



Training Excellence

# BeneHeart D3 Defibrillator

Advanced User Guide

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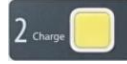
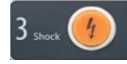


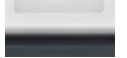


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## Section 1 Device Overview

Point	Training information	Device icon
1.1	Equipment purpose: The D3 defibrillator / monitor can; monitor, cardiovert, provide transcutaneous pacing and defibrillation in manual or AED mode.	
1.2	General information: Device technical specification can be found in Appendix A.	
1.3	The D3 can operate from mains power or battery power.	
1.4	To charge the D3, ensure the battery is inserted correctly. Connect the power cable into the AC port, switch the AC power on at the socket.	
1.5	When the device is connected to AC power, the AC power symbol will be displayed in the readiness display.	
1.6	A charging battery will display an orange LED, a charged battery will display a green LED in the readiness display window.	
1.7	If no battery is detected, no battery icon will be seen. This may be accompanied by a flashing red X device, dependant on configuration.	
1.8	A green tick displayed in the readiness display window illustrates the device is working normally.	
1.9	To change the ECG lead, push the 'lead select button'.	
1.10	To increase or decrease the size of the ECG trace, push the 'gain select button'.	
1.11	The NIBP button is a configurable option and once pressed provides a single blood pressure.	
1.12	To pause alarms for a pre-set time interval, push the alarm pause button - push the button again to reactivate the alarms.	
1.13	To mark a significant event in the device memory, select 'event' and choose from the list provided or choose generic if the treatment pathway is not visible.	
1.14	To enter the main menu options, push the 'main menu' button. Press the button again to close the menu.	
1.15	Use the navigation dial to rotate around onscreen information and menu. Pushing in the navigation dial selects the option.	
1.16	Softkey labels onscreen information change dependant on the on the mode being used.	

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1.17	<p>Rotate the mode select dial to choose a clinical operating mode or power off the device.</p> <p>The shock system follows a 1, 2, 3 approach for ease of use.</p>	<p style="text-align: right;"><b>Button 1</b></p> 
1.18	<p>To charge the device push the charge button.</p>	<p style="text-align: right;"><b>Button 2</b></p> 
1.19	<p>To deliver a shock push the shock button.</p>	<p style="text-align: right;"><b>Button 3</b></p> 
1.20	<p>The patient shock cable is connected to the therapy port, located on the left of the device. Align the green arrows and push the cable in until a 'click' sound is heard. To remove, rotate clockwise and pull.</p>	
1.21	<p>Insert the relevant cables into the correct port provided; ECG, SpO2, BP are all push fit, align arrows prior to cable insertion.</p> <p>CO2 filterlines are inserted into a <b>reusable</b> connector, twist clockwise to insert the filterline and counter clockwise to remove.</p>	
1.22	<p>An alarm lamp is seen at the top / centre of the device. Dependant on alarm urgency this will flash orange or red.</p>	
1.23	<p>To record / print information, push the record button on the right side of the device. The recorder thermally scribes on-screen information onto paper, it is important that only Mindray thermal paper is used.</p> <p>A steady green LED, highlights that the recorder is functioning correctly. A flashing green LED indicates the recorder has ran out of paper.</p>	
1.24	<p>To change the paper; pull down on the latch to the right of the recorder door and change the paper as shown on the inside of the recorder compartment. Ensure the paper is aligned on the roller when closing the door.</p>	
1.25	<p>To turn the device off following any mode, turn the mode select dial to off. The device will wait 10 seconds before fully powering down to ensure patient information is not lost.</p>	

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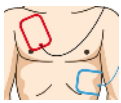




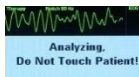
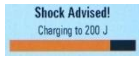



