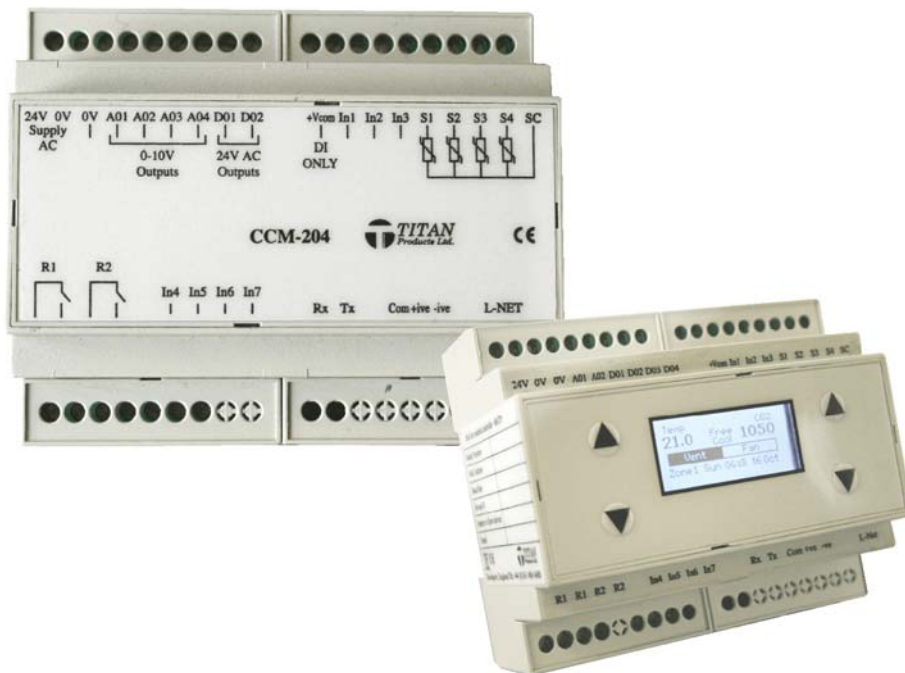


CCM-204 NATURAL VENTILATION CONTROLLER



BACnet Enabled



Description

The CCM204-NV is designed to provide complete control for Natural Ventilation applications . The controller incorporates all the inputs and outputs to ensure that this advanced applications specific controller meets all the demands for energy efficient and flexible temperature control. The controller can be used stand-alone, in a Master/Slave group or part of a BMS system via the standard inbuilt Native BACnet MS/TP communications. The controllers are available with or without an inbuilt display. Alternatively a remote digital room unit (RDU-4) is also available to allow occupants to set individual comfort conditions.

Features

- 24V AC supply
- Native BACnet communications
- Master/Slave grouping (shared information)
- 0-10V outputs up to 4 dependant on configuration
- 2 x 24V AC Triac outputs dependant on configuration
- 7 x 0-10V Analogue inputs or use as Digital Inputs
- 2 x VF relays for plant control
- 4 x 10K3 temperature sensor inputs
- Remote setpoint display option
- In built calendar time clock
- Din Rail Mounting

Specification

Supply	24VAC
Power consumption	3 VA (no RDU) plus outputs 8 VA with RDU display
Triac outputs	350mA max
0-10V outputs	5mA max
Temperature Sensors	10K3A1
Analogue Inputs	0-10V
Digital Inputs	Voltfree
Relay outputs	Volt Free 240V 5 amp max.
Communications	Native BACnet
Network	MS/TP -RS485
Indication	Tx/Rx comm.'s
Time Clock battery support	approx 1700 hrs
Enclosure	Din Mounting (IP20) L94-VO
Size	106 mm wide 92 mm high 62 mm deep

Display Setting Option

The CCM-204 can be used with a remote room display unit the RDU-4 which allows user selection of temperatures and occupancy override. The RDU-4 also allows (through engineers past code) access to amend the controller default settings. For controllers not fitted with an RDU-4 then the plug in FPT601 Field Programming Tool can be used for programming purposes. In addition all the settings can be modified over the BACnet communications interface.

