TMC 3 User Manual

User Guide for the Tactical Mesh Camera System

Table of Contents

Change History

Version	Date	Change Summary	Author
v1.0	21/09/2017	Existing Support Articles Compiled	RE
v1.1	29/01/2019	Updated Firmware Upgrade Procedure	RE

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.

Introduction

The TMC 3 provides a simple, rugged outdoor deployable method for close observation.

It integrates the Silvus StreamCaster 4200 MIMO Mesh radio, a high definition PTZ camera and GPS positioning into a single IP67 sealed unit.

The StreamCaster 4200 from Silvus Technologies offers outstanding RF performance in both of the supported S and C bands. It has excellent range and data bandwidth, with optimum size, weight and power consumption characteristics.

The integrated EV7520 HD Sony block camera offers a 30x optical zoom with and a 63.7° wide angle of view. It supports video resolutions up to 1080p output, along with exceptional low light sensitivity.

The camera's video is encoded into an IP stream via an integrated encoder, this produces simultaneous H.264 and MJPEG encoded streams. Configuration of the encoder including video encoding, trigger settings and network parameters is supported via a web page interface.

The pan and tilt drive trains are actuated by gearless stepper motors, reducing the operational noise to a minimum. Pan and tilt speeds are zoom factor corrected, giving fine control over the entire range of the lens.

It has absolute position feedback and therefore has the ability to self correct its actual position if external forces act upon it. It also offers eight user preset settings that can be saved allowing PTZ framing and camera racking profiles to be easily recalled.

Two removable antennas connect via TNC connectors, this allows the TMC 3 to be mounted in the orientation chosen by the user.

The TMC 3 also features a GPS module that provides positioning information which is made available through the Mesh radio network link.

Kit Contents & Part Numbers

- TMC 3 Camera
  Part: 110-3097

- Dual Band Antennas
  Part: 110-4021

- Passive Power Injector cable
  Part: 110-8301

- CAT5 Cable
  Part: 110-3507

- AC/DC Power Supply 12V 3A
  Part: 110-8910

- GPS Module
  Part: 110-3510

- IP67 Mains Power Supply
  Part: 110-4023

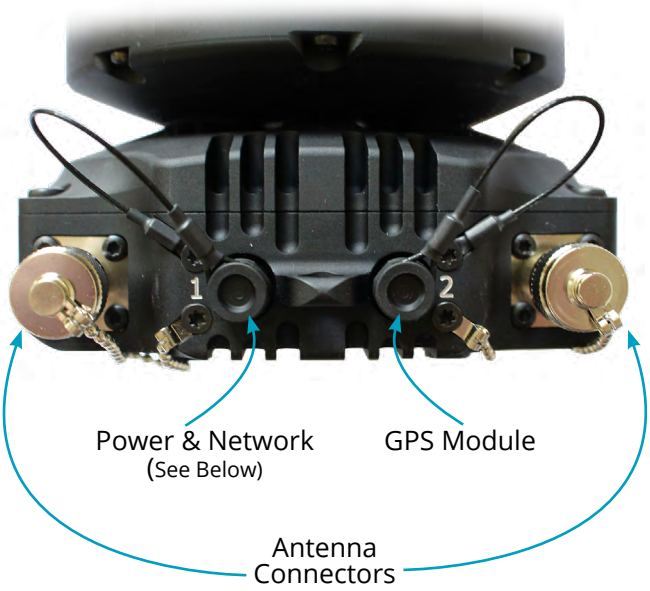
Connections

The TMC 3 has two TNC antenna and two Fischer cable connections, as shown on the right.

Remove the protective caps from all connectors.

Connect the provided antennas to the TNC connectors at the required orientation. Information on antenna orientation is described in the Mounting section of this user guide.

Connect the GPS Module (110-3510) to **Plug 2**.

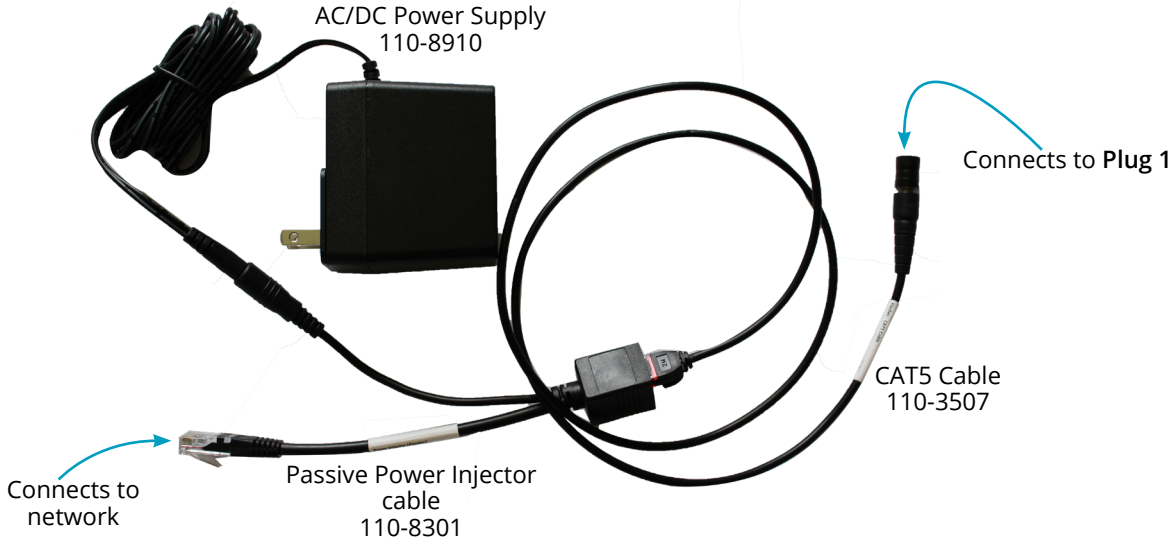


Outdoor Deployment

The IP67 power supply connects directly to **Plug 1** of the TMC 3 camera. All network connections can be made through the Mesh network.

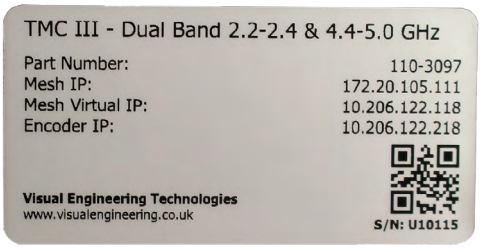
Bench Use

The AC/DC power supply is connected to the Passive Power Injector cable (110-8301) which in turn connects to the Fischer CAT5 Cable (110-3507), as shown below. Network connections can now be made using a cable connection once the RJ45 plug of the injector cable is connected to the local Ethernet network.



