

GE Healthcare

MAC™ 2000 ECG Analysis System

Quick Reference Guide



Global Customer Education

2053535-065 Rev D

Notice

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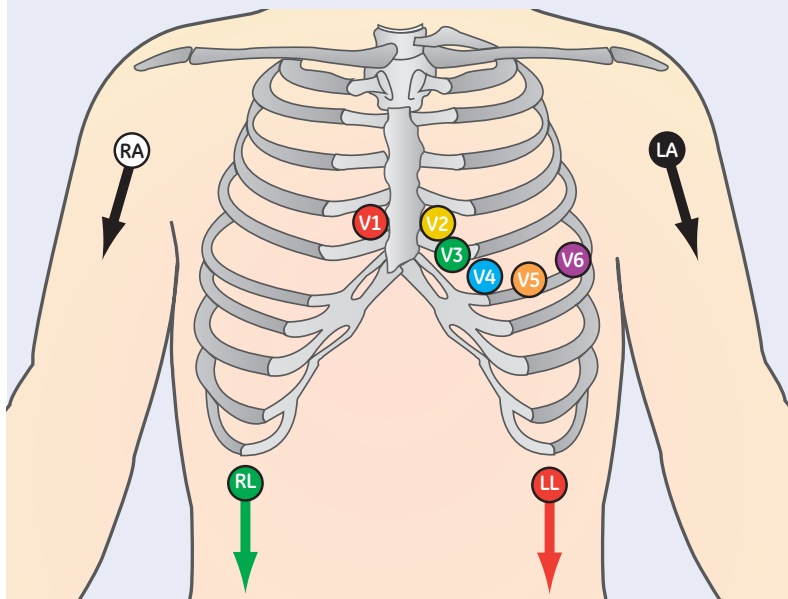
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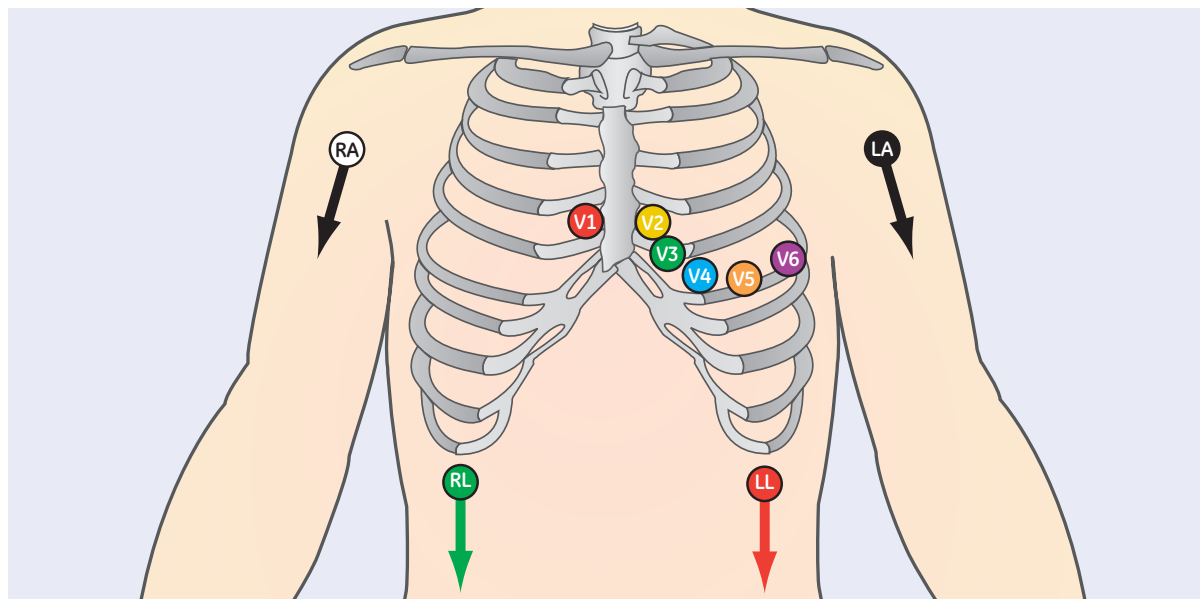
Skin Preparation and Resting 12-lead Placement



The quality of your ECG tracing is a direct result of skin prep and lead placement.

1. Ensure that skin is dry, clean and remove excessive hair.
2. Mark each electrode site with a felt tip pen.
3. Degrease each site with a skin preparation cream.
4. Use a mild abrasion to remove the mark left by the felt tip pen.
5. Apply the electrodes to the prepared sites.
6. Look at the hook-up advisor and on-screen messages for indication of lead problems.

AHA Label	Electrode Placement
V1	Fourth intercostal space next to the sternum on the right side.
V2	Fourth intercostal space next to the sternum on the left side.
V3	Midway between locations V2 and V4.
V4	At the mid-clavicular line in the fifth intercostal space.
V5	At the anterior axillary line on the same horizontal level as V4.
V6	At the mid-axillary line on the same horizontal level as V4 and V5.
RA and LA	Place on the corresponding right and left wrist. An alternate placement to reduce muscle artifact is on the right and left deltoid respectively.
RL and LL	Place on the corresponding right and left ankle. An alternate placement to reduce muscle artifact is on the upper leg as close to the torso as possible.

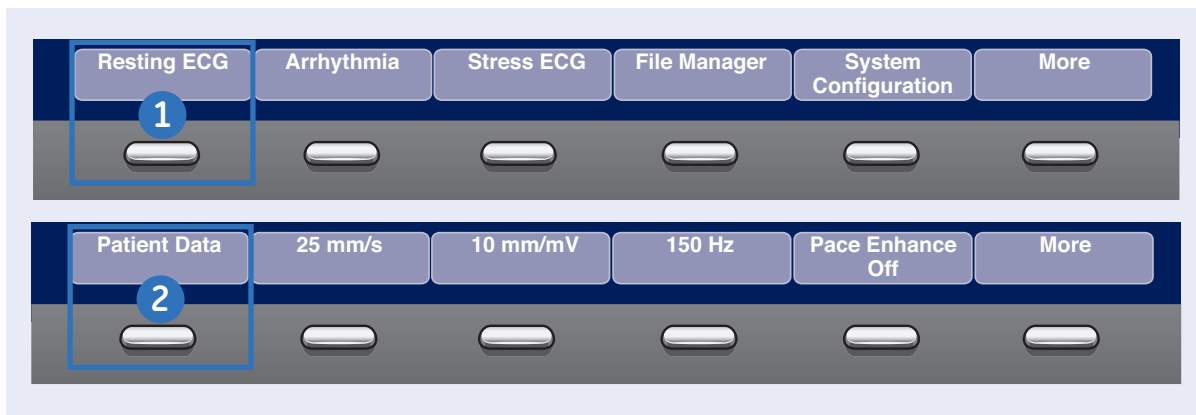


Skin Preparation and Stress ECG Lead Placement

Preparing the patient correctly of their ECG is a critical part of making sure that the reading is accurate and free of noise. Here is what is suggested for a proper patient prep.

1. Ensure that skin is dry, clean and remove excessive hair.
2. Mark each electrode site with a felt tip pen.
3. Degrease each site with a skin preparation cream.
4. Use a mild abrasion to remove the mark left by the felt tip pen.
5. Apply the electrodes to the prepared sites.
6. Look at the hook-up advisor and on-screen messages for indication of lead problems.

