ECHOTRACER

INSTRUCTIONS



SPOTTED GHOSTS

Firmware v1.0

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Screen images are reconstructions with illustrative values. These instructions are based on the supplied v1.0 source and have not been hardware-tested.

Get to know the buttons

With the screen facing you, the three front buttons are **A (left)**, **B (centre)** and **C (right)**. Press and release a button once for each action. The symbols along the bottom of the screen show the current button functions. Use the physical buttons to operate these screens. When connected to ParaLink-Mesh, compatible app controls are also available; the blue start and end handles are adjusted in the app only.

Screen or state	A - left	B - centre	C - right
Scan stopped	Open menu	Start a new scan	Change displayed distance range
Scan running	Change display mode	Stop scan and clear readings	Change displayed distance range
Main menu	Move up	Open highlighted item	Move down
App Settings	Save and return to menu	Change highlighted value	Select next setting
Time Settings	Return to menu	Open highlighted item	Switch between Time Zone and BST
Time Zone	Return to Time Settings	Adjust by 30 minutes	Switch between + and -
BST	Return to Time Settings	Save current choice	Toggle Off / On and save
Firmware updater	Back / Cancel	Check again, when no install prompt is shown	Install, when prompted

Turn EchoTracer on and off

EchoTracer has a small red **power button on its left side**. This is separate from the three front buttons A, B and C.

Turn on

1. Press the red side power button once.

2. Wait for the loading and connection checks to finish. The stopped scan screen appears when EchoTracer is ready.

Turn off

1. If a scan is running, press the centre front button **B** to stop it. If you changed App Settings, leave that screen with **A** to save first.

2. Disconnect the USB charging cable if it is attached.

3. Quickly press the red side power button **twice** to switch the device off.

Charge the battery

1. Connect the USB cable to the device's **USB-C port** and a suitable 5 V USB power source.

2. Connecting USB power turns the device on. This is normal: EchoTracer can remain on while the battery charges.

3. If you only want to charge, leave EchoTracer on the stopped scan screen. If scanning is active, press the centre front button **B** to stop it.

4. On the scan screen, a **blue outline around the battery icon** indicates charging. The battery segments provide an approximate charge level.

5. When you want to switch off after charging, unplug the USB cable and quickly press the red side power button twice.

The device normally stays powered on while USB power is connected. Disconnect USB before switching it off. Unplugging the cable alone is not the shutdown step; use the double press afterwards. EchoTracer continues to show its normal interface while charging.

Power-button operation and USB power behaviour: Hardware power reference.

Start your first scan

1. With the device switched off, make sure its supplied microSD card is inserted. Keep the licence file on the card.

2. Press the red side power button once to switch on. Wait for the loading and connection checks to finish. EchoTracer opens on the stopped scan screen.

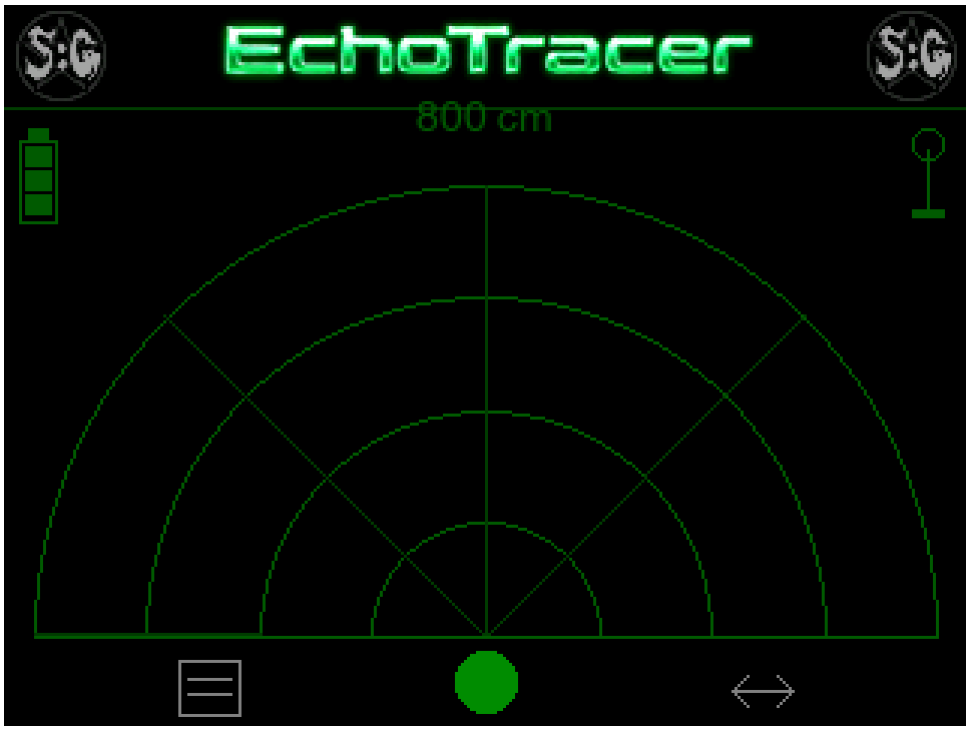
3. Place the device in its intended scanning position. Keep it still while establishing the reference readings.

