



HC-08740A

Opacity Monitoring System

Installation and Operation

MANUAL

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WARNING!

Do not operate or service this equipment before reading the operator's manual. Failure to do so could result in serious injury. Alterations to hardware, wiring, or software must be approved in writing by Preferred Utilities Manufacturing Corp.

Symbols Used in This Manual

The following symbols may be used in this manual to denote certain conditions:



Danger symbol indicates an immanently hazardous situation, which, if not avoided, **will result in death or serious injury.**



Warning symbol indicates a potentially hazardous situation, which, if not avoided, **could result in death or serious injury.**



Caution symbol indicates a potentially hazardous situation, which, if not avoided, **could result in minor or moderate injury.**



Caution symbol without the safety alert symbol indicates a potentially hazardous situation, which, if not avoided, **may result in property damage.**

Hardware covered in this manual:

All HC-8740A models
P/N: HC-31077 Main Opacity Control Board
P/N: HC-31180 Opacity Light Source
P/N: HC-31181 Opacity Light Receiver
P/N: HC-31726 Purge Air Kit
P/N: HC-27367 Sight Glass Assembly

Current Software Version: v1.23

Note: All rights and privileges to the design of this product including the circuit layout and software are the exclusive property of Preferred Utilities Manufacturing Corp. No part of which can be sold, used, or modified without the expressed written permission of Preferred Utilities Manufacturing Corp.



Safety Warnings

Failure to comply in full with the following safety requirements can result in equipment damage and personal injury/death.

1. Read the entire manual to become familiar with the use and operation of this device.
2. Only qualified personnel should attempt to install, wire, commission, startup, service or operate this device.
3. This device is not suitable for use in an explosive ambient atmosphere.
4. Before working on this device, be sure that you understand the processes affected by this device completely.
5. Before working on this device, be sure that any process affected by this device is secure and safe for servicing.
6. Take appropriate precautions to avoid electric shock when working with this device near water.
7. Exercise caution while wiring or working on this device. Multiple voltage sources may be present: take appropriate precautions to avoid electric shock.
8. RFI (radio frequency interference) can affect adversely the operation of this device and devices that are connected together as a system. Do not use radios near this equipment: examples include, but are not limited to; citizen band radios (CB), walkie-talkies, transceivers, and amateur radios (HAM).



Wiring Tips

1. Wire with extreme caution!
2. All wiring must conform to the National Electrical Code and to local code regulations. Verify all electrical ratings on equipment.
3. Connecting high voltage to the low voltage circuits will damage the circuitry!
4. Mount the unit in such a manner that the wiring cable from the main electronics does not touch or approach any high magnetic source. If mounted near a high magnetic source (such as motor starters, 3 ohm transformers, ignitors, etc.), electronic interference may cause the display to read incorrectly.

A. DESCRIPTION OF OPERATION

The Hays Cleveland Model HC-08740A Universal Opacity Monitor provides reliable, continuous measurement of the density of confined particulates such as dust or smoke. It is easy to calibrate and requires no routine maintenance other than occasionally cleaning the sight glass.

The basic system consists of an electronics unit and two breeching components, consisting of a light source that directs a beam through the measured particulate, and a light sensor that receives the beam, detects changes in opacity, and sends a proportional signal to the electronics unit. The wide-beam light source and narrow-view receiver make installation easy because alignment of the breeching units does not need to be precise. The electronics produces a digital readout of percent opacity and a 4-20 mA DC output signal suitable for recording, display, or indication. SPDT contacts are provided for a remote alarm (which can be purchased separately: Preferred Utilities Model: SDA-VB). The operator can select manual or automatic alarm reset. Modbus communications for interface with a SCADA system (Supervisory Control and Data Acquisition system) or other controls is standard. A standard serial printer port is provided. The electronics unit is available in open-mount, surface-mount, and flush-mount formats. It can be installed in any dry, convenient area within 250 feet of the light source and receiver units. The standard model has a vacuum fluorescent display with three status LED's. There are four LED indicators on units equipped with auxiliary functions.

The **Burner Cutoff Auxiliary Function** is a delayed-off timer that shuts the burner down if an alarm condition (opacity exceeding 20%) persists for 120 seconds. The timer can be reset manually only after reduction of opacity: it cannot be reset when opacity is above 20%. (This feature meets the requirements of the New York City air pollution control code for alarm and burner control functions). Model A-08740 Opacity Monitors equipped with the burner cutoff function have four LED indicators on the front of the electronics panel, marked Clear, Smoke, Alarm, and Burner Off. In addition, an audible alarm with adjustable trip point and delay is mounted on the front face of the electronics unit.

The **Overfire Air Timer Auxiliary Function** is a delayed-off timer that provides relay contacts for the control of smoke-reduction air in coal-fired installations. As soon as opacity exceeds the alarm trip point, the relay is energized. It remains energized as long as the alarm condition persists. After the alarm condition is corrected, the relay remains energized for an adjustable period up to five minutes. Model A-08740 Opacity Monitors equipped with the overfire air timer function have four LED indicators on the front of the electronics panel, marked Clear, Smoke, Alarm, and Overfire Air.

Please Note:

- The Hays Cleveland Model HC-08740A Universal Opacity Monitor as shipped includes the electronics unit, light source, receiver, and two sight glass assemblies that must be mounted in the duct.
- The traverse and mounting pipe, plus any required purge connections and/or air supplies, are to be provided by the installing contractor.

P/N HC-31726 Purge Air Blower Kit for positive pressure flue gas pressure:

Purge air is recommended if the flue duct is held at positive pressure. Sight glass lenses on the ends of the traverse pipe will become cloudy when the flue gas pressure is greater than the ambient air pressure, because water from the flue gas condenses on the lenses. This results in false opacity alarms. The lenses can be purged with instrument air (not plant air) if sufficient volume is available, but usually it is not. The solution is a blower to provide ambient air at low pressure (not compressed) that will not condense water on the lenses. A single blower, wired to run whenever the burner is running, can be connected to fittings near the lenses. P/N HC-31726 Purge Air Blower Kit operates with 120/230 V ac, and includes a blower with air inlet filter, four fittings, and two 6-ft lengths of 1-inch liquid-tight flexible conduit used for tubing connections to the traverse pipe near both the light source and receiver lens.



B. ORDERING INFORMATION

HC - 08740A – A – B

A. Auxiliary Modules for Specific Applications:

- A=0 None
- A=1 Burner Cutoff Timer with audible alarm & “Burner Status” LED on panel face.
- A=2 Overfire Air Timer with “Overfire Air” LED for stoker applications.

