**DESCRIPTION**

The CBV Series is a range of BTL Listed BACnet® Advanced Application Controllers (B-AAC) with 2 UniPuts™, 4 Universal Inputs and 3 Digital (Triac) Outputs, along with an integrated airflow sensor and actuator. CBV controllers use the BACnet® MS/TP LAN communication protocol. The -N variant has a facility for connection to an external actuator.

**APPLICATION**

The CBV Series is suitable for controlling single duct or fan assisted Variable Air Volume (VAV) applications. These controllers also support demand ventilation application, occupancy sensing or lighting control to further enhance energy savings.

The fully programmable CBV Series can be tailored to meet a variety of applications using the pre-loaded and configurable application library or by creating and modifying strategies using Cylon’s CXpro™ programming interface.

Typical VAV zoning applications include;

- Cooling only
- Cooling with Reheat
- Cooling with Reheat and Perimeter Radiation
- Series fan VAV
- Parallel fan VAV
- Dump box
- Room pressurization

**BACnet MS/TP Fieldbus**

Supports the following configurable BACnet objects: AI / BI / AO / BO / AV / BV, Trend Logs, and Schedules

- 2 UniPuts™
  Cylon’s patented technology that can be configured as analog / digital outputs or voltage inputs

- 4 Universal Inputs
  Can be configured as analog (voltage or current) or digital inputs

- 3 Digital (Triac) Outputs
  Can switch 24 V AC @ 500 mA (live or neutral)

- Integrated Pressure Sensor
  0 ... 1.3 inches-water (0 ... 320 Pa)
  Can measure differential pressure directly without need for a separate sensor

- Integrated Actuator (CBV-2U4-3T) / External Actuator Port (CBV-2U4-3T-N)
  Belimo actuator featuring a brushless DC motor with integrated position feedback and 45 inch-pounds (5 N-m) of torque

- Support for CBT-STAT family
- Up to 500 Strategy Blocks
- Up to 6 Trendlogs
- 1024 entries per Trendlog
- Data Security
  Strategy and setpoints backed up in Flash

**No Hardware I/O Jumpers**

Hardware points are automatically configured by the downloaded strategy

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### Product Selection Chart

<table>
<thead>
<tr>
<th>Part Number</th>
<th>UniPuts™</th>
<th>Universal Inputs</th>
<th>Triac Outputs</th>
<th>Airflow Sensor</th>
<th>BACnet Bus</th>
<th>CBT-STAT Bus</th>
<th>Integrated Actuator</th>
<th>External Actuator Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBV-2U4-3T</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>CBV-2U4-3T-N</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: 1 – UniPuts™ are software configurable for point types AI, DI, AO or DO-R.

### Point Capacity

<table>
<thead>
<tr>
<th>Part Number</th>
<th>UniPuts™</th>
<th>Universal Inputs</th>
<th>Triac Outputs</th>
<th>Total Inputs + Outputs</th>
<th>Max Inputs</th>
<th>Max Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBV-2U4-3T</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>9</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>CBV-2U4-3T-N</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>9</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

Note: 2 – When UniPuts™ are software configured as AI or DI.
Note: 3 – When UniPuts™ are software configured as AO or DO.
SPECIFICATIONS

MECHANICAL

Size (excluding terminal plugs) CBV-2U4-3T  8.3 x 5.12 x 2.36" [210 x 130 x 60 mm]
CBV-2U4-3T-N  7.1 x 5.12 x 2.36" [180 x 130 x 60 mm]
Enclosure Injection molded ABS
Mounting Direct Mount
Integrated Actuator (CBV-2U4-3T-N) Belimo LMB24-MPL CYL with Brushless DC Motor
Torque: 45 in-lb [5 Nm]
Degrees of Rotation: 95° adjustable with mechanical stop
Fits Shaft Diameter 1/4" to 5/8" [6mm to 16mm]
Noise level  < 35 dB (A)
Running Time - 95 sec constant, independent of load
Integrated position feedback

CONNECTION

Note: Use Copper or Copper Clad Aluminum 70 °C conductors only.
Terminals PCB mounted plug terminal connections
Conductor Area Max: AWG 12 (3.31 mm²)
Min: AWG 22 (0.355 mm²)

