VISUAL ENGINEERING DropCam-SDR Rapid Deployable Mesh Enabled Camera User Manual

VISUAL ENGINEERING
INTEGRATED VIDEO SOLUTIONS

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Contents

Document History

Version	Date	Change Summary
v1.00	6/9/2022	Initial Draft

Warranty and Support

All Visual Engineering products are supplied as standard with a 12 month ‘Return to Base’ warranty.
Please note: Any unauthorised product disassembly, modification or the removal of tamper proof labels will void the 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.

Safe Operating Procedure

- The equipment should be operated within the environmental limits as detailed in the Specifications section of this user manual.
- Only authorised and trained personnel should operate the equipment.

- There are no functions that require the user to gain access to the interior.
- Changes to the radio settings as described in the Maintainer Guide section should only be carried out by personnel that have had the appropriate training.

User Guide

Introduction

The DropCam-SDR is a Mesh enabled camera module which incorporates a DTC Software Defined Radio, a HD camera, a microphone, a flexible antenna pair and a battery.
The simple to use button interface allows the DropCam-SDR to be rapidly deployed.
Demand for system flexibility has led to Mesh being the first choice for transferring video. A digital Mesh radio network allows encoded video, audio and data to be shared between several nodes simultaneously.
COFDM point to point type RF transmission is also supported as a configurable option.
The video output is configurable as either HD or a standard definition windowed version of the video. SD video mode supports a solid state PTZ function by taking advantage of a 3x lossless digital zoom made possible by using the HD sensor as its source.
The DropCam-SDR also supports the option to externally connect IP cameras and HD-SDI cameras as its video source.
The transmitted video can be observed using the TM-RX Mesh Receiver partner product.
The DropCam-SDR can also be configured exclusively as a Mesh relay node. When coupled with high gain antennas it allows the connection of remote nodes that would otherwise be outside the network's RF coverage.
Input and output triggers are also supported which allow the control of auxiliary systems. It also incorporates four LEDs which can be either white light or infrared.
This is all housed in a very rugged CNC machined waterproof enclosure.
Security of the link is ensured either through standard DES encryption or optional AES128 or AES256.

Complete Kit

The DropCam-SDR kit comes complete in a foam lined Peli flight case.
In addition to the DropCam-SDR the kit also includes two antennas, a configuration cable and a mains power adaptor.
The kit contents are shown here and listed below, along with their part numbers.

Part Description		Part Number
1	DropCam-SDR 114150	110-0497
2	Antennas 1 GHz to 1.5GHz	110-0190
3	Configuration Cable	110-0077
4	Mains PSU with Adaptors	110-8661
5	USB Memory Drive	110-8697

Features

Rear Connectors

The DropCam-SDR has two Fischer connections on the rear. They are key specific to avoid incorrect cable use. Remove the protective caps before use.
The blue connector is used for battery charging with the mains PSU, included in the kit.
The green connector is for an Ethernet connection to the embedded SDR Mesh radio.

Battery Charging

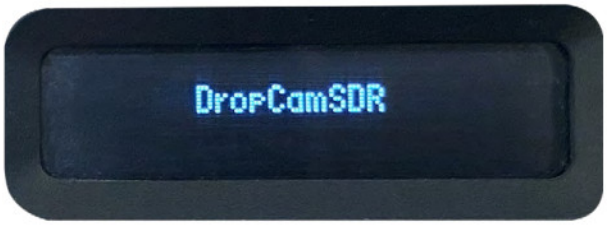
The unit is charged by connecting the mains power supply to the blue Fischer power connector.
The status screen displays the progress of the battery charging.
A fully depleted battery will take approximately 3 hours to gain a full charge.
The status screen reports once the charging cycle is complete.

Connecting Antennas

The antennas are a push fit QMA type.
Click the antennas into position by inserting each antenna vertically downwards on to the antenna connectors.
To remove: Slide the connector’s silver collar up and continue to pull the collar vertically upwards.
Avoid removing the antenna by pulling up on the antenna’s black body as this can cause damage.

Powering On

A long press on the power button will start the boot up procedure.
At start up the status screen will display DropCamSDR, as shown.
The initiation of the start up procedure is further confirmed by the unit producing a haptic vibration.



Status Screen Menus

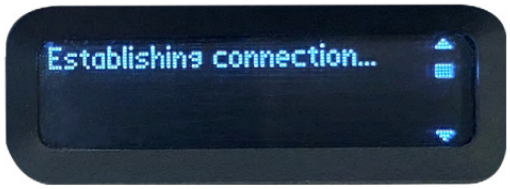
The DropCam-SDR incorporates a simple to use status screen to monitor and configure user settings. Use the '+' control button to scroll through the available options, select an option using the power button.

Battery Level

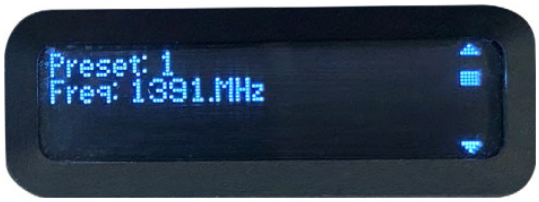
The first status information screen displays the battery level, giving both a percentage of charge remaining and a time in minutes until empty.
Typically a full battery will power the DropCam-SDR for 3 hours this is when the Mesh radio is transmitting full motion video. This time can vary depending on the RF profile used.

