



## 0-10V NATURAL VENTILATION CONTROL

The CCM-204-NV provides on demand control for up to 2 x zones of natural ventilation zones.

### CCM-204-NV FEATURES

- 2 zones of 0-10V control
- Cross flow and fan boost control options
- Flexible CO2 and temperature control options
- Control interlocks for external temperature, heat, wind, rain and fire
- BACnet MS/TP communications

2 x 0-10V control outputs per zone can be allocated to provide cross flow control through low-level and high-level dampers, or single vent applications with a 0-10V modulating fan boost.

Digital inputs can be allocated or written to via the native BACnet communications for wind, rain, fire and heating to ensure the windows or dampers are closed, or set to a minimum position, should the application require.

Temperature and CO2 values derived from either 0-10V sensor inputs or written values via the native BACnet communications, allow the controller to position the windows / dampers either based on the temperature within the space, or on a priority demand basis of both the temperature and CO2 values.

A Titan ACO window interface unit can be allocated to each zone to provide manual override of the auto control to close or open the windows.

## SPECIFICATION

Power Supply:	24VAC/DC +/- 10% Ensure PSU is rated for total output load.
Power Consumption:	150mA (excluding RDU) 400mA (including RDU)
Inputs / Outputs:	4 x 0-10V outputs 2 x Relay outputs 8 x Voltage Free Digital / 0-10V inputs 4 x 10K3A1 temperature sensor inputs
0-10V output rating:	5mA max
Relay output rating:	3A at 24V max
Temperature inputs:	10K3A1
Communications:	BACnet MS/TP (RS485)
Indication:	Tx/Rx
Operating temperature:	5-40 °C
Operating humidity:	20-80% RH non-condensing
IP rating:	IP20
Mounting:	Din Rail
Dimensions:	106 (w) x 92 (h) x 62 (h) mm
Country of origin:	UK
Product Code:	CCM-204/NV



## CONTROL OPERATION

The CCM-204-NV Natural Ventilation controller 2 zones of 0 to 10V or 2 to 10V control for automatic positioning of ventilation dampers dependant on the associated room temperature and/or CO2 conditions.

Each ventilation zone is controlled by two PI functions. The first operates to the desired room temperature setpoint with an optional minimum level of ventilation (if required). The second control function will calculate the desired vent position dependant on the value of the CO2 level and setpoint. The controlled output is dictated by the greater of the two control regimes.

If set up as a cross flow application, each ventilation zone provides two analogue controlled outputs that can be used for upper and lower ventilation actuators whereby the lower vents can be inhibited (if required) for security purposes during the free cool unoccupied periods.

If set up for fan assisted ventilation units, the second analogue output allocated to the zone will provide fan speed control. The fan assistance will only operate when the natural ventilation demand reaches 100% plus a preset additional amount at which point fan assistance becomes active. The control action will modulate the fan speed to match the increased ventilation demand.

The desired room temperature setpoint is derived from the default global temperature setpoint (GSP) which can be adjusted for each zone within a limited range configured in the setup. As the GSP temperature setpoint varies, the desired room temperature setpoint will be automatically adjusted.

## SETUP

The settings listed describe a range of standard options and operational features that are available from the applications library that is resident in the Natural Ventilation Controller software.

All settings are passcode protected and set via a Titan PID field programming tool at commissioning or can be pre-programmed in the factory prior to despatch.

Control settings can also be adjusted via BACnet communications if required.

## BACNET MS/TP NETWORK SETTINGS

Network:	Native BACnet (RS485 MS/TP) or Stand-alone
Unit address:	Sets the controller unit MAC address on MS/TP bus. <b>Range 1 to 127</b>
Baud Rate:	Communication baud rate <b>Range Options: - 9,600 19,200 38,400 or 76,800</b>
Dev Object ID:	Allows the setting of the device object ID. <b>Range 0 to 4194302</b>
Group Control:	Allows individual controllers to be set-up as a <b>Group Master</b> or <b>Group Slave</b> . This sets groups of controllers to take control information and instructions such as temperatures, Global Setpoint, occupancy, Heat, Rain and Fire inputs from a common Master (125 Slaves max). Any number of Groups can be set within the limit of 126 controllers on the MS/TP network

## CONTROL INPUT SETTINGS

### Global Input Settings

The external temperature can be written to the controller via BACnet communications or connected to the S4 input of the CCM-204-NV using a 10K3A1 outputs temperature sensor.

