USER GUIDE FOR THE
COMMERCIAL CARBON DIOXIDE SENSOR, 400 PPM TO 2000 PPM (UP TO 5000 PPM EXTENDED RANGE), CRIR E1

TABLE OF CONTENTS

1.0   GENERAL INFORMATION

The CRIR E1 Commercial Carbon Dioxide (CO_2) sensor is a single channel, non-dispersive infrared (NDIR) sensor. Within the CRIR E1 is a sensing chamber with an infrared source at one end and a detector fitted with an optical filter at the other end. The source emits radiation at wavelengths which include the absorption band of CO_2. The filter blocks wavelengths which are not sensitive to the presence of CO_2, thereby increasing selectivity and sensitivity. As the light passes through the sensing chamber, a fraction is absorbed if CO_2 is present. The difference between the light emitted by the source and received by the detector can then be converted to a CO_2 concentration reading. The Automatic Baseline Correction (ABC) function can automatically calibrate the sensor's lowest reading over a pre-configured interval to 400 ppm CO_2. This enhances long term stability and may eliminate the need for calibration.

See Tables 1 and 2, and Figures 1 and 2 for specifications and mounting and dimensional diagrams.

TABLE 1. SPECIFICATIONS	
CHARACTERISTIC	**PARAMETER**
Target gas	carbon dioxide (CO_2)
Operating principle	non-dispersive infrared (NDIR)
Standard range[1, 2]	400 ppm to 2000 ppm, up to 5000 ppm extended range
Measurement interval	4 s
Accuracy[3]	±50 ppm ±5% of reading
Typical response time (T_{90})	≤120 s
Sensor warm-up time	3 minimum typical
Repeatability	>97%
Operating voltage	4.5 V to 5.5 V unprotected against surges and reverse connection
Power consumption	300 mA peak, 30 mA average
Alarm output, open collector	1000 ppm/800 ppm normal state is conducting maximum 100 mA. Transistor open at CO_2 high or at sensor failure (see Figure 1).
Serial communication[5]	UART, Modbus protocol
Operating temperature range	0°C to 50°C
Storage temperature range	–40°C to 70°C
Operating humidity	0 %RH to 90 %RH non-condensed
Expected operating life	10 years
Maintenance[6]	maintenance-free for normal indoor applications
Weight	<8 g
Dimensions	33 mm x 22 mm X 11,2 mm (tolerance ±0,5 mm)

[1] The CRIR E1 is designed to measure CO_2 in the range of 400 ppm to 2000 ppm with the accuracy specified in Table 1; however, exposure to concentrations below 400 ppm may result in incorrect operation of the ABC algorithm and should be avoided when the ABC is ON.

[2] The CRIR E1 provides readings via UART in the extended range; however, the accuracy is reduced.

[3] In normal IAQ applications, the sensor accuracy is defined after a minimum of three ABC periods of continuous operation.

[4] The sensor accuracy is specified over the operating temperature range and referenced to certified calibration mixtures. Uncertainty of calibration gas mixtures (±1% currently) is to be added to the specified accuracy for absolute measurements.

[5] See Sections 7.0 and 8.0 for Modbus address and parameter definitions.

[6] The CRIR E1 normally does not require maintenance in IAQ applications; however, for some industrial applications, maintenance may be required.

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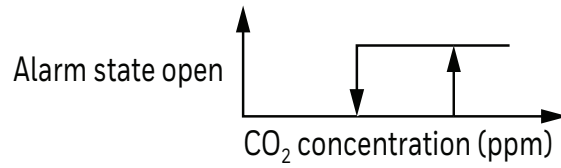**FIGURE 1. ALARM STATE DIAGRAM**

Alarm state open

CO_2 concentration (ppm)

FIGURE 2. MOUNTING DIMENSIONS (FOR REFERENCE ONLY: MM)

Center of gas inlet holes.

