Bad Elf
Base/Rover Configuration Manual

Version 1.x

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Introduction and Overview

Thank you for purchasing a Bad Elf Flex® radio kit. This manual describes the basic operation of your Bad Elf Flex, in combination with a Bad Elf Flex radio kit, as well as specifications and warranty information. For the most recent information, visit bad-elf.com/baserover.

The Flex radio kit provides a UHF radio link used for communicating corrections from a Flex operating as a fixed base station to one or more Flex units operating as rovers. A Flex radio connects via Bluetooth to Flex and requires no additional cables.

What's in the Box?

The following items are included in the standard Flex radio kit:

- Harxon Radio HX-DU1603D
- UHF Antenna
- Rugged carrying case
- AC wall charger
- Charging/Serial Cable
- Survey pole mount

Base and Rover Overview

- What is a Base?
- What is a Rover?
- Limitations

Radio Preparation

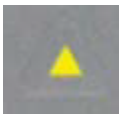
Harxon HX-DU1603D

The Harxon HX-DU1603D is an UHF external radio that is designed for easy mobile use in demanding field conditions for wireless data communication between 410 and 470MHz with

channel spacing selectable to be in 12.5 or 25 kHz. This lightweight transceiver is equipped with an OLED display, menu operation enabled, interference detection, remote control, and exceptional receiving performance. This radio is ideally used for wireless correction data transmission in applications of GNSS/RTK surveying.

Radio Controls and Indicators

Buttons



Up

Down

Left

Right

Power/Confirmation

Powering On/Off

- Long press the power button for 3-5 seconds to boot, Power indicator light shows red .
- Long press the power button for 3 seconds to shutdown.

LED Indicators

- T/RX - wireless transceiver indicator light: green when receiving,red when transmitting
- BT - green when Bluetooth online
- PWR - red when powered on

	• CHG/STY - power charge indicator: red when charging, green when the battery is full

Charging

If there is a manual, replicate the charging instructions. Add external battery charging

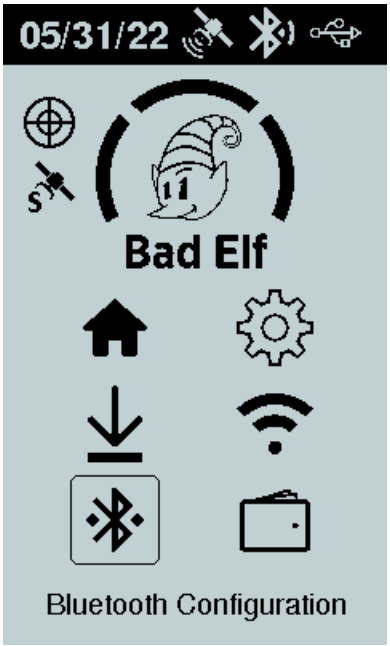
Channel Configuration

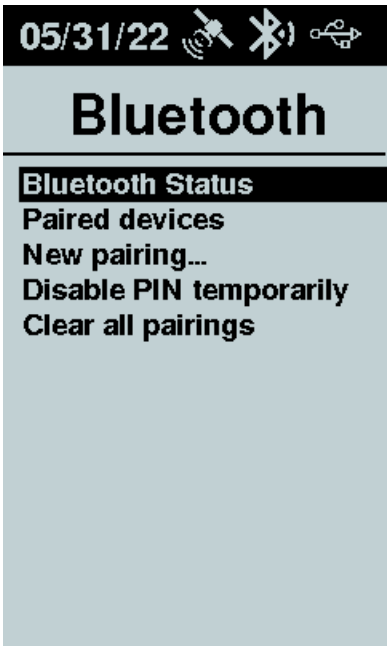
TBD BH

Programming FCC Call Sign

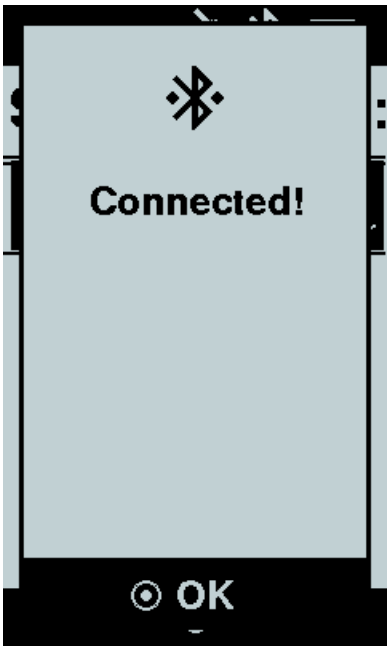
TBD BH

Bluetooth Connection

	In order for Bad Elf Flex to operate as a base or rover, you must establish a bluetooth pairing between the radio and the Flex. Select the Bluetooth Configuration option from the main menu of the Bad Elf Flex. *Tip: Your Bad Elf Flex will remember the last radio it was paired with. We suggest using color coded stickers on the radio and the Flex as a reminder of which radio is already paired with the Flex.*

	Upon selection of the Bluetooth Configuration feature of Flex, scroll down to New pairing... using the down arrow key and select using the enter button. *Note: Ensure your radio is powered on before you select the New pairing function*
	The New Pairing feature will scan for devices and indicate the number of bluetooth devices in range. This process typically takes from 10-15 seconds.

	When the Bluetooth scan process is complete, you are presented with a list of possible devices. Using the up ▲ and down ▼ arrows, select the radio with the serial number matches with the item in the list before proceeding. When you have highlighted the the radio you want to pair with, select using the enter button ●.
	Your Flex starts the pairing process and provides a status indicator that the pairing is in process. The radio serial number is shown for confirmation. The pairing process typically takes 5-10 seconds. If the serial number shown does not match the radio you want to pair with, press the back button ✕ to cancel.

	Upon successful pairing a “Connected” message is displayed. Press OK using the enter button . Your radio is now paired and ready for use. As long as you continue to use this radio with the same Flex, you will not have to repeat this process in the future.
	Should you want to determine which Bluetooth devices have established a piring with your Flex, select the Paired Devices function from the Bluetooth Configuration feature. Press the up and down arrows to select a paired device Press the enter button to view an item’s status or delete a pairing Press the back button to cancel

Wired Connection

Rover Usage

When your Bad Elf Flex is operating in rover mode it behaves identically to standalone operation using a traditional RTK feed. You may either use the Bad Eff Flex app or the Bad Elf Flex receiver's LCD screen to initiate rover mode. Once the Flex receiver establishes connection with the Flex Base, the GNSS solution changes from its current mode (usually SBAS) to float RTK and then finally to fixed RTK. The fixed position solution of your Flex Rover is dependent on decent line-of-sight connectivity with the base.

Note: be aware that once your Bad Elf Flex begins to receive corrections, it will adopt the datum used by the base once a fix is achieved.

Prerequisites

For Flex to operate as a rover, the following items are required:

- Flex Extreme or Flex Standard
- Radio kit
- Optional range pole or equivalent

To prevent interference with the GNSS antenna, when attaching the radio kit to a range pole, ensure the radio antenna does not extend above the base of the antenna cap, as shown below.

If you are using another antenna or mounting the supplied antenna in another location, ensure that the antenna is more than 1 meter from the Bad Elf Flex.

Note: To operate in Rover mode, Bad Elf Flex requires either an Extreme unlock or the use of a Bad Elf Flex token. The Flex app's checklist screen provides options to consume or purchase a token if required. The checklist provides you the means to ensure proper operation of all connections and configurations before consuming a token.

Configuration

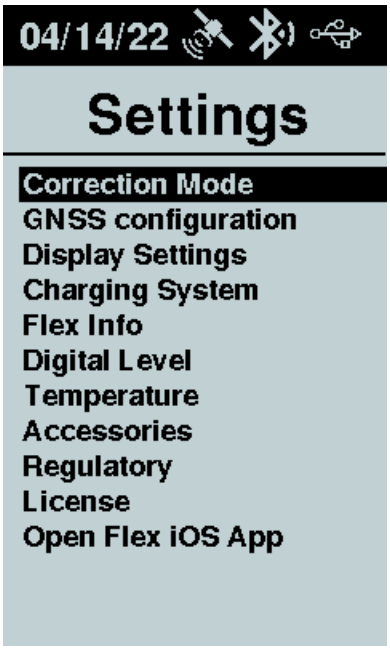
Standalone Configuration via LCD

The Bad Elf Flex supports operating in rover mode without the use of a connected app. A standard checklist interface provides for quick startup and configuration of Flex as an RTK Rover. Starting the Rover feature enables a high-accuracy collection mode using the standard Flex logging options include point and track logging.

Navigating the Rover feature

- Left ◀ and right ▶ arrow buttons select the previous or next display screen
- Enter button ● selects items or provides a context menu
- Back button ✕ returns to the previous item

Starting the Rover



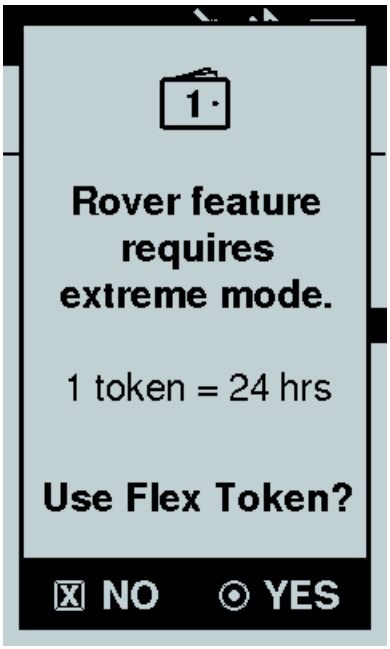
Using the keypad on the Bad Elf Flex, select the settings icon and click the enter button .

