Gateway Installation and User Manual

Revision 1.2

This document's purpose.

| Revision	Comments	Author	Date
1.2	Update minimum separation distance	Dave Kjendal	2015-05-13
1.1	Add RF Exposure section	Dave Kjendal	2015-04-16
1.0	Initial Revision – newer revisions added above	Dave Kjendal	2015-04-01

1   Overview

Senet is a wireless service provider targeting an unserved segment of the market characterized by devices which need long range, low power wireless access at low bit rates. In pursuit of this market, Senet surveyed the available technologies suited to these needs and elected to develop solutions based on a novel radio technology from Semtech marketed under the trademark "LoRa" (http://www.semtech.com/wireless-rf/lora.html).

Over time, Senet will deploy a network of LoRa base stations to provide broad wireless coverage to devices which support LoRa modulation and conform to the LoRaWAN 1.0 MAC layer specification. Senet itself will also produce devices under the Enertrac brand which will leverage this network to provide tank monitoring services.

In addition to the base station and end devices, the solution consists of a centralized network server which coordinates the MAC layer (addressing and packet delivery) across the entire network and application routers which coordinate network access and application security.

Figure 1 - Senet, Inc Network Architecture
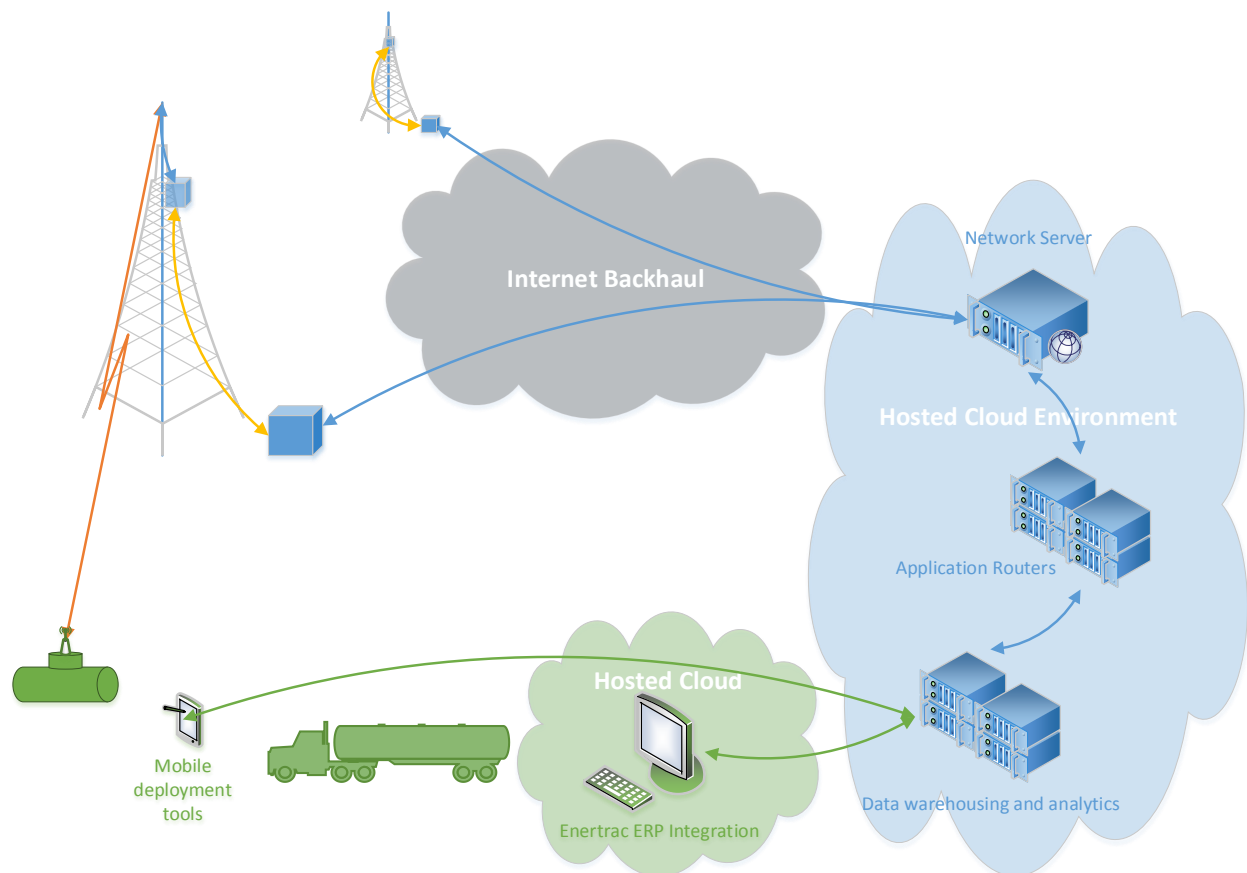
2 User's Manual