Label
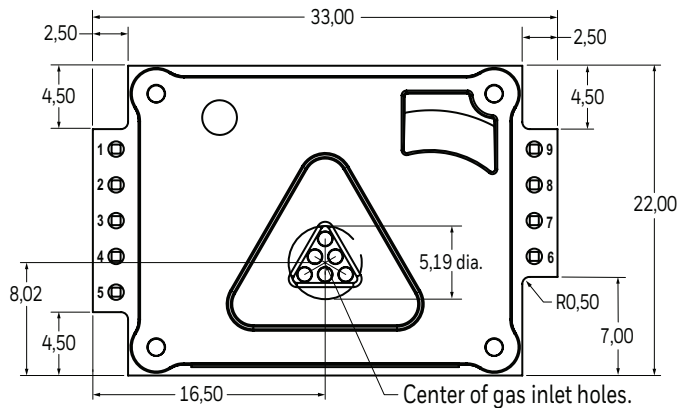
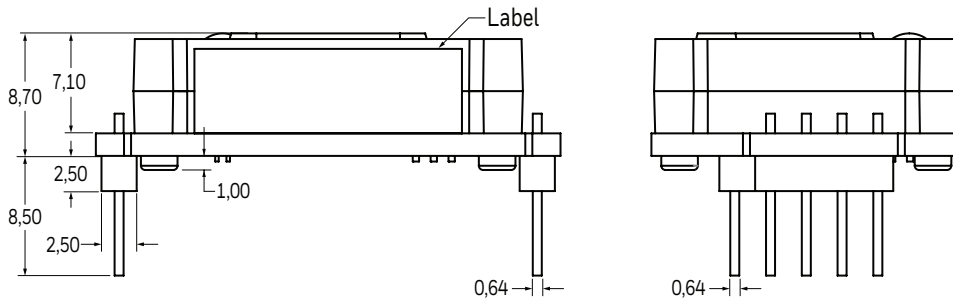| TABLE 2. PINOUT	
PIN NUMBER	**FUNCTION**
1	DAC
2	UART_RXD
3	UART_TXD
4	UART_R/T
5	bCAL_in/CAL_in
6	PWM output
7	Alarm output
8	GND
9	Vin_(4.5 V to 5.5 V)
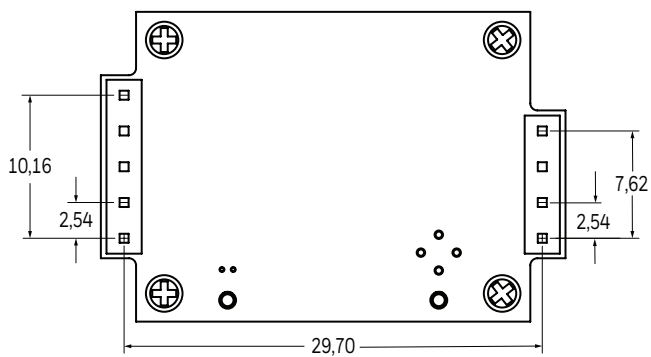
2.0 SENSOR HANDLING

CAUTION
IMPROPER SENSOR HANDLING

- The CRIR E1 is an electrostatic-sensitive device (ESD). Handle the CRIR E1 using appropriate ESD methods such as electrostatic dissipative gloves, wrist straps, etc.
- Handle the CRIR E1 by the black PCB on the edges as shown in Figure 1.
- Ensure that the gas diffusion area shown in Figure 1 is not blocked or contaminated.
- Ensure that force is not applied to the CRIR E1's optical chamber,
- Ensure that the CRIR E1 is not subject to drops and vibration.

Failure to comply with these instructions may result in product damage.

FIGURE 1. CRIR E1 APPEARANCE

PCB (black)

PTFE membrane (white) allows gas to diffuse in the sensor

Optical chamber (silver)
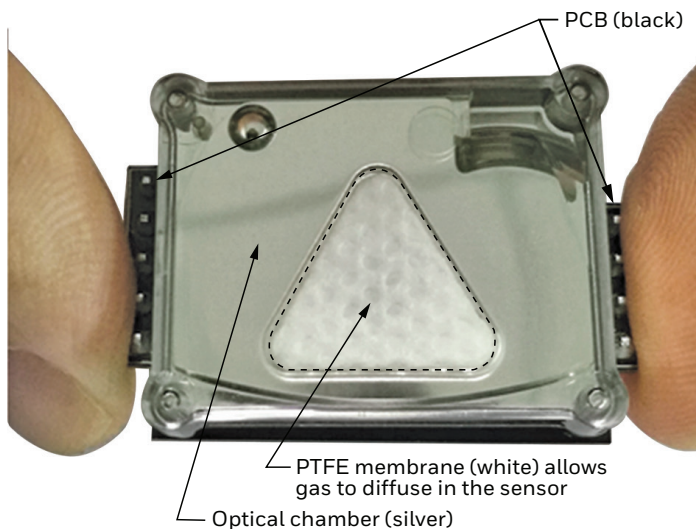
CAUTION
EXPOSURE TO HARMFUL GASES

Ensure that the CRIR E1 does not come into contact with the following harmful gases:
- **Acidic:** Includes HCl, HF, H_2S, SO_2, NOx, etc.
- **Basic:** Includes NH_3, PH_3, N_2H_4, etc.
- **Strong oxidizing:** Includes Cl_2, F_2, O_3, H_2O_2, etc.

