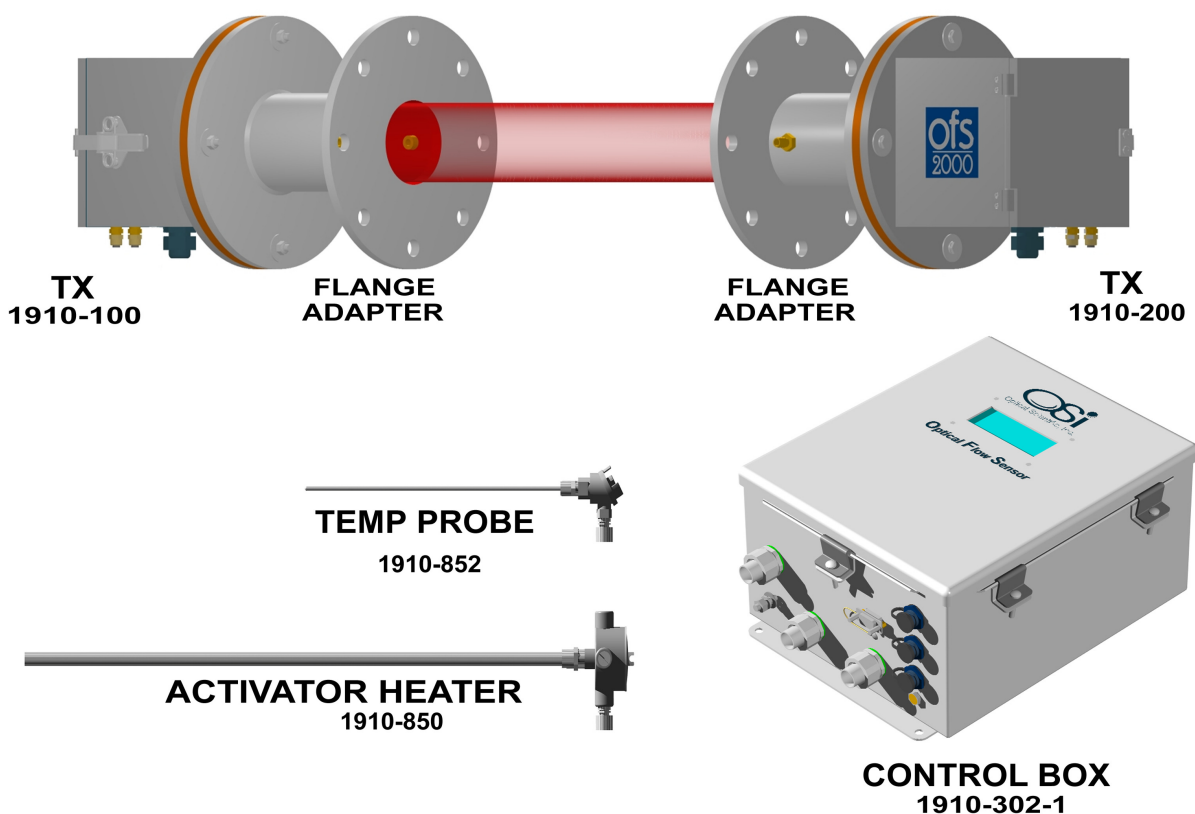


Figure 1-5 OFS 2000C System Components (Typical)

The major components of the OFS 2000C System are shown in the Figure above. The OFS 2000C is intended for “low temperature” airflow monitoring. The Thermal Activator and the Temperature Probes are integral parts of the OFS 2000C System.

The Thermal Activator and the Temperature Probe can also be ordered individually for other OFS applications where low temperatures may cause measurement difficulties. Heaters can be specified to suit your application. Consult OSI Engineering Department before ordering.

**!NOTE!**

Use of the temperature probe and any associated temperature controller for the heater is entirely at the Users' discretion. OSI makes no claim or application recommendations for any ancillary equipment used in conjunction with OFS applications other than that marketed by Optical Scientific, Inc. directly. OSI assumes no responsibility or liability for any injury, accident, or loss occasioned by the use of non-conforming equipment.