2.1 Equipment

Tower Kit uplink/downlink technology must be matched (paired Ethernet or paired DSL). All equipment listed below will be provided by Senet, Inc.

2.1.1 Tower Top Kit

5845 Tower Top Kit with Ethernet downlink

5863 Tower Top Kit with DSL downlink

2.1.2 Tower Bottom Kit

5855 Tower Bottom Kit with Ethernet uplink and Cisco IR910 GSM gateway

5875 Tower Bottom Kit with DSL uplink and Cisco IR910 GSM gateway

5885 Tower Bottom Kit with DSL uplink and Cradlepoint IBR1100 GSM gateway

5886 Tower Bottom Kit with Ethernet uplink and Cradlepoint IBR1100 GSM gateway

2.1.3 Primary Antenna

LCOM HG908U-PRO 8 dBi Omnidirectional Antenna

L-COM DHGV-906U 6 dBi Omnidirectional Antenna

2.1.4 Optional Primary Antenna Cable

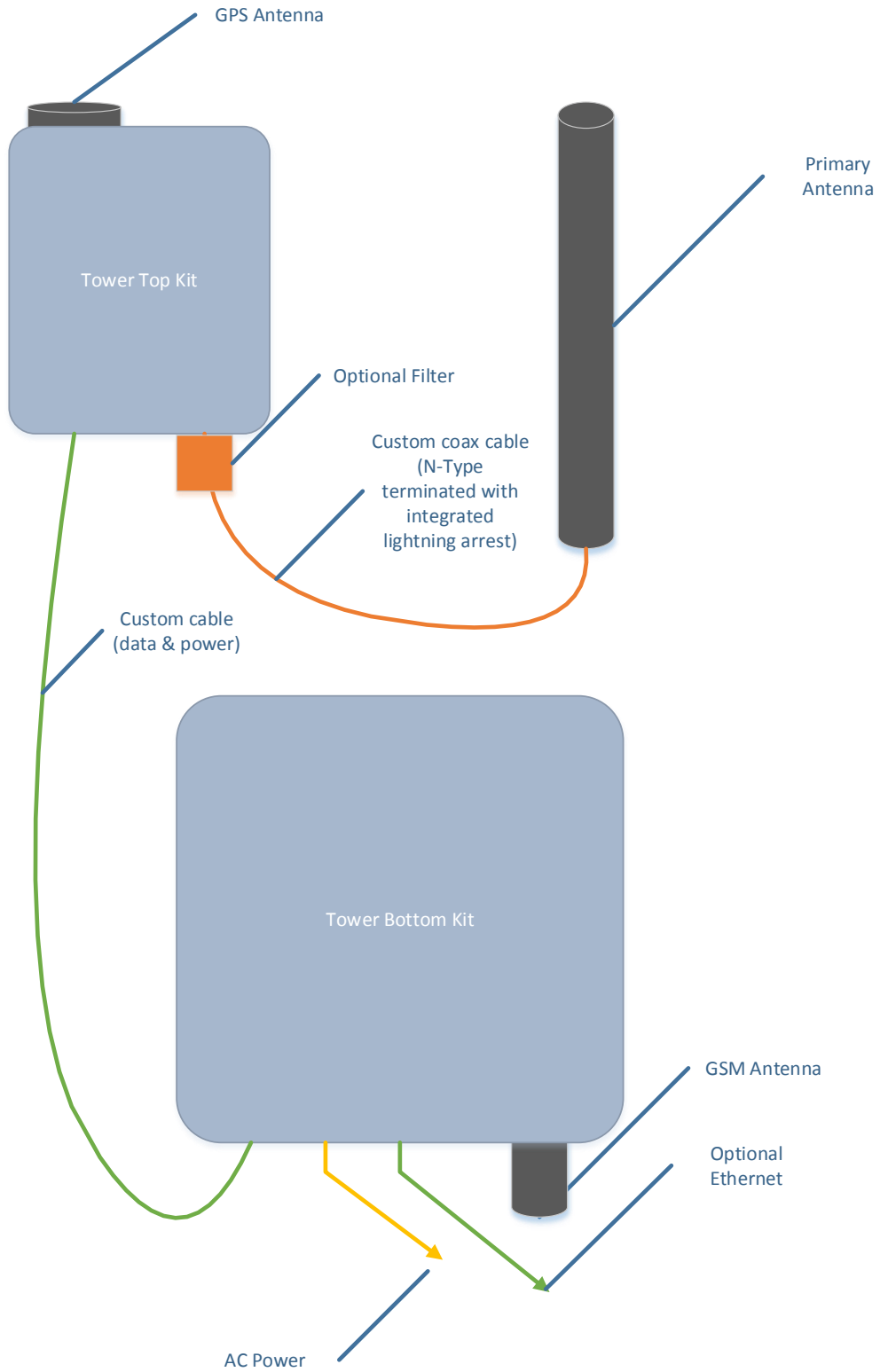10' cable with N-Type connectors and integrated lightning arrestor