IP Addresses

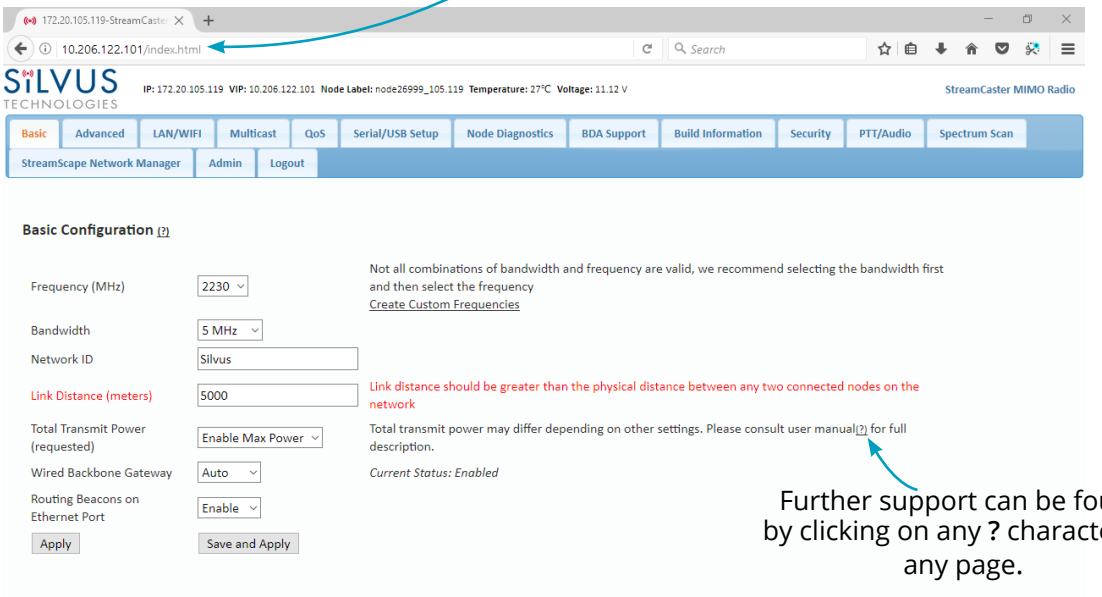
All default IP addresses can be found on the label on the base of the TMC3. This details the fixed and virtual IP address of the Mesh radio and also the IP address of the video encoder.



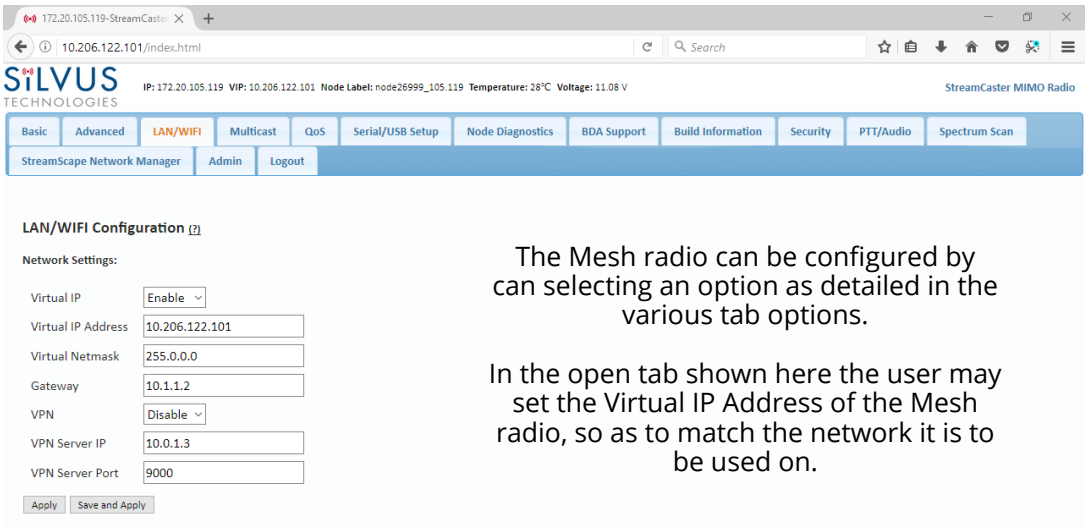
Mesh Network Control

The Silvus StreamCaster 4200 MIMO Mesh radio forms the wireless connectivity solution for the TMC 3. Connection to the radio's user interface is via a web page interface. Ensure that the controlling PC is on the same network as the Mesh radio(s) and enter the virtual IP address of a Mesh radio on the network into the web browser's address bar. The user interface for the Mesh radio will be displayed as shown below.

The virtual IP of the Mesh radio is entered here.
e.g. **10.206.122.101**



Further support can be found by clicking on any **?** character on any page.



The Mesh radio can be configured by can selecting an option as detailed in the various tab options.

In the open tab shown here the user may set the Virtual IP Address of the Mesh radio, so as to match the network it is to be used on.

The VE Camera Viewer

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

The VE Camera Viewer software can be downloaded from the VE website support page:

www.visualengineering.co.uk/supportdownload/26

Viewing Video

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

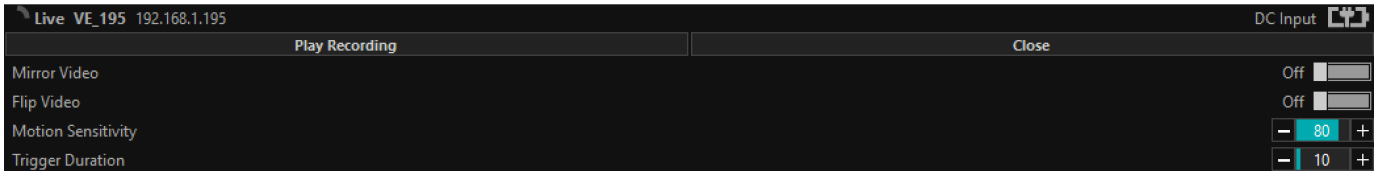
Video Panel Options

The top of the video panel displays information on the playback mode of the displayed video. In the above instance the video playback is a Live stream, it can also be noted that the camera is currently recording since the REC icon is shown. Since the TMC 3 camera does not contain an integrated battery the power source will be displayed as a DC input.

