Jetvent Digital EC System

Installation,

Commissioning &

Maintenance Guide



JETVENT Impulse Ventilation for Car Parks

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Introduction

Congratulations on purchasing the Fantech Jetvent Car Park Ventilation system. This document is a guide on how to install commission and maintain your Fantech Digital EC Jetvent system.

The Jetvent Car Park Ventilation System monitors Carbon Monoxide (CO) and Nitrogen oxides (NOx) levels in a carpark and regulates the operating speed of the Jetvent Fans, main supply and exhaust fans in proportion to the level of pollution detected. There are five components to this system; The Jetvent Zone Controller, Supply air fan, Exhaust air fan, Jetvent Fans (air movers) and air quality sensors.

This document describes the installation and commissioning of the Jetvent System in 'Digital EC' Mode. This configuration is the most advanced solution available today and features digital communication between fans and controllers, and indirect connection of the air quality sensors to the main controller.

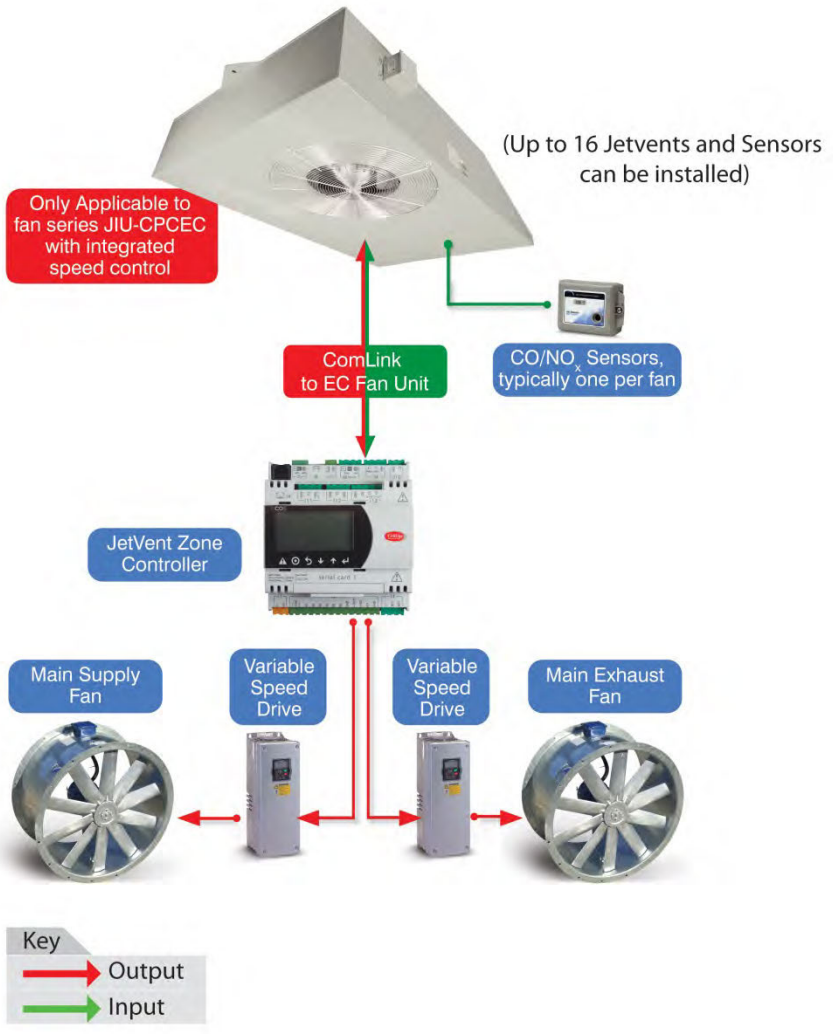


Figure 1: Jetvent 'Digital EC' Layout with ComLink Functionality

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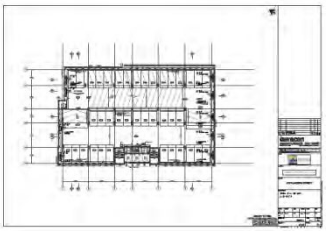
Installation & Commissioning Overview

The instructions for the Jetvent System Installation are split into three main sections around the steps required to install the system:

1. Physical Installation of Fans, sensors and Controller
2. Electrical and Signal Connections for fans and controller
3. Controller commissioning and system testing

Item Checklist

Before proceeding, the following items are required to complete the installation:



