REF 70-01532-02 REV B1

User's Guide

CareCenter MD® Resting

BURDICK

Information in this document is subject to change without notice. Names and data used in the examples are fictitious unless otherwise noted.

Trademark Information

Mortara, Quinton, Burdick, HeartCentrix, and CareCenter MD are trademarks of Mortara Instrument, Inc. All other product and company names are trademarks or registered trademarks of their respective companies.The *Bluetooth*® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. Any use of such marks by Mortara Instrument, Inc. is under license.

℞ ONLY

Mortara Instrument, Inc.
7865 N86th Street
Milwaukee, WI 53224, USA
+1.414.354.1600
800.231.7437 (USA)
QBTechSupport@mortara.com
http://www.burdick.com

Contents

1 Introduction

Contents

CareCenter MD is a personal computer-based system for acquisition and evaluation of 12-channel ECG data both at rest and during exercise, in hospitals and physician offices. Please see the *CareCenter MD™ Product Information and Safety* guide for important safety information regarding this device.

Contact Information

Mortara Instrument, Inc. provides customer service and technical support.

- To order additional product or accessories, contact Customer Care.
- For assistance with product installation, contact Technical Support.

Customer Care
888.667.8272 (USA)
+1.414.354.1600
sales@mortara.com

Technical Support
888.667.8272 (USA)
+1.414.354.1600
QBTechSupport@mortara.com

Overview

CareCenter MD is a diagnostic device capable of ECG monitoring; ST analysis and arrhythmia detection; generation, review, and storage of resting ECG and stress reports; interpretation of adult resting ECG; and select exercise device control.

There are two data acquisition devices, CareCenter MD (USB) which utilizes a USB connection to the computer and CareCenter MD (BT) which utilizes a wireless connection to a proprietary *Bluetooth*® data acquisition module.

Features and options

The system is available in Resting ECG or Stress and Resting ECG configurations. These features and options are available for both configurations of the system.

- Users—the system provides interlinking for a maximum of four concurrent users plus one server user. You can upgrade to add additional users. For information, contact your sales representative or Customer Care.
- Saving data and settings—when any user is logged in, the application creates a connection (user) for the server. All patient's data and records are saved in the database on this server.

  The settings for the system are saved in the database. All users access the same settings. If the settings are changed in one of the networked computers, these changes become effective for all the other users after restarting the application.
- Updating data—listing of patient data and records are updated on the system workstations every 30 seconds.
- Data protection—the application has a locking mechanism that prevents users from editing the same record at the same time. If the network is down, this locking mechanism cannot connect the server and workstations. If the same record is edited, the application uses the most recent version when the network is restored.
- Re-analysis—if the test has not been saved, then the system re-analyzes the ECG test whenever age and gender are changed. For automatic re-analysis:
  - USB—the acquisition device must remain connected to the system
  - Wireless—the acquisition device must remain in acquisition mode

  Note: An optional re-analysis dongle eliminates the need to have the acquisition devices connected to the system. For information contact your sales representative or Customer Care.
- EHR Connectivity—CareCenter MD has a number of ways to interface with your EMR.
  - PDF output—the system can generate a PDF automatically when a test is saved.
  - XML output
  - HL7—bi-directional connectivity to receive orders and share results with an EMR. Note: This option requires a specialized dongle.
  - HeartCentrix
  - Pyramis

For more information on any of these options, please contact your sales representative or Customer Care.

- Database records—the system has a DB (database) replication feature that allows you to duplicate the database that exists on the server so that it also exists on the client.

Using this option increases the amount of disk space required by the client. For more information, see the *CareCenter MD™ System Setup Guide*.

Screen layouts

The application displays a control panel on the left and the main data area on the right. Use the control panel to select tests, select controls during a test, and select viewing options. The main data area displays patient data, device selection, the acquisition data and configuration details.

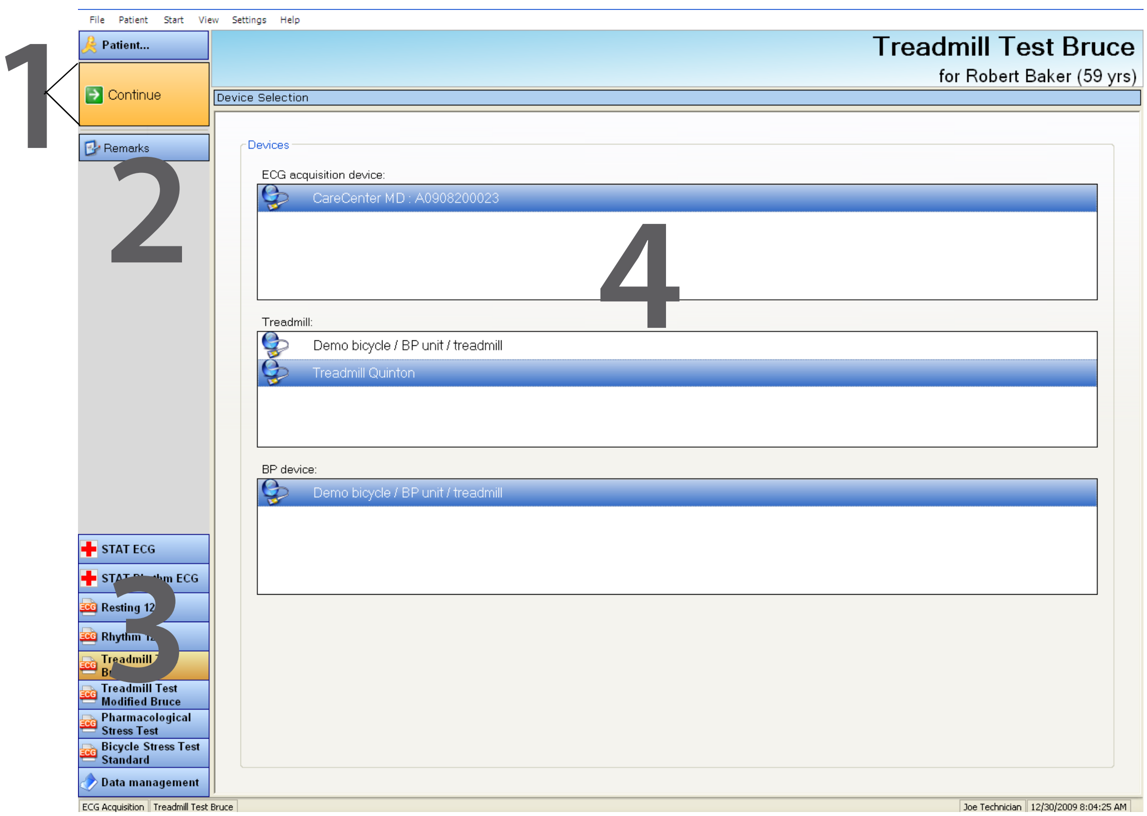


***Figure 1-1:* Example of screen layout**

1. The task button—the function of this button changes according to the appropriate task in the workflow. This button corresponds to the **F2** key.
2. Controls—use these controls to modify the test during acquisition or to select views when reviewing the recording.
3. Available tests—use these buttons to select the type of test or to select Data Management. You can make a selection using a keyboard shortcut, press:

   Ctrl + <number>

   Where <number> is the order of the test with the top test being **1.** The order of these buttons is configurable.
4. Data area—this area displays patient information, acquisition data, data for reviewing the recording, or configuration details.

Small screens

On smaller screens, the layout can be optimized to ensure all information is visible. This feature is enabled in **File | Options... | General | Environment**.

When this mode is activated, the system will rearrange information in the header bar, and hide some less frequently used control buttons. These features can still be activated from the menu or by using the keyboard shortcut assigned to them.

When reviewing results on small screens, some information is split onto additional screens.

Most screen shots in this manual represent the large screen display.

2 Data Management

Contents

This chapter describes the Data Management module.

The procedures in this manual assume Data Management is the default option. To change the default start option, see the *CareCenter MD™ System Setup Guide*.

Patient Search tab

Use the **Patient Search** tab to find patient information.

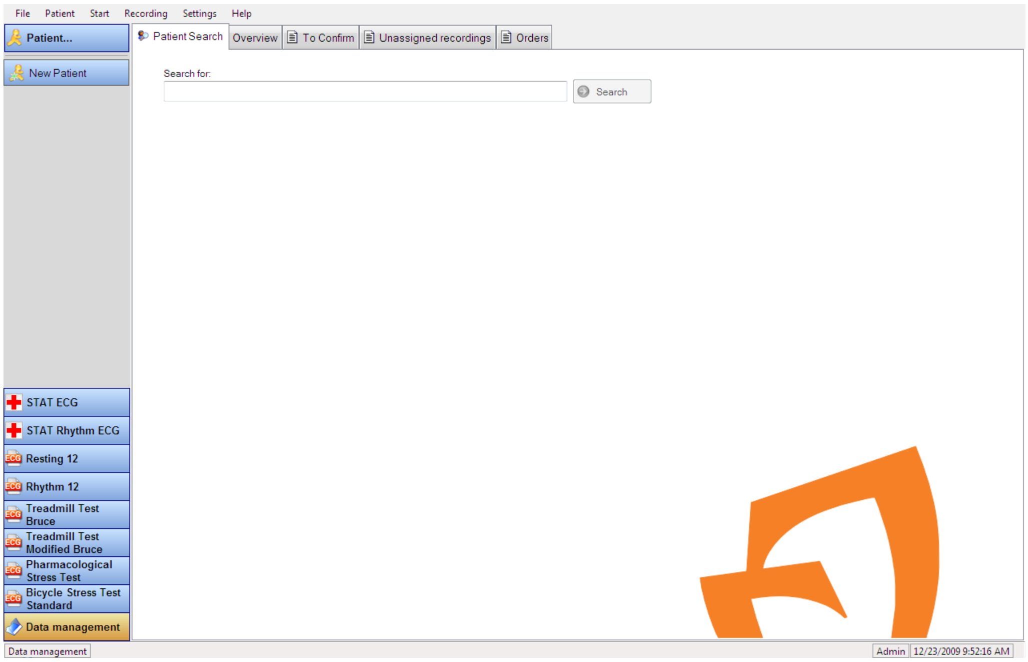


Figure 2-1: **Example of Patient Search tab**

Search for a patient

Use the **Patient Search** tab or the **Patient…** button to search for patient data. The system searches the database for the requested patient data using these fields:

- Patient number
- Last name
- First name
- Remarks

To search for patient data:

1. Choose a method to search for patient data:
   - Select the **Patient Search** tab.
   - Click **Patient....** or press **Ctrl + E**.
   - During a recording, click **Select patient...** or press **F2**.
2. In the Search screen, enter the search criteria in **Search for**.

   You can enter the patient number, the patient's first or last name or entries from Remarks.

   If you enter partial information the system will search for names that start with that pattern. For example, enter 123 and the system will find patient numbers 1234 or 5123 or patients with 123 in the remarks.

   * (asterisk) is a wild card that finds all entries.
3. Click **Search** or press **Enter**.

   The system searches for patients with the given criteria and displays all the results.
4. Select the patient and click **OK** or press **Enter**.

   If the patient does not display you can add a new patient, see *Add a new patient* on page 2-5.

Overview tab

The **Overview** tab displays patient data on the left and the ECG records on the right.

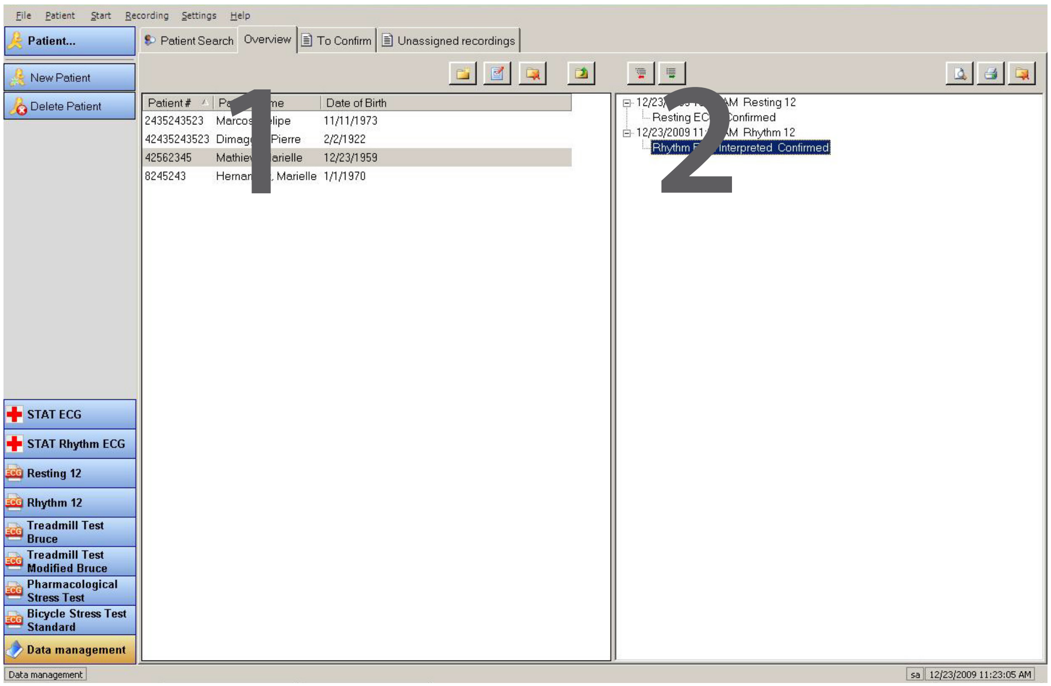


Figure 2-2: **Example of the Overview tab**

1 Patient data list

2 Recording list

Configuration Options

Configure whether or not the **Overview** tab displays	• Select **File | Options... | Database | Data management**.
Configure the patient data fields that display	• Select **File | Options… | Database | Patient Details**.
Configure the patient data list columns	1. Right-click in the patient data list and select **Configure Columns**. 2. For each column to add or delete, choose a method: – Click to select a column. – Use the up and down arrow keys to select the column and press **Enter**.

Patient data list

The patient data list always has one patient selected. You can choose the fields that display and the required field settings and change the name of the fields.

Add a new patient

To add a new patient:

1. Choose a method to add a new patient record:
   
   - Select the new folder icon.
   - Right-click in the patient data list and select **New Patient**.
   - Select **Patient | New Patient** from the title bar.
   - Click the **New Patient** button.
   - Click **New Patient** in the patient search dialog box.
2. In the **Patient Details** dialog box, enter the patient information.

   Note: The **Patient #** must be unique. The system does not accept duplicate entries.

   You must complete all fields that display an exclamation icon.

   The system indicates invalid entries. All required entries must be complete and valid. Table 2-1 describes the default options.
3. Click **OK** to create the new patient record.

Note: The fields that display depend on the patient data configuration.

Mark a patient data record

Select a record or a set of records for editing, deleting, or opening by marking the data record.

Choose a method to mark a single record:

- Search for the record (see *Search for a patient* on page 2-3) and select the record, click **Overview** tab.
- Scroll up or down to locate the record and then click the record.

Choose a method to mark multiple records:

- To select a series of records hold **Shift** and select consecutive records.
- To select individual records hold **Ctrl** and select each record.

Edit patient details

To edit patient details:

1. Choose a method to select the record:

   - Mark the record and click on the edit icon.
   - Right-click the record and select **Edit Patient Details**.
   - Mark the record and select **Patient | Edit Patient Details**.
2. Edit the patient record fields, and click **OK** or press **Enter**.

Delete patient data records

To delete patient data records:

1. Choose a method to select the record:

   - Mark the record and click the delete icon.
   - Right-click on the record and select **Delete Patient(s)**.
   - Mark the record and select **Patient | Delete Patient(s)**.
2. Click **Yes** or press **Enter** to confirm the deletion.

Open a tab

Open a tab to display the patient data for a marked patient. If multiple tabs are open you can bring an open tab to the foreground.

To open a tab:

- Choose a method to open a patient tab:
  - Mark the record and click on the open icon.
  - Double-click the data record in the patient data list.
  - Right-click the record and select **Open File Card**.
  - Mark the record and select **Patient | Open File Card**.

To bring an open tab to the foreground:

- Click the title of the tab.

Recording list

The recording list is a tree structure. When the list is collapsed, the date, time, and test display. Expand the list or an individual entry to see the type of records, status of interpretation and confirmation.

- Records that are validated display with the comment: **Confirmed**.
- Records that have not been validated can be configured to display in red.

Configuration Options

Change the display settings for the test and recording list	• Select **File | Options... | Database | Data management**.

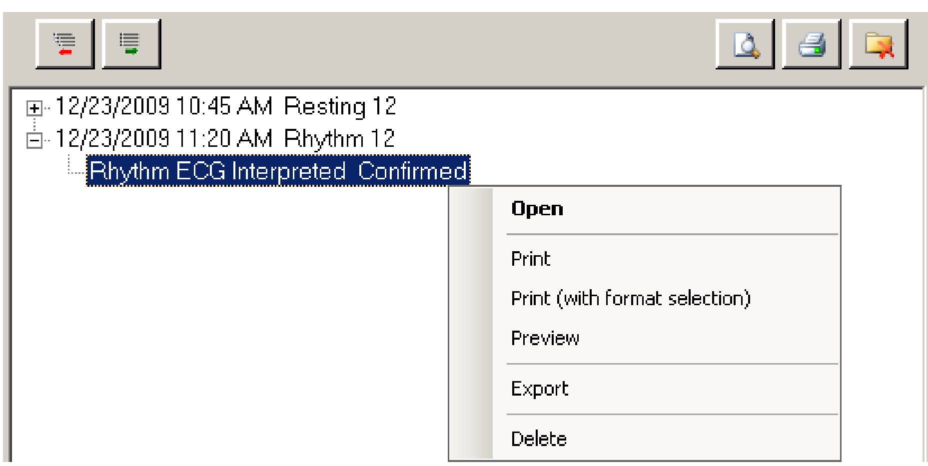


Figure 2-3: **Example of recording list tree**

You can perform these functions.

To...		Do this...
Expand an entry	 →	Choose a method: • Click the + symbol. • Select the test and press the right arrow key.
Expand all the entries		Select the expand icon.
Collapse an entry	 ←	Choose a method: • Click the - symbol. • Select the test and press the left arrow key.
Collapse all the entries		Select the collapse icon.
Open the recording		Choose a method: • Double-click the entry. • Right-click the entry and select **Open**. • Mark the entry and select **Recording | Open**. • Mark the entry and press **Enter**.
Preview the recording		Choose a method: • Mark the entry and select the preview icon. • Right-click the entry and select **Preview**. • Mark the entry and select **File | Print Preview...**.
Print the recording		Choose a method: • Mark the entry and select the print icon. • Right-click the entry and select **Print**. • Mark the entry and select **File | Print**.
Print (with format selection) **Note:** Use Print (with format selection) to change from the default print format or change print parameters.		**1.** Choose a method to open the print format dialog box: – Mark the recording and open the menu **File | Print with format selection...** – Right-click the recording and select **Print (with format selection)**. **2.** In **Print format**, select the print format for the recording. **3.** To preview the format, click **Preview**. **4.** To print, click **Print**. **5.** To save these settings as the default, click **Save as default**.

To...		Do this...
Delete the recording		Choose a method: • Mark the entry and select the delete icon. • Right-click the entry and select **Delete**. • Mark the entry and select **Recording | Delete**.

Export recordings

You can export recordings to an external medium or to another folder. The system automatically saves with the default file name format:

`PPPP-YYYY-MM-DD-HH-MM-SS-TYPE.aed`

Where:

- `PPPP`—the patient number
- `YYYY-MM-DD`—the date of the recording
- `HH-MM-SS`—the time of the recording
- `TYPE`—the type of recording
- `.aed`—the proprietary file format

To export the recordings:

1. Expand the recording list.
2. Choose a method to select the recording:
   - Right-click the recording and select **Export**.
   - Mark the recording and select **Recording | Export**.

