



## BACnet/IP communication with X2 devices

### Features

- BACnet/IP communication over Wi-Fi or Ethernet
- B-ASC Device Profile
- Slave (server) type of communication
- Embedded webserver for IP and network configuration
- Communication parameters (CO) of controller for IP and network configuration

### X2-BAC Protocol Implementation Conformance Statement (PICS)

Vendor Name: Vector Controls

Product Name: X2 Controls series

X2 product description:

The X2 communicating BACnet/IP controllers are designed as universal controls equipment suitable for a large number of applications. They may be used in zoning and other applications which are monitored by a BACnet/IP network.

### Supported BACnet® Interoperability Blocks (BIBB)

The BACnet® interface conforms to the B-ASC device profile (BACnet® Application Specific Controller).

The following BACnet® Interoperability Building Blocks (BIBB) are supported.

| BIBB     | Type              | Name                             |
|----------|-------------------|----------------------------------|
| DS-RP-B  | Data sharing      | Read property - B                |
| DS-RPM-B | Data sharing      | Read property multiple - B       |
| DS-WP-B  | Data sharing      | Write property - B               |
| DS-COV-B | Data sharing      | Change of value - B              |
| DM-DCC-B | Device management | Device communication Control - B |
| DM-DDB-B | Device management | Dynamic device binding - B       |
| DM-DOB-B | Device management | Dynamic object binding - B       |
| DM-TS-B  | Device management | Time synchronization - B         |
| DM-UTC-B | Device management | UTC Time synchronization - B     |
| DM-RD-B  | Device management | Reinitialize device - B          |

### Supported standard BACnet® application services

- ReadProperty
- ReadPropertyMultiple
- WriteProperty
- ChangeOfValue
- DeviceCommunication. Needs a password which is "Vector" (case sensitive and without the quotes).
- I-Am
- I-Have
- TimeSynchronisation
- UTCTimeSynchronisation
- ReinitializeDevice ("cold" or "warm"). Needs a password which is "Vector" (case sensitive and without the quotes).

### Supported standard Object types

- Device
- Analog input
- Analog value
- Binary value
- Multi-state Value
- Network Port

## Configuration of BACnet/IP X2 devices

The communication parameters may be set via operation terminals. Login to the controller as follows:

1. Press UP/DOWN buttons simultaneously for three seconds. The display will show firmware version and revision number. Press the OPTION button to start login.
2. CODE is shown in small display.
3. Select 241 using UP/DOWN buttons.
4. Press OPTION after selecting the correct code.
5. Once logged in with 241 control modules are displayed (Lp1, Lp2, 1u, 2u, etc.) – select with UP/DOWN the communication parameters **CO** and open with OPTION. As soon as the module is open its parameters are displayed.
6. Select the parameters with the UP/DOWN buttons. Change a parameter by pressing the OPTION button. Three arrows are displayed to indicate that the parameter may be modified. Use UP/DOWN buttons to adjust the value.
7. After you are done, press OPTION to save the new value and return to the selection level (arrows disappear when selection is saved). Pressing left hand POWER button without pressing OPTION will discard the value and return without saving. For control parameters press POWER again to leave parameter selection and return to control module selection.

Press the POWER to leave the menu. The unit will return to normal operation if no button is pressed for more than 5 minutes.



More detailed information on the X2 TCP/IP configuration and operation can be found in the 70-00-0900 "X2 Wi-Fi and Ethernet Communication Manual".

The manual can be found on our website [www.vectorcontrols.com](http://www.vectorcontrols.com).

### COM parameters (CO)

| Parameter | BACnet/IP                                                                                                                                                                                                                                                                                                                                                                            | Range   | Default |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|
| CO 00     | Bus plug-in hardware id (read only)                                                                                                                                                                                                                                                                                                                                                  | -       | 7       |
| CO 01     | Bus plug-in software version (read only)                                                                                                                                                                                                                                                                                                                                             | -       | -       |
| CO 02     | Bus plug-in software revision (read only)                                                                                                                                                                                                                                                                                                                                            | -       | -       |
| CO 03     | IPv4 address octet IP0 (192.168.xxx.yyy)                                                                                                                                                                                                                                                                                                                                             | 1...254 | 101     |
| CO 04     | IPv4 address octet IP1 (192.168.xxx.yyy)                                                                                                                                                                                                                                                                                                                                             | 0...255 | 0       |
| CO 05     | IPv4 address octet IP2 (192.168.xxx.yyy)                                                                                                                                                                                                                                                                                                                                             | 0...255 | 168     |
| CO 06     | IPv4 address octet IP3 (192.168.xxx.yyy)                                                                                                                                                                                                                                                                                                                                             | 0...255 | 192     |
| CO 07     | Enable DHCP<br>0 = Static IP<br>1 = DHCP enabled                                                                                                                                                                                                                                                                                                                                     | 0...1   | 0       |
| CO 08     | Enable access point<br>0 = Access point disabled<br>1 = Access point enabled                                                                                                                                                                                                                                                                                                         | 0...1   | 0       |
| CO 09     | <sup>1)</sup> Restore default configuration<br>0 = Normal Mode<br>1 = Reset to defaults immediately<br>7 = Reset to defaults on power up                                                                                                                                                                                                                                             | 0...7   | 0       |
| CO 10     | Not used                                                                                                                                                                                                                                                                                                                                                                             | 0...1   | 00      |
| CO 11     | Device Object ID1 (aabbccdd)                                                                                                                                                                                                                                                                                                                                                         | 0...99  | 00      |
| CO 12     | Device Object ID2 (aabbccdd)                                                                                                                                                                                                                                                                                                                                                         | 0...99  | 00      |
| CO 13     | Device Object ID3 (aabbccdd)                                                                                                                                                                                                                                                                                                                                                         | 0...99  | 01      |
| CO 14     | Device Object ID4 (aabbccdd)                                                                                                                                                                                                                                                                                                                                                         | 0...4   | 00      |
| CO 15     | <sup>2,3)</sup> Automatic address / ID increment and auto-build of "device object name":<br>0 = Auto increment and auto-build of device object name disabled<br>1 = Auto increment is enabled, auto-build of device object name disabled<br>2 = Auto increment disabled; auto-build of device object name enabled<br>3 = Auto increment and auto-build of device object name enabled | 0...3   | 2       |

#### <sup>1</sup> "Restore default configuration" function

If this parameter is set to 1 during run time, the default configuration gets restored from its internal memory (Webserver names, host name, etc.). Any stored SSID / password information will be lost. The Wi-Fi module's Wi-Fi access point ("VectorAP-xxx") will be re-activated to make the webserver accessible. If CO 09 = 7 or the reset button is pressed during power up, the default configuration is pre-loaded to avoid any problems due to invalid configurations in the runtime memory.

#### <sup>2</sup> "Auto increment" function

When this function is enabled and an automatic AEC-PM parameter load is executed at power up of the controller, the following variables will be incremented and written back to the AEC-PM unit:

- **CO03**: Part of IPv4 address CO06.CO05.CO04.**CO03**
- CO11 ... CO14 Device object ID. This is incremented only if the value is not already "4194303".

#### <sup>3</sup> "Auto-build of device object name"-function

The BACnet standard requires that the each BACnet endpoint has a unique name on the network (device object name). The initial name of the AEX-BAC module is "AEX-BAC-IP" equal for all devices.

If the auto-build of the device object name is disabled, this means that it needs to be edited manually in the BACnet client.

Using the auto-build-function the device object name can be automatically assembled using the label "AEX-BAC-IP" followed by the contents of CO11 – CO14 (The device object ID). For example, "AEX-BAC-IP\_01050001".