4. If needed, press **C** to choose the displayed distance range. Read the distance value at the top centre of the screen.

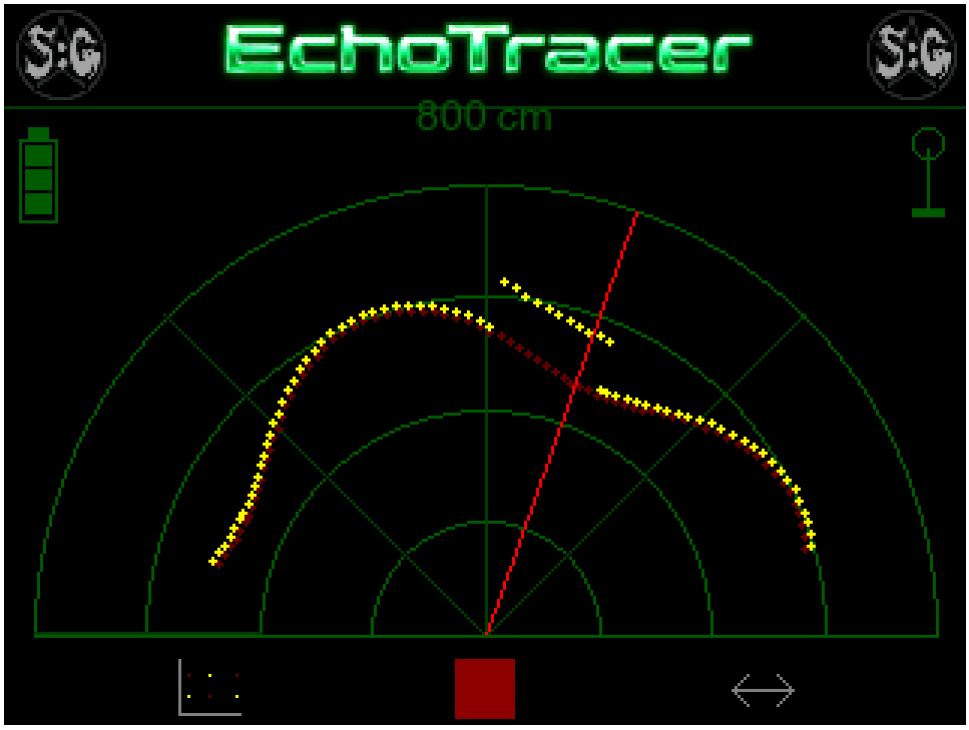
5. Press **B** to start. The centre symbol becomes a red stop square. Allow the first two one-way sweeps to complete while **Calibrating** appears. These establish the reference readings in both directions.

6. Leave the device scanning to compare subsequent readings with that reference.

7. Press **B** to stop. Stopping clears the scan readings; the next start establishes a new reference.



Scan screen before starting. Screen reconstruction; example values.



Example scan in point mode; plotted readings are illustrative. Screen reconstruction; example values.

Read the scan display

• **Dark red points or lines:** the reference distances recorded during calibration.

• **Yellow points or lines:** subsequent distance readings. In blip mode, yellow marks appear only where the change exceeds the tolerance.

• **Bright red sweep line:** the current scan position. In forward-only mode (start and end both at 90°), a repeating red line grows towards a valid detected point, disappears and repeats instead of sweeping.

• **Range at the top centre:** the distance represented by the outer ring. The inner rings divide this into roughly quarter-range steps. Readings beyond the selected range are drawn at the outer edge.

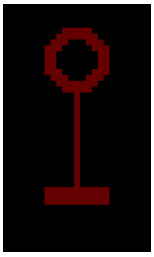
• **Battery icon:** an approximate charge level; a red bottom segment indicates a low reported level. A blue outline indicates charging.

• **Connection icon on the right:** green indicates the device's recorded Wi-Fi connection state; red indicates no recorded connection. A blue ring indicates a ParaLink connection.

A change alert means that a distance reading differs from its reference by more than your selected tolerance. The display does not identify what caused the change. Invalid or missing ultrasonic readings may be omitted.

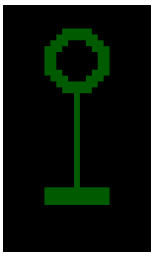
Connection aerial: what each colour means

Look for the small aerial on the right of the scan screen. Match it to the enlarged symbols below.



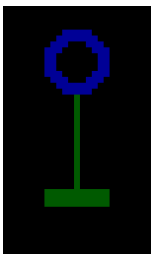
No Wi-Fi connection

A red aerial means EchoTracer has no recorded Wi-Fi connection. Scanning is still available. Check your Wi-Fi settings and restart to reconnect.



Wi-Fi connected

A green aerial means EchoTracer recorded a successful Wi-Fi connection. A green ring alone does not indicate a ParaLink-Mesh connection.