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

Settings

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

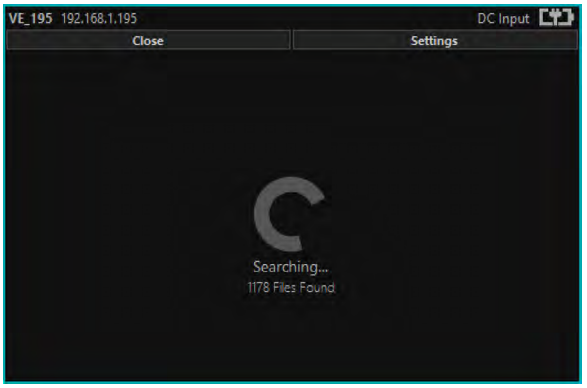


Play Recordings

Recordings will only be available if the TMC 3 camera is fitted with the recording option.

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

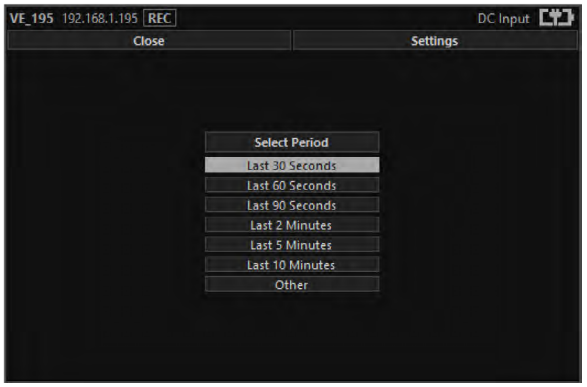
The player will find all available files that are stored on the SD card in the camera. The update screen as shown on the right will be displayed until all files are discovered.



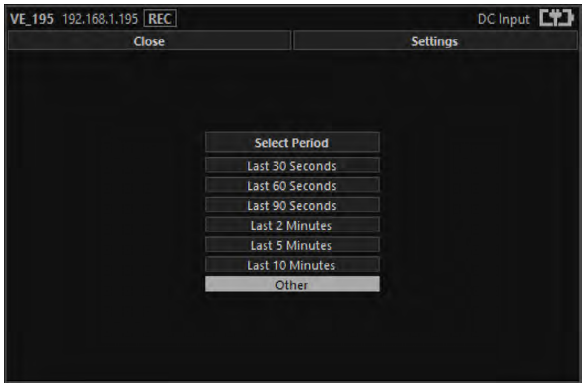
Users can then select a segment of recorded video to be played back from memory. Options are from 30 seconds to 10 minutes.

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

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

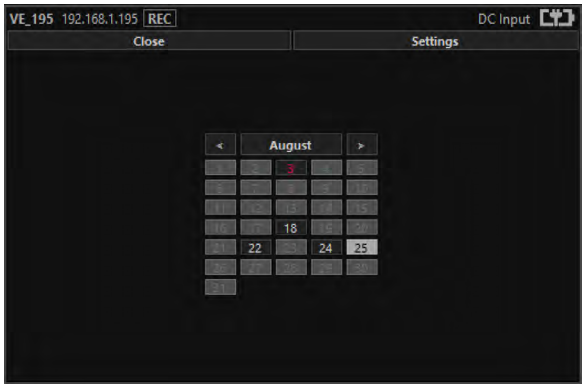


Select “Other” to choose a specific period of timed recording.



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

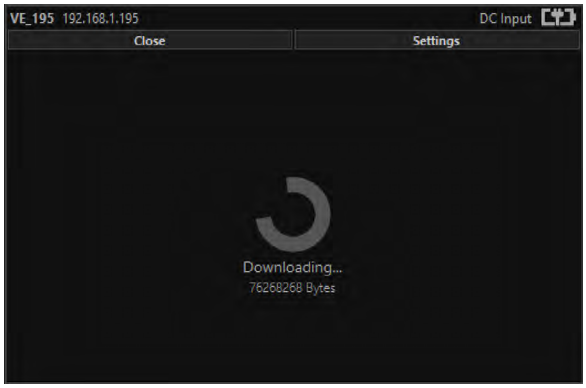
Select the required date, days that don’t hold recordings are greyed out.



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

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

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



Video Panel Coloured Border

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

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

Trigger Alarms

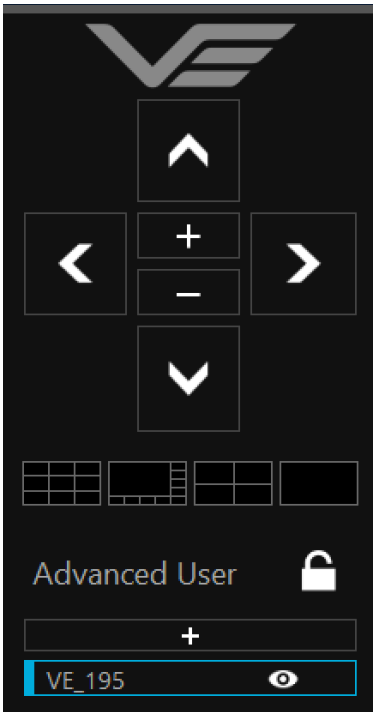
The trigger alarms are enabled either via the player or the web interface. Once a trigger event occurs it will be displayed and sounded in the player. The video panel will have a red edge border and an icon will be shown in the bottom left corner. The trigger icon is either a motion trigger or a low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

Trigger Icon	Trigger Source
	A low light level to high light level transition has been detected.
	Motion has been detected in the video.

Pan, Tilt & Zoom Control

Select a camera from the Camera List, this will cause the selected camera description being edged in blue, as shown on the right. The video panel for the camera will also be edged in blue.

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



Advanced User

To access the advanced mode, which allows full access to the stored recordings, the user needs to hold keyboard keys “A”, “D”, and “V” then click on the padlock icon next to the Advanced User text.

Multiple Viewers

It is possible to connect multiple instances of the Camera Viewer to a single TMC 3.

There is however a maximum limit at which the encoder bitrate can be set to whilst streaming video to multiple viewers. Bitrates set to a value greater than the allowed maximum value for a given number of clients will result in video breakup.

The table below describes the maximum bitrate the camera can be set to for a given number of connected viewing clients.