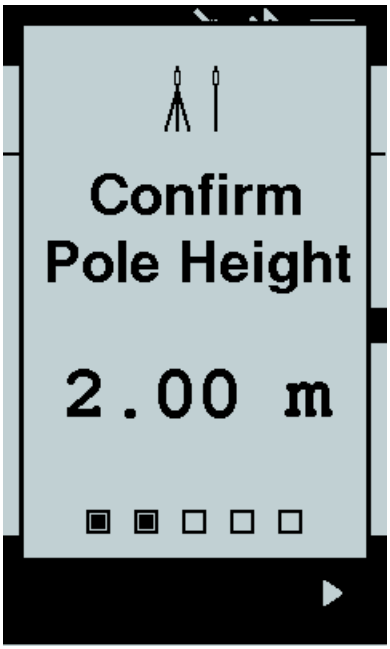
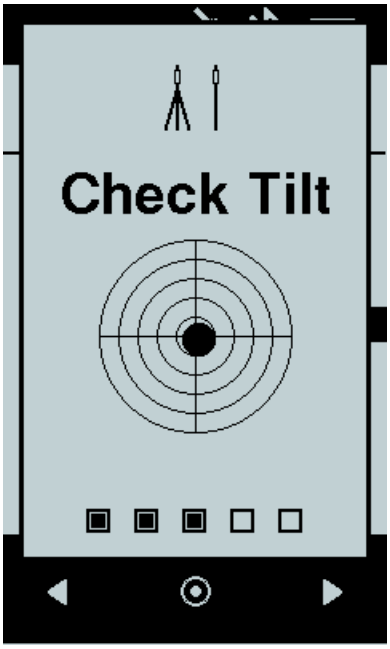
Select Correction Mode using the enter button .

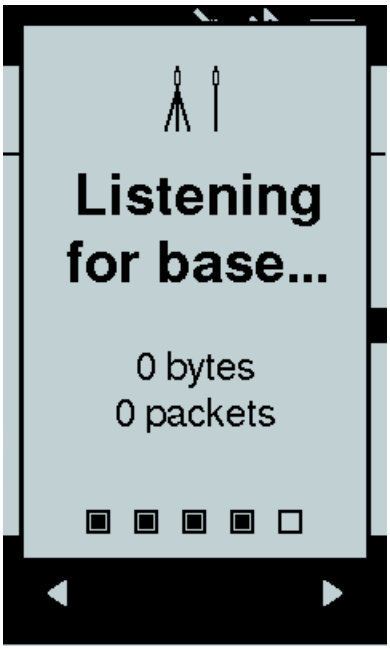
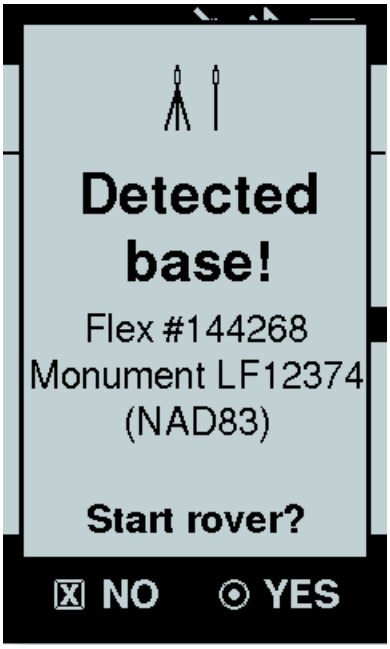
Replace this image

Use the up and down , arrow buttons to scroll to the Rover function.

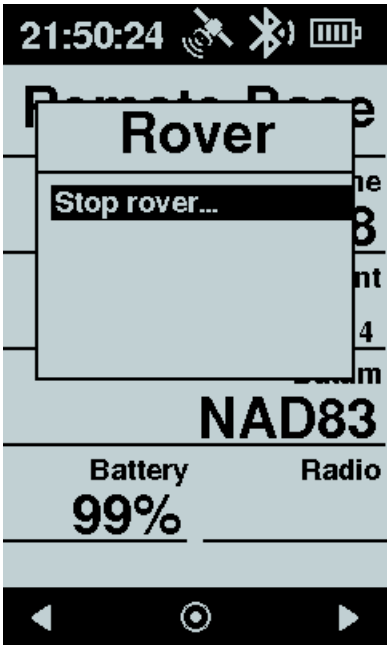
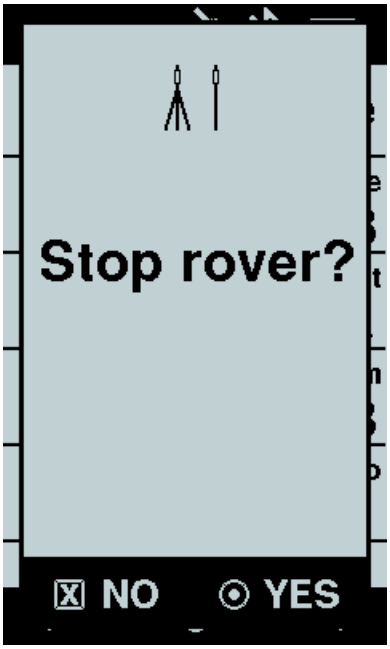
To start the Rover checklist, press the enter button .

	If you are using a Bad Elf Flex Extreme, tokens are not required and this screen is not shown. The Bad Elf Flex standard requires extreme mode through the use of a Flex Token. If a Flex Token isn't active, the Bad Elf Flex prompts you to use a token to enable extreme mode. To enable extreme mode select the option Yes by pressing the enter button. If you want to cancel starting rover mode, press No using the back button.
	In a radio is not connected, the Bad Elf Flex automatically attempts to restore the Bluetooth connection with the last radio it used. The display shows the radio it is searching for and the serial number for reference. This process takes 5-10 seconds and requires the radio to be on. If you want to pair with a different radio or are having any issues pairing with your radio, Cancel by pressing the back button and use the Bluetooth feature from the main menu of your Flex to establish a new pairing.

	Once the Bad Elf Flex confirms Bluetooth pairing with a radio, the checklist displays a confirmation of pole height. If your pole height is correct, use the right button ▶ to proceed to the next item in the checklist. If your pole height is incorrect, cancel the checklist by pressing the back button ✕ and use the Bad Elf Flex app on your phone or tablet to change the default pole height.
	Once you have confirmed the pole height, the Bad Elf Flex confirms unit tilt. Ensure your Bad Elf Flex is mounted tightly on the pole and that the pole is level and completely vertical. If you need to adjust the tilt calibration, pressing the enter button ● provides a feature to adjust and calibrate the internal bubble level. If your calibration is correct, use the right button ▶ to proceed to the next item in the checklist.

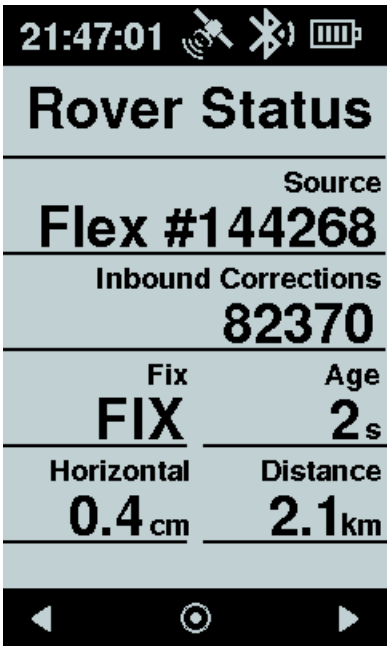
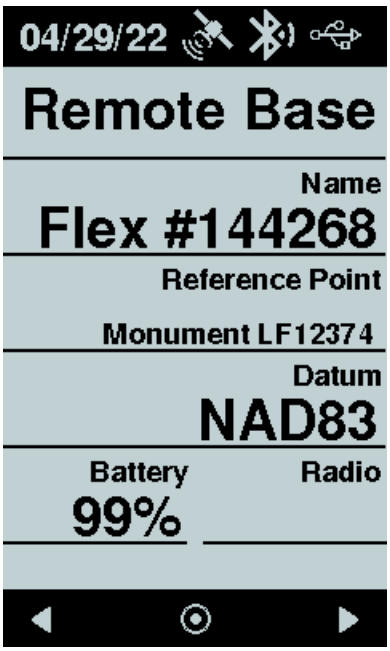
	Upon confirmation of the checklist items, the Bad Elf Flex listens for an incoming corrections feed. Byte count and packet count increase as data is validated. Once a valid stream of corrections is detected, the Bad Elf Flex transitions automatically to the Base Detected mode. To exit starting the rover feature, press the back button .
	Once the base is detected and the Bad Elf Flex determines a viable corrections feed, you may start the rover. The Bad Elf Flex displays the serial number of the Bad Elf Flex base unit and the name of the point used for its reference position. Actions • Press the enter button to start the rover. • Press the back button to exit starting rover mode

Stopping the Rover

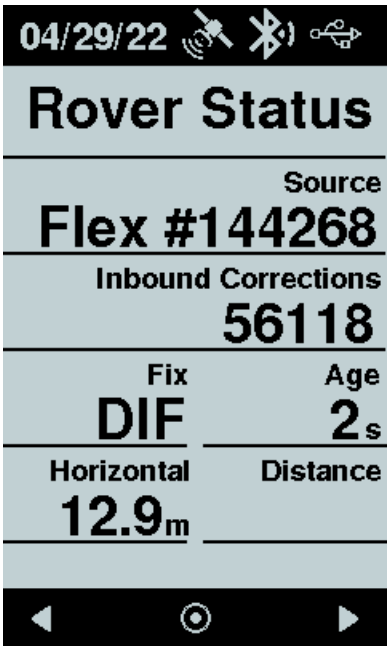
	Actions ● Press the enter button brings up a popup menu with an option to stop the rover. ● Press the enter button to confirm the action
	Actions ● Press the enter button to stop the rover. ● Press the back button to return to the rover status pages - rover remains active

You may also cancel rover mode by navigating to Settings > Corrections and choosing any correction mode other than Rover.

