Road-iQ VideoData Server

Installation Manual

Road-iQ™
Connected Vehicle Solutions
A VELVAC COMPANY

ABOUT THIS MANUAL

The purpose of this Installation Manual is to give you an in depth understanding and installation process of your new Road-iQ system. It also includes an overview of product specifications information pertaining to the tablet interface. For more guides or for additional information please visit www.road-iq.solutions/GettingStarted.

Part Number: X3683
Revised 2/27/2015

SAFETY NOTES

The DVD video display of the in-dash unit will not operate while the vehicle is moving. This is a safety feature to prevent driver distraction. Tablet control functions will only operate when vehicle is in Park and the parking brake is engaged. It is illegal in most states for the driver to view video while the vehicle is in motion.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

Ce dispositif est conforme aux Normes établies par la FCC (Partie 15). Cette opération est soumise à deux conditions:
(1) Ce dispositif ne peut causer d' interférences nuisibles.
(2) Ce dispositif doit accepter toutes interférences reçues, même si elles provoquent un dysfonctionnement du dispositif.

This product complies with Industry Canada RSS-210.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:
(1) This device may not cause interference, and
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

Under Industry Canada regulations, the radio transmitter(s) in this device may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Cet appareil est conforme aux norme RSS210 d'Industrie Canada.

Cet appareil est conforme aux normes d'exemption de licence RSS d'Industry Canada. Son fonctionnement est soumis aux deux conditions suivantes :
(1) cet appareil ne doit pas causer d'interférence et
(2) cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

Conformément aux réglementations d'Industry Canada, les émetteurs radio de cet appareil ne peuvent fonctionner qu'à l'aide d'une antenne dont le type et le gain maximal (ou minimal) pour ces émetteurs - transmetteurs sont approuvés par Industry Canada. Pour réduire le risque d'interférence éventuelle pour les autres utilisateurs, le type et le gain de l'antenne doivent être choisis de manière à ce que la puissance isotrope rayonnée équivalente (p.i.r.e.) minimale nécessaire à une bonne communication soit fournie.

Information to the User

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful Interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful Interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

RF Radiation Exposure Statement

This equipment complies with the FCC/IC radiation exposure limits set forth for portable transmitting device operation in an uncontrolled environment. End users must follow the specific operating instructions to satisfy RF exposure compliance.

The equipment should only be used or installed at locations where there is normally at least a 20cm separation between the antenna and all persons.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

The Road-iQ VideoData Server is a video and data display, acquisition, and playback system. The Road-iQ VideoData Server is designed to collect and record video data from up to six (6) cameras installed on your vehicle, as well as system parameters from your vehicle-bus communication network and GPS location, all in-sync. Live video can be displayed on an iPad on the vehicle's dash in real-time, and recorded video and data can be reviewed on the tablet or transferred to a personal computer. Further, the Road-iQ VideoData Server allows the definition of triggers, which use vehicle parameters to define significant events (excessive speed, panic braking, etc…) which are then marked in the recorded files for easy locating.

Contents

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1 System Contents & Requirements

1.1 System Contents

- **Road-iQ VideoData Server (standard equipment)**

  - **Road-iQ VideoData Server**
    The Road-iQ VideoData Server is the main component of the Road-iQ VideoData Server system. The server is responsible for the collection and management of videos, GPS data, driver inputs, and vehicle data for display, recording, and playback. The Road-iQ VideoData Server can also act as a Wi-Fi Hotspot by way of cellular service through the optional NetHub.

  - **Mounting Hardware**
    Four (4) ¼ inch self-tapping screws are included for mounting the Road-iQ VideoData Server to a wooden or plastic surface.

- **Road-iQ NetHub (optional)**

  - **NetHub**
    The optional NetHub mounts on the vehicle dash and acts as an intermediary between the Road-iQ VideoData Server and the iPad. There are two USB ports on the front of the NetHub for connection to both the iPad and an external USB mass storage device. The NetHub also contains the LTE modem, GPS, antennas, an LED indicator, a warning buzzer, and a SIM card slot.

  - **NetHub Cable**
    The NetHub cable is a 3-meter (approx. 10 feet) long Powered-USB 2.0 cable which connects the Road-iQ VideoData Server with the NetHub.

  - **Mounting Materials**
    Adhesive-backed mounting material is included for attaching the NetHub to the vehicle.

- **Vehicle Harness**
  The Vehicle Harness provides power and ground for the system, as well as the connection between the Road-iQ VideoData Server and the vehicle-bus network(s). This connection provides the Road-iQ

VideoData Server with data from one or more of the supported vehicle vehicle-bus network protocols (J1939, RV-C, OBDII CAN, J1708/J1587, LIN). There are various types of vehicle harnesses available based on the type of installation.

- **GPIO Harness (optional)**
  - The Road-iQ VideoData Server supports four (4) general purpose inputs and four (4) general purpose outputs. The inputs can be used as triggers from vehicle systems that aren't on the vehicle-bus network. The GPIO (general-purpose input/output) harness serves as the access points for the system's general purpose inputs and outputs, as well as secondary connections to the vehicle's LIN-bus and accessory signal input.

- **Velvac Proprietary USB Storage (optional)**

- **User's Manual**

- **Quick Startup Guide**

1.2 Vehicle, Hardware & Software Requirements

- Apple iPad Air, iPad Air 2, iPad Mini 2, or iPad Mini 3
  - Apple iOS 8 or newer.
  - Any iPad storage capacity may be used, though storage size will limit the amount of video and data that can be stored.
- For reading and storing vehicle data, a vehicle with one or more of the following supported communication protocols is required:
  - SAE J1939
  - RV-C
  - OBDII-CAN
  - SAE J1708/J1587
  - LIN
- Data Storage – the Road-iQ VideoData Server system can store video and vehicle data in a number of different user-selectable locations:
  - On the iPad
  - On a USB mass storage device plugged into the Road-iQ video server
  - On a USB mass storage device plugged into the NetHub

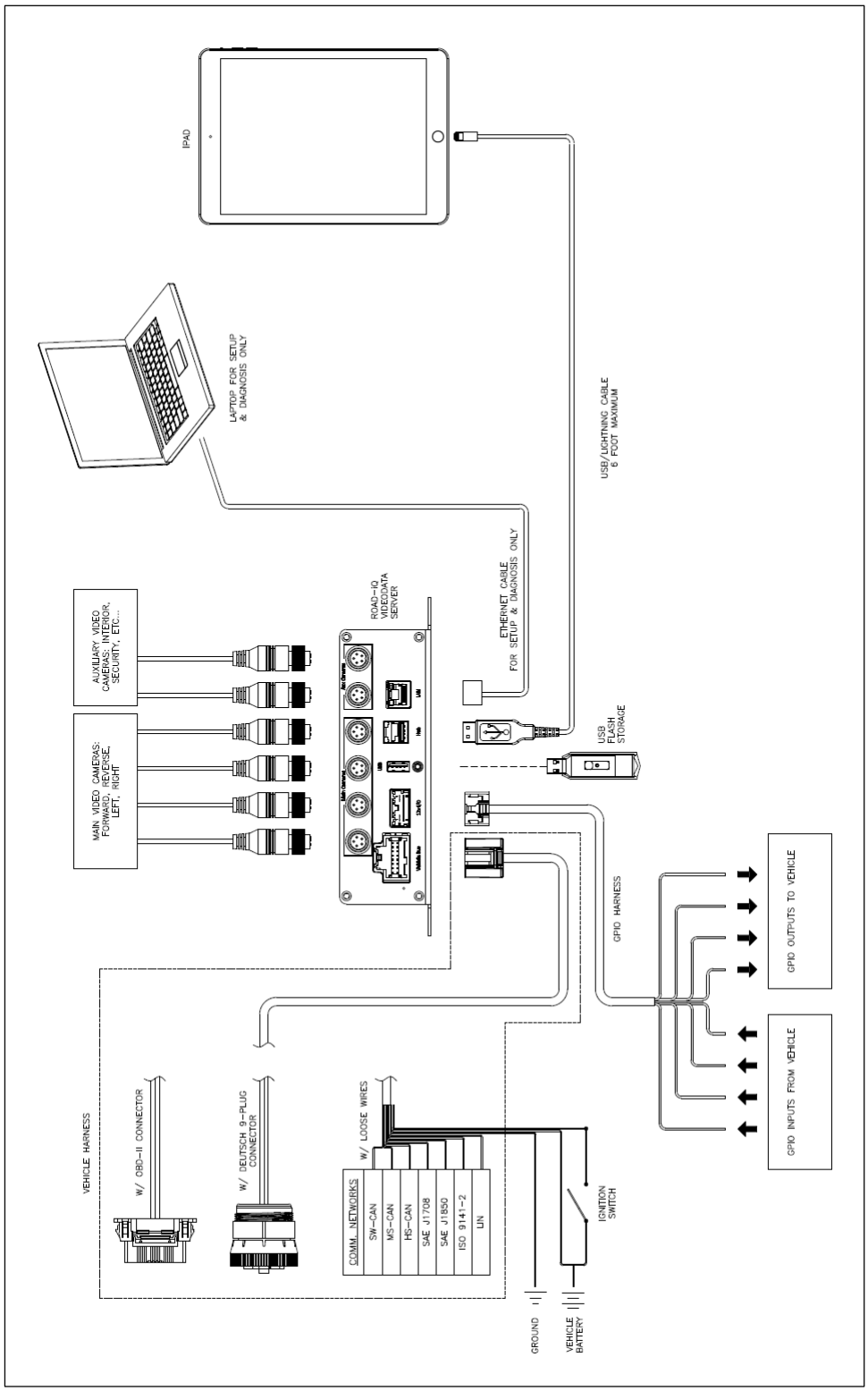
  A USB mass storage device must be a Flash or SSD drive, or an in-vehicle qualified hard-drive. In addition to providing additional storage capacity, a USB mass storage device allows recording of video when the iPad is not connected to the system, and is required to support remote video retrieval from the web.

The rule of thumb in determining how much storage capacity is required is X MB required per hour of recorded vehicle data, and Y MB required per hour of recorded video channel. For example, a system with 4 video channels, and recording vehicle data, will require (X+4Y) MB for every hour to be recorded. To retain 6 hours of recorded video and vehicle data, 6(X+4Y) MB of free storage space will be required.

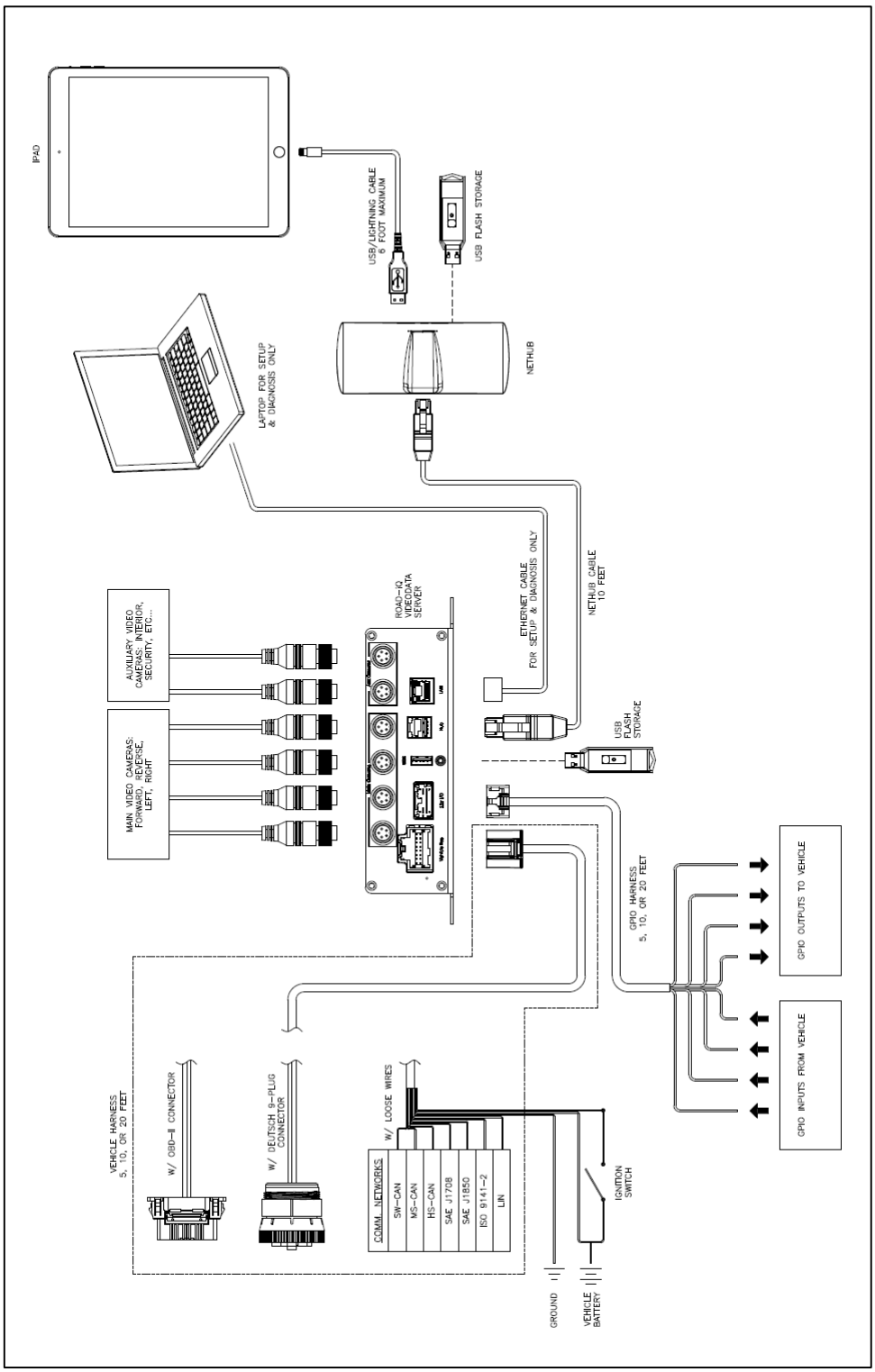
2 INSTALLATION

2.1 SYSTEM DIAGRAM

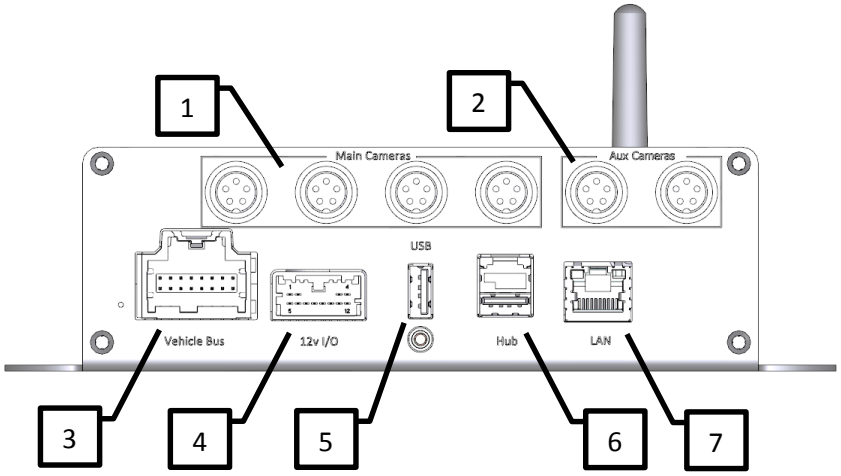
For a basic installation (without NetHub):


