

SMOKE OPACITY INDICATOR/CONTROL



27PH7 Controller/Indicator



55AF2 Recorder



44DU2 Light Source



47EM4 Receiver

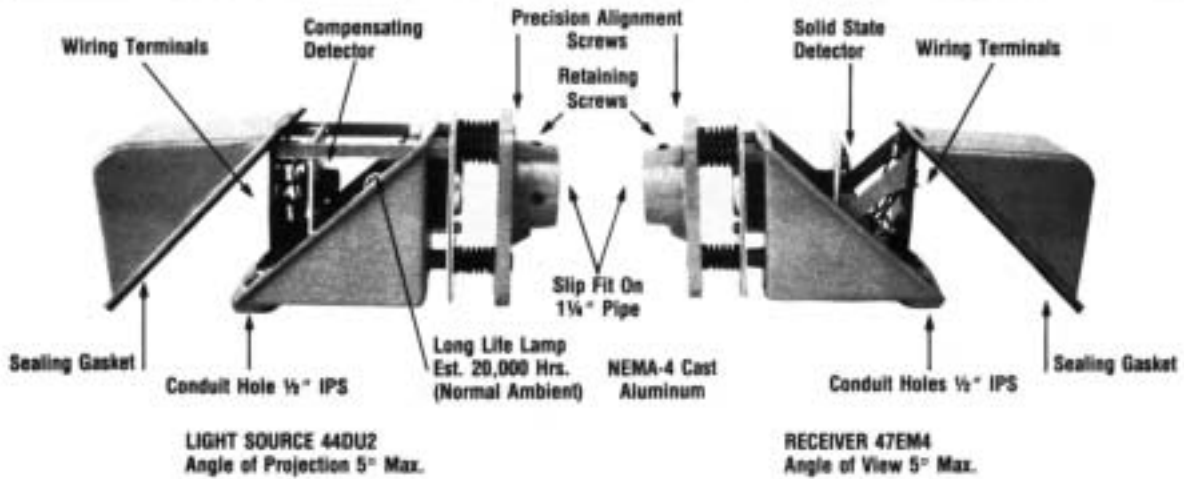
DESCRIPTION

FIREYE® FE-5 electronic opacity monitoring controls are designed to Detect-Indicate-Alarm-Record-Control emissions from chimneys, flues and ducts associated with oil or coal fired furnaces or boilers, incinerators, industrial process equipment, turbines, diesels, etc. FE-5 system accurately detects the opacity of the monitored area by photoelectrically measuring the obscuring particulates between the light source and receiver. The control/indicator displays a 0-100% opacity meter and additionally an *excess* and *alarm* signal light.

The control system includes a miniature strip chart recorder which provides a continuous record of the time and measured opacity. Output circuits permit the addition of remote audible or visual alarms and the energizing of smoke eliminating equipment when desired. The FE-5 is designed for simple installation with stable and trouble-free operation through the use of solid state electronics, including automatic compensation for lamp deterioration and supply voltage variation.

SPECIFICATIONS

Line Supply:	120 VAC (min. 102, max. 132) 50/60 Hz. (27PH7-1000/1001) 230 VAC (min. 196, max. 253) 50/60 Hz. (27PH7-1002*)
Alarm Time Delay:	Adjustable 0 to 60 seconds
Voltage Regulation:	Internal electronic 230VAC (min. 196, max. 253), 50/60 Hz.
Power Consumption:	20 VA
Load Contacts 1-NO, 1- NC:	10 amps non-inductive
Humidity:	90% RH max. noncondensing
Ambient Temperature Limits	
Control and Recorder:	32° F min., 125° F max.
Light Source and Receiver:	-20° F min., 150° F max.
Distance between Light Source and Receiver:	2 ft min., 18 ft max.
Wiring Distance Between Control and Light Source:	#14 wire — 100 ft max. #12 wire — 200 ft max. #10 wire — 300 ft max.
Spectral Response:	80% within - 400 — 700nm
Operational Error:	∂ 5% max. of full scale
Zero Drift:	± 3% of span max.
Span Drift:	5% of span max.
Linearity:	± 3% of span max.
Meter and Recorder Response Time:	1 second max.
Alarm Set Point:	0-100% opacity (differential less than 2%)
Shipping Weight (complete system):	24 lbs.
Approvals:	Canadian Standards Association, File LR. 26603 City of Los Angeles, Dept. of Building and Safety *Approvals do not apply to 230VAC operation



