



BioTester

Version 3.02

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The manufacturer assumes no responsibility for the use of this product in a medical environment or any incidents that may occur from the use of this product.

The manufacturer reserves the right to update the hardware, software and documentation at any time without notice.

*Thank you to the Biomedical
Engineers, technicians and hospital
staff who have been involved
in this project.*

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2 Quick Guide

BioTester v3.02

Id Line

Then

ECG 60S Normal Press dn/up arrows to select the fn
Sinus left right arrow to change parameters

Pace 60S Normal
Sinus

Stim ---.- ---mA
---.- ---mA

Resp 10 10.0R

Sine 50.0Hz S

Tri 50.0Hz S

Pulse 50.0Hz S

Options

To turn off the BioTester, press the left or Quit button until the arrows are displayed under the leftmost text. Then press and hold the down button until the display shows:

Power Off
Let go!!

3 OVERVIEW

The BioTester ECG simulator has been around for over 10 years, and up to 50 units are in use in biomedical service centres and hospitals around Sydney. The first versions were very time consuming and difficult to make, and the focus on this improved version has been to reduce the manufacturing cost so that the BioTesters may be provided at a competitive cost. Other improvements are crocodile clips for ECG connection (also easily replaceable), sealed front panel improved and easier software, reduced features set - only ECG simulation, Stimulator tester and respiration, and improved accuracy.

4 OPERATION

The *BioTester* is a compact instrument, designed to simulate some functions of a patient. The BioTester is designed for use by a wide range of different medical personnel. The main applications are for Biomedical Engineering during routine testing, service and repair of equipment, by medical personnel during training and by hospital and medical staff to ensure that functions of equipment is correct and accurate. The BioTester's main features are:

| | |
|------------------------|------------------------------------|
| ECG simulation | any rate from 10BPM to 240BPM |
| Stimulator tester | testing stimulators and TENS units |
| Respiration simulation | 0.1R to 10.0R |

To run the unit, install a PP3 size 9V battery into the battery compartment. Now activate the unit by pressing the on/off switch on the front of the unit. The display will activate and show "BioTester v3.xx" where 3.xx is the software version. The second line is the operator ID line (*please see Section 12 for a detailed explanation*). This display and the display backlight will be on for 2 seconds, and then the current function will be displayed.

5 ECG SIMULATION

With the up arrows (↑↑↑) under the leftmost region, press the down arrow repeatedly until the display shows ECG at the top left. If needed, first press the left or Quit button to set the arrows to the leftmost item, and then press the down button until the ECG function is shown..

In this mode, the ECG waveform parameters are displayed and can be adjusted. The ECG waveform is output continuously. The ECG type, rate and size are displayed on the LCD screen - these values are configurable by the operator. The heart symbol will flash during the QRS complex.

A pulse beep is available in the Options mode (*refer Section 12*), which will make the BioTester beep twice during the QRS complex.

To change the ECG rate, press the right (or left) button until there are three up arrows underneath the ECG rate. This indicates that the ECG rate is selected and ready for adjustment. Press the up and down arrows to adjust the ECG rate.

To change the ECG size, press the right (or left) button until one arrow is displayed underneath the ECG size indicator. This indicates that the ECG size is selected and ready for adjustment. The three ECG sizes are low, medium and high.

To change the ECG waveform type, press the right (or left) button until two arrows are shown on either side of the ECG waveform name. The ECG waveform name is the furthest text to the right on the screen. The typical waveform is Normal Sinus. Other waveforms are:

