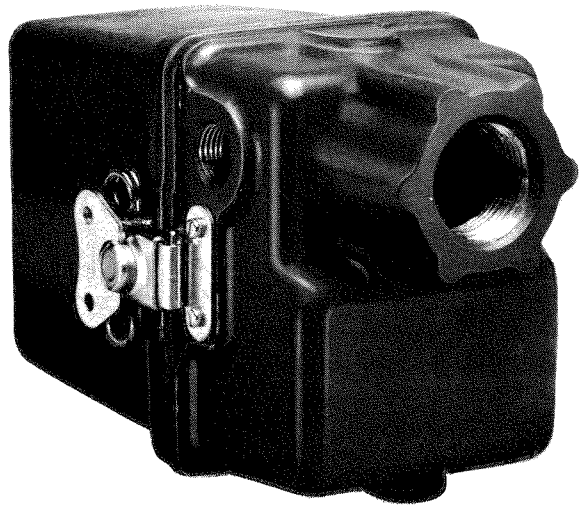


Ultraviolet Flame Scanner C9501N

DESCRIPTION

The FIREYE C9501N Flame Scanner provides an effective means of flame monitoring in an application where a scanner can be mounted in a direct line of sight from the flame to be monitored. The C9501N Scanner is used in conjunction with Fireye R9005, R9100, R9101, R9103 and R9105 Flame Controllers.

The C9501N Ultraviolet Flame Scanner responds to ultraviolet (UV) radiation wavelengths between 1850 and 2650 angstroms, which are emitted by natural gas and light oil (No. 2) flames. If coal, heavy oil or other residual fuels are used, the C9502 Infrared Flame Scanner should be utilized.

The C9501N Flame Scanner (Figure 1) incorporates an ultraviolet sensitive detector tube, electronic circuitry to generate and transmit an output signal, a quartz viewing window and a mechanical light-blocking chopper, which is used to test detector tube status.

The scanner chassis is mounted in a weatherproof cast aluminum enclosure. The base casting and cover casting fit together and are secured with spring-loaded, half-turn fasteners. The base casting has a 1 inch NPT (National Pipe Thread) tapping for mounting onto a threaded sight pipe. The base also includes a 3/4 inch NPT tapping for connection of a purge air line.

FEATURES

- Adjustable gain control within the scanner module.
- Electronic circuitry to process and transmit an output signal.
- A mechanical "light chopper" that blocks the photocell from light at preset intervals, testing its status.
- Scanner electronic circuitry mounted in a weatherproof cast aluminum enclosure.

SPECIFICATIONS

ELECTRICAL—Power for the flame scanner is provided by the supervising flame controller. Eight foot nonshielded leadwires (five), insulation rated at 220°F (105°C), 600 vdc breakdown, oil-resistant. An optional 5 pin military connector is available.

MECHANICAL— 1 inch NPT to sight pipe, 3/4 inch NPT purge air, 1/2 inch NPSM tap for electrical fitting.

OPERATING TEMPERATURE RANGE— --4°F to +185°F (-20°C to +85°C) measured at mounting hub, housing ambient air not to exceed 160°F (71°C).

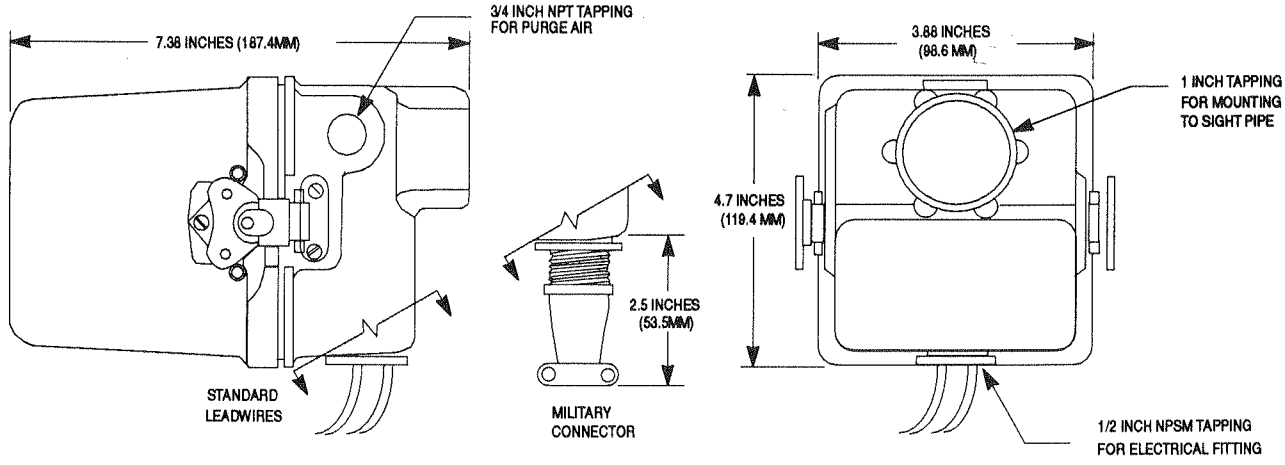
DIMENSIONS—See Figure 1.

