



TM-RX Receiver User Manual



Rugged, Battery Powered
Mesh Video Receiver



Table of Contents

Document History	4
Warranty and Support	5
Safe Operating Procedure.....	5
User Guide.....	6
• Introduction	6
• TM-RX Kit.....	7
• TM-RX Features	8
• The Battery	9
• Battery Insertion.....	9
• Battery Charging.....	10
• TM-RX Power On	11
• TM-RX Screens	12
• Home Screen.....	13
• Status Overlay.....	14
• Viewer App	15
• Digital PTZ	17
• Cameras App.....	18
• Add a Camera	19
• GPS App.....	21
• GPS Tracking	22
• Settings App	23
• Player App	24
• Export Recordings	25
• Security App	26
• Info App	27
• Radio App	28
• Downloads	30



Table of Contents

Maintainer Guide	31
• Web Interface Access	31
• Login Prompt	32
• PC IP Address Configuration.....	33
• Dashboard	34
• Mesh Settings.....	35
• Key RF Settings.....	36
• Additional RF Settings	37
• Security	37
• Signal Levels.....	38
• Video Encoders	39
• Video Redistribution	39
• VLC Playback	40
• Audio Encoders	41
• GPS Map Downloader.....	42
• Setup	42
• Select Area.....	43
• Download	43
• Save	43
• JSON Configuration	44
• Upload User Settings.....	44
• Export User Settings	44
• Upload Camera Settings	45
• Export Camera Settings.....	45
• JSON Example Files	46
• Firmware Update.....	47
• File Uploader	47
• Mesh Networks	48
• Mesh Topologies	48
• System Configuration	50
• Part Replacement	51
• Battery Door Latch.....	51
Specifications	52
Dimensions	53
• TM-RX Receiver	53
• Dual Li-Ion Battery Charger	54



Document History

Version	Date	Change Summary
v1.00	12/12/2017	Initial Draft
v1.01	29/03/2019	Product Updates
v1.02	13/08/2020	Feature Updates
v1.03	07/08/2020	Adding a Custom Camera
v1.04	15/03/2021	Transcoding, JSON Config, Info and Security Apps
v1.05	30/03/2021	Orientation Sensor
v1.06	04/05/2021	Firmware Update Procedure
v2.00	14/03/2024	System Updates



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, other than as described in the [Part Replacement](#) section.
- 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 TM-RX Receiver is a fully portable Mesh enabled digital diversity receiver which incorporates a DTC Software Defined Radio, a high resolution scratch resistant daylight viewable video screen, a flexible antenna pair and a battery.

The receiver has been designed for ease of use effectively operating 'straight out of the box'. It also allows further configuration by a Maintainer to provide greater system flexibility and capability.

Demand for RF flexibility has led to Mesh being the first choice for video transmission. A digital Mesh radio network allows encoded video, audio and data to be exchanged and shared between several nodes simultaneously.

COFDM point to point transmission is also supported as a system build option which incorporates UHF telemetry to support system control.

Housed in a compact rugged waterproof enclosure, the TM-RX is powered by the integral battery, which provides > 2 hours of continual operation. The batteries can be recharged using the charger supplied in the kit.

An internal backup battery allows the main battery to be hot swapped without any interruption to its operation, the status of the internal battery is displayed during this time.

The on-screen display provides the viewer with vital information such as the status of the RF link and battery levels of both the TM-RX and supported remote Mesh cameras.

A magnetic joystick, button interface and touch-screen control allows the user to configure a wide range of parameters in both in the TM-RX and supported remote cameras on the Mesh network.

The screen is manufactured from Gorilla glass, making it scratch resistant and resilient to being dropped. The touch screen can be operated using bare hands or capacitive screen compatible gloves. The brightness of the screen is adjustable so as to allow viewing in differing daylight levels.

A host of features can be controlled through its extensive menu structure, as described in the [TM-RX Screens](#) section.

Its external Fischer connectors support a direct Ethernet connection to the integrated SDR radio and an audio headset interface.

Security of the link is ensured through standard DES encryption or optional AES128 / AES256 encryption.

The outer casing is machined from aluminium, all external mating surfaces are gasket sealed to maintain an IP67 environmental rating.

TM-RX Kit

The TM-RX Receiver kit comes complete in a foam lined Peli flight case.

In addition to the TM-RX Receiver the kit also includes all necessary antennas, connecting leads, batteries and a battery charger with a mains power supply.

The kit contents are shown here and listed below, along with their part numbers.



	Part Description	Part Number
①	TM-RX Receiver	Frequency Dependant
②	SDR Antennas	Frequency Dependant
③	Telemetry Antenna	Frequency Dependant
④	Li-Ion Batteries	110-8401
⑤	Dual Li-Ion Battery Charger	110-8709
⑥	TM-RX Configuration Cable	110-0077
⑦	AC/DC Power Supply	110-8661
⑧	Documentation	110-8679



TM-RX Features



The Battery

The battery is the VE SLI-50 with a 48Wh capacity, which is used to power the TM-RX. It can be used in either orientation to simplify battery changes.

The battery incorporates a gas gauge circuit which accurately measures the power in and out of the cell, providing an accurate time remaining indicator, both under charge and discharge conditions.

To check the power remaining in the battery simply press the indicator button to get the power level to display on the LED power level meter for several seconds.



Battery Insertion

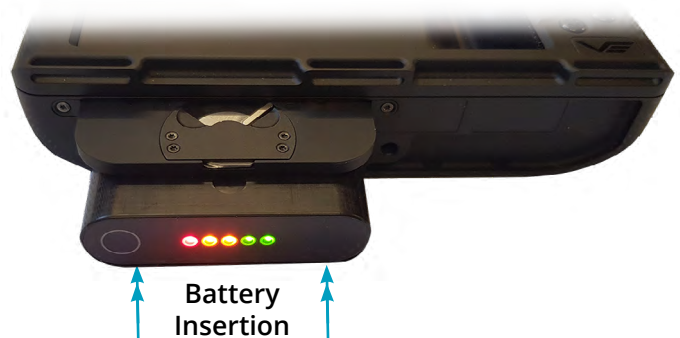
Open the battery hatch by releasing the locking mechanism as indicated in the image on the right.



Insert the battery into the open battery hatch with the LED indicator facing outwards, as shown.

It is possible to insert the battery in either orientation, with the indicator button on the right or the left.

Push the battery home, close the battery hatch door and secure the battery latch.



The battery being inserted on the right is showing its remaining charge on its power level meter as the indicator button has recently been pressed.

Note: An extra internal backup battery allows the main battery to be hot swapped without any interruption to its operation. The internal battery will support unit power for 15 seconds to allow the battery swap to be completed.

Battery Charging

The TM-RX Receiver battery can be charged in the MAL Li-Ion dual battery charger supplied in the kit.

The MAL takes full advantage of the battery management circuitry. It displays accurate information on the batteries condition, capacity and time to charge on a colour OLED display on the front of the unit.



The charger is powered by the supplied AC/DC supply, which connects into the Fischer connector on the rear of the unit.





TM-RX Power On



A long press on the **Power/Home Button** will start the boot up procedure.

The TM-RX Receiver is ready to use after booting up. The unit will boot up into the lowest light level, the Handler can increase this using the + button on the unit.

❄️ Powering on in sub-zero temperatures ❄️

If the TM-RX is turned on in sub-zero temperatures the boot sequence will include a pre-heat cycle, during this period the display will remain off and the vibration motor will pulse every 20 seconds to indicate the internal heaters are operational. Once the required internal temperature has been reached the unit will boot as normal.

The pre-heat time will vary depending on the internal temperature and can vary from a few seconds to several minutes in very extreme conditions.



TM-RX Screens

The TM-RX will boot directly into the [Viewer App](#) screen, which shows the video feed from the Mesh camera. If no Mesh camera is powered on, or if the video stream is lost due to a loss of RF signal the TM-RX will show a black screen.



Each menu function down the right hand side of the screen can be controlled using the touch-screen or the button next to the menu graphic.

To view **full screen video** triple tap the video panel.
Return to the menu overlay viewer screen with a further triple tap.

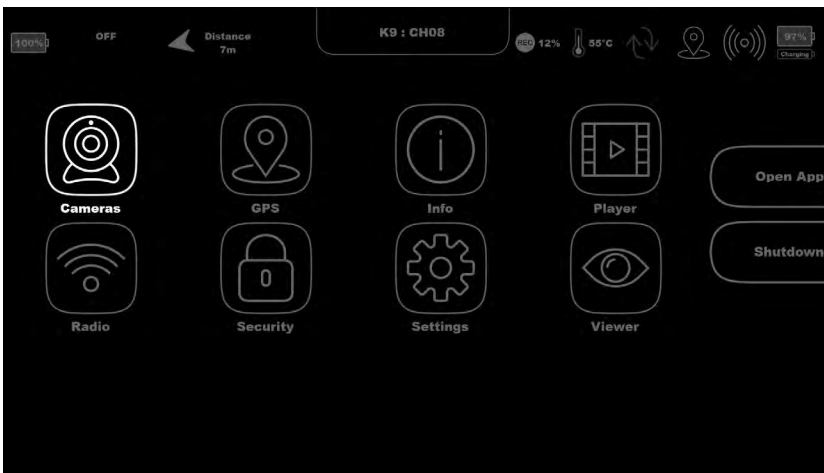


The + and - buttons adjust the screen backlight brightness.

Home Screen

Pressing the Power/Home button from any screen view takes the user to the Home Screen, which displays the various Apps including: [Viewer App](#), [Cameras App](#), [GPS App](#), [Radio App](#) and the [Settings App](#).

On the Home Screen the current App choice is highlighted in white, the Cameras App is shown selected here. Different App selections can be navigated and chosen using the touch-screen or with the joystick.

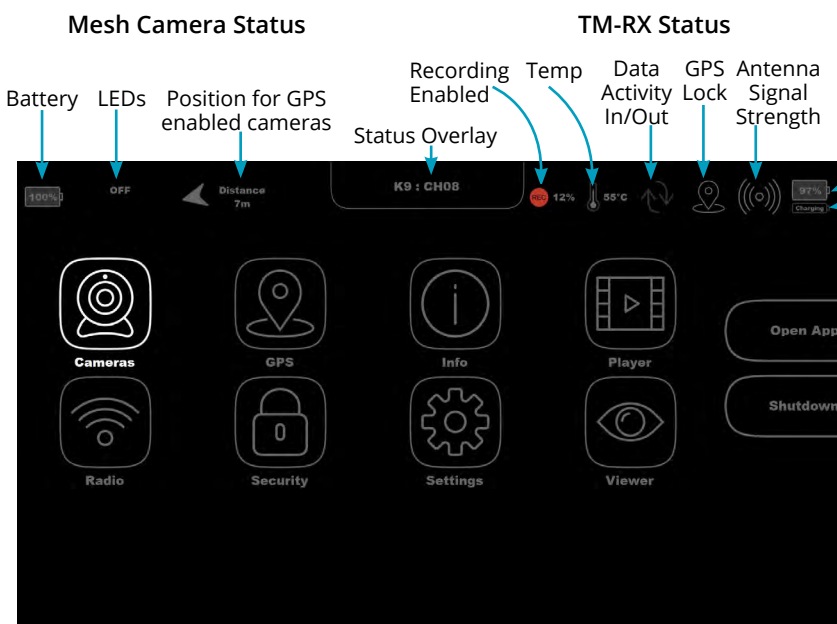


Select Open App or select the App on the touch-screen for associated functions.

Return to the home screen by pressing the **Power/Home Button**.

A long press on the **Shutdown** option will turn the unit off.

Along the top of the display is a host of icons that displays the system status. TM-RX status icons are displayed on the right. The status of the connected Mesh camera is shown by the icons on the left.



The top battery icon indicates the battery level of the main TM-RX battery, this toggles between % battery charge remaining and the time to expire in hours and minutes.

The lower battery icon indicates the state of the internal backup battery, which is either charging or ready.



Status Overlay

The status overlay in the top centre of the screen will change depending on certain circumstances. In the example above it displays the camera that is currently selected (K9 : CH08), this is the usual state for the majority of the time. There are two instances in which it displays other information, as described below.

Low Battery

To alert the user of a low battery level the Low Battery status update will appear for three seconds every minute during the last ten minutes of battery life. The haptic feedback will also pulse intermittently when the battery is low.



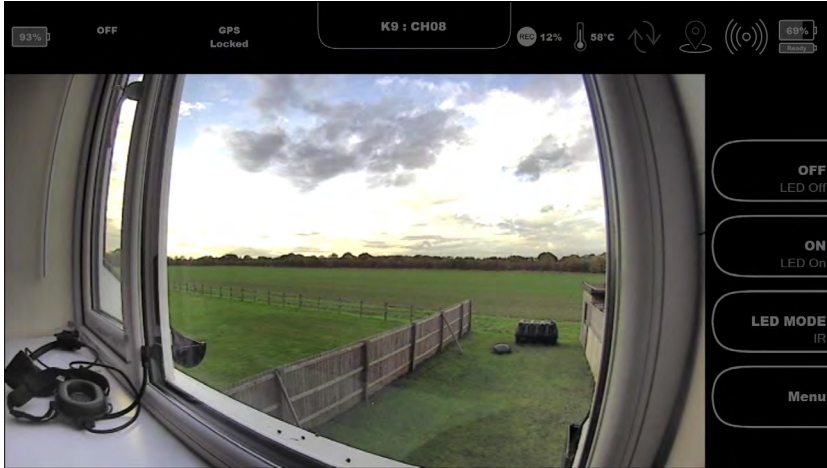
Backlight

The screen backlight can be controlled using the + and - buttons when using the [Viewer App](#). The backlight graphic will appear for three seconds after each change of the backlight level to indicate the current value.



Viewer App

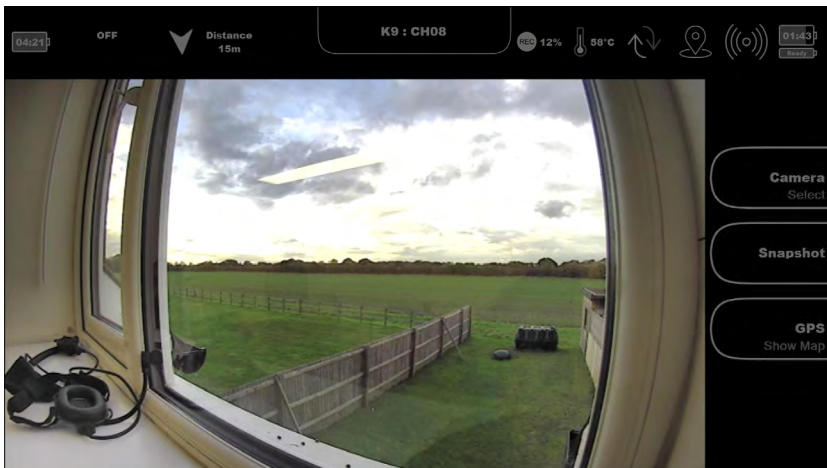
System functions that are dependant on the video to be viewed are grouped into the Viewer App menus.



The **LED Control** of the connected Mesh camera is controlled using the listed menu options.

Select the LED Mode of: IR, Auto IR, White, Auto white or Strobe.

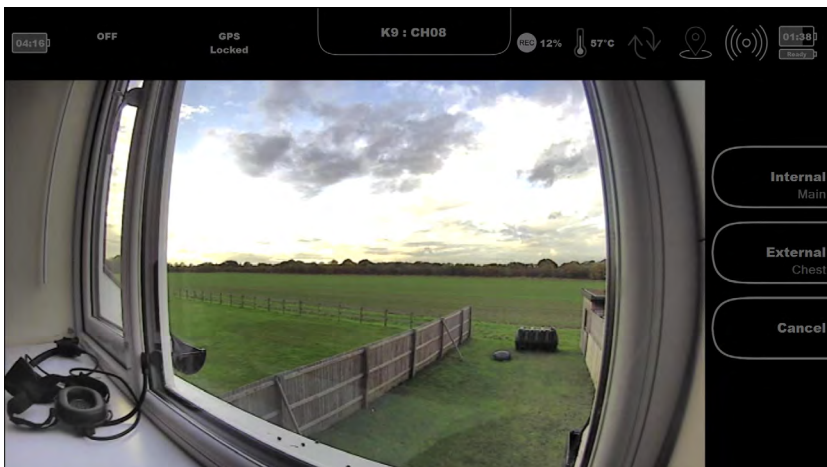
Selecting Menu will display further menu options as described in the slide below.



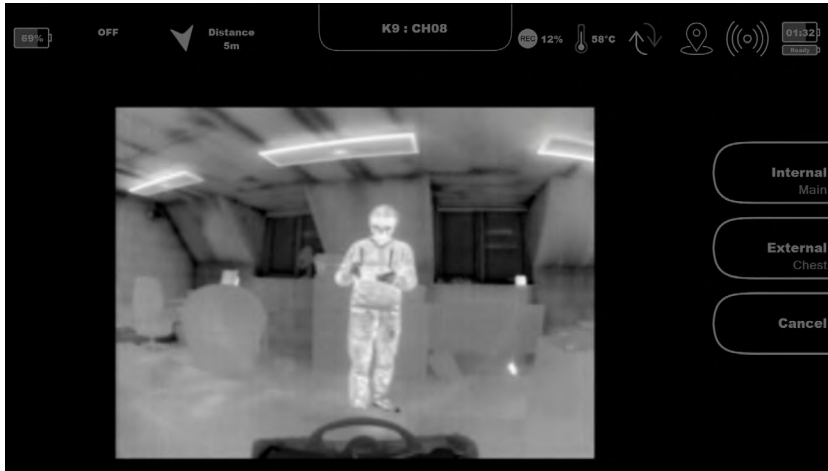
Select **Camera** to switch between camera options as described in the slide below.