## Section 2 Device testing

Point	Training information	Device icon
2.1	<p>The D3 defibrillator performs an automated self-test at 03:00am known as a 'routine test'</p> <p>The routine test performs a battery and therapy module / main board check including a 1 joules internal discharge and if connected to the test plug (shown) the device will perform a 10 joules cable check.</p> <p>If the test plug is not connected, then the 10 joule test will not be performed but the test will still pass.</p>	
2.2	<p>A green tick denotes the device has passed its test. A red cross denotes the device has failed the test.</p> <p>If a red cross is seen, it is recommended that an 'energy delivery test' is undertaken, if the device fails again, contact your Medical Engineering Department.</p>	
2.3	<p>To perform an energy delivery test, follow these steps:</p> <ol style="list-style-type: none"> <li>1. Ensure the device is connected to AC power before starting the test procedure</li> <li>2. Prior to any test procedure, ensure the device and cables are clean, intact, with no breaks</li> <li>3. Turn the device to <b>monitor mode</b></li> <li>4. Press the <b>main menu</b> button</li> <li>5. Using the navigation dial – select '<b>User Test</b>'</li> <li>6. End patient monitoring by selecting '<b>Yes</b>'</li> <li>7. Select '<b>Routine Test</b>' and '<b>Energy Delivery Test</b>' using the navigation dial</li> <li>8. Push the '<b>Start</b>' softkey when ready to perform the test</li> <li>9. Review warning messages and select '<b>Ok</b>' to continue</li> <li>10. Push the charge button and shock button when prompted to do so</li> <li>11. Repeat the test as prompted to test battery power</li> <li>12. When prompted to test from paddles, choose to continue or cancel as this may not be required</li> <li>13. Press '<b>return</b>' to complete the test, '<b>record</b>' to print results or '<b>transmit</b>' if organisationally required</li> <li>14. Exit the test menu by pushing the '<b>Exit</b>' softkey and turn the mode select dial to off</li> </ol>	
2.4	<p>It is recommended that a 'Controls Test' as well as functional and electrical testing is performed every 12 months during an annual service inspection by the Medical Engineering Department.</p>	
2.5	<p>To review previous tests performed, select the '<b>History</b>' softkey from the user test menu.</p>	

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## Section 3 AED

AEDs are to be used on patient who are non-responsive, not breathing or not breathing normally. The AED will determine if the patient is in a shockable or non-shockable rhythm and provide the user with instructions that will guide them through the initial stages of a resuscitation attempt.

Point	Training information	Device icon
3.1	Connect the pads to the patient chest as per standard resuscitation training, using the correct positioning as advised for adults or paediatrics. For further information see pads packaging.	
3.2	Ensure the pads are connected to the defibrillator shock cable.	
3.3	Turn the mode dial to AED.	
3.4	Onscreen messages will appear e.g. Apply Pads – follow the voice and visual prompts.	
3.5	If required, change the patient category to paediatric. Changing the patient category reduces the pre-set energy.	
3.6	When an ECG trace is detected, do not touch the patient. Touching the patient during this time will interfere and prolong the analysis.	
3.7	If a shockable rhythm is detected, the device will automatically charge to the pre-set energy. A charge tone will be heard during this time and the on-screen charging bar will highlight that the defibrillator is charging. Mindray devices use escalating biphasic energy of 200 - 300 - 360 joules. The device will auto escalate energy in AED mode.	
3.8	The user will be prompted to push the flashing shock button - when it is safe to do so, perform this action. The device will auto-disarm if the shock button is not pressed within 30 seconds.	
3.9	After delivery of the shock, it is safe to touch the patient. On-screen information will continue to guide the user through the resuscitation attempt.	
3.10	A metronome may be provided dependant on your device configuration. Perform CPR to this rate and rhythm. To turn off the metronome, push the volume softkey.	
3.11	The device may determine the patient's rhythm as non-shockable, in this instance follow the voice and visual prompts given by the device.	
3.12	An on-screen clock will count down cycle times.	


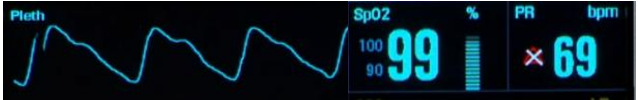

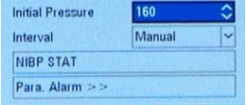
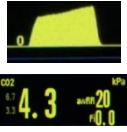

