

# Mobile Video Surveillance System



D00 Technologies

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Building G2, PO Box  
293783, Dubai Airport  
Free Zone, Dubai, UAE

+971 (0)4299 3400

+971 (0)4299 3500

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## Introduction

### Company Introduction

DOO Technologies specialize in real time total capture 360 degree video providing equipment and solutions for a variety of environments in Defense, Homeland Security, Public Safety, law Enforcement and the Commercial sector.

- 25 years experience in Advanced Optical Image Processing
- 25 years experience in Camera Systems and Image Capture
- 20 years experience in Aviation Engineering

*“Introducing Defence Industry Technology to Homeland Security and Emergency Services”*

### System Introduction

This document has been designed to describe the configuration and functionalities of the vehicle camera system and the multiple applications the vehicle can be used for.

The camera system is an affordable, robust and highly reliable integrated vehicle video solution that can be tailored to meet you requirements.

Real time video communication from vehicle to vehicle and vehicle to command can be transmitted delivering the unique 360 degree video technology which is independently viewed and navigated by individual operators.



## System Description

### Operations Brief

The vehicle camera system can be utilized in multiple situations ranging from covert operations, recognisance, surveillance and detection where the 360 degree video data can be transmitted to central command as well as recorded.

### Equipment Brief – Vehicles

A vehicle can be configured with short, medium and long range camera systems with both day and night mode and each of the camera systems can be operated and viewed independently by operators within the vehicle using its multifunctional display and control systems.

### Equipment Brief – Base

All video and location data can be accessed in real time remotely using multiple transmission protocols such as Microwave, Satellite, 3G, WIMAX, and WIFI. The full spherical 360 degree video image transmitted from the vehicle can be reordered for future evaluation to discover new information, training and prosecution.

### Advantages

- 360 Degree Real Time situational awareness and analysis
- Assess and determine operational strategies
- Save crucial time in critical decision making situations
- Capture every angle from every direction
- One camera – multiple users – multiple views
- Integrates with data and maps to create superior visual intelligence
- Integrates with PTZ cameras in current operation
- Recorded video in 360 degrees for future evaluation

### Summary

360 degree advantage...

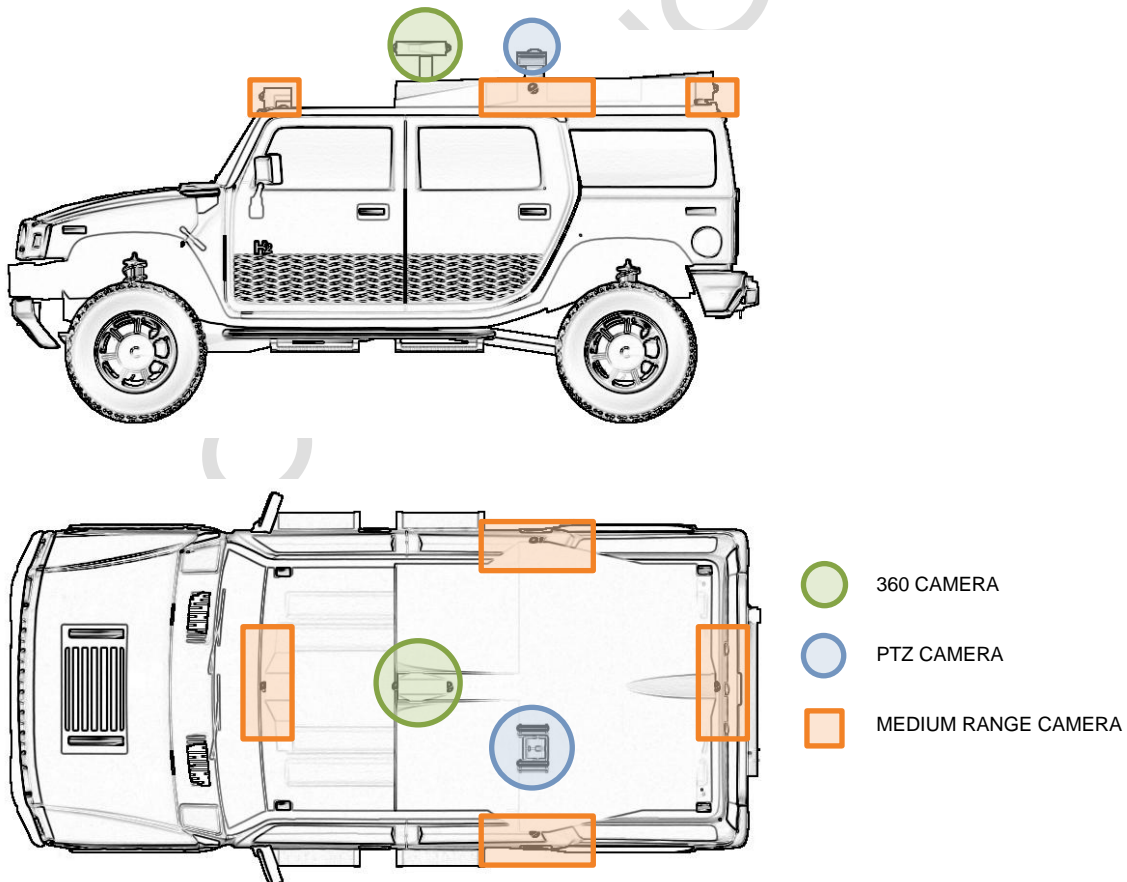
***“Identify threats to ensure the safety of your people, property and assets”***

## Equipment Specifications

### Camera Systems

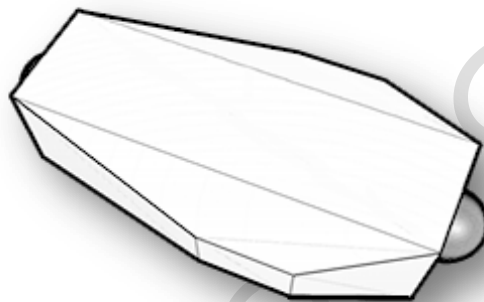
The vehicle is equipped with three individually built-in camera systems. Each system is working in parallel to provide short, medium and long range coverage:

- **Short Range:** 360 Camera Unit for a full spherical surrounding coverage in the short range (0m-50m),
- **Medium Range:** MultiCam Panoramic Unit for a full panoramic surrounding coverage in the medium range (25m-200m),
- **Long Range:** PTZ IR Camera for a Pan Tilt and Zoom capability at high rotation speed, day and night vision with a x36 zoom for the long range (100m-1000m in detection mode).



### 360 Camera Unit

The **DT360-IP6MP** product specified shall be an industrial grade, colour, full-featured, high-speed day/night Dual 3MP megapixel network camera. The system shall provide full 360x180 coverage at short range distance. The product is designed to meet or exceed industrial and surveillance applications requiring a low power, rugged video camera with IP network capability. The camera has a built-in web server and FTP server. It is IEEE 802.3af Power-over-Ethernet ready and can also be powered directly using 12-24 VDC or 24 VAC. The camera will include a NTSC/PAL analogue public view output.



The external housing shall be customized to fit the vehicle bodywork.