AHA Label	Electrode Placement
V1	Fourth intercostal space at the right sternal border
V2	Fourth intercostal space at the left sternal border
V3	Midway between V2 and V4
V4	Mid-clavicular line in the fifth intercostal space
V5	Anterior axillary line on the same horizontal level as V4
V6	Mid-axillary line on the same horizontal level as V4 and V5
RA	Recommend placing in the soft fleshy area just below the right clavicle
LA	Recommend placing in the soft fleshy area just below the left clavicle
RL	Recommend placing on the corresponding right side of the thorax at the lower edge of the rib cage, or at the lower level of umbilicus at the right mid-clavicular line.
LL	Recommend placing on the corresponding left side of the thorax at the lower edge of the rib cage, or at the lower level of umbilicus at the left mid-clavicular line.



Patient Data (ADT)

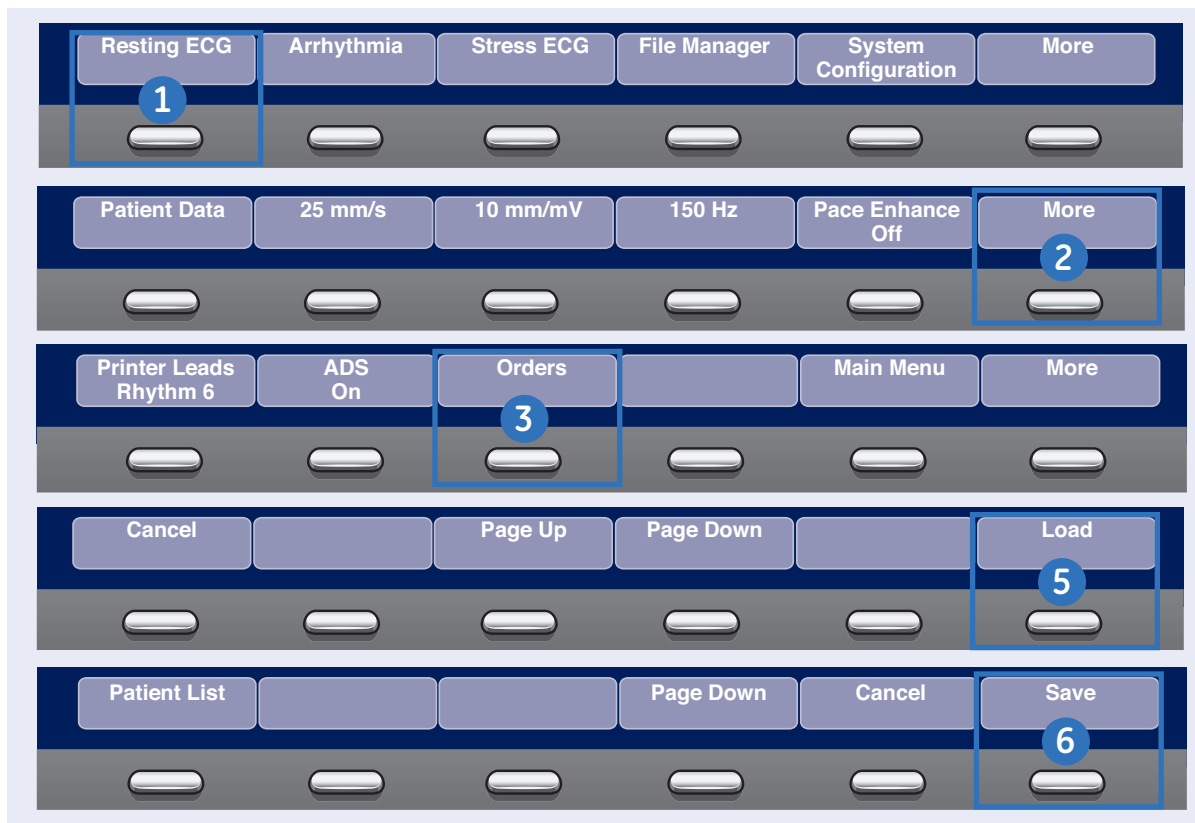
The MAC 2000 allows you to download patient demographics via an ADT interface. You can download patient demographics using internal or external keyboard, or barcode reader. Use the following procedures to query the database and select patient demographic for each.

Database Query Using Barcode Reader

1. Select **Resting ECG**.
2. Select the **Patient Data**.
3. Scan the patient barcode using the barcode reader. A dialog box opens with the scanned Patient ID.
4. Click **OK** to accept the selection.
5. The patient demographic data is populated. Modify any fields as necessary.
6. Select **Save**.

Database Query Using Internal or External Keyboard

1. Select **Resting ECG**.
 2. Select the **Patient Data**. A dialog box opens instructing you to enter the Patient ID.
- ID Number
3. Enter the Patient ID using the internal keypad or external keyboard. A dialog box opens with the Patient ID you entered.
 4. Click **OK** to accept the selection.
 5. The patient demographic data is populated. Modify any fields as necessary.
 6. Select **Save**.



Simple Orders

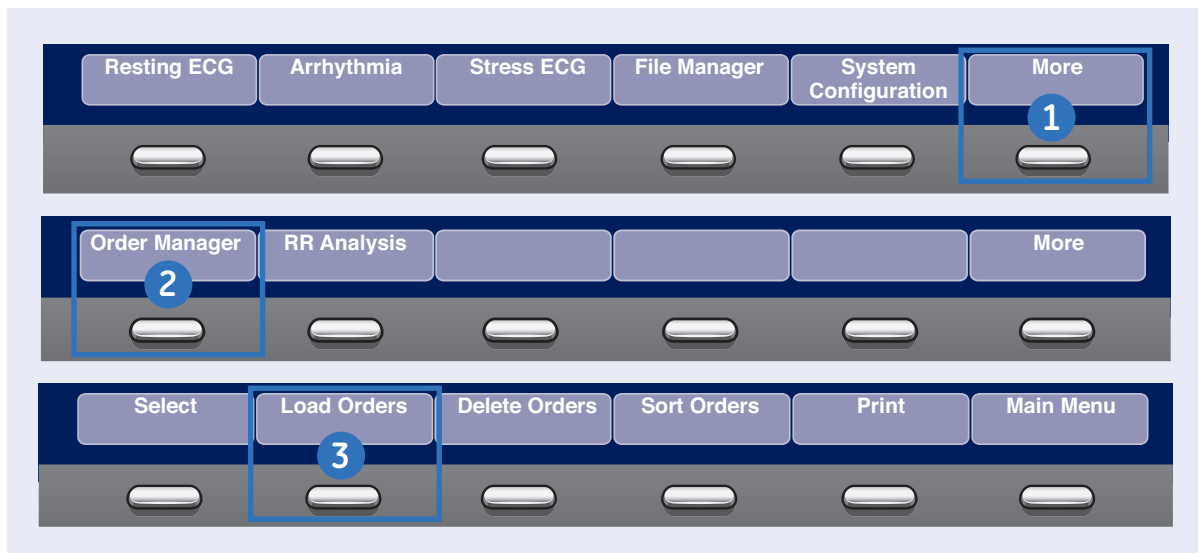
Simple Orders provides an interface to quickly download and execute one order at a time. Use the following steps to execute a simple order.

