

***Critical Environment Technologies  
Canada Inc.***

*www.critical-environment.com*

**Installation Manual for  
*AST-IS8 \* AST-IS9***

**Infrared CO2 / Temperature sensor / transmitter with  
Industrial enclosures duct mount**



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## **AST-IS8 (no display)**

## **AST-IS9 (c/w LCD display)**

Infrared Carbon Dioxide (CO<sub>2</sub>) sensor/transmitters with integral temperature sensor, LCD digital display (model AST-IS9) and without digital display (model AST-IS8), all mounted in an industrial duct mount, water tight enclosure. The enclosure cover has a built-in rubber gasket and all other connections must be tight and sealed to prevent water intrusion. Improper installation resulting in damage is not covered under warranty.

<b>TERMINAL</b>	<b>DEFAULT OUTPUT</b>	<b>DEFAULT OUTPUT RANGE</b>	<b>OUTPUTS OF THIS SENSOR</b>	<b>OUTPUT RANGE OF THIS SENSOR</b>
OUT-1	0-10 VDC	0 - 2000 ppm CO <sub>2</sub>		
OUT-2	0-10 VDC	0 - 50 deg. C.		

Table I. Default output configurations for AST-IS8 & AST-IS9

<b>CONFIGURATION</b>	<b>OUTPUT RANGE</b>	<b>FORMULA FOR CALCULATION</b>
0-10 VDC	0-2000 ppm 0-50 deg. C	CO <sub>2</sub> value = Volt / 10 * 2000 Temperature value in C = Volt / 10 * 50
2-10 VDC	0-2000 ppm 0-50 deg. C.	CO <sub>2</sub> value = (volt - 2) / 8 * 2000 Temperature value in C = (volt - 2) / 8 * 50
4-20 mA	0-2000 ppm CO <sub>2</sub> 0-50 deg. C.	CO <sub>2</sub> value = (mA-4) * 2000 / 16 Temperature value in C = (mA-4) * 50 / 16
a - b	c - d	Value = (reading-a) / (b-a) * (d-c) + c
		a = lowest value of the configuration b = highest value of the configuration c = lowest value of the range d = highest value of the range

Table II. Calculation of CO<sub>2</sub> value & temperature value for the AST-IS8 & AST-IS9

### **OUTPUT CONFIGURATIONS**

The sensors are supplied from the factory (unless otherwise ordered) with 0-10VDC linear outputs for OUT-1 and OUT-2 (see table-1) if they are ordered as independent transmitters (no controller). If they are ordered from our factory with one of our controllers, OUT-1 and OUT-2 are set to 4-20 mA. If other options are needed for the application, the output jumpers have to be configured before the unit is powered up. Each jumper selection is independent from the others, except for the "start point selection" jumper, which affects both OUT-1 and OUT-2, linear outputs. Alternative measuring ranges of the outputs can be selected with the UIP software (version 4.3 or later).

JUMPER	POSITION	FUNCTION
Start point selection jumper	0%	-Jumper top position provides 0VDC or 0mA start point for OUT-1, OUT-2 (0-20 mA or 0-10V)
	20%	-Jumper bottom position provides 2VDC or 4mA start point for OUT-1, OUT-2 (4-20 mA or 2-10V).
OUT-1	Current	-Connection in position "Current" provides 0/4-20 mA output range for OUT-1
	Voltage	-Connection in position "Voltage" provides 0/2-10VDC output range for OUT-1
OUT-2	Current	-Connection in position "Current" provides 0/4-20 mA output range for OUT-1
	Voltage	-Connection in position "Voltage" provides 0/2-10VDC output range for OUT-1

Table III. Configuration jumpers for AST-IS8 & AST-IS9

## SELF DIAGNOSTICS

The transmitters contain complete self-diagnostics procedures. A full unit test is executed automatically every time the power is turned on. In addition, constantly during operation, the sensor probes are checked against failure by checking the valid dynamic measurement ranges. All EEPROM updates, initiated by the sensor itself, as well as by external connections are checked by subsequent memory read back and data comparisons. Three different circuit checks return error bytes to the system RAM. The error codes are available by connecting a pc with a special RS232 cable connected to the UART port slide connector. The error codes are shown in the software UIP (version 4.3 or later). *Warm up* and *Out of range* are the only bits that are reset automatically after return to normal state. All other error bits have to be reset manually after return to normal by power off/on.

