Protocol Implementation Conformance Statement

ANNEX A - PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT (NORMATIVE)
(This annex is part of this standard and is required for its use.)

Date: June 29, 2023
Vendor Name: Network Thermostat
Vendor ID: 1342
Product Name: X-Series Thermostat
Product Model Number: X5-IP, X7-IP, X5-WIFI, X7-WIFI
Application Software Version: N/A
Firmware Revision: IP 4.61, WIFI 10.30, 11.6, 12.46
BACnet Protocol Revision: 16

Product Description

The Network Thermostat (NetXтм) X-Series thermostats are commercial grade color touchscreen thermostats with either WiFi (-WIFI) or Ethernet (-IP) communications, with an advanced remote sensor bus, and optional CO_2 and optional wireless sensors. Use the X-Series for either conventional and heat pump applications (Gas/Elect 2H/2C, HP 3H/2C), along with humidification, fresh air damper, IAQ controls and more. The X7C version includes a revolutionary CO_2 sensor, with no field calibration needed for five (5) years. In addition to BACnet-IP over WiFi or Ethernet, the thermostats have an embedded web server (DirectConnectтм) which helps deliver a near-effortless setup and configuration including adjustable temporary override times and temperature ranges, occupied and unoccupied events, keypad lockout, and many more features.

The X-Series is designed to also operate with the NetX CloudConnectтм Online Management Suite, allowing the best combination of BAS control and user experience in the modern 'smart thermostat' world.

BACnet Standardized Device Profiles Supported (Annex L):

✓ BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks Supported (Annex K):

BIBB	Name	Supported
DS-RP-B	Data Sharing-ReadProperty-B	Yes
DS-RPM-B	Data Sharing-ReadPropertyMultiple-B	Yes
DS-WP-B	Data Sharing-WriteProperty-B	Yes
DS-WPM-B	Data Sharing-WritePropertyMultiple-B	Yes
DS-COV-B	Data Sharing-Change Of Value-B	Yes
SCHED-WS-I-B	Scheduling-Weekly Schedule-Internal-B	Yes
DM-DDB-B	Device Management-Dynamic Device Binding-B	Yes
DM-DOB-B	Device Management-Dynamic Object Binding-B	Yes
DM-DCC-B	Device Management-DeviceCommunicationControl-B	Yes
DM-TS-B	Device Management-TimeSynchronization-B	Yes
DM-UTC-B	Device Management-UTCTimeSynchronization-B	Yes
DM-RD-B	Device Management-ReinitializeDevice-B	Yes

Segmentation Capability

✓ Able to transmit segmented messages   Window Size: 3

✓ Able to receive segmented messages   Window Size: 3

Standard Object Types Supported

Type	Support	Creatable	Deletable
Analog Input (AI)	Yes	N/A	N/A
Analog Value (AV)	Yes	N/A	N/A
Binary Input (BI)	Yes	N/A	N/A
Binary Value (BV)	Yes	N/A	N/A
Device (DEV)	Yes	N/A	N/A
Multi-state Value (MV)	Yes	N/A	N/A
Positive Integer Value (PIV)	Yes	N/A	N/A
Schedule (SC)	Yes	N/A	N/A

Data Link Layer Options

○ ARCNET (ATA 878.1), 2.5 Mb. (Clause 8)

○ ARCNET (ATA 878.1), EIA-485 (Clause 8), baud rate(s)

✓ BACnet IP, (Annex J)

○ BACnet IP, (Annex J), BACnet Broadcast Management Device (BBMD)

○ BACnet IP, (Annex J), Network Address Translation (NAT Traversal)

○ BACnet IPv6, (Annex U)

○ BACnet IPv6, (Annex U), BACnet Broadcast Management Device (BBMD)

○ BACnet/ZigBee (Annex O)

○ Ethernet, ISO 8802-3 (Clause 7)

○ LonTalk, ISO/IEC 14908.1 (Clause 11), medium:

○ MS/TP master (Clause 9)

○ Point-To-Point, EIA 232 (Clause 10), baud rate(s):

○ Point-To-Point, modem, (Clause 10), baud rate(s):

○ BACnet Secure Connect (Annex AB)

○ BACnet Secure Connect Node

Device Address Binding

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain
other devices.)

