



# Pivotal Echo 5G™ Installation Manual

*Version 1.0*

# Table of Contents

<b>Safety and Regulatory Information .....</b>	<b>4</b>
FCC Signal Booster User Information .....	4
FCC Part 15 Information for User .....	4
FCC Radiation Exposure Statement .....	4
<b>Intellectual Property .....</b>	<b>5</b>
<b>Disclaimer of Warranties; Exclusion of Liability.....</b>	<b>5</b>
<b>Contact Information .....</b>	<b>5</b>
<b>Overview of Echo 5G.....</b>	<b>6</b>
<b>Installation &amp; Setup .....</b>	<b>7</b>
System Components .....	7
General Configuration .....	8
Choosing a Device Location .....	9
Finding the Best Window for Reception.....	9
Pre-Installation Cleaning.....	9
Installing Outdoor (ODU) and Indoor (IDU, alignment cling) Components.....	10
Installing the ODU on the outside of your window .....	10
Installing the IDU on the Inside of your Window .....	11
<b>Connecting to Echo 5G.....</b>	<b>13</b>
Add the Echo 5G as a Recognized Device via Laptop .....	13
Establish Network Connection to the Echo 5G via Laptop .....	15
Add the Echo 5G as a Recognized Device via Smartphone.....	17
<b>Echo 5G Web Interface .....</b>	<b>19</b>
Connecting to Echo via Web Browser .....	19
Device Settings (Details).....	20
Setting Azimuth or Elevation Manually .....	20
<b>Appendix A – Technical Specifications .....</b>	<b>22</b>

**Appendix B – Troubleshooting & Support** .....23

    Indicator Lights Overview ..... 23

    What the IDU Indicator Light Displays Mean..... 23

    What the ODU Indicator Light Means ..... 24

    Troubleshooting Issues ..... 24

    Getting Technical Assistance ..... 25

**Appendix C – Warranty Information** .....26

    Standard Limited Warranty ..... 26

    User License Agreement for Software ..... 27

**Appendix D – Glossary** .....30

**Appendix E – Removal Instructions**.....32

# Safety and Regulatory Information

---

This manual should be read and used as a guideline for properly installing and operating the Pivotal Echo 5G device. This manual may be changed for system improvement, standardization, and other technical reasons without prior notice. Updated manuals are available at: <https://pivotalcommware.com/UserManual.pdf>.

For questions on the manual or their content, contact [support@pivotalcommware.com](mailto:support@pivotalcommware.com).

## FCC Signal Booster User Information

**WARNING.** This is not a CONSUMER device. This device may not be sold at retail. You **MUST** have an FCC LICENSE or express consent of an FCC Licensee (or express consent of your service provider) to operate this device. Antennas must be installed at least 20 cm (8 inches) from any person. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.

## FCC Part 15 Information for User

Outdoor Unit (ODU) – FCC ID: **2AUVU-OES3**.

- This device contains FCC IDs: **2AUVU-UBR410M** and **Z64-WL18SBMOD**

Indoor Unit (IDU) – FCC ID: **2AUVU-IES3**

Pursuant to part §15.21 of CFR Title 47, you are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.

*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.*

**Note:** 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. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment to an outlet on a circuit different from that which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

## FCC Radiation Exposure Statement

To ensure the safety of users, the FCC has established criteria for the amount of radio frequency energy various products may produce depending on their intended usage. This product has been evaluated to comply with the FCC’s exposure criteria. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The installation of the Echo unit should allow at least **20 centimeters** between the device and persons to be in compliance with FCC RF exposure guidelines.

Use only Pivotal Commware approved power supplies and accessories that are specifically designed for your Echo device.

# Intellectual Property

---

All Intellectual Property, as defined below, owned by or which is otherwise the property of Pivotal Commware, Inc. (“Pivotal”) or its respective suppliers relating to the Pivotal device, i.e., Pivotal Echo 5G, including but not limited to, accessories, parts, or software relating thereto (the “Echo 5G”), is proprietary to Pivotal and protected under federal laws, state laws, and international treaty provisions. “Intellectual Property” means any Pivotal (or where applicable, Pivotal’s supplier’s) intellectual property including, but not limited to, inventions (patentable or unpatentable), patents, trade secrets, copyrights, software, computer programs, and related documentation and other works of authorship. You may not infringe or otherwise violate the rights secured by the Intellectual Property. Moreover, you agree that you will not (and will not attempt to) modify, prepare derivative works of, reverse engineer, decompile, disassemble, or otherwise attempt to create source code from the software. No title to or ownership in the Intellectual Property is transferred to you. All applicable rights of the Intellectual Property shall remain with Pivotal and its suppliers.

# Disclaimer of Warranties; Exclusion of Liability

---

This document provides an introduction to features, functions, setup, and operation of Pivotal Commware’s Echo 5G. For more information, refer to the [Warranty Information](#).

# Contact Information

---

Headquarters:  
10801 120th Ave NE #200  
Kirkland, WA 98033 USA  
[www.pivotalcommware.com](http://www.pivotalcommware.com)

*Do you have questions about your Echo 5G device?*

*For 24-hour information and assistance, please contact Verizon’s Automated Response System at:*

[www.verizonwireless.com/support/](http://www.verizonwireless.com/support/)

# Overview of Echo 5G

The Echo 5G is a self-installable, on-the-window, precision beamforming repeater designed to counteract mmWave penetration, reflection, and structural shadowing losses so it can gently flood an interior with native mmWave signal. Essentially, the Echo 5G acts as a portal between indoor and outdoor worlds.

For fixed wireless access (FWA) providers serving homes and enterprises, the Echo 5G facilitates Gigabit speeds and introduces a superior broadband choice and experience to cable and DSL end users. For 5G-connected devices, the Echo 5G enables outdoor-to-indoor signal transitions so users can ubiquitously enjoy the immersive 5G experiences that only mmWave capacity can deliver.

The Echo 5G product line accomplishes this using Pivotal’s patented Holographic Beam Forming® (HBF) technology whose cost, size, weight, and power consumption (C-SWaP) profile is significantly lower than phased array beamformers; specifically, an order of magnitude less cost, less than half the weight, and less than one-third the power consumption.

With HBF, Echo 5G overcomes a major obstacle to cost-effectively delivering 5G broadband access to homes and businesses with mmWave-in-building penetration.

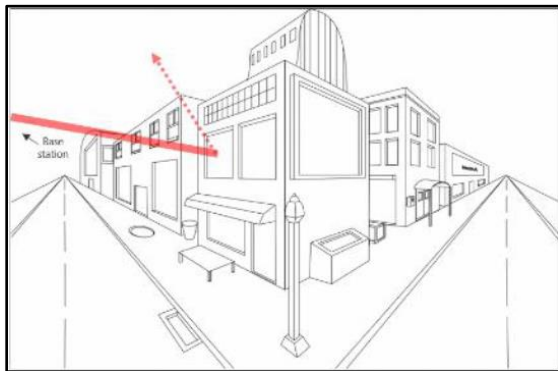


Figure 1: Millimeter wave signals bounce off windows

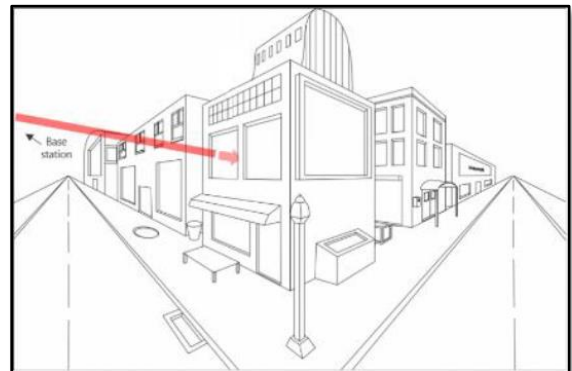





Figure 2: The Echo 5G boosts the signals through the glass

# Installation & Setup

The Echo 5G is designed to be easily installed. The following material provides guidance to perform a typical installation. Subsequent sections offer additional assistance if needed.

