Installation & User's Guide
(Instructions & Limitations)
Landing Height System
(NORSEE Certified Edition)

Models:
LS-100-G / LS-100-B
(Internal Installations only)

Date: 12/09/2020

Rev A3

Revision History

Revision	Date	Description
A	02/06/2020	First Release
A1	04/20/2020	SW Revision to switch off Wi-Fi Module
A2	09/15/2020	User's Guide added to Installation Guide
A3	12/09/2020	Added voice reminders feature

MICROKIT
Solutions LLC

1   Limited Warranty / Disclaimers

Microkit Solutions LLC warrants this product for materials and workmanship for a period of one year starting from the date of installation. Microkit Solutions, at its sole discretion, will either repair or replace this product if found to be defective due to material or workmanship during this period and under normal use.

This limited warranty does not cover units which have been opened, disassembled, altered, modified, or tampered with in any form. This warranty does not apply to cosmetic damage, damage caused by accident, misuse, abuse, fire or flood, theft, improper connections, or installation errors.

All repair and/or replacement under this warranty are free to the customer. However, the customer is responsible for any shipping charges and any related removal and reinstallation costs.

This warranty covers the original purchaser only. This limited warranty is not transferable to subsequent purchasers or owners of this product.

MICROKIT SOLUTIONS LLC, ITS STAFF, DEALERS, RESELLERS AND THEIR STAFF IN NO EVENT SHALL BE LIABLE FOR ANY WARRANTIES, REMEDIES, DAMAGES, DIRECT, INCIDENTAL, CONSEQUENTIAL, OR INDIRECT RESULTING FROM THE USE OR INABILITY TO USE AND/OR MISUSE OF THIS PRODUCT

THIS LIMITED WARRANTY AND CONDITIONS ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, REMEDIES AND CONDITIONS, WHETHER ORAL OR WRITTEN, EXPRESS, OR IMPLIED.

SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO PART OF THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

Table of Contents

2 Introduction

The Landing Height System provides height above landing surface audio announcements when reaching a specific height above the ground.

It uses a built-in LIDAR with eye-safe Class 1 Laser module for ground range. For the purpose of this document; LIDAR module or Laser module are used interchangeably. A hard surface such as Tarmac, Asphalt, and Concrete runways, along with turf/grass or dirt strip are suitable for accurate range reading.

This guide covers two LHS models; **LS-100-G and LS-100-B**. These units are not approved for external installations (under a wing access panel). **These two models are designed and approved for internal installations only (above an access panel)** and differ slightly in the unit case dimensions and the type/model of the built-in Laser module used.

LHS LS-100-G is designed to start announcing from 70ft while LS-100-B starts at 100ft. *Note that the LHS may skip the first announcement depending on the approach angle, descent rate, ambient light, sun exposure and other terrain environments before reaching the actual runway surface.*

The Landing Height System announces the height during the Landing phase. It is specifically designed not to announce on Takeoff, though it does announce the range during a go-around maneuver if the go-around is initiated below 50 feet.

This product is not suitable and not approved for use over water or if the runway has a water level of 4" or more.

MICROKIT
Solutions LLC

This system accepts standard aircraft power from 12V or 24V systems. It outputs a Differential Audio Signal (Hi/Lo) with a low power (< 1W) Audio signal capable of loading a standard 8 Ohm speakers or Audio Input HI/LO pair within the Audio Panel or Intercom. Audio Signal output is also compatible with Single-Ended single wire Audio input Panels or Intercom.

The Landing Height system is not a required system and may not be used as a substitution for any certificated aircraft system."

3 Specifications

Voltage Supply: 9V-28V (30V MAX)

Power consumption: 1W Nominal; 200mA @ 12V Peak

Operating Temperature: -4° F (-20° C) to +140° F (60° C)

Storage Temperature: -4° F (-20° C) to 185° F (85° C)

Weight: 210 gm (7.5 oz)

Dimensions (LS-100-G): 93 mm (L) x 53 mm (W) x 56 mm (H)

Dimensions (LS-100-B): 93 mm (L) x 53 mm (W) x 60 mm (H)

4 Installation Instructions & Limitations

Installers are required to read this section fully before starting the installation and to note any limitations for the installation of this Landing Height System.

For installation on a Pressurized Airplane; penetration of the pressurized vessel to allow for routing wires may be considered a major alteration and may require further FAA approval.

