Critical Environment Technologies

INSTALLATION & INSTRUCTION MANUAL

REV: B (AUG-15-2001)

AST-CCB-W CATALYTIC COMBUSTIBLE GAS SENSOR - TRANSMITTERS

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IMPORTANT NOTICE

READ AND UNDERSTAND THIS OPERATION MANUAL PRIOR TO USING THIS INSTRUMENT.

THIS INSTRUMENT SHOULD BE INSPECTED AND CALIBRATED AT REGULAR INTERVALS BY QUALIFIED AND TRAINED PERSONNEL. FOR MORE INFORMATION REFER TO THE "CALIBRATION" SECTION OF THIS MANUAL.

THIS INSTRUMENT HAS BEEN DESIGNED TO BE INSTALLED IN AREAS NOT CLASSIFIED AS EXPLOSION RATED. FOR YOUR SAFETY, READ THE SPECIFICATIONS SECTION OF THIS MANUAL FOR A LISTING OF THE HAZARDOUS AREAS IT HAS BEEN DESIGNED FOR.

INSTRUMENT SERIAL NUMBER: _____

PURCHASE DATE: _____

PURCHASED FROM: _____

WARRANTY

CRITICAL ENVIRONMENT TECHNOLOGIES CANADA INC. WARRANTS THIS INSTRUMENT TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF TWO YEARS (ENCLOSURE AND ELECTRONICS), ONE YEAR (CATALYTIC SENSOR HEAD), FROM THE DATE OF PURCHASE. THE WARRANTY STATUS MAY BE AFFECTED IF THE INSTRUMENT HAS NOT BEEN MAINTAINED AS PER THE INSTRUCTIONS INDICATED IN THIS MANUAL OR HAS BEEN ABUSED OR DAMAGED IN ANY WAY. THIS INSTRUMENT IS ONLY TO BE USED FOR PURPOSES STATED HEREIN.

APPLICATION

THE MODEL AST-CCB-W HAS BEEN DESIGNED AS A REMOTE MOUNT ANALOG SENSOR / TRANSMITTER FOR THE DETECTION OF COMBUSTIBLE GASES AND VAPOURS. THIS INSTRUMENT IS A DIFFUSION DEVICE. IT OPERATES ON POWER SUPPLIED BY A REMOTE SOURCE AND PROVIDES A ANALOG SIGNAL REPRESENTING THE CONCENTRATION OF TARGET GAS MEASURED. IT WILL OPERATE WITH ANY GENERIC CONTROL DEVICE THAT ACCEPTS 4 - 20 MA ANALOG SIGNAL.

SELECTING AN INSTALLATION LOCATION SHOULD BE IN ACCORDANCE WITH LOCAL REGULATIONS, PROJECT ENGINEERING SPECIFICATIONS AND MANUFACTURERS SPECIFICATIONS.

ENVIRONMENT

THE POLYCARBONATE ENCLOSURE UTILIZED FOR THIS INSTRUMENT IS WATER / DUST TIGHT AND CORROSION RESISTANT. ENSURE THAT A LIQUID TIGHT CONDUIT FITTING IS UTILIZED TO MAINTAIN THE SAME LEVEL OF PROTECTION. THE CATALYTIC COMBUSTIBLE SENSOR HEAD UTILIZED FOR THIS INSTRUMENT IS MADE OF 316 STAINLESS STEEL. THIS TRANSMITTER IS NOT TO BE INSTALLED IN CLASSIFIED HAZ-RADOUS (EXPLOSION RATED) AREAS.

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1.0 GENERAL DESCRIPTION

The model AST-CCB-W are analog transmitters designed to be remote mounted for the detection of combustible gases and vapours in non-classified hazardous areas (non explosion rated environments). They are housed in water / dust tight, corrosion resistant, polycarbonate enclosures with attached stainless steel sensor housing.

AST-CCB-W transmitters provide continuous monitoring with continuous analog signal output, representing the quantitative measurement of the presence of a combustible gas or vapour. The industry standard 4 - 20 mA signal is linear and can be “fed” into a building management system, plc or any generic controller that will accept a 4 - 20 mA analog signal. The controlling device can then be utilized to provide a measure of control and alarm.