The yellow LED flashes if an error has been detected. If a fatal error has been detected the yellow LED is lit.

See next page for the error code listing.

## Error Codes and Action Plan

Bit #	Error Code	Error Description	Suggested Action
0	N/A	<b>Fatal Error</b>	Try to restart sensor by power OFF/ON. Contact local supplier.
1	2	<b>Reserved</b>	
2	4	<b>Algorithm Error</b> Indicate wrong EEPROM configuration.	Try to restart sensor by power OFF/ON. Check detailed settings and configuration with UIP software version 4.3 or higher. Contact local supplier.
3	8	<b>Output Error</b> Detected errors during output signals calculation and generation	Check connections and loads of outputs. Check detailed status of outputs with UIP software version 4.3 or higher.
4	16	<b>Self Diagnostic Error</b> Accompanies most of the other errors. Can also indicate overload or failures of sensors and inputs.	Check detailed self diagnostics status with UIP software version 4.3 or higher. Contact local supplier.
5	32	<b>Out of Range Error</b> Accompanies most of the other errors. Can also indicate overload or failures of sensors and inputs. Resets automatically after source of error disappearance.	Try sensor in fresh air. Check connections of temperature probe. Check detailed status of measurements with UIP software version 4.3 or higher.  See Note-1 below
6	64	<b>Memory Error</b> Non fatal error during memory operations.	Check detailed settings and configuration with UIP software version 4.3 or higher.
7	128	<b>Warm Up State</b> Is always set after power up or power failures. Resets after restart sequence.	If it doesn't appear in half a minute, check power stability.

Note-1: Any probe is out of range. Occurs, for instance, during over exposure of CO2 sensor, in which case the error code will automatically reset when the measurement values return to normal. Could also indicate the need for a zero point calibration. If the CO2 readings are normal and still the error code remains, the temperature sensor could be defective or the connections to it are broken.

Remark: If several errors are detected at the same time the different error code numbers will be added together into one single error code!

**Please Note: Sensor accuracy is defined at continuous operation (at least three weeks after installation)**

### **MAINTENANCE**

AST-IS8 and AST-IS9 are basically maintenance free. An internal self adjusting calibration function takes care of normal long term drift associated with the CO2 sensor. To secure the highest accuracy, a time interval of five years is recommended between CO2 calibrations unless some special situations have occurred. A zero calibration can be performed by use of pure nitrogen or that has passed through a chemical absorber and a PC together with the UIP software version 4.3 or higher. The service bag can be used to produce CO2 free air. The software can be sourced from your local supplier. The RS-232-cable (P/N A232-05-07) and zero calibration bag can be ordered from your local supplier. The cable is to be connected to the UART port slide connector (see Fig-5). For change of control parameters and re-calibration (CO2 and temperature sensors) this PC tool has to be used. The check can be done on site without interfering with the ventilation system.

This is for sensors with measuring ranges between 0-3000 ppm and 0-4%:

When a zero calibration shall be executed a plastic tube with 2.2 mm outer diameter and 0.8 mm inner diameter shall be inserted in marked holes of the sensor. Plastic tubing is connected to the tube. The gas flow should be between 0.3 and 1.01 LPM.

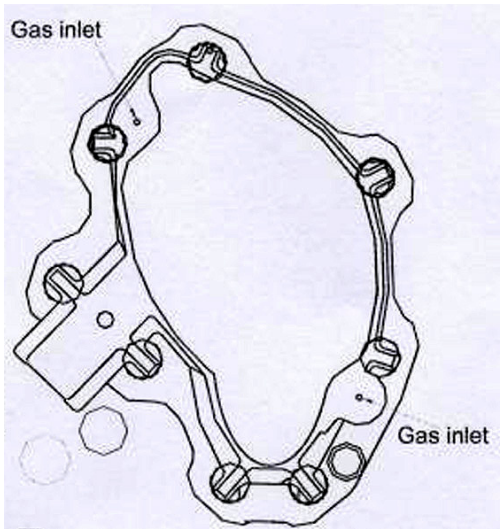
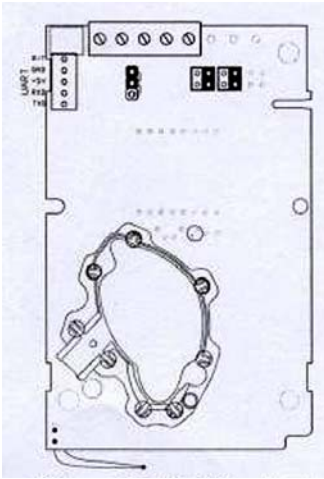


