



Norav Users Guide

NM-700

NV-54/NM700
Revision 200220

Norav Users Guide NM-700
NM-700 Monitoring system

For SW version 4.4x.

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Standards Compliance

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*.

This product complies with regulatory requirements of the following European Directive 93/42/EEC concerning medical devices.



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

Caution

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 a misuse of the software product.

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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.

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

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INTRODUCTION

Manual Organization

This manual explains in detail how to install and use the NM-700.

The software must be installed before the hardware.

Document Conventions

Notes and Cautions

Pay particular attention at specific points in a procedure when one of the following messages appears:



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 or loss to equipment. Pay careful attention to instructions.








Note

Notes provide pertinent information to help obtain optimum performance from the software or signify an important step or procedure that requires special attention.

Abbreviations and Acronyms

Abbreviation	Meaning
BP	Blood pressure
ECG	Electrocardiogram
ID	Identification
LQTS	Long QT Syndrome
SN	Serial Number
USB	Universal Serial Bus

Equipment Symbols

Symbol	Description
	Type CF equipment, defibrillator proof
	Class II equipment
	Complies with the Medical Device Directive of the European Union
	Date of Manufacture
	Waste electrical and electronic equipment (WEEE)

OVERVIEW

Package Contents

The NM-700 package contains the following elements:

- ECG Acquisition/Transmitter units
- Patient ECG cable (AHA or IEC type 10 lead, or 4 lead, or 5 lead)
- Bluetooth USB adapter
- USB extension cable (for the Bluetooth adaptor)
- SpO2 oximeters (optional)
- CD of NM-700 software installation
- CD of NEMS-A software installation
- Installation instructions
- Software license key

Indications for Use of the NM-700

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 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.

The NM-700 system is a PC-based ECG monitoring for up to 7 patients.

Contraindications for Use and Adverse Effects

The device has no contraindications or adverse events.

Safety Warnings and Precautions



WARNING

- **ELECTROSURGERY** – There is a risk of burns and injury to the patient. If an electro surgery device is used, disconnect the ECG cable from the device.
- **CABLES** – Cables present a possible strangulation hazard. To avoid possible strangulation, route all cables away from patient's throat.
- **CONDUCTIVITY** – Electric shock or device malfunction may occur if electrodes contact conductive materials. Keep the conductive parts of lead electrodes and associated parts away from other conductive parts, including earth. Also make sure that no contact to other conductive parts is possible if the electrodes loosen during recording.
- **GENERAL DANGER TO THE PATIENT** – Instructions listed in this manual in no way supersede established medical practices concerning patient care. Perform the established medical practices under all circumstances.
- **EXPLOSION HAZARD**—Do not use in the presence of a flammable anesthetic mixture with air or oxygen or nitrous oxide.
- **DEFIBRILLATION** - Device is defibrillation protected when the original Norav Medical patient cable is used. However, as a safety precaution when possible, remove the electrodes before defibrillation.
- **GENERAL DANGER TO THE PATIENT** - The device is not designed for direct cardiac application.
- **INFECTION RISK** – Reuse of disposable parts that come into contact with patients pose a risk of infecting patients. Do not reuse disposable parts that have had direct contact with the patient, such as ECG electrodes.
- **INTERPRETATION HAZARD** - Computerized interpretation is only significant when used in conjunction with clinical findings. A qualified physician must over read all computer generated tracings.
- **MAGNETIC AND ELECTRICAL INTERFERENCE** - Magnetic and electrical fields are capable of interfering with the proper performance of the device. For this reason make sure that all external devices operated in the vicinity of the device comply with the relevant EMC requirements. X-ray equipment or MRI devices are possible sources of interference as they may emit higher levels of electromagnetic radiation.
- **OPERATOR** - Medical technical equipment such as this system must only be used by qualified and trained personnel.

PATIENT SAFETY

- A patient undergoing a test must be at a distance of at least (relates to the wired models only):
 - 1.5 meters from the computer, printer and other peripherals, and
 - 2.5 meters from the ceiling.
- If such conditions cannot be fulfilled, the entire system needs to be connected to the A/C power supply through an Isolation transformer meeting the IEC/EN 60601-1 standard.

OPERATION WITH OTHER DEVICES



WARNING

- Other devices which are part of the system must meet the requirements of the Standard for Information Technology Equipment (IEC/EN 60950-1) and the Standard for Electrical Medical Devices (IEC/EN 60601-1)
- The personal computer should be approved to the appropriate safety standard for non-medical electrical equipment (IEC/EN 60950-1, or its national variants). Also, the use of additional protective earth ground or an isolation transformer is required for the electric power circuit to which the NM-700 Telemetry ECG System is connected in order to satisfy the IEC/EN 60601-1 safety standard.
- Computers and printers used with Medical Devices should be evaluated for IEC/EN 60950-1, IEC/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 60950-1 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.
Therefore anybody, who connects additional equipment to the signal input or output connector to configure a medical system, must make sure that it complies with the standard.
- When using NM-700 Telemetry ECG in combination with any other equipment, refer to a qualified service technician for correct handling.



- **DAMAGE TO THE DEVICE THROUGH BATTERY LEAKAGE** – Batteries may leak if left in an unused device for prolonged periods. If you intend to store the device for longer than one week, remove the battery from it.
- **CABLE DAMAGE** – Bending or wrapping the cable can damage it. When attaching and affixing the ECG cable, make sure not to bend it excessively. Avoid coiling the ECG cable around the device, as this can damage the cable.
- **DAMAGE TO THE DEVICE** – You may only open the battery compartment of the recorder. Do not use force when handling the recorder.
- **SAFETY ONLY WITH APPROVED ACCESSORIES** – Safe and reliable operation of the device is only possible when using the supplied and approved accessories.
- **DIFFICULTIES FINDING CAUSES FOR MALFUNCTIONS** – To find and repair a malfunction, both device and ECG cable are needed. Remember to include the ECG cable when returning the device for service or repair. (Avoid wrapping the ECG cable around the device, as this can damage the cable.) Always use the same ECG cable with a device. If an institution has several devices and ECG cables, try to ensure that each device is matched with a specific ECG cable. In this way, cable or recorder failures can be isolated and eliminated faster. 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.
- **DAMAGE TO DEVICE AND ACCESSORIES** – Unauthorized personnel do not have the proper training to repair the device. Repairs carried out by unauthorized personnel could result in damage to the device or accessories. Send the device for inspection to an authorized facility if you find or even suspect a malfunction. Please add a detailed description of the observed malfunction.
- **DAMAGE TO THE DEVICE** – Take care to prevent chemicals/liquids from entering the connectors or internal part of the device.




- **Pacemaker** - It is recommended that a minimum separation of 15 cm (6 inches) be maintained between either the ECG transmitter or SpO2 oximeter and a pacemaker to avoid potential interference with pacemaker. Some studies have shown that wireless devices might 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 a pacemaker:
 - Should always keep the ECG transmitter and SpO2 oximeter unit at least 30 cm from their pacemaker when the unit is turned on.
 - Should not carry the ECG transmitter or SpO2 oximeter in their breast pocket.

If you have any reason to suspect that interference is taking place, turn off both the ECG transmitter and SpO2 oximeter immediately.



- If audio is playing on the PC, the ECG shows interference. Do not run an audio CD on the PC while running an ECG test.
- Operate the unit only at clinics and hospitals. Do not use at home.




Caution

- **Power supply** - NM-700 Telemetry ECG computer uses mains power supply. The ECG transmitter and SpO2 oximeter uses battery power supply. On the PC side there is a signal receiver which uses a power supply via USB port.

