



**K60c and Wireless Communication System  
User Guide**

Release 1.0  
October 16, 2020

Kwikbit is a trademark of Kwikbit Inc.  
©2016-2020 Kwikbit Inc. All rights reserved.

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 (for USA) and ISED rules (for Canada). 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.

You can determine whether your equipment is causing interference by turning it on and off. If the interference stops, it was probably caused by the equipment. If the equipment causes interference to radio or television equipment, try to correct the interference by using one or more of the following measures:

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

Any modifications to this product which are not authorized by Kwikbit Inc. could void your authority to operate this equipment.

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCT.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE ARE PROVIDED "AS IS" WITH ALL FAULTS. KWIKBIT DISCLAIMS ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL KWIKBIT OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OF DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF KWIKBIT HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

## Table of Contents

<b>Preface</b>	<b>5</b>
Preface overview	5
About this guide	5
Additional documentation	5
Additional help	6
<b>Kwikbit K60 System Overview</b>	<b>6</b>
<b>K60 System Description</b>	<b>8</b>
<b>Technical Specifications</b>	<b>11</b>
System Specifications	11
Radio Specifications	11
Mechanical, Power and Environmental Specifications	12
System Enclosure	13
<b>System Throughput</b>	<b>14</b>
<b>Element and Network Management</b>	<b>14</b>
<b>Ethernet Bridge Support</b>	<b>17</b>
<b>Installation Planning</b>	<b>17</b>
<b>LED Indicator Codes</b>	<b>17</b>
<b>Using the K60 Web User Interface (UI)</b>	<b>18</b>
Requirements	18
K60 Web UI Page	19
Logging In	19
<b>Using the K60 Command Line Interface (CLI)</b>	<b>21</b>
Requirements	21

K60 CLI commands	21
<b>System Provisioning</b>	<b>21</b>
Initial System Setup and IP Configurations	22
<b>Appendices</b>	<b>24</b>
Glossary	24
FCC Regulatory Statement	25
FCC Radiation Exposure Statement	25
ISED Industry Canada Regulatory Statement	26
ISED Industry Canada Radiation Exposure Statement	26

# 1 Preface

## 1.1 Preface overview

Thank you for choosing the K60c system from Kwikbit. This guide introduces you to system concepts, system architecture and commonly used terms.

This preface describes:

- Audience for this guide
- Additional documentation
- Where to go for more help

## 1.2 About this guide

This guide provides an overview of the K60c system, its components, its network architecture, and how it is configured and deployed.

This guide is intended for network and system administrators who must install, configure, and manage K60 distribution networks. This guide is meant to provide an overview of the system. This guide does not provide detailed information on network configuration.

It is assumed readers of this guide are familiar with:

- Basic networking concepts
- Layer 2 (link layer) of OSI model
- Layer 3 (network layer) of OSI model
- Routing and switching in networks
- Radio frequency (RF) systems engineering
- Virtual local area network (VLAN) technology

## 1.3 Additional documentation

- Information about network management is available in the Kwikbit Edge Controller User Manual

### 1.4 Additional help

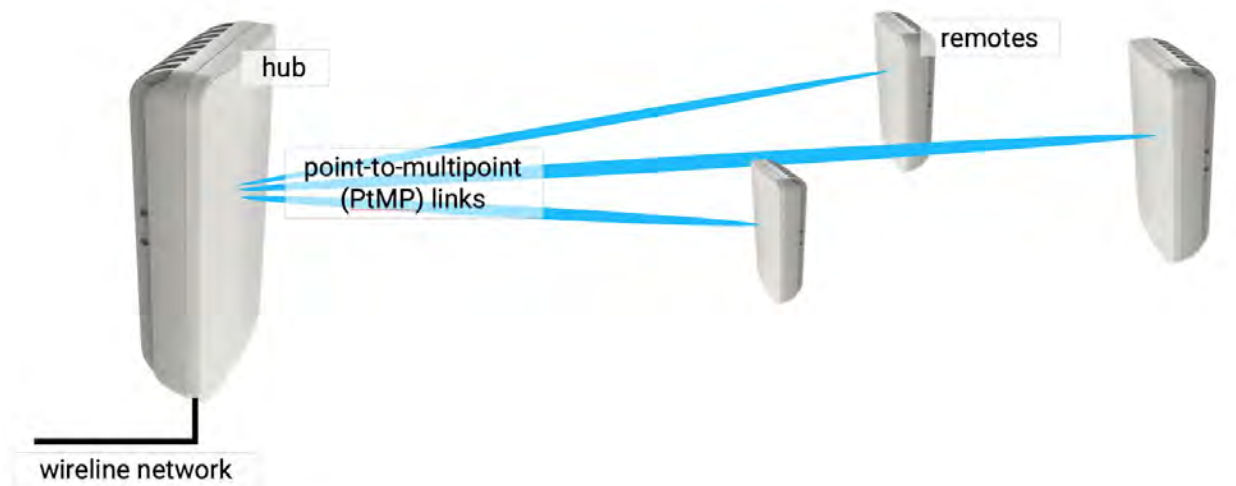
Kwikbit is committed to providing our customers with high quality technical support via the following methods:

