

FIREYE® INFRARED SCANNER ASSEMBLY C9502N

DESCRIPTION

The 9502N IR 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 C9502N Scanner is used in conjunction with FIREYE R9005, R9100, R9101, R9103 and R9105 Controllers.

The C9502N Flame Scanner responds to infrared (IR) radiation wavelengths between 5,000 and 10,000 angstroms, enabling the detection of coal, heavy oil and other residual fuel flames that tend to mask or absorb UV radiation, making UV flame detection difficult. If light oil, or natural gas is used, the C9501 Ultraviolet Flame Scanner should be utilized.

The C9502N Flame Scanner (Figure 1) incorporates a solid state sensor that is sensitive to infrared light radiation, 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 response to absence of flame.

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, 1-inch sight pipe. The base also includes a 1/2 inch NPT tapping for connection of a purge air line.

FEATURES

- Automatic gain control instantly compensates for varying firing rates to decrease the risk of false trips caused by a low flame signal and to increase the flame discrimination capability of the scanner
- Adjustable gain control within the scanner module.
- A photocell that reacts to specific radiation band width is generated by burner flames.
- Electronic circuitry to process and transmit an output signal.
- A mechanical "light chopper" that blocks the photocell from light at preset intervals, testing its response.
- The scanner electronic circuitry is mounted in a weather proof cast aluminum enclosure.



SPECIFICATIONS

ELECTRICAL—Power for the flame scanner is provided by the supervising Flame Controller, 8 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 200°F (-20°C to +93°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—5,000 to 10,000 angstroms.

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

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 slightly downward, so that unburned particles or condensed moisture will not fall or drain onto the scanner.

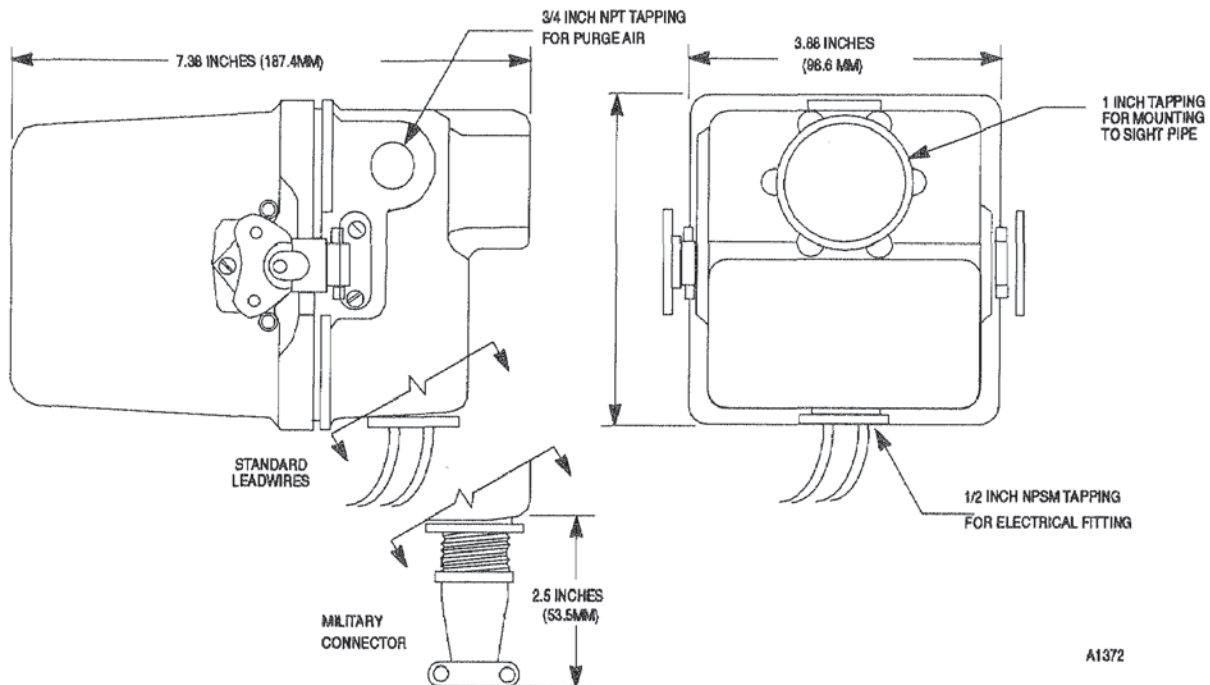
2. Prepare a hole in the burner front or windbox wall to clear the sight pipe at the angle of approach selected. Select a length of 1 inch standard pipe (with NPT thread on one end) no longer than is necessary to place the scanner housing in an unobstructed and accessible area. If a sight pipe longer 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 too small.
3. Thread the scanner base assembly onto the sight pipe until tight.
4. Make certain that the wiring connector points down in the final position and 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.
7. When the optional military connector is purchased, a 16 gauge -5 conductor cable with a five pin plug assembly must be used to connect the scanner to the controller. FIREYE offers a kit (part number DE601-006) to facilitate this connection. Table 2 shows the pin connections.

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 (SCFH) 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.

