# WHALETEQ

# DFS200

## User Manual


**Revision 2025-05-19**
**DFS200 APP Version 1.6.10**
**DFS200 PC Software Version 1.0.1.10**

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# 1 Introduction

## 1.1 Concept

WhaleTeq DFS200 is designed as an AED field tester for on-site installation, periodic function inspection, and maintenance service empowered by data retrieval and routine creation.

AED (Automated External Defibrillator) is a life-saving medical device that delivers defibrillation upon identifying and analyzing the ECG of resuscitation-needed patient. Because AEDs are installed in public areas where they can be reached before ambulance arrival, the majority of AEDs relies on one-time batteries and require only minimal training compared to hospital-use defibrillators.

Ensuring the functionality of AEDs on a periodic basis becomes widely accepted around the world, and DFS200 is the ideal tool to conduct such a regular inspection.

## 1.2 Applications

WhaleTeq DFS200 is a handheld and versatile AED field tester, functioning as an ECG signal simulator, defibrillation energy guarantee equipment, and AED battery measuring tool for AED regular maintenance checks. DFS200 is controlled and communicated via a mobile APP through smartphone Bluetooth connection.

For ECG signal, DFS200 simulates NSR (Normal Sinus Rhythm) as well as various arrhythmias that may or may not need AED defibrillation. The amplitude and BPM of NSR can be adjusted. In addition, users may enable *consecutive test* for certain AED models with the feature of 3 discharges in a row. Arrhythmia convert combination (ECG waveform before vs. after defibrillation) is available.

For energy guarantee, DFS200 allows customized pass/fail criteria of adult and pediatric defibrillation discharge, respectively, of the delivered energy. To ensure the durability of DFS200, protection against

multiple defibrillations is implemented. (DFS200 is recommended to be used for analyzing defibrillation shock at the interval of at least 60 seconds apart.)

The battery measurement introduced here is for that of the AED. Periodic inspection on AED battery is essential to ensure the availability of defibrillation when needed. The record includes test date & time, serial number of AED tested, as well as test results of the maintenance task. Users may add notes as reminders and export the results for further analysis.

- **Optional Accessories**

1. **Battery Measurement Probe with Load**
   The battery measurement probe with load can better estimate remaining battery level via cross-checking reference table (as the table below). The AED battery level is responsible for the defibrillation shock energy. The battery measurement probe with load can simulate the actual power consumption within the AED as if the battery is installed in the AED making the test more accurately. As a result, users can obtain more information than from the AED self-test. For more information, please refer to the application note ''Use DFS200 Battery Measurement Probe (with load) to check AED battery level''.

**Table 1: Voltage and Battery Level Reference Table for Different Battery Types**

| | 9V/4200mAh | 12V/4200mAh | 15V/1400mAh | 21V/1400mAh | 30V/1400mAh |
|---|---|---|---|---|---|
| 100.00% | 9.00V | 11.96V | 15.00V | 20.95V | 29.95V |
| 80.00% | 8.92V | 11.36V | 13.98V | 19.71V | 28.18V |
| 50.00% | 8.82V | 11.30V | 13.91V | 19.62V | 28.06V |
| 30.00% | 8.72V | 11.17V | 13.76V | 19.43V | 27.69V |
| 20.00% | 8.52V | 11.07V | 13.61V | 19.21V | 27.44V |
| 10.00% | 8.33V | 10.84V | 13.36V | 18.83V | 26.91V |
| 0.00% | 7.78V | 10.51V | 12.92V | 18.22V | 26.05V |

Note:

(1) This voltage-battery level table can be used for checking remaining battery level from the measured voltage.

(2) Panasonic CR-123 battery is used for the battery information provided in the voltage-battery level table.

(3) The 9V/4200mAh battery mentioned above uses CR-123

lithium batteries, which are composed in parallel or series to meet the battery specification required by the experiment.

(4) All experiments and measurements are carried out with WhaleTeq DFS200 and DFS200 battery measurement probe with load.

(5) The load current of DFS200 battery measurement probe with load is set to 200mA.

(6) The specifications and features of CR-123 batteries of various brands are different. Therefore, the results will be slightly different from the above contents.

**2. Paddle Box Set**

The paddle box set has outstanding electrical conductivity and mechanical characteristics. Besides, the conductive gel drainage grooves are designed for easy cleaning.

- **Optional Functions**

**1. DFS200 PC Software**

The DFS200 PC software displays shock energy and waveforms on one screen, and allows users to store customized waveforms and set commonly used ECG signals for standalone operations, benefiting the QA department by rapidly verifying AED performance.

**2. AED Intelligent Management Solution (AIMS)**

The DFS200 can work with WhaleTeq's AED Intelligent Management Solution (AIMS) which includes functions such as AED tester and mobile APP, AED CMMS PLATFORM, and IoT customized module. (AIMS Introduction)

# 2 Specifications

## 2.1 General Specifications

**Table 2: General Specification**

| Items | Specifications |
|---|---|
| Temperature | Operating: 0°C — +50°C (+32°F — +122°F) |
| | Storage: -20°C — +60°C (-4°F — +140°F) |
| Humidity | 10% — 90% non-condensing |
| Communications | Wireless (Low Energy Radio)<br>USB Type-C connector |
| Operation Modes | Remote (APP) |
| Power | 9V alkaline battery*1<br>Battery level display & low power alert on APP |
| Mechanical | Housing: ABS Plastic<br>Size (L x W x H): 17.0 x 8.55 x 4.0cm<br>Weight: 330g |

## 2.2 Compliance Specifications

**Table 3: Compliance Specification**

| Items | Specifications |
|---|---|
| Safety Standards | CE: IEC/EN61010-1:2010 + A1:2016; Pollution degree 2<br>61010-2-030:2017 |
| Electromagnetic Compatibility Standards (EMC) | CE: EN61326-1; EN301489-1/EN301489-17<br>FCC: EMC P15B |
| Other Standards | CE: RF EN 300328; EN62311<br>NCC: RF LP0002 |

## 2.3 Energy Measurement Specifications

**Table 4: Energy Measurement Specification**

| Items | Specifications |
|---|---|
| Maximum Energy | Range: Up to 600J<br>Accuracy:<br>± 1% of reading ± 1J for below 2.5kV;<br>± 2% of reading ± 2J for 2.5kV and above |
| Load Resistance | Resistance: 50 Ω<br>Accuracy: ±1%, non-inductive (<2 μH) |
| Pulse Width | Range: 1.0 — 50.0ms<br>Accuracy: ±0.1ms |
| Voltage | Range: Up to 5000$V_p$<br>Accuracy: ± (1% of reading + 2V), typical |
| Maximum Average Power | 12W, equivalent to 1 defib pulse of 360J every 30 seconds |
| Battery Level (AED Battery) | Measurement Voltage: 0.40 — 40.00V<br>Accuracy: ± 0.05V for 5.00 — 40.00V |
| Battery Level (AED Battery, measured with 200mA load) | Measurement Voltage: 3.60 — 40.00V<br>Accuracy: ± 0.5V for 3.60 — 40.00V |

**Specifications are subject to change without prior notice.*

## 2.4 ECG Signal Specifications

**Table 5: ECG Signal Specification**

| Items | Specifications |
|---|---|
| Waves | Ventricular Fibrillation - Coarse<br>Ventricular Fibrillation - Fine<br>Ventricular Tachycardia (≥ 180 bpm)<br>Ventricular Tachycardia (≥ 234 bpm)<br>Atrial Fibrillation<br>Asystole |

| Items | Specifications |
|---|---|
| Normal Sinus Rhythm (NSR) | 30 — 240 (by 10) BPM |
| Amplitude | 0 — 5 mV *(Vp-p 5mV)* |

# 3 Instrument Familiarization

## 3.1 Top

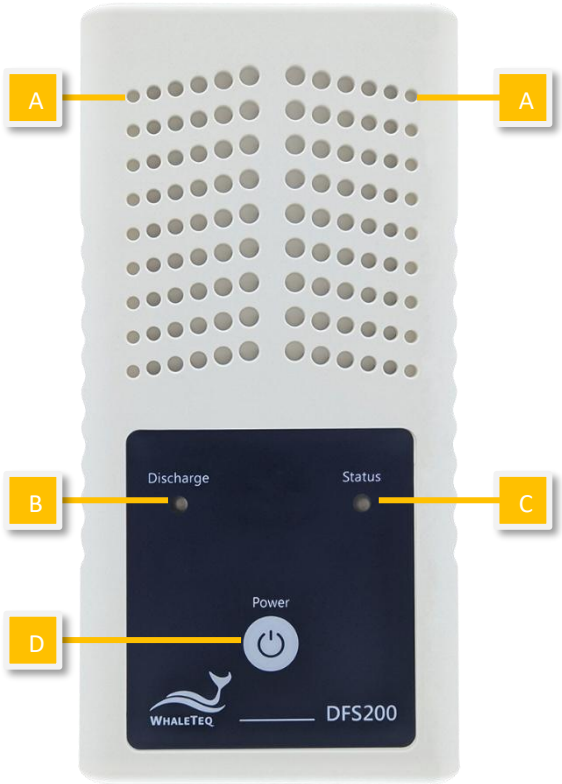


**Figure 1: Top Side of DFS200**

**A. Ventilation Holes:** Allow ventilation during operation. Keep this side up when in use.

### B. AED Discharge LED:

**Table 6: AED Discharge LED**

| Scenario | LED Behavior |
|---|---|
| No Discharge | No light |
| Discharge Detected (Pass) | If the discharge value equals to or is greater than the joule number set by users, the green light continues for a while. |
| Discharge Detected (Fail) | If the discharge value is less than the joule number set by users, the red light continues for a while. |

Note: The Discharge LED follows the pass/fail range of either adult or pediatric modes from the mobile APP (5.6.3 Set Pass/Fail Range) or the optional PC software (6.1.3 Set Pass Range) settings.

