NORAV medical
ECG Excellence

Mobile ECG
INSTRUCTIONS FOR USE

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Mobile ECG Instructions for Use

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Manufacturer and Contact Information

Norav Medical GmbH

Christof-Ruthof-Weg 10

D55252 Mainz-Kastel

Germany

Phone: +49 (0) 6134-567983-0

Fax: +49 (0) 6134-567983-14

E-Mail: info@norav.com

Disclaimer

This system is intended as a decision support system for persons who have received appropriate medical training and should not be used as a sole basis for making clinical decisions pertaining to patient diagnosis, care, or management. Any application of medical information from the program, other than the original design or intended use thereof, is not advised and considered misuse of the software product.

Norav Limited Warranty

Norav products are warranted to be free from manufacturing and material defects for a period of one (1) year from the date of shipment from Norav or the dealer to the original purchaser.

Excluded from this warranty are expendable supply items including, but not limited to, electrodes, lead wires, patient cables, and battery. This warranty does not apply to any product that Norav determines to have been modified or damaged by the customer.

Except for the express warranties stated above, Norav disclaims all warranties including implied warranties of merchantability and fitness. The stated express warranties are in lieu of all obligations or liabilities on the part of Norav for damages, including but not limited to, special, indirect, or consequential, arising from or in connection with the use or performance of Norav products.

Any action for breach of warranty shall be commenced within one (1) year of said breach or be forever barred. Any repairs made to the product that are not covered by the warranty shall be billed to the customer.

For service or technical support, contact your local supplier or Norav Medical GmbH.

Standards Compliance

The interference generated by the device was tested according to the EMC Directive 89/336/EEC and found compliant with the standard.

The software complies with Standards for Analysis of Ventricular Late Potentials Using High Resolution or Signal Averaged Electrocardiography, published in 1991 by the Task Force Committee of the European Society of Cardiology, the American Heart Association, and the American College of Cardiology.

The NR ECG device conforms to MDD 93/42/EEC Annex II, IEC 60601-1, and IEC 60601-1-2.

The NR ECG device is tested and certified for the following standards:

- EN 60601-1: International
- EN 60601-2-25: International
- Class and Protection Type

Device	Class	Protection Type
NR-1207-E	II	BF
NR-1207-3		CF

- Defibrillation protection: Built in for ECG cable lead wires with "Banana" and "Clip" ends.

Table of Contents

1. Introduction

Document Conventions

Warnings Cautions and Notes

Pay particular attention to specific points in a procedure when one of the following messages is displayed:

Warning

Warnings call attention to possible hazards involving potential damage or injury to persons.

Caution

Cautions refer to practices necessary to protect against potential damage to equipment or loss of equipment. Pay careful attention to instructions.

Note

Notes provide pertinent information to help obtain optimum software performance or signify an important step or procedure requiring special attention.

Abbreviations and Acronyms

Abbreviation	Meaning
API	Application Programming Interface
AHA	American Heart Association
BP	Blood Pressure
BT	Bluetooth®
ECG	Electrocardiogram
EMC	Electro Magnetic Compatibility
FCC	Federal Communications Commission
FTP	File Transfer Protocol
FTPS	File Transfer Protocol Secure
ID	Patient Identification
IEC	International Electrotechnical Commission
LQTS	Long QT Syndrome
MDD	Medical Device Directive
MFER	Medical waveform Format Encoding Rules
NFC	Near Field Communication
NR	Norav Recorder
Record	ECG test
SpO2	Oxygen Saturation
USB	Universal Serial Bus

Safety

Warning

The NR ECG device uses battery for main power supply (unless connected via the USB port). It is also sensitive to electrical interference. To prevent possible injury, read this page carefully prior to installing the device.

Caution

US Federal Law restricts this device to sale by, or on the order of, a physician.

- Other devices which are part of the system must meet the requirements of the Standard for Information Technology Equipment (IEC 60950) and the Standard for Electrical Medical Devices (IEC 60601-1)
- Computers and printers used with Medical Devices should be evaluated for EN 60950-1, EN 60601-1 or equivalent safety standard to maintain the safety of Medical Devices.
- Accessory equipment connected to the analogue and digital interfaces must be certified according to the respective IEC/EN standards (e.g., IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment). Furthermore, all configurations shall comply with the valid version of the standard IEC/EN 60601-1-1. Therefore, anybody who connects additional equipment to the signal input or output connector for configuring a medical system, must make sure that it complies with the standard. Use only the original data cable/power adapter assembly.
- Magnetic and electrical fields can have an influence on the function of instruments. Ensure that all non-Norav Medical equipment which is operated nearby complies with the EMC requirements (regulations for Electro Magnetic Compatibility). X-Ray, CTs, etc. can cause interference with other equipment, because of their authorized higher emission of electromagnetic interference.
- **Pacemaker** – minimum distance of 15 cm (6 inches) is recommended between the wireless NR ECG device and a pacemaker to avoid potential interference with the pacemaker. Some studies have shown that wireless devices may interfere with implanted cardiac pacemakers if used within eight inches of the pacemaker. Pacemaker users may want to avoid placing or using a wireless device this close to their pacemaker.

  Patients with pacemaker:
  - Should always keep the wireless NR ECG device at least 30 cm from their pacemaker when the NR ECG device is turned ON.
  - Should not carry the NR ECG device in their breast pocket.

  If you have any reason to suspect that interference is taking place, turn OFF the NR ECG device immediately.
- Use only the recommended battery type as instructed in the technical specifications for NR ECG devices (single AA alkaline or NiMH rechargeable battery).
- Do not use a battery with expired date.
- Remove the battery from the NR ECG device when it is not in use.
- In the event of apparent changes in the performance of the device, discontinue use immediately. Do not resume use until the device is approved by the manufacturer or by a representative of the manufacturer.
- Defibrillation protection is built in for ECG cable lead wires with "Banana" and "Clip" ends.

- Operation only by trained medical staff.
- This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
  a. This device may not cause harmful interference.
  b. This device must accept any interference received, including interference that may cause undesired operation.

Note

- The manufacturer is not responsible for any Radio or TV interference caused by unauthorized modifications to this equipment. Such modifications may invalidate user authority to operate the equipment.
- Install hardware only after software installation.

Intended Use

ECG Intended Use

ECG is intended to disclose either normal condition or patterns of arrhythmia, myocardial ischemia, rate abnormalities, or features of prognostic value in adults and pediatric populations in the following cases:

- Patients with suspected cardiac abnormalities.
- Populations of patients at an age or period in which a routine baseline evaluation of ECG characteristics is desired.

NR ECG Device Indications for Use

Angina pectoris (chest pain) is a clinical syndrome resulting from myocardial ischemia, indicative of reduced blood supply to the cardiac muscle. The electrocardiogram may establish the diagnosis of ischemic heart disease if characteristic changes are present. Stress testing is the most widely used method to decide whether this chest pain is related to myocardial ischemia, and thus to coronary artery disease. In stress testing, the contractile capability of the heart muscle is monitored via ECG during patient exercise. Patients exercise by bicycle, treadmill, or other means, while the ECG is monitored continuously. Exercise loads are determined by predefined protocols. The ECG signals are recorded for the resting, exercise, and recovery phase portions of the exercise protocol. The changes in ECG waveforms are compared to the resting ECG records. Most of the commercial stress test systems control the bicycle or treadmill automatically according to the requirements of the chosen protocol, although this is not essential.

ST segment monitoring is intended as aid to the evaluation of myocardial ischemia in patients with known or suspected coronary artery disease. The ST segment algorithm has been tested for accuracy of the ST segment data, and a database is used as a tool for performance testing.

The significance of the ST segment changes must be determined by a physician.

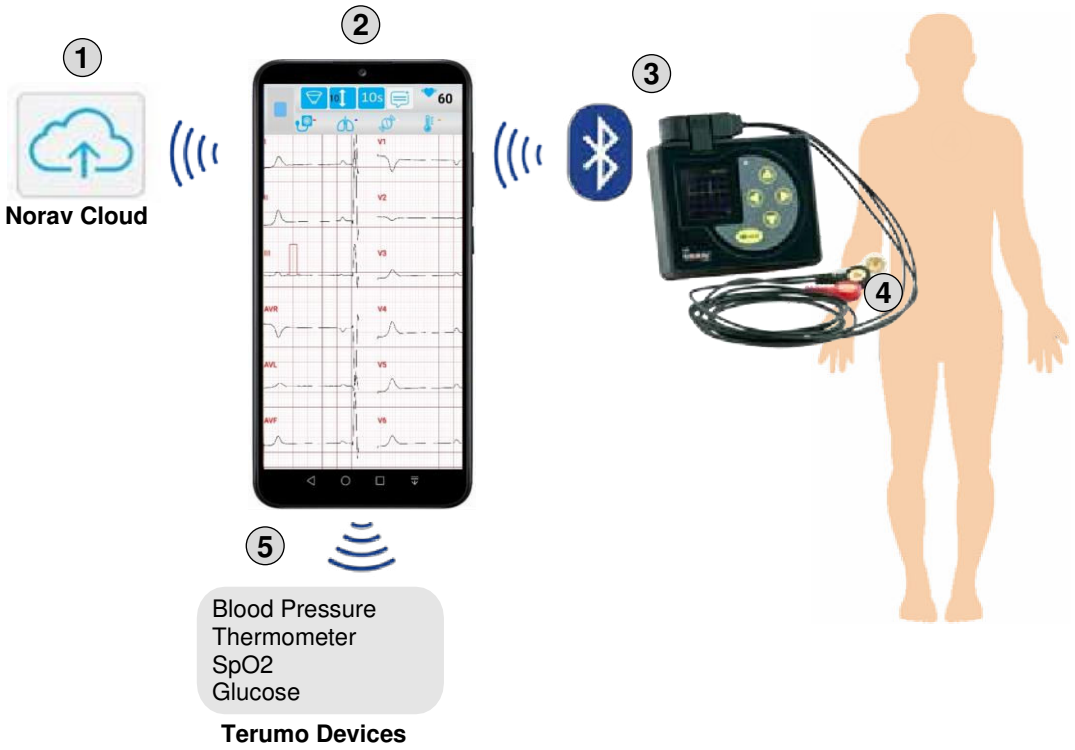
NR ECG Device Contraindications for Use and Adverse Effects

The NR ECG device has no contraindications or adverse events.

2. Overview

System Description

- The NR ECG device is attached to the patient with the IEC 10-Electrode cable (4) – see Section Attaching NR ECG Device Leads to Patient (page 21).
- The Mobile ECG app is installed on a mobile device (2) – see Section Installing the App (page 13).
- The mobile device receives ECG readings from the NR ECG device through Bluetooth® communication (3) – see Section Pairing NR ECG Device to Mobile Device (page 15).
- The Mobile ECG app generates reports that can be edited, managed, and shared. Reports can be uploaded to cloud or to FTP site (1) – see Section Report Screen Options (page 27).
- The mobile device receives measurements from external devices via NFC protocol (5) – see Section External Measurements (page 69).



Recommended System Specifications

Component	Specification
Operating System	Supported from Android ver. 21 (Lollipop)
CPU	At least 2 GHz Quad Core (recommended)
Memory	4 GB
Bluetooth®	4.0 and up
SD Card	32 GB storage
Resolution	800 x 1280 minimum
NFC Mode	Read Vital Signs from Terumo devices and reflect their values on the mobile device display and print.

3. Getting Started

This chapter explains how to begin using the NR ECG device, mobile device, and mobile app including:

1. Unpacking (page 12)
2. Installing the App (page 13)
3. Pairing NR ECG Device to Mobile Device (page 15)
4. Starting the App (page 19)

Unpacking

Open the device package and verify the following package content (see Table 1 and Figure 1).

Table 1: NR ECG Device Package Content

PN	Description
NR-ECG	Wireless Bluetooth® 12-Lead NR ECG Device
C10-B-E-E1-07	NR ECG 10L Cable, Banana, IEC, EI (banana ends - defibrilated)
C10-B-E-E1-08	NR ECG 10L Cable, Banana, IEC, EI (banana ends - defibrilated)
C10-B-E-TEI-08	NR ECG 10L Cable, Trunk, Banana, IEC, EI (banana ends - defibrilated)
C10-B-U-E1-07	NR ECG 10L Cable, Banana, AHA, EI (banana ends - defibrilated)
C10-B-U-E1-08	NR ECG 10L Cable, Banana, AHA, EI (banana ends - defibrilated)
C10-B-U-TEI-08	NR ECG 10L Cable, Trunk, Banana, AHA, EI (banana ends - defibrilated)
C10-B-E-E1-07	NR ECG 10L Cable, Banana, IEC, EI (banana ends - defibrilated)
C10-B-E-E1-08	NR ECG 10L Cable, Banana, IEC, EI (banana ends - defibrilated)
C10-B-E-TEI-08	NR ECG 10L Cable, Trunk, Banana, IEC, EI (banana ends - defibrilated)
C10-B-U-E1-07	NR ECG 10L Cable, Banana, AHA, EI (banana ends - defibrilated)
C10-B-U-E1-08	NR ECG 10L Cable, Banana, AHA, EI (banana ends - defibrilated)
C10-B-U-TEI-08	NR ECG 10L Cable, Trunk, Banana, AHA, EI (banana ends - defibrilated)
C5-C-E-EI-07	NR ECG 5L Cable, Clip, IEC, EI (clip ends - defibrilated)
C5-C-E-EI-08	NR ECG 5L Cable, Clip, IEC, EI (clip ends - defibrilated)
C5-C-U-EI-07	NR ECG 5L Cable, Clip, AHA, EI (clip ends - defibrilated)
C5-C-U-EI-08	NR ECG 5L Cable, Clip, AHA, EI (clip ends - defibrilated)
Battery AA	Battery AA
Instructions for Use (on CD)	Instructions for Use on CD
Installation Instruction	Installation Instruction
BT-USB	Bluetooth® USB Adapter
USB extension cable	USB extension cable
ANT	Detachable antenna for Bluetooth® USB

Figure 1: NR ECG Device Package Content

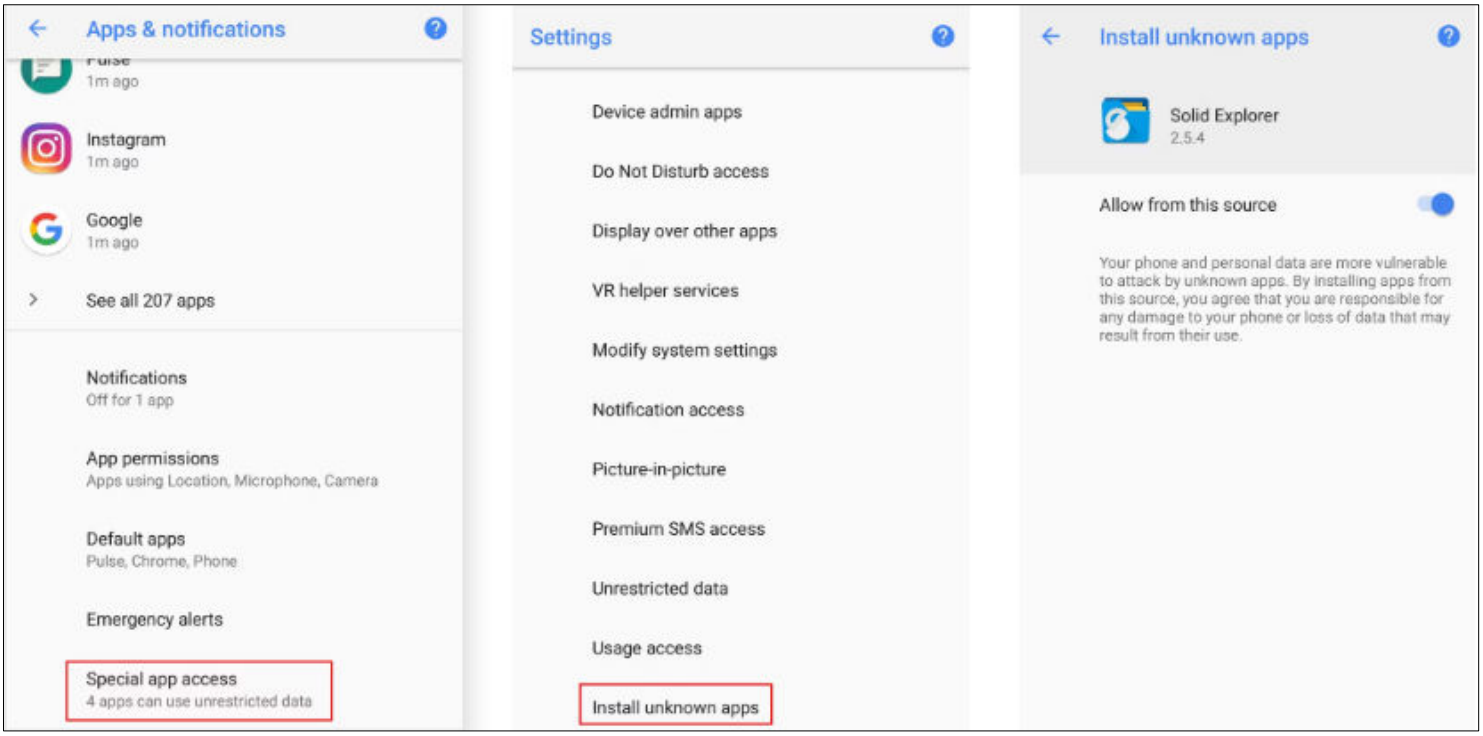
Installing the App

Note

Installing the app requires permission to install files from unknown sources. Clearing the **Unknown sources** checkbox after installation is recommended.

To install the app on the mobile device:

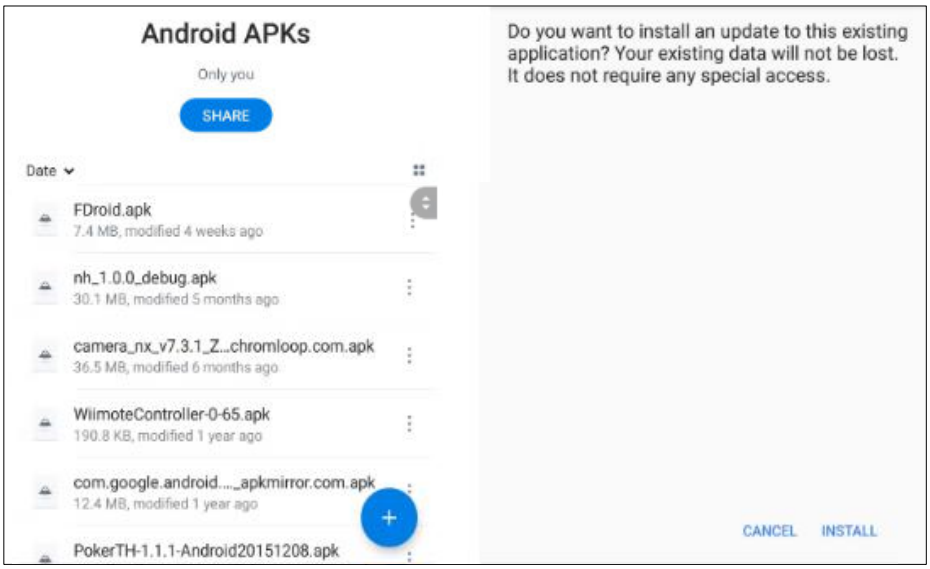
1. On the mobile device settings (see Figure 4), scroll down, tap Security, then tap More settings, and then tap Install apps from external sources.
2. Please refer to third party app installation: https://www.makeuseof.com/tag/how-to-manually-install-side-load-apps-on-your-android-device/.
   Now, you must toggle the Unknown Sources option on a per-app basis, instead of globally. This allows sideloading from certain apps often used, while keeping others blocked for security.
   A. To toggle this on Android 8 through Android 11, open **Settings → Apps & notifications** (see following figure - left).
   B. Expand the Advanced section at the bottom and tap **Special app access** (see following figure - left).
   C. On the resulting menu, scroll down and select **Install unknown apps** (see following figure - middle).
   On Android 12, you can find this setting under **Apps → Special app access**; there is no Advanced heading.
   On this menu, you can view a list of apps on your mobile device that are capable of installing other apps.
   D. Select the app through which you want to install apps, like your browser, cloud storage service, or file explorer.
   E. Tap **Allow from this source** to enable it (see following figure - right).



3. Tap an **APK** file (see following figure).

   You are prompted to install the APK file.

   If your Operaing System is Android 8 - Oreo or newer, make sure granting permission to the cloud storage app to install apps.



The app shortcut  is displayed on the mobile device apps screen (see Figure 2).

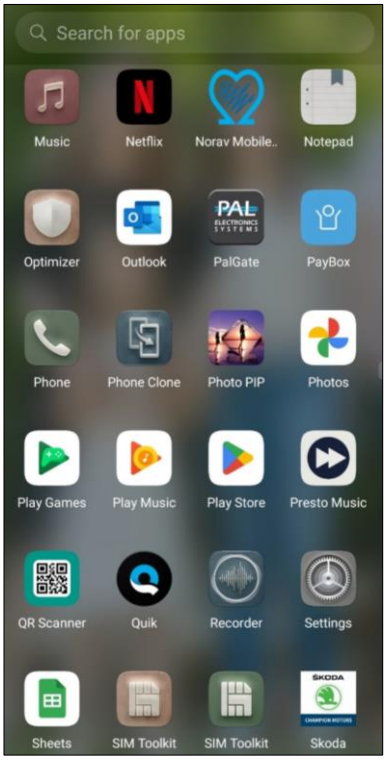


Figure 2: Norav Mobile ECG App Shortcut

Pairing NR ECG Device to Mobile Device

The pairing procedure establishes connection between the mobile device and the NR ECG device.

