WR TESTWORKS
Autonomic and Peripheral | Labs and Software

Neurological Testing Management Software

Version 2.9.0
User Guide

Contents

CE 0413

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Phone: 800-635-1312 • Fax: 651-604-8499 • Web:www.wrmed.com

OVERVIEW

About WR-TestWorks™

The WR-TestWorks™ software operates and/or acquires data from several devices manufactured by WR Medical Electronics, and interfaces with other FDA cleared devices. The software accepts demographic data and captures patient physiological data for peripheral sensory, cardiac, and autonomic nervous system testing. Physicians can reference physiologic events recorded during patient monitoring or while a patient undergoes specific maneuvers. The software will record, display, save, analyze, and generate reports.

Devices supported:

QSweat™ - Quantitative Sweat Measurement System
- Parameters measured: Sweat Rate and Volume

CASE IV™ - Computer Aided Sensory Evaluator
- Parameters measured: Peripheral sensory thresholds (Vibration, Thermal cooling/warming, and heat-pain)

HRV Acquire – ECG and patient feedback
- Parameter measured: ECG (3-Lead), Valsalva effort Pressure (mmHg), and Chest Expansion Effort. *Optional*; External Arterial BP.

BMEYE NexFin™ and **NexFin HD™** - Continuous finger arterial pressure measurement system, with brachial pressure waveform reconstruction.
- Parameters measured: Beat to beat systolic, diastolic, and mean blood pressure
- Hemodynamic parameters - *optional*; cardiac output, stroke volume.

Finometer™ - Continuous finger arterial pressure measurement system, with brachial pressure waveform reconstruction.
- Parameters measured: Beat to beat systolic, diastolic, and mean blood pressure

Colin™ Pilot 9200/7000 - (*Discontinued*) Continuous tonometric beat to beat blood pressure system.
- Parameters measured: beat to beat systolic, diastolic, and mean blood pressure and ECG (3-Lead)

IVY Biomedical™ ECG Model 3000 – Cardiac Trigger Monitor
- Parameters measured: ECG (3-lead)

SMT – Sniff Magnitude Test
- Parameters measured: Nasal pressure

Data Analysis:

QSweat –
Total Volume

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Response latency
End offset to baseline
Rate

Cardiac –
HRDB (Heart Rate to Deep Breathing): Min/Max delta using Heart Rate or R-R interval, Heart Rate/Blood Pressure Changes with Stimulus
Valsalva: Valsalva Ratio using Heart Rate or R-R interval, Heart Rate/Blood Pressure Changes with Stimulus, and Adrenergic
Tilt/Stand: Min SBP, Min/Max HR, Heart Rate/Blood Pressure Changes with Stimulus, 30:15 Ratio (HR), 30:15 Ratio (R-R)

CASE IV –
Cooling: Threshold, Displacement, and Duration
Warming: Threshold, Displacement, and Duration
Vibration: Threshold, Displacement, and Duration
Heat-Pain: HP 0.5, HP 5.0, HP 5.0-0.5, Thresholds, Displacements, and Duration

QST (Manual) –
Touch Pressure: Threshold, and Magnitude
Touch Pressure as Pain: Threshold, and Magnitude
Thermal discrimination: Threshold

SMT (Sniff Magnitude Test)—
Magnitude Ratio: Average

IMPORTANT CONCEPTS

Operators:

- *Administrator*- The person in charge of the WR-TestWorks™ software. This person installs and customizes the software, and is responsible for adding and defining users and studies. Only one administrator is defined upon initial installation, but more than one person may be assigned administrator status.
- *User*- A person who operates the WR-TestWorks™ software. Users are assigned to categories "user groups" that determine the amount of responsibility allowed: administrator, physician, analyst, technician, and clerk. At this point, all non-administrators have the same access rights. In future releases, the administrator may assign the access rights for each user level.

Data Organization:

- *Study*- A study is a collection of patients and visits. A patient can participate in more than one study; however, a visit (and its member tests) belongs to only one study. Studies are useful for

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grouping related visits and for defining the rules for what tests constitute a visit. In non-trial scenarios, a study is simply an entire database of patients, visits, and tests, often for a given time period.

- *Patient*- A patient is a person who undergoes tests within a study by means of one or more visits. Patient attributes include demographic data such as name, date of birth, gender, and so on (data that never changes or changes infrequently).
- *Visit*- A visit can consist of one or more tests and has certain information about the patient associated with it (such as height and weight). Typically, all tests within a visit take place on the same day or within a short period of time.
- *Test*- A test is a single session of collecting data from a patient. The test has a date associated with it, a technician, a set of raw data, etc.
- *Analysis*- An analysis is an interpretation of raw test data. The same set of raw test data can be analyzed in more than one way. Each analysis may have different analysis parameters and/or use different analysis techniques.
- *Report*- A report is a presentation of an analysis or group of analyses. Reports are typically previewed in a window before being printed. A single analysis can be represented in more than one report. For example, a full report, a summary report, etc.

Functionality:

- *Test Explorer*- Through the Test Explorer, users can view the patients and their associated tests and analyses in a particular study. Many tasks can be started in the Test Explorer, such as patient data editing, beginning a new test, viewing saved tests and analyses, and more.
- *Component*- A software module associated with a medical device.

WARNINGS AND CAUTIONS

Please refer to the Hardware manual(s) of each device used for any warnings, cautions, indications, and contraindications.

User Responsibilities:

The WR Medical WR-TestWorks™ software will perform in conformity with the description thereof contained in this manual and accompanying documentation, when used with properly assembled, operated, maintained, and repaired devices connected to the system. Parts that are missing or damaged shall be replaced immediately.

The user of this software shall have the sole responsibility for any malfunction, which results from improper use, not following device maintenance instructions, or improper repair.
Clinical judgment should always be used when interpreting the results of any test. As with any monitored parameter, artifacts and poor signal quality may lead to inappropriate values.
Please read and adhere to the following considerations regarding the use of the software:

- WR-TestWorks™ is to be used and to be operated by qualified personnel only

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- If the accuracy of any reading is questionable, first check the patient's vital signs by alternate means and check the device connected for proper functioning.
- WR-TestWorks™ software is intended only as an adjunct in patient assessment. It must be used in conjunction with clinical signs and symptoms

TECHNICAL SUPPORT

For questions regarding the WR-TestWorks™ software please contact:

Technical Support / Help Desk
WR Medical Electronics Co.
1700 Gervais Avenue
Maplewood, MN 55109
Phone: 651-604-8400 (Toll Free US: 800-635-1312)
Fax: 651-604-8499
Email: neuro@wrmed.com
Web: www.wrmed.com

The Help Desk is available during normal business hours (8:00am to 4:30pm, Central Time)

DISCLAIMER OF WARRANTIES AND LIMITATIONS

WR Medical Electronics Co. makes no warranty or representation, either express or implied, with respect to the WR-TestWorks™ Software, its quality, merchantability, or fitness for a particular purpose. The software is provided as is, no oral or written information or advice given by either party or its employees shall create a warranty or make any modification, extension or addition to the warranty.

WR Medical Electronics Co. shall not be liable for any direct, indirect, incidental or consequential damages, including lost profits and damages for personal injury or property damage, arising from or in the connection with the licensed rights or its use whatsoever.

In no case shall WR Medical Electronics Co.'s liability exceed the purchase price for the software. Information in this document is subject to change without notice and does not represent a commitment on the part of WR Medical Electronics Co.

SOFTWARE INSTALLATION

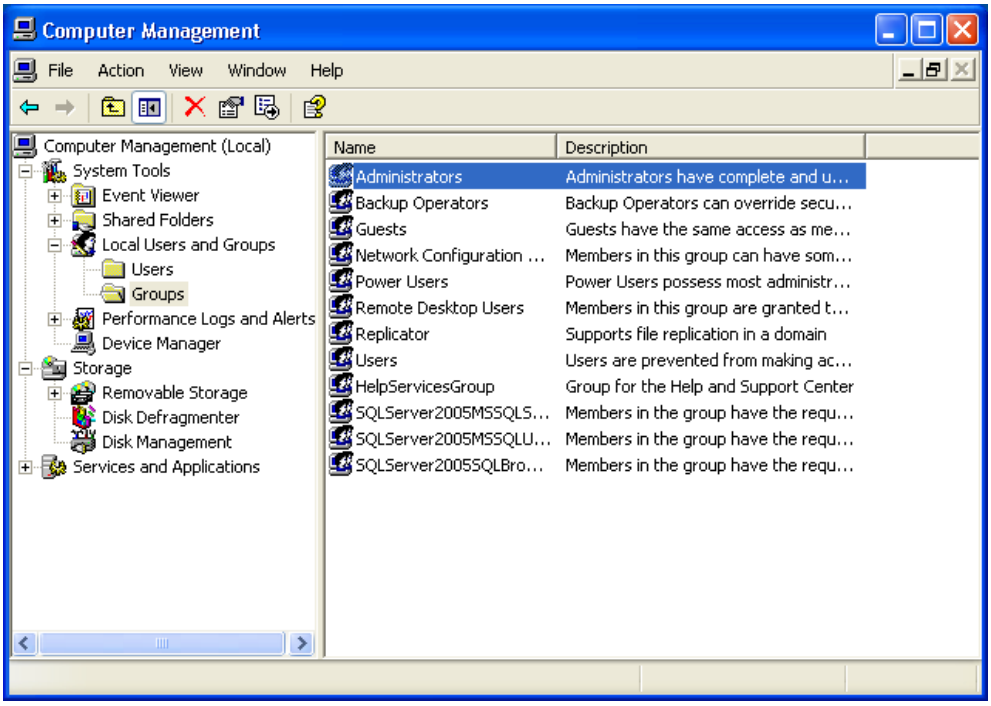
Installing WR-TestWorks™

Minimum System Requirements

- Microsoft Windows 7 (NOTE: Windows 7 requires load administrative rights)
- >1.2Ghz Processor
- >256MB RAM
- >10Gb Free Disk Space
- CD-RW Drive
- 1024 x 768/64k Color Screen
- > 2 USB 2.0 ports

Begin the installation by inserting the WR-TestWorks CD-ROM in the CD-ROM drive. [If the installation does not begin automatically, navigate to the CD-ROM drive using Windows Explorer (or My Computer) and double-click Testworks.exe.]

NOTE: PC users must be members of the Administrators or Power Users group to be able to install and run WR-TestWorks™ software.



Follow the on-screen instructions and enter the requested information…

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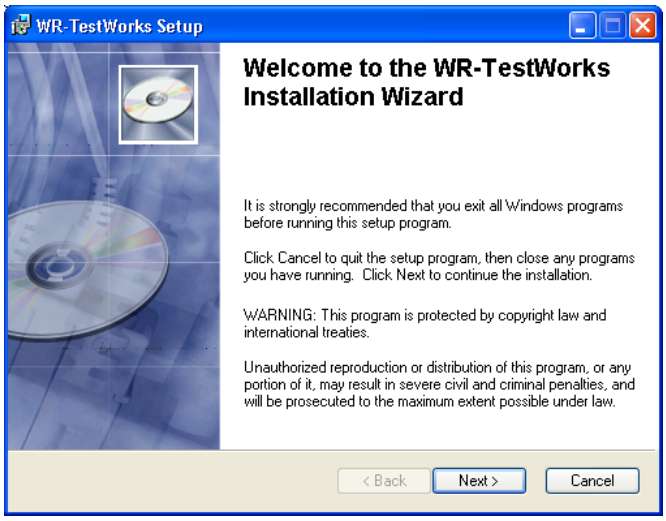
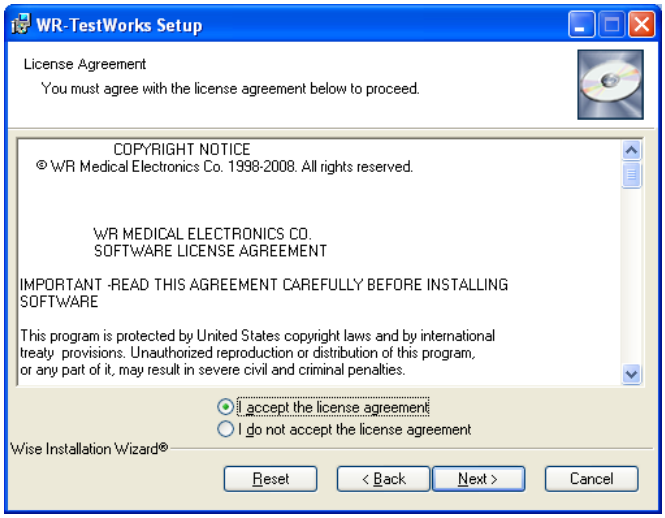
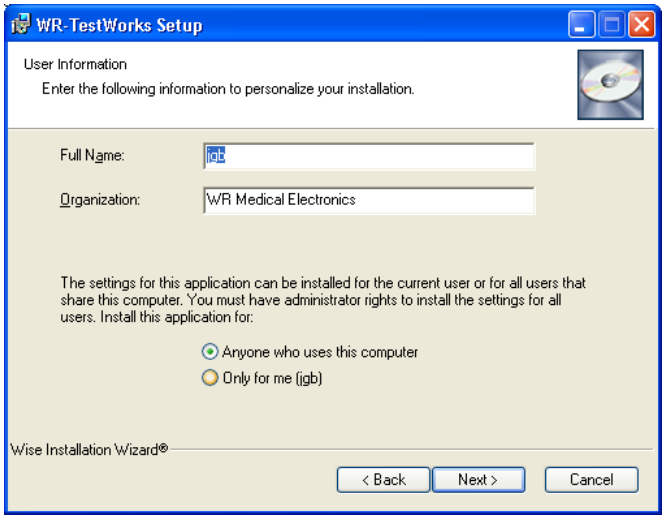




Review the license agreement, also found in the appendix. Choose “I accept the license agreement” to continue. Or do not accept and cancel the installation.



Enter the user name associated with the local workstation, along with the organizational name. On shared workstations you may choose to only allow program access to yourself or everyone. This is Windows™ XP access, not WR-TestWorks™ access.

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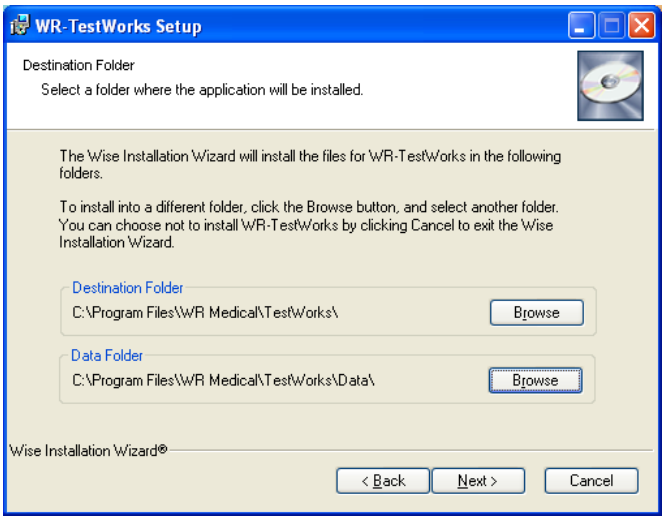


Choose the program destination folder by selecting the 'Browse' button and modifying the drive and path. The default location is presented and for performance a local drive is recommended.

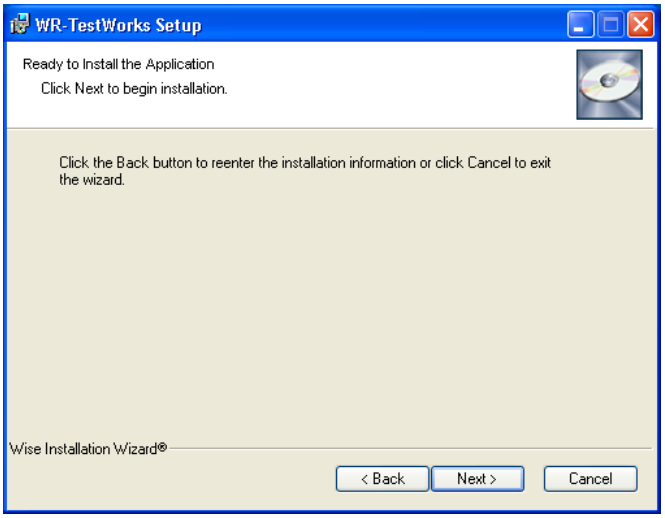
For a network based installation (shared data files located on a network server, rather than the local hard drive), use the 'Browse' button to change the path of the Data Folder to the desired location on your server. This can be entered in UNC format (\\server\share) or conventional (C:\directory). The data directory should have enough free space to contain studies.

NOTE: All WR-TestWorks™ users must have Read/Write permissions on the network share. Domain Members must have local administrator rights on the local machine.

NOTE: The 'Data Folder' directory is only available at installation, once installed any changes must be made in the system registry.

Approximate storage usage:

Recording	Storage Requirement	Notes
HRDB	≈3Mb	Per patient recording @200 Hz, 280k/min (10.5 Min)
VALS	≈3Mb	Per patient recording @200 Hz, 280k/min (10.5 Min)
TILT	≈4Mb	Per patient recording @200 Hz, 280k/min (15 Min)
QSweat	≈100K	Per Patient recording (4 Sites – 15 Min)
QST	≈2k	Per Patient recording
SMT	≈100k	Per Patient recording
Total	≈10Mb	All tests Per Patient



Press 'Next', to perform the installation.

NOTE: The time remaining may indicate 0 seconds for several minutes during installation.

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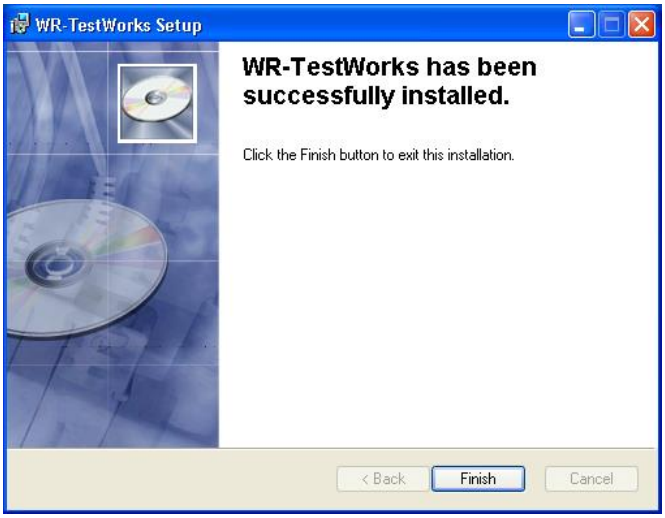
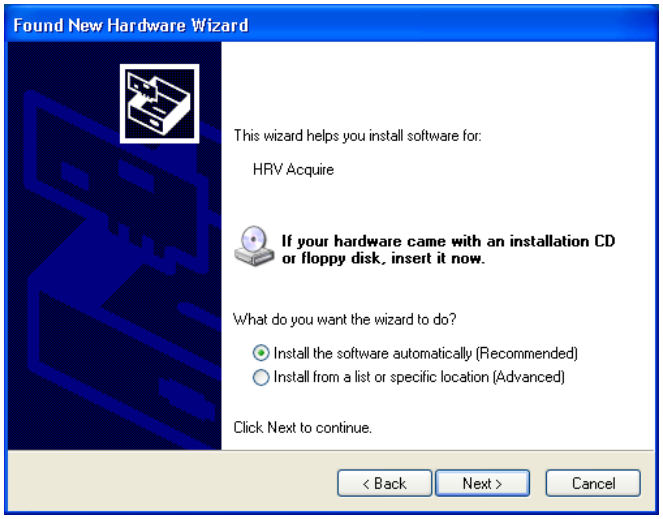
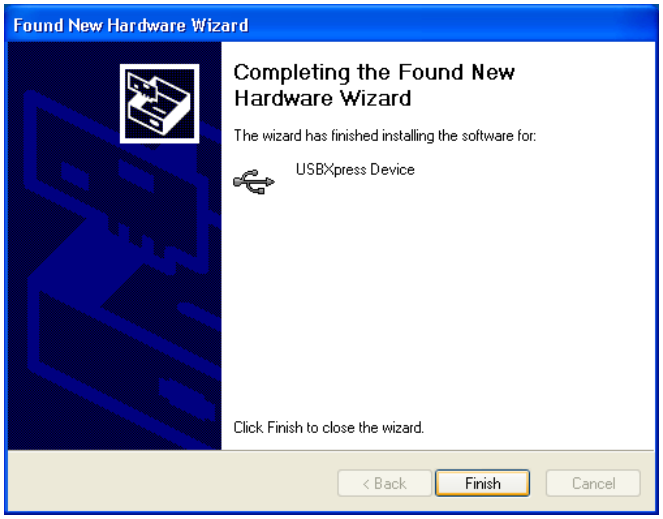


Press 'Finish' to complete the installation.

If installing a USB based device, leave the CD-ROM in the drive and connect the device via USB cable to the computer and turn on the device power to allow Windows to detect the device and install the driver.





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SETUP ON WINDOWS 7 COMPUTERS

Windows 7, due to updated security standards enacted by Microsoft, requires some extra steps for accurate operation. The first requirement is that the user account for login to the computer must be set up as an administrator, via the Windows User settings system.

The program must also be set to run as an administrator. This should be done prior to the first run of the software. To set the program to run as an administrator, navigate to the installation directory (By default: C:\Program Files\WR Medical\TestWorks\ or C:\Program Files (x86)\WR Medical\TestWorks\) and right click on the TestWorks.exe file, choosing the "Properties" option. In the dialog that opens up, click on the "Compatibility" tab. At the bottom is a button for changing settings for all users. Click this, and then check the box for "Run this program as administrator".

At this time the software may be run. There will be some warnings about being unable to locate the master database. This is normal. Simply exit the program, and run it again. All errors should have cleared up.

RECOVERING FROM A NON-ADMINISTRATOR INSTALLATION

In the event a system was run as a non-administrator, it may be possible to correct this. The first step will be to go through ensuring the user(s) accessing WR-TestWorks are administrators in the Windows 7 system, and setting the program to run as administrator. Before running the program again, however, some extra steps must be taken.

The most important thing is to re-acquire the data. As part of Windows 7's protections, the data gets modified separately from the normal location. This location is a subset of the user's Application Data directory. This can be found at the path "C:\Users\<user login>\AppData\Local\VirtualStore\Program Files (x86)\WR Medical\TestWorks\Data\". These files should be backed up, along with the data in the normal "Data" directory accessed via the icon on the desktop. Then, the files from the "AppData" directory should be copied and overwritten to the normal installation directory.

WARNING: If the computer is part of a domain network with multiple user logins, the above method can cause loss of patient data. In this case, the safest option is to simply copy the data from the "AppData" location for archival purposes, and start with a new blank study to ensure no loss of data or corruption.

NOTE: If the data is stored at a network location (Such as S:\Neuro\WR-TestWorks\Data\ or \\shareserver\Neuro\TWData) there is no need to copy the data and may be safely skipped.

Upon re-running the program, the user will be prompted to re-enter all settings and license keys. There may also be some errors about locating data. Simply close the program and reopen. The errors should be gone at this stage. In the event the errors have not disappeared, please contact our support staff, who can assist in correcting any problems that may have arisen.

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ADDITIONAL SOFTWARE SETUP

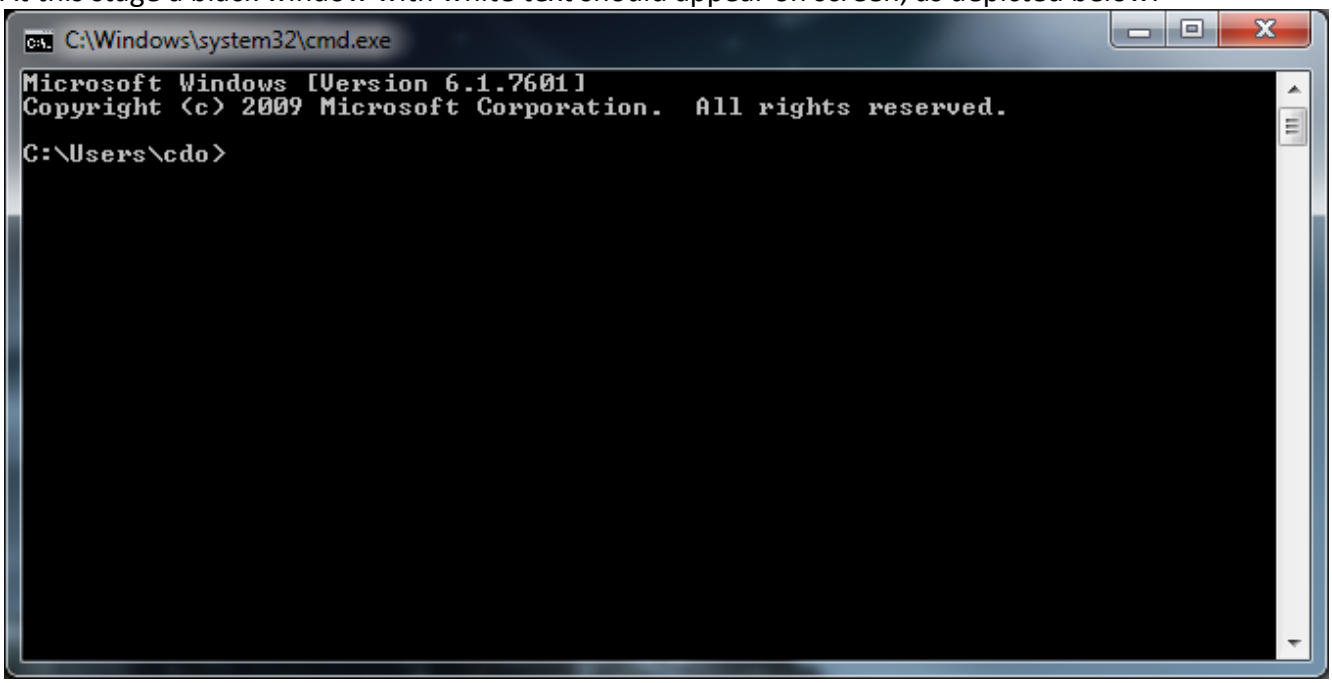
Additional software such as Microsoft™ Office products can be installed separately.
PrimoPDF™ (Freeware) software can be found on the WR-TestWorks CDROM.
Adobe™ Acrobat Reader (Freeware) software can be found on the WR-TestWorks CDROM.

OBTAINING A MACHINE ID FOR LICENSING

This document will guide you through the process of generating a machine ID for a computer to be licensed for use with the WR-TestWorks software.

The first step requires insertion of the WR-TestWorks installation media (CD or USB Thumb Drive) into the target computer. With the media mounted, the next step will be to launch a command line window. This can be accomplished by going to the Start menu and selecting "Run" and typing "cmd" in the prompt (for Windows XP systems) or typing "cmd" in the search bar (for Windows Vista/7 systems) and pressing enter.

At this stage a black window with white text should appear on screen, as depicted below:



The next step will involve knowing what the drive letter for your installation media is. For CD Drives this is usually "D:" or "E:". For USB Thumb Drives it may be another value such as "H:" or "K:" or "S:". To determine which is the correct media, you may examine the listed drives under "My Computer" and locate which drive letter corresponds to your installation media. In this example we will use "F:".

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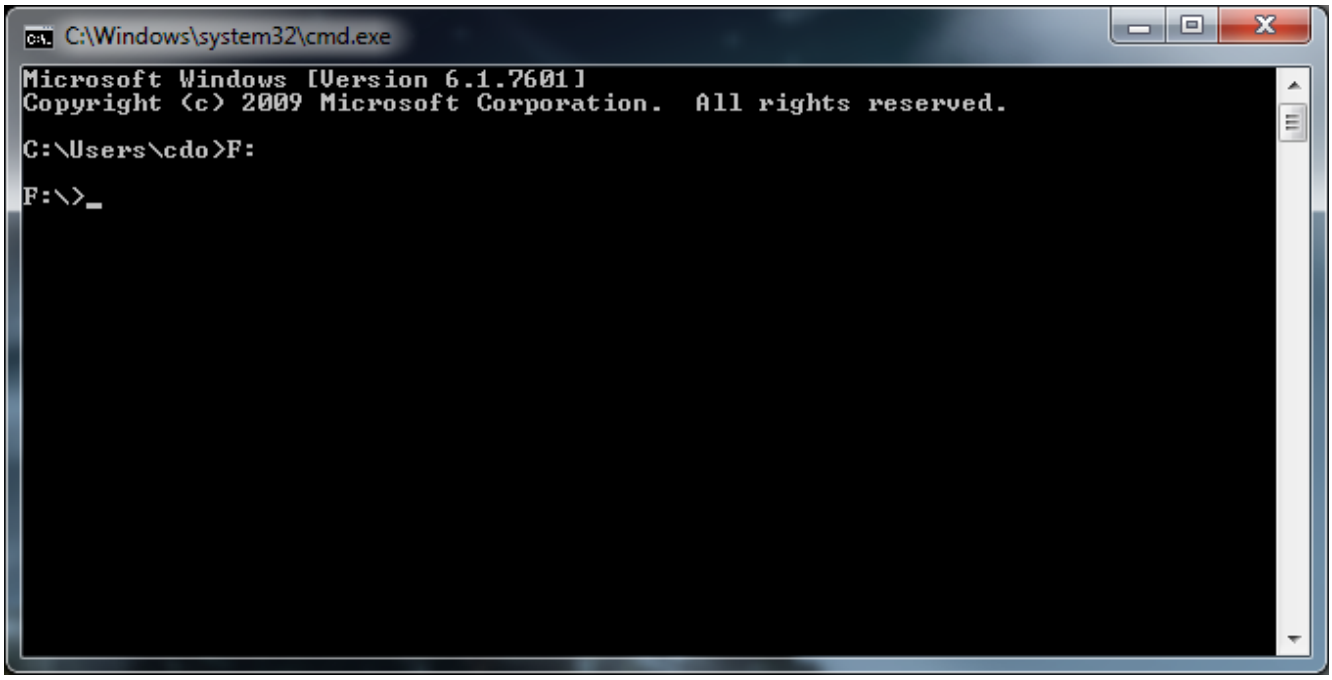
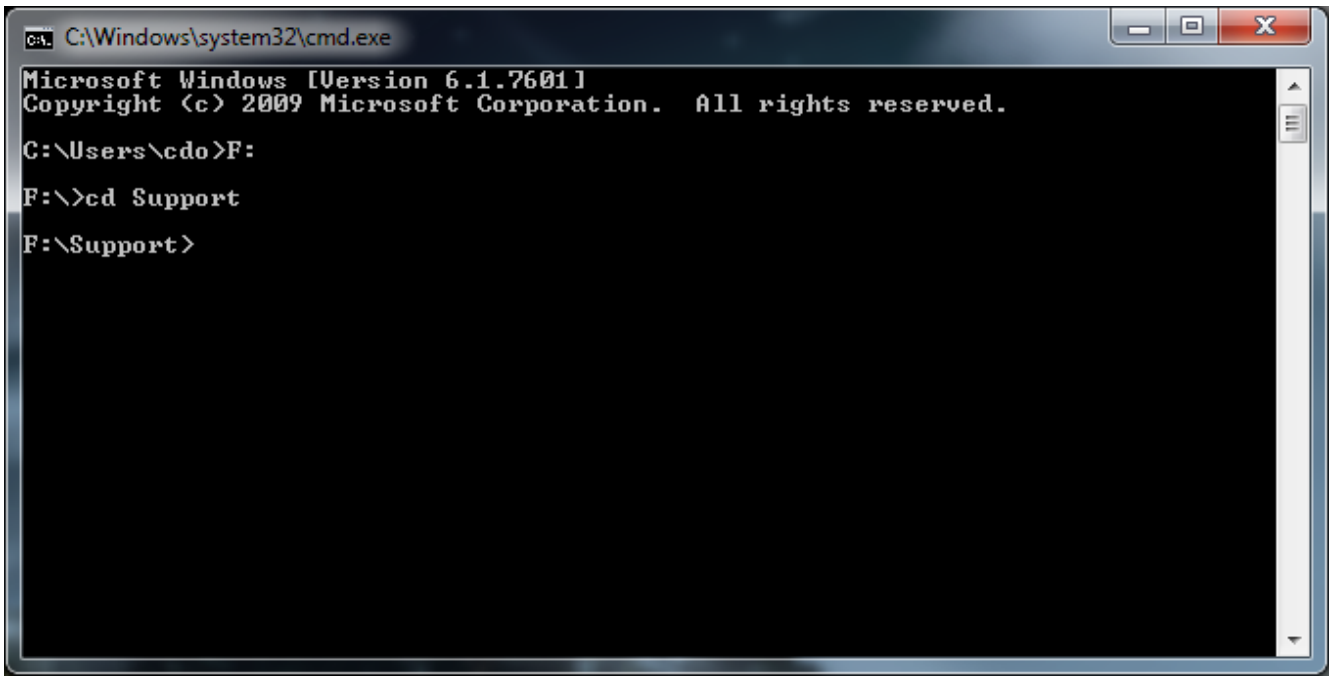
In the command window, type the drive letter with a colon and press enter. This will change the prompt to that drive, as depicted below:



Once the prompt has been changed to the necessary drive, you must navigate into the "Support" folder. This is accomplished by typing "cd Support" and pressing enter. A successful change of directory is pictured below:



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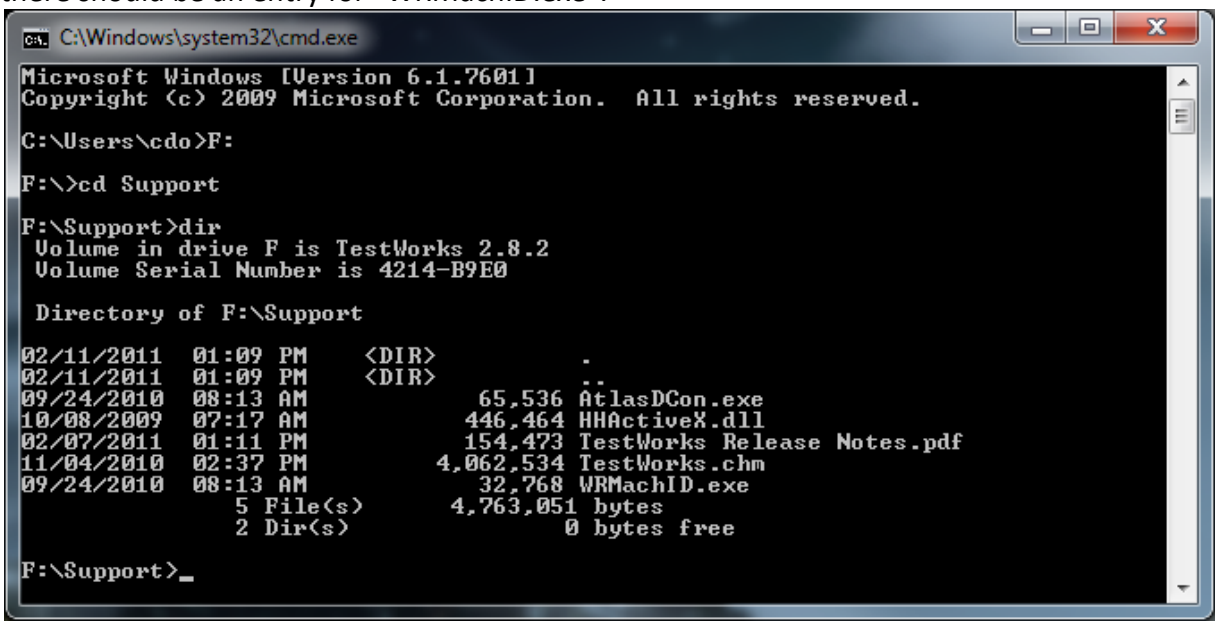
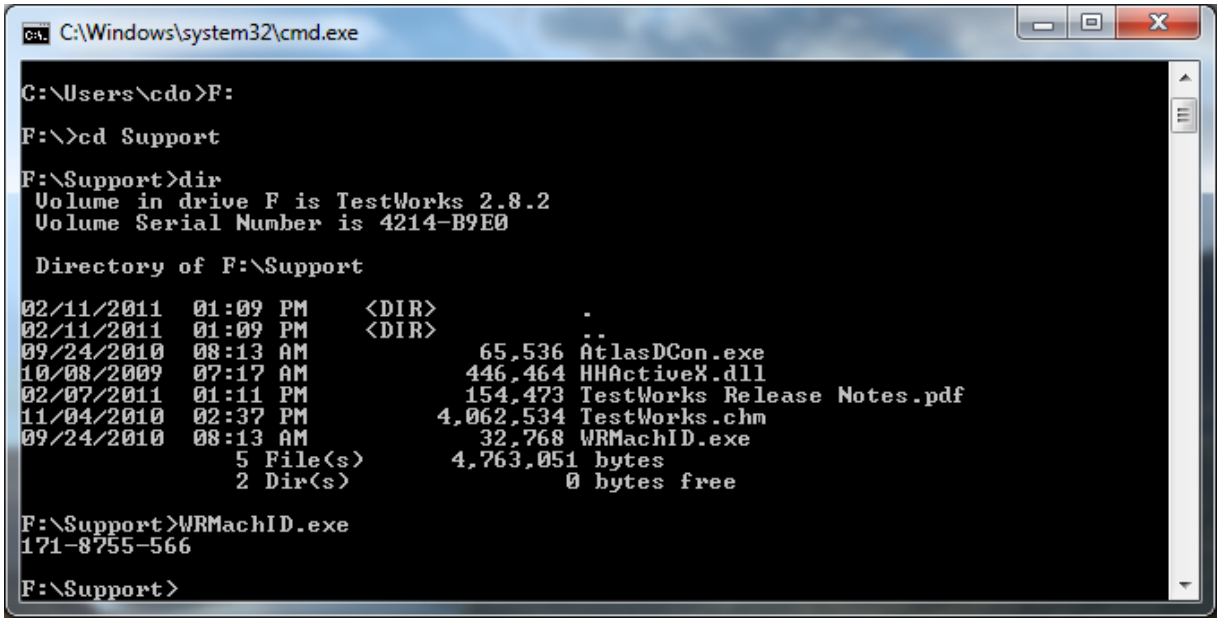
To ensure that you have successfully entered the support directory, you may type “dir” to list files in the directory you are currently in. You should see output similar to below; in particular there should be an entry for “WRMachID.exe”.



At this stage the final step can be executed. Type “WRMachID.exe” and press enter. This will generate a machine ID for use in licensing operations. This number is in the format “xxx-yyyy-zzz”. It should be written down and given to WR Medical help staff so that the appropriate licenses for your installation may be generated. Sample output of a machine generated license is below.



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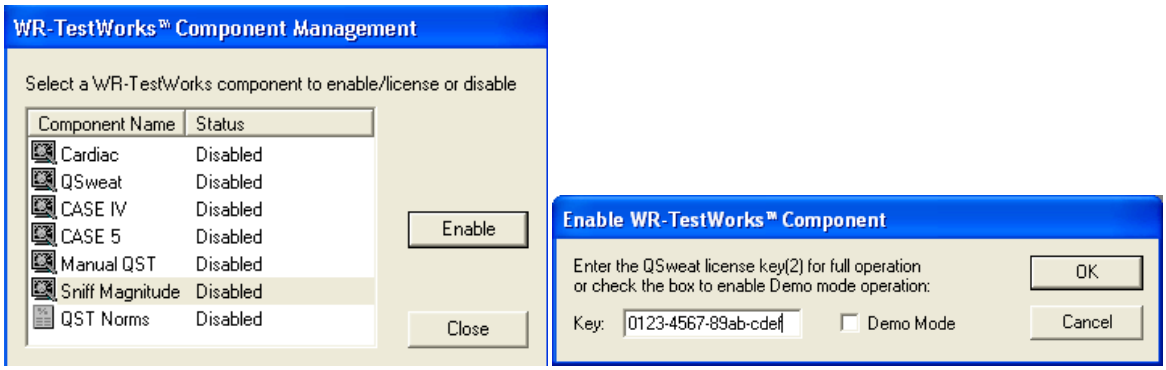
No more action is required and the command window may safely be closed by typing “exit” and pressing enter, or clicking the “X” button on the window. Please ensure you contact WR Medical with the machine license so that your licenses may be generated and given to you.