### C. DFS200 Status LED:

**Table 7: DFS200 Status LED**

| Mode | Power On | Low Power |
|---|---|---|
| Standalone Operation | Green/ Red light alternates every second. | Red light blinks every 2 seconds. |
| Mobile APP connected (Bluetooth) or PC connected (USB) | Green light blinks every 2 seconds. | |

### D. On/Off Button:

**Table 8: ON/OFF Button**

| Scenario | Button Behavior |
|---|---|
| On | Press the button for about 1 second to turn on DFS200. |
| Off | Long press the button for 3 seconds to turn off DFS200. Alternatively, after DFS200 idles for 3 minutes, it'll automatically be turned off. The length of idle time can be customized via the mobile APP described in 5.6.2. |

## 3.2 Front and Rear

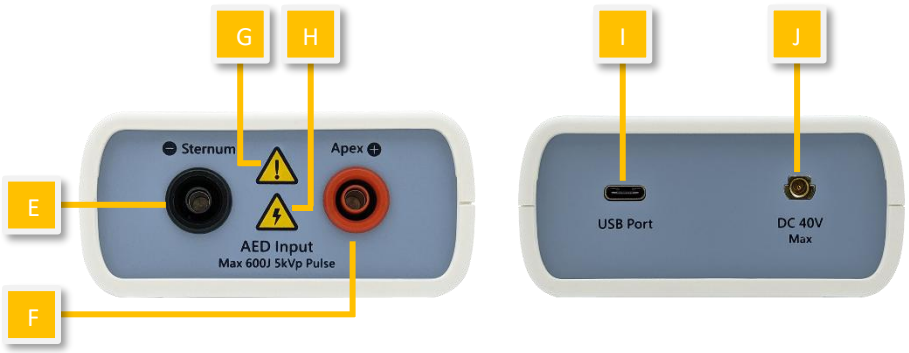


**Figure 2: Front and Rear Side of DFS200**

**E.** **AED Interface Jack (Sternum):** Connect the Sternum jack to the AED pad labeled Sternum via DFS200 accessory “AED Interface Cable”.

**F.** **AED Interface Jack (Apex):** Connect the Apex jack to the AED pad labeled Apex via DFS200 accessory “AED Interface Cable”.

**G.** **Caution:** DFS200 is recommended to be used for analyzing defibrillation shock at the interval of at least 60 seconds apart.

**H.** **Caution, the possibility of electric shock:** From the time AED starts charging for defibrillation until right after energy delivery, users are recommended to stay clear from DFS200.

**I.** **USB Port:** Connect to the computer to use the optional PC software.

**J.** **DC 40V Max:** Insert the SMA connector here and place test leads at the AED battery to measure the voltage of the AED battery.

## 3.3 Back

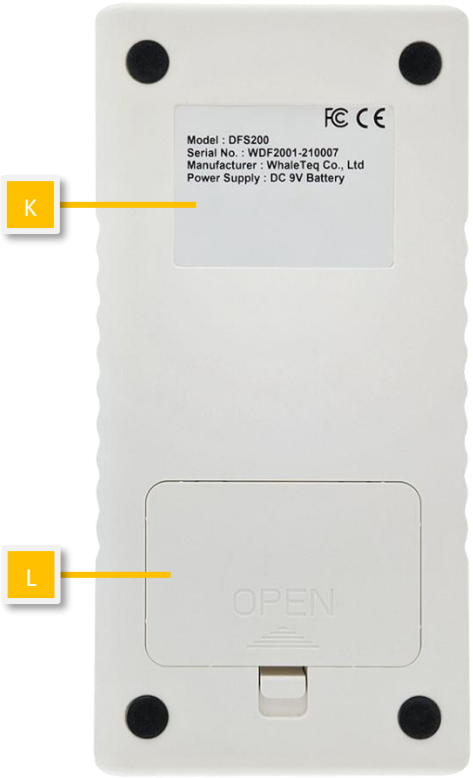


**Figure 3: Back Side of DFS200**

**K.** **Label:** Contain information including model, serial number, manufacturer, and power supply.

**L.** **Battery Compartment:** Insert 9V battery for power supply. Both disposable alkaline batteries and rechargeable batteries can be used.

## 3.4 Wiring Diagram

- **AED Testing Scenario**

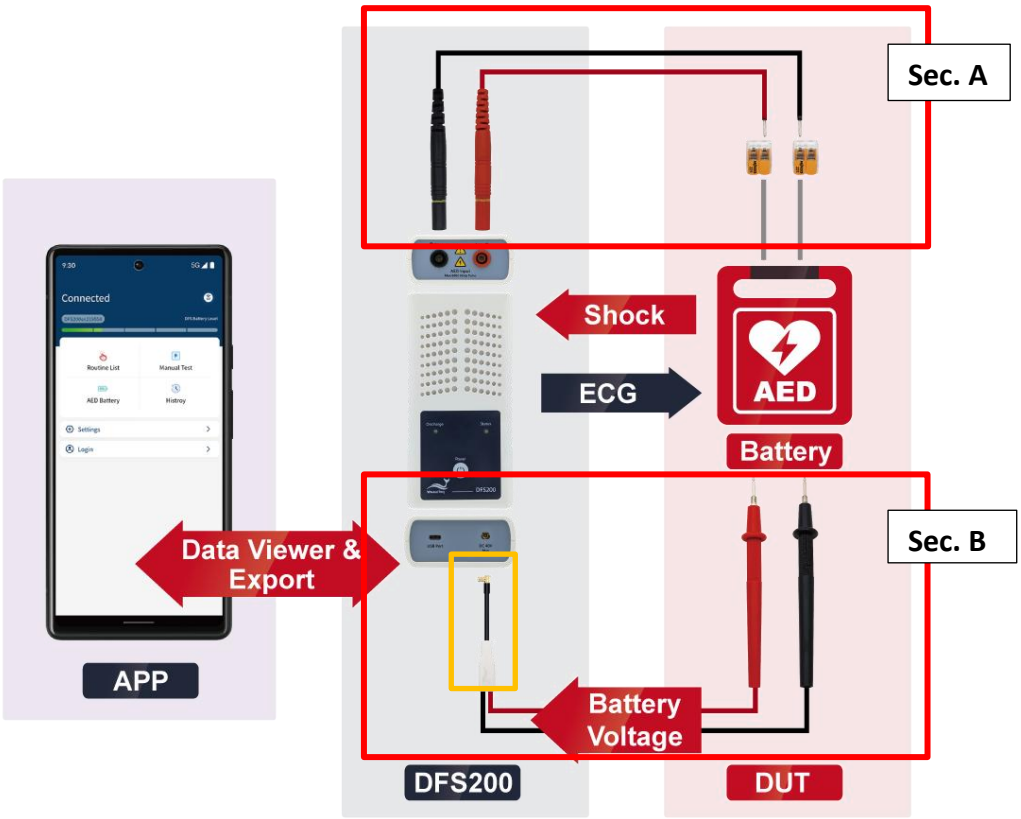


**Figure 4: Wiring Diagram (1)**

Note:

1. Sec. A is for Routine List and Manual Test while Sec. B is for AED battery.
2. To plug in properly, please make sure the yellow lines on the black and red banana males that connect to DFS200 in sec. A totally disappear in the port.
3. When removing the connector in sec. B from DFS200 (the yellow frame part), please pull out the connector by holding the black part instead of the white part.

- **Defibrillator Testing Scenario (Optional)**

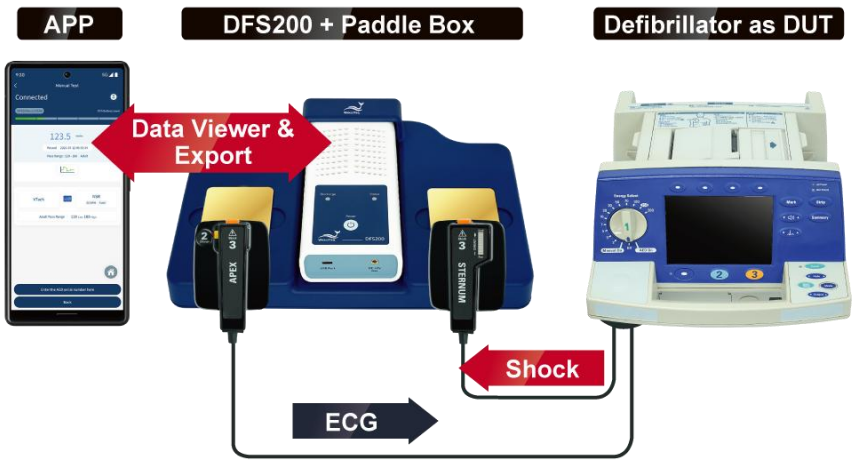


**Figure 5: Wiring Diagram (2)**

# 4 Getting Started

## 4.1 Smartphone Requirement

**Android**

Android 6.0 and above

**iOS**

iOS 10 and above

**Bluetooth**

Bluetooth Low Energy 4.2 and above

## 4.2 APP Installation

Please follow the steps below to download and execute DFS200 APP.

1. Download DFS200 APP from Google Play or App Store.

2. Allow the permissions including Location and Storage.
3. Tap on DFS200 APP to conduct an AED test via executing DFS200.

Note: If DFS200 APP cannot be installed properly, check for the operating system or restart the smartphone.

## 4.3 Firmware Update

Checking DFS200 firmware updates using the PC software:

For users who have purchased the PC software

1. Visit WhaleTeq's official website to download the DFS200 PC software and enter the activation key. The software will automatically check the firmware version of the connected DFS200. If a firmware update is needed, a window will show as below. Click "Yes" to initiate the update. After the update is complete, please restart the software before conducting any tests.
The PC software will automatically check the DFS200 firmware version each time it is activated.

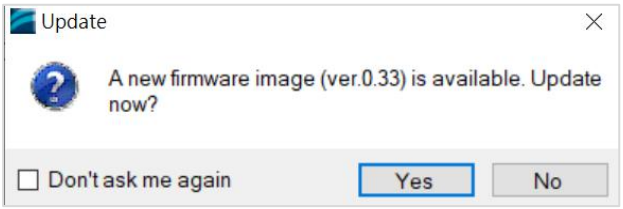


**Figure 6: DFS200 Firmware Update Window on PC Software (1)**

2. To manually check the DFS200 firmware version, click the settings icon "☰" and select "Check for Update" to bring up the firmware version check window. If a new firmware version is available, a firmware update window will show. Click "(Y)" to initiate the update. After the update is complete, please restart the software before conducting any tests.


