

TM-RX Rece



Rugged, Battery Powered Mesh Video Receiver 1arch 2024





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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 <u>Specifications</u> 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 <u>Part Replacement</u> section.
- Changes to the radio settings as described in the <u>Maintainer Guide</u> 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 <u>TM-RX Screens</u> 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
AC/DC Power Supply	110-8661
8 Documentation	110-8679







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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.

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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.



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



Release Battery Latch

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

TM-RX Rec



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

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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.



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 <u>Viewer App</u> 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.

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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: <u>Viewer App</u>, <u>Cameras App</u>, <u>GPS App</u>, <u>Radio App</u> and the <u>Settings</u> <u>App</u>.

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.

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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.





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 <u>Viewer App</u>. The backlight graphic will appear for three seconds after each change of the backlight level to indicate the current value.

30%]	OFF	Distance 10m	Backlight = 75%	REC 12% 56'C	Nº S	
------	-----	-----------------	-----------------	--------------	------	--



Viewer App

System functions that are dependent 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.

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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 <u>Player App</u>. This feature is **not available if recording has been enabled**.

Select **GPS** to show maps as described in the <u>GPS App</u>.



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.

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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.



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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.

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

Cameras can also be added or removed as described in the <u>Add a Camera</u> section.

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

	12		
Camera Name		K9 : CH08	
Video Stream Address		192.168.1.221	
Stream Mode	UDP (DTC)		Ca
Stream Multicast Address		239.50.60.221	

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.

148) OFF Di	stance 3m	K9 : CH0	08 RED 129	50°C	
	Mesh Ca	amera Settings			
Stream Port				1000	01 E
Cache Size				60 n	ns
Radio Preset					Can
Camera Model			ТМ-К9		
Show On Map			Selected		

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.





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



Ca	mera Settings
Camera Name	Camera
Stream URL	
Stream Transport	TCP UGP Cam
Cache Size	100 mS

Change the **Camera Name** as required.

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00;43]	OFF	GPS No Lock	K9 : CH08	12% J 49°C	
			Stream URL		
		rtsp://1	92.168.1.195/h264.sdp		
	2 3	£ 4 5%	6 7 ⁸ 8 9		+ Insert
q	we	rt	y u i a		Clear
a	s d	fg	h j k l		¢ Cancel
	zx	CV	b n m ,		Done
(\boxtimes)	Û			1 CapsLoo	sk (

Change the **Stream URL** as required.

	amera Settings
Camera Name	K9 : CH16
Stream URL	rtsp://192.168.1.195/h264.sdp
Stream Transport	TCP UDP Can
Cache Size	100 mS

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 <u>GPS Map Downloader</u> and then uploading the file to the TM-RX using the <u>File Uploader</u>.



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

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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 <u>Viewer App</u>



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 overlayed 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 overlayed onto the GPS map.

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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.

Se's K9 : CH08	
Device Settings	
Display	
Аррз	
Joystick & Buttons	Cane
Network	
Telemetry	

58%	GPS Locked	K9 : CH08	REG 12% 56°C	02:32
	De	evice Settings		
Radio				Oper
GPS				
Recording				Cance
Cursor On Target				Save
Configuration				

42%)	OFF	GPS Locked	K9 : C1	H08	REC 12%	₿ 56°C ₹	<u>(((0)))</u>	011 52]
			Recording					
Reco	ord Viewer Sess	ions		Enabled	\square			Edit
Eras	e All Recording	5						Back
								Cancel
								Save

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 <u>Radio App</u> 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.

