



## CRAD 80 USER GUIDE

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## I. Revision History

Version	Date (MM/DD/YYYY)	Comments
1.0	27/04/2020	Initial Release

## II. List of Abbreviations

<b>PTZ</b>	Pan, Tilt and Zoom
<b>AGC</b>	Automatic Gain Control
<b>BPR</b>	Bad Pixel Replacement
<b>FPN</b>	Fixed Pattern Noise
<b>FPS</b>	Frames Per Second
<b>GUI</b>	Graphical User Interface
<b>LWIR</b>	Long Wave Infra-Red
<b>NETD</b>	Noise Equivalent Temperature Difference
<b>NTSC</b>	National Television System Committee
<b>NUC</b>	Non-uniformity Correction
<b>PAL</b>	Phase Alteration Line
<b>RFPN</b>	Residual Fixed Pattern Noise
<b>ROI</b>	Region of Interest
<b>Tint</b>	Integration Time
<b>USB</b>	Universal Serial Bus
<b>VGA</b>	Video Graphics Array
<b>ICD</b>	Interface Connection Document
<b>IP</b>	Internet Protocol
<b>NTP</b>	Network Time Protocol
<b>BLC</b>	Backlight Compensation
<b>WDR</b>	Wide Dynamic Range
<b>ICR</b>	Infrared Cut Removal
<b>FOV</b>	Field of view

# 1 About

## 1.1 Trademarks

- MTech™ is a trademark of MTech Imaging Pvt Ltd

## 1.2 Licensing

### **Software**

“Software” is defined as machine-readable code or firmware, which is owned by or licensed to MTech Imaging referred as **MTech**, resides in Product memories, tapes, disks, CDs, or other media and provides operating instructions. With respect to any Software that is furnished to BUYER and/or BUYER’s customers (“Recipient”) hereunder, the Recipient is granted a non-exclusive, license to use the Software in conjunction with the Product(s) purchased, for the life of said Product. Notwithstanding the foregoing, the Recipient is not granted any title or ownership rights to the Software whatsoever. The Recipient is not authorized to reproduce, copy, modify, repair, decompile, reverse engineer, disassemble, reverse translate, or in any manner decode the Software. BUYER agrees to include and enforce terms no less stringent to its customers.

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### **Remedies, Damages and Limitations**

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Actions, however asserted, shall be commenced within two years from the date the cause of action accrues; provided, however, an action for nonpayment may be commenced at any time within four years from the date the cause of action accrues.



### 1.3 Warnings

The CRAD 80 imager system and related firmware and software components are not designed or intended for use or resale in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communications systems, air traffic control, or other devices or systems in which a malfunction of the camera hardware or software would result in foreseeable risk of injury or death to the operator of the device or systems, or to others.

#### **Operating**



Camera controllers and payload boards are a matched set and should not be interchanged with other like products. Inadvertent or intentional mixing of parts with that of another unit may result in poor image performance and void the product warranty.



Do not plug/unplug the interface cables and power cables when camera is ON



Always use the specified power adapter with the system, improper power source may damage the system and void the warranty.

#### **Handling**



To avoid any accidents, firmly install the system with bolts at the base. The system supports high-speed azimuth rotation and if not firmly held may compromise equipment safety measures. Operation without proper installation may void the warranty



Avoid touching the Camera lens, Install the dust cap/Lens Cap provided.



Avoid forcefully stopping the system when it is in motion. This may damage the driver motors and may cause injury to the person.

#### **Lens cleaning**



Cleaning of the Lens should only be considered in case of absolute necessity. Only use isopropyl alcohol and special lint-free cloth/paper for optics. Follow classical rules for optics cleaning (only translation motion without return, from the centre to the edge, never use the paper twice).

#### **Camera Life**



Avoid viewing very intense energy sources, such as the sun, lasers, electrical arcs, whether powered or not since this may cause damage to the detector or its factory calibration. Direct exposure to the sun for a long time will damage the sensor.

### **Electrostatic Discharge**



Electronic Devices are sensitive to electrostatic discharge. Please follow appropriate ESD procedures when handling the open electronics board sets. The open electronics should not be exposed to moisture or dust

### **Accessories**

Use only the approved accessories and options with this product. Incompatible accessories may damage the camera, compromise equipment safety measures and/or provide inaccurate readings.

### **Export Control Status**

CRAD-80 are subject to Export control. Please contact MTech Imaging Pte Ltd for guidance to re-exporting or transferring to another party.

## 2 Getting Started

### 2.1 Safety Instructions

Please read the manual before working with the camera. If the equipment is used in a manner not specified by the manufacturer, and safety protection provided by the equipment may be impaired.

- Read and follow all instructions carefully
- Keep these instructions for future reference
- Do not submerge this apparatus in the liquid of any kind
- Unit is not intended for exposure to the saltwater atmosphere
- Do not plug the power supply with wet hands
- Clean as per the recommended instructions using a dry non-abrasive cloth
- Do not install near any sources of intense heat such as radiators, furnaces, stoves or other apparatus that regularly produce excessive heat
- Do not exceed the operating temperature range
- Refer all servicing to qualified service personnel



[Figure 1: CRAD 80 Imager System](#)

## 2.2 Unpacking and Handling

A typical packaging solution is presented along with steps for properly unpacking the device

■ **This Section will be updated**

Step No	Step description
1	Inspect the shipping container and note any damage that may have occurred during shipping
2	Open shipping container by breaking the seal and lift the card board lid –a notch or an edge has been provided at the box front to ease this process
3	Remove top layer of protective foam or padding and review contents of the package to ensure all components are present. If discrepancies arise, please notify your authorized dealer
4	Remove antistatic bag(s) containing module(s) or camera assembly and accessories and set them on a suitable work surface
5	Unseal antistatic bags and inspect contents. Proper ESD procedures are required to prevent damage to sensitive electrical components
6	Inspect camera/modules and lens for proper configuration and material workmanship

[Table 1: Unpacking the device](#)

## 2.3 What You Need to Get Started

- CRAD-80 ImagerUnit/System
- Power Adapter
- External Interface Cable
- Firm Mount Plate
- CRAD Sun Shade
- Windows-10 PC with latest Service Packs installed
- Reliable Power Source 110/220V AC
- A Rigid Mounting Platform or Pole for the System to be firmly mounted

### 2.3.1 CRAD-80 Imager System

The system is held firmly with the shipment latches. These latches need to be released before any operation.



[Figure 2:CRAD-80 unboxed](#)

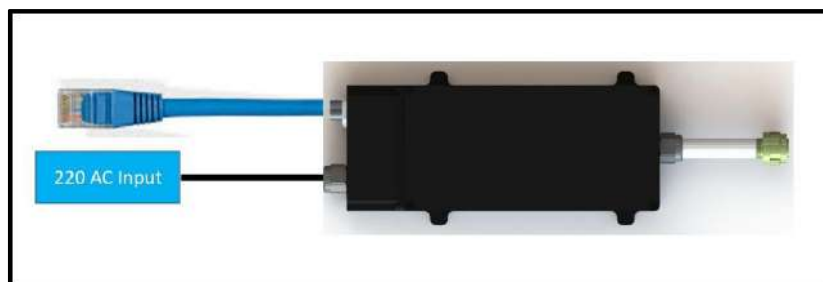
**Note:** The two latches as shown in the image below are there to minimize the system's Azimuth and Elevation movements during shipment

### 2.3.2 External Interface Cable

The imager is interfaced with a power adapter as shown in Figure Below and the power adapter includes three interfaces

- a. **Power** : To be connected to the DC Power Adapter shipped with the system
- a. **Ethernet (RJ45)** : To be connected to a router/switch or directly to the ethernet port of PC
- b. **RS-485** : This is for interface the Camera with external RS485 bus, mainly for debug and Maintenance, should not be connected to any interface for normal operations

User End:











[Figure 3:Figure 3: External Interface User End Connections](#)

The adapter has two ports at user End

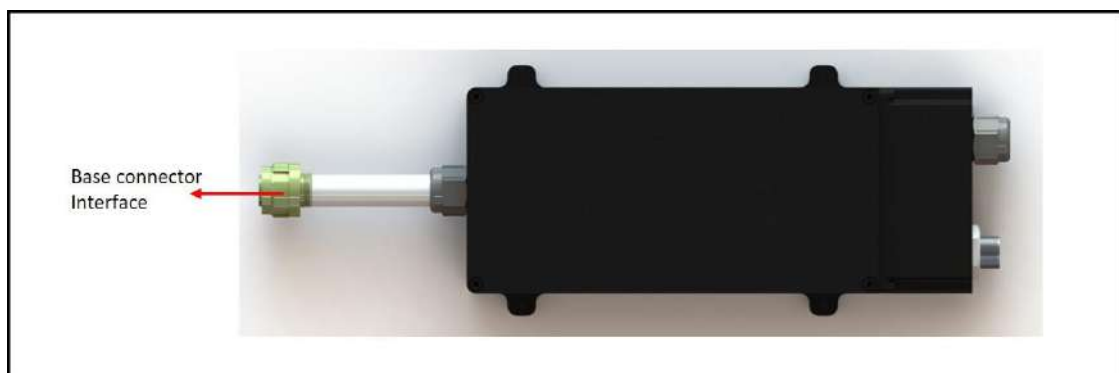
1. Ethernet port for communication
2. AC power input to the Adapter

**Note:** RS485 is only for Internal use.

S No	Interface Connection	Specifications	Cable Color Codes
1	Power Input	110-230V (Configurable by switch)	Phase Neutral Ground  (color code needs to add)
2	Ethernet Cable	10/100 Mbps	Tx+  Tx-  Rx+  Rx-   (Color coding according to RJ45)
3	RS485 Cable	Full duplex	RS485 A  RS485 B  RS485 Y  RS485 Z   (color coding according to sliping)

[Table 2: User Interface Connections](#)

Camera End:

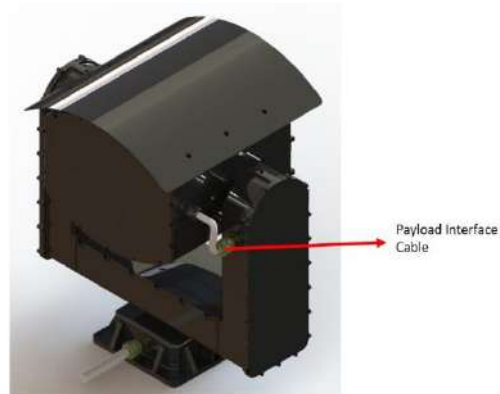


[Figure 4: Camera End connection](#)

Base Connector shown in the Figure should be connected to 22 Pin Base connector of the Imager system.

### 2.3.3 Payload interface Cable:

The payload interface cable is shown in the picture below



[Figure 5:Payload cables](#)

Payload Cable provide following interfaces

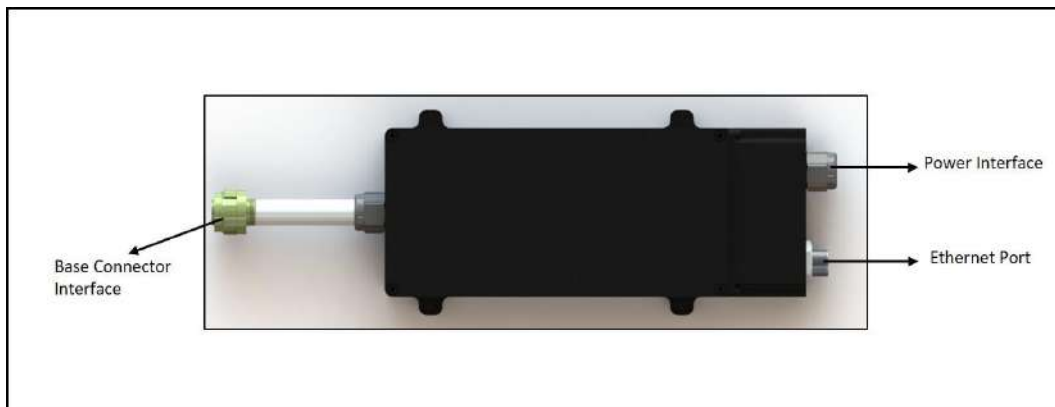
S No	Payload Interface	Specifications
1	Ethernet Interface	10/100 Mbps
2	Power Interface	24V DC $\pm 5\%$ , 6.5 A
3	RS 485 Connections	Full Duplex

[Table 3: Payload Interface Cable Connections](#)

### 2.3.4 Power Adapter

The power adapter is used to provide a 24V supply to the system (Positioner & Payload) and Specification of power adapter are :

- AC Input Range Selectable by a switch(110V/230V)
- Output voltage 21.1v to 28.8v DC (6.5 amp)



[Figure 6:Power Adapter](#)

### 2.3.5 CRAD Sun Shade

The sunshade is provided to protect the payload from overheat from direct sun exposure. The sunshade is mounted to the Camera with the 6 screws (6x SOC HD M4 x 30Lg) shipped with the system.