Use only the recommended battery type as instructed in the technical specifications to operate the ECG and SpO2 devices.
Do not use batteries with expired dates.
Remove batteries from the ECG and SpO2 unit when it is not in use.

- Use only with battery compartment closed.




Note

The ECG transmitter and SpO2 oximeter devices are complies with Part 15 of the FCC Rules.


Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference and
- (2) This device must accept any interference received, including interference that may cause undesired operation.



Note

The manufacturer is not responsible for any Radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.



Note

Install hardware only after software installation.

CLASSIFICATION OF THE EQUIPMENT

- According to the type of protection against electric shock:
INTERNALLY POWERED EQUIPMENT
- According to the degree of protection against electric shock:
TYPE CF APPLIED PART
- According to the degree of protection against ingress of water: ORDINARY EQUIPMENT
- According to the degree of safety of application in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide:
EQUIPMENT NOT SUITABLE FOR USE IN THE PRESENCE OF A FLAMMABLE ANAESTHETIC MIXTURE WITH AIR OR WITH OXYGEN OR NITROUS OXIDE.
- According to the mode of operation:
CONTINUOUS OPERATION

EMC Specifications according to IEC 60601-1-2


Table 1: Electromagnetic Emissions

Emissions Test	Compliance	Electromagnetic Environment—Guidance
<i>This device is intended for use in the electromagnetic environment specified below. The customer and/or user of this device should ensure that it is used in such an environment.</i>		
RF Emissions CISPR 11	Group 2	This device must emit electromagnetic energy in order to perform its intended function. Nearby electronic equipment may be affected.
RF Emissions CISPR 11	Class B	This device is suitable for use in all establishments, including domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Emissions IEC 61000-3-2	N/A	
Voltage Fluctuations/Flicker Emissions IEC 61000-3-3	N/A	

Table 2: Electromagnetic Immunity

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment—Guidance
<i>This device is intended for use in the electromagnetic environment specified below. The customer and/or user of this device should ensure that it is used in such an environment.</i>			
Electrostatic Discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, relative humidity should be at least 30%.
Electrical Fast Transient/Burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	N/A	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	N/A	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions, and voltage variations on power supply input lines IEC 61000-4-11	±5% U_T (>95% dip in U_T) for 0.5 cycle ±40% U_T (60% dip in U_T) for 5 cycles ±70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec.	N/A	Mains power quality should be that of a typical commercial or hospital environment.
Power Frequency (50/60 Hz) Magnetic Field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the AC mains voltage before application of the test level.			

Table 3: Guidance and Manufacturer's Declaration—Electromagnetic Immunity

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment—Guidance
<i>This device is intended for use in the electromagnetic environment specified below. The customer and/or user of this device should ensure that it is used in such an environment.</i>			
Portable and mobile RF communications equipment should be used no closer to any part of the device, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.			
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	Recommended Separation Distance $d = 1.17\sqrt{P}$ $d = 1.17\sqrt{P}$ 80 MHz to 800 MHz $d = 2.33\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey ^a , should be less than the compliance level in each frequency range ^b . Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	

a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the device is used exceeds the applicable RF compliance level above, the device should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the device

b. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [3] V/m.

NOTES:

- At 80 MHz and 800 MHz, the higher frequency range applies.
- These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Table 4: Recommended Separation Distances

The following table details the recommended separation distances between portable and mobile RF communications equipment and NR recorder.


<i>This device is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. Users of this device can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communication equipment (transmitters) and the device as recommended below, according to maximum output power of the communications equipment.</i>			
Rated Maximum Output Power of Transmitter W	Separation Distance According to Frequency of Transmitter(m)		
	150 kHz to 80 MHz $d = 1.17\sqrt{P}$	80 MHz to 800 MHz $d = 1.17\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.33\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.2	1.2	2.3
10	3.7	3.7	7.4
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTES:

- At 80 MHz and 800 MHz, the higher frequency range applies.
- These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

MAINTENANCE

	<p><i>The ECG and SpO2 devices are not waterproof. Do not expose the device to water or any kind of liquid. Maintain in a dry place.</i></p> <p>ELECTRICAL HAZARD — <i>Improper handling during inspection or cleaning could result in electrical shock. To avoid potential shock, observe the following guidelines at all times:</i></p> <p>Caution</p> <ul style="list-style-type: none"> • <i>Before inspecting or cleaning the system, turn it off, unplug it from AC power, and remove the battery.</i> <p><i>Do NOT immerse any part of the equipment in water</i></p>
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Perform a visual inspection daily, preferably before the equipment's first use each day. During the inspection, verify that the device meets the following minimum conditions:

- The device case is free of cracks and other damage.
- All plugs, cords, cables, and connectors are free of kinks, frays, and other damage.
- All cords and connectors are securely seated.
- All keys and controls operate properly.

If you notice any items that need repair, contact an authorized service representative to make the repairs. Discontinue using the device until the appropriate repairs can be made.

Cleaning the Device

Clean the exterior surface of the device monthly, or more frequently if needed.

USE the following materials to clean the device:

- Mild dishwashing detergent
- Clean, soft cloth
- Water

DO NOT USE any of the following materials to clean the device, because their use may damage equipment surfaces.

- Organic solvents
- Ammonia-based solvents
- Abrasive cleaning agents
- Alcohol
- Virex
- Sani-Master

Use the following procedure to clean the surfaces of the device.

- 1) Dilute mild dishwashing detergent in water to create a cleaning solution.
- 2) Soak a clean cloth in the solution and wring out any excess.
- 3) Thoroughly wipe the surface of the device with the damp cloth.
Avoid contact with open vents, plugs, or connectors.
- 4) Repeat step 2 and step 3 as necessary until the surface is adequately cleaned.
- 5) Wipe the surfaces with a dry, clean cloth or paper towel

Calibration

The device does not need any calibration.

INSTALLATION

System Requirements and Prerequisites

PC Minimum Configuration

CPU speed	RAM memory	HDD free space	DISPLAY resolution	Operation System	Number of free USB ports
2GHz	2GB	20GB	1600 x 900	Windows 7, 8, 10	1

Table 5: Minimum Hardware Configuration

Installing or updating software



Note:

Close all Norav software applications (if any are running) before you install or update the software.

To Install NM-700 software

- Insert the NM-700 installation CD in the drive. The installation program starts automatically.
- Follow the instructions on-screen.
- After the procedure is completed, restart the computer.

To Install NEMS-A Database optional software (*This option is available with the D1 license*)

1. Insert the NEMS-A installation CD in the drive. The installation program starts automatically.
2. Follow the instructions on-screen.
3. After the procedure is completed, restart computer.

Hardware installation

Safety



WARNING

The ECG and SpO2 devices are sensitive to electrical interference. To prevent possible injury, read this page carefully prior to installing the device.

- The ECG and SpO2 devices are designed to work only with medical devices that comply with the IEC60601-1 standard.
- Connect the Bluetooth adapter via USB using a compatible cable only. Use only the original USB cable.
- 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.
- If audio is playing on the PC, the ECG shows interference. Do not run an audio CD on the PC while running an ECG test.
- Defibrillation protection is built-in.
- To avoid artifacts use software with 50/60 Hz filter, Baseline filter and EMG filter.

Install Bluetooth adapter

1. Connect the Bluetooth adapter to the USB port.
2. The new hardware is identified. After the driver is installed, a Bluetooth icon appears in the system tray.