Site Mechanical Drawings Indicating Jet Fan placements



Jet Fans consignment for the project / area worked on



Jet Fan Zone Controller Kits containing controller, PSU and required accessories

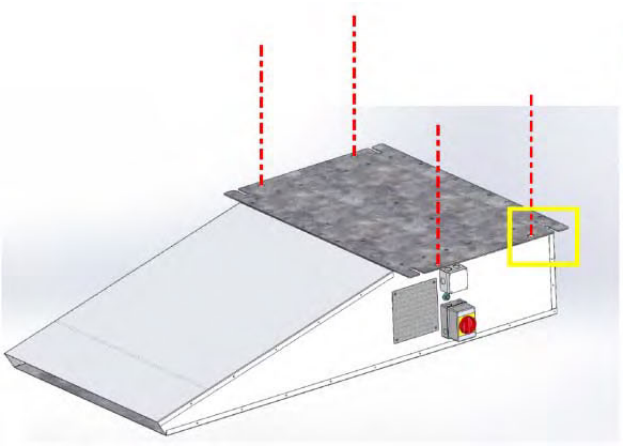


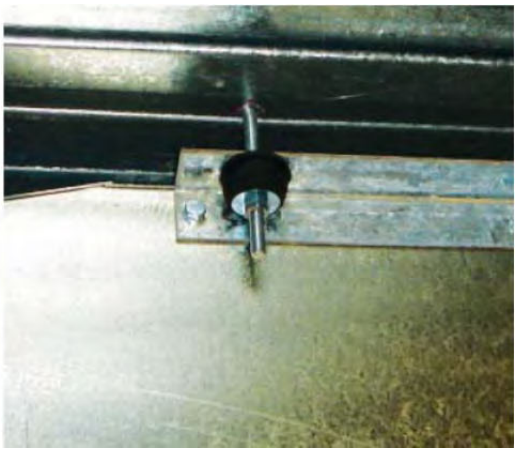
Adequete tools for mechanically installing the Jet Fans and electrically connecting/disconnecting the units

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Installing the Jet Fans

The Jetvent Fans, Supply Fan and Exhaust Fan are to be installed as per the site map and approved CFD testing. Jet Fans have to be attached to the ceiling structure of the carpark with hardware appropriate to the size and weight of the units (Typically 8mm fasteners).

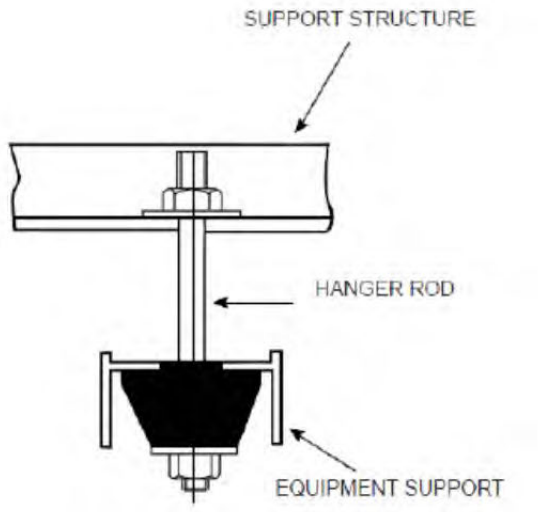


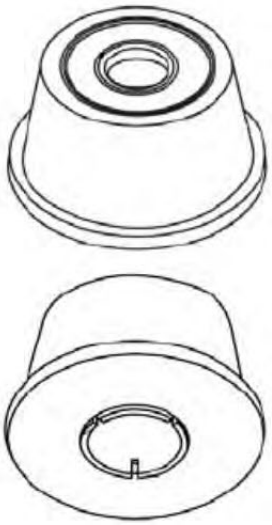


Mounting Points are illustrated in Red. Two sets of holes are provided on the unit, one is a 25mm Hole to support the fan with anti-vibration mounts (close up of yellow box Illustrated on the right), and the second is a slot to be used for mounting directly via hanger rods or bolts. For anti-vibration mounts, the following parts are required:

Front Mounting Points: 2 x Embelton RHE1-Green

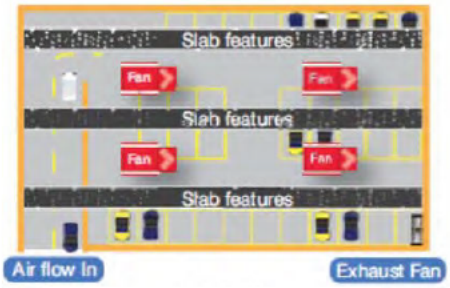
Rear Mounting Points: 2 x Embelton RHE1-Blue