[Figure 7: Sun Shade for CRAD80](#)

#### **SunShade Assembly:**



[Figure 8:Sunshade Mounting](#)

#### **2.3.6 Mount Plate Adapter**

Mount Plate is used as a platform for supporting the weight and maintaining the stability of CRAD-80 Imager. The Mount plate is mounted with 4 screws (4×SOC HD M8 × 35Lg) to Base of the CRAD-80.





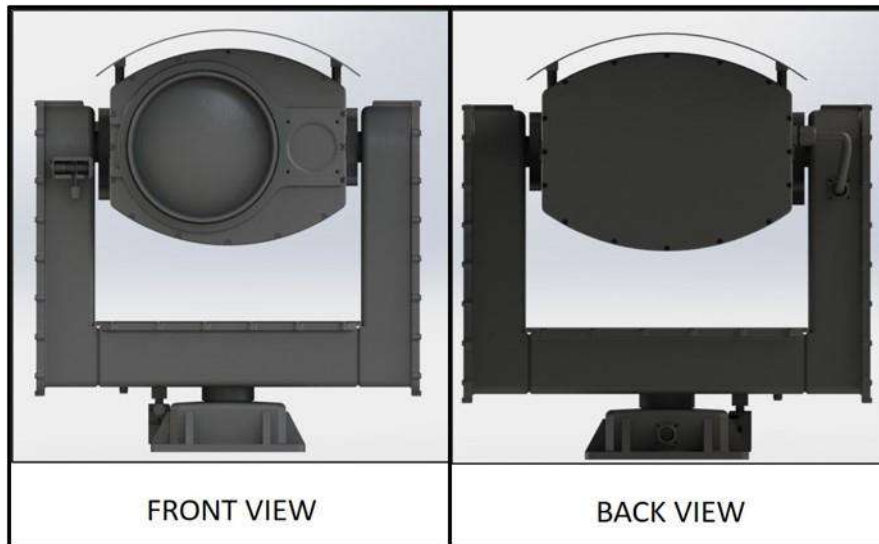
[Figure 9:Mount Plate Adapter Mounting](#)

#### 2.3.7 CRAD-80 SW Support Disk contents

1. CRAD-80 Release Notes.pdf
2. User Manual.pdf (This manual)
3. EULA 030612.pdf (End User License Agreement)

### 3 Introduction

CRAD-80 is a Multi-spectral Target tracking system. The system includes high precision Pan/Tilt Platform with a resolution of better than 1mRad to provide a high-quality tracker control and surveillance of any intrusions. The complete system including the Payload and the electro-mechanical platform is designed for rugged, outdoor 24x7 operation. The interfaces are all based on weatherproof rugged DTL-38999 connectors.



[Figure 10:CRAD-80](#)

CRAD PAN-TILT sub-system is a continuous 360° Pan motion platform designed for 15 Kg Payload. The system includes high precision motor controls and the fast response operation ideally required for object tracking and security surveillance operations.

#### 3.1 Salient Features

- High-Performance Thermal imaging – VGA format (640x480) with superb image detail and excellent thermal sensitivity for increased range and detection performance
- High-Resolution Day Camera – 3 MP
- Multi-Spectral (Thermal, Visible) Target Tracking Systems
- 1mrad Resolution
- Supports 15kg payload
- Environment Compliance is IP66

## 3.2 System Description

CRAD80 is a multi-sensor positioner system comprising of two channels of imagers:

- Low Noise LWIR (Long Wave Infra-Red) M8 Camera with 25-225 mm Zoom Lens
- High-Resolution CMOS Imager with 3MP resolution and 30x Optical Zoom

Payload Specifications	
Thermal Imager(M8)	
Image sensing	Monochrome
Array type	Uncooled micro-bolometer a-Si
Spectral band	8 to 14µm(LWIR)
Pixel pitch	17µm
Array size	640x480
Max Frame rate	60Hz (Supported 25Hz)
NETD	<50mK @f/1 , 300K, 30Hz
Colour palette	4 Available
Polarity	White Hot/ Black Hot
Pixel operability	≥99.5%

[Table 4:Thermal Imager Specifications](#)

Day Imager	
Image sensing	RGB
Array type	1/1.8"3.19M Global shutter CMOS Image Sensor
Spectral band	400 to 1000nm
Pixel pitch	3.45µm
Array size	2064x1544 Image array
Pixel operability	≥99.5%

[Table 5:Day Imager Specifications](#)

Interfaces	Specifications
Digital video out	H.264 over ethernet
Analog video out	PAL/NTSC
Communication Protocol	Onvif-S Over Ethernet

[Table 6:System Interfaces](#)

Thermal Imager Features Specifications	
Image Correction	NUC/BPR
Filtering	Smoothing and Sharpening Filters
AGC	Auto/Manual
1-NUC	Shutter Based Non Uniformity Correction

[Table 7:Thermal Imager Features](#)

Optical specification Thermal Imager	
Optical fill factor	100%
Focal Length	25-225mm
HFOV	24.6°(W) ~ 2.8°(T)
VFOV	19.8°(W) ~ 2.2°(T)
F number	0.85(W)~1.3(T)

Continuous Zoom	Supported
Absolute Zoom	16 FOV's Supported
Zoom Speed	8 Sec (Wide to Tele End)
Auto Focus Speed	<5 Sec
Minimum Focus distance	15m

[Table 8:Optical specification of Thermal Imager](#)

Optical Specifications Day Imager	
Optical fill factor	100%
Focal Length	6-180mm
HFOV	61.2°(W) ~ 2.32°(T)
VFOV	36.1°(W) ~ 1.31°(T)
F-number	F1.5(W ) ~ F4.3(T)
Continuous Zoom	Supported
Absolute Zoom	30 FOV's Supported
Zoom Speed	4 Sec (Wide to Tele End)
Auto Focus Speed	<3 Sec
Zoom Ratio	1 to 30x

[Table 9:Optical Specifications of Day Imager](#)

Payload Electrical Specification	
Input Voltage(DC)	24V
Power Consumption	<30Watt Max

[Table 10:Payload Electrical Specification](#)

Payload Mechanical Specifications	
Payload Dimensions	LxWxH(308x305x252.5 mm) without sun shield
payload Weight	13.5 kg

[Table 11:Payload Mechanical Specifications](#)

Payload Environmental Specification	
Temperature, Full Performance	-20 to +60°C
Temperature, Storage	-40 to +85°C

[Table 12:Payload Environmental Specification](#)

Positioner Specification	
PAN Speed	0.01° to 100° /sec
Tilt Speed	0.1° to 25° /sec
PAN Resolution	0.01°
TILT Resolution	0.01°
PAN Motion Range	360°
Tilt Motion Range	-45° to +45°(user Configurable)

[Table 13:Positioner Specification](#)

Positioner Electrical Specification	
Input Voltage	Min- 20V Typical- 24V MAX - 25.9V
Power	45 Watt Max

[Table 14:Positioner Electrical Specification](#)

Positioner Mechanical Specification	
Dimensions	LxWxH (500x 200x 450.5 mm)
Weight	16.5 Kg

[Table 15:Positioner Mechanical Specification](#)

Environment	
Operating Temperature	-20 to +60°C
Storage Temperature	-40 to +80°C

[Table 16: CRAD-80 Specification](#)

### 3.3 Minimum System Requirements

To install and run the Software, ensure the host PC supports the following specifications as the minimum system requirements:

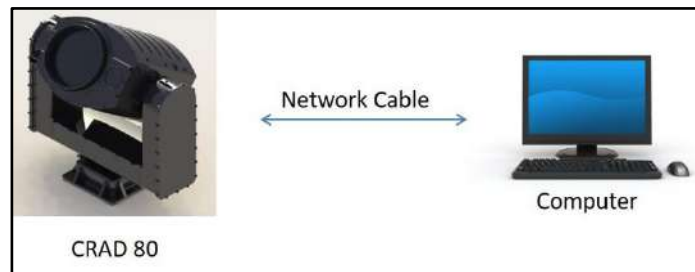
- Operating System : Microsoft Windows10
- CPU : 2GHz or faster
- Memory : 8GB recommended and 500 MB of available hard-disk space
- Display : 1024×768 resolution or above
- Ethernet Interface : RS45 connector compatible with 10/100 Mbps (802.3 compliant)

## 4 Network Connections

Connecting the camera to a switch or a router is the common connection method but the user must set the IP for the first time by connecting directly to a PC/Laptop.

### 4.1 Setting an IP

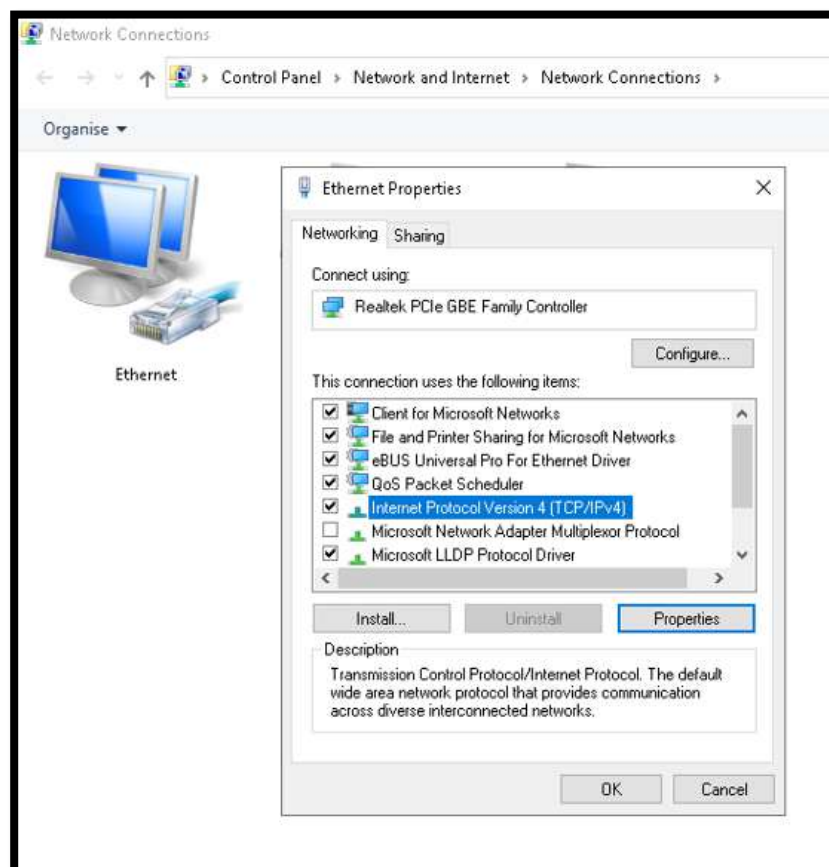
Connect the CRAD-80 system to PC as shown below to set the IP address.



[Figure 11: Connecting CRAD-80 to PC to set an IP address](#)

Power ON the system and wait till power-ON initialization process is complete (Typically takes a minute).

