- Integrated Temperature, Relative Humidity and Dew Point Transmitter. Housed in a rugged stainless steel body offering excellent corrosion protection.
- RH Accuracy at 25 C: Model 1240 2% typical / 3% maximum; Model 1240HA 1.8% typical / 2% maximum. Please see graphs under Specifications section for more details.
- Electronics are sealed for environmental durability and reliability. Three additional seals at each of the transition points to further prevent water and air flow through the body of the probe ensuring fast accurate measurement.
- Rugged, removable bronze filter protects sensors while providing excellent heat transfer
- Sensor module contains its own calibration and additional protection. It is replaceable.
- ½" NPT thread at sensor end allows duct mounting using a flange.
- ½" NPT thread at wiring end allows use of standard junction boxes.
- Wiring is via flying leads requiring no special connectors or cable assemblies.
- Multiple sensors multiplexed on same wires
- Real-time data and configuration information is exchanged using the Modbus open communication standard over an **isolated three wire RS485 interface**
- **Operates from 12 VDC, 24VDC, 48VDC and 24VAC power supply rails. Power input is not polarity sensitive.**
- Modbus Reader utility allows quick read/write access to registers to speed up configuration and familiarization.

DESCRIPTION

The Model 1240 is a temperature, relative humidity, and dew point transmitter that is completely self contained. It measures temperature and relative humidity and then calculates the dew point temperature. Depending on the temperature, dew point over ice or over water will be calculated automatically.

The electronics are sealed for long-term resistance to moisture. The temperature / humidity sensor is replaceable without further calibration. The sensor and configuration information is communicated to other devices via the Modbus communication protocol.
The Model 1240 contains a very flexible power supply input and a robust 3-wire isolated RS485 interface. The sensor and configuration information is communicated to other devices via the Modbus communication protocol. .

The Model 1240 is our standard accuracy version with an RH accuracy of 2% typical and 3% maximum. The Model 1240HA is our high accuracy version with an RH accuracy of 1.8% typical and 2% maximum. Please see the Specification section for more details.

NOTE	This PDF datasheet has attachments. To access them, it may be necessary to use an actual Adobe Reader. since some readers built into internet browsers do not allow access to attachments.

Removable Filter and Replaceable Sensor Module

The bronze filter is removable, has excellent corrosion protection and provides good heat transfer for an accurate measurement.

The sensor module contains a digitally calibrated sensor that is replaceable. The module integrates additional sensor protection to prevent damage in case of reversal while being replaced or serviced.

Power Supply

The Model 1240 features an exceptionally flexible switching power supply. It allows the Model 1240 to be easily integrated into building automation, industrial automation, telecommunication and remote telemetry type systems.

It operates from 12 VDC, 24 VDC, 48 VDC and 24 VAC power supply rails with a design margin better than +/-25% to allow for installation variations. A main advantage of the on board power supply is low power consumption. The unit draws 5 mA at 24 VDC. This makes it ideal for low cost battery backup systems if one is desired.

The power supply is well protected against overvoltage spikes via solid state transient voltage suppressors. It is additionally protected against over current conditions via fuses on both voltage input lines. On board thermal fuses do not have to be replaced. They will simply recover when the fault condition is corrected. Input voltage is polarity insensitive.

RS485 Communication

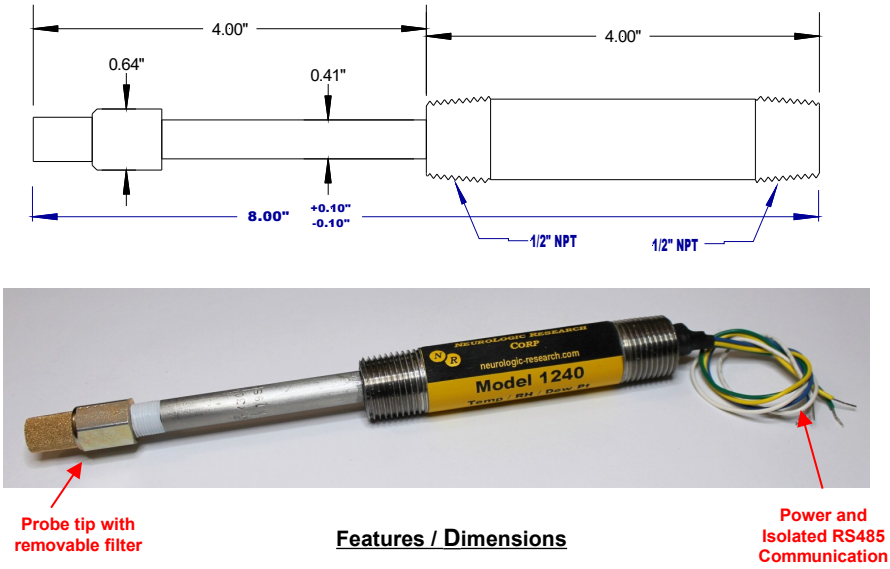
The physical communication interface is implemented using an isolated half duplex RS485 transceiver. The RS485 lines are isolated from the voltage input lines, Connection to the RS485 network is via 3 wires consisting of a RS485A, RS485B and an RS485 common. For maximum protection, each wire is internally fused and has additional external clamps relative to the other two communication lines.