**Figure 7: DFS200 Firmware Version Check Window on PC Software**

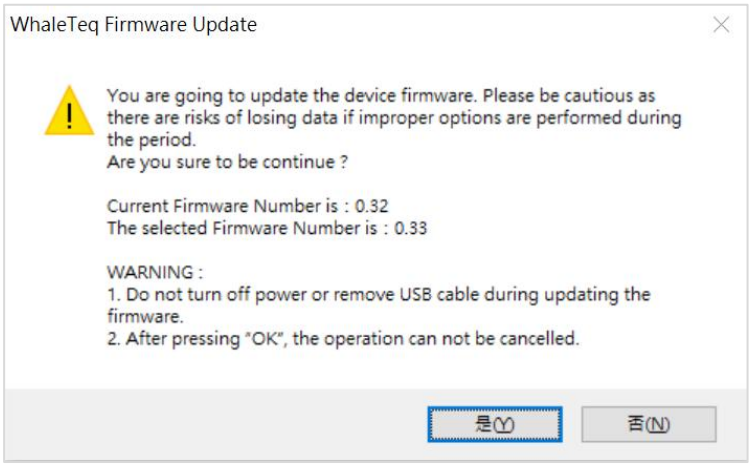


**Figure 8: DFS200 Firmware Update Window on PC Software (2)**

For users who haven't purchased the PC software

Visit WhaleTeq's official website to download the DFS200 PC software. Enter "WhaleTeq DFS200 Firmware Update" in the computer operating system's search field or go to the path "C:\ProgramData\Microsoft\Windows\Start Menu\Programs\WhaleTeq\WhaleTeq DFS200" to access the "WhaleTeq DFS200 Firmware Update" application (  ).

Double-click this application to check the DFS200 firmware version. If a new firmware version is available, a firmware update window (as shown in Figure 8) will show. Click "(Y)" to initiate the update. After the update is complete, please restart the DFS200.

Note: DFS200 with firmware version 0.28 or below cannot be updated using the PC software. To check the current firmware

version of DFS200, users can connect DFS200 to the DFS200 APP and go to the "DFS Device Settings" page. For updating firmware version 0.28 or below, please return the DFS200 to WhaleTeq. For contact information, please refer to "13 Contact WhaleTeq".

### 4.3.1 System Requirements

To install and use the optional PC software, users should use a Windows OS PC to connect the USB port of DFS200.

PC requirements:

- Windows PC (Windows 7 or later, suggest to use the genuine version)
- Microsoft .NET 4.0 or higher
- Administrator access (essential for installing software, driver, and Microsoft .Net Framework)
- 1.5 GHz CPU or higher
- 1GB RAM or higher[1]
- USB port

### 4.3.2 Optional PC Software Installation

Please follow the steps below to download and execute the DFS200 PC software.

1. Go to WhaleTeq's official website to download the DFS200 PC software.
2. Open the file explorer and select the download location.
3. Double click on *WhaleTeqDFS200.exe* to execute it.

Note: If the installation cannot be executed, please contact WhaleTeq's service team (service@whaleteq.com).

[1] Relative to normal PC processing, there is no special use of PC speed. However, there has been noted a slow increase in system RAM usage over long periods of time up to 30-40MB (related to MS Windows "garbage collection"). PCs with only 512MB or less installed and are running several other programs (in particular, Internet Explorer), may exceed the available RAM, requiring access to the hard drive and dramatically impacting speed. In this case, streaming interruptions and other problems may occur.

# 5 APP Functions and Operation Instructions

## 5.1 APP General Introduction

### 5.1.1 APP Function

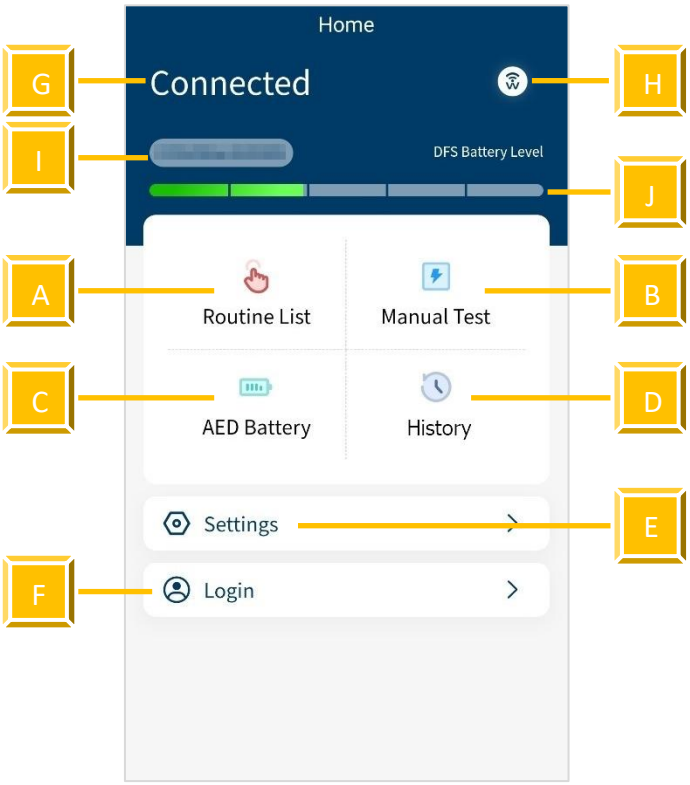


**Figure 9: Home Screen of DFS200 APP**

DFS200 APP contains the most used functions for maintaining AED:

**A.** **Routine List**: for creating a list of to-do work beforehand upon arriving at AED maintenance destination.

**B.** **Manual Test**: test for checking the performance of an AED with arrhythmia combinations of user's choice.

**C.** **AED Battery**: test for ensuring the battery level is good enough for giving defibrillation when needed.

**D.** **History**: for saving the test time, AED serial number, test results including defibrillation and battery, as well as notes keeping.

**E.** **Settings:** include DFS Management, 3 Consecutive Defibrillation, Reset, Language Switch, Terms & Conditions of Use, Privacy Policy, and APP version.

**F.** **Login:** for AED CMMS PLATFORM.

Other icons on the home screen:

**G. Connection Status:** to know the connection status with a DFS200 at a glance.

**H. Connection Icon** : see section 5.1.2 and section 5.1.3.

**I. DFS ID**: to identify the DFS200 currently in use.

**J. DFS Battery Level**: to alert when low battery.

### 5.1.2 Smartphone Wireless Connection

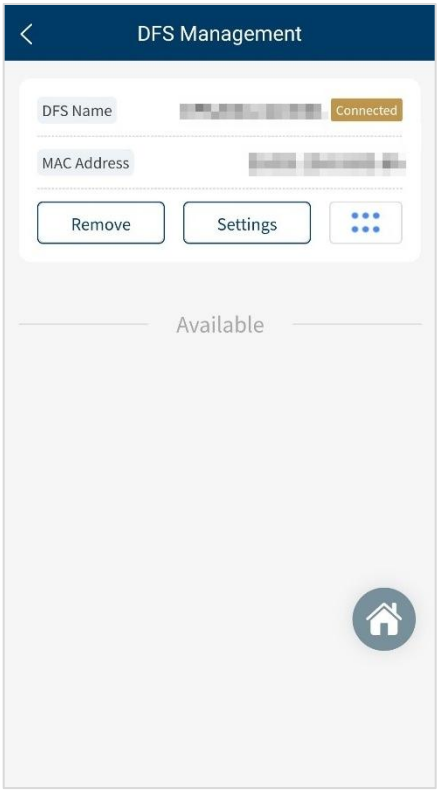


Figure 10: Pairing Interface

Click DFS to open DFS200 APP. The APP controls the DFS200 device via smartphone's Bluetooth.

If the Bluetooth of the smartphone is OFF, by clicking , the APP pops up a message reminding the user to turn on the smartphone's Bluetooth.

If the Bluetooth is ON, by clicking , the APP shows Paired Devices as well as Other Available Devices (see the figure on the left). DFS200 in APP is recognized as ''*DFS200sn*'' with 6 digits of the serial number corresponding to that labeled on the device.

For not yet paired devices, select the intended DFS200 from Other Available Devices and pair to start. When connected, the APP connectivity icon changes to and the DFS battery level appears. For having been paired devices, DFS200 will connect automatically when both Bluetooth and DFS200 are on.

Note:

(1) If there is an incoming call when the APP is operating, the connection between the smartphone and the DFS200 might be affected. If they disconnect, please go to ''DFS Management'' to reconnect the desired device.

(2) If Bluetooth is unexpectedly disconnected while using the APP to play signals, the DFS200 will switch to standalone mode and continue playing the ECG signal from before the disconnection.
To play the preset ECG signal in standalone mode, reconnect the APP to the DFS200. Then go to the "DFS Device Settings" page, configure the settings on "Standalone ECG Waveform Setting" and save them. Afterward, turn off your phone's Bluetooth, restart the DFS200, and it will play the configured ECG waveform in standalone mode.

### 5.1.3 DFS200 Connection

When the APP shows  , no DFS200 is connected. The Status LED blinks in alternating red and green when the APP is not connected. Please turn on the Bluetooth function and choose desired DFS200 to use.

When the APP shows  , it is confirmed that DFS200 is connected. When connected to DFS200 APP, the Status LED blinks green.

### 5.1.4 DFS200 Auto-off

Auto-Off: DFS200 will be turned off after the device idles for a certain time. The default value is 3 minutes. See section 5.6.2 for more details.

### 5.1.5 DFS200 Low Battery

When DFS200 is in low battery, and the connection is via smartphone Bluetooth, the Status LED blinks red. At the same time, the APP screen would blink low battery icon.

## 5.2 Routine List Operation

DFS200 simulates normal heart signals as well as heart signals for a variety of arrhythmias. To do a quick inspection of an AED, it is recommended to use the Routine List. After setting all the test items in the Routine List, users can complete a quick check of the performance of the AED. To connect AED with DFS200, please refer to section 3.4 Wiring diagram and make sure sec. A is properly connected.