MICROKIT
Solutions LLC

Installation of the Landing Height system is supplemental only; it is not intended as a replacement for or modification to an existing, approved, or required system. No operational credit may be taken for installation of this system.

4.1 Installers

This unit must be installed by an authorized mechanic for the Aircraft type/ model. Installers are required to log the installation appropriately and if the unit is to be installed externally, to verify the appropriate pull test. Installers are also required to verify the pilot is able to switch off the LHS unit or Audio output on-demand using an appropriate method mentioned below.

Note that this guide covers internal installation only. See **LS-101-B** model guide for a different unit that is approved for external installation.

The LHS FAA NORSEE approval for installation and operation on certified airplanes limits the height announcements down to 5 ft. The appropriate selection via Wi-Fi "Certified Airplane Operation" button must be selected for operation on certified airplanes.

4.2 Location

The two LHS models covered in this guide are approved to be installed on an "Access Panel/Inspection plate internally.

The installation may be accomplished with a log book sign off if it is minor but will require additional FAA approval if it is determined to be

major. Note: Installers should contact the appropriate FAA office for evaluation if not installing the LHS on an inspection plate or access panel. Installation on an Inspection plate or access panel is likely considered minor.   Penetration of pressurized vessels may be considered major and further FAA approval may be required.

Do not install the unit in the engine exhaust soot stream.

For internal installation, installers must verify the installation will not interfere with existing control rods, cables or other moving parts.

Any adjacent cables, control rods or moving parts must be checked for its full movement range, so the planned wiring and unit location does not interfere with any moving parts or surfaces. The unit needs an unobstructed view of the ground below. It can be installed at an angle, the angle will be detected during first setup and adjusted internally so the system can provide the correct vertical range.

At the base of the unit, the spread of the laser beam is small, about 0.5 degree. The spread increases at this rate as distance increases. Any hard surfaces or objects (such as landing gear or fairings) should not be seen by the beam depending on the installed height above ground level.

Generally, the beam diameter would not be more than 1" using the highest possible installation point. It is best to choose a location a few inches away from the wheels and this can be easily verified before any actual wiring or permanent installation fixture.

MICROKIT
Solutions LLC

The installer must verify the Pilot is able to switch off the LHS in an emergency using one of the following:

- A dedicated LHS push-pull circuit breaker to remove power
- External panel mounted LHS toggle-switch to remove power
- A dedicated LHS audio panel "Switched" channel to disable the audio annunciation

Refer to Section 4.3 for more details.

4.3 Connection Limitation

A dedicated 1A circuit breaker with Push/Pull feature is the recommended method for aircraft power connection to the LHS unit. This circuit breaker must be labeled "LHS".

If a Push/Pull type dedicated circuit breaker is not suitable for installation; a standard aircraft circuit breaker can be used but another method to allow the pilot to disable Audio or the system itself must be used. One method is to install a toggle switch labeled "LHS" which allows the pilot to switch off the unit on-demand.

A "Switched" type Audio input on the Audio Panel can also serve as a means to allow the pilot to disable the Audio announcements.

If the circuit breaker is the only means to disable the unit; this circuit breaker must be dedicated 1A breaker and of the Push/Pull type labeled with "LHS"

This requirement ensures the pilot is able to physically switch off or disable the Audio input channel in the event the system did develop an unforeseen error situation where the pilot determined that the

system is malfunctioning.   For example, hearing 10 feet while on downwind.

If a "Switched" type audio channel can be used to disable the Audio or a toggle switch is installed; the unit can share its power with non-essential accessories such as cigarette lighter.

4.4 Pre-installation verification

Audio functionality must be checked prior to fixture installation or drilling/wiring. This ensures compatibility and allows the correct selection of the Audio input channel prior to actual installation.

With the unit in hand, prepare a temporary short wiring to power the unit and connect to the selected Audio channel for testing. Refer to **Section 4.5.2**

If the installer suspects the actual final placement may not provide a full unobstructed view of the ground below, installers must test the unit placement location before any actual wiring or drilling.   This can be done using the below mentioned method.

A 9V alkaline or equivalent battery can be used to power the unit (without connecting the Audio wires). This powers the unit and allows Wi-Fi connection to the unit to check the reported range.