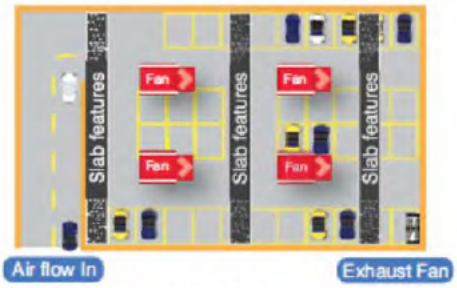


Jet Fan Installation Do's and Don'ts:

The following are some scenarios that may be encountered in a fan installation



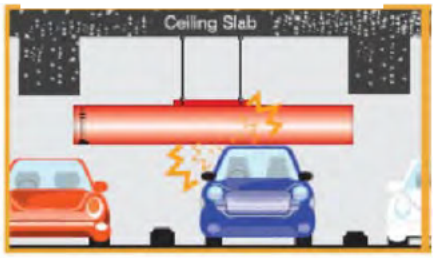
Fans discharge parallel to beams most effective



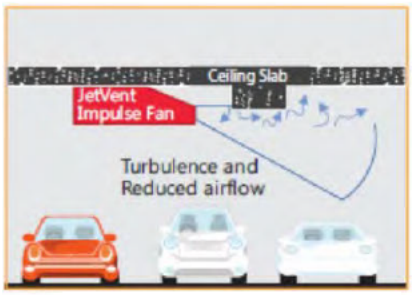
Fans discharge perpendicular to beams less effective



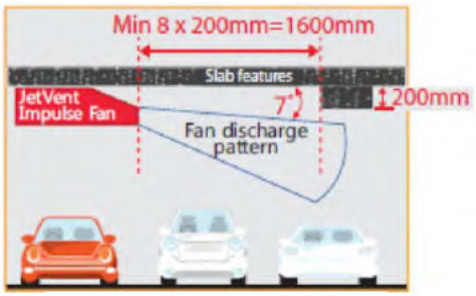
Sufficient Clearance



Insufficient clearance



Obstruction too close



Obstruction out of the way

Note: Proper site coordination between trades is necessary to avoid clashes between fans, pipe work, signage and other obstructions



Example of a Jetvent Fan Installed in a car park.

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Sensor Installation

The main purpose of any carpark ventilation system is to ensure that the levels of harmful pollutants from vehicles operating in a car park stay within safe levels. To achieve this while achieving energy efficient operation, the Fantech Jetvent system is configured to vary its speed proportionally against the concentration of these pollutants detected in the carpark (i.e. system hits high speed under the detection of high pollution levels)

To sense pollution levels, the Fantech Jetvent System uses CO sensors to detect pollution. Optionally, CO2 and NOx sensors may also be used, but this is not mandated by Building Codes and their referenced standards.



Typically, the sensors would be mounted 1.5m above floor level on the reverse (i.e. away from trafficable laneways) side of the columns in the carpark.

Controller Installation

Two controller kits are available to be purchased; Switch board kit and a Fan Mounted kit.

Switch Board Kit

The switch board kit consists of the intelligent controller, transformer and connectors. It is designed to be mounted on a DIN rail within a switch board located in the car park area.



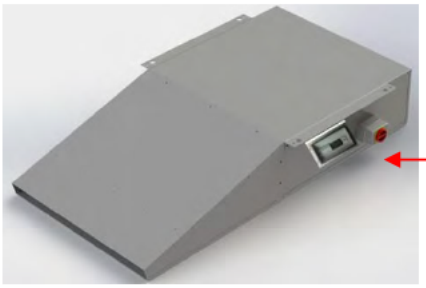




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Fan Mounted Kit

The fan mounted kit consists of the intelligent controller, transformer, connectors, and circuit breaker and comes wired into an IP65 box and mounted on the side of a Jetvent Fan.