Part Codes

CCM-204-NV	4 x 0-10V outputs and 2 x 24V Triac Outputs
CCM-204-NV/D	4 x 0-10V outputs and 2 x 24V Triac Outputs with inbuilt display
RDU-4/STD	Standard RDU

Control Settings

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. The inbuilt display or the RDU user interface provides the ability to adjust zone temperature Setpoints and to select timed occupancy extension as and when required.

All other setting are access code restricted and can be modified using the inbuilt display or RDU unit or via the BMS using the inbuilt BACnet communications. In addition the TITAN FPT601 hand held field programming tool can be used to upload new control configurations.

Controller Settings & Options

Description

Network	Native BACnet or Stand-alone
Unit address	Sets the controller unit MAC address on MS/TP bus. Range 1 to 127
Baud Rate	Communication baud rate Range Options: - 9,600 19,200 38,400 or 76,800
Dev Object ID	Allows the setting of the device object ID. Range 0 to 4194302
Group Control	Allows individual controllers to be set-up as a Group Master or Group Slave . This sets groups of controllers to take control information and instructions such as temperatures, setpoint and occupancy, 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

Overall Control Strategy

The controller provides PI control for 2 zones of natural ventilation using the 0 to 10V or 2 to 10V outputs for automatic positional control of ventilation dampers dependant on the associated room temperature and/or CO2 conditions. Where greater than 100% natural ventilation is required fan assistance can be provided via an additional 0-10V output to operate a variable speed EC fan.

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 setpoint. The controlled output is dictated by the greater of the two control regimes.

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 (see temperature setpoint).

For Fan assisted units the fan speed will be controlled by an additional PI control loop. 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 fan will start at a "Minimum Speed" setting and the controller action will modulate the fan speed to match the increased ventilation demand.

Temperature Setpoint

Dependant on the controller set up the Temperature Setpoint which is common to both zones can be derived from :-

A **Date** range with specific seasonal temperature settings

A temperature **Compensated Setpoint** varying with the prevailing external temperature conditions

A **Fixed Setpoint** which is a permanent fixed value which is applied to the controller GSP at setup.

The Global Setpoint (GSP) is allocated to both controlled zones and this can be adjusted for the individual Zone via the user display within a predefined limited range. The Reset Setpoint (RSP) setting which takes the GSP value as the base setting will become the zone default value when the controller is switched On/Off.

Global Inputs

External 10K3A1 Thermister

The external temperature sensor 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 (See Temperature Setpoint).

Heating Control Interlock

A volt-free digital input (In1D) is used to detect when the building heating system is switched on. During Heat On periods, the vents will be reset to the min% control setting for the zone and "Heat Closed" will be indicated on the display.

To conserve energy input, following a period of heat on, free cooling in the unoccupied periods will be automatically inhibited for 24 hours .

There is an option to enable CO2 ventilation control during the heating phase. A separate venting min and max can be set for CO2 control during the Heat On periods.

Rain Detector

This signal will come from the TITAN rain detector module providing a volt-free digital input (InD2). When rain is detected, the ventilation will be reduced to the min% setting or fully closed. There is a delay setting for the response to closing and opening of the vents if required.

During the rain detector mode manual override open from the ACO room user interface will be inhibited and the display will indicate "Rain Closed".

Fire Interlock

A volt-free digital input (InD3) is used for a fire signal. When this signal is detected the dampers will be set to the fully closed position and the display will indicate "Fire Closed".

Zone Inputs

Zone Temperature

The standard input is one 10K3 Thermister per zone used for the temperature control sensor. If averaging is required, this can be achieved with field wiring.

CO2 0-10V Input

A CO2 sensor is provided per zone as an additional control regime for ventilation. These sensors will provide a linear 0-10V signal across a range of 0-2000ppm.