Rover Status Screen

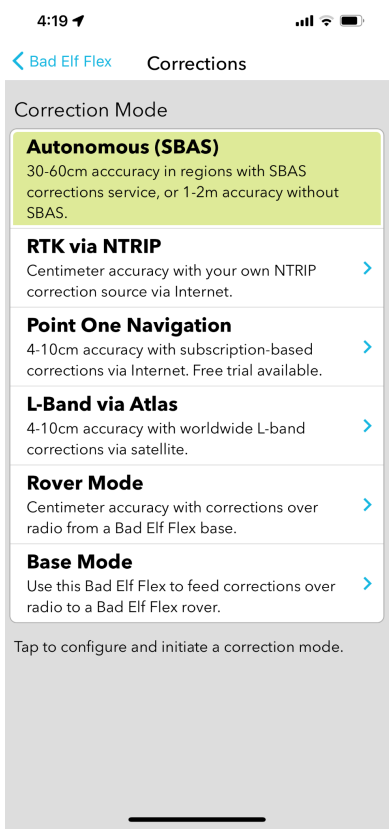
	Primary Rover Status Page ● Source - contains the name of the Bad Elf Flex Base Station ● Inbound Corrections - incrementing byte count of received corrections data ● Fix - GNSS Fix type ○ FIX - RTK or L-Band Fixed solution ○ FLT - RTK or L-Band Float solution ○ DIF - Differential corrected solution ○ AUT - Autonomous solution ○ NO - No solution ● Age - age in seconds of the current fix ● Horizontal - an estimate of the horizontal accuracy based on the corrections source ● Distance - approximate distance between the base and the rover
	Secondary Rover Status Page - Remote Base Information ● Name - remote base name ● Reference Point - reference point used for base ○ Here means base is using a named point ○ Otherwise name references a point selected from base or created on base ● Datum - the base reference datum used for corrections ● Battery - the charge level of the internal battery ● Radio - ???

Error Conditions

	Example: loss of RTK fix During normal operation the Fix type is FIX denoting an RTK solution. If the base stops transmitting or conditions occur where corrections are not received, the FIX type changes to the current fix type of the standalone GNSS engine.

Bad Elf Flex App

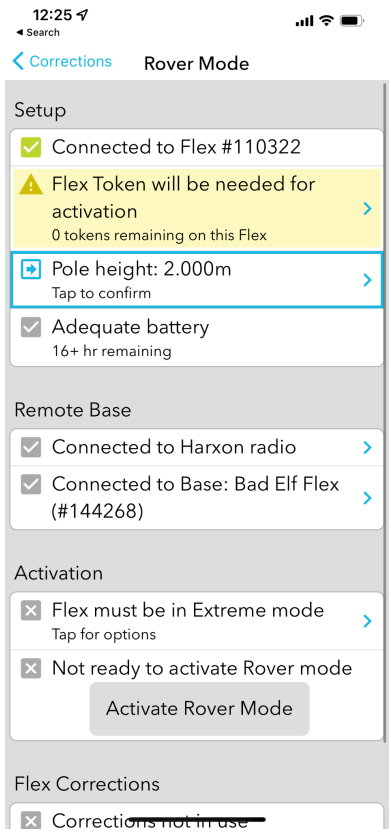
The Flex app provides a UI-rich experience to manage and activate the Rover feature of Flex.The Rover mode feature is accessed under the unified corrections mode function of the Flex app. To begin a Rover session, select the Corrections function of the Flex app.



Starting the Rover Mode Checklist

To enable rover feature usage from the Flex app, follow the steps below:

- From the main menu tap “Correction Mode”
- Tap the row labeled “Rover Mode”

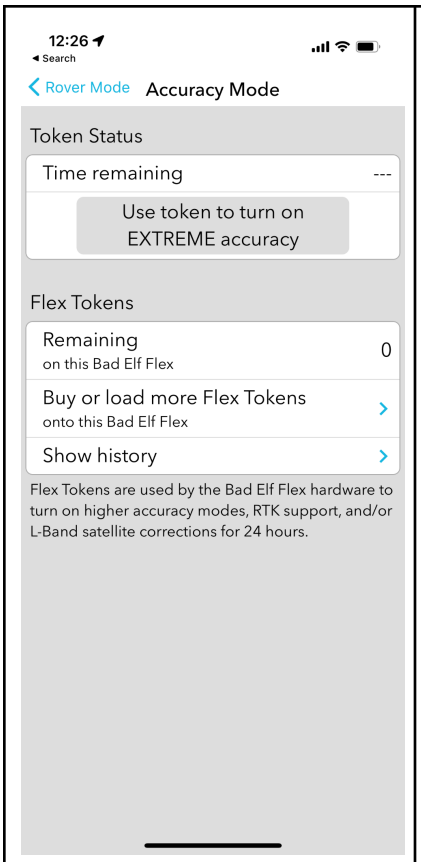


Flex Rover Mode Checklist

The Flex app provides a checklist containing all of the prerequisite items and checks required for proper usage. As you confirm each item, a green checkbox is placed to the left of that item. This essential series of items ensures rover operation is fully functional, providing quality information, and all operating parameters are correct.

Setup Section

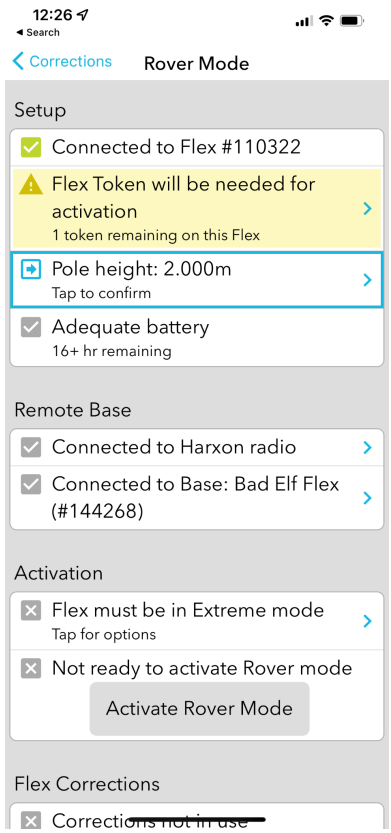
1. Confirmation of bluetooth connection with Flex
2. Activation requirements section
3. Pole height confirmation and editing, tap the arrow on the right to adjust pole height
4. Battery check, displays battery level and external power availability. Rover mode cannot start unless there is XX% power available or externally charging
5. Radio connectivity confirmation
6. Base connectivity confirmation



Flex Token Screen

A Standard Flex operating in Rover mode requires a Flex token to operate as an RTK rover. During the checklist process, you may access the token screen to confirm or add additional tokens.

Note: you do not need to purchase or use a token to operate the checklist. The checklist allows you to confirm all required setup and configuration necessary to operate in Rover mode is correct. When the checklist is complete you may choose to use a token and enter Rover mode.

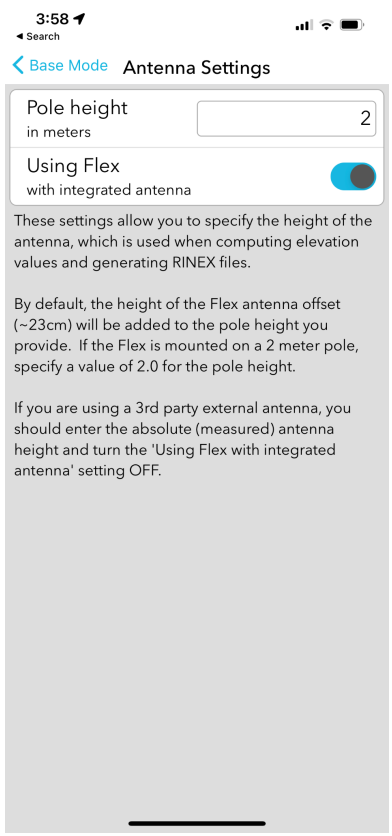


Rover Pole Height Configuration

The pole height is a critical component used as part of the orthometric height for a Rover. Ensure the correct value for your range pole is entered in the pole height field.

