



neptronic®

Universal Wall-Mount Controller

TSUB Series

Modbus Communication Module User Guide



Introduction

The TSUB Modbus Communication Module User Guide provides information for using Neptronic[®] TSUB communication feature. The TSUB uses Modbus communication protocol over serial line in the RTU mode and provides a Modbus network interface between client devices and Neptronic TSUB Series devices.

The TSUB Modbus Guide assumes that you are familiar with Modbus terminology.

The following are the requirements for Modbus:

- *Data Model.* The TSUB Modbus server data model uses only the Holding Registers table.
- *Function Codes.* The TSUB Modbus server supports a limited function codes subset comprising:
 - Read Holding Registers (0x03)
 - Write Single Register (0x06)
 - Write Multiple Registers (0x10)
- *Exception Responses.* The TSUB Modbus server supports the following exception codes:
 - Illegal data address
 - Illegal data value
 - Slave device busy
- *Serial Line.* The TSUB Modbus over serial line uses RTU transmission mode over a two-wire configuration RS485 (EIA/TIA-485 standard) physical layer.
 - The physical layer can use fixed baud rate selection or automatic baud rate detection (default) as per the **Modbus Auto Baud Rate** device menu item or holding register index 1.
 - The supported baud rates are 9600, 19200, 38400, and 57600.
 - The physical layer also supports variable parity control and stop bit configuration as per the **Modbus Comport Config** device menu item or holding register index 2.
 - In auto baud rate configuration, if the device detects only consecutive bad frames (2 or more) for one second with any given baud rate, it will reinitialize itself to the next baud rate.
- *Addressing.* The TSUB device only answers at the following address:
 - The device's unique address (1 to 246) that can be set through the device menu or through holding register index 0.

Holding Registers Table

Table Glossary

Name	Description	Name	Description
W	Writable Register	ASCII	For registers containing ASCII (8-bit) characters
RO	Read Only Register	MSB	Most Significant Byte
Unsigned	For range of values from 0 to 65,535, unless otherwise specified	LSB	Least Significant Byte
Signed	For range of values from -32,768 to 32,767, unless otherwise specified	MSW	Most Significant Word
Bit String	For registers with multiple values using bit mask (example, flags)	LSW	Least Significant Word

Holding Register Table

Protocol Base	Register Index	Description	Data Type	Range	Writable
0	40001	Address - Neptronic ID and Modbus address of current device.	Unsigned	MSB = 22, LSB = 1-246	W
1	40002	MSTP Baud Rate.	Unsigned <i>Scale 100</i>	0, 9600, 19200, 38400, or 57600, 0 = Auto Baud Rate Detection <i>Value/100 (e.g. 38400 baud = 384)</i>	W
2	40003	Communication port configuration.	Unsigned	1 = No parity, 2 Stop bits, 2 = Even parity, 1 stop bit, 3 = Odd parity, 1 stop bit	W
3	40004	ProdName_87, characters 8-7 of 8 name characters.	ASCII	MSB = 84 (T), LSB = 85 (U)	W
4	40005	ProdName_65, characters 6-5 of 8 name characters.	ASCII	MSB = 67 (C), LSB = 66 (B)	W
5	40006	ProdName_43, characters 4-3 of 8 name characters.	ASCII	MSB = 50 (2), LSB = 52 (4)	W
6	40007	ProdName_21, characters 2-1 of 8 name characters.	ASCII	MSB = 32 (Space), LSB = 0 (Null)	W
7	40008	Controller Product_Version, actual firmware version.	Unsigned	1 to 65535 (e.g. 115)	RO
8	40009	Controller parameters version.	Unsigned	1 to 65535 (e.g. 102)	RO

Protocol Base	Register Index	Description	Data Type	Range	Writable
9	40010	System Status 1.	Bit String	<p>[B1, B5, B7 – B15]: Reserved</p> <p>B0: System operation 0 = Normal, 1 = Fault</p> <p>B2: System override by NSB or OCC 0 = Normal, 1 = OFF</p> <p>B3: ChangeOverMode 0 = Cooling, 1 = Heating</p> <p>B4: AL_FlowSwitch 0 = No alarm, 1 = Alarm activated</p> <p>B6: AL_DirtyFilter 0 = No alarm, 1 = Alarm activated</p>	RO
10	40011	System Status 2.	Bit String	<p>[B1, B3-B6, B12-B14]: Reserved</p> <p>B0: Selector Switch Status 0 = Remote Mode, 1 = Local Mode</p> <p>B2: CO2 Alarm 0 = Normal, 1 = Alarm</p> <p>B7: AL_Override 0 = Off, 1 = On</p> <p>B8: AL_WindowOpened 0 = Off, 1 = On</p> <p>B9: AL_DoorOpened 0 = Off, 1 = On</p> <p>B10: AL_UI1 0 = Off, 1 = On</p> <p>B11: AL_UI2 0 = Off, 1 = On</p> <p>B15: AL_OverHeat 0 = Off, 1 = On</p>	RO
11	40012	Internal temperature sensor reading.	Signed Scale 100	Unit: °C/°F, Range: 0°C to 50°C or 32°F to 122°F Value x 100 (e.g. 23°C = 2300 or 33°F = 3300)	RO
12	40013	External temperature sensor reading.	Signed Scale 100	Unit: °C/°F, Range: -40°C to 100°C or -40°F to 212°F Value x 100 (e.g. 23°C = 2300 or 33°F = 3300)	RO
13	40014	Changeover temperature sensor reading.	Signed Scale 100	Unit: °C/°F, Range: -40°C to 100°C or -40°F to 212°F Value x 100 (e.g. 23°C = 2300 or 33°F = 3300)	RO
14	40015	Control temperature reading.	Signed Scale 100	Unit: °C/°F, Range: -40°C to 100°C or -40°F to 212°F Value x 100 (e.g. 23°C = 2300 or 33°F = 3300)	W
15	40016	Internal humidity sensor reading.* Not available on all models.	Unsigned Scale 10	Unit: % RH, Range: 10%RH to 90%RH, Value x 10 (e.g. 30%RH = 300)	RO
16	40017	External humidity sensor reading.	Unsigned Scale 10	Unit: % RH, Range: 10%RH to 90%RH, Value x 10 (e.g. 30%RH = 300)	RO