ACO Manual Control

Each zone operates with a TITAN ACO unit which incorporates an inbuilt timer. This provides a 0-10V signal for Auto (1.5V – 8.5V), Close override (<1V) and Open override (>9V). (see Manual Control)

Control Overrides

In addition to the **Heat, Rain and Fire** override inputs there are a number of control override signals within the Natural Ventilation control configuration and these are:

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

A TITAN ACO room unit is used to provide manual selection of Auto/Close/Open control. Under Auto the ventilation is controlled on temperature and/or CO2 levels. If manual Open is selected, the ventilation is opened to 100%. If manual close is selected, then the ventilation will be fully closed. Both selections are indicated on the controller/RDU display.

The ACO Closed and Open override functions operate for a field adjustable time period from 30min to 3 hours after which the controller is reset to Auto. The ACO Open and Closed signals are ignored when the controller is in the Off condition

Unoccupied (Time Extension)

Occupancy is dictated by the scheduling (see time control). During unoccupied periods the RDU button “Ext” may be pressed to extend the occupancy control by a preset amount. An additional press of the “Ext” button will cancel the extension. During the time extension override period the display indicates the remaining time to run for occupancy extension

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 controller incorporates a time clock control allowing time programming for the occupancy period/s with a weekly 7 day selection, exceptions and holiday scheduling.

Each week day can be programmed to provide 3 x On (Occupancy start) and 3 x Off (Occupancy end) times.

The time programmer allows the day entries (time profiles) to be copied from one day to another.

DST: - No/Yes

The time clock includes an option for Winter (GMT) and the Daylight Saving Time (DST).

The selection defines whether Daylight Saving Time is in operation. Changing this setting adds or subtracts 1 hour from the current time.

Yes = + 1hour to the controller time setting (GMT) which sets the time clock to daylight saving (DST).

No = The standard time setting (GMT) winter time is displayed and used.

Time Update: - Manual/System This defines whether the date and time will be updated via BACnet BMS or if manual adjustment is required.

Time Program Exceptions The controller time clock can be programmed for Exceptions to the normal week/day events. The maximum number of Exception entries is 10 of which the Cal-Off (Hol) is one entry and the Cal-On is one entry. To maximise the programmable Exceptions it is important that where possible all Holidays and Repeatable events are entered in the Calendar Program Exceptions.

Calendar Exceptions

Cal-Off:- The Off (holiday) Schedule is a Calendar Exception and will allow a maximum of 20 annual entries to be programmed up to a year in advance and these events can be:-
A specific Date or a Date Range where a date range is one entry.

Cal-On:- This allows up to 20 On (occupied) events to be programmed in advance and these Exceptions are for repeatable events on specific dates that have the same time profile.

Exceptions An Exception timed event or profile can be entered for:-
-A specific Date
-A Date range where the event or time profile is repeated throughout the date range period
-A Day in a Week where the event is repeated for example each month on the same day.

Setup (Engineer’s settings)

The CCM controller provides a group of global control options and a number of zone control settings for each zone. All the settings are done through the Display, RDU or FPT601 Field Programming Tool. Each setting is displayed in various menus and the setting are as follows:-

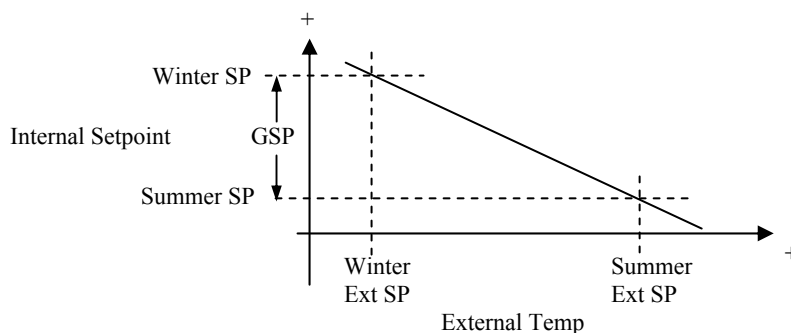
Global Temperature Setpoint

GSP Type:- (Ext Temp/Date/Fixed) The Global Temperature Setpoint (GSP) can be derived from a date (seasonal), external temperature (compensated) or Fixed. The GSP is used for the base setting of the zone control point which can be adjusted between min/max values on the RDU for the individual Zones.