The RS485 receiver on the Model 1240 has high input impedance and is fault tolerant. It requires no additional pull up or pull down resistors for proper operation and allows up to 128 devices to be connected on the bus.

As with all RS485 communications, termination using a 120 Ohm resistor at each end of the bus is a requirement. Termination resistors must be placed between the RS485A and RS485B lines.

Finally, while communication may be successful on a test bench or short bus wires, connecting the third wire, RS485C is also a requirement for proper operation as it establishes a reference point for the RS485A/B signals. Note, the RS485 wiring is polarity sensitive.

Wiring and Installation



Features / Dimensions

The Model 1205 may be mounted in a large variety of ways. In its most basic form the entire probe can be simply fastened into any 1/2 inch NPT port with access to the process being measured. The probe can also be used with an optional flange for duct mounting or suspended from a conduit box fastened at the wiring end. In application such as outdoors, where the sensor may be subject to water droplets or severe condensation it must be mounted with the probe tip pointed down. For outdoor applications please consider our Model 40A which is a Rain and Sun Guard.

The Model 1240 is supplied with five flying leads to connect to the RS485 Modbus network and power supply. The table below defines the connections by wire color. **Please note: RS485 wiring is polarity sensitive**.

POWER & RS485 COMMUNICATION WIRING	
VinA / VinB	**(2)White Wires**. Polarity insensitive power supply connection
RS485A	**Yellow Wire**. Connect to positive or A side of 485 communication network. RS485 communication is **polarity sensitive.**
RS485B	**Blue Wire**. Connect to negative or B side of 485 communication network. RS485 communication is **polarity sensitive.**
RS485C	**Green Wire**. Common reference for RS485 communication.

MODBUS COMMUNICATION IMPLEMENTATION

The Model 1240 implements the Modbus RTU or non-ASCII version of the protocol. Note, this section assumes the reader has a working knowledge of the Modbus protocol

All data is communicated via either 16-bit registers or single bit registers. The16-bit registers are transmitted with the most significant byte followed by the least significant byte. This is per Modbus standard.

Input Registers are read only 16-bit registers used to return real-time data. Holding Registers are read/write 16-bit registers. They are used to read and write data from or to a Modbus device. In the Model 1240, a Holding Register can be either volatile or non-volatile. Non-volatile Holding Registers are used for configuration data and retained across a power cycle.

Input Status registers are single bit read only values that can be on or off. Coil Registers are also single bit registers that can be read or written.

The following Modbus Functions are implemented:

- Read Coil – Modbus Function code 1
- Read Input Status – Modbus Function code 2
- Read Holding Registers – Modbus Function code 3
- Read Input Registers – Modbus Function code 4
- Write 1 Coil – Modbus Function code 5
- Write 1 Holding Register – Modbus Function code 6
- Diagnostics Loop Back only - Modbus Function code 8
- Write Multiple Coils – Modbus Function code 15
- Write Multiple Holding Registers - Modbus Function code 16

Modes of Operation and Setting up Communication Parameters

To communicate with the Model 1240 or any RS485 Modbus device you need to know its Modbus address, baud rate, and parity settings. There are no jumpers or dip switches to change.

When the unit is first powered up, it goes into a Setup Mode. While in Setup Mode, it will communicate via Modbus address 255, a baud rate of 19200, no parity and 1 stop bits. If it does get a request using these Setup Parameters, it will stay in Setup Mode until no communication is seen for 5 seconds. It will then recall its Modbus address, baud rate, and parity settings from non-volatile memory and use those until power is interrupted again. This allows any unit's configuration to be read and written without first knowing its communication parameters.