1. Go to network connections, click on the properties and select the IPv4 properties as shown below



[Figure 12: Network Connection Properties](#)

2. Set the IP address as shown below

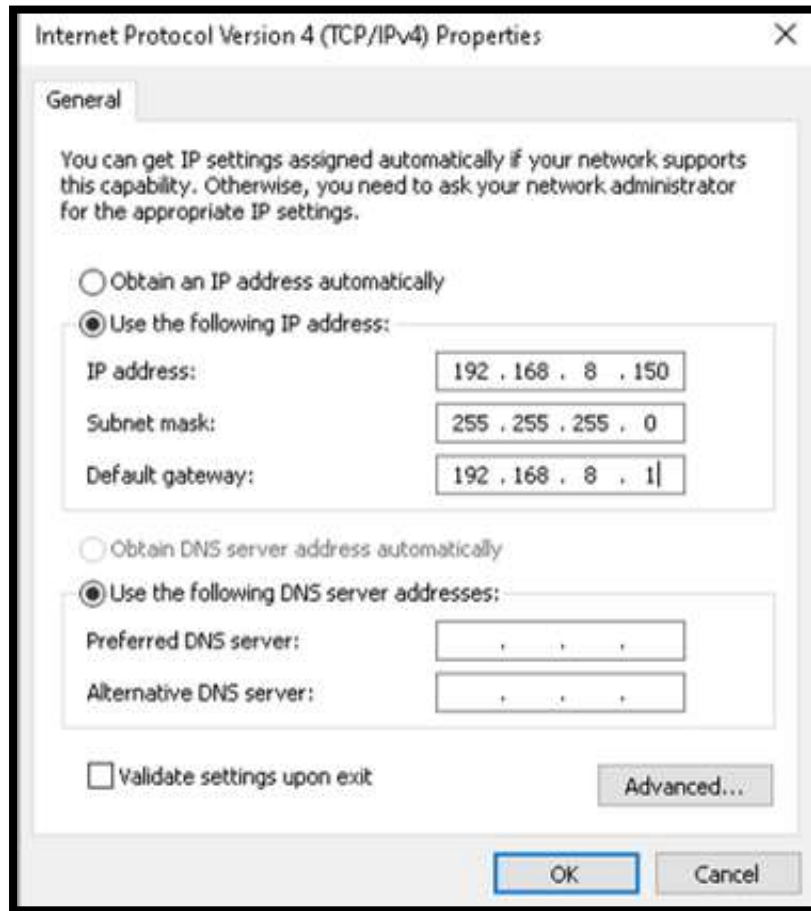


Figure 13: IPv4 settings

**Note:** User can set any value in IP address( 192.168.8.xx )

3. Now Go to the browser and open a Webpage with the following address  
**"192.168.8.165:80"**

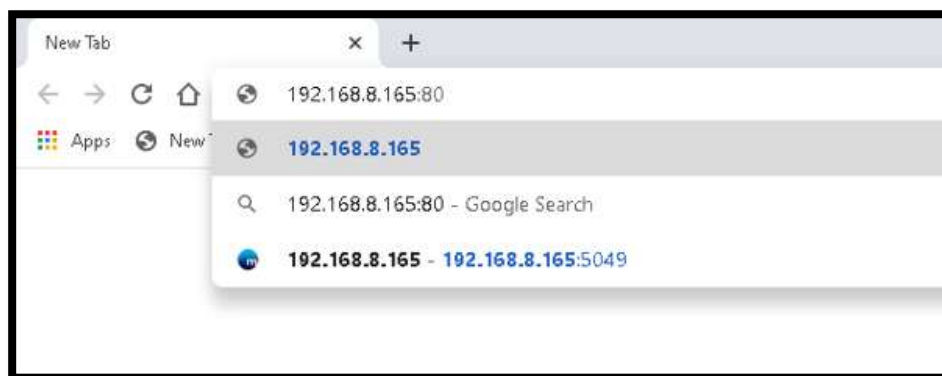


Figure 14: Accessing the CRAD-80 through Webpage

4. Enter the username and password to access the functionalities of the system
5. Go to configuration settings as shown below

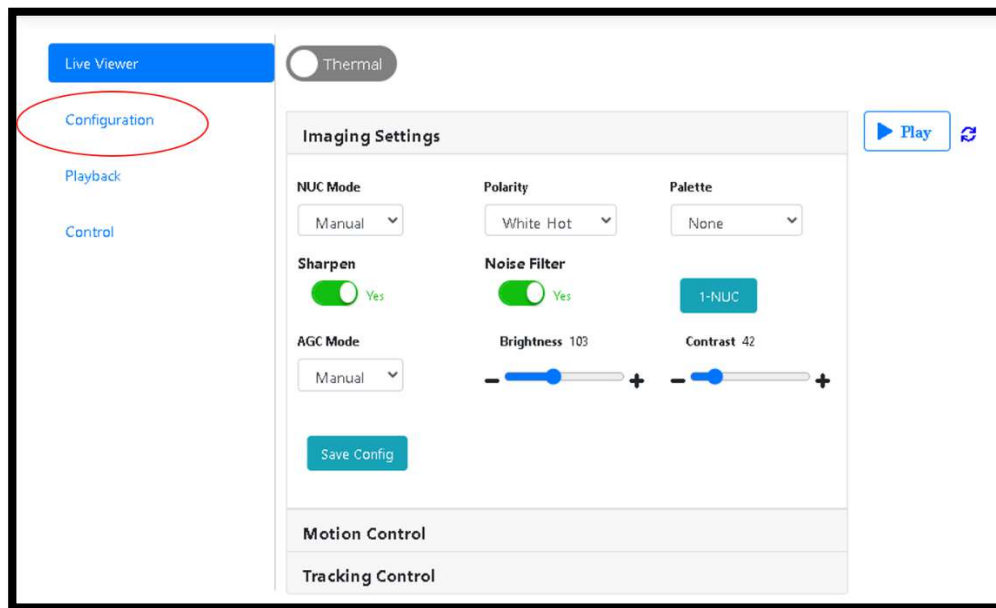


Figure 15: Configuration Tab

6. Select the config TAB and go to Network option as shown below

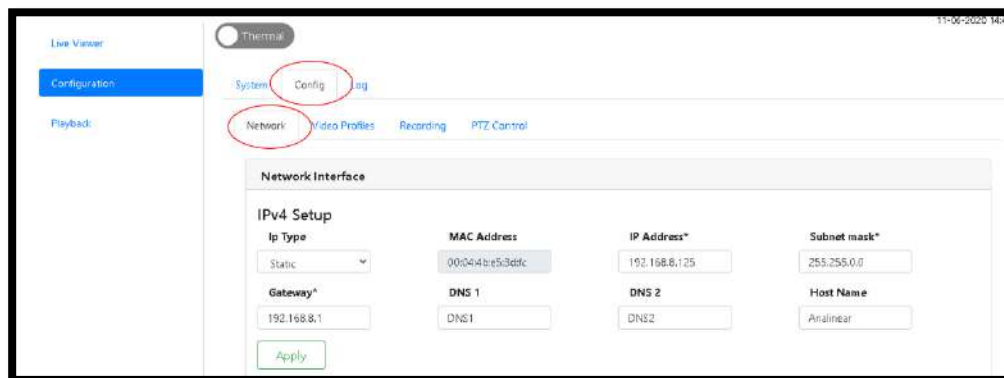


Figure 16: Network Settings Tab

7. Select the Ip type , IP address , subnet and gate way mask as required and click on **Apply** button.

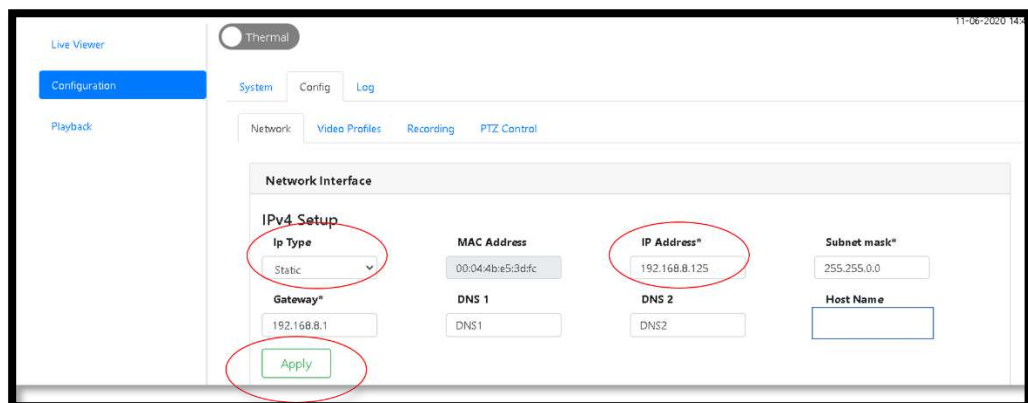


Figure 17: Static IP ADDRESS setting



**Caution:**

*After clicking on “Apply” button, unit will automatically reset to apply the settings. User has to wait for min 60 secs and connect the Etehrnet cable to Switch or a Router to access the webpage with New IP set. User can also connect to the PC directly provided all the IPV4 settings are changed as per the New IP set.*

*User should not turnoff or reboot the system during this process which will affect the settings and user will not be able to access the system.*

*Note: Incase if webpage is not accessible or IP address is not set properly then user can go to command prompt and enter “ping saaz02” to know the valid address.*

*TBD: SNAPSHOT*

#### 4.1.1 Connect via a Switch or a Router

Connect the unit to a network switch or a router as shown In figure 7.



[Figure 18:Connect via a switch or a Router](#)

## 4.2 Dynamic IP Connection

Connecting the network camera via a router

**Step1:** Connect the network camera to a router as shown in Figure 7.

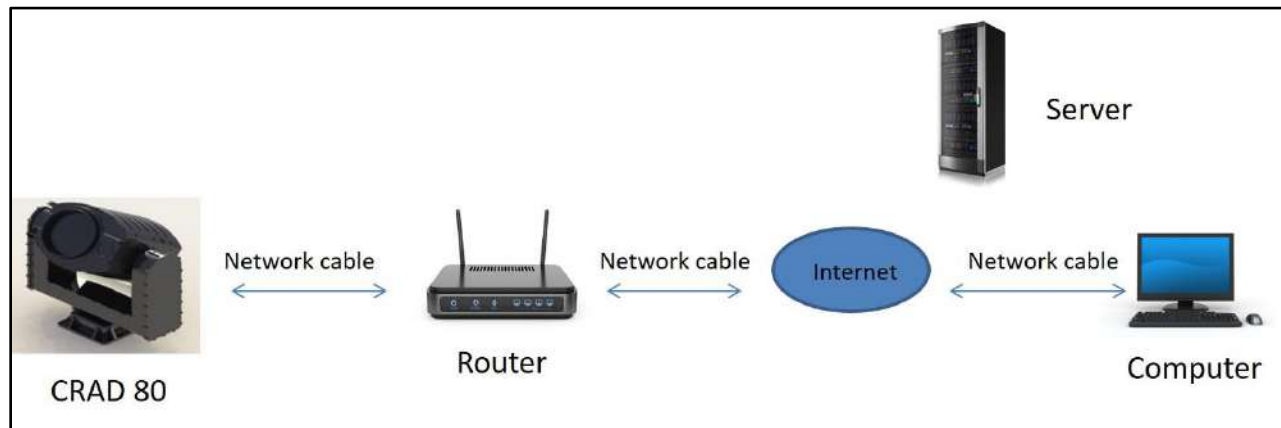
**Step2:** On the camera, assign a LAN IP address, a subnet mask and a Gateway.

**Step3:** On the router, set port forwarding. E.g. 80, 8000 and 554 ports. The steps for port forwarding vary depending on different routers. Please look up the router's user manual for assistance with port forwarding.

**Step4:** Apply a domain name from a domain name provider.

**Step5:** Configure the DDNS settings in the setting interface of the router.

**Step6:** Visit the camera via the domain name.



[Figure 19:Connect the network camera via a router using dynamic IP](#)

## 5 Communication with CRAD80

Communication with the CRAD-80 can be accomplished with Ethernet interface. CRAD-80 Supports Onvif s using client GUI and Custom command interface through the webpage. CRAD-80 is fully configurable with the webpage and partially with Onvif client GUI because of limitations in Onvif s profile.

### 5.1 ONVIF

~~ONVIF stands for Open Network Video Interface Forum. It's an open industry standard that provides interoperability among IP security devices such as security cameras, video recorders, software, and access control systems. They have created several categories for compliance to make it easier for companies to create products that are compatible with other manufacturers. By using the same protocol, every IP security device can receive the same commands to execute some instruction such as initiate a high-resolution video streaming, record the footage or move a PTZ (Pan Tilt Zoom) camera.~~

### 5.2 The ONVIF profiles

CRAD80 is compliant to the Profile-S as specified by ONVIF. Profile-S is the most basic profile used by IP devices such as IP cameras and NVRs, it supports the request and control of video streaming, audio, metadata, relay outputs and PTZ (Pan, Tilt, and Zoom) control over IP networks.