| Number | Name | Description |
|--------|-----------------|------------------------------------|
| 1 | Normal Sinus | Normal rhythm for a healthy person |
| 2 | Myocard Infarc | Myocardial Infarction |
| 3 | Angina Invert | Angina Inverted T |
| 4 | Angina Flat T | Angina with a Flat T wave |
| 5 | Angina Peak T | Angina with a Peak T wave |
| 6 | ST-depr InverT | ST-depressed and Inverted T |
| 7 | ST_elev T | ST elevated T |
| 8 | ST-depr T | ST depressed T |
| 9 | ST-JPt Depres | St Junctional Point |
| 10 | AVBlock Type 3 | Third-degree AV block |
| 11 | AVBlock Type 2 | Type2 second-degree AV block |
| 12 | AVBlock Type 1 | Type1 second-degree AV block |
| 13 | AVBlock | First degree AV block |
| 14 | IdioVent Rhythm | Idioventricular rhythm |
| 15 | Ventric Fibril | Ventricular Fibrillation |
| 16 | Junction rhythm | Junctional Rhythm |
| 17 | Atrial Fibril | Atrial Fibrillation |
| 18 | Flutter | Flutter |
| 19 | Prematur Atrial | Premature Atrial |

6 PACE OPERATION

The Pace waveform is identical to the ECG waveform, with the addition of a short 2ms pacemaker spike at the start of the ECG waveform to simulate a pacemaker. This can also be heard when the pulse beep is activated.

7 STIMULATOR METER

The stimulator tester will measure the output amplitude and rate of nerve muscle stimulators and TENS machines. The stimulator tester will measure to an amplitude range of 100mA +-1mA and a rate of 8000ms +- 1ms (for a pulse width greater than 200us). The load applied is 220R for Channel1 and 100R for Channel2.

The stimulator should be connected across V6-LA for Channel1 (with V6 being the positive) and RA-V2 for channel2 (with RA being the positive). Since the stimulator pulses are measure through the ECG leads, this means that a small ECG signal is also put into the stimulator which is very useful for electrophysiological machines, such as the Micropace EPS.

The stimulator screen will automatically show the Stimulator mA and period as shown below:

```
Stim    25.0mA 498ms
▲▲▲▲ 25.0mA 498ms
```

In addition a lightning symbol will illuminate for a short time after each pulse. After 10seconds of no activity each channel will revert to bars as shown below.

```
Stim    --.-mA ---ms
▲▲▲▲  --.-mA ---ms
```

To calibrate the mA reading, press the enter button. Then adjust the reading on the right to the current value and press Enter. Repeat this for channel2 and press Enter again to quit to Stimulator mode. Quit may be pressed at any time to quit. The calibration will only be saved if either channel value is saved. The first number on the left is the ADC value, and the second number is the current cal value. The third number is the calibrated value to be adjusted.

8 RESPIRATION SIMULATOR

The respiration function changes the resistance across the RArm and LArm connectors to simulate an expiring and inspiring chest. A pair of lung symbols are displayed on the screen during inspiration (when the resistance is increasing). The waveform changes linearly with time, and the respiration will be displayed as a triangle wave on a patient monitor.

In this mode, the Respiration waveform parameters are displayed and can be adjusted. The Respiration waveform is output continuously. The respiration rate and size are displayed on the LCD screen - these values are configurable by the operator.

To change the respiration rate, press the right (or left) button until there are three up arrows underneath the respiration rate. This indicates that the respiration rate is selected and ready for adjustment. Press the up and down arrows to adjust the respiration rate to any value from 2 to 120BPM.

To change the respiration amplitude, press the right (or left) button until there are four up arrows underneath the respiration amplitude. This indicates that the respiration amplitude is selected and ready for adjustment. Press the up and down arrows to adjust the respiration rate to any value from 0.1R to 10.0R.

9 SINE WAVEFORM

Press the down arrow repeatedly until the display shows Sine at the top left. If needed, first press the left or Quit button to set the arrows to the leftmost item, and then press the down button until the Sine function is shown. The Sine waveform is very similar to the ECG waveform with the exception that the frequency is displayed in Hz (or Hertz).

To change the frequency, press the right (or left) button until there are four up arrows underneath the frequency. This indicates that the frequency is selected and ready for adjustment. Press the up and down arrows to adjust the frequency to any value from 0.1Hz to 99.9Hz.

To change the amplitude, press the right (or left) button until one arrow is displayed underneath the amplitude indicator. This indicates that the amplitude is selected and ready for adjustment. The three amplitudes are low, medium and high.

