Eclipse Combustion

Instruction Manual
No. 855, 5/00

Solid State UV/IR Scanner

Model 5600-92SC

About This Scanner

The model 5600-92SC (#21349) scanner features a highly reliable solid-state detector for monitoring gas or oil flames when used with Eclipse flame controls. The detector is sensitive to a broad range of flame radiation from ultraviolet to infrared making it ideally suited for use on combination gas-oil burners. The scanner responds to the flickering radiation of the flame and discriminates against constant background light. This device will not produce a flame signal if any internal components fail, therefore it can be used on burner systems that continuously operate longer than twenty-four hours. It is protected against reverse connection and comes with a shielded cable lead. The scanner is UL listed, CSA certified and FM approved. This scanner operates with Veri-Flame controllers with model numbers VF560xx7xx.

APPROVED

1.0 Specifications

Supply Voltage ..... 12 Vdc nominal
Supply Current ..... 15mA typical, 20mA maximum
Supply Wiring ..... 6 ft. (183 cm) 2 conductor #18 AWG shielded cable. Shield is connected to housing.
Temperature Range ... 0°F to 176°F (-20°C to +80°C)
Materials ..... Housing: Aluminum. Lens Support: Nylon.
Shipping Weight ..... 7 oz (175 grams)
Options ..... Magnifying lens assembly (Part # 49600-98), Insulated coupling (Part # 49099)
Heat Block Seal 23HBS (Part # 400011)

2.0 Sensor Installation

Warning 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/or main flame of the intended burner by testing the control system under varying operating conditions and firing rates. Follow the test procedures given in this manual and the equipment provider's instructions after installation and at regularly scheduled maintenance intervals.

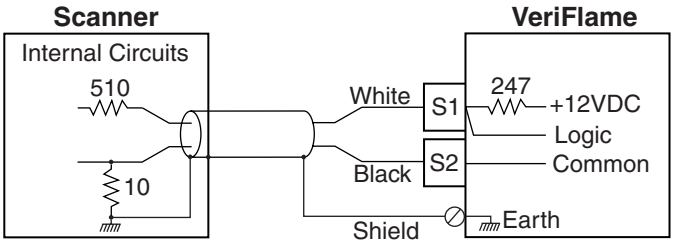
Sensor Wiring

Route sensor wiring a sufficient distance from ignition and other high voltage wiring to avoid electrical interference. Some areas may have high levels of electromagnetic fields or ground currents that require the use of special cables, isolation and grounding methods. Figure 1 illustrates the sensor wired to an Eclipse Veri-Flame. The white wire supplies power and carries the flame signal (S1), the black wire connects to circuit common (S2), and the shield is connected to the housing. Internal scanner circuits create low impedance (10 ohm) from the shield to the black wire circuit common.

The scanner's wiring end has a 1/2" female thread for connecting flexible seal-tight metal conduit. If sensor wiring is to extend beyond the supplied 183 cm (6 ft.) length, use conductors sized from #14 to #18 AWG and rated for 75°C (167°F) and 300 volt insulation or better.

Wiring runs less than 20 ft. (6 m) and have at least one foot of separation from ignition and other high voltage conductors may use unshielded wiring if each scanner has its own dedicated conduit. For wiring runs from 20 ft. (6 m) up to 85 ft. (25 m) use two-conductor shielded cable (Belden #8760). Multiple shielded cables can be run in a common conduit. Use isolated shielded pairs to avoid the possibility of interference (cross-talk) between wiring of multiple scanners. For longer wiring runs, use a pair of RG62A/U coax cables (Eclipse #21741) per scanner. Success of longer wiring runs is dependent upon site conditions, therefore the equipment layout should be redesigned to allow the control to be mounted closer to the burner. In some installations the shield may need to be disconnected from earth ground (floated).

Figure 1



Sensor Installation

In most cases, the location for this scanner will be pre-determined by the burner manufacturer. However proper application of this scanner requires knowledge of the burner, the combustion chamber, and the process. This scanner may not detect burners that have a very stable and constant intensity flame. Opposing burners, flame swirl patterns, outdoor installations, and substance in the line-of-sight may require special mounting techniques.

- Consult the burner manufacturer's instructions for mounting location. The scanner should view the intersection of the pilot and main flames.
- Position the scanner within 18 inches (457 mm) of the flame. Longer distances could limit the field of view and may reduce the turndown or firing range of the burner.
- Mount the scanner to a 1/2" N.P.T. pipe nipple to the burner. Insure that the scanner body does not exceed +80°C (176°F) from conducted, radiated, or ambient temperature. To protect from high temperatures, use the 1/2" F.N.P.T. insulated coupling (#49099) with a heat block seal (#400011) and source of clean purging air (5 CFM typical), or a purge assembly constructed with a 1/2" WYE fitting.
- Keep the scanner lens and line-of-sight free of contamination. Be aware that scanners looking up are susceptible to dirt and dust settling. Soot, steam, and unburned hydrocarbons may reduce or even mask the radiation from the flame. A purging assembly as described above may alleviate these problems.
- Some burners have an open construction allowing the scanner to view into a furnace. Avoid sighting background sources of light that vary in intensity due to hot swirling gases, vibration, or moving product. Mask the background by use of an orifice, the magnifying lens assembly (#49600-98), or a combination of both to reduce the field of view.

3.0 Test Procedures

Perform the following tests for every new installation and at periodic maintenance intervals. Depending on the burner equipment (such as pilot versus direct spark), some of the tests may not be possible.