Figure-1 Part of the PCB with holes for gas inlets marked

### **DUCT MOUNTING**

If for some reason the printed circuit board (PCB) needs to be removed, special precaution must be taken in order not to damage the temperature probe in the sampling tube. When putting the PCB backing the protective housing, the probe must be gently positioned in the sampling tube.



AST-IS8 & AST-IS9 pcb with CO2 sensor for measuring lower ppm ranges with long temperature sensor are for duct mounting

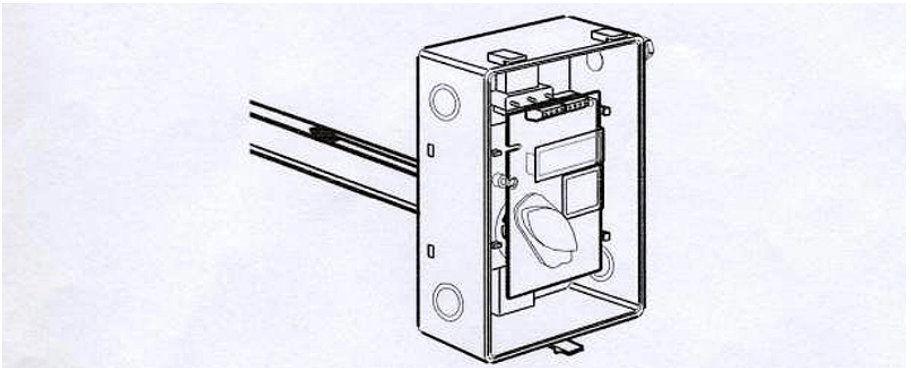


Figure 4 The AST-IS8 and AST-IS9 for duct mounting. The temperature probe is the black body in the sampling tube.

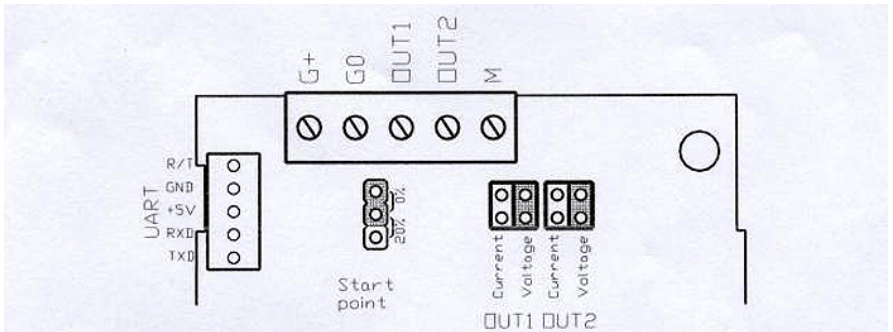


Figure 5 Terminals and jumpers on the AST-IS8 & AST-IS9. The darker positions are default settings. The start point jumper is not mounted on some models.

## **WARRANTY and LIMITATION OF LIABILITY**

1. Critical Environment Technologies Canada Inc. (CETCI) warrants that for a period of 2-years following receipt by the buyer of the product supplied by CETCI will be, under normal use and care, free from defects in workmanship or material and to be in material conformity with CETCI's specifications. Units returned to CETCI for warranty repair shall be shipped to CETCI, at buyer's expense, according to CETCI's instruction (obtain an RMA number from CETCI). Within 90-days of the receipt of product, CETCI shall replace or repair such units and shall ship them to Buyer's designated return destination freight prepaid.

2. Warranty Limitations. This warranty does not extend to any unit that has been subject to misuse, neglect or accident; that has been damaged by causes external to the unit; that has been used in violation of CETCI's instructions; that has been affixed to any non-standard accessory attachment; or that has been modified, disassembled, or reassembled by anyone other than acetic.

3. The seller is not responsible for any consequential loss or damage, which may occur by reason of purchase and use of this product. The warranty is, in any event, strictly limited to the replacement/repair of the product.