Failure to comply with these instructions may result in product damage.

NOTICE

To extend the CRIR E1's lifetime, ensure that it does not come into contact with salt spray, oil mist, soot, and high humidity.

3.0 AUTOMATIC BASELINE CORRECTION (ABC)

The CRIR E1's built-in, self-correcting ABC algorithm allows maintenance-free operation in normal indoor environments. This algorithm automatically calibrates the sensor's lowest reading over a preconfigured time interval to 400 ppm CO_2, the expected CO_2 concentration in fresh air, thus compensating for sensor drift.

Table 3 shows the ABC period specifications. Please refer to Section 8.0 Modbus Function Description for setting the ABC period.

TABLE 3. ABC PERIOD SPECIFICATION	
CHARACTERISTIC	**PARAMETER**
ABC periods[1]	4 hr to 4800 hr (default is 180 hr)

[1] ABC periods can be configured per the user's requirements. The available range is four hr to 4800 hr, and it must be the integer multiple of four.

One ABC period (*n* hours) requires the completion of *n*/4 intervals of four hours of operation per interval. The CRIR E1, however, does not necessarily need to operate continuously for *n* hours to activate the ABC function. The CRIR E1 counts the number (*m*) of completion of four hour intervals. If *m* reaches *n*/4, the ABC function is activated. For each four hour interval, however, the CRIR E1 must operate continuously, otherwise its contribution to *m* is not counted.

For example, if the sensor powers off after six hours of operation, the first four hours of operation is counted as the completion of one four hour interval, which is added to *m* and stored in the sensor memory. The remaining two hours of operation, however, do not count because the four hour requirement is not met. Therefore, they are not recorded after the power off. To complete the next four hour interval, the CRIR E1 must be powered on and operate continuously for another four hours.

NOTICE

Exposing the CRIR E1 to CO_2 concentrations below 400 ppm may result in incorrect operation of the ABC algorithm and shall be avoided when the ABC function is ON. For how to switch the ABC function on/off, refer to Section 8 Modbus Function Description.

4.0 TERMINATION

Table 4 specifies the pins and I/O options dedicated to the CRIR E1.

TABLE 4. TERMINATION (VDD = 3.3 V NOMINAL)			
PIN NUMBER	**PIN FUNCTION**	**DESCRIPTION**	**ELECTRONIC SPECIFICATION**
		Power Pins	
8	GND	power supply minus terminal sensor's reference (ground) terminal	— —
9	Vin	power supply plus terminal	unprotected against reverse connection
		operation voltage range	4.5 V to 5.5 V
		Communication Pins	
2	UART_RxD	UART data receive line configured as digital output	no internal protection pulled up to VDD at processor reset (power up and power down)
		absolute maximum voltage range[1]	GND to VDD + 0.5 V
		internal pull up to VDD resistor	120 k
		input low level[1]	GND to 0.75 V
		input high level[1]	2.3 V to VDD + 0.3 V
3	UART_TxD	UART data transmission line configured as digital output	no internal protection, pulled up to VDD at processor reset (power up and power down)
		absolute maximum voltage range[1]	GND to VDD + 0.5 V
		internal pull up to VDD resistor	120 k
		output low level[1]	0.4 VDC maximum at 8 mA sink
		output high level[1]	2.4 VDC minimum at 8 mA source
4	UART_R/T	direction control line for half duplex, RS485 transceiver like MAX 485 configured as digital output	no internal protection, pulled down at processor reset (power up and power down)
		absolute maximum voltage range[1]	GND to VDD + 0.5 V
		internal pull down to GND resistor	120 k
		output low level[1]	0.4 VDC maximum at 8 mA sink
		output high level[1]	2.4 VDC minimum at 8 mA source
		Input/Output Pins	
1	DAC	DAC output configured as analog output used for direct reading by customer's microcontroller or to provide analog output	no internal protection, pulled down at processor reset (power up and power down)
		normal concentration range	400 ppm to 2000 ppm
		normal voltage range	0.72 V - 0.05 V to 2 V - 0.1 V
		relationship between output voltage (V) and CO_2 concentration (ppm)	$V(output) = 0.4 + 0.0008 \times C(CO_2)$
		output accuracy	±20 mV

[1]The specified parameter relies on the subcontractor's specification and is not tested by Honeywell.