Radio Presets

Following power on the Mesh radio will take a short time to initialise and establish a connection.



The radio presets are configured as described in the **Maintainer Guide**.

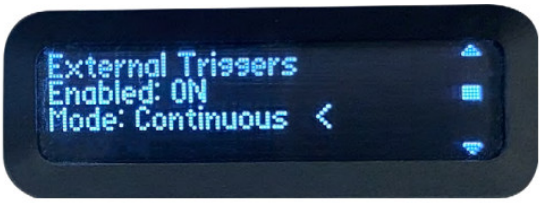


Use the '+' control button to scroll through the preset options, select a preset using the power button.

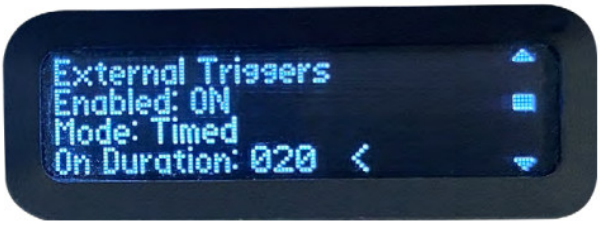
External Triggers

The DropCam-SDR can be configured to activate on external trigger events.

If this feature is required please contact support for the necessary cable which provides the physical connection to external triggers.
support@visualengineering.co.uk

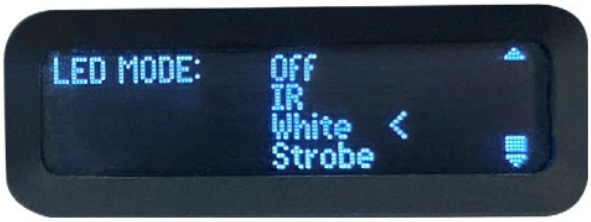


Different trigger configurations include continuous and timed.
Timed events can be configured to have duration of 20, 30, 90 or 120 seconds.



Video Quality
Configure the level of video quality to match the deployment.
Typically a reduced video quality selection will match a limited bandwidth radio link.

LED Mode
The DropCam-SDR incorporates IR and white LEDs.
Activate either type by selecting the option in the menu.
Activating the strobe mode will rapidly flash the white LEDs.



Video Mode
The camera can output either HD or SD video.
By default the DropCam-SDR will always boot up in SD mode.

When SD video is selected it is possible to PTZ the SD video frame around within the higher resolution HD frame.

PTZ control of the SD video frame can be controlled using the joystick and the + and - keys on the TM-RX receiver partner product.

TM-RX Receiver product details and specifications can be found here: **https://www.visualengineering.co.uk/tm-rx-mesh-receiver/p/1196**

Powering Off

A long press on the Power Button will power the unit off.
In addition to the indication on the status screen the power down is further confirmed by a haptic vibration.

Range Extender

In addition to the DropCam-SDR being used as a video source on a Mesh network it can also be used exclusively as a range extender.
Taking advantage of its portability, strategic placement of the DropCam-SDR can incorporate the connection of remote nodes that would otherwise be outside the network's RF coverage.
This mode of configuration optimises battery life by switching off the internal video encoder and camera module.

Maintainer Guide

This section is intended for the Maintainer to setup the network and radios using a web browser control interface.

Mesh Radio Configuration

The following web browser control interface is not required for normal operation. Web browser control of the Mesh radio should only be undertaken by users wishing to achieve the following:

- Switch the operating mode of the radio
- Change the system frequency
- Change the system IP addresses
- Change the Encryption key
- Understand the RF performance of the system better

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

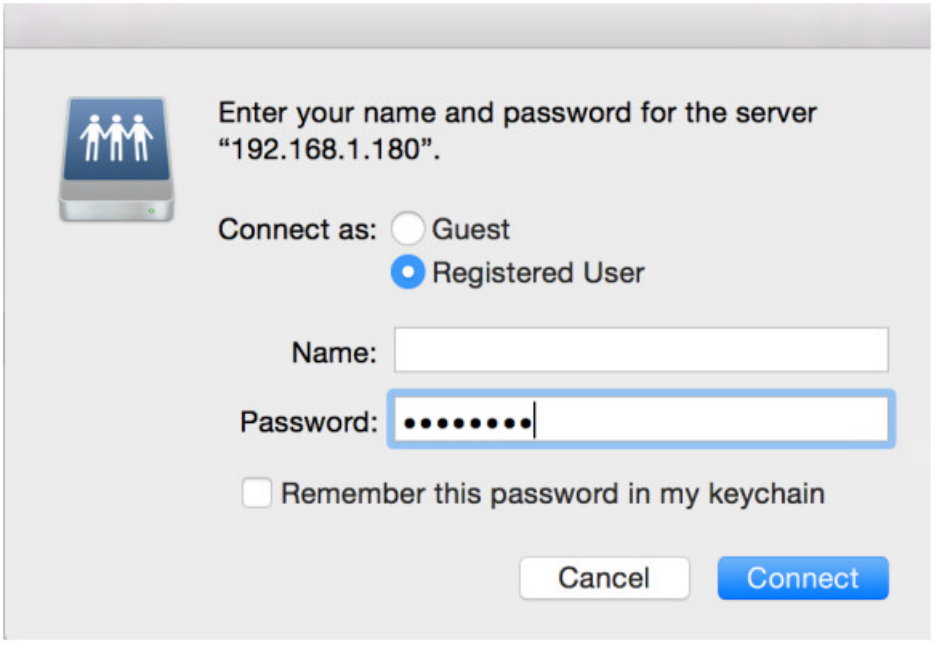
Activating the Web Interface

Power up the DropCam-SDR and connect its configuration cable to the green Ethernet connector.
Then connect the RJ45 connector to a PC.

