

CL-211

User Manual



Warranty

All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year, beginning from the date of delivery to the original purchaser.

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Date: 2016/10



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1. Hardware Information

1.1. Introduction

The CL-211 is a data logger module designed to accurately measure PM2.5, CO, temperature and humidity. It contains RS-485 communication interface that can be used to measure a variety of PM2.5, CO, temperature and humidity measurements. The data storage memory can store up to 450,000 PM2.5, CO, temperature and humidity records. The Data Logger Utility is included to allow installation, configuration, retrieval and display of data in a powerful chart format that can be exported to Excel.



1.2. Specifications

| | |
|--------------------------------------|--|
| Model | CL-211 |
| PM2.5 Measurement | |
| Range | 0 to 400 ug/m ³ |
| Resolution | 1 ug/m ³ |
| Response Time | <= 1min. |
| CO Measurement | |
| Range | 0 to 1000 ppm (Electrochemical) |
| Resolution | 1ppm |
| Accuracy | ±5% of measured value |
| Response Time | 30 seconds |
| Warm-up Time | 60 seconds |
| Temperature Measurement | |
| Range | -10 to +50 °C |
| Resolution | 0.1 °C |
| Accuracy | ±0.6 °C |
| Relative Humidity Measurement | |
| Range | 0 to 100% RH |
| Resolution | 0.1% RH |
| Accuracy | ±5% RH |
| Dew Point | |
| Range | Calculated using temperature and relative humidity |
| Resolution | 0.1 °C |
| System | |
| PM2.5/CO2/RH/T Alarm | Yes |
| Real Time Clock | Yes |
| Data Logger | Yes, up to 450,000 records |
| Relay Output | Form C x 1, 30 VDC @ 16 A or 250 VAC @ 16A |
| Interface | RS-485 |
| Electrical | |
| Powerd from Terminal Block | +10 to +30 VDC |
| Power Consumption | 1.2 W(Max.) |
| Mechanical | |
| Installation | Ceiling mounting |
| Protection Class | IP20 |

