



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

Register Index	Description	Data Type	Range	Writable
40000	Address - Neptronic ID and Modbus address of current device.	Unsigned	MSB = 22, LSB = 1-246	W
40001	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
40002	Communication port configuration.	Unsigned	1 = No parity, 2 Stop bits, 2 = Even parity, 1 stop bit, 3 = Odd parity, 1 stop bit	W
40003	ProdName_87, characters 8-7 of 8 name characters.	ASCII	MSB = 84 (T), LSB = 85 (U)	W
40004	ProdName_65, characters 6-5 of 8 name characters.	ASCII	MSB = 67 (C), LSB = 66 (B)	W
40005	ProdName_43, characters 4-3 of 8 name characters.	ASCII	MSB = 50 (2), LSB = 52 (4)	W
40006	ProdName_21, characters 2-1 of 8 name characters.	ASCII	MSB = 32 (Space), LSB = 0 (Null)	W
40007	Controller Product_Version, actual firmware version.	Unsigned	1 to 65535 (e.g. 115)	RO
40008	Controller parameters version.	Unsigned	1 to 65535 (e.g. 102)	RO
40009	System Status 1.	Bit String	[B1, B5, B7 – B15]: Reserved B0: System operation <i>0 = Normal, 1 = Fault</i> B2: System override by NSB or OCC <i>0 = Normal, 1 = OFF</i> B3: ChangeOverMode <i>0 = Cooling, 1 = Heating</i> B4: AL_FlowSwitch <i>0 = No alarm, 1 = Alarm activated</i> B6: AL_DirtyFilter <i>0 = No alarm, 1 = Alarm activated</i>	RO

Register Index	Description	Data Type	Range	Writable
40010	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
40011	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
40012	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
40013	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
40014	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
40015	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
40016	External humidity sensor reading.	Unsigned Scale 10	Unit: % RH, Range: 10%RH to 90%RH, Value x 10 (e.g. 30%RH = 300)	RO
40017	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). Value x 100 (e.g. 3 V = 300/18°C = 1800 or 33°F = 3300)	RO
40018	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). Value x 100 (e.g. 3 V = 300/18°C = 1800 or 33°F = 3300)	RO
40019 to 40020	Reserved			
40021	External CO2 sensor value in ppm.	Signed Scale 1	Unit: ppm, 0 to Register (CO2 range), Value x 1 (e.g. 500 ppm = 500)	RO
40022	Reserved			

Register Index	Description	Data Type	Range	Writable
40023	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
40024	Actual system occupancy state.	Unsigned	1 = NoOccupancy, 2 = Occupancy, 3 = Override	RO
40025	Actual night setback state of the system.	Unsigned	1 = Day, 2 = Night, 3 = Override	RO
40026	Actual heating demand of ramp 1.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
40027	Actual heating demand of ramp 2.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
40028	Actual cooling demand of ramp 1.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
40029	Actual cooling demand of ramp 2.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
40030	Actual changeover demand.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
40031	Actual fan demand.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
40032	Actual dehumidification demand.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
40033	Actual humidification demand.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	RO
40034	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
40035	<i>Reserved</i>			
40036	Analog output 2 value.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	W
40037	Analog output 3 value.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 100% = 1000)</i>	W
40038	<i>Reserved</i>			