B. Mounting/Enclosure Options

- B=0 Open-mount package for OEM applications
- B=1 Cabinet: surface-mount on wall (NEMA 1)
- B=2 Cabinet: semi-flush mount on panel (NEMA 1)

Accessories and Spare Parts:

HC-31180	Opacity Light Source*
HC-31181	Opacity Light Receiver*
HC-27367	Sight Glass Assembly*
HC-31726	Purge Air Kit
HC-31077	Replacement Main Opacity Control Board
HC-31040	Replacement Display Unit
SDA-VB	Remote Audible/Visual Alarm

*Included with main Opacity kit

C. SPECIFICATIONS

Power Requirements: 120Vac +/- 10%, 50/60 Hz

Ambient Temperature Ranges: 32-130F (0-54C) for electronics unit. 32-160F (0-70C) for light source and receiver units.

Fuse: 1, @ 1 Amp

Measurement Range: 0-100% Opacity

Retransmit Output Range: 4-20mA dc, 750 Ohms maximum load. Directly proportional to measurement range, where 4mA = 0% and 20mA = 100%. Output is grounded (not isolated).

Resolution: Digital meter reads 0-100% opacity with 1% resolution.

Response Time: 1 second for 90% of actual change in opacity.

Accuracy: +/- 5% opacity under all specified conditions.

Light Source to Receiver Distance: minimum 4ft (1.20m) to maximum 15ft (4.57m).

Light Source Lamp Life: 1 year minimum.

Spectral Response of Photocell: 350 – 1100 nm.

Cable Length: 250ft (76m) maximum.

Indicators:

Green: "Clear" LED.

Yellow: "Smoke" LED and flashing display.

Red: "Alarm" LED and flashing display.

Alarm Timer: adjustable 0-300 second delay.

Alarm Trip Point: adjustable 0-99% opacity.

Alarm Reset: automatic; field convertible to manual.

Alarm Contacts: Isolated SPDT, 10 Amp, 120 V ac resistive, fail safe.

Purge Delay Timer: adjustable 1-600 second delay

NYC Burner Cutoff (optional): fixed 20% trip point and fixed 2-minute (120-second) delay

NYC Burner Cutoff contacts: isolated SPDT, 10 Amp, 120 V ac resistive, fail safe.

Overfire air timer (optional): maintains contact closure after smoke abatement for a period adjustable from 1-300 seconds.

Overfire air contacts: isolated SPDT, 10 amp, 120 V ac resistive, fail safe.

Housing for enclosed models: NEMA 1.

Relative Humidity: 0-90%, non-condensing.

Modbus Communication: RTU. 9600 or 19200 Baud rate. N/8/1 (no parity, 8 data bits, 1 stop bit).

Printer port: RS232 serial port, DB9-M connector, 9600 baud, N81 (no parity, 8 data bits, 1 stop bit). Output adjustable, generated every 0-60 minutes, where 0 = disabled.

Output format: 5 sequence #, blank space, 3 digit opacity, "%" symbol, carriage return, line feed.

Example: 01234 011% c/r l/f

Shipping Weight: varies with options; these are typical:

Electronics units in enclosures are 7.5-8.5 lbs.

Open-mounted electronics units are 6.5-8.0 lbs.

Light source and receiver, combined, 9 lbs.

D. INSTALLATION

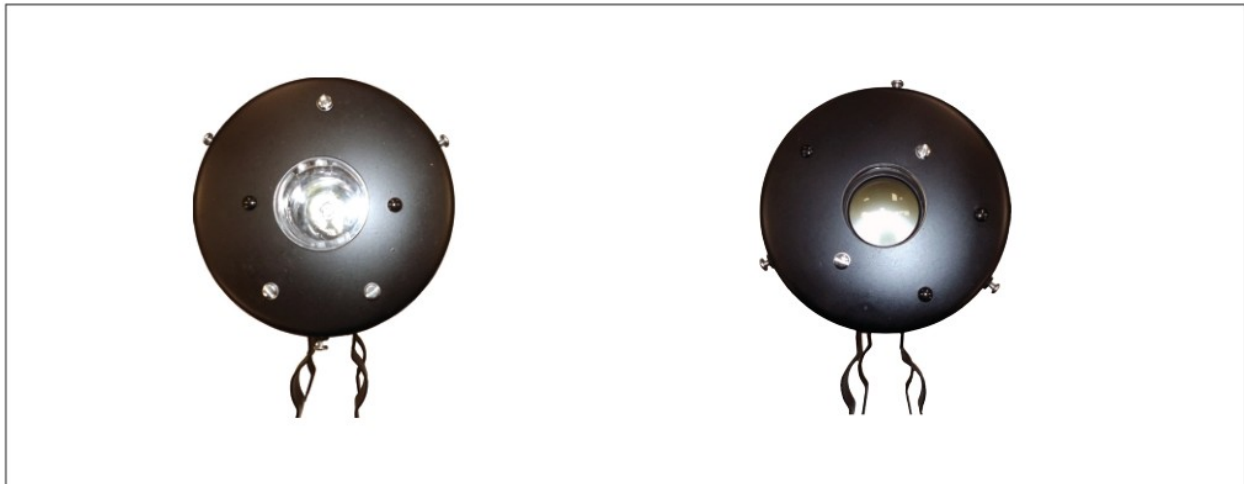
Mounting:

Mount the electronics/display unit in a dry location where the ambient temperature is within the specified temperature range, 32-160 °F (0-70 °C).

- Mount the unit away from excessive vibration.
- Do not mount in a wiring cabinet that has any power wiring in excess of 120 V ac.
- Mount the unit in such a manner that the wiring cable from the main electronics does not touch or approach any high magnetic source. If mounted near a high magnetic source, electronic interference may cause the display to read incorrectly.

Referring to **Figure 2**, mount the light source and receiver units directly opposite each other on the particulate passage. Select a position where a true, low-turbulence particulate sample is present, and where the sight glasses are safely and conveniently accessible for cleaning. For applications where soot on the sight glass might present a problem, apply purge air as shown in **Figure 3** and **Figure 4**.

The width of the passage must not exceed 15 feet (4.57 meters). The length of the wires to the control unit must not exceed 250 feet (76 meters).



Stack Units, left to right: P/N 31180 Light Source and P/N 31181 Receiver: These stack-mounted units are included with the base electronics/display unit and two P/N 27367 Sight Glass Assemblies.