1. Insert a battery into the NR ECG device (see Figure 3 - Back View).
2. Attach the ECG cable to the NR ECG device (see Figure 3 - Front View).
3. To turn **ON** the NR ECG device, press the  button (see Figure 3 - Front View).

Back View **Front View**

Figure 3: NR ECG Device

Note

This pairing procedure is necessary for initial setup of mobile device and NR ECG device.

4. Open **Settings** on the mobile device and turn **ON** Bluetooth (see Figure 4).

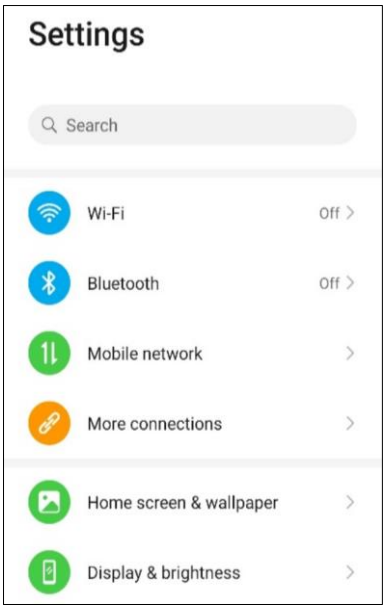


Figure 4: Settings on Mobile Device

5. To find nearby Bluetooth® connected devices, tap Scan on the Bluetooth® menu (see Figure 5).

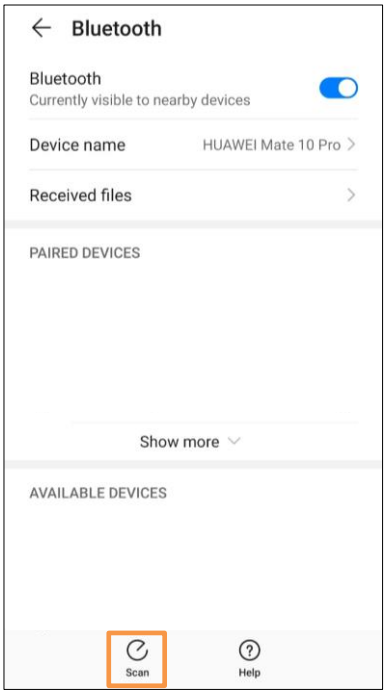


Figure 5: Scan for Bluetooth® Connected Devices Dialog Box

All Bluetooth® devices are displayed (see Figure 6).

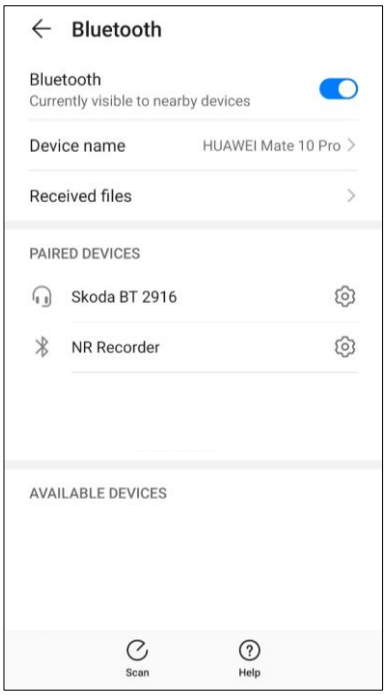


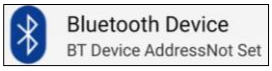
Figure 6: Detected Bluetooth® Devices Screen

6. Select the name of the NR ECG device (see Figure 7).

Figure 7: Selecting NR ECG Device and Entering PIN Dialog Box

7. Type the default **PIN** Code **12345** and tap **OK** (see Figure 7).
   Now the mobile device and the NR ECG device are paired (see Figure 6).
8. To complete the connection between the mobile device and the NR ECG device, see Section Device Settings (page 49).

Selecting the NR ECG Device

1. Tap 

(see Figure 62).

   The **Select Device to Connect Dialog Box** is displayed (see Figure 8).

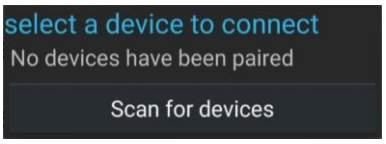
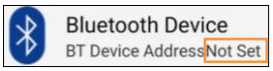


Figure 8: Select Device to Connect Dialog Box

2. To connect the NR ECG device, tap Scan for devices (see Figure 8).

   When the NR ECG device is connected, 

is changed to 

3. Select the NR ECG device (see Figure 9).

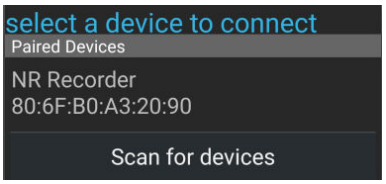


Figure 9: Select NR ECG Device

Starting the App

1. Tap the  icon (see Figure 10).

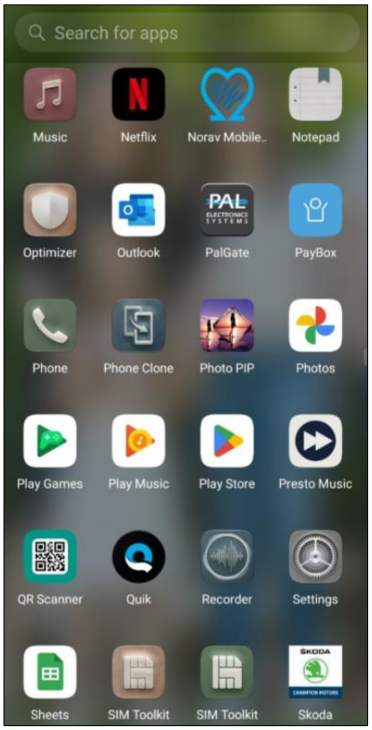


Figure 10: Starting the App

The **Home Screen** is displayed including the following buttons (see Figure 11).

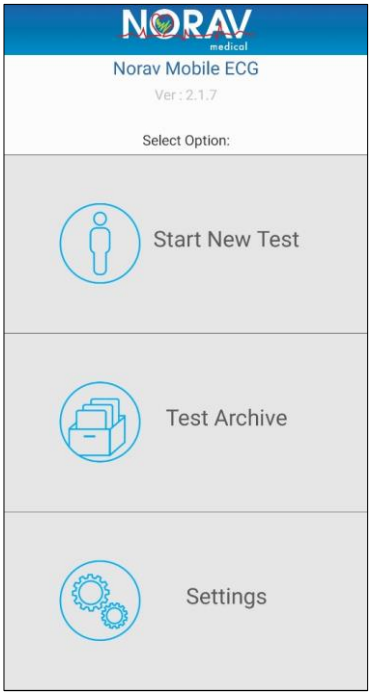


Figure 11: Home Screen

- **Start New Test** – Run a new test (see Chapter 4 - Running a Test (page 20).
- **Test Archive** – View archived test results (see Chapter 5 - Managing Archive Tests (page 35).
- **Settings** – App settings (see Chapter 6 - Managing Settings (page 36).

4. Running a Test

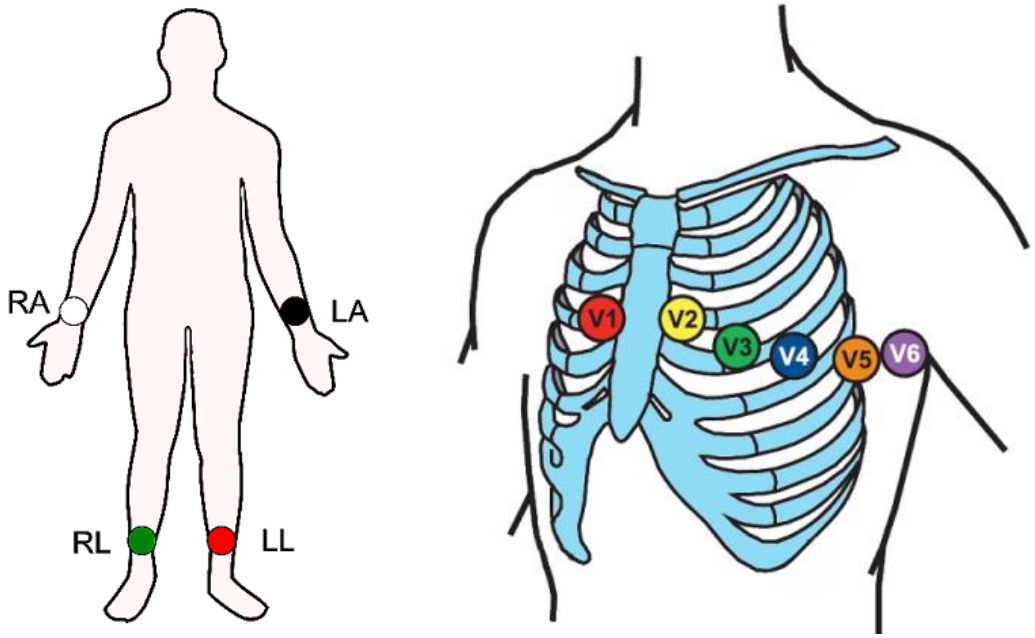
This chapter reviews the tasks associated with running a test and includes the following sections:

Attaching NR ECG Device Leads to Patient

To prepare the patient for ECG test, attach the monitoring leads according to the AHA or IEC color coding (see Table 2).

Attaching 10-Electrode Cable for Standard 12-Lead ECG

Attach the 10-Electrode cable to the patient limbs and chest (see Figure 12 and Table 2).



4-Electrodes on Patient Limbs **6-Electrodes on Patient Chest**

Figure 12: 10-Electrode Cable on Patient Limbs & Chest (AHA Color Codes)

Note

Make sure the NR ECG device is turned **ON**
(see Section Pairing NR ECG Device to Mobile Device – Step 3 page 15).

Table 2: AHA and IEC Electrode Color Coding for 10-Electrode Cable

Placement	AHA Color Codes	IEC Color Codes
Right forearm or wrist	White RA	Red R
Left forearm or wrist	Black LA	Yellow L
Right lower leg, proximal to ankle	Green RL	Black N
Left lower leg, proximal to ankle	Red LL	Green F
Fourth intercostal space, right sternal edge	Red V1	Red C1
Fourth intercostal space, left sternal edge	Yellow V2	Yellow C2
Midway between V2 and V4	Green V3	Green C3
Fifth intercostal space, mid-clavicular line	Blue V4	Brown C4
Anterior axillary line in straight line with V4	Orange V5	Black C5
Mid-axillary line in straight line with V4 and V5	Purple V6	Purple C6

Attaching 5-Electrode Cable for Derived 12-Lead ECG

Attach the 5-Electrode cable to the patient chest (see Figure 13 and Table 3).

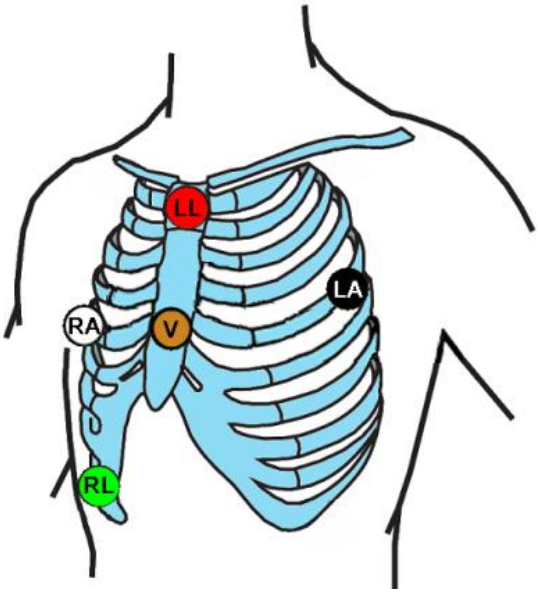


Figure 13: 5-Electrode Cable on Patient Chest (AHA Color Codes)

Table 3: AHA and IEC Electrode Color Coding for 5-Electrode Cable

Placement	AHA Color Codes	IEC Color Codes
In the right midaxilary	White RA	Red R
Left forearm or wrist	Black LA	Yellow L
On the right lower edge of the rib cage	Green RL	Black N
On the manubrium sterni	Red LL	Green F
At the level of the fifth of the lower sternum	Brown V	White C

Entering Patient Information

To enter patient information:

1. Tap 

on the **Home Screen** (see Figure 11).

   The **Enter Patient Details Dialog Box** is displayed (see Figure 14).

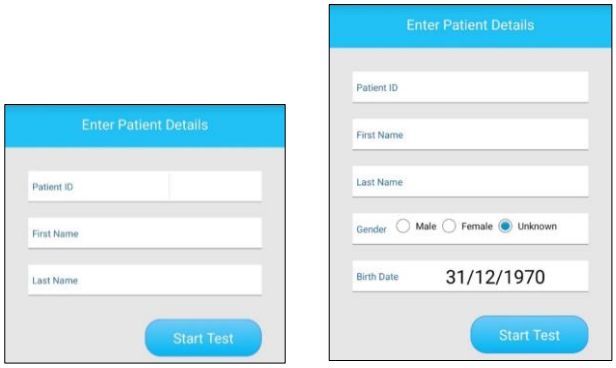


Figure 14: Enter Patient Details Dialog Box

2. To enter patient details, tap the relevant field and then type.

Note

To add the **Gender** and **Date of Birth** fields (see Figure 14 - right) to the **Patient Details Dialog Box**, see Section Showing Personal Info (page 63).

3. Tap 

(see Figure 14).

   The **Test Screen** with ECG waves is displayed (see Figure 15).

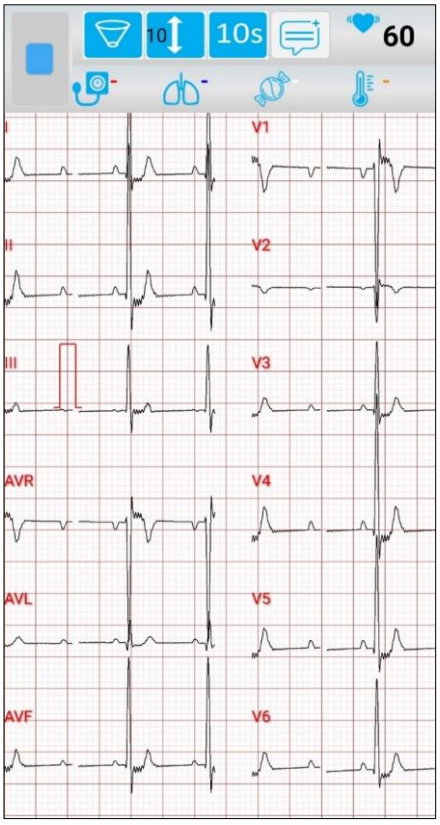


Figure 15: Test Screen

Monitoring Test

1. View the ECG readout graphs (see Figure 15).
2. View heart rate 

(see Figure 15).
3. To select data filter(s), tap  (see Figure 15).

   The **Data Filter Selection Dialog Box** is displayed (see Figure 16).

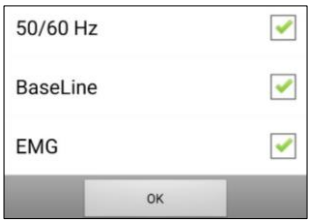


Figure 16: Data Filter Selection Dialog Box

4. Select the required filter type and tap 

.

   For setting Data Filters, see Section Data Filters page 45).

5. To change the ECG Vertical Scale (mm/mV), tap 

.

   The **Vertical Scale Dialog Box** is displayed (see Figure 17).

Figure 17: Vertical Scale Dialog Box

6. Select the required scale.
7. To select a 10-second test or 24-hour test, tap 

, which toggles between **10 s** and **24 h**.

   10-second test is the standard ECG test, whereas 24-hour test can detect arrythmia, atrial fibrillation, and other sporadic phenomena that a 10-second test cannot detect.

8. View measurements acquired via NFC from external devices 

(see Section External Measurements (page 69).

9. Tap the  icon to enter manual measurements (see Figure 18) and Section Manual Measurements page 30).

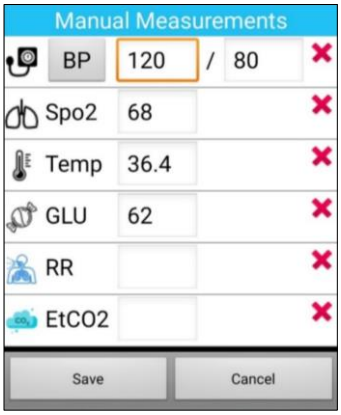
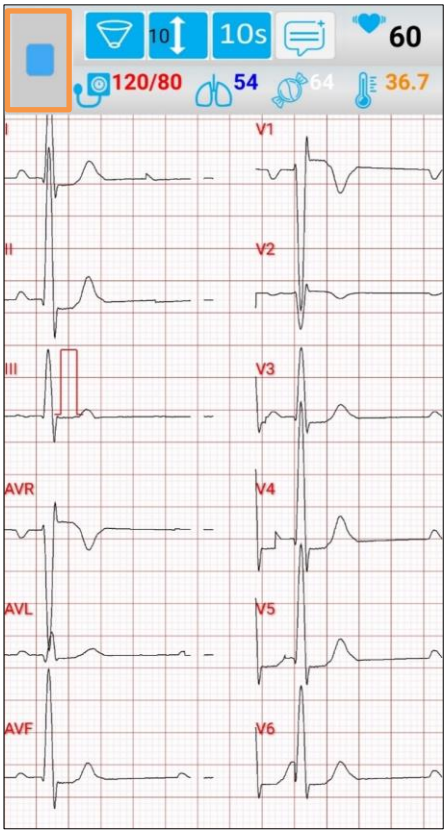


Figure 18: Manual Measurements Dialog Box

Viewing Test Report

The **Stop** button starts blinking about 10 seconds after the test starts, indicating the test can be stopped and External Measurements can be added manually or with external devices (see following figure).



1. Tap the **Stop** button when test is finished.

   The **Report Mode** screen is displayed (see Figure 19), and a test report is automatically saved in the Test Archive (see Chapter 5 – Managing Archive Tests page 35).

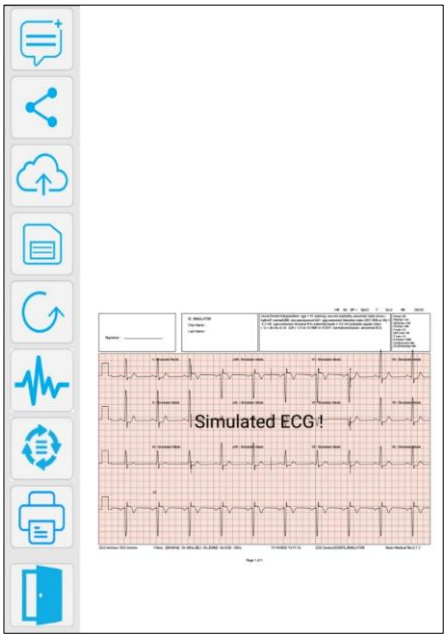


Figure 19: Report Mode Screen

2. View the ECG report, using either of the following options:
   - **Zoom** – Scale the report by placing two fingers and spreading them (see Figure 20).

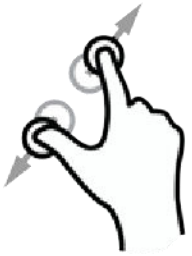


Figure 20: Zooming into Report

   - **Swipe** – Scroll through report pages of any test longer than 10 sec. performed in the 24-h mode by dragging one finger to see different parts of the report (see Figure 21).

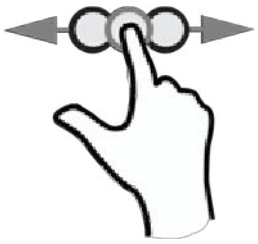


Figure 21: Scrolling between Report Pages

3. Edit and share report using one of the available options (see Section Report Screen Options page 27).

Report Screen Options

To generate actions on report, select one of the icons from the report mode options (see Figure 19).

Adding Remarks to ECG Report

1. Tap the  icon (see Figure 19).

   The **Enter ECG Summary Dialog Box** is displayed (see Figure 22).
   Usually, the summary is already filled with MEANS interpretation text.

2. Clear the text (if needed) using the Clear Text button (see Figure 22).

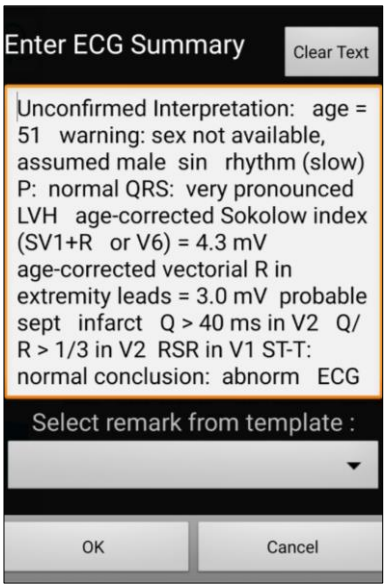


Figure 22: Enter ECG Summary Dialog Box

3. To **add remarks manually** to ECG Report, tap the **Enter ECG Summary** field and type text in the field (see Figure 22).

   Or

   To **add remark templates** to ECG Report, tap the 

drop-down list.

The **ECG Remark Templates Screen** is displayed (see Figure 23).

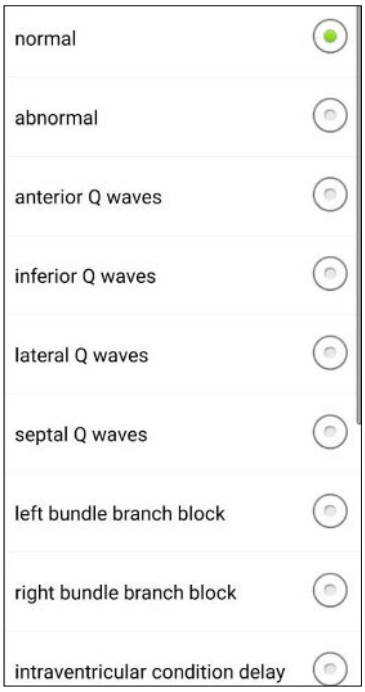


Figure 23: ECG Remark Templates Screen

4. To select ECG remark template(s) from the list, tap the respective radio button(s) (see Figure 23).
5. Tap OK.

   The remark template is added to the ECG Summary (see Figure 24).