The external temperature sensor/value is used for a number of control options.

- a) Used for a low limit to reset the temperature control to minimum fresh air should the external temp fall below a preset level (See External Low Limit). CO2 control of the ventilation can be set to take priority in low limit temperature conditions.
- b) Used to monitor the external temperature in un-occupied modes to activate or inhibit free cooling (see Free Cooling).
- c) Used to adjust the Global Temperature Setpoint in compensated control mode.

If the External temperature value is supplied from the BMS then the controller physical input must be taken out of service (OOS).

### Additional Global Inputs

The CCM-204-NV supports several global inputs that can be written to or allocated to a digital input:

Input Type	Control Action
Rain	Close all vents / windows fully or to min position
Fire	Close all vents / windows
Unoccupied	Close all vents / windows
Occupied	Auto control of vents / windows
Night purge	Open selected vents / windows

### Zonal Inputs

- Zone Temperature** 0-10V (scaled 0-50°C), 10K3A1 thermistor input or written to via BACnet communications.
- Zone CO2** 0-10V (scaled 0-2000ppm) or written to via BACnet communications.
- Manual Control (ACO)** 0-10V control signal from ACO to manually open or close window / vent position.

## GLOBAL APPLICATION SETTINGS

### Control Overrides

- External Low Limit** If the external temperature falls below a set threshold, the normal temperature control is inhibited and the vents are reset to minimum position (option selectable). The CO2 level is still allowed to control the ventilation under low external temperature conditions.
- Internal Low Limit** If the internal temperature falls below a set threshold, the CO2 control and/or Manual Open signals can be inhibited (if required).
- Manual Control** Use a Titan ACO room interface unit to manually position the ventilation open or closed.

## Free Cooling

During unoccupied periods the ventilation should normally be fully closed. Free cooling automatically allows the ventilation to open under temperature controlled conditions provided that the external temperature is below the internal temperature. The Free Cooling will be inhibited if the external or internal temperature is below the low limit threshold setting. Free Cooling can also be restricted to a set date range thereby only allowing the function to operate during a pre-defined period such as the summer months.

Fan assistance and manual control are not available during the un-occupied free cooling mode.

## Time Control

The occupancy times can be transmitted to the controllers by the BMS or if required the CCM-204-NV can be programmed via its own internal calendar time scheduler. In a Group Master/Slave setup the group occupancy can be transmitted from the designated CCM-204-NV Master.

## Global Temperature Setpoint

### GSP Type

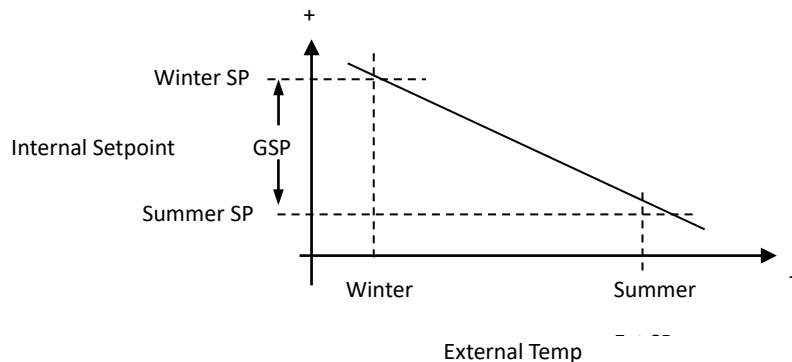
Ext Temp/Date/Fixed

The Global Temperature Setpoint (GSP) can be derived for a seasonal range (date), external temperature and temperature compensated (Ext Temp) or Fixed. The GSP is used for the base setting of the zone control point which can be adjusted between min/max values.

If a Fixed setpoint is selected, then this is set at setup or over the network and this value will become the controller's fixed default value.

If Date is selected then the GSP value is set for the seasonal dates that are entered into the controller setup.

If externally compensated, then a continuous temperature compensated adjustment of the GSP is exerted within the controller using the internal Winter and Summer SP with the Winter and Summer Ext SP. (see fig below). The value of the external temperature can be derived from a sensor input or via the network.