INSTALLATION — LIGHT SOURCE AND RECEIVER

Light Source Type 44DU2 and Receiver Type 47EM4 are installed on opposite sides of the area to be monitored. They slip fit on 1 1/4" pipe and are secured with set screws. The locations chosen to monitor must reveal the true smoke pattern, be accessible for maintenance and within the ambient temperature limits of the light source and receiver.

The light source and receiver should be mounted on a length of pipe which extends completely through the area to be monitored (Figure 1). The cutout area of the pipe must provide full flow through the opening. The light source and receiver are designed for negative pressure ducts. Sealing flanges #60-280 are available as accessories to seal off positive pressures up to 1 PSI (Figure 2).

Should instrument air be required for cooling or maintaining clean lenses, it should be installed as shown in figure 2. When installed out of doors, rain shields are required over the light source and receiver.

FIGURE 1.

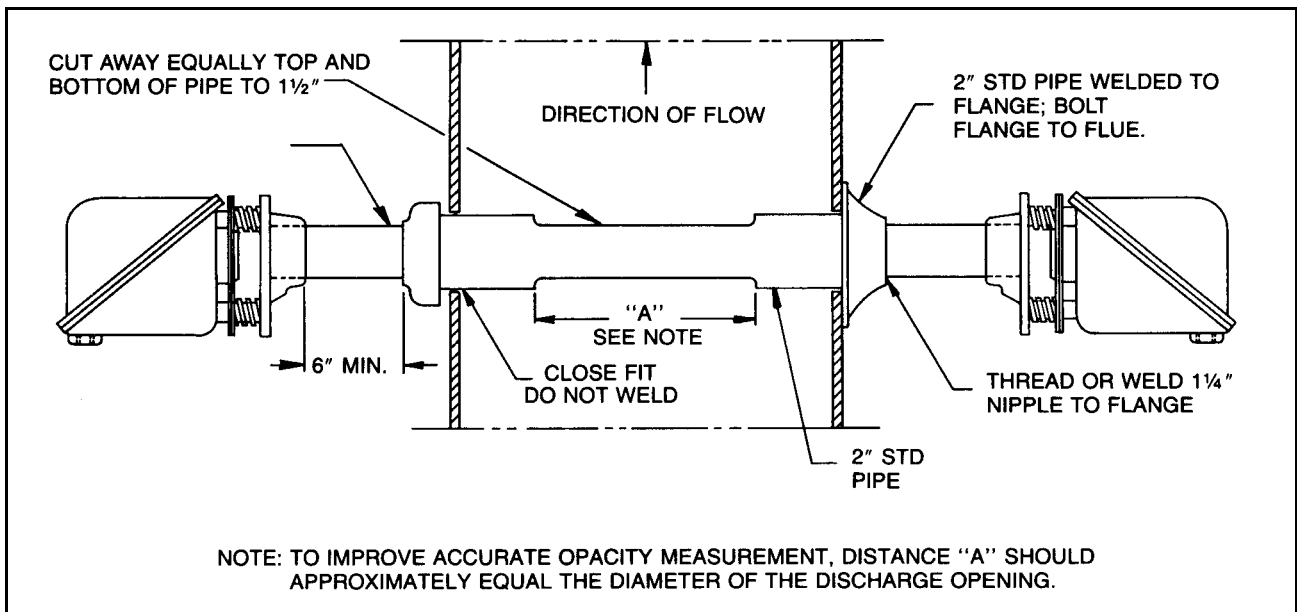
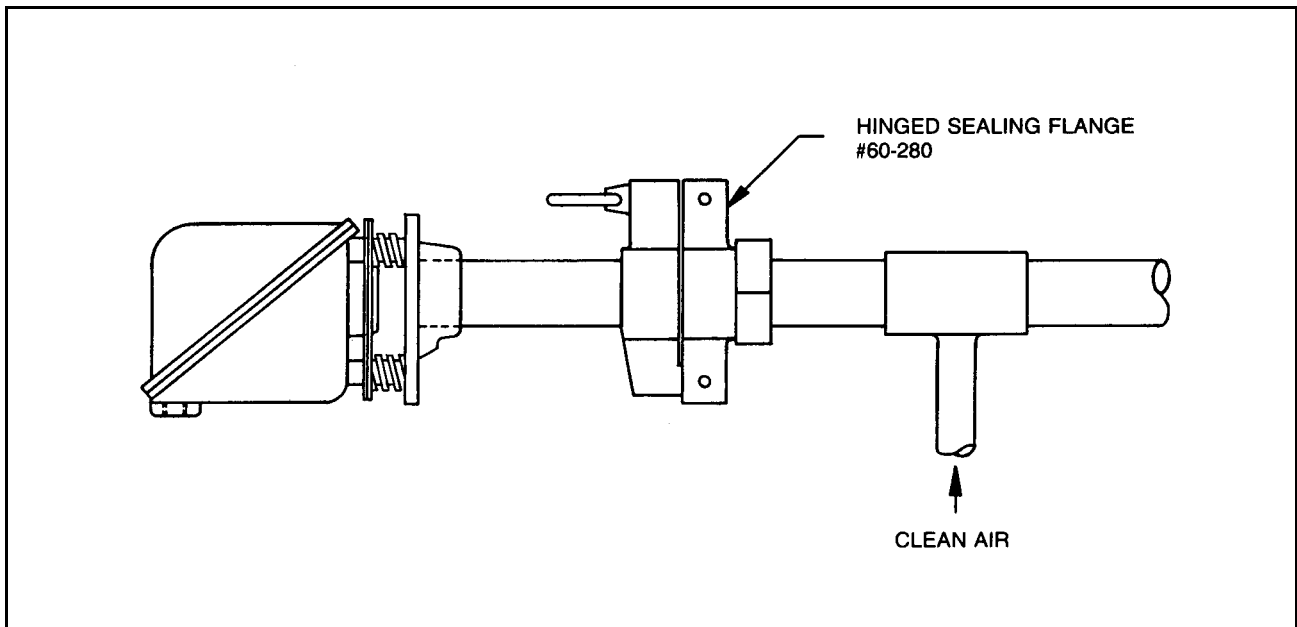