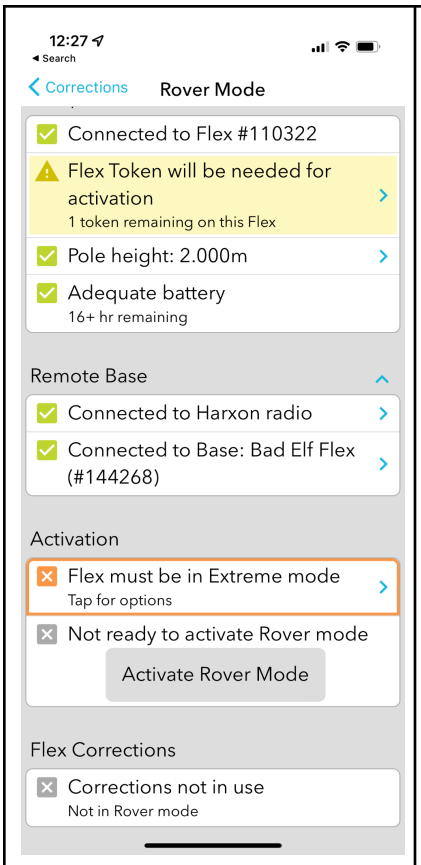
If the pole height is correct, tap the row to move to the next step in the checklist.

To change the pole height value, tap the > icon on the right side of the row.



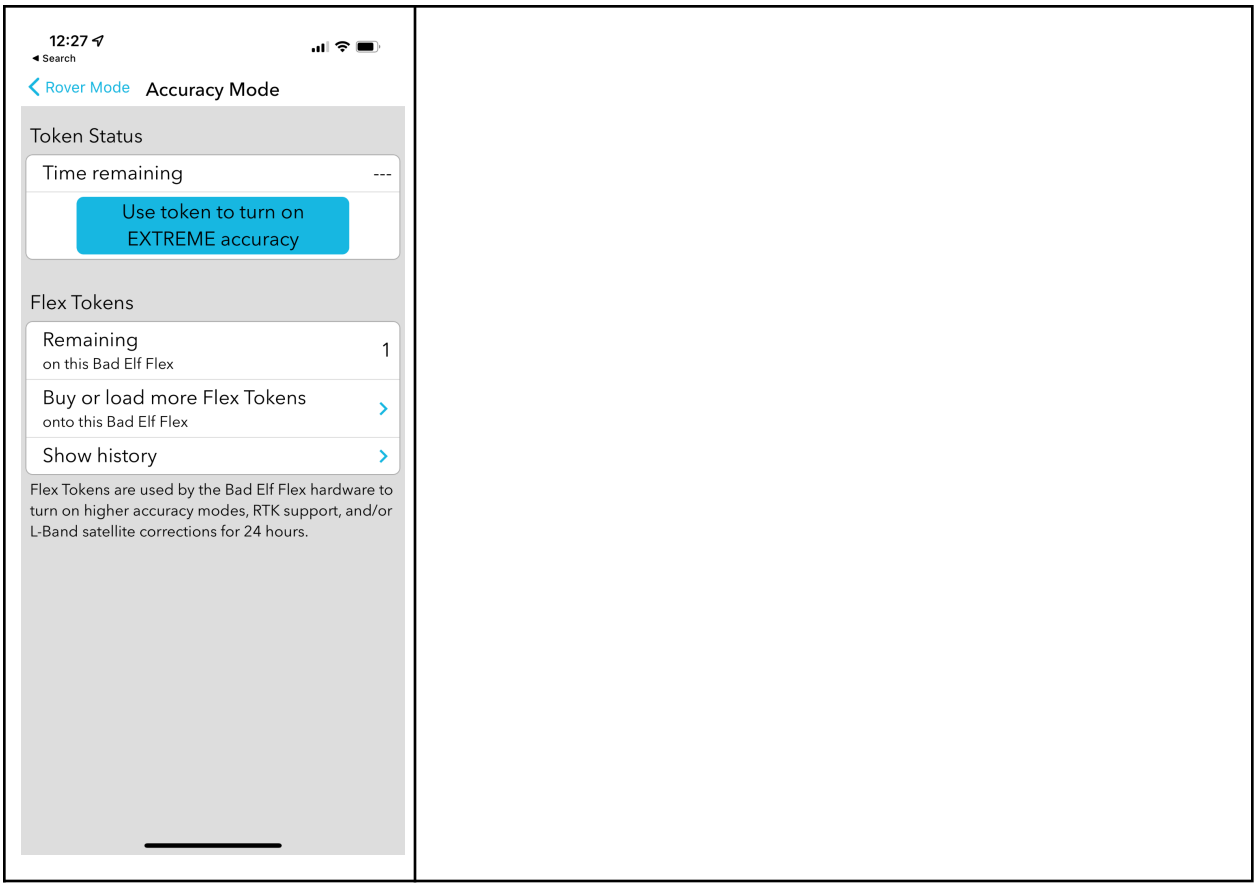
Pole height description

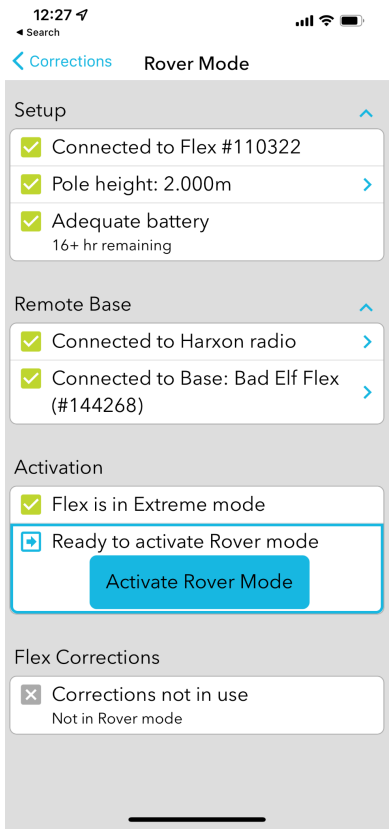
Note, if you are not using a pole, enter a value of 0 in the pole height. Or you may use a value that represents the height of the Flex above ground. For example, if holding the Flex in your hand, you may wish to use a value of 1 meter.



Flex mode confirmation

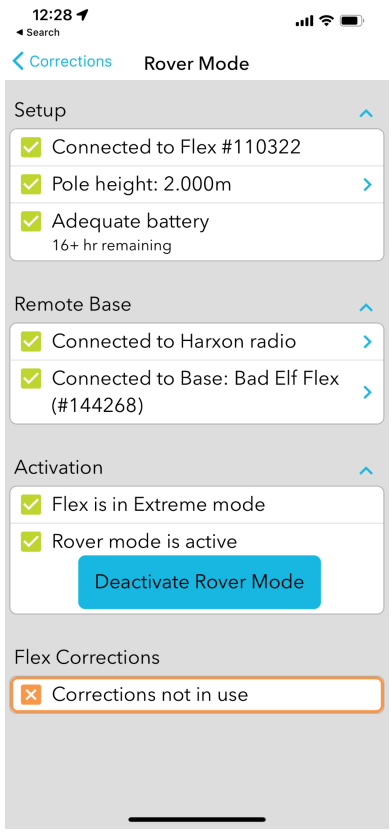
Once the checklist is complete and all items are verified, Flex makes one final check for a token, only if your unit is a Standard Flex. If you want to operate in Rover mode, you must consume a Bad Elf Flex token to continue. Pressing on the “>” takes you to the Flex token screen where you can activate Extreme mode.





Activating Rover Mode

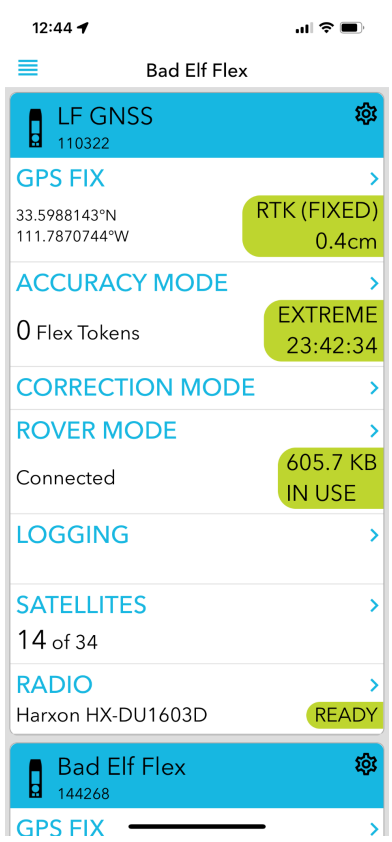
To activate the Rover, click the Activate Rover Mode button. Upon successful activation the status line changes to a green check. If an error occurs upon activation the status line displays the error condition preventing activation.



Deactivating Rover Mode

While active, the indicator at the bottom of the screen displays the number of RTCM packets received and the number of kilobytes of data received during this session

To deactivate the Rover, click the Deactivate RoverMode button. Upon deactivation, the Flex reverts back to standalone GNSS configuration. If a token was used, the remaining time still counts down. You may at any time restart the rover as long as the token is still valid.



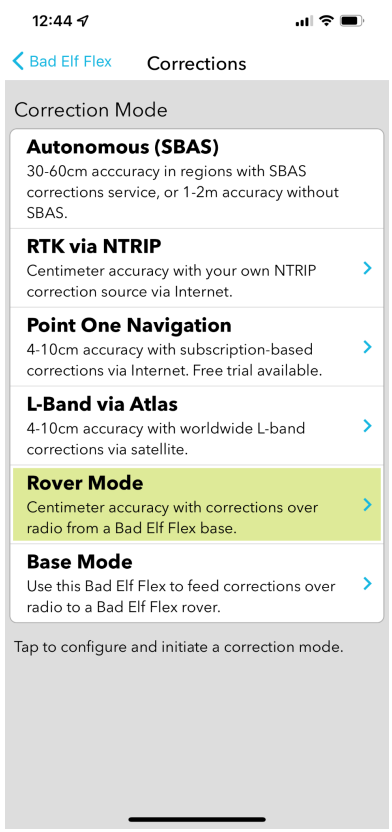
Rover Mode Confirmation

Correction mode - press the “>” on right to confirm the mode of operation is “Rover mode”

Rover Mode - press the “>” on right to view and confirm data flowing from the Base.