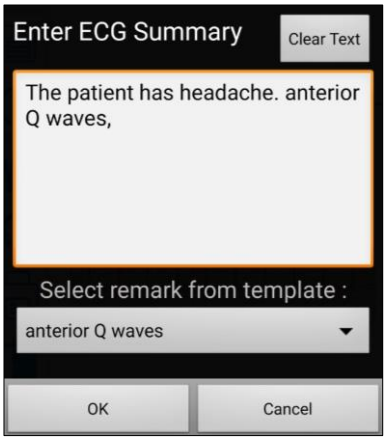


Figure 24: Report Mode Screen

The user can also manage the remarks on the Settings Screen (see Section Editing ECG Remarks page 62).

Sharing Report

To share the PDF report with others:

1. Tap the  icon (see Figure 19).

   The **Share via Screen** is displayed (see Figure 25).

   You can share reports using WhatsApp, Google Drive, Dropbox, and other PDF share support apps.

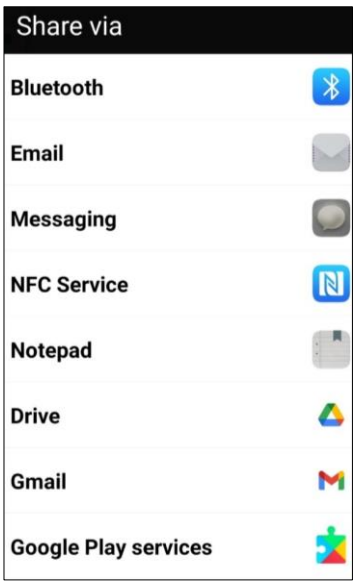


Figure 25: Share via Screen

2. Select one of the apps used for delivering the report (see Figure 25).

   For advanced settings, see Section Email Settings page 64.

Uploading Report to Cloud

Norav Mobile ECG can be integrated with Norav ECG Management System (NEMS-Q) with the capability of sending ECG tests from the mobile device to the Server, which allows the technician or physican to review the retrieved ECG tests.

FTP must be configuered before uploading the tests to NEMS-Q cloud.

To upload a report to the cloud:

1. Tap the  icon (see Figure 19).

   The **Uploading Test to Norav Cloud** message is displayed (see Figure 26).

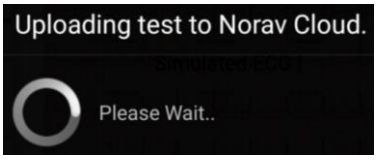


Figure 26: Uploading Test to Norav Cloud Message

2. When upload is finished, the **Upload Success** message is displayed (see Figure 27).

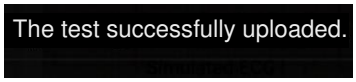


Figure 27: Upload Success Message

   Reports are uploaded to a cloud according to the FTP definitions made on the Settings screen (see Section FTP Settings page 53).

Manual Measurements

Manual Measurements include comprehensive information (Vital Signs) about the patient.

The data is saved for each test to Report and displayed above the ECG readout graph.

Vital Signs can be shown automatically by Norav NFC devices (see Section External Measurements page 69) while Vital Signs are also displayed on the report (see Figure 29) and when composing a new email (see Figure 30).

To open Manual Measurements:

1. Tap  (see Figure 19).

   The **Manual Measurements Dialog Box** is displayed (see Figure 28).

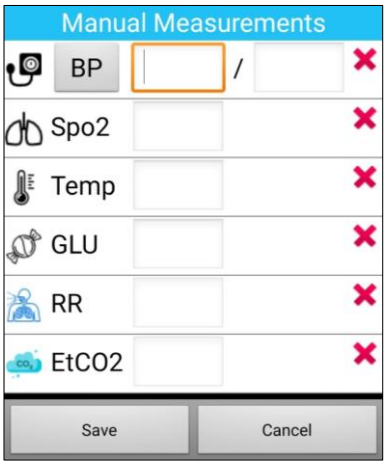


Figure 28: Manual Measurements Dialog Box

2. Tap the **BP** fields  and type **Systolic and Diastolic Blood Pressures**.
3. Tap the **SpO2** field  and type **the Saturated Oxygen** value.
4. Tap the **Temperature** field  and type the **Body Temperature**.
5. Tap the **Glucose** field  and type the **Glucose** value.
6. Tap the **RR** field  and type the **Respiratory Rate** value (**Tablet only**).
7. Tap the **EtCO2** field  and type the **End-Tidal CO2** value (**Tablet only**).
8. Tap  .

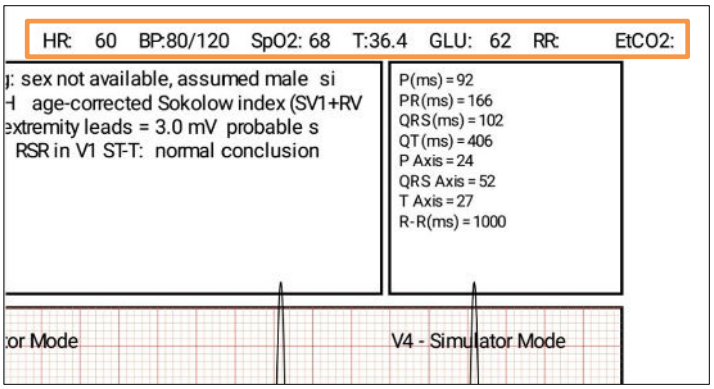


Figure 29: Vital Signs Displayed on Report

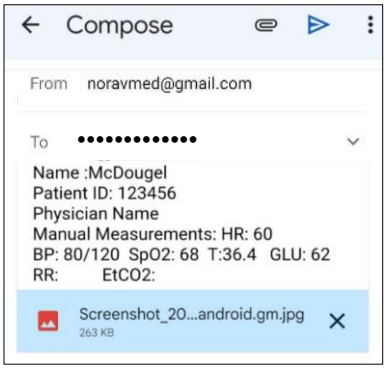


Figure 30: Vital Signs Displayed on New Email

Starting New Test for New Patient

To start a new test for a new patient:

1. Tap  (see Figure 19).

   The **Enter Patient Details Dialog Box** is displayed (see Figure 31).

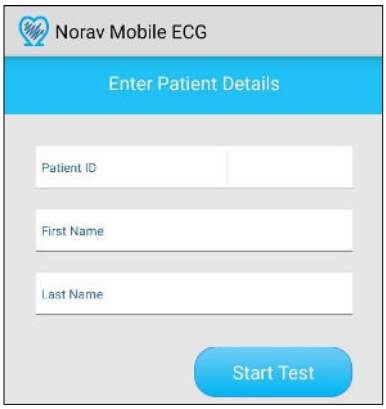


Figure 31: Enter Patient Details Dialog Box

2. Fill the **Patient ID**, **First Name**, and **Last Name**.
3. Tap 

.

Starting New Test for Existing Patient

Note

This action does not save the current report. It creates a new test with the same patient details.

To start a new test for the same patient:

1. Tap 

on the **Home Screen** (see Figure 11).

   The **List of Archived Records** is displayed (see Figure 32).

Figure 32: List of Archived Records

2. Tap the required patient or the patient's ID in the **Search** field.

   The selected patient is displayed.

3. Tap the selected patient.

4. Tap  (see Figure 19).

Recalculating MEANS Measurements & Interpretation for Record

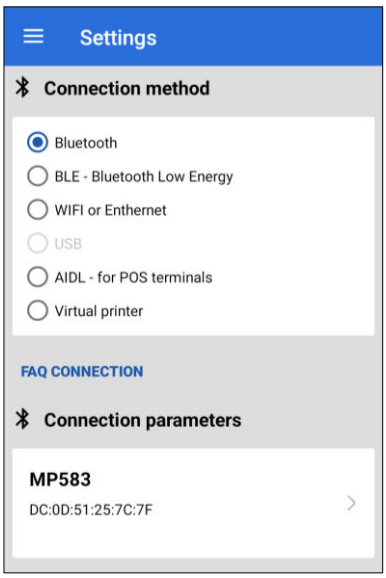
To recalculate MEANS measurements and interpretation for a record:

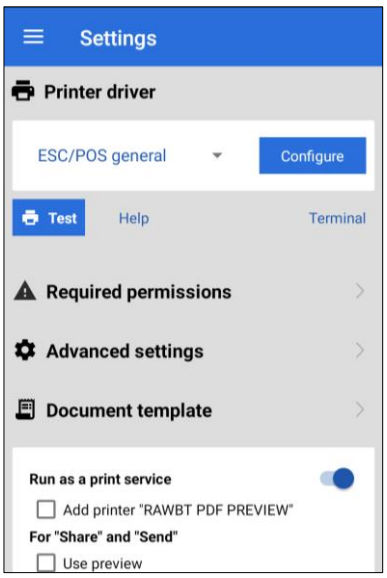
Tap  (see Figure 19).

Printing Record

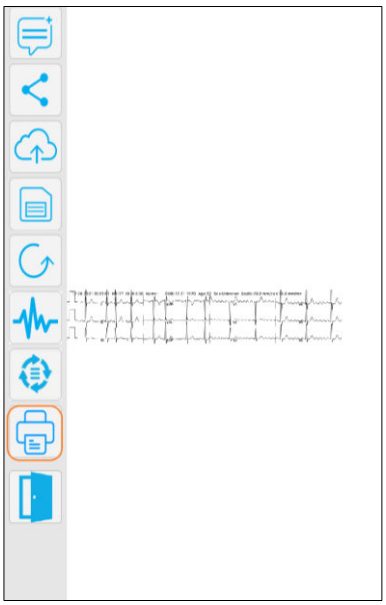
To print a record:

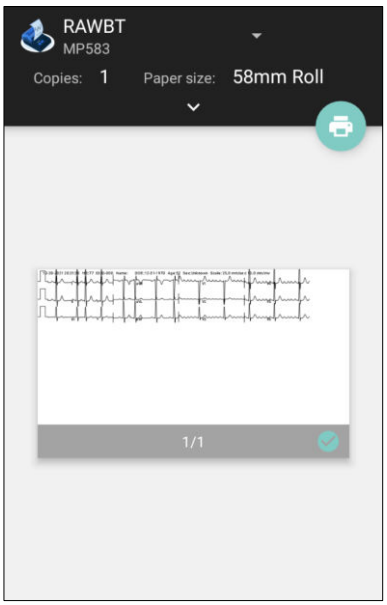
1. Install the RawBT Printer service (third party driver) for Android from Google Play: https://play.google.com/store/apps/details?id=ru.a402d.rawbtprinter
2. Open the **RawBT App Settings** and select the following settings (see figures below):
   - ◊ **Connection method** – Bluetooth
   - ◊ **Connection parameters** – Select the **Printer Name** (**MP583**)
   - ◊ **Printer driver** – ESC/POS general





3. Open the **Mobile ECG App → Settings → Report Type → Narrow 50 mm** (see Section Report Types page 40).
4. Create a new test report or select an existing test from Archive.
5. Tap on the selected test report (see figure below - left).





6. To print the ECG strip, tap (see figure above - right).

The **Mobile Printer** starts printing the ECG strip (see Figure 33).

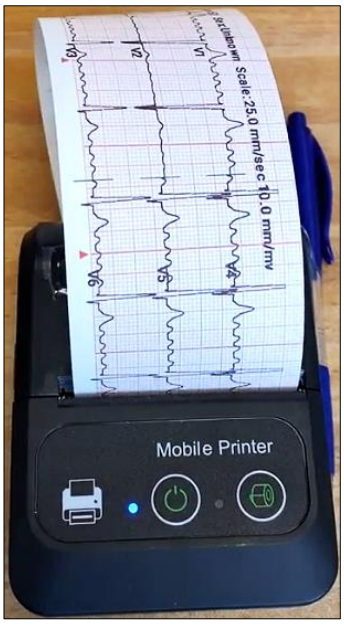


Figure 33: Mobile Printer

Exiting the App

1. To exit the app, tap the  button at the bottom left of the report screen (see Figure 34).

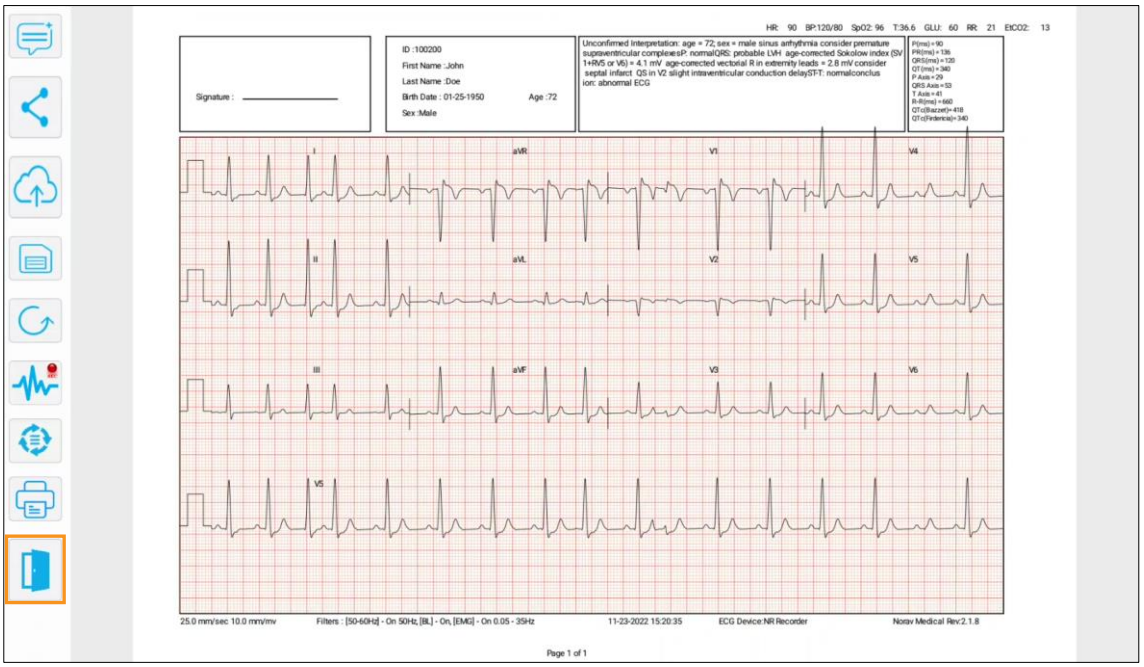


Figure 34: Report Screen

The **Exit Application Dialog Box** is displayed (see Figure 35).

Figure 35: Exit Application Dialog Box

2. Tap Yes.

5. Managing Archive Tests

This chapter reviews viewing, sharing, and editing archived test results:

To view share and edit archived test results:

1. Tap 

on the **Home Screen** (see Figure 11).

   The **List of Archived Reports** is displayed (see Figure 32).

2. Type part of the patient details in the 

field (see Figure 32).

   The list of reports is minimized, and the display of reports matches the search keywords.

3. Tap to select a test report to view (see Figure 32).
4. View and scale the test report (see Section Viewing Test Report page 25).
5. Edit and share the test report using one of the available options (see Section Report Screen Options page 27).

6. Managing Settings

This chapter reviews the tasks associated with managing the app settings and includes:

ECG Display Settings

This section reviews the tasks associated with editing ECG display presets (see Figure 36).

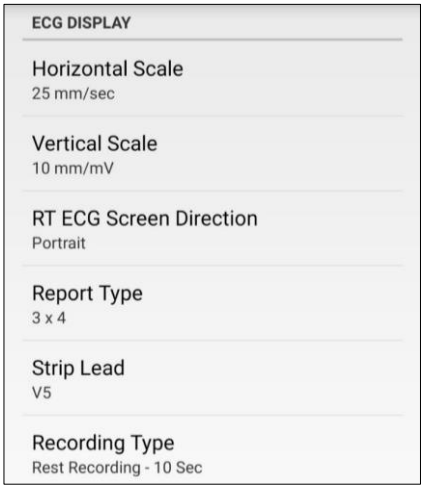


Figure 36: ECG Display Options

Note

These actions affect the report display.

Horizontal Scale

Setting ECG graph horizontal progress rate in mm/sec.

Changing the horizontal scale is like adjusting the paper speed on an ECG recorder paper (default setting is 25 mm/sec.).

1. Tap Horizontal Scale (see Figure 36).

   The **Horizontal Scale Dialog Box** is displayed (see Figure 37).

Figure 37: Horizontal Scale Dialog Box

2. Select value (see Figure 37).
   - ◊ 100 mm/sec. (see Figure 38)
   - ◊ 50 mm/sec. (see Figure 38)
   - ◊ 25 mm/sec. (see Figure 38)
   - ◊ 12.5 mm/sec.

Figure 38: Different Horizontal Scales Display

Vertical Scale

To set ECG graph vertical gain in mm/mV (default setting is 10 mm/mV):

1. Tap Vertical Scale (see Figure 36).
   The **Vertical Scale Dialog Box** is displayed (see Figure 39).

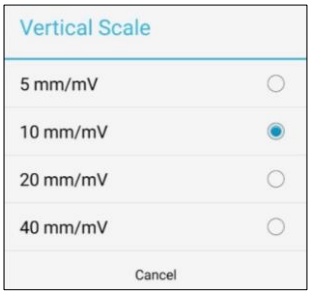


Figure 39: Vertical Scale Dialog Box

2. Tap one of the following options to select gain (see Figure 39).
   - ◊ 5 mm/mV (see Figure 40)
   - ◊ 10 mm/mV (see Figure 40)
   - ◊ 20 mm/mV (see Figure 40)
   - ◊ 40 mm/mV (see Figure 40)

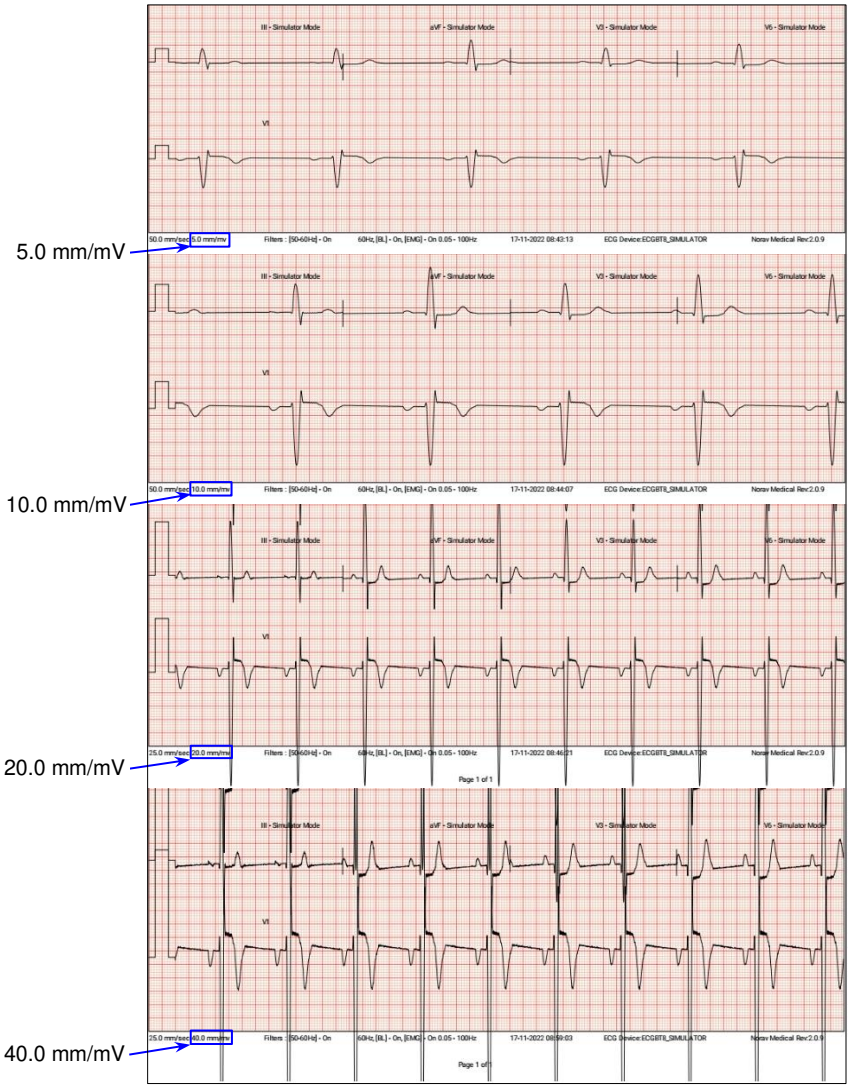


Figure 40: Different Vertical Scales Display

RT ECG Screen Direction

To adjust screen orientation for **Test/Report Screen** display (default setting is Portrait):

1. Tap RT ECG Screen Direction (see Figure 36).

   The **RT ECG Screen Direction Dialog Box** is displayed (see Figure 41).

