Guardian VIP
User Manual

Rapid Deployable
Security System

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Change History

Version	Date	Change Summary	Author
v1.0	1/12/2015	Initial Draft	MB
v1.1	7/12/2015	Added Dimension Drawings	MB
v1.2	1/3/2016	Production System Update	MB
v1.3	2/3/2016	Reformatted	RE
v1.4	12/10/2016	Camera Viewer Updates	RE
v2.0	4/5/2017	Updates for Gen 2 System	RE
v2.1	3/4/2018	Viewer & Encoder Web Pages Updates	RE
v3.0	6/3/2019	Updates for Gen 3 System	RE
v3.1	21/2/2019	Default Addresses Updates	RE

About the User Manual

This user manual describes the operation of the Guardian VIP rapid deployable security system.

Initially, the user manual introduces the reader to the operation of the Guardian VIP system. This includes a description of the various components, a guide to their use and how to interface them all together, in order to produce a working system.

As part of this description, the system initialisation, hardware interfacing and the use of Software tools are described in detail.

The guide follows a step by step approach, describing the simple sequence in which the system needs to be configured to get the user up and running in the shortest possible time.

This is followed up with a description of the system in further detail, including the use of software support applications, technical specifications and component dimensions.

User Manual Part Number

The VE part number for this manual is **110-8664**.

Warranty and Support

All Visual Engineering products are supplied as standard with a 12 month 'Return to Base' warranty.

In the event of a suspected product failure, users should contact the Visual Engineering support team on the telephone number +44 (0) 1206 211842 or please email us at:

support@visualengineering.co.uk

Should the fault persist or if the support team are unable to resolve the fault, it may be necessary to return the equipment.

Equipment should only be returned using the RMA (Returns Management Authorisation) process. Users should contact the support team on the above number and request an RMA number.

Introduction to the Guardian VIP System

Guardian VIP is a rapid deployable wireless video security system. It has been designed for protecting travelling VIPs staying in hotels and apartments.

The wireless video camera nodes are designed to blend in with the surrounding environment, disguised as items commonly located in hotels and apartments. The camera nodes link back to an operator's console where all of the video feeds can be monitored.

At the core of the system is a digital MESH radio technology. The MESH radio allows video data to be exchanged in a fluid and self-healing method between the camera nodes within the system.

The system also records and raises alarms in the event of motion or light level changes. The central console can display video from up to 6 camera nodes and can support up to 4 triggers from each camera node.

The system also has a VIP panic buttons. Once a VIP presses a button it raises a high priority alarm back at the central monitoring console.

The system also has the ability to host a composite video input, so as to allow the integration of the hotel's in-house CCTV surveillance into the system.

All aspects of the system can be run on battery power. All batteries can be recharged from mains power in the Operator's Base Station.

The system is configurable to have different included components. A typical complete system will pack away into a single Peli Storm iM2300 case with a packed weight of 26kg.

A selection of different camera concealments are available on request.

The Guardian VIP system is available in a range of frequencies including:

- UHF: 390MHz
- LBand: 1 to 1.5GHz
- SBand: 2 to 2.5GHz

The Guardian VIP Kit

Kit Contents

The Guardian VIP system is completely configurable. This allows the customer to compile a system that meets their particular requirement.

The kit configurations shown on the right are examples of Peli flight cases packed with differing system configurations.

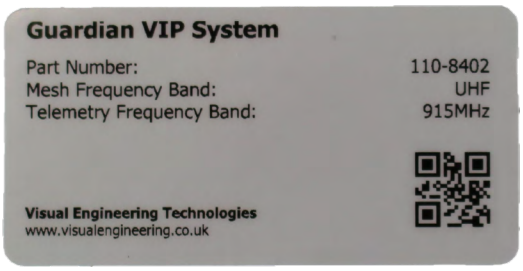
The systems can comprise of the following system components:

- PC or MacBook with PSU
- Operator's Base Station
- Relay Nodes
- CCTV Camera Nodes
- Battery Packs
- Dual Battery Packs
- Dummy Batteries
- Antennas
- Network Video Recorder
- Key Fob Panic Buttons
- Key Fob Charging Adaptor
- Base Station PSU
- Base Station to PC Ethernet Cable
- Relay Node RJ45 to Fischer Cable
- CCTV Dome Release Key
- Wall Mount Plates
- Adhesive Command Strips
- Peli Flight Case

Key Components

Part Numbers and Labels

All components of the Guardian VIP system have part numbers and QR code identification. These numbers should be quoted to Visual Engineering for fault reporting and re-ordering purposes.



The system is available in a number of frequency bands. Users should know which band they have before deploying the system, the frequency band of the system is shown on the part number label.

- UHF: 390MHz
- LBand: 1 to 1.5GHz
- SBand: 2 to 2.5GHz

Default IP Addresses

The Guardian VIP system uses Mesh radios to connect between the camera nodes and the Base Station. Additionally there is an IP encoder to accompany each Mesh radio.

Each of these devices has a default IP address, as detailed in the following table which describes a system with a Base Station, one Relay Node and three CCTV nodes.

Node	Mesh Radio IP	Video Encoder IP
Base Station	192.168.1.180	192.168.1.190
Relay Node 1	192.168.1.181	192.168.1.191
CCTV Node 2	192.168.1.182	192.168.1.192
CCTV Node 3	192.168.1.183	192.168.1.193
CCTV Node 4	192.168.1.184	192.168.1.194
CCTV Node 5	192.168.1.185	192.168.1.195

Both the Mesh Radio and the Video Encoders have a web browser built in.
Pointing a PC web browser to one of the above default IP addresses will display a web page that will allow the user to configure the device.
The description of how to configure the Mesh Radio and the Video Encoder is described in subsequent sections of this user guide.

Operator's Base Station

The Guardian VIP system is a Mesh camera system. Video from the system is received at the Base Station and displayed on the Operator's laptop. The first step in using the Guardian VIP system is to set up the Base Station and laptop.

Connecting the Base Station

Firstly, users should identify the Base Station and its antennas from the kit and connect all the antennas as shown below.

The RF A and RF B N-Types are for the Mesh radio connection.
The Telemetry antenna in the middle is for the Panic Alarm.

Once the antennas are connected to the Base Station, the power and Ethernet connections can be made.

The mains power supply for the Base Station is shown below.

Switching the Base Station on

The Base Station will default off when DC power is connected to the rear.
Users should always use the Base Station with DC connected. When the DC power is connected the Base Station will be able to charge the spare camera node batteries.

The Base Station has an internal UPS battery, this is capable of powering the unit without additional DC power into the rear. However, the internal battery should be saved for emergency UPS operation only. When running on internal UPS battery the Base Station cannot charge the spare camera node batteries.

To turn on the Base Station press and hold the button on the front for three seconds. The LEDs on the front panel should now be lit, as described below.

Base Station Front Panel LEDs

The Base Station has several LEDs that indicate the active state of the unit's various functions. Mains power, Mesh radio status, battery charging state and VIP panic alarm are described in the following table.

LED	On	Off
Power	External power is connected	External power is not connected
Status	Green - Connected to Mesh Amber - Not connected to Mesh	Base Station is switched off
Partial Battery	Battery is charging	Battery is fully charged or not inserted
Full Battery	Battery is fully charged	Battery is charging or not inserted
Alarm	When flashing the respective VIP panic alarm has been activated	

VIP Panic Alarm at the Base Station

Once the Operator's Base Station is switched on it is constantly listening for a panic message from the Key Fob VIP panic button. This operation is explained in a later section. If the panic button is pressed the Base Station will automatically sound an alarm and flash the respective alarm LED. This alarm can be cancelled by pressing and holding the button on the front panel until the alarm stops.

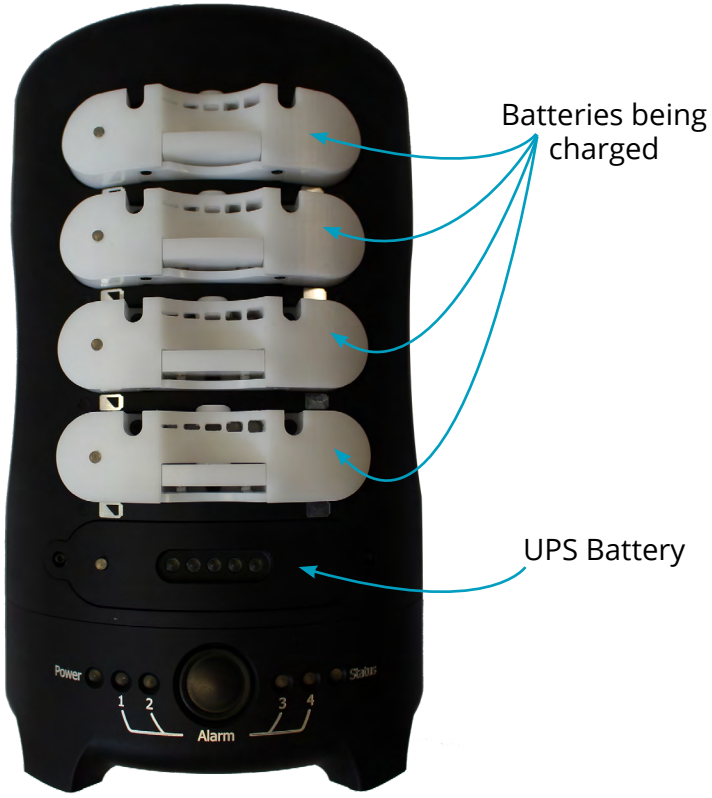
Switching the Base Station off

Regardless of whether the unit is running on mains power or UPS power the Base Station is switched off by pressing and holding the button on the front for four seconds, after which time any lit LEDs will be switched off, indicating that the unit has powered down.

If the DC supply is simply disconnected the unit will switch to the UPS battery backup supply. It will then be necessary to press the button for four seconds to fully power the unit down.

Battery Charging

The Base Station is used to charge the batteries. It has four charge locations arranged in a stack, as shown below.



Batteries are charged by sliding a battery into the charge location. The Base Station needs to have its DC power supply connected. Batteries should be slid into a charging position until they click in to place. They can be released by lifting the central tab of the battery.

The charge status of each battery is indicated on the Base Station's front panel LEDs. If the Partial Charge LED is lit the battery is charging. If the Full Battery LED is lit the battery is fully charged.

The UPS battery is intended for use when there is a temporary interruption in power supply.

A battery will take 2.5 hours charging time from being completely flat to being completely full.

Batteries

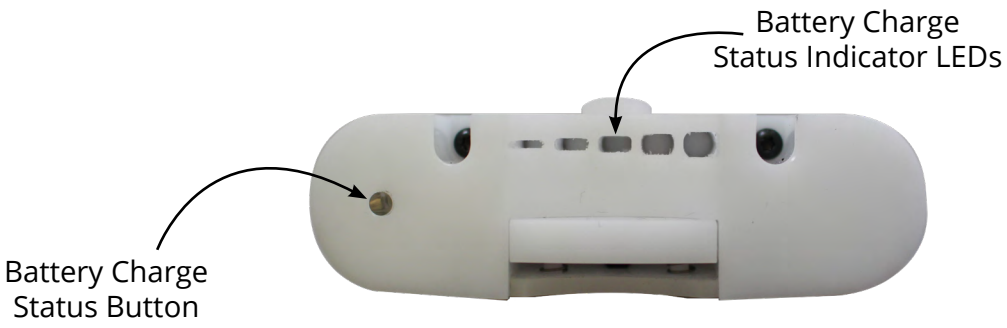
The batteries that are provided in the kit power both CCTV and Relay nodes. Operators need to ensure that sufficient batteries are charged before undertaking any operation. Guardian batteries are supplied with black or white end caps to match the camera housing colour. White end caps should be used for CCTV nodes, black end cap batteries should be used for Relay nodes.

Battery Specifications	
Capacity	3200mAH
Cell Configuration	4S1P
Charge Time	2.5 Hours
Voltage	Nominal 14.8v
Chemistry	Lithium Ion
Discharge Time	6 Hours

Battery Status

A Guardian VIP battery pack is equipped with a charge status indicator. This meter can show at a glance the remaining battery charge. To observe the battery status simply press the Status Button. The remaining charge in the battery is then briefly displayed on the Status Indicator LEDs. If all five LEDs are lit the battery holds a full charge. If only one LED is lit the battery holds a minimum charge.

The UPS battery in the Base Station has the same Status Charge Indicator, in the same way the Charge Status Button can be pressed to display the power level remaining in the Base Station whilst running on battery.



Dual Battery Pack

To extend the operating time of a battery powered node in a Guardian system it is possible to double the power available to a node by connecting it to the dual battery pack.

The dual battery pack is shown here. It accepts two standard Guardian battery packs and has a connector that can be interfaced via an extension cable to a dummy battery pack that is inserted in the node to be powered.

Dummy Battery Pack

In combination with the dual battery pack the dummy battery pack allows a Guardian node to be powered by two batteries simultaneously.

The dummy battery pack, as shown here, has the same size and shape as that of a standard battery pack but accepts the extension cable from the dual battery pack as its powered input.

Battery Extension Cables

The dual battery pack and the dummy battery are connected together using either a 1m or a 30cm extension cable.

