Cheetah
Energy Control

Operating & Maintenance Manual

Quintex
Energy Management Systems
www.quintex.co.uk

Cheetah C3 CUB

Automatic Catering Ventilation Controls

For systems installed with Vacon 100 Inverters
FEB 2016

671697

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SYSTEM OVERVIEW:

System Operation and Design Features

The Cheetah (C3) CUB system is a demand-based energy management system that can be installed to automatically control commercial kitchen ventilation systems. It is a modular system that can be installed to control multiple canopies and/or ventilation fans, as required.

The *Cheetah* system will save energy by controlling the level of ventilation (depending on cooking activity) in commercial catering environments. This is achieved by continuously measuring the temperature in the extract canopy duct/s and controlling the extract fan/s and supply fan/s (where applicable), by using Variable Frequency Drives (Inverters).

Smoke and steam produced by cooking activity is also detected by laser optic sensors fitted to the extract canopy/s. The *Cheetah* system will quickly accelerate the ventilation fan/s to maximum speed when smoke or steam is detected and will continue to run them at full speed for a period of time whilst the smoke and/or steam clears so that all vapours are fully purged from the canopy/s. After purging the canopy, the system will then return to operating by temperature control, until the next optic sensor detection. The Cheetah system will always react to the greatest demand either from temperature, steam or smoke so that conditions in the kitchen are not compromised.

Based on the laws of affinity: a ventilation fan operating at half-speed uses only 13% of the full-speed operating power, but still moves half the volume of air that it would when running at full-speed. The electricity consumption of the motors is therefore significantly reduced by running the ventilation fans at lower average speeds.

Further power savings are made from the reduction of conditioned air being unnecessarily extracted through the ventilation system. *Cheetah* is designed to be an autonomous system and the fans are set to ramp down to a pre-set minimum speed when there is little or no catering demand. In most cases, where possible, the pre-set minimum speed is set to 40% (20Hz) of the maximum operating speed. During normal operation, Cheetah will not stop the fans, it will only reduce the speed of the fan/s to a set minimum.

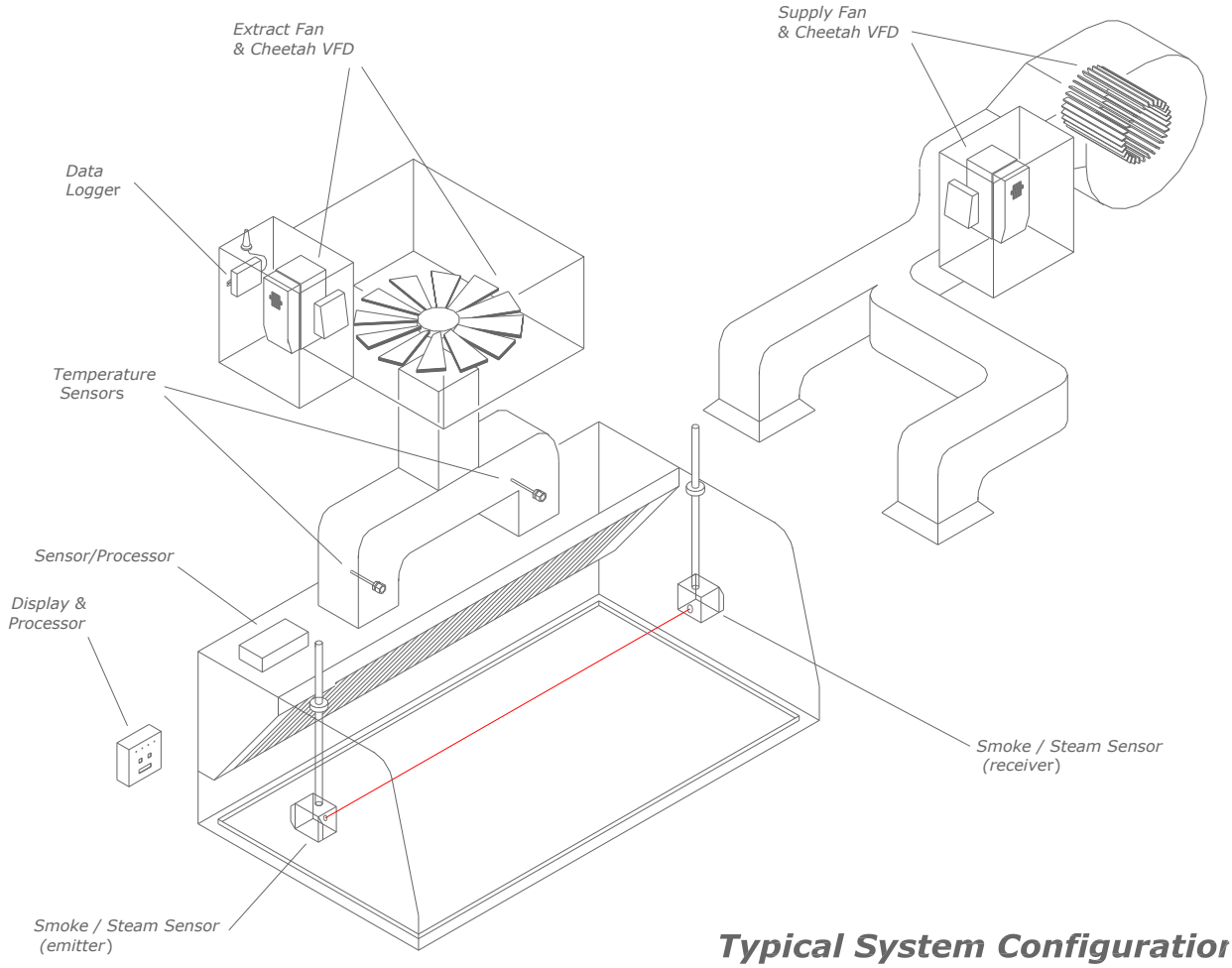
The *Cheetah* system is installed with remote GPRS communications and data-logging facilities. This allows systems installed at sites to be remotely accessed by *Quintex* (as required) and the system/s performance operation can be monitored over a period of time.

Cheetah has been designed so that any fault conditions will cause the connected fans to operate at full-speed (50Hz), until the issue is corrected. In this way, if a temperature or an optic sensor becomes faulty, the fan/s will run to the full (set) speed. Similarly, if the connected VFD/s loses digital communications with the *Cheetah* system, the connected motors will run at full speed until digital communication is restored.

There is no direct link between *Cheetah* and a gas interlock system that may be present at a site. However, because the Cheetah system adjusts fan operating speeds, it can influence the operation of the interlock. As part of the Cheetah system commissioning process, Quintex will test for the minimum fan speed required to enable the gas supply, via any interlock system. The minimum speed will always be set above the minimum speed required. Over time, any site gas interlock system/s should be regularly maintained to ensure that the fan operation detection is consistent with the operation at the time that the *Cheetah* system was commissioned. In particular, differential pressure sensing switches (used by gas interlock systems to sense airflow) can become blocked with contaminants (grease) and this can cause spurious gas interlock activations unless they are routinely cleaned.

PROTECTION COULD BE IMPAIRED IF THIS PRODUCT IS USED IN A MANNER THAT IS NOT SPECIFIED BY THE MANUFACTURER.

