IEC-60268-16 rev. 5

CE

Bedrock BTB115 TalkBox

Operating manual

Document version 3.2

Contact information and support

The Bedrock product line, including the Bedrock BTB115 TalkBox, is designed and manufactured by Bedrock Audio B.V. in the Netherlands.

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Further documents and data files related to the BTB115 TalkBox are released online :

www.bedrock-audio.com/support

NOTE: All screenshots and product pictures shown in this manual correspond to the BTB115 TalkBox with hardware platform 2.2 running firmware version 3.2.0 or higher. If you are using a different device model or a different firmware version, the screenshots may not fully correspond to what is being displayed on your device's screen.

Document version 3.2, release date August 2024. Applies to models: BTB115

Contents

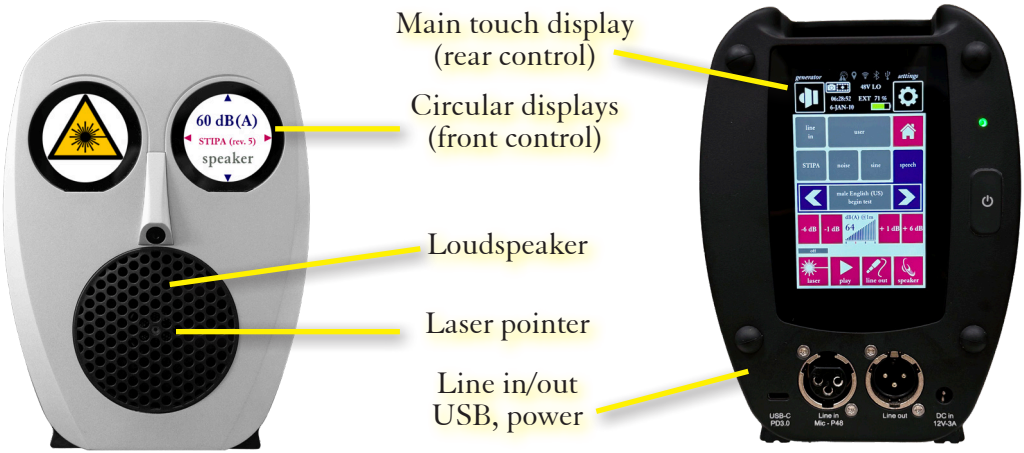
1. Introduction

Congratulations on purchasing your Bedrock BTB115 TalkBox. The BTB115 TalkBox is a versatile and reliable signal source for acoustic measurements, including STIPA and full STI speech intelligibility measurements.

Using the BTB115 Talkbox is quite easy, thanks to its intuitive user interface featuring three touch screens. Most users will get the hang of doing measurements with the TalkBox without spending too much time with this manual. Nonetheless, we strongly recommend that you do read this manual before using your TalkBox for the first time, in order to get acquainted with the various features of the device, as well as the procedures for calibration and maintenance.

If you are upgrading to the BTB115 after previously having owned a BTB65, you will enjoy the following improvements:

- Real-time filtering on the line-in port
- On top of standard test signals, user uploadable signals (via USB)
- Improved touch displays (capacitive touch), on both sides of the device
- Laser distance measurement with an indication of the SPL at the laser dot
- More elaborate options for calibration by end users as well as service centers
- Off-grid operation on an internal rechargeable NiMH battery
- USB-C connectivity
- Wireless control connectivity (Bluetooth/WiFi)
- .... and more



2. General use and safety precautions

2.1. Protecting your device

Your Bedrock BTB115 contains a high-sensitivity wideband loudspeaker that was calibrated at the factory for accurate control over the reproduced sound pressure levels and frequency transfer function. To make sure that the performance of your TalkBox remains undegraded over the years, we recommend taking the following precautions:

- Protect the TalkBox from dropping, shock and vibration. If you use a tripod to mount the device during measurements, we recommend that you use a sturdy model with a sufficiently wide base.
- Do not expose the device or its power supply to rain, moisture or liquids of any kind. Take special care to prevent liquids to permeate into the device through the connectors or along the display bezel.
- Do not operate at ambient temperatures above 35°C/95F.
- Do not use close to flames or open fire.
- Do not use in environments where flammable or explosive materials may also be used.
- Do not keep the device powered on while unattended for prolonged periods of time.
- Use the power supply only with the international adapter suitable for your region.
- During transportation and storage, keep the device in a suitable casing or container – preferably its original case. The device needs to be protected from shocks and vibration (due to transportation or falling), excessive temperatures, liquids and moisture, and any other external conditions that could do damage to the device. Care should be taken that other objects cannot come into direct contact with the display during transportation.

2.2. Protecting yourself and others

Whenever using the Bedrock BTB115, take precautions to keep yourself and others safe. In particular, take note of the following warnings related to electrical hazards, eye safety and hearing protection:

The included power supply comes with adapters for use worldwide, and operates on a wide AC voltage range of 100 – 250V. Do not use the power supply if the casing appears cracked or broken, or if it has been exposed to fluids or moisture. Contact with components inside the power supply while this is plugged in may result in serious injury or death. When using a third-party USB-C power supply, choose one that supports USB Power Delivery 2.0 or higher.

The Bedrock BTB115 features a class II laser to assist in placement of microphones and for distance measurements. Never look directly into the laser, and make sure that others cannot accidentally look directly into the laser either. Do not use around children or animals. Do not disassemble or remove the laser from its enclosure.

The Bedrock BTB115 is capable of producing high sound levels at close range. Do not hold the ear up to the loudspeaker grille, and observe a distance of at least 0.6m (2ft) between your ears and the loudspeaker when operating.