IPAD
LAPTOP FOR SETUP & DIAGNOSIS ONLY
USB/LIGHTNING CABLE 6 FOOT MAXIMUM
ETHERNET CABLE FOR SETUP & DIAGNOSIS ONLY
ROAD-IQ VIDEODATA SERVER
AUXILIARY VIDEO CAMERAS: INTERIOR, SECURITY, ETC...
MAIN VIDEO CAMERAS: FORWARD, REVERSE, LEFT, RIGHT
USB FLASH STORAGE
GPIO HARNESS
GPIO OUTPUTS TO VEHICLE
GPIO INPUTS FROM VEHICLE
VEHICLE HARNESS
W/ OBD-II CONNECTOR
W/ DEUTSCH 9-PLUG CONNECTOR
W/ LOOSE WIRES
COMM. NETWORKS
SW-CAN
MS-CAN
HS-CAN
SAE J1708
SAE J1850
ISO 9141-2
LIN
IGNITION SWITCH
GROUND
VEHICLE BATTERY

If installing a NetHub-equipped system, use the following diagram:

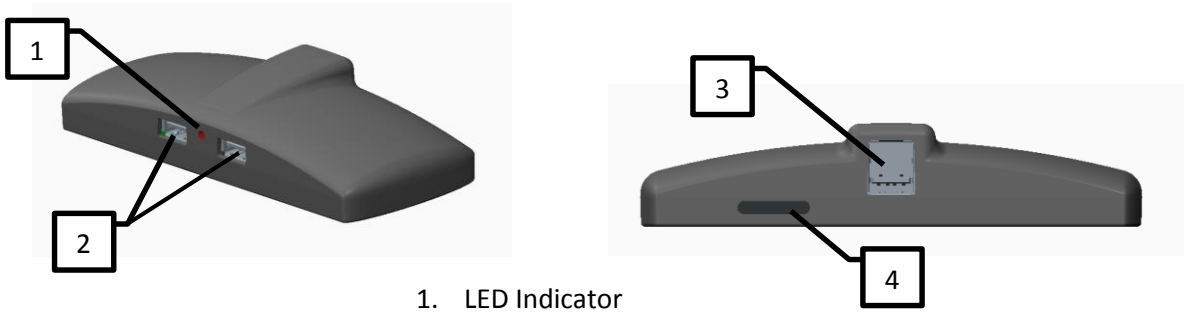


2.2 VIDEODATA SERVER FRONT PANEL



1. Main Camera Inputs
2. Auxiliary Camera Inputs
3. Vehicle Harness Connection
4. GPIO Harness Connection
5. USB Port
6. NetHub Connection
7. LAN Connection

2.3 NETHUB PORTS



1. LED Indicator
2. USB Ports
3. NetHub Cable Port
4. SIM Card Slot

2.4 Required Tools & Equipment

- Safety Glasses
- #2 Philips Head Screwdriver
- Wire cutters
- Wire strippers
- Crimp connectors
- Heat shrink tubing
- Power drill
- Drill bits (pilot holes for VDS mounting screws)
- Hole saws, various sizes as required to route wiring harnesses
- Rubber grommets, various sizes as required to route wiring harnesses
- Multimeter
- iPad or laptop with a web browser
    - Wi-Fi capability or Ethernet port & cable required

2.5 Warnings

- Always disconnect the vehicle battery when working on vehicle electrical systems
- Always use safe practices when creating new wiring connections

2.6 Planning Your Installation

There are some considerations that should be planned for before mounting the components or routing the harnesses of the Road-iQ Video Data Server. These considerations include:

- Location of the iPad
    - As the end user's primary point of contact with the system, the location of the iPad should typically take priority over the location of other system components.
    - It is recommended that the Lightning cable that connects to the iPad be a maximum of 2.5-feet in length, which will restrict the location of the other components in the system. This distance can be extended through use of either the NetHub, or a high-quality USB extension cable.
    - It is recommended that the iPad mounting location not obstruct the driver's view of the road, yet it should still be easily visible with a quick glance.
    - The recommended mounting location of the iPad is below the overhead storage compartments, centered left-to-right, which places the iPad where an automotive rear-view mirror would be located.

- Location of the NetHub
    - In addition to expanded system functionality, the optional NetHub also helps to extend the distance between the Road-iQ VideoData Server and the iPad. The maximum 2.5-foot long Lightning cable now plugs into the NetHub, which is connected to the Road-iQ VideoData Server by the NetHub cable (10 feet). See the diagrams in section 2.1 for more information on the connections between components.
    - The NetHub cable length will partly determine the available mounting locations for the VideoData server. Various lengths of NetHub cables are available if needed.

  - The NetHub should mount with a line-of-sight to a vehicle window to ensure adequate GPS and cellular reception.
  - Recommended locations for the NetHub, in order from best-to-worst, are:
    - Underside of the overhead storage (behind the iPad)
    - Driver or passenger kick-panel areas (similar to a brake controller)
  - Do not mount the NetHub in the following locations:
    - Inside any closed area (dash, glove-box, cabinet, etc…)
    - Close to high-power equipment (batteries, generator, etc…)

- Location of the Road-iQ VideoData Server
  - It is recommended that the Road-iQ VideoData Server, particularly the connections on the front panel, remain accessible by the end user for maintenance purposes.
  - The Road-iQ VideoData Server should be mounted on a flat and rigid surface. For best performance, the surface should be level as well. The unit contains inertial sensors which will require additional time to calibrate if the unit is mounted at an angle.
  - Do not mount the Road-iQ VideoData Server in following conditions:
    - Inside a sealed compartment; some airflow is required for component cooling.
    - High-vibration areas such as the engine-bay
    - High-moisture areas such as the vehicle exterior
    - Areas that pose a high risk for moisture or impact, such as the cabin floor, directly beneath a cup-holder, etc…
    - Inside metallic enclosures, or with the rear antenna close to a metallic surface; this can hinder the Wi-Fi performance of the system.
    - Do not locate close to a generator that can cause noise or interference

- Location of the vehicle diagnostic port or CAN-bus splice
  - If making a connection to a vehicle CAN-bus, the location of this connection must be determined.
  - This connection is made by connecting the vehicle harness to the vehicle's diagnostic port (OBDII, RV-C, or J1939), or by splicing into the desired network using a Y-adapter. Vehicle diagnostic ports are typically located under the vehicle dash on the driver's side, while a CAN-bus splice can be made anywhere on the network.
  - The location of this connection, as well as the length of the vehicle harness, will partly determine the available mounting locations for the Road-iQ VideoData Server.
  - The vehicle harness is available in a number of lengths to accommodate different installation needs. If using the vehicle harness with loose wires (no connector), the wires can also be extended during installation if needed.

- Length & Routing of the GPIO harness
  - The available length of the GPIO harness could limit mounting location of the server. The GPIO harness is available in a number of lengths to accommodate different installation needs. The wires can also be extended during installation if needed.

2.7 Mounting the iPad

2.7.1 Rosen Mount

-

2.7.2 RAM Mount

-

2.7.3 Padholdr Mount

-

2.8 Mounting the VideoData Server & NetHub

- When a mounting location for the Road-iQ VideoData Server has been determined, secure the unit to the surface using four (4) self-tapping screws through the four (4) mounting feet and screw into the mounting surface.

2.9 Powering the Road-iQ VideoData Server

- Connect the Vehicle Harness to the Road-iQ VideoData Server port labeled “Vehicle”:

- The vehicle harness wires needed for this step are colored as follows:

Function	Color
Power	Red
Ground	Black
ACC	Yellow / White

If using a vehicle harness with a diagnostic port connector, some or all of these functions may be provided through that connection. In these cases, some or all the wires shown above will already be installed to the diagnostic port connector.

- Connect the Vehicle Harness power wire (red) to the vehicle power bus (11-36V).
  - The power source must be capable of providing 3 amps
  - If it is desired that the Road-iQ VideoData Server be operational when the vehicle is shut off, the power wire should be connected to a constant power source (one that is not switched with the vehicle's ignition)
- Connect the Vehicle Harness ground wires (2X black) to a chassis ground.
  - Grounding best practice.
- Connect the Vehicle Harness ACC wire (yellow w/ white stripe) to a power source that is switched ON when the unit should be operational. By default, the ACC line acts to signal the VideoData Server to indicate when the unit should be operating. The ACC power source can be:
  - Switched with vehicle ignition, so that the Road-iQ VideoData Server operates only when the vehicle is operating.
  - Constant power through a toggle switch, allowing the end user to manually choose when the Road-iQ VideoData Server will operate

    Note: there is an additional ACC line included in the optional GPIO harness. This line, also yellow with a white stripe, can be used in place of the Vehicle Harness ACC line if it aids in the routing of the harnesses.

2.10 Connecting to the vehicle CAN-bus

- The remaining wires on the Vehicle Harness are for connecting to the vehicle's CAN-bus communication network. The wires are colored as follows:

Function	Color	Notes
SW_CAN	PURPLE	
LIN_BUS	WHITE	
HS_CAN_P	YELLOW	TWISTED PAIR
HS_CAN_N	YELLOW / BLACK	
J1708_P	BLUE	TWISTED PAIR
J1708_N	BLUE / BLACK	
MS_CAN_P	GREEN	TWISTED PAIR
MS_CAN_N	GREEN / BLACK	

- The CAN-bus can be accessed in a number of ways:
  - Through a diagnostic port connector installed on the Vehicle Harness
  - Using a Y-adapter at an existing CAN connection to add the server to the network
  - Splicing directly into the network wires

- If you will be using a diagnostic port connector (OBDII, J1939, and/or RV-C):

- Locate the vehicle's corresponding diagnostic port(s).
- Route the harness to that location
- Plug the connector into the port. If applicable, secure the connector to the port using the threaded ring on the connector.

- If you will be using a Y-adapter to join the network:
  - Route the Vehicle Harness's network connector to an already installed networked device.
  - Disconnect the device from the network
  - Install the Y-adapter between the device and the network harness, connecting the network harness and the device to the adapter.
  - Connect the Road-iQ VideoData Server's Vehicle Harness to the open connection on the Y-adapter. See the diagrams in section 8.1 for further clarification.

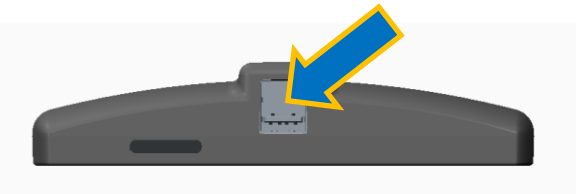
- If you will be splicing into the vehicle's network wires:
  - Locate the vehicle CAN-bus wires you will splice into
  - Route the corresponding twisted pair from the Vehicle Harness to the splice location
  - Splice the Vehicle Harness wires into the vehicle's network wires, taking care to preserve proper positive and negative wires.

2.11 Connecting the NetHub

Note: If not installing a NetHub-equipped system, please skip to section 2.12

- Connect the NetHub cable into the ROAD-IQ VIDEODATA SERVER port labeled "Hub", making sure that the orientation aligns with the keyed grooves:

- Connect the NetHub unit to the NetHub cable using the port on the rear of the hub:



- Verify the connection as the indicator light on the NetHub should illuminate continuously when the vehicle ignition is turned to ACC or ON, depending on how the ACC wire in section 2.9 was connected.

2.12 Connecting the GPIO Harness

Note: If not installing a GPIO-equipped system, please skip to section 2.13

- Connect the GPIO Harness to the VideoData Server port labeled I/O.

- GPIO harness wire colors are as follows:

	Number	Wire Color
Input	0	PURPLE
	1	PURPLE / GRAY
	2	GRAY
	3	GRAY / PURPLE
Output	0	BLUE
	1	BLUE / ORANGE
	2	ORANGE
	3	ORANGE / BLUE

- Inputs require a 3-36V signal to register ON.
- Inputs will register a pulsed signal of less than 5-seconds interval as ON; this allows vehicle functions such as turn signals to be used as a constant trigger.