Cheetah System Components



The main components of the Cheetah system are:

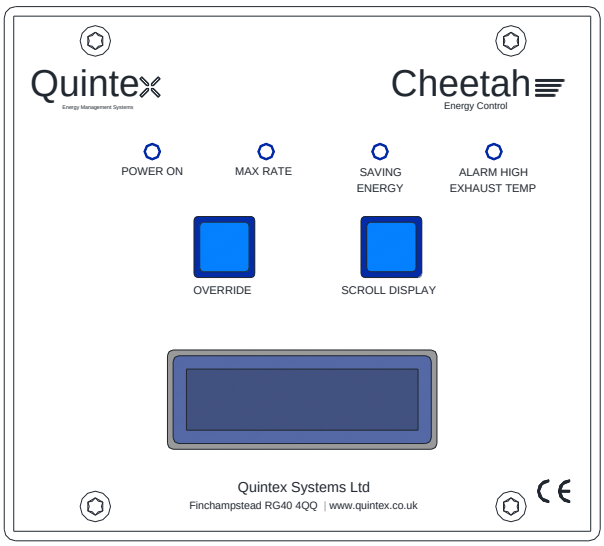
Component:	Description:
TEMPERATURE SENSORS	*Cheetah* temperature sensors are (usually) mounted in the extract canopy ductwork. They are located in the main airflow.
OPTIC SENSORS	*Cheetah* optic sensors are Class-2 devices that include additional block-detection safety protection. They are installed in pairs and span the length of a canopy.
DISPLAY UNIT	The *Cheetah* Display unit provides an operator interface with the Cheetah system.
SENSOR-PROCESSOR UNIT	A *Cheetah* Sensor/Processor is a local HUB unit into which the relevant temperature and optics sensor equipment is plugged.
VARIABLE FREQUENCY DRIVE	Typically, the VFD is a Vacon 100 speed controller that is used to vary the speed of the connected fan, based on the control from the Cheetah system. Other VFDs may be accommodated with the use of a *Cheetah* Input/Output unit.
DATA-LOGGER (RCDLU)	The *Cheetah* Remote Communications Data Logger Unit provides direct communications to the *Cheetah* system via a GPRS modem. It can be accessed by the *Quintex* technical department.

CHEETAH DISPLAY UNIT:

GENERAL

The *Cheetah* Display Unit is usually located in the kitchen. It can be installed on a wall or on the side of an extract canopy, generally near to the main (primary) extract canopy. When installed on the wall, it is usually mounted at approximately 2m from the level of the floor (above head height) to prevent accidental damage. The screen on the *Cheetah* Display gives a continual view of the operational status of the system.

DISPLAY OPERATION

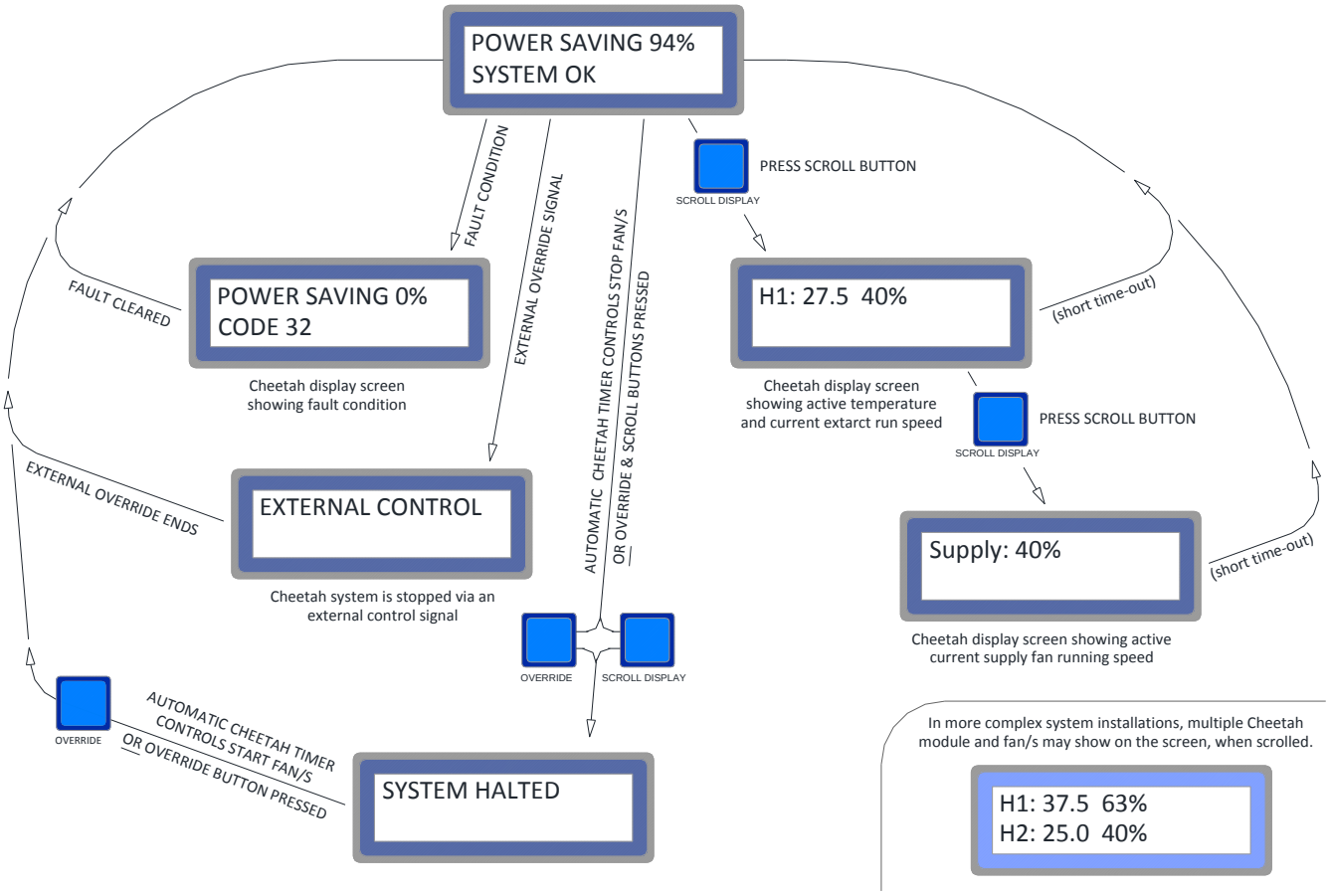


In normal operation the Cheetah Display LED screen will show the active extract motor power saving that is being made. It does not show the running speed of the system – running speed/s can be accessed by use of the *SCROLL* button. NOTE: the power savings figure shown is disproportional to the running speed of the fan.
If the system detects an error on the system, an error code will display (see section: **ERROR CODES - CHEETAH DISPLAY**).

POWER ON (LED)	The power light shows that the Cheetah Display Unit (and therefore the Cheetah system) has electrical power applied to it.
MAX RATE (LED)	The Max Rate light will be on when the system is running at full-speed due to use of the OVERRIDE button.
ALARM HIGH EXHAUST TEMP (LED)	The Alarm High Exhaust Temperature is able to be set during the configuration of the system/s. If the temperature in the duct exceeds the temperature set-point, then the Alarm (LED) will light, and the display audible alarm will sound.
ENERGY SAVING (LED)	Illuminates when the fans are not operating at full-speed and energy savings are being made by the system.
OVERRIDE (BUTTON)	When pressed, all of the connected fans will run to full speed. The override will operate for a pre-set time (one hour set as standard) and thereafter, the system will return to automatic control (temperature and optical). The OVERRIDE button will also bring the fans on (if they have been timed-off by the Cheetah system, internal timer function) provided the fans (VFDs) have a power supply to them.
SCROLL DISPLAY (BUTTON)	Can be used to 'scroll' the screen on the Display Unit between all active operating conditions including: the current (instantaneous) fan running speeds and duct temperatures.
***IF REQUIRED:* The connected fan/s can be STOPPED (eg. overnight) by pressing both the OVERRIDE and SCROLL buttons (at the same time). Pressing the OVERRIDE button again, will restart the fan/s.**	

SCROLL BUTTON OPERATION.