The following settings need to be entered if externally compensated adjustment is used for the GSP

#### Winter SP

The maximum internal temperature setpoint to be used during winter conditions.

Range: 0 – 30°C

#### Summer SP

The minimum internal temperature setpoint to be used during winter conditions.

Range: 0 – 30°C

**Win Ext SP**

The external temperature that corresponds to the maximum winter control setpoint when using external temperature compensation to define the global setpoint.

**Range: 0 – 30°C**

**Sum Ext SP**

The external temperature that corresponds to the minimum summer control setpoint when using external temperature compensation to define global setpoint.

**Range: 0 – 30°C**

**Mid-season SP**

The temperature setpoint to be used during mid-season (only required when "DATE" GSP is selected).

**Range: 0 – 30°C**

**Winter Start**

The date on which the winter setpoint becomes active when using the 'Date' defined global setpoint. (only required when "DATE" GSP is selected)

**Spring Start**

The date on which the mid-season setpoint becomes active when using the date defined global setpoint (only required when "DATE" GSP is selected)

**Summer Start**

The date on which the summer setpoint becomes active when using the date defined global setpoint (only required when "DATE" GSP is selected)

**Autumn Start**

The date on which the mid-season setpoint becomes active when using the date defined global setpoint (only required when "DATE" GSP is selected)

**Global Control Settings:**

<b>Rain Vent Position</b>	If rain is detected by the controller then automatic control is inhibited and the ventilation dampers are driven to the minimum % setting (ZN Min % if set) until the rain detection is cleared.
<b>Rain Delay Close</b>	This defines the delay between the rain detection signal being present and any action being taken.
<b>Rain Delay Open</b>	There is a fixed delay of 10 seconds between the rain detection signal being cleared and the commencement of normal operation.
<b>CO2 Setpoint</b>	Defines the point at which the CO2 value begins to open the ventilation using its own Proportional control function and this setting is common to the 3 controlled zones. <b>Range: 0 – 2000ppm</b>
<b>Int Time</b>	This defines the integral time for the all PI control loops and a value of zero disables the integral control action. <b>Range: 0 – 5 minutes</b>
<b>Ext LL Position</b>	Defines whether the vents should be fully closed or set to Min% when the external temperature falls below the low limit setting. If disabled then the natural ventilation temperature control is not inhibited or reset by low external temperature conditions. <b>Range: Min%/Closed/Disabled</b>
<b>Ext LL Thres.</b>	Defines the external low limit threshold below which the ventilation dampers will be closed. <b>Range: 0 – 30°C</b>
<b>Int LL CO2</b>	Defines whether an internal low limit temperature will inhibit CO2 ventilation control. <b>Range: Enabled/Disabled</b>
<b>Int LL Man</b>	Defines whether an internal low limit temperature will inhibit CO2 control or manual open override from the ACO room unit <b>Range: Enabled/Disabled</b>

<b>Int LL Thres</b>	The internal low limit temperature value that will inhibit the activation of the CO2 control and manual override from the ACO. The use of the inhibit action on both conditions can be individually selected. <b>Range: 0 – 30°C</b>
<b>Heat Position</b>	The ventilation position will automatically go to the closed or minimum % setting if Heat On is detected.
<b>CO2</b>	Defines whether CO2 control is required. If Ctrl is selected then the output control is based on the greater of the temperature or CO2 values also if selected the CO2 values are displayed on the RDU <b>Range: No Ctrl/Ctrl</b>
<b>Free Cool</b>	This selects whether the Free Cooling action in the unoccupied periods is allowed. Free cooling will also be inhibited for 24 hours following a heat on period. This is to conserve energy input. <b>Range: Enable / Disable</b>
<b>Free Cool Dates</b>	This allows Free Cooling to take place during a specific date range. The setting of the start and stop dates need to be defined. For example: <ul style="list-style-type: none"> <li>• Free Cool Start Date: - 01/05</li> <li>• Free Cool Stop Date: - 01/09</li> </ul>
<b>Free Cool Low vent</b>	Defines whether the Free Cooling action in the unoccupied periods is allowed on the low vent within a cross flow application for security reasons. <b>Range: Enable / Disable</b>
<b>Free Cool Max%</b>	Restricts the vents opening to a pre-selected maximum percentage during the free cool periods.
<b>Free Cool Int</b>	The internal temperature limit above which the action of Free Cooling in the un-occupied period will be activated. <b>Range: 0 – 30°C</b>
<b>Free Cool Ext Temp</b>	Free cooling in the unoccupied periods is active when the external temperature rises above 12°C.
<b>Manual Close control</b>	The ventilation position will fully close when the Manual Closed button on the ACO is pressed. The manual closed position is subject to a timer within the ACO which is adjustable 30 to 180mins after which automatic control will be restored.
<b>Occ Override Time</b>	Allows occupancy extension outside normal hours of operation. The controller will automatically time out and reset to the desired operation after the elapse of override time setting. <b>Range: 0 – 8 hours</b>
<b>Fire control action</b>	Defines whether to Close or Open the vent on the detection of a Fire. <b>Range: Open / Close</b>