#### General Camera Specifications

- The Day/Night high-resolution colour camera specified shall incorporate a progressive scan CMOS imager with a 1/2-inch optical format, not less than 3.1 million pixels and shall have a dichroic infrared mirror.
- The image resolution of each side (FRONT/BACK) shall be no less than 2048(H) x 1536(V) pixels. The camera's aspect ratio (horizontal vs. vertical lines) shall be user configurable and not limited to 4:3 or 16:9 aspect ratios.
- The 360 camera shall produce 12 frames per second (fps) at full 4096(H) x 1536(V) resolution. The maximum frame rates are 12fps at 4:3 aspect ratio and 16fps at 16:9 aspect ratio.
- Minimum light requirement to produce a colour image shall be approximately 0.30 lux (0.03 fc) with a f1.2 lens. When in the Night mode, less than 0.05 lux (.005 fc) shall be required to produce a black and white image.
- The camera shall provide automatic white balance, automatic exposure, gain control, electronic shutter, and backlight compensation.
- A night mode shall slow the shutter speed down to enhance the night-time sensitivity of the camera.
- The camera shall have at least Dual 64MB of RAM and 4MB of flash memory.
- Digital image authentication shall be optionally available and licensed to verify that images have not been altered, manipulated, or tampered with, in any way.
- The camera shall provide both a TCP/IP protocol video output via a RJ-45 Ethernet connection and an NTSC (PAL) analogue video output via a BNC connection. Video outputs may be used simultaneously.

- The camera shall provide on-screen time/date and text displays. The text display can be programmed to dynamically change when motion alarms are detected.
- The camera shall provide built-in motion detection allowing up to eight separate, rectangular motion windows (zones) to be independently configured. Each window may have its interior pixels included or excluded from consideration by the motion detection algorithm. Windows configured to have pixels included in the motion calculations shall allow the threshold of both the sensitivity (pixel values) and size (quantity of pixels) to be set.
- User and Administrator password protection levels shall be provided.
- A recessed mechanical reset button shall be provided to return the camera to factory default settings.
- Up to eight (8) rectangular privacy windows may be configured to mask out specific video from view in the image.
- The camera shall capture image sequences by time lapse intervals or trigger events and transfer the jpeg images via FTP and/or e-mail.

#### **Camera Networking Requirements**

- The camera shall provide integrated support for IP, TCP, UDP, ICMP, ARP, FTP, SMTP, DHCP, HTTP, RARP, BOOTP, SNMP, Telnet, and TFTP protocols.
- The camera shall provide a multiview function where a single browser page shall be capable of displaying streaming images from up to nine cameras simultaneously.

#### **Connectors**

- RJ-45 - Ethernet connector (IEEE 802.3af PoE compliant)
- Analogue video: 75Ω BNC connector
- Compact Flash Media Slot: (CF Media Type I or II or Micro Drive)
- Alarm I/O: - 4-pin terminal (rear) screw terminal.
- Power Supply: 2-pin captive terminal screw terminal.
- Factory reset: Momentary pushbutton switch

#### **Electrical Specifications**

- Power Consumption: less than 2.5 watts
- Power requirement: 12-24VDC or 24VAC via a two-pin removable connector or via IEEE 802.3af Power-over-Ethernet on CAT5, CAT5e, or CAT6 cable.

#### **Mechanical Specifications**

- Weight: 2400g
- Dimensions with lenses: 90 H x 220 W x 338 D mm

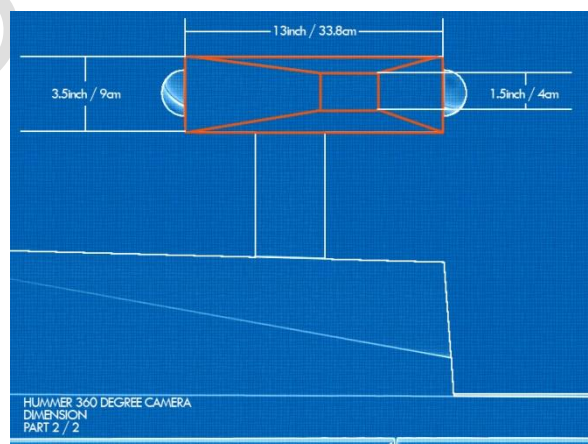
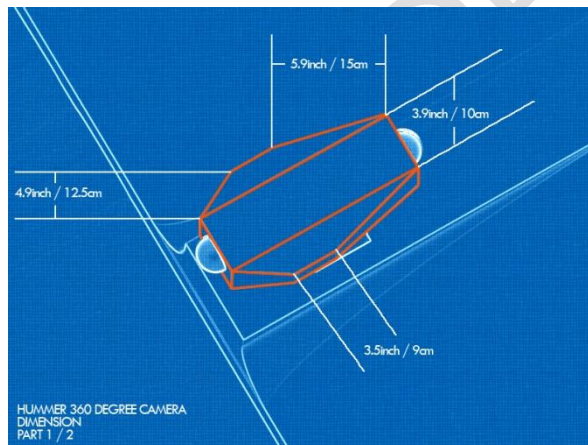
The camera shall feature solid-state components to resist shock and vibration and have no moving parts.

#### **Environmental Specifications**

- Operating temperature range: -20° C to +55° C (-4° F to +131° F)
- Humidity: 10% to 80%, non-condensing

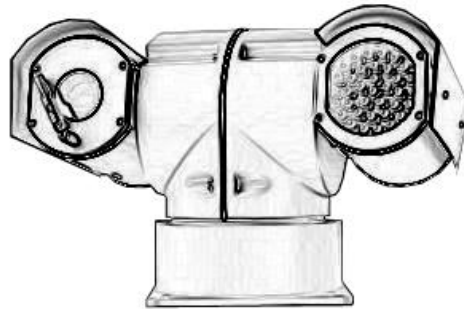
**Certifications and Approvals**

- Electromagnetic Compatibility
  - Emissions:
    - FCC, class A part 15
    - EN 55022:1998 with A1:2000, A2:2003; Class A
    - CISPR 22: 1997 with A1:2000, A2:2002; Class A
    - AS/NZS CISPR 22:2002; Class A
  - Immunity:
    - EN 55024:1998 with A1:2001, A2:2003
    - CISPR 24:1997 with A1:2001, A2:2002
  - Safety:
    - EN 60950-1:2001 with A11:2004
    - IEC 60950-1:2001
  - RoHS
    - All material and/or components used in the manufacture of the product shall be in compliance with the EU Directive 2002/95/EC Restriction of Hazardous Substance (RoHS).



## PTZ Camera Unit

The PTZ Security Camera is a highly advanced Infrared Pan/Tilt/Zoom Security Camera System. The camera features shockproof design and works well in fixed and mobile video surveillance applications. The PTZ Security Camera provides 360 Continuous pan rotation and 180 tilt rotation for maximum scene coverage. The camera provides a powerful IR LED array for infrared illumination of 300ft in addition to the Sony FCB-EX1010 WDR Wide Dynamic Range, 36x optical zoom True Day Night block camera. Built for rugged Surveillance the system is IP66 Weatherproof including built in Heater and Blower and Wiper/Defogger function.



### IR PTZ 36x Camera Main Features:

- 360° Continuous Pan Rotation and 180° Tilt Rotation
- IR LED with 300 feet Range
- Built-in SONY FCB-EX1010 Block Camera
- Weatherproof design, w/ high cast aluminium casing, Protection grade IP66
- Shockproof , suitable for car surveillance
- 6 cruising tracks with 16 preset each, 128 preset positions
- Power options : DC12V / AC24V
- 4I/O in, 1 I/O out (Available only on AC24V )
- Custom Pattern Tour
- Home options feature
- Shock absorber and Wall mount bracket included
- Wide Dynamic feature
- Wiper / Defogger Function

### Video

Picture Elements: Approx, 380K Pixels (NTSC) / Approx, 440K Pixels (PAL)  
 Horizontal Resolution: NTSC: 530TVL (wide end) / PAL: 530TVL (wide end)  
 Lens: 36x Zoom. F=3.4mm Wide) to 122.4mm Tele), F1.6 ~F4.5

Zoom Speed Movement (NTSC): Optical Wide/Optical Tele 4.0sec, Optical Wide/Digital Tele 6.0sec, and Digital Wide/Digital Tele 2.1sec.