The Cheetah display unit has various screens that can be accessed in order to view the real-time operation of the system. Additional operating information can be accessed by pressing the *SCROLL* button, as shown in the diagram below. Cheetah systems installed with multiple canopies and/or fans may show more information on the display screen.



- The normal operating screen is the **DEFAULT screen**.

  PRESS SCROLL

- The operating speed and active duct temperature of canopy (or fan) number 1 is displayed for a short period of time. If a second fan (or canopy) is installed as part of the system, then it should also be shown.

  PRESS SCROLL AGAIN

- If installed, Supply (make-up) fan and air-flow information will be shown

- In fault conditions, a code will be shown on the screen, refer to Cheetah fault codes section of this manual for further information. The most common faults are: **CODE 16 – network error** or **CODE 32 – error with Sensor/Processor #1**.

- For some installations, an external control signal may have been added (wired-in) to the Cheetah system. When the external control signal activates, the display screen will show **EXTERNAL CONTROL**.

- For some installations *Cheetah* automatic timing controls may have been requested to be set-up. When the timing controls activate the fans will stop and **SYSTEM HALTED** message will be shown on the screen. The same message will show if the system is manually halted but pressing (and holding) both the ***OVERRIDE*** and ***SCROLL*** buttons, simultaneously. Pressing the ***OVERRIDE*** button will exit the **SYSTEM HALTED** condition.

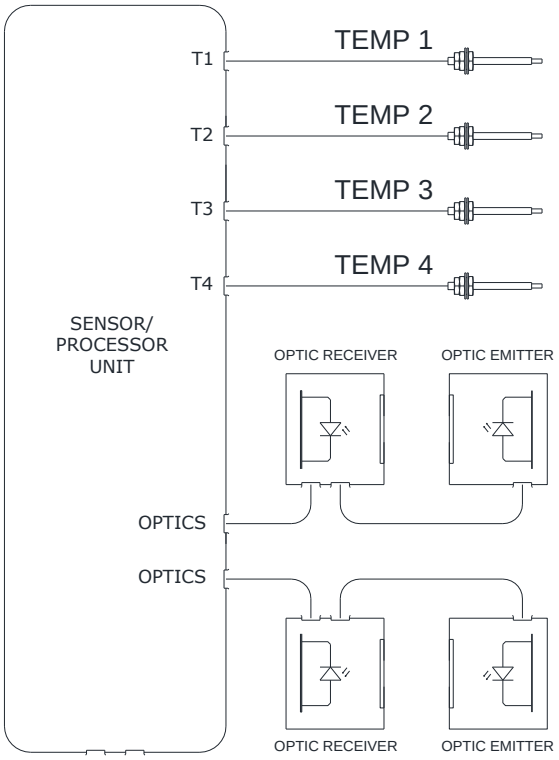
SYSTEM SET-UP:

GENERAL

During the installation and commissioning of a *Cheetah* system, the technician will program and configure the Cheetah system by using specialist software on a laptop computer that is connected to the LonWorks network. The *Cheetah* Configurator software is specifically designed to set-up the system parameters, and to assign the correct LonWorks communications addressing between all of the installed devices and in doing so configures the system. System components are self-identifying. The main parameters include – individual min. & max. temperature sensor set-points, optic trigger levels, optic run time, high temperature alarm set-point & override time period. Refer to the diagram below to understand the capabilities and related parameters associated with each sensor-processor unit.

BASIC CONFIGURATOR OPTIONS

Cheetah: key sensor parameter adjustments



ID:	Parameter:	Description:	(factory default)
TMinStpt[0] TMaxStpt[0]	MIN TEMP SPAN (°C) MAX TEMP SPAN (°C)	Setting of the LOWER (0Hz) temperature set-point Setting of the HIGHER (50Hz) temperature set-point	(24) (35)
TMinStpt[1] TMaxStpt[1]	MIN TEMP SPAN (°C) MAX TEMP SPAN (°C)	Setting of the LOWER (0Hz) temperature set-point. Setting of the HIGHER (50Hz) temperature set-point.	(24) (35)
TMinStpt[2] TMaxStpt[2]	MIN TEMP SPAN (°C) MAX TEMP SPAN (°C)	Setting of the LOWER (0Hz) temperature set-point. Setting of the HIGHER (50Hz) temperature set-point.	(24) (35)
TMinStpt[3] TMaxStpt[3]	MIN TEMP SPAN (°C) MAX TEMP SPAN (°C)	Setting of the LOWER (0Hz) temperature set-point. Setting of the HIGHER (50Hz) temperature set-point.	(24) (35)
OpticsCal[0]	OPTIC SENSITIVITY	The setting of the percentage drop in optic signal value required to trigger fans to run to full (set) speed.	(5)
OpticsRun	OPTICS RUN TIME (s)	The setting of the time that fans will run-on for after the steam and/or smoke has been cleared.	(90)
OpticsCal[1]	OPTIC SENSITIVITY	The setting of the percentage drop in optic signal value required to trigger fans to run to full (set) speed.	(5)
HighGasTemp	HIGH TEMP ALARM (°C)	The temperature at which the high temperature warning alarm will sound and run the fans to full (set) speed NOTE: setting to ZERO will disable the alarm function	(100)
Bypass	OVERRIDE TIME (m)	The time that the fans will run at full (set) speed for when the override button is pressed.	(90)

Any adjustments can only be made by a trained engineer. Adjustments can be made either; on-site with the use a laptop installed with the required software and network connection hardware), or remotely - by Quintex. There are no user-adjustable *Cheetah* parameters.

VARIABLE FREQUENCY DRIVES:

Vacon 100:

A Vacon 3-phase AC VFD is used to adjust the speed that ventilation fans run at by changing the frequency of the electrical supply voltage. Single-phase Vacon20 VFDs are also available when required and are covered later in this manual.

VFD Installation:

Depending on where a VFD is to be mounted, the correct size and IP (ingress protection) rated device will be chosen when a system is installed. If a fan motor is upgraded after a Cheetah system has been installed, then a new (larger) VFD may be required to suit the new ventilation unit.

A VFD mounted to outdoor external (exposed plant) fans needs to be installed in a draft-ventilated cabinet, ideally near to the Air-Handling-Unit that is being controlled. An IP21 VFD is mounted within the draught-ventilated enclosure.

An IP54 VFD can be used when the installation is indoors (internal plant). The VFD is mounted to a suitable structure (wall or frame) without an enclosure.

Each VFD is installed (electrically wired) between any local isolation (if present) and the fan motor. VFDs are installed as close to the motor as possible in order to reduce issues associated with long lengths of cable and the high switching frequencies of VFDs.

Vacon 100 - AC Variable Frequency Drive (Inverter)

The following information shows the part numbers of Vacon 100 VFDs that can be supplied as replacement VFD units, or as upgrades, when the load of a fan unit has been increased by remedial works. These units are the only models (installed with specialist application software) that will operate correctly with Cheetah, when installed as a fully networked (LonWorks) system.

Any replaced VFD will have to be configured into the Cheetah system network by a trained Quintex engineer, with the appropriate equipment.

Both tables (below) show the same incremental VFD sizes (in the rating column, in BOLD) match this to the motor FLC,
One table is for **IP21** units & the other is for **IP54** units. Part numbers will be printed on the outside of any new equipment VFD packaging box.
The listed information shows the typical range of VFDs between 1.1kW (3.3A) and 30kW (61A) rated motor power that is commonly supplied.
Larger sizes are available, on request.

