DPRC SERIES

Room Dewpoint Transmitter
Setup Guide for Modbus Communication

MODBUS

MODBUS ADDRESS	TYPICAL OFFSET	UNITS	DATA TYPE	ACCESS	NOTES
40001	+0	°C/°F	Word	Read	16-bit integer, Temperature value x 10 (multiplier = 10) -300 to 500 for -30.0 to 50.0 °C, -220 to 1220 for -22.0 to 122.0 °F
40002	+1	%RH	Word	Read	16-bit integer, %RH value x 10 (multiplier = 10) 0 to 1000 for 0 to 100.0 %RH
40003	+2	°C/°F	Word	Read	16-bit integer, Dewpoint Temperature value x 10 (multiplier = 10) -300 to 500 for -30.0 to 50.0 °C, -220 to 1220 for -22.0 to 122.0 °F
40004	+3	°C/°F	Word	Read	16-bit integer, Wet Bulb Temperature x 10 (multiplier = 10) -300 to 500 for -30.0 to 50.0 °C, -220 to 1220 for -22.0 to 122.0 °F
40005	+4	kJ/Kg BTU/lb	Word	Read	16-bit integer, Enthalpy value (multiplier = 1) 0 to 340 kJ/kg, 0 to 146 BTU/lb
40006	+5	°C/°F	Word	R/W	16-bit integer, Temperature Offset (multiplier = 10) -100 to 100 for -10.0 to 10.0 °F or -50 to 50 for -5.0 to 5.0 °C (Note: resolution is 10 for °F and 5 for °C)
40007	+6	%RH	Word	R/W	16-bit integer, RH Offset (multiplier = 10) -100 to 100 for -10.0 to 10.0 %RH (Note: resolution is 10)
40008	+7	hPa	Word	R/W	16-bit integer, Atmospheric Pressure 812 to 1013 hPa
40009	+8	Feet	Word	R/W	16-bit integer, Altitude 0 to 6000 ft
40010	+9		Word	R/W	16-bit integer, Display Mode 0 to 10
40011	+10		Word	R/W	16-bit integer, Temperature Units 0 = °C, 1 = °F
40012	+11		Word	R/W	16-bit integer, Enthalpy Units 0 = kJ/kg, 1 = BTU/lb

This section describes the implementation of the Modbus protocol. This device communicates on standard Modbus networks using RTU mode transmission. It operates as a slave device (address from 1 to 255) and expects a Modbus master device to transmit queries, which it will answer.

RTU Message Format

MODBUS FRAMING	8 BIT BINARY
Data Bits	start bits --- 1 data bits --- 8 parity bits --- none, odd or even stop bits --- 1or 2
Baud Rate	300, 600, 1200, 2400, 4800, 9600, 19200 or 38400
Duplex	Half duplex
Error Checking	Cyclical Redundancy Check (CRC) CRC-16 --- polynomial x16+x15+x2+x0 0x8005 or reversed version 0xA001 or CRC-CITT --- polynomial x16+x12+x5+x0 0x1021 or reversed version 0x8408
Latency	More than 3.5 characters --- minimum, 50, 100, 150, 200, 250, 300 or 350 mS

RTU Framing Support and Bit Sequences

Start	1	2	3	4	5	6	7	8	Stop	
Start	1	2	3	4	5	6	7	8	Stop	Stop
Start	1	2	3	4	5	6	7	8	Odd	Stop
Start	1	2	3	4	5	6	7	8	Even	Stop

RTU Function Codes

0x03 --- Read holding registers

Query

Slave address (0x01 to 0xFF)	Function code (0x03)	Starting address MSB	Starting address LSB	Quantity of registers MSB	Quantity of registers LSB	CRC LSB	CRC MSB

* Starting address = 0x0000 to 0xFFFF,   Quantity of registers = 0x0000 to 0x007D

Response

Slave address (0x01 to 0xFF)	Function code (0x03)	Byte count 2N	Register value MSB	Register value LSB	…	CRC LSB	CRC MSB