Protocol Base	Register Index	Description	Data Type	Range	Writable
17	40018	Analog input 1 reading.	Signed Scale 100	Unit: Volts or °C/°F, Range: 0V to 10V, -40 to 100°C or -40 to 212°F, 0 (open), 1 (close). <i>Value x 100 (e.g. 3 V = 300/18°C = 1800 or 33°F = 3300)</i>	RO
18	40019	Analog input 2 reading.	Signed Scale 100	Unit: Volts or °C/°F, Range: 0V to 10V, -40 to 100°C or -40 to 212°F, 0 (open), 1 (close). <i>Value x 100 (e.g. 3 V = 300/18°C = 1800 or 33°F = 3300)</i>	RO
19 to 20	40020 to 40021	<i>Reserved</i>			
21	40022	External CO2 sensor value in ppm.	Signed Scale 1	Unit: ppm, 0 to Register (CO2 range), <i>Value x 1 (e.g. 500 ppm = 500)</i>	RO
22	40023	<i>Reserved</i>			
23	40024	CO2 control value in ppm.	Signed Scale 1	Unit: ppm, 0 to Register (CO2 range), <i>Value x 1 (e.g. 500 ppm = 500)</i>	RO
24	40025	Actual system occupancy state.	Unsigned	1 = NoOccupancy, 2 = Occupancy, 3 = Override	RO
25	40026	Actual night setback state of the system.	Unsigned	1 = Day, 2 = Night, 3 = Override	RO
26	40027	Actual heating demand of ramp 1.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
27	40028	Actual heating demand of ramp 2.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
28	40029	Actual cooling demand of ramp 1.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
29	40030	Actual cooling demand of ramp 2.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
30	40031	Actual changeover demand.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
31	40032	Actual fan demand.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
32	40033	Actual dehumidification demand.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
33	40034	Actual humidification demand.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
34	40035	Cooling Heating SwitchTimerCount - countdown until the system is able to swap the demand.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 7200 seconds, <i>Value/1 (e.g. 100 secs = 100)</i>	RO
35	40036	<i>Reserved</i>			
36	40037	Analog output 2 value.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	W

Protocol Base	Register Index	Description	Data Type	Range	Writable
37	40038	Analog output 3 value.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 100% = 1000)	W
38	40039	<i>Reserved</i>			
39	40040	Binary output - 6 relays output status.	Bit String	[B0-B1, B7-B15]: Reserved B2: Binary Output 3 0 = Open, 1 = Close B3: Binary Output 4 0 = Open, 1 = Close B4: Binary Output 5 0 = Open, 1 = Close B5: Binary Output 6 0 = Open, 1 = Close B6: Binary Output 7 0 = Open, 1 = Close	W
40	40041	System command.	Bit String	[B2, B6, B9-B15]: Reserved B0: Cfg_ServiceDisplayAddress 0 = Normal, 1 = Display address on LCD B1: Cfg_CoolingRampLock 0 = Off, 1 = On B3: Cfg_HeatingRamp1Lock 0 = Off, 1 = On B4: Cfg_HeatingRamp2Lock 0 = Off, 1 = On B5: Cfg_ChangeOverRampLock 0 = Off, 1 = On B7: Cfg_HumidifyRampLock 0 = Off, 1 = On B8: Cfg_DehumidifyRampLock 0 = Off, 1 = On	W
41	40042	System mode status.	Unsigned	1 = Auto [Register 40074 allows Auto Mode (1 or 5)] 2 = Heating [Register 40074 allows Heating Mode (1, 2 or 4)] 3 = EMH [Register 40041 Bits 2 and 1 = On and Enable (1) and Register 40074 allows Heating Mode (1, 2 or 4)] 4 = Cooling [Register 40074 allows Cooling Mode (1, 3 or 4)] 5 = Fan [Register 40040 Bit 12 = Advanced (1) and Bit 13 = Enable] 6 = Off [Register 40044 Bit 6 = Enable (0)]	W
42	40043	Fan speed selection by user.	Unsigned	1 = Auto, 2 = Low, 3 = Med, 4 = High	W
43	40044	Temperature setpoint in occupancy or day mode.	Signed Scale 10	Unit: °C/°F, Range: min to max setpoint, Value x 10 (e.g. 18°C = 180)	W

