

AEDtrax™ User's Guide



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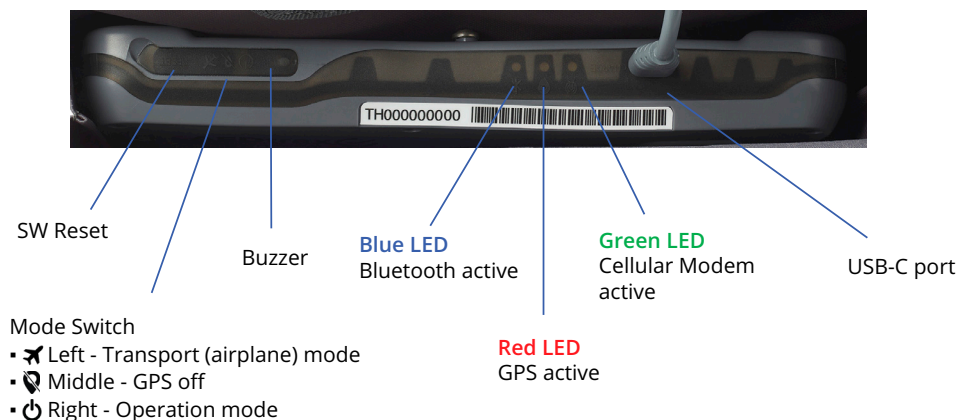


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Product Overview

Device



AEDtrax™ is a solution for providing real-time status of automated external defibrillators (AEDs) through an integrated tracking, monitoring, and notification system outside of a Wi-Fi network. Compatible with ZOLL AED 3® defibrillators, AEDtrax automates the process by providing the following features:

- Monitoring atmospheric conditions to ensure the device is working in safe conditions
- Receiving ZOLL AED 3 self-test files (.DSF, .DHF) and resuscitation code files (.CRD) via USB
- Position and motion detection, including:
 - Static - using RFID for devices that have a designated resting location
 - Dynamic - using accelerometer and GPS sensors
- Communicating all operational data through the LTE network
- Suspending all RF components when needed to minimize radio interference
- Entering very-low-power transport mode during shipping as needed

Intended Purpose

AEDtrax is an Internet of Things (IoT) enabled monitoring module with an intended purpose to transmit AED self-test and operational status data (e.g., readiness indicators, battery status, electrode expiration) to a secure online portal.

AEDTrax does not:

- Analyze or interpret clinical data
- Control or modify therapy delivery
- Provide diagnostic or treatment functionality
- Affect the structure or function of the body

Contents

AEDtrax Shipping Box Content
AEDtrax (batteries included)
USB-A to USB-C cable
RFID card
Torx T8 Tool (For USB cable attachment only)

Terminology

- **ZOLL AED 3** – The ZOLL AED 3® defibrillator is an Automated External Defibrillator (AED) that is designed to be used for both adult and child victims of sudden cardiac arrest.
- **AEDtrax** – low-power monitoring and tracking system

RF – radiofrequency components for communication or position tracking

- **Receiver** – an RF component than only receives radio signals
- **Transceiver** – an RF component that both transmits and receives radio signals
- **GPS** – global positioning system; a global navigation satellite system; receiver
- **RFID** – short-distance card reader; uses ISO 15693 standard cards; transceiver
- **LTE** – 4G phone network communications using CAT-M1 or NB-IoT standards; transceiver
- **BLE** – Bluetooth Low Energy for initial configuration; transceiver

USB – Universal Serial Bus industry standard for interfaces and protocols

- **Host** – bus controller regulating traffic and actions; in this scenario, the AED 3
- **Client** – bus peripheral responding to host commands; in this scenario, the AEDtrax
- **MSC** – mass storage class protocol; presents the client as a file storage device

Operational Modes – modes of device functionality regulated by hardware and software switches

- **Operational (normal)** – detects and tracks motion; sends scheduled telemetry and files intended for common use
- **GPS off** – ignores motion; sends scheduled telemetry and files
 - intended for public service vehicles whose position should not be tracked
- **Transport** – activates airplane mode and switches the device to low-power mode; status change is reported to Plustrac
 - intended for shipping the AEDtrax to the point-of-use in very-low-power mode
- **Airplane** – ignores motion; suspends all RF components
 - activated automatically if AEDtrax detects ZOLL AED 3 is active to minimize interference

Using AEDtrax

Device Setup

The AEDtrax is attached to the back of the ZOLL AED 3 device in the storage compartment. The two connect using a USB-A to USB-C cable. For specific instructions on how to install AEDtrax onto the ZOLL AED 3, see the *AEDtrax Setup Guide for the ZOLL AED 3* (9650-004352-01).

