TVU Networks®

TVU One™
Transmitter

TVU One transmitter

Hardware User Guide

Document Part Number:
TVUOne UG Rev A EN 04-2019

Legal notices

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Specifications in this publication are subject to change. Contact TVU Networks Corporation for specifications that are critical to your application. Go to www.tvunetworks.com for the latest product information.

Related literature and media

The following list contains related literature and media:

Product data sheets

- TVU One Data Sheet

Hardware Set up and Operating manuals

- TVU One Transmitter Hardware User Guide
  (part number: TVUOne UG EN Rev A 04-2019)

Software Set up and User manuals

- TVU One Transmitter Software User Guide
  (This manual, part number: TVU One Software User Guide
  Document part number: TVUOne SW User Guide Rev A EN 04-2019)

Media

Not applicable

FCC/CE Compliance

Federal Communications Commission (FCC) Regulation of Electronic News Gathering (ENG) Mobile Systems

The FCC provides specific policies and procedures related to radio frequency (RF) emissions in mobile and portable devices. The FCC outlines test requirements and specific test procedures based on the type of device. These test requirements and procedures can also cover Specific Absorption Rates (SAR) for RF.

TVU transmitter devices have always conformed to all applicable FCC regulations covering mobile systems for electronic news gathering. All required tests for TVU transmitter devices as outlined in the regulations were performed by a third-party testing lab, which issued a certificate of compliance for TVU transmitters. The certificate is applicable to both the FCC and CE. Additionally, the data modems used in TVU transmitters are commercially available off-the-shelf brands and have been FCC and carrier certified.

Contact us

Supporting documentation demonstrating TVU transmitters' compliance with the applicable FCC regulations is available upon request. Contact TVU Networks at +1.650.440.4812 for assistance and questions regarding approved modem cards for use with TVU transmitters.

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1 Introduction, setup, and base operation

This User Guide provides a product overview, setup, and base operation information for the TVU One transmitter.

Product overview

TVU One represents a tremendous leap forward in professional live video streaming solutions. TVU One delivers high-definition picture quality with 0.5 second latency at 3 Mbps within an ultra compact and rugged hardware design. It uses HEVC or H.265 compression standard to deliver greater efficiency in data use as well as increased transmission stability. With TVU One, broadcasters of live video can fully leverage the versatility of a small, lightweight, IP-based high-definition video field transmitter without sacrificing performance, features or picture quality.

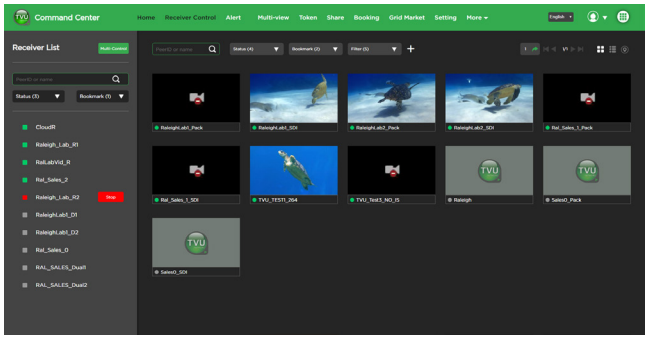
Contents and features

TVU One has a robust set of features and functions designed to fit the needs of any live broadcaster. The TVU One runs on the TVU platform and includes the following features:

- **Simple Worry-Free Operation** – TVU pioneered one button operation in portable live video streaming transmitters, and TVU One carries on that tradition. TVU One requires no in-field configuration, and boots up in less than 20 seconds with just the push of a button.
- **Small Form Factor, Big Features** – Despite its small size, TVU One is feature-rich with no compromises to performance or capabilities. To see a full list of hardware and software specifications for TVU One, refer to "Product Specifications".
- **Inverse StatMux Plus** – TVU One features proprietary video transmission technology called Inverse StatMux Plus (IS+). With IS+, unsurpassed HD picture quality is dependably delivered at sub-second latency over cellular 3G/4G/LTE modems even when transmitting in a moving vehicle traveling at over 60 mph/100 kph.
- **Powerful Real-Time Store and Forward** – TVU One can simultaneously live stream and record. TVU One can record up to 7 hours of full HD footage, depending upon the selected configuration. Additionally, TVU has HD file transfer functionality that ensures the delivery of a HD quality error-free video clip to the studio in real-time without needing to wait until the clip is fully recorded on the transmitter.
- **Fully Compatible with TVU Grid** – TVU's IP based video switching, routing and distribution solution allows a broadcaster to share a TVU One live video transmission with any other TVU Grid enabled station, operations center or physical location. TVU Grid features very low latency when switching, routing or distributing live video.