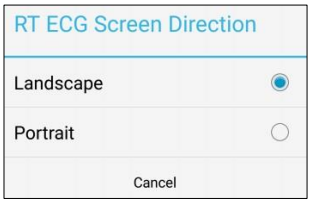


Figure 41: RT ECG Screen Direction Dialog Box

2. To select screen orientation, tap the **Landscape** or **Portrait** radio button (see Figure 41).

   ◊ **RT ECG Screen Landscape** view (see Figure 42)

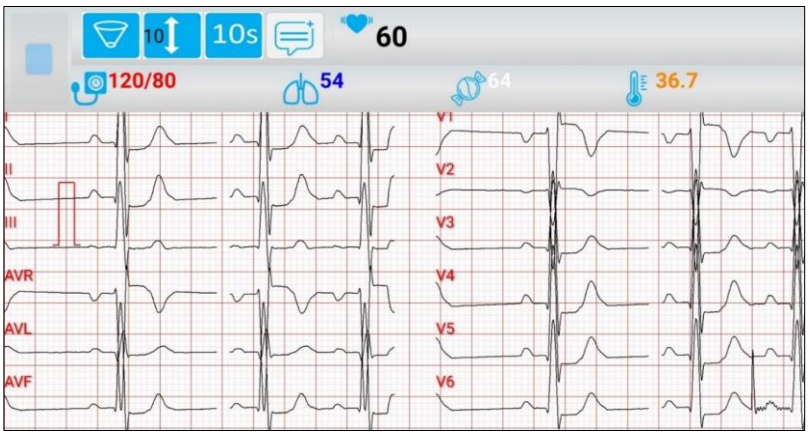


Figure 42: RT ECG Screen Landscape View

   ◊ **RT ECG** Screen **Portrait** view (see Figure 43)

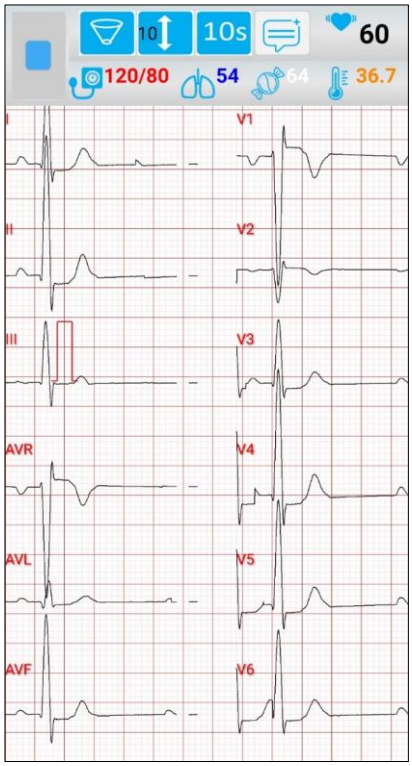


Figure 43: RT ECG Screen Landscape View

Report Types

Note

This action affects the **Test Archive**. Currently only PDF report is available.

To set the report graph layout display:

1. Tap Report Type (see Figure 36).

   The **Report Type Dialog Box** is displayed (see Figure 44).

2. Select the **Report Type** (see Figure 44).

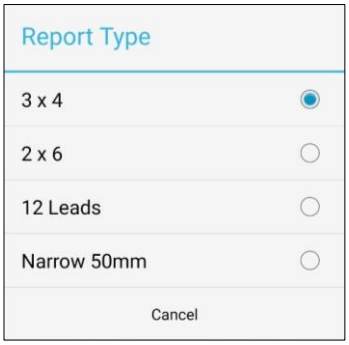


Figure 44: Report Type Dialog Box

◊ **3 on 4** – rows in columns (see Figure 45).

This report type shows all leads from 1 sec. to 2.5 sec., except the strip lead print (aVF) in Simultaneous Mode (not in Successive mode that is not supported by the mobile app) from 1 sec. to 10 sec.

- Channel I, II, III (0 s to 2.5 s)
- Channel aVR, aVL, aVF (2.5 s to 5 s)
- Channel V1, V2, V3 (5 s to 7.5 s)
- Channel V4, V5, V6 (7.5 s to 10 s)
- Channel Strip Lead (0 s to 10 s)

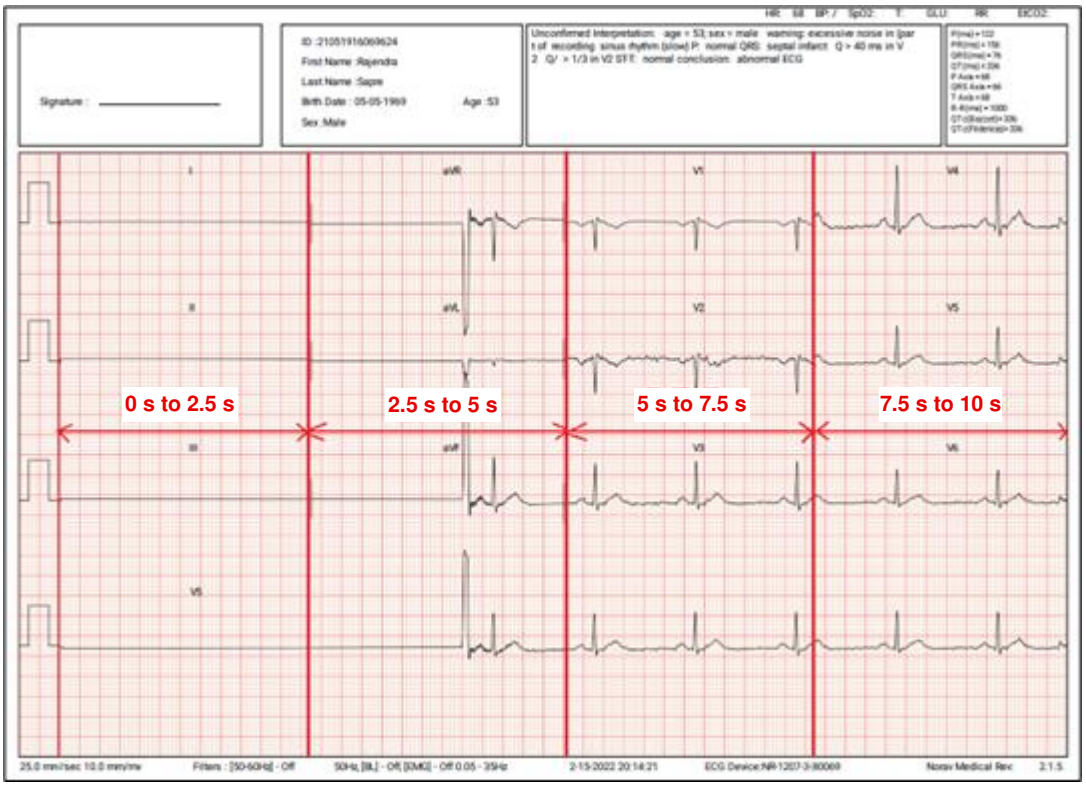


Figure 45: 3 on 4 Report Type

◊ **2 on 6** – columns in rows (see Figure 46).

This report type shows all leads from 1 sec. to 5 sec., except the strip lead print (V5) from 1 sec. to 10 sec.

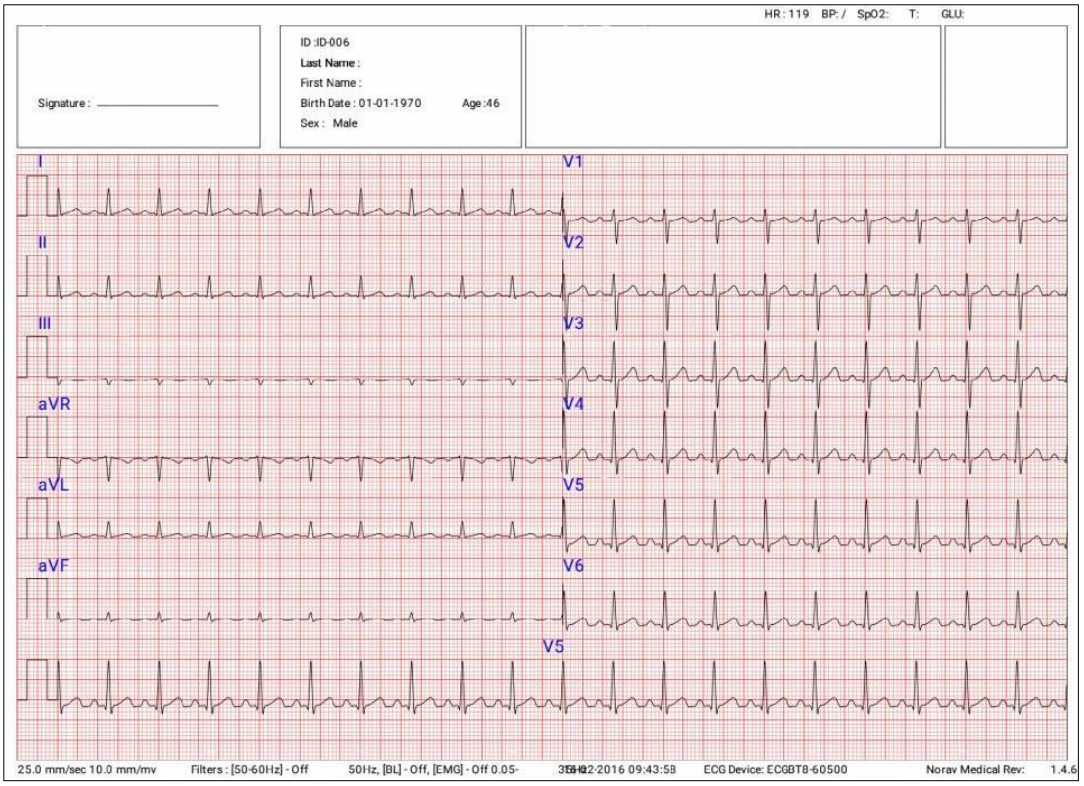


Figure 46: 2 on 6 Report Type

◊ **12-Lead** (see Figure 47).

This report type shows all leads from 1 sec. to 10 sec.

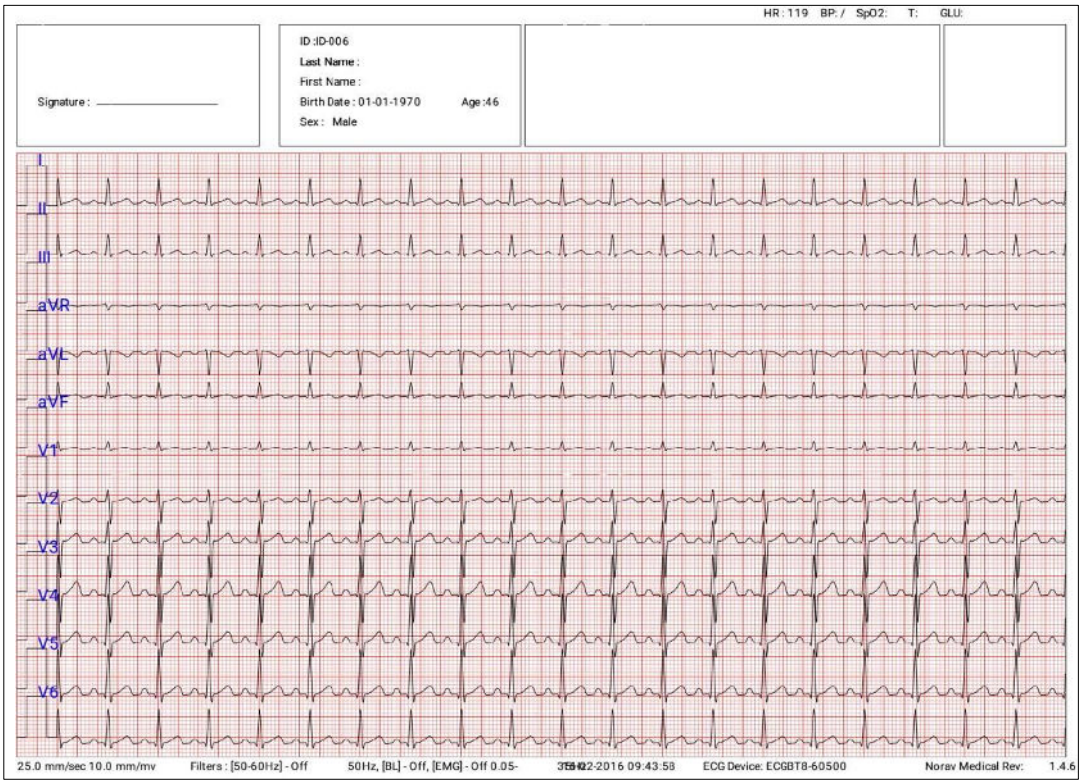


Figure 47: 12-Lead Report Type

◊ **Narrow 50 mm** – Applicable for thermal printer with narrow strip of 2-3 inches (see https://drive.google.com/file/d/1tgIoMilABHt18wQ9wioSAjrt3IObMAHy/view?usp=share_link and Figure 48).

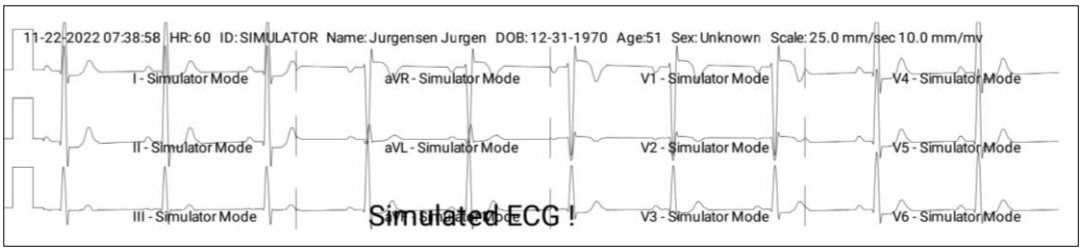


Figure 48: Narrow 50 mm Report Type

Strip Lead

To set default Strip Lead for the report:

1. Tap [Strip Lead] (see Figure 36).

   The **Strip Lead Dialog Box** is displayed (see Figure 49).

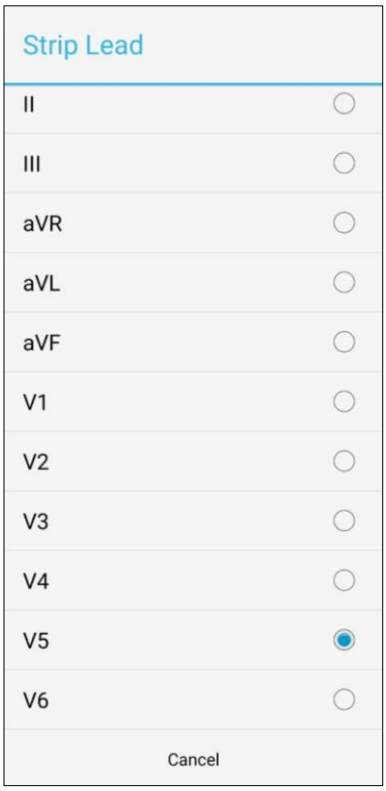


Figure 49: Strip Lead Dialog Box

2. Select a **Strip Lead** from the list (see Figure 49).

The **Strip Lead** (V5 for example) on the report (see Figure 50).

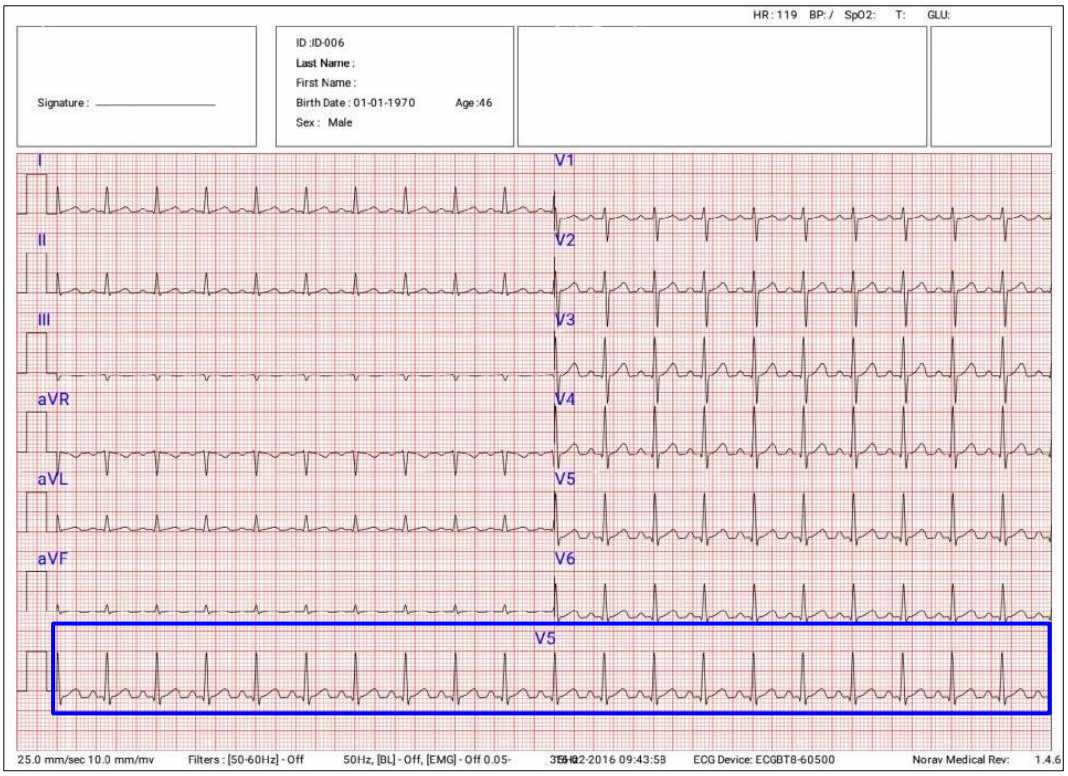


Figure 50: Strip Lead (V5) on Report

Recording Types

To set test recording options (default setting is 10-sec. recording):

1. Tap Recording Type (see Figure 36).

   The **Recording Type Dialog Box** is displayed (see Figure 51).

Figure 51: Recording Type Dialog Box

2. Select **Recording Type** (see Figure 51):

   ◊ **Rest Recording - 10 sec.**: Running the test, but only the last 10 sec. are saved for the report.

   ◊ **Rhythm Recording - 24 h**: The entire recorded data is saved for the report.
   Long recording means that when starting a new test, it is saved from the start (not just the last 10 sec.), and the test is stopped when the user stops it.

Data Filters

Data Filters are digital filters made to reduce noise (see Figure 52).

Figure 52: Recording Type Dialog Box

Data filters:

- **50/60 Hz Filter** (page 45)
- **Base Line Filter** (page 46)
- **EMG Filter** (page 47)

50/60 Hz Filter

Power-line interference is always present in indoor biopotential measurements, even when its extremely low magnitude makes it imperceptible. In special situations, this kind of interference can be neglected, but this is not a general rule.

It is common practice to apply 50/60 Hz notch filter to reduce this kind of interference. In such cases, there is no considerable distortion observed on the recorded signal.

Several kinds of notch filters (analog and digital) were implemented for evaluation of the distortion caused on ECG signals. These filters were applied to ECGs of humans, and then distortion estimates were computed from their resulting signals.

To set noise cancellation (default setting is 50 Hz):

1. Tap 50/60 Hz Filter (see Figure 52).

   The **50/60 Hz Filter Dialog Box** is displayed (see Figure 53).

Figure 53: 50/60 Hz Filter Dialog Box

2. To select a filter, tap the respective radio button (see Figure 53).

3. To select the **50 Hz Filter** status, tap the  icon on the **Test Screen** (see Figure 54).

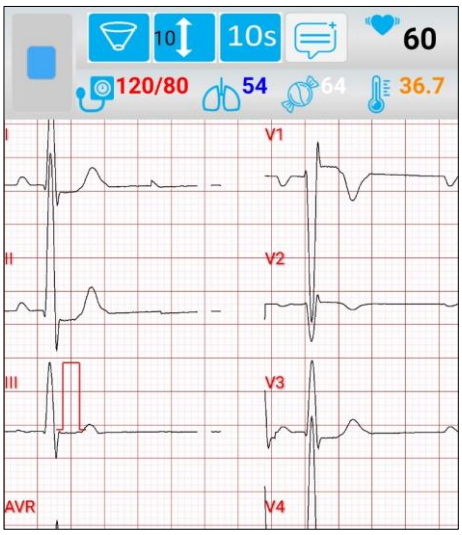


Figure 54: Test Screen

The **Data Filter Selection Dialog Box** is displayed (see Figure 55).

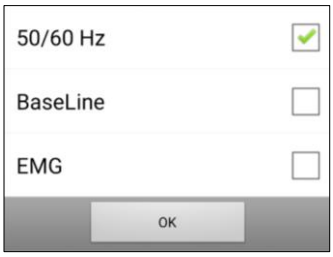


Figure 55: Data Filter Selection Dialog Box

4. Select **50/60 Hz** and tap OK.

Base Line Filter

Base Line Filter reduces base line drift due to respiration (default setting is **ON**).

1. To disable Base Line Filter, tap Base Line Filter (see Figure 52).
2. To select the **Base Line Filter** status, tap the  icon on the **Test Screen** (see Figure 56).

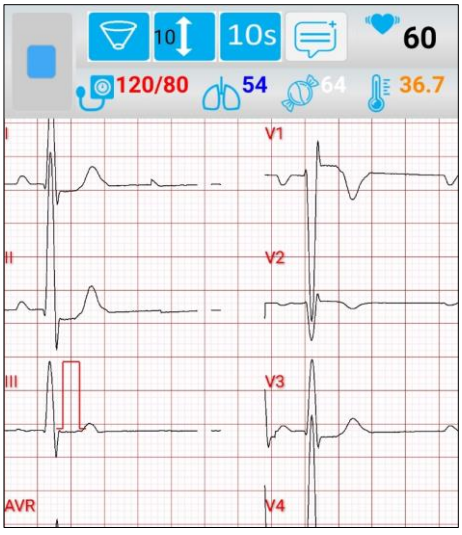


Figure 56: Test Screen

The **Data Filter Selection Dialog Box** is displayed (see Figure 57).

