Medtronic

LEADPOINT™
Clinical and Technical
Reference Manual

CE
0543

At the time of printing / transfer to the CD-ROM, this manual correctly described the device and its functions. However, as modifications may have been carried out since the production of this manual, the system package may contain one or more addenda to the manual. This manual including any such addenda must be thoroughly read, before using the device.

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Table of Contents

Using the Program

Introduction

The Leadpoint™ software is a surgical monitoring software. The determination of the target localization is performed by way of microelectrode recording.

With the Leadpoint™ software, you can record, display and analyze the signals from the microelectrodes advanced into the brain as they produce an electrical signal. The recorded signals are available as sound and as curves on the screen. This provides information that guides the surgeon in determining the most optimal location.

The Leadpoint™ software system provides the following functions: amplification, filtering, visual display and audio monitoring of the microelectronic signal, peripheral stimulation, impedance testing, recording analysis and saving of data.

The screen layout is user-definable and can be customized to suit your requirements, for example to display information at certain times during surgery. The user-configurable analysis of the signal is for optional use.

WARNING This program is not intended for the monitoring of the general state of a patient during surgery.

WARNING Backed by knowledge of technique and medicine, the responsibility rests with the physician to make the correct interpretations. In order to avoid a patient being predisposed to any risks, the physician monitoring the test should consider and be able to recognize any non-neurological changes.

How this Chapter Is Organized

This chapter provides a quick overview of the daily use operations of the Leadpoint™ Software. Accompanied by frequent examples and illustrations, you will be guided through a strategic selection of features intended to facilitate the use of the Leadpoint™ software.

The first part of this chapter, *Using the Program* shows you how to operate the Leadpoint™ software uncovering the central features - the various windows and the buttons you are likely to use the most often.

The second part of this chapter covers *Advanced Features* of the Leadpoint™ software as for instance *Analyzing the Signals* and *Converting the Data.*

The third part of this chapter includes a number of *Additional Features* such as the *Markers* and the *Trend Plot Window*.

The fourth part of this chapter contains a *Tutorial*. The point of departure is four types of setups: two simple setups, one for stimulation and one setup on an advanced level. All setups include thorough guidance providing hands-on examples to walk you through the steps of how to operate the Leadpoint™ software.
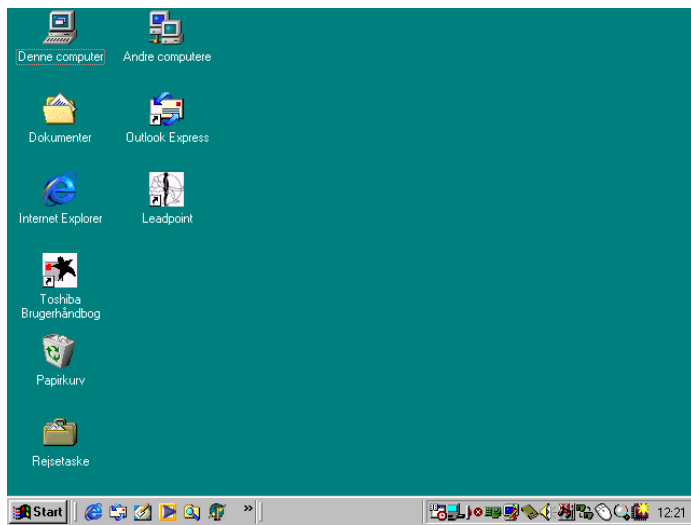
Starting the Leadpoint™

Figure 1 The Windows'® Desktop.

- Turn the power switch on.
- Turn the computer on.
- Before you begin, please close all other programs currently running on your computer.
- Double-click the Leadpoint™ icon on your Windows desktop. The program will perform a swift self-test before displaying the Start Page, see below.
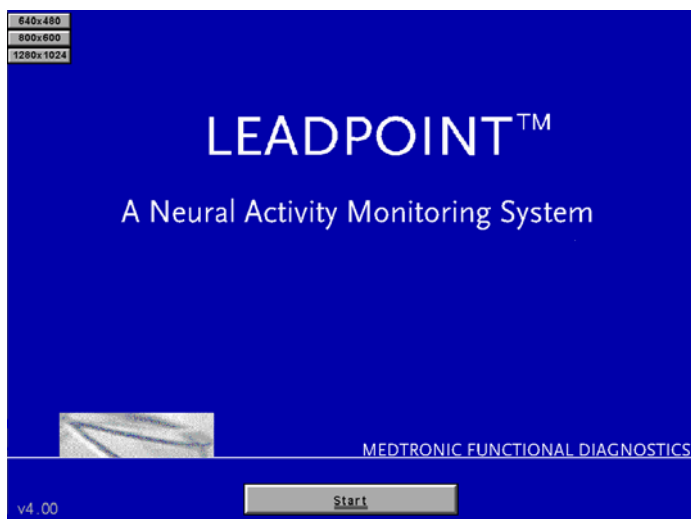
Figure 2 The Start Page of Leadpoint™

Patient Data Window

- Click [Start] on the Start Page, and the *Patient Data Window* appears, see fig. Figure 3 The Patient Data Window

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NOTE The Patient Data Window automatically turns off after one minute for security reasons.
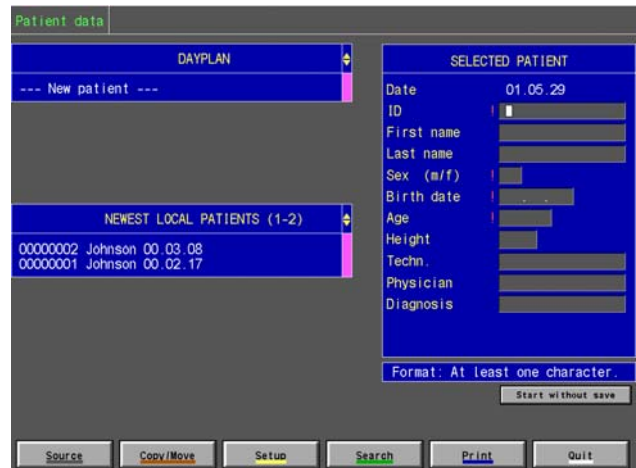
Figure 3 The Patient Data Window

The *Patient Data Window* includes 3 text boxes: the Dayplan, the Selected Patient, and the Newest Local Patients, and 7 buttons: see figure 3 above. For further details on the Patient Data Window, please see the section on Handling Patient Data on page 54.

The Dayplan Box
Provided that a patient booking system is connected, the Dayplan box will list the patients scheduled for the day. Selecting a patient from this box will move the patient data to the Selected Patient box.

The Selected Patient Box
In which you enter the patient data. If you fill in patient data, all the boxes marked with an "!" have to be filled in at a minimum, otherwise the program cannot proceed, see figure 3 above.

When the Patient data has been entered, a [OK] button appears in the lower right of the Selected Patient box, see Figure 4

■ Click [OK] to proceed to the Select Test Menu, see the section on Selecting a Test below.

The Newest Local Patients Box

■ When patient data already exists in the system, you can begin a new investigation by selecting and, by way of the mouse, clicking on the patient in question.

■ Use the vertical scroll bar to the right, to scroll through the listed patients. The scroll box moves in up- and downward directions, see Figure 4

■ Then click [OK], or [New invest.] to proceed to select a test, see Figure 4

TIP Clicking the double arrow in the upper-right corner of the Dayplan box and the Newest Local Patients box, invokes a simple search box.
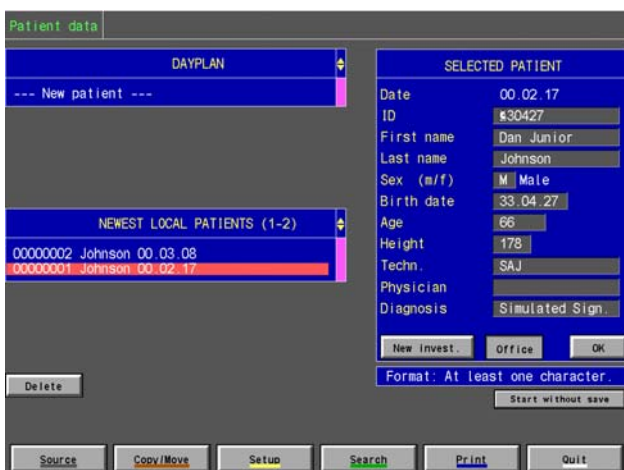
Figure 4 New Invest and OK Buttons. Vertical Scroll Bar.

TIP The format of the date (yy.mm.dd) in the Selected Patient box may be selected in the Set-up Menu by clicking the local button.

TIP You can move between the text boxes by using ↑, ↓, ↵, [TAB], [Shift TAB], or by way of using basic mouse actions.

■ By moving the mouse, you can move the pointer to the wanted text box:

■ Then click in the text box. The blinking pointer indicates that data can be entered.

■ Complete the data entry by pressing ENTER ↵ on the keyboard.

Start without Save

■ You can commence an investigation without entering any patient data by clicking [Start without save]. However, when you return to the Patient Data window, this data will not be saved.

For further information on the buttons: [Source], [Copy/Move] [Setup], [Search], [Print], [Quit] and [Delete], please see the section on Patient Data Window Buttons on page 56.

Selecting a Test

After having entered the patient data, or selected a patient who has previously undergone an investigation, you may select a test in the Select Test menu, see Figure 1 The Windows'® Desktop.

Leadpoint™ comprises up to 40 different tests. Tests, which have enabled at least one modality have a selectable button situated next to the name of the test, see Figure 5
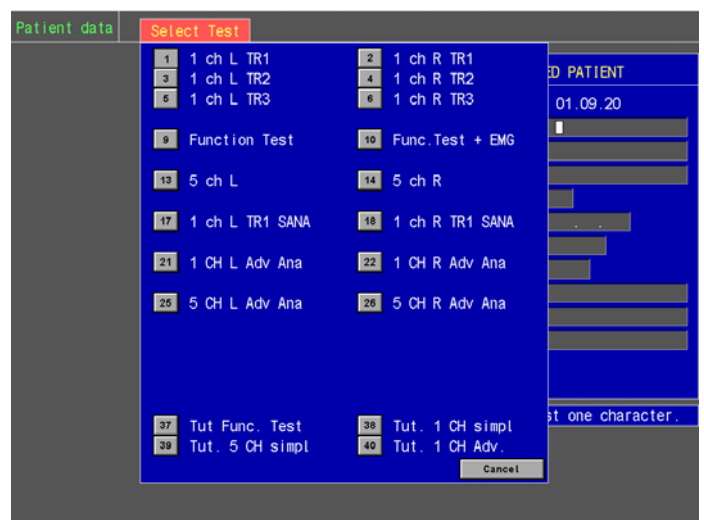
Figure 5 Selectable buttons (1-6) in the Select Test Menu.

■ To select the wanted test, click one of the selectable buttons in the Select Test Menu, and the test with the related information and windows opens.

■ Click [Patient] to return to the Patient Data Window, see Figure 6

Window Overview

The screen layout is user-definable, and can be customized to suit your requirements.

In the example below, the window setup consists of six windows:

- The Trace Window (see page 11)
- The Raster Window (see page 15)
- The Notes Window (see page 16)
- The Log Window (see page 18)
- The Result Window (see page 26)
- The Overview Window (see page 27)

The Lower Buttons are displayed in the bottom of the screen:

- The Modality Button (see page 20)
- The Function Buttons (see page 21)
- The Shortcuts to other Tests (see page 21)
- The Show/hide Buttons (see page 22)
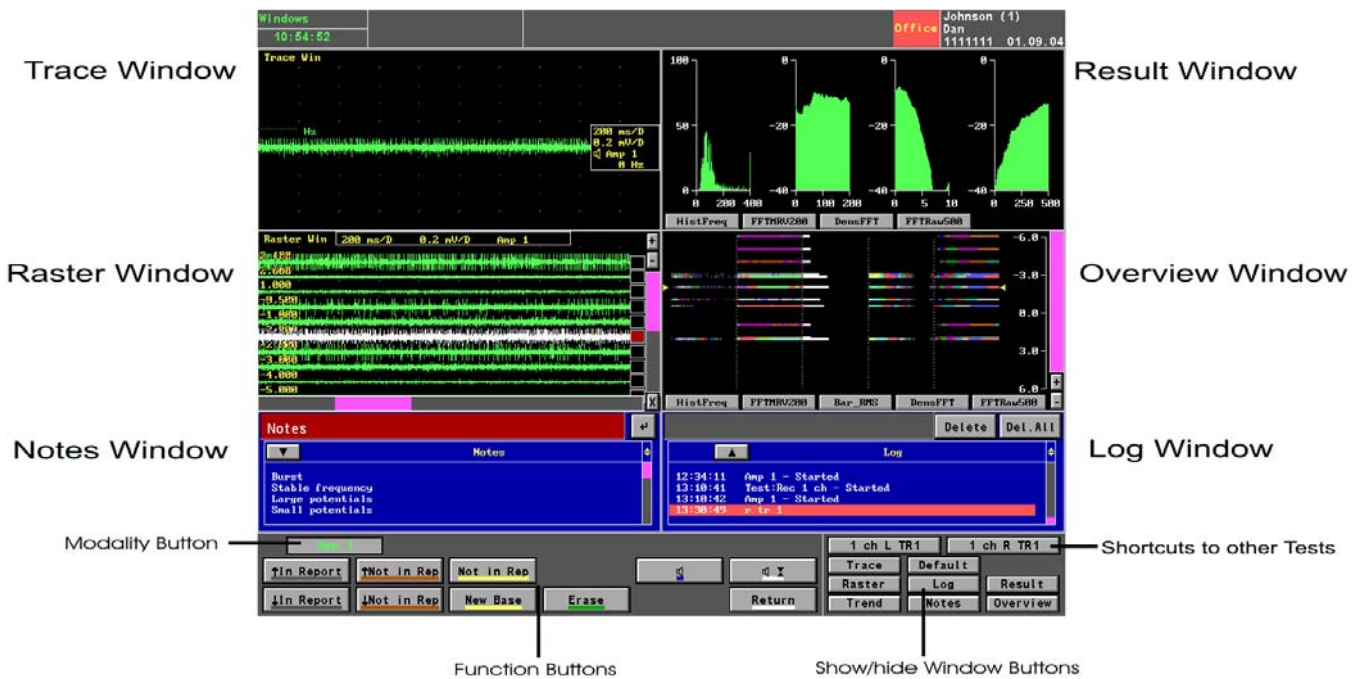
The Trace Window
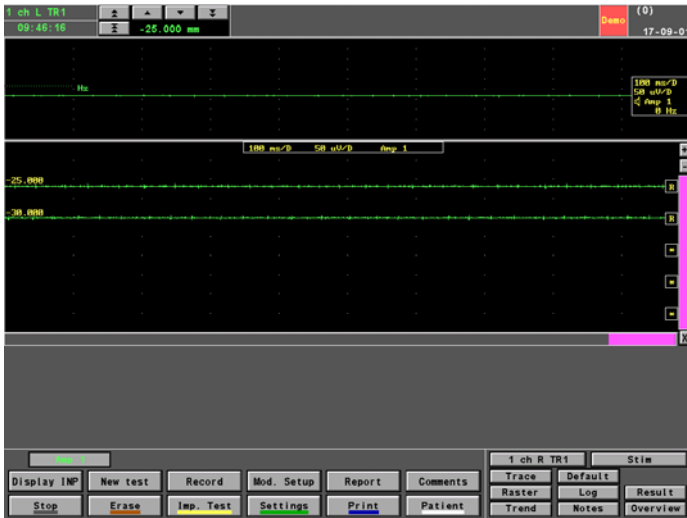
Figure 6 The topmost part of the screen: the Trace Window

The **Trace Window** provides you with an on-line view of the microelectrode recording findings. It depicts the recorded signals from one or several channels (max. 8 channels). For free running modalities, the input signal is continuously being updated. Stimulated modalities may consist of an input trace, an averaged trace and a baseline trace. Only the input, or the average trace can be displayed at the same time with the baseline trace, see. The baseline curve, or the previous curve can be displayed on the top of each trace, (see the section on Modality Buttons on page 20.).

The Information Box
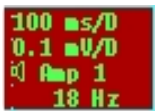
An information box is attached to the right of each trace, (see Figure 7). Information displayed here can for instance be the neuronal firing frequencies (spikes/second) of neurons encountered in trajectories traversing the areas in the brain. Furthermore, parameters such as sweep speed, sensitivity, name of montage, frequency, speaker and clip sound can be displayed for free running modalities; see the section on Trace Window Function Buttons available for free running trace on page 12.

For stimulated modalities, the number of averaged and rejected traces can be displayed, too. See

Selecting a Trace

The information Box can also be used for selecting a single trace.

■ *Selecting a Single Trace*

Select the trace by clicking on the Information Box, or by activating the Move/Position button in up- or downward directions, see **The Dedicated Keyboard** on page 12.

■ *Selecting a Trace when Multiple Traces are Present*

If multiple traces are present in the Trace Window, you may select another trace by the up/down arrows on the move/position button on the dedicated keyboard, see Figure 8 below.

Selecting a trace will change the functions of the lower buttons on the screen, and thus provide some options for changing the trace parameters; see Figure 7 below, and see the section on Trace Window buttons available for free running traces below.
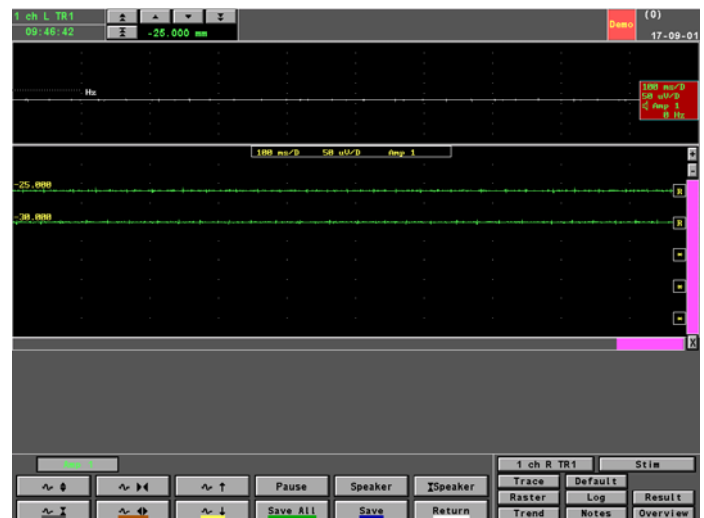
Figure 7 Information Box and Parameter Buttons

■ To change the sensitivity use the up/down arrows of the sweep speed/sensitivity buttons on de dedicated keyboard see Figure 8, or use the up, or down buttons on the PC keyboard.
■ The Trace Window buttons may be used to change the sweep speed, use the key combinations on the PC keyboard: <ctrl←>, or <ctrl→>; or use the left/right arrows of the sweep speed/sensitivity buttons on de dedicated key-

board see Figure 8 and the Trace Window Function Buttons below.

NOTE When changing the sweep speed, or the sensitivity, both Trace Window and Raster Window traces will be affected.

Information Box Values

The values to be displayed in the information box can be set in the Advanced IOM Modality Setup Menu, see the section:

The Dedicated Keyboard
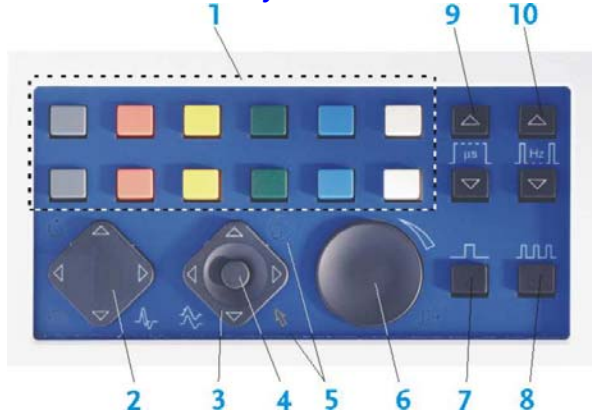
Figure 8 Dedicated Keyboard

1	Function Keys	*2*	Sweep Speed / Sensitivity
3	Move/Position	*4*	Wheel Mode Button
5	Mode indicators	*6*	Intensity Wheel
7	Single Stimulus	*8*	Repetitive Stimulation
9	Stimulus Duration	*10*	Repetition Rate

Function Keys (1)

The colored function keys on the dedicated keyboard correspond to the 12 function button on the screen. Information on the Function Buttons, see page 21.

Sweep Speed/ Sensitivity (2)

Sweep Speed	▷ *Right*	*Increases the Sweep Speed.*
	◁ *Left*	*Decreases the Sweep Speed.*

Sensitivity	△ *Up*	*Increases the Sensitivity*
	▽ *Down*	*Decreases the Sensitivity*

Move/Position Button (3)

▽△ *Up/down arrows. Select trace in the Trace Window*

Wheel Mode Button (4)

Toggles between ↰ *Intensity Mode and* ↺ *Cursor Mode. When set to Cursor Mode, the selected Trace Window is set to Triggered Mode, too. If the test includes a stimulated modality, the mode returns to Intensity Mode immediately.*

Intensity Wheel (6)

The wheel controls the stimulus intensity or simulates cursor movements without using the mouse. If it is in cursor mode, the trigger/clipping level may be adjusted.

↰↺ Mode Indicators (5)

The Wheel mode status is indicated by light diodes.

NOTE *The dedicated keyboard may have a slightly different layout for you equipment. In this case, please consult your User Guide.*

Trace Window Function Buttons

The following function buttons are available for *the selected free running trace*:

[～ ↕]	***Gain up*** Enlarge the sensitivity.
[～ ⌶]	***Gain down*** Shrink the sensitivity.
[～ ▶◀]	***Sweep speed down*** Decrease time.
[～ ◀▶]	***Sweep speed up*** Increase time.
[～ ↑]	***Move trace up*** Screen position only, DC level is not changed.
[～ ↓]	***Move trace down*** Screen position only, DC level is not changed.
[Pause]	***Pause*** or ***Resume*** Hold or re-run the trace. If "Input"

(see *Display INP/AVG* buttons in the section on Function Buttons on page 21) is active; the capture is updated at each stimulation, but no averaging is performed for EP modalities and no saving is made for stimulated EMG modalities.

Save | Save | the current trace for display in raster window.

| Save All | **Save All** traces

| Speaker | **Speaker** Turn the sound off or on. Further information, see page 20.

| ☓Speaker | **Clip Sound** Play certain parts of the trace.

Some additional trace buttons exist for *the stimulated modalities*:

| Erase | **Erase** Remove the trace.

| Free Run | **Free Run** Make the trace a free running trace temporarily. For EP modalities, the input sensitivity is used in this mode. No averaging or saving for raster is made in this mode.

| Trigged | **Trig** Return from free run to stimulated trace.

| New Base | **New Base** Make the selected trace the baseline.

Sound Features
Turning the Sound off or on

Click the on information box to the right of the trace in the Trace Window, and subsequently the appearances of the lower buttons change, providing additional functions. Among these you will discover a Speaker button: | Speaker | see
Figure 9 below.

■ Click | Speaker |, and a small speaker icon 🔊 will appear in the information trace box indicating that the sound is turned on. An absent speaker icon indicates that the sound is turned off.

■ To turn the sound off, click the | Speaker | button.

For setting the default state for the speaker, Please see Setup Program – Preferred Settings on page 69 in the section on the *Speaker*.

The Clip Sound Feature

Turning on the *Clip Sound* by clicking | ☓Speaker |, potential background noise may be filtered, and only parts of the signals around peaks higher than the frequency triggering line will be played.

■ By clicking the information box in the Trace Window thus providing further parameter buttons at the bottom of the screen, you will find the Clip Sound among these buttons, see Figure 8 below.

■ Click | ☓Speaker |, and notice that the speaker icon in the information trace box changes into a Clip icon 🔇. The status of clip sound is also shown with the trigger level marker. Click again to turn it off. See also Clip Sound Level on page 14.
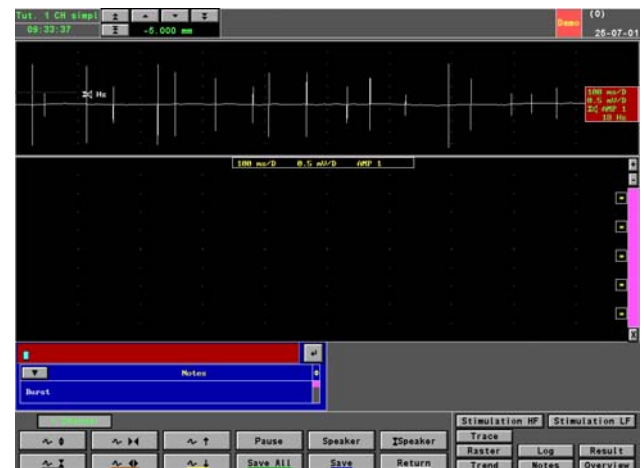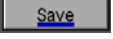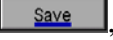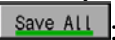
Figure 9 Clip Sound and Speaker and Buttons.

Saving the Current Trace

To save the current trace for display in the Raster Window, follow these steps:

■ Click the information box, and notice that the Function Buttons change. Among these you will find the | Save | button.

■ Click | Save |, and the current trace in the Trace Window will now be displayed in the Raster Window. For further information, see the section on The Raster Window on page 15.

■ If more than one channel is present they may all be saved by clicking | Save All |; and the traces in

the Trace Window are now displayed in the Raster Window.

■ To retrieve the previous Function Buttons, click `Return`.
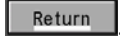
■ To return to the Data Patient Window from the Trace Window, click `Patient`.

The Function of the Trigger

Figure 10 Frequency Triggering and Trigger Mode.

Activating the Trigger Function
Frequency Triggering Marker (Hz)

■ By way of clicking on the first half of the dotted line, and while dragging the mouse up, or down at the same time, the *Frequency Triggering Marker (Hz)* can be placed in the wanted position. It moves in up- and downward directions, and it sets the level for measuring the frequency. The frequency is shown in the information trace box to the right of the trace in the Trace Window.

Trigger Mode

■ The *Trigger Mode* can be activated by way of the mouse in the Trace Window: by clicking on the second half of the dotted line, while at the same time dragging in the mouse from the left side of the window frame. It may also be activated by way of pushing the Wheel Mode button, see Figure 8.

The Trigger Mode shows, when the level is higher than the pre-set, and it is indicated by a

small horizontal marker. Only peaks, which are above the (pre-set) level of the marker will be measured and displayed.

Deactivating the Trigger Mode

■ Deactivate the Trigger Mode by way of using the mouse, dragging the horizontal marker out the window. You may also deactivate the Trigger Mode by pushing the Wheel Mode button, see Figure 8.

NOTE Two values for the sweep speed are maintained by the system: one for free running, which is typically slow as for instance 100 ms per division; and one for the triggered mode, which is typically fast as for instance 0.5 ms per division. The appropriate sweep speed is automatically selected when switching from one mode to the other.

Using the Dedicated Keyboard to Set the Level

The level can also be set by using the Intensity Wheel on the dedicated keyboard, see Figure 8.

Clip Sound Level

When the Clip Sound is active, only parts of the signal around "high peaks" will be played. The definition of "high peaks" is that they are larger than the trigger level. For description of how to see and set the state for the Clip Sound, see page 13

■ Turning on the Clip Sound by clicking `Speaker`, potential background noise will be filtered, and only peaks above the frequency triggering line will be played. For further information, please see the section on The Clip Sound Feature on page 13.

The Raster Window

Figure 11 The centermost part of the screen: the Raster Window

When you save a signal in the Trace Window, it will automatically be transferred to the **Raster Window**; (see Saving the Current Trace on page 13). The Raster Window provides an outline of the curve shapes for one channel.

Number of Rasters

One to 20 rasters may be displayed simultaneously, the latest of these topmost. If one of these rasters is the baseline curve, it will be highlighted. (No base-line curve exists for the free running channels).

■ By clicking ⊞, the plus icon, or the minus icon, you may alter the number of rasters to be dis-played in the Raster Window at any time during acquisition in the range 1- 20.

■ By clicking the plus icon, you add a raster to the Raster Window.

■ By clicking the minus icon, you deduct a raster from the Raster Window.

Alternatively, the number of raster curves may be preset in the Preferred Adv. IOM Settings Menu, see Setup Program – Preferred Settings on page 69 in the section on Raster.

The Scrolling Control

The horizontal scrolling control on the window frame provides a **scroll box,** which enables you to view a particular period of the time recording, see Figure 11 above.

■ To enable the scroll bar, click the ⊠ button at the lower-right part of the Raster Window, see Figure 12 below. The scroll box moves along the scroll bar, and indicates the time frame (sec-onds) you have chosen to see.

Report Contents

Each trace is provided with a small box that is situated to the right of the trace see Figure 11. If the trace is to be included in the report, it will be marked with an 🅁. If marked with a ✳, the trace will not be in the report.

Note Display

If an edited note is attached to the trace, it will be displayed just above the trace in the Raster Window, provided that it has been selected in the in the Adv. IOM Modality Setup, (How to find this setup, see page 60). See Figure 12 below in which "stable frequency edited" is shown just above the trace. Information on Selecting Predefined Notes see page 18.
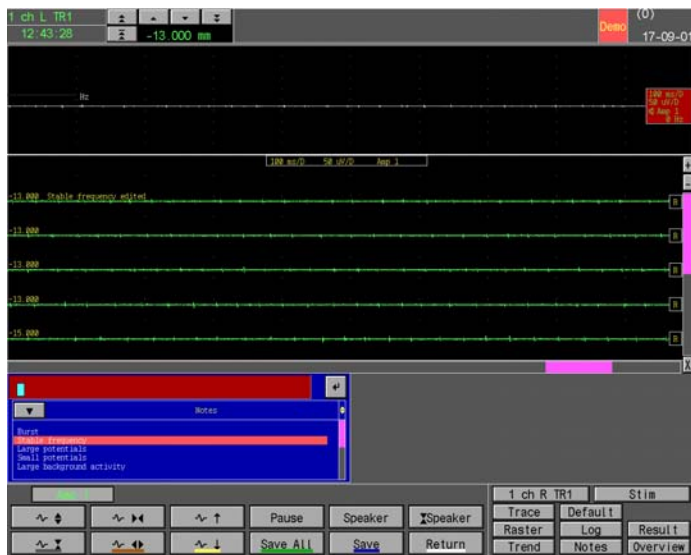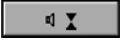
Figure 12 Edited Note in the Raster Window.