Figure 1: Housing Dimensions

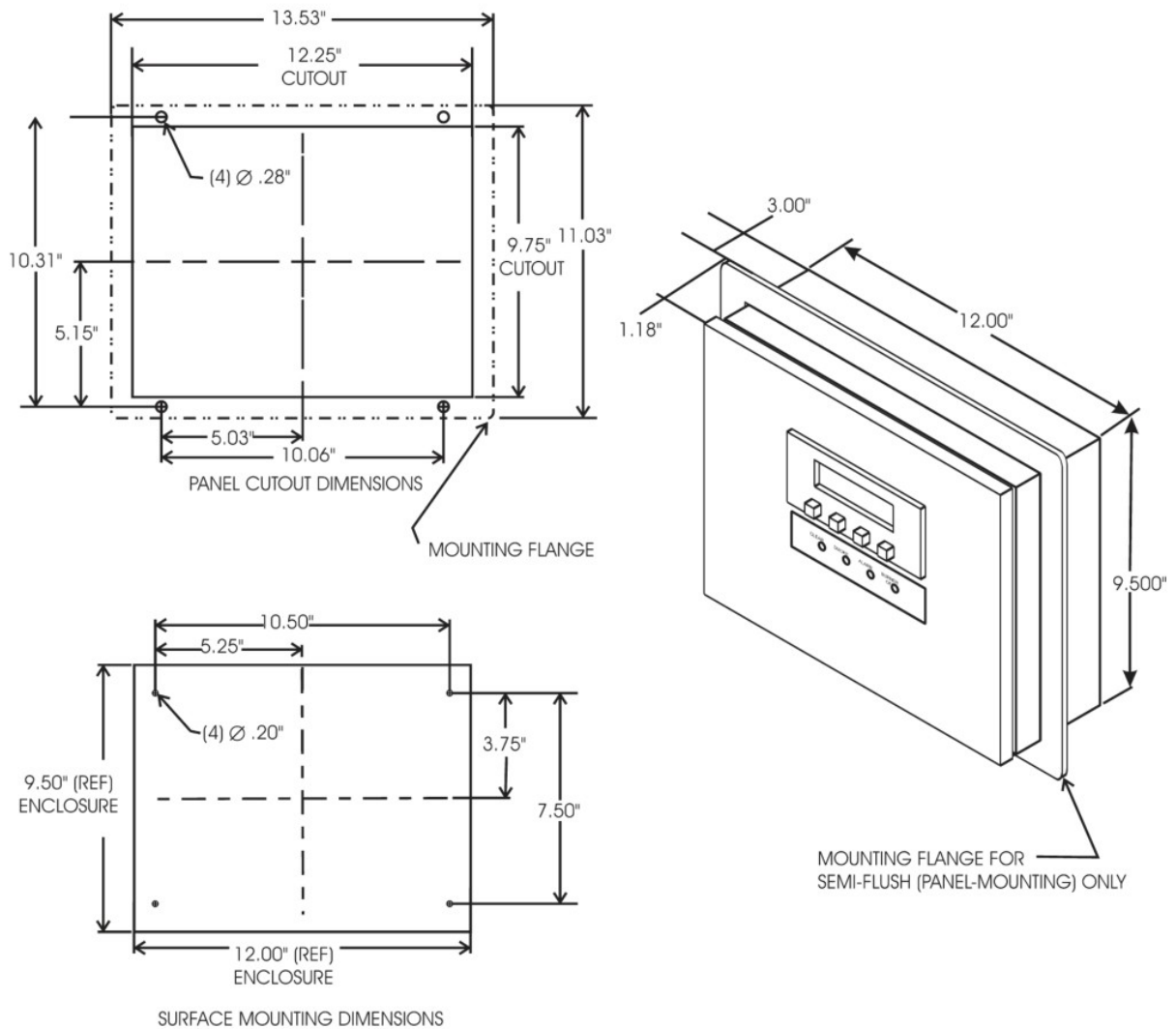
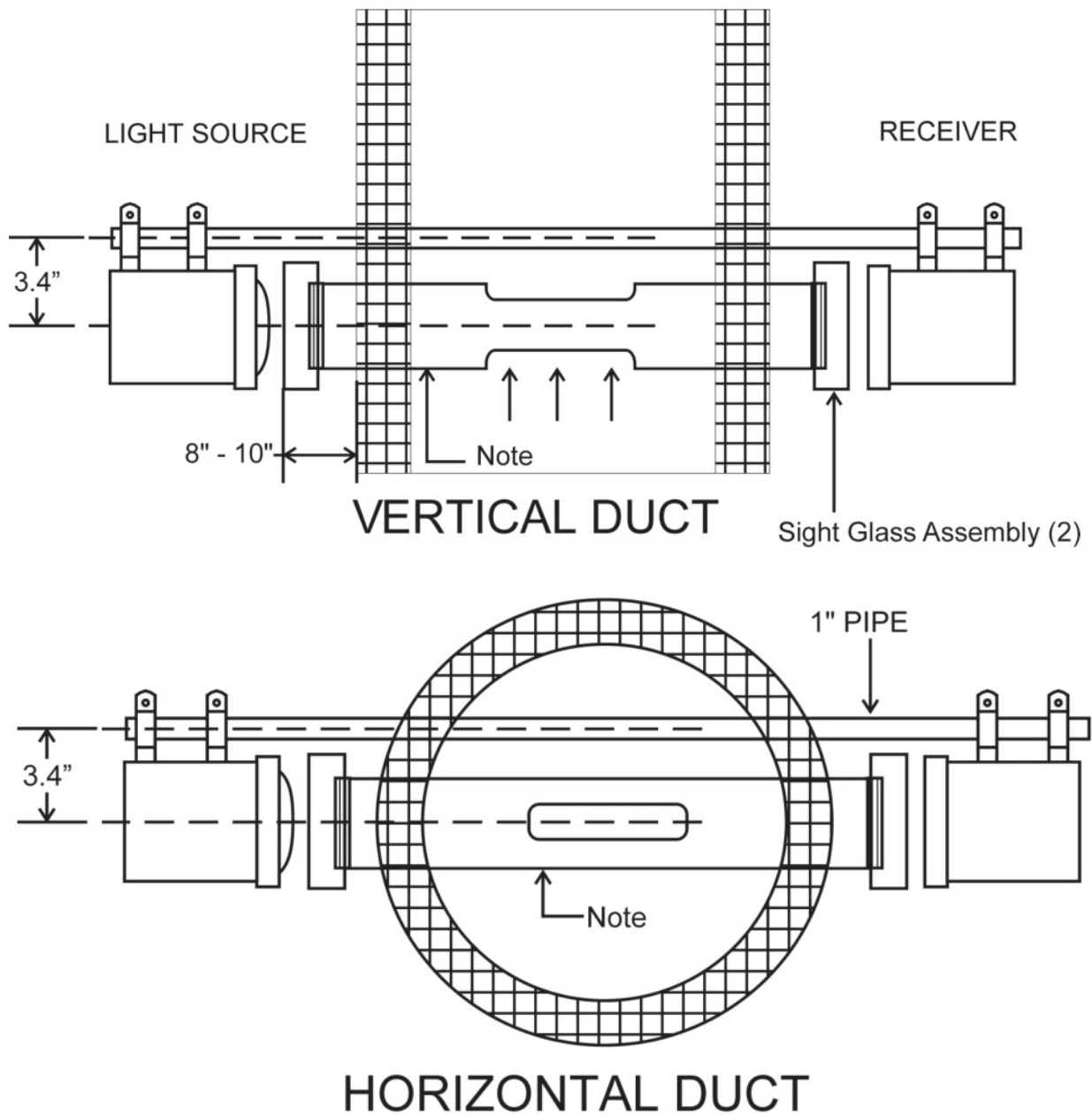


Figure 2: Mounting the Light Source and Receiver Units



Note: 4" pipe; threaded and slotted.
Slot width: 1.5"
Slot length: equal to stack exit
diameter or breeching radius,
whichever is less.
All pipe supplied by others.