2.1.5 Optional RF Filter

Bandpass filter tuned for 915MHz, location specific

2.1.6 Custom Tower Cable

Combination DC power and data cable connecting the top and bottom kit. Pre-terminated to length.

Figure 2 - Tower Kit Block Diagram

GPS Antenna

Tower Top Kit

Primary
Antenna

Optional Filter

Custom coax cable
(N-Type
terminated with
integrated
lightning arrest)

Custom cable
(data & power)

Tower Bottom Kit

GSM Antenna

Optional
Ethernet

AC Power

2.2 Installation

Senet, Inc. requires that all equipment be professionally installed. The complete installation checklist is provided below. Aside from the specified optional equipment, changes or modifications to the gateway equipment, including the top and bottom kit, the antennas and filters, not expressly approved by Senet could void the user's authority to operate this equipment.

The Senet LoRa Gateway is suitable for mounting in unprotected (unconditioned, outside) areas. The Tower Top Kit is designed to be mounted in close proximity to the primary antenna, on large towers or other tall structures. For cable distances (from Top Kit to Bottom Kit) longer than 100m, kit equipped with DSL extenders is required.

Installation will follow local building ordinances and tower installation practices. While the custom cable is relatively light, it must be securely fastened to the structure at regular intervals.

2.3 Operation

The Senet LoRa Gateway begins operation as soon as power is applied to the system. Connectivity to the Senet cloud infrastructure (over secure internet tunnels) is required before any receptions are processed or transmissions occur. The gateway initiates these tunnels automatically when internet connectivity is established. Depending on model, this may be accomplished through Ethernet, 4G or 3G backhaul technologies.

Successful transition into full operational mode must be confirmed by Senet's Network Operations staff.

Packets received by the Gateway are forwarded to Senet's cloud infrastructure for processing.

2.4 RF Exposure

FCC Rule Part 1.1310 specifies limits for exposure to radio frequency radiation. To maintain compliance with these rules this equipment must be installed such that the installers and operators of this device will not be closer that 22cm to the antenna under normal conditions.

