



# Recharge

Version 6.5

## User Manual

*Nasan Medical Electronics Pvt. Ltd.*

© All Rights Reserved

*Hope you don't require service at all.*

*But incase you require,*

*Please contact: 09371039255/09371809026*

*For any working days 9.30a.m to 6 p.m*

Dear customer,

We take this opportunity to thank you once again for your patronage. We reiterate our commitment to live up to the confidence you have shown in us. Our continued endeavor is to exceed your expectation by offering you products that have optimum features and reliable, high quality performance backed by prompt technical support.

It is our pleasure to give you this user manual. Please study the same thoroughly before using the system.

Contact details:

**Nasan Medical Electronics Pvt. Ltd.**

1<sup>st</sup> floor Rangali Society

Opp. Karve statue

Kothrud

Pune-411038

Website: [www.nasanmedical.com](http://www.nasanmedical.com)

Phone: 020-25391290,

# Table of contents

1. Introduction
2. System configuration
3. Configuring the ST-Win system
4. Conducting a test
5. Reviewing test
6. Printing Reports
7. Rerun Test
8. Utilities
9. Enhanced features
10. Trouble shooting
11. Appendix A –
  - ❖ Safety Precautions- Earthing
  - ❖ Important tips for conducting a test
12. Appendix B -
  - ❖ Patient preparation
  - ❖ Electrode placement
13. Appendix C -
  - ❖ ST-Win acquisition unit specifications
  - ❖ Interconnection diagram
14. Appendix D -
  - ❖ Defragmentation
  - ❖ Installation Report



User manual for  
**ST-Win Recharge**

**The complete Windows based stress test system.**

---

## **1. Introduction-**

Nasan Medicals has pioneered PC based medical equipments in India. We thank you for purchasing our ST-Win Recharge.

This ST Win recharge is based on same principle used in mobile phone. Doctor will buy ST Win Recharge unit and treadmill as we buy mobile handset. Doctor will keep recharging number of tests (allowing 100 Tests in one recharge) as we recharging talk time for our mobile phone.

The system records and enables review of electro-cardiogram, arrhythmic disorders and diagnosis of stress induced ECG.

The distinctive feature of ST-Win is the full frequency response from 0.05 Hz to 100 Hz.

### **Nasan's ST-Win system-**

Nasan's ST-Win system is a new generation computerized stress test system based on the latest technology. The system is designed to facilitate you to conduct cardiovascular stress testing in a user friendly and precise way.

The system consists of the following modules,

- ❖ ST-Win acquisition unit
- ❖ Interconnection cables
- ❖ Treadmill
- ❖ Central processing unit (PC)
- ❖ Display monitor-**17 inches**
- ❖ Keyboard
- ❖ Mouse
- ❖ Printer

## **System features-**

Nasan's ST-Win System is most accurate and economic system with special features as below:

- ❖ ***Simultaneous 12 lead ECG acquisition and processing.***
- ❖ ***Digital signal processing for removal of base line wanders and power line noise removal.***
- ❖ ***Standard, manual and user made Protocol can be used to acquire the ECG.***
- ❖ ***Automatic or user selectable fiducial points.***

The user can change the E, J and post J points during acquisition and also while reviewing the test.
- ❖ ***Facility to record Un-averaged ECG at request.***

At any instant, user can record un-averaged ECG. A printout may also be requested.
- ❖ ***Facility for Rhythm recording at request.***
- ❖ ***Online printouts.***

During the test, the user may request for a raw ECG and Linked median printout at any instant and selected median report at review stage. He can also get printouts according to the pre-configured stage report protocol.
- ❖ ***Post-test review and editing of results.***
- ❖ ***Facility for user defined protocols along with standard protocols.***
- ❖ ***High-resolution printouts on ordinary paper resulting in lower operating cost since the user can take print with or without grid on plane paper.***
- ❖ ***Editable summary report.***
- ❖ ***Sending the reports to the consultant doctors for referring by use of Internet.***
- ❖ ***Beep on QRS.***

## 2. System requirement-

---

### Requirement of PC for ST-Win system:

- |                                      |   |
|--------------------------------------|---|
| 1. Motherboard                       | : Recommended<br>Make : D-Link, ASUS, INTEL, HIS.<br>Chipset : Intel, VIA.<br>Speed : FSB, 400MHz. and onwards. |
| 2. CPU                               | : Recommended<br>Make : Intel P-5 Speed 2.4 GHz. 400 FSB.   |
| 3. RAM                               | : Recommended<br>Make : Symtronics, Hyundai, Transcend.<br>Size : 512 MB.<br>Speed : 266MHz.                    |
| 4. Serial Ports (RS – 232)           | : Two working serial ports, one for mouse and other for ST-Win acquisition unit.                                |
| 5. VGA card                          | : 64 bit, 2 MB memory PCI VGA card.   |
| 6. Monitor                           | : <b>17"</b> color monitor  |
| 7. SMPS                              | : Recommended<br>Make : Priya, Mercury, and Intex.<br>Capacity: 300 Watt.                                       |
| 8. Hard disk                         | : Recommended<br>Make : Seagate.<br>Size : Barracuda 40GB 7200 RPM.   |
| 9. Display Settings                  | : Resolution - 1024 X 768.  |
| 10. Key board                        | : with 101 keys.  |
| 11. Mouse                            |   |
| 12. Operating system                 | : Windows XP  |
| 13. 1 KVA stabilizer.                |   |
| 14. CD ROM                           | : Recommended<br>Make : LG. Samsung Sony, ASUS.<br>Type : Speed 52X.  |
| 15. Printer                          | : Recommended<br>Type : HP Laser Jet 1000, HP Laser Jet 1010, HP Laser Jet 6L Gold/ Pro.                        |
| 16. Independent earthing connection. |   |

### 3. Configuring the ST-Win system-

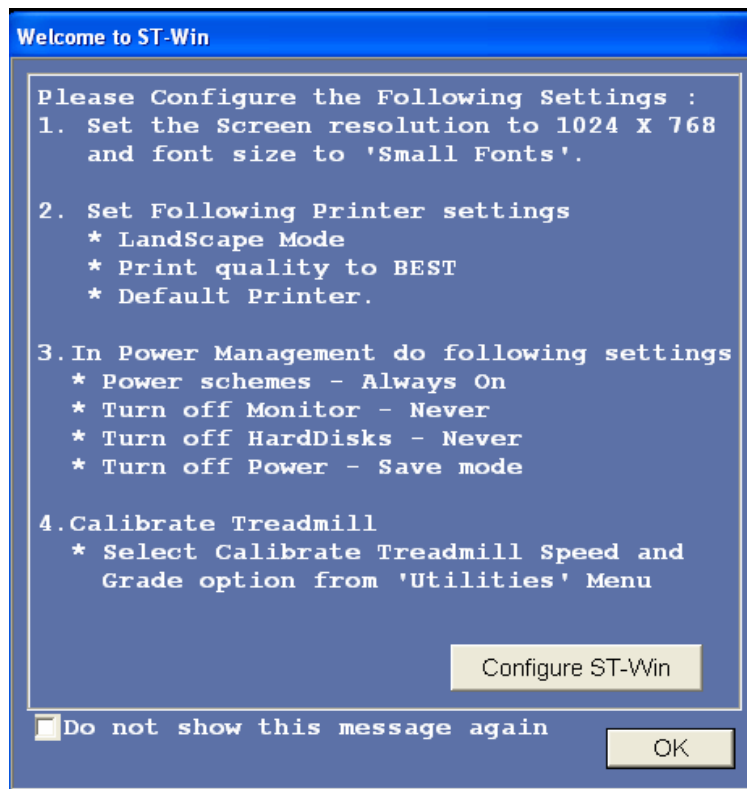
#### **WARNING:**

#### **System 'POWER ON' sequence:**

1. Switch 'ON' PC.
2. Switch 'ON' 'St Win' Unit.
3. Switch 'ON' Treadmill.

Strictly follow above sequence for safety.

When the application is started, dialog box as shown in fig. 3.1 is displayed, which asks you to configure the software as per the requirement. It is necessary to configure the system before conducting a test. Configure your PC as per instruction given in the dialog box for the best results.



**Fig 3.1: Installation dialog box.**

- For setting monitor resolution to 1025x768 use the procedure given below:
  1. Go to the Windows "**Start**" menu.
  2. Select "**Control panel**" option.
  3. Control Panel window will open.
  4. Double click on "**Display**" icon.

5. A window named "**Display Properties**" is displayed on screen.
6. Select "**Settings**" tab.
  - Set Desktop area to 1024 x 768.
  - Set Color pallet to 16 bits hi colors.
9. Click the "**Apply**" button
10. Press '**OK**'.

- **Printer Setup-**

To set the printer-

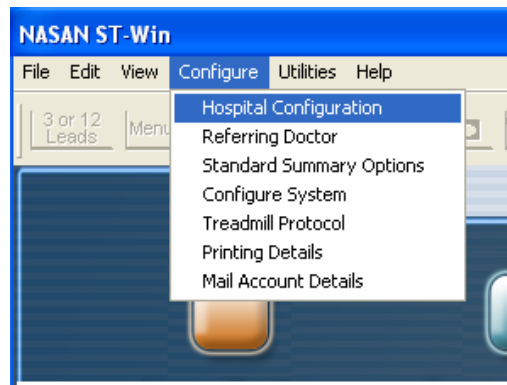
1. Go to Windows "**Start**" menu.
2. Select "**Control Panel**" option.
3. Control Panel window will open.
4. Double click on "**Printer and Faxes**" option.
5. Right click on the printer icon and select '**Properties**' option.
6. Set following properties for the printer
  - Landscape Mode
  - Print quality to '**BEST**'
  - Page size to '**A4**'.

## Configuring the System

For configuring the ST-Win system go to '**Configure**' menu or press '**Configure System**' button on '**Welcome to ST-Win system**' dialogue box' which provides allows following tools listed as in fig.3.2,

1. Hospital configuration.
2. Standard summary report.
3. ST-Win configuration.
4. Treadmill Protocol.
5. Printing details.
6. Mail Account Details.





**Figure 3.2: Configure Menu.**

### 1. Hospital configuration-

This option from the '**Configure**' menu provides facility of storing the list of doctors and the consultant doctors attached to your hospital. This list gets popped up in the Patient details entry dialog box, from where you can select the concerned doctor for the patient.

Sr.No	Name	Designation
1	rr	rr
2	Dr. Amit	M.D.

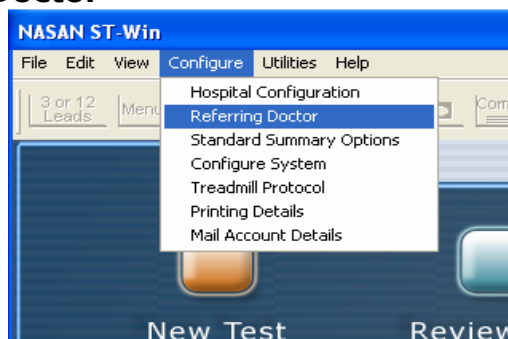
**Figure 3.3: Hospital configuration.**

For entering the details follow the following steps.

1. Select the '**Hospital configuration**' option from the '**Configure**' Menu.
2. A window will appear on the screen as shown in fig. 3.3.
3. Enter hospital name in the upper edit box.
4. Enter hospital address.
5. Enter the name and designation of a doctor you want to add to your list and click the '**Add**' button.
6. To delete any doctor from the list, select the corresponding Sr.No. and click the '**Delete**' button.
7. Double-click on Sr.No. to change or modify any doctor's details.

8. After entering all the information click on "**OK**" to save the contents in the list.
9. Press "**Cancel**", the information will not get saved.

## 2. Referring Doctor



**Figure 3.3B: Referring Doctor Configuration**

This option from the 'Configure' menu provides facility of storing the list of referring doctors. This list gets popped up in the Patient details dialog box, from where you can select the concerned referring doctor for the patient.

For entering the details, follow the steps.

1. Select the '**Referring doctor details**' tab from the '**Configure**' Menu.
2. A window will appear on the screen as shown in fig. 3.3C
3. Enter the reference doctor's name and designation you want to add to your list and click the '**Add**' button.
4. To delete any doctor from the list, select the corresponding Sr.No and click the '**Delete**' button. The selected doctor will be deleted.
5. To change or modify any doctor's details double-click on Sr.No & click the '**Modify**' button.
6. After entering the entire information click on "**Apply**" button to save the contents in the list.
10. Press "**Cancel**", the information will not get saved.

 A screenshot of the 'Configure Referrer Doctor Info' dialog box. It has two input fields at the top: 'Reference Doctor's Name' and 'Reference Doctor's Designation'. Below them is a table with columns 'Sr.No', 'Name', and 'Designation'. The table contains one row with '1', 'shirin Taralkar', and 'M.D.'. At the bottom are buttons for 'Add', 'Modify', 'Delete', 'OK', and 'Cancel'. A note at the bottom says 'Double click on the record you wish to modify.'
 

Sr.No	Name	Designation
1	shirin Taralkar	M.D.

**Figure 3.3C: Referring Doctor Configuration**

### 3. Standard summary option editor-

Standard options are used while preparing summary report, which can be pre configured using '**Standard summary option editor**'

To use this option, click '**Standard summary option editor**' from '**Configure**' menu. Some standard field contents are already filled for your convenience. To add your personalized field contents in any of the objects, follow the steps given below.

**Figure 3.4: Standard summary option editor.**

1. Select '**Field name**' from the list and type the new contents in the edit box and press '**Add**' button. Your new field content will get added to the list.
2. In order to modify your field contents **double-click** the item you wish to modify from the list of field contents. The item will appear in the Field Contents edit box. Make changes in the content as per your requirement and press '**Modify**' button. The changed item will appear in the list.
3. To remove any of the personalized field contents item, click the item from the Field Contents list that is to be deleted and press the '**Delete**' button. The item gets deleted from the list after confirmation.
4. To save the changes and exit click on '**OK**' button.
5. Click '**Cancel**' to discard the changes.

### 4. Configure ST-Win-

'**ST-Win configuration program**' allows you to configure different display and print options. To configure the system select '**ST-Win configuration**' option from '**Configure**' menu. The screen as shown in fig.3.5 is displayed.

**Configure ST-Win**

Speed Unit: kmph

TM Speed At Exer. Stop: 1.2 kmph

ST Level Lead In Summary: I

Long Lead In Reports: V5

Screen Display Leads: I, II

Trend Report Leads: I, II, III

Stage Report Leads: V5, V5, V5, V5, V5, V5

Treadmill: Treadstar XP

COM Port for amplifier: COM1

Median update time in seconds: 1

Treadmill speed constant: 0.01745

Treadmill grade constant: -1.0627

Treadmill Slope: 0.0265675

☒ Advance stage

☐ Automatic printouts

☐ Set Trace-I lead same as AUTO Enlarged Median

☐ Automatic Printing Of Peak Exercise Linked Median Report

☐ In linked median report print long lead having maximum ST depressionn.

☐ Automatic Print Selected Median Report

☐ Change Paper Orientation to LandScape

Stage Report Protocol

Advance ...