PIN NUMBER	PIN FUNCTION	DESCRIPTION	ELECTRONIC SPECIFICATION
5	bCAL_in /CAL	digital input forcing background or zero calibration **background calibration:** when closed for minimum 4 s, maximum 8 s, bCAL (background calibration) assuming 400 ppm CO_2 exposure. **zero calibration:** when closed for minimum 16 s CAL (zero calibration) assuming 0 ppm CO_2 exposure.	no internal protection, pulled up to VDD[2] at processor reset (power up and power down)
		absolute maximum voltage range[1]	GND to VDD + 0.5 V
		internal pull down to GND resistor	120 k
		input low level[1]	GND to 0.75 V
		input high level[1]	2.3 V to VDD + 0.3 V
6	PWM	PWM output configured as digital output used for direct reading by customer's microcontroller or to provide analog output.	no internal protection, pulled down at processor reset (power up and power down)
		normal concentration range	400 ppm to 2000 ppm
		PWM cycle time	1004 ms ± 5%
		beginning of each cycle	high level output, 2 ms
		end of each cycle	low level output, 2 ms
		relationship between CO_2 concentration (ppm) and PWM output	$C(CO_2) = 2000 \times (T_H-2) / (T_H+T_L-4)$ T_H: time (ms) of high level output in a cycle T_L: time (ms) of low level output in a cycle
		PWM resolution	0.5 ms ± 4%
		absolute maximum voltage range[1]	GND to VDD + 0.5 V
		internal pull down to GND resistor	120 k
		output low level[1]	0.4 VDC maximum at 8 mA sink
		output high level[1]	2.4 VDC minimum at 8 mA source
7	Alarm_OC	open collector output for alarm indication	no internal protection, pulled up to G+ at processor reset (power up and power down)
		absolute maximum voltage range[1]	GND to 5 V + 0.5 V
		internal pull up to G+ resistor	10 k
		maximum sink current[1]	100 mA
		saturation voltage[1]	2.3 V to Vin + 0.3 V

[1]The specified parameter relies on the subcontractor's specification and is not tested by Honeywell.

5.0 CALIBRATION

With the ABC function on, the sensor readings, which may have drifted due to mishandling during transportation and/or installation, may gradually be recalibrated to the correct numbers. However, in case the user cannot wait for several cycles of ABC to run, the two quick manual calibrations given in 5.1 and 5.2 may be performed.

5.1 CAL_in Pin Calibration

Two CAL_in Pin calibration types are offered:

- **bCAL (background calibration):** Requires the sensor to be exposed to fresh air (400 ppm CO_2).
- **CAL (zero calibration):** Requires the sensor cell to be completely immersed in a CO_2-free atmosphere.

A switch input is defined for the operator or master system to select one of the two prepared calibration codes shown in Table 5. It is recommended that the sensor be exposed to the targeted gas atmosphere for at least 10 minutes to ensure the CO_2 concentration inside the sensor chamber is stable at the targeted value.

TABLE 5. DEFAULT SETTINGS OF BCAL_IN AND CAL_IN	
INPUT	**DEFAULT FUNCTION**
bCAL_in	available when closed for minimum 4 s, maximum 8 s; bCAL assuming 400 ppm CO_2 sensor exposure
CAL_in	available when closed for minimum 16 s; CAL assuming 0 ppm CO_2 sensor exposure

5.2 Modbus Calibration

Two Modbus calibration types are offered:

- **Background calibration:** Requires the sensor to be exposed to fresh air (400 ppm CO_2).
- **Second point calibration:** Requires the sensor to be exposed to a certain atmosphere with a steady CO_2 concentration other than 400 ppm, and that this CO_2 concentration should be informed via Modbus communication to the sensor.

For more details about the Modbus address and parameters configuration for user calibration, refer to Section 8.0 Modbus Function Description.