Glossary: a) LEL: “Lower Explosive Limit” Lowest concentration of a combustible gas in air that will support combustion when exposed to an ignition source.

b) UEL: “Upper Explosive Limit” A point at which the concentration of combustible gas in air exceeds the maximum concentration that will support combustion.

c) Inhibitors: Substances that produce a temporary loss of pellistor sensitivity.

d) Poisons: Substances that produce a permanent reduction in pellistor sensitivity.

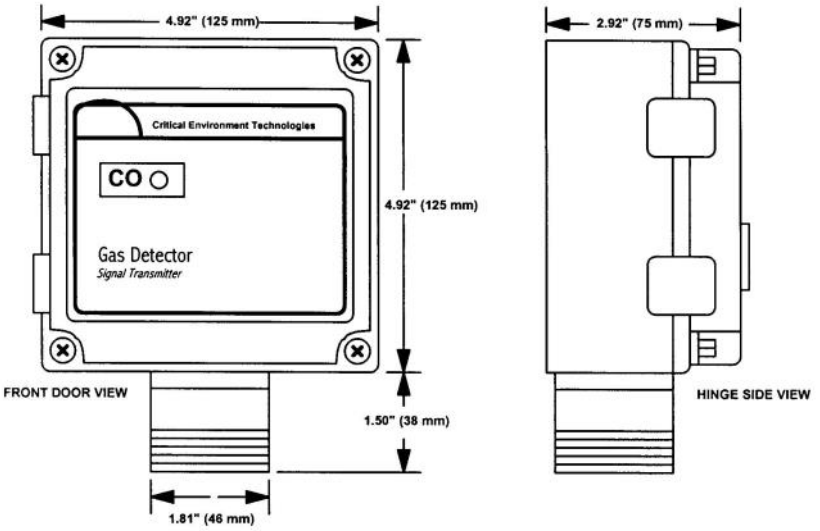
1.1 SENSORS

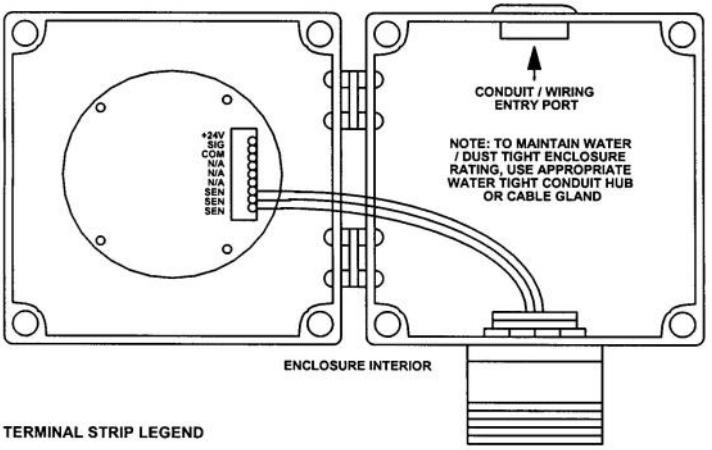
All AST-CCB-W series transmitters utilize poison-resistant, catalytic pellistor sensor elements. Catalytic pellistor sensors are designed to provide extreme accuracy and selectivity to combustible gases and vapours. They are very stable over long periods and require minimal maintenance (two to four times per year calibration).The affect of moderate swings in temperature and humidity are only minimal on these sensors.

2.0 SPECIFICATIONS

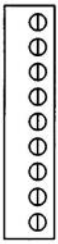
Size:	4.92” X 4.92” X 2.92” (junction box) 125 mm X 125 mm X 75 mm
Weight:	1.72 pounds (780 grams)
Construction:	Junction box: Polycarbonate (water tight) Sensor housing: 316 Stainless steel
Sensors:	Type: Catalytic pellistor (poison resistant) Life span: 3 years “plus” (in clean ambient atmospheres) Calibration frequency: Two to four times per year Range: 0 - 100% LEL of target gas / vapour
Power:	18 to 30 VDC, approximate current draw: 150 mA
Output Signal:	Linear, analog 4 - 20 mA into 1000 ohms @ 24 VDC power
Accuracy:	+/- 1% LEL (dependent upon calibration frequency)
Resolution:	8 Bit DA, 8 Bit AD (better than +/- 0.5% of full scale)
Operating Temperature:	-20 deg. to +40 deg. C.
Humidity:	15 to 99% (non-condensing)
Loop Resistance:	Maximum 1000 Ohms
Bridge Voltage:	Standard 2.0 VDC for poison resistant sensor
Adjustments:	Bridge voltage: For trimming sensor power voltage Null: For setting transmitter “ZERO” point Gain: For setting transmitter for gas accuracy Span: For setting 4 - 20 mA output