Web	support.kwikbit.com
E-mail	support@kwikbit.com
Phone	+1 (952) 657-5628

## 2 Kwikbit K60c product versions

The K60c is also made in an enhanced-range version that uses a different internal antenna. These units are marked “K60c+.” This guide applies to both versions. Specifications and operation are the same except as noted.

## 3 Kwikbit K60c System Overview



**Figure 1: K60c System in a Point-to-Multipoint (PtMP) Wireless Communication Application**

Kwikbit is a leader in gigabit wireless distribution solutions that intelligently adapt to challenging environments to maximize performance and reliability.

The K60c system operates in the 60 GHz unlicensed frequency band and is designed primarily for line-of-sight (LoS) operation. Non-line-of-sight (NLoS) operation is possible

within short range and in the presence of reflective surfaces. By utilizing advanced beamforming techniques, the K60c system automatically adapts in Point-to-Multipoint (PtMP) communication configuration and is adaptable to changes in the operating environment. The beam forming capability also makes system installation simple for non-technical staff as precise mechanical alignment, as required by previous generation 60 GHz systems, is not required.

The K60c system is designed for use in multiple applications including gigabit access, IoT backhaul (sensors, security cameras, etc.), optical fiber extension, and corporate and enterprise data services by providing 1 Gbps of symmetric throughput.

The K60c system operates in unlicensed Time Division Multiplexing (TDD) band 57.05 – 64.00 GHz in both Point-to-Point (PtP) and Point-to-Multipoint (PtMP) configurations. Some of the main product characteristics are shown in Table 1.

**Table 1: Main K60c Characteristics**

Duplex Mode	Time Division Multiplexing (TDD)
Physical Layer / Antenna System	K60c: 64 patch beamforming antenna  K60c+: 128 patch beamforming antenna
Operation Configuration	PtP and PtMP
Capacity	1.86 Gbps goodput aggregate
Symmetry	Dynamic downlink (DL) and uplink (UP) based on offered load
Frequency of Operation	57.05 – 64.00 GHz
Channel Bandwidth	2.16 GHz
Network Interface	1x 1 gigabit Ethernet
Form Factor	7.3 x 3.15 x 1.2" with integrated antenna

The K60c system consists of the following components:

- **Hub Unit:** control communication to one or more Remote Units
- **Remote Unit:** scan for available Hub Units and connect to the Hub configured or assigned via the Edge Controller
- **Edge Controller:** Optional appliance computer that provides WebUI tools for deployment planning, commissioning, network configuration, management, monitoring and fault isolation. Edge controller is highly recommended for networks of medium and large scale.

The K60c Hub and Remote Units are identical from a hardware perspective, only differing in software configuration. The K60c has a small form factor that can be easily and unobtrusively deployed in many different outdoor environments.

K60c units will interoperate with other products in the Kwikbit K60 product line.

## 4 K60c System Description

Kwikbit's K60c wireless outdoor networking solution is designed to meet the requirements of network planners where rapid and flexible deployment, high reliability, multi-gigabit capacity and excellent latency performance are needed. Applications for the system include IoT gateway aggregation, Wi-Fi access point backhaul, video camera connectivity and other gigabit IP based applications. The system can function either as a Point-to-Point (PtP) or Point-to-Multipoint (PtMP) wireless Ethernet bridge.