1. Select **Resting ECG**
2. Select **More**.
3. Select **Orders**.



Note! If *Auto Execute Single Order* setting is enabled in *Resting ECG Setup* and only one open order for that given location is present the system will automatically download that single order and populate the Patient Information screen.

4. Select an order from the list.
5. Select **Load**.
6. The order will download and populate the Patient Data screen. Modify as patient data as necessary.
7. Select **Save**.



Advanced Order Manager

Advanced Order Manager provides an interface to download and store multiple orders on the system and execute them later. Use the following procedure to execute an advanced order.

1. From the Main Menu, select **More**.
2. Select **Order Manager**.
3. Select **Load Orders**.
4. Enter the location(s).

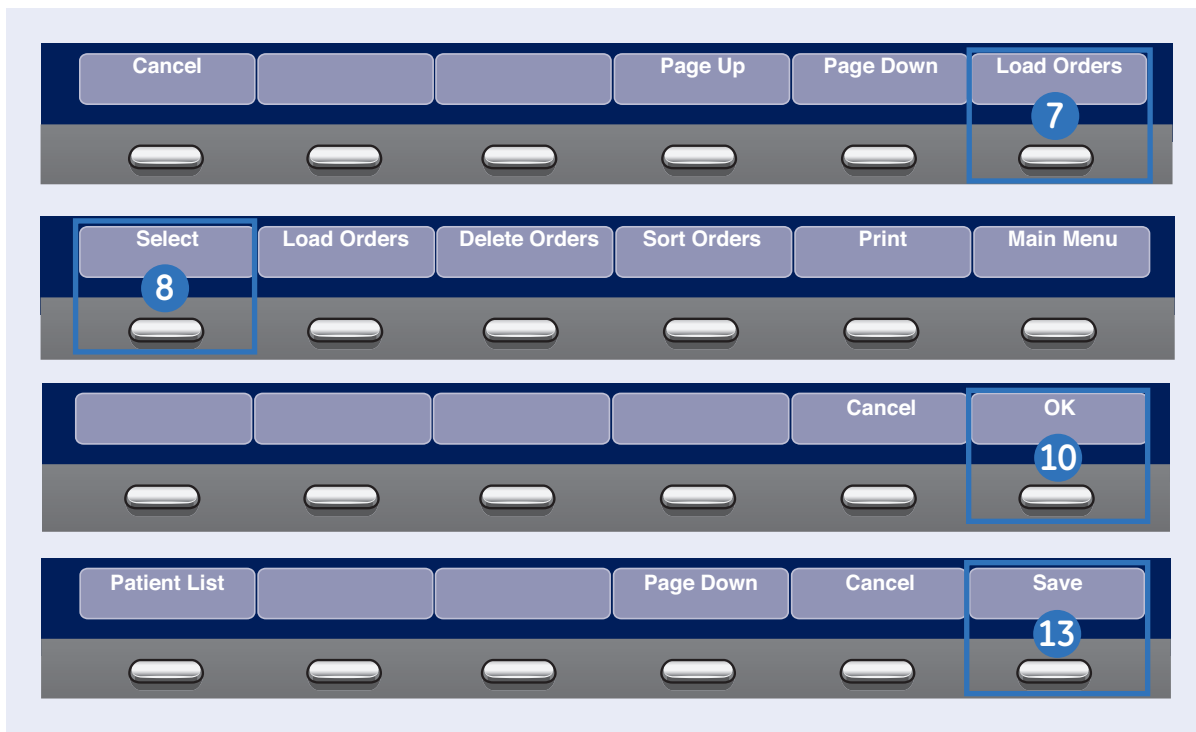


Note! To query multiple locations, add a comma between each location number e.g. 1,2,5,7.

5. Select **Ok**.

4

Enter the location(s) you want orders for. Separate the locations with commas, e.g. 1,13,65



6. Select the order(s) from the list.
7. Select **Load Orders**.
8. Select **Select**.
9. Select an order.

10. Select **Ok** to confirm the order selection.

Order number 001STYE07 for 'Really, Silly'
 Patient Number : 299912341 has been
 selected.
 Press either 'OK' to run the test or 'Cancel' to
 select a different order.

11. Select **Patient Data** to open with the patient information screen which will be populated from the selected order.
12. Modify the patient and test data as necessary.
13. Select **Save**.

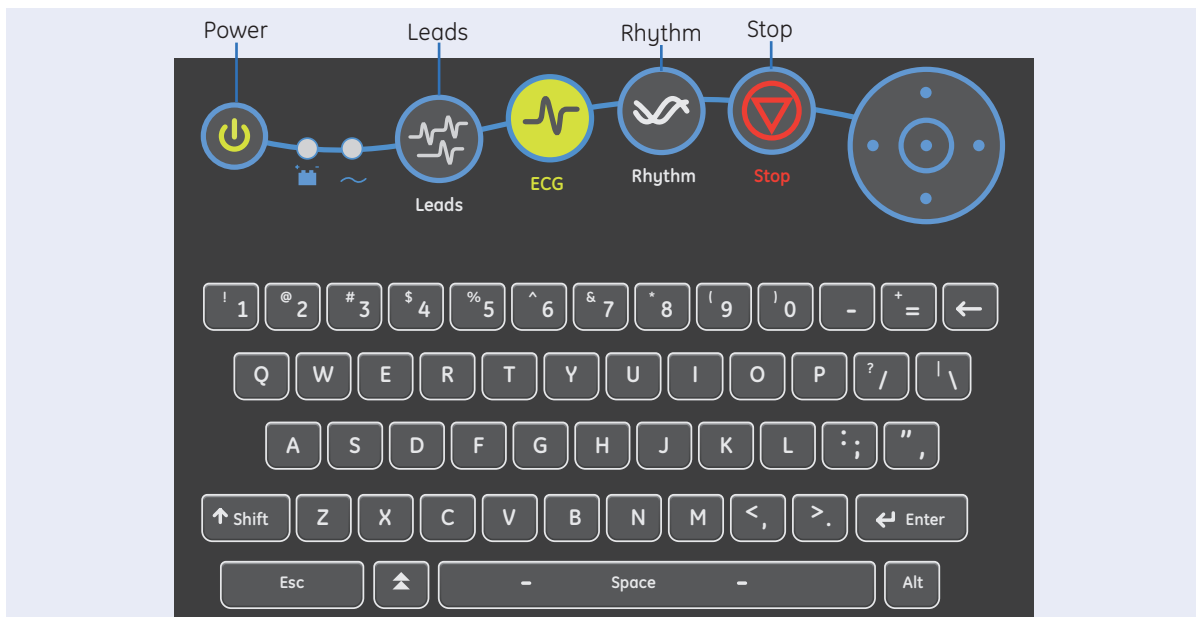


Acquire an ECG

1. **Prepare the patient.**
2. Open the Resting ECG function in one of two ways:
 - Power on the unit or
 - From **Main Menu** select **Resting ECG**.
3. Verify waveform quality by:
 - Checking **Hook-up Advisor**. Green indicates a good quality waveform.
 - Cycle through the lead groups to visually verify lead quality by selecting the **Leads** key on the keyboard.
4. Use the appropriate keys to make adjustments to (if necessary):
 - **Speed**
 - **Gain**
 - **Filter**
5. Select **Patient Data** to enter the patient information.
6. Select **Page Down** to access other Test Information windows.
7. Select **Save** to save and close the Patient Data window.
8. Select the **ECG** key on the keyboard to record and print an ECG.
9. If you have your system set to **Preview before Analysis**, select **Continue** to proceed to analyze and print an ECG or **Cancel** to cancel the analysis.
10. If finished, continue with step 11, or continue with these options:
 - Select **Print** to print another copy
 - Select **Save** if the unit is not set to save the ECG automatically.
- Select **Transmit** to transmit that single record to the default transmit location.
- Select **Next Patient** to start a new patient or Select the **ECG** key to take another ECG on the same patient.
11. When finished, do one of two things:
 - Proceed to **File Manager** to transmit records. (See **Transmit Stored Records**.)
 - Turn the unit off and plug it into AC power.