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## Section 4 Monitoring

Point	Training information	Device icon
4.1	<p>Ensure all relevant cables are attached to the device and the patient.</p> <p>Cables ports are located on the right-hand side of the device. To insert the cables, align the corresponding arrows and push the cables into the device.</p> <p>CO2 monitoring requires a reusable adapter to be pushed into the device port prior to the filter line being inserted clockwise and counter-clockwise for removal. Filter lines are disposable accessories.</p> <p>Always ensure the right size and type of monitoring accessories, for the right size and type of patient.</p>	 
4.2	Turn the mode dial to monitor.	
4.3	Use the navigation dial to rotate around the screen. Press the navigation dial in to make a selection.	
4.4	Choose between adult, paediatric or neonatal patient groups. Selecting a specific patient group changes the preconfigured alarm settings for this patient demographic.	
4.5	<p>Individual alarms can be set per patient by highlighting the specific monitoring numerical display and choosing para-alarm. Select the specific alarm you wish to change using the navigation dial. Further alarm options are available via the main menu button.</p> <p>Arrhythmia alarms can be set when selecting the ECG Heart Rate numerical display.</p>	
4.6	To change the ECG lead, push the 'lead select button'.	
4.7	To increase or decrease the size of the ECG trace, push the 'gain select button'.	
4.8	To review further information for any patient monitoring value, use the navigation dial to select the patient value and push in to select.	







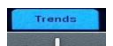

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4.9	<p>When the 3 or 5 lead cable is attached, the user will see:</p> <ul style="list-style-type: none"> <li>• An ECG display</li> <li>• A corresponding heart rate value</li> </ul> 
4.10	<p>When the SpO2 sensor is connected to the patient, the user will see:</p> <ul style="list-style-type: none"> <li>• An oxygen saturation level</li> <li>• A SpO2 pleth wave</li> <li>• An arterial pulsation bar</li> <li>• A pulse rate</li> </ul> 
4.11	<p>To take a non-invasive blood pressure, apply the correct sized blood pressure cuff to the patient.</p> <p>Begin a single reading by pressing the NIBP button on the front of the device.</p>  <p>Further NIBP options are available within the NIBP menu. To view these options select the NIBP onscreen numerical value and select using the navigation dial.</p> <p>The user can from this menu:</p> <ul style="list-style-type: none"> <li>• Review and amend cuff pressures for systolic BP</li> <li>• Set NIBP intervals</li> <li>• Set continuous NIBP, known as STAT, (STAT provides continual NIBPs over a 5-minute interval)</li> <li>• Review and amend alarm parameters</li> </ul> 
4.12	<p>To monitor CO2, insert the adaptor and connect the appropriate filterline.</p> <p>CO2 monitoring will auto zero and auto display once connected to the patient</p> <p>When the CO2 filterline is connected to the patient the user will see:</p> <ul style="list-style-type: none"> <li>• A CO2 waveform</li> <li>• An end-tidal CO2 value</li> <li>• Fraction of inspired CO2 value</li> <li>• An airway respiration rate</li> </ul>  <p>Further CO2 options are available by selecting the on-screen CO2 value.</p>
4.13	<p>Alarms</p> <p>When an alarm is activated, an onscreen message will appear notifying the user and the corresponding patient value will flash. An audible tone will be heard, and the alarm lamp will be seen to illuminate / flash to attract attention.</p> <p><b>Audible Alarms</b></p> <p>The device uses different alarm tone patterns to match the alarm level:</p> <ul style="list-style-type: none"> <li>• High level alarms triple + double + triple + double beeps</li> <li>• Medium level alarms triple beeps</li> <li>• Low level alarms single beep</li> </ul> 

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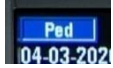










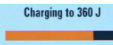
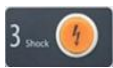



	<p><b>Alarm Lamps</b></p> <p>If an alarm occurs, the alarm lamp will flash. The colour and flashing frequency match the alarm level as follows:</p> <ul style="list-style-type: none"> <li>• High level alarms, the lamp quickly flashes red</li> <li>• Medium level alarms, the lamp slowly flashes orange</li> <li>• Low level alarms, the lamp lights orange without flashing</li> </ul>	 
4.14	<p>To pause alarms for a pre-set time interval, push the <b>'Alarm Pause'</b> button. Push the button again to reactivate the alarms.</p> <p>An onscreen message notifies the users that the alarms are currently paused for a specific time interval.</p>	 
4.15	To reset all changes to alarm parameters, push the <b>'Alarm Reset'</b> softkey.	
4.16	To review onscreen waveforms as they are seen, push the <b>'Freeze'</b> softkey. Push the <b>'Unfreeze'</b> softkey to return to standard monitoring. During this time numerical data will continue to change as a safety feature.	
4.17	Patient trends are automatically recorded. To view trend data, push the <b>'Trend'</b> softkey.	
4.18	To return to the main menu, push the main menu button or use the navigation dial to select <b>'Exit'</b> in the onscreen information window.	
4.19	To record, please review section 1.24.	