Startup WR-TestWorks™, using the icon placed on the desktop by the installation, to complete WR-TestWorks™ setup.

When running the software for the first time, you will be presented with the following dialog. Click the ‘Ok’ button and continue with licensing components purchased.

Adding (or removing) devices or modules to the WR-TestWorks™ framework can be accomplished through the component management window (accessible during initial setup, or through the ‘Utilities→Components…’ main menu item). To enable purchased components, highlight the component in the list and click ‘Enable’. Enter the license key associated with the component, including all dashes. [License keys are typically located on the CD sleeve or on the inside of the WR-TestWorks™ User’s Guide.] When all purchased components are enabled, click ‘Close’.



NOTE: You can select ‘Demo Mode’ by checking the demo box instead of entering a license key. You will be able to record but not save while in demo mode.

SOFTWARE SETUP – DEVICE CONFIGURATION

When running the software for the first time, you will be presented with the following dialog. Click the ‘Ok’ button

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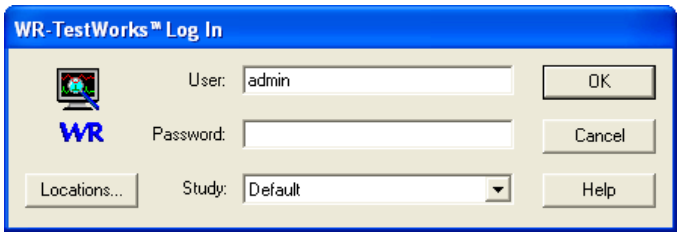
and continue to log into WR-TestWorks and perform device configuration.



Log into WR-TestWorks™ as an administrator. (First time, using the default user (admin) and no password.) Any study may be used for configuring the software.

During the initial setup of WR-TestWorks, device configuration dialogs will be presented for each enabled component. In most cases the configuration selections will be based upon the equipment used and the physician preferences.

Device configurations are accessible and can be modified (by administrator level users) at anytime through the 'Device' menu. Changes to the device configurations will take effect upon the next associated test.

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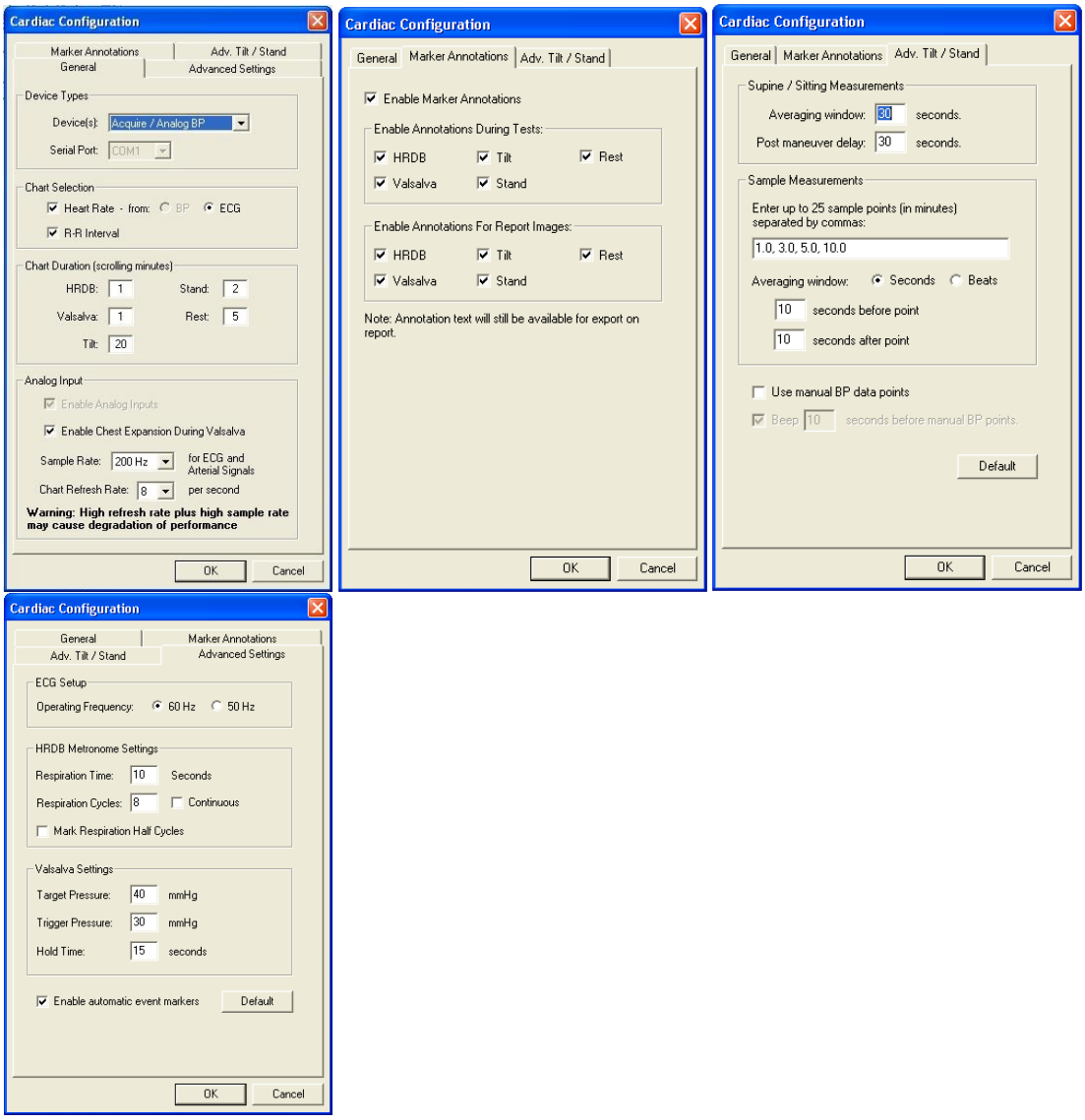
Cardiac Configuration



Cardiac Device Configuration Table:

Device(s)	Select the Cardiac device(s) connected
Serial Port	COM port selection (serial port, used by Colin devices only)
Chart Selection	Charts to display on screen and Source of Heart Rate signal (if selectable)
Chart Duration	Defines length of time displayed on charts (scrolling) during recording
Analog Input	Enable to record analog waveforms (may be required by certain devices)
Enable Chest Exp.	Enables chest expansion waveform during valsalva recordings
Sample Rate	Analog signal acquisition rate (samples/second)
Chart Refresh Rate	Number of times per second to refresh the chart **Warning: High refresh rate plus high sample rate may cause degradation of performance**

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Marker Annotations:

Enable	Enable Marker Annotations
Enable During Tests	Enable Annotations During Tests (HRDB),(Valsalva),(Tilt),(Stand), and (Rest)
Enable On Reports	Enable Annotations On Reports (HRDB),(Valsalva),(Tilt), (Stand), and (Rest)

HRV Acquire Configuration Table:

ECG Setup -		
Operating Frequency	Sets internal DSP line filter	60 Hz or 50 Hz (Line Freq.)
HRDB Metronome Settings -		
Respiration Time	Breathing cycle time (in/out total)	2-20 seconds
Respiration Cycles	Number of breathing cycles to perform (in a set) or continuous	8 cycles typical
Mark Respiration Half Cycles	Mark each respiration (in & out)	Default - No
Valsalva Settings -		
Target Pressure	Desired expiratory pressure	2-50 mmHg (40 mmHg typical)
Trigger Pressure	Pressure to start hold timer	2-50 mmHg (30 mmHg typical)
Hold Time	Time to hold pressure at target	1-30 seconds (15 sec typical)
General Settings -		
Enable automatic event markers	Generate event markers within WR-TestWorks recordings	Default - Yes

Tilt / Stand Configuration Table:

Supine/Sitting -		
Averaging window	Pre- and Post- maneuver measurement averaging window	1-60 seconds
Post maneuver delay	Delay following maneuver before taking post measurement	0-300 seconds
Sample Points -		
Sample points	Times (in minutes from maneuver start) for blood pressure and heart rate measurement points	Up to 10 points
Averaging Window	Selection of beats or seconds to average before and after the specified time points for sample measurements	1-30 beats, 10-30 seconds
General Settings -		
Use manual BP data points	Select this option to allow entry of manual BP data during testing	Default=no
Beep	Select this option for audio alerts at the specified number of seconds prior to manual BP sample points	0-20 seconds

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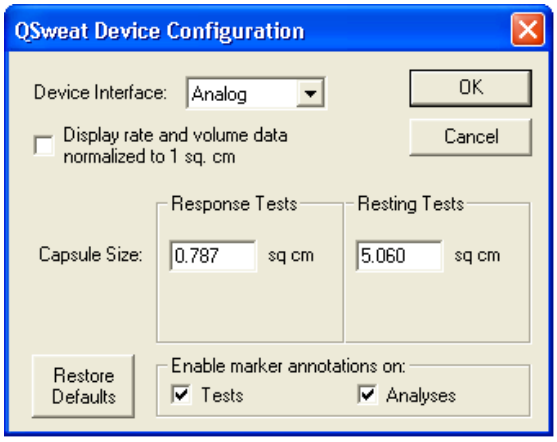
QSweat Configuration

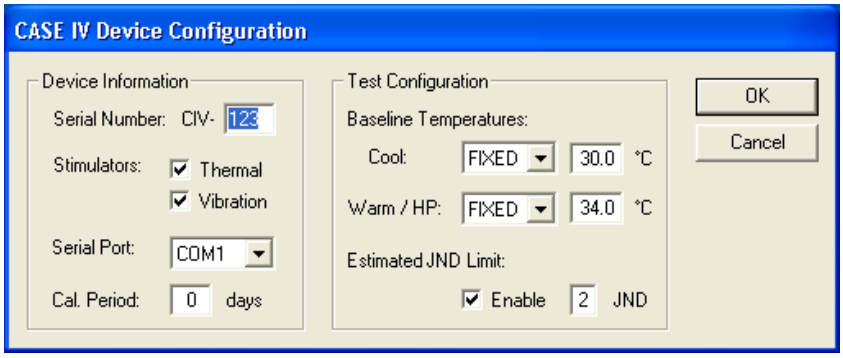


Select the device interface type; Analog (NIDAQ) or USB.
Enter the values desired to correspond to the capsule size for both Response and Resting sweat test types. The standard sizes can be restored by checking the 'Restore Defaults' button.

The 'Display rate and volume data normalized to 1 sq. cm' checkbox may be selected to normalize the rate and volume data based upon the capsule sizes entered. (**NOTE**: Previous versions, and papers, have used absolute values.)

Select 'Enable marker annotation on:' either in Tests or Analyses as desired.

CASE IV Configuration



Device Information	
Serial Number:	Enter the serial number of the CASE IV device
Stimulators (x)Thermal (x) Vibration	Select stimulators connected to CASE IV device
Serial Port:	Enter the COM port the device is connected to.
Cal. Period:	Enter the number of days desired between calibration reminder prompts. Note "0" is never.
Baseline Temperatures [default values shown]	
Cool:	Baseline for cooling test types
Warm / HP:	Baseline for warming and Heat-Pain test types
Estimated JND Limit:	Allowable difference between estimated JND level (from practice tests) and actual test result.

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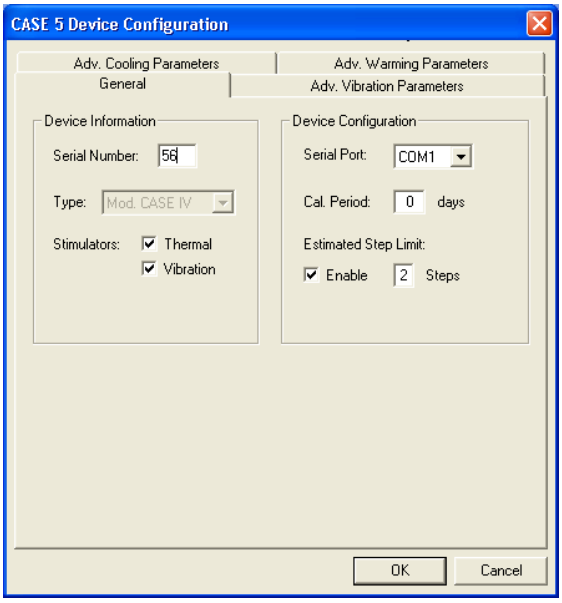
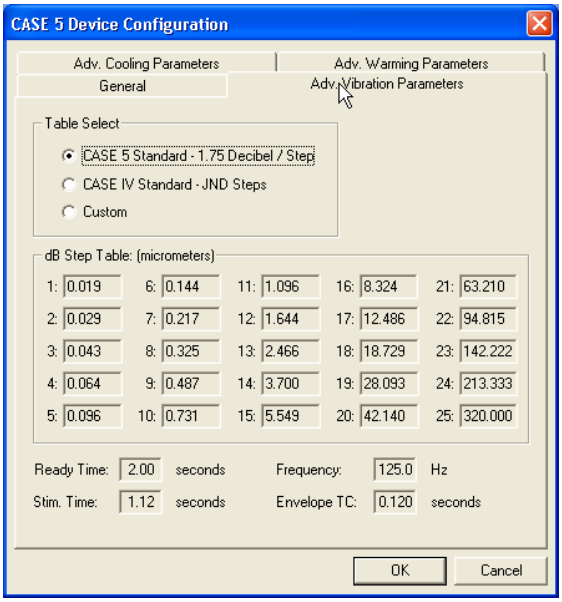
CASE V Configuration



Device Information (General)	
Serial Number:	Enter the serial number of the CASE IV-IIb device
Stimulators (x)Thermal (x) Vibration	Select stimulators connected to CASE IV-IIb device
Serial Port:	Enter the COM port the device is connected to.
Cal. Period:	Enter the number of days desired between calibration reminder prompts. Note “0” is never.
Estimated Step Limit:	Allowable difference between estimated Step level (from practice tests) and actual test result.



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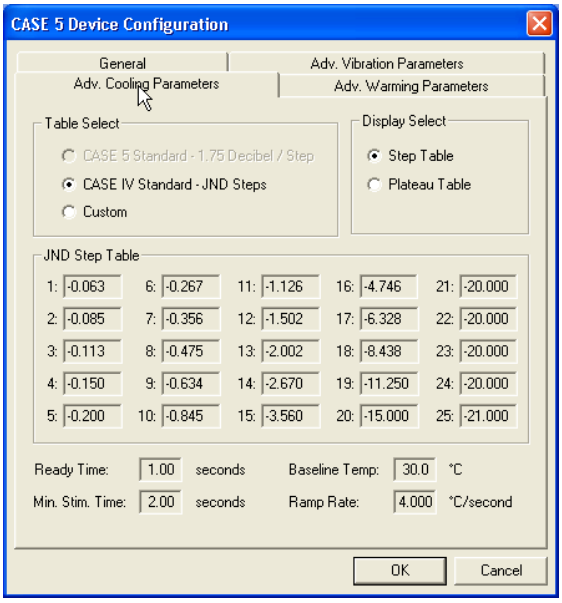
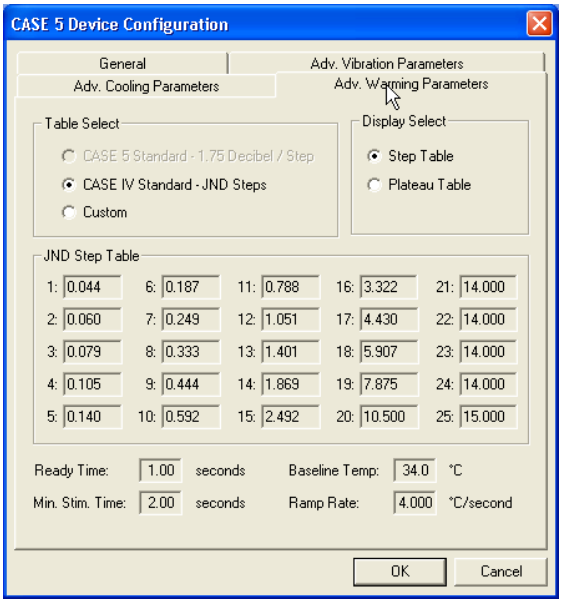
Adv. Vibration Parameters	
Table Select: (Case 5 Standard)	Select the Table to use. CASE 5 (Default), CASE IV JND or Custom.



Adv. Cooling Parameters	
Table Select: (Case IV Standard)	Select the Table to use. CASE IV JND (Default) or Custom
Display Select:	Step Table (Default) or Plateau Table



Adv. Warming Parameters	
Table Select: (Case IV Standard)	Select the Table to use. CASE IV JND (Default) or Custom
Display Select:	Step Table (Default) or Plateau Table

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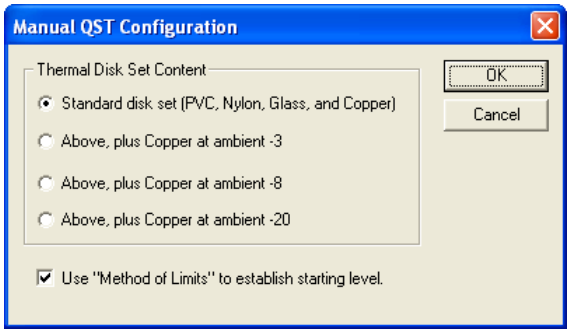
Manual QST Configuration

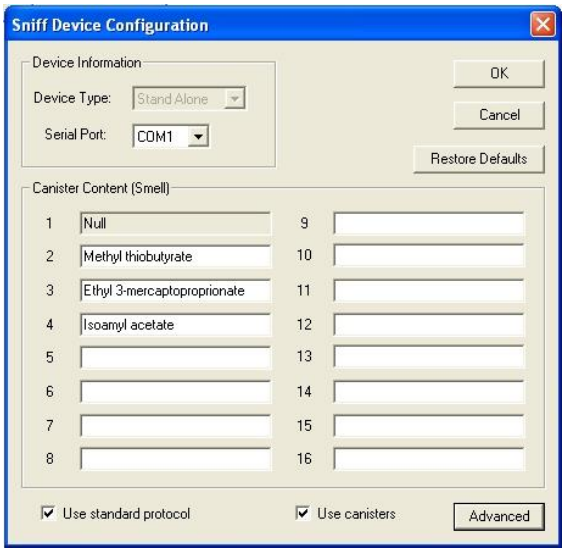


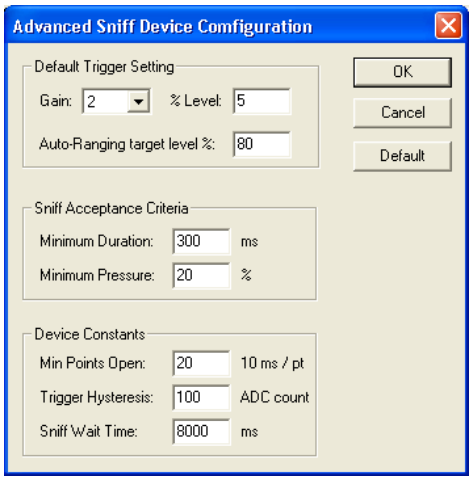
To increase the range of thermal stimuli, select from the following -3, -8, -20 choices. Cool the Copper disk(s) by external means to the selected temperature.

Use the checkbox to enable “Method of Limits” testing.

Note: There is no configuration for the Touch-pressure as Pain (Monofilament).

SMT Device Configuration





Enter the serial port the device is connected to and the label to be used for each canister. Advanced settings are described in the following table. Defaults can be restored by selecting the ‘Restore Defaults’ or ‘Default’ button.

Gain	Starting range for nasal pressure recording (1,2,4,8)
% Level	Trigger point in % of full range to start / stop sniff recordings
Auto-Ranging target level %	Level (in % of full range) to target for maximum sniff level during auto-ranging operation
Minimum Duration	Time (in milliseconds) of minimum acceptable sniff duration
Minimum Pressure	Pressure level (in % of full range) required for an acceptable sniff
Min Points Open	Number of 10ms sample points that canister will remain open following trigger
Trigger Hysteresis	ADC count (8196 full scale) below trigger level required to arm start trigger
Sniff Wait Time	Time (in milliseconds) to wait for sniff trial to meet starting trigger point

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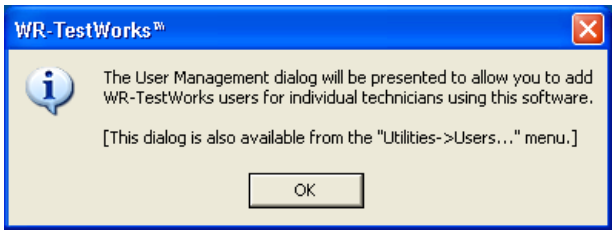
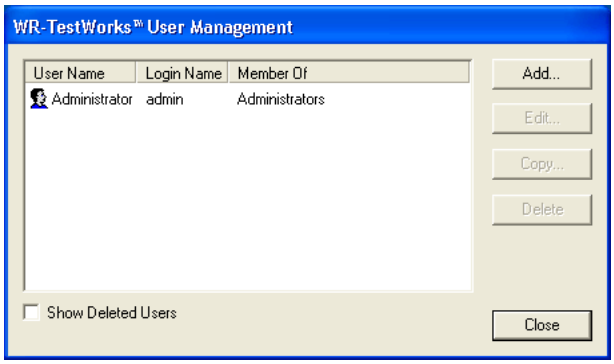
SOFTWARE SETUP - USER & STUDY MANAGEMENT



When running the software for the first time, you will be presented with the following dialog. Click the 'Ok' button and continue with user management.

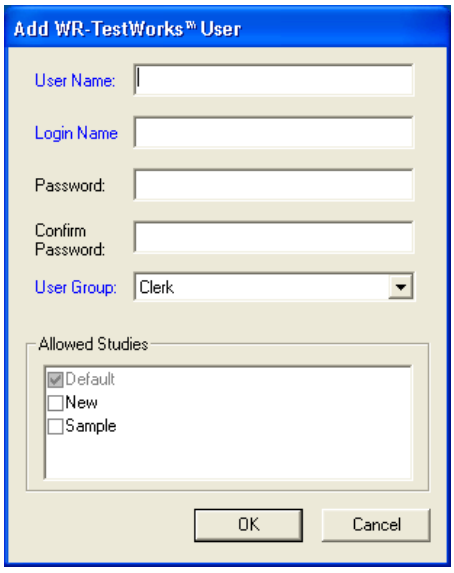
User Management

Users can be added, edited, copied, deleted or restored within the User management dialog box (accessible during initial setup or through the 'Utilities→Users…' main menu item). Each user of WR-TestWorks™ should have a separate login to identify the tests or analyses they performed.



To add a new user, select 'Add…' and enter the user information. Required fields shown in *blue*.

To edit, copy, or delete an existing user select the user in the list, then the desired operation button.



User Name = full name (first and last) that will be used on test reports (as technician or analyst).
Login Name = name used to log into WR-TestWorks™.
Password = any alphanumeric, including spaces, from 0 to 10 characters, case-sensitive.

User group = See Table

Allowed Studies = the studies which the user will be allowed to access. [Administrators can access all studies.]

When finished, press 'OK'.

NOTES:

- Passwords are not required.
- User passwords are the same for all studies.
- User membership and access can be copied to a new user.
- Only members of the administrator group can add users and studies.

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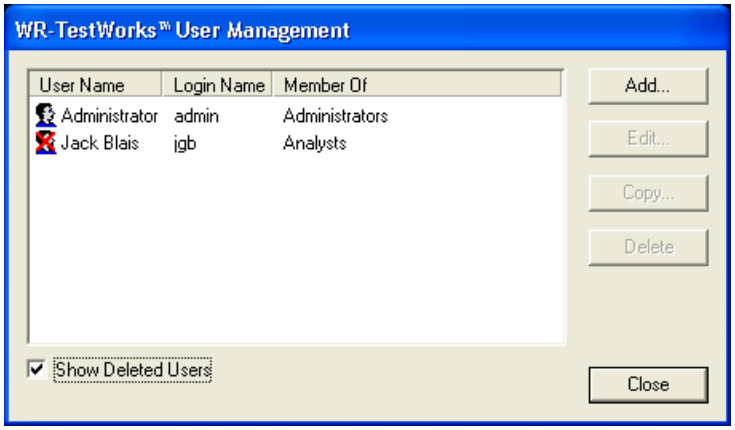
User Group	Permissions
Clerk	Cannot delete tests, patients, or analysis. Cannot create or modify users or studies
Technician	Cannot delete tests, patients, or analysis. Cannot create or modify users or studies
Analyst	Cannot delete tests, patients, or analysis. Cannot create or modify users or studies
Physician	Cannot delete tests, patients, or analysis. Cannot create or modify users or studies
Administrator	Full access

Use the 'Administrator' group for users who need to create users and/or studies, or delete patient / test / analysis records. For non-administrator users, be sure to check all studies that they are allowed to access.

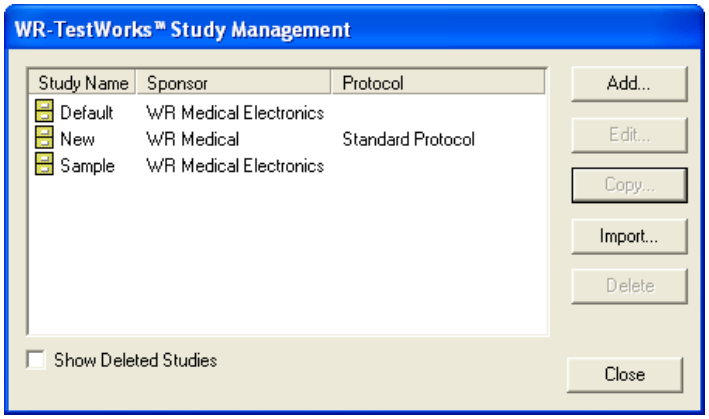


To restore a user that was deleted, select the 'show deleted user' box and highlight the user to be restored and select the 'Restore' button.

Note: 'Deleted' users may not log into WR-TestWorks™, but their information is retained for historical reports and may be 'Restored'. Use the 'Show Deleted Users' check box to see these users.

Study Management

A "study" holds a collection of patients that are tested. Typically based upon time frames, they may also be based upon disorder types or clinical trials. The Study Management dialog (accessible during initial setup or through the 'Utilities→Studies…' main menu item) is used to create / edit studies.



To add a new study, select 'Add…' and enter the study information. Required fields shown in *blue*.

To edit, copy, or delete an existing study, select the study in the list, then the desired operation button. To import a study, click on the import button.

Once you have created a study, you can copy the settings to another study by using the 'Copy' button from the study management window.

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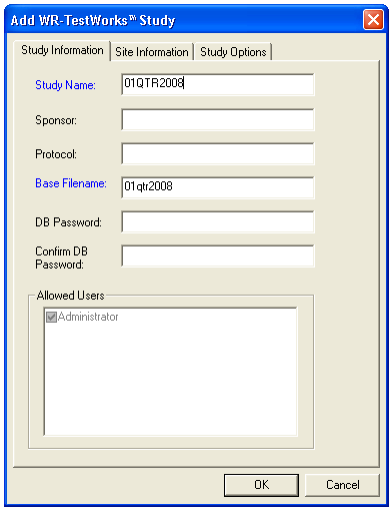
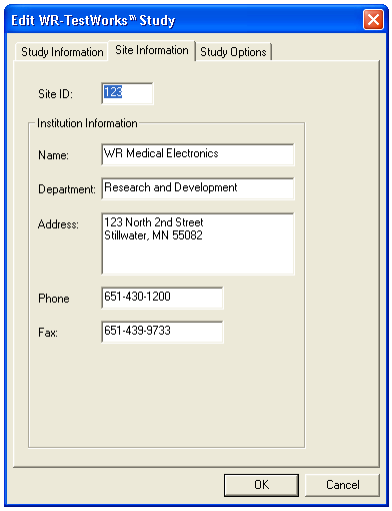


Study Information Tab:

Study name = name of study or patient grouping.
Sponsor = (Optional)
Protocol = (Optional)
Base Filename = the file-safe name for the 'study' name [can be changed if needed].
DB Password = (Optional) If used, the Database will be password protected
Confirm DB Password = (Optional) repeat of DB password

In the 'Allowed Users' box confirm the selection of users allowed access to this new study.

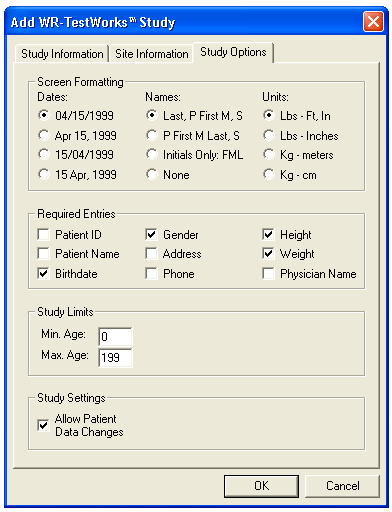


Site Information Tab:

Site ID = assign different ID's to each location (as part of a larger trial)

Name = the institution name that may appear on test reports
Department = the department name that may appear on test reports
Address = the address that may appear on test reports

Phone = the phone number that may appear on test reports
Fax = the fax number that may appear on test reports



Study Options Tab:

Dates = the format to use for display/entry of dates
Names = the format to use for display of names.
Units = the unit of measurements to use for display/entry.

Required Entries = the fields that will be required on data entry forms (in 'Blue') NOTE: Birthdate, Gender, Height, and Weight are required for most components.

Min. Age = the minimum age allowed in study.
Max Age = the maximum age allowed in study.

Allow Patient Data Changes = allows patient data to be modifiable by all users.

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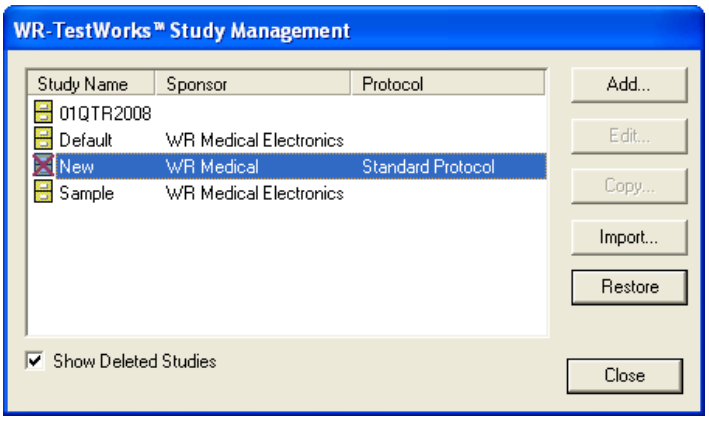
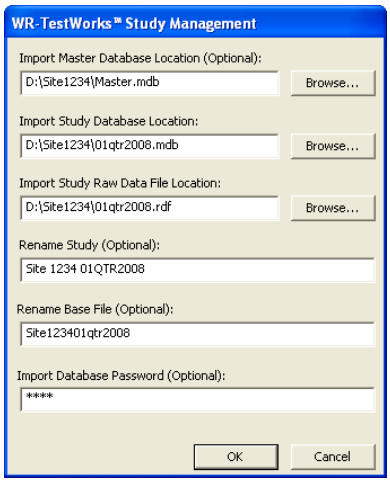
Tip: if studies are setup based upon month/quarter/year, and an existing patient returns for further testing, the existing patient demographic records can be brought into the newly created study by logging into the last study and using the Patient→Copy menu (do not copy tests and analyses).

Tip: Once a study is created you can select and copy the format to a new study.



To restore a deleted study, check the 'Show Deleted Studies box, highlight the study to be restored, and press the 'Restore' button.

NOTE: Studies may be 'Deleted' from the active list (in the login dialog), but the actual study data files are retained and may be 'Restored'. Use the 'Show Deleted Studies' check box to see these studies.



Study Import Dialog:
Import master database location = the optional path to the remote master database being used for importing a study into the current WR-TestWorks installation.
Import study database/data file locations = path to the remote study database and raw data file being used for importing a study into the current WR-TestWorks installation.
Rename study/base file = the optional new study name and/or optional base file name for the study being imported.
Database password = the password for the study database; if required.

If a master database for the study is available, the importer will copy over the study database and raw data file along with the users permitted to access the selected study.

If the Rename Study and/or Rename Base File fields are left blank default values determined by the file names and/or values from the remote master database are used instead.

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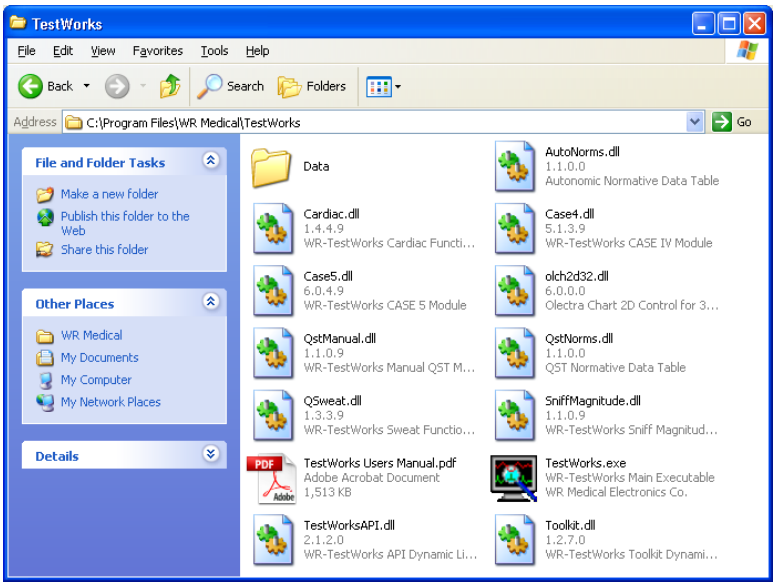
DATABASE ADMINISTRATION

Database Management

Both the system files and data files can be found under the location chosen during the installation. The default location is C:\Program Files\WR Medical\TestWorks.



Backing up studies

There is no built-in backup integrated within WR-TestWorks™. The system administrator must manually copy and paste all of the '.mdb' and '.rdf' extension files to offline (backup) storage.
There is no need to backup the system files, only the files found under the 'data' directory.

Creating a backup using Microsoft XP's built in tools can be done by selecting the files and 'right' clicking 'Send To→CD-RW'. Insert a blank recordable media, either a DVD or CD-ROM, and follow the instructions found in the 'Write these files to CD'. (See series of images below)

Note: The file size for each study is limited to 2GB of data. However, the amount of data in the [study name].mdb and .rdf files should not exceed the capacity of the backup device. For example, if a CD-RW is used as the backup media the file size should not exceed 700MB.

Note: **Always include the 'Master.mdb' file in any backup. But, only restore it if the original file is missing or destroyed.**

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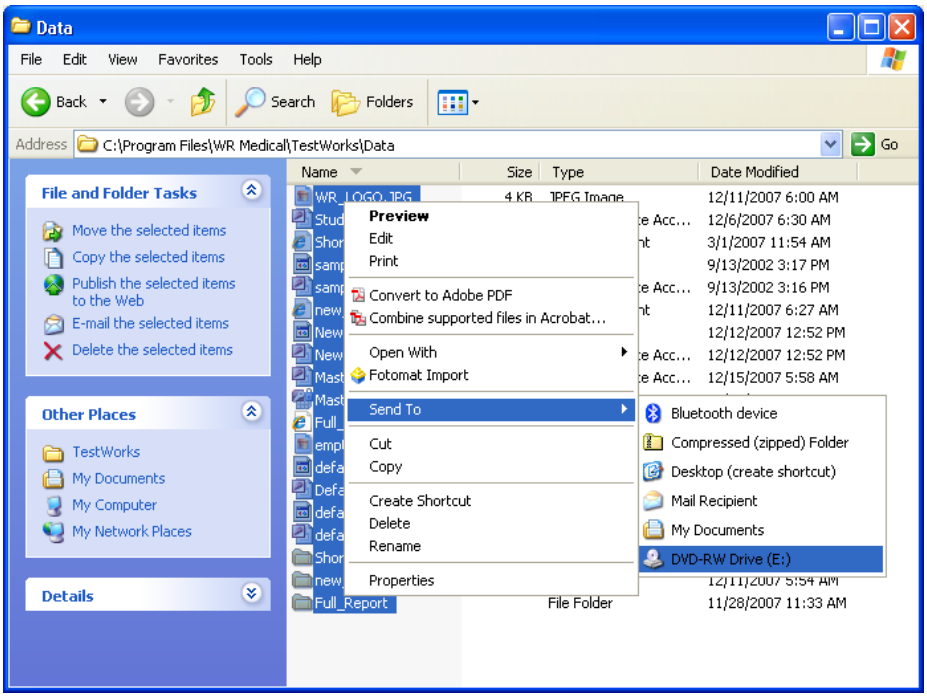

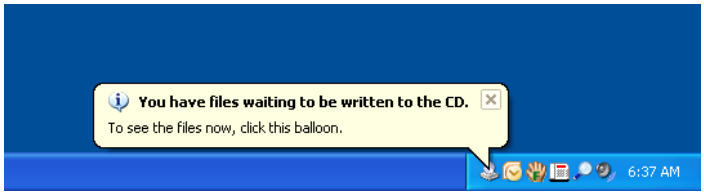

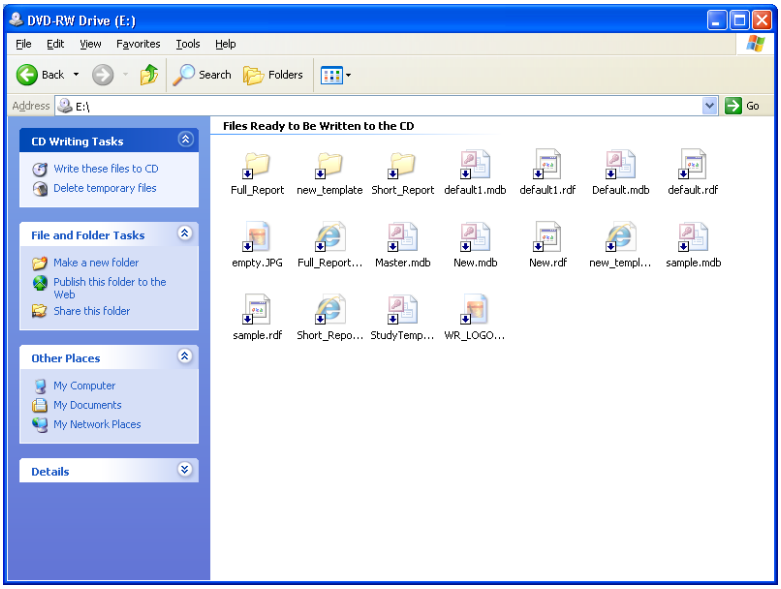

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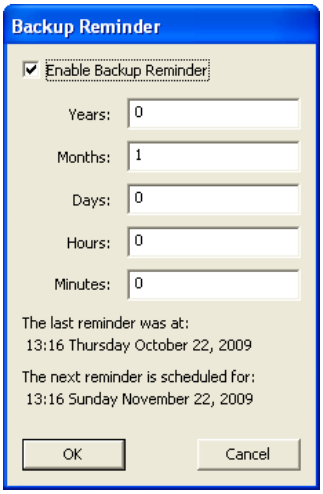
Backup Reminder



WR-TestWorks™ has the ability to remind users to back up the study and data information. By default, reminders are disabled, and the default reminder interval is one month.