Note! Steps 1, 5 and 8 are the minimal basic steps for acquiring an ECG. All other steps are only used as required depending on options and features turned on.

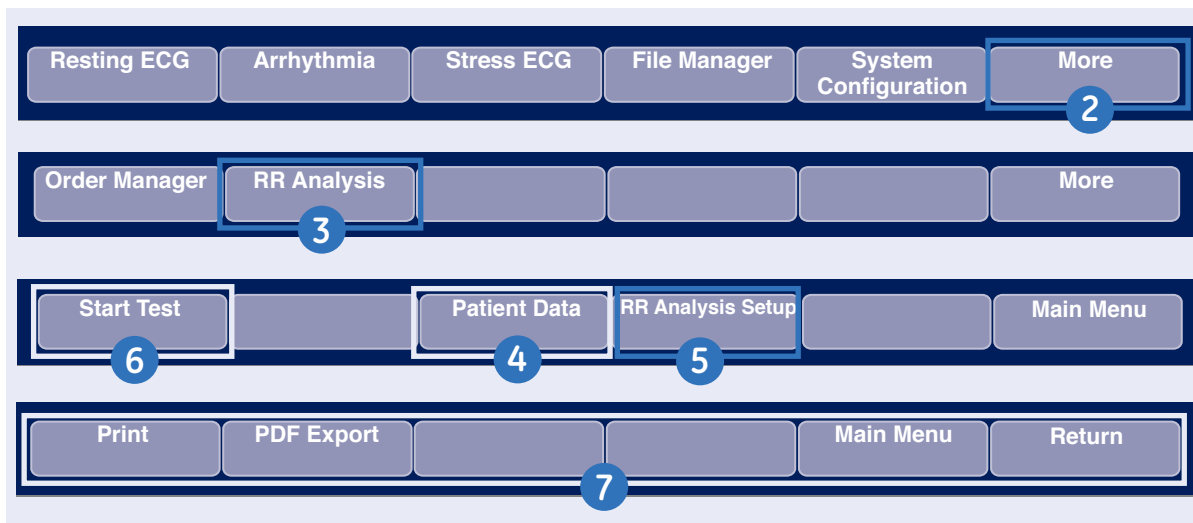


Print Continuous Rhythm

1. Prepare the Patient.
2. Open the Resting ECG function in one of two ways:
 - If the select default power on option is Resting ECG, simply power on the unit or
 - From **Main Menu** select **Resting ECG**
3. Verify waveform quality by:
 - Checking **Hook-up Advisor**. Green indicates a good quality waveform.
4. Use the keys to make adjustments to (if necessary):
 - **Speed**
 - **Gain**
 - **Filter**
5. Select **Patient Data** to enter patient information.
6. Select **Page Down** to access other Test Information windows
7. Select **Save** to save and close the Patient Data window.
8. Select the **Rhythm** key on the keyboard to print a continuous rhythm.
9. Select the **Stop** button to stop printing.



Note! Rhythm reports are not stored to File Manager.



Printing an RR Analysis Report (not sold in all countries)

Use the following steps to generate an RR Analysis report.

1. Prepare the patient.
2. From the Main Menu select **More**.
3. Select **RR Analysis**. You can also access RR Analysis from the Resting ECG mode after an ECG has been acquired.
4. Select **Patient Data** and enter the patient data.
5. Adjust the setup options (target, record lead, gain, speed, filter, pacemaker detection, rhythm record, and

RR table) as necessary by selecting **RR Analysis Setup**.

6. Select **Start Test** to start the test.

When the target is achieved, a preview of the summary results, histogram, and trendgram are shown on the display.



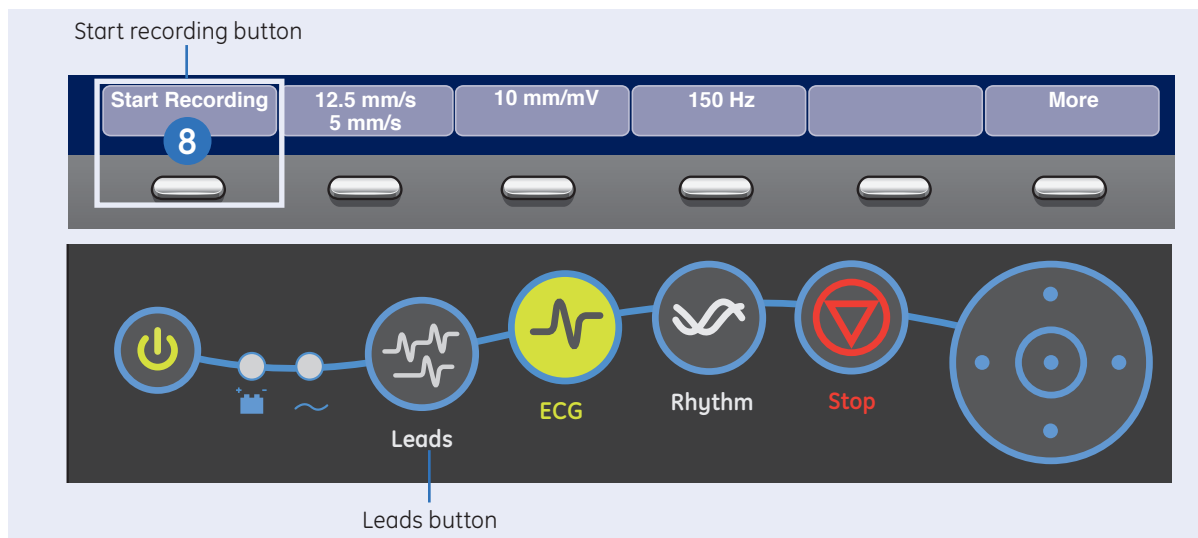
Note! You may select **Stop Test** to stop the test prior to the reaching the target.

7. While reviewing the preview, do any of the following:

- To discard the reading and begin over, select **Return** and repeat from Step 5.
- To discard the reading and return to the Main Menu, select **Main Menu**.
- To accept the reading and print the report on the thermal printer, select **Print**.
- To accept the reading and export the results as a PDF file, select **PDF Export**.



Note! Steps 1, 4 and 6 are the minimal basic steps for acquiring RR Analysis.