VACON 100 IP21			
PART NUMBER:	RATING:	POWER:	FRAME SIZE:
VACON0100-3L-0003-5+BM3L+SDC4+WT03+A1134	3.4A	1.1kW	MR4
VACON0100-3L-0004-5+BM3L+SDC4+WT03+A1134	4.8A	1.5kW	MR4
VACON0100-3L-0005-5+BM3L+SDC4+WT03+A1134	5.5A	2.2kW	MR4
VACON0100-3L-0008-5+BM3L+SDC4+WT03+A1134	8.0A	3kW	MR4
VACON0100-3L-0009-5+BM3L+SDC4+WT03+A1134	9.6A	4kW	MR4
VACON0100-3L-0012-5+BM3L+SDC4+WT03+A1134	12.0A	5.5kW	MR4
VACON0100-3L-0016-5+BM3L+SDC4+WT03+A1134	16.0A	7.5kW	MR5
VACON0100-3L-0023-5+BM3L+SDC4+WT03+A1134	23.0A	11kW	MR5
VACON0100-3L-0031-5+BM3L+SDC4+WT03+A1134	31.0A	15kW	MR5
VACON0100-3L-0038-5+BM3L+SDC4+WT03+A1134	38.0A	18.5kW	MR6
VACON0100-3L-0046-5+BM3L+SDC4+WT03+A1134	46.0A	22kW	MR6
VACON0100-3L-0061-5+BM3L+SDC4+WT03+A1134	61.0A	30kW	MR6

VACON 100 IP54			
PART NUMBER:	RATING:	POWER:	FRAME SIZE:
VACON0100-3L-0003-5+BM3L+SDC4+IP54+WT03+A1134	3.4A	1.1kW	MR4
VACON0100-3L-0004-5+BM3L+SDC4+ IP54+WT03+A1134	4.8A	1.5kW	MR4
VACON0100-3L-0005-5+BM3L+SDC4+ IP54+WT03+A1134	5.5A	2.2kW	MR4
VACON0100-3L-0008-5+BM3L+SDC4+ IP54+WT03+A1134	8.0A	3kW	MR4
VACON0100-3L-0009-5+BM3L+SDC4+ IP54+WT03+A1134	9.6A	4kW	MR4
VACON0100-3L-0012-5+BM3L+SDC4+ IP54+WT03+A1134	12.0A	5.5kW	MR4
VACON0100-3L-0016-5+BM3L+SDC4+ IP54+WT03+A1134	16.0A	7.5kW	MR5
VACON0100-3L-0023-5+BM3L+SDC4+ IP54+WT03+A1134	23.0A	11kW	MR5
VACON0100-3L-0031-5+BM3L+SDC4+ IP54+WT03+A1134	31.0A	15kW	MR5
VACON0100-3L-0038-5+BM3L+SDC4+ IP54+WT03+A1134	38.0A	18.5kW	MR6
VACON0100-3L-0046-5+BM3L+SDC4+ IP54+WT03+A1134	46.0A	22kW	MR6
VACON0100-3L-0061-5+BM3L+SDC4+ IP54+WT03+A1134	61.0A	30kW	MR6

NOTE: some internal parameters locations (addressing) detailed in the standard Vacon applications manual ARE different to the functions of the bespoke application to operate with the Cheetah system. Contact Quintex for further advice.

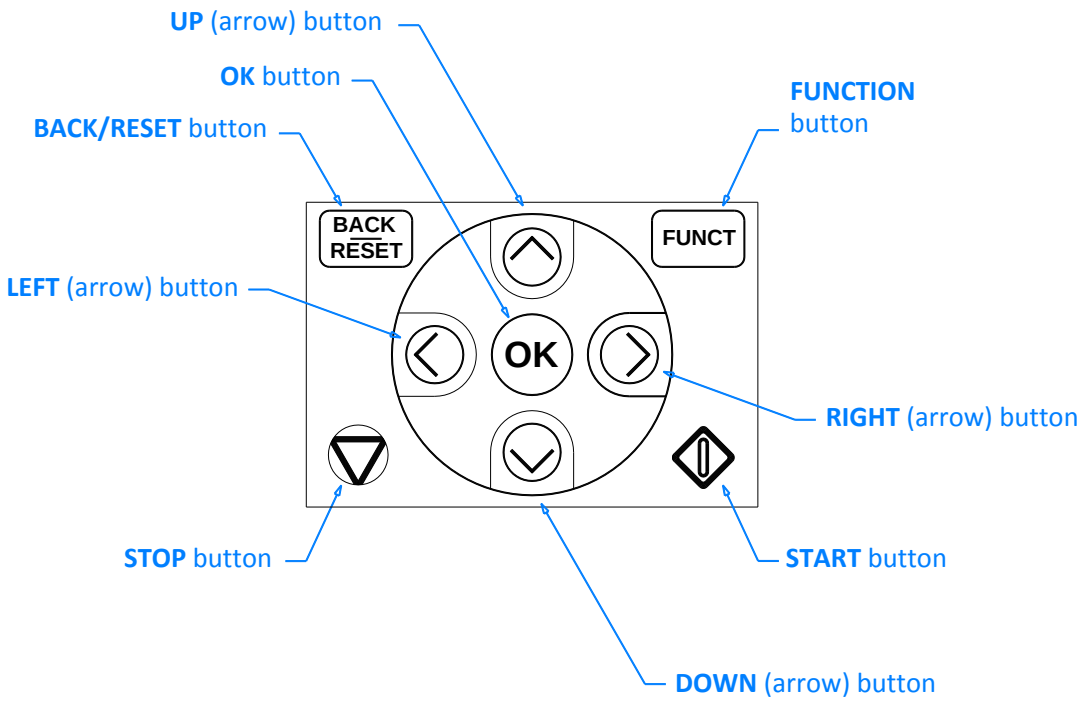
VACON 100 KEYPAD NAVIGATION (and RESET)

The Vacon Inverters installed with the Cheetah system have a unique, bespoke software-application installed to allow them to operate with the digital (LonWork) communications of the Cheetah controls. The Inverter functions are checked during commissioning and should not normally require adjustment. If parameter adjustment is necessary this should be carried out with reference to the Vacon Instruction Manuals and the key setting parameters, by trained personnel.

The Vacon Inverter will usually operate displaying the motor running frequency (this is one of the monitoring screens available to view operational data relating to the drive / motor). If a fault occurs and the VFD stops, the RESET button can be used to clear the fault and attempt to restart the VFD. Repeated faults/resets should not be ignored and should be reported.

MODIFYING INVERTER PARAMETER SETTINGS SHOULD ONLY BE DONE BY TRAINED PERSONNEL.

Vacon 100 keypad navigation buttons



BUTTON	DESCIPTION:
BACK/RESET	Use it to move **BACK** in the menu, **EXIT** the Edit mode, **RESET** a fault.
UP (arrow)	Use it **SCROLL** the menu **UP**, and to **INCREASE** a value that is being adjusted.
FUNCT	Use it to **ACCESS** the control page and to **CHANGE** the control place.
RIGHT (arrow)	Use it to navigate **RIGHT** in the menu structure.
START	Use it to **START** the VFD (RUN) – when set to operate in keypad mode.
DOWN (arrow)	Use it **SCROLL** the menu **DOWN**, and to **DECREASE** a value that is being adjusted.
STOP	Use it to **STOP** the VFD. To restart the VFD (when in FieldBus mode) power-cycle (fully OFF-and-ON).
LEFT	Use it to navigate **LEFT** in the menu structure.
OK	Use it GO into an active level (or item), ACCEPT a selection.

VACON 100 VFD KEY SETTINGS:

During the commissioning of a Vacon 100 VFD the installation technician will set each VFD to operate with the motor to which it has been connected. It is essential that two key parameters are set correctly so that they match the specifications motor that the VFD is connected to. The key motor parameters are:

- **Motor Current Limit** (P1.7) – is the Motor Current (Overload) Limit, and must be set to the rated motor current (from motor technical specification plate), plus an added 10%.