Additionally, each transport bag or storage cabinet intended for use should have its own RFID tag (ISO15693 Vicinity Card). When mounting the tag on the transport bag or storage cabinet, ensure:

- The RFID card has at least 1 inch (2.5 cm) gap from the metal backing.
- The RFID card is aligned with the RFID antenna active area as indicated on the casing.

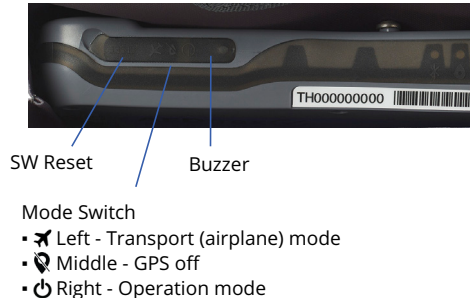


Modes

Mode Switch

AEDtrax has three different modes to toggle between using the mode switch:

- Transport (left),
- GPS-off (middle), and
- Operation (right)



Transport Mode

Transport mode turns on airplane mode and sets the device to low-power operation. While in transport mode, the device continues to receive files over USB if the attached AED generates any, but does not send any transmissions. The device is shipped set to transport mode.

To take AEDtrax out of transport mode, move the mode switch away from transport mode. The device immediately exits airplane mode, connects online, and transmits its exit from transport mode. If set to operation mode and RFID is enabled, AEDtrax also attempts to detect the nearest RFID and starts GPS tracking. The device operates in either GPS-off or Operation mode depending on the position of the mode switch.

GPS-Off Mode

GPS-off mode enables all of the AEDtrax functions except for GPS tracking. In GPS-Off mode, AEDtrax:

- Monitors atmospheric conditions (telemetry).
- Receives ZOLL AED 3 self-test and resuscitation code files.
- Uploads data to Plustrac.
- Enters airplane mode when the AED is in use.

To turn on GPS tracking, set up and enable the RFID card and set the device to Operation mode.

Operation Mode

Operation mode enables all of the functions of GPS-off mode, as well as GPS tracking. The following prerequisites are mandatory for GPS and motion tracking:

- The mode switch is set to operation (normal) mode.
- GPS and RFID are enabled.
- The device is not in airplane mode (due to transport mode or an active AED).

When the device detects movement, the device transmits its GPS coordinates every 30 seconds. Once the AED is stationary for 60 seconds, GPS tracking ends. GPS tracking automatically turns off if the AED turns on.

To enable the RFID card and GPS tracking, see the *RFID Connection and Use Guide* (9652-XXXX-01).

Automatic Systems

Bluetooth Low Energy

The Bluetooth Low Energy (BLE) mode turns on automatically after device boot and reboot. The BLE mode will remain on for a total of three minutes to perform device configuration. While the device is in Operation or GPS-off mode, you can turn on BLE by setting the mode switch to the transport position and back to its original position.

BLE automatically turns off during airplane mode and transport mode to comply with low-interference requirements and to consume minimal power.

LTE

LTE is activated through either:

- Detection of motion that started a GPS tracking flow.
- Device entering or exiting transport mode.
- Internal schedule when device sends daily telemetry.
- USB power-off detected and a defibrillator file is ready for upload.

LTE is deactivated through either:

- The transmission queue being empty for longer than 10 seconds.
- An emergency shut-off through airplane mode.

Telemetry

The device takes the following measurements every hour:

- Atmospheric pressure
- Atmospheric humidity
- Atmospheric temperature
- Battery voltage

Telemetry measurement is skipped if:

- The AED is in use.
- AEDtrax is in airplane mode.

AEDtrax sends the data once per day and deletes the local file after a successful upload.

