



Video Processor User Manual

Products covered by this manual



Document Reference

Viq602c

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Firmware

Viq004_5819

Viq006_5810

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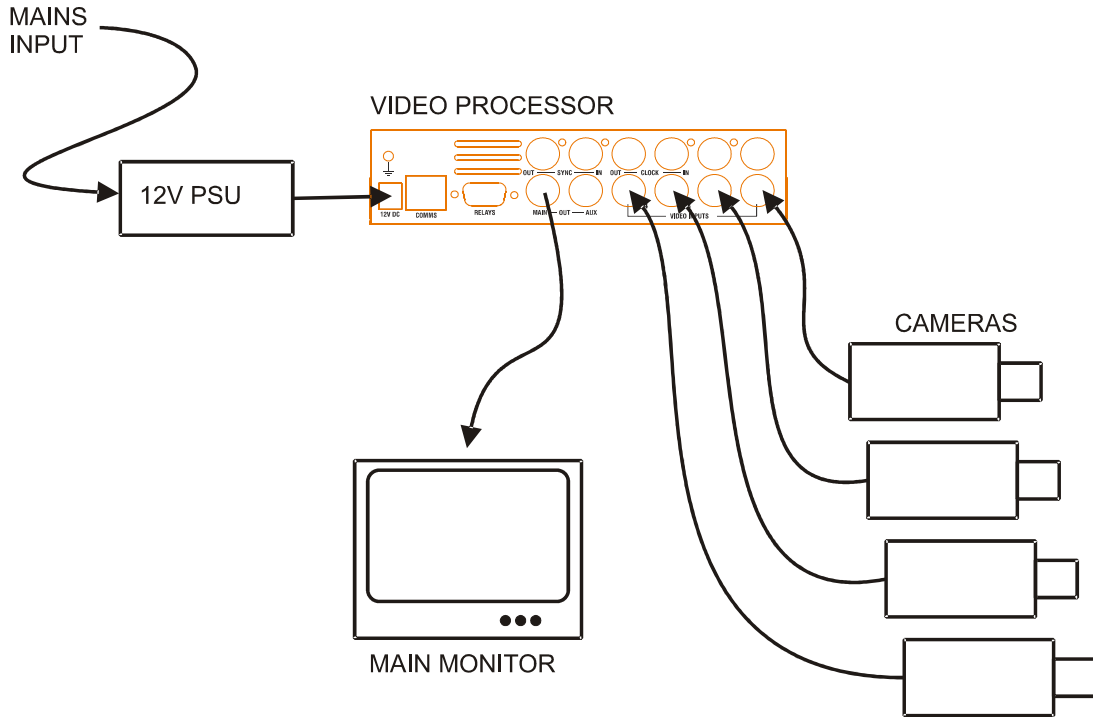
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1 Overview

- The Vi-Q4C3 is a quad video processor that accepts analogue video from up to four cameras or other video sources and combines them on a single video output.
- Each video input image can contribute to the composite real-time image on the analogue video output.
- The image from each input channel can be individually scaled, cropped, mirrored and positioned.
- Menus allow the user to configure the unit
- Configuration may also be uploaded and downloaded using a PC
- The Vi-Q4/C3 has fully user-programmable screen formats
- The Vi-Q4/C3 can be gen-locked from another Vi-Q4/C3
- The Vi-Q4/C3 has features specifically aimed at rail transport applications including special circuitry to monitor performance, alarm relays for reporting error conditions, rugged build standard for hostile environments.
- Video presence is displayed on front-panel LEDs and loss of video can trigger alarm relays (per channel) if required.
- Freeze detection hardware, that is independent of the main video processing path, monitors the system to ensure frozen or swapped images cannot be displayed should a malfunction occur within the unit.
- If polled RS485 communication is used, an alarm is invoked if communication is lost.
- Watchdog timers monitor the correct operation of the main processor and other hardware.
- Software updates may be installed via either the front-panel or rear-panel RS485 ports.