The part numbers for the cables are described in the table on the right.

Battery Extension Cable Part Numbers	
1 metre	110-3400
30cm	110-3715

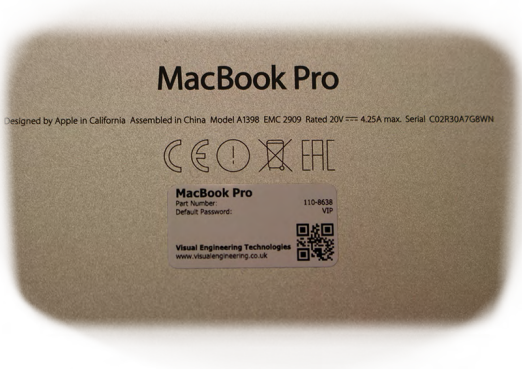
Laptop Configuration

The supplied Operator's laptop is either a MacBook or rugged PC, as shown.

For the MacBook plug the Ethernet adaptor into one of the Thunderbolt sockets on the side. Connect the RJ45 Ethernet cable from the Base Station to the laptop. Provide power to the laptop and switch on.

Logging in to the Operator's laptop

The Operator's laptop is password protected. The default password is noted on a sticker on the base of the laptop.



The default password is '**VIP**'.

When the laptop has fully booted, users can activate the VE Camera Viewer application by double clicking the icon labelled 'VE Camera Viewer'. See The VE Camera Viewer chapter for a full description of the software.

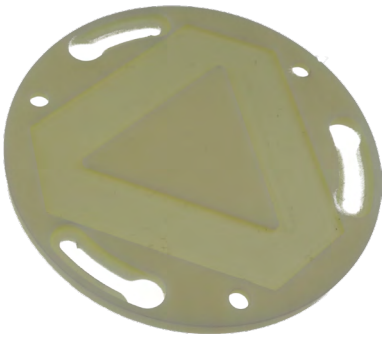
CCTV Nodes

The Guardian VIP system contains CCTV style wireless camera dome concealment nodes, as shown here.

Each node contains a digital wireless Mesh radio, a camera, antennas and a battery. Each node is capable of motion detection and light level triggers.

Installing a CCTV Node

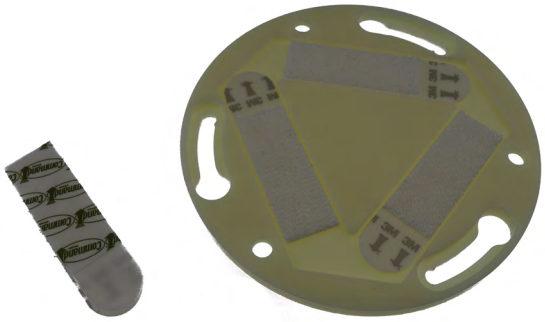
The CCTV camera dome concealments are designed to be hung from the ceiling using adhesive strips known as 'Command Strips'.



Each CCTV concealment comes with a mounting plate that can be attached to the ceiling. The plate can be screwed to the ceiling using the screw holes provided.
It can also be stuck to the ceiling using Command Strips. Command Strips can be easily removed after use, ensuring a damage free deployment.
The mounting plate and Command Strips are shown here.

Users should be careful to follow the instructions when fixing the mounting plate.
These instructions can be found on the rear of the box, as shown here.

Command Strips should be applied to the plate in three strips as shown to the right.



Once the mounting plate is firmly stuck, the camera can be hung from the plate by aligning the mounting lugs to the holes in the plate and applying a twist lock action, as shown in the images below.

Camera offered to plate, lugs aligned to mount.

Twist camera and lock it to the plate.

Installing a Battery into the CCTV node

With the camera dome firmly attached to the ceiling, it is ready to be activated by installing a charged battery. There is no additional on/off switch to activate the camera node.
The battery is inserted into the battery slot of the camera, as shown below. Press the battery until it locks into place. The battery can be released by a lifting the central tab. The battery will then pop out of the camera dome.

Battery Partially Inserted

Battery Pressed Home

CCTV Node Positioning

The Camera Dome Node contains a high definition camera that can be manually positioned onto a target. The camera has manual settings for pan and tilt control.

Removing the CCTV Node Housing

The camera is accessed by first removing the smoked glass dome. The dome is removed by inserting the dome release key into the slot on the dome rim, marked with an arrow.
If the dome is ceiling mounted whilst doing this, the dome should be held to prevent it falling and being damaged.

Now that the smoked glass dome has been removed the internal black plastic dome will be revealed, as shown below left. The black plastic dome housing should now be removed by unclipping it to expose the camera, below right.

External dome removed

Black plastic dome removed

Manually Adjusting the Camera Pan and Tilt

With the domes removed the camera can now be accessed.

It can be manually adjusted horizontally for pan and tilted vertically by gently turning and tilting the camera onto the desired target. The camera will hold its position once released.

The camera supports auto focus. Zoom can be controlled using the zoom control panel in the [The VE Camera Viewer]

Relay Node

The Relay Node can incorporate a camera or run as just a radio relay within the system. The Relay Node with a SWZ HD camera connected is shown on the right.

The Relay Node incorporates a digital Mesh radio and a battery in a single deployable unit.

The SWZ HD camera shown here produces an IP encoded video stream, it has a motorised pan and tilt action and supports a zoom setting through the switching of the video between three discrete cameras. This offers an effective 10x zoom. All PTZ functions can be controlled remotely by the software running on the Operator's laptop.

The flexibility the Relay Node offers together with its high gain antennas make it ideal for extending the peripheral working range of the Guardian VIP security system.

Relay Node Antenna Assembly

Users should install the two straight N-Type antennas onto the Relay Node, as pictured

Relay Node Connections

The Relay Node has an integrated standard tripod 1/4"-20 screw fixing, this allows cameras such as the SWZ or SWZ HD to be mounted directly.

The node has a Fischer type plug which allows the SWZ HD camera to be directly connected, using the cable provided in the kit. The connector provides all of the camera's power and Ethernet interface requirements.

If the Relay Node is used without a SWZ HD camera the RJ45 to Fischer Interface Cable, as shown below can be used to connect the Relay Node to any chosen network device.

RJ45 to Fischer
Interface Cable

Installing a Battery into the Relay Node

With the antennas installed and the Fischer cable connected the Relay Node is now ready to receive a battery. Installing a charged battery will automatically activate the Relay node. There is no additional on/off switch.

The battery is inserted into the battery slot as shown on the right. Press the battery until it locks into position.

The battery can be released by lifting the central tab. The battery will then pop out. The batteries for the Relay Node have black end caps to match the node housing.

In the images shown here a Dummy Battery Pack is used, this allows the node to be connected to the Dual Battery Pack.

Battery partially inserted

Battery fully inserted

Powering a Node with the Dual Battery Pack

All node types can have their battery operation time doubled by using the Dual Battery Pack in conjunction with the Dummy Battery Pack. The CCTV node shown on the right shows this in use.

Depending upon the deployment the user can decide whether to use the 1metre or the 30cm extension cable to connect the node to the Dual Battery Pack.

The node will be powered once the Dummy Battery Pack is inserted into the node and the cable is connected between the node and the Dual Battery Pack, there is no additional on/off switch.

VIP Panic Button

The Guardian VIP kit is supplied with VIP Key Fob panic buttons, as shown here.

A VIP pressing a Key Fob panic button will cause an audible alarm and the respective alarm LED to flash on the Operator's Base Station.

The Key fob panic button operates on a separate frequency to the rest of the Guardian system. Its signal is received through the central antenna at the Base Station.

Charging the Key Fob VIP Panic Button

The Key Fob VIP Panic button contains a battery and should be charged in advance of operations.

Charging is achieved by connecting the Key Fob to a mini USB charge adaptor.

The USB adaptor is then connected to a USB port on the Operator's laptop.

Once the Key Fob is attached to the USB power the LEDs in the Key Fob will flash to indicate a charging sequence.

The battery takes two hours to charge and once charged will operate for two weeks.

Activating the Key Fob VIP Panic Button

Pressing the red button on the Key Fob when in range of the Operator's Base Station will cause an audible alarm to sound at the Base Station. Additionally, the respective alarm LED on the Base Station will flash. The LEDs on the Key Fob will also flash an alarm sequence indicating that the alarm has been activated by the VIP.

The alarm status can be cleared by pressing the green button on the Base Station until the alarm stops. This will also stop the LEDs flashing on the Key Fob.

The Key Fob VIP Panic button has a typical range of 500m non line of sight.

Network Video Recorder

Certain customer system configurations may include the requirement for a Network Video Recorder, similar to the one pictured below.

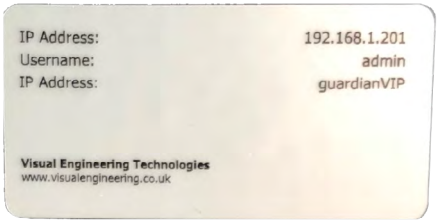
The NVR should be powered with the cable supplied in the kit. The NVR should also be connected with the supplied Ethernet cable to the Base Station using one of its spare RJ45 sockets.

Web browsing and control of the NVR is achieved by directing the Operator's laptop to the IP address of the NVR which is detailed on the under side of the unit.

Users should refer to the NVR manufacturers information for a description of how to use and configure the chosen NVR.

To login to the NVR point the Operator's laptop web browser to the NVR's default IP address, this information together with the Username and password are detailed on the label on the rear of the unit.

- IP Address **192.168.1.201**
- Username: **admin**
- Password: **guardianVIP**



The VE Camera Viewer

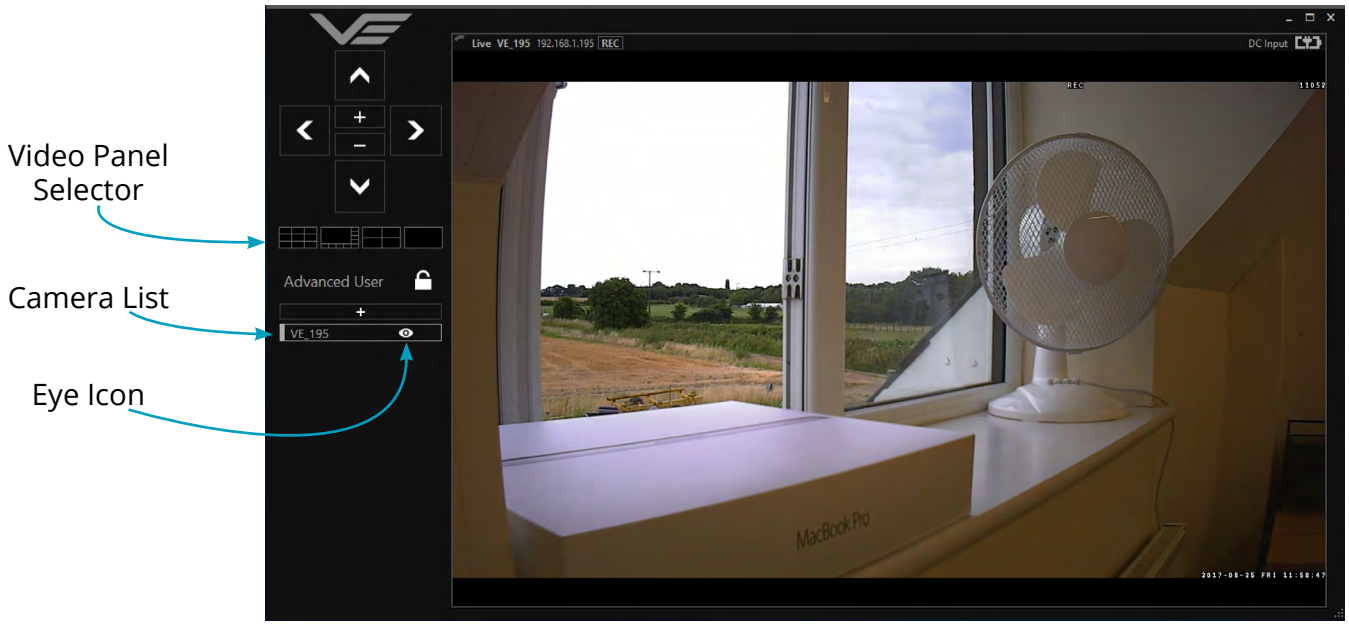
The VE Camera Viewer is a software application used to display the video from all cameras in the system. It will auto detect any VE cameras that are on the network and populate a list on the left hand side of the player.

The VE Camera Viewer software can be downloaded from the VE website support page or from the memory stick provided in the kit.

www.visualengineering.co.uk/supportdownload/26

Viewing Video

The VE Camera Viewer is intuitive and simple to use. Any camera on the network will be displayed in a list on the left hand side of the player. The video can be viewed by clicking the “Eye Icon” next to the camera’s name. The video panel selector can be used to select how the video panels are arranged, this is useful when several video feeds are in the system.