Zoom Speed Movement (PAL): Optical Wide/Optical Tele 4.0sec, Optical Wide/Digital Tele 6.2sec, Digital Wide/Digital Tele 2.3sec.

Focus Movement Time: 8 to near 1.0sec

Digital Zoom: 12x (432x with optical zoom)

Angle of View: Approx. 57.8° (wide end) to Approx. 1.7°(Tele end)

Min. Working Distance: 320mm (Wide end), 1500mm (Tele end)

Sync System: Internal / External (V-Lock)  
 Min. Illumination: 1.4 Lux/1/60 sec (NTSC), 1/50sec (PAL) (Typical value), 0.1 Lux/1/4 sec (NTSC), 1/3sec (PAL) (Typical value), 0 Lux with IR LEDs on

Recommended Illumination: 100 to 100,000 Lux  
 S/N Ratio: 50dB (Weight ON)  
 Back Light Compensation: ON/OFF  
 Electronic Shutter Speed:  
 - NTSC: 1/4 to 1/10000 sec. (20 steps)  
 - PAL: 1/3 to 1/10000 sec. (20 steps)

White Balance: AUTO, ATW, Indoor, Outdoor, One Push WB, Manual WB  
 Gain: Auto / Manual (-3 to 28dB, 16steps)  
 Wide Dynamic Range WDR: ON/OFF  
 Aperture Control: 16 Steps  
 Video Output: VBS: 1.0Vp-p (Sync negative), Y/C Output

**LED IR Illuminator:**  
 Semi Covert High Intensity IR LED Array  
 300ft IR Illumination

**PTZ Functions:**  
 Pan Preset Speed: 100°/s  
 Tilt Preset Speed: 60°/s  
 Pan Speed: 0°~80°/s  
 Tilt Speed: 0°~40°/s  
 Pan Range: 360° Continuously  
 Tilt Range: +90°~-90°  
 Presets: 128 presets, 6 track Groups with 16 presets each  
 Communication: RS485 control  
 Baud rate from 2400Bps to 19200Bps,

**Environment:**  
 Relative Humidity: 90% without agglomeration  
 IP Grade: IP66  
 Work Temperature: -35°C to 55°C  
 Shock: »4G

**Power:**  
 Power Supply: DC10.5V ~ DC18V (50VA) (optional) AC24V (60VA)

**Consumption:**  
 Camera and PTZ : 18W (no IR and no PTZ movement)  
 Camera Module only: 5W  
 PTZ on Movement Consumption: 24~30W  
 Heater Consumption: 4W  
 Wiper Consumption: 3W

## Medium Range Camera Unit

The MultiCam Panoramic Module is composed with four independent IP cameras. Each one is based on the **DT180-IP2MP**. The combination of 4 units located in the FRONT/BACK/LEFT/RIGHT of the vehicle shall provide a full panoramic coverage at medium range with a cumulative resolution of 8 Mega Pixels.

The **DT180-IP2MP** product specified shall be an industrial grade, colour, full-featured, high-speed day/night 2MP megapixel network camera. The system shall provide full 180x180 coverage at medium range distance. The product is designed to meet or exceed industrial and surveillance applications requiring a low power, rugged video camera with IP network capability. The camera has a built-in web server and FTP server. It is IEEE 802.3af Power-over-Ethernet ready and can also be powered directly using 12-24 VDC or 24 VAC. The camera will include a NTSC/PAL analogue public view output.

The external housing shall be customized to fit the vehicle bodywork.

### General Camera Specifications

- The Day/Night high-resolution colour camera specified shall incorporate a progressive scan CMOS imager with a 1/2-inch optical format, not less than 2 million pixels and shall have a dichroic infrared mirror.
- The image resolution of each unit (FRONT/BACK/LEFT/RIGHT) shall be no less than 1600(H) x 1200(V) pixels. The camera's aspect ratio (horizontal vs. vertical lines) shall be user configurable and not limited to 4:3 or 16:9 aspect ratios.
- The MultiCam Panoramic Unit shall produce 7 frames per second (fps) at full 6400(H) x 1200(V) resolution.
- Minimum light requirement to produce a colour image shall be approximately 0.30 lux (0.03 fc) with a f1.2 lens. When in the Night mode, less than 0.05 lux (.005 fc) shall be required to produce a black and white image.
- The camera shall provide automatic white balance, automatic exposure, gain control, electronic shutter, and backlight compensation.
- A night mode shall slow the shutter speed down to enhance the night-time sensitivity of the camera.
- Each Unit shall have at least Dual 64MB of RAM and 4MB of flash memory.
- Digital image authentication shall be optionally available and licensed to verify that images have not been altered, manipulated, or tampered with, in any way.
- The camera shall provide both a TCP/IP protocol video output via a RJ-45 Ethernet connection and an NTSC (PAL) analogue video output via a BNC connection. Video outputs may be used simultaneously.
- The camera shall provide on-screen time/date and text displays. The text display can be programmed to dynamically change when motion alarms are detected.
- The camera shall provide built-in motion detection allowing up to eight separate, rectangular motion windows (zones) to be independently configured. Each window may have its interior pixels included or excluded from consideration by the motion detection algorithm. Windows configured to have pixels included in the motion calculations shall allow the threshold of both the sensitivity (pixel values) and size (quantity of pixels) to be set.
- User and Administrator password protection levels shall be provided.

- A recessed mechanical reset button shall be provided to return the camera to factory default settings.
- Up to eight (8) rectangular privacy windows may be configured to mask out specific video from view in the image.
- The camera shall capture image sequences by time lapse intervals or trigger events and transfer the jpeg images via FTP and/or e-mail.

#### **Camera Networking Requirements**

- The camera shall provide integrated support for IP, TCP, UDP, ICMP, ARP, FTP, SMTP, DHCP, HTTP, RARP, BOOTP, SNMP, Telnet, and TFTP protocols.
- The camera shall provide a multiview function where a single browser page shall be capable of displaying streaming images from up to nine cameras simultaneously.

#### **Connectors**

- RJ-45 - Ethernet connector (IEEE 802.3af PoE compliant)
- Analogue video: 75Ω BNC connector
- Compact Flash Media Slot: (CF Media Type I or II or Micro Drive)
- Alarm I/O: - 4-pin terminal (rear) screw terminal.
- Power Supply: 2-pin captive terminal screw terminal.
- Factory reset: Momentary pushbutton switch

#### **Electrical Specifications**

- Power Consumption: less than 2.5 watts
- Power requirement: 12-24VDC or 24VAC via a two-pin removable connector or via IEEE 802.3af Power-over-Ethernet on CAT5, CAT5e, or CAT6 cable.

#### **Mechanical Specifications**

- Weight: 1200g
- Dimensions with lenses and housing: 90 H x 220 W x 338 D mm

The camera shall feature solid-state components to resist shock and vibration and have no moving parts.

#### **Environmental Specifications**

- Operating temperature range: -20° C to +55° C (-4° F to +131° F)
- Humidity: 10% to 80%, non-condensing

#### **Certifications and Approvals**

- Electromagnetic Compatibility
  - Emissions:
    - FCC, class A part 15
    - EN 55022:1998 with A1:2000, A2:2003; Class A
    - CISPR 22: 1997 with A1:2000, A2:2002; Class A
    - AS/NZS CISPR 22:2002; Class A

- Immunity:
  - EN 55024:1998 with A1:2001, A2:2003
  - CISPR 24:1997 with A1:2001, A2:2002
- Safety:
  - EN 60950-1:2001 with A11:2004
  - IEC 60950-1:2001
- RoHS
  - All material and/or components used in the manufacture of the product shall be in compliance with the EU Directive 2002/95/EC Restriction of Hazardous Substance (RoHS).