ENVIRONMENT

Note: This equipment is intended for field installation within an enclosure.
Ambient Temperature 32 °F … 122 °F (0 °C … 50 °C) ambient.
Ambient Humidity 0% … 90% RH non-condensing
EMC Immunity EN61326-1:2013 Class B
EMC Emission EN61326-1:2013 Table 2
Approvals UL Listed (CDN & US) UL916 Energy Management Equipment - File No. E176435
BTL Listed – BACnet Advanced Application Controller (B-AAC)

ELECTRICAL

Supply Requirements 24 V AC +15 % / –20 % 50/60 Hz
Transformer Rating Up to 55 VA (up to 12 VA internal power plus up to 43 VA supplied to Triac loads)
BACnet Loading ¼ unit load device

PROCESSOR

Type STM32 F103ZET6 32bit processor
Clock Speed 8 MHz crystal, 72 MHz internal processor clock rate
System Memory (soldered to PCB not removable) 1M external flash, 64K SRAM internal to processor
1024k SRAM external

COMMUNICATIONS

Local serial port RS232 TTL port @ 9600 Baud
Max cable length 4 m
BACnet MS/TP port RS485 @ 96k, 192k, 38k4 or 76kBaud (defaults to 38k4)
Max cable length 1.2 km
CBT-STAT Port RS485 with a maximum cable length 500 m

SOFTWARE FEATURES

Maximum number of Strategy Blocks 500
Maximum number of Trend log Modules 6
Maximum internal Trend log capacity (standard) 1024
Data Security Strategy and Set points backed up in Flash

INTERFACE

Engineering Software CXproHD

INPUTS / OUTPUTS

Note: Shielded cable is recommended for all input connections.

UniPuts™ When configured as Input:
Analog Input
Range: 0 ... 10 V @ 40 kΩ
Resolution: 12 bit
Digital Volt-Free contact, @ 25 mA not continuous

When configured as Output:
Analog Output 0 ... 10 V, 20 mA, 12-bit resolution
Digital Output 0 ... 10 V, 20 mA

Universal Inputs Analog Input
Range: 0 ... 10 V @ 130 kΩ
Resolution: 12 bit
Temperature measurement
Range: 32 °F to 122 °F (0 °C … +50 °C)
Resolution: 12 bit
Passive Input for a large range of temperature sensors. 10KΩ sensors are recommended.

Current input
Range: 0 ... 20 mA @ 380 Ω
Accuracy: ±0.5% full scale [100μA]
Digital Volt-Free contact, Dry Contact

Digital (Triac) Outputs
24 V AC Triac @ 500 mA maximum. Switch live or switch neutral.

Triac Common
Connected to 24 V AC: Digital Outputs will switch live.
Connected to 0 V: Digital Outputs will switch neutral.

Airflow Sensor
0 ... 1.3 inches of water (0 ... 320 Pa) airflow measurement using internal microbridge type airflow sensor.

Integrated Actuator
CBV-2U4-3T only: Belimo LMB24-MPL CYL

External Actuator Port
CBV-2U4-3T-N only: points 9 and 10 are dedicated to operating the actuator.
DIMENSIONS AND WIRING