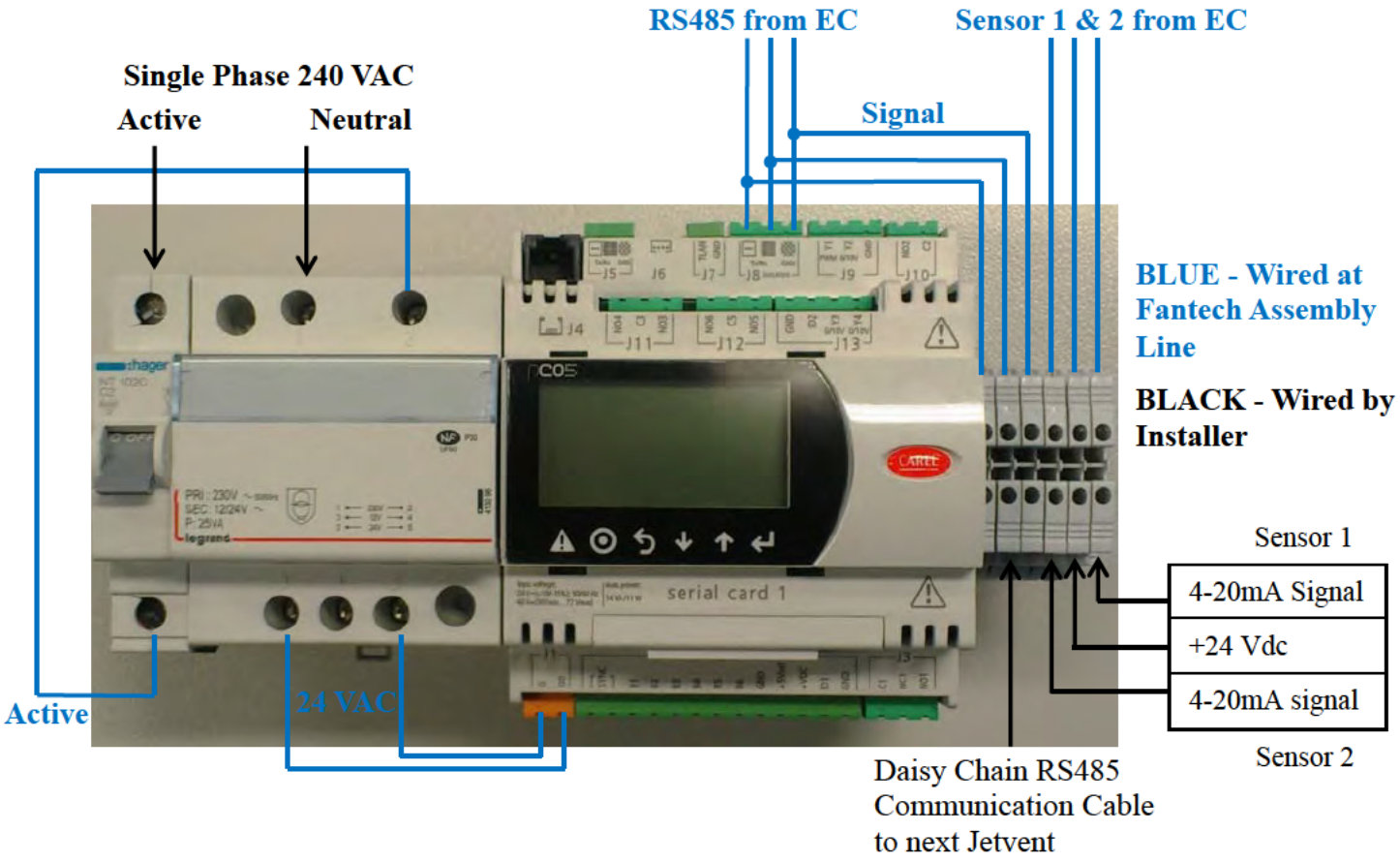
Control Box on the side of a Jetvent





Wall Mounted Control Box

The wiring from the factory is as shown below, please install the black wire only



Electrical Installation

There are a number of guidelines for the connection of the controllers and sensors in the Jetvent system as noted below. Please refer to Fantech wiring diagram W01.

Controller Configurations

There are three control configurations available when installing the EC Jetvent system:

Standalone Controller

The standalone control configuration is popular for small to medium car park installations. The Sensors are connected to the Jetvent fan and then the Jetvent fans are connected in daisy chain to the Jetvent Controller. The controller may be mounted on the first fan in the loop, or in the carpark switchboard.

All functions of the system are modified and programmed via keypad at the controller.

Controller to BMS

The Jetvent Controller may be connected to the BMS via BACnet over IP or MSTP. MODBUS over RS485. In this configuration, the carpark controller manages fan operation exactly as per the Standalone Configuration, but the BMS has the ability to monitor system operation, fan, controller and sensor statuses and adjust operating set points as necessary. Refer to Fantech guide INST-JTBACNET for further information on configuring the system for BMS monitoring.

Jetvent direct BMS

The Jetvent Fans can be connected directly to a BMS system that has MODbus connectivity. For instructions on how to control the fans via the BMS, refer to document INST-ECMODBUST1 or INST-ECMODBUST2 depending on whether you have a Type 1 or Type 2 EC Fan. Sensors for the system may be connected to the BMS by high-level interface or analogue means if analogue input modules are fitted to the BMS system.

