

Self-Check U.V. Scanner

Model 5602-91



About This Scanner

The self-check U.V. scanner is used for continuous gas or oil flames. A mechanical shutter in the scanner closes every ten seconds, at which time the Eclipse flame safeguard checks for a flame signal. If a signal is present, indicating a runaway scanner, the flame safeguard shuts down the system. The scanner features a high quality fused silica quartz lens, machined alloy housing with seals and a long life push-pull electromagnetically driven photo shutter. The detectors and signal processor automatically check every 10 seconds. It can be replaced without disturbing wiring. With no scheduled replacement parts, this scanner operates with the Series 6000 Multi-Flame and Series 6500 Bi-Flame controllers.

Factory Mutual (FM) recommends these scanners be used when any fired equipment is operated continuously (more than 24 hours without shutdown).

1.0 Specifications

Mechanical	Overall Length: 197 mm (7-3/4") Diameter: 83 mm (3-1/4") Housing Material: Machined 6061 aluminum alloy Finish: Clear anodized Sight Tube Entrance: 25 mm (1") pipe thread Purge Air Entrance: 10 mm (3/8") pipe thread Purge Air Flow: 5 cfm, 10 psi maximum
Electrical	Supply Voltage: 120V +10/-15%, 60HZ Supply Current: 0.04A Output: 10V square wave frequency modulated
Supply Wiring	Type: Instrumentation cable with two pairs of individually shielded #18 AWG conductors, 60°C (140°F), 300V minimum, ALPHA #5620B1802 or BELDEN #9368

(Section 1.0 continues onto the next page)



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1.0 Specifications *(continued from page 1)*

Temperature Range	-18° to +60°C (0°F to 140°F) case temperature
Shipping Weight	2 kilograms (4.5 lbs.)
Optical	Angle of View: @ 2.5° depending on sight pipe size and length Spectral Sensitivity: 180 to 230 nano meters; scanner is solar blind

2.0 Sensor Installation

Caution

Incorrect sensor installation may cause the sensor to generate a false flame signal. This can cause unburned fuel to collect in the combustion chamber, resulting in explosions, injuries, and property damage. Be certain that the flame sensor detects only the pilot and main flames, not glowing refractory or burner parts.

Sensor Wiring

Route sensor wiring a sufficient distance from ignition and other high voltage wiring to avoid electrical interference. To reduce interference, ground both braided shields as shown in Figure 1.

If sensor wiring is to extend beyond the supplied 122 cm (4 ft.) length, use #14 to #18 AWG wire suitable for 75°C (167°F) and 600 volt insulation, and run each pair of leads in its own shielded cable. Multiple shielded cables can be run in a common conduit, but only on short distances.

Figure 1 illustrates how the sensor should be wired to the Eclipse Multi-Flame. Near the end of each of the four sensor cable leads is a letter tag for identification. Referring to Figure 1, perform the following steps:

- Cut the cable mantle back to expose 229 mm (9") of wire.
- Expose wires from shielding braid without cutting the shielding.
- Connect shielding to terminal 10 on either J4 or J5 terminals.
- Connects the wires to the terminals as listed in Table 1.

Caution

Cable lead "B" should only be connected to power (120 VAC); connecting it to any other terminal will bypass the safe-start check of the scanner.

(Section 2.0 continues onto the next page)

Table 1–U.V. Scanner Wiring to Multi-Flame

5602-91 Scanner Lead	J4 Terminal		J5 Terminal		Expansion Board Terminals*
	Scanner #1	Scanner #1	Scanner #3	Scanner #4	
A	Neutral	Neutral	Neutral	Neutral	Neutral
B	120 VAC	120 VAC	120 VAC	120 VAC	120 VAC
C	3	9	3	9	U.V.
D	2	8	2	8	Ground
Shields	4	10	4	10	Shield

* Burners 5 and up each have the same terminal label.

2.0 Sensor Installation *(continued)*

Sensor Installation

Consult the burner manufacturer's instructions for mounting location.

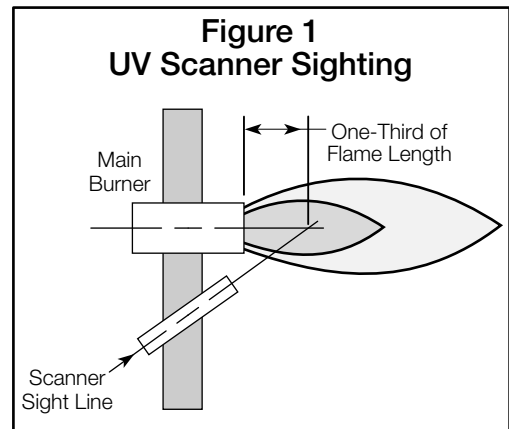
- Position the scanner within 762 mm (30 inches) of the flame.
- Scanner threads are 1" F.N.P.T.
- Ambient temperature limits are -18° to $+60^{\circ}\text{C}$ (0° to 140°F). For higher temperatures, the scanner includes a 1/8" N.P.T. purge tap on the housing.
- Maximum furnace pressure is 60 psig.
- To assist in sighting the scanner, a swivel mount (#5000-73/74) may be used.
- A small hole drilled in the scanner sighting pipe (not the scanner housing) will aid in keeping the sight tube clear.