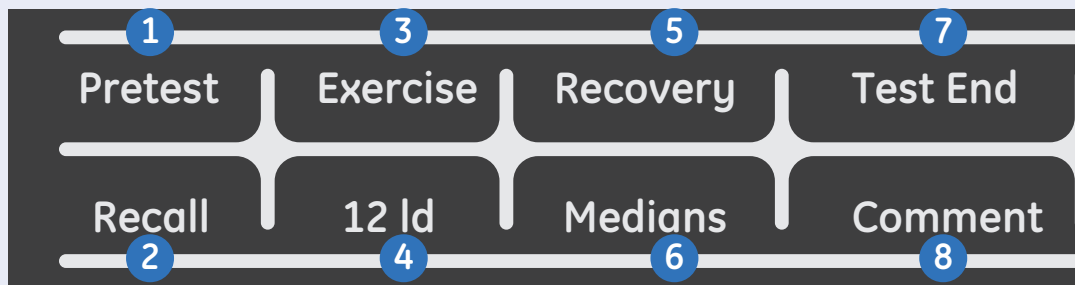


Acquire an Arrhythmia

1. **Prepare the Patient.**
2. Open the Arrhythmia function in one of two ways:
 - If the select default power on option is Arrhythmia, simply power on the unit or
 - From **Main Menu** select **Arrhythmia**
3. The **Patient Data** window automatically opens. Enter the desired information.
4. Select **Page Down** to access other Test Information windows.
5. Select **Save** to save and close the Patient Data window.
6. Verify waveform quality by:
 - Checking **Hook-up Advisor**. Green indicates a good quality waveform.
 - Cycle through the lead groups to visually verify lead quality by selecting the **Leads** key on the Keyboard.
7. Make adjustments to (if necessary):
 - **Speed**
 - **Gain**
 - **Filter**
8. Select **Start Recording**.
9. Select **Stop Recording**.
10. Select **Confirm Stop** to stop the recording or **Continue Recording** to continue to collect information.
11. After the recording is stopped, select the type of Arrhythmia report you wish the printout to include: Summary Report, Table Report, or Episode Report.
12. Select **Main Menu**.



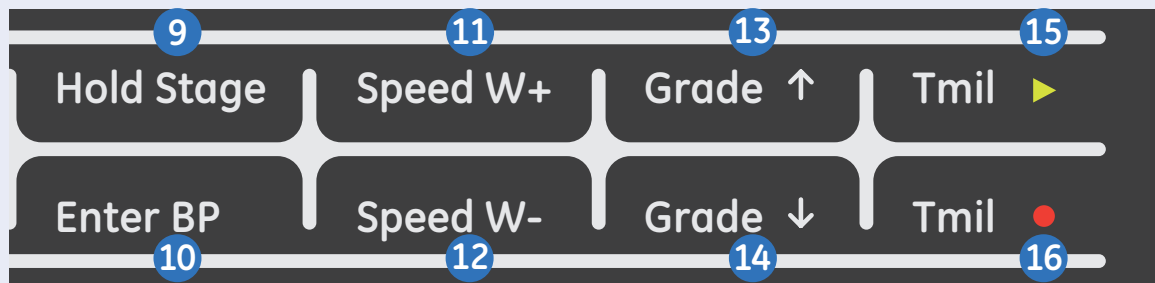
Note! Steps 1, 3 and 8 are the minimal basic steps for acquiring an ECG.



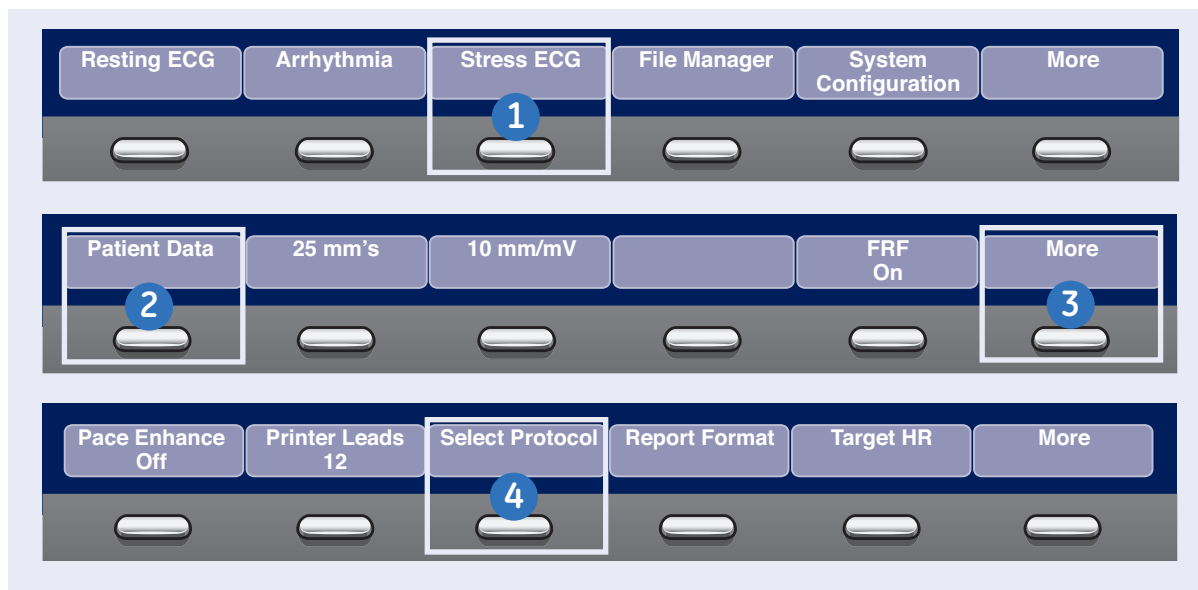
Stress ECG Testing Keyboard

The Stress ECG test keys are located at the top of the stress test keyboard. These keys are used to control the functions of the stress test as well as the connected stress device.

1. **Pretest:** Advanced the test to the Pretest Phase or while in the Pretest Phase if selected will advance to the next stage in that phase.
2. **Recall:** Prints a one-page rhythm strip report using the previous 10 secs of data from the point from which you select the Recall key
3. **Exercise:** Advanced the test to the Exercise Phase or while in the Exercise Phase if selected will advance to the next stage in that phase.
4. **12 Ld:** Prints a 12 lead report.
5. **Recovery:** Advances to the Recovery phase or while in the Recovery Phase if selected will advance to the next stage.
6. **Medians:** Prints a median report. Set the type of median report you wish to print in the Stress Setup window under In-test Reports.
7. **Test End:** Ends the current test. When a confirmation message appears on the screen, select the desired function key.
8. **Comment:** Allows you to enter comments about the test. Comments are printed on the Tabular Summary Report. You can enter up to 100 characters.



- 9. Hold Stage:** Maintains the current test stage and doesn't allow the protocol to go to next stage. Select again to remove the stage hold and to go back to programmed protocol staging.
- 10. Enter BP:** Allows you to enter a Blood Pressure reading manually or triggers a reading for a supported external device.
- 11. Speed W+:** Increase treadmill speed or ergometer load. Selecting this button will result in the system no longer following the selected protocol and places the system in manual mode.
- 12. Speed W- :** Decreases treadmill speed or ergometer load. Selecting this button will result in the system no longer following the selected protocol and places the system in manual mode.
- 13. Grade↑:** Increase treadmill incline. Selecting this button will result in the system no longer following the selected protocol and places the system in manual mode.
- 14. Grade↓:** Decrease treadmill incline. Selecting this button will result in the system no longer following the selected protocol and places the system in manual mode.
- 15. Tmil >:** Starts the Treadmill
- 16. Tmil●:** Stops the Treadmill

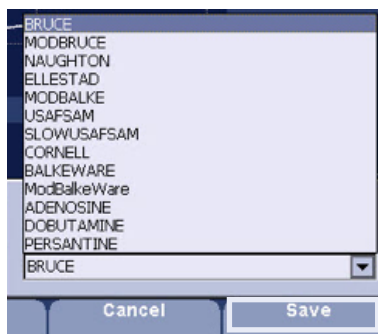


Accessing Stress ECG Mode

The Stress ECG mode is a purchasable option and allows you to conduct a Stress ECG test with a direct connection to treadmill or ergometer.