Some of the main characteristics of the system include:

- **Time Division Duplex (TDD):** The K60c solution features TDD access mode with variable frame length.
- **Adaptive Modulation with Link Adaptation:** The K60c system supports BPSK, QPSK on both the downlink and uplink path to achieve high capacity in the channel bandwidth (1.86 Gbps Ethernet layer throughput for combined downlink and uplink traffic).
- **Beamforming:** Use of the 60 GHz band allows extremely fast communication, but also presents the challenge of limited propagation. Signals in the 60 GHz band are also more susceptible to disruption from physical barriers than at lower frequencies. The K60c system includes adaptive beamforming, a technique that enables robust multi-gigabit communications at greater distances. Kwikbit's beamforming feature uses directional antennas to reduce interference and automatically focus a signal between two devices into a concentrated beam. During the beamforming process, devices establish communication and then fine-tune



their antenna settings to improve the quality of directional communication until there is enough capacity for the desired data transmission.

One key benefit of Kwikbit's beamforming is that if an obstacle blocks the line of sight between two devices, for example, if someone walks between them, the devices can quickly establish a new communications pathway. Another benefit of the K60c beamforming is that non-technical personnel can quickly and easily install the system. Precise physical alignment of the radios, as required with previous 60 GHz products, is not required with the Kwikbit system. The beamforming feature also enables the PtMP communication capability of the system.

- **Power Management:** The K60c system utilizes the scheduled access mode to reduce power consumption. Devices connected with each other via a directional link schedule the periods during which they communicate and, in between those periods, they can sleep to save power. This capability allows devices to more precisely tailor their power management to their actual traffic workload, reduces potential co-channel interference and enables efficient spectrum utilization.
- **Advanced Security:** The K60c system utilizes strong security mechanisms, including Galois/Counter Mode, a highly-efficient mode of encryption that is designed to support higher communication speeds. Encryption is based on the government-grade Advanced Encryption Standard (AES) and is implemented in hardware for performance and efficiency.
- **Integrated Antennas:** The K60c units integrate a specially-designed antenna module that enables a 90° azimuthal and 40° vertical beam sweep range.
- **PtMP with Dynamic Bandwidth Allocation:** The K60c system can operate in PtP or PtMP configurations with up to eight Remotes. The capacity allocated to each Remote is variable according to the requirements of connected devices.
- **Compact Form Factor:** The K60c transceiver units are highly integrated, compact, and lightweight, so they can be easily mounted on poles, pipes and walls.
- **Connectivity:** K60c devices include a standard RJ45 Gigabit Ethernet port that serves as a PoE In port.


The Kwikbit K60c system provides these network management features:

- Each K60c unit incorporates a WebUI. This WebUI enables configuration, fault management, and administration of the unit, as well as provides system state and performance information.

- A command-line interface (CLI) is also available. It provides features similar to those of the WebUI.

Unit name: KB-C6-02-74  
[login](#)

Description: system description not set  
Location: system location not set



Status | Admin | Wireless | LAN | Management-Interface

**Device information**

Device model:	K60
Ethernet MAC address:	70:88:6B:C6:02:74
Hardware version:	2
Firmware version:	2.0.117
Boot-loader version:	KBBLVERSION:0.7.prod.robot:2020-06-05_15-13-48.k60:7ae57ee
Current time:	2018.01.07-05:25:08

**Wireless**

Frequency (MHz):	Seeking peer unit
SSID:	kwikbit
Role:	remote
Radio peers:	None

**LAN interfaces**

Interface number	1	2
Enabled:	Yes	Yes
Status:	Not connected	Connected
Duplex:	N/A	Full
Speed:	N/A	1000
Maximum supported speed:	1 Gb/s	1 Gb/s
Power Over Ethernet:	Input	Output (PoE+) Enabled
LAN peers:	None	KB-C6-D3-20

**Management interface**

IP address:	169.254.6.253 (auto)
Subnet mask:	255.255.0.0
Default gateway:	0.0.0.0

**Figure 2: K60c Hub and Remote WebUI interface page**

- The Kwikbit Edge Controller is a very powerful part of the Kwikbit solution. The Edge Controller connects through an Ethernet connection to the root K60c unit and enables non-technical personnel to physically install an entire network without K60c units being configured on the bench in advance. A local or remote IT resource can design, commission and manage the network using the Edge Controller's WebUI.