- Outputs will provide a maximum of 500 mA @ 12V when activated.
- Connect the appropriate harness wires to the vehicle's wiring based on the desired functionality. By default, the Road-iQ VideoData Server is programmed for the following inputs and actions:

Input #	Trigger Input	Action
0	Drive	Displays 2 large side views w/ a small rear-view at the bottom of the screen
1	Reverse	Displays 2 small side views w/ a large rear-view at the bottom of the screen
2	Right Turn Indicator	Displays 1 large side view w/ a small rear-view at the bottom of the screen
3	Left Turn Indicator	Displays 1 large side view w/ a small rear-view at the bottom of the screen

A sample wiring diagram for this default application is included in the appendix.

2.13 Connecting the camera(s)

- Connect the vehicle cameras to individual threaded connectors on ROAD-IQ VIDEODATA SERVER:

- There are four (4) main camera channels and two (2) auxiliary cameras channels. Main camera channels are those that can be displayed while driving. These are typically used for front-facing, rear-facing, and blind spot cameras. Auxiliary cameras will be recorded, and can be accessed through the remote functions of the app, but are not displayed while driving. The
- The six (6) threaded camera connectors correspond to video channels 1 through 6 (video channel 7 uses the forward camera on the iPad to monitor the driver). The iPad display orientations are designed around the following channels:

Channel	Camera
1	Front-facing
2	Vehicle left-side

3	Vehicle right-side
4	Rear-facing
5	Auxiliary
6	Auxiliary
7	iPad, driver-facing

3 SETUP

3.1 ACCESSING THE INSTALLER CONTROL PANEL

The Installer Control Panel is the tool used to access and modify the settings of the VideoData Server, as well as to check for and initiate firmware updates. The setup process is begun by connecting a web-browser equipped computer (tablet, laptop or desktop) to the VideoData Server. There are multiple options for making this connection and accessing the installer control panel:

1. Through a laptop using an Ethernet cable connected to the server
2. Through a laptop or tablet using a Wi-Fi connection to the server
3. Through an iPad using a Lightning cable & the Road-iQ app

- To connect the Road-iQ VideoData Server to a laptop using an Ethernet cable, connect the cable between the LAN port on the Road-iQ VideoData Server and the Ethernet port on the computer.

- To connect the Road-iQ VideoData Server to a laptop or tablet using a Wi-Fi connection, browse the available Wi-Fi networks, select the network named “Road-iQ,” and enter the default password.
- To connect the Road-iQ VideoData Server to the iPad, install the Road-iQ app on the iPad (see section 3.11), and ensure that the iPad is connected to the Road-iQ VideoData Server as it would normally be used.

- If you *are not* accessing the installer control panel through the Road-iQ app, open the web browser on the laptop or tablet. Enter the VideoData Server's local IP address (https://192.168.2.1) into the address bar, and press enter.
- If you *are* accessing the installer control panel through the Road-iQ app, launch the app…

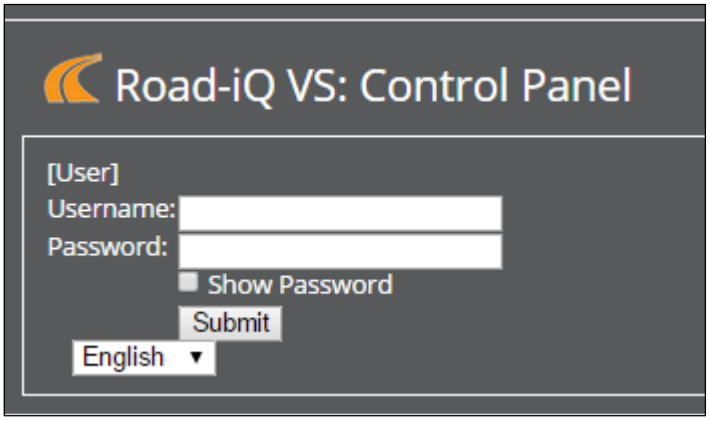
- The Road-iQ VideoData Server home page should appear on the screen. Click the 'Control Panel' link to access the Installer Control Panel:

HOME PAGE SCREENSHOT

- The Installer Control Panel should load and appear as below:

SCREENSHOT OF CONTROL PANEL DEFAULT GUEST PAGE W/ BLANK LOGIN FIELDS

Administrator privileges are required to complete the installation process. To login as an administrator, enter the username and default password in the fields below the Road-iQ logo and click 'Submit':



Username: admin

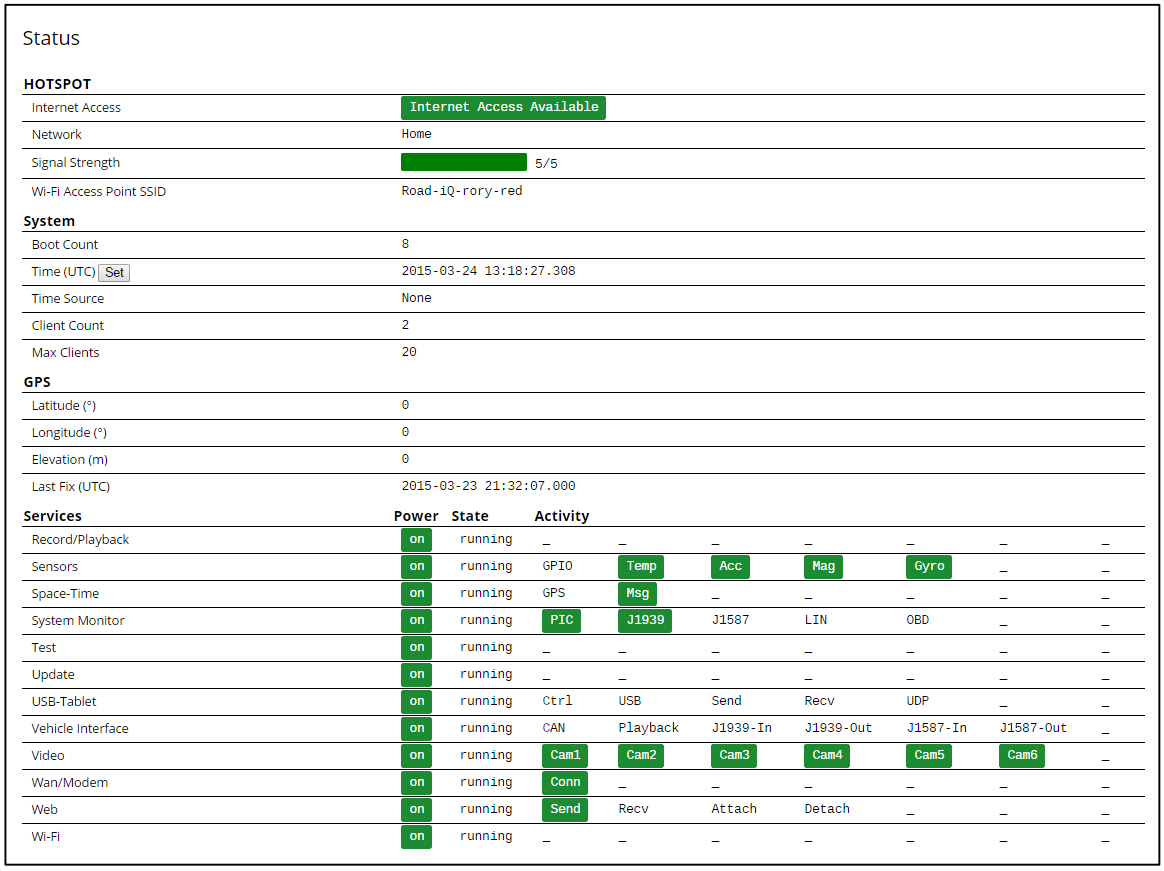
Default Password: admin

Upon logging in as an administrator, the default screen will show more information than was available as a 'guest':

SCREENSHOT OF DEFAULT ADMIN SCREEN

3.2 Control Panel 'Status' Screen

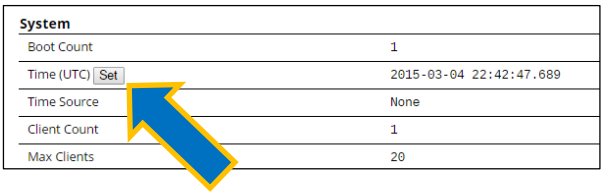
The 'Status' screen shows the current status of various system parameters. The indicators in the 'Services' section are color coded, based on their current status. An indicator highlighted in green indicates that the service is present and operational. An indicator highlighted in yellow... See the appendix for further descriptions of the information shown on the control panel screens.



Status

HOTSPOT									
Internet Access	Internet Access Available								
Network	Home								
Signal Strength	5/5								
Wi-Fi Access Point SSID	Road-iQ-rory-red								
System									
Boot Count	8								
Time (UTC) Set	2015-03-24 13:18:27.308								
Time Source	None								
Client Count	2								
Max Clients	20								
GPS									
Latitude (°)	0								
Longitude (°)	0								
Elevation (m)	0								
Last Fix (UTC)	2015-03-23 21:32:07.000								
Services	**Power**	**State**	**Activity**						
Record/Playback	on	running	_	_	_	_	_	_	_
Sensors	on	running	GPIO	Temp	Acc	Mag	Gyro	_	_
Space-Time	on	running	GPS	Msg	_	_	_	_	_
System Monitor	on	running	PIC	J1939	J1587	LIN	OBD	_	_
Test	on	running	_	_	_	_	_	_	_
Update	on	running	_	_	_	_	_	_	_
USB-Tablet	on	running	Ctrl	USB	Send	Recv	UDP	_	_
Vehicle Interface	on	running	CAN	Playback	J1939-In	J1939-Out	J1587-In	J1587-Out	_
Video	on	running	Cam1	Cam2	Cam3	Cam4	Cam5	Cam6	_
Wan/Modem	on	running	Conn	_	_	_	_	_	_
Web	on	running	Send	Recv	Attach	Detach	_	_	_
Wi-Fi	on	running	_	_	_	_	_	_	_

The only setting that can be changed on the 'Status' screen is the time & date. Typically the time & date will be set via GPS by way of the iPad, but it can be overridden if necessary. To override the time & date settings, click the 'Set' button:



System	
Boot Count	1
Time (UTC) Set	2015-03-04 22:42:47.689
Time Source	None
Client Count	1
Max Clients	20

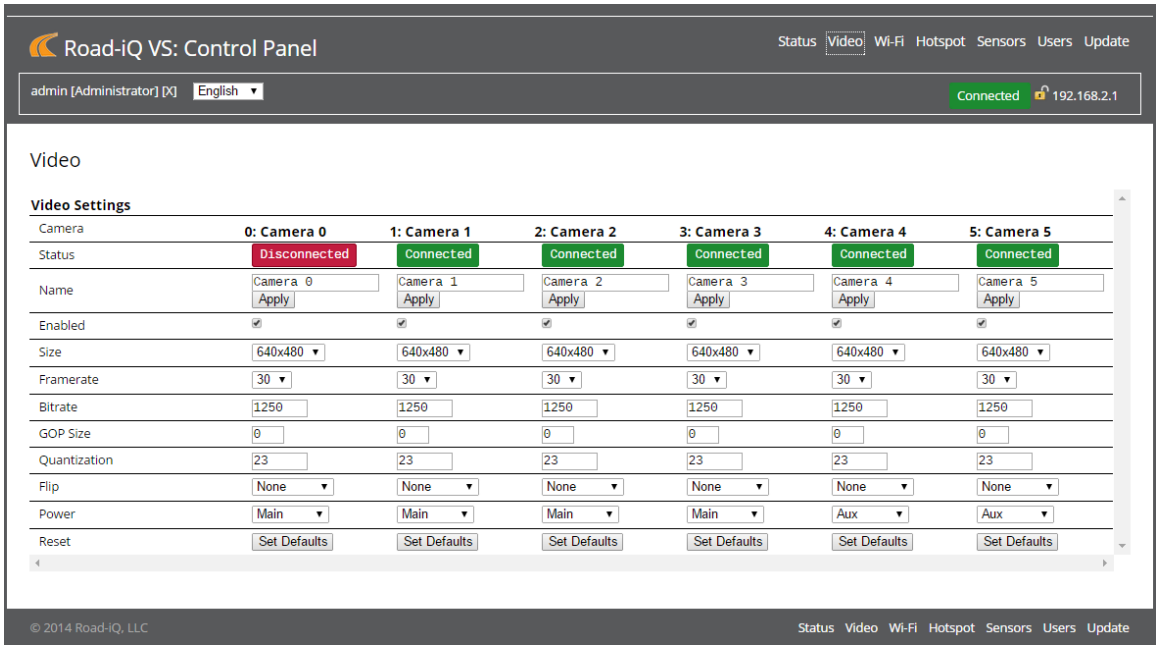
Set the correct time & date, then click the 'Apply' button:

INSERT SCREENSHOT

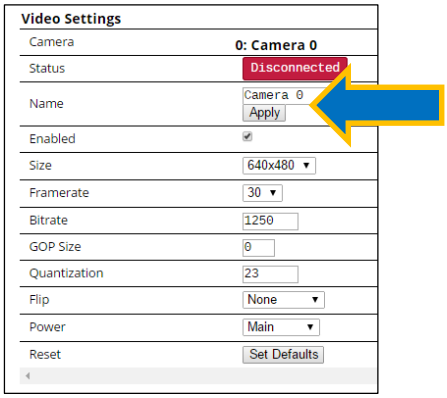
The 'Time Source' should now be set to 'User'.