## ZONAL APPLICATION SETTINGS

<b>Zn RSP Range</b>	This is the + and - adjustment of offset of the zone GSP allowed by the BMS or RDU/FPT <b>Range: 0 – 5°C</b>
<b>Zn Temp PB</b>	Defines the proportional band for the temperature control. <b>Range: 1 – 5°C</b>
<b>Zn CO2 PB</b>	This defines the proportional band for the CO2 control. <b>Range: 100 – 1000ppm</b>
<b>Zn Min%</b>	This defines the value for the minimum fresh air position during the occupied periods of temperature and CO2 control. Used to position the vent if Heat override is activated. <b>Range: 0-100%</b>
<b>Zn Heat Vmax %</b>	If the Heating Override input is used, this defines the ventilation maximum position for CO2 ventilation control during a heating cycle. If CO2 ventilation is not required when the background heating is ON then set this value to 0%. <b>Range: 0-100%</b>

## ZONAL APPLICATION SETTINGS (CROSS FLOW APPLICATIONS)

<b>Zn High Vent V out</b>	Selects the range of the control output for the high vent. <b>Range: 0-10V / 2-10V</b>
<b>Zn Low Vent V out</b>	Selects the range of the control output for the low vent. <b>Range: 0-10V / 2-10V</b>

## ZONAL APPLICATION NOTES AND SETTINGS FOR FAN BOOST APPLICATIONS:

<b>Zn Fan Dead Band (Db)</b>	There is fixed deadband (Db) between the 100% vent position and the start of the fan. This Db is equal to 10% of the temperature Pb setting or the CO2 Pb setting. Control of the fan is dictated by the greater of the two measurements.
<b>Zn Fan Pb</b>	The control value of the fan proportional band is established from the Temp and CO2 Pb settings. The controller automatically adopts these setting for the fan control and uses which ever condition is the greatest.
<b>Zn Fan Min Output</b>	If fan control is required under the controlled conditions, the output will initially go to 2V for a period of 10 seconds to ensure the fan rotation is established. After this start up time, the output will revert to the automatic control value with the minimum voltage output being fixed at 1.5V.
<b>Zn Fan Max</b>	This is the maximum voltage output required to control the fan. <b>Range: 0 – 10V</b>

## CONTROLLER PHYSICAL IO

<b>4 x Analogue Inputs</b>	Used for the CO2 sensors and ACO manual override units for each of the two zones.
<b>3 x Digital Inputs</b>	Used for Heat Interlock, Rain Detection, Fire Shut down
<b>4 x Temperature Sensors</b>	Used for measurement of the controlled zones and the external temperature condition.
<b>4 x 0-10V Analogue Outputs</b>	Configured to provide the following control options depending on if the controller is set up for a cross flow or fan boost application:  <b>Cross Flow:</b> Zone 1 low ventilation control Zone 2 low ventilation control Zone 1 high ventilation control Zone 2 low ventilation control  <b>Fan Boost:</b> Ventilation control zone 1 Ventilation control zone 2 Fan control zone 1 Fan control zone 2
<b>Triac 24VAC Outputs</b>	Digital 24V AC outputs are not allocated in the standard Natural ventilation control.
<b>Relay Outputs</b>	Relay outputs are not allocated in the standard Natural ventilation control.

## CONTROLLER TERMINAL LAYOUT

