neptronic®

TROB24 Series Thermostat

BACnet® Communication Module
User Guide

BACnet

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Introduction

This document provides information on using the Neptronic thermostat communications feature. This product provides a BACnet® network interface between BACnet® client devices and Neptronic products. It uses the BACnet® Master Slave/Token Passing (MS/TP) protocol at the BACnet® MAC layer.

This document assumes you are familiar with BACnet® and BACnet® terminology.

BACnet® Overview

Performance

The thermostat uses a synchronous implementation for BACnet® messages. Each BACnet® confirmed service request is answered as quickly as possible without using Reply Postponed. In particular, MS/TP implementation performs within Tusage_delay of 15ms in order to assure Tusage_timeout values within 20ms.

Support for MS/TP

The thermostat supports a Full Master Node state machine for MS/TP. All parameters are configured via the thermostat menu or via the BACnet® WriteProperty service. Changes made via the WriteProperty take effect immediately and does not require a restart of the thermostat. For more information on the configurable properties, please refer to the *Getting Started* section on page 3. For more information on the thermostat menu, please refer to the thermostat's *Specification & Installation Manual* for more details.

BIBB Support

The thermostat generally behaves as a B-ASC type profile server. The following specific BIBBs are supported per their relevant definitions in Annex K to BACnet®: DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B, DM-DDB-B, DM-DOB-B, DM-DCC-B

Object Support (in general)

The thermostat supports a table-based fixed list of BACnet®-visible values which appear as Present_Values of various BACnet® standard object types, in addition to a Device object.

Alarms

Although the thermostat supports the ability to indicate various alarm conditions through value changes in properties of several of its objects, it **does not** generate BACnet® Event Notifications.

Features

Neptronic thermostats also offer the following time-saving features.

Auto Baud Rate Detection
The thermostat automatically configures its baud rate by detecting the network speed upon connection.

Auto Device Instance Configuration
The thermostat automatically configures its device instance to 153000 + MAC address.

Copy Configuration
Copy the thermostat's entire configuration and broadcast it to other thermostats of the same type on the same network.

Getting Started

The following BACnet® properties are configurable and may need to be modified to effectively establish communication on the network and to guarantee uniqueness of each device in a BACnet® system.

- **MAC Address** (Default: 001)
  Set to between 000 and 254 via thermostat menu* (128-254 represent MS/TP non-token-passing slave devices).

- **Device Instance** (Default: Auto)
  The thermostat automatically configures its device instance to 153000 + MAC address. Can also be set manually via thermostat menu* or through the WriteProperty service to *Device Object.Object_Identifier.* The device's Object_Identifier is a combination of the Device Object_Type (8) and the Device_Instance (0-4194302), therefore its decimal or hexadecimal representation tends to be incomprehensible. For example, the Device_Instance=1000 has an equivalent Object_Identifier of 0x020003E8 hexadecimal or 33555432 decimal. While it's the device's Object_Identifier property that can be changed using a BACnet® WriteProperty service, this document refers mostly to Device_Instance.

- **Baud Rate** (Default: 0 = Auto)
  The thermostat automatically configures its baud rate by detecting the network speed upon connection. Can also be set manually via thermostat menu* or through the WriteProperty service to *Device Object.proprietary property #1001*. This value is Unsigned type, and available values are 9600, 19200, 38400, 76800.

- **Max_Master** (Default: 127)
  To increase network efficiency or if there are less than 127 devices on the network, the Max_Master value can be configured through WriteProperty service to the *Device Object.Max_Master*. For more information, refer to the MAC address and Max_Master section on page 4.

- **Device Object.Object_Name**
  Name of device, for example TROB24T4XYZ1. This value can be configured through WriteProperty service to the *Device Object.Object_Name*.

** NOTE: When referring to the thermostat menu in this section, it includes the Quick Access Menu when in operation mode (RUN) and the Installer Menu when in programming mode (PGM).Refer to the thermostat's Specification & Installation Manual for more details.*

Quick Setup

Take advantage of the Auto Baud Rate Detection, Auto Device Instance Configuration, and default Max_Master value, to get up and running with no programming.