Select **Snapshot** to take a still image of the video, which can be viewed in the [Player App](#). This feature is **not available** if recording has been enabled.

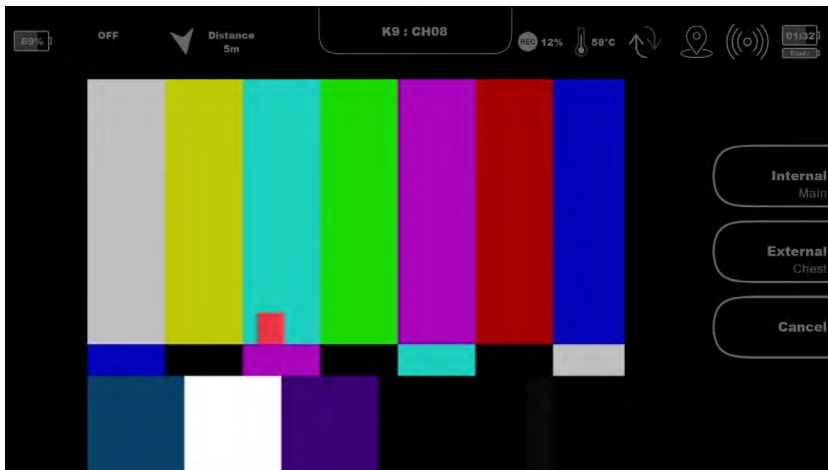
Select **GPS** to show maps as described in the [GPS App](#).



Select either **Internal** to view the main camera or select **External** to view any connected auxiliary camera.



In this example the **Internal** main camera has been selected, which has been fitted with a **Thermal** camera head.



If no camera is present the test bars signal will be displayed.

If the Internal camera has been selected then check the Mesh camera head connections.

If the External camera has been selected check the auxiliary cable connections.



Digital PTZ

Certain VE Mesh enabled cameras such as the DropCam-SDR support digital PTZ control of the video frame. This is achieved by viewing the SD video feed from a camera which has a HD sensor fitted. Control of the viewed frame is through the use of the joystick & the + and - keys.

HD Sensor View

The dotted line area highlights an SD video area within the HD sensor field of view.



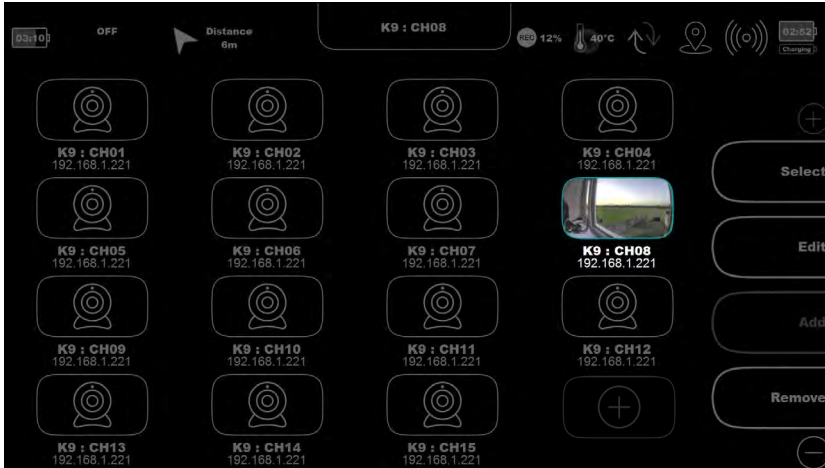
SD Video View

Move the SD view around with the joystick. Zoom in and out using the + and - buttons.



Cameras App

Each Mesh network is capable of having up to a maximum of 16 nodes. Any active channel is shown as a thumbnail of video. In the example below there is one active node on channel 8.

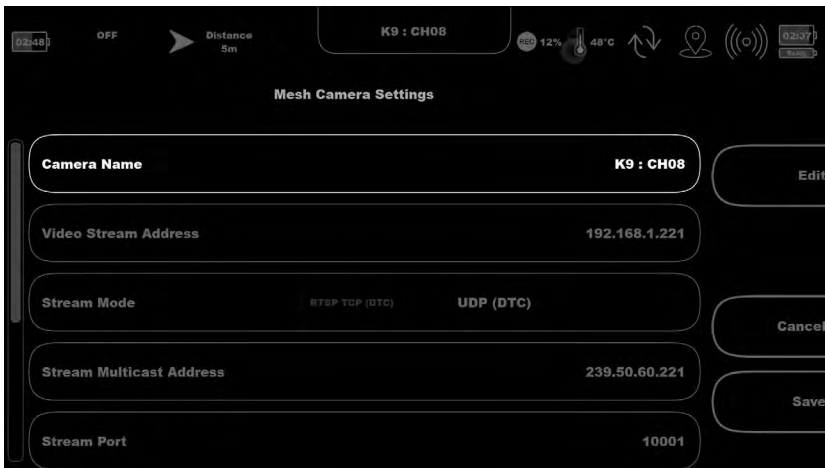


To view the thumbnail video **Select** it with the joystick & buttons or the touch-screen.

Press **Edit** to edit camera settings as described in the slide below.

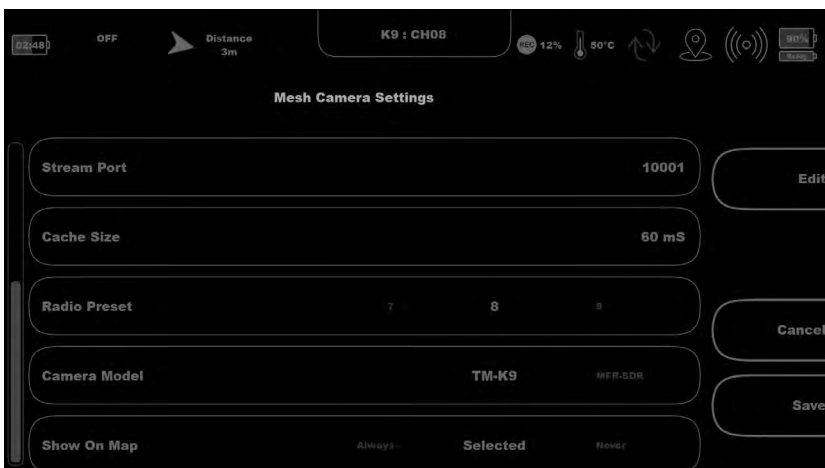
Cameras can also be added or removed as described in the [Add a Camera](#) section.

A long press on **Remove** will remove the highlighted camera from the list.



Edit Cameras allows the user to edit various parameters including Camera Name and Video Stream Parameters.

Scroll down this menu for further options as shown in the slide below.

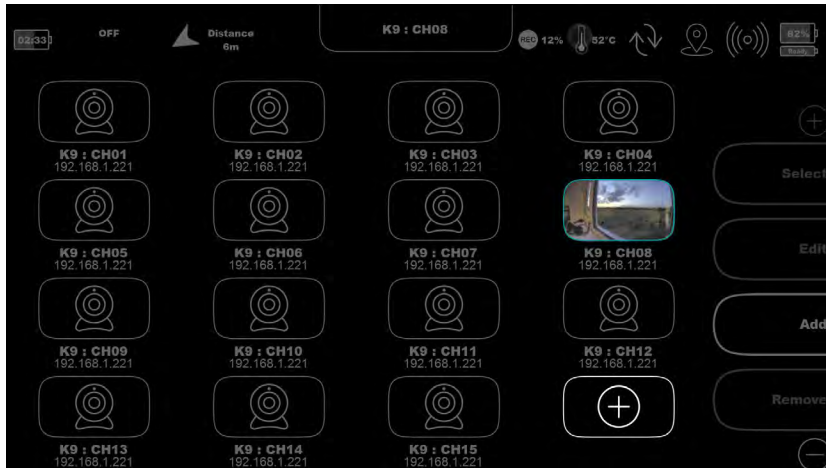


Further parameters including Cache Size and Radio Preset can also be edited.

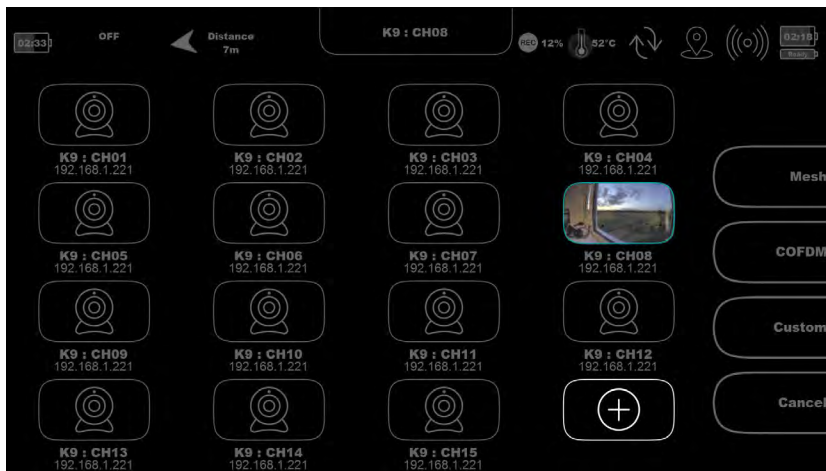


Add a Camera

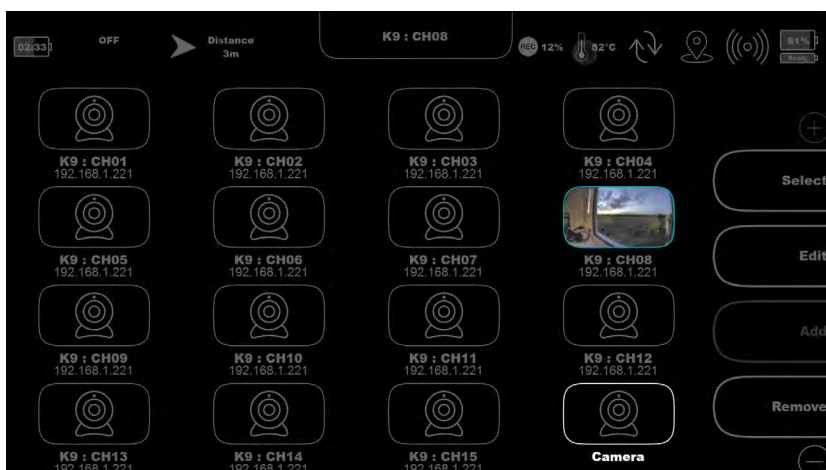
Cameras can be added to the camera list, this allows cameras to be setup with custom parameters including name, stream URL and streaming method.



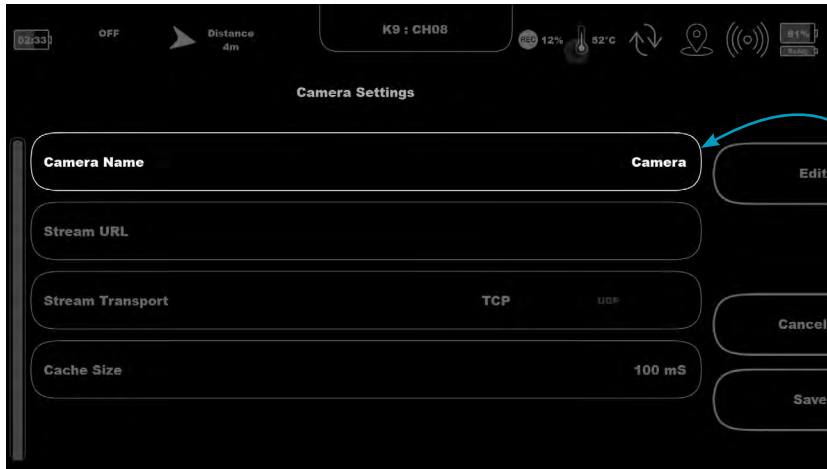
Select the **Add** option in the Cameras App.



Select the **Custom** option in the Cameras Add menu.



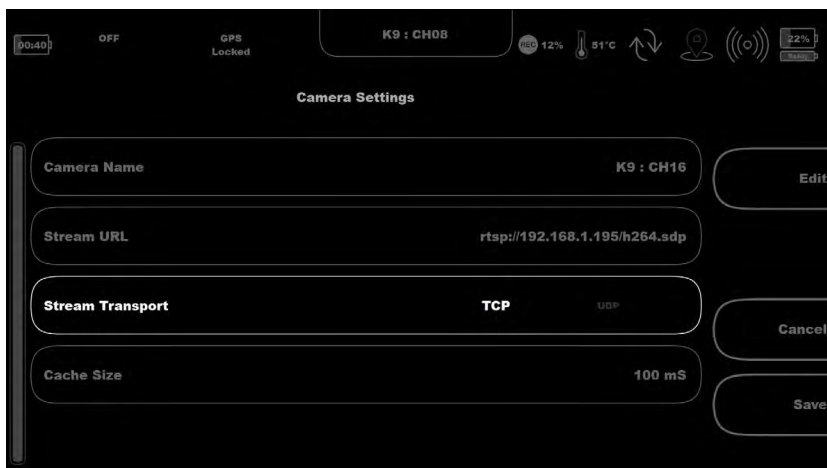
Highlight the Camera that has just been added and select **Edit**.



Change the **Camera Name** as required.



Change the **Stream URL** as required.



Select the required **Stream Transport** mode to either TCP or UDP.

UDP is a more efficient method which carries less overhead than TCP but lacks some reliability as not all video frames are required to be received in full.

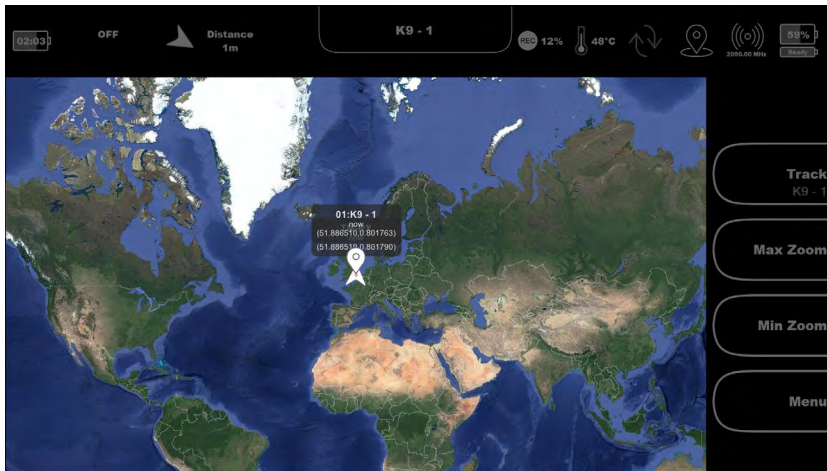
The **Cache Size** can also be adjusted, increasing it will cause the player to cache more data to decode the video stream, which can result in a better image during poor reception. Decreasing the cache size will result in the latency of the stream being reduced.

Ensure to press the **Save** button once the changes are completed.

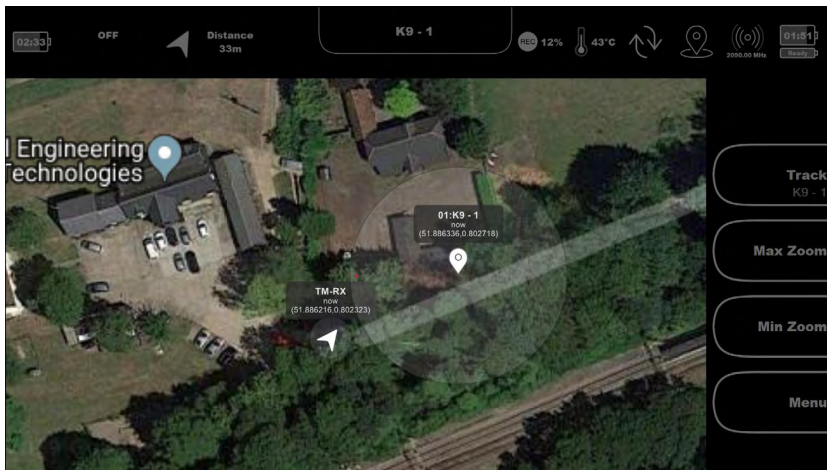
GPS App

The GPS App displays a map view showing the location of the TM-RX and any Mesh cameras on the network.

GPS maps can be uploaded to the TM-RX by first downloading a selected geographical area using the [GPS Map Downloader](#) and then uploading the file to the TM-RX using the [File Uploader](#).



Selecting **Track** toggles between the GPS tracking of the TM-RX and a camera on the Mesh network..



Zoom to reach the required overview, using the Max Zoom and Min Zoom controls.

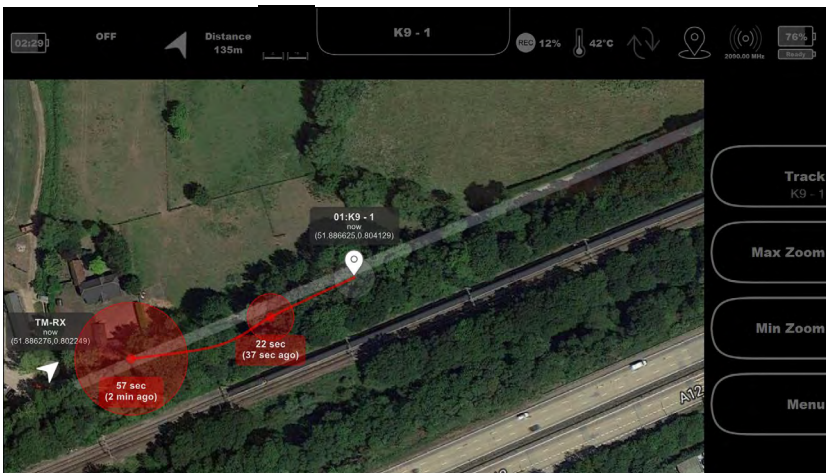
Zoom adjustments can also be made using the + and - control buttons or a single tap on the screen. Pinch zoom is not supported on the TM-RX screen.