3.0 TRANSMITTER ENCLOSURE DRAWING



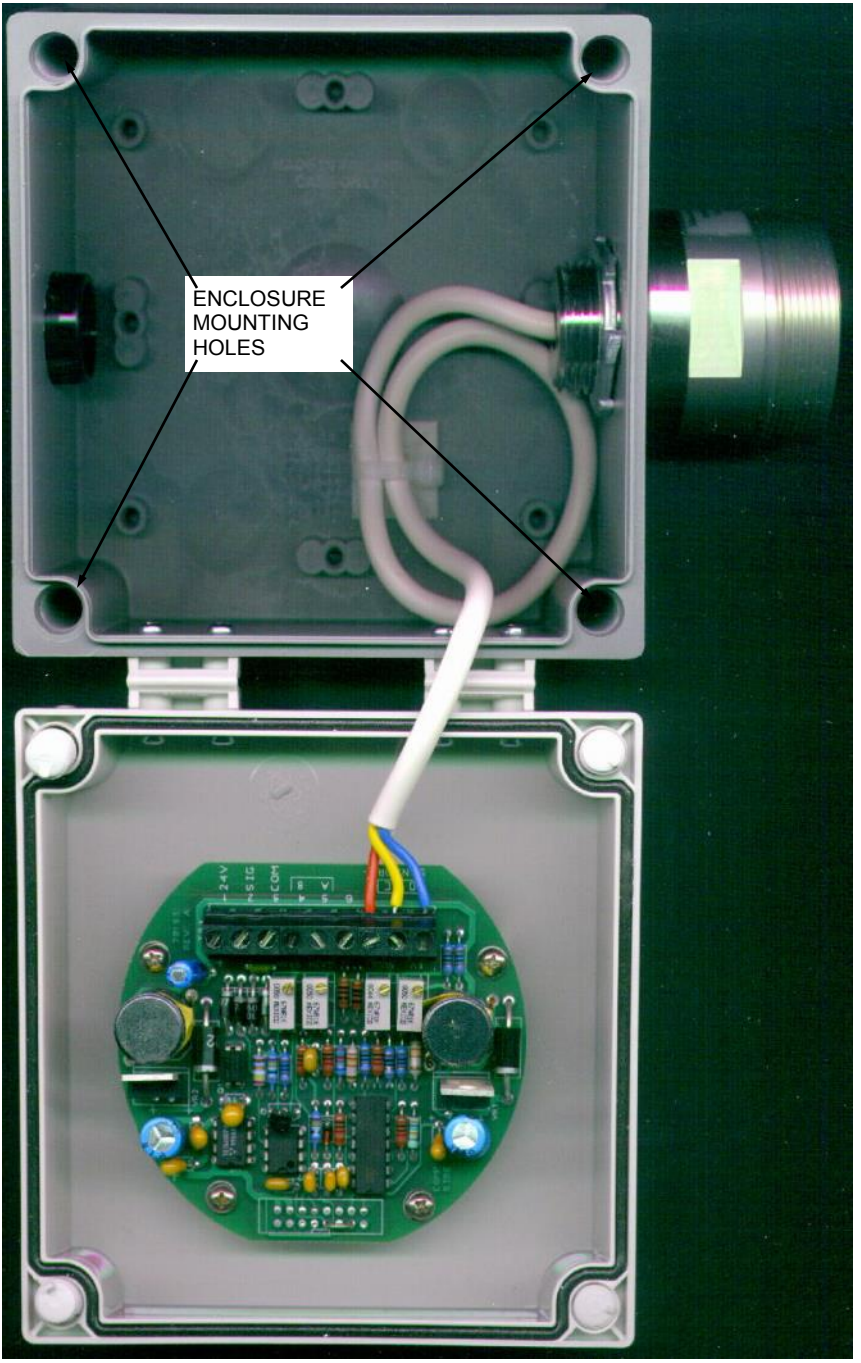


TERMINAL STRIP LEGEND



1 +24V
2 SIG
3 COM
4 NOT USED
5 NOT USED
6 NOT USED
7 INTEGRAL SENSOR WIRING
8 INTEGRAL SENSOR WIRING
9 INTEGRAL SENSOR WIRING

4.0 INTERIOR LAYOUT PHOTO



4.1 TRANSMITTER INSTALLATION INSTRUCTIONS

Four 3/16" diameter mounting holes can be located on the four outer corners of the transmitter enclosure (see photo on previous page). Conduit entry location can be located on the top of the enclosure. The transmitter enclosure should be installed with stainless steel sensor diffusion head pointing downward (vertical position).