Note that Wi-Fi is only available during the first 3 minute and is disabled if no connection is made to the unit Wi-Fi network.

The unit can be placed by tape or held by hand at the location desired.

Range reading can be seen on a phone or Tablet/PC via Wi-Fi connected to the unit. Refer to **Section 7** for Wi-Fi connection and software setup.

The reported range should be within 2" of the distance from the ground, assuming the unit is looking straight down. Note that if the unit is held at an angle, the reported distance will be higher. Measure the theoretical straight line between the Unit viewing window and the ground and that distance should be within 2" of the reported distance on the Wi-Fi device.

4.5 Installation of Landing Height System Unit

4.5.1 Internal attachment to Access Panel/Inspection Plate

The LHS unit may only be installed or attached to a removable inspection plate. Installers must contact the appropriate FAA office for approval if not installing the LHS on an inspection plate or access panel.

Cut the access panel plate according to the following profile. It is recommended to replace the original access panel with a similar plate of the same material and size. This way any drilling or cutouts

MICROKIT
Solutions LLC

can be performed on this new panel. The unit can be oriented internally in any direction.

Two suggested methods to prepare the access panel to ensure viewing window clearance.

Note; different cutouts are required depending on the LHS model.
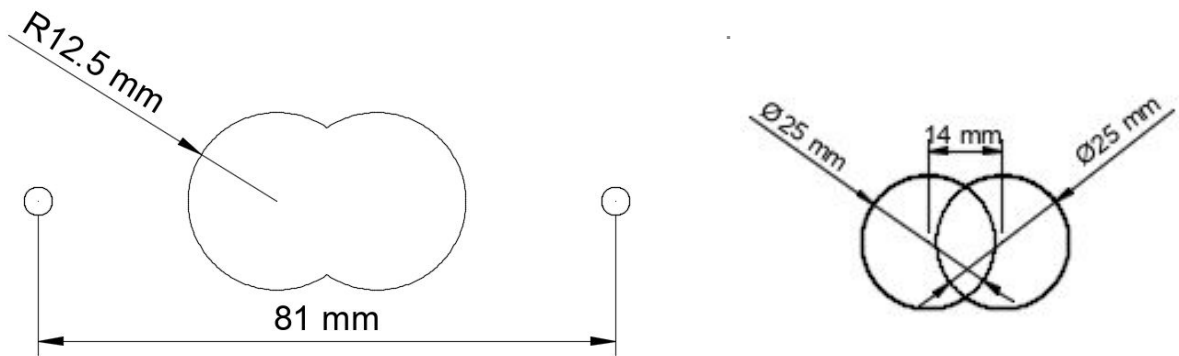
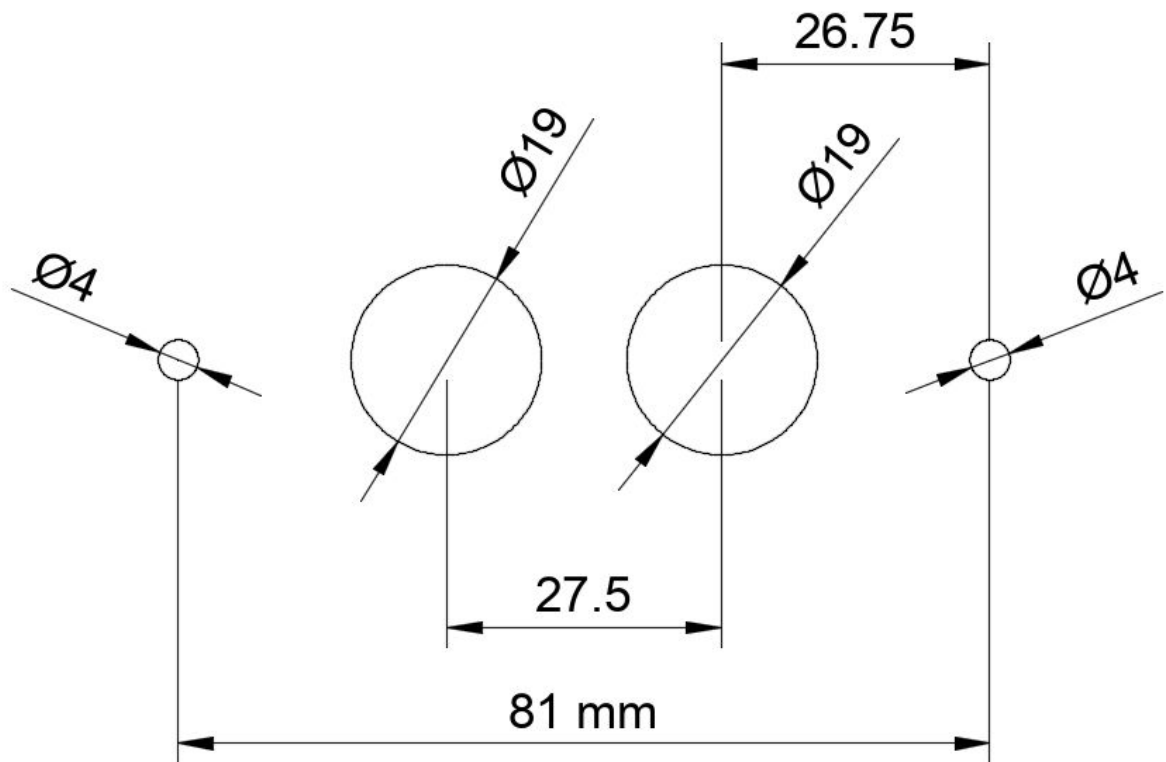**Option A) Rectangle Cut-out (Model LS-100-B)**
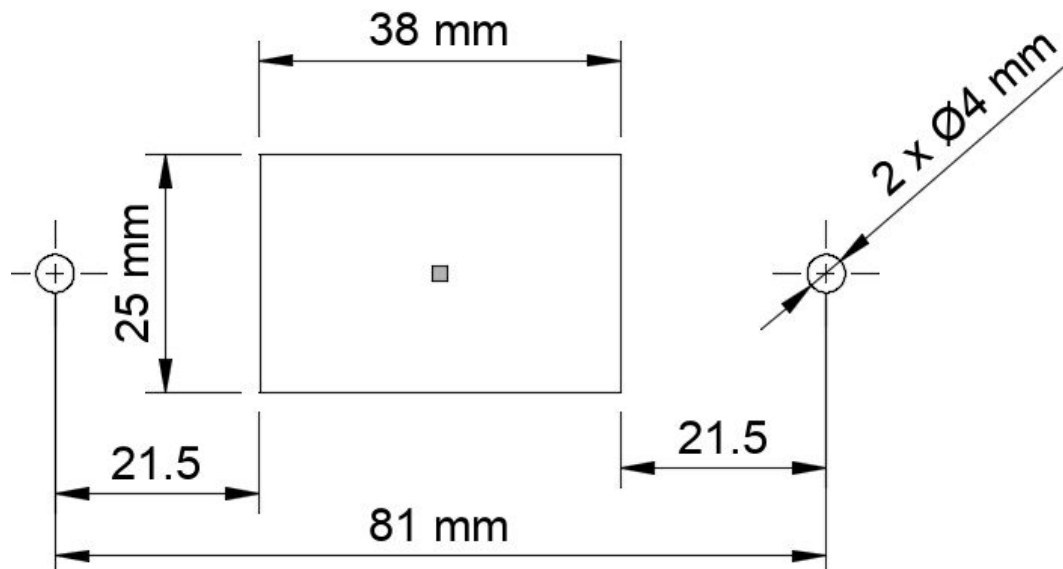
Note: +/- 2 mm accuracy for the rectangle cutout is acceptable as this still clears the viewing window of the Landing Height System unit.

Option B) Using a 25 mm drill bit (Model LS-100-B)

Alternatively, two 25 mm holes with 14 mm apart can also clear the viewing window of the Laser module.

R12.5 mm

81 mm

Ø25 mm   14 mm   Ø25 mm

Cut-out profile for Model LS-100-G

26.75

Ø19   Ø19

Ø4   Ø4

27.5

81 mm

MICROKIT
Solutions LLC

Example of installation on a Piper Warrior with a replacement access panel

4.5.2 Wiring

The unit is supplied with a 4-wire quick-disconnect waterproof connector. This allows the unit to be fully removed along with the access panel to provide access to the location for other maintenance requirements.

RED	Aircraft Power (+12V/+24V)
YELLOW	Aircraft GND
BLUE	Audio Hi
GREEN	Audio Lo (Leave unconnected for Single-ended audio panel.