   The system displays the **Save As** dialog box.
3. Browse to the appropriate location and click **Save**.

Configuration Options

Configuration Options	
Configure the default export location or change the default structure of the file name	• Select **File | Options... | General | Import / Export** and change the appropriate settings.

Import recordings

You can import recordings from an external medium or from another folder.

To import recordings:

1. Select **Recording | Import**.

   The system displays the **Open** dialog box.

2. Browse to the location of the file to import and click **Open**.

   The system displays the assignment dialog box, which displays the patient information contained in the recording. The information may vary depending on the settings in the original system.

   If there is a conflict between the patient record being imported and the patient information that exists in the database, the system flags the information.

   The system will search for this patient in the database. Select the correct patient:

If...	Do this...
Patient information displays	**1.** Select **Use in auto search** to identify the fields to use in the database search. The system displays a list of patients that match the auto search criteria. **2.** Select the correct patient from the list.
Patient information displays that conflicts with existing information 	**1.** Click the conflict icon. The system prompts you to resolve the conflict. **2.** Select the best choice to resolve the conflict. You may need to enter additional information to distinguish the entry. **3.** Select **OK**. **Note:** Once the conflict is resolved, the system will resolve this type of conflict in the same way without prompts.
Patient fields are blank— existing patient 	**1.** In the **Search for** field, enter search criteria which can be: – patient number (or fragment) – part of the patient name (first or last) – field remarks (or fragment) **2.** Click the **Search** or press **Enter**. The system displays a list of patients that match the auto search criteria. For more information see *Search for a patient* on page 2-3. **3.** Select the correct patient from the list.
Patient fields are blank— new patient	**1.** Click the **New Patient** button. The **New Patient** dialog displays. **2.** Enter the new patient details. For more information, see *Add a new patient* on page 2-5.

3. Click **OK** to import the recording.

   Note: You cannot import a record that already exists in the database. If the record already exists in the database, the system displays an error.

Patient data

Each patient has a patient data tab. The patient data tab displays patient data, tests, and recordings. The title of the patient data tab is:

[*Patient number*] *Patient last name*, *Patient first name*.

The patient tab may use these sub-tabs:

- Medications (default)
- Indications
- Symptoms
- Previous Diseases
- Previous Therapies
- Remarks
- Relatives

Note: To move between sub-tabs see *Navigating in CareCenter MD* in the *System Setup Guide*.

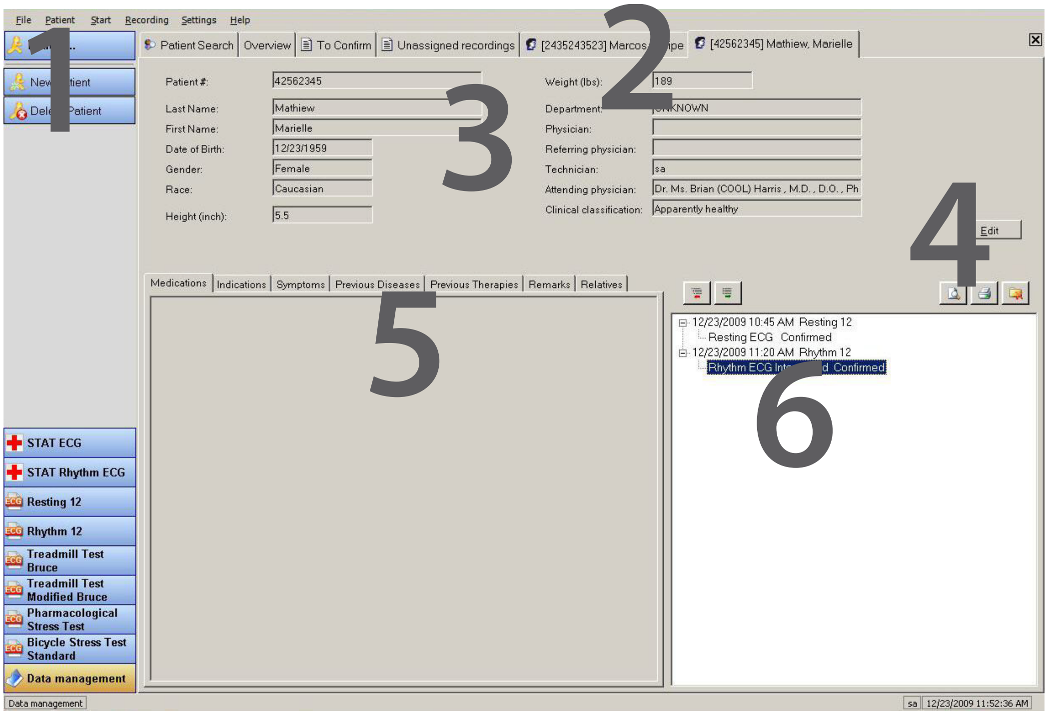


Figure 2-4: **Example of the patient data tab**

1 Patient buttons on the control panel:

Patient... (search)
New Patient
Delete Patient

2 Patient tabs

3 Patient information

4 Edit patient button

5 Patient data sub-tabs

6 Recording list

To edit the patient data fields, choose a method:

- Click **Edit** to open **Patient Details**.
- Select **Patient | Edit Patient Details**.

Configuration Options

Configure patient data sub-tabs	• Select **File | Options... | Database | Patient details**.

Note: The sub-tabs display at the end of the list.

To Confirm tab

The **To Confirm** tab displays a list of all records which have patients assigned, and have not been confirmed.

Note: If the record does not have a patient assigned, it does not display on the **To Confirm** tab.

To confirm a recording from the **To Confirm** tab:

1. Search for the record:
   a. Select the type of acquisition.
   b. Select the time period for the acquisition.
2. Open the record.
3. Click **Confirm** to confirm the test.

To manage the records to confirm, right-click on the record and select the option. The options are:

- **Open**—opens the record
- **Print**—prints the recording in the standard print format
- **Print (with format selection)**—print the using a customized format
- **Preview**—print preview in the standard print format
- **Export**—copies the file to a remote location
- **Delete**—delete the recording
- **Open file card for that patient**—opens the tab for the patient assigned to the record
- **Move to another patient record**— assigns the record to another patient's data tab

Configuration Options

Configure whether or not the **To Confirm** tab displays	• Select **File | Options... | Database | Data Management**.

Unassigned Recordings tab

The **Unassigned Recordings** tab displays a list of all tests for which no patient information has been entered. The test or recording information is stored on the **Unassigned Recordings** tab. At a later time you can add the test or recording to a current patient, or you can create a new patient and then add the test or recording.

To manage an unassigned recording, right-click on the record and select the option. The unassigned recording options are:

- **Assign**—assign the recording to a patient
- **Open**—open the unassigned recording
- **Print**—print the unassigned recording in the standard print format
- **Print (with format selection)**—print the unassigned recording using a customized format
- **Preview**—print preview in the standard print format
- **Delete**—delete the unassigned recording

Note: Burdick recommends displaying the **Unassigned Recordings** tab. If the **Unassigned Recordings** tab does not display you cannot see or search for unassigned tests.

Configuration Options	
Configure whether or not the **Unassigned Recording** tab displays	• Select **File | Options... | Database | Data Management**.

Orders tab

Use the **Orders** tab with the HL7 option to create, edit and execute orders.

To...	Do this...
Create an order	**1.** Click the **New Orders** button or right-click on the orders list and select **New Order**. **2.** In the **Search for** field of the Search screen, enter the search criteria. You can enter the patient number, the patient's first or last name or entries from Remarks. If you enter partial information the system will search for that pattern. For example, enter 123 and the system will find patient numbers 1234 or 5123 or patients with 123 in the remarks. * (asterisk) is a wild card that finds all entries. **3.** Click **Search** or press **Enter**. The system searches for patients with the given criteria and displays all the results. **4.** Select the patient and click **OK** or press **Enter**. If the patient does not display you can add a new patient, click **New Patient** and enter a new patient, see *Add a new patient* on page 2-5. **5.** Enter the new order information and click **OK** or press **Enter**.
Open an order for edit	Choose a method: • Click **Edit Order**. • Right-click on the record and select **Edit Order**.
Cancel an order	• Right-click on the order and select **Cancel Order**.
View patient information for an order	Choose a method: • Select **Patient | Open File Card**. • Right-click on the order and select **Open file card for that patient**.
Modify the **Orders** tab	• Select **Settings | Configure this card**.

Configuration Options

Configure whether or not the **Orders** tab displays	• Select **File | Options... | Database | Data Management**.

Custom tabs

You can edit optional custom tabs. On a custom tab you can configure the display field, the order of the fields, and include sort information.

To	Do this...
Create a custom tab	1. Select **Settings | Add a New Card**. 2. Enter a name for the custom tab. 3. Select the display and sort options for the custom tab.
Modify a custom tab	• Select **Settings | Configure This Card**.
Delete a custom tab	• Select **Settings | Remove This Card**.

3 ECG Acquisition

Contents

This chapter describes how to acquire an ECG.

Test procedure programs

During the installation, the test type programs are set up. You may modify these programs or create new ones.

The acquisition device unlocks specific test procedures. You can only complete recordings for which you have the appropriate permissions.

Observe the instructions for the type of acquisition and options, as listed below. For more information see the *System Setup Guide*.

Table 3-1: Basic test types

Test type	Settings	
Resting 12	Type of acquisition:	Resting ECG
	Leads:	I II III aVR aVL aVF V1 V2 V3 V4 V5 V6
	Duration:	Automatic recording stops after 10 seconds
	ECG Interpretation:	yes
STAT ECG	Type of acquisition:	Resting ECG
	Leads:	I II III aVR aVL aVF V1 V2 V3 V4 V5 V6
	Duration:	Records ECG until stopped manually
	ECG Interpretation:	yes
Treadmill Test Bruce	Type of acquisition:	Stress Test
	Leads:	I II III aVR aVL aVF V1 V2 V3 V4 V5 V6
	Duration:	The complete test is acquired
	Arrhythmia monitoring:	yes
	Stress protocol:	Bruce: • Load start with 1.7 mph, 10% grade • Increase by up to .9 mph, 2% grade • Stage duration 3 minutes • Stores a 10-second ECG strip at the end of every stage • Blood pressure measurement at the end of every stage
Pharmacological Stress Test	Type of acquisition:	Stress Test
	Leads:	I II III aVR aVL aVF V1 V2 V3 V4 V5 V6
	Duration:	The complete test is acquired
	Arrhythmia monitoring:	yes
	Stress protocol:	Pharmacological Stress Test: • No exercise device • Stage duration varies

The system includes additional test procedures for advanced diagnostic capabilities.

Table 3-2: Additional test types

Test type	Settings	
Resting 6	Type of acquisition:	Resting ECG
	Leads:	I II III aVR aVL aVF
	Duration:	Automatic recording stop after 10 seconds
	ECG Interpretation:	No interpretation if less than 12 standard leads
Nehb	Type of acquisition:	Resting ECG
	Leads:	I II III D A J
	Duration:	Automatic recording stop after 10 seconds
	ECG Interpretation:	No interpretation if less than 12 standard leads
Frank	Type of acquisition:	Resting ECG
	Leads:	I II III X Y Z
	Duration:	Automatic recording stop after 10 seconds
	ECG Interpretation:	No interpretation if less than 12 standard leads
Rhythm 6	Type of acquisition:	Rhythm ECG
	Leads:	I II III aVR aVL aVF
	Duration:	Automatic recording stop after 30 seconds
	ECG Interpretation:	No interpretation if less than 12 standard leads
Resting Dorsal	Type of acquisition:	Resting ECG
	Leads:	I II III aVR aVL aVF V4 V5 V6 V7 V8 V9
	Duration:	Automatic recording stop after 10 seconds
	ECG Interpretation:	No interpretation if less than 12 standard leads
Resting right precordial	Type of acquisition:	Resting ECG
	Leads:	I II III aVR aVL aVF V1 V2 V3R V4R V5R V6R
	Duration:	Automatic recording stop after 10 seconds
	ECG Interpretation:	No interpretation if less than 12 standard leads
Rhythm Dorsal	Type of acquisition:	Rhythm ECG
	Leads:	I II III aVR aVL aVF V4 V5 V6 V7 V8 V9
	Duration:	Automatic recording stop after 30 seconds
	ECG Interpretation:	No interpretation if less than 12 standard leads
Rhythm right precordial	Type of acquisition:	Rhythm ECG
	Leads:	I II III aVR aVL aVF V1 V2 V3R V4R V5R V6R
	Duration:	Automatic recording stop after 30 seconds
	ECG Interpretation:	No interpretation if less than 12 standard leads

Table 3-2: Additional test types (continued)

Test type	Settings	
Bicycle Stress Test Dorsal	Type of acquisition:	Stress Test
	Leads:	I II III aVR aVL aVF V4 V5 V6 V7 V8 V9
	Duration:	The complete test is acquired
	Arrhythmia monitoring:	yes
	Stress protocol:	WHO: • Load start with 25 Watts • Increase by 25 Watts • Stage duration 2 minutes • Stores a 10-seconds ECG strip at the end of every stage • Blood pressure measurement at the end of every stage
Bicycle Stress Test right precordial	Type of acquisition:	Stress Test
	Leads:	I II III aVR aVL aVF V1 V2 V3R V4R V5R V6R
	Duration:	The complete test is acquired
	Arrhythmia monitoring:	yes
	Stress protocol:	WHO: • Load start with 25 Watts • Increase by 25 Watts • Stage duration 2 minutes • Stores a 10-second ECG strip at the end of every stage • Blood pressure measurement at the end of every stage
STAT Rhythm ECG	Type of acquisition	Rhythm ECG
	Leads	I II III aVR aVL aVF V1 V2 V3 V4 V5 V6
	Duration	ECG recording until stopped manually
	ECG Interpretation	yes
Rhythm 12	Type of acquisition:	Rhythm ECG
	Leads:	I II III aVR aVL aVF V1 V2 V3 V4 V5 V6
	Duration:	Automatic recording stops after 30 seconds
	ECG Interpretation:	yes

Table 3-2: Additional test types (continued)

Test type	Settings	
Treadmill Test Modified Bruce	Type of acquisition:	Stress Test
	Leads:	I II III aVR aVL aVF V1 V2 V3 V4 V5 V6
	Duration:	The complete test is acquired
	Arrhythmia monitoring:	yes
	Stress protocol:	Modified Bruce: • Load start with 1.7 mph, 0% grade • Increase by up to .9 mph, up to 5% grade • Stage duration 3 minutes • Stores a 10-second ECG strip at the end of every stage • Blood pressure measurement at the end of every stage
Bicycle Stress Test Standard	Type of acquisition:	Stress Test
	Leads:	I II III aVR aVL aVF V1 V2 V3 V4 V5 V6
	Duration:	The complete test is acquired
	Arrhythmia monitoring:	yes
	Stress protocol:	WHO: • Load start with 25 Watts • Increase by 25 Watts • Stage duration 2 minutes • Stores a 10-seconds ECG strip at the end of every stage • Blood pressure measurement at the end of every stage

Configuration Options

Configure test procedures	• Select **File | Options ... | 12 Lead ECG | Test procedures**
Create or modify protocols	• Select **File | Options ... | 12 Lead ECG | Protocols**
To enable the procedures in Table 3-2	• Select **File | Options ... | 12 Lead ECG | Test procedures**

Launch a default test procedure automatically

During the installation, the **Data Management** module is preset as the default start option.

The system can be set to automatically launch the preset test procedure when the application starts.

Configuration Options	
Configure the default start option	**1.** Select **File | Options… | General | Environment**. **2.** Select **Start with test procedure** and activate a test procedure as start option. This test procedure is automatically launched for each test. At the program start and after a record is saved, the system automatically changes to tab of the patient, for whom the record is saved. **3.** To select a test, rather than automatically launching a test, in **Start with module**, select the **Data management** module.

Select a default test procedure manually

You can select the test procedures from the control panel on the left side of the display. The display sequence determines the keyboard shortcuts. The buttons are in order with the top position corresponding to **Ctrl+1**.

To manually select a test procedure, choose a method:

- Select **Start** and click the desired test procedure.
- Press the keyboard shortcut for the test.

  Note: The tests that display depend on your configuration. If you add or remove buttons or change the order of the buttons, the keyboard shortcuts will change.

Table 3-3: Example of test procedure list

Test Button	Keyboard shortcut
STAT ECG	**Ctrl+1**
STAT Rhythm ECG	**Ctrl+2**
Resting 12	**Ctrl+3**
Rhythm 12	**Ctrl+4**
Treadmill Test Bruce	**Ctrl+5**
Treadmill Test Modified Bruce	**Ctrl+6**
Pharmacological Stress Test	**Ctrl+7**
Bicycle Stress Test Standard	**Ctrl+8**

Configuration Options	
Reorder or set the keyboard shortcuts	• Select **File | Options... | 12 Lead ECG | Test procedures**
Note: Always save the changes to test procedures and then restart the system to ensure your changes take effect.	

Select a default test procedure in Data management

When selecting a test procedure from Data management:

<table>
<tr><th>If...</th><th>Then...</th></tr>
<tr><td>A patient tab is open</td><td>When the test program launches, this patient's data is associated to the active patient.
The active patient is the one for whom the ECG recording is carried out. (The STAT ECG does not have an active patient.)</td></tr>
<tr><td>The Overview tab is open</td><td>When the test program launches, the data marked in the patients list is associated to the active patient. The system prompts you to confirm this is the correct data.
1. To prevent the message from displaying again, select Don’t ask me again.
2. To reactivate messages select File | Options… | General | Environment, select Show disabled message boxes again.
If the record is saved after the acquisition of the ECG, the system associates the record to this patient.
After the change to the ECG record, the data of the active patient displays in the title bar of the program.</td></tr>
</table>

Select the active patient

The active patient is the patient for whom the current ECG record is saved and stored.

- If the test procedure is selected in the Data Management screen, the system automatically uses that patient as the active patient. See *Select a default test procedure in Data management* on page 3-8.
- If the test procedure is automatically launched, you must select the active patient during the ECG recording.

The title bar of the program shows the data of the active patient in the form:

[*Patient number*] *Last name*, *First name Date of birth*

Select the patient before starting an ECG acquisition

If possible, select the active patient before starting an acquisition.

If the active patient is unassigned, the system assigns the **Select patient...** function to the orange (main) button and to the **F2** key.

Note: The orange button and **F2** are reassigned as you progress through the workflow.

- Click **Select patient...** or press **F2**.

  To search for a patient, see *Search for a patient* on page 2-3. The patient found during the search is used as the active patient, and thus for the ECG acquisition.

Configuration Options

Configure the display of the main button. (If the button does not display.)	• Select **File | Options... | 12 Lead ECG | ECG** and select **First step of the "Green Arrow" button is opening the patient search**

Select the patient during an ECG acquisition

You can select the active patient after the start of an acquisition.

To select the patient data during the acquisition:

1. Click **Patient...** or press **Ctrl + E**.
2. To select a different patient, click **Search**.

   To search for patient data, see *Search for a patient* on page 2-3.

Automatically open the search dialog

If you configure the system to return to a preset test rather than to Data Management , then you can configure the search dialog to display automatically. This function is always on for stress test acquisitions.