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
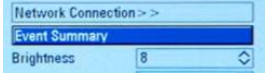
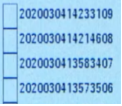
## Section 5 Manual Defibrillation

Point	Training information	Device icon						
5.1	<p>Connect the disposable pads to the patient's chest as per standard resuscitation training. Use correct positioning as advised for adults, paediatrics or neonates. For further information see pads packaging.</p> <p>Pads can be used for;</p> <ul style="list-style-type: none"> <li>• 50 shocks at 360 joules</li> <li>• 24 hours of monitoring</li> <li>• 1 hour of pacing at 140mA</li> </ul>							
5.2	Ensure the pads are connected to the defibrillator shock cable.							
5.3	Turn the mode dial to manual defib	<p style="text-align: right;"><b>Button 1</b></p>						
5.4	<p>Manual mode users can see information specific to defibrillation;</p> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <ol style="list-style-type: none"> <li>1. ECG waveform</li> <li>2. Selected energy</li> <li>3. An impedance indicator</li> <li>4. Shock counter</li> <li>5. An elapsed timer</li> <li>6. Patient mode, date and time</li> <li>7. Battery status</li> </ol> </div> <div style="width: 45%;"> <ul style="list-style-type: none"> <li>■ [Full bar] ≤100%, but &gt;80% of capacity</li> <li>■ [4/5 bars] ≤80%, but &gt;60% of capacity</li> <li>■ [3/5 bars] ≤60%, but &gt;40% of capacity</li> <li>■ [2/5 bars] ≤40%, but &gt;20% of capacity</li> <li>■ [1/5 bars] ≤20% of capacity</li> <li>■ [Low battery icon] Low battery and charging is required immediately</li> <li>■ [No battery icon] Battery is not installed</li> </ul> </div> </div>							
5.5	<p>Adult defibrillation energies are incremental and require manual escalation using the energy select buttons.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>Shock 1</td> <td>200 joules</td> </tr> <tr> <td>Shock 2</td> <td>300 joules</td> </tr> <tr> <td>Shock 3</td> <td>360 joules</td> </tr> </tbody> </table>	Shock 1	200 joules	Shock 2	300 joules	Shock 3	360 joules	
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	When the device turns on, regardless if a shock is required, the device will charge 50% to enable rapid defibrillation.									
5.6	For paediatric and neonatal energies, refer to current guidelines for shock energy per kilogram.  Users can select paediatric or neonatal mode or reduce the energy using the energy select buttons.									
5.7	An impedance indicator (section 5.4, point 3) can be seen on-screen.  The indicator will assist users determine shock success. Users should not delay the shock for impedance correction strategies. Review the impedance indicator when appropriate to do so, e.g. during times of CPR.  <table border="1" data-bbox="328 667 1355 1003"> <tr> <td></td> <td>Green indicates impedance is within normal range</td> </tr> <tr> <td></td> <td>Amber indicates impedance is higher than normal</td> </tr> <tr> <td></td> <td>Red indicates impedance is too high or pads are disconnected</td> </tr> </table> <p>No illuminated light accompanied by '---' indicates the therapy cable is not connected properly.</p>		Green indicates impedance is within normal range		Amber indicates impedance is higher than normal		Red indicates impedance is too high or pads are disconnected			
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	Amber indicates impedance is higher than normal									
	Red indicates impedance is too high or pads are disconnected									
5.8	To charge the defibrillator push the ' <b>Charge</b> ' button	<b>Button 2</b> 								
5.9	The charge siren is designed to change in pitch and tone to alert users within the area that the device is charging. An on-screen progress bar shows the increase in charge.									
5.10	To defibrillate, push the flashing ' <b>Shock</b> ' button	<b>Button 3</b> 								
5.11	To disarm the defibrillator, push the ' <b>Disarm</b> ' softkey. If the shock button is not pressed after 30 seconds the device will auto disarm.									
5.12	Waveform capnography or CO2 monitoring is considered a gold standard in cardiac arrest. To monitor CO2 during cardiac arrest ensure the <b>reusable</b> CO2 adapter is inserted into the CO2 port. Twist the filter line clockwise into the CO2 adapter. Twist counter clockwise to remove.									
5.13	Manual mode users can see information specific to capnography;  <div style="text-align: center;"> <span style="border: 1px solid black; padding: 2px;">2</span> </div>  <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">1</div> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">3</div> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">4</div> </div> <table border="1" data-bbox="1002 1899 1396 2000"> <tr> <td>1.</td> <td>A CO2 waveform</td> </tr> <tr> <td>2.</td> <td>The end tidal CO2 value</td> </tr> <tr> <td>3.</td> <td>An airway respiration rate</td> </tr> <tr> <td>4.</td> <td>Fraction of inspired CO2 value</td> </tr> </table> <p>CO2 will auto zero.</p>	1.	A CO2 waveform	2.	The end tidal CO2 value	3.	An airway respiration rate	4.	Fraction of inspired CO2 value	
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4.	Fraction of inspired CO2 value									