Figure 3: Typical Arrangement for Sight Glass Purge

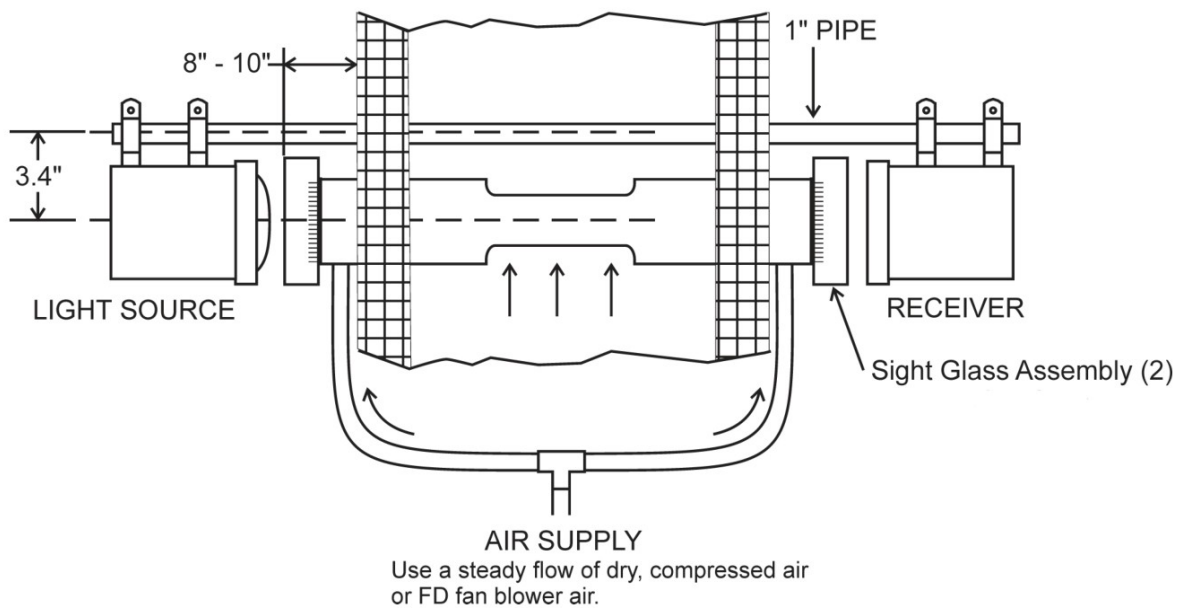
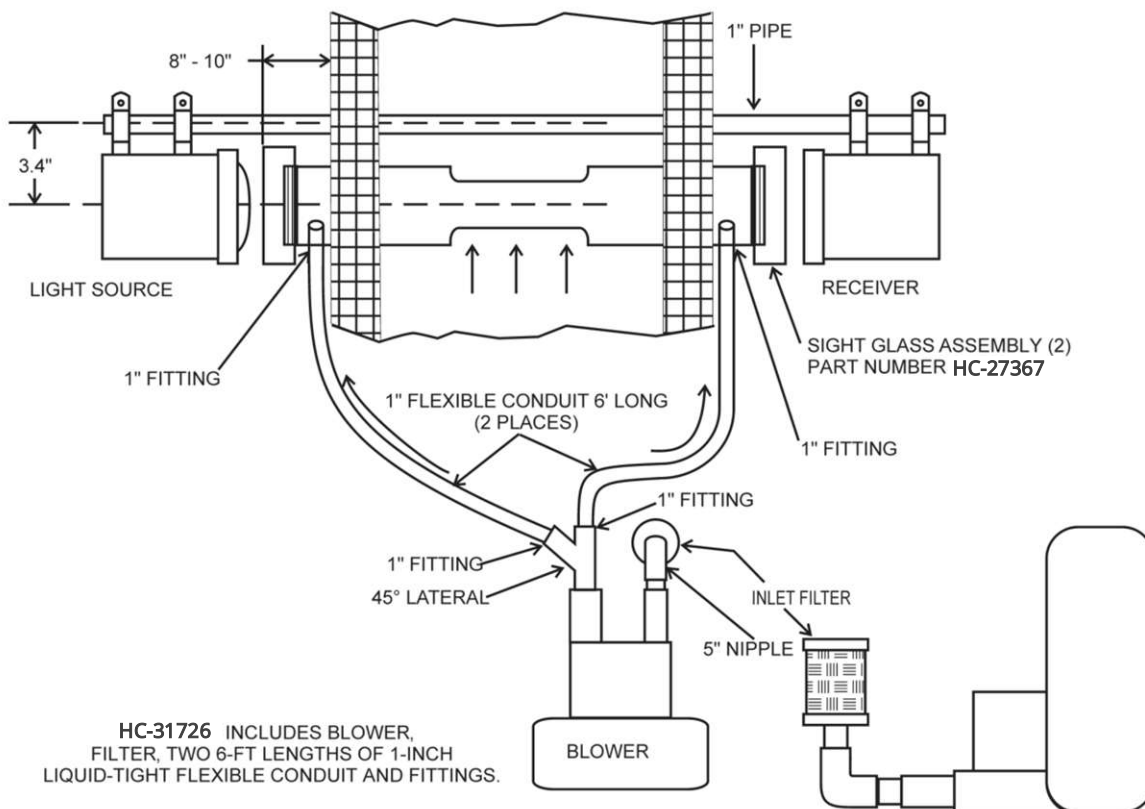


Figure 4: Sight Glass Purge with Blower (P/N: HC-31726)



BLOWER ELECTRICAL DATA
1/8" HP, 115/230 VAC, F. LA. 2.0/1.1 -1.0
PROVIDE FOR BLOWER TO RUN
WHENEVER BOILER IS ON.

E. WIRING

All system wiring must be run in accordance with the National Electrical Code and all local code requirements.

- Always remove all power to the system before wiring.
- This product is designed to work in a variety of applications and conditions; however, some applications may not be applicable due to the presence of high electrical noise, lack of adequate ground connections, floating neutrals or other known or unknown conditions. It is therefore important to ensure proper system environment before installing these devices.
- All wires near hot surfaces should be rated for 90°C (195°F) or at least 25°C (50°F) higher than the surface temperature.
- The most effective ground is to run the ground wire in the same raceway as the hot and neutral from the main distribution service panel (not intermediate sub-panels) to the damper controller.
- The ground path needs to be low impedance (less than 1 ohm) to the equipment frame, which in turn needs low impedance to earth ground. For a ground path to be low impedance at RF frequencies, the connection must be made with minimum length conductors having maximum surface areas.
- All connections should be free of nonconductive coatings and protected against rust.
- Utilizing conduit as a means of providing a ground must be avoided.