Configuration Options

Configure the system to prompt for the active patient	1. Select **File | Options... | General | Environment** and select a test procedure from **Start with test procedure**. 2. For each test type to prompt for the active patient: a. Select **File | Options... | 12 Lead ECG | Test procedures**, and select the test procedure program. b. Click the **General** tab and select **At acquisition start, automatically ask for a patient**. **Note:** STAT and STAT Rhythm tests do not prompt for the active patient. 3. After you save a record for the active patient, select **Continue** and the system prompts for whether or not you want to carry out a further test procedure of this patient. – To acquire another ECG, click **Yes**. – To search another patient's file, click **No**.

Additional active patient options

These additional options are available after you select the procedure:

Menu Item	Function
Show Patient Details	To display and edit the details for the active patient, choose a method: • Right-click **Patient...** and select **Show Patient Details...**. • Select **Patient | Show Patient Details...**.
Close active Patient	If you do not want to use the data of the active patient for the ECG acquisition, choose a method: • Close the active patient. • Right-click **Patient...** and select **Close active Patient** • Select **Patient | Close active Patient**.
Select Patient...	Up to five patient tabs can be open in Data Management. The open patients are listed in the patient menu. To select a patient whose tab is open, choose a method: • Right-click **Patient...** and then select the patient from the list. • Select **Patient** and then select the patient from the list.

Select the ECG acquisition device

You must install and connect the acquisition devices to the system before using the devices for an acquisition. To install an acquisition device, see *Getting Started* or the *CareCenter™ MD System Setup Guide*.

Selecting a USB device

The system automatically searches for connected USB acquisition devices. If the system cannot find a USB acquisition device, or if the system finds several devices, the system displays the **Device Selection** dialog box.

- If the system cannot find an acquisition device, then the device list is empty and the **Continue** button is inactive, connect a USB acquisition device to the computer according to the *CareCenter MD™ System Setup Guide*:
- If the system finds several USB acquisition devices:
  a. Click on the device that you want to use.

     To scroll: click in the list and use the arrow keys to scroll to the device.

  b. Click **Continue** or press **F2**.

Selecting a wireless device

The system does not search automatically for wireless acquisition devices. CareCenter MD displays all the wireless devices which are activated in **File | Options...| Devices | CareCenter MD (BT)**. It does not matter whether these devices are on or off.

Caution: Electrical shock

Touching an exposed battery has the risk of electrical shock. Always ensure the battery compartment for the wireless acquisition device is properly closed during use.

If the system cannot find a wireless acquisition device, or if the system finds several devices, the system displays the **Device Selection** dialog box.

- If the device list is empty, connect a wireless acquisition device according to the *CareCenter MD™ System Setup Guide*.
- If the system finds several devices:
  a. Click on the device that you want to use.

     To scroll: click in the list and use the arrow keys to scroll to the device.

  b. Click **Continue** or press **F2**.

Note: Ensure the wireless acquisition device has enough battery charge to last for the entire acquisition session.

Enter a comment

You can configure the comment box to open automatically at the start of an acquisition or at the end of an acquisition.

To manually enter comments during a test or acquisition:

1. Click **Remarks** or press **F3**.

   The **Comments** tab opens.
2. Enter your comment.

   Use the auto-type function for repeated terms.

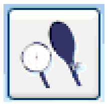
   If required, enter more information on the other tabs, or automatically display the information entered there.
3. To print comments, select **Print comments**.
4. To prevent comments from printing, clear **Print comments**.
5. Click **OK**.

Configuration Options

Configure when the comment box displays for each test procedure	1. Select **File | Options … |12 Lead ECG | Test procedures**. 2. For each test procedure, click the **General** tab and choose the **Comment box** behavior.

Measuring and entering blood pressure

Start the blood pressure device



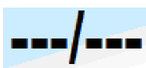
If a blood pressure device is connected, you can start the measurement manually.

- Click the blood pressure icon.

Enter blood pressure values manually

If a blood pressure device is not connected, you can enter the measured values manually.

To manually enter a blood pressure:



1. Click on the blank blood pressure field or press **Shift + F3**.

   If a blood pressure device is connected, you can also enter the measured values manually.

   - Click on the blank blood pressure field or press **Shift + F3**.

2. Enter the systolic and the diastolic value without separators.

   It is not necessary to enter a diastolic value. Only systolic values under 350 are accepted.

   The systolic value must be greater than the diastolic value.

3. Press **Enter** or click beyond the blood pressure field to close the input dialog box.

Apply electrodes

Follow all safety precautions for the patient cable, see the *Product Information and Safety* guide.

Use only high-quality Burdick-approved electrodes. Handle the electrodes with care to achieve good recording quality.

The ECG acquisition always starts with the electrode placement screen including the disturbance level indication and ECG preview. The electrode placement diagram shows the electrode positions. You can select the name of the points of application or the marking on the electrode cables.

- Apply the patient cable with no tension in the electrodes.
- For reusable electrodes, use a contact spray.
- For a resting ECG:
  - Make sure that the patient lies comfortably and is relaxed.

    The arms should have enough space to rest beside the patient. Holding the arms into the body can cause artifacts.
  - Burdick6 recommends placing a roll under the hollows of the knees of the patient.

WARNING! Patient safety.

To prevent tripping, always ensure the patient belt allows freedom of movement. Use the belt loops to manage excess cable length. Before beginning the test, ensure there are no obstructions.

The system prompts you to apply the electrodes and displays an electrode placement diagram. See Figure 3-1.

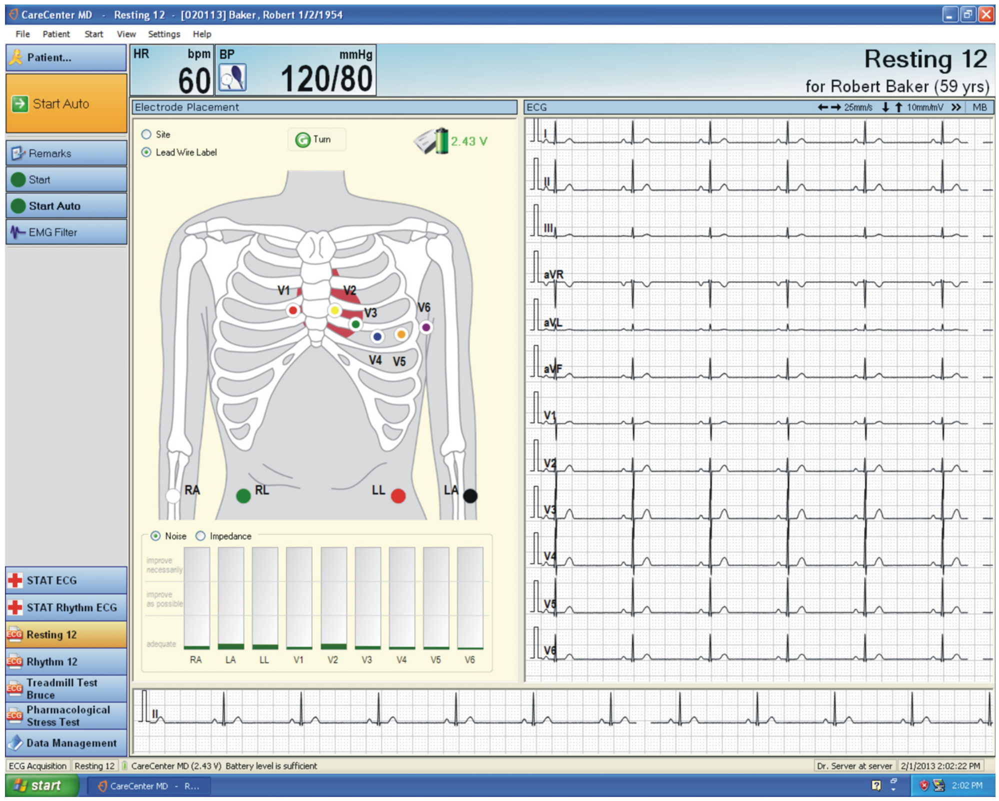


Figure 3-1: **Example of lead placement**

To apply the electrodes from acquisition mode, with the acquisition device selected:

1. To toggle the electrode labeling (for Nehb and Frank only), select **Site** or **Lead Wire Label**.
2. To see the electrode placement scheme from another angle (side or back) click on the image of the torso or the **Turn button**.
3. Apply the electrodes to the patient.
   - Always start with the right leg placement.
   - If an electrode is not applied the electrode position on-screen blinks.
   - The representation of an ECG lead starts as soon as the system recognizes the electrodes are applied correctly.
   - The electrode fault detection begins working, when you apply the right leg and two additional leads.
4. Using the **Electrode Placement** display, try to improve the quality of the electrode application, until all electrodes display in the **adequate** range.

   Note: Turning on a filter does not affect electrode quality measurements.

5. To assess the skin transmission impedance, select **Impedance**.

The system does not display ECG during the impedance measurement.

Note: You must complete **Electrode Placement** before the system can start the acquisition.

6. Once all electrodes are applied, click the orange **Start Auto** button or press **F2** to start acquiring the ECG or the stress test.

   Note: The actual title of the orange button and the manual start controls are dependent on the workflow. **Start Auto** initiates a timed test, **Start** initiates a test that is not timed, and **Start Test** initiates a stress test.

   - If the system displays electrode faults you can start the acquisition using the working electrodes, click **Start Auto** or **Start** to start the acquisition.
     – At least the right leg electrode and two additional limb electrodes must be operational.
     – If you start the ECG with an electrode fault, then the system does not display all channels. The display depends on the electrodes that are working properly.

   Note: If the transmission is interrupted, the trace will stop displaying and the system indicates the error condition until the transmission is restored.

Configuration Options

Configure the lead placements
- Select **File | Options | 12 Lead ECG | ECG**.

ECG filters

Filters can influence the ECG: therefore, avoid using filters when they are not required. The available filters are:

- Mains (AC Line) filter—inhibits disturbances coming from power supply lines, fluorescent lamps, as well as energy-intensive consumers.

  These energy-intensive entities cause electromagnetic fields which spread in the room and can disturb ECG acquisition. Therefore, when selecting the location of the patient for the test, consider this influence and locate a place where the network disturbances are as low as possible.

  Poor contact between electrode and body also has adverse effects on the acquisition. Ensure the electrodes are applied properly with good contact.

- EMG (Muscle Artifact) filter—acts against artifacts caused by muscle motions. For ECGs at rest, such artifacts are usually caused by having such a narrow space that patients hold their arms to their bodies. Ensure patients lie comfortably and calmly with enough space for their arms to rest at their sides.
- Baseline filter—prevents excessive excursion of the ECG waveform. Strong motions of the patient can adversely affect the stability of the ECG waveform.

Note: When filters are applied, pacer spikes may exhibit minor distortion which will appear as a small secondary spike immediately adjacent to the primary spike. This distortion does not affect the automatic interpretation algorithm.

Configuration Options

Change the default filter settings	1. Select **File | Options … | 12 Lead ECG | Test procedures**. 2. Select the **ECG** tab and configure the filter settings.

Note: Each test procedure is configured separately.

Enable a filter

Any filters that are enabled display in the title bar of the ECG representation.

- E—EMG (Muscle Artifact) filter
- M—Mains (AC Line) filter
- B—Baseline filter

With every new acquisition, the filters are reset to the state preset for the test procedure.

You can change the filter settings for an individual test:

To...	Do this...
Enable the Mains (AC line) filter	• Select **Settings | Mains (AC Line) filter**.
Enable the EMG (muscle Artifact) filter	• Click **EMG filter** or select **Settings | EMG (Muscle Artifact) filter**.
Enable the filter defaults (including the Baseline filter)	**1.** Select **File | Options… | 12 Lead ECG | Test procedures**. **2.** Select the **ECG** tab and configure the settings.

Default filter settings

Table 3-4 lists the default filter settings.

Table 3-4: Default filter settings

Filter	STAT ECG	Resting ECG	Rhythm ECG	Stress Test
Mains (AC Line) filter	On	On	On	On
EMG (Muscle Artifact) filter	Off	Off	Off	On
Baseline filter	On	On	On	On

Change the ECG representation

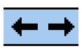
You can change the speed, sensitivity, size and position of the ECG waveform.

Configuration Options

With every new acquisition, the speed is reset to the state preset for the test procedure.	
Configure the presets for each type of test procedure	1. Select **File | Options… | 12 Lead ECG | Test procedures**. 2. Click the **Display** tab and set the presets.

Change speeds

To change the speed of the displayed ECG in the test:



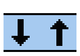
1. Click the arrow to the left to decrease the speed.
2. Click the arrow to the right to increase the speed.
3. Alternatively:
   a. Right-click in the ECG and select **Speed**.
   b. Select the speed.

Default settings

	Setting range [mm/s]	Presetting [mm/s]
Multi-channel ECG	**5**, **10**, **25**, **50**, **100**	**25**
Rhythm line	**5**, **10**, **25**, **50**, **100**	**25**

Change sensitivity

To change the sensitivity of the displayed ECG in the test:



1. Click the down arrow to decrease the sensitivity.
2. Click the up arrow to increase the sensitivity.
3. Alternatively:
   a. Right-click in the ECG and select **Sensitivity**.
   b. Select the sensitivity.

Default settings

	Setting range	Presetting (mm/mV)
Multi-channel ECG	5, 10, 20	10
Rhythm line	5, 10, 20	10

Resize the window

To resize the window:

- Click the right arrows to enlarge the window.
- Click the left arrows to shrink the window.

Move the ECG waveform

You can move each of the ECG waveforms in vertical direction and prevent the waveforms from writing over each other.

To move the waveform:

1. Click the label of the ECG waveform you want to move.

   A ruler displays.
2. Click and drag the waveform up or down to the re-position the waveform.
3. Click beyond the ruler to hide it immediately, or right-click and select **Hide ruler**.

   Otherwise, the ruler is automatically hidden after a short time.
4. To reset the original positions, with the ruler visible, right-click on one of the waveforms labels and select **Reset lead positions**.

Change a lead

You can associate another lead to every ECG waveform or hide it completely.

To change a lead:

1. Right-click on the label of the ECG waveform to which you want to associate another lead or which you want to hide and select the lead to display.
2. Click the ellipsis to hide the waveform.
3. To close the window without changing the lead, click on the already selected entry or beyond the context menu in the ECG.

Select a view

Different views are available to display the ECG waveforms in different arrangements. To define the views, they are divided into lines and columns.

Note: Temporary changes made to the waveform views are not saved when moving between views. To save your preferences, set your preferences, select save, exit, and then re-start the application.

Note: During a long ECG acquisition, when using a multi-column lead selection (for example 3x4) in the Rhythm Line Display, recordings of 30 minutes or more may result in a slight misalignment of the viewable sweep bar as the ECG waveform is refreshed. This occurs in the Rhythm Line Display only, not in the primary diagnostic ECG display. Reviewing and printing of ECG waveforms and stored ECGs are not affected. For long ECG recordings, select no more than 3 leads to display in the Rhythm Line Display.

To change the views:

- Right-click in the ECG representation and select the view.

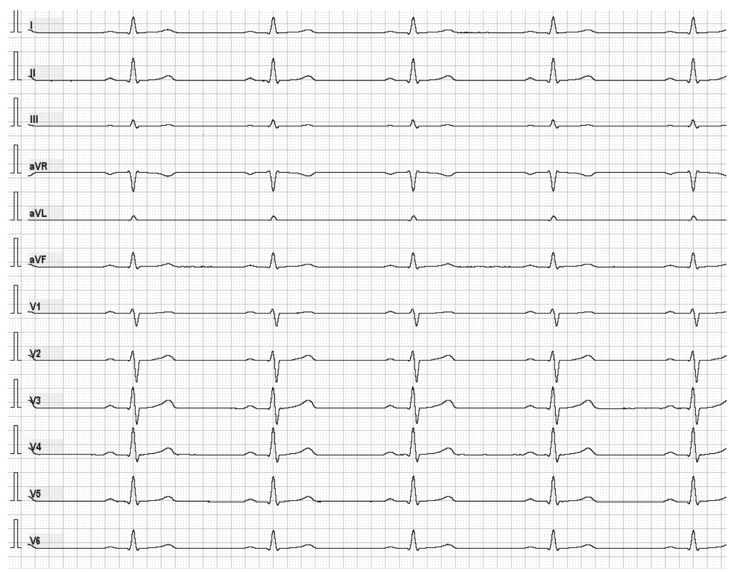


Figure 3-2: **Example of 1 column with 12 leads**

Figure 3-3: **Example of 2 columns with 6 leads**

Figure 3-4: **Example of 4 columns with 3 leads**

Configuration Options

Change the available views, or configure views for each test procedure	1. Select **File | Options… | 12 Lead ECG | Test procedures**. 2. Select procedure and then select the **Lead Program** tab. 3. Modify the **View** selections.

Toggle views

If not all leads are visible on screen, you can cycle through the views to see the other leads.

- Click **Next set of leads or press F8** to toggle the views.

If you selected a 3-channel or a 6-channel representation, you can use the refresh in the header to switch to the other lead groups.

Change the mode of representation

The mode of representation affects only multi-column representations.

- Synchronous mode—the waveforms in the left column and the waveforms in the right column are written simultaneously.
- Sequential mode—the waveforms in the left column and the waveforms in the right column are written consecutively.
  - Advantage—the waveform is overwritten only half as often. This allows longer viewing of the ECG.
  - Disadvantage—the ECG within a column is updated only half as often.

Configuration Options

The synchronous mode is the default.	
Enable the sequential mode for each procedure and for every view	1. Select **File | Options… | 12 Lead ECG | Test procedures**. 2. Select the **Display** tab. In all representations which are displaying real-time ECG, you can select a multi-column view. To activate these views select the **Sequential mode** option.

Pediatric ECG

For patients 16 years and under, the program does not create diagnostics. Instead, the program creates a measurement table. In this table, the measurement values of the patient are compared with those from statistics distributed after Gaussian distribution. The tables use the same naming convention as the tables created by Andrè Davignon et al.

If the values of the patient are beyond this distribution, they are marked with an asterisk (*).

Configuration Options

Configure the pediatric ECG statistical distribution	1. Select **File | Options… | 12 Lead ECG | ECG analysis**. 2. In **Table for pediatric ECG**, select the gauss distribution for the table: – None – 2% to 98% – 5% to 95% Values beyond this distribution are marked with an asterisk (*)
Configure a default age and gender to use for analysis	• Select **File | Options … | 12 Lead ECG | ECG analysis**. – To set the default age, select **If DoB is missing, analyze with an age of** and select the age. – To set the default gender, select **If gender is missing, analyze with** and select the gender.

Pacemaker detection

The settings for pacemaker detection can be changed during the ECG acquisition.

To change pacemaker detection:

1. Open **Settings | Pacemaker detection**...
2. Select the electrodes to be used for the detection.
3. Select whether the pacemaker spikes should be replaced with 1 mV impulses.

Pacemaker impulses

Impulses delivered by pacemakers can be so narrow that it is not possible to display the original pulse. Therefore, the system shows a synthetic impulse exactly at the point of the ECG where the original impulse was detected.

The synthetic impulse is displayed on all channels and always with positive polarity.

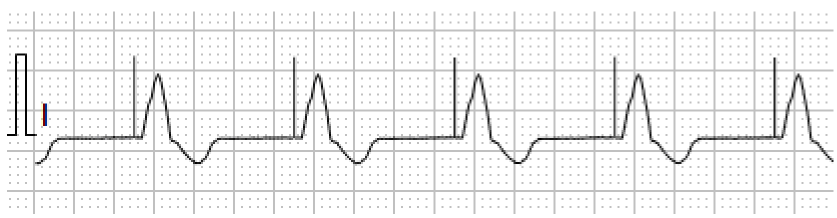


Figure 3-5: **Example of pacemaker impulses**

The level of the synthetic impulse is 1 mV. By default, the width of the synthetic impulse is set to 8 ms.

