sci_Zone

LinkStar-STX3-ME

User Manual

SZ-LINKSTARSTX3ME-10010v1x00

DRAFT

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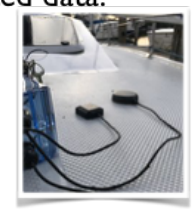
1 Getting Started!

1 Place the *LinkStar-STX3-ME*™ **outdoors** with a clear view of the sky…if you want to receive your transmitted data.



The *LinkStar-STX3-ME* needs an unobstructed view of the sky

Make sure the GPS antenna is pointing upwards

Make sure the radio antenna is pointing upwards

2 Plug in your AC adapter FIRST.

Do NOT plug in the USB cord to your computer first! It will supply power to the *LinkStar-STX3-ME* computer, BUT it will NOT be enough power for the radio transmitter!

3 You are communicating!

Once your GPS red light is flashing about once every 15 seconds, your *LinkStar-STX3-ME* has a lock on is location (latitude, longitude and altitude), and it will begin to broadcast packets of data in regular intervals you can define!

4 To talk directly to your *LinkStar-STX3-ME* you will need to configure your *Macintosh* or *Windows* PC computer to communicate over USB

The computer of the *LinkStar-STX3-ME* is an ***Industrial BeagleBone Black***

Go to www.sci-zone.com/linkstar-stx3/software to download the appropriate drivers for your computer

5 Connect the included USB cord from your *LinkStar-STX3-ME* to your computer

6 Browse your *LinkStar-STX3-ME!*

You can browse your *LinkStar-STX3-ME* either through *Safari* , *Chrome* or *Firefox* (*Internet Explorer* will **NOT** work)

With your USB cord connected between the computer and the *LinkStar-STX3-ME* go to **`192.168.7.2/VMS-STX3/VMS_login.html`** on your browser and login (username: **`Admin`** password: **`quicksat1)`**. *Explore!*

2 More Details - Introduction

This document describes the physical, electrical, and functional characteristics of the *LinkStar-STX3-ME* satellite transmitter system. The information contained in this document is intended to provide the end user with the necessary technical information required to use the *LinkStar-STX3-ME* in a custom application.

The ***LinkStar-STX3*** satellite radio is the next generation in simplex based communications powered by *Globalstar™*, the world's most modern satellite network. *Globalstar* has reduced the size of its Simplex Transmitter Unit (STX2) by 2/3 allowing for a compact, low power design and efficient communications. *sci_Zone* has taken the next step and developed the flexible *LinkStar-STX3* "cape" that can be stacked onto a *BeagleBone Black* providing an advanced and flexible compute platform that can beacon data packets! Using the *Globalstar* Simplex data network, the ***LinkStar-STX3*** allows information to be transmitted from areas well beyond the reach of reliable cellular coverage around the globe, in near space, and in low Earth Orbit!

The ***LinkStar-STX3*** provides opportunities to integrate satellite connectivity into products used for vehicle and asset tracking, remote data reporting and data logger reporting that have limited size requirements. Affordable pricing, low power consumption and its small size make the ***LinkStar-STX3*** satellite transmitter a highly efficient device ready for integration in a wide variety of applications.

Now YOU can develop your own sophisticated system that collect and report data. Your unit can already report your unit's position, altitude, speed and heading. With added sensors you can transmit pipeline pressure, seismic alerts, weather information and wave height to name a few of the many elements your *LinkStar-STX3-ME* can measure and report. Your unit is designed to work outdoors. It can operate in temperatures between +85 ºC through -40 ºC. The enclosure is a water and dust proof unit, designed to IEC52, IP65 and NEMA 1, 2, 4, 4x, 12, and 13 specifications, UL Listed to UL508-4x specifications, UV stabilized polycarbonate with UL94-V2 flammability rating.

This document is intended to be used by software and hardware engineers, technicians, and technical management, and assumes a general knowledge of basic engineering practices by the user.

Section 1 will get you quickly using your *LinkStar-STX3-ME* radio system.
Section 2 presents the "big picture" and related documents.
Section 3 discusses how the *LinkStar-STX3-ME* radio system works

Section 4 covers how you can directly talk to the *LinkStar-STX3-ME* radio system through the included USB cable.
Section 5 discusses how you can remotely see the messages broadcasted from your *LinkStar-STX3-ME* radio system.
Section 6 covers the hardware details of the *LinkStar-STX3-ME* radio system
Section 7 presents the *LinkStar-STX3-ME* radio system regulatory information
Appendix A presents the technical specification of the TW2500 antenna used by the *LinkStar-STX3-ME* radio system to transmit the data packets.

ADVANTAGES AND FEATURES

- Increases reliability through multiple transmissions
- Global coverage
- Low power consumption
- Standard radio is a *BeagleBone Cape* designed to work with the *BeagleBone Black*, allowing for immediate development, testing and use!
- Versatile use: ***LinkStar-STX3*** can be integrated for use in a wide range of applications including satellites, near space payloads, liquid petroleum gas (LPG) tanks, water tanks, pipelines, electricity, meters, cars, trucks, boats and sea or land containers

2.1 Related Documentation

- Adafruit Ultimate GPS, October 18, 2016
- BeagleBone Black System Reference Manual, Revision C
- GPS ACTIVE 28dB MAGNETIC ANTENNA+RG174(5M)+SMA PLUG
- Remote Telemetry Service Frequency Plan For Simplex Transmitters, GS-07-1248, Rev. 2.6
- User Manual, element14 BeagleBone Black Industrial, January 2014

3 How Does The *LinkStar-STX3-ME* Work?

The *LinkStar-STX3* operates on the *Globalstar™* LEO satellite network. LEO (Low Earth Orbit) means that there are a number of satellites in low earth orbit that constantly orbit the planet and can communicate with *Globalstar™* based devices that are within range of its current position. See Figure 1.