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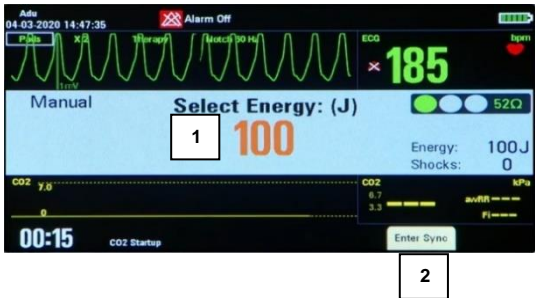
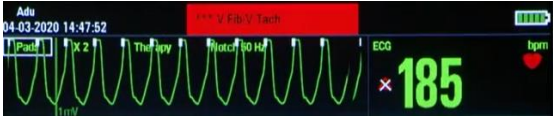
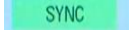

	Further C02 and manual zeroing options are available by highlighting and selecting the C02 numerical display.	
5.14	To manually mark a significant event into the device memory; push the <b>'Event'</b> button and select the appropriate event from the list provided or select 'generic'.	
5.15	To review and print time stamped information prior to the device being turned off, select:  Menu → Others → Event Summary	
5.16	To review time stamped information following the device being turned off, access the archive menu. To do this, select;  Menu → Others → Archives → Select <b>'Yes'</b> to end patient monitoring Select the appropriate anonymised information categorised by date and time.	
5.17	To record, please review section 1.24	
5.18	For information regards defibrillation using either hard shell paddles or internal paddles, please consult the Operators Manual.	

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## Section 6 Cardioversion

Electrical cardioversion resembles defibrillation, however, unlike defibrillation cardioversion is often performed on patients who are alive but are cardiovascularly unstable secondary to a broad or narrow complex tachycardia. A shock synced with the R wave frequently reverts an unstable tachycardia to a normal perfusing rhythm.

Ensure your patient is sedated and your organisational policy / procedure followed during this process.

Point	Training information	Device icon
6.1	To prepare for cardioversion complete sections 5.1 to 5.3	
6.2	<p>Cardioversion energy is determined locally for adult patients. Follow your organisations policy / procedure for energy selection. For paediatric and neonatal energies follow national guidelines.</p> <p>Use the energy select buttons to increase or decrease the energy output.</p>	
6.3	<p>Additional to the onscreen information described in section 5.4, users will now be required to press the <b>'Enter Sync'</b> softkey. Once <b>'Enter Sync'</b> is activated and the command confirmed with the relevant softkey, all detectable ECG R waves will be highlighted by an onscreen white marker as seen in section 6.4.</p> <div style="display: flex; align-items: center; justify-content: center;">  <div style="border: 1px solid black; padding: 5px; margin-left: 20px;"> <ol style="list-style-type: none"> <li>1. Select the appropriate energy</li> <li>2. Push the Enter Sync softkey</li> </ol> </div> </div>	
6.4	<p>White markers are now synced with the patient's ECG R wave. This is the safest part of the ECG complex to shock. There is a risk of ventricular fibrillation (VF) if the shock is given during the repolarisation process / on a T wave.</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>The defibrillator will display an on-screen message to highlight that the R waves are now sync'd. If the white markers are not seen or the onscreen 'SYNC' message does not appear, there may be poor R wave progression. In this instance, consider connecting the 3 or 5 lead ECG cable and changing the ECG view by pushing the <b>'lead select'</b> button.</p>	 