Configuration Options

Change the value of the synthetic impulse	1. Select **File | Options... | Devices**, and open **CareCenter MD (BT)** or **CareCenter MD (USB)**. 2. Enter the desired width in the **Pacemaker Impulse Width (ms)** input box. The value must be between 2 ms and 16 ms.

Print the record

Use **Print with Format selection** to use other print formats or to set other printing parameters.

The TCR-1000 supports in-test print speeds of 5 mm/s and 25 mm/s. Approved laser printers support in-test print speeds of up to 50 mm/s.

Note: When a continuous rhythm test has a displayed speed greater than 25 mm/s, the TCR-1000 is limited to printing at 25 mm/s during in-test printing. To print the test to the TCR-1000 at 50 mm/s, before or during the test, set the printer to a PDF writer (for example Bullzip PDF). When the PDF displays, select **File | Print** from the PDF and select the TCR-1000 printer.

To...	Do this...
Preview the record in the standard print format	Choose a method: • Click **Preview**.  • Press **Ctrl** + **F**. • Select **File | Print Preview...**.
Print the record in the standard format	Choose a method • Click **Print**.  • Press **Ctrl** + **P**. • Select **File | Print**.

To...	Do this...
Preview and print alternate formats	**1.** Choose a selection method: – Right-click **Preview** and select **Dialog**. – Select **File | Print with Format Selection...**. **2.** Select the print formats. – Clear the check boxes for formats that should be neither printed, nor previewed. – Select the formats to be printed or displayed. **3.** To change the settings, click **Print parameters**. **a.** Select the appropriate settings. ECG—multi-channel ECG representation Rhythm— single-channel rhythm representation below the multi-channel ECG Averaged Beat Vector loop Full disclosure—Rhythm queue' in the rhythm ECG and in the exercise ECG Grid ECG line thickness **b.** To use these settings as the standard format, click **Save as default**. **4.** Click **Preview** to display the selected formats on the screen, or Click **Print** to print the selected formats. **5.** Click **Save as a default** to use these formats as the default formats (standard print format).
Change the standard format selection	**1.** Open **File | Options… | 12 Lead ECG | Printing** and select the type of test **2.** Move the desired print formats to **Used printing formats**. **3.** Select the print formats which you want to print as standard. **4.** To select the print formats for a specific test procedure, select **File | Options... | 12 Lead ECG | Test procedures** on the **Printing** tab. **5.** To change the printing parameters for a specific test procedure, enable **Use different parameters**.

Save a PDF

The system can create a PDF either by printing to a PDF writer (for example Bullzip PDF), or through the one-click PDF export capability. One-click PDF printing can be enabled in **File | Options… | 12 Lead ECG | PDF export**.

To...	Do this...
Save a PDF	Click PDF
Change the PDF report format	1. Open **File | Options… | 12 Lead ECG | PDF export** and select the type of test 2. Move the desired print formats to **Used printing formats**. 3. Select the print formats which you want to print as standard. 4. To select the print formats for a specific test procedure, select **File | Options... | 12 Lead ECG | Test procedures** on the **PDF generation**. 5. To change the printing parameters for a specific test procedure, enable **Use different parameters**.

Signing the ECG

You or your patient can sign the ECG after it has been acquired and before it is saved.

1. Click **Remarks** or press **F3**
2. Select the **Signature** tab.
3. If an electronic signature pad is connected, use it to capture a handwritten signature. Otherwise you can type a text 'signature'.

Save the record

After completion of the test, the final default workflow step is saving the test.

1. Click **Save** or press **F2**.
    - If no active patient was selected, the system opens the search function automatically. Select the data as described in *Search for a patient* on page 2-3.

      Before saving, the system displays a message with the data of the active patient.
    - If the indicated patient data does not correspond with the real data, you have 3 seconds time to cancel the saving process.
        – Click **Cancel**.
    - If you find out that a wrong patient was selected, you can select a different patient as the active patient, select **Patient | Select Patient...**. If the age or the gender settings change due to the selection of another patient, the ECG is analyzed again.

      Note: If the test has not been saved, then the system re-analyzes the ECG test whenever age and gender are changed. For automatic re-analysis:
    - USB—the acquisition device must remain connected to the system
    - Wireless—the acquisition device must remain in acquisition mode
        – Click **OK** to confirm the repeated analysis of the ECG.

    - As an alternative you can, click **Save** or press **Shift + F12**.

2. If you do not want to save the record click **Cancel** or press **Ctrl + X**.

4 Acquire a Resting ECG

Contents

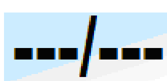
This chapter describes how to acquire a resting ECG.

Operating steps - overview

The system uses the orange (main) button (or the **F2** key) to perform a typical workflow. Use the orange button (or **F2**) to start and to save an automatic 10 seconds 12-channel ECG acquisition. Shaded steps are optional. For more information on each step see *Detailed procedures* on page 4-4.

	Step		Selection
1	Search for a patient or enter a new patient.		**Patient Search** tab or **Patient...**
2	Select the test procedure.		**Resting 12** or **Ctrl** + <number>
Options		If multiple acquisition devices are installed, select the device.	**Continue** or press **F2**
		If using a *Bluetooth* wireless device, power on the device.	
3	Apply the electrodes: • Incorrectly applied electrodes blink. • The graphs indicate the hook up quality, check the ECG traces.		
Options		Enable the filter only if you cannot achieve sufficient acquisition quality.	**EMG filter**
		Enter a remark.	**Remarks** or press **F3**
		Start a blood pressure measurement device or enter a blood pressure value manually.	Blood pressure icon or press **Shift** + **F3**
4	Start the acquisition. **Note:** The button is active only if all electrodes are applied correctly.		**Start Auto** or press **F2**
Options		Start an acquisition manually if the electrodes are not applied correctly.	**Start Auto** or press **Ctrl** + **A**
		The system starts a timer which stops the record after 10 seconds. If you restart the timer within 10 seconds, the acquisition starts from the beginning.	**Reset** or press **Ctrl** + **R**
		Start and stop the acquisition manually.	**Start** or press **Ctrl** + **S** **Stop** or press **Ctrl** + **T**
5	Review the recording.		
Options		Repeat the acquisition in manual or in automatic mode.	**Repeat** or press **Ctrl** + **S** **Repeat Auto** or press **Ctrl** + **A**
		Confirm the diagnosis. The system adds your full name and the date and time to the diagnosis or to the remark.	**Confirm** or press **Ctrl** + **B**
		Preview using the standard formats.	**Preview** or press **Ctrl** + **F**
		Print the recording in the standard format.	**Print** or **Ctrl** + **P**
		Save a PDF	**PDF**
6	Save the record.		**Save** or press **F2**
Option		Cancel without saving the record.	**Cancel** or press **Ctrl** + **X**

Controls for acquiring a Resting ECG

Control Panel	Option	Description
	**Remarks** or **F3**	Enter comments regarding the acquisition. See *Enter a comment* on page 3-12.
	**EMG filter**	Enables the EMG (muscle artifact) filter. See *ECG filters* on page 3-17.
	**Start** or **Ctrl + S**	Starts the acquisition manually and changes to manual acquisition. See *Start the acquisition for Resting ECG (manually)* on page 4-5. You can start manual recording if electrode errors are indicated and the orange **Start Auto** button is deactivated. See *Apply electrodes* on page 3-14.
	**Start Auto** or **Ctrl + A**	Starts automatic recording if electrode errors are indicated and the orange **Start Auto** button is deactivated. See *Apply electrodes* on page 3-14.
	**Stop** or **Ctrl + T**	Stops the acquisition. If the acquisition is stopped within10 seconds, the ECG is not analyzed. Use this function if sudden disturbances occur.
	**Reset** or **Ctrl + R**	Restarts the automatic acquisition. The remaining time is set to 10 seconds, and the progress bar, to 0%. Use this function if you see a passage which should not be saved during the acquisition.
 	Blood pressure icon or blank blood pressure field or **Shift + F3**	Includes blood pressure measurement. See *Measuring and entering blood pressure* on page 3-13.

Detailed procedures

This section contains detailed instructions for acquiring a Resting ECG.

Search for a patient or enter a new patient

To search for a patient, see *Search for a patient* on page 2-3. To enter a new patient *Add a new patient* on page 2-5.

Select the test procedure

Note: If you add or remove buttons or change the order of the buttons, the keyboard shortcuts will change.

Select the test procedure, before applying the electrodes.

1. Click one of the resting test buttons or press the keyboard shortcut (**Ctrl + 1** is the top of the list) or select **Start** from the menu bar and then select the test procedure:
   - **Resting 12** (default)
2. If multiple acquisition devices are enabled, select the device to be used for this test procedure and click **Continue** or press **F2**.

   Note: Each *Bluetooth* wireless device paired with this system displays on the selection screen; be sure to power on the wireless device you are using.

Apply the electrodes

Prepare the patient and apply the electrodes as described on *Apply electrodes* on page 3-14. If filters are necessary, see *ECG filters* on page 3-17.

Start the acquisition for Resting ECG (automatically)

Automatic recording is preset by default. The orange **Start Auto** button is active only if no electrode errors are indicated.

To start the acquisition:

◆ Click **Start Auto** or press **F2**.

The system initiates the ECG acquisition, the orange button indicates the remaining time, and the progress bar indicates the elapsed time.

- The recording is stopped automatically after 10 seconds.
- If a disturbance occurs, the time is restarted. The remaining time is set to 10 seconds, and the progress bar, to 0 seconds.

If no active patient was selected, the patient search function opens automatically after the acquisition stops.

Start the acquisition for Resting ECG (manually)

Manual acquisition is deactivated by default.

To start the acquisition manually:

1. Click **Start** or press **Ctrl + S**.

   The system initiates the ECG acquisition. The recording runs until it is stopped manually. At the start, the progress bar displays. As soon as the progress bar has reached the right margin, you can save an ECG with 10-second of duration.

   - If a disturbance occurs, the time is restarted. The progress bar is set to 0 seconds.

2. Click **Stop** or press **Ctrl + T**.

   The last 10 seconds are saved, and with 12-channel lead, also analyzed. Requirement is that the progress bar has reached 10 seconds.

   If no active patient was selected, the patient search function opens automatically after the acquisition stops.

Configuration Options	
Configure a manual acquisition as the default for a particular procedure	1. Select **File | Options... | 12 Lead ECG | Test procedures**. 2. In the **General** tab select the procedure and clear **"Green arrow" button stops acquisition automatically after 10 seconds**.

Review the recording

After completion of the recording the record displays. When records are automatically analyzed; the main measurement values, the results of analysis, the averaged beat and the beat classification display.

Records are analyzed only when:

- Test procedure has 12-channel standard leads
- Acquisition duration is at least 10 seconds
- Date of birth and gender of the active patient are first entered or changed

Note: If the test has not been saved, then the system re-analyzes the ECG test whenever age and gender are changed. For automatic re-analysis:

- USB—the acquisition device must remain connected to the system
- Wireless—the acquisition device must remain in acquisition mode

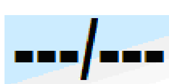
As long as the electrodes are connected to the patient, the running ECG displays in the rhythm line. You can view more representations to see more details.

- Click the view buttons or select **View** and then select a displayrepresentation.
  - **ECG**—ECG display, results of analysis and averaged beat
  - **Measurement Table**—Measurement table, results of analysis and averaged beat
  - **Averaged Beat**—Averaged beat, results of analysis and ECG
- When selecting views from the menu, you can choose whether to include additional information windows, or maximize the main window. The selected option will be used when the control buttons are pressed in the future.
- In Small Screen mode, there are separate buttons for:
  - **ECG**
  - **Measurement Table**
  - **Averaged Beat**
  - **Analysis Results**

Also see *Displaying a Resting ECG Record* on page 7-1.

Controls for reviewing a resting ECG

Functions for checking the record.

Control Panel	Option	Description
	**Remarks** or **F3**	Enter comments regarding the acquisition. See *Enter a comment* on page 3-12.
	**Confirm** or **Ctrl + B**	Confirms the correctness of the diagnosis or the comment. See Chapter 9, *Confirming Tests*. **Note:** After the record is confirmed, it cannot be changed.
	**Repeat**	**Ctrl +S** to repeat the recording manually, or **Ctrl +A** to repeat in automatic mode.
	Blood pressure field or **Shift + F3**	Includes the blood pressure measurement. See *Measuring and entering blood pressure* on page 3-13.

Print the record

See *Print the record* on page 3-26.

Save a PDF

See *Save a PDF* on page 3-28

Save the record

See *Save the record* on page 3-29.

5 Acquire a Rhythm ECG

Contents

This section describes how to acquire a Rhythm ECG.

Operating steps - overview

The system uses the orange (main) button (or the **F2** key) to perform a standard workflow. Shaded steps are optional. Use the orange button (or **F2**) to record automatically, review, and save 30 seconds of a rhythm ECG.

For more information on each step see *Detailed procedures* on page 5-7.

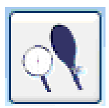
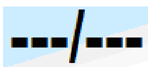
Steps		Selections
1	Search for a patient or enter a new patient.	**Patient Search** tab or **Patient...**
2	Select the test procedure.	**Rhythm 12** or **Ctrl** + **<number>**
Options	If multiple acquisition devices are installed, select the device.	**Continue** or press **F2**
	If using a *Bluetooth* wireless device, power on the device.	
3	Apply the electrodes: • Incorrectly applied electrodes blink. • The graphs indicate the hook up quality, check the ECG traces.	
Options	Enable the filter only if you cannot achieve sufficient acquisition quality.	**EMG filter**
	Enter a remark.	**Remarks** or press **F3**
	Start a blood pressure measurement device or enter a blood pressure value manually.	Blood pressure icon or press **Shift** + **F3**
4	Start the acquisition. **Note:** The button is active only if all electrodes are applied correctly.	**Start Auto** or press **F2**
Options	Start an acquisition if the electrodes are not applied correctly.	**Start Auto** or press **Ctrl** + **A**
	The system starts a countdown timer which stops the record after 30 seconds. Use **Prolong** to continue the acquisition and reset the countdown timer to 30.	**Prolong** or press **Ctrl** + **R**
	Set a marker and label it.	**Marker** press **F4**
	Stop the multi-channel ECG and move back to see and mark events that can be printed.	**Freeze Frame** or press **F6**
	Save the last 10 seconds as an ECG strip.	**Save 10s** or press **F5**
	Save the continuous ECG as an ECG strip. Click again to stop saving.	**Start ECG strip**
	Print the continuous ECG. Click again to stop printing.	**Rhythm**
	Print the last 10 seconds as an ECG strip.	**10sec ECG**
	You can start and stop the acquisition manually.	**Start** or press **Ctrl** + **S** **Stop** or press **Ctrl** + **T**

	Steps	Selections
5	Review the recording.	
Options	To review, use these views:	**Rhythm** **ECG** **ECG Strip** **Measurement Table** **Averaged Beat**
	Repeat the acquisition in manual or in automatic mode.	**Repeat** or press **Ctrl + S** **Repeat Auto** or press **Ctrl + A**
	Confirm the diagnosis. The system adds your full name and the date and time to the diagnosis or to the remark.	**Confirm** or press **Ctrl + B**
	Preview using the standard formats.	**Preview** or press **Ctrl + F**
	Print the recording in the standard format.	**Print** or **Ctrl + P**
	Save a PDF	**PDF**
6	Save the record.	**Save** or press **F2**
Options	Cancel without saving the record.	**Cancel** or press **Ctrl + X**

Controls for acquiring a Rhythm ECG

Control Panel	Option	Description
	Remarks or **F3**	Enter comments regarding the acquisition. See *Enter a comment* on page 3-12.
	EMG filter	Enables the EMG (muscle artifact) filter. See *ECG filters* on page 3-17.
	Start or **Ctrl + S**	Changes to a manual acquisition. Use manual recording to record ECGs longer than 30 seconds. See *Start the acquisition for Rhythm ECG (manually)* on page 5-8. You can start manual recording if electrode errors are indicated and the orange **Start Auto** button is deactivated. See *Apply electrodes* on page 3-14.
	Start Auto or **Ctrl + A**	Starts an automatic recording. You can start automatic recording if electrode errors are indicated and the orange **Start Auto** button is deactivated. See *Apply electrodes* on page 3-14.
	Stop or **Ctrl + T**	Stops the acquisition. You can stop the automatic recording earlier than 30 seconds.
	Prolong or **Ctrl + R**	**Note:** For automatic acquisitions only. Extends the recording by another 30 seconds.
	Marker or **F4**	Marks a place in the ECG which makes it easier to find at a later time. To add or change marker labels, select **File | Options... | 12 Lead ECG | Marker Labels**. To set a marker: **1.** Click **Marker** or press **F4**. The sequential numbers for the marks display in the **Marker label** field. – To assign a specific name to the marker, overwrite the default entry. – To use a default name, select one of the pre-defined labels. **2.** To set the marker automatically and prevent the dialog box from displaying, select **Don't show this dialogue again, set marker directly**. **3.** Save the mark with **Set mark**. The mark displays in the rhythm strip and in the multi-channel ECG. **Note:** The point of time of the mark is decided by the click of the **Marker** button or the press of the **F4** key, not the closing of the dialog box.

Control Panel	Option	Description
	**Freeze Frame** or **F6**	Stops the multi-channel ECG, while the rhythm channel and all measurement functions continue. **1.** Click **Freeze Frame** or press **F6**. When the recording is paused, you can move back through the ECG and save ECG strips, mark and print sections, and measure RR distances. See *ECG view* on page 8-12. **2.** Click **Freeze Frame** once more or press **F6** again to let the ECG continue.
	**Save 10s** or **F5**	Saves the last 10 seconds of an ECG strip. The main measurement values for the strip are indicated. The system retrospectively saves the ECG strip which ends immediately with the mouse click. You can mark this ECG strip. **Note:** only See *Editing the analysis for this ECG strip* on page 8-8.
	**Start ECG strip**	Saves an ECG strip of maximum 30 seconds. You can mark or delete this ECG strip. **1.** Click **Start ECG strips**. The system starts saving the continuous ECG as an ECG strip. **2.** During strip recording click **Stop ECG strip** to stop the strip prematurely. The main measurement values for the last 10 seconds of the strip are indicated.
	**Rhythm**	Enables continuous printing. When you click the button to start continuous printing, the button changes color and prompts **Click to stop**. **Note:** You must manually stop continuous printing. To print: **1.** Click **Rhythm**. The rhythm queue prints channels depending on the print parameters. It can take several minutes until a complete page is printed. **2.** To stop printing, click **Printing (Click to stop)**.

Control Panel	Option	Description
	Blood pressure	Measure the blood pressure values several times one after the other automatically, or enter them manually during the ECG session. To be able to start the automatic measurement again, the preceding measurement must be finished.
	blank blood pressure field or **Shift + F3**	**1.** Click the blood pressure icon. See *Measuring and entering blood pressure* on page 3-13. As soon as the blood pressure is automatically measured or entered manually, the value displays in the lower line for 1 minute. Within this time, the actual value can be corrected. No new value is added. **2.** Correct the blood pressure values as long as they are displayed on the lower line. After that, the value in the lower line is deleted and shown as the last measured value on the upper line of the BP field. **3.** Add a new blood pressure value by clicking the blood pressure icon or by pressing **Shift + F3**.

Detailed procedures

This section contains detailed instructions on acquiring a rhythm ECG.

Search for a patient or enter a new patient

- To search for a patient, see *Search for a patient* on page 2-3.
- To enter a new patient *Add a new patient* on page 2-5.

Select the test procedure

Note: If you add or remove buttons or change the order of the buttons, the keyboard shortcuts will change.

Select the test procedure, before applying the electrodes.