TVU Grid Web interface

The TVU One integrates with the TVU Command Center Web interface which provides a cloud-based centralized management and control solution of all TVU devices and services. For detailed information about TVU Command Center, refer to the "TVU Command Center Set up and User Guide".



TVU Command Center Web interface

About this user guide

This user guide provides detailed information about the following topics:

- Important safety guidelines
- TVU One transmitter components
- Setting up the TVU One transmitter
- Using the TVU One touch screen controls
- Operating the TVU One transmitter

Before you begin

Before you begin setting up the TVU One transmitter, it is recommended that you identify the devices you intend to use with the unit including: cameras, cables, power sources, modems and unit accessories.

Be sure to read and follow the Safety notices contained in this guide before you setup your new TVU One.

Safety notices and statements in this document

The safety notices and statements that may appear in this document are as follows:

Note: These notices provide important tips, guidance, or advice.

IMPORTANT: These notices provide information or advice that might help you avoid inconvenient or problem situations.

ATTENTION: These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.

CAUTION: These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.

TVU One unit and battery safety and airline travel guidelines

CAUTION:

The following CAUTION statements indicate situations that can be a potentially hazardous procedure step or situation:

> **To reduce the risk of electric shock, do not remove cover (or back). No user-serviceable parts inside. Refer servicing to qualified service personnel**

1. To reduce the risk of fire or electric shock and interference, use the recommended accessories only.
2. This apparatus can be operated at a voltage in the range of 12 - 19 V DC.
3. Only use a TVU networks supplied AC adapter with this unit.

   Important information regarding the supplied AC adapter:

   - The supplied AC adapter is designed to be used with an input voltage in the range of 100-240 V AC.
   - Voltages other than 120 V are not intended for U.S.A. and Canada.
   - Operation at a voltage other than 120 V AC may require the use of a different AC plug. Please contact either a local or foreign TVU Networks authorized service center for assistance in selecting an alternate AC plug.
4. A coin type battery is installed inside of the unit. Do not store the unit in temperatures over 60 °C (140 °F).
5. Danger of explosion or fire if battery is mistreated.
6. Do not leave the battery in an automobile exposed to direct sunlight for a long period of time with doors and windows closed.
7. Do not disassemble the battery or dispose of it in fire.
8. Do not store the battery in temperatures over 60°C (140°F).
9. Replace battery only with same or specified type.
10. To completely disconnect this equipment from the AC mains, disconnect the mains plug from the AC receptacle.
11. To maintain adequate ventilation, do not install or place this unit in a confined space. To prevent risk of electrical shock or fire due to overheating, ensure that nothing obstructs ventilation.

IMPORTANT:

The following safety notices and instructions provide information or advice that might help you avoid inconvenient or problem situations:

1. Unplug this apparatus during lightning storms or when unused for long periods of time.
2. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

AC adapter

The rating plate is on the underside of the AC Adapter. Disconnect the AC mains plug from the AC mains socket when not in use.

Use only TVU Networks supplied or authorized batteries and chargers

This device is designed to be used only with TVU Networks supplied batteries. Use only TVU Networks supplied devices and chargers to charge the supplied batteries. To see a list of qualified external batteries to use with this device, please contact TVU Networks. Use of non-qualified batteries with this system may cause damage to the unit or possibly fire.

FAA regulations

FAA Regulations require rechargeable and non-rechargeable lithium batteries, cell phone batteries, laptop batteries, external batteries, portable rechargers, spare (uninstalled) lithium ion and lithium metal batteries must be carried in carry-on baggage only.

When a carry-on bag is checked at the gate or at plane side, all spare lithium batteries must be removed from the bag and kept with the passenger in the aircraft cabin. The battery terminals must be protected from short circuit.

This includes spare lithium metal and spare rechargeable lithium ion batteries for personal electronics such as cameras, cell phones, laptop computers, tablets, watches, calculators, etc. This also includes external battery chargers (portable rechargers) containing a lithium ion battery. For lithium batteries that are installed in a device (laptop, cell phone, camera, etc.), see the entry for "portable electronic devices, containing batteries" in this chart.

Size limits

Lithium metal (non-rechargeable) batteries are limited to 2 grams of lithium per battery. Lithium ion (rechargeable) batteries are limited to a rating of 100 watt hours (wh) per battery. These limits allow for nearly all types of lithium batteries used by the average person in their electronic devices. With airline approval, passengers may also carry up to two spare larger lithium ion batteries (101-160 watt hours). This size covers the larger after-market extended-life laptop computer batteries and some larger batteries used in professional audio/visual equipment.