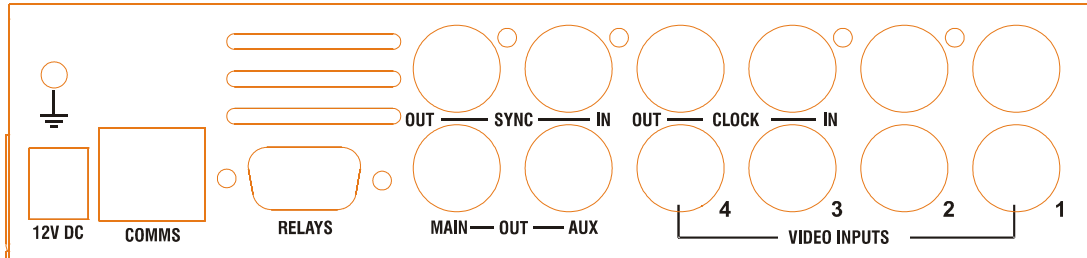
2 Connections and Indicators

2.1 Typical Configuration



2.2 Rear Panel

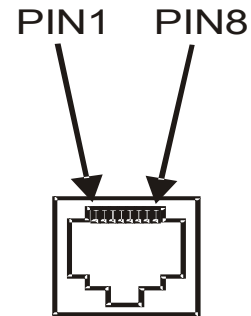
The rear panel connectors are detailed below and in subsequent pin-out tables:



Identification	Connector Type	Function
MAIN OUT	BNC	Multi-screen output
AUX OUT	BNC	Test output
1	BNC	Camera 1 Input
2	BNC	Camera 2 Input
3	BNC	Camera 3 Input
4	BNC	Camera 4 Input
SYNC OUT	BNC	Composite sync gen-lock output
SYNC IN	BNC	Composite sync gen-lock input
CLOCK OUT	BNC	54MHZ video processor clock gen-lock output
CLOCK IN	BNC	54MHZ video processor clock gen-lock input
COMMS	RJ45	RS485 port
12V	2.1mm Coax Power	12V DC Power input, 500mA
RELAYS	9-way Female D-type	Alarm relays contacts

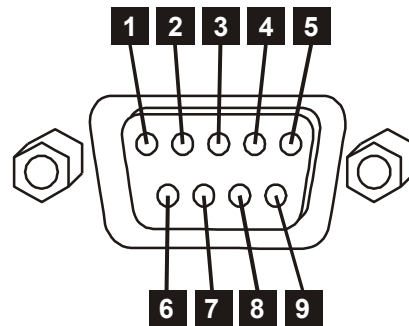
2.2.1 COMMS Port Pin-out

Pin	Function
1	RS485 Input+ (A)
2	RS485 Input- (B)
3	RS485 Output+ (A)
4	+12V output for Keyboard
5	GND
6	RS485 Output- (B)
7	Not used
8	Not used



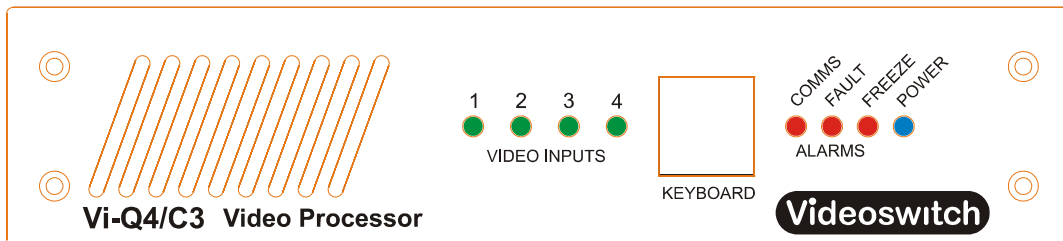
2.2.2 RELAYS Port Pin-out

Pin	Function
1	Alarm 1 – Video loss 1
2	Alarm 2 – Video loss 2
3	Alarm 3 – Video loss 3
4	Alarm 4 – Video loss 4
5	GND
6	Alarm 5 - System error alarm
7	Alarm 6 - Comms loss alarm
8	Relay Common
9	12V Input or output



2.3 Front Panel

The Vi-Q4C3 has LEDs on the a front panel with to indicate video status and alarm information. It also has a RS485 port for configuration and test purposes.