Pilot & Main Sensors Installation

Aim the scanners at the third of the flame closest to the burner nozzle, especially with oil flames which typically have less U.V. radiation in the outer flame. The scanner should view the intersection of the pilot and main flames, as shown in Figure 1 at right. Note especially:

- Sight the scanner away from the ignition spark. Sighting the spark or its reflections from burner internals can cause nuisance shutdowns during burner ignition. If necessary, use a scanner orifice to reduce spark pickup.
- Perform a minimum pilot test when installing or adjusting any pilot or main burner system, as detailed in "Minimum Pilot Test" in Section 3.0.

Two scanners may be wired in parallel to detect flame in difficult burner scanning locations.



3.0 Test Procedures

Perform the following test for every new installation:

Flame Signal Strength

Insert the positive probe of a 0-15 VDC, 10k ohmmeter into the test point on the control cover. Connect the negative probe to ground. The chart at right shows the desired flame signal strength.

Signal Strength	U.V. Scanner
Good	5-11 VDC
Marginal	1.7-4 VDC
Inadequate	0-1.7 VDC

Minimum Pilot Test

Run this test to ensure that the sensor will not detect a pilot flame too small to reliably light the main flame.

- 1) Manually shut off the fuel supply to the burner, but not to the pilot.
- 2) Start the system normally. The control will hold the operating sequence at the pilot flame step.
- 3) Push in the Test/Reset button on the control cover to the "Test" position.
- 4) Measure signal strength as described in "Sensor Wiring" in Section 4.0.
- 5) Reduce pilot fuel until the flame relay drops out. Increase pilot fuel until the flame signal is slightly greater than 2 VDC, and flame relay just manages to pull in. This is the minimum pilot. If you don't think this flame will be able to safely light the main burner, sight the sensor further out on the pilot flame and repeat steps 2 through 5.
- 6) Push the Test/Reset Button again so that it pops out to the "run" position and begin the start-up sequence again.
- 7) When the sequence reaches the main flame trial for ignition, smoothly restore the fuel supply to the burner. If the main burner does not light within five seconds, immediately shut off the burner supply to shut down the system. Realign the sensor so that it requires a large pilot flame. Repeat steps 1 through 6 until the main burner lights off smoothly and reliably.

(Section 3.0 continues onto the next page)

3.0 Test Procedures *(continued from page 3)*

- Pilot Flame Failure Test**
- 1) Manually shut off the fuel supply to the pilot and main burner.
 - 2) Push in the Test/Reset button on the control cover to the “Test” position.
 - 3) Start the system normally. The controller should lock out; if it doesn’t, then the controller is detecting a false flame signal. Find the problem and correct it before resuming normal operation.
- Main Flame Failure Test**
- 1) Manually shut off the fuel supply to the main burner, but not to the pilot.
 - 2) Start the system normally.
 - 3) Push the Test/Reset Button so that it pops out to the “run” position. This should ignite the pilot and lock out. If the system does not lock out, the controller is detecting a false flame signal. Find the problem and correct it before resuming normal operation.
- Spark Sighting Test**
- 1) Manually shut off the fuel supply to the pilot and main burner.
 - 2) Start the system normally.
 - 3) Measure the flame signal as described in “Flame Signal Strength” in this section.
 - 4) If a flame signal greater than 2 VDC is measured for more than three seconds during the trial for ignition, then the sensor is picking up a signal from the spark plug; see “Sensor Wiring” in Section 2.0.
- Limit & Interlock Tests**
- Periodically check all interlock and limit switches by manually tripping them during burner operation to make sure they cause a system to lock out.

Warning

Never operate a system that is improperly adjusted or has faulty interlocks or limit switches. Always replace faulty equipment with new equipment before resuming operation. Operating a system with defective safety equipment can cause explosions, injuries, and property damage.

4.0 Maintenance

Caution

Turn off power before disconnecting or installing sensors or controls.

- Systems Checks** Periodically test the sensors as described in Section 3.0.
- Sensor Lens** Clean the glass lens regularly with a soft, damp cloth. Small amounts of dust will measurably reduce the flame signal strength.
- Rotation** Periodically swap spare sensors and control units with active ones.



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