* N= Quantity of registers

0x06 --- Write single register

Query

Slave address (0x01 to 0xFF)	Function code 0x06	Register address MSB	Register address LSB	Register value MSB	Register value LSB	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	Function code 0x06	Register address MSB	Register address LSB	Register value MSB	Register value LSB	CRC LSB	CRC MSB

* Register address = 0x0000 to 0xFFFF,   Registers value = 0x0000 to 0xFFFF

Exception response

Slave address (0x01 to 0xFF)	Function code + 0x80	Exception code 0x01, 0x02 or 0x03	CRC LSB	CRC MSB

* An exception response is only returned if the CRC is correct
Exception code 01 --- illegal function, 02 --- illegal address, 03 --- illegal data value

The RTU function codes supported by the dewpoint sensor are shown below.

0x03 --- Read TEMPERATURE_VALUE

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x00	0x00	0x01	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value MSB	Register value LSB	CRC LSB	CRC MSB

* Register value   = 0xFED4 to 0x01F4, corresponding to -30.0 to 50.0 °C (multiplier = 10)
       or   = 0xFF24 to 0x04C4, corresponding to -22.0 to 122.0 °F (multiplier = 10)

The temperature value is either in °C (default) or °F depending on the value of the TEMPERATURE_UNITS register.
This register has a multiplier of 10, the application must divide by 10 to obtain the correct value.

0x03 --- Read RELATIVE_HUMIDITY_VALUE

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x01	0x00	0x01	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value MSB	Register value LSB	CRC LSB	CRC MSB

* Register value   = 0x0000 to 0x03E8, corresponding to 0 to 100 %RH (multiplier = 10)
This register has a multiplier of 10, the application must divide by 10 to obtain the correct value.

0x03 --- Read DEWPOINT_TEMPERATURE_VALUE

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x02	0x00	0x01	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value MSB	Register value LSB	CRC LSB	CRC MSB

* Register value   = 0xFED4 to 0x01F4, corresponding to -30.0 to 50.0 °C (multiplier = 10)
       or   = 0xFF24 to 0x04C4, corresponding to -22.0 to 122.0 °F (multiplier = 10)

The dewpoint temperature value is either in °C (default) or °F depending on the value of the TEMPERATURE_UNITS register.

This register has a multiplier of 10, the application must divide by 10 to obtain the correct value.

0x03 --- Read WET_BULB_TEMPERATURE_VALUE

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x03	0x00	0x01	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value MSB	Register value LSB	CRC LSB	CRC MSB

* Register value = 0xFED4 to 0x01F4, corresponding to -30.0 to 50.0 °C (multiplier = 10)
    or = 0xFF24 to 0x04C4, corresponding to -22.0 to 122.0 °F (multiplier = 10)

The wet bulb temperature value is either in °C (default) or °F depending on the value of the TEMPERATURE_UNITS register.

This register has a multiplier of 10, the application must divide by 10 to obtain the correct value.

0x03 --- Read ENTHALPY_VALUE

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x04	0x00	0x01	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value MSB	Register value LSB	CRC LSB	CRC MSB

* Register value = 0x0000 to 0x0154, corresponding to 0 to 340 kJ/kg (multiplier = 1)
    or = 0x0000 to 0x0092, corresponding to 0 to 146 BTU/lb (multiplier = 1)

The enthalpy value is either in kJ/kg (default) or BTU/lb depending on the value of the ENTHALPY_UNITS register.

0x06 --- Write TEMPERATURE_OFFSET

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x05	Register Value MSB	Register value LSB	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x05	Register Value MSB	Register value LSB	CRC LSB	CRC MSB

* This register is used to add or subtract an offset to the temperature value if necessary to conform to a local reference.