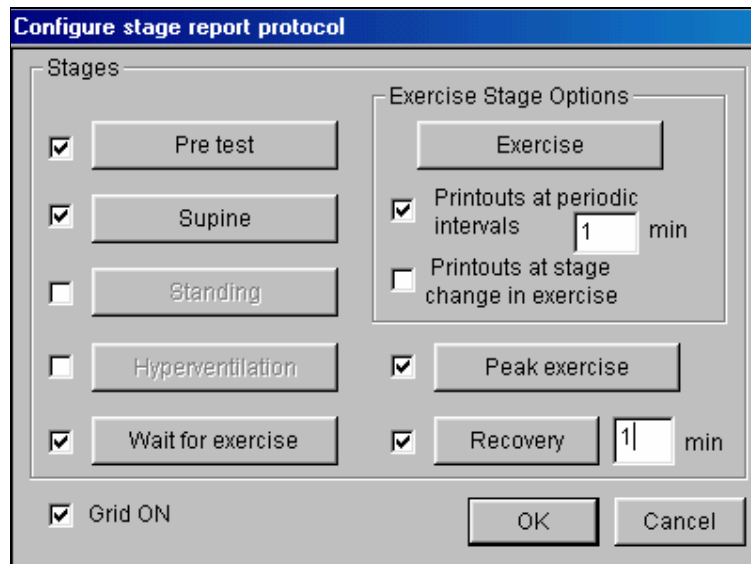
OK

Cancel

**Fig.3.5: ST-Win configuration program.**

1. Select the speed unit for treadmill to '**Kilometers per hours**' or '**Miles per hours**' as per the requirement of Treadmill.
2. Configure treadmill speed at exercise stop to '**1.2 kmph**' or '**Slow-0 kmph**' or '**Fast-0 kmph**' as per the requirements.
3. To configure '**ST level lead in the summary report**', select the required lead from the 12 leads dropdown list box. ST level lead of the selected lead is displayed in the Summary report.
4. To Configure Trace1 and Trace2 leads on acquisition screen, select required '**Screen display leads**' leads from list of 12 leads.
5. To configure leads for printing ST Slope, ST Level and J-Amplitude trends, select required '**Trend report leads**' from list of 12 leads.
6. **Stage report leads.** This option has 6 drop down boxes. User can select the required leads from the list. This will select the lead for printing.
7. Select '**Treadmill**' from the list box, to interface with software. The options available are '**Compact**', '**Trackmaster**', '**Treadstar**' and '**Treadstar XP**'

8. Select the '**COM port**' as COM 1, COM 2 COM 3, COM 4, COM 5, COM 6 to which Stress test amplifier is connected.
9. **Median update time in seconds** this option is provide for setting the time to update the median. Select the required time to update the medians from the dropdown box.
10. Check the '**Advanced stage**' check box to have the facility of advancing to the next stages before completing the exercise stage as per the protocol.
11. Check the '**Automatic printouts**' option to print the report as per '**Stage report protocols**' while conducting the test.
12. To print linked median report automatically at peak exercise stage check '**Automatic printout of peak exercise linked median report**' takes the printout when peak exercise stage is over. Check the checkbox for automatic printouts of peak exercise linked median report.
13. To print selected median report automatically at review stage check '**Automatic print selected median report**' takes the printout when review button is pressed. Check the checkbox for automatic printouts of selected median report
14. Check the '**Set Trace-I lead same as AUTO Enlarge Median**' option to display Trace1 lead automatically same as enlarged median lead.
15. Check the "**Print lead having maximum ST depression as long lead in Linked Median Report**" option to print long lead with maximum ST depression in linked median report.
16. Check the "**Change Paper Orientation to Landscape**" option to print report in Landscape Orientation.
17. To set the protocol for online printouts click the '**Stage report protocol**' button.
  - A dialogue box as shown in above fig.3.6 is displayed on the screen.
  - Check the stages that you want to include in your protocol for printing. A dialog box shown in the fig. 3.7 below is displayed.
  - To configure printouts at defined interval in Exercise and Recovery stage, enter interval in text box. Click the check box of '**Grid ON**' to have the grid on the printouts.



**Configure stage report protocol**

Stages

- ☒ Pre test
- ☒ Supine
- ☐ Standing
- ☐ Hyperventilation
- ☒ Wait for exercise

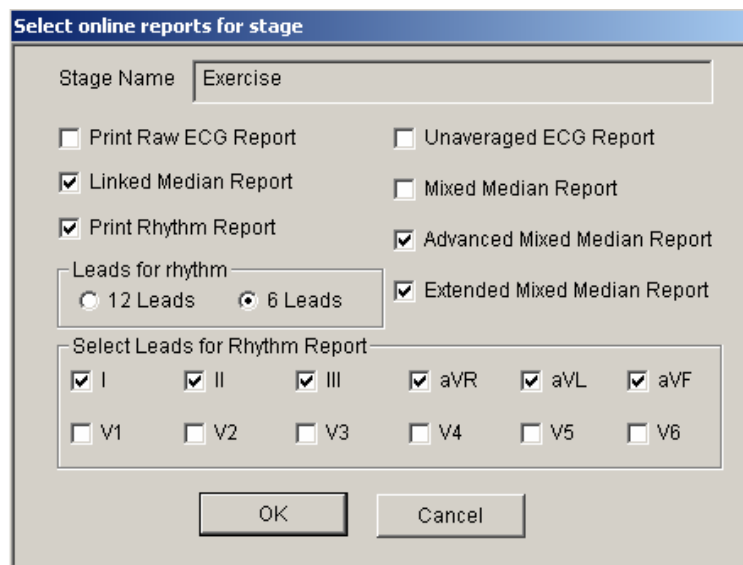
Exercise Stage Options

- ☒ Exercise
  - ☒ Printouts at periodic intervals  min
  - ☐ Printouts at stage change in exercise
- ☒ Peak exercise
- ☒ Recovery  min

☒ Grid ON

OK Cancel

**Fig.3.6: Stage report protocol creator.**



**Select online reports for stage**

Stage Name

- ☐ Print Raw ECG Report
- ☒ Linked Median Report
- ☒ Print Rhythm Report
- ☐ Unaveraged ECG Report
- ☐ Mixed Median Report
- ☒ Advanced Mixed Median Report
- ☒ Extended Mixed Median Report

Leads for rhythm

☐ 12 Leads ☒ 6 Leads

Select Leads for Rhythm Report

- ☒ I ☒ II ☒ III ☒ aVR ☒ aVL ☒ aVF
- ☐ V1 ☐ V2 ☐ V3 ☐ V4 ☐ V5 ☐ V6

OK Cancel

**Fig 3.7 Select online report stages**

- Enter interval time in text box to configure printouts at defined interval in Exercise and Recovery stage.
- Click the check box of '**Grid ON**' to have the grid on the printouts.
- Press the '**OK**' button to '**save and exit**' the protocol settings.
- Press the '**Cancel**' button to exit without saving.

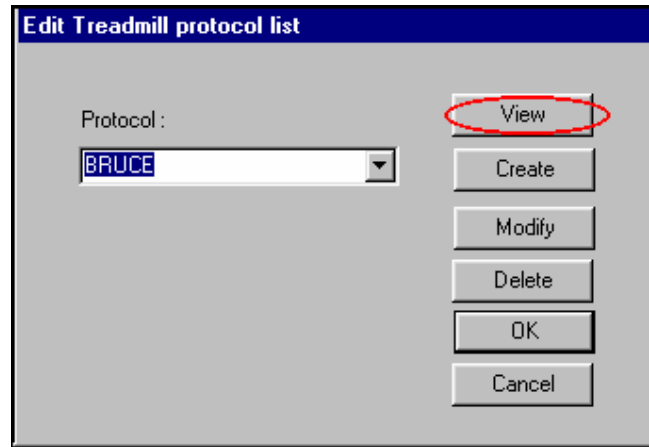
15. Advance button is having the constant generated by calibrating the treadmill. Only Nasan service engineer can execute it.

16. At the right corner the constants of the selected treadmill are visible.

17. Click "**OK**" button of the ST-Win configuration program to save the settings you have made.

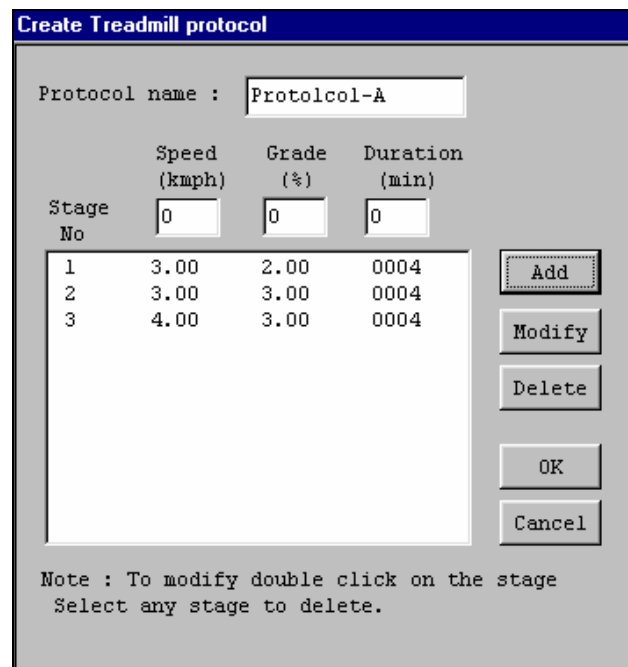
## 5. Treadmill protocol -

Some standard protocols are pre-configured in the software. But if Doctor wants to use protocol other than the standard one, select '**Treadmill protocol**' option from '**Configure**' menu. A dialogue box as shown in fig .3.10 is displayed on the screen.



**Fig.3.10: Treadmill protocol list.**

1. Standard protocols are not to be modified. But the user can have a view over them by selecting a particular protocol from the dropdown list and pressing the '**View**' button.
2. To add new protocol, press '**Create**' button. A dialogue box as shown in figure 3.11 is displayed.



**Fig. 3.11: Treadmill protocol creator.**

3. Enter protocol name in the text box, speed and grade in the respective text boxes. To add this contains in the protocol press '**Add**' button.
4. To delete the stage, select the required stage number from the '**Stage no.**' list and press '**Delete**' button

5. To modify the stage double click the '**Stage no.**' to be modified, the stage contents will appear in the text boxes.
6. After editing the stage, press '**Modify**' button.
7. Press '**OK**' to save the change and exit.
8. Press '**Cancel**' to exit without saving.
9. To modify the user defined protocol; select the protocol name from the list and click '**Modify**' button. A dialogue box shown in fig.3.10 is displayed filled with contents of existing protocol. Make the require changes and press '**Modify**' button. Press '**OK**' button after doing required modifications.
10. For deleting any protocol from the list, select the protocol you want to delete and press the '**Delete**' button. Selected protocol is deleted after confirmation.
11. Press '**OK**' to save the change and exit.
12. Press '**Cancel**' to exit without saving.

## 6. Printing details-

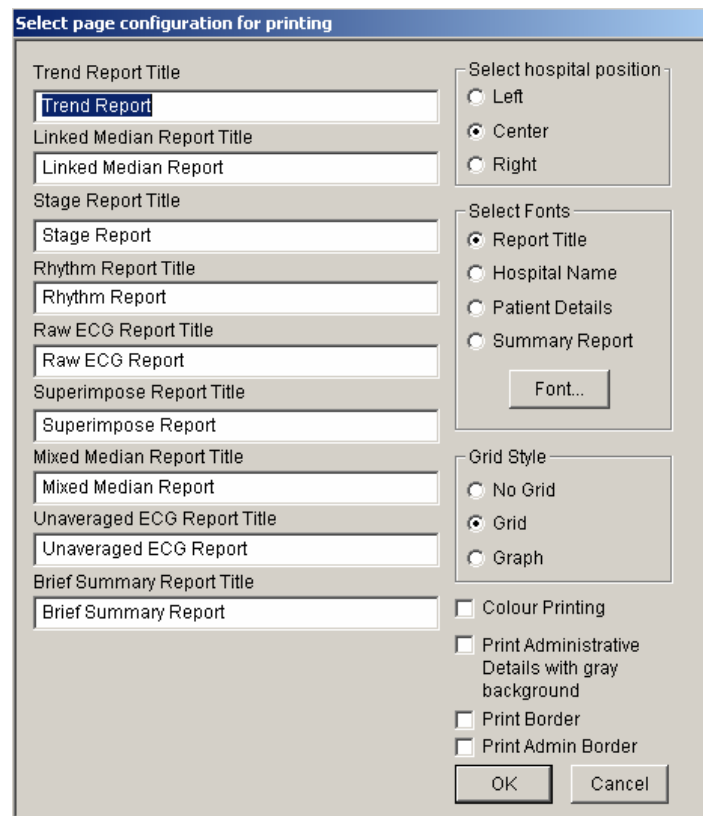
To have the printouts of the required report, printing details option is provided. This configuration is used while printing the reports with the require titles, fonts and their sizes and alignments. You can set following details-

- Report title.
- Report title alignment (either center right or left of the page).
- Fonts for report title, hospital name, Patient details and Summary report.
- Grid type.
- Color or black and white printing.
- Administrative details with gray background.
- Print borders for the printouts.

For this purpose select the '**Printing Details**' option from '**Configure**' menu.

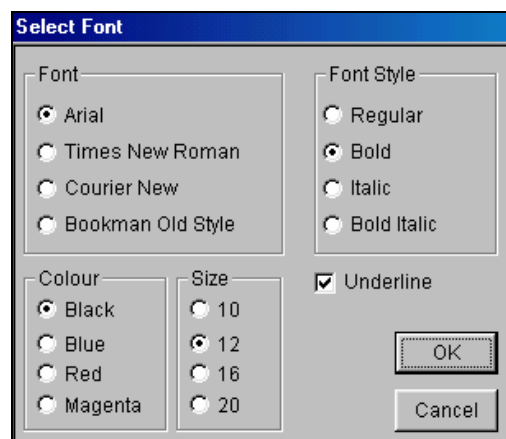
A dialog box as shown in fig 3.12 is displayed.





**Figure 3.12: Print page details.**

- To set the font, click the '**Font**' button. A dialog box as shown in fig.3.13 will appear where you can configure
  - Font,
  - Font color,
  - Font style,
  - Font size,
  - Underline the text.



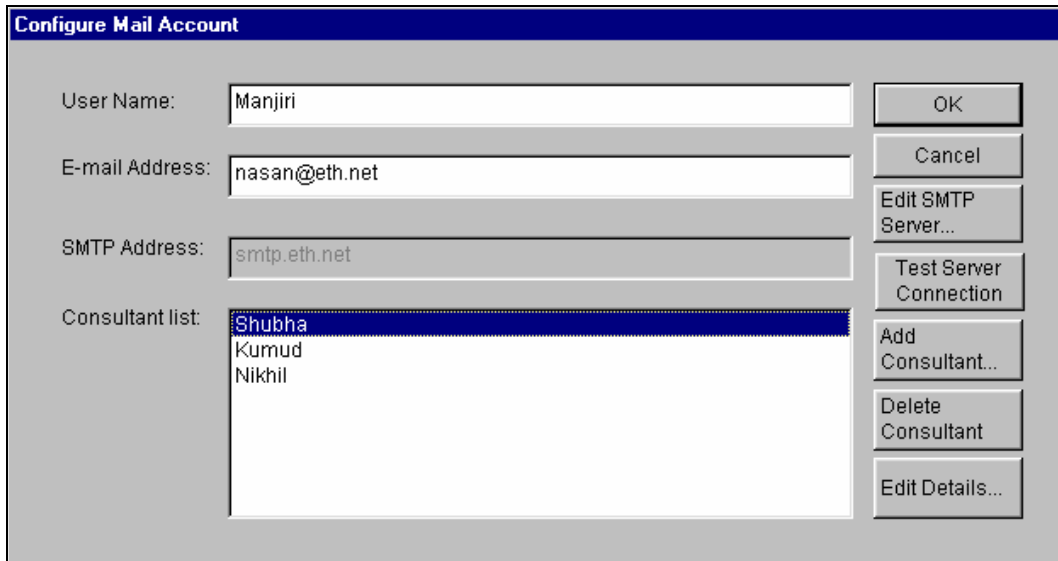
**Fig.3.13: Select font.**

- Press '**OK**' to save the settings and exit.

- Press '**Cancel**' to exit without saving.

## 7. Mail account details-

The software has a facility of mailing the marked pages to consultant. To configure the mail addresses of the consultant doctors go to '**Configure**' menu and select the '**Mail account details**' option. The screen displayed in the figure 3.14 will appear on the screen.



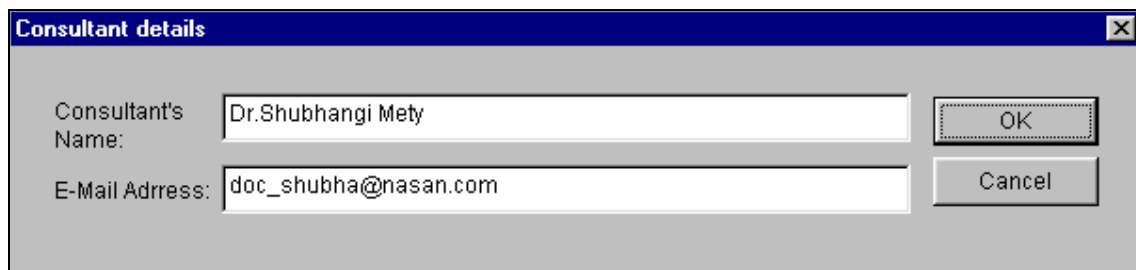
The 'Configure Mail Account' dialog box is shown. It has a title bar 'Configure Mail Account'. The fields are: User Name: Manjiri, E-mail Address: nasan@eth.net, SMTP Address: smtp.eth.net. The Consultant list is a list box containing 'Shubha', 'Kumud', and 'Nikhil', with 'Shubha' selected. On the right side, there are buttons: OK, Cancel, Edit SMTP Server..., Test Server Connection, Add Consultant..., Delete Consultant, and Edit Details...