ParaLink-Mesh connected

A blue ring at the top of the green aerial means EchoTracer is connected to ParaLink-Mesh. The stem and base stay green.

These symbols are enlarged from the connection-icon drawing code. The red and green states reflect the connection recorded by EchoTracer; they do not continuously verify internet access.

Change the scan view

While scanning, press **A** to cycle through **Points - Lines - Blips - Points**. Points show individual readings; Lines join neighbouring readings; Blips show changes exceeding the tolerance. Changing view does not start a new calibration.

Press **C** on the scan screen to cycle the displayed range. From the startup value of 800 cm, the sequence is 700, 600, 500, 400, 300, 200, 100, 50, then 800 cm again. This changes the display scale; it does not guarantee that the sensor can measure reliably at every listed distance.

Open the menu

1. If a scan is running, press **B** to stop it.
2. Press **A** to open the menu.
3. Use **A** to move up and **C** to move down. Press **B** to open the highlighted item.
4. Choose **Run EchoTracer** to return to the scan screen. Press **B** there to start scanning.



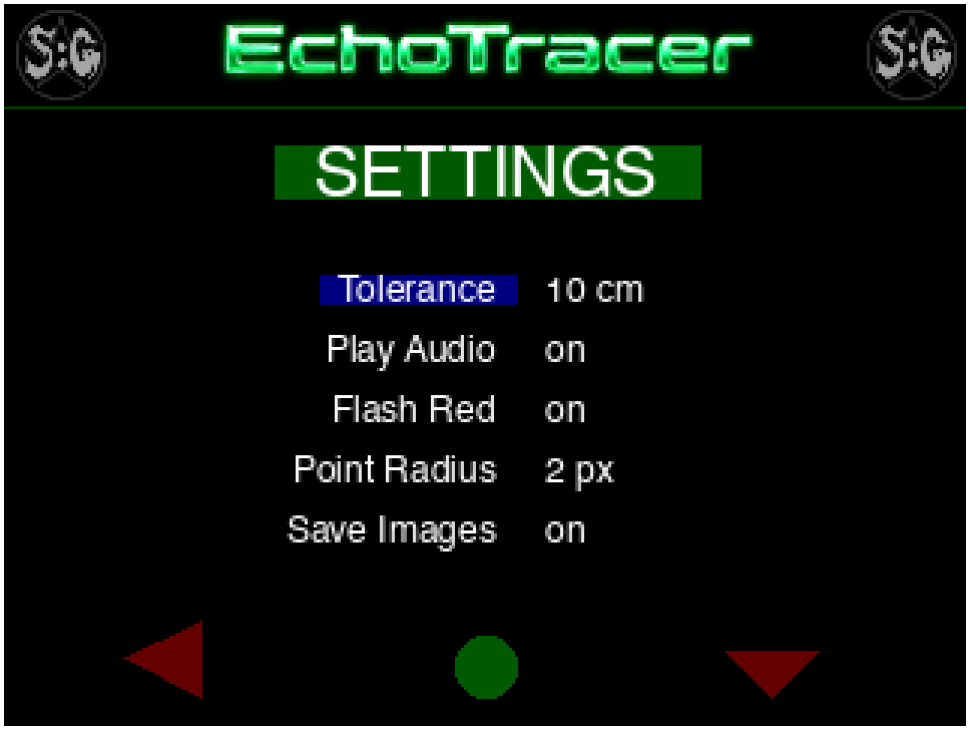
Main menu with Run EchoTracer selected. Screen reconstruction; example values.

Adjust alerts and image saving

1. Open the menu and select **App Settings**.
2. Press **C** until the setting you want is highlighted. The selection cycles back to the first setting after Save Images.

3. Press **B** to change its value. Repeat as needed.

4. Press **A** to save your choices to the card and return to the menu.



App Settings with illustrative values, not factory defaults. Screen reconstruction; example values.

Setting	Choices	What it does
Tolerance	0-30 cm, in 1 cm steps	A change must exceed this amount to trigger an alert. A larger value ignores smaller changes. After 30, the value cycles to 0.
Play Audio	off / on	Enables a short tone when a qualifying change is detected.
Flash Red	off / on	Makes the outer ring and baseline turn dark red briefly during a change alert. Works independently of audible sound.
Point Radius	1 / 2 / 3 px	Changes point size in point mode. The value cycles back to 1 after 3.
Save Images	off / on	Saves a scan image at the end of a one-way sweep if a qualifying change occurred during that sweep.

Find saved scan images

Enable **Save Images** before scanning. Images are saved automatically for sweeps containing a detected change; this is not continuous video or a manual screenshot button. Date/time naming works after either phone or internet synchronisation. Check the clock before starting if accurate timestamps are important; existing files are not renamed when the clock later synchronises.

1. Stop scanning and switch the device off before removing the microSD card.

2. Insert the card into a computer or card reader.

3. If the clock was synchronised, look in `DateTimeFiles/YYYY-MM-DD/`. Files are named like `image_HH-MM-SS_0.bmp`, with a sequence number to distinguish captures.