Protocol Base	Register Index	Description	Data Type	Range	Writable
44	40045	System option1.	Bit String	<p>B0: Cfg_TempUnitTstat 0 = °C, 1 = °F</p> <p>B1: Cfg_TempUnitModbus 0 = °C, 1 = °F</p> <p>B2: Cfg_TempSetPointLock 0 = Off, 1 = On</p> <p>B3: Cfg_HumSetPointLock 0 = Off, 1 = On</p> <p>B4: Cfg_ProgramModeLock 0 = Off, 1 = On</p> <p>B5: AL_FreezeProtection 0 = Off, 1 = On</p> <p>B6: Cfg_UserSysOffModes 0 = Enable, 1 = Disable</p> <p>B7: Cfg_KeyPadBottomLeftLock 0 = Off, 1 = On</p> <p>B8: Cfg_KeyPadUpperLeftLock 0 = Off, 1 = On</p> <p>B9: Cfg_KeyPadArrowsLock 0 = Off, 1 = On</p> <p>B10: Cfg_UserFanAutoMode 0 = Enable, 1 = Disable</p> <p>B11: Cfg_NightOrNoOccMode 0 = Setpoint, 1 = OFF</p> <p>B12: Cfg_HumControlSource* 0 = Intern Sensor, 1 = Extern Sensor Not available on all models.</p> <p>B13: Time Mode 0 = 24h, 1 = 12h</p> <p>B14: Cfg_WindowOpenedMode 0 = Setpoint, 1 = OFF</p> <p>B15: Cfg_DoorOpenedMode 0 = Setpoint, 1 = OFF</p>	W

Protocol Base	Register Index	Description	Data Type	Range	Writable
45	40046	System option2.	Bit String	<p>[B2, B5-B7]: Reserved</p> <p>B0: Baud Rate 0 = Auto, 1 = Manual</p> <p>B1: Cfg_ActivateSchedule 0 = Off, 1 = On</p> <p>B3: Cfg_AnalogOutput2Direction 0 = Direct, 1 = Reverse</p> <p>B4: Cfg_AnalogOutput3Direction 0 = Direct, 1 = Reverse</p> <p>B8: Cfg_BinaryOutput3Direction 0 = Direct, 1 = Reverse</p> <p>B9: Cfg_BinaryOutput4Direction 0 = Direct, 1 = Reverse</p> <p>B10: Cfg_BinaryOutput5Direction 0 = Direct, 1 = Reverse</p> <p>B11: Cfg_BinaryOutput6Direction 0 = Direct, 1 = Reverse</p> <p>B12: Cfg_BinaryOutput7Direction 0 = Direct, 1 = Reverse</p> <p>B12: Cfg_FanSpeedOption 0 = Standard, 1 = Advanced (OE1)</p> <p>B13: Cfg_UserSysFanMode 0 = Disable, 1 = Enable</p> <p>B14: Cfg_HideFanDisplay 0 = No, 1 = Yes</p>	W
46	40047	System option3.	Bit String	<p>[B1-B5, B8-B9, B11-B12, B14]: Reserved</p> <p>B0: DAYLIGHT_SAVINGS_STATUS 0 = Normal, 1 = Summer</p> <p>B6: Cfg_AnalogInput1MinVolt 0 = 0.0 Volt, 1 = 2.0 Volt</p> <p>B7: Cfg_AnalogInput2MinVolt 0 = 0.0 Volt, 1 = 2.0 Volt</p> <p>B10: Cfg_VFDTempInput 0 = Intern Sensor, 1 = Extern Sensor</p> <p>B13: Cfg_FloatingBO3/BO7Direction 0 = Direct, 1 = Reverse</p> <p>B15: Cfg_DeltaTempLogic 0 = Off, 1 = On</p>	W

Protocol Base	Register Index	Description	Data Type	Range	Writable
47	40048	System option4.	Bit String	[B3-B5, B7, B10-B15]: Reserved B0: Cfg_CO2ControlSource <i>0 = Internal Sensor, 1 = External Sensor</i> B1: Cfg_DisplayHumidity <i>0 = Display the temperature only, 1 = Display the temperature and humidity</i> B2: Cfg_DisplayCO2 <i>0 = Don't display CO2 control value, 1 = Display CO2 control value</i> B6: Cfg_VFDTempSetpointSource <i>0 = VFDTempSetpoint, 1 = TempSetpoint</i> B8: Cfg_AnalogOutput2OffVoltage <i>0 = Off, 1 = Minimum</i> B9: Cfg_AnalogOutput3OffVoltage <i>0 = Off, 1 = Minimum</i>	W
48	40049	Display information.	Unsigned	1 = Temperature and Demand, 2 = Setpoint and Demand, 3 = Temperature Only, 4 = Setpoint Only, 5 = Off	W
49	40050	Temperature control source.	Unsigned	1 = Network Temp, 2 = Intern Temp, 3 = Extern Temp	W
50	40051	Network fallback timeout.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 60, <i>Value/1 (e.g. 30 mins = 30)</i>	W
51	40052	Minimum occupancy/day setpoint.	Signed Scale 10	Unit: °C/°F, Range: 10°C to max or 50°F to max <i>Value x 10 (e.g. 18°C = 180 or 60°F = 600)</i>	W
52	40053	Maximum occupancy/day setpoint.	Signed Scale 10	Unit: °C/°F, Range: min to 40°C or min to 104°F <i>Value x 10 (e.g. 18°C = 180 or 60°F = 600)</i>	W
53	40054	Cooling temperature setpoint in unoccupied or night mode.	Signed Scale 10	Unit: °C/°F, Range: 10°C to 40°C or 50°F to 104°F <i>Value x 10 (e.g. 18°C = 180 or 60°F = 600)</i>	W
54	40055	Heating temperature setpoint in unoccupied or night mode.	Signed Scale 10	Unit: °C/°F, Range: 10°C to 40°C or 50°F to 104°F <i>Value x 10 (e.g. 18°C = 180 or 60°F = 600)</i>	W
55	40056	Heating proportional band for ramp 1.	Unsigned Scale 10	Unit: °C/°F, 0.5°C to 5°C or 1°F to 9°F <i>Value x 10 (e.g. 1°C = 10 or 2°F = 20)</i>	W
56	40057	Heating proportional band for ramp 2.	Unsigned Scale 10	Unit: °C/°F, 0.5°C to 5°C or 1°F to 9°F <i>Value x 10 (e.g. 1°C = 10 or 2°F = 20)</i>	W

