



# General Information

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This manual provides the necessary information for the installation and operation of the Stimulation Module.

These instructions must be studied before putting the module into operation.

The output of this module could prove to be hazardous to both patient and operator if used contrary to the best physiotherapy practices.

The information contained in this manual is subject to change without notice.

No part of this manual may be photocopied, reproduced, or translated into another language without the prior written consent of EMS Physio Ltd.

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## Record of Amendments

### Stimulation Module Model 73

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ISSUE	COMMENTS	DATE
1	Initial Issue	1-12-94
2	CE Marking	16-2-96
3	Revised	1-6-98
4	Revised	12-09-01
5	Revised	17-02-05
6	Revised Company Name	25-09-06

# EC Declaration of Conformity

EMS Physio Ltd  
Grove Technology Park  
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Declares that the following medical device is in conformity with the essential requirements and provisions of Council Directive 93/42/EEC and is subject to the procedure set out in Annex 2 of Directive 93/42/EEC under the supervision of Notified Body Number 0120, SGS United Kingdom Ltd.

Product Name                      Medi-Link Stimulation Module

Model Number                      73

Signature

A handwritten signature in black ink, appearing to be 'D. Smith', written over a horizontal line.

Position                              Technical Director

Date first issued                      16 February 1996

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# Warranty

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EMS Physio Ltd (hereinafter called the company) product is warranted against defects in materials and workmanship for a period of two years from the date of shipment. The Company will, at its option, repair or replace components which prove to be defective during the warranty period, provided that the repairs or replacements are carried out by the Company or its approved agents.

The Company will consider itself responsible for the effects on safety, reliability and performance of the product:-

only if assembly operations, re-adjustments, modifications or repairs are carried out by persons authorised by it,

only if the product is used in accordance with the instructions for use,

only if the electrical installation of the relevant room complies with the appropriate national requirements.

Should the product be returned to the Company for repair it must be sent carriage paid.

Consumable items, for example, self-adhesive electrodes, sponge electrode covers and batteries, are excluded from the above warranty.

# Introduction

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The Stimulation Module generates a number of commonly used low-frequency waveforms.

Surged 50 Hz sinusoidal currents may be used to produce rhythmical muscle contraction. This can help in the reduction of oedema and produce an increase in circulation in the treated area.

Diadynamic currents were introduced by Dr. Pierre Bernard. They are various combinations of half and full wave rectified 50 Hz sinewaves. Their therapeutic benefits include pain relief, reduction of swelling and inflammation, increased local circulation, muscle strengthening and re-education. The Stimulation Module produces DF (diphase fixe), MF (monophasé fixe), CP (courtes périodes), CPiso (courtes périodes isodynamique), LP (longues périodes) and RS (rythme syncope) waveforms.

Faradic pulses are of short duration (less than 1 ms) and have a repetition rate of 50 Hz. They are normally surged to produce rhythmical muscle contraction.

Galvanic or direct current is used for pain relief and iontophoresis.

The Stimulation Module produces a wide range of interrupted galvanic pulses. Rectangular pulses from 10 $\mu$ s to 600 ms are available and other shapes from 10 ms to 600 ms.

A special strength-duration program is provided. In this mode the strength-duration curve is plotted on the control module display and rheobase and chronaxie are automatically calculated and displayed.

Up to 16 user defined set-ups may be stored making the module quick and easy to use.

In constant current modes, the module monitors the electrode impedance and automatically terminates the output if the impedance is too high for the required current to be delivered safely.

## Precautions

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The therapist must be aware of the following precautions and potential hazards.

Simultaneous connection of a patient to high frequency surgical equipment may result in burns at the site of the stimulator electrodes and possible damage to the stimulator itself.

Operation in close proximity (less than 1 metre) to shortwave or microwave therapy equipment may produce instability in the stimulator output.

Consideration must be given to the current densities for any electrode used with the Stimulation Module. Current densities greater than 2 mA rms/cm<sup>2</sup> are not recommended because of the risk of burning. All the standard EMS conductive rubber electrodes may be used up to the maximum output of the module without exceeding this figure. When using other electrodes, the maximum safe output current should be assessed before use. First estimate the effective contact area of the electrode in square cm, and then apply the following formula:-

rms output current (mA) = Area of electrode (cm<sup>2</sup>) x 2

The ratio of the rms to the peak current for the different operating modes is given in the technical specification section of this manual.

The output indicator on the Medi-Link shows the peak output voltage or the peak output current in mA depending upon the selected mode of operation.

When using direct current, extreme care must be taken to ensure the patient's safety from electrochemical burning. In particular, care must be taken to avoid uneven pressure on the electrodes causing high local current density. Electrodes must not be applied where there are cuts or abrasions.

# Contraindications

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**Acute Sepsis**, due to the risk of spreading infection.

**Tumours**, due to the risk of increased growth or metastatic activity.

**Pregnancy**, do not treat the lower abdomen, back or pelvis.

**Menstruation**, do not treat lower back or abdomen due to risk of increased bleeding or pain.

**Cardiac conditions**, do not treat the chest area or near the cervical ganglion.

**Cardiac pacemakers**, especially demand type, or any other implanted electronic device.

**Febrile conditions**

**Large open wounds in treatment area**

**Dermatological conditions in treatment area**

**Thrombosis**

**Hypersensitivity or fear of electrical treatments**

**Any patient who cannot understand the nature of the treatment**, for example, young children, very old or senile patients who cannot report back adequately or understand the potential dangers. This may apply equally to persons who do not speak the same language as the therapist.

**Severe hypotension/hypertension**, do not treat in the region of the lower cervical spine.

If in doubt the patient's physician should be consulted.

**Electrodes should never be placed so that the applied current crosses the chest.**

# Technical Specification

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The Stimulation module generates sinusoidal, diadynamic, faradic, galvanic and interrupted galvanic waveforms.

## **Sinusoidal**

Frequency	50 Hz
Surge rate	1 to 60 / minute
Surge pattern	Rectangular, triangular, trapezoidal or user defined
Output	0 - 250 V pk-pk into 2500 ohm, constant voltage

## **Diadynamic**

Current type	DF, MF, CP, CPiso, RS, LP
Output	0 - 70 mA peak into 500 ohm, constant current
Polarity	Positive, Negative or Autoreverse

## **Faradic**

Frequency	50 Hz
Surge rate	1 to 60 / minute
Surge pattern	Rectangular, triangular, trapezoidal or user defined
Output	0 - 150 V pk-pk into 2500 ohm, constant voltage

## **Galvanic**

Output	0 - 70 mA into 500 ohm, constant current
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## **Interrupted Galvanic**

Pulse Width	10 $\mu$ s to 600 ms
Pulse Shape	Rectangular, triangular, trapezoidal or user defined
Pulse Rate	1 to 60 / minute
Output	0 - 125 V into 2500 ohm, constant voltage

## General

Treatment Time	1 - 30 minutes
Treatment Programs	16 User definable programs
Size (H x W x D)	100 x 80 x 210
Weight	1 kg

The Stimulation module is designed for use only as part of a Medi-Link system.

All information on model, serial number, and month/year of manufacture is located on the rear panel.

Each Stimulation module is supplied with a patient lead, 2 medium (100 x 70 mm) rubber pad electrodes, 2 medium sponge covers, electrode connection cables, 2 sizes of elasticated stretch bandages and this manual.

The Medi-Link Stimulation module has been designed to meet the requirements of IEC 601-1:1988 (BS5724:Part 1:1989) "Medical Electrical Equipment, Part 1:General requirements for Safety", and IEC601-2-10:1987 (BS5724:Section 2.10:1988) "Specification for nerve and muscle stimulators".

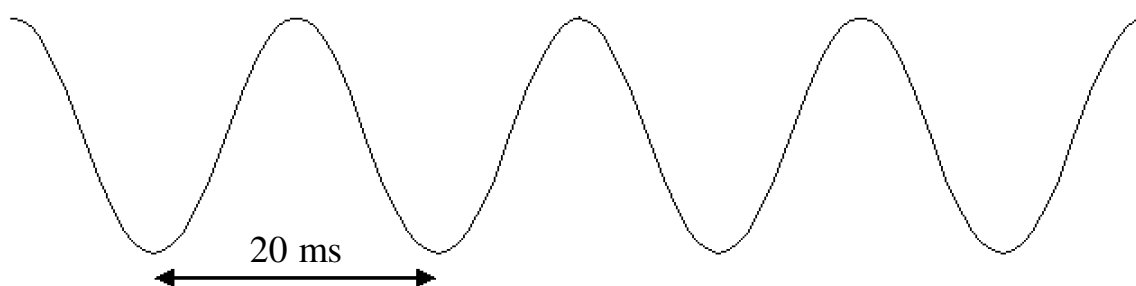
## Output Waveforms

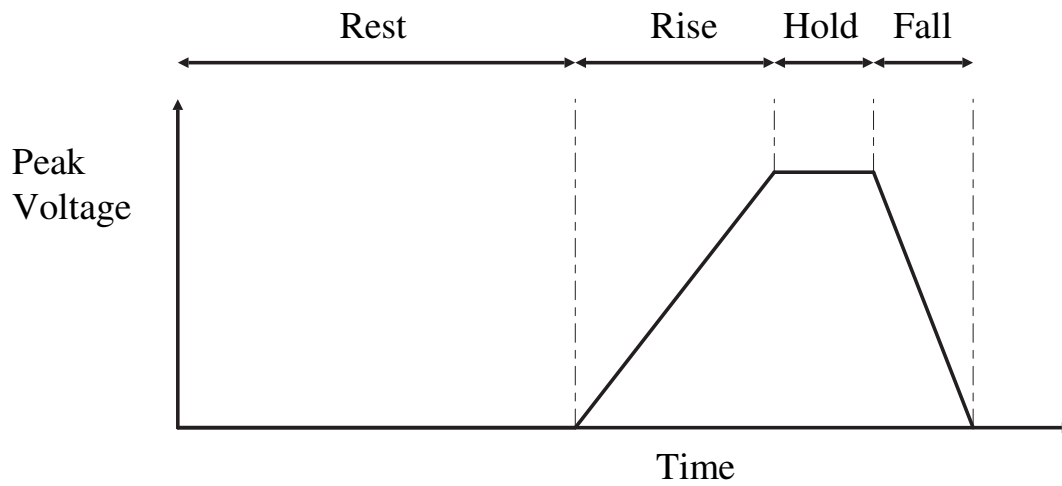
### Sinusoidal

The output is an amplitude modulated 50 Hz sinewave. The amplitude is determined by the position of the output control on the Stimulation module and the surge pattern and rate selected. The maximum amplitude is 125 V.

rms voltage = peak voltage x 0.707 for a continuous wave

Three standard surge patterns are provided. The rest, rise, hold and fall times are given as percentages of the total surge cycle.





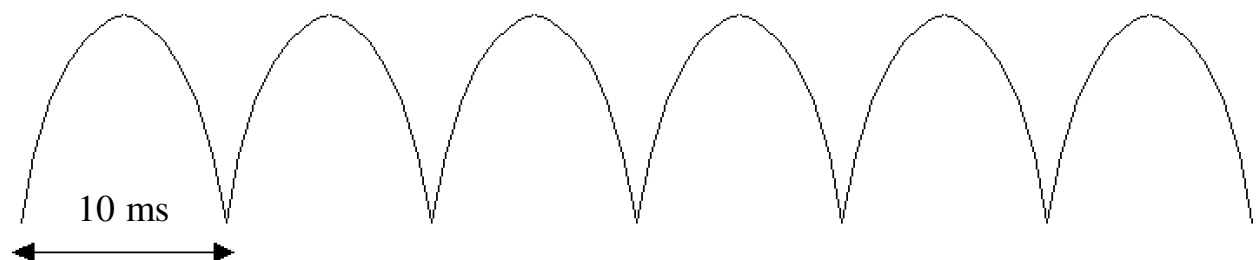
Pattern	Rest	Rise	Hold	Fall
Rectangular	50	5	40	5
Triangular	50	33	16	1
Trapezoidal	50	25	13	12

### Diadynamic

In the diadynamic mode the Stimulation module produces six different waveforms. All have a maximum peak current of 70 mA.

DF - diphasé fixe

This is a continuous full wave rectified 50 Hz sinewave.

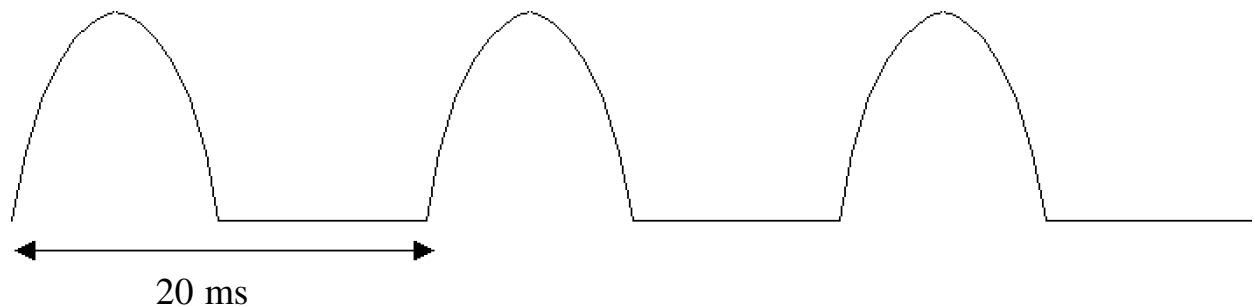


$$\text{rms current} = \text{peak current} \times 0.707$$

maximum rms current is 50 mA

## MF - Monophasé fixe

This is a continuous half wave rectified 50 Hz sinewave



rms current = peak current x 0.5

maximum rms current is 37.5 mA

## CP - Modulé en courtes périodes

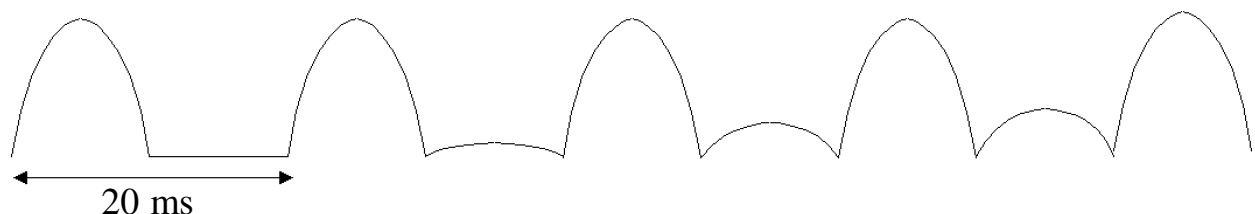
This is a combination of MF and DF. The module provides 1 second of MF (half wave signal) followed by 1 second of DF (full wave), the sequence being repeated continuously.