S No	Features	Support
1	System Settings	Yes
2	User Authentication	Yes
3	User Handling	Yes
4	Query Services and Capabilities	Yes
5	Device Discovery	Yes
6	Network Configuration	Yes
7	IP Address Filtering	Yes
8	NTP	Yes
9	Automatic IP Assignment	Yes
10	Media Profile Configuration	Yes
11	Media Transport	Yes
12	Video Streaming	Yes
13	Video Encoder Configuration	Yes
14	Video Source Configuration	Yes
15	PTZ Motion Continuous/Absolute	Yes
16	Presets Support	Yes
17	PTZ – Home Position	Yes

[Table 17: CRAD-80 ONVIF Compliance Matrix](#)

## Device Discovery:

Device discovery is a network setting that affects whether your computer can see/find other devices on the network and whether other devices on the network can see your computer. In case of 'camera discovery' these devices are cameras. So if we talk about 'camera discovery', we mean the process where the computer is looking for cameras connected to the network. As a result of the process, your computer (more specifically a device discovery application installed on your computer) automatically scans and discovers all of your network cameras and dynamically maps logical connections.

As it was mentioned above, device discovery that can be implemented by using WS-Discovery. WS-Discovery – that is Web Services Dynamic Discovery – is a technical specification that defines a multicast discovery protocol to locate services on a local network. The communication between nodes is done by using Web Services standards, notably SOAP-over-UDP.

The WS-Discovery standard introduces a specific discovery behaviour suitable for e.g. video surveillance purposes. For instance, a fully interoperable discovery requires a well-defined service definition and a service searching criteria. The specification covers device type and scopes definitions in order to achieve this.

A successful discovery provides the device service address. Once a client has the device service address it can receive detailed device information through the device service.

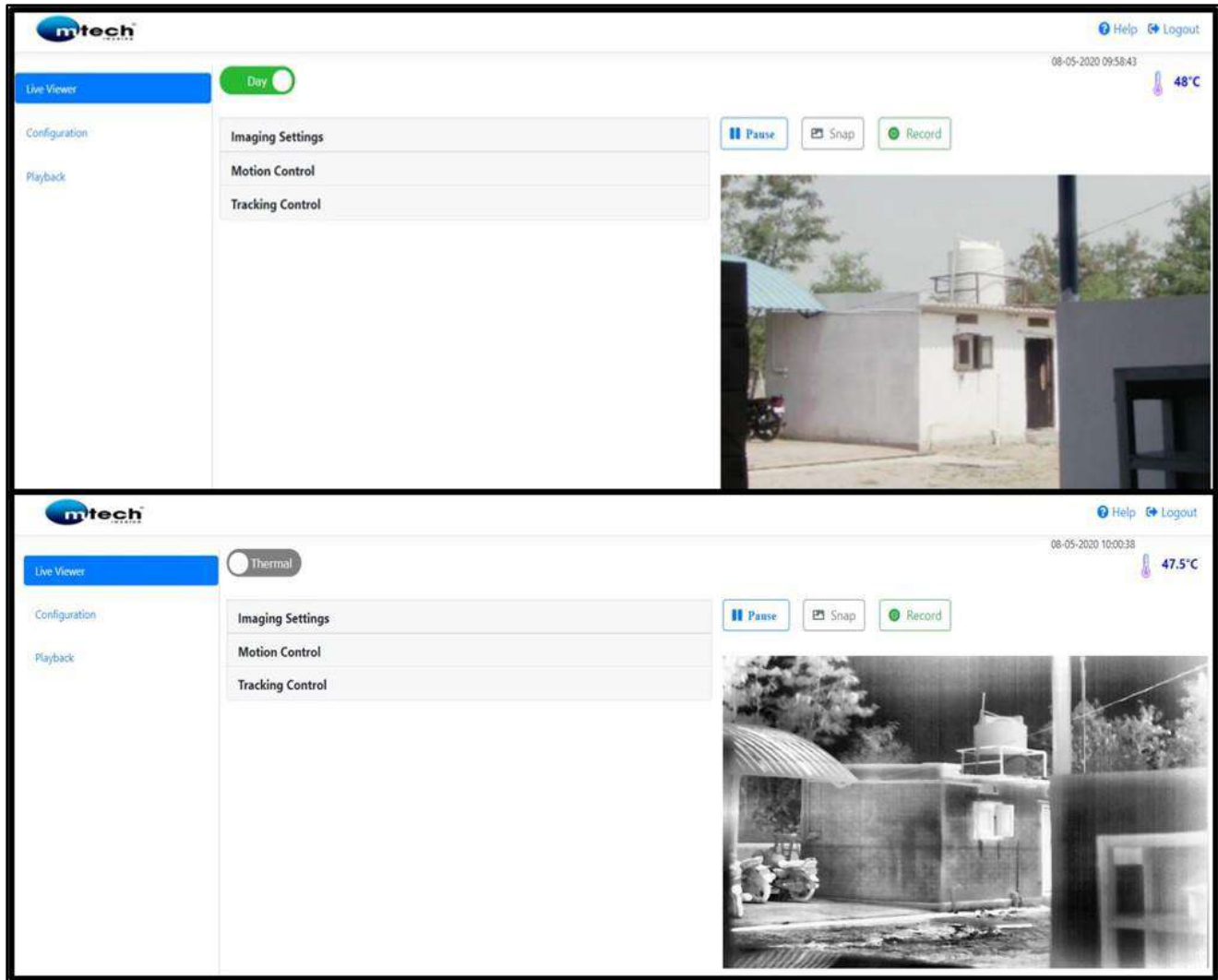
In addition to the standard web services discovery protocol, the ONVIF specification supports remote discovery proxies to find registered devices through the remote discovery proxy even if the client and the device reside in different administrative network domains.

## 5.3 Configuration, Admin Rights and User controls

**Why this empty ??**

## 6 GUI Features and Web Interface

CRAD-80 Can be controlled and configured through Onvif client GUI or webpage.



[Figure 20: WebpageControls](#)

Figure15 shows the Web page with Thermal and Day imager. User can stream/record the video in MP4 format. User can capture images by clicking the snap button.

Web interface accomplishes the configuration and control of Thermal Imager/Day Imager/Positioner.

## 6.1 Accessing web page

The recommended browsers to access the webpage are Internet Explorer and Google Chrome. Following steps are required to access the system

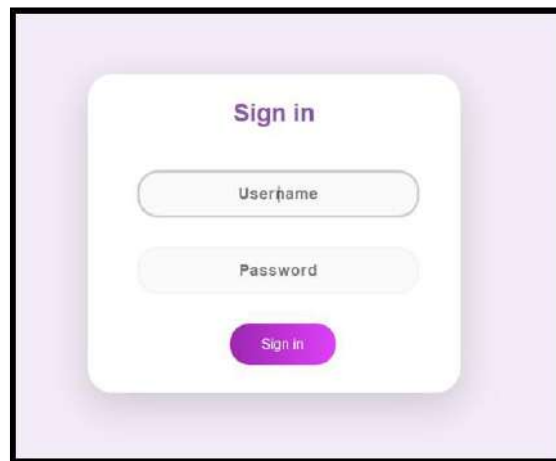
### Step 1:

Enter Camera IP Address in the address bar of the browser.

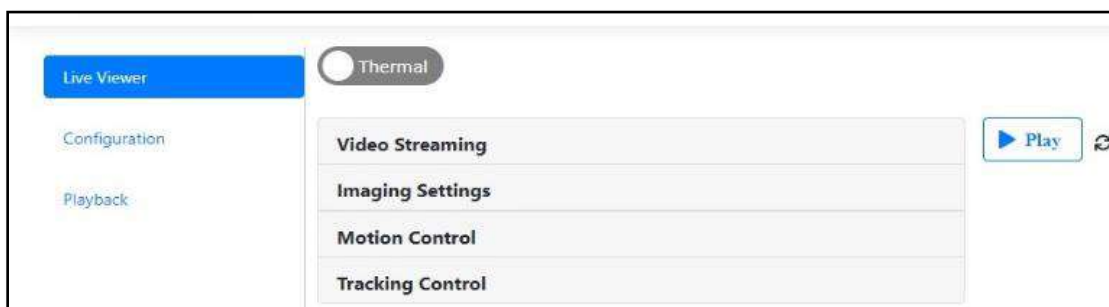
***E.g.: 111:93:22:10:5049***

### Step 3:

Provide Username and Password to start accessing the webpage



[Figure 21 Login page](#)



[Figure 22 Control page](#)

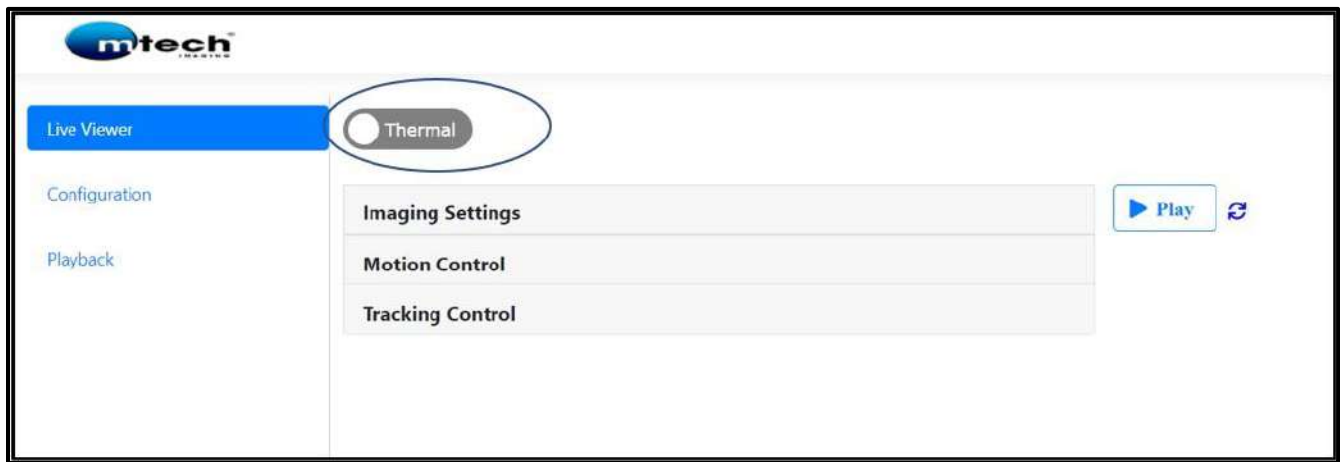
## 6.2 Configuration and Control Page

The System Control Page provides to access three main TABS as shown below

- Live Viewer
- Configuration
- Playback

## 6.3 Live Viewer

Live Viewer section can be accessed to stream the video out and the user can select between Day Camera and Thermal Camera using slider shown below



[Figure 23 Camera Control toggle switch](#)

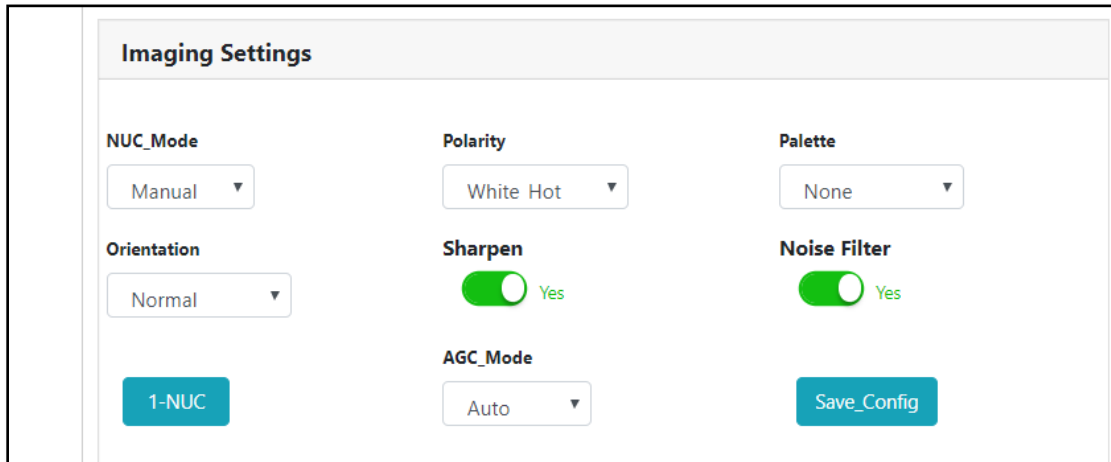
User can view the day camera video or thermal video by clicking on the Play Button as shown in the Figure18.