○ Yes

✔ No

Networking Options:

○ Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.

○ Annex H, BACnet Tunneling Router over IP

Character Sets Supported

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

✔ ISO 10646 (UTF-8)

○ IBM^{TM}/Microsoft^{TM} DBCS

○ ISO 8859-1

○ ISO 10646 (UCS-2)

○ ISO 10646 (UCS-4)

○ JIS X 0208

Gateway Options

If this product is a communication gateway, describe the types of non-BACnet equipment/networks(s) that the gateway supports:

N/A

Object Types Supported

All objects below have the standard required properties in addition to the optional ones detailed below.

Analog Input [AI] Optional Properties

Property	Datatype	Notes
Reliability	Reliability	no-fault-detected, no-sensor if the sensor is not connected, or communication-failure on faceplate communication issues
Min_Pres_Value	REAL	This value will change depending on the BACnet temperature units to express it in either Fahrenheit or Celsius
Max_Pres_Value	REAL	This value will change depending on the BACnet temperature units to express it in either Fahrenheit or Celsius

Analog Value [AV] Optional Properties

Property	Datatype	Notes
Reliability	Reliability	Either no-fault-detected, no-sensor if the sensor is not connected, or communication-failure on faceplate communication issues
Min_Pres_Value	REAL	This value will change depending on the BACnet temperature units to express it in either Fahrenheit or Celsius
Max_Pres_Value	REAL	This value will change depending on the BACnet temperature units to express it in either Fahrenheit or Celsius

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Binary Input [BI] Optional Properties

Property	Datatype	Notes
Reliability	Reliability	Either no-fault-detected, no-sensor if the sensor is not connected, or communication-failure on faceplate communication issues
Inactive_Text	CharacterString	
Active_Text	CharacterString	

Binary Value [BV] Optional Properties

Property	Datatype	Notes
Reliability	Reliability	Either no-fault-detected, no-sensor if the sensor is not connected, or communication-failure on faceplate communication issues
Inactive_Text	CharacterString	
Active_Text	CharacterString	

Multi-state Value [MV] Optional Properties

Property	Datatype	Notes
Reliability	Reliability	Either no-fault-detected, no-sensor if the sensor is not connected, or communication-failure on faceplate communication issues
State_Text	Array	BACnetARRAY[N] of CharacterString

Positive Integer Value [PIV] Optional Properties

Property	Datatype	Notes
Reliability	Reliability	Either no-fault-detected, no-sensor if the sensor is not connected, or communication-failure on faceplate communication issues
Event_State	EventState	Always Normal
Min_Pres_Value	Unsigned	
Max_Pres_Value	Unsigned	

Schedule [SC] Optional Properties

Property	Datatype	Notes
Weekly_Schedule	Array[7] of DailySchedule	This schedule controls the Occupancy, and supports up to 6 entries per day
Event_State	EventState	Always Normal

Device [DEV] Optional Properties

Property	Datatype	Notes
Location	CharacterString	Same parameter for Site in the embedded web pages. **Writable**.

Property	Datatype	Notes
Description	CharacterString	
Max_Segments_Accepted	Unsigned	
Local_Time	Time	Can be set with the appropriate BACnet service
Local_Date	Date	Can be set with the appropriate BACnet service
UTC_Offset	INTEGER	Although writing to this property supports giving it any integer value, it will internally pick the closest allowed timezone. **Writable**.
Daylight_Savings_Status	BOOLEAN	Differs from the standard in that the value reported corresponds to whether automatic DST adjustment is enabled, instead of representing whether it is in effect. **Writable**.
APDU_Segment_Timeout	Unsigned	
Active_COV_Subscriptions	List	BACnetList[N] of BACnetCOVSubscription
Application_Software_Version	CharacterString	Corresponds to the front plate firmware version
Object_Name	CharacterString	This is the thermostat name. **Writable**.