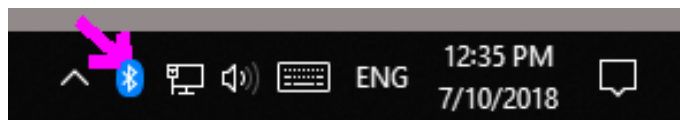


Figure 1: Bluetooth adapter driver installed.

Install NR-314-T / NR-1207-3 ECG device

Patient Cable Connection



Connecting:

Insert the ECG cable connector into the slot on top of the ECG unit.

Make sure to insert the cable connector until both of two latches of the cable connector are locked on the unit.

Disconnecting:

Remove the ECG cable connector by squeezing the two side latches on the head of the cable connector and pulling away from the connector slot.

Figure 2: Patient Cable Connection

Battery Installation



Open the battery compartment cover by moving left and up the cover latch.



Insert a fresh AA battery. First insert from the negative terminal.

Ensure that the battery's removal ribbon goes behind the battery.



Close battery compartment cover and press on it until latches into the base part.

Make sure that the ribbon is completely hidden under the cover.

Figure 3: Battery Installation

Add ECG monitors and SpO2 oximeters to the Bluetooth Device List

1. Power up all ECG devices and SpO2 oximeters.

First check that the batteries have been inserted correctly. You should always use fully charged batteries for a new monitoring session. Alternatively, you can use alkaline batteries. Take care to insert the batteries correctly.



Important

Use only alkaline batteries or NiMH rechargeable batteries.

Although zinc-carbon batteries and NiCd rechargeable show adequate voltage in the battery test, the output is often insufficient to carry out monitoring.

2. Double click on the Bluetooth icon in the system tray. Click “Add Bluetooth or other device” then select “Bluetooth”.
3. Select the ECG device or the SpO2 oximeter.
 - For a ECG device enter **12345** as the passkey
 - For a SpO2 oximeter enter the PIN code written on the rear label of the device
4. Click “Connect”.
5. After device is paired click “Done”.

Installing the software license key

1. Connect the HASP dongle to the USB port.
2. The new hardware is identified. After the driver is installed, a red indication light appears on the HASP dongle.

Registering ECG monitors and SpO2 devices on the Telemetry System

1. Switch ON all of the telemetry transmitters and SPO2 sensors.
2. Run the **Telemetry NM 700** software application.
3. Select **Scan devices** in the View main menu bar.
4. When **Searching...** panel appears click **SEARCH** button.
5. Wait until the successful detection message appears.
6. Click **Finish** to close the message box.

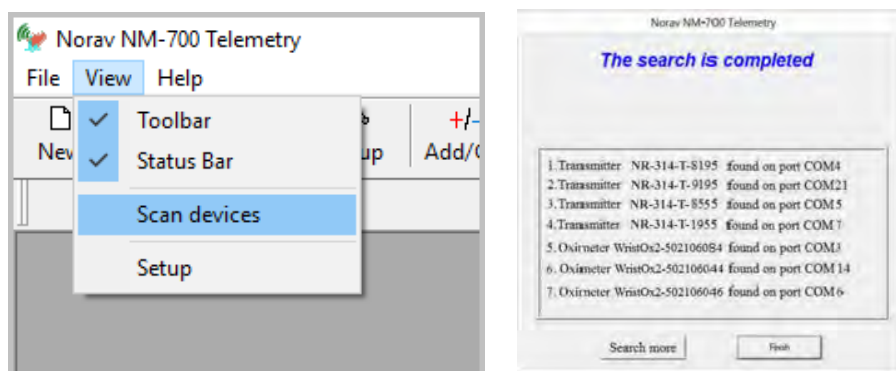


Figure 4: Register ECG and SpO2 devices.

SOFTWARE INTERFACE

The system includes:

1. **Telemetry ECG** real time acquisition application
2. **ECG Viewer** application
3. **NEMS-A Database** (on a separate CD)

The following sections will describe the operational interface of these interfaces.