Protocol Base	Register Index	Description	Data Type	Range	Writable
57	40058	Cooling proportional band for ramp 1.	Unsigned Scale 10	Unit: °C/°F, 0.5°C to 5°C or 1°F to 9°F Value x 10 (e.g. 1°C = 10 or 2°F = 20)	W
58	40059	Cooling proportional band for ramp 2.	Unsigned Scale 10	Unit: °C/°F, 0.5°C to 5°C or 1°F to 9°F Value x 10 (e.g. 1°C = 10 or 2°F = 20)	W
59	40060	Changeover proportional band.	Unsigned Scale 10	Unit: °C/°F, 0.5°C to 5°C or 1°F to 9°F Value x 10 (e.g. 1°C = 10 or 2°F = 20)	W
60	40061	Heating deadband for ramp 1.	Unsigned Scale 10	Unit: °C/°F, 0°C to 5°C or 0°F to 9°F Value x 10 (e.g. 1°C = 10 or 2°F = 20)	W
61	40062	Heating deadband for ramp 2.	Unsigned Scale 10	Unit: °C/°F, 0°C to 5°C or 0°F to 9°F Value x 10 (e.g. 1°C = 10 or 2°F = 20)	W
62	40063	Cooling deadband for ramp 1.	Unsigned Scale 10	Unit: °C/°F, 0°C to 5°C or 0°F to 9°F Value x 10 (e.g. 1°C = 10 or 2°F = 20)	W
63	40064	Cooling deadband for ramp 2.	Unsigned Scale 10	Unit: °C/°F, 0°C to 5°C or 0°F to 9°F Value x 10 (e.g. 1°C = 10 or 2°F = 20)	W
64	40065	Changeover deadband.	Unsigned Scale 10	Unit: °C/°F, 0°C to 5°C or 0°F to 9°F Value x 10 (e.g. 1°C = 10 or 2°F = 20)	W
65	40066	Changeover setpoint.	Signed Scale 10	Unit: °C/°F, 10°C to 40°C or 50°F to 104°F Value x 10 (e.g. 12°C = 120 or 60°F = 600)	W
66	40067	Fan time out in seconds.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 255 seconds, Value x 1 (e.g. 100 secs = 100)	W
67	40068	Fan damping factor in seconds.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 255 seconds, Value x 1 (e.g. 100 secs = 100)	W
68	40069	Heating integral time factor in seconds.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 250 seconds, Value x 1 (e.g. 100 secs = 100)	W
69	40070	Cooling integral time factor in seconds.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 250 seconds, Value x 1 (e.g. 100 secs = 100)	W
70	40071	Cooling Heating SwitchTimer - Delay between cool and heat or vice versa.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 120 minutes, Value x 1 (e.g. 100 mins = 100)	W
71	40072	Cooling anticycle delay in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 15 minutes, Value x 1 (e.g. 10 mins = 10)	W
72	40073	NSB override delay in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 180 minutes, Value x 1 (e.g. 100 mins = 100)	W
73	40074	Unoccupied override delay in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 180 minutes, Value x 1 (e.g. 100 mins = 100)	W