## CPiso - Modulé en courtes périodes isodynamique

This is the same as CP except that the amplitude of the MF signal is 12.5 % less than the amplitude of the DF signal.

## LP - Modulé en longues périodes

This provides an MF signal for 5 seconds. Then, over the next 2.5 seconds, the amplitude of the other phase of the 50 Hz rectified signal is increased smoothly to give a DF signal for a further 5 seconds. Finally the signal returns to MF by smoothly reducing one phase of the half wave rectified signal over the next 2.5 seconds. The whole sequence takes 15



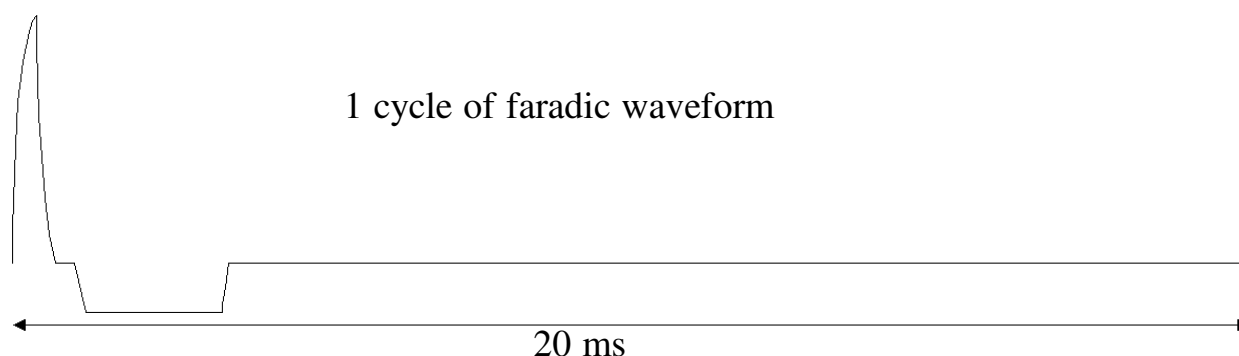
Part of LP waveform showing how the alternate phase increases in amplitude.

RS - rythme syncopé

This is 1 second of MF followed by 1 second with zero output, this sequence being repeated continuously.

### Faradic

The faradic mode produces a 0.5 ms pulses at a 50 Hz repetition rate. The surge settings are the same as for sinusoidal mode. Peak output is 125 V.

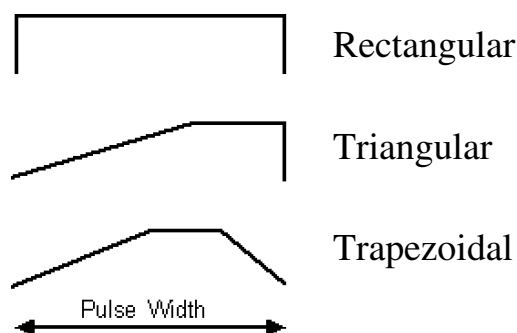


### Galvanic

The galvanic mode produces a direct current of up to 70 mA

#### Interrupted Galvanic

Interrupted Galvanic mode produces three standard pulse shapes



In addition to the pulse shapes shown the user can also define a pulse shape in terms of rise, hold and fall times as a percentage of the pulse width for pulses greater than 10 ms in duration.

Repetition rates from 1 to 60 pulses per minute are provided

### S/D Curve

For S/D curves the module provides rectangular interrupted galvanic pulses at a repetition rate of 30 pulses per minute.

# Installation

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The Stimulation Module is a therapy module and should be installed in a Medi-Link system either adjacent to the Control Module, or next-but-one to the Control Module.

1. Turn OFF the Medi-Link system and remove the mains cable.
2. If fitted remove the carrying handle from the system. This is done by pushing the release button on the handle away from the system and pulling the handle upwards until it disengages from the three fixings on the right of the system.
3. Place the Stimulation Module next to the Medi-Link system on a flat surface.
4. Push in the button on the front of the Stimulation Module and slide the module onto the three fixings on the end of the Medi-Link system.
5. When in position release the button and the module should latch onto the system. If this does not occur, pressing the modules together should result in the latching action. Although the modules may simply be pressed together, use of the release button is recommended.
6. DO NOT attempt to add or remove a module when the system is on.
7. Connect the mains cable to the socket on the rear of the Control Module, release and position the display, and switch on the Medi-Link system.
8. The system will display the EMS logo, Company name and MEDI-LINK followed by the message "Checking system configuration" (see figure 1). The Medi-Link will detect the presence of the Stimulation Module, give a short beep and display the messages "Configuration has changed" and "Loading application programs". The Medi-Link will then take between 15 and 45 seconds to re-configure itself and load the new application.
9. On successfully loading the application programs the display will show the System Menu screen (see figure 2).
10. Note that the next time the system is switched on there will be no need for the Medi-Link system to re-load the application programs. On switching on the display will show the EMS logo, Company name, MEDI-LINK and the "Checking system configuration" message for approximately 2 seconds followed by the System Menu.



**Electro-Medical Supplies  
(Greenham) Ltd.**

# MEDI-LINK

**Checking system configuration**

Figure 1 - Logos and Company name

<b>SYSTEM MENU</b>	
<b>1 STIMULATION</b>	<b>29 Mar 94</b>
<b>2 ULTRASOUND</b>	<b>16:04:08</b>
<b>SYSTEM SET-UP</b>	
<b>HELP</b>	

Figure 2 - System Menu

## Controls and Markings

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With the exception of the output current, all other settings for the Stimulation Module are input from the Medi-Link Control Module. The Output Level Control is located at the top of the module (see figure 3)

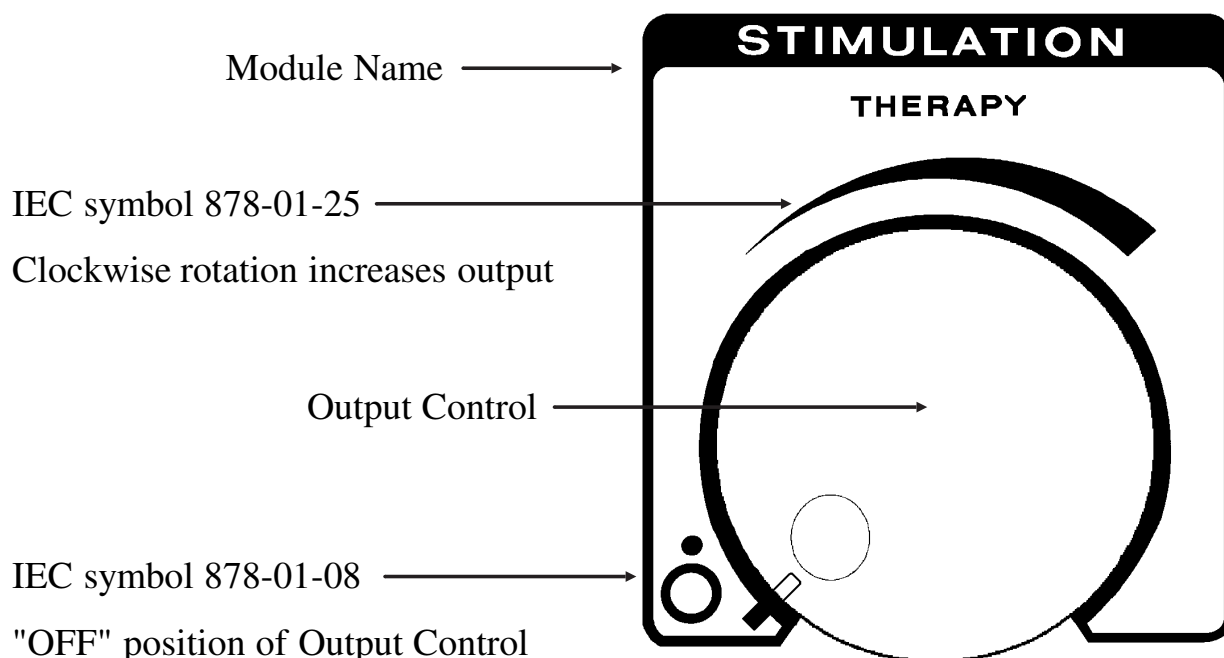


Figure 3 - Output Control

There are 2 sockets on the front panel of the module. The right hand socket is the Output Socket for connection of patient leads when a constant voltage mode is used (sinusoidal, faradic, interrupted galvanic or S/D curve). The left hand socket is the Output Socket for connection of patient leads when a constant current mode is used (diadynamic or galvanic). Beneath each socket is an indicator light showing when each socket is active (See figure 4).

Model number, serial number and date of manufacture are located on the rear of the module (see figure 5).

The rated output current and voltage are also shown on the rear panel.

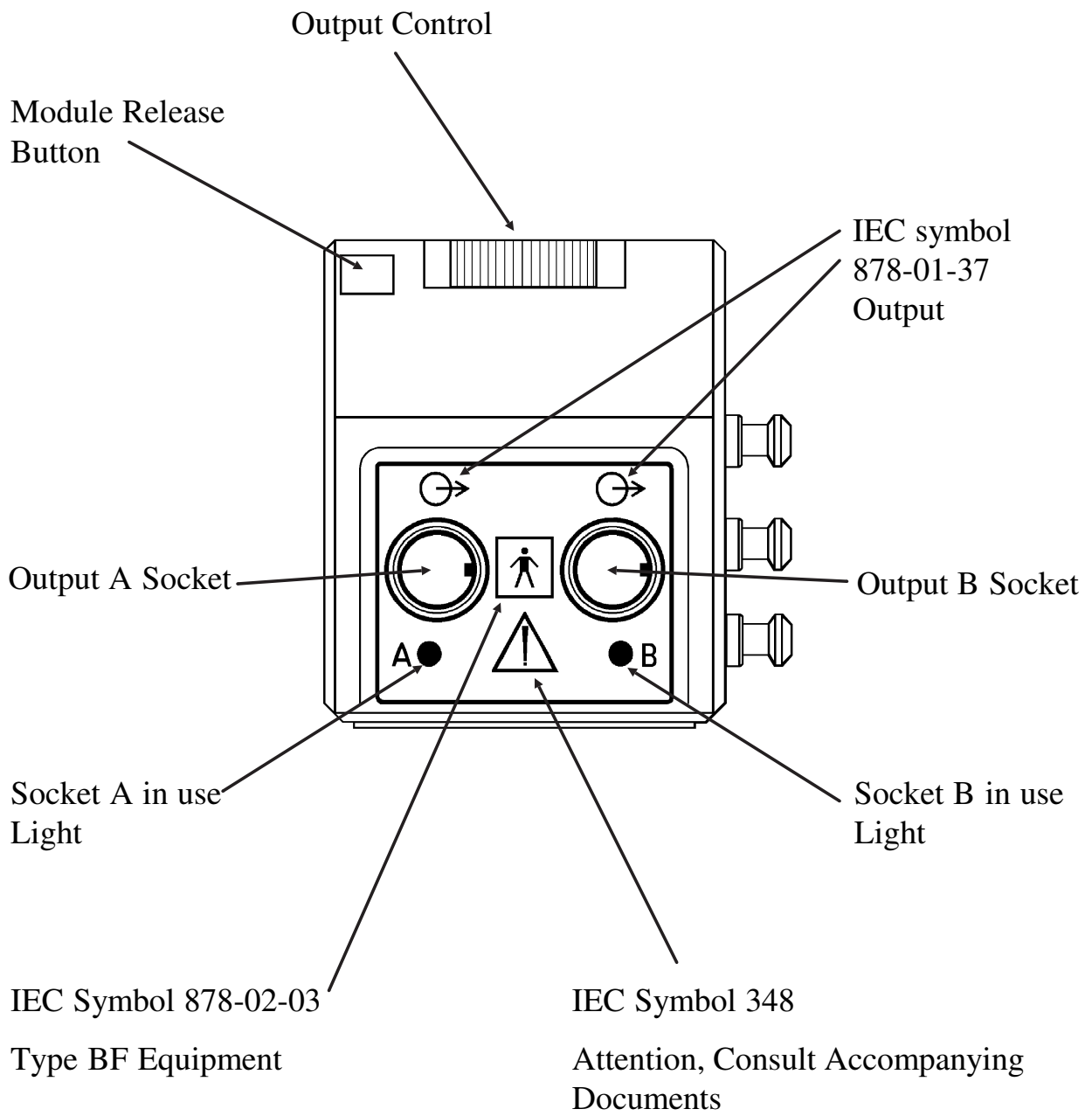


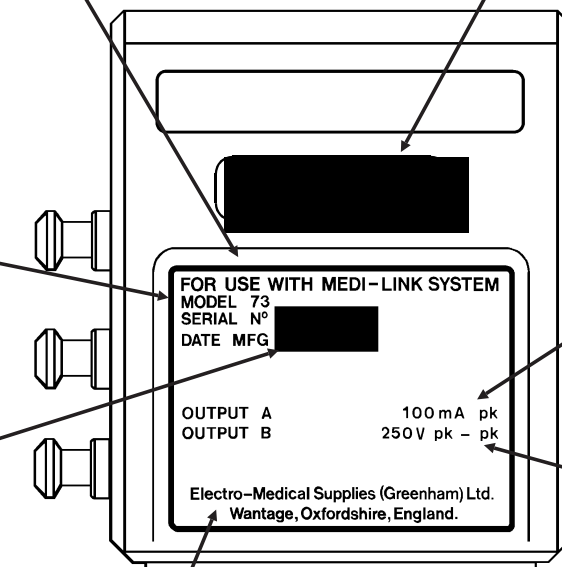
Figure 4 - Stimulation Module Front View

Statement indicating that the module is only for use as part of a Medi-Link system

CE Mark showing conformity to 93/42/EEC

Model Number

Serial Number and Date of Manufacture



Rated Output A Current

Rated Output B Voltage

Name and Address of Manufacturer

Figure 5 - Stimulation Module Rear View

# Operating Instructions

1. Having connected the Medi-Link system to a suitable mains supply and positioned the display at a suitable angle, switch on using the power switch on the Control Module. The mains indicator on the Control Module will light and the display will show the title screen (figure 1) and after approximately two seconds, the System Menu will appear (see figure 2).
2. Move the highlighted bar to Stimulation with the up and down arrow keys and then press ENTER.
3. The Medi-Link will run the Stimulation program and the display will change to show the Stimulation Set-Up (figure 6). All the current settings of the module are displayed and in the box on the right of the display is a small graphic representation of the current waveform.

