

## How to use the LightHawk 560 Checklist

The LightHawk 560 Installation Checklist with its active MS Word features may be completed, saved and submitted via email to TELEDYNE Monitor Labs at [GoTML@Teledyne.com](mailto:GoTML@Teledyne.com). When submitting several checklists for multiple stack locations at a single site, please use a file-naming convention that provides some ability to discriminate between COMS locations.

***\* Your order cannot be scheduled for production until accurate information is provided for all fields marked with an asterisk.*** TML cannot provide an estimated delivery date until the necessary site specific information is provided.

### 1. CUSTOMER CONTACT INFORMATION:

Fill out your name, phone number, email address, final installation address, and other information. The Stack Identification should be a 10-character (maximum) name that describes the stack, duct or process on which the monitor will be located. Example: "UNIT1\_STK", "KILN1\_DUCT", etc.

### 2. MOUNTING FLANGES (Customer supplied)

The Standard mounting flanges are 2" 150lb ANSI flanges and must be supplied by the customer. The flanges are welded to 2" Sch. 40 pipe that is also customer supplied. To acknowledge that you will use your own standard flanges press the first button ("I will supply my own ....."). If the application requires mounting pipes longer than 13", larger diameter pipes must be locally fabricated in order to maintain good alignment (consult drawing 1800-0013 sheets 1 and 2).

If you are adapting to an EXISTING non-standard flange or using mounting pipes other than 2" Sch. 40, select the "I wish to use something other ...." button and provide details in the text box provided. You may consult the TML factory to evaluate the use of available flange adapters.

### 3. FLANGE TO FLANGE CALIBRATION DISTANCE

Record this distance in English or Metric units. This distance is to be measured from the outside of one mounting flange to the outside of the other mounting flange with an accuracy of  $\pm 1\%$  of the distance. (Consult drawing 1800-0007) TML recommends that the user measure this dimension after the mounting pipe and flanges have been installed and consider using a laser tape device to make the measurement.

\*NOTE: The accuracy of the factory calibration and subsequent opacity measurement are both dependent on this dimension being measured and reported accurately.

### 4. TEMPERATURES, PROCESS AND AMBIENT

- Select the appropriate button that describes your maximum process temperature. This information is necessary to determine whether or not the hardware in your system can safely operate without damage

This information is necessary to ensure that the hardware configuration chosen is adequate for the user's application (high temperature seals, stainless steel nozzles and a heat shield may be required when the temperature exceeds 500 °F)

- Specification ranges of the ambient temperature of the equipment on the stack and the ambient temperature of where the Enhanced Remote Panel will be located are on the form. If you believe that either temperature will exceed the ranges specified, let us know by selecting the appropriate button.

## 5. PROCESS STATIC PRESSURE

Select the most accurate process static pressure range in **INCHES of WATER COLUMN** at the monitor installation location. The static pressure is the difference in pressure between the inside of the stack and the outside ambient pressure.

This information is necessary to ensure that the hardware configuration chosen is adequate for the user's application (*high positive pressure >15" H2O may require options*)

## 6. MOUNTING CLEARANCES

Review the proposed installation locations and reference the TML drawings. Check OK if sufficient clearances are available. Mark Other and consult the factory if alternative installation configurations are required.

- Stack Equipment: Be certain that there is sufficient clearance between the stack mounted equipment and any potential obstructions (i.e.: distance to floor, horizontal distance to catwalk rail). Weather hood is...20" W x 22 ¼" L x 33" H. (See drawing 1800-0007).

## 7. PURGE FAIL CABLE LENGTH

The purge fail cable is supplied with the system and connects the Retroreflector with the Optical Head assembly. This cable must be routed through customer-supplied 1/2" (min.) flexible and rigid conduit. A Standard 40 foot (12.2meters) of purge fail cable will be provided with each monitor purchased. List cable lengths that exceed 40 feet under Other.

*Consult the TML factory for pricing of cables greater than 40 feet in length.*

## 8. DATA CABLE LENGTH

**DATA CABLE LENGTH Direct Interface** (*Not provided with standard system, available as option*)

The cost of the cables from the Optical Head to the output or display device has not been included in the COMS base price. TML will provide the cable at additional cost to the customer.