To operate **Routine List**:

1. Click the Routine List on the home screen and click the Add button, Figure 12 will show on the screen.

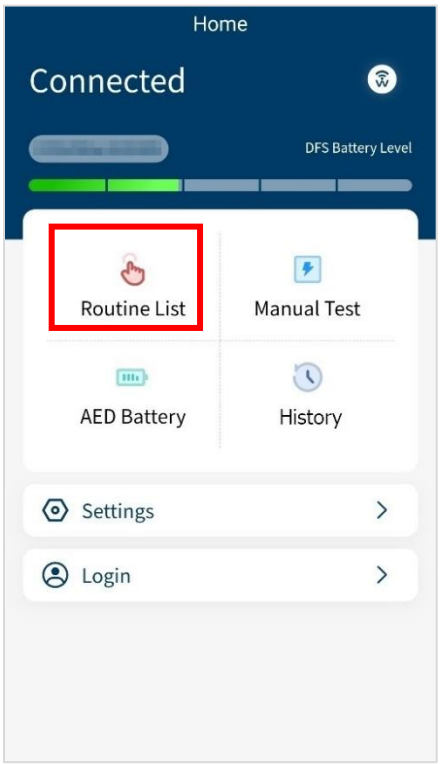


Figure 11: Routine List on the Home Screen

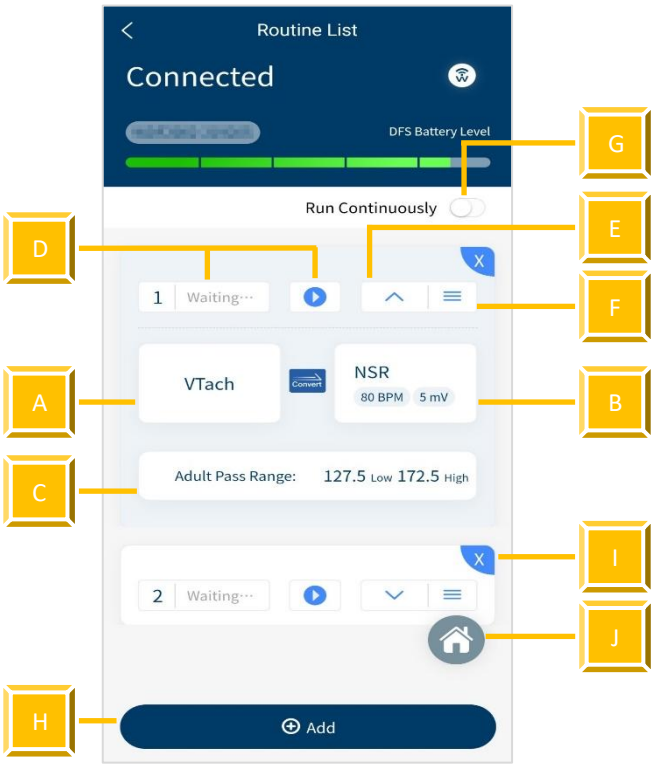


Figure 12: Routine List Interface

**Table 9: Button Functions in Routine Test**

| Item | Name | Description |
|---|---|---|
| **A** | ECG pattern (before) button | To set the ECG pattern before defibrillation. |
| **B** | ECG pattern (after) button | To set the ECG pattern after defibrillation. |
| **C** | Pass Range button | To set the pass range of the defibrillation. |
| **D** | Start/Stop button | To start/stop the test (when users starts testing, the status beside the start button will change). |
| **E** | Hide/Expand button | To hide or show the parameter(s). |
| **F** | Sequence button | To adjust the sequence of the test item(s). |
| **G** | Run Continuously switch | If users turn on Run Continuously switch, all test items will be automatically played according to the user-defined order.<br>Note: To bring up the Run Continuously switch requires at least 2 test items. |
| **H** | Add button | To add new test item(s).<br>Note: Users can add up to six test items at once. |
| **I** | Delete button | To delete the test item(s). |
| **J** | Home button | To return to the home screen. |

2. Click the VTach and users can see various ECG patterns from the list. Choose the desired test pattern. The provided ECG patterns are listed below:

| | |
|---|---|
| VTach | Asystole |
| VTach-Fast | AFib |
| VFib-Coarse | NSR |
| VFib-Fine | CUSTOM-1 |
| | CUSTOM-2 |

Note:
(1) To change the parameters for CUSTOM-1 and CUSTOM-2, please contact WhaleTeq (Section 13).
(2) The selections of the ECG patterns are divided into two categories, red and black. The red ones trigger the AED to send a defibrillation shock, and the black ones don't.

3. Click the NSR and choose the outcome ECG pattern after the defibrillation shock. Also, users can change the BPM ranging from 30 to 240 BPM set in 10 BPM intervals and the amplitude ranging from 0 to 5 mV set in 0.5 mV intervals.
4. Click the Adult pass range below to customize the pass range between 1 to 600 joules for either adult or pediatrics.
   Note: The pass range sets in Routine List only applies in this mode and won't change the range in DFS Management setting.
5. When the settings are complete, press the start button to start testing.
   Note: The DFS200 will continue outputting the pre-shock ECG pattern while the AED gives a shock.
6. After the test, the data will automatically be saved in History. To input the AED serial number and any notes for detail, follow the steps below.

To **Enter the serial number** (for Routine List, Manual Test, and AED battery):

1. Click Enter the AED serial number here button.


**Figure 13: Outcome Page of Routine List**

2. Enter the AED serial number and any notes in the detail page.
3. Click the save button to complete the procedure.

Note:

(1) Users can also enter the AED serial number through History. See section 5.5.

(2) Users can enlarge the waveform for further analysis. See page 30 to learn more.

## 5.3 Manual Test Operation

With arrhythmia combinations of user's choice, Manual Test is for checking any brand and model of AED, including but not limited to fully automatic AED and those with increasing energy for consecutive defibrillation shocks. For models providing consecutive defibrillation shocks with increasing energy, users shall turn on the option "Manual Test 3 Consec. Defib," which is available from Settings. (See Settings 5.6.4)

To operate the **Manual Test**:

1. Click the Manual Test on the home screen.

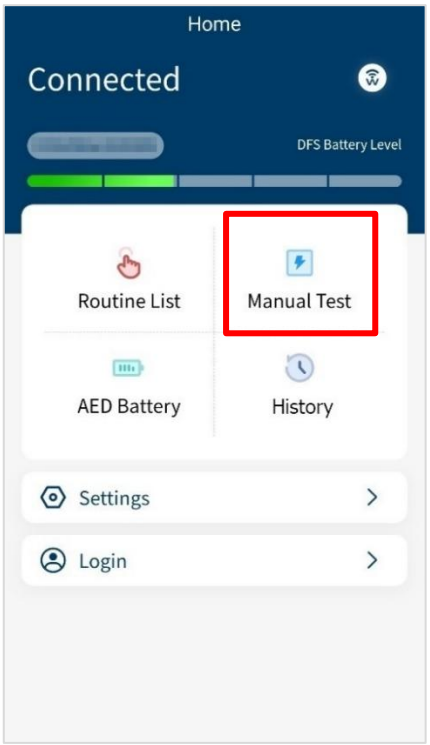


**Figure 14: Manual Test on the Home screen**

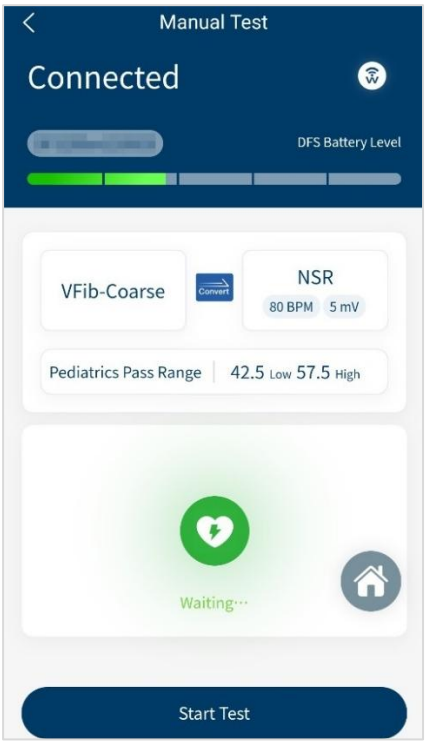


**Figure 15: Manual Test Interface**

2. The interface of Manual Test is similar to Routine List. Click VTach to select the ECG patterns before defibrillation and click NSR to select the ECG patterns after the defibrillation.
   Note: The pass range in Manual Test cannot be changed here. See section 5.6.3 to adjust the pass range for Manual Test.
3. Click the Start Test button to initiate the test.
   Note: The DFS200 will continue outputting the pre-shock ECG pattern while the AED gives a shock.
4. After the test, users will see the outcomes shown on the screen.