1) Connect the thermostat to the network and then power up the thermostat. The thermostat automatically configures the baud rate and device instance.
2) If you need to set a unique MAC address (default 001), continue to step 3. If not, setup is complete.
3) With the thermostat in Operation Mode (jumper = RUN), go to the Quick Access Menu by pressing and holding both function buttons on the thermostat for 5 seconds. Refer to the thermostat's *Specification & Installation Manual* for more details.
4) Enter the password (637).
5) Set a unique MAC address.
6) Power down and then power up the thermostat

Manual Setup

If your site has more than one TROB24 network and/or you wish to use a Device_Instance other than 153,000, follow these instructions.

1) With the thermostat in Operation Mode (jumper = RUN), go to the Quick Access Menu by pressing and holding both function buttons on the thermostat for 5 seconds. Refer to the thermostat's *Specification & Installation Manual* for more details.

2) Enter the password (637).
3) In this mode you can manually configure the MAC address, Device Instance and Baud Rate.
4) Power down the thermostat, connect the thermostat to the network and then power up the thermostat.
5) Repeat steps 1 to 4 for each.
6) To increase network efficiency or if there are less than 127 devices on the network, the Max_Master value can be configured through WriteProperty service to the *Device Object.Max_Master*. For more information, refer to the *MAC address and Max_Master* section on page 4.

Copy Config

Copy the thermostat's entire configuration and broadcast it to other devices of the same type on the same network.

1) With the thermostat in Operation Mode (jumper = RUN), go to the Quick Access Menu by pressing and holding both function buttons on the thermostat for 5 seconds. Refer to the thermostat's *Specification & Installation Manual* for more details.
2) Enter the password (637).
3) Scroll to "Copy Config" and select yes. Follow onscreen instructions.

MAC address and Max_Master

The MAC address must be unique on the entire MS/TP network. However, having a unique MAC address and a high baud rate does not guarantee efficient operation of the thermostat and other MS/TP units on the MS/TP network. Some MAC address and Max_Master combinations are more efficient than others. BACnet® requires token-passing units to occasionally "poll" for other masters based on the MAC address and Max_Master. A "poor" combination of MAC addresses and Max_Master can lead to a slower network due to lost time polling for masters that are not present. Unless there are 126 other units on the MS/TP network, the default Max_Master of 127 is not the most efficient choice for the thermostat. The Max_Master default of 127 was selected to ensure that any master, specifically a BACnet® client, can be found when the thermostat is first started.

Example 1:
This example is slow and inefficient because every time either unit is required to find another master unit it has to poll 126 units until it finds the right one to pass the token.

- MAC=0. Max_Master=127
- MAC=1, Max_Master=127

Example 2:
This example is better but it's still slower. The Max_Master is set to the most efficient value; however because of the gap between the two MAC addresses, each unit must poll 4 units until it finds the right one to pass the token.

- MAC=0. Max_Master=5
- MAC=1 to MAC=4 are not used
- MAC=5, Max_Master=5

Example 3:
This example is an incorrect configuration. The MAC=0 will never find MAC=2 because it will never poll for the master MAC address=2.

- MAC=0. Max_Master=1
- MAC=2, Max_Master=2

Example 4:
As a general guideline, the most efficient set up for an MS/TP network is one in which the units are consecutively numbered starting at MAC address 0 and all have Max_Master=the maximum MAC address in the system. If consecutive numbering is not possible, then the next most efficient set up is one in which all units have Max_Master=the maximum MAC address in the system.

- MAC=0. Max_Master=3
- MAC=1, Max_Master=3
- MAC=2, Max_Master=3
- MAC=3, Max_Master=3

Device Object Properties

The following table lists all the BACnet® properties supported for the device object. The "W" indicates if the property is writable using the BACnet® WriteProperty service.