**Fig. 3.14: Configure mail account.**

This dialog box contains the configuration of the consultant doctors. Enter the senders name in User name field and Senders E-mail Address in E-mail Address filed. SMTP Address is the SMTP address of the user's mail account. SMTP addresses of some mail accounts are given in "**Help**" menu.

To test the server connection press "**Test server connection**" button. This will give you the message whether the server connection is working or not.

To add Consultant in the consultant list click '**Add Consultant**' button. The dialog box as shown in the fig 3.15 will appear on the screen.



The 'Consultant details' dialog box is shown. It has a title bar 'Consultant details'. The fields are: Consultant's Name: Dr.Shubhangi Mety, E-Mail Address: doc\_shubha@nasan.com. On the right side, there are buttons: OK and Cancel.

**Fig.3.15: Consultant details.**

Enter the consultant doctor's name and also his/her E-mail Address. The doctor name will get displayed in the list. This list is displayed while sending the reports.

**Delete Consultant:**

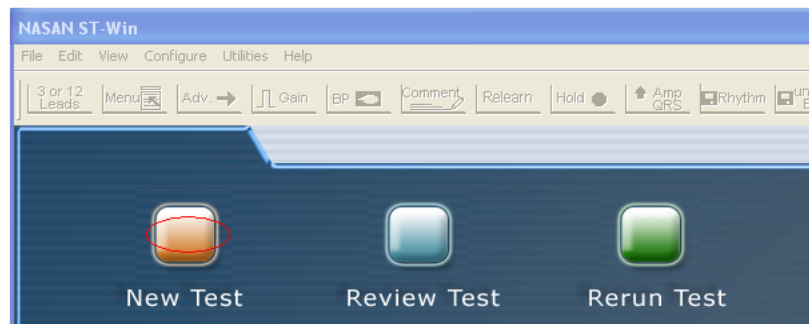
Select the referrer from the referrer's list and press the '**Delete Consultant**' button. The selected name will get deleted from the list of the referrer after confirmation.

**Edit details:**

To edit the details of the Consultant choose the referrer from the list and click '**Edit details**' button or double click on the Consultant's name. This will display the display the dialog box to change the Name and the e-mail ID of the referrer.

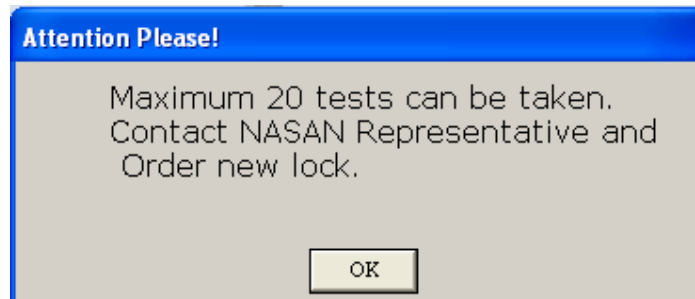
## 4. Conducting a test

For live test, connect hardware lock to USB port of PC. If hardware lock drivers are not installed automatically then install it from ST Win Recharge CD. Double click on 'ST Win Recharge' icon on the desktop. To start a new test for a patient, click on the '**New Test**' button present on screen or go to '**File**' menu and select '**New test**' option.

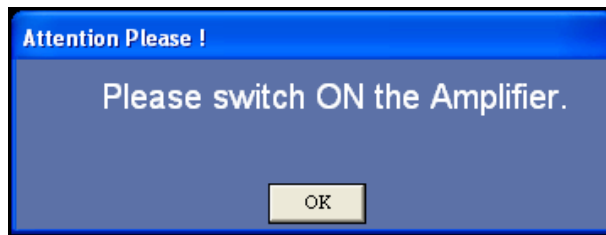


**Fig.4.1 Idle screen**

Following message box will be displayed on idle screen when last twenty tests are remains.



Click 'OK' button. 'Please switch ON the amplifier' message box is displayed on the screen.



Click 'OK' button. Following patient information dialog box as shown in fig. 4.2 is displayed for entering the patient details.

**Enter patient details**

Patient Id:

Patient Name\*:  Age\*:

Height(cm):  Weight (kg):  Sex: ☒ M ☐ F Target HR:

Address:

TM Protocol:  ☐ Manual Protocol

Doctor Name:  ...

Designation:

Referred By:  ...

Medication:

Brief History:

OK Cancel

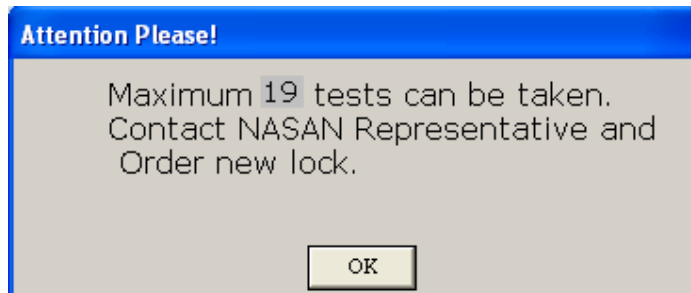
**Fig. 4.2: Patient information.**

1. Check the '**Manual Protocol**' check box to implement the manual protocol in the test.

2. Editable target HR facility is given in patient detail dialog box.

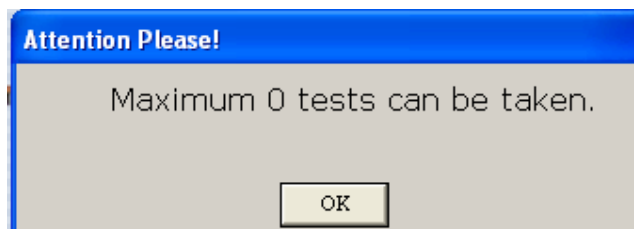
After entering the details press "**OK**" button. An acquisition screen is displayed as shown in fig 4.3.

After completing this test select again 'New Test' option for next test and then following message box will be displayed on idle screen which will display the remaining no of tests.



When all tests are over then if you select 'New Test' or 'Rerun test' option from 'File' menu or from idle screen. Following message box will be displayed on idle screen.

Maximum 0 tests means no more test can be taken.





**Fig. 4.3: Acquisition screen.**

You will see following details on Acquisition screen

- Tool bar at the top of screen.
- 12 Leads medians
- 12 running ECG traces of 12 sec.
- All the parameters like gain, Start time, Phase time, ST auto, 80 ms Post J, ST Level, ST slope, HR, QRS Detection lead, Blood pressure, Stage, Protocol name, Protocol stage, Speed, Grade, Mets.
- Beep is sound on every detected QRS. To set QRS beep ON or OFF, press F7 key, QRS beep status is toggled. Bell symbol on screen indicates the ON/OFF status of QRS beep.

Tool bar at the top of the screen have following controls-

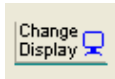
- 1. Change Display**
- 2. Menu.**
- 3. Adv (Advanced stage).**
- 4. Gain.**

- 5. BP.
- 6. Comments.
- 7. Relearn.
- 8. Hold.
- 9. Rhythm.
- 10. Un-avg ECG (Un-averaged ECG).
- 11. Amp QRS (Amplify QRS).
- 12. Raw ECG.
- 13. Linked Medians.
- 14. Long lead
- 15. Stop Test.



**Fig: 4.4 Tool bar.**

### **1. Change Display**



Use this menu to toggle 3 and 12 lead display mode. Press '**Change Display**' to view the all 12 leads median traces on the screen, 3 lead ECG with a single Enlarged Basal medians shown in fig 4.5. Drop down buttons at the left bottom corner are available to change the leads on this screens. Click '**Change Display**' button to go back to 12 lead display mode.

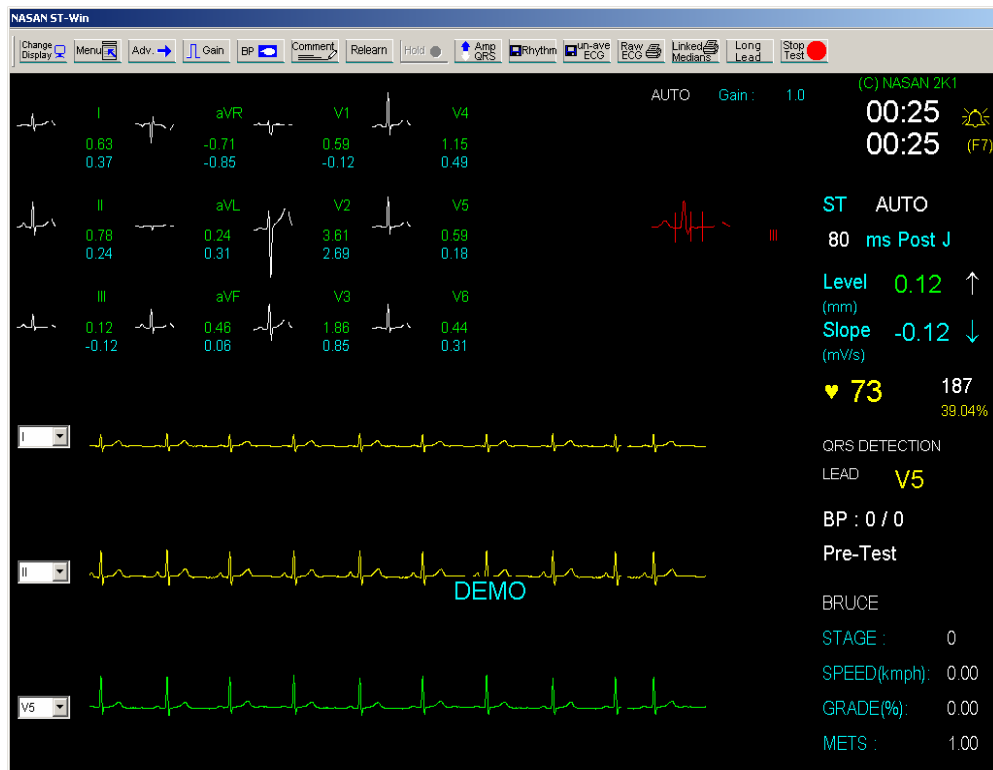


Fig 4.5 3 lead acquisition.

## 2. Menu



If 'Menu' button is pressed on 3 leads display mode the control panel as shown in fig 4.6



Fig: 4.6 Menu bar.

- To select the changed median display lead manually. The caption of 'Manual Median' button changes to 'Auto Median'. Click "Change Median" button to select next lead. Click "Auto Median" button to automatically select enlarged median lead same as the lead having minimum ST level.

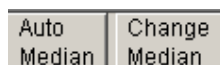


Fig 4.7

- To change the position of E, J, Post J points, press the 'Manual points' button. Three buttons named E-Point, J-Point, Post J Point gets enabled on the menu bar as seen in the fig 4.8

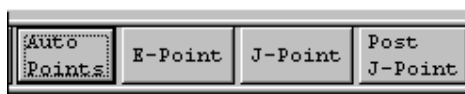
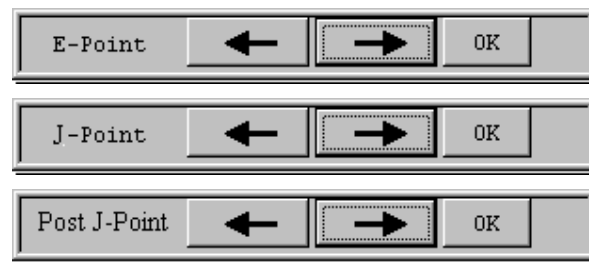


Fig 4.8

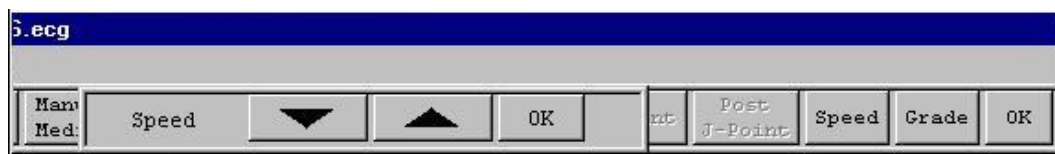


- Press '**E-point**' button to change the position of E-point to left or right press the '<-' or '->' button as shown in fig 4.9 respectively. Similarly press J-point and Post J-point button to change the position of J-point and post J-point respectively.



**Fig 4.9**

- In all stage user can increase or decrease the '**Speed**' and '**Grade**' of the treadmill. Press '**Speed**' or '**Grade**' button to change the speed and grade of the treadmill. Speed and Grade can be varied up to first stage of BRUCE protocol using up and down arrow keys as shown in figure 4.10.



**Fig.4.10: Speed.**

By pressing the arrow buttons doctor can increase or decrease the speed and grade of the treadmill.

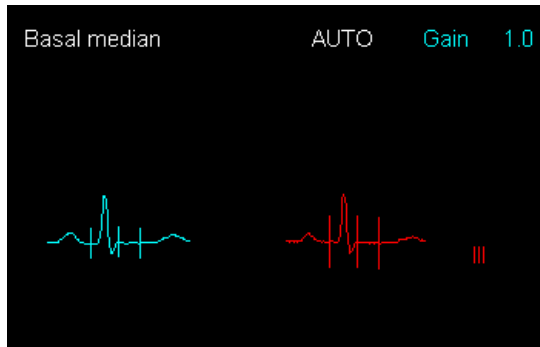
If '**Menu**' button is pressed on 3 lead display mode the control panel as shown on fig4.11 is displayed.



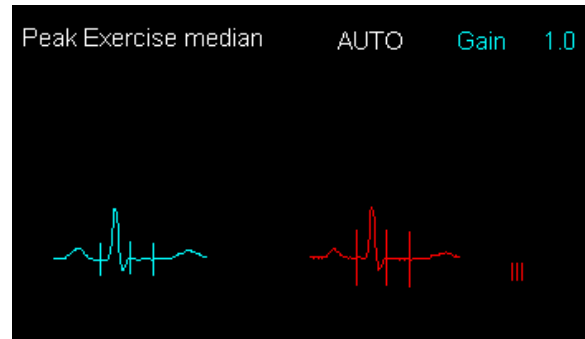
**Fig 4.11: Menu bar.**

- To zoom the medians while acquisition, select the zoom factor to which you want to zoom the medians.
- Pressing the Move button present on the tool bar can separate the basal median and the current stage median. Two arrow buttons will be displayed. Press these buttons to move the medians.
- Move button provide the facility to move the current median from the basal median in exercise stages and 12 lead ECG screen.
- Press '**OK**' button to go back to main tool bar by saving the changes done in the positions of the points.
- When the test reaches to recovery stage '**Peak median**' button gets enabled in menu option, which is visible in 3 lead acquisition screen only. This button provides

the facility to compare the current median with the basal median or peak exercise median.



**Fig 4.12: Basal median**



**Fig 4.13: Peak exercise median.**



- If the Filter ON /OFF facility is required by the user only then FILTER button is visible on the menu bar. Using **Filter ON** or **Filter OFF** buttons the user can select the filtered or non-filtered ECG.

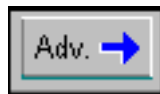


Click this to switch ON filter

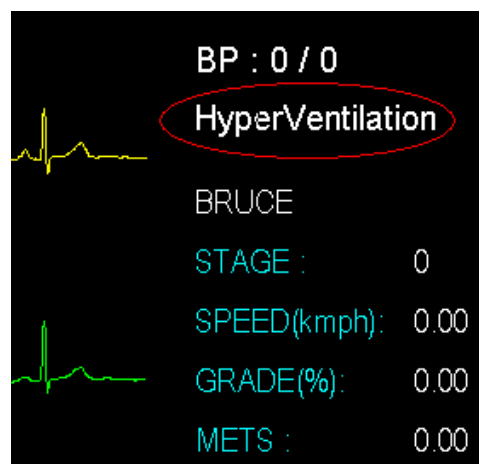


Click this to switch OFF filter

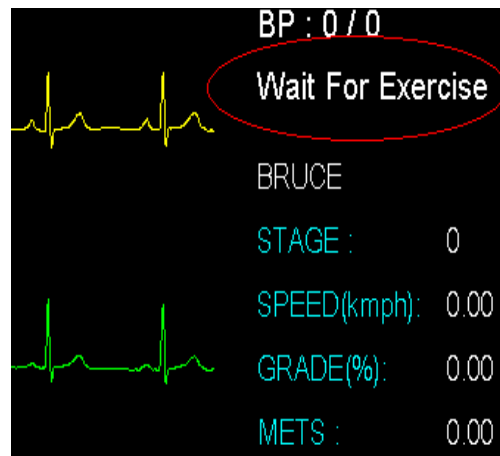
### **3. Adv (Advanced stage)**



Press 'Adv' button to go to the next stage. The advanced stage button is used when you want to switch over from present stage to next stage according to the protocol as shown in fig 4.14 & 4.15.

