Technical Note

Using Alarms on the Honeywell HumidIcon™ Digital Humidity/Temperature Sensors: HIH-6130/6131 Series

1.0   Introduction

The Honeywell Honeywell HumidIcon™ Digital Humidity/ Temperature Sensors: HIH-6130/6131 Series supports up to two configurable alarm outputs which can be used to monitor whether the ambient humidity has risen or fallen below preprogrammed values. The alarms have configurable thresholds, polarity and outputs to provide flexible interfacing with other components.

This document describes:

- Alarm functionality
- Configuration options
- How to combine alarms
- How do disable alarms

2.0   Alarm Output

The alarm output can be used to indicate whether a predefined humidity level has been reached. The alarms can be configured in two ways:
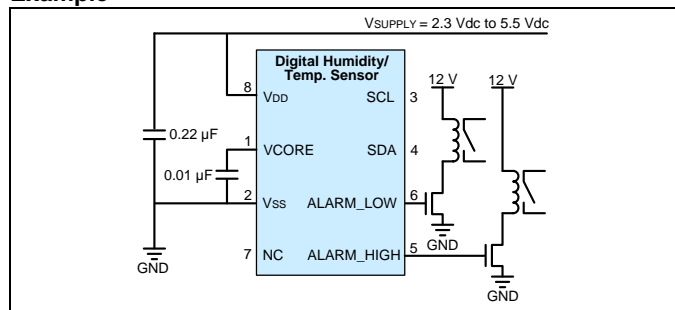
- As an open-drain output to drive a load connected to V_{DD} (see Figure 1).

Figure 1. Alarm Open Drain Output Application Circuit Example
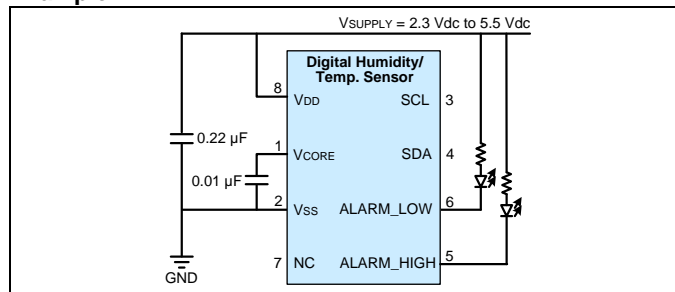
- As a full push-pull driver for interfacing with a microcontroller or to drive a high voltage external device, (see Figure 2).

Figure 2. Alarm Push-Pull Output Application Circuit Example

If available, both alarms can be used at the same time. The alarm outputs are updated when a measurement cycle is completed.

3.0.   Alarm Functionality

3.1   Alarm Hysteresis

There are four registers associated with the alarm thresholds (see Appendix A for the EEPROM addresses):

- Alarm_High_On
- Alarm_High_Off
- Alarm_Low_On
- Alarm_Low_Off

Each register contains a 14-bit value that determines the humidity at which the alarm turns on or off. The two Alarm_High registers set the hysteresis of the Alarm_High pin, while the two Alarm_Low registers set the hysteresis for the Alarm_Low pin (see Figure 3).

Figure 3. Alarm Hysteresis
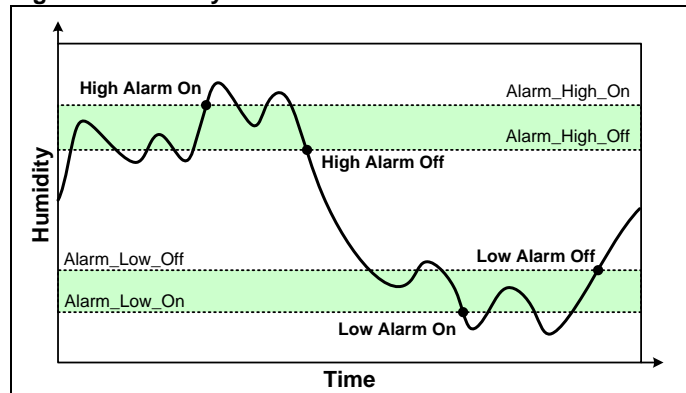
NOTICE
Alarm registers may only be accessed using Command Mode. (See Technical Note "Entering and Using Command Mode on Honeywell Digital/Temperature Sensors".)

3.2   Definitions

- Alarm_High_On register determines the humidity threshold where the high alarm is activated.
- Alarm_High_Off register determines the humidity threshold where the high alarm is deactivated.

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The contents of the alarm registers correspond to humidity as follows:

$$\text{Humidity (\%RH)} = \frac{\text{RegisterContents}}{(2^{14} - 1)} \times 100\%$$

Thus, 0 %RH = 0x0000 and 100 %RH = 0x3FFF or 16383.