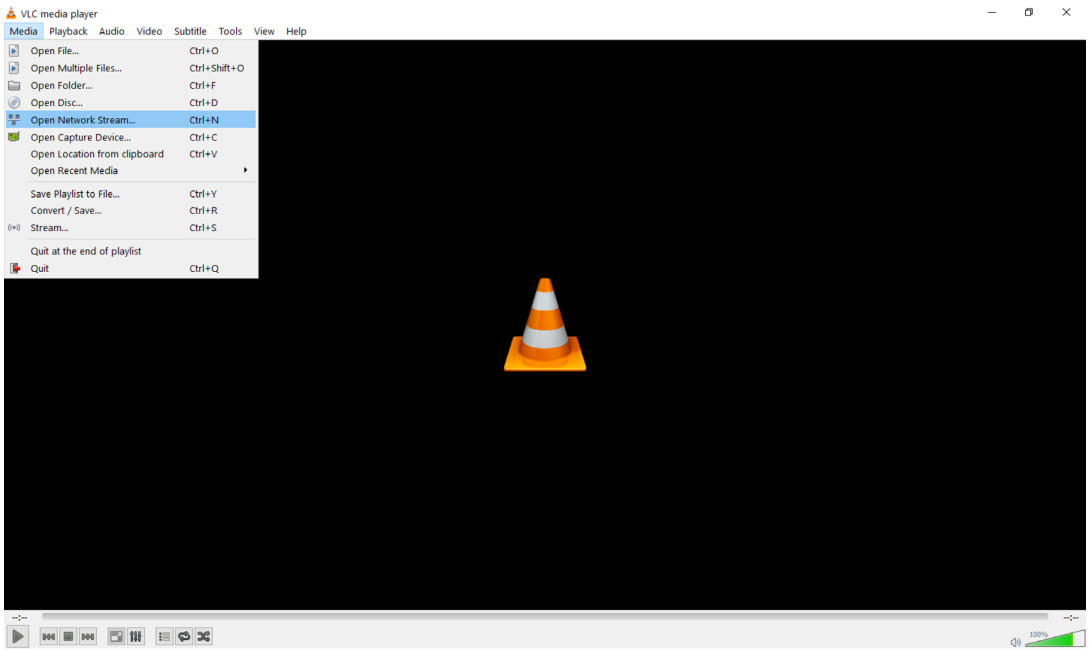
Client Count	Maximum Camera Bitrate
1	10Mb/sec
2	8Mb/sec
3	6Mb/sec
4	4Mb/sec

Using VLC to Play Streams

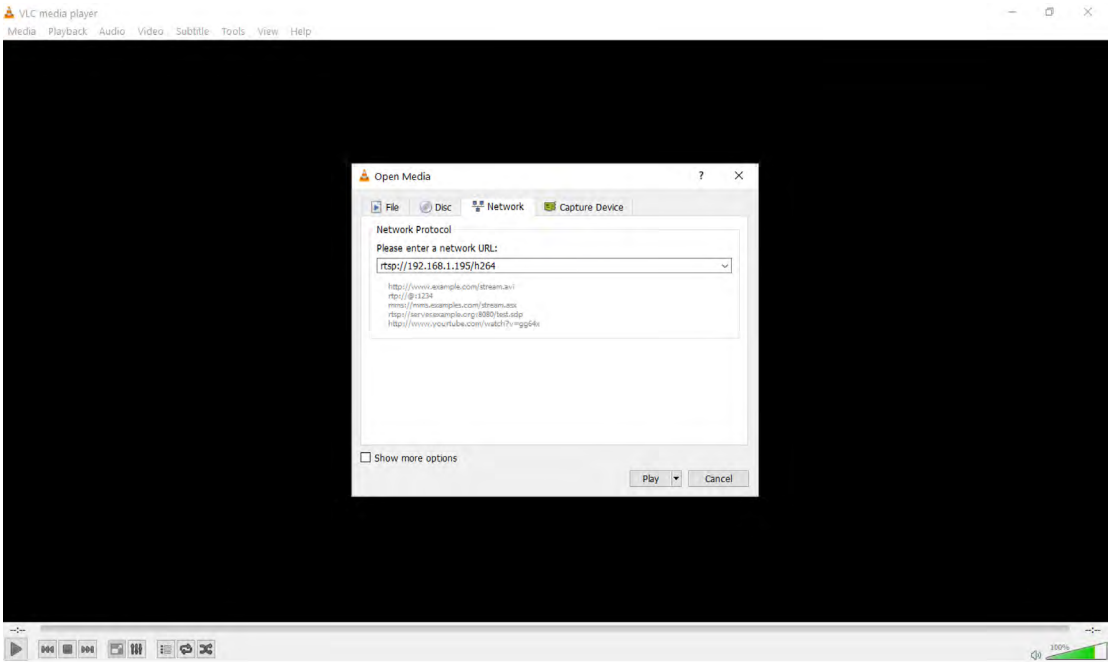
The TMC 3 is compatible with many players, a simple freeware player is VLC Media Player, which can be downloaded from:

http://www.videolan.org/vlc/index.en_GB.html

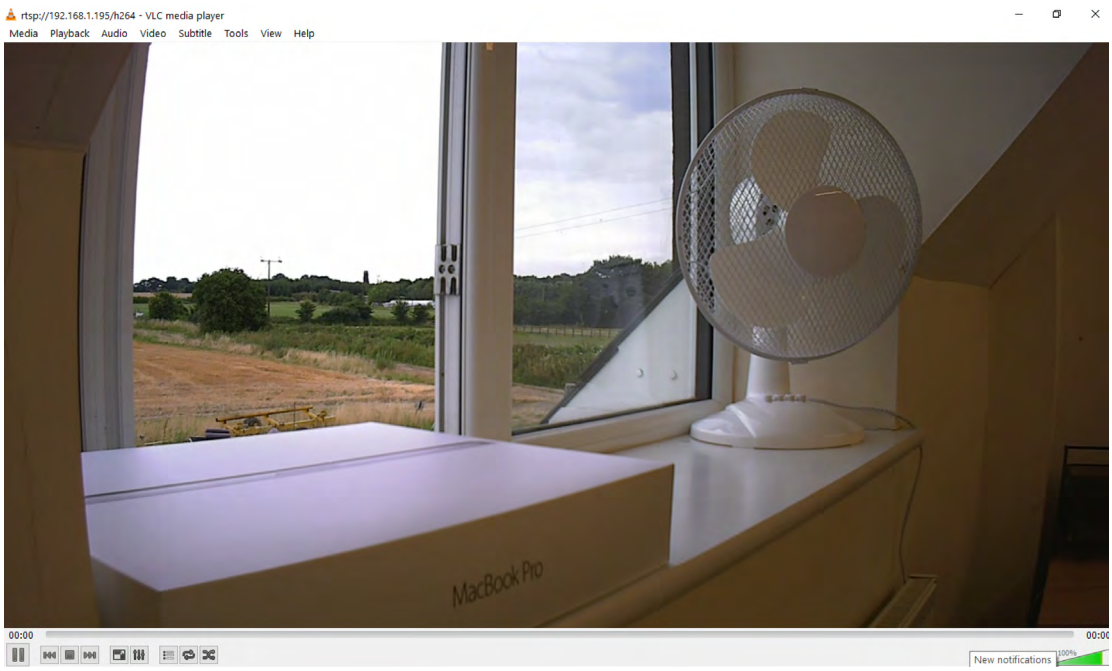
- Install and run the VLC Media Player application.
- From the Media menu select the 'Open Network Stream' as shown below.