The user must determine the length of the data cable measured from the Optical Head to their DAS/PLC or other output device. Minimum recommended conduit size is 1/2". A Direct Interface configuration requires two cables; a non-shielded 4-conductor / 20 AWG (Alpha 66-44) and a 6-shielded pair / 24 AWG (Alpha 6386/Belden 9991). Consult the TML factory for current price and delivery of data cable.

**DATA CABLE LENGTH with Enhanced Remote** *(Not provided with standard system, available as option)* The cost of the cable from the Optical Head to the output or display device has not been included in the COMS base price. TML can provide the cable at additional cost to the customer.

The user must determine the length of the data cable measured from the Optical Head to the Enhanced Remote Panel. Minimum recommended conduit size is 1/2". The Enhanced Remote Panel configuration requires only a single twisted pair, 16 AWG with shield (Alpha 5610B1601). Consult the TML factory for current price and delivery of data cable.

## **9. OPTICAL HEAD POWER CIRCUIT CAPACITY**

Supply voltage and current capacity of the customer supplied circuits for the STACK equipment must meet the specified minimum requirements.

Stack Equipment: Maximum power draw is:

- 14VA single phase for the Optical Head
- 414VA single phase for one Purge Blower
- 828VA single phase for dual Purge Blowers (414VA for each blower)

A minimum of one 115VAC single phase, 10A circuit is required. Two circuits are required for dual blower systems. Blowers can also operate on a 230VAC single phase supply.

Indicate whether 115VAC or 230VAC will be supplied at the stack location.

## **10. CORRECTION FOR STACK EXIT PATHLENGTH**

Most regulatory agencies require that monitor opacity readings be corrected to correspond to the observable opacity where the emissions exit to the atmosphere. The EPA calls this the Path Length Correction Factor or PLCF.

Record the following to calculate the Path Length Correction Factor (PLCF):

- a.) Monitor Path Length

Record the inside dimension of the duct or stack at the monitor location.

b.) Outlet Path Length

- For a round stack - record the inside diameter of duct or stack at the exit
- For square or rectangular duct or stack, record both dimensions at the exit.

## 11. MAXIMUM OPACITY LIMIT

Changes to US EPA regulations require manufacturers to configure and test COMs differently based on the user's maximum opacity emissions. Select the opacity limits imposed by your controlling regulatory agency.

If the user's operating permit includes both Instantaneous and Integrated opacity limits, please record both limits on the checklist.

## 12. SPECIFY FULL SCALE

The Standard output scaling includes:

**Opacity** = 100%

**Optical Density** = 2.000

**Particulate Mass** = Consult the TML factory

*The user's operating permit may require a specific opacity full scale based on the classification of the emission source.*

### Calibration Configuration

The LightHawk 560 will output various information to confirm proper operation and validate the emissions data. The timing and sequence of the Calibration Cycle output may be controlled by:

- **Auto Cal** Sequence - The real time clock in the Optical Head determines the start and duration of each phase of the calibration data.
- **External Mode** Control - The user's DAHS, PLC or Data Logger circuits control the start time of a predetermined sequence or manually control individual output modes.

## 13. USE AUTO CAL SEQUENCE

Check **YES** if the **Auto Cal** sequence is to be used to collect calibration data. Check **NO** if the user will be exclusively using External Mode control.

## 14. SYSTEM CONFIGURATION:

(Select one) **Direct Interface** or **Enhanced Remote**

The LightHawk560 is available in two basic configurations.

- The Direct Interface configuration does not have the Enhanced Remote Panel. The Direct Interface requires more wires to be run from the stack or duct.
- The Enhanced Remote option gives the user more information down at the 'remote' location and offers more inputs and outputs than the Direct Interface. The Enhanced Remote option requires only one cable with two wires to be run from the stack or duct to the Enhanced Remote Panel's location.

***This section is for a Direct Interface option:***

**SPECIFY OUTPUT UNITS:**

Select the analog output units your monitor is to report in, ***Opacity, Optical Density*** or ***Particulate Mass*** (select one) Standard default = ***Opacity***

**CURRENT OUTPUTS:**

The Direct Interface has two analog outputs available. They are isolated from each other and circuit common.

- Channel 1 is always the Instantaneous value and usually does not carry calibration values.
- Channel 2 is always Selectable Average and usually carries calibration values.