BACnet Objects

Name	Type	ID	Notes	FW Revision
Indoor Temperature	AI	1	0.01 degree precision, 1 degree change COV	
Indoor Humidity	AI	2	Relative humidity as a percentage	
System Mode	MV	1	OFF (1), COOL (2), HEAT (3), AUTO (4), or EMER (5)	
Fan Mode	MV	2	Fan mode, *writable values* are AUTO (1) or ON (2) only	
Manual Occupied Cool Setpoint	AV	1	COOL setpoint which will be active in the Occupied state *when* the device is operating in Manual Mode	
Manual Occupied Heat Setpoint	AV	2	HEAT setpoint which will be active in the Occupied state *when* the device is operating in Manual Mode	
Manual Unoccupied Cool Setpoint	AV	3	COOL setpoint which will be active in the Unoccupied state *when* the device is operating in Manual Mode	
Manual Unoccupied Heat Setpoint	AV	4	HEAT setpoint which will be active in the Unoccupied state *when* the device is operating in Manual Mode	
Occupancy Toggle	BV	1	Toggles the occupied (1)/ unoccupied (0) state (commandable)	
Manual Operation	BV	2	If enabled (1) the device operates in Manual Mode (disabling advanced scheduling, relying on the BACnet the schedule object instead). It is *recommended* to use Manual Mode when controlling the device via BACnet.	

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Name	Type	ID	Notes	FW Revision
Cool/Heat State	BI	1	The last active state COOL (0) or HEAT (1)	
Stages Active	PIV	1	Number of currently active stages	
Override System Mode	MV	3	OFF (1), COOL (2), HEAT (3), AUTO (4), or EMER (5)	
Override Fan Mode	MV	4	Override fan mode, *writable values* are AUTO (1) or ON (2) only	
Override Cool Setpoint	AV	5	COOL setpoint value during an override	
Override Heat Setpoint	AV	6	HEAT setpoint value during an override	
Override Status	BI	2	Indicates if an override is active (1) or not (0)	
Override Time Remaining	PIV	2	Time remaining until the end of an active override in minutes	
BACnet Temperature Units	BV	3	Units to use via BACnet, tehse may be different from the ones used on the ASCII protocol as well as the ones displayed on screen, (0) for F and (1) for C	
Display Temperature Units	BV	4	Units used on the physical display, (0) for F and (1) for C	
HVAC Type Setting	BV	5	Conventional (0) or Heat Pump (1)	
HVAC Cooling Stages Setting	PIV	3	Number of cooling stages present	
HVAC Heating Stages Setting	PIV	4	Number of heating stages present	

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Name	Type	ID	Notes	FW Revision
HVAC Heat Type Setting	BV	6	Heating type, Gas (0) or Electric (1)	
HVAC Min On Time Setting	PIV	5	Minimum system operating ON time in minutes	
HVAC Min Off Time Setting	PIV	6	Minimum system operating OFF time in minutes	
HVAC Emer Heat Enabled Setting	BV	7	Diabled (0) or Enabled (1)	
HVAC Heat Pump Dual Fuel Setting	BV	8	Normal (0) or Dual Fuel (1)	
HVAC Adaptive Recovery Setting	BV	9	Diabled (0) or Enabled (1)	
HVAC Remote Indoor Sensor Averaging Setting	BV	10	Derive the remote indoor sensor value from the Remote Only (0) or Averaged (1) with the integrated sensor	
HVAC Fan Purge Time Setting	PIV	7	Fan purge time in minutes	
HVAC Lock Screen Setting	BV	11	Lock (1) or Unlock (0) front-plate display user interaction	
HVAC Lock Screen Code Setting	PIV	8	A 4 digit code to manage the screen lock 0000 to 9999	
HVAC Stage 1 Differential Setting	AV	7		