Register Index	Description	Data Type	Range	Writable
40039	Binary output - 6 relays output status.	Bit String	[B0-B1, B7-B15]: Reserved B2: Binary Output 3 <i>0 = Open, 1 = Close</i> B3: Binary Output 4 <i>0 = Open, 1 = Close</i> B4: Binary Output 5 <i>0 = Open, 1 = Close</i> B5: Binary Output 6 <i>0 = Open, 1 = Close</i> B6: Binary Output 7 <i>0 = Open, 1 = Close</i>	W
40040	System command.	Bit String	[B2, B6, B9-B15]: Reserved B0: Cfg_ServiceDisplayAddress <i>0 = Normal, 1 = Display address on LCD</i> B1: Cfg_CoolingRampLock <i>0 = Off, 1 = On</i> B3: Cfg_HeatingRamp1Lock <i>0 = Off, 1 = On</i> B4: Cfg_HeatingRamp2Lock <i>0 = Off, 1 = On</i> B5: Cfg_ChangeOverRampLock <i>0 = Off, 1 = On</i> B7: Cfg_HumidifyRampLock <i>0 = Off, 1 = On</i> B8: Cfg_DehumidifyRampLock <i>0 = Off, 1 = On</i>	W
40041	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
40042	Fan speed selection by user.	Unsigned	1 = Auto, 2 = Low, 3 = Med, 4 = High	W
40043	Temperature setpoint in occupancy or day mode.	Signed Scale 10	Unit: °C/°F, Range: min to max setpoint, <i>Value x 10 (e.g. 18°C = 180)</i>	W

Register Index	Description	Data Type	Range	Writable
40044	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

Register Index	Description	Data Type	Range	Writable
40045	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
40046	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

Register Index	Description	Data Type	Range	Writable
40047	System option4.	Bit String	<p>[B3-B5, B7, B10-B15]: Reserved</p> <p>B0: Cfg_CO2ControlSource 0 = Internal Sensor, 1 = External Sensor</p> <p>B1: Cfg_DisplayHumidity 0 = Display the temperature only, 1 = Display the temperature and humidity</p> <p>B2: Cfg_DisplayCO2 0 = Don't display CO2 control value, 1 = Display CO2 control value</p> <p>B6: Cfg_VFDTempSetpointSource 0 = VFDTempSetpoint, 1 = TempSetpoint</p> <p>B8: Cfg_AnalogOutput2OffVoltage 0 = Off, 1 = Minimum</p> <p>B9: Cfg_AnalogOutput3OffVoltage 0 = Off, 1 = Minimum</p>	W
40048	Display information.	Unsigned	1 = Temperature and Demand, 2 = Setpoint and Demand, 3 = Temperature Only, 4 = Setpoint Only, 5 = Off	W
40049	Temperature control source.	Unsigned	1 = Network Temp, 2 = Intern Temp, 3 = Extern Temp	W
40050	Network fallback timeout.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 60, Value/1 (e.g. 30 mins = 30)	W
40051	Minimum occupancy/day setpoint.	Signed Scale 10	Unit: °C/°F, Range: 10°C to max or 50°F to max Value x 10 (e.g. 18°C = 180 or 60°F = 600)	W
40052	Maximum occupancy/day setpoint.	Signed Scale 10	Unit: °C/°F, Range: min to 40°C or min to 104°F Value x 10 (e.g. 18°C = 180 or 60°F = 600)	W
40053	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 Value x 10 (e.g. 18°C = 180 or 60°F = 600)	W
40054	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 Value x 10 (e.g. 18°C = 180 or 60°F = 600)	W
40055	Heating 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
40056	Heating 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

Register Index	Description	Data Type	Range	Writable
40057	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
40058	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
40059	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
40060	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
40061	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
40062	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
40063	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
40064	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
40065	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
40066	Fan time out in seconds.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 255 seconds, Value x 1 (e.g. 100 secs = 100)	W
40067	Fan damping factor in seconds.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 255 seconds, Value x 1 (e.g. 100 secs = 100)	W
40068	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
40069	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
40070	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
40071	Cooling anticycle delay in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 15 minutes, Value x 1 (e.g. 10 mins = 10)	W
40072	NSB override delay in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 180 minutes, Value x 1 (e.g. 100 mins = 100)	W
40073	Unoccupied override delay in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 180 minutes, Value x 1 (e.g. 100 mins = 100)	W