Writing via BACnet to the device property "Object Name" (in the device object, see page 4) will reset the auto-build option and sets the parameter CO15 parameter to 0 or 1 depending on the previous setting.

## X2 object overview

The same module for BACnet/IP communication is used over the entire X2 product range. When the module initializes, it reads the properties from the X2 device, such as in and outputs, control loops, alarms, time schedules and so forth. It then activates and assigns its objects to the available physical points.

If an output or an input is not physical present in the scope of the product, its object will not be generated.

The available physical properties for each device may be found in its product datasheet under the scope table.

Here is a brief overview.

### Available inputs

|      | TCX2-40863 | TCX2-23343 | TCX2-24273 | TCX2-14050 | TCI2-204.202 | SxC2-201.102 | SxC2-200.101 | TRI2-221.202 |
|------|------------|------------|------------|------------|--------------|--------------|--------------|--------------|
| UI1  | UI-01      | UI-01      | UI-01      | UI-01      | UI-01        | UI-01 (S)    | UI-01 (S)    | UI-01 (S)    |
| UI2  | UI-02      | UI-02      | UI-02      | UI-02      | UI-02        | UI-02 (S)    | UI-02 (S)    | UI-02 (S)    |
| UI3  | UI-03      | UI-03      | UI-03      | UI-03      | UI-03        | UI-03 (S)    | UI-03 (S)    | UI-03 (S)    |
| UI4  | UI-04      | UI-04      | UI-04      | UI-04      | UI-04        | UI-04 (S)    | UI-04 (S)    | UI-04        |
| UI5  | UI-05      | UI-05      | UI-05      | VI-01      | VI-01        | UI-05 (S)    | UI-05 (S)    | UI-05        |
| UI6  | UI-06      | UI-06      | UI-06      | VI-02      | VI-02        | UI-06        | VI-01        | UI-06        |
| UI7  | UI-07      | VI-01      | VI-01      | VI-03      | VI-03        | VI-01        | VI-02        | VI-01        |
| UI8  | UI-08      | VI-02      | VI-02      | VI-04      | VI-04        | VI-02        | VI-03        | VI-02        |
| UI9  | VI-01      | VI-03      | VI-03      |            |              | VI-03        | VI-04        | VI-03        |
| UI10 | VI-02      | VI-04      | VI-04      |            |              | VI-04        |              | VI-04        |
| UI11 | VI-03      |            |            |            |              |              |              |              |
| UI12 | VI-04      |            |            |            |              |              |              |              |

(S) = Sensor inputs

### Available output modules

|     | TCX2-40863 | TCX2-23343 | TCX2-24273 | TCX2-14050 | TCI2-204.202 | SxC2-201.102 | SxC2-200.101 | TRI2-221.202 |
|-----|------------|------------|------------|------------|--------------|--------------|--------------|--------------|
| AO1 | AO1        | AO1        | AO1        |            | AO1          | AO1          | AO1          | AO1          |
| AO2 | AO2        | AO2        | AO2        |            | AO2          | AO2          |              | AO2          |
| AO3 | AO3        | AO3        | AO3        |            |              |              |              |              |
| DO1 | DO1        | DO1        | DO1        | DO1        | DO1          | DO1          | DO1          | DO1          |
| DO2 | DO2        | DO2        | DO2        | DO2        | DO2          |              |              | DO2          |
| DO3 | DO3        | DO3        | DO3        | DO3        |              |              |              |              |
| DO4 | DO4        | DO4        | DO4        | DO4        |              |              |              |              |
| DO5 | DO5        |            | DO5        | DO5        |              |              |              |              |
| DO6 | DO6        |            | DO6        |            |              |              |              |              |
| DO7 |            |            | DO7        |            |              |              |              |              |

### Objects for digital outputs.

The available objects for digital outputs depend on their configuration. The reason is that an output assigned to a fan module will have different objects than if assigned to a floating or binary output.

There are 4 different object tables for digital objects:

- Digital output in fan configuration (applies to all binary outputs that are part of the fan module)
- Digital output in 3-point floating configuration (Always two binary outputs)
- Digital output in PWM configuration
- Digital output in binary configuration

### Available loops

| TCX2-40863 | TCX2-23343 | TCX2-24273 | TCX2-14050 | TCI2 | SxC2 | TRI2 |
|------------|------------|------------|------------|------|------|------|
| LP1        | LP1        | LP1        | LP1        | LP1  | LP1  | LP1  |
| LP2        | LP2        | LP2        |            | LP2  | LP2  | LP2  |
| LP3        |            |            |            |      |      |      |
| LP4        |            |            |            |      |      |      |

### Available alarms

All devices have 8 alarms.

## Properties of supported BACnet objects

### Device Object

| Property                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Format     | R/W  |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------|
| APDU Timeout                    | Time between retransmissions in milliseconds. This device does not support retransmissions, so this always reads as "0".                                                                                                                                                                                                                                                                                                                                                | Integer    | R    |
| App Software Version            | Controller firmware version (assembled by firmware)<br>VXXrY ("X" = Version; "Y" = Revision)                                                                                                                                                                                                                                                                                                                                                                            | String     | R    |
| Database Revision               | Increases if the settings change                                                                                                                                                                                                                                                                                                                                                                                                                                        | Integer    | R    |
| Daylight Savings Status         | Daylight savings status of host controller                                                                                                                                                                                                                                                                                                                                                                                                                              | Boolean    | R/W  |
| Description                     | Description of controller or location (max 32 characters)                                                                                                                                                                                                                                                                                                                                                                                                               | String     | R/W  |
| Device Address Binding          | Address binds                                                                                                                                                                                                                                                                                                                                                                                                                                                           | List       | R    |
| Firmware Revision               | Open source BACnet stack firmware revision                                                                                                                                                                                                                                                                                                                                                                                                                              | String     | R    |
| Local Date                      | Date of host controller                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DD-MM-YYYY | R    |
| Local Time                      | Time of host controller                                                                                                                                                                                                                                                                                                                                                                                                                                                 | HH:MM:SS   | R    |
| Max APDU Length Accepted        | The maximum APDU length supported by this device is 1476.                                                                                                                                                                                                                                                                                                                                                                                                               | Integer    | R    |
| Model Name                      | Controller product name<br>"X2-abcde-XYZ" (assembled by firmware)<br>a = number of loops<br>b = number of passive inputs<br>c = number of universal inputs<br>d = number of binary outputs<br>e = number of analog outputs<br><br>XYZ = WEB ( <b>W</b> i-Fi <b>E</b> xternal antenna <b>B</b> ACnet/IP)<br>XYZ = WIB ( <b>W</b> i-Fi <b>I</b> nternal antenna <b>B</b> ACnet/IP)<br>XYZ = ETB ( <b>E</b> thernet <b>B</b> ACnet/IP)<br><br>Example:<br>"TCX2-40863-WEB" | String     | R    |
| Number Of APDU Retries          | Number of retransmissions. This device does not support retransmissions, so this always reads as "0".                                                                                                                                                                                                                                                                                                                                                                   | Integer    | R    |
| Object Identifier               | Device object identifier (CO11...CO14): 0-4194303                                                                                                                                                                                                                                                                                                                                                                                                                       | Integer    | R/W  |
| Object List                     | List of all objects currently implemented in the device                                                                                                                                                                                                                                                                                                                                                                                                                 | List       | R    |
| Object Name                     | Name of device (max 32 characters)                                                                                                                                                                                                                                                                                                                                                                                                                                      | String     | R/W* |
| Object Type                     | The value is always "8: Object Device" for the device object                                                                                                                                                                                                                                                                                                                                                                                                            | List       | R    |
| Protocol Object Types Supported | The enumeration of the supported object types                                                                                                                                                                                                                                                                                                                                                                                                                           | List       | R    |
| Protocol Revision               | BACnet protocol revision number                                                                                                                                                                                                                                                                                                                                                                                                                                         | Integer    | R    |
| Protocol Services Supported     | The enumeration of the supported services                                                                                                                                                                                                                                                                                                                                                                                                                               | List       | R    |
| Protocol Version                | BACnet protocol version number                                                                                                                                                                                                                                                                                                                                                                                                                                          | Integer    | R    |
| Segmentation Supported          | This device does not support segmentation, so this always reads as "NO_SEGMENTATION (3)".                                                                                                                                                                                                                                                                                                                                                                               | List       | R    |
| System Status                   | Current physical and logical status supported:<br>- OPERATIONAL (0)<br>- NON_OPERATIONAL (4) (IF INT. I2C BUS ERRORS)                                                                                                                                                                                                                                                                                                                                                   | List       | R    |
| UTC Offset                      | Offset to UTC time in case UTC time synchronization is enabled:<br>-780...780 in minutes                                                                                                                                                                                                                                                                                                                                                                                | Integer    | R/W  |
| Vendor Identifier               | 561                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Integer    | R    |
| Vendor Name                     | Vector Controls GmbH                                                                                                                                                                                                                                                                                                                                                                                                                                                    | String     | R    |