Use single 4-core shielded wire (22 or 24AWG) or use two 2-core shielded wires.

The unit uses less than 200mA of power (on +12V systems). A dedicated 1A circuit breaker with Push/Pull feature must be used if this will be the only means to switch off the unit or disable audio. Refer to **section 4.3** for more details about the power connections and disabling the unit or audio on-demand.

MICROKIT
Solutions LLC

The unit delivers < 1W of Audio output power using a Differential Audio output (Audio Hi/Lo) through an 8 Ohm load such as a Speaker or Audio Input.

Some Audio panels may not have an available 8 Ohm input channel and may offer 500 Ohm input. The internal aircraft Audio panel amplifier should amplify the signal, but this must be tested to confirm compatibility before major wiring or cutouts are made. A 500 Ohm unused ADF channel on King KMA 20 was tested and worked correctly.

Select an unused Audio Channel on the Audio Panel, such as NAV2, ADF, COM3 and so on. It is recommended that the selected channel be of the "Switched" type. Meaning, the pilot can enable/disable or mix this audio input channel using a button/switch on the Audio panel; similar to when the pilot activates the NAV button/switch to identify a NAV station. This also applies to Audio Panels integrated within a Glass Panel and/or Digital type Audio panels; the Pilot must be able to disable the Audio Input using the Glass Panel.

If a suitable "switched" channel is not available; then a dedicated Push/Pull 1A circuit breaker must be used to allow the pilot to disable/enable the system on-demand. Alternately, an external toggle switch can be installed so the pilot is able to switch off the system if desired.

The cable shield for the audio wires needs to join the Audio Panel chassis/ground to the Unit Ground wire.

MICROKIT
Solutions LLC

For Audio Panels that accept a single-ended Audio input; use the Audio HI output pin and leave Audio Lo unconnected. Do not connect any Audio Output to GND or Voltage source.

4.5.3 Software Setup

While the airplane is on flat ground, measure the vertical height of the unit from the ground below, and use the Wi-Fi connection to set up the unit.   Refer to **Section 7** for Wi-Fi setup.

Even if the unit is looking at the ground at an angle; the vertical distance is the actual vertical height of the unit above ground. Refer **Section 8** for Wi-Fi functions.

Note the Wi-Fi Interface is only available for the first 3 minutes after power up to allow for device connection.   Once the unit is set up and operational, the Wi-Fi interface becomes unnecessary and the Unit automatically switches Wi-Fi off 3 minutes after power-up if no Wi-Fi activity is detected.

MICROKIT
Solutions LLC

5 Maintenance

The Landing Height System does not require any field maintenance. The unit should not be installed in the engine exhaust soot stream, otherwise periodic inspection of the unit viewing window is required to clean any deposits. Use a dry clean cloth without applying any pressure on the viewing window.   A slightly wet (water only) cloth can be used if needed. Note the viewing window is black

6 Operating Limitations

- Pilots must be able to switch off the unit (or audio output) on demand

- The Landing Height system is not a required system and may not be used as a substitution for any certificated aircraft system.

- The system is not authorized to be used below Weather Minimums for the type of flights.

- The Landing Height System is a non-required system. It can only be used as an aid once the runway is fully identified and all regulatory requirements for landing are met without the system aid.

- The Landing Height System is not approved for use over water or if the runway has a water level of 4" or more.

- The Landing Height System is not approved for installation on float or amphibious aircraft
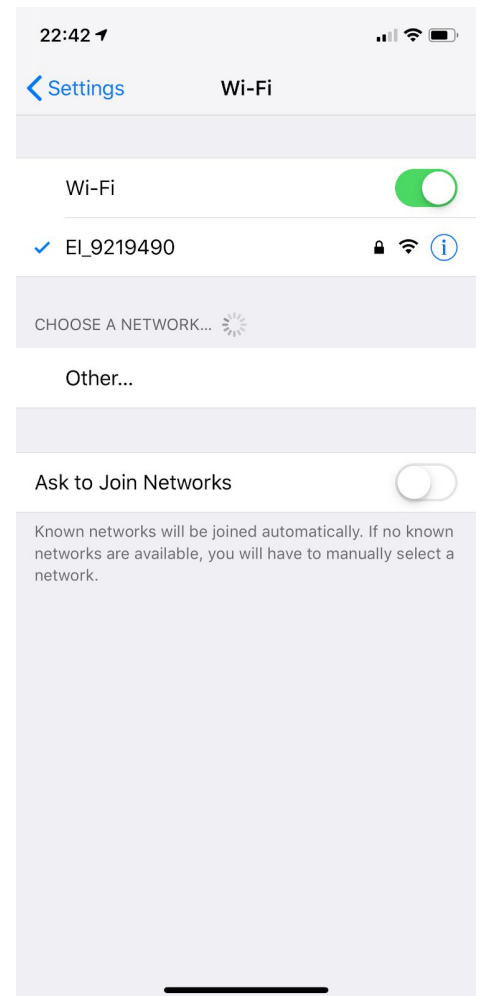
7 Wi-Fi Connection