3.3 VIDEO SETUP

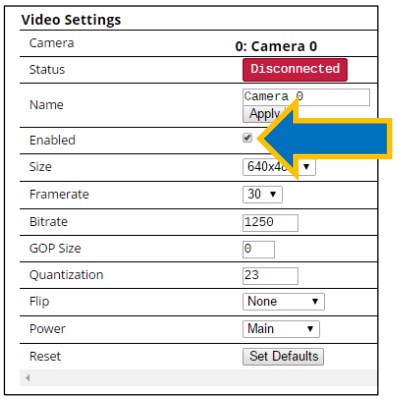
Clicking 'Video' on the Installer Control Panel brings up the 'Video Settings' page:



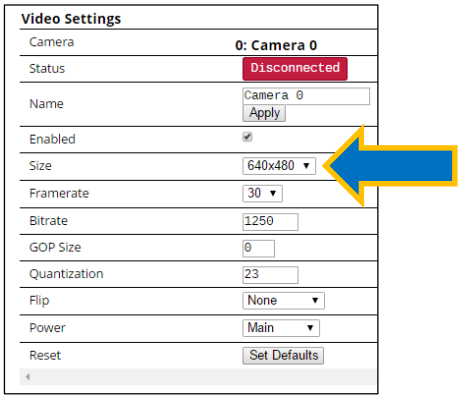
The name of a camera can be changed to better indicate what the camera is viewing (i.e. 'Front', 'Rear', 'Left', 'Right', etc…) To change the camera name, edit the text in the 'Name' field and click 'Apply':



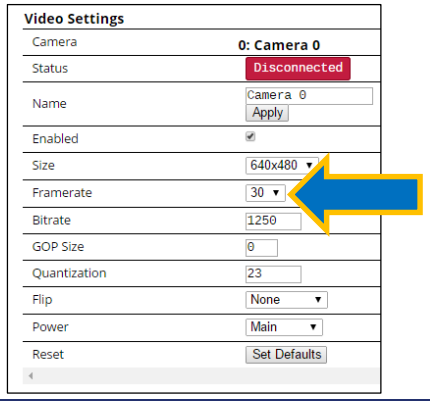
By default, all camera channels are enabled. If the Road-iQ VideoData Server is being installed in a vehicle with fewer than 6 cameras, the unused channels should be disabled to minimize power and storage consumption. If a channel is enabled without a camera connected, the channel will display and record a test pattern (color bars). Disable the channel by un-checking the 'Enabled' box:



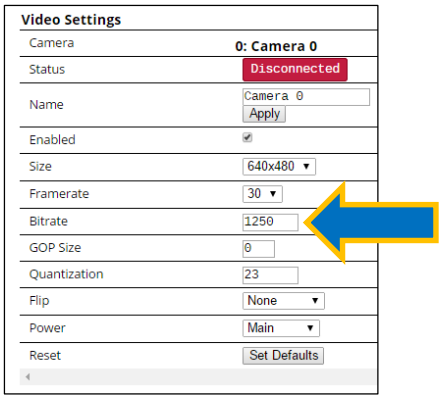
The 'Size' setting controls the picture dimensions of the recorded video. A larger picture size will offer more resolution, but only if the camera can support a picture of that size and will always increase the storage size of the file. The 'Size' setting is set by default to the optimal setting for Velvac cameras, but can be changed from the dropdown if necessary:



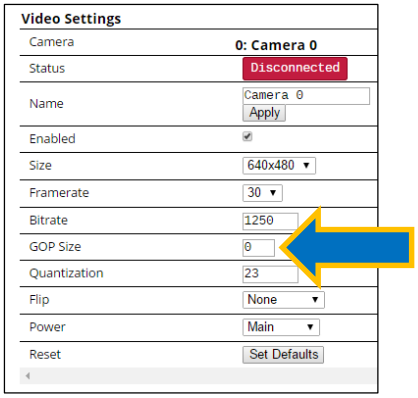
The framerate of the recorded video can be adjusted to allow for either smoother video or smaller file size. The default setting of 30 frames per second (fps) provides a reasonable compromise between the two, but can be adjusted by selecting a framerate from the dropdown:



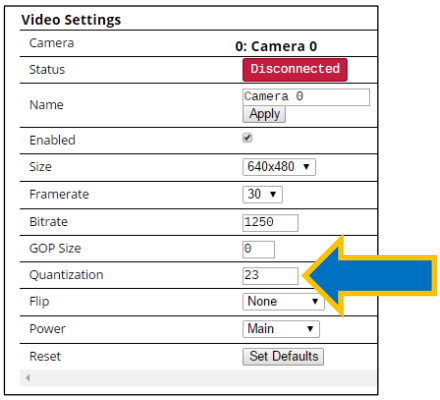
The recording bitrate can be adjusted. Bitrate adjustments are a tradeoff between video quality and bandwidth usage. A high bitrate will result in a higher quality video but will consume more bandwidth. As with framerate, the default setting is a good compromise, but it can be adjusted by changing the number in the 'Bitrate' field:



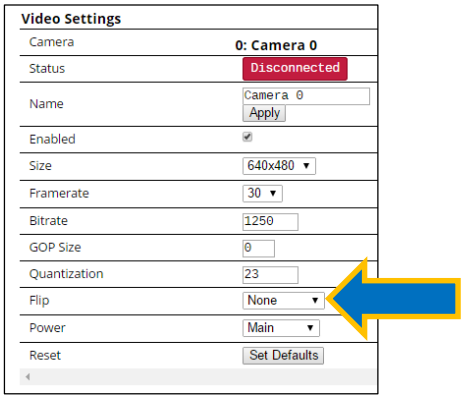
The GOP (group of pictures) size can be adjusted. The GOP size primarily affects how soon the iPad can sync the video when starting up. A higher GOP size will consume less bandwidth, but video syncs will take more time. The video quality will also degrade with a higher GOP size. As with the other recording parameters, the default setting provides a good compromise, but it can be adjusted by changing the number in the 'GOP Size' field:



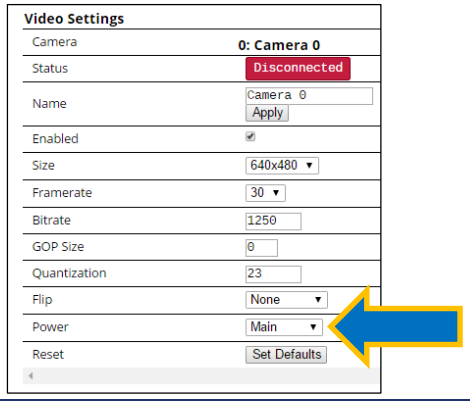
The recording quantization can be adjusted:



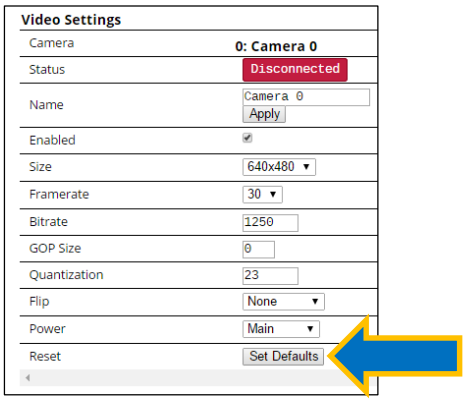
Camera images can be flipped (mirrored) either horizontally or vertically, before being displayed and recorded. This is typically used in rear-facing applications (blind-spot and backup cameras) to give the driver an image that is consistent with what they would see in a rearview mirror. By default, 'Flip' is set to 'None'. To flip an image, select either 'Horizontal' or 'Vertical' from the 'Flip' dropdown:



The camera channel power supply can be changed. The main & auxiliary power supplies can be controlled independently, allowing main & auxiliary cameras to be powered on/off separately. To change the power setting, select either 'Main' or 'Aux' from the 'Power' dropdown:



The channel settings can also be reset to their default settings by clicking the 'Set Defaults' button:



3.4 Cellular Service Setup

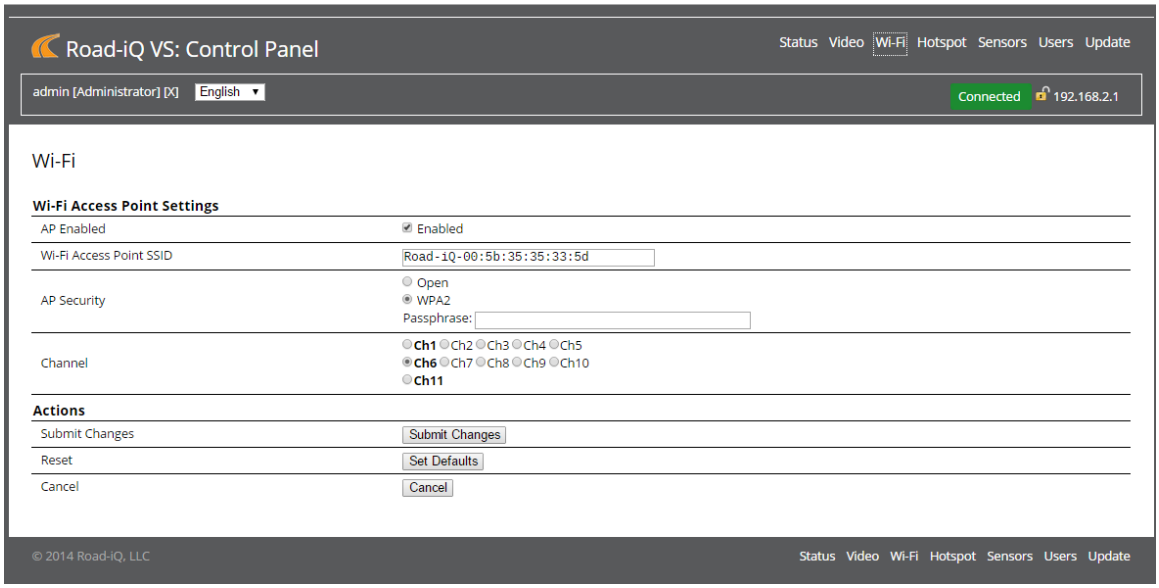
The following cellular service packages are available through Velvac & Verizon Wireless:

Call Velvac Customer Service at 800-783-8871 between the hours of X AM & Y PM Central to setup cellular service. Please have the following information ready:

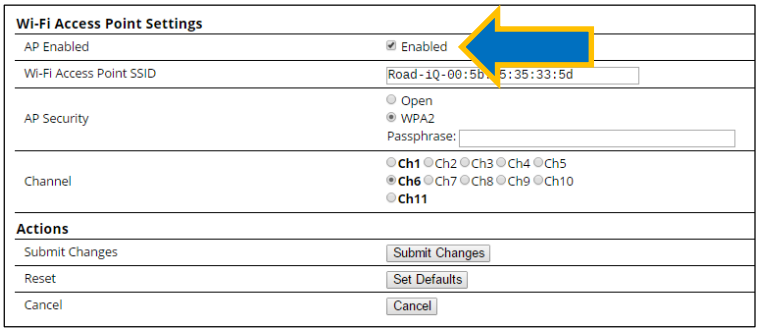
-

3.5 Wi-Fi Setup

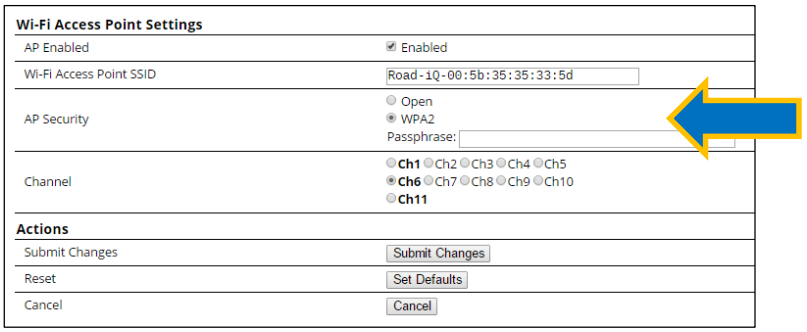
Clicking 'Wi-Fi' on the Installer Control Panel brings up the 'Wi-Fi' page:



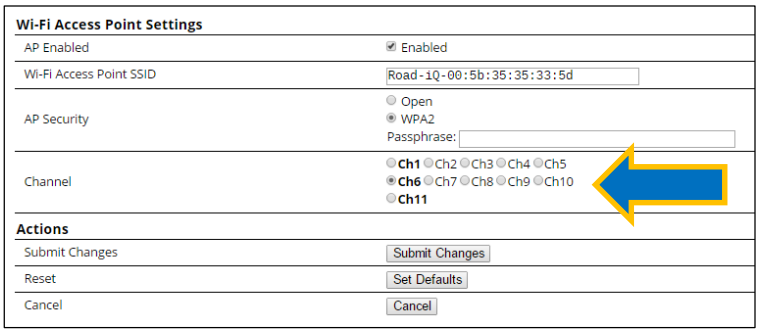
The Wi-Fi Access Point settings control the connectivity for communication and data-transfer (not internet access) between the Road-iQ VideoData Server and the iPad, allowing users to wirelessly access the server. By default the Wi-Fi Access Point (AP) is enabled. To disable the Wi-Fi Access Point, uncheck the box for 'AP Enabled':



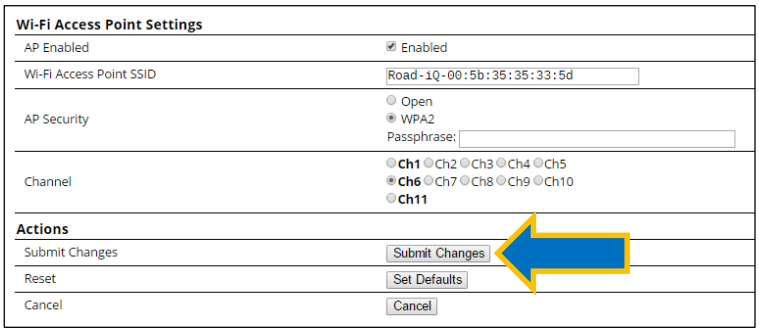
To secure the Wi-Fi Access Point and limit access to the server the WPA2 security protocol can be enabled by selecting 'WPA2' in the AP Security section. A passphrase is required for access under WPA2. Enter the desired passphrase in the passphrase box:



The Wi-Fi channel used can be changed by selecting the desired channel's radio button:



If any changes have been made to the Wi-Fi Access Point settings, the changes must be applied to the server by clicking 'Submit Changes':



Wi-Fi Access Point settings can also be reset to the default settings by clicking 'Set Defaults'. Any setting changes that have not been submitted can be abandoned by clicking 'Cancel'.