The factory default configuration is Modbus address 240, even parity and 19200 baud rate. This address and communication parameters can also be used immediately after receiving the unit from the factory. If there is only one unit on the RS485 bus, no further communication setup is needed. Note, that while successfully communicating with the Model 1240 using a particular set of communication settings, it will **NOT** use the modified parameters until communication using the previous parameters is terminated for at least 5 seconds. This allows the configuration process to complete in an orderly fashion. When the host device switches to the new parameters, the Model 1240 will start answering.

NOTE	**A "No Parity" setting is supported only with one stop bit but NOT two**

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Coils (Function Code 1, 5 and 15)

Modbus Coils are read/write single bit registers. They are specified using a 0xxxx Modbus addressing designation.

Modbus Address Designator	Register Address (Decimal)	Description
00001-00008	0-7	Reserved

Input Status (Function Code 2)

Modbus Input Status Registers are read only 16 bit registers. They are specified using a 1xxxx Modbus addressing designation.

Modbus Address Designator	Register Address (Decimal)	Description
10001-10016	0-16	Reserved

Input Registers (Function Code 4)

The following Input Registers are implemented. These registers are read only. They are specified using a 3xxxx Modbus addressing designator.

NOTE	The firmware only allocates 64 byte transmit and receive communication buffers. This limits the number of registers that can be read with a single read to around 25.

Modbus Address Designator	Register Address	Description
30001	0	**Firmware ID** 0x1240 to identify firmware as Model 1240. In Hex
30002	1	**Firmware Version** 0x0100 for version 1.00 in hex. MSB is major and LSB minor version.
30003	2	Reserved
30004	3	**Restarts**. Number of times the unit was power cycled or reset
30005	4	Reserved
30006	5	**Temperature**. Signed 32 bit integer occupying two registers
30007	6	**Humidity** Signed 32 bit integer occupying two registers
30008	7	**Dew Point** Signed 32 bit integer occupying two registers
30009-30021	8-20	Reserved
30022-30023	21-22	**Temperature (Floating Point)** IEE754 float occupying two registers
30024-30025	23-24	**Humidity (Floating Point)**. IEE754 float occupying two registers
30026-30027	25-26	**Dew Point (Floating Point)** IEE754 float occupying two registers
30030-30053	29-52	Reserved

Holding Registers (Function Code 3, 6, 16)

The following volatile Holding Registers are implemented. These can be read and written by the host computer and are normally accessed using 4xxxx addressing designator.

Modbus Address Designator	Register Address (Decimal)	Description
40001-40005	0-4	**Reserved**

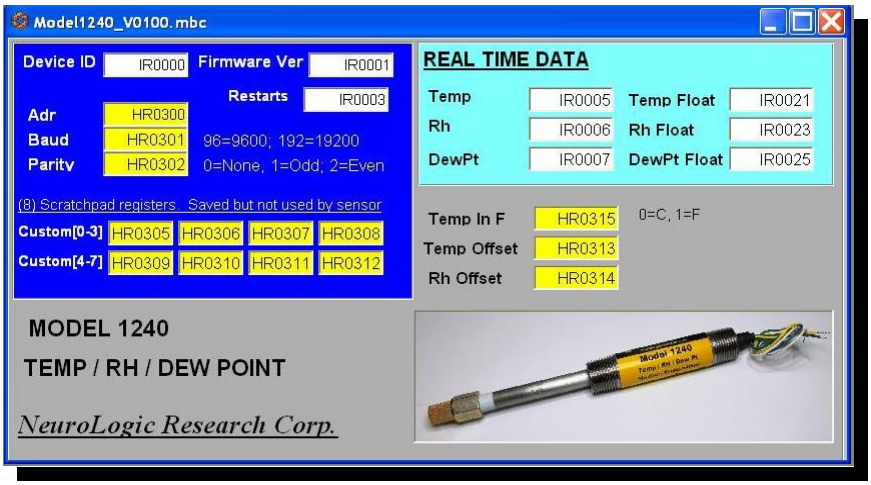
Non-Volatile Holding Registers (Function Code 3, 6, 16)

Unlike Modbus Holding Registers defined in the previous section, the following registers are used for configuration and saved to on board non-volatile memory.