The backup reminder can be enabled and disabled within WR-TestWorks™. This dialog can be reached under the "Utilities->Backup Reminder…" menu item. By selecting or deselecting the checkbox "Enable Backup Reminder" the reminders can be enabled or disabled. When enabled, the fields for Years, Months, Days, Hours, and Minutes are available for a user to enter a custom time period between reminders. These values are added collectively, therefore a setting of 1 Year or a setting of 12 Months result in the same time span of a reminder on the same date of the last reminder but with one year advanced.

Note: When the reminder for backups is displayed, the data can be successfully backed up. No data access takes place while this dialog is open, and therefore backups can be successfully been made. The main program window for WR-TestWorks™ will be displayed once the "OK" button has been pressed.

Restoring studies

To restore a study, copy the [study name].mdb and .rdf files from the backup into the data directory.

Note: *Do not restore* the 'Master.mdb' file unless the system was corrupted or re-installed. This file contains the user names, study information, and test ID numbers. Overwriting the current file may cause new tests to fail when saving and/or test ID's to be out of sequence.

Note: If the complete data directory was backed up, the WR-TestWorks™ studies may be accessed directly from the backup CD-ROM by using the Remote Access feature during login.

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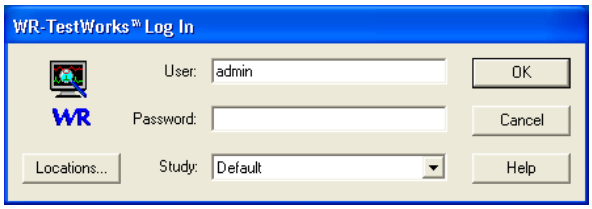
TESTWORKS EXPLORER

Logging In

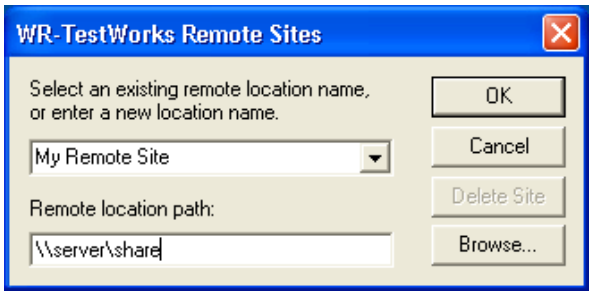


Enter user name and password, select desired study and click OK.

By default, the WR-TestWorks login dialog will present the previous user/study combination.

Remote Access

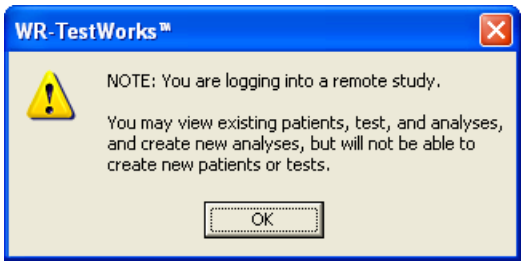
Use the 'Locations...' button to access an alternate (remote) WR-TestWorks database.



Select the remote site from the drop-down list of previously defined locations. <local> identifies the data location defined during installation.

Or, create and name a new remote data location, providing the path to the new location or using the 'Browse…' button to navigate to the location.

When accessing a remote database, the login and main explorer windows will be colored in a slight tint of green. This is to reflect remote status. Creation of patients or tests is not allowed, however test analyses may be performed remotely and saved in the database. Also, reports can be generated and printed remotely.



A reminder will be presented when logging into a remote or read-only WR-TestWorks study, identifying the limitations to normal operation.

Shared Access

WR-TestWorks supports shared database operations, allowing multiple users to be logged into the same study simultaneously. Database locking is used to prevent conflicting operations. If an operation is prevented from executing, a message will be displayed indicating the source of the conflict, allowing the user to correct the situation and retry.

The 'Refresh' button  may be used to update the Test Explorer with changes from another user.

Note: Full network configuration and drive access are beyond the scope of this document. However, for remote access to operate, the directory on the main workstation must be shared with full read/write

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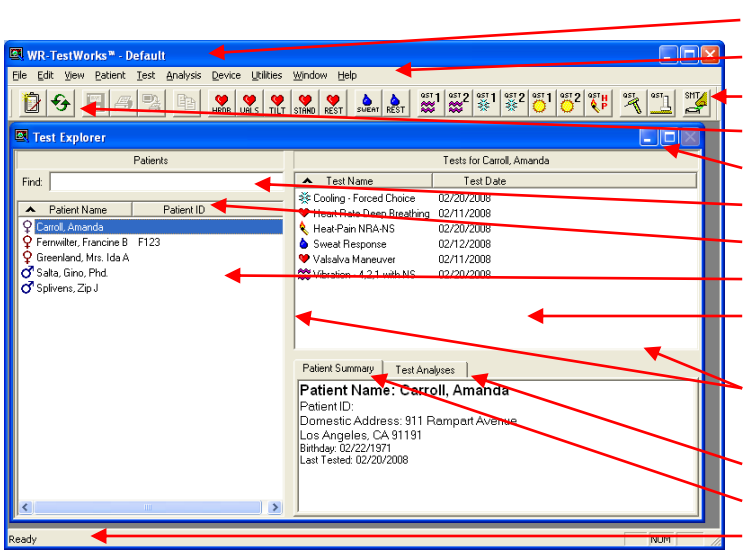
access. By navigating to the directory 'program files\WR Medical\TestWorks\data' and right click→sharing. This share can then be accessed remotely by either mapping a drive letter or in UNC (\\server\share) format.

Main Window

Nearly all operations within WR-TestWorks are available from the Test Explorer through the main menu, toolbar, or right-click context menus within the display panels.

The Test Explorer displays three panels of information; a patient list, a test list (for the selected patient), and either the selected patient's summary or the selected test's analyses. The data content of these panels is configurable (see below) and may be sorted by clicking the desired column header. These panes may be resized by dragging the splitter bars between the panes.



Title Bar (indicates study)
Main menu (drop-downs)
Toolbar (test selections)
List Refresh button
Minimize/Maximize window
Patient search (by sort field)
List sort select headers
Patient list
Test list

List splitters (to resize panels)

Analysis list
Patient summary
Status bar (command description)

Main Menu Items

Menu Name	Menu Items	Description
File	Log Out	Log the current user out of a study and display login dialog. [Available only if a user is logged in.]
	Change Password…	Bring up the change password dialog for current user.
	Close	Close the active window.
	Save	Save the current test or analysis.
	Save as HTML…	Save the current report in HTML.
	Export…	Export the current visible test data.

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Menu Name	Menu Items	Description
	Print…	Bring up the standard Print dialog to print the current test report.
	Print Setup…	Bring up the standard Printer setup dialog.
	Exit	Log off and exit WR-TestWorks™.
Edit	Copy	Copy the current test report selection to the clipboard.
	Select All	Select entire test report content.
View	Toolbar	Show/hide the main toolbar.
	Status Bar	Show/hide the status bar.
	Explorer Options...	Bring up the Explorer Options property sheet to allow selection of Explorer column content and order.
	Report Options…	Bring up the Report Options dialog.
	Deleted Items	Display deleted patients, tests, and analyses in Test Explorer
	Refresh	Reload Test Explorer contents
Patient	New…	Bring up the patient property sheet to create a new patient record.
	Properties…	Bring up the patient property sheet for the currently selected patient.
	Export…	Bring up the Export dialog to export test/analysis data for the currently selected patient(s) according to the selected format.
	Copy	Bring up the copy patient dialog. Allows user to copy patient record from one study to another. Optionally copies associated test and analysis records and raw data.
	(Un)Delete	Toggles the “deleted” state of the currently selected patient(s).
Test	New→ Test Type 1 Test Type 2	Create a new test of the specified type for the selected patient in a new window. NOTE: Only one "New" test may be open.
	Open	Open the selected test in a new window.
	Report	Generate a (composite) test report for the currently selected test(s) and all associated analyses.
	Export	Bring up the Export dialog to export test/analysis data for the currently selected test(s) according to the selected format.
	Copy	Bring up the copy test dialog to copy the current patient test to another study. Optionally copies associated analyses.
	(Un)Delete	Toggles the “deleted” state of the currently selected test(s).

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Menu Name	Menu Items	Description
Analysis	Open	Open the selected analysis in a new window.
	Report	Generate a (composite) test report for the currently selected analyses.
	(Un)Delete	Toggles the “deleted” state of the currently selected analyses.
Current Test Type	Notes	Bring up Notes dialog for visit/test/analysis notations.
	Erase	Clears the test recording. Available only when a new test is recording or stopped after recording.
	Stop	Stops the test recording. Available only when a new test is recording.
	Record	Starts recording test data. Available only when a new test has no recorded data.
	Mark	Marks an event within a test. Available only when a new test is recording.
	Timer	Enables/Disables the event timer display. Available only when a new test is recording.
	Analyze	Save the recorded test data and Analyze the test data using the specified method. Methods are test-specific.
	Report	Generate and display a test report for the current analysis. Available only when a test has been analyzed.
	Composite Report	Generate and display a composite test report for all analyses performed on the open test. Available only when a test has been analyzed more than once.
	Command n	Perform a command or action for the active test. Command is test-specific and state-specific.
Device	Device Type 1→ Command 1 Command 2 Device Type 2→ Command 1 Command 2 Etc.	For each device type (Q-Sweat, Cardiac, etc.) there may be application-level command items.
Utilities	Users…	Bring up the user management dialog.
	Studies…	Bring up the study management dialog.
	Components…	Bring up the component management dialog.
	Norms Lookup…	Bring up the norms lookup utility.
	Backup Reminder…	Bring up the backup reminder dialog.
	Archive…	Bring up the archive dialog (future).

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Menu Name	Menu Items	Description
	Database→ Backup… Restore… Compact…	Bring up various database maintenance dialogs. Some of these are available only when no one is logged in. (future)
Window	Cascade	Arrange windows so they overlap.
	Tile	Arrange windows as non-overlapping tiles.
	Arrange Icons	Arrange icons at bottom of window.
Help	About …	Show copyright and component version information.
	Contents…	Show the online Software Users Manual

Main Window Toolbar

NEW PATIENT: Creates a new patient record.

REFRESH: Refreshes the Test Explorer lists.

SAVE: Saves the active test or analysis (available after recording or analyzing).

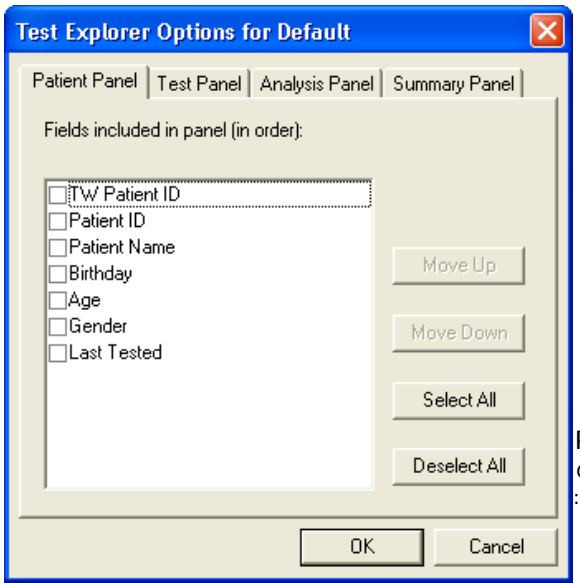
PRINT: Prints the current test report to the default printer.

PRINT SCREEN: Prints the current test screen to the default printer.
(NOTE: the background will be inverted and print in color.)

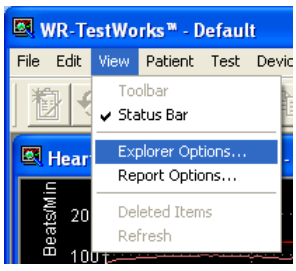
COPY: Copies the selected item to the Windows clipboard. (Available for test reports.)

The remainder of the Main Window Toolbar consists of the available tests from the enabled modules.

Explorer Options



To modify the Test Explorer panel contents, select View→Explorer Options from the main menu.



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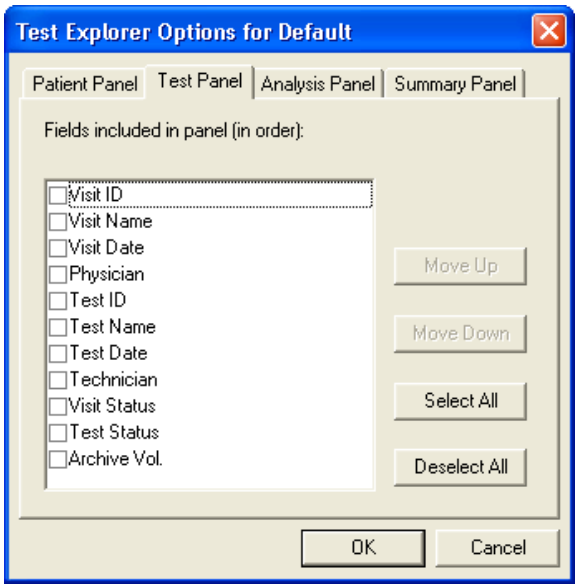
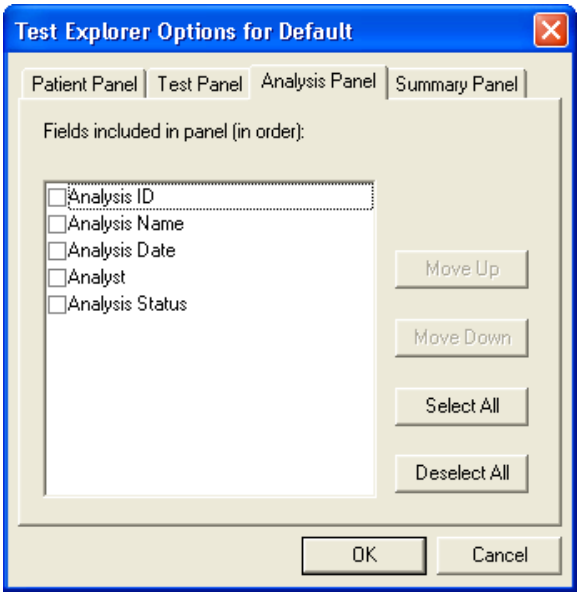
In the Patient Panel you can select which columns of information appear in the patient list. Determine the order of columns by moving the selections up and down in the list.



In the Test Panel you can select which columns of information appear in the Test List. Determine the order of columns by moving the selections up and down in the list.



In the Analysis Panel you can select which columns of information appear in the Analysis panel. Determine the order of columns by moving the selections up and down in the list.

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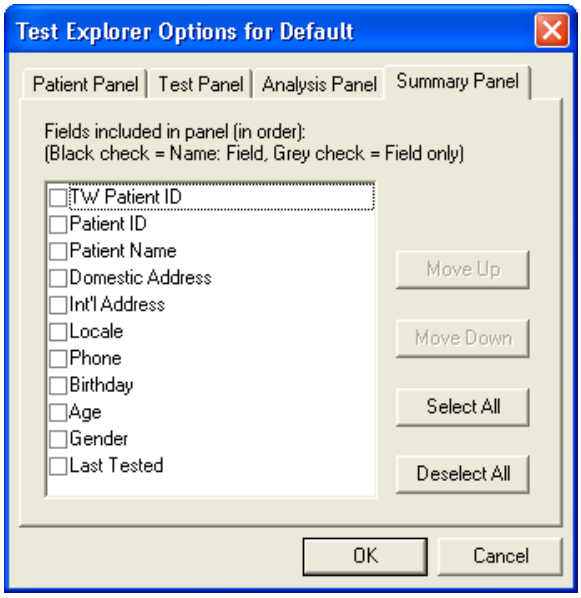


In the Summary Panel you can select the information that appears in the Patient Summary Panel, and order of appearance.

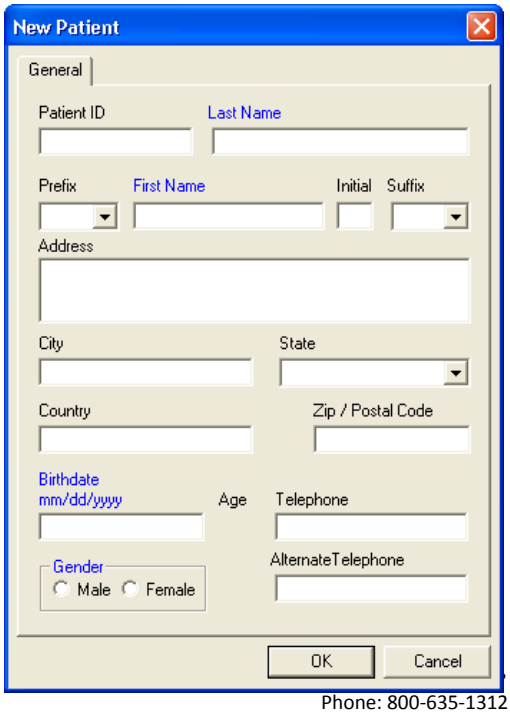
- In addition, you are able to control whether the field name precedes the data in the Patient Summary area of the Test Explorer. A black check will display the field name followed by the data; a grey check will display the data only. For example:
  - Black Check: Patient ID:12345
  - Grey Check: 12345
- The topmost (First) item defined in the Summary Panel is displayed in **Bold** in the Patient Summary.

Add Patient

Entering patient data is the first step users will take when testing a patient. There are three ways to begin adding a new patient.

1. Select Patient→New from the main menu.
2. Right-Click in the patient panel and select 'New Patient…'
3. Select the New Patient icon from the toolbar. 

The New Patient dialog box will open. Complete the fields as necessary.



- Blue Fields are required (as defined in the study options tab of Utilities→Studies)
- Patient ID can be up to 20 alphanumeric characters including spaces.
- The software will automatically determine the gender if a standard prefix (e.g. Mr. or Mrs.) is used, but the gender may be altered if necessary.
- The patient age will automatically be calculated from the birth date.

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- The software will automatically assign a numerical-order WR-TestWorks™ ID to the patient (visible in the Patient List depending on the defined explorer options).

Revising Patient Data

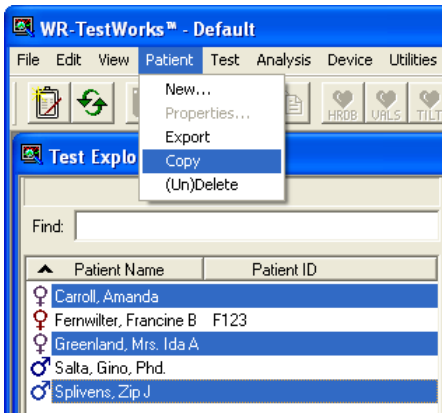
Occasionally, users may need to revise existing patient data.

1. In the Patient List, select the patient whose data needs to be revised.
2. There are three ways to begin revising;
    - Select Patient→Properties from the main menu.
    - Right-Click on the patient name and select 'Properties'
    - Double-click on a patient in the list.
3. The edit patient information dialog box will open. Revise the fields necessary.
    - Blue Fields are required.

Notes: If this patient is included in more than one study, the data will have to be changed in each study. [If the current study does not allow patient data changes, the user must be at administrator level.]

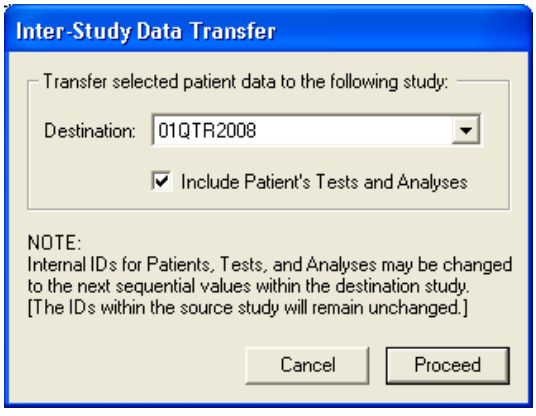
Copy Patient(s) from one study to another

From the Patient List, select (highlight) one or more patients. [Hold the 'Ctrl' key while clicking to select additional non-contiguous patients. Hold the 'Shift' key if a contiguous section is to be selected.]



Then Select Patient→Copy from the main menu, or 'Copy' from the right-click context menu.

This will bring up the Inter-Study Data Transfer dialog.



Select the destination study from the drop down list and place a check mark if the raw data and analyses are to be transferred also.

Select 'Proceed' button to continue.

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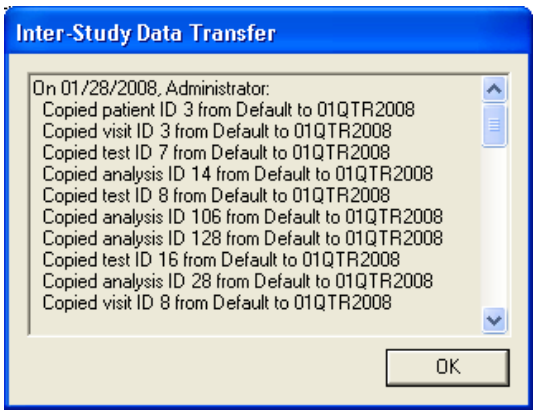


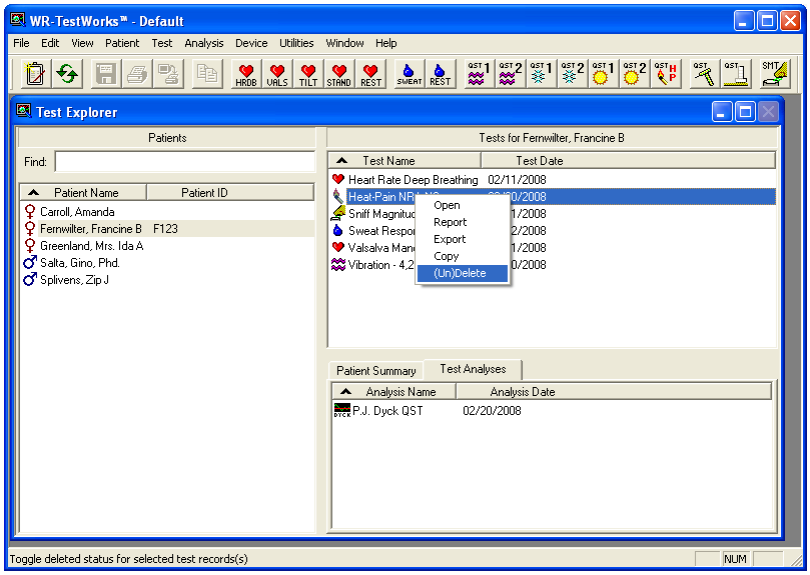
A list of items copied will be presented upon completion.

Select 'Ok' to complete.

Note: To prevent conflicts in patient and test IDs, a given patient may only be copied into a study that he/she is not already present within.

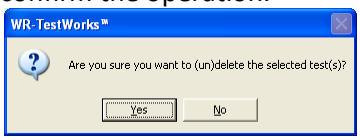
Deleting / Un-Deleting Patients, Test, and Analyses

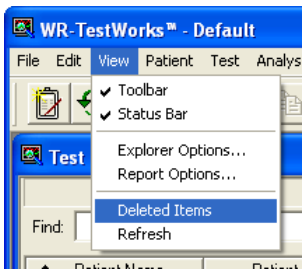
Once recorded and saved, all patient study data within WR-TestWorks cannot be erased and cannot be changed. Items may be "deleted" to remove them from view in the Test Explorer panels and to exclude them from Copy, Export, and Report operations.



To delete (or un-delete) items, select one (or more) items, then right-click and select '(Un)Delete' from the context menu or select '(Un)Delete' from the appropriate main menu root (Patient, Test, or Analysis).

A dialog box will be presented to confirm the operation.





To be able to view items in the Test Explorer panels that were previously deleted, begin by selecting the 'View→Deleted Items' main menu item. [The menu item will be "checked" when deleted items are displayed.]

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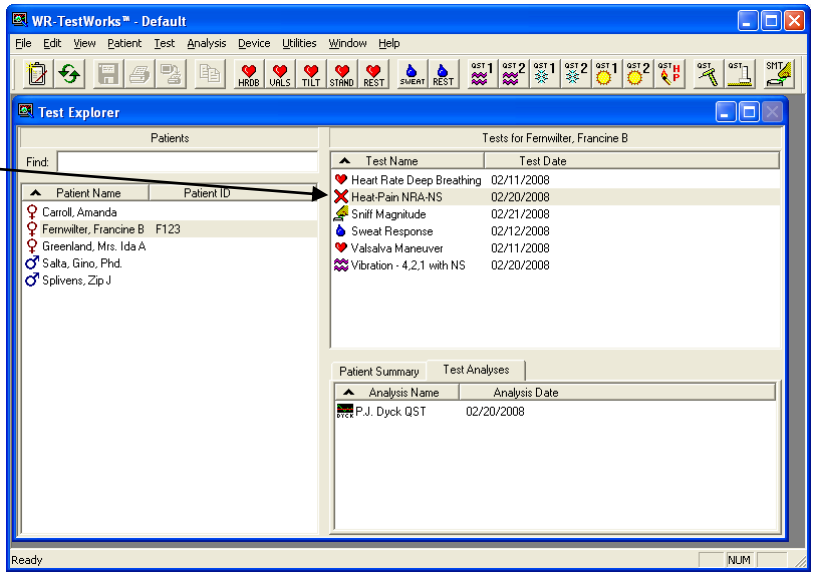
All deleted items will use a red ‘X’ icon to indicate the “deleted” status. The only operation allowed on these items is ‘(Un)Delete’ (performed in the same manner as deleting) to restore the selected item(s).

Note: By default, this feature is enabled. This can be disabled upon request. Please contact WR Medical Electronics Co. for instructions.



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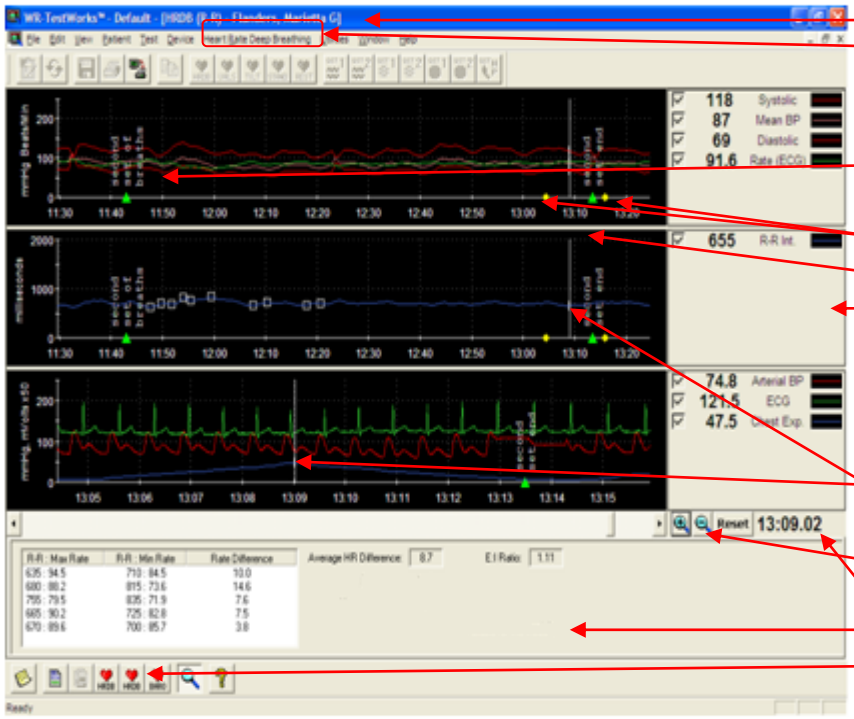
Test / Analysis Window

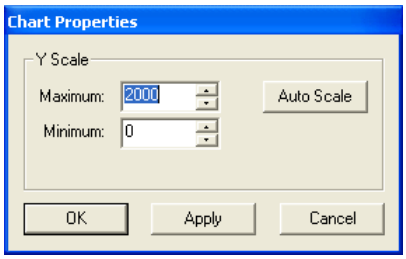
The test window provides a graphical display of the test recording through the use of one or more charts. Several test types and most analysis methods also include a data panel under the charts to display (or enter) other pertinent information.



Changing chart Properties

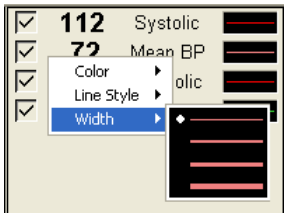
The relative sizes of individual charts may be adjusted by dragging the 'Chart Splitter' located between the chart panes.

It is possible to change the display of the Y (vertical) axis during or after recording. Double-Click on the chart to display the Chart Properties dialog box. Adjust the minimum and maximum scale values as desired, or click the Auto Scale. Click Apply or the OK button.



X-Axis controls include the scroll bar, and the zoom in/out/reset buttons.

Trace enable, color, line style, and width can be changed in the chart legend with the checkbox and by 'right' clicking on any of the trace samples and selecting from the options presented.



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Test Toolbar

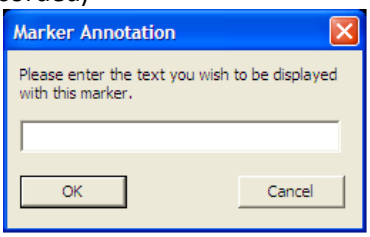
The Test Toolbar consists of various buttons to control the test operations during data acquisition (recording) and analysis. A "recorder" model is used to acquire continuous real-time data.

ERASE: Erases all recorded test data from the current test (available during or after recording).

STOP: Stops recording of test data (available during recording)

RECORD: Begins recording test data (available when no data is recorded)

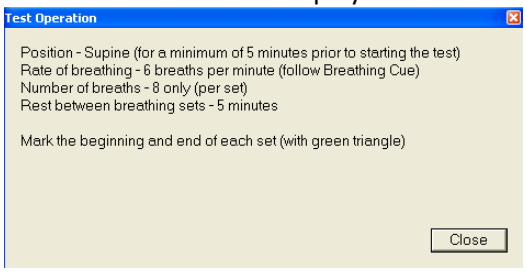
MARK: Brings up the dialog to insert a marker along with a text annotation, allowing spots in the data to be 'tagged' at any point during the test, as indicated by a triangle within test windows. The annotation, if entered, appears vertically oriented above the marker with its center at the chart.



TIMER: Toggles the event timer window on or off. (Shows time elapsed since last event marker.)

MARKER: Enable / Disable marker text

TEST OPERATION: Display how-to-do Box.



Other standard toolbar buttons include the following.

NOTES: Opens the 'Notes' dialog to enter visit, test, and analysis notes and the visit interpretation (available before, during, and after recording).

REPORT: Saves the active analysis and generates a test report.

COMPOSITE REPORT: Saves the active analysis and generates a composite test report (including all associated analyses).

ANALYZE: Saves test and displays analysis options (available after recording).

MAGNIFY: Toggles magnification of the analog waveform chart (or individual trials vs. composite traces/points).

Additional toolbar buttons are presented (as appropriate to the test, analysis, or device) and are described in the application specific sections that follow.

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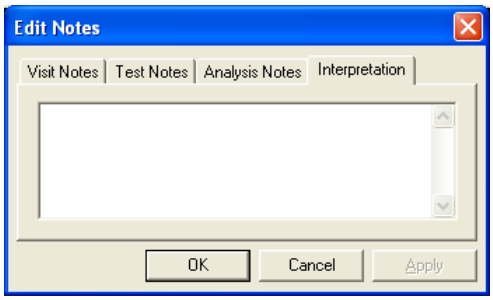
EDIT NOTES DIALOG

The Edit Notes dialog is accessed from the test toolbar and contains tabs that are appropriate to the current open test/analysis.



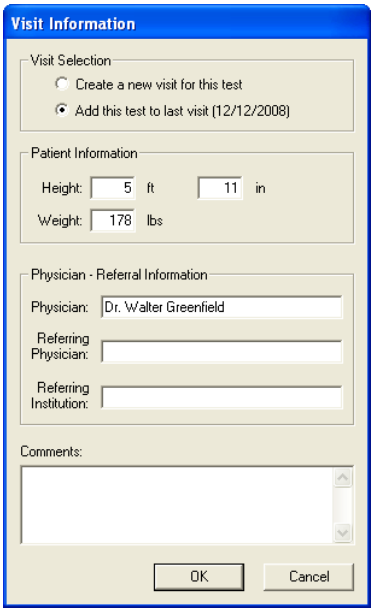
Visit Notes: General comments relevant to entire set of tests in the visit.
Test Notes: Remarks specific to the current open test.
Analysis Notes: Comments specific to the current open analysis (if any).
Interpretation: Overall interpretation of all tests in the visit.

The notes may be edited at any time (during or after testing/analyzing). Keep in mind that the Visit Notes and Interpretation are applied to all tests in the visit.

The notes are displayed on the default test reports as “Visit Remarks” in the patient information section, “Interpretation” preceding all tests, “Remarks” in the test information section(s), and “Comments” in the analysis section(s).

VISIT INFORMATION DIALOG

The Visit Information dialog is presented prior to beginning a new test (after selecting the patient and test type).



The new test may be included with the most recent visit (default, if last visit was within past week), or a new visit may be created for the test.

NOTE: If adding this  test to an existing visit, changes to the patient or physician information will also change these values for all other tests associated with the visit.

Patient height and weight are initialized with data from the most recent visit, and may be changed to reflect their current information.

The comment field allows entry of general conditions that are relevant to the entire visit. [This comment is also accessible from the ‘Notes’ test toolbar button.]

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CARDIAC COMPONENT

Cardiac Test Types

HRDB (Heart Rate Deep Breathing)

VALS (Valsalva Maneuver)

TILT (Tilt Table)

STAND (Response to Standing)

REST (Resting recording)

Cardiac Specific Test Toolbar buttons

METRONOME ON/OFF:  [HRV Acquire Only] Starts/Stops metronome display on HRV device.

TEST HELP:  Displays test operations and marker usage for current test type.

ZERO BELLOWS: 

ZERO Chest Bellows input.

Charted Signals

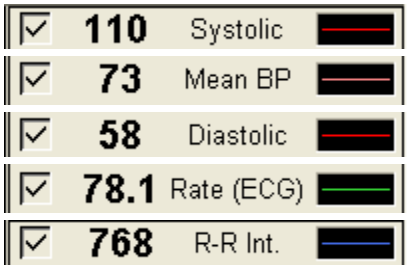
Beat-to-beat Systolic BP (mmHg):

Beat-to-beat Mean BP (mmHg):

Beat-to-beat Diastolic BP (mmHg):

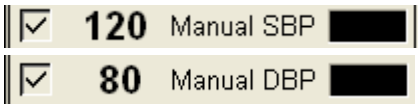
Beat-to-beat Heart Rate (Beats/Min):

Beat-to-beat R-R Interval (Milliseconds):



Manual Systolic BP (mmHg):

Manual Diastolic BP (mmHg):

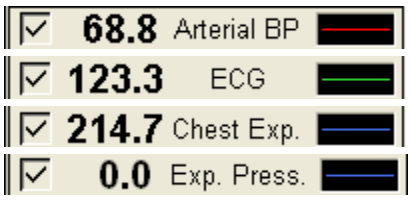


Continuous Arterial BP (mmHg):

Continuous ECG Data (mVolts):

Chest Expansion Data (arbitrary units):

Valsalva Expiratory Pressure (mmHg):



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NOTE: The number of panes and data traces presented in the Main Test window depends upon the devices used and the selected configuration. The windows shown are with a continuous beat to beat blood pressure device connected. See device or system configuration for more details.

HRV Acquire device only:

If the HRV Acquire device is unable to detect heart beats, a yellow "Check ECG" message will be displayed in the bottom chart window.

Check ECG

Check to see that the electrodes are fresh and the cables are connected properly.

HEART RATE RESPONSE TO DEEP BREATHING

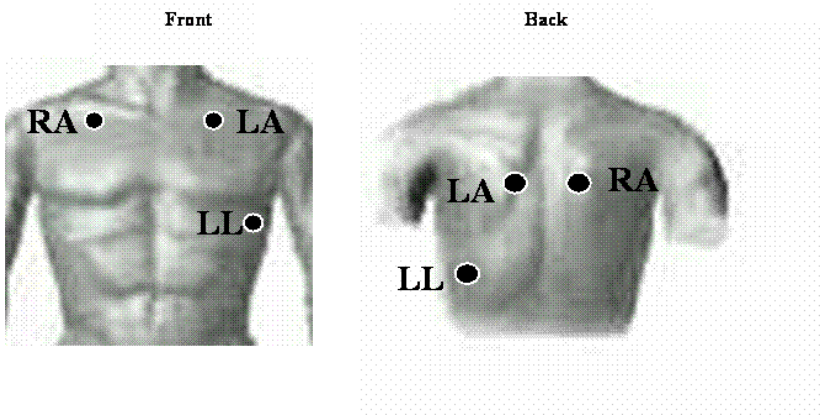
Performing HRDB – Sample Protocol

Several items affect Heart-Rate Deep Breathing (HRDB). These must be considered by the technician and controlled in order to maintain standardization and consistency between test subjects, for repeated tests on the same patient. Sampling rates supported by the cardiac devices are 200 Hz, 250 Hz, 300 Hz, and 400 Hz.

Instructions:

1. Have the patient come in, relaxed and comfortable, with an empty bladder.
   Patient should be supine for a minimum of 5 minutes prior to starting the test.

2. Attach the ECG electrodes (white on right, black on left, red is reference). You may want to prepare the skin with an alcohol wipe, NuPrep, or other standard ECG preparation. If you are getting a lot of artifact, remove the pads, prepare the skin, and then start again with fresh pads. Two sites for electrode placement are:
   The interscapular area just medial to the tip of the scapula.
   The supraclavicular areas.
   Reference electrode site is not critical.



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3. Attach the chest expansion bellows to the patient. To start, expand the bellows by 4-5 inches, stretching it over the patients' chest, with the black bellows material on the front of the patient and the Velcro material on the back. (see photo above right)Place on the rib cage, at the location where the greatest expansion is expected. Do not place over the reference ECG electrode, which may cause ECG artifact. Plug the Luer fitting in to the specified location on the HRV Acquire main unit AFTER attaching the bellows firmly to the patient. (see photo bottom right.

NOTE: If chest expansion trace is not visible during the recording (it is in the negative range) the user can press the zero icon 

to reset the trace on the chart.

4. Turn on the ECG device and the WR-TestWorks™ software.
5. Select (or create) the patient in the Test Explorer, and select the HRDB test icon. 

6. Enter visit information, and begin recording. 

7. Explain the procedure to the subject:

"We are going to be testing your autonomic nerves. This test is quite simple. We will ask you to breathe deeply at the same rate as the oscillating bar (or to breathe in and out according to my hand movements) for a total of 8 breaths. After a 5-minute rest, we will ask you to repeat the test with another 8 breaths. It is important to breathe as deeply as possible. You can breathe in through your nose and out through your mouth if that is comfortable for you. Do not hold your breath at any time, but use a full 5 seconds for breathing in and a full 5 seconds for breathing out. We will have you try it for 2 breaths so you can see how it feels."

8. Give the patient a practice test. The practice should be only two breaths. [HRV Acquire Only: Start/stop metronome as needed with toolbar button. ]
9. Let the subject rest 2 minutes after the practice. Clear the test recording  (optional).

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10. Start the first set. Press the Mark button  (green triangle) in WR-TestWorks™ to signify the beginning of the test. Press the Mark button again when the set is completed.

HRV Acquire device only:

11. Press the Metronome button  to start the metronome operation when the patient has fully exhaled (metronome begins with inspiration phase). Press again to stop metronome after set is completed. If automatic event markers are enabled (default), event marks will be inserted into the recording at the start and stop points.