The Edge Controller can be connected to the cloud for remote management of multiple locations.

## 5 Technical Specifications

### 5.1 System Specifications

Aggregate capacity	Up to 1.8 Gbit/sec (Layer 2/ Ethernet)
Ethernet frame type	Transparent bridging of all Ethernet types including VLAN and VLAN stacking
Latency	250 microseconds average
L2 switching	Complete Layer 2 switching with VLAN support
Security	AES 128 with automatic secure key distribution
Network Attributes	Ethernet bridge, 802.1Q, DSCP/ToS/802.1p (IPv4/v6) and 802.1ad/ QinQ tagging
Network Interfaces	1 x GbE RJ-45 with PoE in
Other Interfaces	LED indicator for power, link condition, signal strength, and unit location
Provisioning	Zero-touch deployment and commissioning with Edge Controller web application
Management	Web GUI, CLI, REST API and Edge Controller (optional)

### 5.2 Radio Specifications

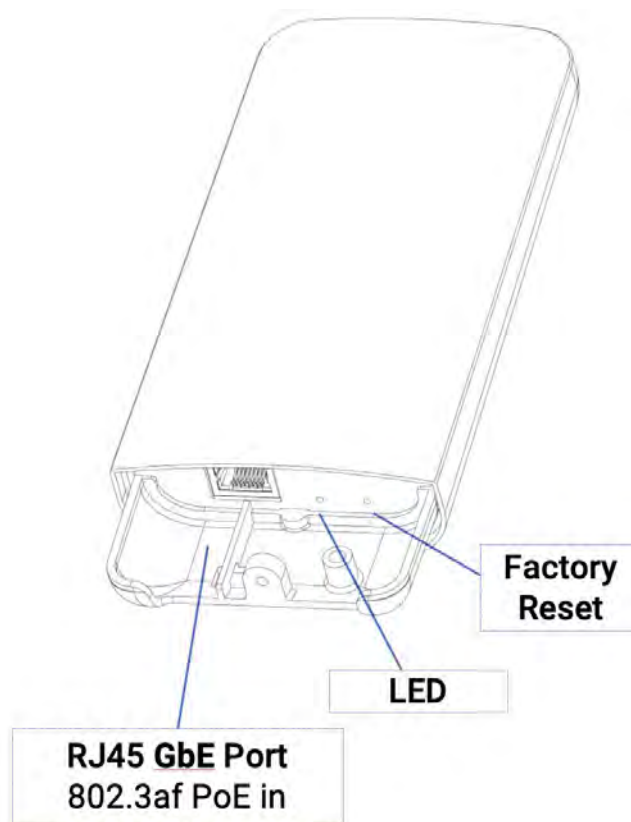
Access Technology	Single carrier beamforming physical layer
Duplex	Time Division Multiplexing (TDD)

Modulation	BPSK, QPSK; 8 levels of adaptive modulation and coding schemes
Frequencies	57.05 - 64.00 GHz
Channel Bandwidth	2.16 GHz
Antenna System	K60c+: 128 patch beamforming antenna K60c: 64 patch beamforming antenna Each with 90° horizontal and 40° vertical scan range
Output power (maximum)	40 dBm EIRP
Typical Range	K60c+: 400 meters K60c: 225-285 meters

### 5.3 Mechanical, Power and Environmental Specifications

Configuration	Single-piece indoor unit with integrated antenna
Dimensions (H x W x D)	185 x 80 x 30 mm 7.3 x 3.15 x 1.2 inches
Weight	255g / 9 ounces
Power Input	802.3af PoE
Power Consumption	K60c: 6 watts K60c+: 8 watts
Operating temperature	-30° C to +55° C
Humidity	Up to 95% non-condensing
ESD	IEC EN 61000-4-2
EMC	IEC EN 61000-4-3

## 5.4 System Enclosure



**Figure 3: Ports on K60c (Hub and Remote)**

The K60c enclosure is a rugged casing that is supplied with a combination pole and wall mounting bracket. The mounting bracket allows for a range of orientation flexibility to enable mounting in challenging locations. Units installed at the same location can be interconnected for medium and large network deployments.