Measuring Flame Signal Strength

Insert the positive probe of a 0-15 VDC (100k ohm minimum input impedance) into the test point on the Veri-Flame control cover. Connect the negative probe to ground or S2 of the Veri-Flame. Readings greater than 2 VDC are adequate.

Minimum Pilot Test

Run this test on pilot ignited burners 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) Push the Test/Reset button on the Veri-Flame cover to the "Test" position ("button in").
3) Start the system normally. The control will hold the operating sequence at the pilot flame step.

4) Measure the flame signal strength as described above.
5) Slowly reduce the pilot fuel until the Veri-Flame drops out. Increase the pilot fuel slightly and restart the system. Observe the flame signal and adjust the pilot fuel as required to prevent flame failure. This is the minimum pilot.
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 main burner. If the main burner does not light within five seconds, immediately shut off the burner fuel supply, stop the control, and purge the system. Attempt to light the burner again before proceeding with adjustments.
8) For burners with an adjustable scanner sighting assembly, adjust the sighting assembly further away from the nozzle of the pilot flame thus requiring a larger minimum pilot for adequate signal strength. For burners with fixed sighting, increase the pilot flame. Repeat steps 1 through 8 until the main burner lights off smoothly and reliably.

Ignition Interference Test

Test the effect of the ignition system (transformer, spark plug, wiring and grounding) on the flame signal and control. Ignition interference can decrease or increase the flame signal strength or can cause erratic operation of the control. The scanner placement on some burners allows direct sighting of the spark, creating a strong but false flame signal. The Veri-Flame sequence does not interrupt the spark upon flame detection until after the trial for ignition period. Therefore spark detection is not a problem, however ignition interference should still be reduced or eliminated where possible.

1) Manually shut off the fuel supply to the burner.
2) Start the system normally. Observe the flame signal during ignition to see if it responds during the spark. Readings above 2VDC indicate spark interference or spark sighting.
3) On pilot ignited burners, manually shut off the fuel supply to the main burner. For direct spark burners, lock the burner firing-rate at the start position.
4) Push the Test/Reset button on the Veri-Flame cover to the “Test” position (“button in”).
5) Start the system normally. Observe the flame signal during spark and after the trial for ignition. Spark interference causes the signal during the spark to differ more than 2VDC from the signal after the spark.
6) If spark interference is observed, try to minimize its affect:
   a) insure proper grounding for the ignition circuit
   b) isolate the scanner from ground and/or remove the shield connection from ground
   c) check for proper spark gap
   d) clean, repair, or replace faulty wiring and connectors
   e) separate or shield the scanner wiring from the ignition wiring
   f) reverse the wires feeding the primary to the ignition transformer
   g) move the location of the ignition transformer

Pilot Flame Failure Test

1) Push the Test/Reset button on the Veri-Flame cover to the “Test” position (“button in”).
2) Start the system normally.
3) After the pilot has lit, manually turn of the fuel supply. The controller should lock out on flame failure. If not, then the controller is detecting a false flame signal. Find the problem and correct it before resuming normal operation.

Main Flame Failure Test

1) Push the Test/Reset Button so that it returns to the “run” position (“button out”).
2) Start the system normally.
3) After the sequence lights the main flame, manually shut off the fuel supply. If the control does not shut down in less than 4 seconds after visually observing that the flame extinguished, it may be detecting a false flame signal. Find the problem and correct it before resuming normal operation.

Background Radiation Saturation Test

1) Start the system normally.
2) Observe the flame signal as the system comes up to temperature. Any degradation of the flame signal may be due to the background radiation masking the flickering content of the flame. Mask the background with a reducing orifice, lengthening the sighting pipe, or realigning the sensor.

Process Conditions Test

1) Start the system normally.
2) Observe the flame signal as the system operates at various firing rates under process (at temperature) conditions.
3) Perform the Main Flame Failure Test under these conditions and verify that the control shuts down in less than 4 seconds after visually observing that the flame extinguished.

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 or bypassed safety equipment can cause explosions, injuries, and property damage.

4.0 Maintenance

Caution Turn off power before disconnecting or installing sensors or controls.

All burner systems must be maintained to insure their safe operation. The operator of this equipment must be trained in safe operating procedures. The owner and operator must set a regularly scheduled maintenance interval based on recommendations from the equipment manufacturers, environmental conditions, and their own operational history.

System Checks

Periodically test the sensors as described in Section 3.0.

Sensor Lens

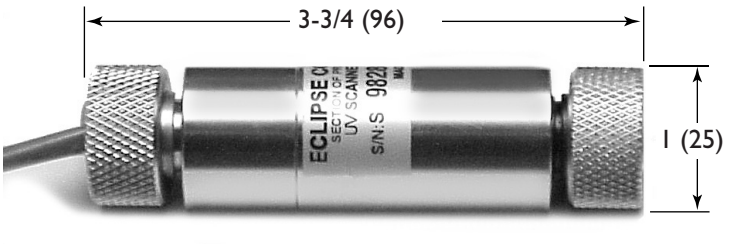
Clean the glass lens regularly with a soft, damp cloth. The presence of foreign material will measurably reduce the flame signal strength.

Rotation

To insure operability of stored items and to reduce the possibility of extended down-time, periodically swap spare sensors and control units with active ones.

5.0 Dimensions

Units in inches, (mm)



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