If **Fixed** GSP is selected then all the seasonal settings are removed from the setup display and replaced by one fixed GSP temperature setting.

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

If **Ext Temp** is selected then a continuous temperature compensated adjustment of the GSP is exerted on the controller using the internal Winter and Summer SP with the Winter and Summer Ext SP. (see fig below)



The following settings need to be entered if Date or External Temperature adjustment is used for the GSP.

Winter SP:- 0 – 30°C (default 22°C) The maximum internal temperature setpoint to be used during winter conditions.

Mid Season SP:- 0 – 30°C (default 19°C) The temperature setpoint to be used during mid-season. (Only required when “DATE” GSP is selected)

Summer SP:- 0 – 30°C (default 16°C)	The minimum temperature setpoint to be used during summer conditions.
Win Ext SP:- 0 – 30°C (default 12°C)	The external temperature that corresponds to the maximum winter control setpoint when using external temperature compensation to define the global setpoint.
Sum Ext SP:- 0 – 30°C (default 16°C)	The external temperature that corresponds to the minimum summer control setpoint when using external temperature compensation to define global setpoint.
Winter Start (date for seasonal GSP change)	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 (date for seasonal GSP change)	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 (date for seasonal GSP change)	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 (date for seasonal GSP change)	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 Settings and Control Strategies

Rain Delay Close :- (adjustable with a default 5 secs)	This defines the delay between the rain detection signal being present and any action being taken.
Rain Delay Open :-	There is a fixed delay of 10 seconds between the rain detection signal being cleared and the commencement of normal operation.
Rain Vent Position :- Closed/Min% (default Closed)	If rain is detected then automatic control is inhibited and the ventilation dampers are driven to the closed position or the minimum % setting (ZN Min %) until the rain detection is cleared.
CO2 Setpoint :- 0-2000ppm (default 800ppm)	The CO2 sensor gives 0-10V output for a range of 0 to 2000ppm. This setting defines the point at which the CO2 sensor begins to modulate the ventilation to open using its own PI control function.
Int Time :- 0-5min (default 2min)	This defines the integral time for the all PI control loops and a value of zero disables the integral control action.
Ext LL Position :- Min%/Closed/Disabled (default Closed)	This defines whether the vents should close fully or set to Min% when the external temperature falls below the low limit setting. If disabled is selected, the natural ventilation temperature control is not inhibited or reset by low external temperature conditions.
Ext LL Thres :- 0 – 30°C (default 10°C)	This defines the external low limit threshold below which the ventilation dampers will be closed.
Int LL CO2 :- Enabled/Disabled (default Enabled)	This defines whether an internal low limit temperature will inhibit CO2 ventilation control.
Int LL Man :- Enabled/Disabled (default Enabled)	This defines whether an internal low limit temperature will inhibit manual open override from the ACO room unit.
Int LL Thres :- 0 – 30°C (Default 16°C)	This is 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 at the time of commissioning.
Heat Position :-	The ventilation position will automatically go to the minimum % setting if Heat On is detected.
CO2 :- No Ctrl/Ctrl (default Ctrl)	This defines whether CO2 control is required. If Ctrl is selected then ventilation control is based on the greater of the temperature or CO2 values also if selected the CO2 values are displayed
Free Cool :- Enabled/Disabled (default Enabled)	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.

Free Cool Dates:- Enabled/Disabled (default Enabled)	This allows Free Cooling to take place during a specific date range. The setting of the start and stop dates needs to be defined for example: Free Cool Start Date: - 01/05 Free Cool Stop Date: - 01/09
Free Cool Int :- 0– 30°C (default 16°C)	This is the internal temperature limit above which the action of Free Cooling in the un- occupied period will be activated.
Free Cool Ext Temp	Free cooling in the unoccupied periods is active when the external temperature rises above 12°C
Man Closed Position :-	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.
Occ OR Time :- 0 – 8 hours (default 1hour)	This allows occupancy extension outside normal hours of operation from the RDU.