Wires must be 14AWG minimum with temperature rating of at least 90C. See the following wiring diagram for external connections

Figure 5: Base Field Wiring (No Auxiliary Modules)

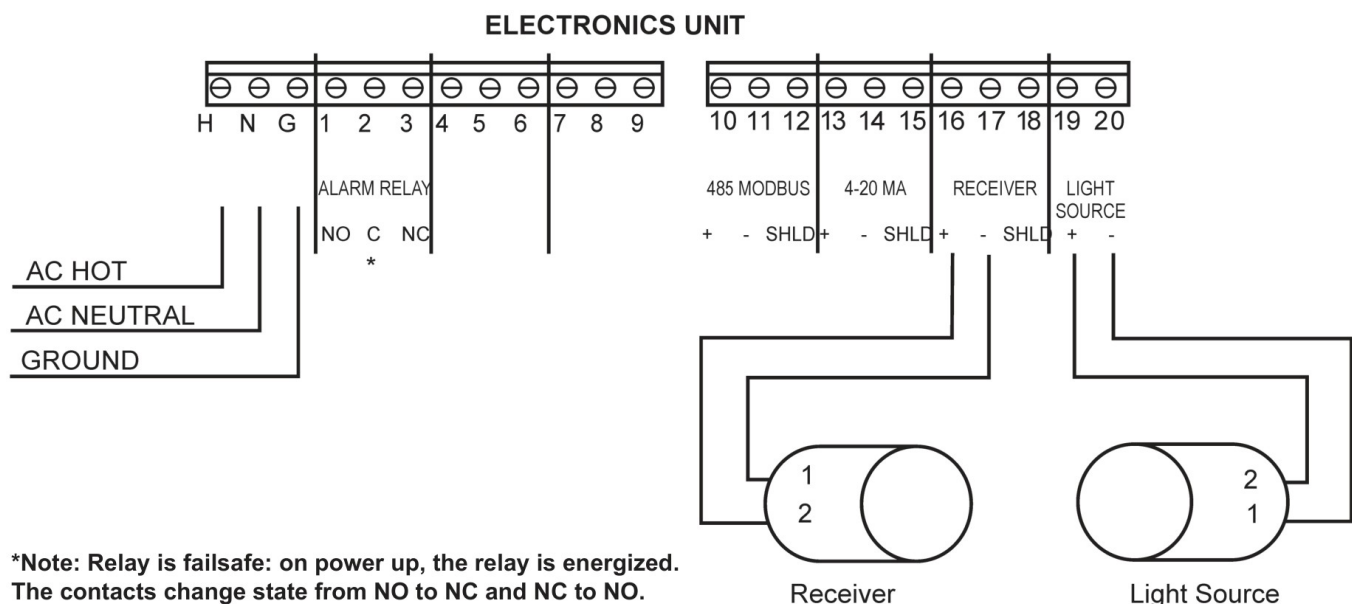


Figure 6: Field Wiring For 8740A With NYC Burner Shutdown Module

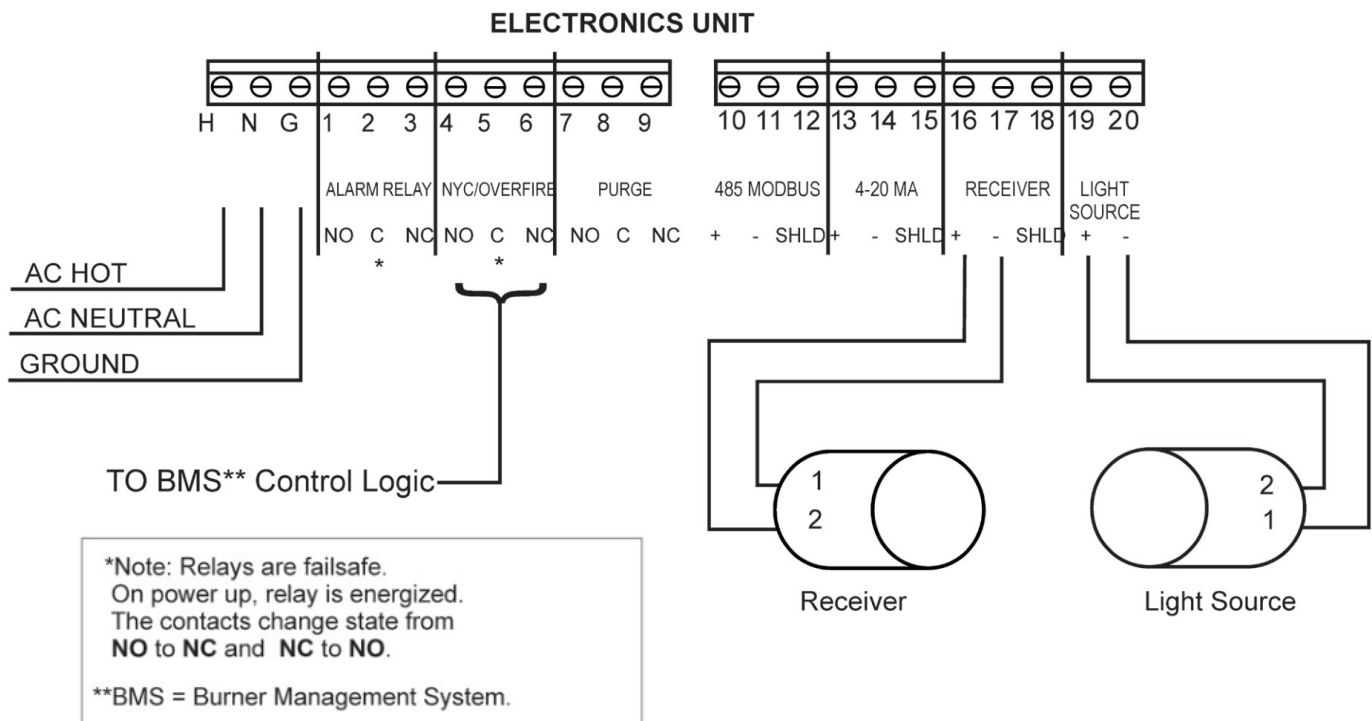
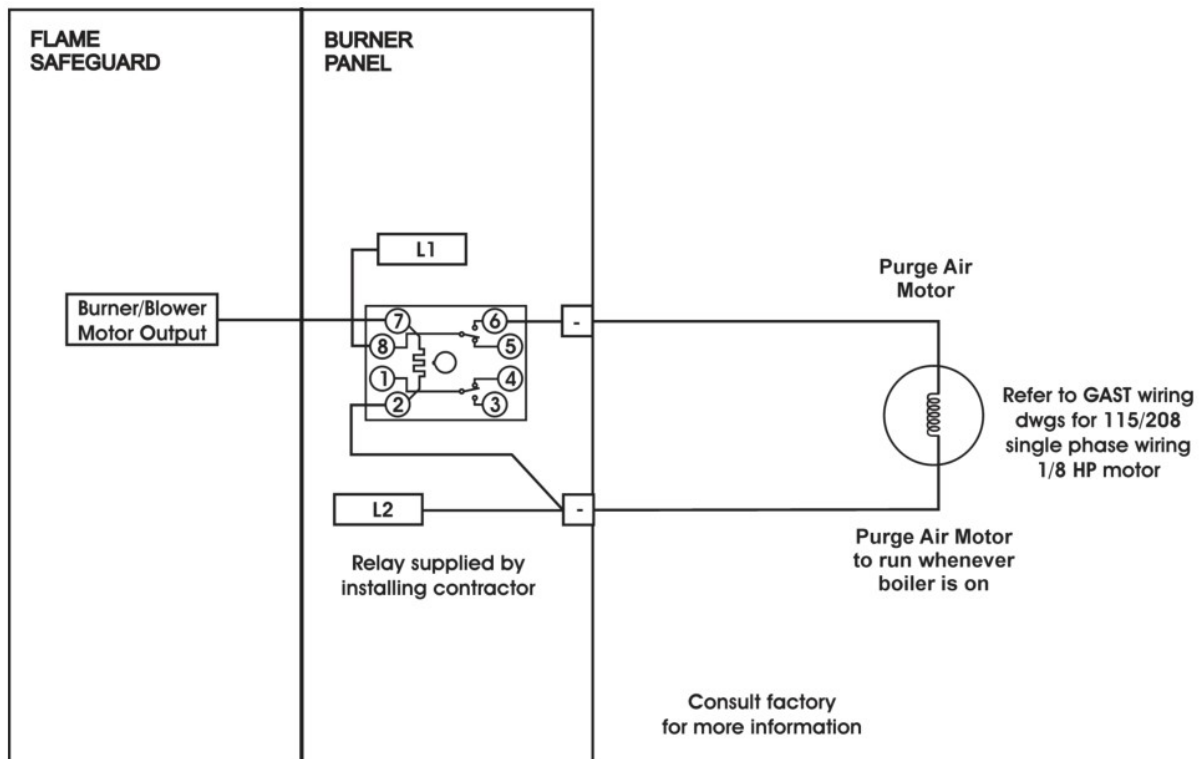