Property	Value	Writable
Object_Identifier	Programmable where the instance part of the Object_Identifier is in the range of 0-4194302. The device instance must be unique system-wide. The default value for the device instance=153001 (Vendor_Identifier*1000)	W
Object_Name	Programmable up to 32 characters. The device name must be unique system-wide. The default value is Model_Name.	W
Description	Programmable up to 32 characters. The default value= "BACnet thermostat"	W
Object_Type	8	
System_Status	*Non-Operational if major error on device.*	
Vendor_Identifier	Always 153	
Vendor_Name	Always "National Environmental Products Ltd"	
Model_Name	Example : "TROB24T4XYZ1"	
Firmware_Revision	currently "1.18"	
Application_Software_Version	currently "1.08"	
Protocol_Version	Always 1	
Protocol_Revision	Always 4	
DataBase_Revision	Default = 0, will be incremented if Object_Name and/or Odject_Identifier is modified	
Max_APDU_Length_Accepted	Always 235	
Segmentation_Supported	(3) = No Segmentation	
APDU_Timeout	3000	
Number_of_APDU_Retries	Always 0	
Protocol_Services_Supported	Always 0x00 0x09 0x40 0x02 0x60 (i.e. a bitstring in BACnet® order) - writeProperty, readProperty - deviceCommunicationControl - unconfirmedPrivateTransfer - who-Is, who-Has	
Protocol_Object_Types_Supported	Always 0x00, 0xB4, 0x80, 0x10 (i.e. a bitstring in BACnet® order) - analog-input, analog-value, binary-input, binary-value - device - multi-state-value	
Object_List	Per the standard. Because of restrictions on the size of the transmit buffers, the entire Object_List cannot be returned at once, rather the Object_List must be read, one-at-a-time.	
Device_Address_Binding	Always empty.	
Max_Master	Programmable in the range of 0-127. Default value=127	W
Max_Info_Frames	Always 1	
Proprietary property #1000	Programmable. This proprietary property represents the MS/TP MAC address in the range of (0-254). Values 128 to 254 represent MS/TP non-token-passing slave devices. Default value=1	W
Proprietary property #1001	Programmable. This proprietary property represents the MS/TP baud rate. This value is Unsigned type, and available values are 9600, 19200, 38400, 76800. Writing 0 will activate auto baud rate functionality. Reading this property will always return actual baud rate. Default : Auto* (Auto Baud Rate Detection requires V1.18 and up)	W
Proprietary property #1002	Programmable. This proprietary property represents that period of time that an object in/out of service will automatically return to normal. Range = 0-120 minutes (unsigned type). Writing 0 means no automatic return to normal. Default: 15 minutes.	W

Object Types Supported

A complete list of all BACnet® objects for the thermostat is listed in the following section:

The Device Object has already been described. The following tables list all the BACnet® properties supported for each object type. Most of the properties are locked in. The exception is Present_Value, which represents the dynamic operating values of the device, and the Status_Flag, Event_State and Reliability properties which reflect the availability of the Present_Value. Unless otherwise specified, properties are not changeable.

Object Type	Supported	Optional Properties Supported	Writable Properties	If "Out of Service" is True
Analog Input	☑	Reliability Description Min_Present_Value Max_Present_Value Resolution	Out_of_Service	Present_Value Status_Flag
Analog Value	☑	Reliability Description	Present_Value[1] Out_of_Service[2]	Present_Value Status_Flag
Binary Input	☑	Reliability Active_Text Inactive_Text Description	Out_of_Service	Present_Value Status_Flag
Binary Value	☑	Reliability Active_Text Inactive_Text Description	Present_Value[3] Out_of_Service[4]	Present_Value Status_Flag
Device	☑	Max_Master Max_Info_Frame Description #1000 (MAC ADD) #1001 (BAUD RATE) #1002 (TIME OUT)	Object_Identifier Object_Name Max_Master Description #1000 #1001 #1002	N/A
Multi-State Value[5]	☑	Description Reliability States_Text	Present_Value[6]	N/A

Out of Service

Neptronic thermostats offer the use of the "Out of Service" writable property. When set to true, this property disconnects the object from the physical input, enabling you to input other values. This could be useful for special applications or when troubleshooting. For example, you can ignore the temperature read from a sensor and input the desired temperature value in order to perform specific tests.