Protocol Base	Register Index	Description	Data Type	Range	Writable
74	40075	Occupancy minimum time in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 720 minutes, <i>Value x 1 (e.g. 100 mins = 100)</i>	W
75	40076	Unoccupied override delay countdown in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 180 minutes, <i>Value x 1 (e.g. 100 mins = 100)</i>	W
76	40077	Fan mode (speed) in unoccupied or NSB mode.	Unsigned	1 = Low, 2 = Med, 3 = High, 4 = Auto	W
77	40078	Fan mode (speed) when window is opened (alarm).	Unsigned	1 = Low, 2 = Med, 3 = High, 4 = Auto	W
78	40079	Fan mode (speed) when door is opened (alarm).	Unsigned	1 = Low, 2 = Med, 3 = High, 4 = Auto	W
79	40080	System control mode.	Unsigned	1 = Auto, 2 = Heat, 3 = Cool, 4 = Heat or Cool, 5 = Auto Lock	W
80	40081	Override System occupancy/NSB mode.	Unsigned	1 = Locally, 2 = OFF, 3 = Occupied, 4 = Unoccupied, 5 = Day, 6 = Night	W
81	40082	Internal temperature sensor offset correction.	Signed Scale 100	Unit: depends on system unit, Range: $\pm 5^{\circ}\text{C}$ or $\pm 9^{\circ}\text{F}$ <i>Value x 100 (e.g. $2^{\circ}\text{C} = 200$ or $3^{\circ}\text{F} = 300$)</i>	W
82	40083	Universal Input 1 signal.	Unsigned	1 = OFF 2 = Extern sensor 10K 3 = Change over sensor 4 = Change over normally cool 5 = Change over normally heat 6 = Outside air sensor 7 = Extern sensor 0-10V 8 = CO2 sensor 0-10V 9 = Occupancy binary input 10 = NSB binary input 11 = Override binary input 12 = Window binary input 13 = Door binary input 14 = Dirty Filter binary input 15 = Flow switch binary input 16 = OverHeat binary input 17 = Selector switch binary input 18 = Fan Feedback 19 = Humidity sensor 0-10V 20 = Pressure sensor 0-10V 21 = Extern sensor TT-012 22 = Delta T Inlet 10K 23 = Delta T Inlet 0-10V 24 = Delta T Outlet 10K 25 = Delta T Outlet 0-10V	W
83	40084	Universal Input 2 signal.	Unsigned	1 = OFF 2 = Extern sensor 10K 3 = Change over sensor 4 = Change over normally cool 5 = Change over normally heat 6 = Outside air sensor 7 = Extern sensor 0-10V 8 = CO2 sensor 0-10V 9 = Occupancy binary input 10 = NSB binary input 11 = Override binary input 12 = Window binary input 13 = Door binary input 14 = Dirty Filter binary input 15 = Flow switch binary input 16 = OverHeat binary input 17 = Selector switch binary input 18 = Fan Feedback 19 = Humidity sensor 0-10V 20 = Pressure sensor 0-10V 21 = Extern sensor TT-012 22 = Delta T Inlet 10K 23 = Delta T Inlet 0-10V 24 = Delta T Outlet 10K 25 = Delta T Outlet 0-10V	W
84 to 85	40085 to 40086	Reserved			

Protocol Base	Register Index	Description	Data Type	Range	Writable
86	40087	External temperature sensor offset correction.	Signed Scale 100	Unit: depends on system unit, Range: $\pm 5^{\circ}\text{C}$ or $\pm 9^{\circ}\text{F}$ <i>Value x 100 (e.g. $2^{\circ}\text{C} = 200$ or $3^{\circ}\text{F} = 300$)</i>	W
87	40088	Changeover control mode.	Unsigned	1 = Local, 2 = Cool, 3 = Heat	W
88	40089	Minimum external temperature reading.	Signed Scale 10	Unit: depends on system unit, Range: -40°C to 0°C or -40°F to 32°F <i>Value x 10 (e.g. $-20^{\circ}\text{C} = -200$ or $-20^{\circ}\text{F} = 200$)</i>	W
89	40090	Maximum external temperature reading.	Signed Scale 10	Unit: depends on system unit, Range: 50°C to 100°C or 122°F to 212°F <i>Value x 10 (e.g. $60^{\circ}\text{C} = 600$ or $140^{\circ}\text{F} = 1400$)</i>	W
90	40091	Maximum CO2 reading.	Signed Scale 1	Unit: PPM, Range: 1000 to 5000, <i>Value x 1 (e.g. $2000 = 2000$)</i>	W
91	40092	Alarm level of CO2.	Signed Scale 1	Unit: PPM, Range: 1000 to CO2 range, <i>Value x 1 (e.g. $1000 = 1000$)</i>	W
92	40093	Fan output signal.	Unsigned	1 = 1 speed, 2 = 2 speeds, 3 = 3 speeds, 4 = Analog	W
93 to 95	40094 to 40096	Reserved			
96	40097	Ramp to control analog output 2.	Unsigned	1 = Off 2 = Changeover with fan 3 = Cooling 1 with fan 4 = Cooling 2 with fan 5 = Heating 1 with fan 6 = Heating 2 with fan 7 = Heating 2 8 = Cooling 1 Heating 1 With Fan 9 = HumidifyWithFan 10 = CO2 alarm 11 = 6 Way Valve 12 = Delta temperature 13 = VFD/ECMTempLoopEnable 14 = VFD Pressure Loop 15 = FAN	W
97	40098	Minimum voltage for analog output 2 (volt).	Unsigned Scale 10	Unit: Volt, Range: 0V to 10V, <i>Value x 10 (e.g. 3 V = 30)</i>	W
98	40099	Maximum voltage for analog output 2 (volt).	Unsigned Scale 10	Unit: Volt, Range: 0V to 10V, <i>Value x 10 (e.g. 3 V = 30)</i>	W
99	40100	Ramp to control analog output 3.	Unsigned Scale 10	1 = Off 2 = Change Over with fan 3 = Cooling 1 with fan 4 = Cooling 2 with fan 5 = Heating 1 with fan 6 = Heating 2 with fan 7 = Heating 2 8 = Cooling 1 Heating 1 With Fan 9 = HumidifyWithFan 10 = CO2 alarm 11 = 6 Way valve 12 = Delta temperature	W
100	40101	Minimum voltage for analog output 3 (volt).	Unsigned Scale 10	Unit: Volt, Range: 0V to 10V, <i>Value x 10 (e.g. 3 V = 30)</i>	W
101	40102	Maximum voltage for analog output 3 (volt).	Unsigned Scale 10	Unit: Volt, Range: 0V to 10V, <i>Value x 10 (e.g. 3 V = 30)</i>	W

