Operator’s Manual
**Important Symbols in This Manual**

⚠️ The exclamation point calls your attention to a requirement, safety issue, or important action that should not be overlooked.

✅ A check mark highlights a tip or feature.

**Important Symbols on the Product**

**Caution**

⚠️ This symbol indicates critical safety information. Ignoring text that accompanies this symbol could result in injury or death due to improper handling.

**WEEE Directive: Disposing of VuLink at the end of its useful life**

In accordance with the EU Waste Electrical and Electronic Equipment Directive of 2005 and later Directives, VuLink should not be discarded with regular household waste. Check local electronic/electrical waste regulations before disposing of a VuLink device.
Safety Information

Using VuLink Correctly

⚠️ Read these instructions carefully before using VuLink. Don’t use VuLink in any manner not specified in the manual or quickstart guide. Follow all safety warnings.

Installing and Replacing Batteries

⚠️ Never mix old and new batteries, or Lithium and alkaline batteries. Make sure all three batteries are installed in the same orientation. Use only In-Situ recommended Lithium batteries for longest battery life.

⚠️ A blinking red and green battery LED indicates a problem with the batteries. Do not deploy the VuLink in this condition. Check batteries and reinstall as necessary.

Installing the Antenna

⚠️ Use only In-Situ recommended cellular antennas. Maintain a safe distance of at least 14cm from the antenna and VuLink when the device is in operation.
1 **Cable**

**Rugged Twist-Lock Cable**
Connects VuLink to an Aqua TROLL, Baro TROLL, Level TROLL, or Rugged TROLL instrument.

Vented or non-vented.

2 **Instrument**

- Aqua TROLL
- Baro TROLL
- Level TROLL
- Rugged TROLL

3 **Software**

- **HydroVu Software**
  View data, manage instruments, create alarms, and modify VuLink settings in your browser.

- **VuSitu Mobile App**
  Communicate with VuLink on any Bluetooth-enabled mobile device and the VuSitu mobile app.

4 **Batteries**

The following accessories are available for VuLink.

**Cellular Antenna**
Part #: 0043630
The cellular antenna permits strong cellular network connectivity.

**Rugged Cable Splitter**
Part #: 0095500 (vented)
Part #: 0085840 (non-vented)
With the Rugged Cable Splitter, you can connect as many as 8 instruments to VuLink.

**Load-Bearing Universal Adapter**
Part #: 0101000
To attach pulse instruments and devices that don’t have a Twist-Lock connector, use the Load-Bearing Universal Adapter.

**Mounting Kit**
Part #: 0095570
The Mounting Kit lets you attach VuLink to a pole, wall, or other structure.
Using VuLink in any manner not specified by the manufacturer (In-Situ) may impair the device’s built-in protections.

1. **Carabiner**

   VuLink hangs from the top of a well with the detachable carabiner.

2. **VuLink Telemetry Device**

   VuLink provides power to monitoring instruments, transmits data to the cloud, and notifies you when maintenance is required.

3. **Instrument**

   An In-Situ instrument measures water quality and/or water level.
1. Create a HydroVu account.

Visit hydrovu.com and create an account.

2. Go to the telemetry page.

Click the telemetry page link in the menu on the left side of the page. Then click Add a VuLink.

3. Scan the QR code on your VuLink.

Open your web camera and scan the QR code on your device, or type the registration code into the provided field.

4. Attach the antenna and connect an instrument.

After connecting the external or on-board antenna and instrument, follow the instructions on the next pages of this quickstart guide.
Setting Up VuLink

VuLink works with Aqua TROLL, Level TROLL, Baro TROLL, and Rugged TROLL instruments. Follow the steps below to connect an instrument and start transmitting data.

5 Attach the antenna and remove the battery pull-tab.

- Make sure the antenna is properly attached before proceeding.
- Remove the battery cover by twisting it counter-clockwise and pulling down.
- Remove the yellow tab to allow current to flow through the batteries. Replace the cover.
- Press the button. All LEDs turn on. Each LED changes color according to device status.

Never mix old and new batteries, or Lithium and alkaline batteries. Make sure all three batteries are installed in the same orientation.

Troubleshooting Network Connectivity

If VuLink has trouble connecting to a 4G network, switching to 2G may help. Launch VuSitu and follow the instructions below. Contact your cellular provider for coverage details.