- Open a web browser on the PC
- Type the IP address of the unit e.g. 192.168.1.180 into the address bar
- The web browser opens a Login Prompt

To find IP address of the DropCam-SDR radio check the details of the external device in the radio app of the TM-RX Receiver.
If the TM-RX Receiver is not being used in partnership with the DropCam-SDR then use the Node Finder application to find the radio's IP address on the connected network.

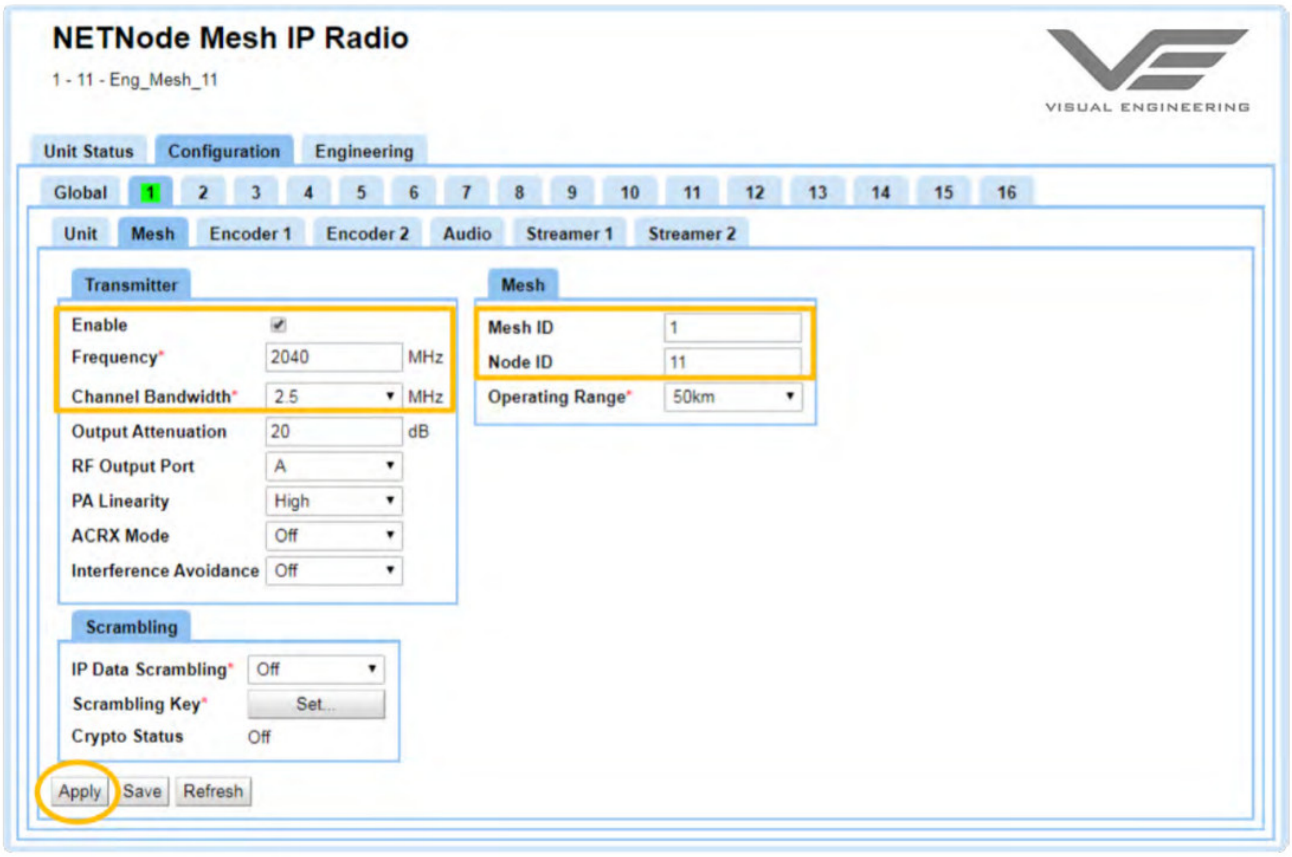
Login Prompt



- Authentication is required to connect
- By default there is no user name
- By default the Password is Eastwood
- Click the Connect button