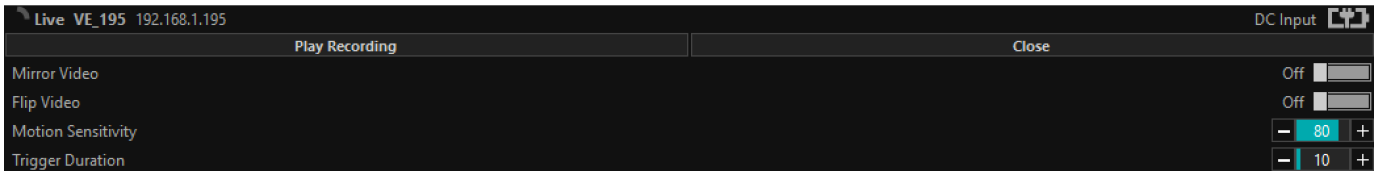
Video Panel Options

The top of the video panel displays information on the playback mode of the displayed video. In the above instance the video playback is a Live stream, it can also be noted that the camera is currently recording since the REC icon is shown. Since the HD IP camera does not contain an integrated battery the power source will be displayed as a DC input.

If the mouse is hovered between the video panel and the above information the player will offer the user the option to enter Settings or Play a Recording.

Settings

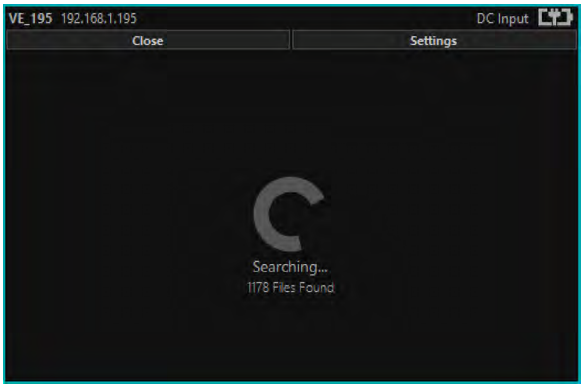
Under Settings the user can flip or mirror the video feed.
The Motion Sensitivity can also be set to a value between 0 to 100. A value of 0 sets the motion trigger to off, a value of 100 sets the motion to maximum sensitivity.
The Trigger Duration sets the duration of the audible tone and the red trigger icon displayed in the player.



Play Recordings

If the Play Recording option is highlighted and selected as shown below the player will allow the user to select a recording to playback.

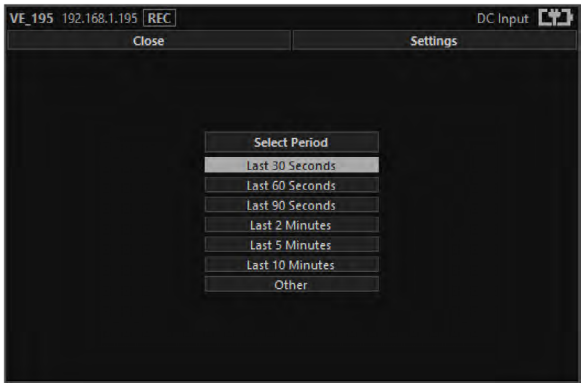
The player will find all available files that are stored on the SD card in the camera. The update screen as shown on the right will be displayed until all files are discovered.



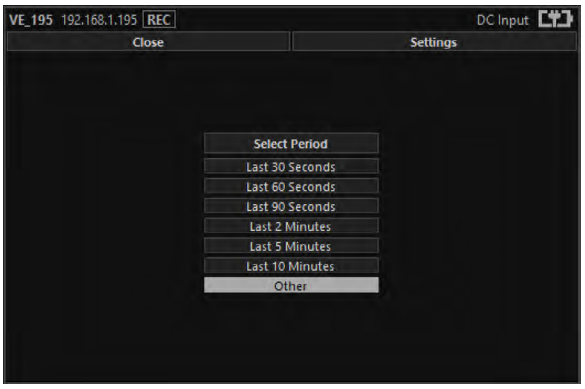
Users can then select a segment of recorded video to be played back from memory. Options are from 30 seconds to 10 minutes.

The full range of download periods is only available in advanced mode.

To access the advanced mode the user needs to hold keyboard keys “a”, “d”, and “v” then click on the padlock icon next to the Advanced User text.

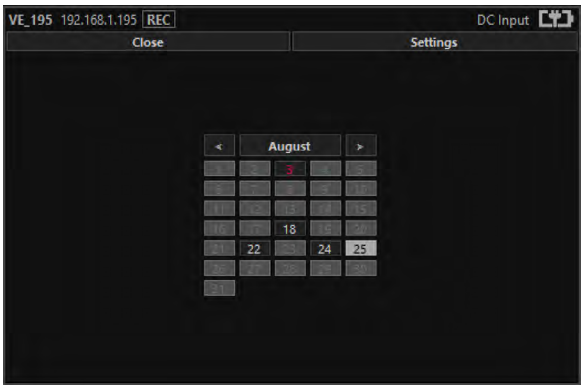


Select “Other” to choose a specific period of timed recording.



Select the required month, months that don’t hold recordings are greyed out.

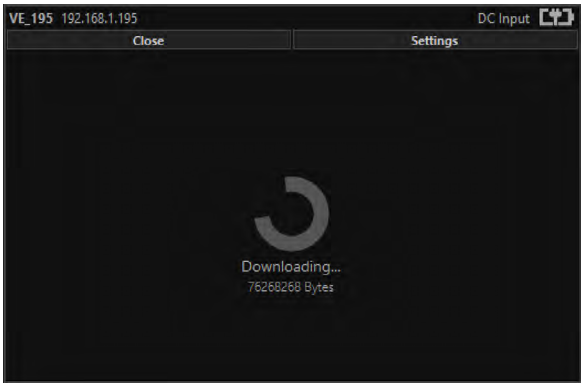
Select the required date, days that don’t hold recordings are greyed out.



Select the required hour of day, hours that don’t hold recordings are greyed out.

Select the required start and end time from the time dial. Press the play icon.

The files will then be downloaded, after which time the video recording can be viewed in the video panel.



Video Panel Coloured Border

The video panel is edged in a colour, the meaning of which is described in the following table.

Video Panel Edge Colour	Meaning
Red	A trigger alarm has occurred
Blue	This panel is selected for Pan Tilt Zoom Control
Grey	No trigger alarms & not selected for PTZ Control

Trigger Alarms

The trigger alarms are enabled either via the player or the web interface. Once a trigger event occurs it will be displayed and sounded in the player. The video panel will have a red edge border and an icon will be shown in the bottom left corner. The trigger icon is either a motion trigger, a low to high light level change or an external trigger as described in the table below.

Alarm Symbol	Trigger Source
	A low to high light level transition has been detected.
	Motion has been detected in the video.
	An external alarm on input 1 has been detected.
	An external alarm on input 2 has been detected.

Pan, Tilt & Zoom Operation

Only Relay Nodes with PTZ cameras attached support remote control Pan, Tilt and Zoom.

The node the user wishes to control remotely should be selected by clicking on the node's video panel. This will result in the video panel and the node identifier being edged in blue.

In the example on the right, the CCTV Node 2 has been selected for PTZ control. CCTV nodes only have zoom control, pan and tilt control is achieved manually.

The PTZ control panel has the following control buttons:

- Pan Control: left & right arrows
- Tilt Control: up & down arrows
- Zoom in: + symbol
- Zoom out: - symbol

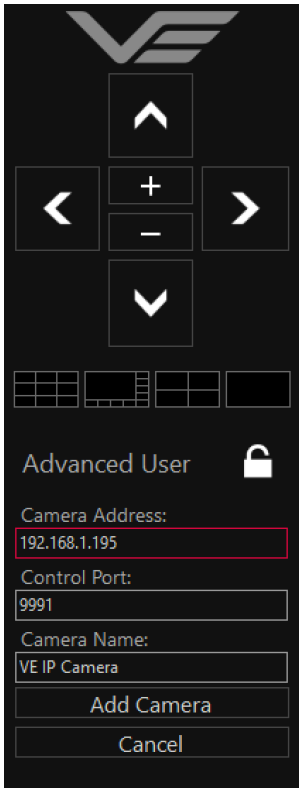
Manually Add & Delete a Camera Node

It is possible to manually add a node to the player. This is an alternative to the player automatically finding nodes on the network.

To manually add a node click the + button.

It is then possible to input an IP address, together with the control port, the default for the camera nodes is 9991.

Following this add a name for the camera and click 'Add Camera'



Occasionally it may be necessary to delete a camera node from the list. This may be because it has been removed from the network but is still allocated in the node identifier list.

Click on the node identifier and the trash icon to do this.

It isn't possible to delete a node that has been automatically added and is streaming video to a video panel. If the node has been manually allocated it can be deleted at any time.

Advanced Functions

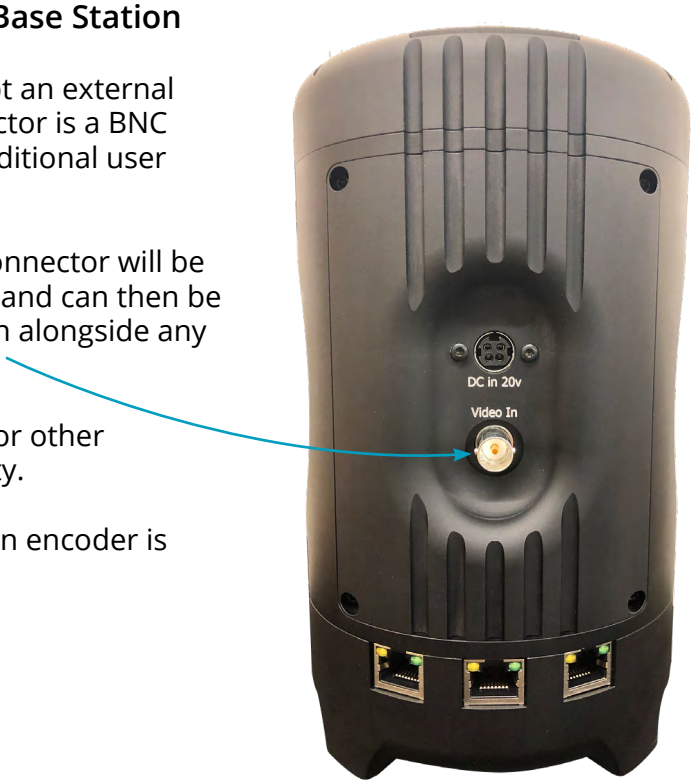
Connecting External Video into the Base Station

The Base Station has the facility to accept an external video in at the rear. The 'Video In' connector is a BNC female. This allows the connection of additional user cameras or any PAL video source.

Video sources presented on the video connector will be encoded to IP using an internal encoder and can then be played on the Camera Viewer Application alongside any other video sources.

Users may wish to integrate hotel CCTV or other cameras into the system using this facility.

The default IP address of the Base Station encoder is 192.168.1.190



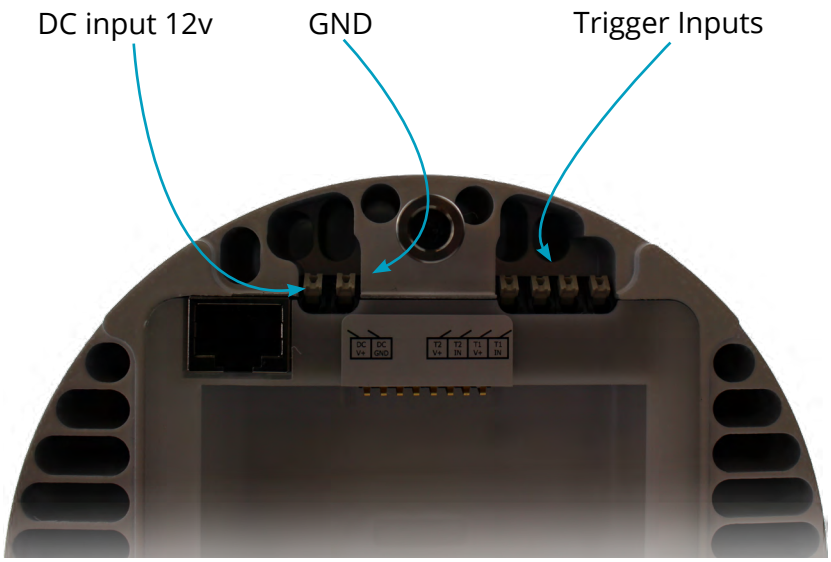
Connecting External DC and Triggers to the CCTV nodes

The camera nodes and Relay Nodes can be powered from an external DC source. This feature may be useful if longer deployments are required.

The CCTV Node can be powered from DC by connecting a 12V signal with a 1A capacity to the connector on the base of the CCTV camera dome node, as shown here.

Nodes can also accept external trigger inputs. These should be wired as described by the label on the base. External triggers are closed contact type, so that they trigger once the two contacts are connected together.

External trigger events will be displayed on the [The VE Camera Viewer]



Web Interface & Configuration

The following web browser control interface is not required for normal operation.