DOO TECHNOLOGIES

## Positioning System

The Vehicle is equipped with a Ruggedized USB GPS device. With an embedded receiver and an antenna, the device tracks multiple satellites at a time while providing fast time-to-first-fix, precise navigation updates once per second, and low power consumption.

### Garmin GPS 18x USB

The GPS 18x USB interfaces to a computer with an available USB port. The technical specifications for this device are given below:

#### Physical Characteristics

- A. Size: 61 mm (2.4 inches) in diameter and 192.5mm (0.77 inches) in height
- B. Weight: 105 g (3.7 oz)
- C. Colour: Black
- D. Cable Length: 2 meter

#### Electrical Characteristics

- A. Input Voltage: USB power 4.4 – 5.5 Vdc
- B. Input Current: 110mA @ 5.0 Vdc
- C. GPS Receiver Sensitivity: -185 dBW minimum

#### Environmental Characteristics

- A. Operating Temperature: -30°C to +80°C (-22°F to +176°F)
- B. Storage Temperature: -40°C to +90°C (-40°F to +194°F)

#### GPS Performance

- A. Receiver: WAAS Enabled GPS receiver continuously tracks and uses multiple satellites to computer and update your position.
- B. Acquisition Times
  - Reacquisition: Less than 2 seconds
  - Hot: Approx. 1 second (all data known)
  - Warm: Approx. 38 seconds
  - Cold: Approx. 45 seconds
- C. Update Rate: 1 record per second
- D. Accuracy:
  - GPS Standard Positioning Service (SPS)
    - Position: <15 meters, 95% typical
    - Velocity: 0.1 knot RMS steady state
  - WAAS
    - Position: <3 meters, 95% typical
    - Velocity: 0.1 knot RMS steady state
  - Measurement Pulse Output Time:  $\pm 1$  ms at rising edge of the pulse

- Dynamics: 999 knots velocity (only limited at altitude greater than 60,000 feet), 2g dynamics

**Interfaces**

- A. Interface Electrical Characteristics: USB 2.0 full-speed protocol compatible, as well as USB 1.1 full-speed protocol
- B. USB Protocol: This protocol provides a mechanism for using the link and application layer protocols over USB

## Computer System

The Vehicle is equipped with a high performance computer system designed to work on a continuous 24/7 basis:

**i. Internal Specifications**

Processor: Intel Core 2 Quad Q9550, 2.83GHz, ATX Motherboard

Memory: 4GB DDR2

Hard Drive: 320GB, 3.5", SATA

Optical Drive: DVD-RAM, Sata

Expansion Slots: (3) PCI slots, (2) PCIe x1, (1) PCIe x16

Ethernet: Onboard Gigabit Ethernet Adapter, RJ45

Graphic Card: NVidia GeForce 8800 GTS 640MB memory

I/O Ports: PS/2 Keyboard & mouse ports, 12 USB ports, 8 channels audio, 1 coaxial S/PDIF out port, 1 RJ45 port

PCI Video Capture Board

Operating System: Windows XP Professional Service Pack 3

**ii. Physical Specifications**

Dual rear mounted cooling fans, removable front filter

Enclosure: 3 Unit High low profile rack mount style enclosure

Dimensions: 19.0"W x 5.25"H x 21.0"D

Power: 110/220 VAC, 460 Watt ATX power supply

Locking/latching front door with removable air filter

## Transmission Systems

The Vehicle is equipped with transmission systems to remote access the system functionalities and to transmit the 360 degrees and the PTZ video. The transmission systems detailed below:

### 3G

3.5G router is a HSDPA wireless gateway router, a plug & play device for communication through the local Telecom Operator. It works with HSDPA, UMTS, EDGE, GPRS, and GSM networks.

#### Technical Specifications

Operating Frequency: UMTS/ HSDPA 2100MHz  
GSM/GPRS/EDGE 850/900/1800/1900MHz  
High-speed up to 7.2 Mbps depending on network capabilities  
Receiver Technology: Supports receiver diversity and equalization  
Dimensions: 155mm x 115mm x 28mm  
External Interface:

- Four LAN interface (RJ45)
- One telephone interface (RJ11)
- One USB interface, Multiplex for power supply and USB data transfer

WLAN: Up to 54Mbps  
Weight: <500g (the power supply adapter is not included in weight)

### WIFI

The vehicle is equipped with a Gigabit router & Access Point which is perfect for high transfer rates for both wireless and wired connections.  
The wifi devices used in the vehicle are

1. **Omni directional (Short Range)**
2. **Unidirectional (Long Range)**

#### *Omni directional*

The features of this Wi-Fi device are as below:

##### **a. Wireless Lan specification**

- Standard Compliance: IEEE – 802.11b/g/a/n
- Transmission Method: DSSS, OFDM, MIMO
- Frequency Range: 2412-2472MHz(Channels 1-13), 5150-5250MHz(Channels 36-48), 5250-5350MHz(Channels 52-64)
- Transmission Rate: Up to 300 Mbps
- Access Mode: Infrastructure Mode

- Security: WPA2, WPA-PSK(TKIP, AES), 128/64bit WEP, Mac Address Filter
- b. Wired Lan Specification**
  - Standards Compliance: IEEE – 802.3ab, 802.3u, 802.3
  - Transmission Rate: 10/100/1000Mbps
  - Transmission Encoding: 100 BASE-TX 4B5B/MLT-2, 10 Base-T Manchester Coding
  - Access Method: CSMA/CD
  - Speed and Flow Control: 10/100/1000, Auto Sensing, Auto MDIX
  - Number of LAN Ports: 4
  - LAN Port Connector: RJ45
- c. Other Specifications**
  - Power Supply: External AC 100-240V Universal, 50/60 Hz
  - Power Consumption: About 11.0W (Max)
  - Dimensions: 190mm x 150mm x 38mm
  - Weight: 630g
  - Operating Environment: 0-40°C, 20–80% (non–condensing)

### *Unidirectional*

The features of this Wi-Fi device are as below:

- a. System Information**
  - Processor Specs: Atheros AR2316 SOC, MIPS 4KC, 180MHz
  - Memory Information: 16MB SDRAM, 4MB Flash
  - Networking Interface: 2 x 10/100 BASE-TX (Cat5, RJ45) Ethernet Interface
- b. Regulatory Compliance Information**
  - Wireless Approvals: FCC Part 15.247. IC RS210
  - RoHS Compliance: YES
- c. Radio Operating Frequency**
  - Frequency: 2412-2462 MHz
  - Data Rates: up to 54Mbps with TX Power from 26 dBm to 22 dBm and RX Sensitivity from -97dBm to -74dBm with tolerance of +/-1dB
- d. Adjustable Channel Size Support**
  - 5MHz, 10MHz, 20MHz, 40MHz
- e. Range Performance**
  - Outdoor (BaseStation Antenna Dependant): Over 50km
- f. Physical / Electrical / Environmental**
  - Enclosure Size: 18 in. Length x 13 in. Height x 2 in. Width
  - Weight: 8.8lbs
  - Enclosure Characteristics: Outdoor UV Stabalized Plastic(Antenna) and die cast metal (system)
  - Mounting: Mounting on Roof of vehicle
  - Max Power consumption: 6.5 Watts
  - Power Supply: 12V, 1A (12 Watts). Supply and injector
  - Power Method: Passive PoE

- Operating Temperature: -40°C to 85°C (System PCB optimized for hi-temp)
- Operating Humidity: 5 to 95% Condensing
- Shock and Vibration: ETSI300-019-1.4

## COFDM (Video Transmission) (Optional)

This transmitter is a feature-rich COFDM digital video transmitter.