Pressing **Viewer** takes the user back to the [Viewer App](#)

GPS Tracking

It is possible to create a GPS tracking trace of the TM-K9 Receiver or any connected Mesh camera that has GPS capability. To view tracking ensure that Show Paths is enabled in the GPS settings menu.

Once the device to Track has been selected, the map will be overlaid with a red trace graphic showing its recent movements. Enabling Show Hotspots in the GPS settings menu will display instances of paused movement as a red circle.



In this example the K9-1 Mesh camera is being tracked and its recent movements are overlaid onto the GPS map.

The current location is displayed as 'K9-1 now' along with its GPS co-ordinates.

The hotspot positions are displayed with the duration spent at the hotspot location and time since being at the hotspot location.

Settings App

The Settings App allows access to a list of system features including boot-up, network, RF, GPS and recording configuration.



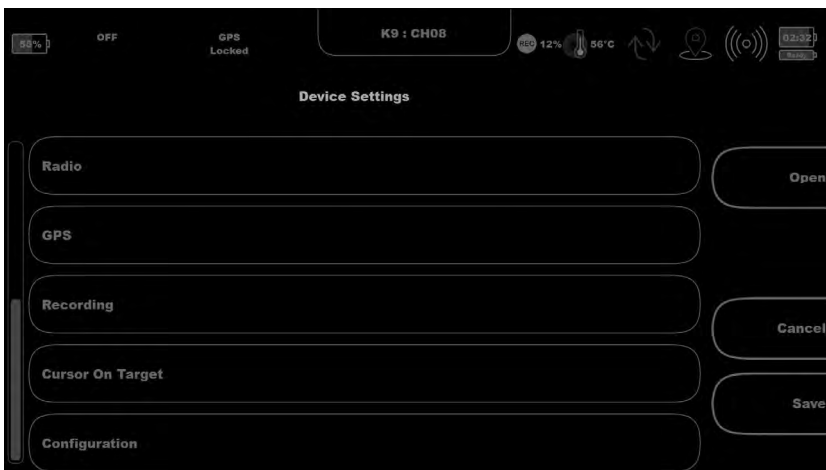
Display - Allows editing of the backlight features.

Apps - Allows the user to change which App will be loaded automatically on boot up.

Joystick and Buttons - Allows haptic feedback to be turned on/off.

Network - Allows editing of the TM-RX IP address settings.

Telemetry - Point to point mode settings.

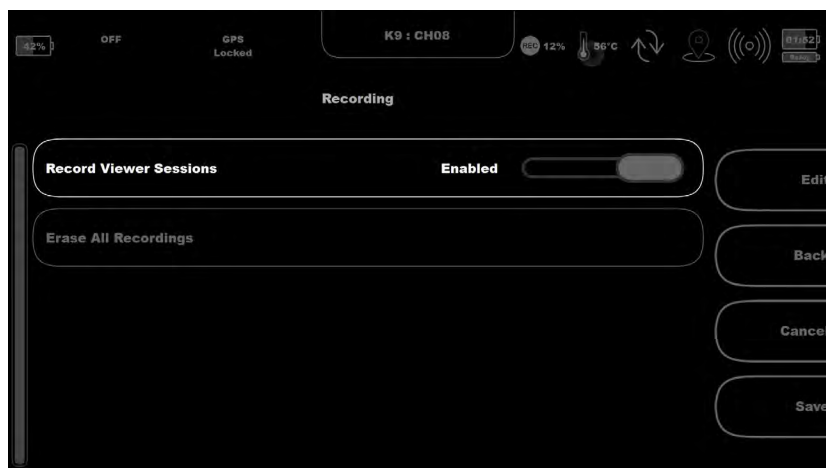


Radio - Parameters not covered by the [Radio App](#)
GPS - configure paths and hotspots on GPS maps.

Recording - Described in the slide below.

Cursor On Target - Configures whether CoT data is distributed through the network.

Configuration - Export settings control.



Recording - If recording is enabled all video will be recorded to memory when viewing video in the Viewer App.

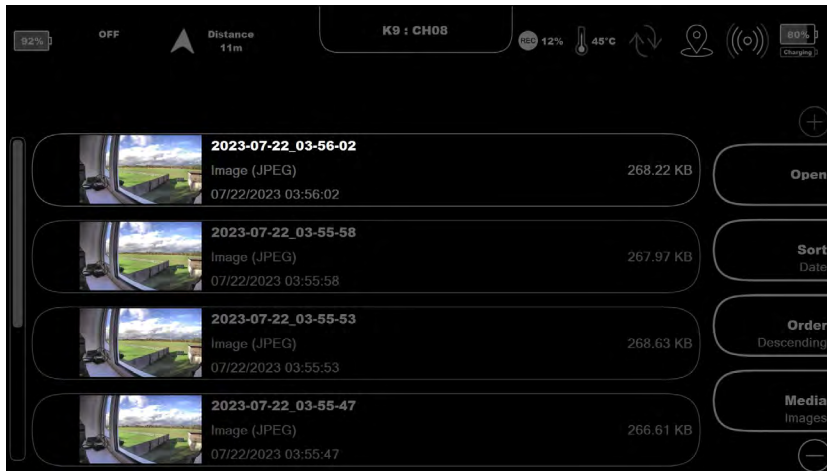
A separate video file will be created every time the Viewer App is opened and closed.

Erase All Recordings will delete all saved video recordings.



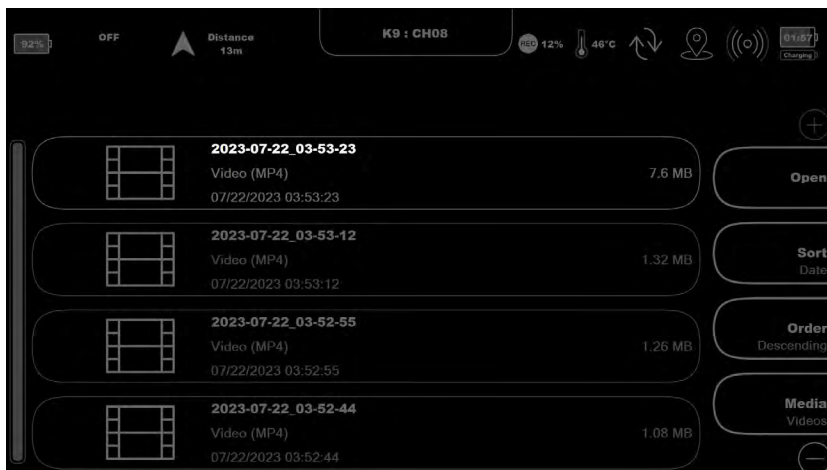
Player App

The Player App allows access to saved files including all video clips and Snapshot images.



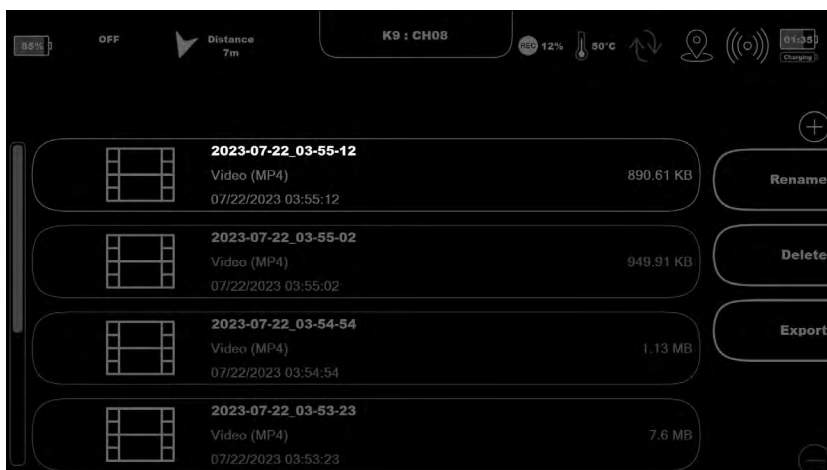
Select a file to be viewed on the touch screen or navigate to it using the Control Buttons.

Open to view, navigate back to the list menu by selecting **List**.



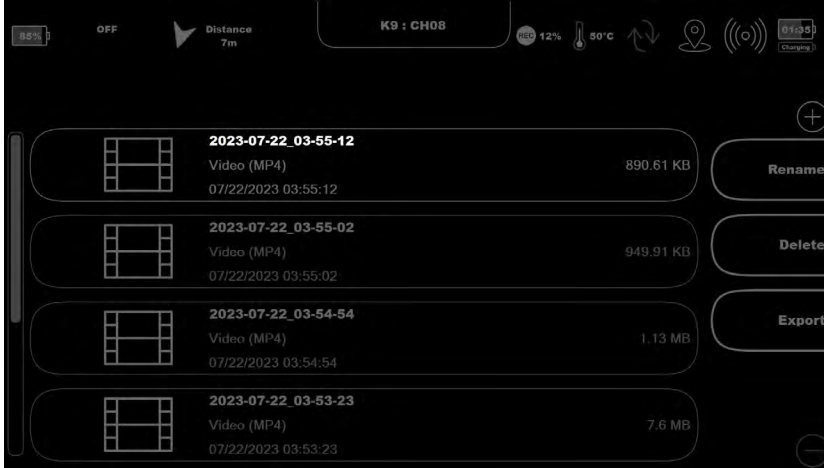
Press the **Media** button to toggle between stored images and videos.

Video recording is enabled in the Recording option in the [Settings App](#).



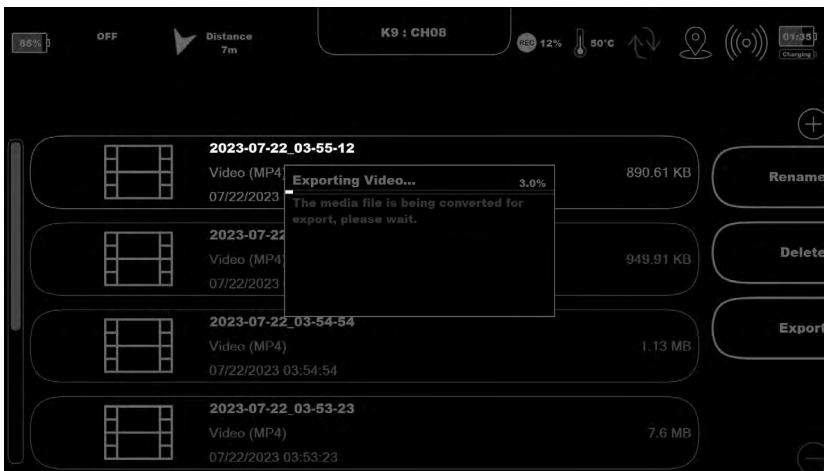
Press the - button to gain access to the lower menu options that allow files to be renamed, deleted or exported.

Export Recordings

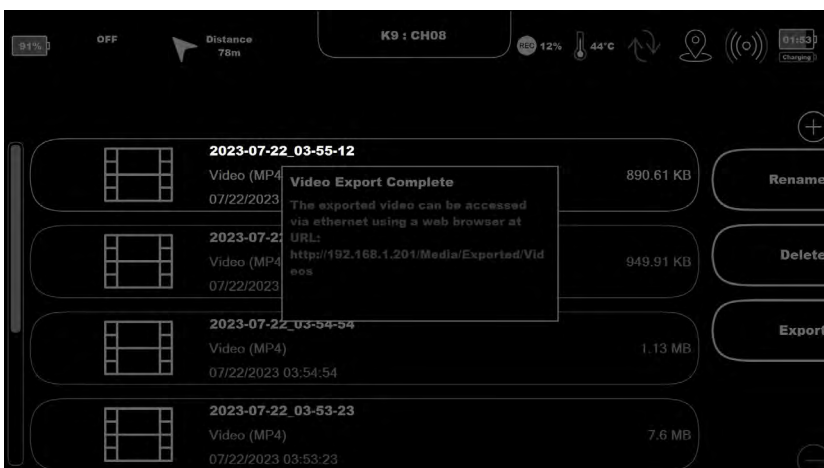


Any of the video recordings listed can be downloaded directly to a PC as described in the [Downloads](#) section.

Additionally recordings can be exported. The export process will transcode the file to make it compatible with the DEMS 360 standard.



The transcode process will take approximately the same time as the length of the video recording.

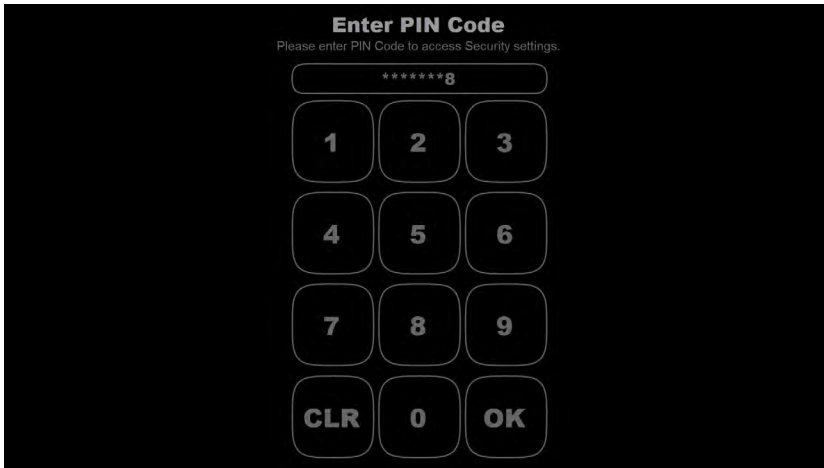


Exported files can be accessed in the **Exported directory** via the web interface as described in the [Downloads](#) section.



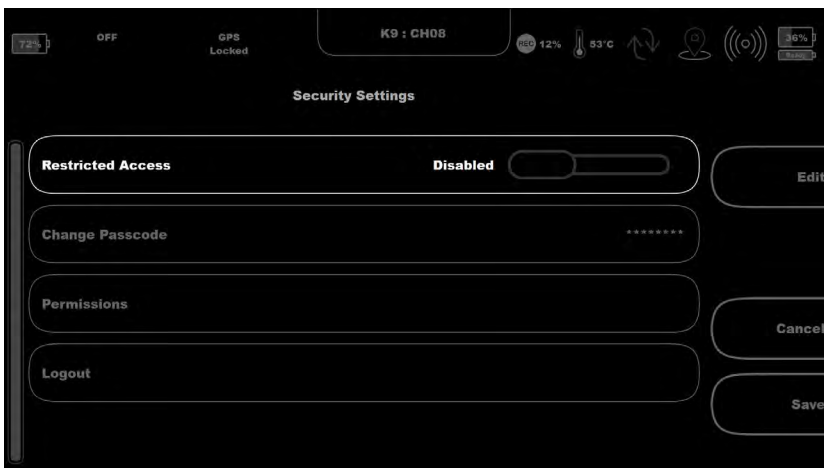
Security App

The security App can configure access to specific areas of the TM-RX. As such many of the TM-RX functions explained in this manual may not be accessible if the unit is locked.



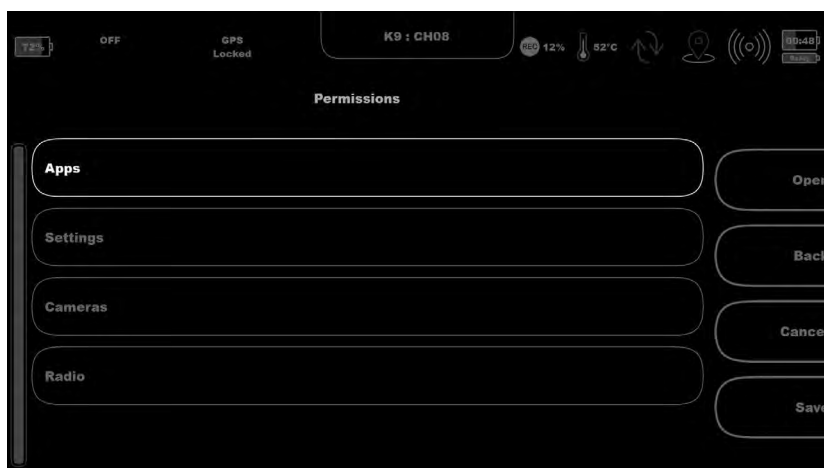
Access is protected with an 8-digit pin code.

Default unlock PIN Code:
12345678



Restricted Access can be enabled or disabled.

The **Default unlock PIN code** can be changed to one chosen by the Maintainer, who is responsible for configuring the system.

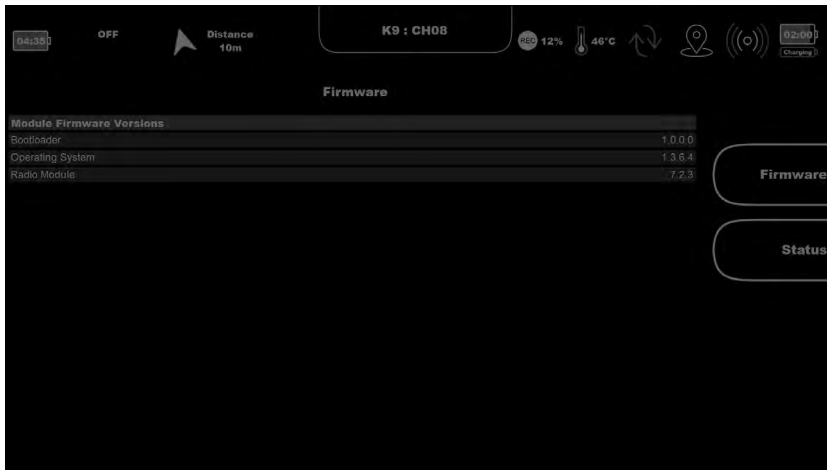


Access to Apps and Settings can be controlled in the Permissions menu.