3.6 HOTSPOT INFO & SETUP

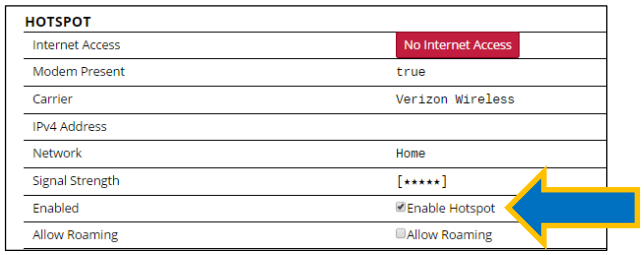
Clicking 'Hotspot' on the Installer Control Panel brings up the 'Hotspot' screen:

Hotspot

HOTSPOT

Internet Access	Internet Access Available
Modem Present	true
Carrier	Verizon Wireless
IPv4 Address	100.123.5.141
Network	Home
Signal Strength	5/5
Enabled	Enable Hotspot
Allow Roaming	Allow Roaming
Manufacturer	Telit
Model	LE910-SVG
Revision	17.00.573
Serial Number	353238060041489
SIM ID	89148000000734721740
Type	4
Phone Number	
Mode	LTE
Power	On
Network	Home
Signal Quality	99
Location Code	521
Cell Id	22294
Registration	Home
Status	Unknown
SIM Status	Valid
APN1	vzwims
APN2	vzwadmin
APN3	vzwinternet
APN4	vzwapp
APN5	

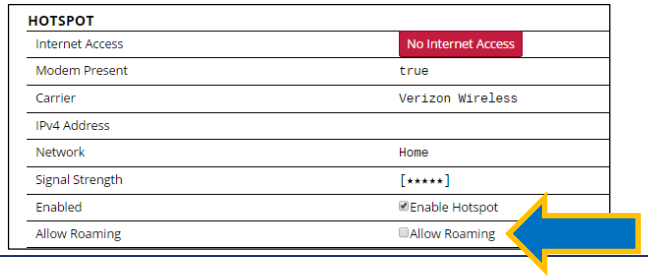
By default hotspot and roaming functionality are enabled. To disable hotspot functionality entirely, uncheck the 'Enable Hotspot' box:



HOTSPOT

Internet Access	No Internet Access
Modem Present	true
Carrier	Verizon Wireless
IPv4 Address	
Network	Home
Signal Strength	[*****]
Enabled	Enable Hotspot
Allow Roaming	Allow Roaming

In order to avoid excessive cellular data charges, users may want hotspot functionality to be disabled while roaming. To automatically disable the hotspot while roaming uncheck the 'Allow Roaming' box:

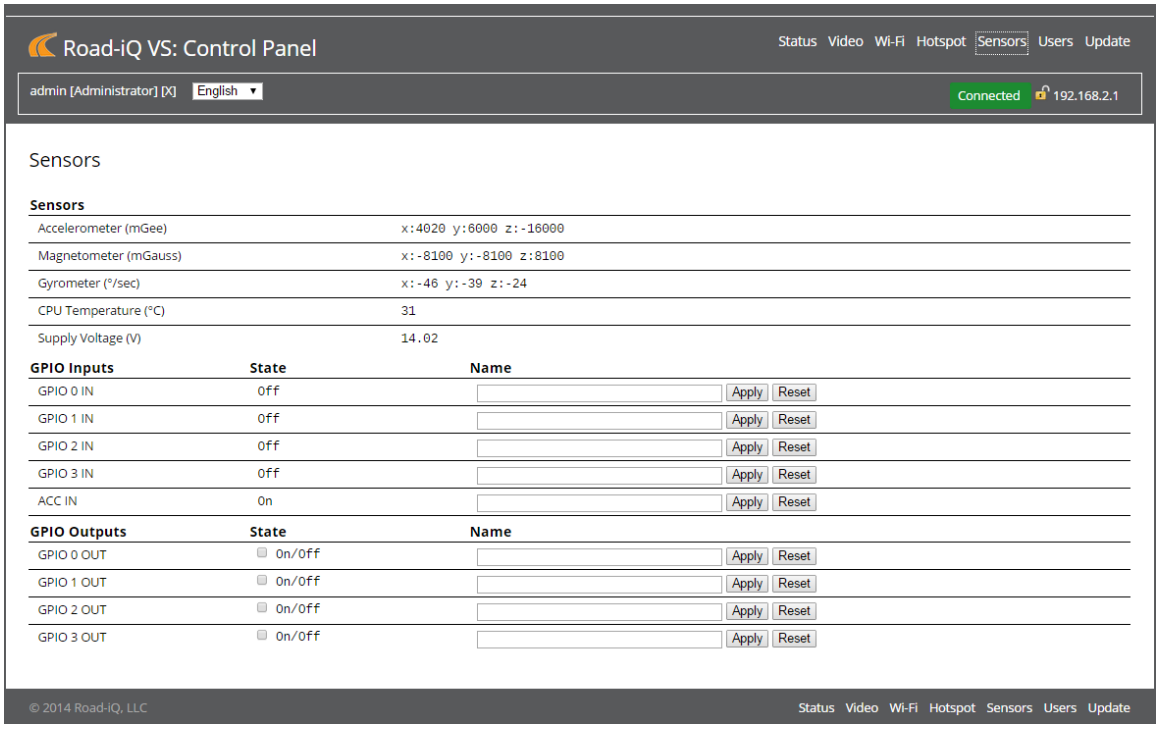


HOTSPOT

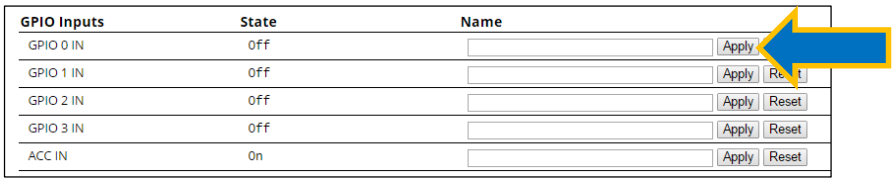
Internet Access	No Internet Access
Modem Present	true
Carrier	Verizon Wireless
IPv4 Address	
Network	Home
Signal Strength	[*****]
Enabled	Enable Hotspot
Allow Roaming	Allow Roaming

3.7 SENSORS INFO & SETUP

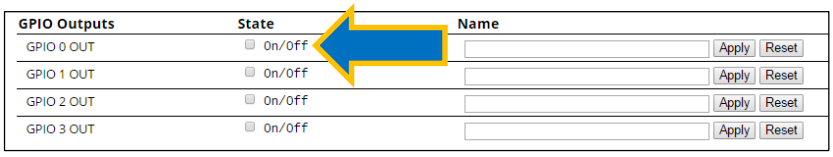
Clicking 'Sensors' on the Installer Control Panel brings up the 'Sensors' page:



GPIO inputs will indicate their current state ('On' or 'Off'). A name can be applied to the input to identify how it is being used. Enter the name for the input in the 'Name' field and click 'Apply':



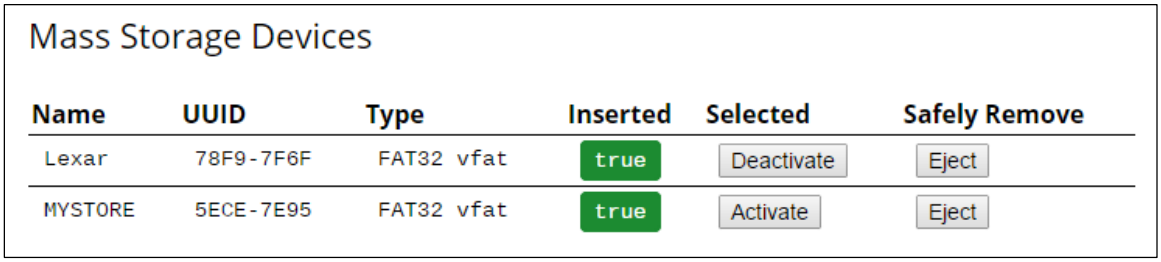
GPIO outputs are OFF when unit boots. The state of the output can be toggled between 'On' and 'Off'. If an output is to be used it must be toggled 'On'. To toggle 'On', check the box next to 'On/Off' for the desired output:



GPIO outputs can also be renamed following the same process as the inputs. The logic to control the behavior of the GPIO outputs is set and controlled through the iPad app. The setup for output logic and behavior is covered in a later section.

3.8 STORAGE SETUP

Clicking 'Storage' on the Installer Control Panel brings up the 'Storage' page. This page shows the various data storage options currently available, indicates if the device is currently in use, and allows the user to eject/unmounts any of the storage devices:



- Name: The name of the storage device
- UUID: Universally-unique identifier of the storage device
- Type: Format of the storage device

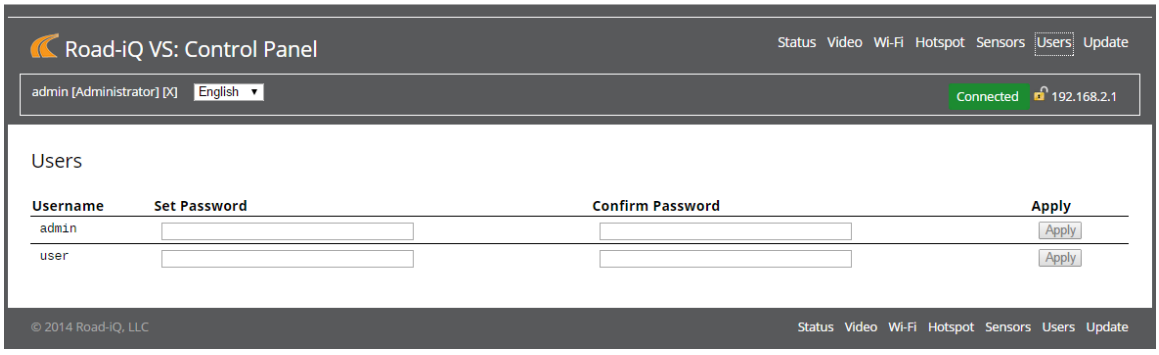
For a given storage device, the 'Inserted' column will read 'true' if the storage device is inserted into the system, either at the NetHub or at the Road-iQ VideoData Server itself. This column will show all devices currently inserted into the system, whether they are in use or not.

To record to a mass-storage device, click the 'Activate' button of the device you wish to record to. To stop recording to a certain device, click the 'Deactivate' button of the device.

To safely remove a mass-storage device from the system, click the 'Eject/Unmount' button next to the device name and wait for the indication that the device is now OK to be removed.

3.9 USERS SETUP

Clicking 'Users' on the Installer Control Panel brings up the 'Users' page:

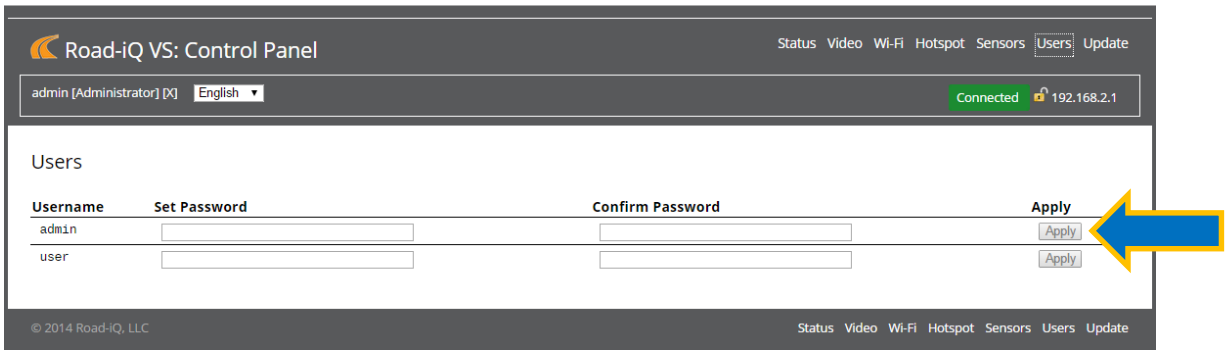


User logins are used for security purposes, to prevent unauthorized persons from making configuration changes or otherwise taking control of the device. Guests (no login necessary) can view most info, but cannot change any settings. Users can most info and change some settings. Admins can view all info and change all settings. Default usernames and passwords are:

Username	Password

admin	admin
user	user

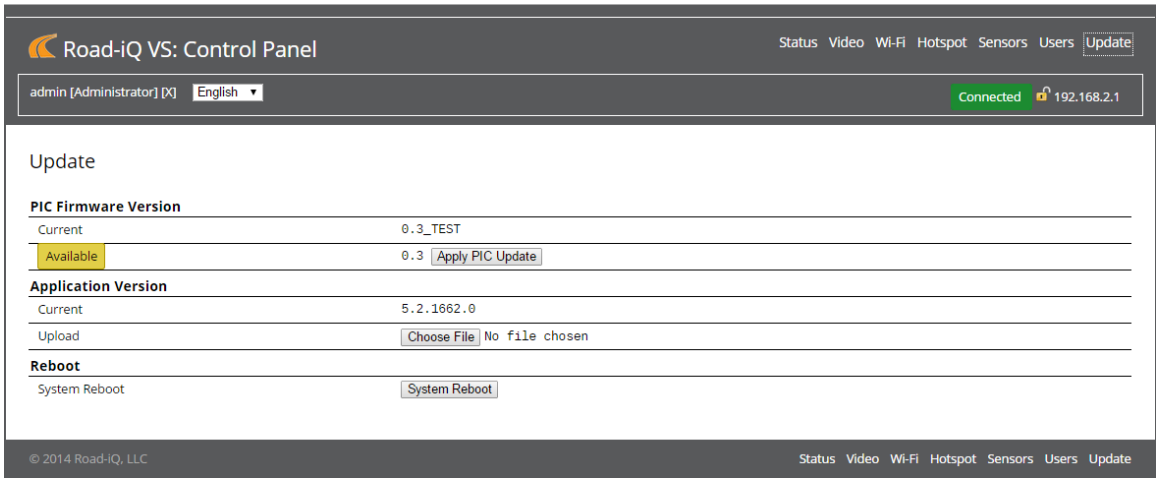
User passwords can be changed on the 'Users' screen by setting & confirming the new password in the two open fields and clicking 'Apply':



The user passwords that are available to be reset are dependent upon which user is currently logged in. The administrator, for example, can change passwords for both 'admin' and 'user', while the user can only change the 'user' password.