For security reasons there is a timeout that will set the Out of Service property back to false after 15 minutes. This value can be modified to between 0 and 120 minutes (see proprietary property #1002).

[1] Present_Value property is writable for every AV object except: AV.1, AV.2, AV.3, AV.42, AV.46, AV.49, AV.68, AV.69
[2] Out_of_Service property is writable for objects that Present_Value is not writable: AV.1, AV.68, AV.69. Object will automatically return to normal after a programmable period of time. See Proprietary property #1002 of Device object.
[3] Present_Value property is writable for every BV object except: BV.7
[4] Out_of_Service property is writable for objects that Present_Value is not writable. See list above. Object will automatically return to normal after a programmable period of time. See Proprietary property #1002 of Device object.
[5] MSV object states number and text can vary depending of system set-up. Use carefully.
[6] Present_Value property is writable for every MSV object except: MSV.9

TROB24 Series Objects Table

The TROB24 thermostat series of controllers use the following BACnet® object table. The *type* is the BACnet® Object type, the *instance* is the BACnet® Object. Together the *type* and *instance* form the BACnet® Object_Identifier for an object according to the following C-language algorithm:

- object_identifier=(unsigned long)((unsigned long)*type*<<22)+*instance*

ID[7]	Name	Writable Property	Notes
AI.1	InternTemp	Out of service	0-50ºC or 32-122ºF, Resolution 0.01ºC/0.02ºF
AI.2	ExternTemp	Out of service	-40-100ºC or -40-212ºF, Resolution 0.01ºC/0.02ºF
AI.3	ChangeOverTemp	Out of service	-40-100ºC or -40-212ºF, Resolution 0.01ºC/0.02ºF
AI.10	PressureSensor	Out of service	0-10.00 Volt, Resolution 0.01 Volt
AV.1	ControlTemp	Out of service	-40-100ºC or -40-212ºF, Resolution 0.01ºC/0.02ºF
AV.2	HeatingDemand1	N/A	0-100%, Resolution 0.1%
AV.3	CoolingDemand1	N/A	0-100%, Resolution 0.1%
AV.5	InternTempOffset	Present Value	±5.0ºC, Resolution 0.1ºC
AV.6	ExternTempOffset	Present Value	±5.0ºC, Resolution 0.1ºC
AV.7	TempSetPointDay	Present Value	AV.8 to AV.9, Resolution 0.5ºC/1ºF
AV.8	MinSetPointDay	Present Value	0 to AV.9 , Resolution 0.5ºC/1ºF
AV.9	MaxSetPointDay	Present Value	AV.8 to 40ºC or 104ºF, Resolution 0.5ºC/1ºF
AV.10	TempSetPointCoolNight	Present Value	AV.11 to 40ºC or 104ºF, Resolution 0.5ºC/1ºF
AV.11	TempSetPointHeatNight	Present Value	10.0ºC or 50ºF to AV.10, Resolution 0.5ºC/1ºF
AV.12	CoolingPropBand1	Present Value	0.5-5ºC or 1-10ºF, Resolution 0.5ºC/1ºF
AV.13	HeatingPropBand1	Present Value	0.5-5ºC or 1-10ºF, Resolution 0.5ºC/1ºF
AV.14	CoolingDeadBand1	Present Value	0.3-5ºC or 0.6-10ºF, Resolution 0.1ºC/0.2ºF
AV.15	HeatingDeadBand1	Present Value	0.3-5ºC or 0.6-10ºF, Resolution 0.1ºC/0.2ºF