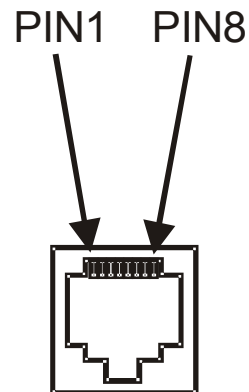


2.3.1 Indicator LEDS

LED	Function	Colour
1	Video Input 1 present	Green
2	Video Input 2 present	Green
3	Video Input 3 present	Green
4	Video Input 4 present	Green
COMMS	No commands received via COMMS port within programmed period	Red
FAULT	A system fault has been detected	Red
FREEZE	Freeze detected one or more camera images	Red
POWER	12V power is present	Blue









2.3.2 KEYBOARD Port Pin-out

Pin	Function
1	RS485 Input+ (A)
2	RS485 Input- (B)
3	RS485 Output+ (A)
4	+12V output for Keyboard
5	GND
6	RS485 Output- (B)
7	Not used
8	Not used



3 Menus

Menus are accessible using a Vi-K1000 keyboard plugged into the CONSOLE or COMMS port. They may also be accessed using a virtual keyboard included in the configuration manager application, Vi-SA2

Key name	Key legend	Action
MENU		Enter the menu system.
Up		Select the prior menu item or scroll a value when editing
Down		Select the next menu item or scroll a value when editing
Right		Go a level deeper into the menu or move cursor when editing
Left		Come out of a level in the menu or move cursor when editing
TAG		Set the default setting of a menu item
ESC		Escape from a menu level or from editing a value
LIVE		Leave menu completely. Any changes will be saved.

3.1 Login

Some parts of the menu are password protected. Enter the password here to gain access to the menu.

- Use **left** and **right** to move the cursor
- Use **up** and **down** to select the digits
- Use **left** or **ESC** to exit this menu item

A message on the screen will indicate if you have logged in successfully. A timer keeps you logged in while you are pressing keys. After a period of inactivity, you will be logged out. You may manually log out by changing the password to an invalid value (e.g. all zeros). The default user password is: 111111.

3.2 Installer

3.2.1 PTDI Enable/Disable

3.2.2 Normal Format

3.2.3 Reversed Format

3.2.4 Video Loss Mask

3.3 Display

3.3.1 Format

Prior to editing image positions or title positions, select the screen format that you wish to edit. If you select format 0, a colour bar test pattern is displayed.

3.3.2 Format Title

3.3.3 Image Metrics

- Use the **number** keys 1, 2, 3 and 4 to select the camera for which you wish to adjust the image position.
- Use the **up** and **down** keys to select which field you wish to edit
- Use the **left** and **right** keys to edit the number in the selected fields
- Use **DEFAULT** to restore the factory defaults of the selected screen format
- Repeat for other cameras
- Press **ESC** to exit this screen back to the menu

The image parameters that can be adjusted are:

Field	X range	Y range	Comments
Visible	YES or NO		Determines whether the camera image is displayed
Top Left	0 to 176	0 to 142	Position of the top-left corner of the displayed camera image
Bottom Right	0 to 176	0 to 142	Position of the bottom-right corner of the displayed camera image
Scale	0 to 255	0 to 255	The scale of the displayed image relative to the input image (255 represents 1:1)
Offset	0 to 176	0 to 142	The position in the input image that becomes the top-left of the display image.
Mirror	YES or NO	YES or NO	Set to YES if you want the image to be mirrored horizontally, vertically or both.