- Enter the camera URL and stream type, eg: **rtsp://192.168.1.195/h264**
  The URL depends upon the IP address of the camera and the stream type, eg: h264 or jpeg. This is shown below



- Press play and the video stream will appear, as shown below.



IP Video Encoder

Once the TMC 3 is powered and has an network connection to a PC, users can web browse to the camera's video encoder to control its functions.

The web browser allows control of the encoders parameters such as resolution, bit-rate, and network settings.

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

Users can web browse the settings using any of the standard web browsers; Firefox, Internet Explorer or Chrome.

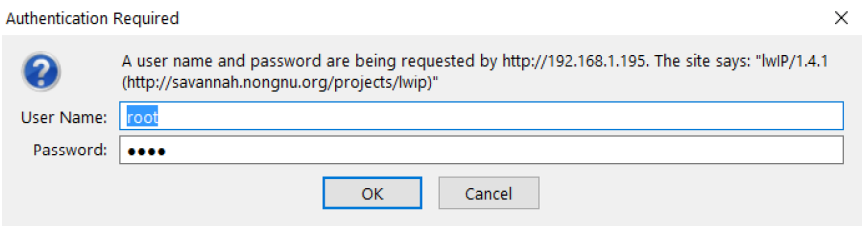
Simply type the camera's IP address into the browser's address bar, using the encoder IP address.

Video Encoder Login

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

Default **User Name** is:
root

Default **Password** is:
1234



Default IP Address

Encoders are have a default IP address as detailed on the label found on the base of the TMC 3.

If the camera is not responding on this address it is possible that the IP address has been changed.

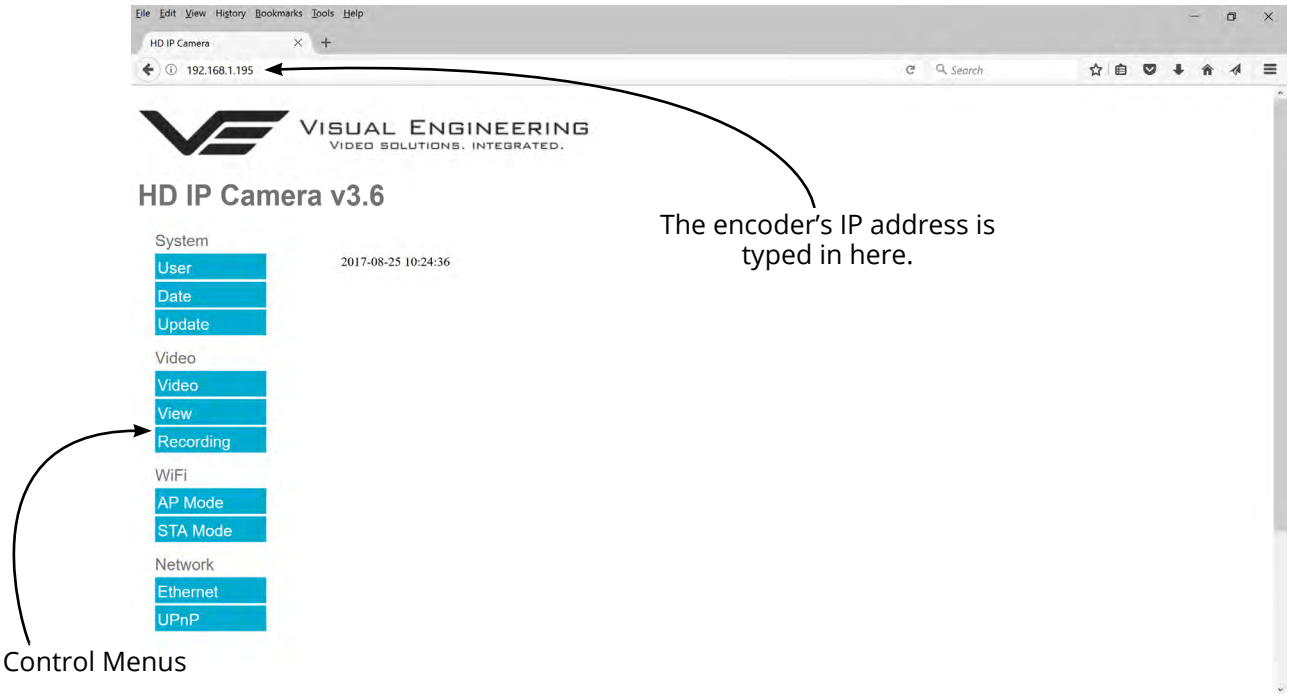
If the new IP address is unknown, the user can use the VE Camera Viewer software application to locate the IP address. This method is explained in the The VE Camera Viewer section of this user guide.

Video Encoder Control

The mechanism for configuring the H.264 encoder in the TMC 3 is its web browser interface.