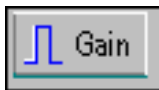


**Fig 4.14 Before Advance stage button is pressed**



**Fig 4.15 After Advance stage button is pressed**

#### 4. Gain



Press the '**Gain**' button to change the gain of the traces. Press the gain button, the gain value toggles between 0.5, 1.0 and 2.0. Current gain value is displayed on right corner of the screen as shown in fig. 4.16. ECG traces and median are drawn with new value of gain.



**Fig 4.16: Increased gain.**

## 5. BP



You can enter the BP of the patient when the test is going on by pressing the '**BP**' button as shown in fig 4.17. Fifty Seconds before end of each exercise stage, this BP entry dialog box is automatically shown to enter the BP.

A rectangular dialog box with a grey border. It contains two input fields. The first is labeled 'Systolic' and contains the number '120'. The second is labeled 'Diastolic' and contains the number '82'. To the right of these fields is an 'OK' button.

**Fig.4.17 BP dialog box.**

## 6. Comments

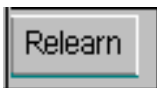


When the '**Comment**' button is pressed, a text box is displayed as shown in fig.4.18 .You can enter comments at every stage. Press '**OK**' button to save the comments and '**Cancel**' button to exit.

A rectangular dialog box with a grey border. It contains a text input field with the text 'Arrhythmia detected'. To the right of the field are two buttons: 'OK' and 'Cancel'.

**Fig: 4.18 Comment box.**

## 7. Relearn



If there is noise on ECG traces because of loose electrode or some other reason, median calculations go wrong. Press electrode; wait till traces get stabled and then press '**Relearn**' button to recalculate the medians and heart rate

## 8. Hold



Press '**Hold**' button to hold the exercise stage while acquisition. When this button is pressed the present stage duration gets increased until release button is pressed.

## 9. Release



Release button takes place of '**Hold**' button when a test is hold. It remains in its place until it is pressed to release the test. Then this '**Release**' button is pressed it changes to '**Hold**' button again.

## 10. Rhythm



Press '**Rhythm**' button to save 10 sec ECG of all leads. Saved Rhythms can be reviewed in Review

### 11. Un-Avg (Un-averaged ECG)



Press '**Un-avg ECG**' button to save 5 sec ECG of all leads. Saved Rhythms can be reviewed in Review.

### 12. Amp QRS (Amplify QRS)



In case of short R-waves heart rate calculations go wrong. Press '**Amp QRS**' button to amplify the QRS-lead for calculations (Display gain will not change).

### 13. Raw ECG



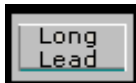
Press '**Raw ECG**' button to take printout of the raw ECG of that particular instance.

### 14. Linked Median



Press '**Linked Median**' button to take linked median printouts of that particular instance.

### 15. Long lead



Press Long Lead button. Following menu with lead names will be displayed.



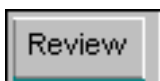
Select desired long lead. Selected lead will be printed in linked median report at the time of acquisition.

### 16. Stop Test



Press '**STOP Test**' button to stop the treadmill and also to stop the test. If '**STOP Test**' button is pressed before reaching the exercise stage, the test will not be saved. Short key "**F5**" is given to stop the test from keyboard.

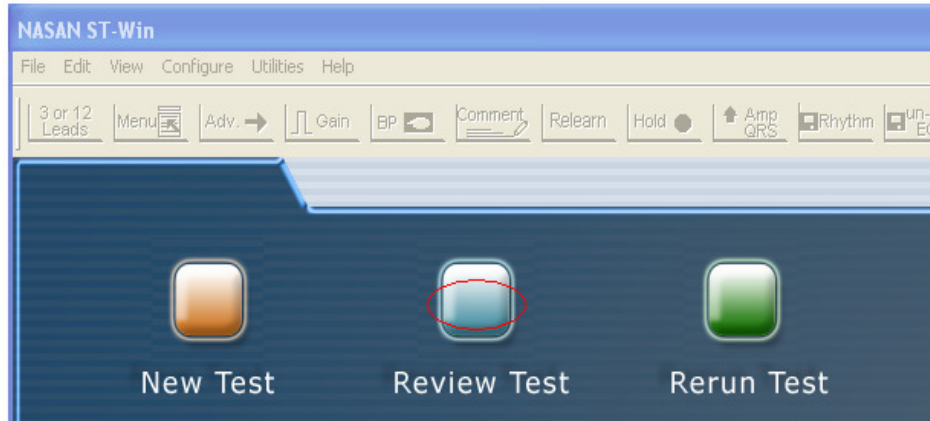
### 17. Review



When the test reaches the recovery stage '**Review**' button is displayed on the toolbar in place of '**STOP TM**' button. By pressing the '**Review**' button you can directly go to review screen by completing recovery state of the test.

## 5. Reviewing The Test-

To analyze the recorded data, select '**Review test**' from '**File**' menu or click on '**Review Test**' button on main screen. Refer (Figure 5.1).

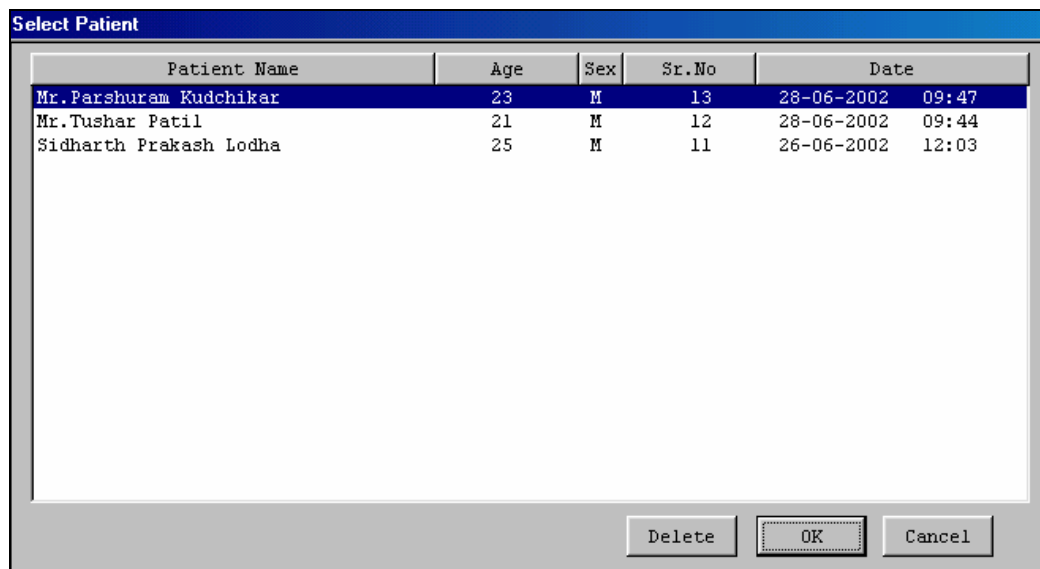


**Fig 5.1: Main screen.**

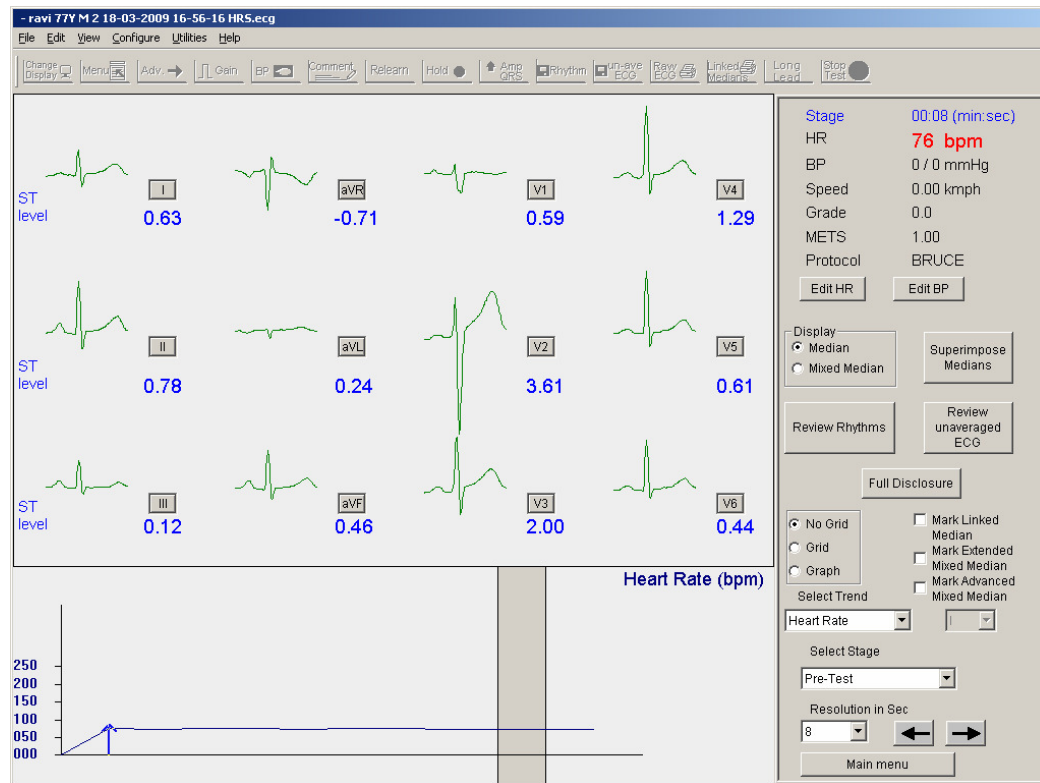
Patient list as shown in fig. 5.2 is displayed. Select the patient to review and press '**OK**' button. Review screen as shown in fig. 5.3 is displayed.

You can delete the test by selecting the patient from the list and pressing '**Delete**' button. The application ask for confirm action before deleting the test.

If you click on '**Patient name**' button then the patient files are sorted alphabetically. If you click on '**Age**' button then the patient files are sorted according ascending order according to age of the patient. Similarly you can sort the patient files according to sex, ID and date by clicking respective buttons.



**Fig 5.2: Patient Details.**



**Fig 5.3: Review screen.**

Review screen has the following details,

- Medians of all 12 leads with ST levels.
- Median buttons with lead names to display zoom medians.
- Heart rate trend.
- Review control panel.

Review control panel has following information on it,

- Cursor time in mm:hh format.
- Heart rate in bpm.
- Blood pressure in mmHg.
- Speed in kmph/mph.
- Grade in %.
- METS.
- Protocol name.

## **Review Control Panel**

### **1. Edit HR-**

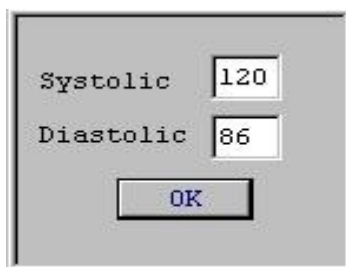


**Fig 5.4 Heart rate entry**

Press '**Edit HR**' button to enter the heart rate at current cursor position. Dialog box as shown in fig 5.4 is displayed. Enter new Heart rate and press ok to save. The heart rate trend is updated accordingly.

### **2. Edit BP-**

Use this button to edit the blood pressure at current cursor position on trend. Dialog box as shown in the figure 5.5 is displayed. Enter systolic and diastolic BP values and press OK to save values. BP trend is updated accordingly.

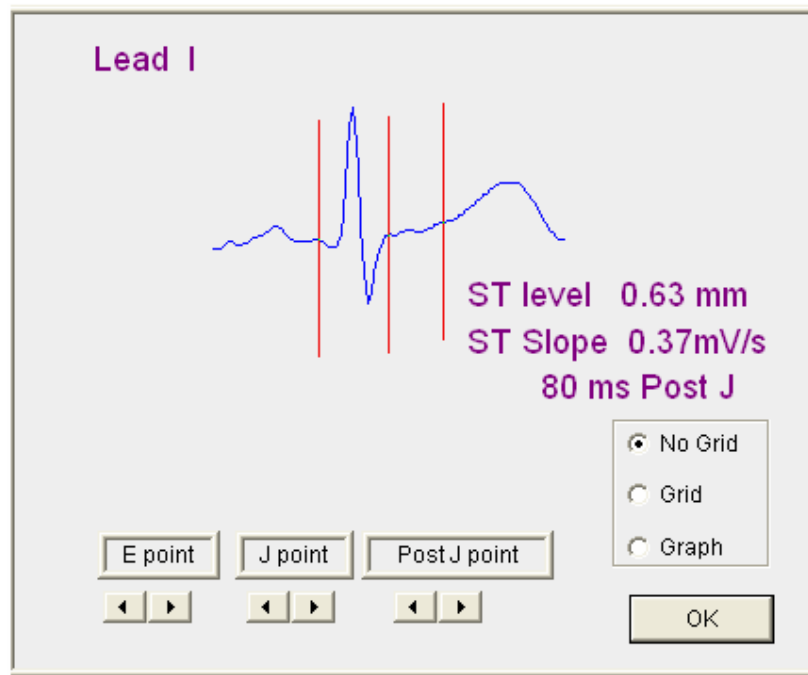


**Fig 5.5 Edit BP**

### **3. Zoom median-**

To view zoom medians and edit E, J and Post-J points, press lead name button adjacent to median. Dialog box as shown in fig 5.6 will appear on the screen. The pressed lead is enlarged and displayed.





**Fig 5.6: Zoom median.**

- E, J and post-J points can be edited using arrow keys on the screen.
- Click on the Grid or Graph or No Grid buttons to display the Grid or Graph or No Grid on the screen.
- Press OK to view medians screen.

#### **4. Mixed Median-**

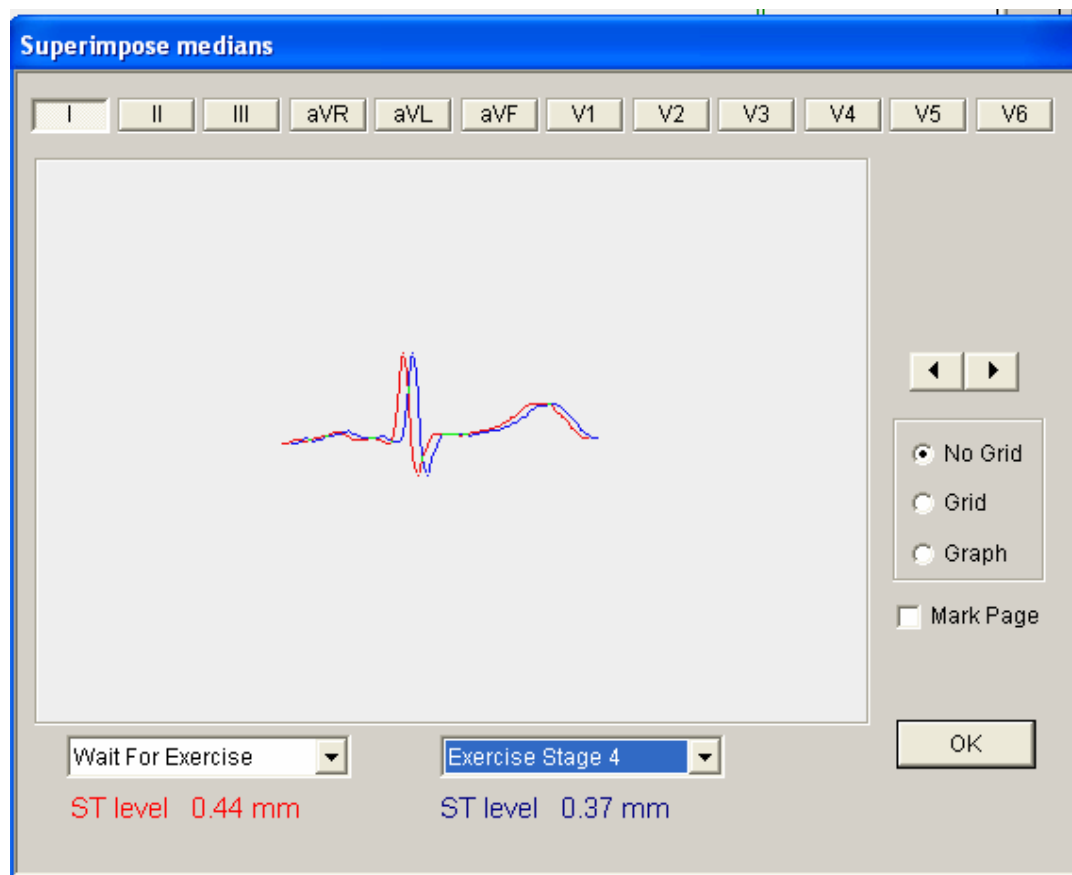
To view raw ECG with medians select '**Mixed median**' radio button, 2.5 seconds of ECG data of all 12 leads with medians at current cursor position is displayed. ST levels are display below lead names.