The Sound Play Back Feature

NOTE This feature is for the acquire mode only.

Use the Play Back Feature when you wish to listen to a previously recorded signal.

- Click **R**, which is situated to the right of the raster curve in the Raster Window, thus producing the sound feature options:

- Click [🔊] to listen to a reproduction of the recorded signal of the relevant trace.

- Click [🔊], if you wish to filter potential background noise, and only want to listen to the signals, which are above the frequency triggering line.

Raster Function Buttons

While a trace is selected (when the trace button has been clicked on, and it has taken on a color), the appearances of the buttons available at the bottom of the screen will change, thus providing other functions, which can be used to modify the Raster/Trace parameters.

Function Buttons available to modify parameters:

In Report
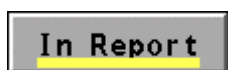
In Report Include trace in report.

↑*In Report* Include the selected trace and the most recent recorded traces in the report.

↓*In Report* Include this and all previous traces in the report.

Not in Report

Not In Rep Exclude this trace from the report.

↓*Not In Rep* Exclude this and all previous traces from the report.
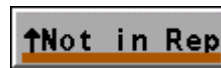
↑*Not In Rep* Exclude this and all new traces from the report.

Various

Erase Remove the trace.

New Base Make the selected trace the baseline. Only applicable for the stimulated modalities.

The Notes Window
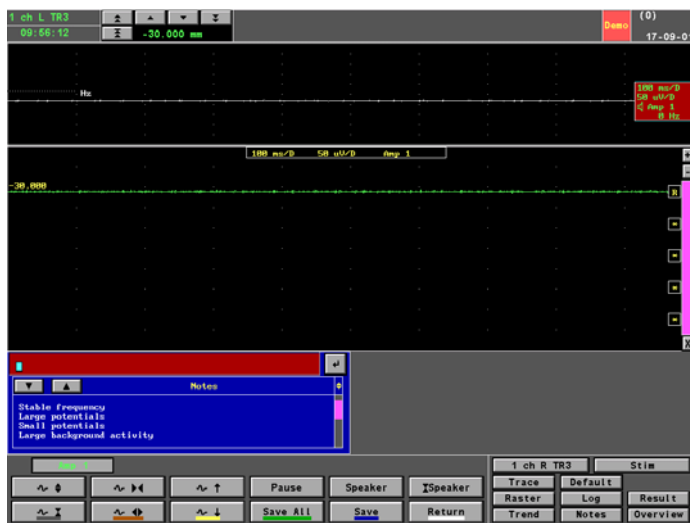
Figure 13 The Notes Window in the lower-left part of the screen

The *Notes Window* contains a list of 16 predefined and editable notes, plus space available for free text notation, see Figure 13 above. To predefine other notes, please see the section on Notes Setup menu on page 60.

Displaying the Notes Window

If the Notes Window is not displayed in the current window setup:

■ Then click **Notes** in the lower-right corner of the screen, and the Notes Window appears - provided that one has been defined. (For information see page 67, and confer on page 22).
■ Then click on "show" to display the Notes Window.

Selecting Predefined Notes

■ Click ▼ to go through the notes one by one.
■ Move the pointer to the wanted note, for example "Stable frequency": click on it to select it, and the note will be shown in the edit box just above the Notes Window, see Figure 14 below.
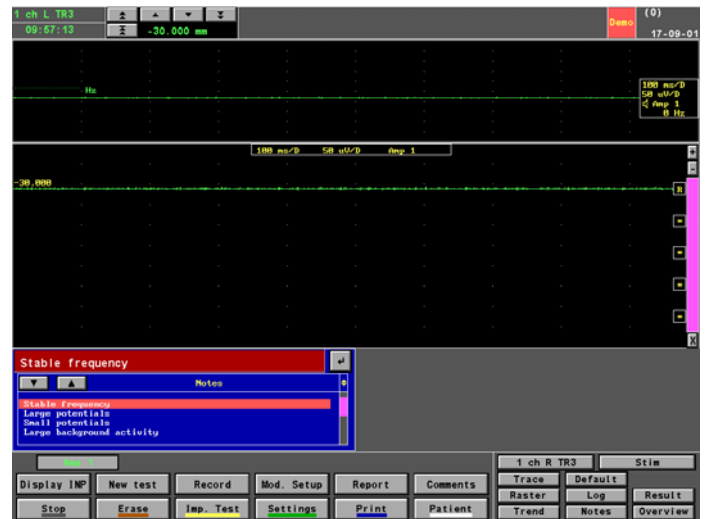
Figure 14 The Edit Box.

■ Then click ↵ (situated to the right of the edit box), or press ENTER ↵ on the keyboard, and the wanted note, for example "Stable frequency", will be transferred to the Log. (For information on , see page 18).

Quick Search
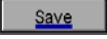
■ Click ⬍ in the right corner of the Notes Window, and a small Search Box appears.
■ Type a part of any of the pre-defined notes, then press ↵ on the keyboard, and the note will be listed in the edit box.

Vertical Scroll Bar

■ Use the small vertical scroll box situated below the Quick Search icon for a swift scroll through the predefined notes. It moves in up- and downward directions.

Editing Predefined Notes

■ Select and click on a predefined note, for example "Burst", and it appears in the edit box.
■ Now you can edit the note, or add more text, for example "edited note on the Burst", see Figure 15.

- Then click ⏎, or press ENTER ↵ on the keyboard, and the text in the edit box ("edited note on the Burst") will be transferred to the Log.
- Click [Save], and the trace with the edited note will be shown just above the trace in the Raster Window.

When a trace is saved, the previously entered note is attached to it. The note will be displayed leftmost, and just above the trace in the Raster Window, see Figure 15 below.
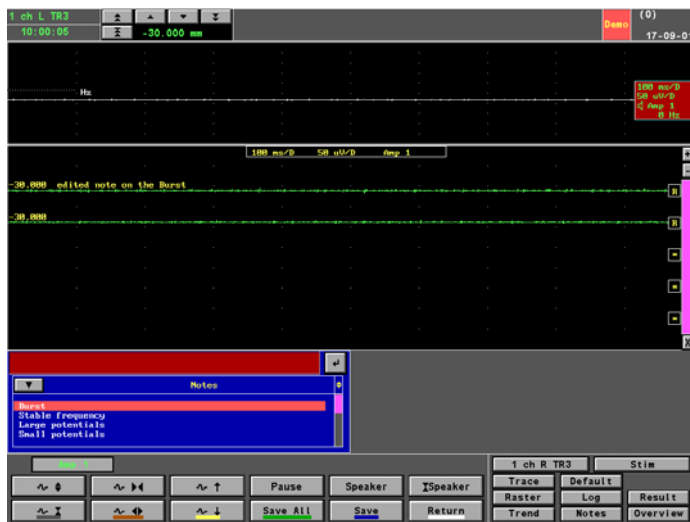
Figure 15 Raster Window: "Edited Note on the Burst". Scroll Bar and Window Buttons.

Free Text Notation
- The blinking pointer in the edit box in the Notes Window indicates that notes can be written here.
- For example, type "free text notation" in the edit box, see Figure 16 below:

Using the Program 18
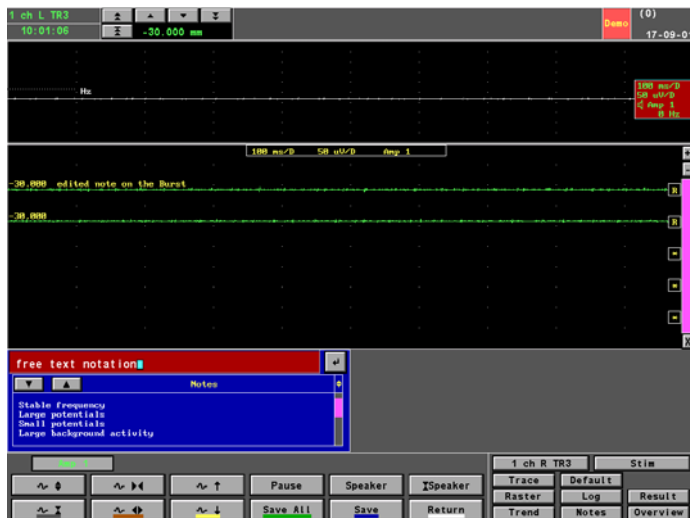
Figure 16 "Free Text Notation" in the Edit Box

- The click ⏎, or press ENTER ↵ on the keyboard.
- Click on the Information Box in the Trace Window, followed by:
- Clicking [Save], and the note will be saved just above the trace in the Raster Window, see Fig. 18 below. The note will automatically be transferred to the Log Window.
- If the Log Window is absent, you display the Log Window by clicking [Log] in the lower-right part of the screen, see Figure 17 below, and then:
- Click "Show" and the Log Window appears.
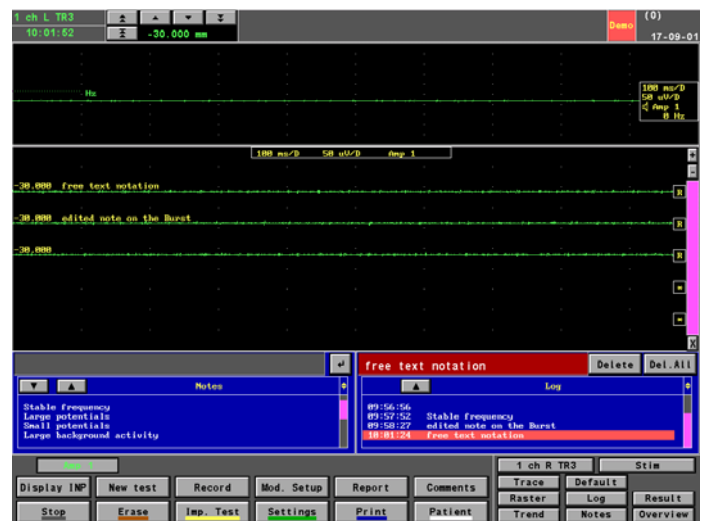
Figure 17 Saved Note just above the Trace in the Raster Window

- Then click on "Show" to display the Log window.

NOTE Information typed in the Notes Window before saving, will be attached to the signal saved hereafter.

The Log Window

Figure 18 The Log Window in the lower-right part of the screen

The *Log Window* encompasses all notes, the time of saving, and the start of a modality.

For each time a test, or a modality is started, or every time you enter a note, an entry will automatically be made into the Log.

All notes can be edited, or deleted at any time. However, when a note is deleted, it will not be recoverable.

Displaying the Log Window

If the Log Window is not displayed in the current window setup:

■ Then click `Log` in the lower-right corner of the screen:

■ Then click "Show", and the Log Window appears - provided that one has been defined; (for information on how to define a window, please see the section on page 67); and confer the section on page 22.

Quick Search

■ Click ❖ in the upper-right corner of the Log Window, and a small Search Box appears.

■ Type the wanted note, and press ENTER ↵ on the keyboard, and the wanted note will be listed in the edit box.

Changing the Log

■ For instance, writing "No frequency" in the edit box (that is situated to the left of the buttons `Delete` and `Del.All`, see Figure 18 above) followed by pressing ENTER ↵ on the keyboard, produces a small dialog box with the question: change log? *Yes* or *No.*

■ Click *Yes*, and the Log now includes the changed text.

Deleting Notes in the Log

■ Select and click on the note that you want to delete, and it appears in the edit box.

■ Click `Delete` situated just above the Log Window, and a small dialog box appears: Delete note! Are you sure - *Yes* or *No.*

■ Click *Yes,* and the note is deleted.

■ Use `Del.All`, if you wish to delete all notes in the log.

Lower Buttons
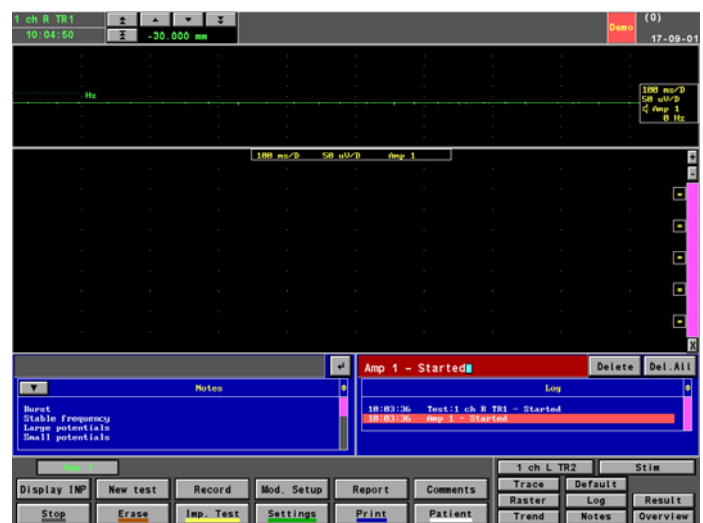
Figure 19 One Modality Button just below the Raster Window

Figure 20 The Modality Buttons and Left Arrow Key

Modality Buttons

16 *Modality Buttons* are available, however, up to five of these can be displayed at a time, see above. Commonly, only one modality buttons is displayed see Figure 19 above.

Each modality is color-coded, and the text displayed on the button will take on the same color as the trace. Use the arrow keys to the left, or to the right to scroll through more modality buttons, see above.

Clicking one of the modality buttons produces a Modality Selection List Box providing a list of available commands, for example stop, pause, erase all, select, save and cancel. See Figure 21 below. The total number of commands depends on the previous state and the modality type.
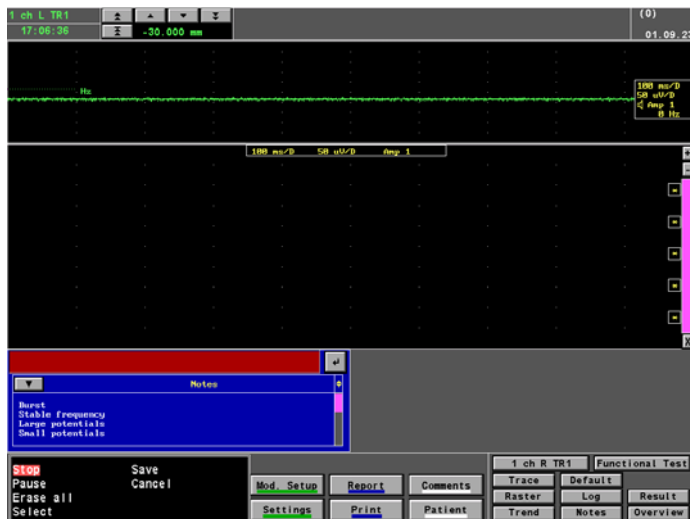
Figure 21 The Modality Selection List Box in the lower-left part of the screen

Modality Button Functions

Start	Run the modality. Starting a stimulated modality will stop all other stimulated modalities. A stimulated EMG modality is started with a single stimulation; an EP modality with repetitive stimulation.
Stop	Stop the modality.
Pause	Stop the collection of data, but the modality (and stimulator if defined) is still active. Same function as described for Trace Window Pause and Resume above. Here it acts on all channels in the modality.
Resume	Re-run the modality. Same func-

tion as described for Trace Window Pause and Resume above. Here it acts on all channels in the modality.

Select	Make this modality the active modality. Gain and sweep speed can now be adjusted for this modality. Generally, dedicated keyboard works on the selected modality.
Erase all	Erase all traces.
Save all	Save all traces.
Cancel	Do not make any selection.

The following command buttons are available for *stimulated modalities* only (EP, stim. EMG):

Erase	Erase the trace just recorded.
New Base Line	Make the trace just recorded the base line trace. Same function as described for Trace Window New Base Line above. Here it acts on all channels in the modality.
Show Base Line	Show base line (and hide, if present, previous trace). See description of the trace window above.
Hide Base Line	Hide base line trace.
Show Prev. Trace	Show previous trace (and hide, if present, base line trace). See description of trace window above.
Hide Prev. Trace	Hide previous trace.
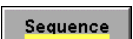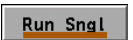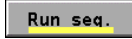
Function Buttons

The Function Keys are the two rows by six buttons in the lower-left part of the screen. They may be activated in three ways: by way of the mouse, by means of the colored Function Keys on the dedicated keyboard (see page Figure 8 Dedicated Keyboard), and by the function keys F1 - F12 on the PC keyboard.

Start — Start/stop the currently selected modality. See description for Start and Stop under Modality buttons earlier in this chapter.

Erase — Erase the trace just recorded for the current modality.

Imp. Test — Click this button or press (Ω) on the EP Head box to start impedance testing for all electrodes connected.

Settings — Change to settings page. Settings for the selected modality may be changed. Activating [Overwrite] on the settings page saves settings for the selected modality only. See also the section on Setup Program – Preferred Settings on page 69.

Print — Print a screen dump of this page on the selected printer.

Patient — Return to the Patient Data window

Display INP — Select the input or averaged signal to be displayed for the currently selected modality. (Applicable for the stimulated modalities only)

New test — Change to test overview window for selection of one of up to 40 predefined tests.

Sequence — It is possible to run a sequence of stimulated modalities, where the screen automatically switches to the new modality as it is started. If the test does not contain any stimulated modalities, this button has the text "Record", see below. The stimulated modalities (EP and EMG Stim) can be started as a single sequence or a recurrent sequence. Click this button and the following two buttons will be present.

Run Sngl — Run Single: perform a single run of all modalities in the defined sequence. (A modality is finished when all its channels have reached auto stop).
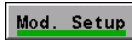
Run seq. — Run Sequence: first a run of all defined modalities is performed. Then the modalities will be started with a recurring time in seconds set in the "Advanced IOM Modality Setup" menu. When a sequence is running, the time left before run will be displayed in the modality buttons, which are in the sequence.

Record — If the test contains free-running modalities, it is only the button "Record..." which appears. Activating the Record... button, the program automatically saves free running traces each time the "Max Sweep" is exceeded. See also Recording on page 27, and Without the Motor Option/Encoder Option on page 24.

Report — Print a report of the measurements.

Mod. Setup — Change to Modality Setup Menu. The menu will have a limited number of functions available, as some setup values cannot be changed after the test is started. See The Modality Setup Menu on page 60.

Comments — Insert conclusions and general notes. Common to all tests performed in the investigation.

Shortcut Buttons to other Tests

Stimulation HF **Stimulation LF**

Figure 22 Shortcut Buttons to other Tests

For each test, up to two shortcuts to other tests may be defined. These will appear as labeled buttons in the lower-right corner of the screen, just above the window: Window Buttons, see Figure 22 above, and Figure 23 below.

Please see the section on "Program Setup on page 59 under "*Connected Tests*"".

Show/ hide Window Buttons

Figure 23 Show/hide Window Buttons in the Lower-right Part of the Screen

Clicking any of the Show/hide Window Buttons: `Trace`, `Raster`, `Trend`, `Result` or `Overview`, produces a Multiple Selection List Box, see Figure 24 below.

This box displays a list of options, and among these you will find "Show", or "Hide", dependant on whether the relevant window is displayed or hidden.

- Clicking "Hide" in the Multiple Selection List Box will hide the relevant window.

- Clicking "Show" in the Multiple Selection List Box will display the relevant window on the screen.
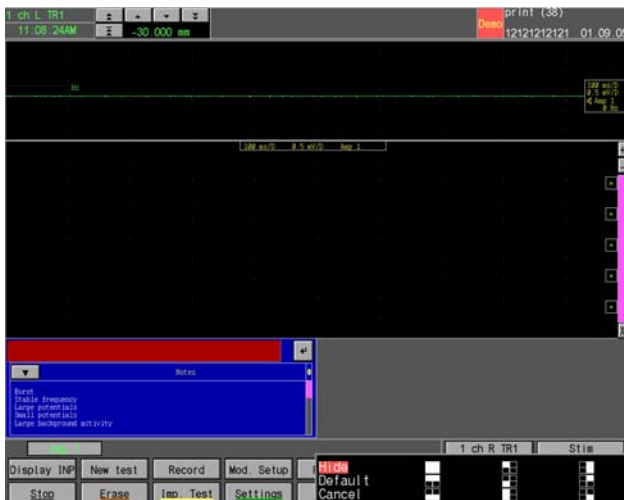
Figure 24 Multiple Selection List Box in the Lower-right Part of the Screen

NOTE The Multiple Selection List Box will remain available for 10 seconds only. In order to keep the Multiple Selection List Box displayed, and to select an option, position the mouse pointer on the Zoom Option that you want to select, while holding down the mouse button. Release the mouse button, and the option becomes selected.

Figure 25 The Multiple Selection List Box

NOTE The message: "No window defined" appears, when you click a button to display a window which has not been defined in the Advanced IOM Window Setup; information on how to define a window, please see page 67 in the section.

The Multiple Selection List Box also includes various Zoom Options see below.

Zoom Options

If you wish to view a particular window in one of the predefined sizes, and/or select one of the predefined window screen compositions, use the various Zoom Options, please see Figure 25 above.

Predefined Window Sizes are available in various sizes see Figure 25 above. For instance, if you wish to increase the size of the Trace Window to a full-screen display, please follow these steps:

- Click `Trace` in the lower-right part of the screen, and the Multiple Selection List Box appears, see Figure 25 above.

- Then click the "Full Screen Display" button that is situated in the topmost level in the second column to the left, and the selected window size appears, see Figure 26 below.

- To restore the window to their default setup and size, click `Default` in the lower-right part of the screen, and the setup as shown in 23 above appears.

- Click "Cancel" to quit the Multiple Selection List without changes, see Figure 25.
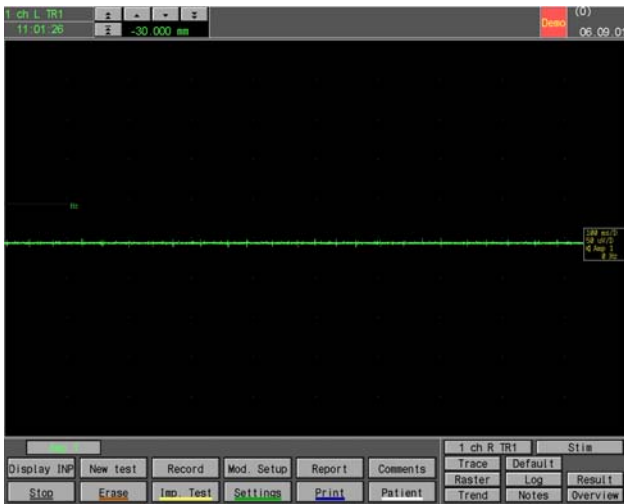
Figure 26 Full Screen Display of Trace Window

Predefined Window Screen Compositions are available, too. For instance, if you would like the Trace Window to be positioned in the upper-left quarter of the screen, please follow these steps:

■ First, click **Trace** in the lower-right part of the screen, and the Multiple Selection List Box appears.

■ In this list box, select and click the "upper-left quarter zoom feature button" which is situated in the second topmost level in the fourth column to the left, and the selected window screen composition appears, see Figure 27 below:
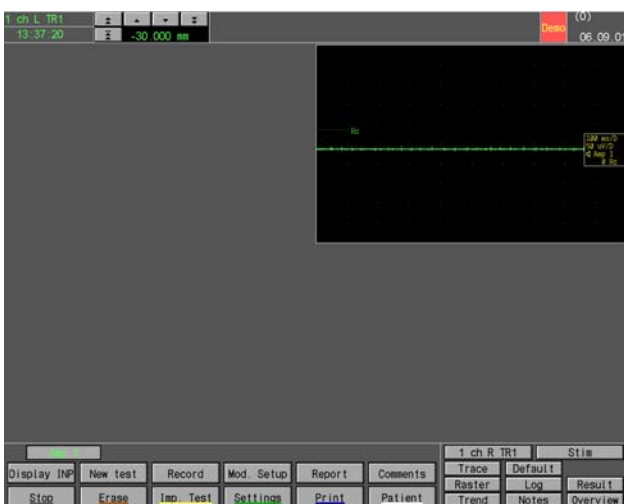
Figure 27 Trace Window in upper-left Quarter Position

■ To restore the windows to their default setup and size, click **Default** in the lower-right part of the screen.

If you would like the Trace Window to be positioned in the lower-half part of the screen, please follow these steps:

■ First you click **Trace** in the lower-right part of the screen, and the Multiple Selection List Box appears, see Figure 27 above.

■ Then select and click the "lower-half" zoom feature button, which is situated in the button level of the second column to the left, see Figure 28 below:
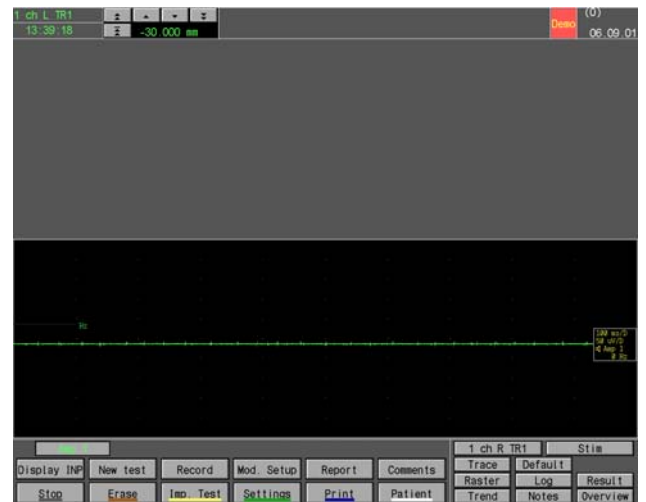
Figure 28 The Trace Window in lower-half Position

■ To restore all windows to previous setup and size, click **Default** in the lower-right part of the screen

Electrode Positioning System

WARNING Moving the electrode too deeply into the brain may cause serious injury to the patient. It is at any moment the responsibility of the physician to observe the depth by all the means available in order to avoid this situation.

NOTE The **Distance to the Target (DT)** is the distance that the electrode has to travel to reach the target; e.g. -5.000mm indicates that the electrode is 5.000mm from the target; and +1.250mm indicates that the electrode has passed the target by 1.250mm.

NOTE The **Distance Driven (DD)** indicates how far the electrode has traveled towards the target. The value goes from 0.000mm and onwards from the electrode's base position (when fully retracted) to full extension; e.g. 50.000mm - when used with a Medtronic microTargeting Drive. This value shall at all times be identical to the value on the display of the microTargeting Controller, and on the scale on the microTargeting Drive.

In the upper-left part of the screen, the current position of the electrode is displayed in either the small toolbar (without the Motor Option/Encoder Option), or in the Position Display (when the Motor Option/Encoder Option is attached and active). See the figures below.

Without the Motor Option/Encoder Option
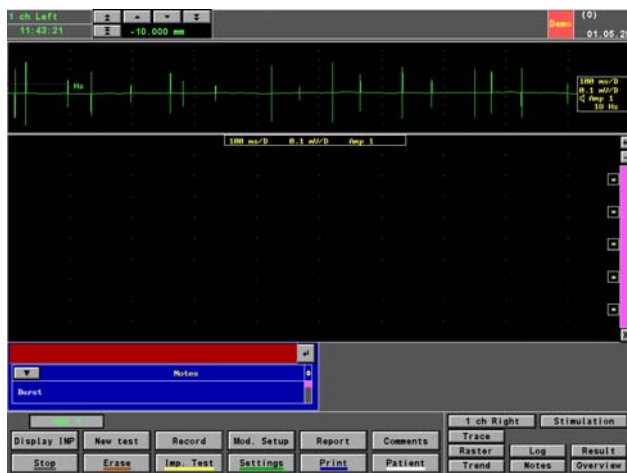
Figure 29 The Small Toolbar with Controls.

If no option is active, five control buttons are available to manually enter the position. The small toolbar provides the controls, which make it possible to decrease, or increase the distance to the target by mm macro steps and by mm micro steps, see Figure 29 above. The figure in the small toolbox indicates the distance to target. In Figure 29 above, the figure is -10.000mm.

Small Toolbar Controls
- Click ▲ to increase the distance by mm macro steps.

- Click ▲ to increase the distance by mm micro steps.
- Click ▼ to decrease the distance by mm macro steps.
- Click ▼ to decrease the distance by mm micro steps.
- Click ▲ to retrieve the base position.

Specifications on the distance to the target will be displayed just above the raster curve in the Raster Window when the trace is saved. For further information on The Raster Window,

With the Motor Option/Encoder Option

If such an option is active and working faultlessly, the Position Display has the following form, see Figure 30 below:
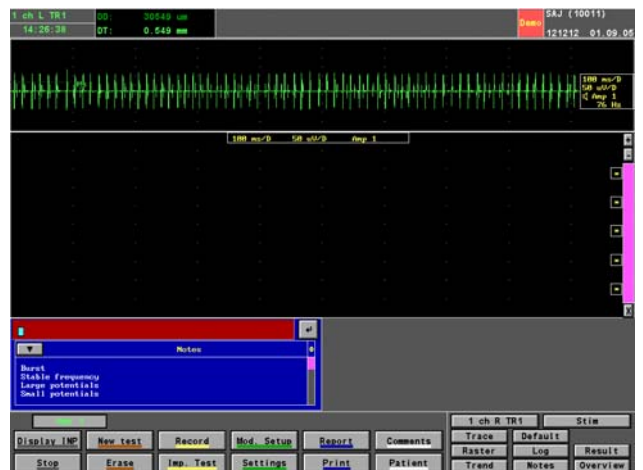
Figure 30 Position Display included DD and DT in the upper-left part of the screen

The Position Display including DD and DT
In the upper-left part of the screen the current position of the electrode is displayed in the Position Display, see Figure 30 above. The Distance to the Target (DT) value is displayed in green figures. When the position is changed, the color turns yellow and remains so, until a full sweep is recorded (typically 10 seconds). During this period of time, it is recommended not to save the signal as it represents different positions and may include movement artifacts stemming from the electrodes. For the same reason, continuous recording is as default not active while this display is yellow. To

change the settings for this, see Registry settings on page 84.

The distance to the target is calculated as follows: DT = DD - Base Position

---

To change the Base Position for the Micro Drive, see *Micro Drive Settings* on page 65.

Playing back Previously Recorded Signal and Sound

NOTE This feature is for OFFICE MODE only.