  As an example,

  *If the rated motor current [FLC] is 7.2A then the **MOTOR CURRENT LIMIT** must be set to **7.9A**.*

- **Motor Nominal Current** (P1.12) – is the Motor Current setting, and is set to the rated motor current (from motor technical specification plate).

  As an example,

  *If the rated motor current [FLC] is 7.2A then **MOTOR NOMINAL CURRENT** must be set to 7.2A).*

Checking these motor specific VFD parameters (and resetting if applicable) is also required if fan units and/or motors are replaced. If a fan/motor has been upgraded to a larger size, then a larger (rated) VFD may also be required.

Vacon 100 *COMMON CHEETAH PARAMETERS*		
PARAMETER	**DESCRIPTION**	**DEFAULT**
P1.3	Minimum frequency reference	20.00 Hz
P1.4	Maximum frequency reference	50.00 Hz
P1.5	Acceleration Time 1	6.0 s
P1.6	Deceleration Time 2	90.0 s
P1.7	**Motor Current Limit**	***set to motor (FLC+ 10%) A***
P1.9	Motor Nominal Voltage	400V
P1.10	Motor Nominal Frequency	50.00 Hz
P1.11	Motor Nominal Speed	1435 rpm (as motor plate)
P1.12	**Motor Nominal Current**	***set to motor (FLC) A***
P1.13	Motor Cos Phi	0.85 (as motor plate)
P1.16	Start Function	Flying Start
P1.17	Stop Function	Coasting
P3.2.1	**Remote Control Place**	**I/O control**
P3.2.2	**Remote/Local**	**Remote**
P3.2.3	Keypad Stop Button	Yes
P3.3.1.9	Keypad Direction	Forward
P3.5.1.15	Run Enable	DigIN Slot0.2
P3.5.3.2.1	Basic RO1 Function	Run
P3.5.3.2.4	Basic RO2 Function	Fault
P3.9.1.4	Undervoltage Fault	No History
P3.9.1.6	Response to FB Comm Fault	Alarm,PresetFreq
P3.9.1.7	Slot Communication Fault	Alarm,PresetFreq
P3.9.1.13	Preset Alarm Frequency	49.99 Hz
P3.9.2.1	Motor Thermal Protection	No Action
P3.9.3.4	Stall Frequency Limit	5.00 Hz
P3.10.1	Automatic Reset	Enabled
P3.10.4	Trial Time	60.00 s

CHEETAH INPUT-OUTPUT UNIT:

Some ventilation systems have pre-existing VFDs that cannot accept digital (LonWorks) controlled instructions. Other VFDs, and devices such as EC fans, are not able to be LonWorks controlled. For applications of this type there is the option of installing a *Cheetah Input-Output unit*. The *Input-Output unit* has been specifically designed to convert digital (LonWorks) communications signals to analogue control signals (it is a D-to-A converter). The *Input-Output unit* connects to (and is configured within) the *Cheetah* BUS network. It will send and receive various basic speed control signals to a device to which it is connected.

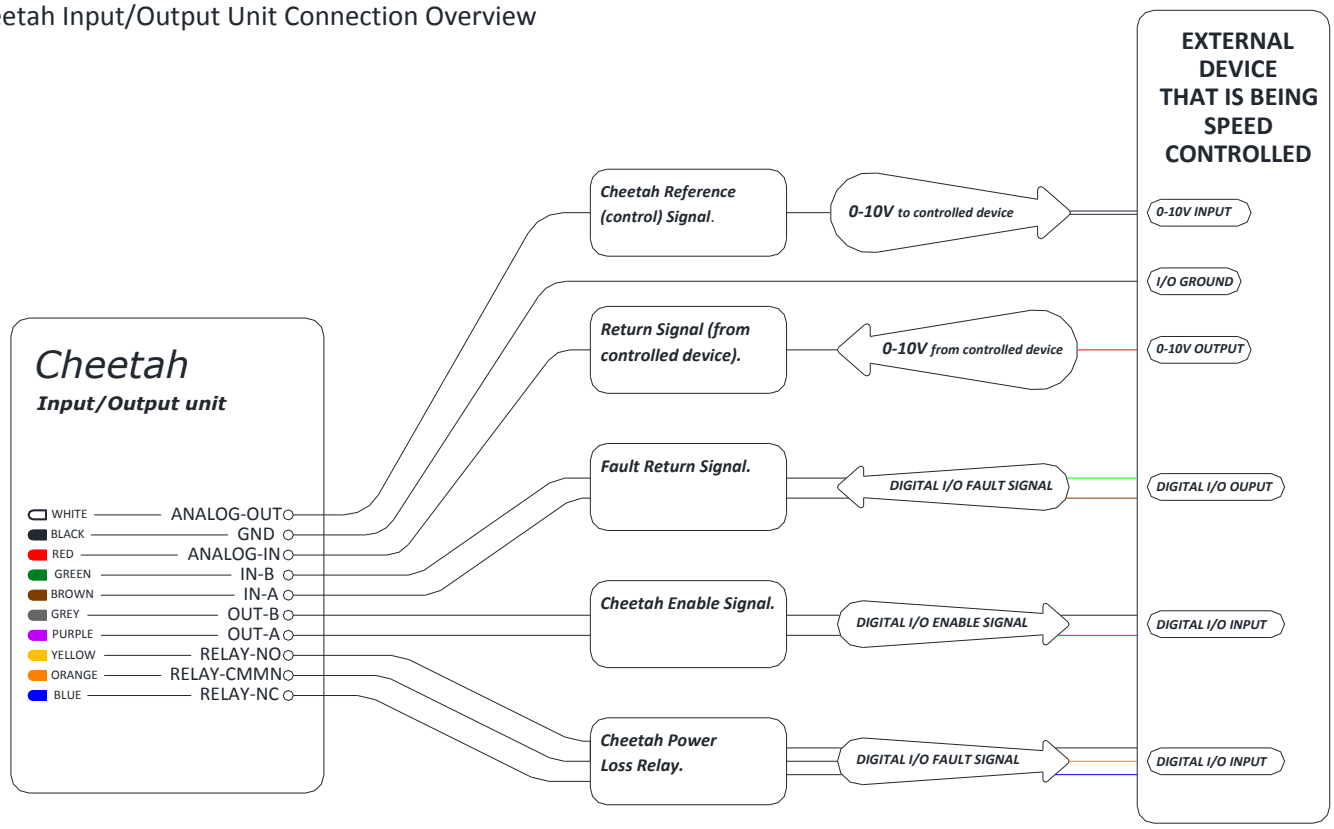
The external device can be directly controlled (for example, it can be wired to a VFD, via the I/O terminals). Or the control can take place via an intermediate control system, such as a BMS that is already integrated to the applicable VFD/s. For VFDs that do not have a LonWorks option (for example, a single phase VFD or an EC fan) then the *Cheetah Input-Output unit* will provide the necessary D-to-A conversion.

(Refer to the Input/Output unit Overview diagram below to understand the method of control that is employed. The technicians that install, or replace speed control devices should refer the operating manual of the controlled device to determine the required terminal connections and operational configuration, in each specific case).

PRIMARY CONTROL – the Analogue Output, the Analogue Input and the relevant Ground connections *MUST* be implemented for all *Input/Output* unit installations for the system to operate correctly.

SECONDARY CONTROL – other connections shown can be made, depending on the system design and the devices that are being controlled. Sometimes, pre-existing controls mean that secondary controls (such as the Cheetah enable signal) cannot be implemented.

Cheetah Input/Output Unit Connection Overview



DETAILED DESCRIPTION OF CHEETAH INPUT/OUTPUT TERMINALS:

- **Analogue <u>OUTPUT</u> (0-10V) control signal**
  [Available on terminal **6** – (**WHITE** conductor), with terminal **5** – (**BLACK** conductor) as the ground]

  This output provides the reference signal to an external device and is the commanded (percentage) fan running speed instruction from the Cheetah system. This commanded speed is based on the sensed conditions in the catering area.