1.5 Thermal Activator



Figure 1-6 Thermal Activator

The Standard Thermal Activator is rated at 800W @ 120V or 240V 50/60Hz

[P/N 1910-850 = 120V; 1910-850-1 = 240VAC]

Other wattages are available by special order for special applications. It is recommended that a dedicated branch circuit controlled with a circuit breaker be provided. The heater element is 3/4" in diameter 36" long with an INCONEL™ sheath and threaded to fit a 3/4" NPT port. The active portion of the heating element begins 12" from the base and extends the remaining 24" to the end of the rod. The connector head is a NEMA 7 rated housing suitable for use in Class I, Div. 1 & 2, Groups C,D environments. The heater element is equipped with a K-type thermocouple. For OFS 2000-C application a current-sensing circuit is also included. The connecting cable (provided) plugs into the J10 "HTR SENSE" connector at the bottom of the Control Box.

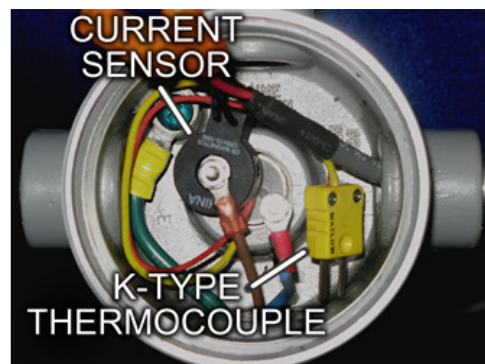


Figure 1-7 Heater Current Sensor



!CAUTION!

800W heater can reach temperatures of over 1000°F [538 °C] when unregulated. Do not operate without sufficient airflow to dissipate heat and/or proper control.

1.6 Temperature Probe



Figure 1-8 Temperature Probe

The Temperature Probe [1910-852] is an RTD type. It is an integral part of the OFS 2000C (Combustion) system and is shown here for reference only. The probe itself is 1/4" diameter 18" long, stainless steel, with an aluminum connector head. It screws into a 1/2" NPT port and is provided with a cable which plugs into the J9 connector at the bottom of the OFS 2000C Control Box. The operational range for OFS 2000-C is -40° to +932°F [-40° to +500°C].

2 Pre – Installation

2.1 OFS Placement

Since air flow has the characteristics of a fluid, the best location for any flow sensor is always at the place where the flow profile is well developed and consistent. A certain amount of leading and trailing distance (usually defined in “pipe diameters”) from bends or flow disturbances in the pipe or stack is necessary for stabilization. Most types of flow sensors need very long straight distances to achieve a steady near-laminar flow. The common sensor sees turbulence as an error which needs to be eliminated. For OFS, turbulence is desirable. It is always easier to add turbulence than to eliminate it. Because the OFS light beam passes through the entire flow cross-section, it can tolerate much shorter linear length, where other instruments may require ten times the distance or more before they can become effective.

Usually linear lengths more than two times the pipe diameter leading (upstream of the OFS) and one times the pipe diameter trailing are good enough for OFS to make a representative flow measurement. In some cases, OFS 2000-C units have been installed right at the elbow of a pipe and still provided satisfactory measurements. Consult OSI if you have any placement concerns.

Application requirements may require differing arrangements from the standard stack or duct. The shape, diameter, or cross section must also be taken into consideration. In some cases two OFS systems have been used in an “X” configuration to measure a large stack. In others, they have been mounted diagonally to measure across a rectangular duct corner-to-corner. The OFS will measure at any distance from 0.15 to 10 meters. Other distances are possible. Again consult OSI if you have questions regarding proper placement.

Note: In cases like this shown in the figure, it is advisable to mount the units so that the light beam is aligned along the axis of the upstream bend. This ensures that any stratification in the developed flow pattern will pass through the light beam and not slip by on either side.

The Transmitter should be placed on the inside curve of the upstream bend

Placement of the Temperature Probe and Thermal Activator are described in the following section.