Use the play back feature, when you wish to review particular patient data again. This feature presents the previously recorded signal "*live''* in combination with a reproduction of the sound in the Trace Window.

■ Click ▣ which is situated to the right of the raster curve in the Raster Window, this displays the selected curves repetitively as free running in the Trace Window. It also provides the sound feature option buttons in the lower part of the screen:

■ Click [◁] to listen to, and to watch a reproduction of the recorded sound and the signal of the relevant trace.

■ Click [◁ ⵌ], if you wish to filter potential background noise, and only want to listen to the sounds, which are above the frequency triggering line.

See also the description on
The Clip Sound Feature on page 13, and on Clip Sound Level on page 14.

NOTE Limitations: changing the Clip Sound Level does not influence the sound, before the next repetition starts. The timing of the sound may be slightly different from the display.

Generating a Report

If you wish to generate a report, follow these steps:

■ If the [Report] button is not displayed, then click [Return], and:

■ Click [Report], and the Report will be printed.

After printing the report, the Lead Point automatically returns to the Patient Data Window.

If you wish to change the subset of traces to be included in the report, proceed as follows:

■ By clicking on ▣ to the right of the trace in the Raster Window, further buttons for changing the parameters appear. These buttons will allow you to tailor-make the report to suit your requirements.

■ For instance, clicking the "not in report" will exclude this and all traces above from the report. Traces included in the report, are marked with an ▣.

You may select the contents of your report in the Modality Setup Menu on page 60 ff in the section "*Report".*

Advanced Features

This chapter covers a number of advanced features of the Leadpoint™ software; *Analyzing the Signals,* and *Converting the Data* to mention a few examples.

Analyzing the Signals

The Leadpoint™ software includes the facility to produce an analysis of the signals; illustrated as curve charts in the Result Window, and as a mapping using color bars in the Overview Window see the figures below.

NOTE In the present application, the methods of analysis have not yet proven valuable for clinical use. They are included for scientific purposes only.

The screen layout may have different forms, an example is shown in Figure 31 below. The screen is divided into four windows: a Trace Window (top left), a Raster Window (lower left), a result Window (top right) and an Overview Window (middle right).
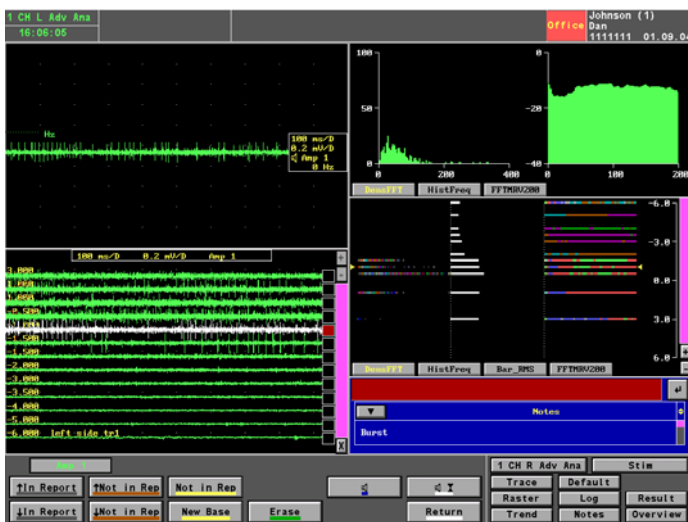
Figure 31 The Four Windows Displayed.

The Result and the Overview Windows

The Result window
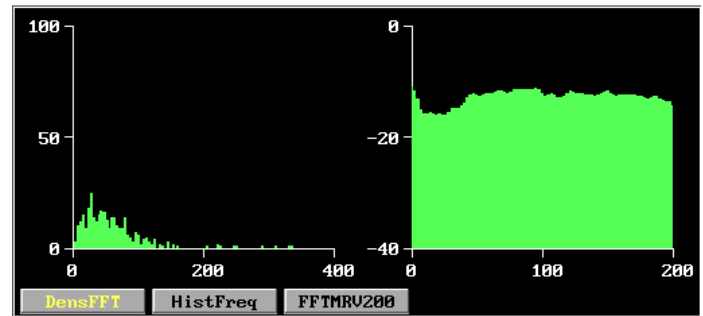
Figure 32 The Result Window from Fig. 38 above.

The Result Window provides a graphical representation of the analysis of the signal selected in the Raster Window. The Result Window can hold up to 5 result curves from one recording from one channel only.

If no signal is selected, it is the last saved signal displayed. One example is the HistFreq display, the left chart in Figure 32. This shows the histogram of the frequency of the detected peaks in the signal. The frequency is along the x-axis, and the number of occurrences is along the y-axis. For further explanation and setup, please see the description in the subsection *Results* in the section the Modality Setup Menu on page 60.

TIP Holding down the mouse button while clicking anywhere in the Result, or the Overview Windows will produce a pop-up menu. It displays additional information on the abbreviated form of the name on the various buttons in the window. See Figure 34 below.

The Overview Window
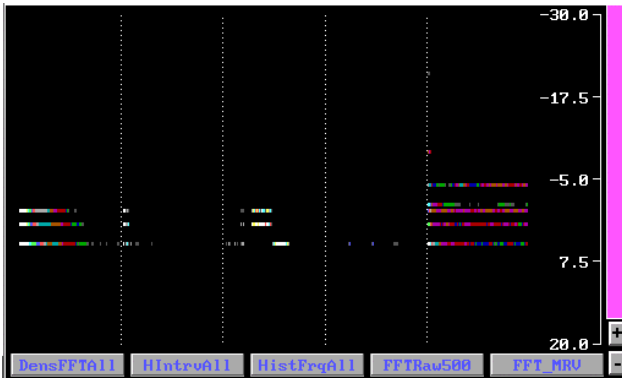
Figure 33 The Overview Window.

The Overview Window can hold up to 5 color bar displays. Each of these shows an analysis result of <u>all</u> recorded curves for a channel. It is meant to give the user an overview of the signal behavior through a whole trajectory.

A color bar may either show one single value, or a color-coded result.

An example of a single value is **Bar_RMS** of Figure 34. In this case the RMS value of each recorded curve is shown as the length of the bar.

An example of a color-coded result is **HistFreq** of Figure 34. This shows the result curve from Figure 32 with the same name, but converted to lighter colors for high values, and darker for lower values. For a more detailed description of the analysis results available and the setup please see see the description in the subsection *Results* in the section on The Modality Setup Menu on page 60.

The Ruler Scale

In the right-hand side of the overview window, a ruler with millimeter scale is available. It shows the depth of the electrode, when the recordings were made. The value corresponds to the Distance to the Target (DT), confer Electrode Positioning System on page 23.

- By using the +/- you can increase, or decrease the distance in the Ruler Scale.

Result and Overview Window Buttons

Clicking the lower buttons in the Result and the Overview Windows will display the relevant curves and color mappings for each trace.

The *black color* indicates that the relevant button is active, and that the chart is displayed.

The *yellow color* indicates that the button is inactive, and that the chart is not displayed.

A maximum of five buttons can be set up for each trace. However, there are multiple button options available, and may be selected in the Advanced Modality Setup Menu, see page 60.

- Selecting a trace in the Trace Window by clicking on [R] brings about two yellow arrows pointing at the relevant color bar in the Overview Window see Figure 34 below:
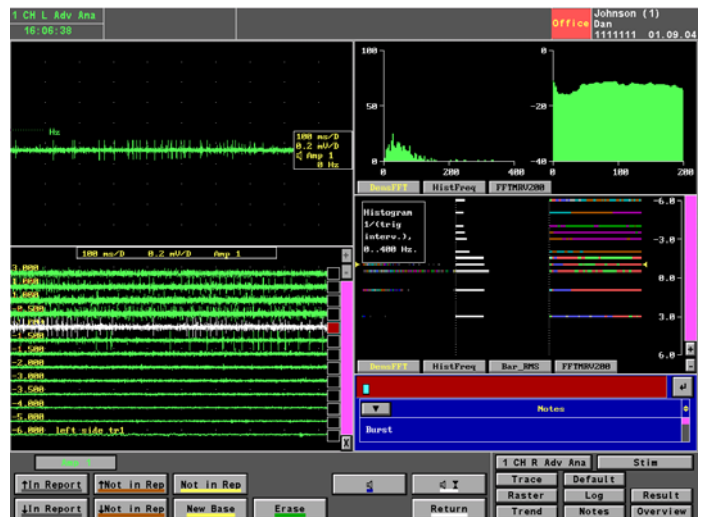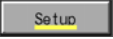
Figure 34 Overview Window: 2 yellow arrows

Show/Hide Windows Buttons: See information on page 22. Information on the various *Zoom Options*, please see page 22.

Recording

Make sure that you have selected [Autosave] in the Advanced IOM Modality Setup. To change the status of the Auto save button, follow these steps:

- Go to the Patient Data Window by clicking [Setup], and the Setup menu appears.

- Here you click [Program] which brings about the Advanced IOM Test Overview.

- Select the test by clicking the leftmost button under "Modalities" for the relative test.

- Then click [Mod. Setup], and the advanced Modality Setup Menu appears, and in this menu, then:

- Click [Autosave] until the wanted state is obtained see Figure 35 below.

NOTE Leadpoint has Auto save as default
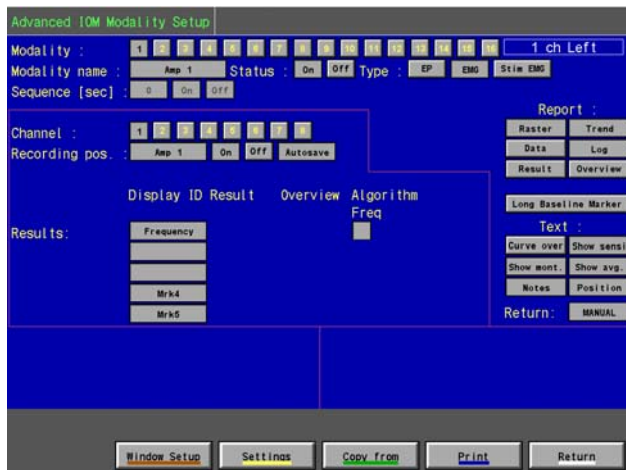
Figure 35 The Auto Save Button

Then return to the appropriate window setup by clicking [Return], and then:

- Click the [Record] button, and the recording begins. Subsequently, the information on this trace will be saved each time a full curve is recorded

  The information saved will also be available in the Log window. See page 18 for information on the Log Window

- Click [Record...] and the recording stops.

NOTE Continuous recording takes up a large amount of disk space.

The disk file generated by the recording may get very large, and fill up the entire disk. For this reason, the size of the file is continuously shown in the upper-left part of the screen in the Status Bar: [Size : 1.4Mb]

For recording with a Motor Option, or an Encoder Option, see the sections Without the Motor Option/Encoder Option on page 24 ff.

- When the investigation has been carried out, click [Return], and then:
- Click [Patient].

Converting Data

If a recording has been made with one test setup and you wish to display the results with another test setup, then you may convert the measurement results.

In the example below, a recording made with the simple test 1 is converted into a more complex test 21, which includes the analysis windows.

- Select and click on the patient in the Newest Local Patients box in the Patient Data Window.
- Click [OK] in the Selected Patient box, thus producing the Select Test Menu, see Figure 36 below:
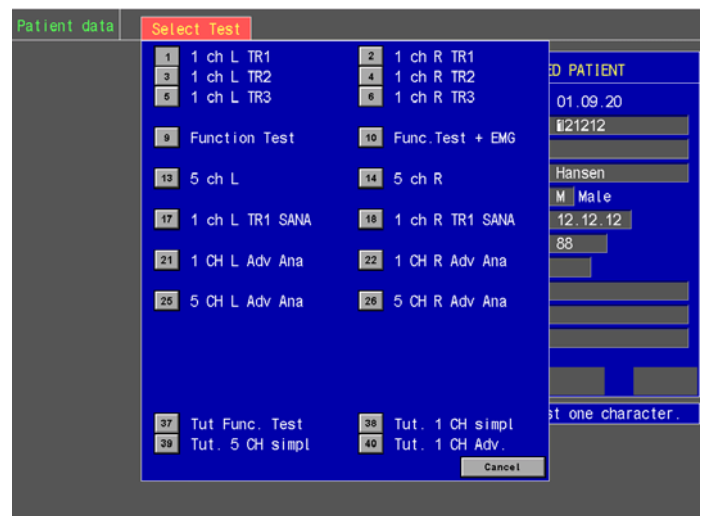
Figure 36 The Select Test Menu

- Select and click on the wanted test in the Select Test Menu, thus providing the wanted test.
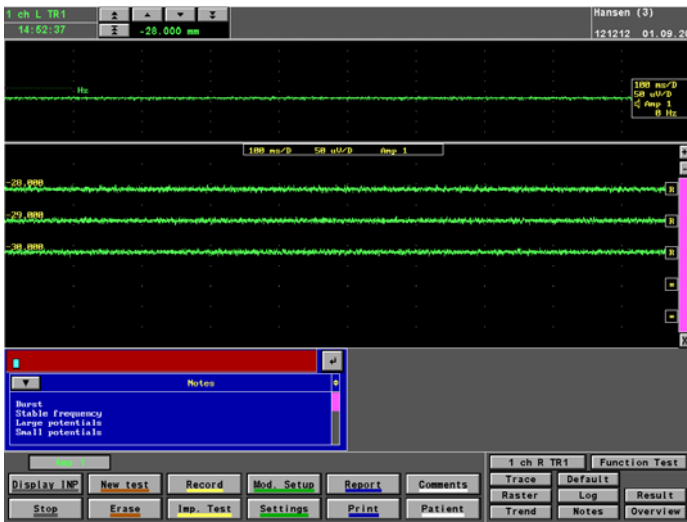
Figure Test number 1

■ Click New test situated in the lower-left part of the screen, and the Select Test Menu reappears including the Convert button, see Figure 37 below:
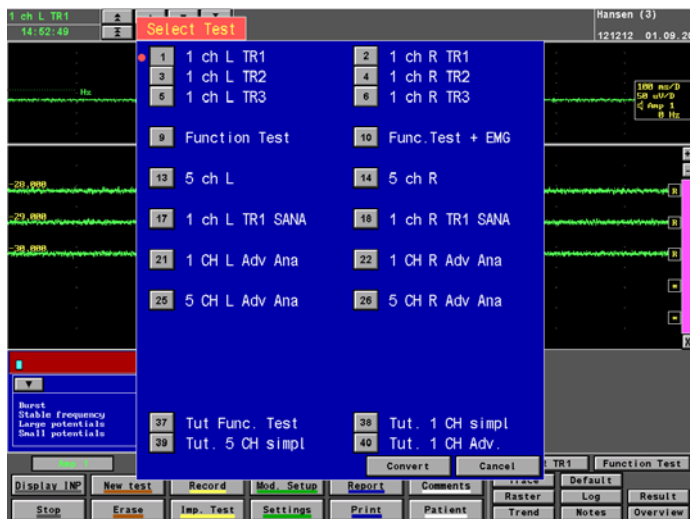
Figure 37 The Select Test Menu including the Convert Button situated in the lower-right part of the screen

■ Click Convert, and the Select Setup Menu appears providing a list of the convertible tests, see Figure 38 below:
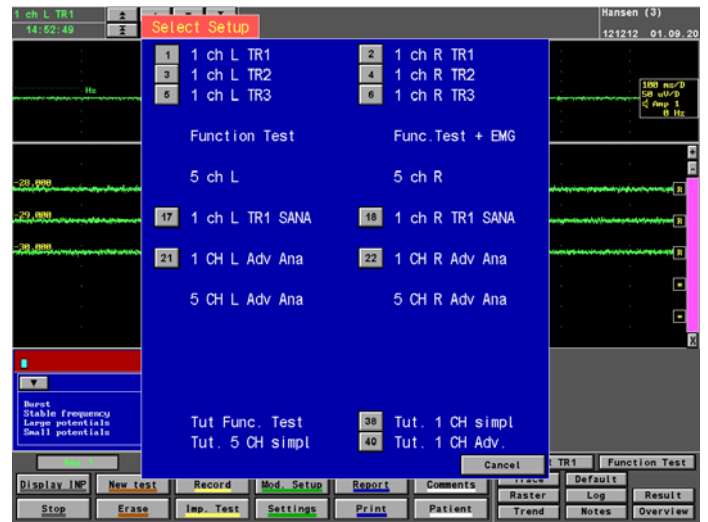
Figure 38 The Select Setup Menu

The Leadpoint™ only converts tests with full data compatibility, i.e. it will only convert tests including the same number of channels, the same number of modalities, etc.

■ Select and click on the test you wish to convert. For instance, select and click on test 17 1 ch L TR1 SANA, thus producing the wanted test, see Figure 39 below:
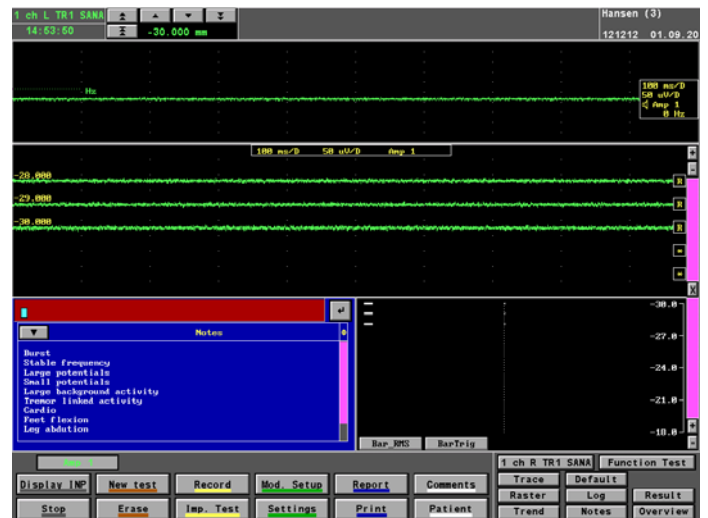
Figure 39 The Test: 1 ch L TR1 SANA

Stimulation

The current stimulator may be used in the two types of modalities: Stim EMG and EP.

Attach the stimulating electrode to the stimulator output connector.

The stimulator is a constant current stimulator, and setting the stimulator to, for example, 5 mA, will deliver this current through its output. It uses a voltage of up to 350V to drive this current. The voltage depends on the impedance of the electrode. If 350V is insufficient, the intensity field will flash red during the stimulation.

Warning Stimulating through a small area can produce a high current density (mA/cm^2), which in severe cases may cause damage to the patient in the area where the stimulus is applied. A maximum limit for current intensity can be defined on the Extended Stimulation setup page (click **settings** and **Ext Setup**), so for example, the maximum obtainable stimulation intensity will be 10mA.

Warning The electrode's documentation may specify the electrode's maximum charge density. If this is based on a constant voltage stimulation, then divide the voltage limit by the specified impedance in order to calculate the current limit.

Control of Stimulator

Intensity
To control the stimulus intensity, use the Intensity wheel to increase and decrease. Use the up/down $\triangle \triangledown$ buttons to define the duration of the stimulating pulse. See figure 8.

Rate
Use the up/down $\triangle \triangledown$ buttons to define the stimulation rate, if recurrent stimulation is wanted. See figure 8.

Single Stimulus
Press ⌐ to stimulate once. See figure 8.

Repetitive stimulation
Press ⊓⊓⊓ to stimulate repetitively. To stop repetitive stimulation either press ⌐ or ⊓⊓⊓. See figure 8.

Additional Features

In addition to the basic features of the Lead-point™, it offers additional features for stimulated modalities such as Evoked Potentials.

Markers

In the Trace and Raster Windows, two *trace latency markers* can be set on the traces. Long markers can be used for manually measuring the latency values.

Trace Latency Markers

Each Trace and Raster Window may have one or two *trace latency markers* vertically positioned through all the traces, see Figure 40 below.
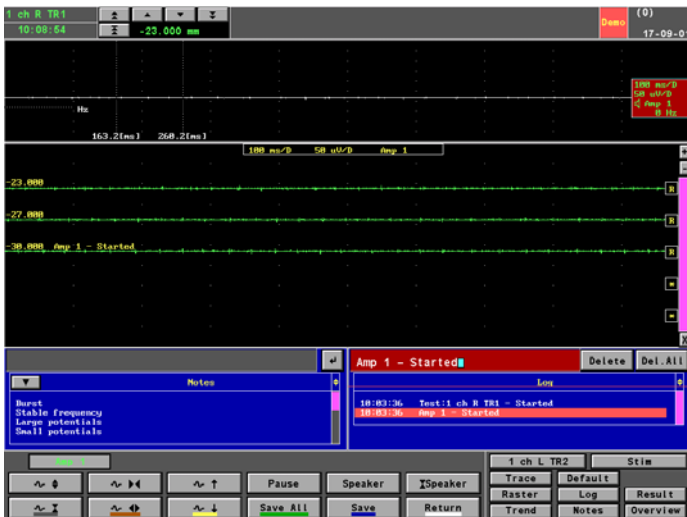
Figure 40

If all the traces have the same sweep speed, the latency value will be displayed at the bottom of the Trace Window, see Figure 40 above; if they have different sweep speeds, a latency value will be noted for each trace.

NOTE For trace latency markers: Latency is the difference in time between the stimulus/start time and the position of the marker.

Handling Trace Latency Markers

Activating
If a Trace Latency Marker is absent, you can drag the marker to the window by:

■ Clicking the left margin of the window, and then while pressing and holding down the mouse button, you can drag the long marker in.

Deactivating
If you want to remove a marker, proceed as follows:

■ Position the mouse pointer over the marker, then click on it, and then while pressing and holding down the mouse button and moving the mouse, you drag the marker out the window.

For other types of Markers, please see Program Setup on page 59 in then section *Markers*.

The Trend Plot Window
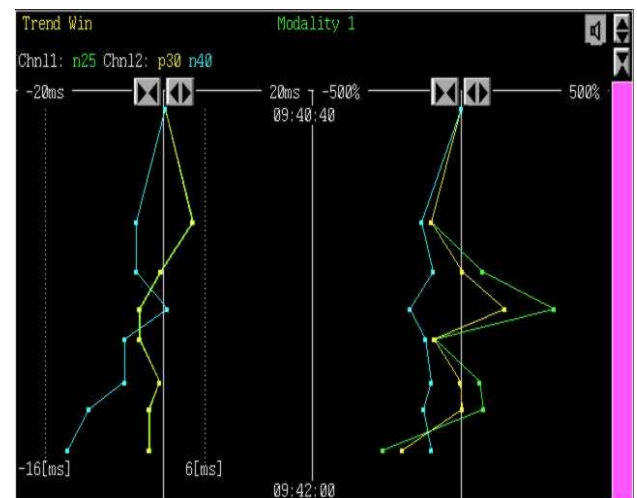
Figure 41 The Trend Plot Window

Utilize the *Trend Plot* to facilitate the inspection of variation in the signal; it compares marker values, viz. amplitudes and latencies, to a user-definable baseline response.

A trend plot is for one stimulated modality only. In the top of the window, the modality name is displayed color-coded; and the name of montage and the markers are listed color-coded, too. The corresponding color is used in the Trend Plot. Each marker has to be defined in the Settings' Menu to be present in the Trend Plot. For further information on the Markers, and in the chapter on the Modality Setup Menu on pages 60 ff.

The Trend Plot Window above has two plots present in the same window. If either amplitude, or latency markers are omitted, then only one plot will be present.

If a new baseline is defined for the corresponding channel, or modality then the trend plot will be drawn correspondingly.

The left part of the chart indicates the latency in ms, and the right part of the chart indicates the amplitude in percent.

The scale will be auto scaled, if the value exceeds the preset value. For instance, if the preset value is 50ms, and the value increases to 100ms, the trend plot chart will readjust automatically to comprise the 100ms in the chart.

Altering the Time Scale

The up/down arrows make it possible to alter the time scale up or down.

Both the start time (at the top of the scale, and showing 09:40:40 in Figure 41), and the end time (at the bottom of the scale, and showing 09:42:00 in Figure 41) for the trend are displayed in the center of the Trend Plot Window. If left untouched, the time scale will be auto scaled.

The Alarm Button

The Trend Plot window includes an alarm button situated in the upper-right part of the screen in Figure 41. When clicked, you will hear a sound signal used to indicate that markers are exceeding a limit line in the Trend Plot Window.

Warning This feature must not be used for intensive care monitoring; it is meant as a help to pay attention to the variation in the signals measured.

Time of Recording
- Click on the wanted trace in the Raster Window, and then by pressing and holding down the mouse button, a thin horizontal line appears in the Trend Plot Window indicating the time at which the trace was recorded.

Multi Modalities

The Leadpoint™ is capable of executing multiple modalities in a single test. For instance, it can record Evoked Potentials simultaneously with Free Running Modalities. In stead of running two stimulated modalities at the same time, the Leadpoint™ offers an alternative, i.e. the facility of sequencing soffering a single, or recurrent sequence of modalities that can be run at a given interval. For further information, please see the section on Automatic Sequencing of Recording.

Tutorial

The Leadpoint tutor covers steps for operating the Leadpoint's four tutorials providing two simple setups, one for stimulation and one tutorial including a setup on an advanced level.

Tutorial 1

One Channel Simple

This tutorial describes the use of the program for single channel recordings.

NOTE This description covers the use without the microTargeting Drive .

Starting the Leadpoint
■ Turn the power switch on.

■ Turn the computer on.

■ Before you begin, please close all other programs currently running on your computer.

■ [Leadpoint icon] Double-click the Leadpoint icon on your Windows desktop. The program will perform a swift self test, before displaying the Start Page, see Figure 42 below:
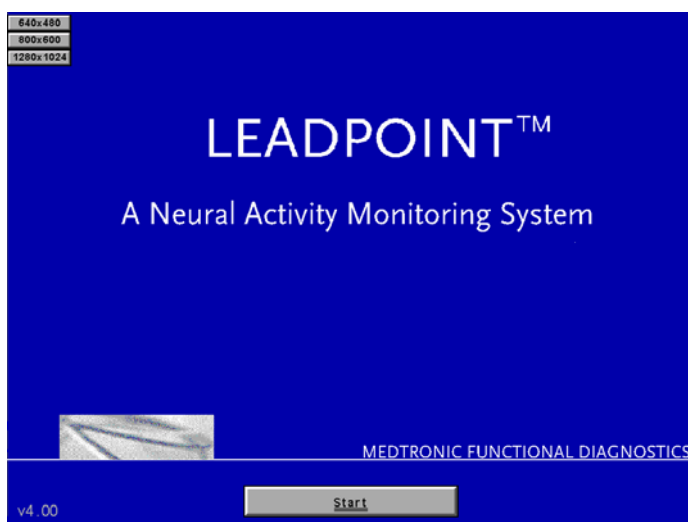
Figure 42 The Start Page of Leadpoint™

■ Click [Start] on the Start Page, and the Patient Data Window appears, see Figure 43 below:
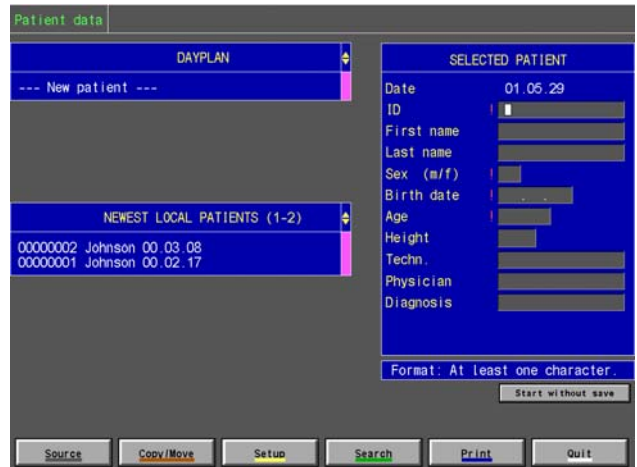
Figure 43 The Patient Data Window

Entering Patient Data
■ Select and click on the patient data wanted, or enter the patient data in the Selected Patient box. All the boxes marked with an "!" have to be filled in at a minimum, otherwise the program cannot proceed, see Figure 43 above.

When the patient data has been entered, an [OK] button appears in the lower-right of the Selected Patient box.

■ Click [OK] to proceed to the Select Test Menu, see Figure 44 below.
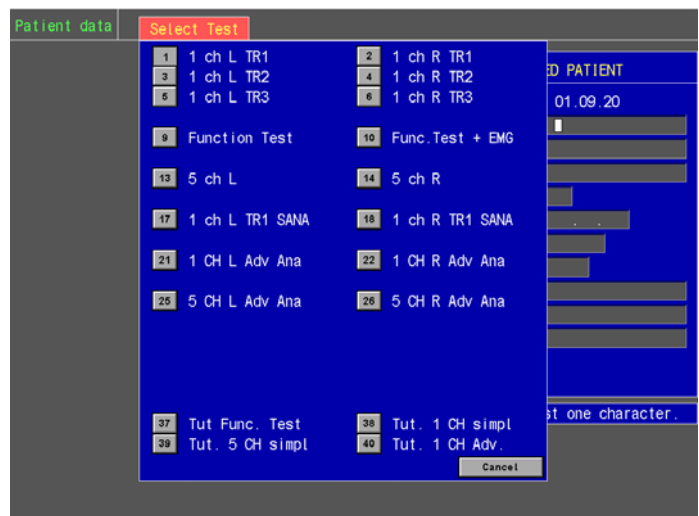
Figure 44 The Select Test Menu.

Selecting the Test

■ In the Select Test Menu, click the selectable button number `37` named: Tut. 1 CH simpl, see Figure 44 above.

Having selected the test, the window setup for Tutorial 1 appears, see Fig. 51 below:

Figure 45 Tutorial no 1: Tut. 1 CH simpl.