For example, to enable the Alarm_High output at humidity above 80 %RH:

$$\text{Alarm\_Low\_On} = \frac{80\ \%RH}{100\%} \times (2^{14} - 1) = 13107 \text{ or } 0 \times 3333$$

Similarly, to enable the Alarm_Low output at humidity below 10 %RH:

$$\text{Alarm\_Low\_On} = \frac{10\ \%RH}{100\%} \times (2^{14} - 1) = 16383 \text{ or } 0 \times 0666$$

The High Alarm hysteresis is equivalent to the difference between the registers.

- Alarm_Low_On register determines the humidity threshold where the low alarm is activated.
- Alarm_Low_Off register determines the humidity threshold where the low alarm is deactivated.

High and Low Alarm flow charts are shown in Figure 4.

Figure 4. High and Low Alarm Flow Charts
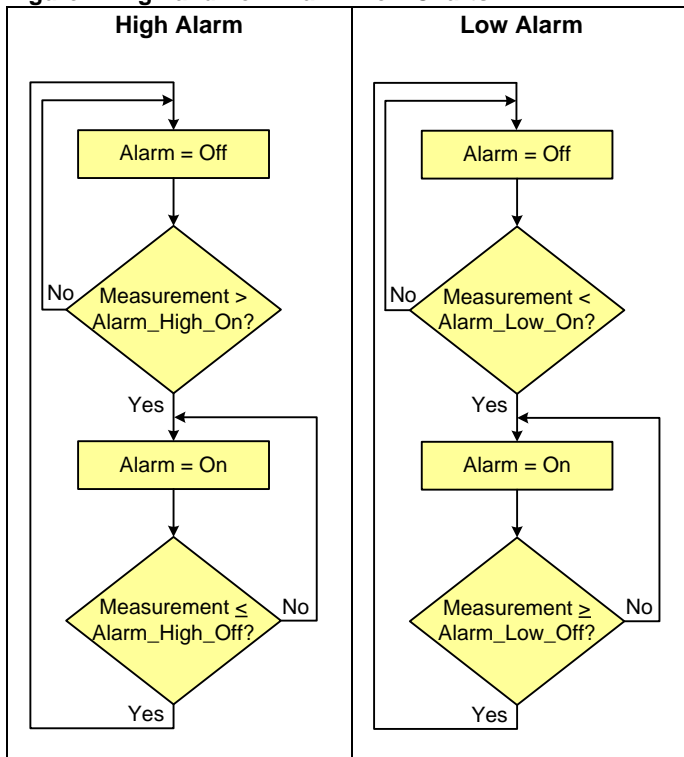
4.0 Alarm Configuration

A fifth register, the Customer Configuration Register (see Appendix B), is associated with the alarm outputs and contains the configuration bits. Both alarms may be configured independently using the Alarm_Low_Cfg and Alarm_High_Cfg bits (see Table 1).

Table 1. Customer Configuration Register Alarm Bits

Bit	Description
7	Alarm_Low Polarity: 0 = Active_ High, 1 = Active_ Low
8	Alarm_Low Output Configuration: 0 = Full_Push-Pull, 1 = Open_Drain
9	Alarm_High Polarity: 0 = Active_High, 1 = Active_Low
10	Alarm_High Output Configuration: 0 = Full_Push-Pull, 1 = Open_Drain

- For applications which interface to other logic circuits, such as a micro-processor or to drive an external device, Full Push-Pull is recommended.
- For driving loads directly connected to the sensor voltage supply open drain would be a typical choice (see Figures 1 and 2).

The polarity of the alarm output is configured using the Alarm Polarity bits. The ability to change the alarm polarity gives the user flexibility in how the sensor interfaces with an application.

In the example shown in Figure 1, the alarm outputs are used to control an LED. For the LED to light up when the alarm is on or active, the alarm output must be low, so the alarm polarity bit should be set to 1, Active_Low.

## 5.0 Creating Two High or Two Low Alarms

The Alarm Polarity bits also give the user the option to create two high alarms or two low alarms.

Consider an application requiring two high alarms. Conventionally, if the Alarm_Low Polarity is configured as Active High, then the Alarm_Low output will become active (goes high) when the humidity falls lower than the humidity value represented in the Alarm_Low_On register and becomes inactive (goes low) when the humidity rises above the humidity value represented in the Alarm_Low_Off register.

Similarly, if the Alarm_High Polarity is configured as Active High, then the Alarm_High output will become active (goes high) when the humidity rises above the humidity value represented in the Alarm_High_On register and becomes inactive (goes low) when the humidity falls below above the humidity value represented in the Alarm_High_Off register (see Figure 5).