\* Only writable if CO15 < 2

### Analog Input Object (AI)

| Property          | Description / Property description                                            | Format         | R/W |
|-------------------|-------------------------------------------------------------------------------|----------------|-----|
| Object Identifier | AI number                                                                     | Integer        | R   |
| Object Name       | Name of the input, Assembled from template plus number                        | String         | R   |
| Description       | Description of the input (max 32 characters)                                  | String         | R/W |
| Present Value     | Current value of input                                                        | Floating point | R   |
| Status Flags      | In Alarm, Fault, Overridden, Out Of Service                                   | List           | R   |
| Event State       | Always NORMAL                                                                 | List           | R   |
| Out Of Service    | Setting out of service decouples the object from the physical input.          | Boolean        | R/W |
| Units             | Describes the units used. Degree Celsius or Fahrenheit has to be set by MV02. | List           | R   |
| COV Increment     | Minimum change in present value that will cause a COV notification.           | Floating point | R/W |

## Analog Value Object (AV)

| Property          | Description / Property description                                                  | Format         | R/W                |
|-------------------|-------------------------------------------------------------------------------------|----------------|--------------------|
| Object Identifier | AV number                                                                           | Integer        | R                  |
| Object Name       | Name of the value, Assembled from template plus number                              | String         | R                  |
| Description       | Description of the input (max 32 characters)                                        | String         | R/W <sup>(1)</sup> |
| Present Value     | Current value of the object                                                         | Floating point | R/W <sup>(2)</sup> |
| Status Flags      | In Alarm, Fault, Overridden, Out Of Service                                         | List           | R                  |
| Event State       | Always NORMAL                                                                       | List           | R                  |
| Out Of Service    | Setting out of service decouples the objects present value from the physical input. | Boolean        | R/W                |
| Units             | Describes the units used. Degree Celsius or Fahrenheit has to be set by MV02.       | List           | R                  |
| COV Increment     | Minimum change in present value that will cause a COV notification.                 | Floating point | R/W                |

(1) Writable only for objects with instance numbers < 711

(2) Writable only for certain objects

## Binary Value Object (BV)

| Property          | Description / Property description                                                                | Format  | R/W  |
|-------------------|---------------------------------------------------------------------------------------------------|---------|------|
| Object Identifier | BV number                                                                                         | Integer | R    |
| Object Name       | Name of the input, Assembled from template plus number                                            | String  | R    |
| Description       | Description of the input (max 32 characters)                                                      | String  | R/W  |
| Present Value     | Current value of the object 0/1<br>See "Active Text" and "Inactive Text" for value interpretation | Integer | R/W* |
| Status Flags      | In Alarm, Fault, Overridden, Out Of Service                                                       | List    | R    |
| Event State       | Always NORMAL                                                                                     | List    | R    |
| Out Of Service    | Setting out of service decouples the objects present value from the physical input.               | Boolean | R/W  |
| Active Text       | Description of active state (for present value = 1)                                               | String  | R    |
| Inactive Text     | Description of inactive state (for present value = 0)                                             | String  | R    |

\* Writable only for certain objects

## Multi State Value Object (MV)

| Property          | Description / Property description                                                  | Format  | R/W  |
|-------------------|-------------------------------------------------------------------------------------|---------|------|
| Object Identifier | MV number                                                                           | Integer | R    |
| Object Name       | Name of the input, Assembled from template plus number                              | String  | R    |
| Description       | Description of the input (max 32 characters)                                        | String  | R/W* |
| Present Value     | Current value of the object; see "state text" for explanation                       | List    | R/W  |
| Status Flags      | In Alarm, Fault, Overridden, Out Of Service                                         | List    | R    |
| Event State       | Always NORMAL                                                                       | List    | R    |
| Out Of Service    | Setting out of service decouples the objects present value from the physical input. | Boolean | R/W  |
| Number Of States  | Number of states of this object                                                     | Integer | R    |
| State Text        | Description of state                                                                | String  | R    |

\* Writable only for objects with instance numbers < 711

## Network Port Object

| Property                 | Description / Property description                                                                   | Format       | R/W |
|--------------------------|------------------------------------------------------------------------------------------------------|--------------|-----|
| Object Identifier        | Network port number                                                                                  | Integer      | R   |
| Object Name              | Name of the network port                                                                             | String       | R   |
| APDU Length              | Maximum APDU length accepted                                                                         | Integer      | R   |
| Bacnet IP Mode           | Bacnet IP mode: NORMAL, FOREIGN, BBMD                                                                | List         | R/W |
| Changes Pending          | Changes pending flag indicates that a property of Network Port has been changed                      | Boolean      | R   |
| FD BBMD Address          | IP address and port of BBMD with which the device is to register as a foreign device                 | HostNPort    | R/W |
| FD Subscription Lifetime | Time-to-live value of foreign device in seconds                                                      | Integer      | R/W |
| IP Address               | IP address of this network port                                                                      | Octet string | R/W |
| IP Default gateway       | Communication gateway                                                                                | Octet string | R   |
| IP DHCP enable           | Enable DHCP protocol                                                                                 | Boolean      | R/W |
| IP DNS Server            | IP address of DNS server                                                                             | Octet string | R   |
| IP Subnet mask           | Subnet mask of this network                                                                          | Octet string | R   |
| Link speed               | Link speed of this port. It is set to 0 as this device cannot determine the communication speed.     | Integer      | R   |
| Mac Address              | Mac address of this device                                                                           | Octet string | R   |
| Network Number           | Number of current network. It is set to 0 as the network number cannot determine the network number. | Integer      | R   |
| Network Number Quality   | Quality of above Network Number                                                                      | List         | R   |
| Network Type             | Indicates the network type of this network                                                           | List         | R   |
| Out of Service           | Setting out of service decouples the objects present value from the physical input.                  | Boolean      | R/W |
| Protocol Level           | Indicates the protocol level used                                                                    | List         | R   |
| Reliability              | Reliability of this network port                                                                     | List         | R   |
| Status Flags             | In Alarm, Fault, Overridden, Out Of Service                                                          | List         | R   |

Note: If any of the writable properties above is changed, the changes pending flag is set. To activate the changes, it is necessary for the client to initiate a ReinitializeDevice service request with 'ACTIVATE\_CHANGES' or 'WARMSTART'.