Live Viewer Mainly contains the three Sub Sections

- Image Settings
- Motion control
- Tracker Control

### 6.3.1 Image Settings

#### 6.3.1.1 Thermal Imager Settings:



The image shows a software interface titled "Imaging Settings". It contains several configuration options:

- NUC\_Mode:** A dropdown menu currently set to "Manual". Below it is a blue button labeled "1-NUC".
- Polarity:** A dropdown menu currently set to "White Hot".
- Palette:** A dropdown menu currently set to "None".
- Orientation:** A dropdown menu currently set to "Normal".
- Sharpen:** A toggle switch that is turned on, with the word "Yes" next to it.
- Noise Filter:** A toggle switch that is turned on, with the word "Yes" next to it.
- AGC\_Mode:** A dropdown menu currently set to "Auto".
- A blue button labeled "Save\_Config" is located at the bottom right.

[Figure 24:Image Settings Option](#)

**NUC mode:** Various NUC modes can be selected from the dropdown in the below picture.

**Manual NUC:** In this mode, the shutter is used as a reference to correct NU lines.

**Auto mode:** In this mode, NUC can be done automatically using shutter thus eliminates user to press 1-NUC button. Auto NUC can be configured based on FPA temperature variation & time interval.

**External NUC:** In this mode, external scene reference is considered for correction.

#### **Polarity :**

By Using the Dropdown User can select White-Hot/Black-Hot in Polarity Tab.



[Figure 25:Black/White Hot Images](#)



**Palette:**

User can select different colour pallets as shown in the following figures

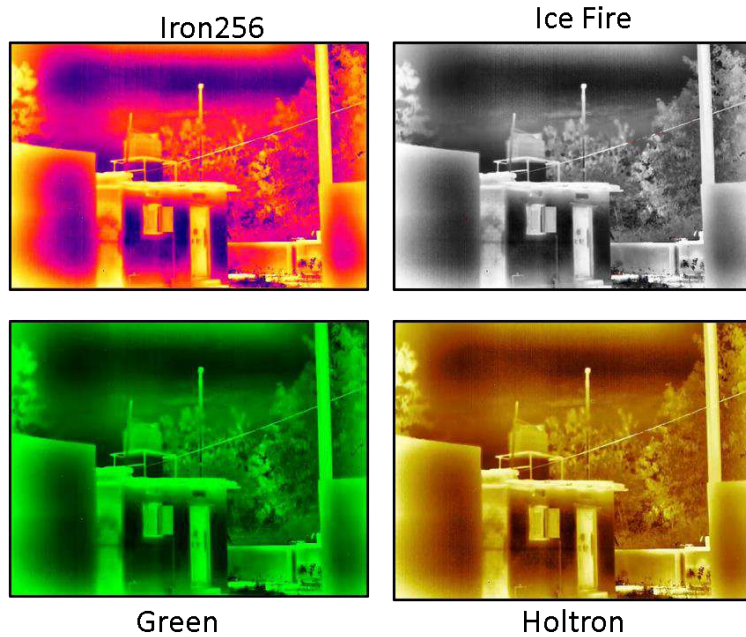


Figure 26: Color Pallets options

**Sharpen:** User can enable the Sharpen Filter to enhance the edges if required and it is always recommended to keep this option ON along with Noise Filter.



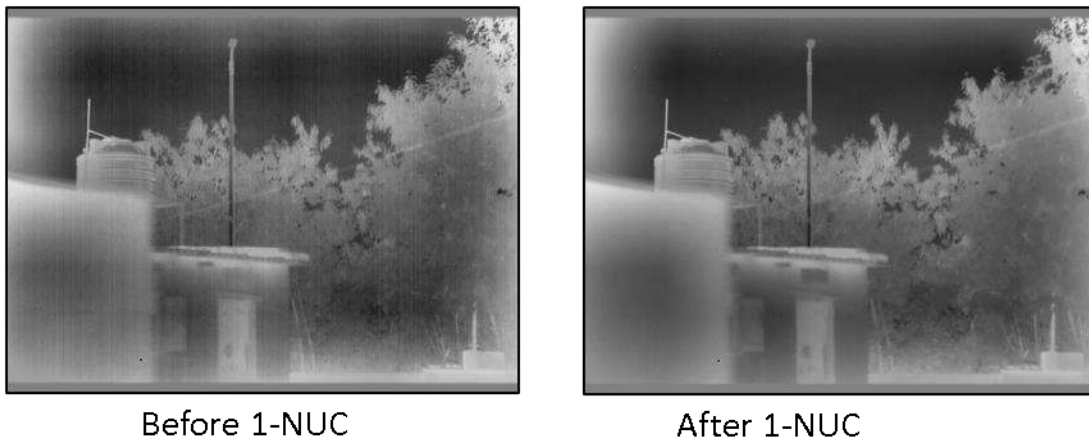
Figure 27:Sharpen Enable image

**Noise Filter:**



[Figure 28:Noise Filter comparison](#)

User should often do the NUC correction by clicking on the **1-NUC** button.



[Figure 29: 1-NUC](#)

**AGC mode:**

Automatic gain control (AGC) algorithm uses an Adaptive Histogram equalization method to Enhance the dynamic range of the image.

#### 6.3.1.2 DAY Imager Settings:

##### **BLC\_Mode:**

BLC allows the camera to adjust the exposure of the entire image to properly expose the subject in the foreground. User can change the level to adjust the brightness of the monitoring area. By using the Slider User can set the BLC\_Level from min to max.

##### **Orientation:**

User can change the orientation of the image like NORMAL, INVERT, REVERT, and REVERT\_INVERT. By default, it is in Normal mode.

##### **WDR (Wide Dynamic Range):**

Wide-D image processing technology gives the ability to see clear, detailed images in high-contrast or backlit environments.

WDR\_Level: Adjusts the intensity of backlight compensation.

- Noise may Exist between the dark area and bright area in the WDR mode
- In WDR mode, noise may occur in the motion area

##### **IR Correction:**

To change the IR Mode in Imager User need to click on IR\_Correction option.

##### **White balance:**

User can enable the white balance option. By default, it is set to Auto Mode

##### **EXP Comp:**

Exposure Compensation allows Imager to override exposure settings picked by camera's light meter, to darken or brighten images before they are captured.

##### **Auto ICR:**

In low-light conditions, the camera automatically switches from Day to Night mode, removing the IR-cut filter to boost sensitivity for clear pictures in near-darkness. The spherical privacy zone masking feature enables areas of view to be selectively masked for privacy.

**ICR (Infrared Cut Removal):**

ICR is a filter that sits between the lens and the image sensor (CCD or CMOS) of a security camera and is used to filter the excess of light that comes through the camera lenses. This filter helps the camera to produce good-quality images with accurate colour.

**High-Resolution mode:**

The High-Resolution mode uses the camera's electronic shutter to avoid the internal vibrations that might occur if eight images were recorded in quick succession using a mechanical shutter. This ensures the camera remains still so the maximum detail can be taken from the scene.

**Noise Reduction:**

The Noise Reduction Filter is an excellent means of eliminating unwanted noise in photos that were taken at a high ISO, because you have control over the luminance and colour noise, also you can address the noise issues on a per-channel basis.

**Stabilizer:**

Image Stabilization is a method to reduce the likelihood of taking blurry photos by moving the camera lens automatically to compensate for camera movement which can be induced by System Rotation or vibration.

**High Sensitivity:**

High-sensitivity image processing cameras are essential for achieving a quality video image with low image noise even in poor lighting conditions. User can enable and adjust the settings on the web page.

**Defog:**

The de-fog feature allows clearer and natural viewing in foggy or misty scenes. When this feature is activated, the camera detects the haze level and automatically applies the required effects.

**Note:** After Setting all parameters User Need to click on the Save\_config Button to Save the Updated Parameters.

#### 6.3.1.3 Snap & Recording

User can capture the snap and record the video based on the configuration settings. User can go to the **playback** tab and select the imager to download the snap and video recorded.

The user at Admin level can set the time for recording as 30Secs, 60Secs and 90secs in configuration TAB.



[Figure 30:Recording Section](#)

### 6.3.2 Motion Control Tab

User can control the positioner and Lens using the options shown in Figure 25.

Figure 31: Motion Control Tab

#### 6.3.2.1 Lens Control

##### **ZOOM Control:**

User can do continuous(or step) Zoom In/Out using the option shown and the corresponding FOV is updated.

**Note:** Speed Slider defines the speed and value 3 corresponds to Continuous operation

##### **FOCUS Control:**

Continuous far/Near focus can be adjusted using Focus+/Focus- and the user can enable Autofocus to set the focus automatically.

**Note:** Only centre 256x256 array is considered for focusing on the thermal imager. If there is no sharp object in that area then Autofocus output will be not correct.

##### **FOV:**

User can set predefined Field on views using the dropdown menu provided. Thermal Imager has 16 FOV settings and Day Imager has 30 FOV settings.

- Min FOV in thermal Imager corresponds to 25mm and Max FOV corresponds to 225mm
- Min FOV in Day Imager corresponds to 6mm and Max FOV corresponds to 180mm

#### 6.3.2.2 PT CONTROL

PAN/TILT control can be done in continuous and absolute mode.

##### **Continuous Mode:**

User can Pan(Azimuth) and Tilt(Elevation) using the option provided in the webpage and the user can also set the speed using the sliders provide for both Azimuth and Elevation.

If the user clicks on double arrow then it will start to PAN continuously until a stop command is received.

**NOTE:** It is Mandatory to send the stop command before sending any other command after setting the PT in continuous motion.

## ABSOLUTE MODE:

In this section User can Go Commanded positions of Azimuth and Elevation angles with Desired speed.

**Azimuth:** Pan commanded angle will be set In this section.

**Elevation:** Tilt commanded angle will be set In this section

**E-Direction:** This section will set the tilt direction (UP/DOWN) in absolute mode.

**Zoom:** Zoom level will be set by using this slider.

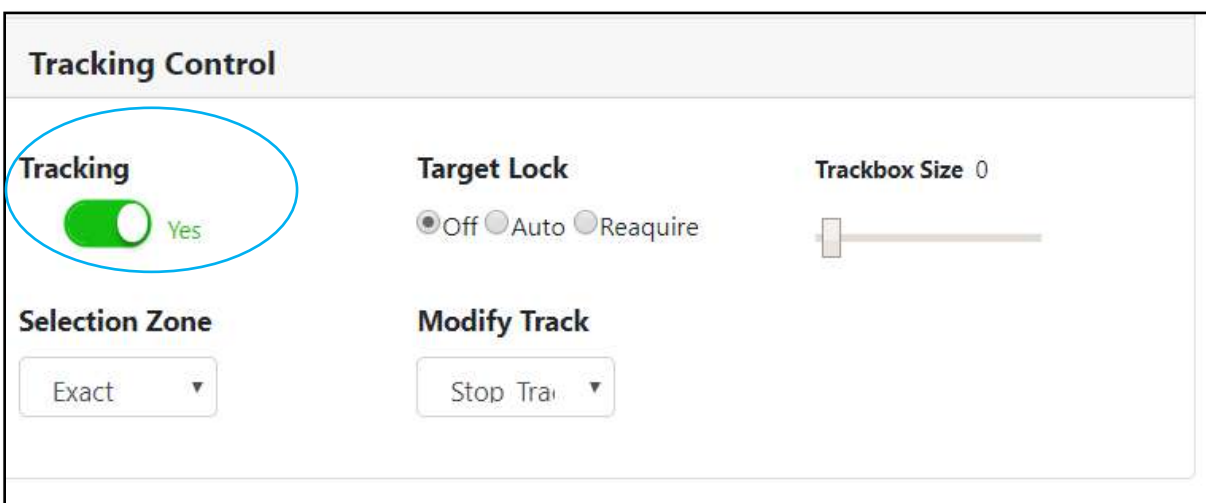
After updating Azimuth,Elevation and Zoom values user need to click on SET button.

**Preset:**

### 6.3.3 Tracker Control

The CRAD-80 Imager can detect movement in the field of view, for example a moving vehicle or person. If Tracking is enabled, the Imager will automatically pan and tilt to follow the moving object. In case there is much simultaneous movement, the area with the most movement will be followed. Tracking continues until the moving object stops or disappears from the monitored area.