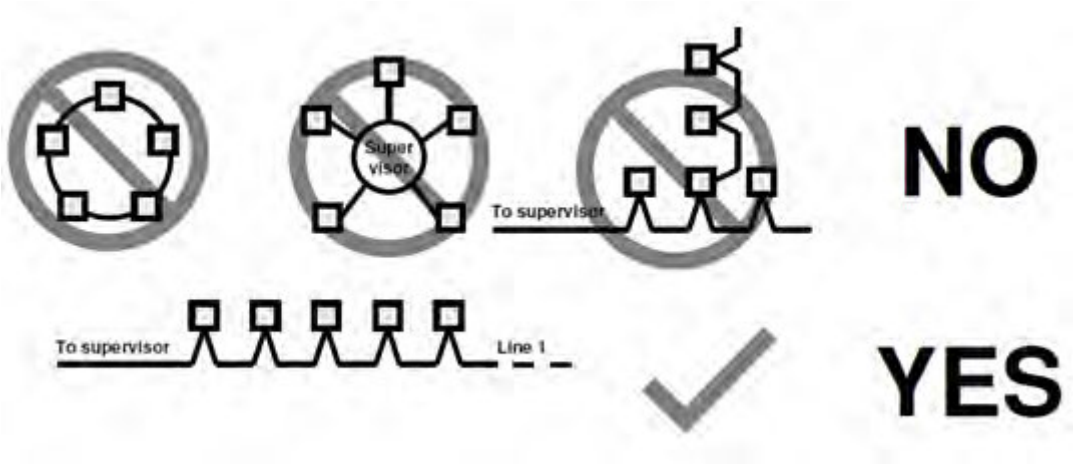
All control operations are made by the BMS in this installation.

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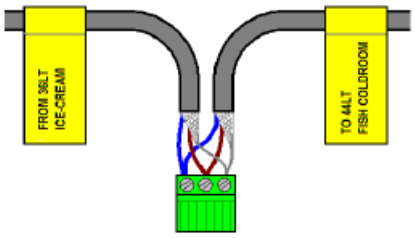
Controller Communications Wiring

The design of the communications line is an important part of the system design. This communication line allows the digital messages to be passed between the Jetvent controller and Jetvent fans. The communication line should be designed with the following details being considered;

- Maximum recommended communications wiring length is 1000m.
- The communications line must be connected in daisy chain to the various Jetvent Fans. It is recommended that the Jetvent controller is located at one end of the chain. No branches of the line or star connections are allowed, as shown below.

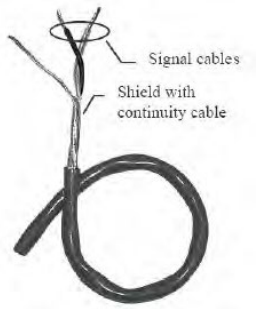


- Use separate conduits for power and communication cable.
- Keep communications cable away from devices that generate EMC interference, such as powered antennas, transformers, contactors and neon lights.
- It is good practice to mark, at every controller, the arriving and leaving cables with references to indicate where the wires run to for future maintanence and reference.



Communications Cable Type

To create a reliable RS485 communication line, use low capacitance (<100 pF/m)





twisted pair cable with shield and an impedance of around 120 ohms @ 100 kHz.

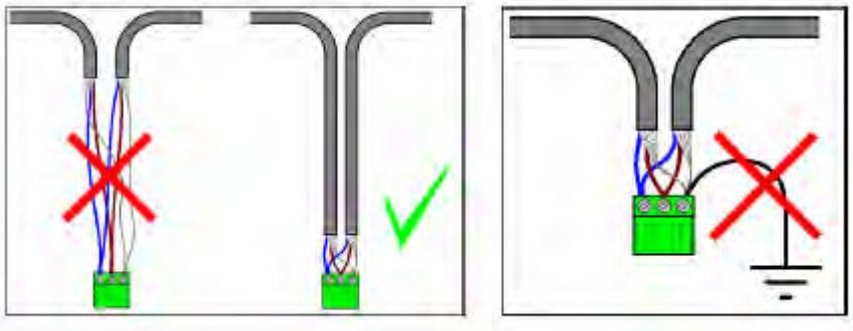
The cable used can be size AWG20 (diameter 0.4-0.8mm; cross section area 0.39-0.5mm^2) or AWG22 (diameter 0.55-0.65mm; cross section area 0.24-0.33mm^2).

BELDEN 8761 cable (AWG22) is recommended for lengths up to 500 metres, or BELDEN 8762 (AWG20) for lengths exceeding 500 metres. MAX DISTANCE ALLOWED 1000m.