NOTE: If the HRV Acquire configuration includes a value for the respiration cycles, the metronome will stop automatically after the specified respiration cycles have been performed.

12. Rest for 5 minutes

13. Start the second set. (Additional sets can be done, repeat after rest period)

14. When complete, stop the recording. 

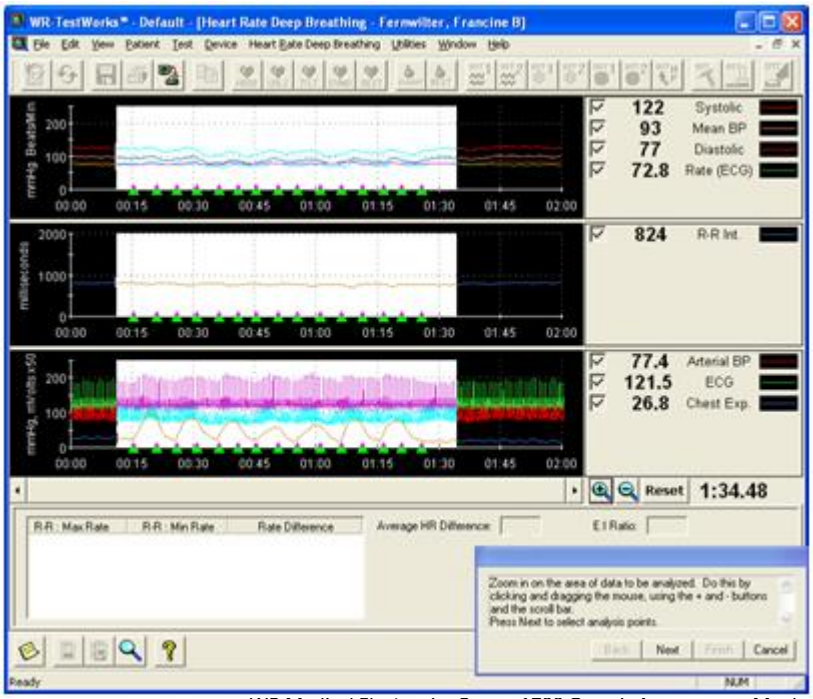
NOTE: Keep recording within WR-TestWorks™ throughout the entire test, even while the patient is resting between sets.

HRDB ANALYSIS TECHNIQUES

HRDB using HR:  Analysis based on Heart Rate

HRDB using R-R:  Analysis based on the R-R Interval

Heart Rate, Blood Pressure Changes with Stimulus:  Analysis based on Linear Regression



Select the analysis icon  from the test toolbar (bottom of the screen), then the HRDB or HRDB (R-R) icon ( **or**  **)** (the status line or pop-up tooltip will indicate the analysis type while the mouse pointer hovers over the buttons). Follow the instructions in the dialog box to analyze the test. [HRDB (R-R) shown.]

Select the desired breathing set by clicking and dragging the mouse in the chart area.

TIP: To see the entire test in the analog chart pane, deselect the - magnifier button.

Press the 'Next' button and the software will choose the highest consecutive 5 valley-peak points shown on the R-R frame.

TIP: When analyzing HRDB recordings with small HR or R-R variations, enlarge the analysis chart by clicking and dragging the chart splitters between the chart panes, or by using the Auto Scale feature in the Chart Properties dialog (accessed by double-clicking in the chart area).

Points may be adjusted by removing incorrect points and replacing them with correct points. To remove a point, "right-click" near it (the point closest to the cursor will be removed). Select new points by "left-clicking" on the desired point (marked by the current cursor position).

When the desired points are selected, press the 'Next' button and the resulting analysis data is shown in the analysis window.

Press the 'Finish' button in the user guide, then press the save icon. 

To create a composite report, after saving the first set analysis, zoom out again, select the second set, and analyze it. The composite report button,  on the test toolbar, will include both analyses on one test report.

VALSALVA MANEUVER

Performing Valsalva – Sample Protocol

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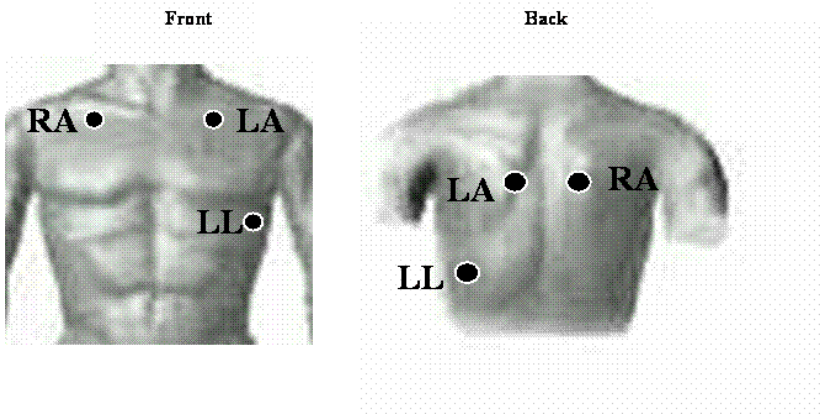
The heart is monitored by ECG, pressure recording, or other methods while the patient performs the Valsalva maneuver; cardiac volume decreases in unaffected patients but may dilate in the patient with impaired myocardial reserve; there is a characteristic complex sequence of cardiocirculatory events, departure from which may indicate disease or malfunction.

Several items affect the Valsalva Recording. These must be considered by the technician and controlled in order to maintain standardization and consistency between test subjects, for repeated tests on the same patient.

Instructions:

1. Have the patient come in, relaxed and comfortable, with an empty bladder.
   Patient should be supine for a minimum of 5 minutes prior to starting the test.

2. Attach the ECG electrodes (white on right, black on left, red is reference). You may want to prepare the skin with an alcohol wipe, NuPrep, or other standard ECG preparation. If you are getting a lot of artifact, remove the pads, prepare the skin, and then start again with fresh pads.
   Two sites for electrode placement are:
   The interscapular area just medial to the tip of the scapula.
   The supraclavicular areas.
   Reference electrode site is not critical.



3. Connect blood pressure device, where applicable.

4. Turn on the ECG device and the WR-TestWorks™ software.
5. Select (or create) the patient in the Test Explorer, and select the Valsalva test icon. 

6. Enter visit information, and begin recording 
.

7. Explain the procedure to the subject:

"We are going to be testing your autonomic nerves. This test is quite simple. We will ask you to exhale into the mouthpiece and cause the light bar to move upwards to the 40 mmHg line and continue blowing for 15 seconds. After a 5 minute rest, we will ask you to repeat the test with another effort. It is important to try and reach 40 mmHg and hold it as steady as possible. Do not hold your breath at any time. We will have you try it so you can see how it feels."

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8. Give the patient a practice test.

9. Let the subject rest 2 minutes after the practice. Clear the test recording  (optional).

10. Start the first set. Press the Mark key  (green triangle) in WR-TestWorks™ to signify the beginning of the trial when the expiratory pressure reaches 20-30 mmHg. Press the Mark key again when the maneuver is completed after 15 seconds.

HRV Acquire device only:

10. To start the first set. Have the patient start exerting pressure, when the trigger threshold is reached the event mark will be inserted and the countdown timer will start. When the countdown reaches zero the second marker will be placed.

NOTE: See configuration section for additional settings.

11. Rest for 5 minutes

12. Start the second set.

13. When complete, stop the recording. 
NOTE: It is important to continue recording at least 30-45 seconds after the maneuver.

NOTE: Keep recording on WR-TestWorks™ throughout the entire test, even while the patient is resting between sets.

VALSALVA ANALYSIS TECHNIQUES

HRDB using HR:  Analysis based on Heart Rate

HRDB using R-R:  Analysis based on the R-R Interval

Heart Rate, Blood Pressure Changes with Stimulus:  Analysis based on Linear Regression

Adrenergic:  Analysis based on BP

Select the test analysis icon  from the test toolbar (bottom of the screen), then the Valsalva or Valsalva R-R icon  (the status line or pop-up tooltip will indicate the analysis type while the mouse pointer hovers over the buttons). Follow the instructions in the user guide dialog box to analyze the test.

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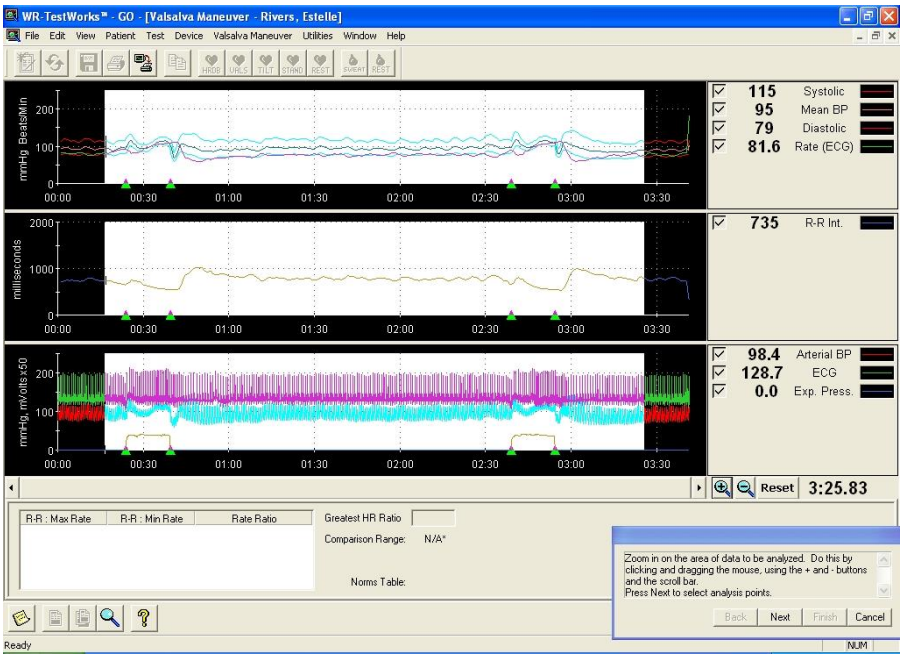

Select the desired Valsalva maneuvers by clicking and dragging the mouse in the chart area. The area to be analyzed should include from the start of the first maneuver to 30-45 seconds beyond the end of the final maneuver.

NOTE: To see the entire test in the bottom chart pane, deselect the magnifier button.

Press the 'Next' button and the software will choose the local maximum and minimum heart rate points for each maneuver (shown on the R-R frame).

Points may be adjusted by removing incorrect points and replacing them with correct points. To remove a point, "right-click" near it (the point closest to the cursor will be removed). Select new points by "left-clicking" on the desired point (marked by the current cursor position).

On occasion, the auto-selected points will include pairs between maneuvers. Deselect these points using the right mouse button.

When the desired points are selected, press the 'Next' button and the resulting analysis data is shown in the analysis window.

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Press the 'Finish' button in the user guide to complete the analysis.

If a test report is desired, press the report button  . The analysis will be automatically saved and a test report generated. Otherwise, press the save button  and continue with other testing.

HEAD-UP TILT

A Tilt Table Test is performed to evaluate one of the causes of syncope.

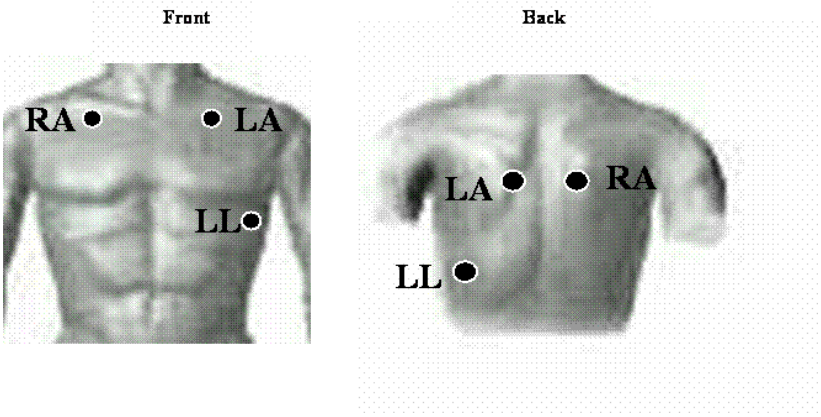
Performing Head-Up Tilt – Sample Protocol

It is important to perform the tilt at a standard time after lying down (20 minutes).

Instructions:

1. Have the patient come in, relaxed and comfortable, with an empty bladder. Patient should be supine for a minimum of 20 minutes prior to starting the test.

2. Attach the ECG electrodes (white on right, black on left, red is reference). You may want to prepare the skin with an alcohol wipe, NuPrep, or other standard ECG preparation. If you are getting a lot of artifact, remove the pads, prepare the skin, and then start again with fresh pads. Two sites for electrode placement are:
   The interscapular area just medial to the tip of the scapula.
   The supraclavicular areas.
   Reference electrode site is not critical.



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3. Connect blood pressure device, where applicable.

4. Turn on the ECG device and the WR-TestWorks™ software.
5. Select (or create) the patient in the Test Explorer, and the Tilt test icon. 

6. Enter visit information, and begin recording. 

7. Explain the procedure to the subject:

"We are going to be tilting you up to a near vertical position and monitor your heart rate and blood pressure."

8. If the tilt test is configured for manual blood pressure entry, enter the baseline blood pressure.

9. After at least a minute of baseline recording, tilt the patient up (to 70 degrees).
10. Press the Mark key  (green triangle) in WR-TestWorks™ to signify the beginning of the tilt.

11. If the tilt test is configured for manual blood pressure entry, enter the blood pressure values for each sample point as it is encountered.

12. Press the Mark key  again when tilted down. Continue recording at least one minute following the tilt down.
13. When complete, stop the recording. 

14. If providing manual blood pressure, check the entries for accuracy prior to saving the test. Once saved, these values may not be changed (as they are part of the "recorded" test).
A reminder is shown: **Check Manual BP entries for accuracy. Once saved, they cannot be changed.**

TILT ANALYSIS TECHNIQUES

Heart Rate, Blood Pressure Changes with Stimulus: 

Linear Regression analysis

30:15 using HR: 

30:15 Ratio based on Heart Rate

30:15 using R-R: 

30:15 Ratio based on the R-R Interval

Tilt using HR: 

Tilt analysis based on Heart Rate

Tilt using R-R: 

Tilt analysis based on the R-R Interval

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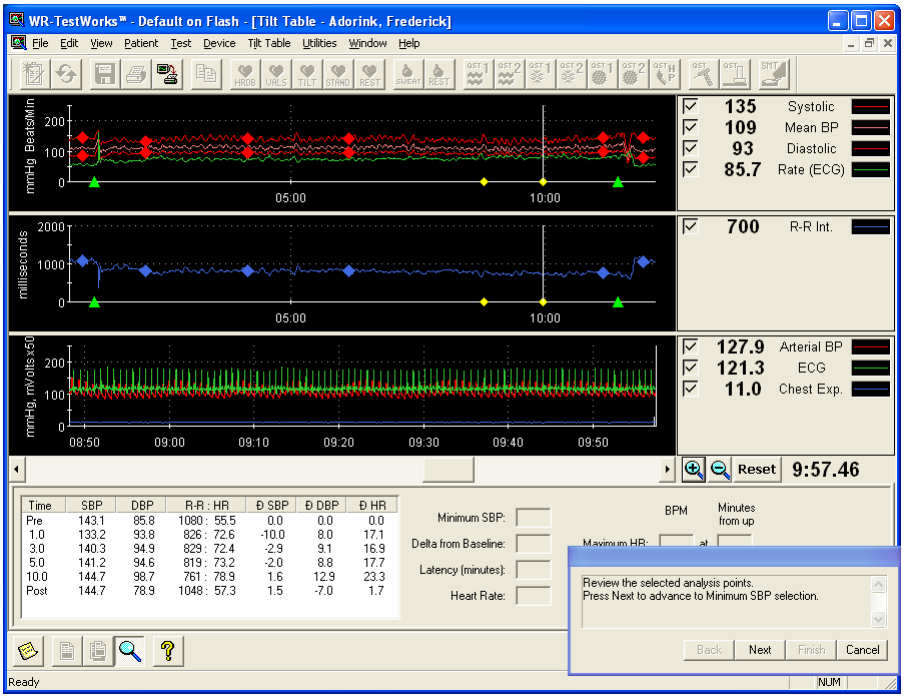
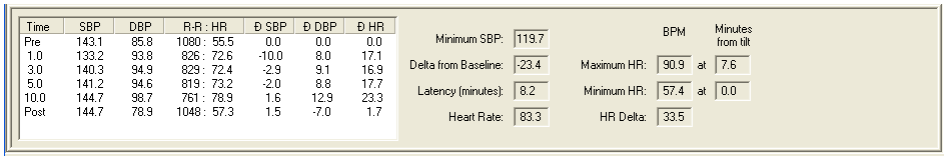


Select the analysis icon  from the test toolbar (bottom of the screen), then the desired analysis icon (the status line or pop-up tooltip will indicate the analysis type while the mouse pointer hovers over the buttons). Follow the instructions in the dialog box to analyze the test. [Tilt (R-R) analysis shown.]

Using the event markers and tilt configuration settings, the analysis automatically chooses the chart range and sample points. Sample points are displayed on the chart with diamond markers.

Press the 'Next' button to proceed to choosing the minimum SBP level, and again to advance to the selection of the minimum and maximum heart rate points. The resulting analysis is shown in the analysis window.



Press the 'Finish' button in the user guide to complete the analysis.

If a test report is desired, press the report button  . The analysis will be automatically saved and a test report generated. Otherwise, press the save button  and continue with other testing.

REST/STAND

The resting test can be used for various response tests, such as the cold presser or sustained hand grip. Marks can be placed when needed and meaningful. There are no specific analyses for REST test recordings but data can be exported and printed. STAND tests may be analyzed with the 30:15 ratio or Tilt analysis techniques.

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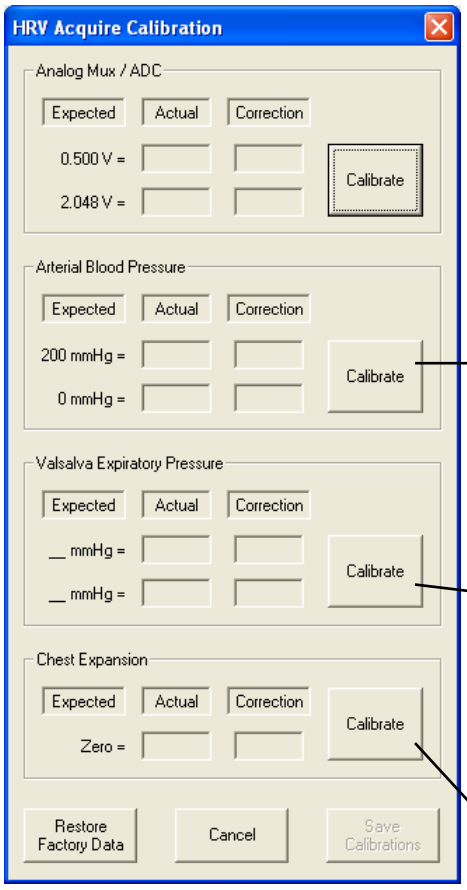
HRV Acquire Device Calibration

The HRV Acquire device is calibrated during the manufacturing process, and the resulting constants are stored within the internal FLASH memory of the device. The Cardiac application software will load the constants during initialization.

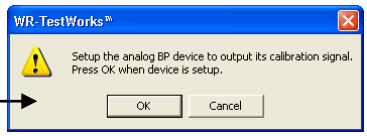
As with any electronic equipment, it is recommended that periodic (yearly) certification be performed. The following equipment will be needed to perform this operation; a calibrated manometer traceable to NIST standards (+/-2% or less in accuracy) and an arterial BP device that can output a square wave calibration signal.

Launch the HRV Acquire calibration program from the Device→Cardiac→Calibrate main menu item.



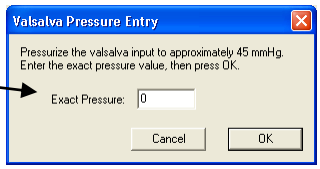
The analog mux / ADC calibration uses internal precision references (no external connections required).

The arterial BP input is calibrated with the specific BP device used with the system. This allows for correction of errors in either the HRV Acquire input or the BP device output.



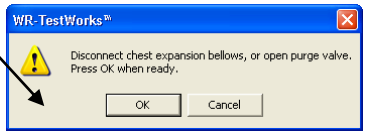
Consult the BP device manual to enable its calibration output waveform (0-2V square wave) and press 'OK'.

Valsalva expiratory pressure is calibrated with a fixture capable of holding known air pressures (near 5 and 45 mmHg).



Pressurize the Valsalva input near the requested level, enter the exact pressure value, and press 'OK' (for each requested pressure).

Chest expansion calibration simply measures the zero offset (atmospheric pressure), with the input open. Press 'OK' after disconnecting the chest expansion bellows.



For each calibration item the actual measurement and correction (error) is displayed. If performing verification, check that the correction values are within acceptable tolerances, and finish by pressing 'Cancel'. To compute and save new calibration constants based upon the measurements taken, press 'Save Calibrations'.

NOTE: The factory calibration constants are not over-written when saving new calibration data, and may be restored at any time by pressing the 'Restore Factory Data' button.

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QSWEAT COMPONENT

Q-Sweat Test Types

SWEAT RESPONSE (evoked)

RESTING SWEAT

Q-Sweat Specific Test Toolbar buttons

TEST SETUP: Selects recording channels and recording locations (before recording)

VIEW INPUTS: Views the individual channel sensor inputs (during recording)

TEST LOG: Views recording events such as intermittent air leaks and times of occurrence.

Charted Signals

Data Channel 1(nL/min): 0.0 Forearm

Data Channel 2(nL/min): 0.0 Prox Leg

Data Channel 3(nL/min): 0.0 Dist Leg

Data Channel 4(nL/min): 0.8 Foot

The Status window (below charts) will show the status of each channel and the device.

Status	FOREARM	PROX LEG	DIST LEG	FOOT	DEVICE
	ON	ON	ON	ON	

Status	FOREARM	PROX LEG	DIST LEG	FOOT	DEVICE
	AIR LEAK	AIR LEAK	AIR LEAK	AIR LEAK	DESICCANT

NOTE: The Device flag 'DESICCANT' may display in red when the device is first started; this is normal as the system purges moisture. If, after 5-10 minutes, it is still displayed, check the desiccant cartridge for replacement.

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Q-Sweat Device Preparation

Prior to starting a test (15-30min), the Q-Sweat device should be powered on with the capsules seated on the parking fixture to allow the system to purge any accumulated moisture. The desiccant should be checked to determine remaining time (See hardware manual).

TIP: A Q-Sweat test recording may be started to monitor the drying process.

USB version only:

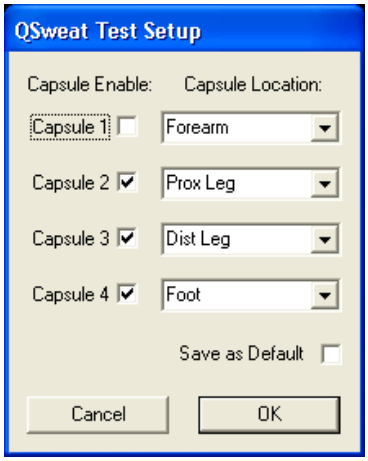
The "Power" LED on the front panel of USB based Q-Sweats also indicates the operational status:

Steady green	- unit is in use
Pulsing green	- unit is ready for patient testing
Steady amber	- unit is warming up (or drying out)
Flashing yellow	- power-on self-test error* (contact WR Medical)
Light off	- device powered off, or micro not running

*The self-test error is indicated in the device status window of a Q-Sweat test.

Q-Sweat Test Setup

The selection of the capsules to use during a Q-Sweat test and their specific locations are established through the test setup dialog. This is accessed from the test toolbar of a new Q-Sweat test,  prior to starting the test recording.



Capsule enables allow selection of the Q-Sweat channels to use for a given test (it is not necessary to start with capsule 1, or use contiguous capsules).

Capsule locations may be selected from the drop-down list, or a custom location may be entered.

If the specified test setup is to be used as the "standard" setup, check the 'Save as Default' box and all subsequent tests will be initialized with the current setup.

View Inputs Dialog

All raw sensor inputs may be monitored during recording with the View Inputs dialog, accessed from the test toolbar.  This dialog is useful in troubleshooting the system by allowing comparison of channel data.

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Performing Q-SWEAT Recordings –

1. Have patient come in, relaxed and comfortable, with an empty bladder.
2. Prepare the skin surrounding the area to be tested.
3. Select (or create) the patient in the Test Explorer, and select the desired test icon.  or 
4. Enter visit information, and make any changes in the setup  prior to starting the recording.
5. Select the record button  to begin recording with capsules on the parking fixture.
    a. Confirm that the channels have dried sufficiently (sweat rates low and traces flat).
    b. For resting sweat tests, record a minute of baseline rates on the parking fixture.
6. Attach sweat collection capsules using Velcro and/or silicone straps.
    a. Confirm that there are no air leaks (status window), and adjust capsules as needed.
    b. For sweat response tests, clear the previous recording from the parking fixture,  and record a minute of baseline sweat rates.

       NOTE: The baseline sweat rates will not be zero, this is normal. It is best to have a flat baseline prior to starting. This baseline will be subtracted out during the analysis.
7. Press the mark button at the beginning or end of any event. 
8. To end recording press the stop button. 

Q-SWEAT ANALYSIS TECHNIQUES

SWEAT TOTAL:  Perform a totalized sweat analysis (for Sweat Response tests).

RESTING RATE:  Perform a resting rate analysis (for Resting Sweat tests).

Select the analysis icon  from the test toolbar (bottom of the screen) to save the test and present the analysis toolbar.

If desired, select the section of the recording to analyze by clicking and dragging the mouse in the chart area. Be sure to include the baseline recording in the selection.

Select the Sweat Total  or Resting Rate  icon (based upon test type). Follow the instructions in the dialog box to analyze the test (one channel at a time). [Sweat Total shown.]

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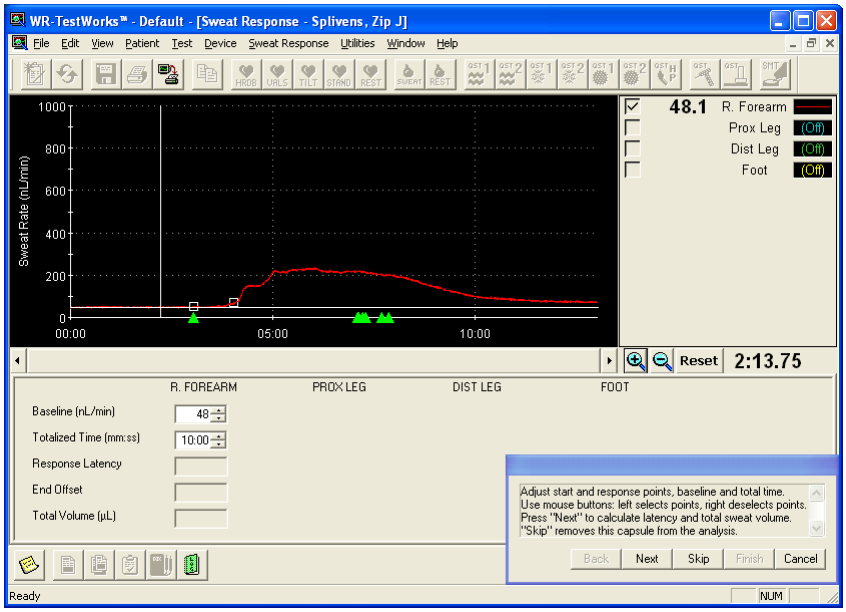
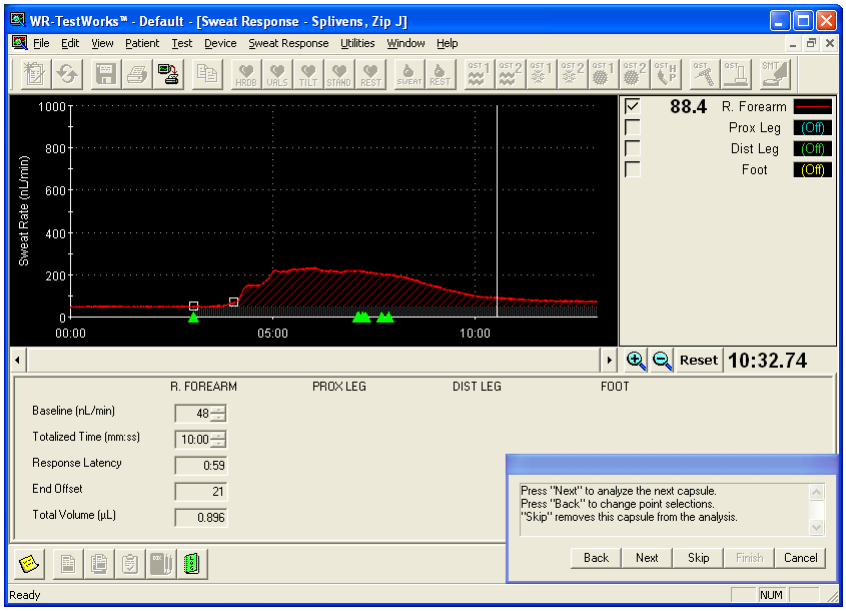


Adjust the start and response points, if necessary, by right-clicking to remove points and left-clicking to select points.

Verify, or adjust, the baseline value (initialized as the lowest 5 second average rate between the auto-selected start and response points).

Press 'Next' to calculate and display the total sweat volume.



Use the 'Back' button to select different start/response points, to adjust the baseline level, or to return to previous channels.

'Skip' removes the current channel from the analysis.

Select 'Next' to continue, analyzing each channel.

Press the 'Finish' button when all channels are complete.

If a test report is desired, press the report button  . The analysis will be automatically saved and a test report generated. Otherwise, press the save button  and continue with other testing.

Device Calibration:

The QSweat device is calibrated during the manufacturing process, and the resulting constants are required by the Q-Sweat application software prior to using the device. For analog interface devices, a CD-ROM is provided that contains these constants in a '.reg' file, which needs to be loaded into the systems registry. For USB devices, these constants are stored within the device itself, and the software loads them during initialization.

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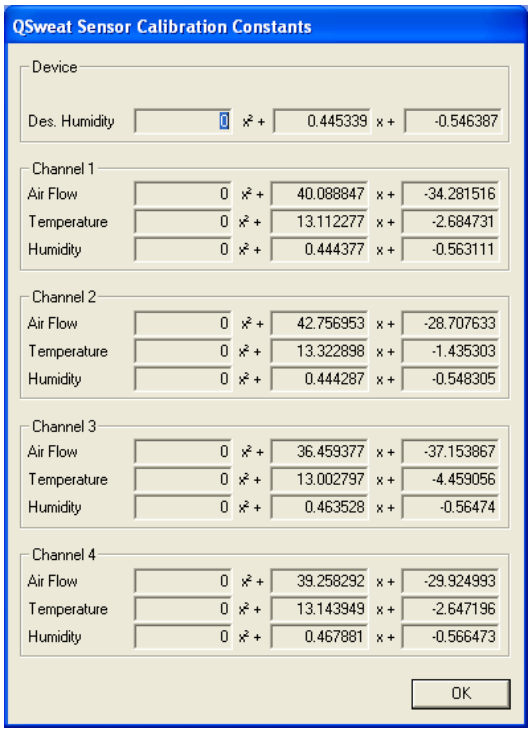
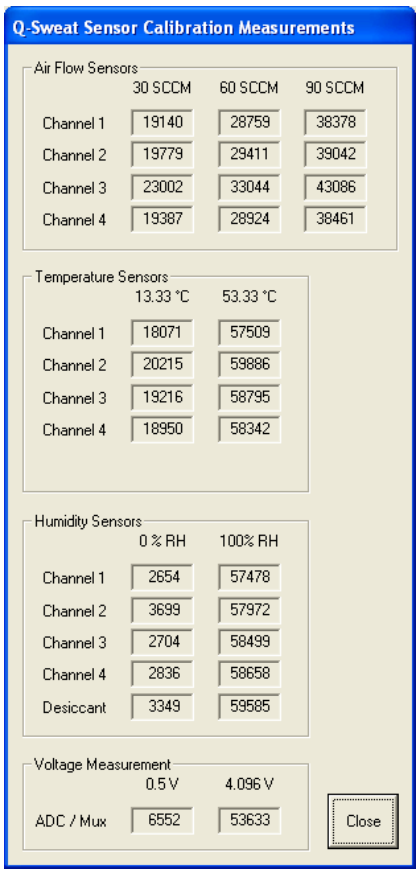
These calibration constants may be displayed for reference only as shown (Analog on the left, USB on the right).





NOTE: The values for the analog (NIDAQ) interface devices are stored within the computer system being used, not the device. Moving the device to a new computer requires these values to be written into the computer system used.

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CASE IV COMPONENT

Quantitative Sensory Test Types

Vibration 4,2,1 with Null Stimuli

Vibration Forced Choice

Cooling 4,2,1 with Null Stimuli

Cooling Forced Choice

Warming 4,2,1 with Null Stimuli

Warming Forced Choice

Heat Pain NRA with Null Stimuli

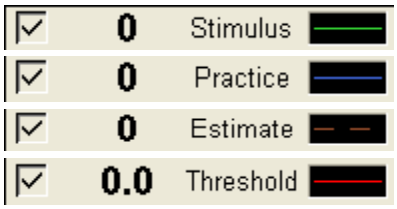
Charted Signals

Stimulus delivered:

Practice Stimulus:

Estimate (+/-) from Practice:

Threshold Level:



RECORDINGS

Quantitative Sensory Testing (QST) measures vibration and thermal (cooling, warming and heat-as-pain) detection thresholds using stimuli that are specific and sensitive, and testing algorithms that are time efficient. Stimulators are attached or placed on the skin, typically on the foot or hand, and samples are given to familiarize the patient with the stimulus. An automated test is performed and analyzed by Testworks software. Typically the test is performed on the left side, unless there are physical abnormalities, loss of intact skin or other issues which require the right side to be tested.

Patient Preparation

- Patients should not use any sedatives or tranquilizers for a time prior to the test as determined by the physician. The test cannot be done on patients with mental retardation, dementia, or when the patient is inattentive, uncooperative, sedated, or too ill to cooperate.
- Compressive stockings, belts, and garments should be avoided the day of the test.
- Do not apply to broken skin or on areas of exfoliating skin conditions.
- Skin temperature should be at least 32 degrees C.
- Patient should be comfortably seated.

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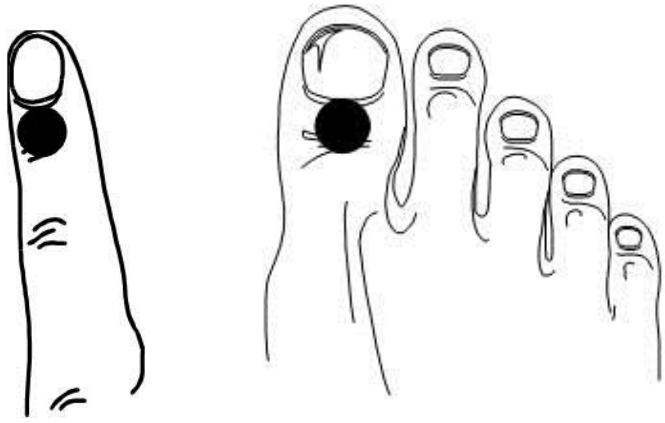
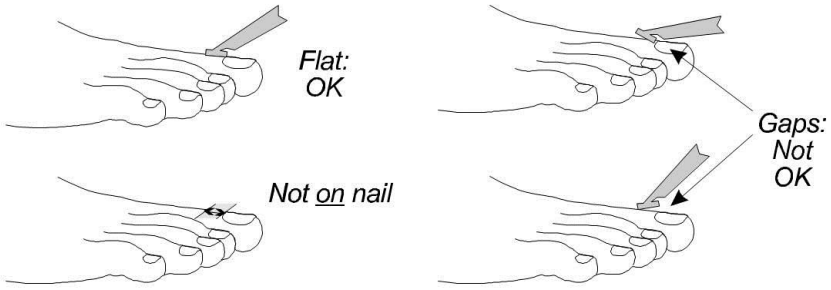
Performing CASE IV Vibration Test – Sample Protocol

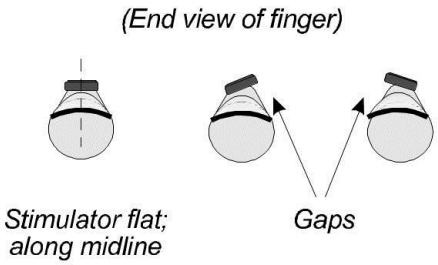
Test Sites – Vibration (typical)

Midline of first digit, below the nail and above the first joint
Midline of big toe, below the nail and above the first joint



NOTE: Position of the vibration stimulator is important, see illustrations below.
If a test is unsatisfactory, it can be repeated on the same day.





Instructions

1. Select (or create) the patient in the Test Explorer, and select the desired test icon QST 1 or QST 2 .

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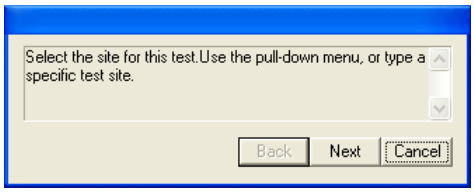
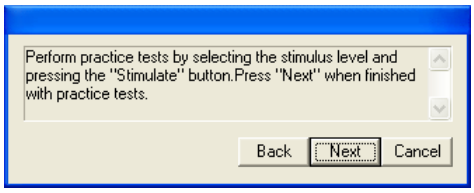
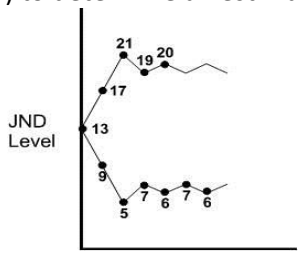
2. Enter the visit information.
3. Select the desired test site from drop-down list, or enter a different site.



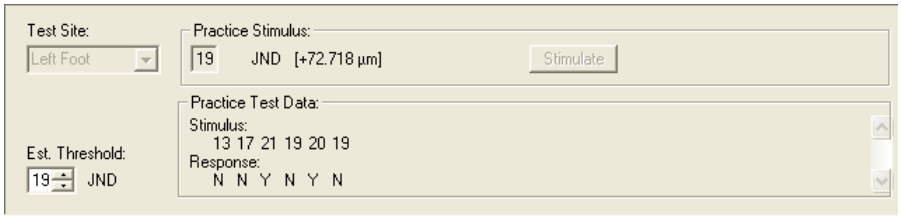
4. Place the vibration stimulator at the selected test site.
5. Read the appropriate Patient Instructions card(s) to the patient, and give sample stimuli in a way that mimics the automated test (4-2-1 algorithm) to determine an estimated threshold level.



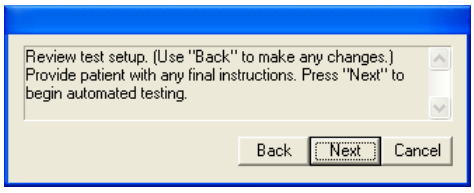


NOTE: The patient will use the response device to enter 'Yes' or 'No' as to whether (or not) they felt the stimulus. If they pressed the response button prior to the end of the stimulus it will not be recognized and must be re-entered.
[For forced-choice tests, they must indicate the period in which they felt the stimulus '1' or '2'.]

6. When the patient understands the test operation, and an estimated threshold has been identified, press 'Next' and enter the estimated threshold level for this test.