Name	Type	ID	Notes	FW Revision
HVAC Stage 2 Differential Setting	AV	8		
HVAC Stage 2 Delay Setting	PIV	9	In minutes	
HVAC Aux Heat Delay Setting	PIV	10	In minutes	
HVAC Temperature Override Range Setting	AV	9	Range allowed for setpoint changes during an override while the display is locked, from `2F (+/- 1F)` to `8F (+/- 4F)`, or `1-4 C` if `BACnet` units are in Celsius (see `BV3`)	
HVAC Override Time Setting	PIV	11	Duration of an override when started in minutes `0-1440`, with `0` disabling overrides entirely	
HVAC Temperature Calibration Offset Setting	AV	10		
HVAC Balance Point High Setting	AV	11		
HVAC Balance Point Low Setting	AV	12		
HVAC Cool Setpoint High Limit Setting	AV	13		
HVAC Cool Setpoint Low Limit Setting	AV	14		

Name	Type	ID	Notes	FW Revision
HVAC Heat Setpoint High Limit Setting	AV	15		
HVAC Heat Setpoint Low Limit Setting	AV	16		
Network Time Protocol Auto-Sync Setting	BV	12	If true, periodically fetches date and time from the currently configured NTP server, or allows setting date and time manually if false	
Digital Input 1	BI	3	LED 1 digital input state	
Digital Input 2	BI	4	LED 2 digital input state	
Occupancy Input	BI	5	State of the occupancy input	
Outdoor Temperature	AI	3	Outdoor temperature (read only) coming from either AV-23 being written periodically, or otherwise the weather service (if the zipcode is set) or an external sensor	
Outdoor Humidity	AI	4	Outdoor humidity (read only) coming from either AV-24 being written periodically, or otherwise the weather service (if the zipcode is set)	
Remote Indoor Temperature	AI	5		
Remote Outdoor Temperature	AI	6		
Remote Indoor Humidity	AI	7		
Remote Aux 1 Temperature	AI	8	Remote Aux 1 (typically supply) sensor reading, if present	

Name	Type	ID	Notes	FW Revision
Remote Aux 2 Temperature	AI	9	Remote Aux 2 (typically) sensor reading, if present	
Remote Aux 3 Temperature	AI	10	Remote Aux 3 (typically) sensor reading, if present	
Remote Aux 4 Temperature	AI	11	Remote Aux 4 sensor reading, if present	
Remote Aux 5 Temperature	AI	12	Remote Aux 5 sensor reading, if present	
Remote Aux 6 Temperature	AI	13	Remote Aux 6 sensor reading, if present	
Remote Aux 7 Temperature	AI	14	Remote Aux 7 sensor reading, if present	
Remote Water Leak	BI	6	Remote water leak sensor state (true is tripped), if present	
Remote Door/Window	BI	7	Remote door window sensor state (true is tripped), if present	
Remote Occupancy	BI	8	Remote occupancy sensor state (true is tripped), if present	
Occ/Unocc Weekly Schedule	SC	1	Occupied/Unoccupied BACnet schedule, note it will only be used if in Manual Mode (see BV2, Manual Operation above)	
CO2 Sensor Value	AI	15	Current sensor value in parts per million (ppm)	
CO2 Sensor Max Reading	AV	17	Maximum recorded sensor value in parts per million (ppm)	
CO2 High Limit Setting	AV	18	Configurable from 500 to 2000 ppm	