## Available objects

### Controller State

| Object | Name       | Description                                                                         | R/W |
|--------|------------|-------------------------------------------------------------------------------------|-----|
| BV 00  | OpStOo     | Operation state:<br>0 = Off, 1 = On                                                 | R/W |
| MV 00  | Occupation | Operation state Occupied/Unoccupied:<br>1 = Occupied, 2 = Unoccupied                | R/W |
| MV 01  | Ctrl-Mode  | Operation state Cool/Heat:<br>1 = Cool, 2 = Heat                                    | R/W |
| MV 02  | Temp-Unit  | Operation state Celsius/Fahrenheit:<br>1 = Celsius, 2 = Fahrenheit                  | R/W |
| BV 01  | FanOnly    | Operation state Fan Only<br>0 = Inactive, 1 = Active                                | R/W |
| BV 02  | Schedule   | Operation state Time Schedules<br>0 = Inactive, 1 = Active                          | R/W |
| BV 03  | AccOpMod   | Enable access to operation modes<br>0 = Disable, 1 = Enable                         | R/W |
| BV 04  | AccSp      | Enable access to set points<br>0 = Disable, 1 = Enable                              | R/W |
| BV 05  | AccMan     | Enable manual control in cascade and for fan speeds<br>0 = Disable, 1 = Enable      | R/W |
| BV 06  | AccHeCo    | Enable change of heating/cooling mode for 2 pipe systems<br>0 = Disable, 1 = Enable | R/W |
| BV 07  | AccSchd    | Enable access to time programs<br>0 = Disable, 1 = Enable                           | R/W |
| MV 03  | OPA-Mode   | Operation State Master/Slave mode:<br>1 = Master, 2 = Slave                         | R/W |
| MV 04  | Wink       | Operation State "Wink" function:<br>1 = Wink OFF, 2 = Wink ON                       | R/W |
| MV 05  | Season     | Operation State Summer/Winter mode:<br>1 = Summer, 2 = Winter                       | R/W |

### X2-Inputs

The available input objects depend on the actual configuration of the X2 product. Sensor inputs will be treated as universal inputs in X2-BAC. Please observe the table on page 3 to see which inputs are the available for the selected product. At this stage all products have 4 virtual inputs with the objects listed below.

### Universal inputs

| Object | Name     | Description                                   | Access |
|--------|----------|-----------------------------------------------|--------|
| AI 101 | UI-01    | Universal input 1 value                       | R      |
| AV 101 | UI-01-OS | Universal input 1 offset (calibration = 01u6) | R/W    |
| AI 102 | UI-02    | Universal input 2 value                       | R      |
| AV 102 | UI-02-OS | Universal input 2 offset                      | R/W    |
| AI 103 | UI-03    | Universal input 3 value                       | R      |
| AV 103 | UI-03-OS | Universal input 3 offset                      | R/W    |
| AI 104 | UI-04    | Universal input 4 value                       | R      |
| AV 104 | UI-04-OS | Universal input 4 offset                      | R/W    |
| AI 105 | UI-05    | Universal input 5 value                       | R      |
| AV 105 | UI-05-OS | Universal input 5 offset                      | R/W    |
| AI 106 | UI-06    | Universal input 6 value                       | R      |
| AV 106 | UI-06-OS | Universal input 6 offset                      | R/W    |
| AI 107 | UI-07    | Universal input 7 value                       | R      |
| AV 107 | UI-07-OS | Universal input 7 offset                      | R/W    |
| AI 108 | UI-08    | Universal input 8 value                       | R      |
| AV 108 | UI-08-OS | Universal input 8 Offset                      | R/W    |

## Virtual inputs

| Object | Name (8 Bytes) | Description            | Access |
|--------|----------------|------------------------|--------|
| AV 109 | VI-01          | Virtual input 1 value  | R/W    |
| AV 110 | VI-01-OS       | Virtual input 1 offset | R/W    |
| AV 111 | VI-02          | Virtual input 2 value  | R/W    |
| AV 112 | VI-02-OS       | Virtual input 2 offset | R/W    |
| AV 113 | VI-03          | Virtual input 3 value  | R/W    |
| AV 114 | VI-03-OS       | Virtual input 3 offset | R/W    |
| AV 115 | VI-04          | Virtual input 4 value  | R/W    |
| AV 116 | VI-04-OS       | Virtual input 4 offset | R/W    |

## Writing to virtual inputs

Virtual inputs may be written to with BACnet if set to communication module in the X2 controller. If there is a time out period specified under the settings of the X2 controller, the input will have to be written to within the delay specified, else this input will be disabled. All the connected functions and control loops will then be disabled too and Err 4 will be displayed on the operation terminal.

## Alarms

| Object | Name  | Description                                                | Access |
|--------|-------|------------------------------------------------------------|--------|
| MV 601 | AL-01 | Alarm 1: 1 = Not Active, 2 = Active, 3 = Need confirmation | R/W*   |
| MV 602 | AL-02 | Alarm 2: 1 = Not Active, 2 = Active, 3 = Need confirmation | R/W*   |
| MV 603 | AL-03 | Alarm 3: 1 = Not Active, 2 = Active, 3 = Need confirmation | R/W*   |
| MV 604 | AL-04 | Alarm 4: 1 = Not Active, 2 = Active, 3 = Need confirmation | R/W*   |
| MV 605 | AL-05 | Alarm 5: 1 = Not Active, 2 = Active, 3 = Need confirmation | R/W*   |
| MV 606 | AL-06 | Alarm 6: 1 = Not Active, 2 = Active, 3 = Need confirmation | R/W*   |
| MV 607 | AL-07 | Alarm 7: 1 = Not Active, 2 = Active, 3 = Need confirmation | R/W*   |
| MV 608 | AL-08 | Alarm 8: 1 = Not Active, 2 = Active, 3 = Need confirmation | R/W*   |

\*) Writable to "not active" only, if state is "not active, need confirmation".

## Control Loops

| Object | Name       | Description                                                                                        | Access |
|--------|------------|----------------------------------------------------------------------------------------------------|--------|
| MV 211 | LP-01-ST   | Loop 1 state<br>1 = Disabled, 2 = Heating, 3 = Cooling                                             | R      |
| AV 211 | LP-01-SSP  | Loop 1 saved set point                                                                             | R/W    |
| AV 212 | LP-01-CSP  | Loop 1 calculated set point                                                                        | R      |
| AV 213 | LP-01-PROP | Loop 1 proportional output 0-100%                                                                  | R      |
| MV 212 | LP-01-DO   | Loop 1 binary output: Activated binary stage<br>1 = SOFF, 2 = S01, 3 = S02, 4 = S03, ..., 64 = S63 | R      |
| MV 221 | LP-02-ST   | Loop 2 state                                                                                       | R      |
| AV 221 | LP-02-SSP  | Loop 2 saved set point                                                                             | R/W    |
| AV 222 | LP-02-CSP  | Loop 2 calculated set point                                                                        | R      |
| AV 223 | LP-02-PROP | Loop 2 proportional output 0-100%                                                                  | R      |
| MV 222 | LP-02-DO   | Loop 2 binary output: Activated binary stage                                                       | R      |
| MV 231 | LP-03-ST   | Loop 3 state                                                                                       | R      |
| AV 231 | LP-03-SSP  | Loop 3 saved set point                                                                             | R/W    |
| AV 232 | LP-03-CSP  | Loop 3 calculated set point                                                                        | R      |
| AV 233 | LP-03-PROP | Loop 3 proportional output 0-100%                                                                  | R      |
| MV 232 | LP-03-DO   | Loop 3 binary output: Activated binary stage                                                       | R      |
| MV 241 | LP-04-ST   | Loop 4 state                                                                                       | R      |
| AV 241 | LP-04-SSP  | Loop 4 saved set point                                                                             | R/W    |
| AV 242 | LP-04-CSP  | Loop 4 calculated set point                                                                        | R      |
| AV 243 | LP-04-PROP | Loop 4 proportional output 0-100%                                                                  | R      |
| MV 242 | LP-04-DO   | Loop 4 binary output: Activated binary stage                                                       | R      |