Web browser control of the Mesh radios should only be undertaken by users wishing to achieve the following:

- Change the system frequency
- Change the system IP addresses
- Change the Encryption key
- Understand the RF performance of the system better

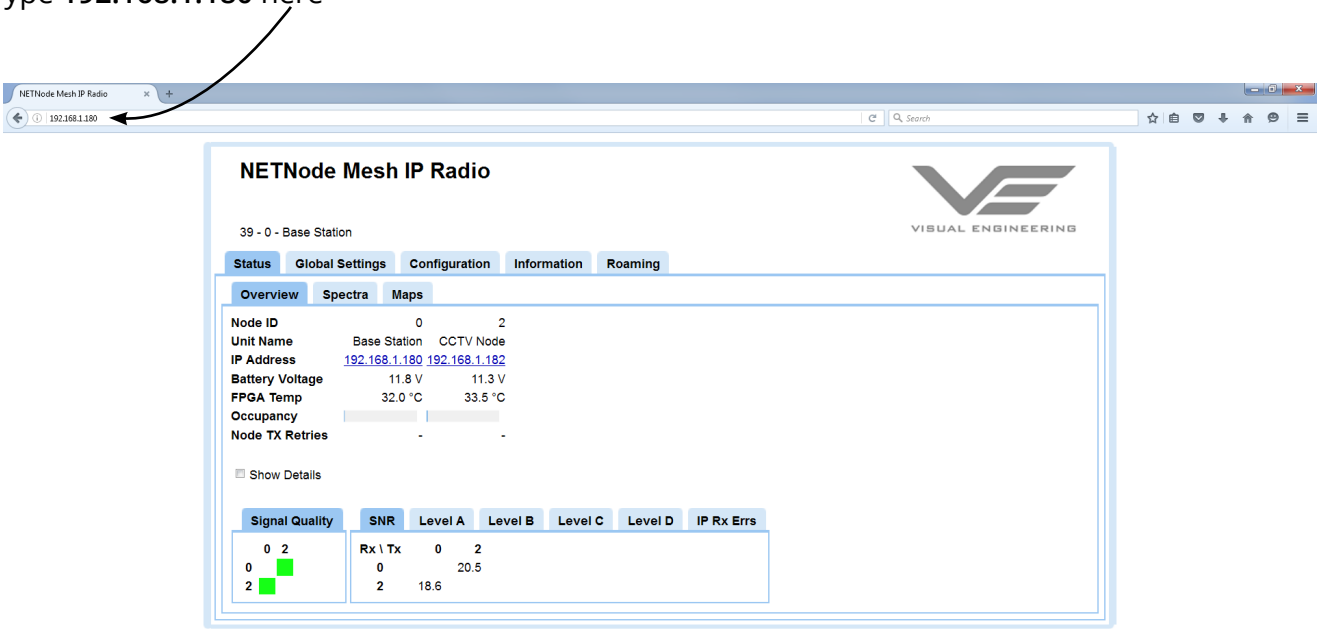
Users should be very careful when using this interface because it is entirely possible to make changes that will leave the system inoperable, requiring the system to be returned to base for repair.

Activating the Web Interface

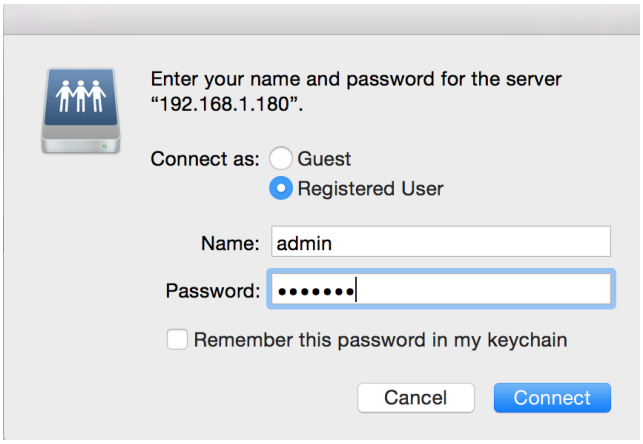
Power up the Base Station and a camera node and ensure that the Status LED on the front panel of the Base Station is green, indicating RF system lock.

- Open a web browser on the PC
- Type the Node IP address of the Base Station Mesh node, e.g. **192.168.1.180**
- The web browser opens the **Status** → **Overview** page following a **Login Prompt**

Type **192.168.1.180** here



Login Prompt

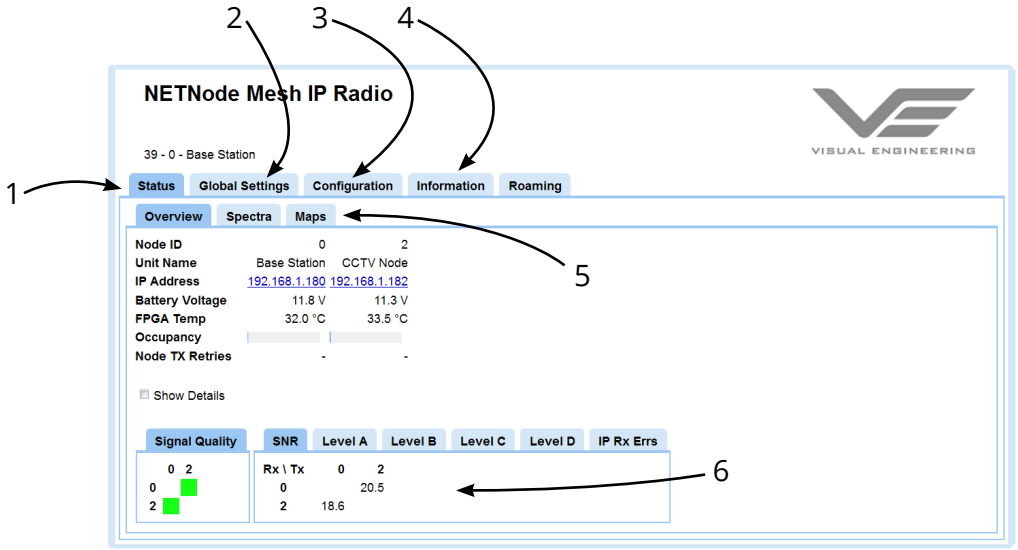


- Authentication is required to connect
- By default, the Name is **admin**
- By default the Password is **meshweb**
- Click the Connect button

Once logged in to the Guardian VIP system the user can begin configuring it to suit.

The Main Window

This is the main entry point for the RF configuration of the Guardian system. The following six parameters are explained in the table that follows.

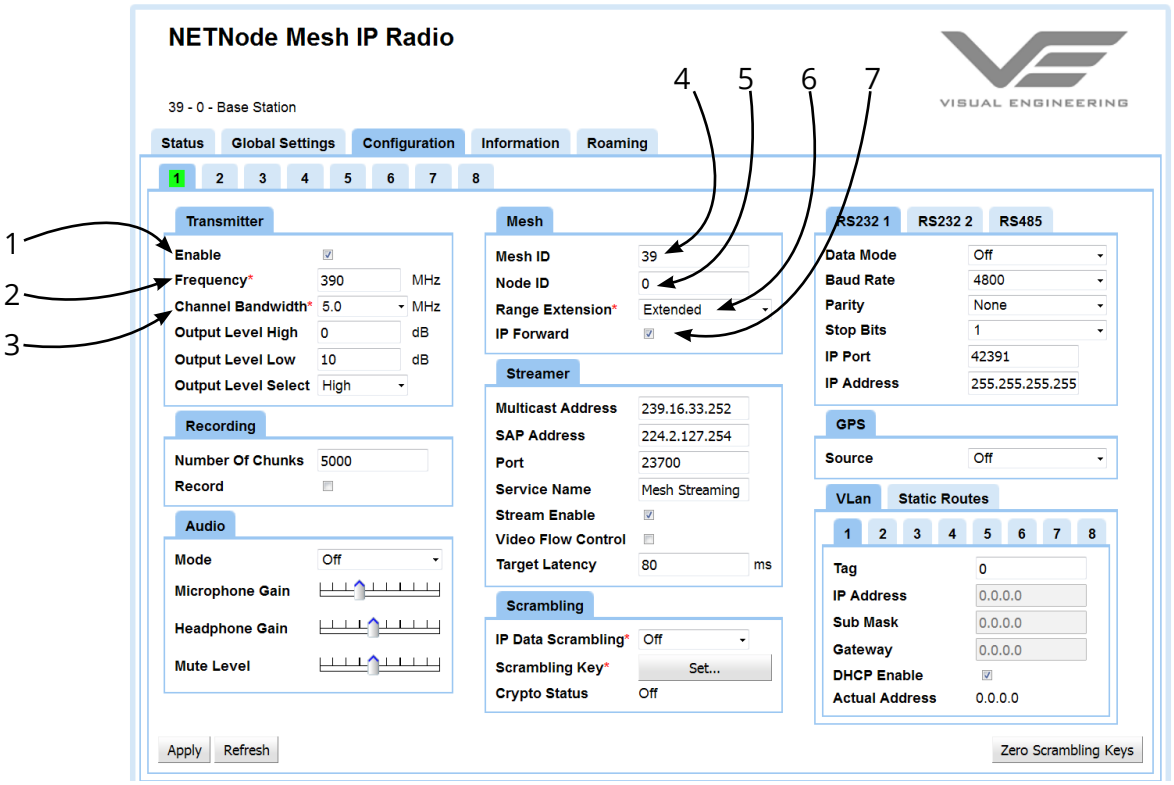


Item	Description
1 Status tab	Divided into Overview, Spectra and Maps sub-tabs. This displays detailed status information of received signal quality, battery and mapping information.
2 Global Settings tab	Divided into Main, Ethernet Ports and Interlink Mode panes. The Set Clock, Format File system, Restore Defaults and Password buttons are found here.
3 Configuration tab	Divided into Transmitter, Recording, Audio, Mesh, Streamer, RS232, GPS, Scrambling and VLAN panes. The Configuration tab contains the list of 8 presets. In each preset the user can specify demodulation parameters, decoding modes, and descrambling.
4 Information tab	Contains information including software versions and unit specific data. This information is of use during a support call.
5 Sub-Tabs	Simply enables the user to break down information from a tab.
6 SNR Pane	The tabs and sub-tabs are broken down into panes of information. In the above example it refers to Signal to Noise ratios.

Basic Settings

This explains how to configure a Mesh so that the user can start to explore what can be done with a Mesh network. These basic settings are set to appropriate default values in a Guardian VIP system.

There are only seven things to configure to form a Mesh network. Choose the configuration tab and set up these seven options.

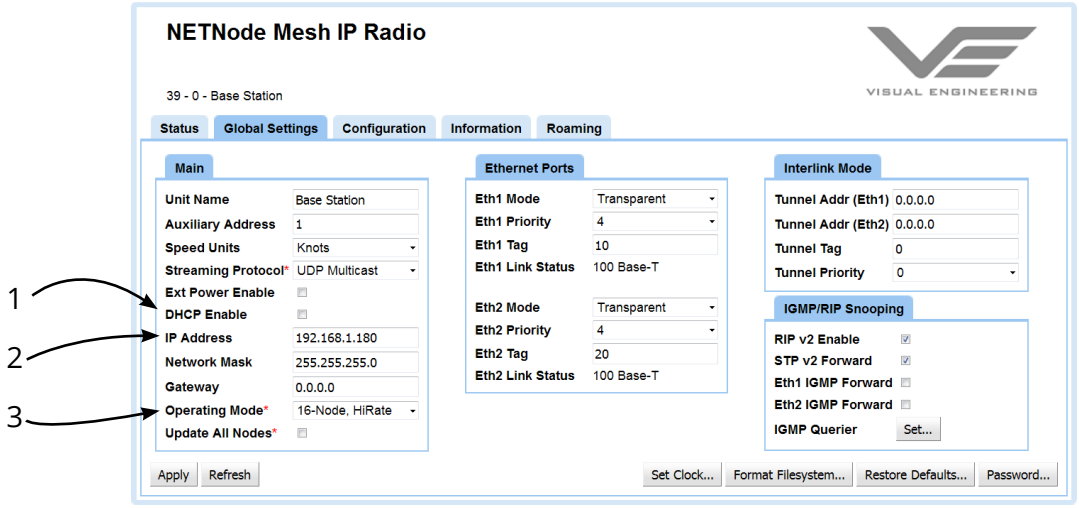


Item	Description
1 Enable	Place a check in this box to switch the transmitter on.
2 Frequency	Type in the frequency required for use in the Mesh. This must be the same on all units (see configuration defaults earlier).
3 Channel Bandwidth	Select the required bandwidth to use for the Mesh from the drop-down list. This must be the same on all units. This is normally set to 5MHz. Lower bandwidths will give extra range but will reduce capacity.
4 Mesh ID	Type in the required Mesh ID. This must be the same on all units in the Mesh network. The Mesh ID tells the unit which Mesh it belongs to. All nodes are defaulted to Mesh ID 101.
5 Node ID	Type in a Node ID for each node in the Mesh. The node ID must be unique and can only be 0 to 15 for a sixteen node Mesh system. Note: A node may automatically reassign its node ID at power up if it finds a conflict with an existing node.
6 Range Extension	Select 'Extended' on all nodes for increased range of performance. This will reduce the bandwidth slightly.
7 IP Forward	Check this box to switch the IP forwarding on.

Note: Remember to click the **Apply** button to save any changes.