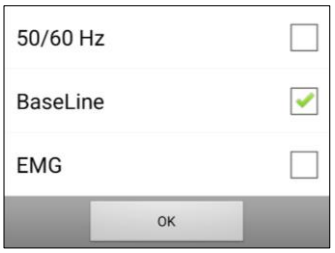


Figure 57: Data Filter Selection Dialog Box

3. Select **BaseLine** and tap OK.

EMG Filter

To set cutoff frequency for EMG filter (default setting is 35 Hz):

1. Tap EMG Filter (see Figure 52).

   The **EMG Filter Dialog Box** is displayed (see Figure 58).

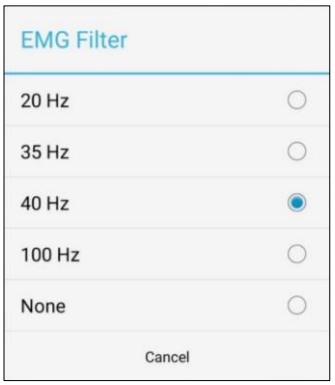


Figure 58: EMG Filter Dialog Box

2. To select a filter, tap the respective radio button (see Figure 58).
3. To select the **EMG Filter** status, tap the icon on the **Test Screen** (see Figure 59).

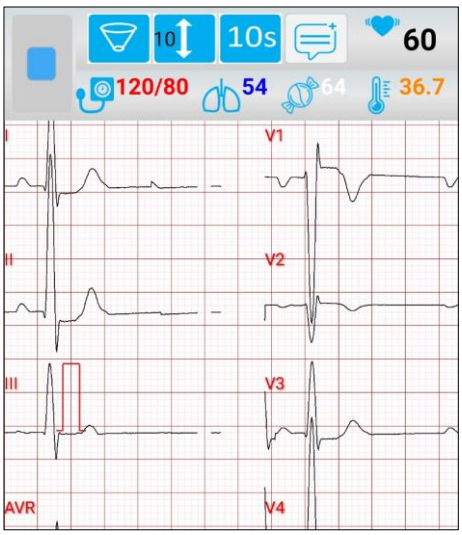


Figure 59: Test Screen

The **Data Filter Selection Dialog Box** is displayed (see Figure 60).

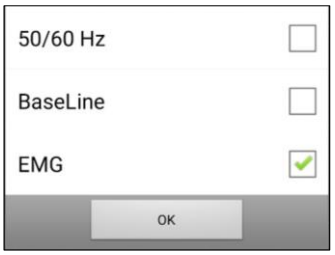


Figure 60: Data Filter Selection Dialog Box

4. Select **EMG** and tap OK.

Note

The selected 50/60 Hz, Base Line, and EMG filter values are displayed on the bottom of the report (see Figure 61).

Figure 61: Report with 50/60 Hz, Base Line, and EMG Filter Values

Device Settings

This section reviews the tasks associated with editing the device presets (see Figure 62).

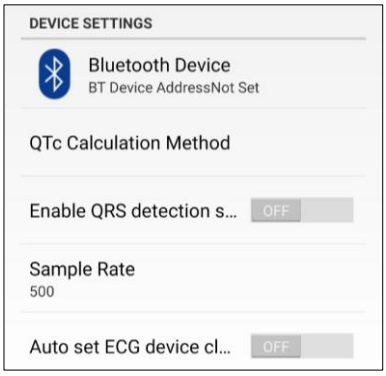


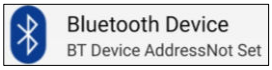
Figure 62: Device Settings Dialog Box

Bluetooth® Device

Note

This section is relevant when the mobile device and the NR ECG device are paired (see Section Pairing NR ECG Device to Mobile Device page 15).

To set Bluetooth® device address:

1. Tap 

(see Figure 62).

   The **Select Device to Connect Dialog Box** is displayed (see Figure 63).

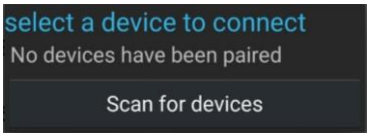
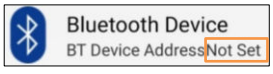


Figure 63: Select Device to Connect Dialog Box

2. To connect the NR ECG device, tap Scan for devices (see Figure 63).

   When the NR ECG device is connected, 

is changed to 

5. Select the NR ECG device (see Figure 64).

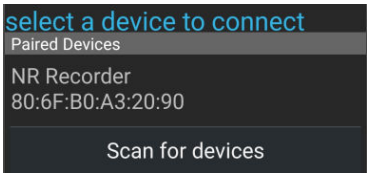


Figure 64: Selecting NR ECG Device

QTc Calculation Methods

The corrected QT interval (QTc) estimates the QT interval at a standard heart rate of 60 beats per minute.

This allows comparison of QT values over time at different heart rates and improves detection of patients at increased risk of arrhythmias.

There are multiple formulas used for estimating QTc. It is not clear which formula is the most useful:

- Bazett formula: $QTC = QT / \sqrt{RR}$
- Fridericia formula: $QTC = QT / RR^{1/3}$
- Framingham formula: $QTC = QT + 0.154\ (1 - RR)$
- Hodges formula: $QTC = QT + 1.75\ (\text{heart rate} - 60)$

Note

The RR interval is given in seconds (RR interval = 60 / heart rate).

To apply QTc calculation methods:

1. Tap QTc Calculation Method (see Figure 62).

   The **Select QTc Calculation Methods Dialog Box** is displayed (see Figure 65).

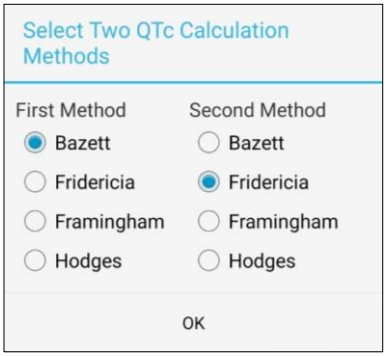


Figure 65: QTc Calculation Methods Dialog Box

2. Select two methods (one from **First Method** and one from **Second Method**.
3. Tap OK.

Enabling QRS Detection Sound

To enable heart rate sound (monitor beep) on every heartbeat (QRS), which is **OFF** by default: tap Enable QRS detection s... OFF (see Figure 62).

OFF is changed to ON.

Note

The heart rate sound starts after 10 seconds, simultaneously with blinking of the **Stop** button.

Sample Rate

To set the ECG sample rate (samples per second):

1. Tap Sample Rate (see Figure 62).

   The **Sample Rate Dialog Box** is displayed (default setting is 500) – see Figure 66.

Figure 66: Sample Rate Dialog Box

2. Select one of the following options (see Figure 66):
   - ◊ 250 samples/sec.
   - ◊ 500 samples/sec.
   - ◊ 1000 samples/sec.

For comparison between different sample rates and the same heart rate.

The sample rate enables compressing data per second without manipulating the wave structure.

Auto Set NR ECG Device Clock

To set the NR ECG device clock automatically, tap Auto set ECG device cl... OFF (see Figure 62).

OFF is changed to ON.

User Settings

This section describes how to edit user information:

1. To enter personal information, tap an option from **User Settings** (see Figure 67).
   - Clinic Name
   - Clinic Address
   - Physician Name

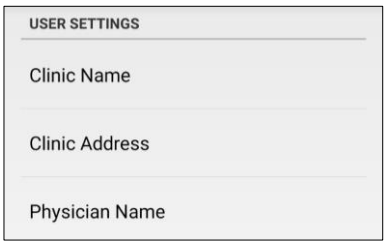


Figure 67: User Settings

The relevant **Dialog Box** is displayed (see Figure 68, Figure 69, and Figure 70).

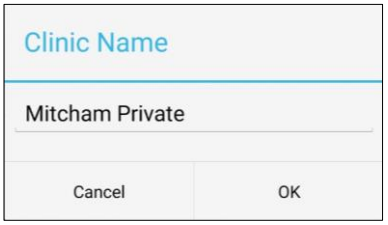


Figure 68: Clinic Name Dialog Box

2. Tap the Clinic Name field and type information (see Figure 68).
3. To save, tap OK.

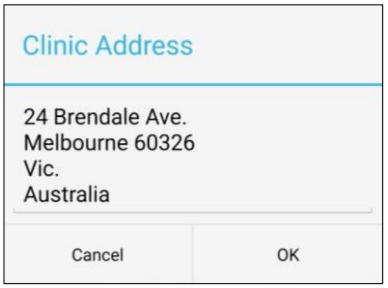


Figure 69: Clinic Address Dialog Box

4. Tap the Clinic Address field and type information (see Figure 69).
5. To save, tap OK.

Figure 70: Physician Name Dialog Box

6. Tap the Physician Name field and type information (see Figure 70).
7. To save, tap OK.

FTP Settings

This section contains the FTP parameters of a remote storage (see Figure 71).

The default parameters are for the Norav cloud service.

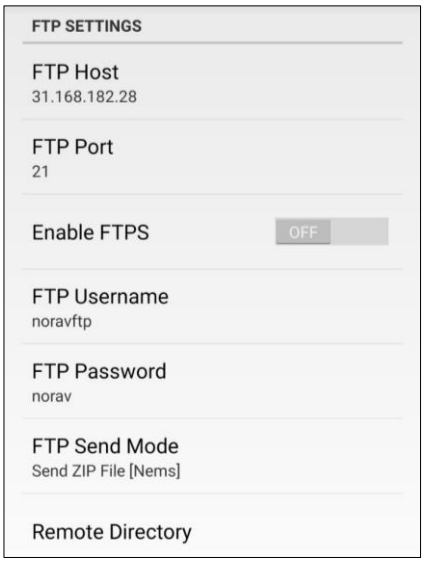


Figure 71: FTP Settings Selection

FTP Settings:

- **FTP Host** (page 54)
- **FTP Port** (page 54)
- **Enabling FTPS** (page 54)
- **FTP Username** (page 55)
- **FTP Password** (page 55)
- **FTP Send Mode** page 56)
- **Remote Directory** (page 56)

FTP Host

To use different cloud services by changing the FTP address (default setting is Norav cloud).

1. Tap FTP Host (see Figure 71).

   The **FTP Host Dialog Box** is displayed (see Figure 72).

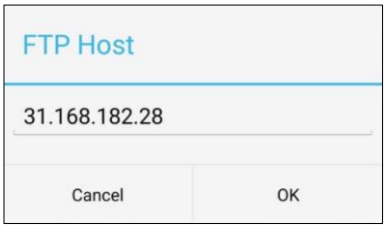


Figure 72: FTP Host Dialog Box

2. To type, tap the FTP Host field (see Figure 72).
3. Enter new IP address (see Figure 72).
4. To save, tap OK (see Figure 72).

FTP Port

To set the FTP port:

1. Tap FTP Port (default setting is 21) – see Figure 71.

   The **FTP Port Dialog Box** is displayed (see Figure 73).

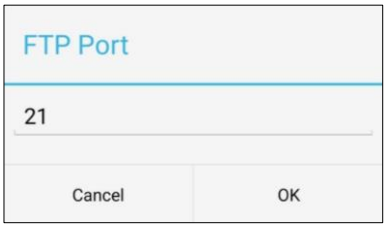


Figure 73: FTP Port Dialog Box

2. To type, tap the FTP Port field (see Figure 73).
3. Enter FTP port number (see Figure 73).
4. To save, tap OK (see Figure 73).

Enabling FTPS

FTP Secured states (see Figure 71).

- **OFF** – FTP
- **ON** – FTPS

To enable FTPS (see Figure 71):

1. Tap Enable FTPS OFF (see Figure 71).

   OFF is changed to ON.

2. Change the port number to your FTPS Server port number.

FTP Username

To add FTP username:

1. Tap FTP Username (see Figure 71).

   The **FTP Username Dialog Box** is displayed (see Figure 74).

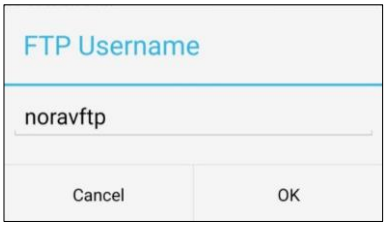


Figure 74: FTP Username Dialog Box

2. To type, tap the FTP Username field (see Figure 74).
3. Enter a new username (see Figure 74).
4. To save, tap OK (see Figure 74).

FTP Password

To enter a new password according to the new FTP (default password is norav):

1. Tap FTP Password (see Figure 71).

   The **FTP Password Dialog Box** is displayed (see Figure 75).

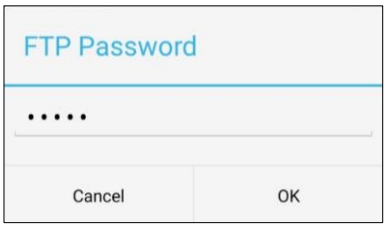


Figure 75: FTP Password Dialog Box

2. To type, tap the FTP Password field (see Figure 75).
3. Enter a new password (see Figure 75).
4. To save, tap OK (see Figure 75).

   New reports are uploaded to a new cloud.

FTP Send Mode

To set the file type sent to FTP:

1. Tap FTP Send Mode (see Figure 71).

   The **FTP Send Mode Dialog Box** is displayed (see Figure 76).

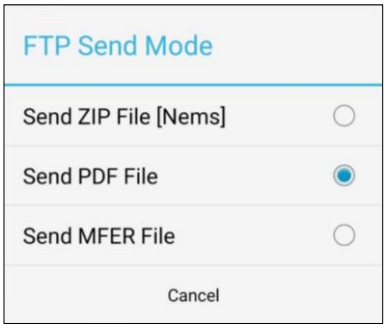


Figure 76: FTP Send Mode Dialog Box

   - ◊ **Send Zip File** – Sending a ZIP file to Norav FTP for receiving ECG measurements and interpretation (the ZIP file contains ECG raw data, PDF report, and XML tag)
   - ◊ **Send PDF File** – Sending a PDF ECG Report file
   - ◊ **Send MFER File** – Sending an MFER ECG Test file

2. To select the file type, tap the respective radio button (see Figure 76).

Remote Directory

To enter an FTP remote directory for the file(s):

1. Tap Remote Directory.
2. The **Remote Directory Dialog Box** is displayed (see Figure 77).

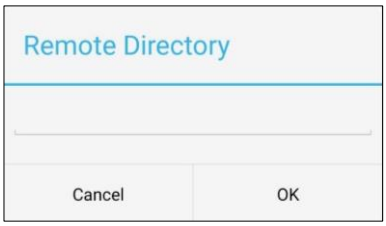


Figure 77: Remote Directory Dialog Box

3. To type, tap the Remote Directory field (see Figure 77).
4. Enter remote directory (see Figure 77).
5. To save, tap OK (see Figure 77).

Simulator Settings

To enable the simulator, which simulates the NR ECG device, for creating simulated ECG waves (default setting is OFF):

Tap 

(see Figure 78).

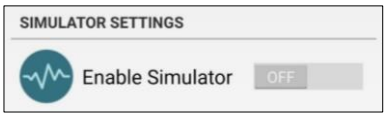


Figure 78: Simulator Settings

The Simulator is enabled 

.

General Settings

This section reviews the tasks associated with editing the general presets (see Figure 79).

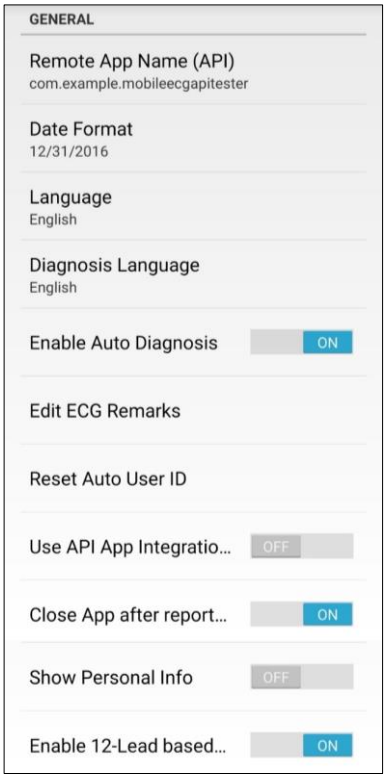


Figure 79: General Settings

- **Remote App Name (API)** – page 82
- **Date Format** (page 59)
- **Language** (page 60)
- **Diagnosis Language** (page 61)
- **Auto Diagnosis** (page 61)
- **Editing ECG Remarks** (page 62)
- **Resetting Auto User ID** (page 63)
- **Updating Auto User ID** (page 63)
- **Using API App Integration Mode** (page 82)
- **Closing the Mobile App after Report Generation** (page 82)
- **Showing Personal Info** (page 63)
- **Enabling 12-Lead based on 5-Electrode Placement** (page 80)

Date Format

To change date display format on reports (default setting is mm/dd/yyyy):

1. Tap Date Format (see Figure 79).

Note

This action affects the date display of all reports in the **Test Archive**.

The **Date Format Dialog Box** is displayed (see Figure 80).

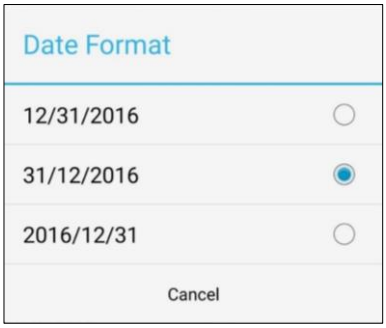


Figure 80: Date Format Dialog Box

Date Formats:

- ◊ mm/dd/yyyy (month–day–year)
- ◊ dd/mm/yyyy (day–month–year)
- ◊ yyyy/mm/dd (year–month–day)

2. To select **Date Format**, tap the radio button of the required date format.

Language

To set the app language (default is English):

1. Tap Language (see Figure 79).

   The **Language Dialog Box** is displayed (see Figure 81).

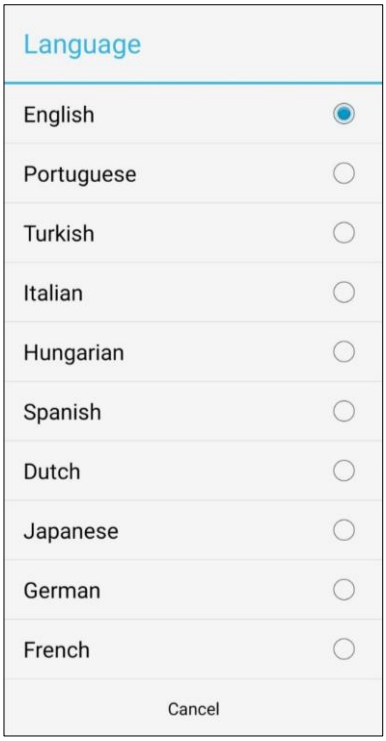


Figure 81: Language Dialog Box

2. To select a language, tap the radio button of the required language (see Figure 81).
3. We recommend restarting the app.

Diagnosis Language

To set the automatic ECG diagnosis language (default is English):

1. Tap Diagnosis Language (see Figure 79).

   The **Language Dialog Box** is displayed (see Figure 82).

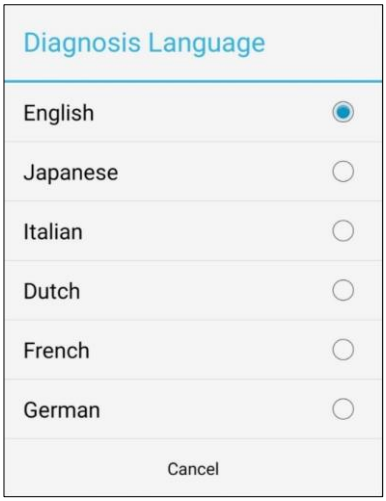


Figure 82: Diagnosis Language Dialog Box

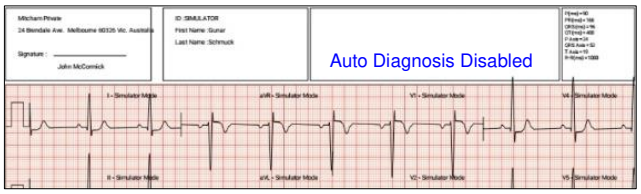
2. To select the diagnosis language, tap the radio button of the required language (see Figure 82).

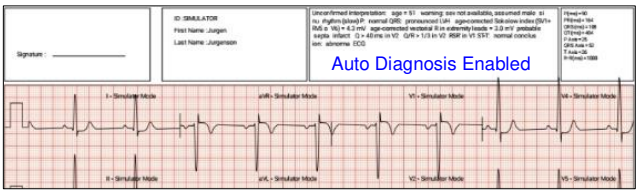
Auto Diagnosis

To disable automatic diagnosis (default setting is ON) when you want to enter diagnosis manually:

Tap Enable Auto Diagnosis ON (see Figure 79).

ON is changed to OFF.





Editing ECG Remarks

ECG remarks are used for adding summaries to reports (see Section Adding Remarks to ECG Report page 27).

To edit remark templates:

1. Tap Edit ECG Remarks (see Figure 79).

   The **Edit ECG Remarks Dialog Box** is displayed (see Figure 83).

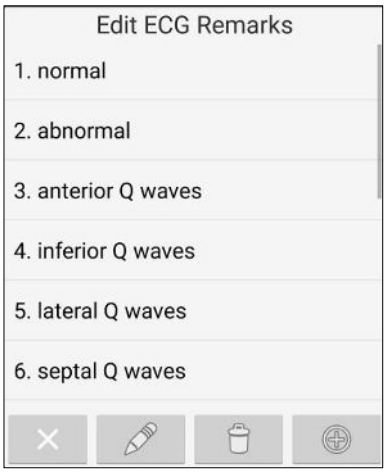


Figure 83: Edit ECG Remarks Dialog Box

   The remark templates include 15 common diagnosis interpretations (see Figure 83).