FIGURE 2.

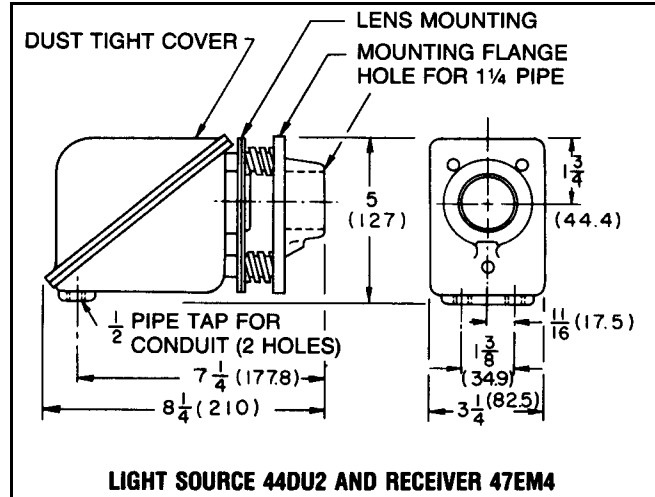


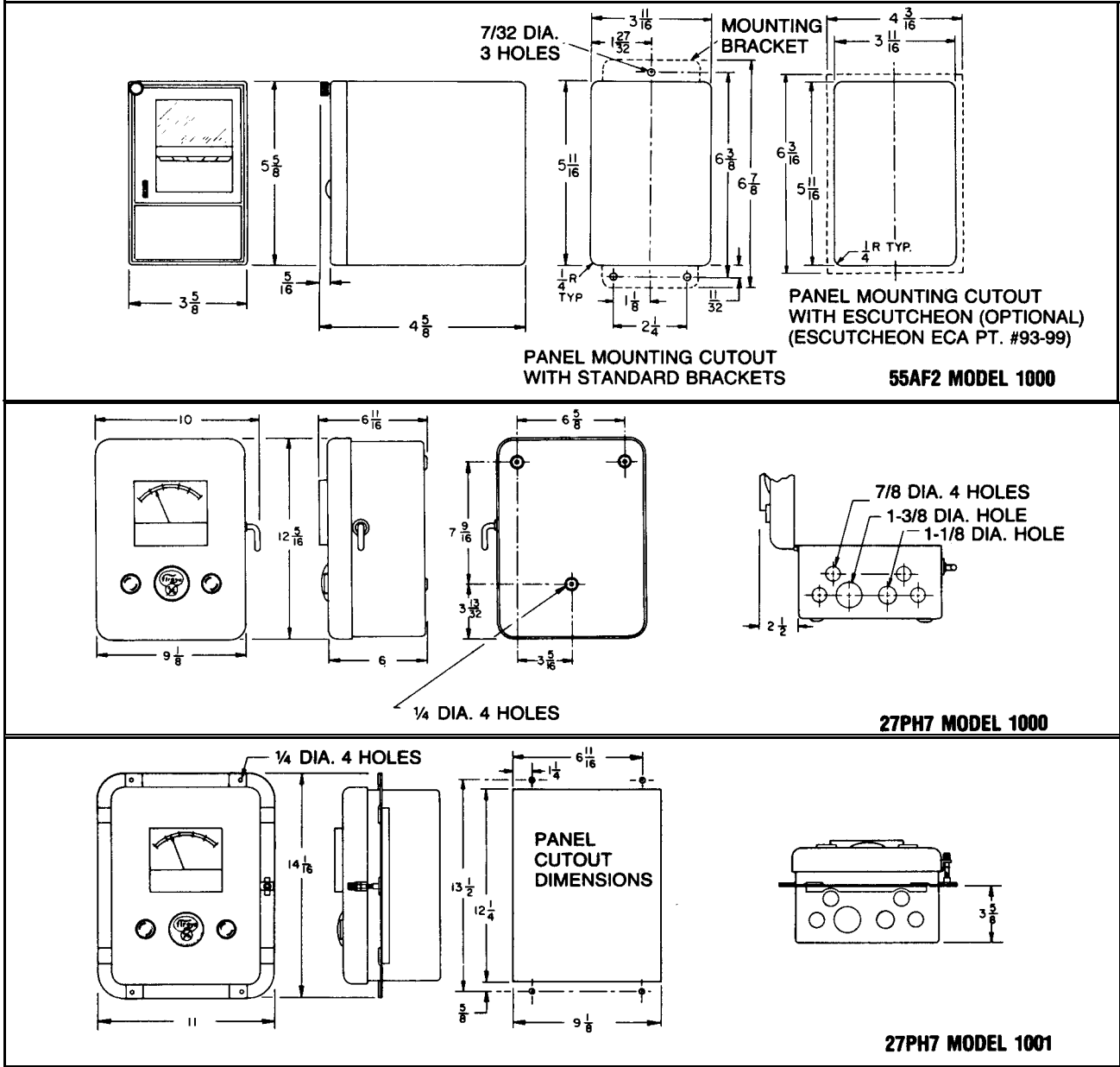
INSTALLATION

Control 27PH7 Model 1000 is designed for surface mounting, (Model 1001 is for flush mounting), at any distance within 100 feet of the light source when #14 wire is used. Choose a location that is within the ambient limits and free from excessive vibration. Conduit openings are located in the bottom. Any unused opening must be capped.

Reorder Type 55AF2 Model 1000 (60 Hz.), Model 1001 (50 Hz.) is designed for surface mounting, and when equipped with a #93-99 escutcheon it may be flush mounted. The recorder can be installed at any convenient location. See the pamphlet packed with the recorder for detailed instructions.

An alternate type of recorder may be used. The signal input specifications are 0 to 10 volt DC, linear, 10,000 ohm/volt or greater.