92%	OFF	Distance 11m	K9 : CH08	REC 12% 45'C			
		2023-07-22_03-56-02 Image (JPEG) 07/22/2023 03:56:02			268.22	кв	(+) Open
		2023-07-22_03-55-58 Image (JPEG) 07/22/2023 03:55:58					Sort Date
		2023-07-22_03-55-53 Image (JPEG) 07/22/2023 03:55:53				кв	Order Descending
		2023-07-22_03-55-47 Image (JPEG) 2 07/22/2023 03:55:47					Media Images

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

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

92%	OFF	Distance K9 : CH0	08	157] 1989
		2023-07-22_03-53-23 Video (MP4) 07/22/2023 03:53:23	7.6 MB	pen
C		2023-07-22_03-53-12 Video (MP4) 07/22/2023 03:53:12		Sort Date
		2023-07-22_03-52-55 Video (MP4) 07/22/2023 03:52:55	1.26 MB	rder nding
		2023-07-22_03-52-44 Video (MP4) 07/22/2023 03:52:44	1.08 MB	edia deos

85%	OFF	Distance 7m	K9 : CH08) Q	
		2023-07-22_03-55-12 Video (MP4)		890	.61 KB	Rename
		07/22/2023 03:55:12 2023-07-22_03-55-02 Video (MP4)			.91 KB	Delete
		2023-07-22_03-54-54 Video (MP4) 07/22/2023 03:54:54			13 MB	Export
		2023-07-22_03-53-23 Video (MP4) 07/22/2023 03:53:23				Θ

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

Video recording is enabled in the Recording option in the <u>Settings App</u>.

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



Export Recordings

85%]	OFF	Distance 7m	K9 : CH08	12% § 50°C	
		2023-07-22 03-0	55-12		(+)
		Video (MP4) 07/22/2023 03:55	5:12	890.61 KB	Rename
C		2023-07-22_03-3 Vīdeo (MP4) 07/22/2023 03:55	55-02	949.91 KB	Delete
		2023-07-22_03- Video (MP4) 07/22/2023 03:54	54-54 4:54	1,13 MB	Export
		2023-07-22_03- Video (MP4) 07/22/2023 03:53	53-23		

Any of the video recordings listed can be downloaded directly to a PC as described in the <u>Downloads</u> section.

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

85%]	OFF	V Distance K9 : CH08	50°C
		2023-07-22_03-55-12	(+)
		Video (MP4] Exporting Video 3.0%	890.61 KB (Rename
		The media file is being converted for export, please wait.	
		2023-07-22 Vīdeo (MP4	949.91 KB
	H	07/22/2023	
		2023-07-22_03-54-54	Export
		Video (MP4)	
		07/22/2023 03:54:54	
	H F	2023-07-22_03-53-23	
		Video (MP4)	
		07/22/2023 03:53:23	

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

91%	OFF	Distance 78m	K9 : CH08	12% 🔓 44°C	Q (1)	
		2023-07-22 Video (MP4	2 03-55-12 Video Export Complete		890.61 KB	Rename
		07/22/2023 2023-07-22 Video (MP4	The exported video can be accessed via ethernet using a web browser at URL: http://192.168.1.201/Media/Exported/V eos		949.91 KB	Delete
		07/22/2023 2023-07-22 Video (MP4	2 _U3-54-54) 04:54:54		1.13 MB	Export
		2023-07-22 Video (MP4 07/22/2023	2_03-53-23) 03:53:23		7.6 MB	e

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.

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Default unlock PIN Code: 12345678

72%) OFF	GPS Locked	K9 : CH08	RED 12% 83	
	Se	ecurity Settings		
Restricted Access		Disable	d	Edit
Change Passcode				
Permissions				Cancel
Logout				Save

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.

	Locked	Permissions	
		remissions	
Apps			
Settings			В
Cameras			
Radio			$\supset \succeq$

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.

04i38) OFF Distance 10m	K9 : CH08	80 12% J 46'C	((o)) 02:00 Charging 5
	Firmware		
Module Firmware Versions			
Bootloader			0.0.0
Operating System			364
Radio Module			7.2.3 Firmware
			Status



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93%] OFF	Distance 8m	K9 : CH08	12% 46'C	((o)) (3%) (torging)
		Status		
				OK
				OK
				OK Firmware
				status
				Gtatus

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 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.