6.0 SELF-DIAGNOSTICS

The CRIR E1 has the following built-in, self-diagnostic functions:

- A full system check that runs automatically every time the power is turned on.
- The sensor probes are checked against failure constantly during operation by checking the valid dynamic measurement ranges.
- All flash updates, initiated by the sensor itself or by external connections, are checked by subsequent memory read back and data comparisons.

These system checks return error bytes to the system RAM. The full error codes are available from the UART port communication. The Out of Range error is reset automatically after the CO_2 readings return to the normal measuring range. The Memory error can be reset by power off/on. After the reset of the Memory error, it is recommended to check the settings stored in the memory to ensure they are the desired values.

7.0 MODBUS REGISTER DEFINITION

7.1 Input Registers Definition (See Table 6.)

7.2 Holding Registers Definition (See Table 7.)

TABLE 6. INPUT REGISTERS DEFINITION			
IR#	**#**	**NAME**	**DESCRIPTION**
IR1	0	–	Reserved
IR2	1	–	Reserved
IR3	2	–	Reserved
IR4	3	–	Reserved
IR5	4	Temperature	Detector Temperature
IR6	5	Meter Status	DI 1 – reserved[1] DI 2 – reserved[1] DI 3 – reserved[1] DI 4 – reserved[1] DI 5 – reserved[1] DI 6 – Out of Range DI 7 – Memory error DI 8 – Reserved[1]
IR7	6	Output Status	DI 1 – Alarm Output status (inverted due to Open Collector) DI 2 – PWM Output status (1 means full output)
IR8	7	Space CO_2	Space CO_2
IR9	8	PWM Output[2]	PWM Output[2]
IR10	9	Sensor Type ID High[3]	Sensor Type ID High[3]
IR11	10	Sensor Type ID Low[3]	Sensor Type ID Low[3]
IR12	11	Memory Map version	Memory Map version
IR13	12	FW version Main.Sub[4]	FW version Main.Sub[4]
IR14	13	Sensor ID High[5]	Sensor ID high[5]
IR15	14	Sensor ID Low[5]	Sensor ID low[5]
IR16	15	Serial Num.1	Serial Num.1, corresponding to the ASCII red 2-digit code. Default: ASCII 000-0000-000
IR17	16	Serial Num.2	Serial Num.2, corresponding to the ASCII red 2-digit code. default: ASCII 000-0000-000
IR18	17	Serial Num.3	Serial Num.3, corresponding to the ASCII red 2-digit code. Default: ASCII 000-0000-000
IR19	18	Serial Num.4	Serial Num.4, Corresponding to the ASCII red 2-digit code. Default: ASCII 000-0000-000
IR20	19	Serial Num.5	Serial Num.5, Corresponding to the ASCII red 2-digit code. Default: ASCII 000-0000-000
IR21	20	–	Reserved
IR22	21	–	Reserved
IR23	22	–	Reserved
IR24	23	–	Reserved
IR25	24	–	Reserved
IR26	25	–	Reserved
IR27	26	–	Reserved
IR28	27	–	Reserved
IR29	28	–	Reserved
IR30	29	–	Reserved
IR31	30	–	Reserved
IR32	31	–	Reserved

[1] Reserved DIs returns 0.

[2] 0x3FFF represents 100% output, i.e. 2000 ppm CO_2.

[3] IR10 low byte + IR11 contains Sensor Type ID 3-bytes value.

[4] IR13 high byte is FW Main revision, low byte – FW Sub revision.

[5] IR14 + IR15– 4-bytes sensor's serial number.