1. Click one of the rhythm test buttons or press the keyboard shortcut (**Ctrl + 1** is at the top of the list) or select **Start** from the menu bar and select the procedure (**Rhythm 12** is the default).
2. If multiple acquisition devices are enabled, select the device to be used for this test procedure and click **Continue** or press **F2**.

   Note: Each *Bluetooth* wireless device paired with this system displays on the selection screen; be sure to power on the wireless device you are using.

Apply the electrodes

Prepare the patient and apply the electrodes as described on *Apply electrodes* on page 3-14. If filters are necessary, see *ECG filters* on page 3-17.

Start the acquisition for Rhythm ECG (automatically)

Automatic recording is preset by default. The orange **Start Auto** button is active only if no electrode errors are indicated.

To acquire a rhythm ECG automatically:

- Click **Start Auto** or press **F2**.
  The system initiates the ECG acquisition.
  - The recording stops automatically after 30 seconds.
  - The orange button indicates the remaining time and the system indicates the time which was already recorded.
  - If a disturbance occurs, the recorded time continues. The remaining time is reset to 30 seconds.

  If no active patient was selected, the patient search function opens automatically after the acquisition stops.

Configuration Options	
Change the acquisition length	• Select **File | Options... | 12 Lead ECG | Test procedures** and on the **General** tab select **Auto stop in (seconds)**.

Start the acquisition for Rhythm ECG (manually)

Manual recording is deactivated by default.

To acquire a rhythm ECG manually:

1. Click **Start** or press **Ctrl + S**.
   - The system initiates the ECG acquisition. The recording runs until it is stopped manually.
   - The system indicates the elapsed time once the recording starts.
   - In case of 12-channel lead, the acquisition can be analyzed if more than 10 seconds were acquired.
2. Click **Stop** or press **Ctrl + T**.

   After you stop the recording, the system saves the last 10 seconds as an ECG strip, and analyzes the strip if the recording has all 12-channel leads. The strip is analyzed if the acquisition time has reached 10 seconds.

   If no active patient was selected, the patient search function opens automatically after the acquisition stops.

Configuration Options	
Configure a manual acquisition as the default for a particular procedure	1. Select **File | Options... | 12 Lead ECG | Test procedures**, 2. In the **General** tab select the procedure and clear **"Green arrow" button stops acquisition automatically after 30 seconds**.

Review the recording

After the acquisition is complete, the recording displays for confirmation.

If the records are automatically analyzed, the main measurement values, the results of analysis, the averaged beat and the beat classification are displayed. Records are automatically measured and analyzed only when:

- The test procedure has 12-channel standard leads
- The duration of the acquisition is at least 10 seconds
- Date of birth and gender of the active patient are first entered or changed

Note: If the test has not been saved, then the system re-analyzes the ECG test whenever age and gender are changed. For automatic re-analysis:

  - USB—the acquisition device must remain connected to the system
  - Wireless—the acquisition device must remain in acquisition mode

As long as the electrodes are connected to the patient, the running ECG displays in the rhythm line.

You can view more representations to see more details.

- Click the review buttons or select **View** and select the display.
  - **Rhythm**—1-channel view of the whole ECG as "a rhythm queue" and multi-channel ECG strip
  - **ECG**—multi-channel ECG, results of analysis and averaged beat
  - **ECG Strip**—multi-channel ECG, results of analysis and averaged beat of a strip
  - **Measurement Table**—measurement results of analysis and averaged beat of a strip
  - **Averaged Beat**—averaged beat, results of analysis and ECG of a strip

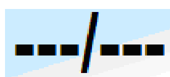
See also Chapter 8, *Displaying a Rhythm ECG Record*.

When selecting views from the menu, you can choose whether to include additional information windows, or maximize the main window. The selected option will be used when the control buttons are pressed in the future.

- In Small Screen mode, there are separate buttons for:
  - Rhythm
  - **ECG**
  - **ECG Strip**
  - **Measurement Table**
  - **Averaged Beat**
  - **Analysis Results**

Controls for reviewing a rhythm ECG

While you are reviewing the record, you can perform these functions.

Control Panel	Option	Description
	**Remarks** or **F3**	Enter comments regarding the acquisition. See *Enter a comment* on page 3-12.
	**Confirm** or **Ctrl + B**	Confirms the correctness of the diagnosis or the comment. For more information see Chapter 9, *Confirming Tests*. **Note:** After the record is confirmed, it cannot be changed.
	**Repeat** or **Ctrl + S**	**Ctrl + S** to repeat the recording manually, or **Ctrl + A** to repeat in automatic mode.
	Blank blood pressure field or **Shift + F3**	Includes the blood pressure measurement. See *Measuring and entering blood pressure* on page 3-13.

Make a measurement in the ECG window

You can make a measurement or create an ECG strip for analysis.

Table 5-1: ECG window functions

To...		Do this...
Make an RR or heart rate measurement		**1.** In the title bar click the **ECG measurement tool**. The system displays the marking lines. **2.** Drag the marking line from the starting point for the RR distance and position it over the R spike of a beat. **3.** Drag one of the other lines and position the line on another R spike. **4.** To add or delete lines, right-click in the ECG and select the action , or press **Ctrl** + '+' or **Ctrl** + '-'. **5.** To scroll the ECG, move a line to the left or right margin of the visible ECG.
Mark and edit an ECG strip of 10 seconds		**1.** In the title bar, click **Select 10 seconds ECG**. **2.** Click in the ECG and drag the selected range to the desired position. **3.** Click the **Edit** button. The selected strip displays in grey in the time bar. Depending on the speed, the grey range can be greater or smaller than the visible range. For more information see *ECG view* on page 8-12.
Mark and edit an ECG strip of any length		**1.** In the title bar, click **Select variable length ECG**. **2.** Click in the ECG and drag the marker to select a strip. As soon as the selected section is longer than 10 seconds, another mark appears and splits the selected section. The section on the right marks 10 seconds, which the system automatically measures and interprets. **3.** To correct the beginning and the end of the selected strip: position the cursor on either margin, and drag to move the margin. **4.** Click **Edit** and select the function.

Print the record

See *Print the record* on page 3-26.

Save a PDF

See *Save a PDF* on page 3-28

Save the record

See *Save the record* on page 3-29.

6 Emergency ECG

Contents

This chapter describes how to acquire an emergency ECG. The system includes the **STAT ECG** (Resting 12 Lead ECG) and **STAT Rhythm ECG**. You can start an emergency ECG without entering patient information. The emergency ECG displays until you stop the recording.

When the emergency ECG is not assigned to a patient when it is saved, it appears on the **Unassigned Recordings** tab. For more information on recordings see *Test procedure programs* on page 3-2.

Settings

Use these settings to configure the emergency ECG. While you can change these settings at any time, they are usually configured just once after the installation.

Recording type

The system is configured for the STAT ECG (Resting Emergency ECG) test procedure. STAT Rhythm ECG test procedure can be added from configuration options. The Rhythm test procedure allows you to record the ECG for a long time. During the recording or later you can select multiple ECG strips for analysis or interpretation.

Configuration Options

Allow only a single emergency procedure	• Select **File | Options... | 12 Lead ECG | Test procedures** clear the **STAT ECG** or **STAT Rhythm ECG** option.

Start option

You can configure the system to always start with an emergency test procedure.

Configuration Options

Change the start up default to the emergency test procedure	1. Select **File | Options... | General | Environment**. 2. Select **Startup with test procedure**. 3. Select the emergency test procedure. (**STAT ECG** or **STAT Rhythm ECG**).

Age and gender

The automatic analysis program requires the age and gender of the patient in order to calculate measurement values and perform the interpretation. For emergency ECG, the system uses a 35 year old male as the default age and gender.

Configuration Options

Set a default age and gender	1. Select **File | Options... | 12 Lead ECG | ECG analysis**. 2. Select age and gender for use in the analysis program. **Note:** The output of **Analysis Results** uses the default gender and age for diagnosis.

Data management

You can perform an emergency ECG without selecting an existing patient. In order to display the recording, the **Unassigned Recording** tab must be displayed.

Configuration Options

Enable the **Unassigned Recording** tab	1. Select **File | Options... | Database | Data management**. 2. Drag the **Unassigned recordings** tab to the **Used tab pages** column.

Blood pressure device

All test procedures can use the automatic blood pressure device. If your system is connected to the automatic blood pressure device, you can use it in emergency test procedures.

WARNING! Delay in analysis.

If your blood pressure device is not ready for use, you can not start the emergency recording.

For using the blood pressure device in emergency test procedure, select **File | Options... | Devices** the page for connected device (e.g. SunTech® Tango®+).

Select to enable for the emergency test procedure where the external device should be used.

Operating steps - overview

The system uses the orange (main) button (or the **F2** key) to perform a standard workflow. Use the orange button (or F2) to start and save a STAT ECG acquisition. Shaded steps are optional.

	Steps	Selections
1	Select the test procedure.	**STAT ECG** or **STAT Rhythm ECG**
Options	If multiple acquisition devices are installed, select the device.	**Continue** or press **F2**
	If using a *Bluetooth* wireless device, power on the device.	
2	Apply the electrodes: • Incorrectly applied electrodes blink. • The graphs indicate the hook up quality, check the ECG traces.	
Options	Enable the filter only if you cannot achieve sufficient acquisition quality.	**EMG filter**
	Enter a remark.	**Remarks** or press **F3**
	Start a blood pressure measurement device or enter a blood pressure value manually.	Blood pressure device or press **Shift + F3**
3	Start the acquisition. The button is active only if all electrodes are applied correctly.	**Start** or press **F2**
Options	Start an acquisition if the electrodes are not applied correctly.	**Start** or press **Ctrl + S**
	Auto Resting ECG: Start the automatic timer if the acquisition is still in progress. The acquisition starts from the beginning, the previous acquisition is deleted.	**Reset** or press **Ctrl + R**
	Auto Rhythm ECG: To continue the acquisition for 30 seconds.	**Prolong** or press **Ctrl + R**
4	Stop the acquisition manually.	**Stop** or press **Ctrl + T**
5	Review the acquisition.	
Options	Repeat the recording in manual **(Ctrl + S)** or in automatic mode **(Ctrl + A)**.	**Repeat** or press **Ctrl + S** or press **Ctrl + A**
	Confirm the diagnosis. The system adds your full name and the date and time to the diagnosis or to the remark.	**Confirm** or **Ctrl + B**
	Preview using the standard formats.	**Preview** or press **Ctrl + F**
6	Print the recording in the standard format.	**Print** or **Ctrl + P**
7	Save a PDF.	**PDF**
8	Save the record.	**Save** or press **F2**
	Cancel without saving the record.	**Cancel** or press **Ctrl + X**

Controls for acquiring emergency ECGs

Table 6-1 lists the functions available for the STAT ECG and STAT Rhythm ECG. To change the ECG display (sensitivity, recording speed, number of channels, channel position) see *Change the ECG representation* on page 3-19.

Table 6-1: Emergency ECG controls

Control Panels	Option	Function
	Remarks or **F3**	Enter comments regarding the acquisition. See *Enter a comment* on page 3-12.
	Stop or **Ctrl + T**	Stops the recording. You can stop the recording at any time, however, the analysis program (measurement and interpretation) needs at least 10 seconds of ECG data.
	Reset or **Ctrl + R**	**Note:** Resting ECG only Restarts the automatic recording time if you had started the acquisition using **Start Auto**.
	EMG Filter	Enables the EMG muscle artifact filter. For more information see *ECG filters* on page 3-17.
For STAT Rhythm ECG only:		
	Prolong or **Ctrl + R**	**Note:** Rhythm ECG only. Prolongs the recording time if you had started the acquisition using **Start Auto**. The remaining time is reset to 30 seconds.
	Marker or **F4**	Marks distinctive points within the ECG. See *Controls for acquiring a Rhythm ECG* on page 5-4.
	Freeze Frame or **F6**	Stops or starts the display of multi channel ECG. See *Controls for acquiring a Rhythm ECG* on page 5-4.
	Save 10s or **F5**	Saves the last 10 seconds of ECG as strip. The main measurement values are calculated and displayed. See *Controls for acquiring a Rhythm ECG* on page 5-4.
	Start ECG strip	Saves a strip with a maximum length of 30 seconds. You can label or delete this strip later. See *Controls for acquiring a Rhythm ECG* on page 5-4.

Table 6-1: Emergency ECG controls

Control Panels	Option	Function
	**Rhythm** or **Printing (Click to stop)**	Starts or stops continuous printing. When you click the button to start continuous printing, the button changes color and prompts **Click to stop**. The system prints selected channels base on the user settings. **Note:** You must manually stop continuous printing.
	**10sec ECG**	Prints the last 10 seconds of ECG in adjusted print format.

Detailed procedures

This section contains detailed instructions on acquiring an emergency ECG.

Select the test procedure

Note: If you have selected a patient in data management, this patient is NOT used for emergency ECG.

Note: If you add or remove buttons or change the order of the buttons, the keyboard shortcuts will change.

1. Choose a method to select the test procedure:
   - Click the **STAT ECG** or **STAT Rhythm ECG** button.
   - Press the appropriate keyboard shortcut. (**Ctrl + 1** starts at the top of the list).
   - Select **Start** and then select the emergency ECG procedure.
2. If multiple acquisition devices are enabled, select the device to be used for this test procedure and click **Continue** or press **F2**.

   Note: Each *Bluetooth* wireless device paired with this system displays on the selection screen; be sure to power on the wireless device you are using.

Identifying the recording

The system automatically generates an identification for the recording and displays it in the indication bar. The identifier consist of the term **#STAT#** and the date and time when the test procedure was started.

To change the patient identification:

◆ Click on the automatically generated name and enter a short description.

If you know the name of the patient, enter the patient name, however, this entry is not entered in the database, rather it is intended to assist in assigning the recording to a patient at a later time.

Assigning the recording (prior to acquisition)

When performing an emergency ECG, any patient data entered for the test is replaced with the #STAT# identifier and a time stamp. Use the time stamp on printed reports to correlate to a specific patient. To assign the patient after the acquisition, see *Assign the recording (after acquisition)* on page 6-9.

Apply the electrodes

Prepare the patient and apply the electrodes as described on *Apply electrodes* on page 3-14. If filters are necessary, see *ECG filters* on page 3-17.

Start the acquisition for an emergency ECG

Choose a method to start the acquisition:

- Click the **Start** button or press **F2**.

- To acquire exactly 10 seconds of ECG, click **Start Auto** button.

  After 10 seconds the ECG can be analyzed, printed and saved. (For Rhythm Emergency ECG, the Start Auto button starts a 30 second recording.)

  Note: You cannot start the acquisition when Impedance is running.

Stop the acquisition

To stop the acquisition:

1. Acquire at least 10 seconds of undisturbed ECG.

2. To stop an acquisition, click the **Stop** button or press **F2**.

   The last 10 seconds will be analyzed (if gender and age are available).

   Note: If the test has not been saved, then the system re-analyzes the ECG test whenever age and gender are changed. For automatic re-analysis:

   - USB—the acquisition device must remain connected to the system
   - Wireless—the acquisition device must remain in acquisition mode

3. If you started the acquisition using **Start Auto** you can stop it early: click **Stop** or press **Ctrl + T**.

   To evaluate the ECG:

   - For **STAT ECG** see *Review the recording* on page 4-5.
   - For **STAT Rhythm ECG** see *Review the recording* on page 4-5.

Save the recording

Note: Always save the emergency ECG before printing.

To save the recording:

- Click the **Save** button or press **F2**.

  You have up to 3 seconds to cancel the save.

Assign the recording (after acquisition)

You can assign the patient before or after the acquisition. In order to assign the recording to a patient, the patient must exist in the application database.

All recordings that have not been assigned to a patient display in Data Management on the **Unassigned recordings** tab.

To assign a patient:

1. Click **Data management**.
2. Select the **Unassigned recordings** tab.

   For more information see *Unassigned Recordings tab* on page 2-14.
3. If the patient exists in the database, right-click a recording and select **Assign** or double-click the recording and use **Search for** to locate the patient.
4. To create a patient, double-click a recording and click **New Patient**.

   For more information see *Search for a patient* on page 2-3.

   Note: Demographic information may not display in the first emergency ECG report on a new patient.

Other functions

You can preview, print, or delete the recording.

To preview, print, or delete the recording:

1. Click **Data management**.
2. Select the **Unassigned recordings** tab.

   For more information see *Unassigned Recordings tab* on page 2-14.
3. Right-click a recording and select the function.

7 Displaying a Resting ECG Record

Contents

This chapter describes the Resting ECG view.

Displaying an ECG record

Open the recordings as described in *Recording list* on page 2-7.

ECG window

The title bar of the program shows the test procedure, the recording date and time as well as the patient's data.

Analyzed records display in a multi-panel window. To configure how the panels display, see *Controls for changing the view* on page 7-5.

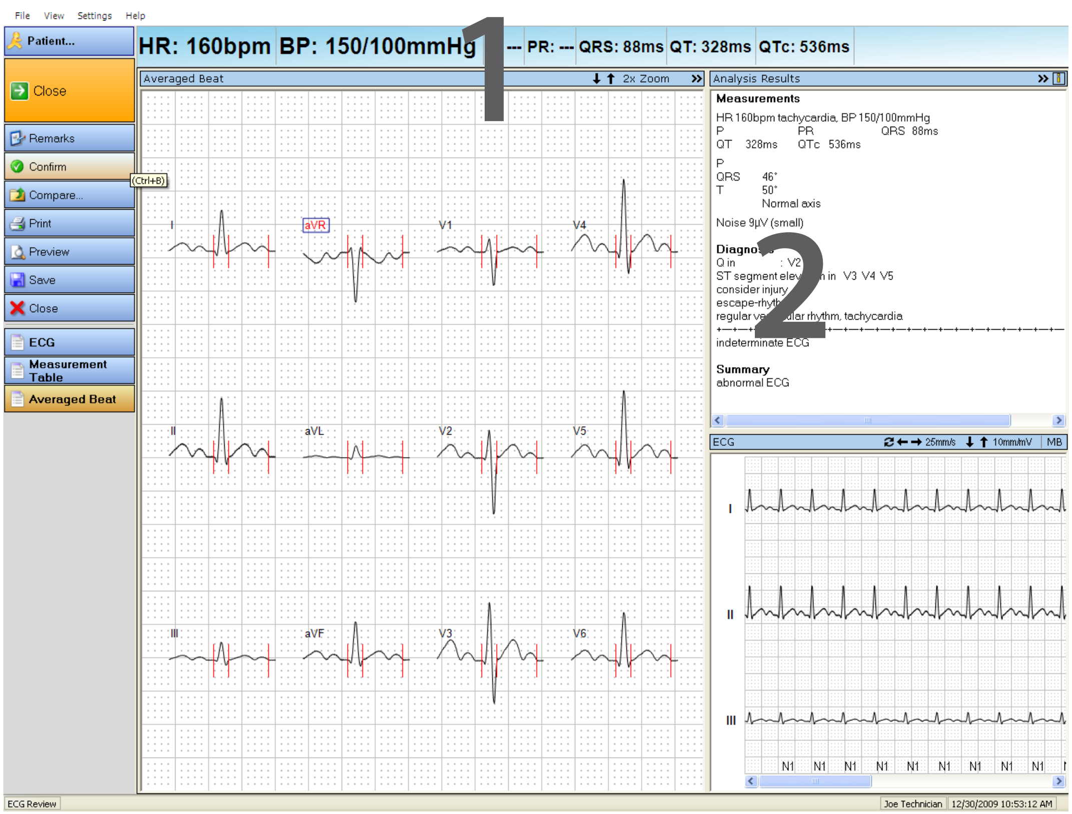


Figure 7-1: **Example of Resting ECG View**

1. Buttons for toggling of speed and sensitivity, button for enlarging the multi-channel ECG surface and for indication of the enabled filters
2. **Analysis Results** panel includes measurements, diagnosis, and summary sections

Controls for reviewing

Control panel	Option	Function
	**Remarks** or **F3**	Enter comments regarding the acquisition. See *Enter a comment* on page 3-12.
	**Confirm** or **Ctrl + B**	Confirms the correctness of the diagnosis or the comment: **Note:** After the record is confirmed, it cannot be changed. See Chapter 9, *Confirming Tests*.
	**Compare...** or **Ctrl + O**	To compare the current record with another record for this patient: • Click the **Compare...** or select **View | Compare...** See *Opening a record for comparison* on page 7-9.
	**Print** or **Ctrl + P**	See *Print the record* on page 3-26.
	**Preview** or **Ctrl + F**	See *Print the record* on page 3-26.
	**Save a PDF**	See *Save a PDF* on page 3-28.
	**Save** or **Shift + F12**	Closes the record and saves the changes.
	**Close** or **Ctrl + X**	Closes without saving changes. If there are changes in the record the system prompts you whether or not to save.