4. If time was unavailable, look in `NumberedFiles/` for files such as `image_1.bmp`.

5. Copy the BMP images to your computer. Return the card to the device before switching it on again.

Set the local time

EchoTracer can obtain the date and time from **ParaLink-Mesh on your phone** or, when used on its own with internet access, from an internet time server (NTP). The clock supplies the dates and times used for new saved image folders and filenames.

Automatic time from ParaLink-Mesh

Whenever EchoTracer connects to a compatible ParaLink-Mesh app, it synchronises to the phone's date and time, even if it already obtained internet time during startup. This happens after startup loading, once the app connection is established. **The phone takes priority.**

Phone time includes the phone's local time zone and daylight-saving adjustment. EchoTracer's saved **Time Zone** and **BST** settings are ignored after phone synchronisation, so no extra hours are added. Check that the phone itself shows the correct date, time and time zone.

No internet connection or mobile data is needed for phone time: the phone and EchoTracer only need to be connected through the same local Wi-Fi network or a working phone hotspot. Once synchronised, EchoTracer can save date/time-named images on a router with no internet access.

The clock continues running if the app disconnects. Each new app connection synchronises it again. After a restart, EchoTracer needs to obtain time again from the app or an internet time server. Background internet time updates stop after phone synchronisation for that powered-on session.

Standalone internet time and local settings

When EchoTracer starts without a compatible app connection, it tries internet time during loading. Allow up to 15 seconds for this check; startup continues if time is unavailable. With internet time, the saved Time Zone and manual BST settings determine the local clock and new image timestamps. These settings do not manually set the date and time. They remain saved for standalone use, even when phone time is active.

1. Open **Menu - Time Settings**.

2. Press **C** to highlight **Time Zone**, then press **B**.

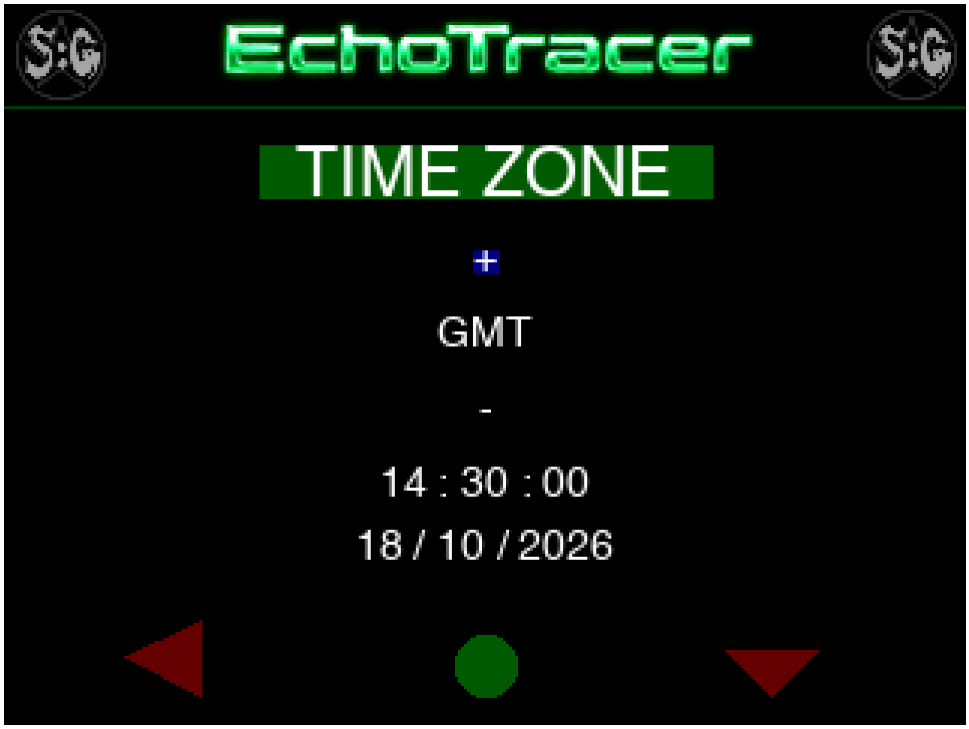
3. The + option is selected when you enter. Press **B** to increase the offset by 30 minutes. To decrease it, press **C** to select -, then press **B**.

4. Repeat until the required offset is displayed. Offsets range from GMT -12:00 to GMT +14:00 and wrap around at either end. Changes save immediately.

5. Press **A** to return to Time Settings.



Time Settings menu. Screen reconstruction; example values.



Time Zone with + selected and an example clock. Screen reconstruction; example values.