## Analog Outputs

| Object | Name      | Description                                                                 | Access |
|--------|-----------|-----------------------------------------------------------------------------|--------|
| MV 311 | AO-01-ST  | Analog output 1 state<br>1 = Disabled, 2 = Normal, 3 = Manual, 4 = Override | R/W    |
| AV 311 | AO-01-VAL | Analog output 1 value<br>0-100%                                             | R      |
| AV 312 | AO-01-OV  | Analog output 1 override value<br>0-100%                                    | R/W    |
| MV 321 | AO-02-ST  | Analog output 2 state                                                       | R/W    |
| AV 321 | AO-02-VAL | Analog output 2 value                                                       | R      |
| AV 322 | AO-02-OV  | Analog output 2 override value                                              | R/W    |
| MV 331 | AO-03-ST  | Analog output 3 state                                                       | R/W    |
| AV 331 | AO-03-VAL | Analog output 3 value                                                       | R      |
| AV 332 | AO-03-OV  | Analog output 3 override value                                              | R/W    |

## Digital Outputs

### Digital Outputs in 3-point / floating configuration

| Object | Name         | Description                                                                                                        | Access |
|--------|--------------|--------------------------------------------------------------------------------------------------------------------|--------|
| AV 411 | DO-01-FLT    | Binary Output 1 value in 3-point floating configuration (DO1 (open) and DO2 (close) are used)<br>Position = 0-100% | R      |
| AV 412 | DO-01-FLT-OV | Binary Output 1 override value in analog mode 3-point floating configuration<br>Position = 0-100%                  | R/W    |
| MV 411 | DO-01-ST     | Current State for Binary Output 1<br>1 = Off, 2 = Normal, 3 = Manual, 4 = Override                                 | R/W    |
| AV 431 | DO-03-FLT    | Binary Output 3 value in 3-point floating configuration (DO3 (open) and DO4 (close) are used)                      | R      |
| AV 432 | DO-03-FLT-OV | Binary Output 3 override value in 3-point floating configuration                                                   | R/W    |
| MV 431 | DO-03-ST     | Current State for Binary Output 3                                                                                  | R/W    |
| AV 451 | DO-05-FLT    | Binary Output 5 value in 3-point floating configuration (DO5 (open) and DO6 (close) are used)                      | R      |
| AV 452 | DO-05-FLT-OV | Binary Output 5 override value in 3-point floating configuration                                                   | R/W    |
| MV 451 | DO-05-ST     | Current State for Binary Output 5                                                                                  | R/W    |

### Digital Outputs in PWM configuration

| Object | Name         | Description                                                                        | Access |
|--------|--------------|------------------------------------------------------------------------------------|--------|
| AV 413 | DO-01-PWM    | Binary Output 1 in PWM configuration from 0-100%                                   | R      |
| AV 414 | DO-01-PWM-OV | Binary Output 1 override value in PWM configuration from 0-100%                    | R/W    |
| MV 411 | DO-01-ST     | Current State for Binary Output 1<br>1 = Off, 2 = Normal, 3 = Manual, 4 = Override | R/W    |
| AV 423 | DO-02-PWM    | Binary Output 2 in PWM configuration from 0-100%                                   | R      |
| AV 424 | DO-02-PWM-OV | Binary Output 2 override value in PWM configuration from 0-100%                    | R/W    |
| MV 421 | DO-02-ST     | Current State for Binary Output 2                                                  | R/W    |
| AV 433 | DO-03-PWM    | Binary Output 3 in PWM configuration from 0-100%                                   | R      |
| AV 434 | DO-03-PWM-OV | Binary Output 3 override value in PWM configuration from 0-100%                    | R/W    |
| MV 431 | DO-03-ST     | Current State for Binary Output 3                                                  | R/W    |
| AV 443 | DO-04-PWM    | Binary Output 4 in PWM configuration from 0-100%                                   | R      |
| AV 444 | DO-04-PWM-OV | Binary Output 4 override value in PWM configuration from 0-100%                    | R/W    |
| MV 441 | DO-04-ST     | Current State for Binary Output 4                                                  | R/W    |
| AV 453 | DO-05-PWM    | Binary Output 5 in PWM configuration from 0-100%                                   | R      |
| AV 454 | DO-05-PWM-OV | Binary Output 5 override value in PWM configuration from 0-100%                    | R/W    |
| MV 451 | DO-05-ST     | Current State for Binary Output 5                                                  | R/W    |
| AV 463 | DO-06-PWM    | Binary Output 6 in PWM configuration from 0-100%                                   | R      |
| AV 464 | DO-06-PWM-OV | Binary Output 6 override value in PWM configuration from 0-100%                    | R/W    |
| MV 461 | DO-06-ST     | Current State for Binary Output 6                                                  | R/W    |
| AV 473 | DO-07-PWM    | Binary Output 7 in PWM configuration from 0-100%                                   | R      |
| AV 474 | DO-07-PWM-OV | Binary Output 7 override value in PWM configuration from 0-100%                    | R/W    |
| MV 471 | DO-07-ST     | Current State for Binary Output 7                                                  | R/W    |