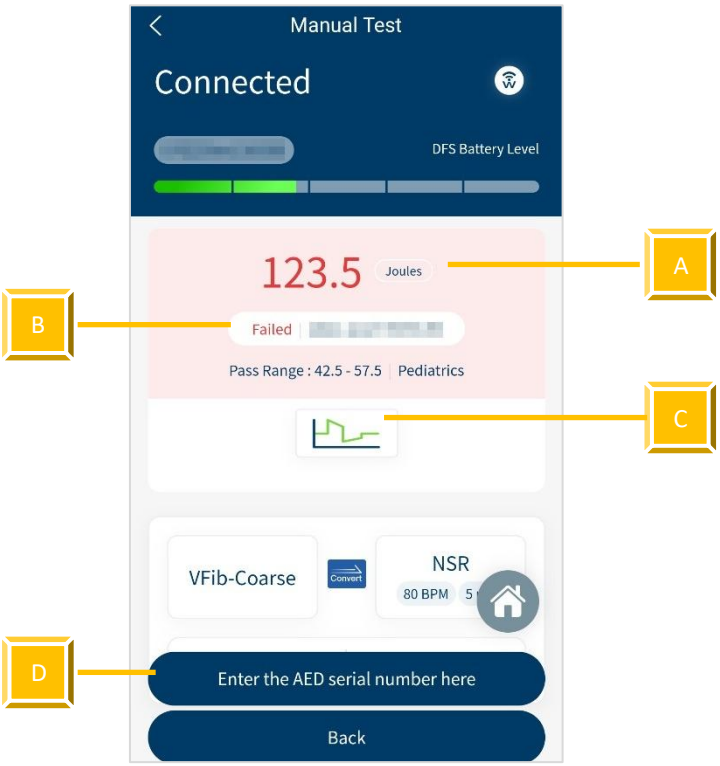


**Figure 16: Outcome Page of Manual Test**

**Table 10: Elements on the Outcome Page of Manual Test**

| Item | Name | Description |
|---|---|---|
| **A** | Outcome | To display the Joules of the defibrillation. |
| **B** | Status | To show whether the Joules lies within the pass range.<br>Note: If the test passes, the background color will be blue. If failed, red. |
| **C** | Waveform | To show the waveform of the defibrillation. |

| Item | Name | Description |
|---|---|---|
| D | Enter AED serial number | To enter the serial number of an AED and any notes to this test data. |

To **enlarge the waveform picture** (for both Routine List and Manual Test):

1. Click the waveform on the outcome page and users will see the left figure below.

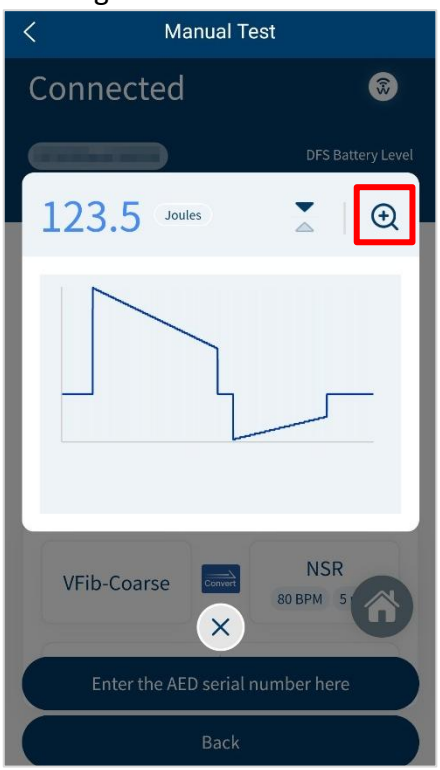


Figure 17: Waveform Enlarge Once


Figure 18: Waveform Enlarge Twice

2. To enlarge again, click the magnifying glass on the right upper-hand side.
3. To close the image, click the cross on the screen.

To **flip the waveform figure** (for both Routine List and Manual Test):

1. Click the waveform on the outcome page and users will see the left figure below.
2. Click the arrow icon in the red frame and the system will flip the waveform figure.

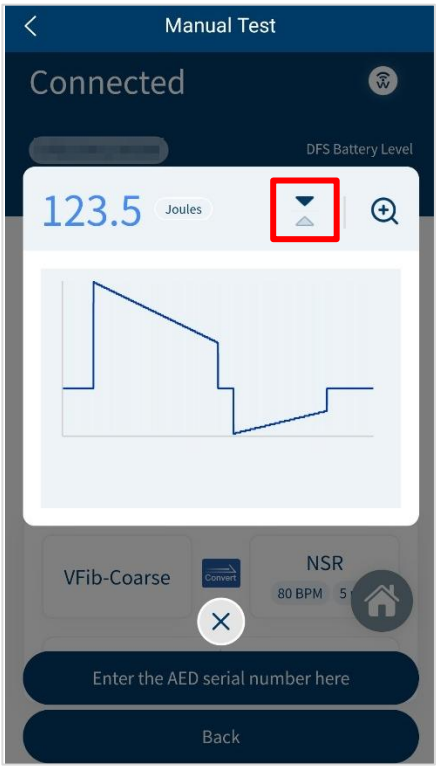


Figure 19: Arrow Icon


Figure 20: Waveform Displayed Upside Down

## 5.4 AED Battery Test Operation

AED battery test is for checking whether the battery level of the AED is good enough for giving defibrillation when needed. To conduct an AED battery test with DFS200, please refer to section 3.4 Wiring diagram and make sure sec. B is properly connected.

To operate **AED Battery**:

1. Click the AED Battery on the home screen.
2. Follow the steps on the screen to complete the AED Battery test. Please put the removed AED battery on a fixed surface, and avoid holding the AED battery, test probes and mobile phone for testing at the same time, so as to remain the same measurement position. The result will show up after placing the test probes at the AED battery for 5 seconds, and the test data will automatically be saved in History. To add the AED serial number or any notes to the data, click Enter the AED serial number here button.

Note: The battery measurement probe with load is an optional accessory which can simulate the actual power consumption within the AED as if the battery is installed in the AED. To know more about this accessory, please refer to section 1.2.

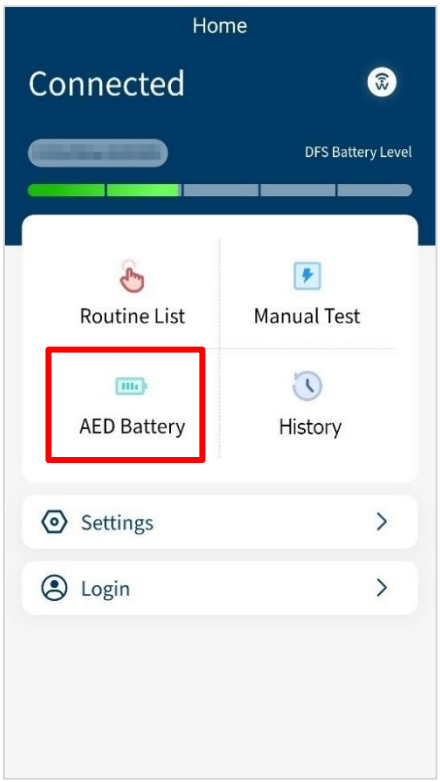


**Figure 21: AED Battery on the Home Screen**

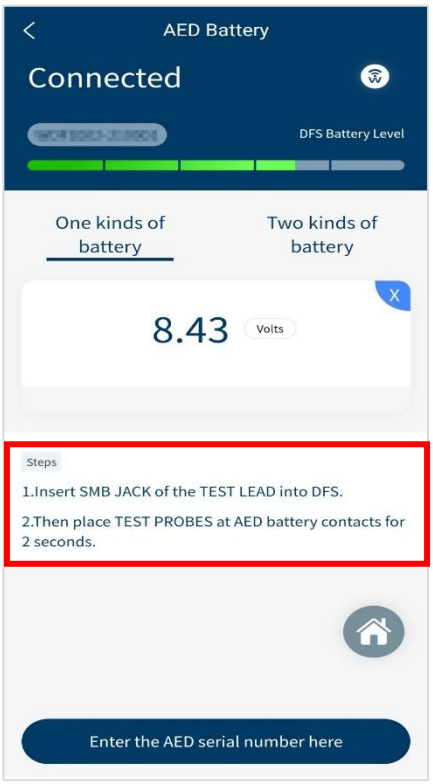


**Figure 22: AED Battery Interface**

## 5.5 History

The record in History keeps the test date & time, the serial number of AED tested, as well as test result completes the maintenance task. Users may include notes as reminders and export the results for further analysis.

To operate **History**:

1. Click History on the home screen and users will see Figure 24 on the screen.
2. In this page, users can manage, sort, or export the data by clicking different buttons. The button functions are listed below:

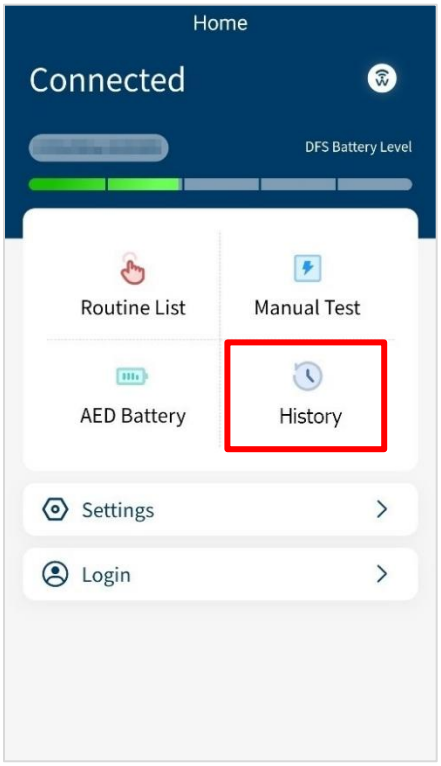


Figure 23: History on the Home Screen

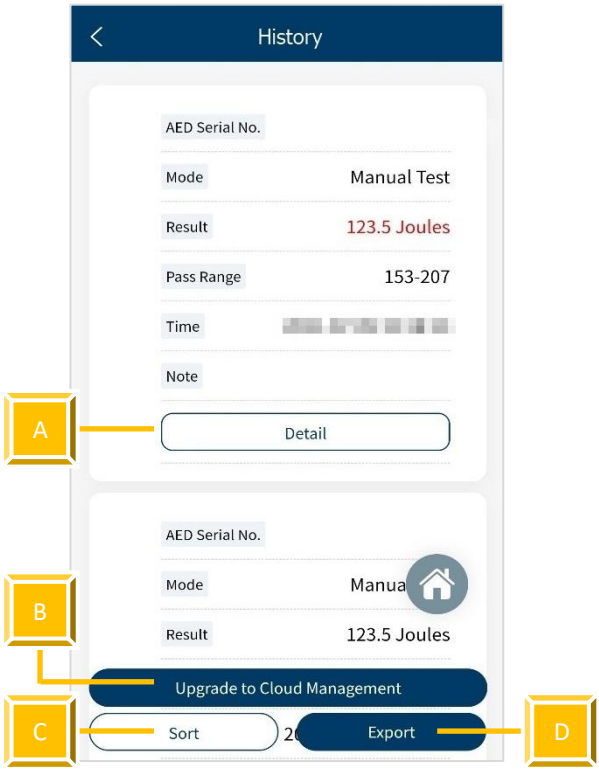


Figure 24: History Interface

**Table 11: Button Functions in History**

| Item | Name | Description |
|---|---|---|
| **A** | Detail | To add AED serial number and any notes to the data. |
| **B** | Upgrade to Cloud Management | To better manage the data through a particular system.<br>Note: To know more about this system, please refer to sec.13 to contact WhaleTeq. |
| **C** | Sort | To sort the data in different sequences. |
| **D** | Export | To export the data (*.csv) to other platforms. |

## 5.6 Settings

### 5.6.1 Login

Login for AED CMMS PLATFORM which can help users to further manage or analyze the data. To know more about this system, please refer to sec.133 and contact WhaleTeq.