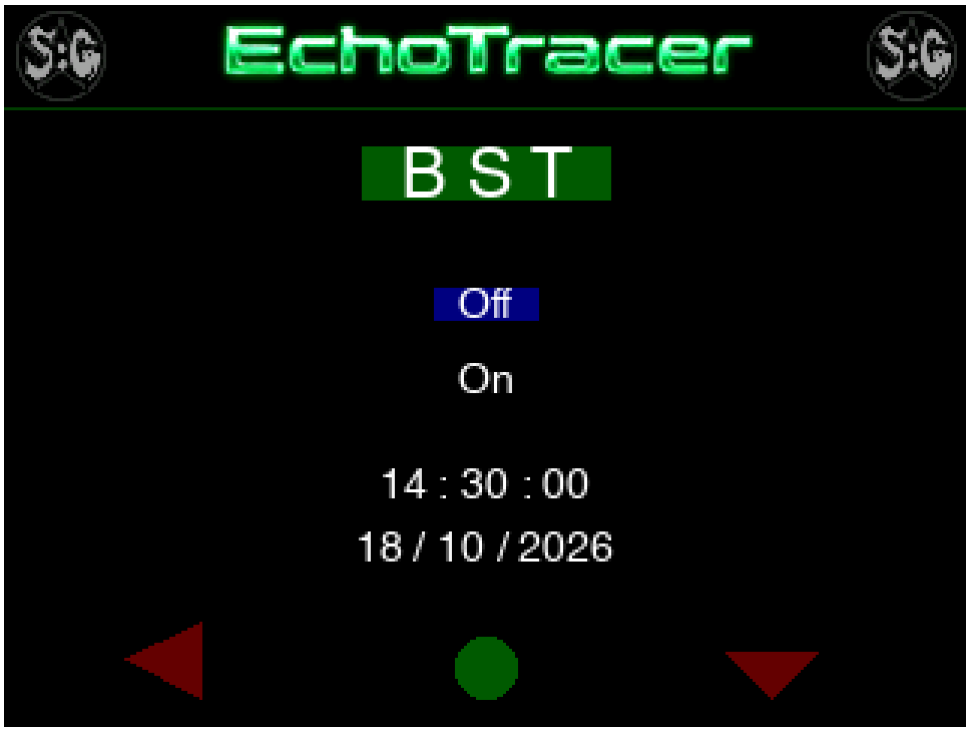
Switch BST on or off

1. In **Time Settings**, press **C** to highlight **BST**, then press **B**.

2. Press **C** to toggle between **Off** and **On**. Each change saves immediately. On adds one hour to your Time Zone setting.

3. Press **A** to return.

For **standalone internet time**, BST is a manual setting; it does not change automatically with the seasons. For UK time, use GMT with BST Off in winter and GMT with BST On during British Summer Time. After phone synchronisation, the phone's local time is used instead and these settings have no effect on the active clock. If the screen says **Time not synced**, connect to the updated ParaLink-Mesh app or provide internet access and allow the clock to synchronise.



BST screen with Off selected. Screen reconstruction; example values.

Connect to Wi-Fi

Scanning can run without an internet connection. Wi-Fi is used for clock synchronisation, firmware checks and the ParaLink connection. You can connect to a home Wi-Fi network or a phone's Wi-Fi hotspot. Network details are supplied through a file on the card.

1. Switch the device off and open its microSD card on a computer.

2. Open `wifisettings.txt` in the root of the card using a plain-text editor. If it is absent, create it with that exact filename.

3. Set the following two lines to your network name and password, keeping the spelling and capitalisation of the field names shown below. Preserve any other existing settings in the file.

4. Save the file, eject the card, return it to the device and switch on. Connection is attempted during startup.

```
WIFIName=YourNetworkName
WIFIPassword=YourNetworkPassword
```

Connect through a phone hotspot

A phone hotspot lets you connect EchoTracer when there is no home Wi-Fi available, for example while away from home.

1. Enable the Wi-Fi hotspot or Personal Hotspot in your phone's settings. Make a note of the hotspot network name and password.

2. Use a **2.4 GHz** hotspot. If your phone offers a Wi-Fi band or compatibility option, choose 2.4 GHz or enable its compatibility mode.

3. With EchoTracer switched off and USB disconnected, open its microSD card on a computer. In `wifisettings.txt`, set `WIFIName` to the hotspot's network name and `WIFIPassword` to its password. These replace the previously saved network details.

4. Save the file, eject the card and return it to EchoTracer. Keep the hotspot enabled, then switch EchoTracer on.

5. Look for the green aerial on the scan screen. Phone clock synchronisation through ParaLink-Mesh works without internet access. Standalone internet time and firmware downloads need a working internet connection; enable mobile data if you want those features through a cellular hotspot.

Keep the phone nearby and its hotspot switched on while using the connection. Firmware downloads may use your mobile data allowance. To return to a different Wi-Fi network later, update the same two lines on the card and restart EchoTracer.

Connect to ParaLink-Mesh



Click picture to visit the ParaLink-Mesh webpage

Find out more about ParaLink-Mesh, including how to get started.

With a compatible ParaLink-Mesh app or server running on the same local network, EchoTracer attempts to discover and connect to it automatically. A blue ring in the connection icon indicates an app connection. The app provides phone date/time synchronisation and, with compatible firmware, adjustable start/end scan positions. Both work over the local network without internet access. Use the ParaLink-Mesh page linked above for app setup and supported features. If you are using the phone as a hotspot, keep that hotspot enabled while using ParaLink-Mesh.