Figure 7: Wiring For Purge Blower System



F. Operation & Maintenance

Continuous Display Screen

When power is applied to the unit, the continuous display screen lights. It provides a continuous display of particulate density from 000% Opacity (no particulates detected) to 100% Opacity (particulates are dense enough to block all light), in 1% increments. The display window indicates the parameters and messages shown in **Figures 8-9** in this manual.

Indicator LED Lights and Status Messages

The green LED lights and the “Clear” message appears on the first line of the display to indicate that opacity is below alarm trip point. As soon as the trip point is exceeded, the green LED and “Clear” message go out and the yellow LED and blinking “Smoke” message come on. On the second line of the display, the alarm delay timer countdown appears. The red LED and blinking “Alarm” display are activated if the excessive opacity persists after the alarm delay period expires. If automatic alarm reset mode is selected, the Clear message and green LED will resume after the smoke has cleared to the point that the monitor detects an opacity percentage less than the alarm trip point. If manual alarm reset mode is selected, press the reset button to reset the alarm in all Standard and Overfire Air Timer models. See **Figures 8 and 9**.

For NYC models equipped with the 2-minute shutdown and alarm options, reset both the main and NYC alarms by first pressing the reset button, and then pressing the “Dec” key to reset the NYC alarm, and the “Inc” key to reset the main alarm. If the main alarm is in automatic reset mode, it will be necessary to reset only the NYC alarm. See **Figure 9**.

Output Functions

A 4-20 mA signal corresponding to 0 to 100% opacity provides for remote recording, control, or indication. SPDT alarm contacts are provided for remote alarm or control. The alarm relay is normally energized for fail safe operation. Refer to lines 11a through 11c on **Figures 9** for calibration of the retransmitted output.

Note that the output can be varied from the low (4 mA dc) and high (20 mA dc) values by ± 0.5 mA dc.

Field Configuration on the Continuous Display Screen

The scrolling display permits the operator to view and change parameters. Press the “Enter” button repeatedly to scroll through the parameters, which appear on the bottom line of the display. With a parameter visible, press the “Inc” button to increase its value. Press the “Dec” button to decrease its value. The new value becomes effective immediately: pressing “Enter” again brings up the next parameter.

After 10 seconds of inactivity, the display reverts to the default screen except during calibration mode.

Following an alarm event, press the “Reset” button to clear the “Alarm” message and restore the “Clear” message to the display if the unit is a Standard or Overfire Air Timer model configured (on the printed circuit board) for manual alarm reset. If the unit is configured for automatic alarm reset, the “Clear” message will replace the “Alarm” message automatically as soon as the excessive opacity is cleared.

For NYC models equipped with the 2-minute shutdown and alarm options, reset both the main and NYC alarms by first pressing the reset button, and then pressing the “Dec” key to reset the NYC alarm, and the “Inc” key to reset the main alarm. If the main alarm is in automatic reset mode, it will still be necessary to reset the NYC alarm.

The scrolling display includes the parameters and messages shown on **Figures 8-9**.

Calibration on the Continuous Display Screen – Auto Calibration

To calibrate the light source and receiver units, press the “Enter” button until the “Enter Cal Menu?” message appears. While holding down the “Inc” button, press the “Dec” button simultaneously to display the “Calibrate Opacity” screen. While holding down the “Inc” button, press the “Dec” button simultaneously to display the “Auto-Cal Purge” screen and initiate the purge countdown from the purge delay value (which is already configured: see section 3.2 above, and line 5 in Figures 11, 12, or 13). Following the countdown, the “Calibrate Phase-1” message appears, along with a countdown from 04 to 00, and the light source lamp goes out. Following the countdown, the “Calibrate Phase-2” message appears, and the light source lamp comes on and varies in intensity as it adjusts to the diameter of the stack. While the adjustment is in progress, a countdown from “40” displays on the screen, but calibration may be complete before it reaches “00”. At the end of the calibration process, either the default screen display or a calibration error screen appears. “Cal Err #1” means that the receiver has not detected enough light from the light source. “Cal Err #2” means that the receiver has detected too much light from the light source. In either case, the process conditions responsible for the error message must be corrected, and then the calibration process must be repeated until successful.