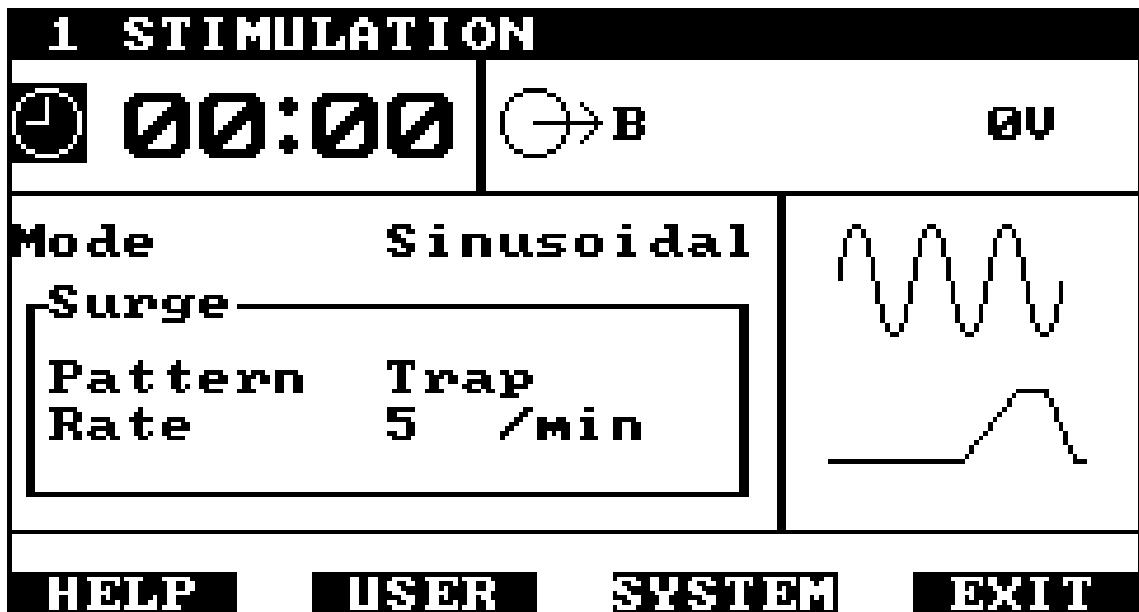


Figure 6 - Stimulation Set-Up

4. If the Output Control on the Stimulation Module is in the OFF position then the bottom of the screen will show the options available with the four function keys (F1-F4). If the Output Control is not in the OFF position, the message "Turn Output control Off" will flash at the bottom of the screen and an intermittent alarm will sound. The Medi-Link will not allow the user to proceed until the Output Control on the Stimulation Module is returned to the OFF position.
5. To change the settings of the Stimulation Module use the up and down arrow keys to highlight the parameter to be changed.

6. **Time:** The maximum Treatment Time is 30 minutes. The Treatment Time can be set in two ways.

When the clock symbol is highlighted, the Treatment Time may be incremented by 1 minute at a time by pressing the right arrow key, or decremented by pressing the left arrow key.

Alternatively, if the ENTER key is pressed when the clock symbol is highlighted, a sub-window will appear (see figure 7). The Treatment Time may now be entered from the numeric keypad, confirming the entry with the ENTER key. If F4 is pressed while the Treatment Time sub-window is displayed, the system will return to the Set-Up display without updating the time. If an invalid Treatment Time is entered (greater than 30 minutes) the system will give a short beep, clear the entry and wait for the user to enter another value. Pressing ENTER without entering a numeric value, will set the Treatment Time to zero.

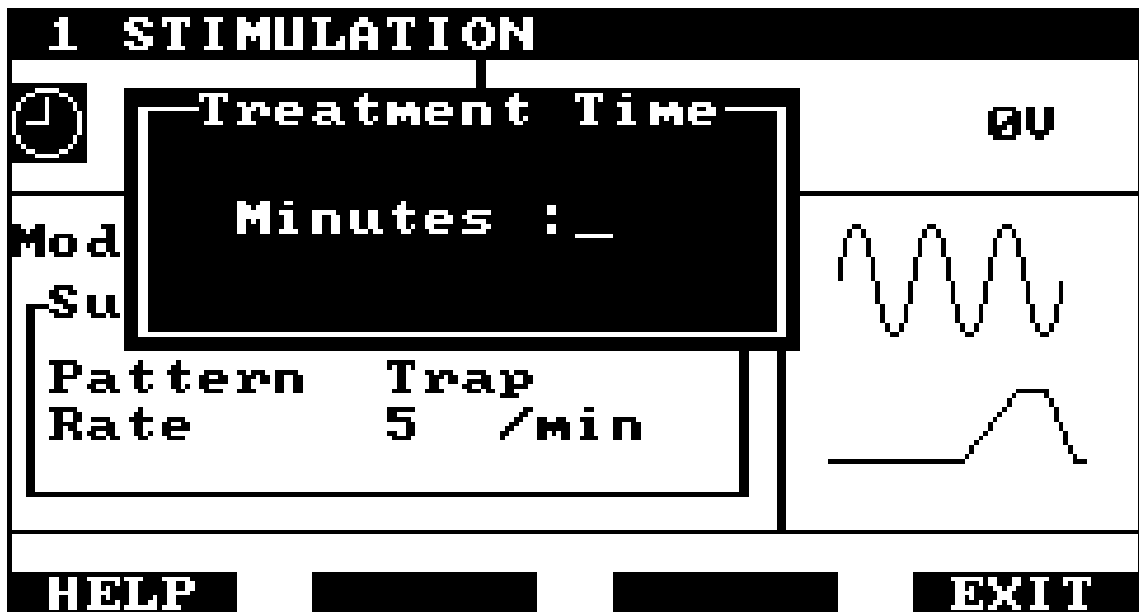


Figure 7 - Setting the Treatment Time

7. **Mode:** There are six modes of operation of the Stimulation Module: Sinusoidal, Diadynamic, Faradic, Galvanic, Interrupted Galvanic and S/D Curve. The mode may be set in two ways.

When the label Mode is highlighted on the Set-Up screen, pressing either the left or right arrow key will change the mode.

Alternatively, if the ENTER is pressed when the label Mode is highlighted, a sub-window will appear (see figure 8). The available options will be displayed in the sub-window with the current mode highlighted.

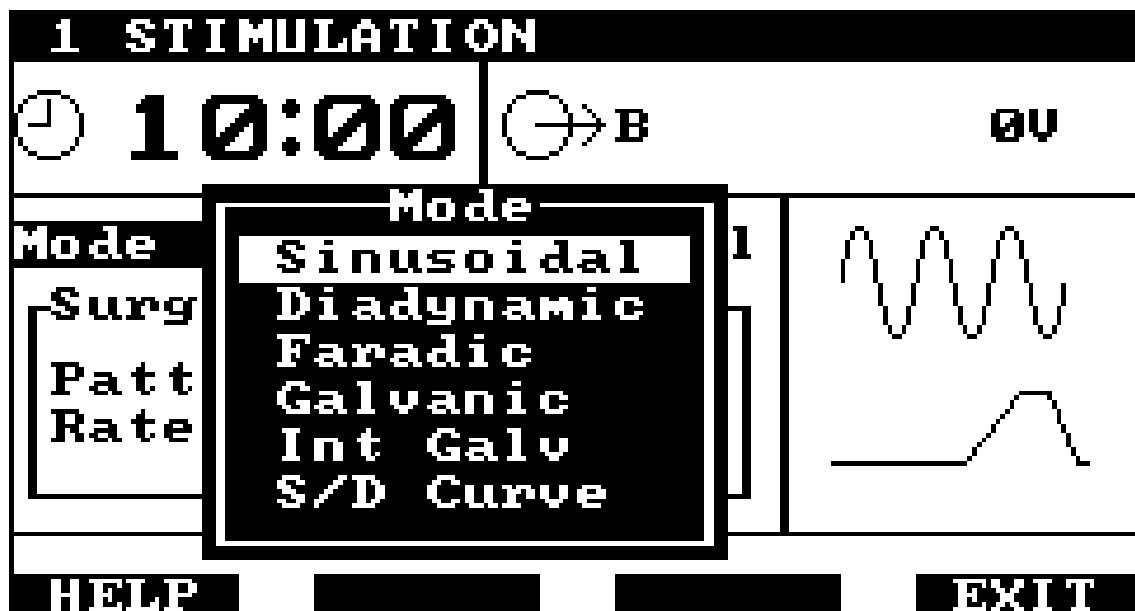


Figure 8 - Setting the Mode

Use the up and down arrow keys to highlight the required mode and then press ENTER. The system will return to the main Set-Up screen and update the mode. Note that the set-up display for each mode is different, and that the graphic representation of the output waveform on the right of the display will also be updated.

If F4 is pressed while the Mode sub-window is displayed, the system will return to the Set-Up screen without changing the mode.

Other options on the setup screen depend on the mode selection. When the mode is changed the list of options below the mode will be updated.

### Sinusoidal Mode

8. In sinusoidal mode, the remaining options determine how the output is surged during treatment. The graphic display on the right hand side of the display shows a sinewave at the top and at the bottom, a graph showing how the output amplitude varies with time during one surge cycle starting with the rest period (figure 6).

9. **Pattern:** The surge pattern determines how the amplitude of the sinewave varies during the surge cycle. Three standard patterns are available - rectangular, triangular and trapezoidal - plus a user option which allows setting of the rise, hold, fall and rest times as a percentage of the total surge cycle.

To change the surge pattern, first use the up and down arrow keys to highlight the label Pattern. Then press either the left or right arrow key to change the surge pattern.

Alternatively, if the ENTER key is pressed when the label Pattern is highlighted, a sub-window will appear (figure 9). The available options will be displayed in the sub-window with the current setting highlighted. Also the rise, hold, fall and rest times for the current selection are shown as percentages of the total surge cycle in a highlighted bar just above the function key labels. Use the up and down arrow keys to highlight the required surge pattern and confirm the selection by pressing the ENTER key. If one of the standard patterns has been selected, the system will return to the main sinusoidal mode set-up screen (figure 6) and display the new pattern.

If User is selected then a second sub-window will appear (figure 10).

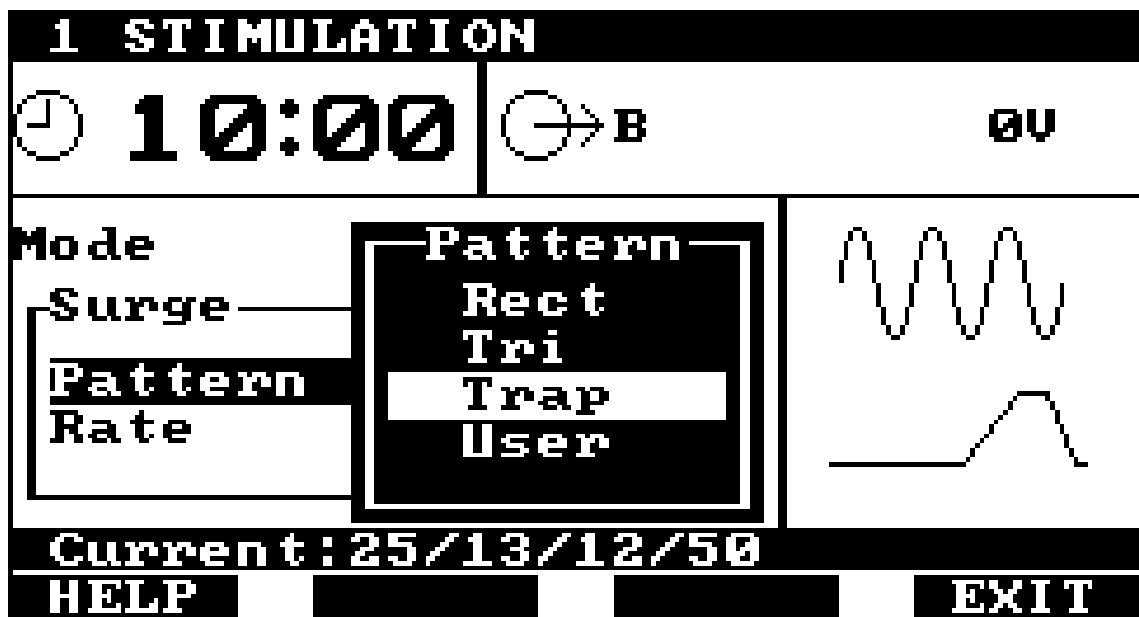


Figure 9 - Setting the Surge Pattern

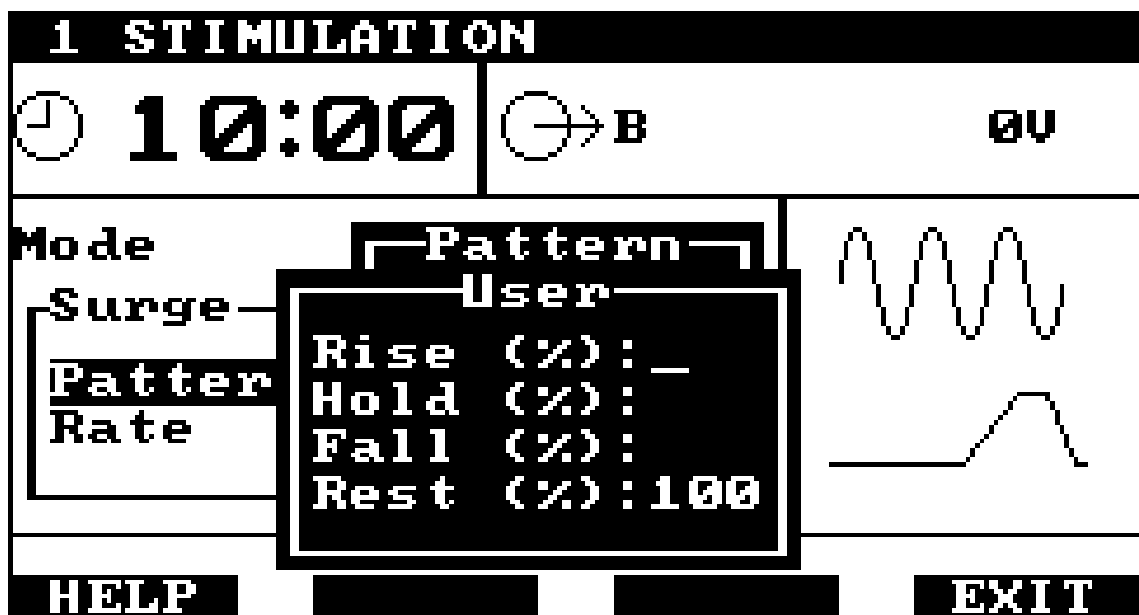


Figure 10 - Setting a User-defined Surge Pattern

The rise, hold and fall times of the surge may be entered as a percentage of the total surge cycle. The rest time will be the percentage remaining. As the system prompts the user to enter the rise time the rest time is shown as 100% since the rise, hold and fall are at present zero. Enter the required rise percentage as a one or two digit number using the numeric keypad confirming the entry with the ENTER key. The cursor will then move to the hold percentage entry and subtract the rise time entered from the rest time (figure 11).