Set the start and end scan positions

With compatible EchoTracer firmware and ParaLink-Mesh app versions, you can limit the physical scan sweep using two **blue lines and small circular handles** in the app's EchoTracer view. Matching blue lines appear on the connected device. The handles are controlled from the app, not from the device's physical buttons.

1. Connect EchoTracer to ParaLink-Mesh and open its scan view in the app.

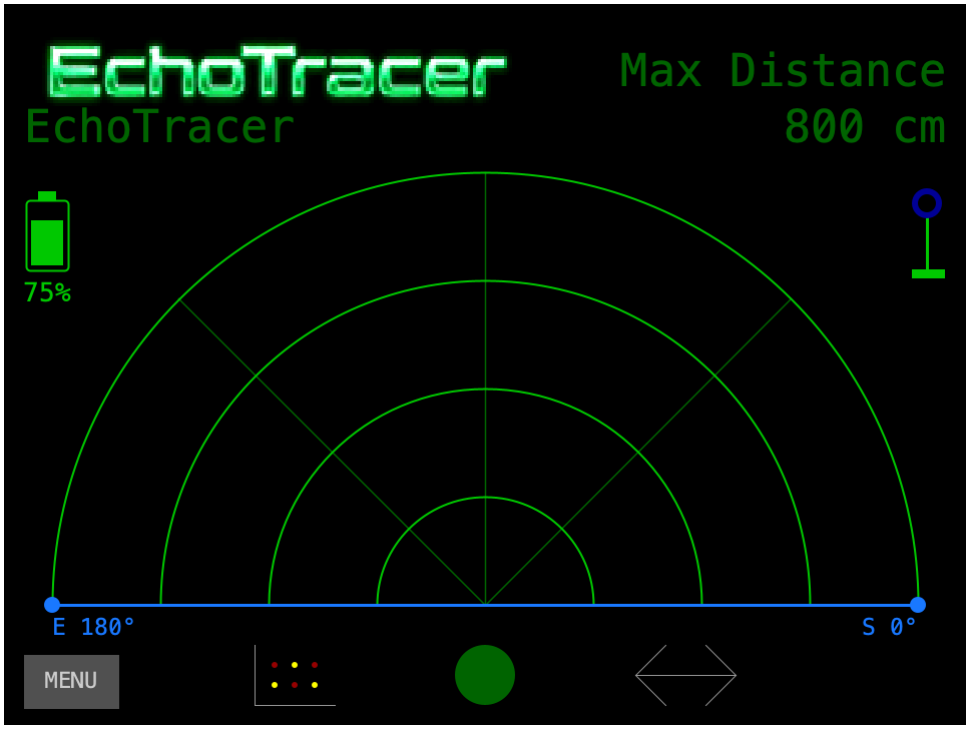
2. Stop scanning using the centre start/stop control in the app or front button **B** on EchoTracer. The limits cannot be adjusted while a scan is running.

3. Press and drag the small blue circle for **S (start)** to an angle from **0° to 90°**.

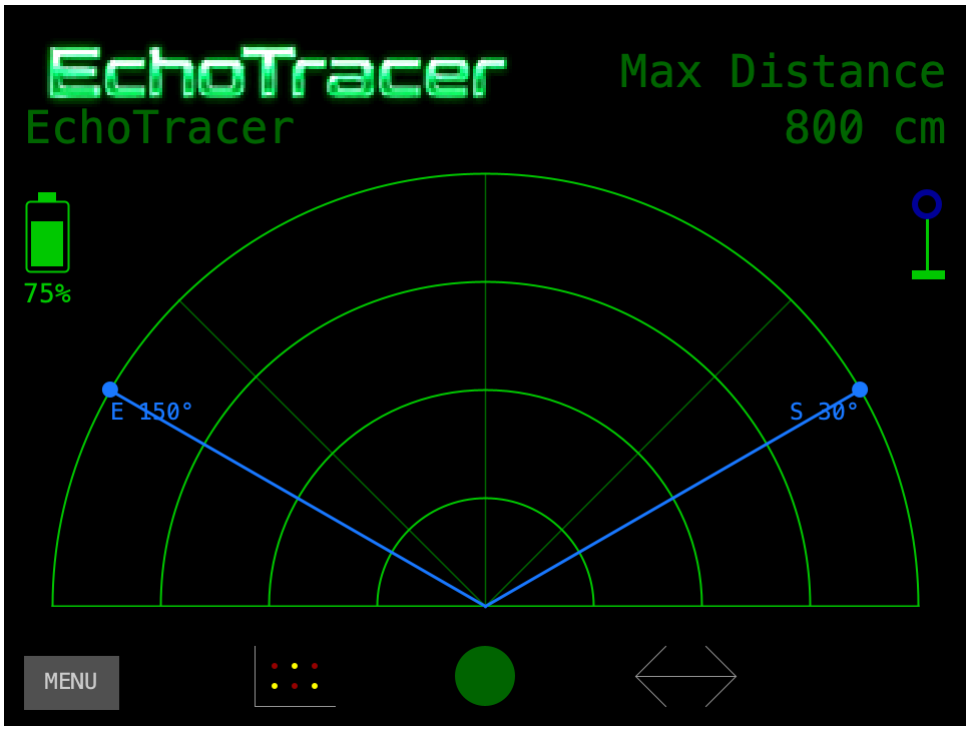
4. Press and drag the small blue circle for **E (end)** to an angle from **90° to 180°**. Release each handle to apply the change, then wait for the device to confirm the position.