**Fig 5.7: Mixed median screen.**

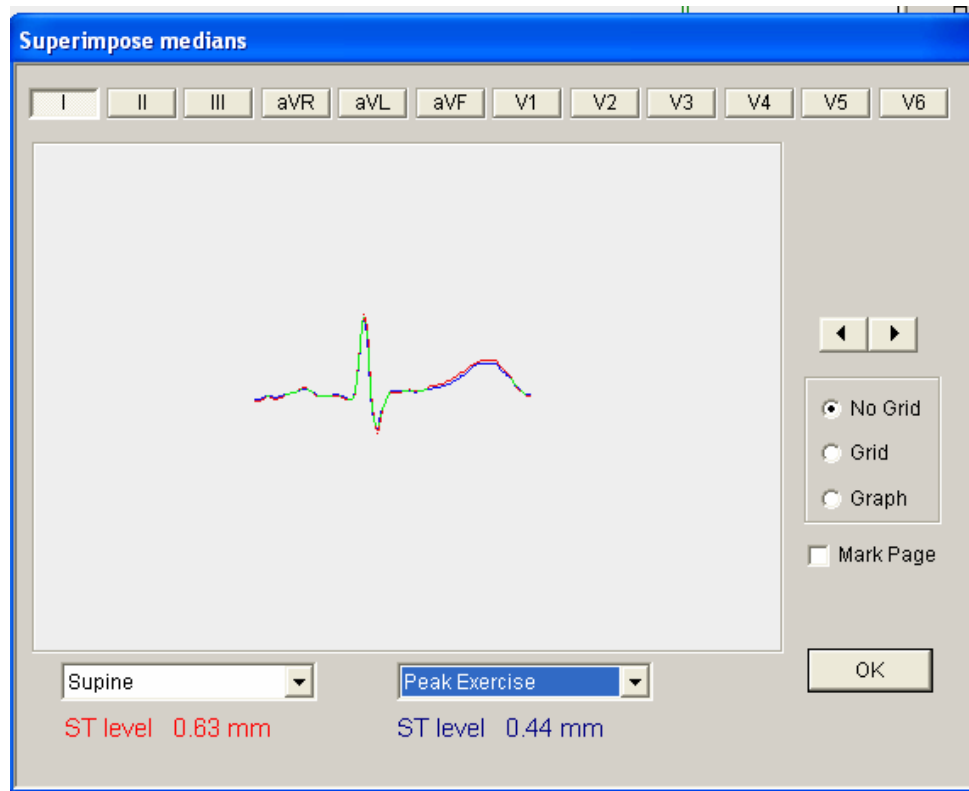
## 5. Superimpose median-

1. To compare the two medians of any stages, click '**Superimpose median**' button. Dialog box as shown in fig. 5.8 with 'wait for exercise' median on left and median at current cursor position on right is displayed.



**Fig.5.8: Superimposing the median.**

2. Two combo boxes at the bottom of superimpose median screen are provided to select medians of different stages for comparison. Median of any stage can be compared with any other stage.
3. Using left and right arrow keys, median on right side can be moved to left or right for exact superimposition and comparison. Refer fig. 5.8.
4. Check the check box named '**Mark Page**' to mark the current page for printing.
5. To view the grid or graph on the current screen click on the Grid or Graph buttons.
6. Press the spin button to move the right side median towards right or left for comparison.
7. The changed ECG is shown in the figure 5.9 below.



**Fig.5.9: Superimposed median.**

8. Press '**OK**' button to exit this screen and go to median screen.

## **6. Review Rhythm-**

Press '**Review Rhythms**' button to view the rhythms recorded while conducting the test. The screen is as shown in fig 5.10. This screen has following details,

- 12 leads ECG of 4 sec.
- Time in hrs and min. in the left corner of the screen.
- Heart rate of the patient at recorded time.

You can also select the time of recorded rhythms from the drop down time box to view rhythm stored while acquisition.

To view the ECG of any 6 lead press '**6Leads**' radio button. This will enable the lead panel. Select the leads by checking the boxes provided. The 6 lead screen as shown in the fig. 5.11. is displayed.

Click the '**Mark page**' check box to mark the page for printing.

Click on the Grid or Graph or No Grid buttons to display the Grid or Graph or No Grid on the screen.

Press "**OK**" button to return back to the main review screen.



**Fig.5.10: Review rhythm screen.**



**Fig.5.11: 6 Lead review rhythm.**

## 7. Unaveraged ECG-

To view unaveraged ECG recorded while conducting test, press '**Review unaveraged ECG**' button. Following screen is displayed as shown in the fig.5.12,



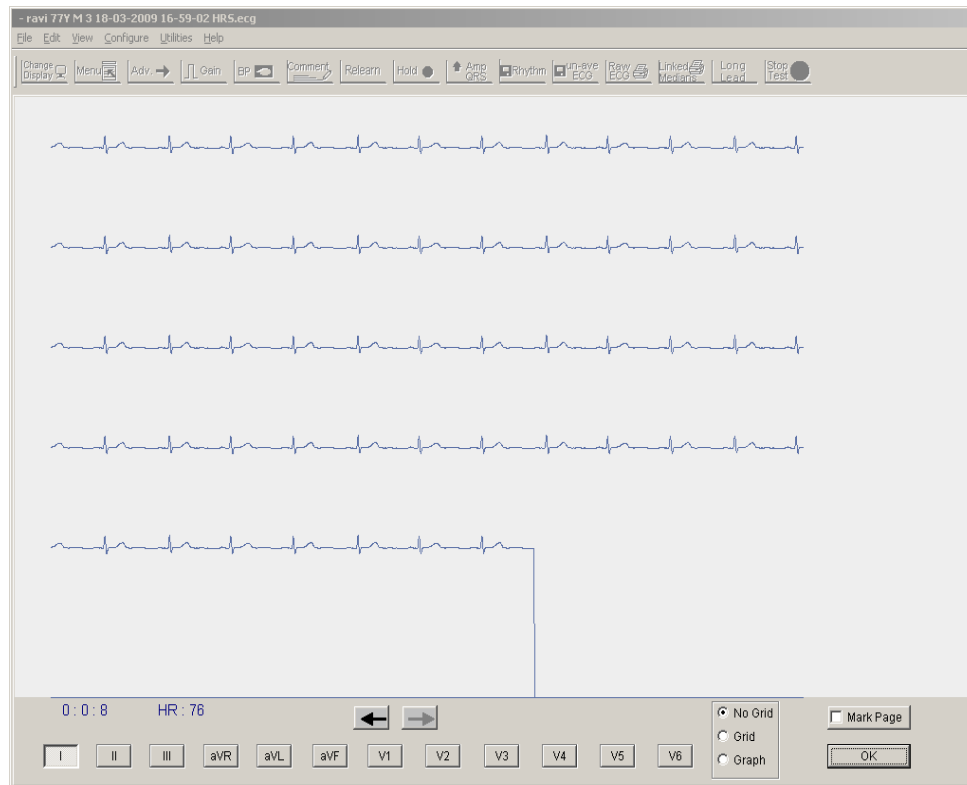
**Fig.5.12: Unaveraged ECG.**

This screen shows following details,

- Heart rate of that instance time.
- Time of recording unaveraged ECG.
- Click on the Grid or Graph or No Grid buttons to display the Grid or Graph or No Grid on the screen.
- Check '**Mark page**' check box to mark page for printing.
- Press '**OK**' to move back to go to the main review screen.

## 8. Full disclosure-

To view the ECG data of one minute at the current arrow cursor position of the heart rate trend, press '**Full disclosure**' button on Review control panel.



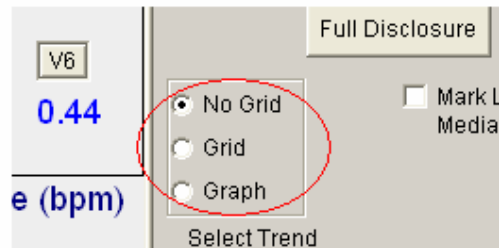
**Fig.5.13: Full disclosure.**

Full disclosure screen as shown in Figure 5.13, has have the following details,

- 12 buttons having the lead names. By clicking those buttons user can view the ECG of one min. of the selected lead.
- At the right corner of the screen information like **time in hrs and min, heart rate and the current stage** of that particular instance is displayed.
- Click on the Grid or Graph or No Grid buttons to display the Grid or Graph or No Grid on the screen.
- For marking the current page for printing check '**Mark Page**' check box.
- For viewing previous or next one min. data press left or right arrow buttons.
- Press '**OK**' to return back to main review screen.

## 9. Grid and graph

This check box is provided to view the medians with the grid or graph. It draws grid on medians if '**Median**' screen is selected or on mixed medians if '**Mixed Median**' screen is selected as shown in fig 5.14.



**Fig 5.14: Grid.**

#### **10. Mark Linked Median-**

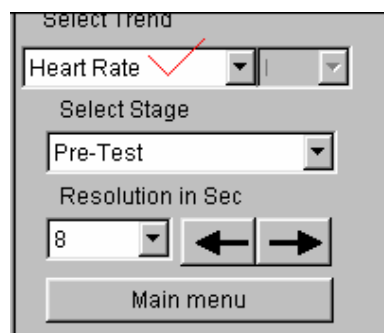
To have printouts of the Link Median at the current cursor position on trend, check '**Mark Linked Median**' check box.

#### **11. Mark Extended Mixed Median**

To have printouts of the Extended Mixed Median at the current cursor position on trend, check '**Extended Mixed Median report**' check box.

#### **12. Select trend-**

To view the different trends like ST slope, ST Level and J amplitude, Blood pressure, select the trend from the select trend drop down list present at the right corner as shown in fig 5.15.



**Fig: 5.15 Select trend.**

#### **13. Select stage-**

To view median at the end of different stages, select stage from '**Select stage**' combo box.

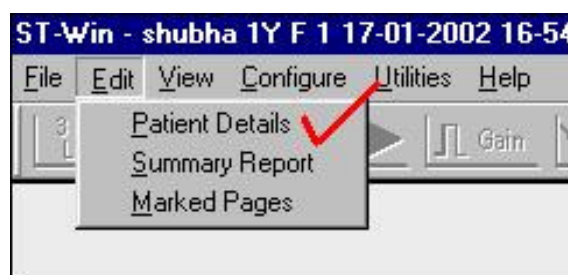
#### **14. Resolution in sec-**



To move the arrow cursor on the trend for viewing the medians or ECG of that particular instance, use the arrow buttons. User can select the step of arrow movement using '**Resolution in sec**' combo box. Resolution can be varied in steps of 8,16,32,48 and 56. the resolution selected for printing will also be selected for printing.

### **15. Edit Patient Details-**

For making any addition or deletion or any changes in patient details go to '**Edit**' menu and press '**Patient details**' option. A dialog box as shown in fig.5.17 is displayed on the screen.



**Fig.5.16: Edit menu.**

 A screenshot of the 'Enter patient details' dialog box. The title bar says 'Enter patient details'. The form contains several fields: 'Patient Id' (empty), 'Patient Name\*' (demo), 'Age\*' (30), 'Height(cm)' (0), 'Weight (kg)' (0), 'Sex' (radio buttons for M and F, with M selected), 'Target HR' (190), 'Address' (empty), 'Phone No' (empty), 'TM Protocol' (BRUCE, with a dropdown arrow), 'Manual Protocol' (checkbox, unchecked), 'Doctor Name' (Rupali, with a dropdown arrow and an ellipsis button), 'Designation' (M.D.), 'Referred By' (Not Applicable, with a dropdown arrow and an ellipsis button), 'Medication' (empty text area), and 'Brief History' (empty text area). At the bottom right, there are 'OK' and 'Cancel' buttons.

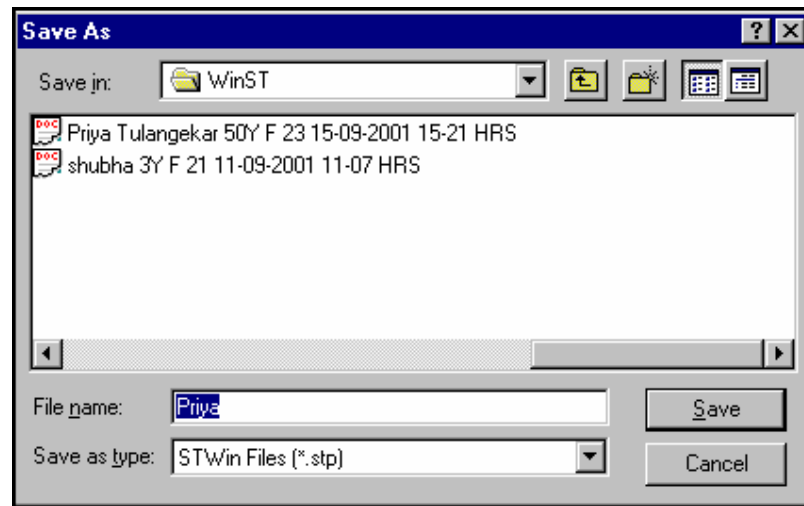
**Fig.5.17: Patient detail dialogue box.**

You are able do required changes. Press '**OK**' button to save the changes.

### **16. Save test for back up-**

You can save the test for backup with the help of '**Save test for back up**' option from '**File**' menu. The test can be saved on the hard disk for later referring purpose. On clicking this option the screen as shown in fig 5.18 is displayed.

Select the folder in which you want to save the test, edit the name of the test and press the '**Save**' button to save.



**Fig.5.18: Save test.**

#### **17. Main menu-**

To go back to main screen, press '**Main menu**' button.

## 6. Printing reports-

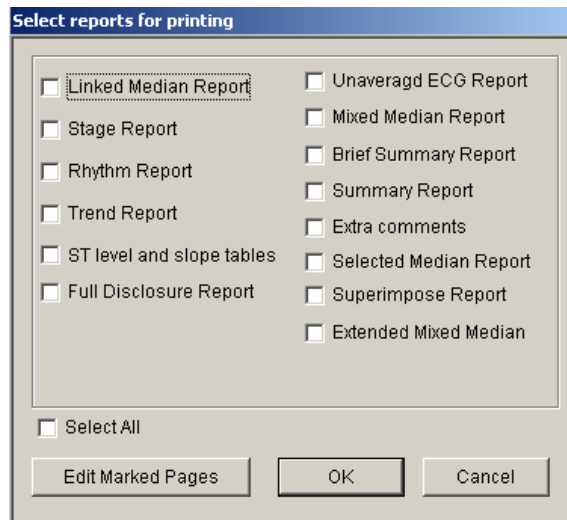
### 1. Print setup-

For setting the properties of the printer go to '**File**' menu and then select '**Printer setup**' option.

- Set following properties for the printer
  1. Landscape Mode
  2. Print quality to '**BEST**'
  3. Page size to 'A4'.
- To set the printer-
  1. Go to Windows "**Start**" menu.
  2. Select "**control Panel**" option.
  3. Control Panel window will open.
  4. Double click on "**Printer and Faxes**" option.
  5. Right click on the printer icon and select '**Properties**' option.