Note:

- The coordinate X=0, Y=0 represents the top-left of the image.
- X-coordinates refer to the horizontal, larger numbers being further to the right
- Y-coordinates refer to the vertical, larger numbers being further to the bottom

3.3.4 Title Positions

- Use the **number** keys 1, 2, 3 and 4 to select the camera for which you wish to adjust the image position.
- Use the number keys **9** and **0** to select the **Date/Time** and **Unit title**
- Use the **up**, **down**, **left** and **right** keys to move the selected title to the desired location on the screen.
- Note that the **down** key moves the title down by 8 steps whilst **up** moves it up by just 1 step. This arrangement allows fine control of the vertical position without requiring too many key presses.
- Use **DEFAULT** to restore the factory defaults of the selected screen format
- Repeat for other cameras
- Press **ESC** to exit this screen back to the menu

Field	X range	Y range
Camera Title	0 to 57	0 to 144
Unit Title	0 to 57	0 to 144
Date/Time	0 to 57	0 to 144

- The coordinate X=0, Y=0 represents the top-left of the image.
- X-coordinates refer to the horizontal, larger numbers being further to the right
- Y-coordinates refer to the vertical, larger numbers being further to the bottom

3.3.5 Selectable Formats

Screen formats may be selected from the keypad by pressing the **number** keys or the **left** and **right** keys. This menu option allows you to specify which formats you want to be able to select.

- Use left and right to move choose the format
- Use up and down to specify whether you want the format to be selectable from the keypad or not. A solid block indicates a format can be selected whereas a dash indicates that it cannot.

3.3.6 Colour Scheme

3.3.6.1 Text Background

You can choose whether the text is surrounded by a solid block of black or blue background colour or just a thin border (to ensure the text can be ready whatever the colour of the video image).

3.3.6.2 Image Borders

Each camera image may be surrounded by a black or white border, or no border.

3.3.6.3 Background

3.3.6.4 Video Loss

3.3.7 Titles

3.3.7.1 Unit Title

The Video Processor may be given a unit title that is displayed on the screen at all times.

- Use **left** and **right** to move the cursor
- Use **up** and **down** to select the character
- Use **DEFAULT** to default or clear the title

3.3.7.2 Camera1 Title

Each camera may be given a title that is displayed on the screen whenever that camera image is displayed.

- Use **left** and **right** to move the cursor
- Use **up** and **down** to select the character
- Use **DEFAULT** to default or clear the title

3.3.7.3 Camera2 Title

See above

3.3.7.4 Camera3 Title

See above

3.3.7.5 Camera4 Title

See above

- 3.3.8 Video Loss Messages
- 3.3.9 Luminance Peaking
- 3.3.10 Automatic Gain Control
- 3.3.11 Disable On-screen Text
- 3.3.12 Startup Screen Timeout

3.4 Alarms

3.4.1 Video Loss Mask

This mask determines which input are monitored for video loss.

- Use **left** and **right** to move the cursor
- Use **up** and **down** to select whether the input is to be monitored for video loss. A solid block indicates that monitoring is **ON**. A dash indicates that monitoring is **OFF**.
- Use **DEFAULT** to default the monitoring settings to all on or all off.

- 3.4.2 Relays Normally On
- 3.4.3 Reboot On Error
- 3.4.4 Reboot on Freeze
- 3.4.5 Max Reboots
- 3.4.6 Reboot Period

3.5 Options

- 3.5.1 Anti-Freeze
 - 3.5.1.1 Freeze Mode
 - 3.5.1.2 Freeze Metrics
 - 3.5.1.3 Freeze White Level
 - 3.5.1.4 Freeze Black Level
 - 3.5.1.5 Freeze Threshold
- 3.5.2 Train Data Interface
 - 3.5.2.1 TDI Line Number
 - 3.5.2.2 TDI Bits/Line
 - 3.5.2.3 TDI Default Data
 - 3.5.2.4 TDI White Level
- 3.5.3 Genlock
 - 3.5.3.1 Genlock Mode
 - 3.5.3.2 27MHz Clock Offset
 - 3.5.3.3 Line Offset
 - 3.5.3.4 Pixel Offset
- 3.5.4 Heartbeat Cursor
 - 3.5.4.1 Enable Cursor
 - 3.5.4.2 Cursor X