Indication bar

You can customize and save the indication of main measurement values and frontal vectors in the header. The indication of heart rate, blood pressure values, main measurement values and frontal vectors apply to an (analyzed) section.

The settings are saved and are preserved while opening other records.

To customize the indication bar from the view:

1. Right-click the indication bar and select **Customize...**.

   The system displays the customize dialog box.

2. Display or hide a value in the header.
   - Select the check box to display the value.
   - Clear the check box to hide the value.

Selection	Example	Description
HR	HR: 60/min	Heart rate always refers to the actual ECG strip. The system always calculates the heart rate by averaging over 10 seconds.
BP	BP: 123/82mmHg	The blood pressure value applies to the actual time of the ECG strip. This value is also used in the **Analysis Results** panel.
Main measurement values		Includes all of the main measurements. The main measurement values (for analyzed ECG strips) of the averaged beat display. These values are also used in the **Analysis Results** panel and in connection with the indication of the enlarged averaged beat.
P	P: 96ms	P-duration
PR	PR: 170ms	PR-interval
QRS	QRS: 84ms	QRS-duration
QT	QT: 360ms	QT-interval
QTc	QTc: 360ms	Corrected QT-interval Where: $QTc = QT/\sqrt{RR}$

Selection	Example	Description
Frontal vectors		Includes all of the frontal vectors. The frontal vectors of the P wave, the QRS complex and the T wave are also taken from the **Analysis Results** panel.
P	P_{vec}: 1.2mm, 54°	P-wave vector
QRS	QRS_{vec} 47°	QRS complex vector
T	T_{vec}: 1.9mm, 50°	T-wave vector

Controls for changing the view

Use the view buttons to change the arrangement within the multi-split panel window, or select the desired panels from the View menu. (Note: multi-split panel windows are only available in Large screen mode.).

Icon	Option	Function
	**Measurement Table**	Displays the values of the averaged beat of this strip in every lead. • Click **Measurement Table** or select **View | Measurement Table**. See *Measurement table view* on page 7-11.
	**Averaged Beat**	Displays the enlarged averaged beat of this strip in every lead: • Click **Averaged Beat** or **View | Averaged Beat**. Now you can measure averaged beat and correct the wave margins. See *Averaged beat view* on page 7-14.
	Enlarge	Maximizes the current view • Click the enlarge arrow button. The system maximizes the current view.
	Reduce	Minimizes the current view: • Click the reduce arrow button. The system returns to the multi-split screen window.

After changing a window, you can save the screen layout by clicking **View | Save Screen Layout**. Note that this can result in screen layouts that do not match their description in the View menu.

Analysis Results

To obtain interpreted results, the system requires a test that includes at least the leads: I, II, and V1 to V6. The Resting 12 test procedure fulfils these conditions for interpretation.

The system also requires a recording with at least 10 seconds of disturbance-free ECG and patient information with at least age and gender. Age and gender may be default values.

If the system cannot analyze the data, the system displays a reason in the **Analysis Results**.

The **Analysis Results** section displays these measurement values and interpretations:

- Heart Rate
- Main measurement values
- Angle of the waves as well as position type
- Indexes
- QT dispersion
- Rhythm and diagnosis results

  Note: See *Rhythm line* on page 8-15 for descriptions of the characters used within the Rhythm diagram. See the *Hannover ECG System HES© Physician's Guide* for more information about the ECG analysis program.

Configuration Options

Configure the display	• Select: **File | Options... | 12 Lead ECG | ECG analysis** and configure: – Indication of the results of analysis in a different language – Indication of the position types – A simple or detailed diagram of the rhythm line – Indication of the indexes – Indication of the interference voltage – Indication of the QT dispersion for all leads or for chest wall leads – Indication of the table with pediatric ECG

Editing the analysis for this ECG strip

You can modify the generated analysis, or add comments to the analysis.

Note: You cannot modify the analysis when the system is comparing records or if the record has been confirmed.

To modify the analysis:

1. Click on **Diagnosis** or **Summary** to modify the automatically generated text.
2. To insert a remark:
   - Enter text directly in the window.
   - To select pre-defined text, click **Insert...** and select the text.

     Default terms for **Rhythm**, **Atrial**, **Ventricular** and **Others** categories are defined and you can add or change entries.

   Note: The system has auto-replace capabilities to automatically replace abbreviations as you type. This can be used to store frequently used phrases and save typing. Auto-replace can be set up from **File | Options.. | General | Auto** replacement.
3. Click **OK** to complete the modification.

Configuration Options

Change or add to the list of terms	• Select **File | Options... | 12 Lead ECG | Diagnosis statements**

Measuring the ECG

You can make a measurement.

Table 7-1: ECG functions

To...	Do this...
Make a measurement	1. Click in the ECG. The system displays the marking lines. 2. Drag the red line into position. 3. Drag the green line into position. The system displays the measurement values. The time interval is always a positive value. The amplitude is given with algebraic sign. Calculation: Amplitude = green horizontal cursor - red horizontal cursor **Note:** If the green line is below the red line, the amplitude is a negative value.

Table 7-1: ECG functions (continued)

To...	Do this...
Simultaneously move both measurement markers	**1.** Move the pointer in between both vertical measurement markers. The pointer changes into a double arrow. **2.** Drag both markers to the desired position.
Hide the measurement markers	**1.** Click the X in the measurement values dialog box. The box and the measuring cursors are hidden.

Opening a record for comparison

You can compare multiple ECG records.

To compare records:

1. Open a record.

2. Click **Compare...** or select **View | Compare...**. and select the record for comparison from the list.

3. Click **OK**.

   The record opened for comparison displays below the already opened one.

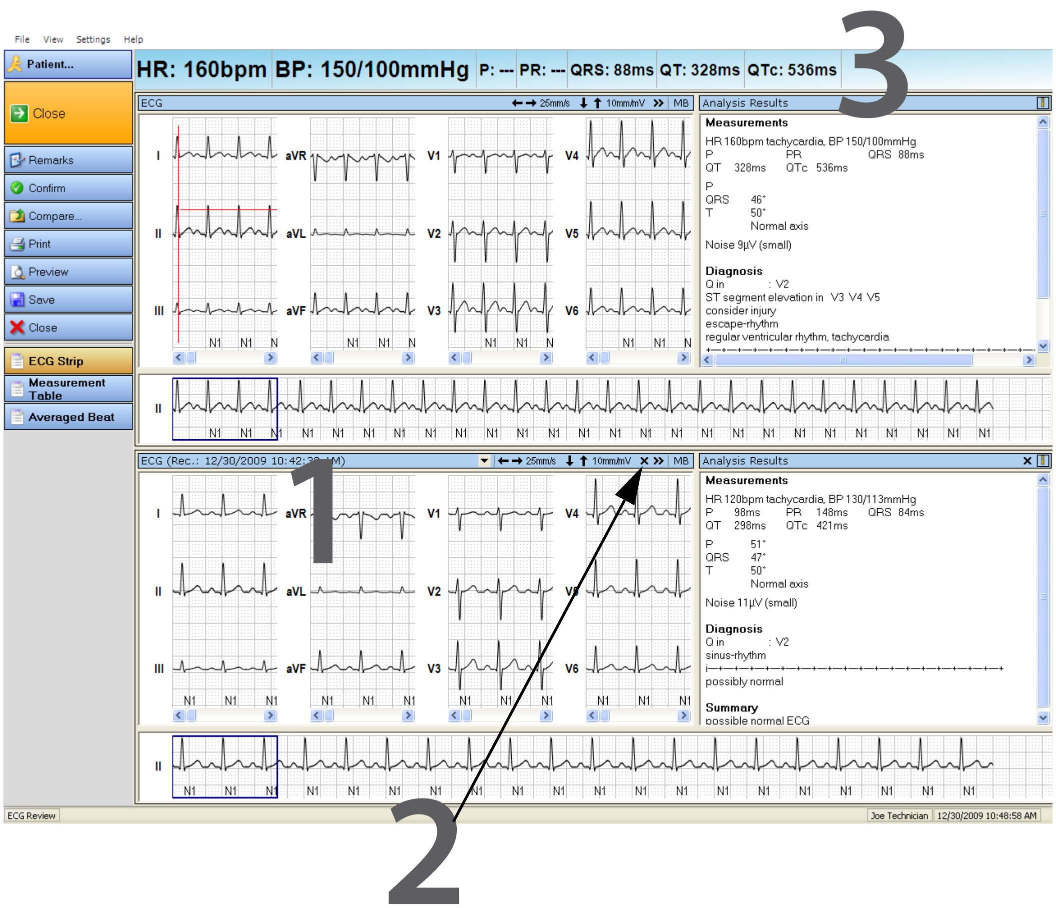


Figure 7-2: **Example of comparison**

1	Record opened for comparison
2	Button for closing of the comparative record
3	Heart rate, blood pressure and main measurement values apply to the record displayed in the upper window

- The title bar of the program shows the unchanged data of the first opened record as well as the patient's data.
- The title bar of the comparative record indicates the date and time of the comparative record.
- Commenting, confirming, printing and blood pressure always apply to the record opened first.
- You cannot edit or print the comparison record. For example, you cannot enter comments, or change the blood pressure information.

4. To open another record for comparison, click **Compare...**.

   Each comparison record displays below the previously opened record.

5. To view the list of available comparative records:

   - On the comparison record title bar, click the down arrow.

     You can select a record which replaces the current comparison record (i.e., which is not displayed additionally).

6. Instead of the ECG, you can display a comparison of the measurement tables and the averaged beats.
   - Click **Measurement Table** or select **View | Measurement Table**.
   - Click **Averaged Beat** or select **View | Averaged Beat**.
7. Click **X** to close the comparative record.

Measurement table view

As with the ECG view, the measurement table can be also displayed as a maximized view. To change the views see *Controls for changing the view* on page 7-5. In small screen mode, the measurement table is only displayed as a maximized view.

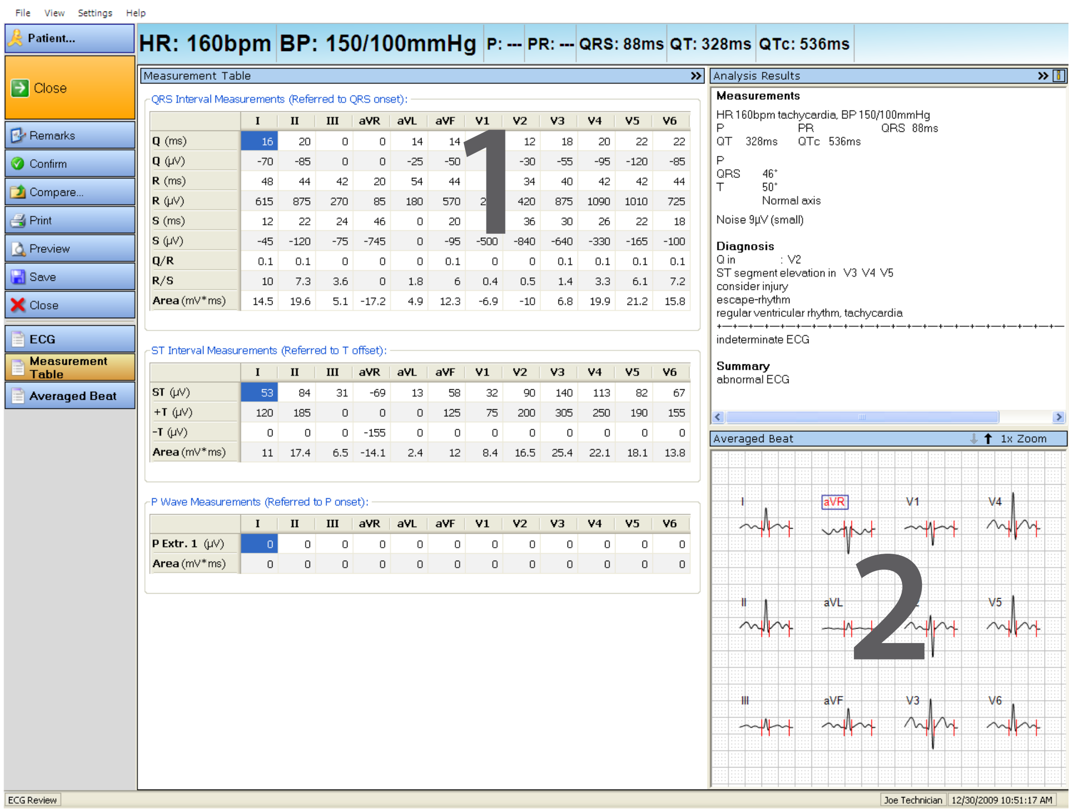


Figure 7-3: **Example of the measurement table view**

1 Measurement table
2 Averaged beat

For each of 12 leads, the measurement table contains these measurement values:

Range	Measurements
QRS range	• Duration and amplitude of the Q, R and S waves • Amplitude ratio between Q and R • Amplitude ratio between R and S • Area of the QRS range
ST and T range	• ST amplitutde value • positive amplitude value of T • negative amplitude value of T • area of the ST and T range
P range	• The first extreme value of the P amplitude (if another extreme value is found, this is indicated, in addition) • area of the P wave

You can change to other views:

- To see the waveforms, click **ECG** or select **View | ECG** and display the options.

  See *Displaying an ECG record* on page 7-2.
- To view the enlarged averaged beat in every lead, to measure it and to correct the wave margins, open representation of the averaged beat.

  a. Click **Averaged Beat** or select **View | Averaged beat**.

  See *Averaged beat view* on page 7-14.

Measurement table in comparison

If a comparative record is open, you can compare the measurement tables of both records.

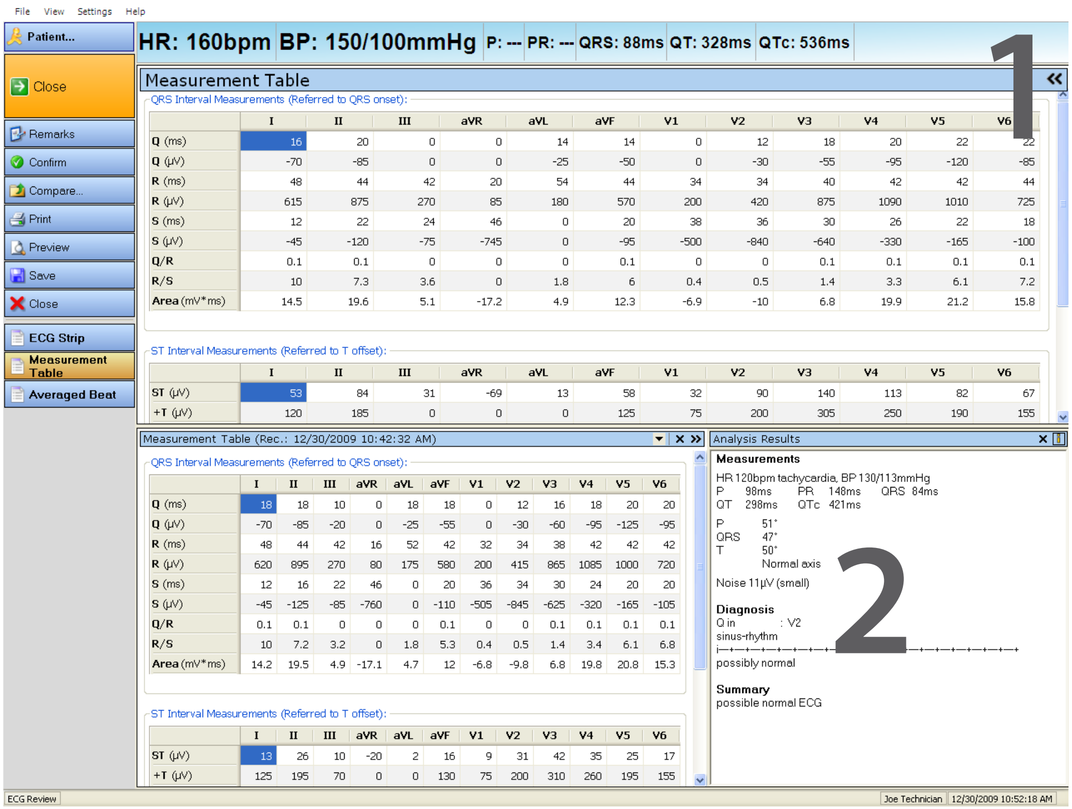


Figure 7-4: **Example of measurement table comparison**

1 Using Enlarge, the table was stretched to full window width

2 The comparative record shows table and results of analysis at the same time

Instead of the measurement table, you can display a comparison of the ECG and the averaged beat.

- Click **ECG** or select **View | ECG** and display options.
- Click **Averaged Beat** or select **View | Averaged Beat**.

Averaged beat view

As with the ECG view, the Averaged Beat can display as a maximized view. To change the views see *Controls for changing the view* on page 7-5.

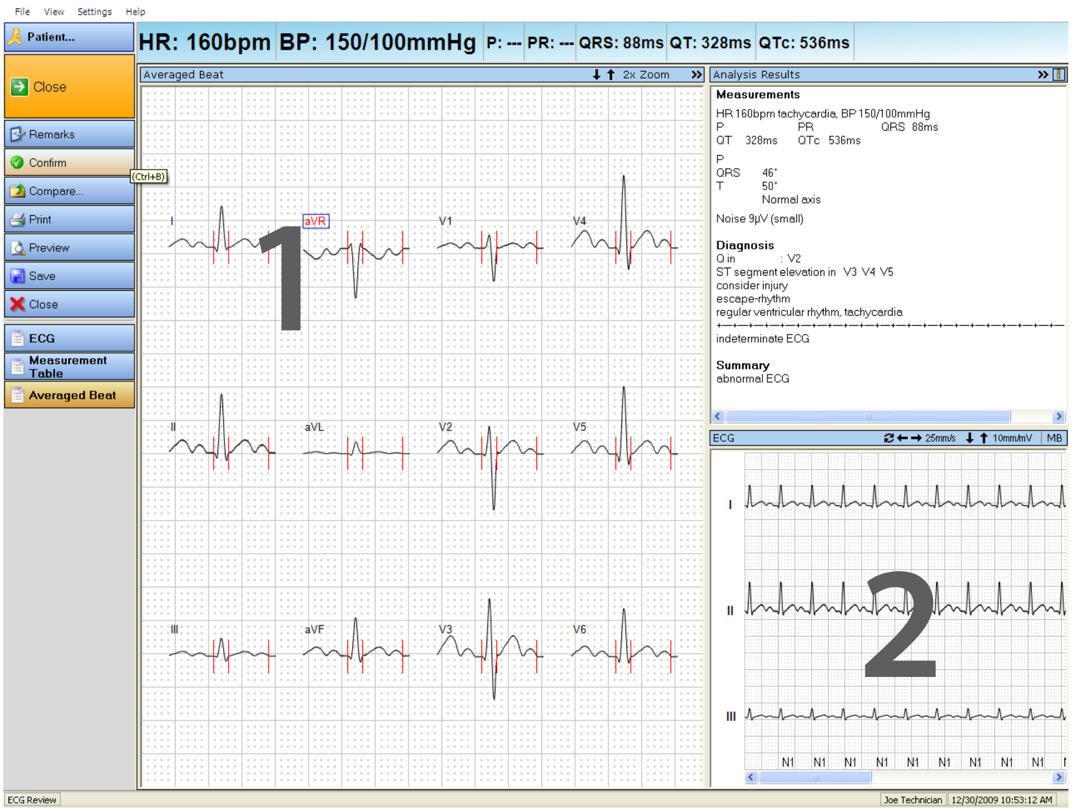


Figure 7-5: **Example of Averaged beats**

1 Enlarge the respective beat by double click

2 Three-channel small preview of ECG strip

To toggle the leads view:

1. Right-click on one of the complexes and select the parameter to modify.
2. In the submenu, select the entry.
3. To change the zoom factor, click ↑ or ↓ in the title bar.