Selecting the Trace

■ Then you select trace 1 by clicking on the information box situated to the right of the trace in the Trace Window, see Figure 46 below. This may be performed by using the dedicated keyboard, too if you are not in demo mode. Please see the section on Information Box Values page 12 for further information on the dedicated keyboard.
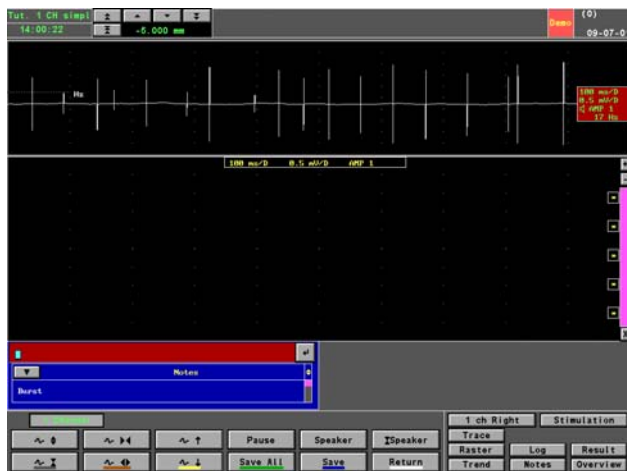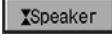
Figure 46 Information Box and Changed Function Buttons

Setting/Adjusting the Distance to Target

A number of additional controls are provided in a small toolbar in the upper-left of the screen, see Figure 46 above. These controls make it possible to decrease, or increase the distance to the target by mm macro steps and by mm micro steps. For further information on Small Toolbar Controls, please see page 24 in the section on the Electrode-positioning System.

Filtering Background Noise

Not for Demo Mode. If you wish to filter potential background noise, and only want to hear the sound above the triggering line, use the Clip sound feature:

■ Click ╳Speaker and now you can move the trigger line in up- and downward directions see Figure 46 above.

Altering the Frequency Triggering Line

Not for Demo Mode If you wish to alter the frequency triggering line, use the Intensity Wheel on the dedicated keyboard situated to the right of the button, which controls the sweep speed/sensitivity, see Figure. 9. For further information, please see page 14.

Altering the Sweep Speed

If you wish to alter the sweep speed, or the sensitivity, use the dedicated keyboard, the PC keyboard, or the Function Buttons (cf. page 21):

Altering the sweep speed via the dedicated keyboard. *Not for Demo Mode:*

■ Use the sweep speed/sensitivity button by toggling to the left or the right.

Altering the sweep speed via the PC keyboard:

■ To control the sweep speed, use the ◁ (left arrow) while pressing down the CTRL button in order to decrease the sweep speed.

■ Use the ▷ (right arrow) while pressing down the CTRL button in order to increase the sweep speed.

■ To control the sensitivity, use the ▽ (down arrow) to increase the sensitivity.

■ Use the Δ (up arrow) to decrease the sensitivity.

Altering the sweep speed via the function buttons, see Figure 46:

■ Click [∿ ▶◀] (sweep speed down) to shrink the trace.

■ Click [∿ ◀▶] (sweep speed up) to enlarge the trace.

Please see Figure 9 on page 12 for information on the dedicated keyboard, and Trace Window Function Buttons on page 12.

NOTE The dedicated keyboard is not functional in Demo Mode.
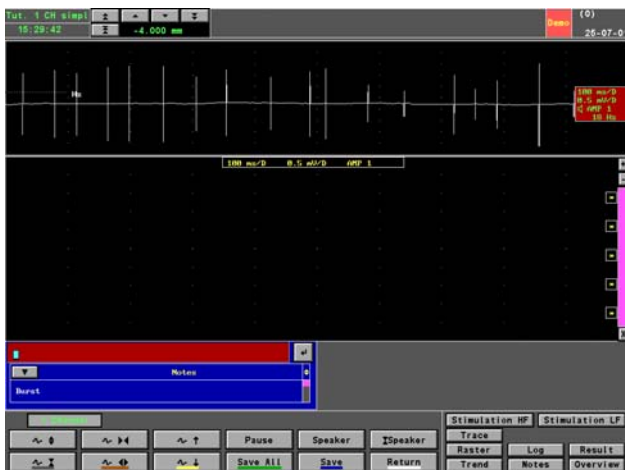
Figure 47 Function Buttons: the Clip Sound

NOTE After altering the position of the electrode, please wait 10 seconds, before you save the signal to avoid that different positions are being saved to the same trace. The Leadpoint™ is preset to save 10 seconds of the sweep.

The length of the sweep (time) can be altered in the Preferred Adv. IOM Settings Menu.

■ Click [Settings], and the Preferred Adv. IOM Settings Menu for the relevant test appears.

■ Click More, and the Max Sweep pop-up window appears.

■ In the column Max Sweep (ms), select and click on the wanted sweep ms.

■ Then click [OK].

Saving the Signal

■ When you want to save the signal, save it by clicking [Save] after having clicked on the Information Box in the Trace Window. The trace will thus be transferred to the Raster Window, see Figure 48 below. For further information on The Raster Window, please see page 15.

The distance entered in the small toolbar will automatically be displayed just above the trace to the left in the Raster Window, see Figure 48 below.

Figure 48 The Distance is displayed in the Small Toolbar and just above the trace in the Raster Window
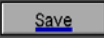
Altering the Distance to Target

■ The next step is to advance the electrode, and to alter the distance to the target via the small tool bar. For instance, change the figure from -5.000mm to -4.000mm by clicking [▼] in the small toolbar.

■ Then wait 10 seconds, before clicking [Save], see Figure 49 below:

Figure 49 Small Toolbar: distance to Target -4.000

NOTE Notice that the trace last saved will be placed topmost in the Raster Window.

Altering the Distance to -3.000mm

■ Then advance the electrode again, and alter the distance to the target. Change the figure from -4.000mm to -3.000mm by clicking ▮ in the small toolbar, see Figure 50 below:

Figure 50 The Distance to Target: -3.000mm

Saving and Selecting Notes

It may be convenient to save some notes while conducting the investigation.

You may select pre-defined notes, or add some text via the Notes Window. Follow these steps to select a predefined note:
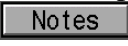
■ If the Notes Window is absent, display the Notes Window by clicking ▮Notes▮ in the lower-right corner of the screen, and the Notes Window appears, see Figure 51 above.

■ To select a predefined note, click ▮▼▮ situated to the left in the Notes Window to go through the notes one by one, see Figure 51 below.

Figure 51 "Burst" Shown in the Edit Box below the Raster Window

■ Move the pointer to the wanted note, for example "Burst": click on it to select it, and the note will be shown in the edit box just above the Notes Window, see Figure 51 above.

■ Then click ▮ (situated to the right of the edit box), and the selected note "Burst", will be transferred to the Log (for information please see page 18).

Notice the figure just above the trace to the left in the Raster Window which represents the distance to the target, in this case it is -3.000mm; see Figure 52 below.

Figure 52 "Burst" in the Log Window Edit Box

■ Then wait 10 seconds, before clicking [Save].
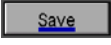
Altering the Distance to -2.000mm
■ Then advance the electrode again, and alter the distance to the target. For instance, change the figure from -3.000mm to -2.000mm by clicking [ ].

■ Then wait 10 seconds, before clicking [Save] to complete the data saving, see Figure 53 below:

Figure 53 The Distance to the Target is -2.000mm

Altering the Distance to -1.000mm
■ Advance the electrode, and alter the distance to the target. Change the figure from -2.000mm to -1.000mm by clicking [ ].

■ Then wait 10 seconds, before clicking [Save] to complete the data saving, see Figure 54 below:

Figure 54 The Distance to the Target is -1.000

TIP It may be convenient to save some notes during the investigation, cf. page 16 on the Notes Window

Altering the Distance to 0.000mm
■ Advance the electrode, and alter the distance to the target. Change the figure from -1.000mm to 0.000mm by clicking [ ].

■ Then wait 10 seconds, before clicking [Save] to complete the data saving, see Figure 48 below:

Figure 55 The Function Buttons, including Save

Raster Window Box

The trace is provided with a button that is situated to the right of the raster curve in the Raster Window see Figure 50 above. If the trace is to be included in the report, it will be marked with an ![R]. If marked with a ![*], the trace will not be in the report.

If an edited note is attached to the trace, it will be displayed just above the trace in the Raster Window ("Burst") as shown in

Figure 55 above. (Information on changing the Log, please see page 19).

Number of Rasters in the Raster Window

When you save a trace in the Trace Window, it is automatically transferred to the Raster Window in which 1 to 20 rasters may be displayed simultaneously. The latest of the rasters will be placed on the topmost level.

Figure 56 The Target Destination

■ Click ![+/-] in the top right of the Raster Window, to include or exclude more rasters in the Raster Window, see Figure 56 above.

The number of rasters may be preset in the Preferred Adv. IOM Settings, please see the section on Setup Program – Preferred Settings on page 69.

Figure 57 Five Rasters in the Raster Window

■ To delete a trace in the Raster Window, click on either ![R] or ![*] to the right of the trace.

■ Then click ![Erase].

■ To return to the window setup, click ![Return].

Viewing a Particular Time Frame

Use the horizontal scrolling control on the window frame to view a particular time frame of the time recording, see Figure 57 above.

■ To enable the scroll bar, click the ![X] button at the lower-right part of the Raster Window, see Figure 57 above. The scroll box moves along the scroll bar.

Continuous Saving of the Signal

■ When you want continuous saving of the signal, click ![Record], and:

■ Then click ![Record...] to stop the recording again, see Figure 58 below.

Figure 58 Continuous Saving of the Signal via the Record. Buttons

In the "status bar", `Size : 1.4Mb`, in the upper-left of the screen below the test name Tut. 1 CH simpl, you can observe as the continuous saving of the signal advances; i.e. the size in Mb increases indicating the amount of recording being saved, see Figure 58 above.

NOTE Continuous recording takes up a large amount of disk space. It requires at least 1 GB hard disk space.

■ When the investigation has been carried out, click `Return` and:

■ Then click `Patient`.

Generating a Report
■ If you wish to generate a report, click on the box to the right of the trace in the Raster Window, thus providing further buttons for changing the parameters. Among these you will find the `Report` button.

■ If the `Report` button is not displayed, then click `Return`, and then:

■ Click `Report`, and Report will be printed.

If you wish to change the subset of traces to be included in the report, proceed as follows:

■ By clicking on `R` to the right of the trace in the Raster Window, further buttons for changing the parameters appear. These buttons will allow you to tailor-make the report to suit your requirements.

■ For instance, clicking the "not in report" will exclude this and all traces above from the report. Traces included in the report, are marked with an `R`.

You may select the contents of your report in the Modality Setup Menu on page 60 ff in the section "***Report".***

Obtaining a Review of the Investigation

■ Click on the patient in question in the Patient Data Window.
■ Select Office Mode by clicking `Office`.
■ Then click `OK`, producing the Test Menu.
■ Select the selectable test provided with a red dot, which produces the review of the test/investigation just performed.

If you select a trace in the Raster Window, it is possible to view the curve *live* in the Trace Window:

■ By clicking the `◁`, and `◁ ⚊`, you may listen to ordinary sound, or Clip Sound.

Tutorial 2

5 Channels Simple

Tut. 5 CH simpl.

This tutorial describes the use of the program for 5 channel recordings

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NOTE A Switch Box is a prerequisite for running this test.

Starting the Leadpoint™

- Turn the power switch on.
- Turn the computer on.
- Before you begin, please close all other programs currently running on your computer.
- Double-click the Leadpoint™ icon on your Windows desktop. The program will perform a swift self test, before displaying the Start Page, see Figure 59 below:

Figure 59 The Start Page of Leadpoint™

- Click [Start] on the Start Page, and the ***Patient Data Window*** appears see Figure 59 above.
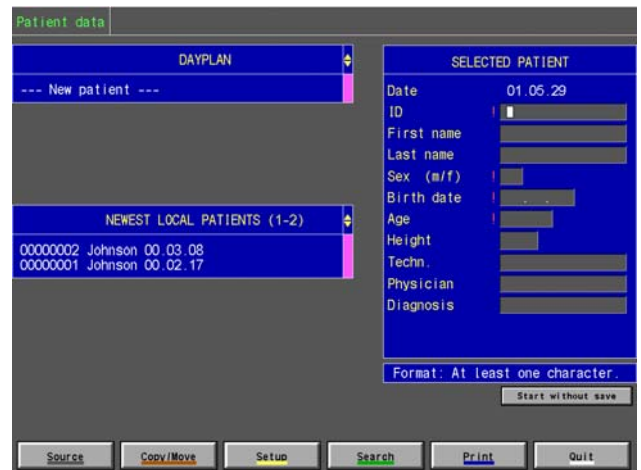
Figure 60 The Patient Data Window

Entering Patient Data

- Enter the patient data in the Selected Patient box. All the boxes marked with an "!" have to be filled in at a minimum, otherwise the program cannot proceed, see Figure 60 above.

  When the Patient data has been entered, an [OK] button appears in the lower right of the Selected Patient box.

- Click [OK] to proceed to the Select Test Menu, see Figure 61 below.
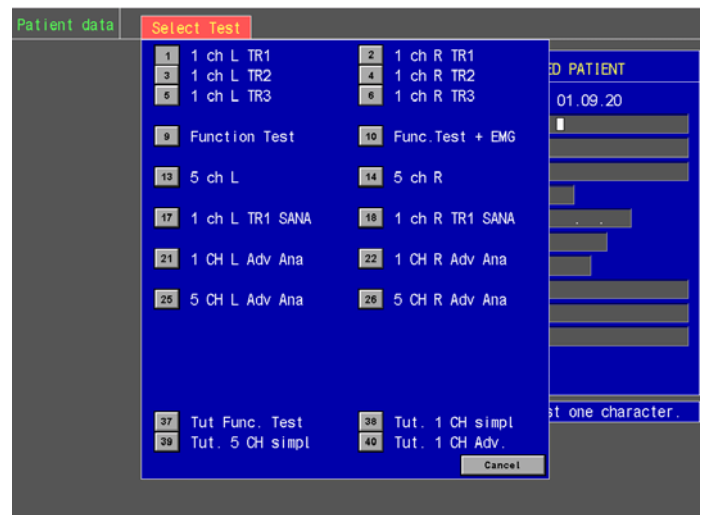
Figure 61 The Select Test Menu

Selecting the Test

■ In the Select Test Menu, click the selectable button number `39` named Tut. 5 CH simpl, see Figure 61 above.

Having selected the test, the window setup for Tutorial 2 appears, see Figure 62 below:

Figure 62

Selecting the Trace 4

■ You select trace 4 by clicking on the Information Box "Posterior" situated to the right of the trace in the Trace Window. See Figure 63 below.
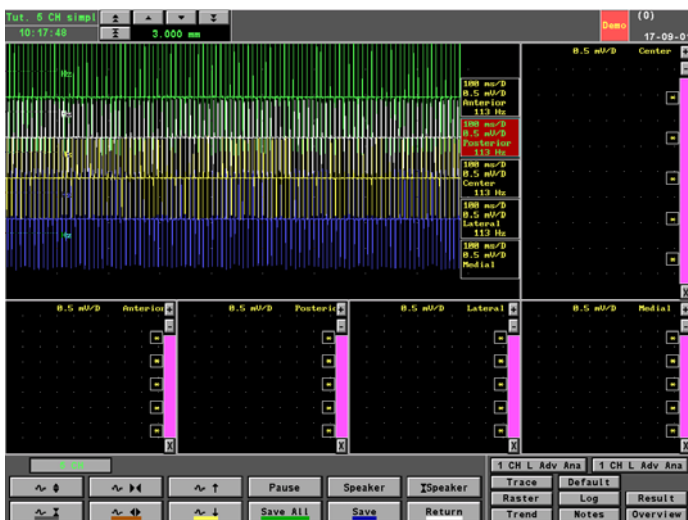
Figure 63

Saving all the Traces

■ Then wait 10 seconds, before you save the trace by clicking `Save All`. This will save the traces

1-4 in the relevant Raster Windows see Figure 64 below.

NOTE After altering the position of the electrode, please wait 10 seconds, before you save the signal to avoid that different positions are being saved to the same trace. The Leadpoint™ is preset to save 10 seconds of the sweep.
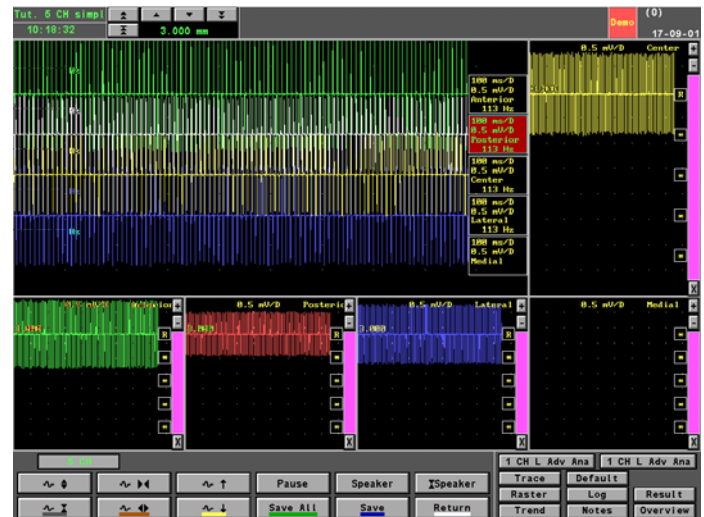
Figure 64

Selecting the Trace 5

■ You select trace 5 by clicking on the Information Box "Medial" situated to the right of the trace in the Trace Window.

■ Then click `Resume` to record from the trace.

■ Press the button for trace 5 on the Switch Box and then wait 10 seconds, before you save the trace by clicking `Save`.

Selecting the Trace 4

■ You select trace 4 by clicking on the Information Box "Posterior" situated to the right of the trace in the Trace Window.

■ Then click `Resume` to record from the trace.

■ Press the button for trace 4 on the Switch Box.

Altering the Distance to the Target

A number of additional controls are provided in a small toolbar in the upper-left of the screen, see Fig. x above. These controls make it possible to decrease, or increase the dis-

tance to the target by mm macro steps and by mm micro steps.
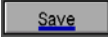
- Alter the distance to the target from -3.000mm to -2.000mm by clicking ▼ (to decrease the distance by mm macro steps). For further information on Small Toolbar Controls, please see page 24 in the section on the Electrode-positioning System.

Saving all the Traces
- Then wait 10 seconds, before you save the trace by clicking **Save All**. This will save the traces 1-4 in the relevant Raster Windows.

Selecting the Trace 5
- You select trace 5 by clicking on the Information Box "Medial" situated to the right of the trace in the Trace Window.
- Then click **Resume** to record from the trace.
- Press the button for trace 5 on the Switch Box and then wait 10 seconds, before you save the trace by clicking **Save**.

Selecting the Trace 4
- You select trace 4 by clicking on the Information Box "Posterior" situated to the right of the trace in the Trace Window.
- Then click **Resume** to record from the trace.
- Press the button for trace 4 on the Switch Box.

Altering the Distance to the Target
- Alter the distance to the target from -2.000mm to -1.000mm by clicking ▼ (to decrease the distance by mm macro steps).

Saving all the Traces
- Then wait 10 seconds, before you save the trace by clicking **Save All**. This will save the traces 1-4 in the relevant Raster Windows.

Selecting the Trace 5
- You select trace 5 by clicking on the Information Box "Medial" situated to the right of the trace in the Trace Window.
- Then click **Resume** to record from the trace.

- Press the button for trace 5 on the Switch Box and then wait 10 seconds, before you save the trace by clicking **Save**.

Selecting the Trace 4
- You select trace 4 by clicking on the Information Box "Posterior" situated to the right of the trace in the Trace Window.
- Then click **Resume** to record from the trace.
- Press the button for trace 4 on the Switch Box.

Altering the Distance to the Target
- Alter the distance to the target from -1.000mm to 0.000mm by clicking ▼ (to decrease the distance by mm macro steps).

Saving all the Traces
- Then wait 10 seconds, before you save the trace by clicking **Save All**. This will save the traces 1-4 in the relevant Raster Windows.

Selecting the Trace 5
- You select trace 5 by clicking on the Information Box "Medial" situated to the right of the trace in the Trace Window.
- Then click **Resume** to record from the trace.
- Press the button for trace 5 on the Switch Box and then wait 10 seconds, before you save the trace by clicking **Save**.

Selecting the Trace 4
- You select trace 4 by clicking on the Information Box "Posterior" situated to the right of the trace in the Trace Window.
- Then click **Resume** to record from the trace.
- Press the button for trace 4 on the Switch Box.

Altering the Distance to the Target
- Alter the distance to the target from 0.000mm to 1.000mm by clicking ▼ (to decrease the distance by mm macro steps).

Saving all the Traces
- Then wait 10 seconds, before you save the trace by clicking **Save All**. This will save the traces 1-4 in the relevant Raster Windows.

Selecting the Trace 5

- You select trace 5 by clicking on the Information Box "Medial" situated to the right of the trace in the Trace Window.

- Then click [Resume] to record from the trace.

- Press the button for trace 5 on the Switch Box and then wait 10 seconds, before you save the trace by clicking [Save].

Selecting the Trace 4

- You select trace 4 by clicking on the Information Box "Posterior" situated to the right of the trace in the Trace Window.

- Then click [Resume] to record from the trace.

- Press the button for trace 4 on the Switch Box.

Altering the Distance to the Target

- Alter the distance to the target from 1.000mm to 2.000mm by clicking [▼] (to decrease the distance by mm macro steps).

Saving all the Traces

- Then wait 10 seconds, before you save the trace by clicking [Save All]. This will save the traces 1-4 in the relevant Raster Windows.

Selecting the Trace 5

- You select trace 5 by clicking on the Information Box "Medial" situated to the right of the trace in the Trace Window.

- Then click [Resume] to record from the trace.

- Press the button for trace 5 on the Switch Box and then wait 10 seconds, before you save the trace by clicking [Save].

Selecting the Trace 4

- You select trace 4 by clicking on the Information Box "Posterior" situated to the right of the trace in the Trace Window.

- Then click [Resume] to record from the trace.

- Press the button for trace 4 on the Switch Box.

Altering the Distance to the Target

- Alter the distance to the target from 2.000mm to 3.000mm by clicking [▼] (to decrease the distance by mm macro steps).

Saving all the Traces

- Then wait 10 seconds, before you save the trace by clicking [Save ALL]. This will save the traces 1-4 in the relevant Raster Windows.

Selecting the Trace 5

- You select trace 5 by clicking on the Information Box "Medial" situated to the right of the trace in the Trace Window.

- Then click [Resume] to record from the trace.

- Press the button for trace 5 on the Switch Box and then wait 10 seconds, before you save the trace by clicking [Save].

TIP You may select the trace by toggling the move/select button up down on the dedicated keyboard, see Figure 8. The dedicated keyboard is not functional in Demo Mode.

Tutorial 3

Functional Test

NOTE This tutorial may not be run in Demo Mode.

Starting the Leadpoint™
- Turn the power switch on.
- Turn the computer on.
- Before you begin, please close all other programs currently running on your computer.

- Double-click the Leadpoint™ icon on your Windows desktop. The program will perform a swift self test before displaying the Start Page, see Figure 65 below:
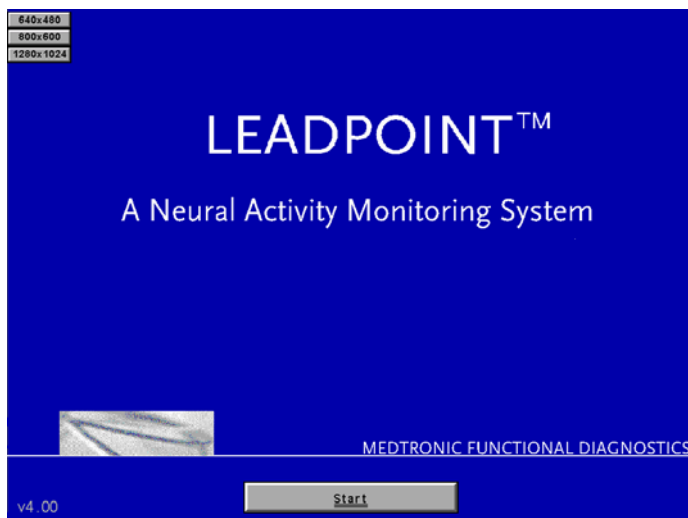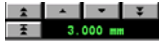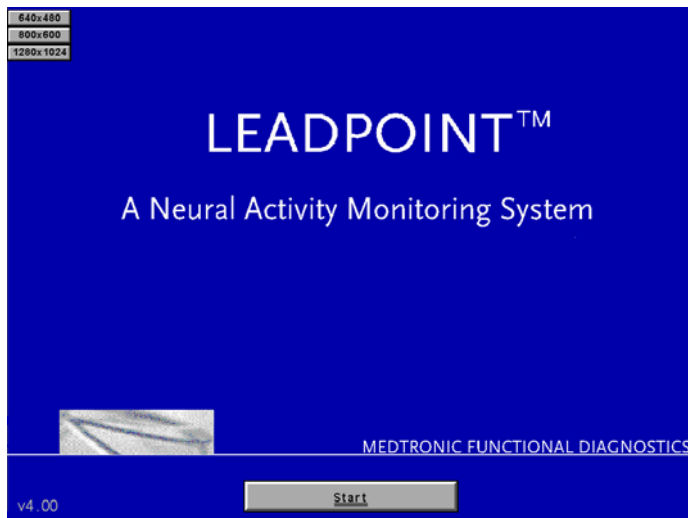

Figure 65 The Start Page of Leadpoint™

- Click [Start] on the Start Page, and the Patient Data Window appears, see Figure 73 above.
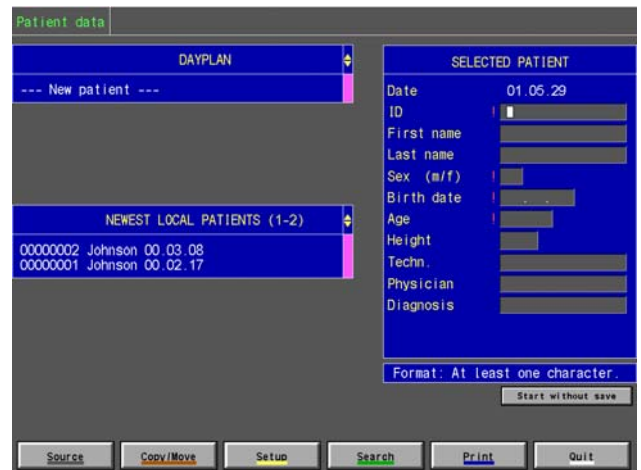
Figure 66 The Patient Data Window

Entering Patient Data
- Enter the patient data in the Selected Patient box. All the boxes marked with an "!" have to be filled in at a minimum, otherwise the program cannot proceed, see Figure 66 above.

  When the Patient data has been entered, an [OK] button appears in the lower right of the Selected Patient box.

- Click [OK] to proceed to the Select Test Menu, see Figure 67 below.
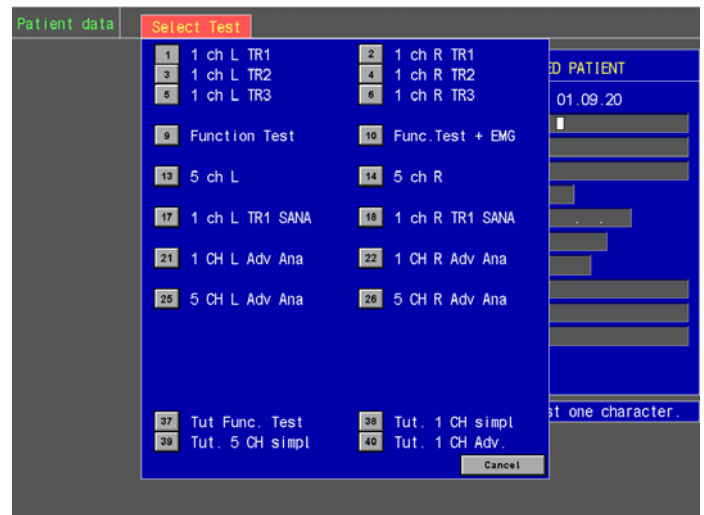
Figure 67 The Select Test Menu

Selecting the Test

■ In the Select Test Menu, click the selectable button number `37` named Tut. Func. Test, see Figure 67 above.

Having selected the test, the window setup for tutorial 3 appears, see Figure 68 below:
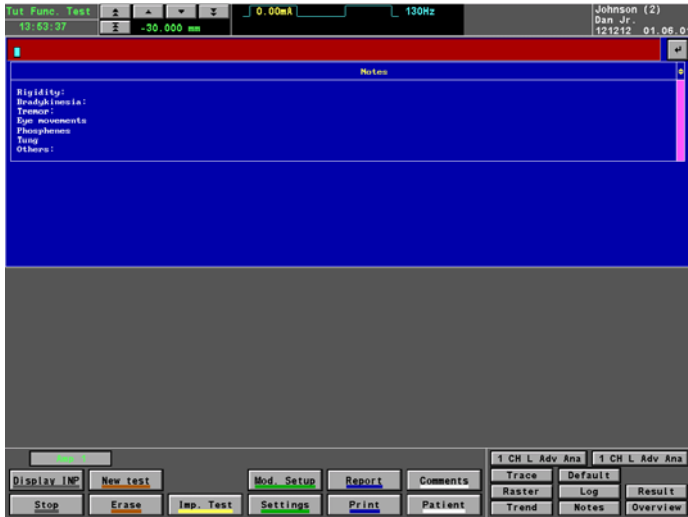
Figure 68 Upper-centermost position: the Status Bar

Stimulation

The small Status Bar , situated to the right of the small toolbar, indicates the values of mA, ms and Hz.

The functionality of the stimulating option is unavailable, when the Status Bar is rendered with a dimmed appearance.

■ Click the Function Button Start to make the stimulation option available.

For stimulation purposes, use ***The Dedicated Keyboard*** see page 12.

Stimulus Intensity

■ To increase, or decrease the stimulus intensity, use the Intensity Wheel (6) on the dedicated keyboard.

Repetitions Rate

■ To increase, or decrease the stimulation rate, use the repetition rate button (10) on the dedicated keyboard. See page 12 ***The Dedicated Keyboard***.

Stimulus Duration

■ Adjust the duration of the stimulating pulse, by using the Stim duration buttons (9) on the dedicated keyboard. See page 12 ***The Dedicated Keyboard***.

Single Stimulus

■ For single stimulus, press the Single stimulus button (7) on the dedicated keyboard. See page 12 ***The Dedicated Keyboard***.

Repetitive Stimulus

■ For repetitive stimulus, press the repetitive stimulation button (8) on the dedicated keyboard. To stop the repetitive stimulus, press this button again, or press the button for single stimulus. See page 12 ***The Dedicated Keyboard***.