To edit exiting remark:

1. Select the remark you want to edit (displayed shaded blue) – see Figure 84.
2. Tap  (see Figure 83).

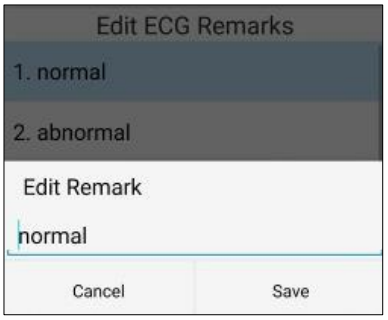


Figure 84: Edit ECG Remarks Dialog Box

3. Edit the remark.
4. Tap Save.

To delete an existing remark:

1. Select the remark you want to delete (displayed shaded blue) – see Figure 84.
2. Tap  (see Figure 83).

To add a new remark:

1. Tap  (see Figure 83).

   The **Add Remark Dialog Box** is displayed (see Figure 85).

Figure 85: Add Remark Dialog Box

2. Tap the Add Remark field and type the new remark.
3. Tap Add.

   The new remark is added to the remark templates.

Resetting Auto User ID

To start a new test, the user fills in the Patient data.

To save time in urgent cases, the user can start the test without any patient data.

In this case, the user ID is generated automatically as follows: ID-000, ID-001, ID-002, etc.

Resetting auto user ID allows user to start this numbering from scratch, i.e., ID-000, ID-001, etc.

To reset auto user ID:

1. Tap Reset Auto User ID (see Figure 79).

   The **Reset Auto ID Dialog Box** is displayed (see Figure 86).

Figure 86: Reset Auto ID Dialog Box

2. Tap Yes.

Updating Auto User ID

After starting the app, you can start a new test without entering a new user ID.

Every time an ECG record is stored or transferred, the user ID is increased by 1 (for example, ID-001 → ID-002), the max. user ID value is 99 and then it is reset to 0.

When restarting the app without storing or transferring an ECG record, the user ID remains the same (for example, ID-001 → remains ID-001)

When sending an email with ECG record of the same patient several times without shutting down the app, the same user ID is added to the report (for example, first transfer: ID-001 and second transfer: ID-001).

Showing Personal Info

To add options for patient personal information (default setting is OFF):

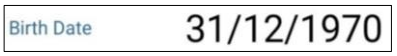
Tap to enable 

(see Figure 79).

Show Personal Info is turned **ON** and enabled 

.

The 

and 

fields are added to the **Enter Patient Details Dialog Box** (see Figure 87).

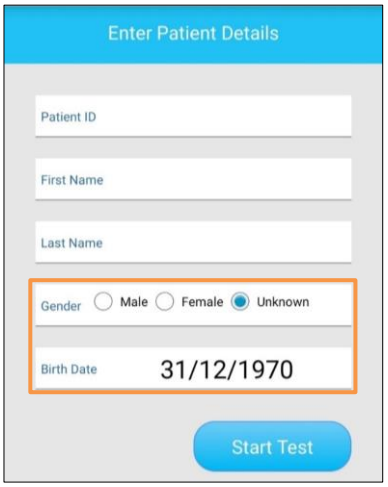


Figure 87: Gender & Birth Date Added to Enter Patient Details Dialog Box

Email Settings

This section reviews setting email address for sharing report (see Figure 88).

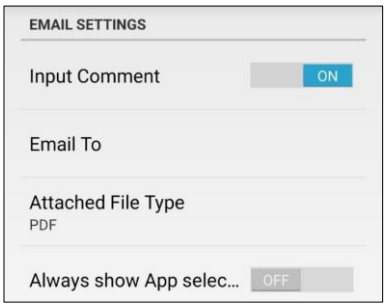


Figure 88: Email Settings Selection

Email Settings:

- **Input Comment** (page 65)
- **Email To** (page 65)
- **Attached File Type** (page 66)
- **Always Show App Selector** (page 66)

Input Comment

To Add comments to the email body text:

Tap Input Comment OFF (see Figure 88).

OFF is changed to ON.

Every time you send email, comments are inserted to the email body text (see Figure 89).

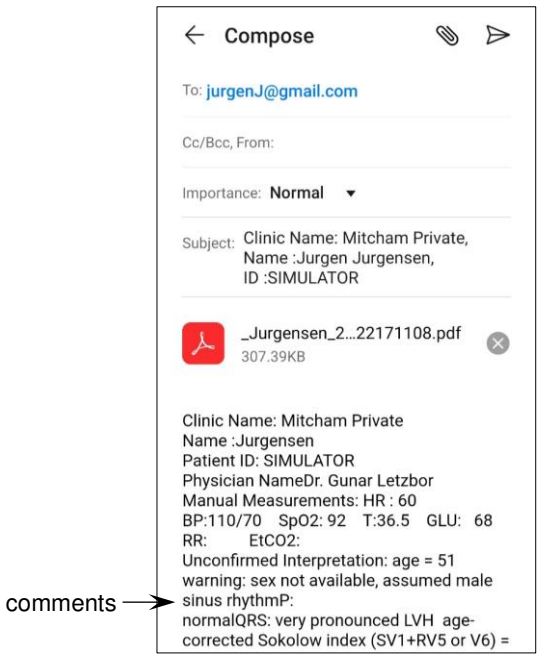


Figure 89: Comments Added to Email Body Text

Email To

This setting allows adding email recipients to save time when sending reports via email.

To add new email address(es):

1. Tap Email To (see Figure 88).

   The **Email to Dialog Box** is displayed (see Figure 90).

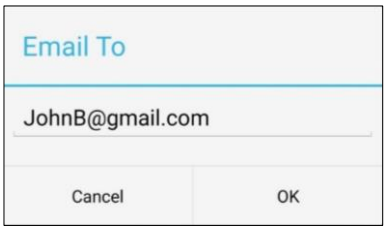


Figure 90: Email to Dialog Box

2. To type, tap the Email To field (see Figure 90).
3. Add email address(es) – see Figure 90.

   You can add multiple email addresses using semicolon (**;**) to separate them.
4. To save, tap OK (see Figure 90).

Attached File Type

To select the file type of a report attached to an email (default setting is PDF).

1. Tap Attached File Type (see Figure 88).

   The **Attached File Type Dialog Box** is displayed (see Figure 91).

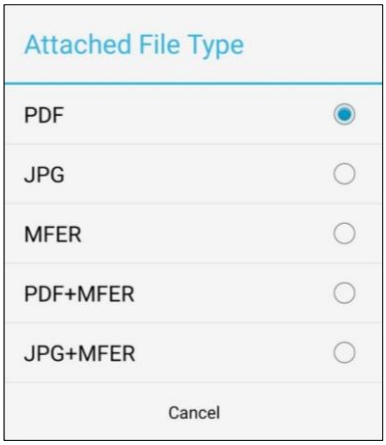


Figure 91: Attached File Type Dialog Box

2. To select file type, tap the respective radio button (see Figure 91).

Always Show App Selector

When sharing PDF report for the first time, all apps used for sharing are displayed (see Section Sharing Report page 29).

To enable showing app selector, tap Always show App selec... OFF (see Figure 88).

OFF is changed to ON.

- When selecting Email (for example) and **Always Show App Selector** is **ON** Always show App selec... ON, the next time, all apps used for sharing are displayed (see Section Sharing Report page 29).
- When selecting Email for the first time and **Always Show App Selector** is **OFF** Always show App selec... OFF, the next time, **ONLY** the previously used application is displayed (Email in this case).

Export Settings

This section reviews the settings associated with exporting ECG pages (PDF), without interpretation and measurements to your mobile device on which the mobile app runs (see Figure 92).

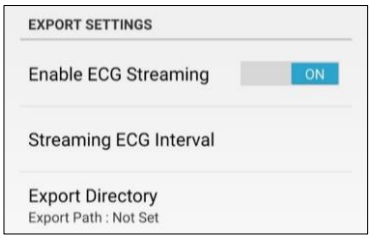


Figure 92: Export Settings Selection

Export Settings:

- **Enable ECG Streaming** (page 67)
- **Streaming ECG Interval** (page 67)
- **Export Directory** (page 68)

Enable ECG Streaming

To enable ECG streaming, tap Enable ECG Streaming OFF (default setting is OFF) – see Figure 88. OFF is changed to ON.

Streaming ECG Interval

To determine the frequency of ECG interval streaming (clear by default):

1. Tap Streaming ECG Interval (see Figure 88).
   The **Streaming ECG Interval Dialog Box** is displayed (see Figure 93).

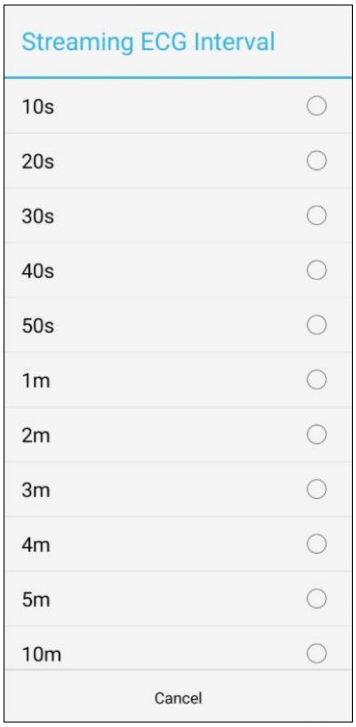


Figure 93: Streaming ECG Interval Dialog Box

2. To select interval frequency (10 sec. to 10 min), tap the radio button of the required interval frequency (see Figure 93).

Export Directory

To define the folder on the mobile device where reports are saved by Norav app:

1. Tap Export Directory (see Figure 88).

   The mobile folder list is displayed (see Figure 94).

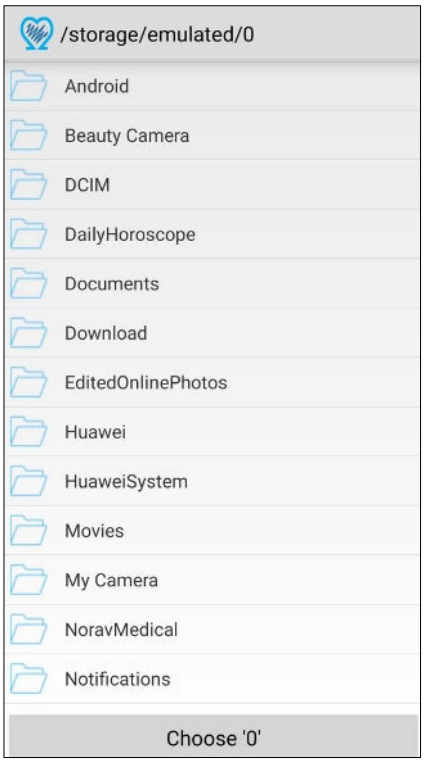


Figure 94: Mobile Folder List

2. To select a folder from the list, tap the required folder (see Figure 94).

External Measurements

1. To enable **Blood Pressure**, **Glucose**, **Body Temperature**, **SpO2**, **Respiratory Rate**, **End-Tidal CO2**, tap the respective OFF to ON (see Figure 95).

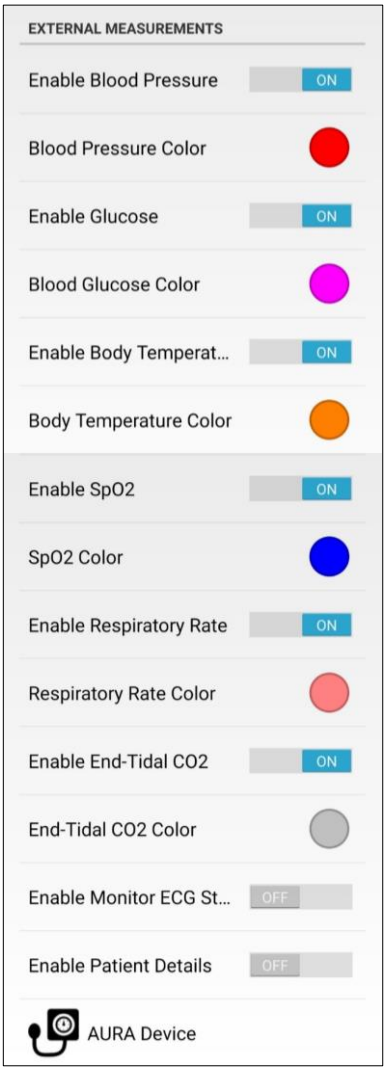


Figure 95: External Measurements

2. To select the label colors for **Blood Pressure**, **Blood Glucose**, **Body Temperature**, **SpO2**, **Respiratory Rate**, and **End-Tidal CO2**, tap the respective measurement, and then tap the desired color from the color pallet (see Figure 96).

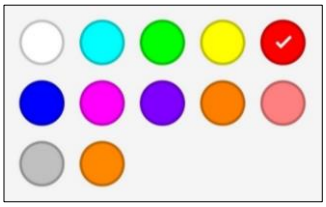


Figure 96: External Measurements Color Pallet

3. To change the background color of a **Test Screen**, tap Enable Monitor ECG St... OFF.
   - ◊ Enable Monitor ECG St... OFF (default) – Test Screen background pink Standard (see Figure 97)
   - ◊ Enable Monitor ECG St... ON – Test Screen background black Monitor (see Figure 98)

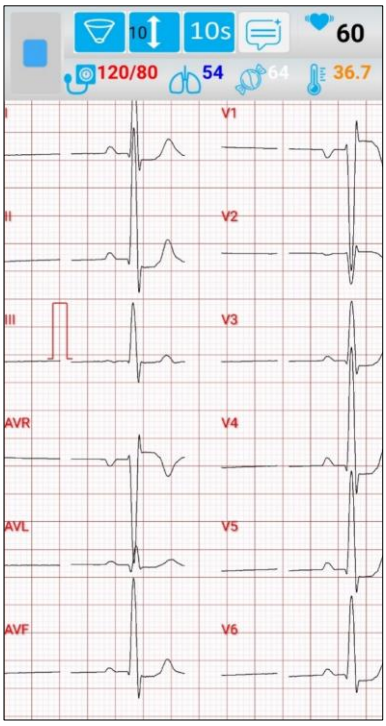


Figure 97: Test Screen Pink Background

Figure 98: Test Screen Black Background

Enabling Patient Details

To view **Patient Details** (**ID**, **First Name**, and **Last Name**) on the Test Screen (**Tablet only**), tap Enable Patient Details OFF.

OFF is changed to ON.

The Test Screen is displayed with the **Patient Details** on the top right side (see Figure 99).

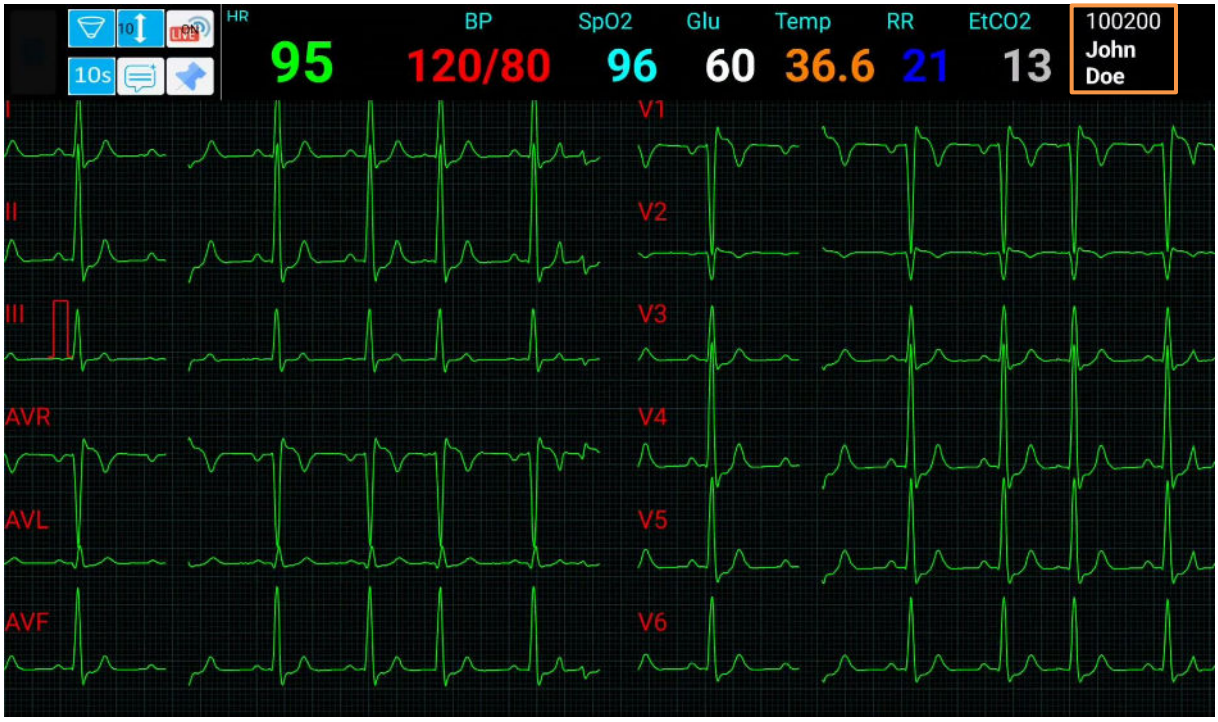


Figure 99: Test Screen with Patient Details (Tablet only)

7. Special Features

Terumo NFC Devices

- Terumo Blood Glucose Level Meter: Data Communication Mode NFC-F (see Figure 100)

Figure 100: Terumo Blood Glucose Level Meter

- Terumo SpO2 Device: Data Communication Mode NFC-F (see Figure 101)

Figure 101: Terumo SpO2 Device

- Terumo Electronic Thermometer: Data communication mode NFC-F (see Figure 102)

Figure 102: Terumo Electronic Thermometer

- Terumo Standard noninvasive blood pressure device for Japanese ambulance (see Figure 103)

Figure 103: Terumo Standard Noninvasive Blood Pressure Device for Japanese Ambulance

Adding External Devices using NFC Connection

To add external devices using NFC connection:

1. Turn **ON** the Terumo NFC device (see Figure 104).

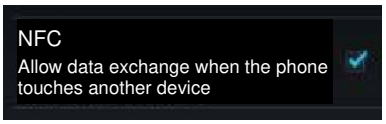
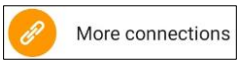


Figure 104: Export Directory Selection

2. To turn **ON** NFC on your mobile device, tap  on the **Settings Screen** (see Figure 105).

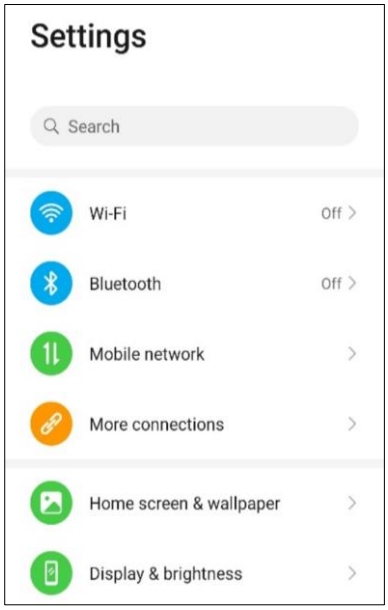


Figure 105: Settings Screen

The **More Connections Screen** is displayed (see Figure 106).

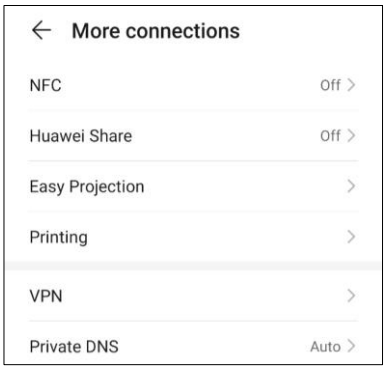
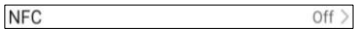


Figure 106: More Connections Screen

3. Tap  (see Figure 106).

The **NFC Screen** is displayed (see Figure 107).

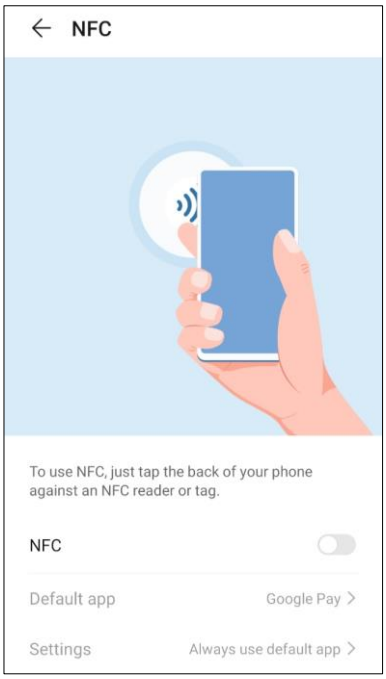


Figure 107: NFC Screen

4. To turn **ON** NFC, tap NFC on the **NFC** screen.

   is changed to .

   The icon is displayed on the top area of your mobile device (see Figure 108).

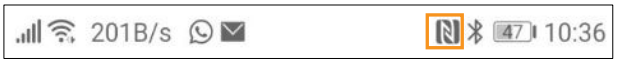


Figure 108: NFC Activation on Mobile Device

5. Carefully place the Terumo NFC device opposite the mobile device.
   Beeping sound notifies the connection.

6. Open the mobile app → Start new test → View ECG trace → Place Terumo NFC device opposite the mobile device.
   - ◊ Measured results are displayed at the top of the ECG screen (see Figure 109 - left).

     Or
   - ◊ Blank measurements are displayed at the top of the ECG screen (see Figure 109 - right).