Quantity limits

None for most batteries – but batteries must be for use by the passenger. Batteries carried for further sale or distribution (vendor samples, etc.) are prohibited. There is a limit of two spare batteries per person for the larger lithium ion batteries described above (101-160 watt hours per battery).

Batteries must be protected from damage. Battery terminals (usually the ends) must be protected from short circuit (i.e., the terminals must not meet other metal). Methods include: leaving the batteries in their retail packaging, covering battery terminals with tape, using a battery case, using a battery sleeve in a camera bag, or putting them snugly in a plastic bag or protective pouch.

See the regulation: 49 CFR 175.10(a)(18)

Tip: Newer lithium ion batteries have the watt hour (wh) rating marked on them. To calculate watt hours, multiply the battery voltage by the amp hours (ah). To learn more about lithium batteries, their restrictions, and how to tell what size they are, go to http://SafeTravel.dot.gov.

Refer to the link below for International Air Transport Association (IATA) regulations and information regarding airline travel with lithium batteries:

http://www.iata.org/whatwedo/cargo/dgr/Documents/LithiumBattery_PassengerFlyer.jpg

Additional airline travel information

When traveling, the TVU One transmitter's onboard battery should be removed from the unit to prevent accidental power on. The onboard battery terminals should be protected to prevent accidental short circuit. Protect the onboard battery terminals by placing them in a plastic bag or covering the battery terminals with electrical tape.

TVU onboard batteries should always be transported as carry-on baggage. It should never be transported in the cargo hold.

TVU One transmitter components

The TVU One transmitter is comprised of the encoder, internal battery, and embedded modems. Weighing just 2.2 lbs./1 kg, the transmitter fits easily in the average person's hand.

TVU One transmitter

TVU One standard components

Standard Components for the TVU Transmitter include the following:

- TVU transmitter with SDI/HDMI input
- Power supply (AC Adaptor)
- TVU transmitter Bag

TVU One optional components

Optional Components for the TVU Transmitter include the following:

- SIM cards
- AC car adapter
- Universal adaptor
- External modems

TVU transmitter controls and operations

TVU transmitter is the central component of the TVU One system. The transmitter handles video capturing, video encoding and transmission, modem management and dialing, and status/monitoring of the system.

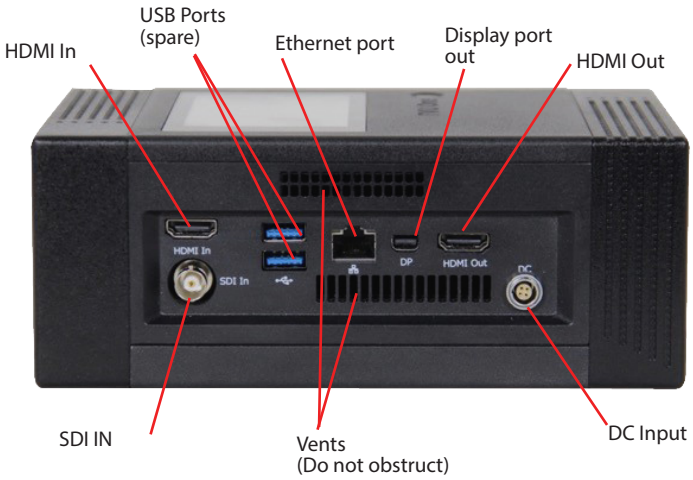
Front panel LCD display and power indicator

Simply press the power button on the front panel to turn on the transmitter. The button turns green when transmitter is powered on. The LCD screen displays configuration and status information for connected modems as well as video input and transmission. When a video input is connected, an input preview is displayed on the LCD.

LCD display and power indicator

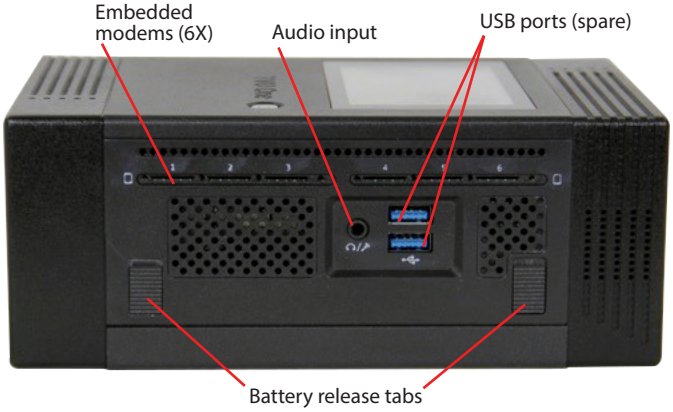
TVU One transmitter side panel overviews

The TVU One transmitter model TM1000 v1 left-side panel features the following input/output connections and controls.