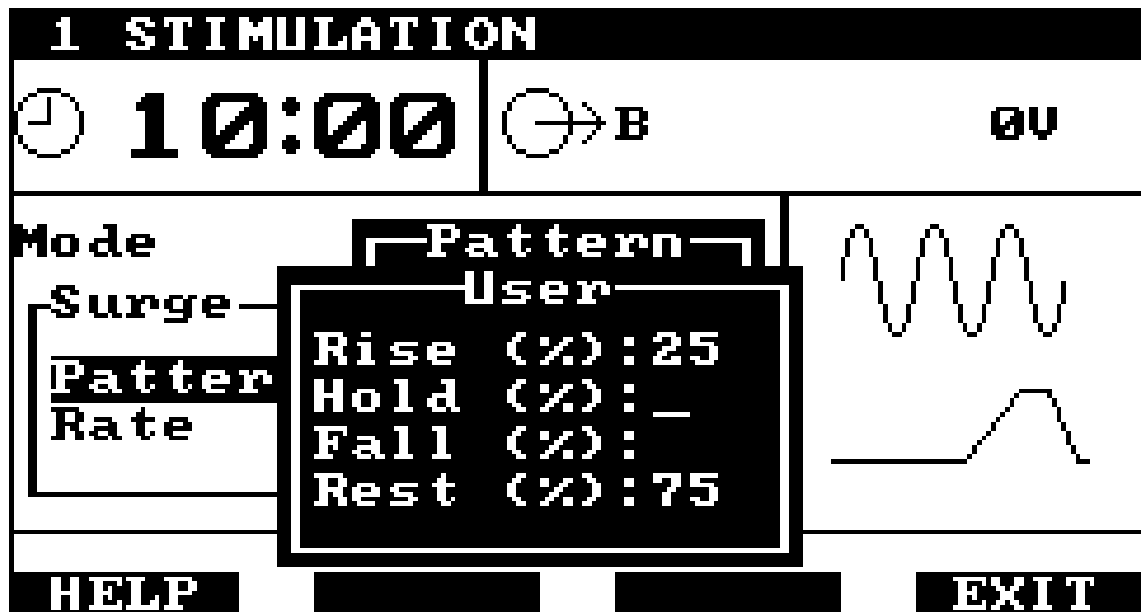


Figure 11 - Setting a User-defined Surge Pattern

Enter the hold and fall percentages in the same way. If zero or a number greater than the displayed rest percentage is entered then the system will give a short beep, clear the entry and wait for the user to enter another value.

After the fall percentage has been entered the system will display the proposed surge and prompt the user to confirm the new surge pattern (figure 12).

Press F2 to confirm the setting. The system will return to the main set-up screen, display the surge pattern as user and redraw the graphic representation of the surge amplitude on the right of the display.

Press F3 to return to the user entry (figure 10) and re-enter the percentages.

Press F4 to return to the surge pattern selection screen (figure 9) without accepting the entered pattern.

Pressing F4 while the user sub-window is displayed will always return to the pattern selection screen (figure 9)

If F4 is pressed while the pattern sub-window is displayed the system will return to the set-up screen without updating the surge pattern.

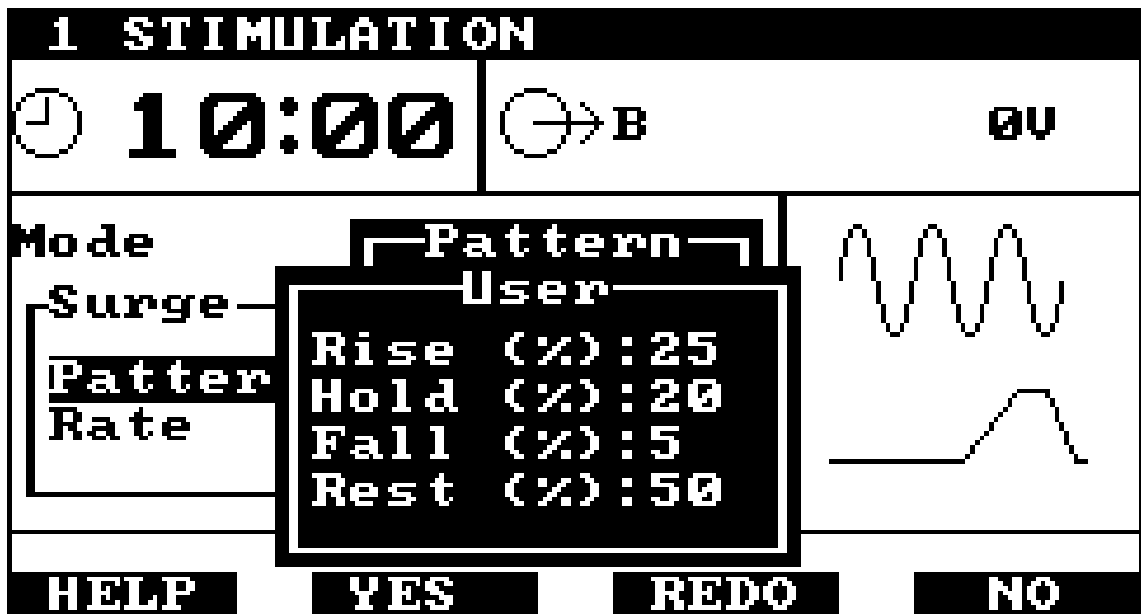


Figure 12 - Confirming a User-defined Surge Pattern

10. **Rate:** The surge rate may be set from 1 to 60 surges per minute. To change the surge rate, first highlight the label Rate using the up and down arrow keys. Then press either the left or right arrow key to decrement or increment the rate.

Alternatively, if the ENTER key is pressed when the label Rate is highlighted, a sub-window will appear (figure 13). The screen cursor will be displayed by the /min label. Enter the desired rate using the numeric keypad, confirming the entry with the ENTER key. The left arrow key acts as a backspace in case the wrong numeric key is pressed. If an invalid rate is entered (0 or greater than 60), the system will give a short beep, clear the entry and wait for the user to enter another value.

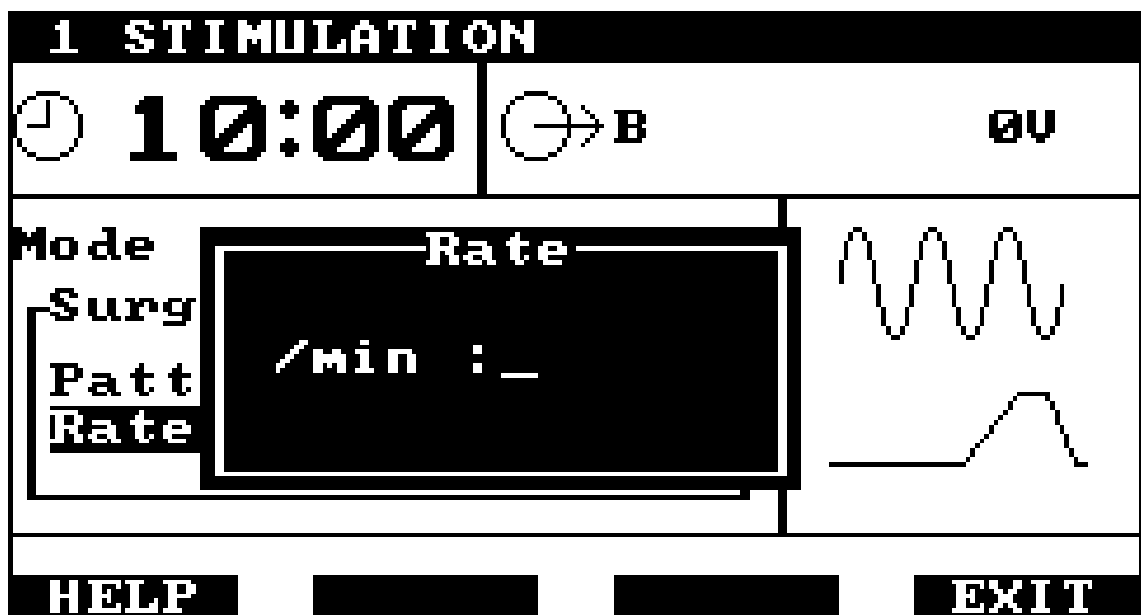


Figure 13 - Setting the Surge Rate

When the rate has been entered the system will return to the main sinusoidal set-up screen and display the new rate.

If F4 is pressed while the Rate sub-window is displayed, the system will return to the set-up screen without changing the setting.

### Diadynamic Mode

11. In diadynamic mode the graphic display on the right shows the selected current type (DF, MF etc). The set-up screen is shown in figure 14.

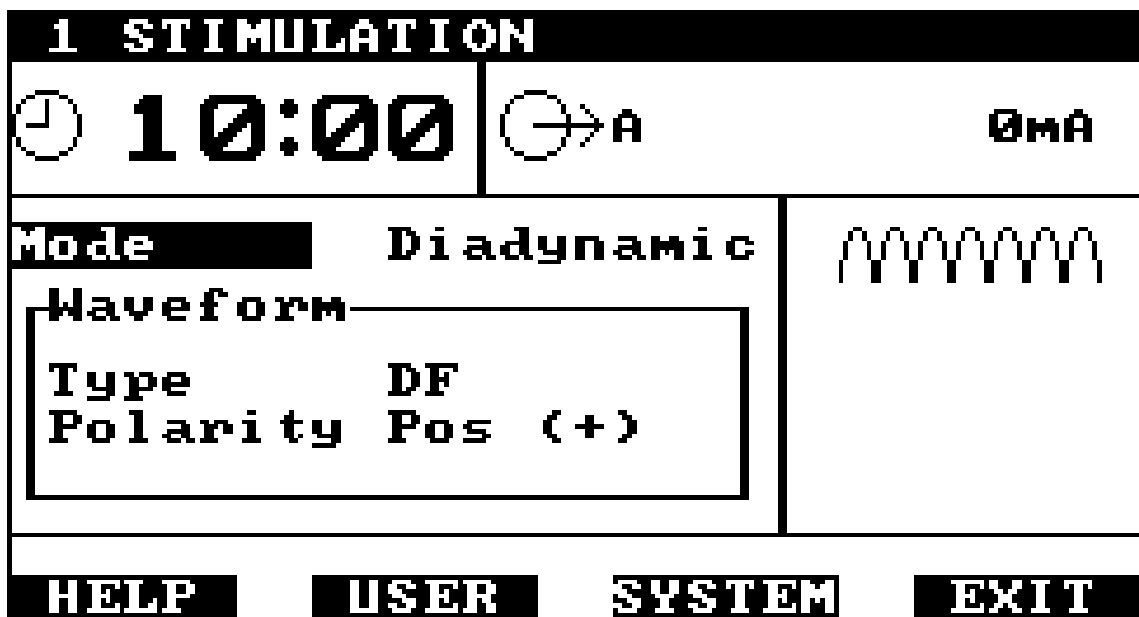


Figure 14 - Diadynamic Set-Up screen

12. **Type:** To change the current type, first highlight the Type label using the up and down arrow keys. Then use the left or right arrow key to change the current type.

Pressing the ENTER key when the Type label is highlight, opens a sub-window which lists the available current types with the current selection highlighted (figure 15). Use the up and down arrow keys to highlight the required type and then press ENTER. The display will return to the diadynamic set-up screen, and update both the diadynamic waveform type and the graphic display at the right of the screen.

If F4 is pressed while the Type sub-window is displayed, then the system will return to the main diadynamic set-up screen without changing the waveform type.

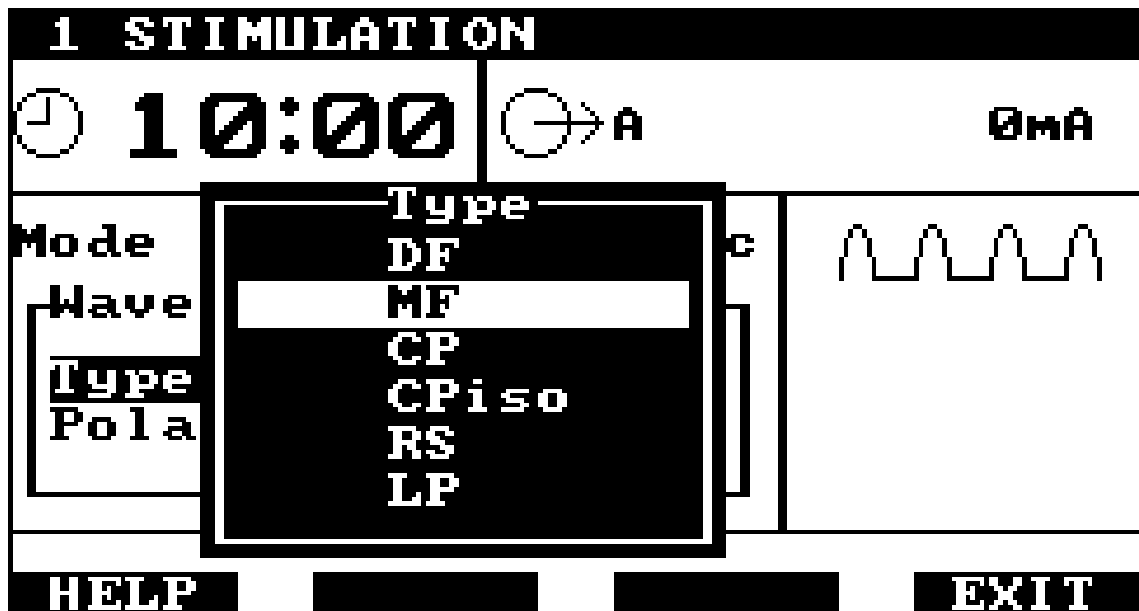


Figure 15 - Setting the diadynamic waveform type

13. **Polarity:** There are three polarity options - positive (yellow lead positive, blue lead negative), negative (yellow lead negative, blue lead positive) or autoreverse. With the autoreverse option, after 2 minutes of treatment the output current is reduced to zero smoothly over the next 5 seconds, the output polarity is reversed and then the output current is increased smoothly over the next 5 seconds to its set value. This will be repeated every 2 minutes until the treatment time remaining is insufficient to complete the polarity reversal sequence.