AV.23	ChangeOverSetPoint	Present Value	10-40ºC or 50-104ºF, Resolution 0.5ºC/1ºF
AV.24	NightSetBackDelay	Present Value	0-180 minutes, Resolution 15 minutes
AV.26	IntTimeFactor	Present Value	0-250 seconds, Resolution 5 seconds
AV.27	CoolingAntiCycleDelay	Present Value	0-15 minutes, Resolution 1 minute
AV.31	FloatingMotorTiming1[8]	Present Value	15-250 seconds, Resolution 5 seconds
AV.42	CoolingDemand2	N/A	0-100%, Resolution 0.1%
AV.43	CoolingPropBand2	Present Value	0.5-5ºC or 1-10ºF, Resolution 0.5ºC/1ºF
AV.44	CoolingDeadBand2	Present Value	0.3-5ºC or 0.6-10ºF, Resolution 0.1ºC/0.2ºF
AV.46	HeatingDemand2	N/A	0-100%, Resolution 0.1%
AV.47	HeatingPropBand2	Present Value	0.5-5ºC or 1-10ºF, Resolution 0.5ºC/1ºF
AV.48	HeatingDeadBand2	Present Value	0.3-5ºC or 0.6-10ºF, Resolution 0.1ºC/0.2ºF
AV.49	ChangeOverDemand	N/A	0-100%, Resolution 0.1%
AV.50	ChangeOverPropBand	Present Value	0.5-5ºC or 1-10ºF, Resolution 0.5ºC/1ºF
AV.51	ChangeOverDeadBand	Present Value	0.3-5ºC or 0.6-10ºF, Resolution 0.1ºC/0.2ºF
AV.52	AnalogOutput1Min	Present Value	0 Volt to AV.54, Resolution 0.1 Volt
AV.53	AnalogOutput2Min	Present Value	0 Volt to AV.55, Resolution 0.1 Volt
AV.54	AnalogOutput1Max	Present Value	AV.52 to 10.0 Volt, Resolution 0.1 Volt
AV.55	AnalogOutput2Max	Present Value	AV.53 to 10.0 Volt, Resolution 0.1 Volt
AV.56	AnalogOutput1MinPos	Present Value	0-100%, Resolution 5%
AV.57	AnalogOutput2MinPos	Present Value	0-100%, Resolution 5%
AV.58	FloatingMotorTiming2 [9]	Present Value	15-250 seconds, Resolution 5 seconds
AV.61	PressureNumFilter	Present Value	1-10 seconds, Resolution 1 second
AV.62	AirFlowVnomOrKFactor	Present Value	100-9995, Resolution 5
AV.63	AirFlowCoolMin	Present Value	0 to AV.64, Resolution 5
AV.64	AirFlowCoolMax	Present Value	AV.63 to AV.62, Resolution 5
AV.65	AirFlowHeatMin	Present Value	0 to AV.66, Resolution 5
AV.66	AirFlowHeatMax	Present Value	AV.65 to AV.62, Resolution 5
AV.67	AirFlowIntFactor	Present Value	0-60 minutes, Resolution 1 minute
AV.68	ActualAirFlow	OutOfService	0 to AV.62, Resolution 1
AV.69	AirFlowSetPoint	OutOfService	0-9999, Resolution 1
AV.71	AdjustAirFlowKFactor[10]	Present Value	0-9999, Resolution 1
AV.72	AnalogOutput1[11]	N/A	0-10V
AV.73	AnalogOutput2[12]	N/A	0-10V
AV.160	AirFlowOffset	Present Value	±500
BI.1	UIxContactInput	Out of service	0= Open 1= Close

[7] ID is equal to ObjectType.Instance
[8] Used if MSV.22 and MSV.23 are in Floating mode.
[9] Used if MSV.24 and MSV.25 are in Floating mode.
[10] Writable only if system is in balancing, BV.14 is set to “Enable” and BV.15 is set to “Maximum”
[11] Writable if MSV.16 is set OFF. Off means no internal process affected to this output.
[12] Writable if MSV.17 is set OFF. Off means no internal process affected to this output.