Regardless of the devices the basic procedure for conducting a Stress ECG test is the same. Now let's access the Stress ECG menu.

1. Select **Stress ECG** from the Main Menu.
2. Select **Patient Data** and enter the appropriate data.
3. Select **More**.

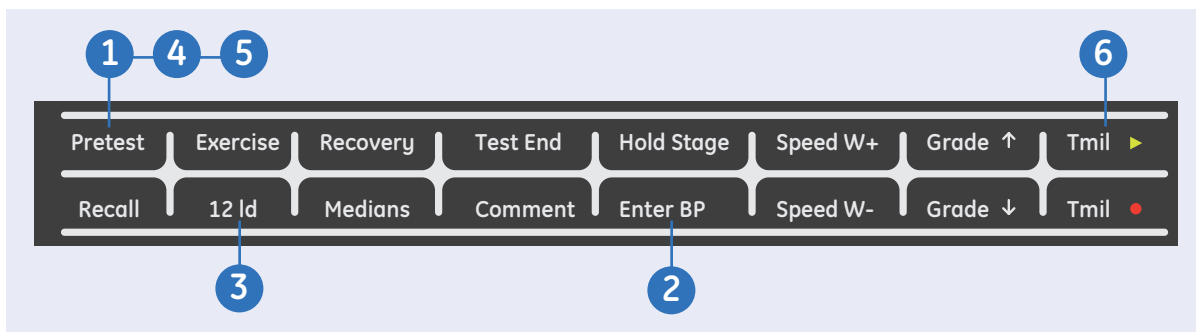


4. Select **Protocol** to choose the desired protocol. The default protocol will be chosen, however you can select another protocol from the list. If you do select a new protocol, select **Save**.

5. You can also turn Pace Enhance On or Off, select the Printer Leads, select Report Formats or change the Target HR.



Note! In setups you can automatically set the Target HR % that you wish to achieve. This number is calculated against the patient's age.

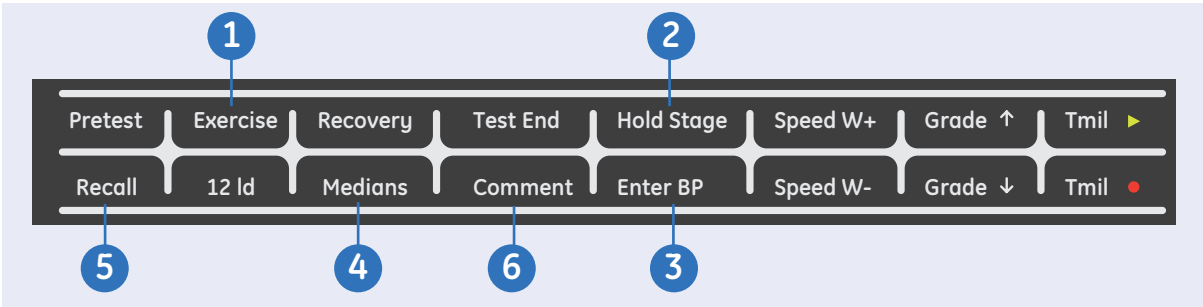


Pretest Phase

A Stress ECG protocol typically is composed of 4 phases. These include Pretest, Exercise Recovery and Test End.

Pretest allows the user to take ECG and blood pressure measurements in a variety of patient positions. Depending on the protocol, it is also a phase that could be used to allow the patient to warm-up before the Exercise portion of the Stress ECG test.

1. Select the **Pretest** button on the keyboard to enter the Pretest Phase.
2. Select the **BP** button on the keyboard and enter patient's blood pressure.
3. Select the **12 Id** button on the keyboard to take a 12-lead ECG
4. Select the **Pretest** button to advance through the Standing and Hypervent stages a BP and 12-lead as required.
5. Select the **Pretest** button to advance to Warm-up.
6. Select the **Tmil>** button to start the treadmill.
7. Have the patient start to walk at speed based on the selected protocol.



Exercise Phase

Once the patient is comfortable walking on the treadmill or peddling on the ergometer, select the Exercise key on the keyboard to start the Exercise Phase. The phase will now indicate Exercise and the stage time and workload will be dictated by the protocol.

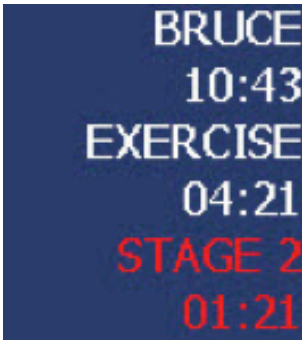
- 1. Select the **Exercise** button on the keyboard. The system will now enter the exercise phase and follow the selected protocol. Select the **Exercise** button a second time will advance the protocol to the next stage.



Note! Selecting the Speed or Grade controls for the treadmill or ergometer will result in the system dropping out of the protocol. At this point the user must

manually control the treadmill or ergometer's workload.

- 2. Select the **Hold Stage** button will result in the stage being held at that workload for as long as the stage is held. Select **Hold Stage** a second time to release the stage to follow the selected protocol.

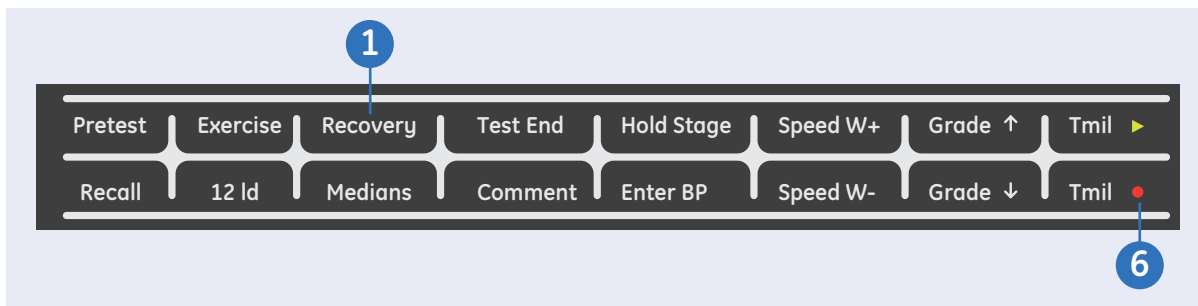


Note! The stage time will turn red when the stage is in hold.

- 3. A blood pressure will be automatically prompted for based on the protocol or you can select the **Enter BP** button on the keyboard to enter a BP.
- 4. A 12 lead will be automatically taken by the system based on the protocol or you can select the **12 Id** button on the keyboard to take a 12 lead. You may also take a median report at any time by selecting **Medians**.
- 5. Select the **Recall** button to capture the previous 10 sec of ECG that just pasted on the screen.
- 6. Select **Comment** on the keyboard to enter a patient related comment.