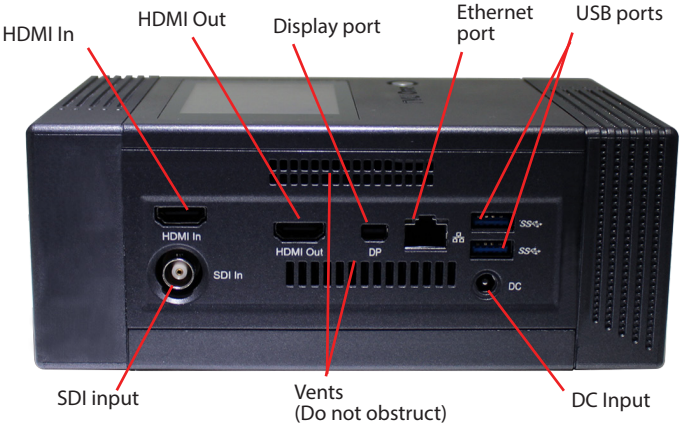
TVU One model TM1000 v1 transmitter left-side panel

The TVU One transmitter model TM1000 right-side panel features the following input/output connections and controls.



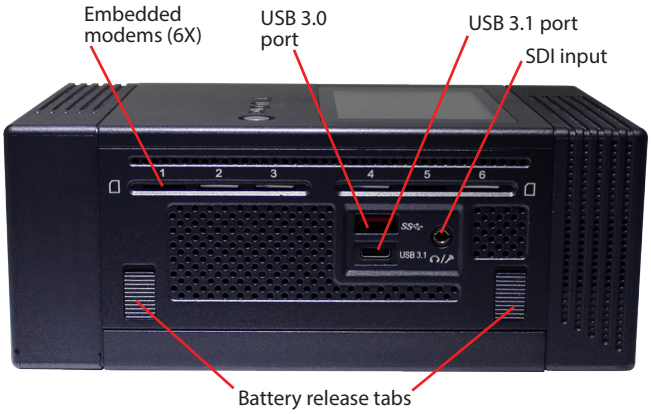
TVU One model TM1000 v1 transmitter right-side panel

The TVU One transmitter model TM1000 v2 left-side panel features the following input/output connections and controls.



TVU One model TM1000 v2 transmitter left-side panel

The TVU One transmitter model TM1000 V2 right-side panel features the following input/output connections and controls.



TVU One model TM1000 v2 transmitter right-side panel

Setting up the TVU One transmitter

Transmitter connections

Complete the following steps to setup the TVU One transmitter:

1. Connect the HDMI cable to the **HDMI In** port (PAL, NTSC, 720p or 1080i).
2. Connect the HDMI cable to the **SDI In** port (PAL, NTSC, 720p or 1080i).
3. Connect the **Ethernet** input cable into the Ethernet port for a LAN connection.
4. To preview the TVU One screen on a monitor, connect the standard HDMI cable to the **HDMI Out** port or connect a monitor cable to the **DP** display port.
5. Connect your custom DC power to the **DC Input** port.
6. Connect the audio component (3.5 mm mini audio output jack) into the **IFB output** port.

Detaching the internal battery from the transmitter

The transmitter internal battery is designed to fit within the unit, but it can also be easily removed. Complete battery power management for the TVU One transmitter is available on the LCD touch screen as well as on the Receiver interface.

Complete the following steps to detach the internal battery from the transmitter:

1. On the side of the transmitter that is opposite the LCD touch screen, users will find two spring-loaded latches.
2. Orient the transmitter LCD panel down and push down on the latches to release the battery and slide it away from the transmitter.

Battery release latches

Charging the internal battery

To charge the internal battery without removing it from the transmitter, simply connect the provided AC power adapter to the DC input on the unit and plug in the other end of the adapter into an electrical outlet. The battery will then begin to charge. Please note that the battery will charge significantly faster (approximately 3 hrs.) when the transmitter is turned off.

Inserting SIM cards

The transmitter SIM card slots are designed to hold up to 6-Mini SIM (2FF) cards in six embedded modems. Take the following steps to insert a SIM card into the embedded modem slots on the transmitter:

1. The SIM card slots are spring loaded. Simply push in the desired SIM card into the appropriate slot until it clicks into place.
2. To remove a SIM card, simple push the SIM card in until it clicks, and it will pop back out.

TVU transmitter bag configurations

The TVU transmitter is designed to be used as a standalone transmitter or in a bag configuration. The carrying bag comfortably holds the transmitter while allowing users easy access to the power button, connections and SIM card slots.