- Press the All Settings button at the bottom of the screen.
- Tap Cellular Network on the Settings screen.
- Tap 2G to change VuLink’s network settings. Press Save.
- VuLink should now connect to a network and sync with HydroVu.

Connecting to a cellular network can take up to 10 minutes the first time VuLink powers up or when VuLink hasn’t been powered up in several weeks or months.
**Adding Instruments**

6 **Connect an Instrument**

Align the flat edge of the connector with the flat edge inside the cable. Twist the cable until it clicks into the secure position. Connect the cable to your instrument.

7 **Add another instrument and press the button (optional)**

Add as many as 8 instruments to VuLink, repeating the steps below for each one. When you’re ready to deploy, use one or more Rugged Cable Splitters to connect multiple instruments.

Disconnect instrument. Attach another and press the button. VuLink connects to the new instrument and the data network. VuLink connects to HydroVu or an FTP site. All LEDs indicate current device status. See the section below for details.

**Understanding the LEDs**

All five LEDs illuminate when VuLink is powered on. The color of an LED indicates status.

**Battery status**

- **Solid green**
  Battery power is at least 75%.

- **Blinking green**
  Battery power is between 50% and 75%.

- **Blinking red**
  Battery power is between 25% and 50%.

- **Solid red**
  Battery power is less than 25%.
Blinking red and green

A blinking red and green LED indicates a problem with the batteries. Do not deploy the VuLink in this condition. Check batteries and reinstall as necessary.

Instrument connection status

Blinking green
Searching for an instrument
Solid green
Connected to instrument

Blinking red
New instrument not found
Solid red
No instruments connected to VuLink

Network connection status

Blinking green
Attempting to connect to network
Solid green
Connected to network

Solid red
Unable to connect to network

Cloud connection status

Blinking green
Connecting and uploading data to HydroVu
Solid green
Upload successful

Blinking red
Unclaimed device
Solid red
Failed to connect to HydroVu.com

Bluetooth connection status

Blinking blue
Ready to connect
Solid blue
Bluetooth connected
Logging With VuLink

VuLink logs get uploaded to the cloud; instrument logs do not. Be sure to understand the differences between these log types before deploying VuLink.

VuLink Logs

1. Program a log into VuLink with the VuSitu mobile app.
2. See your data in HydroVu.

Instrument Logs

1. Program a log into the instrument with VuSitu.
2. Download log files with VuSitu.

Pressing the VuLink button for 5 seconds or longer will stop the active VuLink log. Create a new log in VuSitu to configure custom log settings. If no user-created log is configured, VuLink will automatically create a default log to collect all parameters at 1 hour intervals. Logs on connected instruments are not affected.
Using HydroVu

Use HydroVu to create logs, configure alarms, and modify VuLink’s settings.

Sidebar Menu Options/HydroVu Pages

- View your data
- See Locations
- Create and edit dashboards
- Configure telemetry devices
- Manage alarms
- Upload data
- Set up notifications
- Edit calculated parameters
- Manage users

1-970-498-1500  www.in-situ.com
Using VuLink With VuSitu

After connecting to your VuLink with VuSitu, the app always displays the Connected Telemetry Device screen at launch. You can access all features of the app from this screen.

Connected Telemetry Device Screen

- **Access menu.**
- **Access help information.**
- **View and make changes to instruments connected to a VuLink.**
- **Specify a destination for uploads, like HydroVu or an FTP server.**
- **Create and modify logs.**
- **Adjust VuLink and instrument settings.**
### Creating Alarms

#### VuLink Alarms

VuLink alarms send a notification when VuLink batteries run low, a VuLink parameter crosses a specified threshold, or other events occur at a remote monitoring site.

Tap **All Settings** from the menu.

To create an alarm, tap **Add a real-time alarm**.

Select an instrument to connect.

Select the parameter that should trigger the alarm and set the limits.

#### Connected Instrument Alarms

Connected instrument alarms send a notification when a parameter measured by a connected instrument crosses a specified threshold.

Tap **Connected Instruments**.

To create an alarm, tap **Add a real-time alarm**.

Select the parameter that should trigger the alarm and set the limits.

Use the menu to reconnect to VuLink.
Managing Alarm Responses

Alarms can send a notification by SMS or through the cloud when an alarm threshold is crossed. Message and data rates may apply.

Tap **All Settings** from the menu.

Tap **Manage Alarm Responses**.

Select cloud notifications or SMS notifications. Enter SMS phone number(s).

Confirm that the test message was received.