- 3.5.4.3 **Cursor Y**
- 3.5.4.4 **Flash Period(ms)**
- 3.5.4.5 **Cursor Background Colour**
- 3.5.5 **Command Timeout(ms)**

3.6 Config

3.6.1 Address

3.6.2 Text Size

3.6.3 Lock Keypad

If you do not want the user to be able to select screen formats or cameras, set this option to **YES**. To change screen format you now have to enter menu, enter password and change the screen format in the **Format** menu.

3.6.4 Password

3.6.4.1 **Installer Password**

3.6.4.2 **Super-user Password**

3.6.5 Auto Log-out time(secs)

3.6.6 Restore Factory Settings

Set this option to Yes if you want to default all settings including screen formats to the factory defaults.

4 Command Protocol

Both front and rear RS485 ports are capable of accepting and replying to commands. Replies are only sent to the port receiving the command.

Character format: 9600 baud, 1 start, 2 stop, no parity

Message format:

Start of message	Source address	Dest Address	Extended Data	Command	Parameter	End of Message
[SS	DD	XX..XX	CC	PP]

where

[start of message (5B)

SS source address

DD Vi-Q4/C3 address (0,1,2,3 etc or FF= broadcast)

XX.XX Extended data, 0 to 128 bytes depending on command

CC Command

PP Parameter

] end of message (5D)

Note that, except for start and end characters, all message content comprises pairs of hex-ascii characters.

4.1 RS485 Commands

Key:

VP Vi-Q4/C3 Video Processor

EXT External controller such as PTDI, keyboard, PC

SS Source address byte

DD Destination address byte

XX..XX Extended data bytes (0 to 128 bytes permitted). If representing an ASCII string, two hex numbers are used to encode each ASCII character within the string (e.g. "0123 " is coded as 30313233).

CC Command byte

PP Parameter byte

0xNN Hex number

Command Name	Command Originator	CC	PP	Description
Poll	EXT	0xBB	0x00 to 0xFF	This command should be send to the Video Processor (VP) regularly to hold off the COMMS alarm. The PP value must change (e.g. increment) each time the command is issued
Ack	VP	0xBA	0x00 to 0xFF	This command is send by the VP to acknowledge other commands. The source address is VP address, DD is a copy of the original command's source address,SS. This value can be used to identify the command instead of being a fixed source number. PP is the module 256 sum of all bytes in the original command.
Set screen format	EXT	0x10	0x11 0x17 0x80 to 0xA0	Set displayed screen format to previous number Set displayed screen format to next number Set displayed screen format to 0 to 32
Request configuration	EXT	0x43	0x02	This command will cause the VP to send its whole configuration as a series of Configuration Item commands
Configuration Item	VP	0x42	0x02	The extended data XX..XX in this reply command contains an ASCII string representing a menu configuration item and its value e.g. "Format=5"
Save configuration	EXT	0x42	0xE1	This commands causes the VP to save the entire configuration to non-volatile memory. The memory has a limited life-time of 1 Million write cycles (minimum), so this command should not be issued too frequently.
Log-in	EXT	0x46	0x00	The password represented as an ASCII string is passed as extended data, XX..XX. If a valid password is received, this enables subsequent access to the menu system.
Request Serial Number	EXT	0x43	0x51	Issuing this command to the VP results in a Serial Number reply command
Serial Number	VP	0x44	0x51	This reply command from the VP includes the serial number