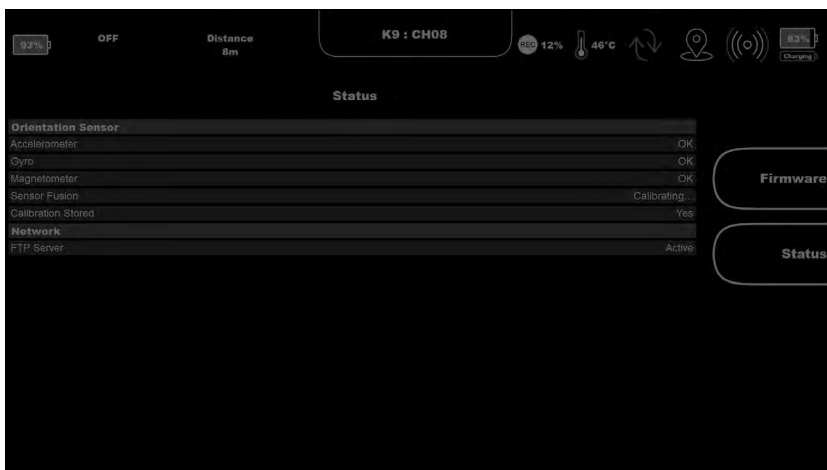


Info App

The Info app can be used to check the TM-RX status.



Firmware displays the TM-RX software versions.



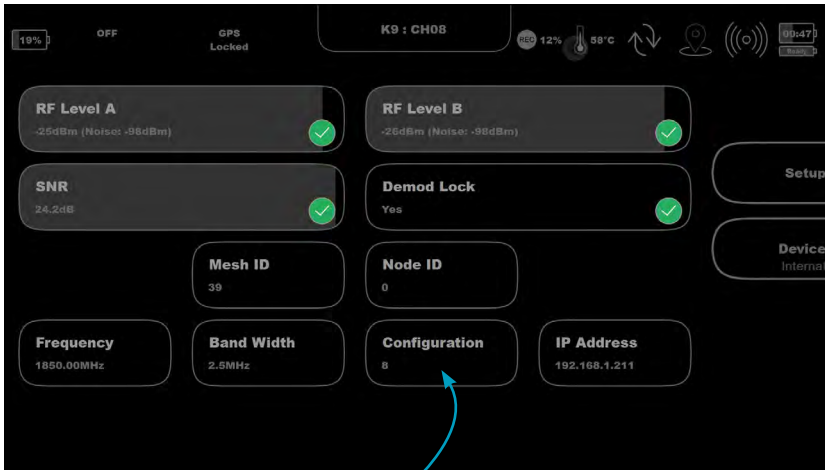
Status shows the status of the Accelerometer, Gyro and Magnetometer sensors.

Sensor Fusion describes the combined system status, which allows a tilt compensated heading to be calculated.

Calibrating can either be an initial calibration or a re-calibration which will occur periodically to ensure accurate results.

Radio App

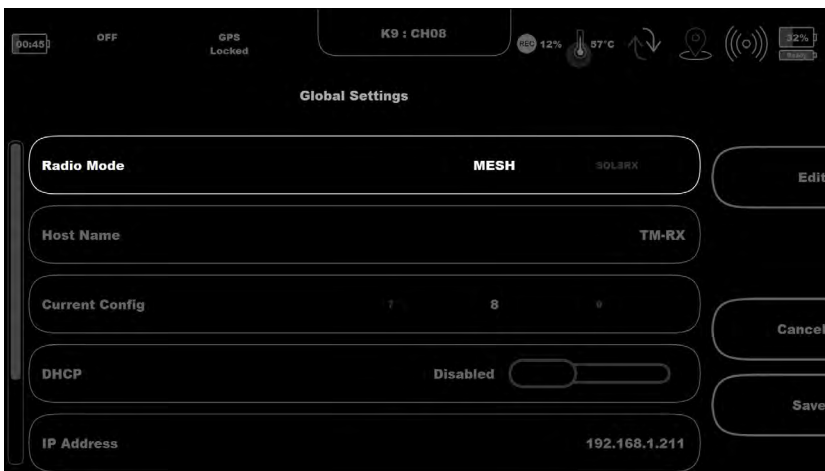
Radio settings gives an overview of the current status of the system radios.



Since the selected Device shown here is “Internal” this information is relevant to the TM-RX. To get the status of the radio module in the Mesh camera toggle the device using the **Device** Button.

Select **Setup** to enter the radio’s **Global** or **Presets** Settings.

To allow for frequency agility across the Mesh group it is possible to change just the configuration preset of the radio. Use the + and - buttons to cycle through the available options. Once the radio has re-tuned to the new configuration all parameters will be updated on the screen.



In **Global** Settings it is possible to change the system radio type.

Pressing **Edit** with Radio Mode selected will allow the radio type to be changed between either Mesh or COFDM point to point (if the system has this licence included).

Warning: Changing the TM-RX Receiver to a different radio type to the Mesh camera will cause the link between the two to stop working.

In **Global Settings** the options include the following, which can be edited as required:

- **Radio Mode** - Toggles between Mesh and COFDM radio type (appropriate licence required).
- **Host Name** - Shows current name.
- **Current Config** - Edit toggles through the preset channels 1-16.
- **DHCP** - Edit toggles this function on or off.
- **IP Address** - The radio module IP address.
- **Subnet Mask** - The radio module subnet mask.
- **Default Gateway** - The radio module default gateway.

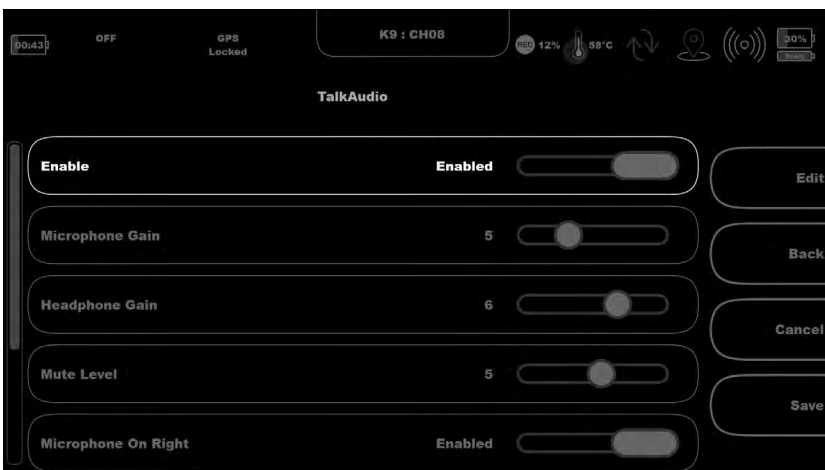


In the **Presets** Settings the radio preset can be selected from 1 to 16.



Enter a **Preset** to change a range of parameters in the selected preset channel to include:

- **Frequency**
- **Modulation Output**
- **Modulation Port**
- **Channel Bandwidth**
- **Output Attenuation**
- **Mesh ID**
- **Node ID**
- **Range Extension**
- **Talk Audio**



Selecting **TalkAudio** allows access to the system's audio settings.

Parameters such as mic gain, headphone gain and noise suppression can be adjusted to suit a particular scenario.



Downloads

A web browser can be used to access TM-RX Receiver downloads which can be video recordings, images, exported recordings and configuration files.

Ensure the PC that is hosting the web browser is on the same IP subnet as the TM-RX. This is described in the [PC IP Address Configuration](#) section.

To access the files enter the following URL into a web browser on a PC:

http://<IP_ADDRESS>/Media

Where the <IP_ADDRESS> is the IP Address of the TM-RX. This can be found in the Network settings, as described in the [Settings App](#) section.



Select one of the directory paths shown in the web browser to access the saved files for download.



Maintainer Guide

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

Web browser configuration of the Mesh radio is not required for normal operation and should only be undertaken to achieve the following:

- Change the system frequency
- Change the system IP addresses
- Change the Encryption key
- Switch the operating mode of the radio
- 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 system inoperable, requiring the system to be returned to base for repair.



Web Interface Access

Power up the TM-RX Receiver and connect the configuration cable to the EXT-B connector, then connect the RJ45 connector end to a PC.

- Open a web browser on the PC
- Type the IP address of the unit e.g. **192.168.1.211** into the address bar
- The web browser will open a **Login Prompt**

To find IP address of radio in the Mesh camera or the TM-RX Receiver refer to the [Radio App](#) section.

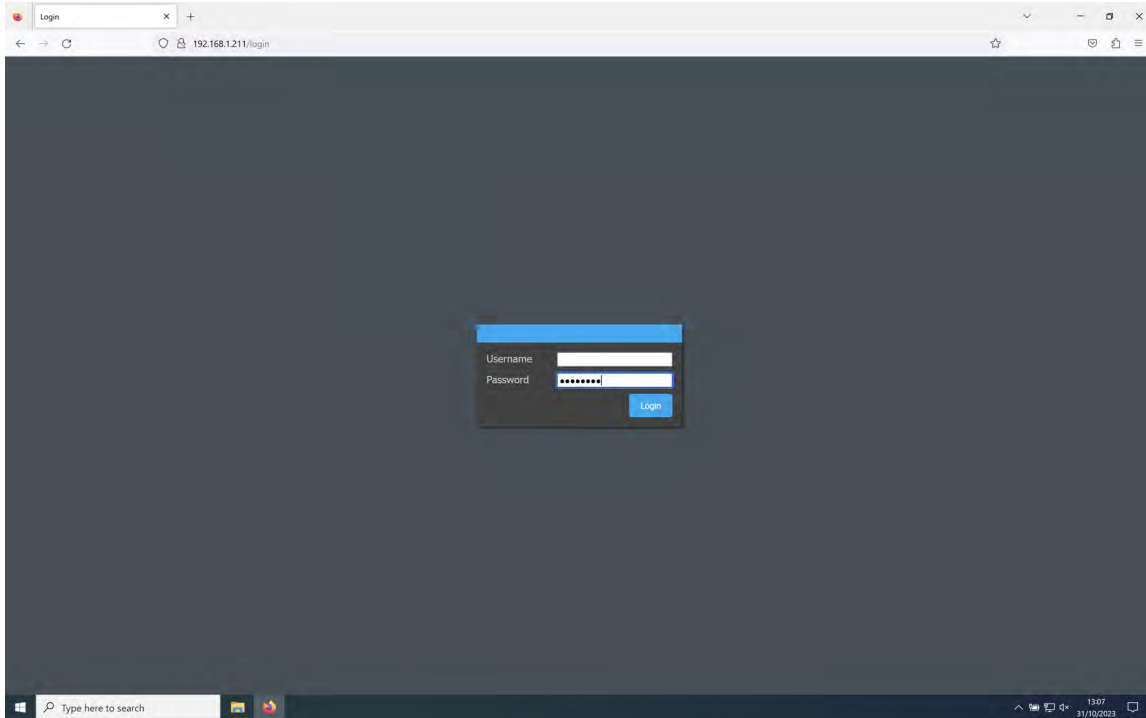
If the link cannot be established to find the IP address of the Mesh camera it will be necessary to use the **Node Finder Application**, it may be necessary to contact Visual Engineering for support in this instance:

support@visualengineering.co.uk



Login Prompt

Login authentication is required to connect to the SDR Mesh radio configuration pages. By default the user name should be left blank and the password is **Eastwood**

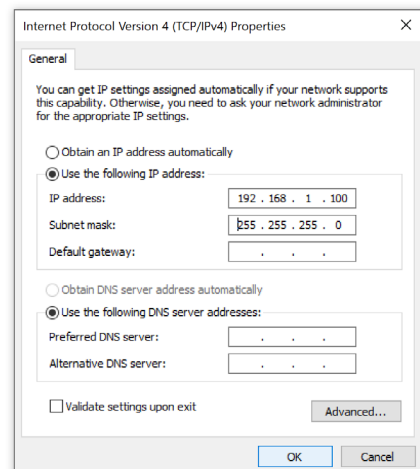
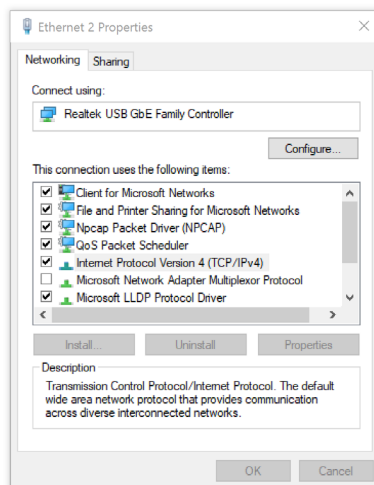
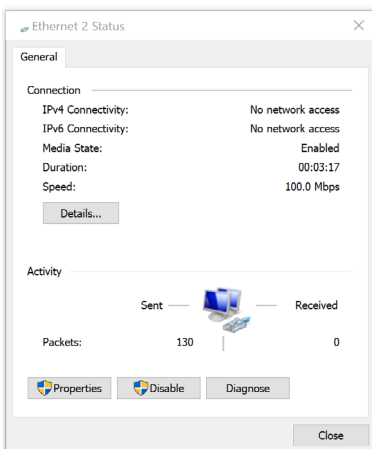
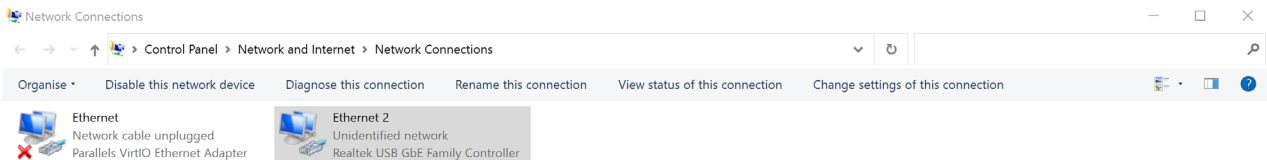
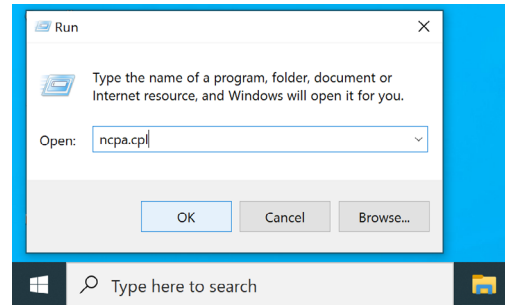


If a connection cannot be established with the login page it may be that the controlling PC is not on the same IP subnet as the radio. The following section describes how to set the PC to a specific IP address.

PC IP Address Configuration

For a direct Ethernet connection between the TM-RX and a PC, it may be necessary to configure the PC's network adapter to use a static IP address, as described below.

1. Open the Run app. (Press and hold Windows Key (W) on the keyboard, then press the "R" key)
2. Type the command "ncpa.cpl", then click OK.
3. Right click on the network adapter where the unit is connected to, then click "Properties". (If there are multiple adapters, the correct one can be identified by disconnecting the Ethernet cable, one of the adapters should now show "Network cable unplugged" upon reconnection it should eventually change to "Unidentified Network", this is the one connected to the system)
4. In the window that pops up, select "Internet Protocol Version 4 (TCP/IPv4)" then click "Properties".
5. Another window will now pop up, select "Use the following IP Address" and enter an IP Address on the same subnet as the system.
6. Click OK and Close

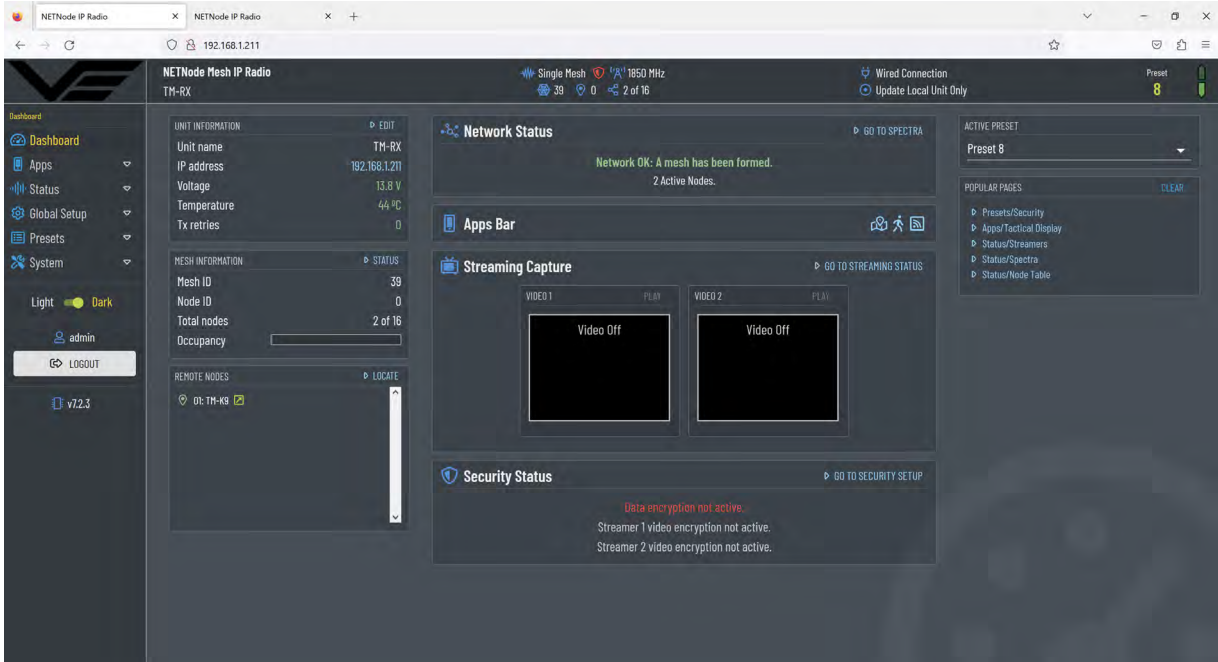


To re-configure to the original settings where the PC's IP address is obtained automatically follow the steps above except in step 5 select "Obtain an IP address automatically"