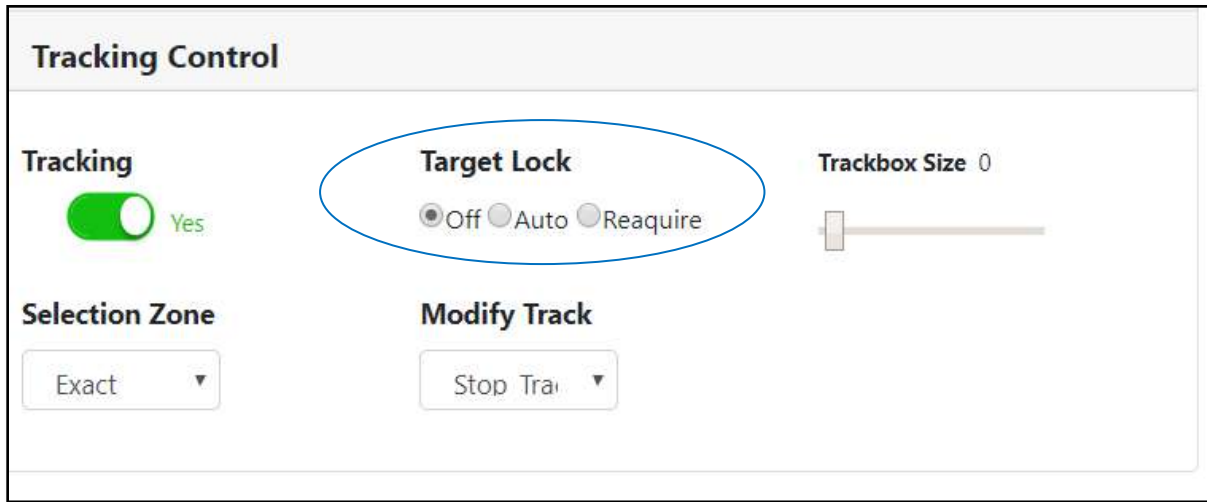
**Tracker:** This Toggle button will Enable the Tracker functionality.



[Figure 32:Tracker](#)



**Target Lock:** Target Lock is used to adjust the optimal Track box size.



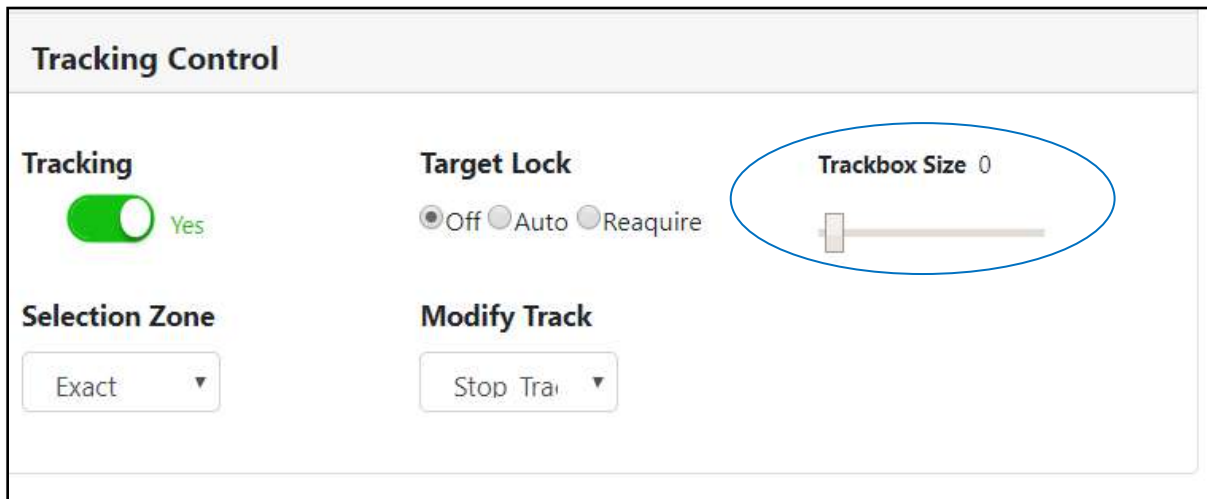
[Figure 33 Target Lock](#)

**OFF:**By this mode user can off Acquisition Assist and Intelligent Assist both at a time.

**Auto:**By using this auto option user can enable the Acquisition Assist and Intelligent Assist. Acquisition Assist is designed to help users select an optimal size and location for track boxes.

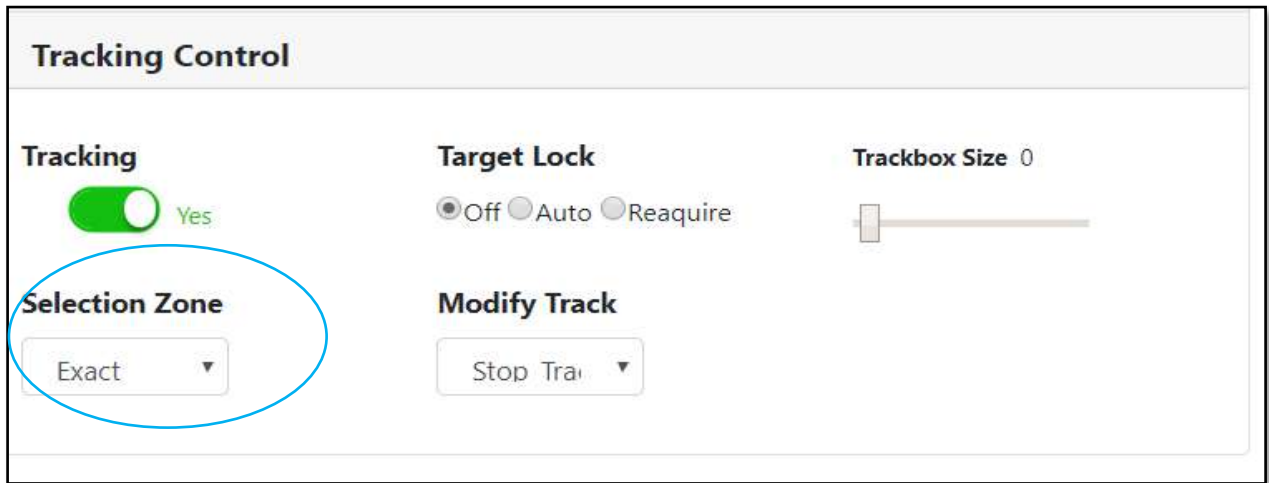
**Reaquire:**Reintilizes the tracker box.

**TrackerBox size:** User can Adjust Tracker Box size Manually.



[Figure 34: Tracker Box size](#)

**Selection Zone:** Defining the Radius of Engagement used with modify tracking modes This is the area around an existing target that interactions can takes place.

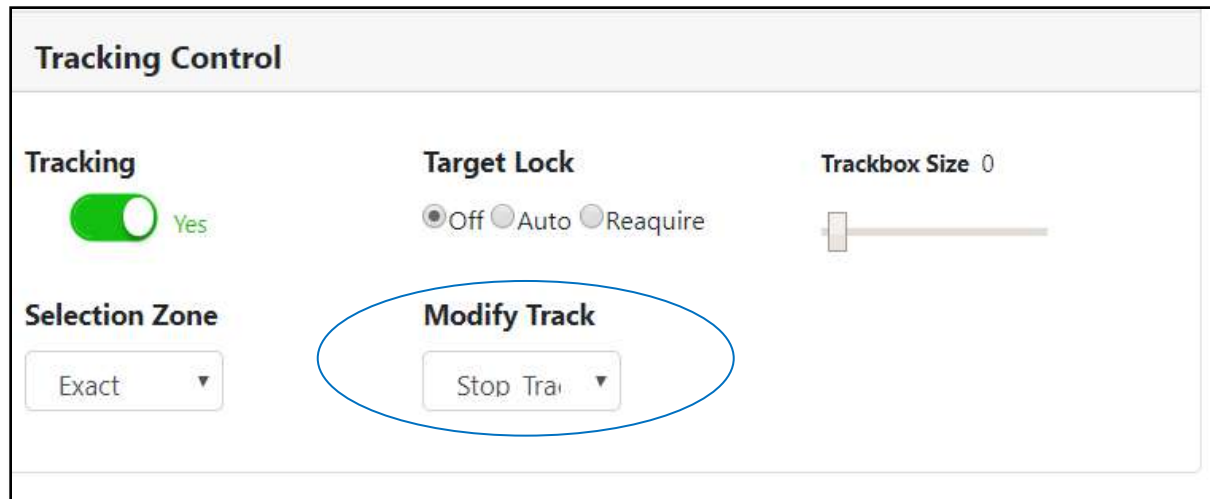


The image shows a 'Tracking Control' panel with several settings. The 'Tracking' toggle is turned on (green). The 'Target Lock' section has three radio buttons: 'Off' (selected), 'Auto', and 'Require'. The 'Trackbox Size' is set to 0. The 'Selection Zone' dropdown menu is highlighted with a blue circle and shows 'Exact' as the selected option. The 'Modify Track' section has a 'Stop Tra' dropdown menu.

Tracking Control		
<b>Tracking</b> <input checked="" type="checkbox"/> Yes	<b>Target Lock</b> <input checked="" type="radio"/> Off <input type="radio"/> Auto <input type="radio"/> Require	<b>Trackbox Size</b> 0 <input type="range"/>
<b>Selection Zone</b> Exact ▼	<b>Modify Track</b> Stop Tra ▼	

[Figure 35 :Selection zone](#)

**Modify Track:** Assigns the Track Box as primary or secondary.

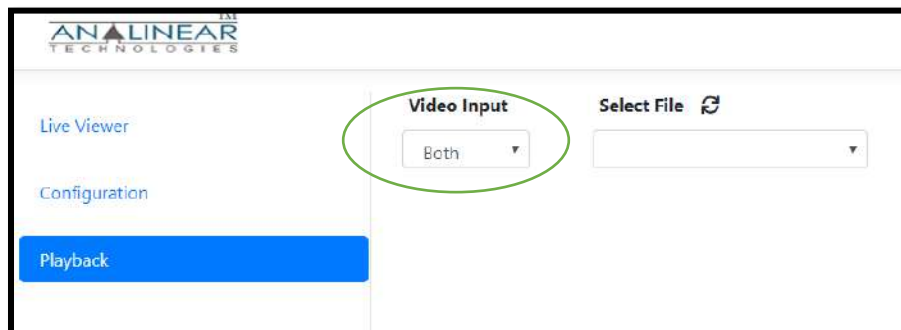


[Figure 36: Modify Track](#)

## 6.4 Play Back

This Section explains how to view and Download the recorded video files. It contains two (2) sub-sections, they are Video Input & Select Files.

**Video Input:**

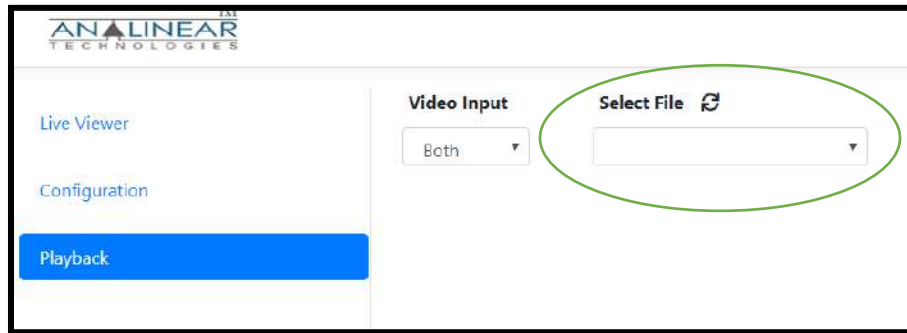


[Figure 37 Video Input section](#)

In this Tab user can select Thermal imager videos or Day Imager Videos by Using the Dropdown Button.

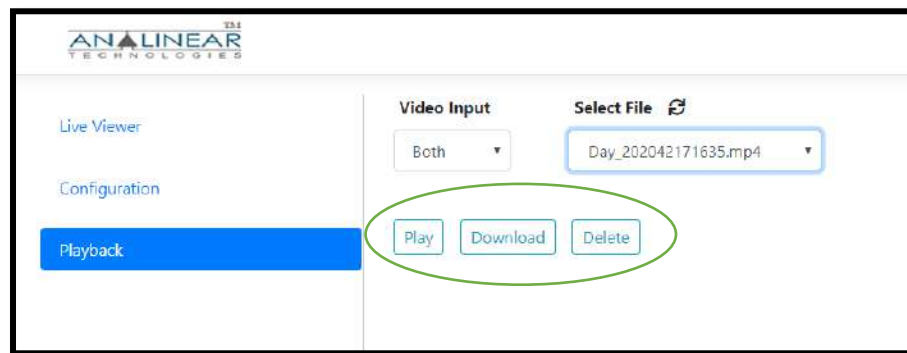
By clicking on dropdown button under the Video Input, it shows Three (3) options, they are thermal, day and both. So user can select any one option files will update in the select file section.