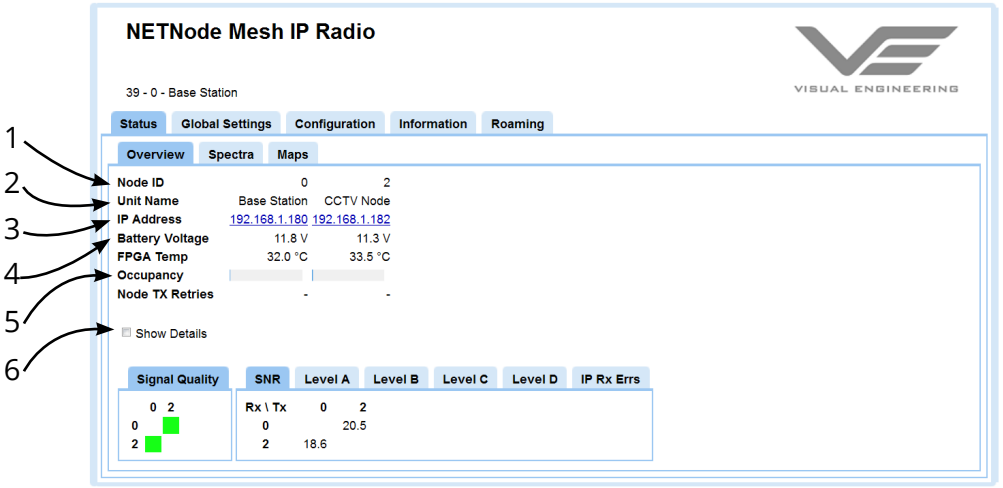
The Global Settings Tab

Global settings are applied to the unit generally and occur in all eight configurations.



Item	Description
1 DHCP Enable	Check this box if you need the Guardian VIP to obtain its IP address remotely from a DHCP server.
2 IP Address	Complete this box to give the Guardian VIP a fixed IP address when DHCP is not used, it is not used by default.
3 Operating Mode	This should be set the same for every node in the Mesh and is defaulted to '16 node HiRate'.

The Status Tab

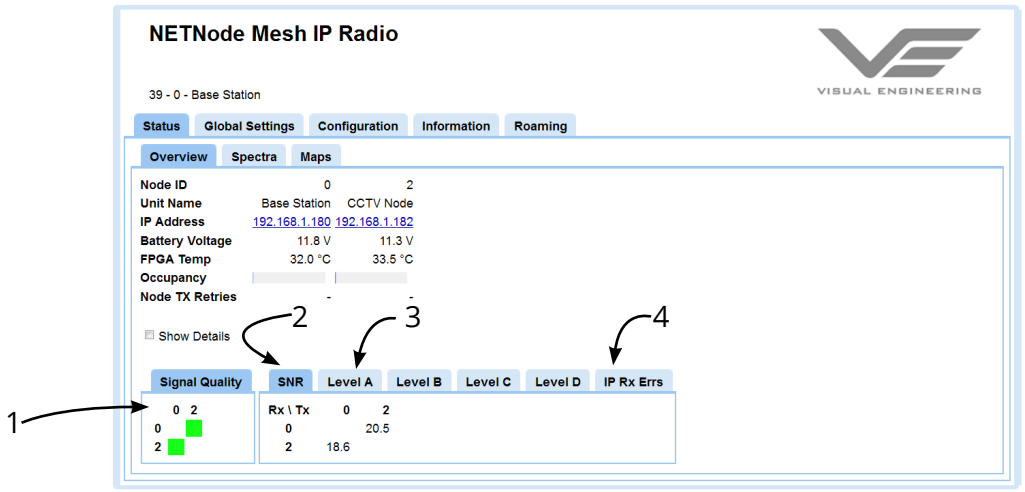


This displays detailed status information of received signal quality and enables navigation between nodes. The Status tab is divided into three sub-tabs:

- **Overview**
- **Spectra**
- **Maps**

Item	Options	Notes
1 Node ID	0 to 11 or 0 to 15	We are showing two Node IDs, 1 and 2. There could be up to sixteen nodes in a Mesh, numbered 0 to 15.
2 Unit Name	Up to 12 alphanu-meric characters can be used for the Unit Name	The Unit Name is a friendly name to make it easier to identify each camera node. This name is assigned in the Global Settings Tab.
3 IP Address	192.168.1.180 for example	This shows the IP address of the unit that we set up in our initial configuration. Notice that it is shown as a hyper-link. If you click on one of these hyper-links the browser will switch to that node.
4 Battery Voltage	0 to 16v	This returns the current input voltage of the node. The voltage should show approximately 12v.
5 Occupancy	Blue and Orange Bars	The blue bar gives a visual indication of the volume of data generated by this node. An orange bar gives a visual indication of the volume of data passing through.
6 Show Details	Check box	Displays network information about IP packets etc.

The Status - Overview Tab



1. Signal Quality

This gives a simple picture of the signal quality around the Mesh system. Ideally, it would have steady green boxes for all links. Naturally, mobile units will go out of range or interference will cause a unit to degrade for a while.
The clever thing is the Mesh will find a new routing and heal itself when it can, so keeping the network on air.

Here's what the colours mean:

Colour	Meaning
Green	16 QAM mode – maximum data rate
Amber	QPSK mode – reduced data rate
Red	BPSK – lowest data rate passing between nodes
White	Link broken or not configured

2. SNR Pane

This pane shows the Signal to Noise Ratios for each of the nodes. Typically SNRs > 15 is very good, 8 to 14 is good, 7 or less is starting to get low.

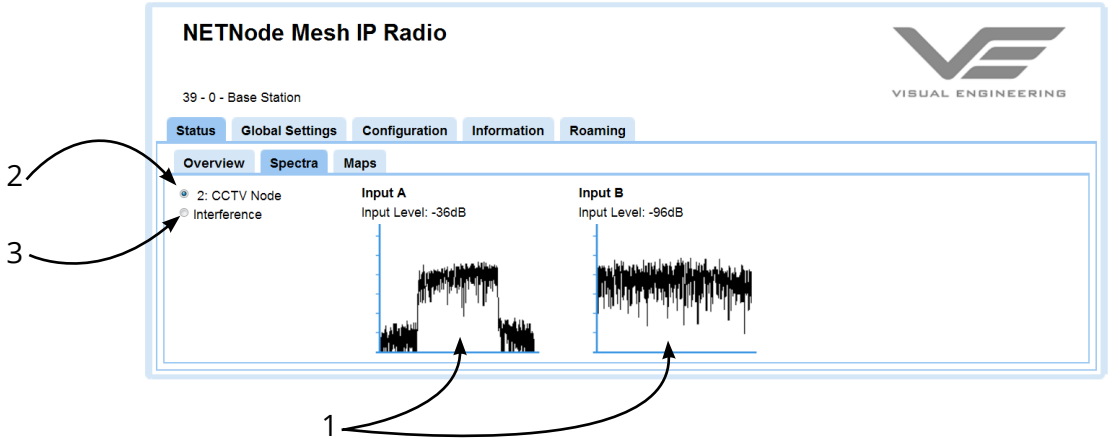
3. Level A Pane

Shows the dBm value for antenna A on a node. There are similar panes for antennas B, C and D.

4. IP RX errors Pane

This pane shows the number of IP receive errors for each node on the system.

The Status - Spectra Tab



1. The Spectra Displays

There are two displays labelled A and B which show the spectra being received on the two diversity antennas of the node that is being interrogated.
In the above example there is a valid COFDM signal being received on Input A of -36dB. The second antenna, Input B, is showing no signal. It can be assumed, therefore, that the second antenna is not connected.

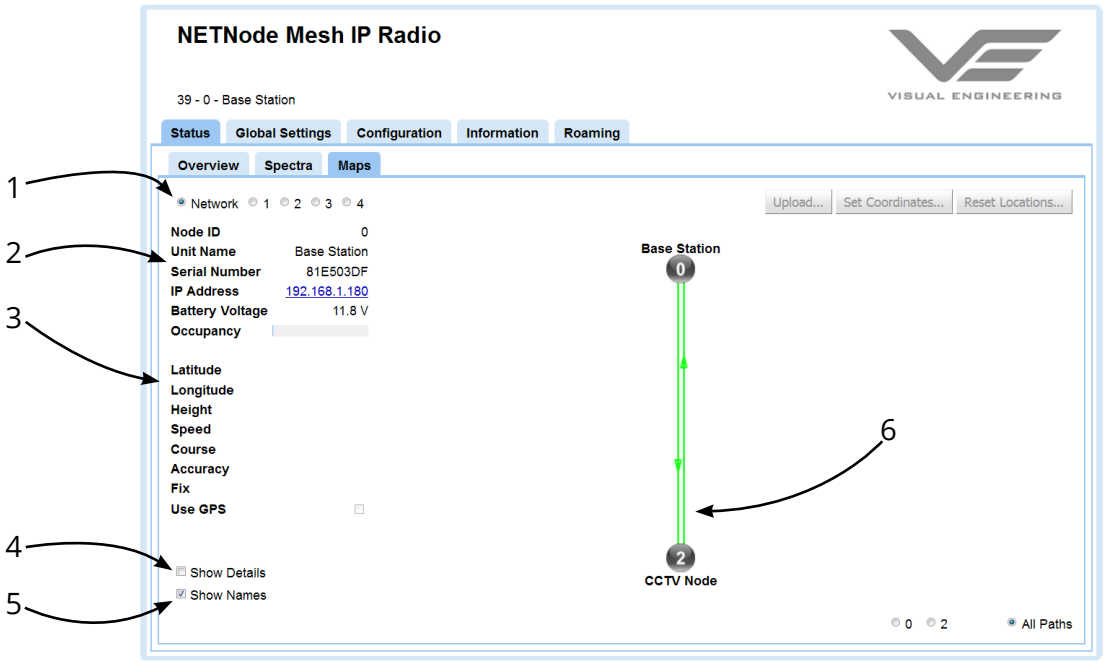
2. Node Selection

There could be several nodes transmitting on the Mesh so we need to define which node we are looking at. This is done with the radio buttons on the left side of the spectra display.
In our example there is only one node on the network, the CCTV Node. This is the one that has been selected.

3. Interference

If the Interference button is selected the display shows the spectra when none of the nodes in the Mesh are transmitting. This enables the user to look for interference on the system frequency that is to be used.
In a clean RF environment, with no interference, the user will see a spectra for both inputs as shown above for Input B of -96dB.

The Status - Maps Tab



1. Radio Buttons

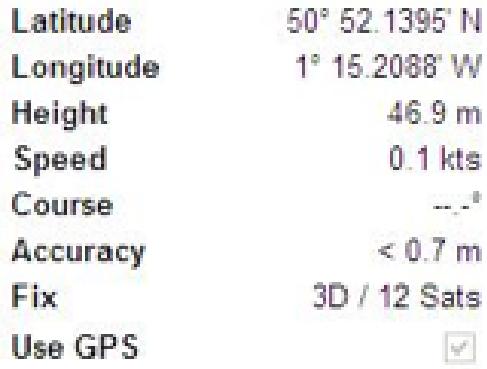
The radio buttons enable you to choose between Network and one of four map displays for the Mesh.

Note: When you are in **Network** mode the **Upload, Set Coordinates** and **Reset Locations** buttons are greyed out.

2. Node Information

Under the radio buttons, node information about the current attached node is displayed. This was covered earlier in the Status Tab section.

3. GPS Information



If the node that we select has a GPS receiver connected and the **Use GPS** box is checked, the node can broadcast precise information about its location to other nodes or fixed assets on the Mesh.

4. Show Details Check box

When the **Show Details** box is checked the node information is expanded to show things like TX IP Packets which are useful when diagnosing network problems.

5. Show Names

When the **Show Names** box is checked the friendly names for the nodes are shown on the network map display.

6. Display Pane

In the previous example the network display is selected. This gives a simple graphical view of the nodes in the Mesh and the links between them.

Note: The buttons above the display are greyed out as they have no function when the **Network** radio button is selected.

Each node is shown as a circle with a white number. If the number turns red, then the node is temporarily congested.

If the **Show Names** box is checked, the node name is displayed.

The links between the nodes are shown as coloured lines. As each node supports bi-directional operation there are normally two lines for each link. Here is what the colours mean:

Colour	Meaning
Green	16 QAM mode – maximum data rate
Amber	QPSK mode – reduced data rate
Red	BPSK – lowest data rate passing between nodes
White	Link broken or not configured

In the previous example there are static lines but when connected to a live system these lines change as the state as the RF environment changes or nodes move about.

Changing Frequency or Encryption Key in the System

For users wishing to change the frequency channel or encryption key in the system, they must check the '**Update All Nodes**' box in the Global Settings page then press apply.

This feature ensures that all nodes are updated simultaneously. If this is not done then it is possible to leave some nodes on one channel and some on another, rendering the system inoperable.

Once the '**Update All Nodes**' tab is set, users can change the frequency or encryption key, both of which can be found in the **Configuration** page.

Camera Node Configuration

Control of the camera nodes and the video encoder in the Base Station is achieved via a web browser interface.

The web browser allows control of the camera recording functions and control over camera parameters such as encoder and network settings.

It also allows the firmware in the camera to be updated, should this be necessary.

All parameters are non-volatile, meaning they will be remembered after re-powering the camera.

Simply type the camera's IP address into the address bar of the Firefox web browser, as shown below with the example address 192.168.1.190

Default Encoder IP Addresses

Below is a list of the default addresses of the Video Encoders in a system containing a Base Station, three CCTV nodes and one Relay node. These specific IP addresses will need to be typed into the web browser address bar.