Earth and Shield Connections

Please follow these connection requirements;

- The shield must always be connected to the dedicated terminal at both ends. At controller Plug J8, this is to the 'GNX' terminal. On the fan, connect to an available GND point.
- Avoid unsheathing the communications cable for an excessive length (>20cm)
- The shield must never be connected to an electrical power earth point



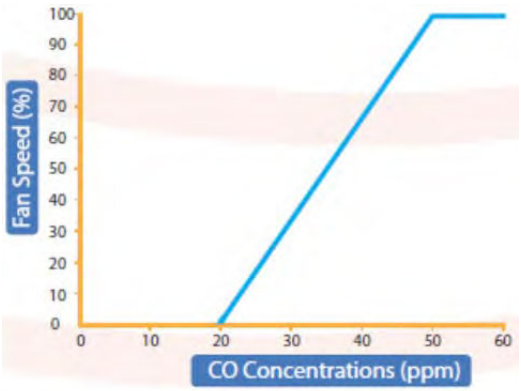
Termination

All communication cables must be terminated with 120 ohm ¼W resistors connected between "+" (A) and "-" (B) terminals, at the furthest extents of the line.

System Operation

Normal Operation

Under normal operating conditions, the Jetvent Controller monitors all sensor readings taken from the sensors in the system and picks the highest signal from among them. The system ramps the speed of the fans collectively from 0% speed to 100% speed between the low and high pollution level setpoints as shown in the figure next to this. Typically, the low and high setpoints are 20 and 50ppm of CO respectively.



To test the Jetvent system the following steps should be taken;

1. Access the Jetvent Zone Controller's display panel.
2. Place a source of CO gas (burning incense stick, CO test gas) at a particular sensor, and scrolling through the sensor value displays, verify the detected CO level is increasing as expected. An automobile may not be a reliable source of CO gas as modern automobiles that have warmed up and achieve catalyst light-off do not produce sufficient levels of CO to trigger the system.
3. Observe the system increasing in speed
4. Repeat for all sensors in the system

Refer to the 'Status Pages' Section for more information about the options that can be viewed in the display during normal operation.

Fire Mode Activation

The Fire Mode switch can be connected to the fire alarm system in the building. This can be tested by closing this signal line. When this occurs the Strobe indicator will flash, the siren will sound and all of the Jetvent fans will stop operating.

Full Speed Override

The full speed override functionality causes the controller to send a full speed signal to all fans on the system. This allows for easy system checks to see if all fans are receiving the appropriate signals, and also any system functionality that requires manual toggling of fans to full speed.

Alarm/Bell Mute Alarm

Once the Fire Mode Alarm is active the Alarm can be cancelled by pressing and holding down the Alarm button on the controller. The controller will then show the fault code listing, which can be paged thru using the up and down keys on the keypad.

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Controller Diagnostic Displays

There are several menu options available to monitor the Jetvent systems operation. The Up and Down keys can be used to toggle between display windows.

	Alarm	Clear Alarm
	Prog	Enter Program Mode
	Esc	Escape
	Down	Decrement menu or number
	Up	Increment menu or number
	Enter	Enter selection

Each display is described below;

Menu	Description
Status Menu	Main status menu; System OK and Software version number Jet Fan Spd: Percentage - Jetvents fan speed CPEF Spd: Percentage - the exhaust fan speed CPSF Spd: Percentage - the supply fan speed
Analogue Fan	Analogue-Two Speed Fans relay switching status Fan Low Relay: ON/ OFF Fan High Relay: ON/OFF Fan Medium Relay: ON/OFF
Strobe Relay/ Siren Relay	Strobe and Siren relay switching status Strobe Relay: OFF Siren Relay: OFF
Analogue Out	Analogue Output signal status
Pollution Calculation	Internal pollution index calculations, weighted Sensors Maximum, Minimum and Average readings Maximum: 200 Minimum: 100 Average: 150
Alarm/ Fire Trip	Digital outputs status; Full speed override and Fire Trip Alarm: OFF Fire Trip: OFF
EC Fans	Fan No X – one screen for every fan installed Sensor 1 Sensor 2 (if two sensors installed) Speed Input (rpm) Actual Speed (rpm) Maximal speed (rpm)

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Commissioning

This section covers initial setup options that have to be made at the controller before the system can be operated.