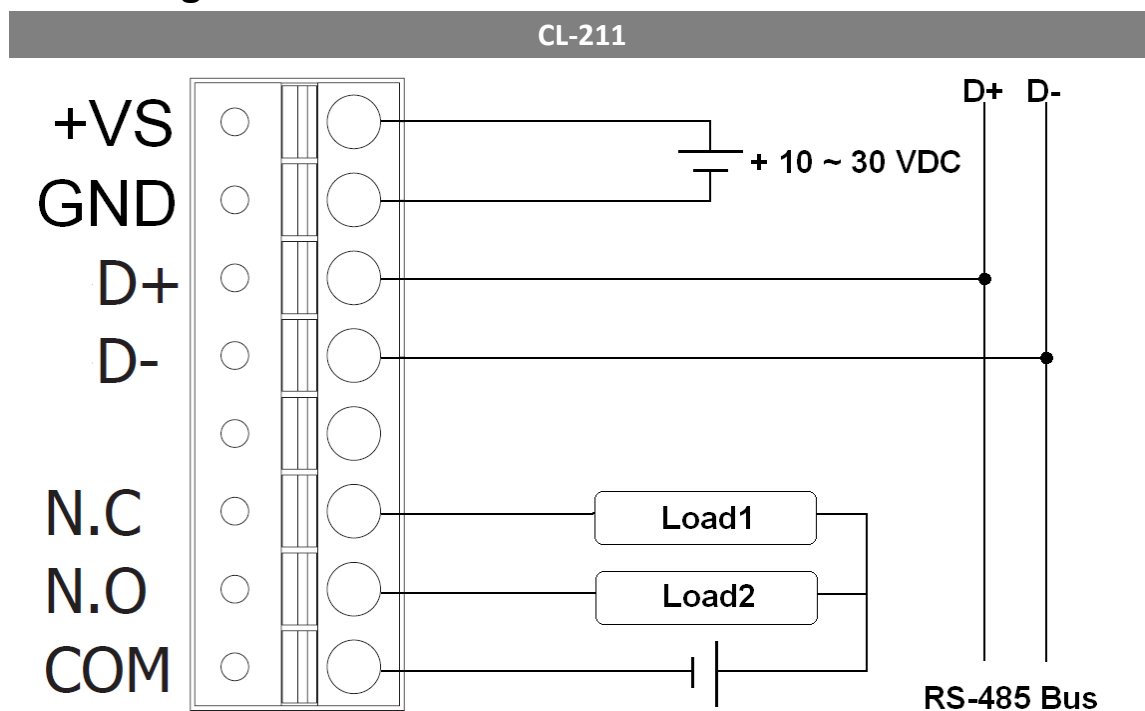


| | |
|--------------------|------------------------------|
| Dimensions (D x H) | Ø 150 mm x 53 mm |
| Environment | |
| Operating Temp. | 0 to +50 °C |
| Storage Temp. | -30 to +80 °C |
| Humidity | 10 to 90% RH, non-condensing |

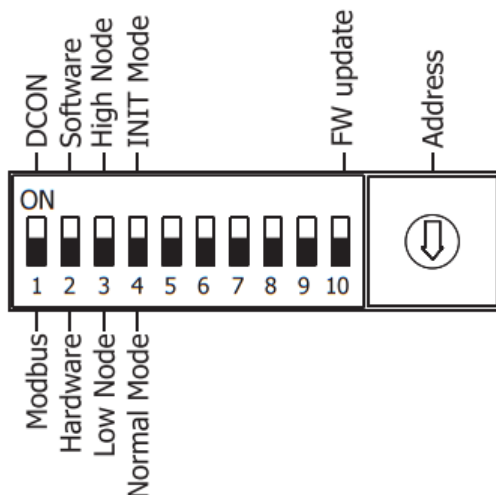
1.3. Pin Assignments

| CL-211 | Pin | Descriptions |
|--------|------------|---------------------------------------|
| | +VS | Power Input (+10 ~ +30 VDC) |
| | GND | Ground |
| | D+ | RS-485 Serial Communication Interface |
| | D- | |
| | N.C | Relay's Normally Closed Contact |
| | N.O | Relay's Normally Open Contact |
| | COM | Relay's Common Contact |

1.4. Wiring Connections



1.5. DIP Switch Configuration

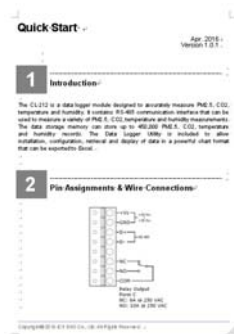


| | |
|---------|--|
| DIP [1] | <p>Protocol: Used to specify the communication protocol to be used by the module</p> <p>ON: DCON OFF: Modbus RTU (default)</p> |
| DIP [2] | <p>Configuration: Used to specify the configuration settings for the module</p> <p>ON: Configure the module using DCON/Modbus commands OFF: Configure the module via DIP Switch (default)</p> |
| DIP [3] | <p>Address: Used to specify the module address when DIP [2] is set to OFF</p> <p>ON: Use Rotary Switch positions 0 to F for node addresses 208 to 223 OFF: Use Rotary Switch positions 0 to F for node addresses 192 to 207 (default)</p> |
| DIP [4] | <p>Mode: Used to specify the Operating Mode</p> <p>ON: Operating in INIT mode OFF: Operating in Normal mode (default)</p> |