Sensor Mounting Heights and Locations (Examples)

Methane (CH4) and Hydrogen (H2) are much lighter than air and so the transmitter should be installed on or near the ceiling.

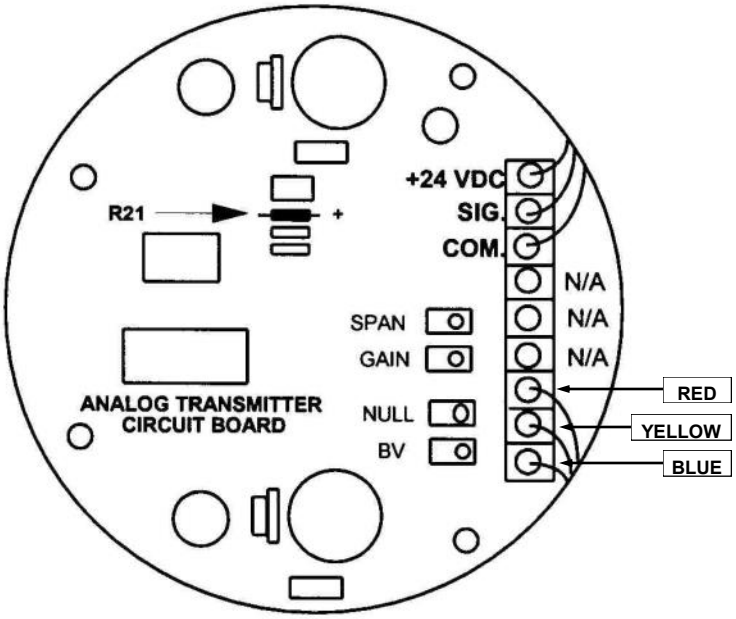
Propane (C3H8) is much heavier than air and so the transmitter should be installed with sensor approximately 6" from the floor.

Always ensure that the sensor / transmitter unit is installed at the right mounting height to easily detect the target combustible gas or vapour.

Attach appropriate conduit to transmitter enclosure and hook-up wiring conductors to terminal block (see drawing on previous page for direction).

Note: Never install sensors in the direct path of moving air, such as exhaust fans, ducts, etc. Moving air can move any target gas away from the sensor. It can also cool the sensor, making it less accurate.

4.2 TRANSMITTER WIRING HOOK-UP DRAWING



4.3 TRANSMITTER WIRING HOOK-UP INSTRUCTIONS

Utilize 18 - 22 gauge, 3-conductor shielded cable, if wiring is not to be installed in the proper conduit. Connections should be made to the top three terminal strip connections. Connect positive wire to no. “1” terminal marked “24V”, signal wire to no. “2” terminal marked ”SIG”, negative wire to no. “3” terminal marked “COM”. Double check connections for correct polarity, prior to powering up transmitter.

Power can be supplied from one of several different control panels manufactured by CETCI, a generic controller manufactured by another company, or a regulated VDC power supply or other such source.

Note: the three terminal locations marked (4, 5 & 6) located directly below terminals 1, 2 & 3, are not to be utilized in the field. They are for in-house use only. **DO NOT CONNECT ANY WIRES TO THESE TERMINAL LOCATIONS.**

5.0 TRANSMITTER OPERATION INSTRUCTIONS

Once power has been connected to the AST-CCB-W transmitter, the signal output may indicate a fail condition at the controlling device, for a brief moment. The sensor output to the circuit then may rise through the transmitter full measurement range, indicating gas alarm conditions on the controlling device. This condition may last for several minutes or more, depending on how long the transmitter has been without power. Once the sensor has reached peak operating temperature and stabilized, the output signal will automatically settle down to normal operating condition (approximately 4.00 mA signal output in clean air).