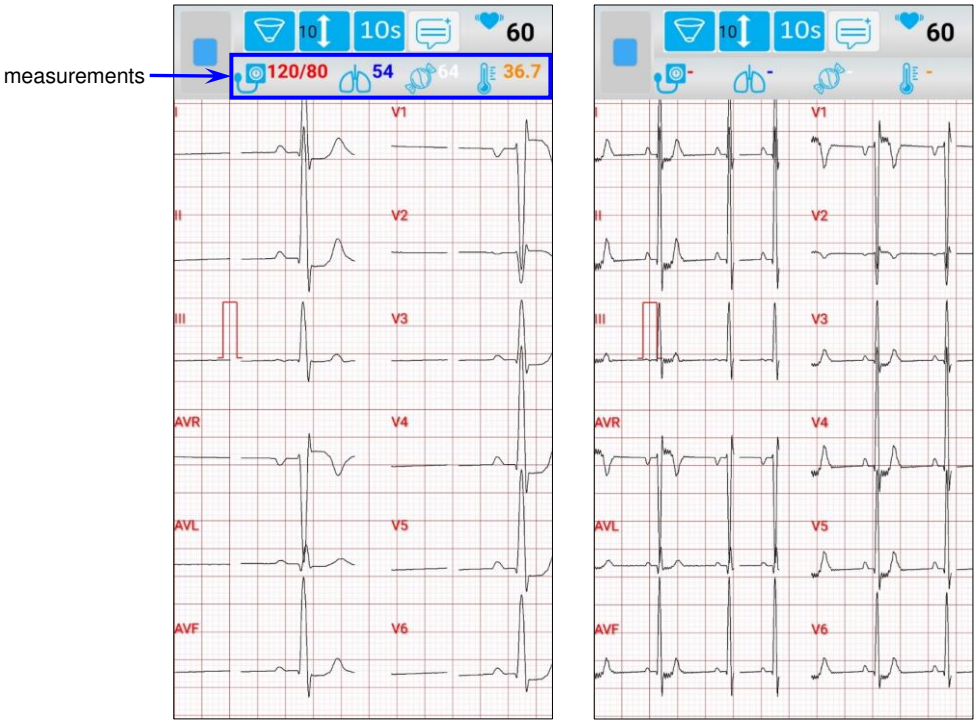


Figure 109: Test Screen with & without Measurements

For a list of devices that support NFC, see https://www.nfcw.com/nfc-phones-list/.

AURA Device

AURA is a portable, body-worn Noninvasive Blood Pressure (NIBP) device, with the optional capability of measuring oxygen saturation (SpO2), for use in clinical settings (see Figure 110).

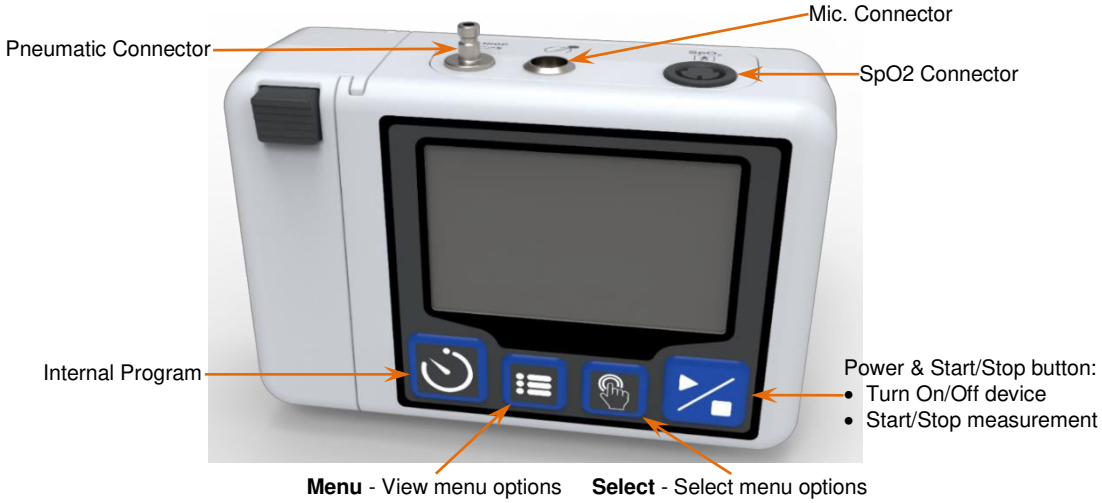


Figure 110: AURA Device

NR ECG Device Model NR-1207-3

The NR ECG device Model NR-1207-3, which supports AURA device (hereinafter named NR-1207-3 device), is used for ECG tests (see Figure 111).

Figure 111: NR-1207-3 Device

Setting up NR-1207-3 Device

1. In the System Settings, select **ECG+** mode.
2. Select **BP Device**.

   The **BP Device Menu** is displayed (see Figure 112).

Figure 112: BP Device Menu

3. Set BP Control: to On (see Figure 112).
4. To pair the NR-1207-3 device to the AURA device, set WK s.n. to the serial number of the AURA device (14 in this example) – see Figure 112.
5. Select Check Connection and press ↵ (see Figure 112).
   The **CONNECTED** message is displayed.

Setting up Aura Device on the Mobile ECG App

1. Tap AURA Device (see Figure 95).
   The **AURA Device Setup Dialog Box** is displayed (see Figure 113).

Figure 113: AURA Device Setup Dialog Box

2. To enable the **AURA Device**, tap Enable AURA Device ON.
3. To enable the **SpO2 Sensor**, tap SpO2 Sensor ON.
4. To set the **BP Measurement Mode**, tap Auto and then select one of the following options from the drop-down list (see Figure 114).
   - Auto – the AURA device selects BP measurement mode automatically
   - Auscultatory – BP measurement method with normal ECG sinus rhythm
   - Oscillometric – BP measurement method without ECG signal

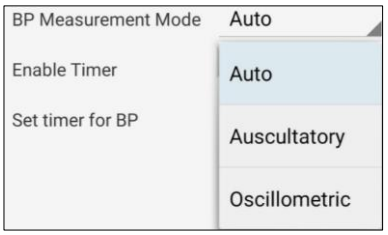


Figure 114: Aura Device Setup Dialog Box

5. To enable **Timer**, tap Enable Timer ON.

6. To **Set timer for BP**, tap the Second 0 field and select from the drop-down list (0 sec. to 59 sec.), and then tap the Minute 1 field and select from the drop-down list (0 min to 59 min) see Figure 115.

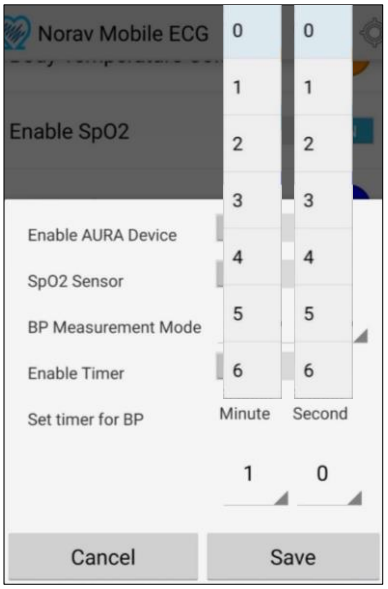


Figure 115: Set Timer for BP

7. To save the setup, tap Save.

Performing ECG Test with BP & SpO2 Measurements

To begin a new test using the AURA device with the NR-1207-3 device leads and SpO2 sensor placed on the patient:

1. Start the test on the mobile app.
   ECG tracings are displayed.
2. The BP test cycle begins after delay defined by **Set Timer for BP** (see Figure 115).
3. When the BP test cycle is complete, the BP test results, SpO2 result, and heart rate result are displayed on the AURA device screen and on the mobile device screen.
4. When the next BP measurement begins, the cuff pressure is displayed on the AURA device screen. The app screen continues displaying the previous BP result until a new result is received from the AURA device.

Note

Pressing the button on the AURA device during BP test, aborts the test.

5. The automatic sequence of BP test cycles continues; a BP test cycle is initiated at the next programmed interval unless the test is stopped on the mobile ECG app.

Viewing Online ECG Test with External Measurements

See Figure 116.

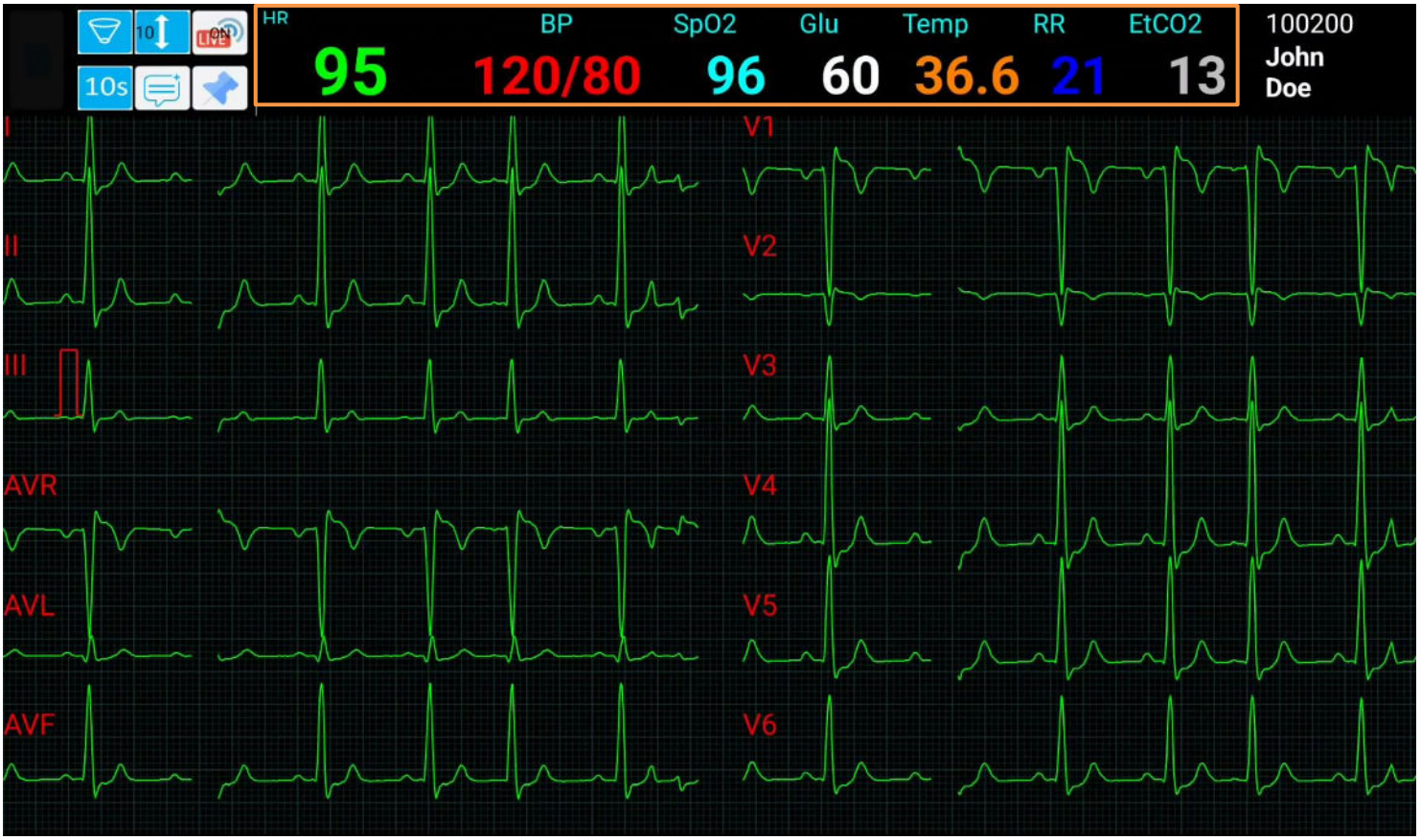


Figure 116: Online ECG Test with External Measurements

Viewing Test Report with External Measurements

See Figure 117.

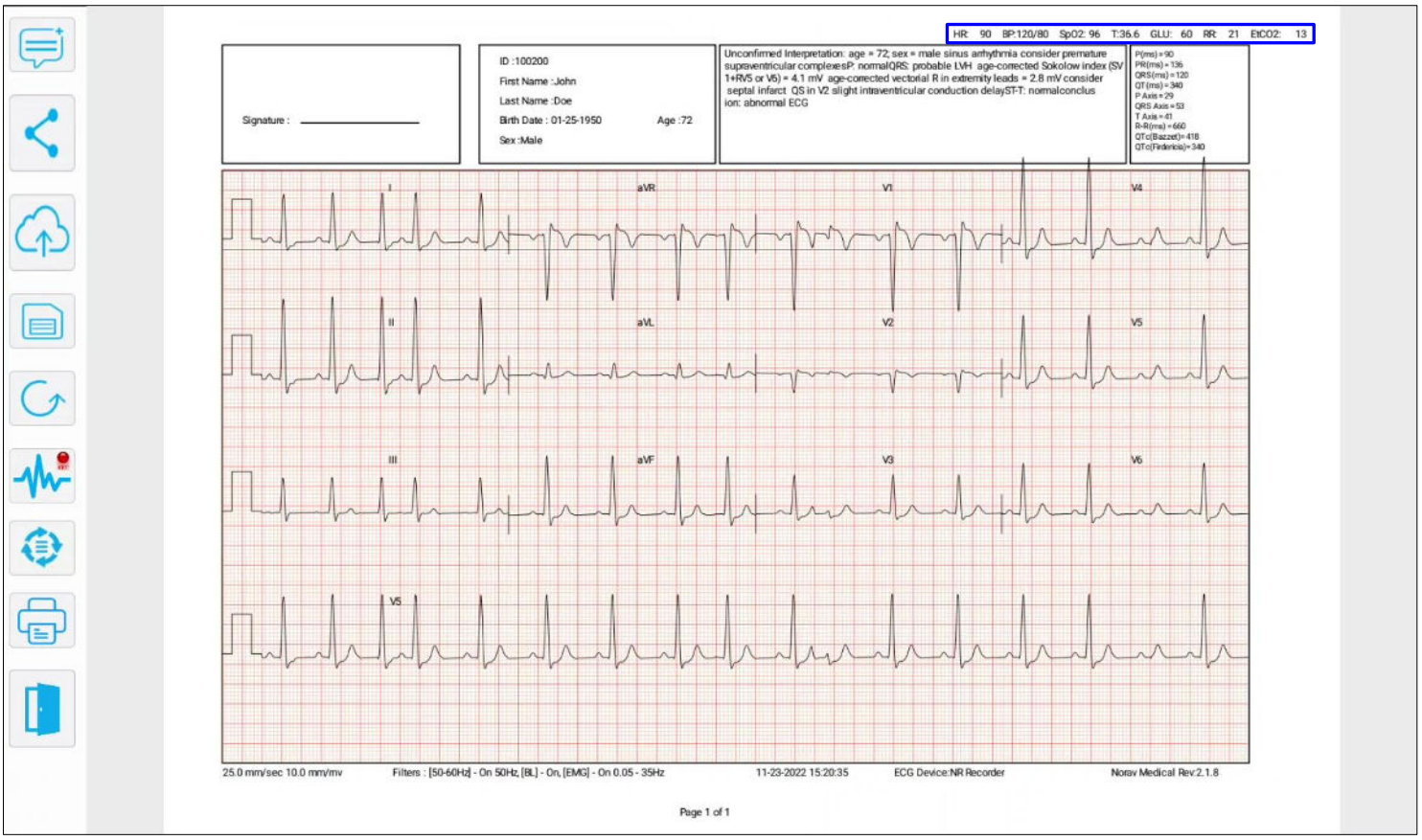


Figure 117: Test Report with External Measurements

Enabling 12-Lead based on 5-Electrode Placement

Supporting 5-Electrode cable (derived leads) converted to 12 derived leads.

Supporting derived leads is important when dealing with Emergency Healthcare (e.g., Ambulance/ED).

1. To enable 12-dervied leads based on 5-Electrode placement on the patient, tap Enable 12-Lead based... ON.

   When not set to **ON**, the user cannot start the test.

2. Connect the 5-Electrode cable to the NR ECG device.
3. Start the test.

To disable this option, tap Enable 12-Lead based... ON to **OFF**.

ON is changed to OFF and the option is disabled.

Note

RT ECG Lead titles with **Derived** notations (see Figure 118).
Report Lead titles with **Derived** notations (see Figure 119).

Figure 118: RT ECG Screen with Derived Lead Titles

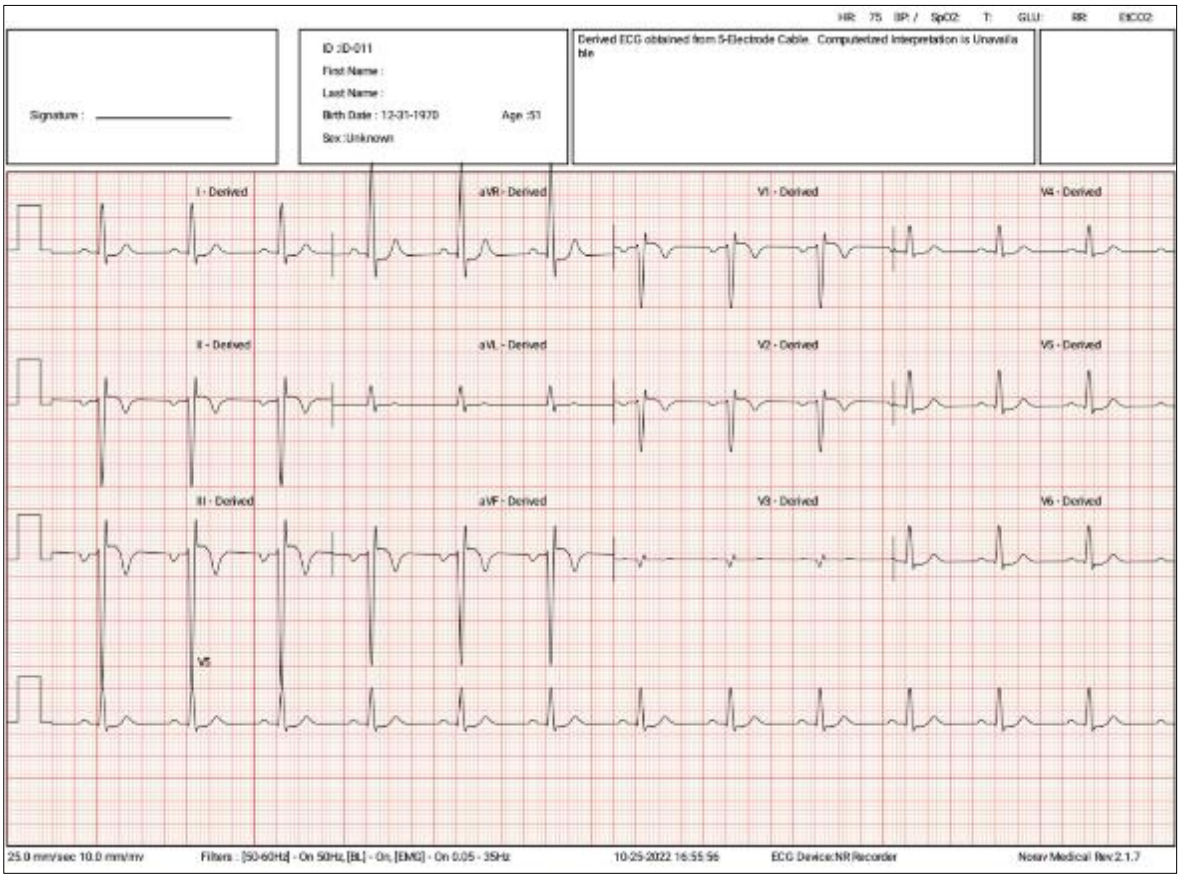


Figure 119: Report Screen with Derived Lead Titles

Remote App Name (API)

Remote App Name is the remote bundle application name that interfaces with Norav Mobile ECG app.

In case of demo project, do not change the name.

To enter a remote app name:

1. Tap Remote App Name (API) (see Figure 79).

   The **Remote App Name Dialog Box** is displayed (see Figure 120).

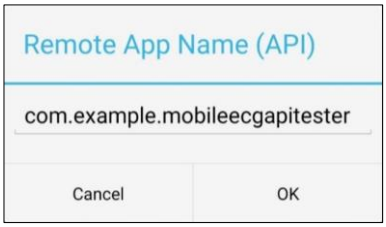


Figure 120: Remote App Name Dialog Box

2. To type, tap the Remote App Name (API) field, and then enter the remote app name (see Figure 120).
3. To save, tap OK (see Figure 120).

Using API App Integration Mode

To enable **API App Integration Mode** (default setting is OFF):

Tap Use API App Integratio... OFF (see Figure 79).

API App Integration Mode is turned **ON** and enabled Use API App Integratio... ON.

Closing the Mobile App after Report Generation

You can close the app after generating a report

(default setting is **ON** – Close App after report... ON).

To disable this option, tap **OFF** Close App after report... OFF.

Simulating Test

To display QRS waves and generate reports without connecting a patient:

1. Tap 

on the **Home Screen** (see Figure 121).

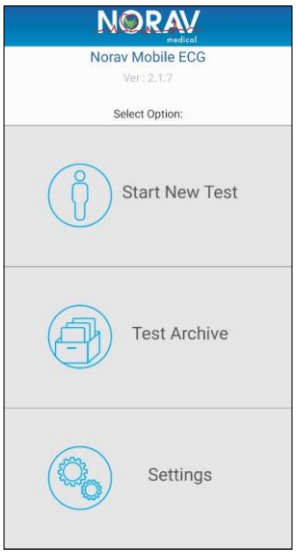


Figure 121: Selecting Settings on Home Screen

2. To enable the Simulator, tap 

(see Figure 122).