The Landing Height System uses a Wi-Fi connection for initial setup and Audio testing.

Use your device Wi-Fi Search and look for **EI_xxxxxx**. The xxxxxx is the unique serial number of the unit.
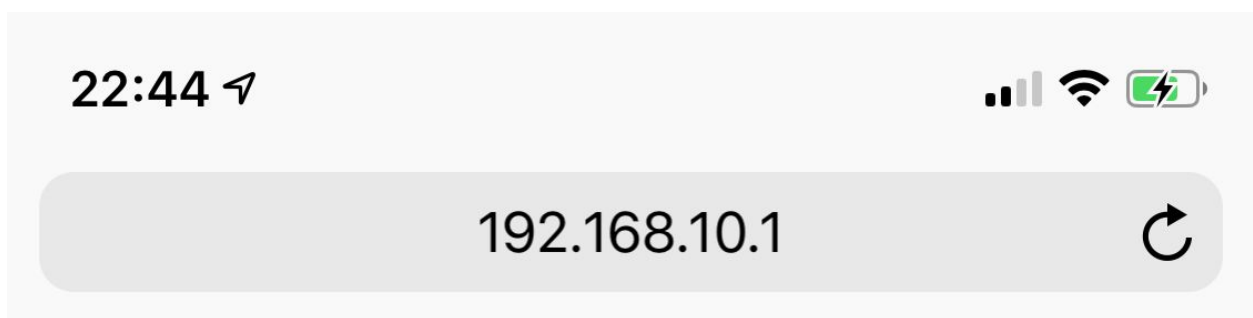
The default Wi-Fi Password: **61331970**

The Wi-Fi System is designed for the Phone screen, but can be used with PCs/Laptops and Tablets such as iPads.

Multiple devices can connect at the same time if required.

Once connected, use your device Browser (Safari / Chrome / others) to connect to the system.   Input 192.168.10.1 on the browser.

Copyright © Microkit Solutions LLC

REF: LS-100-X   Rev:A3

Note the Wi-Fi Interface is only available for the first 3 minutes after power up to allow for device connection.   Once the unit is set up and operational, the Wi-Fi interface becomes unnecessary and the Unit automatically switches Wi-Fi off 3 minutes after power-up if no Wi-Fi activity is detected.

The unit detects when the main page is being displayed by a connected device and delays shutting Wi-Fi off till no activity is detected.
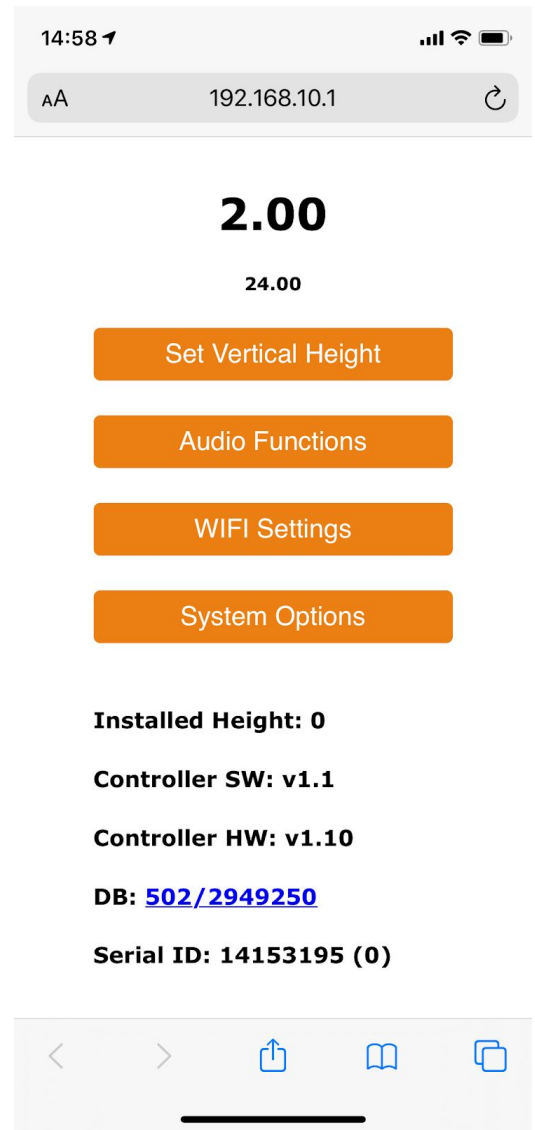
8   Wi-Fi Menu