WIRING

All wiring must be NEC Class 1, installed in ridge or flexible conduit. Use wire with insulation suitable for the existing maximum ambient temperature. If the wiring distance between the control and light source is 100 feet max. — use #14 wire, 200 feet max. — use #12 wire, 300 feet max — use #10 wire. 44DU2 Light Source and 47EM4 Receiver wiring may be run together but **must** be in **separate conduit** from **other power wiring**.

For the wiring between 27PH7 terminals 6 and 7 and recorder pins 1 and 2, use 2 conductor #22 stranded spiral shielded jacketed audio cable.

The switches connected to Terminals 1, 2, 3 and 4, transfer following the preset time delay after excess opacity is detected. Manual reset of the 27PH7 control is required to reset the switches.

The NO switch between Terminals 1 and 2 may be used to energize:

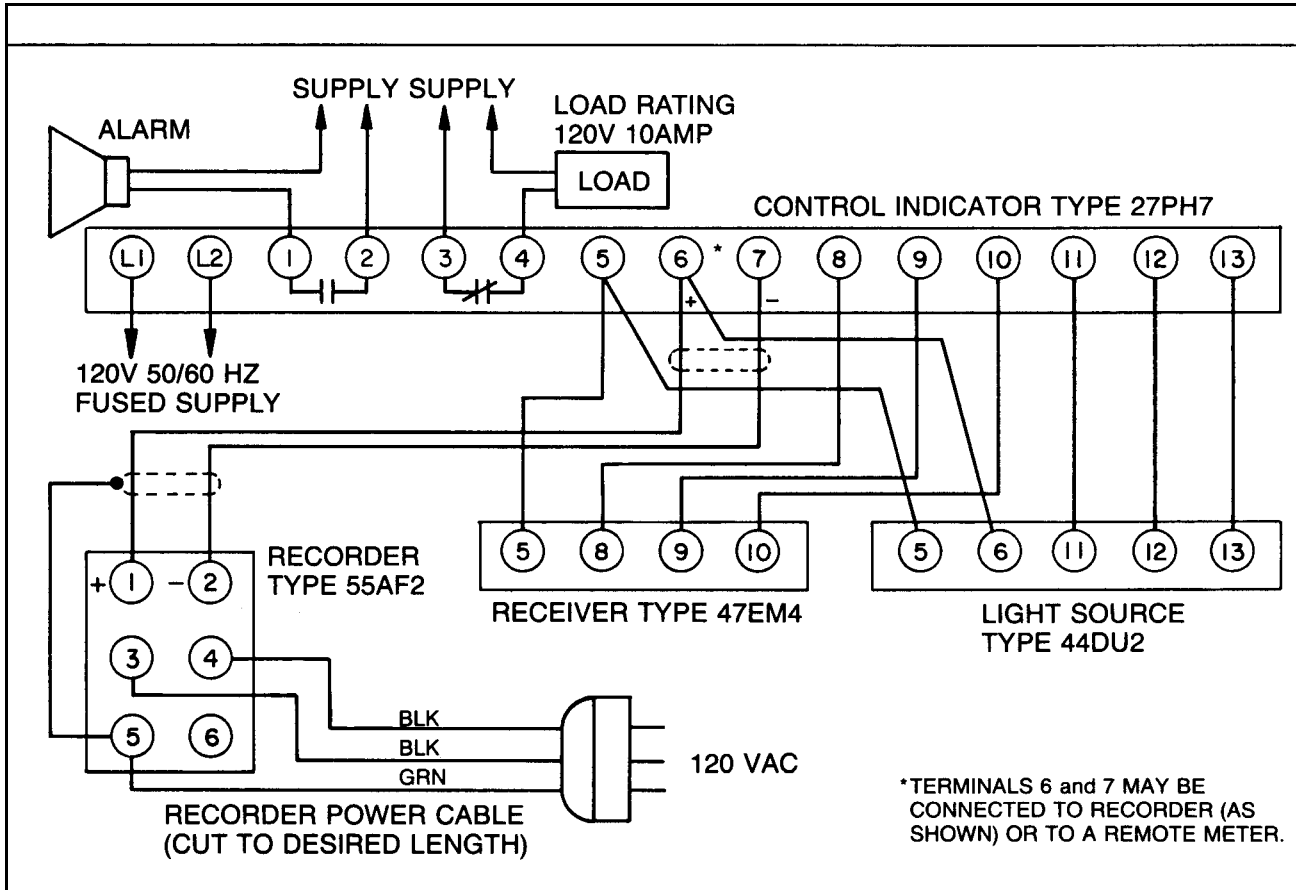
1. Remote alarm horn or light.
2. Smoke eliminating blowers or after burners.