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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.

IS) OFF	GPS Locked	K9 : CH0	8 REC 1	2% 57°C	(((o))) <u>32%</u>
	GI	obal Settings			
Radio Mode			MESH	SÓLARX	
Host Name				TM-RX	
Current Config					Cano
DHCP			Disabled)
IP Address				192.168.1.211	

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.



19%) OFF	GPS Locked	K9 : CH08	RED 12% 56°C	
	Pres	et Configuration		
Preset 1				Open
Preset 2				
Preset 3				Cancel
Preset 4				Save
Preset 5				

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

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18%) OFF	GPS Locked	K9 : CH08	REC 12%	€ 58°C	<u>_</u> (((0))	00:45 (9:80)
		Preset 8				
Freqency				1850M	Hz	Edit
Modulation Output		Ena	abled 🤇			Back
Modulation Port			A+B			Cancel
Channel Bandwidth			2.5MHz		$\supset \succeq$	Save
Output Attenuation			OdB			

 OFF
 GPS
 K9 : CH08
 9 12%
 88°C
 Q
 ((in))
 10%

 TalkAudio

 Enable
 Enabled
 Edit

 Microphone Gain
 5
 6
 Cancel

 Mute Level
 5
 5
 Save

 Microphone On Right
 Enabled
 Save

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 <u>PC IP Address Configuration</u> 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 <u>Settings App</u> 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 <u>Radio App</u> 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

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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.

🖾 Run

10

Open: ncpa.cpl

Type the name of a program, folder, document or

ок

Internet resource, and Windows will open it for you.

Cancel

×

Browse..

- 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

Control Panel > Network and Internet > Network Connection Rename this connection View status of this connection Change settings Change settin	💘 Network Connections			- 🗆 X
Organise • Disable this network device Diagnose this connection Reame this connection View status of this connection Change settings of this connection Image: - <	\leftarrow \rightarrow \checkmark \uparrow 😻 > Control Panel > Network and Internet > Netwo	rk Connections	ٽ ~	م
Ethernet 2 Status Image: Ethernet 2 Winderthiffed network Realted USB GDE Family Controller Image: Ethernet 2 Status Image: Ethernet 2 Properties Image: Ethernet 2 Pr	Organise • Disable this network device Diagnose this connecti	on Rename this connection View status of this connection	Change settings of this connection	📰 · 💷 📀
ethemet 2 status ethemet 2 properties ktiment 2 status General Connection ktiment 2 status ktiment 2 properties kti	Ethernet 2 Network cable unplugged Parallels VirtIO Ethernet Adapter	vetwork bE Family Controller		Y]
Connection IP44 connectivity: No network access IP44 connectivity: No network access Media State: Enabled Duration: 00:03:17 Speed: 100.0 Mbps Details Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems: Image: This connection uses the following tems:	Ethernet 2 Status	Ethernet 2 Properties	Internet Protocol Version 4 (TCP/IPv4) Properties	×
Packets: 130 0 Packets: 130 0 Properties Diagnose Close Diagnose	Connection No network access IPv4 Connectivity: No network access Media State: Enabled Duration: 00:03:17 Speed: 100.0 Mbps Details Activity Sent Received Packets: 130 0 Poperties Disable Diagnose	Connect using: Reatek USB GbE Family Controller Configure This connection uses the following items: Configure This connection uses the following items: Configure Configure This connection uses the following items: Configure Co	You can get IP settings assigned automatically if you the for the appropriate IP settings. O Obtain an IP address automatically @ Use the following IP address: IP addresettings upon exit <td>ar network supports work administrator . 1 .100 . 255 0 Advanced DK Cancel</td>	ar network supports work administrator . 1 .100 . 255 0 Advanced DK Cancel

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.