ID[7]	Name	Writable Property	Notes
BV.1	TempUnit	Present Value	0= Celsius 1= Fahrenheit
BV.2	TempSetPointLock	Present Value	0= Disable 1= Enable
BV.3	UserControlOffMode[13]	Present Value	0= Enable 1= Disable
BV.6	ControlTempSource	Present Value	0= Intern.Sensor 1= Extern.Sensor[14]
BV.7	ChangeOverMode	Out of service	0= Cooling 1= Heating
BV.14	AirFlowBalancing	Present Value	0= Disable 1= Enable
BV.15	AirFlowBalMode	Present Value	0= Minimum 1= Maximum
BV.16	AntiFreezeProtection[15]	Present Value	0= Off 1= On
BV.17	FloatingMotor1Direction	Present Value	0= Direct 1= Reverse
BV.18	FloatingMotor2Direction	Present Value	0= Direct 1= Reverse
BV.29	OnOffOutput1[16]	Present Value	0= Off 1= On
BV.30	OnOffOutput2[17]	Present Value	0= Off 1= On
BV.31	OnOffOutput3[18]	Present Value	0= Off 1= On
BV.32	OnOffOutput4[19]	Present Value	0= Off 1= On
MSV.1	UniversalInput1Function[20]	Present Value	1= Off 2= Extern.Sensor 3= ChangeOverSensor 4= Ch.Ov.ContactNorm.Cool 5= Ch.Ov.ContactNorm.Heat 6= NightSetBack 7= Pressure0-10V 8= AirFlow0-10V
MSV.3	UserControlMode	Present Value	States available if MSV.4 is set to “Auto” 1= Auto, 2= Heating 3= Cooling 4= Off (only if BV.3 is set to “Enable”)
			States available if MSV.4 is set to “Cool” 1= Cooling 2= Off (only if BV.3 is set to “Enable”)
			States available if MSV.4 is set to “Heat” 1= Heating 2= Off (only if BV.3 is set to “Enable”)
			States available if MSV.4 is set to “HeatingOrCooling” 1= Heating 2= Cooling 3= Off (only if BV.3 is set to “Enable”)
MSV.4	ControlMode[21]	Present Value	1= Auto 2= Heating 3= Cooling 4= HeatingOrCooling
MSV.9	NightSetBack	Out of service	1= Day 2= Night 3= Override

[13] Enable or Disable “off” state of UserControlMode (MSV.3).
[14] It can be set to “Use Extern.Sensor” only if one object MSV.1, MSV.12 or MSV.15 is set to “Extern.Sensor”
[15] Available on version 1.03 and above.
[16] Writable if MSV.18 is set OFF. Off means no internal process affected to this output.
[17] Writable if MSV.19 is set OFF. Off means no internal process affected to this output.
[18] Writable if MSV.20 is set OFF. Off means no internal process affected to this output.
[19] Writable if MSV.21 is set OFF. Off means no internal process affected to this output.
[20] Activating external temperature does not automatically modify the control source; it is necessary to also modify BV.6 to control by external temperature. Pressure0-10V and AirFlow0-10V are available on version 1.03 and above.
[21] Locks user options. MSV.3, UserControlMode, will be affected or even locked in one state.