Basic RF Setup

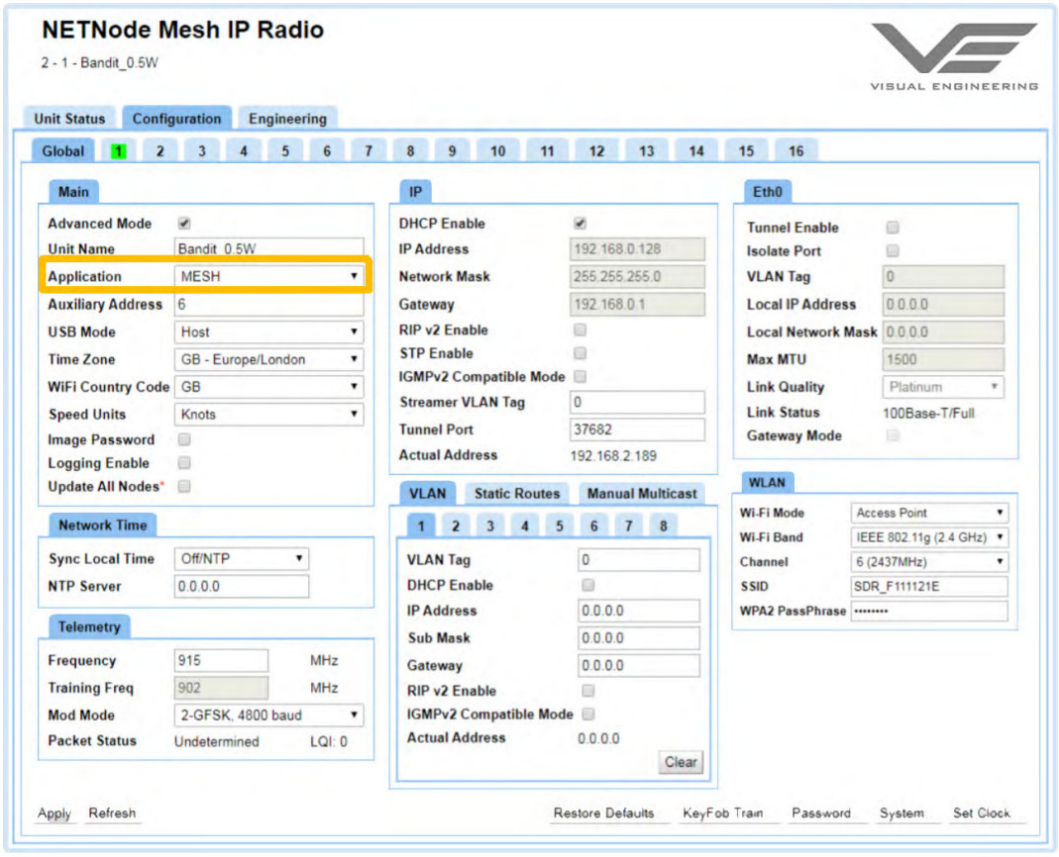
The following can be used to configure a node to join a Mesh network.
Browse to the Configuration>Preset>Mesh tab, the highlighted options are the key points to consider.



Item	Description
Enable	Tick the Enable checkbox to switch the transmitter on.
Frequency	Type in the frequency to use for the Mesh. This must be the same for all units.
Channel Bandwidth	Select the bandwidth to use for your Mesh from the drop-down list. This must be the same for all units.
Mesh ID	Type in a 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 NETNodes on Mesh ID 1 for example will communicate with each other.
Node ID	Type in a Node ID for each node. The node ID must be unique in the Mesh network. **Note**: A node can automatically reassign its Node ID at power up if it finds a conflict with an existing node.
Apply	When the values have been set, click Apply. The unit will not change its values unless this is done.

Switching Radio Mode

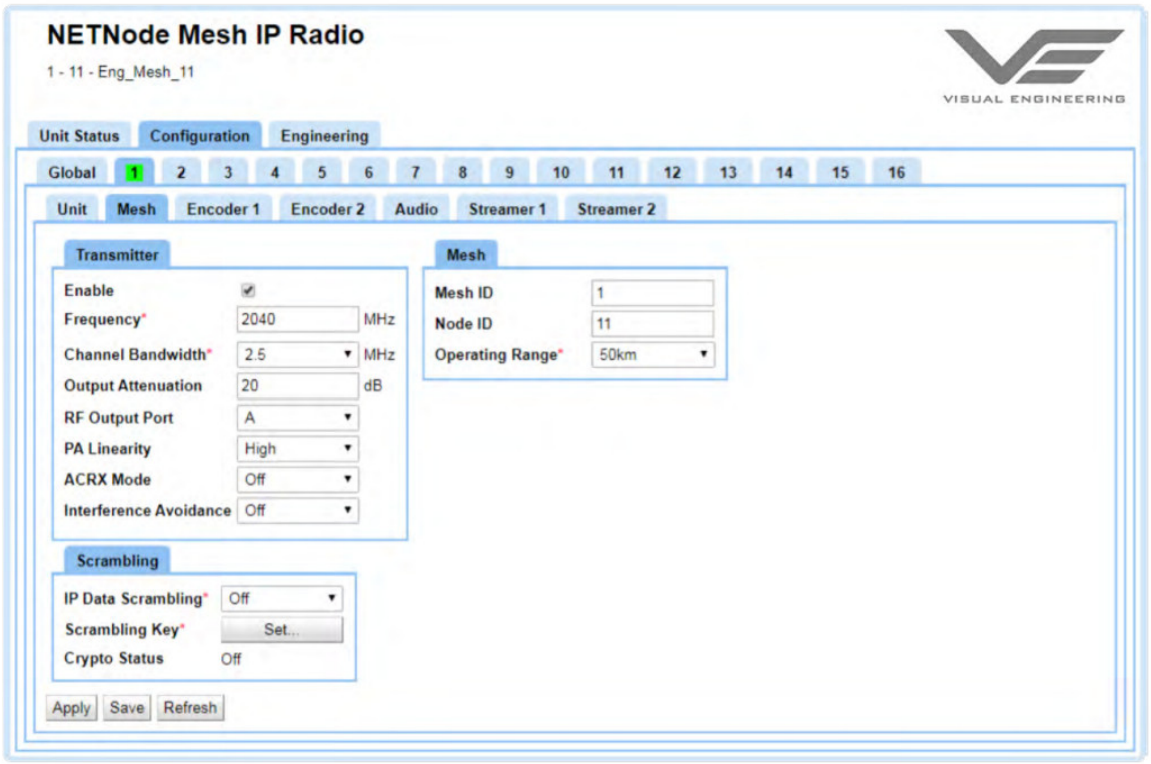
The Global settings page allows the Maintainer to change a wide range of parameters. The highlighted option is where the radio mode can be changed between Mesh and COFDM point to point, if the radio carries the appropriate licences.
The highlighted box below shows where to change between Mesh, SOL-TX or SOL-RX, then click Apply.