Name	Type	ID	Notes	FW Revision
CO2 High Level Detected	BI	9	Whether there is currently a high CO2 level (1) as defined by the limit AV18, or not (0)	
CO2 Max Reset Setting	BV	13	Reset the maximum CO2 detected Manually (0) or Daily (1) at midnight	
CO2 Display Setting	MV	5	Do not show on display OFF, show ON, or only show alerts ALERT	
Active Cool Setpoint	AI	16	Current cool setpoint regardless of whether the thermostat is in Manual Operation or not, or if there's an override active or not. This field will always yield the cool setpoint in use by the thermostat at any given time.	4.59+, 10.29+, 11.5+, 12.45+
Active Heat Setpoint	AI	17	Current heat setpoint regardless of whether the thermostat is in Manual Operation or not, or if there's an override active or not. This field will always yield the heat setpoint in use by the thermostat at any given time.	4.59+, 10.29+, 11.5+, 12.45+
Active Setpoint	AI	18	Currently active heat/cool setpoint depending on the mode and status of the thermostat. If the mode is HEAT or EMER the Active Heat Setpoint is returned, if it's COOL then Active Cool Setpoint is returned, and in any other mode (AUTO / OFF), the last active state (cooling/heating) associated active setpoint is returned.	4.59+, 10.29+, 11.5+, 12.45+
Recirc Fan Timer Mins/Hr	PIV	12	Fan recirculation timer in minutes per hour, the valid range is 0-30, inclusive	4.59+, 10.29+, 11.5+, 12.45+

Name	Type	ID	Notes	FW Revision
BAS Outdoor Temp	AV	19	Writable version of Outdoor Temperature AI-3. If data is written periodically within a 30 minute period, it will be taken as the source for Outdoor temperature, as long as no external outdoor temperature sensor is enabled. The origin priority for the data is external sensor (if enabled), BAS data point (when kept updated periodically), and outdoor weather from the cloud (if enabled). NOTE the cloud weather service can be completely disabled if desired from the Service Settings --> Enable Weather Services on the embedded web pages of the device.	4.61+, 10.30+, 11.6+, 12.46+
BAS Outdoor Hum	AV	20	Writable version of Outdoor Temperature AI-4. If data is written periodically within a 30 minute period, it will be taken as the source for Outdoor humidity, as long as no external outdoor humidity sensor is enabled. The origin priority for the data is external sensor (if enabled), BAS data point (when kept updated periodically), and outdoor weather from the cloud (if enabled). NOTE the cloud weather service can be completely disabled if desired from the Service Settings --> Enable Weather Services on the embedded web pages of the device.	4.61+, 10.30+, 11.6+, 12.46+

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Name	Type	ID	Notes	FW Revision
KHD Relay Operation	MV	6	KHD relay operating mode: `OFF`, `DAMPER`, `DEHUM`, `HUM`, `MANUAL`, `SCHEDULE`, `IAQ`, `CO2`. Note only KHD supports `DEHUM` and `HUM`, and the following modes can only be active on either KHD or K2 at any given point: `DAMPER`, `SCHEDULE`, `IAQ`, `CO2`, otherwise a value out of range error will be returned, and `CO2` may only be set if a sensor is installed.	4.61+, 10.30+, 11.6+, 12.46+
K2 Relay Operation	MV	7	K2 relay operating mode: `OFF`, `DAMPER`, `MANUAL`, `SCHEDULE`, `IAQ`, `CO2`. Note the following modes can only be active on either KHD or K2 at any given point: `DAMPER`, `SCHEDULE`, `IAQ`, `CO2`, otherwise a value out of range error will be returned, and `CO2` may only be set if a sensor is installed.	4.61+, 10.30+, 11.6+, 12.46+
KHD Manual Operation	BV	14	KHD relay `ON` / `OFF` status and toggle. If it's written to while KHD is not in `MANUAL` relay operation, it will not take effect.	4.61+, 10.30+, 11.6+, 12.46+
K2 Manual Operation	BV	15	K2 relay `ON` / `OFF` status and toggle. If it's written to while K2 is not in `MANUAL` relay operation, it will not take effect.	4.61+, 10.30+, 11.6+, 12.46+