7. Put the headphones on the patient (adjusting volume as necessary) and begin the automated test (by pressing 'Next').



8. When testing is completed, remove the vibration stimulator.

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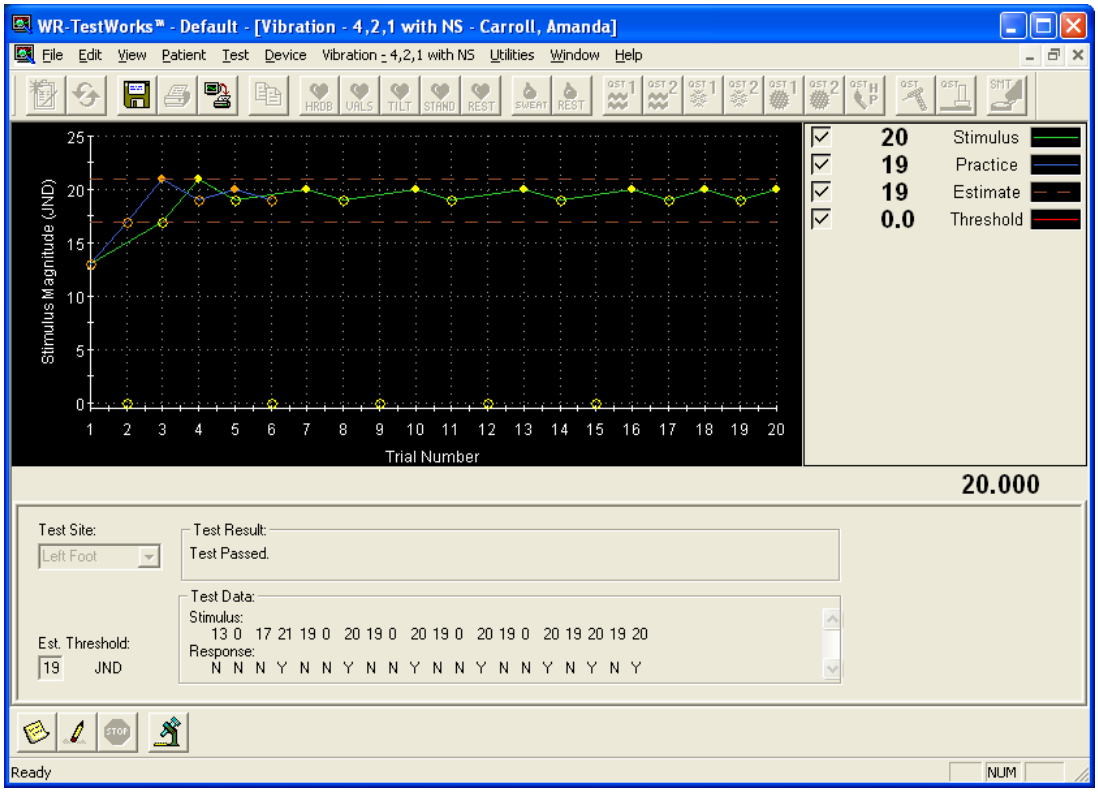
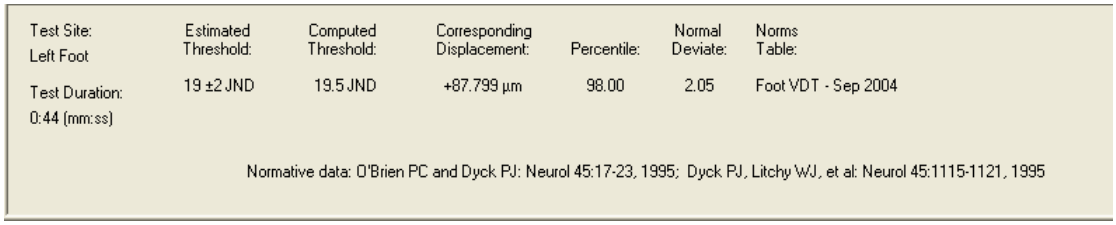


9. Select the analysis icon  from the test toolbar (bottom of the screen) to save the test and present the analysis toolbar.

10. Select the  button to perform automated analysis.



11. If a test report is desired, press the report button  . The analysis will be automatically saved and a test report generated. Otherwise, press the save button  and continue with other testing.

Performing CASE-IV Heat-Pain NRA-NS Test – Sample Protocol

Test Sites - Thermal

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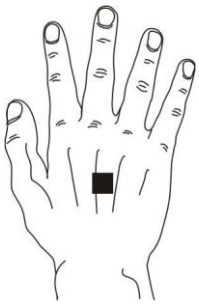
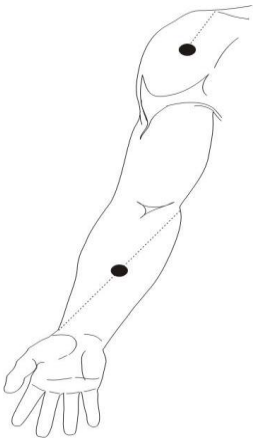
Foot: dorsal surface



Hand: dorsal surface

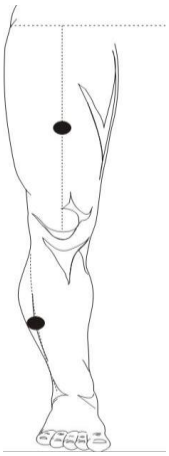


Lateral shoulder: apex of the deltoid muscle - lateral aspect of the shoulder

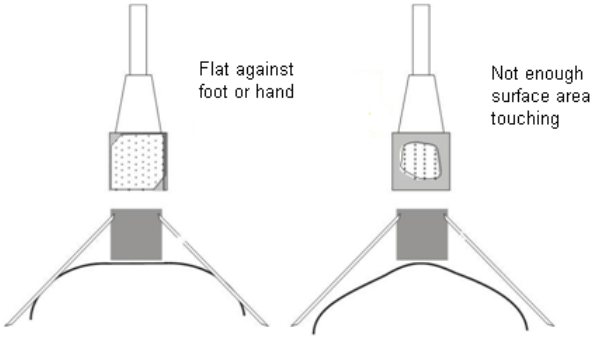
Volar forearm: midpoint between medial epicondyle to radius end

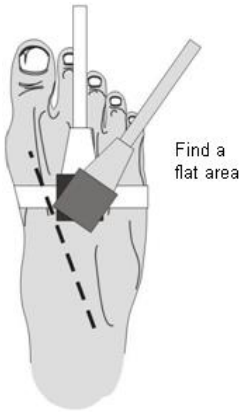
Anterior thigh: midpoint between inguinal crease to midpoint of patella

Lateral leg: midpoint of a line from the tip of the head of the fibula to the tip of the lateral malleolus



Be certain that the stimulator makes good contact with the skin.





Use a stabilizing strap for foot
Warm the foot to 30-32°C., and cover with a sock
Limb should be fully relaxed
Awkwardly positioned limbs may cause numbness

Instructions

1. Select the patient name, select the test icon , and enter visit information.

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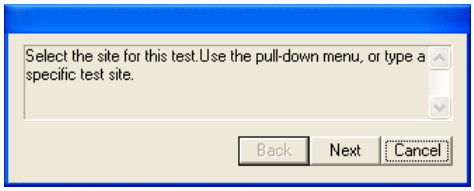
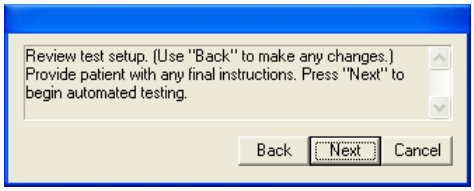
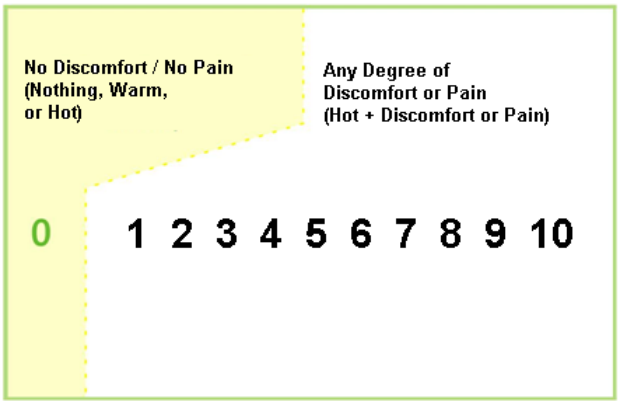
2. Select the desired test site from drop-down list, or enter a different site.

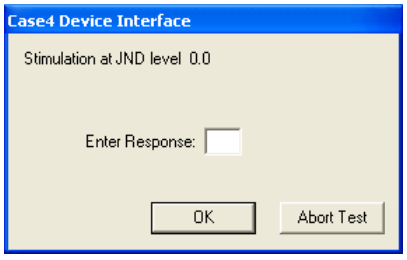


3. Place the thermal stimulator at the selected test site.
4. Read the Patient Instructions cards to the patient. [NO SAMPLES ARE GIVEN FOR HEAT-PAIN.]
5. Begin the automated test (by pressing 'Next').



6. The patient will provide answers from the visual analog pain scale, where 0 is no pain or discomfort and 10 being the highest or most painful.





Enter the patient's response in the dialog box when requested following stimuli.

The next stimulation will continue after response is entered.

7. Continue entering responses until testing is completed. Then, remove the thermal stimulator. NOTE: The test stops if a response is at level 5 or higher.

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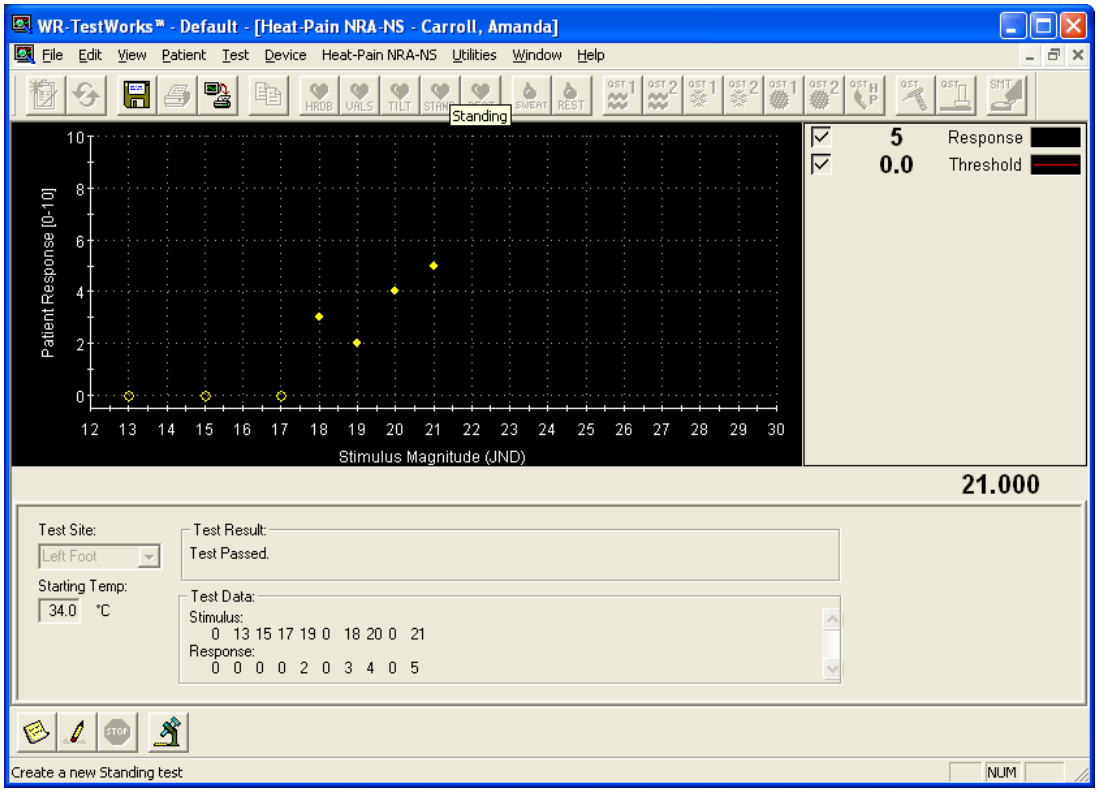
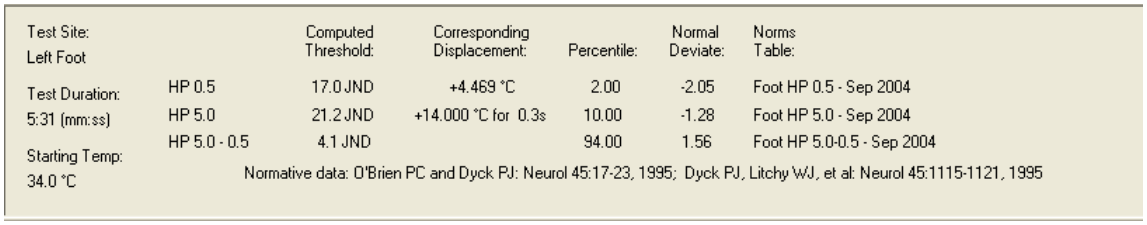


8. Select the analysis icon  from the test toolbar (bottom of the screen) to save the test and present the analysis toolbar.

9. Select the  button to perform automated analysis.



Test Site: Left Foot		Computed Threshold:	Corresponding Displacement:	Percentile:	Normal Deviate:	Norms Table:
Test Duration: 5:31 (mm:ss)	HP 0.5	17.0 JND	+4.469 °C	2.00	-2.05	Foot HP 0.5 - Sep 2004
	HP 5.0	21.2 JND	+14.000 °C for 0.3s	10.00	-1.28	Foot HP 5.0 - Sep 2004
Starting Temp: 34.0 °C	HP 5.0 - 0.5	4.1 JND		94.00	1.56	Foot HP 5.0-0.5 - Sep 2004

Normative data: O'Brien PC and Dyck PJ: Neurol 45:17-23, 1995; Dyck PJ, Litchy WJ, et al: Neurol 45:1115-1121, 1995

10. If a test report is desired, press the report button  . The analysis will be automatically saved and a test report generated. Otherwise, press the save button  and continue with other testing.

NOTE: Do not perform this test on the same site within 24 hours.

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MANUAL QST COMPONENT

Manual Quantitative Sensory Test Types

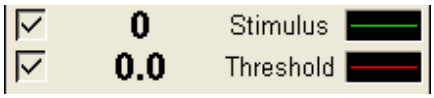
Touch Pressure (Monofilaments)

Touch Pressure as Pain (Monofilaments)

Cooling Discrimination (Thermal Disks)

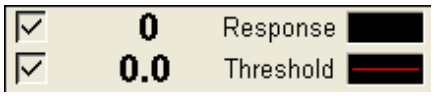
Charted Signals

(Touch Pressure and Cooling)
Stimulus delivered:
Threshold:



Or

(Touch Pressure as Pain)
Response:
Threshold:



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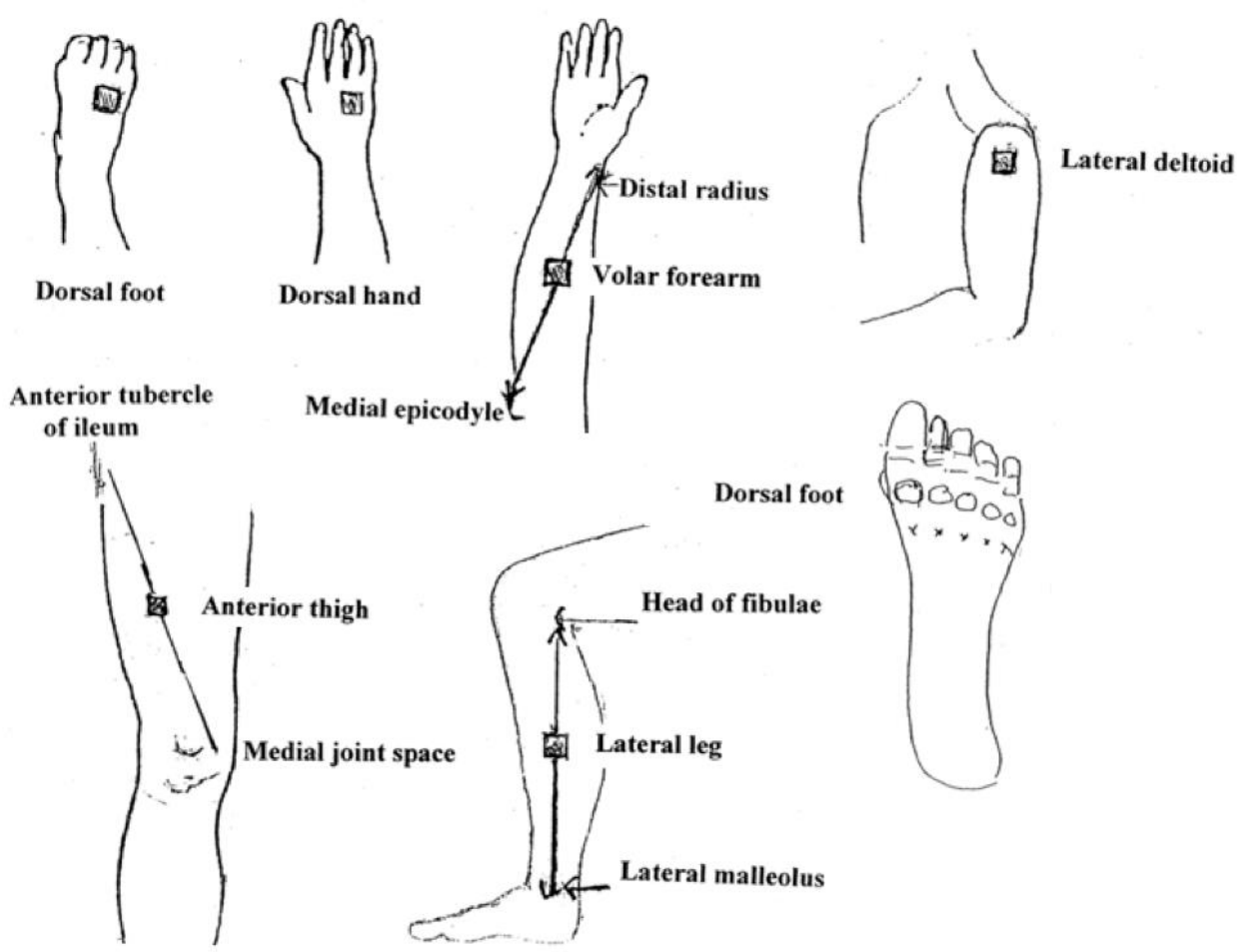
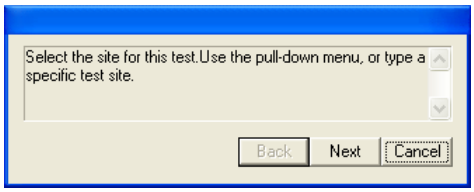
Anatomical Sites of Testing

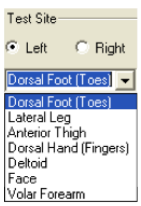


Performing Touch-Pressure Test

Instructions

1. Select (or create) the patient in the Test Explorer, and select the Touch-Pressure test icon  .
2. Enter the visit information.
3. Select the desired test site from drop-down list, or enter a different site.





4. Read the appropriate patient instructions to the patient, and provide sample stimuli.

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"Method of Limits" Instructions

1. This is a test of your ability to feel touch sensation. It will not be painful and the test will take only 10 to 15 minutes. We will need to cover your eyes so that you cannot see what tests are being given.

2. Each time I say "now" you may, or may not, be touched on your ____. If you feel the touch, you should say "yes." If you don't feel it, you should say "no." Sometimes when I say "now" you won't feel it because the touch stimulus is too small or you did not feel it, or you were not touched.

3. To repeat, after I say "now" you must decide whether you felt a touch or not. If you feel you were touched, say "yes" as soon as you feel it. If you didn't feel a touch, wait about 2 seconds before answering "no."

4. Should you become sleepy or distracted, tell me.

5. Are you comfortable and ready? Okay, we will begin with the practice test.

"Forced-Choice" Instructions

1. This is a test of your ability to feel touch sensation. The test is not painful and takes about 10 minutes. The object is to identify the smallest touch you can feel.

2. You will need to close your eyes during the test.

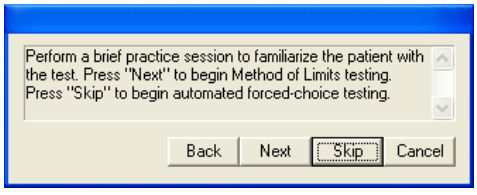
3. Testing is done in pairs and I will indicate these two periods of time by saying "1" then "2". You must say whether you felt the touch in 1 or 2. I will touch you only one time, never in both 1 and 2. If may be difficult for you to judge whether you felt this touch in 1 or in 2 but you must choose 1 or 2. You cannot answer "I'm not sure" or "I don't know".

4. Get comfortable and let's do a practice test.

5. If at any time during the test you begin to feel drowsy or are having difficulty concentrating, please tell me and I will give you a break.

6. Do you have any questions? Please close your eyes, relax, and focus on your ____. Now I will begin the testing.

7. Press 'Next' to begin "Method of Limits" testing, (if desired and enabled in configuration). Press 'Skip' to begin directed forced-choice testing.



8. If the optional "Method of Limits" testing is selected, the following dialog box will be presented to allow entry of trials performed:

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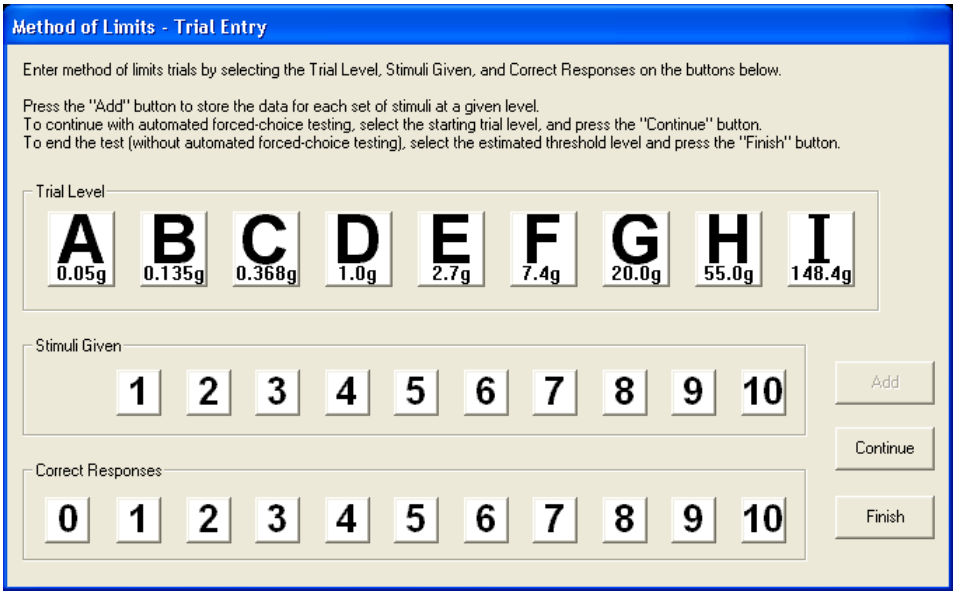

Select the stimulus level from the 'Trial Level' section, record the number of stimuli given (from 1 to 10) and the number of correct responses. Press 'Add' to store the data. Once a threshold or starting level is established, select the level button and press 'Continue' to start automated testing.

If the level determination is satisfactory during the method of limits testing, select the threshold level and press 'Finish' to complete the test (without forced-choice testing). Continue with step 9

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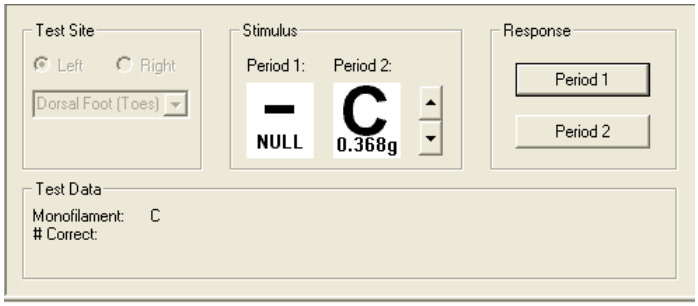
9. Starting with level ‘C’ (or the level determined by the ‘Method of limits’ testing) deliver stimulus manually in the period directed, and record patient response.

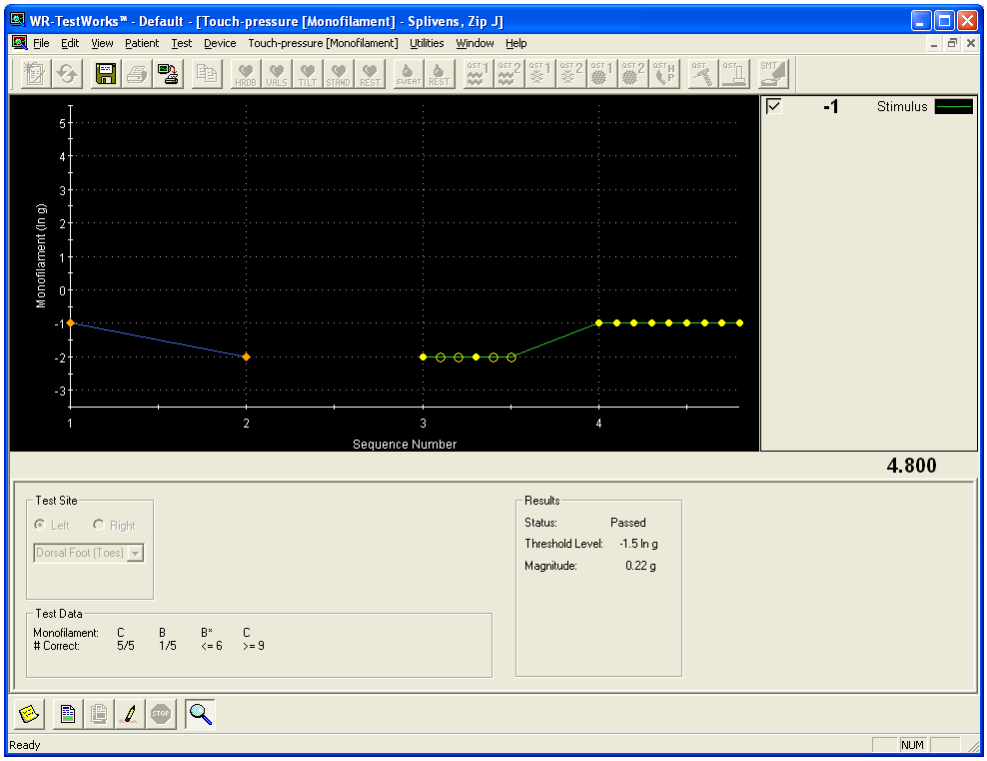


Prior to recording the first trial at a given stimulus level, the level may be changed using the up/down controls in the ‘Stimulus’ box. There will be several trials each level, continue giving stimulus during the period shown on screen.

10. When the stimulus level changes, the stimulus level icon will flash for several seconds. Switch to the next level shown and continue delivering stimulus manually.

11. Once a threshold level has been determined, the test will stop and display the results.

[Method of Limits testing is charted in blue/orange, and Forced-Choice testing is charted in green/yellow. The ‘Magnify’ button toggles display of individual trials.]



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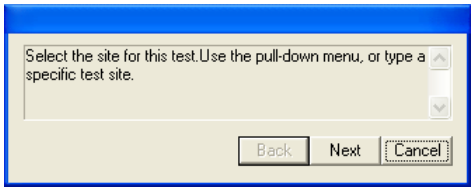
12. If a test report is desired, press the report button  . The test data will be automatically saved and a test report generated. Otherwise, press the save button  and continue with other testing.

Performing Cooling Discrimination [Thermal Disk] Test

Instructions

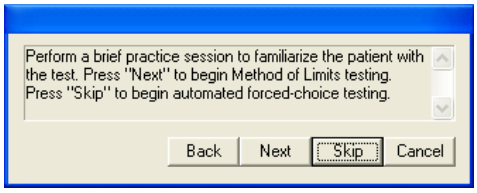
1. Select (or create) the patient in the Test Explorer, and select Cooling Discrimination [Thermal Disk] test icon. 
2. Enter the visit information.
3. Select the desired test site from drop-down list, or enter a different site.



4. Read the patient instructions to the patient, and provide sample stimuli.

"Forced-Choice" Instructions

1. This is a test of your ability to feel differences in cooling. The test is not painful and takes about 10 minutes.
2. You will need to close your eyes during the test so that you cannot see the disks.
3. First I will touch your ____ with one disk and then with the other disk. You must say which one is cooler, number 1 or 2. The first one might be cooler or the second might be cooler. It may be difficult to tell the difference but you must choose 1 or 2.
4. Get comfortable and let's do a practice test.
5. If at any time during the test you begin to feel drowsy or are having difficulty concentrating, please tell me and I will give you a break.
6. Do you have any questions? Please close your eyes, relax, and focus on your ____. Now I will begin the testing.
7. Press 'Next' to begin "Method of Limits" testing, (if desired and enabled in configuration). Press 'Skip' to begin directed forced-choice testing.



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8. If the optional “Method of Limits” testing is selected, the following dialog box will be presented to allow entry of trials performed:

   Select the stimulus level from the ‘Trial Level’ section, record the number of stimuli given (from 1 to 10) and the number of correct responses. Press ‘Add’ to store the data. Once a threshold or starting level is established, select the level button and press ‘Continue’ to start automated testing.

9. If the level determination is satisfactory during the method of limits testing, select the threshold level and press ‘Finish’ to complete the test (without forced-choice testing). Continue with step 9.

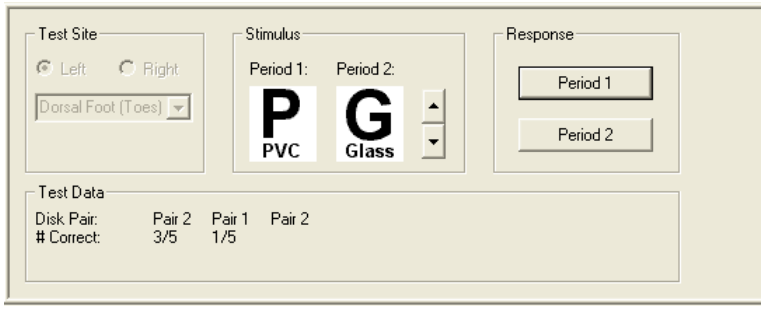
10. Starting with level ‘G’ (or the level determined by the ‘Method of limits’ testing) deliver stimulus manually in the period directed, and record patient response.

Prior to recording the first trial at a given stimulus level, the level may be changed using the up/down controls in the ‘Stimulus’ box.
There will be several trials each level, continue giving stimulus during the periods shown on screen.

11. When the stimulus level changes, the stimulus level icon will flash for several seconds. Switch to the next level shown and continue delivering stimulus manually.

12. Once a threshold level has been determined, the test will stop and display the results.

[Method of Limits testing is charted in blue/orange, and Forced-Choice testing is charted in green/yellow. The ‘Magnify’ button toggles display of individual trials.]



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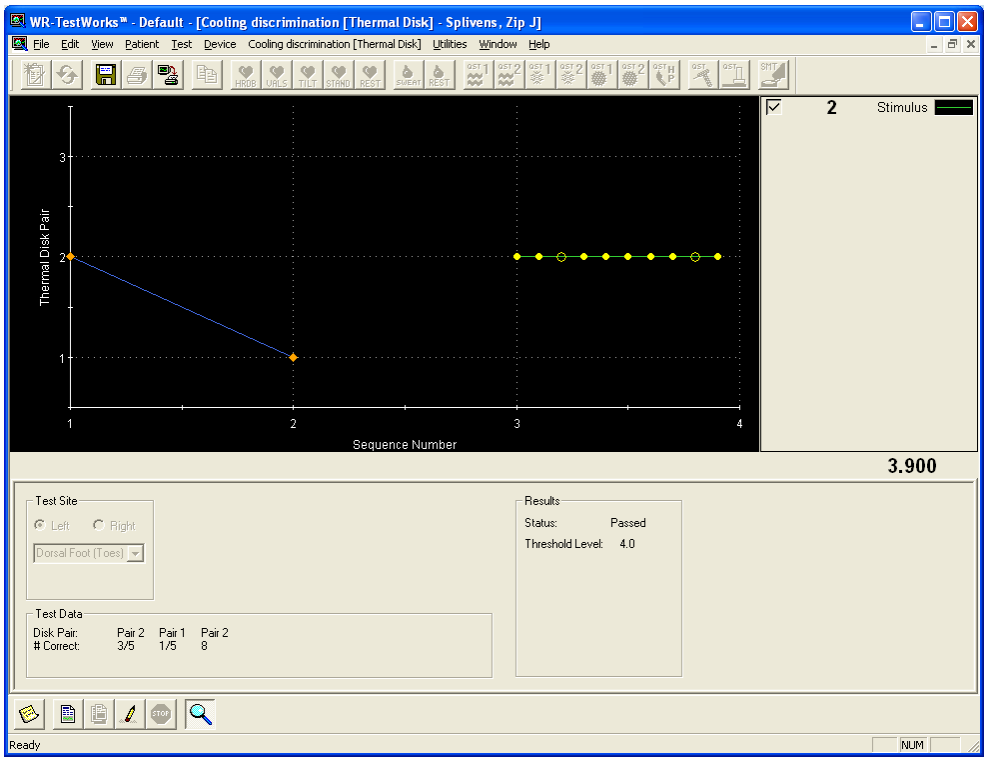


13. If a test report is desired, press the report button  . The test data will be automatically saved and a test report generated. Otherwise, press the save button  and continue with other testing.

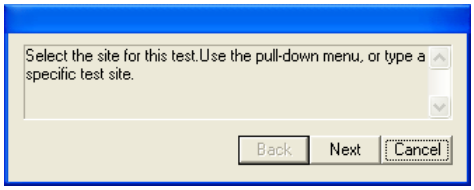
Performing Touch Pressure as Pain [Monofilament] Test

Instructions

Select (or create) the patient in the Test Explorer, and select the Touch-Pressure test icon  .

Enter the visit information.

Select the desired test site from drop-down list, or enter a different site.



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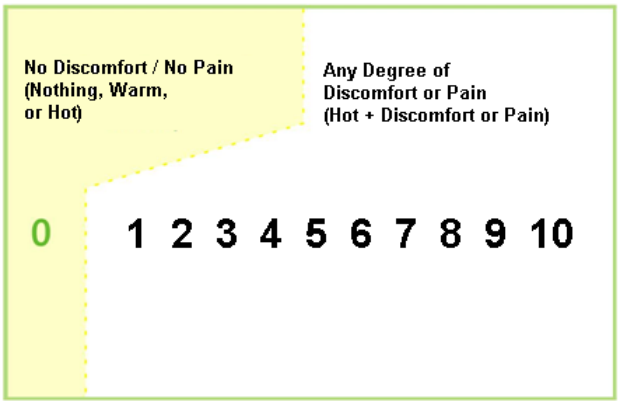
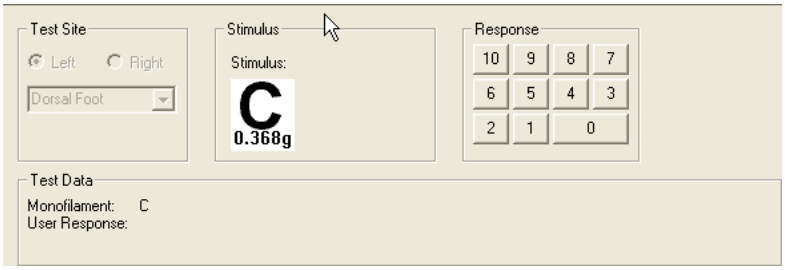
Read the appropriate patient instructions to the patient, No sample stimuli is given.

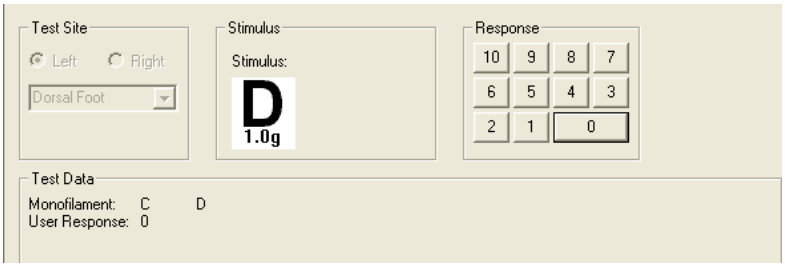
The patient will provide answers from the visual analog pain scale, where 0 is no pain or discomfort and 10 being the highest or most painful.



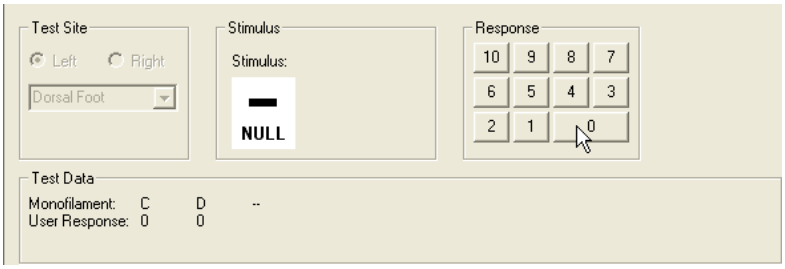
1. Deliver stimuli using the 'C' (0.368g) monofilament and record the patient answer by using the mouse and selecting from the Response values.



2. Continue using stimuli shown in the Stimulus window.



Note: Null stimuli are randomly delivered. The motion of a stimulus should be used, but not delivered.



3. When a response of 5 or greater the test will complete and the threshold values will be displayed.

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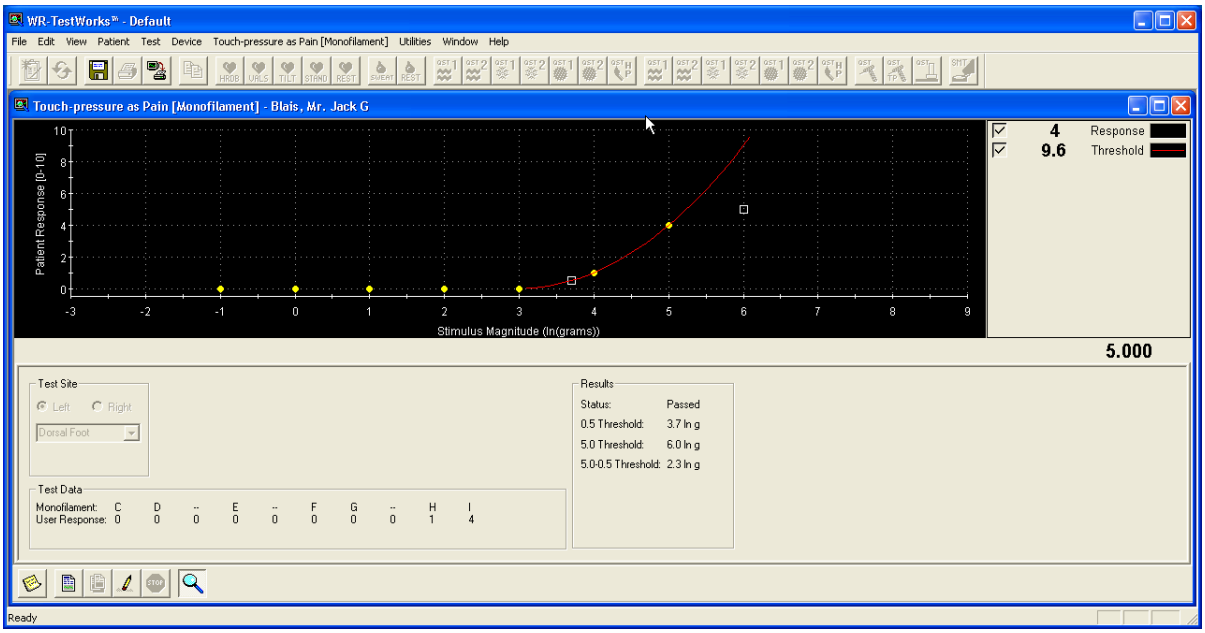
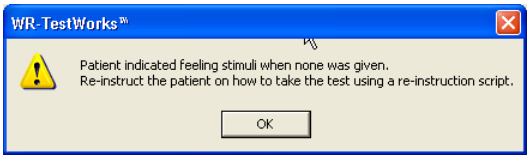


Note: if a value greater the “0” is recorded during null stimuli the test will stop and display the following;



Re-instruct the patient and repeat the test.