TABLE 7. HOLDING REGISTERS DEFINITION

HR#	#	NAME	DESCRIPTION
HR1	0	–	Reserved
HR2	1	–	Reserved
HR3	2	–	Reserved
HR4	3	–	Reserved
HR5	4	ABC Period	ABC period in hours[1], default: 180 hr
HR6	5	User Acknowledgement Register	CI 1 - CO_2 random calibration point has been performed 0X0000 CI 2 - Reserved[2] CI 3 - Reserved[2] CI 4 - Reserved[2] CI 5 - Reserved[2] CI 6 - Reserved[2] CI 7 - Reserved[2] CI 8 - Reserved[2] CI 9 - Reserved[2] CI 10 - Reserved[2] CI 11 - Reserved[2] CI 12 - Reserved[2] CI 13 - Reserved[2] CI 14 - Reserved[2] CI 15 - Reserved[2] CI 16 - Reserved[2]
HR7	6	User Special Command Register[3]	**Command** **Parameter** 0x7C　　0x1 - CO_2 random calibration
HR8	7	User Concentration	User concentration (default: 400 ppm)
HR9	8	–	Reserved, returns "illegal data address" exception
HR10	9	–	Reserved, returns "illegal data address" exception
HR11	10	–	Reserved, returns "illegal data address" exception
HR12	11	–	Reserved, returns "illegal data address" exception
HR13	12	–	Reserved, returns "illegal data address" exception
HR14	13	–	Reserved, returns "illegal data address" exception
HR15	14	–	Reserved, returns "illegal data address" exception
HR16	15	–	Reserved, returns "illegal data address" exception
HR17	16	–	Reserved, returns "illegal data address" exception
HR18	17	–	Reserved, returns "illegal data address" exception
HR19	18	–	Reserved, returns "illegal data address" exception
HR20	19	–	Reserved, returns "illegal data address" exception
HR21	20	–	Reserved, returns "illegal data address" exception
HR22	21	–	Reserved, returns "illegal data address" exception
HR23	22	–	Reserved, returns "illegal data address" exception
HR24	23	–	Reserved, returns "illegal data address" exception
HR25	24	–	Reserved, returns "illegal data address" exception
HR26	25	–	Reserved, returns "illegal data address" exception
HR27	26	–	Reserved, returns "illegal data address" exception
HR28	27	–	Reserved, returns "illegal data address" exception
HR29	28	–	Reserved, returns "illegal data address" exception
HR30	29	–	Reserved
HR31	30	–	Reserved
HR32	31	–	Reserved

[1] Writing ABC_Period zero value suspends ABC function, but ABC samples and ABC time counting do not lose. To resume ABC function with prior ABC samples and ABC time, write ABC_Period non-zero values.
[2] Reserved CIs returns 0.
[3] Special Command Register is write-only.

8.0   MODBUS FUNCTION DESCRIPTION

The serial port configuration is: 9600, 8, 1, N, N. The sensor is addressed as "Any address" (0xFE).

8.1   Input Registers Description

Values are read from IR using "Read input registers" (function code 04).

8.1.1   Read Detector Temperature

Master Transmit:
<FE> <04> <00> <04> <00> <01> <64> <04>
Slave Reply:
<FE> <04> <02> <30> <D4> <51> <9A>
Data Explain:
<30> <D4> is valid data 0x30D4, decimal is 12500. After conversion (divided by 100 first, then subtract 100), it is 25 degrees Celsius. Note that the detector temperature is usually higher than the ambient temperature.

8.1.2   Read Meter Status

Master Transmit:
<FE> <04> <00> <05> <00> <01> <35> <C4>
Slave Reply:
<FE> <04> <02> <01> <60> <AC> <9C>
Data Explain:
<01> <60> is valid data 0x0160, the binary is 0b101100000, the 0th bit of the data bit is DI1, the first bit of the data bit is DI2, and so on. The valid bits are as follows:
DI 6 - Out of Range
DI 7 - Memory error

8.1.3   Read Output Status

Master Transmit:
<FE> <04> <00> <06> <00> <01> <C5 > <C4>
Slave Reply:
<FE> <04> <02> <00> <03> <ED> <25>
Data Explain:
<00> <03> is valid data 0x0003, the binary is 0b11. The valid bits are as follows:
DI 1 - Alarm Output status (inverted due to Open Collector)
DI 2 - PWM Output status (1 means full output)

8.1.4   Read Space CO_2

Master Transmit:
<FE> <04> <00> <07> <00> <01> <94 > <04>
Slave Reply:
<FE> <04> <02> <01> <90> <AC> <D8>
Data Explain:
<01> <90> is valid data 0x0190, decimal is 400 ppm.

8.1.5   Read PWM Output

Master Transmit:
<FE> <04> <00> <08> <00> <01> <A4 > <07>
Slave Reply:
<FE> <04> <02> <3F> <FF> <FC> <94>
Data Explain:
<3F> <FF> is valid data 0x3FFF, it represents 100% output, i.e. 2000 ppm CO_2.

8.1.6   Read Sensor Type ID

Master Transmit:
<FE> <04> <00> <09> <00> <02> <B5> <C6>
Slave Reply:
<FE> <04> <04> <00> <00> <18> <00> <FE> <8B>
Data Explain:
<00> <00> <18> <00> is valid data 0x00001800, IR09 low byte + IR10 contains Sensor Type ID 3-bytes value, so this data is 0x001800, it indicates the type of sensor.