  There is an option (by means of a selector switch, internal to the In-Out unit) to allow for this output signal to be inverted (10-0V) – however, the connected device that is being controlled will need to be reconfigured to accept the inverted signal. By doing this a 'failsafe' (run to full-speed) will be created if power to the Cheetah system (Display unit) should ever fail.

- **Analogue <u>INPUT</u> (0-10V) control signal**
  [Available on terminal 7 – (**RED** conductor), with terminal **5** – (**BLACK** conductor) as the ground]

  This input allows the actual return (percentage) fan running speed be fed-back from the controlled device to the Cheetah system. The actual running speed feed-back should be connected, but in (rare) cases where this is not possible, the input signal should be linked-back to the output signal for operational continuity of a controlled supply fan.

- **Digital Logic <u>ENABLE</u> control signal (<u>OUTPUT</u>)**

  With this terminal connected to the controlled device, off-and-on controls from the Cheetah Display unit will enable and disenable (start and stop) the controlled device.

- **Digital Logic <u>FAULT</u> control signal (INPUT)**

  With this terminal connected to the controlled device, then a fault signal can be returned to the Cheetah unit – if a fault occurs.

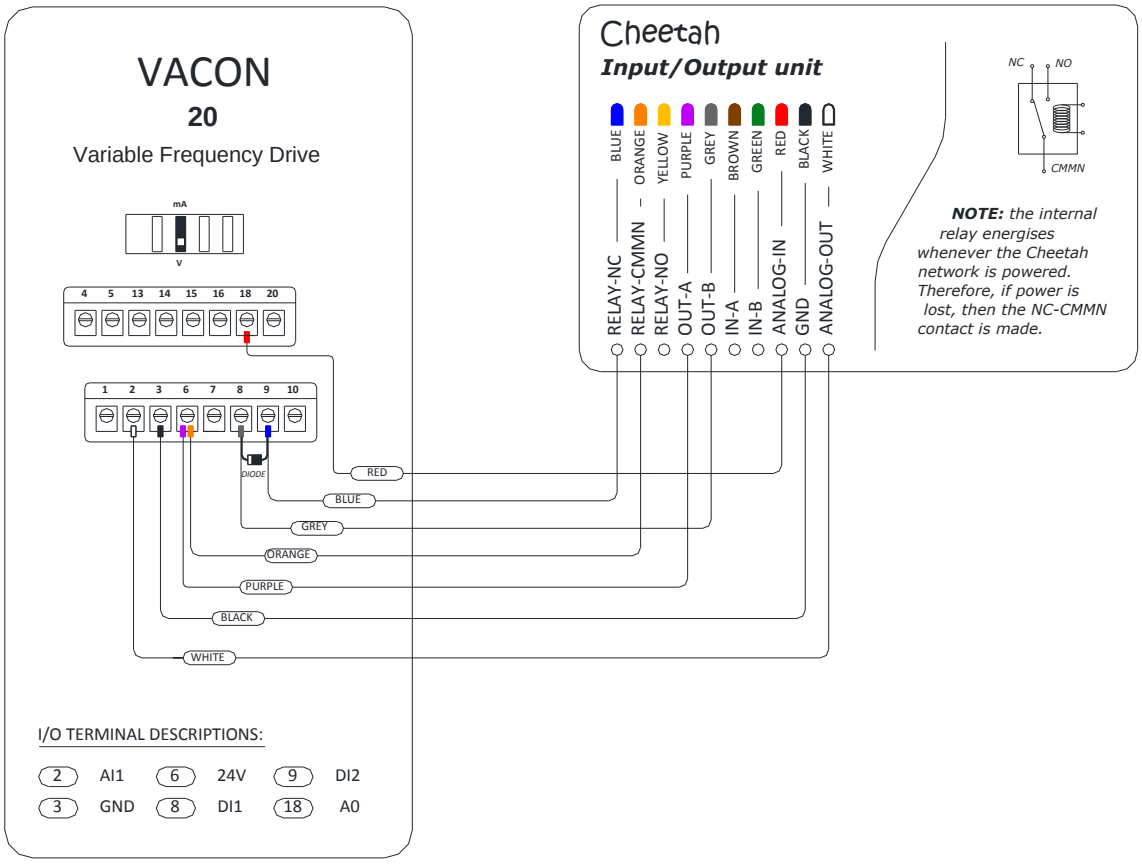
- **Power Loss Relay (terminals) – [COMMON, NORMALLY-OPEN & NORMALLY CLOSED**

  The In-Out unit has terminals available that can be used to monitor the Cheetah system power supply. The on-board relay will change state when the system is un-powered (on loss of power or broken connection/cable). For devices that cannot have the control signal inverted, the relay offers a solution.

SINGLE PHASE (230V) VFD

Single phase motors can be controlled by the Cheetah system with the use of a Vacon20 VFD. The Vacon20 has been specially adapted to run a single-phase (230V) AC motor. The connections and parameter settings for the installation are shown below. Alterations to the configuration and parameters should only be made by (or in association with) a trained technician.

Cheetah Input/Output unit connected to VACON 20 VFD



Vacon 20 *COMMON CHEETAH (CUB) PARAMETERS*		
PARAMETER	**DESCRIPTION**	**DEFAULT**
P1.4	Motor nominal current	***set to motor (FLC) A***
P1.7	Current limit	***set to motor (FLC+ 10%) A***
P2.2	Start function	1 (Flying start)
P2.3	Stop function	1 (Ramp)
P2.4	I/O Start / Stop logic	0 (forward)
P3.1	Minimum frequency	0Hz
P3.2	Maximum frequency	50Hz
P3.3	Remote cntrl place 1 freq ref	4 (AI1)
P3.5	Preset speed 1	49.99Hz
P4.2	Acceleration time 1	6sec
P4.3	Deceleration time 1	90sec
P5.1	I/O control signal 1	1 (DI1)
P5.2	I/O control signal 2	0 (Not used)
P5.7	Run enable	0 (Not used)
P5.8	Preset speed B0	2 (DI2)
P5.9	Preset speed B1	0 (Not used)
P13.2	Under voltage fault	1 (No response)
If motor WINDMILLING is an issue – causing the fan to run in REVERSE when started – then the following settings can be used:		
P2.2	Start function	0 (Ramp)
P4.12	DC current time	2 sec

MAINTENANCE

Cleaning Optic Sensors

The *Cheetah* laser optic sensor and related circuit boards are contained within stainless-steel enclosures – with (internal) dirt-repellent clear covers installed over the laser apertures. It is recommended that the optic sensors are wiped (with a clean damp cloth) once a week to maintain a 'clear window'. Sustained direct pressure-jet washing of the laser aperture cover areas should be avoided.

Cleaning Optic Sensors

The *Cheetah* system relies on temperature sensors to monitor the temperature in the extract ducts of the ventilation system. For optimum system performance, it is recommended that the temperature sensors are routinely cleaned every 6 to 12 months (depending on cooking activity and the resulting contaminant build-up).

To clean the Cheetah system temperature sensor/s use a damp (lightly abrasive) scourer or steel wool to gently rub the grease and dirt build-up from the end of the temperature sensor. Using a mild detergent to dampen the scourer can also be beneficial in the cleaning process.

Cleaning of a *Cheetah* Temperature Sensor, using a scourer.

Cleaning Display unit

The *Cheetah* display unit can be wiped clean as part of normal kitchen cleaning, as required. Wipe with a mild detergent.

When cleaning the Cheetah Display unit, do NOT use an aggressive detergent and do NOT spray wash.