- **Input:** Composite Video, Audio x 2, S-Video, RS232 Data, RS232 Control, Chaining I/O, General Purpose I/O, Power
- **Output:** RF Output
- **RF Frequency Bands:** 5.62 to 5.9GHz, 4.88 to 5.15GHz, 3.1 to 3.4GHz, 2.28 to 2.55GHz, 1.15 to 1.4GHz, 575 to 675MHz, 470 to 520MHz, 340 to 470MHz
- **Power:** 100mW
- **Power Control:** 30dB in 1dB steps
- **Tuning Steps:** 250KHz
- **Modulation**
  - Bandwidths - 8/7/6/2.5MHz/1.25MHz
  - Default Modes:
  - Mode 1 - Short Range 2.5MHz, 16QAM, FEC2/3, 4.8Mb/s
  - Mode 2 - Normal Range 2.5MHz, QPSK, FEC2/3, 2.4Mb/s
  - Mode 3 - Long Range 2.5MHz, QPSK, FEC1/3, 1.2Mb/s
  - Mode 4 - Ultra Long Range 1.25MHz, QPSK, FEC1/3, 600kb/s
- **Video**
  - Line Standard PAL/NTSC
  - Resolution 704, 528, 480, 352
  - Coding Mode MPEG2, MPEG4 optional
  - Delay 43ms to 120ms depending on mode
  - Frame Rate Full/Half/Quarter/Eighth (selectable)
- **Data Interface:** RS232 Data Input 1K2 to 115K2 baud switchable
- **Encryption:** ABS 32 bit as standard or AES128/256
- **Control:** Remote Control RS232 Control from PC GUI Application; Local Control Front Panel 8 channel select, RF on/off, Range mode, Lock, Alarm
- **Power:** DC Input 5.9 to 16V Reverse Polarity Protected; Power Consumption 4.8 to 6W depending on mode
- **Temperature Range:** -20 to +70 deg C

## Display and Control Devices

Multiple Displays and Control Devices are installed in the cabin:



### Front Passenger Touch Screen, 15" TFT Panel

Touch screen facilities direct finger touch input on the panel instead of mouse or touch pad. This Touch Screen is a ruggedized device with the following details:

#### Controls

- Front: 12 Functional buttons, brightness control and Power
- Embedded mouse pointing device.
- Menu Control buttons

#### Ports:

- DVI in
- USB 1 and 2
- DC Power Jack

#### Specifications

- Touch screen Interface: USB
- Resolution: 1024 x 768
- Colour: 16.8 million, XGA, 15" TFT

#### Ruggedness and Operating Environment

The display unit is designed with rugged features such as vibration, shock, dust, and rain/water protection. The display unit may withstand rainfall from top with mild wind blowing only. A clean and moisture-free environment is preferred.

Temperature: 0~45°C (32~113°F) operating  
-20~60°C (-4~140°F) storage

Humidity: 5~95% Non-condensing operating  
95% maximum storage

Altitude: 0~4570 meters (0~40000 feet) operating

## 10.2" TFT LCD Touch Screen

This display device is a 10.2" LCD screen with VGA input and Touch screen fitted in the vehicle for the ease of use for the driver.

The specifications are as below:

### Features:

- 5-wire resistive Touch Screen (USB)
- Multi-Monitor Touch Screen Support
- VGA Input (15 pin D-SUB) x 1 & Video Input x 2
- Audio Input x 3 / Built-in Speakers
- Picture In Picture / Split Screen
- Audio Input / Built-in Speaker
- NTSC / PAL Multi-System
- 16x9 Aspect Ratio
- Upgraded High-Brightness LED Backlight
- Ultra High Resolution - 1024 x 600 Native
- IR Remote Control
- Auto power-on upon signal detection
- AV2 Auto Switching for backup camera
- 26-Pin heavy-duty connector
- Anti Glare Coating
- Brushed, anodized aluminum face plate
- Aluminum Casing
- Supports 10V DC ~ 30V DC
- "E" Mark Certified for Automotive use

### Specifications

- Screen Size: Diagonal 10.2" (16:9)
- Physical Resolution: 1024 (H) x 600 (V) WVGA
- Supported Resolution: 640 x 480 ~ 1600 x 1200
- Dot Resolution: 3072 x 600 = 1,152,000 (dots)
- LCD Brightness: 300 cd/m<sup>2</sup>
- Contrast Ratio: 500:1
- Viewing Angle: 160° Horizontal, 140° Vertical
- Response Time: 10 - 15ms
- Touch Screen Interface: USB port
- Operating Voltage Range: DC 10V ~ 30V
- Power Supply: DC 12V
- Power Consumption: ≤ 20W
- Operating Temperature: -4°F ~ 158°F
- Storage Temperature: -22°F ~ 176°F
- Dimension (in): 10.4W x 7.3H x 1.4D
- Weight (lb): 3.3
- FCC, CE, E13 Certification
- ROHS Compliant
- 5-Wire Resistive Touch screen Advantage

## 17" LCD Keyboard/KVM Drawer (Optional)

This is a 1U rack mounted KVM drawer with 17" inch screen with touch pad and keyboard switching up to 8 VGA video inputs.

### Features:

- Multi-user Matrix KVM with 8 VGA inputs, touchpad, and keyboard
- 1U rack mount drawer
- Slide rails with fixed positions to prevent drawer movement when typing
- 1280 x 1024 LCD with 300 nit brightness and 1000:1 contrast ration typical
- Combo interface wither PS/2, USB & SUN with Multiplatform switch capability
- High Scalability: Interchangeable LCD, Keyboard, Mouse & KVM modules
- Keyboard interchangeable module Kit : 104 key touchpad with full numerical pad
- Built in on screen display controlled by integral membrane switches
- Unique mechanical design to maximize rack mountable space
- Black Anodized aluminum front panel
- VGA, keyboards & mouse all in one by 15 pin HDB connector
- Built in slide rails which can be mounted easily in any 19" rack cabinet
- EMC shielding around the monitor housing to minimize interference

### LCD Screen

- LCD Type: Grade A Industrial Monitor 17 inch Active Matrix TFT LCD panel
- Display Size: 17 inch diagonal
- Resolutions: 1280 x 1024 with 60/70/75Hz
- Response time: Tr = 1.3 / Tf = 3.7ms
- Contrast ratio: 1000:1
- Brightness: 300 cd/m<sup>2</sup>
- Pixel pitch: 0.264H x 0.264V mm
- Panel Color: 16.7 million display colors
- Viewing angle: 160/ 160 (Horiz./Vert.)
- OSD Control: Brightness, Contrast, Phase & Color, H & V position, Auto-tune, Recall & Language
- Signal Input: VGA, Analog RGB
- LCD MTBF: 50,000 hrs
- Keyboard & Pointing Device: Notebook type KB with Numeric Keypad & Touchpad

### Regulatory Approval

FCC , CE , VCCI , 3C\*

### Physical / Power / Environmental Specification:

- Dimension: 442W x 650D x 44H, 17.4W x 25.6D x 1.73H inches
- Weight: 16kg / 35 lbs
- Form Factor: 1U Rack Mounting on slide-out rails
- Rack Mounting: Adjustable range: 15.3" – 35.2" (390-895mm)
- Relative Humidity 90%, non condensing
- Temperature: 0 to 50 degrees C (Operation)  
 -25 to 65 Degree C (Storage)
- Shock: 50G peak acceleration (11ms, half sine wave)
- Vibration: 58~500Hz/ 0.98G (11min/cycle)
- Internal Power Supply: 110V – 220V AC input, 12v 5A output

## Joystick

The Joystick is installed between the front seats to be accessible by the Driver and the right passenger.