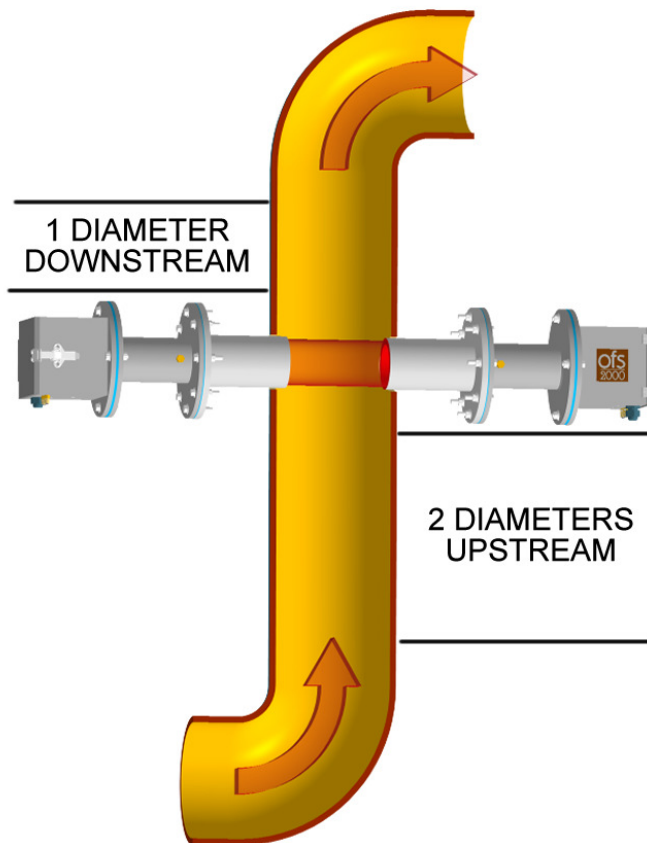


Figure 2-1 OFS Placement

2.2 Thermal Activator Placement

In addition to the general placement considerations described in the previous section, proper allowance must be made for the location of the Temperature Probe [1910-852] and Thermal Activator [1910-850/850-1].

These are placed upstream of the light beam axis as shown in the figure below. The heater and temperature probe are aligned on the centerline and installed on the receiver side of the duct. The heater should be mounted 8" upstream from the TX/RX light beam axis, and the temperature probe should be mounted 24 " upstream from the heater. A certain amount of shifting may be allowed for as not all sites are ideal, but the more critical parameter is the 8" centerline distance between the heater and the light path. This should be adhered to as closely as reasonable..

The following figure shows a typical OFS-2000C installation in a horizontal duct.