4 - 0	○ & 192.168.1.211					ල දු ≡
VE	NETNode Mesh IP Radio TM-RX		₩ Single Mesh 🕥 'A' 1850 MHz 🛞 39 📀 0 🗠 2 of 16	♥ Wired Connection ● Update Local Uni	ı t Only	Preset 🚺 8 🏮
atkaard 20 Dashboard 91 Apps ↔ 101 Status ↔	UNIT INFORMATION Unit name IP address Voltage	▶ EDIT TM-RX 192.168.1.211 13.8 V	-bc* Network Status Network OK: A mesh 2 Active 1	▶ 60 TO SPECTRA has been formed. kodes.	ACTIVE PRESET Preset 8 POPULAR PAGES	DLEAR
🧐 Global Setup 🗢	Temperature Tx retries	44 ºC 0	🚺 Apps Bar	國家國	 Presets/Security Apps/Tactical Display 	
System Light Oark @ admin @> LOGOUT	HESH AIROBHATION Mesh ID Node ID Total nodes Occupancy REMOTE MORES © 0: TH-NG [2]	• STATUS 39 0 2 of 16 • LOCATE • LOCATE	Streaming Capture VIDED 1 PLAY VIDED 1 Video Off		P status/streames D Status/kode Table	
			Security Status	♦ GO TO SECURITY SETUP		

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

VE	NETNode TM-RX	e Mesh IP Radio		₩ Single Mesh 🔘 🛞 39 📀 0	'R ¹¹ 1850 MHz 🚭 2 of 16		 Wired Connection Update Local Unit Only 		Preset 8
Status / Node Table	E Nod	le Table					🧿 Summary	🔿 Detailed 🔿 Vi	deo 🔿 Inte
🖳 Apps	SUMMAR	RA AIEM							
Mill Status	0	Unit Name	IP Address	Battery	Temp	Software version		Occupancy	Tx Retrie
Quality Matrix	0	TM-RX			50 °C	7.2.3			
Levels		ТМ-К9	192,168,1.221			7.2.3			
Light 🍏 Bark 🚨 admin 🖙 Logout									
□ v7.2.3									

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.

NETNode IP Radio	× NETNode IP Radio	× +			~	- 0 ×
$\leftarrow \Rightarrow C$	○ 🔒 192.168.1.221				\$	ල දු ≡
VE	NETNode Mesh IP Radio TM-K9		-₩₩ Single Mesh 💿 ¹ (%) 1850 MHz 	🖬 Over radio lin 이 Update Local	k Unit Only	Preset
Dashboard ② Dashboard II Apps ♥ «III) Status ♥ ③ Global Setup ♥	UNIT INFORMATION Unit name IP address Voltage Temperature Ty retries	₽ EDIT TM-K9 192:168.1.221 13.8 V 44.ºC	-t; Network Status Network OK: A 2A	۵ GO TO SPECTRA mesh has been formed. ctive Nodes.	ACTIVE PRESET Preset 8 POPULAR PAGES	ILEAR.
Elight ← Dark A admin C Locout C v72.3	HESH HYDEKATON Mesh ID Node ID Total nodes Decupancy REHOTE NORES © 00: TH-RK (2)	● STATUS 39 1 2 of 16 ● LOCATE	Streaming Capture UIEC01 STOP Recording START	P 60 TO STREAMING STATUS		
		v	Security Status Data endo Streamer 1 vide Streamer 2 vide	P 60 TO SECURITY SETUP yption not active. o encryption not active. o encryption not active.		

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.

	X NETNode IP Radio X 192.168.1.221/wui_presets/mesh NETNode Mesh IP Radio TM-K9	+ 	• •	 Over radio link Update Local Unit Only 	☆	- 0 × ♡ ± 2 ≡ Preset
Press / Yesh Satings ② Dashboard ③ Apps ~ ↓ Status ③ Global Setup ④ Presets ▲ Heal Settings ④ Takback / Voice ☆ Security ※ Encoders ● Light ● Dark ▲ admin ⓒ Locout ● V22.3	MESH SETTINGS Operating mode Mesh Id Node Id Operating range Advanced Settings	 39 39 1 50km No 	10 11 12 13 14 15 16 → TRANSMITTER Enable transmitter Frequency Channel bandwidth Output attenuation Rf output port PA linearity Interference avoidance		INIT SETTINGS & TALKBACK / 1	VIDEE P SECURITY



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.