## System Components

	<p><b>Echo 5G (1)</b> Outdoor unit (ODU) with HBF antenna and RF front-end functions:</p> <ul style="list-style-type: none"> <li>• Conveys wireless data between user devices and nearby base station</li> </ul>
	<p><b>Rail-mounting tool (1)</b> Comes with pre-attached mounting rails</p>
	<p><b>Wireless Power IDU (1)</b> Indoor Unit (IDU): transmits power through the glass to ODU equipment</p>
	<p><b>Power Adapter (1)</b> Provides power from wall outlet to IDU</p>
	<p><b>Alignment cling (1)</b> Mounts on indoor glass side of Echo 5G, helps with positioning IDU</p>
	<p><b>Extra Rails (2)</b> To replace rails pre-attached to ODU, if necessary</p>
	<p><b>Spacer Ring (1, pre-attached to IDU)</b> Mounts on the indoor glass side to ensure the proper spacing between the ODU and IDU if window is single-pane glass</p>

	<b>Cleaning Wipes (1)</b> To clean both sides of the window before mounting to ensure a good bond
	<b>Allen Wrench (1)</b> To loosen the set screws on each side of the device so the device can be slid off the rails.
	<b>Removal Tool (1)</b> To remove the rails and rail adhesive if necessary.

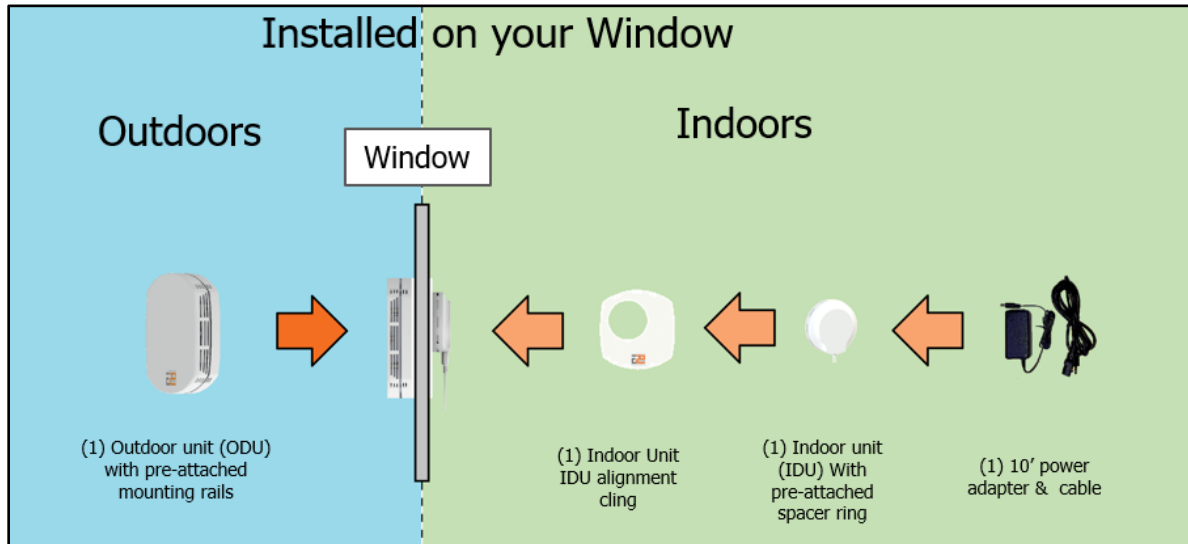
## General Configuration

Here's an example of the Echo 5G system configuration along with a diagram of the components that are installed on your window.



Figure 3: Window-mounted system: Echo Outdoor Unit (ODU) attaches to outside of window and smaller Indoor Unit (IDU) attaches to inside.





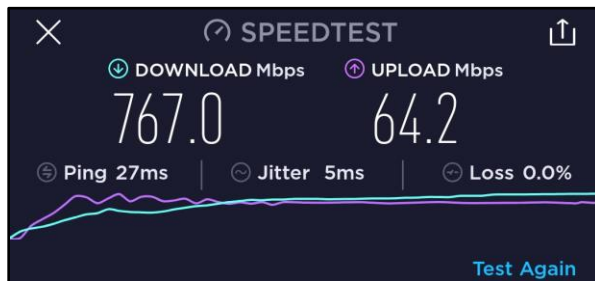
## Choosing a Device Location

The window you choose for your Echo 5G must:

- Receive quality 5G reception
- Be large enough to place the Echo 5G at least **4 inches** from any window edge (or the ground)
- Have an outlet within **10 feet** of the mounting location for plugging in the IDU

## Finding the Best Window for Reception

Identify the window with the best 5G reception by turning off your phone's wi-fi, downloading the SpeedTest App from your phone's App store, opening the app, and selecting 'Go.'



## Pre-Installation Cleaning

Clean the **inside and outside** of the window glass according to the instructions on the back of the packet of wipes included with your Echo 5G.

- [1]** Wipe glass vertically and then horizontally to ensure complete coverage. Be sure pad is wetting the glass surface.
- [2]** While glass surface is still wet, wipe dry with a clean dry cloth or paper towel.

- [3] Apply the item(s) to be bonded within thirty minutes.

## Installing Outdoor (ODU) and Indoor (IDU, alignment cling) Components

Make sure you have carefully [selected a good window](#) and performed the [required glass cleaning](#) before installing your Echo 5G.

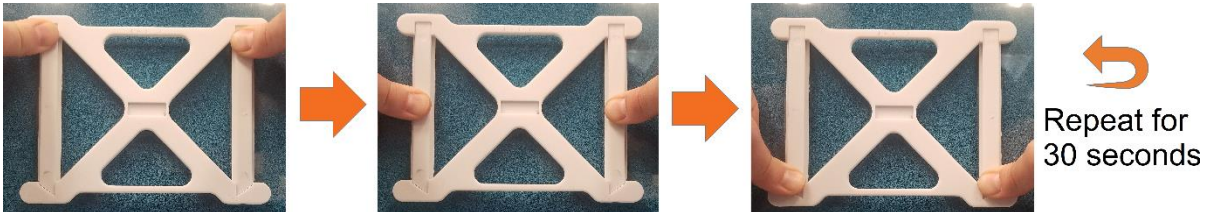
### Installing the ODU on the outside of your window

- [1] Remove the strips to expose the adhesive on the rails that are pre-attached to the rail mounting tool.



- [2] Make sure the rails are level and you are mounting the unit at least four inches from any window edge. Press it against the outside of your window – apply force and hold for 30 seconds.

- [3] Run your thumbs up and down the rails, pressing hard for 30 seconds.



- [4] Let the rails cure for one hour before sliding the device on.



**Wait 60 minutes**

- [5] Slide the ODU onto the rails.



- [6] Use the included Allen wrench to tighten the set screws on the ODU so the unit is tightly secured to the rails.



## Installing the IDU on the Inside of your Window

- [7] Remove the alignment cling from its backing and attach it to the indoor side of the glass, lining up the cling inside with the ODU mounted on the outside.



- [8] Remove the backing from the adhesive on the ring pre-attached to the IDU. Line the IDU up in the corresponding viewport in the cling.

- [9] Press the IDU firmly to the window and hold for 30 seconds.



Note that the adhesive-backed portion adheres to the ring and IDU with Velcro so you can remove the IDU and adjust as necessary once the adhesive-backed Velcro is secured to the window as outlined above.



*Disassembled IDU (velcro, one side), spacer ring (Velcro, both sides), and Velcro-to-window adhesive*



*Assembled IDU, spacer ring, and Velcro-to-window adhesive*

- [10]** Once the IDU has been applied to the window, insert the power adapter and plug the IDU in to a standard 110V outlet. The IDU lights will blink before going solid. If the green IDU light continues blinking for more than 30 seconds, remove the spacer ring and re-attach the IDU.



# Connecting to Echo 5G

You will commission the Echo 5G using the Echo 5G Manager web interface. In order to do this, you must first establish a wireless Bluetooth connection to the Echo device from your [laptop](#) or [smartphone](#).

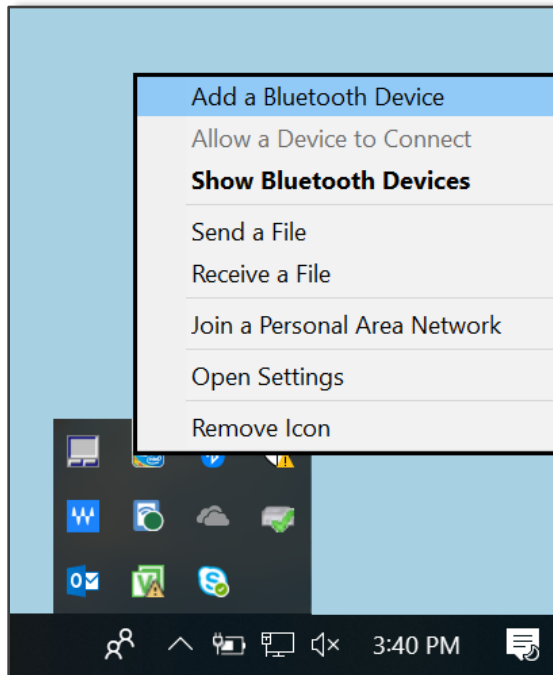
Your laptop/smartphone and the Echo will communicate via Bluetooth. (Specifically, they communicate via IP over a Bluetooth connection). Once connected, you will need to keep your laptop or smartphone within **10 feet** of the Echo unit until you are finished commissioning the device.