### 5.6.2 DFS Management

For first-time users, all DFS200 are listed under Available and none under Paired. Once pairing from Available, the DFS200 is moved to Paired section. If there is more than one DFS200 under Paired section, the top one will be automatically connected when both DFS200 and the smartphone Bluetooth are on. Users may also arrange the DFS200 in Paired section. Please refresh Available for nearby DFS200 that is ON.

Click the ‘’Settings’’ button of a paired DFS200 to go to the DFS Device Settings page, and users can set the standby time (part A, range: 180 to 600 seconds) and the ECG waveform for standalone mode (part B).

Besides, users can also check the current firmware version of the DFS200 on the DFS Device Settings page.

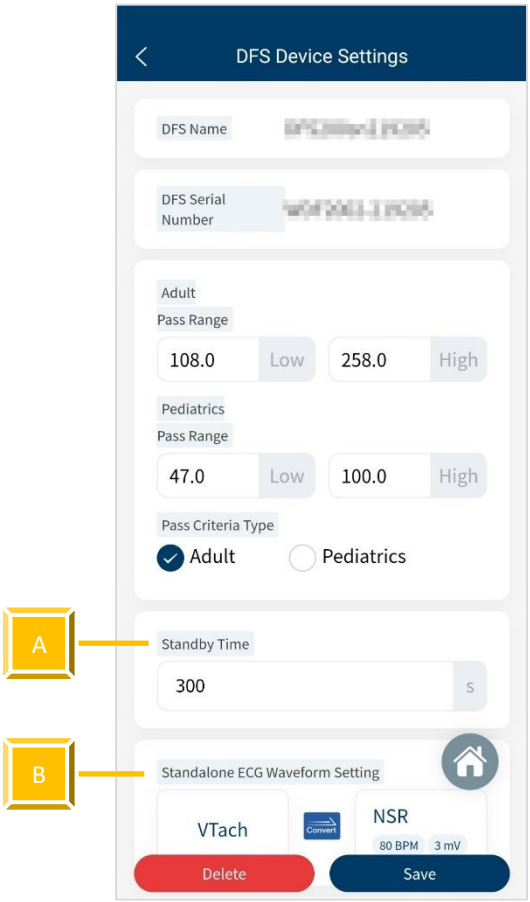


**Figure 25: DFS Device Settings Interface**

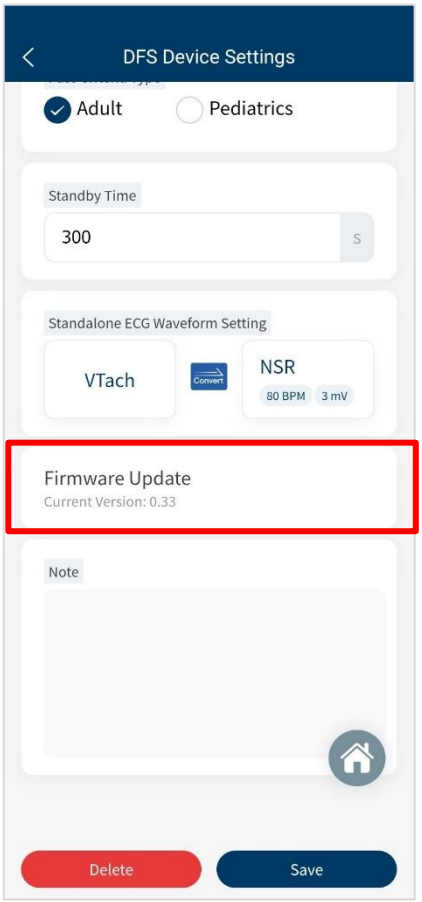


**Figure 26: Current Firmware Version**

### 5.6.3 Set Pass/Fail Range

Users can set adult and pediatric pass criteria here. Only when DFS200 is connected does this page work. Depending on the different models of DUT (AED), the delivered defibrillation is different. DFS200 allows users to self-define the minimal and maximal limits of the defibrillation shock. Equal or above the minimal limit value, the Discharge LED lights green; otherwise, lights red.

### 5.6.4 Manual Test 3 Consec. Defib

Default is off for the majority of AEDs. Turning this function on allows consecutive ECG patterns played as well as consecutive record keeping.

To activate **consecutive defibrillation test**:
1. In Settings, users will see figure 27 on the screen.
2. Enable the ''Manual Test 3 Consec. Defib'' and go to the Manual Test page to click the ''ECG pattern (before)'' button, then check ''Thrice'' and click OK to complete the settings.

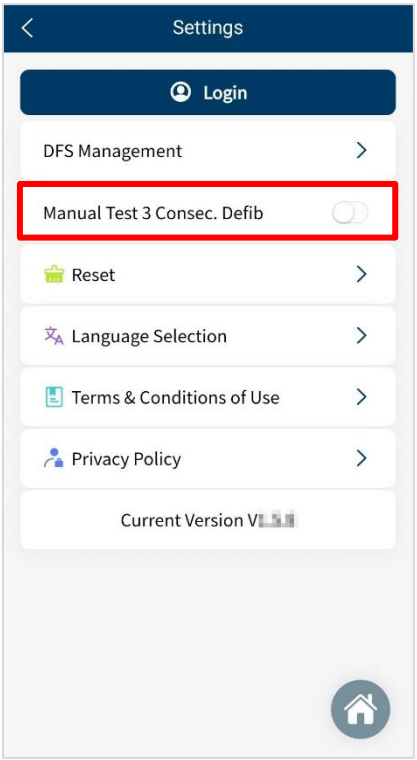


**Figure 27: 3 Consec. Defib. Activation in the Settings Page**

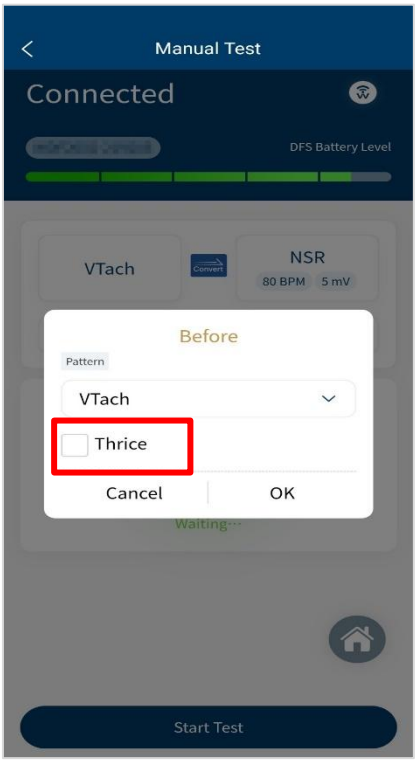


**Figure 28: The Checkbox for Activating the 3 Consec. Defib Function in the Manual Test Page**

### 5.6.5 Reset

Clear the customized setting including paired DFS200. Test results will remain in History.

### 5.6.6 Language Selection

Users can switch the language of the DFS200 APP for Mandarin, simplified Chinese, English, or French.

### 5.6.7 Terms & Conditions of Use

This page informs users about the terms of use regarding DFS200.

### 5.6.8 Privacy Policy

This page informs users of WhaleTeq's policies regarding the collection, use, and disclosure of personal data when using WhaleTeq's Service.

### 5.6.9 Current version

Check the version number of the DFS200 APP here.

# 6 PC Software Functions and Operation Instructions

With the optional PC software, the QA department can rapidly verify the AED performance. Please refer to the following steps for test setup:

1. To ensure a proper connection between the DFS200 and the AED, make sure that the yellow line on the banana connectors of the black and red AED cables is completely inserted into the jack on the DFS200. Connect the other end of the AED cable to the AED using the compact splicing connectors.
2. Use a USB Type-A to Type-C cable to connect the DFS200 to the computer.
3. Power on the DFS200, then activate the installed PC software.
4. After activating the PC software, the ‘’License Activation’’ window will show. Enter the activation key obtained from the purchase of the software to initiate operations.