The touchscreen LCD interface on the transmitter can also be used while the unit is in the bag. In addition, the mesh sections allow for the essential ventilation of the transmitter, so it will not overheat in the carrying bag. The transmitter carrying bag can be worn as a back pack.

There are four transmitter carrying bag configurations for external batteries, they are as follows:

V-type battery configurations:

- TM1000 v1 V-type battery with a black connector
- TM1000 v2 V-type battery with a green connector

G-type battery configurations:

- TM1000 v1 G-type battery with a black connector
- TM1000 v2 G-type battery with a green connector

V-type battery configuration examples:

V-type battery

TM1000 v1 V-type battery, black connector

TM1000 v2 V-type battery, green connector

G-type battery configuration examples:

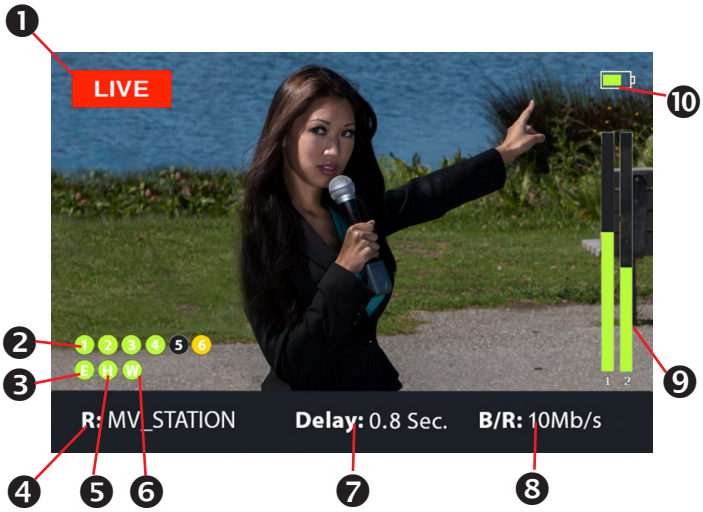
Type G battery

TM1000 v1 G-type battery, black connector

TM1000 v2 G-type battery, green connector

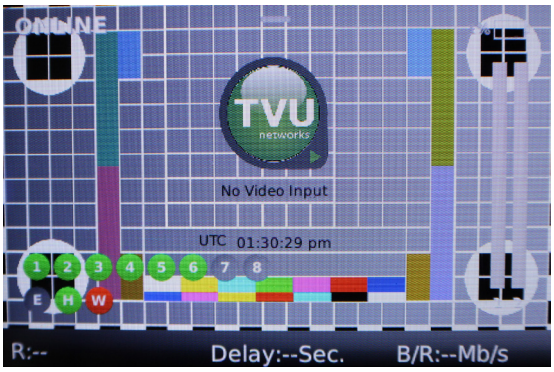
TVU transmitter LCD touch screen interface

The transmitter has an LCD touch screen interface that allows for transmission control while out in the field. When the transmitter is first turned on and SDI connected, the user will see the status display screen.



TVU One LCD touch screen

If there is no transmission feed connected, the TVU test pattern will display on the LCD screen.



TVU One test pattern

TVU One transmitter Live status screen descriptions

❶ **Transmission Status:** The transmission status monitor displays the current transmission status of the TVUPack. If the LCD screen displays "LIVE", it indicates the transmission is Live. If a camera or input source is not connected to the TVU One transmitter, the LCD display panel will display "Online" (Standby) or Preview mode.

❷ **Data Card Status Monitor:**

Displays the current number and status of all data cards connected to the TVU One. The status of data cards connected to the Pack will appear as green, red, orange or black. Green status indicates that the data card is connected. Orange status indicates that the data card is attempting to dial. Red status indicates that the data card is not connected. Black status indicates there is no card.

❸ **Ethernet Connection:** Displays the status of the Ethernet connection.

❹ **Receiver Name:** Shows the receiver name to which the unit is transmitting.

❺ **Hotspot Connection:** Displays the status of the hotspot connection.

❻ **WiFi Connection:** Displays the status of the WiFi connection.

❼ **Latency Status:** Displays the current latency of the transmission.

❽ **Bit Rate Status:** Displays the current Bit Rate (B/R).

❾ **Audio Input Level Monitor:** Dynamically displays the audio input level (DBFS) for the unit with graphical colors.

❿ **Battery Status:** Indicates the status of battery.