Register Index	Description	Data Type	Range	Writable
40074	Occupancy minimum time in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 240 minutes, <i>Value x 1 (e.g. 100 mins = 100)</i>	W
40075	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
40076	Fan mode (speed) in unoccupied or NSB mode.	Unsigned	1 = Low, 2 = Med, 3 = High, 4 = Auto	W
40077	Fan mode (speed) when window is opened (alarm).	Unsigned	1 = Low, 2 = Med, 3 = High, 4 = Auto	W
40078	Fan mode (speed) when door is opened (alarm).	Unsigned	1 = Low, 2 = Med, 3 = High, 4 = Auto	W
40079	System control mode.	Unsigned	1 = Auto, 2 = Heat, 3 = Cool, 4 = Heat or Cool, 5 = Auto Lock	W
40080	Override System occupancy/NSB mode.	Unsigned	1 = Locally, 2 = OFF, 3 = Occupied, 4 = Unoccupied, 5 = Day, 6 = Night	W
40081	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
40082	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
40083	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
40084 to 40085	Reserved			

Register Index	Description	Data Type	Range	Writable
40086	External temperature sensor offset correction.	Signed Scale 100	Unit: depends on system unit, Range: $\pm 5^{\circ}\text{C}$ or $\pm 9^{\circ}\text{F}$ Value x 100 (e.g. $2^{\circ}\text{C} = 200$ or $3^{\circ}\text{F} = 300$)	W
40087	Changeover control mode.	Unsigned	1 = Local, 2 = Cool, 3 = Heat	W
40088	Minimum external temperature reading.	Signed Scale 10	Unit: depends on system unit, Range: -40°C to 0°C or -40°F to 32°F Value x 10 (e.g. $-20^{\circ}\text{C} = -200$ or $-20^{\circ}\text{F} = 200$)	W
40089	Maximum external temperature reading.	Signed Scale 10	Unit: depends on system unit, Range: 50°C to 100°C or 122°F to 212°F Value x 10 (e.g. $60^{\circ}\text{C} = 600$ or $140^{\circ}\text{F} = 1400$)	W
40090	Maximum CO2 reading.	Signed Scale 1	Unit: PPM, Range: 1000 to 5000, Value x 1 (e.g. $2000 = 2000$)	W
40091	Alarm level of CO2.	Signed Scale 1	Unit: PPM, Range: 1000 to CO2 range, Value x 1 (e.g. $1000 = 1000$)	W
40092	Fan output signal.	Unsigned	1 = 1 speed, 2 = 2 speeds, 3 = 3 speeds, 4 = Analog	W
40093 to 40095	Reserved			
40096	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
40097	Minimum voltage for analog output 2 (volt).	Unsigned Scale 10	Unit: Volt, Range: 0V to 10V, Value x 10 (e.g. 3 V = 30)	W
40098	Maximum voltage for analog output 2 (volt).	Unsigned Scale 10	Unit: Volt, Range: 0V to 10V, Value x 10 (e.g. 3 V = 30)	W
40099	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
40100	Minimum voltage for analog output 3 (volt).	Unsigned Scale 10	Unit: Volt, Range: 0V to 10V, Value x 10 (e.g. 3 V = 30)	W
40101	Maximum voltage for analog output 3 (volt).	Unsigned Scale 10	Unit: Volt, Range: 0V to 10V, Value x 10 (e.g. 3 V = 30)	W

Register Index	Description	Data Type	Range	Writable
40102 to 40104	<i>Reserved</i>			
40105	Position of CH1 AO output while heating (%).	Unsigned Scale 1	Unit: %, Range: 0% to 100%, <i>Value x 1 (e.g. 10% = 10)</i>	W
40106 to 40113	<i>Reserved</i>			
40114	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
40115	Delay before activation of BO3 in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 15 Minutes, <i>Value x 1 (e.g. 5 mins = 5)</i>	W
40116	Close position percentage for contact BO3.	Unsigned Scale 1	Unit: %, Range: 15% to 80%, <i>Value x 1 (e.g. 20% = 20)</i>	W
40117	Open position percentage for contact BO3.	Unsigned Scale 1	Unit: %, Range: 0% to BO3closepos-4%, <i>Value x 1 (e.g. 20% = 20)</i>	W
40118	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
40119	Delay before activation of BO4 in minutes.	Unsigned Scale 1	Unit: Minutes, Range: 0 to 15 Minutes, <i>Value x 1 (e.g. 5 mins = 5)</i>	W
40120	Close position percentage for contact BO4.	Unsigned Scale 1	Unit: %, Range: 15% to 80%, <i>Value x 1 (e.g. 20% = 20)</i>	W
40121	Open position percentage for contact BO4.	Unsigned Scale 1	Unit: %, Range: 0% to BO4closepos-4%, <i>Value x 1 (e.g. 20% = 20)</i>	W
40122	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