The BTB115 TalkBox contains a NiMH battery pack. If you intend to discard of the BTB115 at the end of its life cycle, either dispose of it responsibly through a certified recycling center, or contact the manufacturer to return the device for safe disposal at no cost to you.

The expected life span of the battery pack is approx. 5 years. Most commonly, battery packs are replaced by a Bedrock service center during regular periodic maintenance and calibration. If you observe the recommended maintenance and calibration interval of 2 years, we recommend replacing the batteries every other service appointment. If you prefer to replace the battery pack yourself, contact the manufacturer for detailed instructions. For safety reasons, the use of battery packs other than the orignal battery packs certified by Bedrock is strictly prohibited. Improper battery replacement voids your warranty.

NOTE: Per IEC-60268-16, a TalkBox has to define its reference plane. For the BTB115, the reference plane is the plane parallel to the front surface of the talkbox, 250mm from the center of the loudspeaker grid.
At the position of the laser dot, when the distance is 250mm (or 0.25mm), the frequency transfer function from electric input (or digital signal) to acoustic signal is flat within +/- 1 dB in the range from 100 Hz to 16 kHz (in 1/3 octaves).

3. How to use the TalkBox

The TalkBox is a calibrated test signal source for acoustic measuring purposes. When using the TalkBox for generating test signals, the following tasks are automatically taken care of:

- Precise generation of acoustic test signals
- Equalization of these test signals
- Calibration of the absolute output level
- Playback through an acoustic and/or electric output

The TalkBox simultaneously plays back test signals via a balanced XLR output jack (on the back of the device) and via its loudspeaker. The acoustic and electric output channels can be independently muted, and the output level is also controlled independently.

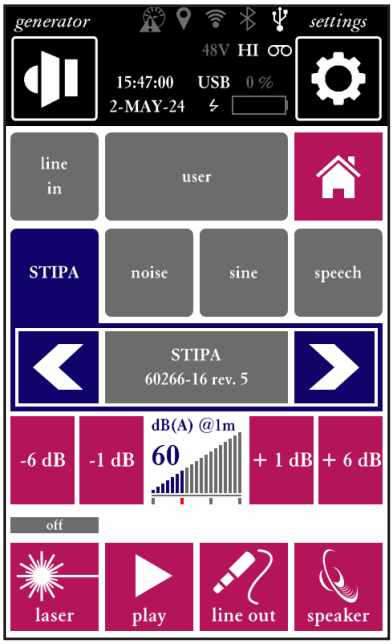
3.1. Menu options at startup

When the on/off button on the back of the TalkBox is pressed, the TalkBox boots up immediately. The Bedrock icon is displayed on the front displays, and an animation appears on the back display. Then the following menu appears:

If you do not make any choices, the TalkBox automatically goes into its the signal generation mode (“start talkbox” after 5 seconds (indicated by a disappearing timing bar).

3.2. Main Talkbox screen

After a short wait (or as soon as you press the big button “press here to start talkbox”) you are brought to the main TalkBox screen. This is where you find all options and controls needed for everyday operation of the device. The other buttons in the menu (needed for calibration and configuration) lead to modules described further on in this manual.



Owners of a Bedrock AM100 analyser will recognise the layout and functions of the top bar (with the loudspeaker and gear cog buttons). The top bar on the BTB115 is similar (albeit slightly different) to the AM100.

The loudspeaker icon provides access to a drop-down menu with basic gain controls for the line input and line output. The gear cog icon produces a similar drop down menu that can be used to enable/disable Bluetooth and WiFi, adjust the display brightness and some other settings.

The “home” button returns the TalkBox to the startup menu. Next to the home button, two buttons are found which are not featured on the BTB65 TalkBox model, which does not have the corresponding features.

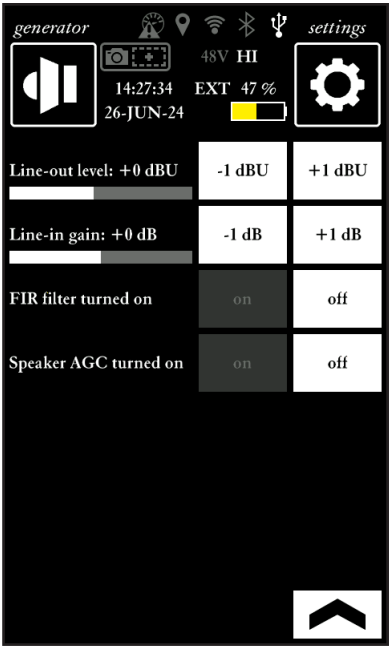
Line in mode

If the “line in” mode is selected, the internal signal generator is disabled, and the signal to be reproduced by the TalkBox is taken from the line in XLR port instead. A high-precision filter filter accurately adjusts the overall frequency transfer of the TalkBox to be flat within +/- 1 dB when measured in 1/3 octave bands from 100 Hz to 16 kHz. This means that the sounds played back will have the exact spectrum (when measured in front of the TalkBox at a distance of 0.25m) of the input signal.

The TalkBox will attempt to play back the input signal with the chosen sound level (by default, 60 dB(A) at 1 meter distance). A slow-acting automatic gain algorithm is used to keep the output level constant, even if the input level drifts slowly over time. Note that not all input signals can be adjusted to the desired output sound level. The chosen signal level will not be achievable when:

- The input signal has very long periods of silence (>3s)
- Shows level and high level fluctuations
- Due to the spectral nature of the signal, would result in overload of the loudspeaker (e.g. very narrow band signals)

Note that the equalisation FIR filter and AGC are activated by default, but may be turned off manually through the left drop down menu in the topbar (loudspeaker icon).