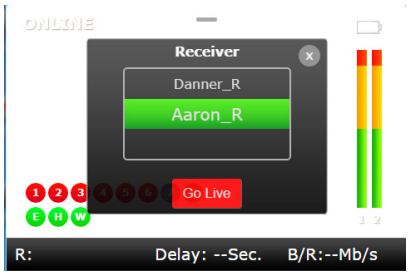
Operating the TVU transmitter

The LCD screen on the transmitter can be operated with simple taps and swipes of a finger, much like a smartphone that has a touch screen user interface. When accessed, the operational functions and status display interfaces available will appear as a pop-up window or drop-down menu that overlays the preview or live video input. Follow these instructions to access all the features and functions the transmitter has to offer through its LCD touch screen.

Going Live

To go Live complete the following steps:

1. Turn On the TVU transmitter.
2. Connect the TVU transmitter to a camera source.
3. Tap the center of the LCD screen. A pop-up screen displays.
4. Select the receiver with which you would like to go Live with. Then, press the red **Go Live** button.

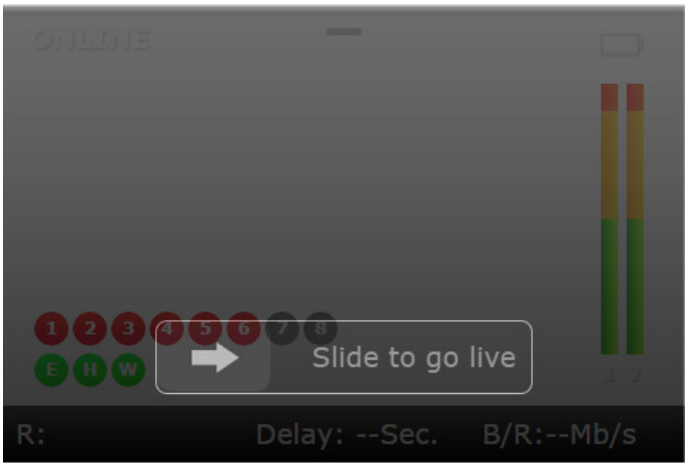


Go Live screen

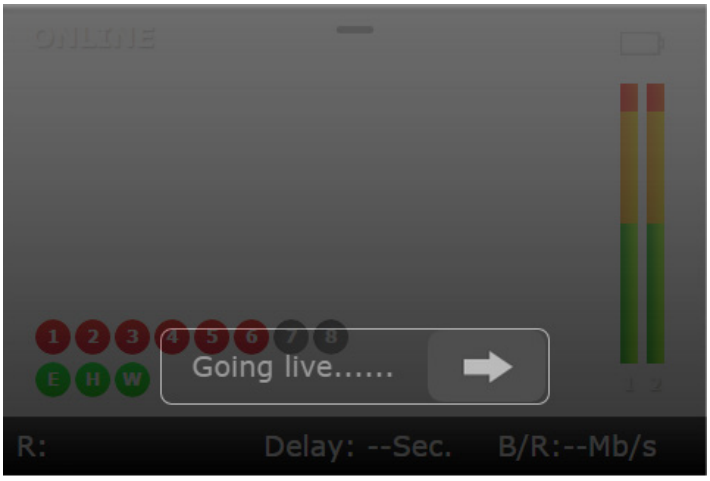
5. When prompted, touch the LCD screen and slide the toggle to the right to start the Live transmission.

To Exit from going Live, touch the X in the top right corner of the screen to close the window.

6. To stop a Live transmission, tap the center of the LCD screen. A "Stop Live" option will display at the bottom of the screen. Slide the toggle from left to the right to stop the Live transmission.