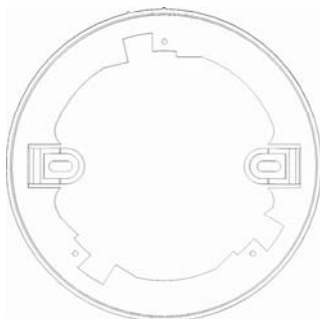
1.6. Package Contents



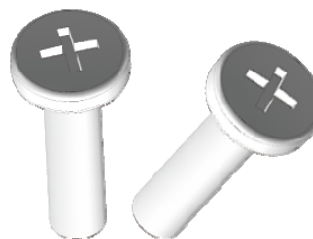
CL-211



Quick Start Guide

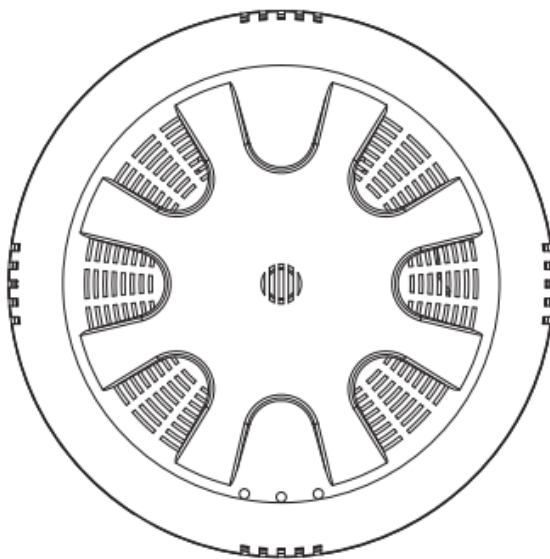


Mounting Plate

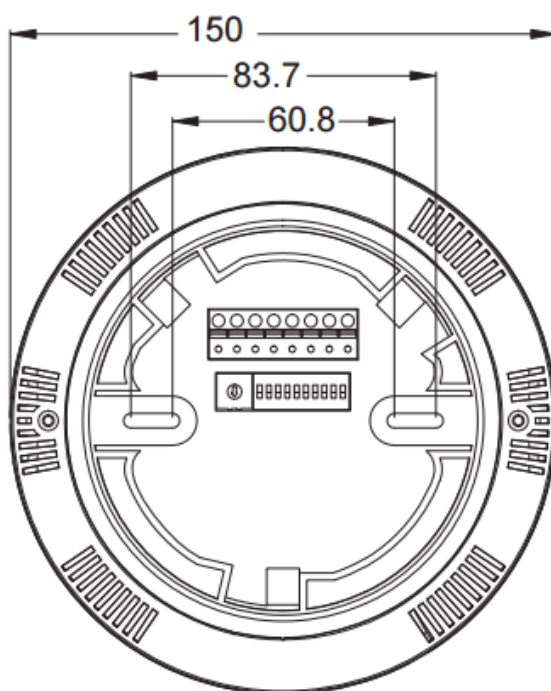


M4x12 Drywall Screws

1.7. Hardware Overview



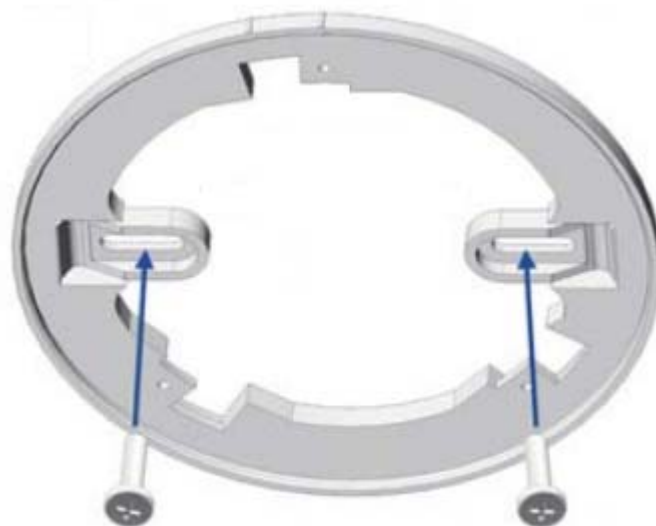
Front View



Rear View

1.8. Hardware Installation

1. Attach the mounting plate



2. Align locking guides



3. Turn the cover clockwise



4. Lock the cover in place



2. DCON Protocol

All communication with the CL-211 module consists of commands generated by the Host and responses transmitted by the CL-211 module. Each module has a unique ID number that is used for addressing purposes and is stored in non-volatile memory. The module ID number is set to 01 by default and can be changed by sending a user command. All commands to the modules contain the ID number as the address, meaning that only the addressed module will respond.