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6.5	To charge the defibrillator, push the 'Charge' button.	
6.6	The charge siren is designed to change in pitch and tone to alert users within the area that the device is charging. An on-screen progress bar shows the increase in charge.	
6.7	To cardiovert, push and <b>HOLD</b> the flashing ' <b>Shock</b> ' button.  Unlike defibrillation, the device reviews the patients ECG for an R wave to sync the shock with. Failure to hold down the shock button may result in no shock being given. Once cardioversion has occurred the term 'Shock Delivered' will be seen on screen and the siren will stop.	
6.8	You may be required to administer more than one shock. For subsequent shocks, always ensure the white markers and onscreen 'SYNC' message is displayed. If not re-sync the device as per section 6.3.	
6.9	To disarm the defibrillator, push the ' <b>Disarm</b> ' softkey. If the shock button is not pressed after 30 seconds the device will auto disarm.	
6.10	Raised cardiothoracic impedance can inhibit a successful shock. Use the impedance indicator highlighted in section 5.7 to ensure impedance is at its lowest. There are several clinical features that would cause raised cardiothoracic impedance, e.g. pad placement or air in the lungs; for further information consult your Resuscitation Department.	





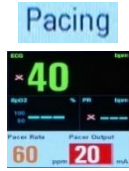
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## Section 7 Transcutaneous Pacing

Transcutaneous pacing is provided by an external device through electrodes applied to the patient's skin. Pacing is required when a patient's heart rate drops, and they become physiologically unstable. A pacing pulse can be provided by fixed mode or demand mode.






Fixed mode stimulates the heart to beat to a specific rate independent of the patient own intrinsic rate. This method is helpful when there is poor R wave progression or when there is no 3 or 5 lead cable.

In demand mode, the pacer will deliver a pacing pulse when the patient heart rate drops below a specified rate. Demand mode is the preferred pacing mode of clinicians and is the focus of this training resource. For further information on pacing, please consult the Operators Manual or contact your Resuscitation Department.

Point	Training information	Device icon
7.1	To prepare for pacing, attach the pads to the patient's chest as previously described in previous sections. The 3 or 5 lead cable must be attached to the patient for ECG monitoring.  During pacing, the electrical impulse given in milliamps (mA) is administered via the pads. Pads cannot simultaneously pace and provide an ECG waveform; the 3 or 5 lead ECG cable is required for this purpose.	
7.2	Turn the mode dial to ' <b>pacer</b> '	
7.3	Lead II is auto displayed	
7.4	White markers automatically appear above each detectable R wave. If the R wave markers do not appear or do not coincide with the R waves, select another lead. The best available ECG view will assist onscreen capture.	
7.5	Pre-set pacer rates are determined locally.  To increase your pacer rate, select ' <b>Pacer Rate</b> ' using the navigation dial. Press to confirm and rotate to incrementally increase the rate. Pacer rates set in pulses per minute (ppm) should equate to that of the patients own heart rate.	
7.6	Using the navigation dial, select ' <b>Pacer Output</b> ' and rotate to increase the mA incrementally. Once done an onscreen ' <b>Pacing</b> ' message will be seen.  Electrical capture is individualistic and occurs when the device is pacing the patient's heart. The mA will need to be increased to ensure capture is achieved. If capture does not occur the patient heart rate and pulse will not increase, and the pacer rate and heart rate will differ on screen.	