The example screen below shows what is to be expected once a valid connection between the PC and TMC 3 has been established by typing the video encoder's IP address into the web browsers address bar. In this example it is using the IP address 192.168.1.195

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



User Menu

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

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

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

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

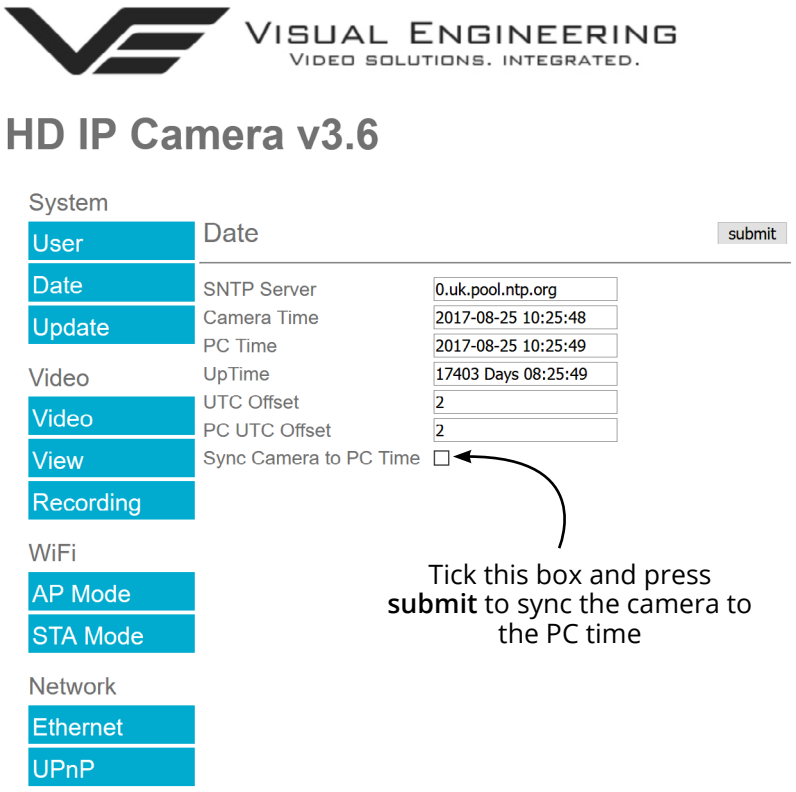
Date Menu

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

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

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

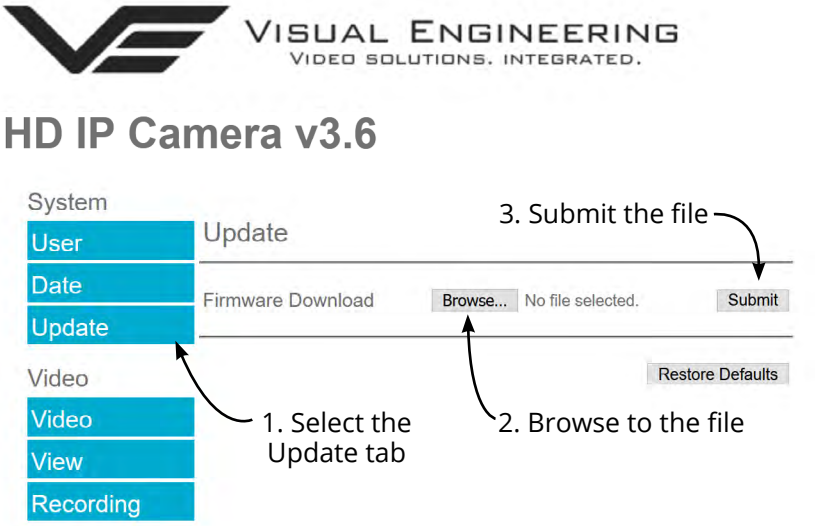
To align the camera to the actual PC time the "UTC Offset" should be made same as the value displayed in the "PC UTC Offset" field.



Update Menu

It is possible to update the camera encoder firmware of the TMC 3. There are three steps to updating the firmware, as shown on the right.

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



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

Important: To fully ensure the upgrade has finished it is advised to refresh the web page and check the banner displays "IP Encoder v3.22" or the camera starts to once again stream video before switching off the power.
It is advised that following a firmware update that the **Restore Defaults** button is pressed, this will revert the encoder back to a default start state. The IP address of the encoder will **revert** to its **default IP address** of **192.168.1.195** following a power cycle.

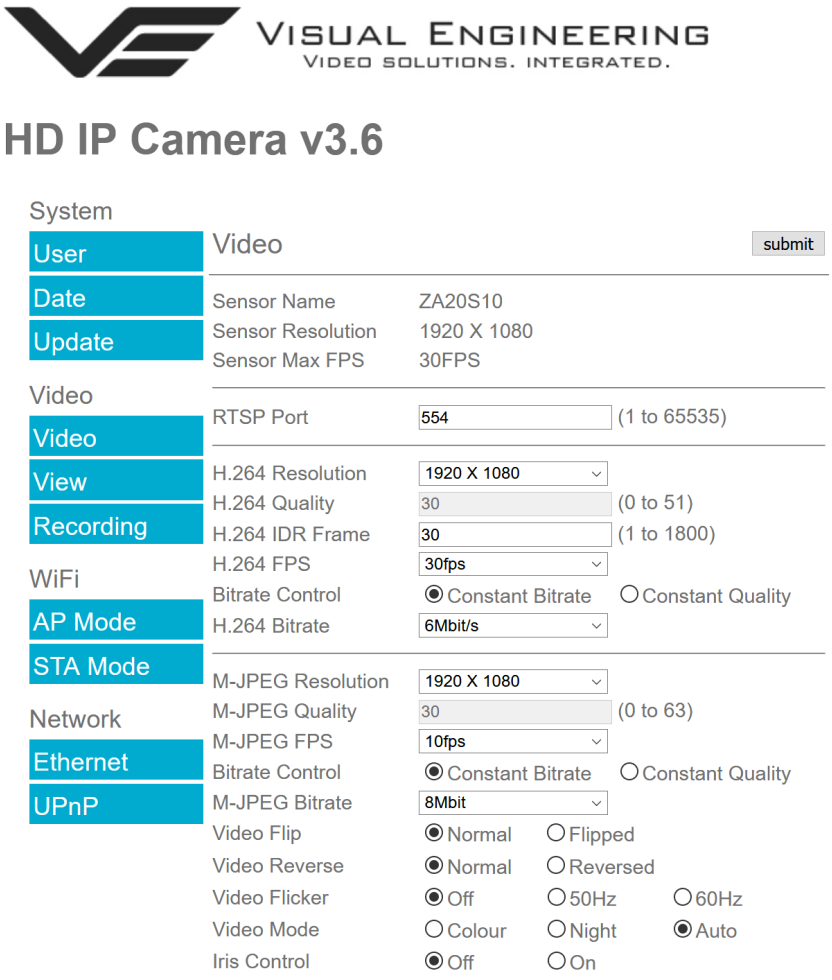
Video Menu

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

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

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

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



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

- **Constant Bitrate**. This is the normal mode of operation, it will output a constant bit-rate for its IP video stream.
- **Constant Quality**. In this mode the bit-rate is varied in a effort to maintain a constant quality. The target quality is set using an arbitrary number between 0 to 51, the lower the number the higher the quality. This is set in the quality field.