8.1 Main Page

Once connected, the main page shows the system reported range. This is automatically refreshed and updated every 0.5 second.
No need to refresh this page manually.

This page shows the Software revisions installed along with internal database size

Database file is only used for firmware upgrade integrity and does not change in size during operation.

When out-of-range or no surface detected, it reports 0.00.

14:58 ⬈	� .ıll 🤍 ▭
AA	192.168.10.1 ↻

2.00

24.00

Set Vertical Height

Audio Functions

WIFI Settings

System Options

Installed Height: 0

Controller SW: v1.1

Controller HW: v1.10

DB: 502/2949250

Serial ID: 14153195 (0)
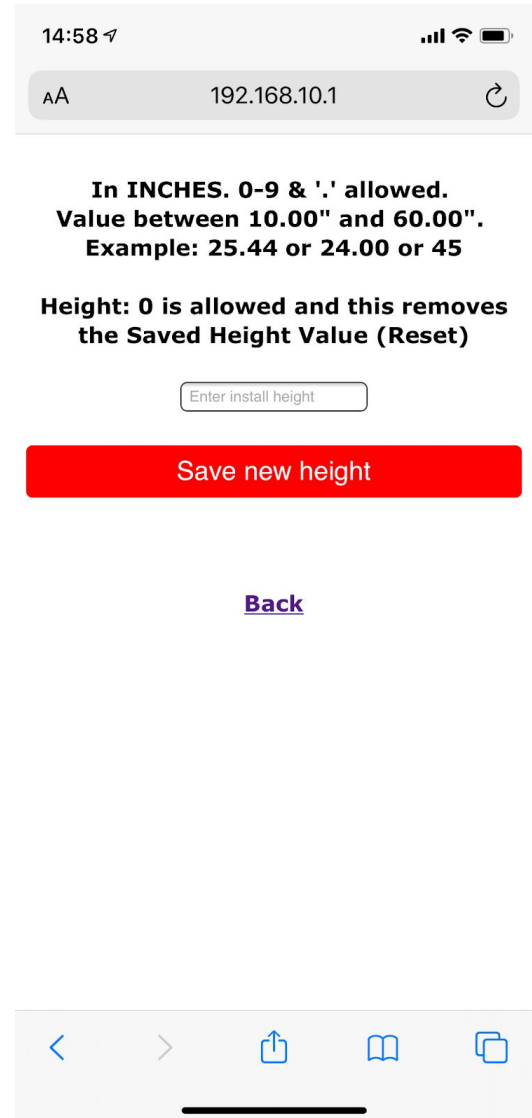
MICROKIT Solutions LLC

8.2 Installed Height Page

Use this page to input the Installed Height.

This is the actual vertical height above ground measured using a tape measure from the grounds below to the black lens at the bottom of the unit.   This value must be set for correct operation of the system. Once set; the reported range will be 0.00, indicating the distance of the wheels above the ground.

If the displayed range is within 2" of the measured height, you can use the reported range. The Landing Height System can be installed at an angle if required. The system uses the reported range along with the user provided install height above ground to calculate and save this angle.

In INCHES. 0-9 & '.' allowed.
Value between 10.00" and 60.00".
Example: 25.44 or 24.00 or 45

Height: 0 is allowed and this removes the Saved Height Value (Reset)

Enter install height

Save new height

Back

Note: Setting up the initial height or Reset must be performed on the ground, on a flat surface and with the engine off.