AIR HANDLING SYSTEM:

The *Cheetah* system relies on the equipment that it is controlling (the extract and supply ventilation air systems) to be in a good state of operational order so that it can operate at optimum efficiency and produce the best results. It is expected that the ventilation systems are sufficiently maintained; including regular belt maintenance, duct and filter cleaning as would be expected for any mechanical ventilation systems. It is important that a ventilation canopy has all filters in position, and that the filters have a regular cleaning schedule.

ERROR CODES - CHEETAH DISPLAY:

If the Cheetah system identifies an error then an error code will be displayed on the screen. The table below shows what each error code relates to.

Error Code on LCD:	Error Type:	Code (in binary)
16	Network	00000000 00010000
32	Hood 1	00000000 00100000
64	Hood 2	00000000 01000000
96	Hoods 1 & 2	00000000 01100000
128	Hood 3	00000000 10000000
160	Hoods 3 & 1	00000000 10100000
192	Hoods 3 & 2	00000000 11000000
224	Hoods 3 & 2 & 1	00000000 11100000
256	Hood 4	00000001 00000000
288	Hoods 4 & 1	00000001 00100000
352	Hoods 4 & 2 & 1	00000001 01100000
416	Hoods 4 & 3 & 1	00000001 10100000
448	Hoods 4 & 3 & 2	00000001 11000000
480	Hoods 4 & 3 & 2 & 1	00000001 11100000

Descriptions of error type:

Network error (CODE 16) – Display Unit cannot communicate with one or more of the configured Cheetah Units. Note that inability to communicate with a VFD is not counted as a network error.

Hood error (*various*) – The cause of this is inability to communicate with a particular sensor. To determine which sensor is causing the problem, a trained Cheetah system engineer can interrogate the system. The value of the variable nvoHdErrors can be inspected either from the configurator or by remote access by a trained engineer with the correct equipment.

VACON 100 FAULT CODES

(ABRIDGED)

Fault Code	Fault ID	Fault Name	Possible Cause	How to correct the fault
1	1	Overcurrent (hardware fault)	Current draw is too high a (>4*I H) in the motor cable. The possible cause can be one of these: • a sudden heavy load increase • short circuit in the motor windings • motor is not the correct type • parameter settings are not properly made	Check the VFD loading. Check of the motor, check of the cables and connections. Perform a test run. Set the acceleration time longer, if required.
	2	Overcurrent (software fault)		
2	10	Overvoltage (hardware fault)	The DC-link voltage is higher than the limits. • Deceleration time id too short • There are high overvoltage spikes in the supply	Check the input voltage(s). Set the deceleration time longer. Activate the overvoltage controller.
	11	Overvoltage (software fault)		
3	20	Earth fault (hardware fault)	The VFD has detected that that the sum of the motor-phase-current is not zero • An insulation malfunction in the cables or in the motor. • A filter (du/dt, sinus) malfunction	Check the motor cables and the motor. Check the filter.
	21	Earth fault (software fault)		
8	600	System Fault	There is no communication between the control board and the power.	Reset the fault and restart the drive. If the fault re-occurs again, contact the Vacon distributor.
	601			
	602		Defective component operation malfunction	
	603		The voltage of auxiliary power in the power unit is too low.	
	604		Output phase voltage does not agree with the reference. Feedback fault	
	605		Operation malfunction	
	606		Software of control unit is not compatible with software of power unit	
	607		The software version cannot be read. There is no software in the power unit. Defective component. Operation malfunction (power board or measurement board).	
	608		A CPU overload	
	609		Defective component. Operation malfunction	Reset the fault and power cycle the VFD twice. (power off, power on)

8	610	System fault	Defective component. Operation malfunction	Reset the fault and restart the drive. If the fault re-occurs again, contact the Vacon distributor.
	614		Configuration error, software error. Defective component (control board), operation malfunction.	
	647		Defective component. Operation malfunction	
	648		Software is not compatible with the application	
	649		Resource overload. A parameter loading, restoring or saving malfunction	
9	80	Undervoltage (fault)	The DC-link voltage is lower than the limits • supply voltage too low • defective component. • a defective input fuse • the external charge switch is not closed NOTE: This fault becomes active only if the drive is in run state.	Check of the supply voltage(s). Inspect the electrical network for fault. If there was a temporary supply voltage break, reset the fault and restart the drive. If the supply voltage is sufficient, there may be an internal VFD fault.
10	91	Input phase	• supply voltage malfunction • a defective fuse or malfunction in the supply cables The load must be a minimum of 10 – 20% for the supervision to work.	Check of the supply voltage(s), the fuses and supply cable. (Advanced inspection - Check the rectifying bridge and the gate control of the thyristor).
11	100	Output phase supervision	The VFD has detected that there is no current in 1 motor phase. • a motor or motor cables malfunction • filter (du/dt, sinus) malfunction	Check of the motor cables and check the motor windings. Do a check of the du/dt or sinus filter
13	120	AC drive undertemperature (fault)		The ambient temperature is too low for the VFD. Increase the ambient temp, or relocate the VFD to a warmer position.
14	130 131 132 133	AC drive overtemperature (fault, heatsink) AC drive overtemperature (fault, heatsink) AC drive overtemperature (fault, heatsink) AC drive overtemperature (fault, heatsink)	The temperature of the VFD heatsink or the power board is too low. NOTE: the temperature limits of the heatsink are different in across the range of frame sizes.	Check the cooling fan operation. Check the ambient temperature. Examine the heatsink for dust/contaminants. Measure the flow of cooling air. Make sure that the switching frequency is not too high in relation to the ambient temperature and the motor load.
15	140	Motor stall	The motor stalled	Do a check of the motor and the load
16	150	Motor temperature	The loading of the motor is too great.	Decrease the motor load. Check of the motor thermal protection parameters

17	160	Motor underload	There is not sufficient load on the motor	Check the load. Check of the parameters. Check of the du/dt and sinus filters.
19	180 181	Power overload (short time supervision) Power overload (long time supervision)	The power of the drive is too high	Decrease the load. Check the VFD is suitably sized for the load.
25	240 241	Motor control fault	Fault seen only with a customer specific application. A malfunction in the start angle identification • The rotor moves during identification • The new angle does not agree with the old value	Reset the fault and restart the drive. Increase the identification current. See fault history source for more info.
26	250	Start- up prevented	It is not possible to do a start- up of the drive. When the run request is on, a new software (firmware or application) a parameter setting or other file that affects the operation of the drive, is loaded to drive	Reset the fault and start the VFD.
32	311	Fan cooling	There is a discrepancy between the fan speed and the speed reference, but the VFD is operating correctly (this fault only occurs in the VFD frame sizes MR7 or larger).	Reset the fault and restart the drive. Clean or replace the fan
	312	Fan cooling	The VFD cooling fan has exceeded its operating lifetime (50k hours).	Replace the fan and reset the lifetime counter of the fan.
46	662	Real Time clock	The voltage of the RTC battery is low	Replace the real time clock battery
50	1050	AI low fault	1 or more of the available analogue input signals is below 50% of the minimum signal range. A control cable is defective or loose. A malfunction in a signal source.	Replace the defective parts. Check the analogue input circuit. Make sure AI1 Signal Range parameter is set correctly
51	1051	Device external fault	The digital input signal that is set with parameter P3.5.1.11 or P3.5.1.12 was activated.	This is a user defined fault. Check the digital inputs and schematics
52	1052 1352	Keypad communication fault	The connection between the control panel and the drive is defective.	Check the keypad connection. If applicable, check remote control panel cable.
53	1053	Fieldbus communication fault	The VFD has stopped receiving fieldbus data.	Check the installation and fieldbus connection.
54	1354	Slot A fault	A defective option board or slot.	Check the option board and slot.
	1454	Slot B fault		
	1554	Slot C fault		

	1654	Slot D fault		
	1754	Slot E fault		
66	1366 1466 1566	Thermistor input 1 fault Thermistor input 2 fault Thermistor input 3 fault	The motor temperature increased.	Check the motor cooling and the load. Check the thermistor connection. If the thermistor input is not used, it has to linked-through. If problem persists, contact distributor.
68	1301	Maintenance counter 1 alarm	The value of the maintenance counter has exceeded the alarm limit.	Do the necessary maintenance. Reset the counter. See parameter B3.16.4 or P3.5.1.40
	1302	Maintenance counter 1 fault	The value of the maintenance counter is higher than the fault limit	
	1303	Maintenance counter 2 alarm	The value of the maintenance counter is higher than the alarm limit.	
	1304	Maintenance counter 2 fault	The value of the maintenance counter is higher than the fault limit	
69	1310	Fieldbus communications fault	The ID number that is used to map the values to fieldbus process data out is not valid	Check the parameters of the fieldbus data mapping menu.
76	1076	Start prevented	The start command is blocked to prevent the accidental rotation of the motor during first power-up.	Reset the drive to start the correct operation. Parameter settings will indicate if it necessary to restart the drive.