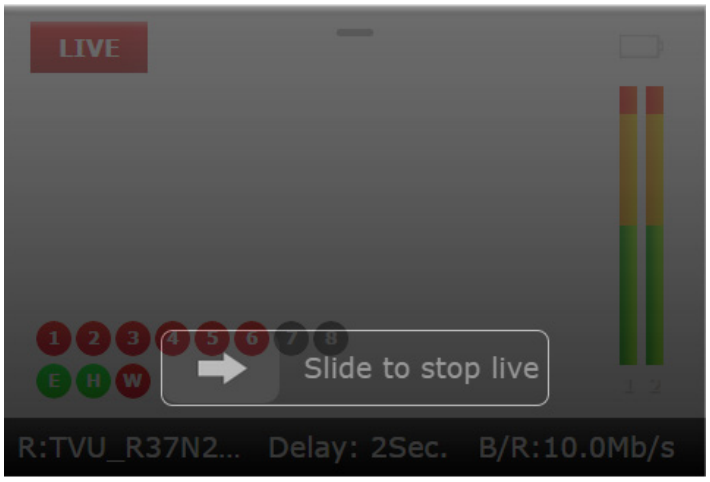


Slide to go live

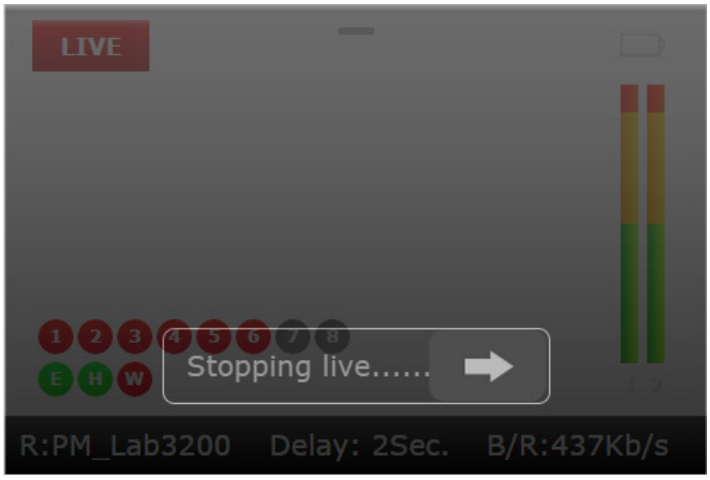


Starting the Live transmission

To stop a live transmission, simply tap the middle of the touch screen and a pop-up screen will appear. A "Stop Live" toggle will appear at the bottom of the page. Slide the toggle from left to right to stop the live transmission



Slide to Stop Live



Stop the Live transmission

Selecting a preset transmission mode

To select a preset transmission mode, complete the following steps:

1. Touch the center of the LCD screen and slide your finger down. The Mode window displays.
2. Tap to select one of the following options:

Your selection will highlight green

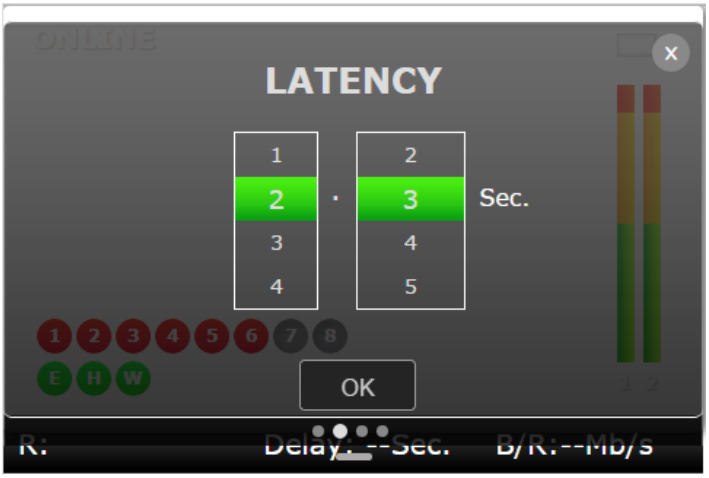
- **Interview:** Bitrate 2048, delay 2 seconds
- **Normal:** Bitrate 5120 delay 4 seconds
- **Fast Moving:** Bitrate 5120, delay 8 seconds
- **SD:** Bitrate 2048, delay 4 seconds
- **Tapefeed:** Bitrate 10240, delay 10 seconds. This mode is optimized for content with multiple scene changes
- **Custom:** A custom transmission mode set by the receiver

3. To save your selection, Click **OK**.
4. To exit from the menu, click the **X** in the top right corner of the screen.

Latency management

To manage the second and sub-second Latency settings, complete the following steps:

1. Touch the top of the LCD screen and slide your finger down.
2. Touch the LDC screen and swipe from the right to the left once. The Latency window displays.
3. Scroll through the menu and tap the menu to make your selection. Then, press **OK**.



Latency menu

4. To exit from the menu, click the **X** in the top right corner of the screen.

Data card monitoring

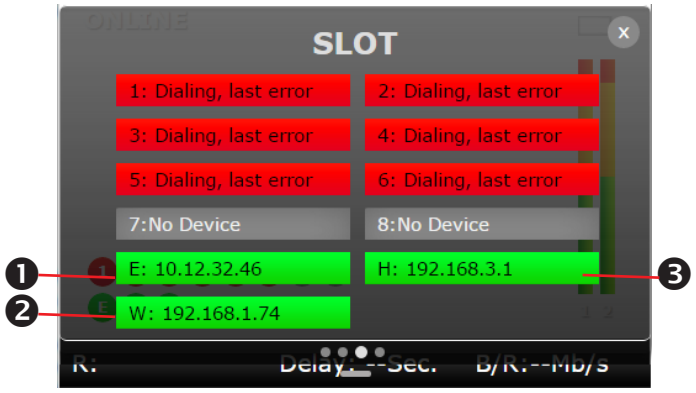
To monitor detailed transmitter information as well as Ethernet, hotspot, and WiFi connections, complete the following steps:

1. Touch the center of the LCD screen and slide your finger down.
2. Touch the LDC screen and swipe from the right to the left three times. The Slot monitoring window displays.