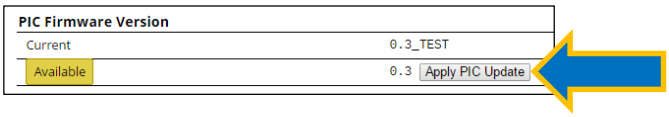
3.10 System Updates

Clicking 'Updates' on the Installer Control Panel brings up the 'Updates' page:

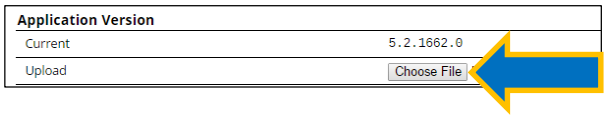


- PIC Firmware Version: Indicates the current PIC firmware version and notifies if a new version is available.
- Application Version: Indicates the current Application Version loaded.
- Reboot: Click 'System Reboot' to reboot the system.

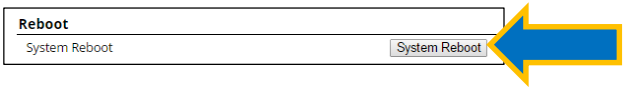
An indicator will automatically appear on the 'Update' page if an update for the PIC Firmware is available. To apply the update, click the 'Apply PIC Update' button:



The current version of the Road-iQ software is shown under 'Application Version'. The software can be updated by clicking the 'Choose File' button and browsing to the replacement file:



The entire system can also be rebooted by clicking the 'System Reboot' button:



3.11 Installing the Road-iQ App

To install the Road-iQ App, load the Apple App Store on the iPad. Use the search function to search for Road-iQ':

IMAGE OF SEARCH BAR

Tap on the 'Road-iQ' app in the search results. When the app page loads, tap 'Install'. When the terms & conditions prompt appears, review the terms & conditions and tap 'Accept'. The app installation should now begin.

3.12 Connecting the iPad and the Road-iQ VideoData Server

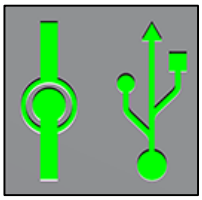
To connect the iPad to the Road-iQ VideoData Server, first plug the Lightning USB cable into the server's 'USB' port, or into either USB port on the NetHub (if equipped).

DIAGRAM

Next, power the Road-iQ VideoData Server by turning the vehicle ignition to the 'ON' position.

> Note: When the Road-iQ VideoData Server is powered depends upon how the ACC line was wired in section 2. The Road-iQ VideoData server operates only when receiving a 12V signal on the ACC line.

From the iPad home screen, tap the 'Road-iQ' app icon to launch the app. When the app loads, verify connection between the iPad and the Road-iQ VideoData Server. The 'Connections' icon on the top right of the screen should be green in color:



3.13 App Setup

- Defining GPIO behavior
- Video streams to display
- Data to display
- Where to record

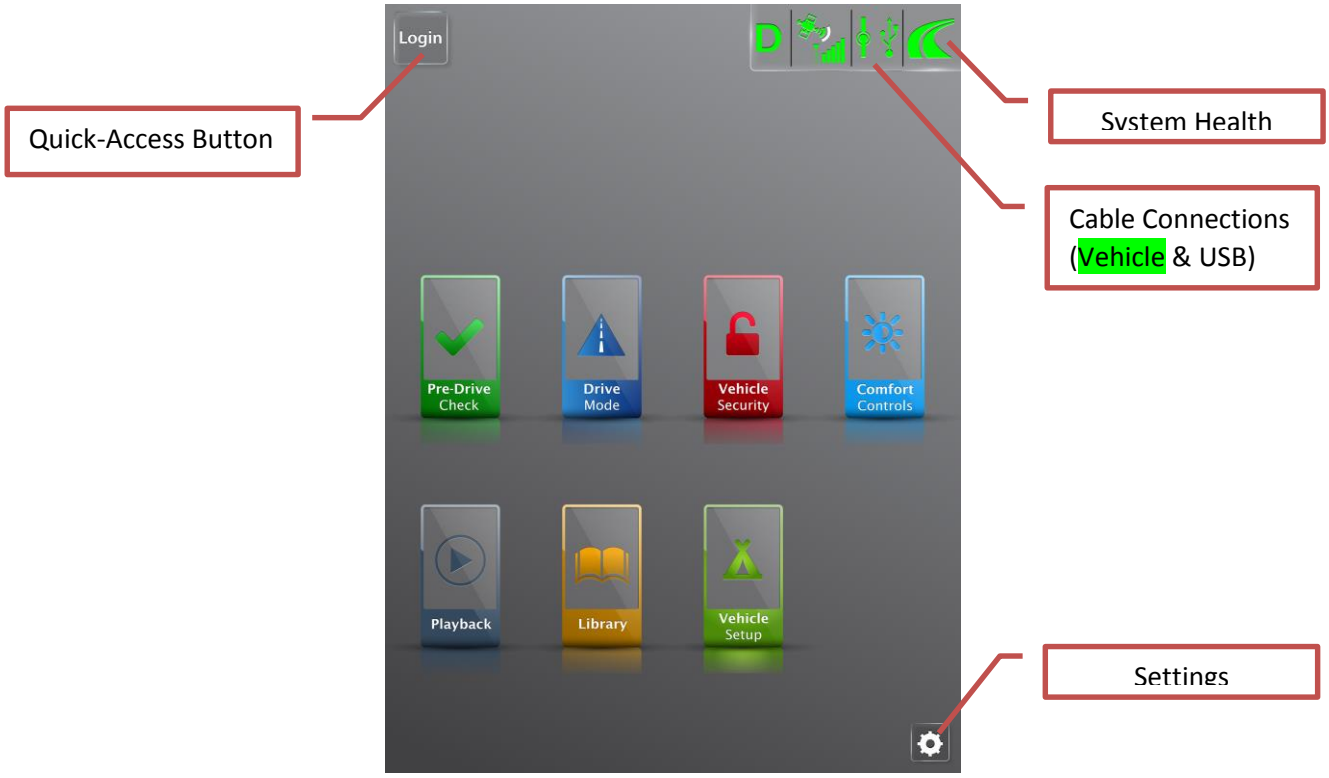
3.14 Verify Operation

- Verify Indicator Statuses:
  - All indicators should be green.
  - No warnings
- Pre-Drive Check:
  - Verify data received
  - Verify functions (lights, indicators, etc…)
- Drive Mode:
  - Verify function of video streaming
  - Verify display of vehicle data (Gauges, Summary)
- Command Center Functions:
  - Verify data received (water & gas levels, etc..)
  - Verify functions (Level, Slides, Awning)
- Vehicle Security:
  - Verify
- Test Drive:
  - Verify GPS function
  - Snapshot function?
- Playback:
  - Verify access to, and playback of, recorded video (all channels)
  - Verify access to, and playback of, recorded data.
  - Verify snapshot function
-

4 OPERATION

4.1 GETTING STARTED

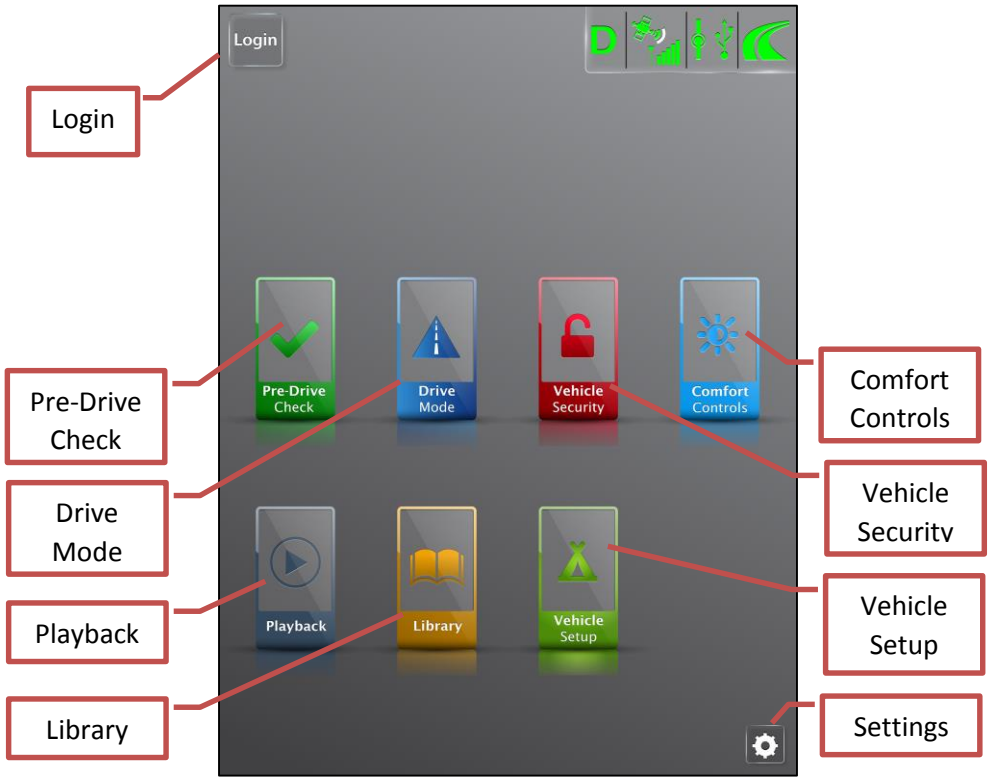
From the iPad home screen, tap the icon for the ROAD-IQ VIDEODATA SERVER App. An intro screen should appear for a few moments while the application loads. Once the application is loaded, there are a few status indicator icons and buttons that are common to every screen in the application:



- The system mode icon indicates whether the system is in 'Drive' mode or 'Park' mode.
- The signal reception icon indicates the strength of both GPS and cellular signals being received.
- The cable connections icon indicates the connection status of vehicle & USB connections.
- The Road-iQ logo indicates system health. A green logo indicates that all systems are normal; yellow indicates a slight error that needs to be resolved; red indicates a system malfunction.
- The quick-access button in the upper left corner provides a quick link to commonly used sections of the application, such as the comfort controls or video playback.
- Most screens will have a "Settings" or "Favorites" button in the bottom right corner.

4.2 Home Screen

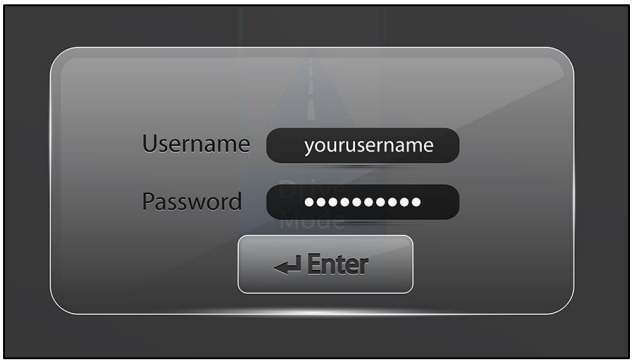
The home screen of the Road-iQ VideoData Server App provides access to the various functional areas of the application:



The 'Login' icon in the upper-left corner allows the user to login as either an administrator or a user. Before logging in, the user is treated as a 'guest'. The type of login (admin vs. user) determines the settings that can be accessed and changed; administrators will have more rights than users:

TABLE W/ AVAILABLE ACTIONS VS. LOGIN

Tap the 'Login' icon, enter your credentials in the login window (shown below), and press 'Enter':



At lower-right corner, tapping the 'Settings' icon allows the user to access and modify system settings.