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SNIFF MAGNITUDE TEST (SMT) DEVICE

SMT Test Types

Sniff Magnitude Test (SMT)

SMT Specific Test Toolbar buttons

TEST SETUP:  Toggles access to trigger setting controls.

MAGNIFY:  Toggles between showing all trials performed with each canister, or the average trial.

Charted Signals

Canister 1 (Null):

Canister 2 (Methyl thiobutyrate):

Canister 3 (Ethyl 3-mercaptoproprionate):

Canister 4 (Isoamyl acetate):

RECORDINGS

Sniff Magnitude Testing assesses the olfactory function of the patient by comparing sniffs to non-odorized air with sniffs to odors. The normal response to odors is to reduce the size of the sniff. If impaired, this reduction is not evident.

SMT Equipment Setup

Connect the SMT device to the computer with the following notes:

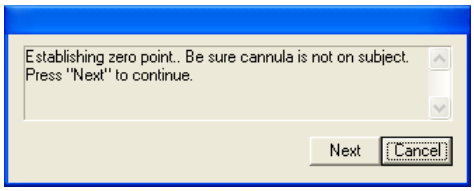
1. Position the computer so that the subject is not able to view the screen.
2. Position the SMT controller box so the front panel is near the subject.
3. Connect the SMT controller power supply to an electrical outlet and to the rear panel.
4. Connect the odor canister cable to the front panel connector
5. Connect the cannula distal end to the front panel of the SMT controller box.

Performing SMT Tests –

1. Select (or create) the patient in the Test Explorer, and select the SMT test icon 

.

2. Enter the visit information.



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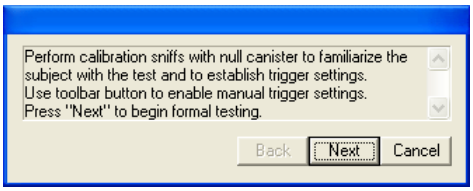
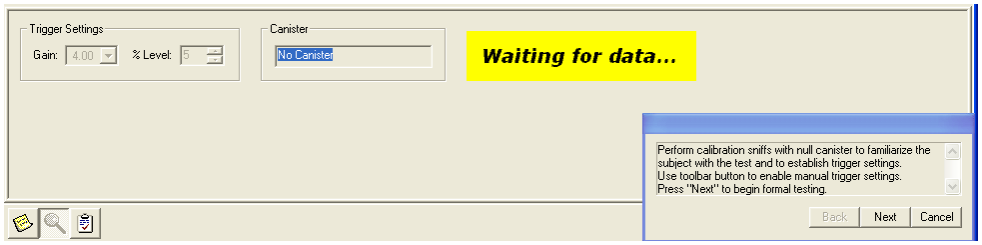
3. With the cannula off the patient, or disconnected from the control unit, press ‘Next’ to establish the zero reference point.
4. Place the cannula in the nostrils of the subject.
   NOTE: the cannula tips should curve downward and the cannula tab should be resting on the subjects’ upper lip. Loop the cannula tubing over the top of the subject’s ears.

5. Give the following Instructions to the subject;
   - When I say “Get Ready,” I am going to hold the canister under your nose
   - “Some canisters will hold odors, others will be empty”
   - When I say “Sniff” I want you to take a sniff like this.
     (Demonstrate a sniff with the canister under your nose.)
   - Place the canister under the subjects nose
     (IMPORTANT: no more than 3.0cm between the nose and the top of the canister)
   - “Go ahead and take a sniff.” Watch the canister open and shut and hear the sound.

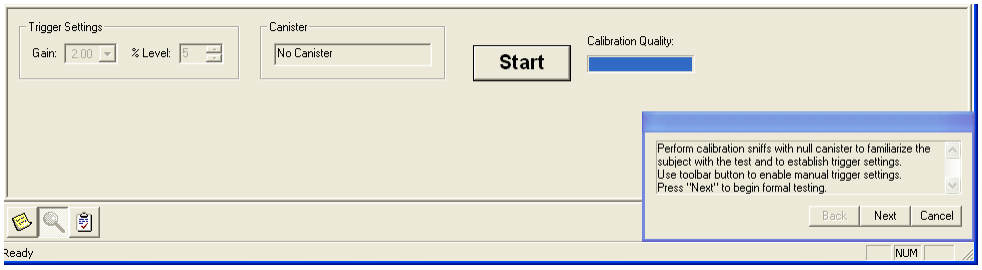
6. Perform several calibration (practice) sniffs using the Null canister to automatically determine the best gain setting.



7. ‘Waiting for data…’ will be shown until a pressure drop from a sniff is detected.
   [It may be helpful to press the ‘Start’ button while the patient is exhaling prior to sniffing.]



8. Continue with sniffs until the ‘Calibration Quality’ meter is fully extended.



9. *Optional* – use the Test Setup  button to enter the gain and trigger manually on the test status pane.

10. Then select ‘Next’ to begin testing.

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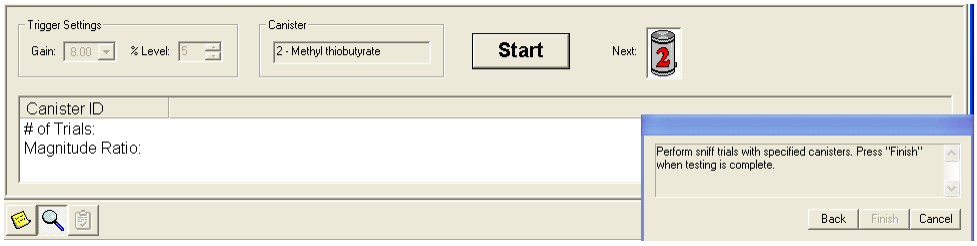
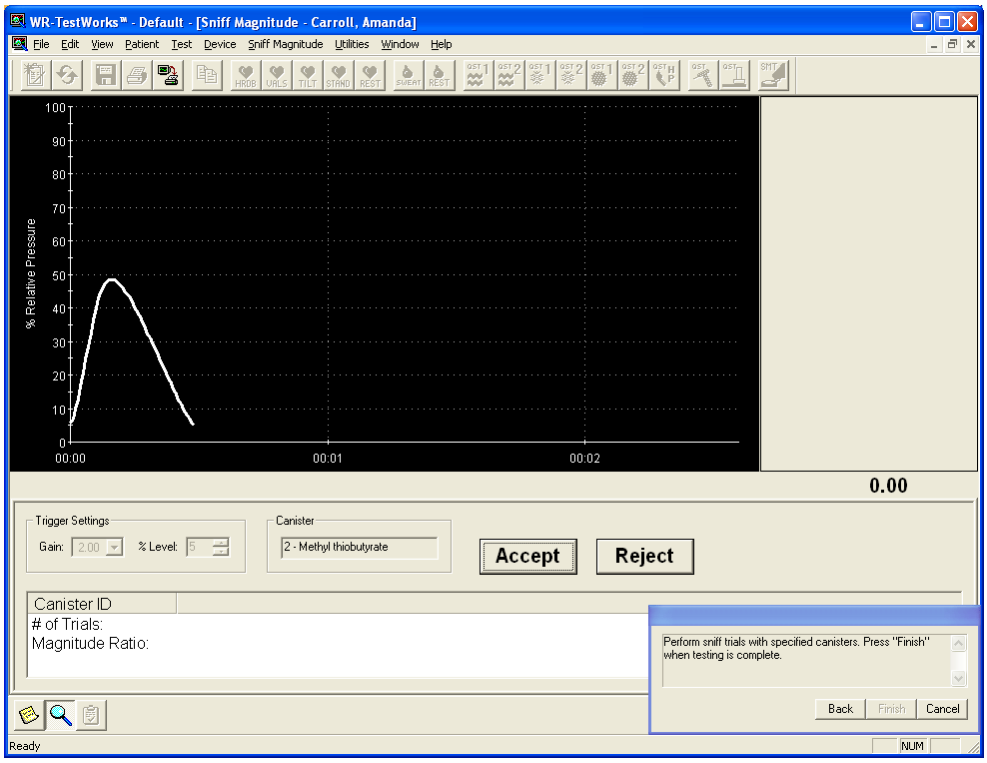
11. If standard protocol testing was selected during configuration, use the canister displayed. [If an incorrect canister is detected the 'Start' button will be grayed out.] Otherwise, change canisters as desired for each trial.



12. Upon completion of a sniff, the recording will be displayed on the chart (in white) and the 'Accept' or 'Reject' buttons will be active. 'Accept' will add the trial to the canister average. 'Reject' will erase the sniff trial and repeat the trial.



13. If the sniff did not meet the established acceptance criteria (from the advanced configuration), a message will be displayed above the 'Accept' and 'Reject' buttons.
Sniff acceptance criteria not met... [The operator may still accept the trial.]

14. Accepted sniff trials will be added to the chart in the color associated with the canister as a dashed trace, and the solid average trace will be updated. Also, the data in the lower table will be updated with the total number of trials and magnitude ratios for each used canister.

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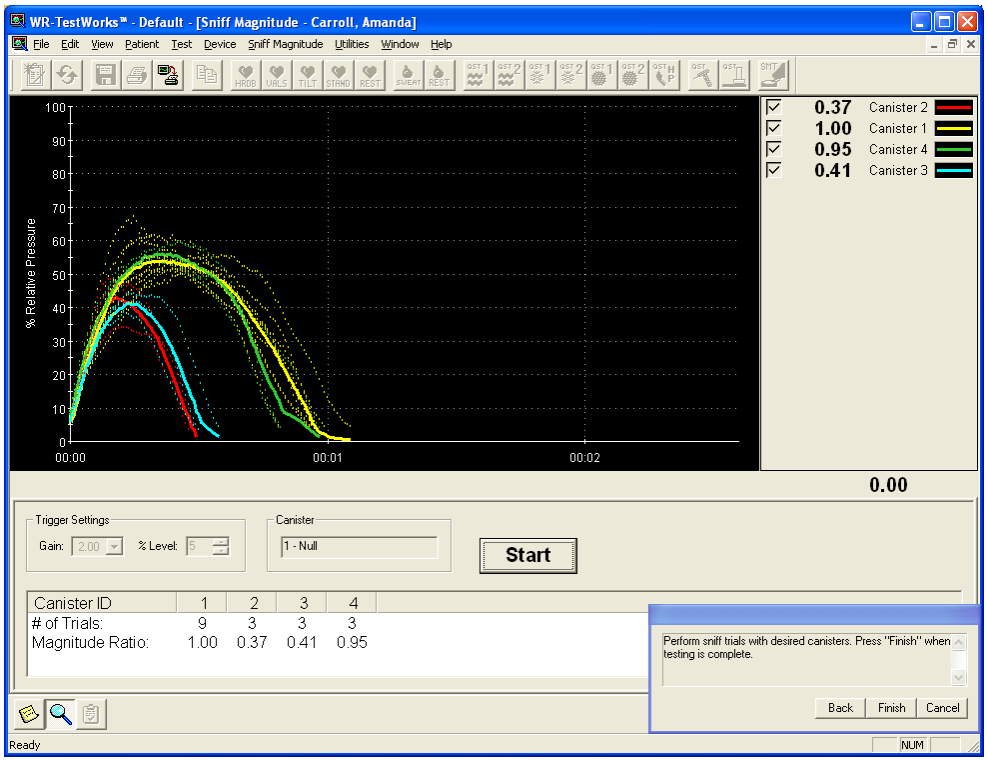
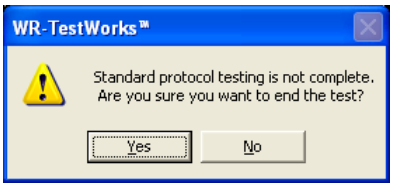
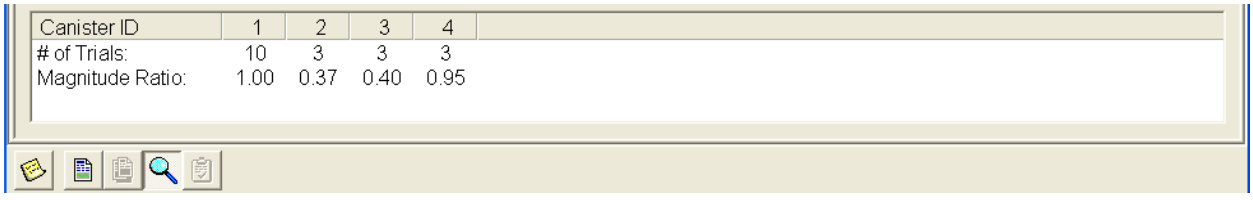


15. Additional trials may be given (as desired). Press the 'Finish' button in the user guide when testing is completed.

16. If 'Finish' is pressed prior to the end of the standard protocol testing, a warning dialog will be displayed.



17. Upon completion of the test, the summary data will be displayed.



18. If a test report is desired, press the report button  . The test data will be automatically saved and a test report generated. Otherwise, press the save button  and continue with other testing.

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DATA EXPORT

There are two methods for data export; the first method (WYSIWYG) exports visible traces from the explorer window for that recording only. The second method is by selecting either one or many patients, which can include tests and analyses with or without the raw data.
This allows users to perform any custom analysis operations using third-party software. This section describes both methods within WR-TestWorks™.

NOTE: Only Comma-Delimited ASCII text file format for *raw data* and Tab-Delimited ASCII text file for *Test and Analysis* are available.

WYSIWYG Method (Raw Data)

While within a test window, select the desired time to export by zooming in or out. Then select from the menu bar FILE→EXPORT. Select the file name and directory for the export.

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NOTE: Time Based recordings ONLY. (Cardiac, QSweat™, and SMT in a future release) If you export a non-time based recording the file will be empty.

Data export is performed for the visible traces and time region of the current test. This allows the user to select the signals and time region within a test to be exported (rather than the entire test). Signals are selected or deselected for export using the trace enables (checkboxes) in the chart legend. The time region exported is selected by zooming in or out until the desired data is displayed. To export all data, zoom out to display the entire recording and leave all traces enabled.

NOTE: The magnify mode for the analog data chart is ignored during the export operation. All analog data associated with the selected beat-to-beat time region is included in the data exported. (It may be desirable to turn the magnify mode OFF when selecting the data to export to eliminate any confusion).

Cardiac data is exported as a comma-delimited ASCII text file with a fixed format of 12 columns. The first line of the file identifies the data column names. Because multiple time bases are associated with the test data, multiple x (time) columns are present for the time associated with the following data column(s). The multiple time bases also results in different lengths of the data columns (rows) as well as "empty" data. For example, the ECG signal acquired at 200Hz will have twice the data as the Arterial waveform acquired at 100Hz yet share the same time base by leaving every other Arterial data column empty.

Column	Name	Description
1	Analog x	Analog data time-base
2	ECG y	Analog ECG (mV with a +125mv offset)
3	Arterial y	Analog arterial Waveform (mmHg)
4	Chest Exp. y	Chest expansion Waveform
5	Exp. Pressure y	Expiratory Pressure (mmHg)
6	BP x	Beat to beat blood pressure time-base
7	Systolic BP	Systolic blood pressure (mmHg)
8	Mean BP	Mean blood pressure (mmHg)
9	Diastolic BP	Diastolic blood pressure (mmHg)
10	HR x	Heart rate data time-base
11	HR y	Heart rate (BPM)
12	R-R x	R-R interval time-base
13	R-R y	R-R interval (milliseconds)

Example:

"Analog x", "ECG y", "Arterial y", "Chest Exp. y", "Exp. Pressure y", "BP x", "Systolic BP", "Mean BP", "Diastolic BP", "HR x", "HR y", "R-R x", "R-R y"
235.2100,129.76, 96.73,,, 245.0950,121.15, 94.92, 77.67, 245.0950, 49.79, 245.0950,1205.00,
235.2150,129.40, 96.97,,, 246.2850,143.87,103.37, 72.30, 246.2850, 50.42, 246.2850,1190.00,
235.2200,128.79, 95.75,,, 247.4450,119.20, 90.31, 71.32, 247.4450, 51.72, 247.4450,1160.00,
235.2250,128.42, 94.04,,, 248.5800,114.31, 88.82, 72.55, 248.5800, 52.86, 248.5800,1135.00,
235.2300,128.42, 95.02,,, 249.6700,118.47, 91.07, 72.06, 249.6700, 55.05, 249.6700,1090.00,
235.2350,128.30, 93.80,,, 250.7200,116.76, 90.34, 72.30, 250.7200, 57.14, 250.7200,1050.00,
235.2400,128.66, 94.53,,, 251.6950,117.49, 91.87, 73.28, 251.6950, 61.54, 251.6950,975.00,
235.2450,129.03, 94.28,,, 252.6350,117.73, 91.48, 73.52, 252.6350, 63.83, 252.6350,940.00,
235.2500,127.56, 94.04, 62.15,, 253.6500,114.80, 90.40, 73.28, 253.6500, 59.11, 253.6500,1015.00,

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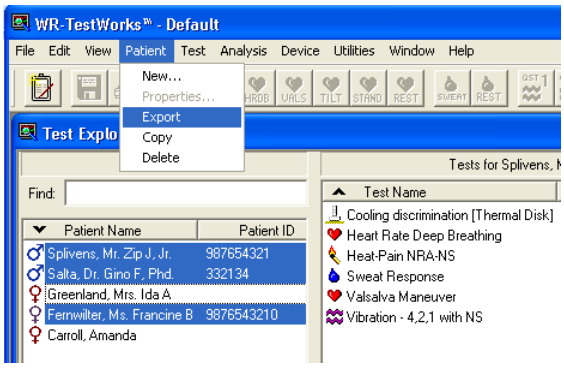
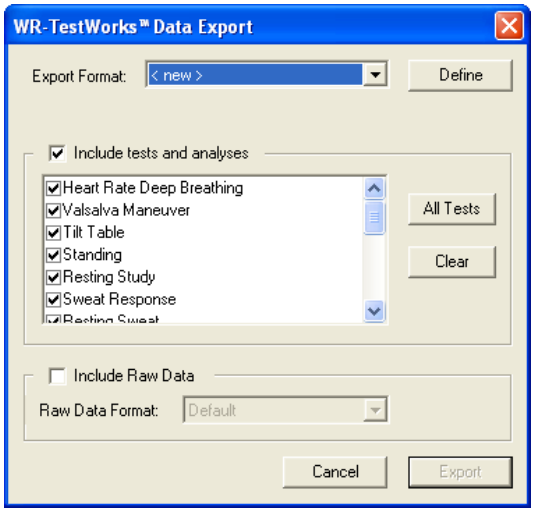
WR-TestWorks™ Data Export (Tests and Analysis)

This method allows for the selection of one/many patients or one/many tests along with the selection of available fields that are stored in the database. Multiple data formats can be defined and saved. The export can be performed with or without the raw data of the recording. If raw data is selected a separate directory will be created for the raw data files.

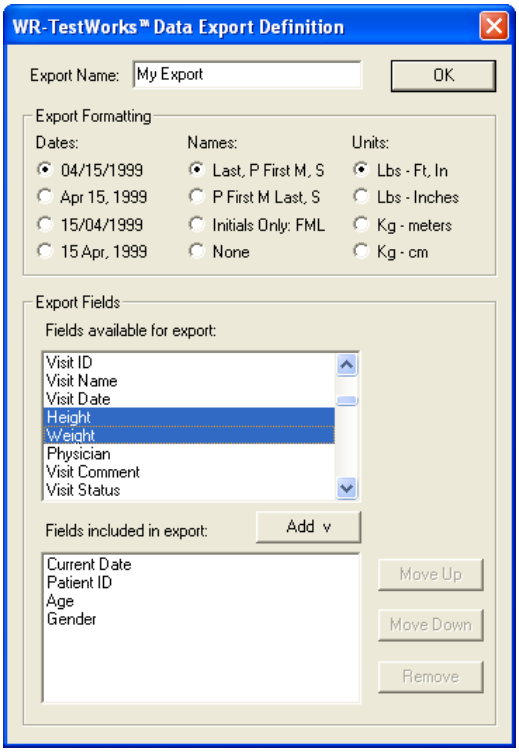
Within the WR-TestWorks™ explorer screen select the group of patients by holding the 'Ctrl' key and make the selection. When finished select Patient→Export.



The data export dialog box will be presented.



Next, select the desired export format from the drop-down list, or define a new export format by selecting the 'Define' button. In this case, the Data Export Definition dialog will be presented.



Provide a name for the definition and select the formatting desired. A list of fields available for export is shown. Click on the field to add, or hold the 'Ctrl' key and select multiple fields, and press the 'Add' button. The selected fields will be appended to the fields included in the export.

[For a full list of fields, see the section: ***DATA FIELDS AVAILABLE FOR EXPORTS AND REPORTS***.]

You can change the field order by highlighting the field(s) in the lower window and use the 'Move Up', 'Move Down', or 'Remove' buttons.

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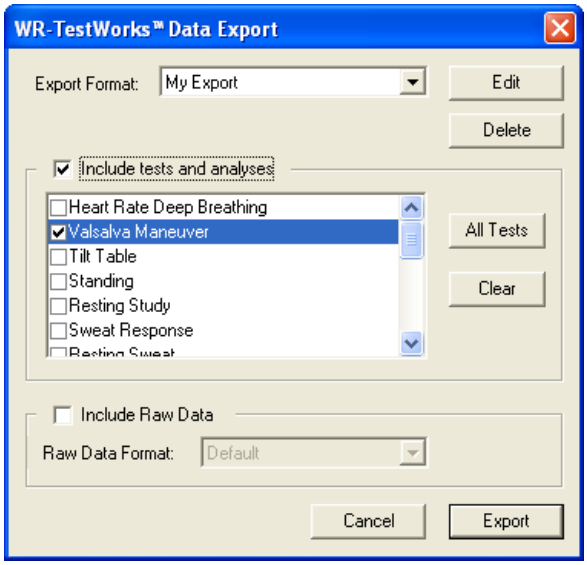
Select the ‘OK’ button to continue.



Select the `Include Raw Data’ if desired. All Corresponding test(s) recording(s) will be exported. Raw data will be stored in a separate directory with the same name as the export name.

NOTE: Raw data only exists for Cardiac, QSweat™, and SMT recordings. No field selection is available, all available raw data is exported in a CSV format file (named with the Test ID).

NOTE: The format `CSV’ is different than the `tab delimited’ file format for the test and analysis data.

SAMPLE EXPORT (Default) No Raw data

Single Patient

123 Default 28 Male 1.85 m 95.3 Kg Dr. Williams 123000001 Valsalva Maneuver 01/05/2001 Administrator 123000118 Valsalva 12/04/2007 Administrator 1.81 27.00 -0.61 Valsalva - Sep 2004
123 Default 28 Male 1.85 m 95.3 Kg Dr. Williams 123000002 Tilt Table 01/05/2001 Administrator 123000117 30:15 Ratio (R-R) 12/04/2007 Administrator 1.70
123 Default 28 Male 1.85 m 95.3 Kg Dr. Williams 123000003 Heart Rate Deep Breathing 01/05/2001 Administrator 123000114 HRDB 12/04/2007 Administrator 14.8 10.00 -1.28 HRDB - Sep 2004
123 Default 28 Male 1.85 m 95.3 Kg Dr. Williams 123000014 Sweat Response 01/05/2001 Administrator 123000116 Sweat Total 12/04/2007 Administrator
123 Default 29 Male 1.85 m 95.3 Kg Dr. Williams 123000023 Cooling - 4,2,1 with NS 09/10/2002 Administrator 123000113 P.J. Dyck QST 12/04/2007 Administrator 8.3 JND 96.00 1.75 Hand CDT - Sep 2004
123 Default 29 Male 1.85 m 95.3 Kg Dr. Williams 123000024 Heat-Pain NRA-NS 09/10/2002 Administrator 123000115 P.J. Dyck QST 12/04/2007 Administrator
123 Default 29 Male 1.85 m 95.3 Kg Dr. Williams 123000025 Vibration - Forced Choice 09/10/2002 Administrator 123000119 P.J. Dyck QST 12/04/2007 Administrator 5.5 JND 70.00 0.52 Hand VDT - Sep 2004

SAMPLE EXPORT (Default) Raw data

QSweat Single Patient

```
Time,R. Forearm,Prox Leg,Dist Leg,Foot
  0.00,  48.00,  46.50,  32.10,  17.20
  0.25,  46.00,  44.80,  34.10,  20.50
  0.50,  44.80,  42.90,  32.80,  19.10
  0.75,  47.30,  42.10,  31.50,  15.20
  1.00,  50.70,  43.10,  33.80,  16.70
  1.25,  52.30,  44.60,  35.60,  17.20
  1.50,  50.10,  43.60,  34.10,  16.00
  1.75,  47.30,  43.30,  32.50,  15.30
```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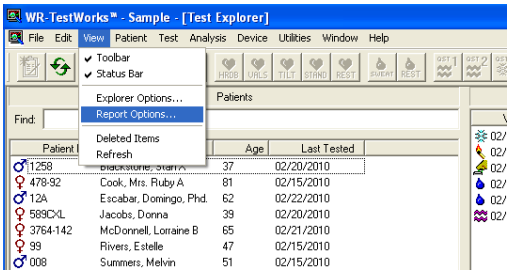
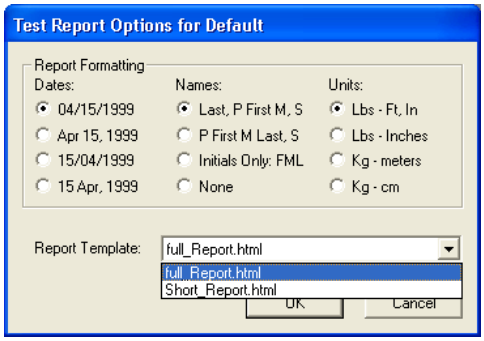
REPORT GENERATION

STANDARD REPORTS

Standard report formats can be selected as shown below. All report formats use HTML formats and can be modified. New report formats can be created and saved for use when needed. For example, you may want one report format for internal documentation and then use a second format for referring institutions or physicians. No data is stored within reports formats, only the HTML script used to generate the output.

Report format template files can be selected from the tool bar View→Report Options.





The formatting of dates, names, and units can be defined and the report template desired can be selected from the drop down box as shown.

To generate a test report for a patient from the Test Explorer, highlight the desired test(s) and select 'Report' from the right-click menu. This will generate a single report which includes all analyses for the selected test(s).

NOTE: Use the 'Ctrl' key to select several tests. The report will be in the same order as shown with all analyses performed on each recording.

Example of 'Short_Report.html' with a multiple tests selected.

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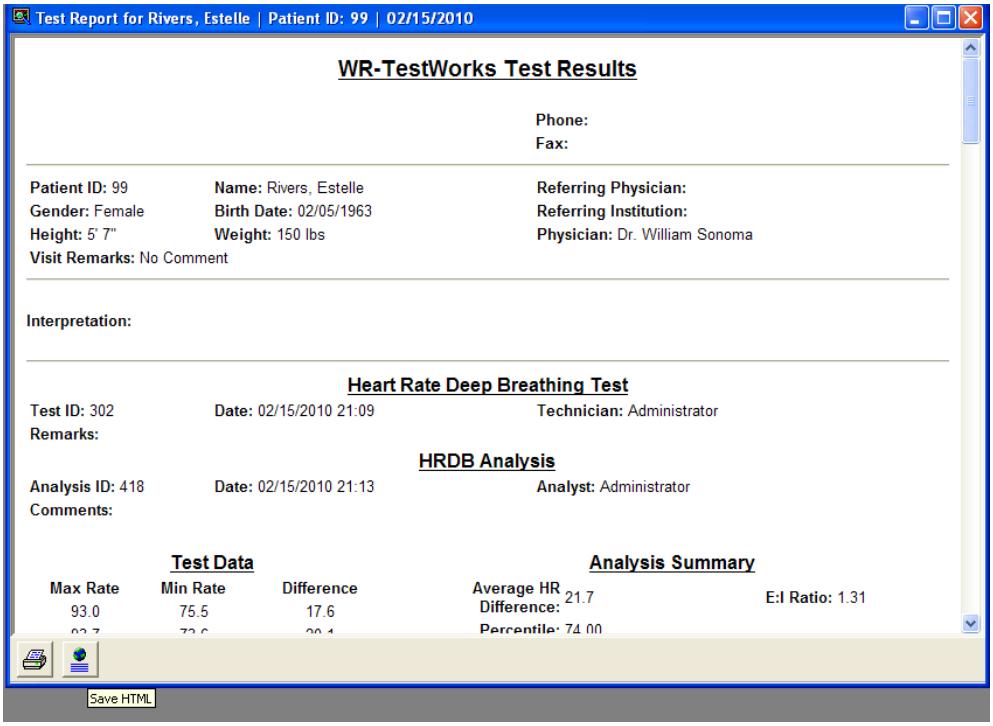

Test reports can be printed or saved as an 'html' file format. Please note that saving an html file creates separate files for the graphs and images.
There is no editing capability within the view window. Editing the report can be done by cutting and pasting into a word processing program such as Microsoft™ Word by using the 'Ctrl-A' (Select All) and then 'Ctrl-C' (Copy) functions. Open a new document and use the 'Ctrl-V' (Paste). You can now edit and save, or print the file. As shown below;

WR-TestWorks Test Results

Phone:
Fax:

Patient ID: 99 **Name:** Rivers, Estelle **Referring Physician:**
Gender: Female **Birth Date:** 02/05/1963 **Referring Institution:**
Height: 5' 7" **Weight:** 150 lbs **Physician:** Dr. William Sonoma
Visit Remarks: No Comment

Interpretation:

Heart Rate Deep Breathing Test

Test ID: 302 **Date:** 02/15/2010 21:09 **Technician:** Administrator
Remarks:

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HRDB Analysis

Analysis ID: 418 **Date:** 02/15/2010 21:13 **Analyst:** Administrator

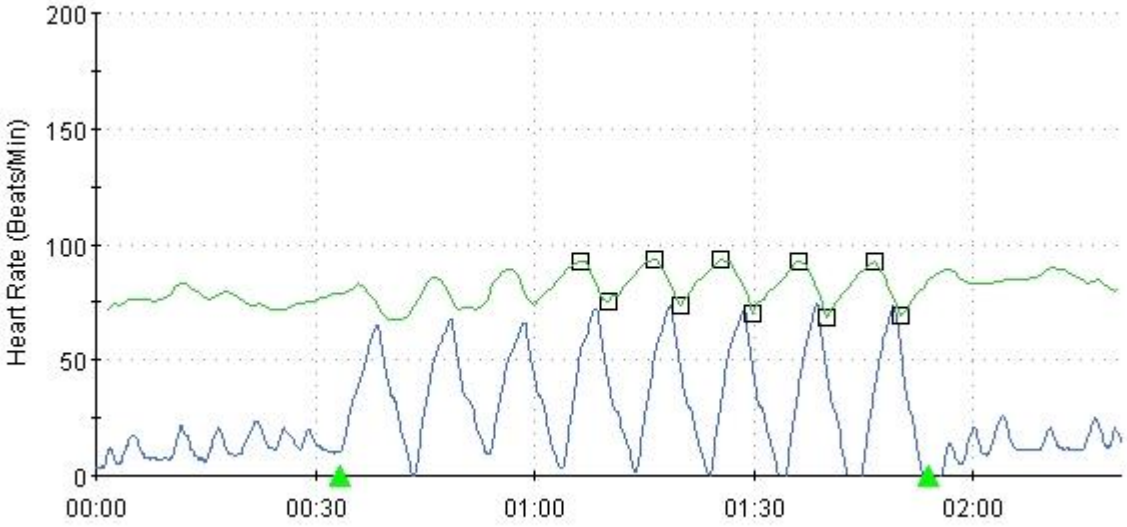
Comments:

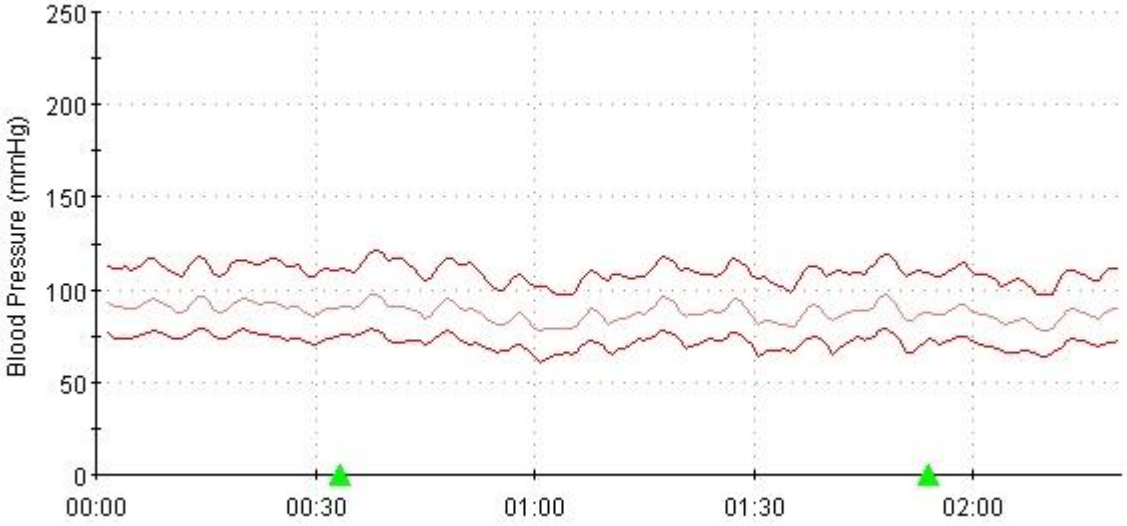
Test Data

Max Rate	Min Rate	Difference
93.0	75.5	17.6
93.7	73.6	20.1
93.7	70.2	23.6
92.3	68.2	24.1
92.3	69.0	23.3

Analysis Summary

Average HR Difference: 21.7 **E:I Ratio:** 1.31





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HRDB Analysis

Analysis ID: 1007 **Date:** 04/08/2010 13:04 **Analyst:** Administrator

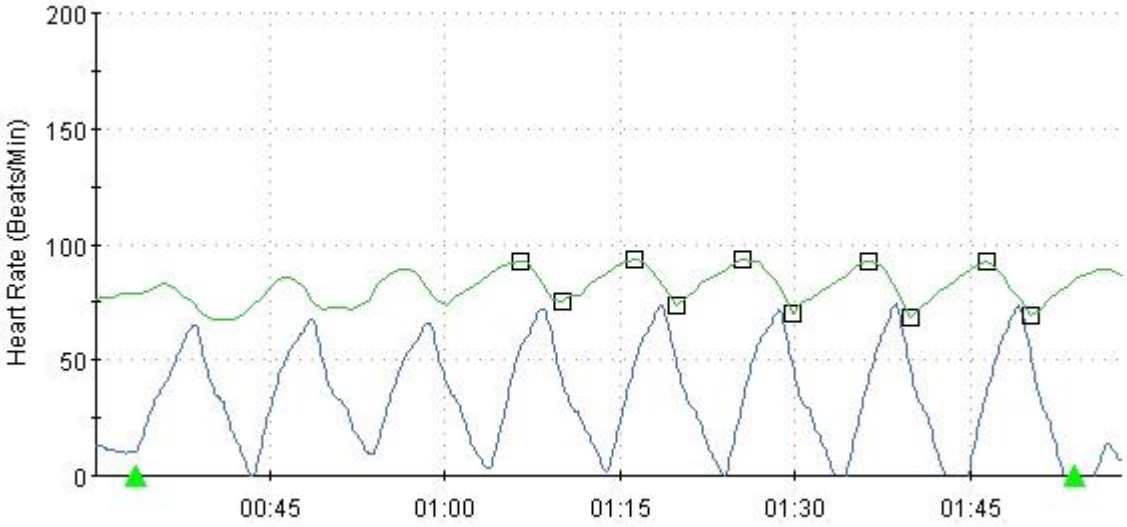
Comments:

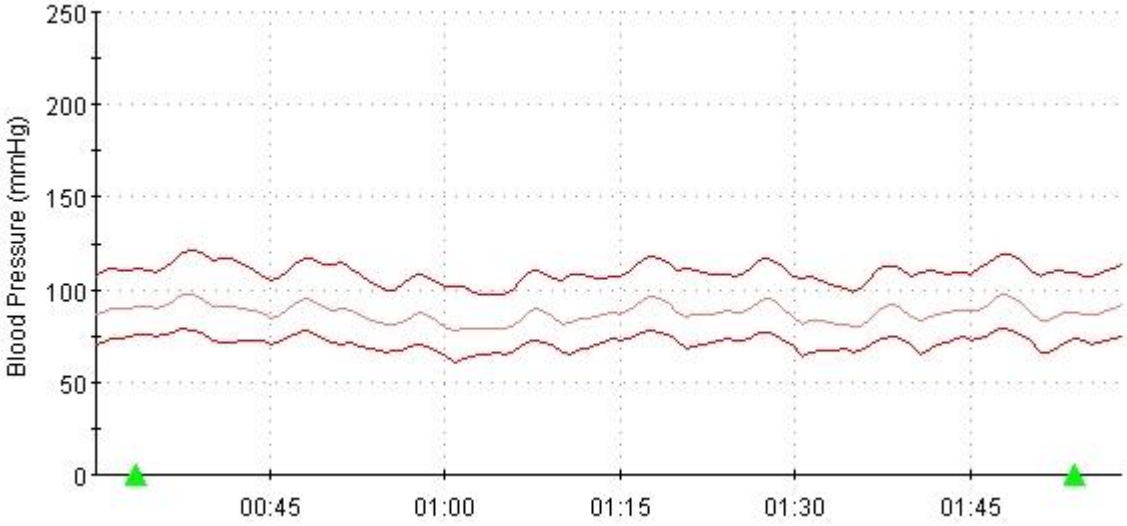
Test Data

Max Rate	Min Rate	Difference
93.0	75.5	17.6
93.7	73.6	20.1
93.7	70.2	23.6
92.3	68.2	24.1
92.3	69.0	23.3

Analysis Summary

Average HR Difference: 21.7 **E:I Ratio:** 1.31





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Tilt Table Test

Test ID: 304 **Date:** 02/15/2010 21:34 **Technician:** Administrator
Remarks:

Tilt Analysis

Analysis ID: 420 **Date:** 02/15/2010 21:50 **Analyst:** Administrator
Comments:

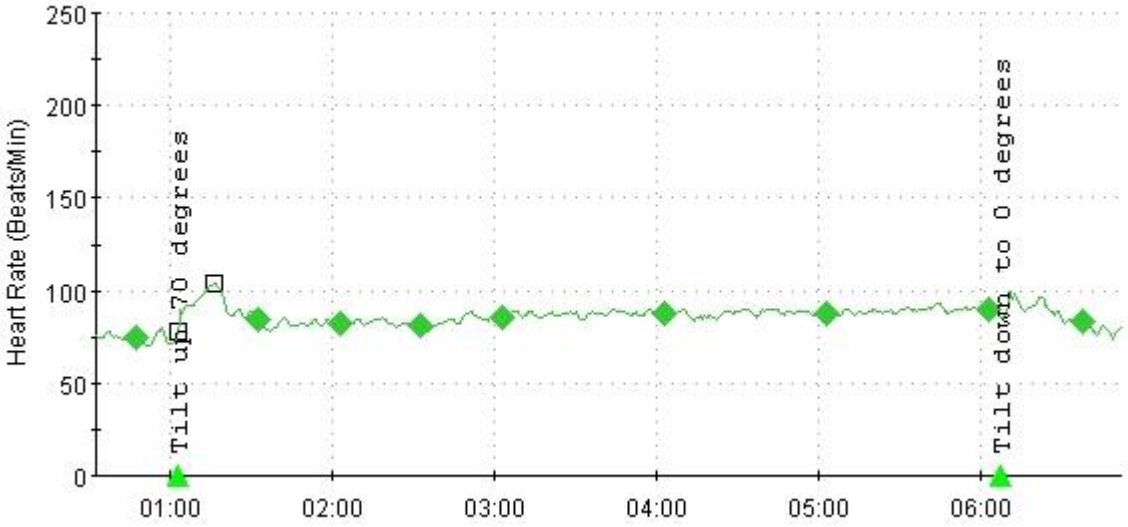
Test Data - Recorded

Time	SBP	DBP	HR	Δ SB	Δ DBP	Δ HR
Pre	119.5	74.0	74.9			
0.5	113.8	72.8	84.3	-5.7	-1.2	9.5
1.0	106.2	70.7	82.2	-13.3	-3.3	7.3
1.5	99.5	65.6	81.6	-20.0	-8.3	6.8
2.0	102.2	68.1	85.4	-17.3	-5.9	10.5
3.0	108.7	71.3	88.1	-10.8	-2.6	13.2
4.0	105.8	70.1	87.7	-13.6	-3.9	12.8
5.0	107.0	71.4	90.3	-12.5	-2.5	15.4
Post	109.8	68.8	82.9	-9.7	-5.2	8.1

Analysis Summary

Minimum SBP 80.1 at 0.2 minutes
SBP Change -39.4
HR at min SBP 99.2

Maximum HR 103.4 at 0.2 minutes
Minimum HR 77.9 at 0.0 minutes
HR Delta 25.5



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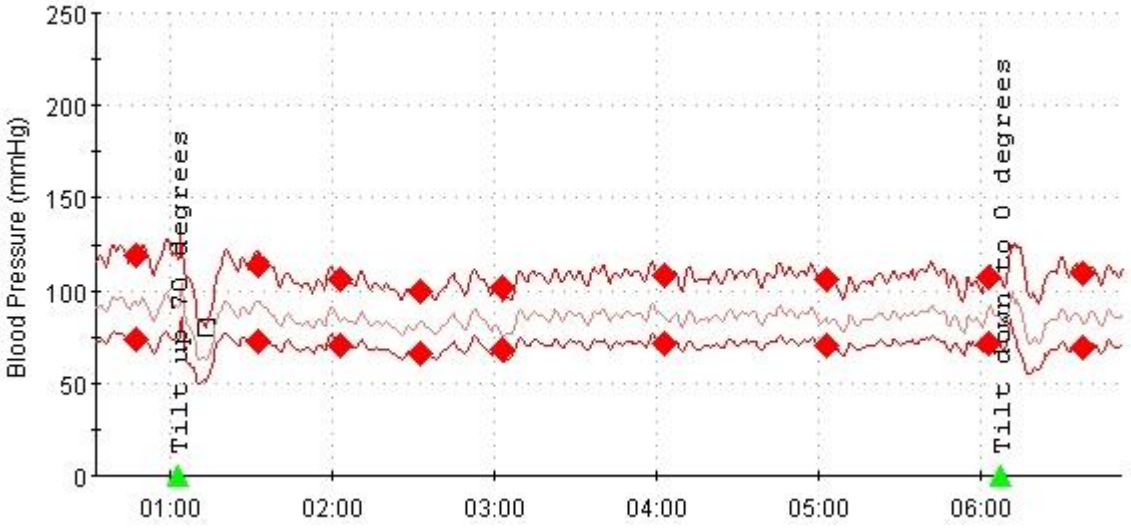

Valsalva Maneuver Test

Test ID: 303 **Date:** 02/15/2010 21:13 **Technician:** Administrator
Remarks:

Valsalva (R-R) Analysis

Analysis ID: 419 **Date:** 02/15/2010 21:18 **Analyst:** Administrator
Comments:

Test Data

Max Rate	Min Rate	Ratio
545 : 110.1	1025 : 58.5	1.88
530 : 113.2	1005 : 59.7	1.90

Analysis Summary

Greatest HR Ratio: 1.90

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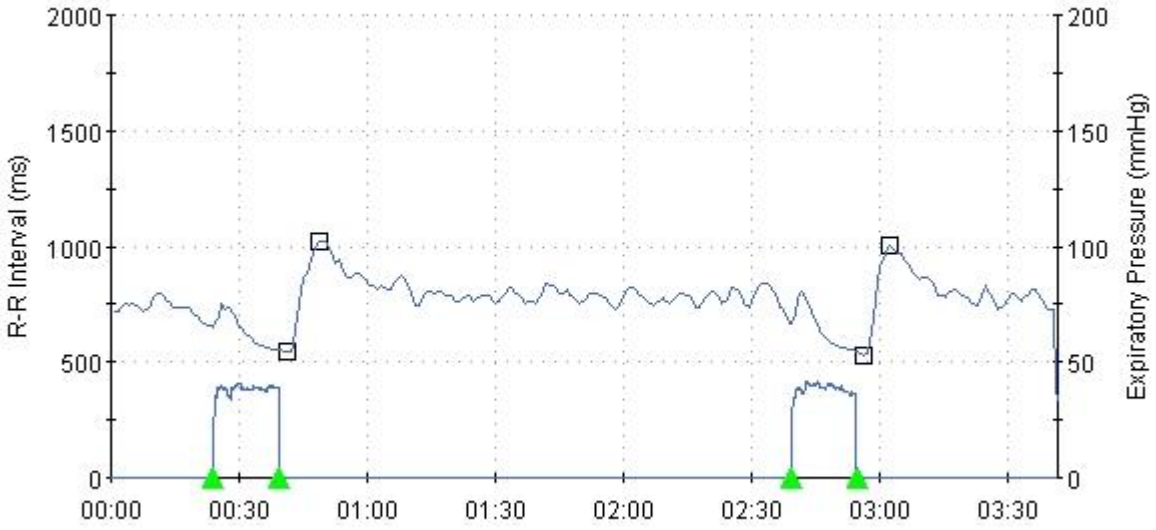

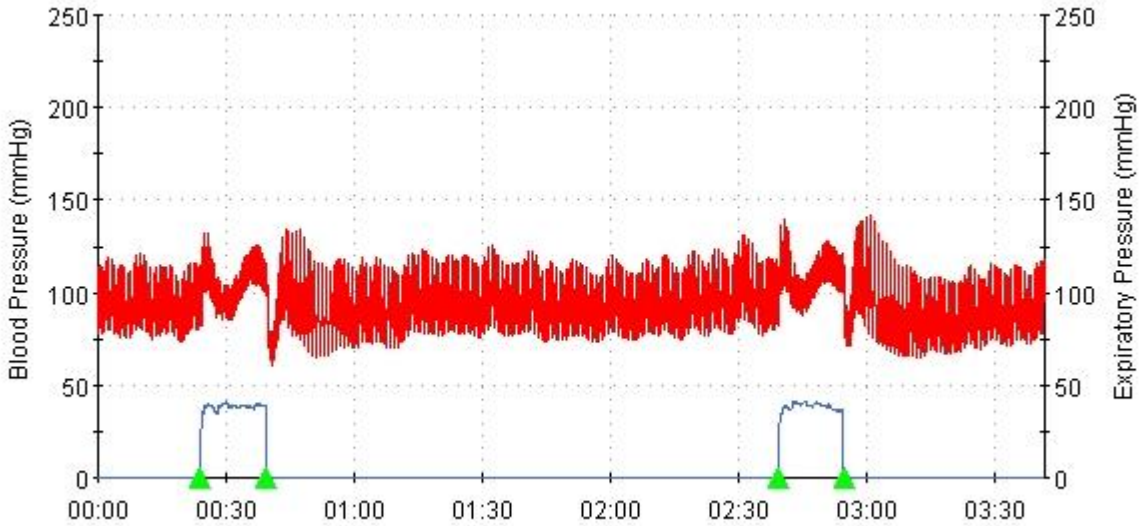

Signature: _____

Below is a second report for additional comparison.

WR-TestWorks Test Results

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Fax:

Patient ID: 3764-142 **Name:** McDonnell, Lorraine B **Referring Physician:**
Gender: Female **Birth Date:** 09/24/1944 **Referring Institution:**
Height: 5' 5" **Weight:** 169 lbs **Physician:** Dr. Howser
Visit Remarks: Visit notes may be used to record patient prescriptions, or environmental conditions that may affect results

---

Interpretation: Visit interpretation allows the physician to record a single narrative regarding the results of all tests in the visit.

Heat-Pain NRA-NS Test

Test ID: 22 **Date:** 02/20/2010 08:17 **Technician:** Administrator
Remarks: Test specific notes that may be used to describe unusual testing conditions or recording anomalies

Test Data

Test Site: Left Foot **Analysis ID:** 22

Stimulus:	13	0	15	17	19	20	21	0	0	22	23
Response:	0	0	0	0	0	0	1	0	0	2	5

Max Allowed Stimulation: 45.0 °C for 10.0s **Test Duration:** 2:25 (mm:ss)
Starting Temperature: 34.0 °C **Ramp Rate:** 4.0 °C
Algorithm: Heat-Pain Non-Repeating Ascending with Null Stimuli (Dyck et al, J Neurol Sci 136:54-63, 1996)

Analysis Summary

	HP 5.0	HP 0.5	HP 5.0 - 0.5
Computed Threshold:	23.0 JND	20.8 JND	2.2 JND
Displacement:	+23.03 °C for 5.2s	+20.80 °C	

●=Pain ○=No pain

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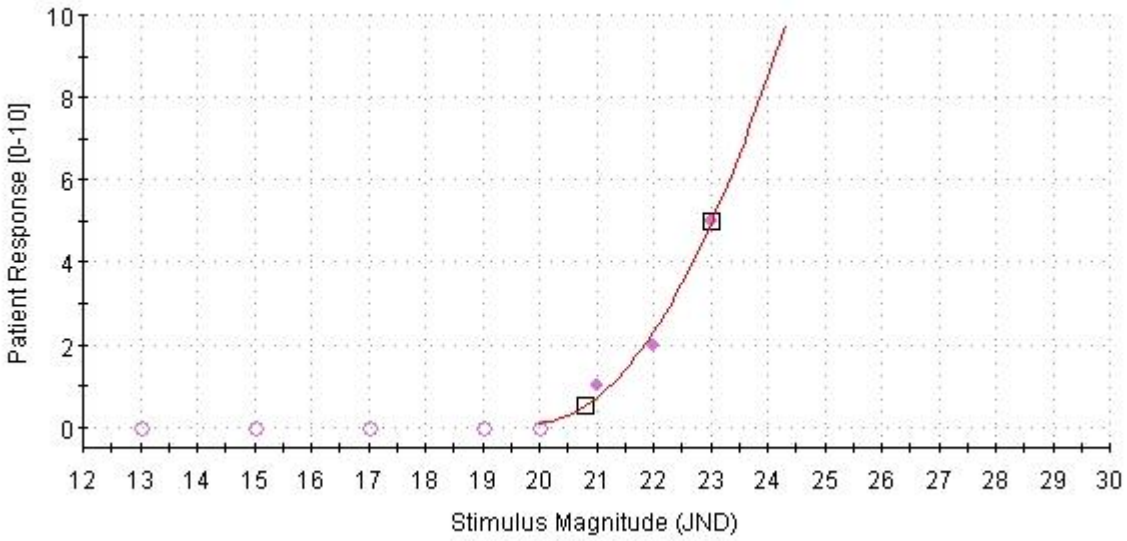

Fitted Quadratic: $f(x) = +0.500x^2 - 19.90x + 198.10$

Sniff Magnitude Test

Test ID: 36 **Date:** 02/21/2010 09:23 **Technician:** Administrator

Remarks: Test specific notes that may be used to describe unusual testing conditions or recording anomalies

Test Data

Test Status: Passed **Duration:** 4:55 (mm:ss) **Trigger Gain:** 4.00 **Trigger Level:** 5

Canister:	Trials:	Magnitude Ratio:
1 - Null	9	1.00
2 - Methyl thiobutyrate	3	0.37
3 - Ethyl 3-mercaptoproprionate	3	0.45
4 - Isoamyl acetate	3	0.49
Average		**0.44**

Solid = Null Light Dots = 2-Methyl thiobutyrate

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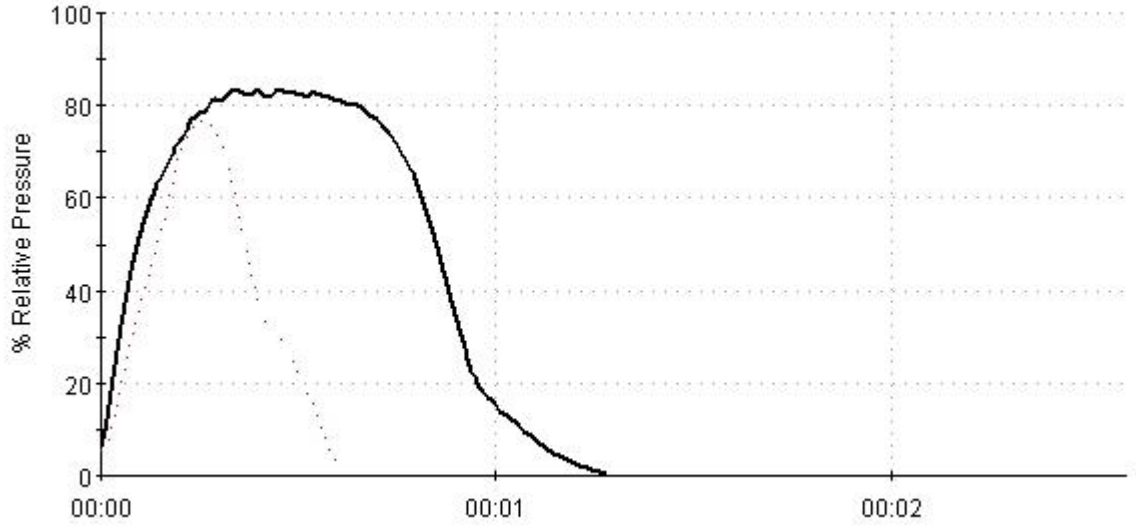
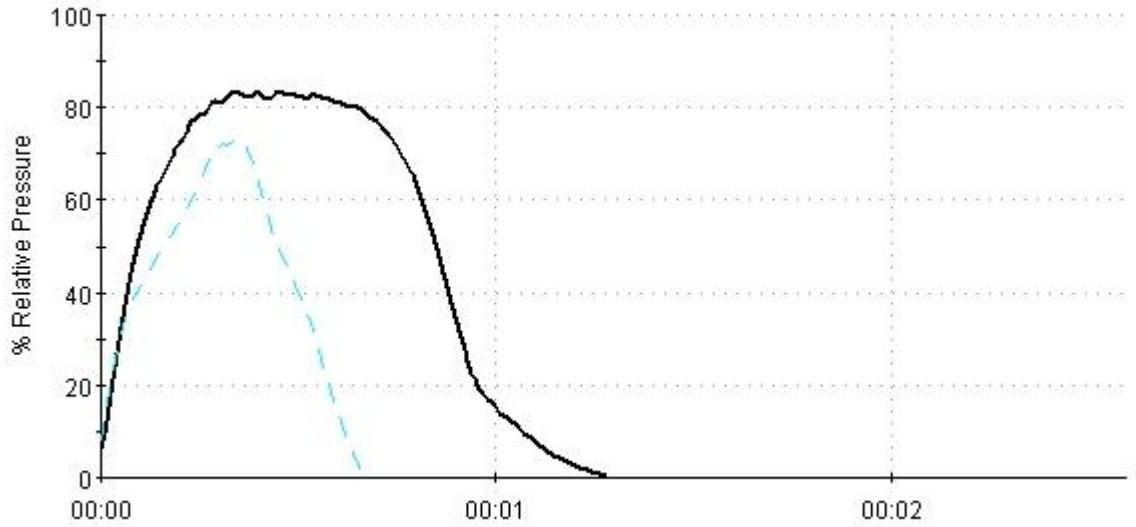


Solid = Null Light Dashes = 3-Ethyl 3-mercaptoproprionate



Solid = Null Light Dash-Dots = 4-Isoamyl acetate

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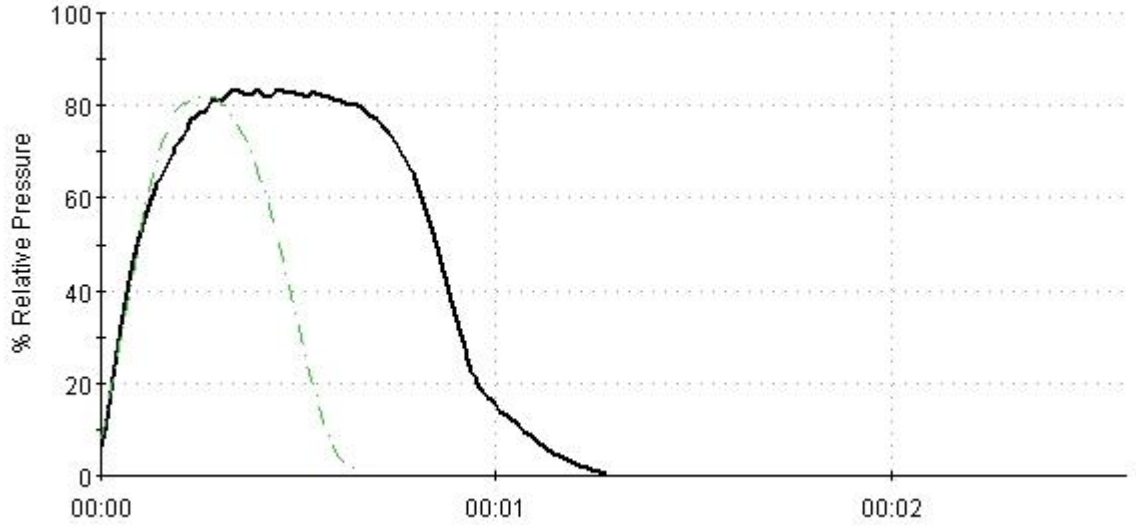

Patient ID: 3764-142 **Name:** McDonnell, Lorraine B **Referring Physician:**
Gender: Female **Birth Date:** 09/24/1944 **Referring Institution:**
Height: 5' 5" **Weight:** 199 lbs **Physician:** Dr. Howser
Visit Remarks: Visit notes may be used to record patient prescriptions, or environmental conditions that may affect results

Interpretation: Visit interpretation allows the physician to record a single narrative regarding the results of all tests in the visit.

Sweat Response Test

Test ID: 15 **Date:** 02/12/2010 11:12 **Technician:** Administrator
Remarks: Test specific notes that may be used to describe unusual testing conditions or recording anomalies

Sweat Total Analysis

Analysis ID: 17 **Date:** 02/12/2010 11:40 **Analyst:** Administrator
Comments: Analysis specific notes that may be used to explain particular point selections or conditions that may impact the analysis results

Test Site	Prox Leg	Dist Leg	Foot
Total Volume (µL)	1.334	1.092	0.647
Totalized Time	10:00	10:00	10:00
Response Latency	0:59	1:20	2:37
Baseline Rate (nL/min)	116	24	17
Ending Offset (nL/min)	139	95	61

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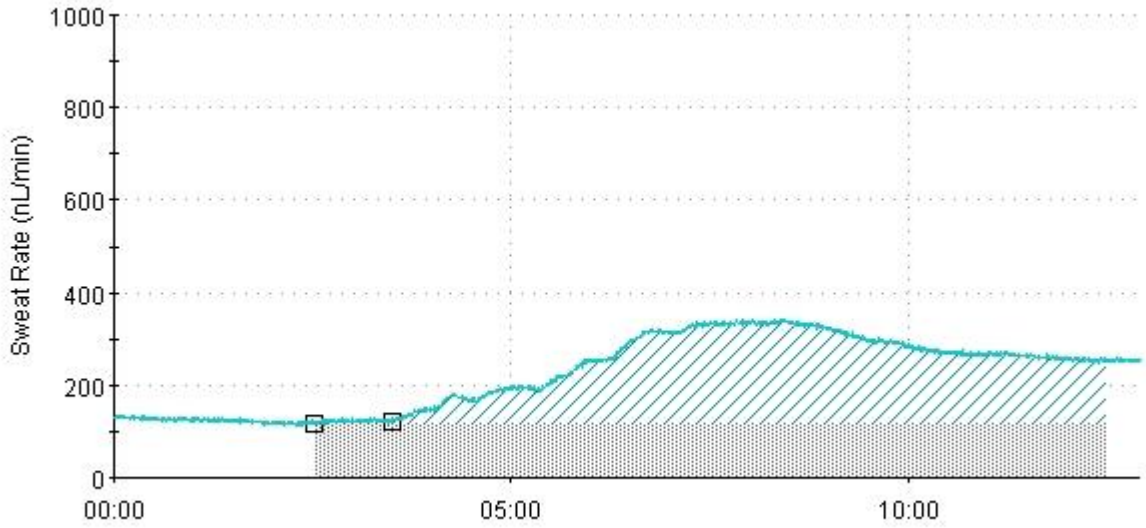
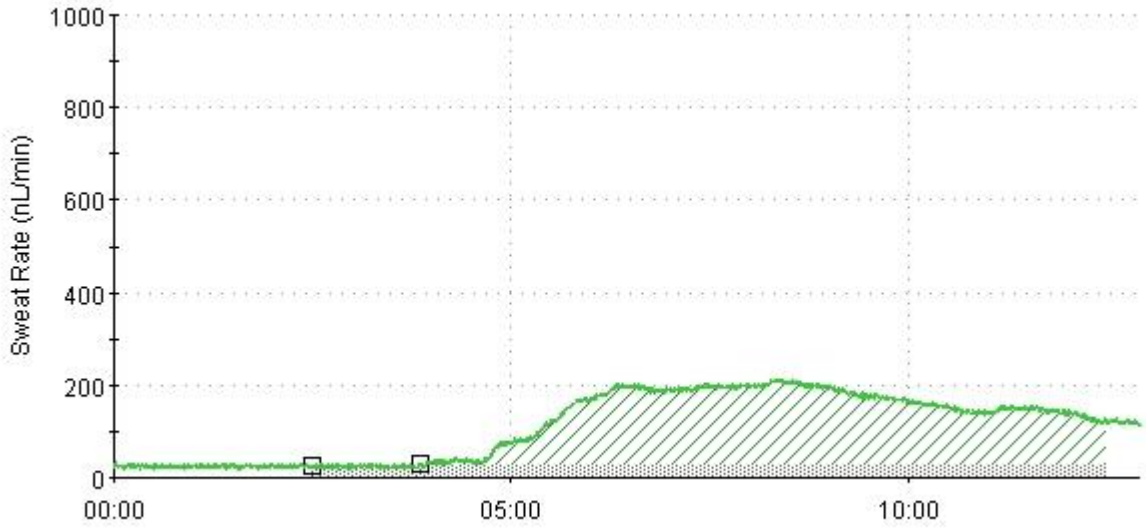
Prox Leg



Dist Leg



Foot

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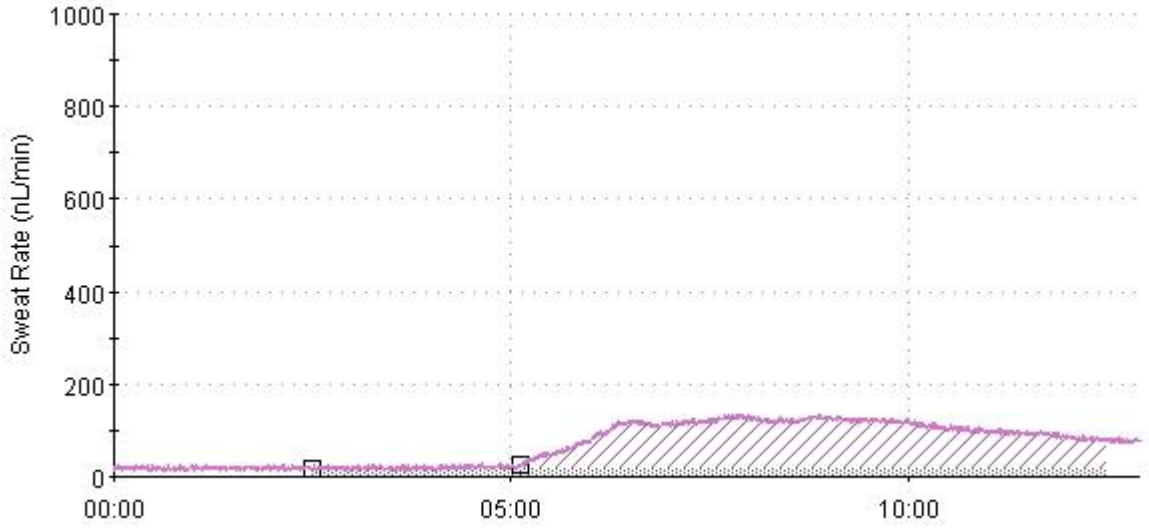

Patient ID: 3764-142 **Name:** McDonnell, Lorraine B **Referring Physician:**
Gender: Female **Birth Date:** 09/24/1944 **Referring Institution:**
Height: 5' 5" **Weight:** 169 lbs **Physician:** Dr. Howser
Visit Remarks: Visit notes may be used to record patient prescriptions, or environmental conditions that may affect results

Interpretation: Visit interpretation allows the physician to record a single narrative regarding the results of all tests in the visit.

Vibration - 4,2,1 with NS Test

Test ID: 21 **Date:** 02/20/2010 08:13 **Technician:** Administrator
Remarks: Test specific notes that may be used to describe unusual testing conditions or recording anomalies

Test Data

Test Site: Left Hand

Stimulus:	13	0	13	9	5	7	0	6	5	6	0	7	6	5	0	6	0	7	6	5
Response:	Y	N	Y	Y	N	Y	N	Y	N	N	N	Y	Y	N	N	N	N	Y	Y	N

Max Allowed Stimulation: 576.60 µm **Test Duration:** 0:29 (mm:ss)
Algorithm: 4, 2, and 1 stepping algorithm with null stimuli (Dyck PJ, O'Brien PC, et al, Neurol 43:1508-1518, 1993)

Analysis Summary

Practice Threshold: 6 ±2 JND **Analysis ID:** 21
Computed Threshold: 5.8 JND
Displacement Chord: +0.724 µm

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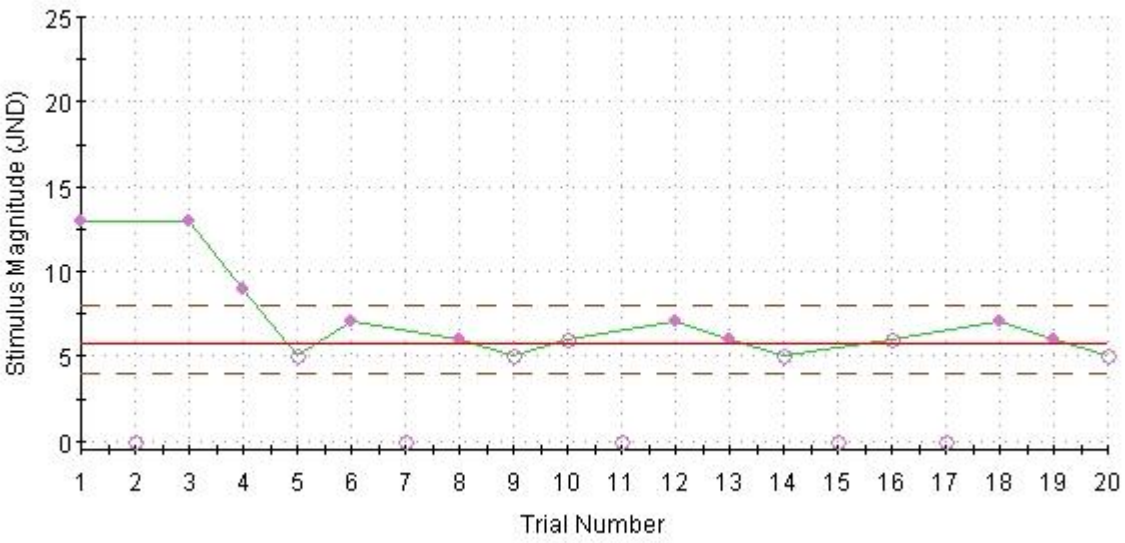
Test Status: Passed

●=Yes ○=No



Signature: _____

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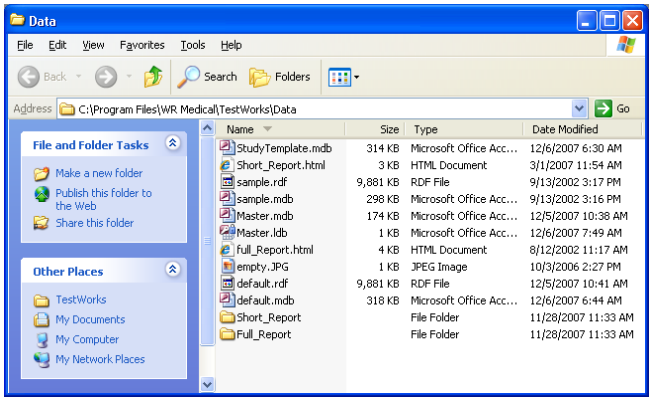
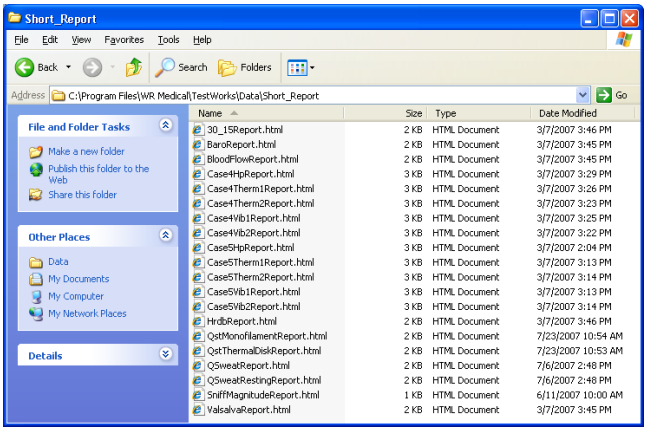
CUSTOMIZING REPORTS

To customize a report or create a new format, some basic HTML knowledge is needed. There are many books available on the subject. To create a new report, several files will need to be created and placed in the correct directories for WR-TestWorks™ to generate the report. In the data directory the master format file along with a directory with the same name for the sub-report templates will need to be created. For example, the report "Short_Report.html" also has the directory "Short_Report". This directory contains the sub-report formats.





Do **not *rename*** sub-reports. The names are fixed within WR-TestWorks™. Renaming sub-reports will cause the template files to be inaccessible.

Report fields do not have the same names as the Data Export fields. Please refer to the ***DATA FIELDS AVAILABLE FOR EXPORTS AND REPORTS*** section for reference.

To help conceptualize the sequence of templates, the master format calls out the sub-report templates to generate the various tests.

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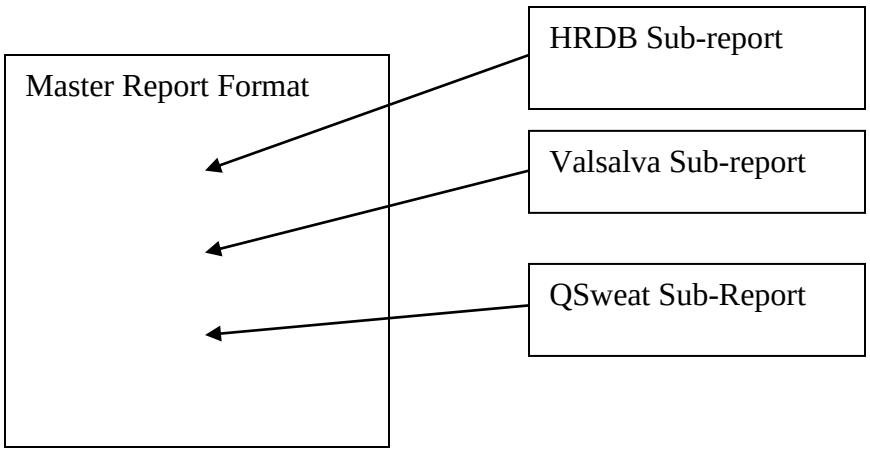

The master report can contain fields that are generic to all tests and must be formatted and called by using the “[$FIELD_NAME]” which WR-TestWorks™ will substitute with the actual data during the report generation.
You can create formatting tags such as; “#reporthead”, “#testhead” and “#testdata”. This allows for simple font changes to be made and the use of section formats can be utilized where needed.
Special WR-TestWorks™ tags are as follows;

The “[$VISIT_START]” tag identifies the start of the visit section, which is repeated for each visit encountered in the selected tests.
The “[$TEST_START]” tag identifies the start of the test section, which is repeated for each test selected.
The “[$ANALYSIS_START]” tag identifies the start of the analysis section, which is repeated for each analysis encountered for each test selected.
The “[$ANALYSIS_CONTENT]” tag identifies where the sub-report is located for each analysis.
The “[$ANALYSIS_END]” tag identifies the end of the analysis section (and test / visit sections).

The “[$(]” “[$)]” tag pair will repeat everything inside the parentheses until all repeat data is exhausted.
The “[$<]” “[$>]”tag pair is used for a single line repeat.
The “[$#<chart name> <X size> <Y size>]” tag defines a chart to insert by name and pixel size.

A sample of a master template is show below;

```
<html>
<head>
<title>[$FULL_NAME] | Patient ID: [$EXT_PATIENT_ID] | [$VISIT_DATE]</title>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
<style type="text/css">
#reporthead {font-family: Arial, Helvetica, sans-serif; font-size: 14pt; font-weight: bold; text-decoration: underline}
#testhead {font-family: Arial, Helvetica, sans-serif; font-size: 12pt; font-weight: bold; text-decoration: underline}
#testdata {font-family: Arial, Helvetica, sans-serif; font-size: 10pt; padding:0pt 0pt 0pt 0pt}
</style>
<style><!--
.pagebreak { page-break-inside: avoid; }
--></style>
</head>
<body bgcolor="#ffffff">
<p id="reporthead" align="center">WR-TestWorks Test Results</p>
[$VISIT_START]
<HR>
<table id="testdata" width="100%" border="0" align="center">
  <tr>
```


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```
  <td width="20%" align="left"><b>Patient ID:</b> [$EXT_PATIENT_ID]</td>
  <td width="35%" align="left"><b>Name:</b> [$FULL_NAME]</td>
  <td width="45%" align="left"><b>Referring Physician:</b> [$REFERRING_PHYSICIAN]</td>
 </tr>
 <tr>
  <td align="left"><b>Gender:</b> [$GENDER]</td>
  <td align="left"><b>Birth Date:</b> [$BIRTHDAY]</td>
  <td align="left"><b>Referring Institution:</b> [$REFERRING_INSTITUTION]</td>
 </tr>
 <tr>
  <td align="left"><b>Height:</b> [$HEIGHT]</td>
  <td align="left"><b>Weight:</b> [$WEIGHT]</td>
  <td align="left"><b>Physician:</b> [$PHYSICIAN]</td>
 </tr>
 <tr>
  <td colspan="3" align="left"><b>Visit Remarks:</b> [$VISIT_COMMENT]</td>
 </tr>
</table>
<HR>
<p id="testdata" align="left">
  <b>Interpretation:</b> [$VISIT_INTERPRETATION]
</p>
[$TEST_START]
<HR>
<table id="testdata" width="100%" border="0" align="center">
 <tr>
  <td id="testhead" colspan="4" align="middle">[$TEST_NAME] Test</td>
 </tr>
 <tr>
  <td width="20%" align="left"><b>Test ID:</b> [$TEST_ID]</td>
  <td width="35%" align="left"><b>Date:</b> [$TEST_DATE] [$TEST_TIME]</td>
  <td width="45%" align="left"><b>Technician:</b> [$TECHNICIAN]</td>
 </tr>
 <tr>
  <td colspan="3" align="left"><b>Remarks:</b> [$TEST_COMMENT]</td>
 </tr>
</table>
[$ANALYSIS_START]
[$ANALYSIS_CONTENT]<br>
[$ANALYSIS_END]
</body>
</html>
```

Below is an example of the sub-report ‘QSweatReport.html’ which if selected will be called by the master.

```
<table id="testdata" width="100%" border="0" align="center">
 <tr>
  <td id="testhead" colspan="4" align="middle">[$ANALYSIS_NAME] Analysis</td>
 </tr>
 <tr>
  <td width="20%" align="left"><b>Analysis ID:</b> [$ANALYSIS_ID]</td>
  <td width="35%" align="left"><b>Date:</b> [$ANALYSIS_DATE] [$ANALYSIS_TIME]</td>
  <td width="45%" align="left"><b>Analyst:</b> [$ANALYST]</td>
 </tr>
 <tr>
  <td colspan="3" align="left"><b>Comments:</b> [$ANALYSIS_COMMENT]</td>
 </tr>
</table>
<br>
[$Q-Sweat.Analyzed Only]
<table id=testdata width=100% border=0>
 <tr>
  <th width=28% align=left>Test Site</th>
```


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```
[$(]
 <th align=center>[$Q-Sweat.Capsule Sites]</th>
[$)]
 </tr>
 <tr>
 <th width=28% align=left>Total Volume ([$Q-Sweat.Volume Units])</th>
[$(]
 <td align=center>[$Q-Sweat.Total Volumes]</td>
[$)]
 </tr>
 <tr>
 <th width=28% align=left>Totalized Time</th>
[$(]
 <td align=center>[$Q-Sweat.Total Times]</td>
[$)]
 </tr>
 <tr>
 <th width=28% align=left>Response Latency</th>
[$(]
 <td align=center>[$Q-Sweat.Latencies]</td>
[$)]
 </tr>
 <tr>
 <th width=28% align=left>Baseline Rate ([$Q-Sweat.Rate Units])</th>
[$(]
 <td align=center>[$Q-Sweat.Baselines]</td>
[$)]
 </tr>
 <tr>
 <th width=28% align=left>Ending Offset ([$Q-Sweat.Rate Units])</th>
[$(]
 <td align=center>[$Q-Sweat.Ending Offsets]</td>
[$)]
 </tr>
 <tr>
 <td colspan=5>[$Q-Sweat.Device Log]</td>
 </tr>
</table>
<br>
<table id=testdata width=100% border=0>
[$(]
 <tr><td> </td></tr>
 <tr>
 <th align="center">[$Q-Sweat.Capsule Sites]</td>
 </tr>
 <tr>
 <td align=center><img src=[$#QSweat_Response_Chart 650 300]></td>
 </tr>
[$<]<tr><td>[$Q-Sweat.Site Logs]</td></tr>[$>]
[$)]
</table>
```

CREATING NEW TEMPLATE

To create new templates create a new master template and the corresponding directory for the sub-templates. This must be done in the data directory. For example, a new master template named ‘new_template.html’ in the data directory would require the folder ‘new_template’ to be created in the data directory.