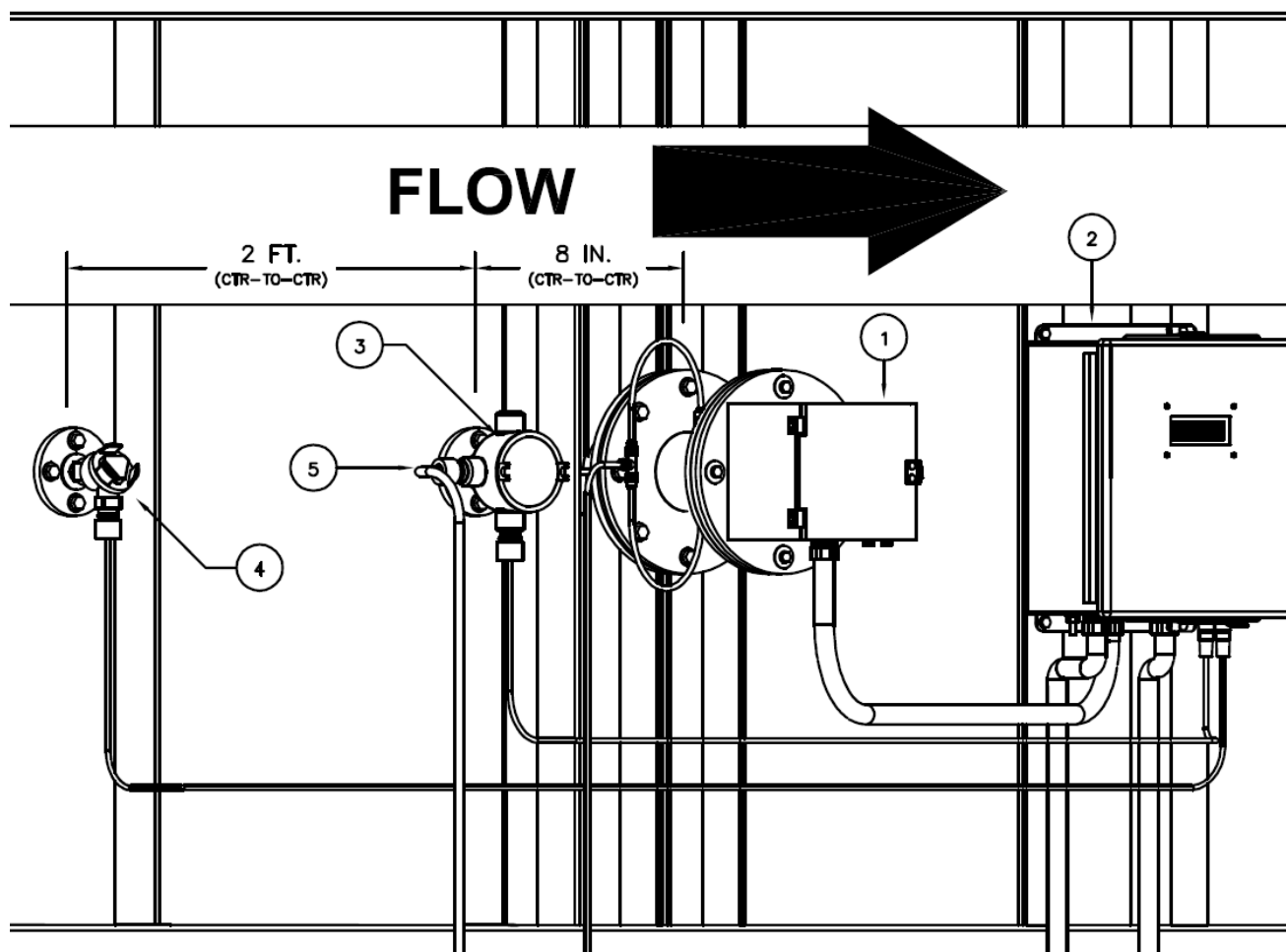


Figure 2-2 Typical Sensor Placement

Component Description	
1 Receiver Unit [1910-200]	Centered on axis with transmitter (opposite side)
2 Control Unit [1910-302-1]	Contains DSP/Sensor and Customer Interface
3 Thermal Activator [1910-850 series]	Mounts in 3/4" NPT fitting 8" upstream on center with RX
4 Temperature Probe [1910-852]	Mounts in 1/2" NPT fitting at least 24" upstream from heater
5 Heater AC Supply	Dedicated AC line

3 Installation

See previous sections for details, or consult OFS 2000C User's Guide for siting concerns.

Thermal Activators require a 3/4" NPT port installed on centerline with the OFS Receiver and 8 inches upstream of the light path. The heater should have a dedicated AC line of suitable gauge (based on wattage and distance), controlled by a circuit breaker. The heater head has connection hubs threaded for 1/2" NPT suitable for liquid tight flexible conduit fittings. Electrical requirements can vary depending on the heater ordered. Consult your Sales Order or Application Profile.

Temperature Probes (if used) require a 1/2" NPT port on centerline with the OFS Receiver and 24 inches upstream of the heater. The Temperature Probe connection hub is threaded for 1/2" NPT, but is shipped with its own connecting cable for OFS 2000C applications.

4 Technical Support

OSI Technical Support

techsupport@opticalscientific.com

Tel: 301 963 3630 xt 216

Fax: 301 948 4670

9AM – 5PM Eastern Time Monday – Friday (except national holidays)

Telephone assistance for overseas customers is available by appointment.
E-mail at least 1 business day in advance.

4.1 Before Calling Technical Support

Please have or be able to provide

- Unit or system model designation :OFS 2000 –W (-F/-V, etc.)
- Unit or system serial number
- Details of the site and installation (stack diameter, purge air, application, site location, etc.)
- Your name, phone number, and e-mail address

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