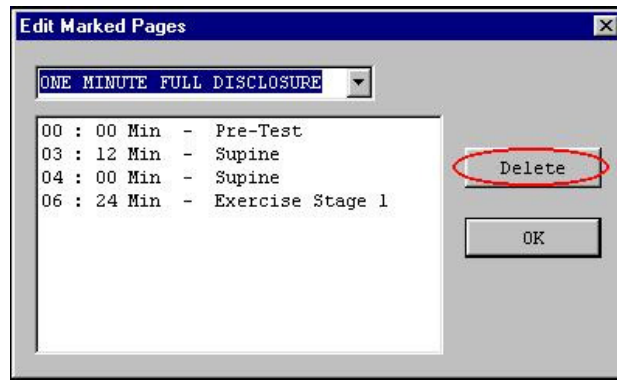
### 2. Print-

To have the printout of the marked pages, click on '**Print**' option from the '**File Menu**' while reviewing the patient data. A dialog box as shown in fig 6.1. is displayed. Select the reports to be printed by checking the respective check boxes. When '**Select All**' check box is checked, all the marked pages of all reports will be selected for printing.



**Fig.6.1: Print report selector.**

- To edit the pages in the report press '**Edit marked pages**' button. Dialog box as shown in the fig 6.2 will appear on the screen.



**Fig: 6.2 Edit Marked pages.**

Select the report title from the drop down list view the marked pages of selected report.

To delete the page, select the page from list and click on '**Delete**' button. The page is deleted after confirmation.

Press '**OK**' to start printing the reports.

### **Printing Summary Report-**

For editing the Summary report, go to the '**Edit**' menu and click '**Summary Report**' option.

- The patient detail dialog box is displayed you can change the patient details as shown in fig.5.17.
- Press the '**OK**' button to view tabular summary report as shown in fig.6.3.  
In his report, stage time, speed and grade of the treadmill, Heart rate in bpm, Blood pressure in mm/Hg., Rate pressure product (R.P.P.), METS, ST level and stage comment of all stages in test are displayed.

Tabular summary report								
Stage Name	Phase Time	Speed / Grade (kmph) / (%)	HR (bpm)	BP (mmHg)	R.P.P	METS	ST Level (I)	Stage Comments
Pre-Test	00:06	0.0 / 0.0	0	0 / 0	0	1.00	0.00	
Supine	00:11	0.0 / 0.0	76	0 / 0	0	1.00	0.63	
Standing	00:17	0.0 / 0.0	74	0 / 0	0	1.00	0.63	
HyperVentilation	00:22	0.0 / 0.0	74	0 / 0	0	1.00	0.63	
Wait For Exercise	00:28	0.0 / 0.0	73	0 / 0	0	1.00	0.63	
Exercise Stage 1	03:00	2.7 / 10.0	75	0 / 0	0	5.70	0.20	
Exercise Stage 2	06:00	4.0 / 12.0	72	0 / 0	0	8.00	0.15	
Exercise Stage 3	09:00	5.5 / 14.0	72	0 / 0	0	10.60	0.10	
Exercise Stage 4	12:00	6.8 / 16.0	72	0 / 0	0	14.30	0.07	
Exercise Stage 5	15:00	8.1 / 18.0	76	0 / 0	0	16.60	0.10	
Exercise Stage 6	18:00	8.9 / 20.0	73	0 / 0	0	18.90	0.12	
Peak Exercise	21:00	9.7 / 22.0	72	0 / 0	0	18.90	0.10	
Recovery 1	01:00	1.2 / 0.0	73	0 / 0	0	1.00	0.12	

\* Double click on stage to modify the Stage Comment

Back OK

**Fig: 6.3 Tabular summary report.**

- In the comment list, the comments entered while acquisition of the test, are displayed. If any comment is suppose to be enter or changed, double click on the stage. A dialog box as shown in the fig 6.4 will appear on the screen. Enter the comment or change the comment and press '**OK**' button to save the comment.

Stage Comment :

OK

Cancel

**Fig: 6.4 Stage comment.**

- Click ok to view summary report options dialog box as shown in fig. 6.5. The dialog box contents the information like
  - Total exercise time.
  - Distance covered. Maximum BP: Max Systolic and diastolic values recorded during the test.
  - Maximum heart rate recorded in the test.
  - Maximum workload recorded in the test.

**Select summary report options**

Total Exercise Time (hh:mm:ss)	0:10:27	Systolic	Diastolic	Maximum HR	192 bpm	
Distance Covered	0.77 Km	Maximum BP	132	112	Maximum WorkLoad	13

Object Of Test	Chest pain diagnosis	Exercise Tolerance	Good
Risk Factor	High stress job	Exercise Induced Arrhythmias	No
Activity	Very active	Haemodynamic Response	Flat
Other Investigations	Chest / 2D echo	Chronotropic Response	Normal
Reason For Termination	Fall of BP and chest pain		

Back OK Cancel

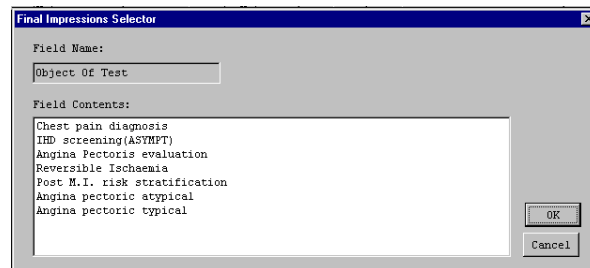
**Fig 6.5: Select summary report option.**

Along with following buttons,

- Object of Test.
- Risk factor.
- Activity.
- Other Investigation.
- Reason for termination.
- Exercise Tolerance.
- Exercise Induced arrhythmias.
- Haemodynamic response.
- Chronotropic response.
- Test conclusion.

### **To select the Object of Test**

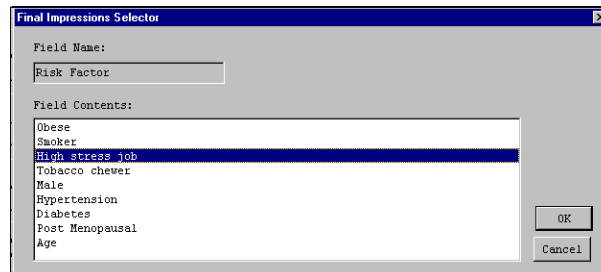
To add the purpose of conducting the test, press '**Object of Test**' button. The '**Final impression selector**' as shown in fig.6.6 is displayed. Select the object of test from the list given and click on '**OK**' button. Multiple selections are allowed. Your object of test will be included in '**Select summary report option**' dialog box. You can also edit the your own sentences in the text box.



**Fig 6.6: Final impression selector.**

### **To select the Risk Factor-**

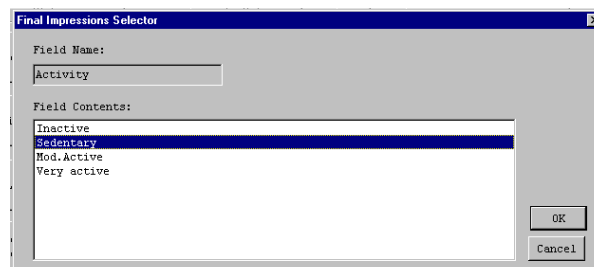
Similarly select the risk factor of the patient by pressing '**Risk Factor**' button. Screen as shown in fig. 6.7 is displayed. Select the appropriate option by clicking on the option and then press '**OK**' button.



**Fig 6.7: Risk factors.**

### **To select Activities-**

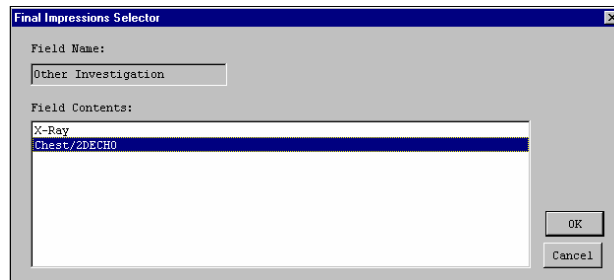
Press '**Activity**' button to add the patient activity in summary report. Select the required parameters and click '**OK**' button.



**Fig 6.8: Activity.**

### **To select other Investigation-**

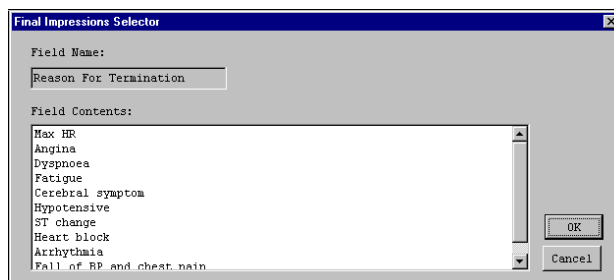
To keep the information about the previous investigations conducted like X-ray etc. before stress test, press the '**Other Investigation**' button the screen as shown in fig 6.9 is displayed, select the option and click on '**OK**' button.



**Fig 6.9: Other investigation.**

### **To select the reason for termination-**

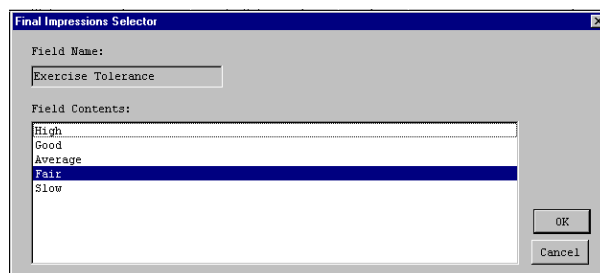
Press '**Reason for termination**' button to include the reasons of terminating the test. You can select the reason from the list as shown in fig.6.10 such as heart block, Max HR etc.



**Fig 6.10: Reason for termination of test.**

### **To select exercise tolerance-**

You can also include the exercise tolerance factor by press '**Exercise Tolerance**' button. This is shown in the fig 6.11. Select the tolerance from the list and press '**OK**' button.

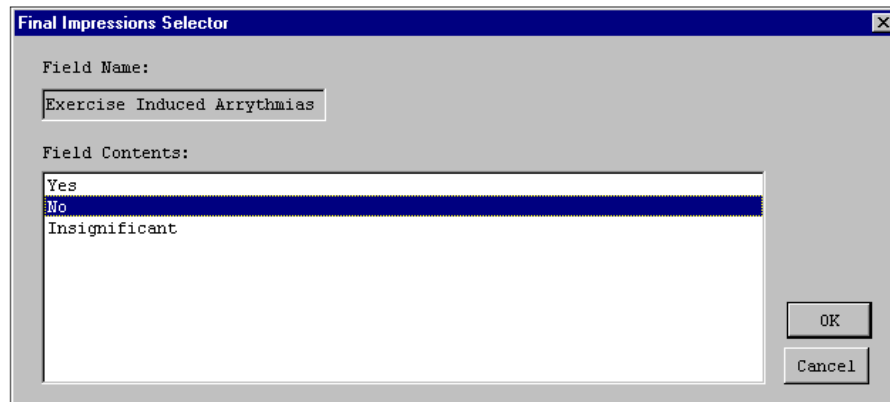


**Fig 6.11: Exercise tolerance.**



### **To select exercise induced arrhythmia-**

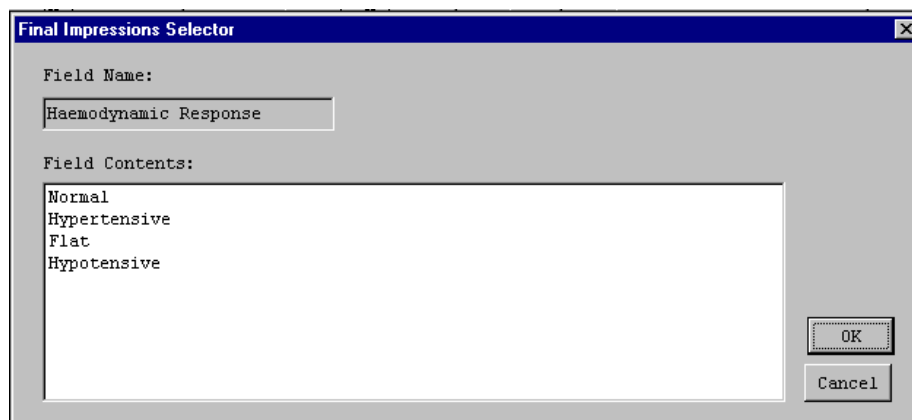
Press the '**Exercise induced arrhythmia**' button to save the information of induced arrhythmia. You can select the option from the list given as shown in fig 6.12 to include in the summary report.



**Fig 6.12: Exercise induced arrhythmia.**

### **To select Haemodynamic Response-**

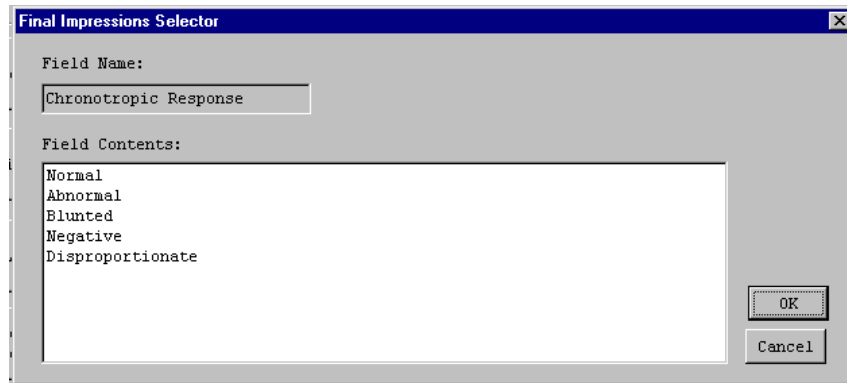
Press '**Haemodynamic response**' button to select the Haemodynamic response of the patient and to include it into the summary report as shown in fig 6.13. Select the response by clicking the response by the mouse. The response gets added in the summary report.



**Fig 6.13: Haemodynamic response.**

### **To select chronotropic response-**

Press '**Chronotropic response**' button to select the Chronotropic response of the patient and to include it into the summary report as shown in fig 6.14.

A dialog box titled "Final Impressions Selector" with a close button (X) in the top right corner. It contains two sections: "Field Name:" with a text box containing "Chronotropic Response", and "Field Contents:" with a list box containing the following items: Normal, Abnormal, Blunted, Negative, and Disproportionate. At the bottom right, there are two buttons: "OK" and "Cancel".

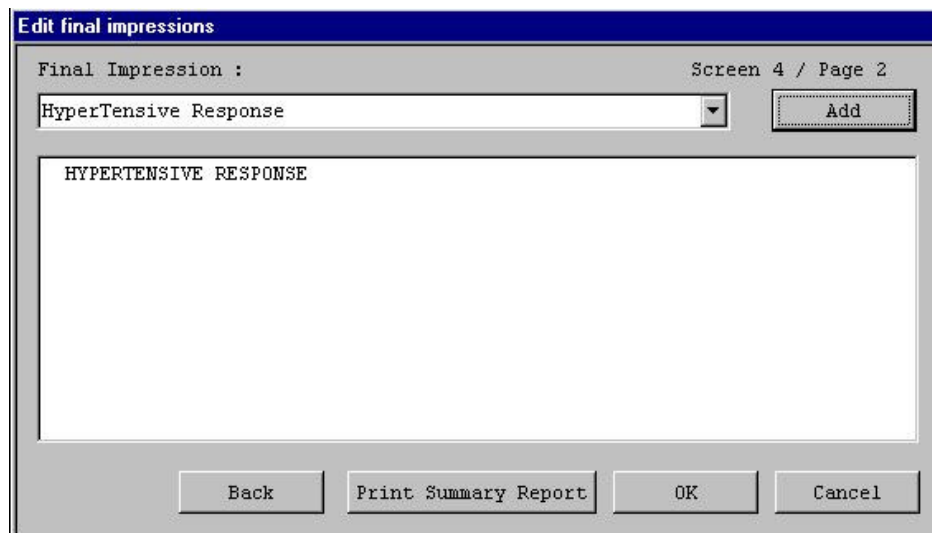
**Fig 6.14: Chronotropic response.**

### **Final Impression-**

After selecting all the details from the '**Select summary report option**' press '**OK**' button to save the selections.

When you press '**OK**' button, the dialog box as shown in fig.6.15 is displayed with '**Print Summary Report**', '**OK**', '**Back**' and '**Cancel**' button.

Press '**Print Summary Report**' if you want to print the summary report with all the details entered up till now. Enter the Final impression by selecting the option from the list present at the top of the dialog box and press '**Add**' button. Press '**Back**' button to go to previous stage.