A powered up sensor / transmitter in normal operating condition will have a linear analog signal output of approximately “4.00 mA”. Once a combustible gas or vapour has been detected, the signal will rise through the detection range of 4 to 20 mA. Eg. a concentration of 50% LEL will output 12.0 mA.

6.0 TRANSMITTER MAINTENANCE INSTRUCTIONS

All sensor / transmitters should be inspected on site after installation to ensure that it (they) have been installed and connected properly. All sensor / transmitters are factory calibrated, twice, prior to shipping, but an on-site gas test serves to confirm accuracy of zero and span settings, in case they have been tampered with. Regular maintenance is minimal and consists of two to four times per year on-site gas calibration (application dependent).

6.1 CALIBRATION PROCEDURE

IMPORTANT: Ensure sensor / transmitter has been powered up for at least 2 to 6 hours prior to performing any calibration procedure.

Equipment Required:
* Calibration adapter for explosion-proof head
* Precision digital multi-meter with “clip-on” leads
* Small blade screwdriver (to adjust potentiometers)
* Calibration kit with appropriate cylinders of zero emis sions air and calibration span gas

Procedure: **a)** Attach “clip-on” leads of digital multi-meter across resistor “R21” as indicated in the drawing in section 4.2 (previous page), observing polarity. Set meter to VDC scale “.000” (millivolts mV).

6.1 CALIBRATION PROCEDURE CONT'D.....

b) Calculate the desired voltage reading to be expected from the transmitter from the following:

$$\frac{\text{(Cal. Gas Concentration X 0.4)}}{\text{Sensor Range (100\%)}} + 0.100 = \text{Desired mV Signal}$$

Eg. Calibration (Cal.) gas concentration = 50% LEL CH4
(50 X 0.4 + 0.100) / 100 = **0.300 VDC (300 mV)**

c) Insert plastic calibration flow adapter and apply zero emissions air or Oxygen to sensor for approximately 2 minutes. Adjust "NULL" potentiometer to obtain a reading of "0.100" VDC (100 mV). in clean air.

d) Apply calibration span gas for approximately 2 minutes. Adjust "GAIN" potentiometer to obtain a reading equal to the target voltage as calculated in "b)". Remove span gas and allow sensor to recover for at least 10 minutes.

e) Circuit design allows some interaction between NULL and GAIN adjustments. Repeat NULL procedure if transmitter does not recover to a reading of "0.100" VDC (100 mV). If more than 2 turns of the NULL potentiometer are required to obtain desired reading, gas flow and GAIN adjust procedure must be repeated.

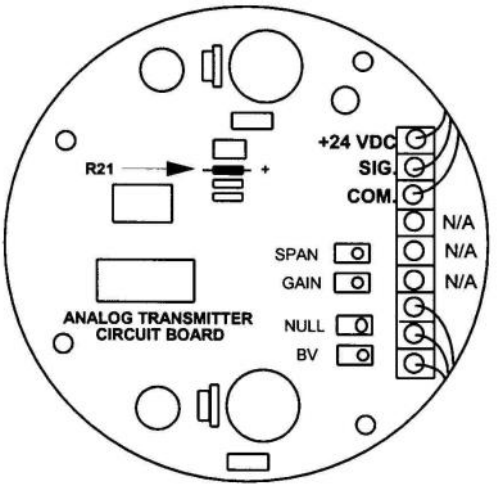
f) Calibration procedure is complete. Remove regulator from gas cylinder for storage.

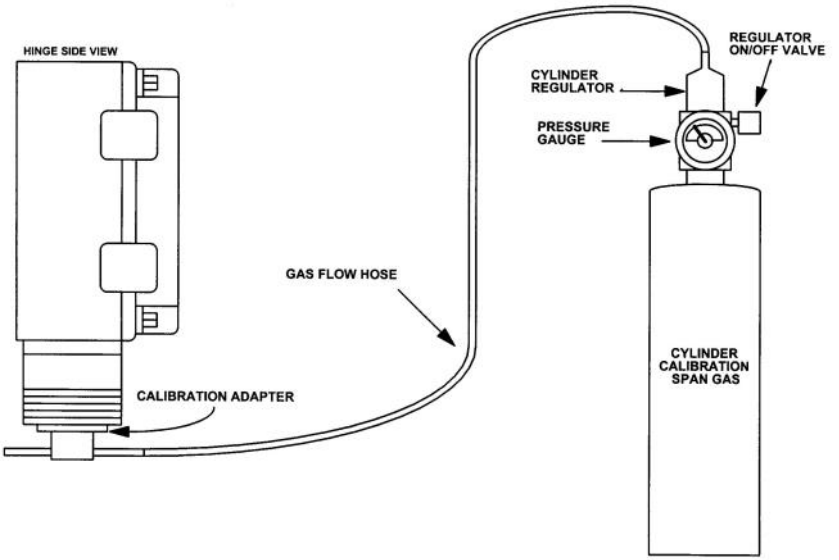
NOTE-1 : When adjusting "NULL" potentiometer, set reading such that meter display just flips over to "0.100" VDC (100 mV) from "0.099" VDC (99 mV).