Command Format:

| | | | | |
|---------------------|----------------|---------|----------|----|
| Delimiter Character | Module Address | Command | Checksum | CR |
|---------------------|----------------|---------|----------|----|

Response Format:

| | | | | |
|---------------------|----------------|------|----------|----|
| Delimiter Character | Module Address | Data | Checksum | CR |
|---------------------|----------------|------|----------|----|

CR = End of command character, carriage return (0x0D), used to end a frame.

Note: All characters should be in upper case.

2.1. DCON Command Sets for the CL-211 Module

| Command | Description |
|------------|---|
| \$AAF | read firmware version |
| \$AAI | read INIT status response: !AA0 -> INIT short to GND !AA1 -> else |
| \$AAM | read module name |
| \$AAP | Read Modbus RTU/DCON protocol response: !AA0 -> DCON !AA1 -> Modbus RTU |
| \$AAPN | Set Modbus RTU/DCON protocol N-> 0: DCON, 1: Modbus RTU |
| \$AA2 | read configuration |
| \$AA5 | read reset status !AA1 first after power on, !AA0 others |
| #AA | Read All Analog Inputs response >(CO in 1 ppm) (PM2.5 in 1 ug/m ³) (relative humidity in 0.01%)(temperature in 0.01°C)(temperature in 0.01°F) (dew point temperature in 0.01°C)(dew point temperature in 0.01°F) |
| #AAN | Read Channel Analog Input N = 0 for CO in 1 ppm, 1 for PM2.5 in 1 ug/m ³ , 2 for relative humidity in 0.01%, 3 for temperature in 0.01°C, 4 for temperature in 0.01°F, 5 for dew point temperature in 0.01°C, 6 for dew point temperature in 0.01°F |
| %AANNTCCFF | set configuration, NN: new address, TT = 00, CC: new baud rate FF: data format |
| @AABA | Read beep on alarm time response !AAHH, HH in hex, 0: disabled, 1 ~ 250: beep on alarm time in seconds, 251: beep on alarm continuously |

| Command | Description |
|----------|--|
| @AABAHH | Set beep on alarm time HH in hex, 0: disabled, 1 ~ 250: beep on alarm time in seconds, 251: beep on alarm continuously |
| @AABE | Read enable/disable beep on alarm response !AAHH, HH in hex, bit 0 for channel 0, bit 1 for channel 1, etc, for each bit, 0: disabled, 1: enabled |
| @AABEHH | Enable/disable beep on alarm HH in hex, , bit 0 for channel 0, bit 1 for channel 1, etc, for each bit, 0: disabled, 1: enabled |
| @AACH | Clear all high latched analog inputs to the current values |
| @AACHN | Clear channel high latched analog input to the current value, N = 0 for CO, 1 for PM2.5, 2 for relative humidity, 3 for temperature in 0.01°C, 4 for temperature in 0.01°F, 5 for dew point temperature in 0.01°C, 6 for dew point temperature in 0.01°F |
| @AACHCN | Clear high latched alarm of a channel, N = 0 for CO, 1 for PM2.5, 2 for relative humidity, 3 for temperature in 0.01°C, 4 for temperature in 0.01°F, 5 for dew point temperature in 0.01°C, 6 for dew point temperature in 0.01°F |
| @AACL | Clear all low latched analog inputs to the current values |
| @AACLN | Clear channel low latched analog input to the current value, N = 0 for CO, 1 for PM2.5, 2 for relative humidity, 3 for temperature in 0.01°C, 4 for temperature in 0.01°F, 5 for dew point temperature in 0.01°C, 6 for dew point temperature in 0.01°F |
| @AACL CN | Clear low latched alarm of a channel, N = 2 for relative humidity, 3 for temperature in 0.01°C, 4 for temperature in 0.01°F, 5 for dew point temperature in 0.01°C, 6 for dew point temperature in 0.01°F |
| @AADACN | Disable AI alarm of a channel, N = 0 for CO, 1 for PM2.5, 2 for relative humidity, 3 for temperature in 0.01°C, 4 for temperature in 0.01°F, 5 for dew point temperature in 0.01°C, 6 for dew point temperature in 0.01°F |