The mechanical enclosure for the transceiver Module has an RJ45 for Gigabit Ethernet network connectivity and PoE power input (802.3at, 802.3at+, or 802.3bt).

## 6 System Throughput

The K60c system uses time division duplexing (TDD) access mode, employing a single frequency for both transmit and receive paths. The throughput for the downlink and uplink depends on a downlink-to-uplink frame bandwidth ratio. The ratio is automatically adjusted based on the offered load in each direction, taking into account all Remotes connected to a Hub in PtMP. Furthermore, the system's throughput depends on the Modulation and Coding Rate (MCS) which varies according to link and signal conditions. The following table details Ethernet uplink and downlink combined throughput for a K60c link.

**Table 8: Throughput Performance for Cyclic Prefix of 1/8**

MCS Index	Modulation	NCBPS	Repetitions	Code Rate	Data Rate (Mbit/s)
1	$\pi/2$ BPSK	1	2	1/2	310
2	$\pi/2$ BPSK	1	1	1/2	620
3	$\pi/2$ BPSK	1	1	5/8	775
4	$\pi/2$ BPSK	1	1	3/4	930
5	$\pi/2$ BPSK	1	1	13/16	1007
6	$\pi/2$ QPSK	2	1	1/2	1240
7	$\pi/2$ QPSK	2	1	5/8	1550
8	$\pi/2$ QPSK	2	1	3/4	1860

## 7 Element and Network Management

The K60c system supports the following network management interfaces:

- K60c Web Interface (WebUI). Accessible via HTTPS, the K60c WebUI provides an interactive visual toolset that allows an operator to modify the full configuration of the K60c system as well as view state, fault, and performance indicator.
- K60c Command Line Interface (CLI) provides a set of commands that allows the operator to manage, maintain and troubleshoot the system.
- The Edge Controller WebUI application provides complete access to configuration, state, performance and fault information for all K60c units in a network system.

The WebUI network management interface on the K60c system is accessible via HTTPS. Power the unit with a PoE power source. Connect to the K60c system with your browser utilizing one of the following methods:

- **Local Name:** Connect a K60c transceiver unit directly to your computer by plugging an Ethernet cable into the RJ45 connector. In the URL field on your computer's browser type **https://KB-XX-XX-XX.local** where **KB-XX-XX-XX** is the Host name of the unit that appears on the label on the side of the unit. For example, if the unit Host name is **KB-C5-6B-78**, then the URL address of the unit is **https://KB-C5-6B-78.local**. Your browser will display a warning stating that the connection is not secure. You may ignore the warning and proceed connecting to the unit. To avoid the warning, please go to the Kwikbit support website, download the Kwikbit security certificate, and install it on your browser.
- **Management IP Address:** Connect using the IPv4 IP address. The factory-assigned IP address appears on a temporary label on the unit. Be sure to use **https://** rather than **http**.

The Command Line Interface network interface on the K60c system is accessible via Secure Shell (SSH). Power the unit with a PoE power source. Connect to the K60c system with your terminal application utilizing one of the following methods:

- **Local Name:** Connect a K60c transceiver unit directly to your computer by plugging an Ethernet cable into the RJ45 connectors. In a terminal application window on your Linux, Unix or MAC computer type **ssh kwikbit@KB-XX-XX-XX.local** where **KB-XX-XX-XX** is the Host name of the unit that appears on the label on the side of the unit. For example, if the unit Host name is **KB-C5-6B-78**, then the command line is **ssh kwikbit@KB-C5-6B-78.local**. For the password prompt enter **kwikbit**.
- **Management IP Address:** Connect using the IPv4 IP address. The factory-assigned IP address appears on a temporary label on the unit.

The optional Kwikbit Edge Controller's management application automatically discovers all connected K60c devices on the network and establishes a secure connection to each one utilizing a security certificate provided by Kwikbit and customized by the customer. For

more information on the Kwikbit Edge Controller device and associated applications, please refer to the Kwikbit Edge Controller User Manual.