SHIPPING WEIGHT—7 pounds (3.2 kilograms).

RESPONSE RANGE—1850 to 2650 angstroms

PURGE AIR RECOMMENDED—600 standard cubic feet per hour at 13 inches water column over furnace pressure.

FIGURE 1. C9501 DIMENSIONS



INSTALLATION

FLAME SCANNER MOUNTING

1. Choose a sighting location where the scanner will have an unobstructed view of the flame under all firing conditions. The greatest amount of UV radiation is produced in the area immediately ahead of the burner. The greatest amount of infrared radiation (IR) is produced in the later (cooler) stages of combustion.

   A scanner monitoring a pilot flame must sight at a point where pilot and main flames intersect to ensure that a detectable pilot flame will reliably ignite the main flame.

   In multiple burner furnaces, choose a sighting angle with the best possible view of the flame of interest and the poorest view of other flames in the furnace. The sight pipe should be inclined sightly downward, so that unburned particles or condensed moisture will not fall or drain onto the scanner.

2. Prepare a hole in the burner front or windbox wall to clear the sight pipe at the angle of approach selected. Select a length of 1 inch standard pipe (with NPT thread on one end) no longer than is necessary to place the scanner housing in an unobstructed and accessible area. If a sight pipe longer than 12 to 18 inches is required, the sight pipe should be of larger diameter (2 inch pipe for example) with the reduction to 1 inch occurring as close to the scanner as practical, so the field of view will not be reduced to a narrow angle.
3. Thread the scanner base assembly onto the sight pipe until tight, making certain that, in the final position, the wiring connector points down.
4. Tack weld the sight pipe to the boiler front plate at the selected location and angle of sight. Project the pipe through the hole in the firewall surface.
5. In many instances it will be convenient to use a swivel mount (model number Q2625A) that is threaded onto the sight pipe. This arrangement allows angular adjustment within a cone of approximately 20 degrees.
6. Install an electrical fitting in the housing base tapping and encase the extension leadwires in 1/2 inch flexible metal conduit or other flexible conduit meeting local standards. Terminate the assembly at a junction box and splice the leadwires to conductors extending to the flame control module. For any wiring runs on or near hot surfaces, use wire rated at 221°F (105°C) or higher.

For watertight connection, use an appropriate fitting and liquid tight conduit arranged to pitch downward from the scanner The scanner wiring scheme is shown in Table 1.

Table 1: Leadwire Connections to Scanner

WIRE COLOR	FUNCTION
Gray	Signal Output
Violet	+28VDC from controller
Yellow	From chopper drive
Red	+520 VDC
Brown	Ground

7. When the optional military connector is purchased, a 16 gauge - 5 conductor cable with a 5 pin plug assembly must be used to connect the scanner to the controller Fireye offers a kit to facilitate this connection. Table 2 shows the pin connections.

Table 2: Optional Pin Connectors to Scanner

PIN	CABLE COLOR	FUNCTION
A	Orange	+28 VDC
B	Blue	Signal
C	Yellow	Chopper
D	Red	+520 VDC
E	Black	Ground

8. The introduction of cooling and/or purging air will be required. A positive flow of air down the sight pipe can eliminate the necessity for frequent lens cleaning and prevent transmission losses caused by products of combustion in the sight path. The purge air source must be oil free and dry and it should provide 600 standard cubic feet per hour at 13 inches water column over furnace pressure. Unless the purge line includes a flexible connecting portion it cannot be attached until the permanent scanner position has been determined.

SIGHTING ADJUSTMENT

An inadequate signal may be the result of improper sighting, poor combustion or an improper scanner for the fuel being burned. If the sight pipe was only tack welded, as instructed, or if it is on a swivel mount, vary the angle to achieve the highest voltage signal reading.

If the scanner is used to monitor both pilot and main flames, adequate signal from each flame should be verified with the other flame off. If a good signal can be acquired from both flames only at two different sighting angles, either the sight pipe should be relocated to a more appropriate area or the use of two scanners should be considered.

In multiple burner furnaces where individual flame discrimination is required, it is possible that a strong signal may be received from an interfering flame as well as from the flame of interest. The best way to correct this condition is to restrict the size of the viewing orifice on the scanner so that the signal intensity from both flames is reduced. Assuming that the monitored flame, which has an optimized sighting angle, will provide a greater signal than an adjacent flame, a reduction of signal strength (by restricting the viewing orifice) will permit the differences in signal level from the two flames to be recognized.