If the equalization FIR filter is turned off, the frequency transfer of the TalkBox will no longer be calibrated, and the spectrum of the output signal will not correspond to the electric input signal. Similarly, if the AGC is turned off, the sound pressure level will not correspond to the level set through the TalkBox signal level controls

There are limits to the level adjustment the AGC circuit can achieve without running the risk of distorting the input signal. If the output signal cannot be achieved, a warning icon will be displayed instead of the intended sound level.

Note that the real-time filter applied to the line in can be recalibrated by the user (see below under "calibration"). This makes it possible to opt for signal playback with a perfectly flat-frequency transfer function at distances different than the default reference plane (which is 0.25m from the front of the speaker grid), or in specific acoustic environments.

If the equalization FIR filter has been calibrated by the user, the reference plane (and reference environment) may no longer correspond to the standard conditions specified in IEC-60268-16 (which is 0.25m, in front of the speaker and at a 0 degree angle compared to the normal of the speaker plane). If standard reference conditions are needed (and when in doubt if currently used calibration settings have been previously adjusted), revert to factory settings in the calibration menu.

User uploaded signals

The BTB115 is capable of playing back user-uploaded test signals. When this option is chosen,

the TalkBox looks for files (uploaded to the TalkBox over USB) in the folder USER. These files need to be 48 kHz 16 bit mono .WAV files; other files cannot be played. On the display of the TalkBox, the corresponding filenames of files found in the USER folder are shown. Signals are played back with the exact spectrum (+/- 1 dB per 1/3 octave band) and the chosen A-weighted SPL.

Depending on the frequency content of the signal, it may not be feasible to achieve the indicated SPL within the physical constraints of the loudspeaker. This is the case for sharply varying or narrow-band signals, such as sine waves. If the indicated SPL cannot be achieved, the level will be adjusted and a warning icon will be displayed.

User uploaded files are subjected to the same signal equalization process (FIR filter) as described above for the line in input.

If the equalization FIR filter is turned off, the frequency transfer of the Talk-Box will no longer be calibrated, and the spectrum of the output signal will not correspond to the digital user defined signals.

If the uploaded .WAV files are stereo files, or sampled at a different sample rate and bit depth then expected (48 kHz, 24 bit), then the signals may be played back incorrectly. If you have signal files that differ in terms of the above specifications, please use any of the various freely available signal auditing tools (such as Audacity) to adjust/resample/convert your signals before uploading. Always test your uploaded signals carefully.

Internal signal generator options: STI, noise, sine and speech

There are four categories of built-in test signals: Speech intelligibility (STIPA), Noise, Sine or Speech. After selecting a category, choose the test signal which you need for your measurements. Consult chapter 4 of this manual for further explanations on the different types of test signals.

A level gauge show the current acoustic output level, defined as the A-weighted sound pressure level at a distance of 1.00m relative to the reference plane (the surface of the loudspeaker grille). In other words, this is the dBA-level measured at 1.00 m straight in front of the TalkBox, when used under anechoic conditions. This level can be adjusted to values between 54 dB(A) and 72 dB(A)

Separate buttons are available for adjusting the level in increments of either 1 dB or 6 dB.

The electric XLR output level can also be adjusted. This is done through the left drop-down menu in the top bar. The XLR output level can be set in 1 dB increments; this level is calibrated in dBU.

At the bottom of the display you will find separate mute buttons for the line out and loudspeaker (with pictograms of a line jack and a loudspeaker). Mute/unmute each of the channels with these buttons. If muted, a grey indicator (“mute”) will appear next to the button.

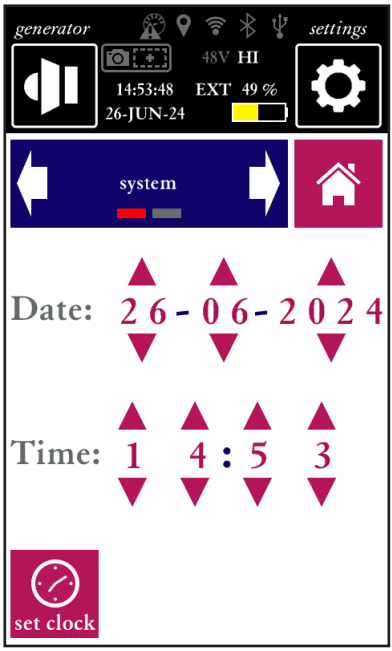
Starting/stopping signal playback and toggling the laser

This leaves only the two buttons unexplained:

- The button marked “laser” toggles the laser pointer on/off. The laser pointer is useful when positioning a microphone in front of the TalkBox, for accurate on-axis alignment as well as measuring the distance to the microphone. We recommend turning it off when it is not needed.
- The start/stop button does precisely what one would expect: it starts and stops test signal playback, simultaneously on both the electric and acoustic output channel.

3.3. Settings

From the main menu of the TalkBox, is separate “settings” module can be started. The settings module provides access to various system settings, such as time and date, power saving and display brightness.



3.4. Status

Similarly, a separate “status” module provides current system information, such as serial numbers, battery and power status, and firmware versions. This information may be used for troubleshooting, eg. upon request by Bedrock staff if you submit support calls.

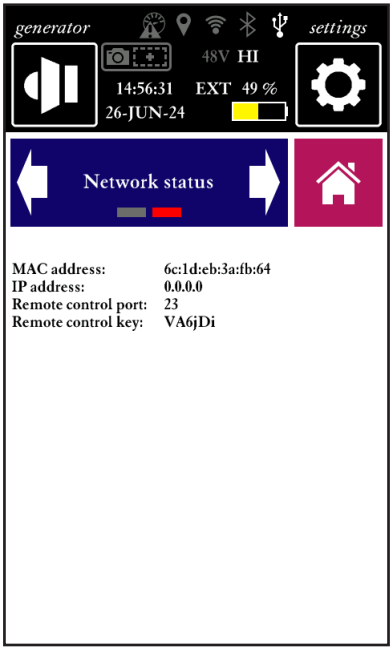
3.5. Network

The Bedrock BTB115 may be controlled remotely via WiFi or Bluetooth. A separate Windows application called Bedrock Studio may be downloaded from the Bedrock Audio website. This application (run on a PC) can be used to connect to any TalkBox within the same network, or with an active Bluetooth connection to the PC.

As an example of a possible application of wireless connectivity, Bedrock Studio can be connected simultaneously to a TalkBox and one or more AM100s. The screens of all devices will be cloned to the PC, allowing control of multiple Bedrock devices from the same computer (anywhere within the network).

The “network” module can be used to scan for available WiFi networks, to select a network and to enter the network password. Once a network has succesfully connected, the “Settings” drop-down menu from the top bar can be used (while operating the talkbox, so also when not in the Network module) to start/stop network connections. This same menu also provides the option to pair/unpair and connect/disconnect Bluetooth.

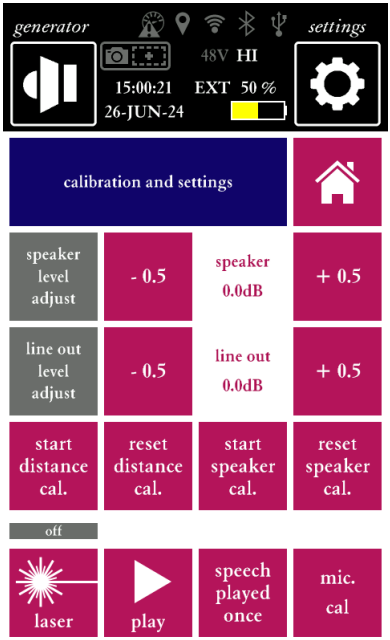
Note that (after connecting to a WiFi network) you will need to know the IP address assigned to the Talkbox and a (randomly assigned) remote control security key.



Please refer to the Bedrock Studio manual for details on using Bedrock studio to operate the BTB115 TalkBox remotely.

3.6. Calibration menu

The calibration menu can be accessed from the main menu (see section 3.1).



The calibration menu can be used for the following purposes:

Adjusting the electric and acoustic input/output level calibration in 0.5 dB increments.

The output levels are accurately calibrated before any TalkBox leaves the factory, and no particular attention to level calibration is normally required from the user. However, should there still be a need for minor adjustments, these can be done here. Note that a test signal playback button is provided within this menu, so that the effect of any calibration adjustments can be observed straightaway while making the adjustments.

If you find that adjustments beyond 0.5-1.5 dB are needed, and especially if the latest service and calibration took place longer than 24 months ago, we recommend contacting a certified Bedrock service center for periodic check-up and recalibration service.

Laser distance calibration.

If you press “start distance cal” the laser distance calibration mode is activated.

Laser distance calibration is done through the front displays. Once the “start” button is pressed in the left eye, a distance will be displayed on the left eye (e.g 0.50 m). **Place an object at precisely the indicated distance and press “Next.”** Repeat this procedure 3-5 times (at 3-5 distances, as indicated in the front displays - simply follow the guidance given there).

If the distance calibration is inconsistent, then a message will be showed on the front displats indicating that calibration has failed. If an incorrect or inaccurate laser calibration has taken place, you can choose “reset distance cal.” to revert to factory calibration settings.

Calibration of the loudspeaker equalization (FIR) filter.

The loudspeaker is calibrated by means of a compensation FIR filter that adjusts the frequency transfer for signals input throught the “line in” and for user uploaded files. This filter ensures a flat frequency transfer (100 Hz - 16 kHz, flat within +/- 1 dB per 1/3 octave band). This FIR filter is determined based on a frequency transfer measurement. This FIR filter is determined under controlled conditions when the TalkBox is initially shipped, but can also be updated/revised by the end user. To do this, press “start speaker cal.”

Once the equalization FIR filter has been calibrated by the user, the reference plane (and reference environment) may no longer correspond to the standard conditions specified in IEC-60268-16 (which is 0.25m, in front of the speaker and at a 0 degree angle compared to the normal of the speaker plane). If standard reference conditions are needed (and when in doubt if currently used calibration settings have been previously adjusted), revert to factory settings by pressing “reset speaker cal.”

In order to carry out the loudspeaker calibration process, you will need a P48 phantom power class 1 measurement microphone, such as the Bedrock BAMT1. Note that this microphone is not included with the BTB115. It can be purchased separately. If you own a Bedrock AM100 or SM90 measuring instrument, you can use the class 1 microphone bundled with your meter.

Before trying to calibrate your loudspeaker, make sure your measurement microphone is calibrated first. See below for the microphone calibration procedure.

Before actually starting the calibration, make sure that you set up your TalkBox and microphone. To recalibrate the loudspeaker FIR filter under reference conditions, the procedure is as follows:

- Take care that your environment is of sufficiently adequate acoustics; while a true anechoic chamber is ideal, in practice a room of more than 16 m2 floor surface and a reverberation time less than 1 s between 125 Hz and 8 kHz suffices. Background noise levels in any band need to be below 40 dBZ in any octave band throughout the calibration. In practice, a quiet office environment with acoustic panels or ceiling baffles/tiles suffices.
- Mount your BTB115 as well as your BAMT1 measurement microphone on a suitable tripod.
- Place the microphone at the reference position: 0.25 from the loudspeaker grid, at 0 degree relative to the normal of the loudspeaker plane (straight in front of the speaker, laser dot hitting the microphone tip).
- If you wish to calibrate for a different reference point (or different conditions), this is possible - and there may be valid reasons to do so (e.g. specific testing needs where the spectrum needs to be controlled at a distance other than 0.25m). If you do so, be aware that your TalkBox will no longer be set up for compliance with IEC-61268-16, and you will need to reset/recalibrate your FIR filter to be compliant again.
- Make sure that there will be no noises or interruptions for 30 seconds
- Press “start speaker cal.”

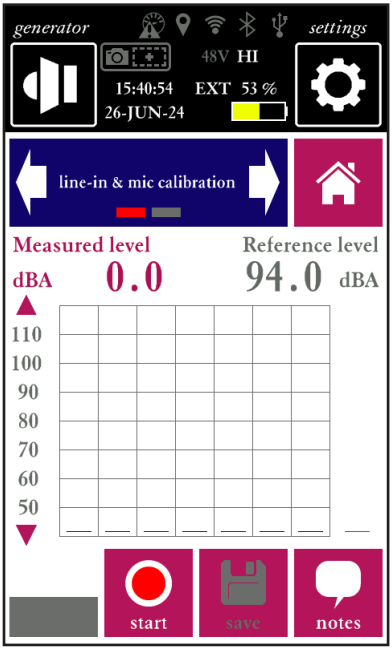
While the speaker calibration is running, you will hear “frozen noise” with a period of approx. 1 second. This signal does not sound like true (natural) noise, and is not purely stochastic. The signal is purposely designed this way; it has a uniform amplitude on a logatithmic scale (pink) with pseudo-random phase. This signal allows for an efficient analysis.

There are two possible outcomes: “calibration success” or “calibration failed.” You will see a corresponding message on the front displays. If the calibration has failed, you can try again - perhaps after eliminating noise sources, or after moving your tripods away from reflective surfaces.

Microphone calibration

If you are using a BAMT1 microphone (or equivalent) to calibrate the loudspeaker transfer function, you will first need to calibrate the sensitivity of your microphone in combination with the BTB115 electric input. For this, you need a field calibrator that presents a known SPL to the BAMT1 (such as the Bedrock BAC1 calibrator.

Connect your microphone (with an XLR cable) to the XLR input of the BTB115. Then press “start.”



Once the calibration completes (after 8 seconds), the calibration factor is displayed. If your calibrator’s reference level (indicated on the calibration certificate of the calibrator) is different from the value displayed, adjust this value. Normally the calibration factor is close to 94 dB.

Press ‘save” to store the calibration factor. Your microphone is now ready for use with your BTB115.

Looping of speech files.

Press the button once to toggle between looped and unlooped (“Speech played once” play back of speech signals. This only applies to speech; all other signals (with the exception of the sweep) always provide continuous playback.

Toggling the laser and playback of a test signal

Buttons are provided to toggle the laser and play a test signal (noise), in case you need to perform these actions while in calibration mode.

3.7 Power supply

The Bedrock BTB115 can be powered in three ways: through the included 12V DC power supply, through a USB-C power supply (not included) or through its internal NiMH battery pack. When powered externally, the internal battery is automatically recharged.

The TalkBox typically operates up to 4-8 hours on its internal battery, and may take up to 6 hours to fully recharge.

3.8. Line-in XLR

The BTB115 has a balanced XLR input that can be user as a line-in (e.g. to receive test signals from external audio sources) or to connect a measurement microphone for calibration purposes.

When the user calibration procedure is initiated on the talkbox, the input XLR will carry 48V phantom power. Equipment not intended to be used with XLR phantom power may be damaged. Disconnect the XLR from external devices (other than P48 microphones) before going into calibration mode.

The sensitivity of the input can be adjusted through the top-left menu (loudspeaker icon) in the top bar.

Note that the TalkBox will attempt to reproduce the signal from the line input at the level set by the user (typically 60 dB(A) at 1 meter). The gain of the internal amplifiers will be adjusted automatically. If the input level is either too high or too low to reach this level, a warning will be displayed.

4. Speech intelligibility measurements

A comprehensive explanation of the STI method and STIPA is beyond the scope of this device manual; there are several online and offline resources that provide guidance and information on doing STI measurements, such as our own white paper on this topic. This manual assumes that the general principles behind Speech Transmission Index testing are known, as well as the basics of designing and executing STI measuring campaigns. This manual explains how to use the TalkBox in this context. First and foremost: note that you will need an STI analyzer (such as the Bedrock AM100 or the Bedrock SM90) for any of the measurements described in this chapter.

4.1 Setting up the TalkBox for STI measurements

In most cases, STI measurements are set up to comply with specific regulations or application standards, such as NFPA-72 Annex D, NEN-2575, DIN-60849/DIN-VDE-0833-4, or BS-5839-8. Consult the applicable standards for guidelines on the exact setup as required.

In general, the setup procedure is as follows:

- **Place the talkbox in the appropriate environment;** most commonly this is at a control panel, lectern or any other position close to a microphone. **Note that the TalkBox replaces the human talker that is normally part of the speech transmission chain.** Place the TalkBox exactly where the talker's head would be. Use a tripod or other mounting materials if neccessary. The TalkBox is fitted with an adapter for standard camera tripods at the bottom.
- **Align the microphone and TalkBox;** make sure that the TalkBox is radiating into the microphone as a human talker would. In some cases, the human talker would *not* talk directly into the microphone, e.g. if the microphone is mounted away from the talker, such as at the corner of a lectern. Make sure that the orientation of the TalkBox matches what a human would do. The laser pointer indicates the reference direction; use this to place microphones on-axis with the TalkBox.
- **Adjust to the right TalkBox-microphone distance.** The distance from the loudspeaker grille (reference) and the laser dot is automatically displayed. The expected level at the laser dot is also displayed.
- **Set the signal level to match the intended vocal effort.** Application standards usually require the sound pressure level to match a certain "nominal" level at 1 meter distance (e.g. 65 dB(A) for NFPA-72, and 60 dB(A) for many other standards. For "relaxed" speech, a setting of 54 dB(A) is common, whereas 66 dB(A) and 72 dB(A) are commonly adopted values when loud speech is expected.
- **Now play the signal.** It is often convenient to keep the signal playing continuously, while working with the STI analyzer to collect data at various measuring locations.

NOTE: IEC-60268-16 recommends a 3 dB adjustment when matching the level of a STI-PA signal to the level of recorded speech. This adjustment is needed to account for the pauses that occur naturally in speech, while the STIPA signal is fully continuous. This correction is already applied by your TalkBox, according to the procedure described in Appendix J of IEC-60268-16 rev. 4. Simply set the TalkBox at the playback level cited in your application standard.

4.2 STIPA measurements

The TalkBox has two variants of the STIPA signal: the STIPA signal according to IEC-60268-16 rev. 4 (2011) and IEC-60268-16 rev. 5 (2020).The difference between the signals is a change in the long-term spectrum of the signal that has been implement in IEC-60268-16 rev. 5 (currently still in draft). The energy in the two lower octaves (125 Hz and 250 Hz) has been reduced, obtaining a better overall agreement with recent literature on human vocal effort.

The question which signal to use depends on the purposes of the measurement; in those cases where rev. 5 of the STI-standard is explicitly required, the rev. 5 STIPA signal must be used. When measuring to requirements and/or standards drafted before 2018, the rev. 4 signal is the most suitable choice. In all other cases, both signals are most likely acceptable. In the majority of practical situations, the difference in measured STI-value is small to negligible.

Note that the TalkBox is compatible with any STIPA analyzer that complies with IEC-60268-16 rev.4 or higher. We recommend a minimum duration of 18s for each individual STIPA test.

4.3. Full STI measurements

The Speech Transmission Index is originally based on a Modulation Transfer Function matrix (MTF) comprising 7 octave bands and 14 modulation frequencies (98 values in total). STIPA is a simplified version, featuring only 2 modulation frequencies per octave band. This has been shown sufficiently accurate for Public Address systems, and most other applications for that matter, but “Full STI” measurements may still be needed to get accurate results in highly complex environments (for example, environments that feature discrete echoes).

The original Full STI method, which has not been available as part of commercially available measuring instruments since the 1990s, dealt with each of the 98 octave-band/modulation-frequency combinations individually. This meant that a single measurement took up to 15 minutes to complete. A novel approach, now implemented in the Bedrock SM50 and SM90, uses a STIPA-like approach to reduce the measurement time to approx. 1 minute.

This novel Full STI approach, as implemented on the BTB65 TalkBox, is similar to STIPA in the sense that it also simultaneously considers two modulation frequencies per octave band. However, each measurement consists of 7 different stages, corresponding to 7 different segments of test signal. A rotation scheme is adopted that applies different modulation frequencies in each band during different phases of the measurement, ending up with a completely filled MTF matrix at the end of the measurement cycle.

The Full STI signal is played back continuously, in the same way as STIPA. The task of synchronizing to the different phases of the signal is performed by the STI analyzer.

Note that the Full STI signal currently works with all Bedrock STI analyzers, but not necessarily with third-party analyzers. Although the Full STI implementation fully complies with IEC-60268-16, the underlying technology is proprietary; vendors of third-party analyzers will need to license the technology before implementing it. Before using the Full STI signal with third-party products, ensure that these are fully compatible and certified by Embedded Acoustics BV.

Also note that the Full STI signal is copyrighted and watermarked. With the purchase of the Bedrock BTB65, a non-transferable perpetual licence is acquired to use the Full STI signal on all projects and for all STI-measuring needs that the TalkBox owner may have, both personally and professionally, also for all those employed by the owner of the TalkBox. However, this license explicitly excludes the rights to sublicense, to distribute, or to embed the signal in third-party equipment.

5. Noise, sine waves and sweeps

5.1 Noise

The BTB65 TalkBox offers two kinds of noise: pink noise and white noise. Pink noise has a flat spectrum on a logarithmic scale (equal energy per octave band), whereas white noise has a flat spectrum on a linear scale (equal energy per FFT bin). Given the logarithmic characteristics of frequency resolution of the human ear, this means that white noise perceptually emphasizes the higher frequencies.

The noise signals can be useful (among many other applications) in the following scenarios:

- Quickly assessing the frequency transfer function of a system. On a real-time analyzer, the pink noise signal will show a flat spectrum (equal in each 1/1 or 1/3 octave band). Any deviation from the flat spectrum reflects frequency-dependent behavior of the transmission channel between the TalkBox and the analyzer
- Measuring the reverberation time (RT60) by means of the interrupted noise method. The TalkBox can be used as a noise source, although especially in larger rooms a secondary high-power loudspeaker will be needed to achieve a sufficiently high sound pressure level. Upon switching of the noise source, the decay curve can be estimated.
- The TalkBox can be used as a source of interfering noise (simulating background noise) in speech intelligibility studies.

5.2 Sine waves

Sine waves (pure tones) are available for each of the ISO-standardized octave frequencies from 125 Hz to 8 kHz. These can be used for measuring pure-tone response, dynamic range and distortion.

5.3 Sweep

Under the “sine” signal tab, the last signal (“sweep”) is a 14 second logarithmic sweep, covering the whole audible frequency rang from 20 Hz to 20 kHz. Note that the TalkBox is not able to produce the lowest and highest frequencies within the sweep’s range, but these will be present in the line out signal. This sweep can be used for measuring the frequency transfer of loudspeakers and rooms, through convolution with the inverse sweep. Third-party software tools need to be used for the convolution process.