NETNode IP Radio	× NETNode IP Radio ×	+			~ - Ø X
$\leftarrow \rightarrow c$	🛇 👌 192.168.1.221/wui_presets/mesh				☆ ♡ ± ☆ =
VE	NETNode Mesh IP Radio TM-K9	-+\\+ Singl 🛞 3	e Hesh 💿 ''A'' 1850 MHz 19 💿 1 🛸 2 of 16	🖬 Over radio link 💽 Update Local Unit Only	Preset
Presets / Mesh Settings Presets / Mesh Settings Dashboard Apps ~	-& Mesh Settings :8		4 5 6 7 🗾 9 10 11 12 13 14 15 16 3		B) Sale (Charles) (C) REFRESH
Hyper Hyper Hyper Hyper Status Solution Solution Solution Head Settings Hunt Settings Unit Settings Hunt Settings Hunt Settings Hunt Settings Jakakek Voice Security Head Setting Jakakek Voice Security Head Setting Jakakek Voice Security Head Setting Jakakek Voice Jakekek Voice	HEAR SETTINGS Operating mode Mesh Id Operating range Advanced Settings COPY PRESET E	Single Mesh 39 1 50km • No	TRANCHITER TRANCHITER Enable transmitter Frequency Channel bandwidth Output attenuation RF output port PA linearity Interference avoidance	1 2 3 25 0 A + B High Dff P GENERAL SETTINGS P UNIT	E MHz HHz B B SETTINGS & TALKBACK / YOICE & SEDURITY

ltem	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.
S 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.

ltem	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.

	NETNode IP Radio		× NETNode IP Radio ×	+			~	- ø ×
1	$\leftarrow \rightarrow \mathbf{C}$	_	🛇 🗟 192.168.1.221/wui_presets/secur	ity				ම 👱 එ ≡
	VE	7	NETNode Mesh IP Radio					
	Presets / Security		Security :8				🕄 SAVE 🧐	CANCEL CO. OFFICE
	Status							
	🗐 Global Setup							
\	0 Presets				SET KEYS			
\mathbf{X}	Mesh Settings							
	E Tulkback / Yolce							
	Theoders							
	 Autlin (00) Streamerz. 				C Encryption Key Entry			
	10ata				56 bit key - [14/14] 01234567890123			
	System							
					CLEAR ALL ZERO ALL SHOW/HIDE	OK CANCEL		
	Light 🔲 Dai							
	😫 admin	_						
	G> LOGOUT							
	🔲 v7.2.3							



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.

NETNode IP Radio		X NETNode IP Radio X	÷				~ - Ø X
$\leftarrow \rightarrow c$		🔿 👌 192.168.1.221/wui_presets/encoders	<i>s</i> /1				☆ ♡ 👱 ඪ ≡
VE		NETNode Mesh IP Radio TM-K9		₩ Single Mesh 🔞 🕅 1850 MHz 💮 39 💿 1 😪 2 of 16	k. 86-	 Over radio link Update Local Unit Only 	Preset
Presets / Encoders / Encoder 1		Encoder 1:8		< 1 2 3 4 5 6 7 🖪 9	10 11 12 13 14 15 16 >		🖹 MYE 😨 (MICE) 📿 REFRESH
		ENCODER OPTIONS			ENCODER MODE		Advanced 🦲
Global Setup		Video source	SDI 1		Encoder mode	Low delay	
E Presets		Video format	Automatic	÷	De-interlace video	●■ No	
•2; Mesh Settings		OSD position	Off	*	SD widescreen	●■ No	
2 Talkback / Voice		OSD type	Date Time	•	Sub-horiz resolution	1/2	👻 640px 🕕
Security					Sub-vert resolution	1/2	🔫 360px
Encoder 1					Sub frame rate	Full	✓ 25fps
Q Audio		JPEG PREVIEW			TEST PATTERN		
((•)) Streamers		Sub sampling	1/4		Generator control	Auto video	
S Advanced		Picture quality	45	<mark>0</mark> %	Pattern mode	Moving pattern	
🔀 System		Frame period	200	💭 ms			
Linht - Dark		Event overlay	e On				
O adata		COPY PRESET 8		P STA		DID 2 D STREAMER 1 D STREAMER SECURITY	D DATA SERVICES D 85232 #1 D 85485
Turoso Co							
67 200001	_						
🚺 v7.2.3							