❶ Ethernet

❷ Hotspot

❸ WiFi connection



Slot monitoring

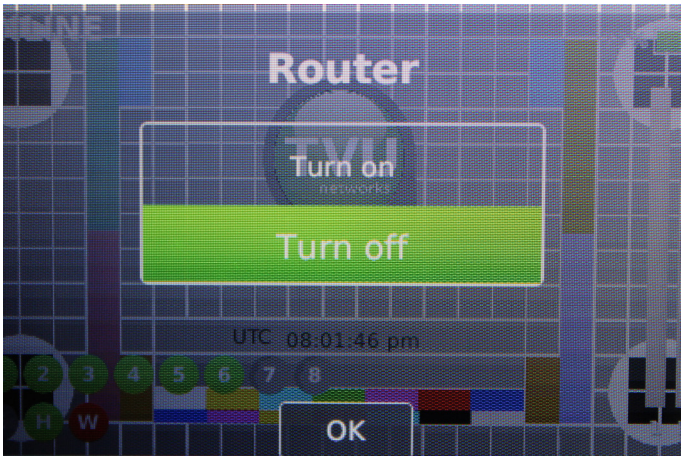
3. To exit from the menu, click the **X** in the top right corner of the screen.

Selecting a router option

TVU Router delivers secure high-speed broadband Internet connectivity and delivers private network access from anywhere.

To select a router option, complete the following steps:

1. Touch the top of the LCD screen and slide your finger down.
2. Touch the LDC screen and swipe from the left to the right once. The Router window displays.
3. Tap the menu to make your selection. Then, press **OK**.



Router menu

4. To exit from the menu, click the **X** in the top right corner of the screen.

TVU One transmitter information

To access the TVU One model number, PeerID, software version, app version input, format, and transmitter configuration information, complete the following steps:

1. Touch the top of the LCD screen and slide your finger down.
2. Touch the LDC screen and swipe from the right to the left four times. The transmitter information window displays.

About screen

3. To exit from the menu, click the **X** in the top right corner of the screen.

Turning Off the TVU One transmitter

To turn off the TVU One transmitter complete the following steps:

1. Press the power button once. A sliding toggle button will display on the LCD screen.
2. Slide the toggle from left to right to power down the unit.

2 Product specifications

This section provides product specifications for the TVU One model TM1000 v1and TM1000 v2 transmitters.

Product specifications

Specification	TVU One transmitter
Video Input formats	HD/SD-SDI (BNC) input -1080i 59.94/50, 720p-59.94/50 480i-59.94, 576-50.
Audio input	Up to 8 channels of embedded audio.
Audio/Video encoding and compression	TVU264 or enhanced H265/HEVC (The TVU One TM1000 v1 model does not support HEVC)
Transmission	Inverse StatMux Plus (IS+)
Dual encoders	Simultaneously live stream a transmission over IP while also encoding a completely separate recording to the internal SSD that can be retrieved for future use.
Return video feed	TVU One feed or SDI input at TX; Requires hotspot
Start-up time	Less than 40 seconds
Supported data connections	Simultaneously aggregates up to 12 data connections including WiFi and Ethernet. System supports cellular 3G/4G/LTE modems, 2.4 GHz WiFi, 5 GHz WiFi, WiMax, Ethernet, Microwave and KaBand, KuBand, BGAN Satellite connections.
Glass-to-glass latency	0.5 seconds
Video recording	Up to 7-hours of live recording
External interface connectors	SDI, HDMI, USB, Ethernet, IFB
Power source	A single removable, rechargeable internal battery
Internal battery run time	120 minutes
DC input	Right angle Mini Jack DC input that connects to external battery or supplied AC adapter. External power adapter: 11-18V DC.
Transmitter controls	- One button start - On-unit monitoring and management - Remote monitoring and management using mobile smart device or laptop
TVU social support	Supports live streaming to Facebook Live. Also capable of capturing and posting still images of TVU One's live stream to social media platforms
Encoder hardware dimensions	7.48 in. x 4.72 in. x 2.76 in. (19 x 12 x 7 cm)
Weight	2.2 lbs (1 kg)
Carrying case	Belt-mount or shoulder bag carrying case options with hot swappable battery mount
Operating temperature	32°F to 104°F (0°C to 40°C)
TVU Software version	TVU6 v6.5

Document Part Number:
TVUOne UG Rev A EN 04-2019

Printed in USA.

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