Preset Tab – Configuration

There are up to sixteen different preset Configurations that can be setup. In this example Preset 1 is being viewed, this is highlighted with a green background to denote that it's live.

Note: Click the Apply button to save any changes.



A detailed description of the parameters are described in the following tables.

Preset Tab – Transmitter

Item	Range	Description
Enable	Set or clear	If selected, this turns the transmitter on.” All NETNodes in a Mesh must have their transmitters enabled.
Frequency	Frequency in Mega hertz	The transmit frequency for the system. If an input frequency is out of r ange for the product, the radio will tune to the lowest or highest availa ble frequency automatically.
Channel Band width	2.5/3.0/3.5/5.0/6.0 7.0/8.0/10.0MHz	The channel bandwidth for system. If a lower bandwidth is used the operating range will increase. If a high er bandwidth is used the operating range will decrease.
Output Attenu ation	0 to 30dB	The level of attenuation in dB that will be applied to the output. This co uld be useful if the transmitter is swamping a second unit nearby.
RF Output Port	A, B or A+B	This will choose which of the output ports (or both) will be used as a tr ansmit port.
PA Linearity	Low, High	High linearity, improves COFDM shoulder performance at the expense of power consumption. Low linearity will have some saving in power consumption but range e xpectations will be compromised.
ACRX Mode	Off, Uplink, Downli nk	Set to on to enable IP forwarding.
Interference Avoidance	Off Slave Local Master	Interference Avoidance ensures the network switches frequency auto matically when channel interference is experienced. If Local Master is selected, the transmitter frequency is replaced by a Set button. If the Set button is clicked, up to eight preset frequen- cies can be entered which are followed by all other Slave nodes in the net work. Slave nodes will have these values greyed out but be viewable.

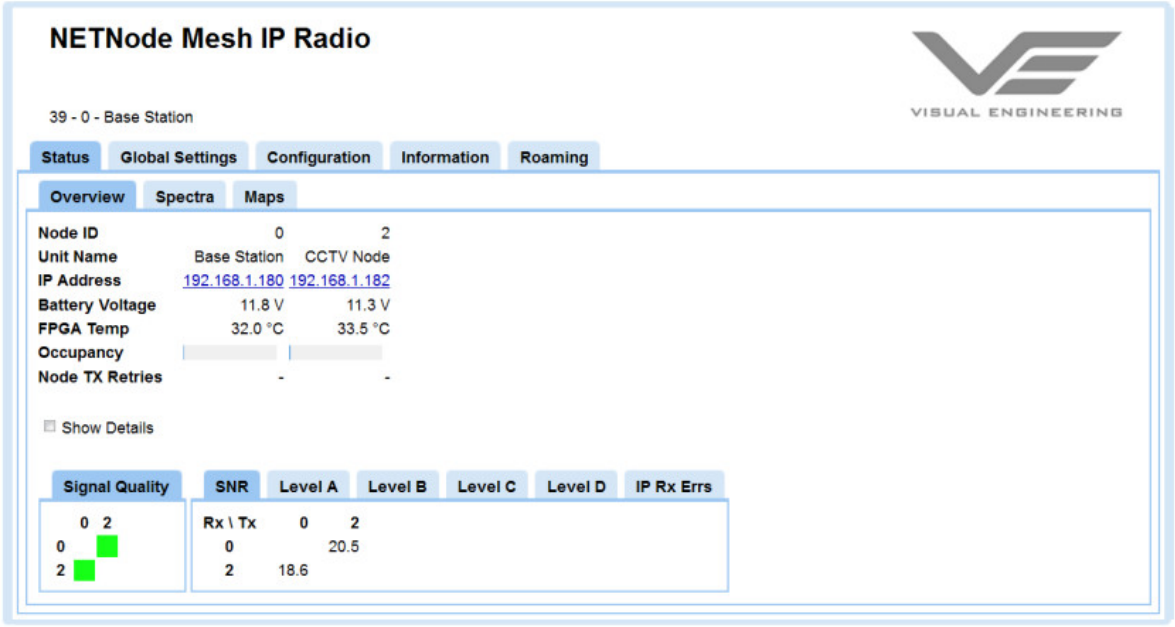
Preset Tab – Encryption

Item	Range	Description
IP Data Encryption	Off AES128, AES128+ AES256, AES256+ DES, DES+	Select the encryption scheme from the drop down menu. The + settings make sure that the network will only process encrypted data. Any unencrypted data will not be accepted by a NETNode if the + is set on the unit.
Scrambling Key	Click to set	If this button is clicked the Scrambling Key settings will open. Enter the key for the scheme. The key size will differ depending on the Key Type selected.
Crypto Status	Information Only	The displays the current encryption status.