5. Start scanning. EchoTracer moves only between the selected angles. Stop again before making further adjustments.

The default is **S 0° / E 180°**, covering the full semicircle. On the app display, 0° is the right edge, 90° points straight ahead at the top, and 180° is the left edge. For example, **S 30° / E 150°** scans a narrower area around the forward direction. **Max Distance** changes the distance scale; the blue handles change the angular sweep.



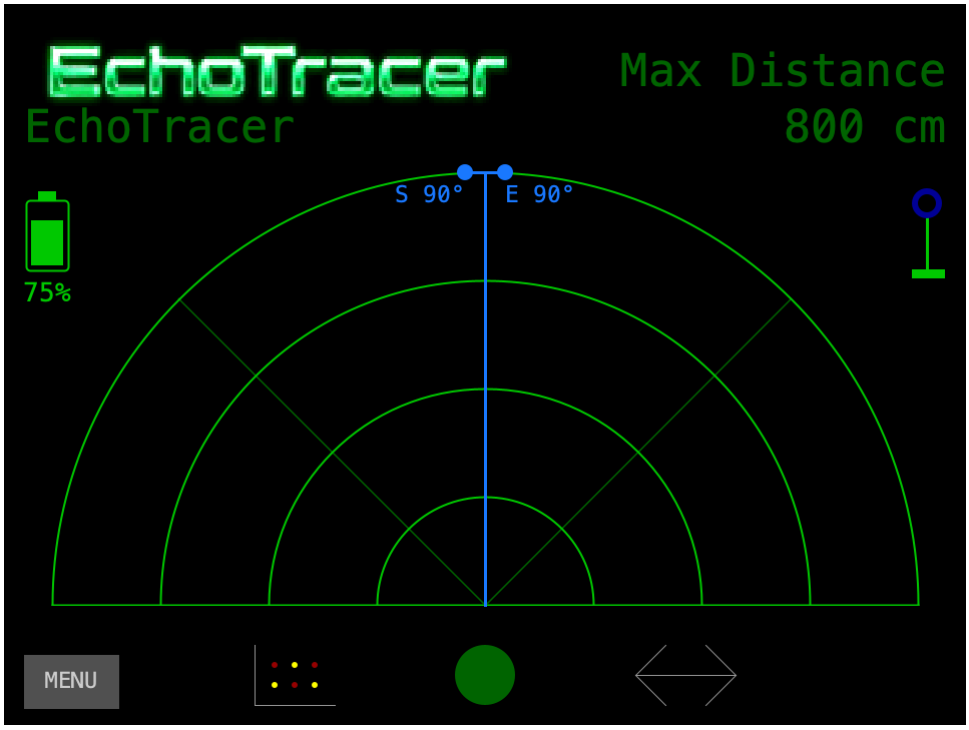
Full range: S 0° / E 180°. Reconstructed using the app drawing code; example values.



Restricted range: S 30° / E 150°. Stop scanning before dragging either handle. Reconstructed using the app drawing code; example values.