The K60c system provides the following network management functions:

1. Device configuration information and status is displayed on the WebUI page interface as shown above in Figure 2. When the mouse cursor is hovered over an Ethernet Port or wireless connections icon, detailed information is displayed. In the Wireless section, the list of wirelessly connected devices is displayed. The list of LAN connected devices is displayed in the LAN Peers section. The WebUI of a connected device is established by clicking on the device's name.
2. Configuration Management. The system configuration section covers several functional areas:
  - Device
    - Device location
    - Device description
  - Wired Network
    - Device IP address assignment
      - Static address
      - DHCP – requires DHCP server
      - Automatic Zero Configuration address assignment
    - Management VLAN
    - Ethernet port
      - Enable / Disable
  - Wireless Network
    - Device role
    - SSID
    - Airlink passcode
    - Channel frequency
    - Preferred Hub (if device configured as Remote)
3. Administration Operations:
  - Flash LEDs of the device – used to identify location of physically installed device
  - Change administrator password of the device
  - Upgrade device software
  - Reboot the device

To reset the device to factory defaults:

- Insert the Reset Dongle (available separately) into Ethernet Port 2
- Cycle the power
- During power-up, observe the LED.
- Remove the Reset Dongle when the LED pattern indicates that the reset has been triggered (refer to the LED Indicator Codes section of this document)
- The device is now operating at factory default settings
- The login password is “kwikbit”



## 8 Ethernet Bridge Support

Designed to seamlessly integrate into existing Ethernet networks, the K60c system is built for Ethernet connectivity services and provides network functionality as a standard Layer 2 (L2) Transparent Bridge (IEEE 802.1d), whereby the K60c cluster (a cluster being one Hub with its group of up to seven Remotes) is the bridge, and the Ethernet ports on the Hub and associated Remotes are the ports of the bridge.

The embedded bridge functionality performs Media Access Control (MAC) address learning (up to 4096 MAC addresses). This function allows the Hub to perform an optimal allocation of radio resources by sending traffic to the Remote behind which the destination of that traffic is located.

The K60c system allows network management traffic to be encapsulated in a dedicated management VLAN and can transport standard Ethernet frames, including oversize frames (up to 1600 bytes including the FCS).

## 9 Installation Planning

When unpacking K60c units during install, be sure to do the following for each unit:

- Locate the label on the unit casing that lists the Serial Number (SN) and Host name of the unit
- Record the SN on your registration card for future reference
- Record the Host name for future reference when provisioning the system

After installation of the K60c, perform the tasks described in Chapter 12 “System Provisioning”.

## 10 LED Indicator Codes

K60c is equipped with a single double color (red and green) LED indicator. The following are the LED indication modes. The sequences indicate the LED state during each 150ms time slot

- during boot up: solid red
- normal operation:
  - o no wireless link: repeat the sequence: green, off, off, green, off, off ...
  - o established wireless link:
    - Hub: solid green

- Remote: signal quality from 1 blink for weakest to 5 blinks for the strongest between pauses. Example: for link quality of 3 the repeat sequence is: pause green green green
- error condition:
  - o repeat the sequence: red, off, red, off, red, off, off, off
- identify the unit
  - o repeat the sequence: red, green
- signal for reset to factory defaults:
  - o repeat the sequence: green, red, green, red, green, red, off, off
- restore factory defaults is in progress:
  - o repeat the sequence: red, off, red, off, off, off, green, off, green, off, off, off

## 11 Using the K60c Web User Interface (UI)

### 11.1 Requirements

The K60c embedded WebUI allows for direct configuration of both Hub and Remote units. It is a standard web application that runs directly on the K60c unit and is accessible through the default port for HTTPS (443) at URL <https://<Host name of the unit>>. Your browser will display a warning stating that the connection is not secure. You may ignore the warning and proceed connecting to the unit. To avoid the warning, go to the Kwikbit support website, download the Kwikbit security certificate, and install it on your browser.

The recommended browsers for the K60c WebUI are:

- Google Chrome
- Safari

Operating System (OS) support for K60c WebUI:

- Windows
- Mac OS X
- Unix
- Linux

Note: With the exception of IE9, the K60c WebUI supports the most recent web browser and OS versions.