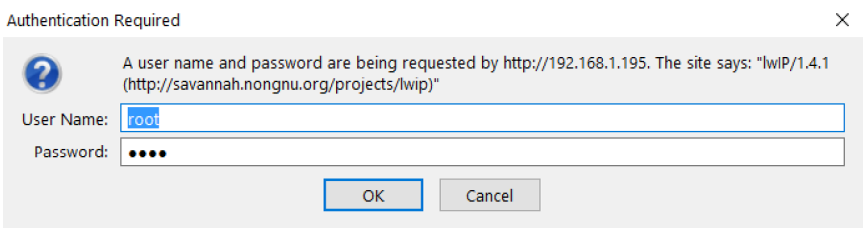
Node	Video Encoder IP
Base Station	192.168.1.190
Relay Node 1	192.168.1.191
CCTV Node 2	192.168.1.192
CCTV Node 3	192.168.1.193
CCTV Node 4	192.168.1.194
CCTV Node 5	192.168.1.195

Camera Login

On trying to establish a connection the user will be prompted for the User Name and Password, enter the following details:

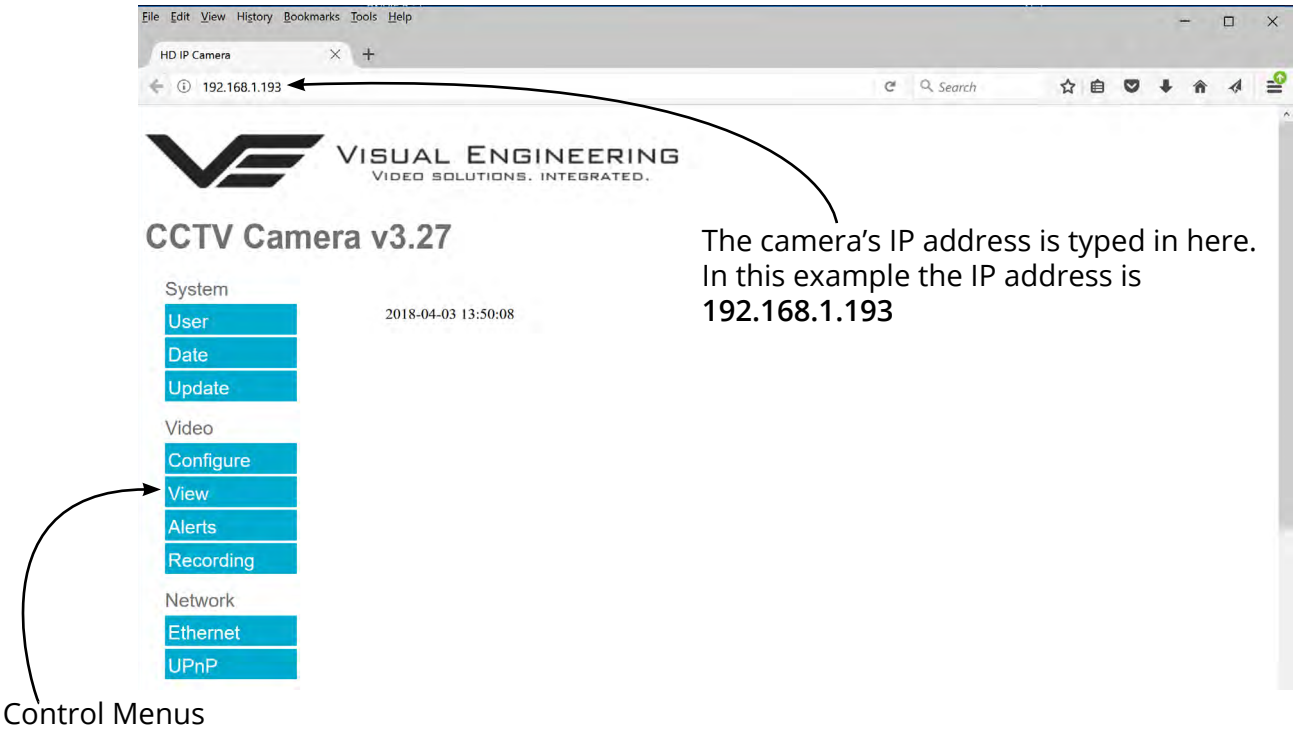
Default **User Name** is:
root

Default **Password** is:
1234



Camera Home Page

Once a connection is established with the camera node on the web interface the user should see the following camera home page:



On the left side of the screen are the Control Menus which allow the user to configure various settings in the camera. The functions of these menus are described in the following sections of this user guide.

User Menu

The user menu page allows users to configure the user ID and password of the camera. It is necessary to confirm the password to change it.

There is also the option to enable/ disable the following:

- FTP Server Connection
- OSD (On Screen Display)
- Audio Out

Changes are only enabled when the **submit** button is pressed.

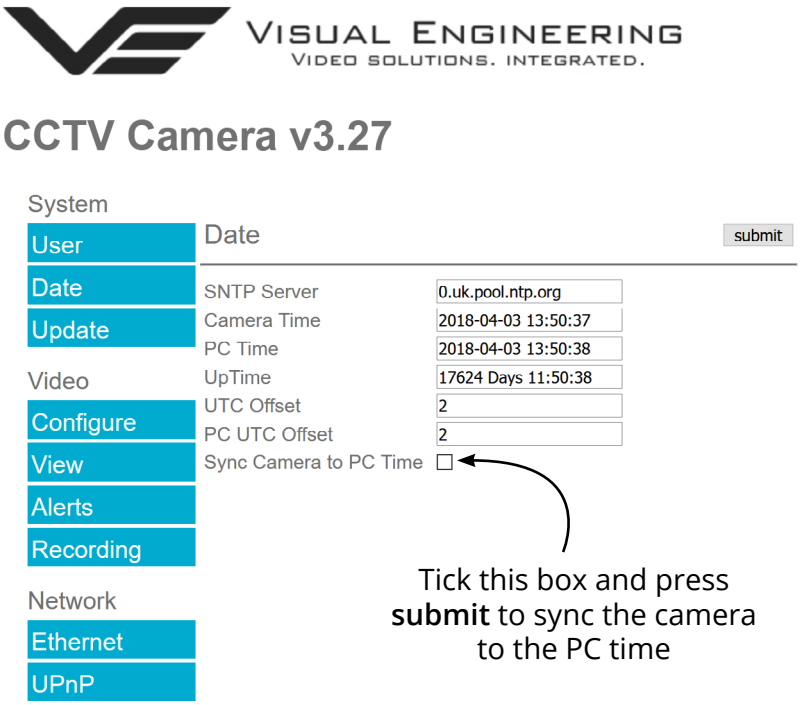
Date Menu

The date menu page allows the user to synchronise the camera time to an SNTP server. In this instance it is necessary to have the PC connected to a network.

If a network connection is not available it is possible to synchronise the camera to the PC time by ticking the "Sync Camera to PC Time" check box and pressing the **submit** button.

The "UTC Offset" can be altered to align the camera time with the local time zone. Changes are only enabled when the **submit** button is pressed.

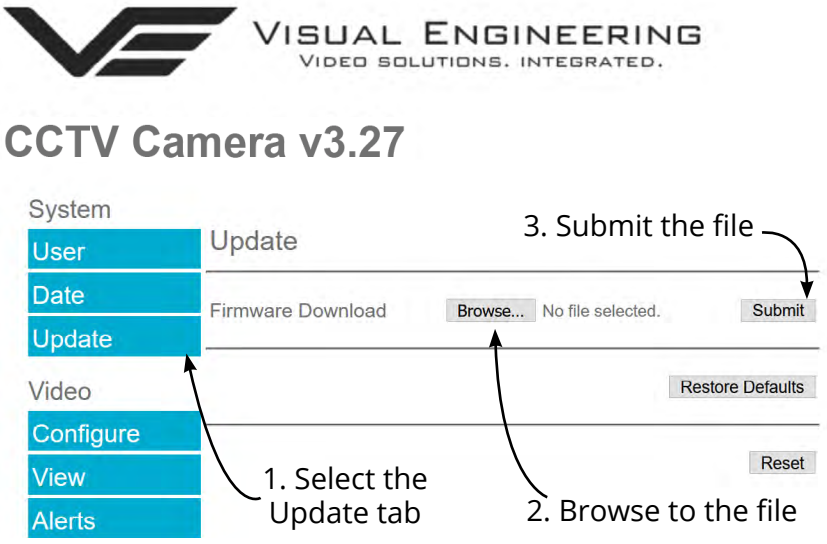
To align the camera to the actual PC time the "UTC Offset" should be made same as the value displayed in the "PC UTC Offset" field.



Update Menu

It is possible to update the firmware of the camera. There are three steps to updating the camera firmware, as shown on the right.

Only update the camera with files that have been approved by Visual Engineering.
Use of other files will render the camera inoperable.



Following a **Submit** the camera will update the firmware and display the following text:
Programming in Progress...Do NOT remove power
Wait until the web page clears this text before trying to move away from the current web page or powering off the camera. Updates typically take approx 3 minutes to complete.

A camera encoder can be given a software reset at any time by pressing the "**Reset**" button on the right hand side of the page.

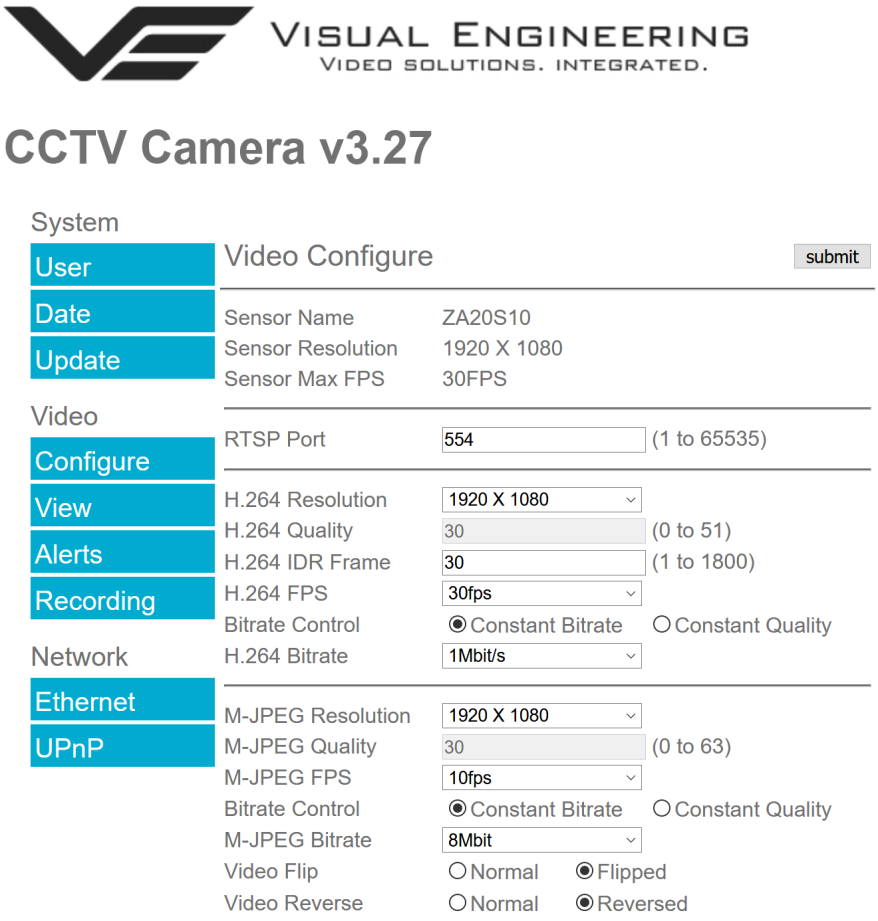
Video Menu

The Video Page is where all the camera's IP encoder parameters are controlled.

The encoder supports two encoding formats, H.264 and MJPEG. The choice of the format is initiated by the user when the stream is enabled.

To initiate a H.264 stream from a camera with an IP address of 192.168.1.195 the URL is:
rtsp://192.168.1.195/h264

To initiate an MJPEG stream from a camera with an IP address of 192.168.1.195 the URL is:
rtsp://192.168.1.195/jpeg



The Video page contains parameters for each encoder type. The Camera has two fundamental modes of operation:

- **Constant Bitrate**. This will output a constant bitrate IP video stream, as set in the Bitrate field.
- **Constant Quality**. In this mode the bitrate is varied in a effort to maintain a constant quality. The target quality is set using a number between 0 to 51, the lower the number the higher the quality, this is set in the quality field. Amendments to this value are only allowed when the constant quality mode is enabled. In this mode the 'ceiling' bitrate is controlled by the value set in the Bitrate field, the encoder will attempt to limit the maximum bitrate to this value.

Other video encoder parameters include:

H.264 Resolution
The maximum resolution is 1920x1080, users can select lower resolutions if there is restricted bandwidth available for the camera's connection.

H.264 FPS (frames Per Second)
The maximum frame rate is 30fps, users may choose to select lower frame rates, thereby reducing the bandwidth required.