TABLE 1: Scanner Wiring Scheme

WIRE COLOR	FUNCTION	CONNECTOR DATA	
		WIRE COLOR	PIN NO.
Gray	Signal Output	Blue	B
Violet	+28vdc from controller	Orange	A
Yellow	From chopper drive	Yellow	C
Brown	Ground	Black	E
Red	+520vdc	Red	D

FIGURE 1. Dimensions of the C9502N Scanner



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 signal voltage 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 shut 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, it should be determined that a flame signal reading of no more than 1 volt is obtained with fuel sources shut off and spark energized. Re-align 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 de-energize the ignition transformer simultaneously with the activation of the 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, and/or is slower than usual, shut off fuel immediately, re-adjust the scanner to sight further out, increase pilot flame size just enough so that it is detected, and repeat the main flame ignition 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 normally adjusted at the controller. If adjusting gain at the controller proves insufficient, the C9502N Flame Scanner has an individual sensitivity adjustment that allows fine-tuning of the signal.

The C9502N scanner has a trimmer potentiometer mounted within the scanner's electronic package that permits sensitivity adjustment from 0 to 100 percent. The sensitivity trim potentiometer is accessible only when the two halves of the scanner are separate. The trim is a four turn potentiometer with no end stops. Turning the potentiometer more than four turns either way means that the adjustment will idle at one or the other end of its range.

Turning the potentiometer to the left (counterclockwise) reduces the sensitivity. The scanners are sent from the factory with the adjustments set at 50 percent sensitivity (two turns from the end). For more specific system calibration information, refer to the instructions supplied with the controller.

To adjust the C9502N Scanner sensitivity, pull the rubber gasket back from the rear portion of the scanner housing until the hole on the right side of the central opening is exposed. See Figure 2. Insert a thin standard blade screwdriver into the hole and turn it gently until it slides into the slot of the trim potentiometer.

The C9502N Scanner has an automatic gain control (AGC) on-off switch as standard equipment. The AGC circuit automatically raises or attenuates the scanner signal to compensate for variations in flame intensity. Scanners are shipped with the AGC switch on. An especially hot, bright coal flame may cause the AGC to lower the flame signal below acceptable limits. In such an instance the AGC should be switched off. To access the switch, unscrew the three machine screws (two above, one below) holding the electronic module inside the rear housing. Pull the electronic module out, holding it by the alignment posts. The AGC switch is found on the top of the electronic package, near one edge of the module as shown in Figure 3.

FIGURE 2. Location of C9502N Gain Trim Potentiometer Access Hole

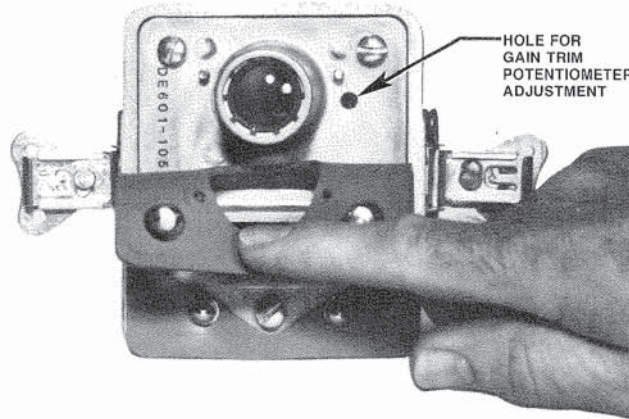
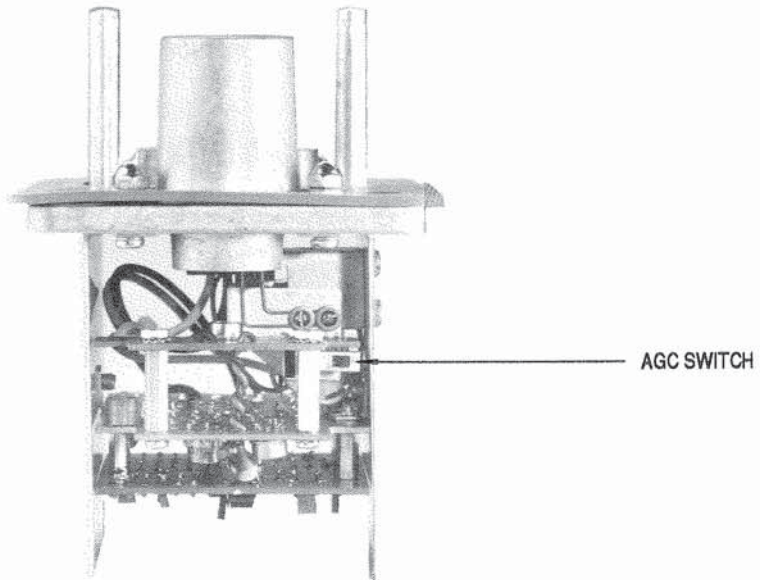


FIGURE 3. C9502N Scanner Electronic Module with Housing Removed



How to Order

C9502N		DESCRIPTION
	5012	40 ft. lead wires
	5023	Military Connector
EXAMPLE: To order a C9502N scanner with 40 ft. lead wires, order: C9502N5012		

To order scanner electronics assembly only order: DE601-108A for both models.

To order scanner base only order:

DE601-104F for C9502N5012 model.
OR DE601-104D for C9502N5023 model.







NOTICE

When Fireeye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireeye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireeye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for one year from the date of shipment of its products to replace, or, at its option, to repair any product or part thereof (except lamps, electronic tubes and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireeye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireeye be liable for consequential or special damages of any nature which may arise in connection with such product or part.



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