### Digital Outputs in binary configuration

| Object | Name         | Description                                                                        | Access |
|--------|--------------|------------------------------------------------------------------------------------|--------|
| BV 411 | DO-01-BIN    | Binary Output 1 in binary configuration<br>0 = Off, 1 = On                         | R      |
| BV 412 | DO-01-BIN-OV | Binary Output 1 override value in binary configuration<br>0 = Off, 1 = On          | R/W    |
| AV 511 | DO-01-RT     | Run time totalizer in hours                                                        | R      |
| BV 511 | DO-01-ALA    | Run time limit exceeded<br>0 = No Error, 1 = RT Limit Reached                      | R      |
| MV 411 | DO-01-ST     | Current State for Binary Output 1<br>1 = Off, 2 = Normal, 3 = Manual, 4 = Override | R/W    |
| BV 421 | DO-02-BIN    | Binary Output 2 in binary configuration                                            | R      |
| BV 422 | DO-02-BIN-OV | Binary Output 2 override value in binary configuration                             | R/W    |
| AV 521 | DO-02-RT     | Run time totalizer in hours                                                        | R      |
| BV 521 | DO-02-ALA    | Run time limit exceeded                                                            | R      |
| MV 421 | DO-02-ST     | Current State for Binary Output 2                                                  | R/W    |
| BV 431 | DO-03-BIN    | Binary Output 3 in binary configuration                                            | R      |
| BV 432 | DO-03-BIN-OV | Binary Output 3 override value in binary configuration                             | R/W    |
| AV 531 | DO-03-RT     | Run time totalizer in hours                                                        | R      |
| BV 531 | DO-03-ALA    | Run time limit exceeded                                                            | R      |
| MV 431 | DO-03-ST     | Current State for Binary Output 3                                                  | R/W    |
| BV 441 | DO-04-BIN    | Binary Output 4 in binary configuration                                            | R      |
| BV 442 | DO-04-BIN-OV | Binary Output 4 override value in binary configuration                             | R/W    |
| AV 541 | DO-04-RT     | Run time totalizer in hours                                                        | R      |
| BV 541 | DO-04-ALA    | Run time limit exceeded                                                            | R      |
| MV 441 | DO-04-ST     | Current State for Binary Output 4                                                  | R/W    |
| BV 451 | DO-05-BIN    | Binary Output 5 in binary configuration                                            | R      |
| BV 452 | DO-05-BIN-OV | Binary Output 5 override value in binary configuration                             | R/W    |
| AV 551 | DO-05-RT     | Run time totalizer in hours                                                        | R      |
| BV 551 | DO-05-ALA    | Run time limit exceeded                                                            | R      |
| MV 451 | DO-05-ST     | Current State for Binary Output 5                                                  | R/W    |
| BV 461 | DO-06-BIN    | Binary Output 6 in binary configuration                                            | R      |
| BV 462 | DO-06-BIN-OV | Binary Output 6 override value in binary configuration                             | R/W    |
| AV 561 | DO-06-RT     | Run time totalizer in hours                                                        | R      |
| BV 561 | DO-06-ALA    | Run time limit exceeded                                                            | R      |
| MV 461 | DO-06-ST     | Current State for Binary Output 6                                                  | R/W    |
| BV 471 | DO-07-BIN    | Binary Output 7 in binary configuration                                            | R      |
| BV 472 | DO-07-BIN-OV | Binary Output 7 override value in binary configuration                             | R/W    |
| AV 571 | DO-07-RT     | Run time totalizer in hours                                                        | R      |
| BV 571 | DO-07-ALA    | Run time limit exceeded                                                            | R      |
| MV 471 | DO-07-ST     | Current State for Binary Output 7                                                  | R/W    |

### Fan module

#### Analog fan mode configuration

| Object | Name    | Description                                                                               | Access |
|--------|---------|-------------------------------------------------------------------------------------------|--------|
| MV 412 | FAN1    | AO1 fan value (FAN1)<br>1 = OFF, 2 = Stage 1, 3 = Stage 2, 4 = Stage 3                    | R      |
| MV 413 | FAN1-OV | AO1 fan override value (FAN1)<br>1 = OFF, 2 = Stage 1, 3 = Stage 2, 4 = Stage 3, 5 = AUTO | R/W    |
| MV 414 | FAN1-ST | FAN1 state description<br>1 = Disabled, 2 = Normal, 3 = Manual, 4 = Override              | R/W    |
| MV 442 | FAN2    | AO2 fan value (FAN2)                                                                      | R      |
| MV 443 | FAN2-OV | AO2 fan override value (FAN2)                                                             | R/W    |
| MV 444 | FAN2-ST | FAN2 state description                                                                    | R/W    |

Note: Not used FAN output is free to use as analog output.

#### Digital fan mode configuration

| Object | Name    | Description                                                                          | Access |
|--------|---------|--------------------------------------------------------------------------------------|--------|
| MV 412 | FAN1    | DO1-3 fan value<br>1 = OFF, 2 = Stage 1, 3 = Stage 2, 4 = Stage 3                    | R      |
| MV 413 | FAN1-OV | DO1-3 fan override value<br>1 = OFF, 2 = Stage 1, 3 = Stage 2, 4 = Stage 3, 5 = AUTO | R/W    |
| MV 414 | FAN1-ST | FAN1 state description<br>1 = Disabled, 2 = Normal, 3 = Manual, 4 = Override         | R/W    |
| MV 442 | FAN2    | DO4-6 fan value                                                                      | R      |
| MV 443 | FAN2-OV | DO4-6 fan override value                                                             | R/W    |
| MV 444 | FAN2-ST | FAN2 state description                                                               | R/W    |

Note: Not used FAN outputs are free to use as digital outputs.

**Fan in lead-lag configuration (rotation mode)**

| Object | Name         | Description                                                                    | Access |
|--------|--------------|--------------------------------------------------------------------------------|--------|
| MV 412 | FAN1         | DO1-3 fan value<br>1 = OFF, 2 = Stage 1, 3 = Stage 2, 4 = Stage 3              | R      |
| MV 413 | FAN1-OV      | DO1-3 fan override<br>1 = OFF, 2 = Stage 1, 3 = Stage 2, 4 = Stage 3, 5 = AUTO | R/W    |
| MV 414 | FAN1-ST      | FAN1 state description<br>1 = Disabled, 2 = Normal, 3 = Manual, 4 = Override   | R/W    |
| AV 415 | FAN1-LL-TIME | FAN1 remaining time until next rotation in hours                               | R      |
| MV 442 | FAN2         | DO4-6 fan value                                                                | R      |
| MV 443 | FAN2-OV      | DO4-6 fan override                                                             | R/W    |
| MV 444 | FAN2-ST      | FAN2 state description                                                         | R/W    |
| AV 445 | FAN2-LL-TIME | FAN2 remaining time until next rotation in hours                               | R      |

Note: Not used FAN outputs are free to use as digital or analog outputs.

## Time schedules

All devices support 12 individual time schedules (TS1 - TS12).