Other video encoder parameters include:

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

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

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

Recommended Settings

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

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

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

Video Flicker can be adjusted to suit the local mains frequency when the camera is used under artificial lighting conditions.

Night Video mode will increase the sensitivity of the camera under low light conditions.

Iris control is effective only on camera models with iris control included.

View Menu

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

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

Ethernet Menu

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

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

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

UPnP Menu

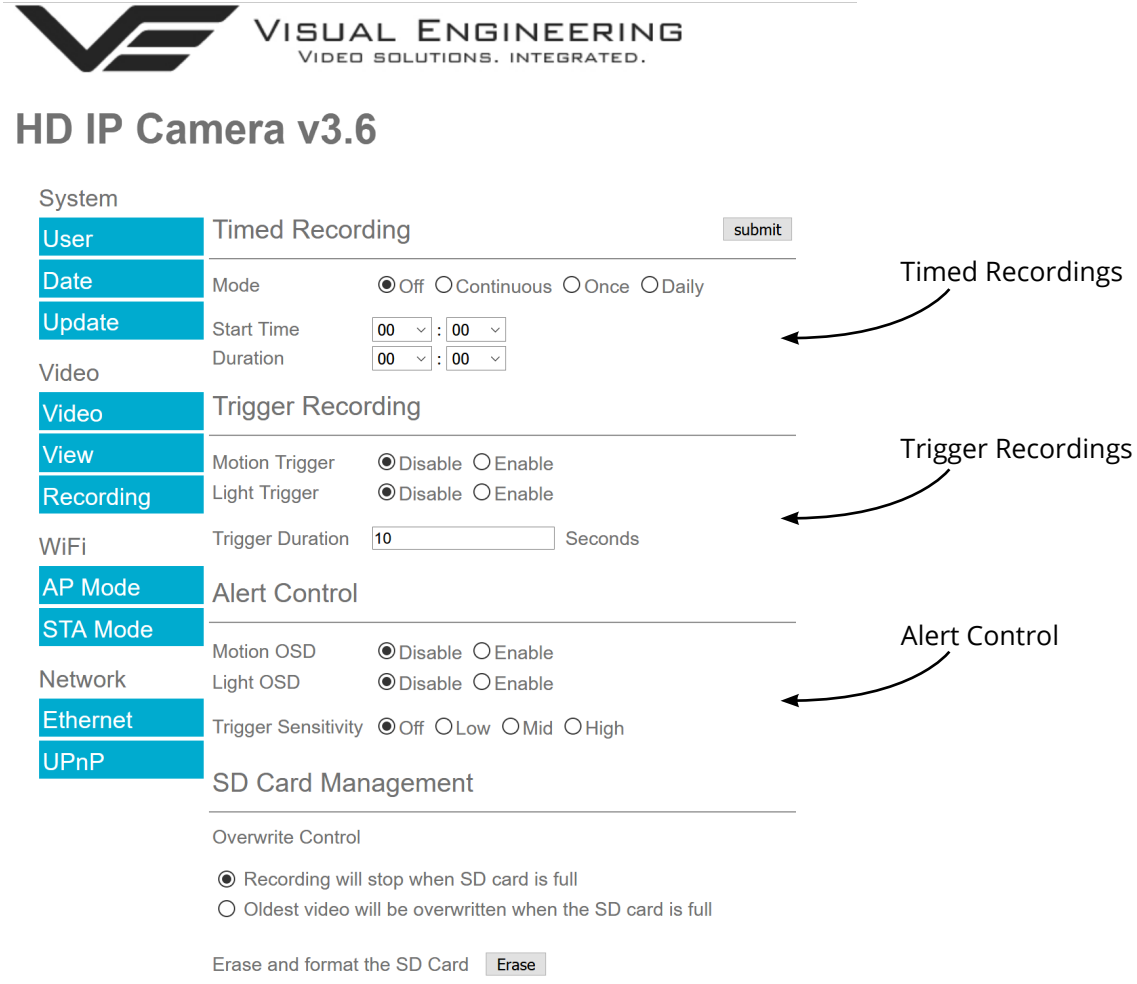
The Universal plug and play menu allows the user to set the Device ID and Camera Name.

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

Recording Menu

Recordings will only be available if the TMC 3 camera is fitted with the recording option.

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



Recordings can be activated in two ways:

- Timed recordings
- Trigger recordings

Timed Recordings

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

Off = No recording takes place.
Continuous = Recording Continuously.
Once = Record once when the start time is reached and record for the set duration.
Daily = Record daily starting when the start time is reached and record for the set duration.

Trigger Recordings

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

Alert Control

Additionally motion and light level triggers can be used to trigger an OSD (On Screen Display) event and an audible tone in the stream. If users require this they should enable the Motion or Light OSD.

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

SD Card Management

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

Following any changes made in the menu the user must press the **submit** button .The camera will then save the changed parameter. Wait until the camera finishes re-configuring before trying to move away from the current web page or powering off the camera.

Erase and Format

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

Mounting

The TMC 3 can be mounted using the threaded holes in the base to attach it a pole or similar structure.

It can be mounted in either orientation, with the camera mounted below the antennas as shown on the left or with the camera above the antennas as shown on the right.

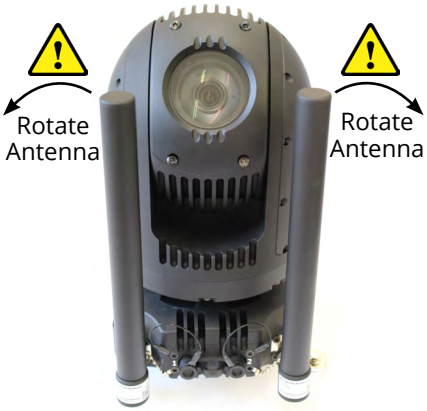
In both of these scenarios it can be seen that the camera is separated from the RF radiating antennas. This ensures that there is no interference between the radio transmitter and the camera's video.

If the TMC 3 is to be mounted onto a flat surface where it is not possible to position the antennas so that they hang below the camera it is important to position the antennas such that they do not interfere with the camera's view.