Comment

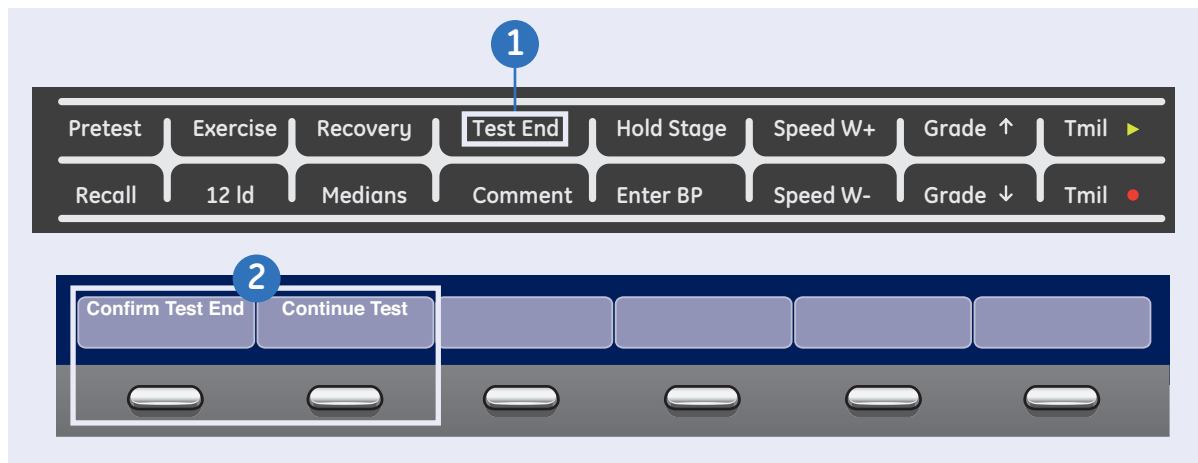
Slight Chest Tightness



Recovery Phase

Once it is determined that the Exercise portion of the stress test has been completed, you will now select the Recovery button and enter into the recovery phase. The Recovery phase is opportunity to continue to monitor the patient to make sure their blood pressure, heart rate, symptoms and ECG return to their pre- test values. The length of the Recovery Phase will depend on your clinician protocol.

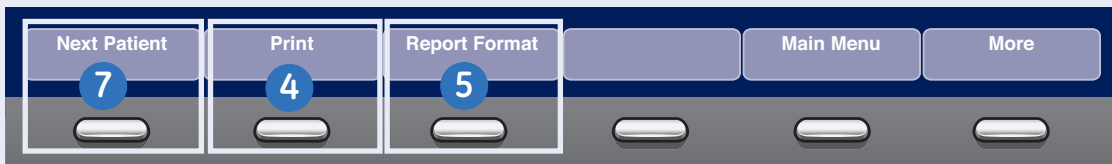
1. Select the **Recovery** key on the function keyboard when the patient has reached peak exercise, or when you are ready to advance to the Recovery Phase.
2. On supported treadmills the speed and grade of the treadmill will gradually decrease according to the protocol.
3. The system will automatically print a peak 12-lead or median report according to the protocol.
4. BP will automatically be prompted based on the protocol.
5. Enter comments or take extra 12 leads or medians as needed.
6. Select **Tmil** on the keyboard to stop the belt. If using an ergometer, have the patient stop peddling.



Test End

Once the Recovery phase is completed you can select Test End on the keyboard and disconnect the leads from the patient.

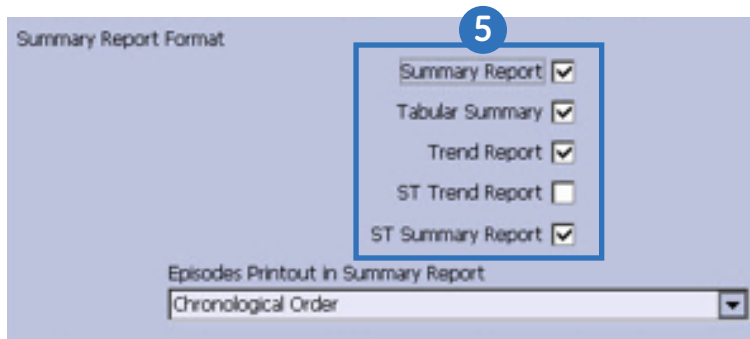
1. Select the **Test End** key on the keyboard when ready to end the test.
2. Confirmation of ending the test appears. Select **Confirm Test End** to end test or select **Continue Test** to continue collecting data for the current patient.
3. Once you have selected **Confirm Test End** the following menu selections appear.



4. Select **Print** to print the default Summary Report Format.
5. If you desire to select different Summary Report components then originally chosen in the Stress Testing Setup, select **Report Format** to override those default selections. The following screen appears to allow you to select the different components.
6. Select **Save** to save your changes and select **Print** to print that Summary report.
7. Select **Next Patient** to conduct a Stress ECG test on the next patient. The system will verify that **The previous test data will be lost. Do you wish to continue with the Next Patient?**
Select **Yes** to continue



Note! Stress ECG test are not saved to the File Manager. Once you select to do you next patient all test data will be lost.



To Select Records:

1. From **Main Menu** select **File Manager**.
2. From File Manager you can select records to:
 - Edit
 - Preview
 - Delete
 - Print
 - Transmit
 - Import
 - Export

To Select All:

1. Select **Select All**. All records are selected.
2. Select the menu key of the desired function, such as **Print**.

To Select Individual Records:

1. Select **Select**.
2. Use the circles on the trippad to highlight the record. Highlighted records are shaded in dark blue.
3. Select the middle of the trippad to select the records. Selected records are then shaded in gray.
5. If needed, continue to select other records.
6. Select the menu key of the desired function, such as **Print**.

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File Manager

Internal Directory Listing - Compatible Files: 8 Selected Files: 1

Patient Name	Patient ID	Date	Time	Sent	U/C	Order Number
Doe, John	0000000000345678	07/28/2008	14:54:30	No	U	
Doe, Mike	0000000000098765	07/28/2008	14:53:53	No	U	
Label, Patty	0000000000394894	07/28/2008	14:53:19	No	U	
Smith, Mike	0000000043256787	07/28/2008	14:52:36	No	U	
Myers, Michael	00000000000987654	07/28/2008	14:51:51	No	U	
Smith, David	0000000003456789	07/28/2008	14:50:33	No	U	
Parker, Sarah Jessica	0000000000012345	07/28/2008	14:49:40	No	U	
Anderson, Pam	0000000000012345	07/28/2008	14:48:21	No	U	

Edit Preview Delete Print Transmit More

Highlighted records are shaded in dark blue

Selected records are shaded in gray

07/28/2008 15:01:41 90/200

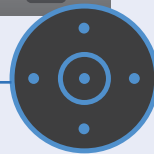
File Manager

Internal Directory Listing - Compatible Files: 8 Selected Files: 2

Patient Name	Patient ID	Date	Time	Sent	U/C	Order Number
Doe, John	0000000000345678	07/28/2008	14:54:30	No	U	
Doe, Mike	0000000000098765	07/28/2008	14:53:53	No	U	
Label, Patty	0000000000394894	07/28/2008	14:53:19	No	U	
Smith, Mike	0000000043256787	07/28/2008	14:52:36	No	U	
Myers, Michael	00000000000987654	07/28/2008	14:51:51	No	U	
Smith, David	0000000003456789	07/28/2008	14:50:33	No	U	
Parker, Sarah Jessica	0000000000012345	07/28/2008	14:49:40	No	U	
Anderson, Pam	0000000000012345	07/28/2008	14:48:21	No	U	