For further (full) information relating to Vacon VFD Troubleshooting – refer to the Vacon 100 Application Manual.

EC CONFORMITY AND WARRANTY INFORMATION.

EC DECLARATION OF CONFORMITY

In accordance with ISO IEC 17050-1 : 2010

Ref/conformity/declaration/issue4

We

Quintex Systems Ltd

of

40 Ivanhoe Road
Finchampstead
Berkshire
RG40 4QQ

Declare under our sole responsibility that the product described below

Brand and Model Name	**CHEETAH 3**
Equipment classification	**ENERGY CONTROL AND SAFETY SYSTEM FOR COMMERCIAL CATERING.**

is in conformity with the following standards

SUBJECT	STANDARD
Electromagnetic Compatibility	EN 61326-1:2006 (Class B Emission) EN 61326-1:2006 (Industrial Immunity levels) EN 61000-3-2:2006+A1+A2 (Harmonic Emissions) EN 61000-3-3:2008 (Voltage Fluctuations and Flicker) EN 301 489-7 V1.3.1 (GSM communication system)
Electrical Safety	EN 61010-1:2010
Radio Equipment	EN 301 511 V9.0.2

thereby meeting the essential requirements of Directive 2004/108 EC (the EMC Directive), Directive 2006/95 (the Low Voltage Directive) and Directive 1999/5/EC (Radio Equipment and Telecommunications Terminal Equipment).

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced Standards and meets all essential requirements of the EMC Directive, Low Voltage Directive and Radio Equipment and Telecommunication Terminal Equipment Directive.

Signed Dr J P Brooker BSc PhD *Signature* .....
Position R & D Manager
Location Finchampstead, England *Date* 8/11/13.....

WARRANTY INFORMATION:

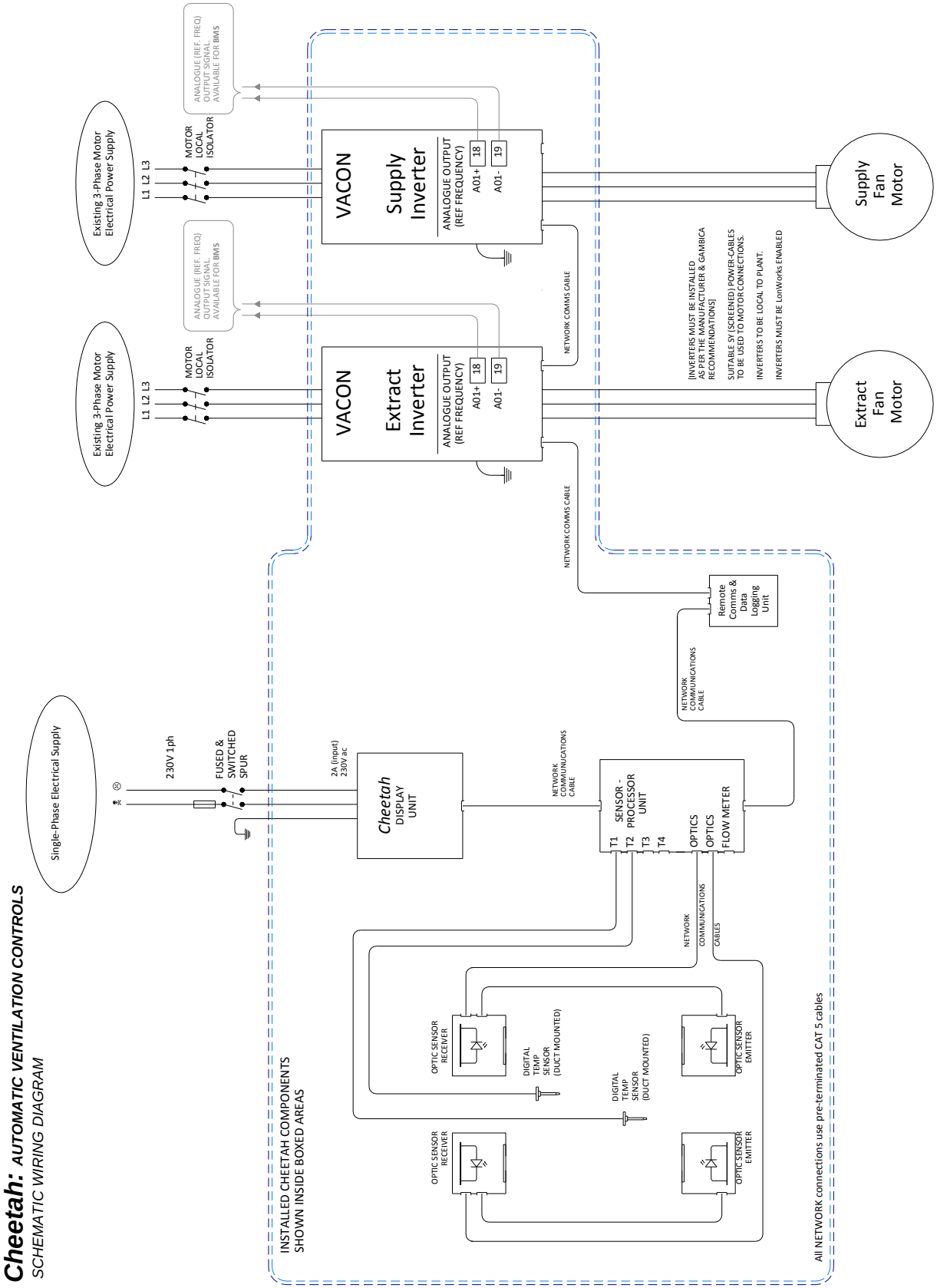
COMPONENTS OF THE CHEETAH SYSTEM (DISPLAY UNIT, SENSOR-PROCESSOR/S, OPTICAL SENSORS, TEMPERATURE SENSORS) HAVE A (12MONTH) ONE-YEAR WARRANTY FROM THE DATE OF INSTALLATION, FOR MANUFACTURE DEFECTS.

THE VACON FREQUENCY INVERTERS HAVE A (12MONTH) ONE-YEAR WARRANTY FROM THE DATE OF INSTALLATION.

MALICIOUS OR ACCIDENTAL DAMAGE OF ANY PARTS OF THE CHEETAH SYSTEM WILL INVALIDATE ANY WARRANTY CLAIMS.

PROTECTION COULD BE IMPAIRED IF THIS PRODUCT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER.

ELECTRICAL SCHEMATIC WIRING DIAGRAM



THE DIAGRAM SHOWS A BASIC CHEETAH SYSTEM WITH A SINGLE-SENSOR PROCESSOR, PLUS EXTRACT & SUPPLY VENTILATION FANS.