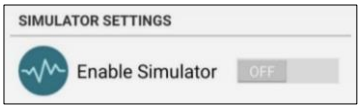


Figure 122: Enabling Simulator

The Simulator is enabled 

.

Note

Saved simulated ECG reports are displayed with **Simulated ECG!** mark (see Figure 123).

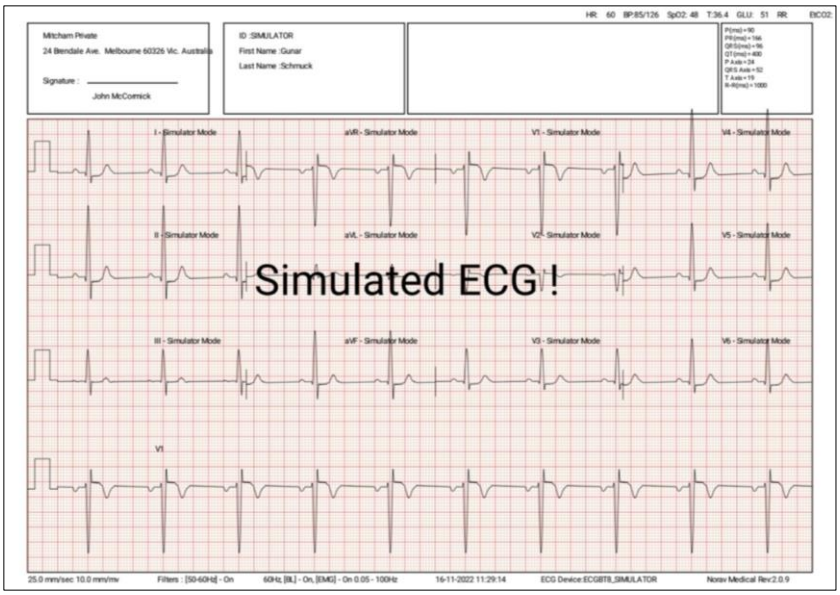


Figure 123: Saved Simulated ECG Report with Simulated ECG! Mark

Uploading PDF to FTP Server

To upload a file to FTP server, tap 

on the **Home Screen**, then tap FTP Send Mode, and then select an option from the FTP Send Mode dialog box (see Figure 124).

FTP Send Mode includes three options:

- Send Zip File [Nems] – Sending Zip file to Norav FTP for receiving ECG measurements and interpretation (see Figure 124).
  The Zip file contains raw data, PDF report, and XML tag.
- Send PDF File – Sending PDF file (see Figure 124).
- Send MFER File – Sending MFER file (see Figure 124).

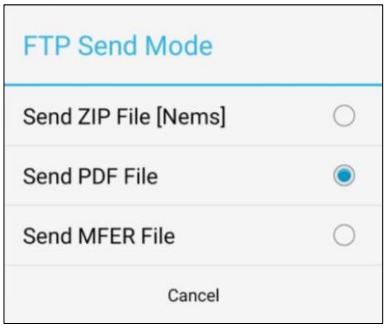


Figure 124: FTP Send Mode Dialog Box

File name modification (with NR serial number) for PDF is based on the following format: YYYYmmddHHmmss_NR-SN_ClinicName

ECG+ Mode

The ECG+ Mode allows recording multiple records as a single NR file. The file is divided to special events, and each event defines patient record. Also, ECG+ Mode allows transmitting data via Bluetooth® simultaneously with saving record in flash-drive.

The ECG+ Mode applies **only** to the NR-1207-3 device.

The benefit of this mode is that the NR-1207-3 device continues recording ECG data to the memory (SD) card of the NR-1207-3 device when there is no Bluetooth® connection.

Setting the NR-1207-3 Device

1. Insert a new battery into the NR-1207-3 device.
2. Insert an empty SD card into the NR-1207-3 device.
3. On the NR-1207-3 device, go to **Settings → ECG Mode → ECG+ → Save as default**.

Remarks for ECG+

1. Open the mobile app and start new test.
2. When you want to start a new test (and test is already running), you are prompted with a message containing the existing patient name and patient ID.
   Choose one of the following actions:
   - ◊ Continue with the same test.
   - ◊ Stop the current test and start a new test.
3. When the record is closed, you are prompted to one of the following actions:
   - ◊ Start a new test in ECG mode (without recording to the NR-1207-3 device).
   - ◊ To use the record as ECG+ recording, download it to NEMS-Q and to the PC.
4. Before starting a new test, a hook-up test is performed to verify the cable type (only 10-Electrode ECG cable is supported).
5. Sample rate is automatically synchronized with the NR-1207-3 device.

ENWA Support

ENWA technology supports **mirroring** the Android mobile device screen during **ECG acquisition in real-time** (this feature is mostly used while transferring the patient to the hospital via Ambulance/Helicopter).

ENWA also allows the remote monitoring clinician, who tracks the ECG for Arrhythmias, to request downloading an MFER test (MFER is ECG Japanese standard format) at a specific time, allowing the technician/cardiologist to analyze the ECG test using raw data format (not image).

Prerequisites

- Internet Browser
- Installing and Configuring the DiCaster App (page 86)

Installing and Configuring the DiCaster App

The DiCaster app is a streaming application for Android.

1. Launch the DiCaster app for the first time (see Figure 125).

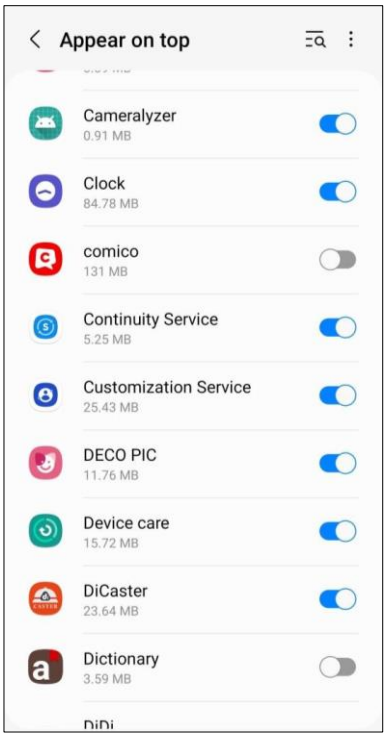


Figure 125: Launching the DiCaster App

The **Broadcast Options Screen** is opened automatically (see Figure 126).

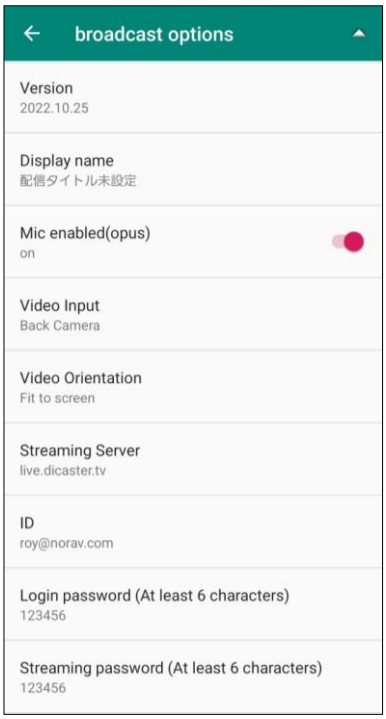


Figure 126: DiCaster App Broadcast Options Screen

2. Start **Live Streaming** (see Figure 127).

Figure 127: Starting Live Streaming

3. If you want to send the Android mobile device screen, select **Video Input** on the **Broadcast Options Screen** and then select **Android Screen** (see Figure 128).

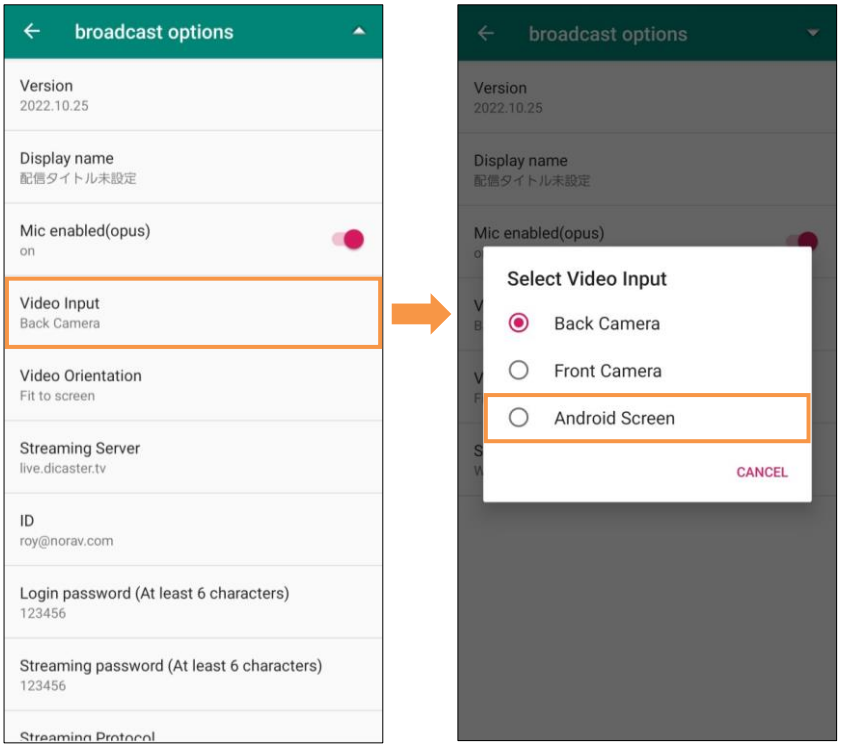


Figure 128: Selecting Video Input → Android Screen

4. To watch live streaming in Chrome browser, access https://live.dicaster.tv.

   The **DiCaster Live Sign-in Dialog Box** is displayed (see Figure 129).

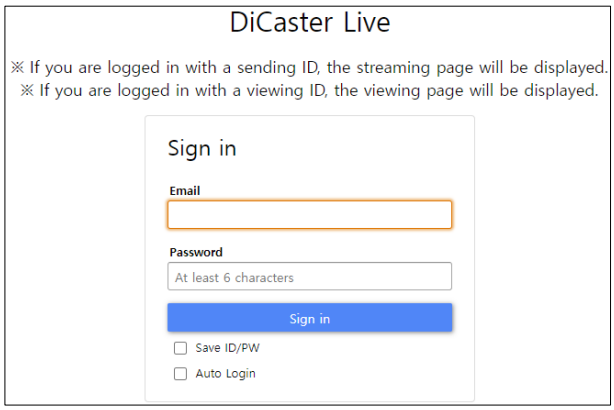
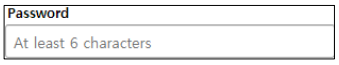


Figure 129: DiCaster Live Sign-in Dialog Box

5. Fill your email in the  field.

6. Set your password in the  field.

7. Click  .

Operation

1. Sign in to https://live.dicaster.tv/.
2. Start ECG Test.
3. Click  .

   Make sure the **ON** caption appears over the Live icon  after clicking (see Figure 130).

   You can see the  notification from the DiCaster website (see Figure 130).

Figure 130: Publishing Notification from the DiCaster App

4. Now you can view the ECG screen on the DiCaster website (see Figure 131).

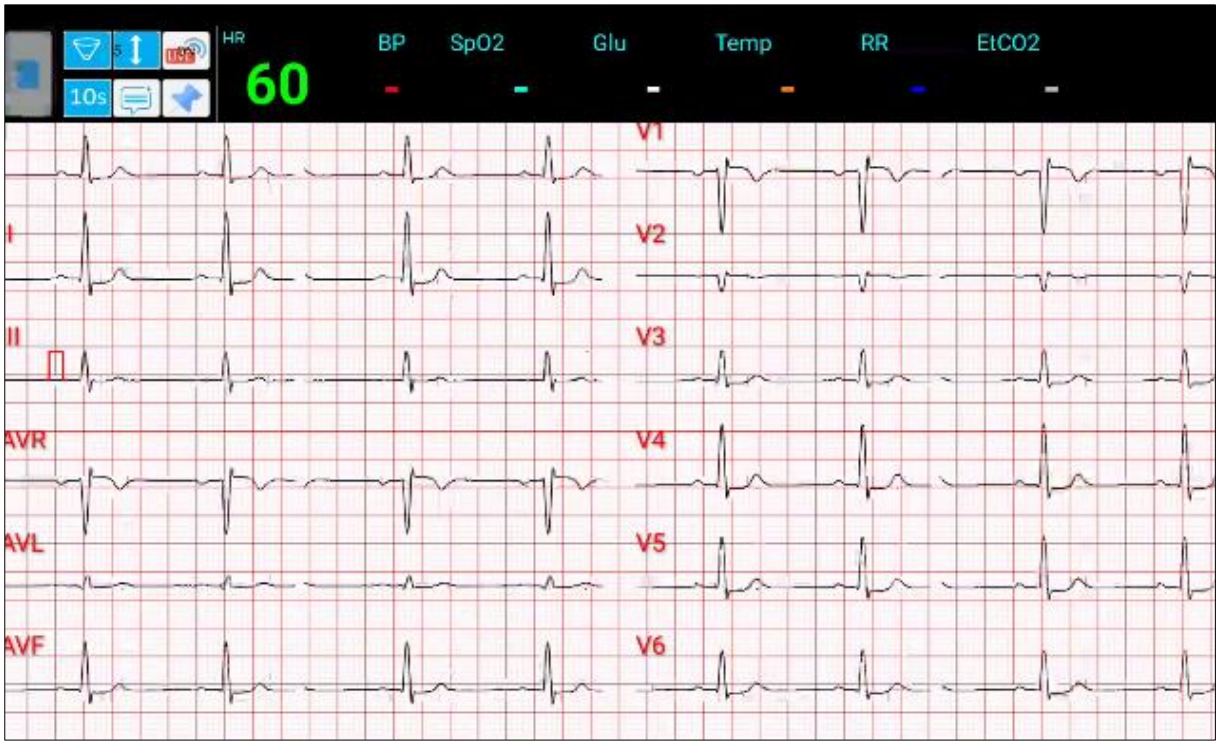


Figure 131: ECG Screen on DiCaster Website

5. To stop mirroring, click  again.

6. To download the **MFER ECG Test**, click on the requested device (on browser), and then click MFER File Download (see Figure 132).
   A few seconds may pass until the file starts downloading.

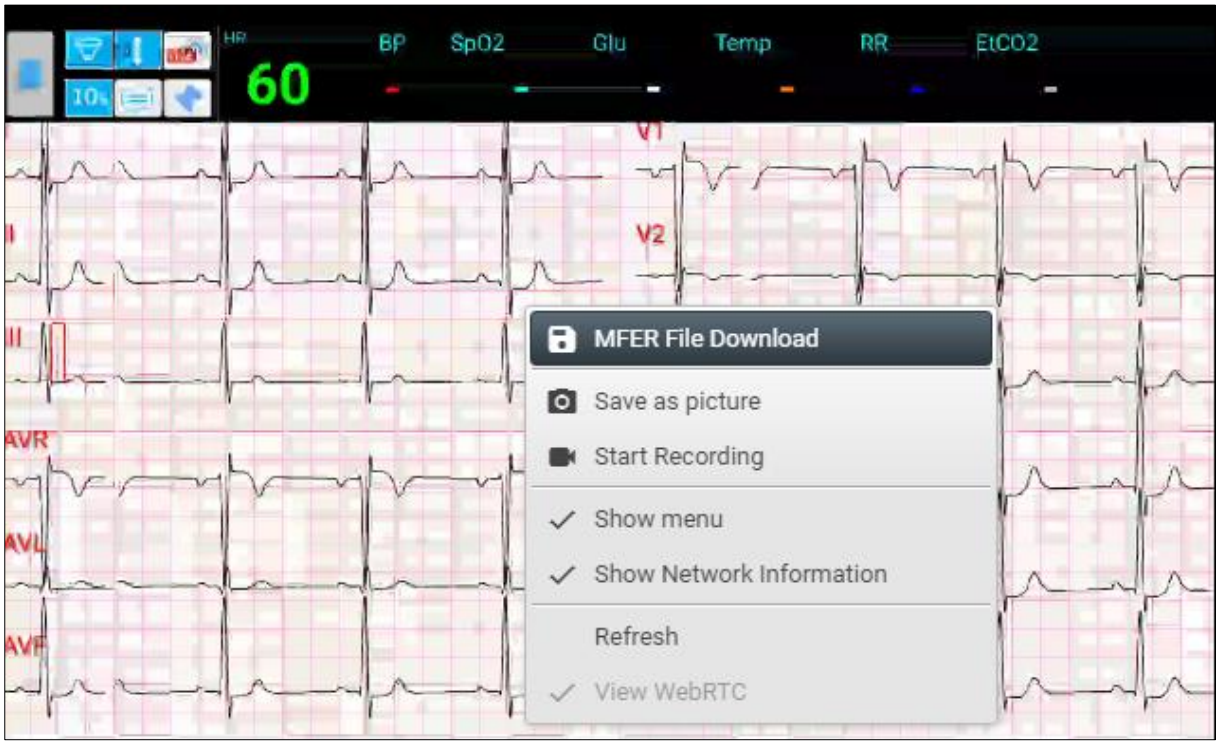


Figure 132: Downloading MFER File

The technician can view the MFER file using the MFER viewer (see Figure 133).

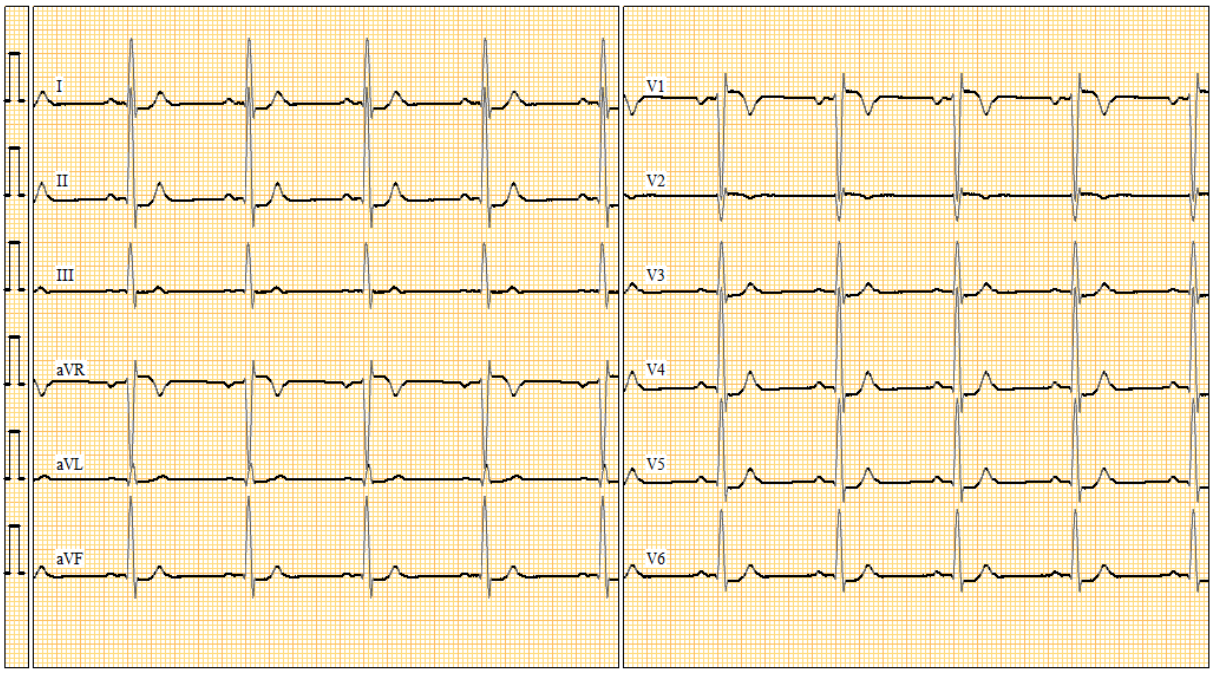


Figure 133: Viewing MFER File using MFER Viewer

8. Troubleshooting

Problem	Cause	Corrective Action
Lead-off is displayed on screen or some leads are printed as bold lines.	• Poor electrode contact. • Loose lead. • Disconnected lead from patient. • Damaged lead or patient cable.	• Reattach the electrode. • Replace the electrode. • Make sure patient's skin is properly prepared. • Make sure shelf life of electrodes is not expired.
Muscle tremor interference superimposed on waveforms.	• Patient is uncomfortable. • Patient feels cold and shivering. • Test bed too small or narrow. • Electrode straps are tight.	• Help patient get comfortable. • Examine all electrode contacts. • Turn ON EMG filter.
AC interference superimposed on waveforms.	• Electrode(s) problem. • Technician touches electrode(s). • Patient touches metal parts of test table or bed. • Damaged ECG cable or power cord. • Electrical devices nearby, lighting, or concealed wiring in wall or floor. • Improperly grounded electrical outlet. • Incorrect data filter frequency setting or data filter is OFF.	• Make sure patient is not touching any metal parts of bed or environment. • Make sure power cord is not intertwined with ECG cable. • Turn ON data filter. • Make sure proper filter setting is selected (50 Hz or 60 Hz, depending on your region). • If interference persists, noise may be caused by other equipment in room or by poorly-grounded power lines. • Try moving to another room.
Noisy ECG signal on leads	May be caused by poor connection of electrodes or leads to patient.	• Examine leads connection to patient. • Make sure the electrodes are properly attached to patient.
Unable to start test	Communication problem with the NR ECG device	• Make sure the NR ECG device was selected in the app Settings in the Bluetooth® section. • Make sure the NR ECG device is ON and ready for pairing (by clicking  on the NR ECG device). • Restart the app (by exiting the app and starting it again). • Make sure the NR ECG device battery is full. • Make sure range from NR ECG device to mobile device is within 10 m and no objects (e.g., sealed window, concrete wall) block the wireless signal.