### Weekly time schedules

| Object | Name     | Description                                                                                                                                                                                                                                                                            | Access |
|--------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| MV 711 | TS1-TYPE | Type of time schedule object<br>1 = OFF<br>2 = OP (Operation mode)<br>3 = LP (Control loop set point)<br>4 = AO (Analog output set point)<br>5 = FAN (Fan output)<br>6 = DO (Digital output)<br>7 = HDAY (Holiday)                                                                     | R/W    |
| MV 712 | TS1-NR   | Type group ID - Valid only for the following types<br>LP: LP1 ... LPx<br>AO: AO1 ... AOx<br>FAN: FAN1 ... FANx<br>DO: DO1 ... DOx<br><br>Example: MV 711 = 4 (AO), MV 712 (group ID) = 1<br>Result: AO1 (TS1 controls AO1)<br><br>8 = Invalid configuration or not used for this type. | R/W    |
| MV 713 | TS1-DAYS | Active days:<br>1 = No days<br>2 = Day 1 - Day 7<br>3 = Day 1 - Day 6<br>4 = Day 1 - Day 5<br>5 = Day 6 - Day 7<br>6 = Day 1<br>7 = Day 2<br>8 = Day 3<br>9 = Day 4<br>10 = Day 5<br>11 = Day 6<br>12 = Day 7<br>13 = other combination of active days (read-only)                     | R/W    |
| AV 711 | TS1-TIME | Time (rounded to 0.25 hours, e.g. 5.25h)<br>5.25 = 5h15 min<br>5.5 = 5h30 min<br>5.75 = 5h45min                                                                                                                                                                                        | R/W    |
| AV 712 | TS1-SP   | Set point of time schedule<br>TS1-TYPE:<br>1=OFF: No set point<br>2=OP: 0 = Off, 1 = Eco, 2 = On<br>3=LP: Set point 0-100%<br>4=AO: Value 0-100%<br>5=FAN: 0 = Fan Off, 1 = Fan stage 1, 2 = Fan stage 2, 3 = Fan stage 3, 4 = Auto<br>6=DO: 0 = Off, 1 = On                           | R/W    |
| MV 721 | TS2-TYPE | Type of time schedule object                                                                                                                                                                                                                                                           | R/W    |
| MV 722 | TS2-NR   | Type group ID                                                                                                                                                                                                                                                                          | R/W    |
| MV 723 | TS2-DAYS | Active days                                                                                                                                                                                                                                                                            | R/W    |
| AV 721 | TS2-TIME | Time (rounded to 0.25 hours, e.g. 5.25h)                                                                                                                                                                                                                                               | R/W    |
| AV 722 | TS2-SP   | Set point of time schedule                                                                                                                                                                                                                                                             | R/W    |
| MV 731 | TS3-TYPE | Type of time schedule object                                                                                                                                                                                                                                                           | R/W    |
| MV 732 | TS3-NR   | Type group ID                                                                                                                                                                                                                                                                          | R/W    |
| MV 733 | TS3-DAYS | Active days                                                                                                                                                                                                                                                                            | R/W    |
| AV 731 | TS3-TIME | Time (rounded to 0.25 hours, e.g. 5.25h)                                                                                                                                                                                                                                               | R/W    |
| AV 732 | TS3-SP   | Set point of time schedule                                                                                                                                                                                                                                                             | R/W    |
| MV 741 | TS4-TYPE | Type of time schedule object                                                                                                                                                                                                                                                           | R/W    |
| MV 742 | TS4-NR   | Type group ID                                                                                                                                                                                                                                                                          | R/W    |
| MV 743 | TS4-DAYS | Active days                                                                                                                                                                                                                                                                            | R/W    |
| AV 741 | TS4-TIME | Time (rounded to 0.25 hours, e.g. 5.25h)                                                                                                                                                                                                                                               | R/W    |
| AV 742 | TS4-SP   | Set point of time schedule                                                                                                                                                                                                                                                             | R/W    |
| MV 751 | TS5-TYPE | Type of time schedule object                                                                                                                                                                                                                                                           | R/W    |
| MV 752 | TS5-NR   | Type group ID                                                                                                                                                                                                                                                                          | R/W    |
| MV 753 | TS5-DAYS | Active days                                                                                                                                                                                                                                                                            | R/W    |
| AV 751 | TS5-TIME | Time (rounded to 0.25 hours, e.g. 5.25h)                                                                                                                                                                                                                                               | R/W    |
| AV 752 | TS5-SP   | Set point of time schedule                                                                                                                                                                                                                                                             | R/W    |
| MV 761 | TS6-TYPE | Type of time schedule object                                                                                                                                                                                                                                                           | R/W    |
| MV 762 | TS6-NR   | Type group ID                                                                                                                                                                                                                                                                          | R/W    |
| MV 763 | TS6-DAYS | Active days                                                                                                                                                                                                                                                                            | R/W    |
| AV 761 | TS6-TIME | Time (rounded to 0.25 hours, e.g. 5.25h)                                                                                                                                                                                                                                               | R/W    |
| AV 762 | TS6-SP   | Set point of time schedule                                                                                                                                                                                                                                                             | R/W    |
| MV 771 | TS7-TYPE | Type of time schedule object                                                                                                                                                                                                                                                           | R/W    |
| MV 772 | TS7-NR   | Type group ID                                                                                                                                                                                                                                                                          | R/W    |

| Object | Name      | Description                              | Access |
|--------|-----------|------------------------------------------|--------|
| MV 773 | TS7-DAYS  | Active days                              | R/W    |
| AV 771 | TS7-TIME  | Time (rounded to 0.25 hours, e.g. 5.25h) | R/W    |
| AV 772 | TS7-SP    | Set point of time schedule               | R/W    |
| MV 781 | TS8-TYPE  | Type of time schedule object             | R/W    |
| MV 782 | TS8-NR    | Type group ID                            | R/W    |
| MV 783 | TS8-DAYS  | Active days                              | R/W    |
| AV 781 | TS8-TIME  | Time (rounded to 0.25 hours, e.g. 5.25h) | R/W    |
| AV 782 | TS8-SP    | Set point of time schedule               | R/W    |
| MV 791 | TS9-TYPE  | Type of time schedule object             | R/W    |
| MV 792 | TS9-NR    | Type group ID                            | R/W    |
| MV 793 | TS9-DAYS  | Active days                              | R/W    |
| AV 791 | TS9-TIME  | Time (rounded to 0.25 hours, e.g. 5.25h) | R/W    |
| AV 792 | TS9-SP    | Set point of time schedule               | R/W    |
| MV 801 | TS10-TYPE | Type of time schedule object             | R/W    |
| MV 802 | TS10-NR   | Type group ID                            | R/W    |
| MV 803 | TS10-DAYS | Active days                              | R/W    |
| AV 801 | TS10-TIME | Time (rounded to 0.25 hours, e.g. 5.25h) | R/W    |
| AV 802 | TS10-SP   | Set point of time schedule               | R/W    |
| MV 811 | TS11-TYPE | Type of time schedule object             | R/W    |
| MV 812 | TS11-NR   | Type group ID                            | R/W    |
| MV 813 | TS11-DAYS | Active days                              | R/W    |
| AV 811 | TS11-TIME | Time (rounded to 0.25 hours, e.g. 5.25h) | R/W    |
| AV 812 | TS11-SP   | Set point of time schedule               | R/W    |
| MV 821 | TS12-TYPE | Type of time schedule object             | R/W    |
| MV 822 | TS12-NR   | Type group ID                            | R/W    |
| MV 823 | TS12-DAYS | Active days                              | R/W    |
| AV 821 | TS12-TIME | Time (rounded to 0.25 hours, e.g. 5.25h) | R/W    |
| AV 822 | TS12-SP   | Set point of time schedule               | R/W    |

### Annual time schedules (holidays)

Annual time schedules used to define holidays have a different format than weekly time schedules. They share however the same address space. So, if a time schedule is changed to holiday mode, the format of the other settings associated with this time schedule change as well.

| Object | Name             | Description                                                                                                                                                                                                               | Access |
|--------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| MV 711 | TS1-TYPE         | Type of time schedule object<br>1 = OFF<br>2 = OP (Operation mode)<br>3 = LP (Control loop set point)<br>4 = AO (Analog output set point)<br>5 = FAN (Fan output)<br>6 = DO (Digital output)<br><b>7 = HDAY (Holiday)</b> | R/W    |
| AV 713 | TS1-HDAY-START   | Start day of holiday<br>1 = first day of the month                                                                                                                                                                        | R/W    |
| AV 714 | TS1-HMONTH-START | Start month of holiday<br>1 = January, 12 = December                                                                                                                                                                      | R/W    |
| AV 715 | TS1-HDAY-END     | End day of holiday<br>1 = first day of the month                                                                                                                                                                          | R/W    |
| AV 716 | TS1-HMONTH-END   | End month of holiday<br>1 = January, 12 = December                                                                                                                                                                        | R/W    |
| MV 721 | TS2-TYPE         | Type of time schedule object                                                                                                                                                                                              | R/W    |
| AV 723 | TS2-HDAY-START   | Start day of holiday                                                                                                                                                                                                      | R/W    |
| AV 724 | TS2-HMONTH-START | Start month of holiday                                                                                                                                                                                                    | R/W    |
| AV 725 | TS2-HDAY-END     | End day of holiday                                                                                                                                                                                                        | R/W    |
| AV 726 | TS2-HMONTH-END   | End month of holiday                                                                                                                                                                                                      | R/W    |
| MV 731 | TS3-TYPE         | Type of time schedule object                                                                                                                                                                                              | R/W    |
| AV 733 | TS3-HDAY-START   | Start day of holiday                                                                                                                                                                                                      | R/W    |
| AV 734 | TS3-HMONTH-START | Start month of holiday                                                                                                                                                                                                    | R/W    |
| AV 735 | TS3-HDAY-END     | End day of holiday                                                                                                                                                                                                        | R/W    |
| AV 736 | TS3-HMONTH-END   | End month of holiday                                                                                                                                                                                                      | R/W    |
| MV 741 | TS4-TYPE         | Type of time schedule object                                                                                                                                                                                              | R/W    |
| AV 743 | TS4-HDAY-START   | Start day of holiday                                                                                                                                                                                                      | R/W    |
| AV 744 | TS4-HMONTH-START | Start month of holiday                                                                                                                                                                                                    | R/W    |
| AV 745 | TS4-HDAY-END     | End day of holiday                                                                                                                                                                                                        | R/W    |
| AV 746 | TS4-HMONTH-END   | End month of holiday                                                                                                                                                                                                      | R/W    |
| MV 751 | TS5-TYPE         | Type of time schedule object                                                                                                                                                                                              | R/W    |
| AV 753 | TS5-HDAY-START   | Start day of holiday                                                                                                                                                                                                      | R/W    |
| AV 754 | TS5-HMONTH-START | Start month of holiday                                                                                                                                                                                                    | R/W    |
| AV 755 | TS5-HDAY-END     | End day of holiday                                                                                                                                                                                                        | R/W    |