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.

NETNode IP Radio	× +					~	- Ø X
$\leftarrow \rightarrow \mathbf{G}$	O 🔏 192.168.1.221/wui_s	tatus/streamers					⊠ 🛓 හු ≡
VE	NETNode Mesh IP Radio TM-K9		₩ Single Mesh 😻 🖓 1850 MHz 🐵 39 💿 1 😪 2 of 16		 Over radio link Update Local Unit Only 		Preset
Status / Streamers	(**) Streamers				(🕽 Details 🔘 Strea	mer 1 🔘 Streamer 2
Apps Apps	SERVICE 1 VILED 1 Source Bitrate Quality JPEG No.AUG0 MIX 1 Source Bitrate Encryption	Automatic SDI 1 1.43 Mbps LoD 640:380p 25fps http://192.168.1.221/image.jpg?i=1 🗔 🗖 Service 1 1.50 Mbps Off	REFRESH • ENCODER SETTINGS • AUDO SETTINGS • STREAMER SETTINGS	SERVICE 2 VIDED 2 Source Bitrate Quality JPEG NO AUDIO PUX 2 Source Bitrate Encryption	Automatic SDI 2 (powered) 2.11 Mbps LoD 360/240p 29/ps http://192.168.1.221/image.jpg?l=23 Service 2 2.20 Mbps Off	0	REFRESH • Encoder Settings • Audio Settings • Streamer Settings
😫 admin	TS RECORDING / SD CARD	udp://@239.50.60.221:10001		MESH	udp://@239.50.61.221:10011)	SECURITY SETTINGS
[] v123	Source Bitrate Encryption Available	None None None 104.7 GB		Encryption	DYF Þ node ta		Þ LEVELS Þ SPECTRA



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.

▲ VIC media player	-		×
Copen Media			
Show more options Play Cancel			
No.			
	ŧ .	0%	1.4

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 <u>Mesh Networks</u> 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.

	NETNodo Moch IB Padia				Hind Connection		Dura ()
VE	TM-RX		Single Head W 1000 HHZ		 Update Local Unit Only 		8
resets / Talkback / Voice Dashboard Apps	Talkback / Voice :8		< 1 2 3 4 5 6 7 B 9	10 11 12 13 14 15 16 >			NCEL 📿 REFRESH
🕪 Status 🗢	TALKBACK AUDIO SETTINGS			SEND & RECEIVE CHANNELS			
😳 Global Setup 🗢 🗢	Enable Talkback / Voice	Local headset		Send channel	Channel 1		
🗏 Presets 🗠	Mic on right channel	🔍 Yes		Receive channels		2 3	
• & Mesh Settings	Noise suppression	🤍 Yes					
2 Talkback / Voice	Echo cancellation	🤍 Yes				10 11	
Encoders 🗢	Side tone	• No			13	14 15	16
Q Audio	Disable voice cue	TES CONTRACTOR					
Data v							
🕮 Advanced 🔹	TALKBACK AUDIO LEVELS						
🗙 System 🔍 🗸	Microphone gain	*					
Light 🤲 Dark	Mute level		e e				
e admin	Headphone gain						
C> LOGOUT	TET (COPY PRESET 8				6 AUDIO 6		
The second second							
🔲 v7.2.3							

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.