Calibration on the Continuous Display Screen – Manual Calibration

To calibrate the light source and receiver units, press the “Enter” button until the “Enter Cal Menu?” message appears. While holding down the “Inc” button, press the “Dec” button simultaneously to display the “Stack Clear?” screen. Check the stack, and press “Enter” to confirm that it is clear. The “Calibrate Phase-1” message is displayed, along with a countdown from 04 to 00, and the light source lamp goes out. Following the countdown, the “Calibrate Phase-2” message appears, and the light source lamp comes on and varies in intensity as it adjusts to the diameter of the stack. While the adjustment is in progress, a countdown from “40” displays on the screen, but calibration may be complete before it reaches “00”. At the end of the calibration process, either the default screen display or a calibration error screen appears. “Cal Err #1” means that the receiver has not detected enough light from the light source. “Cal Err #2” means that the receiver has detected too much light from the light source. In either case, the process conditions responsible for the error message must be corrected, and then the calibration process must be repeated until successful.

Calibration of the Retransmitted 4-20 mA DC Signal

Connect a 4-20 mA meter to the retransmit terminals, and then follow the steps above until the “Calibrate Opacity” screen appears. Next, press “Enter” to display the “Calibrate Retrans” message. While holding down the “Inc” button, press the “Dec” button simultaneously to display the “Set Retrans Low” screen. Observing the meter reading, use the “Inc” and “Dec” keys to correct the value. The output can be varied from 4 mA by ± 0.5 mA dc. When satisfied, press the “Enter” key again and the “Set Retrans High” message is displayed. Observing the meter reading, use the “Inc” and “Dec” keys to correct the value. The output can be varied from 20 mA by ± 0.5 mA dc.

Print Interval Setting

Select a print interval value between 0 and 60 minutes to regulate printed report frequency. A print interval of “0” disables the printer output.

Figure 8: Summary of Continuous Display Screen

Display	Name	Function
Opacity	Opacity	Displays opacity level as 000–100%
Cal%	Calibration	Unit is in opacity calibration mode
Clear	Clear	Opacity is within permissible limits
Smoke	Smoke	Flashes when opacity has exceeded the trip point
Alarm	Alarm	Flashes when opacity has exceeded the trip point for longer than the delay period.
/	Micro-Flipper	Indicates that microprocessor is running.
Delay:	Delay	Adjustable period during which process exceeds trip point before monitor goes to alarm condition.
Cutoff:	Cutoff	120-second period during which process exceeds trip point before monitor goes to alarm condition
*NYC Cutoff:	NYC Cutoff	Displayed when monitor goes to alarm condition after 120-second period in which process exceeds trip point. Models equipped with NYC burner cutoff module only
*Ovrfir	Overfire	Displayed as monitor initiates adjustable period after smoke is cleared during which contacts used to run overfire air blower are closed. Models equipped with overfire air timer module only

*Optional Features

Figure 9: Scrolling Display Screens

Screen	Display Function	Description
1a Default Screen	Line 1: OPACITY = XXX% / CLEAR Line 2: (blank when line 1 reads "clear")	Displays on Line 1 in operating mode when opacity is below the alarm trip point. Microprocessor flipper (/) spins. When "Clear" appears on line 1, there is no line 2 display.
1b Default Screen	Line 1: OPACITY = XXX% / SMOKE Line 2: timer countdown appears	"Smoke" Blinks on Line 1 in operating mode immediately when opacity exceeds the alarm trip point.
1c Default Screen	Line 1: OPACITY = XXX% / ALARM Line2: "Delay = T/O" (T/O = timed out.)	"Alarm" Blinks on Line 1 in operating mode when opacity exceeds the alarm trip point and the adjustable time delay has expired.
2 Model	Displays the model number of the standard opacity monitor and current software version: 8740x V____	Units are factory-configured. If it is necessary to configure the unit again in the field, unplug it and reset the jumpers. Plug the unit in again. Please keep in mind that devices may be needed that are not available in the field.
3 Alarm Trip	Displays the alarm trip point (opacity level at which alarm mode activates).	Adjust while the unit is powered. Press "Inc" or "Dec" key to adjust the setting. Set from 0-99% opacity.
4 Delay Time	In alarm mode, displays the delay period before the blinking "alarm" message replaces the continuous "smoke" message.	Adjust while the unit is powered. Press "Inc" or "Dec" key to adjust the setting. Set from 1-300 seconds.
5 Purge Dly Time	Displays the purge delay timer setting only when monitor is set up in AUTO CAL mode. Determines the time allowed for purging of the system. When the delay period expires the calibration cycle commences.	Adjust while the unit is powered and in AUTO CAL mode. Press "Inc" or "Dec" key to adjust the setting. Set from 1-600 seconds.
6 Modbus Addr	Displays the modbus address.	Adjust while the unit is powered. Press "Inc" or "Dec" key to adjust the setting. Set from 001 to 247.
7 Baud Rate	Displays the baud rate.	Adjust while the unit is powered. Toggle between 9600 and 19200, using "Inc" or "Dec" key to adjust the setting.
8 Print Interval	Displays the print interval	Adjust while the unit is powered. Press "Inc" or "Dec" key to adjust the setting. Set from 00 to 60.
9 Enter Cal Menu?	Prompts user to return to default screen or begin calibration procedure.	Press "Inc" and "Dec" keys simultaneously to display "Calibrate Opacity" screen. Press "Enter" to return to default screen.

Figure 9: Scrolling Display Screens (Continued)