To change the polarity setting, highlight the Polarity label using the up and down arrow keys and then use the left and right arrow keys to change the setting.

Pressing the ENTER key when the Polarity label is highlighted, opens a sub-window which lists the available options with the current selection highlighted (figure 16). Use the up and down arrow keys to highlight the required polarity option and then press ENTER. The display will return to the diadynamic set-up screen and update the displayed polarity.

If F4 is pressed while the Polarity sub-window is displayed, then the system will return to the main diadynamic set-up screen without changing the setting.

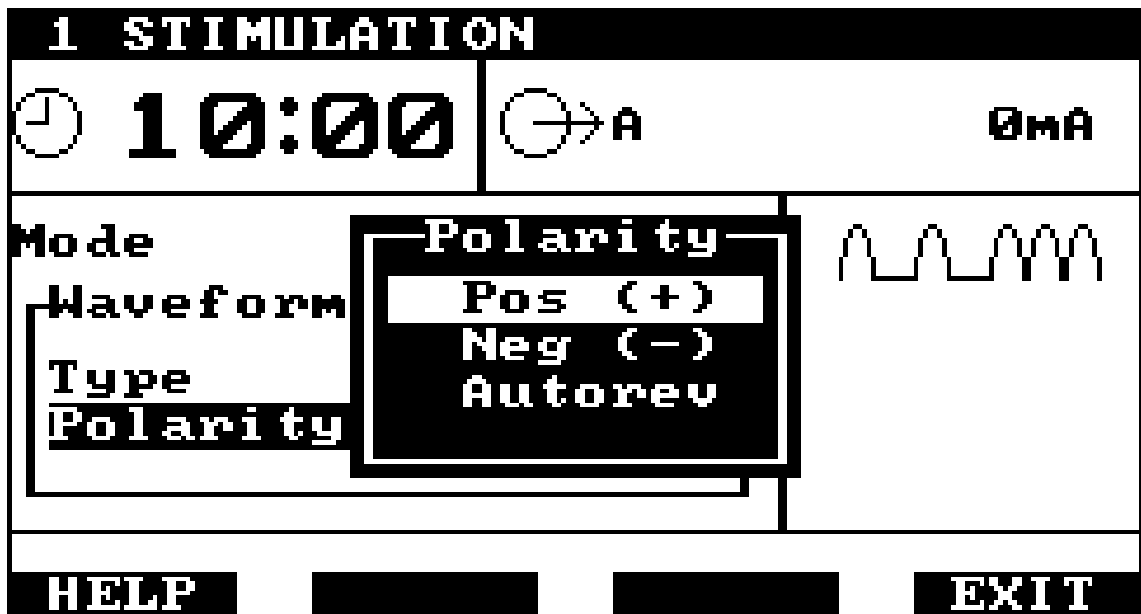


Figure 16 - Setting the diadynamic waveform polarity

### Faradic Mode

14. In faradic mode, the remaining options determine how the output is surged during treatment. The graphic display on the right hand side of the display shows faradic pulses at the top and at the bottom, a graph showing how the output amplitude varies with time during one surge cycle starting with the rest period (figure 17).

Setting the surge pattern and rate is exactly the same as for the sinusoidal mode.

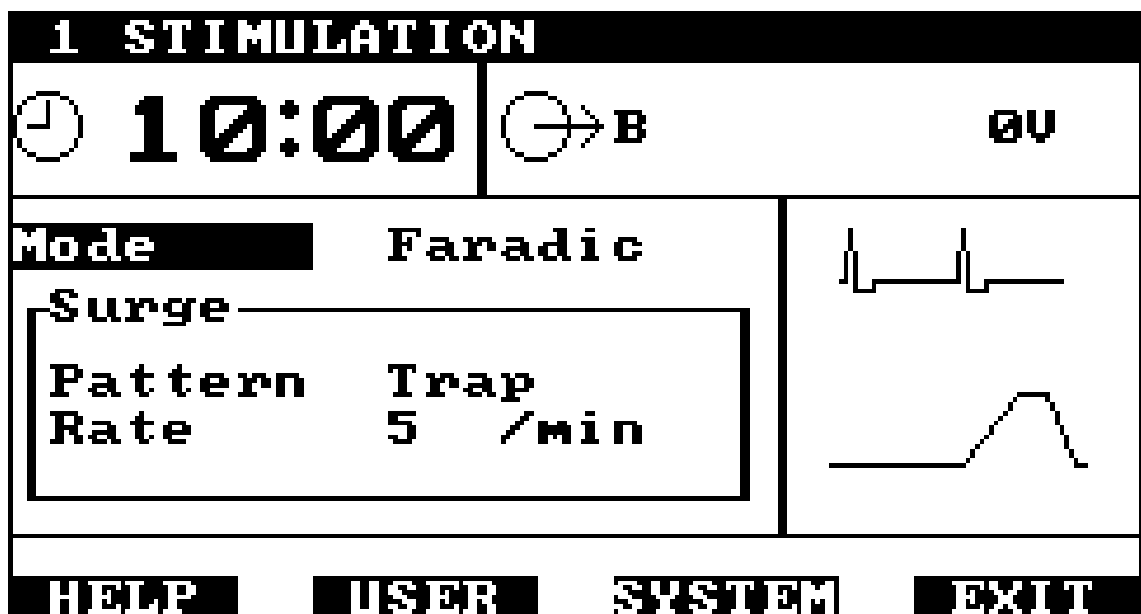


Figure 17 - Faradic set-up screen

## Galvanic Mode

15. In the galvanic mode the Stimulation module produces a constant current dc output (yellow lead positive). There are no additional settings. Figure 18 shows the galvanic mode set-up.

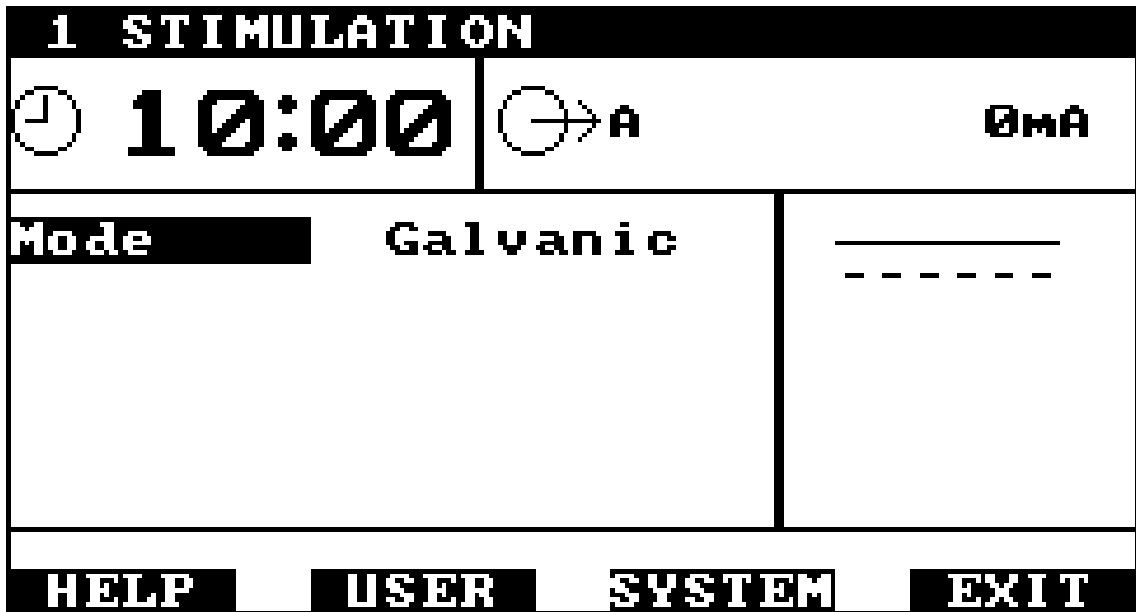


Figure 18 - Galvanic set-up screen

## Interrupted Galvanic Mode

16. In interrupted galvanic mode, the remaining options determine the width, shape and repetition rate of the pulses. The graphic display on the right hand side of the display shows the pulse shape at the top and at the bottom, a graph showing how the output amplitude varies with time during one cycle of the pulse (figure 19).

17. **Width:** For rectangular pulses, 11 pulse widths are available from 10  $\mu$ s to 600 ms. For other shapes, only options greater than 10 ms may be selected.

To change the pulse width, first highlight the Width label using the up and down arrow keys and then the left or right arrow key decrease or increase the width.

Alternatively, press ENTER when the label Width is highlighted to open a sub-window which lists the available widths with the current selection highlighted (figure 20). Use the up and down arrow keys to highlight the required width and then press ENTER. The display will return to the interrupted galvanic set-up screen, and update the displayed width.

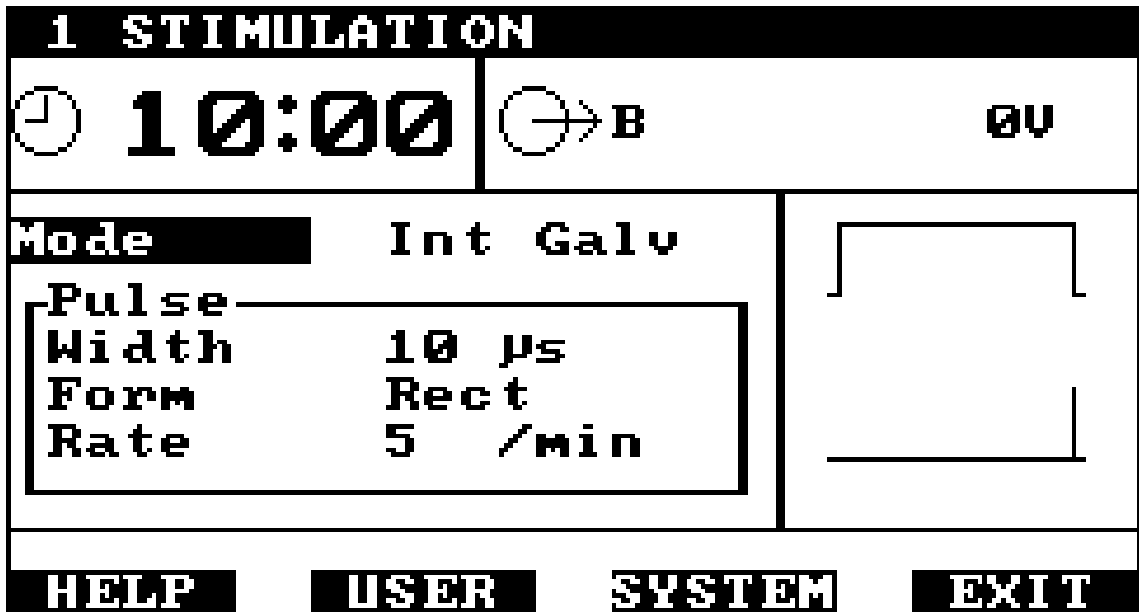


Figure 19 - Interrupted Galvanic set-up screen

If ENTER is pressed with a pulse width less than 10 ms highlighted and the pulse form is not rectangular then the system will give a short beep to indicate that the selection is invalid.

If F4 is pressed while the width sub-window is displayed, then the system will return to the main interrupted galvanic set-up screen without changing the setting.

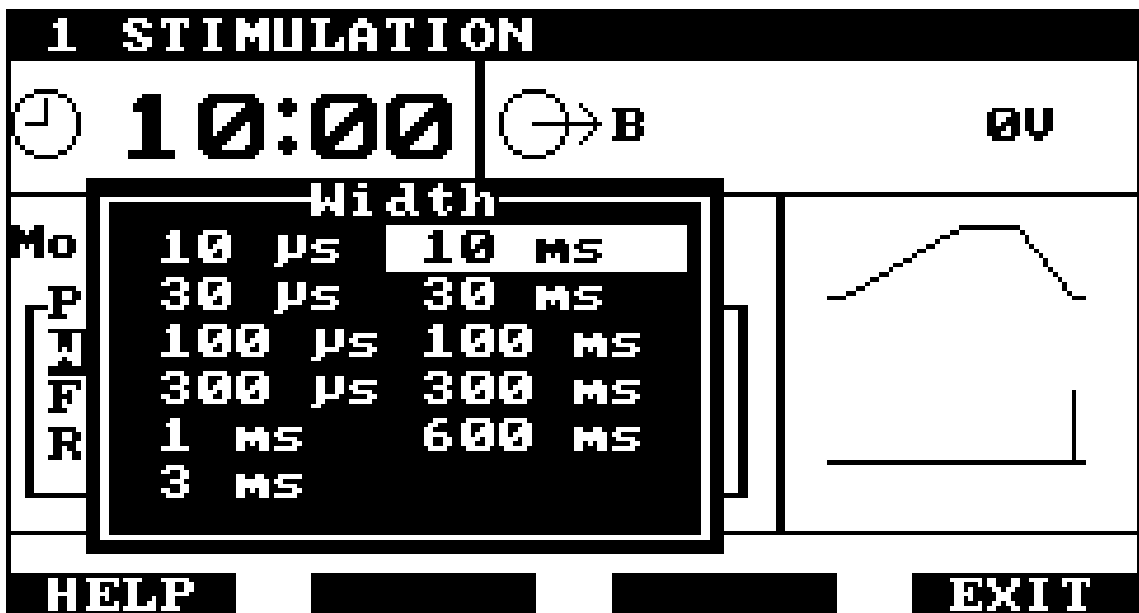


Figure 20 - Setting the pulse width

18. **Form:** Three standard pulse forms are available - rectangular, triangular and trapezoidal - plus a user option which allows setting of the rise, hold and fall times of the pulse as a percentage of the pulse width.