Logging - press the “>” on right to use any of the standard logging functions

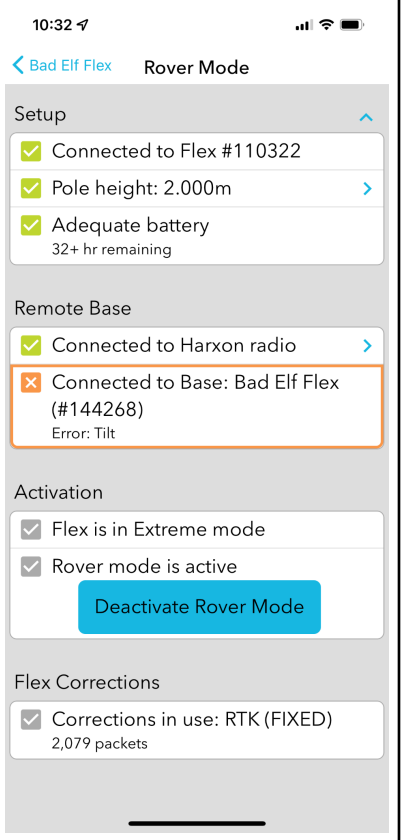
Radio - press the “>” on right to see the status of the connection with your radio



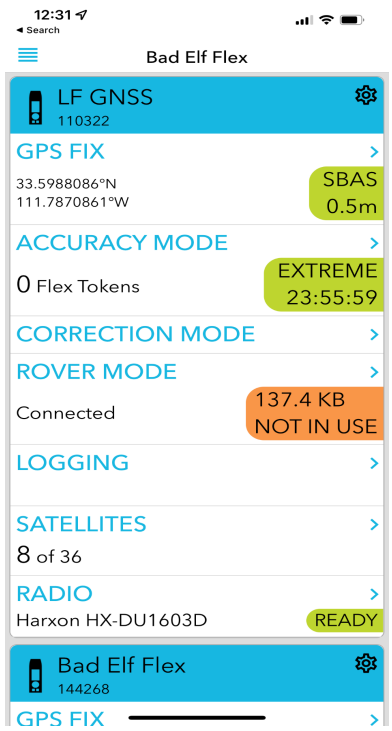
When you select Corrections Mode from the main application menu, the highlighted item indicates the current mode. While operating in Rover Mode, the Rover Mode item is highlighted.

Error Conditions

When using the Bad Elf Flex App, error conditions from the Base or the Rover are reported to the app. If the error is a checklist item, that item is highlighted and may include additional information about the problem.



The example demonstrates a tilt error condition at the Base. Because the base reference point must remain stable, any tilt condition can seriously affect the reliability of all data collected. Before continuing, confirm the Base is mounted in a stable location or has not been tilted or fallen over.

	The example demonstrates a loss of corrections data from the Base. The indication of Not In Use is likely due to the Base Flex not receiving enough satellites to provide corrections. Ensure the Base receiver has a very clear sky portrait and no vehicles or machinery are parked nearby.

Usage & Limitations

Standalone

Third-party Apps

Data Recordings

- Metadata Specification

Base Usage

Prerequisites

For Flex to operate as a base, the following items are required:

- Flex extreme
- Radio kit
- Range pole with bipod or tripod attachment, securely mounted
- FCC license & radio channel programming
- Optional external power

When attaching the radio kit to the base pole, ensure the antenna of the radio antenna does not extend above the base of the antenna cap as shown in the section Rover Usage.

Radio Connection Setup

- TX power level
- Range testing

Configuration

Loading Known Points

Constructing a Known Point File

Loading a Known Point File on Flex

Standalone Configuration

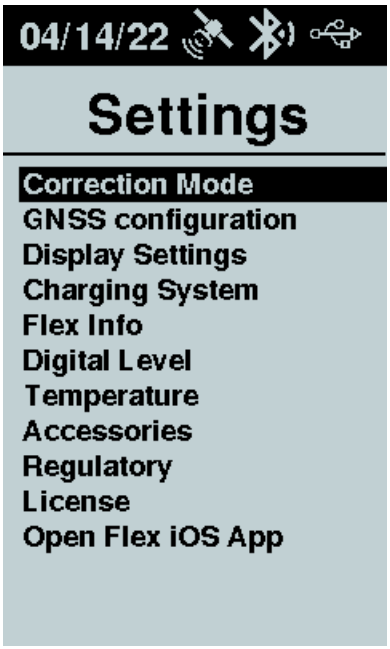
The Bad Elf Flex supports operating in Base mode without the use of a connected app. A standard checklist interface provides for quick startup and configuration of Flex as an RTK Base. Starting the Base feature enables wireless transmission of a high-accuracy corrections feed via a Flex radio.

Note: Many of the Flex UI options are disabled while the Flex is operating in Base mode to ensure maximum stability of the base while in operation.

Navigating the base feature

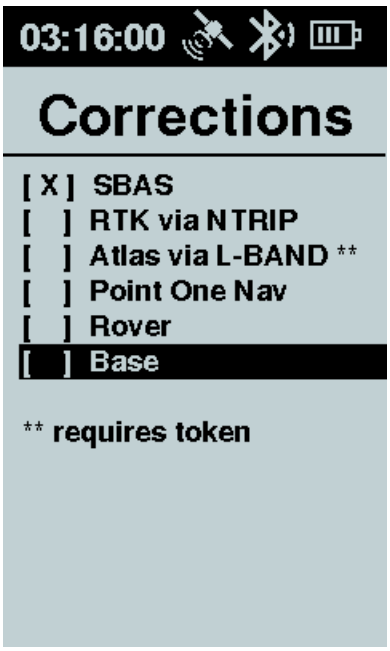
- Left ◀ and right ▶ arrow buttons select the previous or next display screen
- Enter button ● selects items or provides a context menu
- Back button ✕ returns to the previous item

Staring the Base



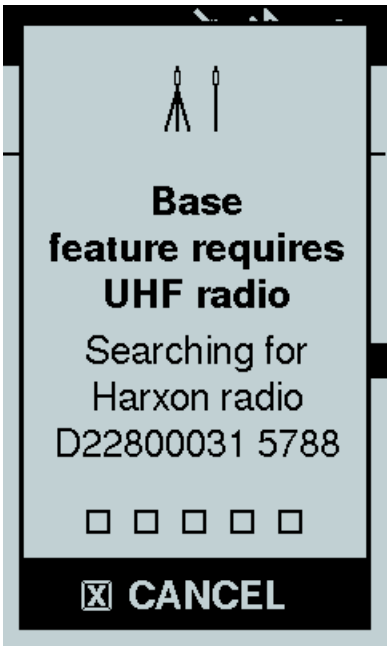
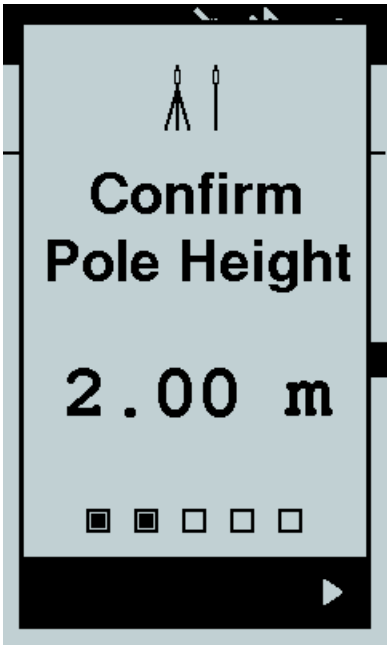
Using the keypad on the Bad Elf Flex, select the settings icon and click the enter button.

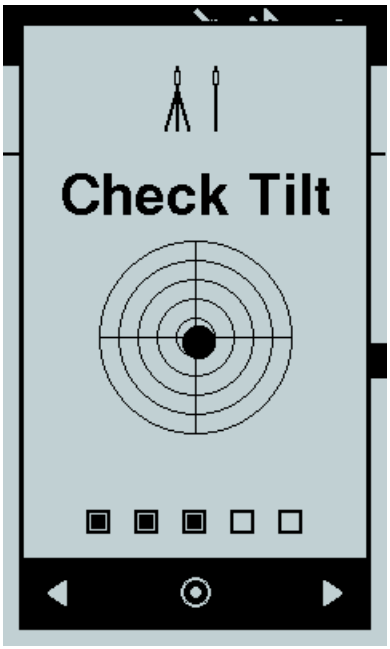
Select Correction Mode using the enter button.



Use the up and down, arrow buttons to scroll to the Base function.

To start the Base checklist, press the enter button.