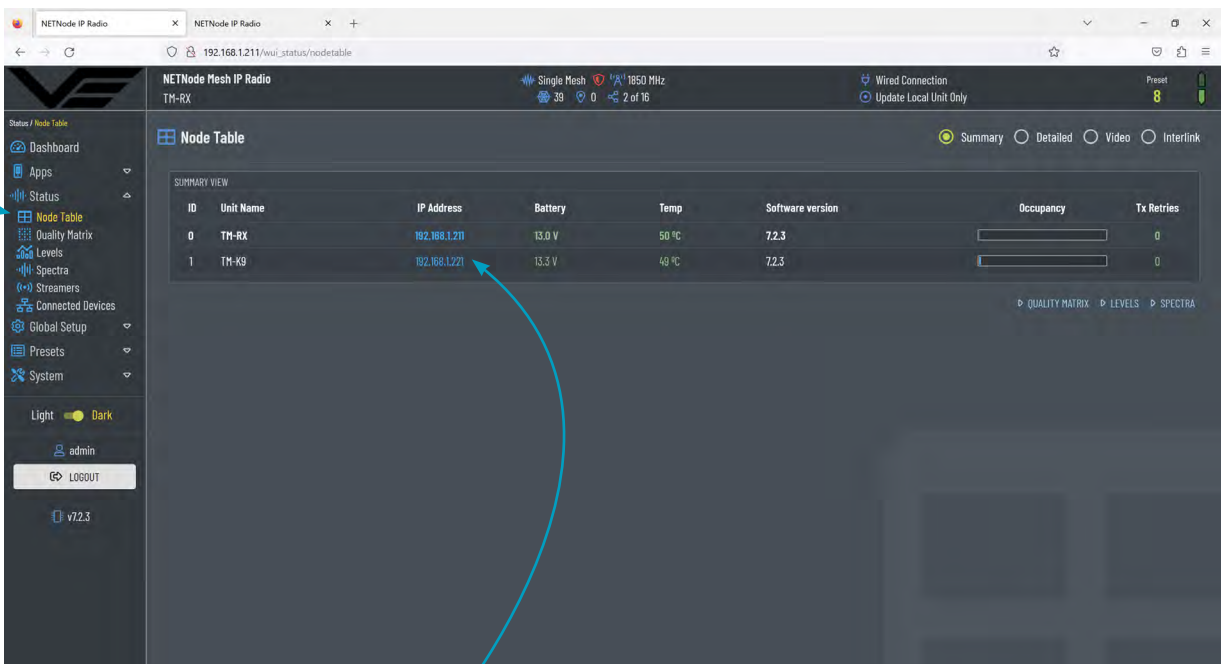
Dashboard

The Dashboard is a summary page. The blue text icons are hyper-links which lead to pages where parameters can be viewed in closer detail or edited.

The **TM-RX Dashboard** below shows an active Mesh with one other active node on Preset 8.

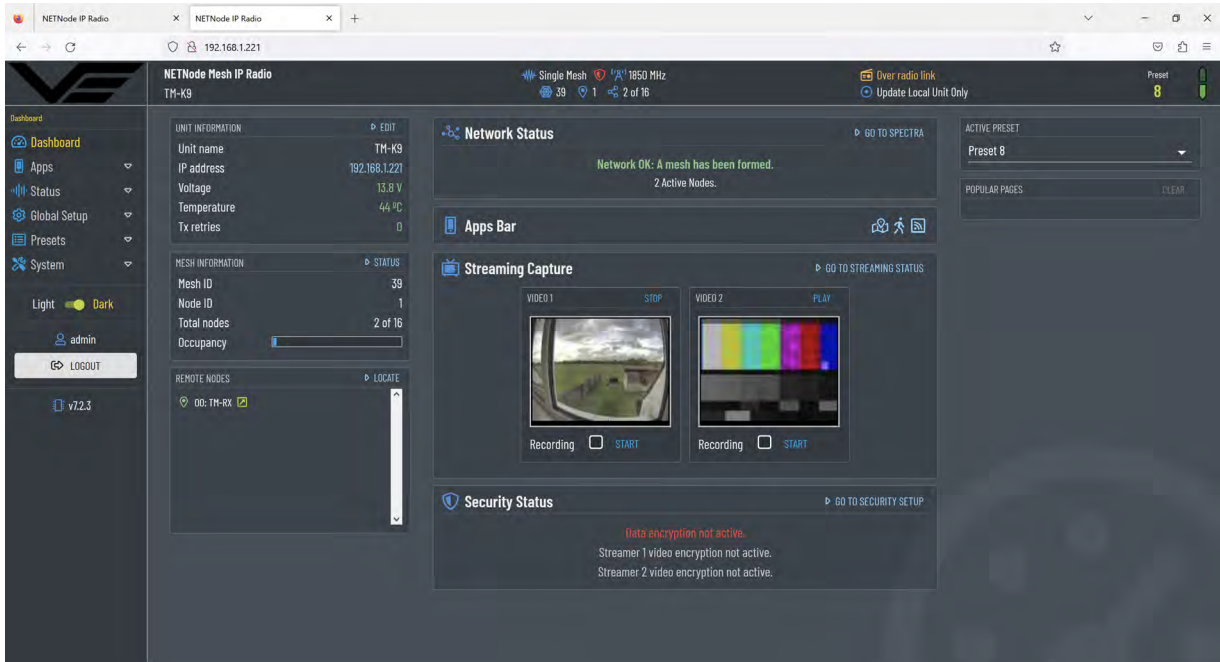


Select **Status>Node Table** to list all active nodes on the Mesh network.



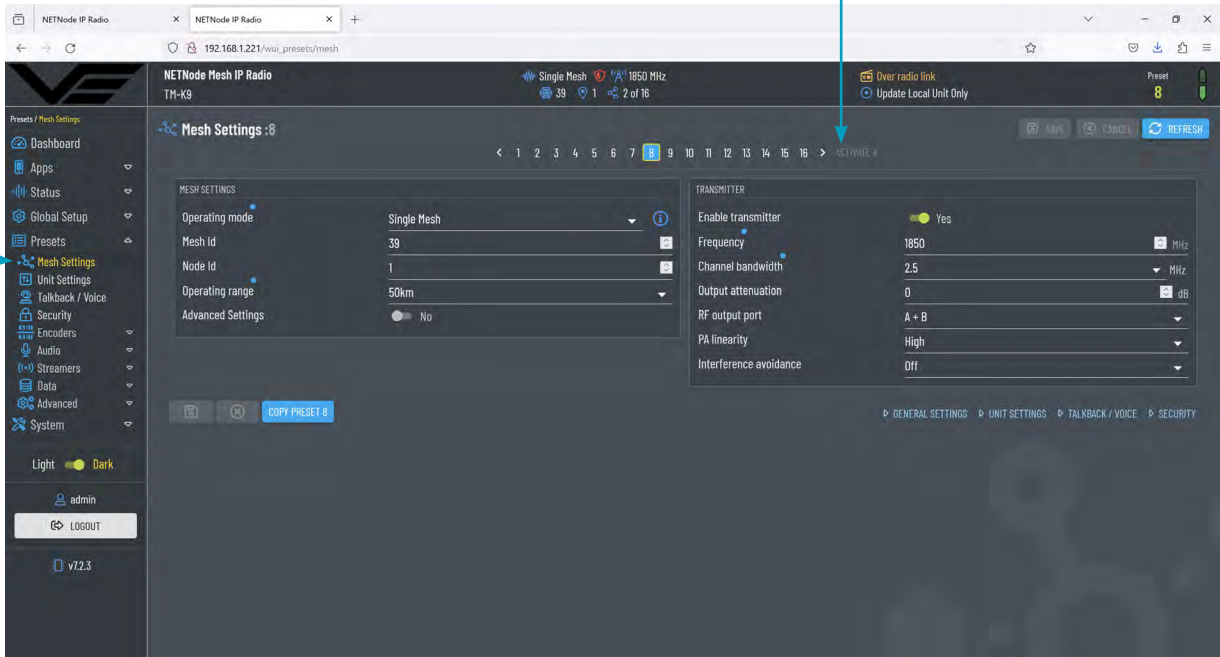
The only other node on the network is named TM-K9. Click on the IP Address to access its Dashboard.

The **TM-K9 Dashboard** below displays the Mesh node status.
VIDEO 1 preview displays the active main camera feed.
VIDEO 2 preview displays a test bars signal since there is no external camera connected.



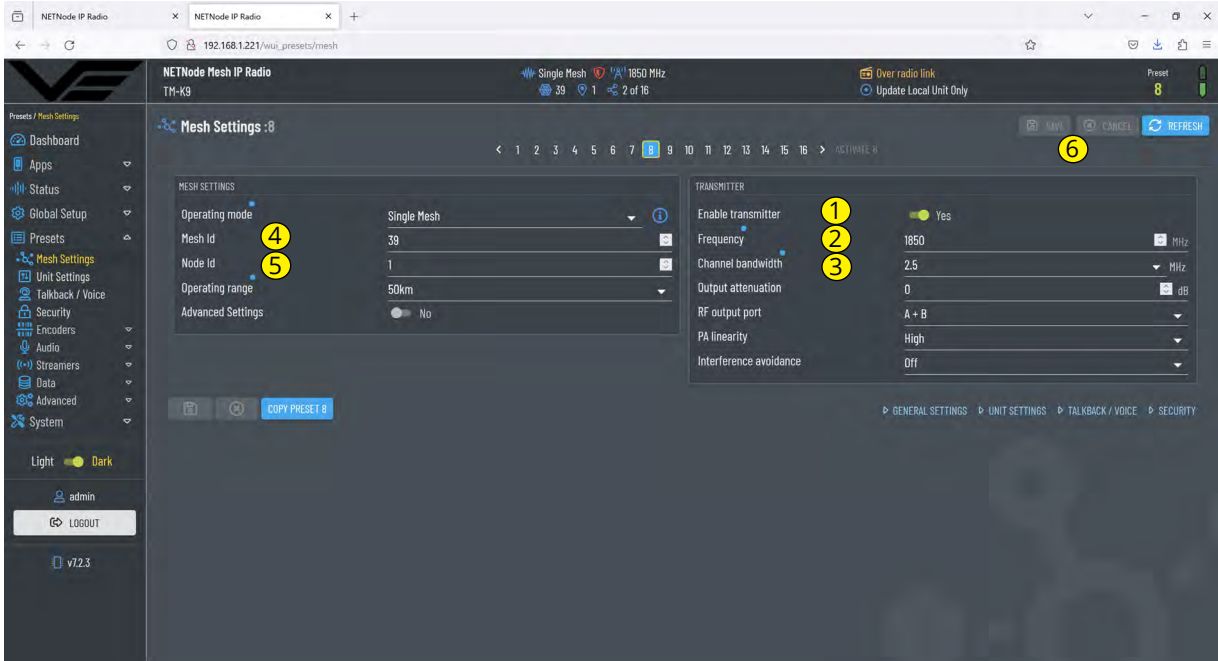
Mesh Settings

The control page below can be used to control and configure a Mesh node.
 Browse to the **Presets>Mesh Settings** tab.
 The RF channel on the selected Mesh node can be changed from here, select the required channel and Activate.



Key RF Settings

The highlighted options in the Mesh Settings page are the key points to consider when configuring the RF channel, as described in the table below.



Item	Description
① Enable transmitter	Slide to Yes to switch the transmitter on. All nodes in a Mesh must have their transmitters enabled.
② Frequency	Type in the frequency to use for the Mesh. This must be the same for all units.
③ Channel bandwidth	Select the bandwidth to use for your Mesh from the drop-down list. This must be the same for all units.
④ Mesh Id	Type in a Mesh ID, this must be the same on all units in the Mesh network. The Mesh ID sets which Mesh network the unit belongs to. All nodes on a particular Mesh ID can communicate with each other.
⑤ 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.
⑥ Save or Cancel	Once values have been set, click Save to commit to the changes or Cancel to revert to the existing configuration.

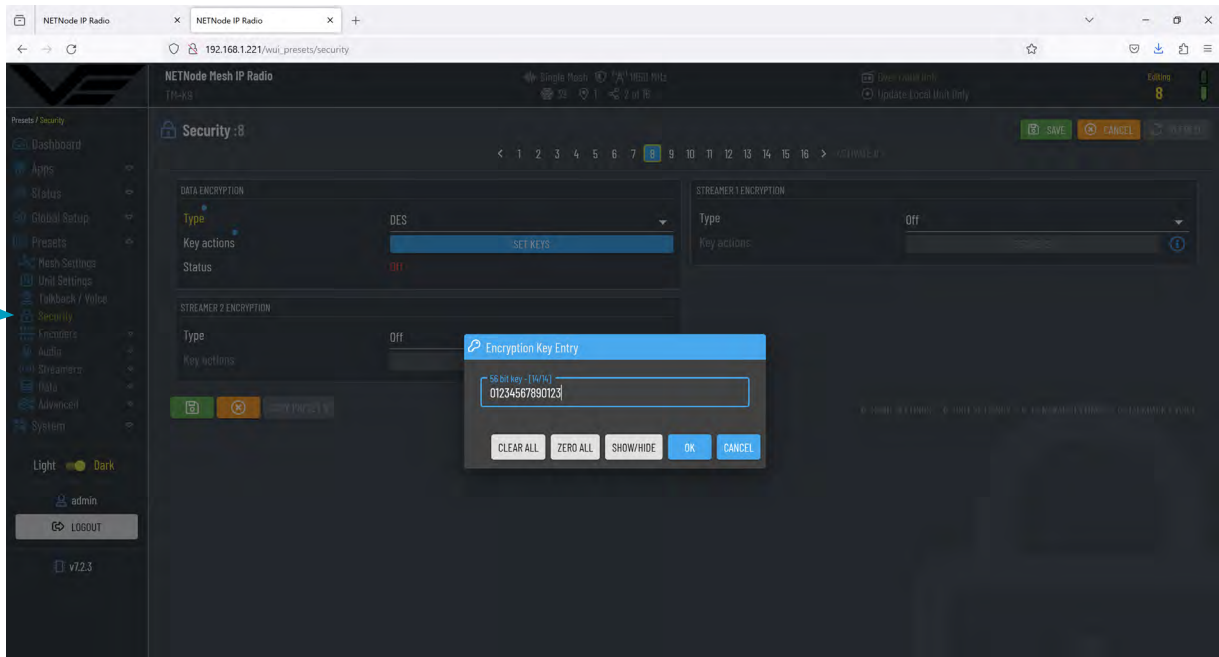
Additional RF Settings

In addition to the key parameters the table below describes additional parameters in the Mesh Settings page that can also be used to optimise the RF performance.

Item	Description
Output attenuation	The level of attenuation in dB applied to the output. Can be useful if the transmitter is swamping a second unit nearby.
RF output port	Selects which of the two output ports (or both) is to be used as a transmit port.
PA linearity	High linearity, improves RF quality at the expense of power consumption. Low linearity will have some saving in power consumption.
Interference Avoidance	Switches frequency automatically when channel interference is experienced. If master mode is selected, the transmitter frequency is replaced by a Set button. If clicked, up to eight preset frequencies can be entered which are followed by all other Slave nodes in the network.
Operating Range	A larger range allows the Mesh network to operate over a bigger distance at the expense of bit-rate.

Security

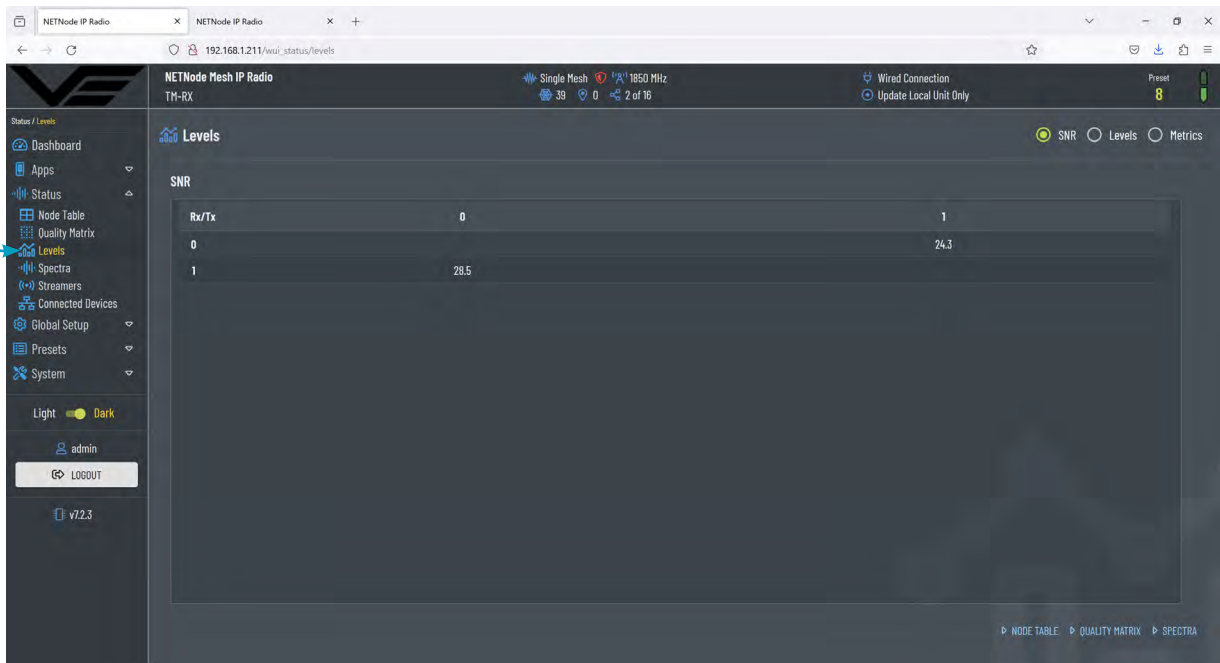
The security page can be used to configure the unit's encryption keys for the data channel and the two video streamers. DES encryption is standard with other types licence dependant. Browse to the **Presets>Security** tab.