Telemetry ECG application

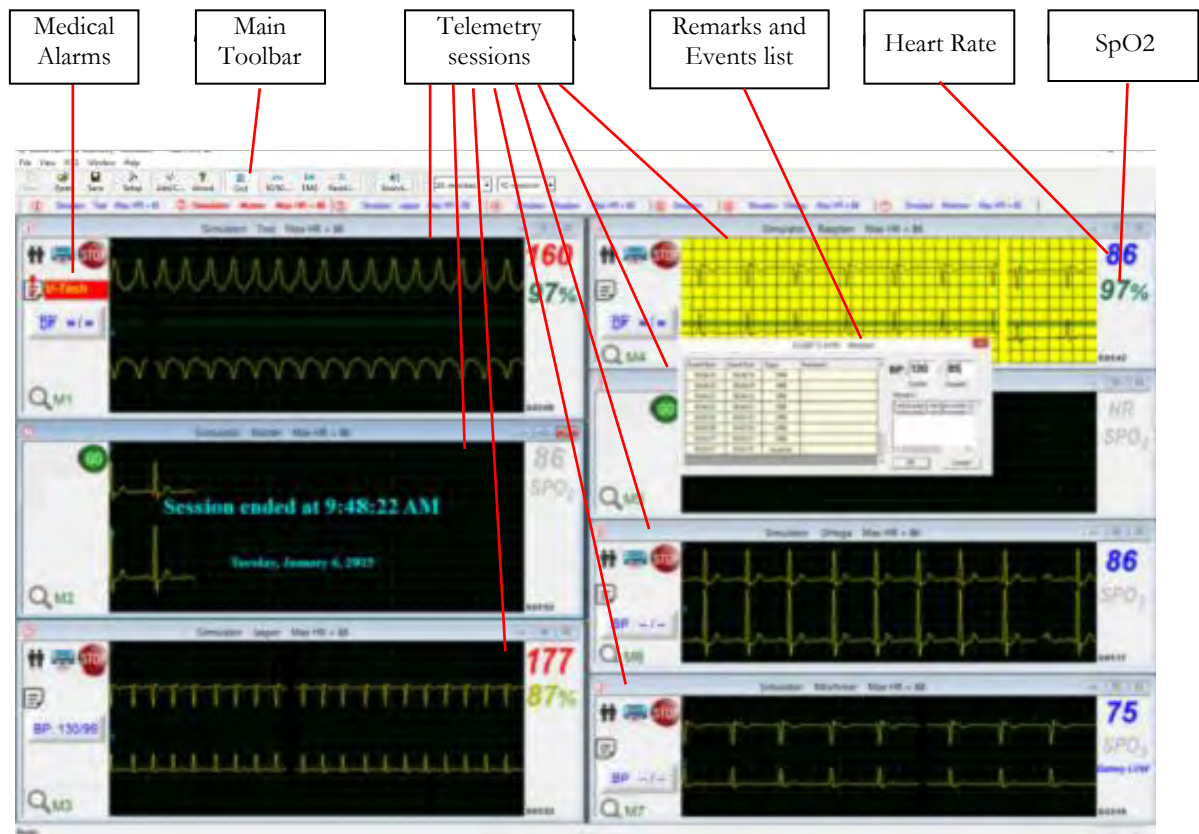












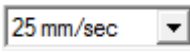





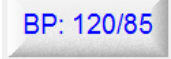






Figure 5: Telemetry ECG main screen

Operation by menu and icons

Menu	Icon	Description
File		
New		Opens a clean screen then splits into up to seven (depending on the number of registered BT2 transmitter devices) windows and numbered tabs above them. Each window will refer to a different patient and enables viewing any patient that is connected. The patient data should be entered upon starting the ECG recording or during the acquisition.
Open		Opens the NEMS-A Database interface displaying lists of patients and their tests that were saved to the disk.
Close		Closes the active window. If unsaved changes were made in this window, a save message will appear prior to closing the window.
Save		Opens the save dialog box to enable saving the recording of the active window to the configured directory on the disk with a selected filename (Default name: <patient name>.mnr or <patient ID>.mnr - depends on the saving configuration in the setup dialog box)
Save as		Opens a dialog box to enable saving the study with a different name and/or in a different directory.
Exit		Quit the application. If data is unsaved, message will appear to confirm saving any unsaved data prior to exiting.
View		
Toolbar		Enables user to customize the displayed toolbars.
Status bar		Displays the status bar when checked (default). When this option is not checked the status bar is hidden.
Scan Devices		Registering of active NM-700 ECG devices. The command is available on the initial screen only, immediately after launching the Telemetry ECG application.
Grid		Optionally displays a 5mm raster on the ECG screen.
Patient Data		Opens the Patient Data dialog box to enable input or edit patient's details viewed in the active window.
Remarks		Edit Remarks and Event comments. Related to the active ECG recording window. Displays the detected ECG events list. Permits writing comments for detected ECG Events or to write free text remarks; input fields to insert BP values.
Setup		Opens a dialog box to enables the customer to tailor his own preferences for operation (see "Setup Options").
Full Screen		Displays the active window in a full screen mode
ECG		
Start/Stop		Controls starting and stopping the ECG recording
Filters		
50/60 Hz		Line interference filter. The user should select either the AC frequency 50 Hz or 60 Hz in the setup.
EMG		Muscle noise filter.
Baseline		Baseline filter.
Mute		Temporarily suppress (silence) the audible alarms. Optionally can be protected with password. The password is " <i>mute</i> ".

Menu	Icon	Description
Window		
Windows		Opens pop-up menu to select the transmitters (ECG active windows) the operator wishes to view. To display a transmitter - check the number representing it. Any Unchecked transmitters will not be displayed. (Default: all stations are checked).
Cascade		Display windows in cascade format
Tile		Display windows in tile format
Next		Activates the next window
Previous		Activates the previous window
Close All		Closes all windows after confirmation of any unsaved data on the window.
Save All		Saves data on all the opened windows. For new data the save dialog box is opened to enable naming the data and choosing the directory.
Arrange		Arranges the windows tiled according to their order.
1, 2, 3, ..., 7		Lists the opened windows. The active window is checked. Other windows do not bear a check mark.
Help		
About		Displays software version number, licenses and contact information
Additional controls on the main toolbar		
PAIR		Search for the Station initiating new acquisition session.
Horizontal Scale		Set the ECG view speed (mm/sec)
Vertical Scale		Set the gain of the ECG signal on the screen (mm/mV).
Telemetry Session window		
Patient Data		Opens the Patient Data dialog box to enable input or edit patient's details viewed in the active session window.
Remarks		Edit Remarks and Event comments. Related to the active ECG session window. Displays the detected ECG events list. Permits writing comments for detected ECG Events or to write free text remarks; input fields to insert BP values.
Print ECG		Click the button on the patient session window to print a current ECG screen.
Start/Stop		Controls starting and stopping the telemetry sessions (ECG recording)
Blood Pressure		Click the button on the patient session window to input the blood pressure.
HR		Click the button on the patient session window to adjust the Tachycardia and Bradycardia HR alarm thresholds.
SpO2		Click the button on the patient session window to connect the SpO2 oximeter or to adjust the Low SpO2 alarm threshold.
Expand		Click the button on the patient session window to maximize the session window.
Restore		Click the button on the full screen opened session to restore the session windows initial size.

Telemetry ECG Setup Options

See under	Function	Description	
ECG recording	Filter 50/60Hz	When marked the default status of 50/60Hz filter will be ON (according to the marked frequency 50 or 60). Default is unmarked.	
	EMG Filter	When marked the default status of the EMG filter is ON. Default is unmarked.	
	BaseLine Filter	When marked, the baseline filter is on. The default is unmarked.	
	Simulator ECG	If unmarked (default) ECG recording is received from the BT2 transmitter unit. If marked the ECG recording is received from a demo file included in the software package. In this case recording transmitter is not needed.	
	Use ECG Database	If unmarked (default) ECG recording is done from and saved to the data directory configured by the user. If marked, the ECG recording saves the recording to the ECG database directory (the DATA DIRECTORY option will be disabled).	
	Data Directory	To specify the ECG data file directory in standalone mode. Default: C:\Program Files (x86)\NM_700\Data	
	Source BackUp Directory	Enables to setup the directory for unprocessed ECG data. Default: C:\Program Files (x86)\NM_700\Data	
	Auto Save test Data in FDA XML Format	To enable export of the ECG data in the FDA XML format file. Applicable for 12-lead ECG sessions only.	
	FDA XML File data Directory	To specify the path for store the FDA XML data files. Default: C:\ProgramData\NoravMedical\NM700\Data.	
	Save Options: Auto Save	When “Auto Save” is marked, data is saved automatically. Default “Auto Save” is unmarked.	
	Save Options: Set File Name By	The default name of a file can be set by the operator to be the Patient’s Last Name or the Patient’s ID.	
	View	ECG’s Color	Enables the user to choose colors for the ECG application.
	Installation	Hospital Name	To specify the name of medical organization
Hospital Address		To specify address of medical organization	
Physician’s Name		To specify the supervising/reporting person name	
	Measurement standard	Sets the unit standard according to the preferred measurement standard type in which the values will be displayed (Default: Metric standard)	
Environment	Display Size	Choose the size of the screen. This setting is required in order to display the ECG and grid in the correct scale.	
	Printout options	Select the Print Graph Paper when needed to print 1mm and 5 mm squares on the printouts. Regular grid is guaranteed to fit any printer. Improved grid shows a finer grid but may not work on some printers.	
	Color Printout	If color printout option is not selected the printer will print in black and white only.	
	Sample rate	Indicates the sample rate of the ECG recording.	
	Smooth ECG trace	Provide smoothing of the ECG trace (on display screen only). The printing quality depends on the system printing settings.	
Alarm Limits	HR, SpO2 and ST Alarm limits	Defines the default limits for HR, SpO2 and ST alarms. The HR and SpO2 alarm limits are adjustable per patient during the patients’ monitoring session.	
	Password protected mute alarm	Enables the password protection of mute alarm function.	