Command Name	Command Originator	CC	PP	Description
				ASCII string in the extended data XX..XX.
Request temperature	EXT	0x43	0xE5	Issuing this command to the VP results in a Temperature reply command
Temperature	VP	0x44	0xE5	This reply command from the VP includes the Temperature ASCII string in the extended data XX..XX. Temperature is degrees Celsius.
Request Firmware Revision	EXT	0x43	0x31	Issuing this command to the VP results in a Firmware reply command
Firmware Revision	VP	0x44	0x31	This reply command from the VP includes the firmware revision ASCII string in the extended data XX..XX.
Set current format	EXT	0x42	0xE6	Set the currently displayed format. A single extended data byte XX selects the required format number 0x01 to 0x20
Set "Normal" format	EXT	0x42	0xE7	Set the format that is selected when in "Normal" state. A single extended data byte XX selects the required format number 0x01 to 0x20
Set "Reversed" format	EXT	0x42	0xE8	Set the format that is selected when in "Reversed" state. A single extended data byte XX selects the required format number 0x01 to 0x20
Set Normal or Reversed state	EXT	0x42	0xE9	Set "Normal" or "Reversed" state. A single extended data byte XX 0x00 for Normal and 0x01 for reversed.
Query current format	EXT	0x43	0xE6	Issuing this command to the VP results in a Current Format reply command
Query "Normal" format	EXT	0x43	0xE7	Issuing this command to the VP results in a Normal Format reply command
Query "Reversed" format	EXT	0x43	0xE8	Issuing this command to the VP results in a Reversed Format reply command
Query Normal or Reversed state	EXT	0x43	0xE9	Issuing this command to the VP results in a Normal or Reversed State reply command
Query Menu Mode	EXT	0x43	0xEA	Issuing this command to the VP results in a Menu Mode reply command
Current format	VP	0x44	0xE6	VP reports the current format. A single extended data byte XX identifies the format number 0x01 to 0x20
"Normal" format	VP	0x44	0xE7	VP reports the "Normal" format. A single extended data byte XX identifies the format number 0x01 to 0x20
Reversed" format	VP	0x44	0xE8	VP reports the "Reversed" format. A single extended data byte XX identifies the format number 0x01 to 0x20
Normal or Reversed state	VP	0x44	0xE9	VP reports the state. A single extended data byte XX identifies the "Normal" state as 0x00 or reversed state as

Command Name	Command Originator	CC	PP	Description
				0x01
Menu Mode	VP	0x44	0xEA	VP reports the menu mode. A single extended data byte XX identifies the menu off (normal operation) as 0x00 or Menu active as 0x01
MENU	EXT	0x01	0x00	Enter menu mode
Up	EXT	0x04	0x00	Navigate up
Down	EXT	0x05	0x00	Navigate down
Left	EXT	0x06	0x00	Navigate left
Right	EXT	0x07	0x00	Navigate right
Escape	EXT	0x03	0x00	Back one menu level
Default	EXT	0x0E	0x00	Default menu setting
Live	EXT	0x34	0x00	Exit menu
Function	EXT	0x64	0x00	Test function. Follow by one or more numbers 1-9, then an OK command
OK	EXT	0x02	0x00	OK comand
ASCII	EXT	0x63	0x00 to 0xFF	Send ASCII character, eg 0x30 to 0x39 for numbers 0 to 9
Baud	EXT	0x9D	Rate/ 1200	Set baud rate. Parameter CC is required baud rate divided by 1200. e.g. for 9600 CC would be 0x08
Upgrade	EXT	0x54		Enter upgrade mode. Extended data XX.XX must encode this ASCII string: Vi-Q4C3
Parse record	EXT	0x48		Extended data XX.XX block. Repeat until entire program image has been sent
Flash	EXT	0x49	0x00 to 0xff	Start flash process if CC matches checksum of downloaded firmware image data
Cancel upgrade	EXT	0x7A	0x00	Cancel flash program mode