| Command | Description |
|-----------------------|--|
| @AADI | read DO response !AA00000 |
| @AADLB | Read the beginning of the period setting of the data logger for period logging mode response !AAyyyymmddhhmmss, |
| @AADLByyyyymmddhhmmss | Set the beginning of the period setting of the data logger for period logging mode yyyy: year, 2000 to 2199, mm: month, 01 to 12, dd: date, 01 to 31, hh: hour, 0 to 24, mm: minute, 0 to 59, ss: second, 0 to 59 |
| @AADLC | Read the data logger command response !AAh, 0: stop, 1: run, 2: run in period mode |
| @AADLCh | Set the data logger command, h->0: stop, 1: run, 2: run in period mode |
| @AADLE | Read the ending of the period setting of the data logger for period logging mode response !AAyyyymmddhhmmss |
| @AADLEyyyymmddhhmmss | Set the ending of the period setting of the data logger for period logging mode yyyy: year, 2000 to 2199, mm: month, 01 to 12, dd: date, 01 to 31, hh: hour, 0 to 24, mm: minute, 0 to 59, ss: second, 0 to 59 |
| @AADLN | Read number of log records in the data logger response !AAhhhhhhh, hhhhhhh in hex format |
| @AADLO | Read the overwriting mode when data logger is full response !AAh, 0: stop logging when full, 1: overwrite |
| @AADLOh | Set the overwriting mode when data logger is full h->0: stop logging when full, 1: overwrite |

| Command | Description |
|---------------------|--|
| @AADLP | Read the samplig period setting of the data logger response !AAhmmss, hh: hour, 0 to 24, mm: minute, 0 to 59, ss: second, 0 to 59 |
| @AADLPhmmss | Set the samplig period setting of the data logger |
| @AADLS | Read logging status of the data logger response !AAhh, hh in hex format, 00: stopped, 01: running, others: error |
| @AAD00V | set DO, V-> 0: off, 1: on |
| @AAEATCN | Enable AI alarm of a channel, N = 0 for CO, 1 for PM2.5, 2 for relative humidity, 3 for temperature in 0.01°C, 4 for temperature in 0.01°F, 5 for dew point temperature in 0.01°C, 6 for dew point temperature in 0.01°F T->M: momentary alarm, L: latched alarm |
| @AAFN | Read fan status Response !AAE, E=0: fan off, 1: fan on, |
| @AAFNE | Turn fan on or off E=0: fan off, 1: fan on |
| @AAFNPi | Read the ith fan off period in a day, i = 0 to 5 response !AAbhbmehem, bh: beginning hour, bm: beginning minute, eh: ending hour, em: ending minute. |
| @AAFNPibhbmehe m | Set the ith fan off period in a day, i = 0 to 5, bh: beginning hour, 0 to 23, bm: beginning minute, 0 to 59, eh: ending hour, 0 to 23, em: ending minute, 0 to 59. The beginning hour/minute should be earlier than the ending hour/minute. Otherwise, the setting is ignored. If all of the six period settings are invalid, then the fan is controlled by the @AAFNE command. |
| @AAHI(data)CN | Set high alarm limit of an AI channel, N = 0 for CO in 1ppm, 1 for PM2.5 in 1 ug/m3, 2 for relative humidity in 0.01%, 3 for temperature in 0.01°C, 4 for temperature in 0.01°F, 5 for dew point temperature in 0.01°C, 6 for dew point temperature in 0.01°F |
| @AAHO | Read humidity offset |