For °F operation, Register value = 0xFF9C to 0x0064 for -100 to 100,
corresponds to T_OFFSET / 10 = -10.0 to 10.0 °F. ie: 0xFFC4 => -60/10 = -6.0 °F offset
resolution is 10, ie: °F offset must be -1.0, 0, +1.0, +2.0, etc. -1.3 is not valid

For °C operation, Register value = 0xFFCE to 0x0032 for -50 to 50,
corresponds to T_OFFSET / 10 = -5.0 to 5.0 °C. ie: 0x0023 => 35/10 = +3.5 °C offset
resolution is 5, ie: °C offset must be -1.5, -1.0, -0.5, 0, +0.5, +1.0, etc. +2.3 is not valid

The operating temperature units (°C or °F) for the device should be selected first, and then add any offset if necessary.

This register has a multiplier of 10, the application must divide by 10 to obtain the correct value.

0x06 --- Write RH_OFFSET

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x06	Register Value MSB	Register value LSB	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x06	Register Value MSB	Register value LSB	CRC LSB	CRC MSB

* This register is used to add or subtract an offset to the RH value if necessary to conform to a local reference.

> Register value = 0xFF9C to 0x0064 for -100 to 100, corresponding to RH_OFFSET = -10.0 to 10.0 %RH.
> ie: 0x001E => 30/10 = +3.0 %RH offset.
> resolution is 10, ie: offset must be -5.0, -4.0, -3.0, -2.0, etc. -4.3 is not valid

This register has a multiplier of 10, the application must divide by 10 to obtain the correct value.

0x06 --- Write ATMOSPHERIC_PRESSURE

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x07	Register Value MSB	Register value LSB	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x07	Register Value MSB	Register value LSB	CRC LSB	CRC MSB

* This register is used to set the atmospheric pressure value to conform to local conditions. This value is used in calculations.

> Register value = 0x032C to 0x03F5, corresponding to ATMOSPHERIC_PRESSURE = 812 to 1013 hPa.

0x06 --- Write ALTITUDE

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x08	Register Value MSB	Register value LSB	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x08	Register Value MSB	Register value LSB	CRC LSB	CRC MSB

* This register is used to set the altitude value to conform to local conditions. This value is used in calculations.

> Note that atmospheric pressure and altitude are linked, changing one also changes the other.

> Register value = 0x0000 to 0x1770, corresponding to ALTITUDE = 0 to 6000 feet.

0x06 --- Write DISPLAY_MODE

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x09	Register Value MSB	Register value LSB	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x09	Register Value MSB	Register value LSB	CRC LSB	CRC MSB

* This register is used to set the parameters displayed on the local LCD in the normal operating mode.
The available settings are:

0 = no display (menu will still display if key pressed)   6 = Temperature plus wet bulb toggle
1 = Temperature   7 = Temperature plus enthalpy toggle
2 = Dewpoint temperature   8 = Dewpoint plus wet bulb toggle
3 = Wet Bulb temperature   9 = Dewpoint plus enthalpy toggle
4 = Enthalpy   10 = Wet bulb plus enthalpy toggle
5 = Temperature plus dewpoint toggle every 5 seconds

0x06 --- Write TEMPERATURE_UNITS

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x0A	0x00	Register value LSB	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x0A	0x00	Register value LSB	CRC LSB	CRC MSB

* Register value   = 0x0000 = sets the device to °C operation
    = 0x0001 = sets the device to °F operation

0x06 --- Write ENTHALPY_UNITS

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x0B	0x00	Register value LSB	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x0B	0x00	Register value LSB	CRC LSB	CRC MSB

* Register value   = 0x0000 = sets the device to kJ/kg operation
    = 0x0001 = sets the device to BTU/lb operation

Exception response

Slave address (0x01 to 0xFF)	Function code + 0x80	Exception code * 0x01, 0x02 or 0x03	CRC LSB	CRC MSB

* An exception response is only returned if the CRC is correct
    Exception code 01 --- illegal function
    Exception code 02 --- illegal address
    Exception code 03 --- illegal data value

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