Zone Settings and Control Strategies (available for each zone)

Zn RSP Range :- 0 – 5°C (default 3°C)	This is the + and - adjustment allowed by the RDU zone setpoint from the base or calculated (GSP) global temperature setpoint.
Zn Temp Pb :- 1 – 5°C (default 4°C)	This defines the proportional band for the temperature PI control loop.
Zn CO2 PB :- 50 – 1000ppm (default 400ppm)	This defines the proportional band for the CO2 PI control.
Zn Fan Dead Band (Db) :-	There is a 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.
Zn Fan Pb :-	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.
Zn Fan Min Output :-	If the fan is required under the controlled conditions then the output will initially go to 2V for a period of 10seconds 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.
Zn Fan Max :- 0-10V (default 10V)	This is the maximum voltage output required to control the fan.
Zn Min% :- 0 – 10V (default 10%)	This defines the value for the minimum fresh air position during the occupied periods of Temperature and CO2 control. Also this setting is used to position the vent if Heat override is activated.
Zn Heat Vmax % :- (default 50%)	If the Heating Override input is used, this setting 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%

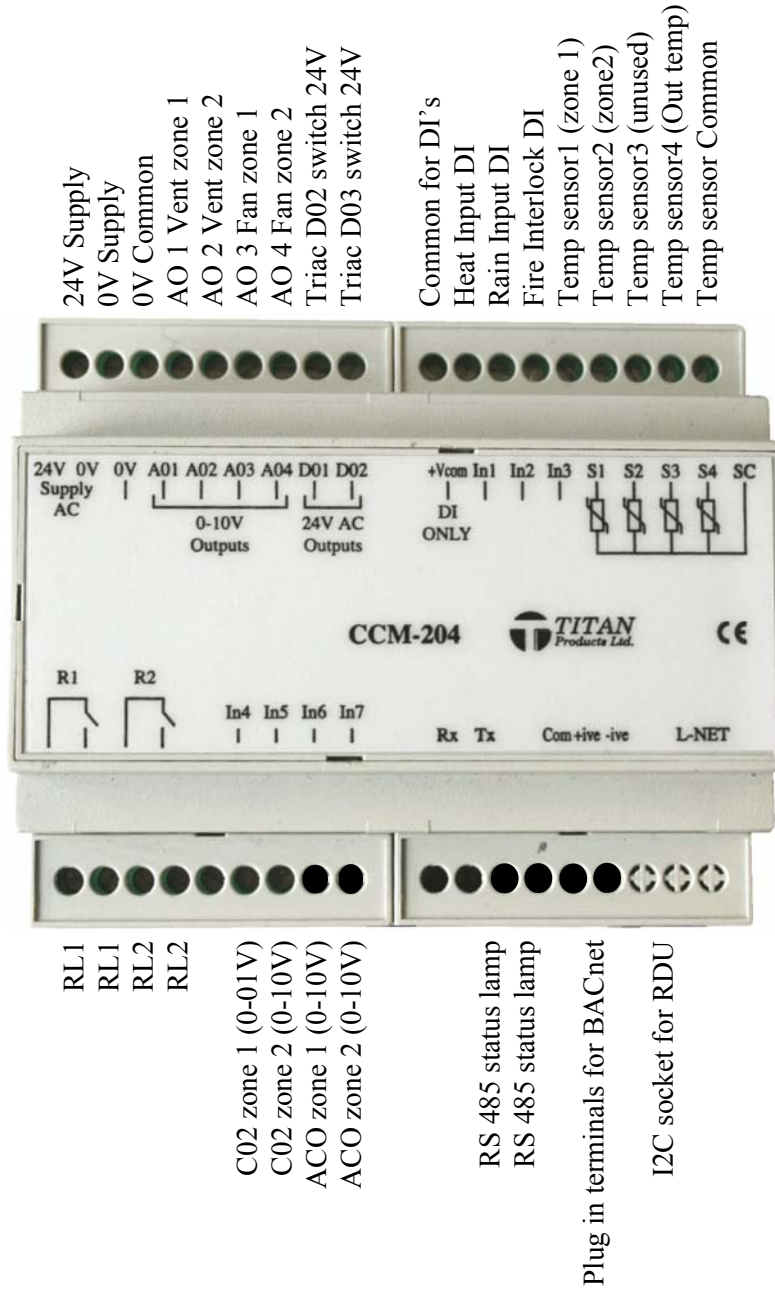
Controller Display & Options

Temp Units :-	All temperature values are shown in degrees C
Disp CO2 :-	The CO2 value will be displayed in PPM if CO2 Control is selected (Ctrl) in the Global Settings.
Maintenance. Passcode (customer entry)	The 4 digit Passcode required to enter the controller at the low level maintenance menu and allows setting of the Time Schedules.
Set Up Passcode (customer entry)	The Passcode required to enter the high level Set Up menu.

Physical IO

4 x Analogue Inputs	Used for the CO2 sensors and ACO manual override units for each of the two zones.
3 x Digital Inputs	The voltfree Digital Inputs are used for Heat Interlock, Rain Detection, Fire Shut down
4 x Temperature Sensors	Used for measurement of the controlled zones and the external temperature condition.
4 x 0-10V Analogue Outputs	Outputs are configured to provide the following control options: - Ventilation Control Zone 1 Ventilation Control Zone 2 Fan Control Zone 1 Fan Control Zone 2
Triac 24Vac Outputs	Digital 24V AC outputs are not allocated in the standard Natural ventilation control

Connections



Remote Display Unit