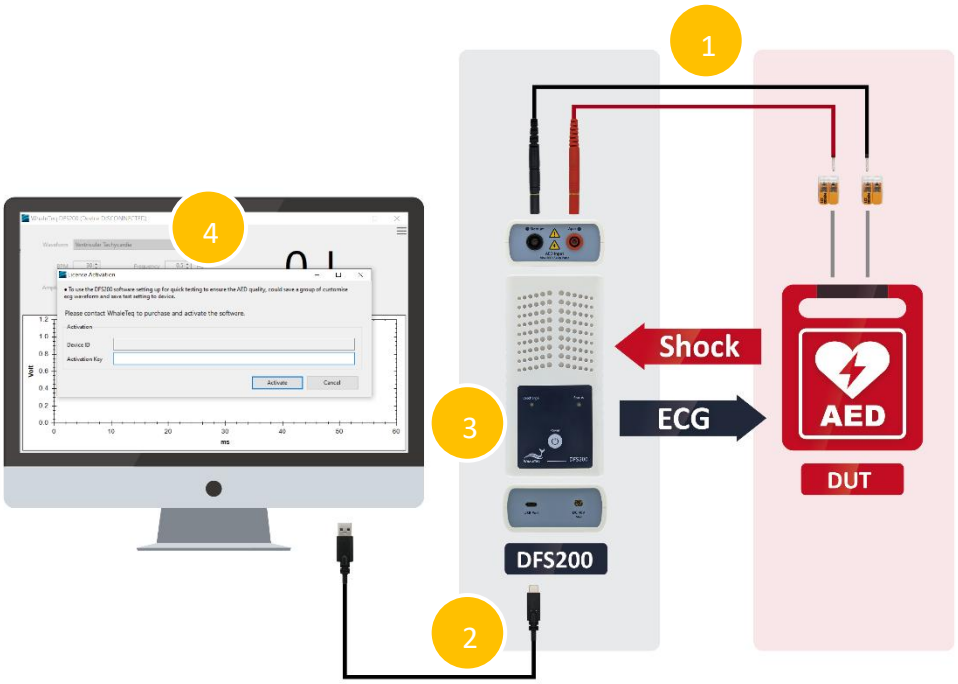


**Figure 29: Diagram of DFS200 Test Setup with the PC Software**

## 6.1 PC Software General Introduction


**Figure 30: Home Screen of the PC Software**

**Table 12: Function Introduction of the PC Software**

| Item | Name | Description |
|---|---|---|
| **A** | ECG Waveform | Select the desired ECG waveform for testing.<br>The provided ECG waveforms are listed below, and users can also load a customized waveform.<br>Ventricular Fibrillation – Coarse<br>Ventricular Fibrillation – FINE<br>Ventricular Tachycardia<br>Ventricular Tachycardia Plus (the faster VT)<br>Atrial Fibrillation<br>Asystole<br>NSR<br>Note: The DFS200 will continue outputting the ECG pattern while the AED gives a shock. |

| Item | Name | Description |
|---|---|---|
| **B** | BPM, Frequency, and Amplitude | Adjustable BPM, frequency, and amplitude are only available for NSR as the desired ECG waveform for testing. |
| **C** | Start Button | Start the test by playing the designated ECG waveform.<br>After the test starts, this button will turn into ''Stop''.<br>Note: A 60-second interval between each defibrillation test is required. |
| **D** | Shock Waveform | Display the shock waveform given by the DUT. |
| **E** | DFS200 Battery Level | Display the battery level of DFS200. |
| **F** | Shock Energy (in Joules) | Display the shock energy (in Joules) given by the DUT. |
| **G** | Pass Criterion | The pass criterion is configured by users to determine whether the shock energy is a pass (shown in black) or a fail (shown in red). |
| **H** | Check for Update | Check whether the DFS200 firmware and the PC software are the latest version.<br>To use the PC software, the DFS200 firmware version must be 0.33 or above. |
| **I** | Custom Waveform | Users can load and save a raw data file for customized testing.<br>Please refer to ''6.1.1 Custom Waveform'' for more information. |
| **J** | Standalone Setup | Users can configure a set of commonly used ECG signals for standalone testing with the DFS200 when not connected to the PC software.<br>Please refer to ''6.1.2 Standalone Setup'' for more information. |
| **K** | Pass Range | Set shock energy pass criteria for the adult and pediatric modes.<br>Please refer to ''6.1.3 Pass Range'' for |

| Item | Name | Description |
|---|---|---|
| | | more information. |
| **L** | WhaleTeq Format | The ECG raw data file that users intend to load must adhere to the WhaleTeq format.<br>Please refer to ‘’6.1.4 WhaleTeq Format’’ for more information. |
| **M** | Help and Feedback | When using this PC software, if users encounter any difficulties, please click this item to provide feedback.<br>Please refer to ‘’6.1.5 Help and Feedback’’ for more information. |

### 6.1.1 Custom Waveform

Click the settings icon "☰" and select "Custom Waveform" to bring up the "Custom Waveform" window, and follow the steps below to load a raw data file:

1. Click the "..." button to bring up the file selection window and choose the desired file.
2. After loading the file, the "Custom Waveform" window will display the waveform of this file. Click "Save" to store it.
3. Disconnect the USB cable connecting the DFS200 and the computer, then reboot the DFS200.

Note:
(1) The saved custom waveform can only be used in the PC software and cannot be used in the DFS200 APP.
(2) The DFS200 can store up to 20 seconds of the custom waveform. If the desired custom waveform exceeds 20 seconds, the DFS200 will automatically trim the excess seconds during the loading process.

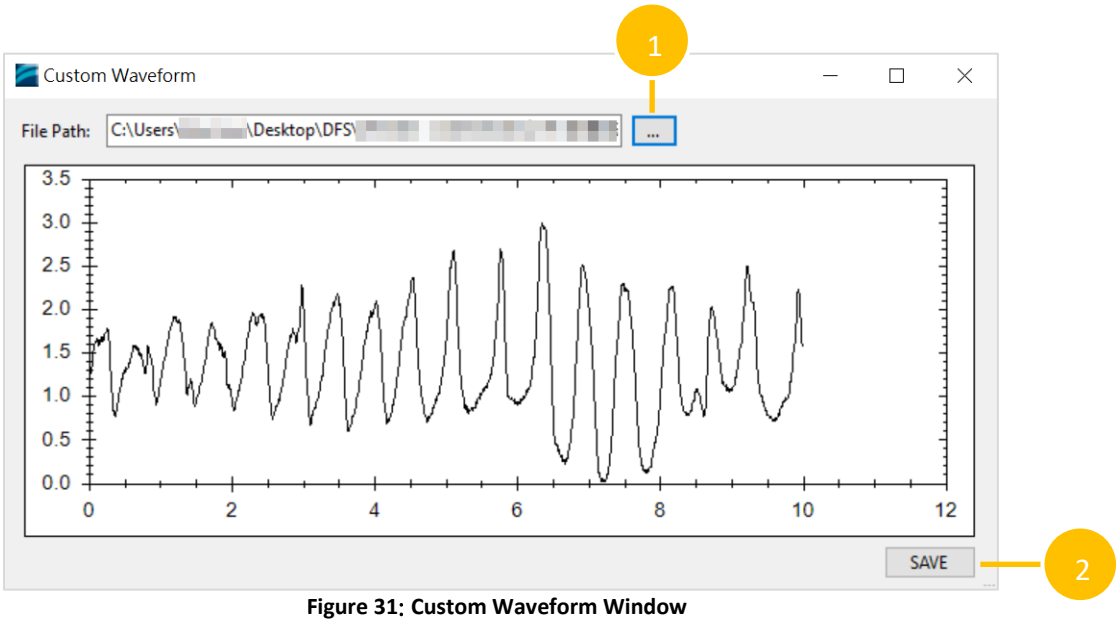


**Figure 31: Custom Waveform Window**

### 6.1.2 Standalone Setup (ECG Signal Settings for Standalone Operations)

Click the settings icon "☰" and select "Standalone Setup" to bring up the "Standalone Setup" window, and follow the steps below to configure and store a set of ECG signals for standalone operations:

1. Select the ECG signal.
2. Selecting "Never turn off the device" enables the DFS200 to continuously play the selected ECG signal until its battery runs down.
Selecting "Turn off device after 600 seconds" allows the DFS200 to play the selected ECG signal for the specified duration (configurable within the range of 180 to 600 seconds). After completing the set duration, the DFS200 will automatically power off.
3. Click "Save" to save the configuration.
4. Disconnect the USB cable connecting the DFS200 and the computer, then reboot the DFS200.

Note: The ECG signal options include the custom waveform stored in "6.1.1 Custom Waveform".

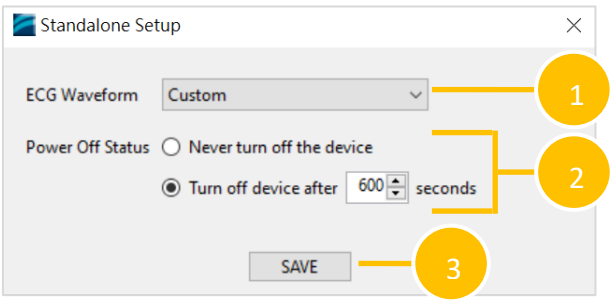


**Figure 32: Standalone Setup Window**

### 6.1.3 Pass Range

Click the settings icon "☰" and select "Pass Range" to bring up the "Pass Range" window, and follow the steps below to set the defibrillation energy criteria:

1. Select Adult or Pediatric modes.
2. Set the upper limit of the criterion (range: 1.0 to 600.0J).
3. Set the lower limit of the criterion (range: 1.0 to 600.0J).
4. Click "OK" to complete the settings, and the values will be displayed on the home screen.

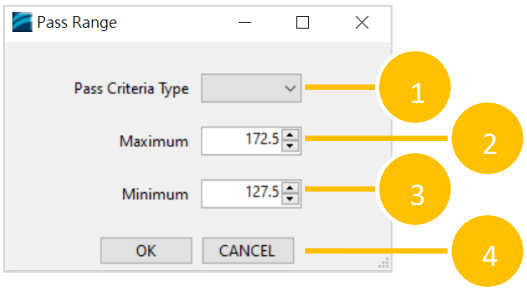


**Figure 33: Pass Range Window**

### 6.1.4 WhaleTeq Format

The ECG raw data file that users intend to load must adhere to the WhaleTeq format below.

**File Format**:
[sampling frequency]
[number of samples per signal]
[number of signals]
[signal description (signal-1)] ...
[sample data-1 (signal-1)]...
[sample data-2 (signal-1)]...
[sample data-N (signal-1)]...

**Description**:
*number of signals*
This number must be greater than 1.

*signal description*
The description text for the signal. The ‘’ECG’’ signal will be loaded first. But if the ‘’ECG’’ signal is not found, the first signal data will be loaded.

*sample data*
The raw data unit is mV. If the amplitude is over 5mV, the raw data will be scaled to 0~5mV.

### 6.1.5 Help and Feedback

Click the settings icon "☰" and select "Help and Feedback" to link to the technical support page on WhaleTeq's official website. Users can fill in questions or provide feedback with attached relevant screenshots and videos for WhaleTeq to assess and provide a solution.