If an output carries calibration values, the analog output will track the calibration values when it is commanded to go into calibration or when it is scheduled to go into calibration. If the output does not carry calibration values, the analog output will hold the last NORMAL mode value when the monitor is in a calibration mode.

Please select the output current configuration you want, **4 - 20 ma** or **0 - 20 ma**. Select only one. Standard default = **4 - 20ma**.

**RELAY OUTPUTS:**

The Direct Interface uses 2 relays that can be configured to actuate on various output modes or monitor conditions. Select any two from the table below. These functions are set via jumper settings and can be easily modified at the site. Contacts are SPDT Form C. The two relays available can be configured as either Normally Open or Normally Closed via a jumper setting. The standard selections most commonly chosen are "Calibration Data on Analog Outputs" and "Instrument Malfunction". The following table lists the available selections.

Function
Calibration Data on Analog Outputs
Instrument Malfunction
Instantaneous Alarm 1 Actuated
Selectable Average Alarm 1 Actuated
UPSCALE data on Analog Outputs
ZERO data on Analog Outputs
Purge Failure
Excessive Dirt Compensation

## DIGITAL INPUT SELECTION

### Digital Inputs

Two discrete inputs are provided to allow monitor output mode control by user supplied circuits. These optical isolators are activated by either dry contact closures or +5VDC signal from a user-supplied circuit. These signals are transmitted to the Optical Head via the Data cable. This configuration is field selectable and may be modified at the time of instrument start up. The following definitions apply to the selection of the External Mode control digital inputs:

**Force Upscale** = The instrument goes into calibration UPSCALE mode. The calibration mechanism moves to the UPSCALE position. Analog output #1 holds the last stack value read, analog output #2 follows the UPSCALE value

**Force Zero** = The instrument goes into calibration ZERO mode. The calibration mechanism moves to the ZERO position. Analog output #1 holds the last stack value read analog output #2 follows the ZERO value.

**Dump PLCF** = The calibration mechanism moves to NORMAL position. Real time stack data appears on the LED readout and on analog output #1. Analog output #2 follows the PLCF value.

**Dump Dust** = The calibration mechanism moves to NORMAL position. Real time stack data appears on the LED readout and on analog output #1. Analog output #2 follows the DUST COMPENSATION value.

**Force Cal Cycle** = The calibration mechanism moves to ZERO, UPSCALE, PLCF, DUST COMPENSATION and then back to NORMAL. It remains in each mode for a configurable period of time.

***This section is for the Enhanced Remote option:***

**DIGITAL INPUT SELECTION**

The Enhanced Remote has 8 isolated inputs available. They are all available and no selection is required on this form. The location and designation of each are fixed. To use any of these inputs, merely connect wires to the appropriate input. A simple jumper setting on the Multi- I/O board determines if they are activated by a dry contact or +5 VDC input. Dry contact closure is the standard configuration. More information is provided on the Installation Drawings and in the Manual.

Input #1	Force Upscale
Input #2	Force Zero
Input #3	Dump PLCF
Input #4	Dump Dust Comp
Input #5	Force Cal Cycle
Input #6	Not Used
Input #7	Test Zero Scale
Input #8	Test Full Scale

**SPECIFY DESIRED ANALOG OUTPUTS:**

The Standard Configuration includes:

Channel 1	Instantaneous Opacity, without cal values displayed.
Channel 2	Selectable average Opacity, with cal values displayed.
Channel 3	One-minute average opacity, without cal values displayed.
Channel 4	Dust Compensation

The Analog Outputs can be easily changed at a later date, through a list on the Enhanced Remote Panel. You may choose the desired Analog Outputs from the following table:

**Parameters for Analog Output**

Parameter Name	Functional description
Instant Opacity	Instantaneous opacity corrected for the system's PLCF. Update time is 6-8 seconds.
Minute Ave Opacity	A one minute average of the instantaneous opacity reading. This value is PLCF corrected. The period is minute to minute according to the real time clock in Optical Head.
Selectable Ave Opacity	An average opacity reading whose time period is selectable in one-minute increments. The time selected should divide evenly into 60 minutes. 1, 2, 4, 6, 10, 12, 15, 30 and 60-minute averages are possible. Six minutes is the standard selection.