H.264 IDR Frame changes the I frame interval in the H.264 stream by setting the parameter, this balances the stream's quality against latency. The default value is 30.

Recommended Settings

Bitrate Available	Resolution	Frame Rate
5-10MB/s	1920x1080	30
4-5Mb/s	1920x1080	15
3-4Mb/s	1280x720	30
2-3Mb/s	800x600	30
1-2Mb/s	800x600	15
512kb/s-1Mb/s	640x480	15
256-512kb/s	320x240	15

Video Flip can be useful when the camera is installed upside down or hanging from a ceiling.

Video Reverse can be useful when viewing the image via a mirror.

View Menu

Viewing the video from the camera can be possible from the web browser by selecting the view button. Users can return to the main menu by selecting the Back button.

Recent web browser releases have stopped supporting the VLC video plug-in, as such the video will not be displayed.
In this instance view the video using either the The VE Camera Viewer or the VLC media player.

Alert Control

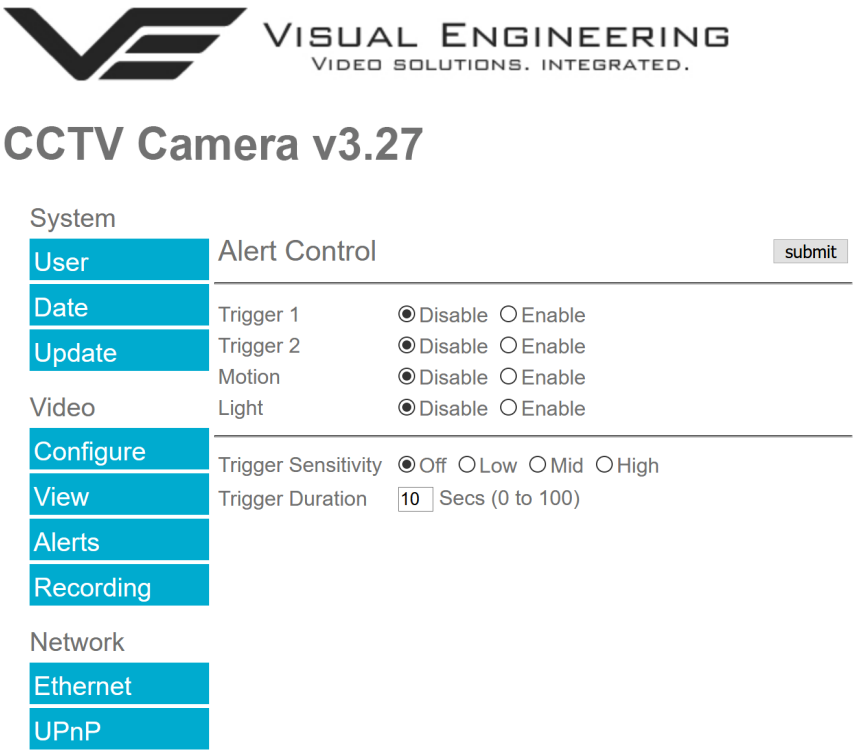
External, motion and light level triggers can be configured such that an audible tone and a visual alarm alerts the viewer.

These controls can also be set using the The VE Camera Viewer as previously explained.

Trigger 1 and 2 enable the closed contact external triggers

Motion and dark to light level triggers can be used to trigger an event. If users require this they should enable the Motion or Light alert.

The level of motion required to invoke a trigger can be set with the Trigger Sensitivity. Four options of Off, Low, Mid or High sensitivity may be set.



The duration of the alarm event will be the duration of the motion event plus the time set in seconds in the Trigger Duration field, values from 0 to 100 seconds are valid.

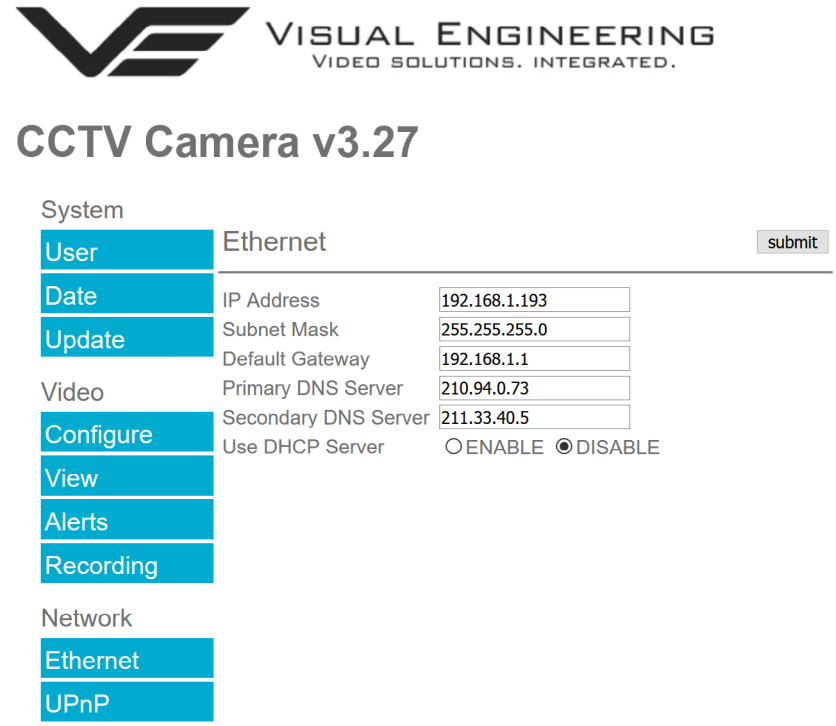
Users should press the **submit** button to enable changes.

Ethernet Menu

Network parameters can be set on the camera by selecting the Ethernet menu.

The camera can operate with a fixed IP address, or can be allocated an IP address from the network, these modes are controlled using the DHCP button enable/disable.

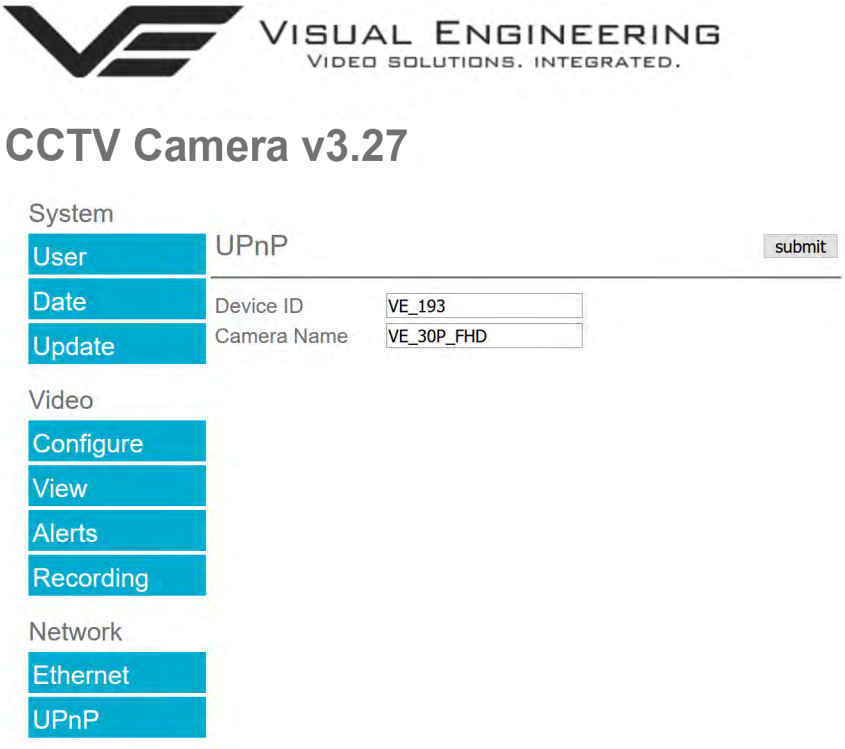
Users should press the **submit** button to enable changes.



UPnP Menu

The Universal plug and play menu allows the user to set the Device ID and Camera Name.

Users should press the **submit** button to enable changes.



Recording Menu

The integral SD Card in each camera node has a capacity of 32GBytes, this offers 17 hours of continuous recording at a total IP bit stream of 4Mb/s or 34 hours at 2Mb/s, etc. If recording capacity is achieved there is a user option to either stop recording or overwrite. The recording web page menu is shown below.

Note: Recording is temporarily paused during activity on the camera's web interface.

Timed Recording

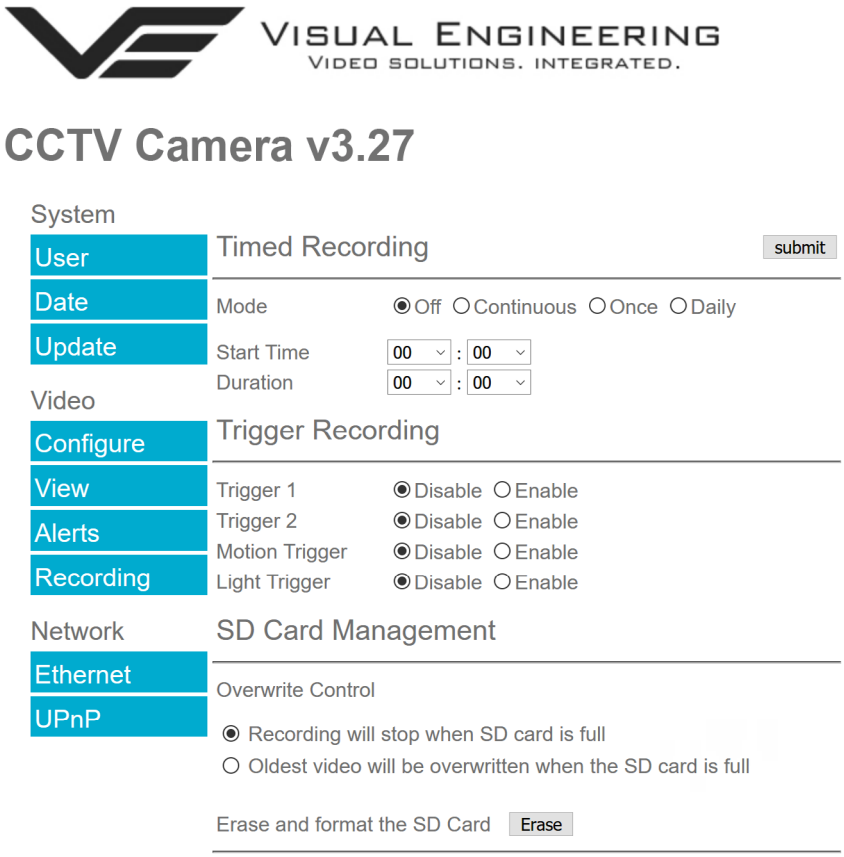
There are 4 options for timed recordings, these are; Off, Continuous, Once and Daily.

Off = No recording takes place.

Continuous = Recording Continuously.

Once = Record once when the start time is reached and record for the set duration.

Daily = Record daily starting when the start time is reached and record for the set duration.



Trigger Recording

Trigger Recordings can be triggered by either motion or light level change.
Trigger recordings are disabled by default, if enabled, a recording will be made.
The duration of the recording will be the duration of the motion event plus the time set in seconds in the trigger duration.

SD Card Management

In the event of the SD card becoming full, there are two options for Overwrite Control. One option is to have the recordings stop when the SD card is full, or the other option is to have the oldest material to be overwritten when the SD card becomes full.

Following any changes made in the menu the user must press the **submit** button . Wait until the camera finishes re-configuring before powering off the camera.

Erase and Format

The SD card will be completely erased and formatted if the **Erase** button is used. The user will be asked to confirm that this is the intention before the SD card memory card is actually erased.

Recovering Recordings

Record Format

Recordings are stored on the SD Card as individual 10 second duration .avi files. This is for a maximum frame rate of 50fps, lower frame rates will increase the length of the stored file proportionately. For example a frame rate of 25fps will create a 20 second video clip.

Video clip lengths are kept intentionally kept short, this allows integration with The VE Camera Viewer so that recent events can be played back with a low data upload overhead.

The file size is proportional to the total bitrate selected by the user.

The files follow the a naming convention of:

YYMMDDHHNNSS

For example a file with the name of: 170801134611 would have the meaning:

YY = Year is 2017
MM = Month is 08, August
DD = Date is 01, the 1st of the month
HH = Hour is 13, 24 hour format
NN = Minutes is 46
SS = Seconds is 11

Additionally files containing motion will have an 'm' appended on the end. This is so any video clips with movement in the video can be easily identified. When searching motion files it is advisable to also check for activity in the video in the file preceding any motion tagged file.

For the file described above with motion in the video it will have the complete file name of:

170801134611m.avi

Recordings are stored in directories for each individual hour, the directory has the form: YYMMDDHH
Since each file is 10 seconds long there will only ever be a maximum of 360 files in each directory.

Recordings can be accessed and downloaded via FTP (File Transfer Protocol) using either The VE Camera Viewer or an FTP application such as FileZilla.