MICROKIT
Solutions LLC

8.3 Audio Page

Use this page to test the Audio.
Audio (0) announces Zero, Audio (all) cycles all stored announcements.   Volume can be adjusted from this page. **It is recommended to use the aircraft Audio Panel volume control if available to change the volume if desired.**
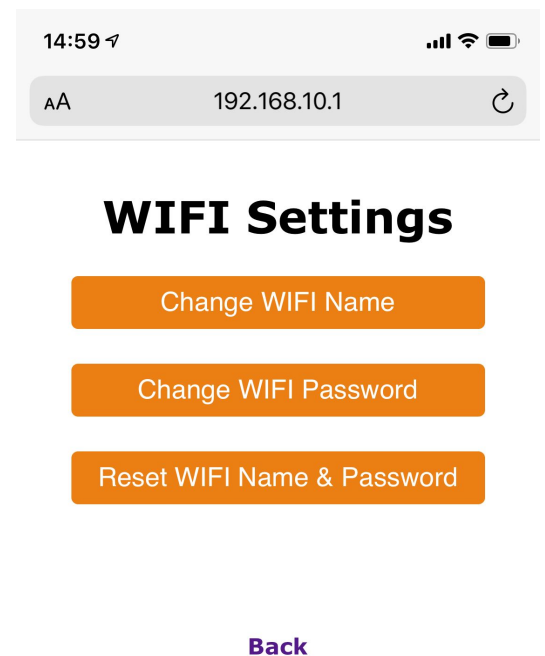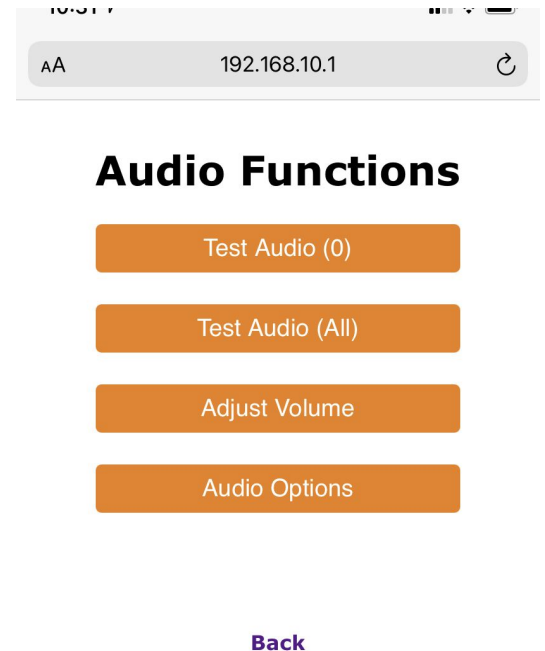
Audio Options button allows setting up voice reminders or options. Example: "Check Landing Gear". Once enabled, a voice announcement is made after the first height announcement or as set up.

AA   192.168.10.1   ⟳

Audio Functions

Test Audio (0)

Test Audio (All)

Adjust Volume

Audio Options

Back

8.4 Wi-Fi Page

This page allows changing the default Wi-Fi network name with any other name such as your Tail-Number.   When changed, the system will restart, search and connect to the new Wi-Fi network name.   Note this is case-sensitive.

It's recommended to change the default Wi-Fi Password
When changing the password, make sure at least one of your devices (phone or iPad) saves the new password and can

14:59 ⟲	∙∙ll 🔋
AA 192.168.10.1 ⟳	

WIFI Settings

Change WIFI Name

Change WIFI Password

Reset WIFI Name & Password

Back

MICROKIT
Solutions LLC

connect to the unit again without asking for the password. If you forget the new password, the only way to reset it is either by using a device (phone or iPad) that saved the password and reset using this page or by returning the unit back for firmware re-programming. We have no way of knowing your new password if you are unable to connect to the unit.

8.5 System Page

Firmware upgrades and Audio changes (such as a different language for callouts) can be requested or downloaded as they become available on our site.

A "Certified Airplane Operation" selection button is available on this page which needs to be selected for LHS units that intended to be installed on certified airplanes per the FAA NORSEE approval to limit height announcements to 5 ft.

MICROKIT Solutions LLC