Protocol Base	Register Index	Description	Data Type	Range	Writable
102 to 104	40103 to 40105	<i>Reserved</i>			
105	40106	Position of CH1 AO output while heating (%).	Unsigned Scale 1	Unit: %, Range: 0% to 100%, Value x 1 (e.g. 10% = 10)	W
106 to 113	40107 to 40114	<i>Reserved</i>			
114	40115	Ramp to control binary output 3.	Unsigned	1 = Off 2 = Changeover with fan 3 = Cooling 1 with fan 4 = Cooling 2 with fan 5 = Heating 1 with fan 6 = Heating 2 with fan 7 = Heating 2 8 = Cooling 1 Heating 1 With Fan 9 = HumidifyWithFan 10 = CO2 alarm	W
115	40116	Delay before activation of BO3 in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 15 Minutes, Value x 1 (e.g. 5 mins = 5)	W
116	40117	Close position percentage for contact BO3.	Unsigned Scale 1	Unit: %, Range: 15% to 80%, Value x 1 (e.g. 20% = 20)	W
117	40118	Open position percentage for contact BO3.	Unsigned Scale 1	Unit: %, Range: 0% to BO3closepos-4%, Value x 1 (e.g. 20% = 20)	W
118	40119	Ramp to control binary output 4.	Unsigned	1 = Off 2 = Changeover with fan 3 = Cooling 1 with fan 4 = Cooling 2 with fan 5 = Heating 1 with fan 6 = Heating 2 with fan 7 = Heating 2 8 = Cooling 1 Heating 1 With Fan 9 = HumidifyWithFan 10 = CO2 alarm 11 = FAN	W
119	40120	Delay before activation of BO4 in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 15 Minutes, Value x 1 (e.g. 5 mins = 5)	W
120	40121	Close position percentage for contact BO4.	Unsigned Scale 1	Unit: %, Range: 15% to 80%, Value x 1 (e.g. 20% = 20)	W
121	40122	Open position percentage for contact BO4.	Unsigned Scale 1	Unit: %, Range: 0% to BO4closepos-4%, Value x 1 (e.g. 20% = 20)	W
122	40123	Ramp to control binary output 5.	Unsigned	1 = Off 2 = Changeover with fan 3 = Cooling 1 with fan 4 = Cooling 2 with fan 5 = Heating 1 with fan 6 = Heating 2 with fan 7 = Heating 2 8 = Cooling 1 Heating 1 With Fan 9 = HumidifyWithFan 10 = CO2 alarm 11 = FAN	W

Protocol Base	Register Index	Description	Data Type	Range	Writable																
123	40124	Delay before activation of BO5 in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 15 Minutes, <i>Value x 1 (e.g. 5 mins = 5)</i>	W																
124	40125	Close position percentage for contact BO5.	Unsigned Scale 1	Unit: %, Range: 15% to 80%, <i>Value/1 (e.g. 20% = 20)</i>	W																
125	40126	Open position percentage for contact BO5.	Unsigned Scale 1	Unit: %, Range: 0% to BO5closepos-4%, <i>Value/1 (e.g. 20% = 20)</i>	W																
126	40127	Ramp to control binary output 6.	Unsigned	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">1 = Off</td> <td style="width: 50%;">9 = HumidifyWithFan</td> </tr> <tr> <td>2 = Changeover with fan</td> <td>10 = CO2 alarm</td> </tr> <tr> <td>3 = Cooling 1 with fan</td> <td>11 = 6 Way valve</td> </tr> <tr> <td>4 = Cooling 2 with fan</td> <td>12 = Delta temperature</td> </tr> <tr> <td>5 = Heating 1 with fan</td> <td>13 = FAN (available only if fan type is 1-2-3 speeds)</td> </tr> <tr> <td>6 = Heating 2 with fan</td> <td>14 = VFD/ECMTempLoopEnable</td> </tr> <tr> <td>7 = Heating 2</td> <td>15 = VFD Pressure Loop</td> </tr> <tr> <td>8 = Cooling 1 Heating 1 With Fan</td> <td></td> </tr> </table>	1 = Off	9 = HumidifyWithFan	2 = Changeover with fan	10 = CO2 alarm	3 = Cooling 1 with fan	11 = 6 Way valve	4 = Cooling 2 with fan	12 = Delta temperature	5 = Heating 1 with fan	13 = FAN (available only if fan type is 1-2-3 speeds)	6 = Heating 2 with fan	14 = VFD/ECMTempLoopEnable	7 = Heating 2	15 = VFD Pressure Loop	8 = Cooling 1 Heating 1 With Fan		W
1 = Off	9 = HumidifyWithFan																				
2 = Changeover with fan	10 = CO2 alarm																				
3 = Cooling 1 with fan	11 = 6 Way valve																				
4 = Cooling 2 with fan	12 = Delta temperature																				
5 = Heating 1 with fan	13 = FAN (available only if fan type is 1-2-3 speeds)																				
6 = Heating 2 with fan	14 = VFD/ECMTempLoopEnable																				
7 = Heating 2	15 = VFD Pressure Loop																				
8 = Cooling 1 Heating 1 With Fan																					
127	40128	Delay before activation of BO6 in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 15 Minutes, <i>Value x 1 (e.g. 5 = 5 mins)</i>	W																
128	40129	Close position percentage for contact BO6.	Unsigned Scale 1	Unit: %, Range: 15% to 80%, <i>Value x 1 (e.g. 20% = 20)</i>	W																
129	40130	Open position percentage for contact BO6.	Unsigned Scale 1	Unit: %, Range: 0% to BO6closepos-4%, <i>Value x 1 (e.g. 20% = 20)</i>	W																
130	40131	Ramp to control binary output 7.	Unsigned	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">1 = Off</td> <td style="width: 50%;">6 = Heating 2 with fan</td> </tr> <tr> <td>2 = Change Over with fan</td> <td>7 = Heating 2</td> </tr> <tr> <td>3 = Cooling 1 with fan</td> <td>8 = Cooling 1 Heating 1 With Fan</td> </tr> <tr> <td>4 = Cooling 2 with fan</td> <td>9 = HumidifyWithFan</td> </tr> <tr> <td>5 = Heating 1 with fan</td> <td>10 = CO2 alarm</td> </tr> </table>	1 = Off	6 = Heating 2 with fan	2 = Change Over with fan	7 = Heating 2	3 = Cooling 1 with fan	8 = Cooling 1 Heating 1 With Fan	4 = Cooling 2 with fan	9 = HumidifyWithFan	5 = Heating 1 with fan	10 = CO2 alarm	W						
1 = Off	6 = Heating 2 with fan																				
2 = Change Over with fan	7 = Heating 2																				
3 = Cooling 1 with fan	8 = Cooling 1 Heating 1 With Fan																				
4 = Cooling 2 with fan	9 = HumidifyWithFan																				
5 = Heating 1 with fan	10 = CO2 alarm																				
131	40132	Delay before activation of BO7 in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 15 Minutes, <i>Value x 1 (e.g. 5 = 5 mins)</i>	W																
132	40133	Close position percentage for contact BO7.	Unsigned Scale 1	Unit: %, Range: 15% to 80%, <i>Value x 1 (e.g. 20% = 20)</i>	W																
133	40134	Open position percentage for contact BO7.	Unsigned Scale 1	Unit: %, Range: 0% to BO7closepos-4%, <i>Value x 1 (e.g. 20% = 20)</i>	W																