IMPORTANT

The electric spark used to ignite a pilot flame is an emitter of ultraviolet and infrared radiation. To ensure that the sighting arrangement does not permit the detection of direct or reflected spark energy, a flame signal reading of no more than 1 volt should exist with fuel sources shut off and spark energized. Realign the scanner or optically shield the igniter, if necessary, to avoid spark detection.

As an additional precaution, it is a common and recommended practice to deenergize the ignition transformer simultaneously with the energizing of main fuel valves.

IMPORTANT

A scanner should not respond to a pilot flame that is too small to reliably ignite the main burner. This can be checked by reducing the pilot flame size to the smallest that can be detected (sensitivity set to maximum) and then determining that such reduced flame will readily ignite the main burner fuel.

CAUTION: If ignition of main flame does not occur at once, or is slower than usual, shut off fuel immediately, readjust the scanner to sight further out, and repeat the test.

If the pilot flame signal is relatively strong, the viewing orifice should be restricted to inhibit detection of a pilot flame. The sensitivity control should not be used to attenuate the signal in this instance unless some means is provided to guard against the setting being changed.

IMPORTANT

When satisfactory sighting has been achieved, the sight pipe should be permanently welded in place to maintain the selected position. If a swivel mount is used, tack weld it to prevent further movement. With the sight pipe in a fixed position, a permanent purge air line connection can be made to the scanner base.

FINAL CALIBRATION

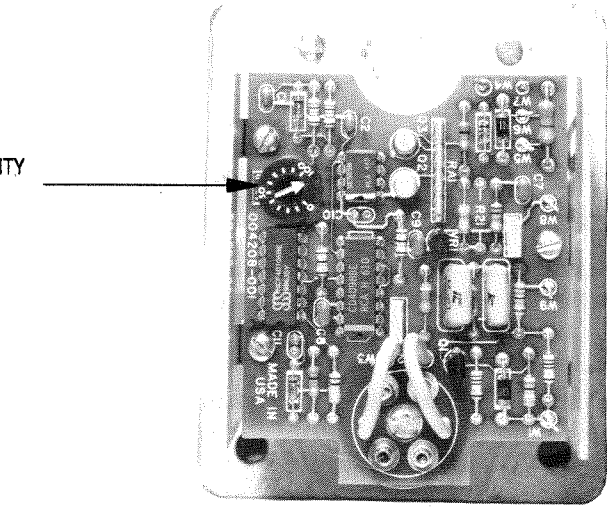
Scanner gain is most easily adjusted at the controller using the "Checking and Adjusting for Proper Flame Signal" procedure in the controller manual.

NOTE: The scanner sensitivity potentiometer located within the scanner housing (see figure 2) should be set at 100 percent when initially performing this procedure.

If the required signal readings cannot be obtained using the scanner gain adjustment on the controller, the C9501N scanner sensitivity potentiometer can also be adjusted to obtain the required readings. The potentiometer is labeled with a 0 to 100 scale (indicating percent) and an arrow that indicates the present setting. It is a single turn potentiometer with two end stops. Turning the potentiometer counterclockwise toward the "0" setting reduces the scanner sensitivity. Turning the potentiometer clockwise to the "100" sets the scanner at maximum sensitivity.

To adjust the C9501N sensitivity, remove the rear cover of the scanner housing and locate the sensitivity potentiometer shown in Figure 2. Use a thin standard blade screwdriver to adjust for the required response as described in the "Checking and Adjusting for Proper Flame Signal" section of the controller manual.

FIGURE 2. LOCATION OF C9501N TRIM POTENTIOMETER



REPLACEMENT OF C9501M WITH C9501N FLAME SCANNER

The C9501N and C9501M Flame Scanners function the same way. However, the sensor used in the C9501N has a higher sensitivity rating. Because of this higher sensitivity, a user-adjustable sensitivity potentiometer is built into the C9501N electronic module to allow greater application flexibility. Typically, setting the sensitivity potentiometer between 60 and 85 percent is equivalent to the C9501M fixed sensitivity setting.

C9501N SENSITIVITY ADJUSTMENT

To achieve the same response after replacing a C9501M with a C9501N Flame Scanner, the scanner sensitivity potentiometer (see Figure 2) should be set at 75 (scale is indicated on the potentiometer). Then perform the "Checking and Adjusting for Proper Flame Signal" procedure from the controller manual.

HOW TO ORDER SCANNER

C9501N		DESCRIPTION
	1023	8 FT. LEAD WIRES
	1034	MILITARY CONNECTOR
EXAMPLE: To order a C9501N scanner with 8 ft. lead wires, ORDER: C9501N1023		
To order Scanner Electronics Assembly Only: Order DE601-106 for both models.		
To order scanner base Only: Order DE 601-104F for C9501N1023 Models or Order DE601-104D for C9501N1034 Models		