To change the pulse form, first use the up and down arrow keys to highlight the label Form. Then press either the left or right arrow key to change the pulse form.

Alternatively, if the ENTER key is pressed when the label Form is highlighted, a sub-window will appear (figure 21). The available options will be displayed in the sub-window with the current setting highlighted. Also the rise, hold and fall times for the current selection are shown as percentages of the total pulse width in a highlighted bar just above the function key labels. Use the up and down arrow keys to highlight the required pulse form and confirm the selection by pressing the ENTER key. If one of the standard forms has been selected, the system will return to the main interrupted galvanic mode set-up screen (figure 19) and display the new pattern.

If User is selected then a second sub-window will appear (figure 22).

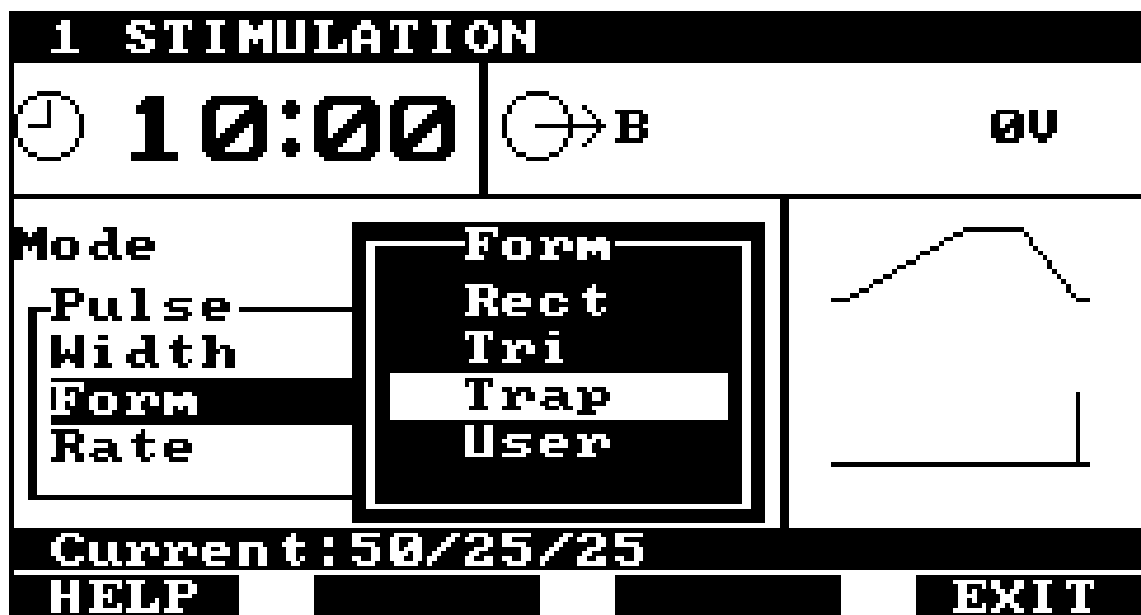


Figure 21 - Setting the pulse form

The rise and hold times of the pulse may be entered as a percentage of the total pulse width. The fall time will be the percentage remaining. As the system prompts the user to enter the rise time the fall time is shown as 100% since the rise and hold are at present zero. Enter the required rise percentage as a one or two digit number using the numeric keypad confirming the entry with the ENTER key. The cursor will then move to the hold percentage entry and subtract the rise time entered from the fall time.

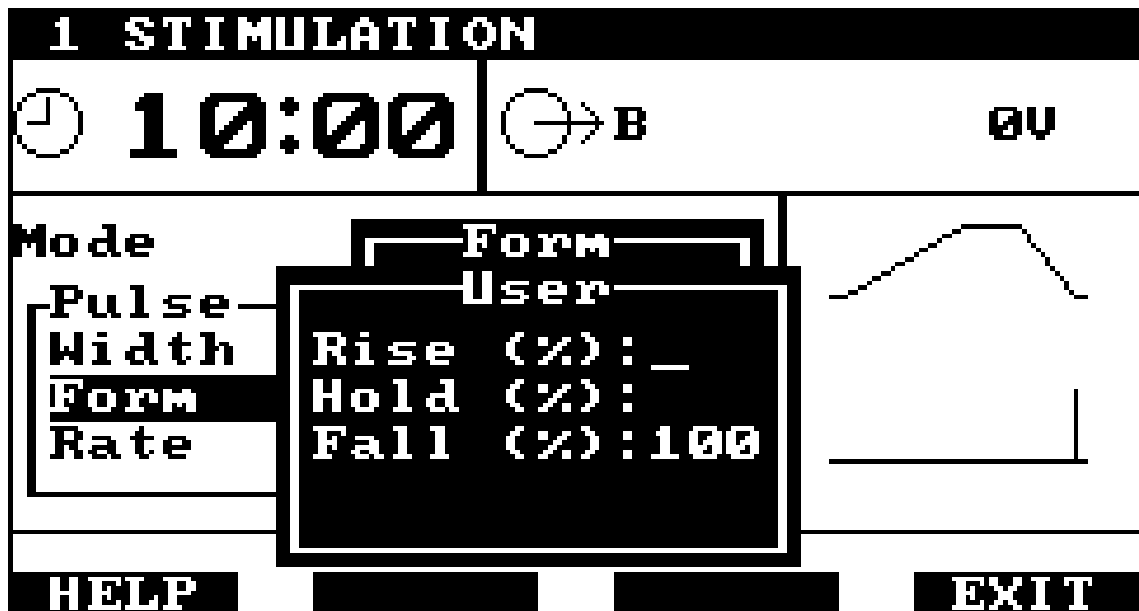


Figure 22 - Defining a user pulse form

Enter the hold percentage in the same way. If zero or a number greater than the displayed fall percentage is entered then the system will give a short beep, clear the entry and wait for the user to enter another value.

After the hold percentage has been entered the system will display the proposed pulse form and prompt the user to confirm it (figure 23).

Press F2 to confirm the setting. The system will return to the main interrupted galvanic set-up screen, display the form as user and redraw the graphic representation of the pulse on the right of the display.

Press F3 to return to the user entry (figure 22) and re-enter the percentages.

Press F4 to return to the pulse form selection screen (figure 20) without accepting the entered values.

Pressing F4 while the user sub-window is displayed will always return to the form selection screen (figure 20)

If F4 is pressed while the form sub-window is displayed the system will return to the set-up screen without updating the pulse form.

19. **Rate:** The pulse rate is entered in exactly the same way as the surge rate in sinusoidal and faradic modes. Figure 24 shows the rate sub-window for interrupted galvanic pulses.

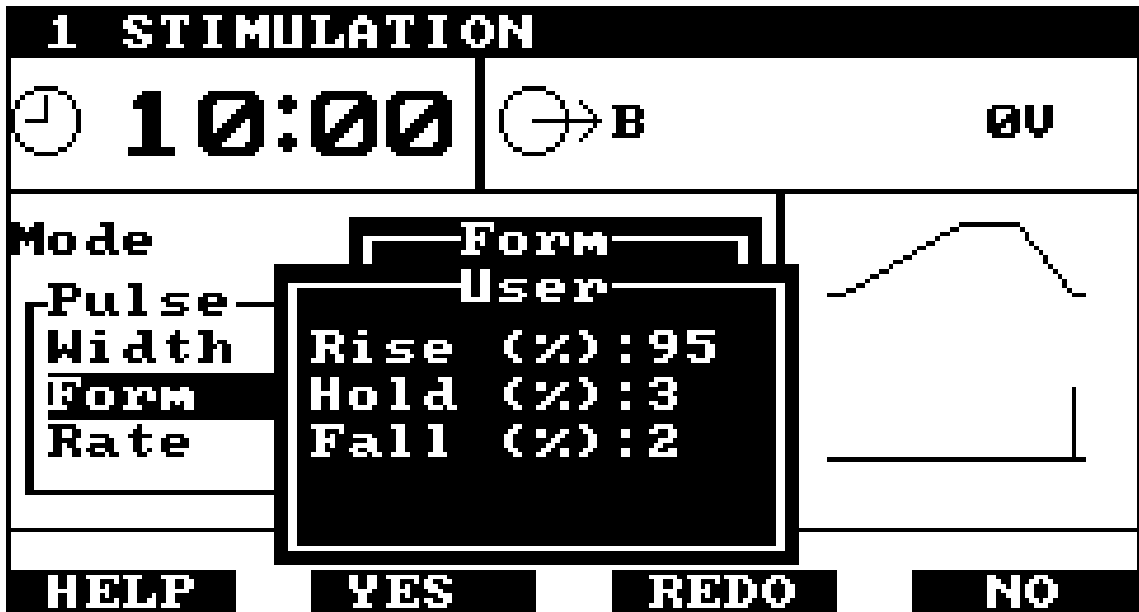


Figure 23 - Confirming a user pulse form

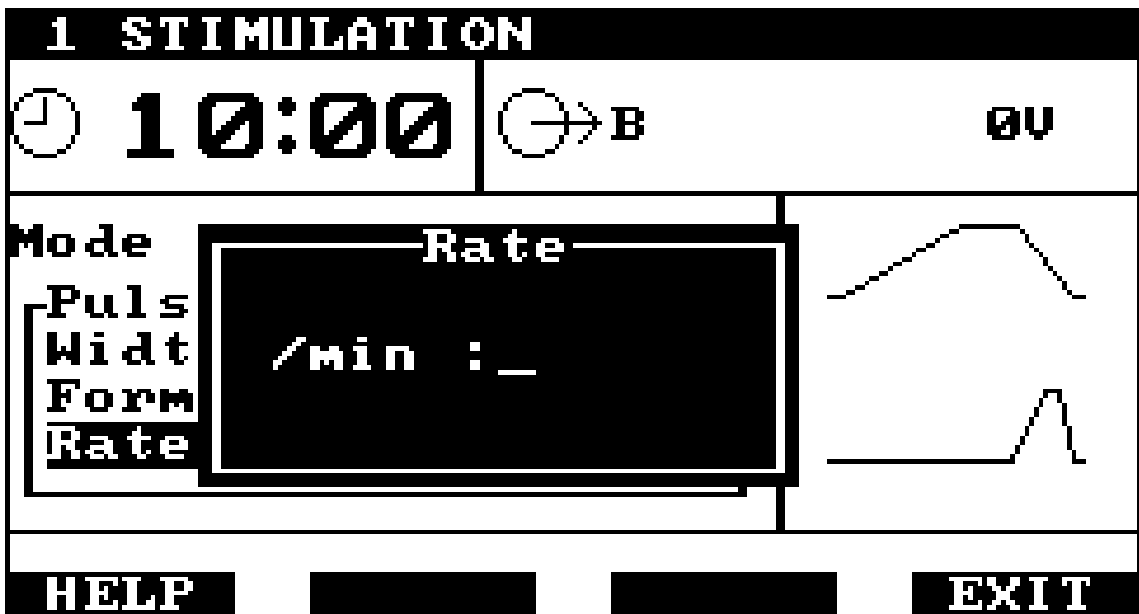


Figure 24 - Setting the pulse rate

## S/D Curve Mode

20. The S/D Curve mode generates rectangular interrupted galvanic pulses for plotting strength duration curves. Figure 25 shows the set-up screen. A start and end pulse width are set in the same way as the pulse width is set in the interrupted galvanic mode. The system will not allow an end pulse width greater than or equal to the start width.

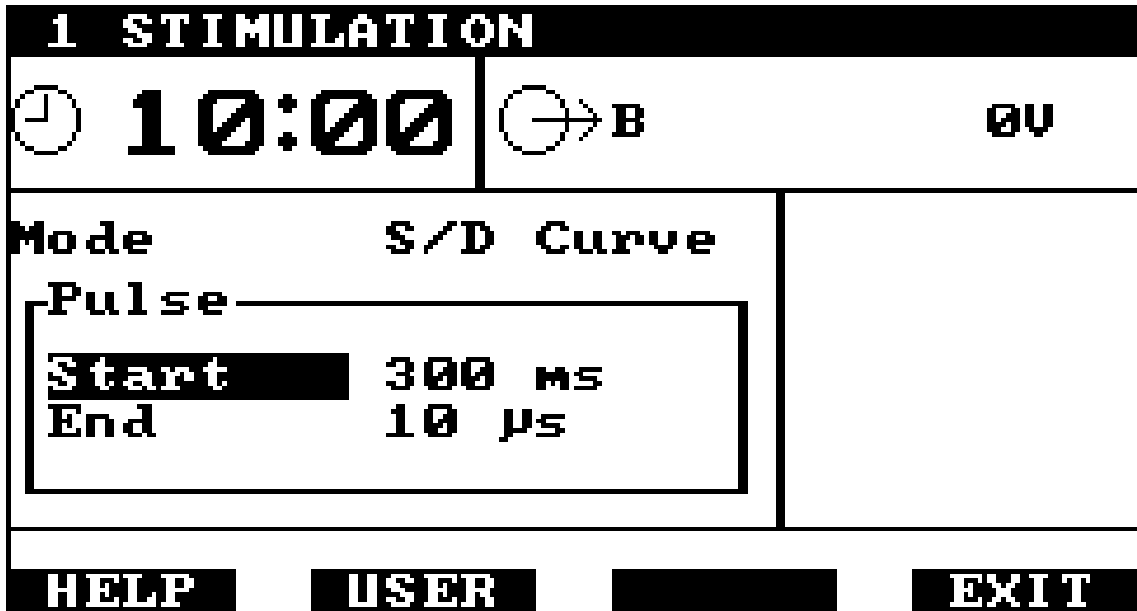


Figure 25 - S/D Curve set-up

21. When all the settings are as required, connect the 2-way output lead to output socket A for diadynamic and galvanic modes (constant current) and output socket B for sinusoidal, faradic, interrupted galvanic and S/D curve modes (constant voltage). Attach suitable electrodes to the patient and connect to the output lead using the blue and yellow cables provided. See section on Electrodes for further advice on applying these.