Signal Levels

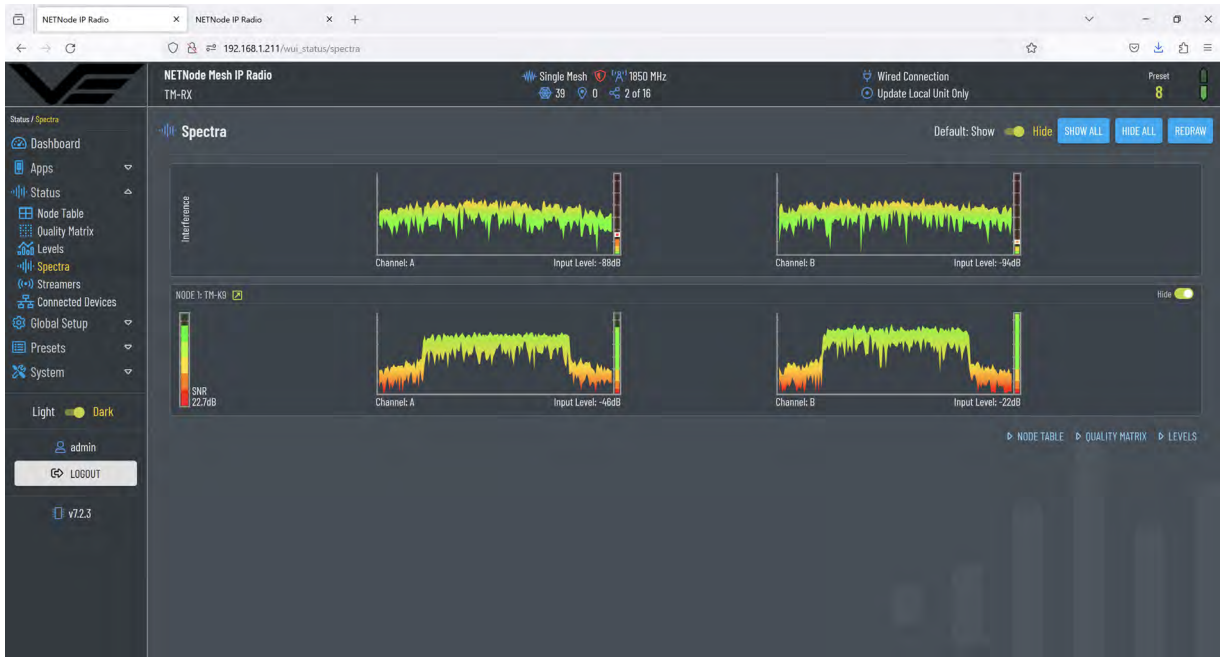
This page gives an overview of the signal quality around the Mesh system. Typically SNRs > 15 are very good. The number will reduce as the unit goes out of range or interference is present. If there are more than two Mesh nodes in the network the system will automatically find a new path to route the signal.

Browse to the **Status>Levels** tab.



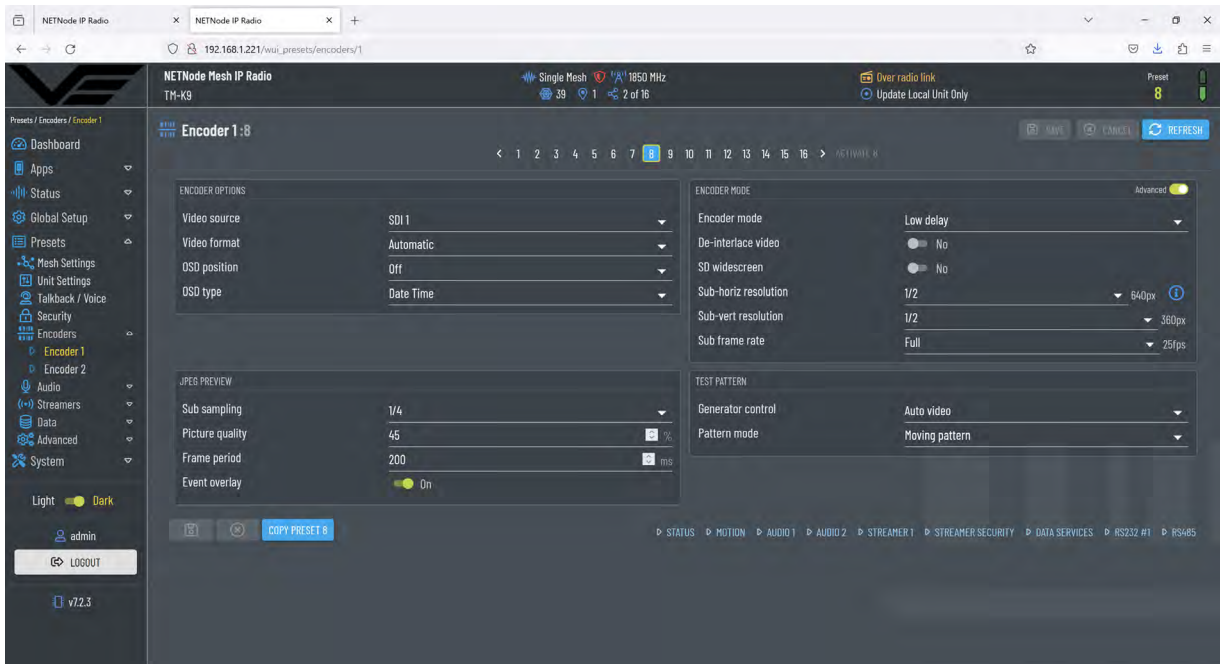
This spectra page below gives a graphical view of the RF channel. The interference graphs can be a very useful tool to detect any other users occupying the spectrum, which will ultimately result in glitches in the RF channel performance.

The RF signal graph of the remote node underneath gives a colour graded overview of the level of the COFDM signal.



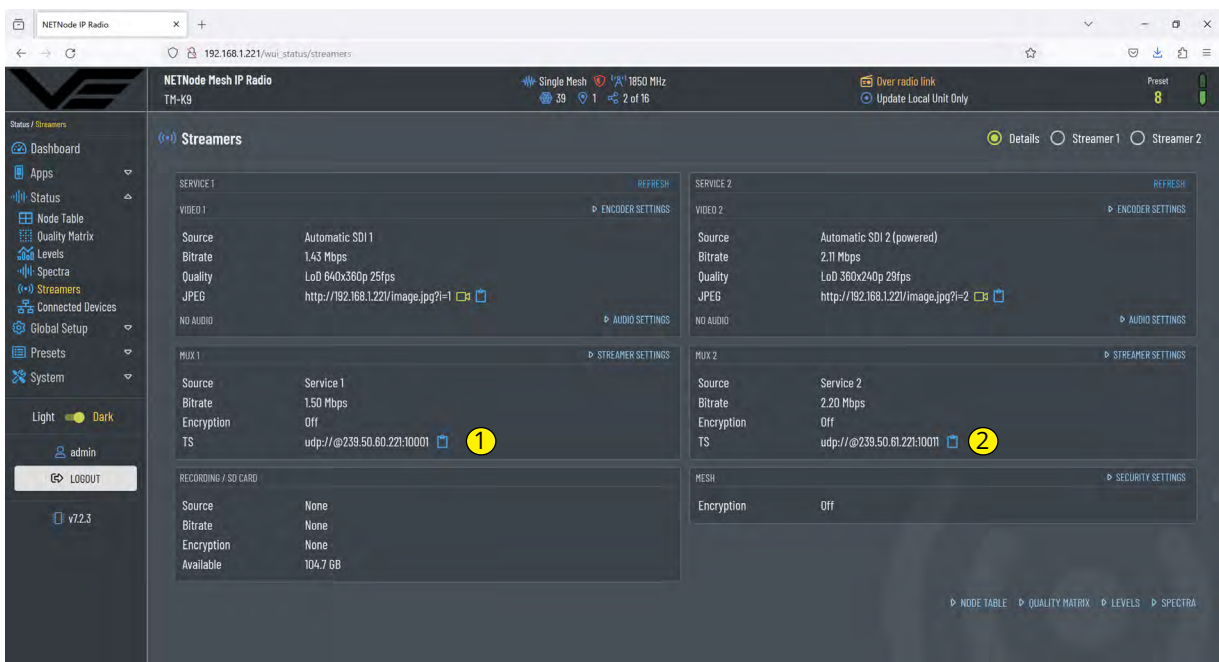
Video Encoders

The two video encoders in the SDR radio are configured to match the system hardware. On screen display information can be added if required. Most other parameters are not normally required to be changed unless re-configuring the system or fault finding.



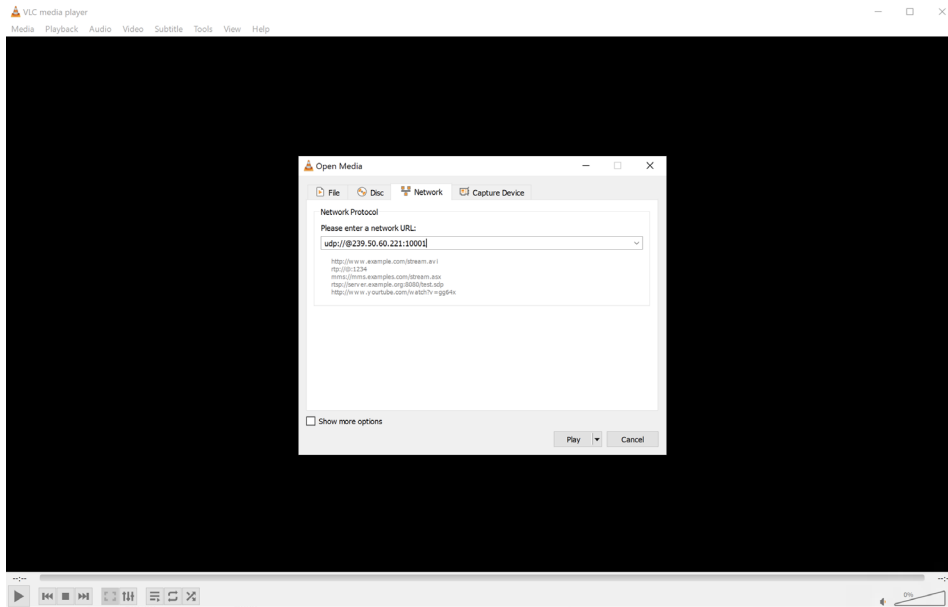
Video Redistribution

The received video streams can be played in a suitable media player connected to the network. Check the URL addresses in the **Status>Streamers** page as highlighted in the example below.

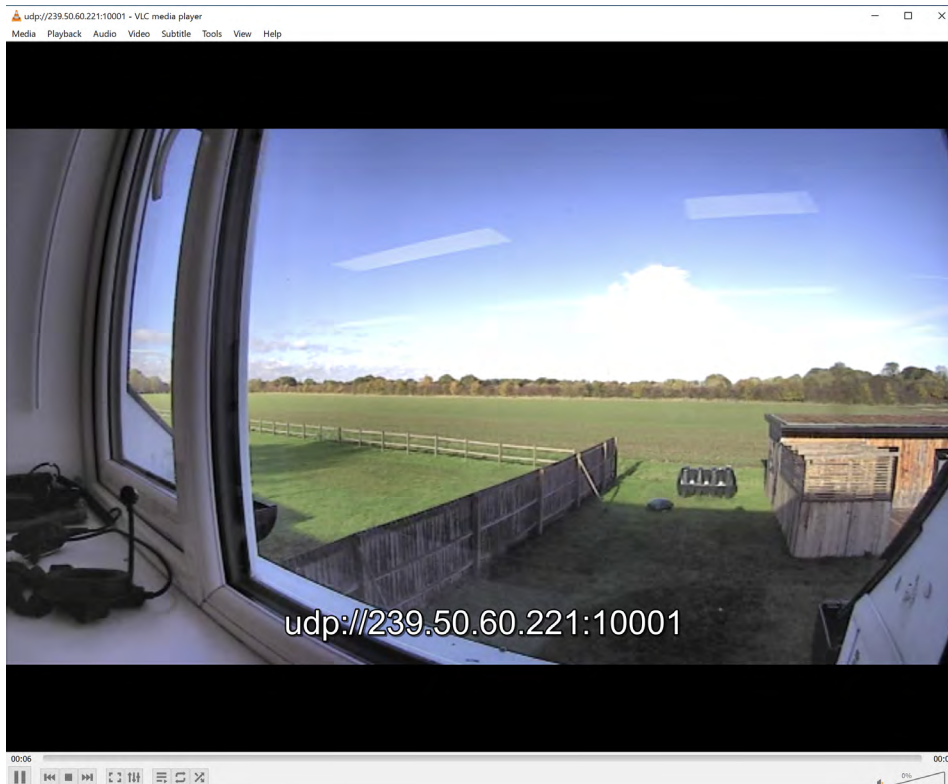


VLC Playback

The VLC is a free media player which can be used to playback the video stream. From the Media menu select the 'Open Network Stream' and enter the URL stream as shown in the example below.

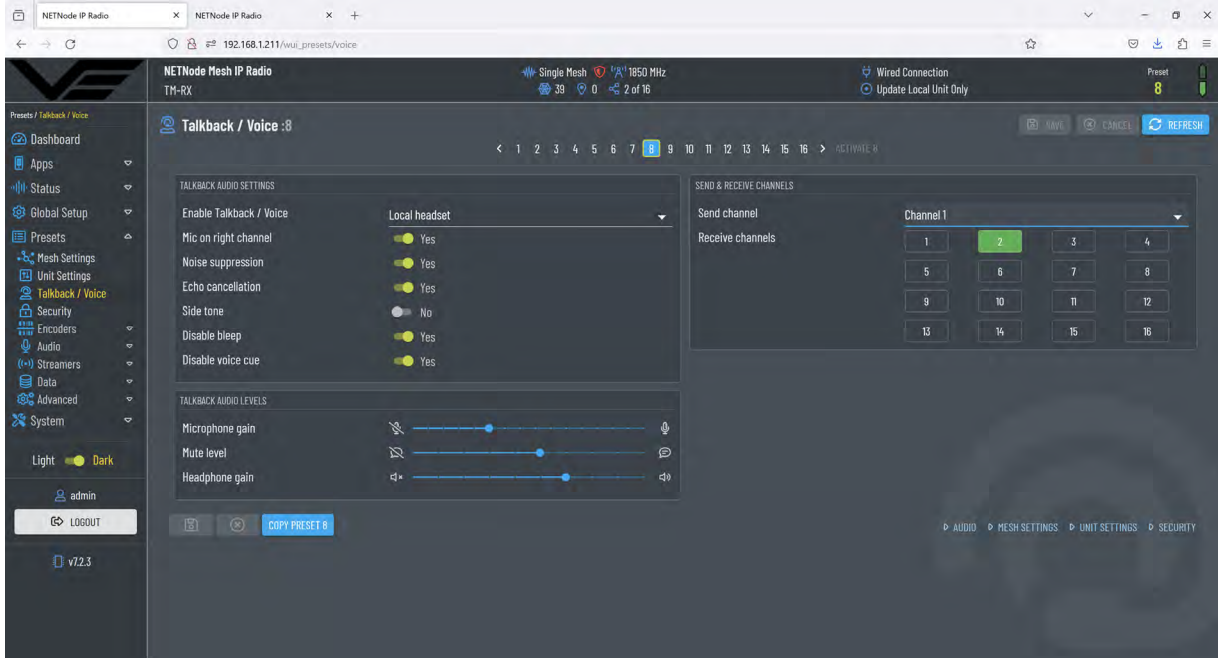


The video can be monitored on the local network connected to the Mesh or remotely monitored through a back-haul system, as described in the [Mesh Networks](#) section.

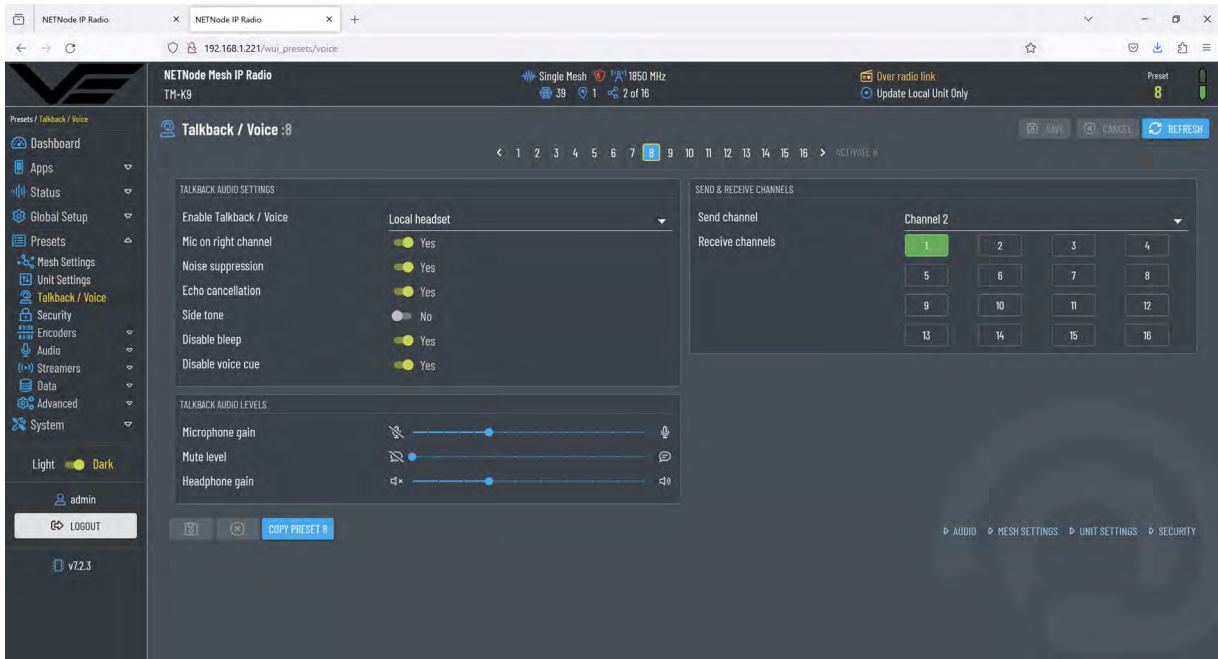


Audio Encoders

The audio encoders in the SDR radio are configured to achieve two way audio between the TM-RX Receiver and the Mesh camera. In the example configuration below the sent audio from the TM-RX Receiver is on channel 1, the TM-RX received audio is on channel 2.