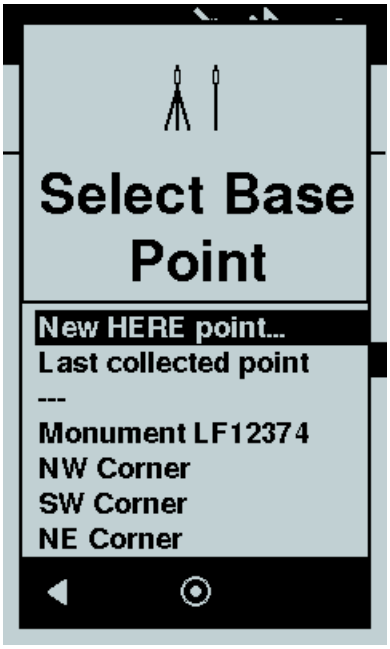
	The Bad Elf Flex automatically attempts to restore the Bluetooth pairing with the last radio it used. The display shows the radio it is searching for and the serial number for reference. This process takes 5-10 seconds and requires the radio to be on. If you want to pair with a different radio or are having any issues pairing with your radio, Cancel by pressing the back button and use the Bluetooth feature from the menu of the Bad Elf Flex to establish a new pairing.
	Once the Bad Elf Flex confirms Bluetooth pairing with a radio, the checklist displays a confirmation of pole height. If your pole height is correct, use the right button to proceed to the next item in the checklist. If your pole height is incorrect, cancel the checklist by pressing the back button and use the Bad Elf Flex app on your phone or tablet to change the default pole height.



Once you have confirmed the pole height, the Bad Elf Flex confirms unit tilt. Ensure your Bad Elf Flex is mounted tightly on the pole and that the pole is level and completely vertical.

If you need to adjust the tilt calibration, pressing the enter button provides a feature to adjust and calibrate the internal bubble level.

If your calibration is correct, use the right button to proceed to the next item in the checklist.



Selecting the Base Reference Point

For the Flex Base to operate properly, a reference point must be established for the transmission of corrections. The reference point must be within ??ft/??m or an error condition occurs and the Base cannot start.

There are three options to establish a Base reference point.

1. Here point - this is a position derived from the current GNSS location and mode of operation
2. Last collected point - this is a position derived from the last collected point through the use of the standalone point collection feature of Flex
3. Known point - a list of known points is provided, if available. Known points are loaded on the Flex using a specially named .CSV point data file stored on a USB removable drive. See the section Loading Known Points for more information.

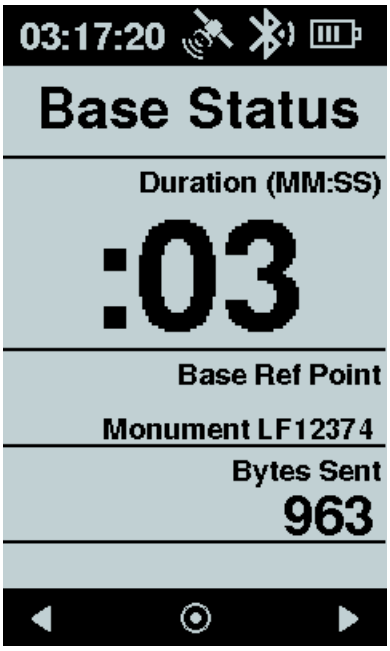
Starting Base Mode

Upon confirmation of the checklist items, the Flex prompts to start the Base. The Base reference point selected is shown on the confirmation dialog.

To start the Base feature, press the enter button.

To exit starting the base feature, press the back button.

Upon confirmation of Base feature startup, Flex completes final internal checks and begins transmitting corrections data over the UHF radio link.

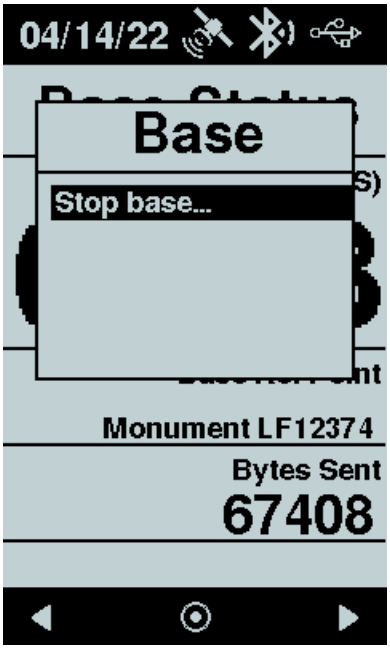


Base Active Screen

When Flex successfully transitions into Base mode, a simplified UI provides key information for the current Base session.

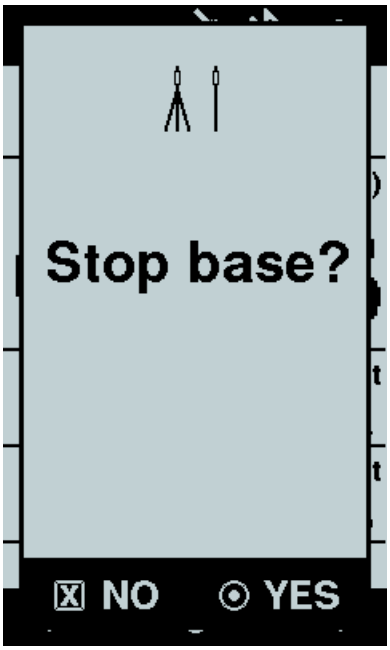
- Duration- the amount of minutes and seconds since activating the Base
- Base Ref Point - the reference point in use as established during the base reference point selection
- Bytes Sent - a counter of corrections bytes sent since startup of this Base session. This field updates every second

Stopping the Base



Actions

- Press the enter button brings up a popup menu with an option to stop the Base.
- Press the enter button to confirm the action



Actions

- Press the enter button to stop the Base.
- Press the back button to return to the Base status page - Base remains active

Error Conditions

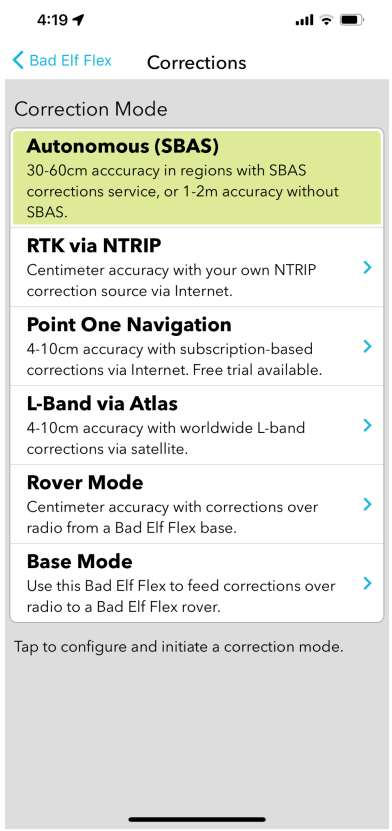
When a Base session is started, a RINEX file recording occurs automatically. This RINEX file may be used to establish an updated reference point in the future or confirm the known point used.

A recording of less than 15 minutes may not contain enough data to reliably post-correct. If you don't plan to use this data it is safe to cancel Base operation by clicking the enter button to stop the Base.

Should you require this additional recording, simply press the back button to return to the Base status page and let more than 15 minutes elapse on the duration since start.

Bad Elf Flex App

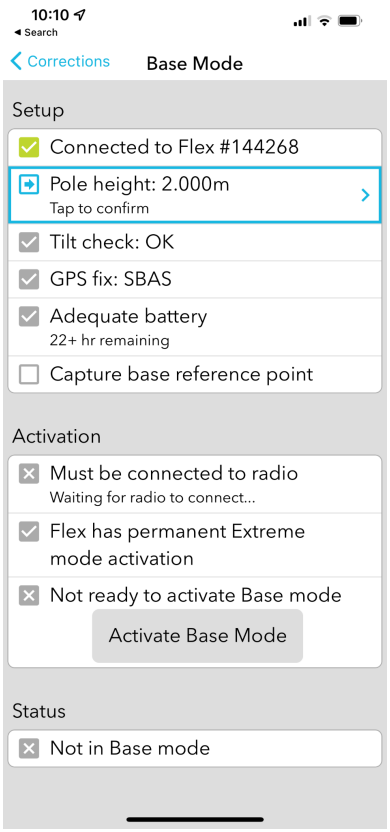
The Flex app provides a UI-rich experience to manage and activate the Base feature of Flex.The Base mode feature is accessed under the unified corrections mode function of the Flex app. To begin a Base session, select the Corrections function of the Flex app.



Starting the Base Mode Checklist

To enable Base mode from the Flex app, follow the steps below:

- From the main menu tap “Correction Mode”
- Tap the “>” on the line labeled “Base Mode”

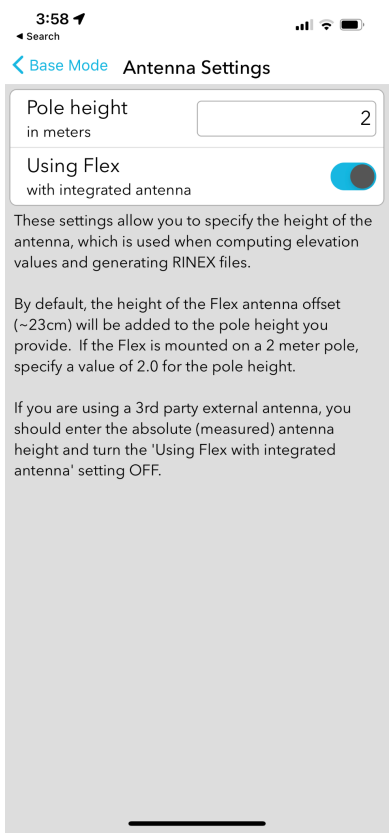


Flex Base Mode Checklist

The Flex app provides a checklist containing all of the prerequisite items and checks required for proper usage. As you confirm each item, a green checkbox is placed to the left of that item. This essential series of items ensures base operation is fully functional, providing quality information, and all operating parameters are correct.