10 TRIANGLE WAVEFORM

Press the down arrow repeatedly until the display shows Tri at the top left. If needed, first press the left or Quit button to set the arrows to the leftmost item, and then press the down button until the Tri function is shown. The Tri waveform is very similar to the ECG waveform with the exception that the frequency is displayed in Hz (or Hertz).

To change the frequency, press the right (or left) button until there are four up arrows underneath the frequency. This indicates that the frequency is selected and ready for adjustment. Press the up and down arrows to adjust the frequency to any value from 0.1Hz to 99.9Hz.

To change the amplitude, press the right (or left) button until one arrow is displayed underneath the amplitude indicator. This indicates that the amplitude is selected and ready for adjustment. The three amplitudes are low, medium and high.

11 PULSE WAVEFORM

Press the down arrow repeatedly until the display shows Pulse at the top left. If needed, first press the left or Quit button to set the arrows to the leftmost item, and then press the down button until the Pulse function is shown. The Pulse waveform is very similar to the ECG waveform with the exception that the frequency is displayed in Hz (or Hertz). The pulse waveform is a 200ms pulse which is used to calibrate ECG recorder speeds.

To change the frequency, press the right (or left) button until there are four up arrows underneath the frequency. This indicates that the frequency is selected and ready for adjustment. Press the up and down arrows to adjust the frequency to any value from 0.1Hz to 99.9Hz.

To change the amplitude, press the right (or left) button until one arrow is displayed underneath the amplitude indicator. This indicates that the amplitude is selected and ready for adjustment. The three amplitudes are low, medium and high.

12 OPTIONS

Press the down arrow repeatedly until the display shows Options at the top left. If needed, first press the left or Quit button to set the arrows to the leftmost item, and then press the down button until the Options function is shown. The options is a list of parameters adjustable by the Operator. Press Enter to access the options list.

In each option, press Enter to access the option, Quit to quit, and up or down to adjust the option value. The Enter button will save any adjusted options.

| No | Display | Description |
|----|-------------|--|
| 1 | ID | Adjust the startup second line ID screen – 16 characters in total |
| 2 | Low Battery | Adjust the low battery setting, and view the current battery voltage |
| 3 | Auto Off | Adjust the auto off time in minutes |
| 4 | Backlight | Adjust the backlight timer in seconds |
| 5 | Pulse beep | Adjust the ECG QRS pulse beep to OFF (0) or ON (1) |
| 6 | Default | Set all options and calibrations to default values |

13 POWER DOWN

To turn off the BioTester, press the left or Quit button until the arrows are displayed under the leftmost text. Then press and hold the down button until the display shows:

Power Off
Let go!!

The BioTester will also power off automatically after 4 minutes of no action.

14 LOW BATTERY

The 9V battery voltage is continually monitored, and when the battery voltage drops below the low battery setting (*refer to Section 12*), the display will briefly show Low battery and the current battery voltage. The battery voltage is checked once every minute, so the low battery alarm will be persistent, but not continuously. To turn off the low battery alarm, set the Low Battery voltage to a lower level in Options.

The ECG connectors are crocodile clips to ensure that

15 ECG CONNECTORS

all different types of ECG connectors can be connected to (from buttons to 2,3,4mm and 1/8"). These black crocodile clips are connected to 2mm plugs which may be removed from the BioTester.

If needed, other adaptors can be made and fitted to the BioTester. Longer ECG connector cables can be made to suit, for a small cost.

16 Specifications

| | |
|----------------------------|--|
| Power Supply | Internal 9V battery |
| Battery current | 15mA typically, 70mA with backlight |
| Battery life | 10 hours typically |
| ECG amplitude | 1/2mV, 1mV or 2mV (+/-0.1mV) 0-5V |
| Waveforms | ECG, Pacemaker, Sin, Triangle, Pulse, |
| Respiration | 0.1 Ω to 10.0 Ω variation from RArm to LArm |
| Stimulator (2 channels) | Reading from 2mA to 100mA (+/-0.5mA accuracy) |