Modbus Address Designator	Register Address (Decimal)	Description
40301	0300	**Modbus Address**. Valid values are 1 to 255. Factory Default is 240, While in Setup Mode address is 255.
40302	0301	**Baud Rate**. 12=1200, 24=2400, 48=4800, 96=9600, 192=19200. Factory default is 19200 which is also used in Setup Mode.
40303	0302	**Parity**. 0=None, 1=Odd, 2=Even. Default is Even Parity. While in Setup Mode no parity is used with 1 stop bit. **Note, currently, no parity with two stop bits are not supported**..
40304	0303	Reserved
40305	0304	Reserved
40306-40313	0305-0312	**Scratchpad Registers**. Eight registers saved and restored but not used by firmware.. Can be used by customer for any purpose to identify the device or its location.
40314	0313	**Temperature Offset** 5-255 are valid. Number of milliseconds input must be maintained without change to be recognized. Value of 5 is the default value which allows for a pulse frequency up to 100 Hz.
40315	0314	**RH Offset** Same as Filter Value 1 but for input 2.
40316	0315	**Temperature Units in Degrees F** Same as Filter Value 1 but for input 3

Using the Modbus Reader Utility

The Modbus Reader is a free third party utility available for the Windows operating system. It allows a dialog box to be defined to read and write data from and to a Modbus device. The dialog box layout, register addresses, display format and Modbus requests are all defined in a Modbus Configuration file with a ".mbc" extension. The Modbus Reader utility uses this file to communicate with the Modbus device. While the Modbus Reader utility is free, the utility to create the configuration file is not.



The Model1240_vx.mbc file is attached to this PDF file. It can be used to immediately test the Model 1240, and exercise its function or to bench configure it before installing in the field. It also allows the user to implement only the portion of the interface that is needed for the project at hand.

NOTE	This PDF datasheet has attachments. To access them, it may be necessary to use an actual Adobe Reader. since some readers built into internet browsers do not allow access to attachments.

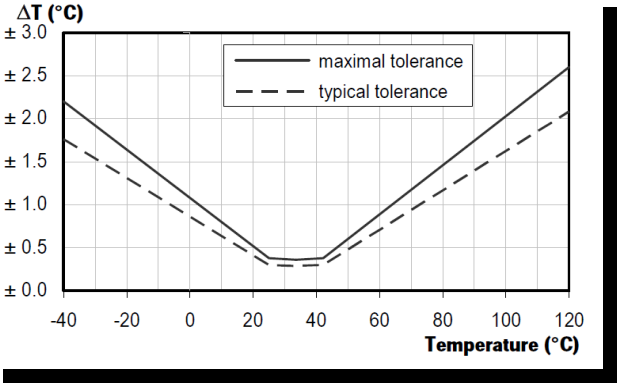
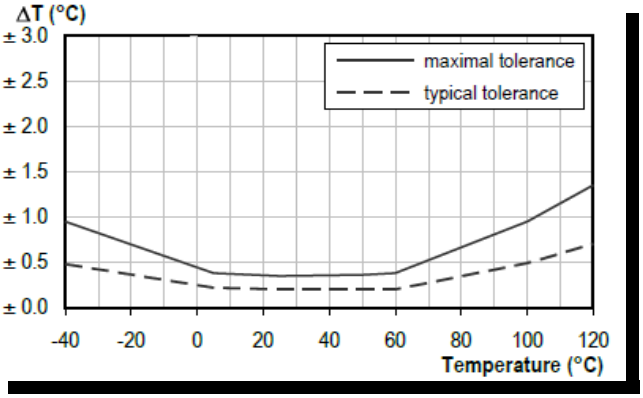
While the Modbus Reader utility uses the specification in the ".mbc" file to communicate to the Modbus device, it still needs to know a few configuration parameters to function on different computers. The serial communication port, Modbus address, baud rate, parity and timeout need to be specified. The Model 1240 configuration screen is shown above. It is very useful in quickly visualizing all the Modbus registers, their type and addresses.

Fields shown in yellow can be modified by the user by double clicking on them. "HR" designates Holding Registers. "IR" designates Input Registers. "DI" designates a single bit Input Status Registers.