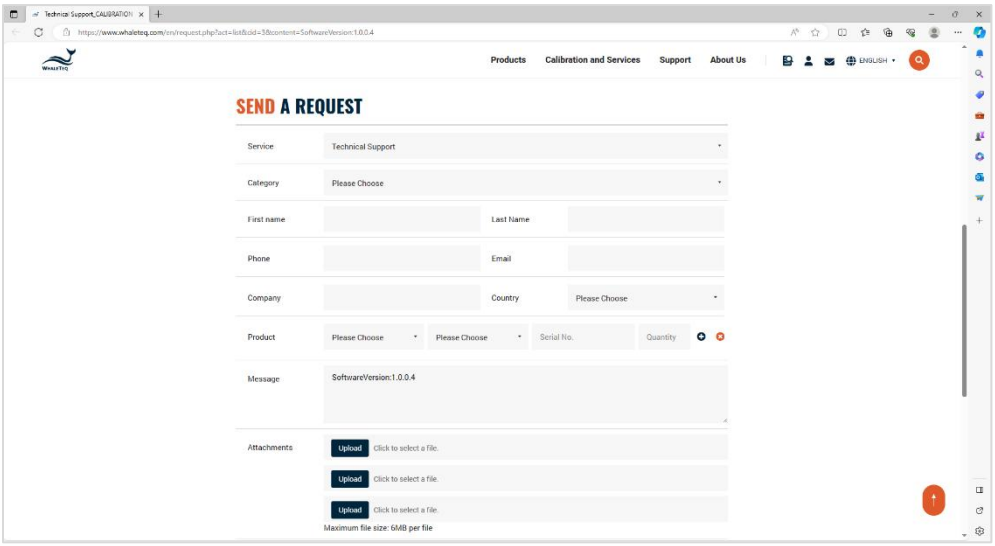


**Figure 34: Technical Support Page on WhaleTeq’s Official Website**

# 7 Standalone Operations

When disconnecting from the mobile APP or PC software, the DFS200 can perform in standalone operations.
The ECG signals for playback in standalone operations are as follows:

| | |
|---|---|
| Standalone operation without connecting to the mobile APP | ECG waveform settings for standalone mode as set in the mobile APP.<br>Users can set a playback duration (range: 180 to 600 seconds), and the DFS200 will automatically power off after completing the set duration.<br>(refer to "5.6.2 DFS Management") |
| Standalone operation without connecting to the PC software | ECG waveform settings for standalone mode as set in the PC software.<br>Users can set a playback duration (range: 180 to 600 seconds) or choose to continuously play the signal until the DFS200 battery runs down.<br>(refer to "6.1.2 Standalone Setup") |

With the above ECG signals specified in advance, the DFS200 automatically plays this ECG signals upon being turned on and the Status LED would blink red/green alternatively.

Then, if the AED determines that a defibrillation shock is needed and then delivers the corresponding energy, the AED Discharge LED lights according to the threshold (adult/pediatric) specified in advance from the mobile APP or the PC software.

The above procedure completes one round of an energy test.

Note: If the user has set an ECG signal for standalone operations using the PC software and later uses the mobile APP to configure another set of ECG signals for standalone operations, the DFS200 will play the signal from the latest configuration.

# 8 Calibration and Validation

It is recommended to get DFS200 calibrated annually. Calibration and validation both require traceable equipment. Steps for Calibration/ Validation methods are available upon request. Please contact WhaleTeq for more details (See section 13).

# 9 Troubleshooting

(1) If after AED defibrillation shock, and the AED Discharge LED does not light up, check the AED interface cable connection.
(2) If users are certain that the AED defibrillation energy matches its specification, but the AED Discharge LED lights red, check 5.6.2 DFS Management setting to ensure the joule threshold is set correspondingly.
(3) When DFS200 “Status” blinks red, change the battery at users’ earliest convenience.
(4) When using the battery measurement probe with load (model no. 300-DFBMPLD) to test an AED battery but can’t have its test result, please check whether the probe’s surface is warm or the probe has been continuously used for more than 30 seconds. The above situations indicate that the probe is overheated, so users should suspend the test and restart after it cools down.

# 10 Cautions

**(1) Follow AED instructions during testing with DFS200.**
**(2) Follow color code and/ or labeling when connecting DFS200 and AED via AED interface cable.**
**(3) When DFS200 is in use, the face containing LEDs and buttons must face up to allow ventilation.**
**(4) To allow ventilation, DFS200 should be used to analyze defibrillation energy at the interval of at least 60 seconds.**
**(5) AED battery test probe should remain steady when testing.**
**(6) USB cable used for FW upgrade must be file-transferrable.**

(7) **Battery, whether one-time use or rechargeable, must be included in DFS200 for accurate energy measurement.**
(8) **When Status LED blinks red, the Discharge LED may dim and blink at a faster frequency. This is a warning to change the battery as soon as possible in order to ensure accurate test results.**
(9) **USB Port cannot be used to charge the battery.**
(10) **For best performance, rechargeable battery capacity is recommended to be 800mAh or above.**
(11) **When not in use for a longer period, remove the battery from DFS200 to ensure a longer lifespan of the battery.**
(12) **DFS200 is a defibrillator / AED handheld tester, which can also be used in laboratory and can calibrate the defibrillation energy.**
(13) **If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.**

# 11 Ordering Information

**Table 13: DFS200 Test System**

| Part No. | Image | Description | Quantity |
|---|---|---|---|
| 100-DF00107 |  | **Model No.**: DFS200<br>**Model Name**: Defibrillator / AED Handheld Tester<br><br>Package contents:<br>• DFS200 x 1<br>• 9V alkaline battery x 1<br>• Open-ended AED cable (Banana Male), 0.5 meter (Black) x 1<br>• Open-ended AED cable (Banana Male), 0.5 meter (Red) x 1<br>• Compact splicing connector x 2<br>• Battery measurement probe with load x 1<br>• DFS carrying bag x 1 | 1 |

**Table 14: DFS200 Optional Accessories**

| Part No. | Image | Description | Quantity |
|---|---|---|---|
| G34-0600101 |  | DFS carrying bag | 1 |
| D06-9000321 |  | 9V alkaline battery | 1 |
| K22-0500101 * |  | Open-ended AED cable (Banana Male), 0.5 meter (Black) | 1 |
| K22-0500102 * |  | Open-ended AED cable (Banana Male), 0.5 meter (Red) | 1 |
| 300-DFBMPLD |  | Battery measurement probe with load | 1 |
| K29-0900501 |  | Battery measurement probe | 1 |
| N61-0210033 |  | Compact splicing connector | 1 |

| Part No. | Image | Description | Quantity |
|---|---|---|---|
| K27-1800304 |  | USB transfer cable: Type-A to Type-C (Male to Male), 1.8 meter | 1 |

*Note: Customization of AED interface cable adapter is available. Please contact WhaleTeq (service@whaleteq.com).

**Table 15: Optional DFS200 Paddle Box Set**

| Part No. | Image | Description | Quantity |
|---|---|---|---|
| 300-DFPDOCK |  | DFS Tester Docking Base for Defibrillator | 1 |
| E13-070P101 |  | DFS Tester Defibrillation Receiving Plate | 2 |

Note: One DFS Tester Docking Base for Defibrillator needs to install two DFS Tester Defibrillation Receiving Plate.

**Table 16: Optional Software**

| Part No. | Description |
|---|---|
| HE0-DF00003 | DFS200 PC Software |

**Table 17: Optional Calibration Service and Warranty Extension**

| Part No. | Description |
|---|---|
| YY0007 | **Model No.**: C3<br>Provides (3) years of calibration service coverage. WhaleTeq equipment can be calibrated to original performance on the basis of (1) year interval. |

| Part No. | Description |
|---|---|
| YY0008 | **Model No.**: R3<br>Extend the limited warranty from (1) year to (3) years. |

## 12 Revision History

**Table 18: Revision Version**

| Version | Revision Description | Issue Date |
|---|---|---|
| 2021-07-27 | First Version | 2021-07-31 |
| 2021-12-31 | Add<br>Chapter 1.2 Battery measurement probe with load &paddle box introduction<br>Chapter 2.3 Energy Measurement Specifications<br>Chapter 3.4 Defibrillator Testing Scenario (Optional)<br>Chapter 9 Caution (5) (12)<br>Chapter 10 ordering information<br>Chapter 11 Package contents | 2022-01-14 |
| 2022-12-28 | Update<br>Chapter 2 Specifications<br>Section 5.1.2 Smartphone Wireless Connection<br>Section 5.4 AED Battery Test Operation<br>Chapter 10 Ordering Information<br>Chapter 11 Package Contents | 2023-01-04 |
| 2023-04-07 | Update<br>Figure 10, 19, 22, and 24<br>Section 5.6.6 Language Selection<br>Chapter 8 Troubleshooting | 2023-04-07 |
| 2023-07-06 | Update<br>Table 11: DFS200 Test System<br>Table 12: DFS200 Optional Accessories<br>Table 15: DFS200 Standard Package Content<br>Table 16: DFS200 Optional Accessories | 2023-07-14 |
| 2023-11-29 | Update | 2023-12-13 |

| Version | Revision Description | Issue Date |
|---|---|---|
| | 1.2 Applications<br>3.1 Top<br>3.2 Front and Rear<br>4.3 Firmware Update<br>4.3.1 System Requirements<br>4.3.2 Software Installation<br>5.1.1 APP Function<br>5.1.4 DFS200 Auto-off<br>5.2 Routine List Operation<br>5.6.1 Login<br>5.6.2 DFS Management<br>5.6.4 Manual Test 3 Consec. Defib<br>7 Standalone Operations<br>11 Ordering Information<br>Add<br>6 PC Software Functions and Operation Instructions | |
| 2024-01-24 | • Update<br>4.3 Firmware Update<br>5.1.2 Smartphone Wireless Connection<br>5.2 Routine List Operation<br>5.3 Manual Test Operation<br>6.1 PC Software General Introduction<br>6.1.1 Custom Waveform<br>6.1.2 Standalone Setup<br>7 Standalone Operations<br>11 Ordering Information<br>Figure 30, 32<br>• Add<br>Figure 6, 7, 8 | 2024-02-01 |
| 2025-05-19 | Update<br>1.2 Applications<br>2.3 Energy Measurement Specifications | 2025-05-29 |

# 13 Contact WhaleTeq

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