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Figure 5. Alarm Outputs with Active High Polarity
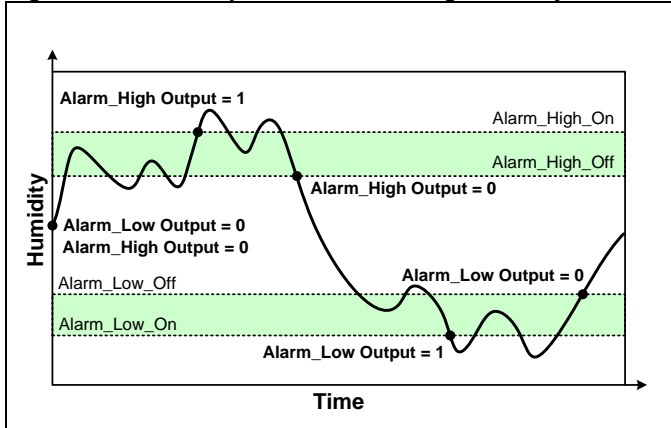
If the polarity of the Alarm_Low output is changed to Active Low then the Alarm_Low output will be high when the humidity is above the humidity value stored in the Alarm_Low_Off register and low when the humidity is less than humidity value in the Alarm_Low_On register (see Figure 6).

Figure 6. Alarm Outputs with Active Low Polarity
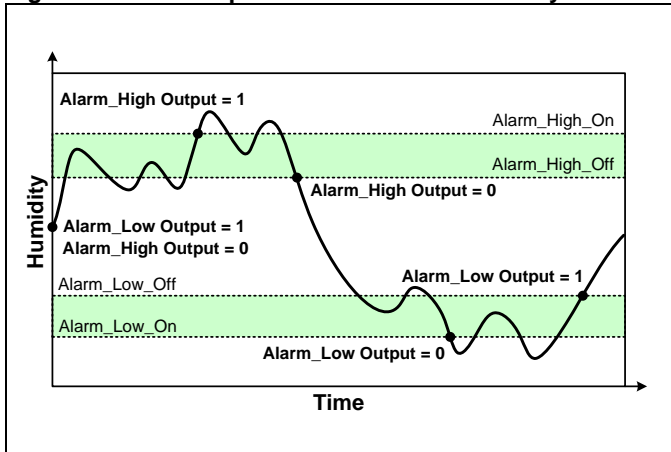
By reversing the polarity of Alarm_Low, its output now behaves in the same manner as Alarm_High, in other words, as a second high alarm; however, the effect of the alarm registers also reverses. The Alarm_Low_On register acts like the Alarm_High_Off register, while the Alarm_Low_Off register acts like the Alarm_High_On register.

The same steps can be done to create two low alarms. Reverse the polarity of Alarm_High and the functions of the Alarm_High_On and Alarm_High_Off registers will also switch.

6.0 Disabling Alarms

If an application does not require the use of alarms, then the alarms may be disabled by setting registers Alarm_High_On and Alarm_High_Off to their maximum value (0x3FFF) and registers Alarm_Low_On and Alarm_Low_Off to their minimum value (0x0000). In this configuration the alarm outputs must be left unconnected in the application.

7.0 Appendices

7.1 Appendix A. EEPROM Memory Map

Table 2 shows the EEPROM Memory Map.

Table 2. EEPROM Memory Map

EEPROM Address	Default	Name	Description
0x00 to 0x15	N/A	reserved	**do not change;** must be left at factory settings; locked EEPROM locations
0x16	0x0000	reserved	**do not change;** must be left at factory settings
0x17	0x0000	reserved	**do not change;** must be left at factory settings
0x18	0x3FFF	Alarm_High_On	high alarm on trip point
0x19	0x3FFF	Alarm_High_Off	high alarm off trip point
0x1A	0x0000	Alarm_Low_On	low alarm on trip point
0x1B	0x0000	Alarm_Low_Off	low alarm off trip point
0x1C	0x0028	Cust_Config	Customer Configuration Register (see Section 4.0)
0x1D	0x0000	reserved	**do not change;** must be left at factory settings
0x1E	0xYYYY (Y=data)	Cust_ID2	customer ID word; for use by customer
0x1F	0xYYYY (Y=data)	Cust_ID3	customer ID word; for use by customer

7.2 Appendix B. Customer Configuration Register

The Customer Configuration Register (see Table 3) is located at EEPROM address 0x1C. It can only be accessed using Command Mode.

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Table 3 .Customer Configuration Register

Bit	Default	Name	Description		
6:0	0101000	device ID	I^{2}C slave address		
8:7	00	Alarm_Low_Cfg	configures the Alarm Low output pin.	**Bit**	**Description**
				7	alarm polarity: 0 = Active_High, 1 = Active_Low
				8	output configuration: 0 = Full_Push-Pull, 1 = Open_Drain
10:9	00	Alarm_High_Cfg	configures the Alarm High output pin.	**Bit**	**Description**
				9	alarm polarity: 0 = Active_High, 1 = Active_Low
				10	output configuration: 0 = Full_Push-Pull, 1 = Open_Drain
11	0	reserved	**do not change;** must be left at factory setting		
12	0	reserved	**do not change;** must be left at factory setting		
13	0	Fast Startup	sets the Command Window duration: 0 = 10 ms,1 = 3 ms		
15:14	00	reserved	**do not change;** must be left at factory setting		

⚠ 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.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this technical note is for reference only. DO NOT USE this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

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

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	+1-815-235-6847
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Sensing and Control

Honeywell

1985 Douglas Drive North

Golden Valley, MN 55422

www.honeywell.com/sensing

Honeywell