Individual views

Choose a method to change the individual view:

- Double-click a lead to show only this lead.
- Right-click and select **View | 1*1** to display only the marked lead.

Figure 7-6: **Example of individual view**

1 Automatically computed and manually corrected wave points over 12 leads

2 Measurement values of the P wave, the QRS and the T wave over all 12 leads

3 QRS measurement values of this lead (corresponds to measurement values in the QRS range in the table)

Changing the lead

Figure 7-7: **Example of lead buttons**

- Click one of the buttons.

  The button **S** toggles the superposition view.
- Right-click and select **Leads |** <lead>

Changing the zoom factor

- Click ↑ or ↓ in the title bar.
- Right-click and select **Zoom |** <zoom factor>.

Changing speed or sensitivity

- Right-click and select **Speed |** <speed>.

Superposition

To show all leads in a cascaded format, right-click and select **View | Superposition**.

Figure 7-8: **Example of Superposition**

1 The selected lead is highlighted with a bold line in the average beat rate

2 In the Superposition representation, an especially exact correction of the wave points is possible

3 Temporal distance and amplitude difference between both red and green measuring lines

Measuring the complex

See *Measuring the ECG* on page 7-7.

Wave margins

The wave margins ascertained by the system are marked by red marks. From the difference between these marks, the main measurement values P, P Q, QRS and QT as well as the values of QTc derived from them are determined.

Locate the wave margin table of the displayed lead on the upper of the screen. You can correct the wave margins by moving the marks.

1. Click on the mark and drag it to the desired position.

   As soon as you have moved a mark, new values from the changed wave margins are entered on the bottom line.

2. Click **OK** to accept the new values.

   The manually ascertained values are copied over to the upper line and marked with MAN. From now on, the system uses only these values.

   The **AUTO | MAN** button is a changeover switch.

3. Click on **MAN** if you want to clear the manual values and display the automatically ascertained values again.

   You can toggle between the manually and the automatically ascertained values.

QRS configuration

Locate the QRS configuration of the displayed lead in the QRS display on the upper right of the screen. The recognized waves are given in their order:

The measurement values to the waves are given in the table at the lower edge of the QRS display. These values are an extract from the *Measurement table view* on page 7-11.

Configuration Options	
Change the QRS units	• Select **File | Options... | 12 Lead ECG | ECG | Units**.

8 Displaying a Rhythm ECG Record

Contents

This chapter describes the Rhythm ECG view.

Displaying a Rhythm ECG record

Open the records as described in *Recording list* on page 2-7.The **ECG** and **Rhythm** views give an overview of the entire recording. The **ECG Strip**, **Measurement Table** and **Average Beat** views apply to a section within the recording.

To...	Do this...
Change the view	• Select **View |** <view setting>.
Save your settings	• Select **View** and enable **Use current view as default**. The saved view is the opening screen when you access a rhythm record.

Rhythm ECG window

The title bar of the program displays the test procedure, the recording date and time as well as the patient's data. The records are displayed in a multi-panel window:

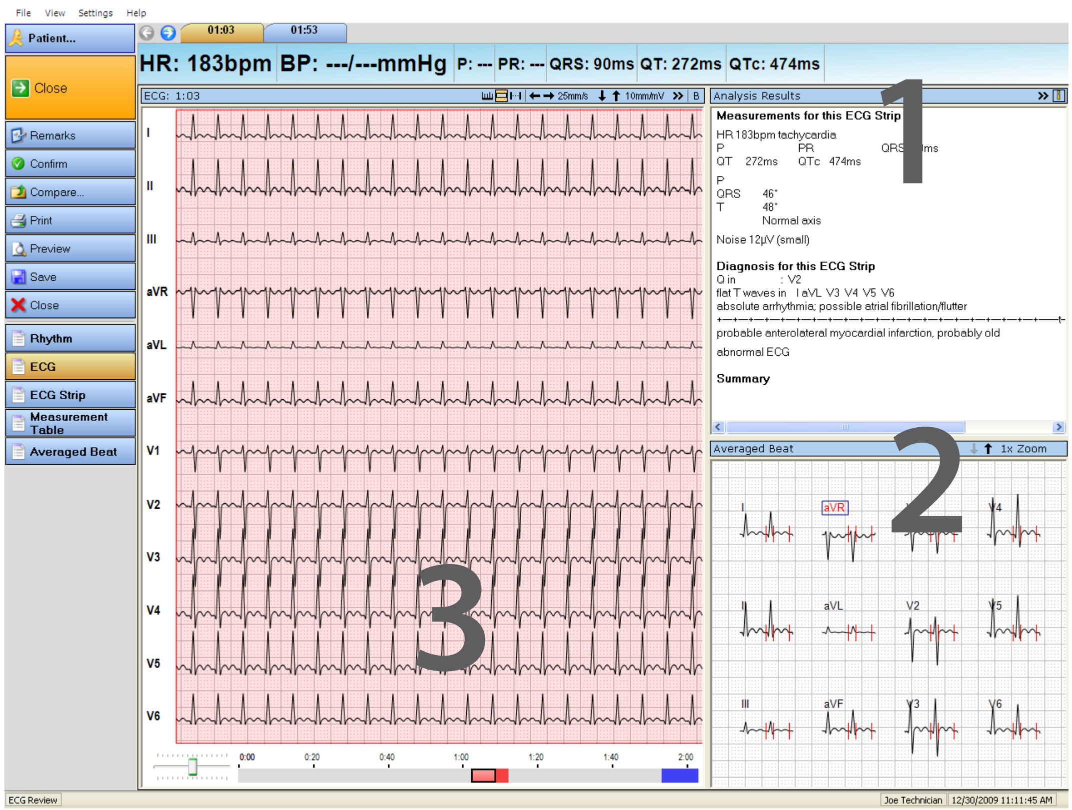


Figure 8-1: **Example of Rhythm ECG window**

1. **Analysis Results** panel shows results of analysis of the selected strip
2. **Average beat** panel rate computed by the analyzer from the ECG of the selected strip
3. Multi-channel ECG of the whole record

Controls for reviewing

Control panel	Option	Function
	**Remarks** or **F3**	Enter comments regarding the acquisition. See *Enter a comment* on page 3-12.

Control panel	Option	Function
	**Confirm** or **Ctrl + B**	Confirms the correctness of the diagnosis or the comment. **Note:** After the record is confirmed, it cannot be changed. For more information see *Chapter 9, Confirming Tests*.
	**Compare...** or **Ctrl + O**	To compare the current record with a former record for this patient: • Click the **Compare...** or select **View | Compare...** See *Opening a record for comparison* on page 7-9.
	**Print** or **Ctrl + P**	See *Print the record* on page 3-26.
	**Preview** or **Ctrl + F**	See *Print the record* on page 3-26.
	**Save a PDF**	See *Save a PDF* on page 3-28.
	**Save** or **Shift + F12**	Closes the record and saves the changes.
	**Close** or **Ctrl + X**	Closes without saving changes. If there are changes in the record the system prompts you whether or not to save.

Indication bar

You can customize and save the indication of main measurement values and frontal vectors in the header. The indication of heart rate, blood pressure values, main measurement values and frontal vectors apply to an (analyzed) section.

To customize the indication bar from the view:

1. Right-click the indication bar and select **Customize...**.

   The system displays the customize dialog box.

2. Display or hide a value in the header.
   - Select the check box to display the value.
   - Clear the check box to hide the value.

Selection	Example	Description
HR	HR: 60/min	Heart rate always refers to the ECG strip. The selected tab indicates the time of the ECG strip. For analyzed records, the system always calculates the heart rate by averaging over 10 seconds.
BP	BP: 123/82mmHg	The blood pressure value applies to the selected ECG strip.
Main measurement values		Includes all of the main measurements. The main measurement values (for analyzed ECG strips) of the averaged beat display. These values are also used in the **Analysis Results** panel and in connection with the indication of the enlarged averaged beat.
P	P: 96ms	P-duration
PR	PR: 170ms	PR-interval
QRS	QRS: 84ms	QRS-duration
QT	QT: 360ms	QT-interval
QTc	QTc: 360ms	Corrected QT-interval Where: $QTc = QT/\sqrt{RR}$

Selection	Example	Description
Frontal vectors		Includes all of the frontal vectors. The frontal vectors of the P wave, the QRS complex and the T wave are also taken from the **Analysis Results** panel.
P	P_{vec}: 1.2mm, 54°	P-wave vector
QRS	QRS_{vec} 47°	QRS complex vector
T	T_{vec}: 1.9mm, 50°	T-wave vector

Configuration Options

Set the units for the vector	• Select: **File | Options… | 12 Lead ECG | ECG | Units**.

Analysis Results

To obtain interpreted results, the system requires a test that includes at least the leads: I, II, and V1 to V6. The Rhythm 12 test procedure fulfils these conditions for interpretation.

The system also requires a recording with at least 10 seconds of disturbance-free ECG and patient information with at least age and gender. Age and gender may be default values.

If the system cannot analyze the data, the system displays a reason in the **Analysis Results**.

The **Analysis** section displays these measurement values and interpretations:

- Heart Rate
- Main measurement values
- Angle of the waves as well as position type
- Indexes
- QT dispersion
- Rhythm line and diagnosis statements

  Note: See *Rhythm line* on page 8-15 for descriptions of the characters used within the Rhythm diagram. See the *Hannover ECG System HES© Physician's Guide* for more information about the ECG analysis program.

Configuration Options

Configure the display	• Select: **File | Options… | 12 Lead ECG | ECG analysis** and configure: – Indication of the results of analysis in a different language – Indication of the position types – A simple or detailed diagram of the rhythm line – Indication of the indexes – Indication of the interference voltage – Indication of the QT dispersion for all leads or for chest wall leads – Indication of the table with pediatric ECG

Editing the analysis for this ECG strip

You can modify the generated analysis, or add comments to the analysis.

Note: You cannot modify the analysis when the system is comparing records or if the record has been confirmed.

To modify the analysis:

1. Click on **Diagnosis for this ECG strip** or **Summary** to modify the automatically generated text.
2. To insert a remark:
   - Enter text directly in the window.
   - To select pre-defined text, click **Insert...** and select the text.

     Default terms for **Rhythm**, **Atrial**, **Ventricular**, **Reasons for Test** and **Others** categories are defined and you can add or change entries.
3. Click **OK** to complete the modification.

Configuration Options

Change or add to the list of terms	• Select **File | Options... | 12 Lead ECG | Diagnosis statements**.

Controls for changing the view

Use the view buttons to change the arrangement within multi-panel window, or select the desired panels from the **View** menu..

Note: Multi-split panel windows are only available in Large screen mode.

Icon	Option	Function
	Rhythm	Displays an overview of the whole record with a 1- channel ECG. • Click **Rhythm** or select **View | Rhythm**. See *Rhythm view* on page 8-14.
	ECG	Displays an overview of the whole record (multi-channel). • Click the **ECG** button or select **View | ECG**. See *ECG view* on page 8-12.
	ECG Strip	Displays the saved strips (one strip per tab). • Click **ECG Strip** or select **View | ECG Strip** and select the display options.
	Measurement Table	Displays the values of the averaged beat of this strip in every lead. • Click **Measurement Table** or select **View | Measurement Table**. See *Measurement table view* on page 7-11.
	Averaged Beat	Displays the enlarged averaged beat of this strip in every lead. • Click **Averaged Beat** or **View | Averaged Beat**. Now you can measure averaged beat and correct the wave margins. See *Averaged beat view* on page 7-14.
	Enlarge	Maximizes the current view. • Click the enlarge arrow button. The system maximizes the current view.
	Reduce	Minimizes the current view. • Click the reduce arrow button. The system returns to the multi-split screen window.

After changing a window, you can save the screen layout by clicking **View | Save Screen Layout**. Note that this can result in screen layouts that do not match their description in the View menu.

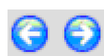
Display functions

Table 8-1 describes the functions available from the ECG view and Rhythm view.

Table 8-1: Rhythm control functions

To...	Do this...
Change the line spacing (line height)	**Note:** Rhythm view only. **1.** Position the cursor exactly between two lines. **2.** Drag the line to the correct height. The system controls the minimum line height. The maximum line height depends on the length of the recording.
Change leads	**1.** Position the pointer on a lead name. **2.** Right-click and select the lead from the menu.
Change the waveform position	**1.** Position the pointer on the lead name. **2.** Drag the line to re-position the waveform.
Make an RR or heart rate measurement	 **1.** In the title bar click the **ECG measurement tool**. The system displays the marking lines. **2.** Drag the marking line from the starting point for the RR distance and position it over the R spike of a beat. **3.** Drag one of the other lines and position the line on another R spike. **4.** To add or delete lines, right-click in the ECG and select the action. **5.** To scroll the ECG, move a line to the left or right margin of the visible ECG.
Mark and edit an ECG strip of 10 seconds	 **1.** In the title bar, click the **Select 10 seconds ECG** icon. **2.** Click in the ECG and drag the selected range to the desired position. **3.** Click the **Edit** button. The selected ECG strip displays in grey in the time bar or the rhythm strip. Depending on the speed, the grey range can be greater or smaller than the visible range.

Table 8-1: Rhythm control functions

To...		Do this...
Mark and edit an ECG strip of any length		1. In the title bar, click the **Select variable length ECG**. icon. 2. Click in the ECG and drag the marker to select a strip. As soon as the selected section is longer than 10 seconds, another mark appears and splits the selected section. The section on the right marks 10 seconds, which the system automatically measures and interprets. 3. To correct the beginning and the end of the selected strip: position the cursor on either margin, and drag to move the margin. 4. Click **Edit** and select the function.
Select a strip		Use the strips for the evaluation of the rhythm record. There is a tab for every saved strip. 1. To see the strips one after the other, click the right and left arrows. 2. Position the pointer on the tab to see the printing state and the name of the strip. The system displays the start time as the tab label.
Edit a strip		1. Right-click on a tab or click on a strip in the ECG view and select **Edit**. 2. Enter a short, clear name or edit the existing name and click **Save**. 3. To print or preview this strip, click **Print** and select **ECG** or **Averaged Beat**. To change the printing format and the parameters select **Settings | Print...**.

ECG view

The ECG view shows the ECG in the main display as a multi-channel representation. To navigate in the whole record, see *Navigating in the ECG display* on page 8-13. To change the number of channels visible at the same time or to change the lead order, right-click and select from the menu.

To change the display characteristics, see *Change the ECG representation* on page 3-19.

You can mark sections of at least 10 seconds in length.

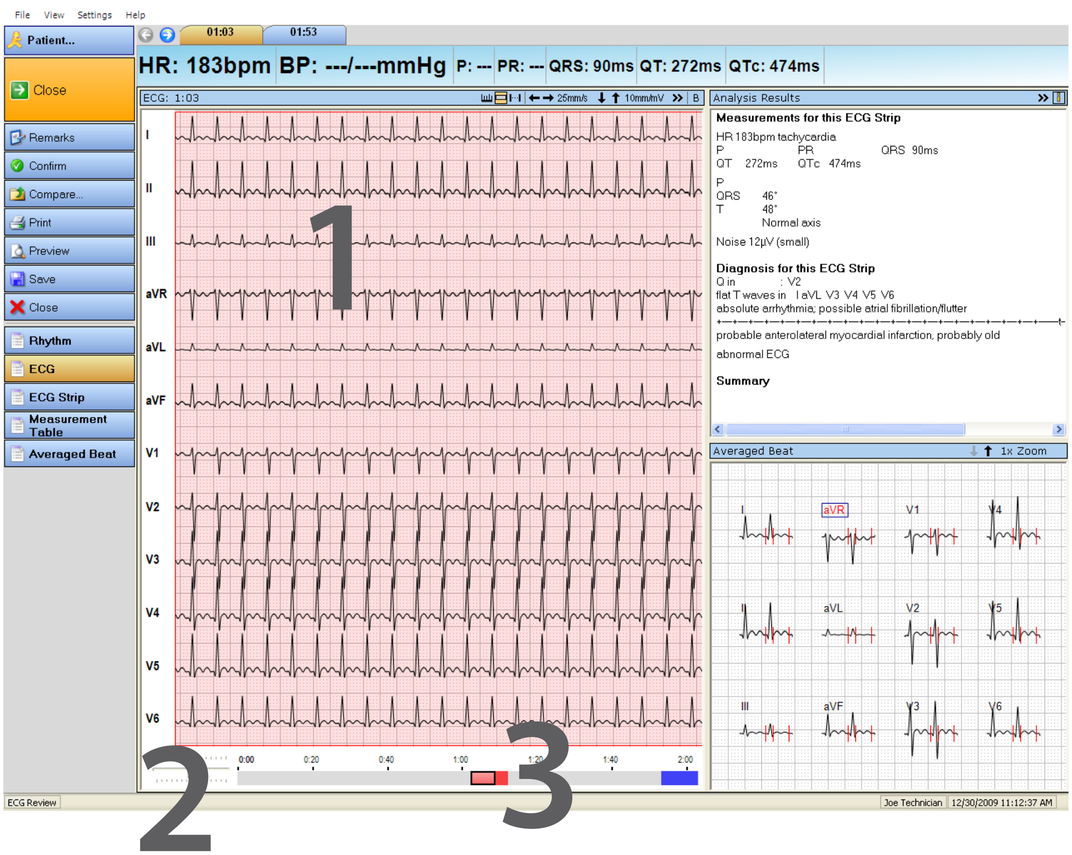


Figure 8-2: **Example of ECG view**

1. Display the whole multi-channel ECG (by moving) in this display
2. The ECG slider control
3. The ECG time bar. The black frame symbolizes the position of the ECG visible in proportion to the whole record

Navigating in the ECG display

The rectangular frame (see item 3 in Figure 8-2) symbolizes the position of the ECG that is visible.

Choose a method to change the position of the visible ECG:

- Drag the slider on the ECG time bar.
- To move the ECG continuously, click and hold the ECG slider control and move the control element to the left or to the right.

  Moving the ECG slider, moves the ECG in proportion.
- Click on any place on the time bar to position the multi-channel ECG to this time.

Rhythm view

The Rhythm view shows the rhythm strips in the main display. The beginning times of every ECG line are indicated to the left of the rhythm strip. The times apply to the start of the recording. The lead names display in every line.

Configuration Options

Configure display channels	1. Select **File | Options... | 12 Lead ECG | Test procedures.** 2. Select the rhythm procedure. 3. Select **Display | ECG rhythm**. If the lead in the rhythm line is changed during the acquisition, then these settings are overwritten.