Preset Tab – Mesh

Item	Range	Description
Mesh ID	1 to 63	Type in a Mesh ID for the NETNode. This must be the same on all units in the network. The Mesh ID tells the unit which network it belongs to. All NETNodes on Mesh ID 60 for example will communicate with each other.
Node ID	0 to 15	Type in a Node ID for each NETNode. The node ID must be unique in the Mesh network.
Operating Range	50km, 100km, 200km, 500km	A larger range lets the Mesh network operate over a bigger distance at the expense of bitrate.

Status Overview Settings



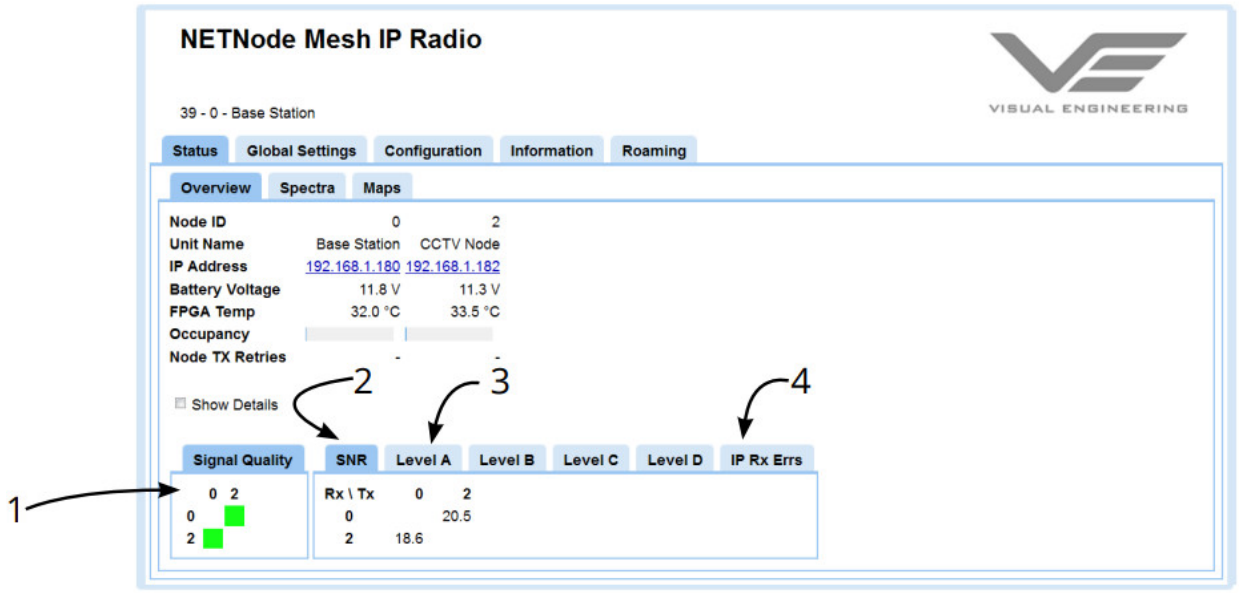
This displays detailed status information of received signal quality and enables navigation between nodes. The Status tab is divided into three sub-tabs:

- Overview
- Spectra

- Maps

Item	Options	Notes
Node ID	0 to 11 or 0 to 15	Node IDs 1 and 2 are shown. There could be up to sixteen nodes in a Mesh, numbered 0 to 15.
Unit Name	Up to 12 characters can be used for the Unit Name	The Unit Name is a user friendly name to make it easier to identify each camera node. This name is assigned in the Global Settings Tab.
IP Address	192.168.1.180 for example	This shows the IP address of the unit that is set up in the initial configuration. It is shown as a hyper-link. The browser will switch to the node of the selected hyper-link.
Battery Voltage	0 to 16V	This returns the current input voltage of the node. The voltage should show approximately 12v.
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.
Show Details	Check box	Displays network information about IP packets etc.

Status Overview Signal



1. **Signal Quality**

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

   A description of the colours:

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 poor.