Note: Terminals 3, 18 and 33 are connected internally.
# INSTALLATION GUIDE

## TERMINALS

<table>
<thead>
<tr>
<th>Location</th>
<th>Illustration</th>
<th>Terminal Numbers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image" alt="Location Illustration" /></td>
<td>1 … 5</td>
<td>Universal Inputs</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Location Illustration" /></td>
<td>17 … 19</td>
<td>UniPuts</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Location Illustration" /></td>
<td>13</td>
<td>Triac Common</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Location Illustration" /></td>
<td>14 … 16</td>
<td>Triac Outputs</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Location Illustration" /></td>
<td>23 … 25</td>
<td>Service Port (screw terminal) &lt;br&gt;<strong>Note:</strong> Service Port must not be connected until after the device is powered on.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Location Illustration" /></td>
<td>26, 27</td>
<td>BACnet MS/TP Port &lt;br&gt;<strong>Important:</strong> In order for the BACnet MS/TP bus to operate reliably, the common power connection (terminal 33) must be connected to Earth. Cylon recommend that this is done at the 24 V AC transformer.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Location Illustration" /></td>
<td>33, 34</td>
<td>Power 24 V AC &lt;br&gt;<strong>Important:</strong> The common power connection (terminal 33) must be connected to Earth. Cylon recommend that this is done at the 24 V AC transformer.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Location Illustration" /></td>
<td>37, 38</td>
<td>Room Display / CBT-STAT Power supply</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Location Illustration" /></td>
<td>39, 40</td>
<td>Room Display / CBT-STAT RS485</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Location Illustration" /></td>
<td>10 … 12</td>
<td><em>(CBV-2U4-3T-N only)</em> External Actuator Terminal. &lt;br&gt;Accessed by removing the top cover</td>
</tr>
</tbody>
</table>
### BACnet MS/TP Terminator

- **OFF**: (BACnet MS/TP bus not terminated at this controller)
- **ON**: (BACnet MS/TP bus terminated at this controller)

### 7-way MS/TP Address Switch

The controller’s BACnet MAC address can be set either electronically (USB or BACnet) or manually using the 8-way DIP switch.

1. **Manual setting for ease of replacement**: Setting the 7-way DIP switch to an address between 1 and 127, and then cycling the power, will force the controller to update its MAC address to match the DIP settings. To replace a manually-addressed controller in the field simply copy the DIP switch setting of the controller you are replacing.

2. **Electronic setting for remote configuration**: Setting the 7-way DIP switch to all zeros will allow the MAC address to be set electronically either locally by USB or remotely over BACnet. It is also possible to use manual setting for initial commissioning, and then cycling the power to force the controller to update its MAC address to match the DIP settings. To enable subsequent electronic configuration, set the DIP switch to all zeros. The controller will retain the manually-set address until it is electronically overwitten.

The address is set in binary, from 1 (00000001) to 127 (11111111). A switch moved to the left (towards the ‘ON’ mark) represents 1, moved to the right represents 0. The bottom-most switch is the least-significant bit, the switch on the top is the most-significant bit.

### Indicator LEDs

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Off</th>
<th>On</th>
<th>Slow Blink</th>
<th>Fast blink</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Red LED (Power)</strong></td>
<td>Power is off.</td>
<td>Power is on.</td>
<td>Indicates no battery/battery is low.</td>
<td>-----</td>
</tr>
<tr>
<td><strong>Green LED (Status)</strong></td>
<td>Unit is not running</td>
<td>Strategy servicing and no comms.</td>
<td>MSTP comms, and Strategy servicing.</td>
<td>Strategy not servicing.</td>
</tr>
<tr>
<td><strong>Yellow LED (override)</strong></td>
<td>Normal operation.</td>
<td>Priority Array set above 16, for one or more Hardware Points, by external BACnet Client, or by CXpro™.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**: When Service Port is in use, the Green LED blinks off as Service Port comms are received.

**Note**: Battery is present only on custom versions.

During firmware upgrade the Yellow LED will remain on while the strategy/comms section reboots, and then the LEDs will rotate Green-Yellow-Red while the IO section reboots.

**CAUTION** - DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER. DISPOSE OF USED BATTERIES ACCORDING TO THE MANUFACTURER’S INSTRUCTIONS.

### Service Port (RJ-45)

**Note**: Service Port must not be connected until after the device is powered on.

### Airflow Sensor

External connection at bottom of housing

**CAUTION**: Terminal accessed by removing the top cover
<table>
<thead>
<tr>
<th>Location</th>
<th>Illustration</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image1.png" alt="Rotary Actuator" /></td>
<td>Rotary Actuator</td>
</tr>
<tr>
<td></td>
<td><img src="image2.png" alt="Damper Manual Override" /></td>
<td>Damper Manual Override</td>
</tr>
<tr>
<td></td>
<td><img src="image3.png" alt="Actuator direction selector" /></td>
<td>Actuator direction selector</td>
</tr>
</tbody>
</table>