The details for the Joystick are as follows:

### Electrical Specifications

- Supply Voltage (USB bus): 5.0V DC
- Supply Current (USB bus): 32mA max

### Mechanical Specifications

- Operating Travel: 36° (18° from center)
- Centering: Single spring, omnidirectional
- Breakout Force: 0.109 Nm
- Operating Force: 0.151 Nm
- Maximum Force: 0.169 Nm
- Operating Temp: -40°C to +85°C
- Life Expectancy: 10 million operations
- Dimension:
  - Height: 127.76 mm (5.03 inches)
  - Width: 156.46 mm (6.16 inches)
  - Length: 168.66 mm (6.64 inches)
  - Switch Function: 3 Axis with Select

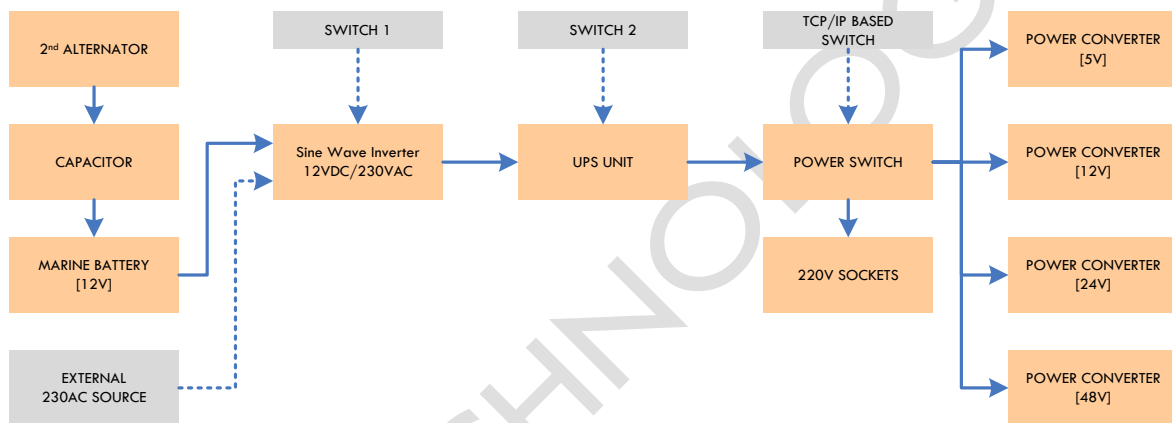
**Wiring:** USB 1.1

**Compliance:** RoHS compliant

## Electrical Configuration and Autonomy

The complete system is powered by the Auxiliary Power Unit. The Auxiliary Power Unit has two main purposes:

- Protect the computer and electrical devices from power variations in the original electrical chain
- Allowing the full system to run with the car engine kept OFF for duration up to 8H.
- To supply different electrical devices with its required power voltages
- To provide multiple power sockets for connecting devices.



The Electrical configuration is explained in diagrams above. The Auxiliary Power Unit is composed with the following items/features:

### 200 Amp (depending on the vehicle) alternator kit

### Digital One Farad Capacitor Unit

### System Battery

This battery is dual purpose. They are designed for engine start and cyclic applications and for use in vehicles with large accessory loads. The specifications of this battery are as below:

#### Performance Specification

- Voltage: 12V
- Cold Cranking Amps @-18°C: 765 A
- Cranking Amps @ 0°C: 870 A
- Capacity (C/20 Rate): 55 Ah
- Internal resistance: 0.0028 ohms

### Physical Specification

- Dimension: 254mm(L) x 175mm (W) x 200mm (H)
- Minimum Weight: 19.9 Kg
- Type Post/Terminal: SAE & GM
- BCI Group: 34/78

### 12VDC to 220VAC Sine Wave Inverter

Sine Wave Inverter turns 12 volts battery voltage into pure 230 volts AC. The inverter automatically gives priority to 230 volts mains power as soon as it is applied. During the switch over from inverter to external mains power supply, the unit synchronises the frequency and phase of the 2 voltages.

The switchover takes place at the zero-voltage point, when the phases are synchronised, which prevents damage to the connected electrical devices.

- Over-voltage and low-voltage cut-off
- Overload and short circuit protection
- Outputs for remote control and external ON/OFF switch
- Adapter for heat dissipation hose
- Cable organiser and mounting plate
- 3 colour LED for status indication
- Microprocessor- controlled output voltage
- Sleep-mode function
- AC connection cable with earthed safety plug and socket

### Technical Data

- Dimension: 116mm (H) x 349mm (W) x 516mm (L)
- Net Weight: 15.5 kg
- Continuous output: 2000 W
- Maximum output: 4000 W
- Input voltage: 12V DC
- Full load efficiency: 90%
- No-load current input: 2.3A
- Frequency: 50Hz

### Remote Control switch for inverter

The remote Control switch panel allows on/off function from chosen location in a vehicle.

- Dimensions: 58 x 72 x 25 mm
- Weight: 40g
- Cable Length: 7.5 m
- Quality features: Power on indicated by red LED

## UPS Device

The UPS is designed to prevent utility power blackouts, brownouts, sags and surges from reaching the electronic equipments. The UPS filters small utility line fluctuations and isolates the electronic equipment from large disturbances by internally disconnecting from the utility line. The UPS provides continuous power from the internal battery until utility power returns to safe levels or the battery is fully charged.

### Output Specifications

- Output Power Capacity: 1980 Watts / 2200VA
- Max Configurable Power: 1980 Watts / 2200VA
- Nominal Output Voltage: 230V
- Output Voltage Note: Configurable for 220:230 or 240 nominal output voltage
- Efficiency at Full Load: 95%
- Output Voltage Distortion: Less than 5% at full load
- Output Frequency ( sync to mains) 47 – 53Hz nominal 57-63 Hz for 60 HZ nominal up to 5:1
- Waveform Type: Sine wave
- Output Connections:
  - (8) IEC 320 C13
  - (1) IEC 320 C19
  - (2) IEC Jumpers

### Input Specifications

- Nominal Input Voltage: 230V
- Input Frequency: 50/60 Hz +/-3Hz (auto sensing)
- Input Connections:
  - IEC-320 C20
  - Schuko CEE 7 / EU1-16P
  - British BS1363A
- Input voltage range for main operations: 160 – 285V
- Input voltage adjustable range formations operation: 151-302V

### Batteries and Runtime Specification

- Battery Type: Maintenance-free sealed Lead-Acid battery with suspended electrolyte: leak proof
- Typical recharge time: 3 hours
- Replacement Battery: RBC55
- RBC Quantity: 1

### Communications and Management

- Interface Ports: DB-9RS-232, USB, Smartslot
- Available Smartslot: 1
- Control Panel: LED status display with load and battery bar-graphs and On Line, On Battery: Replace Battery: and Overload indicators.
- Audible Alarm: Alarm when on battery, distinctive low battery alarm, configurable delays
- Emergency Power Off (EPO): Optional

**Surge Protection and Filtering**

- Surge energy rating: 365 Joules
- Filtering: Full time multi-pole noise filtering, 0.3% IEEE surge let-through, zero clamping response time, meets UL 1449

**Physical Specifications**

- Dimensions: 432mm (Height)x 196mm (Width) x 546mm (Depth)
- Net Weight: 50.92 kg
- Colour: Black
- Units per Pallet: 3.00

**Environmental Specification**

- Operating Environment: 0-40°C
- Operating Relative Humidity: 0-95%
- Operating Elevation: 0-3000 meters
- Storage Temperature: -15 - 45°C
- Storage Relative Humidity: 0-95%
- Storage Elevation: 0 – 15000 meters
- Audible noise at 1 meter: 45.00 dBA
- From surface of unit Online Thermal Dissipation: 275.00 BTU/hr

**Conformance**

- Regulatory Approvals: C-tick, CE, EN 50091-1, EN 50091-2, GOST, VDE
- Environmental Compliance: RoHS 7b Exemption

**Power Convertors for 5V, 12V, 24V, 48V**

The Power converter is a DIN-rail power supply with excellent performance. With tightly regulated output voltage and high immunity against electrical disturbances on the mains they provide a reliable power source for sensitive loads in industrial process controls, machine tools and other equipment exposed to a difficult industrial environment.