ECG Viewer Application

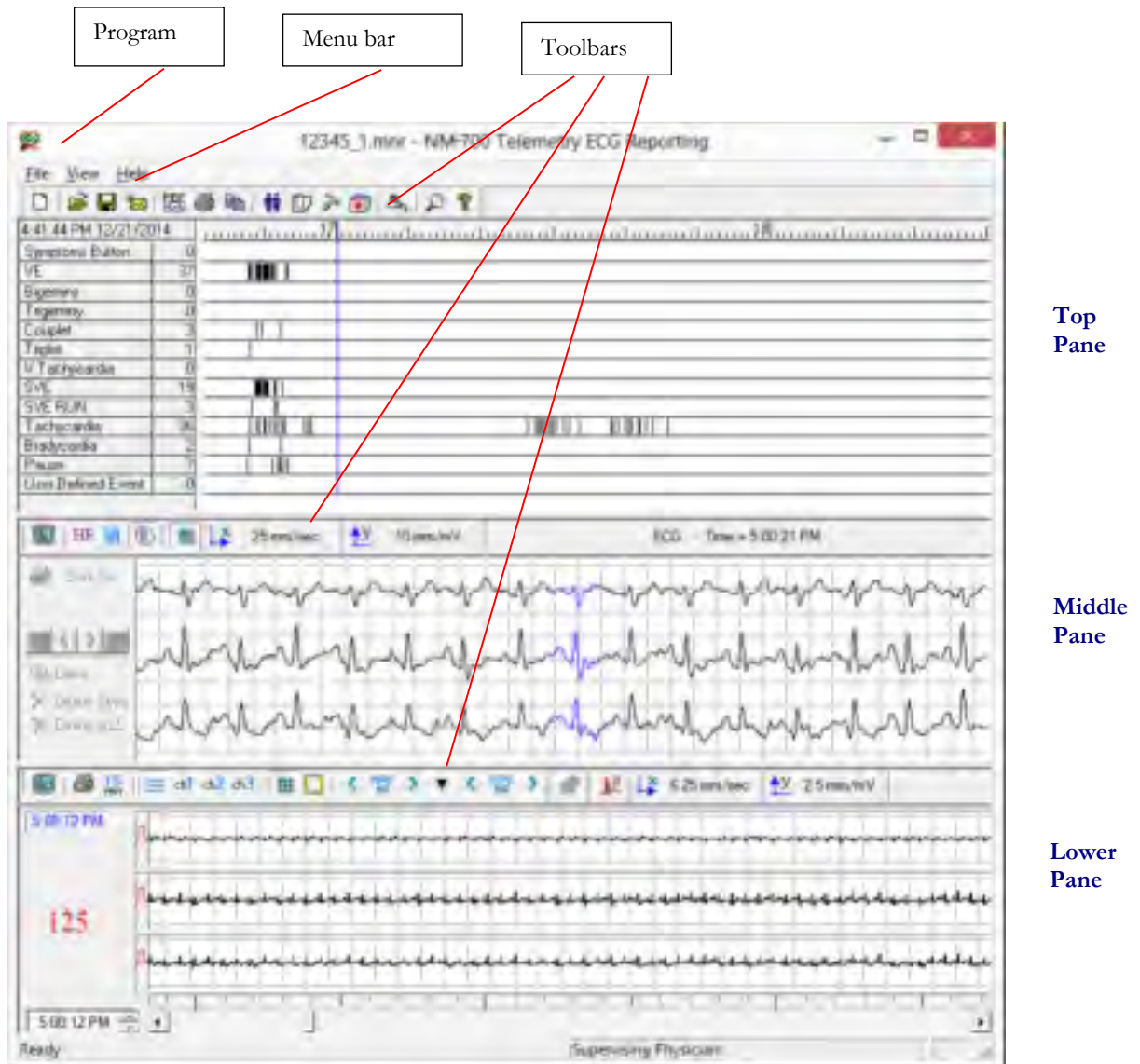






















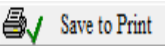


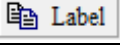













Figure 6: ECG Viewer main screen.

Operation by menu and icons

Top Pane

<u>Menu</u>	<u>Pane/ Icon</u>	<u>Description</u>
File		
New		Clears screen.
Open		Shows recordings that are saved on the disk or in the database.
Save		Saves recording on disk
Save As...		Opens a dialog box to save the file and define the name and the directory of the file
Send...		Sends the recorded data as an email attachment. Prerequisites: e-mail software and an internet connection (not included in the NM-700 package). The recipient must have the NM-700 software installed.
Import from GDT/BDT		Import demographic data from HIS. The file always contains the last patients' data.
Export to GDT/BDT		Export the GDT/BDT file to HIS. The file always contains the last patient data.
Customize Reports		To edit the Summary and to select events to print
		Create PDF file with selected final reports.
Print Reports	Top pane 	Choose and prints final reports.
Print Setup		Choose the printer and printer settings.
Exit		Close the ECG Viewer program.
View		
Tool Bar		Show/hide the tool bar.
Status Bar		Show/hide the status bar.
Zoom		Change the horizontal scale of the events table
Patient Data		View/edit the patient information.
Conclusions/ Medication/ Indications		Enter remarks, conclusions and other comments.
Edit Test Properties		View/edit the recordings' information.
Invert Leads		Change polarity of the ECG traces.
ECG Preview		Open/Close the ECG Preview window (the SPACEBAR key does same).
Change Supervising Physician		Enables selecting a different supervising physician from the list.
Setup		Set preferences for printing, saving, installation, view and GDT/BDT settings; edit report Labels

Menu	Pane/ Icon	Description
Default Screen Size		Re-arrange pane splitters in a default positions
Help		
About		Displays the software version, license and Norav contact information.
Additional controls		
Top pane		Download the unprocessed data file
Middle/Bottom		Toggle the pane size between the full screen and the main screen
Middle pane		View the Heart Rate trends
Middle pane		View Events / per hour chart
Middle pane		View ECG Events (Episodes)
Middle/Bottom		Display the 5mm grid.
Middle/Bottom		Horizontal scale (speed)
Middle/Bottom		Vertical scale (gain)
Middle pane		Add an Event to the list of episodes to print
Middle pane		Sort Events chronologically or by severity
Middle pane		Events navigation control. To play back events in the pane.
Middle pane		Edit Event Label
Middle pane		Delete the selected Event
Middle pane		Delete all events in the group
Bottom pane		Print ECG traces page
Bottom pane		Print 15 minutes of data on a single page
Bottom pane		View all channels
Bottom pane		View a single channel
Bottom pane		Show frame to define a user event or select an area to print.
Bottom pane		Maximum Heart Rate
Bottom pane		Minimum Heart Rate
Bottom pane		Set Maximum HR/Minimum HR
Bottom pane		Define an event

ECG Viewer Setup Options

Click **Setup** on the Toolbar to access the following parameters:

Tab	Option	Description
Save	Save options	If Auto Save is selected, the file is stored by the last name or by the ID. If Auto Save is deselected, a dialog box is displayed during Save, asking the user to enter a file name.
	Check NET Key	Mark to search the license key in the network.
	Use ECG Database	The program will use the NEMS-A database if the option is checked. If the option is not checked, the operator can set up the data storage directory.
	Data Directory	For user-defining the saved ECG recording directories when the ECG database is not used.
	Source Backup Directory	For user-defining the directory of unprocessed ECG data files.
	PDF files Data Directory	For user-defining the directory of automatically created PDF reports
	Default Filters	50/60 Hz filter and/or EMG filter can be selected to be applied.
Installation		Saves users' data (hospital and physician).
	Hospital Name	Free text to input the hospitals' name
	Hospital Address	Free text to input the hospitals' address
	Supervising Physician	To input and edit the physician names list
	Measurement standard	Select either the metric or the USA measurement standard.
	Display Size	To adjust the on-screen grid according to PC display size
	View	
Graph Colors		User selectable background, traces, grid, and text. colors for the ECG application
ECG Full Disclosure Scale Format		Select the horizontal (speed) and the vertical scale (gain) of ECG traces.
Play Speed		Select the play speed
Full Screen Event Format		Select the number of windows displayed on the Events screen.
Episodes to Display		Select event types to be displayed. To remove an Event type from the screen, deselect the event.
Print Reports		Report list
	Full Disclosure Printing	Select Fine or Dark
	ECG Strip Print Scale Format	Use to select the scale format of the printed ECG
	Summary Report Format	Select either the Free Text Format, Table format or both to setup the summary report format.
	ST Trend Report Time Scale	Select how to print the ST Trend: a whole study on one page, one hour per page or 30 minutes per page.
	Graph Paper	Select the Regular Grid or Improved Grid for various printer types.
	Auto Print default Reports	Select to automatically print the default reports upon closing the record file.