Protocol Base	Register Index	Description	Data Type	Range	Writable	
134	40135	Input contact of analog input 1 and 2.	Bit String	[B2-B15]: Reserved B0: Analog input 1 <i>0 = Normally Open, 1 = Normally Close</i>	B1: Analog input 2 <i>0 = Normally Open, 1 = Normally Close</i>	W
135	40136	Delay before activation of UI1 in seconds.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 3600 seconds, <i>Value/1 (e.g. 20 secs = 20)</i>	W	
136	40137	Delay before activation of UI2 in seconds.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 3600 seconds, <i>Value/1 (e.g. 20 secs = 20)</i>	W	
137 to 138	40138 to 40139	<i>Reserved</i>				
139	40140	Humidity control mode status.	Unsigned	1 = Auto, 2 = Dehumidification, 3 = Humidification, 4 = Off	W	
140	40141	Humidity setpoint (%RH) in occupancy or day mode.	Unsigned Scale 10	Unit: %RH, Limited by min/max humidity setpoint, <i>Value x 10 (e.g. 20%RH = 200)</i>	W	
141	40142	Dehumidification setpoint (%RH) in unoccupied or night mode.	Unsigned Scale 10	Unit: %RH, Range: 10%RH to 65%RH, <i>Value x 10 (e.g. 20%RH = 200)</i>	W	
142	40143	Humidification setpoint (%RH) in unoccupied or night mode.	Unsigned Scale 10	Unit: %RH, Range: 10%RH to 65%RH, <i>Value x 10 (e.g. 20%RH = 200)</i>	W	
143	40144	Minimum user setpoint.	Unsigned Scale 10	Unit: %RH, Range: 10%RH to max, <i>Value x 10 (e.g. 20%RH = 200)</i>	W	
144	40145	Maximum user setpoint.	Unsigned Scale 10	Unit: %RH, Range: min to 65%RH, <i>Value x 10 (e.g. 20%RH = 200)</i>	W	
145	40146	Humidity proportional band.	Unsigned Scale 10	Unit: %RH, Range: 3%RH to 10%RH, <i>Value x 10 (e.g. 4%RH = 40)</i>	W	
146	40147	Humidity deadband.	Unsigned Scale 10	Unit: %RH, Range: 0%RH to 5%RH, <i>Value x 10 (e.g. 4%RH = 40)</i>	W	
147	40148	Internal humidity sensor offset correction. * Not available on all models.	Signed Scale 10	Unit: %RH, Range: $\pm 5\%$ RH, <i>Value x 10 (e.g. 2%RH = 20)</i>	W	
148	40149	External humidity sensor offset correction.	Signed Scale 10	Unit: %RH, Range: $\pm 5\%$ RH, <i>Value x 10 (e.g. 2%RH = 20)</i>	W	
149	40150	Pressure sensor value in Pascals.	Unsigned Scale 1	Unit: Pascals, Range: 100 to Register Maximum pressure value range [40135], <i>Value/1 (e.g. 200Pa = 200)</i>	RO	
150	40151	Maximum pressure value range.	Unsigned Scale 1	Unit: Pascals, Range: 200 to 20000, <i>Value/1 (e.g. 200Pa = 200)</i>	W	