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7.7	<p>As the mA is increased, pacing spikes will be seen on-screen to show pacing is activated.</p> 	
7.8	<p>Electrical capture is achieved when a pacing spike is followed by a broadened QRS.</p> 	
7.9	<p>The ECG rate will increase to that of the Pacer Rate.</p>	
7.10	<p>Check the patient's pulse to ensure cardiac output corresponds with the Pacer Rate.</p> <p>As energy is delivered in mA and not joules, it is safe to touch the patient.</p>	
7.11	<p>To review the patients underlying rhythm, push and hold the 4:1 softkey.</p> <p>The device will deliver one pacer pulse per every 4 QRS complex's seen. To resume pacing release the softkey.</p>	
7.12	<p>To rotate around on-screen information: push the <b>'Screen Unlock'</b> softkey and confirm the instruction. To rotate around the screen, use the navigation dial. To re-lock push the <b>'Screen Lock'</b> softkey.</p>	
7.13	<p><b>For advanced users only:</b> To change from Demand Mode pacing to Fixed Mode pacing, use the navigation dial to select the on-screen pacing mode. Change this setting by using the navigation dial.</p>	

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## Section 8 Other functions

Point	Training information	Device icon
8.1	Screen brightness can be configured by pressing; main menu → Others → Screen Brightness. 10 is maximum illumination.	
8.2	A high contrast screen is best used in direct sunlight: select 'High Contrast' from the main menu to activate.	
8.3	Key volume can be configured by pressing main menu → Others → Key Volume 0 is volume off, 10 is maximum volume.	
8.4	Patient demographics and can be edited via 'Patient Demographics' found in the main menu. Information is anonymised by the device by date and time of event.  Information can be downloaded by the Resuscitation Department post event if required.	

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## Appendix A

<b>Technical Specifications</b>	
<b>Physical</b>	
Dimensions:	288mm(w)x203mm(d)x275mm(h)
<b>Weight :</b>	
Main unit:	4.7 kg
Battery package (each):	0.54kg
External paddle set:	0.86 kg
<b>Environmental and Physical Requirements</b>	
Water Resistance:	IPX4 (without external power)
Solids Resistance:	IP4X
Temperature:	Operating: 0 to 45 °C Storage: -30 to 70 °C
Humidity:	Operating / Storage: 10 to 95%.non-condensation
Altitude:	Operating / Storage: -381m to +4575 m
Shock and Vibration:	Meets the requirements of 21.102, ISO9919 (Shock and vibration for transport)
Bump:	Meets the requirements of 6.3.4.2, EN1789 (Medical devices for use in road ambulances)
Free fall:	Meets the requirements of 6.3.4.3, EN1789 (Height of fall: 0.75 m)
EMC:	Meets IEC60601-1-2
Safety:	Meets EN/IEC 60601-1
<b>Display</b>	
Type:	TFT Color LCD
Dimensions:	7 inch
Resolution:	800x480 pixels
Display Waveforms:	Max. 3 channels
Wave Viewing Time:	Max. 16 s (ECG)
<b>Power</b>	
<b>AC Power</b>	
Line voltage:	100 to 240 V~ (±10%)
Current:	1.8 to 0.8 A
Frequency:	50/60 Hz (±3 Hz)
<b>DC Power (through DC-AC Inverter)</b>	
Input voltage:	12 VDC
Power Consumption:	190 W
<b>Battery</b>	
Type:	15.1V, 5600mAh, rechargeable lithium ion battery pack
Number:	1
Charge time:	Less than 3 hours to 90% and less than 4 hours to 100% with equipment power of
Capacity Indicator:	5-segment led indicator for fast battery capacity evaluation
Capacity (new, fully charged battery):	
	Monitoring Mode: 6 hours, Monitoring with a 5-lead ECG,Resp, SpO <sub>2</sub> , CO <sub>2</sub> and NIBP measurements set at an interval of 15 minutes.
	Wi-Fi is disabled