NOTE-2: When adjusting "GAIN" potentiometer, set reading such that meter display just flips over into desired reading. Eg. flowing 50% LEL = reading of "0.300" VDC (300 mV) and it should have just flip over from "0.029" VDC (29 mV).

NOTE-3: When a pellistor sensor head has been calibrated with Methane (CH4) and it is being utilized in an area where another hydrocarbon is present, a more accurate reading of the new target gas can be obtained by multiplying a theoretical response ratio by the indication obtained from the Methane calibrated head. This derived value should only be utilized as an indication. For more accurate readings of gases other than Methane, calibrate the pellistor sensor with the desired target gas. For more information, contact our sales and marketing department.

6.2 CALIBRATION SET UP DRAWING





6.3 SENSOR REPLACEMENT INSTRUCTIONS

To replace a sensor head, first disconnect the power to the transmitter. Loosen terminal strip screws no. “7, 8 & 9” and remove the existing sensor head wires, carefully noting the colour code sequence (see drawing in section 4.2). Carefully unthread the stainless steel sensor head and remove it.

Apply a very small bead of thread protection compound to the first thread of the new sensor head (do not use silicone based compounds) and thread it into place. Ensure that a minimum of eight threads are making contact with the cast aluminum enclosure. Use a wrench to “snug up” the new sensor head (careful not to over tighten).

Re-attach the three sensor wires, noting the colour code sequence. Power up the transmitter and allow it to stabilize for approximately 2 to 6 hours before attempting to perform a calibration procedure.

NOTE-1: All new sensors must be calibrated prior to usage. See section “6.1” of this manual preceding pages, for details.

NOTE-2: Ensure hands are clean prior to handling sensor head diffusion end to avoid contamination of pellistor sensor elements.

NOTE-3: Some substances that can cause temporary loss of sensitivity or permanent poisoning to pellistor sensors are: H2S, Silicone compounds, Chlorine, Chlorinated Hydrocarbons, Phosphate esters, Tetra-ethyl lead and most Halogenated compounds.

NOTE-4: Some common sources of contamination include silicone oils and greases on joints and cases, residues of cutting fluids or mould-release compounds on metal or plastic components, furniture polish, degreasing compounds and some paints.

7.0 REPLACEMENT PARTS & ACCESSORIES

DESCRIPTION	PART NUMBER
Calibration adapter (plastic)	SEE-1000-CA
Transmitter circuit board	SEE-1000-TCB
Replacement stainless sensor head (threaded end)	SEE-1000-SE2
Replacement stainless sensor head (non-threaded end)	SEE-1000-SE1
Splash guard (stainless steel)	SEE-1000-SG
Flow through attachment	SEE-1000-FA
Gas collector cone	SEE-1000-CC

8.0 ACCESSORIES

Calibration adapter: Plastic, friction fit with molded inlet and outlet fittings for gas flow hose attachment.

Splash guard: Stainless steel, thread-on attachment to prevent pellistor damage from splashed liquids.

Flow through attachment: Stainless steel, thread-on attachment used for directing a sample of air / gas to sensor for sample draw applications.

Gas collector cone: Metal, thread-on attachment for collecting lighter-than-air gases and directing them to the diffusion sensor head for quicker response.

SPLASH GUARD

8.0 ACCESSORIES CONT'D.....

FLOW THROUGH ATTACHMENT

NOTE: All accessories shown on these two pages are shown as being attached to the stainless steel, pellistor sensor head.

GAS COLLECTOR CONE

NOTES: