

Anabat Express FS (Full Spectrum Upgrade)

User Manual

Version 1.1



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DOCUMENT HISTORY

Manual Version	Release Date	Firmware Version	Major Additions and Changes
1.0	28/09/2023	2.4.11	An update on the Express user manual
1.1	13/05/2024	3.0.8	SD card recommendations: Toolbox uses sensor log files.

CONTENTS

SUMMARY OF CHANGES TO YOUR DETECTOR	4
GETTING STARTED	5
USER INTERFACE	5
SD CARDS.....	7
USB CABLE.....	7
MICROPHONE	7
POWER REQUIREMENTS.....	8
UPDATING FIRMWARE	9
ANABAT EXPRESS FS BASIC OPERATION	11
RECORDING MODES	12
SETTINGS	13
TRANSECT MODE	13
RECORDING SETTINGS.....	13
DIGITAL ASSET TAG.....	15
DEPLOYMENT.....	15
TESTING THE SYSTEM	15
WEATHERPROOF CONSIDERATIONS.....	15
COLLECTING THE DETECTOR.....	17
DOWNLOADING DATA.....	17
HOW TO DOWNLOAD FROM AN SD CARD	17
FILE NAMES	18
DIAGNOSTIC LOG FILES.....	18
GPS FILES.....	18
SOFTWARE	19
ANABAT INSIGHT.....	19
TOOLBOX within ANABAT INSIGHT.....	19
CHECKING SERIAL NUMBER AND FIRMWARE VERSION	20
POWER AND DATA STORAGE SPACE	22
EQUALIZATION	22
MOUNTING AND PLACEMENT.....	22
TROUBLESHOOTING.....	24
FLASHING INDICATORS	24
FAQS.....	25
FURTHER INFORMATION.....	27

SUMMARY OF CHANGES TO YOUR DETECTOR

Your detector will operate in the same basic way with the following changes (click the links for more information):

- [You can now choose to record in full spectrum or zero crossing.](#)
- [You can set the sample rate and sensitivity on-device](#)
- [ZC files will be recorded in .zc format \(individual sequence files\), not .zca \(an entire night\) like it previously did](#)
- [You can now use SD cards up to 512GB](#)
- [Extended battery life, up to 30 nights in full spectrum, longer in zero crossing](#)
- [Add a digital asset tag to your device](#)
- [No need to convert recordings, open files directly into your analysis software](#)

GETTING STARTED

USER INTERFACE

Inside the Anabat Express FS camouflage case is the control panel and basic instructions on use.



LED Indicators

	Red	Green	Blue	Yellow
Sensitivity LED (new)	Low	Normal	High	Different sensitivity set by PC
Sample Rate LED (new)	ZC recording (.zc)	320ksps full spectrum recording (.wav)	500ksps full spectrum recording (.wav)	Different sample rate set by PC

	— Solid Light	•••• Flashing Light	No Light
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Power LED	Detector is on	. Low battery. Change batteries immediately.	Detector is off or asleep
Schedule LED	Recording on a predetermined schedule	No schedule set	-
Night LED	Will record from dusk until dawn	Satellite fix required	-
Continuous LED	Detector is continuously recording	-	-
Recording LED	Detector is recording	SD Card missing, full or faulty	-
GPS LED	GPS lock acquired	Slow flash: GPS has not yet acquired satellites Fast flash (very briefly): GPS is entering/leaving transect mode	No GPS lock is needed
Microphone LED	-	Should flicker when receiving ultrasonic signal Constant flash: Microphone not detected/faulty	-
Check LED (without magnet)	-	Detector not ready, open case to see what is required. In transect mode: Will flicker when receiving ultrasonic signal.	Detector is off or is working normally
Check LED (with magnet in position)	-	Will flash once to indicate the device is on. Will flicker when receiving ultrasonic signal	Detector is off

Functions

Power Button	Press to turn detector on/off
Settings Button (new)	Long-press to cycle through sensitivity options; double click button to change sample rate/file type
Mode Button	Press to select the desired recording mode, hold down to enter/exit transect mode
SD Card Slot	Insert SD memory card here
USB Port	Insert USB cable here
Battery Compartment	Insert four AA batteries here
Clock Battery	Battery to run the internal clock
Microphone Storage	For storing the microphone when not in use
Dust Cap Storage	For storing the microphone dust cap when not in use
Microphone Socket	Microphone attachment site

SD CARDS

The recorder can use SDHC and SDXC memory cards. Titley Scientific highly recommends Sandisk® Extreme and Sandisk® Ultra SD cards, these cards have been tested with the Express FS and are recommended due to their reliable performance and low power consumption. Using other brands and models may result in reduced battery life or device malfunction and are not recommended. Titley Scientific also does not support the use of microSD cards in adaptors, using these may result in data loss/malfunctions. Memory cards can be purchased from [Titley Scientific](#), or most electronics/office stores.

The amount of storage required for a given deployment time depends on the file type used, sample rate, and the amount of ultrasonic sound activity. You can estimate the amount of data to be collected in a survey using the Battery/Data Estimator in [Toolbox within Anabat Insight](#).

USB CABLE

Your original Anabat Express came with a USB cable for connection to your computer. You can use this cable to configure your detector and upgrade your firmware using [Toolbox in Anabat Insight](#) (see the [Anabat Insight User Manual on our website](#) for instructions).

MICROPHONE

You can use an omnidirectional or directional microphone with your Anabat Express FS:

- The omnidirectional is sensitive from 10 to 150kHz, whilst the directional is sensitive from 10 – 250kHz.
- Weatherproof - rain will not damage these microphones. Please be aware that water collecting on the microphone will block sound until it dries out again. If recording is required during rain the microphone should be mounted in such a way so that water cannot land on the microphone element. For more information, please refer to [WEATHERPROOF CONSIDERATIONS](#).
- Microphone extension cables are available for purchase from [Titley Scientific](#). Cables can be daisy-chained if required.

Please note: Omnidirectional microphones not marked with "V2" or above will consume more power, considerably reducing battery life. We recommend purchasing a new US-O V3 omnidirectional microphone for best performance.

POWER REQUIREMENTS

The Anabat Express FS can be powered internally via 4 x AA batteries. The Power LED will begin to flash when the battery voltage is low. When it drops below a set voltage the detector switches itself off. If the Power LED is flashing you should change the batteries immediately. All AA batteries must be removed from the detector before they are stored for more than a few weeks; otherwise the batteries will slowly discharge and may leak, damaging the detector.

AA batteries can be alkaline, rechargeable, or lithium (1.5V). Make sure all 4 batteries are fresh and of the same type. Open the camouflage case, turn the detector off and insert the batteries into the battery compartment. Do not remove the batteries while the device is on, to avoid potential SD card corruption.

When using rechargeable batteries, we strongly recommend using NiMH batteries specifically advertised as "low self discharge", for example "Eneloop Pro". These batteries are sometimes also advertised as "pre-charged" or "ready to use". The high self discharge rate of standard NiMH batteries will cause them to give shorter run times than expected.

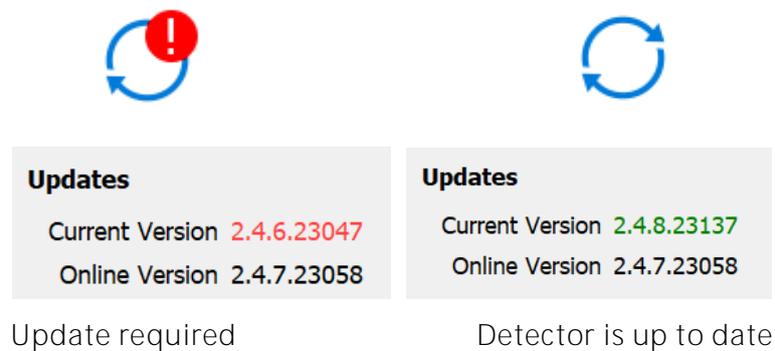
Battery life will depend on the condition and type of batteries being used, as well as ambient temperature, length of your recording session and amount of bat activity/ambient noise. Alkaline AA batteries typically last for up to 30 nights in full spectrum (12 hours recording per night), ZC will be much longer. However in practice recording conditions can vary, so be conservative when using battery life estimates to avoid the loss of sampling time should the batteries run out before you expect. [Toolbox in Anabat Insight](#) allows you to estimate battery life for different conditions.

There is also an internal clock battery which should only need replacing about every 5 years. This is a CR2032 Coin Cell battery and can be purchased from [Titley Scientific](#), or from battery shops.

UPDATING FIRMWARE

It is important to keep the firmware on your Express FS up to date to ensure trouble-free operation. The Express FS firmware can be updated through Toolbox by using an SD card, or via USB cable to your PC.

If your detector is connected via USB cable and your PC is connected to the internet, Toolbox will automatically check for firmware updates. If an update is required, an exclamation point will appear on the update tab (see below).



To update firmware:

1. Download Anabat Insight from [Titley Scientific](#) (free download).
2. Open Anabat Insight, under the Devices menu, select Toolbox.



3. Click on the Updates tab  on the left of Toolbox.

To update via USB cable:

1. Connect the Express FS to the computer via USB cable, then turn on by pressing the Power button.
2. Toolbox will state the current firmware version and the most recent online version. If the firmware needs to be updated, your current version will be displayed in red.

3. To update your detector to the latest firmware, click **Apply to Device**. A progress bar will appear in **Toolbox**, and the LEDs will cycle to indicate the update is occurring. Once complete a message will appear in **Toolbox** stating 'Firmware update complete'.

To update via SD card:

1. Insert a blank SD card into the computer. You can use the same SD card to update multiple Express FS detectors.
2. Click **Apply to SD Card** to save the most recent firmware to the SD card. Once completed, it will state 'Update copied'.
3. Safely eject the SD card from the computer.
4. Insert the SD card and fresh batteries into your Express FS then turn it on. The update will automatically occur. Do not remove the batteries or power off the recorder while the update is being installed. The LEDs will cycle to indicate the update is occurring and the Express FS will restart upon completion. If the LEDs don't cycle then the update file wasn't copied onto the card correctly or the firmware is already up to date.
5. You can now delete the update.adx file from the SD card with your computer, or use the card again to update several Express FS recorders.

ANABAT EXPRESS FS BASIC OPERATION

The Anabat Express FS is designed for fast and easy deployment. Before you start recording with your detector we recommend you check for firmware updates. See the [Anabat Insight User Manual on our website](#) for instructions on updating firmware, setting the clock and time zone.

To begin:

1. Insert fresh batteries and an SD card with sufficient memory for your recording period. Ensure the SD card is correctly orientated per the diagram on the detector when inserting.
2. Remove the microphone socket dust cap from the microphone socket on the front of the case. The microphone socket dust cap can be stored inside the case so it isn't lost.
3. Remove the microphone from inside the camouflage case and connect it to the microphone socket on the front of the case. To connect it, gently insert the microphone into the microphone socket (there is a keyway to ensure correct alignment) and rotate the knurled ring clockwise to tighten the connection finger tight. Do not turn the body of the microphone or over-tighten the connector. Over-tightening or twisting the microphone housing can cause damage and void warranty.
4. Turn the detector on by pressing the Power button.
5. By default your detector will record in full spectrum, with 320ksps sample rate on normal sensitivity. To change this, see [Recording Settings](#).
6. Press the Mode button until your desired recording mode is chosen. There are three recording modes which you can choose from: schedule, night and continuous (see [Recording Modes](#)). For most surveys, the night recording mode is recommended.
7. Wait for the GPS LED to turn on solid. The detector will automatically try to acquire satellites to obtain a GPS fix. While acquiring satellites, the GPS LED will flash. Once a GPS fix is made, the GPS LED will produce a solid light. To assist this process, place/hold the detector where there is a clear sky view, with the microphone facing skywards. The GPS fix will automatically set the clock, record the GPS location and determine the sunset/sunrise times.
8. While the case is still open, rub your fingers in front of the microphone; the Microphone LED will flicker to confirm that an ultrasonic audio signal is detected. If

the LED is steadily flashing consistently, the microphone is not detected by the ExpressFS and will not record.

9. Once no LEDs are flashing, you can lock the lid closed and place the detector in its final deployment location and secure. Use the magnet to check the detector is functional after final deployment (see [DIGITAL ASSET TAG](#)

You can add a digital asset tag to your device which will save asset information in the metadata of all files recorded. This can include company name, device nickname, company contact, company address and asset ID. If you would like to add an asset tag, this can be done using [Toolbox](#) with your detector connected via USB.

Please note: The device nickname is limited to 10 characters.

DEPLOYMENT

10. TESTING THE SYSTEM).
11. The detector will automatically attempt to acquire a GPS fix daily. If a satellite fix cannot be found, the detector will refer to the last GPS fix made. If you are moving your detector to a new location, make sure you turn the detector off and on again at the new location to ensure a correct GPS fix.

RECORDING MODES

SCHEDULE RECORDING MODE

The schedule recording mode can be customised to your preferred recording times, however it must be programmed onto the SD card with a computer prior to use (using [Toolbox in Anabat Insight](#)). See the [Anabat Insight User Manual on our website](#) for instructions on setting up a schedule.

The detector does not require a GPS fix to record in Schedule mode if a deployment location was specified when creating the schedule in Insight or if the specified recording times aren't relative to sunset or sunrise. The detector will still attempt to get a GPS to update its clock if possible.

NIGHT RECORDING MODE

The night mode is designed for speedy & efficient deployment. This recording mode will turn the detector on 30 minutes before sunset and off 30 minutes after sunrise. This mode will continue to record nightly until the batteries run out, the SD card becomes full, or the detector is turned off. Night mode will only work if a GPS fix can be acquired, as the detector automatically calculates the sunset and sunrise times based on the longitude and latitude of the GPS location.

CONTINUOUS RECORDING MODE

The continuous recording mode will record continuously, starting as soon as this mode is selected. This mode will continue to record until the batteries run out, the SD card becomes full, or the detector is turned off. This recording mode is designed to be used when the detector is deployed and collected in the same recording night; it can also be used to monitor acoustic activity in roosts during the day. The detector does not require a GPS fix to record in Continuous mode, however the GPS and time stamps may not be correct if this is the case.

Please note: Do not deploy if any LEDs are flashing, as this means there is an error or problem. See

TROUBLESHOOTING for resolving flashing LEDs. In transect mode, the Check LED will flicker when the detector is recording.

SETTINGS

TRANSECT MODE

Transect mode will record your GPS location every second. This will create a GPS file (.gpx), which will display the path traced by the detector. You can use the transect mode in conjunction with any of the three recording modes (Schedule, Night or Continuous).

To activate the transect mode:

1. Press and hold the Mode button until the GPS LED flashes quickly (should take about 5 seconds).
2. The detector is now in transect mode, when recording in transect mode the Check LED will flicker when receiving ultrasonic signal.
3. To exit transect mode, simply hold the Mode button until the GPS LED flashes quickly again (should take about 5 seconds), or turn the detector off and on again.

Please note: Transect mode will consume batteries more quickly than a standard mode.

RECORDING SETTINGS

The Anabat Express FS is optimized for most detection situations with its default settings. If you would like to change the file type (FS or ZC), sample rate or sensitivity, you can do this on your detector by following the instructions below.

File Type / Sample Rate

1. Double click the Settings Button to toggle between 3 options:
 - Green Sample Rate LED - 320ksps full spectrum recording (.wav)
 - Blue Sample Rate LED - 500ksps full spectrum recording (.wav)
 - Red Sample Rate LED – Zero crossing recording (.zc)

Sensitivity

1. Hold down the Settings Button to cycle between 3 options:
 - Green Sensitivity LED – Normal sensitivity

- Blue Sensitivity LED – High sensitivity
- Red Sensitivity LED – Low sensitivity

If you would like to change other settings, this can be done using [Toolbox](#) with your detector connected via USB. Under the Device Settings tab, you can change the following:

Clock	Set the date and time to match your PC clock.
Time zone	Use the up/down arrows to choose the time zone.
File Type	Choose between .wav (full spectrum) or .zc (zero crossing)
Sample Rate	Available for .wav recording, choose between 192, 320 or 500kps. See the FAQs for more information.
Frequency division	Available for .zc recording, choose between 4, 8 and 16. We recommend 4.
Activation	Choose between Trigger (recommended) and Constant (recording constantly).
Microphone Sensitivity	Select sensitivity on a scale (1 – 20) or 3 pre-set options (Low, Normal and High)
Minimum Trigger Frequency	The minimum frequency that will trigger a recording. Use the up/down arrows to change.
Maximum Trigger Frequency	The maximum frequency that will trigger a recording. Use the up/down arrows to change.
Minimum Event	The minimum duration sound that will trigger a recording. Use the up/down arrows to change.
Minimum Recording Duration	The minimum amount of time recording will continue after a trigger event. Use the up/down arrows to change.
Maximum File Duration	The maximum length (time) of a file. Use the up/down arrows to change.
File Name Prefix	You are able to choose between serial number, spectrum, device nickname, asset ID or no prefix. Use the dropdown menu to choose.
Transect Mode	Transect mode will use the built-in GPS to save your track as a GPX file by logging GPS points once per second. Check the box to turn on.

DIGITAL ASSET TAG

You can add a digital asset tag to your device which will save asset information in the metadata of all files recorded. This can include company name, device nickname, company contact, company address and asset ID. If you would like to add an asset tag, this can be done using [Toolbox](#) with your detector connected via USB.

Please note: The device nickname is limited to 10 characters.

DEPLOYMENT

TESTING THE SYSTEM

To test the operation of the detector before deployment you can open the camouflage case and rub your fingers in front of the microphone; the Microphone LED (inside the case) will flicker to confirm that an ultrasonic audio signal is being detected. To test the operation of the detector while the camouflage case is closed after deployment, place the magnet (at end of lanyard) next to the Check LED (beside microphone, on outside of case); a brief flash indicates unit is working. Hold the magnet next to Check LED and rub fingers near the microphone. The LED flickering faintly confirms that ultrasonic audio signals are being detected.

WEATHERPROOF CONSIDERATIONS

The Anabat Express FS is designed as a weatherproof detector, which means the detector can be left in the field during rain, sunshine and snow without any additional weatherproofing. However if the device is deployed passively, please consider the following advice:

1. The detector is only weatherproof when the camouflage case is closed; do not open the case in the rain. Be careful not to get dirt or other contamination in the rubber seal around case, as this can allow the ingress of water into the detector.
2. Mount the microphone pointing horizontally to prevent water droplets hitting the microphone element. Such water droplets generate large amounts of noise and can block ultrasound signals from reaching the microphone until they dry out. This needs to be considered when you are analysing your data. Sensitivity can be reduced by inclement weather. Do not let heavy rain land directly onto the microphone element. The impact force of the raindrops can permanently damage the sensitive element, reducing its sensitivity.
3. If recording is required during rain the microphone should be mounted in such a way so that water cannot land on the microphone element.
4. Dry off the camouflage case and microphone before opening the detector or removing the microphone. This prevents moisture from entering the detector.

5. The detector should not be partially or fully submerged in water.
6. Desiccant satchels can be added inside the case to prevent condensation, these will need to be periodically replaced or dried in an oven.

Windy, dry conditions can result in electrostatic build-up which may damage the microphone. The movement of wind over an un-grounded object can build-up an electrical charge. Ultimately, the charge will discharge along a metal conductor, such as the metal in the microphone cable. This will result in a spark which could damage the microphone or detector. Also be aware that mounting your microphone or detector on a tall mast may attract lightning. To minimise the chance of electrostatic damage,

1. Isolate the detector from ground, i.e. operate it from internal batteries or make sure the external power supply doesn't have a path to ground.
2. In dry conditions avoid mounting microphones on tall non-conductive masts (inc. fibreglass and nylon), wood or metal masts are preferable.
3. Ground the microphone, either by making sure it is clamped to a properly grounded metal surface directly (metal to metal contact), or by attaching an earth wire to the body of the microphone (e.g. with a hose clamp) and then connect that wire to a grounded surface (e.g. metal mast or ground stake).

Mounting the detector and microphone this way will give electricity from static build-up or lightning an alternative path to ground.

The detector operates in a wide range of temperatures, however the AA batteries you use will have temperature limits; these should be followed. Most alkaline and lithium batteries are recommended for use between -18°C to 55°C; and -20°C to 60°C respectively. Please note that in cold temperatures battery capacity (and therefore detector run time) will be reduced. The capacity of alkaline batteries is significantly reduced in cold conditions and in these circumstances it is recommended to use 1.5V lithium batteries instead. Also be aware that if your detector is left in direct sunlight, especially inside a vehicle, the temperature inside the case may be much higher than ambient temperature.

COLLECTING THE DETECTOR

Best practice is to take the detector inside to a clean, dry place out of the weather. Then dry it off as best as possible if it is wet. If there is a large temperature difference between inside and outside, let it equilibrate to room temperature before opening the case. A cold detector

opened in a warmer place will often result in a film of water condensing over the electronics. Make sure the inside of the case is completely dry before closing the lid.

To turn the detector off, simply open the camouflage case and press the Power button once. Remove the microphone from the microphone socket, do not turn the body of the microphone (twisting the microphone housing can cause damage), and store inside the camouflage case for storage and transport. Replace the microphone dust cap onto the microphone socket whenever the microphone is not attached. Remove the SD card to download the data to your computer. Remove AA batteries for long storage periods. Do not remove the SD card or batteries while the detector is on, otherwise the SD card could be corrupted.

DOWNLOADING DATA

HOW TO DOWNLOAD FROM AN SD CARD

Once you have recorded onto the SD card, you can simply transfer the files from the SD card onto your computer or an external memory source.

1. To begin, remove the SD card from the detector (do not remove while the detector is on).
2. Insert the SD card into your computer (if it has a SD card slot) or into an external SD card reader (available from Titley Scientific).
3. Open the SD card folder in Windows Explorer.
4. Copy/cut the files from the SD card folder into the desired folder/storage device. Make sure to include the log files.

FILE NAMES

Log files are stored as CSV files, with extension of .csv. Files are recorded as either full spectrum, with the extension of .wav, or zero crossing, with extension of .zc. Both of these file types can be opened/viewed directly in [Anabat Insight](#). The full spectrum files can be opened in any software that accepts .wav files.

File names include the date and time of the recording beginning: YEAR-MM-DD_HH-MM-SS.filetype for example 2021-03-15_19-42-07.wav was a full spectrum file recorded on 15th March 2021 at 7:42:07pm.

DIAGNOSTIC LOG FILES

The diagnostic log files contain all the information about the recording sessions on the SD card. Information such as detector settings, battery voltage, GPS locations, files recorded and user interactions can be viewed in these files. Each log file is a .csv which can be opened in Excel.

The recorder will also create sensor files that contain the temperature and battery voltage. Each sensor file is a .csv which can be opened in Excel.

GPS FILES

A GPS file is created if you have used the detector in transect mode. On the SD Card, the GPS data is stored in a .gpx file. This can be opened directly into most mapping software including Google Earth, and displays the path traced by the detector. It can also be converted into a .kml file using [Anabat Insight](#).

SOFTWARE

ANABAT INSIGHT

Anabat Insight is the free software you can use to view and analyse zero crossing and full spectrum recordings from your Titley Scientific detectors. You can open/view .zca, .zc and .wav files in Anabat Insight. The program offers the following features:

- Ability to view recordings in full spectrum and zero crossing
- Metadata management to keep all your calls organised
- Metrics calculations for passes and individual pulses
- GUANO metadata support
- Customizable filters and scans
- Choose between multiple audio modes to listen to calls

- Inbuilt mapping to view tracks and file locations
- Supports open source Auto ID plugins (currently Bat Classify UK)
- Can be used on Windows or Mac

Anabat Insight is available to download for free at the Titley Scientific website (www.titley-scientific.com). We are regularly updating Anabat Insight software to improve its functionality and capabilities, so please ensure that you are using the latest version.

TOOLBOX within ANABAT INSIGHT

Toolbox is available within Anabat Insight and can be used for the following:

- Check the serial number and firmware version of your Anabat Express FS
- Add a digital asset tag to be saved in file metadata
- Set the clock/time zone
- Change the recording settings
- Choose your recording mode
- Set a schedule
- Estimate the battery life

For instructions on how to use Toolbox with your detector, see the [Anabat Insight User Manual on our website](#).

Using Toolbox

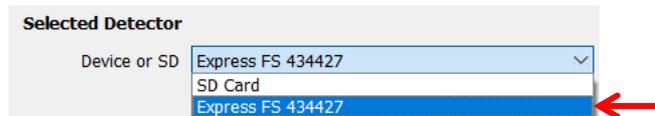
To use Toolbox with your Anabat Express FS, you will either need an SD card, or to connect the detector via USB to your computer. For certain functions (changing some recording settings, checking the device info), you need to connect to the PC.