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	Defib Mode: 200 times, 360J discharge at intervals of 1 minute without recording
	Pacing Mode: 4.5 hours, 50 Ohm load impedance, Pacing rate: 80bpm, Pacing output: 60mA
<b>Recorder</b>	
Method:	High-resolution thermal dot array
Waveforms:	Max. 3 channels
Speed:	6.25mm/s, 12.5mm/s, 25mm/s, 50mm/s
Paper width:	50 mm
Reports:	Real time waveforms, Event Summary, Tabular Trends, Frozen Waveforms, Review, User test, and Configuration
Auto Recording:	Recorder can be configured to record marked events, charge, shock, Alarm, auto test
<b>Data Storage</b>	
Patient profiles:	Max. 100 patients
Events:	Up to 1000 events for one patient
Waveform Storage:	Up to 24 hours of consecutive ECG waveform
Tabular Trends:	72 hours, resolution: 1 min.
Voice recording:	Max. 180 min in total; max. 60 min for each patient
Data Export:	Data can be exported to PC through USB flash memory
<b>Defibrillator</b>	
Waveform:	Biphasic truncated exponential waveform, with impedance compensation
Energy accuracy:	±2 J or 15% of setting, whichever is greater, into 50 Ohm
Power on time:	Less than 2 seconds with a new, fully charged battery
Charge Time:	Less than 3 seconds to 200 Joules with a new, fully charged battery Less than 7 seconds to 360 Joules with a new, fully charged battery
ECG recovery time:	Less than 2.5 seconds
Shock Delivery:	Via multifunction defib electrode pads, or paddles
Patient Impedance Range:	25 to 300 Ω (External defibrillation)
<b>Manual Mode</b>	
Output Energy:	1,2,3,4,5,6,7,8,9,10,15,20,30,50,70,100,150,170,200,300,360 J
Synchronous Cardioversion:	Energy transfer begins within 60ms of the QRS peak Energy transfer begins within 25ms of the External Sync Pulse
<b>AED Mode</b>	
Output Energy:	User configurable
AED Shock Series:	Energy level: 100 to 360 J, configurable Shocks series: 1, 2, 3, configurable Default configuration meets 2015 AHA Guidelines CPR mode with 1-channel ECG monitoring
Sensitivity and Specificity:	Meets AAMI DF-80
<b>Noninvasive Pacing</b>	
Waveform:	Monophasic square wave pulse
Pulse Width:	20 ms or 40 ms, ±5%
Refractory period:	200 to 300 ms, ±3% (function of rate)
Pacing Mode:	Demand or fixed
Pacing rate:	30 ppm to 210 ppm, ±1.5%
Pacing output:	0 mA to 200 mA, ±5% or 5mA, whichever is greater
4:1 pacing:	Pacing pulse frequency reduced by factor of 4 when activated
<b>ECG Monitoring</b>	
Lead type:	3 leads ECG, 5 leads ECG
Lead Selection:	3 leads ECG: I, II, III; 5 leads ECG: I, II, III, aVR, aVL, aVF, V

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Heart Rate Display:	Adult: 15 to 300 bpm
	Pediatric: 15 to 350 bpm
	Neonate: 15 to 350 bpm
Resolution:	1 bpm
Arrhythmia :	Yes
Alarms:	Yes
ECG size:	2.5 mm/mV( $\times 0.25$ ), 5 mm/mV( $\times 0.5$ ), 10 mm/mV( $\times 1$ ), 20 mm/mV( $\times 2$ ), 40 mm/mV( $\times 4$ ), Auto
Sweep speed:	6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s
Patient Isolation (defibrillation proof):	
	Type CF: ECG, RESP, SpO <sub>2</sub> , NIBP
	Type BF: CO <sub>2</sub>
<b>Respiration</b>	
Method:	Trans-thoracic impedance
Range:	Adult: 0 to 200 rpm
	Pediatric, neonate: 0 to 200 rpm
Resolution:	1 rpm
<b>SpO<sub>2</sub> Pulse Oximetry</b>	
<b>Mindray SpO<sub>2</sub></b>	
Range:	0 to 100%
Resolution:	1%
PR Range:	20 to 300 bpm
<b>Nellcor SpO<sub>2</sub></b>	
Range:	1 to 100%
Resolution:	1%
PR Range:	20 to 300 bpm.
<b>NIBP</b>	
Operating mode:	Manual, Auto, STAT
Static pressure range:	0 to 300 mmHg
Displayed Pressures:	Systolic, Diastolic, Mean
Cuff inflation pressure(Default):Adult:	160 $\pm$ 5 mmHg
	Pediatric: 140 $\pm$ 5 mmHg
	Neonate: 90 $\pm$ 5 mmHg
<b>CO<sub>2</sub></b>	
Measurement range:	0 to 150 mmHg
Resolution:	1 mmHg
awRR measurement range:	0 to 150 rpm
awRR accuracy:	0<60 rpm: $\pm 1$ rpm
	60 to 150 rpm: $\pm 2$ rpm

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