## Add the Echo 5G as a Recognized Device via Laptop

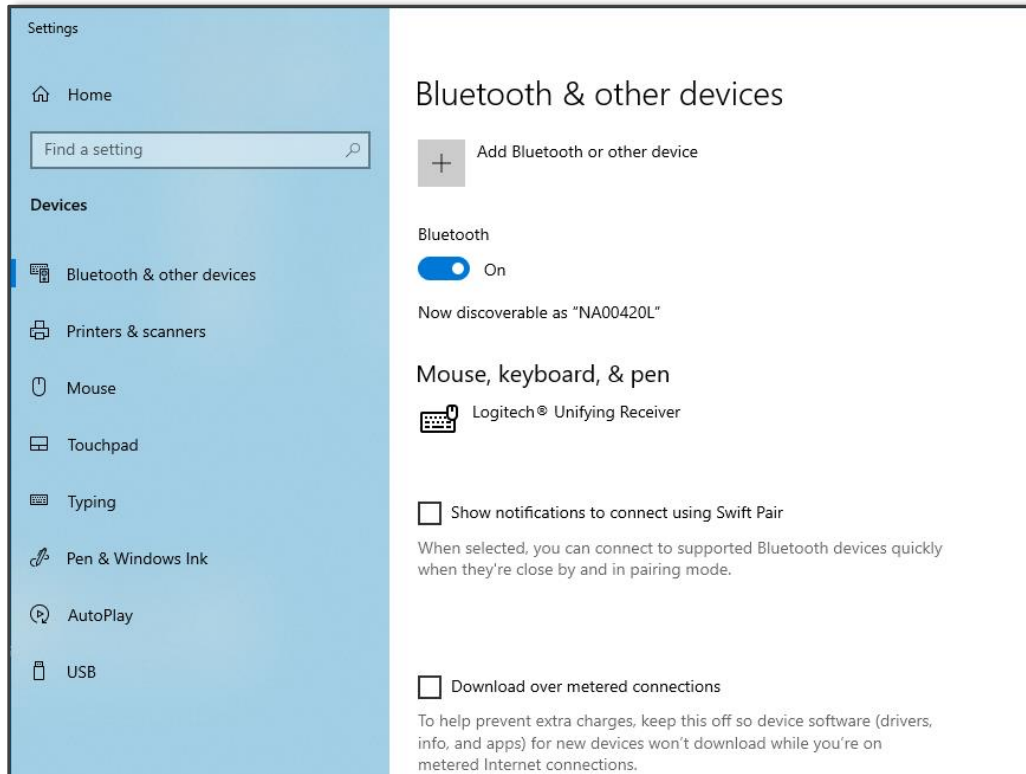
- [1] Power on the Echo 5G so the laptop can discover it as a nearby Bluetooth device.
- [2] On your laptop toolbar, right-click the Bluetooth icon:



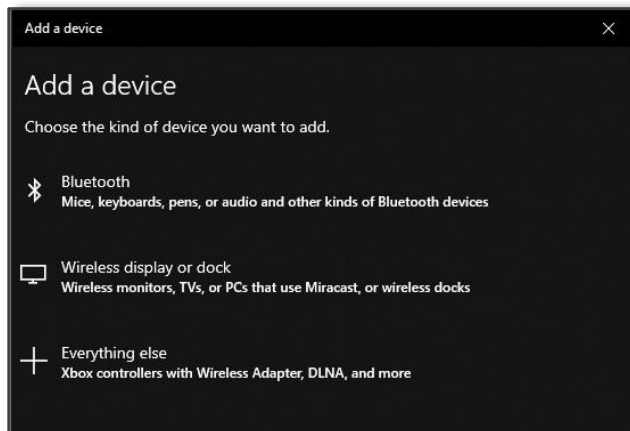
- [3] In the pop-up list, select **Add a Bluetooth Device**.



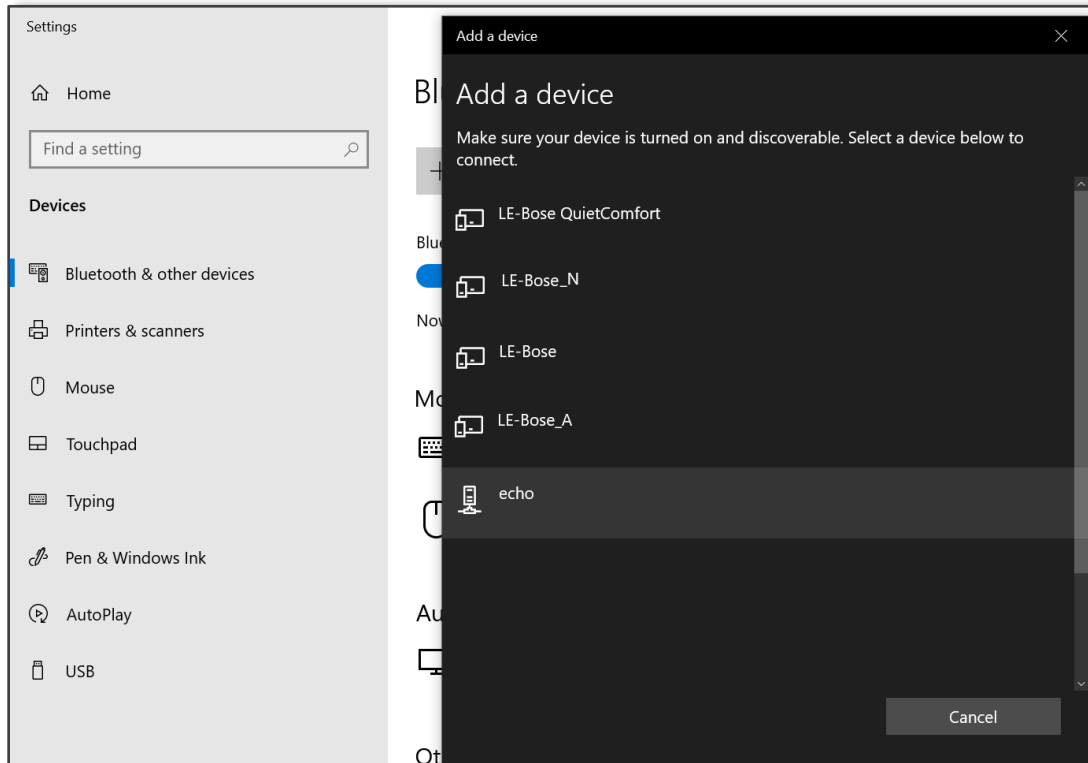
- [4] A Settings screen will appear with a list of options (left side). Select **Bluetooth & other devices** if it doesn't show by default, then select **Add Bluetooth or other device**.



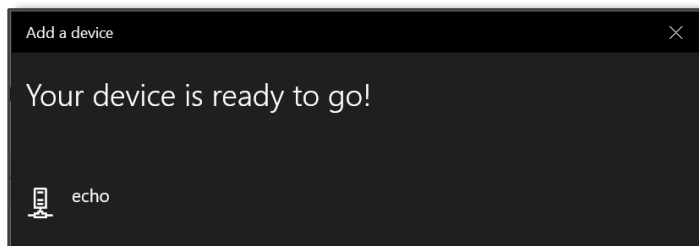
- [5] Select **Bluetooth** as the intended device type.



[6] Select the Echo from the displayed list of nearby Bluetooth devices. It will show as 'echo.'



[7] This adds your Echo unit to the list of devices available for interaction with the laptop. You will see a confirmation message when the Echo and your laptop are finished pairing.