## Select Files:



[Figure 38: Video File Selection](#)

In this Section User can select video files. This Select File contains refresh button and a dropdown button, by clicking on refresh button files will be update. By clicking on dropdown button user can select video files in mp4 format.



[Figure 39: Video section](#)

This Tab contains three Buttons Play, Download, Delete.

**Play:** By clicking the Play Button video will play.

**Download:** By Clicking the Download Button User Can Download Current Playing Video into Local Storage.

When user clicking on the download button, need to give filename and storage location then click on Save and file will be saved.

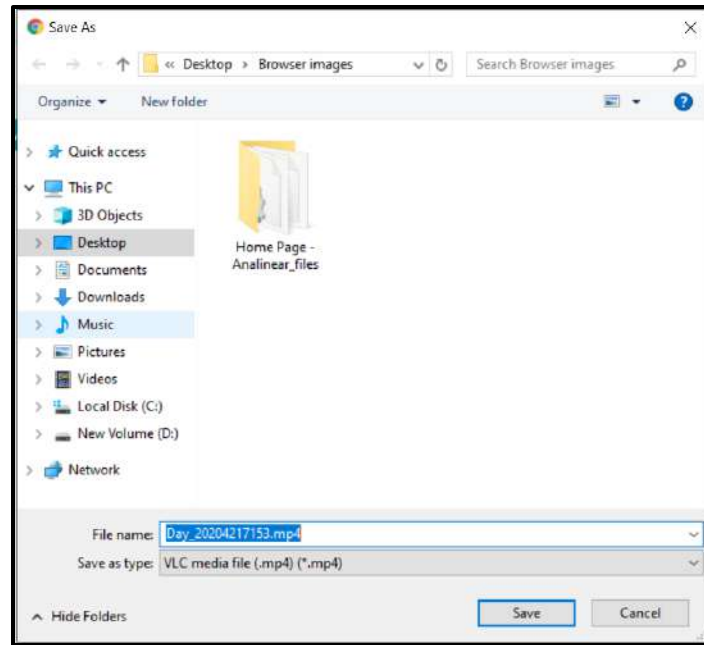


Figure 40:Storage Location

**Delete:** By Clicking the Delete Button User Can delete Current Playing Video.

## 6.5 Firmware Update

## 7 PTZ Operations

The PTZ model groups the possible movements of the PTZ unit into a Pan/Tilt component and into a Zoom component. To steer the PTZ unit, the service provides absolute move and continuous move operations. Different coordinate systems and units are used to feed these operations. The PTZ service provides an Absolute Move operation to move the PTZ device to an absolute position. The service expects the absolute position as an argument referencing an absolute coordinate system. The speed of the Pan/Tilt movement and the Zoom movement can be specified optionally. Speed values are positive scalars and do not contain any directional information. It is not possible to specify speeds for Pan and Tilt separately without knowledge about the current position.

### 7.1 Continuous move

A PTZ-capable device shall support continuous movements. The velocity argument of this command specifies a signed speed value for the Pan, Tilt and Zoom. The combined Pan/Tilt element is optional and the Zoom element itself is optional. If the Pan/Tilt element is omitted, the current Pan/Tilt movement shall NOT be affected by this command. The same holds for the Zoom element.

A device MAY support continuous Pan/Tilt movements and/or continuous Zoom movements by providing only velocity spaces for the supported cases. A device shall stop movement in a particular axis (Pan, Tilt, or Zoom) when zero is sent as the Continuous Move parameter for that axis. Stopping shall have the same effect independent of the velocity space referenced. This command has the same effect on a continuous move as the stop command.

**Left & Right** – the left and right side are considered from the perspective of a camera. With a camera mounted toward the front, an observed video image would be providing the perspective: to “Pan Left”, you would move the positioner Counter Clock Wise (CCW) as viewed from the top. Moving to the right or CW increments the degree heading while moving to the left or CCW will decrement the heading in degrees.

**Up & Down** – moving upward means the table top is moving toward the rear of the unit and the indicated position would increment as the elevation increases. Moving downward would decrement the position in degrees.

### 7.2 Absolute Position

Absolute Move means Moving PTZ to predefined position with respect to the Home. The position argument of this command specifies the absolute position to which the PTZ unit moves. It splits into an optional Pan/Tilt element and an optional Zoom element. If the Pan/Tilt position is omitted, the current Pan/Tilt movement shall NOT be affected by this command. The same holds for the zoom position. An existing Speed argument overrides the Default Speed of the corresponding PTZ configuration during movement to the requested position.

## 7.3 Stop

A PTZ-capable device shall support the stop operation. If no stop filter arguments are present, this command stops all ongoing pan, tilt and zoom movements. The stop operation can be filtered to stop a specific movement by setting the corresponding stop argument.

## 7.4 Presets

### 7.4.1 Set preset

**Preset operations** This section describes operations that manage the presets of a PTZ node. These operations shall be implemented for PTZ nodes supporting presets. The Set Preset command saves the current device position parameters so that the device can move to the saved preset position through the Goto Preset operation. If the Preset parameter is absent, the device shall create a new preset. Otherwise it shall update the stored position and optionally the name of the given preset. If creation is successful, the response contains the Preset number which uniquely identifies the preset.

An existing preset can be overwritten by specifying the Preset Number of the corresponding preset. The set preset command is a non-blocking operation and can be interrupted by other move commands.

### 7.4.2 GotoPreset:

The GotoPreset operation recalls a previously set preset. If the speed parameter is omitted, the default speed of the corresponding PTZ configuration shall be used. The speed parameter can only be specified when speed spaces are available for the PTZ node.

The GotoPreset command is a non-blocking operation and can be interrupted by other move commands.

### 7.4.3 Remove Preset

The Remove Preset operation removes a previously set preset

## 7.5 Home Position operations

This section describes operations used to manage the home position of a PTZ node. These operations shall be implemented for PTZ nodes supporting home positions. The “home” position MAY be set by the SetHome operation or is a fix position of the PTZ unit.

### 7.5.1 SetHomePosition

The SetHome operation saves the current position parameters as the home position, so that the GotoHome operation can request that the device move to the home position. The SetHomePosition command shall return with a failure if the “home” position is fixed and cannot be overwritten. If the SetHomePosition is successful, it shall be possible to recall the home position with the GotoHomePosition command.

### 7.5.2 GotoHomePosition:

This operation moves the PTZ unit to its home position. If the speed parameter is omitted, the default speed of the corresponding PTZ configuration shall be used. The speed parameter can only be specified when speed spaces are available for the PTZ node. The command is nonblocking and can be interrupted by other move commands.

## 7.6 Limits

Elevation range of motion may be limited by electronically. “Soft Limits” are software settable, and are primary method used to limit motion. The P&T units are shipped with the soft limits set at the maximum range of motion, although the range of motion may be limited by using the included software. the user should not set a preset position on a soft limit.

### **Factory:**

Factory Limits allow maximum range of the tilt movement.

**User Programmable Limits:** User limits are programmable limits that are smaller than Factory Limits. The CRAD-80 uses high-precision Hall sensors that allow faster reset sequences and user-programmable ranges. It is possible to set these stops to allow overlapping limits.



## 8 Maintenance And Service Instructions

### **Routine Maintenance**

Inspect the unit on a regular basis to assure the early detection and correction of any minor problem before it becomes a major problem causing downtime. The recommended inspection interval is dependent on the unit's location, severe weather conditions, or heavy use.

The following is a guideline to help establish a planned inspection program for this equipment. The user of this equipment should make the final determination on the inspection intervals.

### **Fresh Water Wash**

The exterior of the Pan & Tilt Unit should be sprayed down every 6 months to reduce damage due to salt spray and/or weather conditions.

### **Inspection Intervals (6 Months)**

Inspect the pan/tilt unit every six months to ensure trouble-free operation and an extended product life. Harsh environments and/or continuous motion applications may require more frequent maintenance.

The following are the recommended inspection intervals for this equipment:

#### **TYPE OF USE INSPECTION INTERVAL**

Intermittent

Heavy User defined

Severe conditions

### **Lubrication Interior Inspection:**

#### **Cleanliness**

Inspect the interior for foreign material/debris such as dust, dirt, or chips. These items can act as an abrasive in the gear lubricant and reduce gear life. Make sure to remove all foreign material. Clean the gears if necessary and reapply gear lubricant.

#### **Worm/Helical Gear & Lubrication**

Visually inspect the gears for worn teeth, poor alignment, and chips. Clean and lubricate the worms and worm gears every time the unit is opened (at least every 6 months). Synthetic Molybdenum Disulphide Grease is recommended.

#### **Cover Seals**

Replace if missing or damaged. Cover O-Ring seals should be inspected every 6 months and replaced if needed. Lubricate the O-Rings with O-Ring lubricant prior to reattaching an access cover.

#### **Bearings**

Ball bearings are sealed and lubricated for life. The two angular contact bearings in the worm carriers should be lubricated with Synthetic Molybdenum Disulphide Grease is recommended.

**Motors**

Motors are lubricated for their design life and require no added lubricant.

## 8.1 Exterior Inspection and Maintenance

**Finish**

Inspect the exterior finish for signs of damage or wear. Touch up damage if necessary.

**Covers**

Make sure the access covers are properly secured (i.e., all the bolts are in place and tightened, the cover seals are intact and not worn or damaged, etc.)

**Wiring**

Examine the interior wires for signs of cracked insulation, frayed or pinched wires and loose connections. If any of these things exist, repair them immediately.

**Mounting**

Check to make sure all of the mounting bolts are secure. If any of them appear loose, tighten immediately.

**Other hardware**

Check to make sure that none of the exterior hardware is loose. If anything appears loose, tighten it using the appropriate tool.

## 8.2 Interior Inspection and Maintenance

**Wiring**

Examine the interior wires for signs of cracked insulation, frayed or pinched wires and loose connections. If any of these things exist, repair them immediately.

**Loose hardware**

Check to make sure that none of the interior hardware is loose. If anything appears loose, tighten it using the appropriate tool.

**Cleanliness**

Inspect the interior for foreign material/debris such as dust, dirt, or chips. These items can act as an abrasive in the gear lubricant and reduce gear life. Make sure to remove all foreign material. Clean the gears if necessary and reapply gear lubricant.

**Gear lubrication**

Visually check the gears for worn teeth, poor alignment and chips. Lubricate the worm gears every time the unit is opened. Re-grease the gears with a low temperature grease. Use a small brush to apply the grease to the worm gear. Rotate the worm Shaft manually. As the gear is turned, apply grease to all teeth on the worm gear.

### Cover Seals

Replace if missing or damaged. Cover O-Ring seals should be inspected every 6 months and replaced if needed. Lubricate the O-Rings with O-Ring lubricant prior to reattaching an access cover.

### Bearings

Ball bearings are sealed and lubricated for life. The two angular contact bearings in the worm carriers should be lubricated with Synthetic Molybdenum Disulphide Grease is recommended

## 8.3 User Information Guide

### General information

- Unpack new timing belts immediately. Store flat on their side, in a coiled circular shape at room temperature in a dry place.
- Timing belts must not be kinked.
- The pitch of timing belt and mating pulley teeth must be the same.
- Store linear drives in a clean dry environment.

## 8.4 Replacing tilt timing belt

- Make sure all power is off to the unit.
- Remove nineteen screws remove the side cover.
- Remove the Idler bracket with four screws.
- Remove the six screws remove motor bracket with belt.
- Remove the old timing belt from the motor.
- Replace the new timing belt.
- Re-tighten the all screws.