Select **Apply and Test**.
Using VuLink with an FTP Server

You can configure VuLink to upload data to an FTP server via VuSitu. Have your FTP hostname, path, port, username, and password ready before getting started.

Connect to VuLink with the VuSitu mobile app.

Recovering Data Via FTP

Use the recovery FTP screen to send data that failed to transmit via a scheduled upload. You need to know the number or date of the last record uploaded before a data gap occurred.

Access the Telemetry Cloud Service screen as shown above.

Tap Upload Missing Data.

Enter a starting date and time, or a starting record number.

Tap Start.
Read the pop-up message about data charges. Tap **Send Data** if you wish to continue.

If the upload is successful, VuSitu displays a confirmation.
Connecting a Pulse Instrument to VuLink

VuLink can upload data from a pulse instrument to HydroVu or an FTP server.

**Required Components**

- Rugged Twist-Lock Cable with one stripped-and-tinned end
- Load-Bearing Universal Adapter (LBUA)
- Cable (from LBUA to pulse instrument)
- Pulse instrument
- VuLink

**Wiring with the Load-Bearing Universal Adapter (LBUA)**

1. Attach the Twist-Lock end of a Rugged Cable to VuLink.
2. Connect the brown and black wires at the other end of the Rugged Cable to the Load-Bearing Universal Adapter.
3. Snip the four unused wires.
4. Run wires from the other end of the LBUA to the pulse instrument.

Refer to the following table when connecting a pulse instrument to VuLink via a Rugged Cable.

<table>
<thead>
<tr>
<th>Rugged Cable Wire Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wire Color</strong></td>
</tr>
<tr>
<td>Brown</td>
</tr>
<tr>
<td>Black</td>
</tr>
<tr>
<td>Red</td>
</tr>
<tr>
<td>Blue</td>
</tr>
<tr>
<td>Green</td>
</tr>
<tr>
<td>White</td>
</tr>
</tbody>
</table>
Setting Up a Pulse Instrument with VuSitu

Add rain gauges and other pulse devices to VuLink with VuSitu pulse configuration.

1. **Add the instrument to VuLink.**

   - Launch VuSitu and connect to VuLink.
   - Tap the Connected Instruments dropdown.
   - Tap Add New.
   - Select the Pulse Instrument radio button.
   - Connect the instrument to VuLink with a cable. Press the Add button in VuSitu.
   - VuSitu displays a confirmation message. Press OK to dismiss it.

2. **Configure it.**

   - Tap the Connected Instruments dropdown.
   - Tap the instrument.
   - Select low or high frequency.
   - Low frequency: Choose one of the three built-in parameters or create a custom parameter.
Tap the gear icon next to the unit field to select a unit.

Enter the value of one pulse in the selected units.

Enter a minimum and maximum value.

Enter a minimum and maximum frequency in hertz.

Tap **Save**. VuSitu displays a “Saving” message.

Tap **Save** to confirm the pulse instrument configuration.

VuSitu displays a “Saving” message.

High frequency: Select **High Frequency** and choose a parameter and unit.

A custom parameter can be anything you want (for example, snow or precipitation), but you must select one of VuSitu’s built-in unit types.
Understanding VuLink SIM Cards

**External SIM Card**
VuLink attempts to use an external SIM card for all communications if one is present. If communication via the external SIM fails, VuLink uses the built-in SIM instead.

**Built-in SIM**
If an external SIM card isn’t present, VuLink uses its built-in SIM for all communication.

Updating VuLink

- The automatic update option ensures that VuLink always has the current firmware.
LEDs on VuLink’s control panel indicate the device’s status.