Register Index	Description	Data Type	Range	Writable																
40123	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																
40124	Close position percentage for contact BO5.	Unsigned Scale 1	Unit: %, Range: 15% to 80%, <i>Value/1 (e.g. 20% = 20)</i>	W																
40125	Open position percentage for contact BO5.	Unsigned Scale 1	Unit: %, Range: 0% to BO5closepos-4%, <i>Value/1 (e.g. 20% = 20)</i>	W																
40126	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																				
40127	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																
40128	Close position percentage for contact BO6.	Unsigned Scale 1	Unit: %, Range: 15% to 80%, <i>Value x 1 (e.g. 20% = 20)</i>	W																
40129	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																
40130	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																			
40131	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																
40132	Close position percentage for contact BO7.	Unsigned Scale 1	Unit: %, Range: 15% to 80%, <i>Value x 1 (e.g. 20% = 20)</i>	W																
40133	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																

Register Index	Description	Data Type	Range	Writable
40134	Input contact of analog input 1 and 2.	Bit String	[B2-B15]: Reserved B0: Analog input 1 B1: Analog input 2 <i>0 = Normally Open, 1 = Normally Close</i> <i>0 = Normally Open, 1 = Normally Close</i>	W
40135	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
40136	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
40137 to 40138	<i>Reserved</i>			
40139	Humidity control mode status.	Unsigned	1 = Auto, 2 = Dehumidification, 3 = Humidification, 4 = Off	W
40140	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
40141	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
40142	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
40143	Minimum user setpoint.	Unsigned Scale 10	Unit: %RH, Range: 10%RH to max, <i>Value x 10 (e.g. 20%RH = 200)</i>	W
40144	Maximum user setpoint.	Unsigned Scale 10	Unit: %RH, Range: min to 65%RH, <i>Value x 10 (e.g. 20%RH = 200)</i>	W
40145	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
40146	Humidity deadband.	Unsigned Scale 10	Unit: %RH, Range: 0%RH to 5%RH, <i>Value x 10 (e.g. 4%RH = 40)</i>	W
40147	Internal humidity sensor offset correction. * Not available on all models.	Signed Scale 10	Unit: %RH, Range: ± 5%RH, <i>Value x 10 (e.g. 2%RH = 20)</i>	W
40148	External humidity sensor offset correction.	Signed Scale 10	Unit: %RH, Range: ± 5%RH, <i>Value x 10 (e.g. 2%RH = 20)</i>	W
40149	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
40150	Maximum pressure value range.	Unsigned Scale 1	Unit: Pascals, Range: 200 to 20000, <i>Value/1 (e.g. 200Pa = 200)</i>	W