Edit Preview Delete Print Transmit More

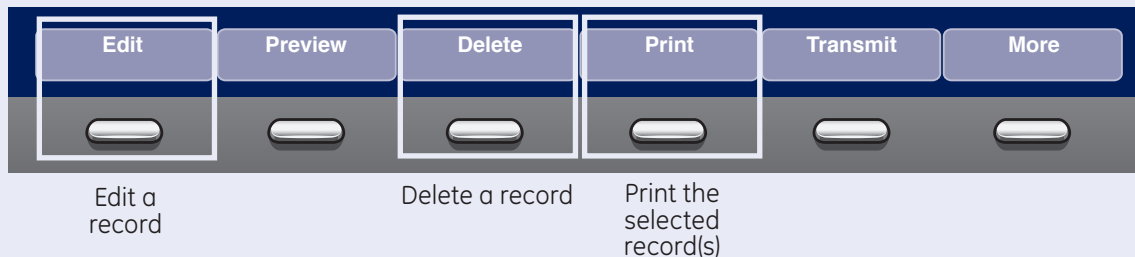
Trippad



Tier 1 F Keys for File Manager



Tier 2 F Keys for File Manager



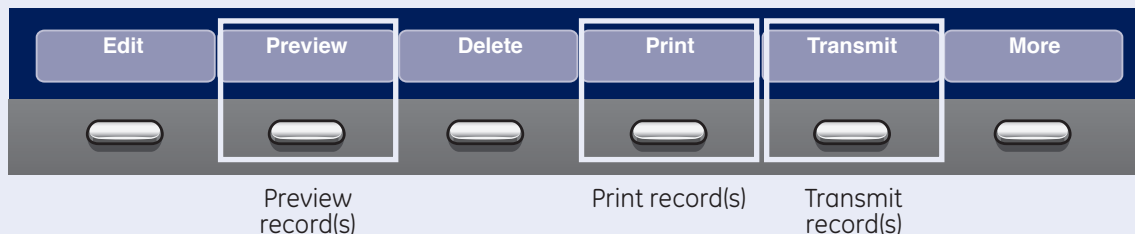
Edit Stored ECG Records

1. From Main Menu select **File Manager**.
2. Select **Select** to highlight the individual record to edit. You may only select one record to edit at a time.
3. Select **Edit** to edit the selected record.
4. Use the keys on the Trimpad to select the Patient Information to be edited.
5. Edit the data as required.
6. Select **Page Down** to access other Test Information Windows
7. Edit the data as required.
8. Select **Save** to save edited fields and close the data window.
9. Highlight the record using the Trimpad and select **Print** to print the edited record.

Delete Stored ECG Records

1. From Main Menu select **File Manager**.
2. Select **Select** to select individual records to delete. **Select All** to select all records.
3. Select **Delete**.
4. A message will appear verifying whether you want to delete the selected record(s).
5. Select **Yes** to delete the record(s). Select **No** to cancel the delete function.

Tier 3 F Keys for File Manager



Print Stored ECG Records

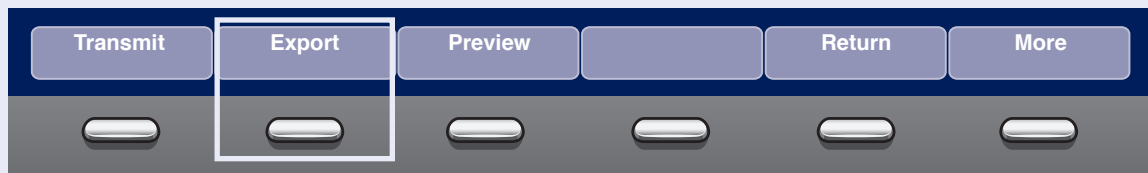
1. From Main Menu select the key for **File Manager**.
2. Select **Select** to highlight an individual records to print. **Select All** to select all records.
3. Select **Print** to print the selected record(s) to the thermal printer.

Transmit Stored Records

1. From **Main Menu** select the key for **File Manager**.
2. Select **Print Directory** to print a list of stored files
3. Select **Select All** to select all records to transmit or select **Select** to select individual records.
4. Select **Transmit** to transmit selected records.
5. One of two things will happen:
 - If only one location is defined, the file(s) will be transmitted to the default location.
 - If multiple locations are defined, select the desired location and select **Ok**.

Preview Stored ECG Records

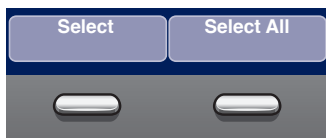
1. From the Main Menu select the key for **File Manager**.
2. Select **Select** to highlight the record to preview.
3. Select **Preview**.
4. The 12 lead display of the ECG record will be displayed.
5. Select **Return** to return to the File Manager main screen.



Export record(s)

Exporting to SD Card

1. Select **Select** to highlight individual records to export. **Select All** to select all records.



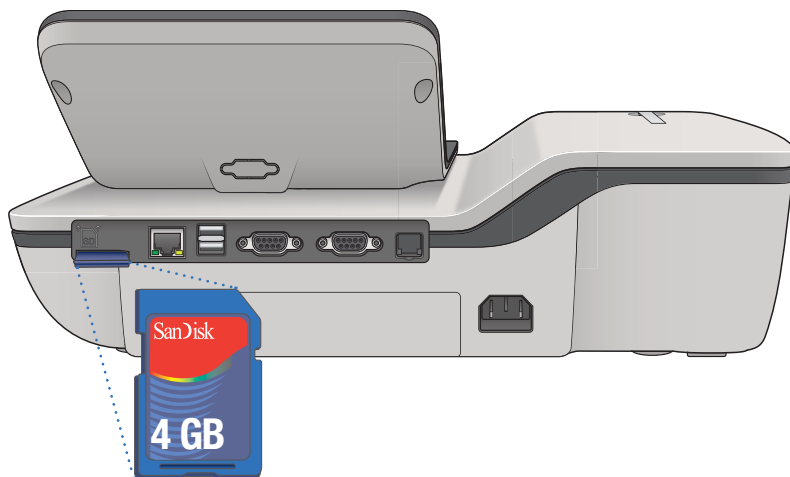
2. If you are exporting to an SD card, insert the card into the MAC 2000 SD Card Slot. Make sure the card has sufficient free space for the selected records and that it is not write protected. If there is no sufficient space on the SD card a message will appear indicating that.
3. Select **More**.

4. Select **Export**. The F keys change to allow you to select the format in which to export the data.

- To export the data in XML, skip to step 5.
- To export the data in PDF, proceed to step 8.

5. To export the data in XML, select **Hilltop XML**. One of two things happens:

- If a shared directory was defined, a window opens for you to select the destination.



Skip to step 6.

- If a shared directory was not defined, the selected records are exported to the SD card.

A window opens to inform you of the export's progress. The window closes when the export is complete.

6. Do one of the following:

- To export to the SD card, select SD Card in the window.
- To export to the shared directory, select Shared Directory in the window.

7. Select **OK**. The selected records are exported to the selected destination. A window opens to inform you of the export's progress. The window closes when the export is complete.



Note! When exporting to a shared directory, the MAC 2000 device logs on to the directory with the user name and password defined on the **Communications Setup** window. If either of those values are incorrect, you will receive an error message. Correct the user name and password on the **Communication Setup** window and repeat the export process.

8. To export the data as a PDF, select **PDF**.
9. Follow steps 6 through 7.

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