| Command | Description |
|-------------------------|--|
| @AAHO(data) | Set humidity offset, data in format of -100.00 ~ +100.00 |
| @AALO(data)CN | Set low alarm limit of an AI channel, N = 2 for relative humidity in 0.01%, 3 for temperature in 0.01°C, 4 for temperature in 0.01°F, 5 for dew point temperature in 0.01°C, 6 for dew point temperature in 0.01°F |
| @AAPO | Read PM2.5 offset |
| @AAPO(data) | Set PM2.5 offset, data in format of -00100. ~ +00100. |
| @AARACN | Read AI alarm enabled/disabled status of a channel response !AAN, N->0: disabled, 1: momentary, 2: latched |
| @AARAO | Read AI alarm status response !AAHLL |
| @AARH | Read all high latched values of analog input channels |
| @AARHN | Read channel high latched value of analog input |
| @AARHCN | Read high alarm limit of an AI channel |
| @AARL | Read all low latched values of analog input channels |
| @AARLN | Read channel low latched value of analog input |
| @AARLCN | Read low alarm limit of an AI channel |
| @AART | Read RTC data response !AAYYYMMDDHHMMSS |
| @AARTYYYYMMD DHHMMSS | Set RTC data |
| @AATO | Read temperature offset in 0.01°C |
| @AATO(data) | Set temperature offset in 0.01°C, -100.00 ~ +100.00 |
| ~** | clear host watchdog timeout counter |
| ~AA0 | read host watchdog status |
| ~AA1 | clear host watchdog timeout status |
| ~AA2 | read host watchdog enable/disable status and timeout value |
| ~AA3ETT | enable/disable host watchdog and set timeout value E-> 0: disable host watchdog, 1: enable host watchdog TT: host watchdog timeout in 0.1s in hex format |
| ~AA4 | read DO power on and safe value |

| Command | Description |
|----------|--|
| ~AA50P0S | set DO power on and safe value P-> 0: power on value off, 1: power on value on S-> 0: safe value off, 1: safe value on |
| ~AARD | read response delay time in ms in hex format |
| ~AARDVV | set response delay time in ms, VV in hex format, 00 - 1E |

Baud Rate Settings (CC)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------|---|----------------|---|---|---|---|---|
| Parity | | Baud Rate Code | | | | | |

Parity (Bits 6 and 7)

| Code | 00 | 01 | 10 | 11 |
|--------|-------|-------|-------|-------|
| Parity | n,8,1 | n,8,2 | e,8,1 | o,8,1 |

Baud Rate Code (Bits 0 to 5)

| Code | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A |
|-----------|------|------|------|------|-------|-------|-------|--------|
| Baud Rate | 1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 57600 | 115200 |

Data Format Settings (FF)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----------|---|---|---|---|---|
| Reserved | CS | Reserved | | | | | |

| Key | Description |
|-----|--|
| CS | Checksum Settings 0: Disabled 1: Enabled |

Note: All Reserved bits should be zero.

3. Modbus RTU Protocol

The Modbus protocol was originally developed for Modicon controllers by Modicon Inc. Detailed information related to the Modbus RTU protocol can be found at: <http://www2.schneider-electric.com/sites/corporate/en/products-services/automation-control/automation-control.page>. You can also visit <http://www.modbus.org> for more valuable information.

The CL-211 module supports the Modbus RTU protocol, with communication Baud Rates ranging from 1200 bps to 115200 bps. The parity, data bits and stop bits are fixed as no parity, 8 data bits and 1 stop bit. The following Modbus functions are supported.

| Function Code | Description |
|---------------|----------------------------------|
| 0x01 | Reads the Coils |
| 0x02 | Reads the Discrete Inputs |
| 0x03 | Reads Multiple Registers |
| 0x04 | Reads Multiple Input Registers |
| 0x05 | Writes a Single Coil |
| 0x06 | Writes a Single Register |
| 0x0F | Writes Multiple Coils |
| 0x10 | Writes Multiple Registers |
| 0x46 | Reads/writes the Module Settings |

Error Response

If the function specified in the message is not supported, then the module responds as below. Note that the address mapping for the Modbus protocol is Base 0.

| Byte | Description | Length (in Bytes) | Value |
|------|----------------|-------------------|----------------------|
| 00 | Address | 1 | 1 to 247 |
| 01 | Function Code | 1 | Function Code + 0x80 |
| 02 | Exception Code | 1 | 01 |

Note:

If a CRC mismatch occurs, the module will not respond.