Tab	Option	Description
	Auto Create PDF Default Reports	Select to generate PDF reports upon closing the record file.
Print Events	Print Format	Select the number of events to be printed on one page.
	Print	Select what to print: user selected events or the defined number of first events of every type.
	Episodes To Print	Use to select the episodes to be printed.
Remarks	List of Default Remarks	Use to add or delete labels from the list.
GDT\BDT Format	Automatic options	Set up automatic GDT communication.
	Save test in GDT/BDT	If checked, saves test automatically in GDT/BDT format.
	Import from GDT/BDT	If checked, imports tests automatically as GDT/BDT format.
	File Format	Select the file format: GDT or BDT.
	Import Codepage 437	Check this option to import Code page 437.
	Export Codepage 437	Check this option to export Code page 437.
	Edit Labels	Click this button to open a dialog box with an editable list of the field labels used in the GDT and BDT files.
	GDT\BDT Data Directory	Define the directory path for saving GDT/BDT files
	Token for NM-700	Default is PEKG.
	Token for Practice EDP	Default is EDV1.

OPERATION

Workflow Routine

Here is a standard workflow routine for telemetry examinations in the NM-700 system:

1. Patient preparation.
2. ECG monitoring.
3. Review results and reports for printing.

Patient Preparation

The ECG trace quality depends very much on the stability and conductivity of the electrodes during the test, especially during exercise when patient movements may cause artifacts. Here are some basic rules to ensure good electrical contact:

- ◇ Shave hair at the electrode contact points
- ◇ Use a special shirt that holds the electrodes and lead wires closely to the body.
- ◇ Use high quality liquid gel electrodes.
- ◇ Make sure that the lead wires do not swing.

Attach the leads.

Patient cable Marking			Position on Patient
5 lead	AHA	IEC	
Ch1-/Ch2- (Red)	RA (White)	R (Red)	just below the right clavicle
Ch1+(Brown), Ch3-(White)	LA (Black)	L (Yellow)	just below the left clavicle
RL (Green)	RL (Green)	N (Black)	on the left lower edge of the rib cage
Ch2+/Ch3+ (Black)	LL (Red)	F (Green)	on the right lower edge of the rib cage
	V1 (Red)	C1 (Red)	4-th intercostal space, right sternal edge
	V2 (yellow)	C2 (Yellow)	4-th intercostal space, left sternal edge
	V3 (Green)	C3 (Green)	midway between V2 and V4
	V4 (Blue)	C4 (Brown)	5-th intercostal space, mid-clavicular line
	V5 (Orange)	C5 (Black)	anterior axillary line in straight line with V4
	V6 (Purple)	C6 (Purple)	mid-axillary line in straight line with V4 and V5

Table 6: Patient cable marking

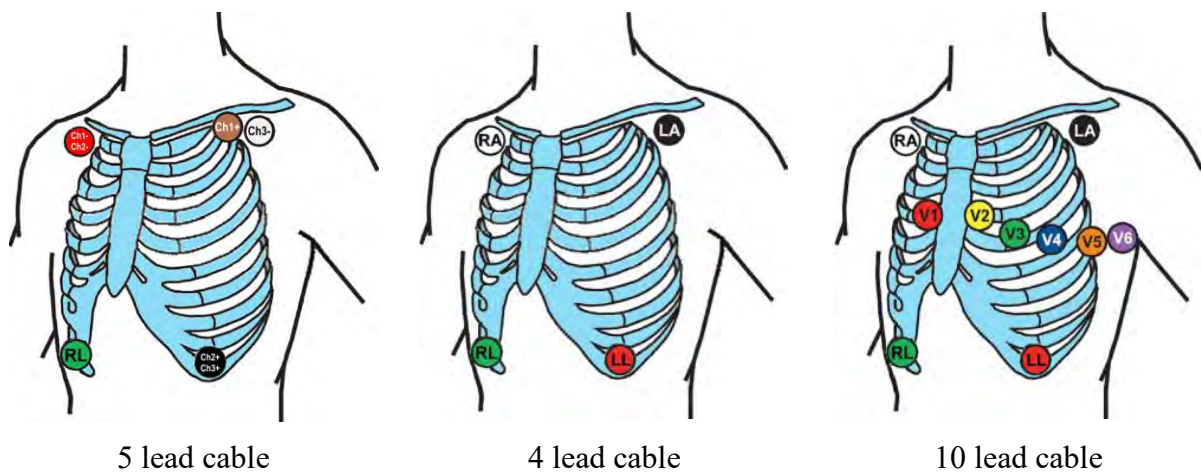



Figure 7: Electrode Placement

ECG Monitoring


To Perform Telemetry ECG Monitoring

1. Power ON the ECG transmitter(s)
2. Run the **Telemetry ECG** application
3. On the main menu click **New test**  button or press the F1 keyboard key.
4. Connect the ECG cable to the patient
5. Start a new telemetry session:


There are two possible ways to start a telemetry session:

Option#1: Check the serial number of the prepared transmitter. Click on the session window which label displays the same serial number as that of the prepared transmitter.

Then click the Start button  to run the ECG traces.

Option#2: Click Pair  main menu button. Wait until the prepared transmitter starts flashing the green led on the box, then press the ON/OFF button on the transmitter front panel. The session window linked with the transmitter will change the background color and starts ECG traces.

When the ECG traces show, the patient details panel appears. Fill the Patient Data and click OK to perform the ECG monitoring.

6. At the end of monitoring click on the Stop button .

During the Telemetry Session

The following features and options are available during the ECG monitoring session:

1. Visual and audible Alarms
2. Printing the current ECG screen
3. Adding the SpO2 saturation registration to the ECG monitoring session
4. Alarm limits adjusting per patient
5. Reviewing of the session history
6. Writing comments
7. Insertion of blood pressure values

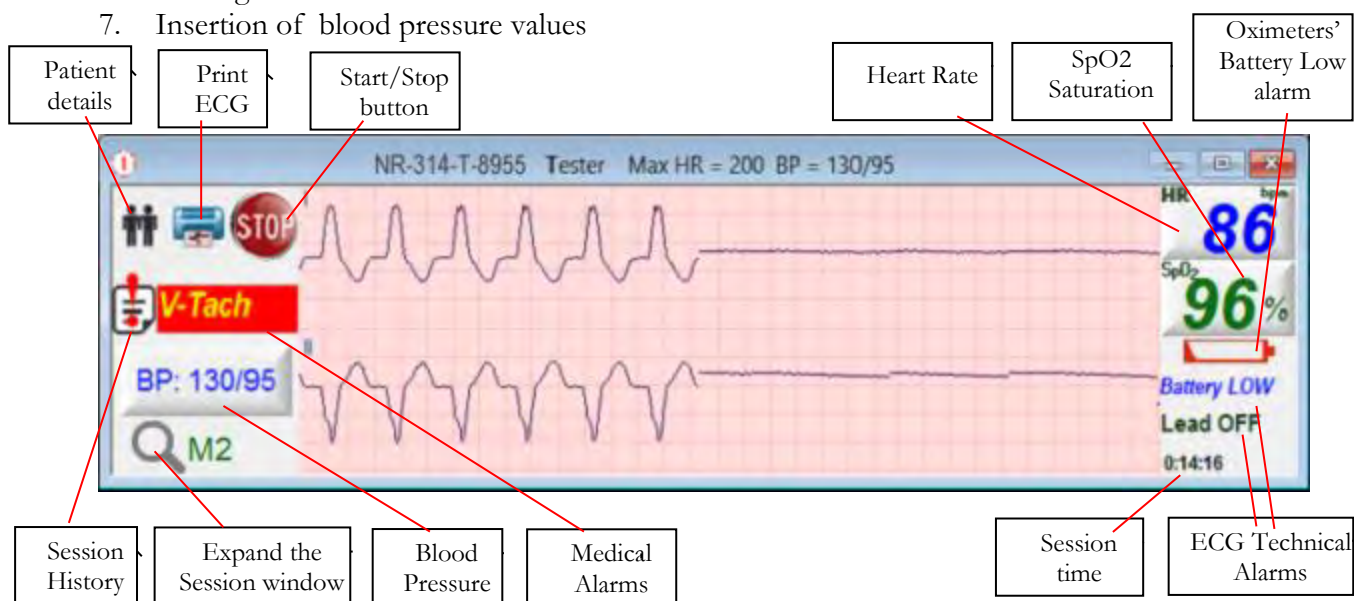




Figure 8: Telemetry session window.