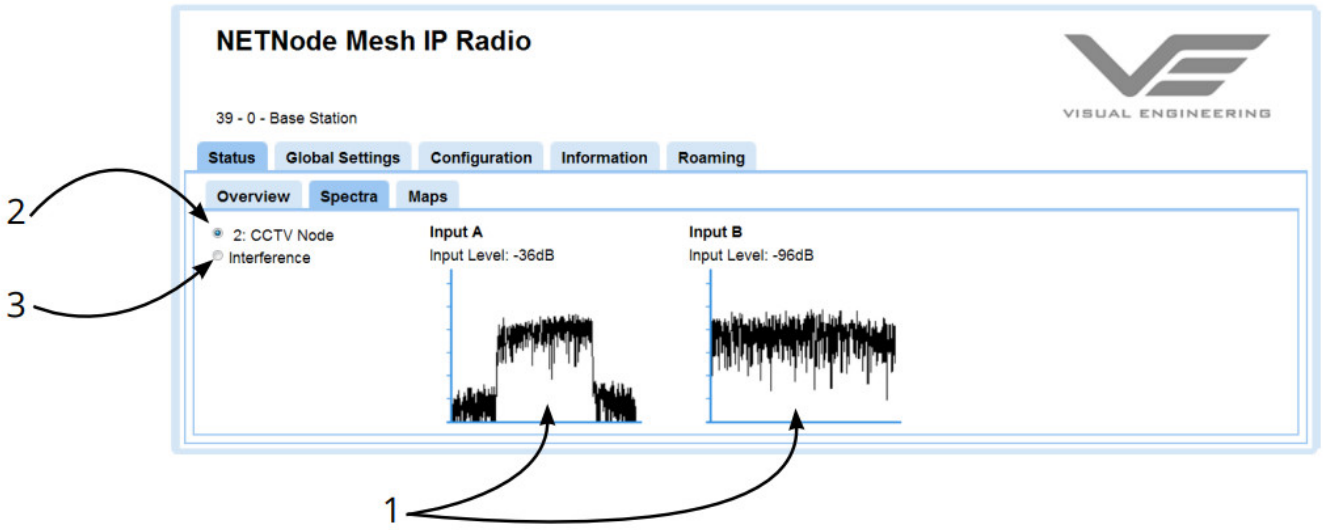
3. **Level A Pane**

   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.

Status Tab – Spectra



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.

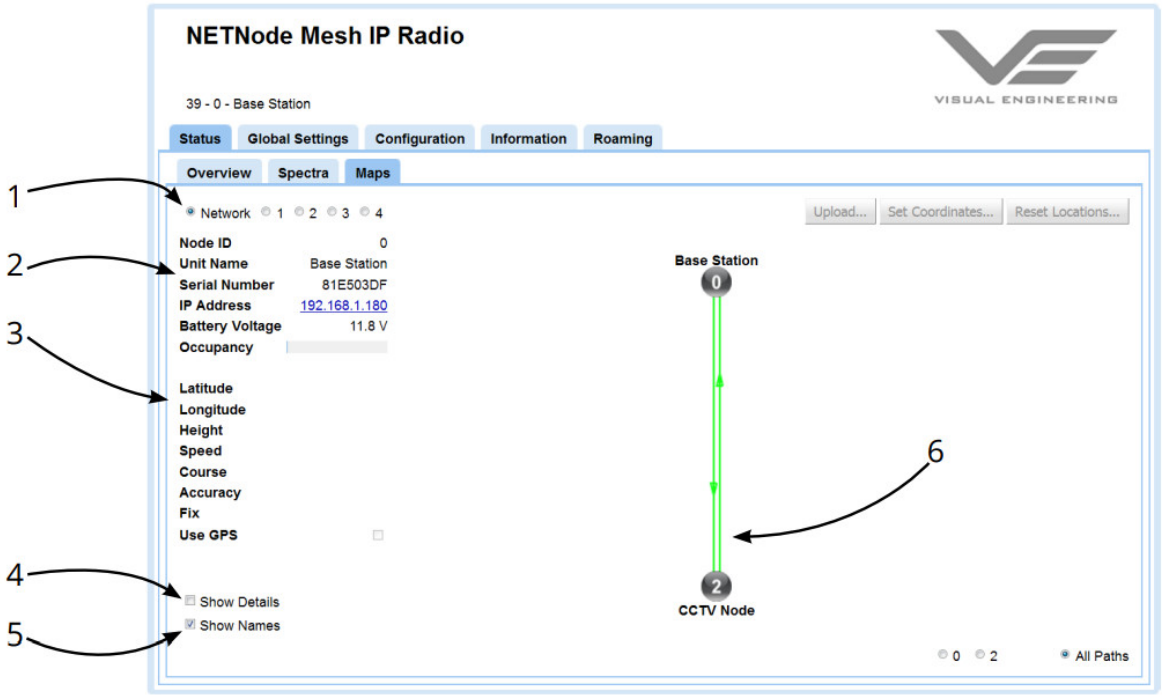
2. **Node Selection**

   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 this 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.

Status Tab – Maps



1. **Radio Buttons**

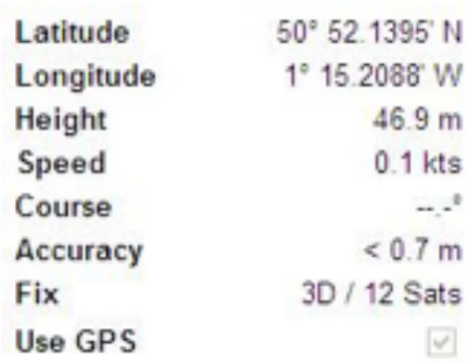
   The radio buttons enable the user to choose between Network and one of four Mesh map displays.

   Note: When 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, as covered earlier in Status Overview.

3. **GPS Information**



   If the unit has GPS receiver connected and the 'Use GPS' box is checked, the node can broadcast precise information about its location to other nodes on the Mesh.

4. **Show Details Check box**

   When the 'Show Details' box is checked the node information is expanded to display TX IP Packet information, which can be useful when diagnosing network problems.