1. Carabiner
2. Bluetooth status
3. Battery status
4. Connection status
5. Network connection status
6. Cloud connection status
7. Antenna
8. Power
<table>
<thead>
<tr>
<th>Specifications</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>3 x D cell (1.5V - 3.6V) Alkaline / Li-SOCl2 [Lithium Thionyl Chloride] / Li-MnO2 [Lithium Manganese Dioxide] supported</td>
</tr>
<tr>
<td>Operation Time (24 hour reporting, Li-MnO2)</td>
<td>Up to 12 years*</td>
</tr>
<tr>
<td>Operation Time (24 hour reporting, Alkaline)</td>
<td>Up to 3 years*</td>
</tr>
<tr>
<td>Clock Accuracy</td>
<td>Less than 1 minute drift per year with ability to synchronize to network provided time for accuracy +/- 1 second</td>
</tr>
<tr>
<td>Network Type</td>
<td>4G LTE Category M1 (LTE-M) / NB-IoT (Narrow Band) with 2G fallback</td>
</tr>
<tr>
<td>Bands</td>
<td>LTE Global - B1(2100), B2(1900), B3(1800), B4(AWS1700), B5(850), B8(900), B12(700), B13(700), B18(800), B19(800), B20(800), B28(700)</td>
</tr>
<tr>
<td>Protocols</td>
<td>HTTPS (HydroVu), SMS (alarms)</td>
</tr>
<tr>
<td>Data Provider</td>
<td>Built-in free** global roaming (see Network List Addendum for details: in-situ.com/VuLinkNetworks), additional single 4FF slot for 3rd party SIM support</td>
</tr>
<tr>
<td>Antenna</td>
<td>SMA-M connector</td>
</tr>
<tr>
<td>GPS</td>
<td>Up to 3m accuracy, built-in antenna</td>
</tr>
<tr>
<td>File Format (non-HydroVu)</td>
<td>CSV</td>
</tr>
<tr>
<td>Remote Setup</td>
<td>Supported</td>
</tr>
<tr>
<td>Overall Length</td>
<td>19.1”</td>
</tr>
<tr>
<td>Diameter</td>
<td>1.85”</td>
</tr>
<tr>
<td>Weight</td>
<td>2.2 pounds/1.0 kg (with included alkaline batteries and carabiner, excluding antenna)</td>
</tr>
<tr>
<td>Materials</td>
<td>Ryton (housing), PVC (battery cover), Titanium (Twistlock connector, eyebolt), 316 Stainless Steel (carabiner), Silicone (keypad cover), Brass (SMA antenna connector), Polycarbonate (label), Viton (O-rings)</td>
</tr>
<tr>
<td>Feature</td>
<td>Specification</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>-20°C to 60°C</td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>-20°C to 50°C (Li-SOCl2/Li-MnO2), 5°C - 40°C (Alkaline)</td>
</tr>
<tr>
<td><strong>Ingress Protection</strong></td>
<td>Device: IP68 System: Up to IP68 per antenna specification</td>
</tr>
<tr>
<td><strong>Protocols</strong></td>
<td>Modbus over RS-485, SDI-12, Pulse low/high frequencies (max 40 khz)</td>
</tr>
<tr>
<td><strong>Connectors</strong></td>
<td>1 In-Situ Twistlock (supports multiple instruments via Rugged Cable Splitter, TROLL Net Hub, or Load-Bearing Universal Adapter)</td>
</tr>
<tr>
<td><strong>Simultaneous Connections</strong></td>
<td>Up to 8 instruments (total maximum of 75mA provided to connected instruments at 16V)</td>
</tr>
<tr>
<td><strong>Venting</strong></td>
<td>Built-in on all models, no desiccant required</td>
</tr>
<tr>
<td><strong>Barometric Compensation</strong></td>
<td>Built-in on all models for automatic compensation of level readings</td>
</tr>
<tr>
<td><strong>Barometer Accuracy</strong></td>
<td>+/- 1 hPa</td>
</tr>
<tr>
<td><strong>Alarms</strong></td>
<td>Configurable based on instrument readings and device parameters</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>Total maximum of 75mA provided to connected instruments at 16V (intended typically to power a single instrument)</td>
</tr>
<tr>
<td><strong>Wireless Setup</strong></td>
<td>Supported via Bluetooth Low Energy</td>
</tr>
<tr>
<td><strong>Logging Rate</strong></td>
<td>1 minute to 7 days</td>
</tr>
<tr>
<td><strong>Transmission Rate</strong></td>
<td>5 minutes to 7 days</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>512 MB (soldered to circuit board)</td>
</tr>
<tr>
<td><strong>Maximum Transmitter Output Power</strong></td>
<td>All LTE FDD bands: +23 dBm +/- 1dB (conducted)</td>
</tr>
<tr>
<td></td>
<td>GSM900: +32.5 dBm +/- 1dB GSM1800: +29.5 dBm +/- 1dB (conducted)</td>
</tr>
<tr>
<td></td>
<td>EGPRS900: +27.0 dBm +/- 1dB EDGE1800: +26.0 dBm +/- 1dB (conducted)</td>
</tr>
<tr>
<td></td>
<td>Bluetooth: +5.5 dBm +/- 0.35 dB (EIRP)</td>
</tr>
</tbody>
</table>