In the center of the home-screen are seven icons which lead into the unique modes of the app:

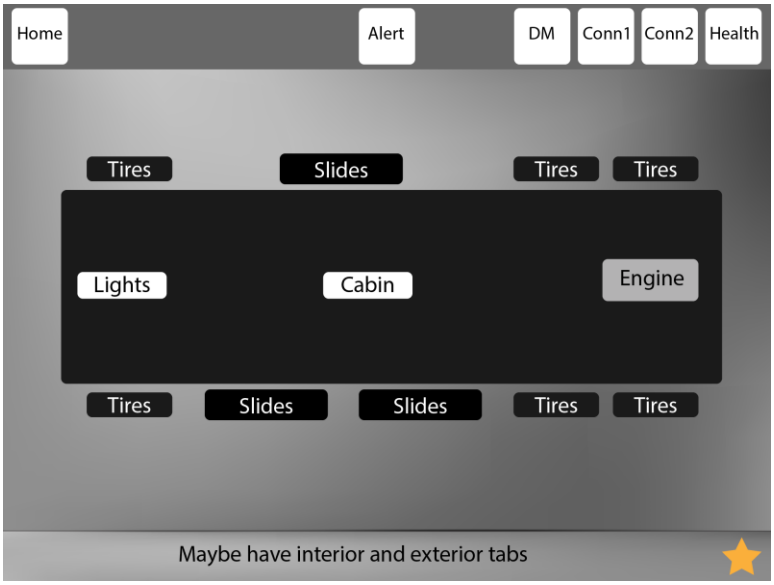
- Pre-Drive Check: Provides the current status of important vehicle systems, as well as remote operation of

some vehicle functions, allowing the user to quickly and easily assess the roadworthiness of the vehicle.

- Drive Mode: Access to live-streaming video and live data display, for use when driving.
- Vehicle Security: Access to live-streaming video for security monitoring.
- Comfort Controls: Remote controls for various interior comfort systems such as HVAC and lighting.
- Playback: Access to recorded video and data for playback.
- Library: Access to the Road-iQ VideoData Server Owner's Manual and other technical documentation.
- Vehicle Setup: Remote controls for vehicle systems used in campground setup, such as slides, levels, awnings, etc…

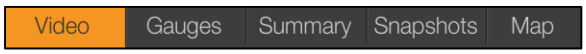
4.3 Pre-Drive Check

From the app home screen, tapping the 'Pre-Drive Check' icon will load the 'Pre-Drive Check' function of the app, seen below:



4.4 Drive-Mode

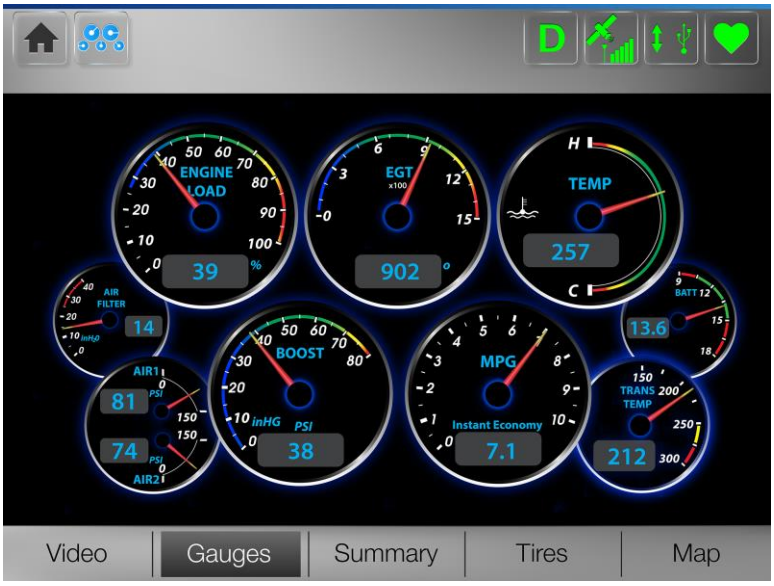
From the Road-iQ App home screen, tapping the 'Drive Mode' icon will launch the 'Drive Mode' functions of the app. Drive Mode provides the user with any information that may be needed while driving, including live video streams from the rear- and side-view cameras, live data display in a virtual gauge cluster, status summary of various vehicle systems, snapshot timeline, and GPS navigation. The user can navigate between the different Drive Mode functions by way of the tabs at the bottom of the screen:



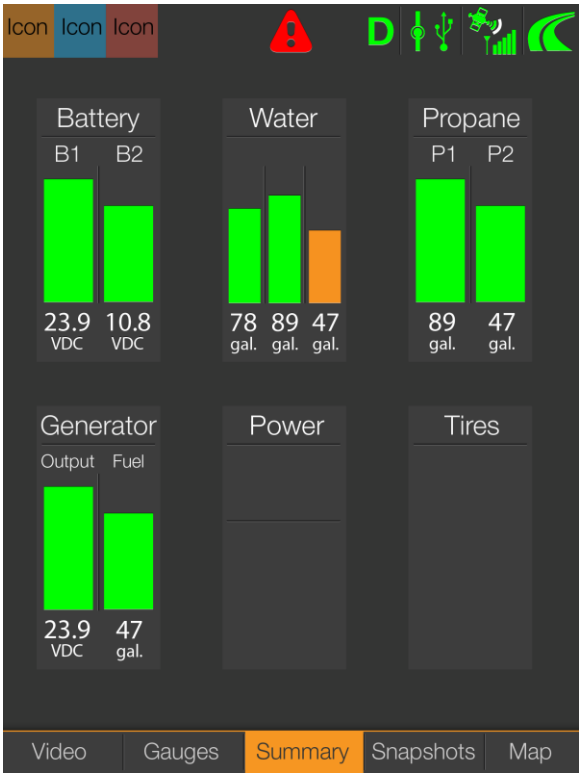
4.4.1 Live Streaming Video

When 'Drive-Mode' is first entered, live video streams are displayed.