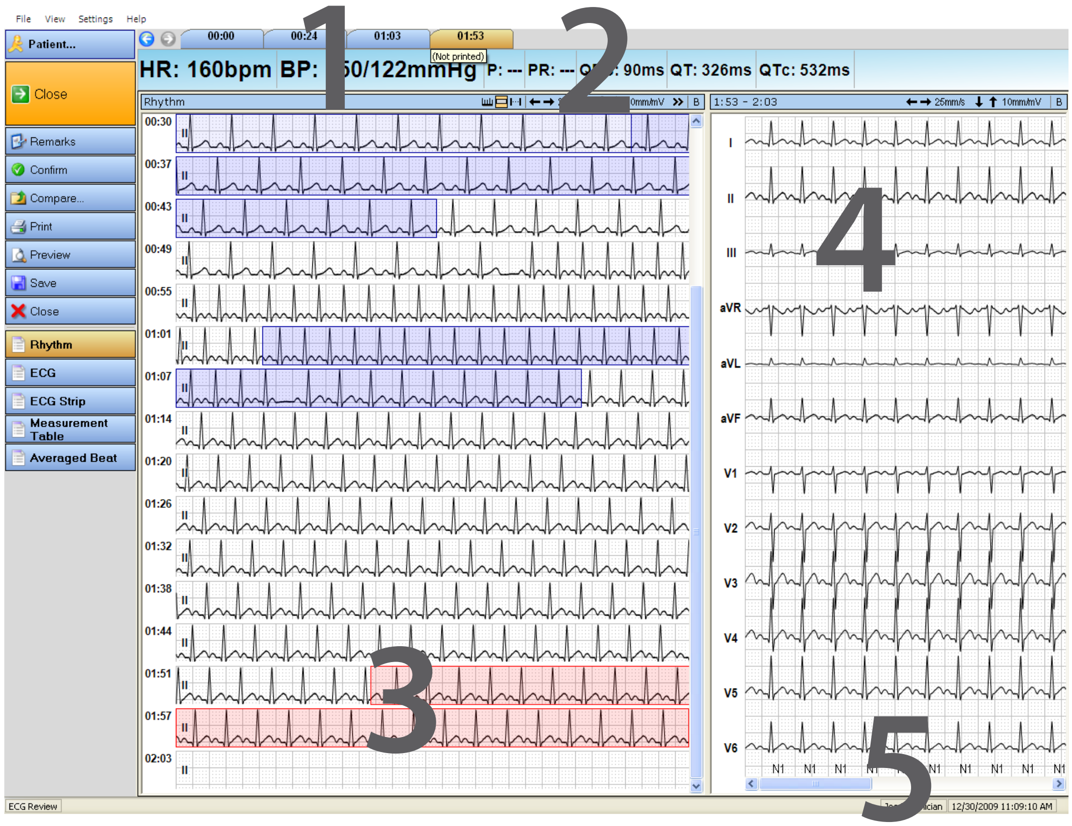


Figure 8-3: **Example of Rhythm view**

1 Tab for the selection of a strip
2 Heart rate, blood pressure and main measurement values of the currently selected section
3 The actual ECG strip in the rhythm strip highlighted in red
4 Multi-channel ECG of the currently selected strip
5 Scroll bar to navigate in the ECG strip

Rhythm line

A rhythm statement displays in the analysis section. The QRS complexes found are represented in a rhythm diagram below this line by characters.

In addition, the QRS are also marked in the ECG rhythm line in the lower edge of the printout. These characters can differ from the markings of the QRS complexes in the above-mentioned rhythm diagram.

According to the settings, the complex types are symbolized by the following characters:

		Rhythm diagram	
	ECG line	**Simple**	**Complex**
Dominant	N1	+	+
Dominant with abnormal P and T wave	N1	+	o
Dominant with abnormal P wave	N1	+	p
Dominant with abnormal T wave	N1	+	t
Dominant with base line variation	N1	+	b
Dominant with abnormal RR interval	N1	+	r
Dominant at 10-seconds margin	N1	+	i
Extrasystole type 1	V1	V	2
Extrasystole type 2	V2	V	3
Extrasystole type 3	V3	V	4
Aberrant	A	A	A
Disturbed complex	X	X	X
Pacemaker	P	P	P

Configuration Options

Configure the display of the rhythm diagram	1. Select **File | Options... | 12 Lead ECG | ECG analysis**. 2. For **Create rhythm diagram**, select: – **No**—to hide the rhythm diagram – **Simple**—to show the simple diagram – **Complex**—to show the complex diagram

Beat classification in the ECG

In the resting ECG and in the exercise ECG, the beat types can be indicated in the ECG. In the rhythm ECG, the beat classification can be indicated only for saved sections.

	Marking in the ECG	Used in: Rest	Used in: Stress
Dominant	N1	√	√
Dominant 2	N2	--	√
Dominant undetermined	N3	--	√
Extrasystole T1	V1	√	√
Extrasystole T2	V2	√	√
Extrasystole T3	V3	√	√
Extrasystole T4	V4	--	√
to			
Extrasystole T20	V20	--	√
Further extrasystoles	V21	--	√
SVES	S	--	√
Escape Systole	E	--	√
Aberrant	A	√	√
Complex with disturbance	X		√
Pacemaker complex	P	√	√

9 Confirming Tests

Contents

Use the confirmation function to enter comments and validate the test.

Performing confirmation

Confirming or validating the test places a confirmation mark on the test. The confirmation mark includes the date and full username of the user that confirmed the test.

The system adds the confirmation mark to:

- The **Remarks** dialog box
- The **Analysis Results** window
- The **Findings** section on the printout

If the confirmation fails, verify:

- The confirming user is logged into the system as an active user
- The password is correct
- The user has privileges to confirm the test

For more information about integrated security, see the *System Setup Guide*.

To confirm a test:

1. Click **Confirm** or press **Ctrl + B**.
2. To save and close the report after the confirmation, select **Immediately save and close the test on confirm**.
3. Click **Confirm**.

   Note: You must have the appropriate privileges to confirm a test.

Revoking confirmation

Use the revoke confirmation function to reset a confirmed test to modify it (for example, to add a remark, conclusion, or measurement). You can revoke a test if it is a test that you have confirmed and your privilege allows you to reset your own tests or if you have unlimited rights to reset tests.

To revoke a confirmation:

1. Click **Revoke confirmation** or press **Ctrl + B**.

   Note: You must have the appropriate privileges to revoke the confirmation of a test.

2. Click **Revoke confirmation** for this test.

10 CareCenter MD Online

Contents

Use the online feature, to quickly transfer the ECG acquisition from one or more workstations (acquiring stations) in the network to other workstations (observing stations).

You can view several acquiring workstations at the same time by adjusting the CareCenter MD Online window to remain in the foreground (on top of opened applications).

WARNING! Patient safety.

When viewing multiple workstations, using CareCenter MD Online, take care to keep patient screens in the same order or orientations, so that you do not confuse data from multiple patients.

Caution: Patient safety.

CareCenter MD Online is not intended as a remote patient monitor. CareCenter MD Online is for reference only.

Caution: Misdiagnosis.

Electronic transmission errors may distort the ECG. A physician must check and confirm every measurement result and diagnosis. Use under clinical supervision only.

CareCenter MD Online overview

CareCenter MD Online requires:

- A network installation with the transmitting and the receiving computers in the network with the system database.
- The transmitting workstation (acquiring workstation) that acquires the ECG using a system acquisition device.
- The receiving workstation (observing workstation) must have a CareCenter MD Online license. This can be a local dongle (CareCenter MD Online) or a multi-user license in the network dongle.
- For each workstation where CareCenter MD Online can review records, you must enable the workstation. Both the server and the workstations must have CareCenter MD Online enabled.

Figure 10-1 is an example of a CareCenter MD online reviewer sending a text message.

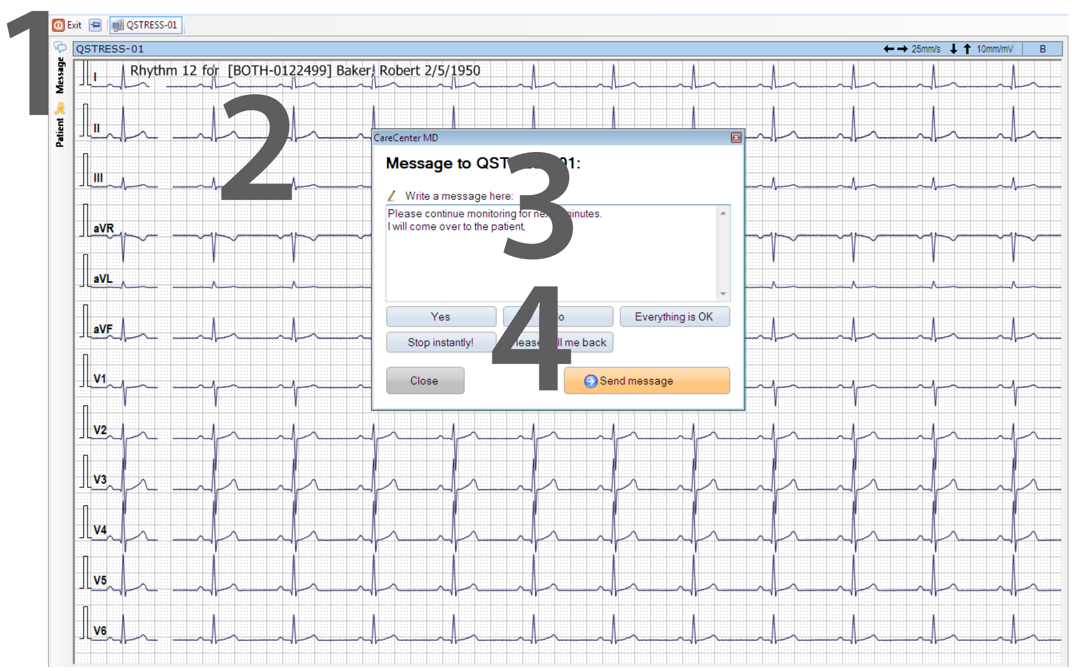


Figure 10-1: **Example of CareCenter MD Online viewing screen**

1 Online icons
2 Online ECG viewing area
3 Text message area
4 Pre-defined messages

Configuration Options

Enable the workstation for CareCenter MD Online	• Select **File | Options... | 12 Lead ECG | ECG** and then select **Allow CareCenter MD Online clients to view this workstation**.

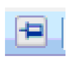
CareCenter MD Online access

From CareCenter MD Online, you can select the transmitting station, configure the view and send messages between the transmitting and receiving workstations.

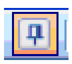
Starting CareCenter MD Online

To start the program:

1. Double-click the **CareCenter MD Online** icon on the desktop or select **Start | Programs | CareCenter MD | CareCenter MD Online**.
2. If the system prompts you, log in with username and password or through integrated security from CareCenter MD. See the *System Setup Guide*.



3. Click the pin in front icon to keep the CareCenter MD Online in the foreground, that is, always on top of all running applications.



4. Click the un-pin icon to deactivate the always-on-top-function.

   This may prevent you from seeing the ECG acquisitions.

Selecting the transmitting station

The available transmitting stations display as buttons above the ECG field. A button displays as soon as CareCenter MD launches on the workstation; it does not matter which ECG test was opened.

1. Click the button for the transmitting workstation.

   When you select a workstation, the button is activated and changes color to orange. To disconnect from the transmitting workstation, click the button again.

2. To send messages to the transmitting workstation, click **Message**. (See *Transmitting messages* on page 10-8).

   When ECG acquisition starts, the selected lead program displays in the header of the ECG window. The system also displays:

   - The name of the workstation
   - The name of the selected test procedure
   - The patient's number, name and age
   - The heart rate, exercise workload, and time in phase

   The transmitting workstation, indicates the receiving workstation by displaying a message button labeled with the name of the receiving workstation.

Displaying a message button is NOT an acknowledgement that the ECG is being monitored.

Exiting CareCenter MD Online

To close CareCenter MD Online from the reviewing workstation:

- Click **Exit**.

  When the workstation stops transmitting the ECG, the button for the workstation is disabled, to indicate the workstation is not being viewed.

  Note: Remote users should exit CareCenter MD Online before the local user logs out of CareCenter MD and logs in as another user.

Showing the patient data

During an ECG acquisition, use the **Patient** button to view the patient's data. Only the selected fields display. You can change or correct patient's data in CareCenter MD only. You cannot change patient data in CareCenter MD Online.

For more information on patient data see *Edit patient details* on page 2-6.

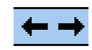
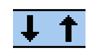
CareCenter MD Online display

You can change how CareCenter MD Online displays the acquisitions.

Changing the ECG parameters

In the header, the selected lead program is indicated on the left.

Table 10-1: Changing ECG Parameters

To...	Do this...
Change the speed	• Click ← to decrease the speed or click → to increase the speed.  • Alternatively, right-click in the ECG and select **Speed** and then select the speed.
Change the sensitivity	• Click ↓ to decrease the sensitivity or click ↑ to increase the sensitivity.  • Alternatively, right-click in the ECG and select **Sensitivity** and then select the sensitivity.
Change or hide a lead	**Note:** These changes are not saved. 1. Right-click on the label of the lead to change or to hide. 2. To change a lead, select the lead to display from now on. 3. To hide the lead, select the ellipsis.  4. To exit without changing a lead, select the marked entry or click outside the menu in the ECG.
Move a lead position	**Note:** To prevent channels from being overwritten, you can only move leads vertically. The changed position is not saved. 1. Left-click the label of the lead position. A scale appears. 2. While holding down the mouse key, move the waveform up or down to the desired position. The ruler is automatically hidden after a short time. 3. To immediately hide the ruler, left-click beyond the ruler, or right-click and select **Hide ruler**.
Restoring lead positions	**Note:** You can restore the original positions of all leads. You cannot restore the leads individually. 1. Display the ruler. 2. Right-click on the lead labels and select **Reset lead positions**.

Changing the view

Different views are available for the representation of the ECG. To configure the views see *Select a view* on page 3-21.

To change the view:

- Right-click in the ECG representation and select the view.

Examples of views

For 3-channel and 6-channel representations, use the **Next lead set** icon in the header or press **F8** to switch to the other lead groups.

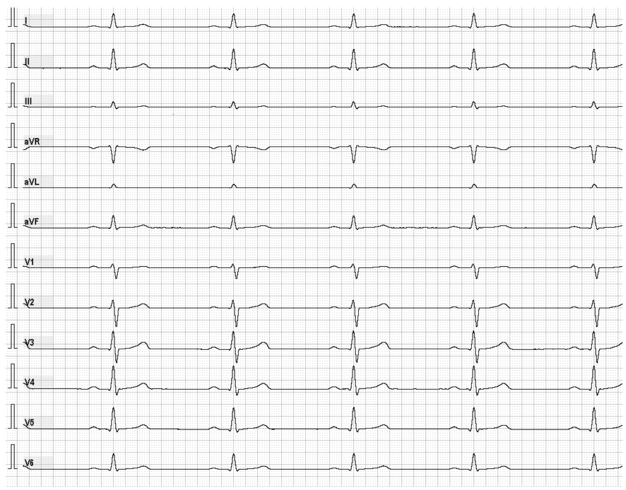


Figure 10-2: **Example of 1 column with 12 leads**

Figure 10-3: **Example of 2 columns with 6 leads**

Figure 10-4: **Example of 4 columns with 3 leads**

Sending and receiving text messages

CareCenter MD Online and CareCenter MD can receive and transmit text messages. Each message opens in its own window.

Caution: Incomplete or inaccurate data.

When using CareCenter MD Online, ensure text message boxes are positioned so the boxes not to overlap and obscure data.

Transmitting messages

To transmit a message from CareCenter MD Online to CareCenter MD:

1. Click **Message**.

   The system opens a dialog box indicating name of the workstation where the message will be sent. (This is the workstation from which you are receiving the ECG.)
2. Click in the text box and enter a message.
3. To add pre-defined text, click one of the buttons containing auto-text.
4. To send the message, click **Send message**.
5. To close the message window, click **Close**.

Configuration Options

Configure pre-defined auto text for transmitting and receiving messages	1. Select **File | Options... | 12 Lead ECG | Test procedures**. 2. Select the CareCenter MD Online tab. 3. Configure the text. You can configure separate text for transmitting and receiving workstations.

Receiving and replying to messages

As soon as CareCenter MD Online starts and an acquiring workstation is selected, this workstation can receive a message. See *Selecting the transmitting station* on page 10-3. The text message dialog box indicates the name of the workstation where the message originated.

To reply to a text message:

1. Choose a method to reply to a text message:
   - Click in the text box to write an answer.
   - Click one of the pre-defined text buttons to enter that text.
2. To send the message, click **Send message**.
3. To close the window without sending a reply, click **Close**.

11 Backup and Restore

Contents

You can backup and restore the CareCenter MD database.

Backup CareCenter MD

Follow your facilities policies and procedures for backing up the system. Burdick recommends backing up the CareCenter MD database on a regular basis from the server. When the backup files are up-to-date it makes restoring the system easier.

The system creates backup files. The default backup file location is `C:/CCMD-backup`.

To backup CareCenter MD:

1. Select **Start | All Programs | CareCenter MD | Backup CareCenter MD Database**.

   The system runs the backup scripts and writes the backup file. When the backup is complete it prompts you to press any key.

2. Press a key on the keyboard.

   The system closes the backup window.

Restore CareCenter MD

Use the restore function to restore data to the CareCenter MD server. The clients will be updated when they connect to the server. Before restoring a system, ensure that no CareCenter MD clients have logged in. If a CareCenter MD client is logged in it can affect the data that is restored. For more information or for help in restoring the database, contact Technical Support.

Caution: Possible loss of data.

Contact your IT department or Burdick Technical support before beginning a restore process. Restoring data incorrectly can lead to loss of data.

Caution: Possible loss of data.

Restoring data to the CareCenter MD server requires deleting data from the CareCenter MD clients. Data for all CareCenter MD instances will match the restored data.

To restore CareCenter MD:

1. On each CareCenter MD client where you will restore the database:
   a. Close CareCenter MD.
   b. Open a DOS command prompt window (cmd.exe) and enter:

      `cd c:\program files\carecenter md\`

      Note: This is the default location of the `s05main.exe` application. If you have changed the default location, then adjust the pathname accordingly.

   c. In the command prompt window, enter:

      `s05Main.exe -dbcreate`

      The system prompts you to delete the database.
   d. Select **Yes**.
   e. In the User Management window, select **Close**.
   f. Close the command prompt window.
2. On the CareCenter MD server:
   a. Close CareCenter MD.
   b. Open a DOS command prompt window (cmd.exe) and enter:

      `cd c:\program files\carecenter md\backup`

      Note: This is the default location of the `ccmdrestore.exe` application. If you have changed the default location, then adjust the pathname accordingly.

   c. In the command prompt window enter:

      `ccmdrestore`

d. In the User Management window, select **Close**.

   The system prompts you to press any key.

e. Press **Enter**.

f. Close the command prompt window.

The system restores the files from the last backup.

Mortara Instrument, Inc. • 7865 N86th Street, Milwaukee, WI 53224 • +1.414.354.1600 • US toll free 800.231.7437 • Fax: +1.414.354.4760 • http://www.burdick.com

Orders and Customer Care • +1.414.354.1600 • US toll free 888.667.8272 • Fax: +1.414.354.4760 • sales@mortara.com

Technical Support • +1.414.354.1600 • US toll free 888.MORTARA (888.667.8272) • Fax: +1.414.354.4760 • QBTechSupport@mortara.com

BURDICK