22. Slowly advance the Output Control (see figures 3 and 4) located on the Stimulation Module. It will be felt to click on. If the Treatment Time is zero, then the message "Turn Output control Off" will flash at the bottom of the display and the system will give an intermittent alarm until the control is returned to its OFF position.

If all settings are valid then in all but S/D curve mode, the word "Treatment" will flash at the bottom of the display and the Treatment Time will begin to count down from its set value (figure 26). The green light below the output socket being used will light.

**Always advance the output control slowly.**

23. For surged outputs and interrupted galvanic pulses, a bar is displayed below the surge or pulse cycle display on the right of the screen showing the current point in the cycle. Both the user and the patient can see when the output is about to be felt.

For surged outputs only advance the control during the hold time of the surge.

For interrupted galvanic pulses the output voltage display is only updated after the pulse and the output control should only be advanced a little at a time.

Slowly advance the Output Control until the patient feels the effect of the applied current. The output display at the top right will show the peak current or voltage together with the adjacent bar graph (see figure 26).

24. In constant current applications, if the module detects a high electrode impedance at any time during treatment then the output of the Stimulation Module is immediately terminated and the error is displayed (see figure 27). Turn the Output Control off and check that the electrodes are secure, and the sponges are damp. Also, check all interconnecting leads before re-applying the output to the patient. Note that in soft water areas it may be necessary to add a small amount of bicarbonate of soda to the water used to wet the sponges to achieve adequate contact.

25. During the last 5 seconds of any treatment the output is smoothly reduced to zero.

When the Treatment Time reaches zero, then the message "Turn Output control Off" will flash at the bottom of the display and the system will give an intermittent alarm until the control is returned to its OFF position.

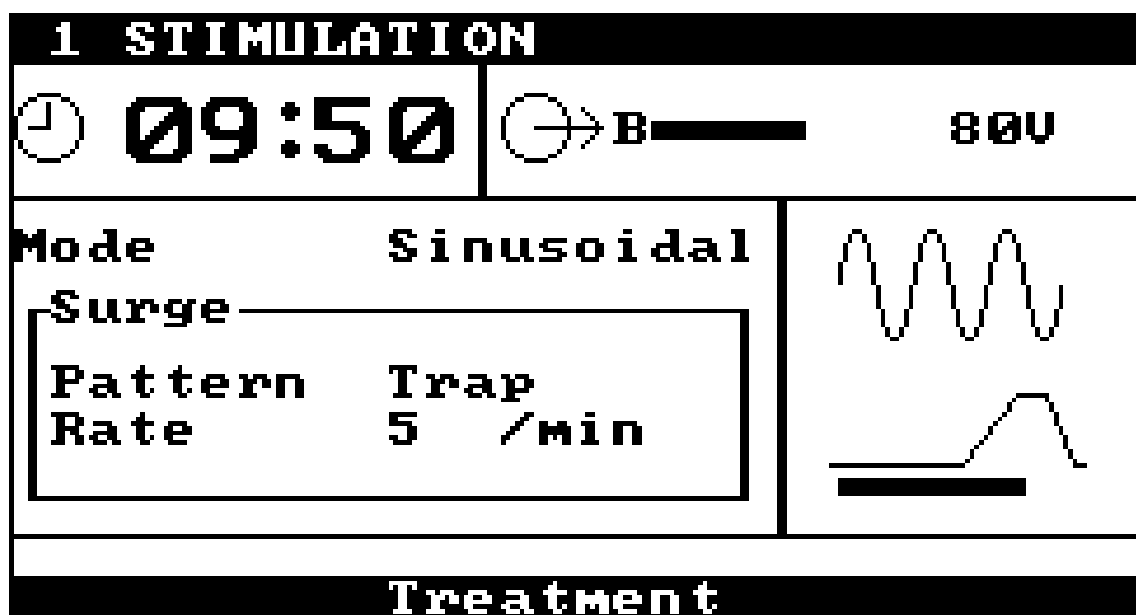


Figure 26 - Display during treatment, sinusoidal mode

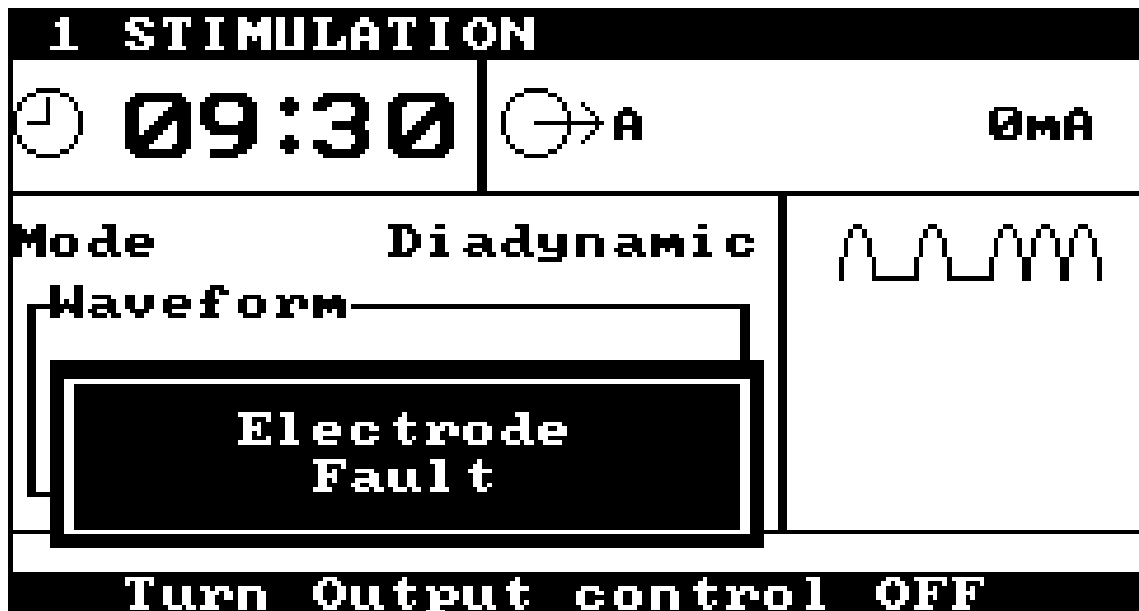


Figure 27 - Electrode fault display, diadynamic mode

### Strength / Duration Curves

26. For strength duration tests, one normal electrode should be used connected to the blue output lead and a muscle testing electrode (ball electrode and handle) connected to the yellow output lead.

Make sure that the treatment time is set to a value more than long enough to complete the test. Advance the output control. The green light below socket B will turn on and the display will plot the axes of the strength duration graph (figure 28)

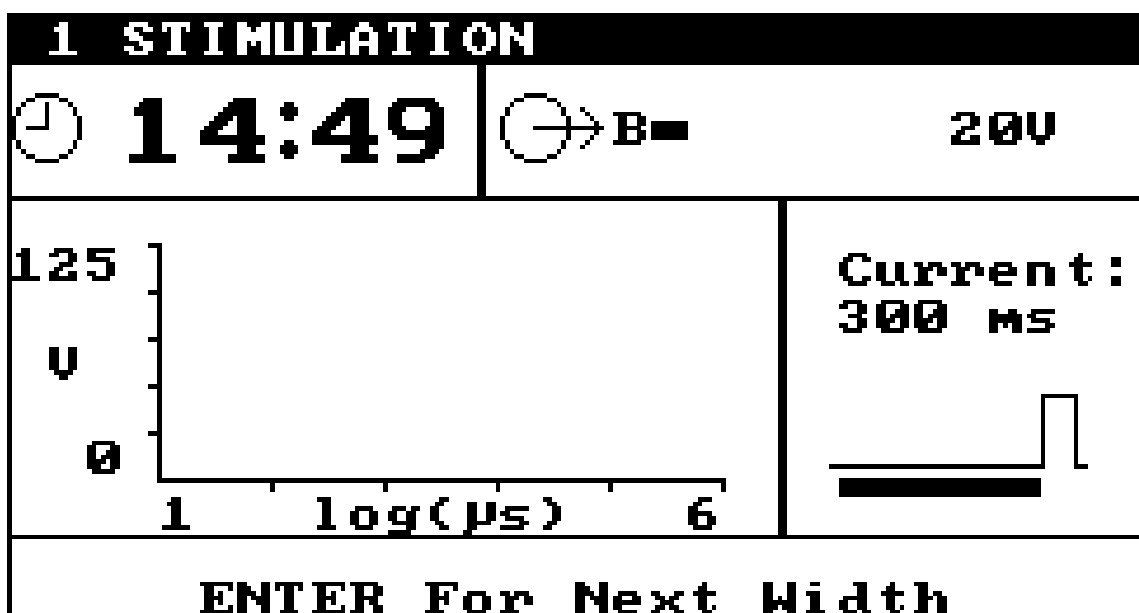


Figure 28 - Strength / Duration graph axes

Apply the muscle testing electrode and slowly increase the output until a muscle contraction is detected. The pulse repetition rate in this mode is fixed at 30 pulses / minute to allow plenty of time for the muscle to recover between contractions.

Adjust the output level to the point at which the muscle contraction is just detectable. Press the ENTER key which will record the output voltage and also decrement the pulse width setting.

At the new pulse width again adjust the output level until the contraction is just detectable and press ENTER. The system will now start to plot the curve (figure 29).

Repeat the procedure for each pulse width within the selected range. At the last width in the selected range the display at bottom of the screen will change to "Last Width" (figure 30).

On pressing ENTER at the last pulse width the message at the bottom of the screen will change to "Turn Output control OFF" and an intermittent alarm will sound (figure 31).

Return the output control to the OFF position. The system will now calculate the rheobase and chronaxie and display the results on the right hand side of the screen (figure 32).

When the results have been recorded, press F4 to return to the main set-up screen. The graph and results will then be cleared.