3 Installation Checklist

3.1 Overview

This checklist will serve as a set of requirements and guidelines to fulfill the on-site equipment testing and handling requirements set forth by Senet Inc. Changes or modifications to the gateway equipment, including the top and bottom kit, the antennas and filters, not expressly approved by Senet could void the user's authority to operate this equipment. Regular installation procedures may be followed in conjunction with these procedures. Please initial all steps when complete, scan and email this completed checklist to Network Operations at Senet, Inc.

3.2 Installation site details

Installation Company:	
Tower ID:	

3.3 Ground Test

To be performed on site prior to tower installation.

If the lower box will be using a cellular connection, AND will be mounted indoors, place it indoors where it will be mounted. This is to verify that the cellular internet connection is suitable inside of the building. Otherwise, lower box may be located anywhere for ground test.	
Connect spool of cable to both upper box and lower box. Ensure that connector is fully latched and properly secured. Both ends of cable will be exposed, so cable may stay spooled up for this.	
Connect bandpass filter to N-type mating connector on top box. Bandpass filter is bidirectional, so either end will work.	
Connect lightning arrest/jumper cable to bandpass filter. This jumper is bidirectional, so either end will work.	
Connect lightning arrest/jumper cable to antenna.	
If an on-site hard wired internet connection is available and authorized, connect a standard Ethernet cable from Ethernet port on outside of lower box, to internet switch, router, or modem. If this connection is not available, the box is already configured for a cellular internet connection, and no hard internet connection is required.	
Connect lower box power cable directly to a standard 120v outlet or with an extension cord. Use a flathead screwdriver to open lower box. Ensure that lights are flashing inside the box to verify power. If no lights are seen, flip tandem circuit breakers located in the top left corner of the box on (red). Once powered up, it will take about two to five minutes for the gateway to begin communication with our server.	
Call Senet, Inc. Network Operations to verify network connectivity.	
Once Senet gives the go ahead, proceed with installation.	

3.4 Tower Installation

Fasten antenna to tower/mast/arm/etc. using appropriate mounting hardware. The supplied hardware may be substituted by the installer if the installation requires it.	
Fasten upper box to tower/mast/arm/etc. using appropriate mounting hardware. The supplied hardware may be substituted by the installer if the installation requires it.	
Connect bandpass filter to N-type mating connector on top box. Bandpass filter is bidirectional, so either end will work.	
Connect lightning arrest/jumper cable to bandpass filter. This jumper is bidirectional, so either end will work.	
Connect lightning arrest/jumper cable to antenna.	
Connect cat5/power cable to upper box, and ensure that connector is fully latched and properly secured.	
Weather seal N-type connections at antenna, bandpass filter, and upper box using appropriate weather sealant/tape. We recommend a self-fusing silicone tap.	
Verify that weep holes underneath antenna are not obstructed by weather seal/tape.	
Use appropriate tape or zip tie to secure latch assembly between the cable run and the upper box. This is an added security measure to make sure that the latch stays closed.	
Properly secure cable to tower using appropriate clips/ties/wraps, etc.	
Mount lower box to wall/studs/frame/pole/etc. using appropriate hardware so that all connections are facing the ground.	
Connect cat5/power cable to lower box, and ensure that connector is fully latched and properly secured.	
Use appropriate tape or zip tie to secure latch assembly between the cable run and the lower box. This is an added security measure to make sure that the latch stays closed.	
If an on-site hard wired internet connection is available and authorized, connect a standard Ethernet cable from Ethernet port on outside of lower box, to internet switch, router, or modem. If this connection is not available, the box is already configured for a cellular internet connection, and no hard internet connection is required.	
Connect lower box power cable directly to a standard 120v outlet or with an extension cord. Use a flathead screwdriver to open lower box. Ensure that lights are flashing inside the box to verify power. If no lights are seen, flip tandem circuit breakers located in the top left corner of the box on (red). Once powered up, it will take about two to five minutes for the gateway to begin communication with our server.	
Call Senet, Inc. Network Operations to verify network connectivity.	
If test passes, the installation of the equipment is complete. Please take photos of tower, shelter, installed top box, installed antenna, installed bottom box, and all connections from top to bottom. Also, take photo of "tape drop" with survey tape reel to verify antenna height from ground to base of antenna mount.	