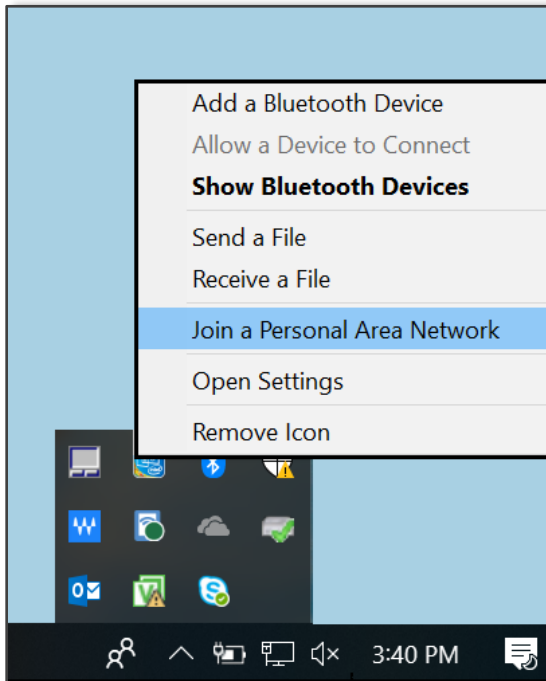
[8] Then select **Done**.

## Establish Network Connection to the Echo 5G via Laptop

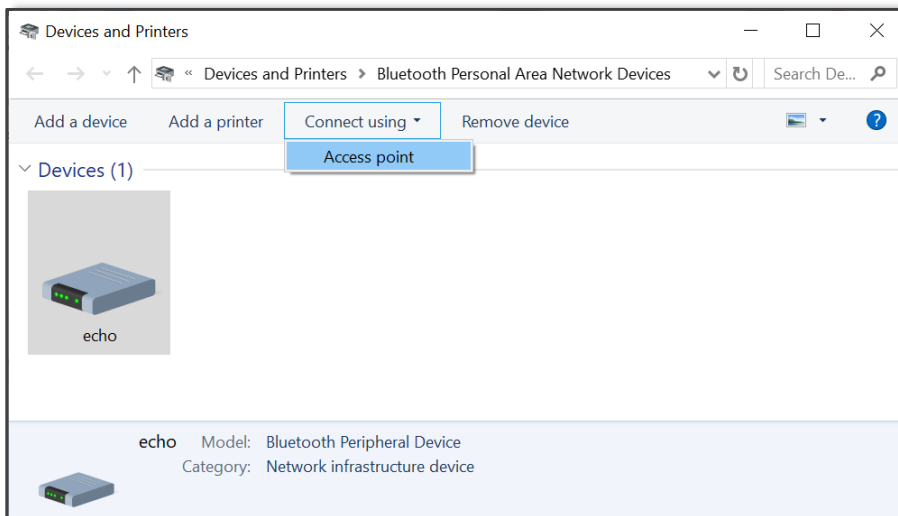
[1] Right click the Bluetooth icon in your laptop toolbar.



[2] In the pop-up list, select **Join a Personal Area Network**.

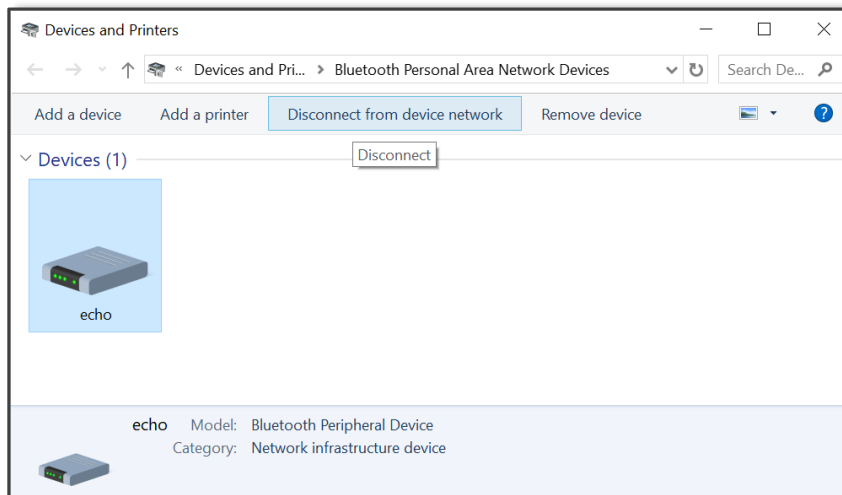


[3] The system displays the *Devices and Printers* panel. Select your Echo device. Then, from the **Connect using** button, select **Access point**.



[4] Confirm that the **Connect** button is now replaced with a **Disconnect from device network** button. This is evidence that the Echo device is currently connected.

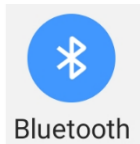




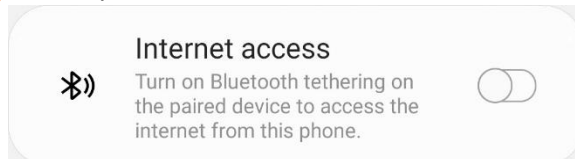
- [5] You will now be able to commission the Echo 5G device from this laptop using the Echo 5G Manager web interface.

## Add the Echo 5G as a Recognized Device via Smartphone

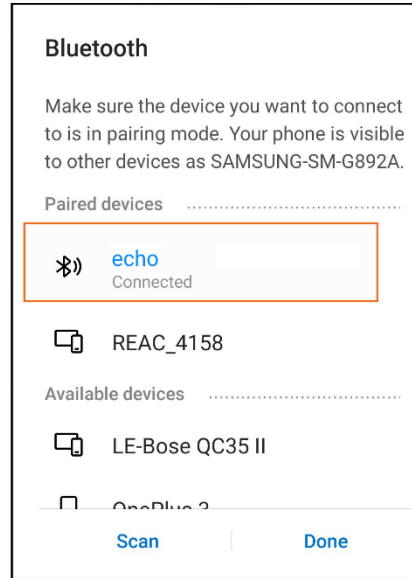
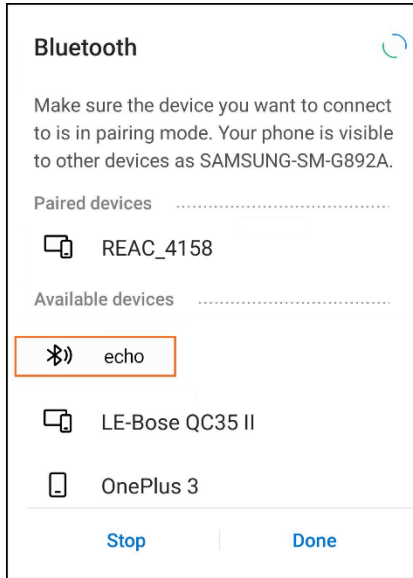
- [1] Turn on your phone's Bluetooth if it is not already on.



- [2] You may also need to turn on Bluetooth tethering in your phone's Bluetooth settings.



- [3] Select the Echo 5G from your list of available Bluetooth devices and wait for it to connect.



# Echo 5G Web Interface

The Echo 5G Web Interface is the same whether it is on a Smartphone browser or laptop browser.

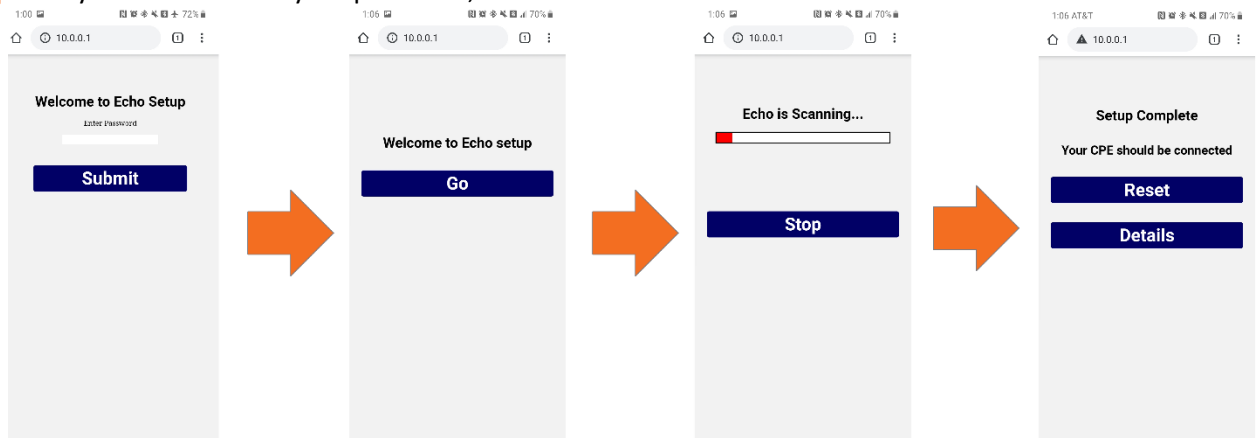
## Connecting to Echo via Web Browser

- [1] Navigate to web address **10.0.0.1** on your phone's web browser.
- [2] Enter the **last six digits of your Echo 5G's serial number** as your password. The serial number can be found on the bottom of the ODU, the back of the IDU, or on the packaging box.