The NC switch between Terminals 3 and 4 may be used for:

1. Shutting off the burner.

To assemble the 55AF2 wiring plug, remove the connector assembly from the plastic housing. Cut wires to the desired length and feed them in through the wiring clamp. Solder each wire neatly to its correct terminal. Insert the connector assembly into the plastic housing and drive the retaining pin into place through the hole in the plastic housing.

Assistance with the design of special applications may be obtained from any Fireeye sales office.





ALIGNMENT

The light source should be first aligned approximately, by removing the receiver unit from the mounting pipe and observe the light spot at the end of the pipe. A piece of paper held 1 to 2 feet away from the end of the pipe will make the light spot visible. Using the #10 Allen wrench provided, adjust the alignment until the light spot is exactly centered in the pipe.

Mount the receiver on the pipe and tighten its mounting screws firmly. Connect a DC voltmeter (10,000 ohms/volt or greater) set on a 15 volt DC scale to terminals 8 (+) and 5 (-) of the receiver.

Adjust the alignment on the receiver to obtain the maximum meter reading. It should peak at about 12 volts DC.

When the light beam is properly aligned, any further movement of the alignment of the light source or receiver will cause the meter reading to decrease.

P/N 129-86, Light Apertures for FE-5 Smoke Indicator System. Install Aperture in front of Housing before mounting on the support pipe.

Select Aperture according to smoke path length.

2-5 ft. 1/4" Aperture

5-9 ft. 3/8" Aperture

9-16 ft. 5/8" Aperture

The correct Aperture is required to permit accurate setting of an alarm point and to obtain correct linearity.

CALIBRATION

Be certain that the light path between the light source and receiver is free of smoke.

Set the "Course 0 Set" and the "Vernier 0" adjustment to exactly 0 on the meter. Then press the "100% test" button and adjust the 100 percent opacity on the meter. Release the test switch and check for 0 percent meter reading again. In order to adjust the alarm point, turn the "alarm point test" point until the meter indicates the desired alarm. Then slowly turn the "alarm set" point until the excess smoke light comes on. Be sure to return the "alarm point test" fully counterclockwise after the adjustment. The "Alarm Delay" is adjusted by turning the index mark to the desired time delay. When the indicated smoke exceeds the alarm point for the length of the time delay, the alarm light will be energized and latched. To reset; reduce smoke level below alarm set point and press reset to cancel alarm.

LAMP REPLACEMENT

Before removing the lamp, it will be necessary to loosen the lamp retaining clamp. After installing the new lamp, retighten this clamp and readjust the two alignment screws to obtain the lowest possible setting.

SERVICING

General

Prior to trouble shooting the FE-5 System, make sure that the installation and wiring have been made in accordance with this bulletin.

Troubles can be isolated by following the approved procedure in the sequence given below:

CONDITION — No power to terminals 1 & 2.

1. Power supply shut off.
2. Blown fuse or circuit breaker.
3. Incorrect wiring.

CONDITION — Equipment energized indicating 100% smoke with clear stack.

1. Light bulb burned out.
2. Incorrect wiring or loose connection.
3. Incorrect alignment of Light Source and Receiver.

CONDITION — Meter does not read “0” with clear stack.

1. Light source and receiver not in alignment.
2. Contamination of light source, receiver or pressure seal windows.
3. System out of alignment.
4. Distance between light source and receiver beyond 20 ft. maximum.
5. Light source lamp deteriorated.

CONDITION — Meter drifts of f ”0” with clear stack.