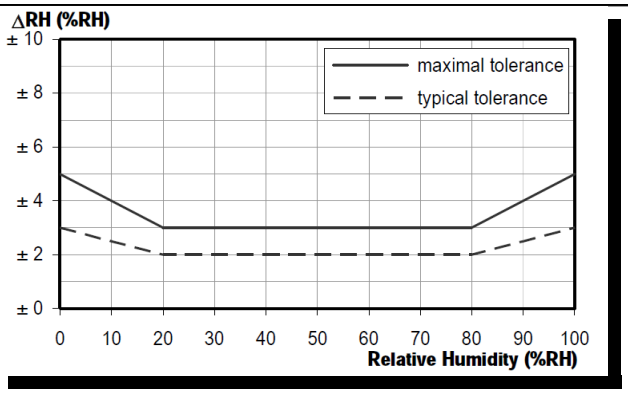
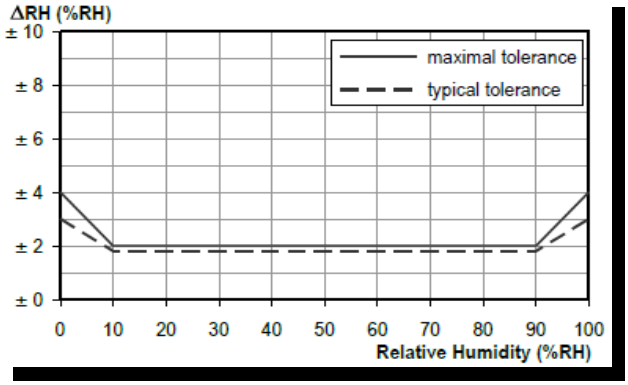
- Install Modbus Reader application on a computer with Windows Operating system
- Make sure your system has a USB to RS485 communication adapter installed and that your system recognizes it. At the factory we use an FTDI chip based USB to serial device but there are others.
- Use File->Open menu to load the Model 1240_vxx.mbc file
- Use the Mode menu and make sure "Master" is selected
- Use Ctl-I or the Mode->Master Setting menu to set the Slave address to 255 and Response timeout to 100 milliseconds
- Use the Connection Menu to select the serial communication port
- Use Ctl-P or the Connection->Comm Parameters to set the Baud Rate to 19200, no parity, 1 stop bits
- Use the F2 key or Connection->Connect menu to start communication
- Cycle the power on the connected Model 1240 or simply unplug the bottom removable terminal block and plug back in..

SPECIFICATIONS

Temperature

Sensing Element	Solid state
Model 1240 Standard Accuracy	
Model 1240HA, High Accuracy	
Temperature Range	-40 to 85C
Resolution	0.06 C

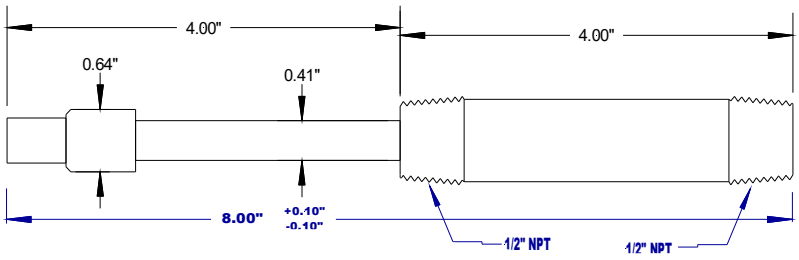
Relative Humidity

Model 1240 Standard Accuracy at 25C	
Model 1240HA, High Accuracy at 25 C	
Resolution	0.05%
Maintenance	No routine maintenance required Bronze filter is removable for cleaning Sensor Module is field replaceable.
Sensor Stability	<0.5% RH typical per year (See notes 1 &2)
Notes	1. Sensor drift and inaccuracies maybe higher if sensor is exposed to high contents of volatile organic compounds. 2. Long term exposure to >80% RH may temporarily offset RH by up to 3% after 60 hours. This recoverable after return to lower RH levels.

Electronics

Operating Environment	-40 to 85C, 0-95% RH non-condensing
Input Voltage Operating	9 to 55 VDC or 18 to 39 VAC at 0.25W maximum.
Input Voltage Maximum	65 VDC / 45 VAC. Please note at this voltage the unit will start to draw more current and may trip the internal thermal fuses but will not be damaged. Normal operation resumes when voltage returns to operationg range.
Input Power Protection	Input power is fused and transient voltage protected. (Fuses do not need to be replaced)
Communication Transceiver Type	Fail safe RS485 transceiver with high input impedance allowing up to 128 devices on a wire trunk. Baud rates of 1200-19200 are supported. NOTE, no parity is only supported with 1 stop bit.
Communication Line Protection	Each communication line is fused with additional transient voltage clamps on all lines relative to each other.

Dimension and Materials

Housing Material	Body and extension tube is 304 stainless steel Filter is Bronze
Duct Mounting Insertion Depth	4 inches
Dimension	

ORDERING INFORMATION

1240	**Model 1240 Modbus Temp/Rh/ Dew Pt Transmitter (Standard Accuracy)**
1240HA	**Model 1240HA Modbus Temp/Rh/ Dew Pt Transmitter (High Accuracy)**

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