The VE Camera Viewer is available to download from the VE website at:
www.visualengineering.co.uk/supportdownload/26

FileZilla is a free application and can be downloaded from
http://sourceforge.net/projects/FileZilla/

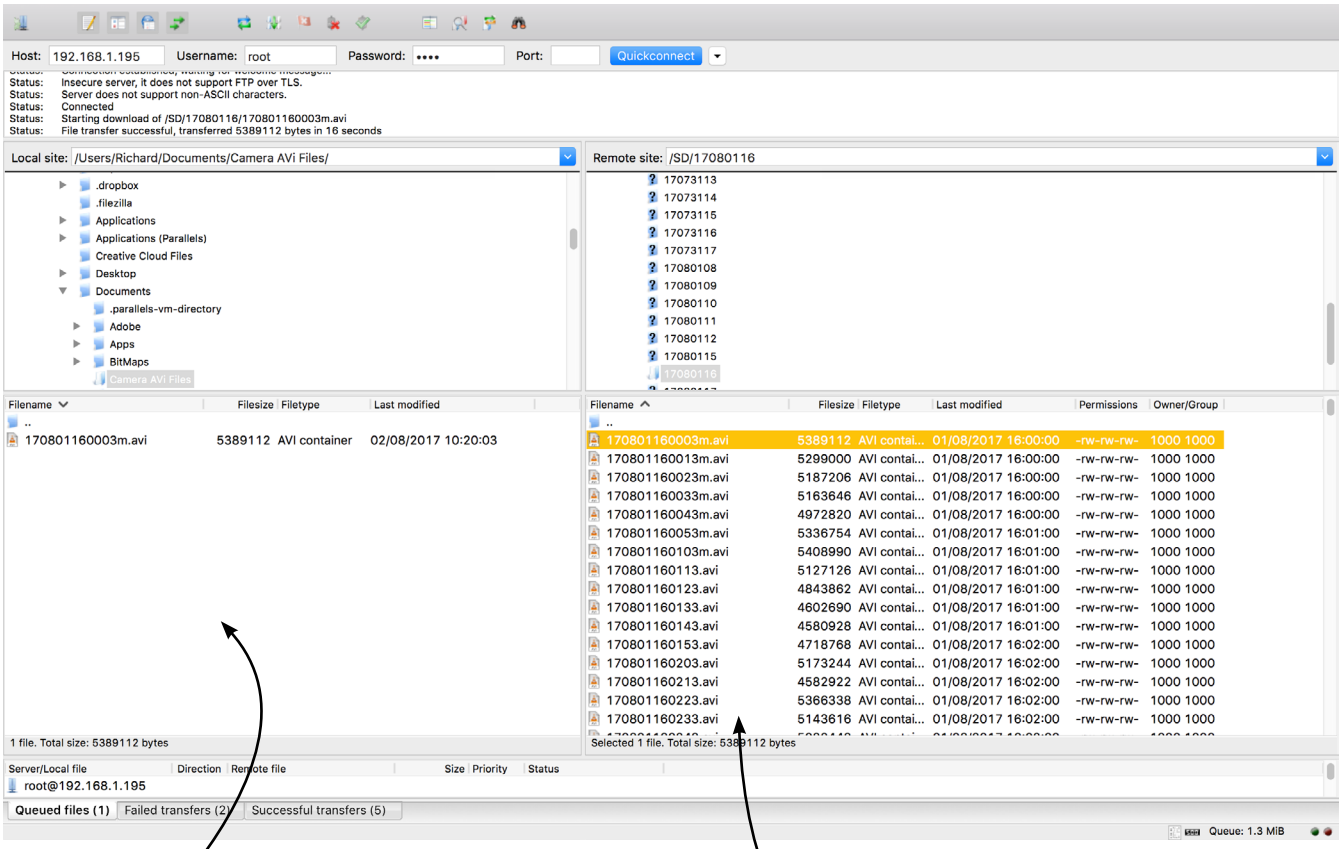
If using FileZilla, downloaded recordings can be played in players such as VLC either individually by selecting Play stored File or in groups by creating a play list.

Using FileZilla

With FileZilla downloaded, installed and running it will appear as shown below.

Set the Host = IP Address of Camera, default IP Address of **192.168.1.195** is shown here
Username = Camera Username, the default is **root**
Password = Camera Password, the default is **1234**

Then press 'Quickconnect'



Files can be dragged across to the location selected on the local computer

File structure on the SD card of the camera

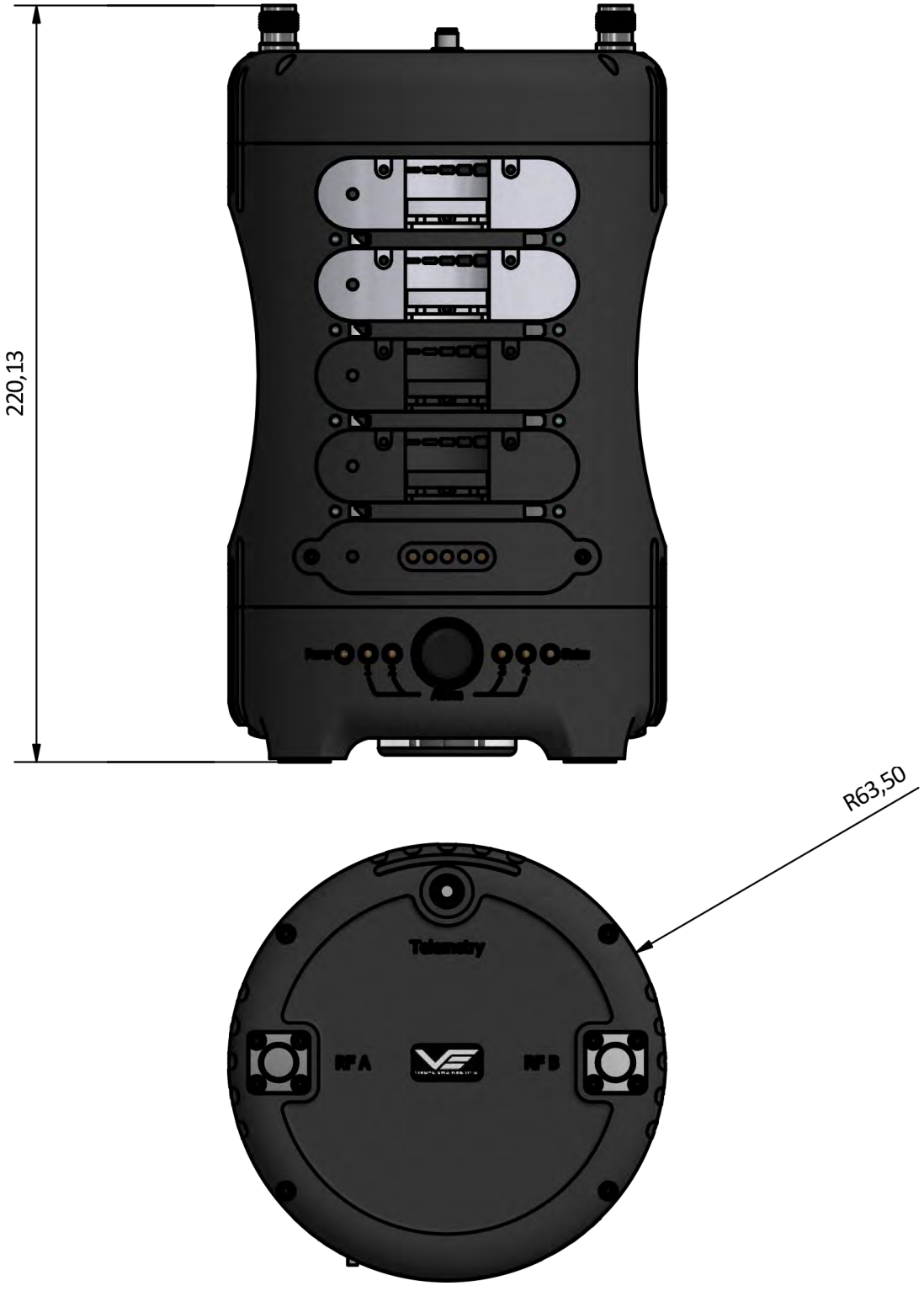
Recordings on the camera will be stored in the directory structure: SD/YYMMDDHH/ as shown above. Individual files can then be selected and downloaded or dragged across to the storage location selected on the local computer.

Technical Specifications

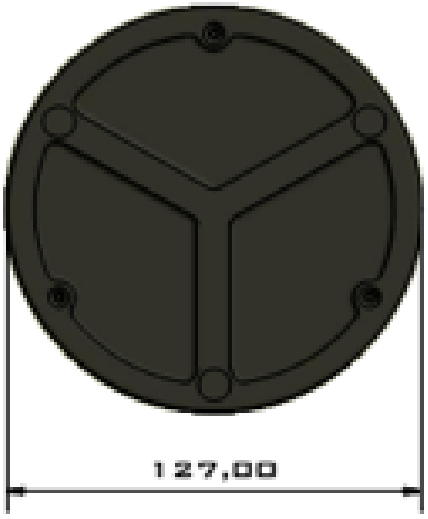
System Specifications			
Frequency Bands	UHF L Band S Band	**Concealment Types**	CCTV dome camera, Relay node, others on request
RF Power and Bandwidth	100mW, 5MHz	**Node Alarms**	Motion, light level and closed contact relay
Modulation	COFDM Mesh	**Antenna Connectors**	N-Type
Range	Typically 100m non line of sight between nodes	**CCTV Camera Type**	Sony FCB-SE600
Panic Alarm RF	915 MHz	**Relay Node Camera Sensors**	3 x 2Megapixel, CMOS
Encryption	ABS or optional AES128 or AES256	**Relay Node Light Sensitivity**	0.008 Lux
Encoding	RTSP Stream H.264	**Relay Node Fields of View**	40° 17° & 8° Horizontal
Storage	32GB Micro SD Card	**Battery Duration**	6 Hours

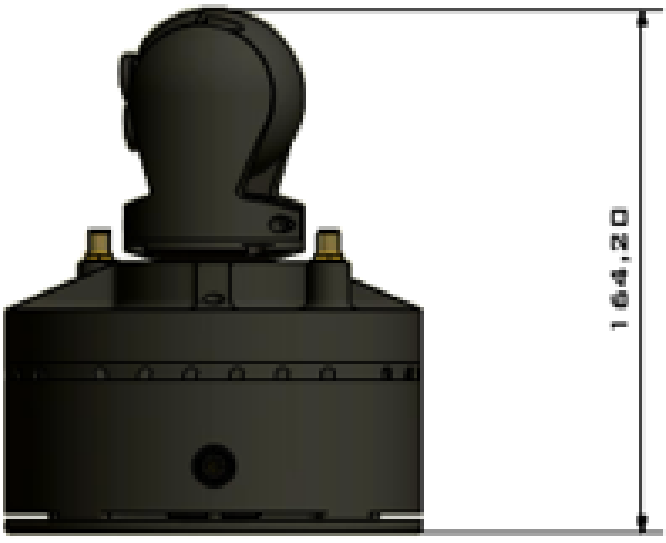
Dimension Drawings

Base Station Dimensions

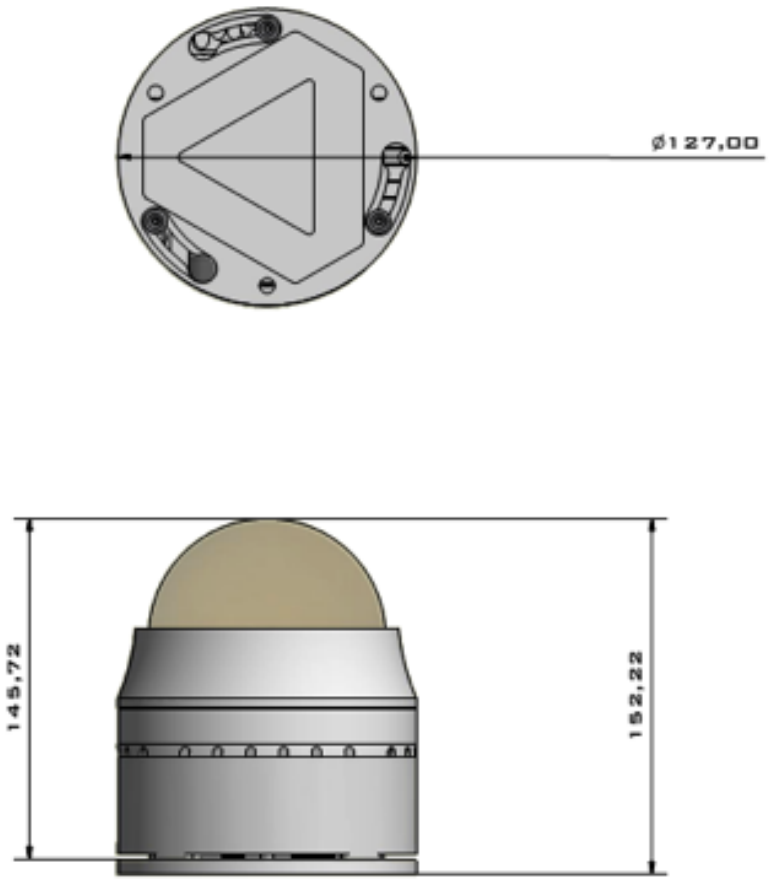


Relay Node Dimensions





CCTV Node Dimensions



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