Required basic K60c unit configuration tasks can be performed using the units WebUI; however, the Kwikbit Edge Controller can be used to quickly and efficiently plan,

commission, configure and monitor small to large K60c networks. See the Edge Controller User Guide for details.

## **11.2 K60c Web UI Page**

The K60c WebUI is a single page that provides device status as well as configuration options.

### **11.2.1 Logging In**

Use your browser to connect to K60c device's WebUI as described above. It is not necessary to login to the system in order to view the WebUI page. You will then be prompted to login once you click on any one of the configuration tabs if you do not have a security certificate installed on your computer. The security certificate based authentication option is available when utilizing an Edge Controller to manage the network.


The default username and password is as follows:

User Name: kwikbit  
Password: kwikbit

The page remains read-only if you do not login to the system and only gives general system information.

Unit name: KB-C6-02-74  
[login](#)

Description: system description not set  
Location: system location not set



Status | Admin | Wireless | LAN | Management-Interface

### Device information

Device model:	K60
Ethernet MAC address:	70:88:6B:C6:02:74
Hardware version:	2
Firmware version:	2.0.117
Boot-loader version:	KBBLVERSION:0.7.prod.robot:2020-06-05_15-13-48.k60.7ae67ee
Current time:	2018.01.07-05:25:08

### Wireless

Frequency (MHz):	Seeking peer unit
SSID:	kwikbit
Role:	remote
Radio peers:	None

### LAN interfaces

Interface number	1	2
Enabled:	Yes	Yes
Status:	Not connected	Connected
Duplex:	N/A	Full
Speed:	N/A	1000
Maximum supported speed:	1 Gb/s	1 Gb/s
Power Over Ethernet:	Input	Output (PoE+) Enabled
LAN peers:	None	KB-C6-03-20

### Management interface

IP address:	169.254.6.253 (auto)
Subnet mask:	255.255.0.0
Default gateway:	0.0.0.0

At the top of the WebUI screen, general node information including unit name, description, and location is displayed. There are two network sections on the page, Wireless and LAN.

The **Wireless** section displays the connection SSID, the unit role (Hub or Remote) and all current wireless connections. If the unit is a Hub, all currently linked Remotes will be displayed under connections. If the unit is a Remote, only one connection to a Hub can be listed. Each connection displays the connected unit name as well as graphical representation of the signal quality of the connection. By clicking on the connected device's name, a browser page of that device is opened. By hovering over the signal quality graphic, detailed signal level information is displayed. You can change SSID and unit Role

configuration by clicking on the tool icon in the section banner, assuming you are an authorized user.

The **LAN** section displays the unit's assigned IP address and the status of the Gigabit Ethernet port. By hovering over the Ethernet port icon, detailed port status information is displayed. The unit's IP configuration can be changed by clicking on the tool icon in the section banner.

The **Device** section displays and provides configuration capability for **Device Location** and **Device Description**.

The **LAN Peers** section displays the names of all K60c units that are connected to the current unit over a LAN connection. In most cases, these would be collocated units that provide additional wireless connectivity from that location.

The **Administration** section displays the software and the hardware versions of the device and includes controls to change user password, upgrade device software, flash device LEDs for device identification, and to reboot the device.

## 12 Using the K60c Command Line Interface (CLI)

### 12.1 Requirements

The K60c CLI allows for direct configuration of both Hub and Remote units. To connect using Command Line Interface from a Linux, Unix or MAC computer terminal window type **ssh kwikbit@KB-XX-XX-XX.local** where **KB-XX-XX-XX** is the Host name of the unit that appears on the label on the side of the unit. For example, if the unit Host name is **KB-C5-6B-78**, then the command line is **ssh kwikbit@KB-C5-6B-78.local**. For the password prompt enter **kwikbit**. You should receive a command prompt

### 12.2 K60c CLI commands

The K60c CLI provides device status as well as configuration options commands.

At the prompt type "?" for the list of commands and their operation.

## 13 System Provisioning

Network planning, installation procedure and commissioning are most efficiently performed using the Kwikbit Edge Controller. In addition, the Edge Controller enables centralized network operation view and management. Please see the Kwikbit Edge Controller User Guide for detailed information.