A dialog box titled "Edit final impressions" with a close button (X) in the top right corner. It contains a section "Final Impression :" with a dropdown menu showing "HyperTensive Response" and a button labeled "Add". Below this is a large text area containing the text "HYPERTENSIVE RESPONSE". At the bottom, there are four buttons: "Back", "Print Summary Report", "OK", and "Cancel". In the top right corner, it says "Screen 4 / Page 2".

**Fig 6.15: Edit Final impression.**

When you press the '**OK**' button next option, ST-Level table will appear on the screen, as shown in fig. 6.16.

### **ST Table-**

This dialog box shows ST-Level of entire stages of all leads for the test, along with the '**Print**', '**Show ST-Slope Table**', '**Back**' and '**OK**' button. You can take the printout of the ST-Level table by clicking the '**Print**' button. Press '**OK**' button to move to next screen.

ST Tables												
ST Level Table:												
Stage \ Lead	I	II	III	aVR	aVL	aVF	V1	V2	V3	V4	V5	V6
Pre-Test	0.54	1.37	0.83	-0.93	-0.17	1.07	0.46	2.88	2.71	1.78	1.61	0.90
Supine	0.81	1.59	0.56	-1.12	0.07	1.05	0.42	3.05	2.54	1.76	1.49	0.98
Standing	0.78	1.59	0.68	-1.10	0.05	1.07	0.37	3.08	2.59	1.78	1.49	0.98
HyperVentilation	0.78	1.59	0.68	-1.10	0.05	1.07	0.37	3.08	2.59	1.78	1.49	0.98
Wait For Exercise	0.78	1.59	0.68	-1.10	0.05	1.07	0.37	3.08	2.59	1.78	1.49	0.98
Exercise Stage 1	1.73	2.20	0.49	-1.98	0.61	1.27	0.32	4.13	3.52	2.86	2.37	1.88
Exercise Stage 2	1.37	1.47	-0.10	-1.47	0.73	0.71	0.27	5.10	4.59	3.76	3.22	1.98
Exercise Stage 3	2.08	1.61	-0.46	-1.73	1.25	0.63	0.66	5.64	4.86	3.71	2.78	1.86
Peak Exercise	2.12	1.32	-0.88	-1.71	1.51	0.29	0.56	5.49	4.96	4.10	3.03	1.71
Recovery 1	2.59	5.40	2.74	-3.98	-0.10	4.10	1.20	7.59	7.45	6.20	5.23	3.86
Recovery 3	1.51	2.30	0.83	-1.90	0.32	1.61	0.71	6.18	5.54	3.88	2.91	1.83
Recovery 6	0.98	1.20	0.20	-1.05	0.39	0.68	0.56	3.39	2.54	1.83	1.37	0.90

Second page
Back
Print
Show STSlope
OK

**Fig 6.16: ST-Level.**

To view the ST-Slope of different stages press '**Show Slope**' button. The screen as shown in the fig 6.17 will appear.

ST Tables												
ST Slope Table:												
Stage\Lead	I	II	III	aVR	aVL	aVF	V1	V2	V3	V4	V5	V6
Pre-Test	0.24	0.61	0.31	-0.73	-0.18	0.43	0.18	2.08	1.71	1.16	1.16	0.49
Supine	0.85	0.61	-0.43	-1.04	0.18	0.18	0.06	2.20	1.71	1.16	0.98	0.85
Standing	0.67	0.73	-0.43	-0.85	0.06	0.18	0.00	2.26	1.89	1.28	0.98	0.85
HyperVentilation	0.67	0.73	-0.43	-0.85	0.06	0.18	0.00	2.26	1.89	1.28	0.98	0.85
Wait For Exercise	0.67	0.73	-0.43	-0.85	0.06	0.18	0.00	2.26	1.89	1.28	0.98	0.85
Exercise Stage 1	1.10	1.53	0.43	-2.69	0.37	1.10	-0.31	2.87	2.50	2.14	1.77	1.47
Exercise Stage 2	0.85	1.22	0.12	-2.81	0.24	0.67	-0.73	2.93	2.75	2.81	2.01	1.47
Exercise Stage 3	1.65	2.01	0.43	-3.66	0.61	1.34	0.06	4.52	4.27	3.11	2.81	1.89
Peak Exercise	2.38	1.89	-0.98	-2.81	0.85	0.37	0.37	5.49	5.01	4.33	3.79	2.32
Recovery 1	0.43	3.48	2.81	-5.98	-1.28	3.36	0.61	-0.31	-0.37	0.12	0.55	1.65
Recovery 3	1.04	1.53	0.67	-3.05	0.31	0.98	0.85	4.82	4.46	3.11	2.26	1.34
Recovery 6	0.85	1.22	0.00	-1.59	0.43	0.73	0.37	3.66	2.81	2.08	1.53	1.04

**Fig 6.17: ST-slope table.**

To view the '**Extra comment**' dialog box click on '**OK**' button of '**ST Slope**' dialog box. You can enter your additional comment as shown in fig 6.18. to have a print out, press '**Print**' button at the bottom. Press '**Back**' button to go 1 step backward. Press '**OK**' button to save the changes.

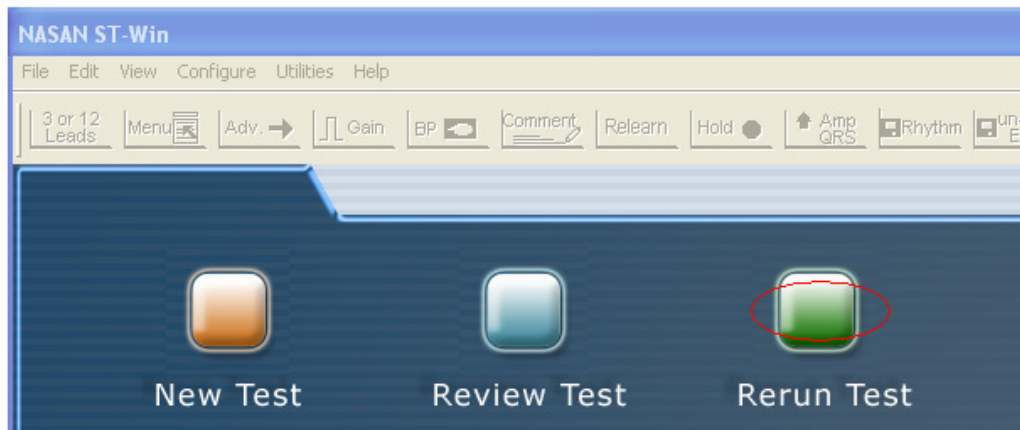
Enter extra comments

ARRHYTHMIA DETECTED IN THE TEST.

**Fig 6.18: Extra comments.**

## 7. Rerun test-

If the test was unfortunately terminated by power failure or any other reason press the '**Rerun test**' button on the main menu screen or select '**Rerun test**' option from '**File**' menu. It is demonstrated in the fig 7.1



**Fig. 7.1: Main screen.**

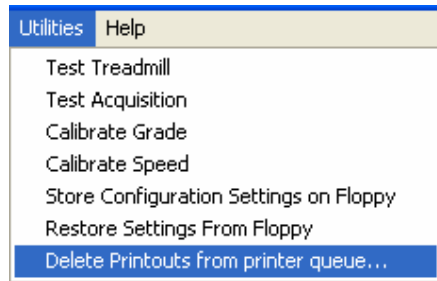
Patient details dialog box with previously filled details of the patient is displayed. Press '**OK**' button to start same test again from first stage i.e. Pre test.

## 8. Utilities-

---

Go to '**Utilities**' menu to do the following connecting work,

- Test treadmill.
- Test acquisition.
- Calibration grade.
- Calibration speed.
- Store configuration of settings on floppy.
- Restore settings from floppy.
- Delete Printouts from printer queue...



**Fig 8.1: Utilities.**

### **Test treadmill**

For testing the Speed and Grade of the treadmill select the '**Test treadmill**' option from '**Utilities**' option. A dialog box is displayed as shown in fig.8.2 with speed and grade buttons. User can test the treadmill by increasing / decreasing the speed and grade buttons by pressing the arrow button seen on the dialog box.



**Fig 8.2: Treadmill tester.**

### **Test acquisition**

'**Test acquisition**' is used to test the connectivity between the amplifier and PC port. When you click on '**Test acquisition**' option the message will come "**Please switch ON the amplifier.**" In case of any loose contact or other problem, error message "**The hardware unit is not working properly**" is displayed.

➤ **Calibrate grade**

For calibrating the grade of the treadmill go to the '**Utility**' menu and press '**Calibrate grade**' option. A dialog box will appear on the screen as shown in the fig 8.3.



**Fig 8.3**

1. When the treadmill reaches to it's maximum elevation press '**OK**' button. When '**OK**' button is pressed treadmill starts moving down and following message as shown in fig 8.4 is displayed.



**Fig 8.4**

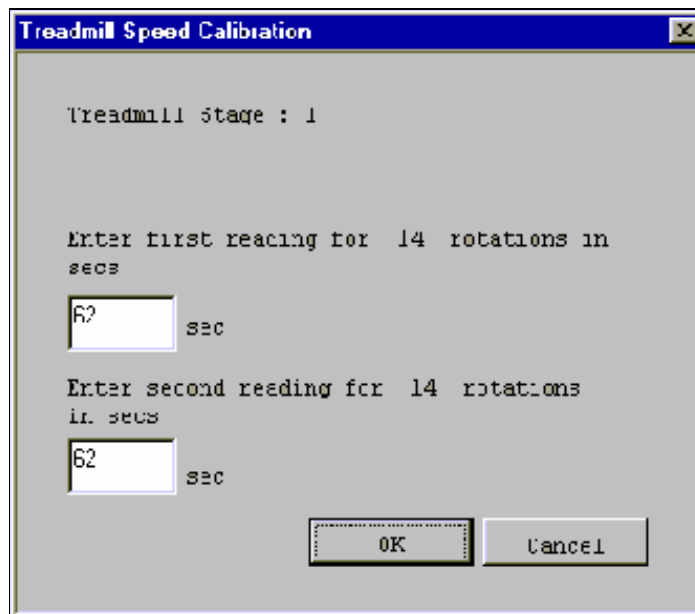
2. After the treadmill reaches its minimum elevation press '**OK**' button. When '**OK**' is pressed calibration constants for grade are calibrated and stored. These calibration constants are displayed in ST-Win configuration dialog box.
3. If an error is detected this message appear on the screen,



**Fig 8.5**

➤ **Calibrate speed**

For calibrating the speed of the treadmill go to '**Utility**' menu and select '**Calibrate speed**' option. This will display the dialog box as shown in the figure 8.6 below. Count the number of seconds for 14 rotations and enter the number in the edit box. Do this for one more time and enter the count in the second edit box. Press '**OK**' button to move to next stage of the protocol.



**Fig.8.6: Treadmill speed calibration.**

Above explained process will be carried out upto 7 stages of BRUCE protocol. At the end of 7<sup>th</sup> stage, speed calibration constants are calculated and saved. These constants are displayed in ST-Win configuration dialog box.

➤ **Store configuration settings on floppy.**

Settings done using configure menu option or through '**Configure system**' button on Installation dialog box can be stored on a floppy. For this purpose go to '**Utility**' menu and select the option '**Store configuration of setting on floppy**'. All the setting will be copied to floppy.

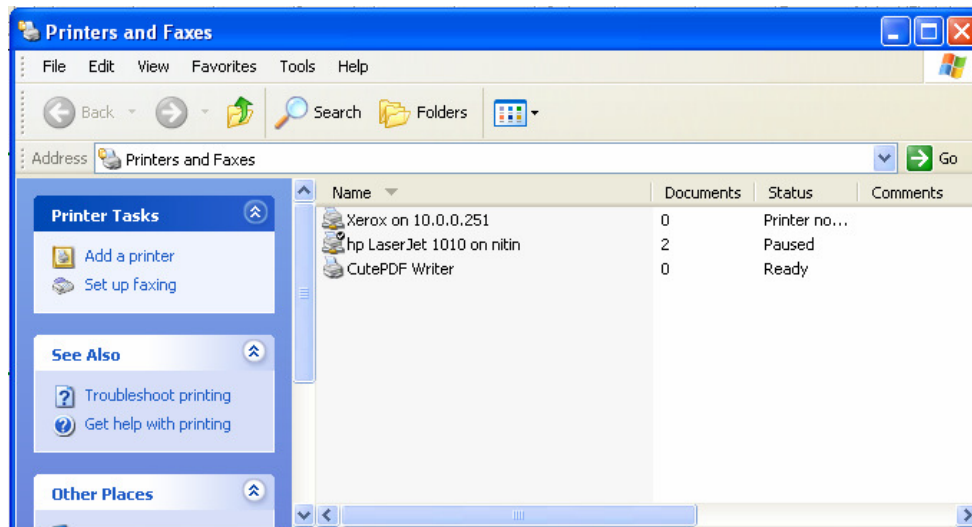
➤ **Restore settings from the floppy.**

Choose this option from '**Utility**' menu to install the setting saved on the floppy. When pressed this button, setting stored in the floppy are restored in the newly installed software.

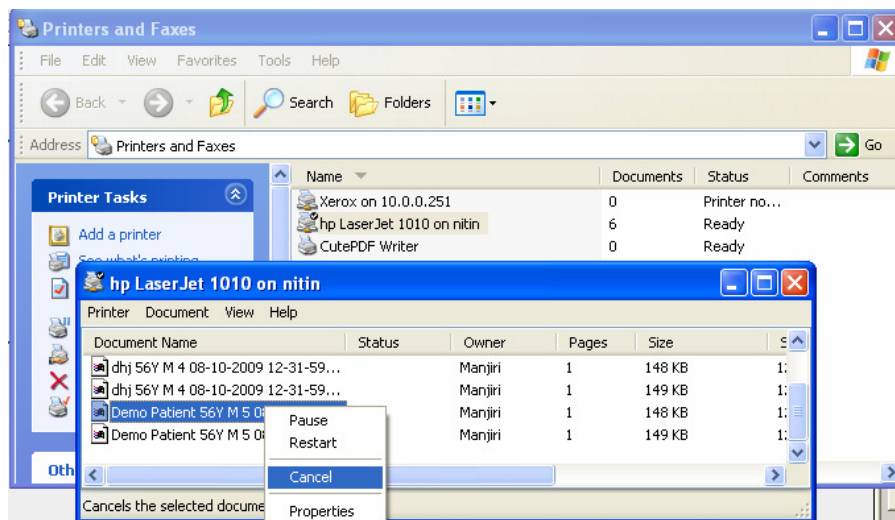


➤ **Delete printouts from printer queue ...**

To delete printouts from printer queue go to Utility and select **'Delete printouts from printer queue. '**option. Following **'Printer and Fax'** dialog box will be displayed.



Select the printer which is connected to ST win unit and double click on it. Following dialog box will be displayed.



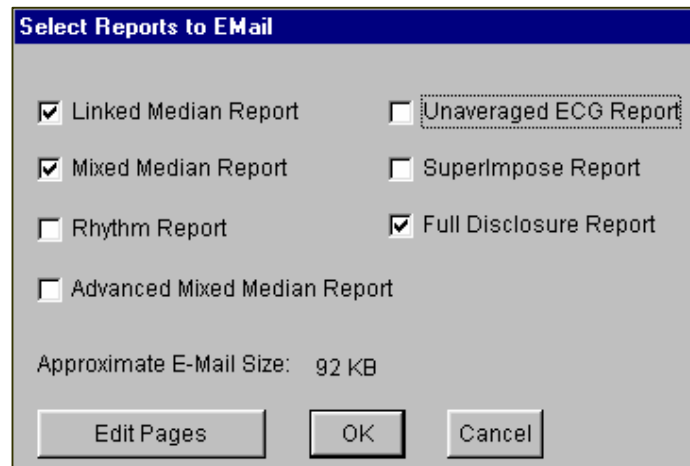
It will display that documents stucked in the queue and if those documents in the queue are not required then right click on it and select 'cancel' option as shown in above figure. It will delete the documents in queue.