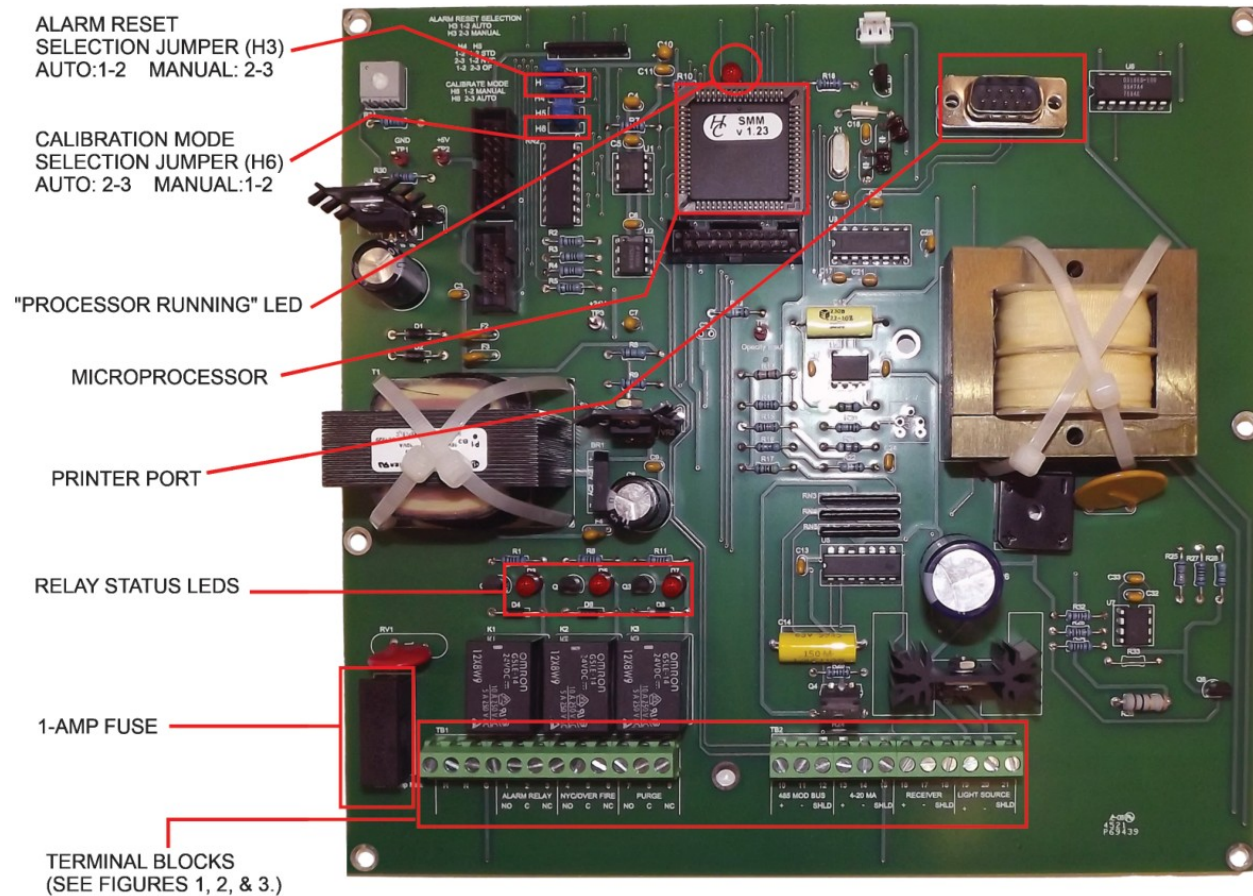
Screen	Display Function	Description
10a Calibrate Opacity	Prompts user to begin calibration of light source and receiver units or to advance to "Calibrate Retrans?" screen, line 11 below	Press "Inc" and "Dec" keys simultaneously to access calibration mode of the light source and receiver units. Press "Enter" key to display "Calibrate Retrans" screen.
10b1 Stack Clear?	Displays only when monitor is set up in MANUAL CAL mode. Prompts the operator to check the stack before calibration commences.	Press "Enter" to confirm that the stack is clear.
10b2 Auto-Cal Purge	Displays only when monitor is set up in AUTO CAL mode. Counts down from value set in line 5 above. Automatically advances to next screen when purge is completed.	Observe countdown from purge delay value to 00.
10c Calibrate Phase 1	First phase of calibration: light source lamp is off.	Observe countdown from 04 to 00.
10d Calibrate Phase 2	Second phase of calibration: light source lamp is on.	Observe countdown from 40 to 00.
11a Calibrate Retrans?	Prompts user to begin calibration of the 4-20 ma DC retransmitted output or return to the default screen.	Press "Enter" to return to default screen. To proceed with calibration, connect a 4-20 ma meter to the retransmit terminals. Press "Inc" and "Dec" keys simultaneously to display "Set Retrans Low" screen.
11b Set Retrans Low	Prompts user to calibrate the low end of the retransmitted output: 4 ma DC.	Observe meter reading, and adjust as necessary by pressing "INC" and "DEC" keys until the meter reading is correct. The output can be varied from 4 ma DC by ± 0.5 ma DC.
11c Set Retrans High	Prompts user to calibrate the high end of the retransmitted output: 20 ma DC.	Observe meter reading, and adjust as necessary by pressing "INC" and "DEC" keys until the meter reading is correct. The output can be varied from 20 ma DC by ± 0.5 ma DC.
12 Cal Err #1	This message displays in calibration mode if the receiver does not detect sufficient light.	Resolve process conditions and recalibrate.
13 Cal Err #2	This message displays in calibration mode if the receiver detects too much light.	Resolve process conditions and recalibrate.

G. Troubleshooting

Diagnostic LEDs

LED's are provided for onboard diagnostic of the I/O (Input/Output). The Relay Status and "Processor Running" LED's are identified in **Figure 10**.

Figure 10: HC-31077 Opacity Board Layout



The “Processor Running” LED indicates the state of the microprocessor by blinking at different rates as shown in **Figure 11**.

Figure 11: Processor Running LED

ON/OFF Timing	Status/Fault
1 Second	MICROPROCESSOR IS FUNCTIONING PROPERLY.
0.1 Second	BROWN OUT: RESET VOLTAGE HAS DROPPED BELOW THE PROPER LEVEL. Turning the power off and then back on may clear up this fault. If it does not, contact Preferred Utilities.
0.05 Second	WATCH DOG TIMER RESET: AN ERROR HAS OCCURRED IN THE MICROPROCESSOR. Turning the power off and then back on may clear up this fault. If it does not, contact Preferred Utilities.

Figure 12: Troubleshooting Recommendations

Component	Symptom	Possible Problem
Control Unit	Alarm or Opacity section of the control unit is not operating properly.	Main Pc. Board is faulty: replace.
		One of the alarm or opacity controls is faulty.
	The 4-20 ma output is not operating properly.	4-20 mA field wiring is faulty.
		Main Pc. Board is faulty: replace.
Display Assembly	The control unit can be calibrated by monitoring the 4-20 ma output, but not by watching the “percent Opacity” display.	Display assembly is faulty: replace.
	Some of the number segments on the “percent Opacity” display do not go on or off properly	
Light Source Assembly	Lamp does not light but 4-10 V DC is present at the lamp terminals.	Lamp is burned out: replace.
	Lamp does not light and no voltage is present at Terminals 1 and 2, but voltage is present at the control unit terminals 19 and 20.	The interconnecting wire is open.
	Lamp does not light, and no voltage is present at Terminals 19 and 20.	Light source fuse is blown: replace.
		Main fuse is blown: replace.
		Light source transformer is faulty: replace.
		Main p.c. board is faulty: replace.
Receiver Assembly	Light source is operating properly but unit will not calibrate.	Receiver assembly is faulty: replace.
		Main p.c. board is faulty: replace.
		Interconnecting wiring is open.

Checksum Error

When the microprocessor values do not match the values stored in memory, “Checksum Error” is displayed. All logic functions stop. To correct the Checksum Error, turn the power off and then back on. If this procedure doesn’t rectify the error, reenter all control parameters. If the problem persists, contact the sales office where you purchased the unit.

H. Modbus

Refer to the overall wiring diagrams. Terminals for Modbus communication are located on the lower left of the printed circuit board. They are marked “RS-485 +, -, SHD.” These terminals provide information with Modbus protocol using RS-485.

The Modbus address assignments are shown in **Figure 13**.

Modbus Settings

MODBUS ADDR: Set the Modbus address from 001– 247, using the “Inc” key to increase the value or the “Dec” key to decrease the value.

BAUD RATE: Select a baud rate of 9600 or 19200, using the “Inc” or the “Dec” key to toggle between these values.

Figure 13: Modbus Memory Addresses