Setup from the factory

When a Jetvent system is ordered the fans and controllers would have undergone the following tests and steps at the factory:

- The controller communicates to all the fans and distinguishes between fans by means of a MODBUS address number of 1 to 247. The controller assumes the fans in the system are to be sequentially numbered 1 up to 16 (16 fans max per controller).
- The controller is set up for 0 (zero) fans and sensors. Fan quantity and sensors are set during commissioning
- The fans are sequentially addressed per order from 1 upwards to the total number of fans
- Fans are run up to full speed for full load current, vibration and direction of rotation checks

Initial Commissioning (Quick Start)

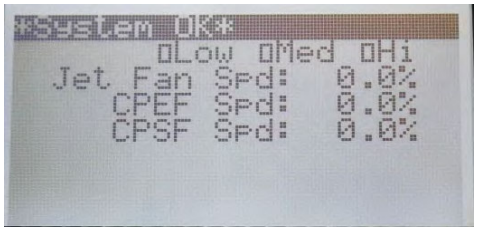
Before beginning on these steps, it is assumed the controller is installed correctly as per previous sections of the instructions and the wiring for the system is completed as per wiring diagram W301. To configure the controller and make the system run, the following steps need to be completed to configure the controller:

- Set the number of fans in the system
- Check / Set the address of the fans in the system
- Configure the sensors connected to each fan
- Confirm system operation

Steps to achieve these steps are as follows:

1. Power up controller.

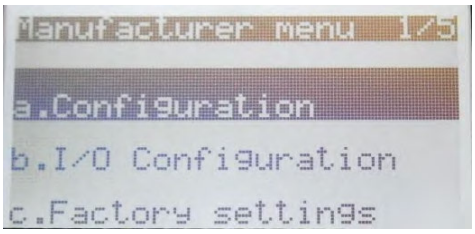
2. Check that the controller display reads *System OK* with no (0%) activity.

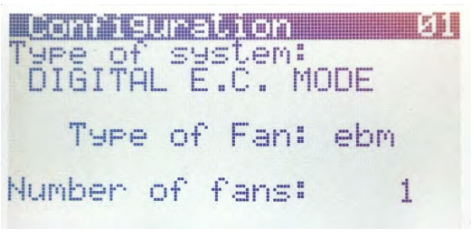


3. Enter the Main Menu -> H.Manufacturer menu, entering 1234 as the password (hit enter between digits)



4. Enter menu a.Configuration, in Screen 01 ensure system is set to “Digital E.C. Mode” and select the appropriate type of fan according to the fans on site and the number of fans wired in at step 3. Hit enter to travel between menu options.





5. Go back to the Manufacturer’s menu, and enter b. I/O Configuration.

6. Each fan has two sensor setup screens labelled Fx and Fx.2 where x is the Fan unit number. Select whether a sensor is connected to a particular fan as per details in step 4, and ensure sensor scale values match sensor specs.



7. Press back until the home screen is accessed and check that *System OK* is displayed and scrolling down to each individual sensor input, changing the level of pollutant at each sensor results in a change in the displayed pollution level.

8. If the system has a fault condition, error in operation or other problems, refer to subsequent sections for further setup instructions and troubleshooting.

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Advanced Setup Options

Changing Fan Address

Main Menu -> H.Manufacturer -> a. Configuration -> Pages F1-16

In the event the fans in the system are not addressed upwards from address 1, the fan address corresponding to Fans 1-16 in the system can be changed to any value between 1-247.

Changing Setpoints & Sensor Detection Scheme

Main Menu -> H.Manufacturer -> b. I/O Configuration -> Pages 05-07

In the event the system setpoints are to be set differently to the default between 5-50ppm of pollution, the low and high setpoints can be adjusted. Pages 05-07 refer to 'Analogue Output Channels' 1-3 which correspond to commanded Jetfan, Carpark Supply and Exhaust Fan speed values respectively. Options as follows:

- Control From: Changes whether the output speed is determined from the highest, lowest or average levels of all sensors in the network.
- 100% Value: Pollution levels at the sensor in ppm x 10 corresponding to 100% output signal / fan speed
- 0% Value: Pollution levels at the sensor in ppm x 10 corresponding to 0% output signal / fan speed

Changing Default Switching Behaviour for Digital Inputs

Main Menu -> H.Manufacturer -> b. I/O Configuration -> Pages 05-07

Changes whether the digital inputs used for fan fault detection, full speed override or fire mode are triggered by a change from an open to closed state (set to Normally Open N/O) or vice versa. By default N/O is the setting.

Purge Timer

Main Menu -> H.Manufacturer -> b. I/O Configuration -> Page 10

Sets up the facility for purge ventilation, which is when the system, irrespective of measured pollution levels after a period of no/low activity will run the fans at a predetermined speed for a given period of time.

- Initiate Delay: Period of time the system must be at a low level of activity before the system automatically runs the fans for 'purge' ventilation.
- Run Duration: Time fans are run for under purge ventilation
- Fan Speed: Speed fans run for during purge ventilation.