Data Collection and File Transfer

The AEDtrax constantly monitors if the AED is in use. The AED is considered active when:

- The AED is in use for life-saving or training operations
- The AED has been turned on in maintenance mode
- The AED has just generated a self test file (DSF or DHF) or a clinical event file (CRD)

When the AED is active, the AEDtrax switches to airplane mode so as not to interfere with the AED's operations. During this time, AEDtrax stores data on the internal SD card. When airplane mode automatically turns off, the new files are transferred to Plustrac and then deleted.

Maintenance

USB Cable

The AEDtrax connects to the ZOLL AED 3 using a USB-A to USB-C cable which has integrated clips and gaskets to ensure dust and air-tightness for all involved components. When replacing the USB cable, use a ZOLL approved cable.



Battery

Battery Monitoring

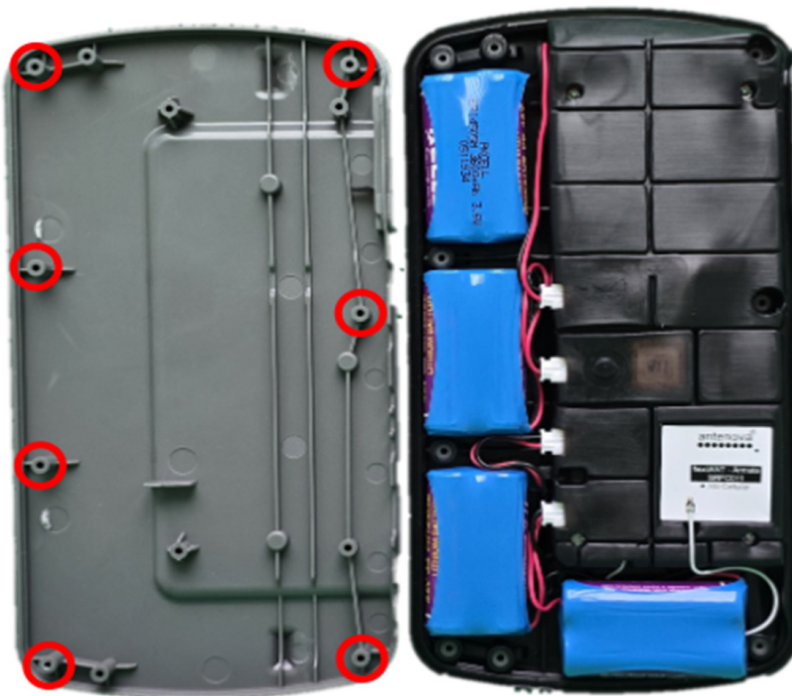
AEDtrax monitors all device telemetry, including battery voltage. If the voltage falls below a certain threshold, Plustrac issues an alerting email. The batteries should be replaced within 3 weeks of receiving the first alert.

Important! You must set up email alerts to receive low voltage messages.

Battery Replacement

1. Set the device to GPS-off mode by sliding the mode switch to the middle.
2. Disconnect the USB cable from the AEDtrax and remove it from the AED 3 storage compartment.
3. Remove seven screws using a Phillips #1 screwdriver and lift the cover.

Note: The screwdriver provided is used to attach the USB cable to the ZOLL AED 3. It is not compatible with the battery compartment screws.



4. Remove all four battery cells by unplugging their corresponding cables. The order of removal does not matter.

Note: Do not remove the black seal. The seal provides electrostatic discharge protection.

5. Install four new ER14505M 3.6V Li-SOCl₂ battery cells by plugging in their cables. The order of installation does not matter. Ensure the black and red wires are neatly tucked beside the batteries, not over or under.
6. Carefully replace the cover and refasten the seven screws.

Note: If using a torque wrench, set to 3.7 lb·ft (5 N·m).

7. Return the AEDtrax to the ZOLL AED 3 storage compartment and reconnect the USB cable.
8. Set the device to the preferred mode.

Firmware Update

Once a day, the device checks for firmware updates. If an update is detected, the device automatically downloads the update.