*Serial number shown on bottom of ODU*

- [3] Once you have entered your password, select **Submit**.



- [4] After submitting your password, the Echo setup will begin. Select **Go** for the Echo to scan and align with the strongest 5G beam source. Once scanning is complete, you will see the *Setup Complete* screen and can reset and rescan or view the details of the scan.
- [5] Should you wish to change your settings at any future time, simply go through this process again. The setup will skip the second and third screens in the image above and take you right to the *Setup Complete* page (as the Echo retains the details of your previous scan). You should select **Reset** for the device to re-scan and re-align.

## Device Settings (Details)

[6] If you select Details, you can view the Azimuth (Az) and Elevation (El) along with other details of the Echo 5G's alignment in either dB or raw format. You can also manually set the Azimuth and Elevation if your connection is weak.

### Setup Complete

Azimuth:  Elevation:

**Uplink**

VPOL UL dB:  HPOL UL dB:

**Downlink**

VPOL DL dB:  HPOL DL dB:

**Switch to Raw**

**Submit**

**Save and Exit**

DL VPOL: -15.2 dBm  
DL HPOL: -15.1 dBm  
UL VPOL: -21.8 dBm  
UL HPOL: -19.0 dBm

**Heat Map**

Min: -10 Max: 0

### Setup Complete

Azimuth:  Elevation:

**Uplink**

VPOL UL 1:  HPOL UL 1:

VPOL UL 2:  HPOL UL 2:

VPOL UL 4:  HPOL UL 4:

**Downlink**

VPOL DL 1:  HPOL DL 1:

VPOL DL 2:  HPOL DL 2:

VPOL DL 4:  HPOL DL 4:

**Switch to dB**

**Submit**

**Save and Exit**

DL VPOL: -15.2 dBm  
DL HPOL: -15.1 dBm  
UL VPOL: -21.8 dBm  
UL HPOL: -19.0 dBm

**Heat Map**

Min: -10 Max: 0

## Setting Azimuth or Elevation Manually

The Manual Setup tab provides access to beam pointing (Az, El) control in degrees.

Azimuth can be adjusted in 2-degree increments and decrements, and the Elevation in 5-degree increments. The inputs are bounded from -35 degrees to +35 degrees in Elevation and -76 degrees to +76 degrees in Azimuth. You can begin with initial setting of 0 for both Az and El.

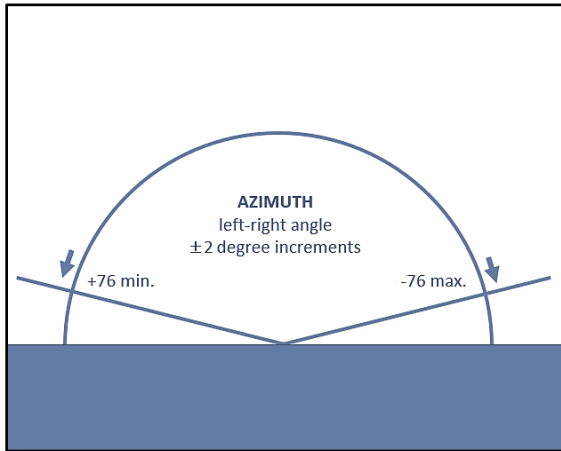


Figure 4: "Top-down view" of azimuth settings range  
"Side view" of elevation settings range

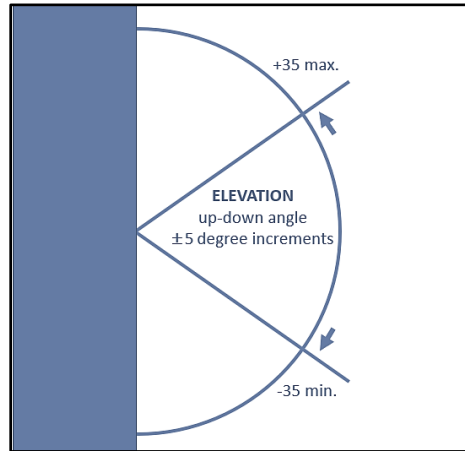


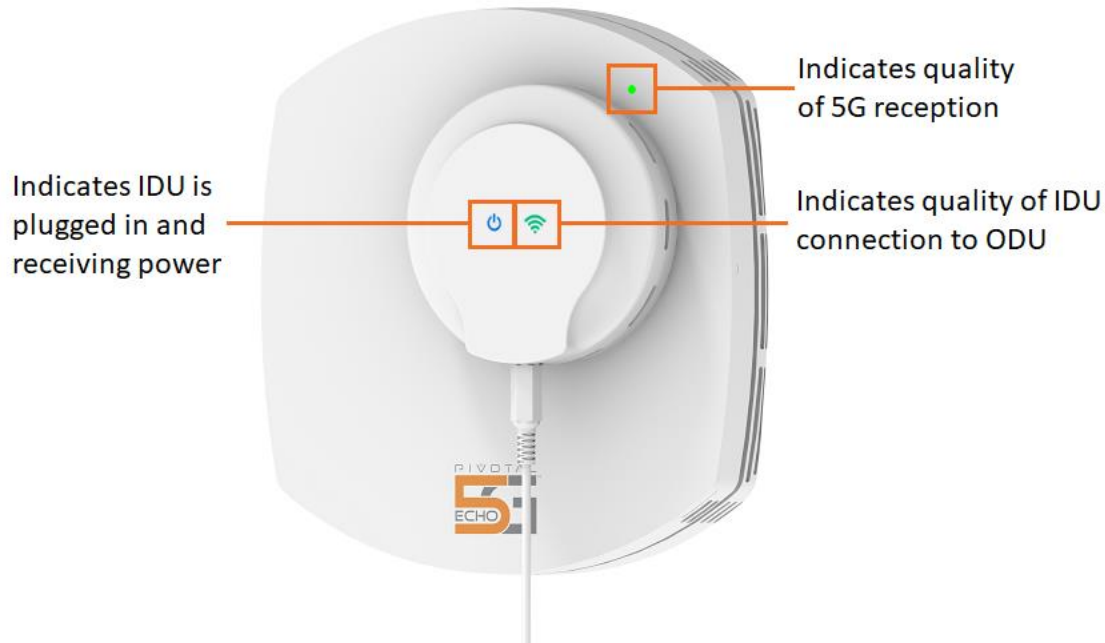
Figure 5: "Top-down view" of azimuth settings range  
"Side view" of elevation settings range

# Appendix A – Technical Specifications



Pivotal Echo 5G	Specifications
Dimensions	7" x 7" x 1.5" for RF ODU, and 3.7" circle, 1.1" depth for IDU
Weight RF ODU	2.4 lbs.
Weight IDU	0.4 lbs.
Power Method	AC adapter for IDU and wireless power magnetically induced for ODU
Max. Power Consumption	36 Watts (from outlet)
Mounting	Adhesive, VHB
Operating Temperature	-30 to 45° C
IP Rating	IP54 for ODU; IP32 for IDU
Configuration Management Interface	Bluetooth® and LTE CAT M1
Maximum Donor Range (to gNB)	3000 ft
Maximum Indoor Range (to CPE/UE)	30 ft
Support Glass Type	Standard: single and double pane
Certifications	FCC, UL
Commissioning	Automated scan with setup via web-interface
Frequency of operation	27.5 to 28.35 GHz
Max EIRP - DL	29.5 dBm
Max EIRP - UL	29.5 dBm
Gain tunable range - DL	15 dB
Gain tunable range - UL	15 dB
HBF antenna gain (donor side)	16 dB
HBF scan loss	6 dB at 76°
HBF az scan envelope	+/-76°
HBF el scan envelope	+/-35°
Static antenna (service side)	6 dB
HPBW towards gNB - azimuth	5°
HPBW towards gNB - elevation	20°
HPBW towards CPE/UE - azimuth	100°
HPBW towards CPE/UE - elevation	100°
Max electronic gain - DL	55 dB
Max electronic gain - UL	55 dB
Min noise figure - DL	5 dB
Min noise figure - UL	5 dB
In-band ripple (per 100 MHz channel)	2 dB