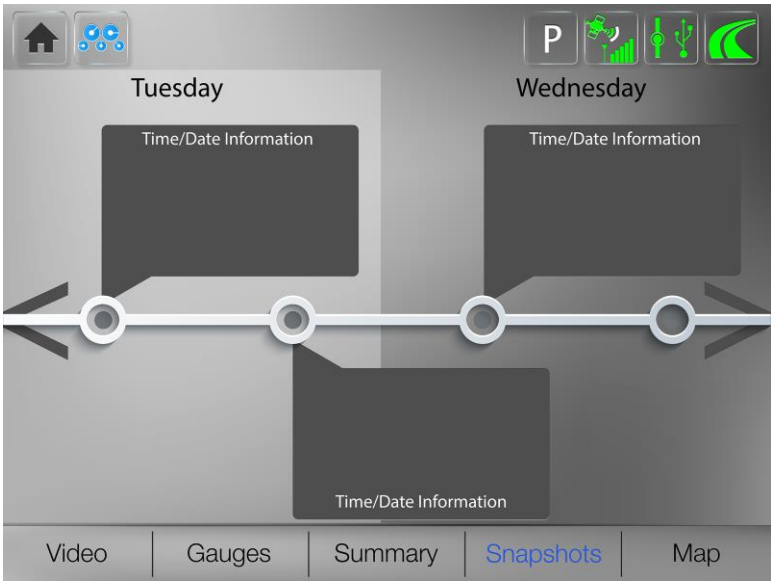
4.4.2 Gauges



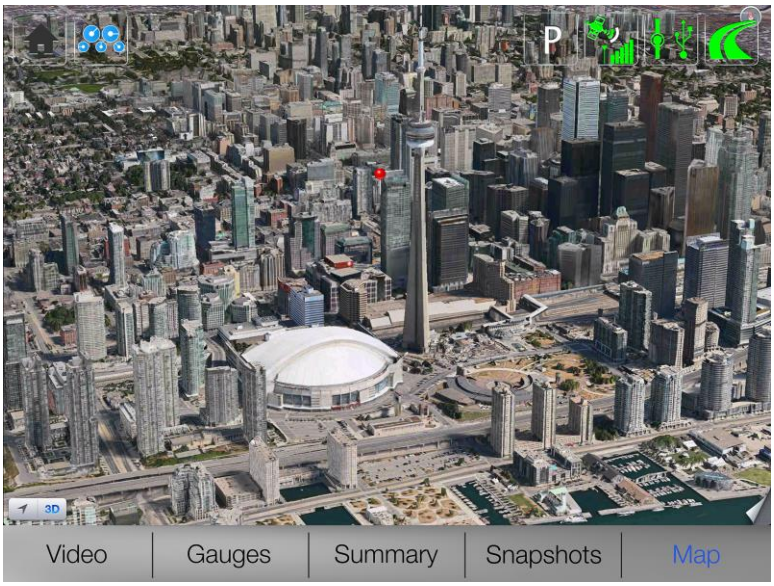
4.4.3 Summary



4.4.4 Snapshots



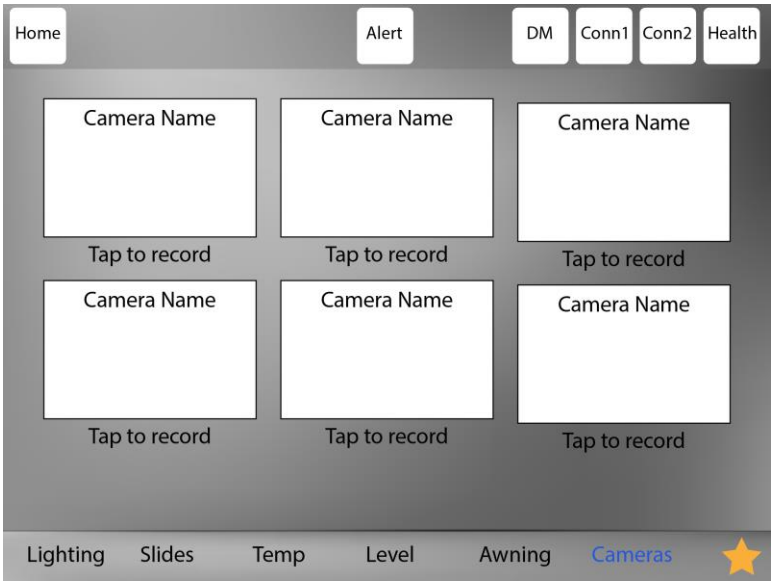
4.4.5 Map



4.5 VEHICLE SECURITY

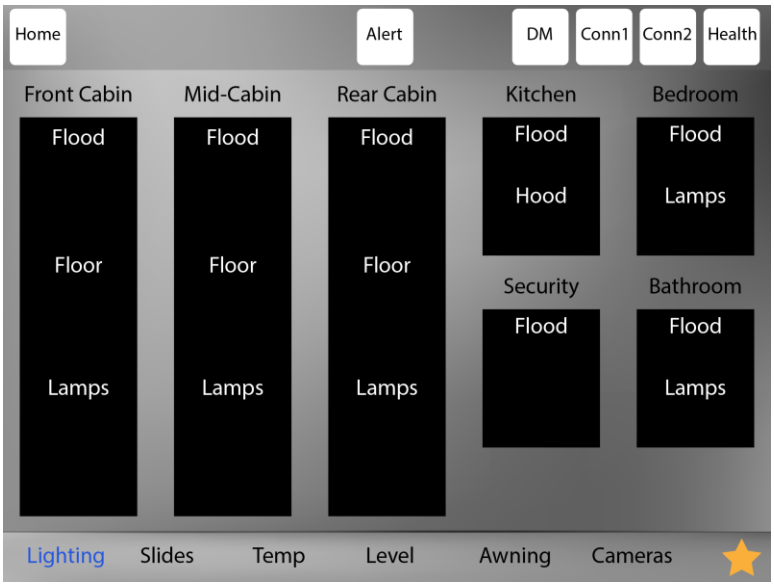
4.5.1 Remote Access & Control

4.5.2 Remote Video



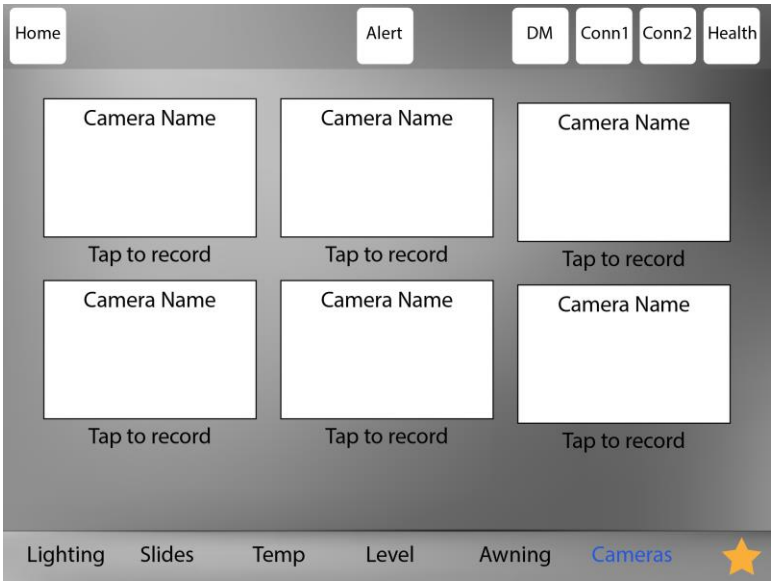
4.6 Comfort Controls

4.6.1 Lighting

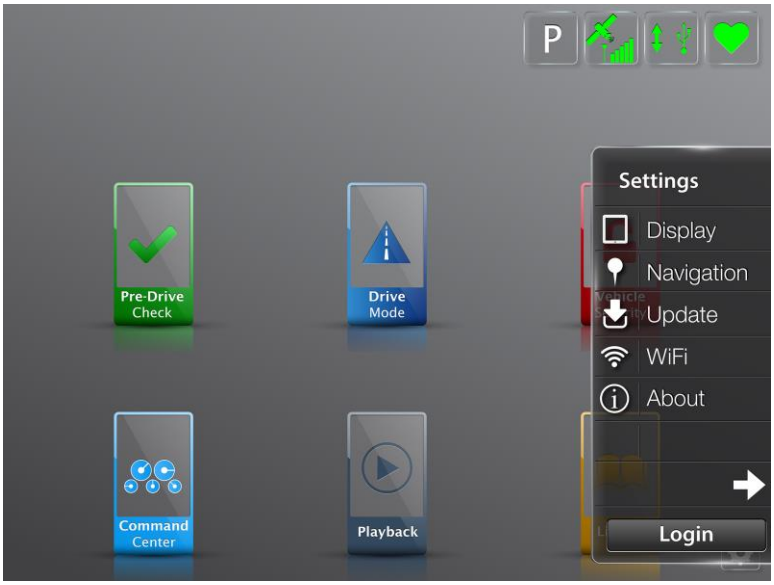


4.6.2 Temperature

4.6.3 Cameras



4.7 SETTINGS



4.7.1 Display Settings

4.7.2 Navigation Settings

4.7.3 Software Updates

4.7.4 Wi-Fi Settings & Password

4.8 PLAYBACK

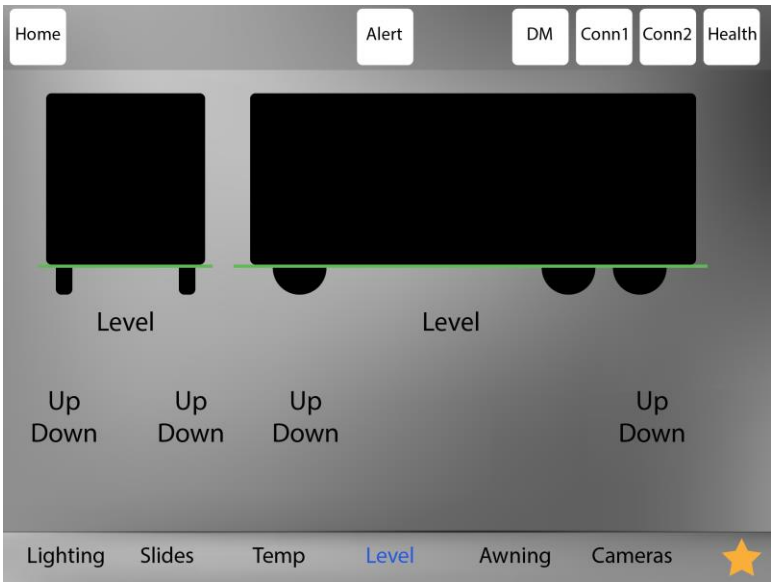
4.9 LIBRARY

4.9.1 Owner's Manual

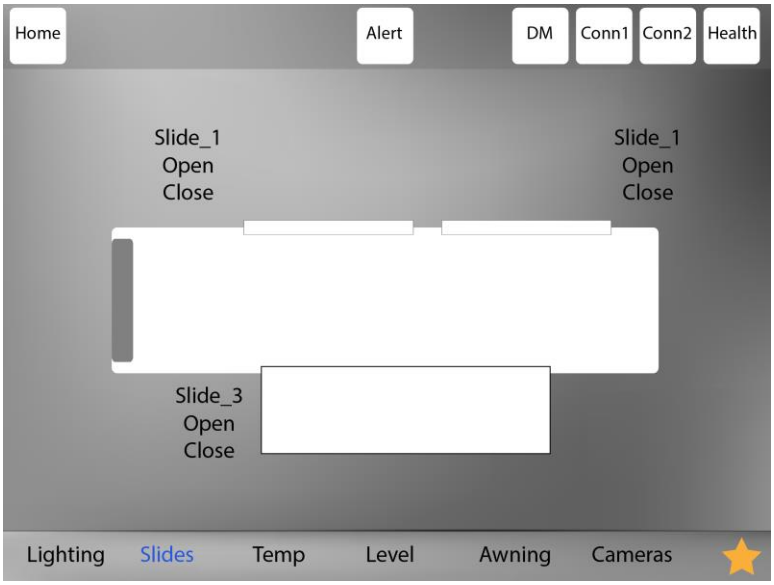
4.9.2 Technical Documentation

4.10 VEHICLE SETUP

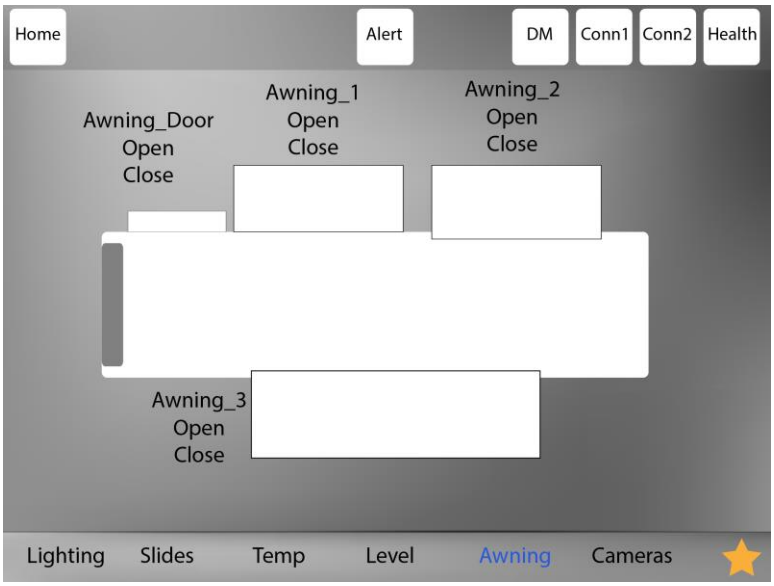
4.10.1 Vehicle Leveling



4.10.2 Slides



4.10.3 Awnings



4.11 VIEWING RECORDED VIDEO; RECORDED VIDEO STORAGE LOCATION.

Recorded video is stored on the iPad in a secure location accessible only by the ROAD-IQ VIDEODATA SERVER and Playback apps. To view recorded videos:

- Launch the playback app
- Enter search criteria
-

4.12 Exporting Video

4.13 Deleting Video in the ROAD-IQ VIDEODATA SERVER App

4.14 Clearing the iPad Photo Folder

4.15 Upgrading app software

4.16 Upgrading ROAD-IQ VIDEODATA SERVER firmware

5 System specifications

System Specifications – Road-iQ VideoData Server	
Operating Voltage	9 – 36 V DC
Current Draw	2 – 3 A, depending on configuration
Power Consumption	
Operating Temperature Range	
Size	
Weight (Server Only)	
Certifications	FCC, RoHS…
Cellular Service (NetHub)	4G/LTE

6 Troubleshooting

The following table can be used for diagnosing and solving issues that may be encountered during installation:

Problem	Potential Cause	Solution

Road-iQ VideoData Server does not appear to be powered	No power to the server	Check for 12V on the Vehicle Bus Harness power wire (red wire, pin #16).
	No power to the ACC line	Check for 12V on the Vehicle Bus Harness ACC wire (yellow/white wire, pin #8) when the vehicle's ignition is ON.
	Server is not grounded	Check for continuity between the Vehicle Bus Harness ground wires (black, pins #4 & #5) and the negative battery terminal.
The NetHub does not appear to be powered	The Road-iQ VideoData Server is not powered.	See 'Road-iQ VideoData Server does not appear to be powered'
	The NetHub cable is not properly connected.	Disconnect and reconnect the NetHub cable from both the Road-iQ VideoData Server and the NetHub. The cable should click and lock into place when installed correctly.
No CAN-bus data is being received		
A GPIO input is not registering as intended		
A GPIO output is not operating as intended		
The iPad is not charging and/or receiving power	The Road-iQ VideoData Server is not powered.	See 'Road-iQ VideoData Server does not appear to be powered'
	The NetHub is not powered.	See 'The NetHub does not appear to be powered'
	The Lightning and/or USB extension cables are not properly connected.	Verify that all cables between the Road-iQ VideoData Server and the iPad are correctly and fully inserted into the proper ports.
Data is not being recorded	Storage memory capacity has been exceeded.	
	Incorrect format.	
	Damaged SD card.	
	Data has been erased.	
	Server is down.	
	USB port has malfunctioned.	
Data is partially being recorded		
Significant lag time		
Loss of Wi-Fi connection to server		
Loss of internet connection	Loss of cellular service	
No CAN-bus data output		
Partial CAN-bus data output		
Delayed CAN-bus data output		

Incorrect CAN-bus data output		
Poor camera image		

7 GLOSSARY OF TERMS & ACRONYMS

- CAN – Controller Area Network: A vehicle bus standard allowing devices to communicate with one-another without the use of a host computer. Allows the VideoData Server to receive information from many vehicle systems through one wiring connection.
- GPIO – General Purpose Input/Output: An electrical connection whose behavior can be defined by the user.
- GOP – Group Of Pictures:
- IPv4 – Internet Protocol version 4: Protocol used to route most traffic on the internet.
- LAN – Local Area Network: A network between computers. In the context of this manual, LAN refers to the network created by connecting the VideoData Server for communication with a personal computer.
- LIN – Local Interconnect Network: A serial network protocol for communication between components in vehicles.
- MAC (media access control) address: A unique identifier assigned to a network interface.
- Quantization: An H.264 compression parameter
- SIM – Subscriber Identification Module: A component (typically a small card) that stores a mobile subscriber ID to authenticate the subscriber.
- SSID – Service Set Identifier: A unique identifier for a wireless-LAN; commonly referenced as the network name.
- UUID – Universally Unique Identifier: A 128-bit number used to uniquely identify an object or entity on the internet.
- ROAD-IQ VIDEODATA SERVER – VideoData Server: VideoData Server can refer to either the individual server component, or to the system as a whole.
-

8 APPENDIX

8.1 WIRING DIAGRAMS

8.2 HARNESS DRAWINGS

8.3 CONTROL PANEL SCREENS

8.3.1 Status Screen

- Hotspot
  - Internet Access: Indicates if internet access is currently available
  - Network: The network name
  - Signal Strength: Strength of the signal on a 1-5 scale
  - Wi-Fi Access Point SSID: Service Set Identifier for the WLAN
- System
  - Boot Count: Number of times the system has booted.
  - Time: Current time.
  - Time Source: Indicates the method used to set the time (None, User, USB, NTP, Cellular, or GPS)
  - Client Count: The number of active connections to the server (tablets or browsers)
  - Max Clients: the maximum number of active connections to the server
- GPS
  - Latitude: Current latitude, measured in degrees.
  - Longitude: Current longitude, measured in degrees.
  - Elevation: Current elevation, measured in meters.
  - Last Fix: Time that position was last updated.
- Services
  - Record/Playback:
  - Sensors:
  - Space-Time:
  - System Monitor:
  - Test:
  - Update:
  - USB-Tablet:
  - Vehicle Interface:
  - Video:
  - WAN/Modem:
  - Web:
  - Wi-Fi:

8.3.2 Video

- Camera: Indicates channel number & camera name
- Status: Indicates whether the camera is connected or disconnected
- Name: Allows changes to the camera name.
- Enabled: Uncheck the box if the camera will not be used.

- Size: Select the camera's output resolution
- Framerate: Select the channel framerate
- Bitrate: Input the desired channel bitrate
- GOP size: Input the desired number of frames between full frames
- Quantization: A lower H.264 compression parameter is higher quality but use more data (i.e. recording space, wireless transmission)
- Flip: Select from the drop-down to display a mirrored camera image
- Power: Fixed power source for the camera (Main or Aux.)
- Reset: Click 'Set Defaults' button to reset camera to default settings

8.3.3 Wi-Fi

- AP Enabled: Check to enable Wi-Fi connectivity
- Wi-Fi Access Point SSID: Service Set Identifier for the WLAN
- AP Security: Select 'Open' (unsecured) or 'WPA2'.
- Channel: Channel used by the WiFi access point
- Submit Changes: Click 'Submit Changes' to save changes
- Reset: Click 'Set Defaults' to reset to default settings
- Cancel: Click 'Cancel' to cancel any changes made

8.3.4 Hotspot

- Internet Access: Indicates if internet access is available
- Modem Present: Indicates if cellular modem in the NetHub is connected
- Carrier: Indicates the cellular service carrier
- IPv4 Address: Indicates the public Internet Protocol (version 4) address
- Network: Indicates name of the wireless network
- Signal Strength: Indicates strength of the cellular signal (1-5)
- Enabled: Check the box to allow hotspot functionality.
- Allow Roaming: Check the box to allow hotspot functionality while roaming.
- Manufacturer: Indicates the modem manufacturer
- Model: Indicates the modem model
- Revision: Indicates the modem firmware version
- Serial Number: Indicates the modem IMEI
- SIM ID: Indicates the SIM card ID
- Type: Indicates the modem type (CDMA, GSM, or LTE)
- Phone Number: Indicates the modem phone number (if applicable)
- Mode: Indicates the modem mode (CDMA, GSM, or LTE)
- Power: Indicates the modem power state
- Network: Indicates the modem network status (Unknown, None, Home, Roaming, Searching, Restricted, Denied, Forbidden)
- Signal Quality: Indicates the cellular signal quality on a scale of 0-99
- Location Code: The location code transmitted to the modem by the cellular service
- Cell ID: Indicates the ID of the cellular tower that the modem is using

- Registration: Indicates the cellular registration
- Status: Indicates the cellular network status
- SIM Status: Indicates the status of the SIM card (Unknown, Valid, Missing or Error)
- APN1:
- APN2:
- APN3:
- APN4:
- APN5:

8.3.5 Sensors

- Accelerometer: Indicates current acceleration values in X, Y, and Z directions, in units of mGee.
- Magnetometer: Indicates the compass heading in X, Y, and Z directions, in units of mGauss.
- Gyrometer: Indicates current yaw values in X, Y, Z planes, in units of °/second.
- CPU Temperature: Indicates current CPU temperature in °C.
- Supply Voltage: Indicates current supply voltage to the VideoData Server.
- GPIO Inputs: Indicates current state of the individual GPIO inputs and the ACC line.
- GPIO Outputs: Indicates the current state of the individual GPIO outputs.

Technical Information and Troubleshooting Help:

For technical questions or troubleshooting contact Velvac Technical Solutions at 800-783-8871 or email your questions to: technicalservice@velvac.com.