Protocol Base	Register Index	Description	Data Type	Range	Writable
151	40152	Actual VFD pressure loop x 10 (%).	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	RO
152	40153	VFD pressure loop setpoint.	Unsigned Scale 1	Unit: Pascals, Range: 100 to Register Maximum pressure value range [40135], Value/1 (e.g. 200Pa = 200)	W
153	40154	VFD pressure loop deadband.	Unsigned Scale 1	Unit: Pascals, Range: 0 to 100, Value x 1 (e.g. 20Pa = 20)	W
154	40155	VFD pressure loop proportional band.	Unsigned Scale 1	Unit: Pascals, Range: 100 to 500, Value x 1 (e.g. 250Pa = 250)	W
155	40156	VFD pressure loop integral time.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 250 seconds, Value x 1 (e.g. 50 secs = 50)	W
156	40157	Actual VFD temperature loop while cooling x 10 (%).	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	RO
157	40158	Actual VFD temperature loop while heating x 10 (%).	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	RO
158	40159	VFD temperature loop setpoint x 10 (°C or °F).	Signed Scale 10	Unit: °C/°F, Range: 10°C to 40°C or 50°F to 104°F, Value x 10 (e.g. 30°C = 300 or 60°F = 600)	W
159	40160	VFD temperature loop deadband x 10 (°C or °F).	Unsigned Scale 10	Unit: °C/°F, Range: 0°C to 5°C or 0°F to 9°F, Value x 10 (e.g. 2°C = 20 or 4°F = 40)	W
160	40161	VFD temperature loop proportional band x 10 (°C or °F).	Unsigned Scale 10	Unit: °C/°F, Range: 0.5°C to 5°C or 1°F to 9°F, Value x 10 (e.g. 2°C = 20 or 4°F = 40)	W
161	40162	VFD temperature loop integral time.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 250 seconds, Value x 1 (e.g. 50 secs = 50)	W
162	40163	Voltage required for closing the 6-way valve.	Unsigned Scale 100	Unit: V, Range: 0 to 11 V, Value x 100 (e.g. 2V = 200)	W
163	40164	Minimum output voltage required for cooling for the 6-way valve.	Unsigned Scale 100	Unit: V, Range: 0 to 11 V, Value x 100 (e.g. 2V = 200)	W
164	40165	Minimum output voltage required for heating for the 6-way valve.	Unsigned Scale 100	Unit: V, Range: 0 to 11 V, Value x 100 (e.g. 2V = 200)	W
165	40166	6-way valve size selection in inches.	Unsigned	1 = 1/2, 2 = 3/4, 3 = 1	W
166	40167	<i>Reserved</i>			
167	40168	Signal type for Analog output 2.	Unsigned	1 = Analog, 2 = On-Off, 3 = Pulsing	W
168	40169	Signal type for Analog output 3.	Unsigned	1 = Analog, 2 = On-Off, 3 = Pulsing	W
169 to 171	40170 to 40172	<i>Reserved</i>			

Protocol Base	Register Index	Description	Data Type	Range	Writable
172	40173	Signal type for Binary output 3.	Unsigned	1 = Pulsing, 2 = On-Off, 3 = Floating	W
173	40174	Signal type for Binary output 4.	Unsigned	1 = Pulsing, 2 = On-Off	W
174	40175	Signal type for Binary output 5.	Unsigned	1 = Pulsing, 2 = On-Off	W
175	40176	Signal type for Binary output 6.	Unsigned	1 = Pulsing, 2 = On-Off	W
176	40177	Signal type for Binary output 7.	Unsigned	1 = Pulsing, 2 = On-Off	W
177	40178	PIR Relay sensor.	Unsigned	0 = Relay was not activated, 1 = Relay was activated	W
178	40179	<i>Reserved</i>			
179	40180	Floating output motor timing for BO3/BO7.	Unsigned Scale 1	Unit: Seconds, Range: 15 to 250 seconds, Value x 1 (e.g. 20 secs = 20)	W
180 to 181	40181 to 40182	<i>Reserved</i>			
182	40183	Floating output value for BO3/BO7.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 1 (e.g. 2% = 20)	W
183 to 185	40184 to 40186	<i>Reserved</i>			
186	40187	Value for Pulse output 3.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	W
187	40188	Value for Pulse output 4.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	W
188	40189	Value for Pulse output 5.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	W
189	40190	Value for Pulse output 6.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	W
190	40191	Value for Pulse output 7.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	W
191	40192	Delta temperature between inlet and outlet.	Signed Scale 100	Unit: depends on system unit, Range: -12°C to 12°C or 10.4°F to 53.6°F Value x 100 (e.g. 8°C = 800 or 6°F = 600)	W
192	40193	Delta temperature set point.	Signed Scale 100	Unit: depends on system unit, Range: -12°C to 12°C or 10.4°F to 53.6°F Value x 100 (e.g. 8°C = 800 or 6°F = 600)	W
193 to 198	40194 to 40199	<i>Reserved</i>			
199	40200	User backlight or contrast intensity.	Unsigned Scale 1	Unit: %, Range: 0% to 100%, Value x 1 (e.g. 30% = 30)	W
200	40201	Occupancy backlight or contrast intensity.	Unsigned Scale 1	Unit: %, Range: 0% to 100%, Value x 1 (e.g. 30% = 30)	W

Protocol Base	Register Index	Description	Data Type	Range	Writable
201	40202	Unoccupancy backlight or contrast intensity.	Unsigned <i>Scale 1</i>	Unit: %, Range: 0% to 100%, Value x 1 (e.g. 30% = 30)	W



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