Tutorial 4

One Channel Advanced

Starting the Leadpoint™
- Turn the power switch on.
- Turn the computer on.
- Before you begin, please close all other programs currently running on your computer.

- Double-click the Leadpoint™ icon on your Windows desktop. The program will perform a swift self test before displaying the Start Page, see Figure 69 below:
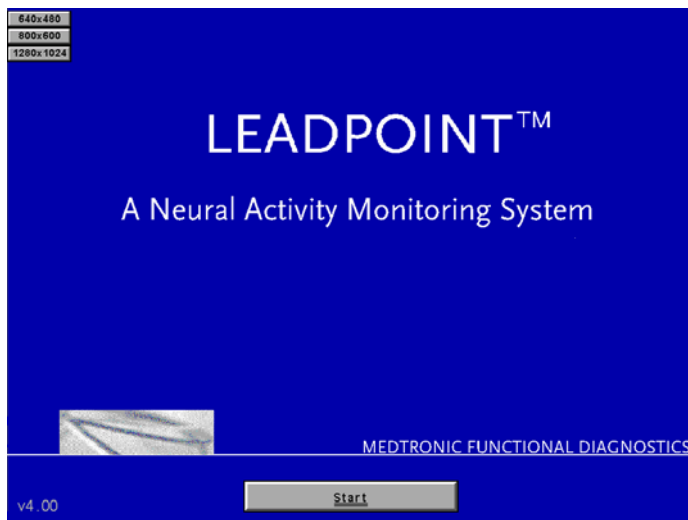
Figure 69 The Start Page of Leadpoint™

- Click Start on the Start Page, and the Patient Data Window appears, see Figure 69 above.

Figure 70 The Patient Data Window

Entering Patient Data
- Enter the patient data in the Selected Patient box. All the boxes marked with an "!" have to be filled in at a minimum, otherwise the program cannot proceed, see Figure 70 above.

When the Patient data has been entered, an OK button appears in the lower right of the Selected Patient box.

- Click OK to proceed to the Select Test Menu, see Figure 71 below.
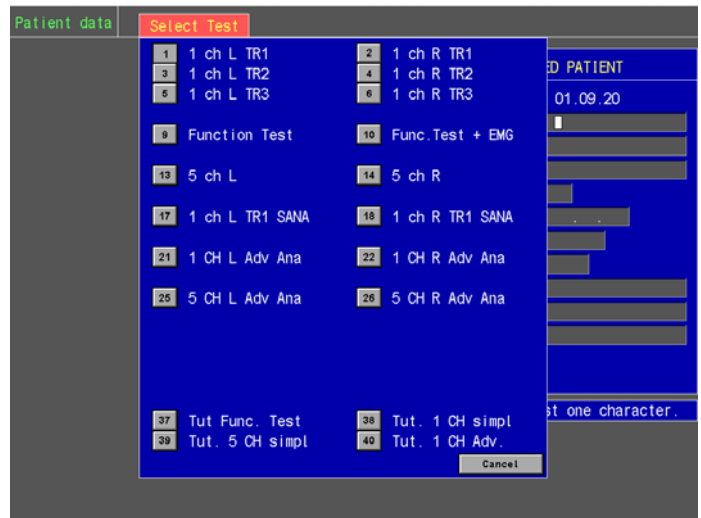
Figure 71 The Select Test Menu

Selecting the Test
- In the Select Test Menu, click the selectable button number 40 named Tut. 1 CH Adv., please see Figure 71 above.

Having selected the test, the window setup for tutorial number 4 appears, including a Trace Window (top), a Raster Window, a Result Window (bottom to the left), and an Overview Window (bottom to the right), please see Figure 72 below. The Notes Window and the Log Window are defined, and can be displayed, too, (see page 22 on the Zoom Options).

Figure 72 Tutorial no 4: Tut.1 CH ADV.

Adjusting the Frequency Triggering
■ Adjust the frequency triggering to just above the baseline noise in the Trace Window.

Selecting the Trace
■ Select the trace by clicking on the Information Box in the Trace Window.

■ Then wait 10 seconds, before you save the trace by clicking Save to complete the data saving.

NOTE After altering the position of the electrode, please wait 10 seconds, before you save the signal to avoid that different positions are being saved to the same trace. The Leadpoint™ is preset to save 10 seconds of the sweep.

Setting/Adjusting the Distance to Target
A number of additional controls are provided in a small toolbar [-5.000 mm] in the upper-left part of the screen, see Figure 72 above. These controls make it possible to decrease, or increase the distance to the target by mm macro steps and by mm micro steps. For further information on the small toolbar controls, please see page 23 in the section on the Electrode Positioning System.

Altering the Distance to Target
■ The next step is to advance the electrode, and to alter the distance to the target via the small tool bar. For instance, change the figure from -5.000mm to -4.000mm by clicking [▼] in the small toolbar.

■ After altering the distance to the target, please hold 10 seconds, before you click Save to complete the data saving, see Figure 73 below:

Figure 73 The Distance to the Target is -4.000mm

Using the Zoom Options
If you wish to view a particular window in one of the predefined sizes, and/or select one of the predefined window screen compositions, use the various Zoom Options see Figure 75 below.
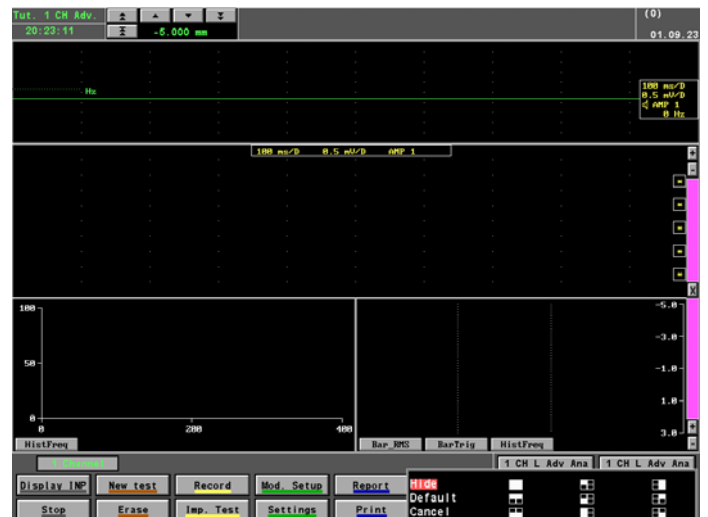
Figure 74 The Multiple Selection List Box
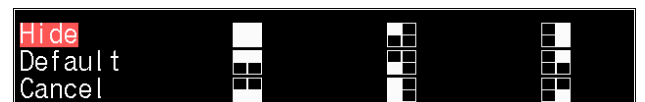
Figure 75 The Multiple Selection List Box

For instance, if you wish to increase the size of the Result Window to a full-screen display, please follow these steps:

■ Click **Result** in the lower-right part of the screen, and the Multiple Selection List Box appears, displaying a list of options, see Figure 75. (The Multiple Selection List Box is available for the following windows: Trace, Raster, Trend, Log, Notes, Result and Overview).

NOTE The Multiple Selection List Box will remain available for 10 seconds only. In order to keep the Multiple Selection List Box displayed, and to select an option, position the mouse pointer on the Zoom Option that you want to select, while holding down the mouse button. Release the mouse button, and the option becomes selected.

■ Then click the "Full Screen Display" button, which is situated in the topmost level in the second column to the left (see Figure 75 above), and the selected window size appears.

■ To restore the window to its previous setup and size, click **Default** in the lower-right part of the screen and the setup as shown in Figure 75 above appears.

For further information on the Zoom Options, please see page 22.

Altering the Distance to -3.000mm
■ Then select the trace again by clicking on the Information Box in the Trace Window.

■ Alter the distance to the target from -4.000 to -3.000mm. Please see Figure 76 below:

■ Then wait 10 seconds, before clicking **Save** to complete the data saving.

Figure 76 The Distance to the Target is -3.000mm

Altering the Distance to -2.000mm
■ Alter the distance to the target from -3.000 to -2.000mm see Figure77 below:

■ Then wait 10 seconds, before clicking **Save** to complete the data saving.

Figure77 The Distance to the Target is -2.000mmThe Result and the Overview Windows

Clicking anywhere in the Result Window, or the Overview Window will produce a pop-up window. It displays additional information on the abbreviated form of the name on the button in the window. See also Analyzing the Signals on page 26 ff.
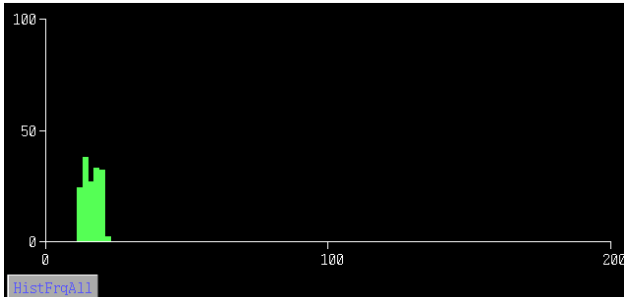
Figure 78 The Result Window and the HistFrqAll Button in the Lower-left part of the Window.
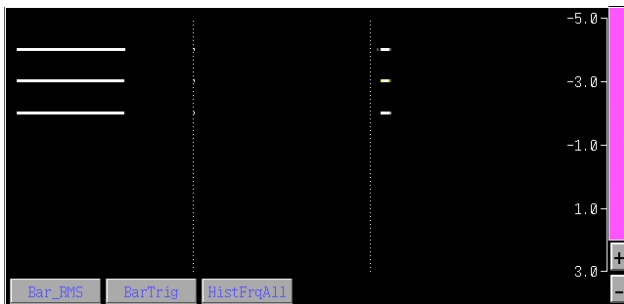
Figure 79 The Overview Window and the Bar-RMS, the BarTrig, the HistFrqAll Buttons, and the Ruler Scale in the Lower-right part of the Window

Clicking the buttons of Bar_RMS, BarTrig and HistFrqAll in the Result and the Overview Windows, will display the relevant curves. The black color indicates that the button is active and that the curve is displayed. The yellow color indicates that the button is inactive and therefore the curve is not displayed.

Altering the Distance to -1.000mm
■ Alter the distance to the target from -2.000 to -1.000mm, see Figure 80 below:

Figure 80 The Distance to the Target is -1.000mm

■ Then wait 10 seconds, before clicking [Save] to complete the data saving.

Altering the Distance to 0.000mm
■ Alter the distance to the target from -1.000 to 0.000mm, see Figure 81 below.

■ Then wait 10 seconds, before clicking [Save] to complete the data saving.
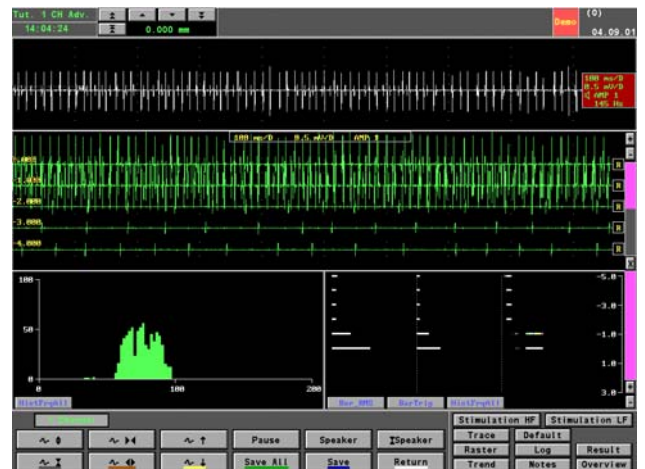
Figure 81 Ruler Scale situated on the right frame in the Overview Window

The Ruler Scale

In the Overview window, a Ruler Scale is provided on the right window frame border providing the distance at the point of departure including the various distances altered during the travel, see Figure 79 above. See also page 27.

■ By using ⊞ you can increase, or decrease the distance in the Ruler Scale.

Figure 82 Ruler Scale Decreased by One Step

Figure 83 Ruler Scale Increased by Four Steps

Altering the Distance to 1.000mm

■ Alter the distance to the target from 0.000 to 1.000mm, see Figure 84 below.

■ Then wait 10 seconds before clicking Save to complete the data saving.

Figure 84 The Electrode Has Passed the Target by 1.000mm

Altering the Distance to 2.000mm

■ Alter the distance to the target from 1.000 to 2.000mm; see Figure 85 below.

■ Then wait 10 seconds, before clicking Save to complete the data saving.
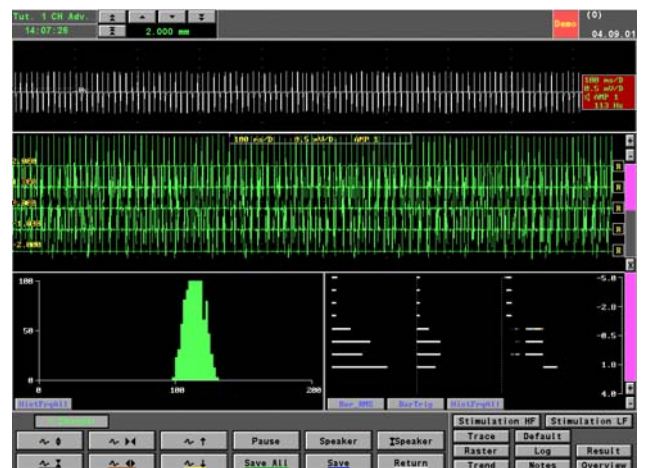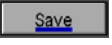
Figure 85 The Electrode Has Passed the Target by 2.000mm

Altering the Distance to 3.000mm

■ Alter the distance to the target from 2.000 to 3.000mm, see Figure 86 below.

■ Then wait 10 seconds, before clicking Save to complete the data saving.
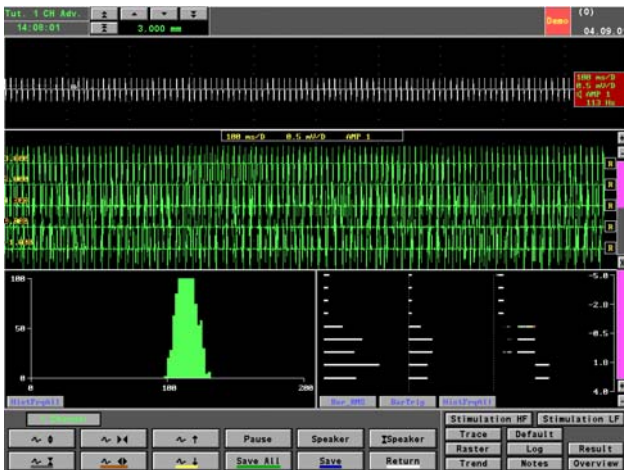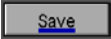
Figure 86 The Electrode Has Passed the Target by 3.000mm

Figure 88 The Electrode Has Passed the Target by 4.000mm

Altering the Distance to 4.000mm

■ Alter the distance to the target from 3.000 to 4.000mm; see Figure 87 below.

■ Then wait 10 seconds, before clicking ☐ Save to complete the data saving.

Altering the Distance to 6.000mm

■ Alter the distance to the target from 5.000 to 6.000mm, see Figure 89 below:

■ Then wait 10 seconds, before clicking ☐ Save to complete the data saving.

Figure 87 The Electrode Has Passed the Target by 4.000mm
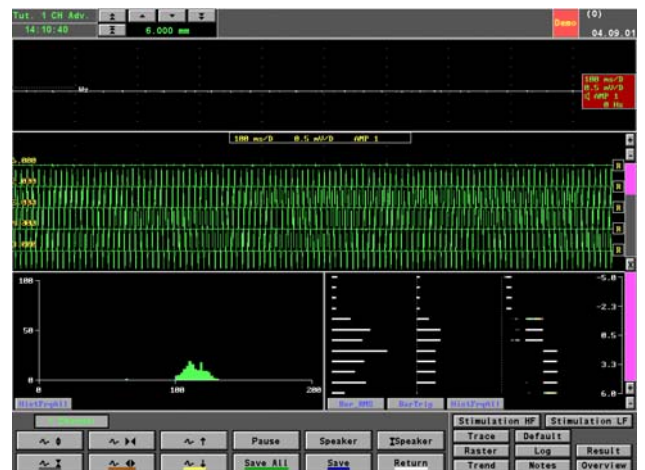
Figure 89 The Electrode Has Passed the Target by 6.000mm

Altering the Distance to 5.000mm

■ Alter the distance to the target from 4.000 to 5.000mm, see Figure 88 below:

■ Then wait 10 seconds, before clicking ☐ Save to complete the data saving.

Altering the Distance to 7.000mm

■ Alter the distance to the target from 6.000 to 7.000mm, see Figure 90 below:

■ Then wait 10 seconds, before clicking ☐ Save to complete the data saving.
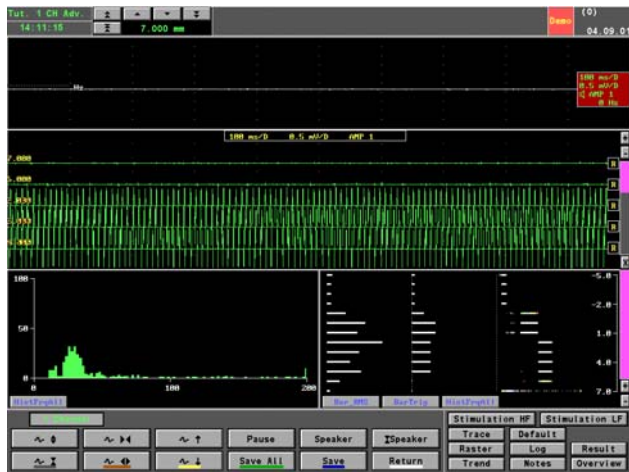
Figure 90 The Electrode Has Passed the Target by 7.000mm

Generating a Report

■ If you wish to generate a report, click on the box to the right of the trace in the Raster Window, thus providing further buttons for changing the parameters. Among these you will find the ⟨ Report ⟩ button.

■ If the ⟨ Report ⟩ button is not displayed, then click ⟨ Return ⟩, and then:

■ Click ⟨ Report ⟩, and Report will be printed.

■ To return to the test, click ⟨ Patient ⟩ in the Patient Data Window.

If you wish to change the subset of traces to be included in the report, proceed as follows:

■ By clicking on ⟨R⟩ to the right of the trace in the Raster Window, further buttons for changing the parameters appear. These buttons will allow you to tailor-make the report to suit your requirements.

■ For instance, clicking the "not in report" will exclude this and all traces above from the report. Traces included in the report, are marked with an ⟨R⟩.

You may select the contents of your report in page 60 ff in the section "*Report"*.

Frequently Asked Questions

Markers cannot be moved

Markers cannot be moved, before the modality is stopped. This is to avoid moving a marker when a new trig occurs. A modality is running, if the middle-top part of the screen has taken on a black background color.

No curve updating, all though the stimulation has been started by pressing the repetitive or the single stim button.

The reason may be that a stimulated modality has to be started.

A curve with Trig$_2$ as trig source is not updated.

Trig$_2$ may be used for multiple (alternating) stimulators. A single stimulation will always cause a trig 1. A single stimulus occurs, if the single stim button on the dedicated keyboard is pressed, or if a stim EMG modality is started.

Handling Patient Data

Figure 91 The Patient Data Window

For every day use, please see the chapter on "Using the Program".

Reviewing previous investigations

Patient Catalogue

The Patient Catalogue is used throughout the manual, referring to the Newest Local Patients list of investigated patients in the lower left part on the screen. The title line shows the current Patient Catalogue *Source* (see the section later in this chapter).

All signals, comments and results are stored automatically during an investigation, provided that you do not start the investigation with the *Start without Save* button. The patients who have undergone an investigation are listed in the Newest Local Patients box in the Patient Data Window. This list may be retrieved in order to review previous investigations. The 8-digit number is a running investigation number allocated by Leadpoint™.

■ Select and click on a patient in the Newest Local Patients box.

NOTE Leadpoint™ automatically goes into OF-FICE mode when the patient data has been stored for more than 24 hours.

In OFFICE mode, you can modify notes in the Log, however, it is not possible to record new data. Use the OFFICE mode to review the patient data and to prevent accidental change, or loss of data.

■ Click [Office] to switch between OFFICE mode and normal recording mode.

■ Click [OK] to reach the Test Setup Menu.

Select patient from The Newest Local Patients Box if found there, otherwise select from DAY-PLAN (1)

Start without save is clicked to start an investigation but without saving any data or signals, i.e. no entry in the Patient Catalogue is created when returning to Patient page. It is not necessary to insert patient data before activating this function.

Searching for Patient Data

You can search through all catalogues for patient data, or for previously conducted investigations in the following way:

■ Go to the Patient Data window, and:
■ Click [Search] in the bottom of the window, and a search dialog box appears as shown in the figure below:
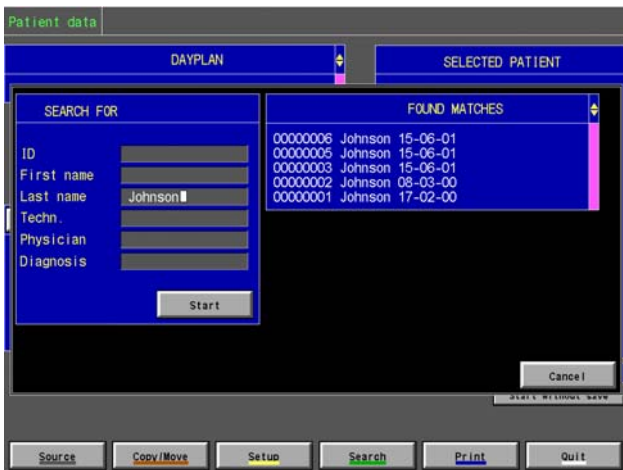
Figure 92 Search in all Catalogues for Patients.

■ Enter the patient data in the box "SEARCH FOR", and click [Start]. The patients matching the   data just entered in the search box will be displayed in the Found Matches box situated to the right of the search box. The figure above displays all the matches for the search profile "Johnson".

The search is performed not only in the patient catalogue for the newest investigations, but all over the Leadpoint™ catalogues (directories), i.e Newest patients (last 200), External and all Archives found on both the local hard disk and on the network server, if used and connected. Please refer to section Setup System for definition of directories.

Press *Stop* to end the search.

To return to the Patient Data Window with the selected patient data:

■ Select and click on the patient in question in the Found Matches box, and the data will be displayed in the Selected Patient box, and highlighted in the Newest Local Patient box.
■ Click [Cancel] to quit the search.

Please note that patients currently locked by another Leadpoint™ on the same network will not be visible to the search-routine.

The Found Matches window will remain filled out until a new search is performed.

Source

Leadpoint™ can hold patient data in different directories for definition of directories. By default, Leadpoint™ will always start up in the Newest patient source catalogue (local or network) and new patient data will always be placed in this. To select another source for reanalyze click *Source.* Click e.g. in *Archive* (local or network) and in the right hand side window, click the investigation range of interest, note the investigation date range.
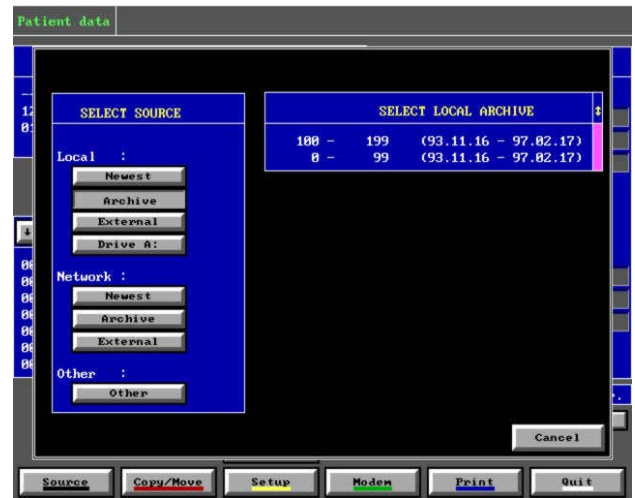
Figure 93 To select another Source.

Click in *Other* and enter a directory using the PC keyboard to address directories outside the Leadpoint™ directories. Reanalyzing an investigation from another source than newest patients will temporarily put Leadpoint™ in office-mode to prevent accidental change or loss of measured data.

NOTE When the source is a directory on the network, do NEVER disconnect the network by pulling out the network-cable.
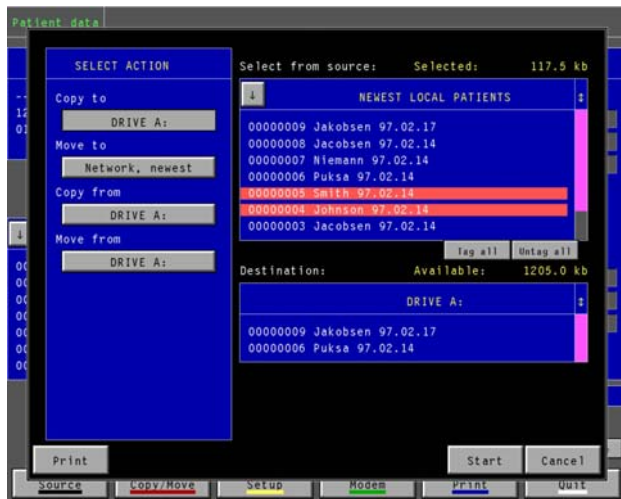
Figure 94 Select the Copy, or Move Action in the Left hand Side of the Window.

Copy/Move

To copy patient files to another media or to move patient files away from the Leadpoint™, use the *Copy/Move* utility.

In the left-hand side window the action is selected, copy or move, and the source/ destination. Copy and move will always operate on the selected Source (see Figure 94 above), either copy/move to the selected source or copy/move from the selected source.

In the right hand side window, patients are selected and the current content of source and destination is displayed. The upper window shows the contents of the chosen source, the lower window the chosen destination.

Select from upper window which patient files are to be copied/moved.

NOTE the selected and available fields, which display how many kBytes are selected for copy/move and how many are available on the destination. If available disk space is less than that required in selection, the selected field turns red. Otherwise, the color is yellow. Untag patients until selected is yellow colored.

NOTE that copying to newest patients always renumbers the investigations to preserve the continuous numbering on the destination.

- Click Start to start the copy/move.
- Click Cancel to abort the copy/move.

Deleting Patient Data
To delete all data related to an investigation, follow these steps:
- Select and click on a patient in the Newest Local Patients box in the Patient Data window, and then:
- Click ▢ Delete , and the small dialog box appears: delete all data, are you sure?
- Click Yes, and the data will be removed from the Filed Patient list. Once the data has been deleted, it will not be recoverable.

Features

ID check and automatic age calculation are performed according to the ID format setup in *Setup local*.

If Leadpoint™ is used in a network, the Filed Patients list is updated at a time interval set in *Setup system*.
Number of patients to be stored in The Newest Local Patients Box is also set in *Setup system*.

When the Newest Local Patients Box is full, the oldest data are transferred to the archive directory as set in *Setup system*.

Patient Data Window Buttons

Delete: use this button to delete the patient data selected in The Newest Local Patients Box.

New invest: use this feature to create a new investigation for the patient in question.

Office: use this feature to review the patient in Office Mode , or in Leadpoint™ mode. Office Mode will reduce the possibility of erroneous overwriting the signal data with new data.

OK: use this button to accept the current patient data information.

Print: use this feature to make a screen dump of this page on the selected printer.

Quit: clicking this button will terminate the application.

Search: to search in all the catalogues.

Source: to go to Source Selection Menu.

Setup: to go to the Setup Menu.

Start without save: will start an investigation without having to enter the patient's name, age, ID etc. NOTE that all data will NOT be saved when returning to the Patient Data Window.

Technical Reference

Setup
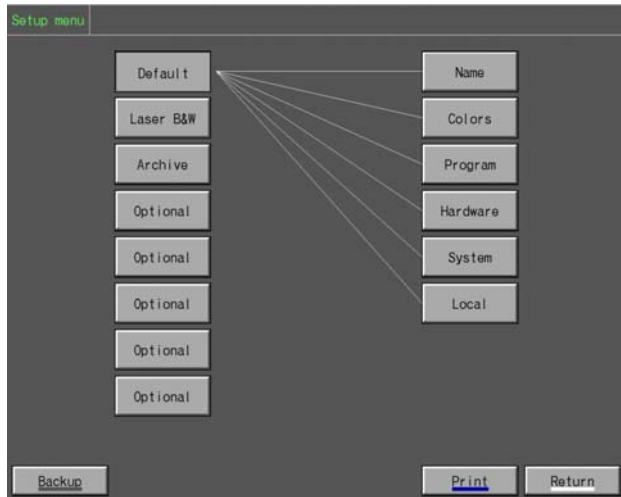
Figure 95 The Main Setup Menu

Select Setup

The first (topmost) setup is always selected when Leadpoint™ is started. To select another setup, follow these steps:

- In the Patient Data Window, click on Setup. Then:
- Click on one of the eight buttons in the left column, to select one of the setups.
- Click on Backup to jump to the Backup Menu.
- Click on Return. The selected setup is now loaded, and will be used immediately.

Security

Starting Leadpoint™ with the command line option 'LP /NOSETUP' prevents a user from accessing the entire Setup section. This feature may be used to ensure that only authorized users are allowed to modify settings and reference values.

Change Setup

The following section describes, how to change the contents of a selected setup. Some are strictly connected to one setup only, while others are common to the Leadpoint™, independent of selected setup (see below). Each setup may be given a name. Follow these steps:

- Click on Select setup.
- Click on Name and insert a new name for this setup just as a reminder.
- Complete the insertion with pressing ENTER ↵ on the PC keyboard.

Setup dependant	Common to all setups
Colors	Program
Hardware	Reference values, preferred settings
System	Local

Setup Colors
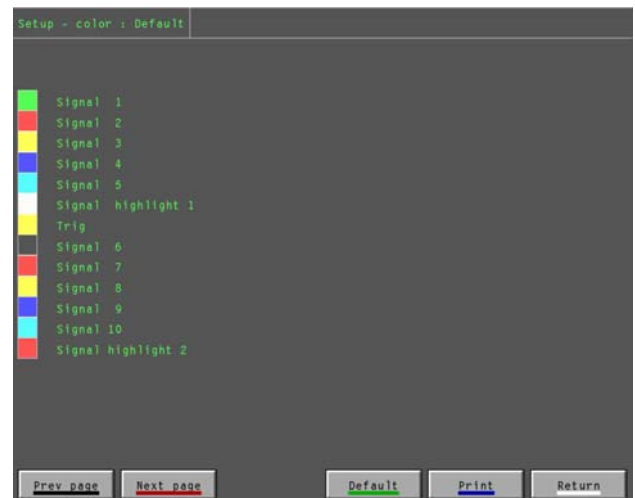
Figure 96 Setup colors

- Click on Setup to be changed.
- Click on *Colors.*
- Click on the small boxes to the left showing the currently selected color.
- Click on *Next page Prev page* to select the page with other color codes.
- Click on *Return* when finished.