To Print the ECG Screen

Click the print  icon on the left panel of the session window. The current 10 seconds ECG strip will print in a six lead format.

To View the Session History and Write Comments

Click the Remarks  icon on the left panel of the session window. The Session History panel appears. There it is possible to view a list of detected arrhythmias and BP values, insert a new BP value, add comments for events or write remarks.

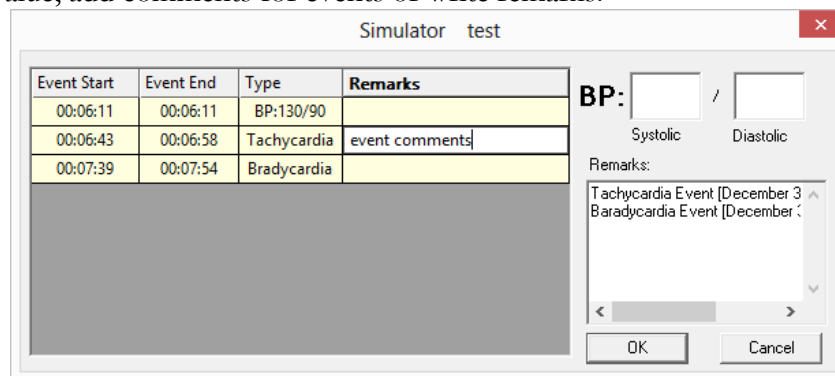







Figure 9: Session History Panel


To Insert a Blood Pressure Value

On the left panel of the session window click on the  button, or click  to open the Session History panel. Insert the blood pressure values. Click OK to apply.


To Add the SpO₂ Monitoring to the ECG Session

Click the  button on the right side panel of the ECG session window. The Oximeter connecting panel appears. Click the oximeter icon  labeled as Available. Wait until 'CP' text will appear on the LCD indicator of the selected oximeter, and then click the  button.

To Specify the HR Alarm Limits in the ECG Session

Click the HR indicator () on the right side panel of the ECG session. Adjust the Tachycardia and Bradycardia alarm limits and then click the **Set limits** button.

To Adjust the Low SpO₂ Alarm Limit or to Stop the SpO₂ Monitoring

Click the SpO₂ indicator () on the right side panel of the ECG session.

To adjust the SpO₂ alarm limit: change the value and then click the **Set limit** button.

To stop the SpO₂ monitoring in the patient session: click the **Disconnect SpO₂** button.

Alarm System

Overview

The NM-700 Telemetry system includes alarms to identify medical or technical problems that can impact the health or safety of the patients. Alarms are grouped into three types:

- **Medical Alarms**, such as Asystole, Ventricular Tachycardia and other heart arrhythmias.
- **Technical Alarms**, including Lead Off, Low Battery and No Signal alerts.
- **Patient Alarm** (“Nurse Call”). Appears after pressing the button on the transmitter.

Visual and audible alarms are available. The operator is able to observe visual alarms, and may control audible alarms by temporarily suppressing (silencing).

All detected alarms are stored as Events in the ECG recording file and can be seen and reviewed offline, in the ECG Viewer.

Tachycardia and Bradycardia alarms are configurable in the system setup. For these alarms the Heart Rate threshold can be adjusted, individually for each user session.

Alarm Priority

Each alarm belongs to a priority group: High, Medium or Low. The highest priority alarm from amongst all of the monitored patients is the one heard,

Additionally, each Medical Alarm has its own priority level that determines its precedence relative to other Medical Alarms. The highest priority Medical Alarm for a given monitored patient is indicated on the corresponding patient’s session window.

The following table is describing the alarms priority levels, as well as the visual and audible signals.


Alarm	Priority		Indication	
	Group	Level	👁 Visual	🔊 Audible
Medical Alarms				
Asystole (Pause ≥ 4 sec)	High	1	Alarm message text is rapidly blinking with a red background	Five rapid high-pitched pulses sounded twice, repeated every 20 seconds
Ventricular Tachycardia	High	2	Alarm message text is rapidly blinking with a red background	Five rapid high-pitched pulses sounded twice, repeated every 20 seconds
Ventricular Fibrillation	High	2	Alarm message text is rapidly blinking with a red background	Five rapid high-pitched pulses sounded twice, repeated every 20 seconds
Tachycardia (High Heart Rate)	High	2	HR value is rapidly blinking, red color	Five rapid high-pitched pulses sounded twice, repeated every 20 seconds
Bradycardia (Low Heart Rate)	High	2	HR value is rapidly blinking, magenta color	Five rapid high-pitched pulses sounded twice, repeated every 20 seconds
Pause (<4sec)	Medium	3	Alarm message text is slowly blinking with a yellow background	Three low pulses, repeated every 25 seconds
SVE Run	Medium	4	Alarm message text is slowly blinking with a yellow background	Three low pulses, repeated every 25 seconds
VPB Triplet	Medium	5	Alarm message text is slowly blinking with a yellow background	Three low pulses, repeated every 25 seconds
VPB Couplet	Medium	6	Alarm message text is slowly blinking with a yellow background	Three low pulses, repeated every 25 seconds
Bigeminy	Medium	7	Alarm message text is slowly blinking with yellow background	Three low pulses, repeated every 25 seconds
Trigeminy	Medium	8	Alarm message text is slowly blinking with a yellow background	Three low pulses, repeated every 25 seconds
ST Elevation	Medium	9	Alarm message text as well the ST	Three low pulses, repeated every 25 seconds

			value on the relevant ECG trace are slowly blinking in RED on YELLOW background	seconds
ST Depression	Medium	10	Alarm message text as well the ST value on the relevant ECG trace are slowly blinking in BLUE on YELLOW background	Three low pulses, repeated every 25 seconds
SpO2 Too Low	Medium	8	SpO2 value is slowly blinking, orange color	Three low pulses, repeated every 25 seconds
VPB Isolated	Low	9	Non-blinking message text with a yellow background	Two consecutive tones, repeated every 60 seconds
SVE Pair	Low	10	Non-blinking message text with a yellow background	Two consecutive tones, repeated every 60 seconds
SVE Isolated	Low	11	Non-blinking message text with a yellow background	Two consecutive tones, repeated every 60 seconds
Technical Alarms				
ECG Battery Low	High		Slowly blinking "Battery LOW" text on the right side panel	Five rapid high-pitched pulses sounded twice, repeated every 20 seconds
ECG Lead Off	High		Slowly blinking "Lead OFF" text on the right side panel	Five rapid high-pitched pulses sounded twice, repeated every 20 seconds
ECG No Signal	High		Slowly blinking text on the right side panel	Five rapid high-pitched pulses sounded twice, repeated every 20 seconds
Oximeter Battery Low	Medium		Slowly blinking battery icon under the oximeter button	Three low pulses, repeated every 25 seconds
SpO2 Sensor Off	Medium		Slowly blinking "- -%" text on the oximeter button	Three low pulses, repeated every 25 seconds
No Signal	Medium		Slowly blinking "- -%" text on the oximeter button	Three low pulses, repeated every 25 seconds
Patient Alarms				
Nurse Call			Reverted color of the ECG window background	Rapid Beep

Table 7: Alarms Priority



Review and Reports

Opening a Data File Already Stored on the Hard Drive

1. Run the **ECG Viewer** application
2. From the toolbar click the Open button  or click File/Open from the menu
3. From the dialog box, browse the appropriate folder and select the *.mnr file you need.
Note: If NEMS-A database is used, the database interface is opened instead of the dialog box.
4. Click the Open button or double-click on the file.