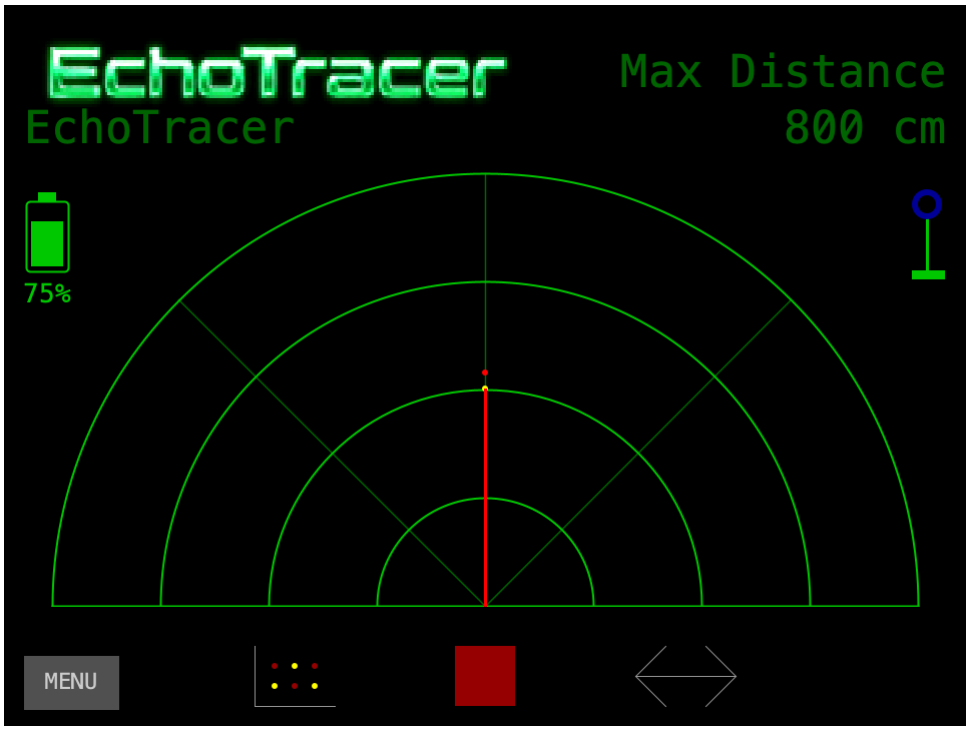
Point straight ahead: 90° / 90°

Set both limits to **90°** while stopped. The blue handles separate slightly so you can select either one: **S is on the left and E is on the right**. Drag S away to reduce the start angle or E away to increase the end angle.



Forward-only setup while stopped: both angles are 90°, with separated S/E handles. Reconstructed using the app drawing code.

Press Start to take readings while the sensor stays facing forward. **The servo does not sweep.** Readings appear as points, and a repeating red line grows from the centre towards a valid detected point, reaches it, disappears, pauses and grows again. With no valid detected distance, no pulse is shown. The blue lines and handles disappear while this mode is running; stop to show and adjust them again.



Forward-only reading: one frame of the growing detection line, with blue controls hidden. The point is illustrative, not recorded investigation data.

On disconnection, EchoTracer returns to normal 0°-180° scanning. The selected limits do not remain active for standalone use. Set them again after reconnecting. If the blue controls do not appear, check that both the app and device firmware support this feature. Older firmware can still scan through the app, but does not offer adjustable limits.

Update firmware

Connect to Wi-Fi and charge the battery to at least 50%, or connect charging power. Keep power connected throughout installation.

1. Stop scanning and open **Menu - Firmware Update**.

2. Wait for the firmware and connection checks. If requested, allow up to 45 seconds for clock synchronisation.

3. If the device reports **Already up to date**, press **A** to return. You can press **B** to check again when no installation prompt is showing.

4. If **Install new firmware?** appears, release all buttons. Press **A** to cancel or press **C** to install.

5. Wait while the download percentage increases. Keep the device powered on.

6. After **Installed!** and **Restarting EchoTracer**, the device restarts automatically.



Firmware installation prompt; available version is illustrative. Screen reconstruction; example values.

Troubleshooting

What you see	What to do
Device will not switch off while charging	Disconnect the USB cable, then quickly press the red side power button twice. The device normally remains on while USB power is connected.
USB cable turns the device on	This is normal. Leave the scan stopped while charging; unplug USB before using the double press to switch off.
No License!	Switch off and check that the supplied microSD card is inserted and its licence file is present. If the message persists, contact the supplier with the device details.
No audible alerts	Enable Play Audio, save with A, and check that a distance change exceeds the tolerance after calibration.
Too many change alerts	Increase Tolerance in App Settings and save with A. Keep the device still; stop and restart the scan to establish a new reference.
No saved images	Enable Save Images and save with A. An image is saved only when a sweep containing a qualifying change reaches its end. Check card space and look in both image folders.
NO INTERNET CONNECTION	Check wifisettings.txt, return the card and restart the device.
Time not synced / Network time unavailable	Connect to the updated ParaLink-Mesh app on the same local network to use phone time, or provide internet access for standalone time sync. Check the Time Zone/BST screen for the clock. Firmware downloads still require internet access. Leave the updater with A and retry if needed.
Update blocked / Battery below 50%	Charge to at least 50% or connect charging power, then press B to check again.
Wi-Fi disconnected; reconnect	Restore the network connection; restart the device if needed, then reopen Firmware Update.
Version, download or installation error	Record the message. Return with A and retry after checking power and internet. If it persists, give the message to the supplier.
No ParaLink connection	Check that the compatible app or server is running and reachable on the same local network. Scanning remains available on the device.
Clock differs from the phone	Check the phone date, time and time zone, then reconnect to ParaLink-Mesh. Both app and firmware must support phone time sync. After sync, EchoTracer's saved Time Zone/BST are ignored until restart.
No blue start/end handles	Connect to ParaLink-Mesh and check both versions support scan limits. In 90°/90° mode, stop scanning to make the handles visible.
Cannot move the blue handles	Stop scanning first. Drag the small circles in the app and wait for each change to be confirmed. S is limited to 0°-90°; E is limited to 90°-180°.
Sensor stays pointing forward	Check whether both limits are 90°. This is forward-only mode. Stop and move S or E to restore a sweep; disconnection restores the full range.