Default will return the color setup to factory default. Color setup is individual for each setup.

Program Setup

Figure 97 The Advanced IOM Test Overview Menu

Find the Advanced IOM Test Overview Menu:

- Click [Setup] in the Patient Data Window, and the Main Setup Menu appears.
- And click [Program] thus producing the Advanced IOM Test Overview Menu. This menu provides you with a quick overview.

A test has one or more modalities attached to it. A modality has its own set of settings: channel and stimulator settings etc. Up to 40 tests can be defined in the system. Each test can have up to 16 modalities attached.

MODALITY A modality can be regarded as "a definition of how and from where to capture information, and how to process it", or more technically precise: "A full setup for a single measurement including a number of channels and possibly a stimulator".

A sub program (running a test) can handle setup of multiple modalities, e.g.:

3 modalities: Evoked Potentials left&right alternate free running curves and stimulated curves. Free running curves run all the continuously, the two other types run one at a time.

Menu layout

No: test number.

Test name: is an edit field in which the test is given a name, which describes the investigation.

- Click in the field to start editing, then:
- Press the *Enter* key on the PC Keyboard to finish editing, or press *Esc* to leave it unchanged.

Connected Tests: for each test, up to two short cuts to other tests can be defined. These will appear as labeled buttons on the Acquire screen. The modalities needed for a complicated operation can be divided into several tests and still be accessed very easily. Defining the shortcut buttons, see below:

- Select and click on one of the 40 available boxes in the Test name column (see the figure above), and the blinking pointer indicates that a new name can be entered.
- Complete the data entry by pressing ENTER ↵ on the keyboard. Setup for of Tests

Modalities: a list of all the color-coded modalities provides an overview the defined modalities (on or off). The color code is listed below the modality list. For one test, only five modalities may be listed at the same time. Use the [<] and [>] buttons to view the other modalities. When a modality, and hereby a test is selected, the corresponding button is pressed and framed by a Red Square.

Lower buttons

Save Test: all the tests are saved automatically when the settings menu is left. By activating the *Save Test* button, a single test can be exported and saved in a file. When saving, specify the whole path file name, and press *Enter*. If an entry is regretted, simply press *Esc*.

Restore Test: a single test can be imported from a file, overwriting the currently selected test. When restoring, specify the whole path, and press *Enter*. If an entry is regretted simply press *Esc*.

Notes Setup: press this button to edit the predefined notes. These notes are used in the measurement phase to quickly enter standard phrases in the Log.

Mod. Setup: by pressing this button the Modality Setup Menu appears. All setup for channels, windows, etc. can be made from this menu including the preferred settings.

Print: use this button to print a screen dump of this page on the selected printer.

Return: to return to the Setup - program Menu
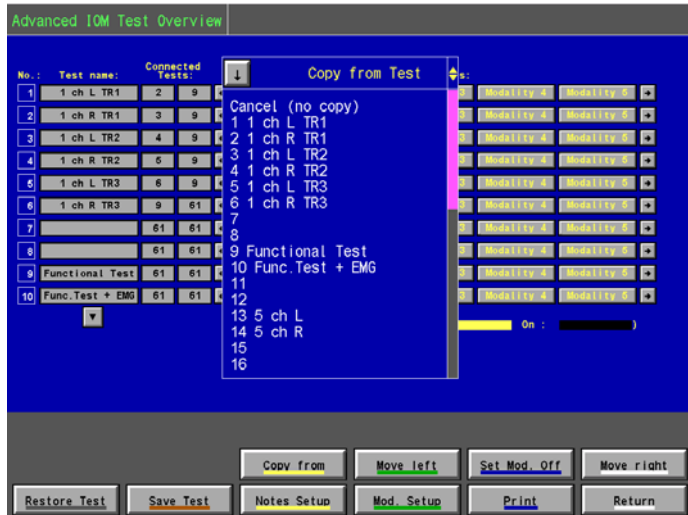
Figure 98 Copy fromTest

Copy from: Copy from Test offers the possibility to copy another test from the list into the current test see Figure 98 above.

■ First select the destination test by clicking one of the modality buttons then:
■ Click the *Copy from* button, and a scroll list appears, then:
■ Select the test from which you want to make copy.
■ Select Cancel, if no copy is wanted.

Move left: this button is used when the modalities have to be rearranged.

■ Clicking the button will move the selected modality one position to the left.
Note that the leftmost modality is the one that is default started when the test is started in the measurement phase.

Set Mod. On/Off: toggles the selected modality on and off respectively. Note that switching a modality off will switch off all the channels for the modality as well. Switching the modality on will have no effect on any channel setup and will **not** switch

the channels on again: this must be carried out manually.

Move right: this button is used when the modalities have to be rearranged. Clicking the button will move the selected modality one position to the right.

Notes Setup menu
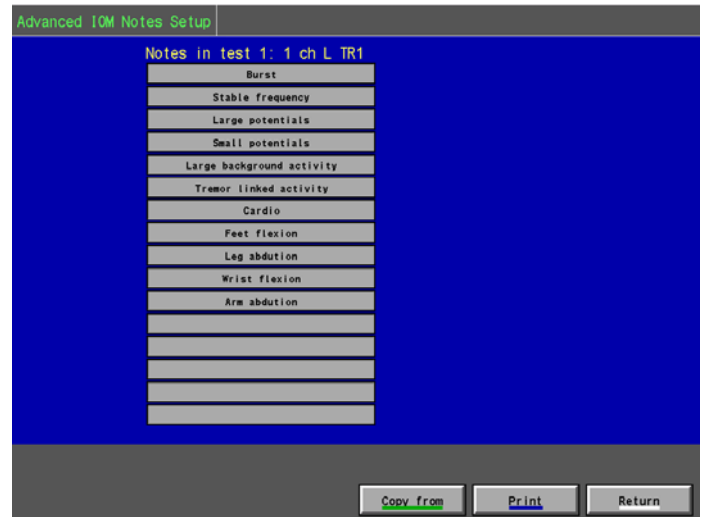
Figure 99 The Advanced IOM Notes Setup Menu.

In the Test Setup Menu:
■ Press *Notes,* and the Advanced IOM Notes Setup Menu appears, see Figure 99 above.

Up to 16 predefined notes can be made. Use this menu to alter the notes. The predefined notes will be displayed in the Notes Window, in the measurement phase. They may be used for fast entry of standard phrases into the Log. See also page 16.

Copy from allows you to copy the notes from another test.

The Modality Setup Menu
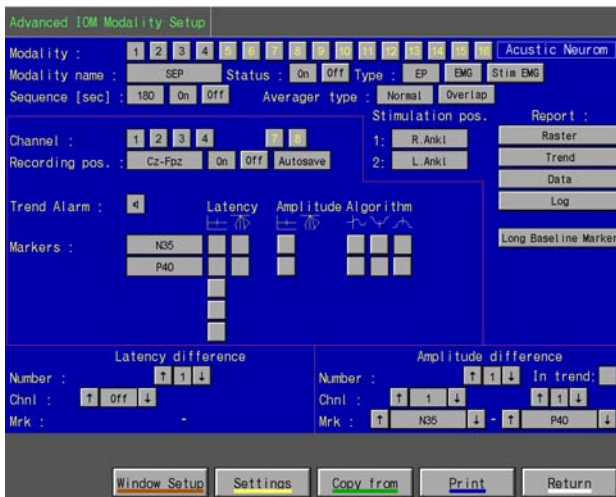
Figure 100 The Advanced Modality Setup Menu

To find the Advanced IOM Test Overview Menu:

■ Click [Setup] in the Patient Data Window, and then the Main Setup Menu appears.

■ Then click [Program], thus producing the Advanced IOM Test Overview Menu.

■ In this menu, click [Mod. Setup] and the Modality Setup Menu appears in which you define the marker.

Menu layout

The name of the test is framed in a text box located in the top right corner of the screen.

Modality: the button pressed is the modality that is currently being edited. The numbers in the buttons are color-coded in the same way as the buttons in the Test Setup Menu.

Modality Name: the name of the modality may be edited by clicking in this field. Press *Enter* on the PC keyboard to finish editing.

Status: indicates the status of the modality, and it corresponds to the functionality: *Set Mod on/off* in the Test Overview Menu. When set on the modality is included in the test. (A corresponding button with the modality name will show up at the acquire screen. Clicking this button provides the following modality options: start, stop, pause, etc.). Please note: when switching off the modality, all channels will be switched off as well, and you have to manually set them on, when the modality is set on again.

Type: in order to handle the various types of measurements, a number of modality types exist:

EP uses any of the stimulators and allows averaging.

Stim EMG uses the current stimulator without averaging.

EMG shows free running curves without stimulators.

Differences as to EMG stimulated and EP and EMG are that EP offers averaging of the input data, and that EMG free running does not use a stimulator. When changing the modality type, all channels for the respective modality will be switched off.

Automatic sequencing of recording may be performed in two ways - depending on the configuration:

1 If either an EP, or a Stim EMG modality has been enabled, and has sequence set to: "On", then the timing specified under Timing [Sec] is used, for further details, please see below.

2 Otherwise, if a free running modality is active and has Auto save set to: "Active", then consecutive curves are recorded. The curve length is specified as the parameter max sweep length on the Settings page.

If neither of the conditions described under 1 or 2 above are fulfilled, the automatic sequenced recording will not be carried out.

Sequence sec: the stimulated modalities (EP and EMG Stim) can be started as a single sequence, or a recurrent sequence with a given interval.

For instance, when one EP modality is started, and when the averager auto stop is reached for all channels, another EP modality is started. When auto stop is reached for all channels for a single sequence, it stops. For a recurrent sequence, all modalities automatically start and run until auto stop.

Timing for a sequence is defined by setting a recurrent time for a modality, e.g. every 180 sec. (3 min.) Another modality could have a recurrent time at 1200 sec. (20 min.).

For EMG Stim modalities, one stimulation will be performed automatically at each start of the modality.

For EP modalities, repetitive stimulation will be performed, when the modality is started (until Auto stop is reached). Any number of modalities can be scheduled for this type of sequencing.

Sequencing timing rules: if several runs happen to be scheduled to start at the same time, they will be queued. The modality with the shortest interval between runs will take priority over the others.

No more than one instance of each modality can be queued. This ensures that also "low-prioritized" modalities (those with long intervals) will be run.

When a sequence is started, all included modalities will immediately be queued for running (using the queuing principle described above). After this, they will recur with their individual intervals.

If a sequence is started, while an ordinary modality is running, this modality will be stopped abruptly, and the sequence will start; and vice versa, when a modality is started manually by the user, while a sequence is running, the sequence will be stopped immediately.

Averager type: for the EP modality type, it is possible to specify the type of averaging applied, namely: *normal,* or *overlap(ping):*

An overlapping averager is utilized to obtain a faster response to changes in the patient's condition: the time (T) to make an averaging depends on the auto stop end settings of the stimulation frequency. A high stimulation provides a fast averaging, however, it may reduce the quality of signal due to physiological reasons. A low value of auto stop causes a much too noisy signal. It is important that the time from a change in the patient's condition until the averaged curve changes be as low as possible.

For a normal averager, the time is between T and 2 x T.

For an *overlapping* averager, however, the time is between T and 1.2 x T, which is 1.4 times faster in comparison to normal mode.

Technical Note*:* at the first start of the modality, the first N sweeps are averaged normally. At subsequent starts of the modality, the oldest N/5 sweeps are automatically discarded and replaced with new N/5 sweeps, before the auto stop is reached (N is the auto stop number on the settings page). After having pressed **_Erase_**, all N sweeps are discarded, and the averaging is performed in the same way as the first start.

Stimulation pos.: in the case of EP and Stim EMG modalities, it is possible to name the position(s), where the stimulation has been made. The position of the stimulation will be displayed in the Trace Window, when the modality is active.

Report: the following types of information can be included in the report:

- *Raster:* the Raster curves plot.

- *Trend:* the Trend Plot is included with trends, which have been defined in the marker section. Please note that in order for the Trend Plot to be included in the report, has to be defined in the Window Setup Menu, see page dow" below.Window Setup on page 66ff.

- *Data:* a data list of all the marker values.

- *Log:* lists all the Log entries.

- *Result:* includes result curves from the analysis. The curves are ordered according to the recording time.

- *Overview:* includes bars with color-coded results, and a Ruler Scale providing the position of the bars in millimeter.

- *Long Baseline Marker:* f this button is clicked, long marker(s) based on marker position(s) on baseline trace will be drawn in the raster curve list. The marker(s) will be vertically positioned through all the traces.

Channel: each modality can retrieve data from up to 8 channels.

All free running EMG modalities are started automatically, when the test is selected, and only one EP, or stim EMG modality can be active at the same time. For this reason, a specific channel may be assigned either to one free running EMG modality, or to one, or more EP (or stim EMG) modalities. The channel button will

simply disappear, when the channel cannot be assigned to the modality.

Recording pos.: provides the possibility to specify a name, or a description for a channel, e.g. 'Cz-Fpz'. The name will be displayed in the Trace Window and in the report.

On Off: the channel is connected to the modality by clicking the on button.

Autosave:

For the stimulated modalities, results can be saved automatically to the raster window.
For EP modalities the result will be saved, when the specified number of averaging has been reached, or when the modality is stopped.
Stim EMG modalities will save the result, when a stimulation has been made.
Alternatively, the accepted traces need to be saved manually.
For free running (EMG) channels, it allows for automatic sequenced recording, see above.

Trend Alarm: when this feature is clicked, you will hear a sound signal to indicate that markers are passing the limit line in the Trend Plot Window. The status of this button will apply to all modalities in the test.

WARNING Do not use this feature for intensive care monitoring. It is meant as a help to pay attention to the variation in the signals measured.

Results/Markers: up to 5 labeled results may be defined for each channel. Stimulated modalities (EP and Stim EMG) use markers, and free running modalities (EMG) use results, see below:

-*Results:* up to 5 analysis results may be selected per free running channel. Each of these analyses is selected by clicking in a box below *Display ID*. The Select Display List Box appears, see Figure 102 The Select Display Selection List below. From this list, you can select between the various types of analysis listed. Click *cancel* to return without changing the analysis, or click *clear* to clear the field.
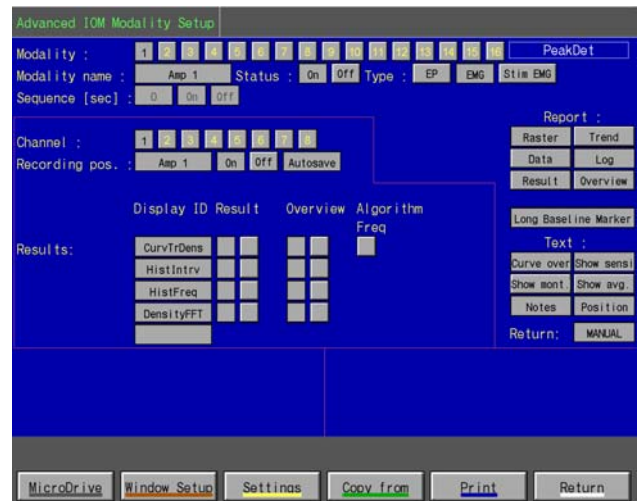
Figure 101 The Advanced Modality Setup Menu
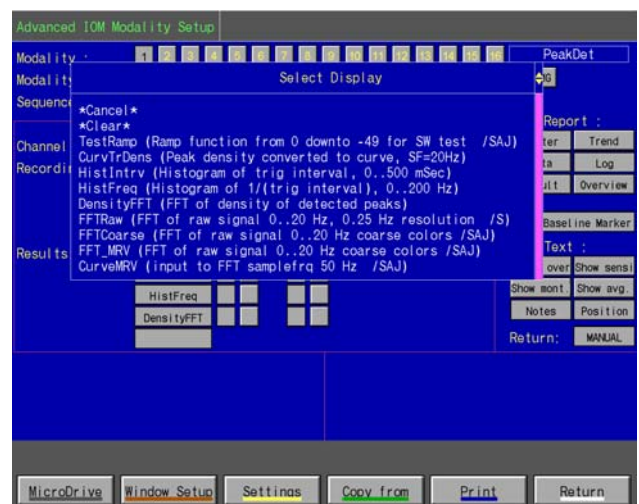
Figure 102 The Select Display Selection List

NOTE None of the available methods of analysis have proven to be useful for clinical evaluation of the signals. They are included for scientific use only.

If you have selected an analysis, its *Display Identifier* is shown in the box situated just below the Display ID, see Figure 100. An identical text is shown on the buttons in the Result, or Overview Windows.

Some analysis provides useful data for both *Result* and *Overview* Windows, while others provide data for only one of these. If data is available, it is reflected in one or two buttons under the *Result / Overview* header. If the leftmost of these is active, buttons enabling the analysis on the Result or Overview Window are available. If the rightmost button is

active, the associated analysis is shown as default.

Markers (only applicable for EP and Stim EMG modalities): up to 5 markers can be defined for each channel. In the measurement phase, the markers are automatically set to points closest to default position and fulfilling the criteria given by the selected algorithm (pos., neg., onset - see below). If the criteria cannot be fulfilled within +/- 15% of the default position, it is set at the default position. The first time a marker is placed on a trace, the default position is calculated from the marker number multiplied by 1.5 division of the trace window, i.e. MRK_1 at 1.5 div, MRK_2 at 3.0 div., MRK_3 at 4.5 div., etc. However, if the marker name contains numbers all other characters will be stripped off. If the resulting value exceeds 5 and gives a position within the window, the initial position will be at this position. E.g. P50, 50N and 5T0 will give the same result, 50 msec.

On subsequent traces the default positions are the positions on the previous trace.

Latency: a marker will always be treated as a Latency marker. It is possible to specify whether the marker is used, and if so, is to be reported in the Trend Plot. If the ***Data*** button in the Report: field is clicked, the marker values will be listed in the report.

Used: specification on whether the latency marker are used, or not. When the corresponding button is pressed, the marker appears in the Trace Window.

Trend: specification on whether the latency marker is to be reported in the Trend Plot, or not.

Amplitude: if a marker is selected (latency marker), then the marker can be selected to be an amplitude marker as well. As for latency markers, the amplitude marker can be reported in the Trend Plot. If the ***Data*** button in the Report: field is clicked, the marker values will be listed in the report.

Used: specification on whether the marker is an amplitude marker as well.

Trend: specification on whether the amplitude marker is to be reported in the trend plot or not.

Algorithm: definition of marker type as onset, positive peak or negative peak.

Onset marker: find the position, where the signal leaves the baseline in a negative direction (upward on the screen).

Positive peak marker: find a positive peak.

Negative peak marker: find a negative peak.

Latency difference: up to 10 latency difference marker pairs can be defined. The difference can be obtained from various markers from the same or different channel(s) in the same modality. In the Trend Plot, the difference marker pair is displayed as a dot, the position is given by a value relative to the baseline marker values.

E.g: $Val = (Mrk1-Mrk2)_{trace} - (Mrk1-Mrk2)_{baseline}$

In trend: if pressed, the difference marker pair will be shown in the Trend Plot.

Difference marker pair values will be displayed in the report data list, if the ***Data*** button is pressed. The value is given from the difference only.

E.g: $Val = (Mrk1-Mrk2)_{trace}$

Amplitude difference: up to 10 amplitude difference marker pairs can be defined. The difference can be obtained from various markers from same, or different channel(s) in the same modal-

ity. In the Trend Plot, the difference marker pair is displayed as a dot, the position is given in percentage of the baseline marker pair values.

E.g.: Val = 100 x

$$\frac{(Mrk_1 - Mrk_2)_{trace} - (Mrk_1 - Mrk_2)_{baseline}}{(Mrk_1 - Mrk_2)_{baseline}}$$

- ***In trend:*** if pressed, the difference marker pair will be shown in the Trend Plot.

Difference marker pair values will be displayed in the report data list, if the ***Data*** button is pressed. The value is given from the difference only.

E.g: Val = $(Mrk1 - Mrk2)_{trace.}$

Frequency (only applicable for free running modalities (EMG)): a measurement of frequency can be set On, or Off per channel. When set to On, a trigger level marker and a measure frequency are shown in the Trace Window.

Text: in the Trace and Raster Windows, pieces of information can be shown in the Trace button, or in the top row. These pieces of information may be displayed individually, or not. This allows making a compromise between a "crowded" screen lay out, or missing information.
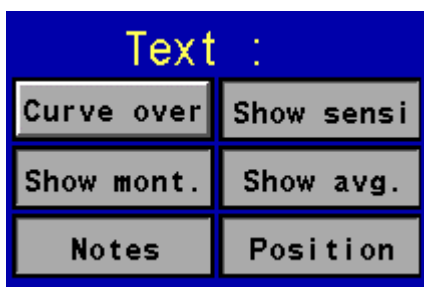
Figure 103 See further description below

- ***Curve over:*** when clicked traces will go trough the trace options buttons.
- ***Show sensi:*** when clicked, information o sensitivity will be shown.
- ***Show mont:*** when clicked, information on montage (channel) name will be shown.

- ***Show avg:*** when clicked, the number of averaged traces and the number of rejected traces will be shown.
- ***Notes:*** when clicked, the previous note is shown above the left-hand end of the trace.
- ***Position:*** when clicked, the electrode position is shown above trace to the left.
- ***Return Manual:*** the ***Manual*** button determines the behaviors of the Function Buttons in the bottom of the screen. If it is "out", all the buttons will automatically revert to their default settings after a 2 seconds timeout. If it is "in", the user must reset the buttons manually, using the ***Return*** Function Button (number 6).

Lower Buttons
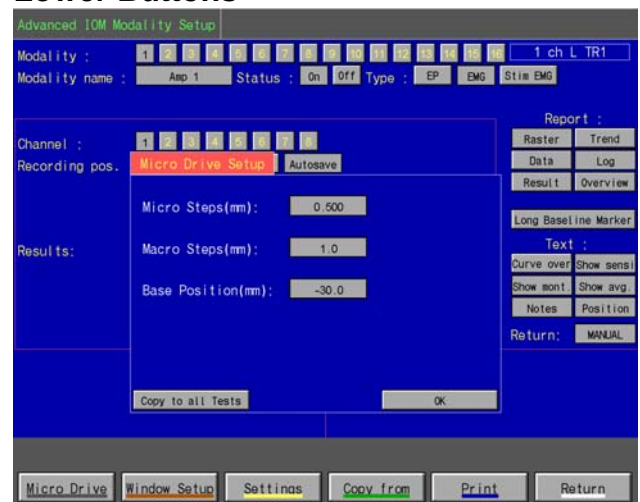
Figure 104 The Micro drive Setup Menu

Micro Drive Settings

You can manually change, or enter the position of the electrode. To find the Micro drive Setup Menu, proceed as follows:

- ■ In the Patient Data window, click ⌷ Setup ⌷, and the Setup Menu will appear.

- ■ Then click ⌷ Program ⌷, and in the Advanced IOM Test Overview menu:

- ■ Then click ⌷ Mod. Setup ⌷ thus producing the Advanced IOM Modality Set-up.

- ■ Click the ⌷ MicroDrive ⌷ button - thus providing the Micro drive Setup Menu. Here, distances in Micro steps, Macro steps and Base Position can be preset, see Figure 104 above.

■ Move the pointer to the wanted box, click on it, and the blinking pointer indicates that data can be entered. When the figures have been typed, press ENTER ↵ on the keyboard to complete the data saving.

■ Click `Copy to all Tests` to set the same values in all tests in the equipment.

■ Click `OK` to proceed.

Window Setup
■ Go to the Advanced IOM Window Setup Menu. **NOTE:** modalities and channels should be set up before entering this menu.

■ To display anything on the screen, a window setup must be made. Trace, raster and trend windows must have assigned channels. The size of the windows can be specified, too. See the section on "Defining a Window" below.Window Setup
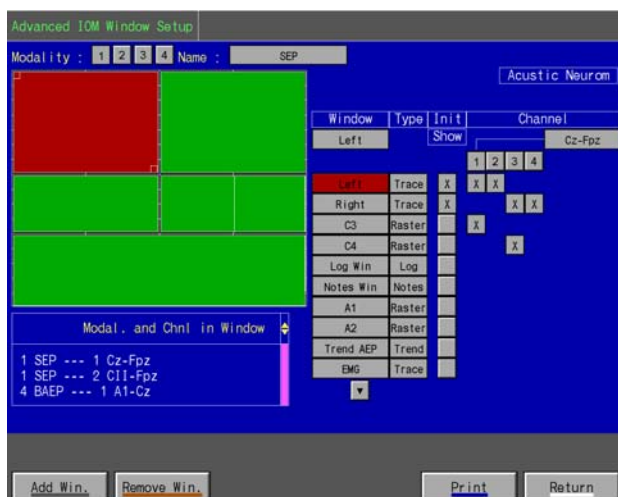
Figure 105 The Window Setup Menu.

The window layout is user-definable. The number of windows and their positions and sizes can be defined. In this menu, all connections between modalities, channels and windows are made. See "*An Example on How to Define a Window*" below.

When using the test and a new modality is started, the window layout changes to this modality's default window layout. Windows defined as "Init Show" provides the default window layout. Windows can be defined to be overlapping, but displaying a window on the screen will hide all underlying windows.

Available window types
Trace Window: each window can hold up to 8 channels from same, or different modalities. Each channel can consist of an input trace, an averaged trace and a baseline trace. Only input or average trace can be displayed at the time together with the baseline. The type of the trace depends on the type of the modality. See The Trace Window on page 11ff.

Raster Window: each window can hold a list of raster traces from one channel only. For each channel one Raster Window can be defined. Number of raster curves in the Raster Window can be set in Settings Menu, and can be altered at any time during acquisition. Minimum is 1, maximum is 20. See The Raster Window on page 15ff.

Trend Plot Window: each window can display trend plots for all markers, and all difference markers for one modality only. For each modality, only one Trend Plot Window can be defined. The modality name is displayed color coded in the upper line. The Montage is listed in white color, and markers are listed color-coded. The corresponding color is used in the Trend Plot. Each marker is defined as being in or out of trend plots (latency plot and amplitude plot respectively) in the "Modality Setup" menu, see page 61. Two plots are present in the same window (If either amplitude or latency markers are omitted, then only one). See The Trend Plot Window on page 31ff.

Log Window: only one Log Window can be made for a test. The Log will contain notes from all tests made for the same patient. See page 18ff.

Notes Window: only one Notes Window can be made for a test. When the Notes Window is displayed, predefined notes can be selected, or new notes can be entered. Press the *Enter* key on the PC keyboard, and the notes will be transferred to the Log page 16ff.

Result Window: each window can hold up to 5 result curves from one recording, and from one channel only. See The Result window on page 26.

Overview Window: each window can hold up to 5 color bar displays for all recordings from one channel. See the section on The Overview Window on page 27.

An Example on How to Define a Window

You can define the types and the sizes of the various windows. To go to the Advanced IOM Window Setup, follow these steps.

■ Click [Setup] in the Patient Data Window.

■ Then click [Program] in the Setup Menu.

■ Then click [Mod. Setup] in the Advanced IOM Test Overview.

■ Click [Window Setup] in the Advanced IOM Modality Setup, and the Advanced IOM Window Setup Menu appears, see figure below:
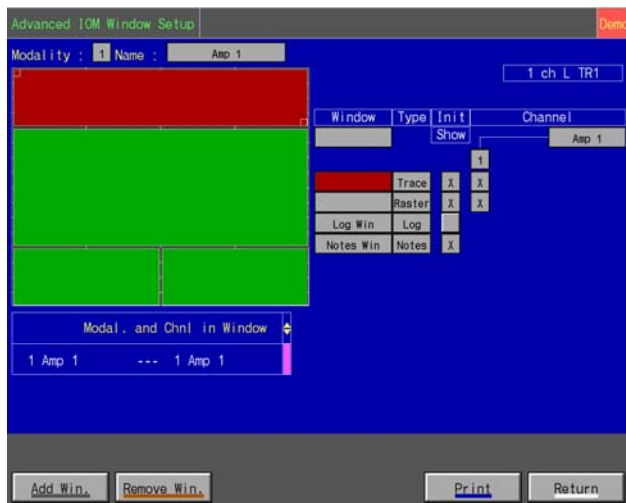
Figure 106 The Advanced IOM Window Setup

Adding a Window

■ In the Advanced IOM Window Setup, click [Add Win.] in the lower-left of the Menu, and the Select Window Type List Box displays the various window types to be selected: Trace, Raster, Trend, Log, Notes, Result and Overview, see the figure below:
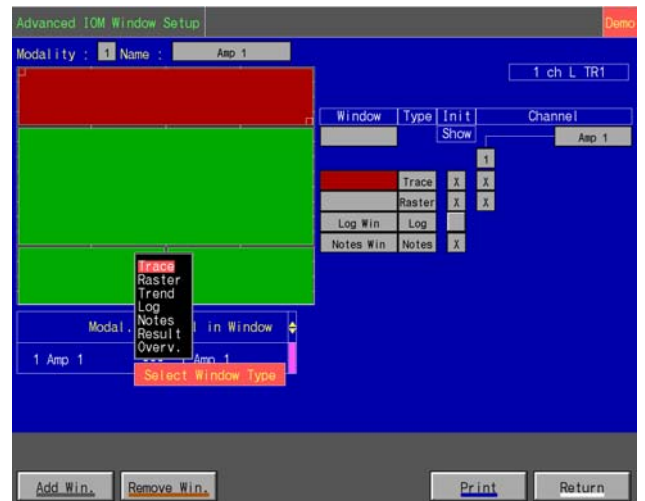
Figure 107 The List Box Including the Various Window Types to be Selected.

■ For instance, click on Trace in the Select Window Type List Box, and the Trace Window is included in the Window Setup Menu. In the figure above, the window selected has taken on another color and includes two sizing handles for scaling the window.