5 Specifications

5.1 Default Screen Formats

Format Number	Screen Format Title	Description
1	VP IN1	Full screen, camera 1
2	VP IN2	Full screen, camera 2
3	VP IN3	Full screen, camera 3
4	VP IN4	Full screen, camera 4
5	LHV4	Vertical split, x4
6	LHV3	Vertical split, x3
7	LHV2	Vertical split, x2
8	RHV4	Vertical split, x4, Reversed
9	RHV3	Vertical split, x3, Reversed
10	RHV2	Vertical split, x2, Reversed
11	LHV4-M	Vertical split, x4
12	LHV3-M	Vertical split, x3
13	LHV2-M	Vertical split, x2
14	RHV4-M	Vertical split, x4, Reversed
15	RHV3-M	Vertical split, x3, Reversed
16	RHV2-M	Vertical split, x2, Reversed
17 to 32	Format 17 - 32	Programmable

All screen modes are fully programmable and may be edited by the user via the keypad or using the Vi-SA2 Configuration Manager software.

5.2 Video Processing

Camera inputs	4
Video format	PAL
Colour/Monochrome	Auto sense
Gain, Brightness, Colour	Auto
Resolution	720 x 576 pixels x 16.8 million colours

Hardware/Software	Embedded processor, proprietary Videoswitch software
Simultaneous processing	Scaling, cropping, pan,
Video inputs	0.5 to 1V pk-pk, 75 Ohms (switch able via menu), composite PAL (BNC),
Gen-lock sync output	This output may be used to gen-lock another video processor
Gen-lock sync Input	Connect this to the "sync output" of a master video processor to gen-lock to it
Gen-lock clock output	This output may be used to gen-lock another video processor
Gen-lock clock Input	Connect this to the "clock output" of a master video processor to gen-lock to it

5.3 Display

Main monitor output	Composite (BNC), 1V pk-pk composite PAL
Main monitor display modes	Full screen, quad, 2-way, 3-way and 4-way vertical and horizontal split with crop or squish. 2-way and 3-way picture in picture (PIP). Optional horizontal and/or vertical mirroring.
Titles	16 character titles for each camera and for unit, may be displayed anywhere on screen
Date and Time	May be displayed anywhere on screen

5.4 Control and Interface

Remote keyboard Inputs	RJ45, RS485, 9600-baud (1 start, 8 data, 1 stop) data	
Passwords	Protects menu and optionally keypad control	
Relays	Relays with volt-free contacts (x6):	
	Video present	
	System Fault	
	Comms loss alarm	
Relay Contact Rating:	24Vdc, 200mA max normally open or closed	
Watchdog timers	In the event of any unexpected condition, the system will automatically restart	
Status LEDs	Video inputs (x4)	Green video presence LEDs
	Comms Alarm	Red alarm warning LED
	Freeze Alarm	Red alarm warning LED
	System Alarm	Red alarm warning LED
	Power	Blue 12V power LED

5.5 Power, Physical & Environmental

Mains Power input	12V DC, 1Amp max
Temperature	5 to 35deg C (operating), -10 to 40deg C (storage)
Humidity	5 to 95% non-condensing
Dimensions/Weight (Unit)	210mm x 44mm x 180mm (WxHxD), 3kg
Dimensions/Weight (Boxed)	270mm x 102mm x 240mm (WxHxD), 4kg

5.6 Firmware & Logic Upgrades

Firmware upgrades Firmware upgrades may be applied using the Vi-SA2 configuration manager running on a PC with an USB-to-RS485 interface.

Firmware may also be updated using a Microchip ICD3 programming interface and Microchip MPLAB IPE (2.26 or later). Connect to the internal header marked "CPU".

Logic upgrades The programmable logic may be upgraded using an ALTERA USB Blaster and ALTERA Quartus II Web Edition (version 13 or later). Connect to the internal header marked "PLD".

5.7 Assembly Drawing