# Appendix B – Troubleshooting & Support

## Indicator Lights Overview

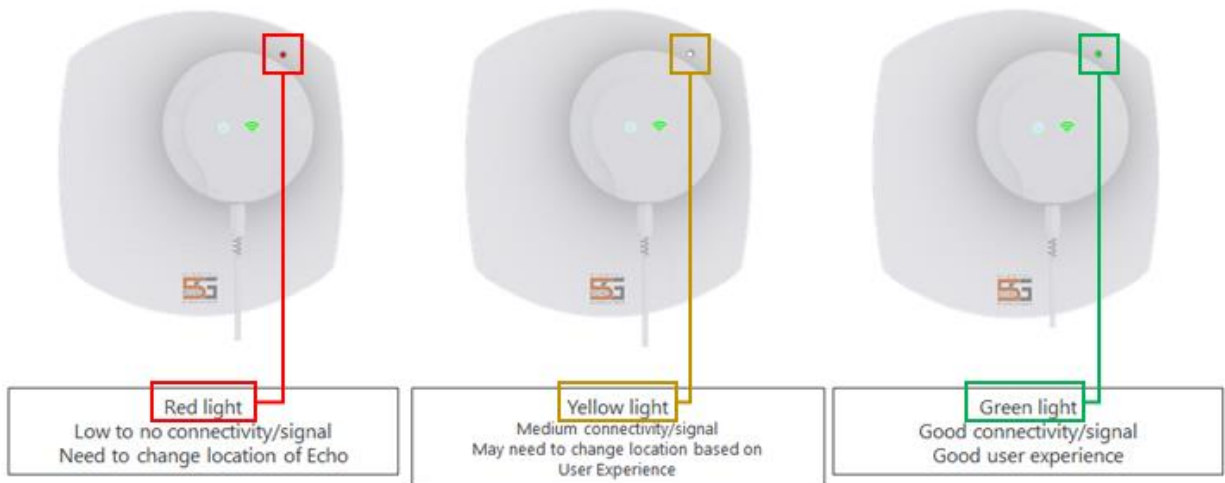


## What the IDU Indicator Light Displays Mean

- 
**Solid blue light indicator**
  - » DC power to the IDU
- 
**Green light indicator**
  - » Blinking green: probing for an ODU
  - » Solid green: IDU is powering the ODU
  - » If the length of the blinking green LED is longer than 30 secs, the spacer needs to be removed or IDU needs repositioning



## What the ODU Indicator Light Means



## Troubleshooting Issues

Issues	Actions
IDU continues to probe for the ODU (green light on IDU blinks for more than 30 seconds)	<p>Make sure the alignment cling and IDU are properly aligned with the ODU.</p> <p>If window glass is double-paned, remove the spacer ring from the IDU and re-attach the IDU.</p>
Echo 5G transmitting signal is weak	Adjust <a href="#">Azimuth (Az) and Elevation (El) settings</a> for better alignment with the gNB.
Echo 5G is not transmitting at all	Power off, then power on the Echo 5G.
Echo 5G loses connectivity during commissioning	Bluetooth connection may have dropped if laptop/smartphone was moved too far away from the Echo 5G during commissioning. Try getting closer to Echo with the device you are using to commission Echo 5G via Bluetooth. You may need to re-do the network connection portion of the <a href="#">Laptop-to-Echo</a> connection process.



<p>Echo 5G signal strength diminishes over time</p>	<p>Possible gradual obstruction in signal path to gNB, such as leaves growing on trees that were not there during initial Echo 5G setup.</p> <p><a href="#">Re-commission</a> the Echo 5G and select <b>Reset</b> and then <b>Go</b> to re-scan and re-align or perform manual adjustment of Gain and Az-El.</p>
---	--

**Notes:**

- The Echo does not lose any settings when GUI/Bluetooth connection has been dropped and subsequently restored.
- If the above listed solutions do not appear to resolve your concern, please [contact Pivotal Commware](#) for additional assistance.

## Getting Technical Assistance

Pivotal Commware is dedicated to the success of your Echo 5G installation and operation. Feel free to contact us with any questions or concerns.

Before calling, gather the following details about your Echo 5G:

- [Serial Number](#) (located on the bottom of the ODU, back of the IDU, and on the packaging box)
- [Device settings](#)

**Pivotal Echo 5G Technical Support:**

- Phone – 1-855-956-2016
- Email – [support@pivotalcommware.com](mailto:support@pivotalcommware.com)
- Website – <https://pivotalcommware.freshdesk.com/support/home>



10801 120th Ave NE, #200  
 Kirkland, WA 98033 USA  
 (425) 365-0408  
 pivotalcommware.com

# Appendix C – Warranty Information

---

Your Pivotal Commware, Inc. ("Pivotal") Echo 5G has been designed to provide reliable, worry-free service. If for any reason you have a problem with your equipment, please refer to the manufacturer's warranty in this section. For information regarding the terms and conditions of service for your Echo 5G, please visit [www.verizonwireless.com/support/](http://www.verizonwireless.com/support/) or call Verizon Wireless Customer Service at (800) 922-0204 or \*611 from your Verizon Wireless mobile phone.

## Standard Limited Warranty

---

### What is Covered and For How Long?

Pivotal warrants to the original purchaser ("Purchaser" or "You") that the Pivotal Echo 5G and accessories ("Products") included in this package are free from defects in material and workmanship under normal use and service for the period commencing upon the date of purchase and continuing for the following specified period of time after that date: All components carry a one-year warranty.

### What is Not Covered?

This Limited Warranty is conditioned upon proper use of Product by Purchaser. This Limited Warranty does not cover: (a) defects or damage resulting from accident, misuse, abuse, neglect, unusual physical, electrical or electromechanical stress, or modification of any part of Product, including antenna, or cosmetic damage; (b) equipment that has the serial number removed or made illegible; (c) any plastic surfaces or other externally exposed parts that are scratched or damaged due to normal use; (d) malfunctions resulting from the use of Product in conjunction with accessories, products, or ancillary/peripheral equipment not furnished or approved by Pivotal; (e) defects or damage from improper testing, operation, maintenance, installation, or adjustment; (f) installation, maintenance, and service of Product, or (g) Product used or purchased outside the United States.

### What are Pivotal's Obligations?

During the applicable warranty period, Pivotal will repair or replace, at Pivotal's sole option, without charge to Purchaser, any defective component part of Product. To obtain service under this Limited Warranty, Purchaser must return Product to an authorized service facility in an adequate container for shipping, accompanied by Purchaser's sales receipt or comparable substitute proof of sale showing the date of purchase, the serial number of Product and the seller's name and address. To obtain assistance on where to deliver the Product, call Verizon Customer Care at (800) 922-0204. Upon receipt, Pivotal will promptly repair or replace the defective Product. Pivotal may, at Pivotal's sole option, use rebuilt, reconditioned, or new parts or components when repairing any Product or replace Product with a rebuilt, reconditioned or new Product. All other repaired/replaced Product will be warranted for a period equal to the remainder of the original Limited Warranty on the original Product or for 90 days, whichever is longer. All replaced parts, components, boards and equipment shall become the property of Pivotal. If Pivotal determines that any Product is not covered by this Limited Warranty, Purchaser must pay all parts, shipping, and labor charges for the repair or return of such Product.

#### WHAT ARE THE LIMITS ON PIVOTAL'S WARRANTY/LIABILITY?

EXCEPT AS SET FORTH IN THE LIMITED WARRANTY CONTAINED HEREIN, PURCHASER TAKES THE PRODUCT "AS IS," AND PIVOTAL MAKES NO WARRANTY OR REPRESENTATION AND THERE ARE NO CONDITIONS, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, OF ANY KIND WHATSOEVER WITH RESPECT TO THE PRODUCT, INCLUDING BUT NOT LIMITED TO:

THE MERCHANTABILITY OF THE PRODUCT OR ITS FITNESS FOR ANY PARTICULAR PURPOSE OR USE;

WARRANTIES OF TITLE OR NON-INFRINGEMENT;

DESIGN, CONDITION, QUALITY, OR PERFORMANCE OF THE PRODUCT;

THE WORKMANSHIP OF THE PRODUCT OR THE COMPONENTS CONTAINED THEREIN; OR

COMPLIANCE OF THE PRODUCT WITH THE REQUIREMENTS OF ANY LAW, RULE, SPECIFICATION OR CONTRACT PERTAINING THERETO.