Instant Opt Density	Instantaneous optical density corrected for the system's PLCF. Update time 6 -8 seconds. This is a mathematical conversion of the opacity reading.
Minute Ave Opt Density	A one minute average of the instantaneous optical density reading. This value is PLCF corrected. The period is minute to minute according to the real time clock in the Optical Head.
Select Ave Opt Density	An average Optical Density reading whose time period is selectable in one-minute increments. The time selected should divide evenly into 60 minutes. 1, 2, 4, 12, 15, 30, and 60-minute averages are possible. Six minutes is the standard selection.
Instant Particulate Mass	Instantaneous Particulate Mass loading in mg/m <sup>3</sup> . Update time is 6-8 seconds. This is a mathematical correlation from the opacity reading by a curve that is developed through extractive testing. This is not available for output until the correlation testing is done and the results entered into the 560's software.
Minute Ave Particulate Mass	A one minute average of the instantaneous Particulate Mass loading reading. Period is minute to minute according to the real time clock in the Optical Head. NOT available for output until testing results are entered.
Select Ave Particulate Mass	An average Particulate Mass loading reading whose time period is selectable one-minute increments. The time selected should divide evenly into 60 minutes. 2, 4, 6, 10, 12, 15, 30, and 60-minute averages are possible. Six minutes is standard selection. Not available for output until testing results are entered.
Dust Compensation Output	The amount of Dust Compensation build up . The Dust Compensation factor applied to the NORMAL and UPSCALE mode readings is limited to ±4% PLCF corrected opacity. However, the Dust Compensation reading is unbounded.
Zero Output	The calibration Zero value.
Upscale Output	The calibration Upscale value.
PLCF Output	The Path Length Correction Factor being applied to the readings.

### RELAY CONTACT OUTPUTS

There are eight relays (K1-K8) available on the LightHawk Multi I/O Module to interface with user circuits. These relays can be configured as either NO or NC vial jumper settings. Each relay is SPST with one normally open contact rated 3A max. The Standard Configuration includes:

- K1 Analog outputs displaying any calibration data
- K2 Analog outputs displaying UPSCALE calibration
- K3 Analog outputs displayed calibration ZERO data
- K4 Instantaneous Opacity exceeds Level 1 set-point
- K5 Selectable average Opacity exceeds Level 1 set-point
- K6 Purge Failure
- K7 Fault (Failsafe)
- K8 Data Valid (Failsafe)

The relays can also be easily changed at a later date, through a list on the Enhanced Remote Panel. Select options for the relay configurations from the following table:

**Parameters for Relay Assignment  
(Digital Output closure conditions)**

<b>Opacity Exceedence</b>	<b>Optical Density Exceedence</b>	<b>Mass Loading Exceedence</b>	<b>System Trouble</b>	<b>Calibration Control</b>
Inst. Opacity Level #1	Inst. Opt Density Level #1	Inst. Mass load Level #1	Cal Failure	Normal on AO
Inst. Opacity Level #2	Inst. Opt Density Level #2	Inst. Mass load Level #2	Excess Dust Compensation Comp	Cal on AO
Min Opacity Level #1	Min Opt Density Level #1	Min Mass load Level #1	Fault	Dust Compensation A.O.
Min Opacity Level #2	Min Opt Density Level #2	Min Mass load Level #2	Data Valid	PLCF on AO
Ave Opacity Level #1	Ave Opt Density Level #1	Ave Mass load Level #1	Purge Failure	Zero on AO
Ave Opacity Level #2	Ave Opt Density Level #2	Ave Mass load Level #2	No Selection	Upscale on

## **ETHERNET MODULE SETUP**

Specify a static IP address, if desired. Otherwise, a default address will be assigned.

Consult your IT department. Many IT departments may want to assign a Static IP address. If this is the case, you will need to supply a Static IP address, a Subnet Mask and a Default Gateway.

## **ENHANCED REMOTE PANEL POWER CIRCUIT CAPACITY**

Maximum power draw is 25 VA single phase for the remote equipment.

The Enhanced Remote Panel normally operates on a 115VAC, 60 HZ, single phase supply. The assembly is usually shipped with a standard straight 115VAC, 3-pronged molded power cord, 15' long. A different cable is available if you plan on operating the Enhanced Remote Panel on 230VAC.