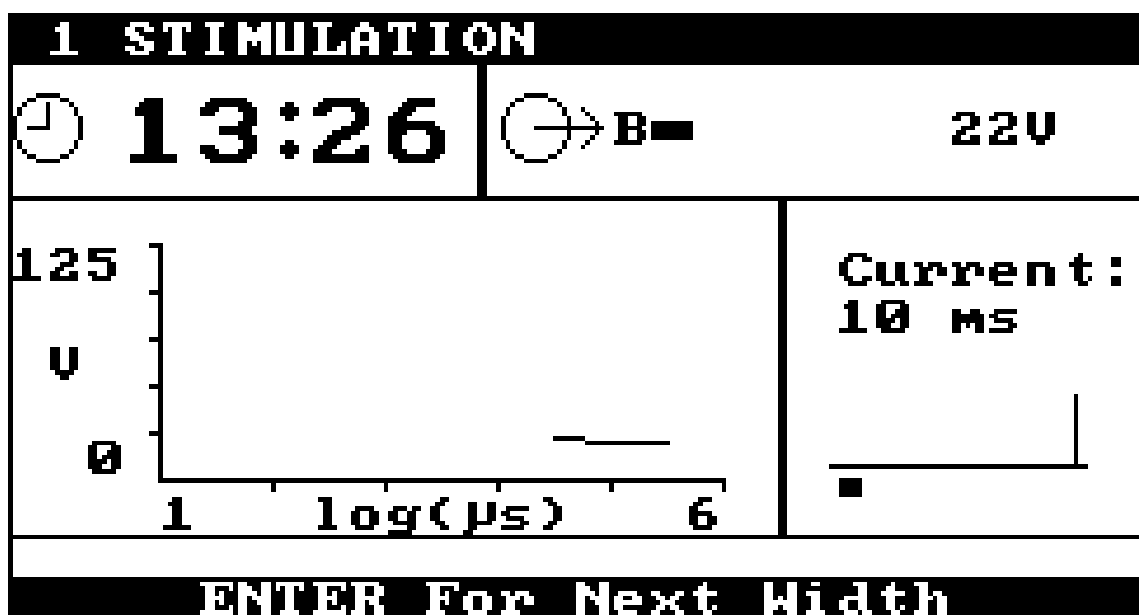


Figure 29 - Strength / Duration graph in progress

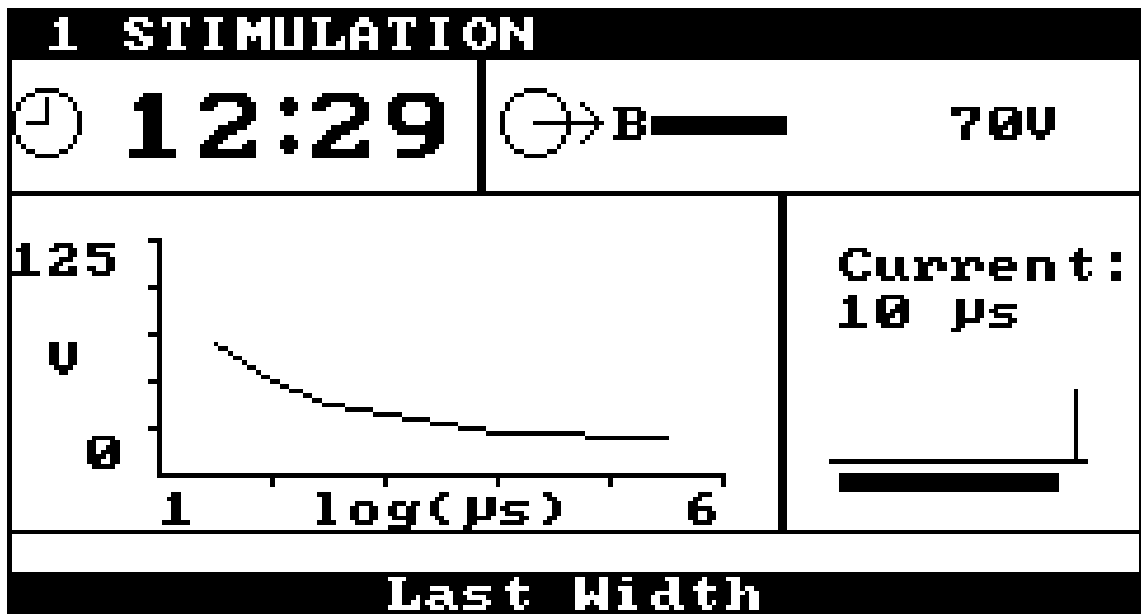


Figure 30 - Strength / Duration curve, last pulse width

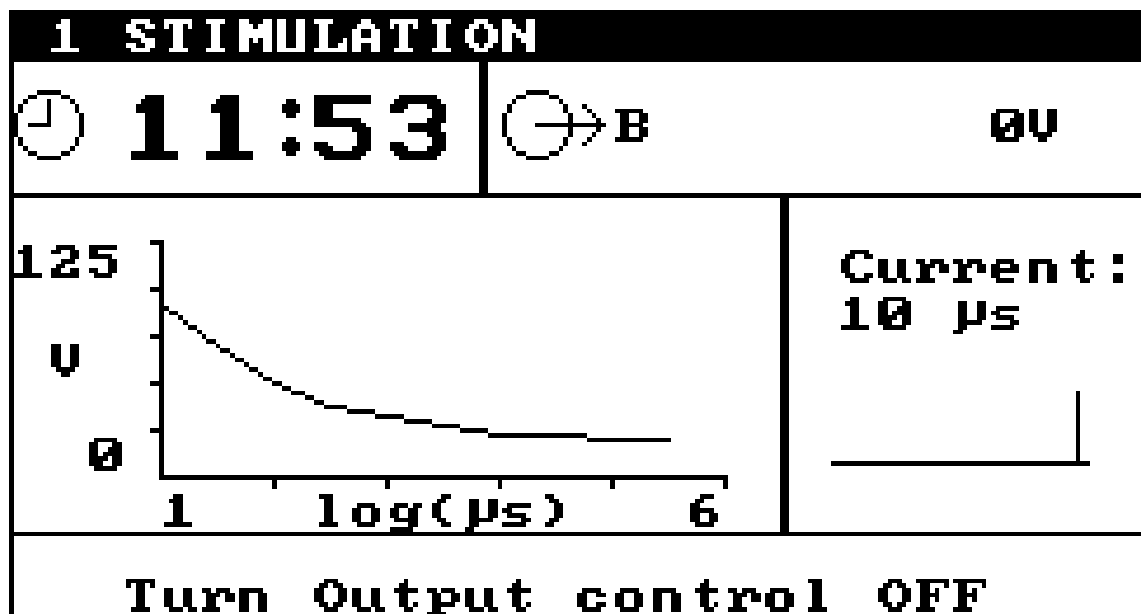


Figure 31 - Strength / Duration curve, end of test

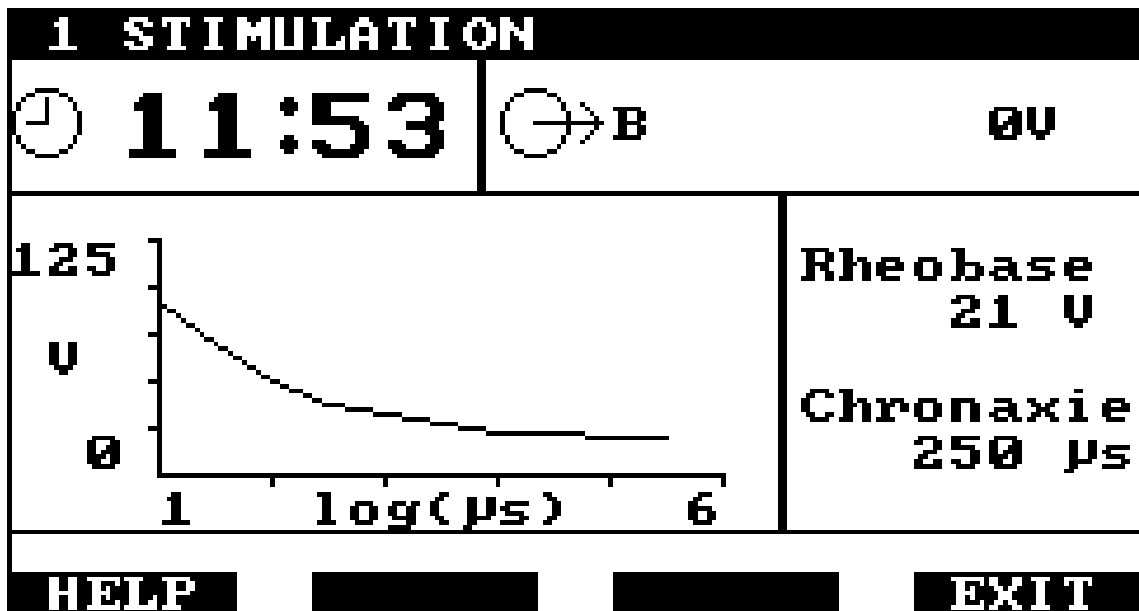


Figure 32 - Strength / Duration curve, final result

27. **F1 - HELP:** When the label for function key F1 is HELP, pressing F1 will suspend the current activity and the display will show help text relevant to the current display or activity (see figure 14) . If the help text is more than can be displayed at one time, it may be scrolled up or down, one line at a time using the up and down arrow keys, or one screen full at a time by pressing F2 - PgUp or F3 - PgDn. To exit from HELP, press F4.

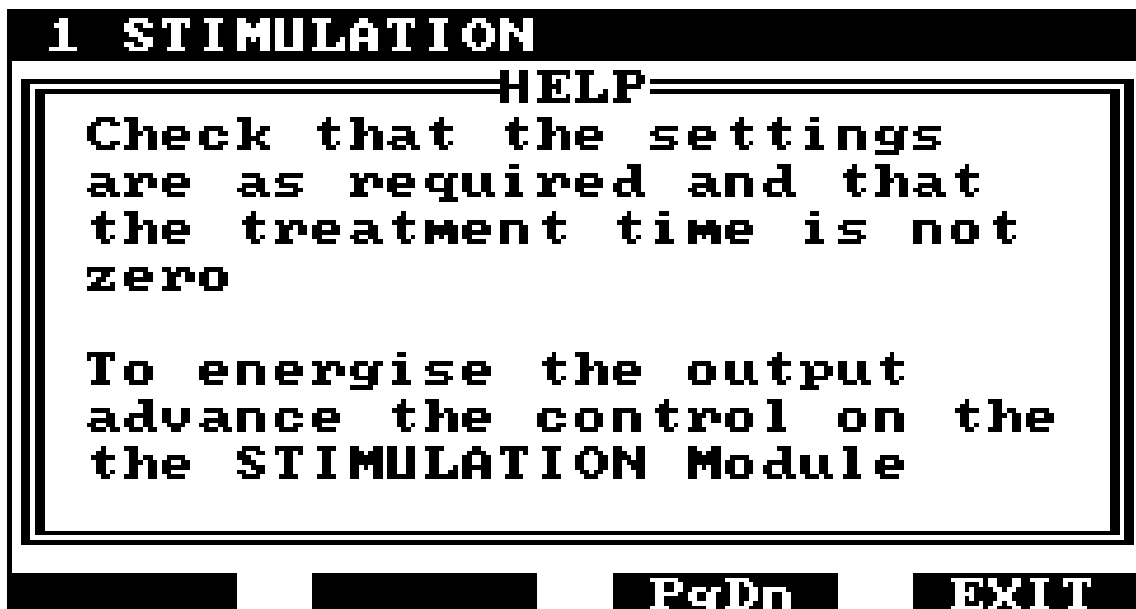


Figure 33 - Help Text Display

14. **F2 - USER:** In order to save time setting up the Stimulation Module, up to 16 individual set-ups can be saved as "User Defined Programs". To save the current set-up as a user defined program, press F2-USER from the main Set-Up display. The system will recall previously saved programs and display them as in figure 34.


1 STIMULATION						
 <b>1</b> <hr/> <b>Mode</b> <hr/> <b>Puls</b> <hr/> <b>Star</b> <hr/> <b>End</b>	USER				QU	
	No	Q	SET-UP			
	1	15	Sin	Tra		5
	2	15	Dia	CP		
	3	20	Far	Tra		5
	4	10	Gal			
	5	10	Int	100		ms
	6	10	S/D	300		ms
	7	-				-
8	-			-		

Figure 34 - User Program Display

Programs shown as dashes, for example, programs 7 and 8 in figure 34, have not been used and are blank.

Use the up and down arrow keys to highlight the program to which the current set-up is to be saved. Note that only 8 programs are displayed at a time, and when the highlight bar reaches the bottom of the user sub-window, pressing the down key will cause the programs to scroll giving access to all 16 programs.

To save the current set-up, press F3 - SAVE. The system will save the set-up and return to the main Set-Up display.

To recall a previously saved program, again press F2 - USER to display the user defined programs. Use the up and down arrow keys to highlight the program to be recalled.

To recall the program press F2 - LOAD. The system will return to the Set-Up display and update the settings to those of the recalled program. If an undefined program is selected the system will give a short beep and wait for the user to make another selection.

To exit from the user sub-window without loading or saving a user defined program, press F4 - EXIT.

15. **F3 - SYSTEM:** Pressing F3 - SYSTEM returns the user back to the System Menu, but without stopping the Stimulation program running. This enables the user to run another application, for example, an Ultrasound program for combination therapy. When F3 - SYSTEM is selected the Stimulation set-up is shown as an inset screen to the right of the display (see figure 35).

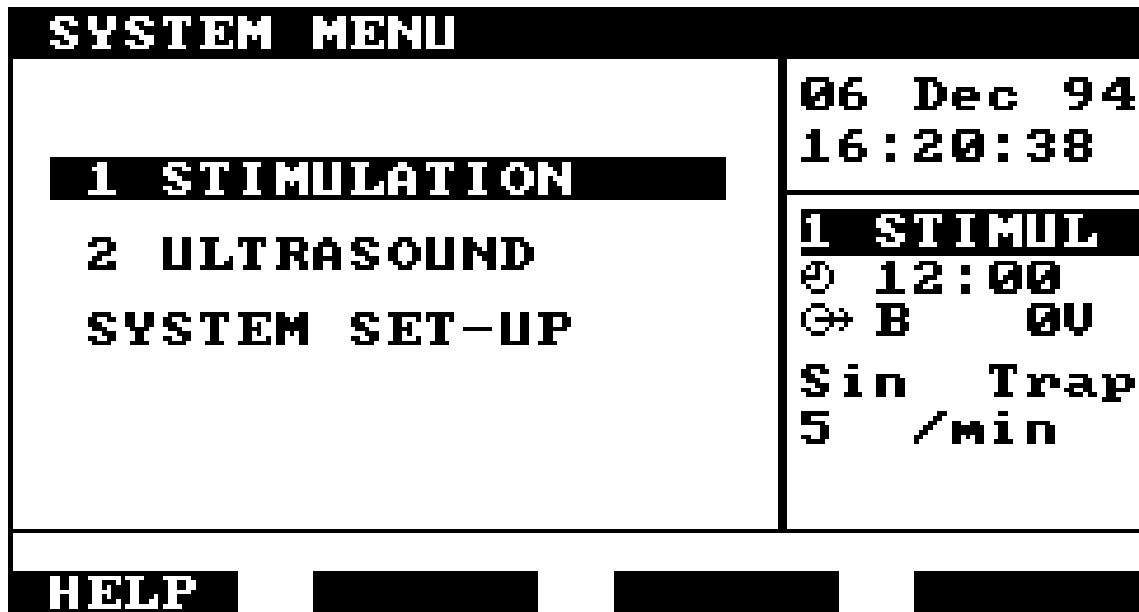


Figure 35 - Stimulation Module as inset screen

When running as an inset screen, the output may be turned on in exactly the same way as when the full screen display is available, and electrode faults are still reported as before. The only restriction is that the keys on the Control Module are now assigned to another program. All set-up must be done in full screen mode. Then select the SYSTEM option before turning the output on. Another module may then be selected and set-up for treatment. This option is not available when S/D Curve mode is selected.

16. **F4 - EXIT:** Pressing F4 - EXIT at the Stimulation Module Set-Up display will terminate the Stimulation program and return to the System Menu. When the Stimulation program is re-run from the System Menu the settings will be as they were when F4 - EXIT was pressed unless the system has been switched off.

# Electrodes

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It is recommended that only electrodes supplied by EMS Physio are used with the Stimulation Module. Three sizes of conductive rubber electrodes are available. These are small (70 x 50 mm), medium (100 x 70 mm) or large (130 x 100 mm). Replacement sponge covers are available for each electrode.

In most applications it is sensible to use as large an electrode as is practical for the area of the body being treated. This will also reduce the possibility of any adverse effects at the site of the electrode due to high current density.

Inspect the area to be treated to ensure there are no open wounds, areas of infection, abrasions etc. Wash the skin in warm soapy water to minimise skin impedance and remove any creams or gels that may have been used.

Explain to the patient what is being done and what is going to happen.

Soak the sponge electrode covers in warm water. In a soft water area it may be necessary to add a small amount of bicarbonate of soda to the water to ensure low contact impedance for the electrodes. Fit the rubber electrodes fully into the sponge covers.

Apply the electrodes to the patient using the elasticated bandages supplied. The bandages must cover the whole of the electrode and maintain an even pressure in order to achieve a uniform current flow. A piece of polythene may be used between the top surface of the sponge cover and the elasticated bandage to prevent the bandage becoming wet.

Connect the electrodes to the stimulator output with the cables provided. For DC applications the yellow lead is positive and the blue negative.

It is important to ensure that the patient feels the expected sensation in the required area during treatment, otherwise the electrodes should be relocated.

**The electrodes must never be placed so that the stimulating current crosses the chest or passes near the heart.**

Electrodes should be cleaned and disinfected between patients.

See the current EMS catalogue / price list for the full range of accessories and electrodes.

# Maintenance

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The conductive rubber electrodes and sponge covers may be disinfected using a 70% v/v aqueous solution of isopropyl alcohol. They are NOT suitable for steam sterilisation or for disinfectants containing sodium hypochlorite.

**N.B.** Isopropyl alcohol is flammable and should be kept away from naked flames. Isopropyl alcohol must not be brought into contact with eyes or mouth.

The module may be cleaned by wiping over with a damp cloth.

Regularly inspect all treatment leads and cables for signs of damage.

There are no user serviceable parts inside the module and it should not be opened.

Full servicing instructions are available on request.