The following are the main features:

- Ultra compact plastic housing
- Connection by spring clamp terminals or detachable screw terminal block
- Reliable snap-on mounting on DIN-rails
- Universal Input 85-264 VAC, 50/60 Hz
- Voltages with 5, 12, 24 and 48 VDC output
- Output Voltage adjustable
- Power OK signal
- Low ripple and noise
- Overload and short-circuit protection
- Parallel operation possible
- Worldwide safety approvals
- Redundancy module

## 5VDC and 12VDC Power Converter

### Input Specification

- Input Specification: Nominal: 100 – 240 VAC, AC Range: 85-264 VAC (Output power derating 5%/V for operation below 90 VAC)
- Input Frequency: 47 – 63 Hz
- Harmonic Limits: EN 61000-3-2, Class A

### Output Specification

- Output voltage adjustable range:
  - 5.0 – 5.2 VDC (5V power Converter)
  - 12 – 16 VDC (12V power Converter)
- Output Power:
  - 12W (5V power converter)
  - 120W (12V power Converter)
- Output Current:
  - 2.4A (5V power converter)
  - 10A (12V power Converter)
- Output regulation: 1 %
- Ripple and noise (20MHz bandwidth): <100mV pk-pk
- Electronic short circuit protection: current limitation at 100-150% typ (automatic recovery).
- Hold-up time: 115VAC – min. 10ms , 230VAC – min. 20ms

### General Specification

- Temperature ranges:
  - Operating: -25°C to +70°C max. (-13°F to +158°F)
  - Storage: -40°C to +85°C max. (-40°F to +185°F)
- Power derating: 2.5%/K above 60°C
- Humidity (non-condensing): 5-95% rel. H
- Temperature coefficient: 0.02%/K
- Case Protection: IP 20 (IEC 60529)
- Environment
  - Vibration acc: 3 axis, sine sweep, 10-55 Hz, 0.075 mm
  - Shock acc: 3 axis, 15g half sine, 11 ms
- Enclosure material: plastic FR2010-110C (UL 94V-0 rated)
- Mounting: DIN-rails as per EN 50022-35x15/7.5 (snap-on with self-locking spring)
- Connection: Screw terminals with combi-type screw heads for wire size 0.5 – 1.5 mm<sup>2</sup>

## 24VDC and 48VDC Power Converter

### Input Specifications

- Input Voltage Range: 85 – 264 VAC/85-375 VDC
- Output derating: - at operation between 85...93VAC/85...130VDC: 15%
- Input Frequency: 47 – 63 Hz
- Harmonic Limits: EN 61000-3-2, Class A
- Input current at full load(typ.) (115 VAC/230 VAC): 24 V converter – 2.0A/1.0A, 48V converter – 1.2A/0.6A
- Recommended Circuit breaker: 5.0A

### Output Specifications

- Output voltage adjustable range:
  - 24 - 28 VDC (24V power Converter)
  - 48 – 56 VDC (48V power Converter)
- Output regulation (10 to 90% load variation): 2.5 % for 24V, 1% for 48V
- Ripple and noise ( 20MHz bandwidth): <50mV pk-pk
- Electronic short circuit protection: current limitation at 120% typ.
- Parallel operation: output current characteristic suitable for parallel operation of max. 5 units
- Overvoltage protection, trigger point: 24VDC: <40VDC, 48VDC: <60VDC
- Hold-up time(115 VAC / 230 VAC): min. 15ms / min. 125ms
- Power OK signal: trigger point of 24 VDC >22V, output signal is 22.0V +- 2.0V / 30mA max. Trigger point of 48 VDC > 44V, the output signal is 44.0V +- 4.0V / 15mA max.

### General Specification

- Temperature ranges:
  - Operating: -10°C to +70°C max.
  - Storage: -25°C to +85°C.
- Humidity (non-condensing): 95% rel. H
- Temperature coefficient: 0.02%/K
- Switching frequency: 55-180kHz depending on load
- Case Protection: IP 20 (IEC 60529)
- Efficiency: 88% typ.
- Enclosure material: plastic FR2010-110C (UL 94V-0 rated)
- Mounting: DIN-rails as per EN 50022-35x15/7.5 (snap-on with self-locking spring)
- Connection: Screw terminals with combi-type screw heads for wire size 0.5 – 1.5 mm<sup>2</sup>

## Power Rack Switch

The switch Rack PDU is a stand-alone, network-manageable device that allows programmable control of eight power outlets. It has built-in network connectivity and monitors the aggregate current draw of the PDU both remotely and locally through the digital display.

### Output Specification

- Nominal Output Voltage: 208V, 230V
- Maximum Total Current Draw per Phase: 16A
- Output Connections: (8) IEC 320 C13

### Input Specification

- Nominal Input Voltage: 200V, 208V, 230V
- Input Frequency: 50/60 Hz
- Regulatory Derated Input Current(NA): 16A
- Input Connections: IEC-320 C20
- Cord Length: 2.5 meters
- Number of Power Cords: 1
- Acceptable Input Voltage: 200-240VAC
- Maximum Input Current per phase: 20A
- Load Capacity: 3680 VA

### Physical Characteristics

- Net Weight: 2.27 KG
- Dimensions: 44mm (H) x 445mm (W) x 108mm (D)

### Environmental Characteristics

- Operating Environment: 0-45°C
- Operating Relative Humidity: 0-95%
- Operating Elevation: 0-3000 meters
- Storage Temperature: -25 - 65°C
- Storage Relative Humidity: 0 – 95%
- Storage Elevation: 0 – 15000 meters

### Conformance

- Regulatory Approvals: cUL Listed CE CSA, EN 55022 Class A, EN 55024, EN 61000-3-2, EN 61000-3-3, GOST, IRAM, MIC, UL 60950, UL Listed VDE, VCCI
- Environmental Compliance: RoHS 7b Exemption

## Digital Thermostat

The vehicle is equipped with two digital thermostats (one accessible by the trunk, one accessible inside above the back seats) to monitor the temperature inside the System Unit.

### Technical characteristics

- Temperature range: -50 to +130°C
- Alarm indicator

## Software Specifications

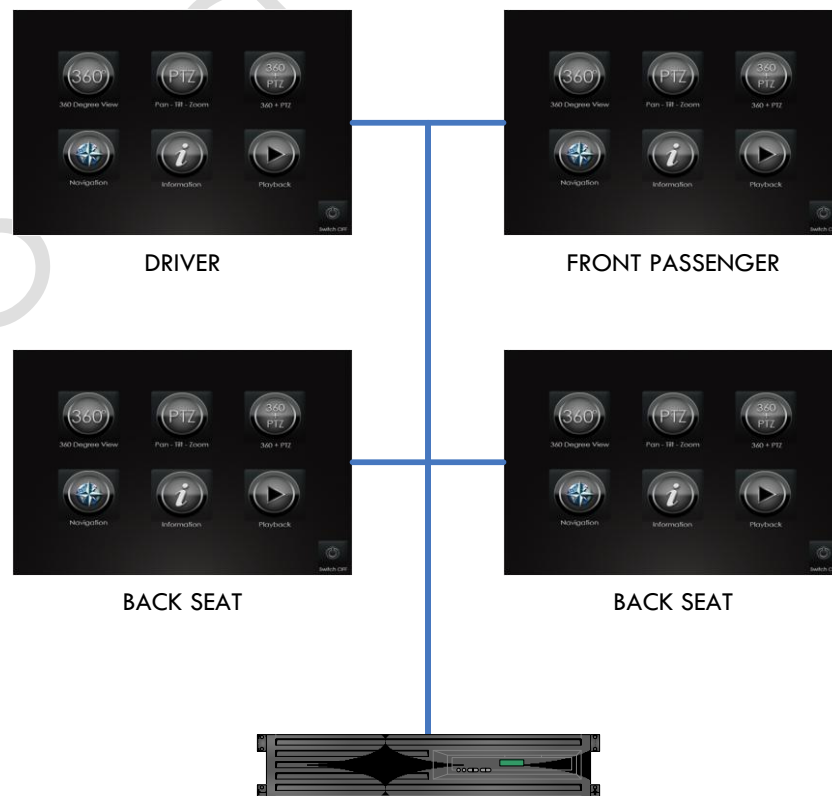
The integrated system provides easy access to critical information such as 360 surrounding view, PTZ functionality and Mapping System. The User Interface is designed to access in a very short time to any critical information, using a touch screen or a joystick. The system can be used simultaneously by four individual users within the vehicle, while being controlled remotely by any authorised user located in a distant location.