To connect the Anabat Express FS to a PC:

1. Download and install Anabat Insight from www.titley-scientific.com
2. Turn on your detector and connect the USB cable from the detector to the PC.
3. Open Anabat Insight, under the Devices menu, select Toolbox.



4. Your Anabat Express FS should automatically be detected, it may take several moments to load when you first connect your Anabat Express FS while the drivers are setup.

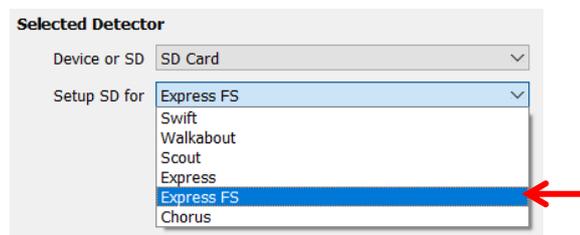


To set up an SD card for Anabat Express FS:

1. Download and install Anabat Insight from www.titley-scientific.com
2. Insert a blank SD card into your computer.
3. Open Anabat Insight, under the Devices menu, select Toolbox.



4. Under Device or SD, select SD card from the dropdown menu.
5. Under Setup SD for, select Express FS from the dropdown menu.



CHECKING SERIAL NUMBER AND FIRMWARE VERSION

The serial number for the detector can be found on the inside of the camouflage case on the right side of the battery compartment, also above the deployment instructions in the case.



You can also check your serial number and firmware version using Toolbox. To check the serial number or firmware version using Toolbox, you'll connect the detector to your computer via USB cable. For further instructions see the [Anabat Insight User Manual on our website](#).

TIPS FOR PASSIVE MONITORING

POWER AND DATA STORAGE SPACE

For short term monitoring sessions the Anabat Express FS can simply be powered by AA batteries. We recommend Alkaline or low self-discharge type Nickel Metal Hydride rechargeable batteries with a capacity of at least 2500mAh. These add very little weight and may last up to 30 nights in full spectrum, depending on the length of your recording sessions, battery type and condition etc. Be conservative in your battery run time estimate because battery capacity is also affected by other factors such as temperature, and they may not last as long as expected in the field. Try the battery life estimator in [Toolbox](#) for a more accurate idea of how long your batteries will last.

EQUALIZATION

In some situations where multiple detectors are deployed, it may be a requirement to ensure all the bat detectors being used are equalized to the same sensitivity. This is important whenever quantitative comparisons of bat activity will be made. Levels of sensitivity will vary among detectors due to differences in age, wear and so on. Bat detectors can be equalized using a 'Chirper' or 'Chirp Board' which emits an ultrasonic signal at a constant frequency.

MOUNTING AND PLACEMENT

The placement of any detector can have a significant effect on the results of a survey. It is important to consider the location and height of the detector. Detectors are typically placed in or beside a 'flyway', a corridor where bats will fly through or beside vegetation. You can place your detector anywhere bats will fly, depending on your survey goals or target species. Avoid placing the detector inside dense vegetation where most bats cannot fly.

You can choose between a weatherproof, omnidirectional or directional microphone. An omnidirectional microphone means that it is able to record ultrasonic sounds from all directions, however sensitivity is limited behind the detector. One advantage of an omnidirectional microphone is that mounting direction is not crucial; however it is more susceptible to any noise from sources all around the microphone. Avoid having vegetation or

other objects between the detector and the bat's expected flight path, or close beside the detector, as echoes can degrade the signal. The best signals will be obtained when the microphone is in the open, away from other objects and pointing in the direction of the bat's expected flight path.

We do recommend that the Anabat Express FS is mounted vertically (refer to the section on weatherproofing) so that any rain water runs off the microphone and doesn't settle on the element. Also make sure that the magnetic lanyard is not being blown around in the wind as this may create unwanted noise on your recordings. It is also important to avoid surface noise, such as vegetation brushing against the detector case or microphone.

The Anabat Express FS camouflage case is designed so that the device can be padlocked closed.

TROUBLESHOOTING

FLASHING INDICATORS

Any LED indicator persistently flashing means there is an error or problem. Do not deploy the detector if there are LEDs flashing. Please see the table below to resolve a flashing LED indicator.