NETNode IP Radio	× NETNode IP Radio ×	+				~	- 0 ×
$\leftarrow \rightarrow \ G$	🔿 🔀 192.168.1.221/wui_presets/voice						ම 🛓 හු ≡
VE	NETNode Mesh IP Radio TM-K9				 Over radio link Update Local Unit Only 		Preset 🚺 8 🔰
Presets / Takkack / Voice Dashboard Apps	Talkback / Voice :8		< 1 2 3 4 5 6 7 🖪 9	10 11 12 13 14 15 16 >			hcel 🤇 Refresh
📲 Status 🗢	TALKBACK AUDIO SETTINGS			SEND & RECEIVE CHANNELS			
🎯 Global Setup 🗢	Enable Talkback / Voice	Local headset		Send channel	Channel 2		
🔲 Presets 🗠	Mic on right channel	C Yes		Receive channels		2 3	
Mesh Settings Unit Settings	Noise suppression	🔍 Yes					
P Talkback / Voice	Echo cancellation	Ves				10 11	
Encoders 🗢	Disable bleen	Var				14 15	16
	Disable voice cue	Tes Yes					
🗎 Data 🗢	TALKBACK AUDIO LEVELS						
💥 System 🗢	Microphone gain	ו					
Light 🦛 Dark	Mute level	R•	Ø				
Q admin	Headphone gain	d×					
CF 100001					P AUDIO P	MESH SETTINGS D UNIT SET	TTINGS & SECURITY
🔲 v7.2.3							

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.

VE Map Downloader	_ 🗆 X
1. Setup 2. Select Area 3. Download	4. Save
Minimum Zoom Level (1)	I
Maximum Zoom Level (18)	
Combine Maps (Combines new data with e	existing cache)

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 <u>File</u> <u>Uploader</u> software application.



VE Map Downloader						
1. Setup	2. Select Area	3. Download	4. Save			
Click 'Download' to start.						
		Do	ownload			

- ve Map Downloader						
1. Setup	2. Select Area	3. Download	4. Save			
Click 'Save Maps' to select a file path.						
		Sa	ive Maps			

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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 <u>JSON Example Files</u> appendix.

Export User Settings



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

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

OFF	GPS Locked Configuration	
Export Settings	Settings Export Complete	ок
	The exported setting the can be accessed vise othernet using a web browser at URL: http://92.168.1.201/Media/Exported/Con figuration/	Back
		Cancel
		Save

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 <u>JSON Example Files</u> appendix.

Export Camera Settings



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

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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 <u>Downloads</u> 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 <u>File Uploader</u> 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 <u>Settings App</u> 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.

🥌 VE File Uplo	ader		- 0	×
	102 100 1 210			
IP Address:	192.168.1.210			
Upload File:			Brow	se
		Upload File		

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 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

map will take on different forms.

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

TM-RX DropCam

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.



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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 <u>Video Redistribution</u> section.



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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.





System Configuration

Using the networking principles outlined above together with a good understanding of how to configure Mesh nodes as outlined in <u>Key RF Settings</u> 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 <u>JSON Configuration</u>. If required, JSON configuration files can be used to recover the system back to a known working state.

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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	
Re	moval Procedure				
1.	Remove 15x CSH	K Torx M1.6x3 (It	em 2).		
2.	Remove Heatsink	Cover (Item 3).			
3.	Remove Battery	Door Catch (Item	i 1).		
ns	tallation Procedur	е			
1.	Insert Battery Doe	or Catch (Item 1)).		
2.	Fit the Heatsink C	Cover (Item 3).			
3.	Insert 15x CSK T	orx M1.6x3 (Item	1 2).		
					\bigcirc
					<u>s</u>





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



190,00

22,00 | 22,00

36,11

11,96

 21,00



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All dimensions are in mm

11,96



Dual Li-Ion Battery Charger





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All dimensions are in mm

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