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Changing Sensor Setup

By default, the system assumes the sensors connected have a 0-200PPM full detection range of Carbon Monoxide. Additional settings available as follows:

- Sensor Type: Electrical Signal type of sensor (No effect in Jetvent Digital EC Setup)
- Min Scale: Sensor values at minimum signal
- Max Scale: Sensor values at maximum signal
- Normalization: Accounts for sensors detecting different gases that have a different exposure threshold to CO. The value relates to a percentage value of the sensor pollution that equates to a maximum exposure level of CO. i.e. setting the Normalization to 50% for a particular sensor indicates that pollution levels of 50PPM on this sensor are treated as a 100PPM signal for a sensor set to 100% normalization.

Maintenance

Due to differing periods of operation, recommended inspection and maintenance periods may vary. It is suggested that inspection and, if necessary, fan cleaning (with non-abrasive cleaner) is carried out at regular intervals of 5000 running hours or 12 months, whichever comes first.

All mounting fasteners, should be checked for tightness within 4-6 weeks of commissioning and periodically thereafter.

Bearings are a 'sealed-for-life' type and hence will not need re-greasing. The motor's cleanliness must be checked to ensure overheating from dirt and dust build-up does not occur.

If possible, also visually check to make sure that the fan's rotating components are not touching any other parts of the fan.

Trouble Shooting

Jetvent Fans are running at full speed

On commissioning if all the Jetvent fans are running at full speed then check the ppm level of the sensors. If anyone of the sensors is reading an unrealistic value, greater than 199 ppm, then the sensor has been wired incorrectly. Under normal operating conditions with no cars present then all the sensors should be under 10 ppm.

Supply or Exhaust Fans are not running

If the supply or exhaust fan is not operating, but all the Jetvent fans are on all full speed, then the VSDs are most likely not programmed to turn on. Check the voltage at J9 and J13, if it reads greater than 0 volts then the VSD should be active. Please contact the VSD manufacturer for programming instructions.

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GOODS AND WARRANTY

1. When supplying goods to a consumer, the following mandated statement applies:
   "Our goods come with guarantees that cannot be excluded under the Australian Consumer Law.
   You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure."

2. The benefits of this warranty are in addition to any rights and remedies imposed by Australian State and Federal legislation that cannot be excluded. Nothing in this warranty is to be interpreted as excluding, restricting or modifying any State or Federal legislation applicable to the supply of goods and services which cannot be excluded, restricted or modified.

3. Subject to the conditions and limitation below, the Company warrants products of its manufacture to be free of defects in workmanship and/or materials at the time of delivery to the Buyer.

4. Any part, assembly or portion thereof found to be defective within one year from the date of commissioning or eighteen (18) months from date of shipment from our factory, whichever is the sooner, unless expressly stated otherwise in the Company's Publications or Literature, will be repaired or exchanged F.O.B factory.

5. The Company reserves the right to replace defective parts of the goods with parts and components of similar quality, grade and composition where an identical component is not available.

6. Goods presented for repair may be replaced by refurbished goods of the same type rather than being repaired. Refurbished parts may be used to repair the goods.

7. Goods or parts that have been returned for repair (except where the repair is as a result of the Company's failure to comply with the statutory guarantees in the ACL) or warranty assessment are deemed to have been abandoned by the Buyer if not collected within 30 days after the Company has notified the Buyer in writing of the warranty assessment outcome or the completed repair.

8. The Company reserves the right to dispose or otherwise deal with an abandoned product or part at its discretion.

9. This warranty does not apply if:
   (i) the goods have not been paid for by the Buyer as per the credit terms provided; or
   (ii) the goods have not been installed in accordance with AS NZS 3000/2000 Australian/New Zealand Wiring rules; or
   (iii) the goods have been misused or neglected.

10. The Company assumes no responsibility under this warranty for the labour costs involved in the removal of defective parts, installation of new parts or service charges related thereto.

11. If a fault covered by this warranty occurs, the Buyer must first contact the Company at the contact address listed below.

12. Any warranty claim must be accompanied by:
    (i) proof of purchase;
    (ii) written details of the alleged defect; and
    (iii) appropriate documentation (such as installation and maintenance records etc).

13. The Company shall have the option of requiring the return of the defective part (transportation prepaid by the Buyer) to establish the claim.

14. The Company makes no warranties or representations other than set out in this clause 7.

15. The repair or exchange of the goods or part of the goods, is the absolute limit of the Company's liability under this express warranty.

Fantech Contacts

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