Scaling a Window

■ When you want to scale the window, for instance, click on [Trace] in the column: "Window" (Type, Init, Channel). The selected Trace Window takes on the same color as the Trace Window button, just clicked on in "the window column", thus producing a frame with two small sizing handles around the window.

■ Then scale the window by dragging any of the sizing handles, releasing the mouse button, when the window is positioned where you want it.

■ Dragging into the window, scales down the Trace Window.

■ Dragging away from the window, scales up the Trace Window.

Figure 108 The Various Windows with Names

Naming a Window

■ You can name a window by clicking on the box just below the column "Window" (Type, Init, Channel), see the figure in the left section of this page. The box takes on another color, and the blinking pointer indicates that you can now type the name of the window.

■ For instance, type Trace Window, and:

■ Press ENTER ↵ on the keyboard, and the name will appear in the relevant window, see the figure above in which three windows have been named: Trace, Raster and Trend.

Removing a Window

■ In the Advanced IOM Window Setup, click Remove Win. to remove a window (see Fig. 28), and the question "Remove window - are you sure" appears, and to which you can click either yes, or no.

■ After defining and scaling the window, return to the wanted setup by clicking Return until you reach the Patient Data Window from where you may continue.

Settings

■ Go to the Settings page. Preferred settings for the current modality. **NOTE**: modalities and

channels should be set up, before entering this menu.
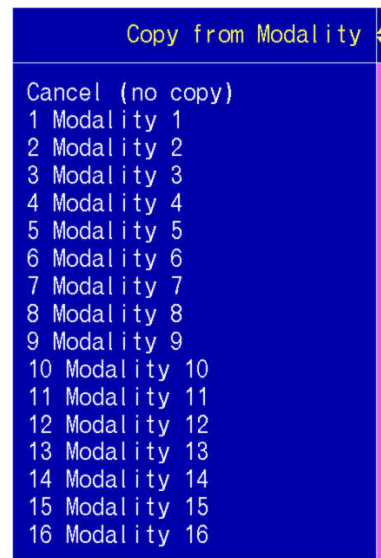
Figure 109 Copy of modality

Copy from: Copy from modality provides the possibility to copy one modality from the list into the current modality.

■ When this button is clicked, a list of all the tests is displayed. Then you:
■ Select at test, and a scroll list of all the modalities pops up. See the figure above.
■ Select the modality you want to copy.
■ Select Cancel, if copying is regretted.

*Print: p*rint a screen dump of this page on the selected printer.

Return: return to the Test Overview Menu

Menu layout

Modality: shortcut buttons to switch between modalities. Only modalities set on are listed. The clicked button is the current modality.

Name: the name of the current modality.

Windows' layout: below the modality button, you will find on overview of all the windows. Please see the section on Scaling a Window on page 67.

Modal. and Chnl in Window: contents of the selected window is displayed. In this display the individual signals (in case of a trace window) are listed, letting the order in the list define the order in the windows. It is possible to change the order in this list.

Just click at a row then click at the destination row.

Window: The first box below the title is an editable text box. The name of currently selected window is displayed in this box, and the name can only be changed here. The following boxes contain the names of all the windows, select one and it is made the current window. See Naming a Window on page 68.

Type: the window type: Trend, Raster, Trend, Log, Notes, Result or Overview.

Init Show: for every modality, it can be specified which windows should appear initially when the modality is started, or selected. Logic is implemented, so a warning is shown, if two windows using same screen area are selected as 'on' simultaneously. This check will be carried out, when the *Return* button is clicked.

Channel: for each modality, a number of channels can be used. Only the channels, which are set in the Modality Setup Menu are selectable.

■ Select one of the numbered buttons, and the Recording pos. is shown in the text box.

■ Click a channel button next to a window name to connect the channel and window.

Bottom buttons

Add Win:

■ Click this button, if you want to add a window. A list of window types pops up, then:

■ Select a window type, and the new window will be added.

Remove Win:

■ Click this button to remove the currently selected window.

Print: print a screen dump of this page on the selected printer.

Return: return to the "Modality Setup Menu

Setup Program – Preferred Settings

Figure 110 Setup – Preferred Settings

This page may be reached in two ways:

1. During program setup.

■ From the Patient page, click *Setup* to reach the Setup menu.

■ Click Program to reach the Test Overview page.

■ Select the test by clicking on it.

■ Click Mod Setup to reach the Test Setup page.

■ Click Settings to reach the Preferred Settings page.

The settings are stored permanently for use in all new investigations.

Or

2. During the investigation

■ Click Settings in the Acquire page

The settings are used (and saved with) in the ongoing investigation only. You may, however, save the preferred settings for the selected test and modality permanently by clicking *Overwrite*.

Channel:
■ Click one of the Channel buttons to define the Sweep, Sens, LowFQ, HighFQ, Speaker and amplifier settings for the a trace. Notice the red line marking the settings for 1 channel.

■ Click in *On* or *Off* to define whether the selected channels are active or not. Each channel is associated with an amplifier 1 through 8 (through 2 or 4, depending on the hardware installed).

Sweep:
■ Click in the sweep column to define the default sweep speed, when entering the program. The sweep speed can be altered within the max. sweep, to change the max. sweep click *More.*

Sens:
■ Click in the Sens column to define the amplifier sensitivity.

LowFQ:
■ Click in the LowFQ column to define the amplifiers lower filter cut off frequency.

Avg: For EP modalities.
■ Select if amplifier or *averager display sensitivity* shall be accessible through activating *sens* or *Avg*, respectively.

HighFQ:
■ Click in the HighFQ column to define the amplifiers upper filters cut off frequency.

Speaker:
■ Click in the Speaker column to define if the speaker is default on or off. The dimmed appearance indicates the selected functionality.

Amplifier:
■ Click in the Amplif. column to select the DIN plugs as input for the selected channel (or safety connectors next to the DIN plugs).

Headbox:
■ Click Act and Ref to use the optional EP headbox as input.
■ Clicking in Act or Ref causes a new window to pop up, move the cursor up or down to select the input pin form the EP headbox. The Lead-

point™ selects the first unused amplifier to be used for this channel.
Note that the same input pin can be selected for several channels.

■ Click *Reject* to insert signal rejection parameters[1].
■ Click *On* to enable rejection, and *All Ch* to enable on all channels[1].

1) For EP modalities only
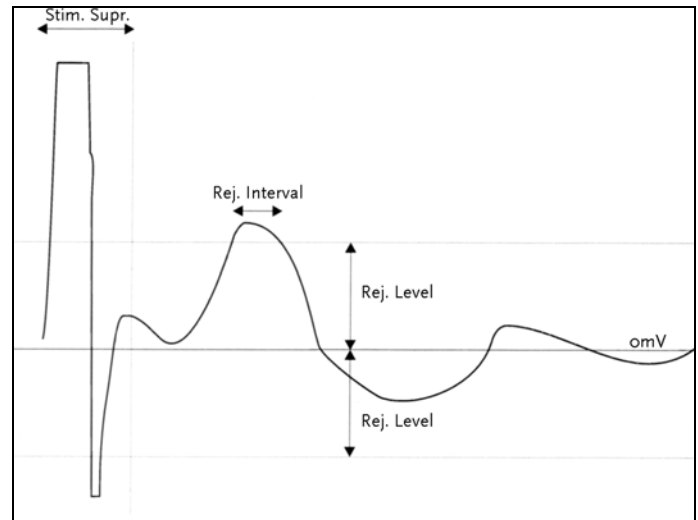
Figure 111 Rejection Interval and Stimulation Suppression

■ Click *Common Reject*[1] to reject all input traces when one channel input is to be rejected.
■ Click *Individual Reject* to reject only the single channel.

Define Stim Suppression interval, Rejection Level and Rejection Interval. In stim suppression interval, rejection is inactive and the rejection level is ignored. An input trace is rejected, if - in an interval longer than the rejection interval, after stim suppression interval - it exceeds the rejection level.

GND.Imp:, Max.Imp:
■ Click the field below the text, and enter an impedance in KΩ to select the limits between good and bad quality for impedance. This limit is used to visualize impedance levels on the screen. Green is good impedance level and red is bad impedance level.

Autostop:[1]
■ Click in the ↑↓ buttons to define the averager count for which it should stop updating. Only applicable for EP modalities.

Raster: the number of rasters may be set in the Preferred Settings Menu, see Figure 110. The number of rasters may be altered at any time during the acquisition in the range 1-20 by clicking + or - in the top right corner of the Raster Window, see the section on the Number of Rasters on page 15

1) For EP modalities only

More for advanced setup

Figure 112 Setup SEP More.

Max. Sweep
■ Click in the fields below to select maximal sweep length This length defines the limits for adjusting sweep speed, i.e. a max sweep of 100 ms will allow for sweep speeds from 0.1 ms/D through 10 ms/D.

Common reject makes the averager stop averaging if any channel is overloaded.

Individual reject makes the averager stop averaging the channel that is overloaded.

Invert signals inverts positive upwards.

Notch filter enables a notch filter. The notch filter is locked to the frequency of the mains supply, making it extremely effective. Care must be taken

when using notch filters, since they can distort the signals. They can however in certain situations be very useful.

Delay inserts a delay from trigger time to sweep start, the delay can be positive as well as negative.

Dual stimulator trig

Figure 113 Setup – Preferred Settings

In case two stimulators are used and activated, each channel may be logically connected and trigged by one of them. Follow this procedure for a dual trig/stim setup:

■ Activate Extended Stim.

■ Switch Stim1 and Stim2 on.

■ Activate Alternating stim.

■ For each channel select Trig 1 and/or 2.

All channels connected to Trig1 will now record signals at every stimulation of stimulator 1 and Trig2 channels will be updated, when stimulator 2 stimulates. If both buttons are pressed, then both stimulator outputs cause trig.

Test:
■ Click in the ↑↓ to select which test to setup, note the name in the headline of the settings window.

NOTE This is only available during program setup.

StimDur:
■ Click in the StimDur Column to define the constant current stimulus duration.

StimFQ:
■ Click in the StimFQ column to define the constant current stimulator rate in repetitive mode.

Pulse Shape:
■ Click on this field to select biphasic stimulation, or:
■ Click on this field to select monophasic stimulation.

Polarity Left -+:
■ Click in the + or -buttons to define the stimulus polarity when examining left side. This feature is a very useful, when using the handheld stimulator and changing from left to right side.

Polarity Right -+:
■ Click in the + or -buttons to define the stimulus polarity when examining right side.

Trig
■ Click in the Trig column to define the sweep trigger mechanism,

Stim: selects the internal stimulator to trigger sweep and report intensity. This mode can also be used for an external stimulator triggered from Leadpoint™.

Ext.: selects an external trigger-to-trigger sweep and internal stimulator. Internal intensity is reported. Please note that stimulus is delayed 2.5 ms. The curves are adjusted to synchronize the sweep start. The delay is only of interest, if an external stimulator is used simultaneously with the internal.

Ext Stim: selects an external trigger to trigger sweep and no intensity reporting.

Stim
This is used to select the stimulator output type.

Single: is used for single current stimulator (option) or multi current stimulator (option) with limited flexibility.

Extend: is also used for these current stimulator types (option), but sets more complex stimulus forms available. See the next pages for more details.

Audio and *Visual*: AEP/VEP stimulators are not available for Leadpoint™.

Extended Stimulator Setup Page
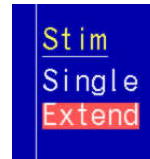
Figure 114 Getting to extended stim setup

The extended stimulator setup page is reached by
■ Clicking on *Extend* on the setup page.
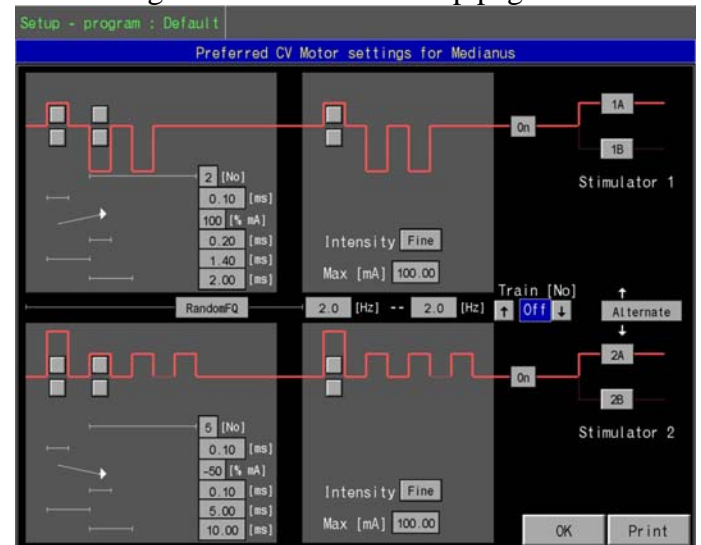
Figure 115 Dual current stimulator, Extended stimulator setup

The content of the extended stimulator setup page depends on the kind of current stimulator attached to the Leadpoint™. The most complex is the one for a dual current stimulator as shown in the figure above. For a single current stimulator, the lower half specifying the output for stimulator two is omitted. The right side including output selection is also omitted for a single stimulator.

Stimulus Form Setup
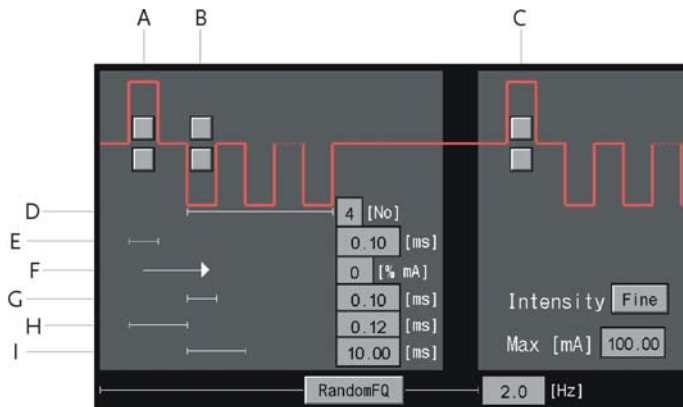
Figure 116 Stimulus form setup

Complex stimulus forms may be set up using the controls shown on. In the example shown here, a main stimulus pulse followed by four secondary are defined. ***Triggering*** of signal acquisition will always happen on the ***start of the main pulse of stimulator 1***.

A) Keys are used to change polarity of main stimulus pulse.

B) Keys are used to change polarity of secondary stimulus pulse.

C) Keys are used to change polarity of main stimulus pulse. Set it to the same as in A), if it is not to be alternating (normal case). Set it to the opposite of A), if it is to be alternating. Alternating polarity triggering occurs both on negative and positive main pulses.

D) Specifies the number of secondary pulses. Pulses are shown graphically. If more than three secondary pulses are specified, then multiple pulses are indicated by a dotted line. Please note that graphical representation is schematically only, pulse duration, intervals and amplitudes are not correctly scaled.

E) Specifies the duration of the main stimulus pulse.

F) Specifies the intensity of secondary stimulus pulse(s) relative to the main stimulus pulse. 0% means same amplitude, negative smaller amplitude and positive larger amplitude. This ratio is maintained, when the main stimulus intensity is changed during acquiring. The intensity of the

secondary pulse(s) may be changed independently.

G) Specifies the duration of the secondary stimulus pulse(s).

H) This is the time from the start of the main pulse to the start of the first secondary pulse

I) This is the time between start of secondary pulses.

Intensity Fine: if this key is activated, the intensity may be adjusted in finer (but slower) steps.

Max mA: this value may be set lower than the normal value of 100 mA. This may for instance be used for near nerve stimulation.

Hz: the frequency of the main stimulation may be set. If the duration of the longest stimulus sequence is longer than 1/stimulation frequency, then the stimulation frequency will be automatically lowered.

Random FQ: activates random stimulation frequency. Frequency will vary randomly between inserted min. and max. values.

■ Release ***Random FQ*** to return to fixed stimulation frequency.

Train:

Figure 117 Train setup

A train of stimulus sequences may be set up. If the number is lowered to below 2, the train function is set off. With train function on, activating the repetitive key on the dedicated keyboard starts a train of sequences with the specified length.

Activating the single key, fires a single sequence. The activation key on the handheld stimulator fires a train independently on whether it is pressed shortly or for a longer period (in opposition to normal stimulation, where pressing it for a longer period causes repetitive operation).

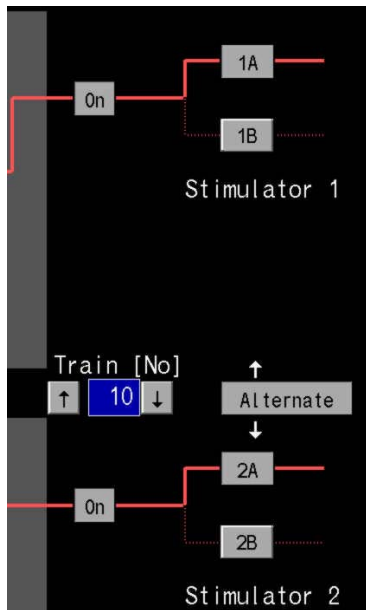## *Output Selection for Dual Current Stimulator*

Figure 118 Output selection for dual current stimulator

For dual current stimulator a set of push button keys specifies the active outputs. If *Alternate* is active, then the two stimulators will alter between being active and not. Note that in this case it is stimulator 1 that triggers the signal acquisition.

Figure 119 Extended stimulus display on the acquire page.

With extended stimulation activated, the display of stimulus parameters on the acquire page of the different programs is changed.

The example shown in the figure above is the most complex one with both dual current stimulator, main and secondary stimulation sequences for both stimulators.

If a single stimulator is used (or if only one of the two stimulators in a dual stimulator is active), then only one line of text is shown.

Each of the up to 6 fields specifying intensities and intervals between main and secondary stimulus may be selected by clicking on them with the mouse.

The value selected may be changed by way of using the intensity knob on the dedicated keyboard. Note that changing one of the intervals will stop the stimulator. To restart the stimulator: press the repetitive key on the dedicated keyboard.

Setup System
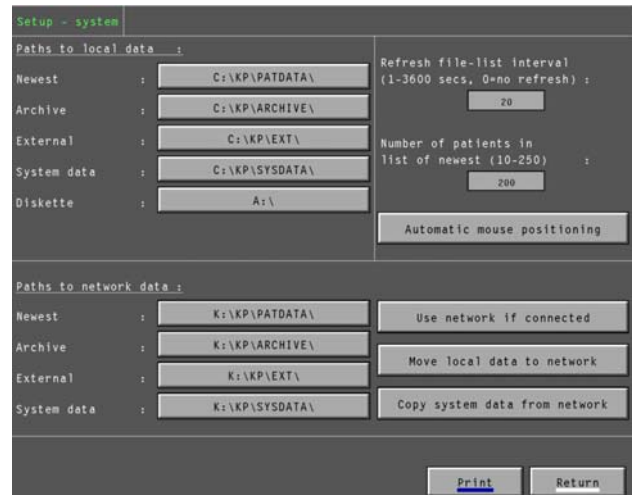
Figure 120 The Setup System with network

In networks systems, it is necessary to specify where disks and directories are located. In single-user systems, all data are usually stored on one disk and in one directory. The local disk and directory are inserted as .\

The screen layout is depending on the hardware installed. If a network is installed, the screen layout is as seen in Figure 120.

When installed, the Leadpoint™ is default setup to use the local hard disk, and the settings should not be changed. Before changing any paths, make sure that the new directories exist, and that all the files from the Leadpoint™ system are present.

Figure 121 Setup System without Network

Path to local data: defines the paths to all local data.

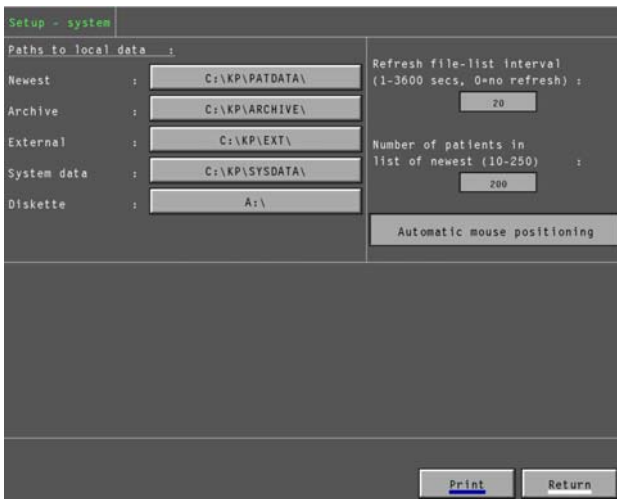**Newest:** this is the directory, in which the newest patient and investigation data are stored. It holds the most recent patients who have undergone an investigation. "Number of patients in list of newest" defines how many.

Archive: when "Number of patients in list of newest" is exceeded, the patients with the lowest investigation numbers are moved to an archive subdirectory. Please refer to archive description, see the section on Archive below.

External: defines the directory, in which patient data and investigation data received via e.g. modem is copied.

System data: defines the directory for reference values, setup values, language files, etc.

Diskette: the name of the diskette drive.
Other disk/tape: defines the name of another media, please refer to the copy/move description on the patient page.

Refresh file-list interval: the Leadpoint™ is capable of running in a network with several Leadpoint™ installations, office installations and booking systems, all running in the same directories. This means that there is a need of updating the Filed patients list with data altered from other systems. This parameter defines, how often this should be performed.

Automatic mouse positioning: the Leadpoint™ can be set up to automatically moving the mouse to the most probable position on the screen.
■ Click Automatic mouse positioning to enable this feature.

Paths to network data: defines the network directory setup, if network is used.

Please refer to Paths to local data for definition.

NOTE that each newest patients directory must have its own archive to prevent that investigation numbers conflict.

Use network if connected:
■ Click on this button to enable usage of the network, when it is connected. If this option is selected, and the network is not active, the Leadpoint™ will run in the local data directories.

Move local data to network: this feature will move all patient data and investigation data from the local directories to the network directories, when reconnected to the network. Please note that this feature will renumber the investigations.

Copy system data from network: this feature will automatically copy setting, reference values, etc. from the network to the local directories, when they have been altered. If the Leadpoint™ is not connected to the network, this will ensure that it will operate with the same settings and reference values, etc. as when it was connected to the network.
If the network should not be used at all, do not press any of these three buttons mentioned above.

Archive

Archiving patient data serves several purposes.

1. Moving data away from the current patient data directory makes it faster to search and operate.

2. Moving data to a different archive medium, makes it easier to search

3. Moving data to a different archive medium provides more storage capacity than the hard disk

4. Moving data to a different archive medium is safer than keeping all data on the hard disk.

Several strategies for archiving the patient data can be chosen. Each department must select a strategy which will fulfill its requirements. A few strategies are outlined below:

The Leadpoint™ will always hold the most recently investigated patient data in the "Newest" directory (please refer to System setup). The total number of patients can be set up in Setup-System-Number of patients in the list of newest patients. When this number is exceeded, the patients with the lowest investigation number are copied to the archive directory, hereafter called the "Primary archive directory".

The archive directory has subdirectories counting 100 patients in each directory, thus facilitating the search. To review patient data from the primary archive:

- Click *Source* in the Patient Data Window, then Archive, and select the archive range of interest.

A hard disk has limited capacity, so a secondary archive medium must be used, i.e. when free space on the hard disk is low, the patient data must be moved to an external medium, e.g. to an MO-disk, or to floppy disks.

Archive Media
1. On the same hard disk as newest patient data (Primary archive medium)

2. MO drive (Primary or secondary archive medium). Please refer to Setup System, Other disk/tape.

3. Floppy disk (Secondary archive medium). Please refer to Setup System, diskette.

4. Network (Primary archive medium).

Moving data from Primary to Secondary Archive Medium

Example: moving both patient and investigation data from the archive investigation number 0-99 to MO drive D, follow these steps:

- Click *Source* and:
- Select Archive, and a new window pops up, then you select 0-99.

- Click *Copy/Move,*
- Click *Move to Drive D:*
- Click on *Tag all,* followed by:
- Clicking *Start.* Observe that patients are copied from the source window to the destination window.

When tagging patients, observe that the selected field above the source window shows less than the available field above the destination window.

To reanalyze patient data placed on a secondary archive medium, place the medium in the drive, and in the Patient Data Winow:
- Click *Source,* and click the appropriate source.
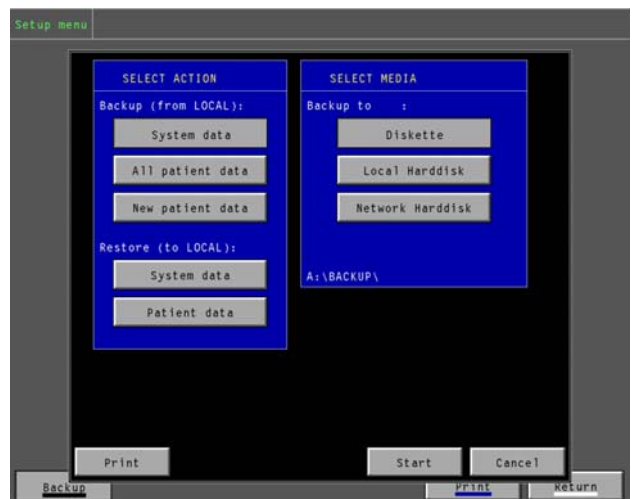
Backup

Figure 122The Backup page: Click **Backup** *on main menu setup*

ATTENTION Data placed on a hard disk may be lost. Hardware malfunction, software malfunction, a user error, virus, etc. can corrupt data. Therefore, it is essential that any system containing data you might want to read in the future be backed up regularly.

The backup is not an 'archive', it serves as "an extra copy of data", which might come in handy in the event that you need to restore data in the case of lost or corrupted data.

Leadpoint™ provides a backup function. In the Set up Menu shown previously in this section, you will find the Backup Button:

■ Click on ***Backup.***

The backup system will only back up files from your current selected paths, for instance, if the button: "network in use" is selected, the backup system will back up files from the network. If the button: "network in use" is not selected, then the backup system will back up files from the local hard disk.

■ Click on ***System data*** to make a backup of the settings, the reference system data, the system setup, etc. Media selects the destination for the backup. Backups previously made to this media will be erased.

■ Click ***All Patient data*** to make a full backup of all patient data and investigation data. This feature will backup from the newest patients list and archive- and ext- subdirectories. Media selects the destination for the backup. Backups previously made to this media will be erased.

■ Click ***New Patient data*** to make an incremental backup.
An incremental backup is a backup of all patient data and/or data on investigation which has been changed, or created after the last full, or incremental backup. The newest patient data, the archive and the ext. directories are searched for new data not backed up. Media selects the destination for the backup. If a backup already exists on the destination, the new data will be appended to this file.

NOTE If the destination disk runs out of disk space during backup, a prompt for a new disk to be inserted will appear.

The backup file also contains the path to the data backed up.

It is advisable to make an "all patient data" backup, on a regular basis, and to make "New Patient data" backups at shorter intervals.

Restore

■ To restore system data, click in ***Restore System data***, and then:
■ Insert and select the media.
■ Click ***Start.***
■ To restore patient and investigation data, click in Restore ***Patient data,*** and:
■ Fill out the recording period to restore, and:
■ Insert the media, and:
■ Click Start.

The destination of the restored files is determined in the same way as the source of the backup. If a network is connected, and the button 'Network in use' is selected in Setup System Menu, then the system will restore the files to the network. Otherwise, the files will be restored to the local hard disk.

The restore process will always overwrite any existing data, so please be careful.

NOTE Neither backup, nor restore should be performed in directories where other Leadpoint™ are currently working. Locked patient data cannot be backed up, or restored. System data cannot be changed, when the data is in use elsewhere. The safest way to ensure this is by performing the backup, or the restore operation, when no other Leadpoint™ is running.

Network Management

Locking is performed on a patient data basis, for instance, if a user opens patient data (when clicking ***OK*** in the Patient Data Window), the patient data will remain locked until the Patient Data Window is loaded again. Only the *.INV file (patient header) is locked/unlocked by Leadpoint™. The refresh function that updates the Filed Patients list checks the lock status of each *.INV file found in the patient data directory. If not locked, the patient name wilkl be displayed in the list, otherwise '*** Locked ***' is shown.

Printer outputs are made to standard outputs LPT1,2,3, which may be redirected to any network printer. Directories specified in the Setup system must follow the local usage of the server directories.

Setup Local

Figure 123 Setup Local.

- ■ Click 'language 1-10' to select language, or an alternative text set.
- ■ Fill in 'date format' YY=year MM=month DD=day.
- ■ Click on 'ID format'.
- ■ Click on 'patient height' unit.
- ■ Click on 'time format'.
- ■ Click on Return when finished.
- ■ Click in the Anatomy column to select anatomies in *Latin*, *English* or *French.*

Description of Signal Analysis

For display on Result and Overview Windows, a number of analyses are available. See Menu layout in the subsection on **Results** on how to include these in your setup. The following analyses may be selected:

Analysis ID	Description	Visible in windows	
		Result	**Overview**
HistInterv	Histogram trig interval, 0 to 500 mSec.	●	●
HistFreq	Histogram 1/(trig interv.), 0..400 Hz.	●	●
FFTRaw20Hz	FFT of raw signal 0 tot 20 Hz	●	●
FFTMRV20	FFT of MRV of signal 0 to 20 Hz	●	●
FFTMRV20	FFT of MRV of signal 0 to 200 Hz	●	●
Bar_RMS	RMS value, 0 to 50 uV		●
BarTrig	Trig frequency during acquire 0 to 500 Hz		●
DensFFT	FFT of density of detected peaks. 0 to 10 Hz	●	●
FFTRaw200	FFT of raw signal 0 to 500 Hz	●	●
TestRamp	Ramp function from 0 to -42 to show color codes	●	●

Figure 124 A more detailed description of the individual parts of the analysis

■ *Trig Interval:* Individual neuron firings are found based on slope and pulse duration criteria. The trig interval is the time between such potentials. *1/(trig interv.)* may also be called the trig frequency, but should not be confused with *Trig frequency during acquire* as described below. The values from this analysis are shown in histograms (bar graphs with the values as x-axis and the number of occurrences at these values as y-axis).