3.1 Modbus Address Mapping(Base 1)

| Address | Description | Attribute |
|--------------------------------------|--|-----------|
| 30001 ~ 30007 40001 ~ 40007 | Analog input value of channel 0 to 6. channel 0: CO in 1ppm, channel 1: PM2.5 in 1ug/m ³ , channel 2: relative humidity in 0.01%, channel 3: temperature in 0.01°C, channel 4:temperature in 0.01°F, channel 5: dew point temperature in 0.01°C, channel 6: dew point temperature in 0.01°F | R |
| 40225 ~ 40231 | High alarm limit of channel 0 to 6, channel 0: CO in 1ppm, channel 1: PM2.5 in 1 ug/m ³ , channel 2: relative humidity in 0.01%, channel 3: temperature in 0.01°C, channel 4:temperature in 0.01°F, channel 5: dew point temperature in 0.01°C, channel 6: dew point temperature in 0.01°F | R/W |
| 40235 ~ 40239 | Low alarm limit of channel 2 to 6, channel 2: relative humidity in 0.01%, channel 3: temperature in 0.01°C, channel 4:temperature in 0.01°F, channel 5: dew point temperature in 0.01°C, channel 6: dew point temperature in 0.01°F | R/W |
| 40449 | CO offset in 1 ppm | R/W |
| 40450 | PM2.5 offset in 1 ug/m ³ | R/W |
| 40451 | Relative humidity offset in 0.01% | R/W |
| 40452 | Temperature offset in 0.01°C | R/W |
| 40481 | Firmware version (low word) | R |
| 40482 | Firmware version (high word) | R |
| 40483 | Module name (low word), 0x0211 | R |
| 40484 | Module name (high word), 0x434C | R |
| 40485 | RS-485 module address, 1 to 247 | R/W |
| 40486 | RS-485 baud rate and parity settings Bits 5:0 Baud rate, valid range: 3 ~ 10 Bits 7:6 00: no parity, 1 stop bit 01: no parity, 2 stop bit 10: even parity, 1 stop bit 11: odd parity , 1 stop bit | R/W |

| Address | Description | Attribute |
|--------------------------------------|---|-----------|
| 40488 | RS-485 response delay time in ms, valid range, 0 ~ 30 | R/W |
| 40489 | RS-485 host watchdog timeout value, 0 ~ 255, in 0.1s | R/W |
| 40492 | RS-485 host watchdog timeout count, write 0 to clear | R/W |
| 40497 | Beep on alarm, 0: disable, 1 to 250: beep on alarm time in seconds, 251: beep on alarm continuously | R/W |
| 30513 ~ 30519 40513 ~ 40519 | High latched analog input value of channel 0 to 6 | R |
| 30545 ~ 30551 40545 ~ 40551 | Low latched analog input value of channel 0 to 6 | R |
| 40865 | RTC year, 2000 to 2159 | R/W |
| 40866 | RTC month, 1 to 12 | R/W |
| 40867 | RTC date, 1 to 31 | R/W |
| 40868 | RTC hour, 0 to 23 | R/W |
| 40869 | RTC minute, 0 to 59 | R/W |
| 40870 | RTC second, 0 to 59 | R/W |
| 40871 | Total number of log records, low word | R |
| 40872 | Total number of log records, high word | R |
| 40873 | The starting record to read log data, low word | R/W |
| 40874 | The starting record to read log data, high word | R/W |
| 40875 | The status of the data logging, 0: stopped, 1: running | R |
| 40876 | The data logger command, 0: stop, 1: run, 2: run in period mode | R/W |
| 40877 | Continue writing when data logger is full, 0: no, 1: yes | R/W |