ALL IMPLIED WARRANTIES AND CONDITIONS THAT MAY ARISE BY OPERATION OF LAW, INCLUDING IF APPLICABLE THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY LIMITED TO THE SAME DURATION OF TIME AS THE LIMITED WARRANTY STATED HEREIN. SOME STATES/PROVINCES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. IN ADDITION, PIVOTAL SHALL NOT BE LIABLE FOR ANY DAMAGES OF ANY KIND RESULTING FROM THE PURCHASE, USE, OR MISUSE OF, OR INABILITY TO USE THE PRODUCT OR ARISING DIRECTLY OR INDIRECTLY FROM THE USE OR LOSS OF USE OF THE PRODUCT OR FROM THE BREACH OF THE LIMITED WARRANTY, INCLUDING INCIDENTAL, SPECIAL, CONSEQUENTIAL OR SIMILAR DAMAGES, OR LOSS OF ANTICIPATED PROFITS OR BENEFITS, OR FOR DAMAGES ARISING FROM ANY TORT (INCLUDING NEGLIGENCE OR GROSS NEGLIGENCE) OR FAULT COMMITTED BY PIVOTAL, ITS AGENTS OR EMPLOYEES, OR FOR ANY BREACH OF CONTRACT OR FOR ANY CLAIM BROUGHT AGAINST PURCHASER BY ANY OTHER PARTY. SOME STATES/PROVINCES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE/PROVINCE TO PROVINCE. THIS LIMITED WARRANTY SHALL NOT EXTEND TO ANYONE OTHER THAN THE ORIGINAL PURCHASER OF THIS PRODUCT AND STATES PURCHASER'S EXCLUSIVE REMEDY. IF ANY PORTION OF THIS LIMITED WARRANTY IS HELD ILLEGAL OR UNENFORCEABLE BY REASON OF ANY LAW, SUCH PARTIAL ILLEGALITY OR UNENFORCEABILITY SHALL NOT AFFECT THE ENFORCEABILITY FOR THE REMAINDER OF THIS LIMITED WARRANTY WHICH PURCHASER ACKNOWLEDGES IS AND WILL ALWAYS BE CONSTRUED TO BE LIMITED BY ITS TERMS OR AS LIMITED AS THE LAW PERMITS. THE PARTIES UNDERSTAND THAT THE PURCHASER MAY USE THIRD-PARTY SOFTWARE OR EQUIPMENT IN CONJUNCTION WITH THE PRODUCT. PIVOTAL MAKES NO WARRANTIES OR REPRESENTATIONS AND THERE ARE NO CONDITIONS, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, AS TO THE QUALITY, CAPABILITIES, OPERATIONS, PERFORMANCE OR SUITABILITY OF ANY THIRD-PARTY SOFTWARE OR EQUIPMENT, WHETHER SUCH THIRD-PARTY SOFTWARE OR EQUIPMENT IS INCLUDED WITH THE PRODUCT DISTRIBUTED BY PIVOTAL OR OTHERWISE, INCLUDING THE ABILITY TO INTEGRATE ANY SUCH SOFTWARE OR EQUIPMENT WITH THE PRODUCT. THE QUALITY, CAPABILITIES, OPERATIONS, PERFORMANCE AND SUITABILITY OF ANY SUCH THIRD-PARTY SOFTWARE OR EQUIPMENT LIE SOLELY WITH THE PURCHASER AND THE DIRECT VENDOR, OWNER OR SUPPLIER OF SUCH THIRD-PARTY SOFTWARE OR EQUIPMENT, AS THE CASE MAY BE.

This Limited Warranty allocates risk of Product failure between Purchaser and Pivotal, and Pivotal's Product pricing reflects this allocation of risk and the limitations of liability contained in this Limited Warranty. The agents, employees, distributors, and dealers of Pivotal are not authorized to make modifications to this Limited Warranty, or make additional warranties binding on Pivotal. Accordingly, additional statements such as dealer advertising or presentation, whether oral or written, do not constitute warranties by Pivotal and should not be relied upon.

---

## User License Agreement for Software

---

**IMPORTANT. READ CAREFULLY:** This End User License Agreement ("EULA") is a legal agreement between you (either an individual or a single entity) and Pivotal Commware, Inc. ("Pivotal") for software owned by Pivotal and its affiliated companies and its third party suppliers and licensors that accompanies this EULA, which includes computer software and may include associated media, printed materials, "online" or electronic documentation ("Software"). BY INSTALLING, COPYING, DOWNLOADING, ACCESSING, OR OTHERWISE USING THE SOFTWARE AND/OR BY USING ANY MOBILE DEVICE ON WHICH THE SOFTWARE IS EMBEDDED (INCLUSIVE OF THE SOFTWARE, THE "PRODUCT"), YOU AGREE TO BE BOUND BY THE TERMS OF THIS EULA.

- 1. GRANT OF LICENSE.** Pivotal grants you the following rights provided that you comply with all terms and conditions of this EULA: You may use any Products purchased by you for your personal, non-commercial use. Your license to the Software embedded on such Products is non-exclusive, non-transferable (except as permitted under Section 6) and non-sublicensable.
- 2. RESERVATION OF RIGHTS AND OWNERSHIP.** Pivotal reserves all rights not expressly granted to you in this EULA. The Software is protected by copyright and other intellectual property laws and treaties. Pivotal or its suppliers own the title, copyright and other intellectual property rights in the Software. The Software is licensed, not sold.
- 3. LIMITATIONS ON END USER RIGHTS.** You may not reverse engineer, decompile, disassemble, or otherwise attempt to discover the source code or algorithms of, the Software (except and only to the extent that such activity is expressly permitted by applicable law notwithstanding this limitation), or modify, or disable any features of, the Software, or create derivative

works based on the Software. You may not rent, lease, lend, sublicense or provide commercial hosting services with the Software.

4. **CONSENT TO USE OF DATA.** You agree that Pivotal and its affiliates may collect and use technical information gathered as part of the product support services related to the Products provided to you, if any. Pivotal may use this information solely to improve its products and services, to provide benchmark reporting to its existing and prospective customers, and/or to provide customized services or technologies to you and will not disclose this information in a form that personally identifies you.

5. **UPGRADES.** This EULA applies to updates, supplements and add-on components (if any) of the Software that Pivotal may provide to you or make available to you after the date you obtain your initial copy of the Software, unless we provide other terms along with such upgrade. To use Software identified as an upgrade, you must first be licensed for the Software identified by Pivotal as eligible for the upgrade. After upgrading, you may no longer use the Software that formed the basis for your upgrade eligibility.

6. **SOFTWARE TRANSFER.** You may not transfer this EULA or the rights to the Software granted herein to any third party unless it is in connection with the sale of the Product. In such event, the transfer must include all of the Software (including all component parts, the media and printed materials, any upgrades, this EULA) and you may not retain any copies of the Software. The transfer may not be an indirect transfer, such as a consignment. Prior to the transfer, the end user receiving the Product must agree to all the EULA terms.

7. **EXPORT RESTRICTIONS.** You acknowledge that the Product is subject to export restrictions of various countries. You agree to comply with all applicable international and national laws that apply to the Product, including the U.S. Export Administration Regulations, as well as end user, end use, and destination restrictions issued by U.S. and other governments.

8. **TERMINATION.** This EULA is effective until terminated. Your rights under this EULA will terminate automatically without notice from Pivotal if you fail to comply with any of the terms and conditions of this EULA. Upon termination of this EULA, you shall cease all use of any Products.