ID[7]	Name	Writable Property	Notes
MSV.12	UniversalInput2Function[22]	Present Value	1= Off 2= Extern.Sensor 3= ChangeOverSensor 4= Ch.Ov.ContactNorm.Cool 5= Ch.Ov.ContactNorm.Heat 6= NightSetBack 7= Pressure0-10V 8= AirFlow0-10V
MSV.13	NightSetBackMode[23]	Present Value	1= Locally 2= Day 3= Night
MSV.15	UniversalInput3Function[24]	Present Value	1= Off 2= Extern.Sensor 3= ChangeOverSensor 4= Ch.Ov.ContactNorm.Cool 5= Ch.Ov.ContactNorm.Heat 6= NightSetBack 7= Pressure0-10V 8= AirFlow0-10V
MSV.16	AnalogOutput1Source	Present Value	1= Off 2= ChangeOverDemand 3= CoolingDemand1 4= CoolingDemand2 5= HeatingDemand1 6= HeatingDemand2
MSV.17	AnalogOutput2Source	Present Value	1 = Off 2= ChangeOverDemand 3= CoolingDemand1 4= CoolingDemand2 5= HeatingDemand1 6= HeatingDemand2
MSV.18	TO1Source	Present Value	1= ChangeOverDemand 2= CoolingDemand1 3= CoolingDemand2 4= HeatingDemand1 5= HeatingDemand2
			States available if MSV.22 is set to “Pulsing”: 1= HeatingDemand1 2= HeatingDemand2
MSV.19	TO2Source	Present Value	1= ChangeOverDemand 2= CoolingDemand1 3= CoolingDemand2 4= HeatingDemand1 5= HeatingDemand2
			States available if MSV.23 is set to “Pulsing”: 1= HeatingDemand1 2= HeatingDemand2
MSV.20	TO3Source	Present Value	1= Off 2= ChangeOverDemand 3= CoolingDemand1 4= CoolingDemand2 5= HeatingDemand1 6= HeatingDemand2
			States available if MSV.24 is set to “Pulsing”: 1= HeatingDemand1 2= HeatingDemand2
MSV.21	TO4Source	Present Value	1= Off 2= ChangeOverDemand 3= CoolingDemand1 4= CoolingDemand2 5= HeatingDemand1 6= HeatingDemand2
			States available if MSV.25 is set to “Pulsing”: 1= HeatingDemand1 2= HeatingDemand2

[22] Activating external temperature does not automatically modify the control source; it is necessary to also modify BV.6 to control external temperature. Pressure0-10V and AirFlow0-10V are available on version 1.03 and above.
[23] Selecting “Locally” enables the thermostat to manage the day or night status for energy conservation. The other 2 statuses force the thermostat into a specific state.
[24] Activating external temperature does not automatically modify the control source; it is necessary to also modify BV.6 to control external temperature. Pressure0-10V and AirFlow0-10V are available on version 1.03 and above.

ID[7]	Name	Writable Property	Notes
MSV.22	TO1Mode	Present Value	1= On_Off 2= Pulsing 3= Floating
MSV.23	TO2Mode	Present Value	1= On_Off 2= Pulsing
			States available if MSV 22 is set to "Floating" 1= Floating
MSV.24	TO3Mode	Present Value	1= On_Off 2= Pulsing 3= Floating
MSV.25	TO4Mode	Present Value	1= On_Off 2= Pulsing
			States available if MSV 24 is set to "Floating" 1= Floating
MSV.26	TO1ClosePos	Present Value	Ignored if MSV.22 is other than "On_Off" 1= 20% 2= 40% 3= 60% 4= 80%
MSV.27	TO2ClosePos	Present Value	Ignored if MAV.23 is other than "On_Off" 1= 20% 2= 40% 3= 60% 4= 80%
MSV.28	TO3ClosePos	Present Value	Ignored if MSV.24 is other than "On_Off" 1= 20% 2= 40% 3= 60% 4= 80%
MSV.29	TO4ClosePos	Present Value	Ignored if MSV.25 is other than "On_Off" 1= 20% 2= 40% 3= 60% 4= 80%
MSV.31	PressureIndOutput	Present Value	if MSV.22 and MSV.24 are set to "Floating" 1= Floating1 2= AnalogOutput1 3= AnalogOutput2 4= Floating2
			if MSV.22 is set to "Floating" 1= Floating1 2= AnalogOutput1 3= AnalogOutput2
			if MSV.24 is set to "Floating" 1= AnalogOutput1 2= AnalogOutput2 3= Floating2
			if MSV.22 and MSV.24 are other than "Floating" 1= AnalogOutput1 2= AnalogOutput2
MSV.33	ChangeOverControlMode[25]	Present Value	1= Locally 2= Cooling 3= Heating

All objects related to pressure independent are available in version 1.03 and above.
AI.10, AV.61 to AV.71, BV.14, BV.15, MSV.31

[25] Selecting "Locally" enables the thermostat to manage the cooling or heating status for change over ramp. The other 2 statuses force the thermostat into a specific state.

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