| Object | Name              | Description                  | Access |
|--------|-------------------|------------------------------|--------|
| AV 756 | TS5-HMONTH-END    | End month of holiday         | R/W    |
| MV 761 | TS6-TYPE          | Type of time schedule object | R/W    |
| AV 763 | TS6-HDAY-START    | Start day of holiday         | R/W    |
| AV 764 | TS6-HMONTH-START  | Start month of holiday       | R/W    |
| AV 765 | TS6-HDAY-END      | End day of holiday           | R/W    |
| AV 766 | TS6-HMONTH-END    | End month of holiday         | R/W    |
| MV 771 | TS7-TYPE          | Type of time schedule object | R/W    |
| AV 773 | TS7-HDAY-START    | Start day of holiday         | R/W    |
| AV 774 | TS7-HMONTH-START  | Start month of holiday       | R/W    |
| AV 775 | TS7-HDAY-END      | End day of holiday           | R/W    |
| AV 776 | TS7-HMONTH-END    | End month of holiday         | R/W    |
| MV 781 | TS8-TYPE          | Type of time schedule object | R/W    |
| AV 783 | TS8-HDAY-START    | Start day of holiday         | R/W    |
| AV 784 | TS8-HMONTH-START  | Start month of holiday       | R/W    |
| AV 785 | TS8-HDAY-END      | End day of holiday           | R/W    |
| AV 786 | TS8-HMONTH-END    | End month of holiday         | R/W    |
| MV 791 | TS9-TYPE          | Type of time schedule object | R/W    |
| AV 793 | TS9-HDAY-START    | Start day of holiday         | R/W    |
| AV 794 | TS9-HMONTH-START  | Start month of holiday       | R/W    |
| AV 795 | TS9-HDAY-END      | End day of holiday           | R/W    |
| AV 796 | TS9-HMONTH-END    | End month of holiday         | R/W    |
| MV 801 | TS10-TYPE         | Type of time schedule object | R/W    |
| AV 803 | TS10-HDAY-START   | Start day of holiday         | R/W    |
| AV 804 | TS10-HMONTH-START | Start month of holiday       | R/W    |
| AV 805 | TS10-HDAY-END     | End day of holiday           | R/W    |
| AV 806 | TS10-HMONTH-END   | End month of holiday         | R/W    |
| MV 811 | TS11-TYPE         | Type of time schedule object | R/W    |
| AV 813 | TS11-HDAY-START   | Start day of holiday         | R/W    |
| AV 814 | TS11-HMONTH-START | Start month of holiday       | R/W    |
| AV 815 | TS11-HDAY-END     | End day of holiday           | R/W    |
| AV 816 | TS11-HMONTH-END   | End month of holiday         | R/W    |
| MV 821 | TS12-TYPE         | Type of time schedule object | R/W    |
| AV 823 | TS12-HDAY-START   | Start day of holiday         | R/W    |
| AV 824 | TS12-HMONTH-START | Start month of holiday       | R/W    |
| AV 825 | TS12-HDAY-END     | End day of holiday           | R/W    |
| AV 826 | TS12-HMONTH-END   | End month of holiday         | R/W    |

## Parameter access through BACnet/IP

Generally we do not encourage changing parameter value through external communications. It can however be done as a work around. This application note explains how access is given and how to interpret the associated values. With two Analog Value objects each configuration parameter of the controller may be accessed. ParAdd (AV 00) is the address of the parameter and ParValue (AV 01) is the value. The correct address may be calculated with the static address table below. Once the address is set, the value of the parameter may be read or written using AV 01.

| Object | Name (8 Bytes) | Description / Property description    | Format | R/W |
|--------|----------------|---------------------------------------|--------|-----|
| AV 00  | ParAdd         | Address of parameter, see table below | AV     | R/W |
| AV 01  | ParValue       | Parameter value                       | AV     | R/W |

### Parameter address overview

With the addresses listed in the table below the settings may be changed of the controller. They correspond with the parameter settings for the addressed TCX2 controller.

The address is calculated by adding the parameter number to the value from the table below. To use the table, choose the type of parameter by selecting the row of the table and then choose the item with the column. UI5 would result in 3400. Parameter 5U10 would thus be address 3410.

| Description     | Parameter Address |       |       |       |       |       |       |       |       |       |       |       |
|-----------------|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                 | 1                 | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    | 11    | 12    |
| User settings   | 2000              |       |       |       |       |       |       |       |       |       |       |       |
| Universal input | 3000              | 3100  | 3200  | 3300  | 3400  | 3500  | 3600  | 3700  | 3800  | 3900  | 4000  | 4100  |
| Control Loop    | 5000              | 5100  | 5200  | 5300  |       |       |       |       |       |       |       |       |
| Analog Output   | 6000              | 6100  | 6200  |       |       |       |       |       |       |       |       |       |
| Binary Output   | 7000              | 7100  | 7200  | 7300  | 7400  | 7500  | 7600  | 7700  |       |       |       |       |
| Fan output      | 8000              | 8100  |       |       |       |       |       |       |       |       |       |       |
| Alarm           | 9000              | 9100  | 9200  | 9300  | 9400  | 9500  | 9600  | 9700  |       |       |       |       |
| Functions       | 10000             | 10100 | 10200 | 10300 | 10400 |       |       |       |       |       |       |       |
| Time Schedules  | 11100             | 11200 | 11300 | 11400 | 11500 | 11600 | 11700 | 11800 | 11900 | 12000 | 12100 | 12200 |
| Communication   | 13000             |       |       |       |       |       |       |       |       |       |       |       |

### Parameter interpretation

All parameters are converted into a readable format by the communication module:

1. Parameters with whole numbered integers are shown 1:1 without conversion:
  - a. Selections of input, outputs indexes
  - b. Selections of mode or type indexes
  - c. Fan speed
  - d. ...
2. Parameters with values which can hold decimals, the parameter value is multiplied by 10
  - a. Input depending values such as input offset, min/max values for inputs and loops
  - b. 0-100% values. Example: 10.5% -> 105
  - c. ...
3. Time delays are shown in seconds
4. OFF/ON parameters are shown as 0/1

Note: With the "read-modify-write" method it helps to understand the correct parameters format which has to be used in order to modify a parameter value correctly.

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