6. Speech recordings

The Talkbox currently features six languages: US English, UK English, French, German, Spanish and Dutch. For each language, speech has been recorded for a male as well as a female talker. Translations of the same two messages are available for each talker:

English
"Attention. Within a few moments, a test of the sound system will begin. You may hear test signals being played, such as tones and noise. No action on your part is required. Thank you for understanding."
"Attention. End of sound system test. Thank you for your cooperation"

German
"Achtung: In wenigen Augenblicken wird die Lautsprecheranlage getestet. Dabei hören Sie möglicherweise Testsignale, zum Beispiel Tonsignale und ein Rauschen. Sie müssen dann nichts unternehmen. Vielen Dank für Ihr Verständnis."
"Achtung: Der Test ist beendet. Vielen Dank für Ihre Mitwirkung."

French
« Attention. Le système de sonorisation et d'information sera testé dans quelques instants. Il se peut que vous entendiez des signaux de test, tels que des signaux de tonalité et des bruits légers. Il n'est pas nécessaire d'y prêter attention. Merci de votre compréhension »
« Attention. Fin du test. Merci de votre collaboration. »

Spanish
"Atención. En unos instantes se procederá a probar el sistema de megafonía. Es posible que escuche señales de prueba, como señales de tono y ruidos de fondo. No es necesario tomar ninguna medida. Gracias por su comprensión"
"Atención. Final de la prueba. Gracias por su colaboración."

Dutch
"Attentie. Binnen enkele ogenblikken wordt het omroepsysteem getest. Mogelijk hoort u hierbij testsignalen, zoals toonsignalen en ruis. U hoeft hierop geen actie te ondernemen. Dank u voor uw begrip"
"Attentie. Einde van de test. Dank u voor uw medewerking."

These sentences may be used to announce the beginning and end of test sessions, but also to determine the speech level.

Note that there is an option in the calibration menu to toggle between looped speech playback and one-time only playback of each recording.

7. Calibration and accuracy

The frequency transfer function and sensitivity is measured individually for each TalkBox at the factory. Before the start of the calibration process, a 10-hour “burn in” cycle is carried out to improve the stability of the loudspeaker. Based on these measurements, the signals played back by the TalkBox are amplified and equalized to accurately match the intended level and spectrum.

7.1. Factory re-calibration

Note that excessive shocks and vibration may alter the characteristics of the TalkBox. Always check your TalkBox if you suspect that it has been dropped or manhandled. When in doubt, return to the factory for a check-up and recalibration. We recommend that each TalkBox is checked and factory-calibrated at least once every 24 months.

7.2. Level calibration

The TalkBox is designed and calibrated to accurately match the chosen signal level at 1 meter distance with a deviation of no more than +/- 0.5 dB. Note that this is the level under anechoic conditions; in a real-life environment, reverberation is likely to contribute somewhat to the overall level at 1 meter distance.

The distance is measured relative to the reference plane (through the midpoint of loudspeaker grille, in parallel with the device front panel). Although we follow the convention in specifying the level at 1 meter distance, calibration measurements for the TalkBox actually take place at 0.25m distance, under the assumption of spherical radiation. The default level of 60 dB at 1.00 meter corresponds with 72 dB(A) at 0.25m.

7.3. Spectral factory calibration (built-in signals)

The requirement in terms of the frequency transfer function is that no individual 1/3 octave band in the range from 100 Hz to 16 kHz may deviate more than 1 dB from the target level for that band. This is only achievable through an equalization process that counteracts the natural frequency-dependent characteristics of the loudspeaker. The “inverse filter” to compensate for the loudspeaker transfer differs between individual devices, and has to be measured independently.

The frequency characteristics as well as the characteristics of the inverse filter for each individual TalkBox are printed on the calibration certificate that is supplied with the TalkBox.

7.4. Spectral calibration (line-in and user signals)

The BTB115 is capable of filtering signals received on the line-input in real time, and play these back throught the loudspeaker with an accurately controlled level and spectrum. If you intend to use the TalkBox with the line input, please consider the following:

- The frequency transfer (from input to acoustic signal at 0.25m in front of the loudspeaker grid) is filtered to be flat. However, any influences on the frequency transfer of equipment between your signal source and the input of the TalkBox is not taken into account. This includes intentional influences (e.g. filters, equalisers) and unintentional influences.
- The signal level is adaptively adjusted to correspond approximately with the acoustic level set on the TalkBox (by default 60 dB(A) at 1 meter). This is done by means of an automatic gain control function that needs time to settle (approx. 10 seconds). This has the following implications:
  - Before starting a new measurement, allow the TalkBox 10-20 seconds for the automatic gain control algorithm to settle.
  - Refrain from using signals that feature long periods of silence (>3 seconds) or signals that fluctuate strongly in terms of the signal level.
- A long Finite Impulse Response (FIR) filter is used for spectral equalisation, which introduces a considerable latency (delay) between line input and acoustic output. This makes the TalkBox unsuitable for use with live inputs (microphones), which would result in strong echoes.
- Note that the user calibration procedure will result in a flat frequency transfer from the electronic/digital signal to the position of the microphone during calibration. If the microphone is placed at the usual reference point (0.25m), the result will respond to the factory calibration. If the measurement microphone is placed at another position (or in a specific acoustic environment), the calibration will be flat relative to the position and conditions during the calibration.

8. Cleaning and maintenance

No further maintenance is needed beyond normal superficial cleaning. We recommend that you clean the instrument with a soft cloth. LCD display cleaner can be used to clean the touch screens, provided that the following precautions are taken:

- Do not spray cleaner directly onto the display or into the loudspeaker grille
- Only use cleaning liquids specifically intended for LCD screens

If you believe that your TalkBox needs repairs or maintenance, contact us at: support@bedrock-audio.com. We recommend to have all calibrations, maintenance and repair to be carried out by a Bedrock certified service center.