If it is desired to provision a K60c network without the use of edge controller, the following tasks associated with preparing a K60c system must be followed:

1. Initial system setup and IP configurations
2. Setting units' roles
3. Setting SSID and airlink connectivity passcode
4. Setting communication channel frequency

### 13.1 Initial System Setup and IP Configurations

All new K60c units shipped from the factory are identical with a default software configuration loaded. You must connect to the management interface in order to configure the following system management parameters:

1. Connect your computer directly to the unit with an Ethernet cable. Once connected, open a browser on the computer and enter the IP address found on the unit's label.
2. After successfully opening the WebUI page, the unit's IP address can be changed by clicking on the **Wired Network** section tool icon:
  - When prompted for username, enter **kwikbit** for the username and **kwikbit** for password.
  - Select the desired address assignment protocol. If static address is selected, enter the network mask and default gateway.
  - Click Submit and the unit will reboot with the new address assignment. Your browser will automatically reconnect and display the page.
3. Click on the Wireless section tool icon to configure wireless communication parameters:
  - Select the role of the unit. When configuring a PtP or PtMP communication system, only one of the wirelessly connected devices may be configured with a Hub role. The units connecting to the Hub wirelessly must be configured as Remotes.
  - Configure SSID, airlink passcode and channel frequency (not required on remote). These parameters must match between the Hub and all wirelessly connected Remotes in order to establish wireless communication.
  - If a configured Remote can connect to multiple Hubs, you may want to set the optimal Hub in the Preferred Hub field.
  - There needs to be a Hub node configured with Network Root = enable. Alternatively, each remote needs to be configured with "Preferred Hub". Lacking both of these will result in Remote nodes periodically scanning attempting to locate the Root node.
  - Click **Submit** to save changes.

4. Click on the tool icon in the Device section to configure the **Location** at which the device will be physically installed and the description of the device. Click **Submit**.
5. In the Admin section, click on the second icon to change the management interface password.

The unit is now configured and ready to be installed.

## 14 Appendices

### 14.1 Glossary

DHCP	Dynamic Host Configuration Protocol
DL	Downlink
DNS	Domain Name System
FCC	Federal Communications Commission
FTP	File Transfer Protocol
Gbps	Gigabits per second
GHz	Gigahertz
HU	Hub Unit
IEEE	Institute of Electrical and Electronics Engineers
ISED	Innovation, Science, and Economic Development Canada
L2	Layer 2
LAN	Local Area Network
LED	Light Emitting Diode
LoS	Line-of-Sight
MAC	Media Access Control
Mbps	Megabits per second
MCS	Modulation and Coding Scheme
MHz	Megahertz
NLoS	Non-Line-of-Sight



NMS	Network Management System
PC	Personal Computer
PtMP	Point-to-Multipoint
PtP	Point-to-Point
QAM	Quadrature Amplitude Modulation
RF	Radio Frequency
RU	Remote Unit
SSID	Service Set Identifier
TDD	Time Division Duplexing
UL	Uplink
VLAN	Virtual Local Area Network
VDC	Volts Direct Current

### **14.2 FCC Regulatory Statement**

Any changes or modifications not expressly approved by Kwikbit Inc. could void the user's authority to operate the 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.

This device is not to be operated on aircraft except for the conditions listed in 47 CFR §15.255 (b).

### **14.3 FCC Radiation Exposure Statement**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. A minimum of 30 centimeters (12 inches) of separation between the K60c and all persons shall be maintained.

#### **14.4 ISED Industry Canada Regulatory Statement**

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

This device is not to be operated on aircraft except for the conditions listed in ISED RSS-210 Annex J.1.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'encompromettre le fonctionnement.

Cet appareil ne doit pas être utilisé à bord d'un avion, sauf dans les conditions énumérées dans ISDE RSS-210, annexe J.1.

#### **14.5 ISED Industry Canada Radiation Exposure Statement**

NOTE: IC Radiation Exposure Statement: This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. A minimum of 30 centimeters of separation between the K60c and all persons shall be maintained.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Un minimum de 30 centimètres de séparation entre le K60c et toutes les personnes doit être maintenu.