LED Indicator	Problem	Solution
Power	Batteries are too low	Replace AA batteries
Schedule	No schedule set	Need to set the schedule on the SD card with a computer, or select a different recording mode
Continuous	Error	Turn the detector off then on again
Recording	SD Card missing, full or faulty	Make sure a card is inserted. Make sure the card is properly seated in its socket. Try removing it and replacing it. If that does not work, use a different card. The faulty card may be fixed if formatted on a computer.
Microphone	Microphone missing or faulty	Should flicker when receiving ultrasonic signal Constant flash: Microphone not detected/faulty
Night	Satellite fix is required	If this persists for several minutes, move to an area with a clearer view of the sky* for better satellite reception and restart the detector by turning it off, then on again. If no GPS fix can be acquired, use a different recording mode
GPS	Satellite fix is required	
Check (front of case)	If flashing without a magnet, satellite fix is required If flickering when receiving ultrasonic signal, the detector is in Transect Mode	
*You only need to move the detector until a GPS fix is obtained. Once a fix is obtained, you can move the detector to its intended deployment site		

FAQS

Q. How far away can a bat be detected using the Anabat?

A. Detection distances will vary with frequency and loudness (amplitude) of the bat calls, atmospheric attenuation, and the directional characteristics and sensitivity of the bat detector. It will also be affected by the amount of structural clutter (obstacles such as vegetation) which can block the path of the signal.

The frequency and amplitude of the bat call have a major influence on how far away the call can be detected, and makes some species easier to detect from afar than others. Quiet (low amplitude) and high frequency bat calls are more difficult to detect than loud (high amplitude) or low frequency calls. Call amplitude can vary within an individual, as many bats will reduce the amplitude of their calls as they approach prey or depending on the context in which they are flying. Call amplitude can also vary between species. Species which always produce low amplitude calls ('whispering bats') will be more difficult to detect from a distance than other species. In addition, bat calls of higher frequencies cannot usually be detected from as far as those of lower frequencies, as higher frequencies suffer greater absorption by the atmosphere than lower frequencies.

Atmospheric absorption depends upon weather conditions such as temperature, humidity and air pressure. This relationship is complex, but in general, cool dry conditions will allow the detection of bat calls over greater distances.

The sensitivity of the detector also has a major influence on detection distance, and while there is always some variability in sensitivity among units, the biggest influence is the sensitivity setting.

Given all the above, it is obvious that detection distances will vary enormously. Many bats are easily detected over 30m under typical conditions, while some species which call at low frequencies may be detectable from as far as 100m. However, some species will be hard to detect from even 1m away. This is why activity levels measured acoustically cannot easily be compared between different species. However, acoustic indices of activity are generally much less biased than indices based on capture data.

Further information on detection distances and the calculation of detection fields and distances can be obtained from the third-party software [AnaVolumes](#).

Q. Can I use the Anabat Express FS as an active detector?

A. While the Anabat Express FS is designed as a passive detector, it can be used as an active detector for transects using the transect mode.

Q. What is the sample rate?

A. A sample rate is the number of samples per second taken in a recording. You can only record to a frequency approximately half the sample rate (Nyquist frequency). For example, at a sample rate of 500ksps you can record sounds up to 250kHz. So ensure your sample rate is at least double your highest frequency band of interest. Additionally, the higher the sample rate, the better quality and larger the file.

Q. What happens if my detector can't get a GPS fix (eg. in a cave)?

A. If your detector secured a GPS fix when first turned on, then cannot secure a subsequent fix the next day, it will default to the previous GPS location and remain in Night mode. However, if you deploy your detector and it does not get an initial GPS fix, it will record from 7pm to 7am. The detector requires a GPS fix whenever it is first turned on in order to work correctly in Night mode.

This may be an issue if you change the batteries, or restart the detector, inside a cave (for example). To avoid this issue, you can create a schedule with Toolbox that will run from sunset to sunrise (or your preferred times), and then manually specify the latitude and longitude using the "Location override". There is a map to make this easier. Set the end date to after you expect the batteries will run out. Save the schedule on the SD card and then use the Express FS in schedule mode.

Q. Can I buy a directional microphone for the Anabat Express FS?

A. Yes, a directional microphone is available for the Anabat Express FS, speak to your local distributor or check the website for pricing.

FURTHER INFORMATION

For further information please visit the Titley Scientific website: www.titley-scientific.com