Register Index	Description	Data Type	Range	Writable
40151	Actual VFD pressure loop x 10 (%).	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 2% = 20)</i>	RO
40152	VFD pressure loop setpoint.	Unsigned Scale 1	Unit: Pascals, Range: 100 to Register Maximum pressure value range [40135], <i>Value/1 (e.g. 200Pa = 200)</i>	W
40153	VFD pressure loop deadband.	Unsigned Scale 1	Unit: Pascals, Range: 0 to 100, <i>Value x 1 (e.g. 20Pa = 20)</i>	W
40154	VFD pressure loop proportional band.	Unsigned Scale 1	Unit: Pascals, Range: 100 to 500, <i>Value x 1 (e.g. 250Pa = 250)</i>	W
40155	VFD pressure loop integral time.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 250 seconds, <i>Value x 1 (e.g. 50 secs = 50)</i>	W
40156	Actual VFD temperature loop while cooling x 10 (%).	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 2% = 20)</i>	RO
40157	Actual VFD temperature loop while heating x 10 (%).	Unsigned Scale 10	Unit: %, Range: 0% to 100%, <i>Value x 10 (e.g. 2% = 20)</i>	RO
40158	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, <i>Value x 10 (e.g. 30°C = 300 or 60°F = 600)</i>	W
40159	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, <i>Value x 10 (e.g. 2°C = 20 or 4°F = 40)</i>	W
40160	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, <i>Value x 10 (e.g. 2°C = 20 or 4°F = 40)</i>	W
40161	VFD temperature loop integral time.	Unsigned Scale 1	Unit: Seconds, Range: 0 to 250 seconds, <i>Value x 1 (e.g. 50 secs = 50)</i>	W
40162	Voltage required for closing the 6-way valve.	Unsigned Scale 100	Unit: V, Range: 0 to 11 V, <i>Value x 100 (e.g. 2V = 200)</i>	W
40163	Minimum output voltage required for cooling for the 6-way valve.	Unsigned Scale 100	Unit: V, Range: 0 to 11 V, <i>Value x 100 (e.g. 2V = 200)</i>	W
40164	Minimum output voltage required for heating for the 6-way valve.	Unsigned Scale 100	Unit: V, Range: 0 to 11 V, <i>Value x 100 (e.g. 2V = 200)</i>	W
40165	6-way valve size selection in inches.	Unsigned	1 = 1/2, 2 = 3/4, 3 = 1	W
40166	<i>Reserved</i>			
40167	Signal type for Analog output 2.	Unsigned	1 = Analog, 2 = On-Off, 3 = Pulsing	W
40168	Signal type for Analog output 3.	Unsigned	1 = Analog, 2 = On-Off, 3 = Pulsing	W
40169 to 40171	<i>Reserved</i>			

Register Index	Description	Data Type	Range	Writable
40172	Signal type for Binary output 3.	Unsigned	1 = Pulsing, 2 = On-Off, 3 = Floating	W
40173	Signal type for Binary output 4.	Unsigned	1 = Pulsing, 2 = On-Off	W
40174	Signal type for Binary output 5.	Unsigned	1 = Pulsing, 2 = On-Off	W
40175	Signal type for Binary output 6.	Unsigned	1 = Pulsing, 2 = On-Off	W
40176	Signal type for Binary output 7.	Unsigned	1 = Pulsing, 2 = On-Off	W
40177	PIR Relay sensor.	Unsigned	0 = Relay was not activated, 1 = Relay was activated	W
40178	<i>Reserved</i>			
40179	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
40180 to 40181	<i>Reserved</i>			
40182	Floating output value for BO3/BO7.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 1 (e.g. 2% = 20)	W
40183 to 40185	<i>Reserved</i>			
40186	Value for Pulse output 3.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	W
40187	Value for Pulse output 4.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	W
40188	Value for Pulse output 5.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	W
40189	Value for Pulse output 6.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	W
40190	Value for Pulse output 7.	Unsigned Scale 10	Unit: %, Range: 0% to 100%, Value x 10 (e.g. 2% = 20)	W
40191	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
40192	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
40193 to 40198	<i>Reserved</i>			
40199	User backlight or contrast intensity.	Unsigned Scale 1	Unit: %, Range: 0% to 100%, Value x 1 (e.g. 30% = 30)	W
40200	Occupancy backlight or contrast intensity.	Unsigned Scale 1	Unit: %, Range: 0% to 100%, Value x 1 (e.g. 30% = 30)	W

Register Index	Description	Data Type	Range	Writable
40201	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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