5. **Show Names**

   When the 'Show Names' box is checked the user 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

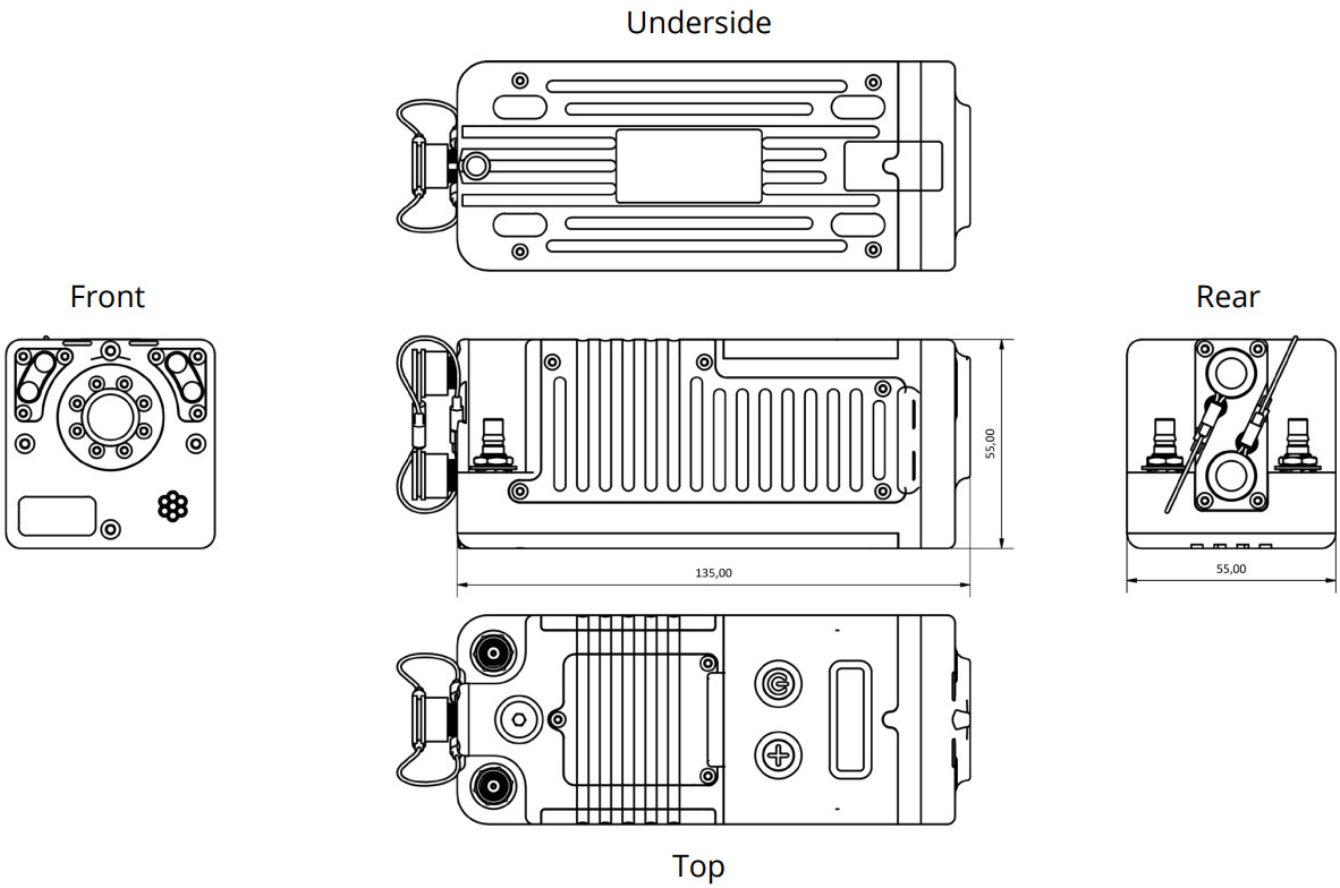
Note: In the above example the lines are static, when connected to a live system these lines change as the state as the RF environment changes or nodes move about.

Specifications

Specifications			
Camera Sensor	3.1 Megapixel, CMOS	**External Camera Inputs**	IP, HD-SDI
Camera Sensitivity	< 0.1 Lux	**External Triggers**	Input and Output
Camera SNR	> 50dB	**Cable Connection**	Ethernet
Horizontal FOV	120°	**Configuration**	Web Interface
RF Frequency	L-Band, S-Band, C-Band	**LEDs**	4 x White or IR
RF Type	COFDM Mesh and PtoP	**Setup Interface**	Button
Pan Tilt Zoom	Supported in SD Mode	**Status Screen**	OLED
Video Encoder Control	Relay Node Configurable	**Integral Battery**	Rechargeable
Video Encoding	H.264	**Max Charge Time**	3 Hours
Audio	High Quality Microphone	**Run Time – FMV**	3 Hours
Encryption	DES, AES128, AES256	**Weight**	600g
Antennas	Flexible Dual Diversity	**Environmental**	IP67
Antenna Connectors	QMA	**Dimensions**	135 x 55 x 55 mm

Dimensions

All dimensions are in mm



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Documents / Resources

	VISUAL ENGINEERING DropCam-SDR Rapid Deployable Mesh Enabled Camera [pdf] User Manual DropCam-SDR, Rapid Deployable Mesh Enabled Camera, DropCam-SDR Rapid Deployable Mesh Enabled Camera, Deployable Mesh Enabled Camera, Mesh Enabled Camera, Enabled Camera, Camera

References

- visualengineering.co