Conversely the sent audio from the TM-K9 Mesh camera is on channel 2, the received audio is on channel 1, as shown below. This configuration is typical of a simple audio pairing between the two.



There are many possibilities to configure the audio matrix where audio from multiple nodes in the Mesh network are received by a single node. For example, many Mesh cameras to one user or many users on an open channel. Care should be exercised to keep careful track of such system configurations as multiple audio crossovers could lead to confusion.



GPS Map Downloader

The TM-RX supports GPS positioning through map referencing for its position and that of any paired GPS enabled camera. Detailed high resolution world wide maps demand a large amount of computer memory. It is for this reason that the choice of which geographical areas are to be stored on the TM-RX is left to the System Maintainer.

The VE Map Downloader is a PC software application which allows the System Maintainer to configure the TM-RX to include the GPS area in which the system is to be deployed.

The VE Map Downloader can be downloaded from the following location:

<https://www.visualengineering.co.uk/supportdownload/50>

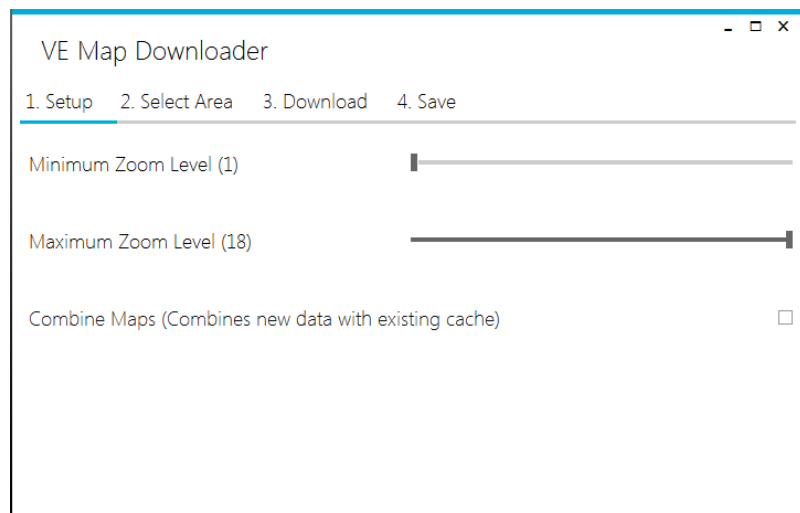
Launch the downloaded executable and follow the installation instructions.
The use of the software is now described:

Setup

The first stage “**Setup**” allows the System Maintainer to define the required resolution of the chosen geographical area.

The two sliders on this page allow the Minimum and Maximum Zoom levels of the geographical area to be set.

These settings allow a high degree of configuration flexibility.



For System Maintainers new to this interface it is advised to leave the Minimum Zoom Level at 1. The Maximum Zoom Level can be adjusted to suit the resolution required for a particular system deployment.

As a general guide, if the Maximum Zoom Level is set to 8 it will produce a map resolution that is at town level where streets are the highest level of detail. If the Maximum Zoom Level is set to 18 it will produce a map where pathways are displayed and cars are recognisable.

It is left to the System Maintainer to decide the level of detail required. It should be noted that the higher the Maximum Zoom Level is set to the larger the map download file will be and hence a longer download period.

Increasing the Minimum Zoom Level to greater than 1 allows a mid resolution of an area to be downloaded, familiarity with the interface is advised before adjusting this parameter.

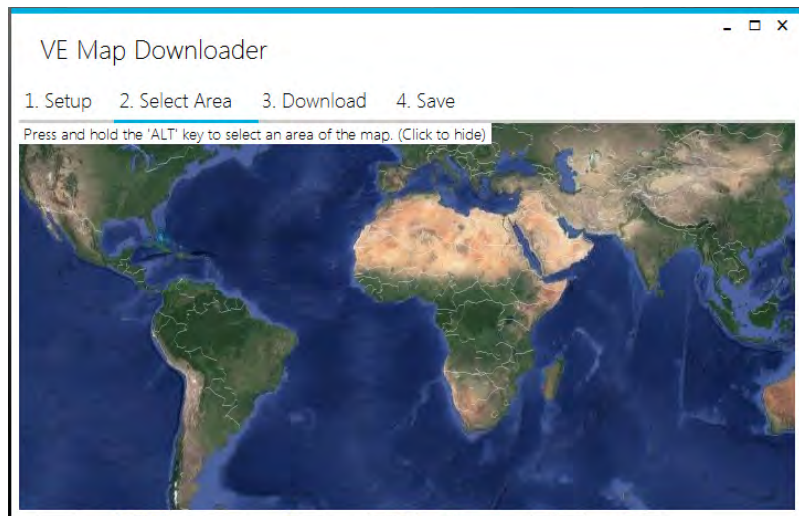
The Combine Maps checkbox allows several map downloads to be combined together during a map download session.

Select Area

The second stage “**Select Area**” allows the System Maintainer to define a chosen geographical area.

Navigate to the area of interest by moving the map left, right and zooming in using the PC mouse or keyboard commands

When the map is positioned press and hold the PC’s ALT key, select the area with a left press on the mouse.

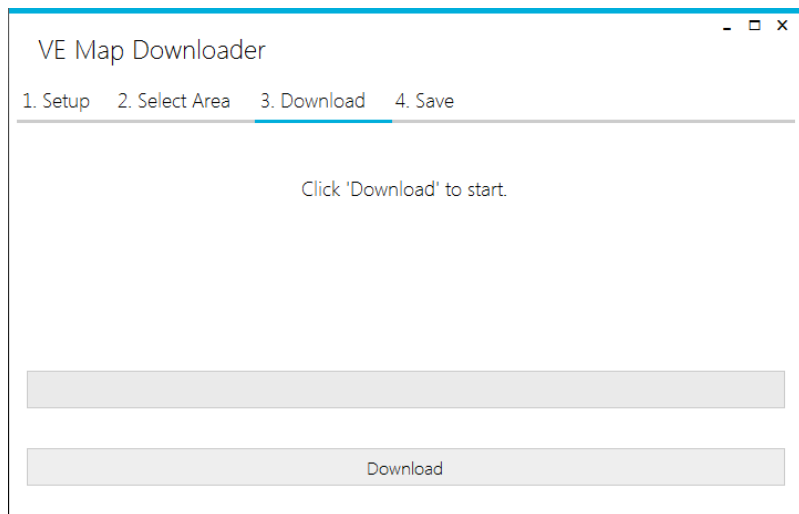


Download

The third stage “**Download**” downloads the selected map area.

The resolution defined in Setup will determine the size and download time of the file.

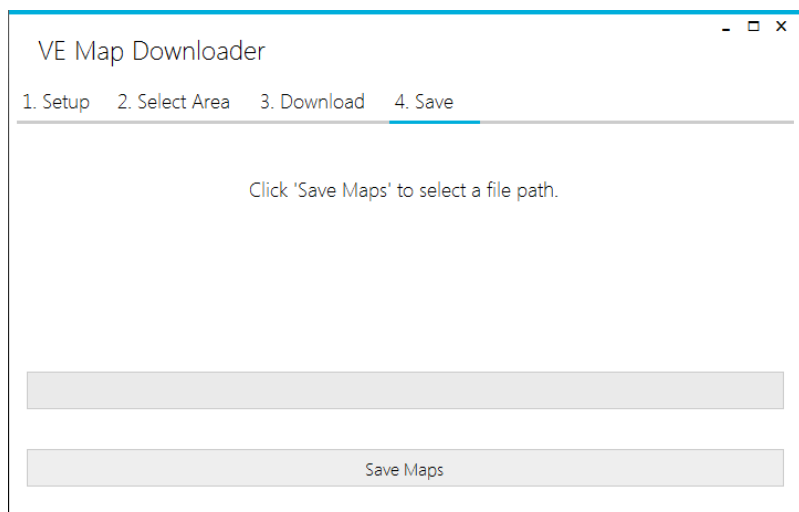
It is possible to repeat the **Select Area** and **Download** steps to combine all data into a single file if the Combine Maps checkbox in **Setup** was selected.



Save

The final stage “**Save**” allows the downloaded map file to be saved to the PC.

This file can now be uploaded to the TM-RX using the [File Uploader](#) software application.



JSON Configuration

The TM-RX supports the upload and export of selected settings via the Java Script Open Notation file format.

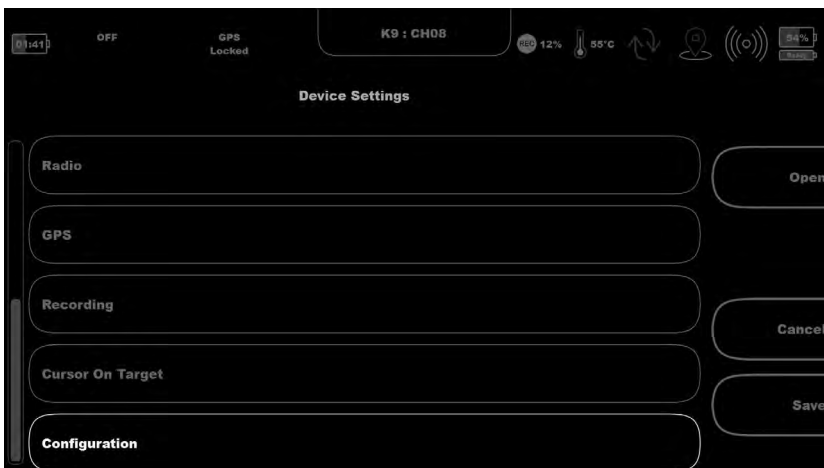
Upload User Settings

User Settings can be uploaded using the [File Uploader](#) Application

The file must have the name: "UserSettings.json"

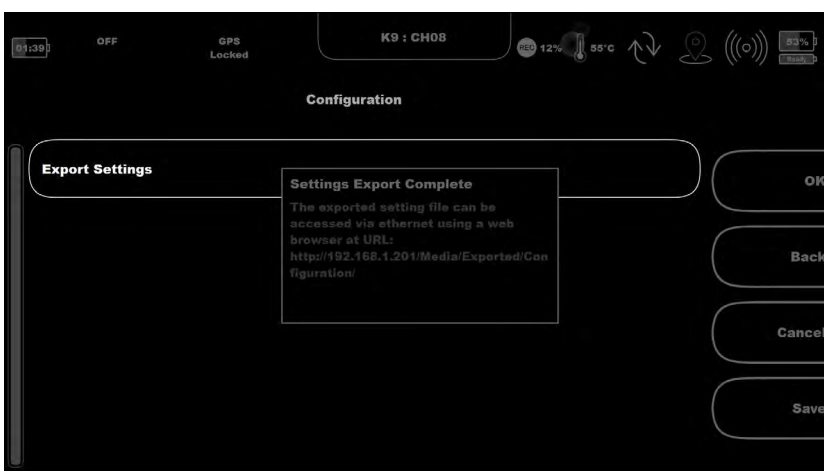
An example JSON file can be found in the [JSON Example Files](#) appendix.

Export User Settings



User settings can be exported, so they can be transferred to another unit, saved as a backup or edited.

This can be done by selecting **Configuration** in the **Settings App**.



Once complete the exported **UserSettings.json** file can be accessed in the **Exported/ Configuration** directory via the web interface as described in the [Downloads](#) section.

Upload Camera Settings

Camera preset configurations can be uploaded using the [File Uploader](#) Application

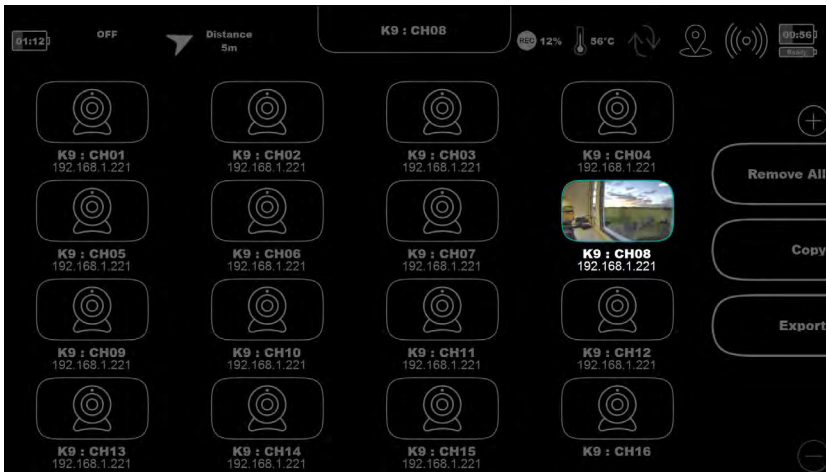
The TM-RX can hold up to 16 different preset camera configurations.

The file must have the name “**Camera##.json**”, where ## is equal to the camera number.
E.g. To upload a camera configuration to Chl 12, the file name would be “Camera12.json”.

To upload a camera configuration to Chl 1 the file name would be “Camera01.json”.

An example JSON file can be found in the [JSON Example Files](#) appendix.

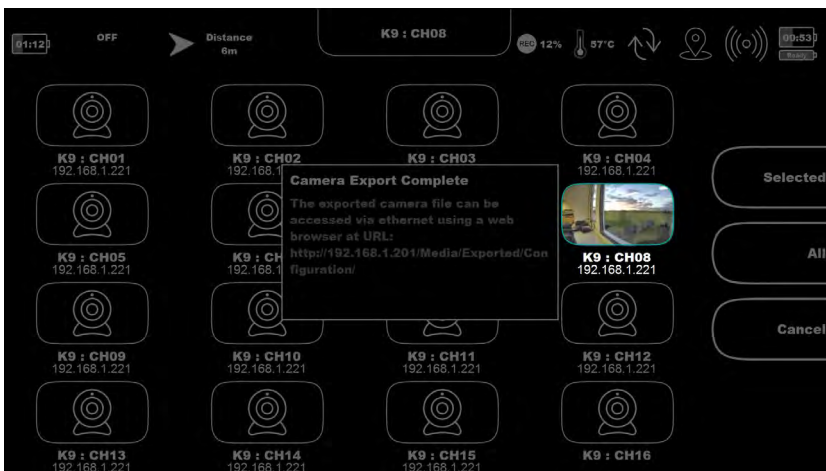
Export Camera Settings



Camera Preset configurations can be exported, so they can be transferred to other units.

This function is accessed via the **Cameras App**.

Scroll down to the **Export** menu using the - button.



Export the configuration for either the **Selected** camera or **All** cameras.

Once complete the exported file can be accessed in the **Exported/Configuration** directory via the web interface as described in the [Downloads](#) section.

The file name will be **Camera##.json**, where ## is the camera number.



JSON Example Files

The File Uploader application can be used to configure selected TM-RX settings, below are example files in JSON format.

Upload User Settings Example File

The file must have the name:
"UserSettings.json".

```
{
  "Display_DarkBoot": {
    "_Value": false
  },
  "Display_AutoBacklight": {
    "_Value": false
  },
  "Display_BacklightBrightness": {
    "_Value": 60
  },
  "Apps_BootApp": {
    "_Value": "Viewer"
  },
  "JoystickButtons_VibrationFeedback": {
    "_Value": true
  },
  "Network_IpAddress": {
    "_Value": "192.168.1.243"
  },
  "Network_SubnetMask": {
    "_Value": "255.255.255.0"
  },
  "Network_DefaultGateway": {
    "_Value": "192.168.1.254"
  },
  "Telemetry_GroupID": {
    "_Value": 12345
  },
  "Telemetry_ExternalModule": {
    "_Value": false
  },
  "Recording_Record": {
    "_Value": false
  },
  "CursorOnTarget_Enable": {
    "_Value": false
  },
  "CursorOnTarget_ServerAddress": {
    "_Value": "127.0.0.1"
  },
  "CursorOnTarget_ServerPort": {
    "_Value": 18122
  }
}
```

Upload Camera Settings Example File

The file must have the name:
"Camera##.json"
Where ## is equal to the camera number.

```
{
  "Enabled": {
    "_Value": false
  },
  "ConnectionType": {
    "_Value": "MESH"
  },
  "CameraName": {
    "_Value": "Camera"
  },
  "TelemetryAddress": {
    "_Value": 0
  },
  "Radio_Preset": {
    "_Value": 1
  },
  "Encoder_Stream_Address": {
    "_Value": "192.168.1.212"
  },
  "Encoder_Stream_Mode": {
    "_Value": "UDP (DTC)"
  },
  "Encoder_Stream_Multicast_Address": {
    "_Value": "239.50.60.212"
  },
  "Encoder_Stream_Port": {
    "_Value": 10001
  },
  "Encoder_Stream_Custom_MRL": {
    "_Value": ""
  },
  "Encoder_Stream_Custom_TCPUDP": {
    "_Value": "TCP"
  },
  "Encoder_CacheSize": {
    "_Value": 100
  },
  "CameraModel": {
    "_Value": "TM-K9"
  }
}
```



Firmware Update

Firmware updates for the TM-RX are available on request from:

support@visualengineering.co.uk

Firmware update files are delivered with the file name “**update.bin**” It is important to retain this file name otherwise the TM-RX will reject the file.