## 9. Enhanced features-

---

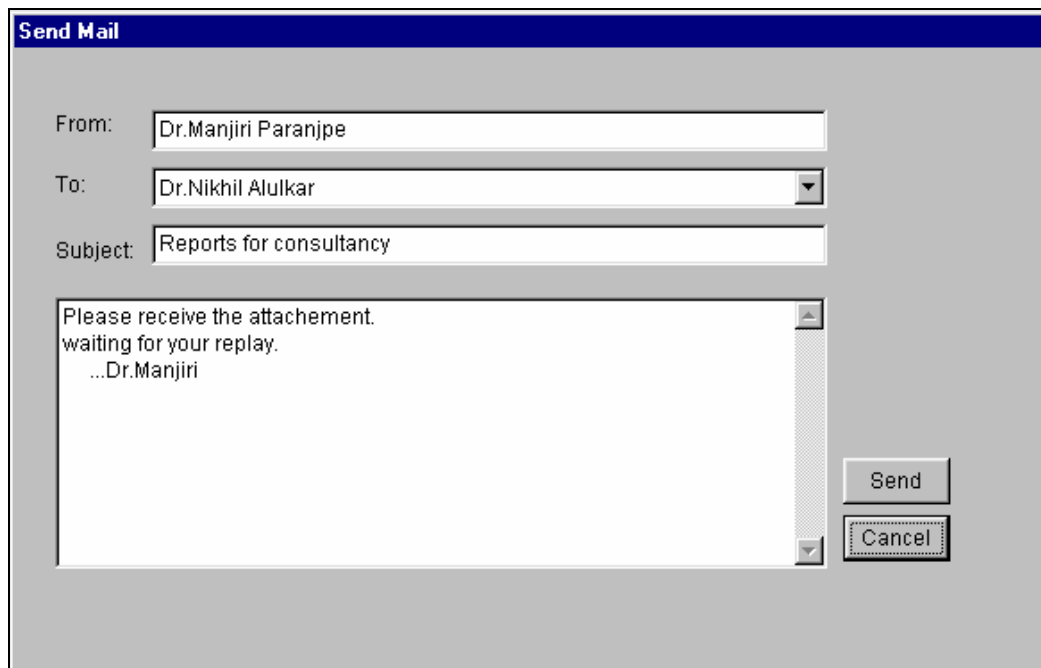
### Sending reports through mail-

To send the reports through mail to the consultant, go to '**File**' menu and select the '**Send report**' option. The dialog box as show in the figure 9.1 will be displayed on the screen.



**Fig.9.1: Select report to E-mail.**

Select the reports to be attached with the mail by clicking the respective report from the dialog box. The approximate size of the mail will be displayed at the bottom of the dialog box. The user can delete the number of marked pages by clicking '**Edit Pages**' button. The dialog box shown in the fig 6.2 will appear on the screen. User can view and delete the marked pages if required. Press the '**OK**' button to go to send mail dialog box as shown in the figure 9.2.

A screenshot of a 'Send Mail' dialog box. The title bar is blue with the text 'Send Mail' in white. The dialog has a light gray background. It contains three input fields: 'From:' with the text 'Dr.Manjiri Paranjpe', 'To:' with a dropdown menu showing 'Dr.Nikhil Alulkar', and 'Subject:' with the text 'Reports for consultancy'. Below these is a large text area containing the message: 'Please receive the attachement. waiting for your replay. ...Dr.Manjiri'. To the right of the text area are two buttons: 'Send' and 'Cancel'.

**Fig.9.2: Send mail dialog box.**

The user name automatically comes as '**From**' name. The user can select the consultant from the '**To**' drop down. Enter the Subject in the subject text box and the queries in the text box provided. After entering the queries press '**Send**' button. This will take some time for attaching the marked pages to the mail. Messages of attaching the mail will be displayed at the bottom of the dialog box. A message box of "**Mail Sent**" will appear if the mail is sent successfully. In case of any error appropriate message will be displayed.

## 10. Trouble shooting-

---

- ❑ **Traces are not coming?**  
Restart the system. Check all the connections. Contact the system engineer.
- ❑ **Traces coming as straight lines?**  
Check if the patient cable connection is proper or not. Check if the amplifier is ON or not.
- ❑ **Medians are coming as straight lines?**  
This will happen if the QRS detection lead (The third lead in the display) does not have tall R waves. Click '**Amp QRS**' button in toolbar to amplify QRS lead for calculations.
- ❑ **Heart rate not coming?**  
This will happen if the QRS detection lead (The third lead in the display) does not have tall R waves. Click '**Amp QRS**' button in toolbar to amplify QRS lead for calculations.
- ❑ **Printouts not coming or printing junk?**  
Check if proper printer driver is installed and do the printer settings as described in installation dialog.

# 11. Appendix A

---

- **Earthing:**

The Earthing for the system should be proper. This is to ensure patient safety and for no interference of line voltage fluctuations. For correct earthing procedure, refer to work order booklet and get it done and approved from licensed electrician only.

If the earthing is not proper, leakage currents may pass from the amplifier to ground through the patient. If the current magnitude is large, it can be harmful for the patient.

## Indications for stress test-

Following are the indications for stress testing.

1. Evaluating the patient with chest pain or with other findings suggestive but not diagnostic of coronary disease.
2. Determining prognosis and severity of the disease.
3. Evaluating the effects of medical and surgical therapy.
4. Screening for latent coronary disease.
5. Evaluation of congestive heart failure.
6. Evaluation of arrhythmias.
7. Evaluation of functional capacity and formulation of exercise prescriptions.
8. Evaluation of congenital heart disease.

## **Absolute contraindications for stress test –**

1. Patients with an acute myocardial infraction.
2. Patient suffering from acute myocarditis or pericarditis.
3. Patient exhibiting signs of unstable progressive angina.
4. Patient with rapid ventricular or atrial arrhythmias.
5. Patient with second or third degree heart block and patients with know severe left main disease.
6. Acutely ill patients, such as those with infections.
7. Patient with locomotion problems.

**Relative contraindications for stress test-**

1. Aortic stenosis.
2. Suspected left main equivalent.
3. Sever ST depression at rest.
4. Sever hypertension.
5. Congestive heart failure.

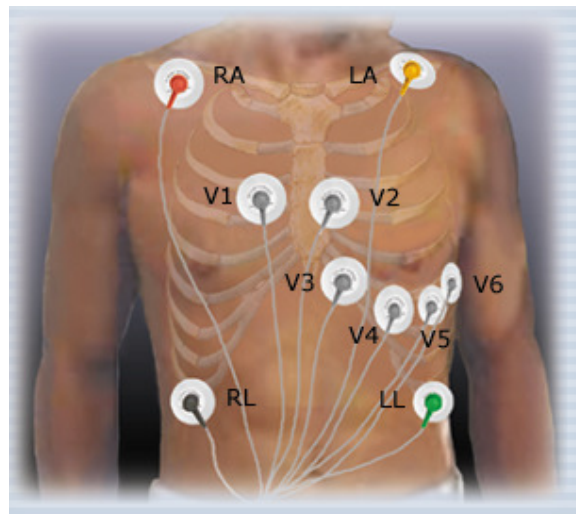
## 12. Appendix B

### a. Patient preparation -

Proper patient preparation is the most important factor in obtaining proper results from a ST-Win system. If electrodes are applied to improperly prepared skin site then this may result in excessive base line shift and severe artifact while obtaining an ECG.

The skin at 6 chest leads and 4 limbs leads sites has to be prepared.

### b. Electrode placement-



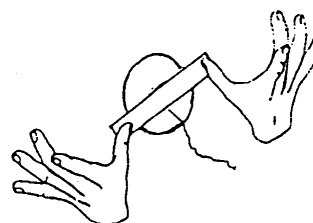
**Electrode Placement**

Place electrode one by one on selected sites. Press the electrodes from inside to outside covering entire electrode area.



Take care that gelled pad is in firm contact with the skin surface.  
Place patient lead on all electrodes as shown in Figure.

Apply Medical adhesive tape (dressing tape/ bandage tape) across the electrode.



- Apply some jelly to the electrode site and thoroughly rub the site with gauze till it becomes slightly red. This removes the horny non-conducting layer of the epidermis enabling a good electric contact with the body fluids.
- Remove all the traces of jelly by wiping the abraded site with warm dry cloth and completely dry up the site with dry towel. The skin must be clean, dry and completely free of jelly for the electrodes to remain well in position till the end of ECG acquisition.
- Take an electrode and peel it off from its plastic backing. Finger contact with the adhesive should be minimized and the jelly in the foam pad should not be disturbed. If the jelly has dried out then discard the electrode.
- Apply the electrode to the prepared site and run your fingers around the foam pad smoothing it from the center out. Repeat this procedure for all sites

**NOTE-**

We recommend the use of good quality disposable electrode (With one time usage only).

**No assurance of quality result can be given if reusable electrodes are used.**

**C. General precautions for using the treadmill-**

Read this section before operating the treadmill.

- Keep the area underneath the treadmill clear.
- Do not start the treadmill when someone is standing on the belt.
- Do not leave a patient unattended on the treadmill.
- Do not stop the treadmill if someone is walking on it except in case of emergency.
- Keep speed and grade at minimum when patients are getting on the treadmill.



# 13. Appendix -C

---

## **ST-Win acquisition unit specifications-**

### **❖ ECG Amplifier:**

- Input dynamic range: +/-5mVAC+/-500mVAC
- Gain: 1000
- CMRR: >120dB
- Frequency response: 0.05Hz to 100 Hz
- Patient Isolation: Through optocoupler

### **❖ Acquisition card:**

- Resolution: 12 Bit
- Sampling rate: 250 samples per second simultaneous
- 256 pole DSP filter for removal of noise and base line wander
- Acquisition and filtering using DSP

### **❖ Electrical:**

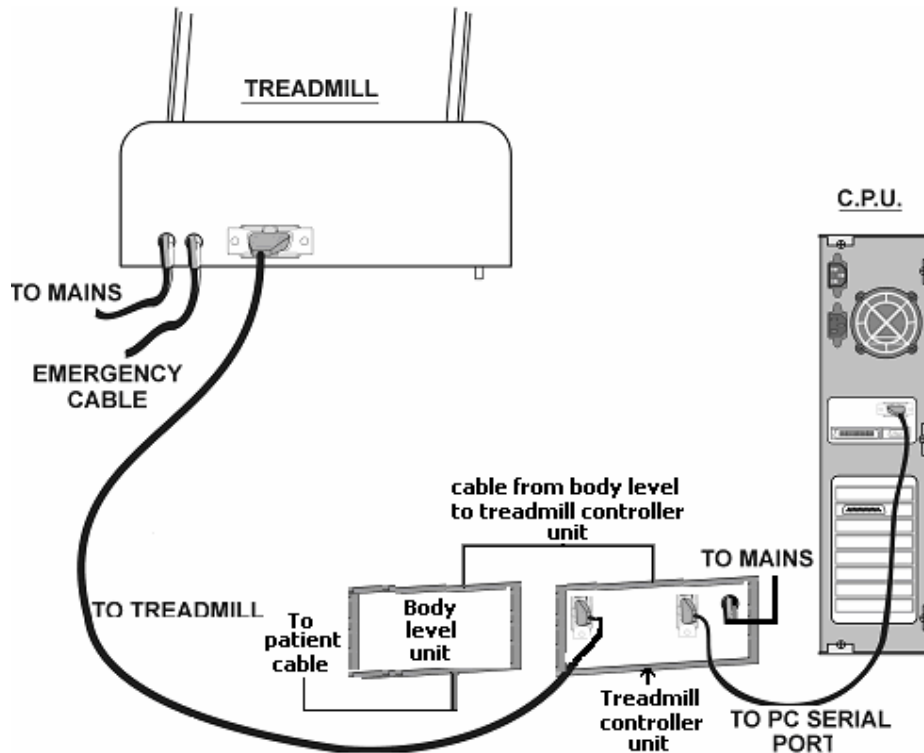
- Operates on 230 VAC +/- 10% @ 50Hz mains

### **❖ Environmental:**

- Operating temperature range: -5 to 50°C
- Humidity: 0 to 95% Non condensing

**Interconnection diagram-**

**ST WIN with Body level unit**



**WARNING:**

DO NOT CONNECT OR REMOVE ANY CABLE WHEN INSTRUMENT IS POWERED ON.

**Note: Always connect Body level amplifier while taking new test and Calibration of treadmill.**

## 14. Appendix -D

---

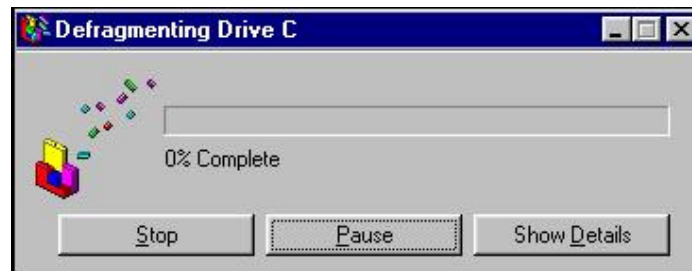
Defragmentation of the hard disk is a recommended job to do at least once in 3/4 months. This is because as the number of test conducted get increased doctors stats deleting the tests.

The tests are stored randomly on the hard disk. This creates delay to open any of the applications. By Defragmentation of the hard disk all the files are arranged in sequence. Thus helps in making PC faster.

Following steps can do this,

- Click '**Start**' button
- Go to '**Program**' then '**Accessories**'
- Go to '**System Tool**'
- Select '**Disk Defragmentation**'

After selecting the Defragmentation option it ask for the drive to select. Select the drive as per your requirement and click the '**OK**' button of that screen. As soon as the button is click Defragmentation starts and the dialog box as seen in the fig 13.1 below will appear on the screen.



**Fig.13.1: Defragmentation.**

This will take several hours to complete as per the data stored in the Hard disk.

**NOTE:** - Please do not carry on any application will Defragmentation is on.



**Nasan Medical Electronics Pvt. Ltd.**  
1<sup>st</sup> floor Rangali Society, Opp. Karve statue, Kothrud-Pune-411038  
Phone: 020-25391290, [www.nasanmedical.com](http://www.nasanmedical.com)

**Installation commissioning report- cum warranty  
Certificate**

**Product Name –**

**Date:** \_\_\_\_\_

<b>Customer Name:</b>		<b>Equipment Location:</b>	
<b>Name of Hospital/Clinic/ Diagnostic Center:</b>		<b>Serial no. of machine:</b>	
<b>Address:</b>		<b>Invoice(Bill) No.</b>	
<b>Phone No.:</b>		<b>Dealer Name:</b>	
<b>Mobile no.:</b>			
<b>Name of the person / persons trained to use and operate the product/s:</b>			
<b>The above-referred unit has been supplied in good condition and installed successfully. The same is functioning satisfactorily. The required training on the use of the said unit has been given to us.</b>			
<b>The warranty valid till 12 months from the date of installation or 13 months from date of invoice, whichever is earlier.</b>			
<b>Note:</b> 1) Training is given only once. Additional training will cost extra. 2) All disputes are subject to Pune jurisdiction only. All other jurisdiction expressly barred.			
<b>Name and signature of NASAN's Sales/Service/Dealer Representative</b>		<b>Name and signature of customer (Please affix stamp / seal)</b>	

**Customer Copy**



**Nasan Medical Electronics Pvt. Ltd.**  
1<sup>st</sup> floor Rangali Society, Opp. Karve statue, Kothrud-Pune-411038  
Phone: 020-25391290, [www.nasanmedical.com](http://www.nasanmedical.com)

**Installation commissioning report- cum warranty  
Certificate**

**Product Name –**

**Date:** \_\_\_\_\_

<b>Customer Name:</b>		<b>Equipment Location:</b>	
<b>Name of Hospital/Clinic/ Diagnostic Center:</b>		<b>Model No. (Serial no. of machine):</b>	
<b>Address:</b>		<b>Invoice No.</b>	
<b>Phone No.:</b>		<b>Dealer Name:</b>	
<b>Mobile no.:</b>			
<b>Name of the person / persons trained to use and operate the product/s:</b>			
<b>The above-referred unit has been supplied in good condition and installed successfully. The same is functioning satisfactorily. The required training on the use of the said unit has been given to us.</b>			
<b>The warranty valid till 12 months from the date of installation or 13 months from date of invoice, whichever is earlier.</b>			
<b>Note:</b> 3) Training is given only once. Additional training will cost extra. 4) All disputes are subject to Pune jurisdiction only. All other jurisdiction expressly barred.			
<b>Name and signature of NASAN's Sales/Service/Dealer Representative</b>		<b>Name and signature of customer (Please affix stamp / seal)</b>	

**NASAN Copy**