■ *Density of detected peaks.* This is based on the detected neuron firings as described under *Trig Interval* above. The firings are converted to a signal over time, where the value is high at times where many peaks are detected and 0 where none are detected. This signal over time may be fed into an FFT as described below.

Trig positions as function of time

Density of detected peaks
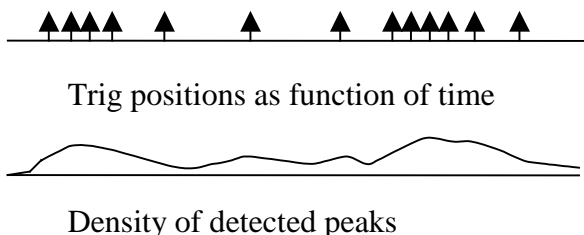
■ *RMS:* This is a measure of the power in the signal. If the sources of the signal are muscle or nerve fibers its value is given by the firing frequency of the fibers, their distance to the electrode

plus other factors like the electrode. As such it can be used as a measure of the "general level of activity". In the application described here, the RMS value is always calculated as a single value describing a whole sweep (typically 10 seconds).

The name RMS stands for the Square root of the Mean value of the Square of the input values. It is here measured in microvolt, or millivolt. The formula is:

$$RMS = \sqrt{\frac{\sum_{i=1}^{N}(v_i)^2}{N}}$$, where v_i is sample value number i, and N is the number of samples.

■ *MRV:* The result and use of MRV is to a high degree identical to RMS, as described above. It does however give lower values than RMS when the input signal is very spiky. In this application the MRV values can both be calculated as a single value describing a whole sweep, or as a series of values describing how the activity of the signal fluctuates over time. If for instance the sources of the signal were the fibers of a muscle with tremor activity, the MRV would have peaks with the rate of the tremor (for instance 5 times per sec-

ond=5Hz). If the signal amplitude is modulated by the heartbeat, the MRV could have 66 peaks per minute (= 1.1 Hz). The name MRV stands for Mean value of the Rectified Value of the input signal. It is here measured in microvolt or millivolt. The formula is:

$$MRV = \frac{\sum_{i=1}^{N} abs(v_i)}{N}$$ where v_i is sample value

number i, and N is the number of samples.
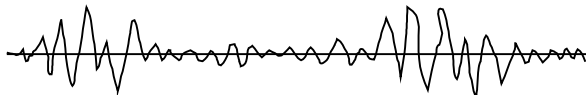
Input signal as function of time

MRV as function of time

■ **FFT:** This calculation gives the spectrum of the signal that is input to the algorithm. A spectrum is a description of how fast and how stable the changes are in the input signal. The x-axis is a frequency axis (measured in Hz). In this application it is shown linearly. The y-axis is the power in the signal at the frequency given by the x-value. The values are shown logarithmically in the y-direction. The unit is decibel (dB), this means that the reference value is shown as 0 dB, 0.1*reference value as –20 db and 0.01*reference value as –40 dB. FFT stands for **F**ast **F**ourier **T**ransform. The formula is considered too complex for this presentation, please see the signal processing literature. For those interested in the detailed parts of the analysis, it can be mentioned that the signal is down-sampled to the appropriate frequency by a sharp FIR filter to avoid aliazing, that it is passed through a Hamming window, and that power spectra from overlapping windows are averaged, where needed.

■ **Trigger frequency during acquire:** This is the value shown in the signal description box at the right end of the trace window. It is the number of times the signal has passed the trigger level during the previous 10 seconds. This value is very dependant on the trigger level that is set by the user. The value cannot be changed after the curve has been saved.

■ **Ramp function:** A test curve with the values 0, -1, -2, -3 .. –42.

System Design

Data Files

Patient Data

File Name	File Description	File Type	Record	Memory requirement (bytes/record)
########.INV	Patient data	Text	1 record per investigation	129
########.AIS	Signals with data	Binary	1 record per saving	Variable
########.AIL	Log file	Binary	1 record per log	
########.AIO	Used settings	Binary	1 record per used test	

######## = running investigation number given by Leadpoint™ and shown in 'Filed Patients' window on Patient Data page.

Preferred Settings

System

ADVIOM.REF	Settings (Windows etc.)	Binary	1 record / test
ADVIOM.SET	Settings (amplifier etc.)	Binary	1 record / test
ADVIOM.TXT	Analysis script file	Text	Variable
ADVIOMA.TXT	Analyses definition file	Text	Variable
ADVIOMU.TXT	Analysis script file	Text	Variable
ANA.EXE	Analysis program	Binary	
OTHER.INI	Other settings	Binary	
LP.EXE	Main program	Binary	
DAYPLAN.TXT	Booked patients	Text	see below
BLP6X10.CBS	Text font	Binary	
ROMAN.COL	Text font	Binary	
SYS8X8.CBS	Text fond	Binary	
SYS8X14.CBS	Text fond	Binary	
SYS8X16.CBS	Text Fond	Binary	
LPSPOOL.##	Printer spooler jobs	Binary	(printer data)
PRSMALL.#	Report printer font	Binary	
PRMEDIUM.#	Report printer font	Binary	
PRLARGE.#	Report printer font	Binary	
EPS.MGA	Epson driver	Binary	
HPL.MGA	HP Laser Jet driver	Binary	
PJET.MGA	HP Paint Jet driver	Binary	
VGA.MGA	VGA graphics driver	Binary	
DJET.MGA	HP Desk Jet driver	Binary	
SYS.INI	Network setup	Binary	
SETUP.INI	Program setup	Binary	1 record / setup
REPORT.INI	Report layout	Binary	1 record / report layout
TEXTS.##	Texts/languages	Text	
USER.INI	User setup	Binary	1 record / user
MODEM.INI	Modem configuration	Text	
MODEM.PHO	Modem phone book	Text	
MODEM.SND	Modem send list	Text	
ALGO640.PCX	Algorithm setup page VGA screens	Binary	
ALGO800.PCX	Algorithm setup page SVGA screens	Binary	

ALGO.INI	Current algorithm setup	Binary	
1024FON1.CBS	Text font	Binary	
1024FON2.CBS	Text font	Binary	
1024FON3.CBS	Text font	Binary	
1280FON1.CBS	Text font	Binary	
1280FON2.CBS	Text font	Binary	
1280FON3.CBS	Test font	Binary	
ALGO1280.PCX	Algorithm setup page XVGA screen	Binary	

File format
File : DAYPLAN.TXT

```
XXXXXXXXXXX          ID (first patient) (11 characters)
XXXXXXXXXXXXXXX      First name (15 characters)
XXXXXXXXXXXXXXX      Last name (15 character)
YYYYMMDD             Investigation date (8 digits)
X                    'M' or 'F' (male or female)        (1 character)
99.9                 Age in years (3 digits, 1 decimal)
999                  Height in cm (3 digits)
XXXX                 Physician signature (3 characters)
XXXXXXXXXXXXXXX      Diagnosis (15 characters)
XXXXXXXXXXX          ID (second patient)
XXXXXXXXXXXXXXX      First name (second patient)
.                    .
.                    .
.                    .
XXXXXXXXXXXXXXX      Diagnosis (last patient)
```

Registry settings

The installation program sets some default values in the Windows' registry. Most of these are of no interest to the user. A set of typical values is shown in the figures below. Some of the parameters may be altered by the user and will be described in the following.

HKEY_LOCAL_MACHINE/Software/Dantec/Lead point/Settings/SysCallParam contains a text string that is used as a parameter to the LP.EXE program. You may edit this string to alter the "behavior" of the program.

- If you change the text from "**/Analyze**" to "**xAnalyze**", then no analysis will be made for the Result and Overview Windows. This could be of interest on a PC with limited speed or memory.

- If you change the text from "**/BlockRecord**" to "**xBlockRecord**", then the blocking of continuous recording after changing the position (see page24) is set out of function, and a new saving is made for each time the signal buffer is filled up.
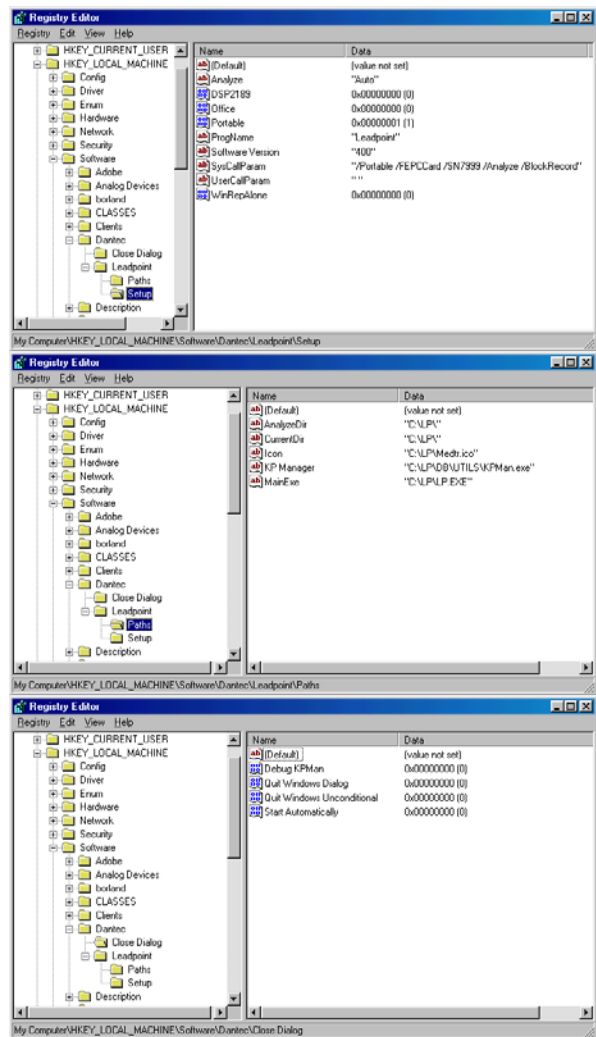
Technical Data

Amplifiers

Preamplifiers
    Electrically isolated preamplifiers. Protected against electrostatic discharge.
    Balanced inputs with electrode cable capacitance reduction.
Loudspeaker
    On/Off Switch
Calibration Signal
    Software-dependent:
    5, 50 µVpp and 5 mVpp, 200 Hz square wave.
Impedance Test of Electrodes
    500Ω-200kΩ
Calibration Test
    Automatic calibration test during power up.
Lower Frequency Limits (-3 dB)
    Software-dependent:
    0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500, 1k, 2k, 3k Hz
Upper Frequency Limits (-3 dB)
    Software-dependent:
    0.02, 0.05, 0.1, 0.2, 0.3, 0.5, 1, 2, 3, 5, 10 kHz, open.
Thermometer Input
    Range: 15°C to 45°C, 59°F to 113°F

Evoked Potential Headbox (optional)

Touch-proof Input Jacks
    21 input pins, software configurable
    2 patient ground pins
Impedance Test Button
    Impedance indicators for each input pin and patient ground
Common Mode Rejection Ratio
    Direct: >90 dB
Lower frequency limits as for EMG amplifiers, but with 0Hz added.

Data Acquisition

Display
    Full width traces: 480/600/768/1024 pixels

Timing

Trigger Mode
    Manual, external, external stimulator, stimulation and free run (program-dependent).
Stimulation Train
    Number of pulses: 2 to 999

Frequency: 0.1 to 200Hz
External Trigger Input
    TRIG IN (Main trigger) 5 V-TTL-level, negative going duration min 21 µs on pin 2 (GND - pin 3, 5) of the connector EXTERNAL TRIG. IN/OUT.
    TRIG IN to stimulus delay 2.5 ms
External Trigger Output
    TRIG 1 OUT (Main trig) >10 µs,
    TRIG 2 OUT (Secondary trig) >10 µs, 5 V-TTL-level, negative going, duration min. 10 µs on pin 1 and 9 (GND - pin 3, 5), respectively, of the connector
    EXTERNAL TRIG. IN/OUT

Electrical Stimulator (constant current)

    Max. output mean power 0.5 W.
    Source voltage 350 V, output resistance >5 MΩ.
Overload Safety
    The selected current will flow as long as the following conditions are fulfilled:
    1): $I \leq 400 \text{ V} / R$

    I(mean)≤1.00 mA   300V <Uoutput ≤400V

    I(mean)=1.20 mA   250V <Uoutput ≤380V

    I(mean)=1.40 mA   230V <Uoutput ≤350 V

    I(mean)=1.60 mA   210V <Uoutput ≤310 V

    I(mean)=1.80 mA   190V < Uoutput ≤275 V

    I(mean)=2.00 mA   170V <Uoutput ≤250 V

    I(mean)=2.20 mA   150V <Uoutput ≤225 V

    I(mean)=2.40 mA   110V <Uoutput ≤200 V

    I(mean)=2.60 mA   80V <Uoutput ≤180 V

    I(mean)=2.80 mA   40V <Uoutput <170 V

    I(mean)=3.00 mA   0V <Uoutput <150 V

    I(mean)=3.40 mA   0V <Uoutput <50 V

    2): P (mean) <0.5 W
R indicates the load impedance, I the selected stimulus current, I(mean) the maximum possible mean current in repetition mode.
P(mean) the output power in repetition mode.

WARNING When the above conditions are no longer fulfilled, the intensity field will flash red.

Stimulus Polarity

Positive, negative and paired stimulation.

Patient Safety

Complies with IEC 601-1, type BF specifications.

Display resolution

Video Standard
    640x480, 800x600, 1024x768,
    1280x1024 Depending on monitor

External Printer

Type of Printer
    LED/Laser printer or color inkjet printer.

Power Supply (Leadpoint™ 2/4)

Type
    External 24V DC supply for Patient Unit
Input
    Power supply with universal input 100-240V AC,
    50/60Hz
Leakage Current
    Max. 0.5mA
Fuses
    In both Neutral and Live
Input Connector
    IEC Power Input Receptable including Ground
Power Concumption
    Max. 100VA (Leadpoint™)
Patient Safety
    Isolation between mains and patient applied parts
    >4kV. Complies with IEC 601-1, type BF
    specifications.

Power Supply Unit (31D30)

Mains Voltage
    100 - 120 V~ 50/60 Hz and
    200 - 240 V~ 50/60 Hz
Power Consumption including Isolated Power Outputs
    Max. 1000 VA.
Isolated power outlets
    100 - 120V~ max. 8A
    200 - 240V ~ max 4A
Thermal Switch
Line Filter
Patient Safety
    Isolation between mains and patient-applied parts
    >4 kV. Complies with IEC 601-1, type BF speci-
    fications.

Speaker

Build into PC Notebook and/or external speakers.

Identification

Time
        Year, month, day
ID: Max. 15 numbers and spaces.
        Name, sex, date of birth, exam. date, height,
        age, technician, physician.

Environmental Conditions

Operating: Temperature +10°C to +40°C.
Relative humidity 20% to 80% non-condensing.

Non-Operating: Temperature -40°C to +70°C.
Relative humidity 10% to 95% non-condensing.

Mechanical Data (Patient Unit, Leadpoint™ 2/4)

Height x Width x Depth: 28 x 343 x 330 mm
Weight: 3.3 kg

Mechanical Data (Leadpoint Workstation)

Height of Instrument Panel
    800 mm.
Total Height
    1240 - 1270 mm (Flat screen top).
Width (excl. holders for electrode arm)
    560 mm.
Width (incl. holders for electrode arm)
    630 mm.
Depth
    550 mm.
Range of Electrode Arm
    Max. 0.9 m, to be mounted on either left or right
    side.
2/4/8 Channel Electrode Box (HWD)
    32 x 210 x 270 mm.
EP Headbox (HWD)
    27 x 118 x 140 mm
CC Stimulator Unit (HWD)
    34 x 119 x 142 mm
Weight of Instrument

Warnings

A

Adding patient: ... to backup
Currently processed patient data.

B

Backup File
… already exists on destination - OK to over-write?
The backup currently copied/moved already exists on the destination. Overwriting erases the already existing data on destination.

Backup-file does not exist
In the path from where to restore, there is no backup file present. Ensure right media is selected, and that the right disk is inserted.

Backing up system data...
Please wait while making a backup of system-data to the chosen destination.

Bad date interval!
The 'To' date is earlier that the 'From' date.

Bad HASP or missing Leadpoint™ hardware!!
The Leadpoint™ software can only run on a Leadpoint™ or on an office installation with a HASP key.

Building archive information...
Reading recording interval of the shown archive-directories.

C

Cannot update Modem queue!!
Modem queue file: Modem.snd is probably corrupted.

Cannot erase control sweep!
Erase all other signals before erasing the control sweep.

Can't save more data
The maximum data space has been reached for this test.

Change log?
The [enter] key has been clicked and the user must confirm (or discard) the change in the log.

Corrupted. Erase file?
The file format does not match any known Lead-point™ file formats. The file can be corrupted, virus infected or created by a newer Leadpoint™ software version than the installed version.

Current patient file: xxxx in use - data NOT restored
Leadpoint™ can't restore current patient because a patient with the same INV number exists on destination, and is currently in use.
Restoring should only be done, when no other Leadpoint™ are doing investigations.

D

Delay changed, erase all or restore old delay ?
When changing delay all previous data will not be consistent with new data. For this reason, you must either erase old data or return to the previous value of the delay parameter. If you do not accept erasing data, then the delay will automatically be restored.

Delete all data, sure??
You are deleting patient data.

Delete all! - Are you sure?
Delete all notes in the log. The notes will not be recoverable.

Delete note ! - Are you sure ?
Delete the selected note in the log. The note will not be recoverable.

Directory does not exist!
Access to a non-existing directory is tried.

Disk full. Insert new disk and press a key.
No more disk space on backup disk. Please insert new disk for the backup to continue.

Duplicate archive-data (INV#) in local archive main directory!

While moving archive data from archive main directory (the directory set up on SETUP, SYSTEM) to the appropriate archive subdirectory, the displayed investigation was found already at destination. Please remove the one not wanted.

E

Erase ALL recording for modality >>modality name<< - Are you sure?

All recordings for one modality will be erased. The recordings will not be recoverable. For this reason, the user must confirm (or reject) the action.

Errors found,

For further information see service manual, appendix A press Enter to continue!

Power-up test has found an error in the hardware; please refer to the service manual.

If you press enter the program will continue with the malfunctioning hardware.

Ext-data ' ... ' already exists on network drive. Data not moved.

Trying to move local ext. data to network (as set up on setup system screen), but conflict occurred. Please remove the investigation not wanted.

Ext-data 'xxx' already exists on network drive. Data not moved

A duplicate investigation number was found while moving local data to network.

Please examine both, and remove the one not wanted.

F

Format:

This explains how to type in the date. Y = Year, M = Month, D = Day.

I

Inconsistent signal!!

Signal buffer overrun, samples are lost.

Invalid date format!

Please use the date format as noted below the input-boxes.

Invalid directory name!!

The entered directory name is invalid.

M

Marker not found in list!

When referencing a marker, it should already be defined as an amplitude or latency marker.

Maximal count reached. Please narrow search!

While searching, 250 matches were found. Search will not search for more. If the investigation searched for was not found, please enter more information to input boxes before pressing START.

Moving data to network...

Moving local data to network as set on SETUP, SYSTEM page.

N

Network Hard disk

The network disk on which Leadpoint™ is installed.

No appropriate destination found

No place found to copy/move patient data to/from. Insert disk in drive and try again.

No files to backup!

Back up new patient data was chosen, but no new data was found.

No modalities defined!

Displayed when a test with no modalities attached is opened. Go to patient page, setup, programs, Advanced IOM and edit the test setup.

No of windows exceeded !!

Only 74 windows can be defined for each test.

Not enough space on destination

The 'selected' amount on data is bigger than the 'available' space on destination.

Not enough disk space to print!!

The hard disk is almost out of space, please refer to chapter Setup, Archive for information of how to free space.

Not enough room on archive-drive!!!

While moving investigation data from 'newest' to archive, the archive drive ran out of disk space.

The investigation was NOT moved and NOT deleted from directory of 'newest' (although not shown in patient list box).
Please free space on archive drive or insert new disk.

Not enough space on hard disk, press a key
The hard disk ran out of disk-space while backing up. The backup was NOT created correctly! Free some disk space and try again.

O

Only one window of the LOG type allowed!!
You are not able to add more windows of this type, as only one LOG window for each test is allowed.

Out of RAM space
The program may require large amounts of RAM and hard disk space in the PC. Running out of RAM or disk space during a lengthy operating session might cause termination of the program, which is not acceptable. For this reason the program will not start unless 22 Mbytes RAM and 100 Mbytes disk space is available. Blinking warning text is shown if available space gets below 5 Mbytes RAM or 10 Mbytes Disk during the investigation. All data are saved and the test is terminated if available space gets below 5 Mbytes RAM or 10 Mbytes Disk.
The amount of RAM and Disk space that was actually available when this message was shown may be inspected in the file *DUMPLOG.TXT* normally in the directory *C:\LP*.

P

Patient already investigated, select from "Filed patients" window!!!
Do always select a patient from the filed patient catalogue (normally the "Newest local patients" window) if present here.

Patient file in use!
In network setups only one installation (Leadpoint™ or Office) can have access to a patient's data

Patient file: xxxx in use, and NOT backed up
While backing up, a locked patient file has been detected. For this patient to be added to the backup, do 'backup new patients' when investigation is finished.
Backup should only be done, when no other Leadpoint™ are doing investigations.

Patient file… already exists on destination
- OK to overwrite?
The backup currently copied/moved already exists on the destination. Overwriting erases the already existing data on destination.

Path not found!!
When changing a directory name, the directory should already exist.

Please free up space before continuing
See the description for *Out of RAM space*. You need to delete some files on your hard disk.

Printer out of paper or offline!!
Printer is out of paper or offline, check paper and connection.

R

Reading patient data...
Reading data belonging to the chosen patient.

Restore from:
Please specify where to look for the backup-file.

Restoring patient: … from backup
Currently restored patient data.

Restoring system data...
An older backup of system data is restored from backup file.

S

Save changes in log?
Changes have been made to the log edit field, shall these changes be saved (or discarded) before proceeding.

Still data in printer spooler!! Quit anyway?
Leadpoint™ is printing if you quit now the printing will not be terminated.

U

Unable to continue
See the description for *Out of RAM space*.

Unable to copy patient files
Leadpoint™ is unable to copy the investigation
displayed. Check if destination drive is accessible
and that writing to it is permitted.

Unable to create backup-directory!
Leadpoint™ can't create the backup directory.
Check write protection of destination drive and
that no files named 'BACKUP' exist in the desti-
nation directory.

Unable to create directory!!!
Receiving Leadpoint™ cannot create directory.

Unable to write to drive
The disk is missing or write-protected.

Unable to read from
Source path is not accessible. Please insert disk
and try again.

Unable to write to drive, changes will not be saved!
Unable to write to drive. Fix and press a key
The new inserted disk is write-protected.
Please enable writing, insert disk again and press a
key on the PC-keyboard.

W

Warning!! Disk space less than
Some disk space must be available to run the
Leadpoint™ software (see Setup System).

X

xxxx already exists on destination - OK to overwrite?
An investigation with the same INV number al-
ready exists on destination. To ensure no lost data,
press NO, examine both investigations, and delete
the one not wanted.
If wrong destination disk has been inserted, Do
NOT change disk now, but press NO, wait for the
copying to end, insert right disk and then restart
copying.

Network
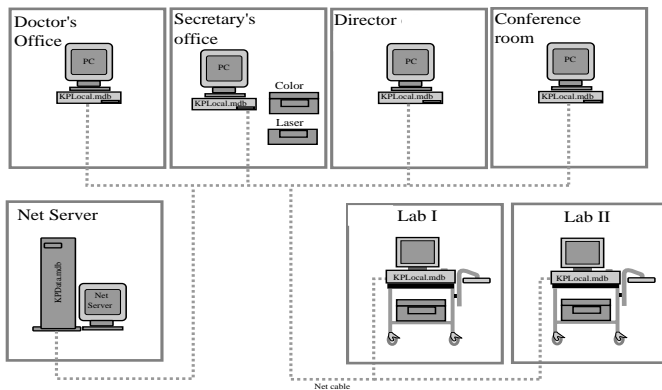
Figure 125 Network installation

Both the Leadpoint™-recording and the Leadpoint™-office stations can be connected to any PC network. When delivered, all Leadpoint™ run in a local mode, i.e all data are stored on the built-in hard disk and cannot be shared with others. By means of a network, signals and data can be recorded using any Leadpoint™-recording station, stored anywhere on the network and then reviewed and analyzed on any Leadpoint™-office, or Leadpoint™-recording station connected to the network. Printouts can be sent to any printer connected to the network.

Leadpoint™ Network installation

- Turn the power Off
- Follow the installation instruction provided in the Installation Manual. Please also refer to section 1. Safety Information in the Leadpoint™ User Guide.

NOTE The Leadpoint™ must be disconnected from all voltage sources, before being opened for any adjustment, replacement, maintenance or repair. (Except for those tasks described in this manual to be performed by the operator, authorized Medtronic personnel must perform such work.)

- Connect the Leadpoint™ to the network.
- Turn the power On.
- Quit the Leadpoint™ by clicking Quit. Are you sure? *Yes*.
- Install network drivers, and modify AUTOEXEC.BAT and CONFIG.SYS as described in the manual delivered with the network
- During the network software installation, define a global disk which can be reached from all Leadpoint™ stations.
- Create two directories on the global disk, where Leadpoint™ data will be stored, for example:

    K:\LP\PATDATA
    and
    K:\LP\PATDATA\ARCHIVE.

- Optionally, but recommended, define a global (color) printer as LPT2, or LPT3. LPT1 - usually the local printer.

- Check that the global disk directories can be accessed from the Leadpoint™ station using the DOS DIR command.

- When the network software is installed, restart the Leadpoint™:

  (Power Off - On, or <Ctrl><Alt><Del>).

- Make sure that no network error messages are shown during the startup procedure. If this is the case, then;

- Quit the Leadpoint™, and check the network installation again.

Setup System

Check the function on the Leadpoint™ recording stations, and make sure that signals can be recorded, and that the stimulator is operating properly.
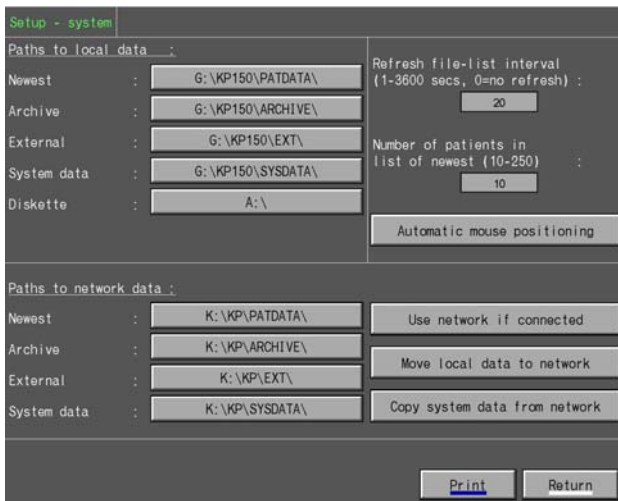
Figure 126 Setup System.

- ■ Click Setup.
- ■ Click System.
- ■ Click "path to patient data", and insert the network directory name: (K:\LP\PATDATA\ in the example above).
- ■ If this fails, insert the original Path, and quit the Leadpoint™, and:
- ■ Check network installation.
- ■ Click *"path to archive data"*, and insert the network directory name (K:\LP\PATDATA\ARCHIVE\ in the example above).
- ■ If this fails, insert the original Path, quit the Leadpoint™, and check the network installation.
- ■ Confirm/set "Refresh file-list interval" to 20 (seconds).
- ■ Confirm/set "Number of patients in file-list" to 200.
- ■ Click on Return.

Hardware Setup
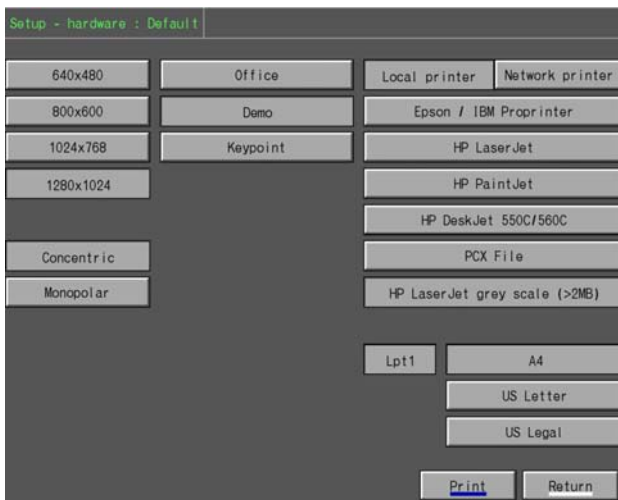
Figure 127 Setup Hardware.

Selecting Printers on the Network

■ Click on *Hardware*.

■ Select the network printer type, and the global printer port (LPT2 or LPT3).

The network printer is used, when the Leadpoint™ is connected to the local network, or the settings for the local printer are used. If the Leadpoint™ is running under Windows, please remember to add a printer in Windows matching the setting in Leadpoint™.

■   Click on Return.
■   Click on Return.

All patient data is now stored and retrieved from the global network disk drive (server), which is seen in the 'Filed patients' window and which is probably empty at this time. All printouts are sent to the selected global network printer.

■ Repeat the procedure above for all Leadpoint™ in the network, both for recording and office stations.

Features using the Leadpoint™ Network

Data editing and data reporting can be performed at office stations, thus reducing the time spend at recording stations.

Review signals and data during rounds and lectures.

Share printers.

Common backup procedure of the network server.

An investigation can easily continue on another Leadpoint™, since all data are accessible from all stations. Do not forget to return to the Patient Data Window, before switching system, otherwise the patient data is not accessible in other Leadpoint™ , see Locking below.

Locking

When a patient is in use by any station on the network, it is locked and cannot be used by anyone else. This is indicated by '***Locked ****' in the 'Filed patients' window. This window is refreshed every 20th second to check for new locks, or unlocked patients.

Patient Data is released on the network as soon as the Leadpoint™ causingthe locking returns to the Patient Data Window. For this reason, an automatic jump is made to the Patient Data Window after a report has been printed, and after a modem transmission.

NOTE Remember to return to The Patient Data Window, when the Leadpoint™ is not in use!!

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Service Centers

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