1. Alignment varying.
2. Soiling of lens or windows.

CONDITION — Excess smoke indicated, but alarm not sounding.

1. Condition corrected within time delay period.
2. Defective alarm relay. Replace relay.

CONDITION — When 100% test push-button is depressed, meter reads less than 100%.

1. Light Source and Receiver wired in conduit with other power wiring. See “wiring” page 5.

Note: If service is required for 55AF2 Recorder, contact Fireeye.

TROUBLESHOOTING THE FE-5 SYSTEM

27PH7 Control/Indicator

1. Disconnect Light Source and Receiver.
2. Check for power input of 102-132V (196-235V) on terminals L1 and L2.
3. Measure terminals 10 to 5, should get 15 VDC regulated.
4. Measure terminals 6 to 5, should get 10-12 VDC regulated.
5. Short 8 -5, meter should go to full scale and excess smoke light should come on. Smoke alarm light should light and relay should pull in following a delay determined by the setting of the time delay knob.
6. Remove short 8 -5, meter should return to a lower reading.
7. Push alarm reset, relay and smoke alarm light should go out. They might become energized again following the release of the reset button.

47EM4 Receiver

1. Wire receiver into 27PH7.
2. Adjust the “100 Percent Adjust” so that the 27PH7 meter indicates between 90 and 100 percent.
3. Shine flashlight or some other columnated light beam into the receiver.
4. Pass the beam through the detector area several times. When the beam strikes the detector, the meter should move down scale. Failure of the meter to respond to light on the detector indicates a problem in the receiver or wiring.
5. The wiring between the 27PH7 and receiver can be checked out by measuring between 10 and 5 and reading 15 VDC and by jumping 8 to 5 and obtaining full scale of deflection of the meter.

44DU2 Light Source

1. Wire the Light Source into the 27PH7.
2. Measure 6 to 5, should get 10 to 12 VDC.
3. Short 6 to 13 and lamp should go out. If lamp does not go out, problem is in 27PH7.
4. A check of the lamp voltage regulation circuit can be made by momentarily blocking the light to the feedback detector on the P.C. board. The lamp should brighten when the object is in place, and should dim when the object is removed.
5. Caution should be exercised in performing this test. If the lamp is allowed to remain bright for a minute or more, it may burn out. If the lamp does not brighten when the object is in place, then the Light Source is defective provided the lamp went out in Step 3.

Note: Lamp voltage is not accurately measured with normally available multimeters since the waveform is one quarter of an AC cycle.

MAINTENANCE

Fireye FE-5 opacity monitor/control system is designed to provide long trouble-free service. A routine maintenance schedule is recommended to assure clean lens of the light source, receiver and pressure sealing flanges. The frequency of lens cleaning should be determined for each installation and will depend on the existing ambient conditions.

The lamp in the light source 44DU2 should be scheduled for annual replacement. The calibration of the system should be rechecked following lamp replacement. The excess and alarm lights are LED, the detector is a silicone semiconductor and requires no replacement. It is unlikely that the alarm relay will ever require replacement. The covers of the control, light source and receiver should be kept closed and latched during normal operation.

ORDERING DETAILS

- 27PH7-1000Control/Indicator for Surface Mounting (120 VAC)
- 27PH7-1001Control/Indicator for Flush Mounting (120 VAC)
- 27PH7-1002Control/Indicator for Surface Mounting (230 VAC)
- 27PH7-1003Control/Indicator for Flush Mounting (230 VAC)
- 44DU2-1000 Light Source
- 47EM4-1000 Receiver
- 55AF2-1000Strip Chart Recorder

ACCESSORIES

- 93-99 Adapter for flush mounting the 55AF@ recorder
- 60-280 Sight pipe sealing flange (2 required)
- 104-7 3" Bell
- 104-15 Vibratory horn — weatherproof
- 61-4038 20% opacity test grid
- 27-431 Replacement light source lamp
- 8-485 Replacement alarm relay
- 43-125 55AF2 Recorder Paper — (single roll)





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 installation or 18 months from date of manufacture* 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 that may arise in connection with such product or part.



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