Figure 1. A LEO Constellation of satellites

Since the satellite position is constantly changing, simplex devices on the ground will transmit (with no knowledge of any of the satellites locations); one or more satellites may receive the transmission. These satellites will then relay the message to the nearest satellite gateway as shown in Figure 2. Once received by the satellite gateway, the simplex message will be delivered to the simplex gateway where redundant messages are discarded and the data from the message is sent to *sci_Zone* and our web based interface to view the data.

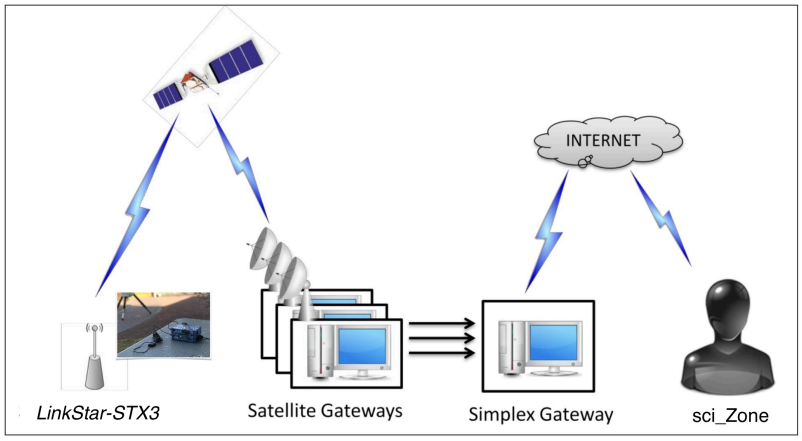


Figure 2. Simplex Messaging

Messages are composed of 1 or more 9-byte payloads. The *LinkStar-STX3* can only transmit 9-byte on-air messages, so user payloads greater than 9 bytes will require multiple on-air packets to be transmitted for each user payload. See Figure 3.

There are brief periods of time where there is no satellite in range of the simplex transmitters due to obstructions and/or satellite coverage geometry. Since a simplex

device has no way of knowing if a transmitted message has been successfully received, the *LinkStar-STX3* device is designed to send multiple (redundant) transmissions for each message being sent over the *Globalstar™* network. The default value for the number of redundant transmissions per message is three. This means that each message sent to the *LinkStar-STX3* will be transmitted three times. Each transmission will contain the exact same data payload. The redundant transmissions of each message will be sent on a randomized 5-minute nominal interval.

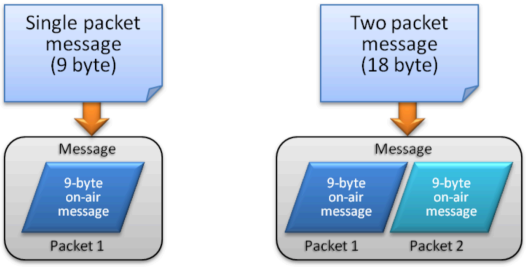


Figure 3. Messaging Packets.

The transmission sequence for a single-packet message using the default setting of three redundant transmissions is shown in Figure 4.

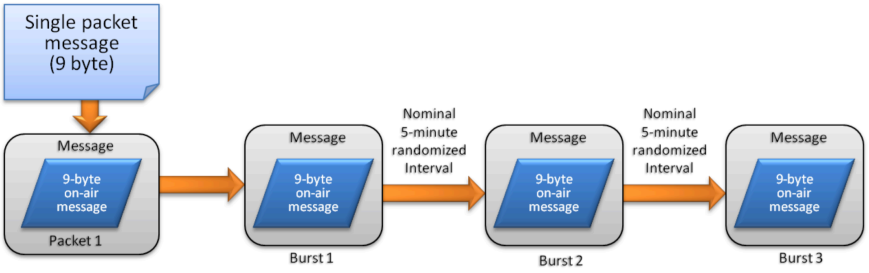


Figure 4. Redundant 9-byte message packet

The transmission sequence for a two-packet message using the default setting of 3 redundant transmissions is shown in Figure 5.

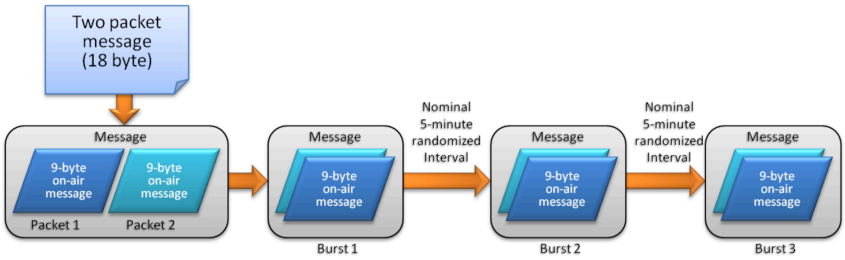


Figure 5. Redundant 18-byte message packet

For normal conditions where the transmitter has an open view of the sky, this will result in a better than 99% chance that the message will be received.