Contacting Technical Service

If an AEDtrax product has issues or requires service, contact the Rescue Ready Services team at:

Email: psconnectivity@zoll.com

Telephone: 1-866-352-5433

Specifications

Device Specifications

Enclosure: 210 mm × 110 mm × 25 mm

Operating temperature: -15°C to +50°C

Power supply: battery-powered

- 8× ER14505M 3.6V, Li-SOCl₂ chemistry
- total capacity 16.8 Ah, up to 5 years of normal use
- user-replaceable, non-rechargeable

Microcontrollers:

- STMicroelectronics STM32L4-series general-purpose microcontroller
- BLE 5.1 microcontroller (Nordic nRF52840)

RF Components, onboard:

- Quectel BG95 LTE/CAT-M1/NB-IoT modem

Frequency Bands:

- Cat M1: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66/B85
- Cat NB2: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B28/B66/B71/B85
- GSM/EDGE: 850/900/1800/1900 MHz

Maximum conducted transmit power is:

- LTE Cat M1/NB-IoT: 23 dBm (200 mW)
- GSM 900: 33 dBm (2W)
- GSM 1800: 30 dBm (1W)

Actual transmit power is dynamically controlled by the cellular network and is typically lower than these maximum values.

- GPS/Galileo/GLONASS GNSS receiver

RF Components, add-on:

- ISO15693 vicinity card reader, daughterboard

Sensors

- 3-axis accelerometer
- Atmospheric sensor

Connectors

- USB-C running in USB 2.0 configuration

Certifications

- EMC: EN 301 489-1 V2.1.1 & EN 301 489-52 V1.1.1
- FCC ID: XMR201910BG95M3
- IC ID: 10224A-2019BG95M3
- CE
- RoHS Compliant
- REACH Compliant
- This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
 1. This device may not cause harmful interference, and
 2. This device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Operational Compliance and Standards

AEDtrax is expected to fulfill the following requirements:

- Behave strictly as a USB peripheral device, without ZOLL AED 3 capability
- When connected to the ZOLL AED 3, draw the minimum amount of current necessary for successful USB insertion detection
- On connecting to the ZOLL AED 3, power down all RF components within a reasonable time to minimize RF interference with the USB host

USB

Power Consumption

The AEDtrax is self-powered using its own battery packs and does not draw significant power through its USB connection.

The USB interface is limited to only signaling the AEDtrax that a cable connects it to a host, as well as actual USB data signaling with the following limits:

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Voltage	V_{CC}	-	5.00	-	V
USB Connected current	I_{VCC}	0.10	0.60	1.00	μA
USB data lines current	I_{DP}, I_{DM}	25	-	500	μA

Radio-Frequency Components

The device contains the following active RF components:

- BLE – u-blox NINA B301 BLE 5.1 transceiver
- LTE – Quectel BG95-M3 NB-IoT/CAT-M1 transceiver
- RFID – NXP PN5180 ISO 15693 transceiver
- GPS – u-blox SAM-M8Q GPS receiver

The RFID component is in full compliance with NFC forum.

Overall RF Component Activity

The RF components are only active when required by external inputs (e.g. accelerometer detects device motion), internal logic (scheduler, timer).

Additionally, the firmware will enter airplane mode whenever there is an active USB connection, powering off all RF components and their software task. This prioritizes the well-being of the defibrillator.

RFID

RFID is activated in the following cases:

- Motion is detected
- GPS tracking flow has ended
- Exiting transport mode

RFID operation is automatic as it powers on, attempts up to three RFID reads, and powers off.

RFID does not power on if the device is in airplane mode or transport mode.

RF Component Verification

The device's overall RF behavior in airplane mode is validated by monitoring it using an RF analyzer. The device can be tested through the following steps:

1. Check AEDtrax is registered, powered off with no batteries connected, with the USB plugged in on the AEDtrax side only, and the mode switch in the no-tracking positioning.
2. Prepare the RF analyzer to scan from the moment AEDtrax is powered.
3. Connect the batteries to the AEDtrax.
4. Observe the BLE activity LED blinking, indicating BLE is working.
5. Observe the modem activity LED blinking, indicating LTE is working.
6. Check the RF analyzer for activity on BLE and LT frequency band.
7. Connect the USB-A/m side of the USB cable to a computer or a defibrillator.
8. The RF analyzer should show LTE and BLE frequency activity stopping within timing tolerance.
9. Disconnect the USB-A/m side of the USB cable.
10. The RF analyzer should show LTE and BLE frequency activity resuming.

GPS

GPS is activated if the device successfully detects motion, and then unsuccessfully detects an RFID card. GPS remains active in 60-second increments for as long as there is motion occurring. The GPS functions as a strict receiver, with no adverse effect on other electronics, either internal to the AEDtrax or to the attached AED.