The **update.bin** file can be uploaded to the TM-RX using the [File Uploader](#) software application.

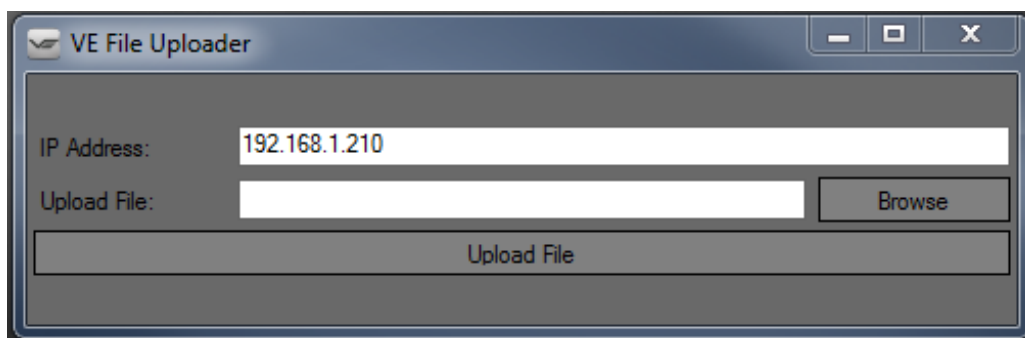
File Uploader

The File Uploader is a PC software application which supports firmware updates, GPS maps and JSON configuration files to be uploaded to the TM-RX.

The File Uploader application can be downloaded from the following location:

<https://www.visualengineering.co.uk/supportdownload/51>

- Start the downloaded executable.
- Ensure the PC and TM-RX are on the same IP subnet. The IP address of the TM-RX can be found by navigating to the Network parameter in the [Settings App](#) section.
- Enter the IP Address of the TM-RX into the File Uploader software.
- Browse to the file to be uploaded from the PC to the TM-RX and press the “Upload File” button.



The TM-RX screen will indicate that the file has been transferred successfully. This is then followed by the TM-RX restarting.



Mesh Networks

In a Mesh network each node acts as an independent router. This allows for continuous connections and reconfiguration around broken or blocked paths by hopping from node to node until the destination is reached.

All nodes in a Mesh network are required to be on the same frequency and share the same Mesh ID.

Mesh networks are self-forming and self-healing which means that the network can still operate when a node or connection fails. This results in a network that is very reliable as there is often more than one path between a source and a destination.

The Mesh network constantly assesses which nodes are in range and the best routing to use.

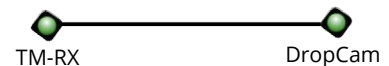
A group of nodes automatically form a network at power on. All nodes detect each other and a network is formed. If a node fails or is out of range the network will find an alternative routing path. Connectivity is thus preserved automatically.

Mesh Topologies

Two Node Network

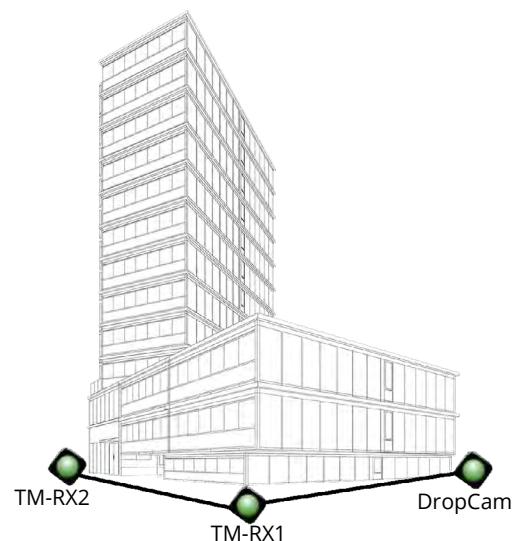
In its simplest form the Mesh network includes a single TM-RX Receiver and a single DropCam, resulting in a Mesh network topology as shown here.

As more nodes get introduced to the system the network map will take on different forms.



Chain Network

Mesh nodes chain together to extend the network range or navigate around obstacles. In this example the video from the DropCam is received at by both TM-RX units. Since the link between the DropCam and TM-RX2 is blocked by the building the link between the two is channelled through the TM-RX1 node.



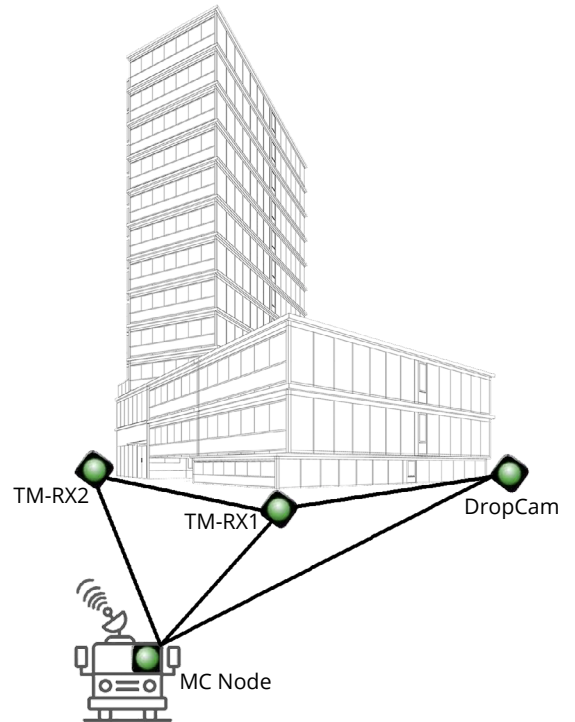
Interlinked Network

As Mesh nodes are added the network map expands. As shown in this example the addition of the Mission Command node added to the previous configuration now gives two active paths between the DropCam and TM-RX2.

The vehicle based MC node can be any active Mesh node such as an additional TM-RX or DropCam equipped with high gain antennas.

Additionally, the MC node also allows the option to extend the Mesh network to any remote location through a 5G connection or a satellite link.

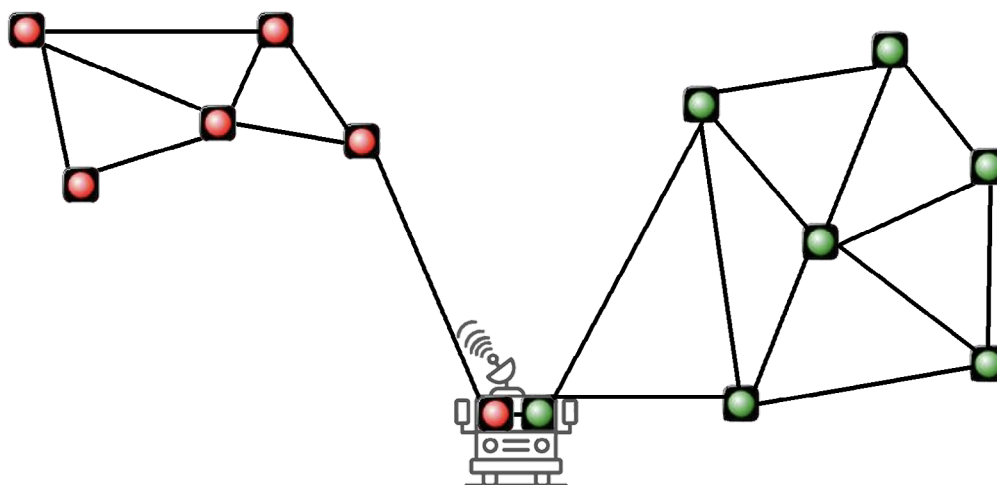
This allows the playback of any video feed in the Mesh network at a remote location. This configuration is described in the [Video Redistribution](#) section.



Combined Network

If two separate networks are incompatible or operating at different frequencies, they can be combined at the IP layer as long as they belong to the same Mesh ID and share the same IP address subnet.

In the example below the red group Mesh network and the green group Mesh network are operating on separate frequencies. By including the Mission Command common receive point these two groups can be combined using a wired IP connection.



Wired IP Connection
in Mission Command
combining the two groups.



System Configuration

Using the networking principles outlined above together with a good understanding of how to configure Mesh nodes as outlined in [Key RF Settings](#) it is possible to adjust the configuration of the system to meet the exact field requirements.

It should be noted that there is a limitation of a **maximum of 16 nodes** that can be supported by a single Mesh network. Furthermore bandwidth planning is important when populating a Mesh network, especially when attempting to stream multiple video streams simultaneously using a low radio bandwidth. In this circumstance the bandwidth limitation can be somewhat mitigated by reducing the video encoding rate.



Care should be exercised when making far reaching changes away from the factory configuration. In the absence of a good system understanding it is entirely possible that certain changes could leave the system inoperable, requiring the system to be returned to base for repair.

As a precautionary measure before changing the system's configuration it's a good plan to back up the system by exporting its settings using [JSON Configuration](#). If required, JSON configuration files can be used to recover the system back to a known working state.

support@visualengineering.co.uk



Part Replacement

Certain TM-RX components that are subject to high levels of wear can be swapped out by the system maintainer. The following describes the required parts and necessary procedures for undertaking this maintenance.

Battery Door Latch

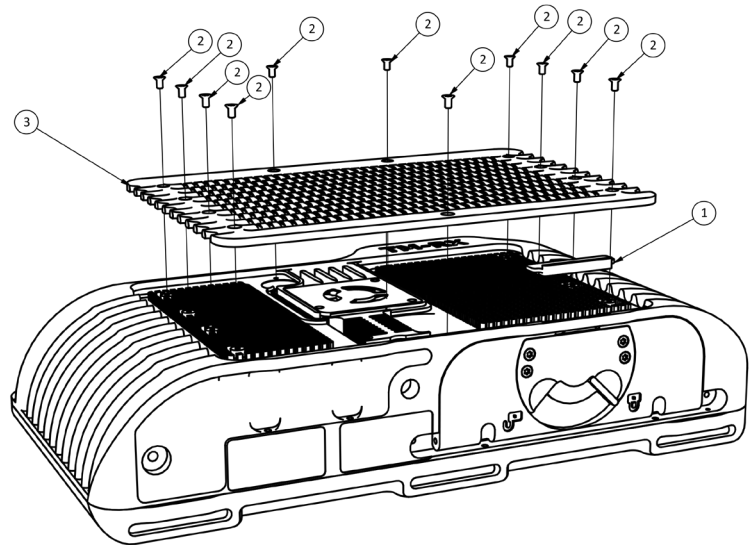
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	110-0374	TM-RX Battery Door Catch
2	15	110-8847	CSK Torx M1.6x3

Removal Procedure

1. Remove 15x CSK Torx M1.6x3 (Item 2).
2. Remove Heatsink Cover (Item 3).
3. Remove Battery Door Catch (Item 1).

Installation Procedure

1. Insert Battery Door Catch (Item 1).
2. Fit the Heatsink Cover (Item 3).
3. Insert 15x CSK Torx M1.6x3 (Item 2).





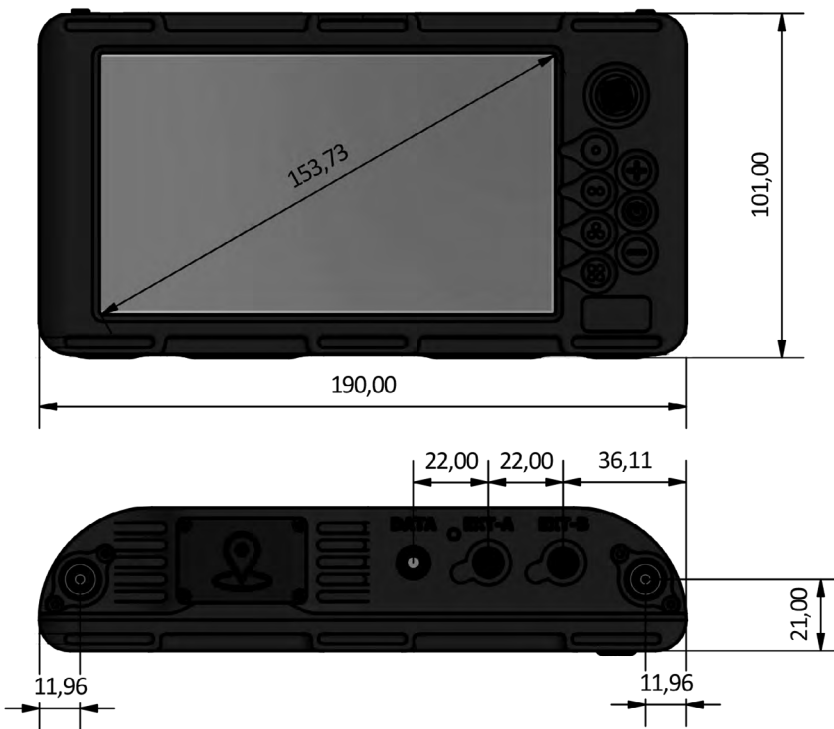
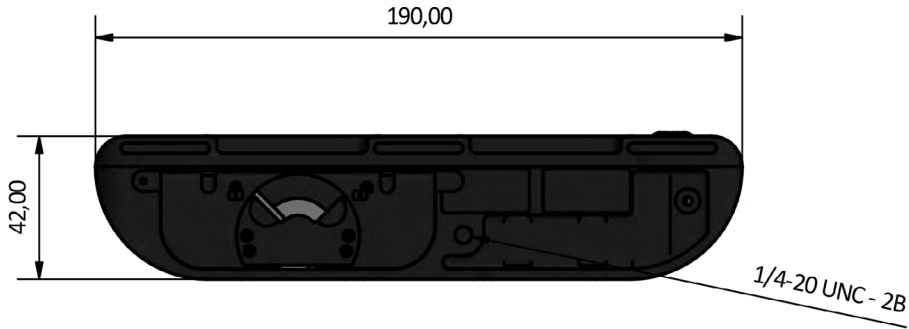
Specifications

Specifications			
Screen Type	High Definition	RX Antennas	Flexible Omni
Screen Size	6"	Alerts	Silent Vibration
Screen Resolution	1920 x 1080	System Configuration	On-Screen Menus
Screen Coating	Anti-Reflective	External Connection	Supplied Cable
Glass Type	Scratch Resistant	External Interface	Ethernet
RF Frequency	L-Band S-Band C-Band	GPS Positioning	Displays TX to RX Distance Delta
RF Type	COFDM Mesh COFDM	Internal Hard Disk	256GB Solid State
Control Interface	Joystick, Buttons Touch-Screen	External Input Voltage	10 to 18V DC
Video Interface	HDMI	Battery Capacity	48Wh
Video Decoding	H.264 & MJPEG	Run Time	>2 Hours - Continual Use
Audio	G711 Decoding Output on EXT-B	Temperature	-20 to +50°C
IP Stream Decoding	RTSP, RTP over TCP or UDP	Dimensions	190 x 100 x 42mm
Decryption	DES or AES128, AES256 (Optional)	Environmental	IP67



Dimensions

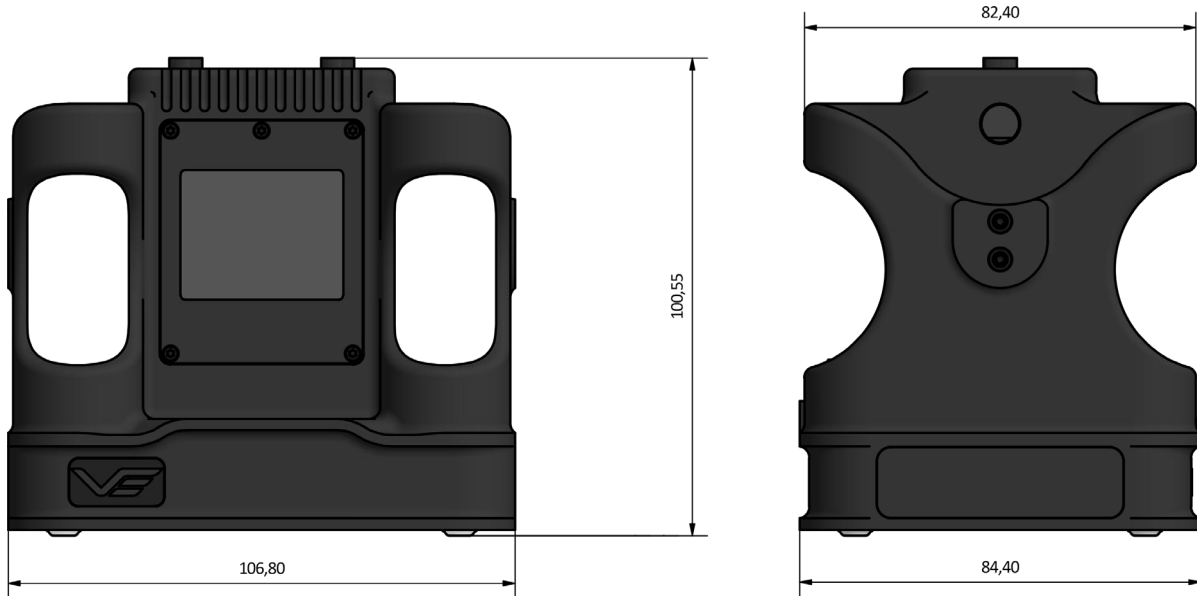
TM-RX Receiver



All dimensions are in mm



Dual Li-Ion Battery Charger



All dimensions are in mm

Visual Engineering Technologies LTD

Kemps Farm
Stanway
Colchester
Essex
CO3 8NB
UK



Product specifications subject to change without notice

Tel: +44 (0)1206 211842
Web: www.visualengineering.co.uk
Email: sales@visualengineering.co.uk