8.1.7   Read Memory Map Version
Master Transmit:
<FE> <04> <00> <0B> <00> <01> <54 > <07>
Slave Reply:
<FE> <04> <02> <41> <01> <5C> <B4>
Data Explain:
<41> <01> is valid data 0x4101, it indicates memory map version.

8.1.8   Read FW Version Main and Sub.
Master Transmit:
<FE> <04> <00> <0C> <00> <01> <E5 > <C6>
Slave Reply:
<FE> <04> <02> <01> <00> <AC> <B4>
Data Explain:
<01> <00> is valid data 0x0100, IR13 high byte is FW Main revision, low byte – FW Sub revision. So this version of FW is 1.0

8.1.9   Read Sensor ID
Master Transmit:
<FE> <04> <00> <0D> <00> <02> <F4 > <07>
Slave Reply:
<FE> <04> <04> <11> <03> <30> <33> <55> <A2>
Data Explain:
<11> <03> <30> <33>is valid data 0x11033033, it means sensor ID.

8.1.10   Read Serial Number
Master Transmit:
<FE> <04> <00> <0F> <00> <05> <14 > <05>
Slave Reply:
<FE> <04> <0A> <53> <43> <30> <37> <31> <31> <30><33><30><33><C4><D6>
Data Explain:
<53> <43> <30> <37> <31> <31> <30><33><30><33> is valid data 0x53433037313130333033. After conversion to ASCII, it is SC07110303.

8.2   Holding Registers Description
Values are read and written from IR using "Read holding registers" (function code 03).

8.2.1   Setup ABC Period
Master Transmit:
<FE> <06> <00> <04> <00> <B4> <DC > <73>
Slave Reply:
<FE> <06> <00> <04> <00> <B4> <DC > <73>
Data Explain:
<00> <B4> is valid data 0x00B4, decimal is 180. It means ABC calibration (a program for automatic calibration) is performed every 180 hours. The value range is (4, 4800) hours and should be an integer multiple of 4. When the value is 0, this function is disabled.

8.2.2   Read ABC Period
Master Transmit:
<FE> <03> <00> <04> <00> <01> <D1 > <C4>
Slave Reply:
<FE> <03> <02> <00> <B4> <AC> <27>
Data Explain:
<00> <B4> is valid data 0x00B4, decimal is 180 hours.

8.2.3   Setup User Concentration
Master Transmit:
<FE> <06> <00> <07> <01> <90> <2D > <F8>
Slave Reply:
<FE> <06> <00> <07> <01> <90> <2D > <F8>
Data Explain:
<01> <90> is valid data 0x0190, decimal is 400 ppm. It means the user calibration concentration is set to 400 ppm.
<2D> <F8> is CRC and should be calculated based on the user calibration concentration value.

8.2.4   Read User Concentration
Master Transmit:
<FE> <03> <00> <07> <00> <01> <21 > <C4>
Slave Reply:
<FE> <03> <02> <01> <90> <AD> <AC>
Data Explain:
<01> <90> is valid data 0x0190, decimal is 400 ppm.

8.2.5   Setup User Acknowledgement
Master Transmit:
<FE> <06> <00> <05> <00> <00> <8D > <C4>
Slave Reply:
<FE> <06> <00> <05> <00> <00> <8D > <C4>
Data Explain:
<00> <00> is valid data 0x0000, it means to clear the calibration completion flag.

8.2.6   Setup User Special Command
Master Transmit:
<FE> <06> <00> <06> <7C> <01> <9C > <C4>
Slave Reply:
<FE> <06> <00> <06> <7C> <01> <9C > <C4>
Data Explain:
<7C> <01> is valid data 0x7C01, it means to start user calibration.

8.2.7   Read User Acknowledgement
Master Transmit:
<FE> <03> <00> <05> <00> <01> <80> <04>
Slave Reply:
<FE> <03> <02> <00> <01> <AC> <50>
Data Explain:
<00> <01> is valid data 0x0001, it means that the user calibration completion flag has been set to 1, indicating that the user calibration has been completed.

For the user calibration process, please use the instructions given in 8.2.3 to 8.2.7 in order.

⚠ WARNING
PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this writing. However, Honeywell assumes no responsibility for its use.

Honeywell serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor **or** contact your local sales office.

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