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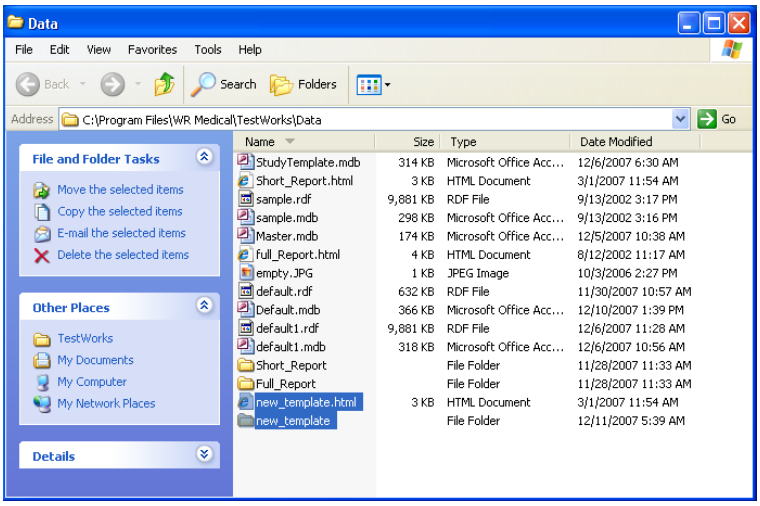

It may be easier to copy the sub-templates from the existing 'Full_Report' or 'Short_Report' directories into the new 'new_template' directory and then modify the existing sub-templates.
It is suggested that 'notepad' is used instead of Microsoft™ Word. However, any editing program can be used.
In this example, the goal is to add a logo to the master template and make a referring report that does not contain graphs or other information that may not want to be included.
Example 'new_template.html' ;

```
<html>
<head>
<title>[$FULL_NAME] | Patient ID: [$EXT_PATIENT_ID] | [$VISIT_DATE]</title>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
<style type="text/css">
#reporthead {font-family: Arial, Helvetica, sans-serif; font-size: 12pt; font-weight: bold}
#testhead {font-family: Arial, Helvetica, sans-serif; font-size: 10pt; font-weight: bold; text-decoration: underline}
#testdata {font-family: Arial, Helvetica, sans-serif; font-size: 10pt; padding:0pt 0pt 0pt 0pt}
</style>
<style>
<!--
.pagebreak { page-break-inside: avoid; }
.style1 {
        font-size: 16px;
        font-weight: bold;
}
-->
</style>
</head>
<body bgcolor="#ffffff">
<table id="reporthead" width="100%" border="0" align="center">
 <tr>
  <td rowspan=3 width="50%"><IMG SRC="C:\Program Files\WR Medical\TestWorks\Data\WR_LOGO.jpg"></td>
  <td width="50%" align="center">DEPARTMENT OF NEUROLOGY</td>
 </tr>
 <tr>
  <td width="50%" align="center">MEDICAL CENTER</td>
 </tr>
 <tr>
  <td width="50%" align="center">NEUROPHYSIOLOGY LABORATORY</td>
 </tr>
 <tr><td> </td></tr>
 <tr>
  <td colspan=2 align="center">Autonomic Function Testing</td>
```


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```
 </tr>
</table>
[$VISIT_START]<HR>
<table id="testdata" width="100%" border="0" align="center">
 <tr>
  <td width="30%"><b>Date: </b>[$VISIT_DATE]</td>
  <td colspan=3><b>Name: </b>[$FULL_NAME]</td>
 </tr>
 <tr>
  <td width="30%"><b>DOB: </b>[$BIRTHDAY]</td>
  <td colspan=3><b>MR#: </b>[$EXT_PATIENT_ID]</td>
 </tr>
 <tr>
  <td width="30%"></td>
  <td width="25%"><b>Sex: </b>[$GENDER]</td>
  <td width="25%"><b>Weight: </b>[$WEIGHT]</td>
  <td width="20%"><b>Height: </b>[$HEIGHT]</td>
 </tr>
 <tr>
  <th width="30%" align="left">MEDICATIONS:</th>
  <td colspan=3> </td>
 </tr>
 <tr>
  <th width="30%" align="left">MEDICAL HISTORY:</th>
  <td colspan=3> </td>
 </tr>
 <tr>
  <th width="30%" align="left">REFERRING PHYSICIAN:</th>
  <td colspan=3>[$REFERRING_PHYSICIAN]</td>
 </tr>
</table>
<HR><BR>
[$TEST_START]
[$ANALYSIS_START]
[$ANALYSIS_CONTENT]<BR>
[$ANALYSIS_END]<BR>
<HR>
<table id="testdata" width="100%" border="0" align="center">
 <tr>
  <th width="20%" align="left">FINDINGS:</td>
  <td width="80%"></td>
 </tr>
 <tr>
  <th width="20%" align="left">IMPRESSION:</td>
  <td width="80%"></td>
 </tr>
</table>
<BR>
<table id="testdata" width="100%" border="0" align="center">
 <tr>
  <td width="40%"></td>
  <td width="60%">_____</td>
 </tr>
 <tr>
  <td width="40%"></td>
  <td width="60%"><b>Doctor Name, M.D.</b></td>
 </tr>
 </table>
</body>
</html>
```

Sample of sub-template ‘QSweatReport.html’ ;

```
<p id=Testhead>SUDOMOTOR (Postganglionic Sympathetic) - Quantitative Sudomotor Axon Reflex Test:
<table id="testdata" width="100%" border="1" align="center">
```


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```
 <tr>
  <th width="28%" align="center">Test Site</th>
  <th width="18%" align="center">Time (min)</th>
  <th width="18%" align="center">Latency (s)</th>
  <th width="18%" align="center">Volume (µl)</th>
 </tr>
[$(]
 <tr>
  <td align="center">[$Q-Sweat.Capsule Sites]</td>
  <td align="center">[$Q-Sweat.Total Times]</td>
  <td align="center">[$Q-Sweat.Latencies]</td>
  <td align="center">[$Q-Sweat.Total Volumes]</td>
  <td align="center"> </td>
 </tr>
[$)]
</table>
</p>
```


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Example Report;

DEPARTMENT OF NEUROLOGY
MEDICAL CENTER

NEUROPHYSIOLOGY LABORATORY

Autonomic Function Testing

Date: 01/05/2001 **Name:** Splivens, Mr. Zip J, Jr.
DOB: 10/14/1972 **MR#:** 987654321
Sex: Male **Weight:** 210 lbs **Height:** 6' 1"

MEDICATIONS:
MEDICAL HISTORY:
REFERRING PHYSICIAN:

CARDIOVAGAL (Parasympathetic):

HR response to deep breathing:

HRDB range: 14.8 bpm (nl >)
E/I ratio: 1.22 (normal >)

SUDOMOTOR (Postganglionic Sympathetic) - Quantitative Sudomotor Axon Reflex Test:

Test Site	Time (min)	Latency (s)	Volume (µl)	
R. Forearm	10:00	0:42	1.138	
Prox Leg	10:00	0:08	2.619	
Dist Leg	10:00	0:50	2.238	
Foot	10:00	0:58	0.698	

CARDIOVAGAL (Parasympathetic):

Valsalva response:

Valsalva HR ratio: 1.81 (nl >)
BP Response (phase I-IV)

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FINDINGS:

IMPRESSION:

_____

Doctor Name, M.D.

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DATA FIELDS AVAILABLE FOR EXPORTS AND REPORTS

TEST/ANALYSIS DATA FIELDS

Site Data			
Export Field Name	**Report Field Name**	**Description**	**Example**
Release Version	[$RELEASE_VERSION]	TestWorks™ Release Version	2.3.9
Current Date	[$CURRENT_DATE]	System Date.	12/5/2007 7:57
Study Name	[$STUDY_NAME]	Database storage file name.	Default
Sponsor	[$STUDY_SPONSOR]	Sponsor name.	WR Medical Electronics
Protocol	[$STUDY_PROTOCOL]	Protocol used.	Standard Published
Site ID	[$STUDY_SITE_ID]	Site Identification.	123
Institution	[$INSTITUTION_NAME]	Name of Institution.	WR Medical Electronics
Department	[$INSTITUTION_DEPT]	Name of Department.	Research and Development
Inst. Address	[$INSTITUTION_ADDRESS]	Institution Street Address.	1700 Gervais Avenue, Maplewood, MN 55109
Inst. Phone	[$INSTITUTION_PHONE]	Institution Telephone Number.	651-604-8400
Inst. Fax	[$INSTITUTION_FAX]	Institution Fax Number.	651-604-8499
Inst. Logo	[$INSTITUTION_LOGO]	Path to image file. NOTE: Only for Report Generation	
Patient Data			
Export Field Name	**Report Field Name**	**Description**	**Example**
TW Patient ID	[$PATIENT_ID]	TestWorks™ Number (Internally generated)	123000004
Patient ID	[$EXT_PATIENT_ID]	Patient Identification.	9876543210
Last Name	[$LAST_NAME]	Patient Last Name.	Fernwilter
First Name	[$FIRST_NAME]	Patient First Name.	Francine
Initial	[$INITIAL]	Patient Initial.	B
Prefix	[$PREFIX]	Patient Prefix.	Ms.
Suffix	[$SUFFIX]	Patient Suffix.	III
Patient Name	[$FULL_NAME]	Translated to full name in desired format.	Fernwilter, Ms. Francine B
Birthday	[$BIRTHDAY]	Translated to desired date format.	9/24/1944 0:00
Age	[$AGE]	Computed from birthday and reference date.	56
Gender	[$GENDER]	Patient Gender.	Female
Street Address	[$STREET_ADDRESS]	Patient Address combined.	1210 North Fourth Street
City	[$CITY]	Patient City.	Stillwater
State	[$STATE]	Patient State.	MN
Country	[$COUNTRY]	Patient Country.	US
Postal Code	[$POSTAL_CODE]	Patient Zip Code.	55082
Locale	[$LOCALE]	Patient Locale combined city and state.	Stillwater, MN
Domestic Address	[$FULL_ADDRESS]	Patient Address, without country.	1210 North Fourth Street Stillwater, MN 55082
Int'l Address	[$INTL_ADDRESS]	Patient Address, with country.	1210 North Fourth Street Stillwater, MN US 55082
Phone	[$PHONE]	Patient telephone number.	(651)-351-8122
Alt. Phone	[$ALT_PHONE]	Patient Alternate telephone number.	(651)-351-8122
Last Tested	[$LAST_TEST_DATE]	Translated to desired date format.	9/10/2002 11:17
Visit Data			
Export Field Name	**Report Field Name**	**Description**	**Example**
Visit ID	[$VISIT_ID]	Patient Visit ID (Internally generated).	123000004
Visit Name	[$VISIT_NAME]	Translated to visit name string.	none
Visit Date	[$VISIT_DATE]	Translated to desired date format.	1/5/2001 0:00

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Height	[$HEIGHT]	Translated from meters to desire units.	5' 5"
Weight	[$WEIGHT]	Translated from kilograms to desired units.	169 lbs
Physician	[$PHYSICIAN]	Attending Physician	Dr. Howser
Visit Comment	[$VISIT_COMMENT]	Visit Comments.	Visit Notes. Patient was on beta blocker.
Visit Status	[$VISIT_STATUS]	Translated to status string.	Passed
Referring Physician	[$REFERRING_PHYSICIAN]	Name of Referring Physician.	Dr. Skinner
Referring Institution	[$REFERRING_INSTITUTION]	Name of Referring Institution.	Medical Clinic
Visit Interpretation	[$VISIT_INTERPRETATION]	Visit Interpretation.	Interpretation. Patient was normal or not normal.
Test Data			
Export Field Name	**Report Field Name**	**Description**	**Example**
Test ID	[$TEST_ID]	Test ID number (Internally Generated).	123000015
Application ID	[$APP_ID]	Module Used.	2
Application	[$APPLICATION]	Translated to application name string.	Cardiac
Test Type	[$TEST_TYPE]	Test ID.	2
Test Name	[$TEST_NAME]	Translated to test name string.	Valsalva Maneuver
Test Date	[$TEST_DATE]	Translated to desired date format.	1/5/2001 0:00
Test Length	[$TEST_LENGTH]	Length of data in time.	0:00 (min:sec)
Technician	[$TECHNICIAN]	Translated to technician name string.	Administrator
Test Comment	[$TEST_COMMENT]	Test Comments.	Test Notes. Patient was feeling dizzy.
Test Status	[$TEST_STATUS]	Translated to status string.	Passed
Archive Vol.	[$ARCHIVE_VOLUME]	Reserved.	
Analysis Data			
Export Field Name	**Report Field Name**	**Description**	**Example**
Analysis ID	[$ANALYSIS_ID]	Analysis ID (Internally Generated).	123000126
Analysis Type	[$ANALYSIS_TYPE]	Analysis Type.	1
Analysis Name	[$ANALYSIS_NAME]	Translated to analysis name string.	HRDB
Analysis Date	[$ANALYSIS_DATE]	Translated to desired date format.	12/5/2007 8:17
Analyst	[$ANALYST]	Translated to analyst name string.	Administrator
Analysis Comment	[$ANALYSIS_COMMENT]	Analysis comments.	Analysis Notes. Patient was not consistent with breaths
Analysis Status	[$ANALYSIS_STATUS]	Translated to status string.	Passed
Serial Number	[$SERIAL_NUMBER]	Serial number of TestWorks™.	1
Visit Time	[$VISIT_TIME]	Length of visit in time.	0:00
Test Time	[$TEST_TIME]	Length of test in time.	11:13
Analysis Time	[$ANALYSIS_TIME]	Length of analysis in time.	8:17
Current Time	[$CURRENT_TIME]	System time.	8:19
Test Result	[$Test Result]	Value for tests with a single result	5.9
Cardiac Data	**NOTE: Report fields are for sub-reports only**		
Export Field Name	**Report Field Name**	**Description**	**Example**
Linear.Slope	[$Linear.Slope]	Slope of best fit line through points	
Linear.Intercept	[$Linear.Intercept]	Intercept point for best fit line	
Linear.R Value	[$Linear.R Value]	R value from linear regression	
Linear.P Value	[$Linear.P Value]	P value from linear regression	
Linear.Beat Offset	[$Linear.Beat Offset]	Number of beats offset for best fit	
Linear.Num Points	[$Linear.Num Points]	Number of points in selection	
Hrdb.EI-Ratio	[$Hrdb.EI-Ratio]	E:I ratio	
30:15.Beat (30)	[$30:15.Beat (30)]	Beat number of “beat 30”	
30:15.Beat (15)	[$30:15.Beat (15)]	Beat number of “beat 15”	
Hrdb.EI-Ratio Normal Range	[$Hrdb.EI-Ratio Normal Range]	Normal Range	
Hrdb.EI Table Name	[$Hrdb.EI Table Name]	Table Name	

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Hrdb.EI-Ratio Table Comment	[$Hrdb.EI-Ratio Table Comment]	Table Comment	
Hrdb.Respiration Rate	[$Hrdb.Respiration Rate]	Seconds per respiration [HRV only]	
Valsalva.Target Pressure	[$Valsalva.Target Pressure]	Valsalva target pressure [HRV only]	
Valsalva.Hold Time	[$Valsalva.Hold Time]	Valsalva hold time [HRV only]	
Cardiac.Num Points	[$Cardiac.Num Points]	Number of point pairs in analysis	
Cardiac.Max Points	[$Cardiac.Max Points]	Maximum points (used for HRDB, VALS, 30:15)	
Cardiac.Min Points	[$Cardiac.Min Points]	Minimum points (used for HRDB, VALS, 30:15)	
Cardiac.Max-Min Deltas	[$Cardiac.Max-Min Deltas]	Deltas between Max and Min points (used for HRDB)	
Cardiac.Max/Min Ratios	[$Cardiac.Max/Min Ratios]	Ratios of Max/Min points (used for VALS, 30:15)	
Tilt.Pre HR	[$Tilt.Pre HR]	Pre-Tilt (supine) Heart Rate	62.3
Tilt.Pre SBP	[$Tilt.Pre SBP]	Pre-Tilt (supine) Systolic BP	121.0
Tilt.Pre DBP	[$Tilt.Pre DBP]	Pre-Tilt (supine) Diastolic BP	79.6
Tilt.Post HR	[$Tilt.Post HR]	Post-Tilt (supine) Heart Rate	65.2
Tilt.Post SBP	[$Tilt.Post SBP]	Post-Tilt (supine) Systolic BP	117.8
Tilt.Post DBP	[$Tilt.Post DBP]	Post-Tilt (supine) Diastolic BP	77.4
Tilt.Post HR Delta	[$Tilt.Post HR Delta]	Post-Tilt delta from Pre-Tilt HR	2.9
Tilt.Post SBP Delta	[$Tilt.Post SBP Delta]	Post-Tilt delta from Pre-Tilt SBP	-3.2
Tilt.Post DBP Delta	[$Tilt.Post DBP Delta]	Post-Tilt delta from Pre-Tilt DBP	-2.2
Tilt.Sample Type	[$Tilt.Sample Type]	Sample point measurement type	“Manual” or “Recorded”
Tilt.Sample Times	[$Tilt.Sample Times]	Times of sample points within tilt	1.0, 3.0, 5.0
Tilt.Sample HRs	[$Tilt.Sample HRs]	Sample point Heart Rates	66.3, 71.8, 69.9
Tilt.Sample SBPs	[$Tilt.Sample SBPs]	Sample point Systolic BPs	114.2, 108.8, 111.5
Tilt.Sample DBPs	[$Tilt.Sample DBPs]	Sample point Diastolic BPs	74.1, 69.8, 71.7
Tilt.HR Deltas	[$Tilt.HR Deltas]	Heart Rate deltas (from Pre-Tilt)	4.0, 9.5, 7.6
Tilt.SBP Deltas	[$Tilt.SBP Deltas]	Systolic BP deltas (from Pre-Tilt)	-6.8, -12.2, -9.5
Tilt.DBP Deltas	[$Tilt.DBP Deltas]	Diastolic BP deltas (from Pre-Tilt)	-5.5, -9.8, -7.9
Tilt.Min SBP	[$Tilt.Min SBP]	Minimum Systolic Bp during tilt	105.4
Tilt.Min SBP Delta	[$Tilt.Min SBP Delta]	Delta (from Pre-Tilt) to Min SBP	-15.6
Tilt.Min SBP Latency	[$Tilt.Min SBP Latency]	Latency (from tilt up) to Min SBP	2.4
Tilt.Min SBP HR	[$Tilt.Min SBP HR]	Heart rate at Min SBP point	72.2
Tilt.Min HR	[$Tilt.Min HR]	Minimum Heart Rate during tilt	61.3
Tilt.Max HR	[$Tilt.Max HR]	Maximum Heart Rate during tilt	74.1
Tilt.Min Max HR Delta	[$Tilt.Min Max HR Delta]	Max-Man Heart Rate delta	8.8
Tilt.Min HR Latency	[$Tilt.Min HR Latency]	Latency (from tilt up) to Min HR	0.3
Tilt.Max HR Latency	[$Tilt.Max HR Latency]	Latency (from tilt up) to Max HR	3.6
Blood Flow.Sites	[$Blood Flow.Sites]	Site names for BPM recordings	
Blood Flow.Starts	[$Blood Flow.Starts]	BPM analysis start times	
Blood Flow.Ends	[$Blood Flow.Ends]	BPM analysis end times	
Blood Flow.Lengths	[$Blood Flow.Lengths]	BPM analysis time durations	
Blood Flow.Flows	[$Blood Flow.Flows]	BPM analysis blood flow values	
Blood Flow.Volumes	[$Blood Flow.Volumes]	BPM analysis volume values	
Blood Flow.Velocities	[$Blood Flow.Velocities]	BPM analysis velocity values	
Blood Flow.Start Delta	[$Blood Flow.Start Delta]	Start time delta between sites	
Blood Flow.Length Delta	[$Blood Flow.Length Delta]	Time duration delta between sites	
Blood Flow.Flow Delta	[$Blood Flow.Flow Delta]	Blood flow delta between sites	
Blood Flow.Volume Delta	[$Blood Flow.Volume Delta]	Volume deltas between sites	
Blood Flow.Velocity Delta	[$Blood Flow.Velocity Delta]	Velocity delta between sites	
Marker.Time	[$Marker.Time]	Marker Time	Time: [mm:ss]
Marker.Annotation	[$Marker.Annotation]	Marker Annotation	Text
Marker.Time With Annotation	[$Marker.Time With Annotation]	Marker Time with Annotation	Annotation, Time:[mm:ss]
Adrenergic.Baseline	[$Adrenergic.Baseline]	Baseline	
Adrenergic.Max 2E	[$Adrenergic.Max 2E]	Max BP 2 Early	
Adrenergic.Min 2E	[$Adrenergic.Min 2E]	Min BP 2 Early	
Adrenergic.2E Delta	[$Adrenergic.2E Delta]	Delta 2 Early	
Adrenergic.Max 3	[$Adrenergic.Max 3]	Max Phase 3	

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Adernergic.Min 3	[$Adernergic.Min 3]	Min Phase 3	
Adrenergic.3 Delta	[$Adrenergic.3 Delta]	Delta Phase 3	
Adrenergic.3 Delta .75	[$Adrenergic.3 Delta .75]	.75 Delta Phase 3	
Adrenergic.PRT	[$Adrenergic.PRT]	PRT	
Adrenergic.Total Difference	[$Adrenergic.Total Difference]	Difference	
Adrenergic.Adrenergic Score	[$Adrenergic.Adrenergic Score]	Score	
Adrenergic.Total Points	[$Adrenergic.Total Points]		
N/A	[$#HR_R2R_Chart 480 240]	R-R Chart	
N/A	[$#HR_R2R_wAux_Chart 420 240]	R-R Chart with auxiliary pressure trace (chest expansion or valsalva)	
N/A	[$#SMD_BP_Chart 480 240]	Blood pressure Chart (SMD)	
N/A	[$#SMD_BP_wAux_Chart 240 240]	BP Chart with auxiliary pressure trace (chest expansion or valsalva)	
N/A	[$#MEAN_BP_Chart 480 240]	Mean BP Chart	
N/A	[$#MEAN_BP_wAux_Chart 480 240]	Mean BP Chart with auxiliary pressure trace (chest expansion or valsalva)	
N/A	[$#Art_BP_Chart 420 240]	Continuous Arterial BP Chart	
N/A	[$#Art_BP_wAux_Chart 420 240]	Continuous arterial BP Chart with auxiliary pressure trace (chest expansion or valsalva)	
N/A	[$#ECG_Chart 420 240]	Continuous ECG Chart	
N/A	[$#Linear _Chart 420 240]	Linear Regression Chart	
N/A	[$#Blood_Flow_Chart 340 240]	Blood flow (BPM) Chart	
QST (CASE) Data	**NOTE: Report fields are for sub-reports only**		
Export Field Name	**Report Field Name**	**Description**	**Example**
C4.Test Site	[$C4.Test Site]	Location of stimulation	Left Hand
C4.Test Duration	[$C4.Test Duration]	Test duration in time	5:44 (mm:ss)
C4.Algorithm	[$C4.Algorithm]	Algorithm used for analysis	
C4.Test Status	[$C4.Test Status]	Status of test	Passed
C4.Max. Stimulation	[$C4.Max. Stimulation]	Max stimulation allowed by test	9.0 ⁻C for 10.0s
C4.Baseline Temp	[$C4.Baseline Temp]	Baseline Starting Temperature.	30.0 ⁻C
C4.Ramp Rate	[$C4.Ramp Rate]	Rate of Δ in degrees per. Second.	4.0 ⁻C
C4.Estimated Threshold	[$C4.Estimated Threshold]	Threshold estimated by technician	8 ⁻2 JND
C4.Displacement	[$C4.Displacement]	Displacement at computed threshold (um or ⁻C)	-0.511 ⁻C
C4.HP Threshold 0.5	[$C4.HP Threshold 0.5]	HEAT_PAIN_TEST	21.3 JND
C4.HP Threshold 5.0	[$C4.HP Threshold 5.0]	HEAT_PAIN_TEST	23.3 JND
C4.HP Threshold 5.0-0.5	[$C4.HP Threshold 5.0-0.5]	HEAT_PAIN_TEST	2.0 JND
C4.HP Displacement 0.5	[$C4.HP Displacement 0.5]	HEAT_PAIN_TEST	+21.28 ⁻C for 0.4s
C4.HP Displacement 5.0	[$C4.HP Displacement 5.0]	HEAT_PAIN_TEST	+23.32 ⁻C for 6.6s
C4.HP Quadratic	[$C4.HP Quadratic]	HEAT_PAIN_TEST	f(x) = +0.25x⁄ -8.95x +77.75
C4.Num Practice	[$C4.Num Practice]	Number of Practice Stimulations	5
C4.Practice Levels	[$C4.Practice Levels]	Values of Practice	13,9,5,7,8
C4.Practice Responses	[$C4.Practice Responses]	Response of Practice	Y,Y,N,N,Y
C4.Num Trials	[$C4.Num Trials]	Number of Stimulations	20
C4.Trial Levels	[$C4.Trial Levels]	Stimulation levels	13,0,13,0,9,5,7,9,11,10,9,0,8,0,9,8,7,0,8,9
C4.Trial Responses	[$C4.Trial Responses]	Stimulation Responses	Y,N,Y,N,Y,N,N,N,Y,Y,Y,N,N,N,Y,Y,N,N,N,Y
C4.Num Turns	[$C4.Num Turns]	Number of Turns	6
C4.Turn Levels	[$C4.Turn Levels]	Turn Level	5,11,8,9,7,9
C4.Turn Responses	[$C4.Turn Responses]	Responses	<13>Y <0>N <13>Y <0>N <9>Y <5>N,<7>N <9>N <11>Y,<10>Y <9>Y <0>N <8>N,<0>N <9>Y,<8>Y <7>N,<0>N <8>N <9>Y
N/A	[$#Step_Chart 380 260]	Stimulus/response step chart	
N/A	[$#Step_Chart_wPractice 380 260]	Stimulus/response step chart with practice trials included	

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N/A	[$#Expanded_Chart 380 260]	Stimulus/response step chart with individual FC stimulations displayed	
N/A	[$#Expanded_Chart_wPractice 380 260]	Stimulus/response step chart with individual FC stimulations and practice trials displayed	
N/A	[$#HP_Chart 300 200]	Heat-Pain test chart	
N/A	[$#Practice_Chart 380 260]	Practice stimulation chart	
C5.Test Site	[$C5.Test Site]	Location of stimulation	Left Hand
C5.Test Duration	[$C5.Test Duration]	Test duration in time	5:44 (mm:ss)
C5.Algorithm	[$C5.Algorithm]	Algorithm used for analysis	
C5.Step Table	[$C5.Step Table]	Table used	
C5.Test Status	[$C5.Test Status]	Status of the test	Passed
C5.Explanation	[$C5.Explanation]	Explanation	
C5.Baseline Temp	[$C5.Baseline Temp]	Baseline starting temperature	30.0 C
C5.Ramp Rate	[$C5.Ramp Rate]	Rate of Δ in degrees per. Second.	4.0 c
C5.Frequency	[$C5.Frequency]	Frequency in Hz	120Hz
C5.Time Constant	[$C5.Time Constant]	Time constant	
C5.Estimated Threshold	[$C5.Estimated Threshold]	Threshold estimated by Technician	8.7
C5.Displacement	[$C5.Displacement]	Displacement at computed threshold (um or C)	-0.511 C
C5.HP Threshold 0.5	[$C5.HP Threshold 0.5]	HEAT PAIN TEST	21.3 JND
C5.HP Threshold 5.0	[$C5.HP Threshold 5.0]	HEAT PAIN TEST	23.3 JND
C5.HP Threshold 5.0-0.5	[$C5.HP Threshold 5.0-0.5]	HEAT PAIN TEST	2.0 JND
C5.HP Displacement 0.5	[$C5.HP Displacement 0.5]	HEAT PAIN TEST	+21.28 ⁻C for 0.4s
C5.HP Displacement 5.0	[$C5.HP Displacement 5.0]	HEAT PAIN TEST	+23.32 ⁻C for 6.6s
C5.HP Percentile 0.5	[$C5.HP Percentile 0.5]	HEAT PAIN TEST	
C5.HP Percentile 5.0	[$C5.HP Percentile 5.0]	HEAT PAIN TEST	
C5.HP Percentile 5.0-0.5	[$C5.HP Percentile 5.0-0.5]	HEAT PAIN TEST	
C5.HP Deviate 0.5	[$C5.HP Deviate 0.5]	HEAT PAIN TEST	
C5.HP Deviate 5.0	[$C5.HP Deviate 5.0]	HEAT PAIN TEST	
C5.HP Deviate 5.0-0.5	[$C5.HP Deviate 5.0-0.5]	HEAT PAIN TEST	
C5.HP Table Name 0.5	[$C5.HP Table Name 0.5]	HEAT PAIN TEST	
C5.HP Table Name 5.0	[$C5.HP Table Name 5.0]	HEAT PAIN TEST	
C5.HP Table Name 5.0-0.5	[$C5.HP Table Name 5.0-0.5]	HEAT PAIN TEST	
C5.HP Quadratic	[$C5.HP Quadratic]	HEAT PAIN TEST	f(x) = +0.25x⁄ -8.95x +77.75
C5.Num Practice	[$C5.Num Practice]	Number of Practice Stimulations	5
C5.Practice Levels	[$C5.Practice Levels]	Values of Practice	13,9,5,7,8
C5.Practice Responses	[$C5.Practice Responses]	Response of Practice	Y,Y,N,N,Y
C5.Num Trials	[$C5.Num Trials]	Number of Stimulations	20
C5.Trial Levels	[$C5.Trial Levels]	Stimulation levels	13,0,13,0,9,5,7,9,11,10,9,0,8,0,9,8,7,0,8,9
C5.Trial Responses	[$C5.Trial Responses]	Stimulation Responses	Y,N,Y,N,Y,N,N,N,Y,Y,Y,N,N,N,Y,Y,N,N,N,Y
C5.Num Turns	[$C5.Num Turns]	Number of Turns	6
C5.Turn Levels	[$C5.Turn Levels]	Turn Level	5,11,8,9,7,9
C5.Turn Responses	[$C5.Turn Responses]	Responses	<13>Y <0>N <13>Y <0>N <9>Y <5>N,<7>N <9>N <11>Y,<10>Y <9>Y <0>N <8>N,<0>N <9>Y,<8>Y <7>N,<0>N <8>N <9>Y
C5.Starting Step	[$C5.Starting Step]	Starting Step	
C5.HP Normal Range 0.5	[$C5.HP Normal Range 0.5]	Normal Range	
C5.HP Normal Range 5.0	[$C5.HP Normal Range 5.0]	Normal Range	
C5.HP Normal Range 5.0-0-5	[$C5.HP Normal Range 5.0-0-5]	Normal Range	
QST (Manual) Data	**NOTE: Report fields are for sub-reports only**		
Export Field Name	**Report Field Name**	**Description**	**Example**
QST.Test Site	[$QST.Test Site]	Location of stimulation.	Left Dorsal Hand (Fingers)
QST.Test Duration	[$QST.Test Duration]	Test duration time.	2:03 (mm:ss)
QST.Algorithm	[$QST.Algorithm]	Algorithm used:	Two-alternative forced-choice technique (Dyck PJ, et al, to be published)
QST.Test Status	[$QST.Test Status]	Status of test.	Passed

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QST.Test Magnitude	[$QST.Test Magnitude]	Gram magnitude of computed threshold (Monofilament Test)	1.65 g
QST.Num Levels	[$QST.Num Levels]	Number of levels tested	3
QST.Stimulus Levels	[$QST.Stimulus Levels]	List of tested levels	C,D,E
QST.Correct Responses	[$QST.Correct Responses]	List of correct responses to levels	<= 6,<= 6,>= 9
QST.MOL Num Trials	[$QST.MOL Num Trials]	Method of Limits trials	2
QST.MOL Stimulus Levels	[$QST.MOL Stimulus Levels]	Method of Limits levels	Pair 3,Pair 1
QST.MOL Stimulus Counts	[$QST.MOL Stimulus Counts]	Method of Limits stimulus counts	3,4
QST.MOL Correct Counts	[$QST.MOL Correct Counts]	Method of Limits correct response counts	3,3
QST.MOL Correct Ratios	[$QST.MOL Correct Ratios]	Method of Limits correct ratios	3/3,3/4
N/A	[$#Step_Chart 380 260]	Stimulus / response step chart	
N/A	[$#Expanded_Chart 380 260]	Stimulus / response step chart with individual trials displayed	
QST.TP Threshold 0.5	[$QST.TP Threshold 0.5]	Touch Pain Threshold	
QST.TP Threshold 5.0	[$QST.TP Threshold 5.0]	Touch Pain Threshold	
QST.TP Threshold 5.0-0.5	[$QST.TP Threshold 5.0-0.5]	Touch Pain Threshold	
QST.TP Quadratic	[$QST.TP Quadratic]	Quadratic Used	
QST.TP Stim Levels	[$QST.TP Stim Levels]	Stimulation Levels	
QST.TP Response Levels	[$QST.TP Response Levels]	Response Levels	
QSweat Data	**NOTE: Report fields are for sub-reports only**		
Export Field Name	**Report Field Name**	**Description**	**Example**
Q-Sweat.Num Capsules	[$Q-Sweat.Num Capsules]	Number of Capsules used in recording.	4
Q-Sweat.Capsule Sites	[$Q-Sweat.Capsule Sites]	Location of test sites.	R. Forearm,Prox Leg,Dist Leg,Foot
Q-Sweat.Total Volumes	[$Q-Sweat.Total Volumes]	Totalized volumes from sites	1.138,2.619,2.238,0.698
Q-Sweat.Total Times	[$Q-Sweat.Total Times]	Totalized times for sites	10:00,10:00,10:00,10:00
Q-Sweat.Latencies	[$Q-Sweat.Latencies]	Latency times for sites	0:42,0:08,0:50,0:58
Q-Sweat.Baselines	[$Q-Sweat.Baselines]	Baseline sweat rates for sites	61,70,39,18
Q-Sweat.Ending Offsets	[$Q-Sweat.Ending Offsets]	Ending offset (from baseline) for sites	27,8,57,11
Q-Sweat.Site Logs	[$Q-Sweat.Site Logs]	Test logs for sites	
Q-Sweat.Rate Units Repeated	[$Q-Sweat.Rate Units Repeated]	Units used for sweat rate for sites	nL/min/cm²,nL/min/cm²,nL/min/cm²,nL/min/cm²
Q-Sweat.Volume Units Repeated	[$Q-Sweat.Volume Units Repeated]	Units used for sweat totals for sites	µL/cm²,µL/cm²,µL/cm²,µL/cm²
Q-Sweat.Rate Units	[$Q-Sweat.Rate Units]	Units used for sweat rate	nL/min/cm²
Q-Sweat.Volume Units	[$Q-Sweat.Volume Units]	Units used for sweat total	µL/cm²
Q-Sweat.Device Log	[$Q-Sweat.Device Log]	Test log for device	
Q-Sweat.Capsule Size	[$Q-Sweat.Capsule Size]	Capsule size used in test	0.787
Q-Sweat.Analyzed Only	[$Q-Sweat.Analyzed Only]	Flag to establish subsequent export of only analyzed channels (applies to repeated fields only)	
Q-Sweat.Absolute Volumes	[$Q-Sweat.Absolute Volumes]	Sweat volumes for sites (in absolute uL)	0.896,2.061,1.761,0.549
Q-Sweat.Standard Volumes	[$Q-Sweat.Standard Volumes]	Sweat volumes for sites (in standardized units /cm²)	1.138,2.619,2.238,0.698
Q-Sweat.Absolute Baselines	[$Q-Sweat.Absolute Baselines]	Baseline sweat rates for sites (in absolute uL)	48,55,31,14
Q-Sweat.Standard Baselines	[$Q-Sweat.Standard Baselines]	Baseline sweat rates for sites (in standardized units /cm²)	61,70,39,18
Q-Sweat.Absolute End Offsets	[$Q-Sweat.Absolute End Offsets]	End offset rates for sited (in absolute uL)	21,6,45,9
Q-Sweat.Standard End Offsets	[$Q-Sweat.Standard End Offsets]	End offset rates for sited (in standardized units /cm²)	27,8,57,11
N/A	[$#QSweat_Response_Chart 420 240]	Q-Sweat response chart	

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N/A	[$#QSweat_Resting_Chart 420 240]	Q-Sweat resting chart	
Marker.Time	[$Marker.Time]	Marker Time	Time [mm:ss]
Marker.Annotation	[$Marker.Annotation]	Marker Annotation	Text
Marker.Time With Annotation	[$Marker.Time With Annotation]	Marker Time and Annotation	Text & Time [mm:ss]
SMT Data	**NOTE: Report fields are for sub-reports only**		
Export Field Name	**Report Field Name**	**Description**	**Example**
Sniff.Test Duration	[$Sniff.Test Duration]	Duration of testing	3:06 (mm:ss)
Sniff.Test Status	[$Sniff.Test Status]	Test status	Passed
Sniff.Explanation	[$Sniff.Explanation]		
Sniff.Trace Patterns	[$Sniff.Trace Patterns]	Description of trace patterns used in chart	Medium Solid,Light Dots,Light Dashes,Light Dash-Dots
Sniff.Num Canisters	[$Sniff.Num Canisters]	Number of canisters used in test	4
Sniff.Canister IDs	[$Sniff.Canister IDs]	Canister IDs used in test	1,2,3,4
Sniff.Canister Smells	[$Sniff.Canister Smells]	Name of smells in canisters used in test	Null,Isoamyl acetate,Methyl thiobutyrate,Ethyl 3-mercaptoproprionate
Sniff.Trials	[$Sniff.Trials]	Number of trials performed for each canister used in test	10,3,3,3
Sniff.Trials Averaged	[$Sniff.Trials Averaged]	Number of trials averaged for each canister used in test	10,3,3,3
Sniff.Average Areas	[$Sniff.Average Areas]	Average area under curve fpr each canister used in test	54.3, 52.0, 43.0, 40.7
Sniff.Magnitude Ratios	[$Sniff.Magnitude Ratios]	SMR for each canister used in test	1.00,0.96,0.79,0.75
Sniff.Odors Only	[$Sniff.Odors Only]	Flag Field to exclude null	
Sniff.Trigger gain	[$Sniff.Trigger Gain]	Gain level used in test	
Sniff.Trigger Level	[$Sniff.Trigger Level]	Trigger level used in test	
N/A	[$#Summary_Chart 380 260]	Sniff chart of all averages	
N/A	[$#Canister_Chart 380 260]	Sniff chart for each canister used in test	

RAW DATA

Field Name	Description
	Cardiac Recording
Analog x	Analog data time-base
ECG y	Analog ECG (mV with a +125mv offset)
Arterial y	Analog arterial Waveform (mmHg)
Chest Exp. y	Chest expansion Waveform
Exp. Pressure y	Expiratory Pressure (mmHg)
BP x	Beat to beat blood pressure time-base
Systolic BP	Systolic blood pressure (mmHg)
Mean BP	Mean blood pressure (mmHg)
Diastolic BP	Diastolic blood pressure (mmHg)
HR x	Heart rate data time-base
HR y	Heart rate (BPM)
R-R x	R-R interval time-base
R-R y	R-R interval (milliseconds)
	QSweat Recording
Time	Time
R. Forearm (From Recording Site)	Value at Time in NanoLiters per Minute
Prox Leg (From Recording Site)	Value at Time in NanoLiters per Minute
Dist Leg (From Recording Site)	Value at Time in NanoLiters per Minute
Foot (From Recording Site)	Value at Time in NanoLiters per Minute
	SMT (Sniff MagnitudeTest) Recording
Time	0 to 2.54 Seconds (255 Values)
Canister # (repeated for each trial)	Value is percent of range (0-100)

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