9. **DISCLAIMER OF WARRANTIES.** You expressly acknowledge and agree that use of the Products is at your sole risk and that the entire risk as to satisfactory quality, performance, accuracy and effort is with you. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, THE PRODUCT IS PROVIDED "AS IS" AND WITH ALL FAULTS AND WITHOUT WARRANTY OF ANY KIND, AND PIVOTAL AND ITS LICENSORS (COLLECTIVELY REFERRED TO AS "PIVOTAL" FOR THE PURPOSES OF SECTIONS 9, 10 and 11) HEREBY DISCLAIM ALL WARRANTIES AND CONDITIONS WITH RESPECT TO THE PRODUCT, EITHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES AND/OR CONDITIONS OF MERCHANTABILITY, OF SATISFACTORY QUALITY OR WORKMANLIKE EFFORT, OF FITNESS FOR A PARTICULAR PURPOSE, OF RELIABILITY OR AVAILABILITY, OF ACCURACY, OF LACK OF VIRUSES, OF QUIET ENJOYMENT, AND NON-INFRINGEMENT OF THIRD PARTY RIGHTS. PIVOTAL DOES NOT WARRANT AGAINST INTERFERENCE WITH YOUR ENJOYMENT OF THE PRODUCT, THAT THE FUNCTIONS CONTAINED IN THE PRODUCT WILL MEET YOUR REQUIREMENTS, THAT THE OPERATION OF THE PRODUCT WILL BE UNINTERRUPTED OR ERROR-FREE, OR THAT DEFECTS IN THE PRODUCT WILL BE CORRECTED. NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY PIVOTAL OR A PIVOTAL AUTHORIZED REPRESENTATIVE SHALL CREATE A WARRANTY. EXCEPT AS EXPRESSLY PROVIDED IN PIVOTAL'S LIMITED WARRANTY, SHOULD THE PRODUCT PROVE DEFECTIVE, YOU ASSUME THE ENTIRE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES OR LIMITATIONS ON APPLICABLE STATUTORY RIGHTS OF A CONSUMER, SO THESE EXCLUSIONS AND LIMITATIONS MAY NOT APPLY TO YOU.

10. **EXCLUSION OF INCIDENTAL, CONSEQUENTIAL AND CERTAIN OTHER DAMAGES.** TO THE EXTENT NOT PROHIBITED BY LAW, IN NO EVENT SHALL PIVOTAL BE LIABLE FOR PERSONAL INJURY, OR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES WHATSOEVER, OR FOR LOSS OF PROFITS, LOSS OF DATA, BUSINESS INTERRUPTION, OR FOR ANY PECUNIARY DAMAGES OR LOSSES, ARISING OUT OF OR RELATED TO YOUR USE OR INABILITY TO USE THE PRODUCT, THE PROVISION OF OR FAILURE TO PROVIDE SUPPORT OR OTHER SERVICES, INFORMATION, SOFTWARE, AND RELATED CONTENT THROUGH THE PRODUCT OR OTHERWISE ARISING OUT OF THE USE OF THE PRODUCT, OR OTHERWISE UNDER OR IN CONNECTION WITH ANY PROVISION OF THIS EULA, HOWEVER CAUSED, REGARDLESS OF THE THEORY OF LIABILITY (CONTRACT, TORT OR OTHERWISE) AND EVEN IF PIVOTAL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. SOME JURISDICTIONS DO NOT ALLOW THE LIMITATION OF LIABILITY FOR PERSONAL INJURY, OR OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THIS LIMITATION MAY NOT APPLY TO YOU.

11. LIMITATION OF LIABILITY. Notwithstanding any damages that you might incur for any reason whatsoever (including, without limitation, all damages referenced herein and all direct or general damages in contract or anything else), the entire liability of Pivotal under any provision of this EULA and your exclusive remedy hereunder shall be limited to the greater of (a) the actual damages you incur in reasonable reliance on the Product, up to the amount actually paid by you for the Product; or (b) US\$50.00. The foregoing limitations, exclusions and disclaimers (including Sections 9, 10 and 11) shall apply to the maximum extent permitted by applicable law, even if any remedy fails its essential purpose.

12. U.S. GOVERNMENT END USERS. The Software is licensed only with "restricted rights" and as "commercial items" consisting of "commercial software" and "commercial software documentation" with only those rights as are granted to all other end users pursuant to the terms and conditions herein.

13. APPLICABLE LAW. This EULA is governed by the laws of the State of Washington, without regard to conflicts of laws principles. This EULA shall not be governed by the UN Convention on Contracts for the International Sale of Goods, the application of which is expressly excluded. If a dispute, controversy or difference is not amicably settled, it shall be finally resolved by arbitration in Seattle, Washington, USA, in accordance with the Arbitration Rules of the Washington State Commercial Arbitration Board. The award of arbitration shall be final and binding upon the parties.

14. ENTIRE AGREEMENT; SEVERABILITY. This EULA is the entire agreement between you and Pivotal relating to the Product and supersedes all prior or contemporaneous oral or written communications, proposals and representations with respect to the Product or any other subject matter covered by this EULA. If any provision of this EULA is held to be void, invalid, unenforceable or illegal, the other provisions shall continue in full force and effect.

# Appendix D – Glossary

Term	Definition
<b>3GPP LTE</b>	LTE protocol per “3rd Generation Partnership Project” a mobile telephone standards org.
<b>5G-NR</b>	The 5G radio system
<b>5G NSA</b>	Non-Stand-Alone flavor of 3GPP 5G-NR ... requiring concurrent 4G capability to function (currently typical)
<b>5G SA</b>	Stand-Alone flavor of 3GPP 5G-NR ... able to work without 4G capability (eventually, future)
<b>5G TF</b>	Verizon 5G Task Force (aka pre-5G)
<b>ADC</b>	Analog-Digital Converter (in electric circuitry)
<b>Az, AZ, Azimuth</b>	The “left-to-right” angle direction relative to nearby gNB location
<b>BW</b>	Bandwidth
<b>Commissioning</b>	(Echo 5G) Installation and initial setup, which tunes the system to optimal functionality
<b>CPE, Customer Premises Equip.</b>	Typically: End-user obtained transceiver that distributes FWA broadband internet to devices within the home via WLAN (Wi-Fi). Effectively replaces cable/DSL internet
<b>dB, decibel</b>	A relative unit of power, used to express change in value as in “increase of 3 dB” -- presented on a logarithmic scale
<b>dBm</b>	A unit of level, indicating a power ratio expressed in decibels (dB) with reference to one milliwatt (mW)
<b>DL, Downlink</b>	Data/information transmitted in the direction from gNB to CPE/UE
<b>KPI</b>	Key performance indicators: set of useful parameters that (in this case) CPE would report to Echo 5G, and Echo 5G would display it for user
<b>EIRP</b>	Equivalent Isotropic Radiated Power, a measure of Transmit power
<b>EI, EL, Elevation</b>	The “up-to-down” angle direction relative to distant gNodeB location
<b>EN-DC</b>	E-UTRA NR dual connectivity (a flavor of NR NSA deployment)
<b>EVM</b>	Error Vector Magnitude, a measure of quality of received signal
<b>FWA</b>	Fixed Wireless Access.
<b>Gigabit speed</b>	A term of user-perceived throughput, as in Gbits/second
<b>gNodeB, gNB</b>	5G NR base station
<b>HBF</b>	Pivotal Commware’s Holographic Beam Forming technology that enables Gigabit speeds beyond the reach of cable and DSL
<b>IDU</b>	Indoor unit. The wireless power unit mounted on the interior side of the window.
<b>Low-E glass</b>	Low-Emissivity windowpanes, on which the coating that reflects sunlight also inhibits RF signals from passing into a building
<b>LTE</b>	Long-term Evolution, generally referring to technology path toward 4G speeds
<b>LTE Cat M1</b>	A flavor of IoT (internet of things) technology under 3GPP LTE umbrella

Term	Definition
<b>Millimeter wave frequencies</b>	Wavelength spectrum that correlates to ~24 GHz frequencies and higher
<b>M&amp;C</b>	Monitoring and Controlling – or – Monitor and Control
<b>OAM, OA&amp;M</b>	Operations, Administration & Management/Maintenance – the necessary processes for setting up and running a system
<b>ODU</b>	Outdoor unit. The unit mounted on the outdoor side of the window.
<b>RF</b>	Radio Frequency
<b>SNR</b>	Signal-to-Noise Ratio
<b>UE</b>	User Equipment – typically CPE or a mobile device/smartphone
<b>UL, Uplink</b>	Data/information transmitted in the direction from CPE/UE towards gNB

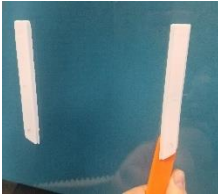
# Appendix E – Removal Instructions

To remove your Echo 5G, take the following steps.

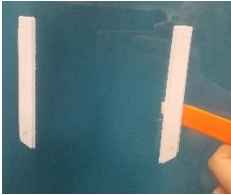
- [1] Loosen the set screws and slide the ODU off the rails



- [2] Slide the end of the removal tool under the rails, starting at the bottom and carefully lift the rails away from the window.



- [3] Work your way up the rails from the bottom or side.



- [4] When you have loosened the adhesive enough you can carefully remove it by hand.



- [5] Use WD40 and the rough side of a sponge to clean any remaining adhesive off your window. You can use window cleaner to remove any streaks left by the WD40.