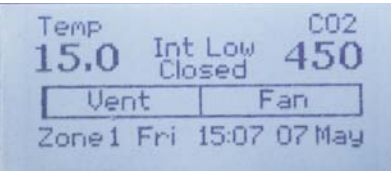
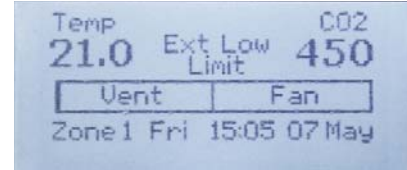
The RDU or inbuilt controller display provides user information and engineer setting via the use of the graphics display and touch sensitive keys. The display options are shown below:



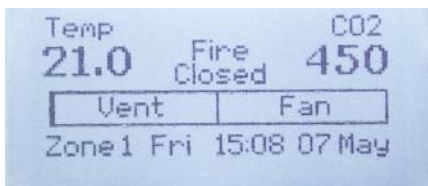
Room Display Unit - RDU



CCM-204-NV/D with inbuilt display



Override Displays – Fire/Rain/Heat



Ancillary Products

The CCM-204 Natural Ventilation Controller can be used with a number of products from Titan Products to create a fully BACnet enabled Multiple Zone Natural Ventilation System.

RDU User Interface Unit

The RDU User Interface Unit allows occupants to increase temperature and switch between zones. The RDU is available in a number of decorative finishes. For more details contact the sales team or visit www.titanproducts.com.



ACO Window Positioning Unit

The ACO Room Ventilation Positioning Unit allows occupants to select OPEN/CLOSED during the NORMAL/AUTO operational mode. The override selections will time out after a preset period and return the controller to normal operation.



IO/AD3/W Window Actuator positioning module

The IO/AD3/W module converts the 0-10V control signals to 24VDC relay control. The module provides time proportional control for reverse operational DC damper actuators. The module also incorporates software to ensure synchronisation of the damper position with the control signal. For more information see data sheet C-024 on www.titanproducts.com.



TITAN Room CO2 Temperature Sensor

Titan Products range of CO2 sensors provide 0-10V signals for a range of 0-2000ppm and incorporate a temp output for a range of 0-50°C. See datasheet S-033 on www.titanproducts.com.



TITAN Room Temperature Sensor

The compatible room temp sensor for the CCM-204 is a 10K3A1 thermistor. The TITAN product code for this is TPTRS.

TITAN room temperature sensors can be supplied in a variety of finishes and with sensing elements for other applications. For more details please see data sheet S-001 at www.titanproducts.com.



TITAN Rain Detector

The TPRD1 is specifically designed to detect the presence of rain. The TPRD1 incorporates a heater to evaporate any residual moisture after a rain fall which speeds up the dry detection rate. For more information please download the datasheet form www.titanproducts.com.





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