This is important not only to ensure that the video is not impaired by the physical antenna but also to ensure separation between the camera's video and the RF signal transmitting from the antennas.

The example shown on the right shows an improper setup, the antenna's position will interfere with the camera's video.

It is therefore necessary to position the antennas at an angle away from the camera's field of view, as indicated.



The example shown here is a correct setup when the camera and antennas are positioned in the same orientation. The antennas are rotated to an angle that does not impair with the camera's field of view.

If possible the antennas should be positioned behind the primary viewing pan angle, as shown here. This may not always be possible if 360° of view is required but should be considered if the camera is being used in a scenario where the main focus is within a 180° field of view, such as a deployment at the side of a street.

Specifications

Specifications			
Waveform	Mobile Networked MIMO	**Camera Sensor**	1/2.8" Type CMOS
Channel Bandwidth	5, 10, 20MHz	**Camera Sensitivity**	<0.05 Lux, ICR On
Encryption	DES Standard, AES/GCM 128/256 Optional (FIPS 140-2)	**Camera Resolution**	1920 x 1080 Pixel
Data Rate	100 Mbps, Adaptive	**Field of View**	63.7° (wide), 2.3° (tele)
MIMO Technologies	Spatial Multiplexing Space Time Coding, Eigen Beamforming	**Pan & Tilt Range**	270° tilt, Continuous pan
RF Output Power	1mW to 4W Variable	**Power Input**	12V
Latency	7mS Average (20MHz BW)	**Power Consumption**	10.8W to 30W max
RF Sensitivity	-99dBm @ 5MHz BW	**Weight**	< 2KG
Frequency Bands	S and C Bands	**Dimensions**	ø 115 x 205.5mm
On Board Storage	Up to 32GB (Optional)	**Casing**	Aluminium
PTZ Control	TCP/IP, Visca, Pelco	**Environmental**	IP67

Connector Pinouts

Plug 1 - Power & Ethernet

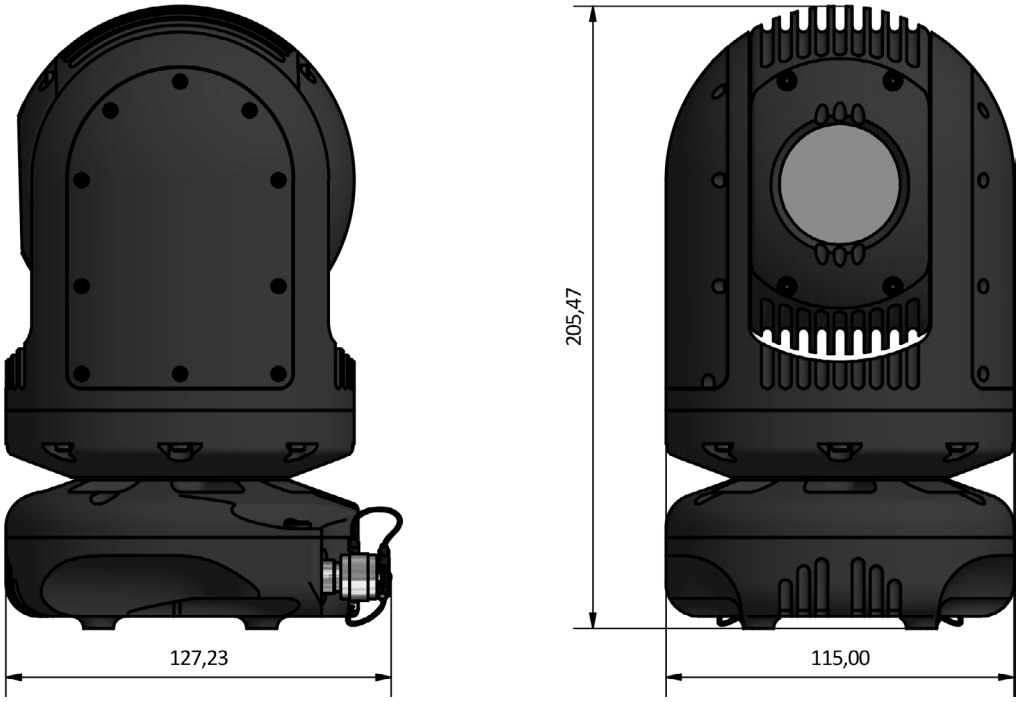
1. SDA
2. ETH TX-
3. ETH RX+
4. RS232 TX (data from camera) / RS485 A
5. 12V Input
6. SCL
7. ETH TX+
8. N.C
9. GND
10. ETH RX-
11. RS232 RX (data to camera) / RS485 B
12. N.C

Plug 2 - GPS

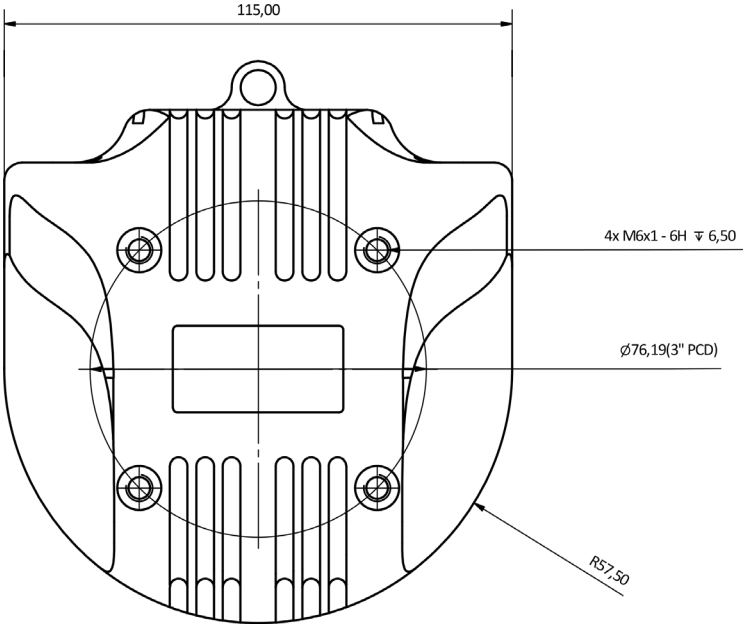
1. N.C
2. N.C
3. N.C
4. N.C
5. N.C
6. N.C
7. N.C
8. N.C
9. GND
10. N.C
11. RS232 RX (data from GPS module)
12. +5V Input

Dimensions

Overall Dimensions



Base Plate Dimensions



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