Setup Section

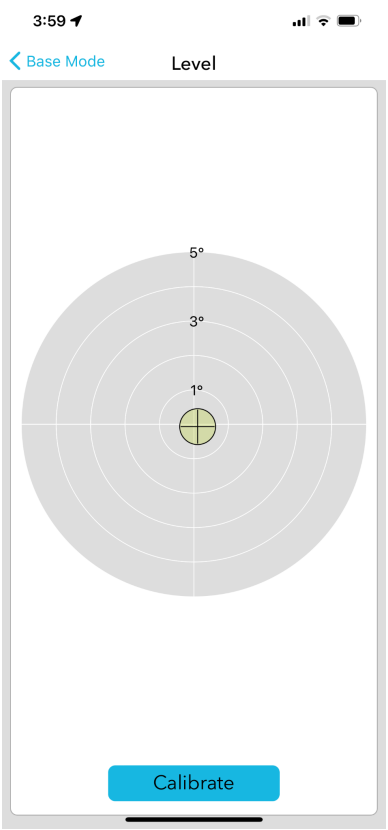
7. Confirmation of bluetooth connection with Flex
8. Pole height confirmation and editing, tap the arrow on the right to adjust pole height
9. Tilt check confirmation, tap the arrow on the right to calibrate bubble level
10. GNSS fix confirmation, displays type of fix and system being used
11. Battery check, displays battery level and external power availability. Base mode cannot start unless there is XX% power available or externally charging
12. Capture base reference point establishes the latitude, longitude, and ellipsoidal altitude the base reports to rovers



Base Pole Height Configuration

The pole height is a critical component used as part of the information transmitted to connected Rovers. Ensure the correct value for your range pole is entered in the pole height field.

Note, if you are not using a pole, enter a value of 0 in the pole height.

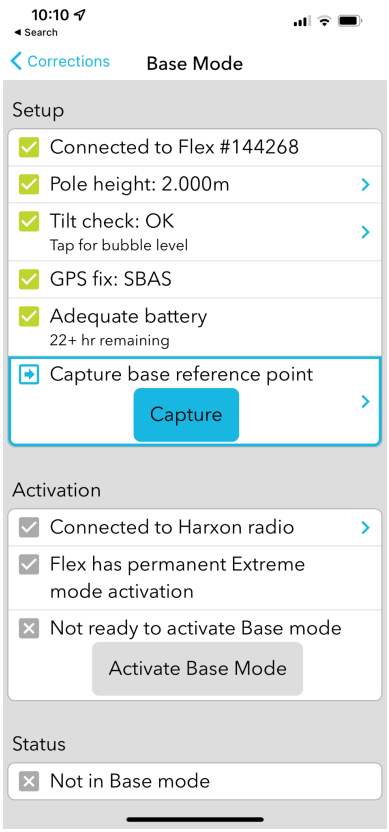


Base Tilt Calibration

Once you have confirmed the pole height, the Flex App asks you to confirm unit tilt. Ensure your Flex is mounted tightly on the pole and that the pole is level and completely vertical.

If you need to adjust the tilt calibration, pressing the calibrate button adjusts internal bubble level.

If your calibration is correct, use the “< Base Mode” link at the top left to proceed to the next item in the checklist.

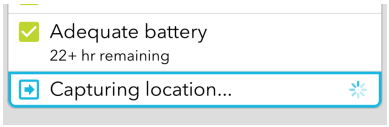


Establishing Base Reference Point

For the Flex Base to operate properly, a reference point must be established for the transmission of corrections. The reference point must be within ??ft/??m or an error condition occurs and the Base cannot start.

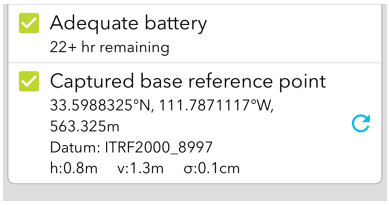
There are three options to establish a Base reference point.

1. Here point - this is a position derived from the current GNSS location and mode of operation
2. Last collected point - this is a position derived from the last collected point through the use of the standalone point collection feature of Flex
3. Known point - a list of known points is provided, if available. Known points are loaded into the Flex app by ????



Base Reference Point - Capture

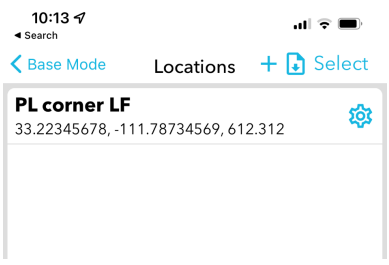
The default method used to establish a base reference point is a “Here” point. Pressing the “Capture” button starts a timed point recording.



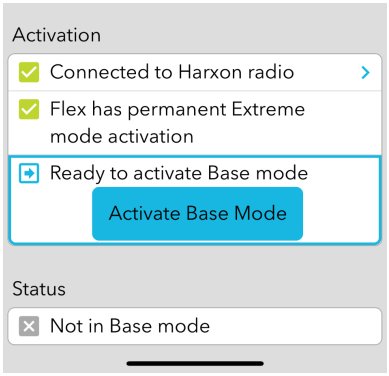
Base Reference Point - Established

Once the Base reference point is established, the coordinates and results are displayed for confirmation.

note : obscure the location

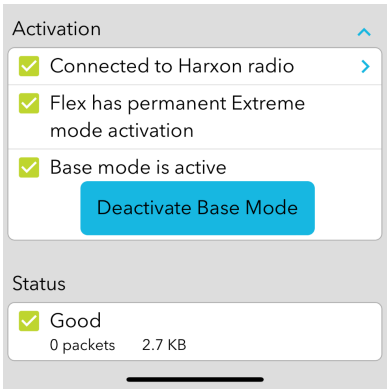


Using a Known Base Reference Point



Activating Base Mode

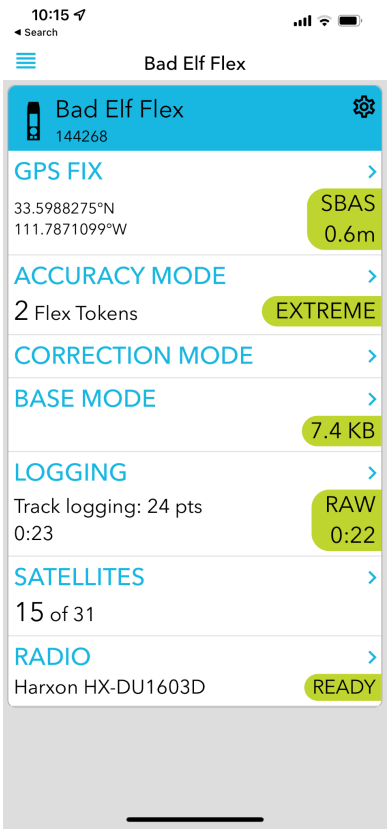
To activate the base, click the Activate Base Mode button. Upon successful activation the status line changes to a green check. If an error occurs upon activation the status line displays the error condition preventing activation.



Deactivating Base Mode

While active, the indicator at the bottom of the screen displays the number of RTCM packets sent and the number of kilobytes of data transmitted during this session

To deactivate the base, click the Deactivate Base Mode button. Upon deactivation, the Flex closes the recorded logging session and notifies connected rovers of a deactivation event.



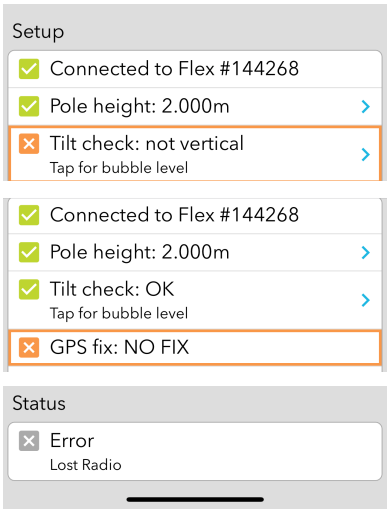
Confirming Base Mode Operation

Correction mode - press the “>” on right to confirm the mode of operation is “Base mode”

Base Mode - press the “>” on right to view and confirm data flowing from the Base.

Logging - press the “>” on right to view the status of the raw recording (RINEX) file

Radio - press the “>” on right to see the status of the connection with your radio



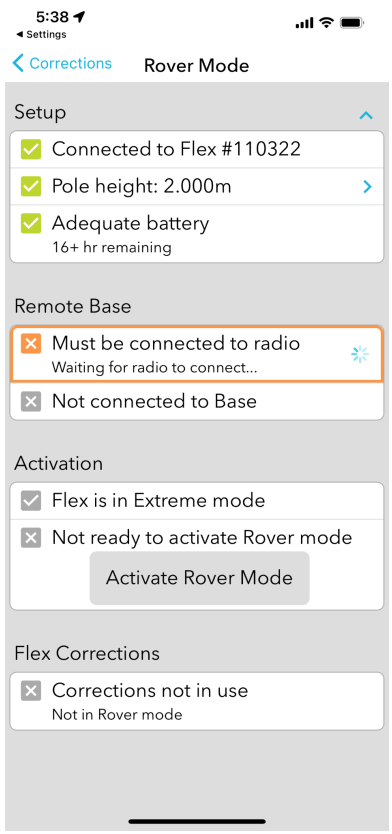
Error Conditions

Errors are either indicated in the checklist section associated with the problem or in the status section.