Reviewing the Summary Report

To review the summary report after analysis is complete, do the following:


1. From the toolbar, click the Customize Report icon .
2. Select Summary Overview.
3. From the toolbar, click the Print icon  to print out your final reports

Editing Patient Data

To edit the patient data:




1. On the toolbar, click the Patient icon  to open the Patient Data dialog box.
2. Insert the new data and click OK to close and store on the hard drive.

Viewing the HR Trend






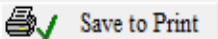
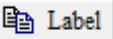
To view the heart rate trends click the  icon.

Lower Pane Use

The lower pane permits viewing the full disclosure ECG, in addition to occurrences prior and subsequent to the Event being viewed.



- To view the lower pane in the Full Screen mode, from the lower pane toolbar, click on the Full Screen icon . Click the icon again to return to the main, three-pane screen.
- To print the strip, from the lower pane toolbar, click Print .
- View individual channels by clicking the CH1, CH2 or CH3 buttons, respectively. This allows a larger range of an individual channel to be viewed.
- View all channels together by clicking the All Leads icon .
- In the results, the numbers displayed in red to the left of the pane represent a ten second HR interval representing the middle of the segment shown, starting at the time displayed in blue.

ECG Events (Episodes) Viewing

1. From the top pane, select an event type you wish to review.
2. From the middle pane, click .
3. Click the event type you wish to view and then click  to play fast-forward each event or  to playback each event.
4. Stop by clicking on the same icon at any given time.
5. To manually scroll over events, click  or .
6. To mark an event for printing in the final report click .
7. To add notes to the event click on .

New Event Specifying

To specify a new event:

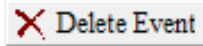
1. From the lower pane, click  to open the Frame.
2. Use the mouse to drag the box to the desired ECG, then click on Define Event .
3. Select the event type from the drop down list.

Event Redefining

To redefine an event:


1. From middle pane press Label
2. Change event type.

Event Deleting

To delete a single event select the event to be deleted and click 






To delete all events in group click 

Histograms

Select the event to be viewed and, from the middle pane, click on Histograms .

Note: *all subsequently selected events are viewed as histograms until it is deselected.*

Maximum / Minimum HR:

1. To view the Maximum or Minimum Heart Rate: from the lower pane, click on  or .
2. To change the Max HR or Min HR: in the lower pane scroll the ECG by the  or  buttons to the needed point then use the  button to store the new Max HR or Min HR.

Preview the ECG traces


Press the SPACEBAR key or ECG Preview icon  on the lower pane tool bar. ECG The preview window allows you to see the ECG traces in a six leads or three leads format.



Figure 10: ECG Preview window

Select a button from the top pane toolbar to perform the following:








Icon	Command	Action
	Print	Prints the displayed ECG.
	Next Channel	Displays the ECG of the next three channels.
	Toggle view mode	Select the six lead or three lead ECG view mode.
	50Hz/60Hz Filter	AC Line interference filter.
	EMG Filter	Muscle noise filter.
	Play	Play the ECG traces.


Table 8: ECG Preview tool bar

Entering Comments

1. To enter conclusions, medication or indications click on  at any time.
2. Type your comments in the dialog box. They will be printed in the Summary Report page.

Sending Study E-mails



To forward a complete study by e-mail:

1. Click on Send Mail 
2. Enter the e-mail address to which the study is to be sent.

Note: *your PC must have an e-mail application*


Note: *the recipient must have the Norav NM-700 Telemetry ECG software installed to view the study.*

Printing the Final Report

A final report can be printed on paper or as a PDF file by clicking  or  in the upper pane. From the dialog box, select the needed report pages. The Summary report page can be generated in different formats, as defaults in the print report setup:

- Free text format.
- Table format
- Both

To access this feature:

1. From the toolbar click Setup 
2. From the Setup dialog box click the Print Reports tab.
3. From the Summary Report field, select the format you prefer.

APPENDIX A: ECG DEVICE SPECIFICATIONS

Feature	Specification		
Model	NR-314-T		NR-1207-3
ECG Lead cable	5 lead	4 lead IEC/AHA	Standard 10 lead AHA/IEC
Defibrillation protection	none	Protected against 360 J discharge	
Signal dynamic range	10mV		
DC max. input	$\pm 800\text{mV}$		
Resolution	12 bits (2.44 $\mu\text{V}/\text{LSB}$)		
ECG sampling rate	250, 500, 1000 samples per second		
Input impedance	$> 10\text{Mohm}$		
CMRR	$> 90 \text{ dB}$		
Frequency range (-3db)	0.05 – 260 Hz (on 1000 samples/s) 0.05 – 65 Hz (on 250 samples/s)		
Communication interface	Bluetooth 2.0+EDR, SPP, Class1 up to 100m		
Battery	1 x AA alkaline or NiMH rechargeable		
Operation Time	Up to 7 hours with alkaline battery		
Size	92 x 75 x 23 mm		
Weight	103 gram without battery		
Safety standard	IEC 60601-1, IEC 60601-1-2, IEC 60601-1-11, IEC 60601-2-47		
Operating temperature	$+10^{\circ}\text{C}$ to $+45^{\circ}\text{C}$		
Storing temperature	-20°C to $+60^{\circ}\text{C}$		
Humidity	10–95%		

APPENDIX B: OXIMETER SPECIFICATIONS

Feature	Specification
Model	Nonin WristOx2®, Model 3150
Oxygen Saturation Display Range	0 to 100 % SpO ₂
SpO ₂ Accuracy	± 3 Arms
Communication interface	Bluetooth 4.2, BLE up to 60m
Battery	2 x AAA alkaline or NiMH rechargeable
Operation Time	>24 hours
Size	51 x 73 x 19 cm
Weight	70 gram with batteries
Classification per IEC 60601-1 / CAN/CSA-C22.2 No. 601.1 / UL60601-1	Internally powered (battery power) Type BF-Applied Part IP3
Operating temperature	-5 ⁰ C to +40 ⁰ C
Storing temperature	-40 ⁰ C to +70 ⁰ C
Humidity	10–95%

APPENDIX C: TROUBLESHOOTING

A Straight Line is Displayed For All Leads

Problem

A straight line appears on the host application screen when the connection to the acquisition box fails.

Solution

Check the connection of the Bluetooth adapter to the USB port.

Check if the ECG unit is powered ON.

Noisy ECG Signal on Leads

Problem

A noisy ECG signal on one or more of the leads may be caused due to poor connection of the appropriate electrodes or leads on the patient.

Solution

Check the connection of the appropriate leads on the patient. Make sure the electrodes are applied well to the patient.