9. Product warranty

The device is covered by a full-service, worldwide pick-up & return warranty until 24 months after the date of purchase. Please direct all warranty claims to:

Bedrock Audio BV
Patrijsweg 18
2289 EX Rijswijk
THE NETHERLANDS
warranty@bedrock-audio.com

Please email us and wait for our response (typically within a business day) before shipping your hardware back. We may ask you to fill out an RMA form, and we will supply you with a reference number for your warranty claim. If you can provide a complete statement of the problems you are experiencing, this will help us solve your hardware issues as soon as possible. Always provide the ID number of your device (found on the bar code label on the back of the device), your name and address, and your date of purchase. If you did not purchase directly from the Bedrock webshop, also include dated proof of your purchase.

In general, our warranty programme covers all defects except for those resulting from accidents, misuse (including improper electrical connections) and improper maintenance. The following is explicitly excluded from product warranty:

- Any damage resulting from dropping, falling or excess vibration
- Any damage done by liquids, including damage resulting from excessive use of screen cleaning liquids
- Any damage resulting from incorrect electric connections to the device through external connectors
- Any damage done by power surges or overvoltage on the USB connector, power supply and/or audio connectors
- Any mechanical damages to the display caused by mechanical forces applied to the screen surface, such as scratches.
- Normal wear and tear

The following voids warranty:

- Repair attempts by an unauthorized party
- Removal of product stickers, tamper proof seals, bar codes or serial numbers
- Attempts to install firmware from any other source than the manufacturer, or firmware intended for a different device model.

Malfunctions that are found to result from any of the above conditions are not covered by warranty. Repairs will take place only at the expense of the owner. If claimed under warranty, an examination fee may be charged and transportation costs will be charged to the owner.

Please do not attempt to open your Bedrock BTB65 yourself, as there are no user-serviceable parts inside. If you do see a legitimate need to open the device yourself, please contact us at warranty@bedrock-audio.com first, so we can discuss preserving your warranty rights. Please be aware that the product is protected by tamper-proof seals.

A worldwide pick-up&return service is included in the warranty. This means that we will have the defective unit picked up at your location at no charge, provided that it is presented in its original equipment case, packed in a cardboard box with suitable cushioning material.

10. Firmware updates

The firmware can be updated through the USB-C port on the back of the device.

Only install official firmware released by Bedrock and intended specifically for the BTB115. Installing third-party software, or firmware intended for different Bedrock products, may permanently render your device inoperable.

The firmware update procedure is as follow:

- Download the latest BTB115 update package from www.bedrock-audio.com/support
- Connect the BTB115 to your PC or Mac using a USB-C cable.
- The Bedrock BTB115 now presents itself as a mass storage device.
- Copy the update package to the folder names UPDATES.
- Power cycle the BTB115. The update package will now automatically install itself. Note that this may take up to 1 hour. Do not interrupt the power supply while the update is installing.

When connected via USB, the system files of the talkbox are present within the file system of the mass storage device as hidden files. On most operating systems, you will not be able to access these files. However, if your computer is set up to display hidden files, you will be able to manually alter or remove system files, permanently making the talkbox inoperable. This is not covered under warranty. Make sure that your computer cannot access hidden files before you connect your BTB115.

11. Technical specifications

Functionality	Playback of acoustic test signals via balanced XLR line-out and loudspeaker. Supported signals: STIPA, Full STI, sine waves (125 Hz - 8 kHz), log sweep, pink noise, white noise, speech (male/female, 6 languages: US English, UK English, French, German, Spanish, Dutch). Playback of user-defined signals (from uploaded files) Calibrated playback of analog signals from line in.
Standards compliance	IEC 60268-16 rev. 4 and rev. 5
Specs acoustic output	Output range (SPL @ 1 m): 54 dB(A) - 72 dB(A) Adjustable in 1 dB increments Frequency transfer flat within +/- 1 dB from 100 Hz to 16 kHz within 1/3 octave band resolution.
Specs electric output	Output range: -20 dBU to 0 dBU Adjustable in 1 dB increments
Display (back)	Capacitive touch, TFT display 800x480 pixels, 16.7M colors Luminance typ. 400 Cd/m2 Viewing angle 70 deg Typ. lifetime 20,000 h
Displays (front)	Twin capacitive touch TFT displays 240x240 pixels, 262k colors Luminance 300 Cd/m2
Environmental	Temperature: 5 -35°C (41-95F) Relative humidity: 0% - 95% (non-condensing)
Electromagnetic compatibility	Complies with EN 61326-1:2006 - EN 61326-1:2006 FCC part 15 compliant (class A device)
Mechanical specs	Size approx. 180 x 130 x 115 mm Weight 1.7 kg Bottom-mounted tripod adapter Loudspeaker diameter 58 mm
Bundled items	Ruggedized waterproof carrying case, TalkBox, power supply, int. power supply adapters (US, EU, UK, AU), calibration certificate

12. Troubleshooting

Problem	Possible cause	Solution
Audio sounds distorted	Operating on line in	Check input level is within specified range
	Mild intermodulation distortion	This is normal and does not affect STIPA or frequency transfer measurements
	Loose parts/wires Loudspeaker malfunction	Send to factory for check-up
No audio after pressing Play	Output muted	Check status of mute button
Speech playback is not looped (plays only once)	Looping is an optional setting in the calibration menu	Enter the calibration menu when the system boots to toggle between looped/unlooped audio playback
Display is not bright enough	Brightness turned to low	Adjust through calibration menu
	Power saving activated (dimmed display)	Adjust power saving in the settings module