### Key Features

- Control Full 360x180 Navigable Video in Real Time while Recording
- Video Playback
- System Control by using Touch Screen and Joystick
- Up to 4 independent Touch Screens at the same time in the vehicle managed by an unique system
- PTZ control using touch screen device
- PTZ Camera and 360 Camera Linked together
- Geo-Tagged Recorded Video Data
- Remote Control

### Graphic User Interface

The application starts on the four screens:



The following screens are accessible through the main interface:

### 360 DEGREE VIDEO

Navigate the 360 Video in Single, Dual, Quad Screen and Panoramic Mode.



SINGLE WINDOW [360]



QUAD WINDOWS [360]



DUAL WINDOWS [360]



THREE WINDOWS [360+PANORAMIC]

**Day/Night Settings:** Daylight, Low Light and Auto IR. With “Force Day” function the camera sets itself to work for daytime colour settings. “Force Night” sets to Black and white and sets to work on low light. With Auto IR selection, the camera senses the light information and sets the camera to “Force Day” or “Force Night”.



## PAN TILT ZOOM CAMERA

Control the PTZ Camera through the video window and using the presets.



The vehicle is equipped with Pan/Tilt/Zoom Camera for extra zooming capability with clear video. PTZ functions are accessible from the graphic interface.

**VIDEO Window (LEFT):** The Camera will Pan and Tilt when the user will tap on the selected part of the Video. The zooming capability is accessible by tapping in the centre of the video window.

**Top Vehicle View (RIGHT):** 8 preselected angles (every 45 degrees) allow the user to pan the camera from a position to another in a very short time.

**Lighting Functions (RIGHT/BOTTOM):** The IR function switches the Infrared sensors “ON” and “OFF” which is installed on the PTZ camera. The video is black and white when the infrared sensors are On as it will be set to night mode. The Camera also automatically switches to night mode with Infrared in Low Light conditions.

**Wipe/Fog:** The application can also control the Fog function and wiper function of the camera with the controls on the screen.

**User Control:** The PTZ camera video can be viewed by all users, but it is only controlled by the first person who had taken the access to the PTZ camera. The Other user can control the PTZ camera when the previous person has stopped using PTZ camera.

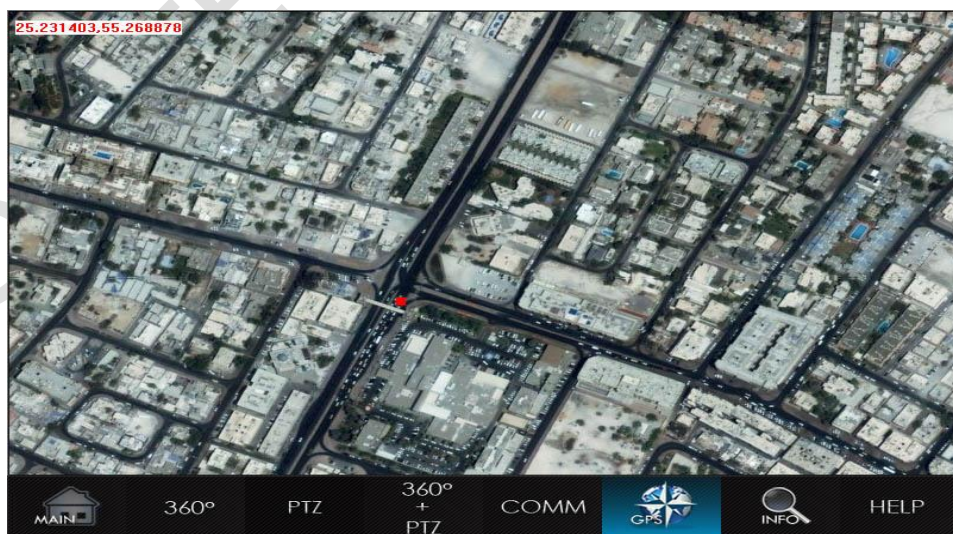
### 360 CAMERA+PAN TILT ZOOM CAMERA

Control the PTZ Camera using the surrounding panoramic view.



### NAVIGATION [GPS]

Display the current location using a Mapping System.

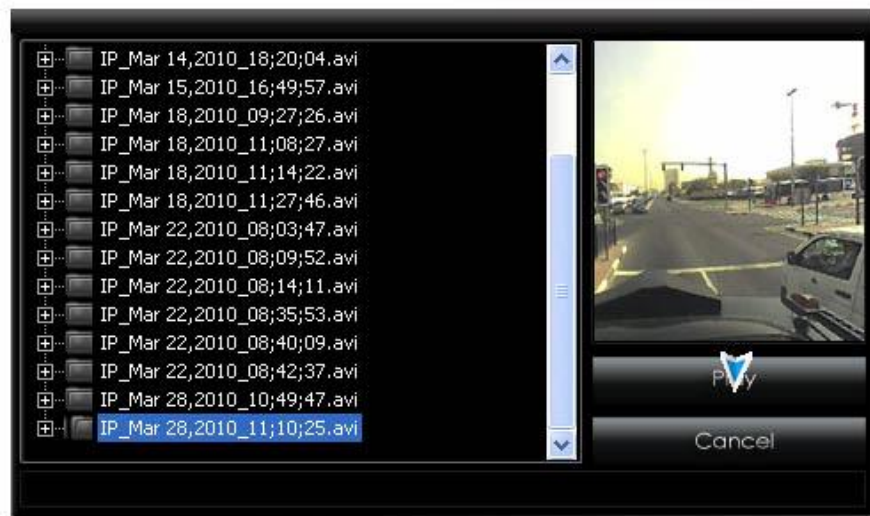


### INFORMATION [HELP]

Provides Help on the application.

### PLAYBACK

Access the recorded 360 Video and PTZ data.



Information such as Time, Location, Duration and GPS Location are displayed while browsing the videos files.



**Play/Pause/Stop:** Once the video playback started, the content is still fully navigable, using different windows configurations such as single, dual, quad windows. Zoom capabilities are of course available.

**Grid:** The Grid will display extra information on the video screen by Alpha Channel such as the angle of the video with respect to the angle of the vehicle. The grid can display angle from 0 to 180 degrees horizontally and -90 to +90 degrees vertically.

## Remote Control

The Vehicle Application is accessible remotely from any location using any available network such as Wifi, Wimax, and 3G through a secured Virtual Private Network.

All functionalities such as 360 VIDEO and PTZ VIDEO are accessible through the Remote Interface.

The GPS Location of the Vehicle is also provided to the Remote Location.

The video quality at the remote location depends on network quality.