| Address | Description | Attribute |
|------------------|---|-----------|
| 40878 | Hour of the data logger sampling period, 0 ~ 24 | R/W |
| 40879 | Minute of the data logger sampling period, 0 ~ 59 | R/W |
| 40880 | Second of the data logger sampling period, 0 ~ 59 | R/W |
| 40881 | Starting year when logging in period mode, 2000 ~ 2159 | R/W |
| 40882 | Starting month when logging in period mode, 1 ~ 12 | R/W |
| 40883 | Starting date when logging in period mode, 1 ~ 31 | R/W |
| 40884 | Starting hour when logging in period mode, 0 ~ 23 | R/W |
| 40885 | Starting minute when logging in period mode, 0 ~ 59 | R/W |
| 40886 | Starting second when logging in period mode, 0 ~ 59 | R/W |
| 40887 | Ending year when logging in period mode, 2000 ~ 2159 | R/W |
| 40888 | Ending month when logging in period mode, 1 ~ 12 | R/W |
| 40889 | Ending date when logging in period mode, 1 ~ 31 | R/W |
| 40890 | Ending hour when logging in period mode, 0 ~ 23 | R/W |
| 40891 | Ending minute when logging in period mode, 0 ~ 59 | R/W |
| 40892 | Ending second when logging in period mode, 0 ~ 59 | R/W |
| 40929 | The first fan off period in a day, beginning hour, 0 ~ 23 | R/W |
| 40930 | The first fan off period in a day, beginning minute, 0 ~ 59 | R/W |
| 40931 | The first fan off period in a day, ending hour, 0 ~ 23 | R/W |
| 40932 | The first fan off period in a day, ending minute, 0 ~ 59 | R/W |
| 40933 ~ 40936 | The second fan off period in a day | R/W |
| 40937 ~ 40940 | The third fan off period in a day | R/W |
| 40941 ~ 40944 | The fourth fan off period in a day | R/W |

| Address | Description | Attribute |
|------------------|--|-----------|
| 40945 ~ 40948 | The fifth fan off period in a day | R/W |
| 40949 ~ 40952 | The sixth fan off period in a day | R/W |
| 00001 | Digital output value of channel 0 | R/W |
| 00129 | Safe value of digital output channel 0 | R/W |
| 00161 | Power on value of digital output channel 0 | R/W |
| 00257 | RS-485 Protocol, 0: DCON, 1: Modbus RTU | R/W |
| 00260 | Modbus RTU host watchdog mode 0: same as I-7000 1: can use AO and DO command to clear host watchdog timeout status | R/W |
| 00261 | RS-485 host watchdog mode, 1: enable, 0: disable. | R/W |
| 00270 | Host watch dog timeout status, write 1 to clear host watch dog timeout status Only for Modbus RTU protocol | R/W |
| 00273 | Reset status, 1: first read after powered on, 0: not the first read after powered on | R |
| 00279 | Fan control, 0: off, 1: on | R/W |
| 00280 | Write 1 to clear all high latched analog input values | W |
| 00281 | Write 1 to clear all low latched analog input values | W |
| 00291 ~ 00295 | Low alarm status of channel 2 to 6. Write 1 to clear low latched alarm. | R/W |
| 00305 ~ 00311 | High alarm status of channel 0 to 6. Write 1 to clear high latched alarm. | R/W |
| 00321 ~ 00327 | Enable/disable alarm of channel 0 to 6 | R/W |
| 00337 ~ 00343 | Alarm type, momentary or latched, of channel 0 to 6 | R/W |
| 00385 ~ 00391 | Write 1 to clear high latched analog input value of channel 0 to 6 | W |
| 00417 ~ 00423 | Write 1 to clear low latched analog input value of channel 0 to 6 | W |
| 00449 ~ 00455 | Enable/disable beep on alarm for channel 0 to 6 | R/W |