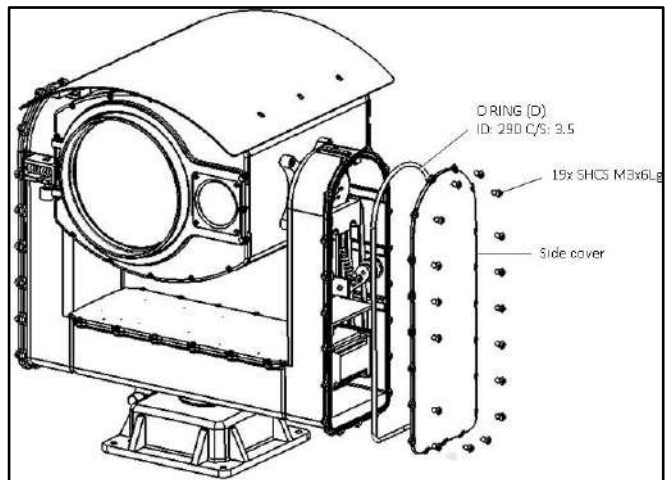
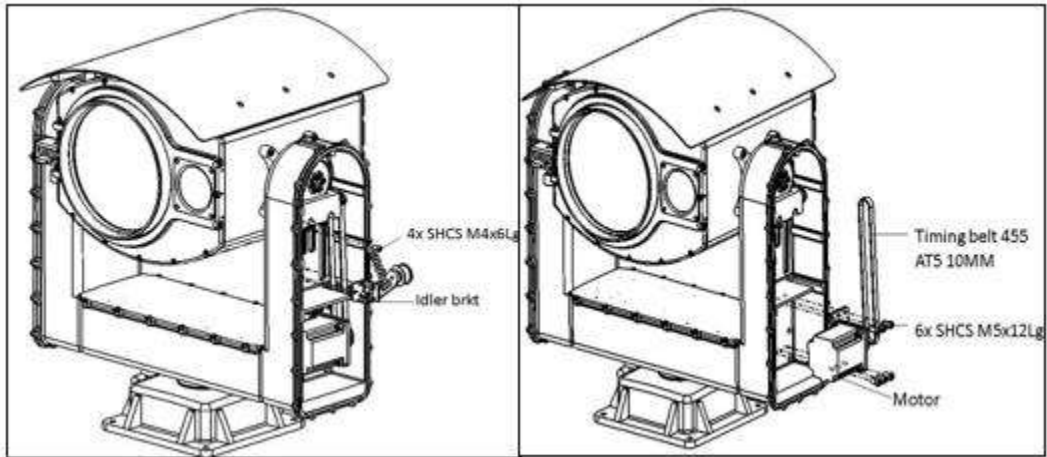


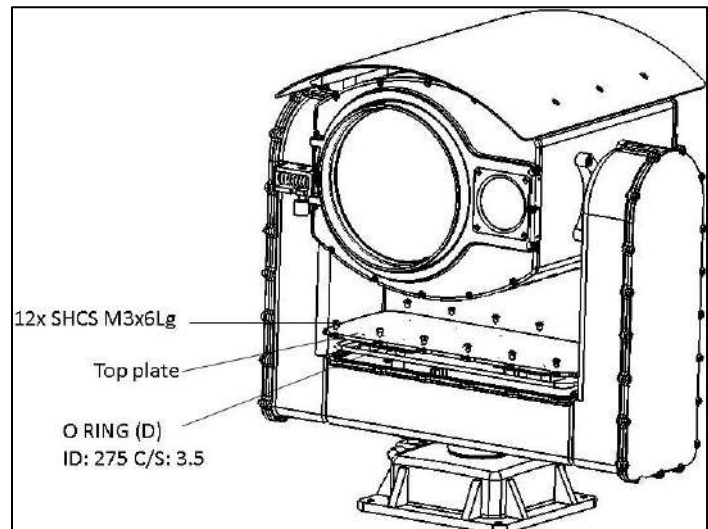
Figure 41: Removing side plates



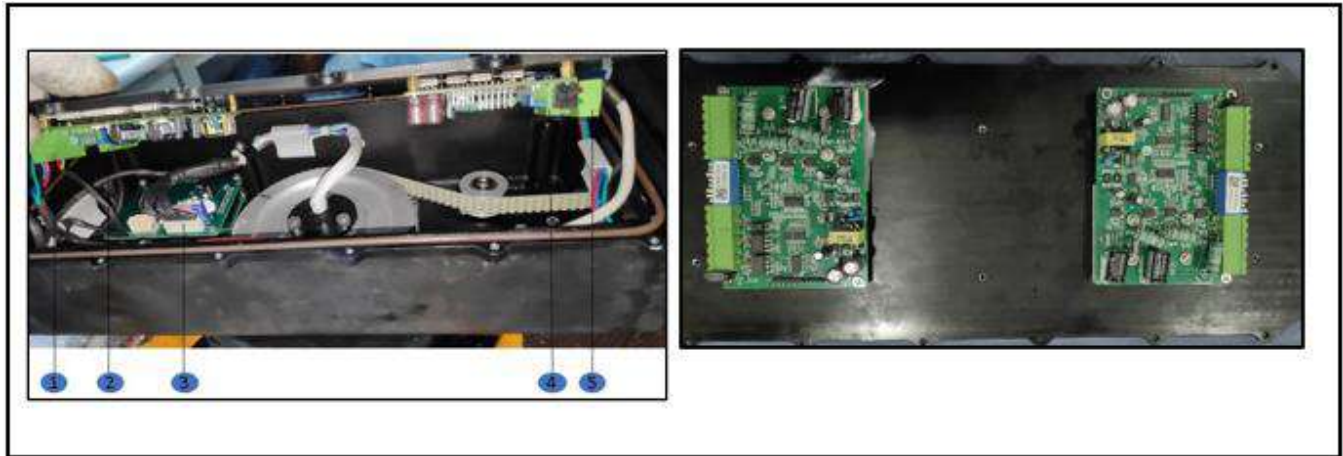
[Figure 42:Removing Idler & Belt](#)

### 8.5 Replacing pan timing belt

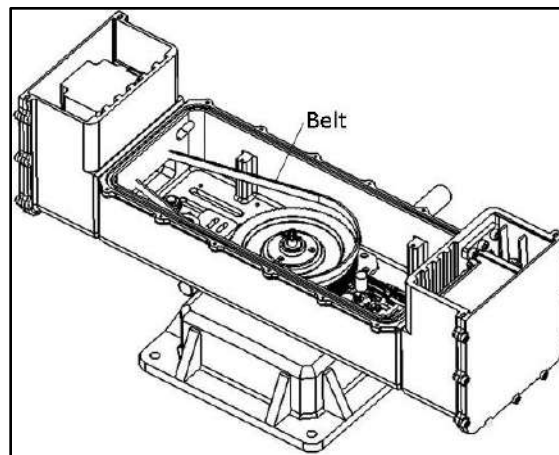
- Make sure all power is off to the unit.
- Remove twelve screws for the top cover.
- Unplug the five connectors of top cover PCB.
- 1 & 2 are Tilt Connectors and 4 & 5 are Pan Connectors (see figure 76).
- 3 is Slipring Connector (see figure 76).
- Remove the top cover.
- Remove the timing belt from pulleys.
- Replace the new timing belt.
- Re-tighten the all screws.



[Figure 43:Removing Top plate](#)



[Figure 44:Top plate](#)



[Figure 45:Pan Belt](#)

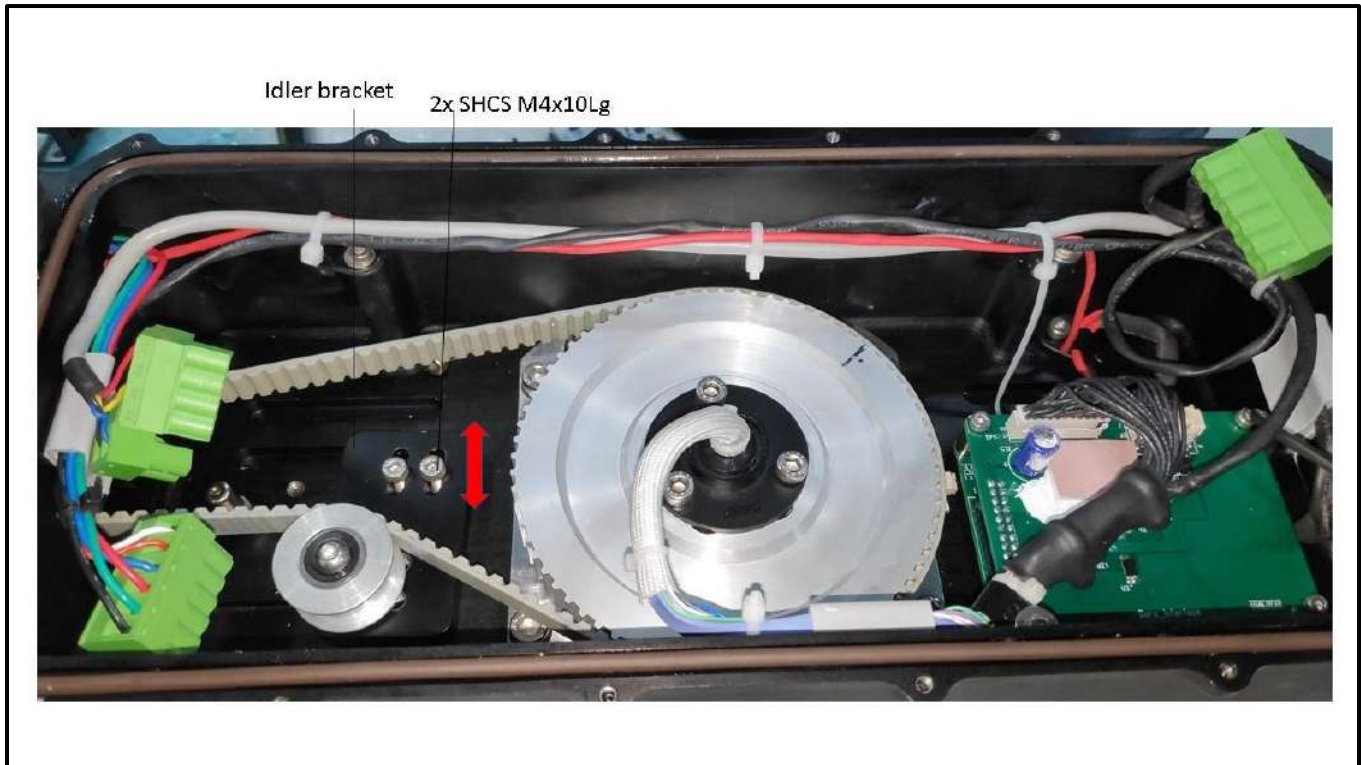
## 8.6 Tensioning timing belt

### 8.6.1 Tensioning pan timing belt

- Make sure all power is off to the unit.
- Remove twelve screws for the top cover.
- Unplug the five connectors of top cover PCB.
- Remove the top cover.
- Next, adjust some tension to timing belt Loosen the two M4 socket head screws approximately 3 turns counter-clockwise on the idler bracket.
- Slide the idler bracket to adjust the tension of the belt.
- Re-tighten the all screws.

**Note:**

A small amount of slack in the belt is acceptable without affecting backlash. If the belt is too tight, it may cause binding and/or excessive belt and bearing wear. Do not apply excess tension to the belt.



[Figure 46:Idler Tensioning](#)

### 8.6.2 Tensioning tilt timing belt

Tilt timing belt have a spring-loaded idler pulley that maintains the proper tension on the belt so no adjustment is needed as the belt wears.

## 8.7 Troubleshooting

A quick visual inspection of the unit might reveal if the problem is mechanical or electrical.

- 1) Remove the Access Covers
- 2) Actuate a movement using the Emulator/GUI software to determine if the Drive Motor is running. If the motor is running, the problem is usually mechanical. If the motor is not running, the problem can be either mechanical or electrical.
- 3) Mechanically uncouple the motor by removing the Drive Belt from the pulley.

**NOTE**

If the motor operates, the problem is usually mechanical (binding Worm Drive Gears, Drive belt tension was too strong, etc.).

**Troubleshooting Guide**

The following table shows some possible issues and the trouble-shooting sequence.

Symptom	Root Issue	Trouble-shooting sequence
Pan and tilt motor will not respond	1. Broken or loose motor wire lead 2. Faulty motor	1. Reconnect wire lead 2. Replace motor
Pan limits fail to work	Damaged or inoperative pan switches	Replace pan switches
Tilt limits fail to work	Damaged or inoperative tilt switches	Replace tilt switches
Pan or tilt limit is not at the correct position	Pan and tilt limits are not set correctly.	Reset the limits
Drive Belt is broken.	Incorrect tension, Misalignment	Remove and replace the broken Drive Belt.

## 9 Video Out

### 9.1 Video Out

### 9.2 Thermal Imager Video Output