Should the unit tilt more than X degrees, a tilt error is reported

Loss of GPS fix results in reporting a NO Fix error

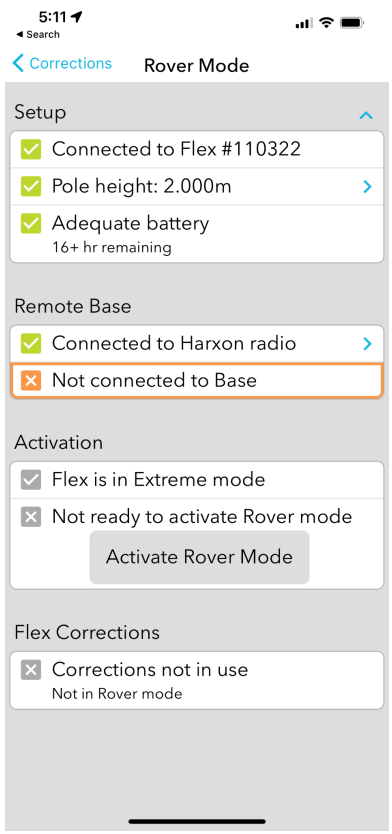
Other status errors such as loss of radio connection appear in the Status section.



Should the Rover discover it is not connected to a radio, an error indicating “Must be connected to radio” is shown.

Possible scenarios under which this may occur include:

- Bluetooth connection lost between Flex and radio
- Radio powered off
- Radio Bluetooth disabled
- Radio out of range with the Flex



Should the Rover not be receiving any corrections, an error indicating “Not connected to Base” is shown.

Possible scenarios under which this may occur include:

1. Base isn’t transmitting corrections
2. Radios are on different channels

Usage & Limitations

- Standalone
- Third-party Apps
- Disabled functionality

Data Recordings

Project Contents

What’s in the zip file?

Metadata Specification

Breakout of metadata contents

Specifications - HX-DU1603D

Communications

Serial	9600bps / 19200bps / 38400bps / 115200bps
Bluetooth	Bluetooth V4.0 (HS)

General Specifications

Frequency Range	410 - 470 MHz
Operating Mode	Half-duplex
Channel Spacing	25 KHz / 12.5 Khz
Modulation Type	GMSK/4FSK
Channels	36 (programmable)
RF Output Power	High Power（2.0W）33.5±0.5dBm@DC 7.26V Low Power (0.5W) 27.5±1.0dBm@DC 7.26V
Radio Protocols	Native format (9600bps, 19200bps),SATEL(9600bps,19200bps) ,Trans EOT (9600bps),TrimTalk450S(9600bps), TrimMark3(19200bps

Battery and Power

Internal Battery	Non-replaceable 7.26V, 6700mAh, 48.642Wh, Lithium ion
Battery Life	8hrs high power mode ?hrs low power mode
External Power	Power supply, 7~9V DC or 12VDC via external battery adapter

Mechanical

Dimensions	147.6L×83W×31.5H mm
Weight	612g
Antenna Interface	TNC Female
Antenna Impedance	50 Ohm
Data Interface	LEMO 5 pin

Environmental

Temperature	Operating: - 0℃~+55℃ (operation below 0℃ reduces operational time) Storage:-20℃~+60℃

Waterproof	IP67

RF Disclosures

Class B Statement – Notice to Users:

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 and Part 90. 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 communication. However, there is no guarantee that interference will not occur in a particular use. 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 the Bad Elf Flex.
- Consult Bad Elf for help.

Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commission rules.

Human exposure to radio frequency energy

Like any other mobile device, the Bad Elf Flex emits radio frequency energy (RF) during use. According to the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the critical effect of RF exposure relevant to human health and safety is heating of exposed tissue.

According to the Federal Communications Commission (FCC), “Some health and safety interest groups have interpreted certain reports to suggest that wireless device use may be linked to cancer and other illnesses, posing potentially greater risks for children than adults. While these assertions have gained increased public attention, currently no scientific evidence establishes a causal link between wireless device use and cancer or other illnesses.”

However, above a certain level (referred to as the threshold) depending on the duration of exposure, RF exposure and the accompanying temperature rise can provoke serious health effects, such as heat stroke and tissue damage (burns). To avoid hazards to health deriving

from high RF exposure, limits are set in relation to the threshold known to show adverse effects, with an additional reduction factor to take care of scientific uncertainties. These limits are generally expressed in terms of the specific absorption rate (SAR). SAR is a measure of the rate of absorption of RF energy in the body. Tests for SAR are conducted with the device transmitting at its highest power level in all tested frequency bands. SAR-limits were first established in 1996 by the FCC in the USA and they were then adopted elsewhere.

You can find additional information about SAR at the following pages:

http://fcc.gov

http://icnirp.org

http://ec.europa.eu

Bad Elf Flex has been tested and certified to not exceed SAR limits in the U.S., Canada, European Union, or Australia.

Limited Warranty Terms and Conditions

Warranty

Bad Elf products will substantially conform to publicly available specifications for the product and that the hardware and any storage media components of the product will be substantially free from defects in materials or workmanship for one year from the date of purchase. Within this period, Bad Elf will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor.

This warranty does not apply to: (i) cosmetic damage, such as scratches, nicks and dents; (ii) consumable parts, such as batteries, unless product damage has occurred due to a defect in materials or workmanship; (iii) damage caused by accident, abuse, misuse, water, flood, fire, or other acts of nature or external causes; (iv) damage caused by service performed by anyone who is not an authorized service provider of Bad Elf; or (v) damage to a product that has been modified or altered without the written permission of Bad Elf. In addition, Bad Elf reserves the right to refuse warranty claims against products or services that are obtained and/or used in contravention of the laws of any country.

Bad Elf makes no warranty as to the accuracy or completeness of third-party applications that use Bad Elf position data.

Repairs have a 90 day warranty. If the unit sent in is still under its original warranty, then the new warranty is 90 days or to the end of the original one year warranty, depending upon which is longer.

Limitations and Remedies

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS, IMPLIED, OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL BAD ELF BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE, OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

Bad Elf retains the exclusive right to repair or replace (with a new or newly-overhauled replacement product) the device or software or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

How to Obtain Warranty Service

To obtain warranty service, contact Bad Elf Product Support for shipping instructions and an RMA tracking number. Securely pack the device and a copy of the original sales receipt, which is required as the proof of purchase for warranty repairs. Write the tracking number clearly on the outside of the package. Send the device to the Bad Elf warranty service station.

Online Auction Purchases: Products purchased through online auctions (that means purchases not made through bad-elf.com, on eBay from bad-elf-llc, on Amazon from Bad Elf, LLC, or an approved reseller) are not eligible for warranty coverage. Online auction confirmations are not accepted for warranty verification. To obtain warranty service, an original or copy of the sales receipt from the original retailer is required. Bad Elf will not replace missing components from any package purchased through any online auction.

Limitation of Liability

BAD ELF'S ENTIRE LIABILITY UNDER ANY PROVISION HEREIN SHALL BE LIMITED TO THE AMOUNT PAID BY YOU FOR THE PRODUCT. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT SHALL BAD ELF OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGE WHATSOEVER UNDER ANY CIRCUMSTANCE OR LEGAL THEORY RELATING IN ANYWAY TO THE PRODUCTS, SOFTWARE AND ACCOMPANYING DOCUMENTATION AND MATERIALS, (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF DATA, OR ANY OTHER PECUNIARY

LOSS), REGARDLESS OF WHETHER BAD ELF HAS BEEN ADVISED OF THE POSSIBILITY OF ANY SUCH LOSS AND REGARDLESS OF THE COURSE OF DEALING WHICH DEVELOPS OR HAS DEVELOPED BETWEEN YOU AND BAD ELF. BECAUSE SOME STATES AND JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

PLEASE NOTE: THE ABOVE BAD ELF LIMITED WARRANTY PROVISIONS WILL NOT APPLY TO PRODUCTS PURCHASED IN THOSE JURISDICTIONS (E.G., MEMBER STATES OF THE EUROPEAN ECONOMIC AREA) IN WHICH PRODUCT WARRANTIES ARE THE RESPONSIBILITY OF THE LOCAL DEALER FROM WHOM THE PRODUCTS ARE ACQUIRED. IN SUCH A CASE, PLEASE CONTACT YOUR BAD ELF DEALER FOR APPLICABLE WARRANTY INFORMATION.

Document Version

This document was published on XXX XX, 2022.

All specifications and usage information are subject to change without notice at Bad Elf, LLC's discretion.

Trademarks

Abbreviations & Terminology

Base	A GNSS receiver placed on a fixed location that provides corrections services to stationary or moving GNSS rovers
Rover	A GNSS receiver that receives corrections from a Base and applies RTK to provide a high-accuracy GNSS solution
RTK	Real Time Kinematics
UHF	Ultra High Frequency
Standard mode	The configuration of a Bad Elf Flex that is operating in single-frequency mode
Extreme mode	The configuration of a Bad Elf Flex that is operating in multiple-frequency mode with RTK services enabled
Extreme unlocked	A Bad Elf Flex that has the services required for Extreme mode permanently enabled